

10TH INTERNATIONAL CONFERENCE
MEDSI 2018

MECHANICAL ENGINEERING DESIGN
OF SYNCHROTRON RADIATION
EQUIPMENT AND INSTRUMENTATION



CITÉ
INTERNATIONALE
UNIVERSITAIRE PARIS

25-29 JUNE



A NEW PROCUREMENT STRATEGY TO CHALLENGE THE SUPPLIER CONSTRAINTS CREATED WHEN USING A FULLY DEVELOPED REFERENCE DESIGN

George Howell



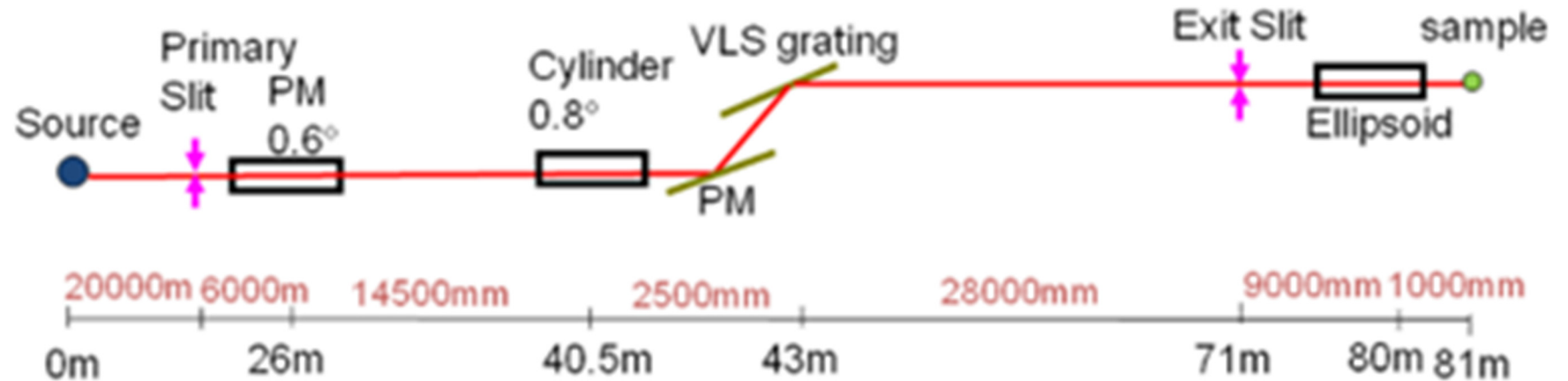
Reference design to lessons learned for the I21 Spectrometer Frames

- Tender reference design
- Procurement Challenges
- Manufacture
- Lessons Learned from the Procurement Process
- Commissioning
- Conclusions

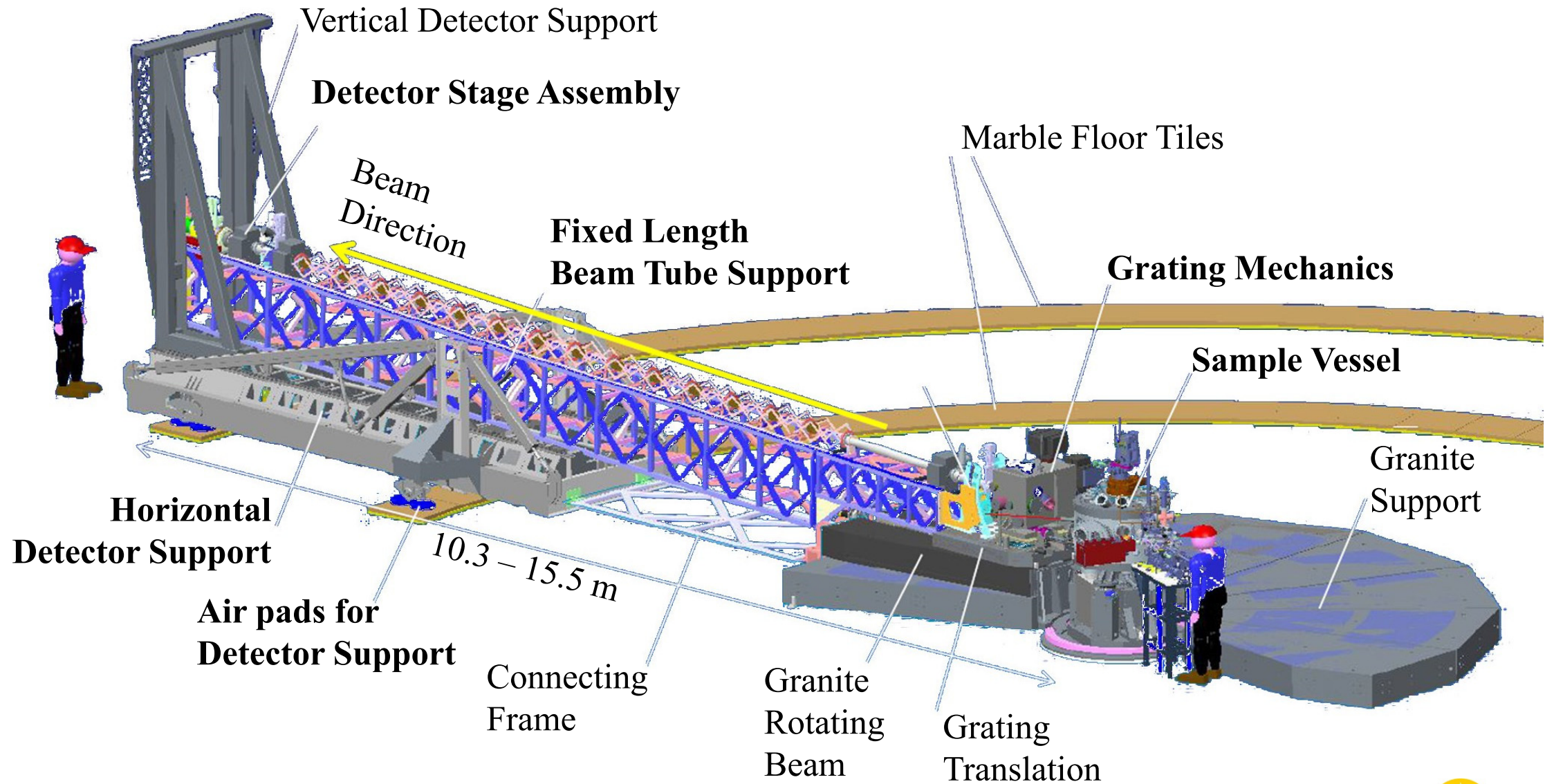
I21 RIXS Beamline

Resonant Inelastic X-Ray Scattering

- Soft X-Ray Beamline
- Plane Grating Monochromator
- Focusing Optics
- Slits
- Exit Slits
- Diagnostics
- Sample Vessel and Spectrometer



