



CLIC-Pre-Alignment MINI WORKSHOP

Markus Schlösser, DESY

CERN, Geneva, 02-04.04.2009



corrosion of references

CORROSION

of references

of vessel

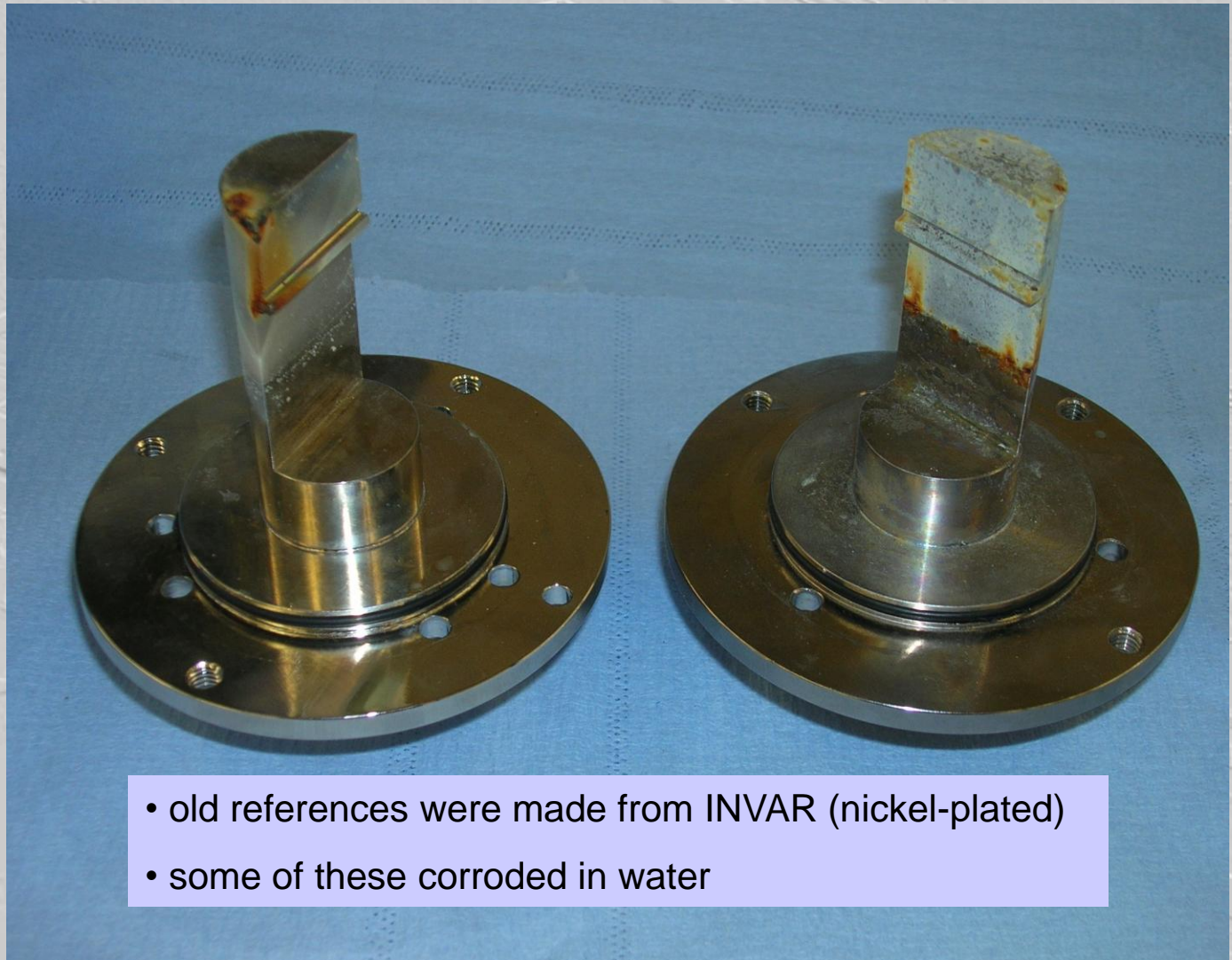
of transducers

DESY HLS

earthquakes

accuracy &
calibration

PETRA III HLS





new references

CORROSION

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PETRA III HLS



- new (PETRA III) references are made from silica glass ($\alpha = 0.5 \cdot 10^{-6}$)
- corrosion free, but delicate
- needs special attention during installation
- costs approximately 120% (compared to invar)





