Elettra Sincrotrone Trieste

Elettra
Sincrotrone
Trieste

From Elettra to Elettra 2.0

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Elettra 2.0 Project

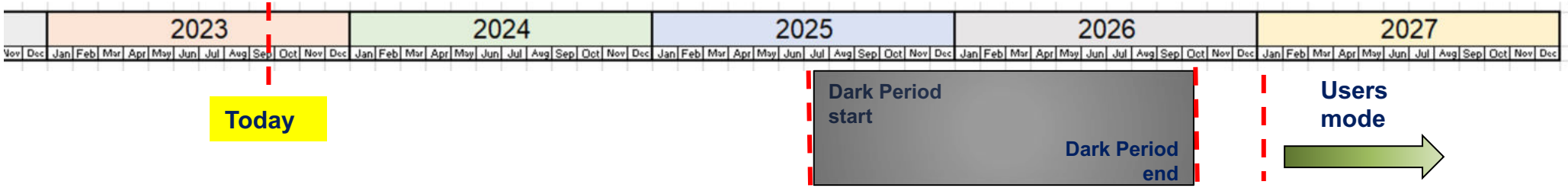
A 4th generation light source that will replace the existing 3rd generation light source.

Elettra is serving since 30 years the user community with excellent results.

To keep the light source competitive for synchrotron research and enable new science and new technology developments, the diffraction limited storage ring Elettra 2.0 is going to replace Elettra.

Elettra Sincrotrone Trieste
1993 – 2023 | 30 years of light

Elettra 2.0 Timeplan



PHASE 1 *(all beamlines in operation)*

Main activities:

- Start upgrade of the Beamline Control System
- Start upgrade of the photon transport optics wherever possible
- Upgrade of the safety hutches
- Installation of safety hutches for SYRMEP-LS and HF-SAXS (space already available)
- Removal of SR-FEL, LILIT and IUVS BLs
- Adjustment of the tunnel wall where possible

PHASE 2

- Installation of most of the new beamlines
- Upgrade of the liquid nitrogen distribution plant
- Completion of the tunnel wall adjustment

PHASE 3

- Installation/upgrade of the remaining beamlines

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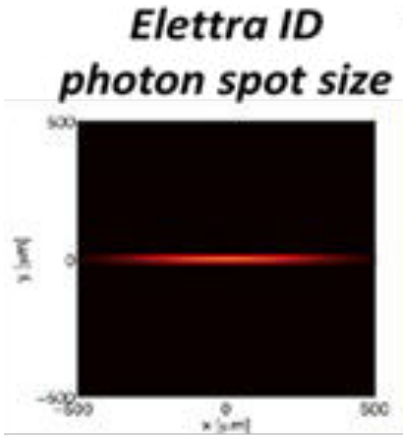
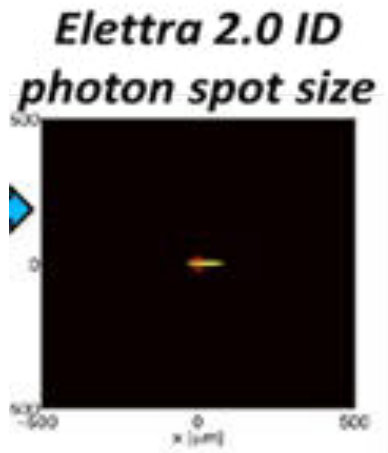
From Elettra to Elettra 2.0

		Elettra	Elettra 2.0
Operating for users		1994-2025	2027-
Beam energy	GeV	2.4 (25%) --- 2.0 (75%)	2.4 GeV (2.0 for some time)
Photon energies	keV	0.003-25	0.015 - 60
e – emittance - coupling	nm-rad	10 --- 7 - 1%	0.212 --- 0.150 – 3%
ID slots		11 Long + 1 short	11 Long + 5 short
Beam lines (IDs, Dipoles)	#	28 (19, 9)	32 (25 3 IVU, 7 3 SB)
e-beam size at LS (σx,σy)	μm	286,16	36,6
Brilliance (ph/s/mm²/mrad²/0.1%bw)		$2x10^{19}$	10^{22}
Coherence ratio at 1 keV	%	0.5	30
e - intensity	mA	160 --- 310	400
Lattice -symmetry		2BA - 12 fold	S6BA-E(nhanced)-12 fold
Fill patterns		multi-bunch, single or few bunch, hybrid	whatever





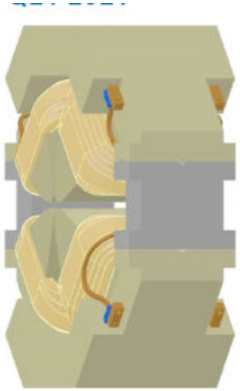
The configuration of Elettra 2.0 is based on an enhanced symmetric six-bend achromat (S6BA-E).

