

20th Meeting of the CCTF WG on TWSTFT
6-7 September 2012, Sèvres, BIPM

AOS STATUS REPORT

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Summary:

- Timing equipment at AOS and GUM
- Current state of realization of TA(PL)
- TWSTFT status at (AOS)
- Fiber optics results for AOS-GUM link

Time & Frequency Equipment



Averaging Time	2HP 5071A opt 001*	CH 1-75A opt 01**	$\sigma(\tau)$ MHM 2010**
1 s	$2e^{-12}$	$2.1e^{-13}$	$2.0e^{-13}$
10 s	$5e^{-12}$	$3.1e^{-14}$	$5.0e^{-14}$
100 s	$8.5e^{-13}$	$7.1e^{-15}$	$1.3e^{-14}$
1000 s	$2.7e^{-13}$	$2.5e^{-15}$	$3.2e^{-15}$
1 day	$2.7e^{-14}$	$7.1e^{-16}$	$3.0e^{-15}$
Long term	$5.0 e^{-15}$???	$2.0e^{-16}$
Jitter	<1.0 ns	< 0.1 ns	< 0.01 ns

* High performance tube

** Autonomous automatic cavity tuning



Time Transfer Equipment

- AOS TWSTFT Earth Station
- GPS/GLONASS/GALILEO Receivers own constructions, developed at the Observatory
 - TTS-2, C/A code
 - TTS-3, GPS/GLONASS, double freq.
 - TTS-4, GPS/GLONASS/GALILEO
- Fiber optics link, AOS-GUM ~420 km, operating continuously from March 2012

TA(PL)



