Some Technologies at the MAX IV Facility

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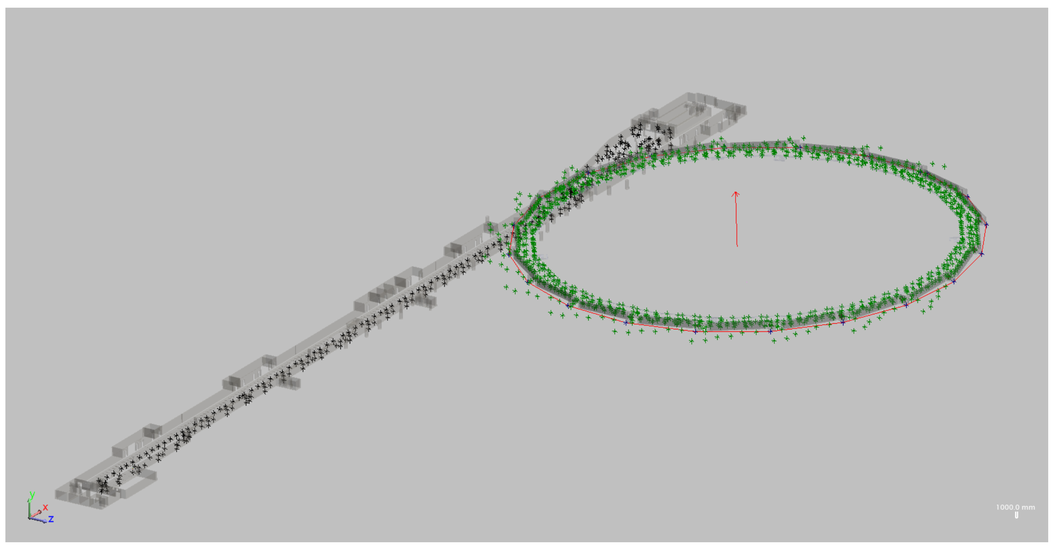
Introduction

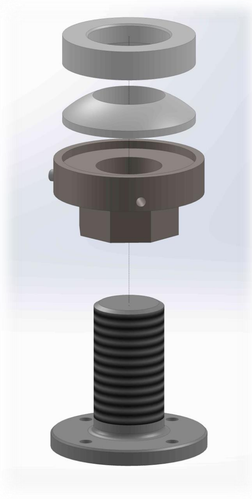
The new facility at MAX IV Laboratory consists of the following parts:

- 250 meter long LINAC with the maximum 3.4GeV energy
- two storage rings: smaller ring will have electron energy of 1.5GeV and circumference of 96meter. The bigger ring will have electron energy of 3GeV and a circumference of 528meter.
- SPF (Short-Pulse Facility)

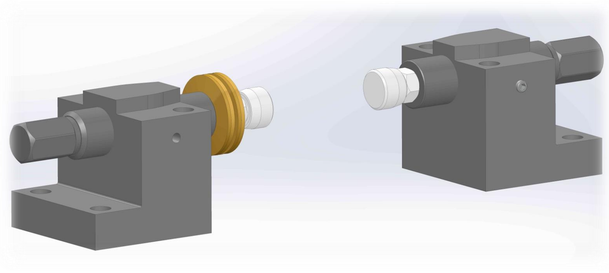
In the first phase 13 beam lines will be build, in total 30 beam lines at two rings will be possible.
In additional the MAX IV design also includes an option for the FEL (Free Electron Laser) as a future development stage of the facility.
The alignment group is a part of the stability group at MAX IV Laboratory and consists of five people. Our general task for the near future is to establish the reference network for all beam lines components for the new facility. LINAC components are already aligned as well as reference network for both rings is established.
All observation are carried out with two Leica AT401 and level observation are carried out with two Leica Wild N3.
The data are collected and stored in Spatial Analyzer and PANDA software package.
Solid Works is used to generate all 3D models and Spatial Analyzer is used to fitted Adjusted network into a 3D models.



