MAX IV Laboratory Status

Kontrollsystem & IT Services (KITS)

Tango Workshop, ALBA, 23rd May 2013

MAX IV

Kontrolls & IT Services (KITS)

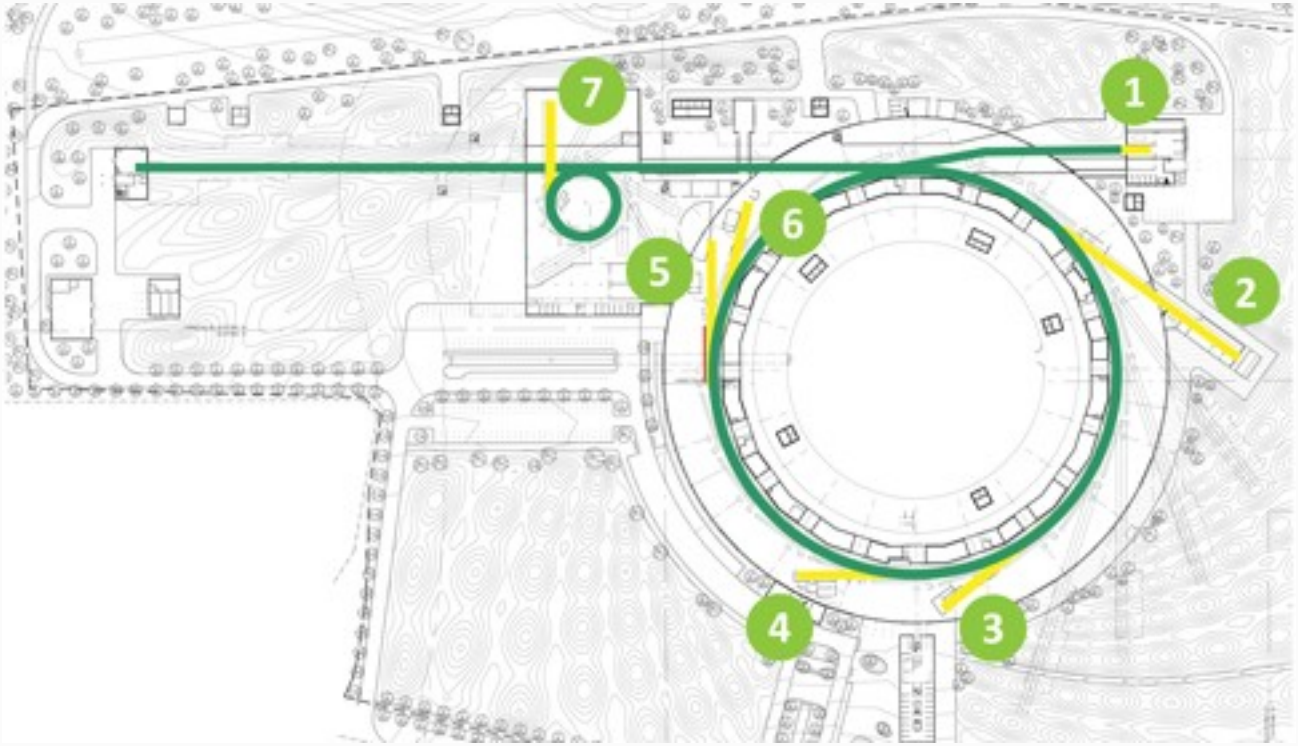
- We are a small group
  - Controls Software
    - Vincent Hardion,
    - Andreas Persson,
    - Mirjam Lindberg,
    - Antonio Milan
    - (+2 recruitments)
  - Controls Hardware
    - Julio Lidon-Simon,
    - Jerzy Jamroz
    - (+2)
  - Networks, Servers, Systems
    - Tobias Lundquist,
    - Daniel Liikamaa (+2)
  - IT Support
    - Tor Auster, Andras Vancsa,
  - Strategy, Scientific & Information Management Systems
    - Krister Larsson, Jason Brudvik (+1)
- Currently agreed total group size of 19 for MAX IV
  - Based on initial facility with 7 beam lines

MAX IV Design Features

- Full energy linac
  - Free Electron Laser planned later in 2018 onwards
- Short pulse facility at end of linac
  - Femtosecond time resolved experiments
- Two storage rings (1.5GeV and 3GeV)
  - Favoring the large soft X-ray community
- Integrated multibend acromat magnets
  - Part of reducing accelerator component scale

