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Plans for a 12 GHz test-stand in Uppsala

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Accelerator Physics in Uppsala

The Svedberg Laboratory

- Cyclotron (since 1948)
research in high-energy physics and radiation biology
- CELSIUS ring (1984 – 2006)
research in nuclear and high-energy physics



Build-up of competence in Uppsala proven by the presence of accelerator-oriented companies, e.g.

- Scandinova (modulators)
- GE Healthcare (cyclotrons)
- Scanditronix (magnets)



Accelerator Physics at Uppsala University

ESS

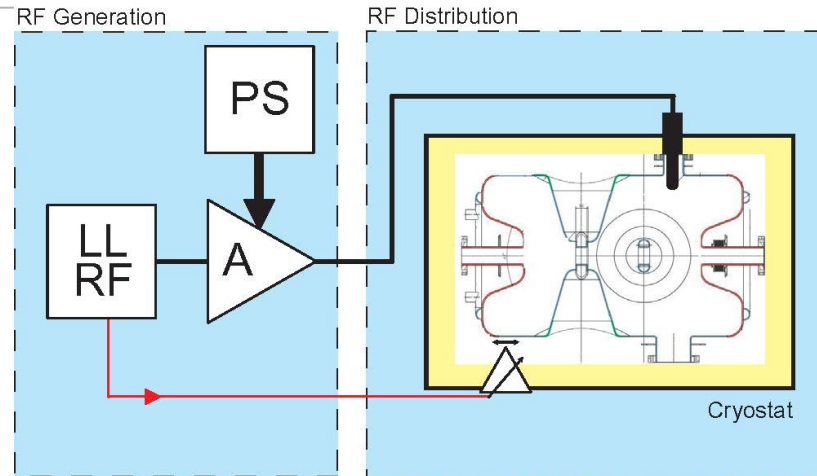
- 352 MHz spoke RF system development,
- prototype spoke cryomodule testing

