First Results from a Hydrostatic Levelling System installed at Diamond Light Source

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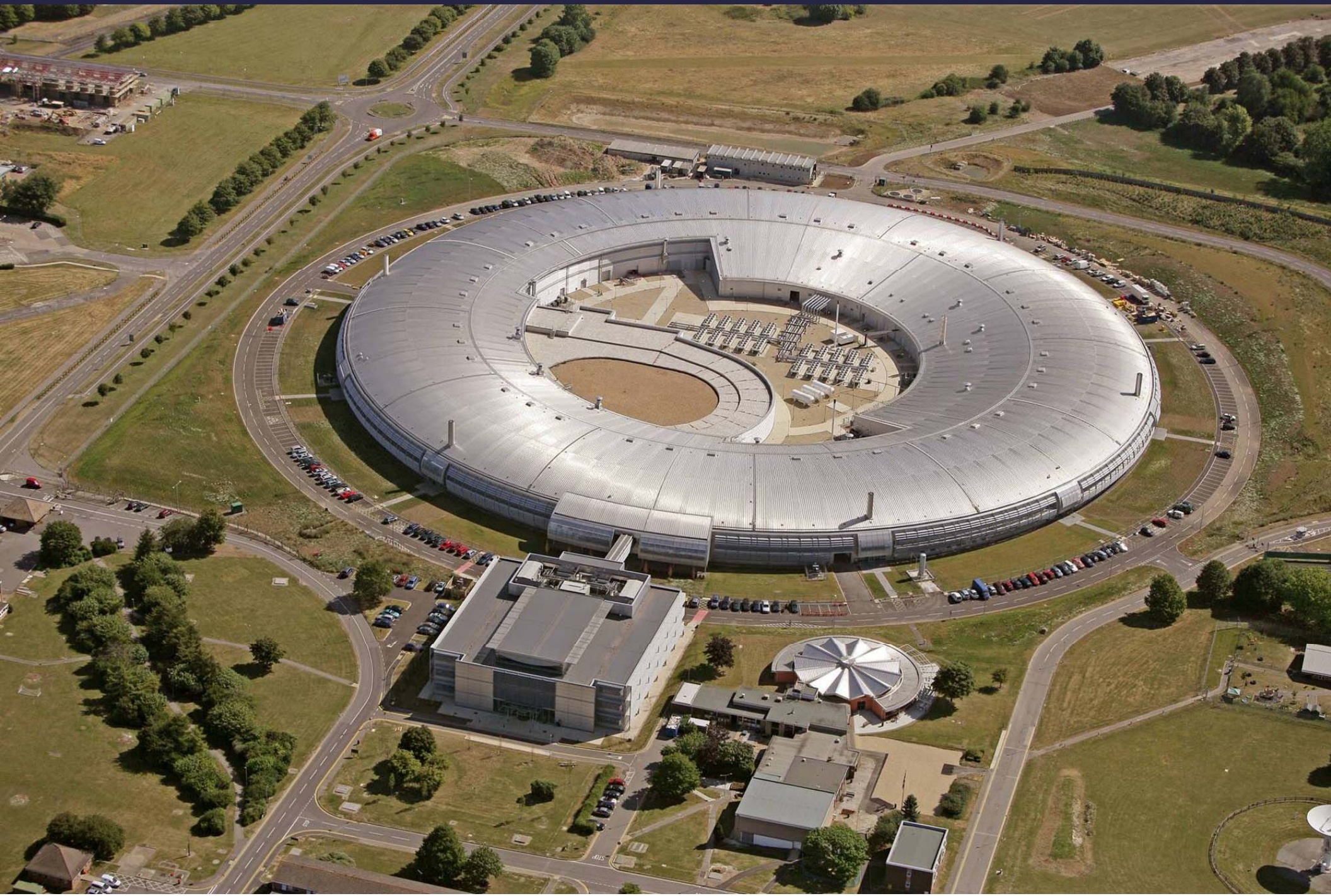
MEDSI 2008 at the CLS

Talk Outline

- Floor stability specification
- Civil Engineering design and construction
- Description of the HLS system
- Tests and first results

