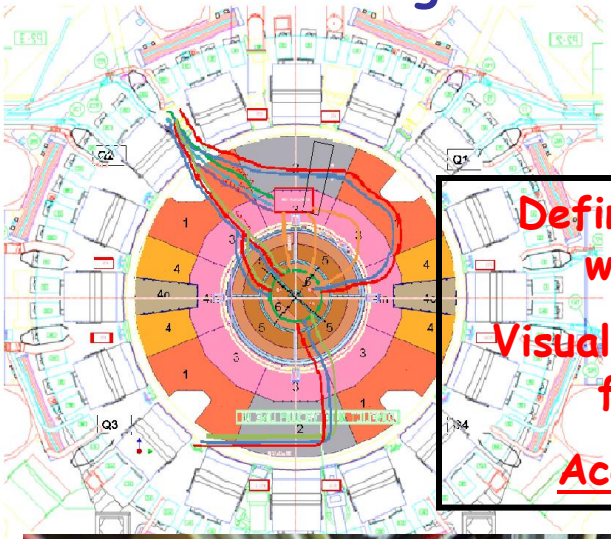
SCAN ATLAS INTO B-LAYER SERVICES DESIGN

- Status of current services to pre-design new services routing
- 3d pictures from scan
- Scan mesh loaded in Catia environment
- Reconstruction of envelope when 3d models miss
- Design of new B-Layer services (made by Sébastien Michal PH-ADO)
- Conclusions

Status of current services to pre-design new services routing

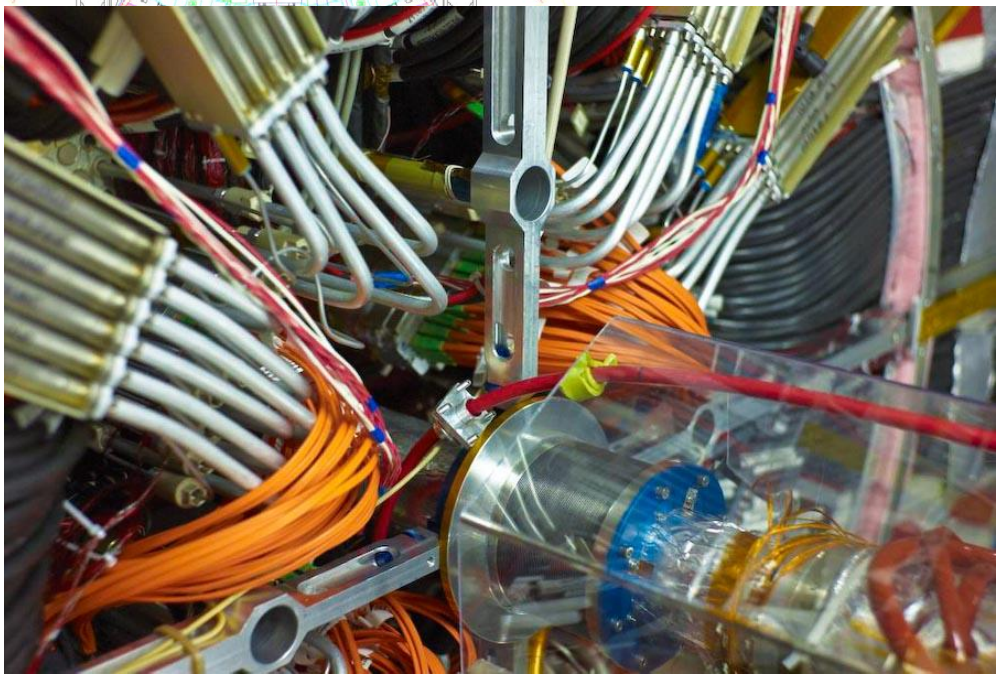
For future studies, need to scan all services routing on calorimeter faces



