



Universidad de Concepción



LCPN - ME

**Custodian of the Chilean National Electrical
Magnitude Standard Laboratory**

PORSEC 2004 – CONCEPCION, CHILE

November 29 – December 3

“ METROLOGY IN REMOTE SENSING AND TELEMETRY”

November 2004

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12/27/2004

A vision

- Metrology is the science of measurement, it has become an essential part of the research and productive infrastructure of developed countries, in particular related to electrical magnitudes.
- Early in the history of civilization and progress to its present status, harmonization of measurements has become an essential prerequisite for science, technology and market development. The international agreement on the “meter” in 1875 was the first governmental treaties of great value for all countries.
- Remote sensing and telemetry are not independent from metrology, in particular scientific and borderline metrology, since they are required to validate their sensors by means of “in situ” measurements traceable to laboratory standards.
- The quality of science and its results, as well as the quality of technology and its services, are associated to a reference metrology, traceable and adequate according to the specific application; otherwise, only produces quality management and substandard technical condition.

Constrain

Lord Kelvin has highlighted the importance of measuring and of doing it well.

“I often say that when you can measure what you are speaking about and express it in numbers, you know something about it; and when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind. It maybe the beginning of knowledge, but you have scarcely, in your thought, advanced to the stage of science, whatever the matter may be.”

William Thompson (Lord Kelvin), March 6, 1886

¿How is a good measurement performed?

Make it adequate to the purpose
Use an appropriate sampling
With a quantifiable uncertainty
And a defined traceability
It should not alter the measured system
Clear and succinct
Opportune
Precise
Understandable
Of reasonable cost

Requirements

- **Stable and traceable Metrological Resources**
- **A National Standard Metrology Laboratory similar or equivalent to that in INMETRO (Brazil), NIST (USA), PTB (Germany), etc.**
- **A Chilean National Metrology Network exists since 1998: it is a new approach to a conventional National Standard Laboratory.**
- **Universidad de Concepción : The Electrical Department of its Faculty of Engineering is the Custodian of the Chilean National Electrical Magnitude Standard Laboratory**
- **In the case of remote sensing and telemetry, a really civilian Chilean Space Agency is needed to support the requirements for developing research in this important areas of knowledge in Chile, to establish good and effective relations with the space agencies of other countries, such as NASA, ESA, JAXA, etc.)**

The background of the slide is a photograph of a modern, multi-story building with large windows and concrete pillars. Several trees with green and yellowing leaves are in the foreground and middle ground. The entire image is covered with a semi-transparent red overlay. The word "Result" is written in a bold, yellow, sans-serif font in the upper center.

