IEN TWSTFT station report

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Summary

- IEN T&F laboratory report
- IEN01 report
- H maser as IEN01 modem frequency reference
- I903 visibility at IEN site
- Time transfer for TAI in 2003
- Cesium fountain frequency comparisons
- Configuration of a new TWSTFT measurement system at IEN
- SATRE modem set-up
- New transceiver failure
- Dual LNB system
- Possibility of a IEN-TL link with PAS-4

IEN time and frequency laboratory

Major Events / Equipment update

Time scale generation

- **IEN cesium fountain accuracy evaluation and first comparison vs. TAI (May 2003)**
- **Second Sigma-Tau Hydrogen maser acquisition (May 2003)**

Synchronization systems

- **Second TWSTFT station ready to operate (November 2002, Transceiver failed)**
- **Ashtech Z-12T Metronome GPS geodetic receiver, near to become both an IGS and EPN (Euref Permanent Network) station. Driven by UTC(IEN), 30 s sampling, hourly and daily files. Participation to TAIP3 project**
- **Javad Legacy GPS geodetic receiver,. Driven by H maser, 1 s sampling, hourly and daily files. Participation to GSTBv1 experiment**

IEN01 Station major events

- New LNA installed (October 2002, MJD52549)
- Discontinue operation (October, November 2002) caused by the transceiver power supply module failure
- Station off-line (December 2002, January 2003) for repair
- Repaired station on line (MJD 52670)
- IEN maser#1 as reference for TW (MJD 52689)
- New FTP server cesio.ien.it (MJD 52736)
- 5 days per week schedule on the EU-USA link (MJD 52743)
- IEN-NIST fountain comparison (MJD 52744 -> MJD 52754)
- 7 days per week schedule on both links (MJD 52782)
- IEN-PTB link calibration (MJD 52789 -> MJD 52796)
- IEN maser#2 as reference for TW (MJD 52885)
- Satellite Change (MJD 52898)

Setup until MJD 52689

Modem type: University of Stuttgart/MITREX 2500A

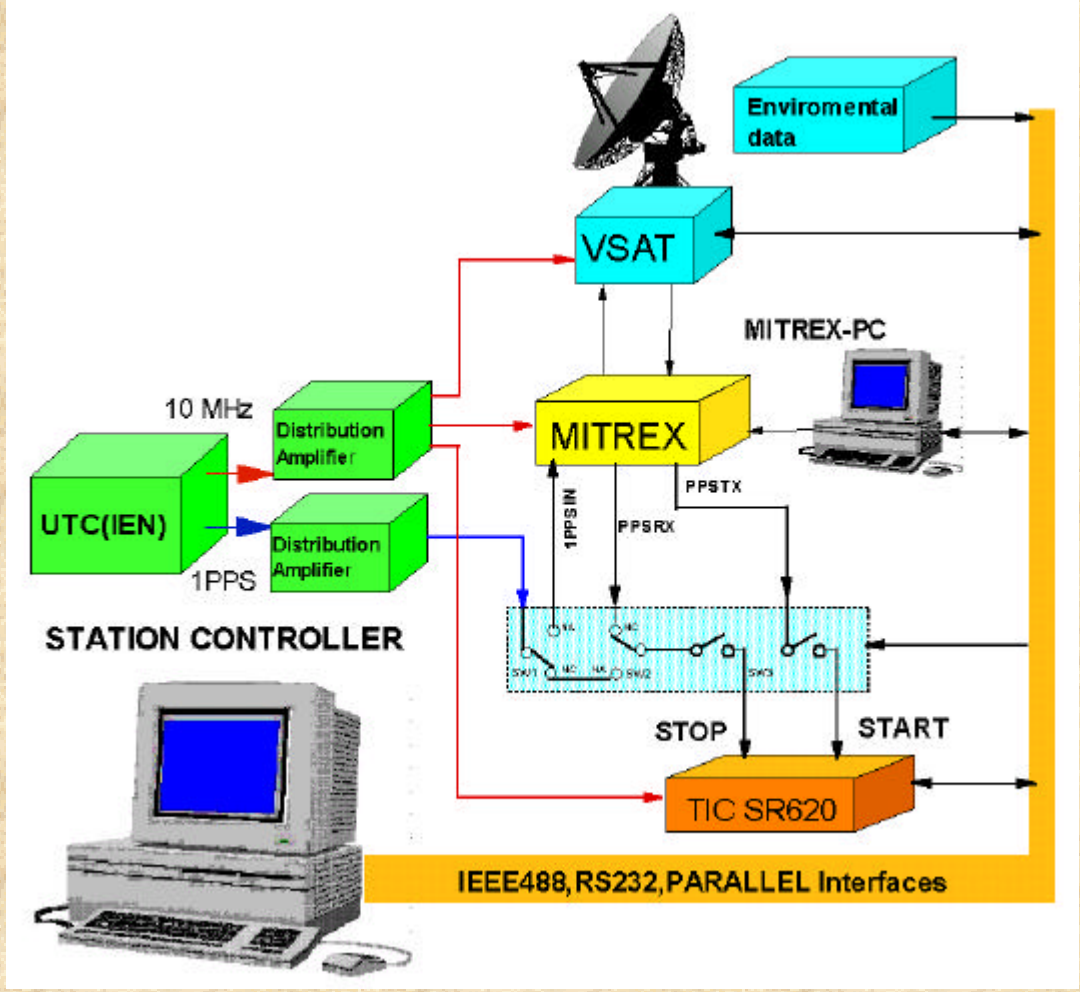
Modem serial no: Italy 1

Antenna: 1.8m, VSAT Prodelin

Degree of automation: 100%

Reference name: UTC(IEN)

Reference type: 1 Cs (steered with internal microstepper)



Setup since MJD 52689

Reference type:

Between MJD 52689 and MJD 52884

IEN Maser #1

Since MJD 52885

IEN Maser #2

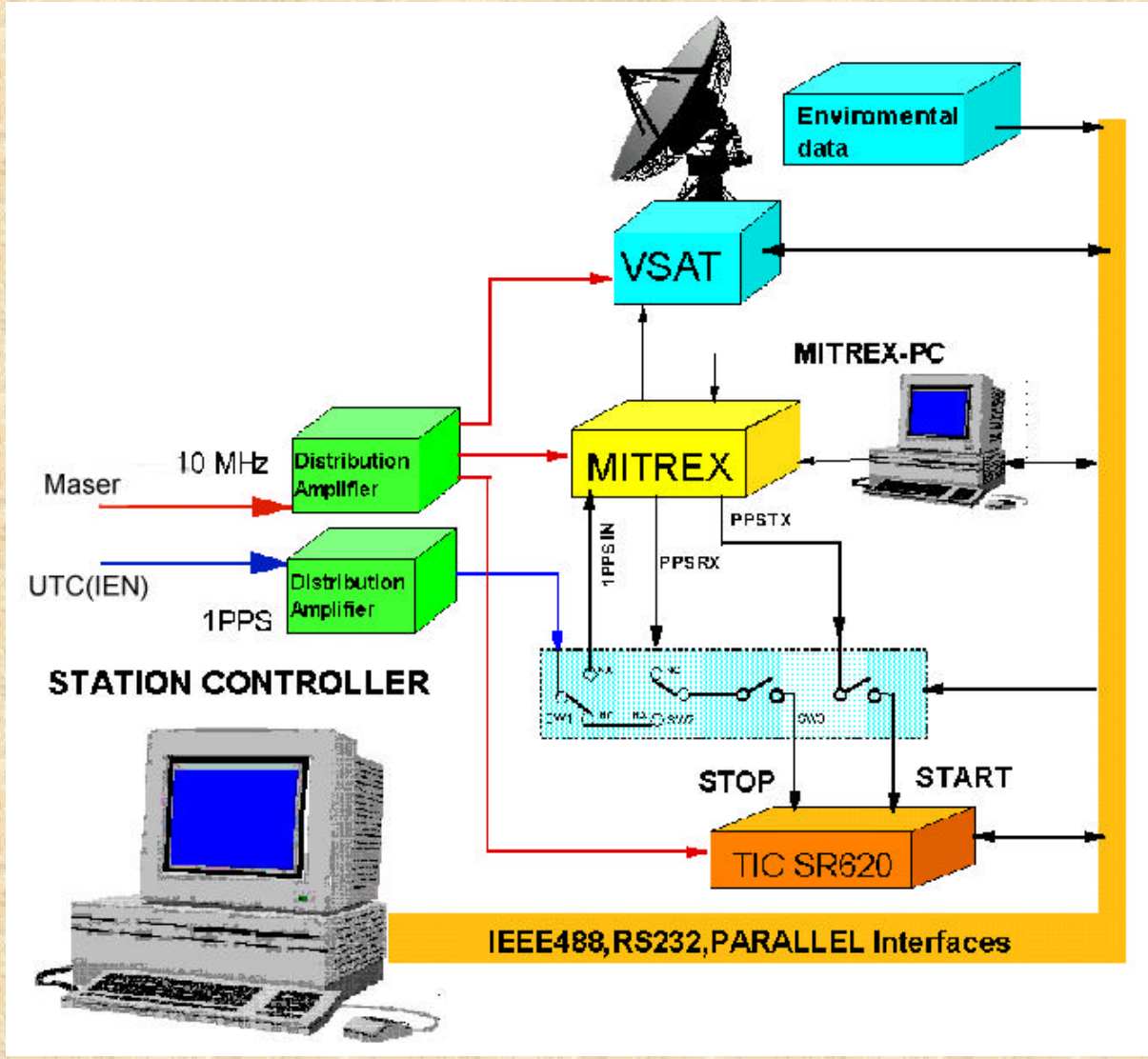
Link to UTC(IEN):

REFDELAY (UTC(IEN)-1PPSTX) measurement

14.04 -> ROA, PTB, OCA, VSL

14.22 -> OP, NPL

14.50 -> NIST, USNO



New FTP server

Server ftp.ien.it discontinued

New server: **cesio.ien.it**
Access: anonymous
Password: your e-mail address

Folders organization
../2001 /2002 ....
These yearly directories contain the IEN TWSTFT measurement files (ITU files).

../1s_data/ ....
This directory contains the 1s counter measurements.
It is organized in yearly subdirectories (.../2001 .../2002 etc).

New satellite arrargement

Intelsat 706 (53° W)

Alt.: 11° 30’

Az.: 248° 30’

IEN site (45° 01’N, 7° 38’ E)

Intelsat 903 (34° 30’ W)