Define an envelope of wires and pipes

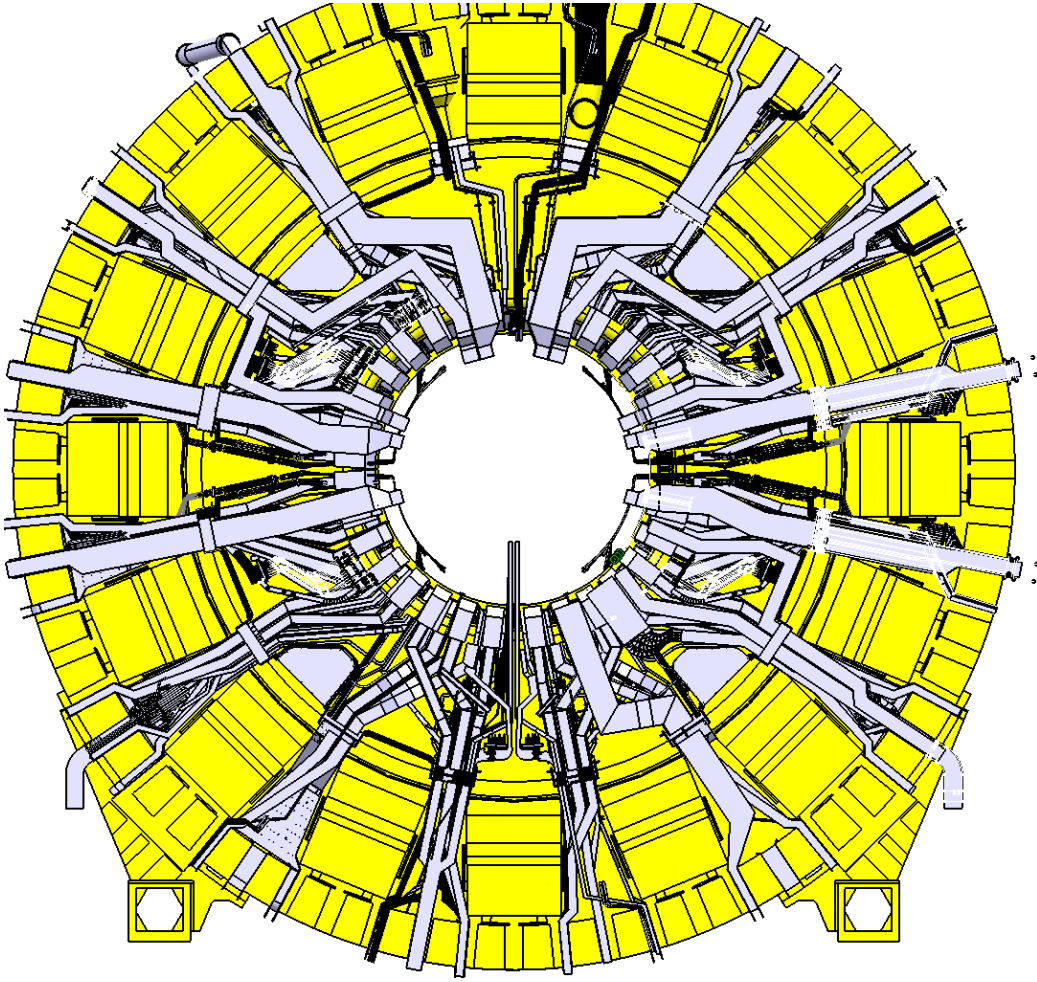
Visualize free space for future routing

Accuracy: 1…2mm



Status of current services to pre-design new services routing

And to enhance our storage data about current detector

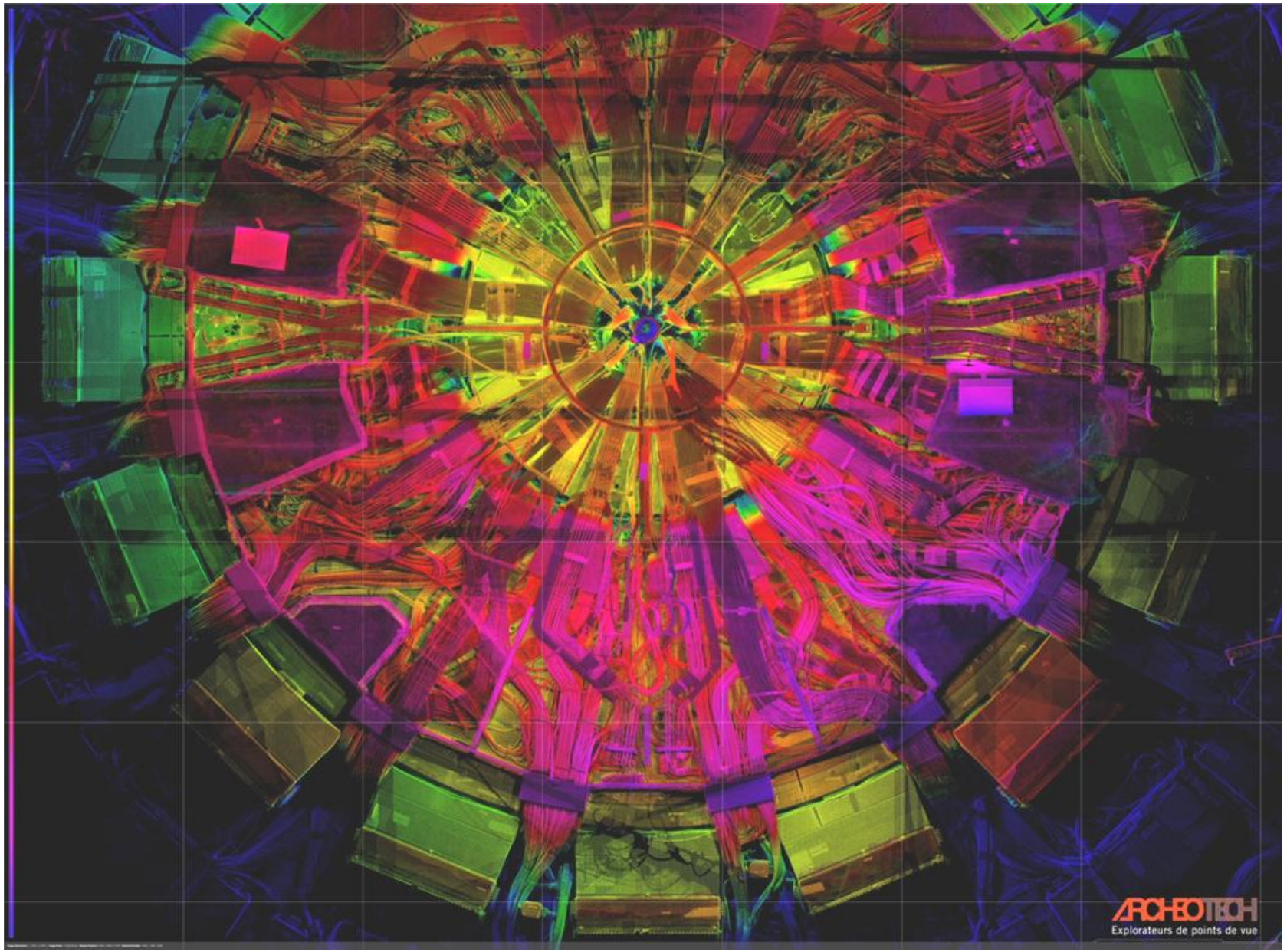


3d pictures from scan

- Atlas calorimeter face scanned with Faro Laser Scanner

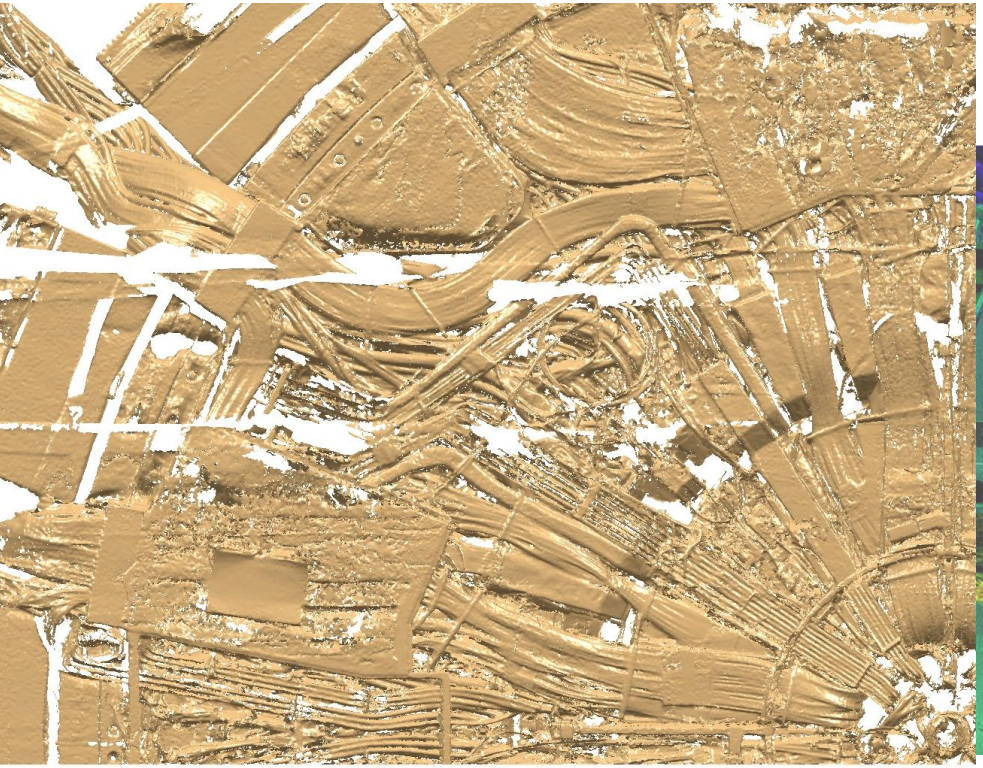
Faro Scout LT to remove useless points (at the beginning, it's a 360° picture)
to visualize 3d picture and measure distance and coordinates points.