MAX IV

MAX IV Topology



8 Beam Lines

- BioMAX – Protein Crystallography
- VERITAS - Resonant Inelastic X-ray scattering
- HIPPIE – High Pressure High Resolution Electron Spectroscopy
- NanoMAX – micro and nano beams for imaging, diffraction scattering, fluorescence
- FemtoMAX – femtosecond experiments
- ARPES (1.5GeV) - angle-resolved photoelectron spectroscopy
- BALDER – hard X-ray absorption spectroscopy
- FinEstBeams (1.5GeV) – Finnish Estonian materials science

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MAX IV Main Milestones

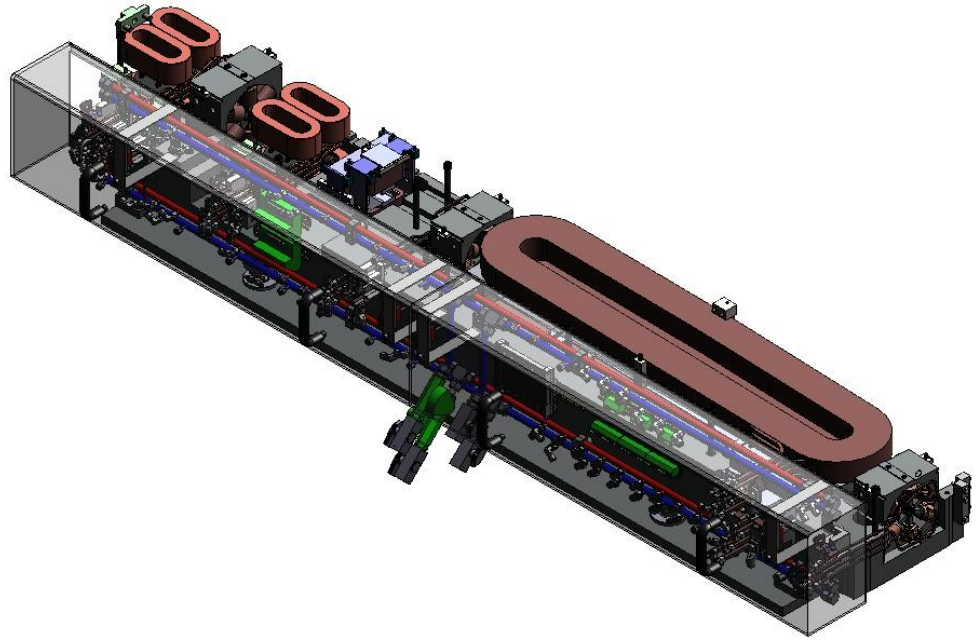
- Linac installation access mid-May 2013
  - Mobile phone coverage and fibre connection being installed.
- Linac commissioning start March 2014
- Femtomax (SPF) end of 2014.
- Storage rings commissioning March 2015
- MAX IV open 21st June 2016

MAX IV Accelerator Sub-systems

- Power supplies
- Timing
- RF
- vacuum, safety, magnets, machine protection, cooling, diagnostic, waveguides, laser, accelerator units, LLRF….

Magnet Power Supplies

- Specification for 1008 magnet power supplies
- Ranges from 10W to 234kW, 16-18bit
- Chose ‘PolyAmp’ (Delta), ‘Danfysik’ and ‘Itest’.
  - We are writing the Tango devices
- Coils for fast orbit correction may be installed?



Power Supplies

- Site Acceptance Tests (|Itest, Delta Elektronika and Danfyisk)
  - No tango testing itself
  - Itest (c++ library delivered)
  - Delta elektronika (library developed with similar interface)
  - Attempt to converge towards standard interface later
  - Stress testing and performance/response time testing (using scopes)
  - Danfysik yet to come
- Results
  - Itest passed all the tests
  - Delta elektronika has 3 or 4 different interface models, less functional than itest (triggers)