Diamond Light Source



Diamond Foundations Performance Criteria

Elastic Deflections

- 6μm under 5 kN load
- 1μm 2 metres from load of 500 kg

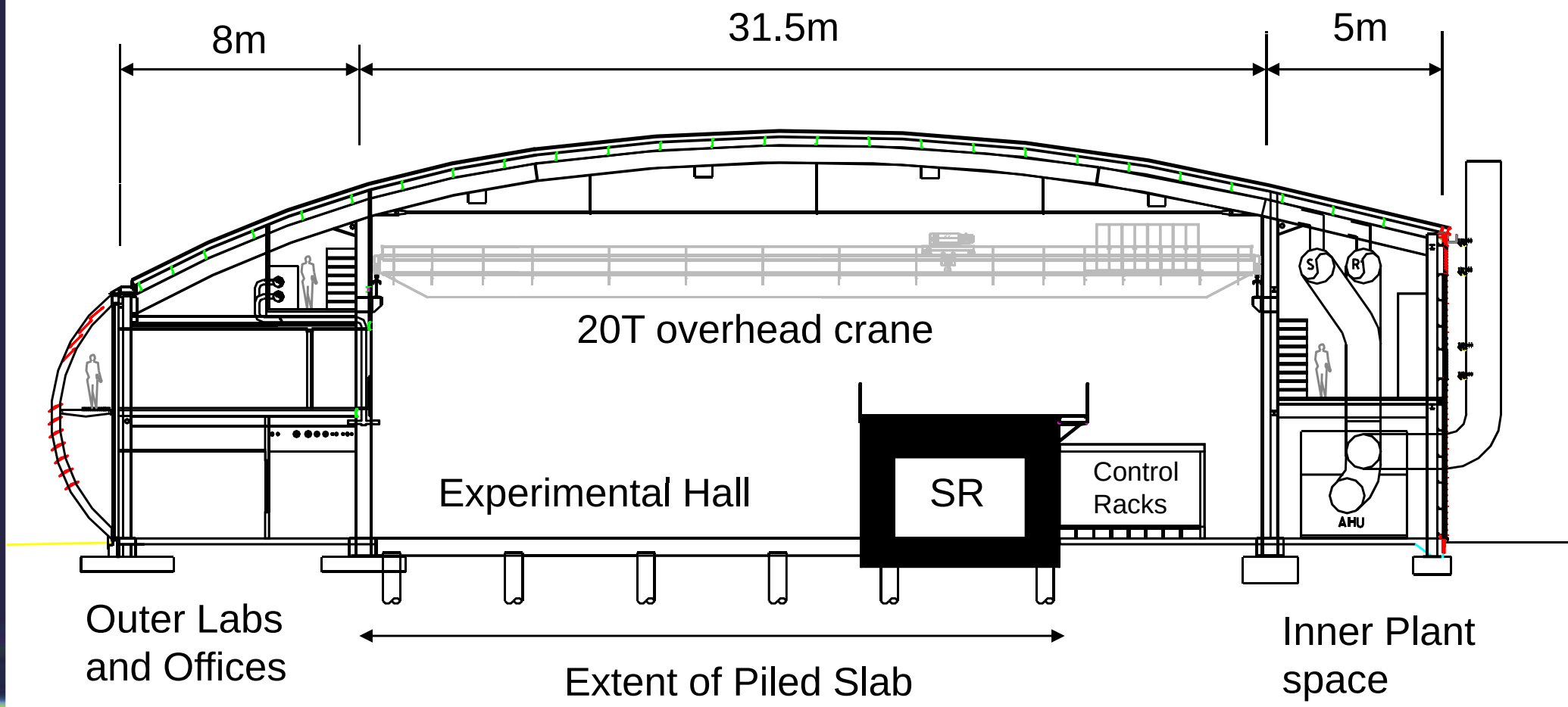
Short Term

- 10μm over 10m per day (all areas)
- 1μm over 10m per hour

Settlements

- 100μm over 10m per year (SR, Booster & Linac)
- 250μm over 10m per year for Experimental Hall