FEL

- FLASH Optical Replica Synthesizer,
- XFEL Laser Heater

CTF3 / CLIC

- Two-beam Test Stand
- RF breakdown issues

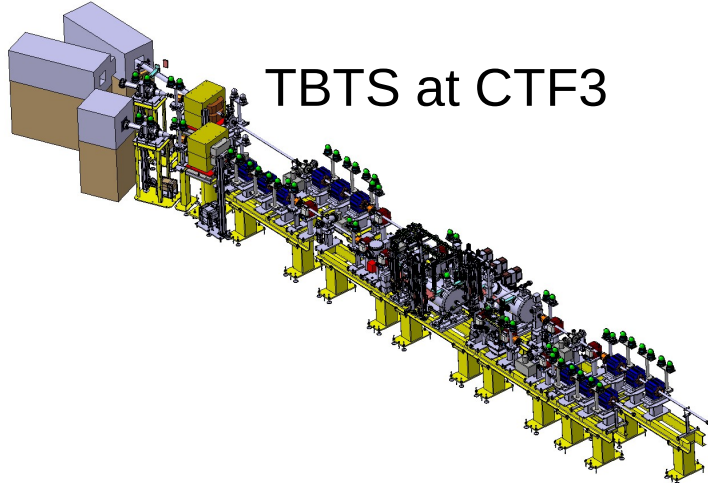




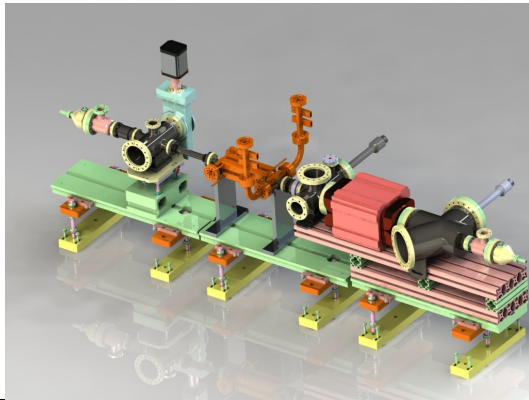
CTF3/CLIC related activities

At CERN

TBTS at CTF3

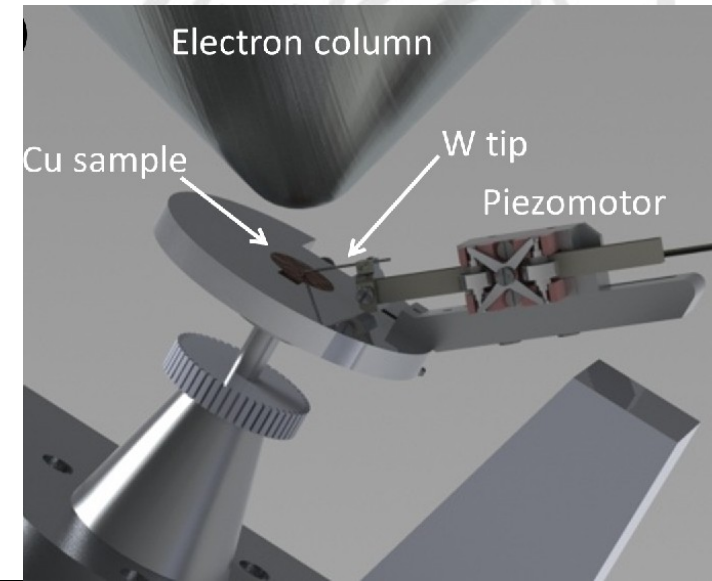


12 GHz test-stand diagnostics at CTF2 - magnetic spectrometer for breakdown and dark currents



DC setup in Uppsala

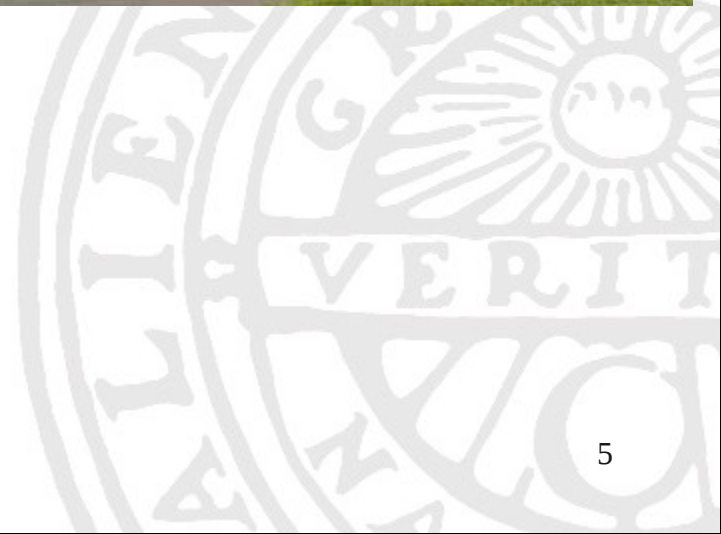
- Piezo-controlled in-situ nanomanipulator tip creating local discharges on the sample inside a SEM
- Focus ion beam (FIB) system for structuring the surface (both anode and cathode)
- Analysis of field emission and vacuum discharges for different materials





