



Belgium@CERN 2022

Future procurement needs in the Accelerator Systems (SY) Department

Wim WETERINGS

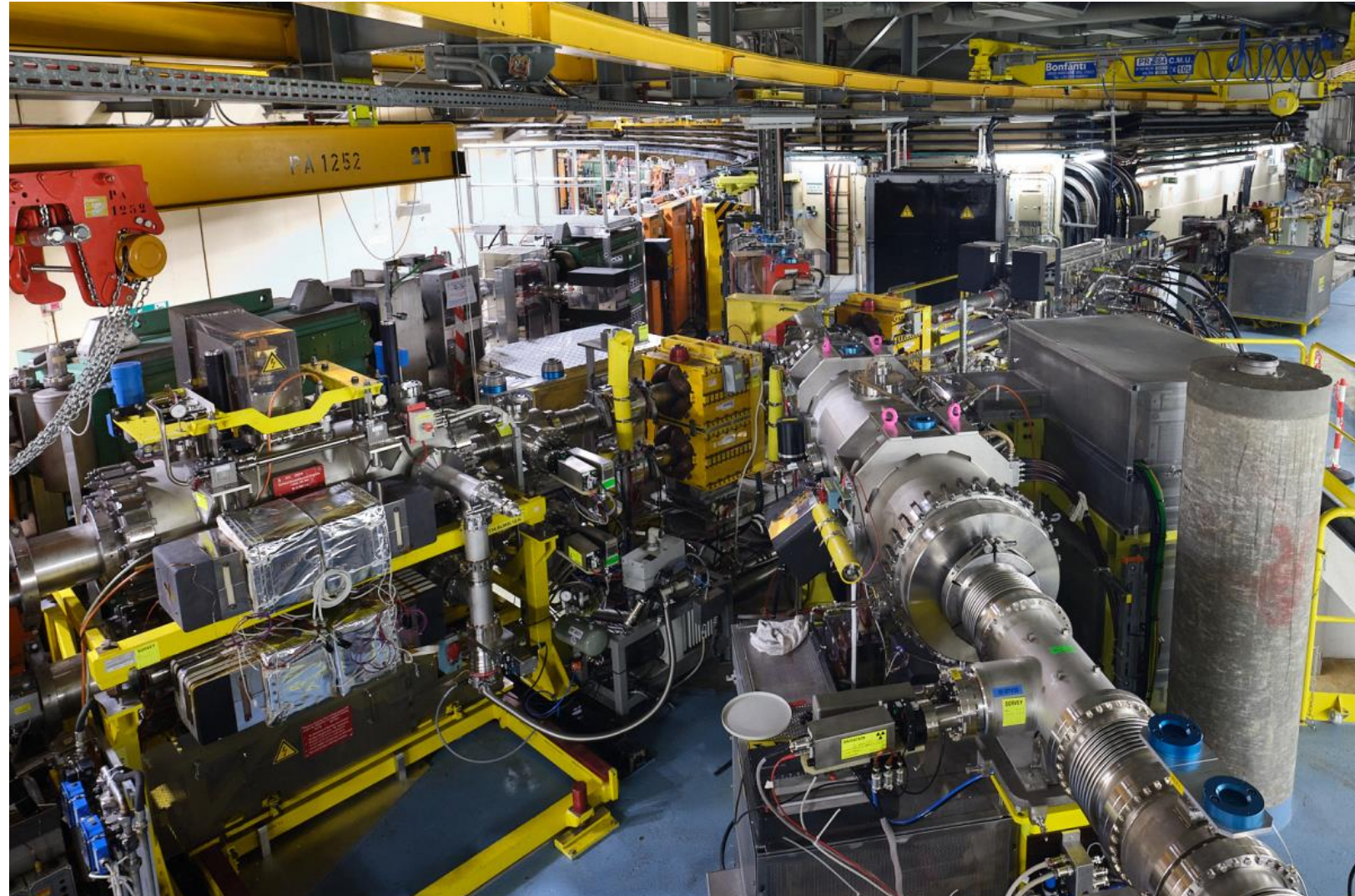
09-05-2022

Accelerator Systems Department

Mandate

The SY department is responsible for accelerator beam-related technical systems:

- Accelerator Beam Transfer;
- Beam Instrumentation;
- Electrical Power Converters;
- Radio Frequency Systems;
- Targets, Collimators and Absorbers.



Accelerator Systems Department

Mission

Systems and equipment operation in the entire CERN complex.

Development and deployment of new hardware and associated controls hardware and software.

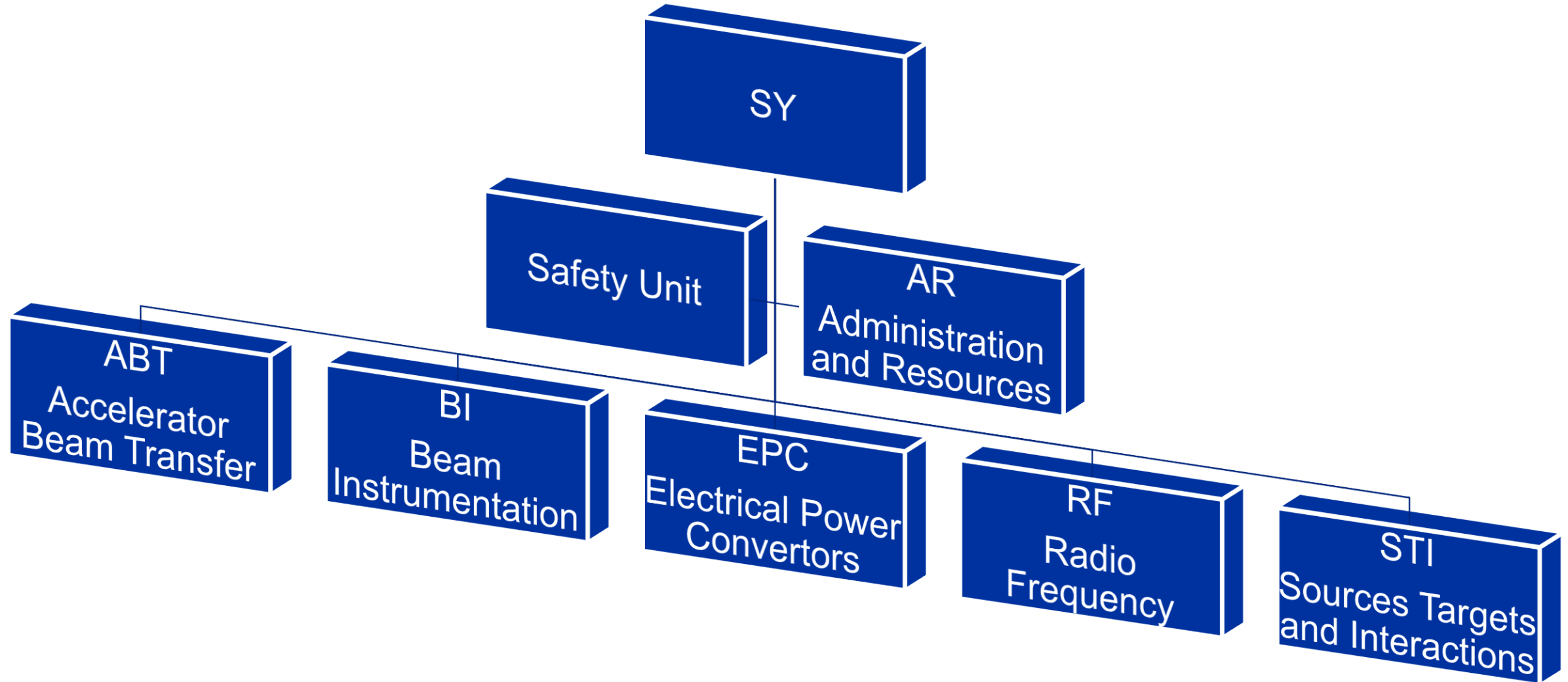
Developing and maintaining specialised simulation software.