Kinematic Screws



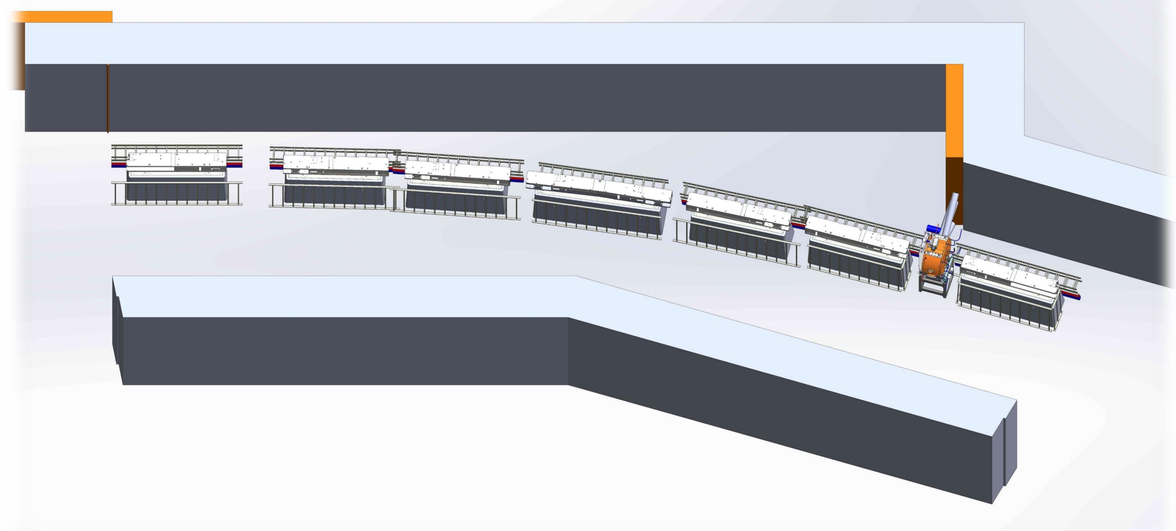
The positions for the adjustment screws are as close to the electron beam as possible. This increases the stability and alignment efficiency. This philosophy is used everywhere in the facility where items have to be aligned. Vendors of beamline components are urged to use the same screws.



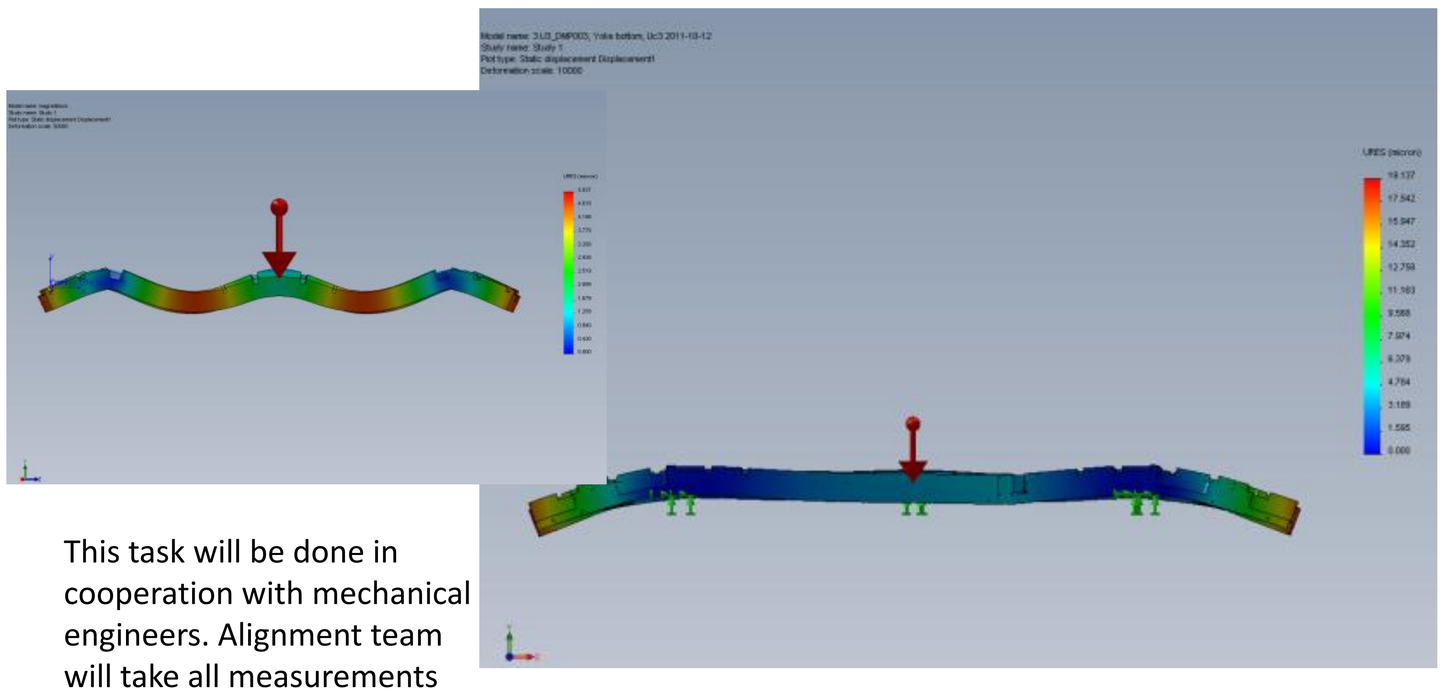
3GeV Achromat

The 3GeV ring consists of 20 achromats each with 7 magnet blocks. The large picture shows one achromat. Each magnet block have several different magnet functions like dipole, quadrupoles etc. Each magnet block consists of two pieces that are machined out of steel blocks. The coils, PBM heads, vacuum chamber etc. are put inside and the system is closed like a sandwich.