3d pictures from scan

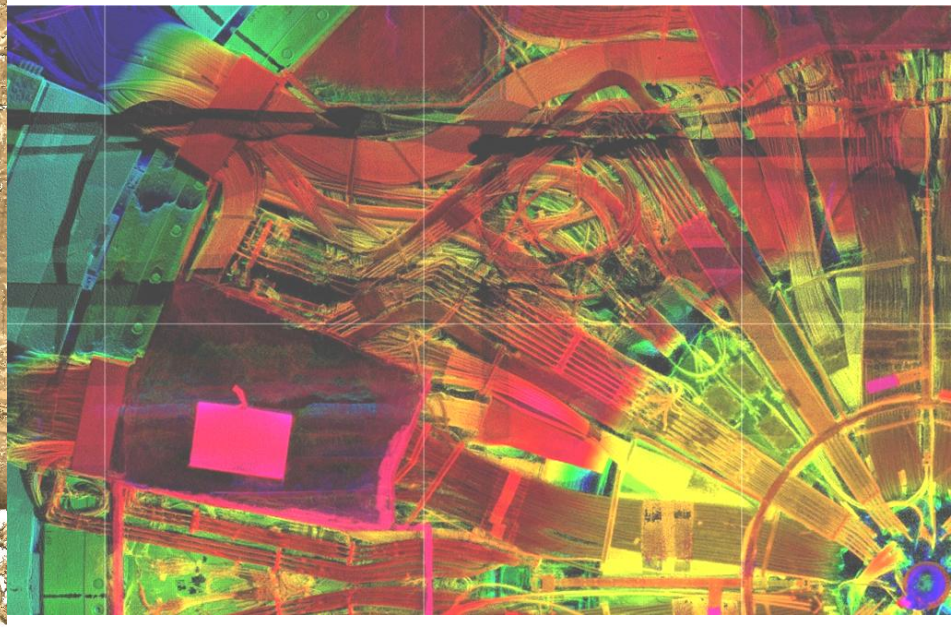


Scan mesh loaded in Catia environment

- Portion of Atlas calorimeter face scanned with Faro Laser Scanner



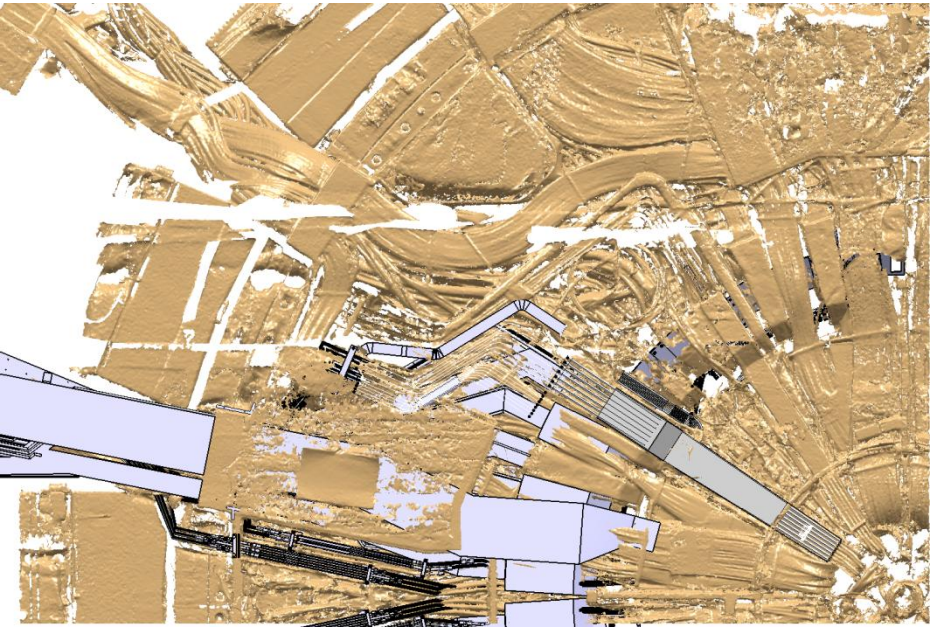
Mesh furnished by Aurélie and loaded in Catia