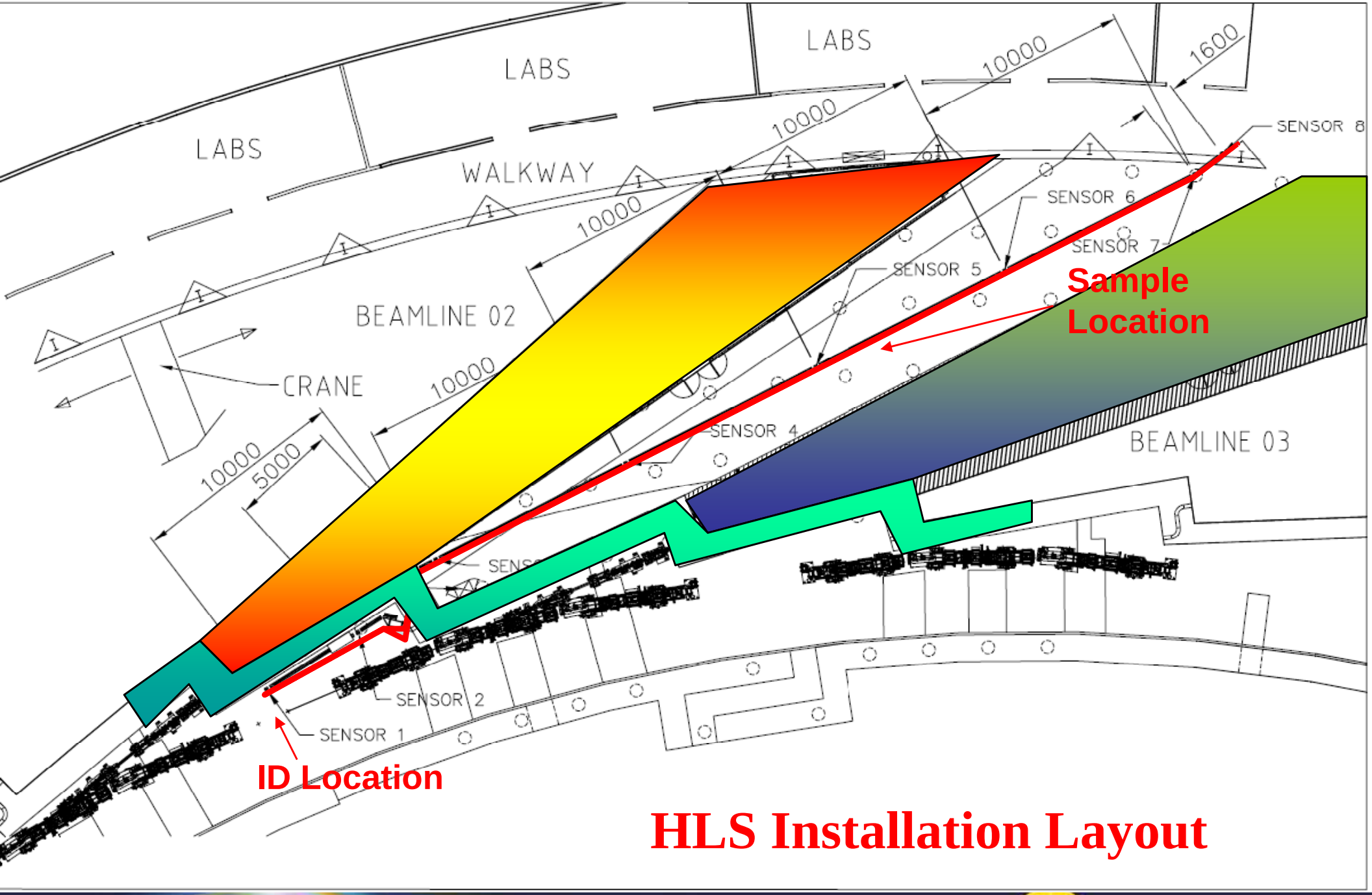
Building Cross-Section



The Synchrotron Hall

But how to measure if the floor is meeting specification?

