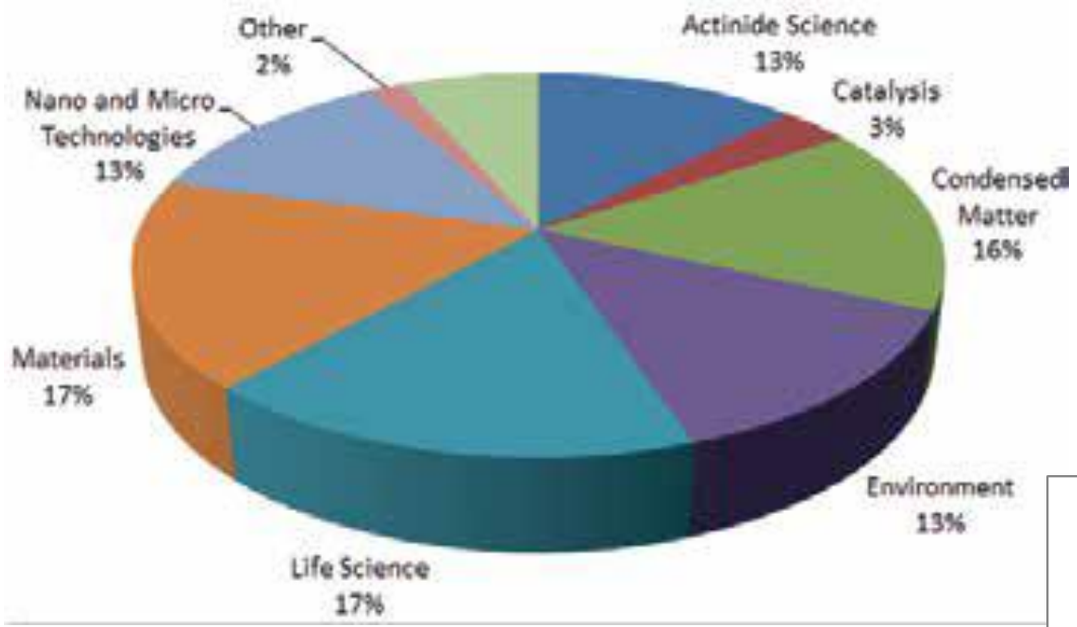
Karlsruhe Institute of Technology

ANKA Status Report

N.Smale, on behalf of all ANKA colleagues, Directors : A.-S. Müller, C Heske, T Baumbach.

Institute for Synchrotron Radiation

Normal users (2.5GeV)

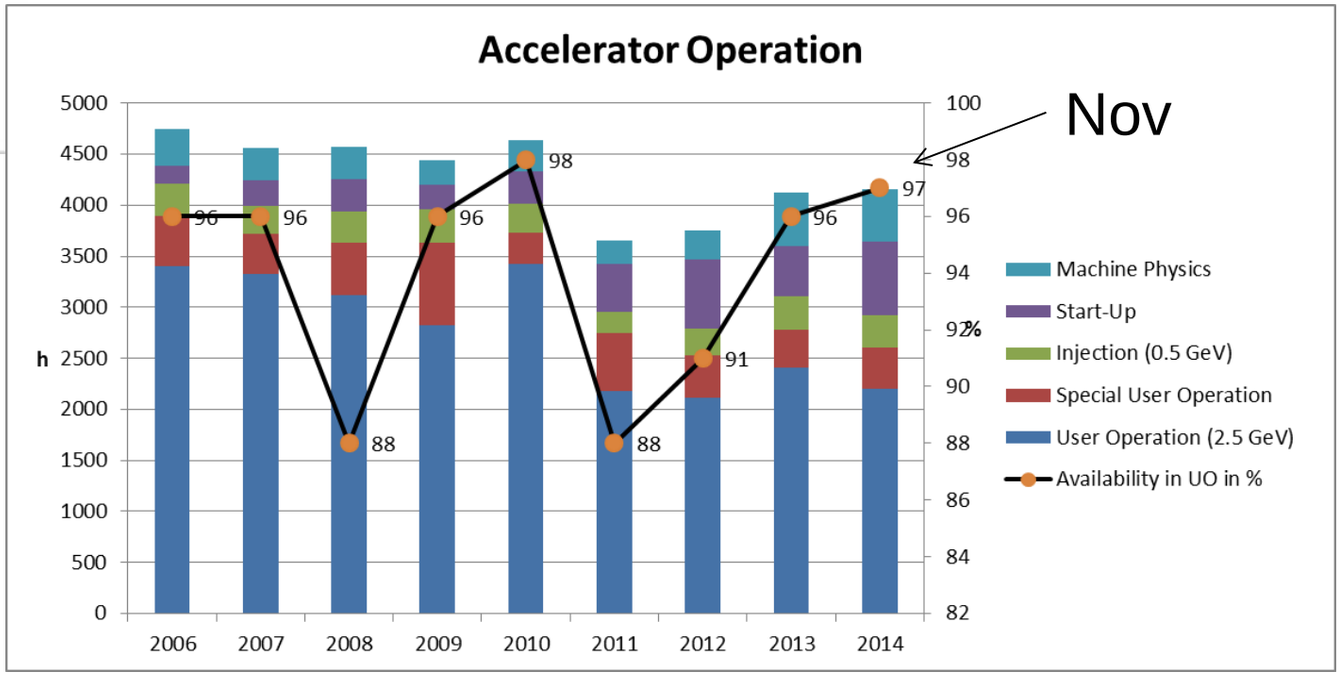


2014 is heading back to the normal 4500 hours of operation even with time for new IDs, new beamlines, and upgrades.

