Asia-Pacific
Economic Cooperation

Asia-Pacific
Legal Metrology Forum

Handbook on Law Enforcement Equipment for Measuring the Speed of Vehicles Workshop

APEC/APLMF Training Courses in Legal Metrology
(CTI 09/2009T)

June 22 – 25, 2009
Chinese Taipei

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Group photo

Photos taken during the training course

Contents

Foreword

This booklet is one of outcomes of the APEC/APLMF Seminars and Training Courses in Legal Metrology (CTI 09/2009T) titled "Workshop on Law Enforcement Equipment for Measuring the Speed of Vehicles" which was held on June 22 – 25, 2009 at the Leader Hotel, Taipei, Chinese Taipei.

This workshop was organized by APLMF and supported by Bureau of Standards, Metrology and Inspection (BSMI), Electronics Testing Center (ETC), Center for Measurement Standards (CMS) and Industrial Technology Research Institute (ITRI) of Chinese Taipei. I would like to extend my sincere gratitude to colleagues of BSMI and other staffs for their outstanding preparation and speakers from member economies for their contributions. Also, special thanks should be extended to the Program Director Toni Widhiastono and Program Executive, Ms. Joyce Yong form APEC Secretariat for their tremendous supports.

APLMF secretariat has conducted the survey among the APEC member economies concerning seminar and training programs in legal metrology to find their needs as well as possible resources available in the region. The survey showed that with the extensive use of various kinds of vehicle speed measuring instrument in the public safety area, there is a strong demand on how to establish the reliable metrological infrastructure, developed traceable measuring standard, provide solid proof for law enforcement in this important field.

I would like to emphasis that it is the first time that this workshop on law enforcement equipment for measuring the speed of vehicles. The main objective of this workshop is to assist APEC and APLMF member economies in developing common understanding about the basic knowledge on various of the vehicle speed measuring instruments, the current international and or domestic standards/regulations on vehicle speed measuring instrument and thus to meet the APEC objective of harmonizing metrology legislation with OIML international recommendations. The participants of this workshop included officials in charge of type approvals and/or regulation of vehicle speed measuring instruments, officials from the law enforcement agencies and National Metrology Institutes (NMIs) as well.

During this workshop, the participants introduced the current control measures pattern approval, verification and calibration and the further development on vehicle speed measuring instruments of various speedometers. Representatives of the APEC/APLMF economies presented at the workshop suggested to continue to work together, and by sharing as much information as

possible through the APEC/APLMF forum, to progress the common objective of developing further standards to support and progress this important field of legal metrology.

In view of the special metrological characteristics and role of vehicle speed measuring instrument, legal meteorology would like to work closely with authorities such as police agencies and transportation agencies which make use of these instrument for legal purposes, in order to ensure the accuracy of such instruments.

Due to the great contributions from the trainers and speaker as well as the effective collaboration between the BSMI and APLMF Secretariat, I would like to say that this training course is certainly a fruitful activity!

Finally, I would like to express my deeply appreciate again to the APEC Secretariat's generosity in contributing to the development in legal metrology among the APLMF member economies.

Sept. 5, 2009

Mr. Pu Changcheng
APLMF President

Summary Report

Nowadays, speed measurement devices have been widely used by traffic and police agencies in order to reduce road fatalities. Life is precious. The benefits of such reduction in fatalities are so huge and difficult to quantify. However, whether the device could serve its purpose effectively heavily relies on its accuracy.

In view of the benefits of speed measurement devices contributing to society, they had been brought into attention at the 15th APLMF meeting. Based on the discussion of 15th APLMF Meeting, the first workshop on Law Enforcement for Measuring the Speed of Vehicles was held on June 22 – 25, 2009 at the Leader Hotel in Taipei, Chinese Taipei. This workshop aims to bring the experts from member economies together to share the information such as control system, the legal metrology regulations as well as standards and test procedures in their economies and present their views. Manufacturers also attended and presented the development of the device and their views on the control system.

There were forty-three participants, including the five chairs and co-chairs, attended the workshop from the following ten economies: Australia (1), P. R. China (1), Hong Kong China(1), Indonesia(4), German(2), Malaysia(1), Papua New Guinea(1), Thailand(1), Viet Nam(1) and Chinese Taipei(30), where ( ) indicates the number of participants from the economy. The attendance from Chinese Taipei included supporting staff members from Bureau of Standards, Metrology and Inspection (BSMI) and two chairs from the Taiwan University, which is one of the leading universities in Asia. Some of the speakers were supported with travel fund by APEC or APLMF. As the host economy, BSMI provided the venue, transportation, field trips and meals. In addition to APLMF and APEC, the workshop was also supported by BSMI, Electronics Testing Center, Taiwan (ETC) and Center for Measurement Standards (CMS), Industrial Technology Research Institute (ITRI).

On Monday morning, June 22, the workshop started off with the opening ceremony. Mr. GUO Su, the APLMF secretary and I, on behalf of the host economy, delivered welcome speeches to all the participants. After the opening ceremony, the following topics were presented by speakers and discussed with all participants for three days. A list of all sessions and presentations is given in Table 1.

Table 1 List of Topics and Presentations in the workshop

Session 1: Current Control Measures in Member Economies Chair: Mr. Brian C. S. Shu, Co-chair: Dr. Sen-Fuh Chang	
1.1	Current Control Measures in Australia Dr. Richard Brittain (NMIA, Australia)

1.2	Speed Meters——the situation in P. R. China Mr. Sun Qiao (NIM, P. R. China)
1.3	Current Control Measures in Indonesia Ms. Sri Rahayu Ayu (DoM, Indonesia)
1.4	Overview of Current Control Measures in Malaysia Dr. Ahmad Sahar Omar (NML-SIRIM, Malaysia)
1.5	Current Control Measures in Papua New Guinea Mr. Joe Magur Panga (PNGNISIT, Papua New Guinea)
1.6	Current Control Measures in the Philippines Mr. Samuel Socrates A. Solidarios (NML-ITDI, Philippines)
1.7	Current Legal Measures on Speed Measurement Instruments in Chinese Taipei Mr. Jin-hai Yang (BSMI, Chinese Taipei)
1.8	Legal Metrology Systems in Thailand
1.9	Speedometer verification and management in Viet Nam Mr. Do Duc Luong (VMI, Viet Nam)
Session 2: Pattern Approval (Radar Speedometers/Laser Speedometers/Inductive Loop Detectors) **Chair: Dr. Chen-Kang Huang, Co-chair: Dr. Sen-Fuh Chang**	
2.1	Dr. Sun Qiao (NIM, P. R. China)
Session 3: Verification and Calibration Technology (Radar Speedometers/Laser Speedometers/Inductive Loop Detectors) **Chair: Dr. Chen-Kang Huang, Co-chair: Dr. Sen-Fuh Chang**	
3.1	Dr. Richard Brittain (NMIA, Australia)
3.2	Dr. Yu-Yi Cheng (CMS, ITRI, Chinese Taipei)
3.3	Mr. Gwo-Jen Wu (CMS, ITRI, Chinese Taipei)
3.4	Mr. Toby Ting (ETC, Chinese Taipei)
Session 4: Harmonization with International Standards **Chair: Dr. Chen-Kang Huang, Co-chair: Dr. Sen-Fuh Chang**	
4.1	Dr. Richard Brittain (NMI, Australia)

Session 5: Future Development **Chair: Dr. Richard Brittain, Co-chair: Dr. Sen-Fuh Chang**	
5.1	Measuring Instruments Mr. Andreas Behrens (ROBOT, Germany)
Session 6: Summary **Chair: Dr. Sen-Fuh Chang** **Co-chair: Mr. Brian C. S. Shu/Dr. Richard Brittain**	
Field Trip	
6.1	Technical visit to Electronics Testing Center, Taiwan
6.2	Technical visit to Centre for Measurement Standards, Industrial Technology Research Institute

At the end of all discussions, a summary session was arranged on Wednesday chaired by Dr. San-Fu Chang, professor of Department of Bio-Industrial Mechatronics Engineering of Taiwan University to summarize all topics and to discuss future planning for this issue. In the summary discussion, a lot of valuable suggestions and requests for the future were proposed as followings:

(1) The importance of good legal metrology infrastructure to support legally traceable measurements of vehicle speed for law enforcement purposes;

(2) The common problems faced by member economies in achieving legally traceable measurements of vehicle speed;

(3) The urgent need for further standards to support this field of legal metrology in the region; and

(4) The benefits of APEC/APLMF economies working together to address this need.

Representatives of the APEC/APLMF economies present at the workshop suggested to continue to work together, and by sharing as much information as possible through the APEC/APLMF forum, to achieve the common objective of developing further standards to support and progress this important field of legal metrology.

Right after the summary session, the workshop was concluded with a closing ceremony by Mr. Lai-Ho Huang, Deputy Director General of BSMI and Dr. ZHANG Chao, APLMF Secretary.

On Thursday, June 25, a Lab tour was arranged to visit ETC and CMS, which are designated institutes by BSMI to carry out the verification and inspection of speed measurement instruments. The test procedures were demonstrated and the participants showed great interests in the procedures and facilities.

In addition to the above activities, the friendship was enhanced among all the participants by taking a boat tour and singing Karaoke together at the welcome dinner on Dian-shui River, which is famous for its sunset and by attending the farewell dinner to enjoy Chinese seafood.

This workshop on speed measurement instruments was the first time to be held by APLMF. BSMI would like to express our sincere and deepest gratitude to the hard work and dedicated support provided by the APLMF secretariat, especially to Dr. ZHANG Chao and Mr. GUO Su. We also greatly appreciate all participating economies as well as all participants, who provided informative presentations and valuable suggestions during the workshop. Among the economies, we particular appreciate Dr. Richard Brittain of NMI, Australia for presiding some of the sessions and his great contributions.

Dr. Jay-san Chen
Director General
BSMI

APEC/APLMF Seminars and Training Courses in Legal Metrology
(CTI 09/2009T)

Workshop on
Law Enforcement Equipment for Measuring the Speed of Vehicles

June 22 – 25, 2009
at the Leader Hotel in Taipei, Chinese Taipei

Program

1. Organizers:

1. Asia-Pacific Economic Cooperation (APEC)
2. Asia-Pacific Legal Metrology Forum (APLMF)

2. Supporting Organizations:

1. Bureau of Standards, Metrology and Inspection (BSMI)
2. Electronics Testing Center (ETC)
3. Center for Measurement Standards (CMS), Industrial Technology Research Institute (ITRI)

3. Main Objective of the Workshop:

The main target of this workshop is to assist APEC and APLMF member economies in developing common understanding about the current standards and regulations on speedometers and thus to meet the APEC objective of harmonizing metrology legislation with OIML international recommendations. Officials in charge of type approvals and/or regulation of speedometers are expected to attend the workshop. The lectures would be focused on the understanding of basic construction of speedometers and current international or national standards and regulations related to speedometers.

4. Topics:

1 Current Control Measures in Member Economies

2 Pattern Approval

2.1 Radar Speedometers
2.2 Laser Speedometers
2.3 Inductive Loop Detectors

3 Verification and Calibration Technology

3.1 Radar Speedometers

3.2 Laser Speedometers
3.3 Inductive Loop Detectors

4 Harmonization with International Standards

4.1 Related International Standards
4.2 Status of Harmonization in Member Economies

5 Future Development

5.1 Measuring Instruments
5.2 Verification and Calibration Technology

5. Venue and Accommodation:

- **Leader Hotel-Taipei**
  No. 83, Sec. 4, Roosevelt Rd., Taipei 106, Chinese Taipei
  Telephone: (886-2) 8369-2858
  Fax: (886-2) 8369-2859
  http: //www. leaderhotel. com/taipei

- **Accommodations**
  Accommodation for the participants will be prepared in the Leader Hotel-Taipei on request from the participant at a rate of **NT$2,500 (about US$70).** Please complete the "**Hotel Reservation Form**" to make the reservation by **May 20, 2009**.

6. Registration:

- Please complete the attached "**Registration Form**" and send it to the APLMF Secretariat by **April 30, 2009** (chairs/speakers)/**May 20, 2009** (other participants).

7. Passport, Entry permission:

- Every participant will be required to hold a valid passport for entry into Chinese Taipei. Some foreign nationals are granted automatic entry permission upon arrival.
- In case that an entry permission is required, please complete the attached "**Entry permission Assistance Form**" and send it to the host (BSMI) by **May 25, 2009**. On your request, the host will send an official 'letter of invitation' to participants for entry permission application at the Trade and Cultural Offices of Chinese Taipei in the participants' country.
- For more information, please visit the Bureau of Consular Affair's website at http: // www. boca. gov. tw/english/index. htm.

8. Access Information:

- **Leader Hotel-Taipei** is about 45 kilometers from Taoyuan International Airport (the CKS Airport). We recommend you to take the "Air Bus" that runs every 30 minutes, and it would take about 70 minutes from the **CKS Airport** to downtown, **Taipei Main Station**, at a cost of NT$145 and then you can transfer to **Taipei MRT** (get off at **Gongguan Station**) about NT$20 or take a taxi about NT$170 to the Leader Hotel-Taipei (立德飯

店/立德台大尊賢會館，台北市羅斯福路四段 83 號).

- **Taxis** are convenient and relatively inexpensive. However, most taxi drivers in Taipei do not speak English. It is most helpful to have your intended locations written in Chinese for the driver.

9. Currency and Credit Cards:

The currency in Chinese Taipei is New Taiwan Dollars. Coin denominations are NT$1, NT$5, NT$10, NT$20, and NT$50. Bill denominations are NT$100, NT$200, NT$500, NT$1,000, and NT$2,000. The current exchange rate for NT dollar is about US$1 = NT$35. Foreign currency and traveler's checks can be exchanged at most banks. International credit cards such as VISA, American Express, Diner Club or Master Card are accepted in most hotels, restaurants, department stores and shops.

10. Climate and Clothing:

The weather in Taipei in June is warm. The average temperature is about 28 Celsius degree. Please visit the website of the Central Weather Bureau (http://www.cwb.gov.tw/V5e/index.htm) for details.

11. Electricity Supply:

The electricity supply in Chinese Taipei is 110V/60Hz. In some cases, 220V/60Hz might also be available. Always check the power supply if you have any questions.

12. Local Time:

Local time in Chinese Taipei is GMT + 8hrs.

13. Contact Persons about the Seminar:

- **APLMF Secretariat** (registration and travel support)
  Ms. ZHENG Huaxin, Dr. Zhang Chao and Mr. Guo Su
  APLMF Secretariat
  AQSIQ No. 9, Madiandonglu, Haidian District, Beijing 100088, P. R. China
  Tel: +86-10-8226-0335
  Fax: +86-10-8226-0131
  E-mail: sec@aplmf.org aplmf@aqsiq.gov.cn

- **Host in Chinese Taipei**
  Ms. Meggie Chu
  Bureau of Standards, Metrology and Inspection (BSMI), 7F, No. 20, Nanhai Road, Taipei 100, Chinese Taipei
  Tel: +886-2-2396-3360 ext. 738
  Fax: +886-2-2397-0715
  E-mail: meggie.chu@bsmi.gov.tw metrology@bsmi.com.tw

Program

Day 1 June 22, Monday Room B01&B02	09：30-10：30	*Registration*
	10：30-10：40	Welcoming Remarks from the host by Dr. Jay-San Chen (Director General of BSMI)
	10：40-10：50	Welcoming Remarks from APLMF Secretariat
	10：50-11：00	Group Photo
	Session 1：Current Control Measures in Member Economies Chair：Mr. Brian C. S. Shu，Co-chair：Dr. Sen-Fuh Chang	
	11：00-12：00	Current Control Measures in Australia Dr. Richard Brittain (NMIA, Australia)
	12：00-13：30	*Lunch break*
	13：30-15：00	Speed Meters-the situation in P. R. China Mr. Sun Qiao (NIM, P. R. China)
		Current Control Measures in Indonesia Ms. Sri Rahayu Ayu (DoM, Indonesia)
		Overview of Current Control Measures in Malaysia Dr. Ahmad Sahar Omar (NML-SIRIM, Malaysia)
		Current Control Measures in Papua New Guinea Mr. Joe Magur Panga (PNGNISIT, Papua New Guinea)
	15：00-15：30	*Coffee break*
	15：30-16：00	Current Control Measures in Philippines Ms. Prapussorn Moungmee (DIT-CBWM, Thailand)
	16：50	*Leave hotel lobby for the welcome dinner by bus*
	18：15-20：30	*Welcome Dinner hosted by the BSMI*
Day 2 June 23, Tuesday Room B01&B02	**Session 1：Current Control Measures in Member Economies Chair：Mr. Brian C. S. Shu，Co-chair：Dr. Sen-Fuh Chang**	
	9：30-10：15	Speedometer verification and management in Viet Nam Mr. Do Duc Luong (VMI, Viet Nam)
		Current Legal Measures on Speed Measurement Instruments in Chinese Taipei Mr. Jin-hai Yang (BSMI, Chinese Taipei)
	10：15-10：30	**Discussions and key points**
	10：30-11：00	*Coffee break*

Day 2 June 23, Tuesday Room B01&B02	**Session 2: Pattern Approval (Radar Speedometers/Laser Speedometers/Inductive Loop Detectors)** **Chair: Dr. Chen-Kang Huang, Co-chair: Dr. Sen-Fuh Chang**	
	11 : 00-11 : 30	Dr. Richard Brittain (NMIA, Australia)
	11 : 30-11 : 45	Mr. Sun Qiao (NIM, P. R. China)
	11 : 45-12 : 00	**Discussions and key points**
	12 : 00-13 : 30	*Lunch break*
	Session 3: Verification and Calibration Technology (Radar Speedometers/Laser Speedometers/Inductive Loop Detectors) **Chair: Dr. Chen-Kang Huang, Co-chair: Dr. Sen-Fuh Chang**	
	13 : 30-14 : 00	Dr. Richard Brittain (NMIA, Australia)
	14 : 00-14 : 30	Dr. Yu-Yi Cheng (CMS, ITRI, Chinese Taipei)
	14 : 30-15 : 00	Mr. Gwo-Jen Wu (CMS, ITRI, Chinese Taipei)
	15 : 00-15 : 30	*Coffee break*
	15 : 30-16 : 00	Mr. Toby Ting (ETC, Chinese Taipei)
	16 : 00-16 : 30	**Discussions and key points**
	Session 4: Harmonization with International Standards (Related International Standards/Status of Harmonization in Member Economies) **Chair: Dr. Chen-Kang Huang, Co-chair: Dr. Sen-Fuh Chang**	
	16 : 30-16 : 45	Dr. Richard Brittain (NMIA, Australia)
	16 : 45-17 : 15	**Discussions and key points**
Day 3 June 24, Wednesday Room B01&B02	**Session 5: Future Development** **Chair: Dr. Richard Brittain, Co-chair: Dr. Sen-Fuh Chang**	
	09 : 30-10 : 00	5. 1 Measuring Instruments Mr. Andreas Behrens (ROBOT, Germany)
	10 : 00-10 : 30	5. 2 Verification and Calibration Technology Mr. Marc Lamy (ROBOT, Germany)
	10 : 30-11 : 00	*Coffee break*
	11 : 00-11 : 30	**Discussions and key points**
	11 : 30-13 : 30	*Lunch break*

Day 3 June 24, Wednesday Room B01&B02	**Summary** **Chair: Dr. Sen-Fuh Chang, Co-chair: Mr. Brian C. S. Shu/Dr. Richard Brittain**	
	13：30-14：30	**Discussions on summarizing all topics**
	14：30-15：00	*Coffee Break*
	15：00-15：30	Closing ceremony (Mr. Huang, Deputy Director General of BSMI and APLMF Secretariat)
	15：30	Workshop Adjourned
Day 4 June 25, Thursday	09：30	*Leave hotel lobby for the technical visit by bus*
	10：00-12：00	Technical visit to Electronics Testing Center (ETC), Chinese Taipei
	12：00-13：30	*Lunch break*
	13：30-16：30	Technical visit to Center for Measurement Standards (CMS), Industrial Technology Research Institute (ITRI)
	18：30-20：30	*Farewell Dinner hosted by the APLMF*

Participants List
APEC/APLMF Seminar and Training Courses in Legal Metrology (CTI-09/2009T)
Workshop on Law Enforcement Equipment for Measuring the Speed of Vehicles

No.	Category	Economy	Name	Organization
1	APLMF	P. R. China	Mr. Guo Su	APLMF Secretary, Department of Metrology, AQSIQ
2	APLMF	P. R. China	Dr. Zhang Chao	APLMF Secretary, Department of Metrology, AQSIQ
3	Chair	Chinese Taipei	Mr. Brian C. S. Shu	Deputy Director, 4th Division, Bureau of Standards, Metrology and Inspection (BSMI), Ministry of Economic Affairs
4	Chair	Chinese Taipei	Dr. Chen-Kang Huang	Dept. of Bio-Industrial Mechatronics Engineering, Taiwan University
5	Chair	Chinese Taipei	Dr. Sen-Fuh Chang	Dept. of Bio-Industrial Mechatronics Engineering Taiwan University
6	Chair	Australia	Dr. Richard Brittain	National Measurement Institute
7	Speaker	P. R. China	Mr. Sun Qiao	National Institute of Metrology, General Administration of Quality Supervision, Inspection and Quarantine
8	Speaker	Malaysia	Dr. Ahmad Sahar Omar	National Metrology Laboratory, SIRIM Berhad (NML-SIRIM)
9	Speaker	Indonesia	Ms. Sri Rahayu Ayu	Directorate of Metrology, Ministry of Trade
10	Speaker	Philippines	Mr. Samuel Socrates A. Solidarios	NATIONAL METROLOGY LABORATORY - INDUSTRIAL TECHNOLOGY DEVELOPMENT INSTITUTE

11	Speaker	Thailand	Ms. Prapussorn Moungmee	Northern weights and Measures Center (Chiang Mai)
12	Speaker	Viet Nam	Mr. Do Duc Luong	Viet Nam Metrology Institute
13	Speaker	Papua New Guinea	Mr. Joe Magur Panga	Papua New Guinea National Institute of Standards & Industrial Technology (PNGNISIT)
14	Speaker	H. K. China	Mr. WONG Tai Wai	Government Laboratory
15	Speaker	Indonesia	Mr. Wayan Ariada	Directorate of Metrology, Ministry of Trade
16	Speaker	Indonesia	Mr. H. Fauzi Nor	Regional Verification Office of East Kalimantan
17	Speaker	Indonesia	Mr. Warsito Fauzi	Regional Verification Office of East Kalimantan
18	Speaker	Germany	Mr. Andreas Behrens	ROBOT Visual Systems GmbH
19	Speaker	Australia	Mr. Marc Lamy	ROBOT Visual Systems GmbH
20	Speaker	Chinese Taipei	Mr. Jin-hai Yang	2nd Section, 4th Division, Bureau of Standards, Metrology and Inspection (BSMI), Ministry of Economic Affairs
21	Speaker	Chinese Taipei	Mr. Toby Ting	Measurement/Calibration Technology Department Electronics Testing Center, Chinese Taipei
22	Speaker	Chinese Taipei	Dr. Yu-Yi Cheng	Center for Measurement Standards (CMS), Industrial Technology Research Institute (ITRI)

23	Speaker	Chinese Taipei	Mr. Gwo-Jen Wu	Center for Measurement Standards (CMS), Industrial Technology Research Institute (ITRI)
24	Local	Chinese Taipei	Mr. Peter Huang	Taipei Measuring Instruments Association
25	Local	Chinese Taipei	Mr. Bo-Chang Su	1st Section, 4th Division, Bureau of Standards, Metrology and Inspection (BSMI)
26	Local	Chinese Taipei	Mr. Chiung-Ting Kuo	1st Section, 4th Division, Bureau of Standards, Metrology and Inspection (BSMI)
27	Local	Chinese Taipei	Mr. Hsien-Liang Chen	2nd Section, 4th Division, Bureau of Standards, Metrology and Inspection (BSMI)
28	Local	Chinese Taipei	Mr. Lin-I Yeh	2nd Section, 4th Division, Bureau of Standards, Metrology and Inspection (BSMI)
29	Local	Chinese Taipei	Mr. Tu Hsiao Pu	7th Division, Bureau of Standards, Metrology and Inspection (BSMI)
30	Local	Chinese Taipei	Mr. Chen Cheng Kuo	7th Division, Bureau of Standards, Metrology and Inspection (BSMI)
31	Local	Chinese Taipei	Mr. Ju-Chia, Chen	7th Division, Bureau of Standards, Metrology and Inspection (BSMI)
32	Local	Chinese Taipei	Mr. Tsung-Yi Tsai	Police Agency, Ministry of the Interior
33	Local	Chinese Taipei	Mr. Lu, Sung-Lin	Police Agency, Ministry of the Interior
34	Local	Chinese Taipei	Ms. Susan Fu	Police Agency, Ministry of the Interior
35	Local	Chinese Taipei	Mr. Smith Tsao	RASER TECHNOLOGY CO., LTD.
36	Local	Chinese Taipei	Mr. Jimmy Tie	RASER TECHNOLOGY CO., LTD.
37	Local	Chinese Taipei	Mr. Humphrey Kuo	Hyndai Trading Company
38	Local	Chinese Taipei	Mr. Matthias Chu	CONFUCIAN CO., LTD.
39	Local	Chinese Taipei	Mr. Gino Hsu	Information Field Co., Ltd.

40	Local	Chinese Taipei	Mr. S. C. Lin	Central Percific
41	Local	Chinese Taipei	Mr. Horace Lee	Maxgain International Technology Co., Ltd.
42	Local	Chinese Taipei	Mr. Mark Chen	Comprofit Technology Co., Ltd.
43	Local	Chinese Taipei	Mr. Molei Chen	M. Precedency Co., Ltd.
44	Local	Chinese Taipei	Mr. Norman Chen	M. Precedency Co., Ltd.
45	Host	Chinese Taipei	Dr. Jay-San Chen	Director General, Bureau of Standards, Metrology and Inspection (BSMI)
46	Host	Chinese Taipei	Mr. Chou, Chun-Jung	Director, 4th Division, Bureau of Standards, Metrology and Inspection (BSMI)
47	Host	Chinese Taipei	Mr. Jenn-Chyi Yang	Section Chief, 3rd Section, 4th Division, Bureau of Standards, Metrology and Inspection (BSMI)
48	Host	Chinese Taipei	Ms. Meggie Chu	3rd Section, 4th Division, Bureau of Standards, Metrology and Inspection (BSMI)
49	Host	Chinese Taipei	Ms. Ching-Ru Lu	3rd Section, 4th Division, Bureau of Standards, Metrology and Inspection (BSMI)

Australian Government
National Measurement Institute

Wednesday 18th February 2009

Introduction to Legal Metrology

Dr Richard Brittain LLB,
Executive Officer, Legal Metrology

measurement.gov.au

Topics

- what is legal metrology?
- brief time-line of legal metrology
- brief overview of the national measurement/legal metrology system
- Australia in the international measurement/legal metrology system
- OIML—— the International Organization of Legal Metrology
- national measurement legislation
- introduction to legal metrology concepts
- questions/discussion

Aims

To give staff an understanding of:

- what legal metrology is
- the scope of legal metrology
- how/why the discipline of legal metrology developed
- the key concepts
- how/why legal metrology concepts differ from some classic scientific concepts
- role/responsibility of the NMI wrt legal metrology
- role/responsibility of NMI staff wrt legal metrology
- reassurance legal metrology no threat/alternative to other scientific activities

What is legal metrology?

1) OIML Website

- Legal metrology is the entirety of the legislative, administrative and technical procedures established by, or by reference to public authorities, and implemented on their behalf in order to specify and to ensure, in a regulatory or contractual manner, the appropriate quality and credibility of measurements related to official controls, trade, health, safety and the environment.

What is legal metrology?

2) OIML: *International Vocabulary of Terms in Legal Metrology*

- Part of metrology relating to activities which result from statutory requirements and concern measurement, units of measurement, measuring instruments and methods of measurement and which are performed by competent bodies.

Australian Government
National Measurement Institute
Introduction to Legal Metrology Wednesday 18th February 2009

What is legal metrology?

3) General legal definition

- all measurements required or permitted by law.

Australian Government
National Measurement Institute
Introduction to Legal Metrology Wednesday 18th February 2009

What is Legal Metrology?

Examples

- measurements which are subject to regulation by law or government decree
- measurements made for trade
- measurements made for health and safety e.g. sound level meters and radiation dosimeters
- measurements made for traffic regulation e.g. speed, size, weight and breathalysers; and
- measurements made for contractual purposes; *inter alia*

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Brief Time-Line of Legal Metrology

International Organization of Legal Metrology (OIML)

- 1937 International Conference of Metrology in Paris
- 37 countries represented
- term "**legal metrology**" adopted for units, methods, instruments for trade or public safety
- 1955 International Convention of Legal Metrology ratified
- 1958 OIML established
- 1959 entered in to force in Australia (17th September)

Brief Overview of National Measurement/Legal Metrology System(s)

- National Measurement Institute (NMI)
- National Association of Testing Authorities (NATA)
- Standards Australia
- units of measurement
- hierarchy of standards
- legal traceability of measurement
- measurements in industry, commerce and the community

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Australia's National Measurement/Legal Metrology System

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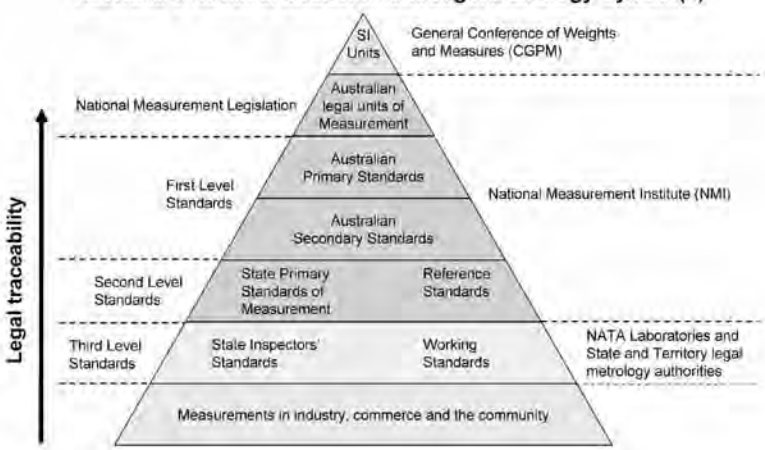
Australia's National Measurement/Legal Metrology System(s)



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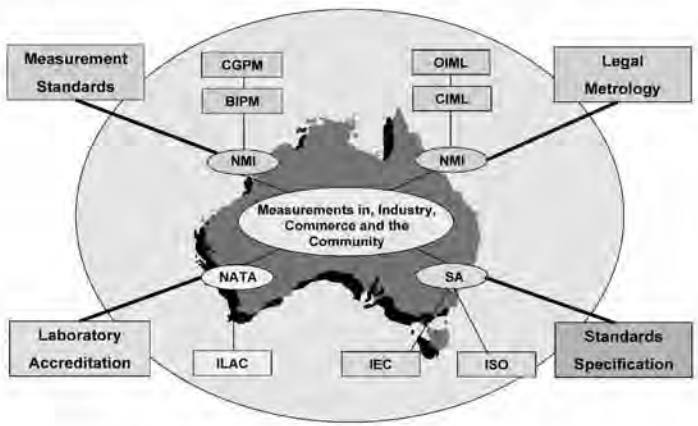
Australia in the International Measurement/Legal Metrology System

- International Bureau of Weights and Measures (BIPM)
- International committee for Weights and Measures (CIPM)
- General Conference of Weights and Measures (CGPM)
- International Organization of Legal Metrology (OIML)

  and
- ILAC
- IEC
- ISO

Australia in the International Measurement/Legal Metrology System(s)



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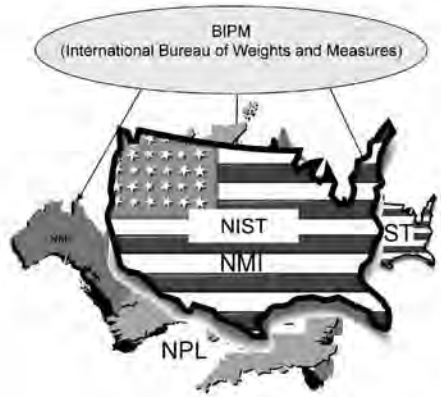

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International Organisation of Legal Metrology (OIML)

aims:

- establish general principles of legal metrology
- unify international laws and regulations on legal metrology
- resolve international problems concerning legal metrology
- draft model laws and regulations for measuring instruments and their use
- develop model organisations for verification and checking of measuring instruments
- encourage cooperation between national metrology laboratories
- specify preferred characteristics and qualities of measuring instruments

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International Organization of Legal Metrology (OIML)

Components:

- BIML which carries out the organisation's work
- International Committee of Legal Metrology (CIML) supervises and advises BIML
- International Conference of Legal Metrology meets to vote on important matters
- 59 countries are full members of OIML (as at 28/8/2008)
- 57 countries are corresponding members (as at 28/8/2008)

International Organisation of Legal Metrology (OIML)

Recommendations for member countries:

- National legal metrology service

Functions:

- to maintain and guarantee the accuracy of the national standards
- to carry out scientific work on all forms of measurement
- to draft laws about legal metrology
- to regulate, advise, supervise and control the making and repair of measuring instruments used in trade or to ensure public safety

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International Organisation of Legal Metrology (OIML)

Functions contd...:

- to check the way in which these instruments are used where the public is concerned
- to detect fraudulent use of measuring instruments
- to coordinate the activities of other organisations concerned in legal metrology
- to organise the teaching of legal metrology
- to represent the country in international matters concerning legal metrology

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International Organisation of Legal Metrology (OIML)

Departments of a national legal metrology service:

- A National Bureau of Legal metrology to direct national service (NMI)
- A National Institute of Legal Metrology to carry out scientific and research into legal metrology (NMI)
- A National Bureau of Verification (NMI) to supervise and coordinate the activities of the following offices and people...