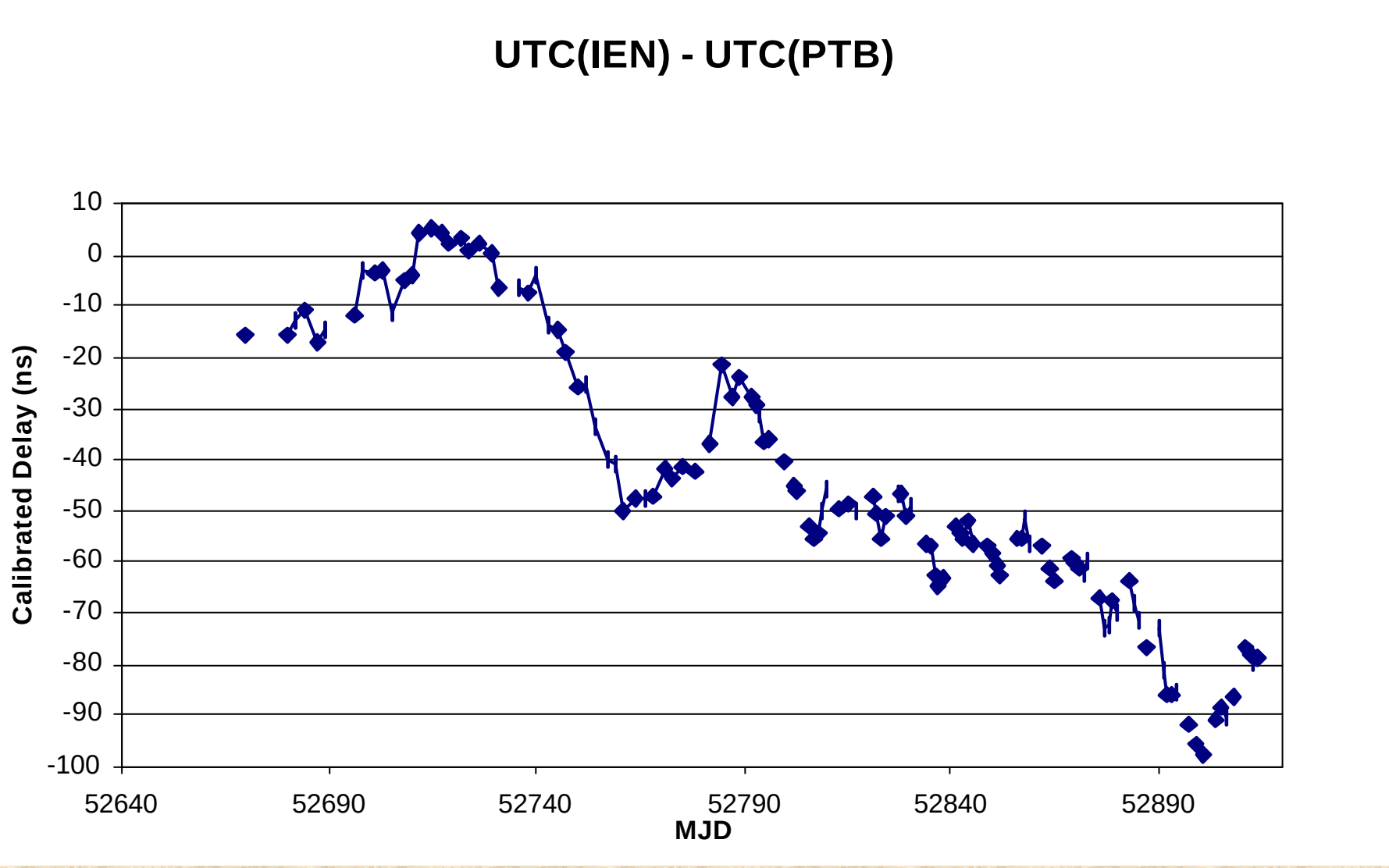
Alt.: 23° 30’

Az.: 232° 00’

Transceiver can manage I903 transmit and receive frequencies

With I903 transmit power raised by 1 dB on both EU-EU and EU-USA links

UTC(IEN) contribution to TAI



CALR(IEN) = -253 ns MJD=52276

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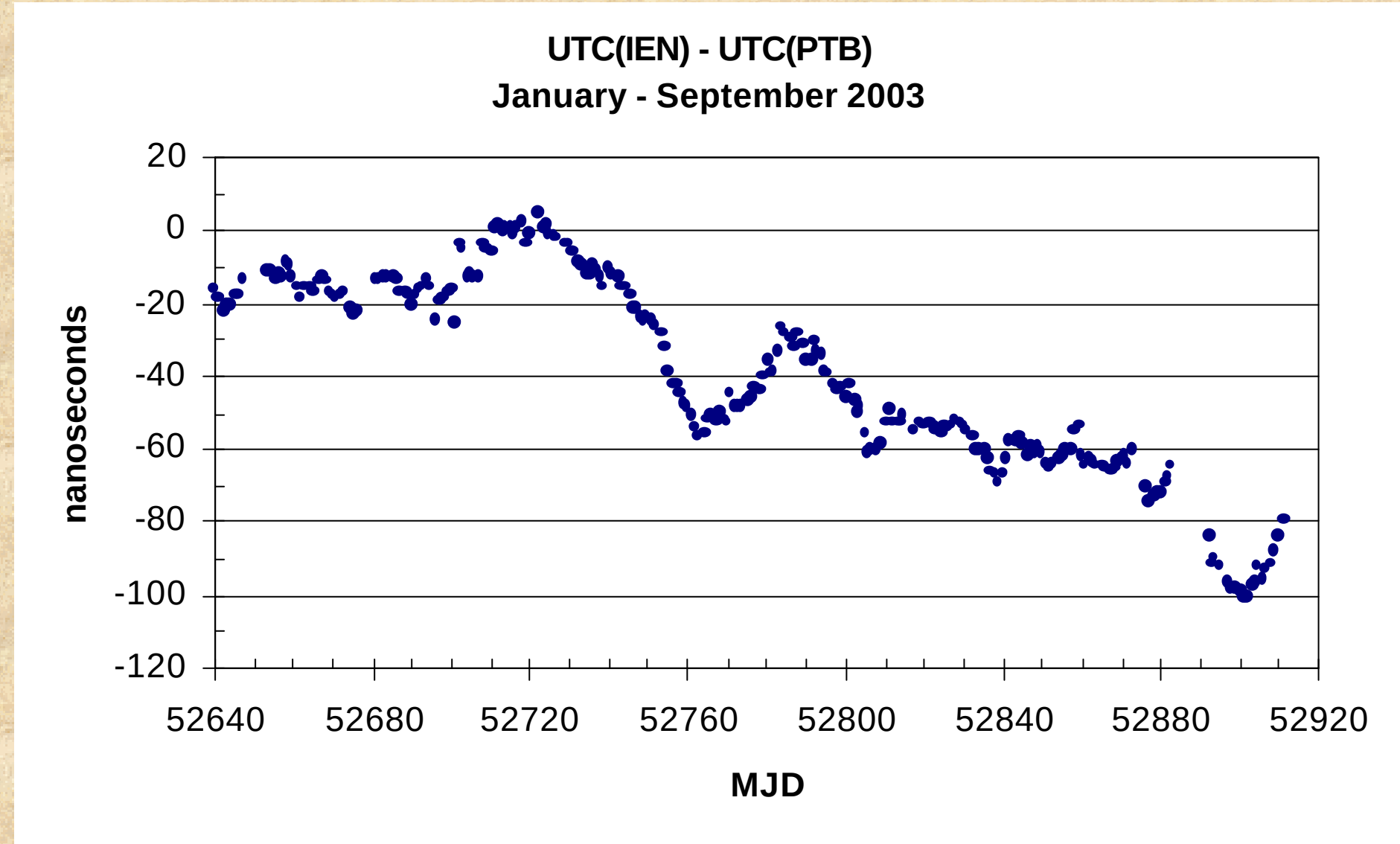
IEN-PTB comparison using GPS CV