Tender Stage Design

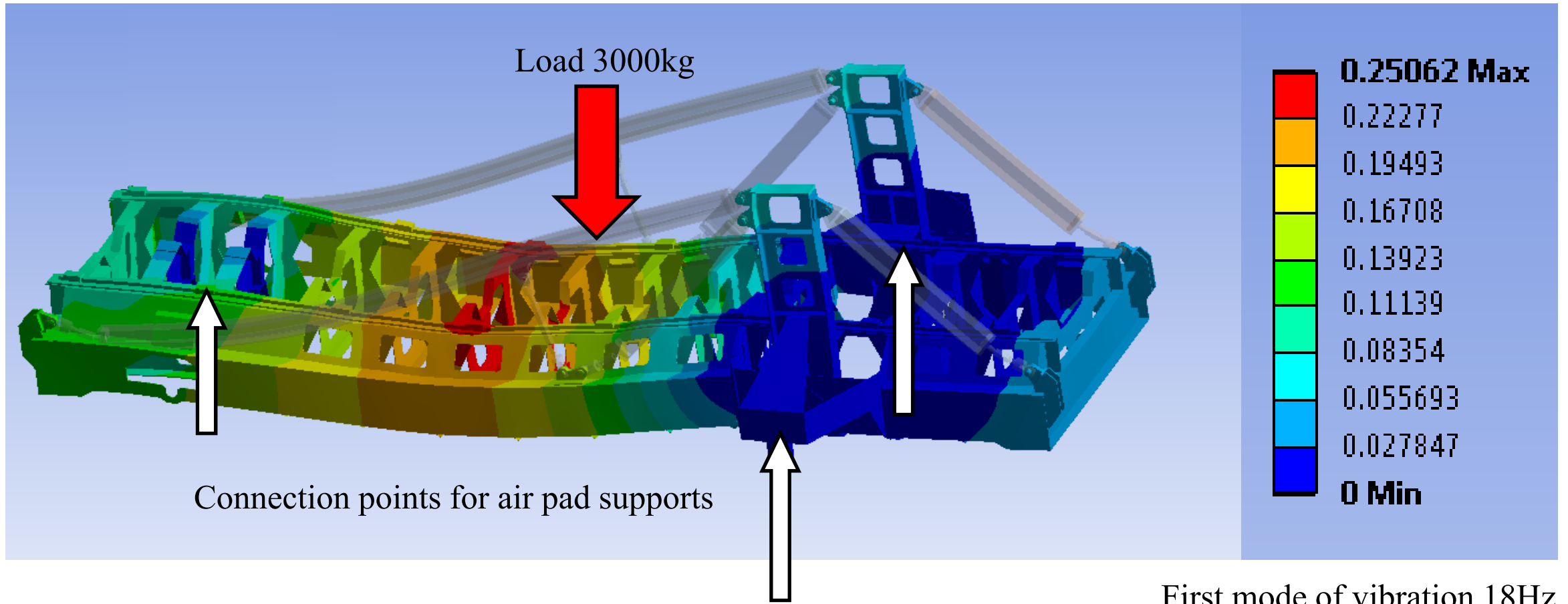


Bailey Bridge



Mabey Footbridge, Glentarken – Scotland
<https://www.mabey.com/uk/products/bridging/mabey-pedestrian-bridge>

