ANKA Status Report

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Slides courtesy of A.-S. Müller and C. Heske.
Outline

- ANKA today and tomorrow
  - Science fields, construction and new beam lines

- Operation
  - Operation status and statistics

- Hardware/software
  - Moving from old to new hardware

- The future
  - super conducting insertion device development
  - Consolidation Plans

- Summary

See tomorrows presentation by M.Schuh for some nice beam studies and diagnostic equipment.
Normal users (2.5GeV)

Approx 10% of machine running time is left for:
- Machine studies
- Single bunch
- Low alpha
- Low Energy

Other users
ANKA today and tomorrow

ANKA – Hall Extension Programm

Complete ANKA Hall
Reality: Construction on all sides!

North-west corner
October 12, 2011
Institute for Synchrotron Radiation
Lab. for the Appl. of Synchrotron Radiation

New Beamlines

- UVCD-CD12, transferred from Daresbury, now commissioned
- IR2, with nanoscope, now in commissioning
- Flute, now funded. Allow small-scale tests of THz generation, compression, radiation transport and instrumentation,…
- T-Bone, proposal for a linac-based coherent radiation source in the THz to Mid-IR range
- Image/X-MIC, twin beam line in construction
- Visible light diagnostic port proving very useful
Visible Light Diagnostics Port

- Dedicated visible light beam diagnostics beam line operational since October 2010
- Significantly increased flux allows measurements for small currents
- Optimised for Streak camera operation
**Beamtime**

- Storage ring operates for about 4500 h / a
  - no 24/7 operation possible due to limited resources (personnel)
  - several operation modes offered
  - availability on average ≈ 92 %

**2008:** Less availability due to e-gun vacuum leaks and longer start-up time (SUL-wiggler-AL-vac.-chamber)

**2009:** Less beamtime due to built-up of IR2 and NANO Frontend

**2011:** Less availability mainly due to control system failures and resulting damage to machine vacuum & RF

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**Acceleration Operation**

- Availability in UO

- **Machine Physics**
- **Start-Up**
- **Injection (0.5 GeV)**
- **Special User Operation**
- **User Operation (2.5 GeV)**

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ESLS  XIX Work Shop, 23.11.2011 Aarhus University DK
Nigel Smale
May: Control system failure caused miss-steering of e-beam, production of whisker in beam path, no turns, venting of sector 4

Sept.: Leak in Diagnostik front end (bellow) (first leak in SR vacuum system since 2002)
A whisker example from U139, not from ANKA
Radio Frequency System

Problems and solutions in 2011

- 3 GHz preamplifier failed (replacement from BESSY, new one built up)
- 500 MHz low-level calibrated with C.Pasotti (ELETTRA)
- 500 MHz klystron input failed (cabling replaced)
- 500 MHz preamplifier failed (RFT)
- Cavity cooling failed (now digital PID regulators)

RF expert hired in Feb.11 (Andreas Böhm)

Actions

- exchange of klystron due in 2012
- implementation of RF lab
- refurbishing of components
Power Supplies

Onset of failures since mid 2011
- Injection kicker, MOSFET dead, but box ALIVE
- Dipole extraction line (transistor board)
- Dipole booster (DC overload)
- Bumper with no spare
- Extraction septum (HV regulation module)

Actions
- Successive replacement of power supplies foreseen
- Electronics expert urgently needed (position soon to be opened)
New (fast) BPM System for ANKA

- Replacement of old BPM electronic by LIBERA-Brilliance
  - First batch (20 units) in 2011, next batch end of the year
  - Advantage:
    - first turn option (injection optimization)
    - turn-by-turn option (instability studies)
    - 1 kHz acquisition (slow instability studies)
    - Stable control interface

- Diagnostics expert urgently needed

- Thanks go to Guenther Rehm, Diamond.
Bunch-by-Bunch Feedback System

1D system (vertical) installed at ANKA

- now routinely used at 2.5 GeV to damp vertical instabilities
- analyzing tool: identification of unstable modes

Take care the y-scales are different
Control System

- ACS (only @ ANKA) became less reliable after an upgrade

- Transition to more commonly used systems foreseen
  - PVSS for PLC based hardware
    (used already at accelerator and beamlines)

- Decision: EPICS or TANGO?
  - TANGO used by beam lines
    cooperation contract with ESRF/SOLEIL
  - EPICS preference for accelerators
    - easier to implement
    - more established in a larger community
    - not CORBA based

- Control system expert needed (position to be opened soon)
Superconducting IDs for ANKA

- scIDs for the ANKA storage ring:
  - SCU15 Demo, SCU2-15 and SCU20 for NANO beamline
  - SCUW for IMAGE beamline

- Understanding the scID needs of light sources around the world
  - COLDDIAG experiment is presently being installed at DIAMOND

- ANKA as test bed for CLIC damping rings
  - additional benefit: wiggler for IMAGE beamline (starting 2012/13)
  - cooperation with CERN & BINP (BMBF call)
Consolidation Plans for ANKA

**Hardware measures**
- Fast orbit feedback & bunch by bunch feedback system
  - to reduce low frequency oscillations
  - improved current, stability, ...
- New RF amplifiers
  - replace klystrons
- Replacement of the present control system (SCADA)
  - enhanced reliability and modularity when adding further components
- Installation of new superconducting insertion devices

**Strategic upgrades**
- Considerable increase of the machine personnel
  - sustain a critical mass, implement upgrades & develop future projects
Summary

- Accelerator components age
  - problems & solutions: upgrade program started
  - adequate operation funding & continuous investment funds required

- Active and competitive R&D program in cooperation with other accelerator labs (e.g. ARD)
  - 11 PhD students and 7 Postdocs (mostly 3rd party funded)
  - upgrade to state-of-the-art

- Resources needed, in particular manpower
  - recruiting started, needs to be further intensified
Thank you for your attention
ANKA today and tomorrow

IMAGE/X-MIC Twin-Beamlines

First beamline is monochromatic with resolution $\Delta E/E = 10^{-4}$ for high resolution transmission microscopy
Second beamline is operational in three modes: white, pink & monochromatic beam, 240mmH and 36mmV