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International Organisation of Legal Metrology (OIML)

Departments of a national legal metrology service contd...

- A Regional Verification Office, which supervises the work of all the local and other verification centres in its territory
- Local Verification Offices, to supervise the use of measuring instruments within a fixed area
- Mobile Verification Offices to check particular types of instruments within a locality
- For example, in Australia, we have mobile units to visit farms to test petrol pumps supermarket scales etc.

International Organisation of Legal Metrology (OIML)

Departments of a national legal metrology service contd...

- Verification Centres, to verify instruments where they are made or repaired
- Verification Officers, authorised to verify instruments
- Metrological Supervising Authorities, which are not part of the national service of legal metrology, but which have important duties connected with legal metrology
- in Australia the States and Territories perform the duties of the National Bureau of Verification

National measurement legislation:

- ***National Measurement Act 1960*** **(Cth)**
- ***National Measurement Regulations 1999*** **(Cth)**
- ***National Measurement Guidelines 1999*** **(Cth)**
- 1 July 2004 responsibility for maintenance and development transferred to legal metrology section of the NMI
- provision for national trade measurement system from1 July 2010

Introduction to Legal Metrology Concepts

- legal units of measurement (ALUMS)
- deeming
- pattern or (type) approval
- pattern compliance
- verification
- certification
- standards
- recognised-value standards
- trade measurement (use for trade)
- legal traceability
- legal metrology control systems
- legal metrology authorities

Australian legal units of measurement (ALUMS)

- sole legal units of measurement of a physical quantity in the jurisdiction of Australia
- Agreed by/at General Conference of Weights and Measures (CGPM)
- Represent international consensus as to the best scientific practice most/appropriate unit wrt to the measurement of a quantity

Australian legal units of measurement (ALUMS)

Deeming

- standards deemed equal to their denomination if two conditions are met:
- First —— they are within a prescribed range their nominal value (MPV —— maximum permissible variation)
- Second —— their value is determined within a prescribed uncertainty (MPU —— maximum permissible uncertainty)
- Standards of prescribed and appropriate class used to calibrate (or certify/verify) measuring instruments of an appropriate and prescribed class
- E.g. weighing scales in shops
- not used to promulgate values of physical quantities

Pattern or (type) approval

- applicable to measuring instruments rather than simple ***material measures***
- performed only once for each design of instrument
- Based on OIML recommendations
- used to check that measuring instruments to be used for legal purposed are fit for purpose i.e. that they operate within the agreed MPE (maximum permissible error) under field conditions
- confirms for how long a measuring instrument can hold a calibration and continue to measure within the MPE under field conditions i.e. recalibration period

Pattern compliance

- testing of production runs of pattern-approved measuring instrument to ensure that production instrument continue to comply with the approved pattern
- performed on a statistical instrument depending on how many instrument and manufactured and on method of manufacture

Verification

- reference standards of measurement —— certificate (reg 13)
- utility meters:
  —— initial verification only
  —— verification mark not certificate
- procedure that ascertains and confirms that the measuring instrument complies with the statutory requirements (VIML)
- statutory requirement:
  - MPE prescribed in the regulations for that type of ***measuring instrument*** or
  - MPE stated in pattern approval certificate for that model of ***measuring instrument***

Certification

- certified reference materials (CRMs)
- chemical standards
- reference material accompanied by an authenticated certificate, having for each specified quantity a value, measurement uncertainty, and stated metrological traceability chain (VIM 2004)
- certified measuring instruments
- pattern approved measuring instrument used for legal purpose other than trade
- certified in accordance with the regulations
- E.g. evidential breathanalysers (EBAs)

Legal Metrology Authorities

- Approving Authorities
- Certifying Authorities
  reference materials
  measuring instruments
- Verifying Authorities
  reference standards of measurement
  utility meters

Standards in Legal Metrology

- Australian primary standard of measurement
- Australian secondary standard of measurement
- recognized-value standard of measurement
- Certified reference materials
- State primary standard of measurement
- reference standard of measurement
  (cf standard of measurement)

Standards in Legal Metrology

National Measurement Act 1960 **(Cth)**
Section 3 Interpretation

standard of measurement means:

(a) a material measure, measuring instrument or measuring system designed or intended to define, realise, conserve or reproduce.

(i) a unit of measurement of a physical quantity; or

(ii) one or more known values of a physical quantity;

in order to transmit that unit or those values to measuring instruments by way of comparison; or

(b) a formula designed or intended to define the magnitude of a physical quantity.

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Standards in Legal Metrology

National Measurement Act 1960 **(Cth)**
Section 3 Interpretation

material measure means a thing designed or intended to conserve or reproduce, in a permanent manner during the use of the thing, one or more known values of a physical quantity.

measuring instrument means:

(a) a thing by means of which a measurement of a physical quantity may be made; or

(b) a component of such a thing.

- **measuring system** —— not defined

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Standards in Legal Metrology

National Measurement Act 1960 **(Cth)**
Section 3 Interpretation

material measure means a thing designed or intended to conserve or reproduce, in a permanent manner during the use of the thing, one or more known values of a physical quantity

Key words —— not defined in national measurement legislation:
designed
intended
conserve
reproduce
permanent manner
physical quantity

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Standards in Legal Metrology

National Measurement Act 1960 **(Cth)**
Section 3 Interpretation

measuring instrument means:

(a) a thing by means of which a measurement of a physical quantity may be made; or

(b) a component of such a thing.

Key words —— not defined in national measurement legislation:
physical quantity

Key words further defined in national measurement legislation:
component

Standards in Legal Metrology

National Measurement Act 1960 **(Cth)**
Section 3 Interpretation

component, in relation to a thing (in this definition called the ***basic thing***) by means of which a measurement of a physical quantity may be made, includes another thing (whether or not forming part of the basic thing) where:

(a) the basic thing is so designed or constructed as to include, or have associated with it, the other thing; and

(b) the other thing is designed or intended to do any or all of the following:

(i) carrying out a conversion of the result of a measurement made by the basic thing

(ii) calculating a number, tax or price by reference to the result of a measurement made by the basic thing

(iii) correcting the result of a measurement made by the basic thing

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Standards in Legal Metrology

(iv) providing or repeating information consisting of or relating to any or all of the following:

(A) the result of a measurement made by the basic thing

(B) a conversion of the result of a measurement made by the basic thing

(C) a calculation of a number, tax or price calculated by reference to the result of a measurement made by the basic thing

(v) controlling the measurement process carried out by the basic thing

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Standards in Legal Metrology

measuring system

not defined in national measurement legislation so has ordinary dictionary meaning

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Recognised-value standard

- Physical quantity assigned a value without verification
- value may not be absolutely correct
- useful to set a common measurement base line or value for legal purposes including trade
- examples:
  - acceleration due to gravity in a vacuum
  - acceleration due to gravity (National Measurement Laboratory, now NMI)
  - density of mercury
  - density of water
  - density of standard mean ocean water
  - velocity of electromagnetic waves in a vacuum
  - positions of the Australian fiducial network locations

Trade measurement (use for trade)

- ***use for trade,*** in relation to a measuring instrument, means use of the measuring instrument for either or both of the following purposes:
- (a) determining the consideration in respect of a transaction
- (b) determining the amount of a tax
- *National Measurement Act 1960* (Cth) s3(1)
- Basis of trade measurement system

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Legal traceability

- Legal traceability - the process whereby measurements made or used in Australia are referred through a chain of calibrations of appropriate and known uncertainty to the appropriate Australian primary standard of measurement in compliance with section 10 of the National Measurement Act 1960. (Cth)
- This prescriptive imperative effectively defines legal traceability in Australia by giving legal sanction to the national standards of measurement

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Legal traceability

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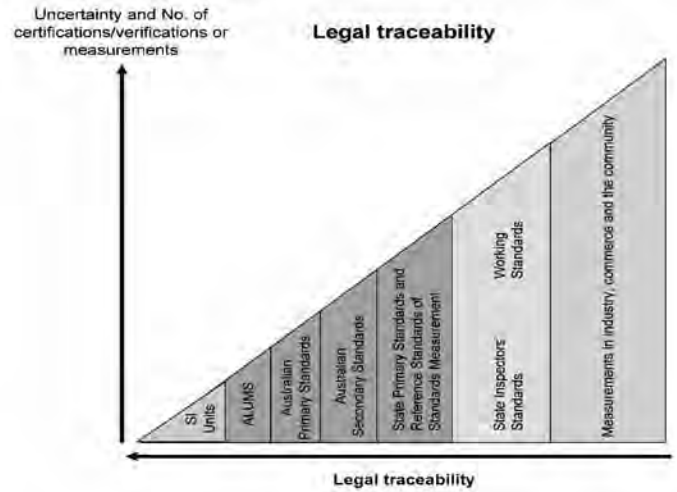
Legal traceability



Certificates as Evidence

Certificates issued by the Chief Metrologist and other Legal Metrology Authorities:

- *prima facie* evidence

taken to be:

- evidence of a matter stated in the certificate
- may be received in evidence in any court in Australia, State, Territory or Commonwealth
- may be received in evidence in any proceeding before a person authorised by law or the consent of the parties to receive and examine evidence

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Certificates as Evidence

Certificates issued by the Chief Metrologist and other Legal Metrology Authorities

Unless the contrary is established taken to have been:

- issued by the person by whom they purport to be issued;
- signed by the person by whom they purport to be signed; and
- the person by whom the certificate purports to be signed is taken to be a person authorised by law to sign such certificates.

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Legal metrology control system

- national pattern approval standard (written requirements based on OIML)
- pattern approval (granted by the NMI)
- conformity to type auditing
- uniform test procedures
- initial certification/verification
- subsequent certification/verification
- use for legal purposes i.e. to make legally traceable measurements

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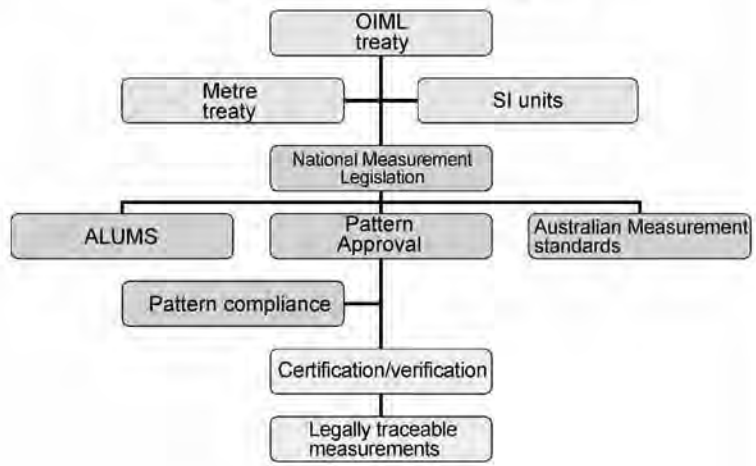
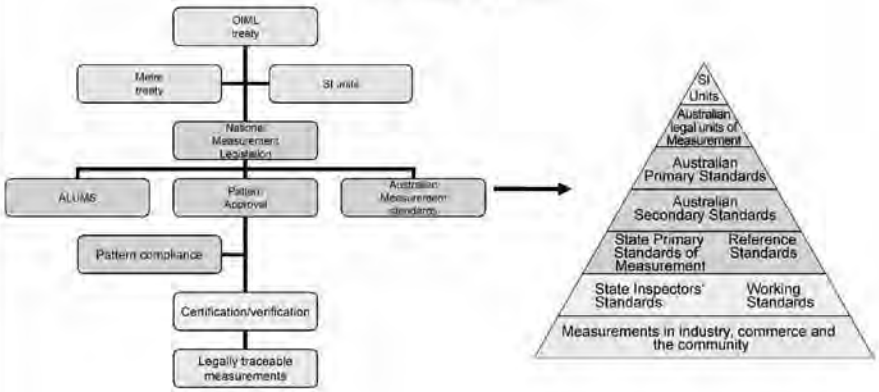
Legal metrology control system



Legal Metrology System



Legal Metrology Systems

1. Default system

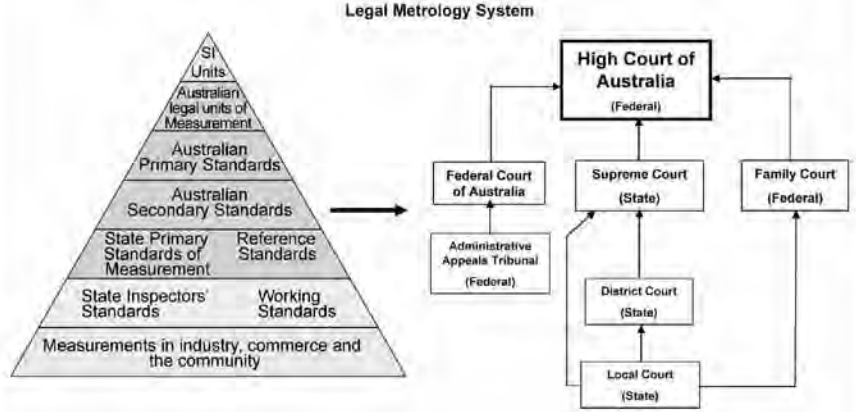
- no connection between technical infrastructure and legal system
- measurement disputes decided according to legal rather than scientific principles
- no safeguard against absurd but binding legal precedents

Legal Metrology Systems

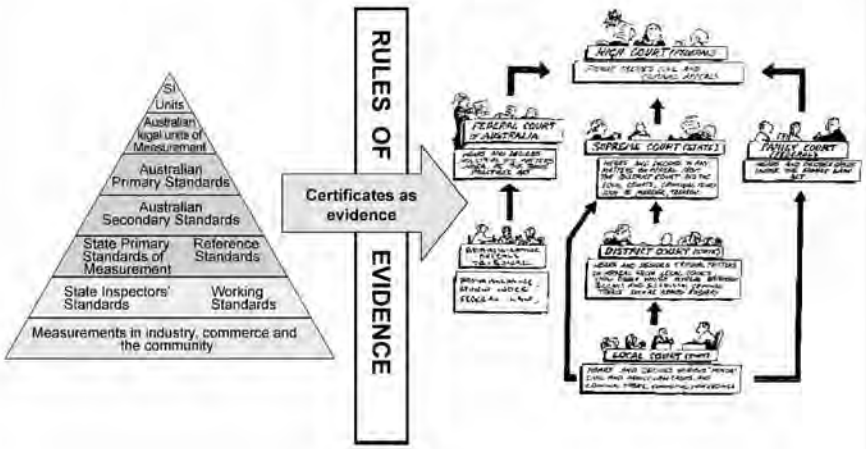
2. Planned system

- clear and deliberate connections between technical infrastructure and legal system
- legal obligations established for measurement
- means of introducing scientific material into legal system

Legal Metrology System



Legal Metrology System



Responsibilities of NMI Staff in Legal Metrology System

Secretary (DIISR)

- metrological functions of Commonwealth

Chief Metrologist

- metrological functions of Commonwealth (by delegation from Secretary)
- verifying authority for utility meters; and
- regulatory responsibility for utility meters (by delegation from Secretary)
- approving authority for measuring instruments generally
- certifying authority for measuring instruments generally
- certifying authority for reference materials generally
- verifying authority for standards of measurement generally

Responsibilities of NMI Staff in Legal Metrology System

NMI Senior Legal Metrology staff

- regulatory responsibility for utility meters (by delegation from Secretary)
- responsibility for appointment of legal metrology authorities and pattern approval (by delegation from the Chief Metrologist)

NMI Senior Physical Metrology staff

- responsibility for the verification of standards (by delegation from Chief Metrologist)
- responsibility for the certification of measuring instruments (by delegation from the Chief Metrologist when exercised)

NMI Senior Chem Bio Staff

- responsibility for certification of reference material (by delegation from Chief Metrologist)
- responsibility for varying the certification of reference material (by delegation from Chief Metrologist)

Scope of Legal Metrology

- section 10 does not mandate the compliance of every measurement made with its legal traceability imperative
- merely specifies how the legal traceability imperative can be met when required
- effectively four conditions to be satisfied before the traceability imperatives of section 10 apply:

1. The measurement must be for a legal purpose;
2. The measurement must be of a physical quantity;
3. There must be ALUMs for the physical quantity being measured; and
4. There must be a necessity to demonstrate legal traceability.

Scope of Legal Metrology

section 10 does not mandate the compliance of every measurement made with its legal traceability imperative

merely specifies how the legal traceability imperative can be met when required

- **first three conditions are largely routine and self explanatory**
- **condition (iv) is likely to be enlivened where results are challenged**
- **in particular when alternative results are produced in a dispute**
- **In this situation CMI, CRMs, RSM provide a statutory means of demonstrating compliance with section 10**

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Questions?

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Wednesday 25th February 2009

Legal Metrology Workshop

Dr Richard Brittain LLB,
Executive Officer, Legal Metrology

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Legal Metrology Workshop Objectives

To understand:

- the structure of our legal system
- what legislation is and the forms that it can take
- where legislation comes from
- how legislation is made and amended
- how Australia's suite of Commonwealth and State and Territory legislation fits together
- where to find the legislation; and
- how to interpret legislation

The Australian Constitution

provides for a "separation of powers" and establishes:

- the Commonwealth's legislative power "vested in a Federal Parliament, which shall consist of … a Senate, and a House of Representatives"
- the Commonwealth's executive power which is …exercisable by the Governor-General
- the Commonwealth's judicial power which is "vested in a Federal Supreme Court, to be called the High Court of Australia, and in such other federal courts as the Parliament creates"

The Australian Constitution

- establishing the Federal Parliament
- giving Federal Parliament its power to make laws
- establishing the judicial system
- establishing the High Court of Australia as the final court of appeal for matters up to and including determination of disputes about the meaning of the Constitution; and
- establishing the relationship between the Commonwealth and the States including which areas their legislatures control

Powers — Commonwealth and State

Commonwealth	State	Shared
marriage and divorce	land	marriage and divorce
bankruptcy	police	bankruptcy
defense	criminal law	
external affairs	education	
interstate and	health	
international trade	roads	
foreign, trading and	industrial safety	
financial corporations	prices and income	
etc.		

The Constitution

Part V. — Powers of Parliament

Legislative powers of the Parliament

51. The Parliament shall, subject to this Constitution, have power to make laws for the peace, order, and good government of the Commonwealth with respect to:

i. trade and commerce with other countries, and among the States
ii. taxation; but so as not to discriminate between States or parts of States
iii. bounties on the production or export of goods, but so that such bounties shall be uniform throughout the Commonwealth
iv. borrowing money on the public credit of the Commonwealth
v. postal, telegraphic, telephonic and other like services

The Constitution

Part V. — Powers of Parliament

Legislative powers of the Parliament contd...

vi. the naval and military defence of the Commonwealth and of the several States, and the control of the forces to execute and maintain the laws of the Commonwealth
vii. lighthouses, lightships, beacons and buoys
viii. astronomical and meteorological observations
ix. quarantine
x. fisheries in Australian waters beyond territorial limits
xi. census and statistics
xii. currency, coinage, and legal tender
xiii. banking, other than State banking; also State banking extending beyond the limits of the State concerned, the incorporation of banks and the issue of paper money

The Constitution

Part V. — Powers of Parliament

Legislative powers of the Parliament contd...

xiv. insurance, other than State insurance; also State insurance extending beyond the limits of the State concerned
xv. weights and measures
xvi. bills of exchange and promissory notes
xvii. bankruptcy and insolvency
xviii. copyrights, patents of inventions and designs, and trade marks
xix. naturalization and aliens
xx. foreign corporations, and trading or financial corporations formed within the limits of the Commonwealth
xxi. marriage
xxii. divorce and matrimonial causes; and in relation thereto, parental rights, and the custody and guardianship of infants

Forms of Legislation

- Acts
- Regulation
- Guidelines
- Rules
- Ordinances
- by-laws (or bye-laws)
- proclamations etc.

National measurement legislation:

- ***National Measurement Act 1960*** **(Cth)**
- ***National Measurement Regulations 1999*** **(Cth)**
- ***National Measurement Guidelines 1999*** **(Cth)**

Locating Legislation

- Annual Volumes of the Acts of Parliament
- Reprints of Acts
- Commercial Legislation Services
- Internet Law Information

  Australian Government:
  (http://scaleplus.law.gov.au)
  http://www.comlaw.gov.au

  the Australian Legal Information Institute:
  http://www.austlii.edu.au

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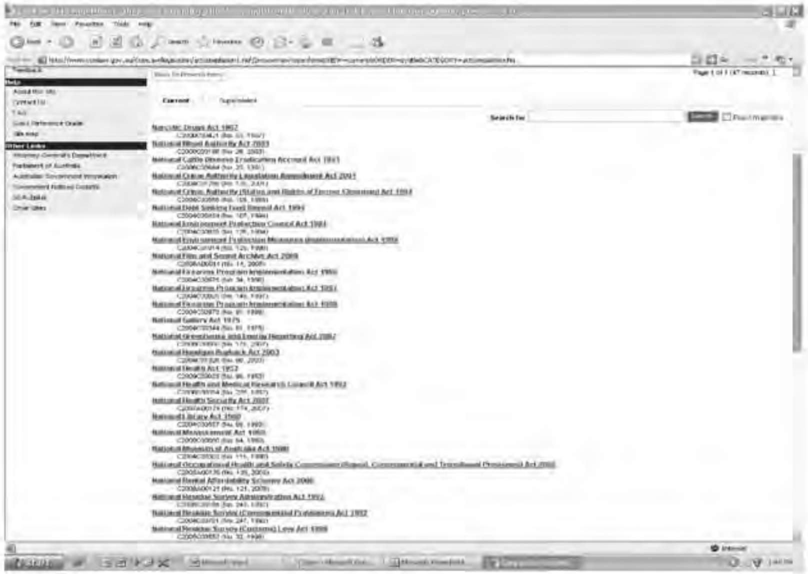

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Locating Legislation cont'd…

State Government legislation:

Australian Capital Territory legislation
http://www.legislation.act.gov.au

New South Wales legislation
http://www.legislation.nsw.gov.au

Northern Territory legislation
http://www.nt.gov.au/lant/hansard/hansard.shtml

Queensland legislation
http://www.legislation.qld.gov.au/OQPChome.htm

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Locating Legislation cont'd…

State Government legislation:

South Australia legislation
http://www.parliament.sa.gov.au

Tasmania legislation
http://www.thelaw.tas.gov.au/index.wsp

Victoria legislation
http://www.dms.dpc.vic.gov.au

Western Australia legislation
http://www.slp.wa.gov.au/statutes/swans.nsf/default.html

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Locating Legislation cont'd…

Prints of legislation prepared by AGPS (formerly the Government Printer) contain some extra information viz:

- The date on which Royal Assent was granted which may be useful in working out when the Act commenced; and
- The date of the Minister's second reading speech which may be useful in locating the second reading speech to find the policy principles behind the legislation.

Dissecting Legislation

- ***Coat of Arms*** —— This appears as a matter of convention in legislation and has no legal effect
- ***Long Title*** —— Prior to 1513 all legislation in the form of Acts was referred to solely by a number. The long title provides a brief description of the purpose of the act as an aid to its interpretation. Parliamentary debate is limited to the subject matter indicted by the title. No provision can be included in a Bill unless it is within the subject matter of the long title. All Bills have a long title starting with the words "A Bill for ..." and these words are dropped from the title of the resulting Act. The term *long title* is used to distinguish what is effectively the *title* of the legislation from the *short title*. Regulations do not have long titles.

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Dissecting Legislation contd...

- ***Short Title*** —— All modern statutes have a short title by which they are normally referred. This section (usually section 1) gives legal sanction to this practice making the short title an authoritative means of referring to statutes.
- ***Commencement*** ——This is usually section 2 and gives the date when the legislation became or becomes effective. Under section 5(1A) of the *Acts Interpretation Act 1901* , Commonwealth statutes come into force twenty-eight (28) days after receiving Royal assent unless a contrary provision is stipulated and it usually is.

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Dissecting Legislation contd...

The main options for **commencement** are:

- Royal Assent
- twenty-eight (28) days after Royal Assent
- on a specified day either in the future, or in the past i.e retrospectively
- on a day to be Proclaimed by the Governor-General, this is generally within a six (6) month limit on the power to Proclaim
- on the commencement of another piece of legislation

NB: A whole act does not have to commence at the same time, various parts of an Act may be given different commencements

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Dissecting Legislation contd...

Commencement - subordinate legislation:

- Regulations come into effect when they are notified in the *Gazette of Commonwealth Government Notices* unless contrary provision is made either in the regulations themselves or in the authorising statute.
- Subordinate legislation must be laid before each of the Houses of Parliament within fifteen (15) days of being made. Either House may, by resolution within fifteen (15) days of the legislation being tabled, disallow any regulation.
- See "disallowable instrument" referred to in section 7B (2) of the Act regarding the Guidelines as explained in the *Acts Interpretation Act 1901*.

Dissecting Legislation contd…

- ***Preambles*** ——A rare practice in modern legislation. They served a purpose similar in effect to the *long title* in older statutes.
- ***Schedules*** ——These are found toward the back of legislation and contain information conveniently set out in tabular form. They form part of the legislation and have the force of law (see section 13(2) *Acts Interpretation Act 1901*).

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Dissecting Legislation contd…

- ***Tables of Acts*** —— This identifies by number and dates of assent and commencement all the statutes that have amended the Act. This section is not part of the Act but is very useful. See also section 13(3) of the *Acts Interpretation Act 1901*.
- Number of an Act —— Legislation passing through Parliament is assigned a number upon completion. This number is based upon the date of completion, for example the first Act passed in the year 2001 would be "No. 1 of 2001". A similar system also applies to Regulations.
- Date of Assent —— This is the date on which the Governor-General gave assent to a Bill that has completed its passage through both Houses of Parliament transforming it into an Act.

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Dissecting Legislation contd…

- *Table of Amendments*——This sets out the history of each section and enables us to determine which sections have been inserted, deleted and/or amended since the Act first received Royal assent. This section is not part of the Act but is very useful. See also section 13(3) of the Acts Interpretation Act 1901.
- *Reprint Date* —— This is a vital piece of information. It refers not to the date on which the legislation was physically printed but it does confirm that the copy incorporates all amendments up to that date. Unless the reprint date is recent it is probably advisable to check for amendments since the reprint date or more recent reprints.

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Construing Statutes

Definitions——In order to add greater precision to ordinary words, definitions are often included in a section in legislation. In most legislation this near the beginning of the legislation, however, in more recent legislation this is found toward the rear of the legislation. These are vital to the accurate interpretation of the legislation. It should also be noted that specific definitions of words might also be given at the beginning of specific sections, Parts and Divisions of legislation to which they solely pertain. Words with specific legal definitions in legislation are generally highlighted in some manner to readers.

Construing Statutes

Provisos ——Beware of words such as "provided that" in any section as the general proposition stated in the section is only operative if the proviso is satisfied. Example section 12(2) of the *National Measurement Act 1960* —— "unless the contrary intention appears"

Implied Conjunctions ——This is where a series of paragraphs in a section are cumulative. The conjunction "and" is included at the end of the penultimate paragraph and implies that the word "and" should follow each of the preceding paragraphs. Example section 13(1) of the *National Measurement Act 1960* (Cth).

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Construing Statutes

Implied Disjunctions——This is where a series of aragraphs in a section are all alternatives. The word "or" is included at the end of the penultimate paragraph and implies that the word "or" should follow each of the preceding paragraphs. Example section 10 of the *National Measurement Act 1960* (Cth).

Concluding Words which Qualifying all Paragraphs—— The concluding words in the case given below (section 19B of the *National Measurement Act 1960* (Cth)) are read as though they were attached to the end of each paragraph, and do not only apply to paragraph (c) .

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Construing Statutes

Subject to——When a provision is subject to another provision then the first is only operative to the extent that the second one allows. Example section 7 on the *National Measurement Act 1960* (Cth).

May/Shall——The word "may" usually implies that the person to whom is refers is left with a discretion. The word "shall" implies that no discretion remains with the relevant person. Examples: section 8A(1) and 18AD(1) of the *National Measurement Act 1960*
See also section 33(2A) of the *Acts Interpretation Act 1901* and section 9 of the *Interpretation Act 1987* (NSW).

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Construing Statutes

Literal Approach—— words have their ordinary meaning whatever the result

The Golden Rule—— words have their literal meaning except if result is absurd in terms of the statute as a whole

The Purpose Approach —— Parliament's intent in passing the legislation (now the HCA preference)

Mischief Rule —— what wrong was meant to be addressed?

Intrinsic *and* ***Extrinsic Materials***

Construing Statutes

Intrinsic Materials

- long title
- preamble
- statements of objects clauses
- structure —— parts, divisions, headings
  but not schedules not marginal notes or footnotes

Extrinsic Materials

- *Acts Interpretation Act 1901* (Cth) s 15AB

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Construing Statutes

Ejusdem generis rule —— limits words in a statute to things of same kind

Noscitur a sociis —— meaning of words limited by their context

Expressio unius —— where something is expressly referred to everything else should be excluded

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Interpretation of Legislation

—— Background Legislation (Commonwealth)

- the *Acts Interpretation Act 1901*
- the *Crimes Act 1914*
- the *Criminal Code Act 1995*; and
- the *Administrative Appeals Tribunal Act 1975*

Background legislation State

- *Interpretation Act 1987* (NSW)

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Common Law and Equity

- a body of rules and principles evolved from judgments made by courts
- based on the "sacred principle" of English law (*stare decisis*) and may be considered binding
- equity fills the gaps in the common law to ensure no wrong goes without a remedy
- independent of a legislator for their validity
- actions of courts cause them to continually develop
- Parliament may enact statutes to destroy a precedent on the basis of "Parliamentary Supremacy"

Common law cf Civil law systems

Common Law	Civil Law
adversarial	inquisitorial
precedent	not bound by previous decisions
rules of evidence	no rules of evidence
parties adduce evidence	judge calls evidence
parties direct proceeding	judge direct proceedings
parties call/examine witnesses	judge calls/examines witnesses
cross-examination	no cross-examination
lawyers active/judge passive	judge active/lawyers passive

Trial and Error

starring

Peter Sellers and Richard Attenborough

(1962)

Rules of evidence

- relevance
- hearsay
- opinion
- judgments and convictions
- tendency/coincidence
- credibility
- identification
- privilege
- discretion

Certificates as Evidence

Certificates issued by the Chief Metrologist and other Legal Metrology Authorities:

- *prima facie* evidence

taken to be:

- evidence of a matter stated in the certificate;
- may be received in evidence in any court in Australia, State, Territory or Commonwealth;
- may be received in evidence in any proceeding before a person authorised by law or the consent of the parties to receive and examine evidence.

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Certificates as Evidence

Certificates issued by the Chief Metrologist and other Legal Metrology Authorities

Unless the contrary is established taken to have been:

- issued by the person by whom they purport to be issued;
- signed by the person by whom they purport to be signed; and
- the person by whom the certificate purports to be signed is taken to be a person authorised by law to sign such certificates.

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NSW Sale of meat

Superintendent of Trade Measurement v Salmon

—— guess the outcome

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Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Law:

***Trade Measurement Act 1989* (NSW)**

Section 25 —— Special provisions for sale of meat

Sub-section 25 (1)

"A person who sells meat other than at a price determined by reference to the mass of the meat is guilty of an offence. Penalty: $5,000."

Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Law cont'd...

Sub-section 25 (4)

'In this section:
*"**meat**" means so much of a slaughtered animal as is ordinarily sold for human consumption (whether or not after being subjected to a process of any kind) but does not include:*
(a) the whole or any part of rabbit or shellfish'
(b) heads, feet hearts, lights, kidneys, brains or sweetbreads' or
(c) meat packed as a pre-packed article'

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Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Law cont'd...

Definition of 'sell' (*Trade Measurement Act 1989* (NSW) section 3)

*"**sell**" includes:*
(a) agree to sell
(b) offer or expose for the purpose of selling
(c) have in possession for the purpose of selling
(d) barter or exchange; and
(e) authorise, direct, cause or permit to be done any act referred to in paragraph (a), (b), (c) or (d)

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Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Facts:

Mid-2003 NSW Trade Measurement inspectors attend Lenard's butchers of Murwillumbah and Tweed Heads NSW a franchised business operated by Mr.Gregory Joseph Salmon and Mr. Rodney Clark as the franchisees.

Found that the defendant displayed or offered for sale the following items:

Chicken Mini Roast (sweet mustard)
at $6.95 each, 600g or $11.99 kg

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Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Facts cont'd...

Chicken Mignon (garlic)
at $1.95 each, 120 g or $16.50 kg

Chicken Fillet Steaks (teriyaki and garlic)
at $2.75 each, 175 g or $15.99 kg

Chicken Spring Rolls
at $1.95 each, 175 g or $11.50 kg

Chicken filo Madagascar (green peppercorn and paprika)
at $2.95 each

Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Facts cont'd...