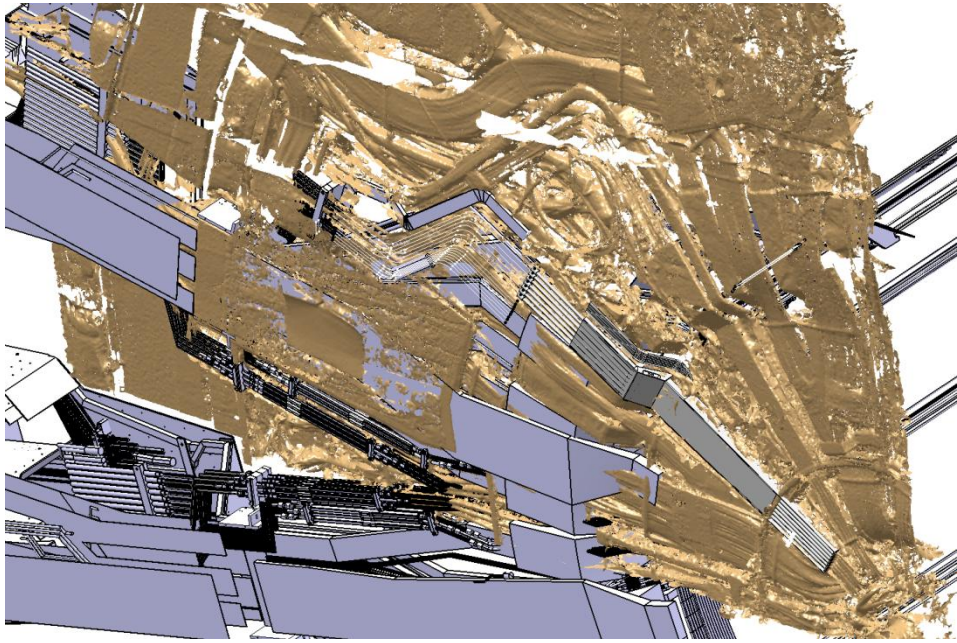


Scan picture with Pointools

Scan mesh loaded in Catia environment

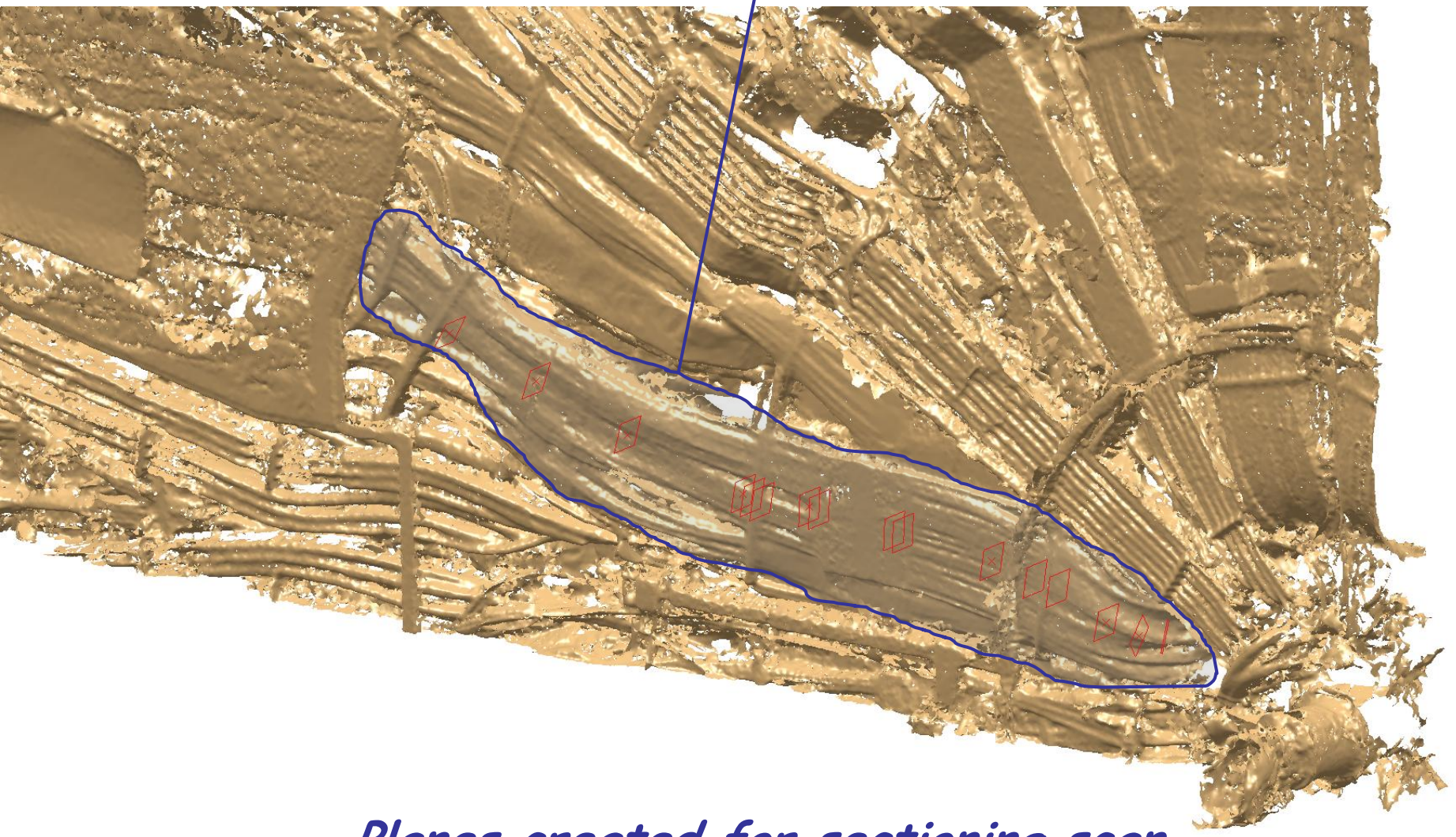
- Portion of Atlas calorimeter face scanned with Faro Laser Scanner