R&D for CERN projects, future studies and facilitating generic progress in accelerator systems.



Accelerator Systems Department

Structure

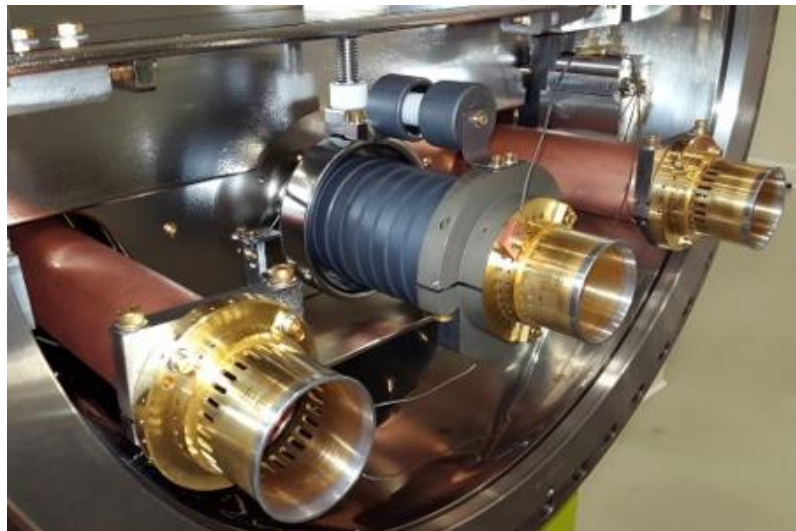
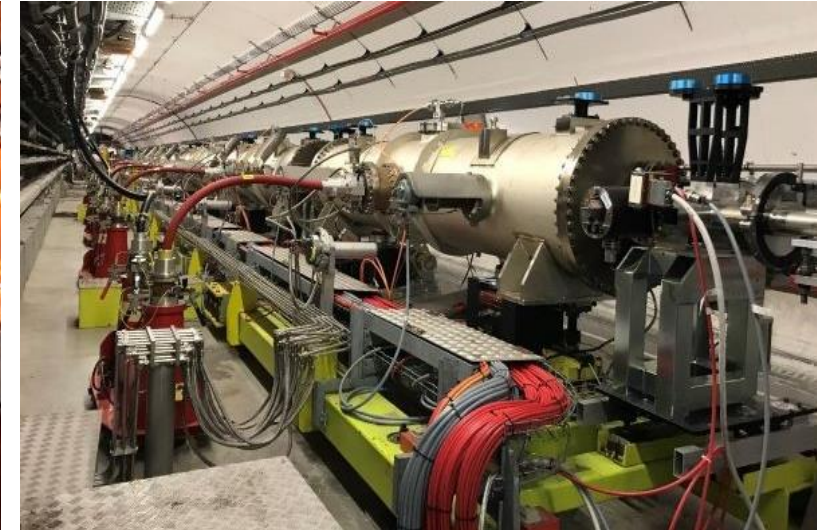
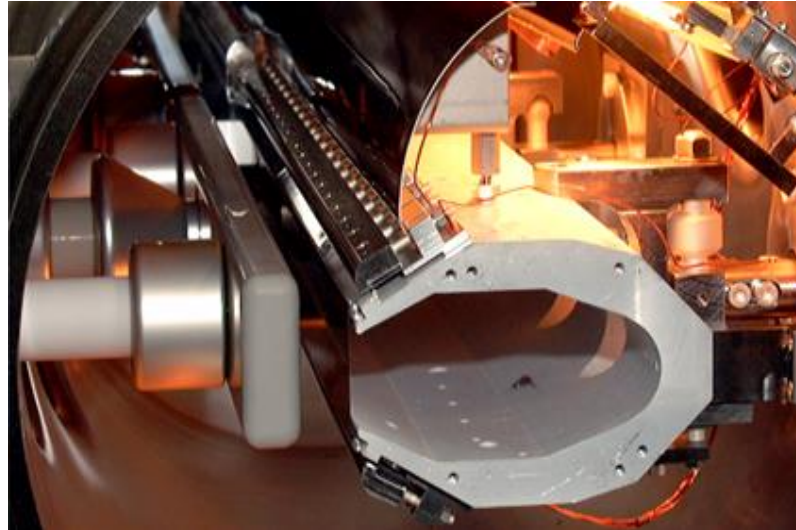


Accelerator Beam Transfer

Mandate

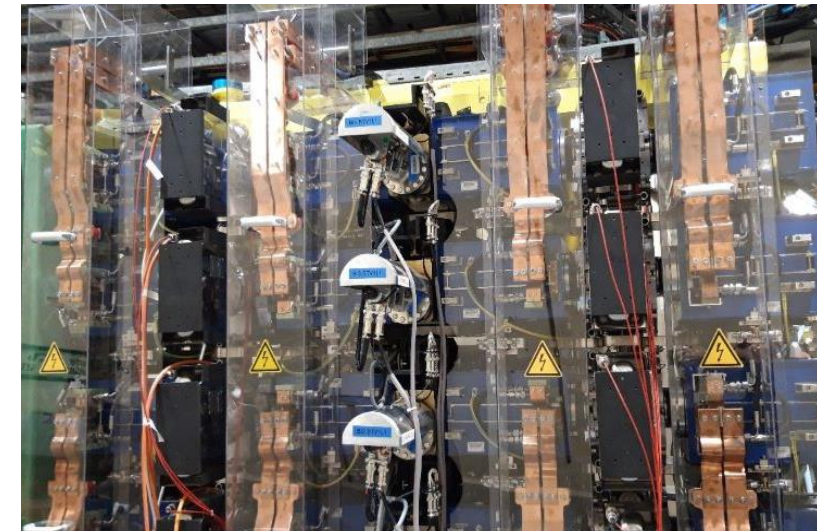
The ABT group is in charge of injection and extraction related equipment and beam-transfer systems:

- Fast pulsed kicker systems;
- Electric field deflectors;
- Magnetic septa;
- Protection devices;
- Injection stripper system;
- Associated equipment control systems and software.