Tender Horizontal Stage Analysis



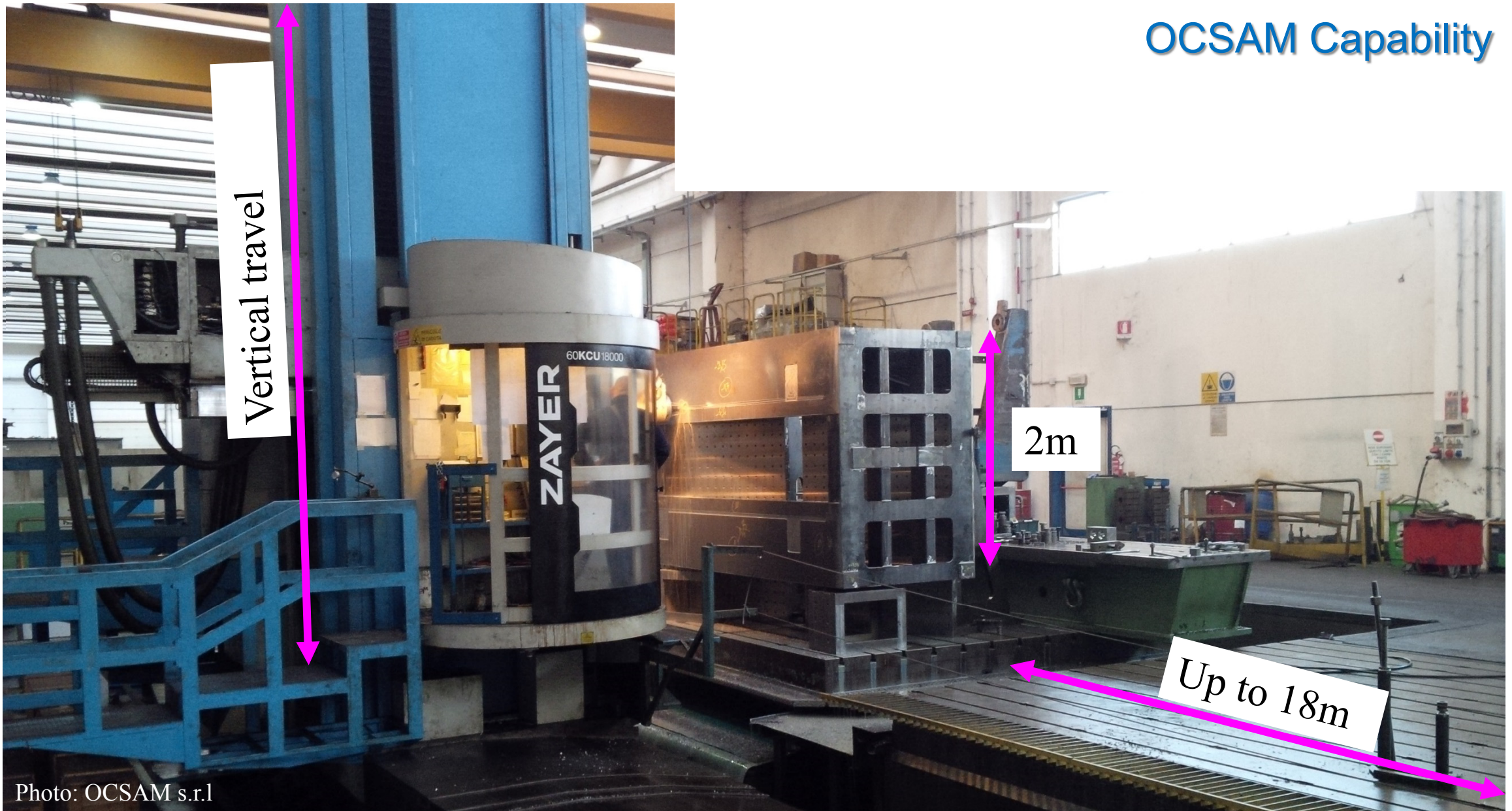
Procurement

- First Challenge
 - Regular supplier to Diamond declined to tender
- Second Challenge
 - The successful supplier OCSAM s.r.l Udine, Italy recommended major changes to the design.

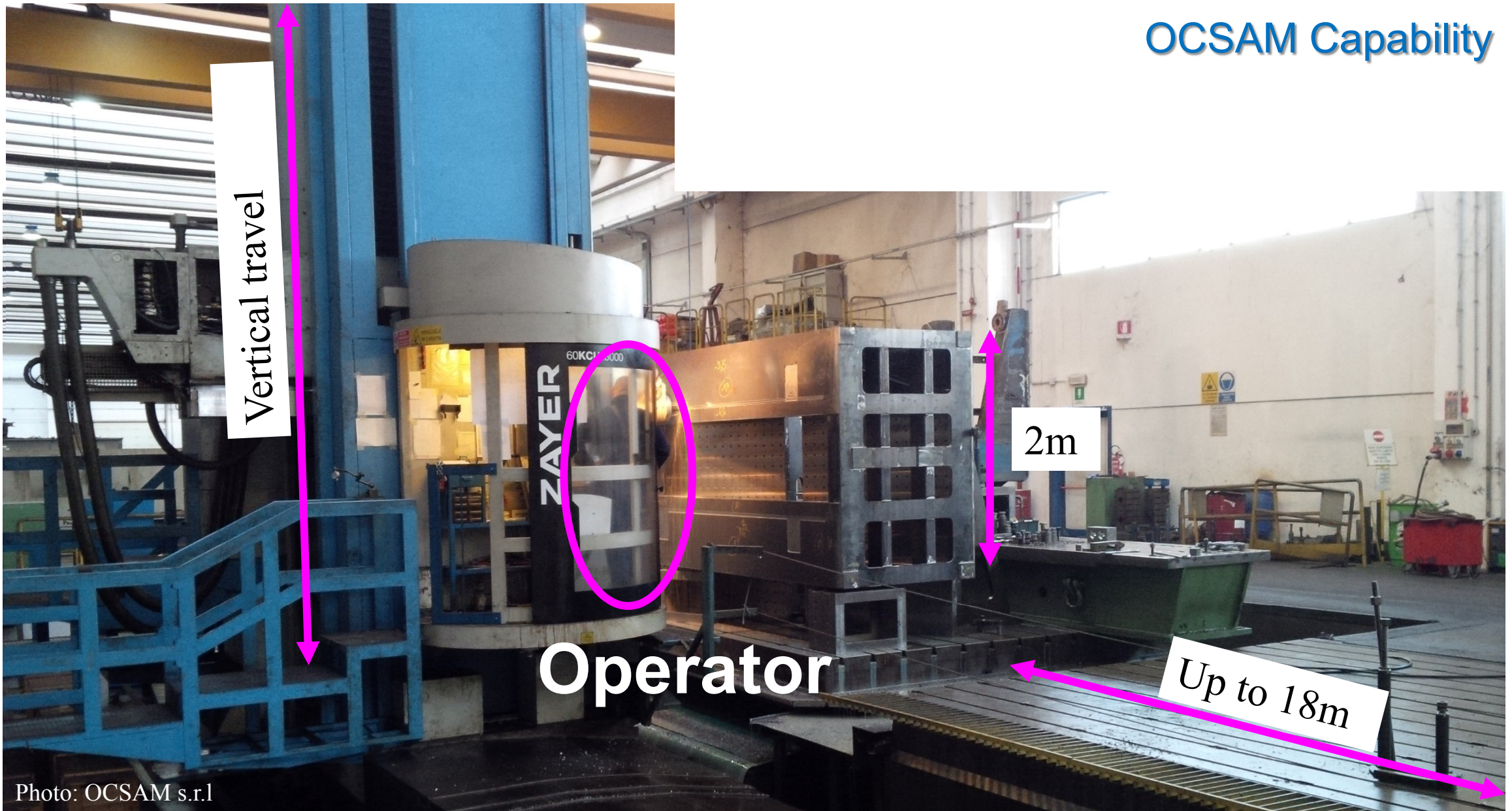
Procurement

- First Challenge
 - Regular supplier to Diamond declined to tender
- Second Challenge
 - The successful supplier OCSAM s.r.l Udine, Italy recommended major changes to the design.
- Result of conversation
 - 13m welded lattice for the Fixed Length Beamtube Support could be milled as one piece
 - Beams for Horizontal Detector Support could be custom made 7m long from 6mm plate
 - The cost and delivery times will not be effected

