



Status Report on Survey and Alignment Efforts at DESY

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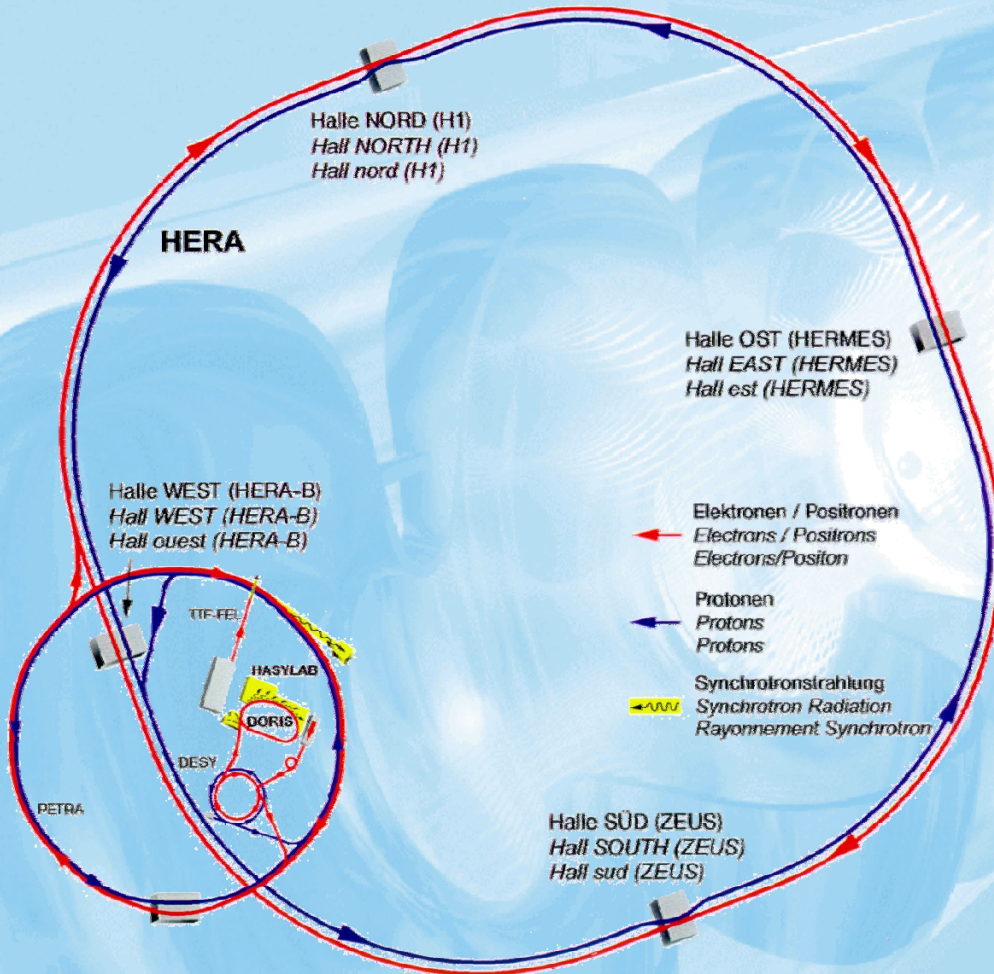
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Accelerator structure at DESY



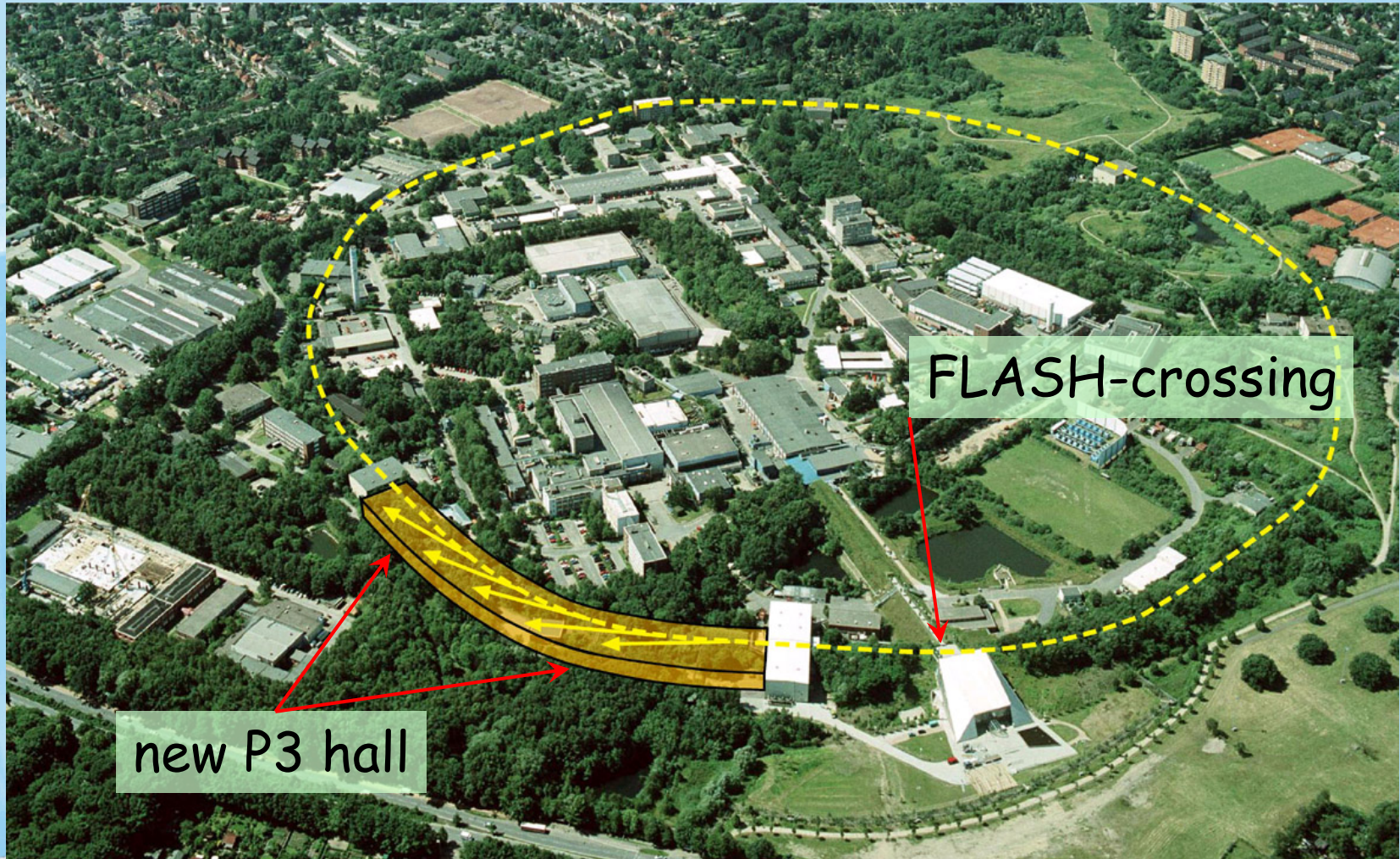
HERA has its final shutdown in June 2007

PETRA is not used as a pre-accelerator any more

PETRA will be converted into a Synchrotron Light Source (PETRA III)