Other users

Approx 18% of machine running time is used for machine studies:

- Single bunch
- Low alpha
- Low energy



Machine Failures > 11h, mostly come-about due to no 24h tech support.

- 1x MF service provider (ENBW) lost onsite power
- 1x MF injection kicker failed for evening injection
- 5x MF often during the night, spread over 3 months, spontaneous noise getting passed the amplitude loop filter.

Beamlines and ID

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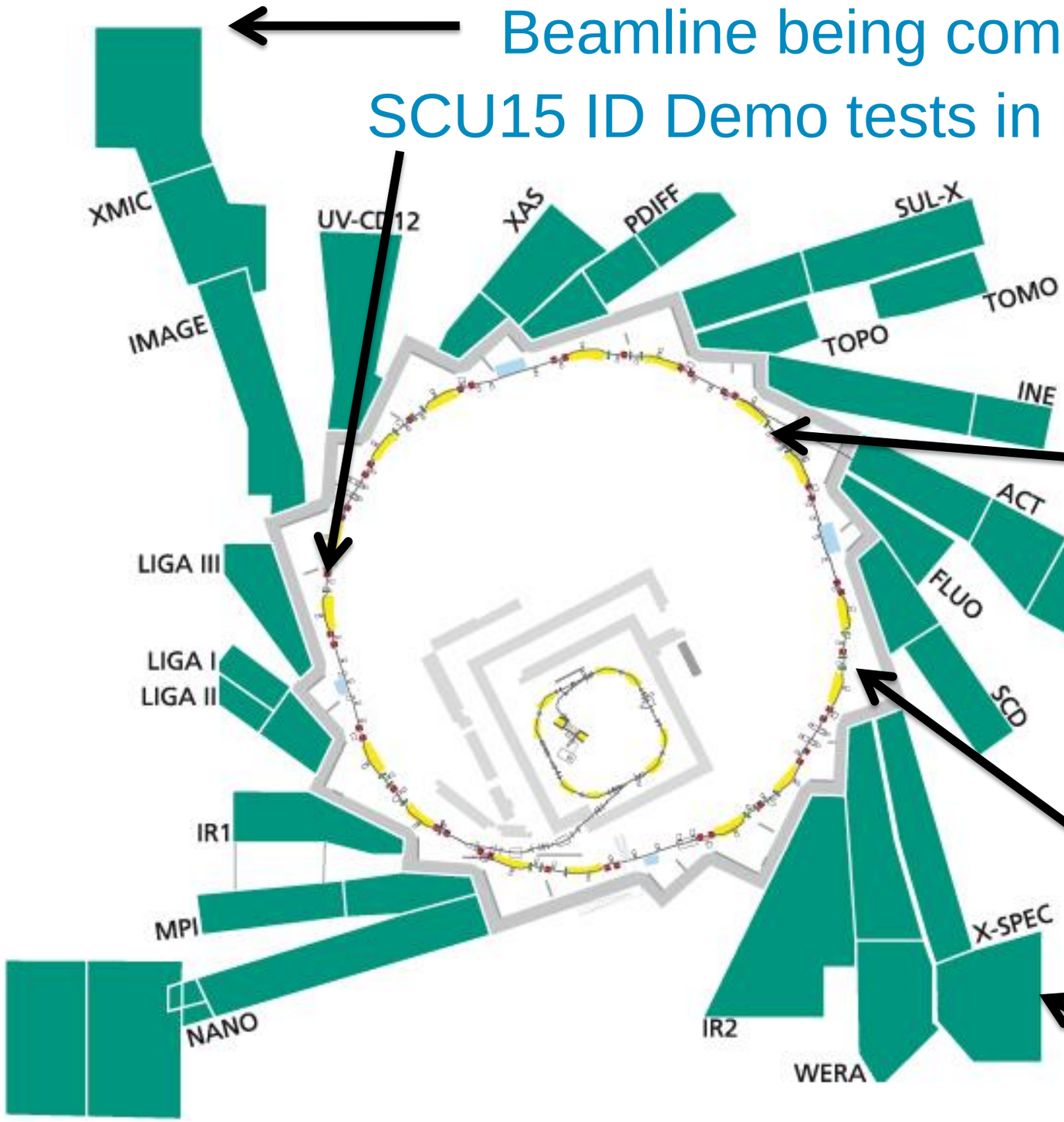


Beamline being commissioned

SCU15 ID Demo tests in Dec

19 beamlines,
3 in the last year

CAT-ACT ID being commissioned

Beamline being built

X-SPEC ID 2015

Commissioning next year

News in Brief

- Superconducting CAT-ACT wiggler (2014)
- Superconducting SCU15DEMO undulator (2014)
- Superconducting CLIC damping wiggler (2015)
- Dual wavelength X-Spec undulator (2015)
- Superconducting SCU 20 undulator (2016)
- Longitudinal BBB feedback system (2015)
- Fast orbit correction (2015)
- FLUTE; small-scale test facility for THz generation, compression, radiation transport and instrumentation. Present status: laser clean room ready, bunker installation started, large part of components ordered.