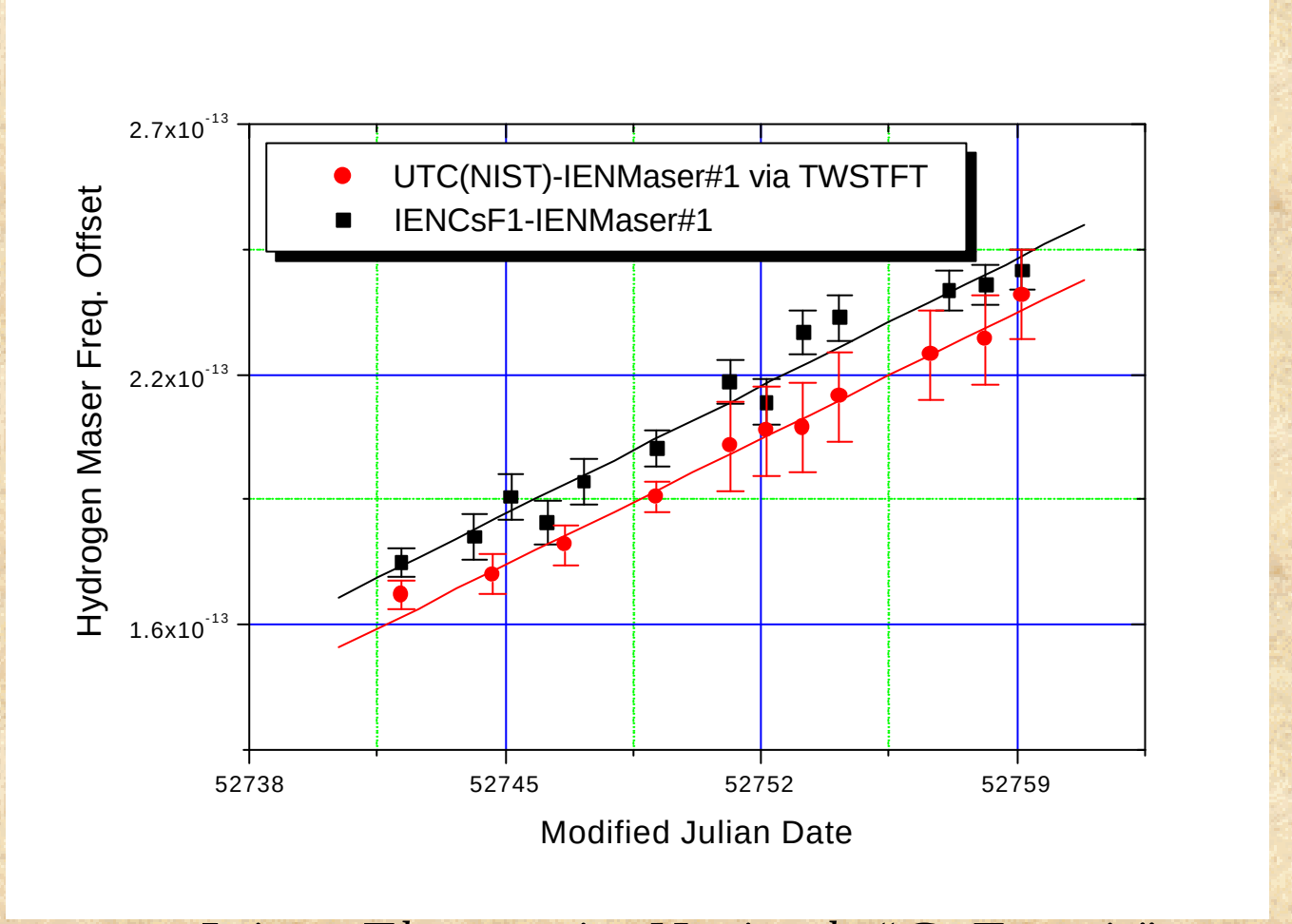


Cesium fountain comparisons

Evaluation period: 52744-52754

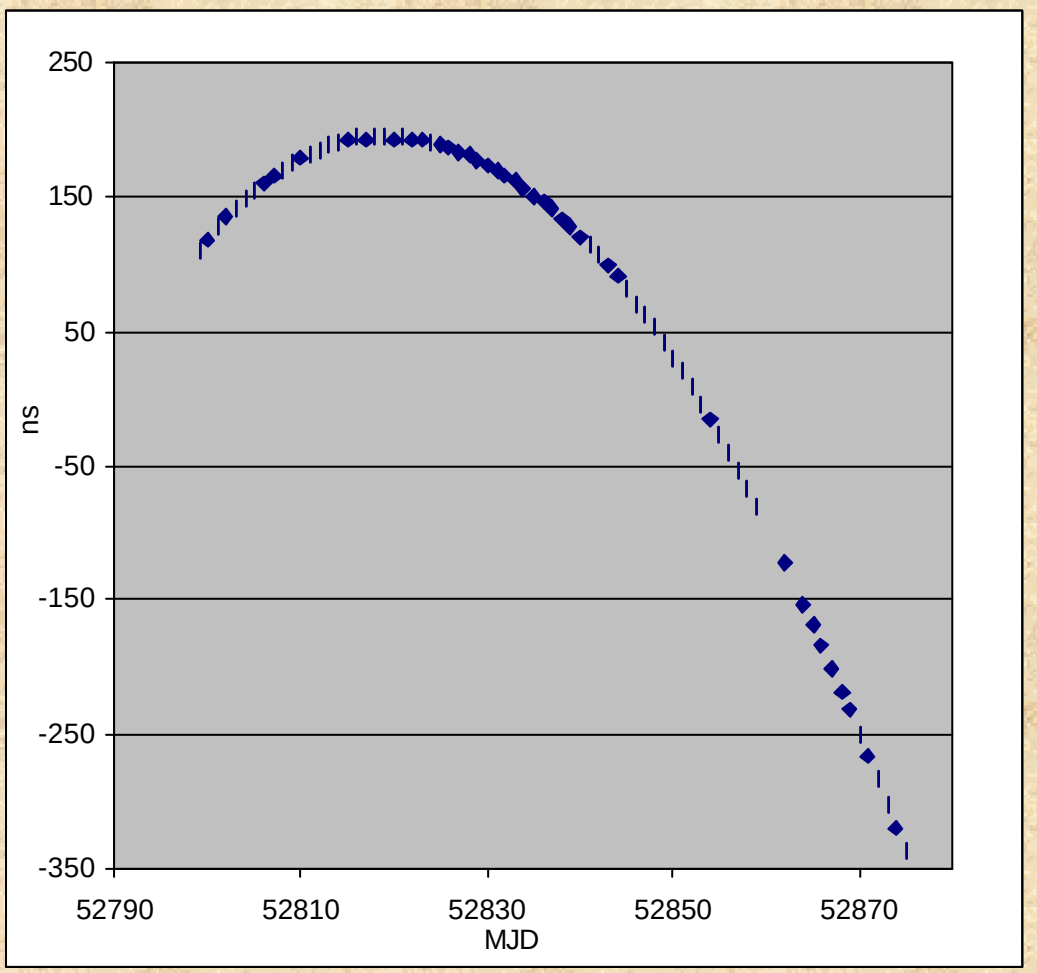
IENCsF1-n[UTC] = 17 · 10^{-15} **(via