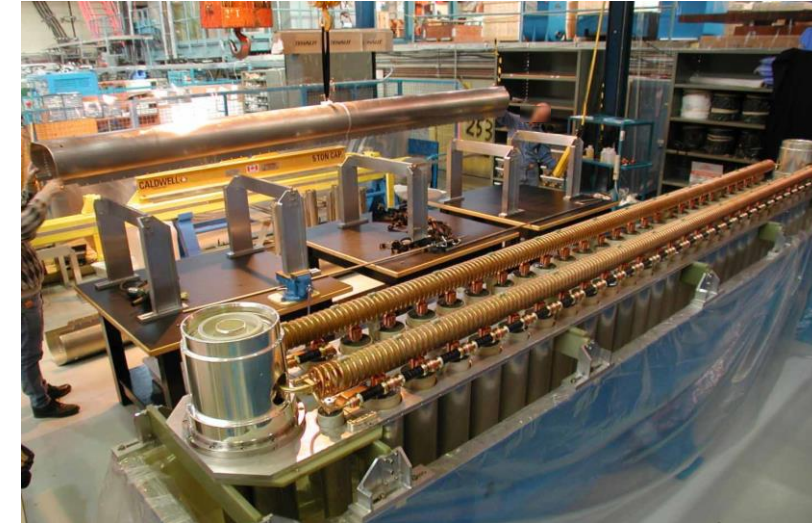
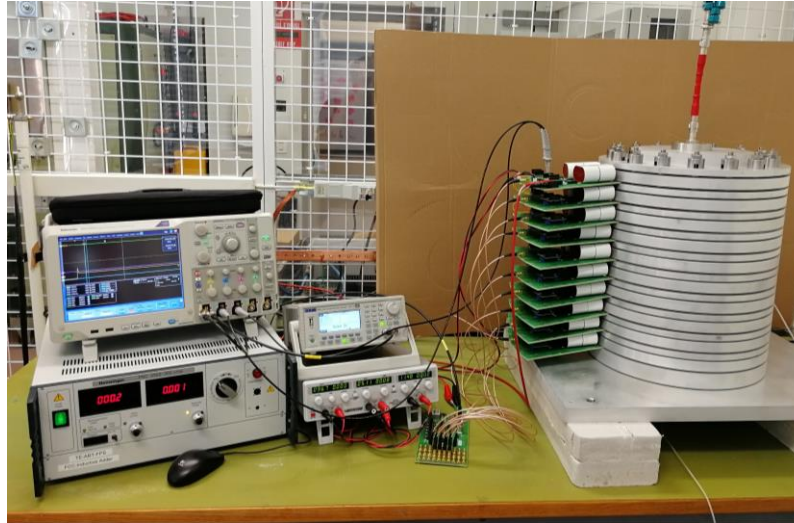
Accelerator Beam Transfer

- **Ceramic components (Al₂O₃)**
 - High tolerances rectified Ceramic UHV spacers, 2m long tubes, 0.4m long U-shaped plates.
 - Ceramic surface coating
- **Stainless-steel and copper high precision mechanical component (some for UHV)**
- **UHV stainless steel vacuum vessels**
- **Copper busbar manufacture**
- **Electrical / mechanical cabinet production**



Accelerator Beam Transfer

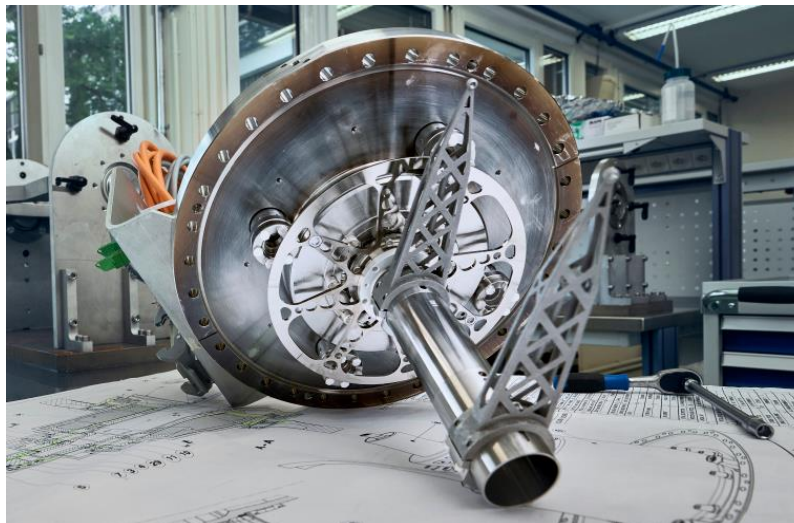
- **High power feedthroughs**
 - Copper and stainless-steel, vacuum brazing, TIG welding and 10kV, 35 kA, 20 bar cooling testing.
- **Solid state power switches with very high di/dt and fast rise time**
 - >10kA/ μ s and 50 ns
- **Capacitor chargers**
 - various types
- **Digitizer**
 - various types
- **80kV / 25 Ω coaxial cables**
- **Thyratron HV switches**
 - various types



Beam Instrumentation

The BI Group is responsible for > 10000 instruments that allow observation of the particle beams and the measurement of related parameters:

- Beam losses;
- Beam position;
- Intensity and Tune;
- Beam profiles;
- Associated equipment control systems and software.



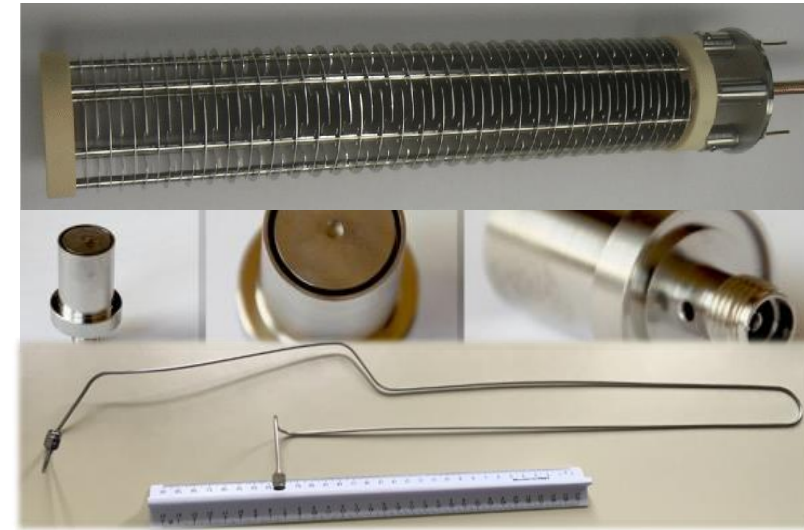
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Beam Instrumentation