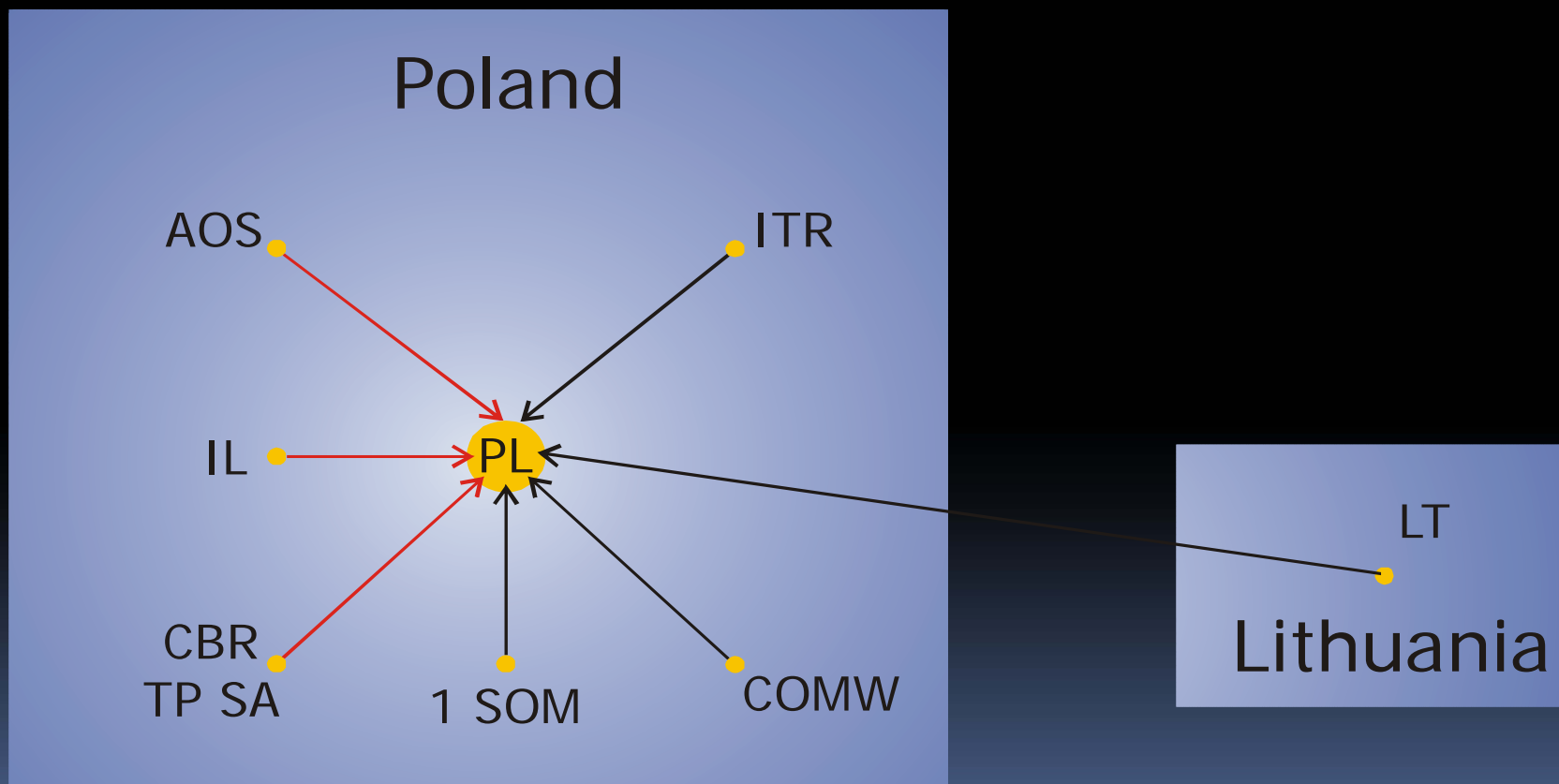
Participating clocks

Central Office of Measures (GUM)	3 HP 5071A, 1HM
Astrogeodynamical Observatory (AOS)	2 HP 5071A, 2 HM
Institute of Telecommunications	2 HP 5071A
Polish Telecom	2 HP 5071A, 2 CS OSC
Tele-Radio Research Institute	1 HP 5071A
Polish Army	1 HP5071A, 1 HM
Lithuania	2 HP 5071A