CAT-ACT High energy beamline for CATalysis and ACTinide research (KIT and BINP collaboration). Commissioned in July 2014

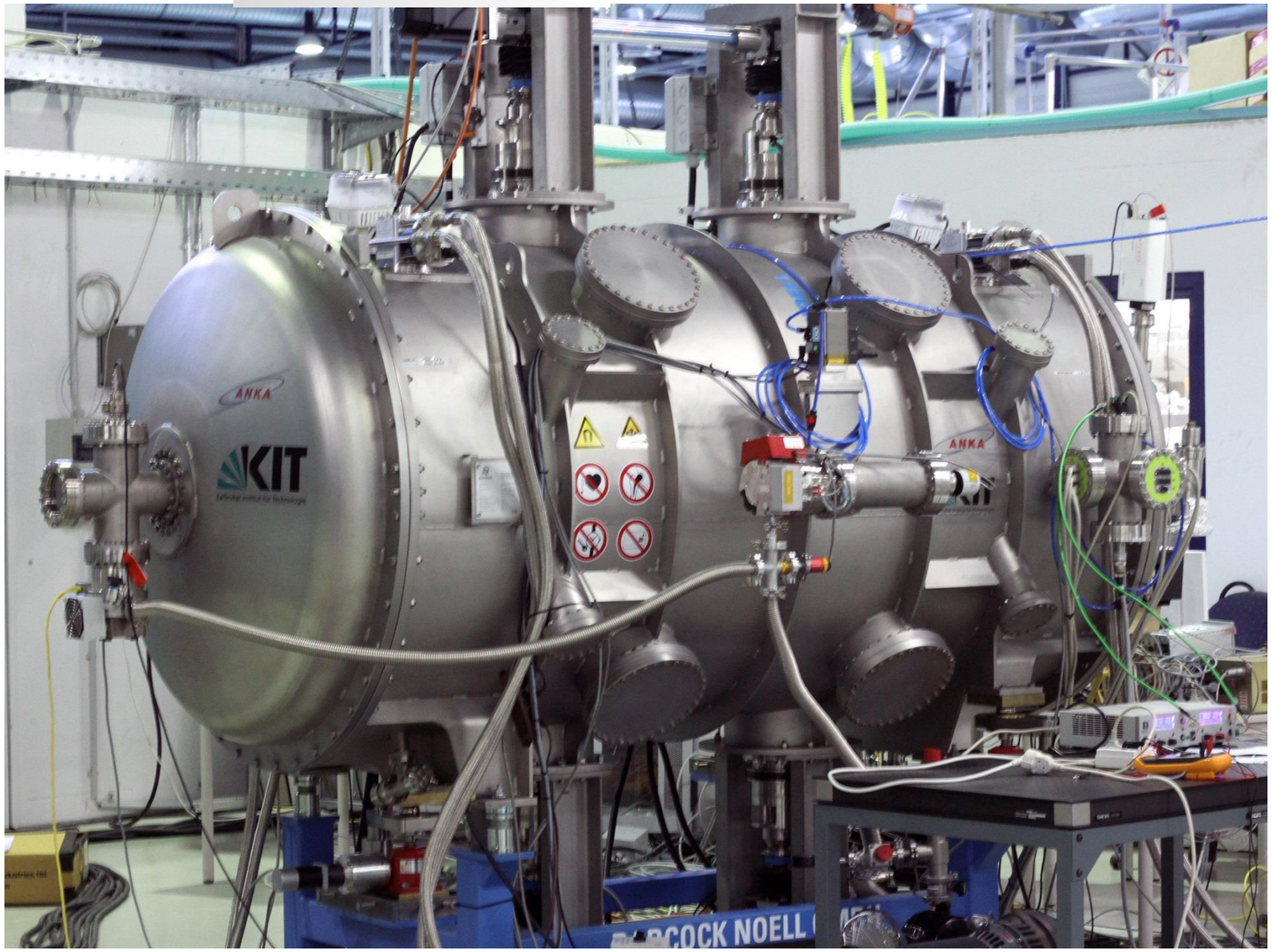
Period-length	48	mm
Number of Main Poles	36	
Pole scheme	¼ - ¾ 1 -1 …¾ -¼	
Magnetic Field	2.5	T
Ramp-Time	< 5	min
k	11.2 < 15	
P @ 200 mA	4.3 < 5	kW
Magnetic gap	20	mm
Vacuum stay clear	15	mm

The CAT-ACT wiggler had been installed in the summer shut down and mean while also successfully tested with beam. This wiggler is a superconducting device manufactured by BINP-Novosibirsk. The magnets are in a LHe-bath, cooled by internal cold-heads with zero LHe consumption.

