



Elettra Sincrotrone Trieste

From Elettra to Elettra 2.0: 25 years of experiences

(passing through the Booster and FERMI)

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Elettra
Sincrotrone
Trieste

Elettra (1993 – «Today»)

1991 – 1993

Construction (buildings, Linac and Storage Ring)

1994

Start of Users' operations (3 beamlines), being the first third-generation light source for soft-X rays in Europe.

Notes

Initially max. energy 2.0 GeV, currently operating both at 2.0 GeV and 2.4 GeV

Injector: a "1.5 GeV" Linac (no full energy injection)

Image from a Russian Spy-Satellite (about mid 1992)



Separate Systems Approach:

- Buildings and infrastructures
- Accelerators subsystems
- Beamlines & Experiments
- "Interface information"

Elettra in 2004





Elettra: first Lessons...

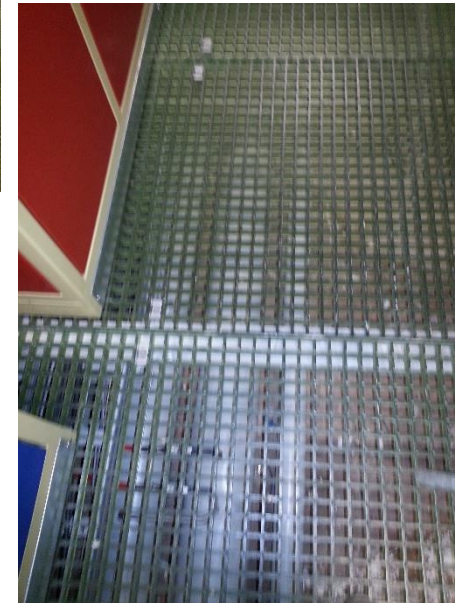
SR tunnel air conditioning: 260 meters with 2 inlet and 2 outlet...

Cooling water pipes under the cabinets: light, easily removable floating floor...

...with large grid holes and electrostatic!



← **“Domestic” solutions**





Elettra: ...more Lessons...

Service mains:

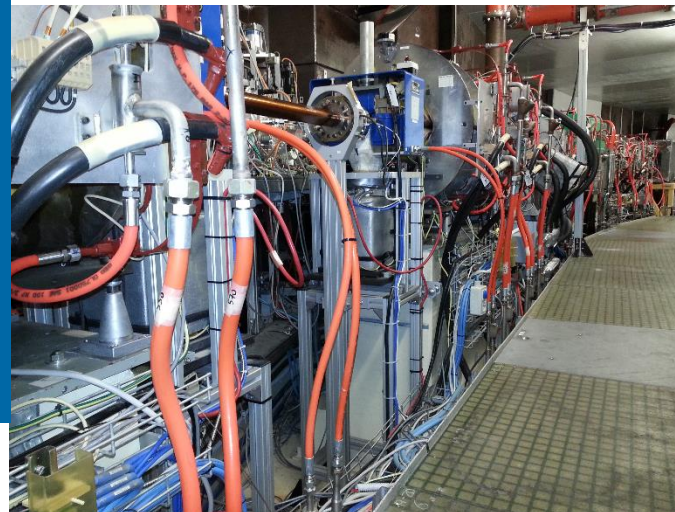
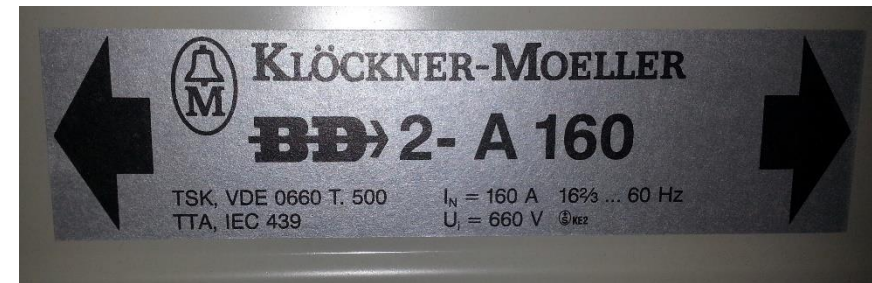
busbar system for flexibility...
...100 kW in SR Tunnel and
Service Gallery.