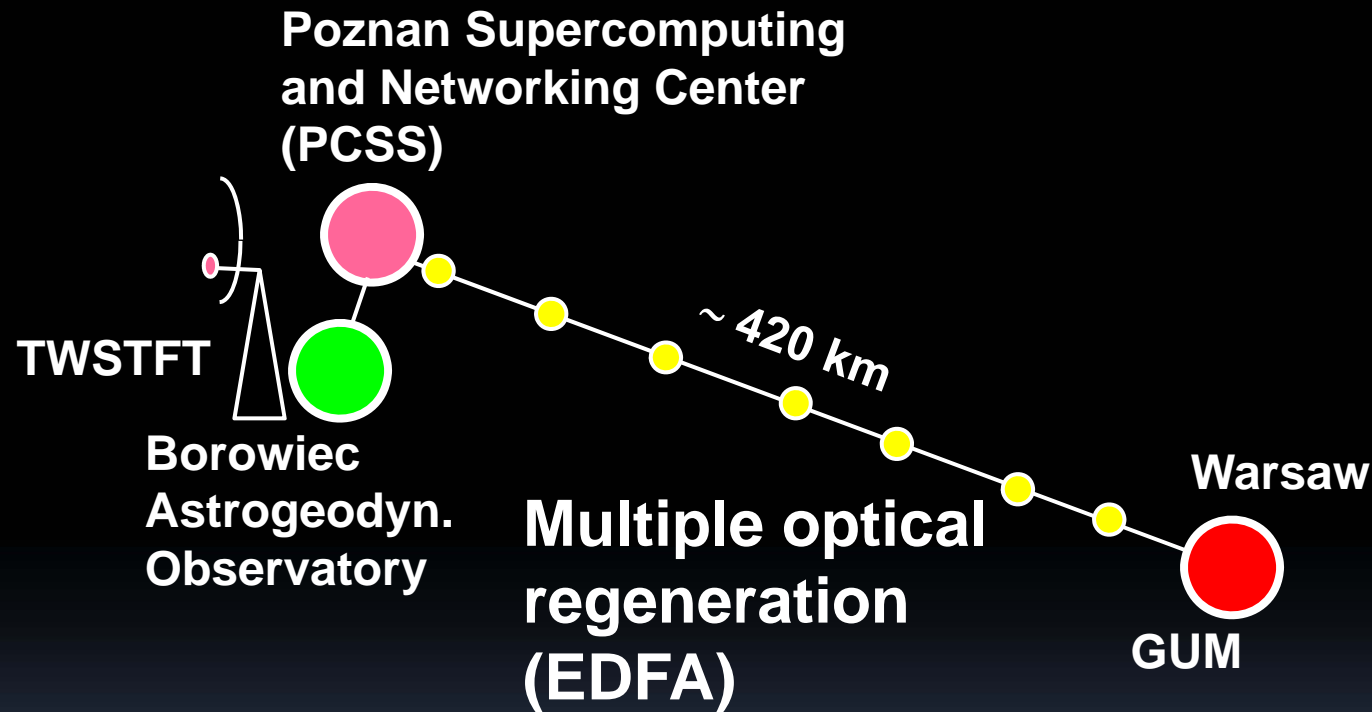
Total 15 Cs + 4 HM



APPLICATION OF TTS-4 RECEIVERS FOR TA(PL) LINKS

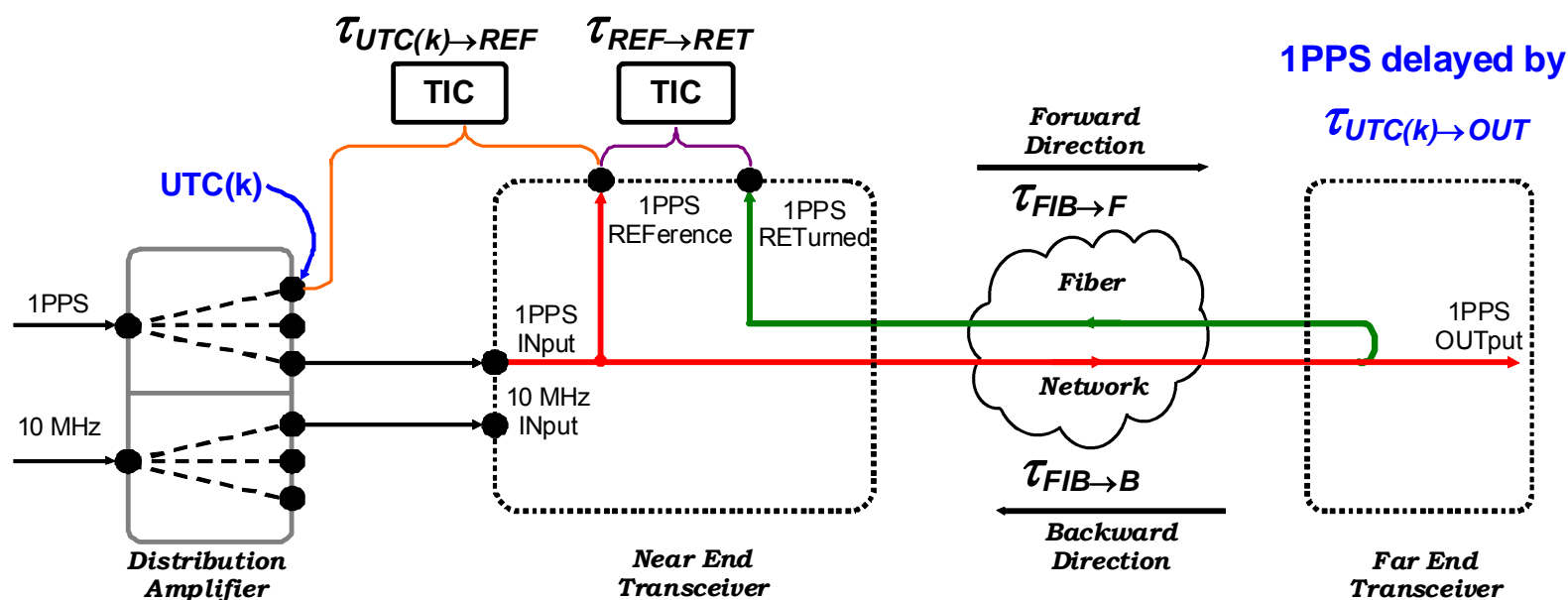


Glass fiber link Warsaw – Borowiec



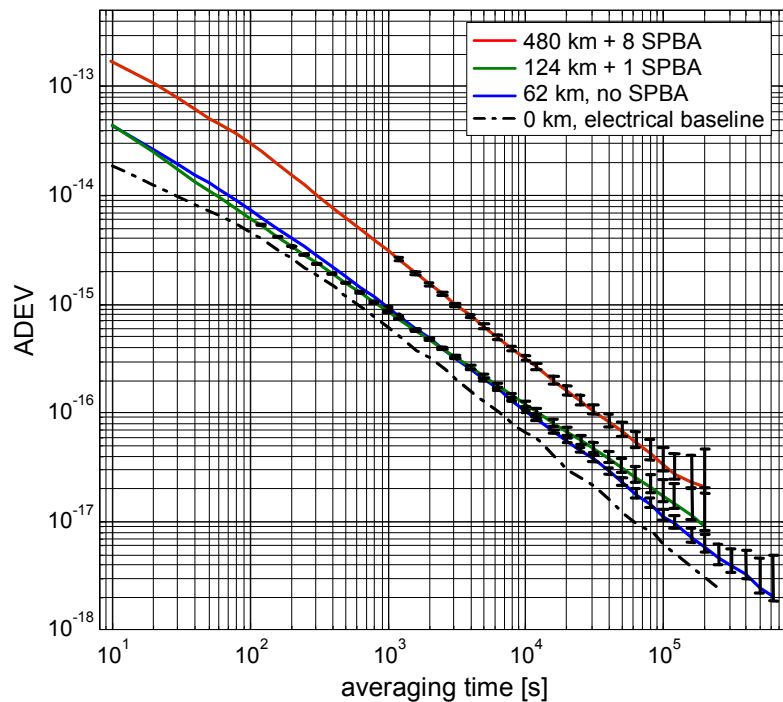
8 amplifiers (EDFA)