SCU15DEMO test at the Image beam line (KIT BNG collaboration). Goes in Dec 2014

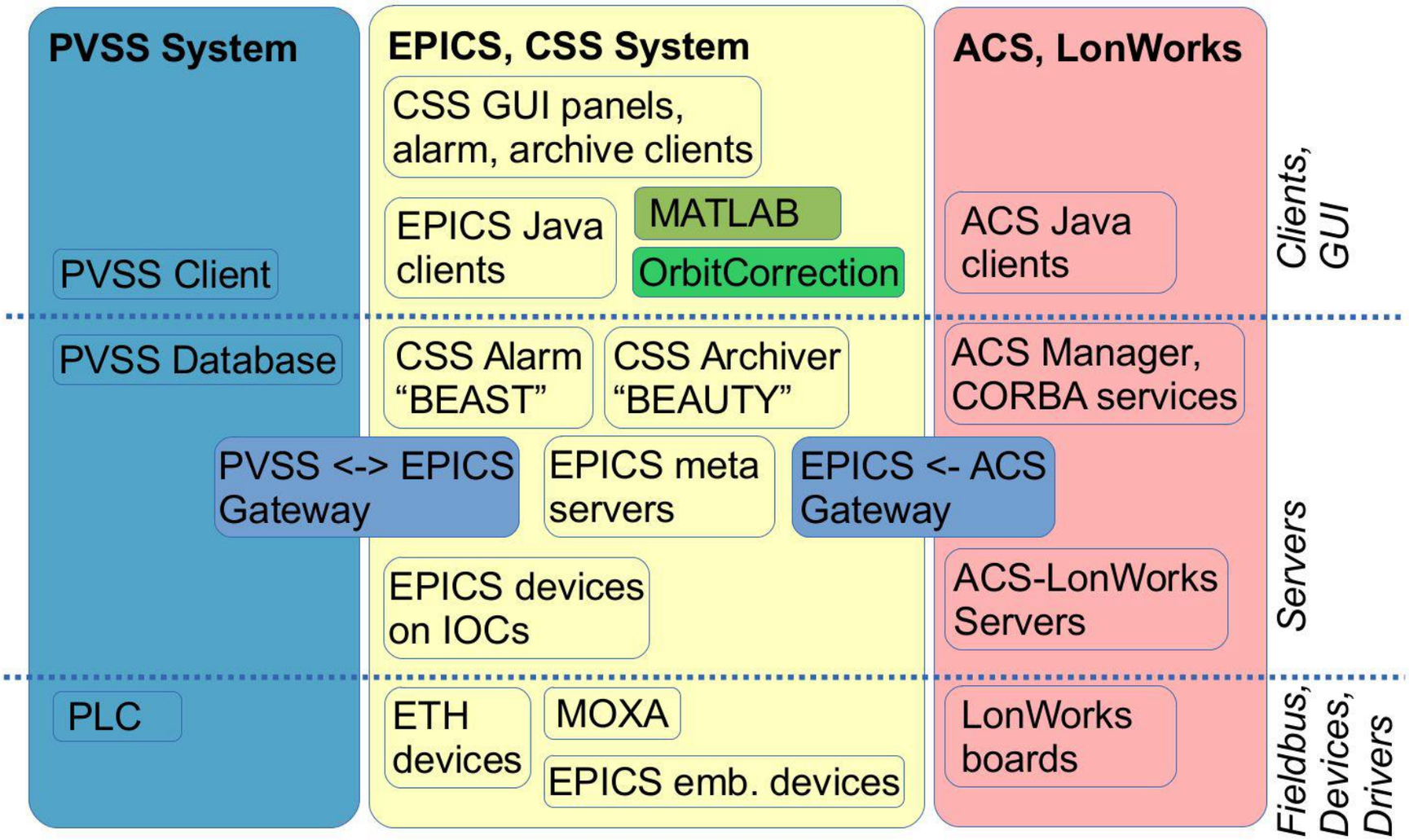
- Cooling time 7 days
- Warming up 4 days
- Ramping <600 s