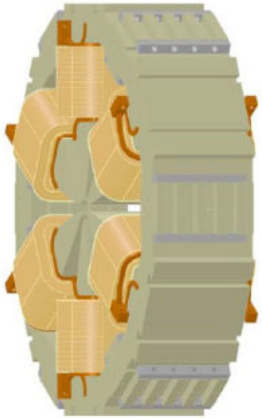
Magnets

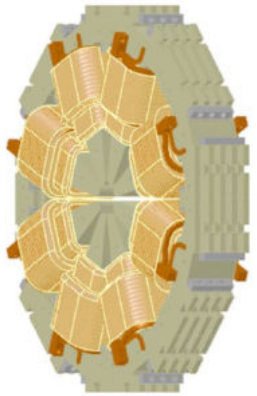
All magnets (552):

- water-cooled
- independently powered
- Correctors 24 + coils in multipoles
- Call for tender for Multipoles concluded
- Call for tender Dipoles closed-> administration phase

The purchasing procedures are underway







Power Supplies Update

- ✓ **300 A unipolar units:**
  - 72 units (without spares)
  - ***COTS (Commercial Off The Shelf)***
- ✓ **100 A bipolar units:**
  - 504 units (without spares)
  - ***In-House design***
- Commercial controller
- COTS Aux and Bulk power supplies
- In-house designed power board and sub-rack (2U high)
- First power board prototype under test, second prototype is ready

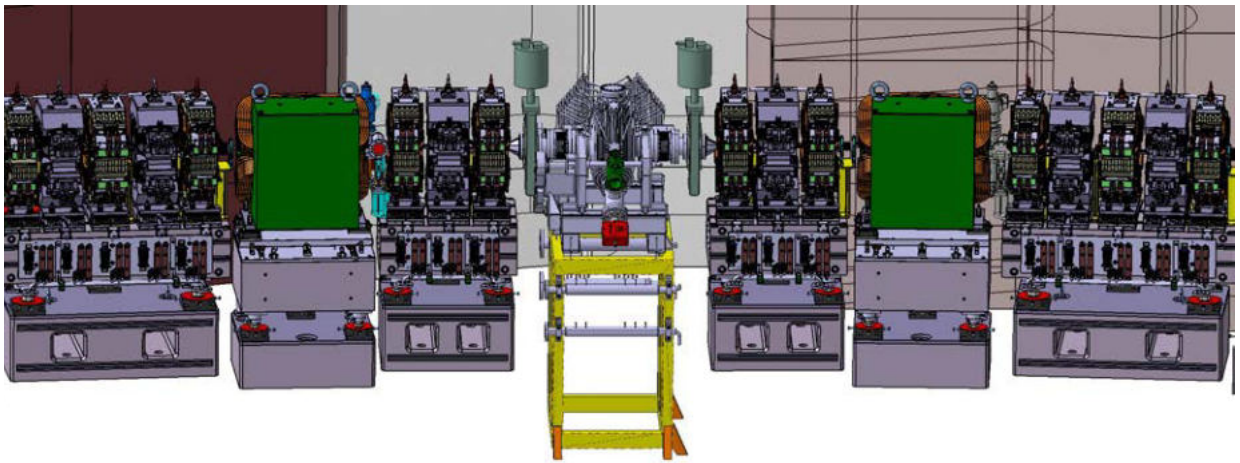
- ✓ **20 A bipolar units:**
  - 456 (without spares)
  - 192 more units for Fast Correctors
  - ***In-House design***
- Commercial controller
- COTS Aux and Bulk power supplies
- In-house designed power board and sub-rack (1U high)
- Two prototypes built and running
- ✓ Built-to-print Procurement strategy
  - One single purchase procedure

The purchasing procedures are underway

RF Systems

Elettra uses 4 rf single cell cavities that will also be used in Elettra 2.0 and 4 rf plants , 3 with klystrons and 1 with IOT replaced by Solid State CRE-331M 130 kW – 500 MHz amplifier.