Cooling water distribution:

organized in sub-sections...
...complicate regulation, too
few flowswitches, under the
floor, uncorrelated naming
between services and
machine.

Magnet & PC design:

Separated, each adding
safety margins, magnet
design change AFTER call for
tender of PC, one sextupole
family operates 1/3 of max
current (optics change),...

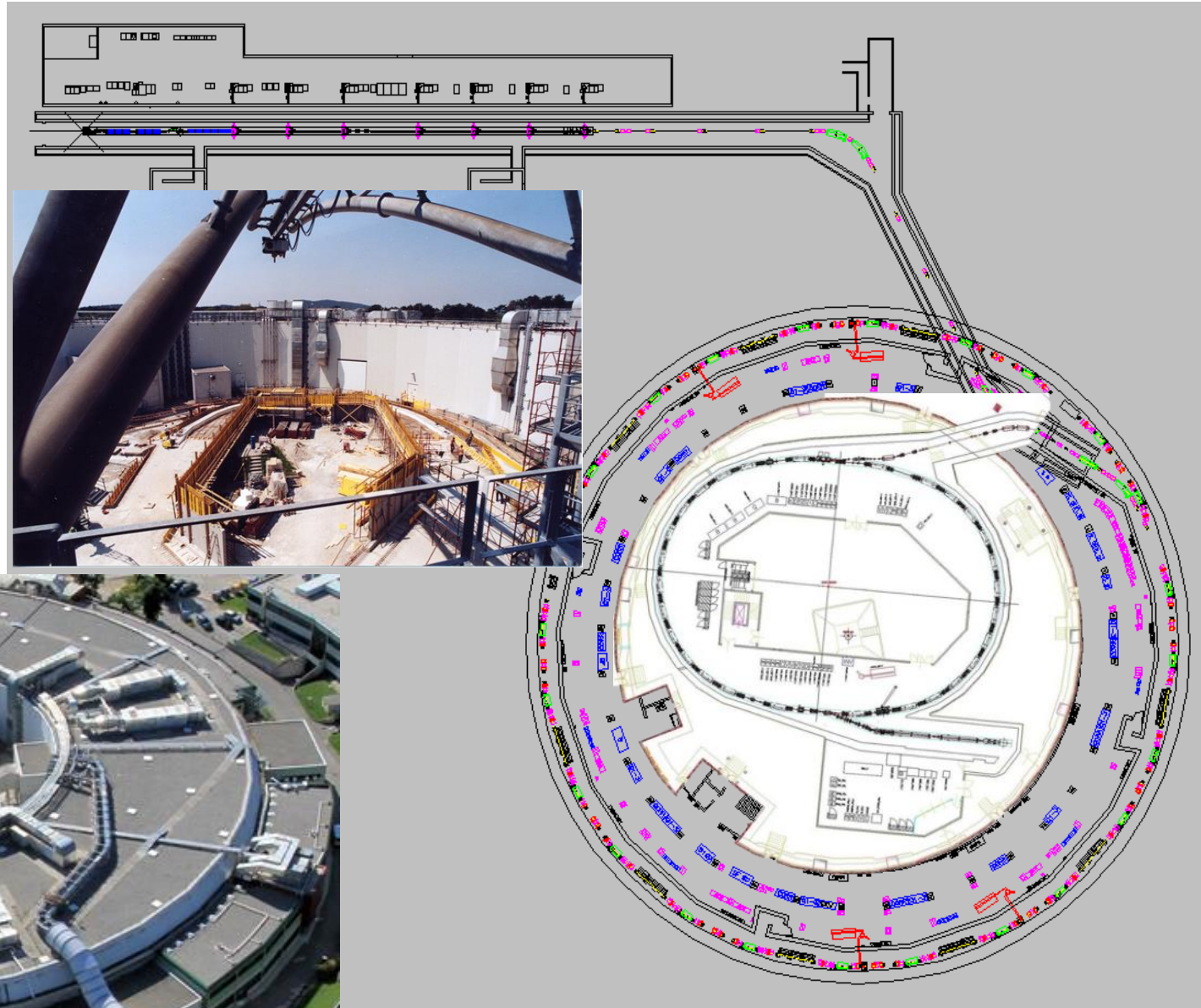




Booster: the Full-Energy Injector

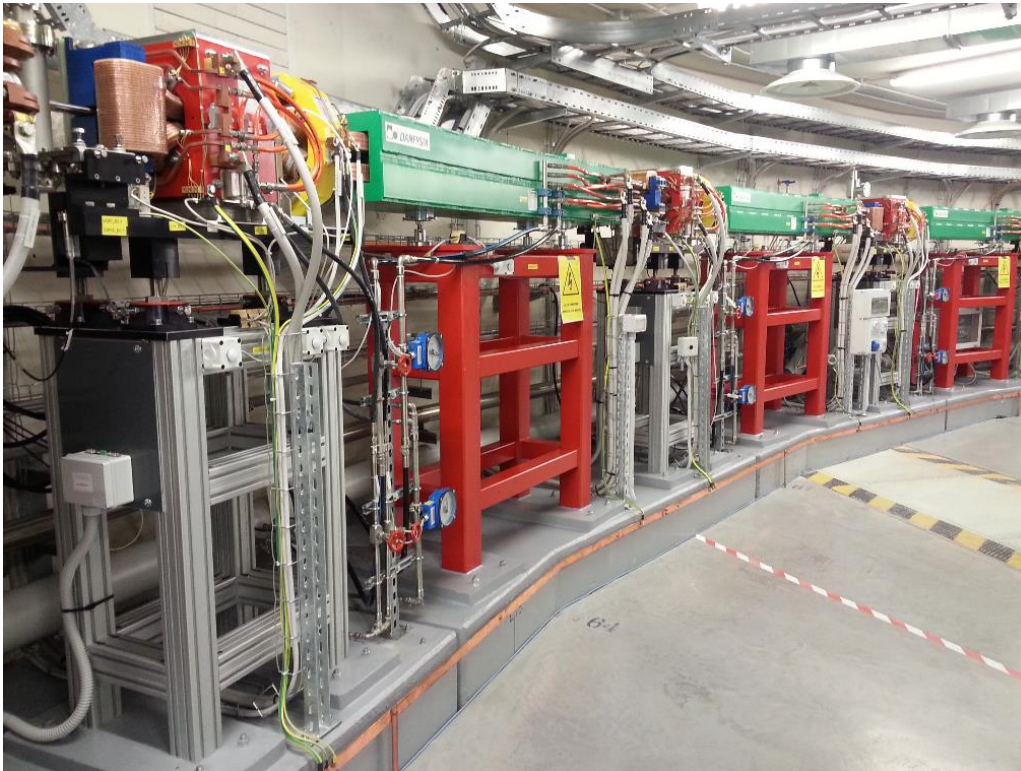
June 2005 – Dec 2007:

- Full energy injector (Linac + Booster) at 2.0 & 2.4 GeV
- Inside the existing building with Elettra operating for Users
- All stuff brought in with 40 m, 7 ton, bridge crane
- Top-Up since 2010



Booster: some Lessons learnt...

- Distributed Air Conditioning
- 1 magnet = 1 flowswitch
- Pipes, valves, cables, alignment feet... all is “easily” accessible
- Same naming conventions for machine and “services” close to the machine
- Remotely monitored water leak detection system (“Frog”).



Booster: ...and more Lessons to learn...

No "Service Gallery" – too (?) expansive:

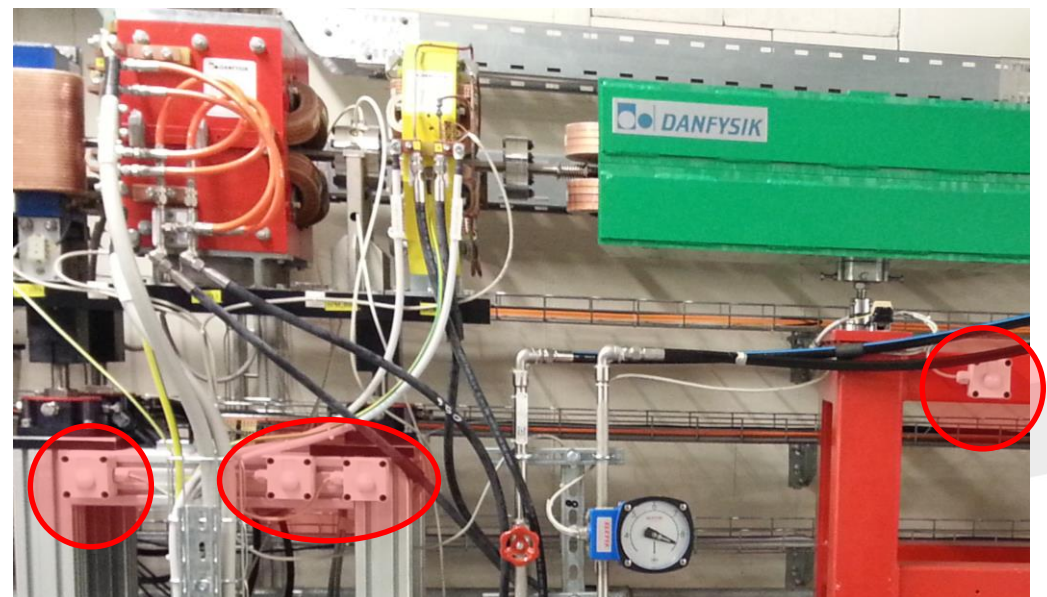
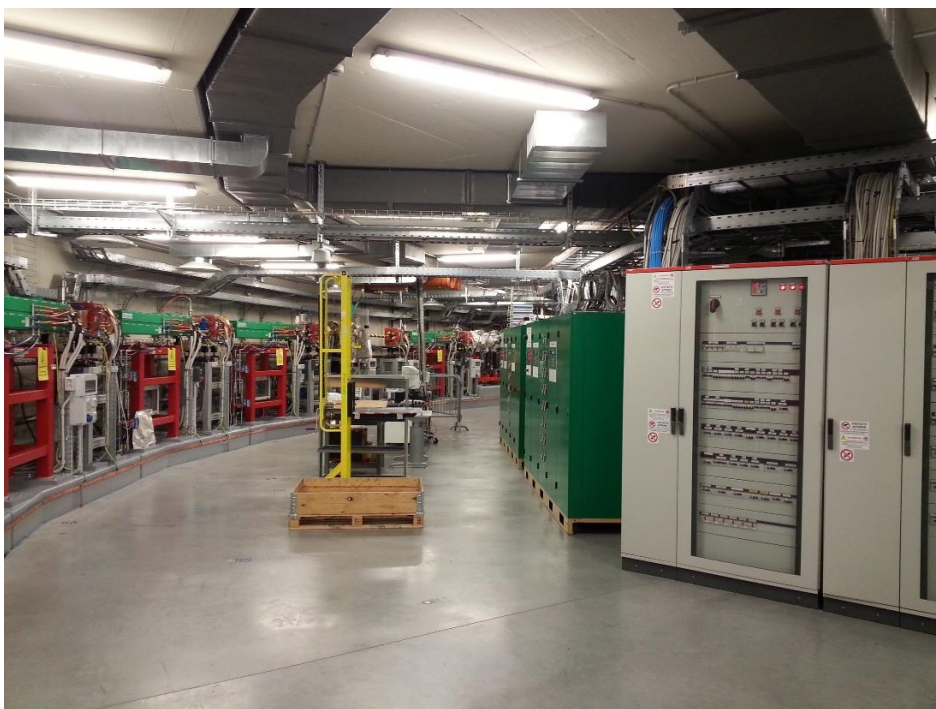
- Distribution board, instrumentation, PC, etc. in the same area as the accelerator...
- Accessibility issues
- Maintenance issues (if PC are ON, magnets are energized and nobody should access the area)

Cooling of Klystron:

- Safety (too much) margins...