Picture of P3

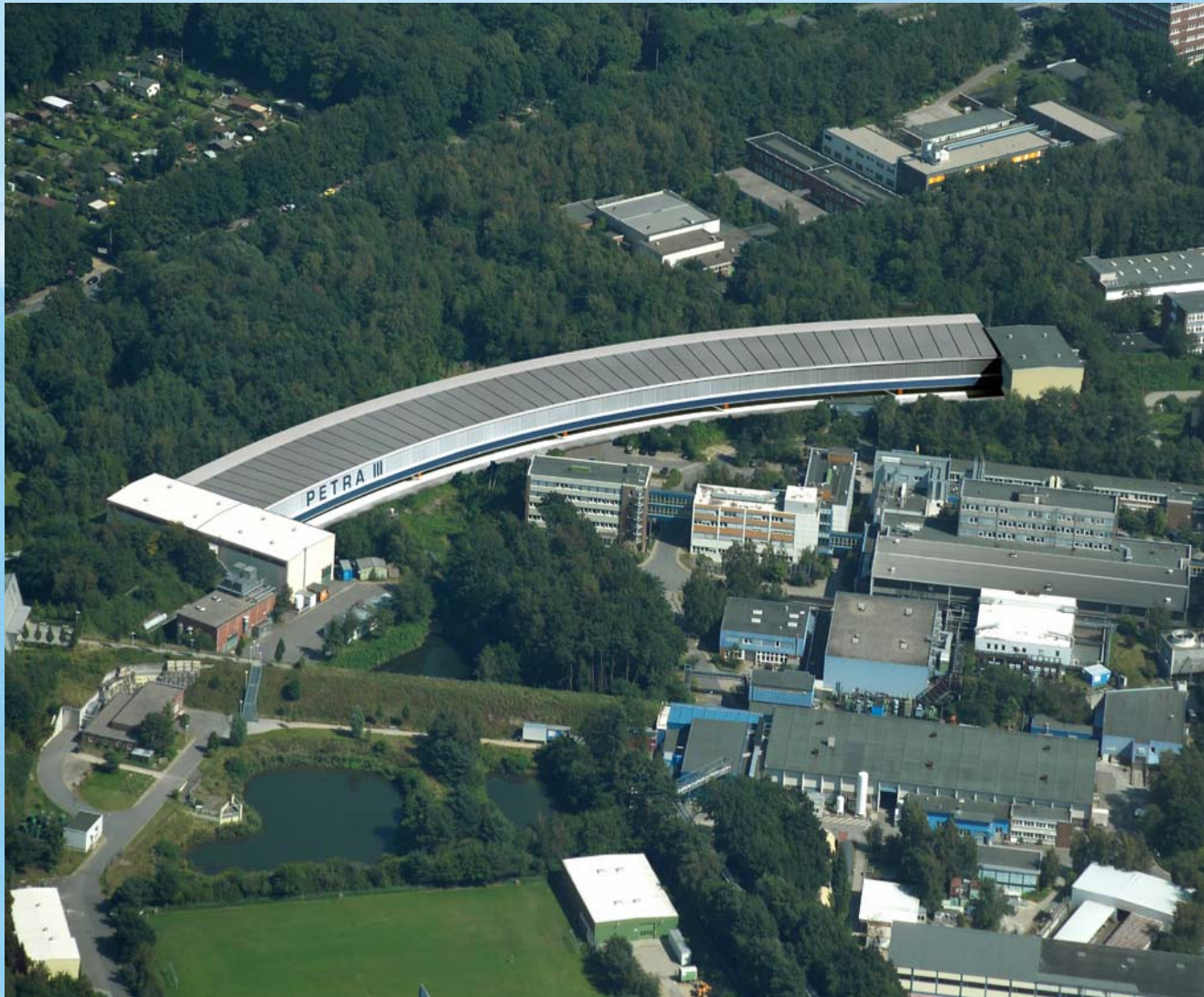


new P3 hall

FLASH-crossing



PETRA III hall (fotomontage)



reference network



- PETRA has no reference network
- machine bears the reference information
- install new reference points in the tunnel
- transfer information to reference points
- transfer „external“ coordinates into tunnel
- remove machine completely during rebuilt
- new reference points ready