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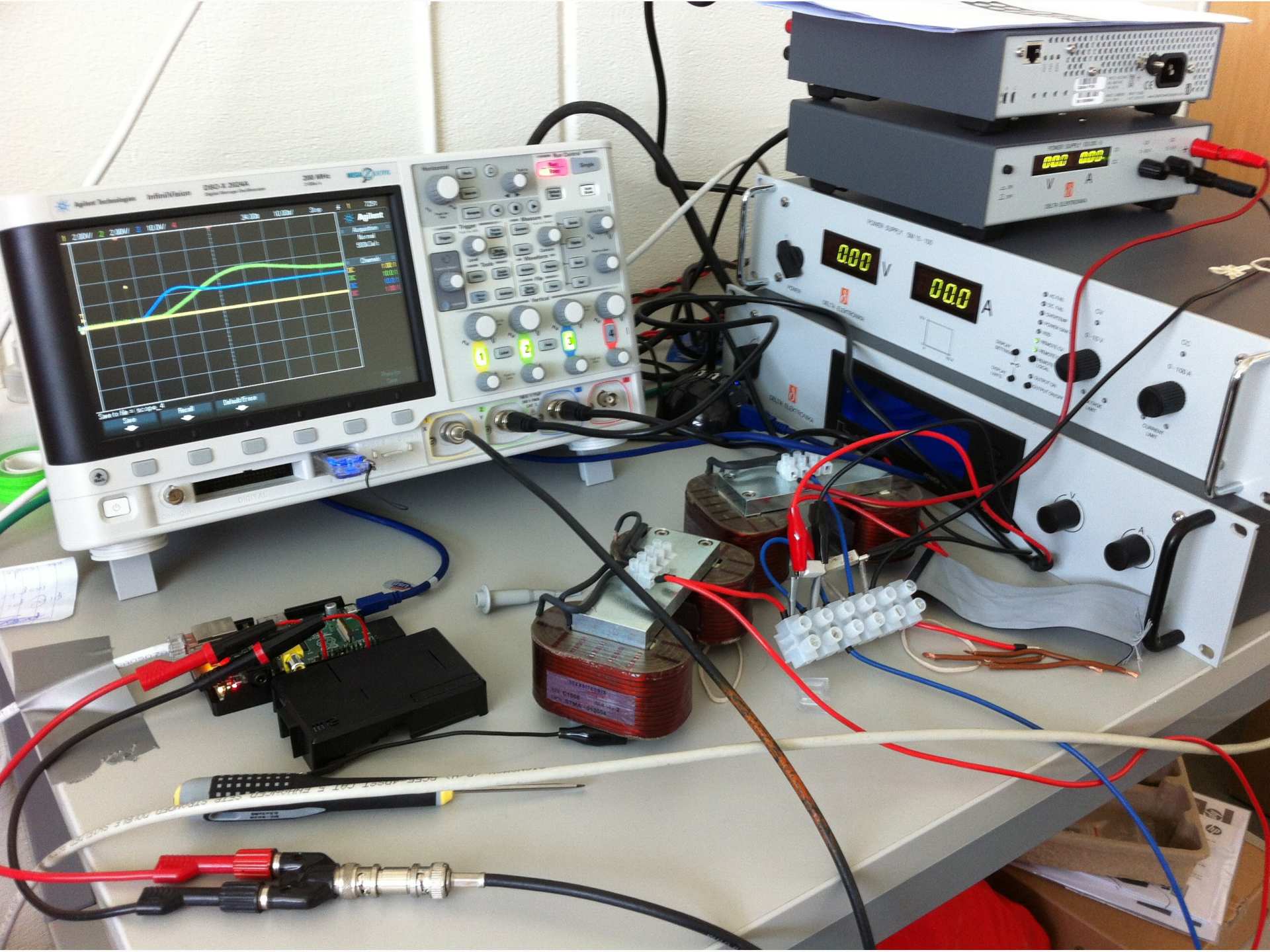

Timing System

- Original design based on trigger boxes from Berkley Nucleonics (BNC)
  - Only linac RF and injection into storage rings considered
- New design proposed by Julio and Jerzy
  - Takes into account femtomax and future SPF
  - Also covers future needs of storage rings and special mode
  - Uses MRF system in combination with DG645 boxes in original design
  - Inspired after visit to XPP (pump probe) beam line at SLAC
  - Cost low due to using EVGs from libera brilliance