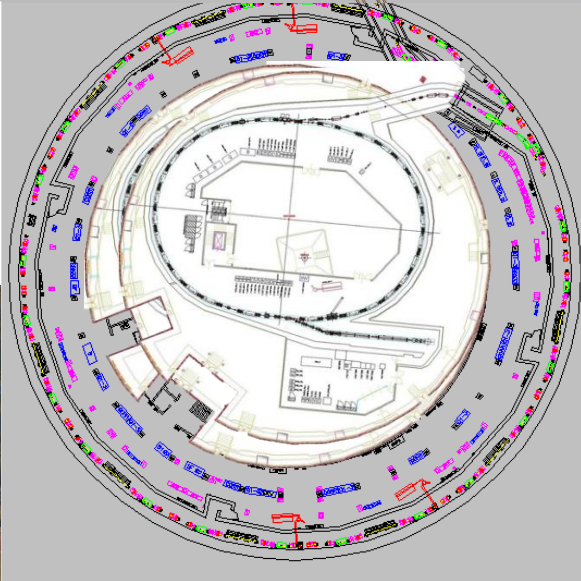
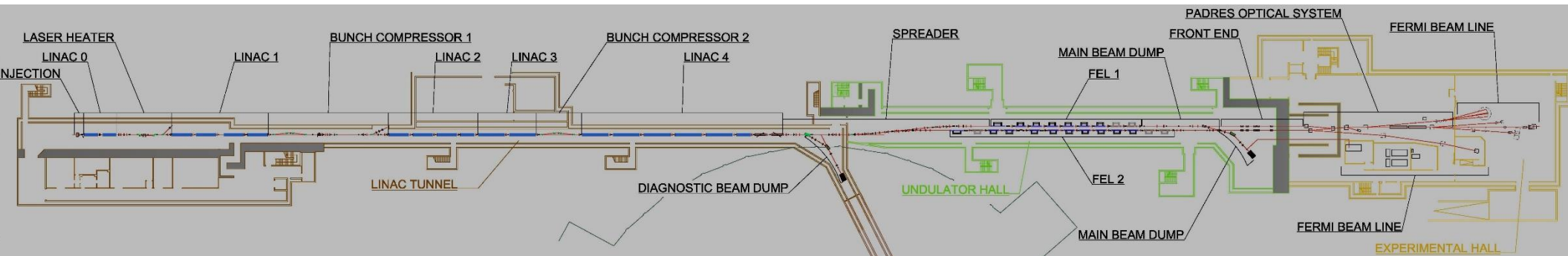
Interlock & Protection system:

- Not (enough) visible, single-state "Magnet On" light





FERMI: the seeded FEL



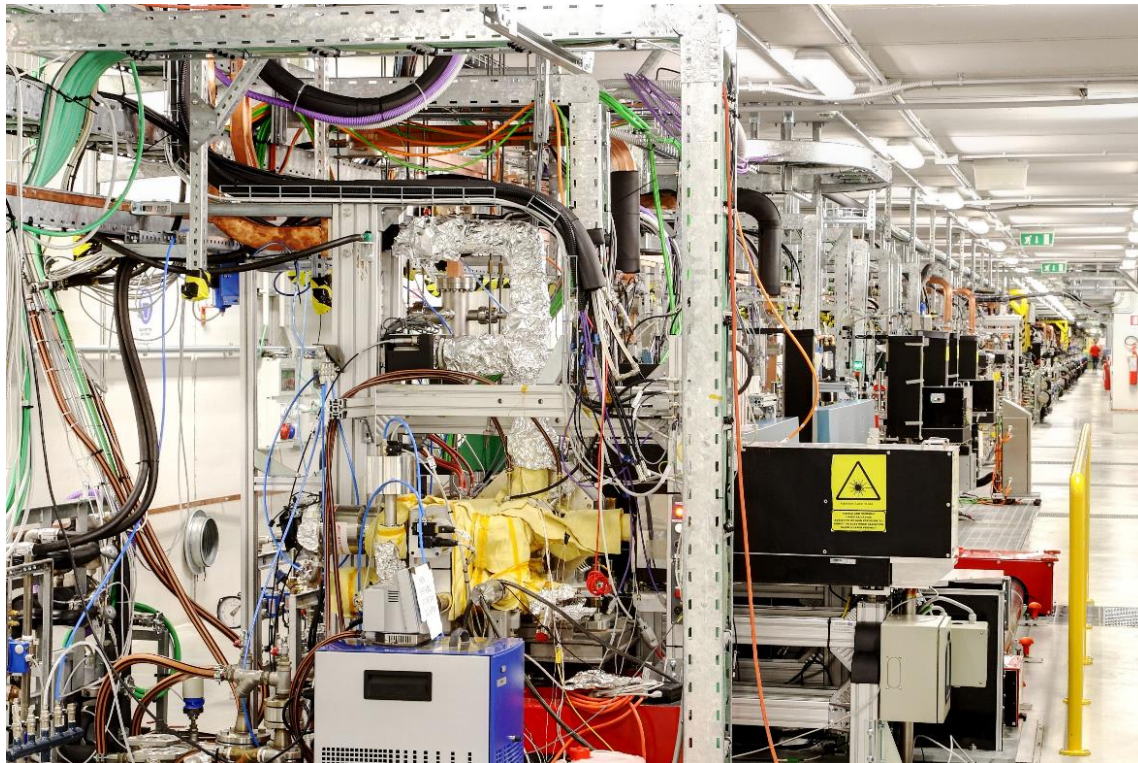
(2006) Jan 2008 – Dec 2010:

- 360 meter long, 5 m under ground level
- Extremely close to Elettra operating for Users!
- Re-use of the existing Linac (tunnel & accelerator)
- Tunnel extended >200 m
- Conventional plants rebuilt

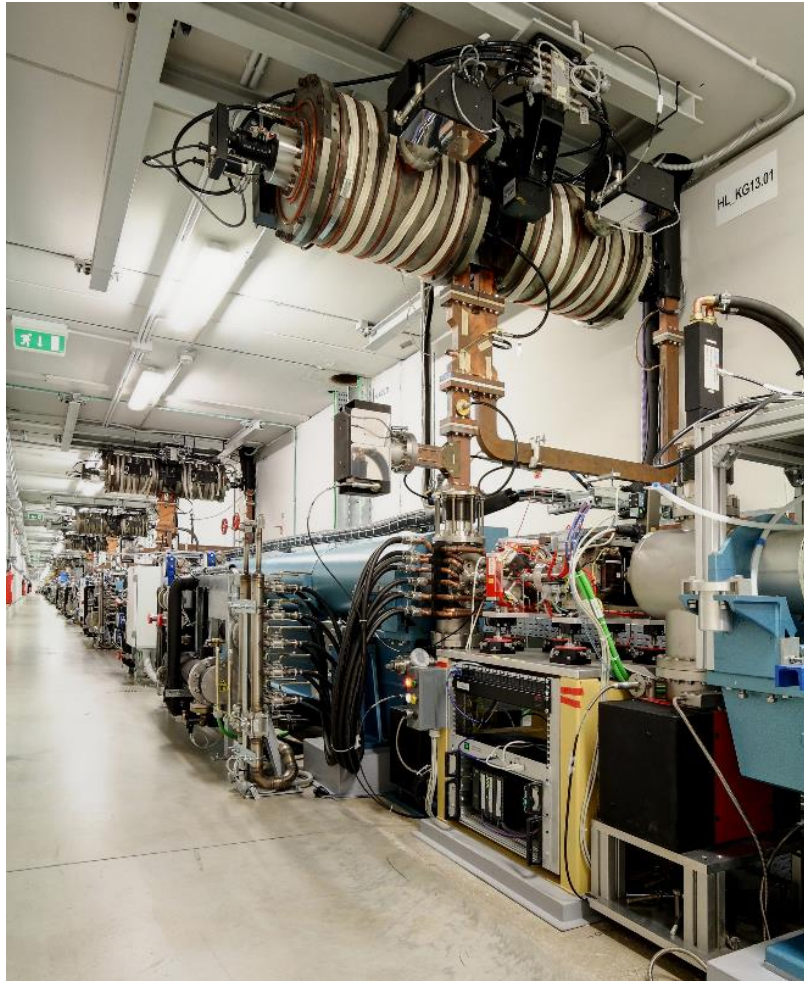
FERMI: «Integrated» Design

Magnet & PC:

- 400 iron magnets and coils and PC
- 36 types of magnets and coils
- 17 types of power supplies
- 2 types of PS cover the 88% of loads (375 vs. 425)
- “Installed Power” and “Utilized Power”: “Contemporary Factor” based on the possible optics (relevant for the contract with the energy Supplier)



FERMI: «Integrated» Design



- Partial integration of the “services” close to the machine in the Control System
- Upgrade with Siemens Desigo™ PLC for the “Services” plants
- Possibility to read the variables from the Services’ plants from Control Room
- Possibility to create logs of alarms from Services’ variables



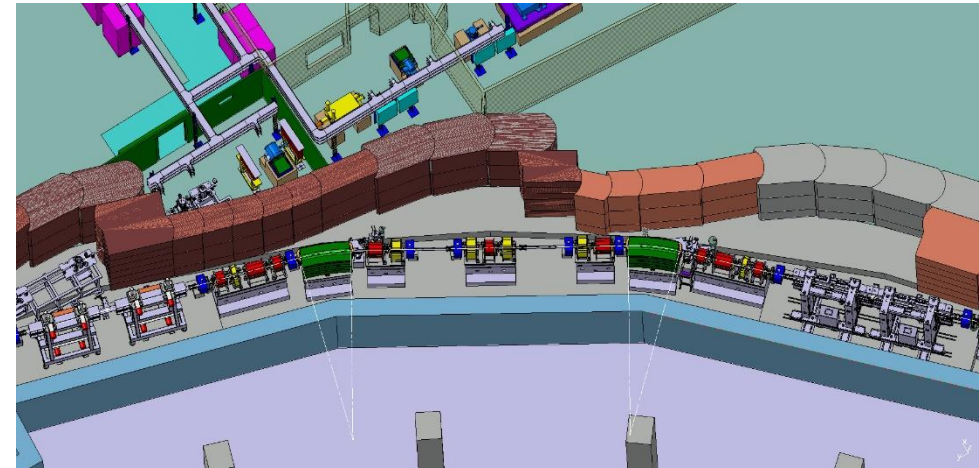
Elettra 2.0:

Don't repeat old mistakes, do new ones!

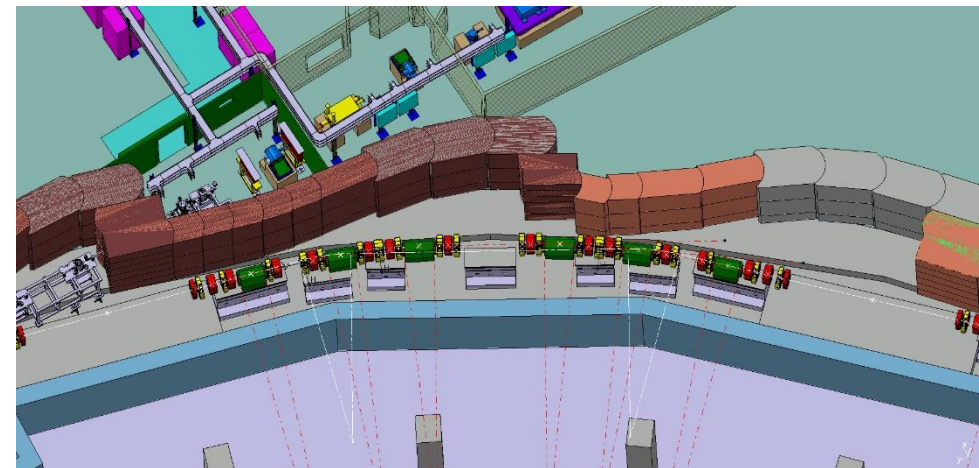
2017 – 20??:

- CDR but... Additional studies on optics.
- Number of magnets & PC between 580 and 700 (4BA or 6BA)
- Air cooling (M & PC)
- Max power on magnet <800 W
- Coordinated design of optics, magnet, mechanics, vacuum, cabling & PC for overall optimization
- Conventional Systems interfaced with Siemens PLC (in-house Know-How)

Elettra
(2BA)



Elettra 2.0
(6BA)





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Thank you!



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