history

present

future



GPS-network



pillar on PETRA wall



„plumbing” instrument
inside tunnel



tunnel network

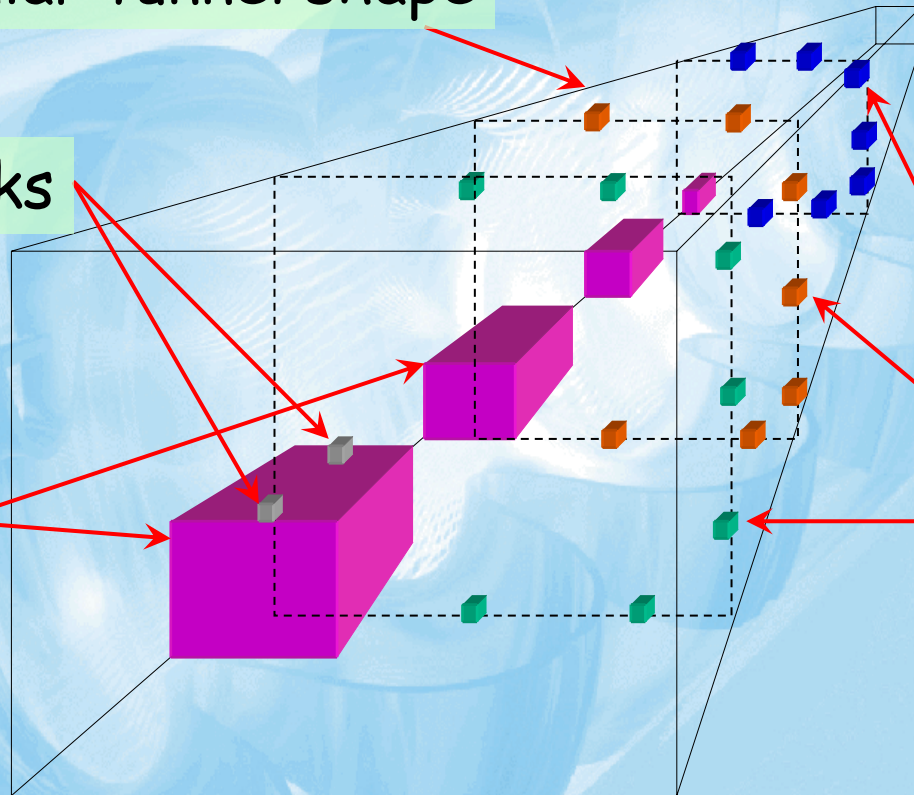


rectangular tunnel shape

target marks

magnets

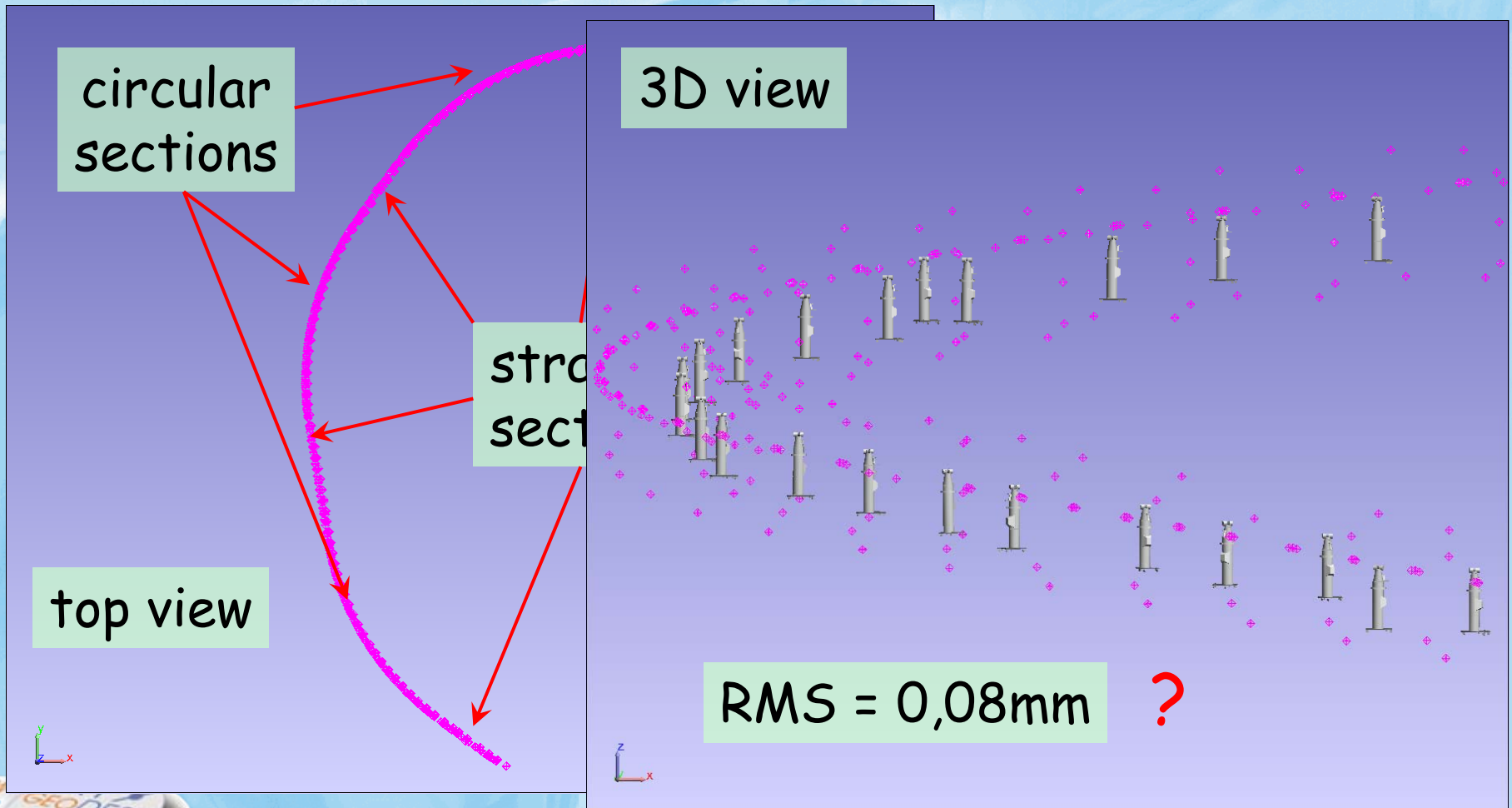
reference points



tunnel network (adjusted)



3/8 of the ring measured during shutdown 2005



Soil of the new Hall



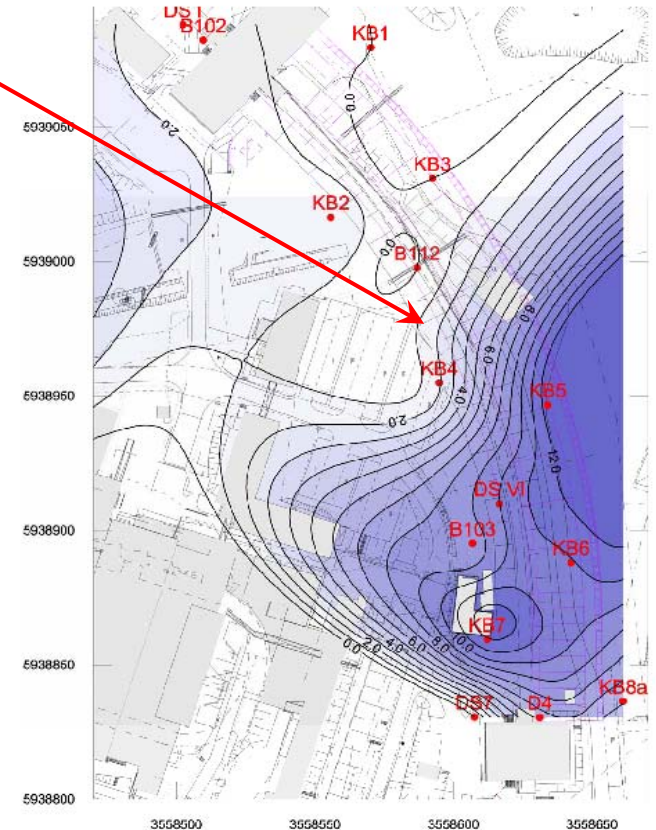
depth of clay layer
under the surface

Question:

Could impound water on
the clay cause deformations
of the new hall?

Solution:

Measure relative deformations
of the existing tunnel
with a HLS

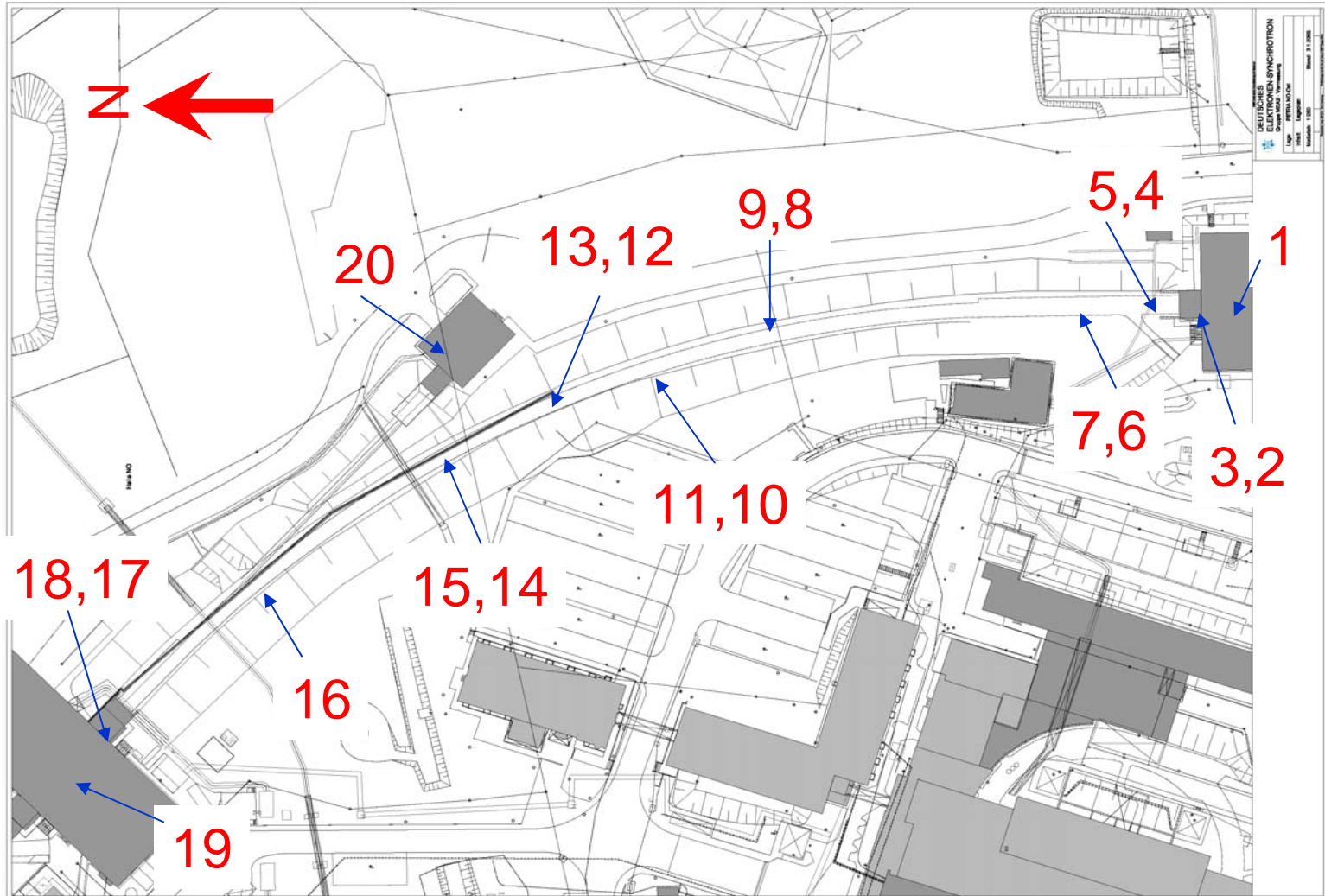


Deutsches Elektronen-Synchrotron DESY
Neubau einer Versuchshalle PETRA III
Schichtdicke der Geschiebeböden