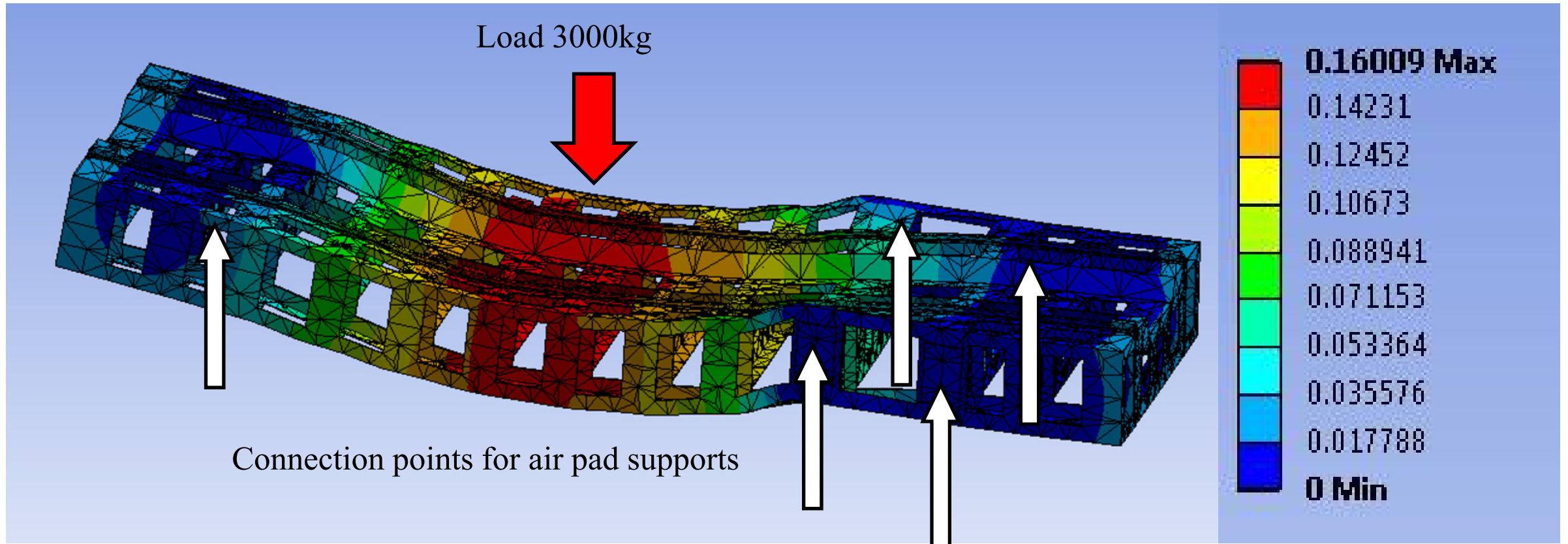
OCSAM Capability



OCSAM Capability



Final Design Analysis



First mode of vibration 36Hz

How Requirements Are Defined

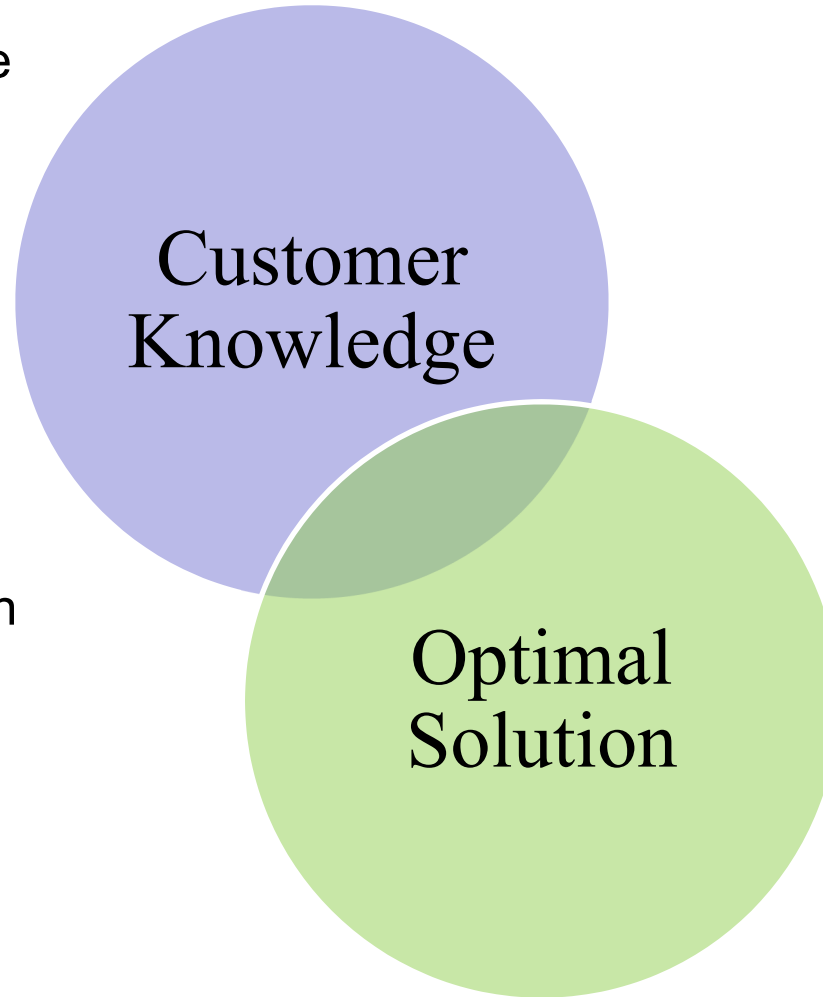
- Scientific requirements
 - User requirements
 - Functional specification
 - Function Tree Analysis
 - Standards and Directives
-
- The Final Design also met these requirements.
 - Requirements used to define the reference design