Block diagram of calibration of the time transfer system

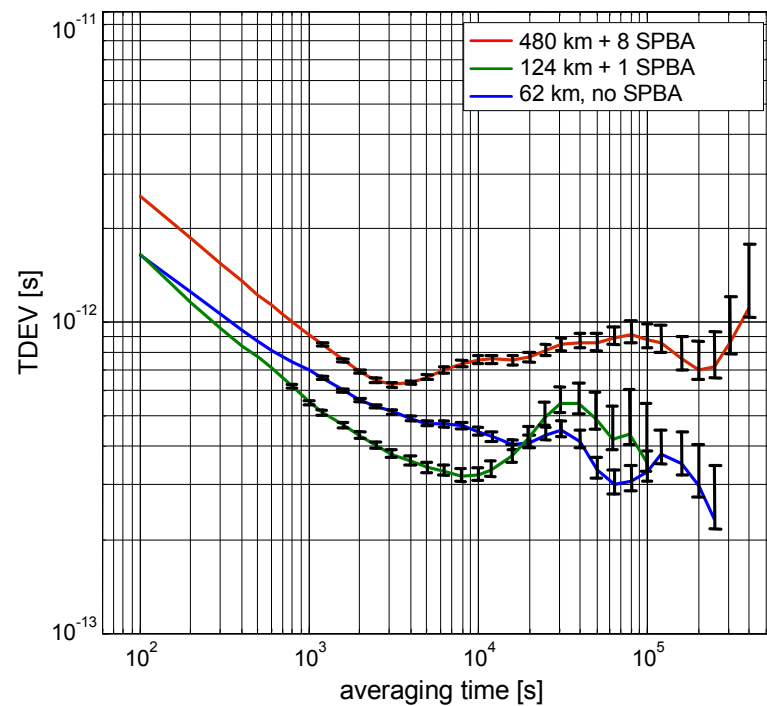


$$\tau_{FIB_F} - \tau_{FIB_B} = (\lambda_F - \lambda_B) \cdot D + \frac{4\omega A_E}{c^2}$$

ADEV (a) and TDEV (b) for different length laboratory-tested links with stabilization of the propagation delays

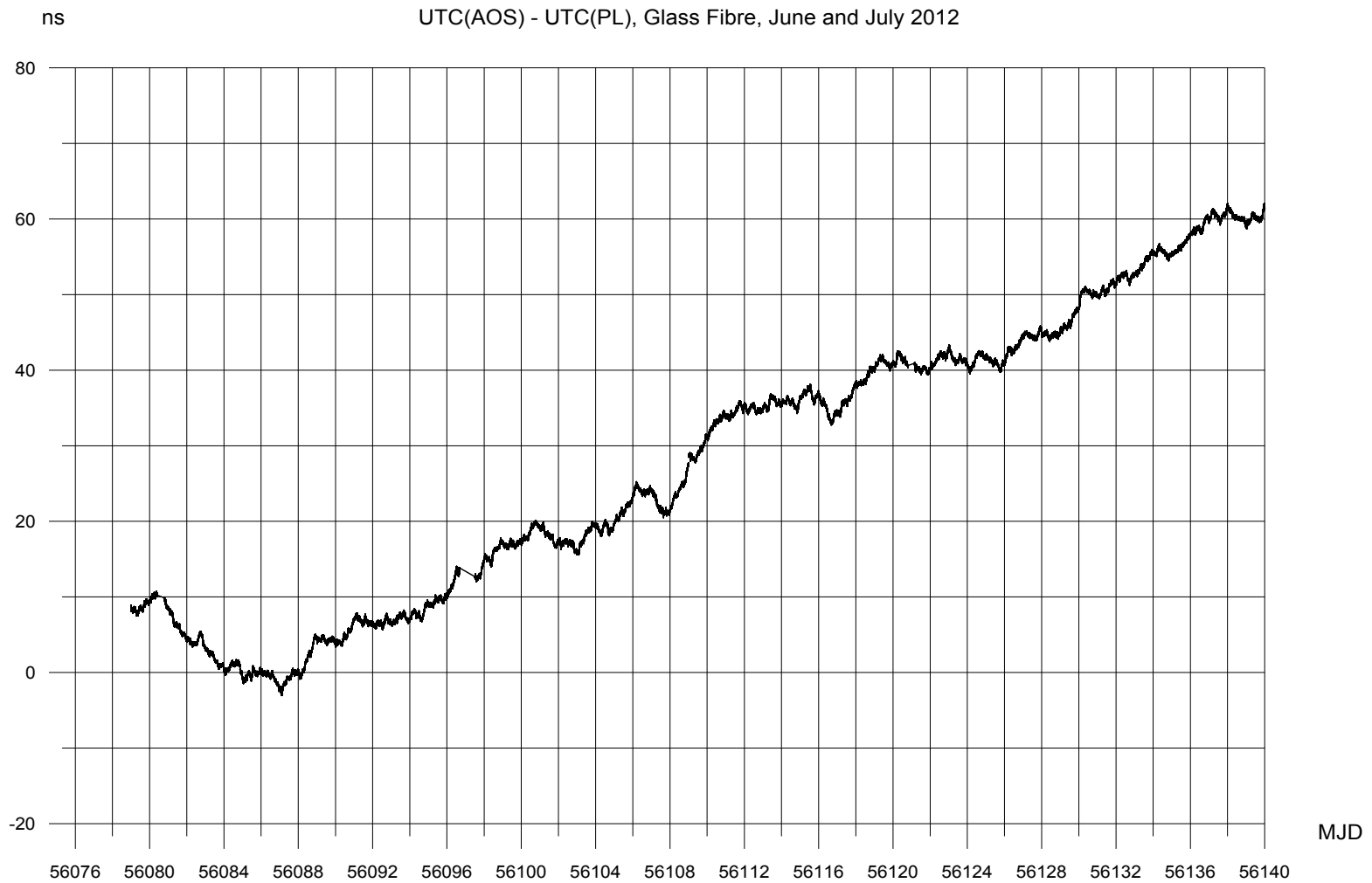


a).