corrosion of measurement pots

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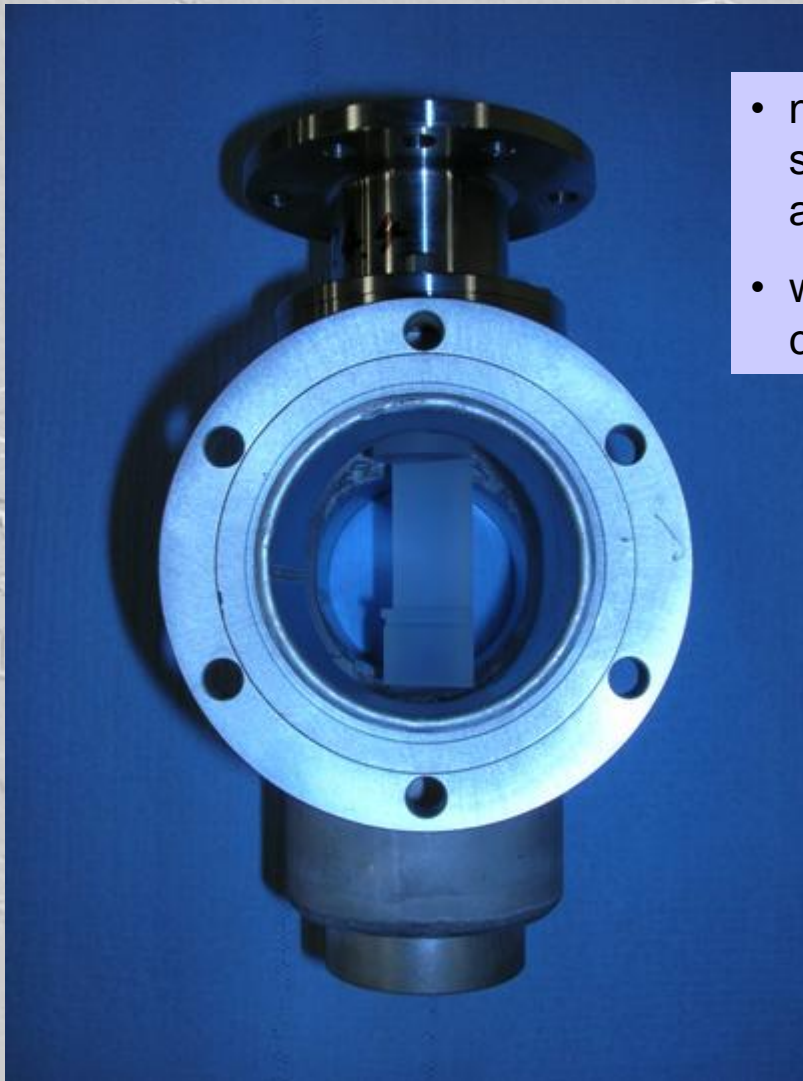
of transducers

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- new measurement pot is made from stainless steel and got special attention to prevent crevice corrosion
- weld seams were abraded and acid cleaned





corrosion of transducers

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- no corrosion during lifetime of old transducers (~5 years)



- new transducers with heavy corrosion (within 5 weeks)





corrosion of transducers

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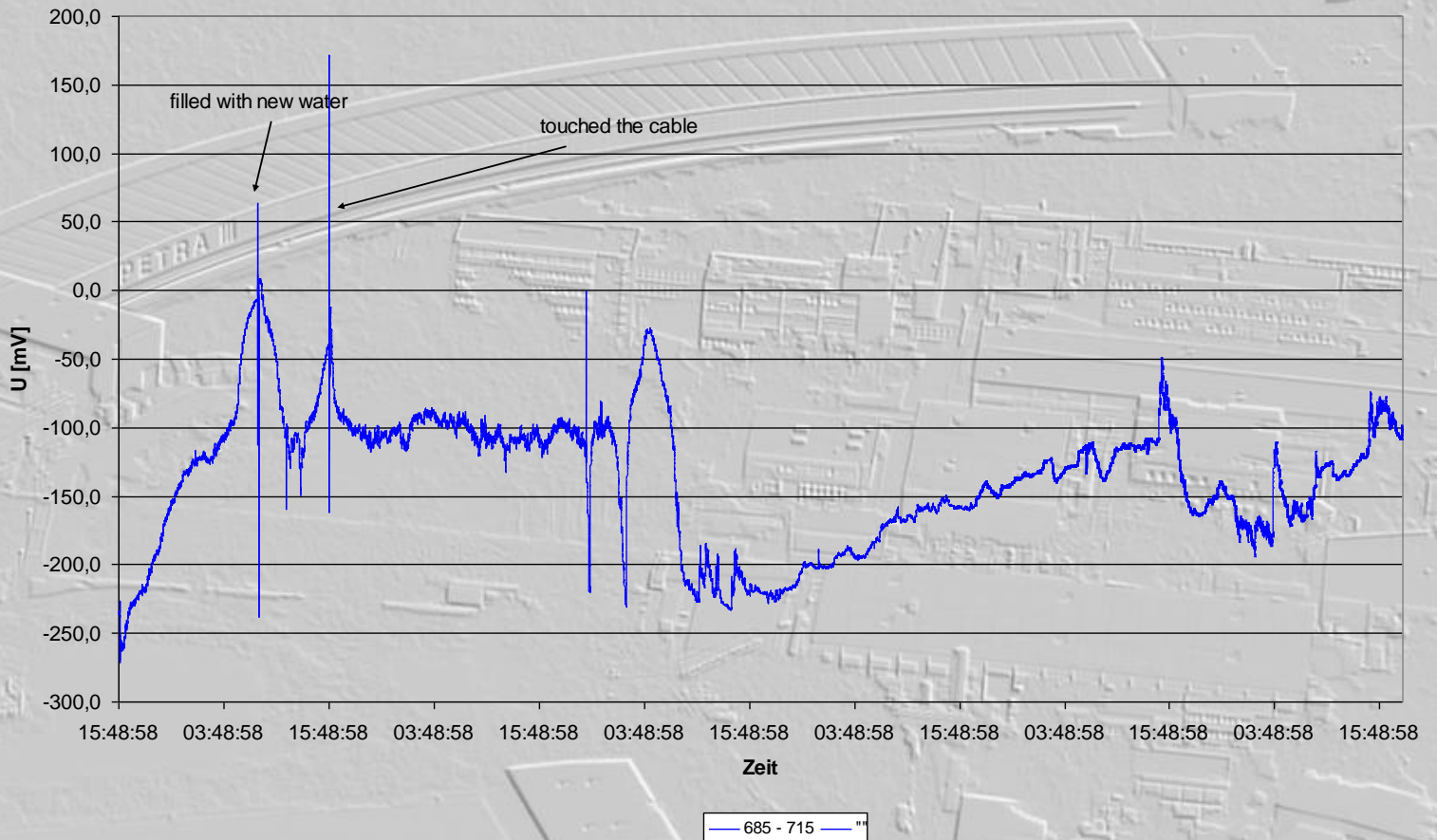
transducers after ~4 weeks in a system