UU collaboration with European Spallation Source

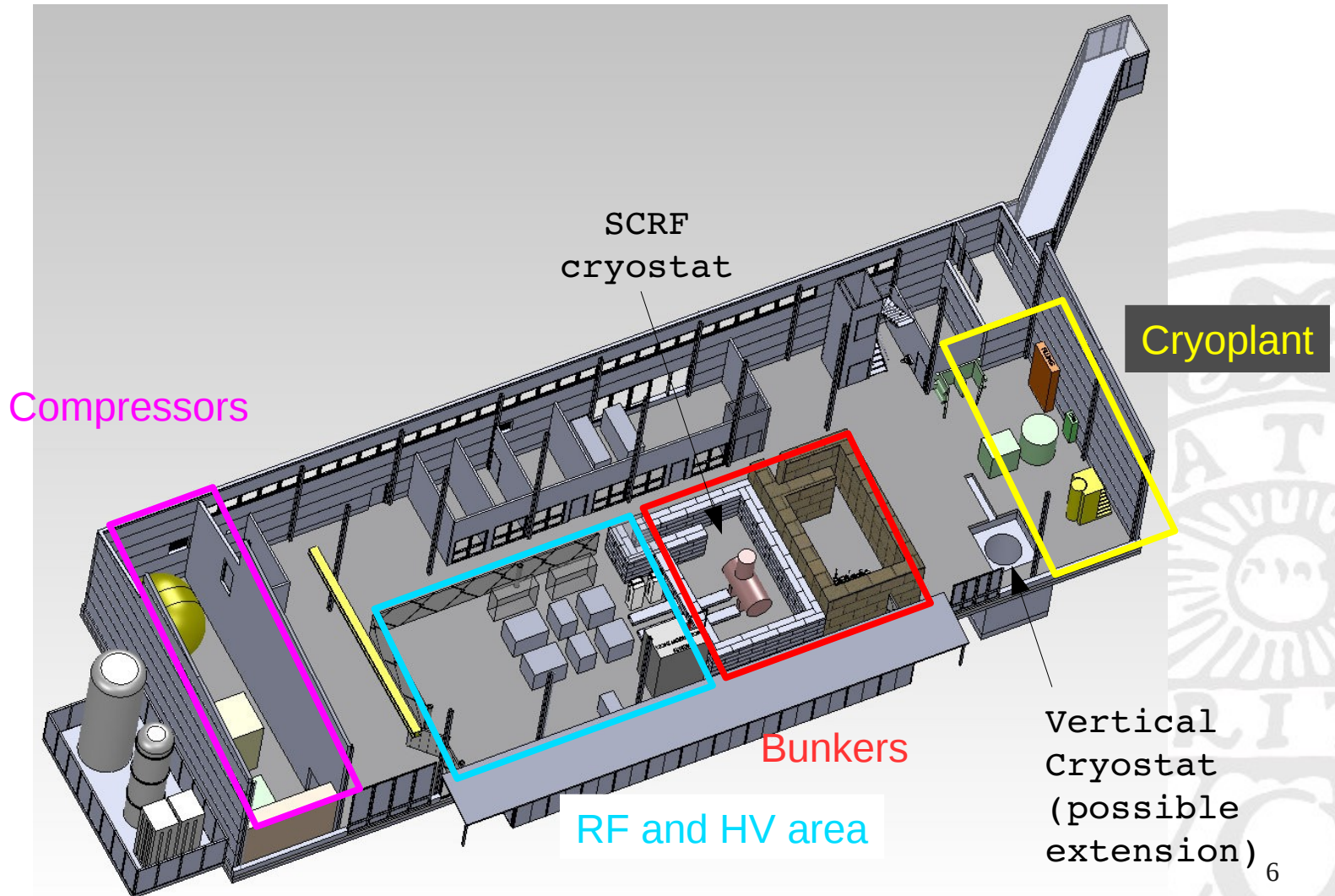
- **New facility at Uppsala University**
 - cryogenic center (LHe and LN2 distribution)
 - RF development project for ESS
 - training of students and staff
- **Integrated with physics and astronomy**
 - located at Ångström laboratory
 - new sub-department (head Tord Ekelöf)
 - 12 staff (full and part-time)
 - multiple funding sources
- **Hardware**
 - 1000 m² hall (FREIA)
 - helium liquefier (>70 l/h)
 - cryostat
 - test bunkers





FREIA Experimental Hall

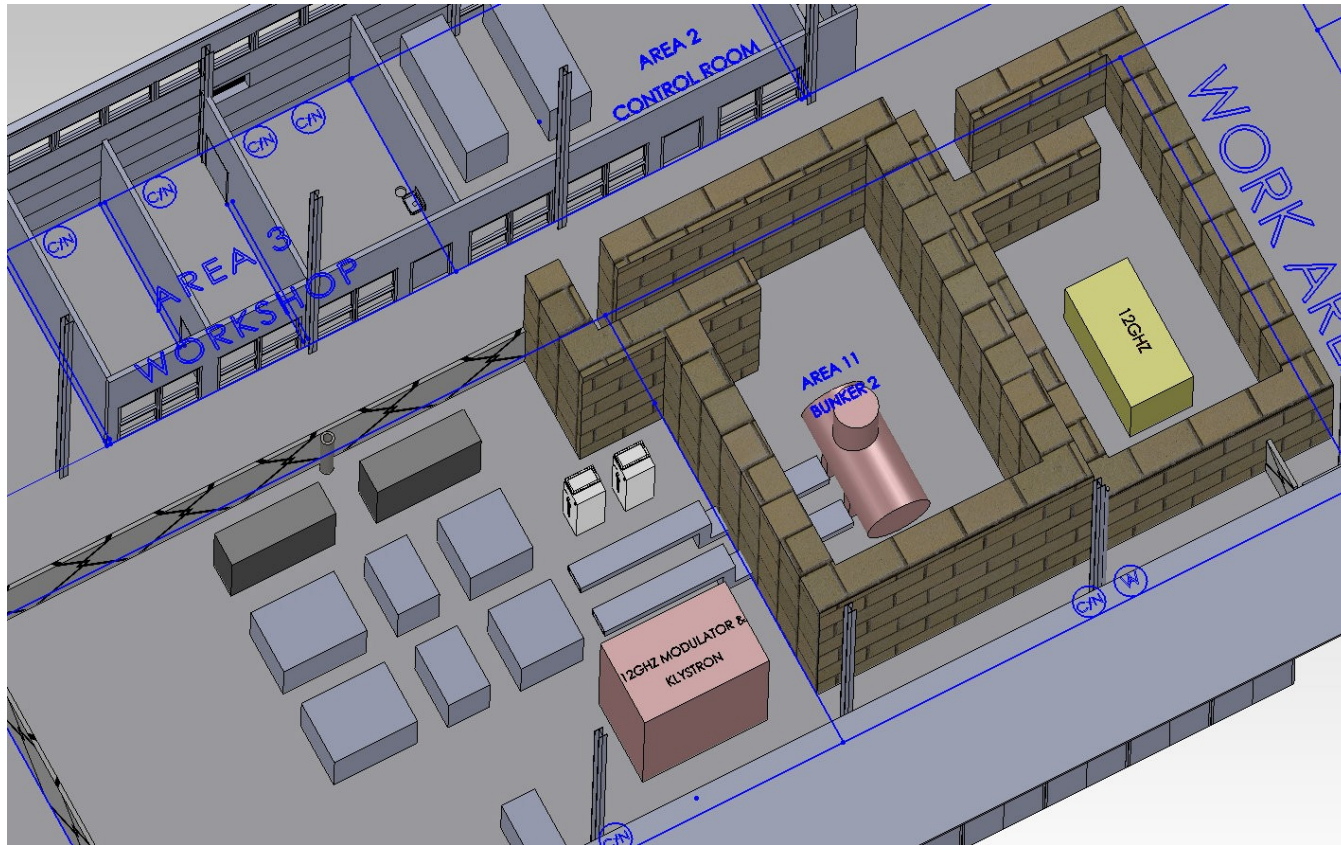
(ground-breaking May 14th)