Optimal
Solution

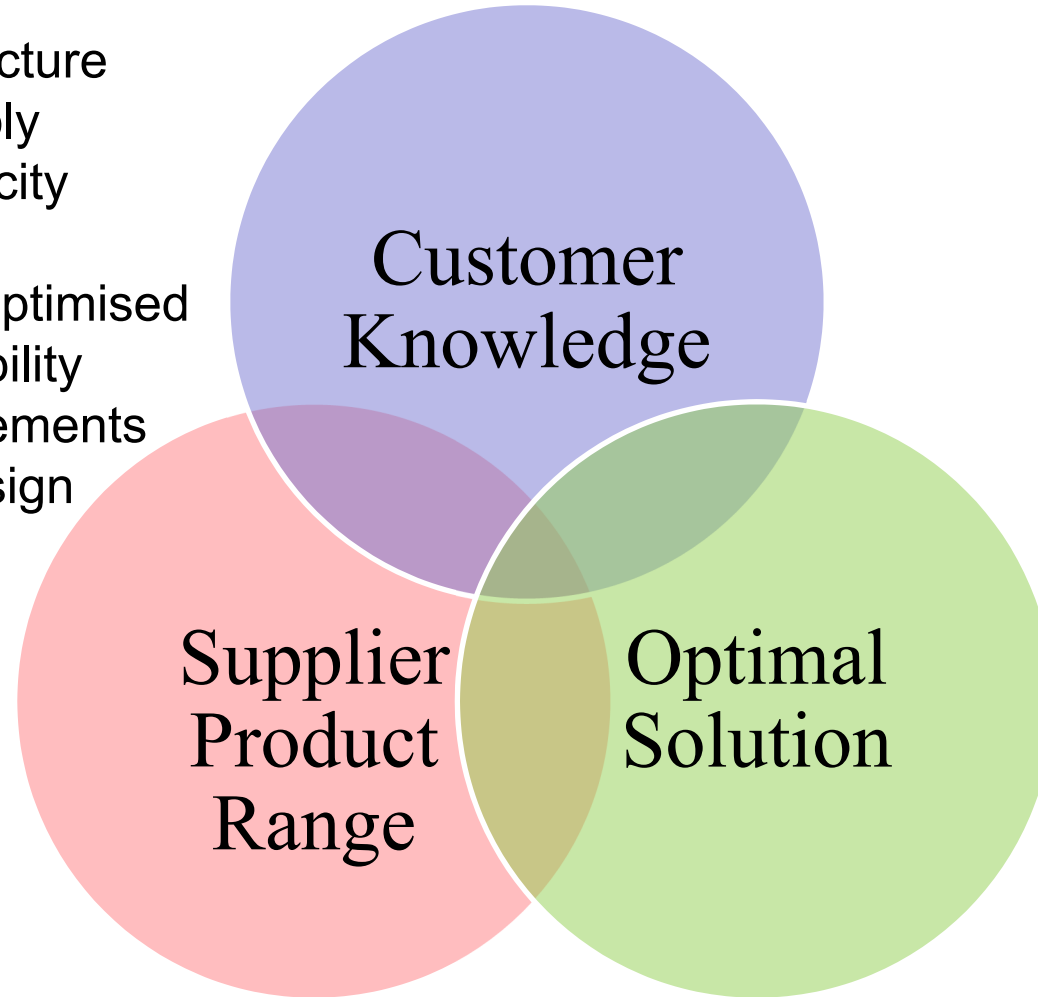
How Requirements Are Defined

- Concept strategy lead to use of standard cross section beams
- Engineering experience
- Visiting similar beamlines
- Knowledge of Supplier capability
- Customer Knowledge mislead the reference design
- Supplier Discussion lead to better design