corrosion of transducers

voltage between two different transducers over 6 days



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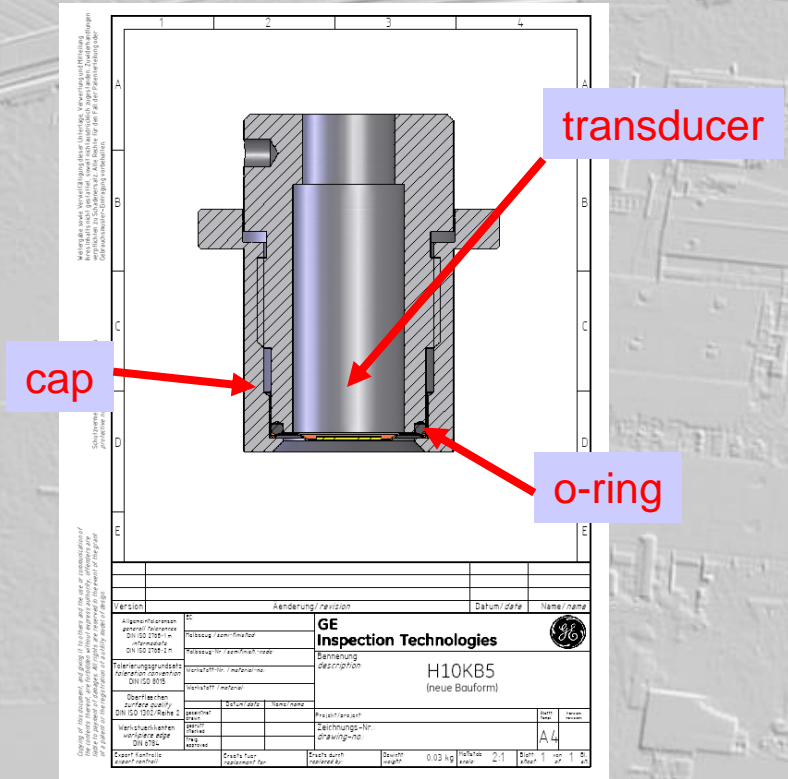
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new transducer

- GE Sensing & Inspection Technologies (Krautkrämer) changed the solder to a non-lead one
- transducers were produced with different solders
- solder is now covered using a cap with o-ring, cap is screwed



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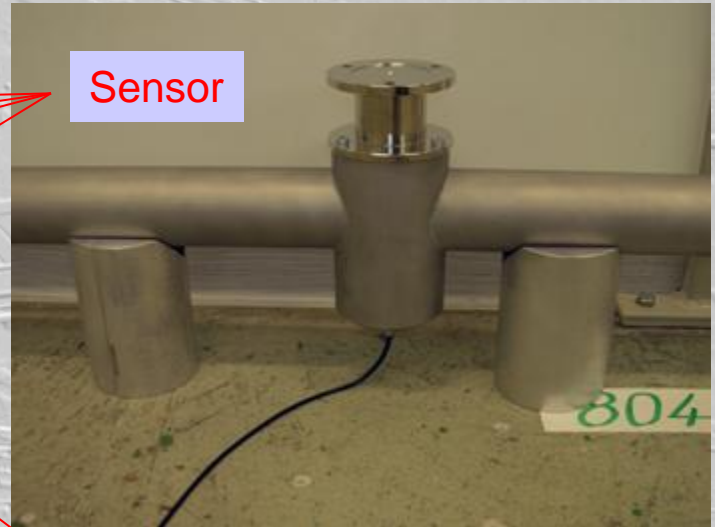
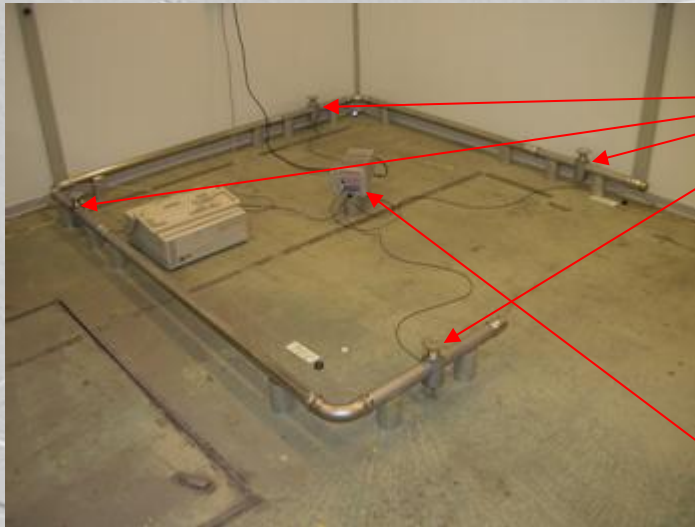