diamond



HLS Installation Layout

1.3 HLS NETWORK

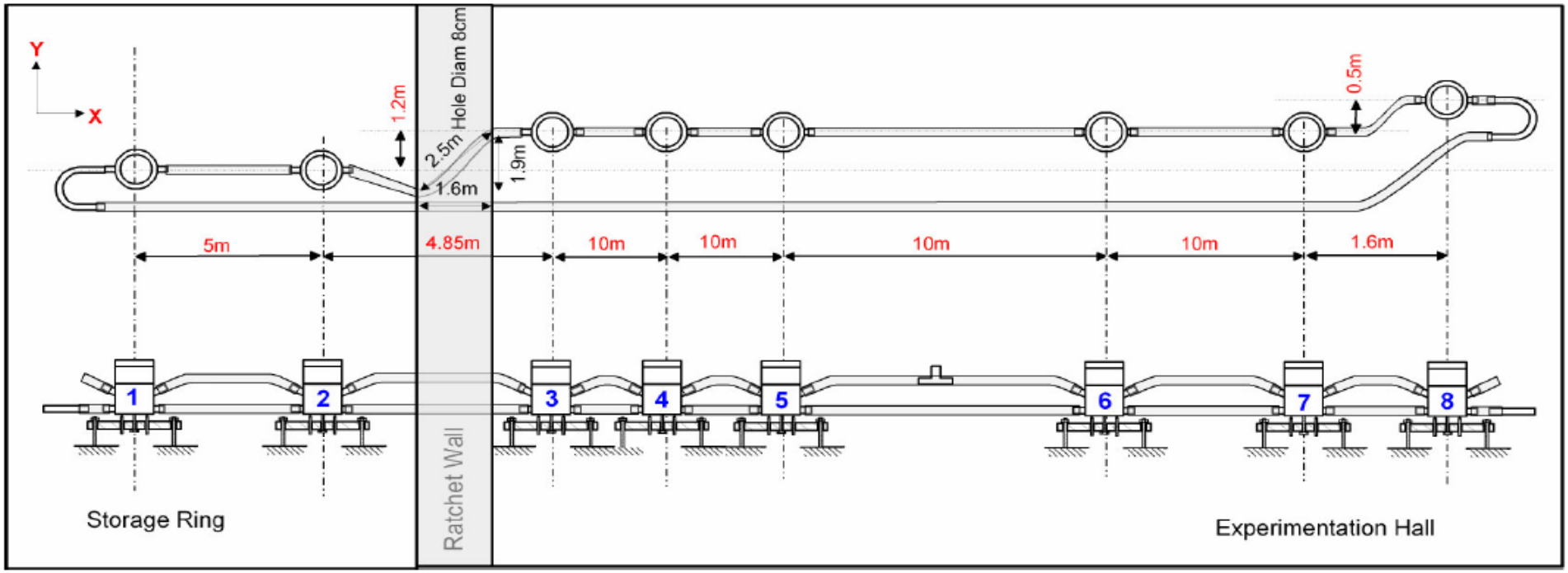
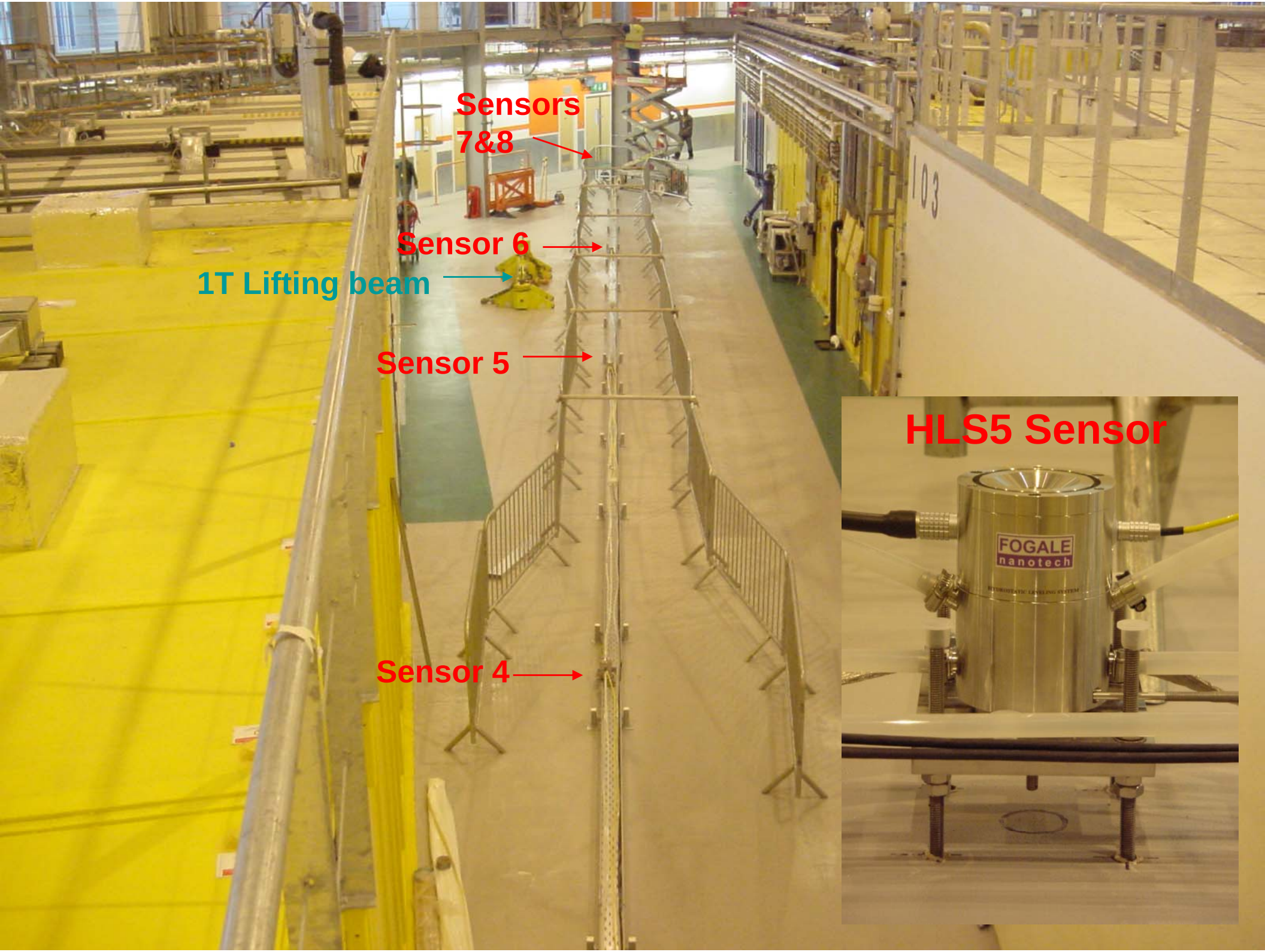