Mr. Salmon the principal defendant prosecuted by summons on the basis that he had "sold meat otherwise than by weight contrary to sub-section 25 (1) of the *Trade Measurement Act 1989* (NSW)".

How find you —— guilty of not guilty?

Result at court of first instance (Magistrates Court) —— not guilty
—— items sold? —— Yes
—— but were they meat? —— **NO!**

Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Superintended of Trade Measurement NSW appealed to Supreme Court of NSW

Arguments on appeal:

Appellant (Superintended of Trade Measurement NSW)

Products sold fall within definition of meat i.e. they constitute "so much of a slaughtered animal as is ordinarily sold for human consumption (whether or not after being subjected to a process of any kind" i.e. "pivotal phrase" is "process of any kind".

Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Superintended of Trade Measurement NSW appealed to Supreme Court of NSW

Arguments on appeal:

Appellant (Superintended of Trade Measurement NSW) cont'd...

Dictionary definition of 'process':
'a systematic treatment of some kind' in this case 'substantially identical products have been produced by the process of combining raw chicken with other foodstuffs in order to have a ready to cook product for sale'.

Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Superintended of Trade Measurement NSW appealed to Supreme Court of NSW

Arguments on appeal:

Appellant (Superintended of Trade Measurement NSW) cont'd...

The chicken is just chicken which has been subjected to a process i.e. it is still within the definition of meat' as none of the changes made affect the chicken so as make it other than chicken i.e. it is still meat. 'Subjection to a process is not limited to cooking, freezing, salting or preserving this is made clear by the words 'of any kind' following the word 'process'.

Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Superintended of Trade measurement NSW appealed to Supreme Court of NSW

Arguments on appeal:

Respondent (Mr.Salmon —— Lenard's butchers franchisee)

Construction leads to great difficulties and absurd results

How would you sell an animal carcass which includes items excluded from the definition of meat i.e. heads, feet, hearts, lights, kidneys, brains or sweet breads? Meat parts by weight and others by any some method agreed between buyer and seller?

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Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Superintended of Trade measurement NSW appealed to Supreme Court of NSW

Arguments on appeal:

Respondent (Mr.Salmon —— Lenard's butchers franchisee) cont'd...

What about steak and kidney —— i.e. a mixture of both meat and non-meat under the sub-section 25 (1) definition. Do you sell the steak by weight and the kidney separately?

Virtually any product containing meat would have to be sold as meat

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Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Superintended of Trade measurement NSW appealed to Supreme Court of NSW

Arguments on appeal:

Respondent (Mr.Salmon —— Lenard's butchers franchisee) cont'd...

Does mixing anything with meat in any proportion immediately convert the whole product to meat?

What about meat pies? Do you have to sell pies by weight?

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Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Superintended of Trade measurement NSW appealed to Supreme Court of NSW

Arguments on appeal:

Respondent (Mr.Salmon —— Lenard's butchers franchisee) cont'd...

Under this argument a corned beef sandwich would be "meat" and would have to be sold by weight because it was produced by a systematic process by which corned beef was combined with bread and butter and pickles to make it into a sandwich.

Superintendent of Trade Measurement v Salmon
(Supreme Court of New South Wales 2003)

Superintended of Trade measurement NSW appealed to Supreme Court of NSW

How find you on this appeal —— guilty or not guilty?

Result on appeal:

Mr.Salmon of Lenard's butchers was acquitted of the allegation under sub-section 25 (1) of the *Trade measurement Act 1989* (NSW).

"A person who sells meat other than at a price determined by reference to the mass of the meat is guilty of an offence. Penalty: $5,000."

Statutory Interpretation
an example and an exercise

from the national measurement legislation

Can you issue a regulation 13 certificates on a bundle of sticks?

background:

person wishing to claim compensation for an occupational over-use injury

approached a Verifying Authority for References Standards of Measurement

requested a regulation 13 certificates stating the weight of a bundle of sticks typical of the type that he claimed he had carried at work and had (allegedly) caused his back injury

Why?

He wanted to take advantage of the evidential status of a regulation 13 certificates to adduce evidence that the bundle of sticks was unreasonably heavy for someone to be asked to carry by their employer.

Can you issue a regulation 13 certificates on a bundle of sticks?

What assistance can we get from the national measurement legislation to answer this question?

National Measurement Regulations 1999 (Cth)

Regulation 3 Definitions

verification, of a standard of measurement, means verification of the standard under regulation 13

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National Measurement Regulations 1999 (Cth)

Regulation 13 Verification of standards of measurement

(1) On application under regulation 12, the verifying authority:
(a) may verify a standard of measurement; and
(b) if the standard is verified —— must issue a certificate of verification to the applicant; and
(c) may issue a copy of the certificate to anyone else the authority considers should be given a copy.

(2) A verifying authority may verify a standard of measurement other than on application.

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National Measurement Regulations 1999 (Cth)

Regulation 13 Verification of standards of measurement cont'd...

(3) If the standard of measurement is verified under the supervision of a verifying authority, the authority may verify the standard.

(4) The verifying authority must not verify a standard of measurement mentioned in paragraph (a) of the definition of ***standard of measurement*** in subsection 3 (1) of the Act unless the standard bears a mark that identifies the standard.

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National Measurement Regulations 1999 (Cth)

Regulation 13 Verification of standards of measurement cont'd...

(5) If the standard of measurement is verified by the verifying authority, the authority must issue a certificate of verification to the applicant.

***National Measurement Act 1960* (Cth)**
Section 3 Interpretation

reference standard of measurement means a standard of Measurement (other than an Australian primary standard of measurement, an Australian secondary standard of easurement, a recognized-value standard of measurement or a State primary standard of measurement) that has been verified in accordance with the regulations and for which the period for which a certificate of verification is given under the regulations has not expired.

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***National Measurement Act 1960* (Cth)**
Section 3 Interpretation

standard of measurement means:

(a) a material measure, measuring instrument or measuring system designed or intended to define, realise, conserve or reproduce:
(i)a unit of measurement of a physical quantity; or
(ii)one or more known values of a physical quantity;
in order to transmit that unit or those values to measuring instruments by way of comparison; or
(b) a formula designed or intended to define the magnitude of a physical quantity.

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Issues to be settled in deciding whether you can issue a regulation 13 certificates on a bundle of sticks

Is a bundle of sticks:

1. an Australian primary standard of measurement;
2. an Australian secondary standard of measurement;
3. a recognized——value standard of measurement; or
4. a State primary standard of measurement?

if it is it cannot be verified as a reference of measurement under regulation 13.

Note: Special provision apply to such standards

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Issues to be settled in deciding whether you can issue a regulation 13 certificates on a bundle of sticks

Is a bundle of sticks:

1. a material measure?
2. a measuring instrument?
3. a measuring system?

Issues to be settled in deciding whether you can issue a regulation 13 certificates on a bundle of sticks

and if so is a bundle of sticks:

designed or intended to define, realise, conserve or reproduce:

(i) a unit of measurement of a physical quantity; or
(ii) one or more known values of a physical quantity;

in order to transmit that unit or those values to measuring instruments by way of comparison

***National Measurement Act 1960* (Cth)**
Section 3 Interpretation

material measure means a thing designed or intended to conserve or reproduce, in a permanent manner during the use of the thing, one or more known values of a physical quantity.

measuring instrument means:
(a) a thing by means of which a measurement of a physical quantity may be made; or
(b) a component of such a thing.

measuring system —— not defined

***National Measurement Act 1960* (Cth)**
Section 3 Interpretation

material measure means a thing designed or intended to conserve or reproduce, in a permanent manner during the use of the thing, one or more known values of a physical quantity

Key words —— not defined in national measurement legislation:
- designed
- intended
- conserve
- reproduce
- permanent manner
- physical quantity

***National Measurement Act 1960* (Cth)**
Section 3 Interpretation

measuring instrument means:
(a) a thing by means of which a measurement of a physical quantity may be made; or
(b) a component of such a thing.

Key words —— not defined in national measurement legislation:
- physical quantity

Key words further defined in national measurement legislation:
- ***component***

***National Measurement Act 1960* (Cth)**
Section 3 Interpretation

(iv) providing or repeating information consisting of or relating to any or all of the following:
(A)the result of a measurement made by the basic thing;
(B)a conversion of the result of a measurement made by the basic thing;
(C) a calculation of a number, tax or price calculated by reference to the result of a measurement made by the basic thing;
(v) controlling the measurement process carried out by the basic thing.

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***National Measurement Act 1960* (Cth)**
Section 3 Interpretation

component, in relation to a thing (in this definition called the ***basic thing***) by means of which a measurement of a physical quantity may be made, includes another thing (whether or not forming part of the basic thing) where:
(a) the basic thing is so designed or constructed as to include, or have associated with it, the other thing; and
(b) the other thing is designed or intended to do any or all of the following:
(i) carrying out a conversion of the result of a measurement made by the basic thing;
(ii) calculating a number, tax or price by reference to the result of a measurement made by the basic thing;
(iii) correcting the result of a measurement made by the basic thing.

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***National Measurement Act 1960* (Cth)**
Section 3 Interpretation

measuring system.

not defined in national measurement legislation so has ordinary dictionary meaning

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Issues to be settled in deciding whether you can issue a regulation 13 certificates on a bundle of sticks

Is a bundle of sticks:

designed or intended to define, realise, conserve or reproduce:

(i) a unit of measurement of a physical quantity; or
(ii) one or more known values of a physical quantity;

in order to transmit that unit or those values to measuring instruments by way of comparison

Key words —— not defined in national measurement legislation:
- define
- realise
- conserve
- reproduce
- physical quantity (see analysis of ***material measure*** above)

Issues to be settled in deciding whether you can issue a regulation 13 certificates on a bundle of sticks

Is a bundle of sticks:

designed or intended to define, realise, conserve or reproduce:

(i) a unit of measurement of a physical quantity; or
(ii) one or more known values of a physical quantity;
in order to transmit that unit or those values to measuring instruments by way of comparison

Key words further defined in national measurement legislation:

- ***unit of measurement***

National Measurement Act 1960 **(Cth)**
Section 3 Interpretation

unit of measurement includes any word or expression that is used in conjunction with numerical values in order to describe the magnitudes of physical quantities.

Can you issue a regulation 13 certificates on a bundle of sticks?

probably not!

Note: Same legal analysis applies to all requests for regulations 13 certificates e.g. requests for regulation 13 certificates on EDMs, multimeters, CROs, slope measuring machines etc.

Exercise:

National Measurement Regulations 1999 (Cth)

Part 8 Dealing with verification, certification, approval and appointment other than on application

Exercise:

Can a **verifying authority** (other than the Chief Metrologist) cancel a regulation 13 certificates if it is found to have been issued in error?

Explain how you arrived at your answer.

23 Grounds for cancellation of verification

The grounds for cancelling the verification of a standard of measurement are that the value ascertained for the standard of measurement is:

a) incorrect; or

b) exceeding the maximum permissible variation for the standard.

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Regulation 81

81 Application of Part 8

This Part applies if reasonable ground exists:

(a) to cancel the verification of a standard of measurement…

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Regulation 82

82 Cancellation, variation and withdrawal of instruments

*1. The **Chief Metrologist** must give the **instrument** holder written notice:*

*(b) if the **Chief Metrologist** proposes to cancel … the **instrument**…*

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Regulation 80

80 Definitions for Part 8

In this Part

***Chief Metrologist** includes*

*a) For the cancellation of a **certificate of verification** or certificate issued under regulation 37—the **verifying** or certifying **authority**…*

***instrument** means:*

a) a certificate; or

b) a permission under regulation 71; or

c) an appointment

Regulation 80

80 Definitions for Part 8

In this Part

certificate does not include a certificate of verification of:

- *an Australian primary or secondary standard of measurement*
- *a State primary standard of measurement*

This does not exclude a regulation 13 certificates
but does it include a regulation 13 certificates?

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3 Definitions

certificate *means:*

- *a* ***certificate of verification****…*

certificate of verification *means:*

- *a certificate issued under* ***regulation 13***

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Final Thought

Let prudence direct you
Temperance chasten you
Fortitude support you; and
Justice be the guide of all
your actions.

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National Measurement Institute

Questions?

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Speed meters -
the situation in P.R.China

Q. SUN, NIM China

APEC/APLMF Seminars
22 to 25 June 2009, Taipei

APLMF

Foreword

APLMF

Speed meters is a **heated** but **controversial** topic worldwide!

Content

APLMF

- **Legal basis for traffic speed measuring instruments**
- **Technical basis for pattern evaluation and verification**
- **Harmonization with international requirements**
- **Future challenges**

Legal basis

APLMF

- **Why we need traffic speed measuring instruments?**

  Chinese government has always prioritized human safety.

  Safety and protection of man and environment

- **What is the ultimate goal by control of speed meters?**

  The measurements to **ensure the safety and security of the Chinese population** are being performed correctly and according to relevant legal regulations all the time.

Legal basis

- **Why is it a heated but controversial issue in China?**

The total length of China's highway is ranked No.2 in the world now and increasing amount of facilities of various working principles have been installed along the roads for over-speed detection.

Drivers fined may doubt the reliability and accuracy of the measurement results, which sometimes may lead to lawsuits against police.

Legal basis

China's Constitution — People

Law on Metrology (Article 9), 1986 — Parliament

Rules for the Implementation of Metrology Law (Article 11), 1987

'Organizing' Ordinances Tasks and Competences

Sector Ordinances
Measuring instruments
Compulsory Verification Catalogue of Working Instruments
1987 — Departement

Legal basis

Sector Ordinances
Measuring instruments
Compulsory Verification Catalogue of Working Instruments
1987

- *Verification Regulation of Vehicles Radar Measuring Speed Meters* (JJG528—2004)*
- *Verification Regulation of Handheld Radar Measuring Speed Meter Calibration System* (JJG771—1992)
- *Verification Regulation of Automatic Monitor System for Vehicles Speed*(JJG527—2007)**

* Revised version of 1988
** Revised version of 1988

Legal basis

Placing on the market of speed meters

Pattern evaluation, type approval and initial verification for the traffic speed measuring instruments.

Pattern evaluation (Type approval)

Initial verification

Legal basis

Type approval

Pattern evaluation

Systematic examination of the performance of **a type of measuring instrument** in order to determine whether the type may be approved for official measurements.

Decision of legal relevance, which the type complies with the relevant statutory requirements.
>> Type approval (certificate)

Legal basis

Verification

Initial and subsequent verification

Procedure (reduced than type approval) which includes the examination to confirm that **each individual measuring instrument** complies with the statutory requirements (error limits).

When the instrument fulfills this requirements then
>> verification certificate

Legal basis

Verification — Calibration

Verification
Procedure which includes the examination, that confirms that each individual measuring instrument complies with the statutory requirements (error limits).

Calibration
refers to the process of determining the relation between the output of a measurement results and the value of the input quantity.

Legal basis

Subsequent examination of measuring instruments

Measuring instruments used for official measurements are subject to periodic verification.

Subsequent verification guarantees continual conformance of the instrumentation with the according requirements.

Authorized verification laboratories are responsible.

Content

- **Legal basis for traffic speed measuring instruments**
- **Technical basis for pattern evaluation and verification**
- **Harmonization with international requirements**
- **Future challenges**

Technical basis

- **Traffic speed measuring equipment in use in China**

  Mainly includes the following categories:
  - Radar
  - Lidar
  - Loop detector


Technical basis

The respective simulation technology has to be developed for simulation tests, either used in pattern evaluation or verifications.

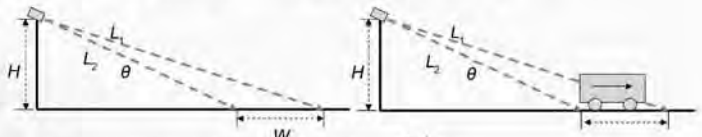
- **Simulation test for Radar:** *IACP Radar module*, *OIML R91*
- **Simulation test for Lidar :**
  1. One beam —— *IACP Lidar module*
  2. Two beams —— Time-delay principle
- **Simulation test for Loop detector :**
  1. Active simulation
  2. Passive simulation

Technical basis

- **Simulation test for Lidar :**
  1. One beam —— *IACP Lidar module*

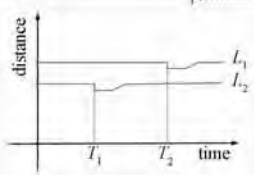

Technical basis

- **Simulation test for Lidar :**
  2. Two beams —— Time-delay principle



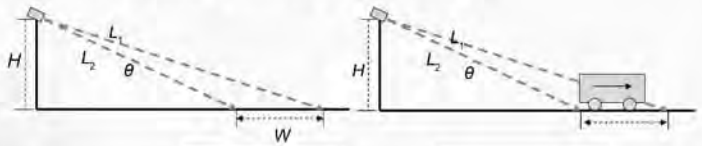
$$W = SQRT(L_1^2 + L_2^2 - 2*L_1*L_2*\cos\theta)$$

$$V = \frac{W}{ABS(T_2 - T_1)}$$



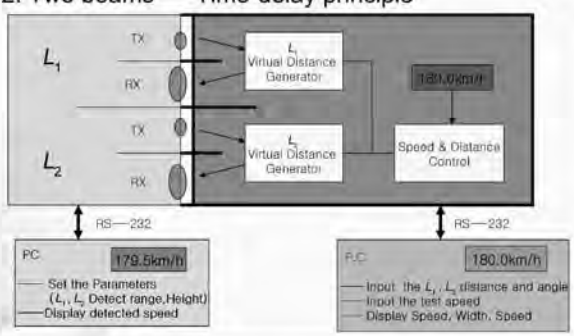
Technical basis

- **Simulation test for Lidar :**
  2. Two beams —— Time-delay principle



Technical basis

- **Simulation test for Lidar :**
  2. Two beams —— Time-delay principle



Technical basis

- **Simulation test for loop detector :**
  1. Active signal emission

Technical basis

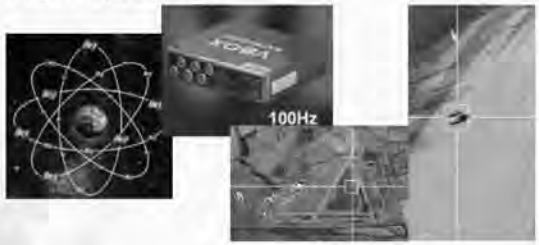
- **The road test technology should be accurate, reliable and convenient.**

  1. Non contact speed meter (Optical principle)

Technical basis

- **The road test technology should be accurate, reliable and convenient.**

  2. GPS speed meter



Content

- **Legal basis for traffic speed measuring instruments**
- **Technical basis for pattern evaluation and verification**
- **Harmonization with international requirements**
- **Future challenges**

Harmonization Issue

- **Is it an option or necessity?**

  1. *IACP standard series*
  2. *OIML R91 recommendation*
  3. China national standard
     GB/T 21255—2007 Motor vehicle speed detector

May it be part of the answer?

Content

- Legal basis for traffic speed measuring instruments
- Technical basis for pattern evaluation and verification
- Harmonization with international requirements
- **Future challenges**

Future challenges

- **Legal challenges**

More national norms, regulations and standards on Speed Meters of different working principles are urgently needed, which are in accordance with international standards, recommendations and directives, etc., and which may result in mutual recognition agreements on speed meters in future.

- **Technical challenges**

Research and development on simulation test technology and on-site test technology are focused, which will lay a solid foundation for legal metrology on speed meters.

Thank you for your attention!

APEC/APLMF Seminars
22 to 25 June 2009, Taipei

Speed Vehicle Measuring Instruments and Indonesian Quality Infrastructure with MSTQ to Control Measure Instruments

By
SRI RAHAYU, S. Si. , MT
Measure Standards & Laboratory of Metrological

I. Background

Indonesia development policy is guided by the principle for sustainable development a thriving economy, social justice and political stability. This policy help to achieve government aim is poverty reduction. Especially for measurement system in economies is more important part to improvement supported of industry and trade sector. National regulations have been made for measurement requirement of measuring instrument in a wide range, particularly for the health, public safety and environment, besides of industry and trade sector.

Indonesian quality infrastructure with MSTQ contribute to sustainable development of economies to get the greater integration into the international trade system, companies more competitiveness and boost private sector, public protection in commerce, health, safety and environment.

It is more important in any transportation (motor, car, railroad, aircraft, ship, etc.) to ensure accuracy and correct measurement of speed vehicle measuring instruments for protects of public safety. Law and regulations of legally controlled measuring instruments at Indonesian have to development referring to OIML recommendations, where covered any kinds of object area (trade, health, safety and environment, etc.).

II. Speed Vehicle Measuring Instruments

The ensure accuracy and correct measurement of speed vehicle measuring instruments are more important in any transportations (motor, car, railroad, aircraft, ship, etc.) for protects of public safety. Speed vehicle is a highly significant factor in how serious the consequences of an accident can be done. The faulty measurement of speed vehicle is significant factor of accident in roadway and other transportations. To reduce accident and protect public safety for especially in transportations, so **national regulations** should be made to ensure accuracy and correct measurement of speed vehicle measuring instruments.

The instrument designed to indicate the instantaneous speed of vehicle are speedometer, tachometer, etc. Additional, odometer is instrument designed to indicate the distance covered by the vehicle following a totalisation of vehicle wheel revolutions, and chronotachograph is Instrument designed to indicate and record instantaneous vehicle speed, the distance covered by the vehicle, and possibly other parameters of the journey.

There are many kinds instruments for speed of vehicle indicator. The international recommendations OIML R55: 1981(E) applies to speedometers, mechanical odometers and chronotachographs for motor vehicles-Metrological regulations. These regulations explain about requirement of technical characteristics and maximum permissible error (mpe) for that instruments.

For measurement speed vehicle with radar, the international recommendations OIML R91: 1990(E) explained requirement of radar equipment for the measurement of the speed of vehicles. Scope of this recommendation is applicable to microwave Doppler radar equipment for the measurement of traffic speed on roads, hereafter, in short, "radar". The recommendation states the conditions that the radar must satisfy when the results of measurement are to be used in legal proceedings. The legal interpretation of the results of measurements, the choice of radar types and the conditions under which these instruments may be applied are left to national regulations.

GPS Speedometers

GPS Speedometers provide vehicle independent speed readout in automotive and marine applications. Using data received from the Global Positioning Satellite network, the GPS Speedometer calculates accurate ground speed and displays it on a clear to read, analog display. Designed the speedometer features an easy to read dial and user selectable yellow or red backlights for night time use. They have some satellites simultaneously, enhanced receiver sensitivity and active antenna result in fast time-to-first-velocity-calculation as well as the ability to operate in the harshest RF environments such as canyons cities and harbours. Speed errors will occur in RF blackout zones such as tunnels. In the event of an RF blackout, the speed readout will go to zero. Three dimensional velocity calculations are accurate to 0.2km/h and pulse output rates are updated 4 times per second. Automotive versions measure three dimensional speed, whereas marine versions measure horizontal speed only to eradicate speed errors due to sea conditions such as swells. GPS Speedometer can be supplied with the readout in kilometers per hour, miles per hour or knots.

The electronic speedometer

The electronic speedometer is intended to measure traveling speed and to record the status of selected locomotive engine parameters every second. It comprises a central processing unit that performs the basic functions, two monitors that are used for displaying the measured speed values and entering locomotive driver's identification data and drive parameters and a speed transducer. The speedometer can be fitted into any of railway traction vehicles.

The monitor is mounted on every driver's place in a locomotive. It is connected to the CPU by a serial link. Monitor transmits a driver, locomotive and train identifications data to the CPU and receives data on travel speed, partial distance traveled, real time and speedometer status from the CPU.

A locomotive driver communicates with the speedometer using the monitor: a keyboard and alphanumeric displays are used for authorization purposes, travel speed values are monitored on analog and digital displays, whereas alphanumeric displays, LEDs and a buzzer signal provide information on speedometer and vehicle status.

The speed transducer has been made using a proximity switch and a toothed wheel coupled to the vehicle axle. An electronic testing set, a self-contained unit, has been developed for purposes of verifying speedometer accuracy and testing & diagnostics of speedometer operation. The set can be used to test both the speedometer as a whole and every component.

By rotating the speed transducer and measuring the rate of revolutions, the set tests the operation of speed transducer. Generating digital input signals and monitoring digital outputs and communication with the monitor and by checking the status and contents of CPU memory resources test the operation of CPU.

Software for efficient speedometer data presentation and analysis has been developed for checking the observance of timetable and railway traffic regulations by an engine driver. It is a standard PC application with all the elements of Windows environment that permits fast and simple presentation of recorded data in a graphical or tabular form.

Calibrations and Verifications of Laser Speedometer

Scope: this specification applies the Lidar Modul (hereafter laser speedometer) that transmits coherent infra-red light pulses, measures the time of flight for the laser pulses reflected from moving vehicles, and then calculates and displays the speed of the target vehicle based on repetition rate.

Verification and inspection:

Inspection of aiming distance of laser speedometers is as follows:

1. Placing the laser speedometer at 50m from the aiming distance detection device as shown in Fig. 1.

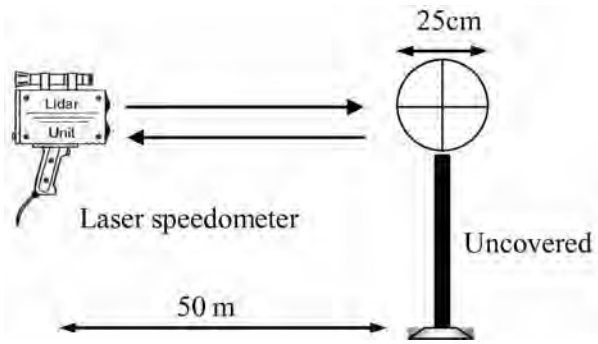


Fig. 1 Aiming Distance Inspection of Laser Speedometer

2. The reflection side of the target device is a disk with 25cm diameter.
3. There shall be no obstacles behind the disk.
4. Carefully aim the center of the target device of the laser speedometer, press the measuring trigger and measure/record the indicated distance of the laser speedometer.

Verification of the laser power intensity of the laser speedometer:

1. Ensure that the wavelength setup of the laser power meter corresponds to the laser wavelength of the laser speedometer to be tested.
2. Shoot the laser light of the tested laser speedometer to a high-speed light detector and send the output of the detector to a high-speed universal counter or oscilloscope. The universal counter or oscilloscope will determine PRR (Pulse Repetition Rate). The device is shown in Fig. 2. 1.
3. Through the convex lens, the laser light of the tested laser speedometer penetrates the 7mm aperture from the 100mm location and shoots at the light detector of the laser power meter. Receiving continues for 10 seconds to read the maximum power of the laser light. The experiment device is shown in Fig. 2. 2 (equipment allocation in reference to IEC 60825).

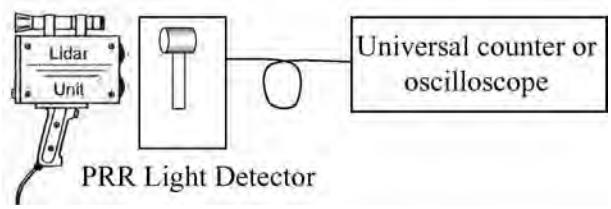


Fig. 2. 1 PRR Detection Device

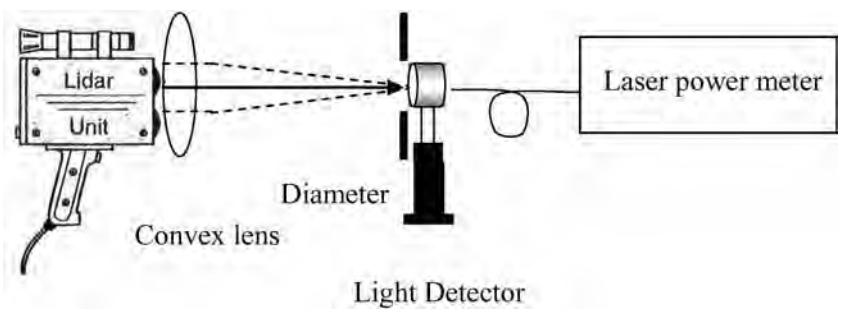


Fig. 2. 2 Inspection of Laser Light Power

Detection the speed accuracy of laser speedometer requires changing the flying time of the laser pulse of the laser speedometer via speed simulation system, to simulate the distance changes of different speeds of vehicles. The verification is conducted as follows:

1. In the laboratory, place the testing module of laser speedometer to match the receiving/transmission module of speed simulation system, which includes receiver and transmitter as shown in Fig. 3.

2. Based on the velocity to be simulated (v), the simulation system will simulate the changes of a series of distances (d) and time (t) of moving vehicles. The formula is:

$$d = C_{air} \cdot t_{RT}/2$$

$$v = \frac{d}{t}$$

in which C_{air} represents the speed of light in the air (approx. 299705663 m/s) and t_{RT} refers to the simulated back and forth time of laser light from the laser speedometer to the target vehicles.

3. Measure the Pulse repetition rate (PRR) and calculate the adjacent laser pulses time (t).

$$t = \frac{1}{PRR}$$

4. Simulate the actual speed of moving vehicles with the data from (2) to (3).
5. With trigger of PC speed simulation program, test the laser speedometer and speed simulation system.
6. Speed accuracy shall include no less than ten sets of test results at various distances and speed.

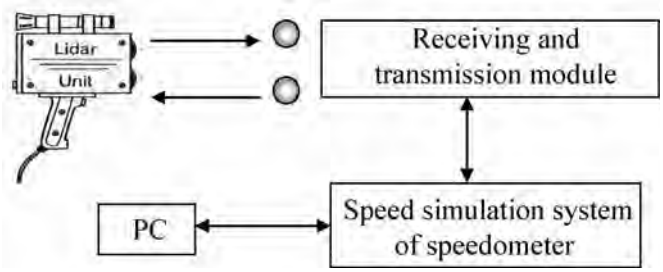


Fig. 3 Speed Accuracy Simulator Operation

III. Indonesian Quality Infrastructure with MSTQ and Current Metrology System

Indonesian Quality infrastructure refers here to all aspects of metrology, standardization, testing, quality management, certification and accreditation that have a bearing on conformity assessment (abbreviated as MSTQ).

Indonesian quality infrastructure contribute to sustainable development:

- Breaking down technical barriers to trade that to get the greater integration into the international trade system.
- Making the companies competitiveness and creates a vital basis for production based on facilitates the international trade in goods. This can lend a considerable boost to the private sector.
- It is required for the establishment of institutions and the shaping of the domestic enabling environment (good governance) and also the achievement of political objectives in the fields of environment, health and consumer protection.

Quality infrastructure with MSTQ is supported metrology systems in Indonesian. Current Metrology Sys-

tem, in general, its fields will be classified in to measurement standard, legal metrology, industrial standard and laboratory accreditation.

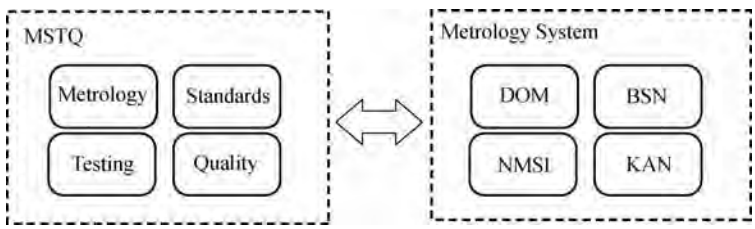
For measurement standards, National Measurement Standards of Indonesia (NMSI) are maintained by four national institutes: KIM LIPI, KIMIA LIPI, BATAN and DOM.

National Measurement Standards of Indonesia have responsibility for:

- establishment and maintenance of national standards,
- development and maintenance of traceability for measurement system,
- establishment of world equivalent measurement standards,
- contribution to maintenance of quality international measurement system,
- and development of technologies concerning measurement standards.

In line with national capability development in the field of standardization and in anticipating World trade globalization era, standardization activities that include an integrated standard and conformity assessment need to have a sustainable development. It is important especially in confirming and enhancing national products competitiveness, improving trade flow as well as protecting public interests. It is the responsibility of National Standardization Agency of Indonesia (BSN) to provide guidance, to develop as well as to coordinate national scope activities focusing on standardization.

BSN is supported by KAN (National Accreditation Committee of Indonesia) in conducting activities related to accreditation and certification in Indonesia. The main task of KAN is to award accreditation to certification bodies(such as those related to quality system, products,personnel, training, environment management system, HACCP system and forest conservation management system), test/calibration laboratory as well as inspection and accreditation of standardization of other fields in accordance with the requirement, and to give advices to the Head of BSN in setting up accreditation and certification systems. KAN is authorized to give instructions to both government and non-government institutions fulfilling the conditions set up by BSN Guide to evaluate accreditation applicants. KAN is also in charge of assuring international acknowledgement of the certificates published by the laboratories, inspection and certification bodies accredited by KAN.