test of DESY HLS electronics

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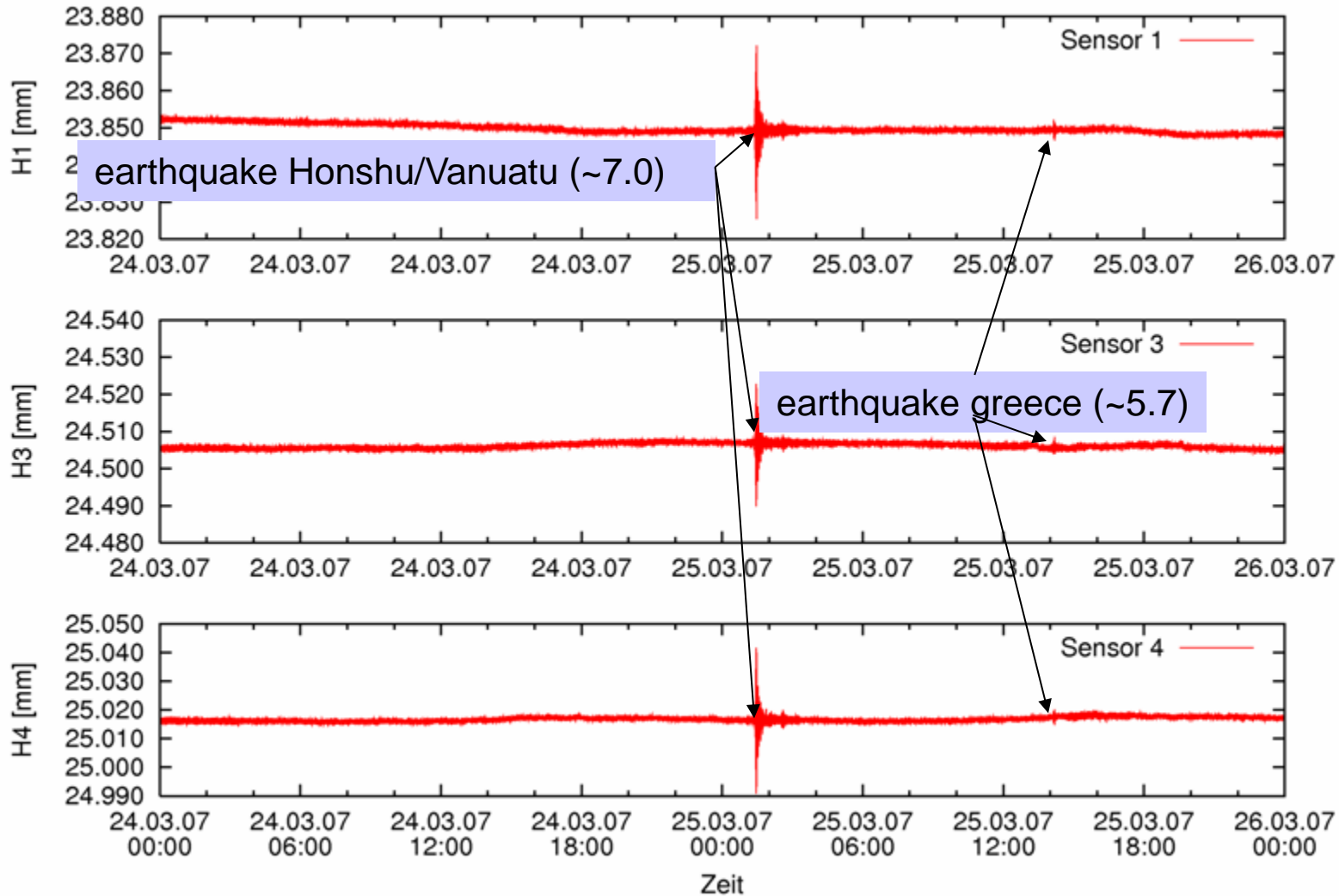


earthquakes (03/25/2007)

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earthquakes 03/25/2007

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earthquake Honshu,
03/25/2007, 00:41:57 UTC (09:42 LT),
magnitude 6.7

