Precise DYNAMIC magnet girder position monitoring at the Swiss Light Source (SLS)

Presented at the FIG Working Week 2017,
May 29 - June 2, 2017 in Helsinki, Finland

Edi Meier

Edi Meier + Partner AG

Winterthur, Switzerland

www.emp-winterthur.ch

edi.meier@emp-winterthur.ch

Michael Boege

SLS Machine Development

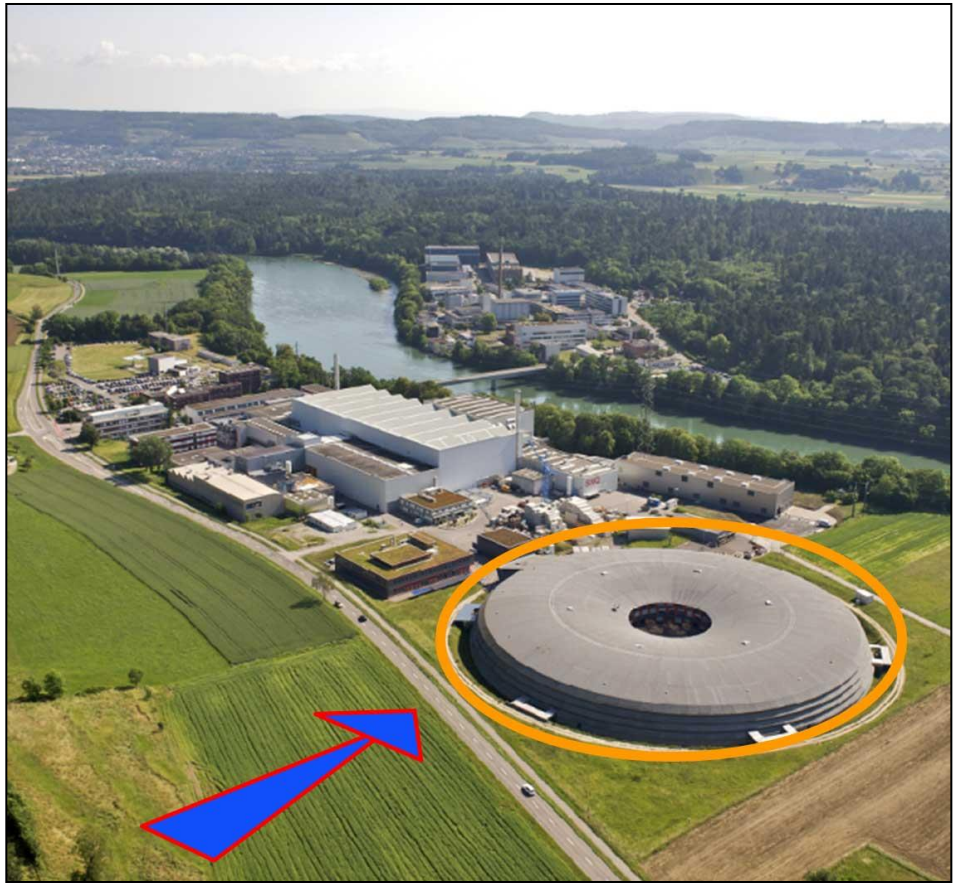
Paul Scherrer Institute (PSI)