- Production of several types of electronic boards
- Production of mini racks for electronics and controls installation in tunnel
- Production of components for ionization chamber

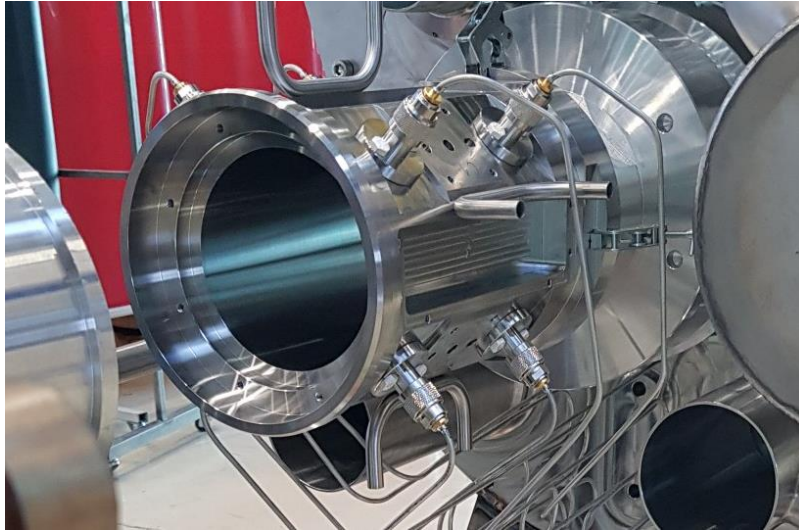


Future Needs



Beam Instrumentation

- Production of high precision UHV mechanical objects
- Production of specific cables and RF vacuum feedthrough
- Production of electron gun and collector at 80kV



Future Needs

Electrical Power Convertors

Mandate

The EPC Group is in charge of the electrical power convertors for all accelerators, transfer lines, experimental areas and tests facilities at CERN:

- Solid-state modulators for RF klystrons;
- High-voltage power convertors for RF amplifiers and particle sources;
- Power convertors from 100W to 100MW for DC, cycling or pulsed magnets;
- Static VAR compensators and harmonic filters.



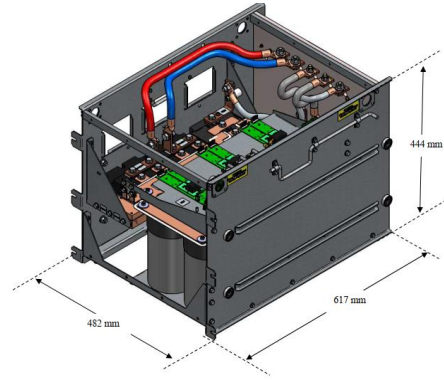
Electrical Power Convertors

Be part of North Area Consolidation Project and HL-LHC upgrade

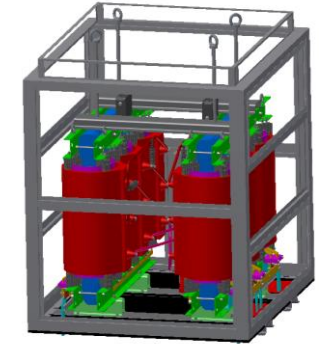
Design, Manufacture & Test build-to-spec equipment