λ_U= 15 mm
100.5 full periods
B = 0.69 T
v. gap = 7 mm
k = 0.98

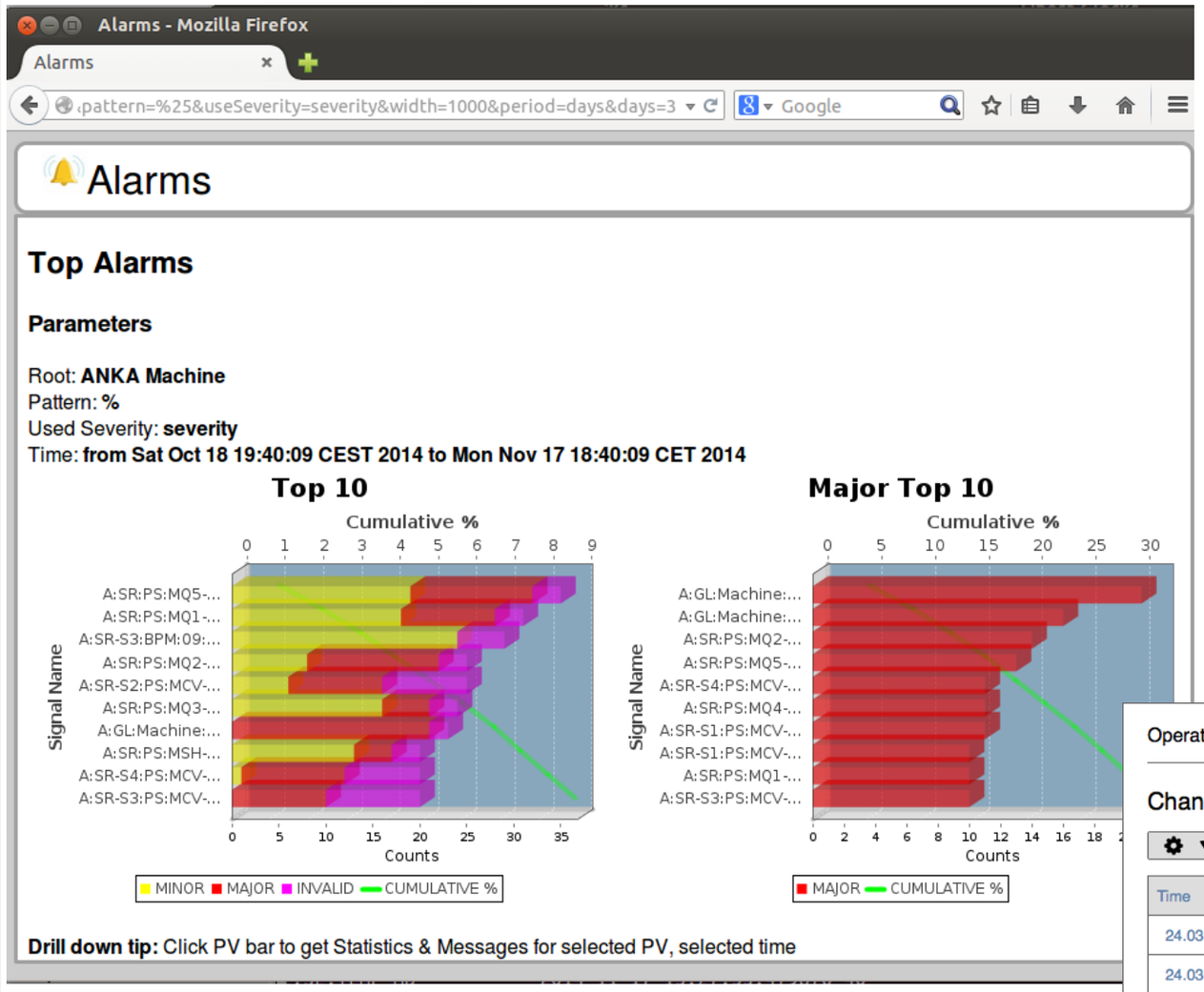


Replacement of Control System

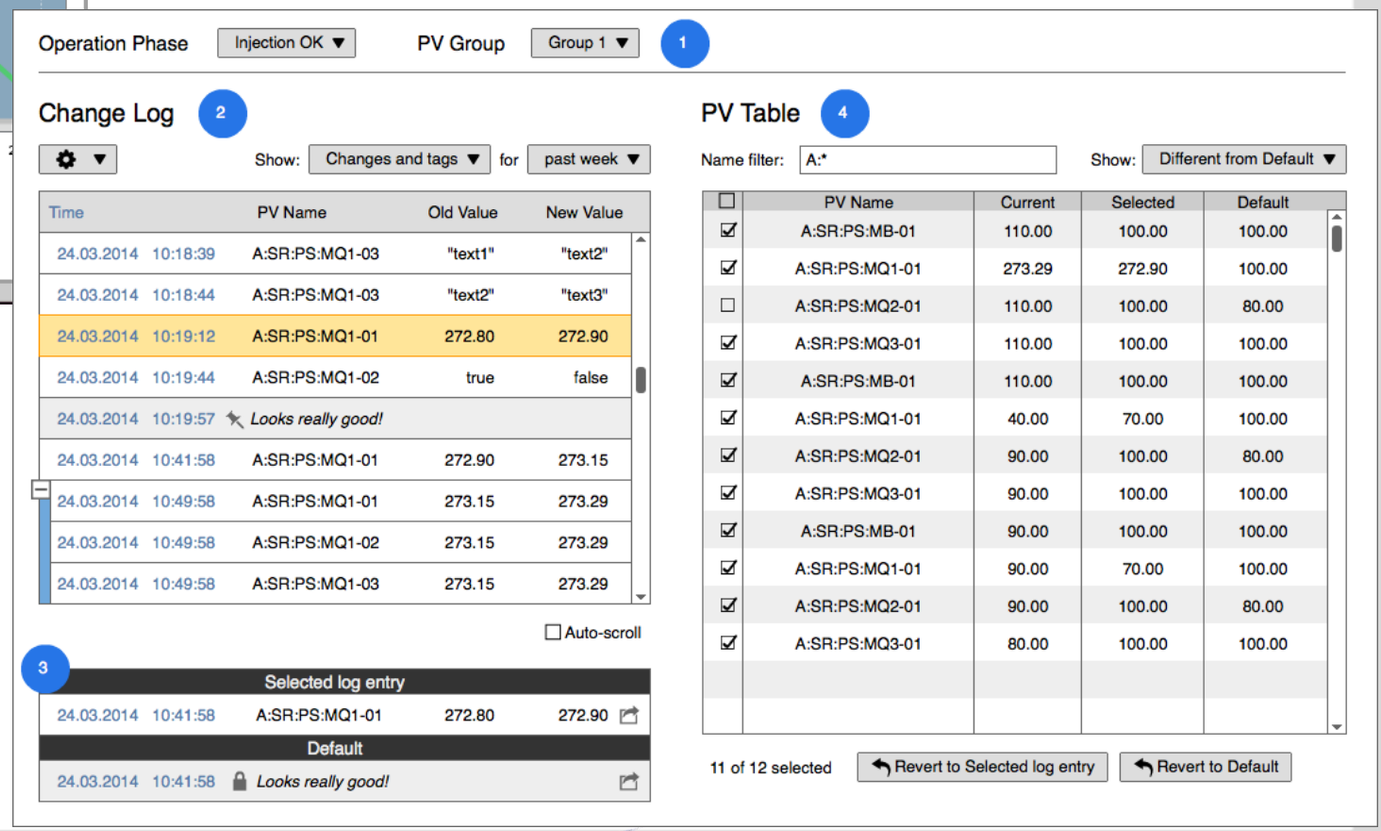
- New control system is based on EPICS and CSS.
  - ➜ Slow but sure transition to insure transparency for the operators.
  - ➜ ~500 physical devices to be moved, ~70% done.
  - ➜ ~25000 EPICS process variables to be read out at up to 10 Hz.