Reconstruction of envelope when 3d models miss

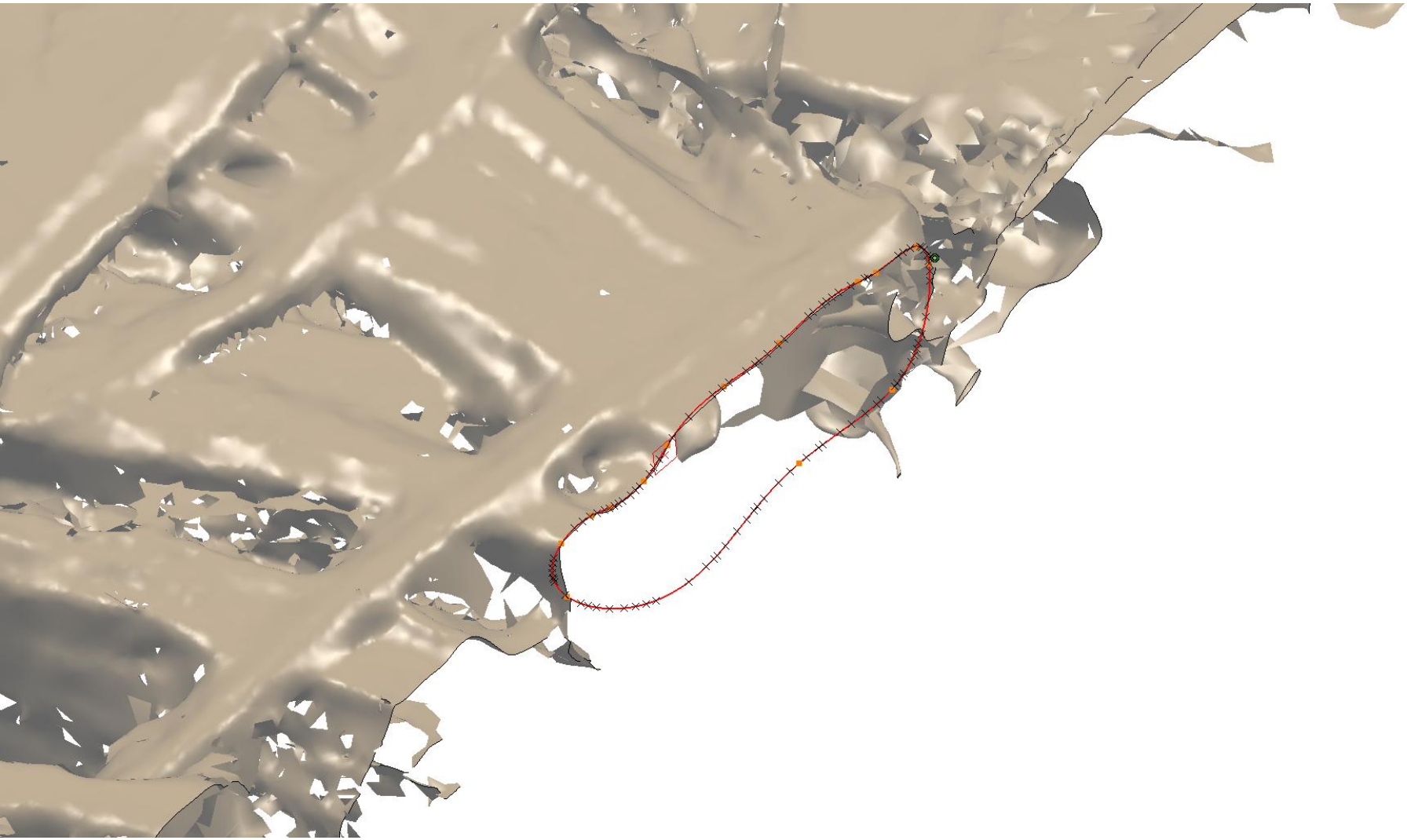
Electrical bundle missing



Planes created for sectioning scan

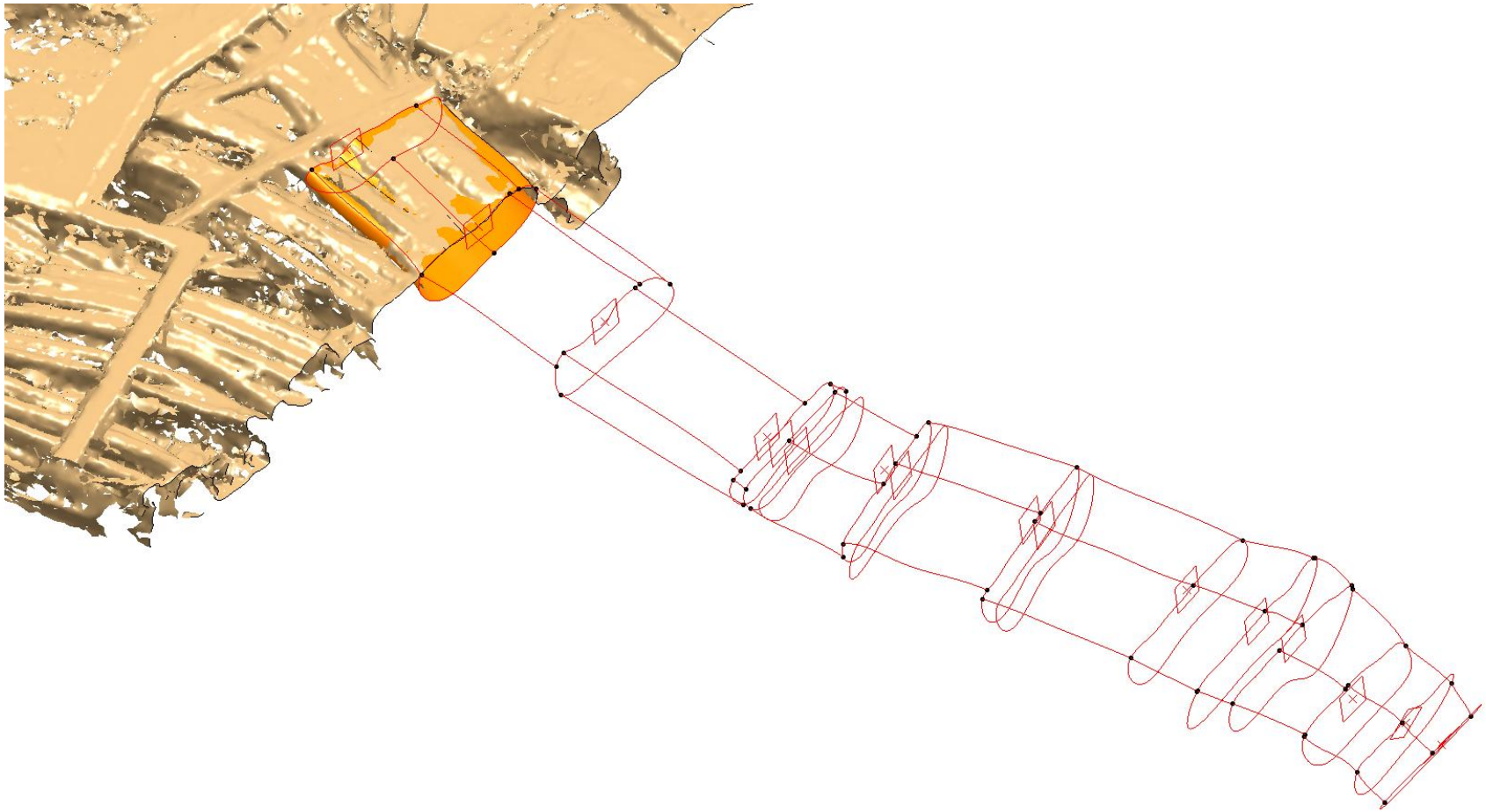
Reconstruction of envelope when 3d models miss

Envelope curve created for each section



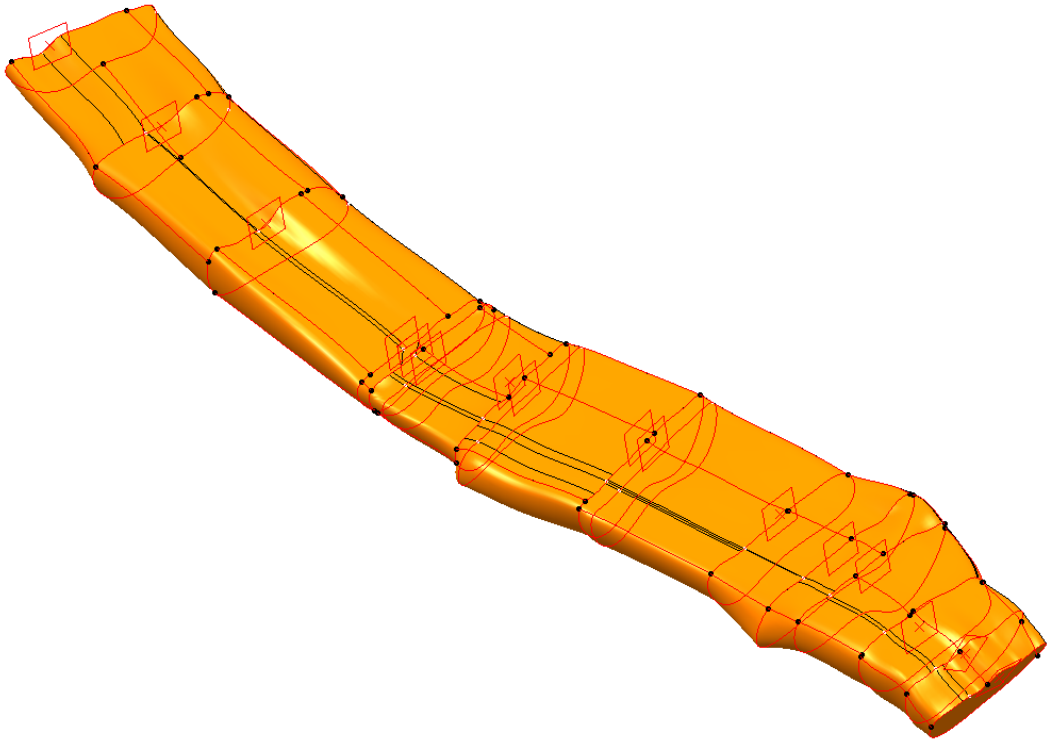
Reconstruction of envelope when 3d models miss