Directorate of Metrology (DOM)

DOM is responsible for all activities related to Indonesia's legal metrology. Its activities cover development of policy on legal metrology. Directorate of Metrology (DOM) is now under the Directorate

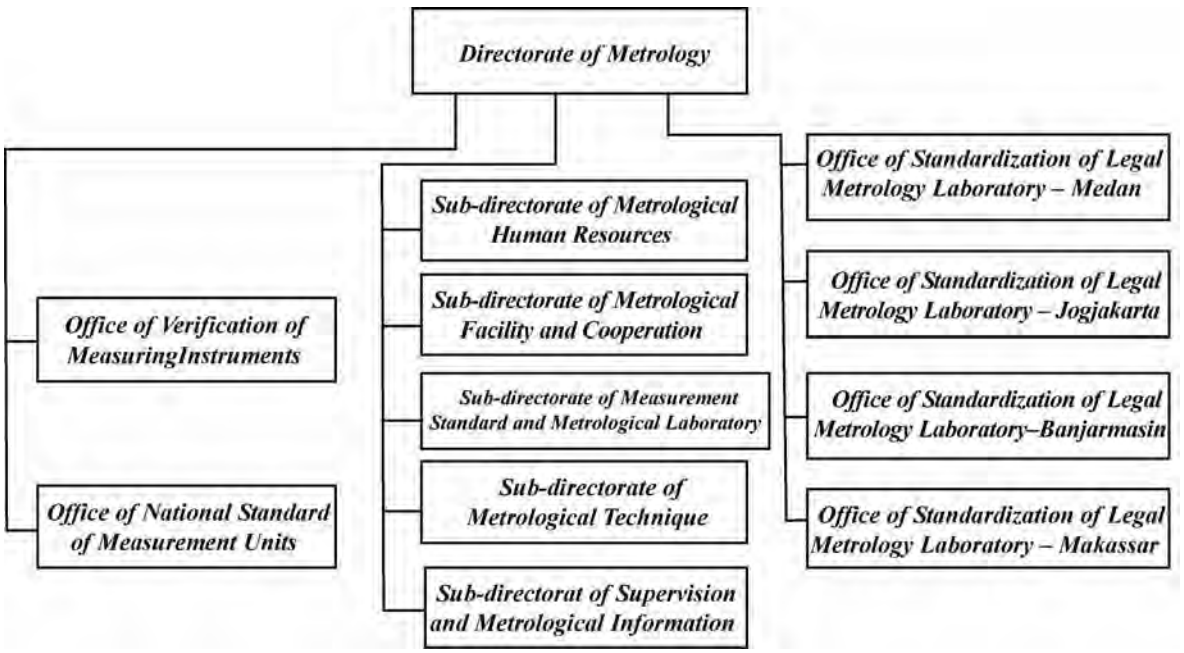
General of Domestic Trade——Ministry of Trade. Indonesia with DOM joined OIML and APLMF in 1960 and in 1999, respectively. Along with the history, DOM is in charge of enforcement of the law of legal metrology, and represents Indonesia in the field of legal metrology.

Technical infrastructure of Indonesian legal metrology will be classified into two categories, which type approval testing and verification. Principle of type approval testing is based on structural testing, of which technical standard are recommended by OIML. One of the most important ideas of legal metrology in Indonesia is the protection of consumers. Consumer protection supported by traceability for legal metrology becomes increasingly important along with economic development.

The following explained of main project of DOM:

- implementation of metrological control on measuring instruments and technical instructions to RVOs,
- type approval and verification/re-verification for special measuring instrument of legal metrology,
- development testing procedures referring to OIML recommendations for type approval testing, install equipment and measuring instruments testing,
- supervision of pre-packaged goods and measuring instrument of legal metrology,
- manage of standard for legal metrology and primary standard of mass,
- cooperation for development legal metrology with stakeholder in domestic, regional and international area.

Regional Verification Offices (RVOs) are organizations of local governments, which have responsibility to directly implement verifications and re-verification of legally controlled measuring instruments at local area authorities in Indonesian. DOM and RVOs is more focused at supervision & control of measure instruments applied in commerce.



IV. Indonesia's Metrology Policy to Control Measure Instruments (measurement Law & regulator body)

Based on the People's Consultative Assembly (MPR) in August 2000 issued the following hierarchy of legislation:

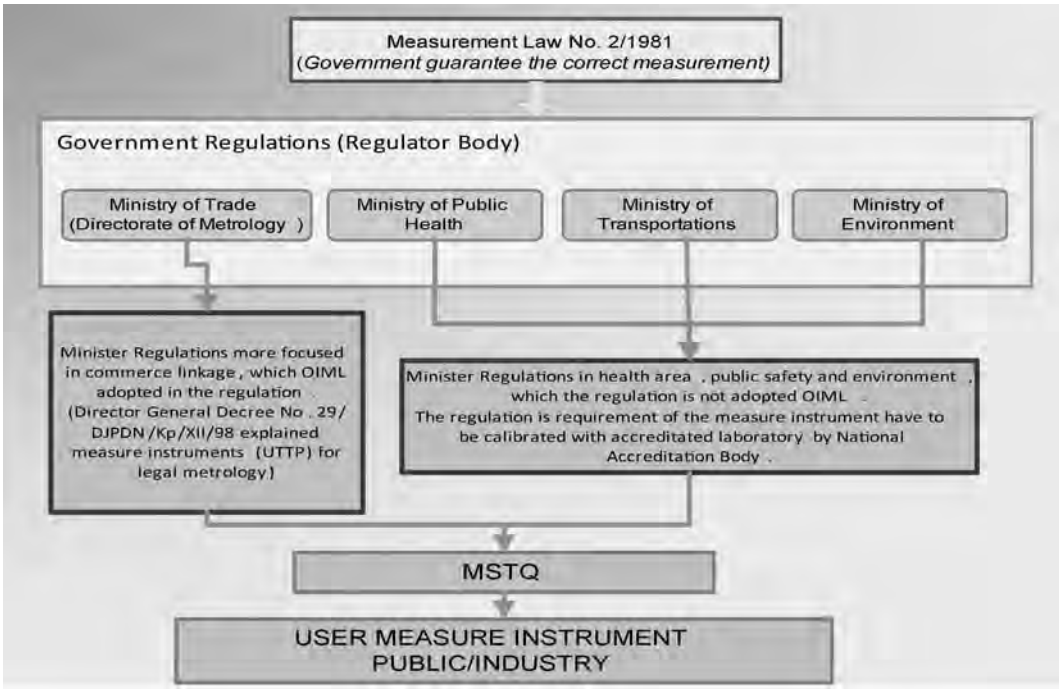
- 1945 Constitution,
- MPR Resolution,
- Law,
- Government Regulation Substituting a Law,
- Government Regulation,
- Presidential Decree,
- Regional Regulation.

In addition, there are also other legislative instruments in current use there are not listed in the above hierarchy. They include Presidential Instruction, Ministerial Decree and Circular Letter. The Ministerial decrees are regulations to implement the government regulations and presidential decrees. The hierarchy explained in Ministerial Letter of No. 06-27 states that the regional regulations should be consistent with the ministerial decrees.

Related with regulation to control measuring instruments, there is Measurement Law No. 2/1981. By the main purpose of Measurement Law which Government is to guarantee of the correct measurement of measuring instrument used in trade, health, safety and environment in order to protect the consumers as well as producers in particular and the public in general. The Measurement Law calls for the use of appropriate measuring instruments in measurement undertaken as part of economic or other activities so as to ensure accuracy and the correct measurement.

Further, Ministerial Decree (regulation of minister) released by Ministry related to control measuring instrument applied in health area, public safety, environment, commerce, etc. Minister regulations in health area, public safety and environment are not referring to OIML recommendations. They regulations are requirement of measure instruments in health area, public safety and environment have to be calibrated with accredited laboratory by National Accreditation body.

To protect of public safety in transportations and control measuring instruments of speed vehicle (motor, car, railroad, aircraft, ship, etc.), Ministry of Transportations have made regulations such as ministerial decrees. Purpose the regulations to ensure accuracy and correct measurement of measuring instruments, but the regulations are not referring to OIML recommendations.



For implemented Measurement Law No. 2/1981 in industrial and trade sector, DOM prepared regulations of technical standards (KST) for type approval testing and verification in legal metrology. Technical standards (technical manuals or testing procedures) are developed and delivered to the regional verification offices (RVOs). DOM development Technical standards referring to OIML recommendations. These regulations released with Ministerial Decree.

With Directorate General-Domestic Trade (DG – DT) Decree No. 29/DJPDN/Kp/XII/98 about measuring instruments for legal metrology, which metrology control of measuring instruments just focused on commerce linkage. The various kinds of legally control measuring instruments by DOM——Ministry of Trade are Length measuring instrument, taxi meter, moisture meter, watt-hour meter, water meter, gas meter, volume measuring instrument (wet can, dry can, tank truck, fixed storage tank, boat tank, rail tank, standard tank, oil flow meter, working meter, fuel dispenser), weighing instrument (non-electronic weighing, electronic weighing, conveyor belt scale, hopper scale, truck scale, weight set, etc.). Beside of that, DOM should develop regulations for supervision of pre-packages goods and legally measuring instruments.

V. Problem Analysis of Metrology System in Indonesia

This following of identifications problem analysis of metrology system in Indonesia:

1. Current control of speed vehicle measuring instruments in Indonesian is not referring to OIML recommendations.
2. Ministry of health, transportations and environment does not adopted OIML recommendations

(OIML systems) to control measuring instruments in their object area.

3. There is no coordination of DOM among Ministry of health, transportations and environment to control measuring instruments.
4. DOM and RVOs do not have sufficient budget to development facility and equipment for testing of legally controlled measuring instruments.
5. Indonesia's type approval testing does not conducted completely due to lack facility and knowledge of techniques.
6. Law and regulations enforcement for control of measuring instruments will not complete.

VI. Conclusion

- It is more important in any transportation (motor, car, railroad, aircraft, ship, etc.) to ensure accuracy and correct measurement of speed vehicle measuring instruments for protects of public safety. Speed vehicle is a highly significant factor in how serious the consequences of an accident can be done.
- Quality infrastructure with MSTQ is supported metrology systems in Indonesian. Current Metrology System, in general, its fields will be classified in to measurement standard, legal metrology, industrial standard and laboratory accreditation. Metrology systems in Indonesia with MSTQ still always to have a sustainable development of economic, trade, industry and public safety in health, transportations, environment, etc.
- Law and regulations of legally controlled measuring instruments at Indonesian have to development referring to OIML recommendations, where covered any kinds of object area (trade, health, safety and environment, etc.).

References:

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Overview of Current Control Measures in Malaysia

Ahmad Sahar Omar
Metrologist
National Metrology Laboratory
SIRIM Berhad, MALAYSIA

APEC/APLMF Workshop on Law Enforcement Equipment for Measuring the Speed of Vehicles
Leader Hotel, Chinese Taipei, 22-25 June 2009

Contents

National Metrology Laboratory (NML), SIRIM Berhad, MALAYSIA

- SIRIM Berhad is formerly known as Standards and Industrial Research Institute of Malaysia
- SIRIM Berhad became a government-owned company under the Ministry of Finance since 1st September 1996
- Consists of 4 main divisions:
  - Research and Technology Division
  - Engineering and Support Services Division
  - Standards and Quality Division —— **NML** is part of this division
  - Marketing and Business Development Division

National Measurement System Act 2007

- This act sits above existing legislations related to measurements and is intended to coordinate the national measurement system of the economy and provide for a coherent approach in establishing traceability and measurement for legal metrology, scientific metrology and industrial metrology.
- The act comes into operation on 15 February 2008 under the Ministry of Science, Technology and Innovation.
- The Ministry appoints the National Metrology Laboratory, Standards and Quality Division at SIRIM Berhad as the National Measurement Standard Laboratory.

National Measurement System Act 2007

- Functions of the National Measurement Standard Laboratory :

- To realize, establish and maintain the National Measurement Standards.
- To disseminate units of measurement that are traceable to the National Measurement Standards.
- To maintain the coordinated universal time.
- To carry out research and develop measurement technology and measurement system.
- **To approve the patterns of measuring instruments.**
- To co-ordinate and promote the national measurement system.
- To assist the Council on matters relating to measurement technology and measurement standards.
- To publish and disseminate technical information relating to measurement technology and measurement standards.
- To perform any other functions as the Minister may require and consider necessary.

National Measurement System Act 2007

Traceability of Measurement :

Any measurement made for the purpose of any written law shall be traceable to the National Measurements Standards as set out in this Act.

Weights and Measures Act 1972

- This act is under the enforcement of Ministry of Domestic Trade and Customer Affairs.
- The act comes into operation since 1972. Focus on the regulation of fair trade practices and control of the measuring instruments used in the direct retail trade sector.
- Amendments were made in 2007 to aligned to the requirements of National Measurement System Act 2007.
- The measuring instruments under the enforcement of this act are : **Linear Measures, Liquid Capacity Measures, Weights, Beam scales, Balances, Counter Machines, Spring Balance and Scales, Dead Weight Machines, Platform Weighing Machines, Weighbridges, Crane Weighing Machines, Automatic Weighing Machines, Instrument for Measurement of Liquid Fuel & Lubricant, Instrument for the Measurement of Alcoholic Liquor, Liquefied Petroleum Gas Dispensers, Parking Meters and Time-recorder for Closed Parking Areas.**

Control of Measuring Instrument used for Road Safety and Transportation Enforcement

- The Road Transport Department and Police Department enforces a numbers of regulations under the Road Transport Act 1987.
- **The measuring instruments under the control of this act are : Vehicle Speed Monitoring Device, Taximeter, Alcohol Breath Analyzer, Vehicle Exhaust Smoke Meter and Illuminometer for Measuring Light Transmission through vehicle windscreen.**
- Competent authorities was appointed by the Road Transport Department/Police Department to undertake the verification of the above measuring instrument, and the verification standard using during the verification was calibrated by the NML-SIRIM Berhad.

Control of Measuring Instrument under various Regulations/Act

Measuring Instrument	Regulations/Act
Land survey measuring instruments	Weights and Measures Act, 1972
Electricity meter	Electricity Supply Act, 1990
Water meter	State Government Regulations
Gas meter	Gas Supply Act, 1993
Bulk storage tanks, flow meter and volume measuring system for Custody Transfer	Custom Excise Act, 1976

Thank You for Your Kind Attention.

APEC/APLMF Seminars and Training Courses in Legal Metrology

(CTI-09/2009T)

Workshop on Law Enforcement Equipment for Measuring the Speed of Vehicles

22-25 June, 2009
Leader Hotel, Taipei, Chinese Taipei

Introduction

Name: Joe Panga

Position: Metrologist (Legal)

Division: Metrology (MSL)

Organization: Papua New Guinea
National Institute of Standards & Industrial Technology (PNGNISIT)

Economy: Papua New Guinea

PNG NISIT

- Established by an Act of Parliament, NISIT Act, 1993
- The national agency responsible for spearheading Standards and Conformance in PNG
- Operates four (4) Technical Divisions (at present)
  ——Technical Standards
  ——Laboratory Accreditation
  ——Certification
  ——Metrology

Metrology Division

- Is in charge of Physical and Legal Metrology Programs in PNG
- Operates the accredited Measurement Standards Laboratory (MSL)
- Provides Calibration & Verification Services

Measurement Standards Laboratory (MSL)

- Maintains the National Measurement System
- Disseminates the National Measurement Standards
- The only accredited Calibration & Measurement Laboratory in PNG (accredited by NATA, Australia)
- Participates in Proficiency Testing
- Custodian of the National Primary Standards (PNG Measurement Standards)

Measurement Standards Laboratory (MSL)

MSL responsibilities are covered under the NISIT Act, 1993

- Part (vi) Units and standards of measurement
- Sections 33 —— Application of this part
- Section 34 —— Papua New Guinea legal units of measurements
- Section 35 —— Contracts
- Section 36 —— Conversion factors

MSL Scope of Responsibilities (P2)

- Section 37——Standards of measurements
- Section 38——Verification of standards of measurement
- Section 39——Measurements to be ascertained in accordance with appropriate standards of measurement
- Section 40——Verification of Means of measurement

Other Legislative Instruments that Empower the field of Measurement

- Trade Measurement Act
- PNG Power Act
- Motor Traffic Act 1950——MTR 1967

MSL Services (Current)

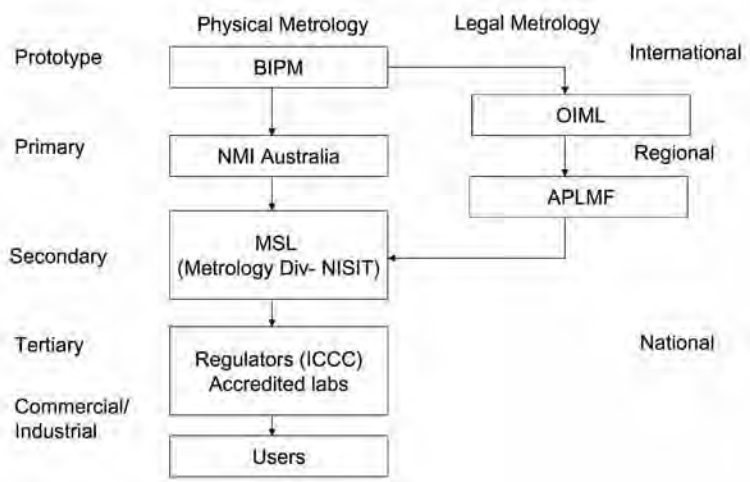
Calibration and Verification Services provided are not directly linked to traffic control instruments

MSL Services (Future Areas)

Calibration and Verification Services which are being looked at:

- Electrical (currently researched and at the establishment stage)
- Time and Frequency (currently researched)
- Vehicle Speed Measuring Equipment (possibility)

Measurement Traceability maintained by MSL



General Overview of LEEMSV In PNG

Organization(s) that regulate all motor traffic controls instruments in PNG are:

- **Department of Transport**
  Enforce Traffic Law through Transport Authority; Regulatory functions
- **National Road Safety Council**
  Engineering; Enforcement and Education
- **NISIT**
  For standards and Conformance

National Road Safety Council In PNG

- Provide Professional and proactive solutions to how and why road accidents occur and offer solutions to alleviate road accidents
- Ensure road users, vehicle and road services are accident free
- Instill skills and raise general awareness level in road safety issues

NISIT and LEEMSV In PNG

- MSL is not providing this services to date
- Possibility to look into providing calibration and verification services for these instruments

Way Forward

- This Training/Seminar to provide a starting point to NISIT to spearhead this agenda back in PNG
- NISIT to initiate dialogue with NRSC in establishing a legal framework that can support this activities

END

Thank you for your Attention

ECONOMY REPORT

(Philippines)

APEC/APLMF Seminars And Training Courses In Legal Metrology: Workshop on Law Enforcement Equipment for Measuring the Speed of Vehicles

June 22 – 25, 2009

Leader Hotel, Taipei, Chinese Taipei

SAMUEL SOCRATES A. SOLIDARIOS

National Metrology Laboratory (NML)
Industrial Technology Development Institute (ITDI)
Department of Science and Technology (DOST)
DOST Science Complex, Gen. Santos Avenue
Bicutan, Taguig City 1631
Philippines

Outline of Presentation

- About the Philippines
- About the Participant
- Department Of Science and Technology (DOST) Organizational Chart
- Industrial Technology Development Institute (ITDI) Organizational Chart
- National Metrology Laboratory Philippines (NMLPhil) Organizational Chart
- History of ITDI
- About ITDI
- About NMLPhil
- Philippine Laws on Weights and Weights
- Current Organizational Structure

The Philippines

About The Philippines

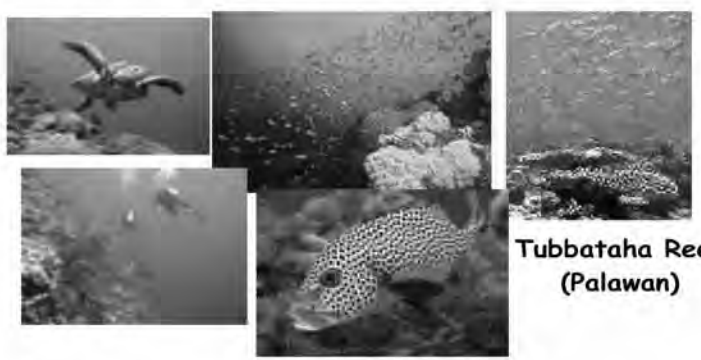
Official name: Republic of the Philippines
Capital: Manila
Language: Filipino & English, 8 major dialects
Population: about 90 million
Religion: 83% Catholic, 5% Moslem, the rest are other Christian denominations & Buddhist
Area: 7,107 islands; ~300,000 sq km
17 Regions, 81 provinces and 136 cities

Boracay Island

Mt. Mayon, Bicol

About The Philippines

Government: Constitutional democracy with two legislative houses
Chief of state: President
Head of Government: President
Currency: Pesos and centavos (1 NT DOLLAR ≈ 1.456 pesos)
Unit of Measure: Metric system (in most trade & legal transactions)
Electricity:220VAC common standard, 110VAC also available



Tubbataha Reef (Palawan)

About The Philippines

Climate: hot & dry season (March – May)
wet or rainy season (June – October)
cool, dry season (November – February)

Average temperatures: 78 ° F/ 25 ° C – 90 ° F/ 32 ° C

Humidity: 77%

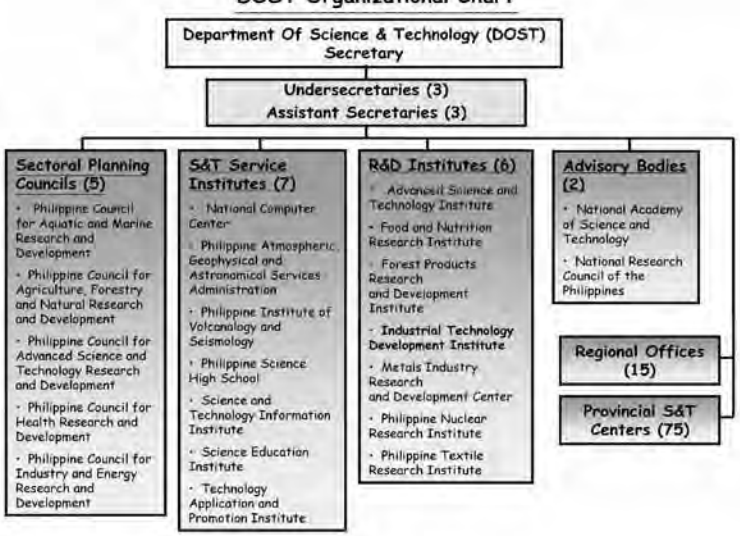
Industry : Farming, rice, sugar, coconuts, pineapples, forestry, fishing, education, health, trade, tourism, transportation, communications, banking, manufacturing, construction, mining, & business process outsourcing

Palawan Underground River
(Puerto Princesa Subterranean River National Park)

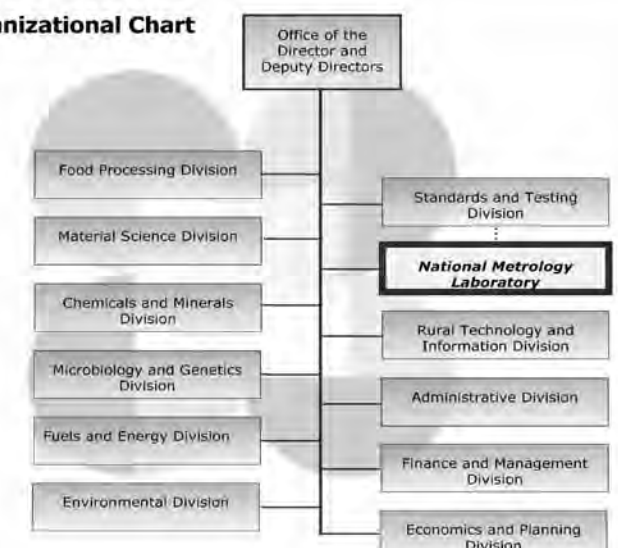
Participant from Philippines

I am **Samuel Socrates A. Solidarios,** a Science Research Specialist working at the Electrical, Time and Frequency Standards Section of the National Metrology Laboratory (NML) of the Industrial Technology Development Institute (ITDI) an agency of the Department of Science and Technology (DOST). I have already about 16 years service in the institute doing R&D in instrumentation and automating process control, before I was assigned to my present job. My current duty for 3 years is to automate the data acquisition process in our laboratories and develop in-house calibration instruments.

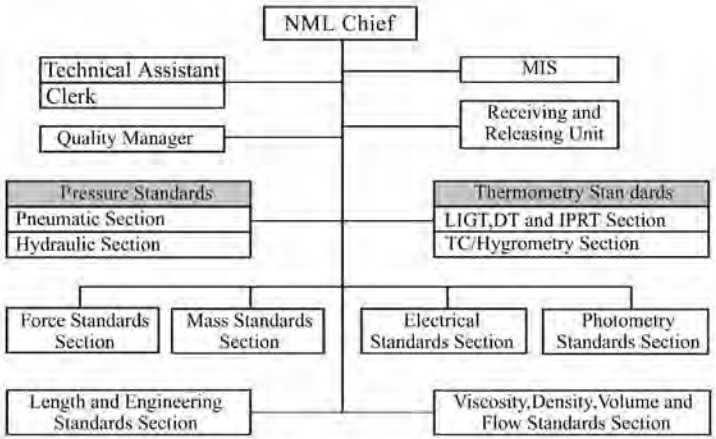
DOST Organizational Chart



ITDI Organizational Chart



NMLPhil ORGANIZATIONAL CHART



History of the Industrial Technology Development Institute (ITDI)

•**1901** — 1st of July — **The Bureau of Government Laboratories (BGL)** came into existence through the Philippine Commission Act. No. 156. It was composed of the biological and chemical laboratories, a science library, and the Serum Laboratory of the Board of Health.

•**1905** — By virtue of the Philippine Commission Act. No. 1407, the BGL was reorganized into the **Bureau of Science (BS)** and expanded its functions to include the Bureau of Mines and the Ethnological Survey Division of Education.

•**1934** — The headship of the BS was passed on for the first time to a Filipino chemist. Dr. Angel S. Arguelles. The present-day Bureau of Soils, Bureau of Mines, Bureau of Fisheries and National Survey Division of Education Museum developed initially as part of the Bureau of Science during the pre-war years.

Cont..History of the ITDI

•**1947** — The BS was transformed into the **Institute of Science (IS)** by virtue of Executive Order No. 94.

•**1951** — The IS was renamed **Institute of Science and Technology (IST**) by virtue of Executive Order No. 392 and for the first time primarily concerned itself to industry-oriented research.

•**1956** — Congress approved RA Number 1606 authorizing the establishment of the National Science Board (NSB). IST was changed to the **National Scientific and Industrial Research Institute (NSIRI)**, and was placed under supervision of NSB.

•**1958** — Under the so-called "Magna Carta of Philippine Science" RA 1067, NSB was reconstituted as the National Science Development Board (NSDB), which was designed to coordinate and supervise all scientific activities in the country. NSIRI became the **National Institute of Science and Technology (NIST)** under the supervision of NSDB.

Cont..History of the ITDI

•**1973** — As part of the overall reorganization of the Executive branch of the government, the NIST was reorganized, but retained the same name. With the merger of the Agriculture Research Center, Biological Research Center and Medical Center, only two (2) technical R&D centers remained, namely Biological Research Center and Industrial Research Center. In addition, these were the Tests and Standards Laboratory and the Scientific Instrumentation Division to provide standardization and technical services.

•**1982** — By virtue of Executive Order Number 784 dated 17 March 1982, the NSDB was reorganized into the National Science and Technology Authority (NSTA). Under the reorganization NIST remained as one the R&D Institutes under the NSTA.

Cont..History of the ITDI

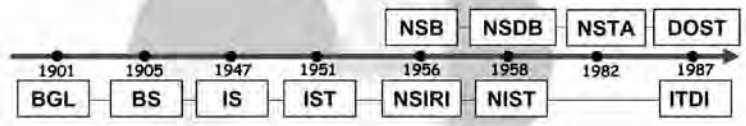
- **1987 to Present** —— The NSTA was reorganized into the Department of Science and Technology (DOST) by virtue of Executive Order Number 128 dated 30 January 1987.

  Under this reorganization, NIST was renamed **Industrial Technology Development Institute (ITDI)** and remained one of the R&D institutes under the DOST.

  ITDI is mandated by Batas Pambansa Bilang 8 *(An Act Defining the Metric System and Its Units, Providing for its Implementation and For Other Purposes)* under section 6 to establish and maintain the national standards for the SI units of quantities such as mass, length, time, electric current, thermodynamic temperature, pressure and luminous intensity; and the Science Act of 1958, pertaining to the test and analyses of products and materials and the calibration of weights and measures.

Historical Timeline (Summary)

(DOST and ITDI)



BGL —— Bureau of Government Laboratories
BS —— Bureau of Science
IS —— Institute of Science
IST —— Institute of Science and Technology
NSIRI —— National Scientific and Industrial Research Institute
NIST —— National Institute of Science and Technology
ITDI —— Industrial Technology Development Institute
NSB —— National Science Board
NSDB —— National Science Development Board
NSTA —— National Science and Technology Authority
DOST ——Department Of Science and Technology

Industrial Technology Development Institute

(ITDI)

Vision:

Excellence in propelling development as provider of technologies and services for the industry

Mission:

To make local industries globally competitive

The Industrial Technology Development Institute or ITDI is one of the research and development institutes (RDIs) under the Department of Science and Technology (DOST). By virtue of Executive Order No. 128 dated January 30, 1987, ITDI is mandated to render variety of services to local industries. It is the flagship agency of DOST generating a large pool of technologies while providing technical services to industry.

ITDI provides various services or interventions to industry to help modernize the production sector and improve their productivity such as:

- Research and development
- Technology transfer and contract projects
- Test and analyses
- Food engineering services
- Metrology
- Process engineering
- Post harvest handling/near farm processing/packaging
- Packaging research and development
- Cleaner production
- Enterprise module
- Energy audit
- Industry training and skills development
- Scale up production facilities
- Technical information and promotion
- Library service.

National Metrology Laboratory

VISION :
NML of internationally recognized competence and nationally sought for traceability of calibrations.

MISSION :
We shall establish, maintain and disseminate the national standards of units of measurements to provide international traceability to measurements done in the country. We shall do this by competently conducting calibrations and measurements at accuracy levels appropriate to the needs of the customer.

As national custodian for weights and measures, ITDI's program on metrology responds to the call for accuracy and traceability in the units of measurement (e.g. mass, length, volume) for product standardization, higher quality and competitiveness of local products, and protection of the consumers.

National Metrology Laboratory —— Philippines

The **National Metrology Laboratory of the Philippines (NML)** is the organization responsible for establishing and maintaining national physical standards for basic and derived quantities such as mass, length, temperature, time interval, voltage and resistance. Dissemination of standard values to users at the best uncertainty levels attainable is performed through the calibration and measurement services offered by the Laboratory.

The NMLPHIL is equipped with high precision standards and measuring instruments for use in its calibration and measurement activities. National standards are regularly calibrated abroad to ensure international traceability.

The NMLPHIL also regularly participates in international intercomparison of measurement standards to further enhance confidence in its measurement results. Personnel qualification is kept up to date through attendance in training programs, seminar and workshops conducted by the international metrology community.

INTERNATIONAL LINKAGES

The Philippines through NML-ITDI is a member of the following International Organizations:

- Asia Pacific Metrology Program (APMP)
- Asia Pacific Legal Metrology Forum (APLMF)
- Bureau International Des Poids et Mesures (BIPM)

NMLPHIL has five major labs divided into sections, which keep and maintain the national standards in the different fields of metrology. Each of these laboratories disseminates the standard units of measurement through our calibration services.

1. Mass, Force and Pressure Standards Sections maintains a 1kg stainless steel cylinder as the national standard for mass. It is traceable to international standards through its calibration at NML, Australia. NML also maintains sets of 1mg to 20kg weights that are calibrated against the 1kg national mass standard. These sets of weights in turn are used to calibrate other mass standards, balances and are also used in measurement of related quantities such as force, pressure, volume and density.

2. Length and Engineering Metrology Standards Section
maintain line and end standards. Its meter bar and gage blocks are calibrated at NML, Australia to maintain traceability to international standards.

3. Viscosity, Density, Volume and Flow Standards Section
maintains standards to calibrate volumetric measures, hydrometers for measuring liquid densities, viscosity of oil, and moisture measurement. Its volume measurements use the gravimetric method and are traceable to the 1kg national standard.

4. Thermometry, Hygrometry and Photometry Standards Sections
maintains fixed-point cell to derive the International Temperature Scale (ITS90). Sets of temperature measuring instruments are calibrated against these fixed-point cells and are used as reference and working standards.

5. Electricity, Time and Frequency Standards Section
maintains the national standards for dc voltage, ac-dc difference and resistance and are traceable to NML, Australia. An inventory of reference and working standards is maintained and calibrated against the national standards for use in its general calibration and measurement activities. Standard time interval and frequency is maintained through a Cesium Beam Primary Frequency Standard. International traceability to Coordinated Universal Time (UTC) is maintained through GPS Common-View (CV) time transfers between NML and NML, Australia.

Major Projects of NMLPHIL

1. GAPS Identification

A nationwide comprehensive survey of the manufacturing, processing and service industries; R&D organizations and schools; municipal inspector's office; and other institutions was conducted and determined their calibration needs.

2. Assistance to Laboratories Outside the DOST System

Under this project, in-house calibration laboratories, commercial laboratories and municipal inspection laboratories were continually targeted for improvement. Manufacturing laboratories were encouraged to have small calibration laboratories of their own to calibrate their own measuring instruments. The local government unit on the other hand will continue to exercise their regulatory power with respect to fair trade by conducting verification test of weights and measures. Seminars, trainings and consultancy services are continuously given to help them.

3. DOST Regional Calibration Laboratories

Existing DOST Regional Calibration centers are from time to time are upgraded to meet the ever growing demand for calibration services while new ones will be established in regions where these services are critically needed.