New Control System Tools



Alarm statistics are available with a www browser. Stats are important for preventative maintenance.



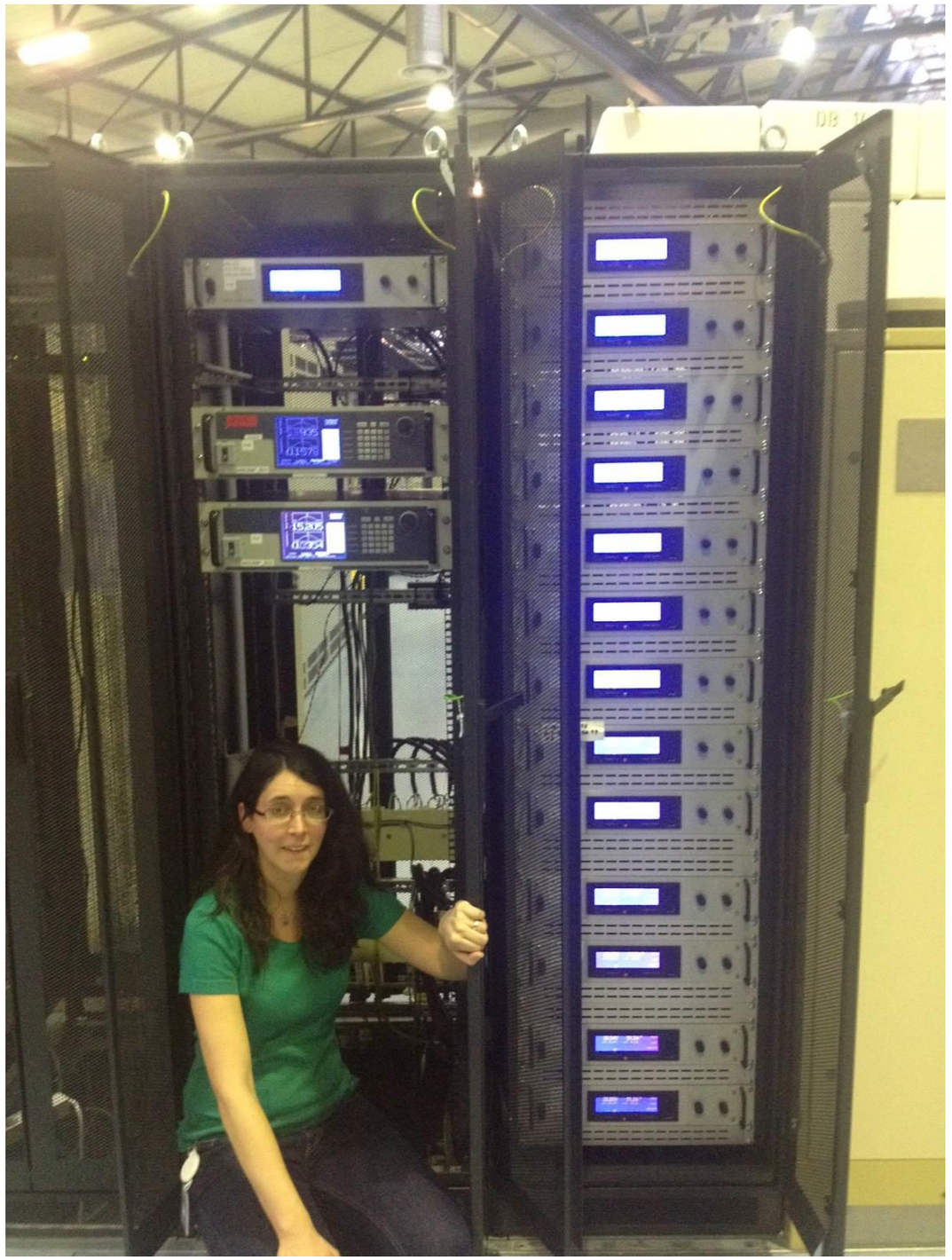
Save and restore. All machine parameters can be set back to any time with second resolution. Also can filter on changed values.