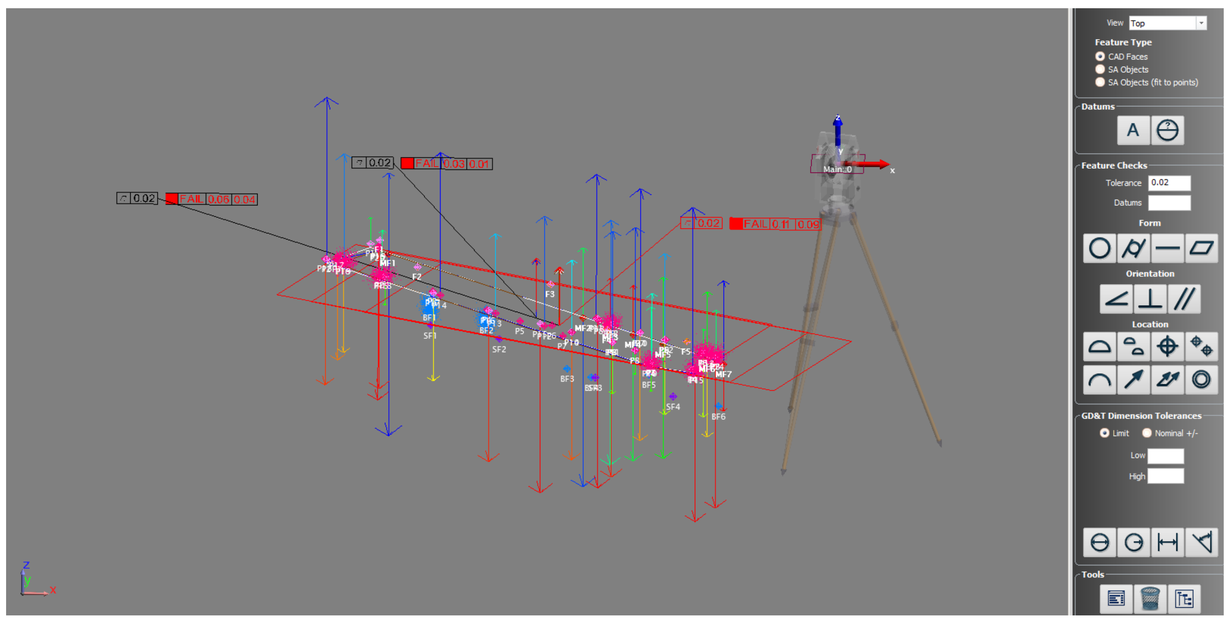
This method enables high precision between the magnet functions within a block. This relaxes the tolerances on block alignment and vibration stability. Using concrete block supports that are grouted to the floor ensures high Eigen frequencies of the system. The lowest calculated Eigen frequency is 90Hz if one disregards the modes where the global soil dynamics are dominating.

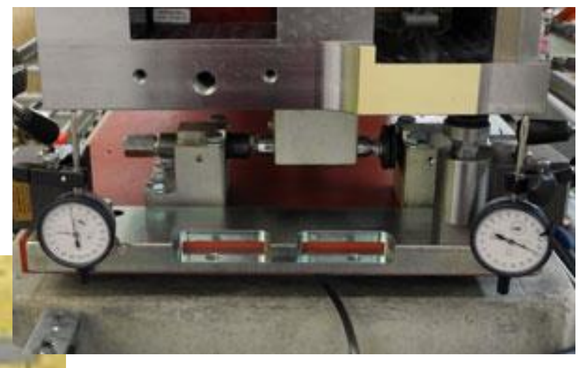


All of the magnets block are aligned vertically with help of three adjustment screws. This solution and the fact that magnet block will be reassembled as two parts during the alignment activities produces a bend of iron blocks. FEM analyses showed that that alignment team need to consider this bend and align straightness of the iron blocks within tolerance of 20µm.



This task will be done in cooperation with mechanical engineers. Alignment team will take all measurements with Leica AT401 and Romer Absolute Arm.
All data and calculation will be stored in Spatial Analyzer software especially use the GD&T package.
First stage will be to set up measurements using metrological clocks and compare those measurements with Leica AT401 and Romer Absolute Arm measurements.
Next challenge will be to adjust straightness of iron block regarding to previous measurements and reassembling upper and bottom part.
After all these steps the team will have to measure deformation of whole magnets block using a calibration bar and CMM instruments.





More information and reports can be supplied by tomasz.zawieruch@maxlab.lu.se

The MAX IV Laboratory

The MAX IV Laboratory opened for operation in 1987 (under the name MAX-lab) and is a national laboratory operated jointly by the Swedish Research Council and Lund University. The laboratory supports three distinct research areas: Accelerator Physics, Research based on the use of Synchrotron Radiation, and Nuclear Physics using high energy electrons.

At present three synchrotron storage rings are in operation MAX I-III and each year close to 1000 researchers visit the laboratory to perform experiments. The MAX IV laboratory is also responsible for the build up of the MAX IV facility situated in the Brunnshög area just outside of Lund and approximately 2 km from the present facility.