Future Needs

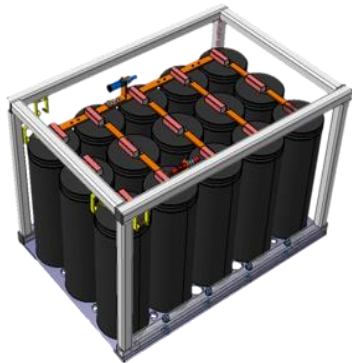
Power Stacks



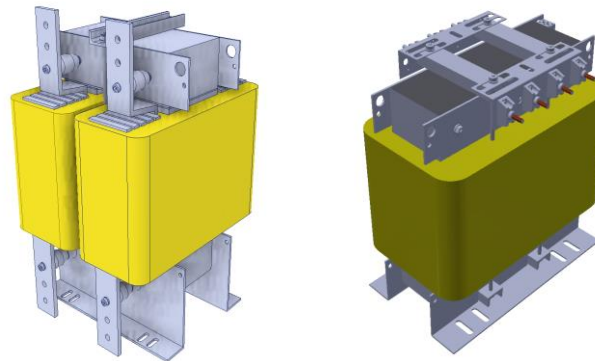
MV transformers



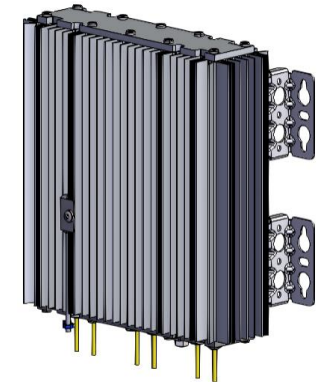
Energy storage modules



LV Magnetics



Power Resistors

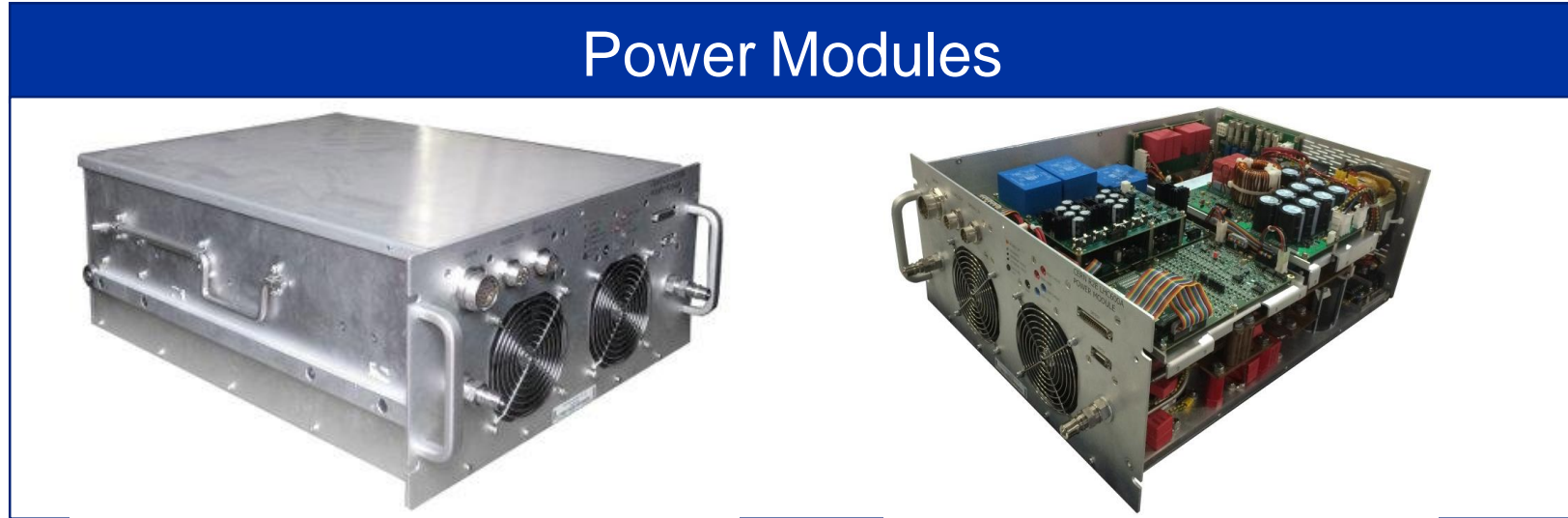


Electrical Power Converters Industry opportunities

Be part of North Area Consolidation Project and HL-LHC upgrade

Manufacture & Test
build-to-print equipment

Power Modules



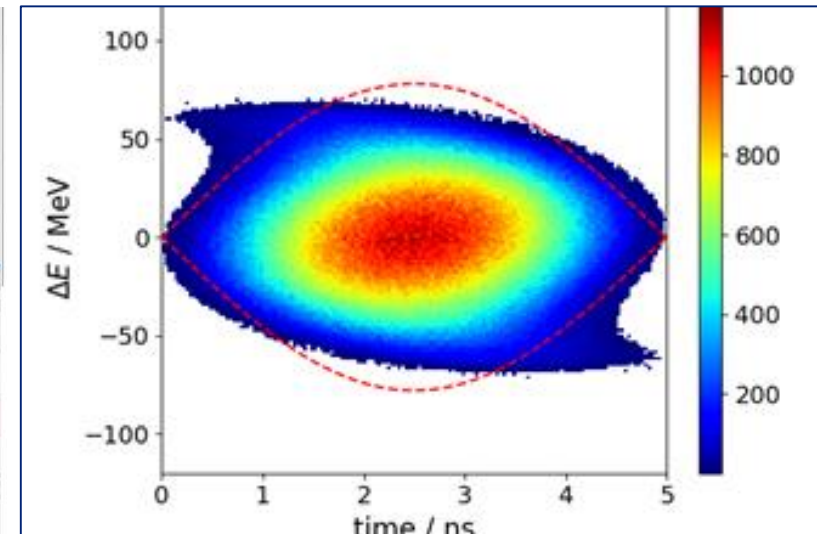
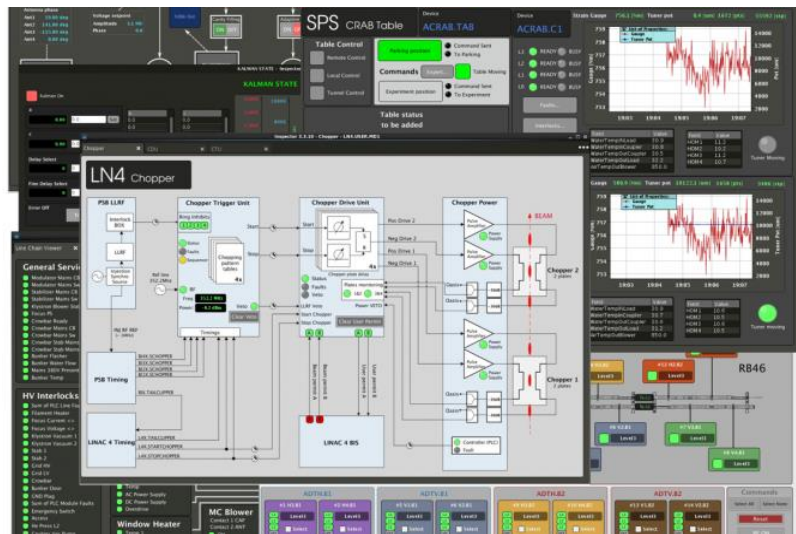
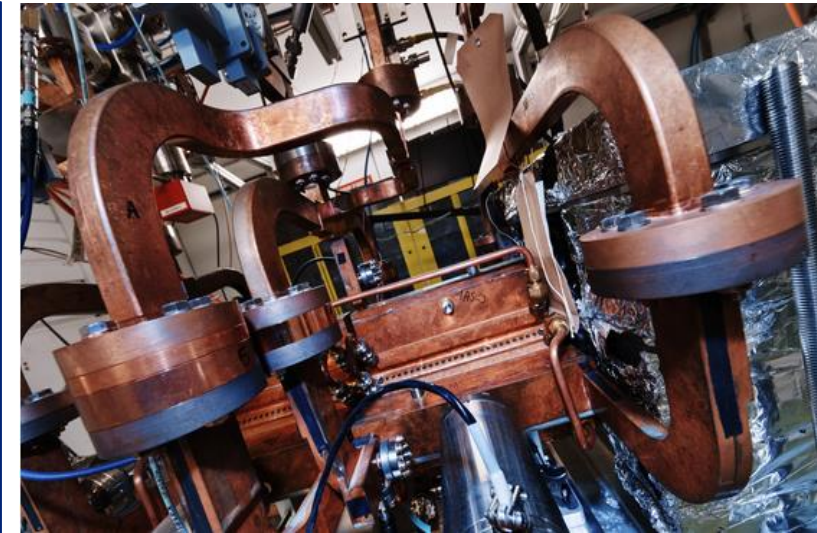
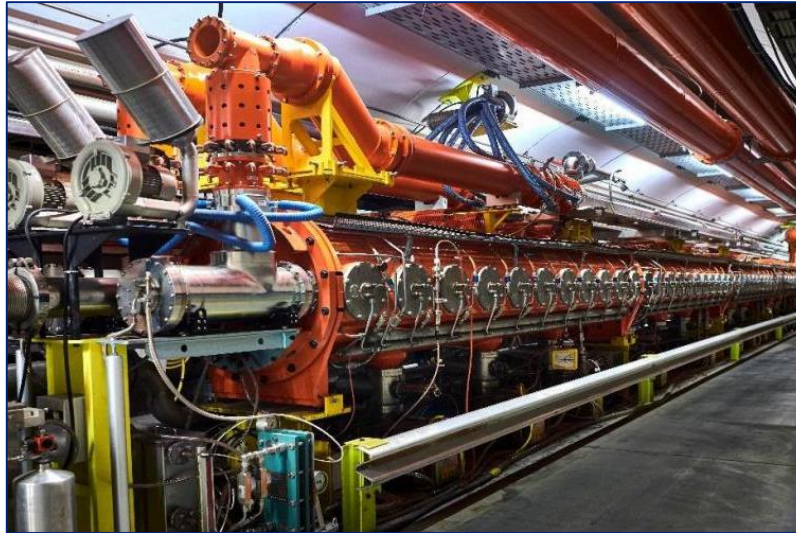
Integration / Cabling