Power Supplies

- Onset of Danfysik 800/8500 series failures since mid 2011
- Actions
  - ➜ Successive replacement of analogue to switch mode power supplies in progress. Common power supply stacked to give necessary power.
  - ➜ Most of booster completed.
  - ➜ SR klystron focus and main coils soon.

SM3300 - Series 3300 W DC POWER SUPPLIES

  - ➜ KEPCO four quadrant power supply problems and slow repair from Compuserve



BPM System for ANKA

- Since 2012 41 LIBERA-Brilliances have been running
- Status:
  - ➜ No devices have been sent back for repair
  - ➜ Lost clock to the rack sent us on a wild goose chase.
  - ➜ One firmware corruption, fixed by ITECH remotely, no charge.
  - ➜ We have had great support from both ITECH and Diamond.
  - ➜ Diamond FA Archiver installed.

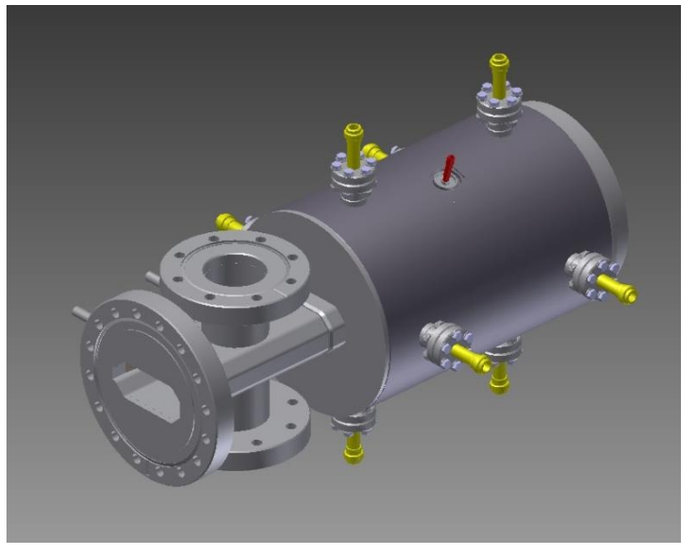
The FA Archiver captures full beam position orbit data at 10 kHz to a short term rolling archive, and republishes the live data stream to interested client applications. We will use it as part of the postmortem data.

µTCA being used for fast orbit correction. Next step is to replace corrector power supplies and magnets.

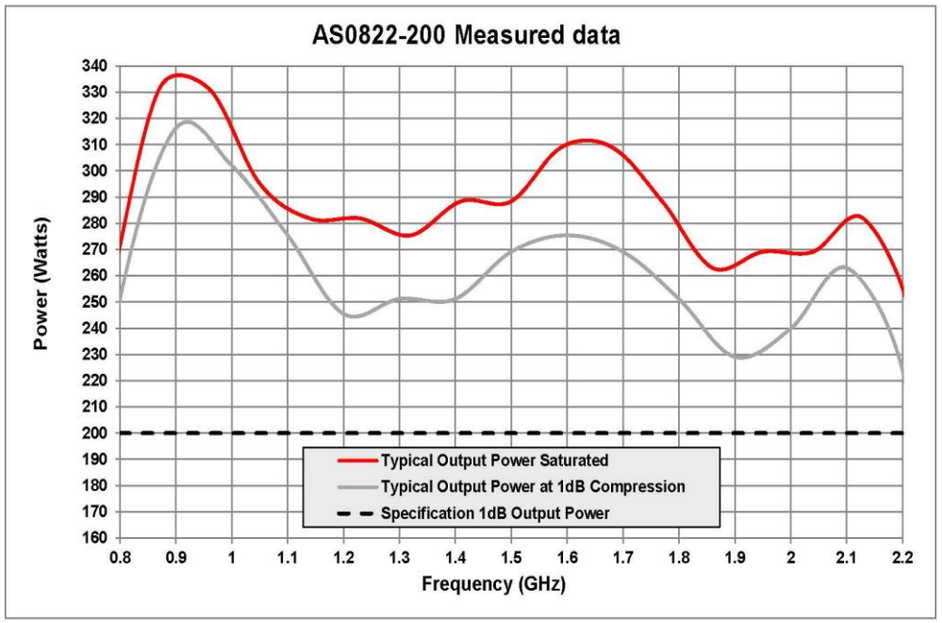
Bunch-by-Bunch Feedback System

- Running a 2 dimensional Dimtel BBB system since end of October 2013.
  - ➜ Routinely used at 2.5 GeV to damp vertical and horizontal instabilities.
  - ➜ Operates through ramp.
  - ➜ Continuous tune measurements.
  - ➜ Very useful during MP