4. DOST Laboratories in the National Capital Region

a. Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAG-ASA), DOST – PAG-ASA has the capabilities for maintaining the epoch time (time of the day) for the country. A Rubidium-Based Time Standard was acquired and it is continuously compared to NML-ITDI and other NMIs through GPS-Common View (CV) method. A cooperative work with NML-ITDI maintains the traceability of this facility to international standards.

b. Philippine Nuclear Research Institute (PNRI), DOST – In the area of ionizing radiation, ITDI delegated its national standards keeping function to PNRI. Among health and safety related functions of PNRI is the dissemination of standards on radiation through calibration and measurements on survey meters, area monitors, personnel dosimeters, environmental monitors and contamination monitoring instruments.

4. DOST Laboratories in the National Capital Region (cont...)

c. National Metrology Laboratory (NML), ITDI, DOST – The NML-ITDI shall continue to take charge of the establishment, maintenance, and dissemination of the national standards of units of measurement.

NMLPHIL developed an interface and program for the semi-automatic operation of a 1 kg mass comparator. It also acquired a 10 kg high resolution mass comparator to improve the build-up, and build down from the 1 kg national standard. OIML class E1 masses were also acquired. Most of the calibration in the Electricity laboratory were already automated through software programs developed by the lab's staff through GPIB, serial and parallel port control. Computer system (purchased under a Japan MITI project) and networking hardware were acquired to improve management of information. Equipment and instruments for the Photometry section were delivered and installed, and experts from China and NMISA, South Africa conducted series of trainings and visits.

5. Metrology Training Center

The Metrology Training Center conducts on-site trainings and in-house trainings on metrology. On-site trainings are conducted at the premises of the requesting company while in-house trainings are conducted at NMLPHIL-ITDI. This project has served over 500 participants from various sectors such as the academe, private calibration laboratories, local government units (LGUs), food manufacturers, traders of agricultural products, manufacturing industries, etc.

6. Laboratory Proficiency Evaluation Program

Interlaboratory comparisons in field of mass, length, volume, thermometry, pressure and electricity were conducted These intercomparisons involved mostly of private calibration laboratories and DOST regional calibration laboratories. Also intercomparisons among semiconductor and electronic companies was also done. Moreover, proficiency of market inspectors nationwide was also tested.

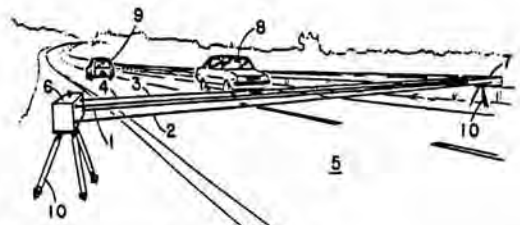
7. NMLPHIL-ITDI ISO/IEC 17025 Accreditation

The NMLPHIL is currently preparing for ISO/IEC 17025 Accreditation. All major laboratories are being primed for accreditation with specific concentration for the following laboratories, Mass, Force and Pressure and Thermometry, Hygrometry and Photometry. These major laboratories are foremost in the plans of NML accreditation with the other major laboratories to follow suit.

8. VERIFICATION SYSTEM for SPEED MEASUREMENT

This is a system for monitoring the speed of vehicles by using a pair of a start and stop laser beams spaced apart by a known measuring distance. The pair of laser beams serve as the laser transmitters. An electronic receiver for each beam is used to detect when reception of each beam is interrupted. One of the receivers is used as a start trigger and the other as the stop trigger on the inputs of a timer/counter. The time difference between the start and stop condition is measured. The speed of the vehicle being monitored is therefore the distance divided by the time difference.

NMLPHIL Speed Measurement



Drawing is from the US Patent Office.

The NML setup is based on the above drawing:

(7) Pair of laser beam transmitter

(6) Start-Stop Laser beam receiver

(1) Start laser beam

(2) Stop laser beam

Not included in the diagram is the timer/counter (Fluke PM6680B) shown above right for measuring the time difference of start-stop laser beams. This setup was used to verify the LASERCAM II. A microcontroller-based portable instrument is being developed to replace this setup.

LASERCAM II

LASERCAM II combines lidar speed detection with digital photo evidence. Only 5 units exist in the Philippines. These are used in the North Luzon Expressway by the Tollways Management Corporation, a company engaged in carrying on the perations and aintenance of toll roads.

Photos from
www.sunagaimpulse.com

List of NML's Reference Standards

Parameter	Standard	Nominal Value
Mass	Stainless Steel Weight	1 kg
	Set of Weights	1 mg–20 kg
Length	Line Standard, nickel-steel	1 m
	Set of Gage Blocks	0.5–100 mm
Density	Silicon Density Standard	2.329074 g/cm³
	Set of Standard Hydrometers	0.6 to 2 g/cm³
Volume	Proving Tanks and Calibrating Buckets	500 mL–20 L
Force	Dead Weights	4 tonf maximum
	Proving Ring	90 tonf
	Standard Load Cells	500 kgf–2000 kN
Pressure/ Vacuum	Dead Weight Piston Tester	0–2000 kgf/cm²
	Dead Weight Balance	0–5 bar
Dc Voltage	Electronic Voltage Standard Cell Bank	1.018 V & 10 V
Ac-Dc Difference	Thermoelectric Comparator	(0.5–1100 V)
Resistance	Standard Resistors	1 Ohm & 10 kiloOhm
Frequency	Cesium Beam Primary Frequency Standard	10 MHz
Temperature	Fixed Point Temperature Standards	0–1085° C
	Pt Resistance Thermometer	(-183 – 660° C)
	Mercury-in-glass Thermometers	(-41.4 – 101.5° C)
	Pt-Rh Thermocouples	0–1100° C

Philippine Laws on Weights and Measures

The Science Act of 1958 (Republic Act No. 2067, as amended by Republic Act. No. 3589

—— R.A. 2067 is known as the Science Act of 1958 creation of the National Development Board (NSDB) and its agencies. The National Institute of Science and Technology (NIST), which is now the Industrial Technology Development Institute (ITDI) is an institute under the NSDB.

Philippine Laws on Weights and Measures

Batas Pambansa Bilang 8 (1978)

—— An act Defining the Metric System and Its Units, Providing for its Implementation and for other purposes. This provides that National Institute of Science and Technology now Industrial Technology Development Institute (ITDI) to establish and maintain the five base units of measurement (mass, length, temperature, electricity, luminous intensity)

Philippine Laws on Weights and Measures

Republic Act No. 7394, Chapter II, Art. 62, Consumer Act of the Philippines

—— Regulation of Practices Relative to Weights and Measures.

Republic Act No. 1365, Section 1 & 5

—— All Copra buyers are required to use moisture meters and regularly calibrated every six months.

Philippine Laws on Weights and Measures

Local Tax Code enacted under Presidential Decree No. 231, Section 14 (1973)

—— "Municipal treasurers are hereby required to keep full sets of secondary standards in their offices for use in testing weights and measures. These secondary standards shall be compared with the fundamental standards in the National Institute of Science and Technology (now ITDI) at least once a year".

Philippine Laws on Weights and Measures

Batas Pambansa Bilang 33, Section 3g by Presidential Decree No. 1865, May 25, 1983

—— Calibration, registration and sealing of Petroleum Product Transport Containers.

Department Of Energy Circular No. DC 2003-11-010, Rule III Sections 12,13,14 & 16 (2003)

—— Calibration and sealing of Petroleum Product transport containers, calibration bucket of owners/operators petroleum retailers by DOST-ITDI.

Philippine Laws on Weights and Measures

Republic Act No. 9236 (National Metrology Act of 2003)

—— An act establishing a National Measurement Infrastructure System (NMIS) providing measurement standards that are internationally traceable and consistent with the Meter Convention.

—— It shall cover units of measurement, measuring instruments, their application and metrological controls, establishment of a laboratory accreditation system, and a system of appropriate penalties.

—— With this Act, a National Metrology Board is created to be chaired by the Secretary of DOST with members from other government agencies. Representative from the business sector, professional metrology association and the academe shall be appointed.

Philippine Laws on Weights and Measures

...(continued) Republic Act No. 9236 (National Metrology Act of 2003)

—— With this Act, a National Metrology Board is created to be chaired by the Secretary of DOST and it shall be composed of the Secretaries of the following agencies or their duly authorized representatives with the rank of Undersecretary:

a) Department of Trade and Industry (DTI)
b) Department of Transportation and Communications (DOTC)
c) Department of Health (DOH)
d) Department of Interior and Local Government (DILG)
e) Department of Justice (DOJ)
f) Department of Environmental and Natural Resources (DENR)
g) Department of Agriculture (DA)

One (1) representative from the business sector, the professional metrology association and the academe, shall be appointed by the President upon the recommendation of the Secretary of the DOST.

Philippine Laws on Weights and Measures

...(continued) Republic Act No. 9236 (National Metrology Act of 2003)

——The ITDI is mandated to serve as the Board's Secretariat and the National Metrology Laboratory (NML) as the institute's laboratory arm shall carry out the technical, calibration and laboratory functions to effectively implement the provisions of this Act. Thus, with this act, an important and critical role of NML in the development of National Standards is greatly anticipated.

Philippine Laws on Weights and Measures

...(continued) Republic Act No. 9236 (National Metrology Act of 2003)

—— The Laboratory accreditation body shall establish a national standard for accreditation, testing and/or calibration laboratories following ISO/IEC GUIDE 58 "Calibration and testing laboratory accreditation systems —— General requirements for operation and recognition" and ISO/IEC 17025 and other relevant international guidelines and standards.

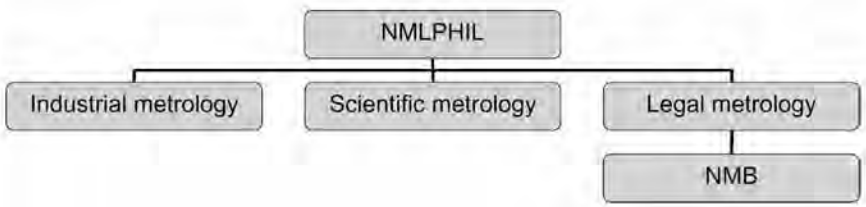
Philippine Laws on Weights and Measures

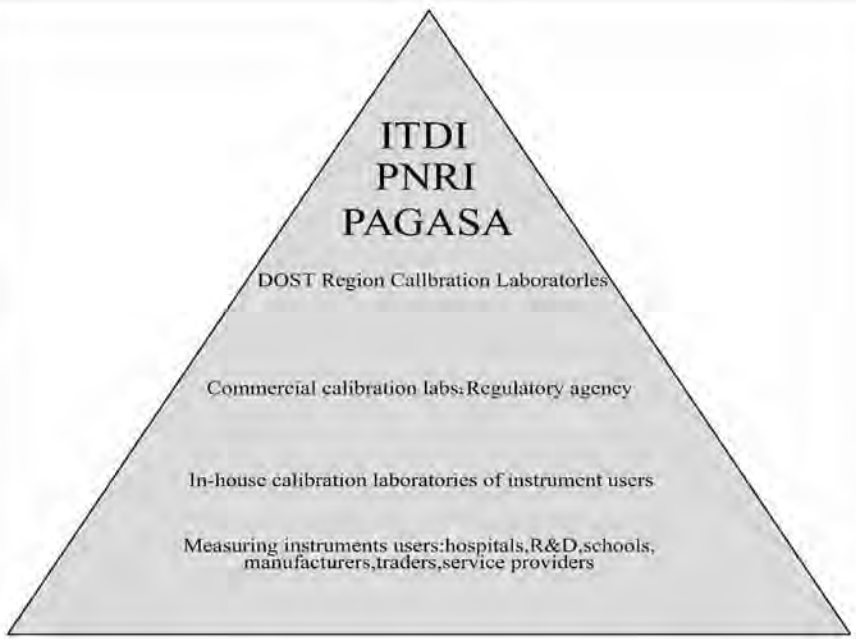
...(continued) Republic Act No. 9236 (National Metrology Act of 2003)

—— The Laboratory accreditation body shall have the following government agencies of offices as members:

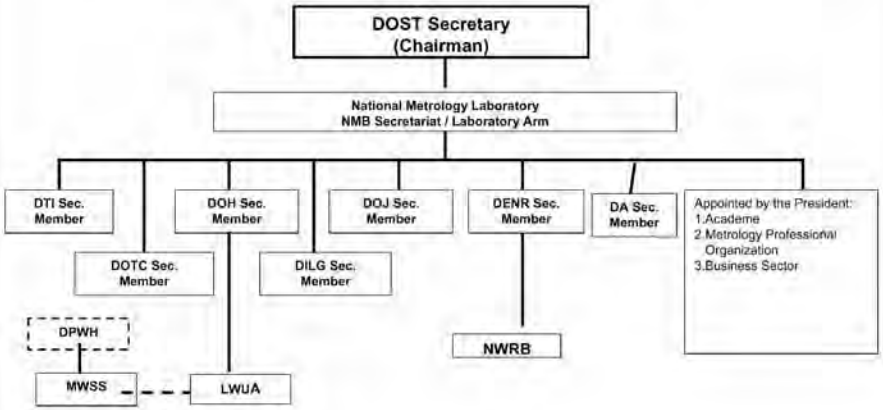
a) Department of Trade and Industry (DTI)
b) Department Science and Technology (DOST)
c) Bureau of Food and Drugs (BFAD)
d) Fertilizer and Pesticide Authority (FPA)
e) Environment Management Bureau (EMB)
f) National Telecommunications Commission (NTC)
g) Department of Energy (DOE)
h) Bureau of Health Devices and Technology (BHDT)
i) Department of National Defense (DND)

Current Organizational Structure





NATIONAL METROLOGY BOARD



Thank you very much!!!

APEC Asia-Pacific Economic Cooperation

BSMI

APLMF

Current Legal Measures on Speed Measurement Instruments in Chinese Taipei

Jin-Hai Yang
Bureau of Standards, Metrology and Inspection
Ministry of Economic Affairs
June 22, 2009

APEC Asia-Pacific Economic Cooperation

BSMI

APLMF

Content

- Instrument
  - ——Radar Speed Meter: (1100)
  - ——Laser Speed Meter: (404)

——Competency authority:

- Low enforcement agency? Legal metrological agency?
- Central government agency or local government agency?

- Measures:
  - ——Business License
  - ——Verification
  - ——Inspection

——Business License:

- Scope: manufacturers, repairs, importers
- Requirements: documents & equipments
- expiration: 10 years

——Verification: initial verification, subsequent verification, and re-verification

- Initial verification
  - ——Scope: all instruments prior to be put on market
  - ——Applicant: manufacturers or importers
  - ——Requirements: documents and photo (if applicable)
  - ——Expiration: 1 year

- Subsequent verification:
  - ——Scope: periodic by legislation
  - ——Applicant: users or owners
  - ——Requirements: documents and photo (if applicable)
  - ——Expiration: 1 year

- Re-verification:
  - ——Scope: instruments after repair, fail to inspection
  - ——Requirements: documents and photo (if applicable)
  - ——Expiration: 1 year

——Laboratories:

- Electronics Testing Center, Chinese Taipei
- Center for Measurement Standards,Industrial Technology Research Institute

——Inspection:

- Why?
- Who?
- When?
- How?

- Regulations:
  - ——General requirement:
    - the instrument shall bear the type number, the maker's trade name or trademark, serial number, and specification of power supply on it.
    - The main part of the instrument and its accessories, including power supply line and signal connection line for detection, shall be well equipped.

- All the switches, press buttons, and twist buttons of the instrument and its accessories shall be functioned smoothly.
- If the instrument is installed on a frame according to the operation manual, the instrument shall be stable and not shakable.
- The speed indication of the instrument shall be digital indication and clear and distinguished instantly.
- The minimum digit of speed indication of the instrument shall be equal to or less than 1 kilometer per hour.

——Radar Speed Meters:

- Technical requirements:
  - ——Unit: km/h
  - ——Minimum of speed indication: ⩽1 km/h
  - ——Speed detection Range: 25 km/h~199 km/h
- Documents:
  - ——user manual
  - ——import declaration
  - ——Photo(if applicable)

- Verification Items:
  - ——Structure and functions
  - ——Microwave transmitter frequencies
  - ——Radiation field type of transmitting antenna
  - ——Microwave radiation power strength
  - ——Accuracy of speed detection at 9 difference speeds, i.e. 25 km/h, 50 km/h, 60 km/h, 70km/h, 90 km/h, 100 km/h, 110km/h, 150km/h and 199 km/h

• Testing Procedure:

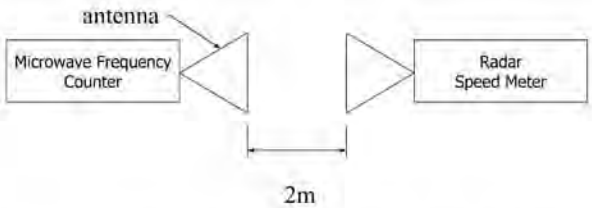


Figure 1 Equipment installation for the verification of transmitting frequency of the radar speedometer

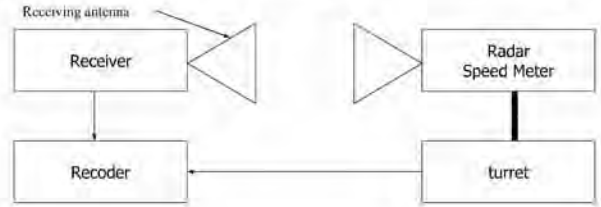


Figure 2 Equipment installation for the verification of antenna field type of the radar speedometer

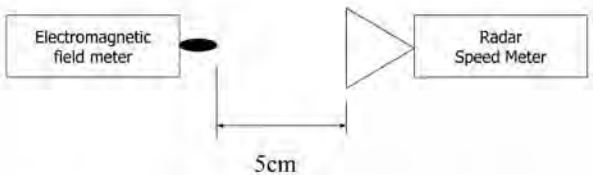


Figure 3 Equipment installation for the verification of radiation power of the radar speedometer

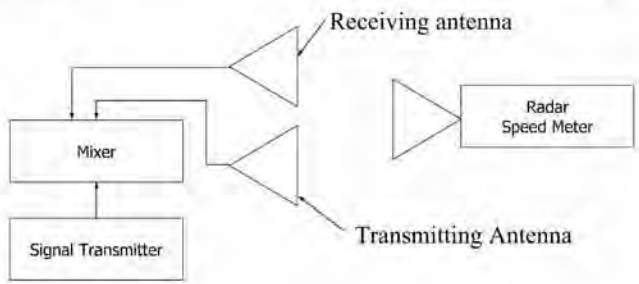


Figure 4 Equipment installation for the verification for detecting accuracy of the radar speedometer

- Maximum Permissible errors for verification:
  - ——Microwave transmitter frequency: ± 0.2%
  - ——Width of main beam of transmitting antenna: <24°
  - ——The difference between main beam and side lobes of transmitting antenna: > 15 db
  - ——Microwave radiation power strength : 10mW/cm^2
  - ——Errors of speed detection: ≤ 1 km/h when speed slower than 150 km/h, or ≤ 2 km/h when speed faster than 150 km/h
- Maximum Permissible errors for inspection: 1.5 times MPE for verification

- Requirements for verification equipments:
  - ——Traceability
  - ——Antenna with frequency range: 10.525GHz~36GHz
  - ——Spectrum analyzer with frequency range: 10.525GHz~36GHz
  - ——Signal generator with frequency range: 100Hz~100 GHz
  - ——Electromagnetic field meter with frequency range: 10.525GHz~36GHz

——Laser Speed Meters:

- Technical requirements:
  - ——There shall be no obvious scratches or cracks that affect the reflection on the speed measurement
  - ——Unit: km/h
  - ——Minimum of speed indication: ≤1 km/h
  - ——Speed detection Range: 16 km/h~300 km/h
- Documents:
  - ——user manual
  - ——import declaration
  - ——Photo(if applicable)

- Verification items:
  - ——Structure and functions
  - ——Aiming distance
  - ——Laser power intensity
  - ——Accuracy of speed detection at least 10 difference speeds
    i.e. 25 km/h, 50 km/h, 60 km/h, 70km/h, 90 km/h, 100 km/h, 110km/h, 150km/h, 200 km/h,250km/h and 300km/h

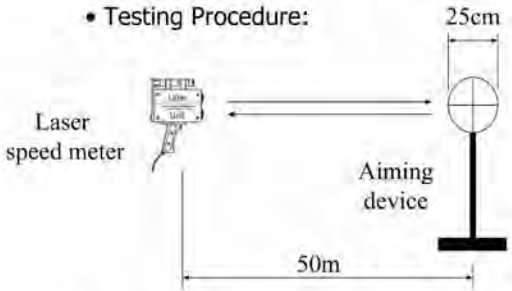


Figure 1 Aiming Distance Device Inspection of the Laser speedometer

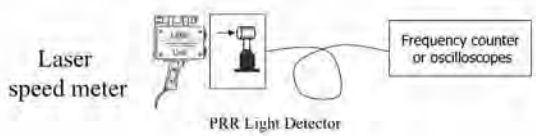


Figure 2a PRR detection Device

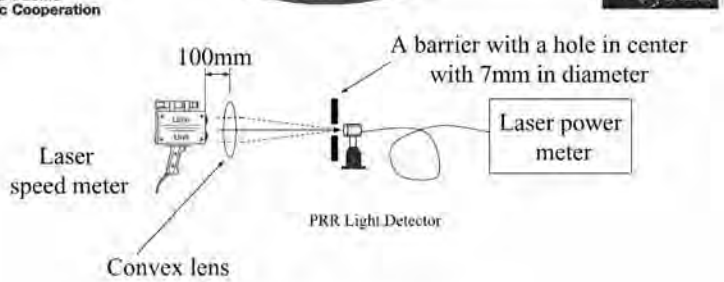


Figure 2b Inspection of Light Power

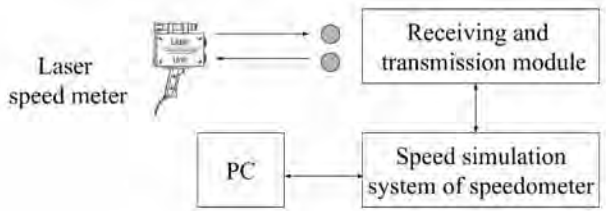


Figure 3 Speed Accuracy Simulator Operation

- Maximum Permissible errors for verification:
  - ——Aiming distance: ± 0.3 m
  - ——Laser power intensity:pulse repetition rate ≤390Hz, pulse repetition rate variation ≤0.1%
  - ——Accuracy of speed detection: -3 km/h, +2 km/h
- Maximum Permissible errors for inspection: 1.5 times MPE for verification

- Requirements for verification equipments:
  - ——Traceability
  - —— Aiming distance measuring equipment with resolution: ≤ 1 cm
  - ——Frequency counter or oscilloscopes
  - ——Laser power meter: wavelength shall cover 905nm ± 50nm and the power range shall meet the requirements of IEC 60825 Class 1
  - ——Speed measurement simulation system of the laser speed meter:
    - » Delayed time range 0.2 μs ~ 5 μs
    - » Input trigger < 100ns
    - » Pulse repetition rate no less than 390Hz

- Difficulty:
  - ——Type approval
  - ——Verification
  - ——Vehicle identification

- Future plan:
  - ——Regulations review
    - Radar speed meters
    - Laser speed meters
  - ——Alternative speed meters
    - Induced loop speed meters
  - ——Long term strategy
    - Type approval
    - International Cooperation

Asia-Pacific Economic Cooperation

Thank you for your attention.

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Legal Metrology System in Thailand

"Law Enforcement Equipment for Measuring the Speed of Vehicles"
June 22—25, 2009 in Taipei, Chinese Taipei

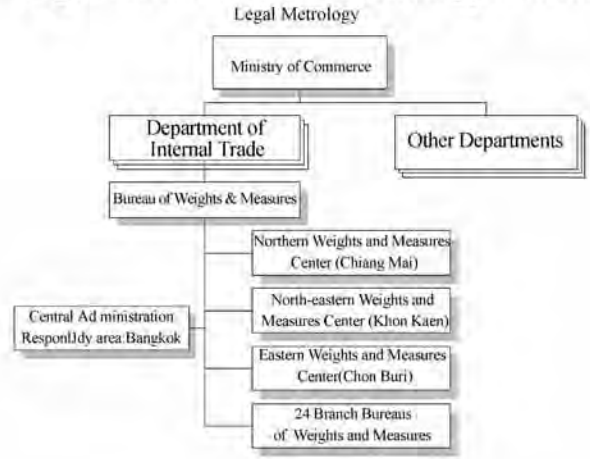
Introduction

- System of legal metrology has a long tradition in Thailand more then 80 years
- In 1923 the "Weights and Measures Act was enacted and revised in 1999
- Most of measuring devices are verified and supervised or under legal control are balances, utility meters, gas and fuel dispensers pre-packed goods

Introduction (cont.)

- Thailand has a population of 62 million
- Responsibilities are divided
  - ——National Institule of Metrology is responsible for unity of scientific metrology
  - ——Bureau of Weights and Measures is responsible for unity of legal metrology

Organization of Legal Metrology in Thailand



- CBWM has 3 regional centers and 24 branches around 162 staff
- annual budget of around THB 60 million (not included salary)
- There are calibration laboratories of working standards in CBWM (Head Office) and regional centers

Law and Ministerial Regulations

Ministerial Regulations are based upon OIML recommendations and intent for carrying out verification and inspection as follows:

- Non-automatic Weighting Instruments (OIML R76)
- Automatic Weighting Instruments (OIML R50, R51 and R107)
- Standard Weights (OIML R111)
- Length-measuring Instruments (OIML R35)
- Automatic Level Gauges (OIML R85)
- Liquid-measuring Devices (OIML R117)
- Gas Volume Meters (OIML R6, R31 and R32)
- Direct Mass Flow Meters (OIML R105)

Weights and Measures Act

- aim of the act
  - ——protection of consumers
  - ——safeguarding of a fair trade
  - ——collect the full amount of government excise and taxes
- verification duty (which measuring devices have to be verified)
- permission to make business of manufacturer, import, repair and sale of measuring instruments
- permission to verify measuring instruments (manufacturer and repairer)

Weights and Measures Act (cont.)

- supervision and inspection of verified measuring devices and pre-packaged goods
- penalties

Core Problems

1. Organizational Structure

——Must be the same level as Department to:

- Strengthen administrative system
- Improve Infrastructure
- Effectively cooperate with regional and international organizations

Core Problems (cont.)

2. Type Approvals

——Lack of human resources for Type Approval concerning measuring instruments

——Testing facilities (lab, equipment, etc.)

——No good communication among organizations (to set up Type Approval system)

Thank You So much for your attention

KHOB-KUN-KA

Workshop on Law Enforcement Equipment for Measuring the Speed of Vehicles

Speedometer verification and management in Viet Nam

Do Duc Luong
Head of Electromagnetic Laboratory VMI

June 22 – 25, 2009, Chinese Taipei

CONTENTS OF REPORT

- Traffic collisions and accidents in Viet Nam at present
- Vietnam Agencies for traffic safety
- Speedometers verification in Viet Nam
- Reseach and Repairing

TRAFFIC COLLISIONS AND ACCIDENTS IN VIET NAM AT PRESENT

- Means of transport rapidly increased
- Each year more than 10,000 lives are lost because of traffic accidents.
- More than 30% caused by speeding related reasons.
- Traffic accidents in Viet Nam was up to alarming limit.

ANNUAL REPORT OF NATIONAL TRAFFIC SAFETY COMMITEE

National traffic safety committee

Traffic accidents report(From January to September 2006)

Traffic accidents	Number of accidents		Number of dead		Number of injured	
	1/1/06 - 30/9/06	01/07-30/9	1/1/06 - 30/9/06	01/07-30/9	1/1/06 - 30/9/06	01/07-30/9
Road	10.376	48 0,5%	9.092	718 8,6%	8.156	-529 -6,1%
Railway	210	-1 -0,5%	100	-26 -20,6%	108	-99 -47,8%
waterway	151	-14 -8,5%	125	16 14,7%	7	-3 -30%
Maritime	50	3 6,4%	36	24 200%	15	15
Total	10.787	36 0,3%	9.353	732 8,5%	8.286	-616 -6,9%
Exceptional serious accidents	103	21 25,0%	292	0 0%	380	17 4,7%

Means of transport	New registered	Total at 2006
vehicles	60.441	961.154
Motocycles	1.940.270	18.246.001

Traffic accidents report 2008

Traffic accidents	Number of accidents	Number of dead	Number of injured
Road	12.103	11.318	2885
Railway	442	196	262
Exceptional serious accidents	59	142	356

Number of accidents	11829
vehicles	3.195
Motocycles	7.904

VIE TNAM AGENCIES FOR TRAFFIC SAFETY

- Our strategies for Law Enforcement
- National traffic safety committee
- Some impotant Degrees
- Viet Nam Agencies for traffic safety and their relationship

OUR STRATEGIES FOR LAW ENFORCEMENT

- To reduce vehicle collisions and accidents.
- To reduce motorist fatalities,injuries.
- To reduce property damage.
- To improve roadway traffic flow.
- To reduce "black points" and congestion
- To improve civil traffic safety knowledge

NATIONAL TRAFFIC SAFETY COMMITTEE

- National traffic safety committee was established in 1997 by decisison number 917/1997/QD-TTg.(NTSC).
- NTSC's tasks and powers :
  - —— 10 tasks in which collect and classify traffic safety situation and regularly reports to Prime Minister is a important task.
- NTSC's members :
  - —— One Deputy Minister of Ministry of transportation as President
  - —— One Deputy Minister of the interior as vice President
  - —— Four Deputy Ministrers from Ministry of Defence,Ministry of Education and training ,Ministry of Justice,Ministry of finance
  - —— Two Deputy general directors from Police general department and Department of civil aviation Viet Nam.

SOME IMPOTANT DEGREES

- Decree number 32/2007/NQ-CP 29/06/2007 about urgent solutions to restrain traffic accidents anf collisions.
  - —— To speed up traffic safety propaganda,widespread and education.
  - —— To improve infrastructrure,Engineering.
  - —— To improve management task.
  - —— To force to ware hemet when driving motocycle since 15/12/2007.
- Decree number 146/2007/ND-CP 14/9/2007 To stipulate terms of sanctions against infringement action in road.
  - —— to specify penalty of up to 3 million VND for exceeding 20km/h over posted limit speed and up to 5 million VND for exceeds 35km/h

DECREE NO. 05/2007/QD-BGTVT SPECIFIES THE SPEED LIMITS

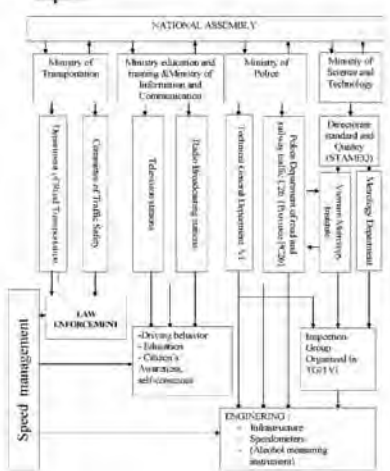
Table 1 for densely populated areas

Type of vehicle	speed limits (km/h)
Up to 30 seats; loading capacity under 3,500 kg;	50
More than 30 seats ; loading capacity more than 3,500kg ; vehicle with trailer; vehicle pulls other vehicle ; special vehicle; motorcycle; motorbike.	40

Table 2 for outside of densely populated areas

Type of vehicle	Speed limits (km/h)
Up to 30 seats (not including bus); loading capacity more than 3,500kg ;	80
More than 30 seats ; loading capacity more than 3,500kg (not including bus);	70
Bus; vehicle with semi trailer; special vehicle; motorbike.	60
Vehicle with trailer; vehicle pulls other vehicle; motorbike.	50

VIET NAM AGENCIES FOR TRAFFIC SAFETY AND THEIR RELATIONSHIP IN TERM OF TRAFFIC SAFETY



SPEEDOMETERS VERIFICATION IN VIET NAM

- Brief history :

— 1996 VMI had started speedometers verification.(radar Doppler)
— Since 2000 year Vietnam had been imported laser speedometers (without camera).
— Since 2003 year had been started use laser speedometers with cameras.
— In 2006 first automatic photo speedometer was imported (Multuradar C)

- ISSUEED STANDARDS:

— 1999 : DLVN 69:1999 (Fully hamonizied with Recommendation OIML 91: radar equipment for the measurement of the speed of vehicles).
— 2005 : DLVN 157:2005 for laser speedometers
— 2008: DLVN 157:2008 for both types radar Doppler and laser

SPEEDOMETERS ARE BEING USED IN VIET NAM

IACP's Consumer product List (CPL)(10/4/2009)

MANUFACTURER	MODEL
Applied Concepts, Inc.	Stalker
Kustom Signals, Inc.	ProLaser III
Laser Atlanta, LLC	Speed laser
Laser Technology, Inc.	MicRo-digiCam System
Laser Technology, Inc.	Ultralyte 100/100 LR
Laser Technology, Inc.	Ultralyte 200/200 LR
Laser Technology, Inc.	Ultralyte LR B
Laser Technology, Inc.	Ultralyte Compact

Speedometers are being used in Viet nam at present

	Model	Type	Manufacturer	Technical performance	Quantity passed verification
1	PROLASER III	Laser	Kustom Signals, INC		146
2	LASERCAM II	Laser	Kustom Signals, INC		69
3	ULTRALYTE	Laser	Laser Technology		89
4	STALKER HOAR	Laser	Applied Concepts, Inc.		17
5	SPEED LASER	Laser	LASER ATLANTA		15
6	STALKER RADAR with Attached Image photographer	Radar Doppler	Applied Concepts, Inc.		89
	Total				425

RADAR DOPPLER SPEEDOMETERS VERIFICATION

Sequence	Characteristics to be verified	Point	Type of verification		
			Initial	Periodical	Abnormal
1	To verify distance measuring error	6.3.1.1	+	+	+
.2	To verify error of base frequency	6.3.1.2	+	+	+
3	To verify pulse repeated frequency error(PRF)	6.3.1.3	+	+	+
4	To verify relative laser power	6.3.1.4	+	+	+
5	To verify instant speed	6.3.3	+		+

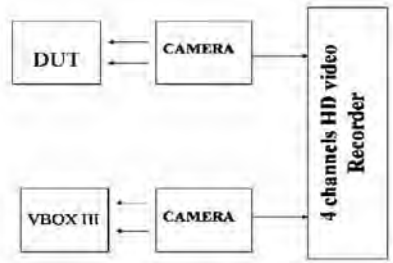
LASER SPEEDOMETERS VERIFICATION

Sequence	Characteristics to be verified	Point	Type of verification		
			Initial	Periodical	Abnormal
1	To verify distance measuring error	6.3.1.1	+	+	+
.2	To verify error of base frequency	6.3.1.2	+	+	+
3	To verify pulse repeated frequency error(PRF)	6.3.1.3	+	+	+
4	To verify relative laser power	6.3.1.4	+	+	+
5	To verify instant speed	6.3.3	+		+

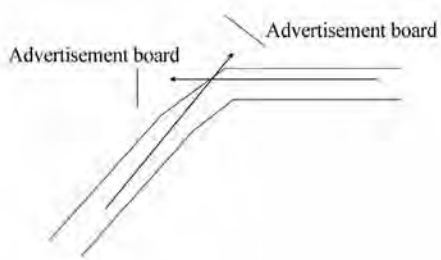
GPS SPEEDOMETER AS STANDARD SPEEDOMETER


GPS

TO VERIFY INSTANT SPEED



TO REDUCE COSINE ANGLE EFFECT



AUTOMATIC LAW ENFORCEMENT PROSPECTIVE STEP

- At present Vietnam uses Photo speed Law Enforcement.
- We are going to go to Automatic Law Enforcements:
  - Legislation
  - IT background.
  - Central processing system
  - Police review (approved events for citations)
  - Customer service (court, full back office,public awareness.