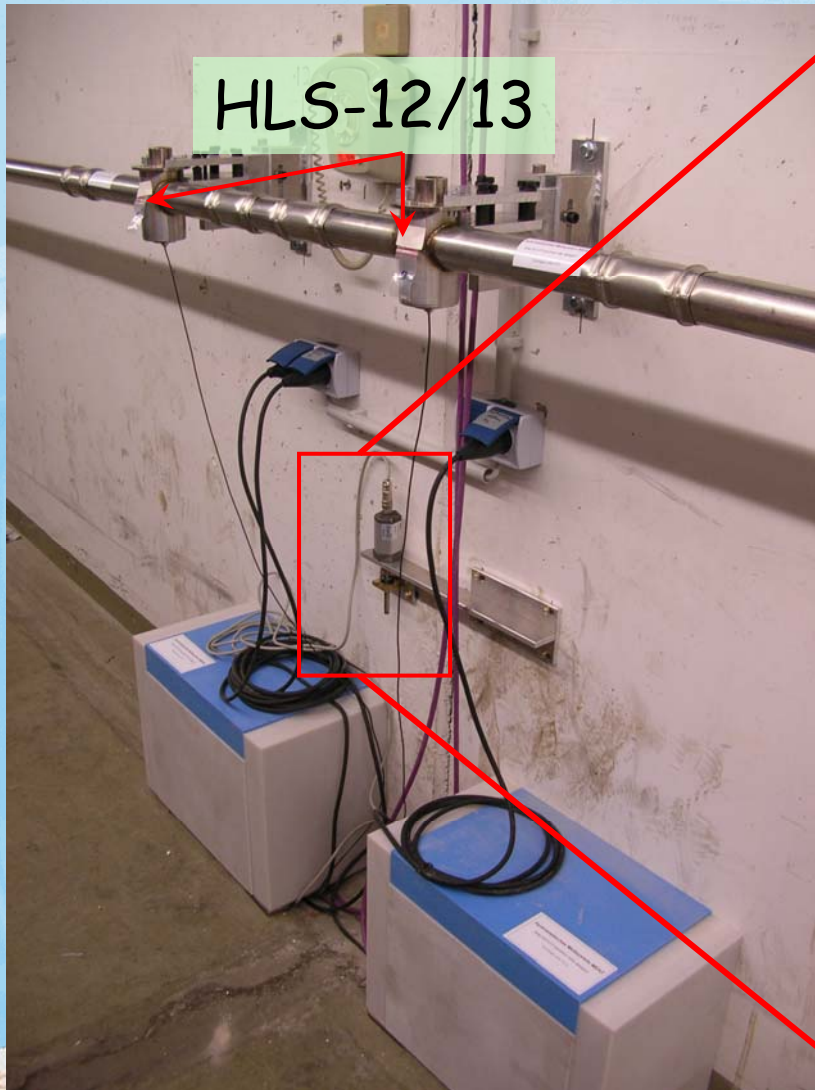
HanseGeoTech
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Prof. Dr. Stefan Hase - Dr. Ing. Frank Schür
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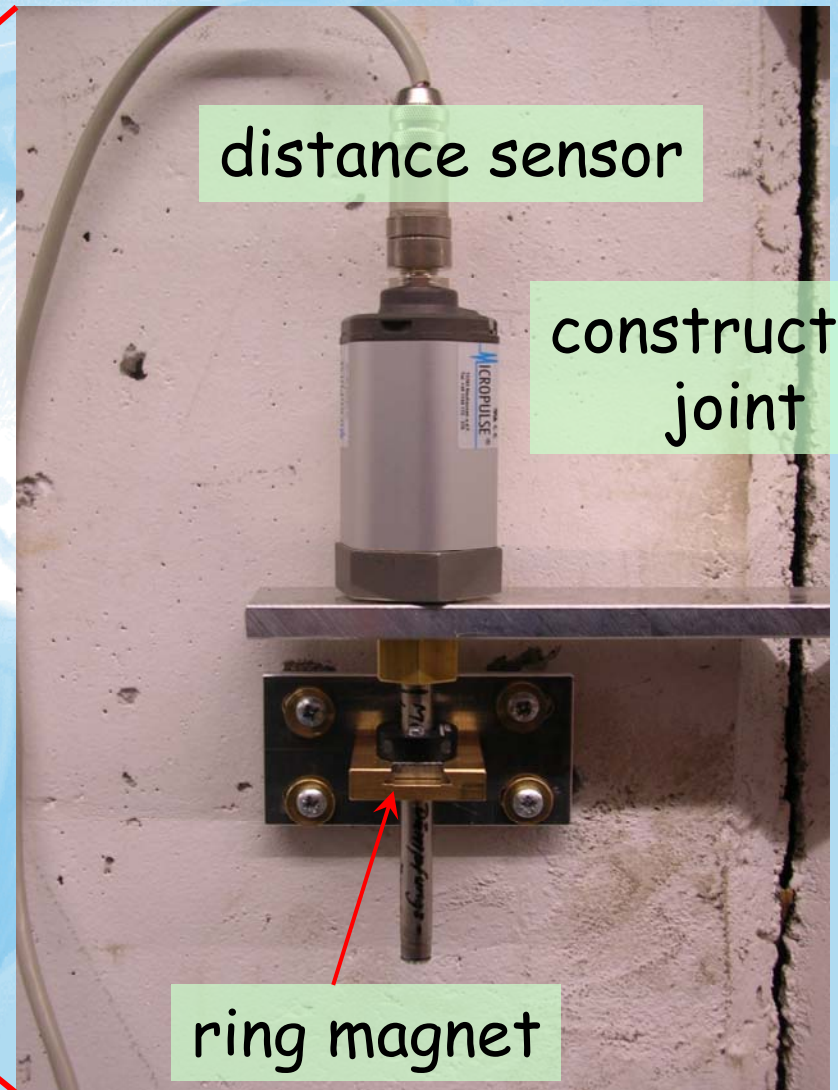
distribution of HLS in PETRA



Comparison with Distance-Sensor



HLS-12/13



distance sensor

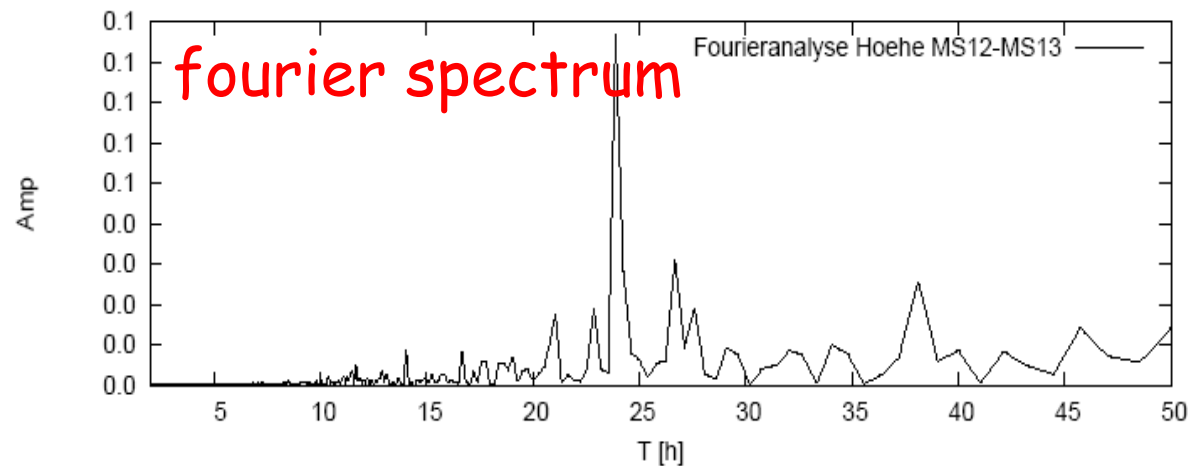
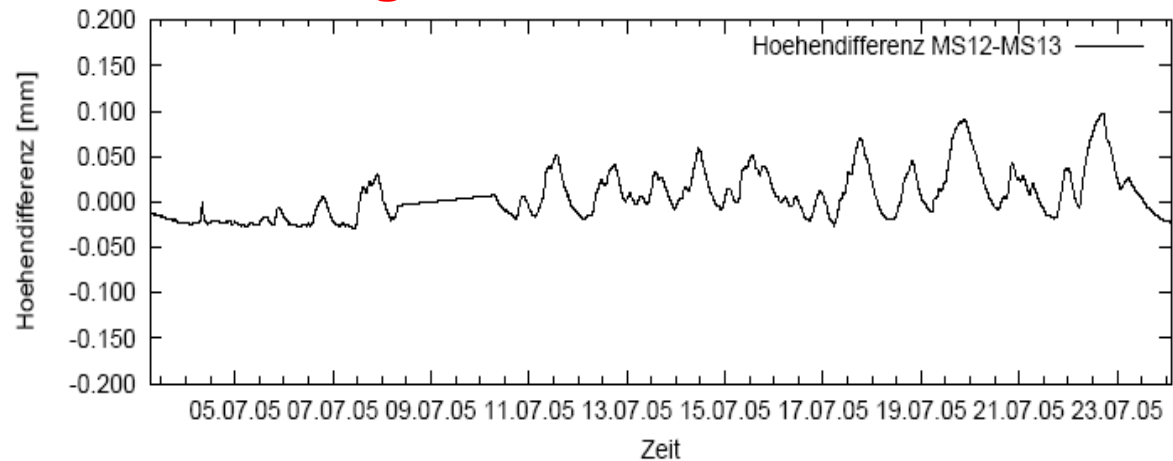
construction joint