CLIC 12 GHz stand-alone test-stand

Bunker for 12 GHz test area



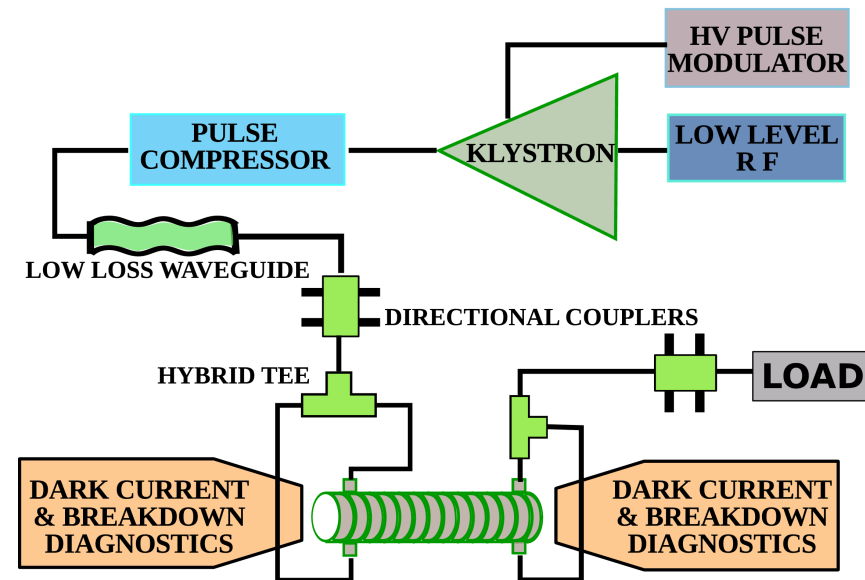
Reserved place for modulator and klystron



12 GHz test stand in Uppsala

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- We plan a system close to CERN's setup
 - 50 MW Klystron
 - Solid state HV pulse modulator
(we hope to profit from the proximity to the ScandiNova Systems AB in Uppsala)
 - Pulse compression
 - RF distribution network
 - RF and discharge diagnostic equipment





Research with 12 GHz test-stand

- We plan to study:
 - Electron (ion) currents vs X-ray flux, and relate to RF power measurements
 - Dynamic vacuum diagnostics with laser
 - *In-situ* boroscope for inspection without disassembly
- Surface studies
 - *Post-mortem* analysis at the Microstructure Lab (SEM, TEM, XPS) and Tandem laboratory (IBA)
- Advanced local RF discharge experiments
 - Coupling RF field to the manipulator tip inside a SEM
 - The same surface analysis techniques as for DC setup



Present situation

- FREIA experimental hall with reserved space for 12 GHz equipment under construction May 2012- June 2013
- Application to Swedish Research Council for CLIC 12 GHz test stand submitted (result Dec 2012)

Time schedule:

	2013				2014				2015				2016			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
General																
Tendering		■	■	■	■	■	■	■								
Fabrication components			■	■	■	■	■	■	■	■						
Assembly & Installation							■	■	■	■						
Commissioning										■	■	■	■			

FREIA will become an ideal place for research and training in RF systems, vacuum discharges, surface analysis techniques and more