Radio Frequency

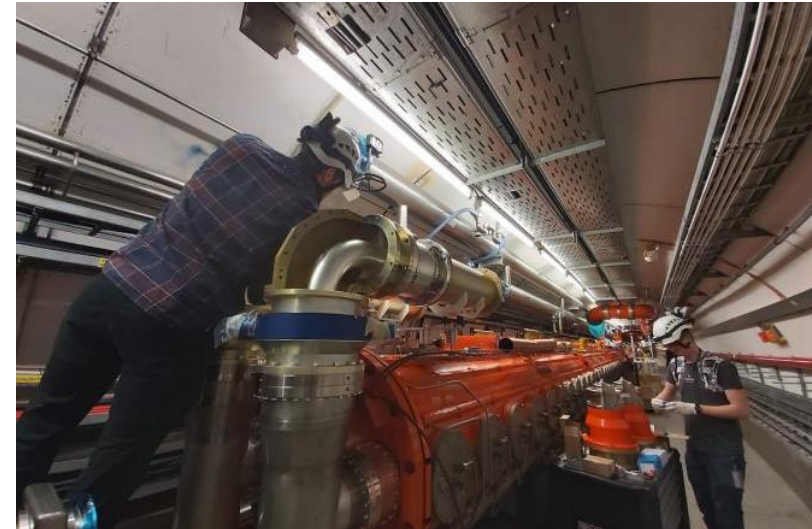
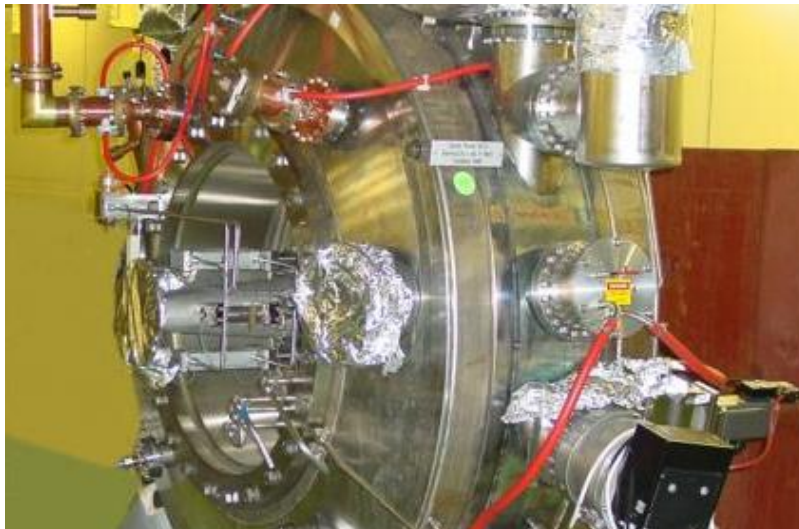
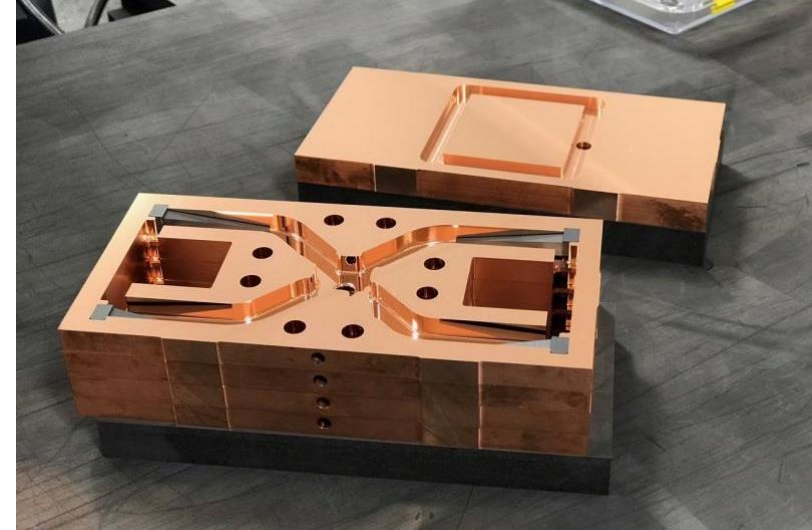
The RF Group is in charge of the CERN's RF systems that accelerate the beams:

- Modulators, klystrons & high-gradient structures;
- High power RF amplifiers & couplers;
- RF cavities for linear accelerators;
- Superconducting RF Cavity technology;
- Longitudinal beam dynamics, beam-cavity interactions;
- Control, interlock and protection systems.



Radio Frequency

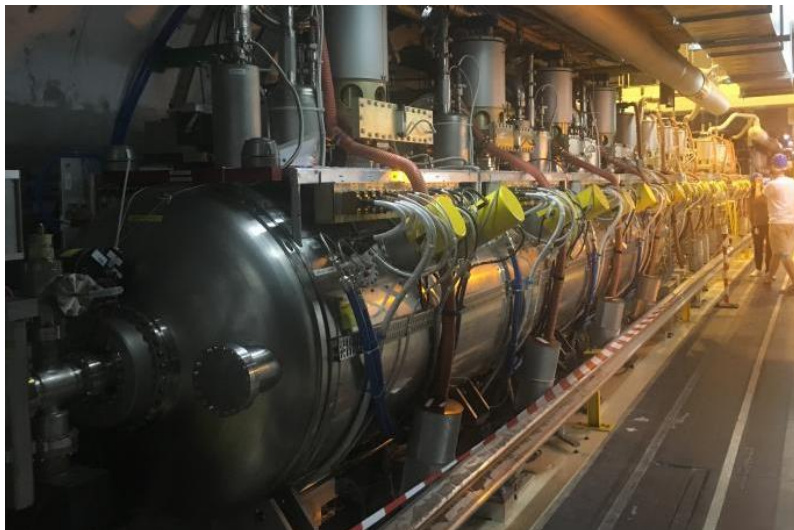
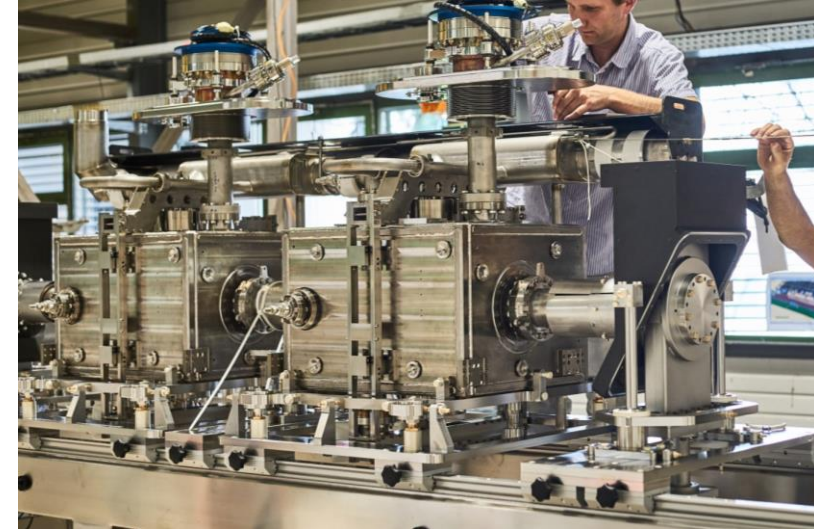
- Presently in R&D phase for FCC, meaning no big contract on cavities is foreseen in the next 5-10 years.
- For R&D looking for ways to manufacture seamless copper cavities
- For the existing RF amplifiers, there will be small-scale purchases of solids state and IOT based amplifiers