Circular T, published in CircT 185)**

IENCsF1-n[UTC(NIST)] = 17.5 ·10^{-15} **(via TWSTFT)**

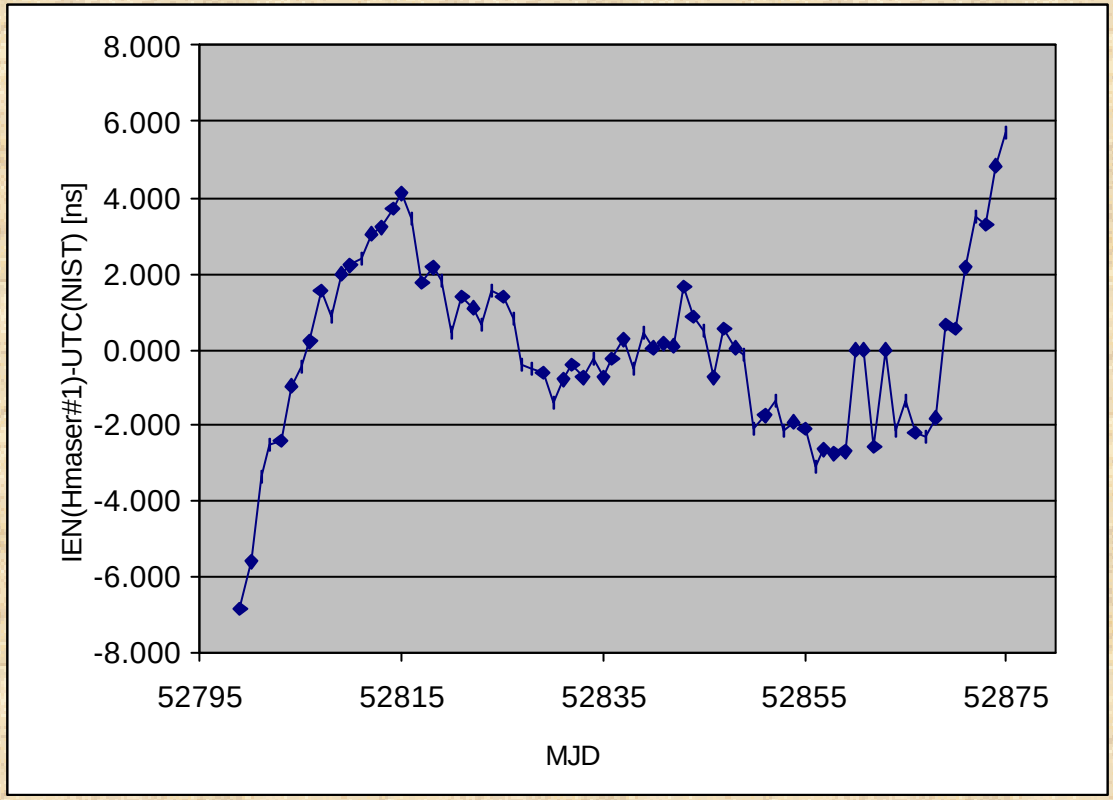


TWSTFT stability

IEN(H-maser#1)-UTC(NIST)