Villigen, Switzerland

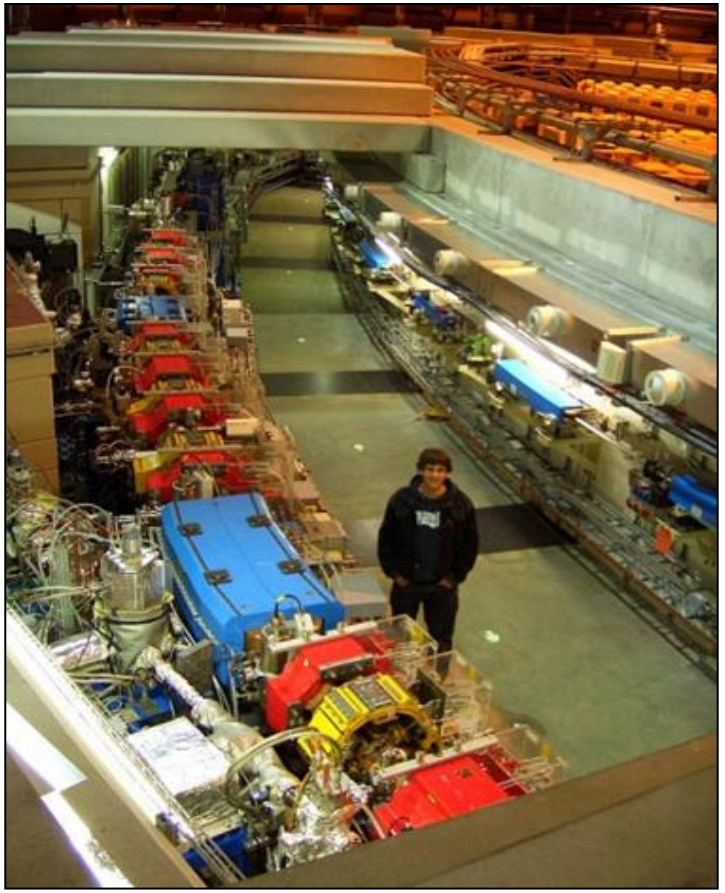
michael.boege@PSI.ch

SLS: Swiss Light Source Accelerator

Paul Scherrer Institute, Switzerland



Synchrotron electron beam: 300m perimeter



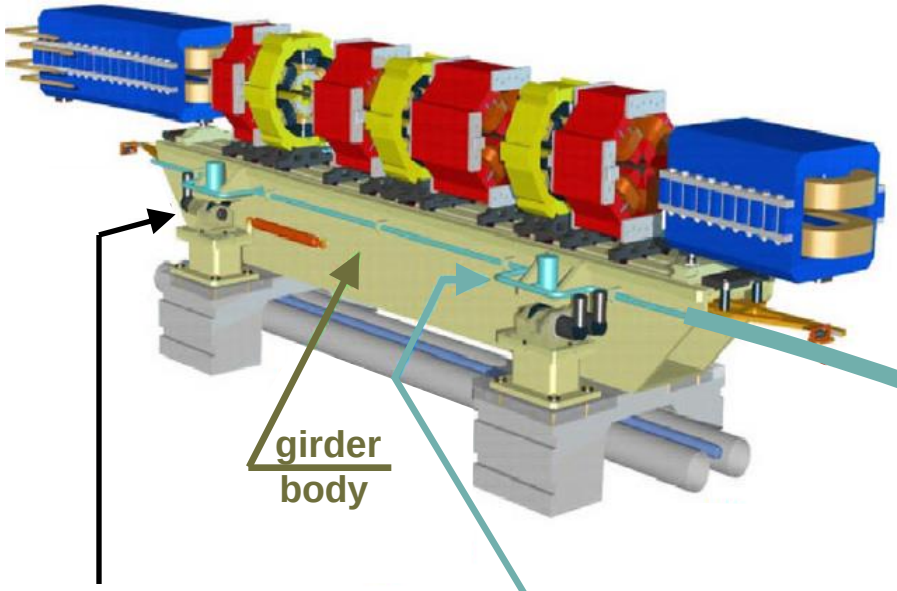
Magnets inside the Synchrotron

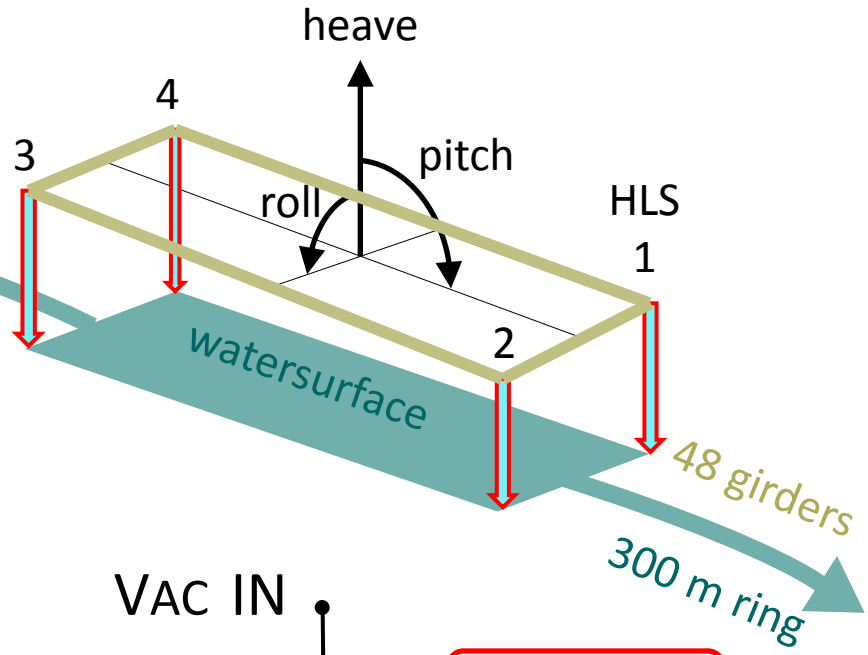
The electron-beam must be guided within a few micrometers.

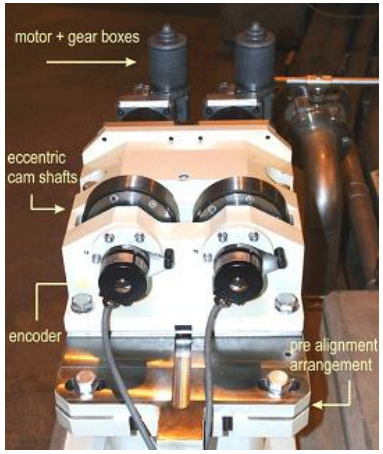
How many sensors are used ?