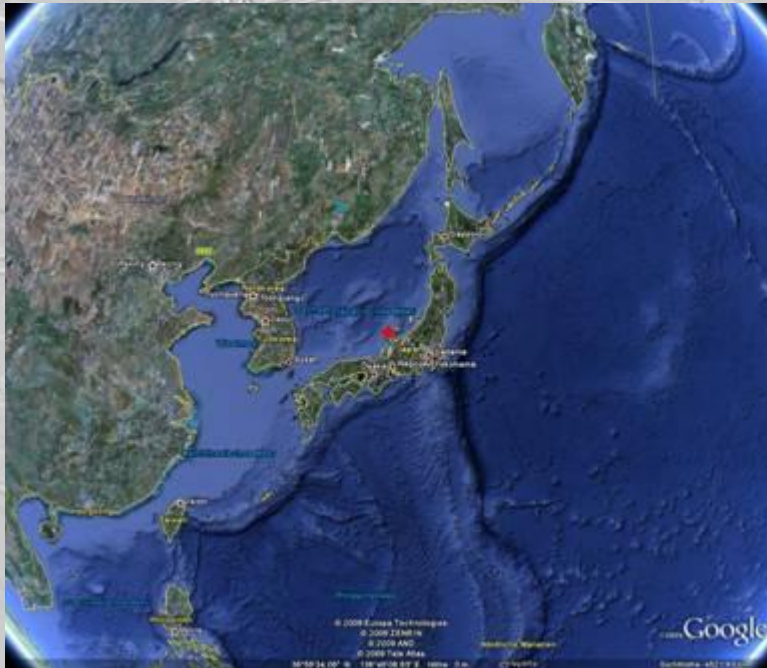
earthquake Vanuatu,
03/25/2007, 00:40:02 UTC (11:40 LT),
magnitude 7.1

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seismometer data „bseg“ (Bad Segeberg, approx. 50km from Hamburg)