Future Needs

Radio Frequency

- A certain number of LLRF and controls electronics cards needs to be re-made or replaced.
- uTCA based systems will be needed over the next decade and slowly replace existing VME systems



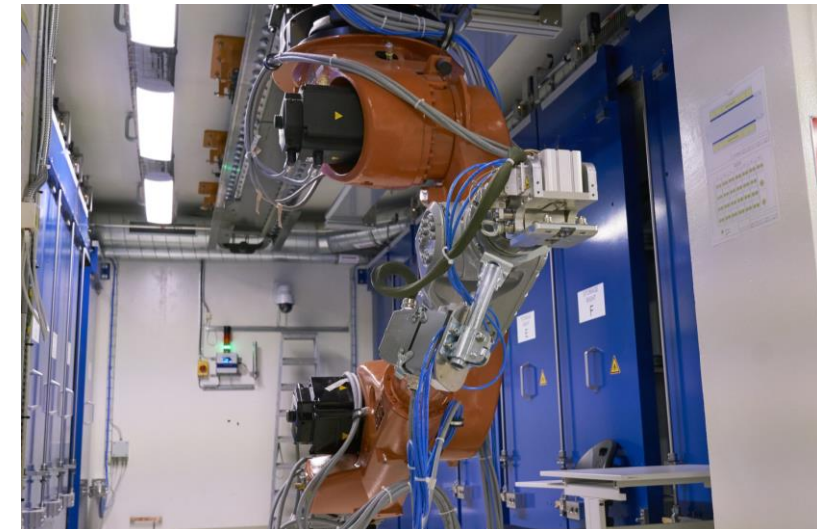
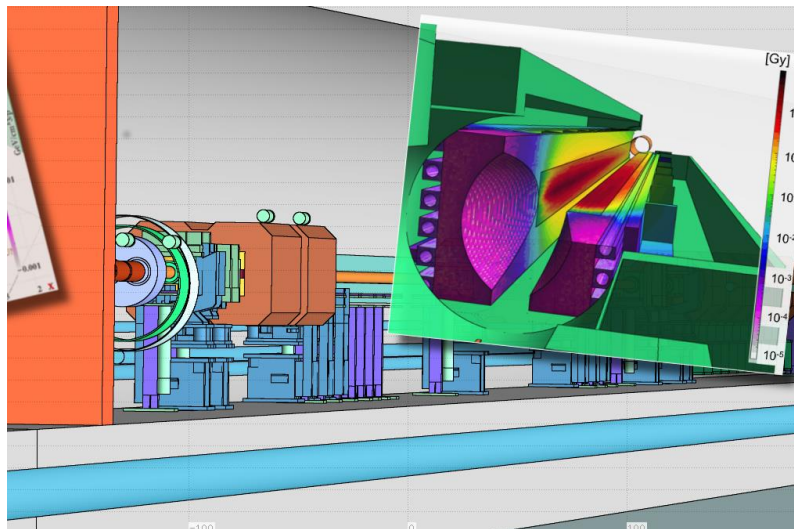
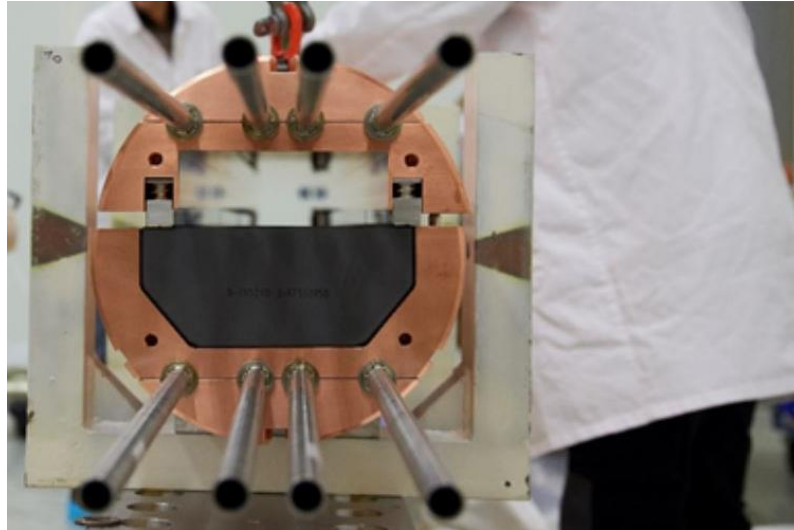
Future Needs

Sources, Targets and Interactions

Mandate

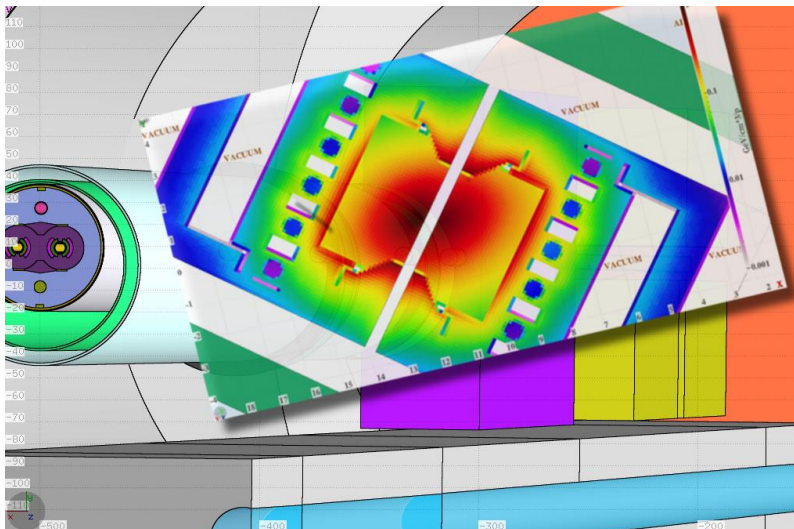
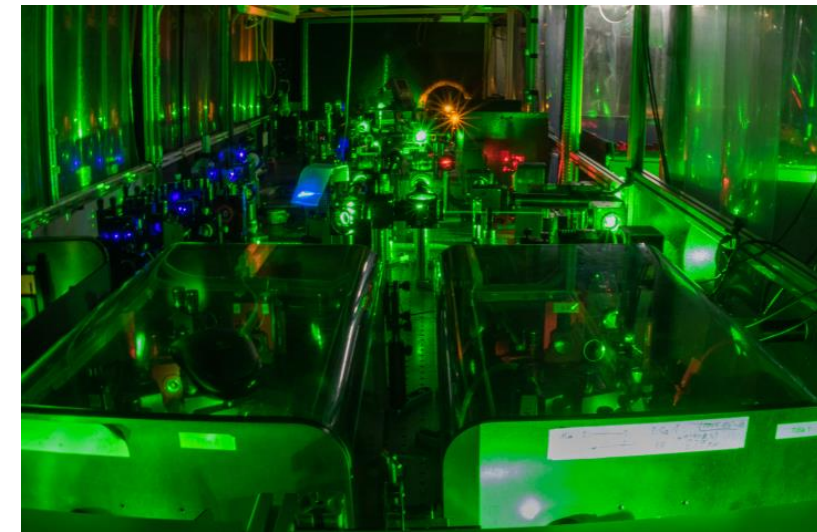
The STI Group applies its broad expertise and know-how on the interaction of beams with matter to a large spectrum of activities:

- Targets, Collimators and Dumps;
- Beam-Machine interaction studies;
- Nuclear engineering;
- Lasers and photocathodes;
- Radioactive beam sources.



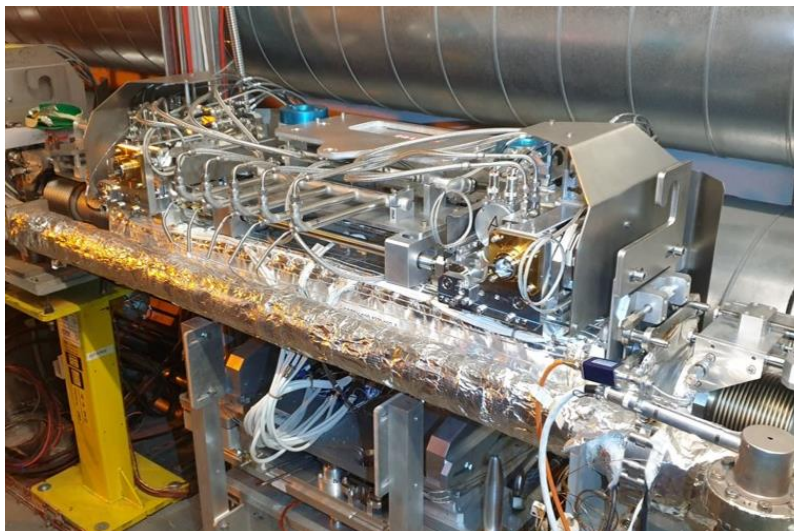
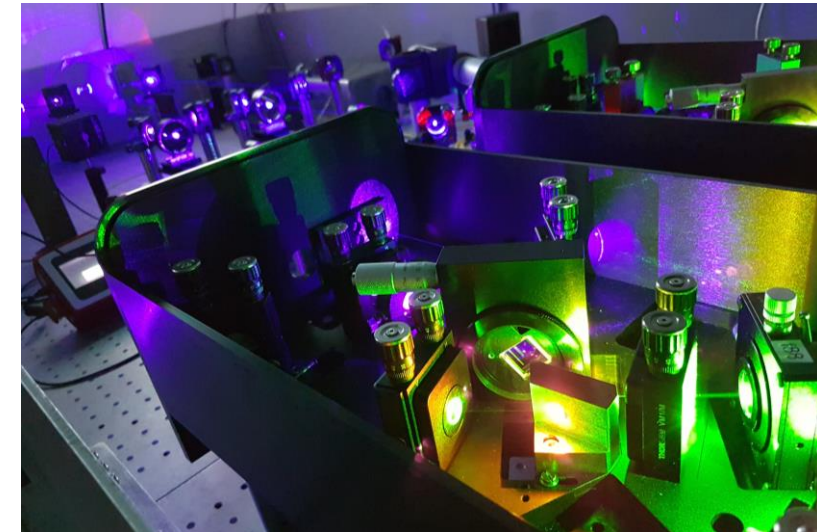
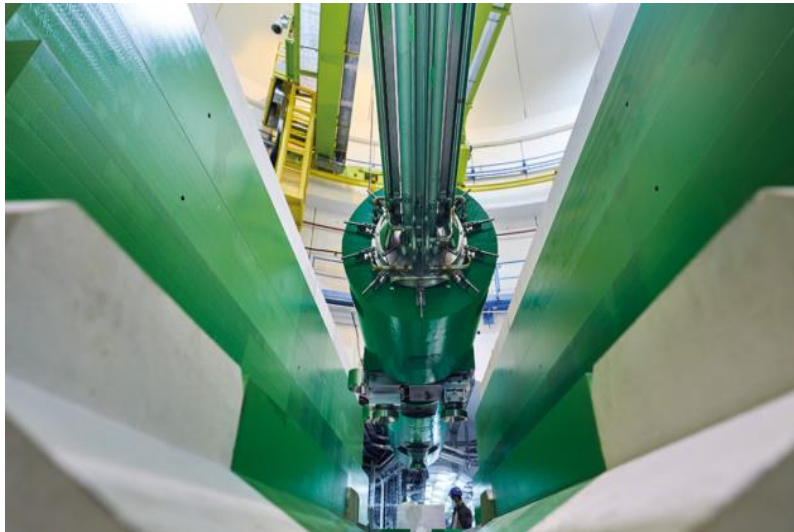
Sources, Targets and Interactions

- Conceptual development of a multipurpose handling cell to house / manipulate large and complex radioactive elements.
- ISOLDE beam dump consolidation, dump core material and cooling system.
- Graphite materials (densities from 1.1 to 1.8 g/cm³) for the HL-LHC beam dump.
- Refractory metals (Ta, W, Ir, Nb)



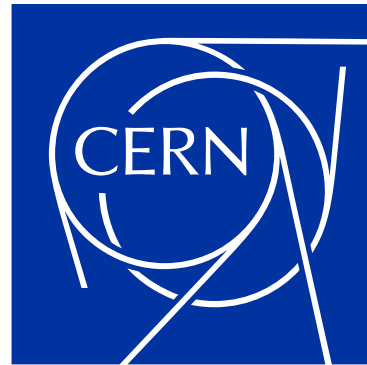
Sources, Targets and Interactions

- **Several Laser component and applications**
 - Laser integration RF locking and electronics.
 - Wavelength meters
 - 80W and 110W lasers
- **Various raw materials for the HL-LHC collimator (stainless steel, bearings, roller screws, etc.)**
- **High precision UHV tanks in stainless steel, aluminium and TiGr5**
- **Cast iron blocks for shielding application**



Future Needs

Thank You for your Attention



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