- HLS Hydrostatic Levelling System at SLS (PSI)
  - 192 HLS Sensors
  - Monitoring since more than 15 years
  - Sampling every 2 seconds
- New HLS Software
  - Upgrade Windows XP to Windows 7
  - Labview, National Instruments

How it was done in the year 2000

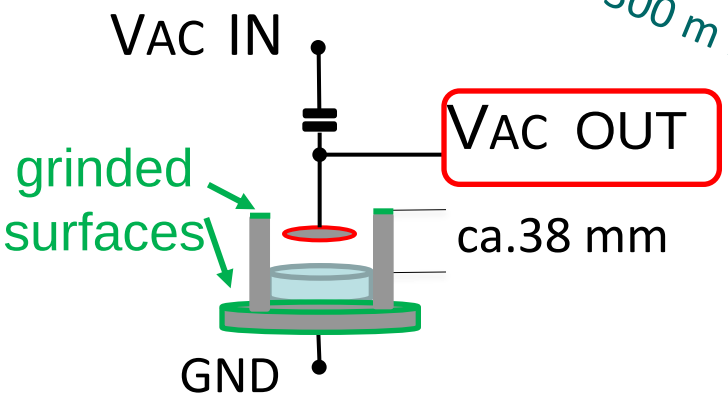






Excenter Motor

HLS Sensor



New Software: Overview Screen “HEAVE”