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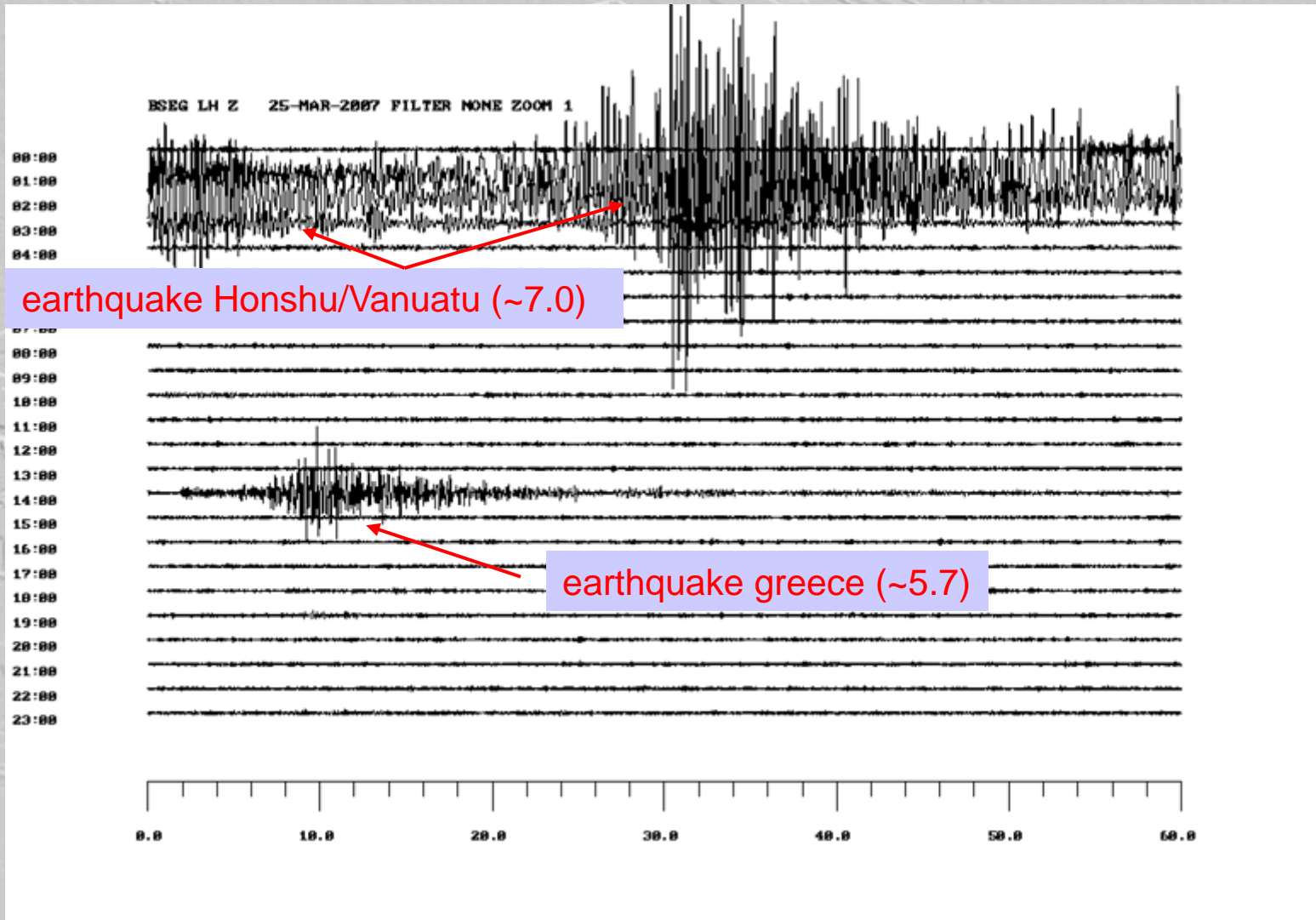
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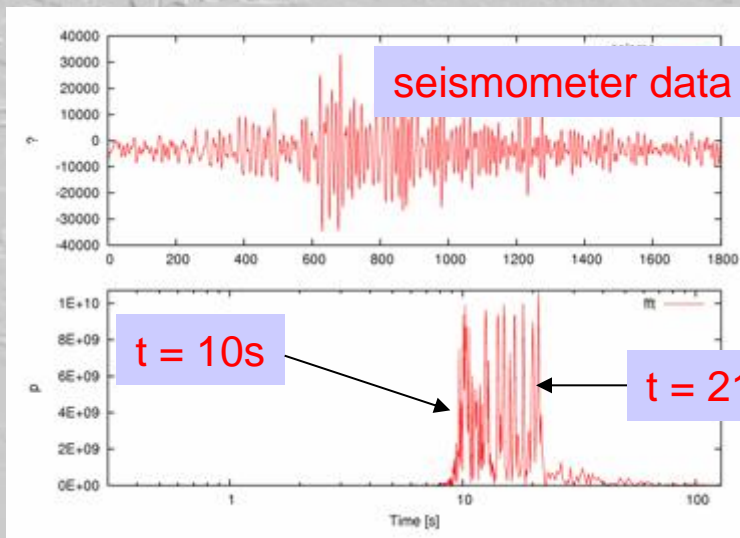
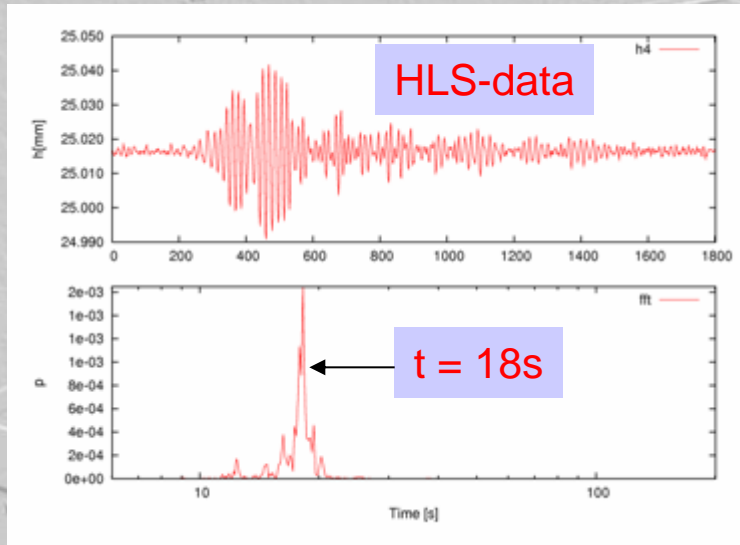


fourier transform of HLS and seismo

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HLS data seems to be narrow band, while seismometer data seems to be more broad band