	Model	Type	Manufacturer	Technical performance	Quantity passed verification
	Multaradar ROBOT	Radar Dopplor	TraffiPax	F = 24.1 GHz P = 100mW Beam width : H 5°; V : 20°	8/10
	Micro-DigiCam system	Laser	Laser Technology, Inc.	Capture range: 50m -200m. -MDC software - Capture image at night with flash. - Ultralyte Compact laser - Up to 15.000 images	5
	FAMAlaser	Laser			5
	SpeeLaser	Laser	PRT GesmbH	-Capture range: 3m -200m -speed 1km/h – 320km/h. Accuracy : fixed ±2km/h; moving ±3km/h	5
	Total				23

RESEACH AND REPAIRING

- In 2008 we had designed and made a sensor for PRF verification.
  - ——6 digits frequency meter
  - ——PRF sensor
  - ——Special pule generator for EMC testing
- In 2009 improve to 8 digits

REPAIRING

- Viet Nam is tropical country with high temprature and humidity.
- ULTRALYTE Laser speedometers are suitable for our coditions.
- Prolaser II speedometers are often break down.

THANK YOU

Calibration research of laser speedometer

Beijing Changcheng Institute of Metrology and Measurement

2009.06

Status of speedometer application

- Application: vehicle speed inspection
- Main speedometer style
- Radar speedometer
- Inductance speedometer
- Laser speedometer

Disadvantages of laser speedometer

- low precision
- low evidence collecting ability
- low anti-jamming ability, etc.

Advantages of laser speedometer

- Long inspection distance
- High precision
- Short measurement time

- Laser speedometer has a wide prospect

Status of calibration of laser speedometer

- In Traffic & Safety Products Monitor and Inspect Center of the Police Ministry
- measurement error of speedometer is obtained by comparing velocity values between speedometer and calibration vehicle, which could show real-time velocity

Status of calibration of laser speedometer

- In PTB, two lights are placed 1m apart. When vehicle is passing, two lights trigger timers respectively. Average velocity, that is calibration value of vehicle velocity, can be calculated through time interval.

Status of calibration of laser speedometer

- In NIST, experimental vehicles with cruise system and stopwatch whose precision better than 0.1μs are drove on flat road for a long time and average velocity can be measured.

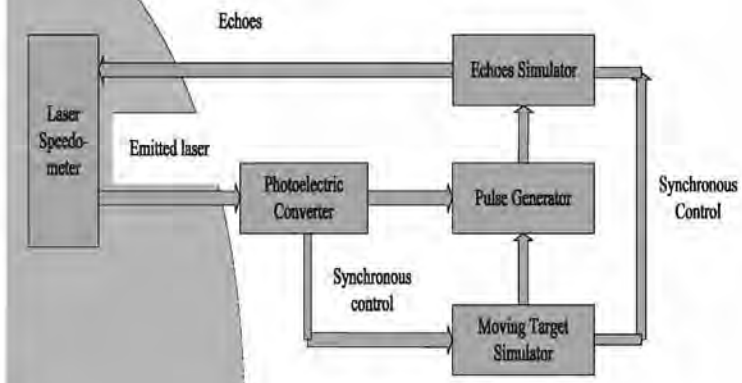
Disadvantages of above calibration methods

- （1）Real vehicle is needed and the range of calibration is limited by vehicle velocity.
- （2）During the measurement process, results from standard instrument and the speedometer should be captured synchronously and compared, therefore, larger synchronous errors result in larger measurement errors.

Disadvantages of above calibration methods

- （3）Replacing instantaneous speed by average speed results in larger measurement errors.
- （4）Above calibration methods require rigorous drive conditions.

Calibration principles and instrument



Characters of calibration instrument

- (1) Photoelectric converter and echoes simulator are connected to form a closed loop by synchronous control circuits.
- (2) Echoes simulator can simulate targets with different reflectivity, size and angle.

Characters of calibration instrument

- (3) The instrument has wide calibration range, because its circuits can fine-tune grads of time interval in wide range.
- (4) Detecting distance and pulse frequency can be adjusted according to the need of laser speedometer.

Advantages of calibration instrument

- Standard value of any velocity can be setup, without thinking about vehicle extreme velocity, road conditions, driving distance, etc.
- Standard velocity is stable and calibration vehicles are not needed anymore.

Calibration experiments

- Many kinds of laser speedometers:
- ComLASER CL-1P of UNIMO Technology Corp. in Korea, CMP2-30 of Noptel Corp. in Finland and Ultralyte Compact LTI20-20 of Laser Technology Incorporation in USA.
- For ComLASER CL-1P (nominal velocity measurement precision is ±1km/h) , repeatability experiment

Calibration experiments

- For laser speedometer LTI20-20 (nominal velocity measurement precision is ±2km/h) , calibration range data are showed as Table 2 (sample number is 10, conditions: temperature 21℃, humidity 63%RH).
- All other types of laser speedometer in LTI .

Conclusion

- (1) Using the standard simulated target of (5~500) km/h produced by calibration instrument to calibrate laser speedometer, repeatability of laser speedometer indicate value is less than 0.2km/h, measurement error is less than 0.1km/h.
- It shows that standard simulated target is stable and calibration instrument has high repeatability.

Conclusion

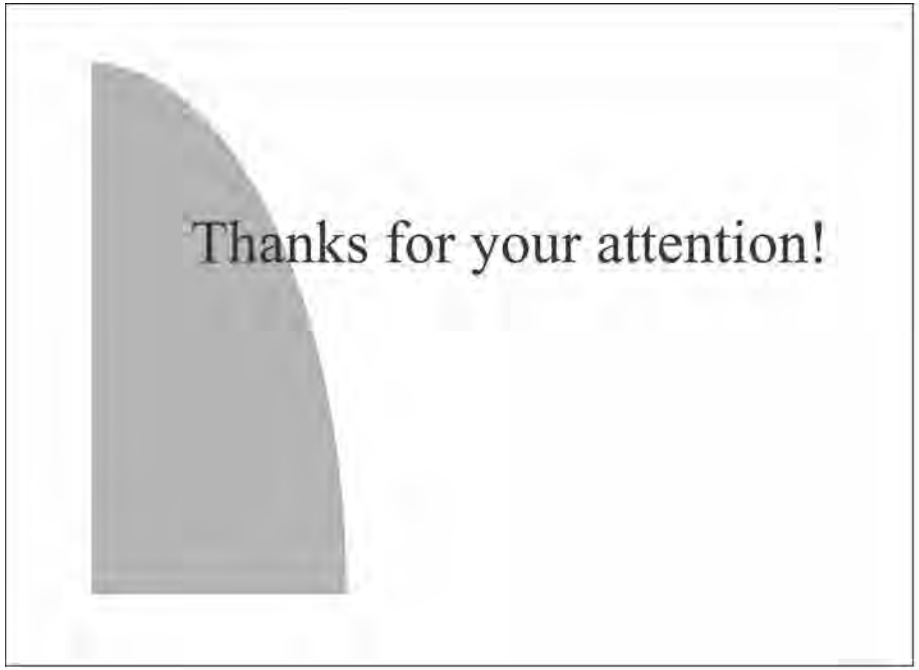
- (2) Any standard velocity value from(5~950) km/h can be setup in the calibration instrument. It shows that the instrument has wide calibration range.

Conclusion

- (3) Calibration range demanded by erification regulations of Vehicles Radar Measuring Speedometers is (20~150) km/h, and verification regulations of Automatic Monitor System for Vehicles Speeding is (20~180) km/h, therefore, calibration range of the instrument is wide enough to meet the calibration need. So many laser

Conclusion

- (4)So many speedometers can be calibrated with this instrument that it has universal performance.


Thanks for your attention!

CALIBRATION METHODS

- Details depend on sensor type used
- Some basic tests common to all

CALIBRATION METHODS

- Actual drive through vehicle test using instrumented dedicated vehicle
- Actual traffic and high level speed instrument standard

CALIBRATION METHODS

- Portable electronic vehicle simulator

MAINTENANCE

- Perform prior to calibration
- Visual inspection of sensor installation
- Electrical tests on sensors

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VISUAL INSPECTION

- Condition of road surfacing and saw cut sealant crucial
- Most sensor failures due to physical damage

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VISUAL INSPECTION

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VISUAL INSPECTION

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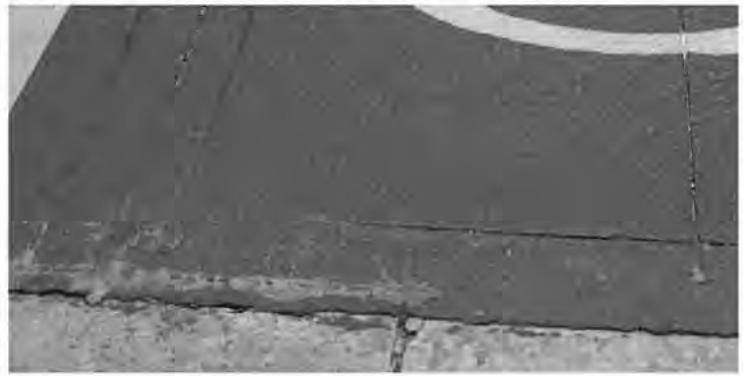
VISUAL INSPECTION

VISUAL INSPECTION



ELECTRICAL TESTS
Piezoelectric sensors

- DC leakage to ground
- Capacitance at 1 kHz
- Dissipation factor
- Changes from installed value give warning of failure

ELECTRICAL TESTS
Piezoelectric sensors

- Waveform monitoring
  - ——Good rise time
  - ——Minimum undershoot and overshoot
  - ——Minimum pre-event undershoot
  - ——Adequate magnitude for small vehicles
  - ——Low base noise level

ELECTRICAL TESTS
Optical fibre sensors

- Check diode drive level (if accessible)
- Optical power and cable loss measurements only required for investigative work——minimize disturbance of optical connections

ELECTRICAL TESTS
Optical fibre sensors

- Waveform monitoring
  - ——Good rise time
  - ——Minimum undershoot and overshoot
  - ——Minimum pre-event undershoot
  - ——Adequate magnitude for small vehicles
  - ——Low base noise level

ELECTRICAL TESTS
Loop sensors

- DC leakage to ground > 100 MΩ
- Inductance at 1 kHz
- DC resistance < 1 Ω

ELECTRICAL TESTS
Loop sensors

- Waveform monitoring
  - ——Frequency as installed
  - ——No change(or much less than lowest threshold)from traffic in adjacent lane
  - ——Frequency instability less than 20% of lowest threshold
  - ——No crosstalk or less than 20% of lowest threshold

ELECTRICAL TESTS
Speed Simulator for Speed Measuring Devices
Piezo, OF and Loop sensors

- Calibration
  - ——Timing measurements
  - ——Waveform check

ELECTRICAL TESTS
RADAR sensors

- Remove sensors to laboratory for simulated vehicle tests
- Check illuminated pattern
  - ——confined within lane
  - ——centre of beam at correct angle

ELECTRICAL TESTS
LIDAR sensors

- Remove sensors to laboratory for simulated vehicle tests
- Check illuminated pattern
  - ——confined within lane
  - ——centre of beam at correct angle

ELECTRICAL TESTS
Scanning LIDAR and RADAR sensors

- Remove sensors to laboratory for simulated vehicle tests
- Check illuminated pattern
  - ——confined within target zone

ELECTRICAL TESTS TIRTL

- Remove system to laboratory for simulated vehicle tests
  - ——requires special simulator for speeds
  - ——Check for squint and beam spacing

ELECTRICAL TESTS TIRTL

- Rotating arm speed simulator
  - ——with calibrated arm length
  - ——calibrated rotation speed meter

ON-SITE TEST EQUIPMENT

- Steel tape and straight edge
- RLC meter with D measurement
- Ohmmeter (4 wire low ohms)
- Megger
- Digital CRO
- Frequency meter

ON-SITE TEST EQUIPMENT

- Digital camera
- SMD tester (sensor simulator)

DRIVE THROUGH VEHICLE

- Speed instrumentation limits
- OH&S considerations

DRIVE THROUGH VEHICLE Instrumentation

- Digital Speedometer
  - ——Roller calibration
  - ——Tyre inflation and wear issues

DRIVE THROUGH VEHICLE Instrumentation

- RADAR
  - ——Limited to about 1km/h uncertainty

DRIVE THROUGH VEHICLE Instrumentation

- Doppler GPS
  - ——Limited to open sky situations without accelerator supplementation

DRIVE THROUGH VEHICLE
Instrumentation

- Optical correlator
  - ——affected by road surface——rain
  - ——lower accuracy compared to GPS
  - ——latency

DRIVE THROUGH VEHICLE
Instrumentation

- Fifth wheel
  - ——mechanically inconvenient
  - ——possible problem in city traffic

DRIVE THROUGH VEHICLE
Instrumentation

- Video analysers
  - ——Not suitable for all installations
  - ——Modest accuracy
  - ——Roadside installation

CALIBRATION UNCERTAINTIES
Device plus camera
(100 km/h)

TIRTL	0.74 km/h
RADAR	1.2 km/h
LIDAR	1.2 km/h
Digital Speedometer	1.3 km/h

CALIBRATION UNCERTAINTIES
Device plus camera
(100 km/h)

GPS	0.7 km/h
Vehicle simulator	0.7 km/h

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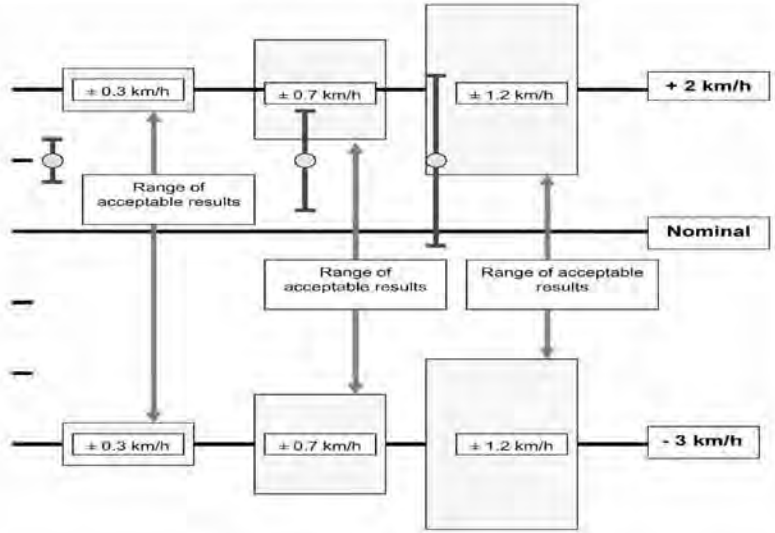

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ITRI
Industrial Technology Research Institute

Verification and Calibration Technology Radar Speed Meters

Speaker: Yu-Yi Cheng (鄭有誼)

2009/6/23

ITRI

Outline

- Fundamental
- Traffic Radar Frequencies
- Stationary Radar Doppler
- Moving-mode Radar Doppler
- Cosine Effect
- Calibration
- Calibration Equipments
- Calibration Items
  - Transmission Frequency
  - Radiation Pattern
  - Near-Field Maximum Power Density
  - Speed Accuracy
- Radar Types

ITRI

Fundamental

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Traffic Radar Frequencies

Band	Frequency	Wavelength	Notes
S	2.455 GHz	4.8 in 12 cm	obsolete
X*	9.41 GHz	1.25 in 3.2 cm	some European countries
X*	9.90 GHz	1.2 in 3.0 cm	some European countries
X	**10.525 GHz** ±25 MHz	1.1 in 2.8 cm	one 50 MHz channel
Ku*	13.450 GHz	0.88 in 2.2 cm	some European countries
K	**24.125 GHz** ±100 MHz	0.49 in 1.2 cm	one 200 MHz channel Europe and some US systems
K	**24.150 GHz** ±100 MHz	0.49 in 1.2 cm	one 200 MHz channel
Ka	**(33.4~36.0)GHz**	0.35 - 0.33 in 9 - 8.3 mm	13 channels; 200 MHz/ch

* Not used in USA.

Stationary Radar Doppler

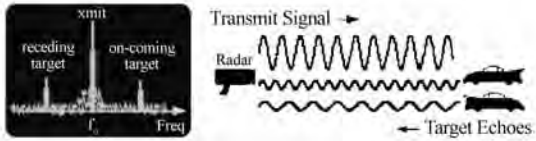
$f_r = f_o + f_d$ for approaching targets

$f_r = f_o - f_d$ for receding targets

f_o:radar transmit frequency

f_r:target echo frequency

f_d:radar Doppler shift



Stationary Radar Doppler

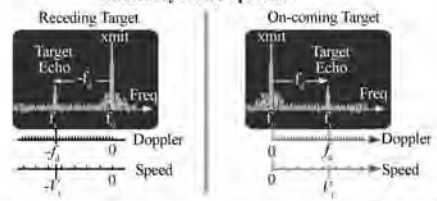
$$f_d = \pm\frac{2v_t f_o}{c} = \pm\frac{2v_t}{\lambda_o} \qquad v_t = \pm\frac{c f_d}{2f_o} = \pm\frac{1}{2} f_d \lambda_o$$

f_d (Hz) : radar Doppler shift

v_t (m/s) : target velocity

λ_o (m) : radar wavelength

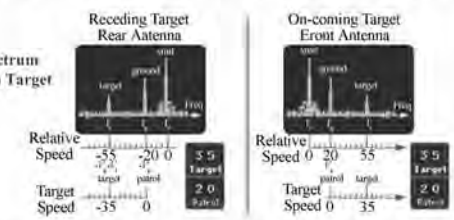
Stationary Radar Spectrum



Moving-mode Radar Doppler

- Moving-mode radar depends on two measurements to derive target speed:
  (1) GROUND ECHO——measures patrol car speed
  (2) TARGET ECHO——measures relative (to radar) target speed

Moving Mode Spectrum
Opposite Direction Target

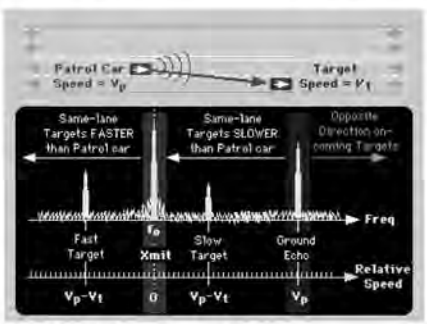


Target Relative Speed to Radar is $V_{relative} = V_p + V_t$

$V_t = V_{relative} - V_p$

Moving-mode Radar Doppler

Moving Mode Spectrum
Same Direction (lane) Target
Front Antenna

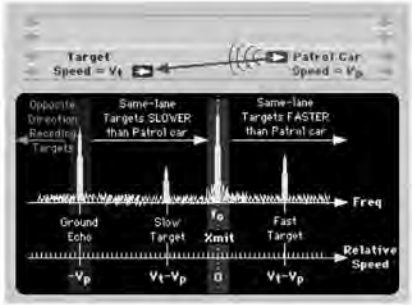


Target Relative Speed to Radar is $V_{relative} = V_p - V_t$

$V_t = V_p - V_{relative}$

Moving-mode Radar Doppler

Moving Mode Spectrum
Same Direction (lane) Target
Rear Antenna



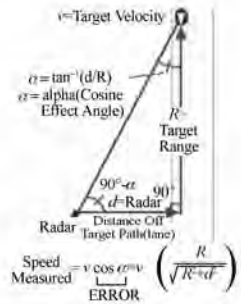
Target Relative Speed to Radar is $V_{relative} = V_t - V_p$

$V_t = V_{relative} + V_p$

Reference : Police Traffic Radar Handbook (nwa.gov)

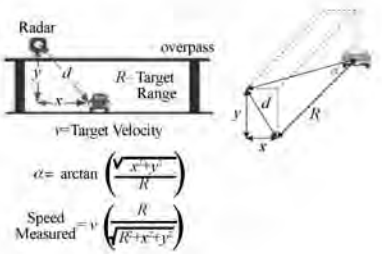
Cosine Effect

Cosine Effect



$\left(\frac{R}{\sqrt{R^2+d^2}}\right)$

Cosine Effect from an Overpass

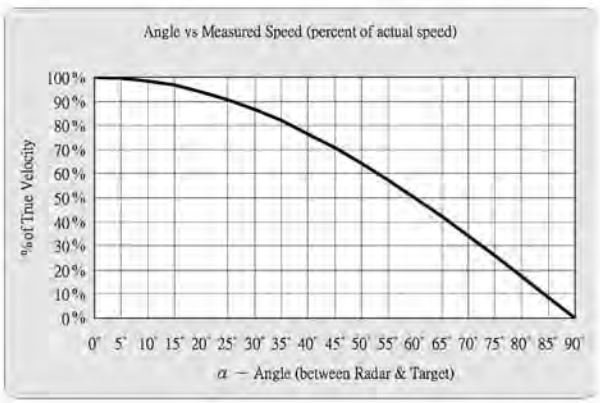


$\left(\frac{\sqrt{x^2+y^2}}{R}\right)$

$\left(\frac{R}{\sqrt{R^2+x^2+y^2}}\right)$

Reference : Police Traffic Radar Handbook (nwa.gov)

Cosine Effect



Calibration

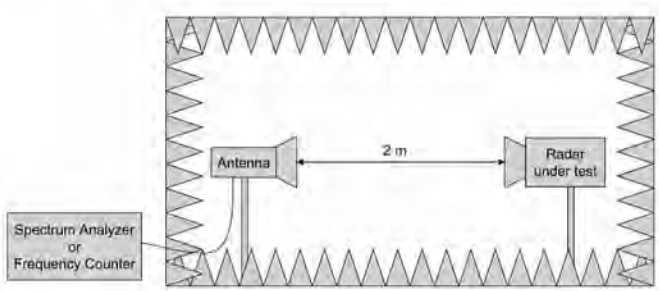
Calibration Equipments

Equipments	Specification
Spectrum Analyzer	Cover 10 GHz ~ 36 GHz
Electric Field Probe	Cover 10 GHz ~ 36 GHz
Waveform Generator	Cover 100 Hz ~ 100 kHz
Mixer	Cover RF/LO 10 GHz ~ 36 GHz Cover IF 100 Hz ~ 100 kHz
Antenna	Cover 10 GHz ~ 36 GHz

Calibration Items

- Transmission Frequency
- Radiation Pattern
- Near-Field Maximum Power Density
- Speed Accuracy

Transmission Frequency



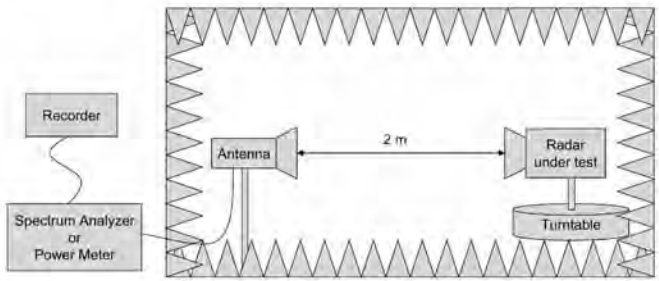
The transmission-frequency measurement setup.

Transmission Frequency

- Transmission Frequency Tolerance：± 0.2 %

Band	Frequency (GHz)	Min (GHz)	Max (GHz)
X	10.525	10.504	10.546
Ku	13.45	13.423	13.477
K	24.125	24.077	24.173
K	24.15	24.102	24.198
Ka	33.4	33.333	33.467
Ka	36	35.928	36.072

Radiation Pattern

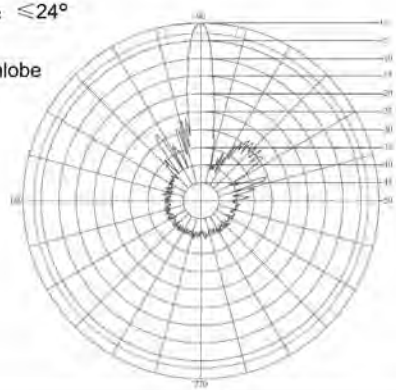


The radiation pattern measurement setup.

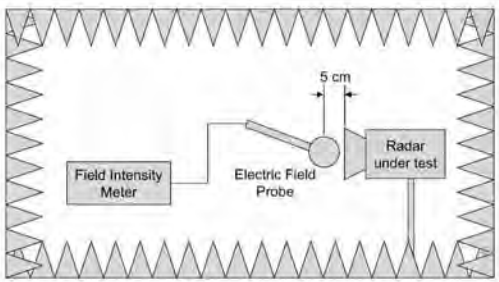
Radiation Pattern

-3 dB Beamwidth Tolerance：≤24°

The difference between mainlobe and sidelobe：>15 dB



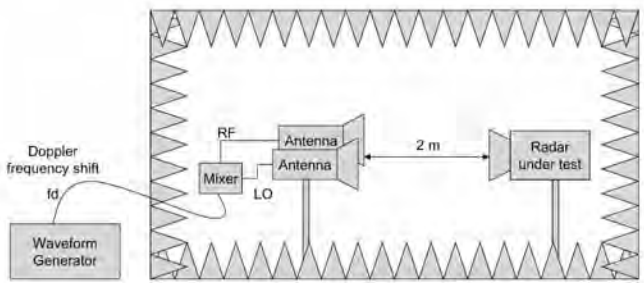
Near-Field Maximum Power Density



The near-field power density measurement setup.

Near-Field Maximum Power Density：≤10 mW/cm^2

Speed Accuracy



The speed accuracy measurement setup.

Speed Accuracy

Radar Doppler Shift

$$v_t = \pm\frac{1}{2} f_d \lambda_o \quad \text{(m/s)}$$

$$v_t' = \pm 1.8 f_d \lambda_o \quad \text{(km/h)}$$

f_d (Hz) : radar Doppler shift

v_t (m/s) : target velocity

v_t' (km/h) : target velocity

λ_o (m) : radar wavelength

For example :

Radar frequency=24.125 GHz

→ λ=0.012435 m

v_t' (km/h)	f_d (Hz)
25	1116.90
50	2233.80
60	2680.56
70	3127.31
90	4020.83
100	4467.59
110	4914.35
150	6701.39
199	8890.51

Radar Types

Manufacturer	Type	Band
DECATUR	GENESIS I	K
	GENESIS II SELECT	Ka
	GENESIS-VPD	K
GATSOMETER	MRC	Ku
	TYPE 24	K
KUSTOM	FALCON	K
MPH	PYTHON	K
	VDSR	Ka
	Z25	K
ROBOT	MultaRadar C	K
TRAFFIPAX	SPEEDOPHOT	K
TIRBAR	DRS-3	X
	MDR-1	X
	K-GP	K
VIA	FALCON PLUS II	K
	FALCON PLUS III	K

GATSOMETER_TYPE 24

GATSOMETER_MRC

TRAFFIPAX_SPEEDOPHOT

DECATUR_GENESIS I

MPH_PYTHON

DECATUR_GENESIS VPD

ITRI

KUSTOM_FALCON

ITRI

MPH_Z25

ITRI

TRIBAR_K-GP

ITRI

VIA_FALCON PLUS

Draft of Technical Specification for Verification and Inspection of Inductive Loop Speed Meters (In Chinese Taipei)

GWO-JEN WU

Measurement Standards & Legal Metrology Division
Center for Measurement Standards
Industrial Technology Research Institute

June 23,2009

Contents

1. Scope

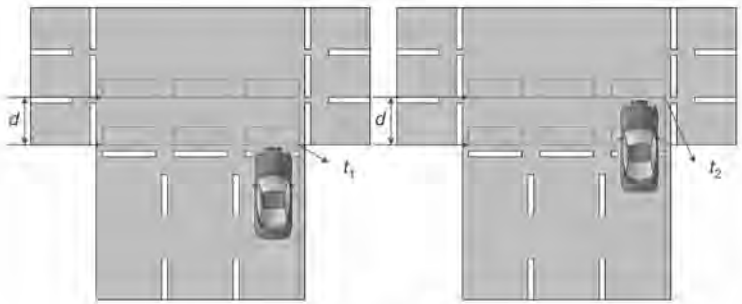
1.1 This specification applies to the inductive loop speed meter with cameras, used for law enforcement, subject to verification and inspection (hereinafter referred to as the inductive loop speed meter).

1.2 The embedded loop shape of the inductive loop speed meter should be rectangular.

1.3 The inductive loop speed meter should contain two inductive loops. It measures the time difference of the target vehicle passing through the first and the second inductive loop, and then calculates and displays the speed of the target vehicle from the distance between the two inductive loops and their time difference. It should be equipped with the automatic device to record the vehicle images.

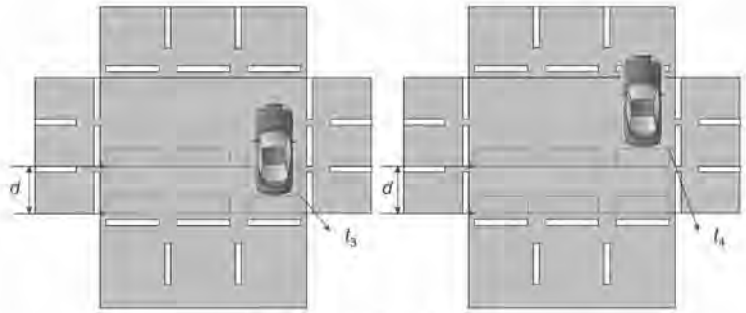
Inductive Loop

Speed Measurement



$$Speed_{entry} = d/(t_2-t_1)$$

Speed Measurement



$$Speed_{exit} = d/(t_4-t_3)$$

2. Definitions of Terms

2.1 Inductive loop speed meter： the speed meter consists of inductive loop and controller cabinet (main part), it is operated with a lead-in wire, pull box, lead-in cable and related equipments.

2.2 Inductive loop： one or more turns of loop wire wound in a slot sawed in the pavement.

2.3 Inductance： the inductance of an inductive loop measured with a inductance meter at a specific frequency; expressed in units of microhenrys (μ H).

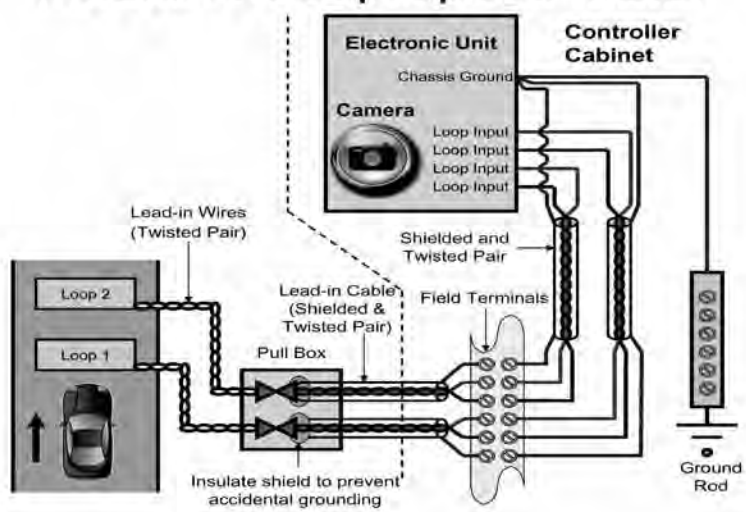
2.4 Lead-in wire： a continuation of the loop wire that runs from the physical edge of the loop to the pull box; usually twisted together to form a wire pair.