Heave [mm] since 2005

N

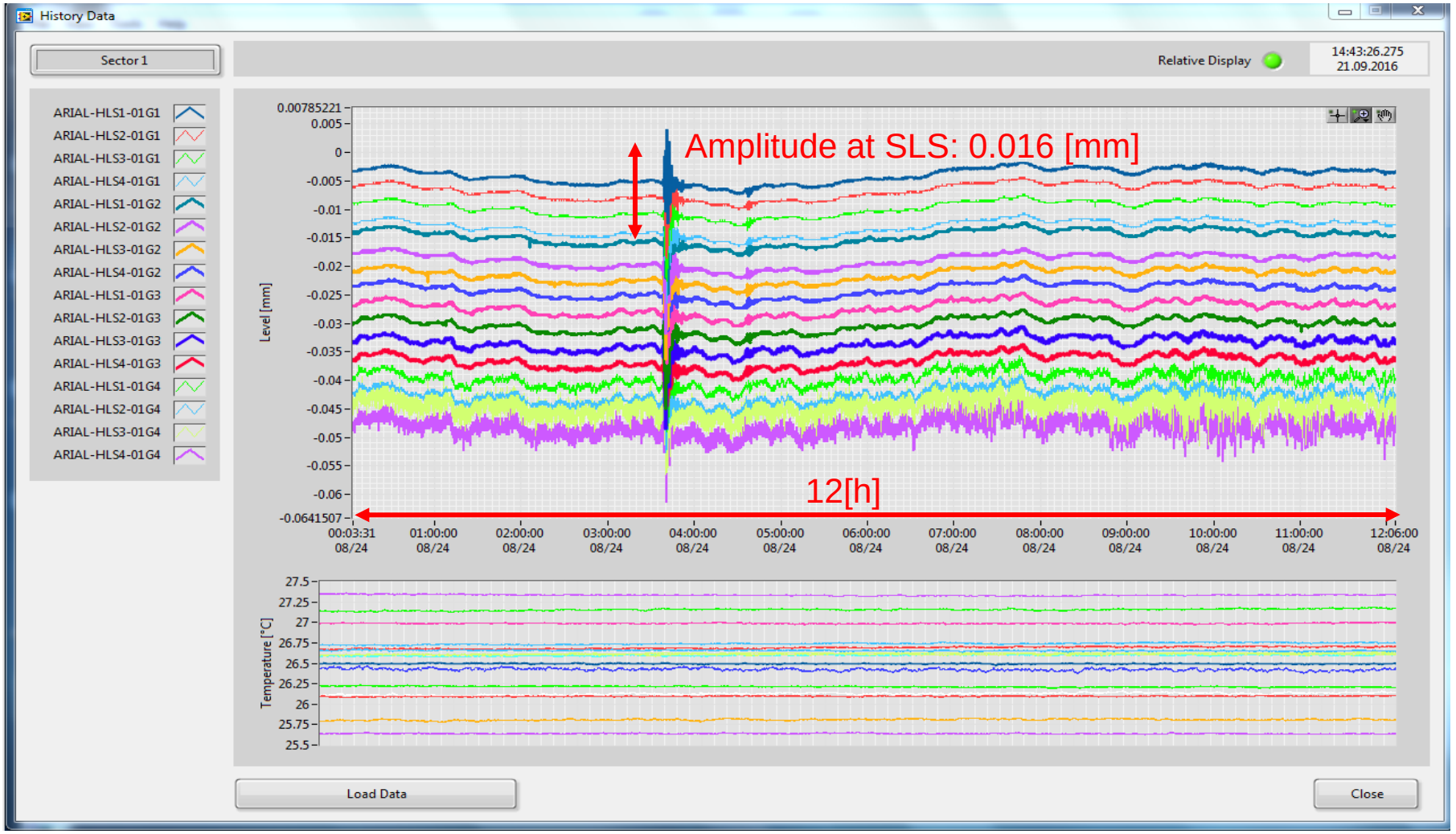
W

E

S

Dynamics Data Example Sector 1

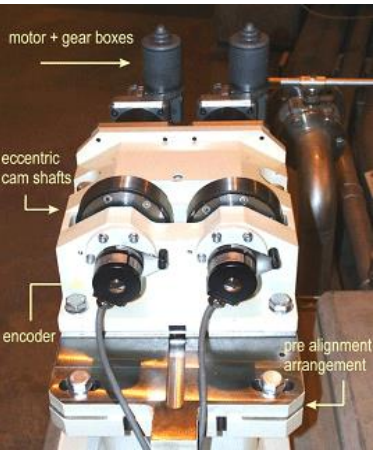
Earthquake Central Italy, 24.8.16, M 6.2