mechanical setup of HLS test is a filter with an eigenfrequency of $t = 18s$



calibration of crystals

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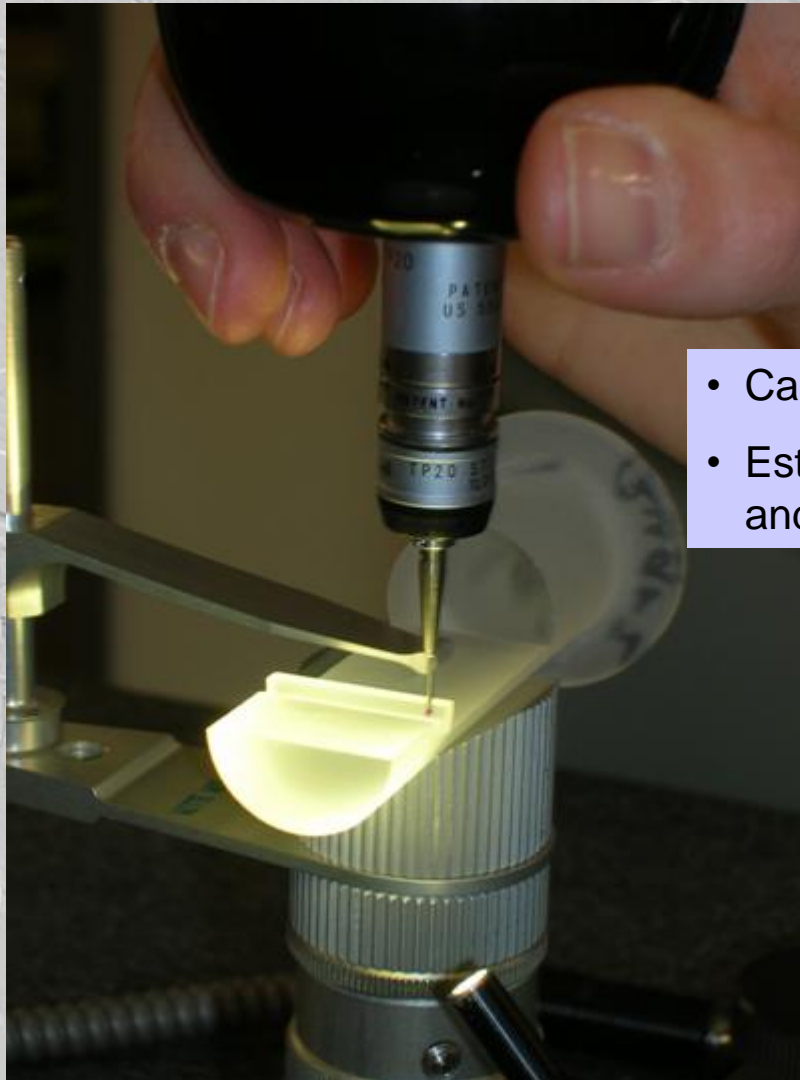
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- Calibration of crystals on a CMM
- Estimated accuracy for distances D_1 and D_2 is $\sigma_D = 0.2\mu\text{m}$





