

Observatoire de la Côte d'Azur



UMR 6203 GEMINI
Equipe R&D M
Groupe Temps-Fréquence
et Transferts de Temps

*Françoise Baumont
Jean-Louis Oneto
Etienne Samain
Hervé Viot
Pierre Claudon
Robert Dalla (part time)*

OCA Geographical Situation





Observatoire de la Côte d'Azur
UMR 6203 GEMINI
R & D M Group

Current Studies

- Satellite Laser Ranging
- Lunar Laser Ranging
- Space Geodesy
- Geodetic GPS
- Time & Frequency



Time & Frequency Team

Members

- *Françoise Baumont*
- *Jean-Louis Oneto*
- *Etienne Samain*
- *Hervé Viot*
- *Pierre Claudon*
- *Robert Dalla (part time)*

OCA Time & Frequency Equipments

A : Time Station

- Two HP5071A High Performance Clocks
- Comparison System of the 2 Cesium
- Monitoring of Weather Conditions
- TU/TS & Frequencies Distribution over Calern Site

OCA Time & Frequency Equipments

B : Construction of real-time UTC(OCA)

[under test]

- Trak Systems 6490A MicroPhase Stepper
- Trak Systems 6460 Multiple Time Scale Generator
- Stanford Research SR620 Counter & Racal 1250 Multiplexer for comparison with TTS2 GPS Reference



OCA Time & Frequency Equipments

C : Time & Frequency Transfer Techniques

- 1 Single Channel TTR5 AOA GPS Receiver
- 1 Multi-Channel TTS-2 VP Oncore Receiver
- 1 VSAT TWSTFT Station since 1990
- Automated Comparison Systems between Cs Clocks and GPS Receivers

OCA Time & Frequency Participation to Time Scales

- TA(F) via Free-Running Clock :
 - GPS TTR5 “Common View”
with the LNE-SYRTE - Paris
- TAI via UTC(OCA) :
 - TWSTFT OCA-PTB Link
 - GPS TTS2 “Common View” as Backup with the
BIPM - Sèvres
 - [scheduled for end of 2005]

OCA Time & Frequency Presentation of TWSTFT Station

- VSAT 1.80m Diameter
- Anacom Transceiver
- Mitrex Modem
- Operating Everyday in Automatic mode, 12 sessions a day
- Calibration scheduled for Spring 2006, including GPS Receivers





OCA Time & Frequency Prospective

- T2L2 (Time Transfer by Laser Link) on Jason-2, to be launched in 2008
- OCA will be essential to T2L2 “Time” component, because of its experience as Laser Ranging and Time Transfer Station
- T2L2 will improve the accuracy of current Time Transfer Techniques down to the 60ps level
- ACES & Galileo Participations are planned

Time Transfert by Laser Link T2L2 On Jason 2



OCA –UMR Gemini

Grasse – FRANCE

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D. Albanese : Optic

F. Baumont: TF

R. Dalla: Electronic

P. Exertier: Gemini Director

M. Furia : Electronic

J.F. Mangin : Laser

J.L. Oneto: TF

J. Paris : Software

J.M. Torre: Laser Station - ILRS

F. Pierron: FTLRS

P. Vrancken : Optical tests

J. Weick : error - link Budget - computation



CNES

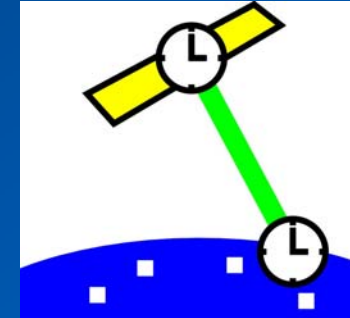
Toulouse – France

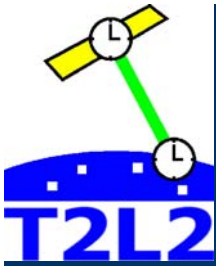
Email : phillipe.Guillemot@cnes.fr

P. Guillemot: System Engineer

I. Petitbon: Project Manager

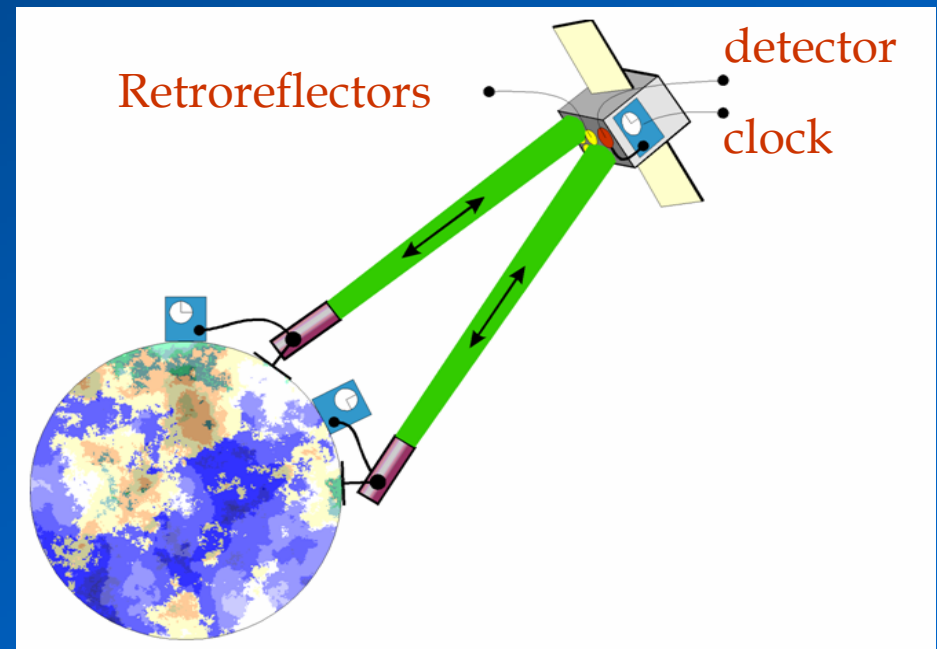
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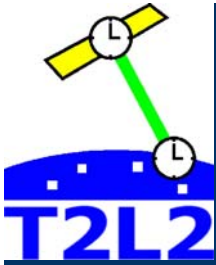




Principle

- **Time Tagging of laser pulses emitted from a laser station to the satellite**
 - Start Time at ground Station t_d (**ground clock**)
 - Arrival time at satellite t_b (**space clock**)
 - Return Time at ground station t_r (**ground clock**)
- **Time Transfer between Ground clock and space clock**

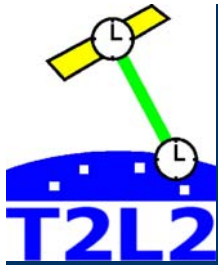




Scientific Objectives

Time and Frequency metrology

- Optical Laser Link validation
 - Uncertainty < 100 ps
- Ground clock Synchronization
 - Compatible with the best clocks available in the world
- Time scale participation through calibrations
 - BIPM/CCTF recommendation



Development plan

- B Phase: start 09/2005 ; end 01/2006
- CD phases : start 01/2006 ; end 11/06
- Jason2 integration : 01/2007

- T2L2 working group constitution 2006
- T2L2 Ground instrumentation 01/2007
- Laser ranging station upgrade : 2008

- Jason2 Launch : 06/2008
- End of exploitation : 2013