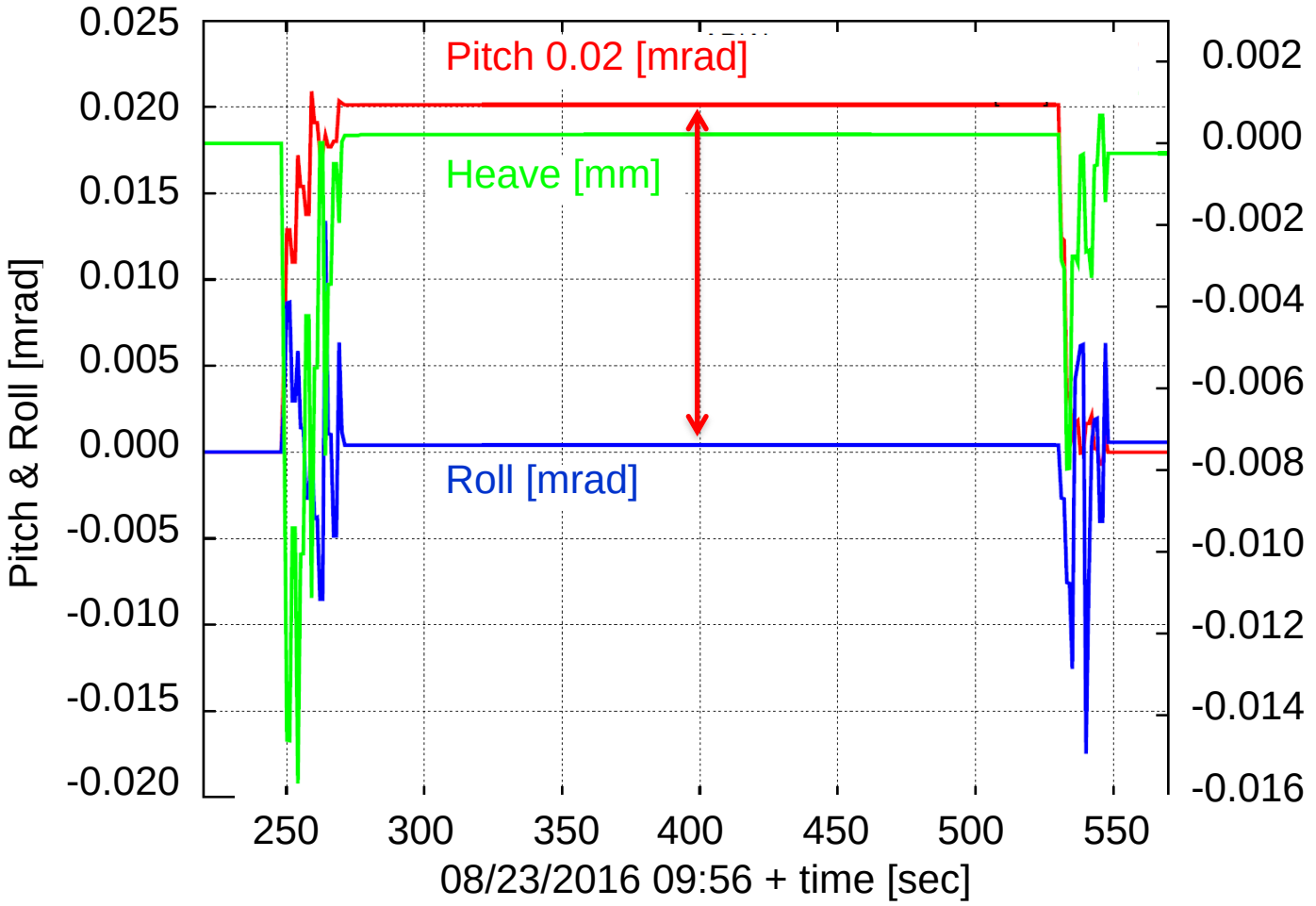


Manual Pitch of a Girder: 0.02 mrad

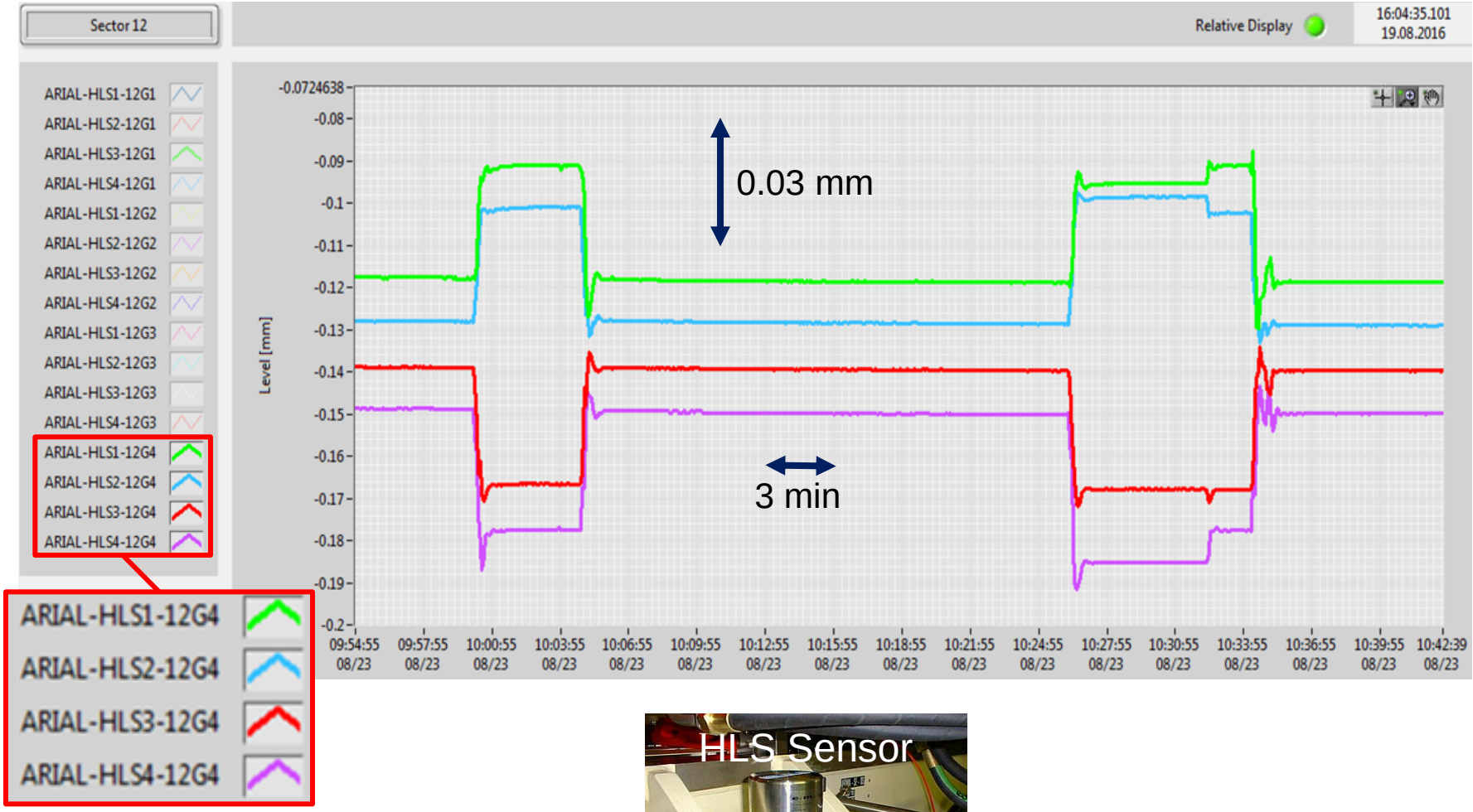
Pitch, Heave and Roll calculated from motor encoders