accuracy of HLS

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σ_{US} : accuracy of ultrasonic measurement

σ_D : accuracy of calibration measurement

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$$\sigma_{\Delta H}^2 = 2\sigma_M^2$$

$$\sigma_M^2 = 5\sigma_D^2 + 6\sigma_{US}^2$$

$$\sigma_{\Delta H} = 1.2\mu\text{m}$$

$$\sigma_M = 0.86\mu\text{m}$$

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$$\sigma_{US} = 0.3\mu\text{m}$$

$$\sigma_D = 0.2\mu\text{m}$$





DTLU with HLS

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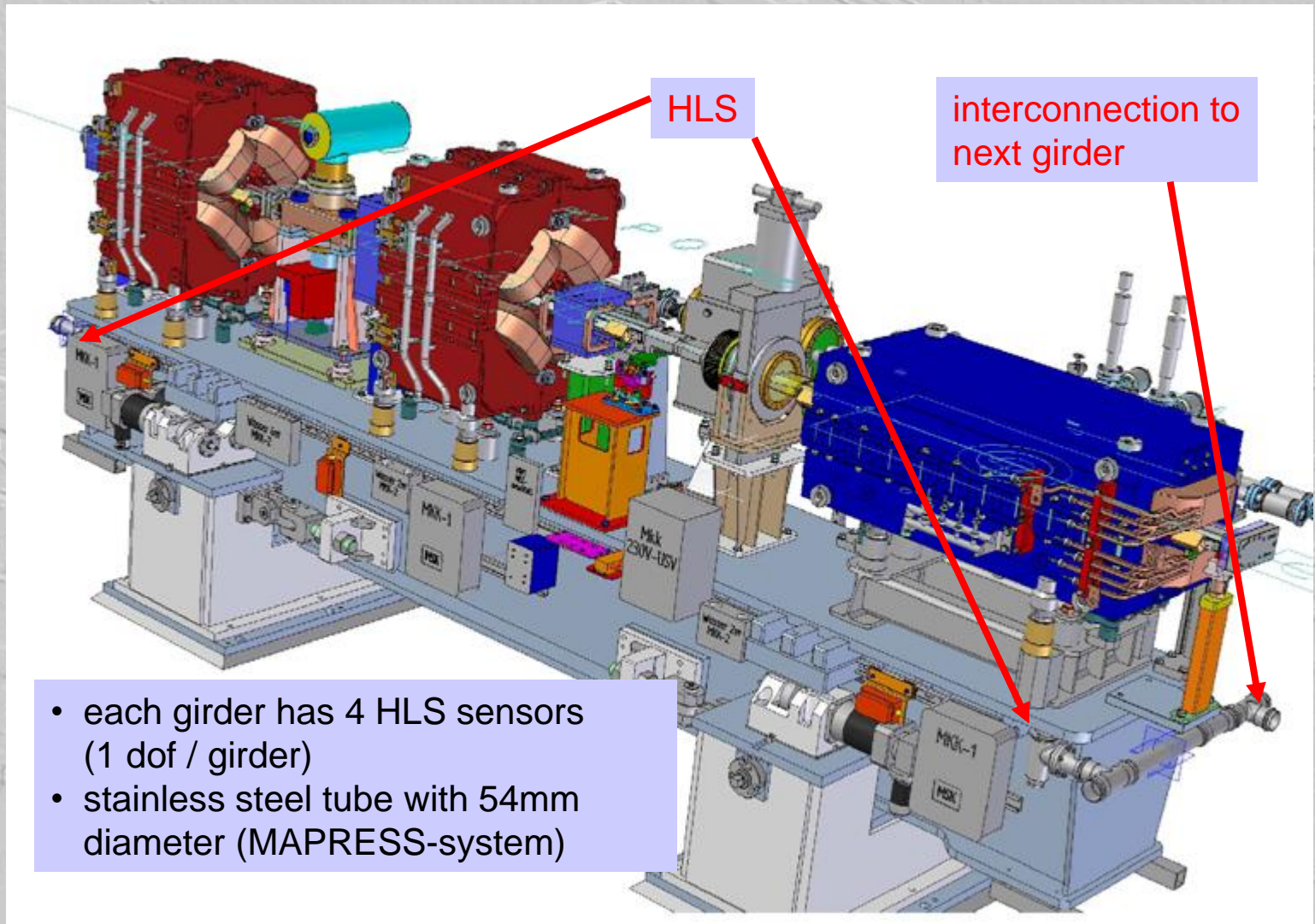
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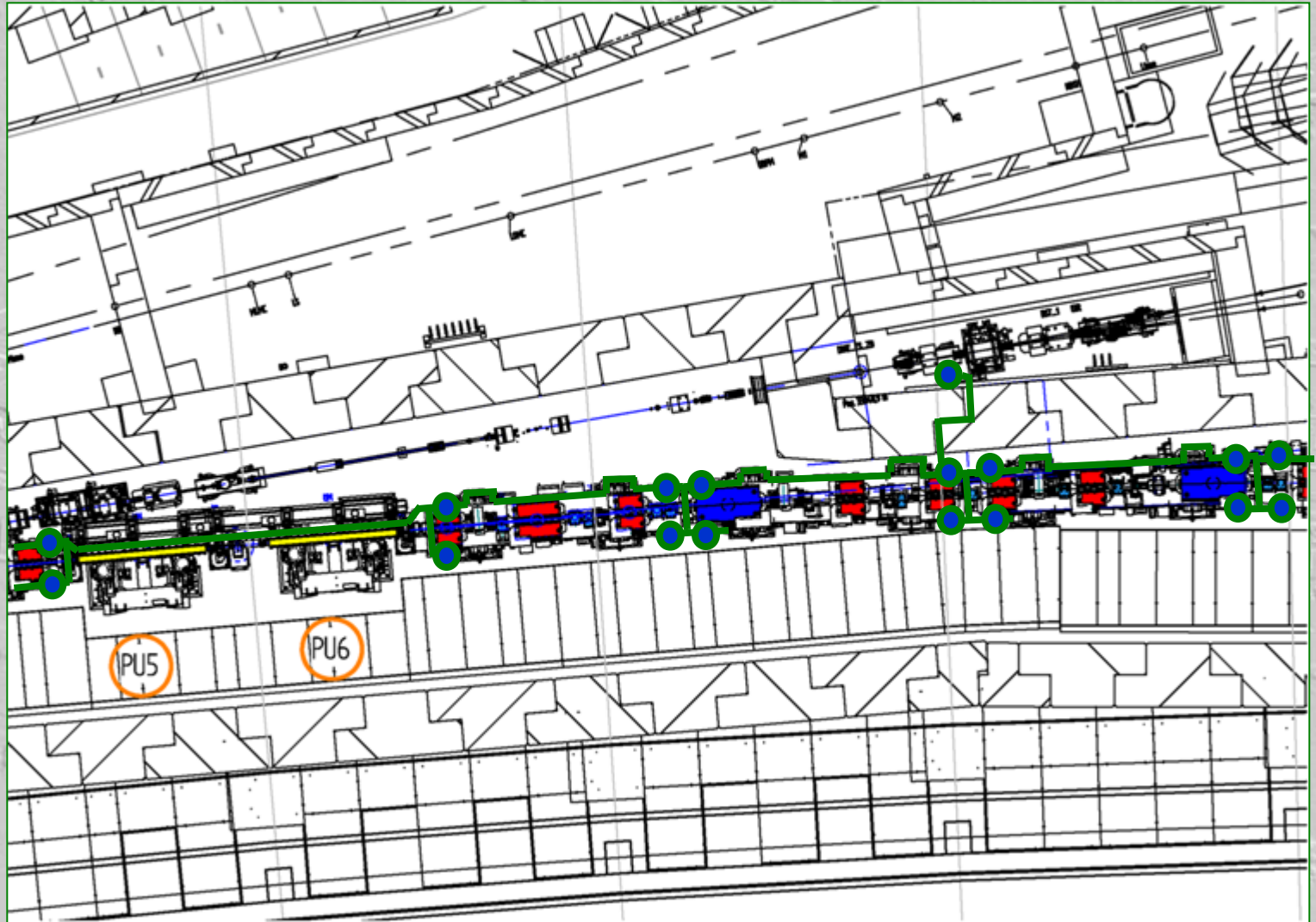


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PETRA III HLS in numbers

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- length of new tunnel section ~ 300m
- 34 girders with 4 sensors -> 136 sensors
- experimental areas: 14 sensors
- connection to old tunnel: 10 sensors

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- 160 sensors in total
- 58 CAN-open nodes, divided in two CAN-bus sections (PC in the middle)
- planned measurement rate 1/60 Hz (1/20 Hz is possible)

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