

# SIM seminar on Time and Frequency

## Paraguay

November 28 – December 1, 2005

### Outline

<b>Topic</b>	<b>Time needed (hours)</b>	<b>Total time (hours)</b>	<b>Files for Class notes</b>
1. <b>Introduction</b> <ul style="list-style-type: none"><li>• Short historic perspective of time measurement (Mauricio Lopez)</li></ul>	1	1	Introduccion_carpeta.ppt
<ul style="list-style-type: none"><li>• The second and the International Systems of units (Jean-Simon Boulanger)</li></ul>	1	2	T1-SI Second and SI units.ppt
<ul style="list-style-type: none"><li>• General concepts of time and frequency metrology (Mike Lombardi)</li></ul>	2	4	1_concepts_nist.ppt 1_intro_article_nist.pdf
2. <b>Frequency standards</b> <ul style="list-style-type: none"><li>* Quartz oscillators (Mauricio Lopez)</li><li>* Cesium clocks (Mauricio Lopez)</li><li>* Rubidium clocks (Mauricio Lopez)</li></ul>	4	8	2_quartz_cenam.ppt  Relojes 1.ppt Relojes 2.ppt
<ul style="list-style-type: none"><li>* Hydrogen clocks (Masers) (Jean-Simon Boulanger)</li></ul>	1	9	T2-Hydrogen Masers.ppt
<ul style="list-style-type: none"><li>* The Global Positioning System (GPS) (Mike Lombardi)</li></ul>	2	11	2_gps_nist.ppt
3 <b>Measurements Methods</b> <ul style="list-style-type: none"><li>* Time domain methods (Mauricio Lopez)<ul style="list-style-type: none"><li>• Direct measurements</li><li>• Single mixer frequency method</li><li>• Double mixer frequency method</li></ul></li></ul>	2	13	Tecnicas de medicion.ppt

* Frequency domain methods (Jean-Simon Boulanger)	1	14	T3-Frequency domain methods.ppt
4. <b>Frequency stability</b> * Allan variance (Mauricio Lopez)	2	16	Varianza de Allan.ppt
* Modified Allan variance (Jean-Simon Boulanger) * Time variance (Jean-Simon Boulanger)	2	18	T4-Modified Allan Deviation.ppt
5. <b>Uncertainty on frequency calibrations</b> Jean-Simon Boulanger	2	20	T5-Frequency calibration.ppt
6. <b>Time scales</b> * UT0, UT1, EAL, TAI, UTC (Mauricio Lopez)	1	21	Escalas de tiempo.ppt
* Local approximations to the UTC: UTC(NRC), UTC(NIST) UTC(CNM), UTC(ONRJ), UTC(ONBA), UTC(IGMA) (Jean-Simon Boulanger)	1	22	T6-Local approximation to UTC.ppt
The interamerican metrology System (SIM) common view GPS comparison network, traceability, and legal metrology (Mike Lombardi)	2	24	6_SIM_CV_nist.ppt 6_SIM_CV_paper.pdf 6_SIM_CV_manual.pdf 6_Legal_Time_nist.pdf
7. <b>Frequency combs, optical clocks and the future of the time unit</b> (Jean-Simon Boulanger)	2	26	T7-The future of time.ppt