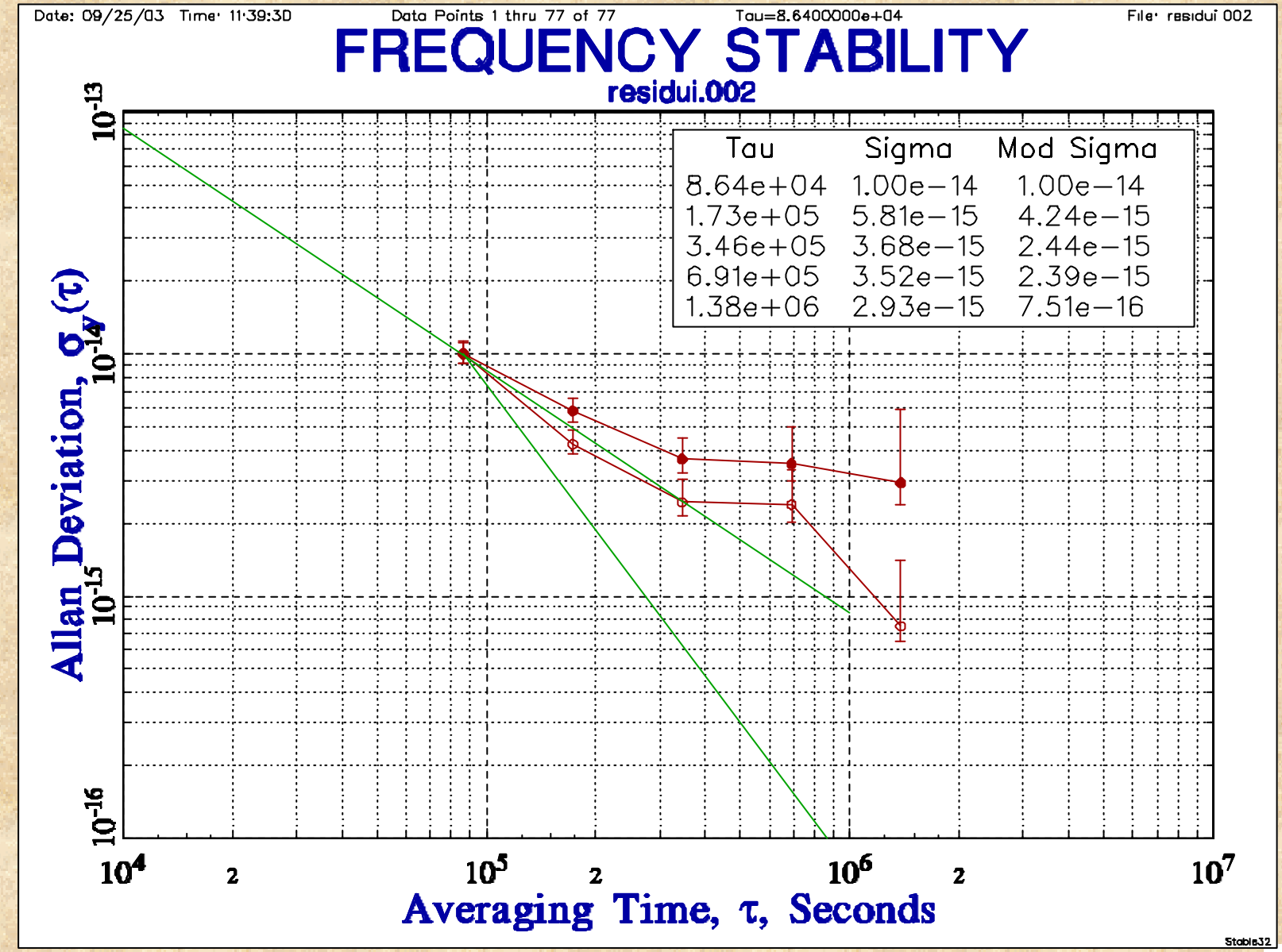


IEN(H-maser#1)-UTC(NIST) Drift removed



TWSTFT stability

IEN(H-maser#1)
vs.
UTC(NIST)
Drift removed



Future evolutions of IEN01

- Use of the new calibration value for IEN-PTB link
- REFDELAY measured for every 2-minute session (UTC(IEN)-1PPSTX taken as 10 points average (30 points now), during the 1 minute window between every slots
- Calibration, with Circular T, of IEN-REM links not yet calibrated

Installation of a second TWSTFT measurement system at IEN

Purpose

- Substitution of obsolete equipments (MITREX modem, transceiver)
- Availability of a backup system
- Possibilty to operate two different links

Configuration

Modem: Timetech SATRE 079

Transceiver: SSEt K-Star

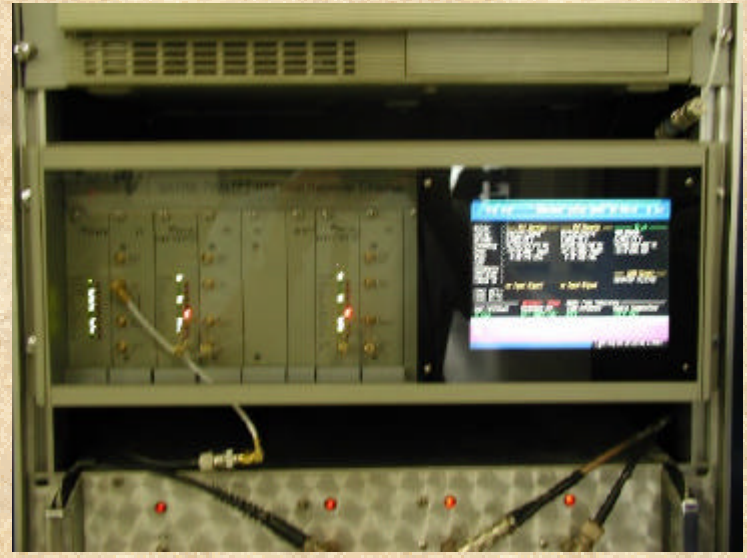
Antenna: Prodelin model 1184 (1.8 m) Intelsat type approved