ring magnet

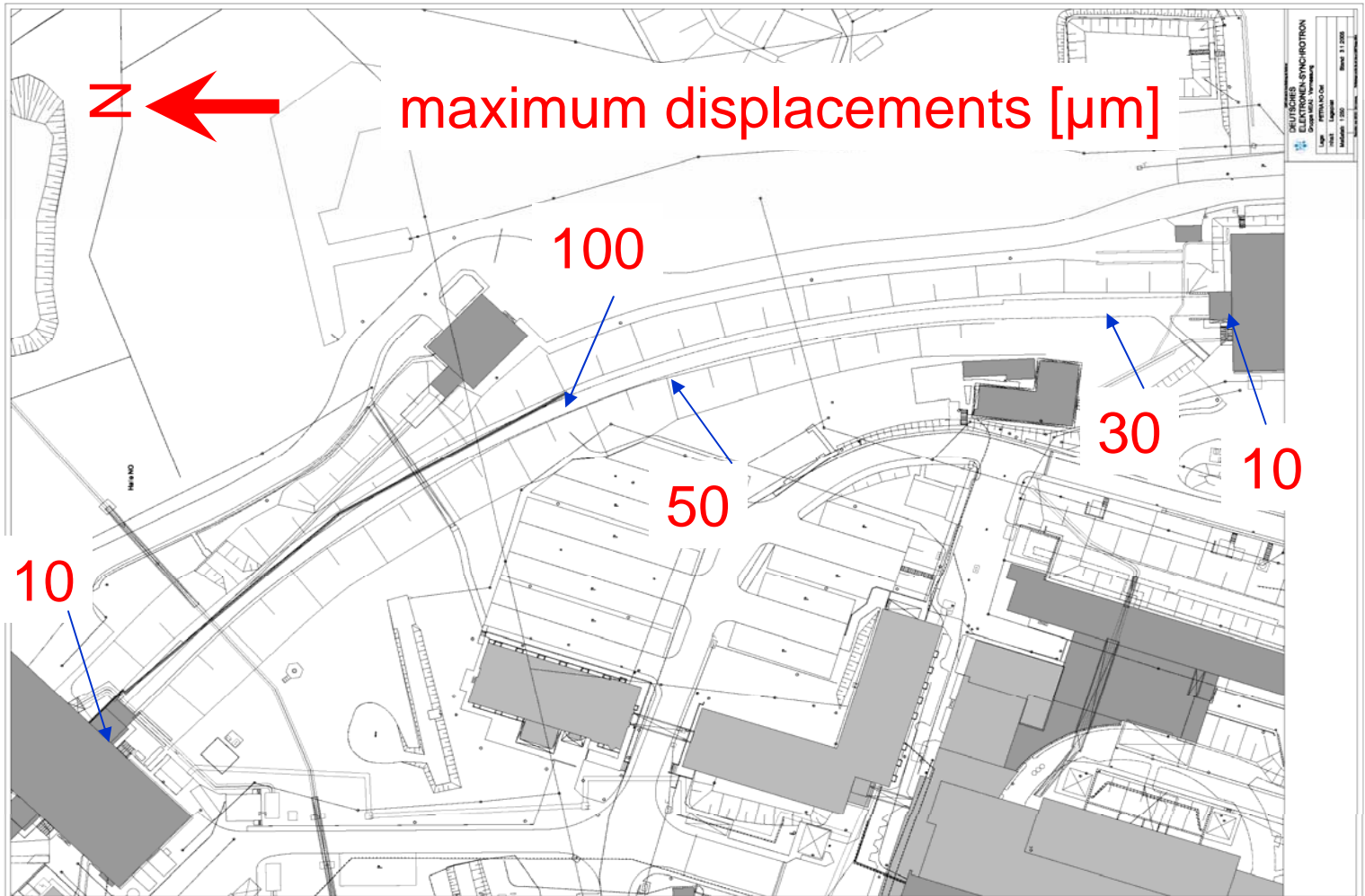
Results of HLS



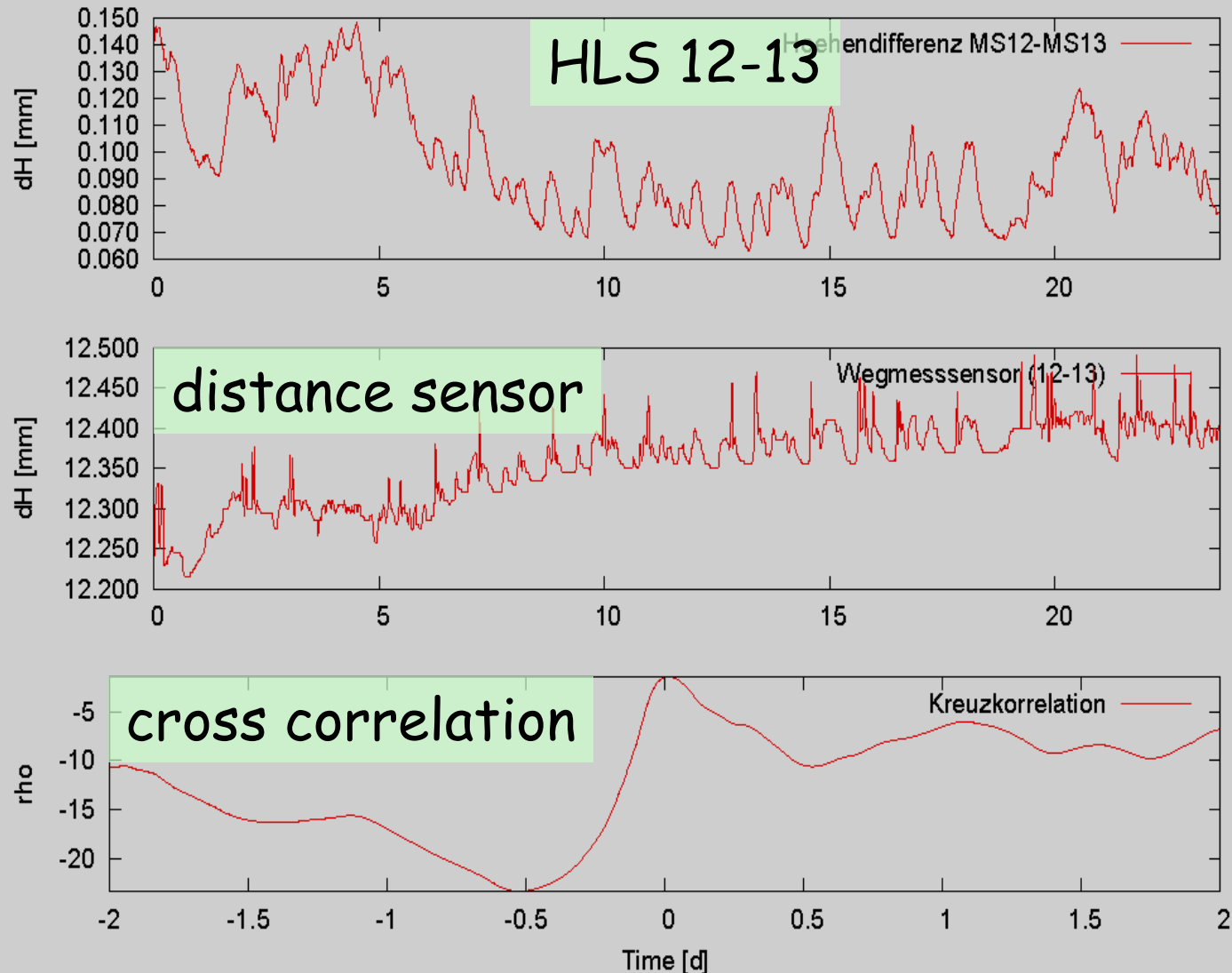
height difference 12-13



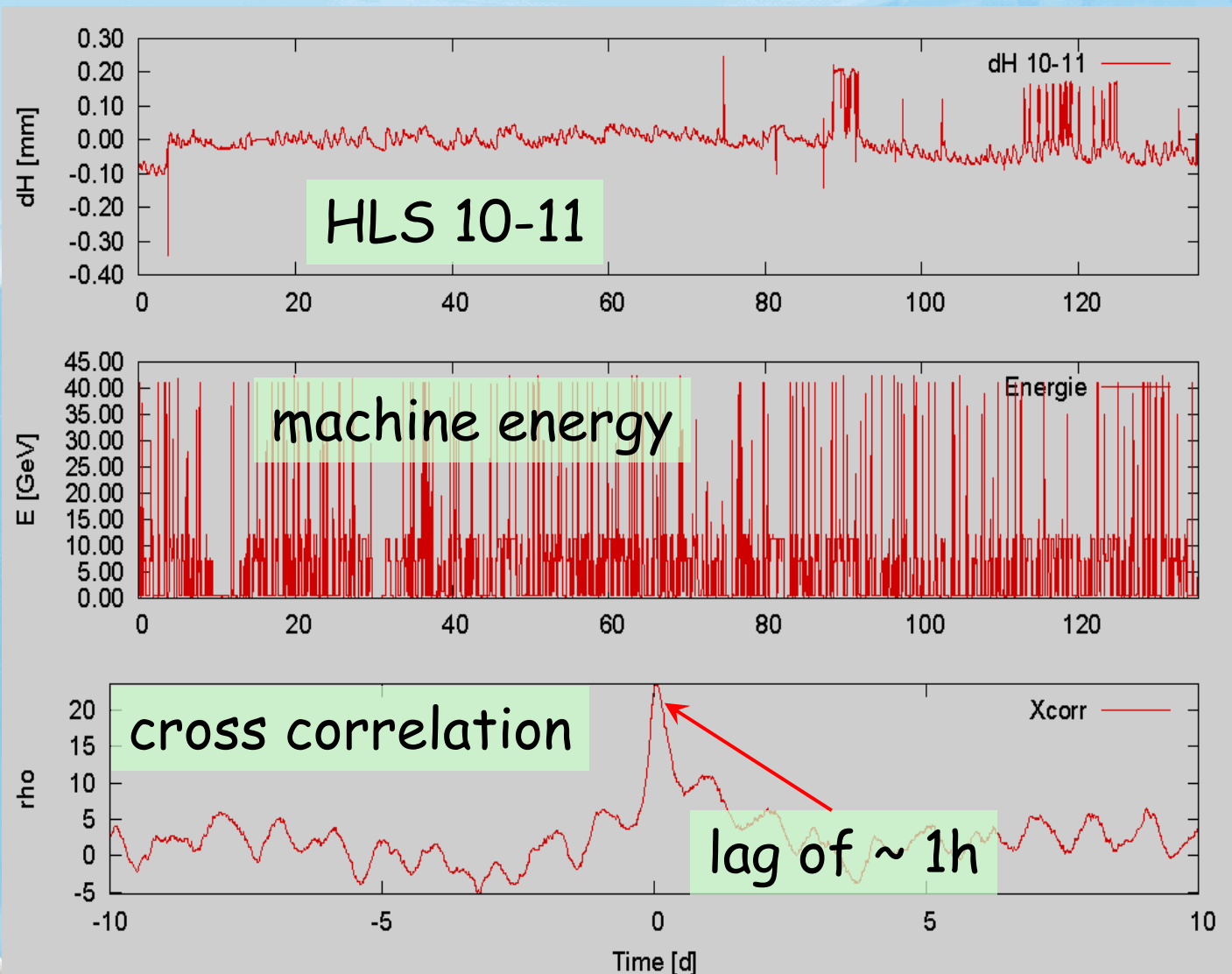
displacements in construction joints



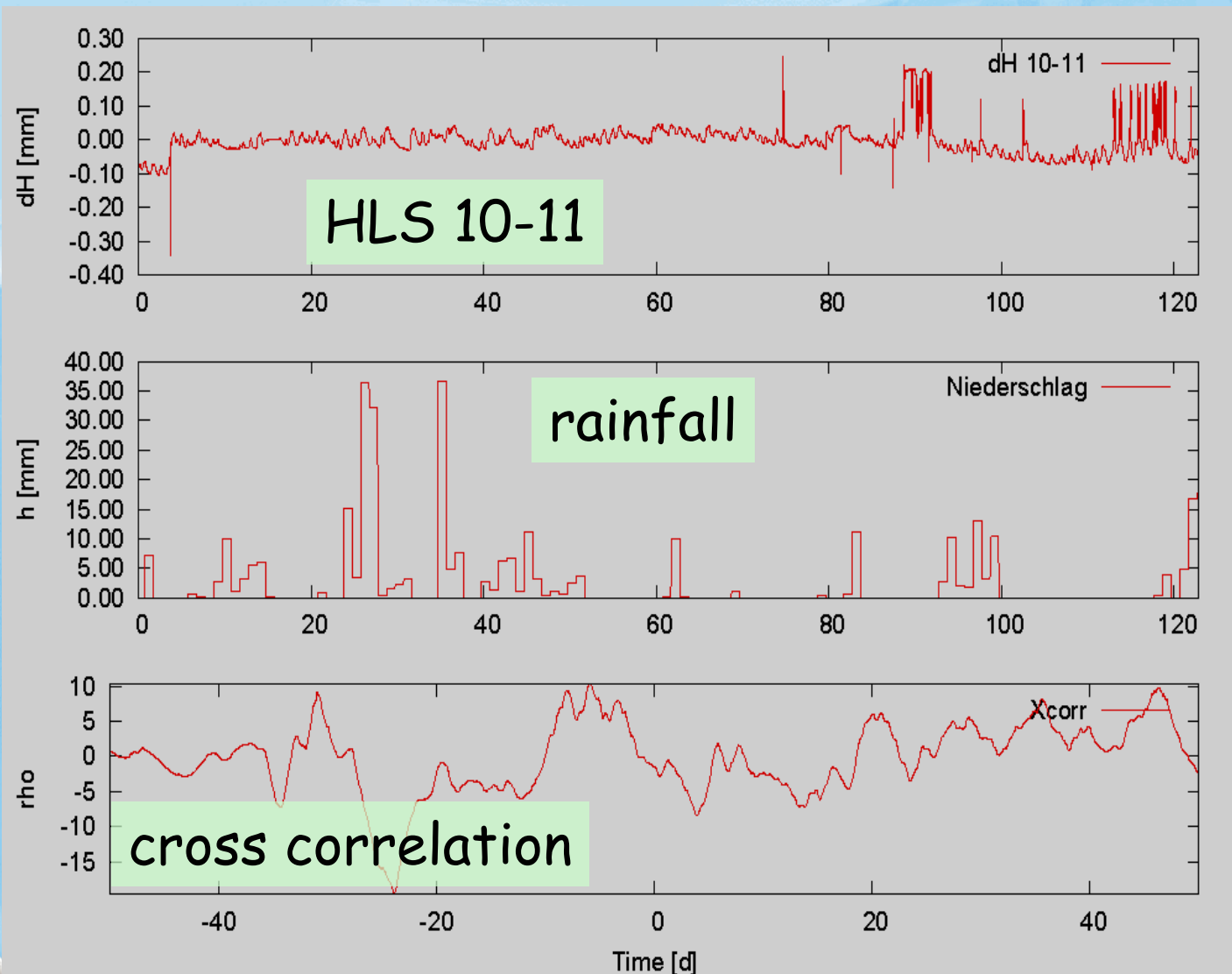
XC between sensors



XC with machine energy



XC with rainfall



results



- HLS movements confirmed
- no correlation between tunnel movement and rainfall
- strong correlation between tunnel movement and machine energy with a lag of $\sim 1\text{h}$
- mechanism is not fully understood yet