Figure 2: HLS network

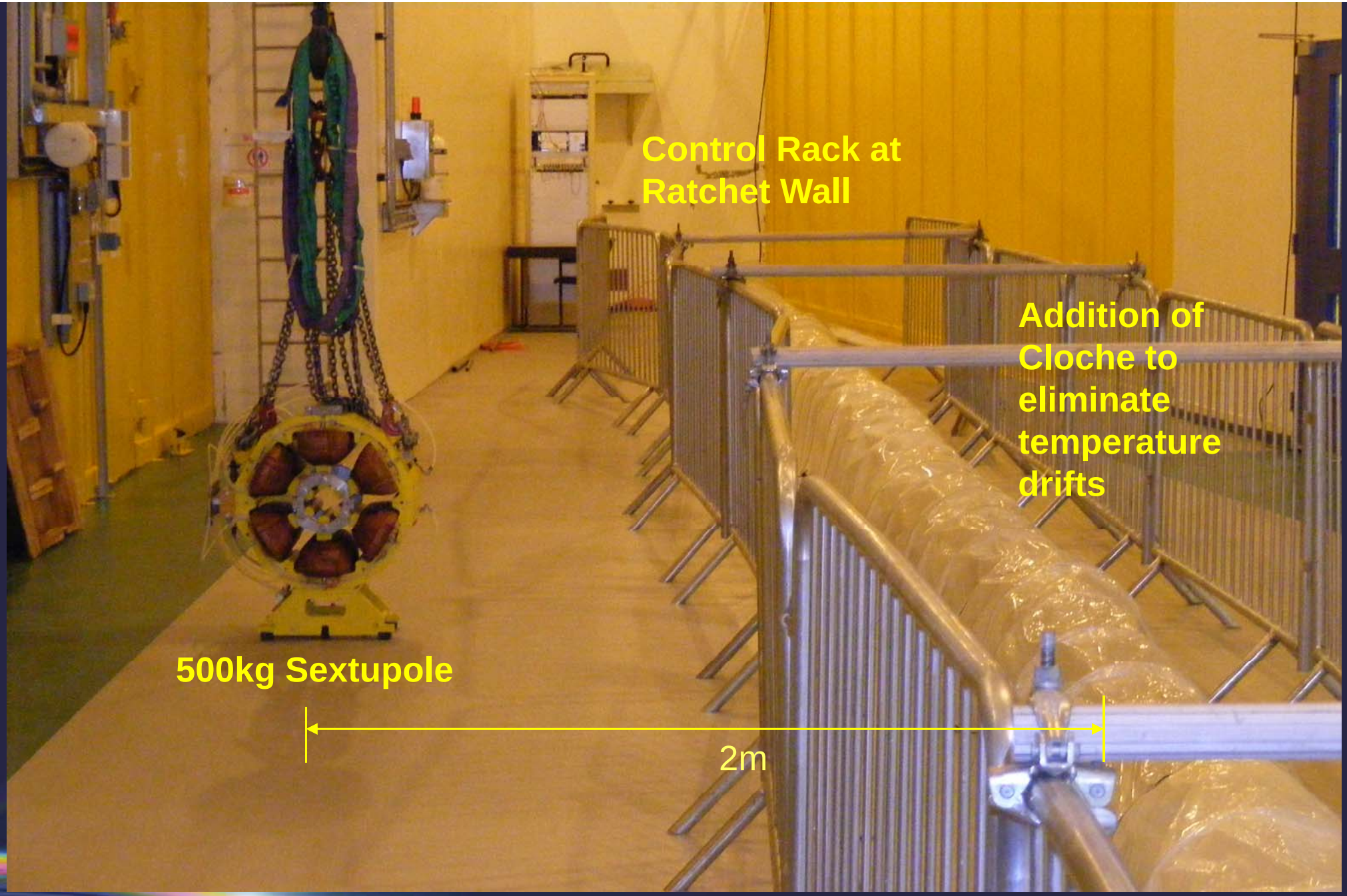
Dimensions TBC

Dimensions between sensors 2-3 and sensors 7-8 are approximate.