Envelope curves and guide lines created for each section



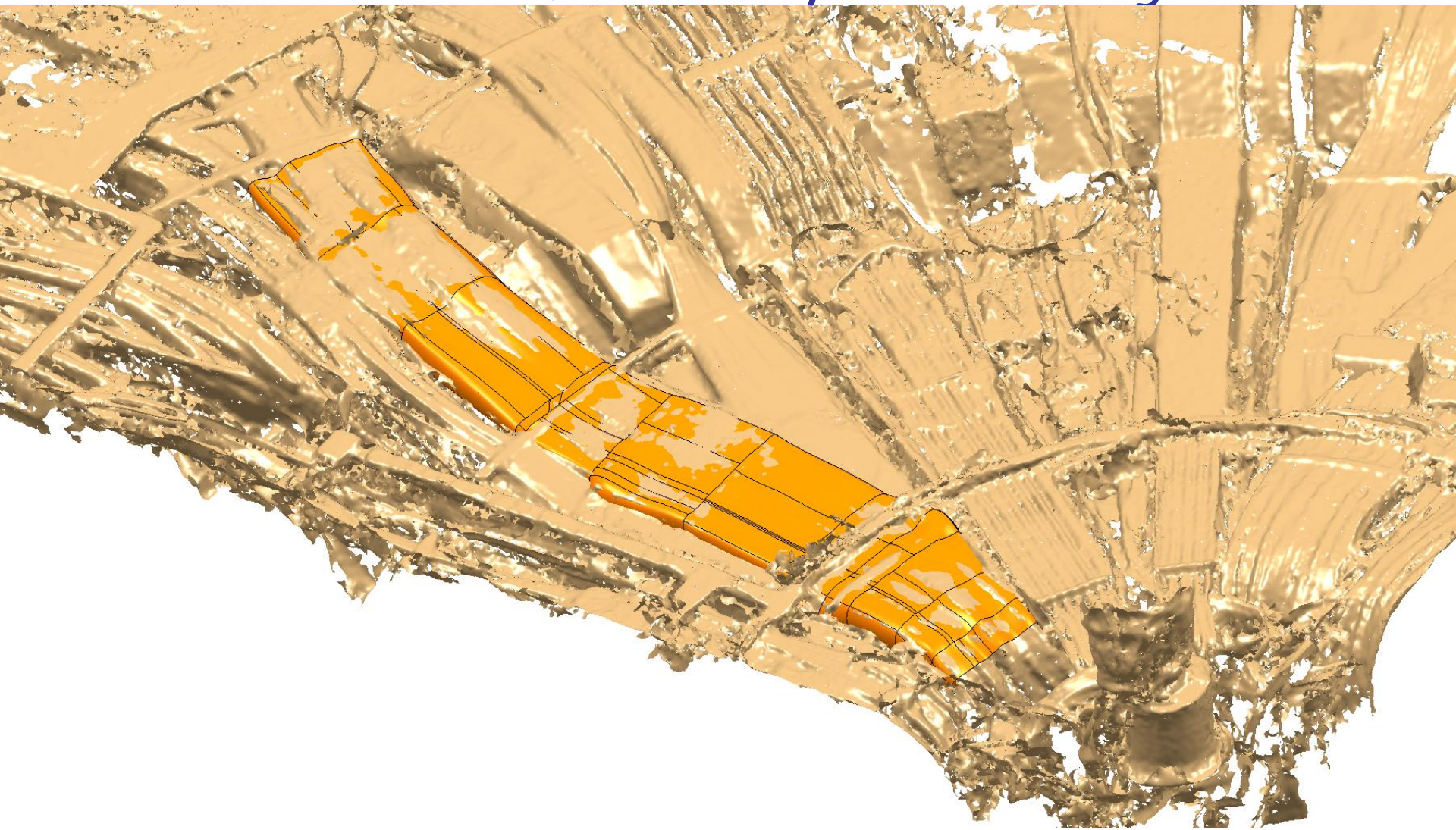
Reconstruction of envelope when 3d models miss

All volumes created from envelope curves and guide lines



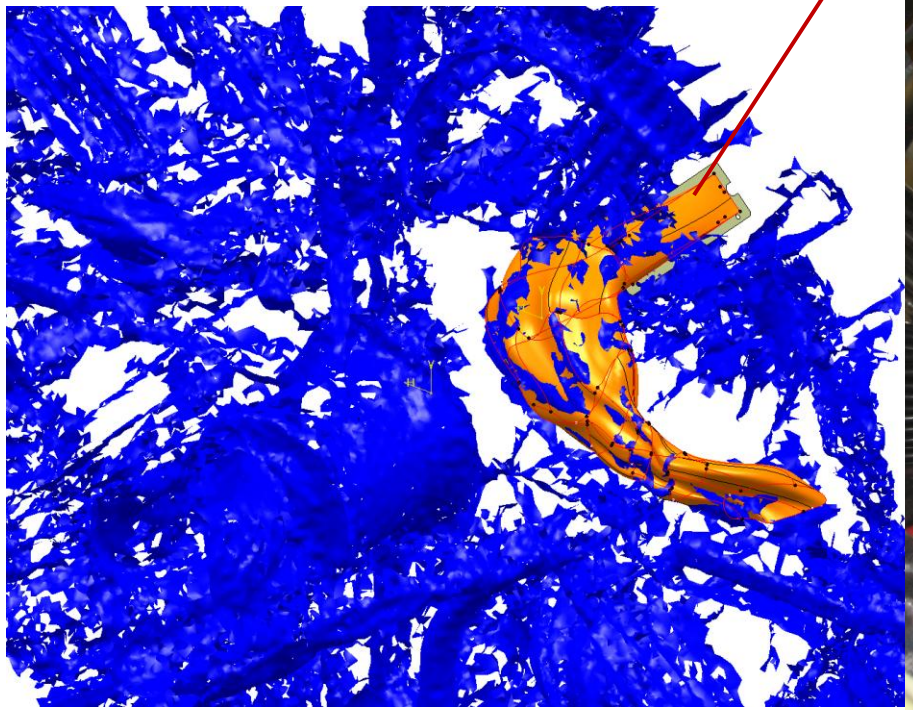
Reconstruction of envelope when 3d models miss

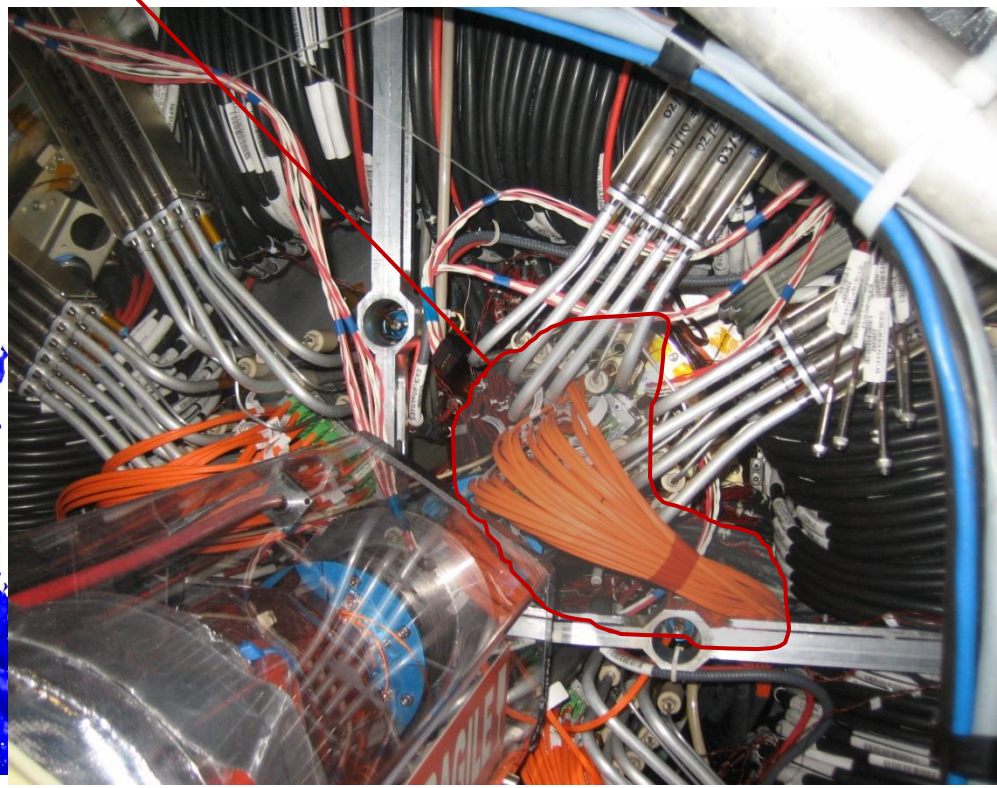
All volumes created from envelope curves and guide lines