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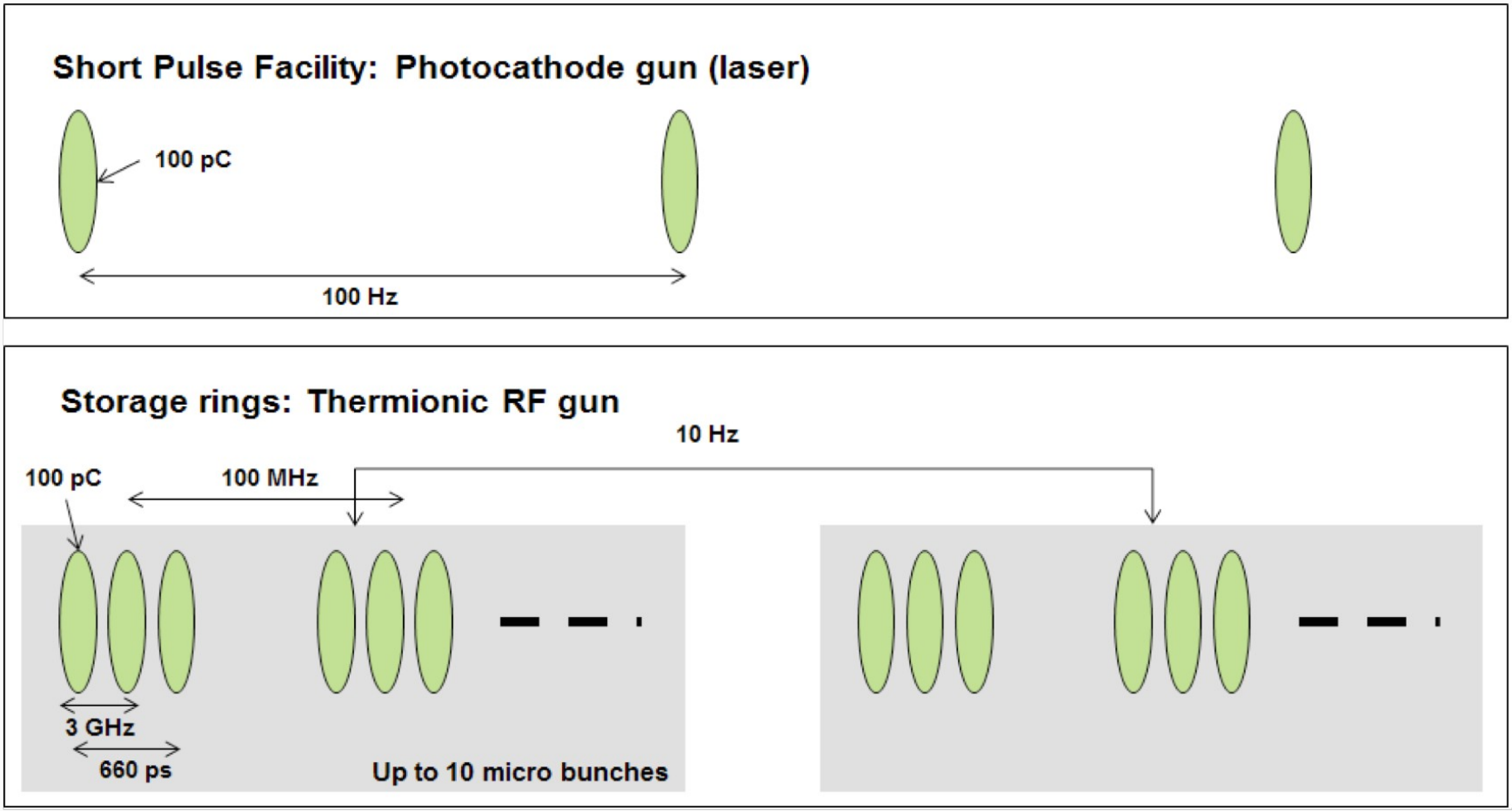
Bunch structures



Motion Controllers

- Max IV chose IcePAP
  - Currently loaning 30 racks from ESRF
    - Linac, femtomax beam line
  - Starting procurement of 50 racks
    - Storage rings and future beam lines
- Control with Sardana and Tango device server

MAX IV

cepap
master

Ongoing Projects with Tango

- MAX IV Injection Test Gun
- EPU 61 undulator (SPECIES beam line)
- Magnets Power supplies

MAX IV Test Gun

- Both Thermionic and Cathode Guns needed
  - photocathode Gun for SPF (injection at 100Hz)
  - Thermionic laser gun needed for storage rings injection (10 Hz)
- Commissioning happening with MAX III
  - Controlled from original MAX control room
- Controls Perspective… using Taurus interface to
  - Plc interface to power supplies (RSView via OPC)
  - Vacuum controller (gamma vacuum SPCe - small pump controller)
  - Eurotherm via ModBus PyPLC from ALBA
  - Temperature control circulator (phoenix2) via serial port
  - Cameras (LIMA)
  - Motorised screens to Trinamic motor

Test Gun & LIMA

- LIMA integration
  - Linac beam viewers point grey gigE cameras plugin implemented
    - Teething troubles to get first production server in use.
      - Changing modes etc, cause blocking of communication
      - Configuration of the camera buffering to get best results
    - Learning to fit the camera behaviour into the LIMA model
  - Using Tango 8 events to get image stream from server to client
    - Economises some network bandwidth
    - Seems reliable