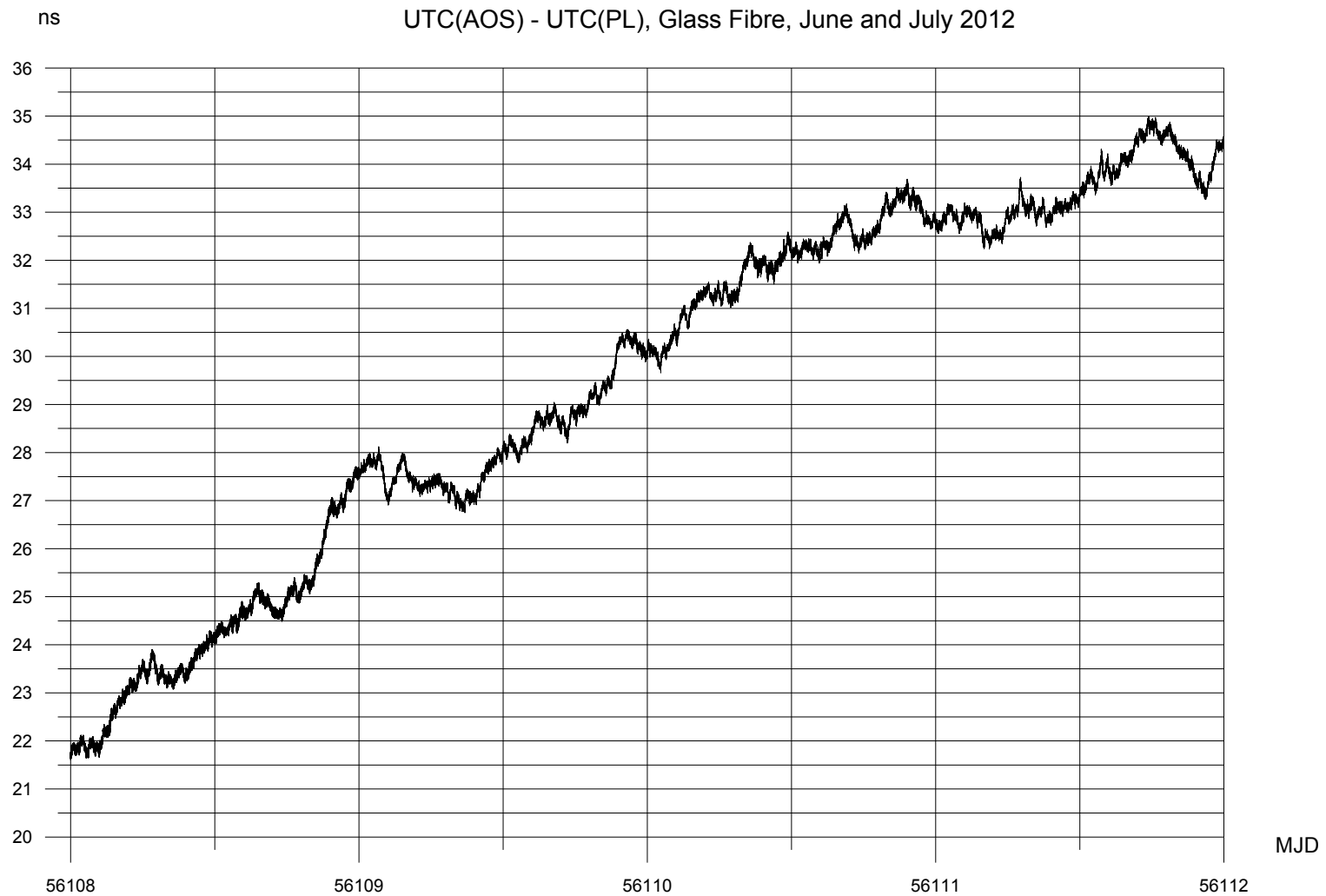


b).