XFEL



Greetings from Johannes Prenting

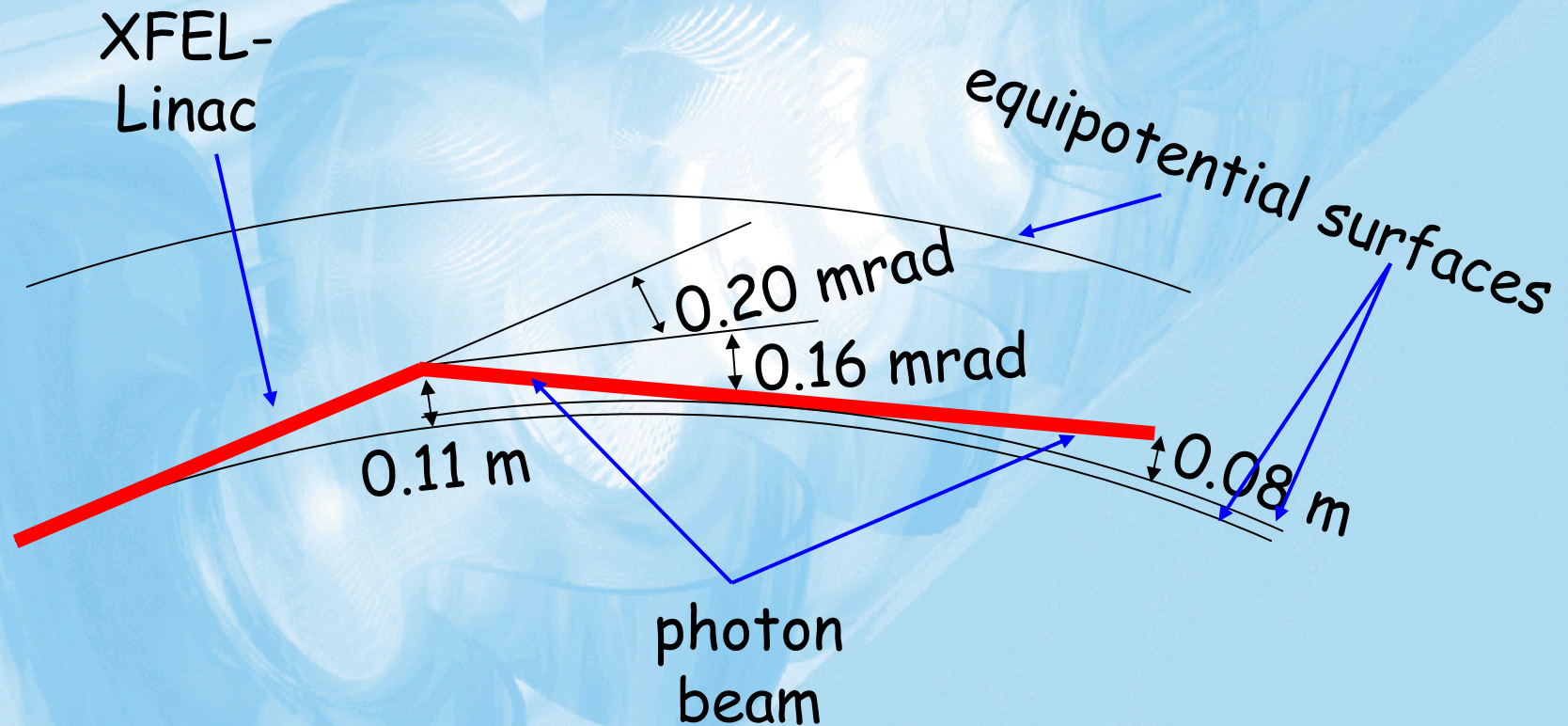
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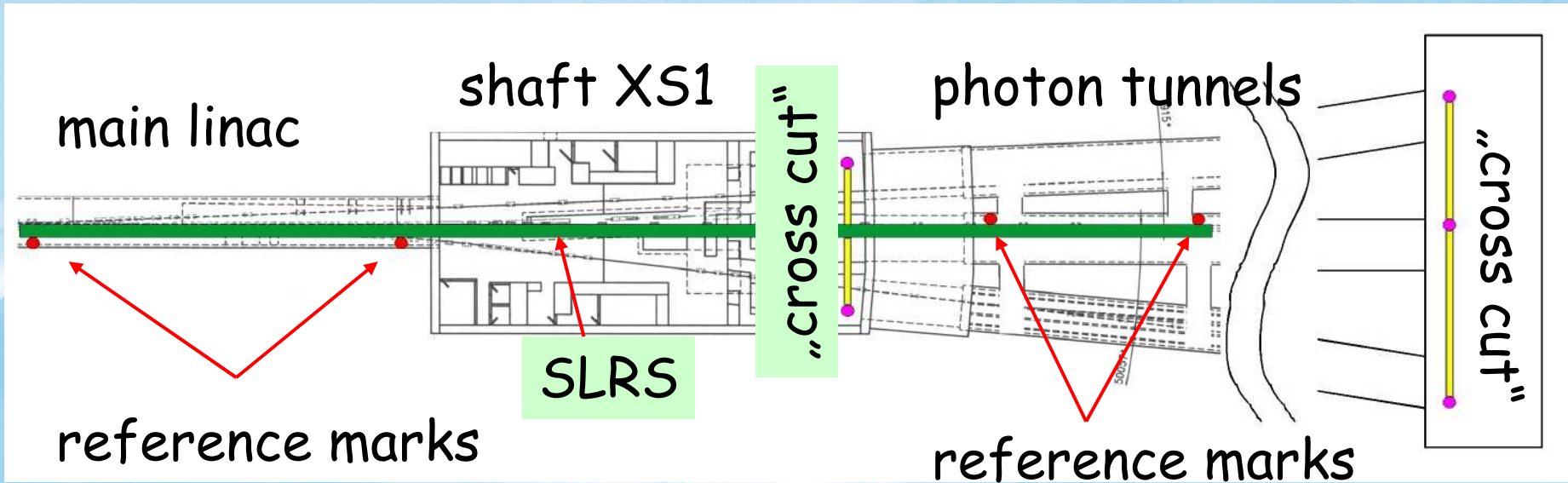
Technical



vertical shape of tunnel has been fixed



Alignment concept



- SLRS is connecting the arriving with the straight outgoing tunnel
- Other tunnels are attached via „cross cuts“
- works for all shafts



ILC / TESLA



- LiCAS project
- easy and fast survey of large linear reference systems



First prototype should
be ready in the
DESY test tunnel
by the end of 2006



Geodetic Instruments



Two FARO SI/SI2 trackers
bought in 2002 and 2004

Both have errors in Interferometer
distance measurement
(even directly after service!)

Errors happen from once a week
to several times a day

Size of error from some 0.1 mm
up to 433mm (so far)

Don't know how to provoke
the error



Measurement results



Target	Time	Azimut [gon]	Vertical [gon]	Distance [m]	dA [mgon]	dV [mgon]	dD [mm]
6-B4	18:34:05	-35.5287	102.2880	7.485031			
6-B4	18:57:48	-35.5294	102.2872	7.051910	0.1	0.0	-433.1
6-B4	18:59:02	-35.5295	102.2871	7.051918	-0.1	-0.2	-433.1
6-B4	19:02:21	-35.5295	102.2873	7.485069			

Error happens with brand new SMR and normal conditions

Error happens even directly after homing

Workaround: measure all points twice!