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EPU 61 Undulator

- No in house experience, therefore use framework contract and hire CosyLab
  - 3-4 visits
    - Setting requirements
    - Development with real hardware
    - Testing and Site acceptance (>30 documented test cases)
- EPU 61 was installed on i511 on schedule with no problems
  - Scientists happy, disturbance compared to old undulator the same but with no correction coils

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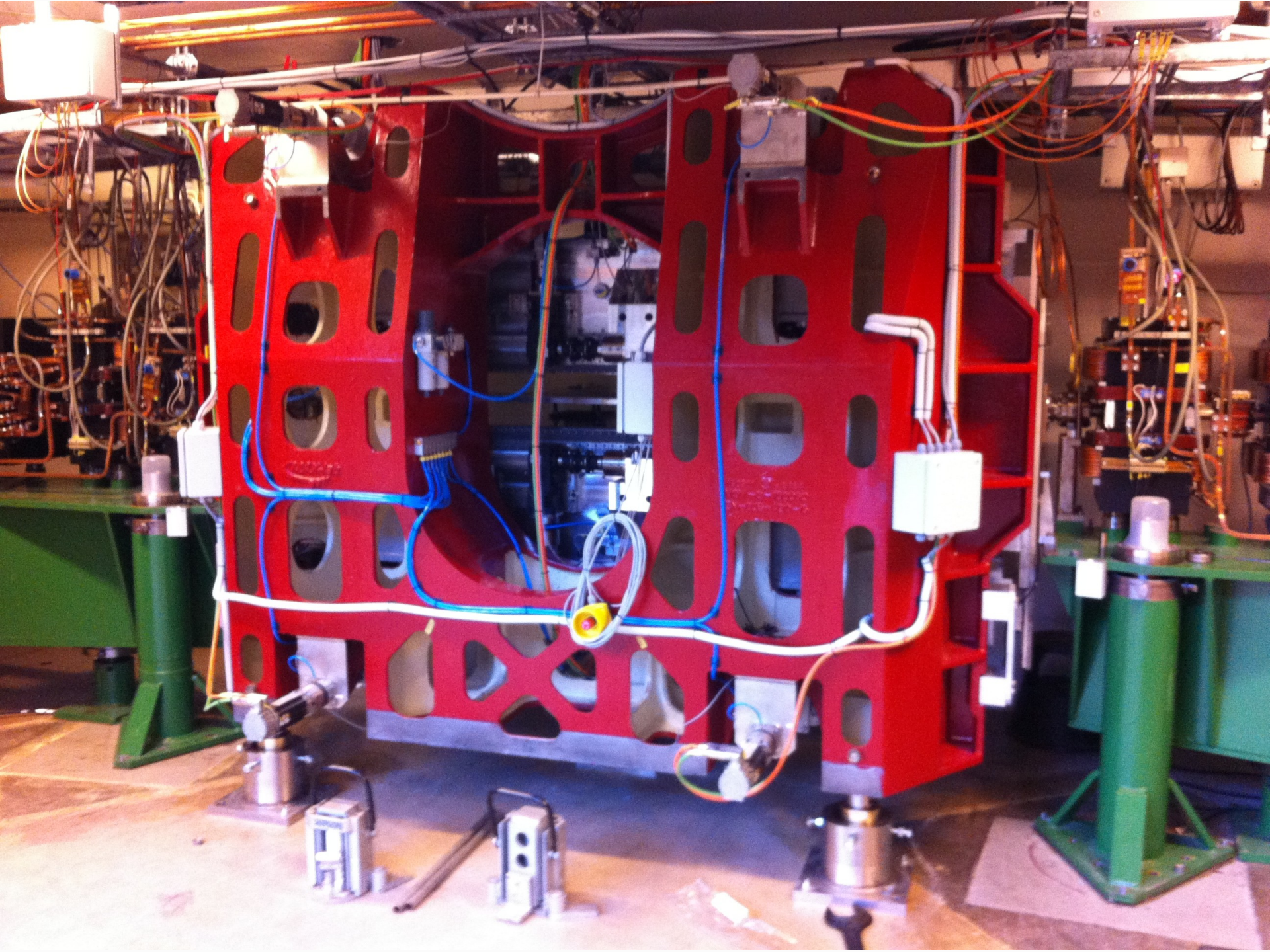

SPECIES on MAX II

- MAX IV standards on existing MAX II beam line
  - Our opportunity to test our MAX IV strategy
  - But an extra project not planned!

Thankyou..

Questions?