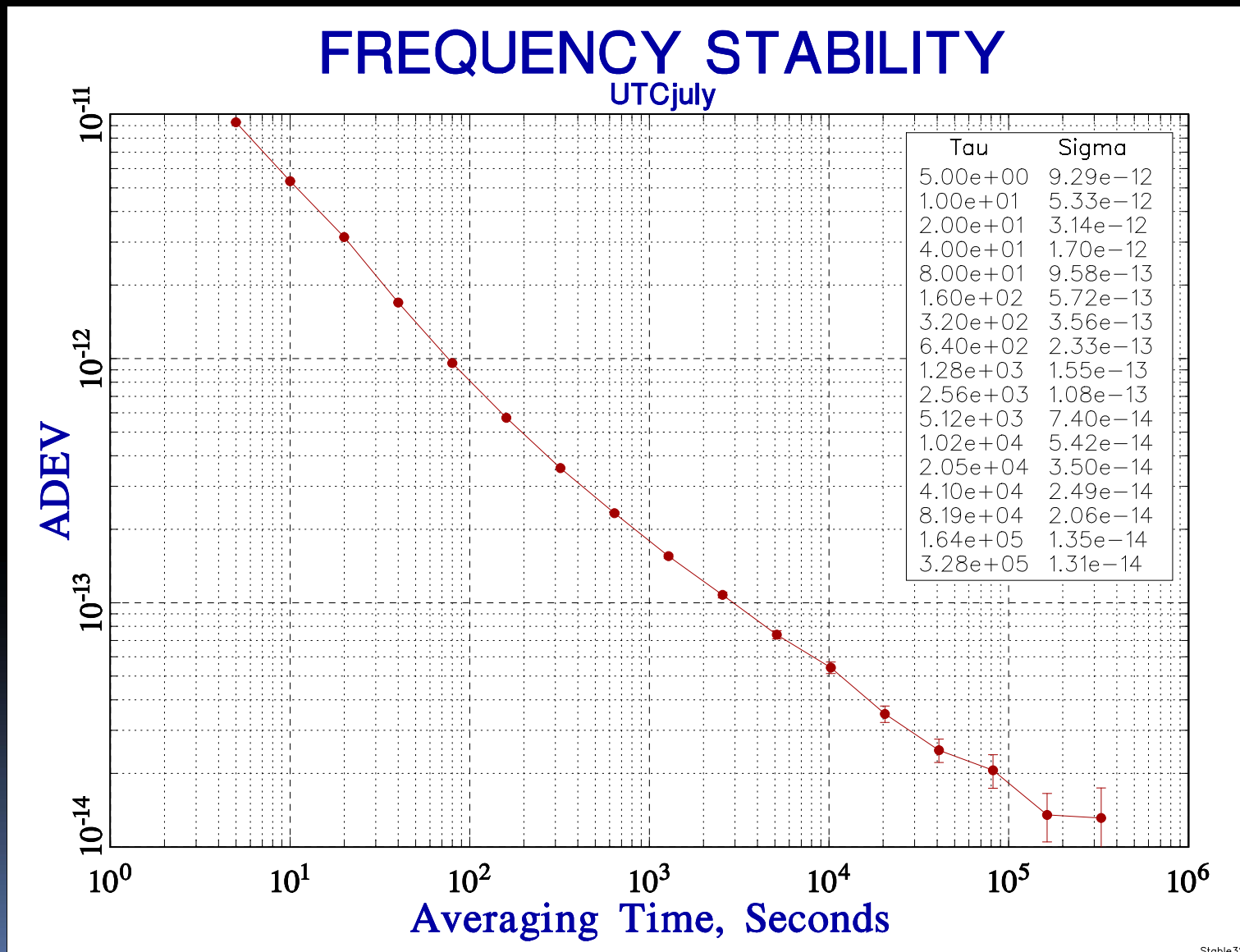
Glass Fibre link, AOS-GUM



Glass Fibre link, AOS-GUM

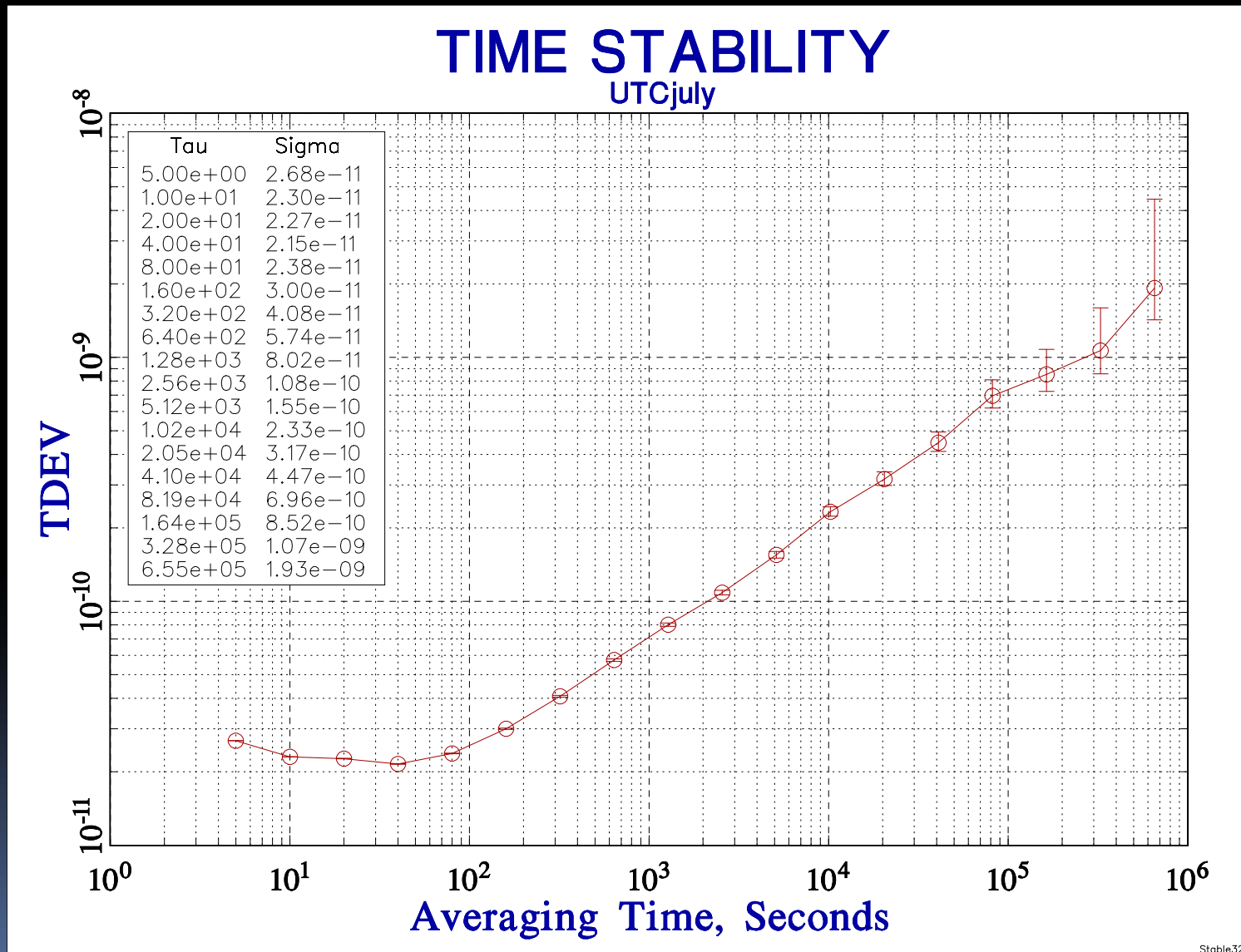


Glass Fibre link, AOS-GUM





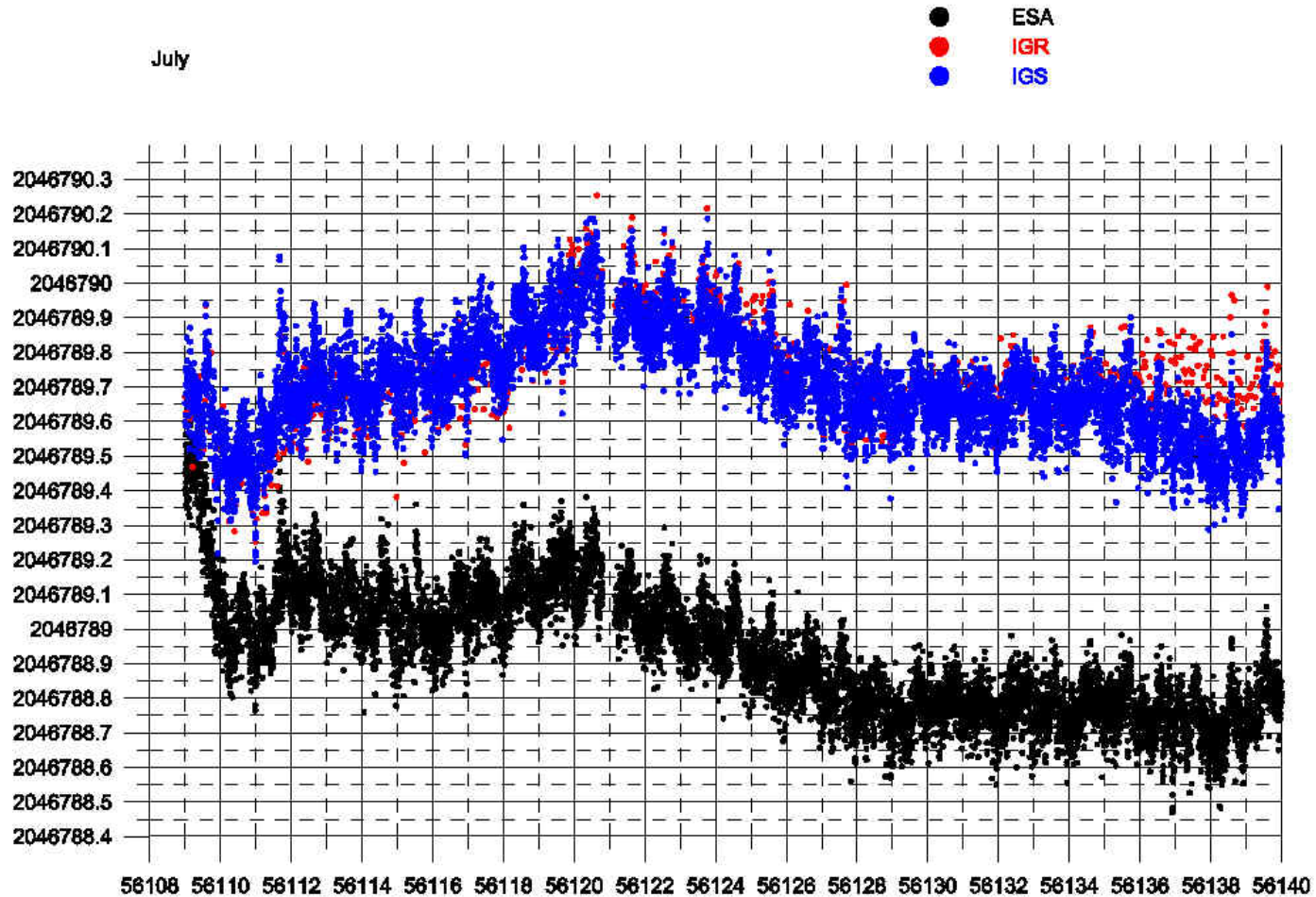