Not applicable for scanning surfaces etc.



Beam loss



After Service, error seems to happen less frequently
...

but: beam loss rate increased dramatically



Test setup: Tracker looks at slowly moving target

$v = 10\text{cm} / 30\text{s}$

Tracker loses beam within 2 min (repeatable)

FARO was not able to solve the problem for nearly one year now

and finally ...



for something completely different...



... this has been our company christmas party 2005...





Thanks
for your attention!



details of PETRA III



- Start of Conceptual Design: 2002
- Final approval: May 2005
- Reconstruction begins: July, 1st, 2007
- User operation: 2009
- Costs 225 Million €
- 90% German federal government
- 10% City of Hamburg



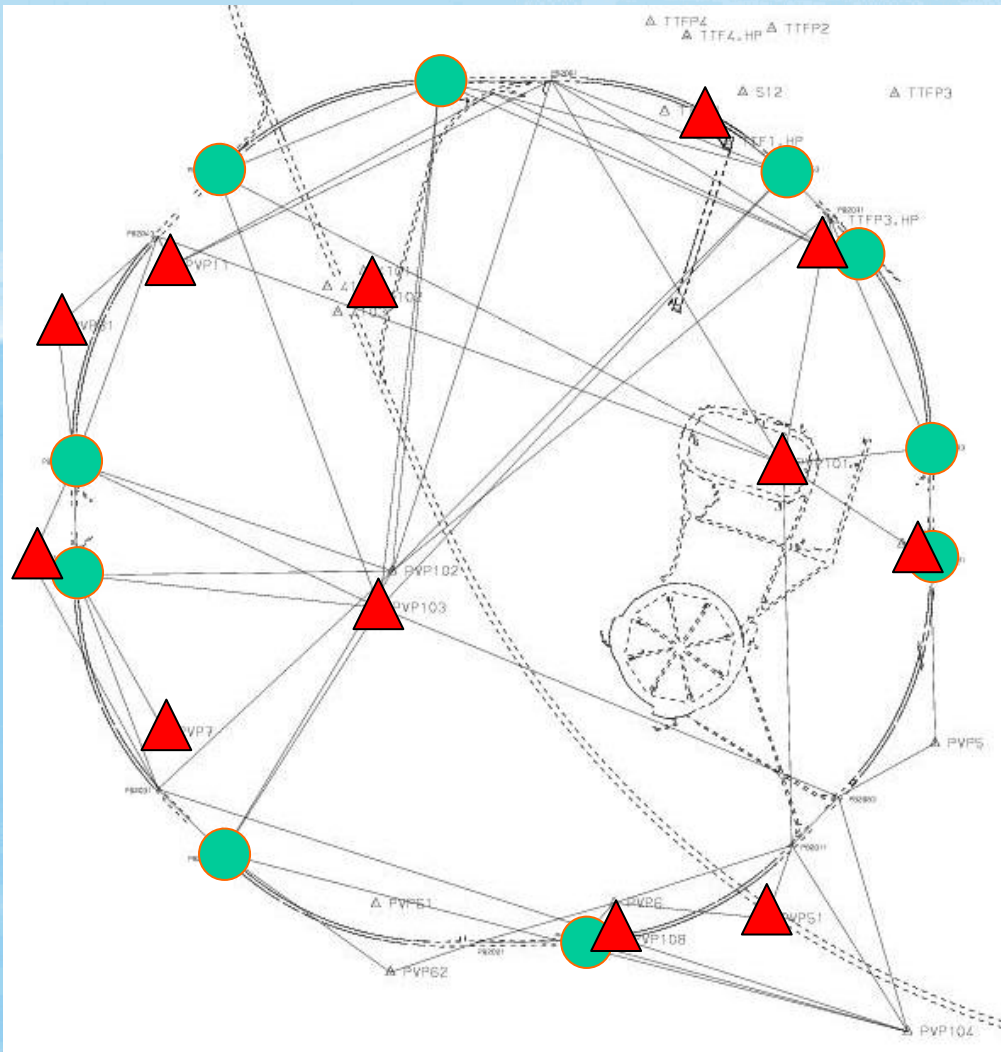
technical details of PETRA III




- new 280 m long experimental hall
- 14 beamlines with up to 30 experimental stations
- highest brilliance and flux
- broad photon energy range (about 0.2keV to 3keV)
- Energy 6GeV
- Current 100mA - 200mA
- Emittance 1nmrad



GPS-network



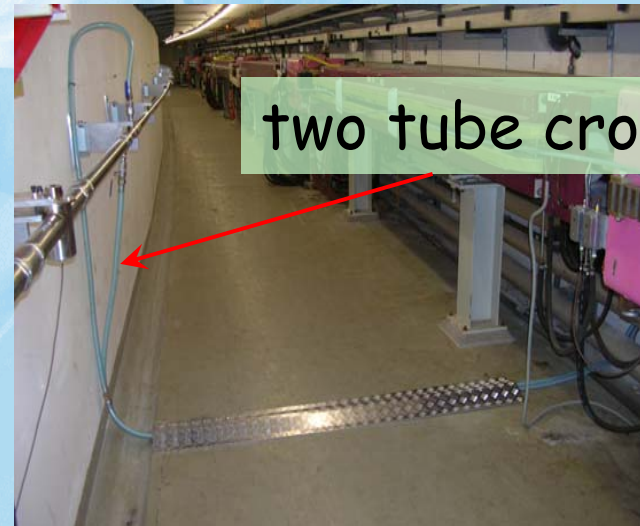
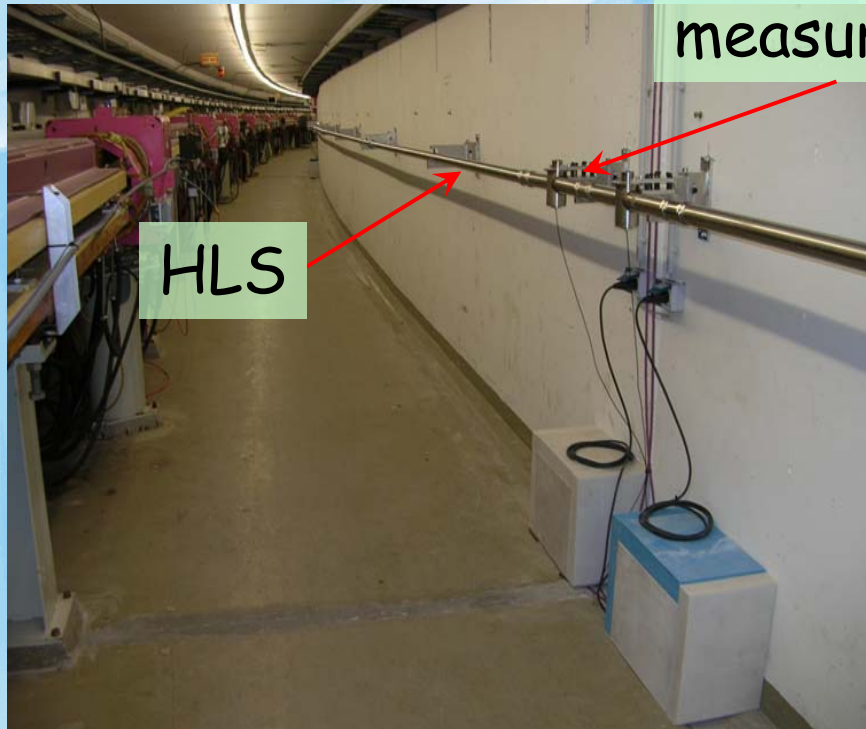
 Pillars on DESY site

 Bolts in the tunnel
(with plumbing tube to
the surface)

Installation of HLS



PETRA tunnel view



results



- magnitude of displacement depends on position
- largest displacement in middle of octant
- smallest displacement at joint between hall and tunnel

-> physicists refused to accept this

-> installation of an independent measurement system



comparison of HLS and direct distance