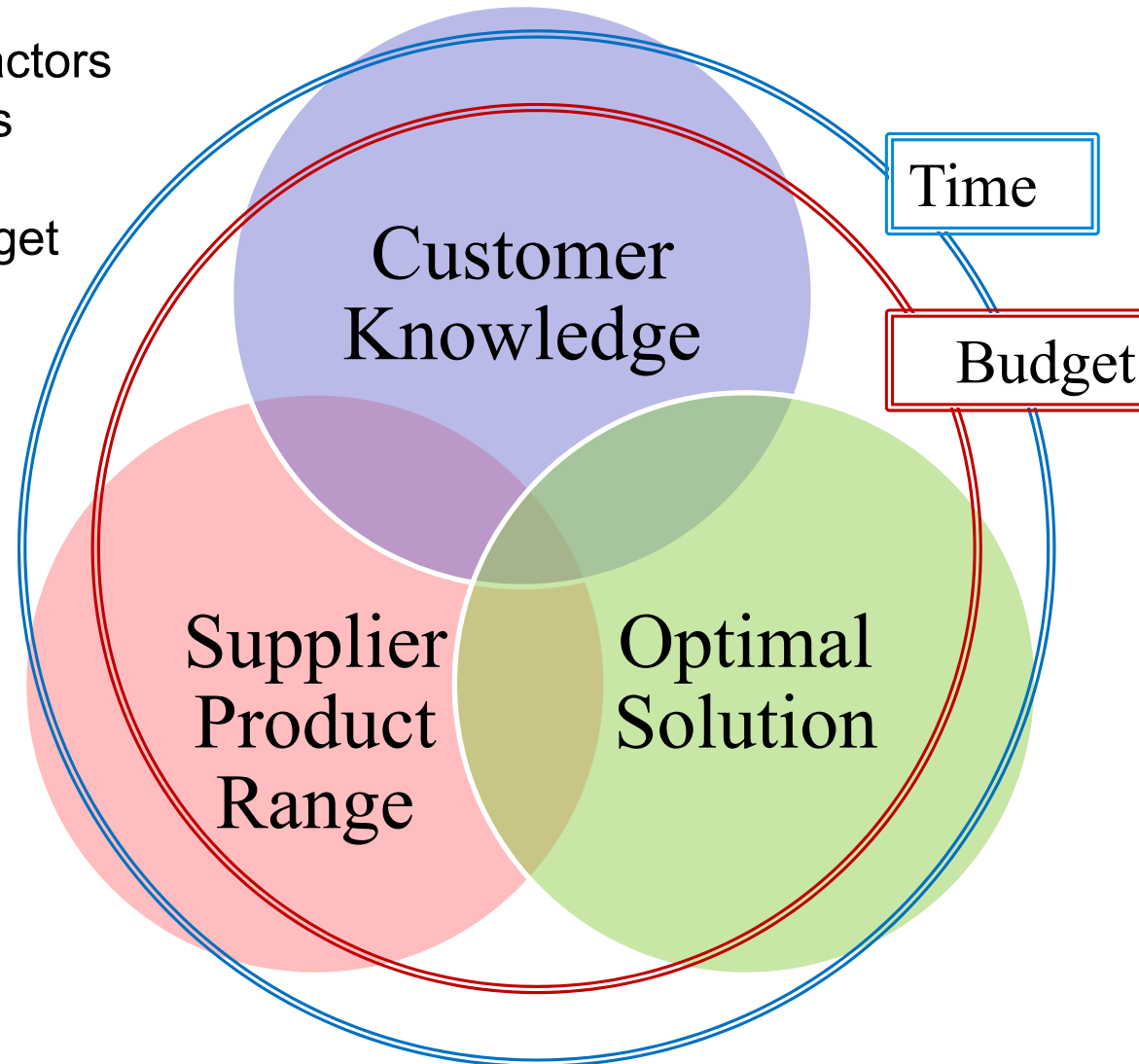
How Requirements Are Defined

- Design for manufacture
- Design for assembly
- Machine tool capacity
- Final design was optimised for suppliers capability
- Significant improvements from reference design