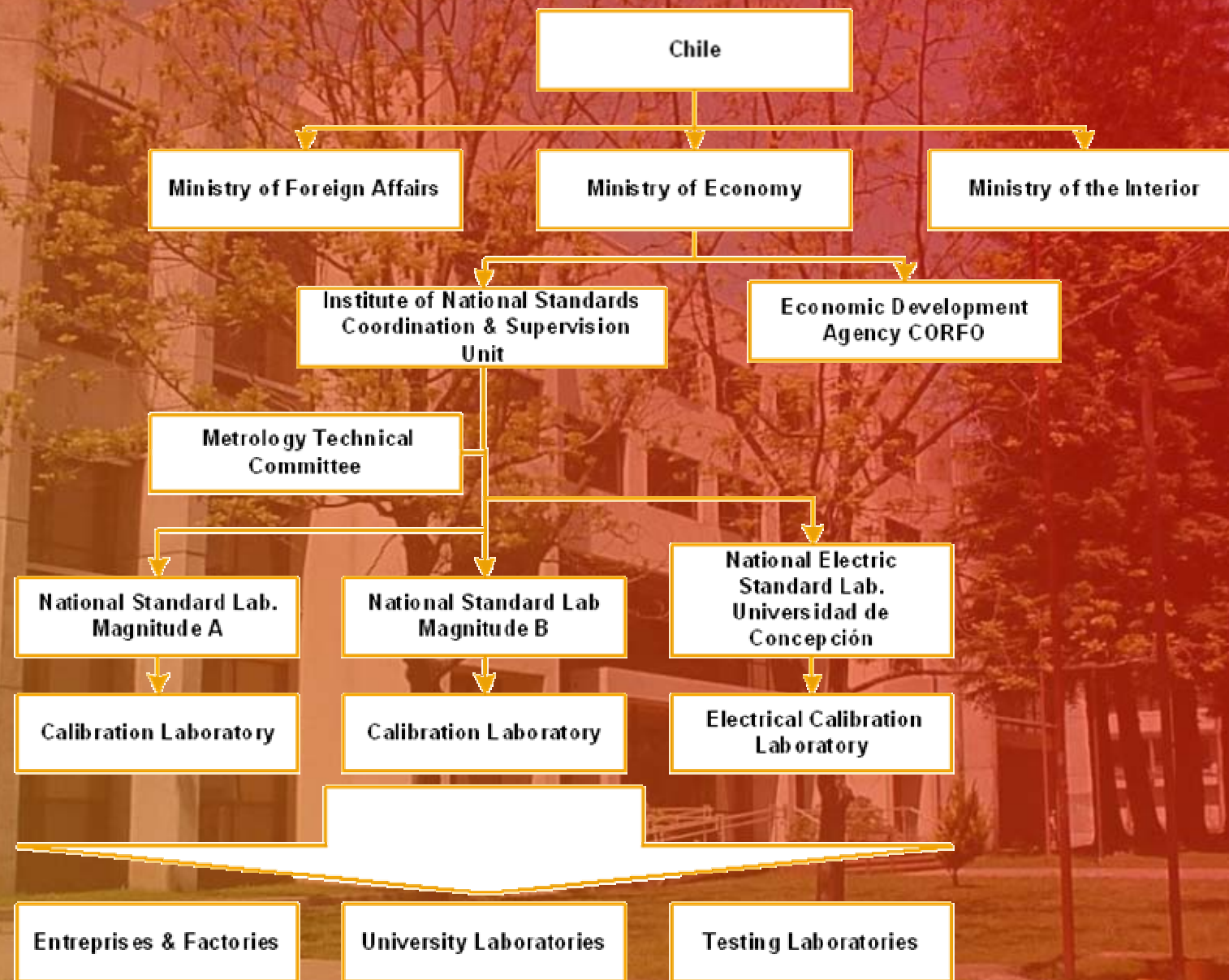
Result

*An Reliable and Robust Electrical Metrology
Support System to Remote Sensing and Telemetry
on Chile and the Latinoamerican Region*