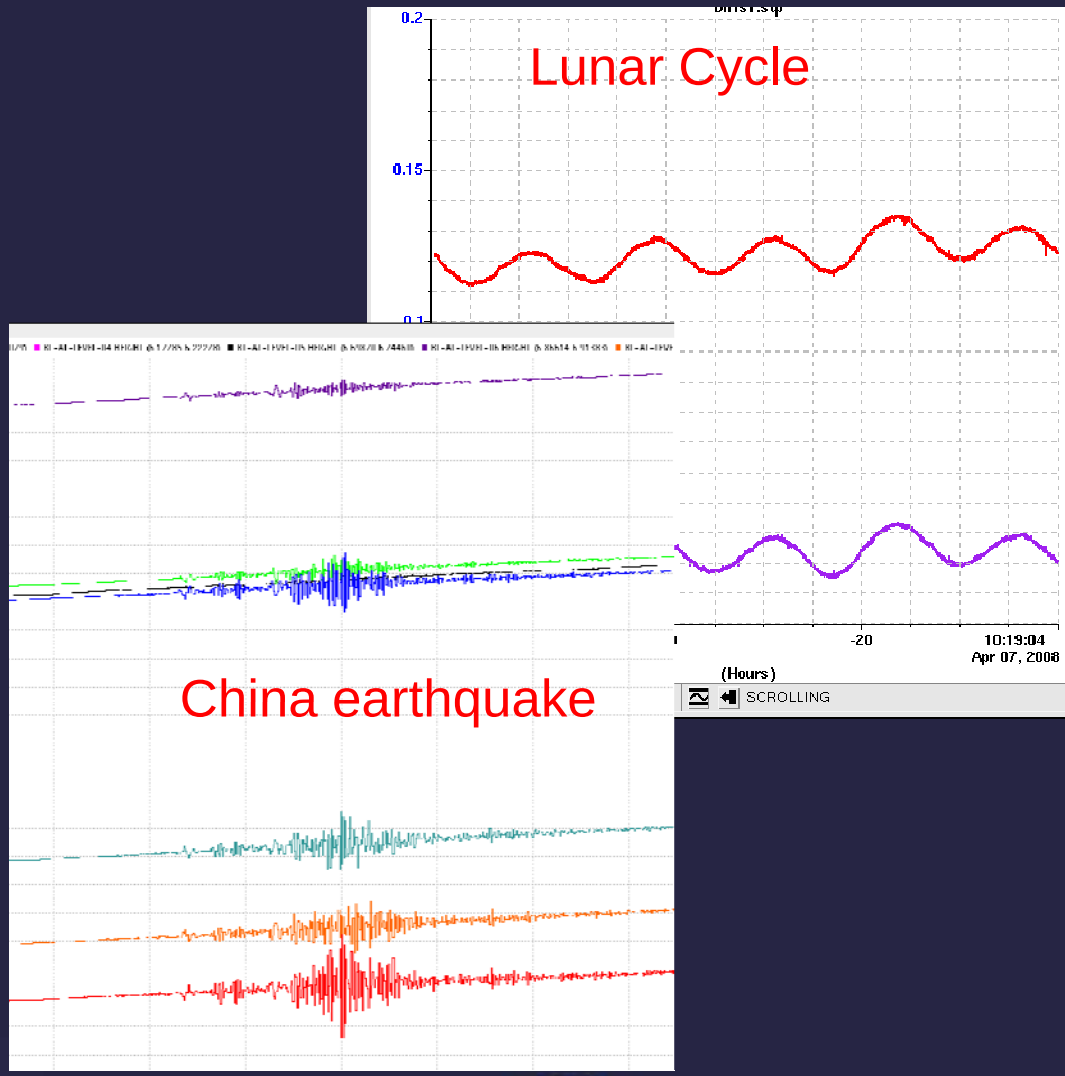
HLS System Layout


Sensors
7&8
Sensor 6
1T Lifting beam
Sensor 5
Sensor 4
HLS5 Sensor
FOGALE
nanotech
103

05
Sensor 8
Sensor 7
3.7T Fork Lift
Floor Joint Line


Control Rack at
Ratchet Wall
Addition of
Cloche to
eliminate
temperature
drifts
500kg Sextupole
2m

Data Handling



Deflection under 5kN Sextupole magnet and Sensor 5

Specified Deflection (µm)	Distance away (m)	Position Inboard is closest to SR	Measured Deflection (µm)
1	2.00	Inboard	-0.5
	1.00	Outboard	-1.0
6	0.30	Inboard	-1.5

Tests using 1T Lifting Beam close to Sensor 6 also confirm the specification has been achieved.

Short Term Settlement over 1 hour and 1 day

- Specification 1 μm/10m per hour, 10 μm/10m per day
- Measurements over 24 hours on 17-5-08
  - Greatest range of movement any sensor 6.5 μm
  - Greatest movement of any sensor in 1 hour 1.5 μm
  - Greatest difference over 10m in 1 hr is 1 μm
- Short Term Settlement Specification achieved
- More data and time to confirm Long Term Settlement

Some Other Observations

- 3.7T Fork Lift on the walkway deflected Sensor 8 by 46 µm but no effect on slab
- Conclude that normal traffic on the walkway is acceptable and won't affect beamline operation
- 29T Crane parked at Sensor 8 depresses S8 by 20 µm and Sensor 7 by 8 µm but Sensor 5 by 1 µm
- Conclude that Crane movements depress outer edge of slab but beamline samples typically at Sensor 5 position unaffected

Conclusion

- DLS Floor Specification derived and facility constructed
- HLS system installed to measure actual performance
- Steady state deflection and short term settlement specification achieved
- Walkway use OK but Overhead crane does depress the edge of the slab
- Any questions?