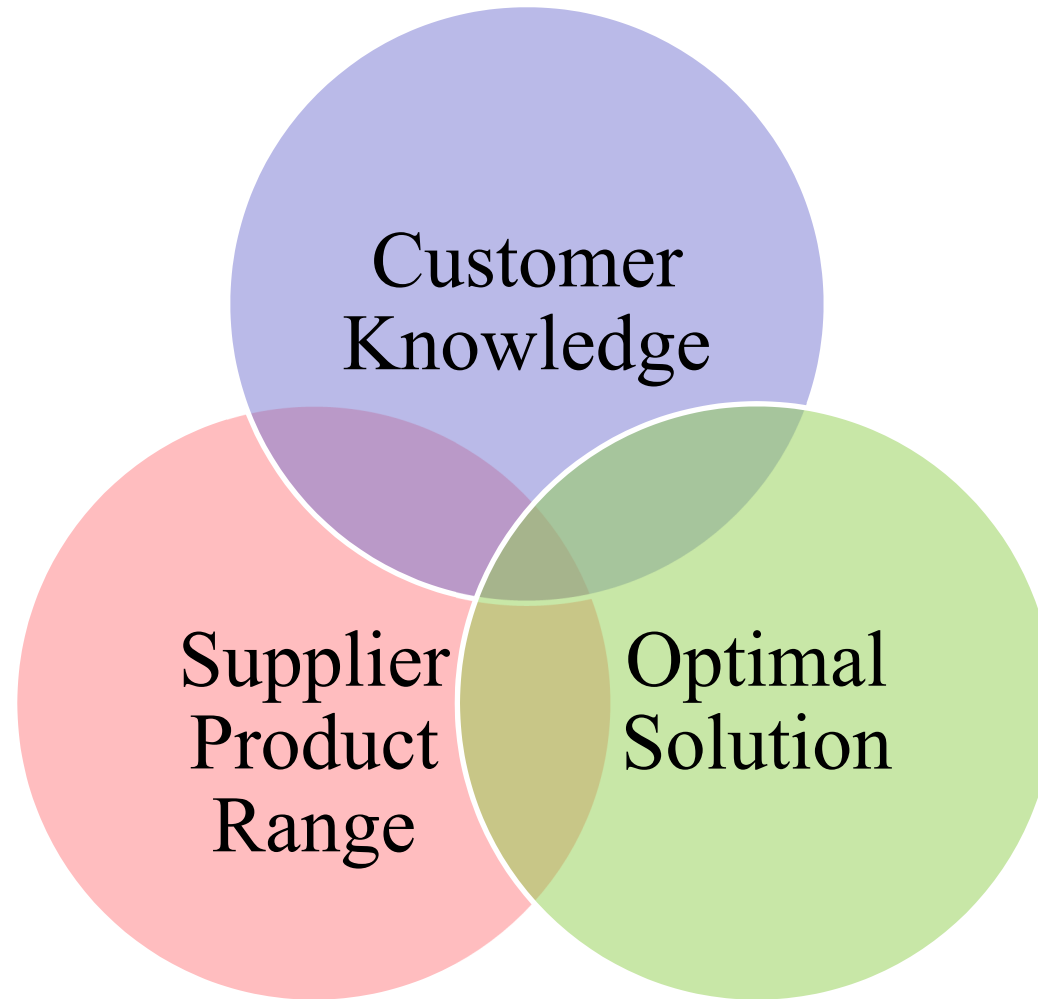


How Requirements Are Defined

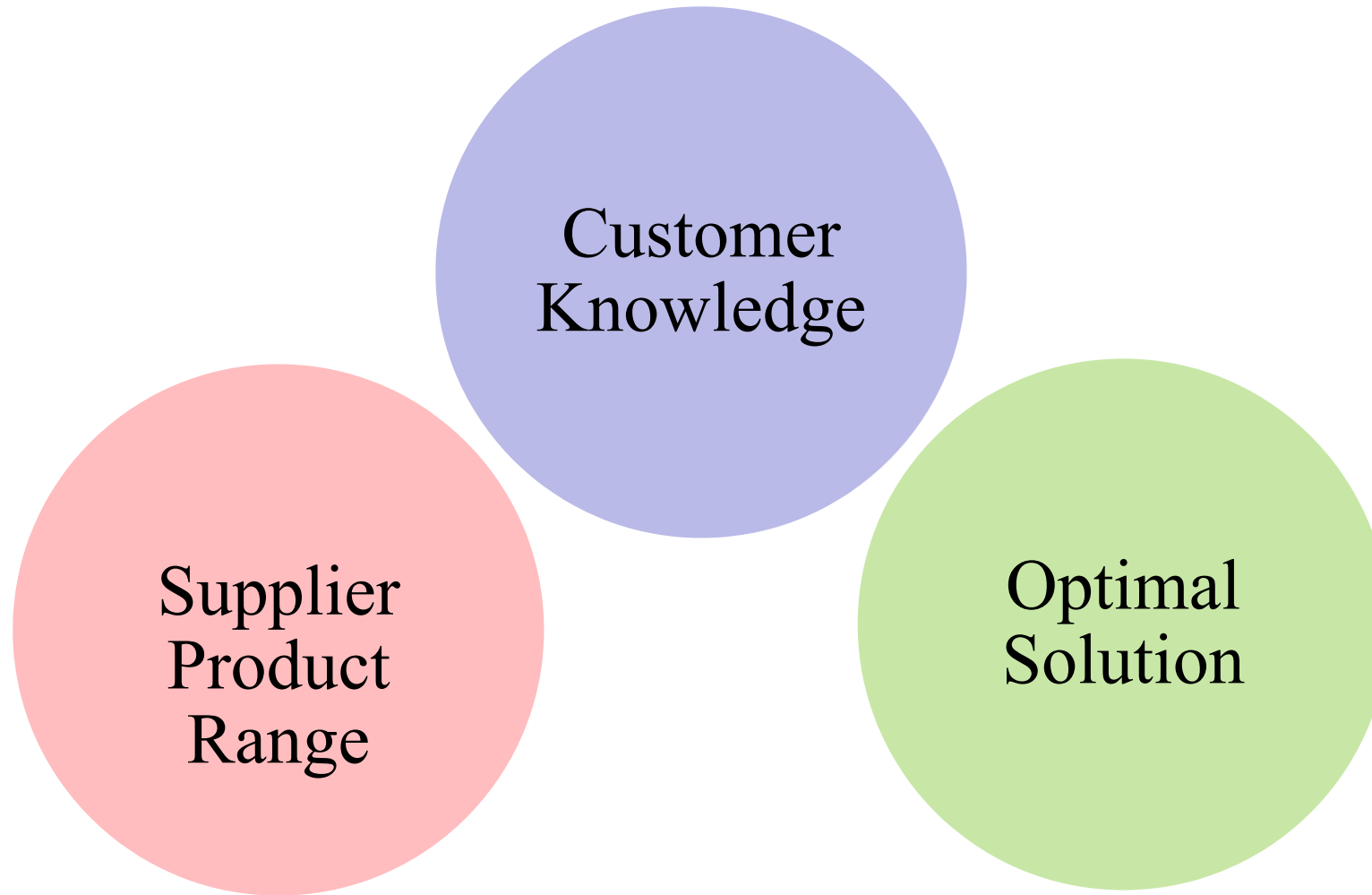
- Convergence of factors
- Further constraints
 - Time scales
 - Available budget



Our Design At The Tender Stage?



Our Design At First Meeting With Supplier - REALITY



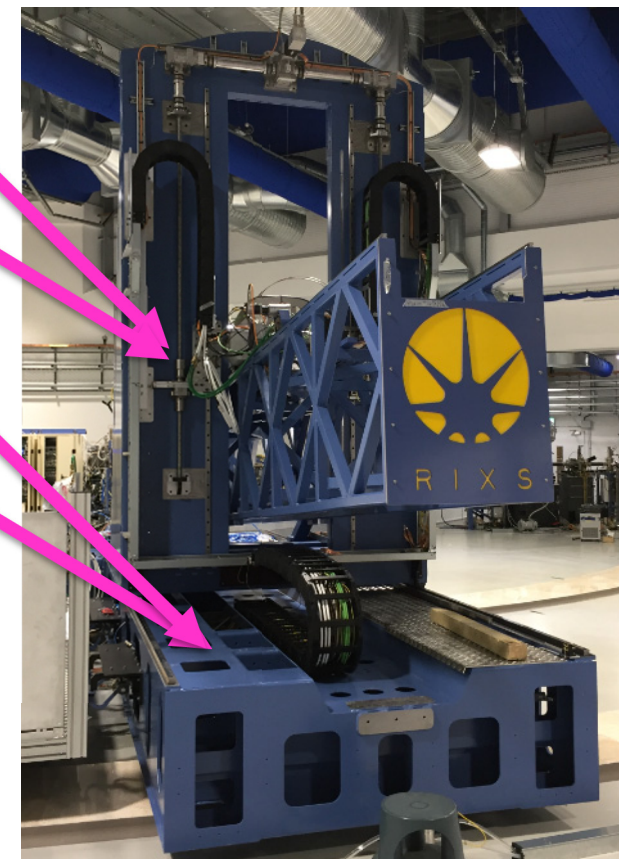
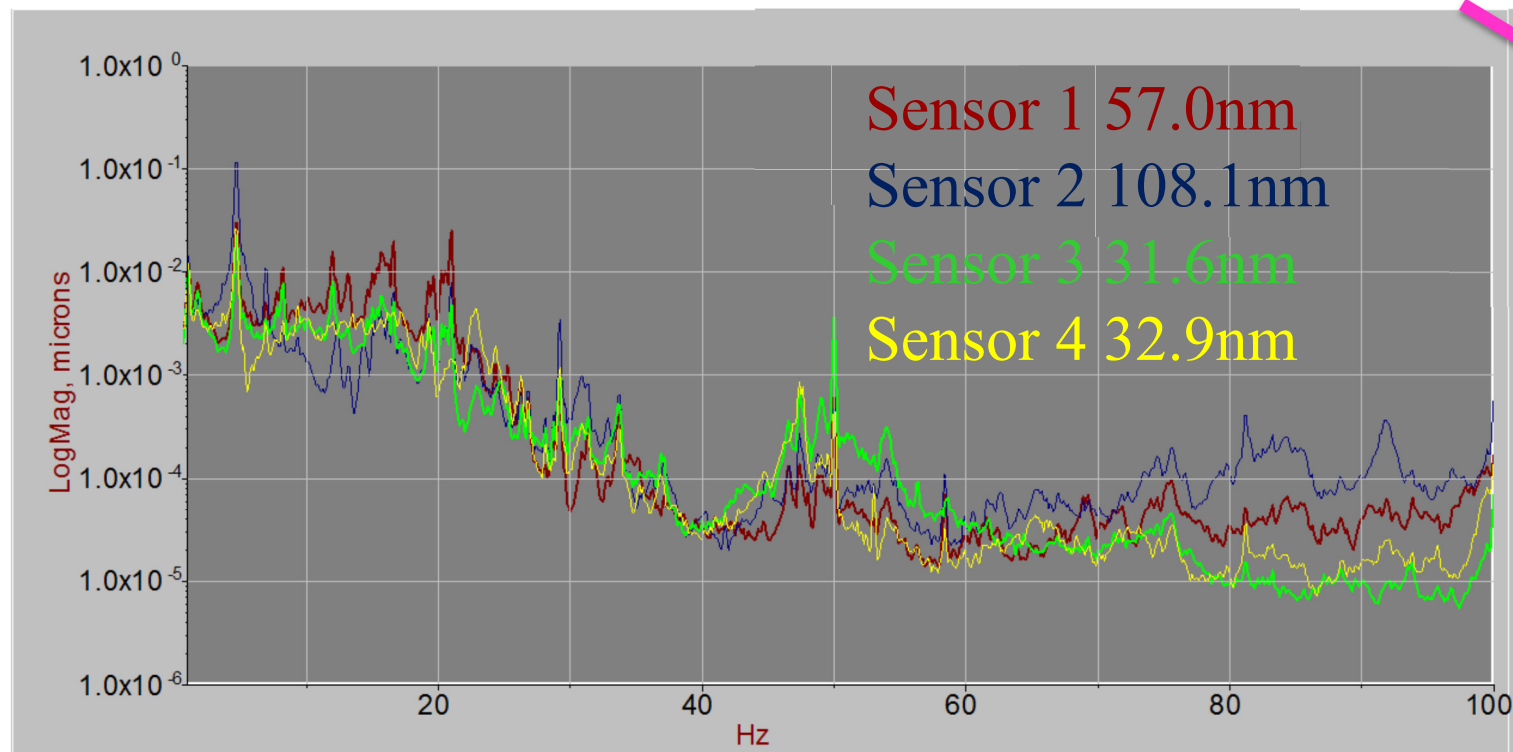
Average displacement RMS spectrum