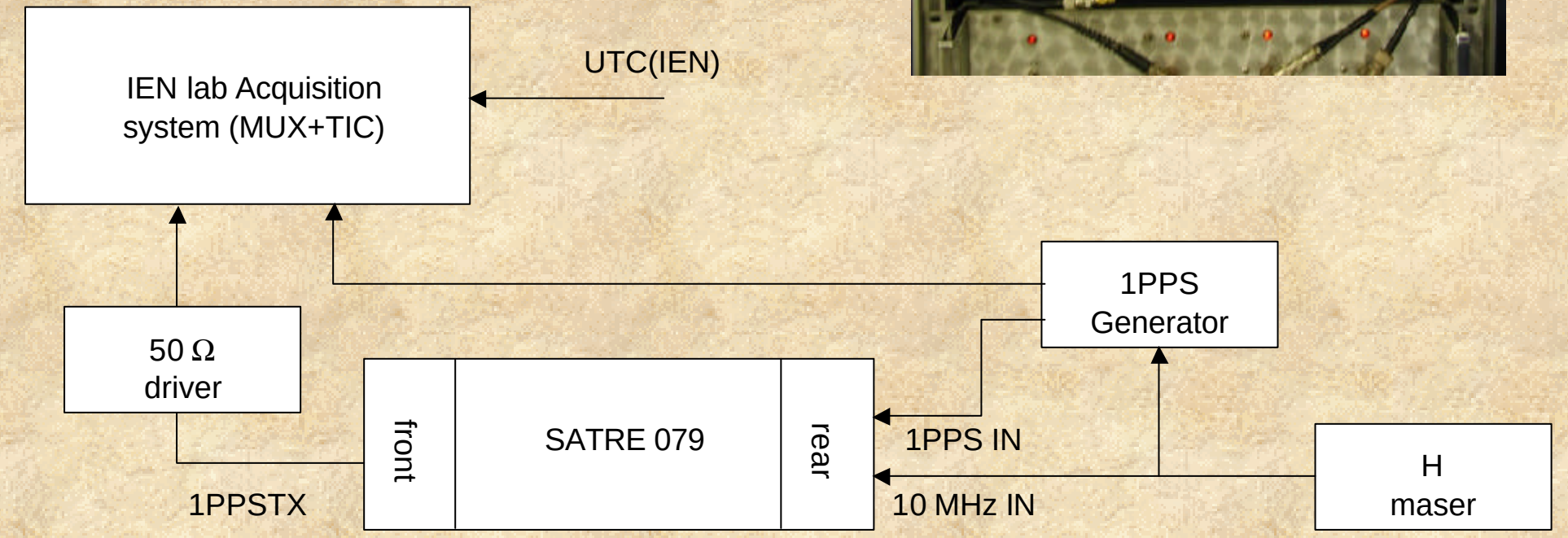
Cables: Modem to Transceiver (40 m) Andrew FSJ50-A

The Modem

Timetech Satre 079

Current software version: 4.80.00





The Transceiver

SSEt K-star

Power: 4 W

Uplink frequency: 14 to 14.5 GHz

Downlink: LNB based.