Glass Fibre link, AOS-GUM



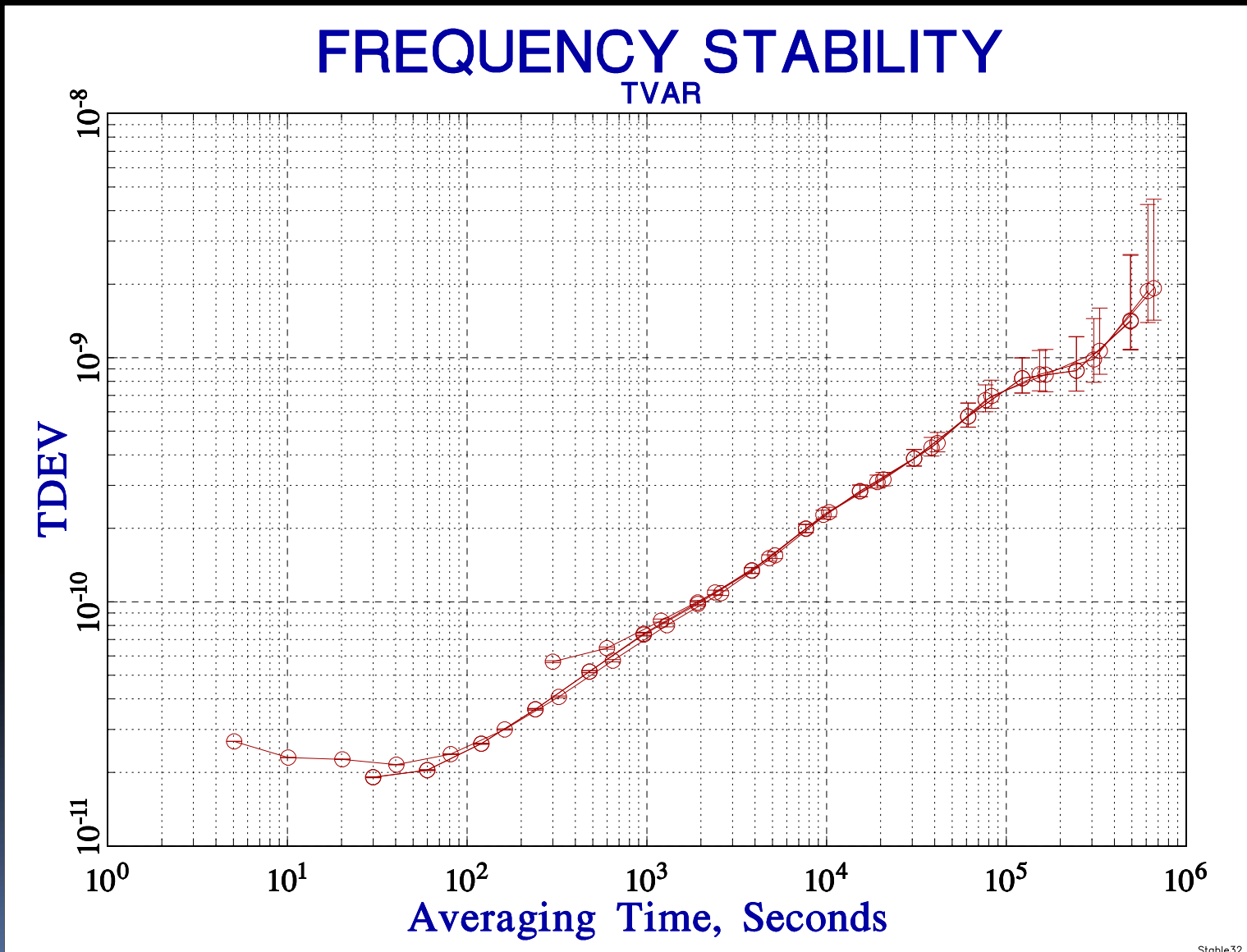
Glass Fibre link, AOS-GUM and PPP



Glass Fiber link - PPP difference for IGS, IGR and ESA orbits



Glass Fibre link, AOS-GUM and PPP



SPECIAL THANKS GO TO:

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Łukasz Buczek

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Kraków, Poland

who developed the idea and equipment for glass
fibre

THANK YOU