12/27/2004

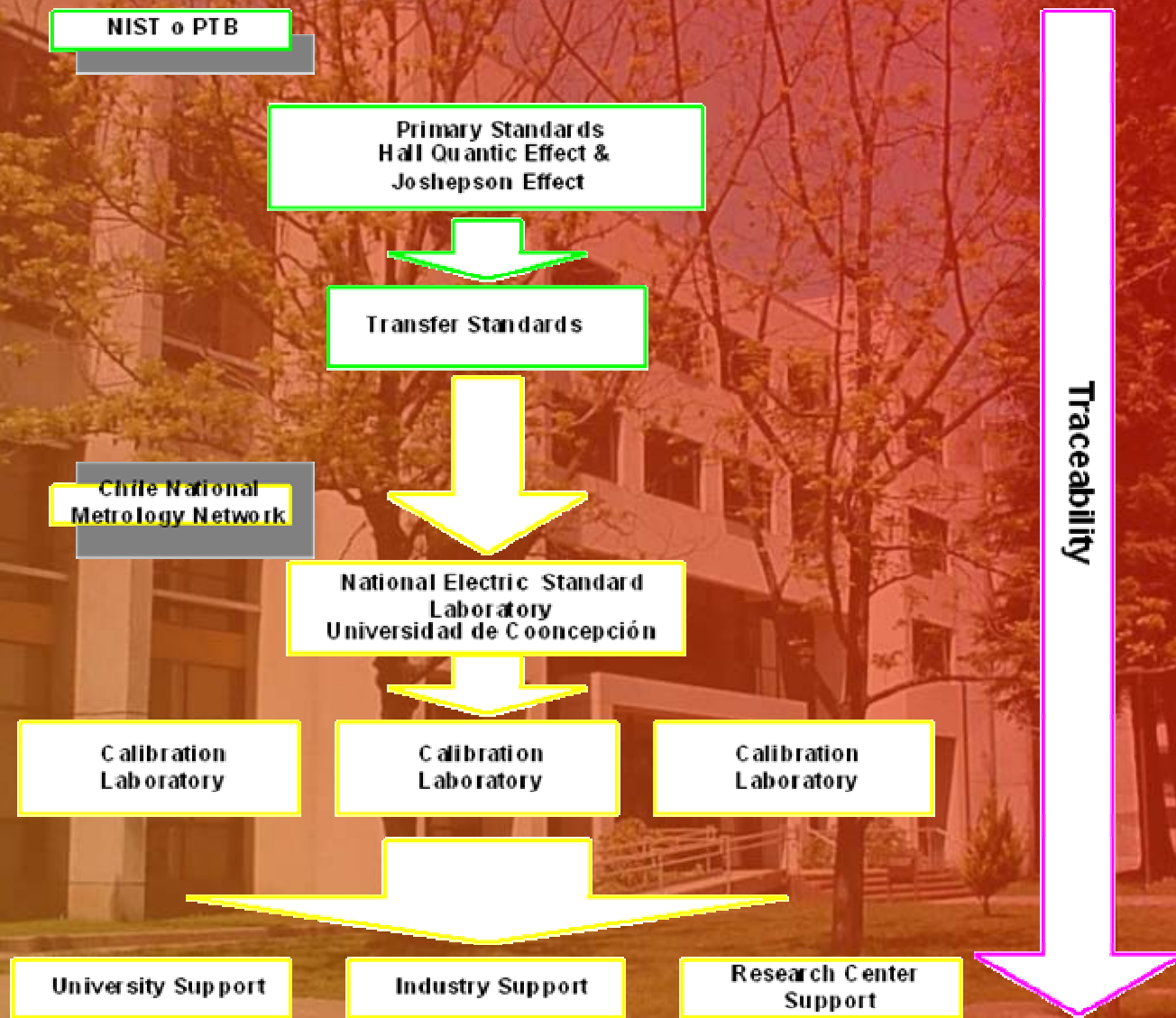
A National Vision

Chile is beginning a more promising future that will have to rely on the development of new technical and industrial capabilities, the research for careful exploitation of its natural resources, whether they are those in its ocean, or those of its lands (mining, forestry, and agriculture), with the support of its National Metrology Network, according to its productivity and resources. The Chilean universities will have an important role to provide its best human and material resources for growth employing them in physical and chemical metrology applied sustainably to the environment.



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Chile National Network of Metrology



LCPN-ME Equipment

Primary Standards LCPN-ME

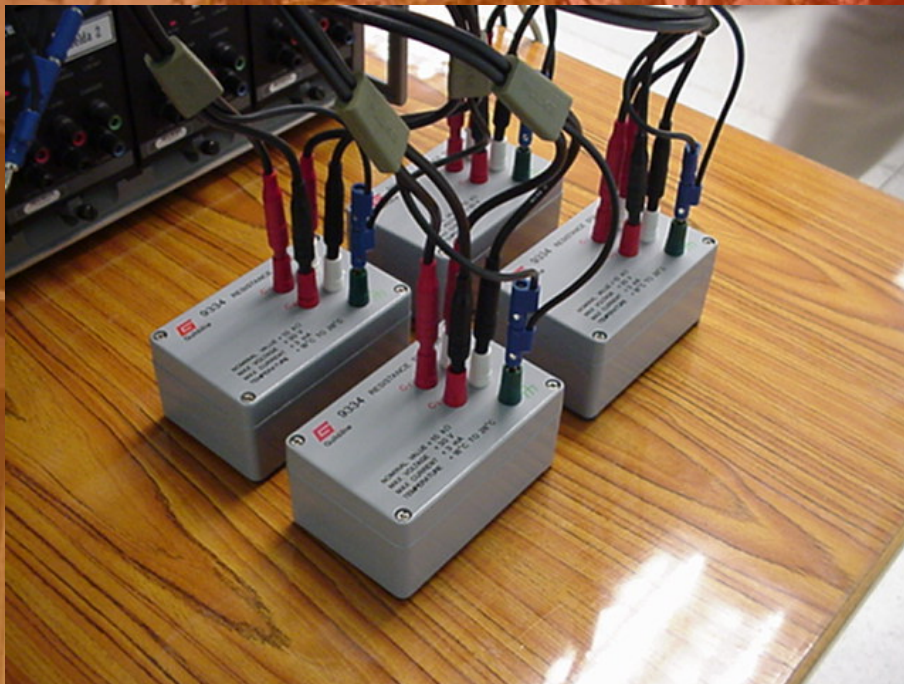
DC VOLTAGE : Primary DC Voltage Standard, Fluke 734A
4 cell 732B, Output Level 10VDC and 1.018VDC, 1ppm



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RESISTANCE : Primary Resistance Standard,

- Guildline 9334/1, 4 cell 1Ω , 2.5ppm
- Guildline 9334/10k, 4 cell $10K\Omega$, 2.5ppm



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**AC Voltage : Primary AC Voltage Standard, Fluke 792A
Thermal Transference Fluke 792A 2mV to 1000V,
10Hz to 1MHz, 10ppm.**



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DC-AC Transfer Standard LCPN-ME



HP 3458A/HFL Multimeter

- 8 ½ Digits
- DC Voltage : 0 to $\pm 1.050\text{V}$, 3 ppm readout
- DC Current : 0 to $\pm 1.05\text{A}$, 20 ppm
- AC Voltage : 1 mV to 700V, 70 ppm
1 Hz to 10 MHz, sine wave
- AC Current: 6 μA to 1.05A, 70 ppm
10 Hz to 100 kHz, sine wave
- Resistance : 0 to 1.2 GOhm



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National Custodian Electric Magnitude Standard Laboratory Chilean Metrology Network

Laboratories of Standards and Calibrations

FDI-CORFO Project

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Facultad de Ingeniería
Universidad de Concepción



Instituto Nacional de
Normalización