Reconstruction of envelope when 3d models miss

Optical fiber bundle missing

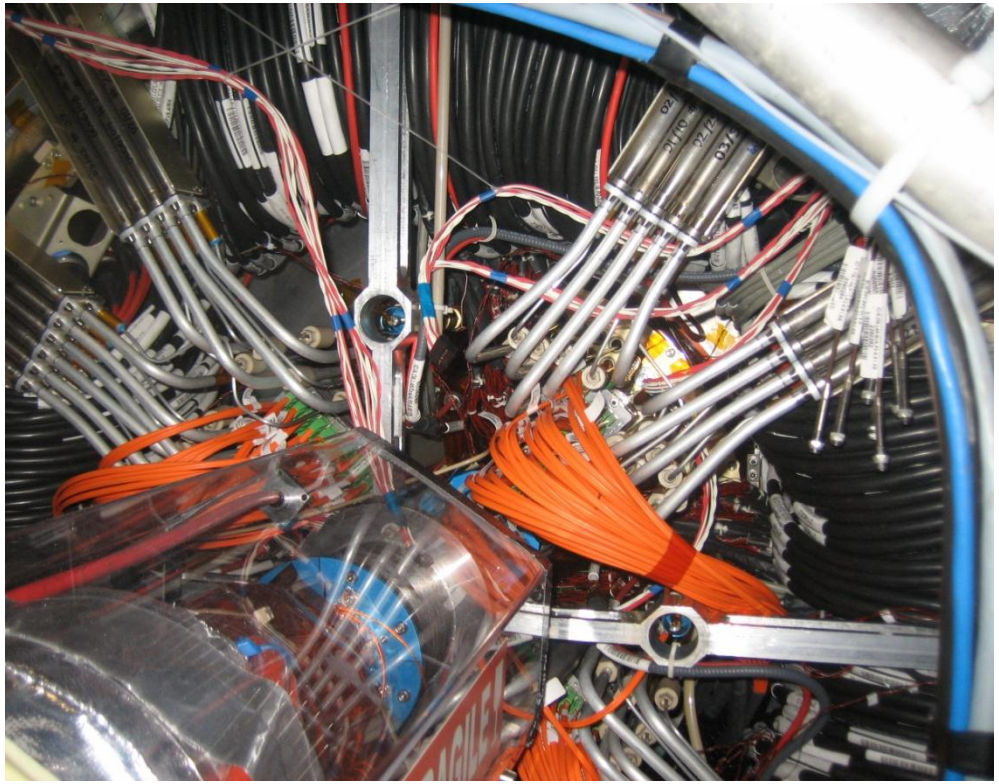


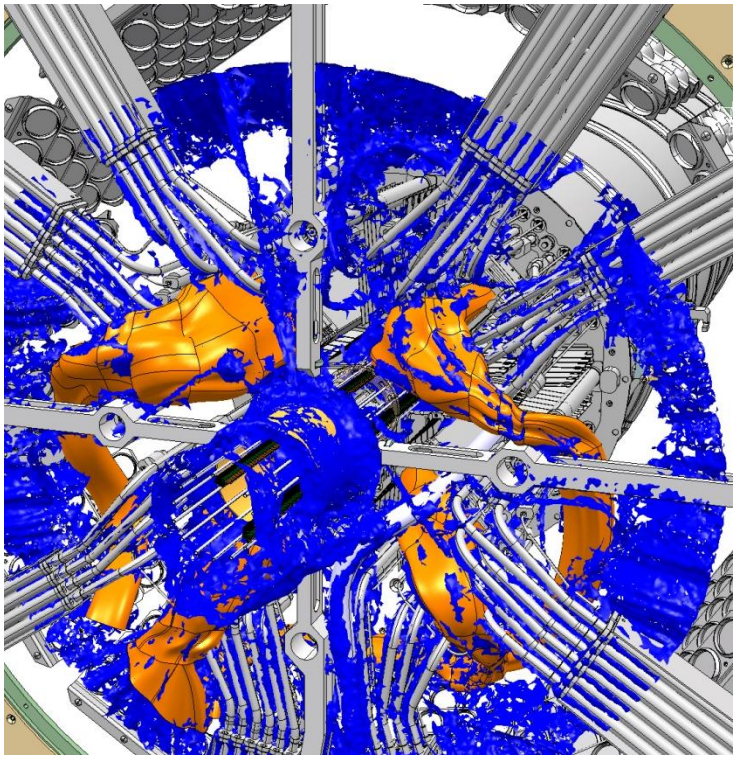


Done by Sébastien Michal (PH-ADO)

Reconstruction of envelope when 3d models miss

Final result for all optical fiber bundle





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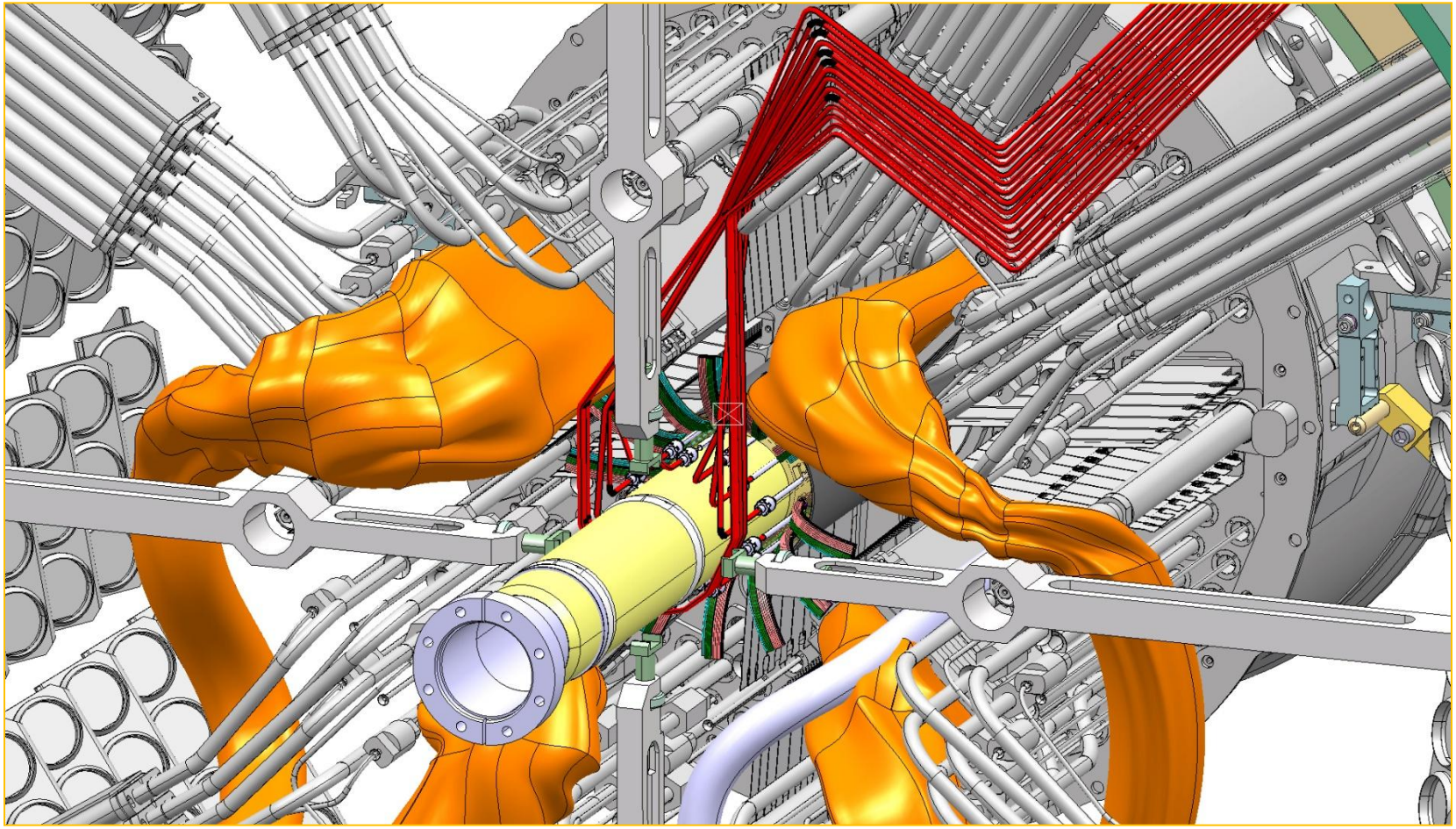
Design of new B-Layer services