- 3rd dimension goes into operation beginning 2015



Amplifier: Milmega AS0102-200 200 WATT



Dimentions h,w,l (mm) = 105,105,272
Resonant freq = 1.375 GHz
Q=5 (broad band)
Bandwidth = 275 MHz
Based on BESSY design, FMB built ~30k€

Thanks go to:Shaukat Khan & Markus Höner (DELTA), Andreas Jankowiak & Jörg Kolbe (BESSY)

Low Level RF (LLRF)

- The present Low Level Electronics is completely analog and was purchased from ELETTRA ~1999. Essential components are the phase, amplitude and frequency loop. Their specifications are:

- Phase loop: Stability: < 0.5° Range: 20° Bandwidth: 1.4 kHz
- Amplitude: Stability: <1% Range: 30 dB Bandwidth: 10 – 1000 Hz
- Freq Loop: Stability: < 0.5% Range: 40 dB Bandwidth: 30 kHz
- Interlock type: RF-Drive switch, opto-isolated interlock output

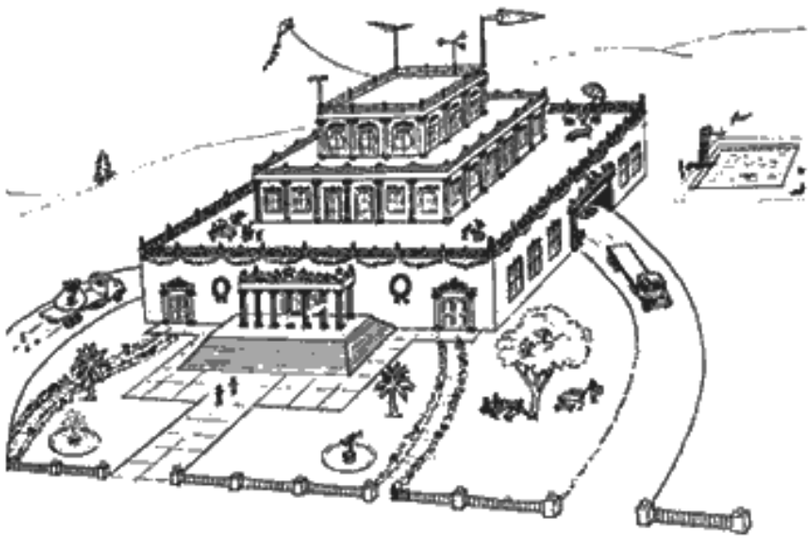
ANKA intends to replace the existing ELETTRA analogue LLRF with a digital system.

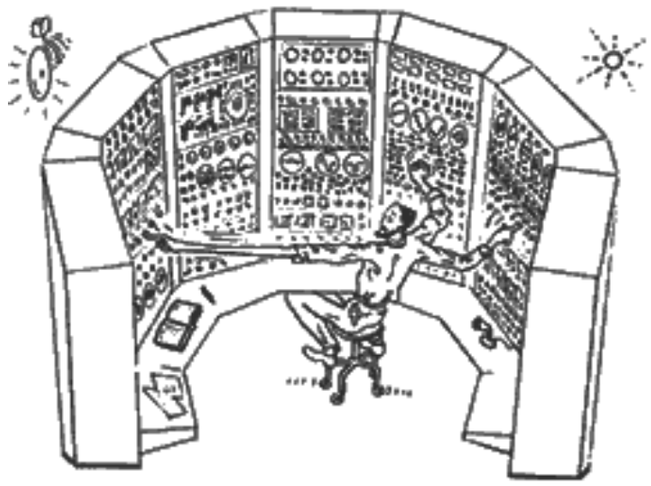
Review of Consolidation Plans from last year

- Fast orbit feedback magnets required (selection process started)
  - ➜ to reduce low frequency oscillations
  - ➜ improved current, stability, ...
- New RF amplifiers (still in the future)
  - ➜ replace klystrons
- Replacement of the present control system (SCADA) (very large proportion completed)
  - ➜ enhanced reliability and modularity when adding further components
- Installation of new superconducting insertion devices (very active)
- Considerable increase of the machine personnel (growing, but not fast)
  - ➜ sustain a critical mass, implement upgrades & develop future projects

Summary

- Machine reliability and availability is on the way up.
- ANKA is very active at present with new beamlines and IDs
- Migration to EPICS has shown many obvious benefits, not least, an improvement in reliability.
- With a new LLRF, fast orbit feedback , fully functional BBB, and state-of-the-art diagnostics (Marcel's talk), the finer details of beam quality can now be addressed.





Thank you for your attention