4 Different LNBs cover the whole downlink frequency band

1) 10.95-11.45 GHz
2) 11.45-11.95 GHz
3) 11.70-12.20 GHz
4) 12.25 12.75 GHz

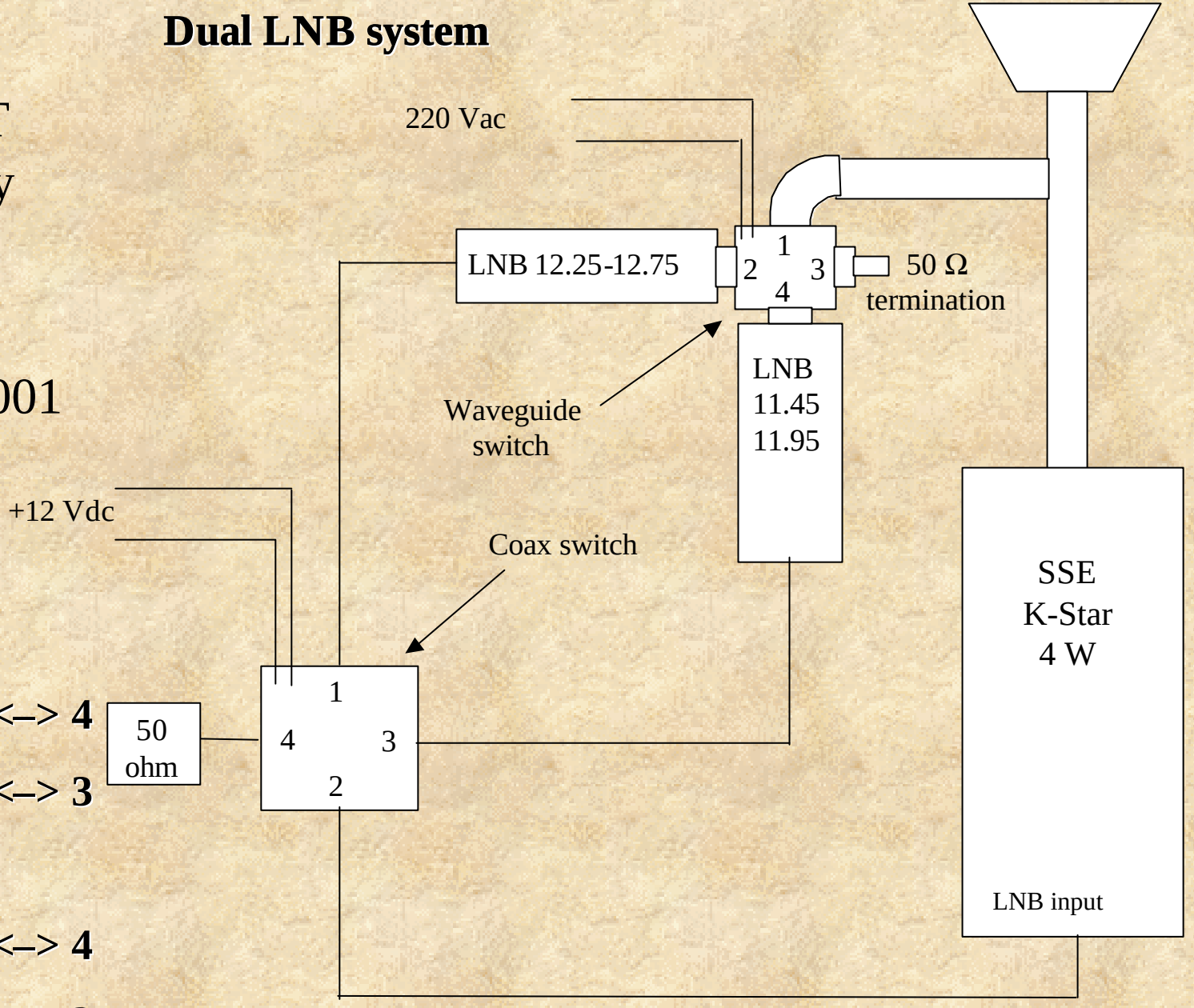
Tranceiver problems

- Acceptance test (2001)
- Antenna installation (Spring 2002)
- Transmitter failure (Summer 2002)
- Warranty not more valid (company bankrupt). Repair expensive
- Transceiver received repaired (Winter 2003)
- Transceiver installation and test (Winter 2003)
- Request for Intelsat approval
- Calibration with TUG transportable station (Spring 2002)
- Transmitter failed again (Summer 2003)
- Repair not more possible
- ……..

Dual LNB system

How to operate a TWSTFT station on bands covered by different LNBs?

Example: EU-EU and EU-USA links on I706 since 2001 to 2003



Waveguide switch (WR 75):

Position 1 **1 <–> 2** **3 <–> 4**

Position 2 **1 <–> 4** **2 <–> 3**

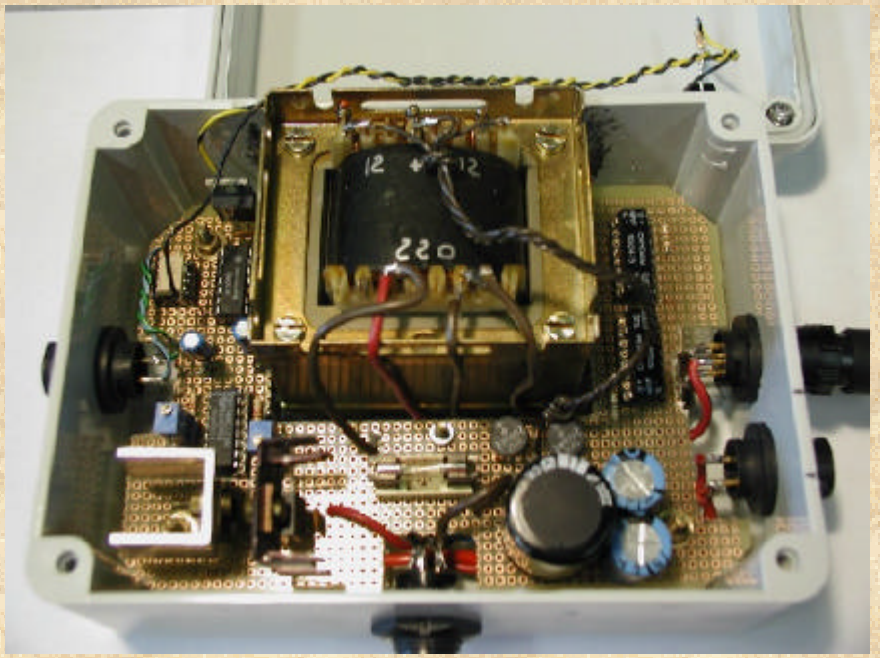
Coaxial switch: (DC-3 GHz)

Position 1 **1 <–> 2** **3 <–> 4**

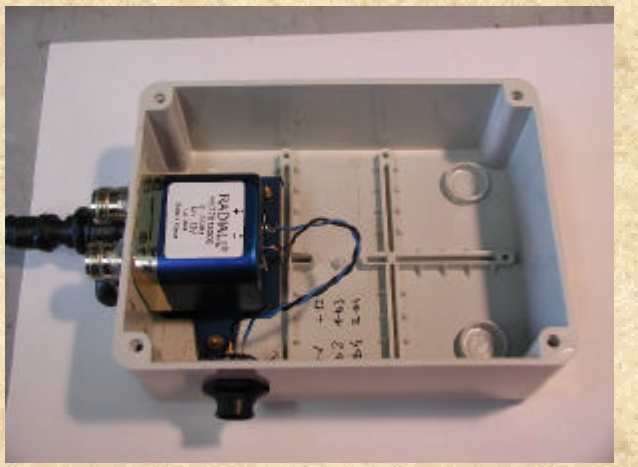
Position 2 **1 <–> 4** **2 <–> 3**

Dual LNB system

Waveguide switch



Control electronics



Coax Switch

(L-band)

IEN-TL link with PAS-4 satellite

Issues

- Satellite visibility at IEN site
- Uplink-Downlink frequencies
- Station Approval by Panamsat
- Link cost / operation budget
- Actual availability of the new IEN TWSTFT system

Visibility – operation frequency

PAS-4 72° E

South-Eastern sky at IEN

Position at IEN site

Alt. 9.2°

Az. 104°

Uplink Freq (IEN): 14414.000 MHz

Downlink Freq. (IEN): 12568.900 MHz

Open Issues

- Actual availability of the new IEN TWSTFT system (new transciver purchase? Availability not foreseen before Spring 2004)
- Station Approval by Panamsat
- Link cost / operation budget (provided by TL for 3 years)