sensor 1 (vertical)

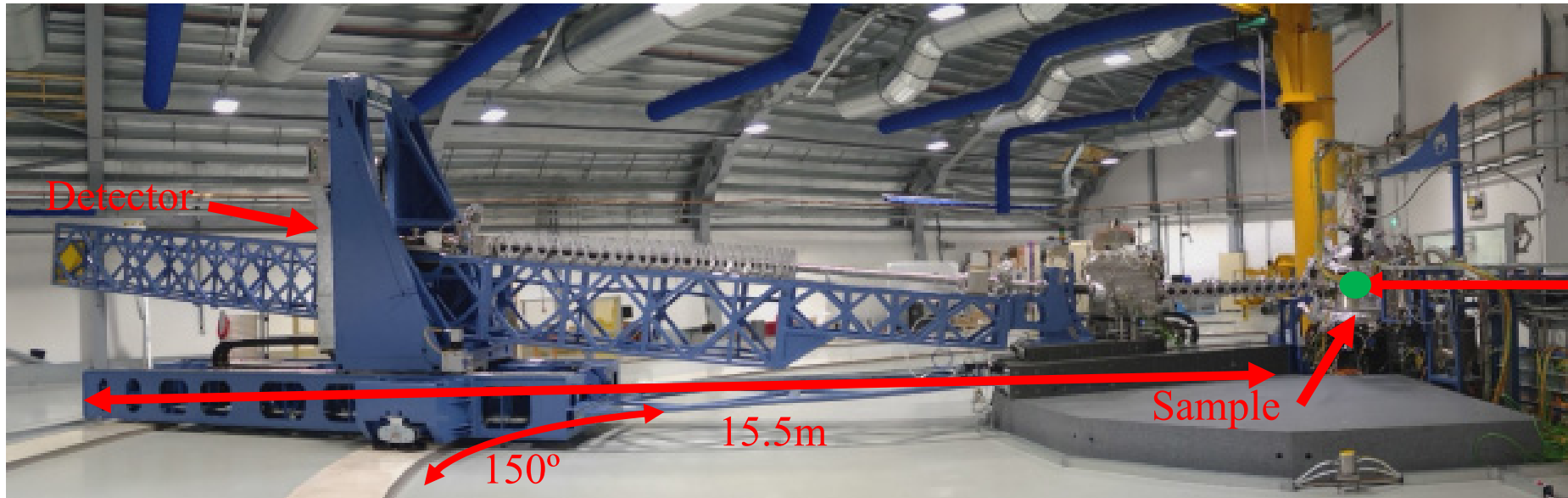
sensor 2 (horizontal)

sensor 3 (vertical)

sensor 4 (horizontal)



I21 Spectrometer



- Installed in I21 Spectrometer Hall
- Operational and taking users
- Performance is meeting the Scientists expectations

Conclusions and Lessons Learned

- Specifications for Tender need to draw out the Suppliers knowledge
 - How well does the scope of work fit with the Suppliers Product Range?
- Using a reference design may prevent a Supplier offering their full capability to provide the Optimal Solution
 - We need to recognise the limitations of our design base line
- Use a Strategy that facilitates the convergence of Customer Knowledge, Supplier Product Range with the Optimal Solution
 - We need to develop an Engineering and Procurement process that identifies and fills gaps in our knowledge
- The developments to the Spectrometer Frames with OCSAM lead to improvements that impact the quality of results the beamline can achieve.
 - Working with OCSAM gave us a second chance with the I21 Spectrometer Frame delivery

Thanks to

Kejin Zhou – I21 Principle Beamline Scientist

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Nick Baker

Andrew Walters

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Stewart Scott

Piergiorgio Giorgiutti (OCSAM)



Questions?