Girder pitched using excenter motors

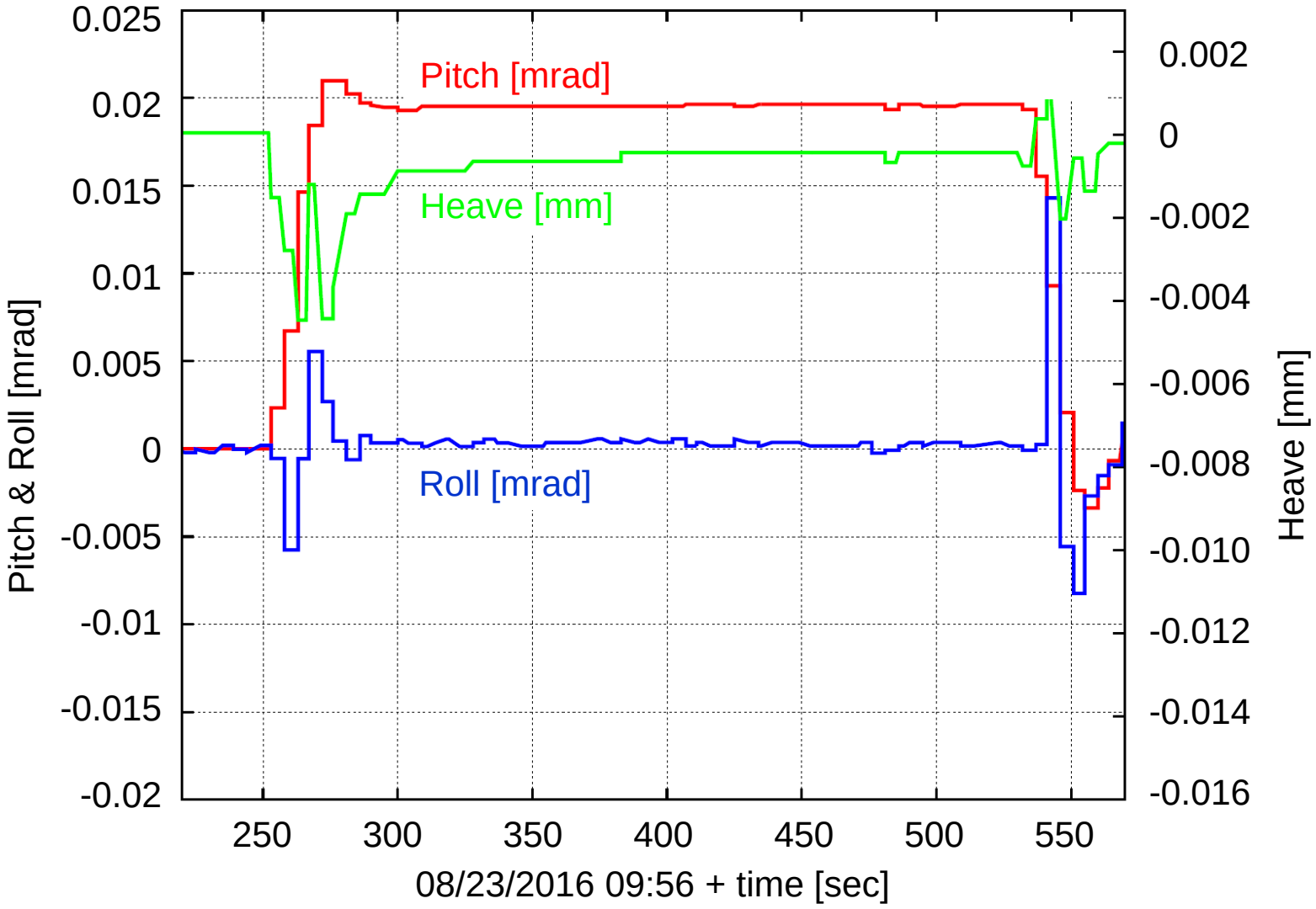




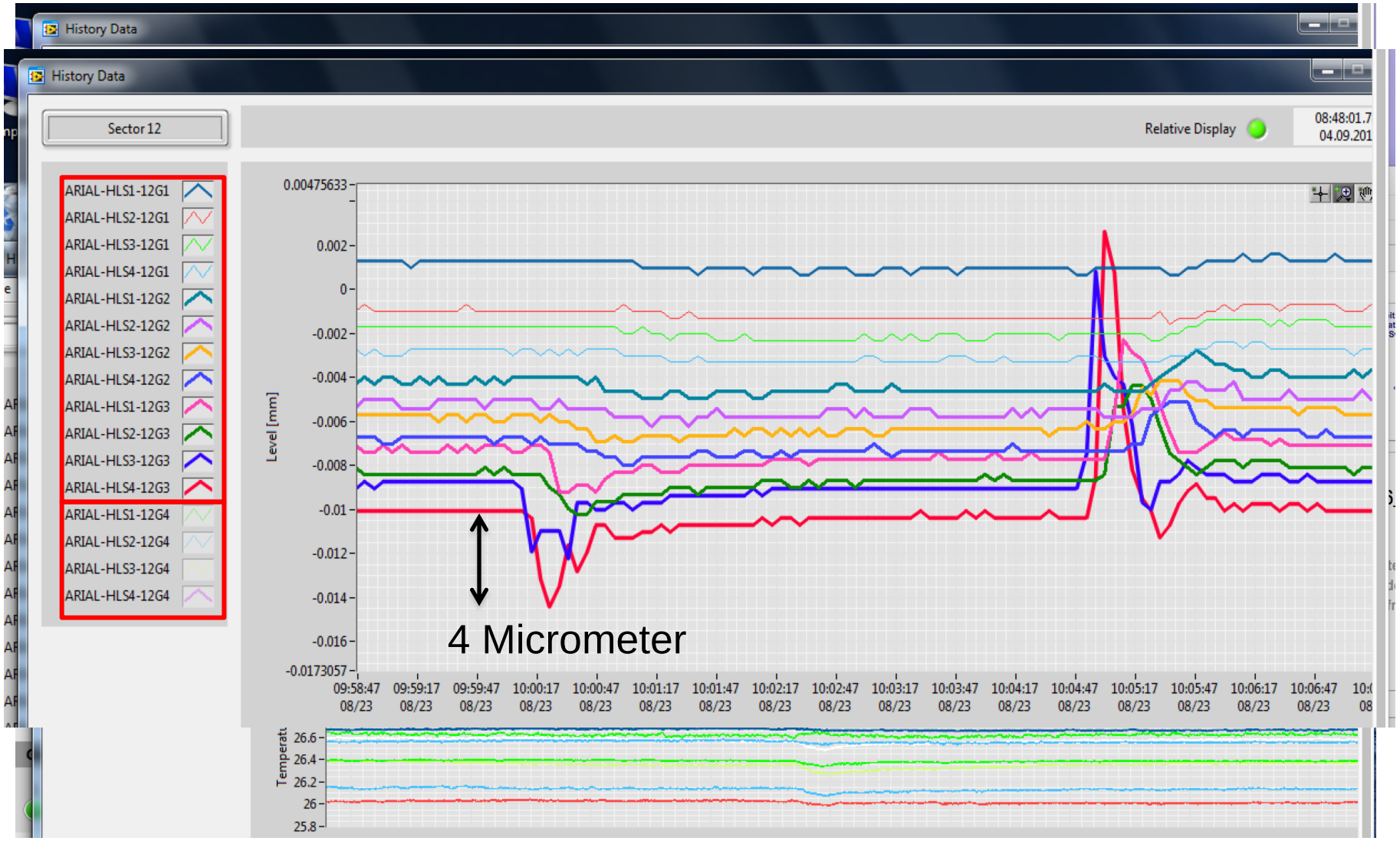
HLS signals induced by Girder-Pitch



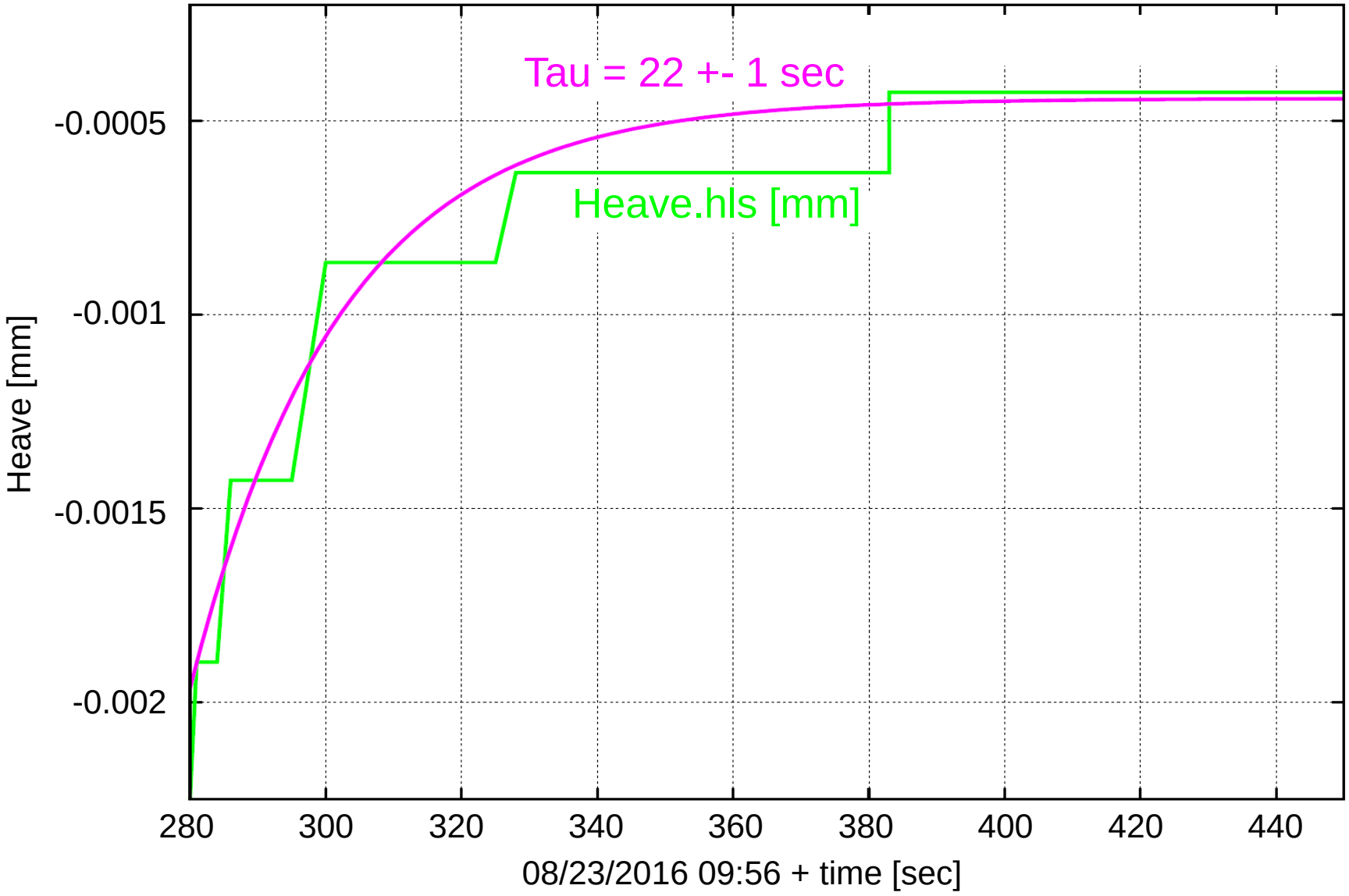
Calculated from HLS readings



Neighbor signals explain the heave error



Time constant – higher Resolution required