2.5 Lead-in cable： shielded wire that is spliced to the lead-in wires in the pull box and which extends from the pull box to the controller cabinet, where it is connected to the electronics unit.

2.6 Pull box： a container that encloses the splices between the lead-in wires and the lead-in cable.

2.7 Insulation resistance：the resistance measured with a ohmmeter between a conductor and the outer insulating jacket of a wire or cable.

Inductive Loop Speed Meter



3. General requirements

3.1 If the model type is the first to be submitted for initial verification, the applicant should provide the following certificates and information.

——Used for law enforcement.

——User's manual and product specification, including operate manual, which should illustrate the electric specifications, the type of equipment, the measurement methods, the error range, a complete product (including camera) assembly structure and related technologies.

——Used with the camera.

3. General requirements

3.2 Photos of the lanes taken by an inductive loop speed meter should be submitted with the instrument for verification. The photos should be able to identify the serial number of the speed meter, the car and its license number, time (including year, month, day, hour and minute), lane, speed and location.

3.3 The inductive loop speed meter should be installed and operated according to the user's manual.

3.4 After the inductive loop speed meter passes verification, its software setting and inductive loops should not affect the metrological accuracy.

3.5 Verification of loops of the inductive loop speed meter is carried out on the installation site.

3. General requirements

3.6 Users should timely check the accuracy of the inductive loop speed meter.

3.7 If the geometric dimensions of the loops could not be measured, on the installation site, due to the significant change or disappearance of the loops, caused by road construction or other factors, users should install new loops, and apply for verification.

3.8 The main part should be used with multiple sets of loops at specific direction and junction. If the main part is used with another loops at different location, it should be re-verification, and the original verification certificate should be back. The installation site of the main part and loops should be recorded on the verification certificate.

3. General requirements

3.9 For field verification of the loops used by police, the police should control the traffic to ensure the safety of the verifiers.

3.10 The inductive loop speed meter should be confirmed with irregular signal recognition for verification.

3.11 The inductive loop speed meter should be able to make at least three speed measurements carried out by automatically detecting the time interval between consecutive target vehicle positions by means of two loops,which are located at fixed distance.

4. Structure

4.1 The inductive loop speed meter should bear the following information on the controller cabinet (main part).

——Name or trademark of the manufacturer.

——Model number and serial number.

——Specification of power supply.

4.2 The controller cabinet (main part) of the inductive loop speed meter and its accessories, including power supply cord for testing, should be completely equipped.

4. Structure

4.3 All the switches, buttons, and knobs of the instrument and its accessories should be functioned smoothly and reliably. There should be no poor contact, loose and obstacle phenomena to interfere with the operation.

4.4 The speed indication of an inductive loop speed meter should be expressed as kilometer per hour (km/h).

4.5 The minimum digit of speed indication of an inductive loop speed meter should be equal to or less than 1 km/h.

4.6 The speed range of an inductive loop speed meter should include at least the range from 30 km/h to 240 km/h.

5. Verification and Inspection Equipments

5.1 Equipments for verification and inspection: Certificates of traceability and uncertainty should be provided. The equipments include:

——Distance measuring equipment: resolution $\leqslant$1 cm

——LCR meter:

- Frequency: 1 kHz
- Inductance: at least 10 μHz
- Resistance: resolution $\leqslant$0.1 Ω

——Insulation resistance meter:

- DC voltage: at least 500 V
- Resistance to ground: at least 500 MΩ

——Speed measurement simulation system.

——Temperature control cabinet or thermometer: resolution $\leqslant$0.1 ℃

6. Verification and inspection procedures

6.1 The structure and specification should be verified and inspected according to the following items:

——Structure

——Perimeter of one loop and distance between two loops (on installation site)

——Inductance and resistance of loops (on installation site)

——Insulation resistance of loops (on installation site)

——Speed accuracy (in the laboratory)

——Temperature effect (for new instrument)

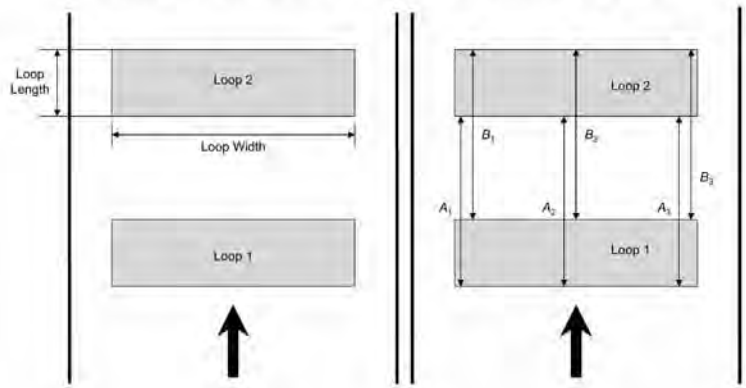
6. Verification and inspection procedures

6.2 Test for perimeter of one loop and distance between two loops

——Measure perimeter of one loop

——Measure distance A1, B1, A2, B2, A3, B3 between two loops

Test for perimeter of one loop and distance between two loops



Test for perimeter of one loop and distance between two loops

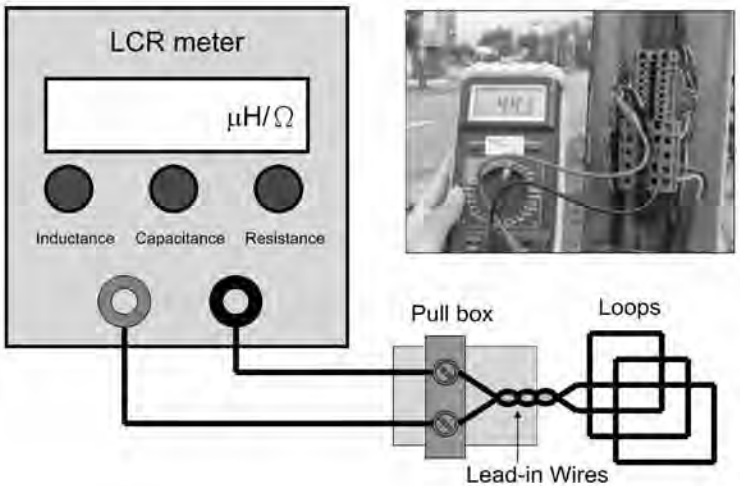
6. Verification and inspection procedures

6.3 Test for inductance and resistance of loops

——Connect the both terminals of the lead-in wire in the pull box with LCR meter

——At 1 kHz

Test for inductance and resistance



6. Verification and inspection procedures

6.4 Test for insulation resistance of loops

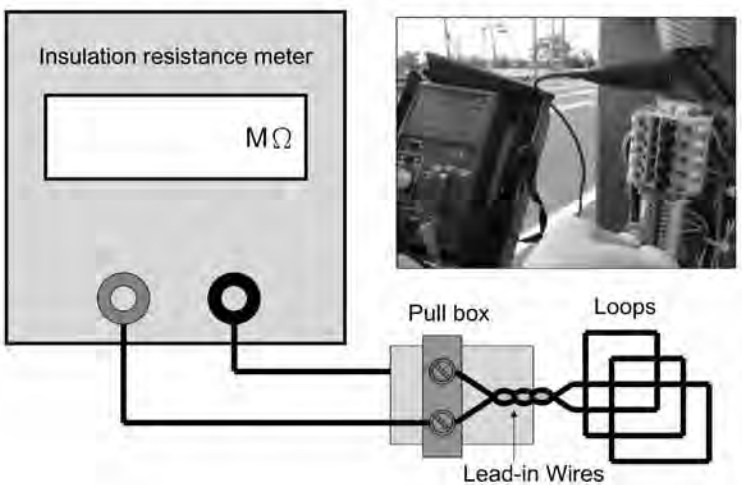
——Test the insulation resistance with insulation resistance meter

——Connect the positive terminal of the insulation resistance meter to the lead-in wire in the pull box

——Connect the negative terminal of the insulation resistance meter to ground

——At 500 VDC

Test for insulation resistance



6. Verification and inspection procedures

6.5 Test for speed accuracy

——Connect the speed meter under test with the speed measurement simulation system in the laboratory

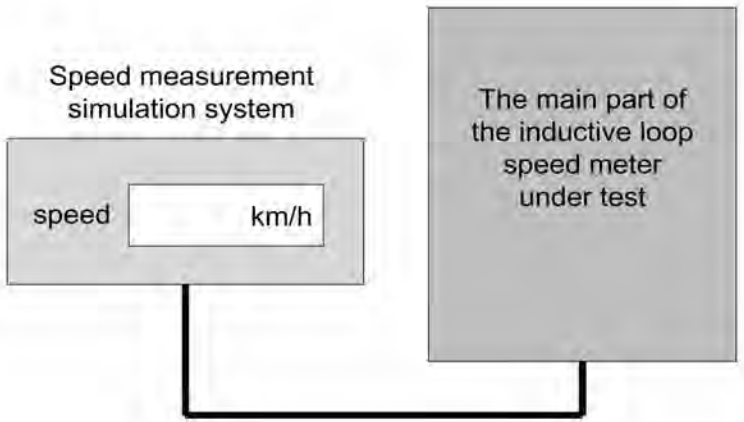
——The distance setting of the speed measurement simulation system should be the same as the speed meter under test

——Test is carried out by transmitting the standard signal, which is generated by the speed measurement simulation system according to the testing speed, to the speed meter under test

——At least ten sets of test results at various speeds

——Test according to the lanes can be used

Test for speed accuracy



6. Verification and inspection procedures

6.6 Test for temperature effect

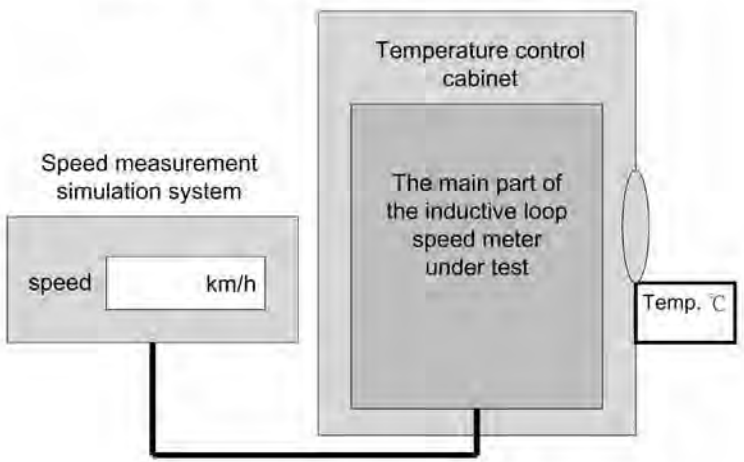
——Place the speed meter under test in the temperature control cabinet

——Connect the speed meter under test with the speed measurement simulation system

——Until the temperature has reached 55 ℃ and stabilized 30 minutes

——Carry out the test as described in section 6.5

Test for temperature effect



7. Verification, Inspection and Maximum permissible errors

7.1 The maximum permissible errors on verification for every test of the speed meter are as follows:

——Distance between two loops: should be 2.0 m or 2.5 m, and its maximum permissible error is 0.5 %

——Inductance: should be measured at the frequency 1 kHz

——Resistance: less than 3 Ω

——Insulation resistance: greater than 100 MΩ

——Speed accuracy: is ± 2 km/h when speed is less than or equal to 100km/h; or ± 3 km/h when speed is higher than 100 km/h

——Temperature effect: is the same as the maximum permissible error of speed accuracy

7.2 The maximum permissible errors for inspection are the same as the maximum permissible errors for verification.

Inductance

Perimeter (m)	Number of Turns	Inductance (μH)
⩾9	2	⩾ 43
	3	⩾ 89
<9	2	⩾ 39
	3	⩾82

Thank you for your time and attention

8. Verification compliance marks

8.1 The period of validity of verification is one year, commencing from the day of a verification compliance mark affixed to the speed meter and expiring on the first day of the following month of the following year.

8.2 The place of verification compliance tag of the inductive loop speed meter shall be obvious and on the panel of the main part .

8.3 After the inductive loop speed meter passes verification, a verification compliance certificate shall be issued.

Verification and Calibration Technology of Laser Speedometer

Speaker: Toby Ting

Date: Jun. 23

Basis of Verification and Inspection

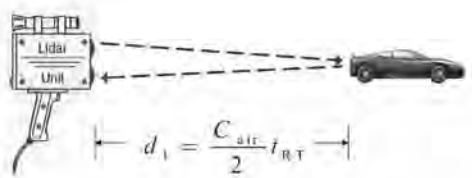
- In Chinese Taipei, the verification and inspection of laser speedometers are follow the 『Technical Specification for Verification and Inspection of Laser Speedometers』, which published by BSMI.
- This technical specification mainly refers to DOT HS 809 239 Speed Measuring Device Performance Specification ——Lidar Module

Scope

- This specification applies to the Lidar Module (hereafter laser speedometer) that transmits coherent infra-red light pulses, measures the time of flight for the laser pulses reflected from moving vehicles, and then calculates and displays the speed of the target vehicle based on the pulse repetition rate.

Theory of Laser Speedometer (1)

- At time=t_1

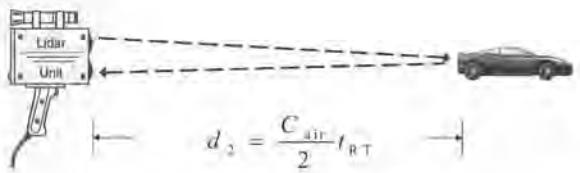


C_{air}: Speed of light in the air;

t_{RT}: Back and forth time of laser light.

Theory of Laser Speedometer (2)

- At time=t_2



$$\text{Vehicle speed} = \frac{d_2 - d_1}{t_2 - t_1}$$

Equipments

	Equipments	Specifications
1	Aiming distance measuring equipment	Resolution≤0.1cm
2	Universal counter or oscilloscopes	Bandwidth 1GHz
3	Laser power meter	Accuracy:±3%(400nm~950nm) Range：10mW(904nm)
4	Speed measurement simulation system	Delay Range:0.2~5μs Trigger Time:<100ns PRR(max):390Hz at least

Verification and Inspection Items

- Structure and functions
- Aiming distance
- Laser power intensity
- Speed detection accuracy

Structure and Functions

Sec.	Contents
2.1	The laser speedometer shall bear the model number, name or trademark of the manufacturer, and the serial number on the instrument.
2.2	Laser speedometers shall bear the specification of power supply.
2.3	The main part of a laser speedometer and its accessories, including power cord and signal connection line for testing, shall be fully equipped.
2.4	All the switches, press buttons, and twist buttons of the instrument and its accessories shall be functioning smoothly and reliably. There shall be no loosening or obstacle phenomena to interfere with the operation.

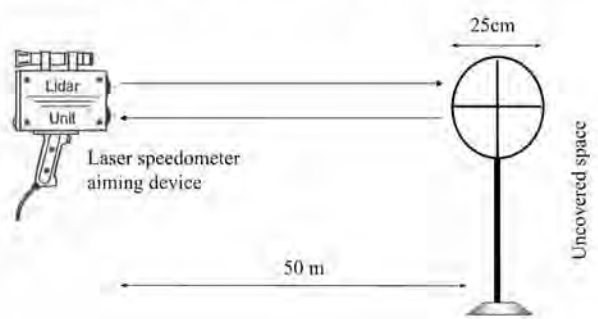
Sec.	contents
2.5	There shall be no obvious scratches or cracks that affect the reflection on the speed measurement.
2.6	If a laser speedometer is installed on a frame according to the operation manual, the instrument shall be stable and not shakable.
2.7	The speed indication of a laser speedometer shall be by digital indication.
2.8	The numbers indicating speed on a laser speedometer shall be clear and distinguished instantly.
2.9	The speed indication of a speedometer shall be expressed as kilometers per hour (km/h or kph).
2.10	The minimum digit of speed indication of a laser speedometer shall be equal to or less than 1kilometer per hour.

Sec.	contents
2.11	The speed range of laser speedometers shall include at least the range from 16 km/h to 300 km/h.
2.12	A picture taken by a photo laser speedometer should be submitted with the instrument for verification.
2.13	Pictures taken by photo laser speedometers shall clearly distinguish the target vehicle and the plate number.
2.14	Pictures taken by photo laser speedometers shall at least provide the following information: serial number of the speedometer, time (including year, month, day, hour and minute), speed value and location, etc.

Aiming Distance

- Placing the laser speedometer at 50 m from the aiming distance detection device as shown in Fig.1.
- The reflection side of the target device is a disk with 25 cm diameter.
- There shall be no obstacles behind the disk.
- Carefully aim the center of the target device of the laser speedometer, press the measuring trigger and measure/record the indicated distance of the laser speedometer.

Figures of Aiming Distance



Aiming Distance——In Practice (1)

1) Use a standard device to demonstrate 50m distance

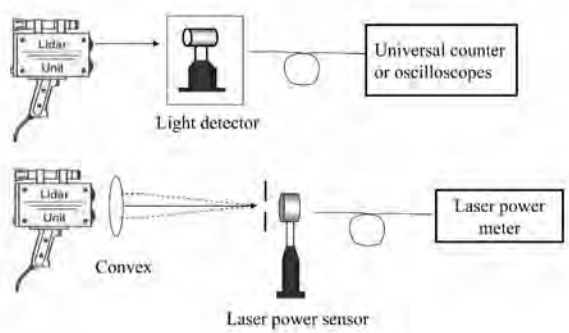
Aiming Distance——In Practice (2)

2) Aim the target, pull the trigger to measure the distance and then record the reading

Laser Power Intensity

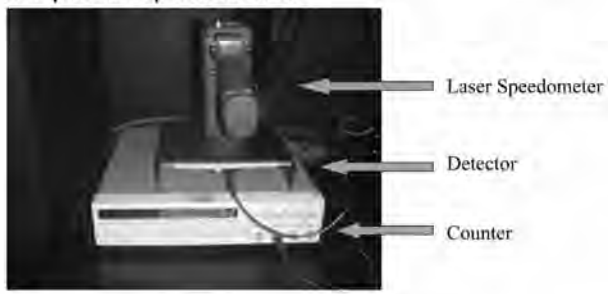
- Ensure that the wavelength setup of the laser power meter corresponds to the laser wavelength of the laser speedometer to be tested.
- Shoot the laser light of the tested laser speedometer to a high-speed light detector and send the output of the detector to a high-speed universal counter or oscilloscope. The universal counter or oscilloscope will determine PRR (Pulse Repetition Rate). The device is shown in Fig. 2a.
- Through the convex lens, the laser light of the tested laser speedometer penetrates the 7mm aperture from the 100mm location and shoots at the light detector of the laser power meter. Receiving continues for 10 seconds to read the maximum power of the laser light. The experiment device is shown in Fig. 2b (equipment allocation in reference to IEC 60825).

Figures of Laser Power Intensity



Laser Power intensity——In Practice (1)

1) Set the laser speedometer firm and measure the pulse repetition rate



Laser Power Intensity ——In Practice (2)

2) Fix all devices and measure the laser light power

Speed Detection Accuracy (1)

- Detection the speed accuracy of laser speedometer requires changing the flying time of the laser pulse of the laser speedometer via speed simulation system, to simulate the distance changes of different speeds of vehicles. The verification is conducted as follows:
- In the laboratory, place the testing module of laser speedometer to match the receiving/transmission module of speed simulation system, which includes receiver and transmitter as shown in Fig. 3

Speed Detection Accuracy (2)

- Based on the velocity to be simulated (v), the simulation system will simulate the changes of a series of distances (d) and time (t) of moving vehicles. The formula is:

$$d = C_{air} \cdot t_{RT} / 2$$

$$v = \frac{d}{t}$$

in which Cair represents the speed of light in the air (approx. 299705663 m/s) and tRT refers to the simulated back and forth time of laser light from the laser speedometer to the target vehicles.

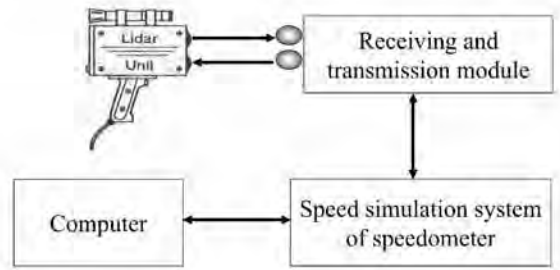
Speed Detection Accuracy (3)

- Measure the pulse repetition rate (*PRR*) and calculate the adjacent laser pulses time (*t*).

$$t = \frac{1}{PRR}$$

- Simulate the actual speed of moving vehicles with the data from (2) to (3).
- With trigger of PC speed simulation program, test the laser speedometer and speed simulation system.
- Speed accuracy shall include no less than ten sets of test results at various distances and speed.

Figures of Speed Detection Accuracy



Speed Detection Accuracy——In Practice

- Simulate the target vehicle speed

Maximum permissible errors

- Verification
  - Aiming distance: ±0.3 m
  - Laser power intensity: pulse repetition rate≤390 Hz pulse repetition rate variation ≤0.1 %
  - Speed detection accuracy: +2 km/h, -3 km/h
- Inspection
  - The maximum permissible errors for inspection are 1.5 times of the maximum permissible errors for verification.

ETC 財團法人 台灣電子檢驗中心
ELECTRONICS TESTING CENTER, Chinese Taipei

Thanks for your attention

Australian Government
National Measurement Institute

APEC/APLMF Seminar - Taipei 22nd - 25th June 2009

Law Enforcement Equipment for Measuring the Speed of Vehicles In Australia

Dr. Richard Brittain LLB,
Executive Officer, Legal Metrology

measurement.gov.au

Topics

- Current control measures in member economies
- Pattern approval
- Verification and certification technologies
- Harmonisation with international standards
- Future Development

Aim

- To share with the APLMF Australia's work in this area

Powers - Commonwealth and State

Commonwealth	State	Shared
marriage and divorce	land	marriage and divorce
bankruptcy	police	bankruptcy
defense	criminal law	
external affairs	education	
interstate and	health	
international trade	roads	
foreign, trading and	industrial safety	
financial corporations	prices and income	
etc.		

The Constitution

Part V.——Powers of Parliament

Legislative powers of the Parliament

51. The Parliament shall, subject to this Constitution, have power to make laws for the peace, order and good government of the Commonwealth with respect to:

i. trade and commerce with other countries, and among the States
ii. taxation; but so as not to discriminate between States or parts of States
iii. bounties on the production or export of goods, but so that such bounties shall be uniform throughout the Commonwealth
iv. borrowing money on the public credit of the Commonwealth
v. postal, telegraphic, telephonic and other like services

The Constitution

Part V.——Powers of Parliament

Legislative powers of the Parliament contd…

vi. the naval and military defence of the Commonwealth and of the several States and the control of the forces to execute and maintain the laws of the Commonwealth
vii. lighthouses, lightships, beacons and buoys
viii. astronomical and meteorological observations
ix. quarantine
x. fisheries in Australian waters beyond territorial limits
xi. census and statistics
xii. currency, coinage and legal tender
xiii. banking, other than State banking; also State banking extending beyond the limits of the State concerned, the incorporation of banks and the issue of paper money

The Constitution

Part V.——Powers of Parliament

Legislative powers of the Parliament contd…

xiv. insurance, other than State insurance; also State insurance extending beyond the limits of the State concerned
xv. weights and measures
xvi. bills of exchange and promissory notes
xvii. bankruptcy and insolvency
xviii. copyrights, patents of inventions and designs, and trade marks
xix. naturalization and aliens
xx. foreign corporations, and trading or financial corporations formed within the limits of the Commonwealth
xxi. marriage
xxii. divorce and matrimonial causes; and in relation thereto, parental rights and the custody and guardianship of infants

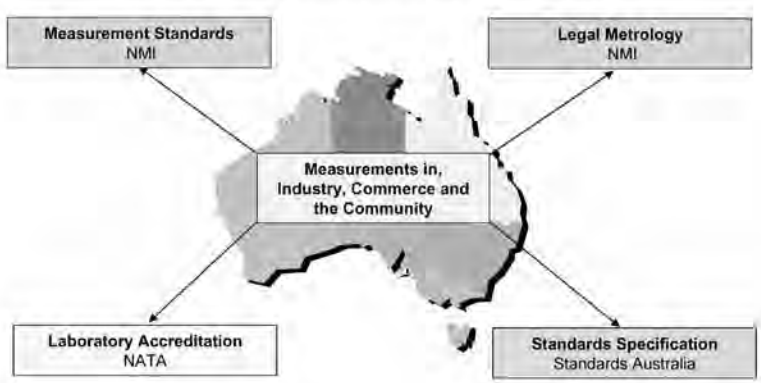
Topic 1——Current Control Measures in Australia

- technical infrastructure——Commonwealth responsibility (generally)
- Police and roads State responsibility (generally)
- Police and road traffic/transport authority in State responsible for regulation of vehicle speed
- Police——mobile vehicle speed measuring instruments (generally)
- Road traffic/transport authority in State——fixed vehicle speed measuring instruments (generally)

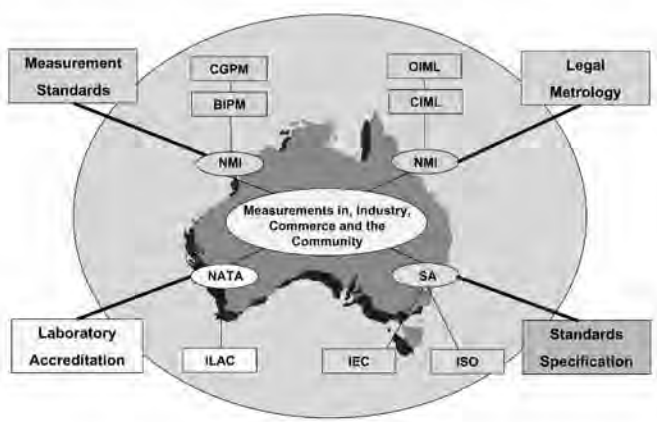
Topic 1——Current Control Measures in Australia

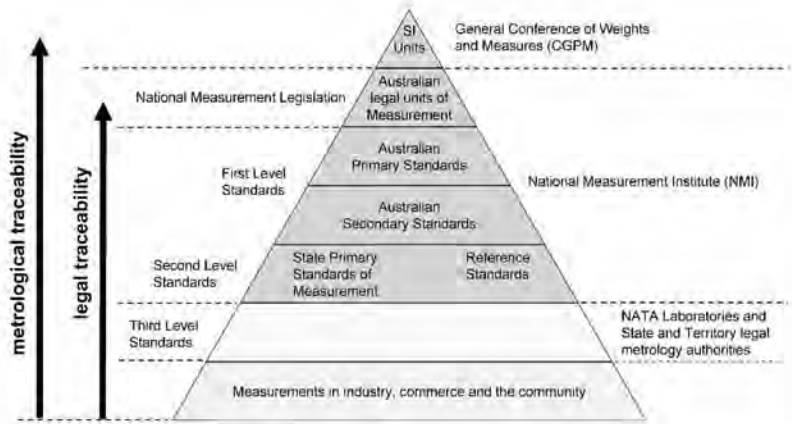
- Commonwealth acting through NMI facilitates national measurement and legal metrology infrastructure
- use of facilities provided by Commonwealth not mandatory but necessary in order to access evidential provisions of national measurement legislation
- e.g. pattern approval facilities provided by Commonwealth based on OIML Recommendation
- use of pattern approved measuring instruments mandated by State trade measurement legislation
- (until Commonwealth takes over in 2010) overview of Australian national measurement and legal metrology infrastructure and metrological control regime useful

Australia's National Measurement/Legal Metrology System



Australia in the International Measurement/Legal Metrology System(s)





National measurement legislation:

- ***National Measurement Act 1960*** **(Cth)**
- ***National Measurement Regulations 1999*** **(Cth)**
- ***National Measurement Guidelines 1999*** **(Cth)**
- 1st July 2004 responsibility for maintenance and development transferred to legal metrology section of the NMI
- provision for national trade measurement system from 1st July 2010

Legal Metrology Facilities

- legal units of measurement (ALUMS)
- pattern or (type) approval
- pattern compliance
- verification
- certification
- standards
- legal traceability
- legal metrology control systems
- legal metrology authorities
- certificates as evidence

Australian legal units of measurement (ALUMS)

- sole legal units of measurement of a physical quantity in the jurisdiction of Australia
- Agreed by/at General Conference of Weights and Measures (CGPM)
- Represent international consensus as to the best scientific practice most/appropriate unit wrt to the measurement of a quantity

Australia's National Measurement/Legal Metrology System(s)

Pattern or (type) approval

- applicable to measuring instruments rather than simple ***material measures***
- performed only once for each design of instrument
- Based on OIML recommendations
- used to check that measuring instruments to be used for legal purposed are fit for purpose i.e. that they operate within the agreed MPE (maximum permissible error) under field conditions
- confirms for how long a measuring instrument can hold a calibration and continue to measure within the MPE under field conditions i.e. recalibration period

Pattern compliance

- testing of production runs of pattern-approved measuring instrument to ensure that production instrument continue to comply with the approved pattern
- performed on a statistical instrument depending on how many instrument and manufactured and on method of manufacture

Standards in Legal Metrology

National Measurement Act 1960 **(Cth)**
Section 3 Interpretation

standard of measurement means:

(a) a material measure, measuring instrument or measuring system designed or intended to define, realise, conserve or reproduce:

(i) a unit of measurement of a physical quantity; or

(ii) one or more known values of a physical quantity;

in order to transmit that unit or those values to measuring instruments by way of comparison; or

(b) a formula designed or intended to define the magnitude of a physical quantity.

Standards in Legal Metrology

National Measurement Act 1960 **(Cth)**
Section 3 Interpretation

material measure means a thing designed or intended to conserve or reproduce, in a permanent manner during the use of the thing, one or more known values of a physical quantity.

measuring instrument means:

(a) a thing by means of which a measurement of a physical quantity may be made; or

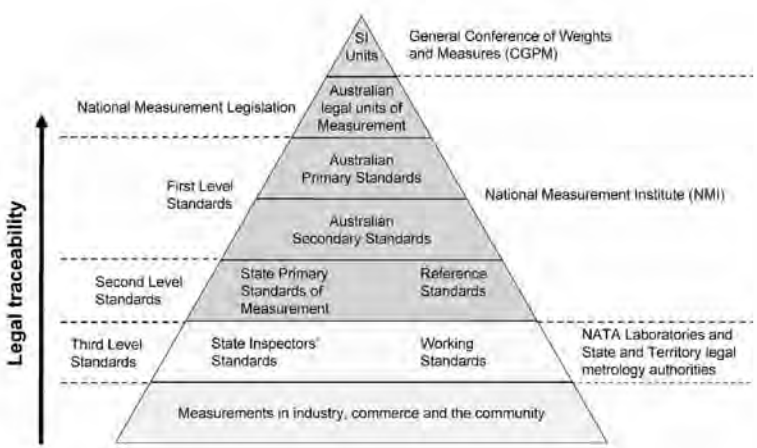
(b) a component of such a thing.

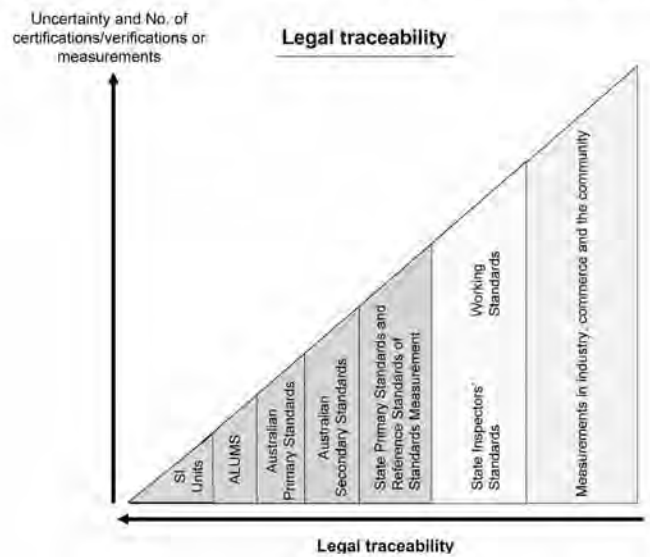
Legal traceability

- Legal traceability——the process whereby measurements made or used in Australia are referred through a chain of calibrations of appropriate and known uncertainty to the appropriate Australian primary standard of measurement in compliance with section 10 of the *National Measurement Act 1960*. (Cth)

- This prescriptive imperative effectively defines legal traceability in Australia by giving legal sanction to the national standards of measurement.