Design of new services routing



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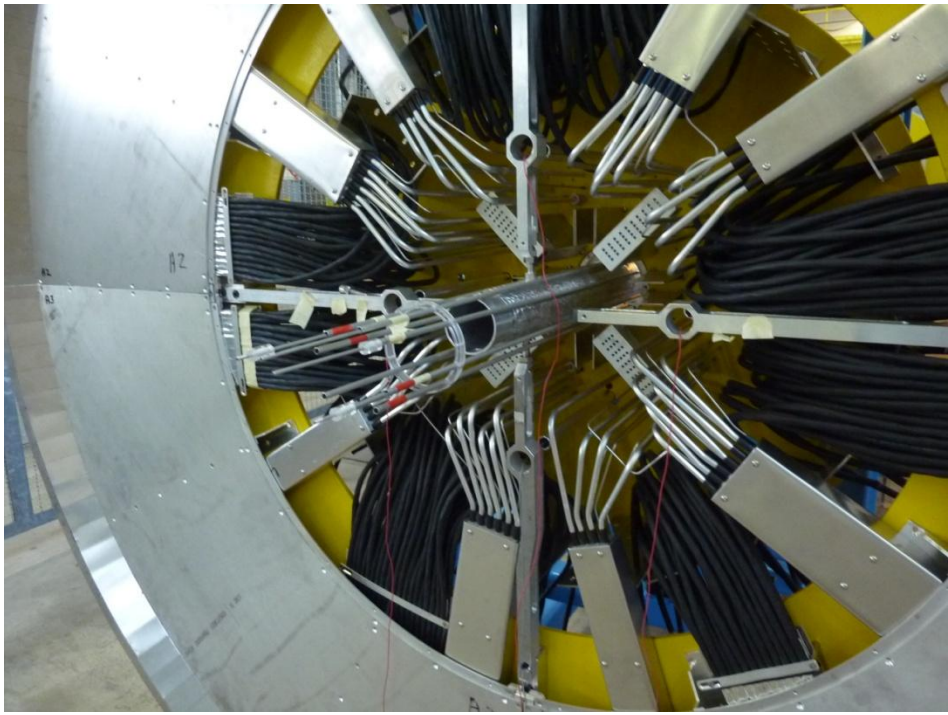
Design of new B-Layer services

Mock-up for mounting test and trial manipulation



Done by Sébastien Michal (PH-ADO)

Conclusion

What we have learned after several tests in Cern or with sellers :

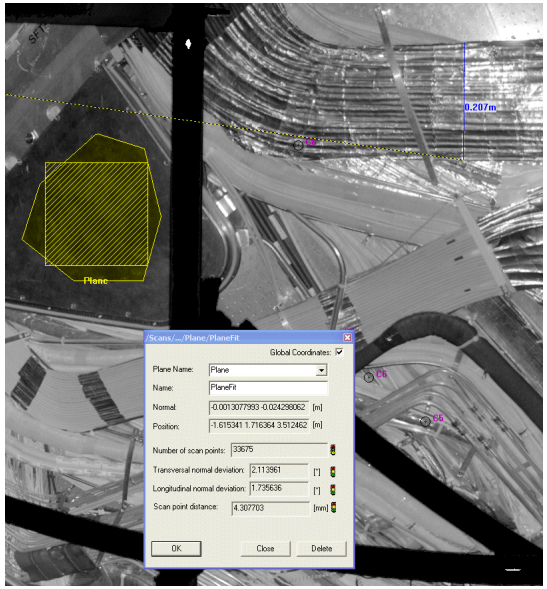
- 2 families of scan:
  - **Manual scan:**
    For small volume, with sufficiently access time.
    Give us cloud of points without noise, very easy to filter and to mesh even on Catia.
    Practically metrology tool.
  - **Remote scan:**
    Very short access time needed and target can be at a great distance.
    Give us cloud of points with lots of noise. Filter them is very time consuming, and requires dedicated softwares.
    Accuracy is worst than manual scan, and depend on filtering and smoothing level.

- Results for Atlas example:
  - We are able to re-build 3d models envelope.
  - We have documentation as built we couldn't have without scans (2 days free access in situ).
  - In retrospect, perhaps Faro scanner was not the best choice for our case.

General conclusion

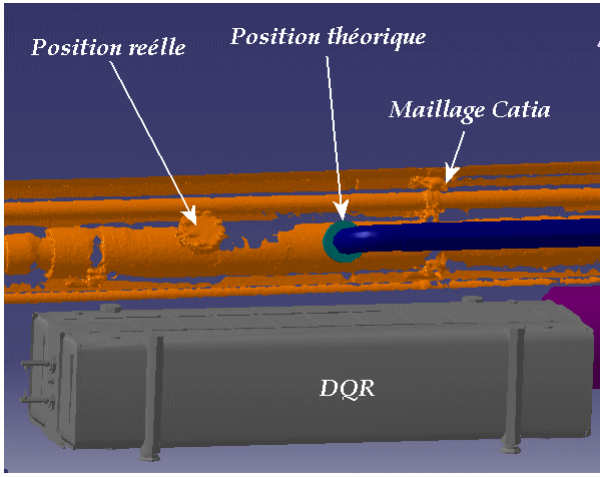
What you can expect from laser scanning techniques:

Measure distances, diameter, plane parameters

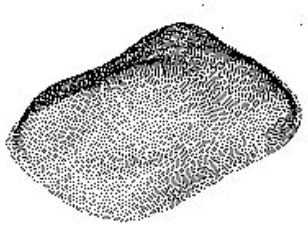


Construct geometrical sets (Points, planes, circles, cylinders)

Compare as built with 3d model: complete/correct existing data



Modelize 3d model and extract 2d drawing to construct the same one



General conclusion

Future of laser scanning techniques in Cern:

- Choose the more appropriate laser scanner and software for Cern needs.
- Find budget to procure them.
- Learn better software use by training
- And use them for:
  - Inspection of the built elements (tolerances and mechanical specifications)
  - to check envelopes, interfaces and services needed in the phase of assembly and integration
  - to improve documentation (missing of poor documentation) for later modification or intervention
  - To implement a virtual "as built" environment to simulate and minimize the time for later interventions in the experimental areas, optimizing the efficiency during shut down and decreasing the exposure of operators to potentially radioactive components. It can also provide the required boundaries for partially automated interventions.