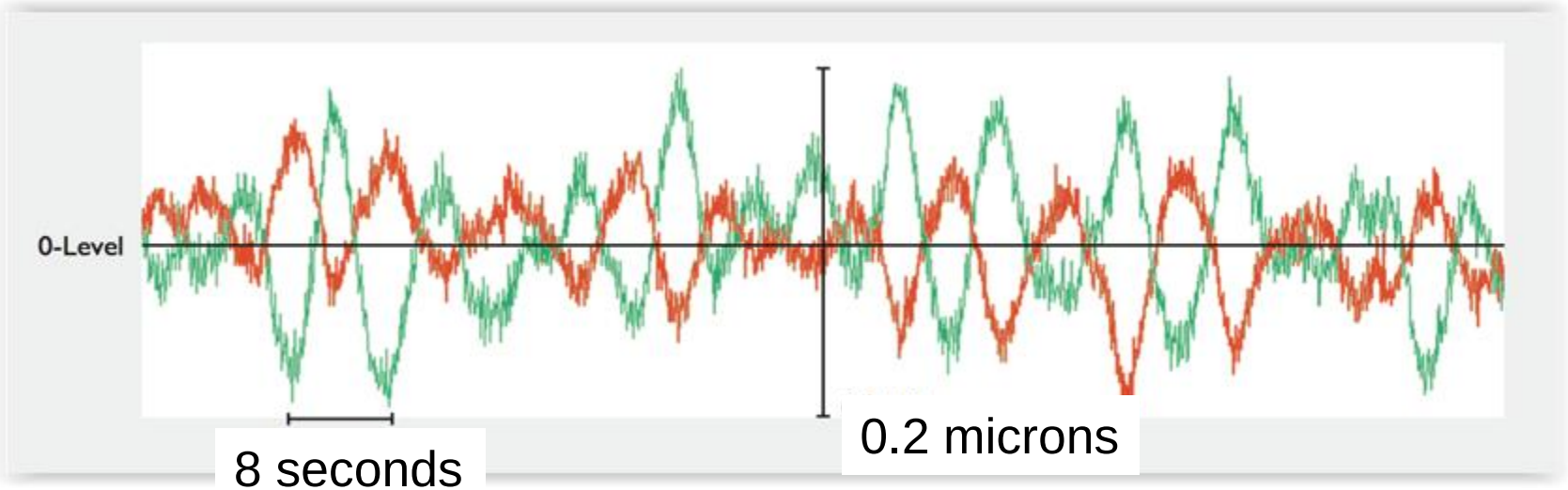
Is higher resolution feasible ?

HLS at Mont Terri Rock-Laboratory for nuclear waste research:

:

- 2 HLS Sensors
- 50m Tube
- 24 bit Dataacquisition
- 20 Samples per second

Ground motion induced by Atlantic waves – 800 km far away !



Summary and Outlook

- For monitoring dynamic motion we are happy to have 192 high resolution sensors.

- The new online software allows us to see systematic effects.
- Liquid transport in the tubes can be predicted.

➢ For the next generation Synchrotron «SLS2» (planned 2020) the «old» HLS Sensors will be integrated in the control-system.

Thank you for listening and good-bye!