Legal traceability





Certificates as Evidence

Certificates issued by the Chief Metrologist and other Legal Metrology Authorities:

- *prima facie* evidence

taken to be:

- evidence of a matter stated in the certificate
- may be received in evidence in any court in Australia, State, Territory or Commonwealth
- may be received in evidence in any proceeding before a person authorised by law or the consent of the parties to receive and examine evidence

Certificates as Evidence

Certificates issued by the Chief Metrologist and other Legal Metrology Authorities

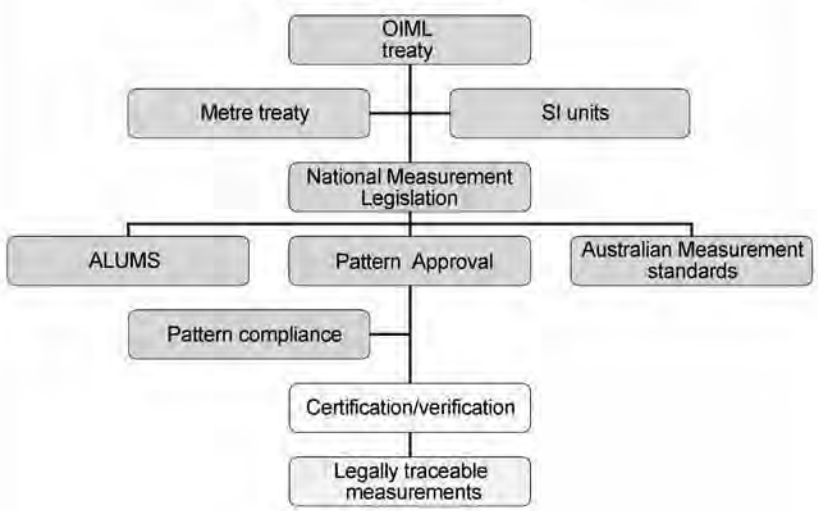
Unless the contrary is established taken to have been:

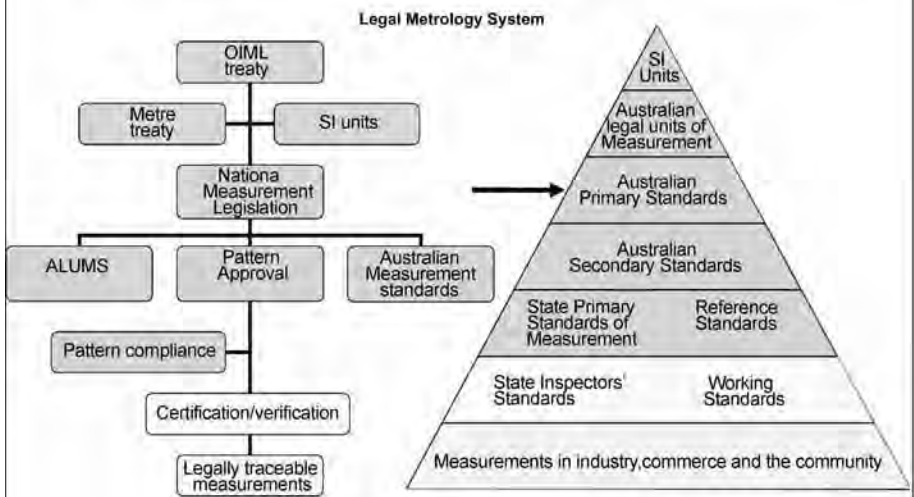
- issued by the person by whom they purport to be issued;
- signed by the person by whom they purport to be signed; and
- the person by whom the certificate purports to be signed is taken to be a person authorised by law to sign such certificates.

Legal metrology control system

- national pattern approval standard (written requirements based on OIML)
- pattern approval(granted by the NMI)
- conformity to type auditing
- uniform test procedures
- initial certification/verification
- subsequent certification/verification
- use for legal purposes i.e. to make legally traceable measurements

Legal metrology control system





Law Enforcement Equipment for Measuring the Speed of Vehicles APEC/APLMF - Taipei 22-25 June 2009

Legal Metrology Systems

Under the common law system

1. Default system

- no connection between technical infrastructure and legal system
- measurement disputes decided according to legal rather than scientific principles
- no safeguard against absurd but binding legal precedents

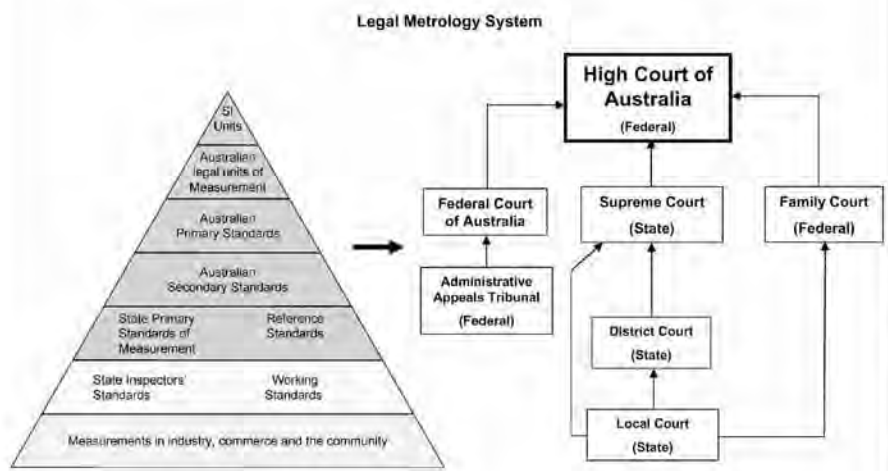
Law Enforcement Equipment for Measuring the Speed of Vehicles APEC/APLMF - Taipei 22-25 June 2009

Legal Metrology Systems

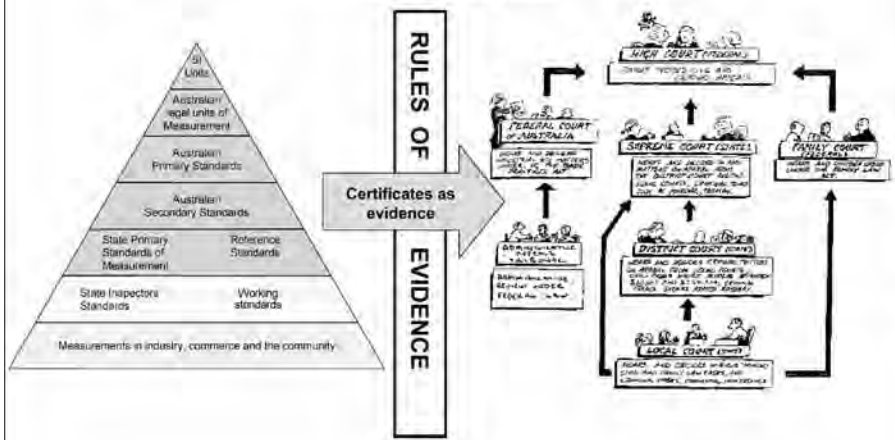
2. Planned system

- clear and deliberate connections between technical infrastructure and legal system
- legal obligations established for measurement
- means of introducing scientific material into legal system

Law Enforcement Equipment for Measuring the Speed of Vehicles APEC/APLMF - Taipei 22-25 June 2009



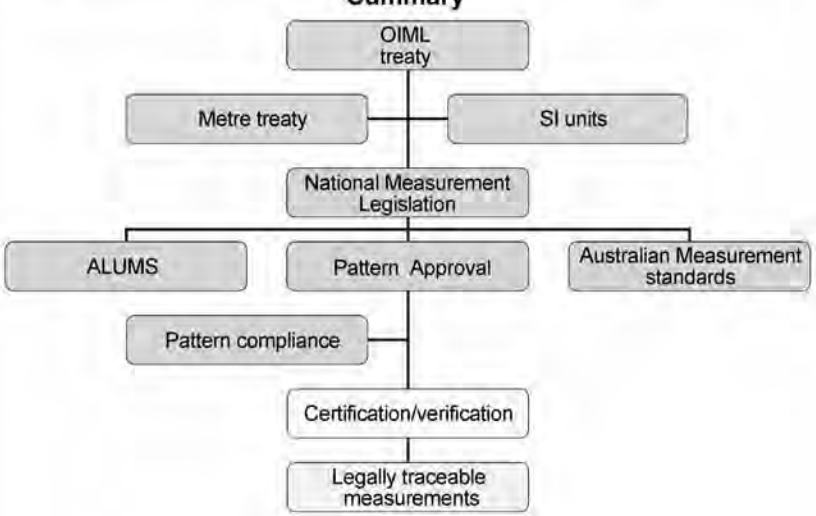
Legal Metrology System



Summary

- Australia has a national metrological control regime for legal measuring instruments
- facilitated by NMI
- used by operators of legal measuring instruments (regulators)
- based on OIML recommendations (where available) and Australia's other international measurement treaty obligations

Summary



Questions?

Topic 2 —— Pattern Approval

- technologies radar, laser and inductive loop detectors
- optical fibre sensors also used in Australia
- piezolelectric sensors also used in Australia
- delivers evidence of fitness for purpose of measuring instruments
- part of a metrological control system —— limited use in isolation

Topic 2 —— Pattern Approval

- need also pattern compliance to ensure production instruments comply approved pattern
- regular ongoing calibration/verification
- ad hoc in Australia at the moment
- not based on any published standard
- carried out by instrument users/purchasers not NMI

Topic 2 —— Pattern Approval

Issues

- in-road sensors are high maintenance
- prone to failure due to wear and tear
- not easy/cheap to install
- not easy to check
- not easy to repair —— usually replace

Topic 2 —— Pattern Approval

Issues with piezoelectric sensors —— need to regularly check

- DC leakage to ground
- capacitance at 1 kHz
- dissipation factor
- monitor changes from installed values carefully (indicative of failure)
- monitor waveform for:
  - good rise time
  - minimum undershoot and overshoot
  - minimum pre-event undershoot
  - adequate magnitude for small vehicles
  - low base noise level

Topic 2 —— Pattern Approval

Issues with optical fibre sensors —— need to regularly check

- check diode drive level ground (if accessible)
- optical power and cable loss measurements (only required for investigative work)
- need to minimize disturbance of optical connections
- monitor changes from installed values carefully (indicative of failure)
- monitor waveform for:
  - good rise time
  - minimum undershoot and overshoot
  - minimum pre-event undershoot
  - adequate magnitude for small vehicles
  - low base noise level

Topic 2 —— Pattern Approval

Issues with loop sensors ——need to regularly check

- DC leakage to ground (resistance > 100 MΩ)
- inductance at 1 kHz
- DC resistance (< 1 Ω)
- monitor changes from installed values carefully (indicative of failure)
- monitor waveform for:
  - changes in frequency
  - no (or low i.e. below threshold) input from cars in adjacent lanes
  - frequency instability < 20% of lowest threshold
  - no (or low i.e. below threshold) pre-event crosstalk

Topic 2 —— Pattern Approval

Issues with radar and lidar —— need to regularly check

- beam confined within traffic lane
- centre of beam at correct angle
- combination of laboratory and field testing needed

Questions?

Topic 3 —— Verification and Calibration Technology

- radar, laser, inductive loop
- optical fibre and piezoelectric also used in Australia
- critical part of legally traceable measurement of vehicle speed
- good metrological practice to have a test/standard ratio:
- 10:1 ideally
- 3:1 in common practice
- 2:1 best available for vehicle speed measuring instruments

Topic 3 —— Verification and Calibration Technology

NMI consultancy on calibration infrastructure and options

- digital speedometers
- TIRTL
- radar
- lidar
- Doppler GPS
- Optical correlators
- 5th wheel technologies
- video analysis

Topic 3 —— Verification and Calibration Technology

- NMI consultancy on calibration infrastructure and options

Technique	Best Uncertainty
TIRTL	0.74 km/h
radar	1.2 km/h
lidar	1.2 km/h
digital speedometer	1.3 km/h
GPS	0.7 km/h
vehicle simulator	0.7 km/h

Questions?

Topic 4 —— Harmonization with International Standards

Topic 4 —— Harmonisation with international standards

4.1 Related International Standards

- shortage of international standards covering legal metrology aspects of law enforcement equipment for measuring the speed of vehicles
- not many pattern approval standards in APLMF economies or anywhere else in world including USA and Europe!
- Australia developing its own standard pro temp until OIML catches up
- New project agreed at October 2008 OIML meeting in Sydney
- NMI Australia developing a pattern approval standard

Topic 4 —— Harmonization with International Standards

Topic 4 —— Harmonisation with international standards

4.1 Related International Standards

- NMI Australia pattern approval standard
- covering fixed installation at present
- technology non-specific
- in format of OIML recommendation
- will form basis of Australia's input to OIML standards development project

Topic 4 —— Harmonization with International Standards

Topic 4 —— Harmonisation with international standards

4.2 Status of harmonisation in member economies

- currently low?
- no mechanism for harmonisation
- not many pattern approval standards in APLMF economies or anywhere else in world in USA and Europe!
- APLMF opportunity?

Topic 4 —— Harmonization with International Standards

Topic 4 —— Harmonisation with international standards

4.2 Status of harmonisation in member economies

- 55% APLMF full members also full members of OIML
- 40% APLMF full members corresponding members of OIML
- 5% APLMF full members not members of OIML
- 33% of APLMF corresponding members also corresponding members of OIML
- 42% of APLMF total membership full members of OIML
- 38% of APLMF total membership corresponding members of OIML
- 19% of APLMF total membership not involved with OIML

Topic 4 —— Harmonization with International Standards

Topic 4 —— Harmonisation with international standards

4.2 Status of harmonisation in member economies

- Australian standards for radar and lidar but not for pattern approval
- AS 2898.1 —— 2003 Radar speed detection
  Part 1: Functions, requirements and definitions
  Part 2: Operational procedures
- AS 4691.1 —— 2003 Laser-based speed detection devices
  Part 1: Definitions and device requirements
  Part 2: Operational procedures
- Australian standards not based on international standards
  i.e. not based on international standards e.g. AS ISO/IEC 17025: 2005 General requirements for the competence of testing and calibration laboratories

Topic 4 —— Harmonization with International Standards

Topic 4 —— Harmonisation with international standards

4.2 Status of harmonisation in member economies

- OIML pattern approval standard
  R 91 1990 Radar equipment for the measurement of the speed of vehicles
- dated ~ 20 years old
- technology specific
- about to be revised
- little regional (or global harmonisation)

Topic 4 —— Harmonization with International Standards

Topic 4 —— Harmonisation with international standards

Summary

- little regional or global harmonisation
- NMI Australia developing a pattern approval standard
- covers fixed installation at present
- technology non-specific
- in format of OIML recommendation
- will form basis of Australia's input to OIML standards development project
- happy to consider input from APLMF
- NMI standard will be published free on NMI website

Questions?

Topic 5 —— Future Development

5.1 Measuring instruments

- change of technology away from in-road sensors such as piezoelectric sensors and induction loops
- point-to-point speed measurement on freeways/motorways/highways
- automatic systems based on vehicle number/license plate recognition
- problem in Australia with varying formats of number plates between states and developing a number plate recognition system
- convergence red-light detection/vehicle speed measurement
- dual technology measuring instruments

Topic 5 —— Future Development

Verification and calibration technology 5.2

- separate sensor from camera/recorder in fixed installations and test separately
- calibrate camera recorder using a calibrated simulator to inject signals into camera/recorder
- use calibration vehicle to verify speed measuring device
- how to measure the speed of the vehicle with low enough uncertainty?
- practical difficulties with this option on working roads
- running it at low/high speeds on busy roads
- obtaining a calibration vehicle

Topic 5 —— Future Development

Verification and calibration technology 5.2

- use traffic to calibrate speed measuring device
- need to be able to measure speed of traffic with low enough uncertainty
- radar and lidar speed measuring devices fundamentally limited by display resolution if not by measurement technology
- Australia investigation radar with display resolution of 0.1 km/h
- NMI hopes to obtain on loan and evaluate whether such devices can be calibrated with low enough uncertainty to be used as standards to verify vehicle speed measuring instruments

Summary

- issues with law enforcement equipment for measuring the speed of vehicles widespread in APLMF region (and globally)
- wide range of very different technologies in use
- both in road and remote sensing technologies in use
- lack of regional or global harmonization in standards
- various local documents with local status
- lack of up to date regional/international pattern approval standard (OIML)

Summary

- fundamental difficulties with obtain suitably low uncertainty verification and certification technologies
- convergence of technologies
- speed/red-light instruments
- dual technology measuring instruments

Opportunities for APLMF

- input to development of new OIML standard
- directly through member economic
- indirectly via corresponding economise and via NMI draft
- need to decide if there are particular regional issues we need included in new OIML standard
- agree strategies to keep regional issues on the global agenda

Questions?

Australian Government
National Measurement Institute

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robot

robot
AUTOMATED TRAFFIC ENFORCEMENT

Workshop on
Law Enforcement Equipment for Measuring the Speed of Vehicles

22 — 25 June 2009 Taipei

Andreas Behrens (CTO)
Marc Lamy (General Manager—Asia)

ROBOT

13,000 cameras are operated in more than 60 countries and areas
40% of world market share

Company Facts

ROBOT has been the market leader in traffic photo enforcement products, with over 40% of world market share.

Key-facts

- Largest photo enforcement camera manufacturer in the world
- Subsidiary of JENOPTIK AG, Germany, 3,000 employees, ~2.5 billion MYR turnover
- 75 years of experience
- Specializing in systems and services for automated traffic enforcement
- Installations in more than 60 countries
- World market leader with more than 13,000 systems currently being used

Agenda

APEC Workshop

Measurement Equipment
—— Radar, Laser, Loop, Piezo
—— Secondary Check

Type Approval
—— Homologation from the point of view of an manufacturer

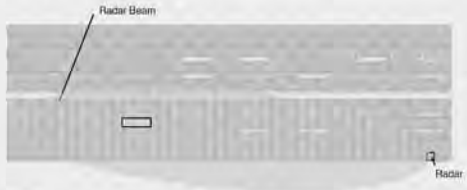
Latest Technology
—— Latest Speed Measurement Technology

Measurement Equipment

Radar

Not a ROBOT Product !

—— and held along the road Radar



Advantage:
—— Simple and cheap

Disadvantage:
—— No clear assignment for multiple vehicles → May cause wrong assignments

Measurement Equipment

Across the Road Radar Sensor

—— Improved detection and measurement rate
—— Root mean square deviation < 0,5 km/h
—— NMI (Netherlands) & Metas (Switzerland) Approval

Ready for MultaRadar C, MultaRadar CM and MultaRadar S 580

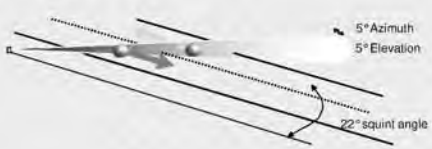
Measurement Equipment

Across the Road Radar with parabolic Aperture

DRS2+ (34GHz / similar to 6F)

—— Newest DSP based Technology

Across the Road Radar Application

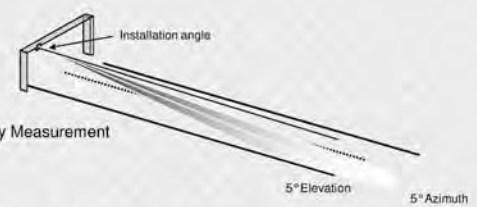


Measurement Equipment

Gantry Radar with parabolic Aperture

DRS2+

F-S2B



Ready for MultaRadar S 482 and TraffiSection (P2P)

robot

APEC Workshop

Measurement Equipment

Laser

——Hand held Laser

Advantage:
—— Reliable

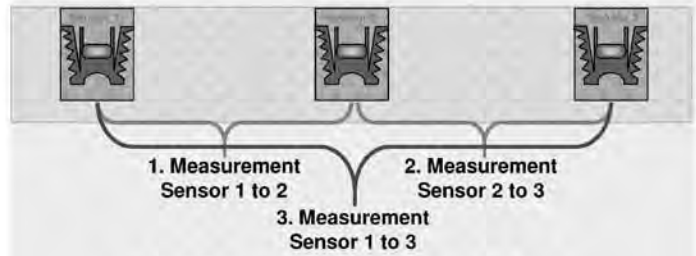
Disadvantage:
——Applicable for single driving cars. The handling will take it's time!

robot

APEC Workshop

Measurement Equipment

Piezo



All 3 Measurements has to be within: 1 km/h.
The lowest speed value will be taken into account.

robot

APEC Workshop

Measurement Equipment

Loop

- Superior technology in combination with Speed enforcement
- Installation in vandalism robust outer housings or in TraffiTower
- Rack system for easy plug in and out of the whole camera equipment
- Digital camera with up to 11 mega pixel

robot

APEC Workshop

Measurement Equipment

MultaRadar
CM / CD

MultaRadar C

SpeedoPhot S

TraffiCapture

Applications:
——Tripod
——In car frontal installation
——In car rear installation
——Container
——(Cabinet)
——(Outer Housing)

SpeedoPhot
& SCIII

6F & SCIII

TraffiPatrol XRD

TraffiPatrol XR

TraffiPatrol

robot

APEC Workshop

Measurement Equipment

TraffiStar SR520

TraffiStar S540

MultaRadar S580 / SD580

TraffiStar SR590

SR490 (France)

TraffiPhot III-SR & SC I IM

Section Control

TraffiStar S550

TraffiPhot S & SC I IM

robot

APEC Workshop

Second Evidence

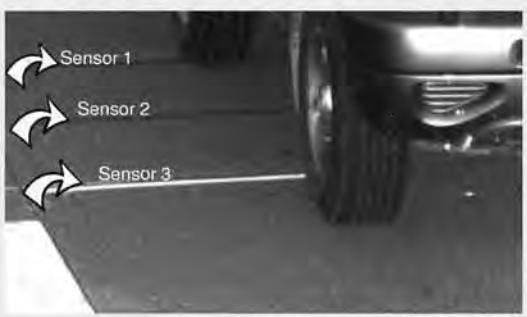
Second Evidence out of a double photo with the knowledge of the photo delay time

robot

APEC Workshop

Second Evidence

Second Evidence out of a single shot photo with the knowledge of the camera delay time or with a "smart" camera delay time.



robot

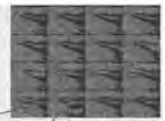
APEC Workshop

robot

APEC Workshop

Second Evidence

Second Evidence out of an additional sequence camera
Distance is estimated by comparing the vehicle position in two frames out of the sequence using virtual markings.
Frame time difference is explicitly available in the data bar.



Start frame

Stop frame

robot

APEC Workshop

Homologation and yearly verification:

Speed measurement accuracy tests:

Official Homologation:

— Metrological laboratory accuracy test (± 1 km/h or ± 1 %)
— Metrological field tests (± 3 km/h or ± 3 %)

=> type approval

Yearly repeated official verification and calibration:

— Functional tests
— Functional field tests

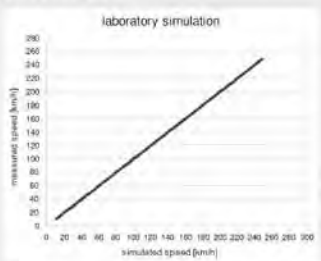
=> certificate

robot

Type Approval

Metrological laboratory accuracy test:

Simulated inputs



The measured speed has to be within:
± 1 km/h (or ± 1 % at speeds above 100 km/h)

robot

Type Approval

Metrological field test:

Example: across the road radar application

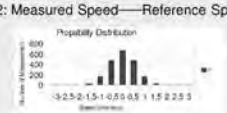
Reference System:
99.8 % of its results should have errors that are within ± 1 km/h (or ± 1 % at speeds above 100 km/h).

Reference Speed Lane 2
$|v_1 - v_2| < 0.3$ km/h

Reference Speed Lane 1
$|v_1 - v_2| < 0.3$ km/h

Measured Speed Lane 1 & 2

Lane 2: Measured Speed—Reference Speed



Lane 1: Measured Speed—Reference Speed

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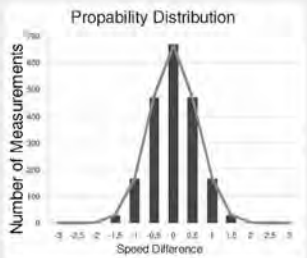
Type Approval

Metrological field test:

Distribution Function:

Measured Speed —— Reference Speed



Gaussian distribution
(normal distribution)

Homologation requirements:

—— Root Mean Square Deviation
—— Mean Value Deviation

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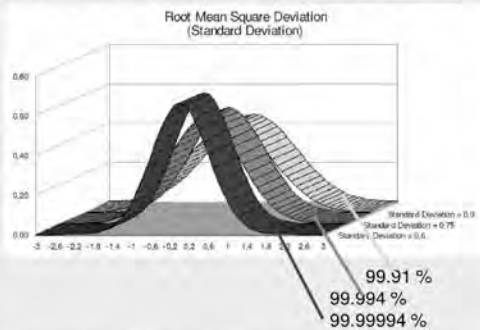
Type Approval

Metrological field test:

Root Mean Square Deviation



Probability that the Speed Difference is less than 3km/h

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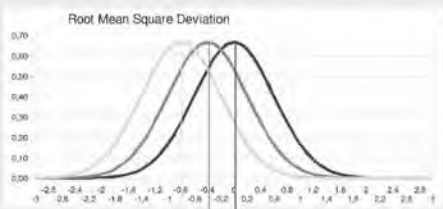
Type Approval

Metrological field test:



Mean Deviation = 0 km/h
Mean Deviation = -0.4 km/h
Mean Deviation = -0.8 km/h

Checking the measured speed mean value (mean deviation)

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Verification & Calibration

Functional Field Test:

Yearly repeated official calibration:

robot

Verification & Calibration

Functional Field Test:

Yearly repeated official verification:

robot

Type Approval

Reference Documents:

International Recommendations / national Standards:

— International Organization of Legal Metrology (OIML):
R 91 - Radar equipment for the measurement of the speed of vehicles - Edition 1990 (E)

— International Association of Chiefs of Police (IACP - US):
Speed-measuring device performance specifications: Down the road radar module - June 2004
Speed-measuring device performance specifications: Across the road radar module - June 2004

— Physikalisch Technische Bundesanstalt (PTB - Germany):
PTB-A 18.11 - Messgeräte im Straßenverkehr: Geschwindigkeitsüberwachungsgeräte – Nov. 2006

— Australian Standard (AS):
AS 2898.1—2003 - Radar speed detection Part 1: Functional requirements and definitions – 2003
AS 2898.1—2003 - Radar speed detection Part 2: Operational procedures – 2003

— Home Office Scientific Development Branch (HOSDB - UK):
The Speedmeter Handbook (Fourth Edition) - 2005

— Das Eidg. Justiz- und Polizeidepartement (EJPD - Switzerland)
941.261 - Verordnung des EJPD über Messmittel zur amtlichen Messung der Geschwindigkeit im Strassenverkehr – 1999 / 2006

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Latest Technology

New Speed Measurement Technologies:

Our RADAR gun has to be to replaced by the latest technology!

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Latest Technology

Across The Road 2D Radar:

MultaRadar CD

robot

Latest Technology

Across The Road 2D Radar:

Across the road Radar including distance measurement

Radar Sensor F—SD2

Lane Identification:

Across the road application:

Systems: MultaRadar CD and MultaRadar SD 580

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Latest Radar Technology

Across The Road 2D Radar:

Example:
Lane 6

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Latest Technology

Across The Road 2D Radar:

New questions for the Type Approval:

Is there a need for an approval about the lane identification — distance measurement - feature?

- Yes, if it's used to be an evidence for choosing the right vehicle.
- Yes, if it's used to distinguish between a direct or a reflection measurement.

Recommendation:

- Laboratory accuracy should be better than ± 2 meter onto a simulated target.

What's about the modulation of the transmitting frequency?

Typical the frequency modulation is less than 0.1%. It's not significant.
(e.g. 10 MHz from 24125 MHz => 0.04%)

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Latest Technology

Tracking Radar:

robot

Latest Technology

Tracking Radar:

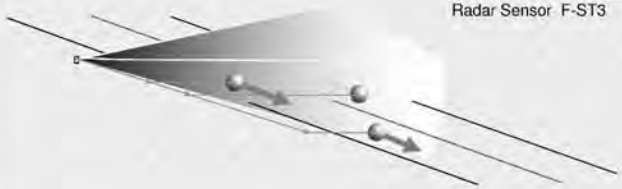
3D RADAR Generation!

Measurement of:

- speed including direction
- distance
- angle

Radar Sensor F-ST3

3D Radar Application:



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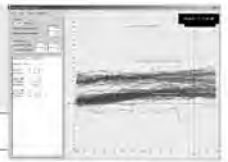
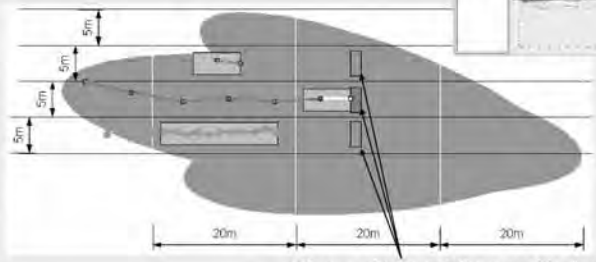
Latest Technology

Tracking Radar:

Includes a full Vehicle Tracking

First Tracking Radar with Lane Discrimination





Zones of Interest (free positioning)

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Latest Technology

Tracking Radar:

New questions for the Type Approval:

What's the speed accuracy? Which measurements has to be taken into account?

Recommendation:
The manufacturer has to specify an application area. Metrological field test have to take place at different position inside this application area.

robot

Latest Technology

Laser Scanner:

Laser Scanner

180° angle
1° angel resolution
15 m distance

40° angle
0.1° angel resolution
40 m distance

Measurement of:

- distance
- angle
- speed out of the vehicle tracking

Laser Scanner:

New questions for the Type Approval:

What's the speed accuracy? Which measurements has to be taken into account?

Recommendation:
The manufacturer has to specify an application area. Metrological field test have to take place at different position inside this application area.

Metrological laboratory accuracy test for a laser scanner?

Yet not perfect!

Yearly repeated official calibration for a laser scanner?

Yet no answer!

Conclusion

Competition and customer requirements lead manufacturers to an ongoing procedure to develop latest technologies.

The Type Approval process is quite behind those market drivers. Most of the latest equipment is not ready in terms of type approval.

The standards, which the approval should be based on, are in a much more worse situation.

Conclusion:

We need to work together!

Workshop on Law Enforcement Equipment for Measuring the Speed of Vehicles

Summary by
Sen-Fuh Chang, professor
BIME, Taiwan University
June 22—25, 2009
The Leader Hotel in Taipei

Outline

- Introduction
- Topic 1: Current control measures on member economies
- Topic 2: Pattern approval
- Topic 3: Verification & calibration technology

Outline (cont.)

- Topic 4: Harmonization with international standards
- Topic 5: Future development
- Discussions
- Conclusions

Introduction

- Thanks for invitation
- Main goal: Safety
  - Reducing injury & damage
  - Not collecting "fines"
- Planning: Step by step
  - Guaranteeing a fair game
  - Short/long term

Topic 1: Current control measures on member economies

- 11 member economies
- Diversified situations
- Legal/technical basis
- Suppliers, users, drivers,examiner, approver

Topic 2: Pattern approval

- (Type approval)
  - Radar/Laser/Loop detector
  - Procedures?
  - Government agencies?
  - Measuring capability

Topic 3: Verification & calibration technology

- Verification:
  - Lab vs. on site
- Calibration:
  - Accuracy
  - Stability

Topic 3: Verification & calibration technology (cont.)

- Other issues
  - Installation
  - Maintenance
  - Individual case
  - Experience

Topic 4: Harmonization with international standards

- Standards
  - Domestic vs. international
- Regulation
  - Which agency is in charge?
  - or responsible?

Topic 5: Future development

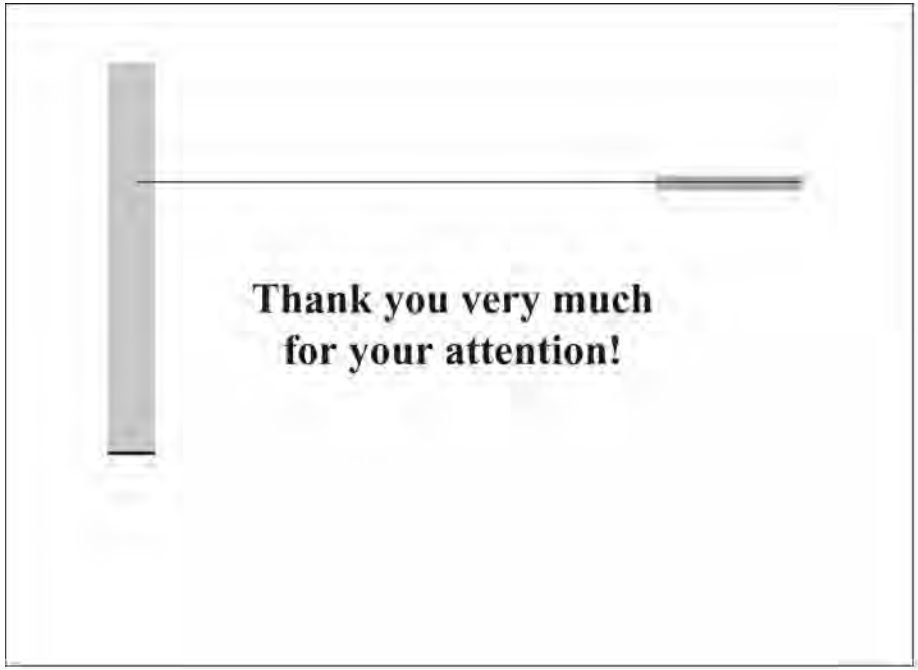
- Regional cooperation
- Global cooperation
- Metrology legislation
- OIML recommendation

Discussions

- Industrial/commercial sectors
- Government officials
- General publics
- Scholars/experts

Conclusions

- Long way to go
- Step by step
- Cooperation
- Help each other


Thank you very much
for your attention!