All 4 klystron/IOT plants have been already replaced. For the double IOT amplifier one part will be reused later in the booster to provide the 1 MV needed voltage.

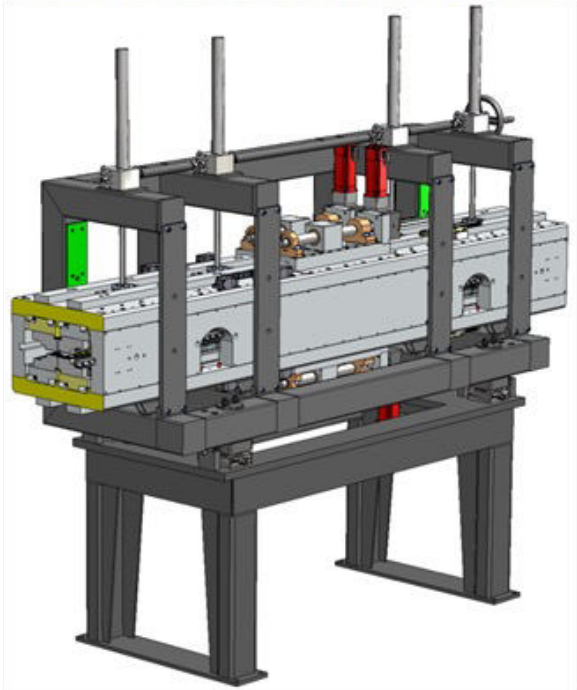


There are plans after 2028 to replace also the cavities with a more modern design equipped with HOM dumpers

Insertion Devices

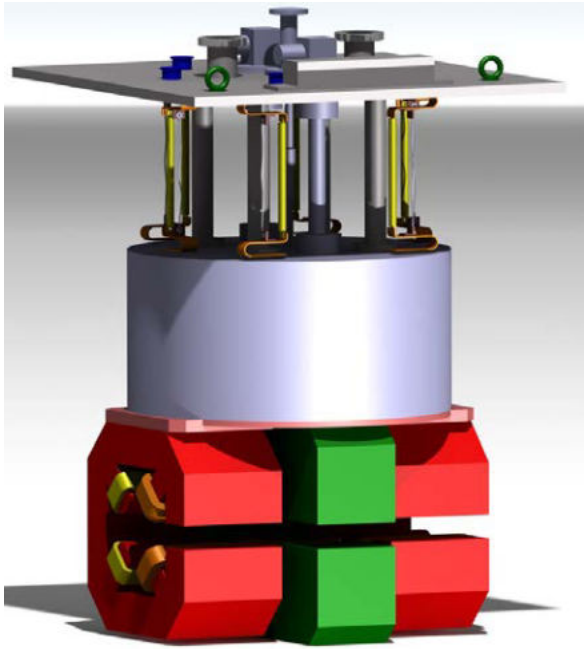
1.8 T short wiggler prototype

EU132: A FIXED GAP EPU



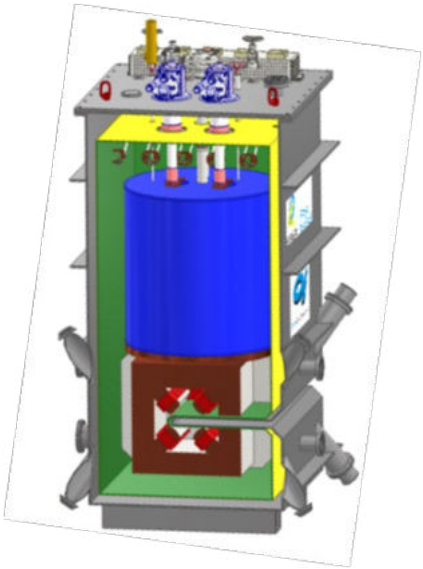
Refurbishment of existing devices
New ID are forseen for the new beamlines

Superconducting Dipoles



Three beam lines at 35 and 50 keV and with flux above **10^{13} ph/sec** will be constructed and will be served by three 6 T SC-Dipoles.

Installation is expected from 2027.



The purchasing procedures are forseen in 2024

Vacuum Chambers and Pumps

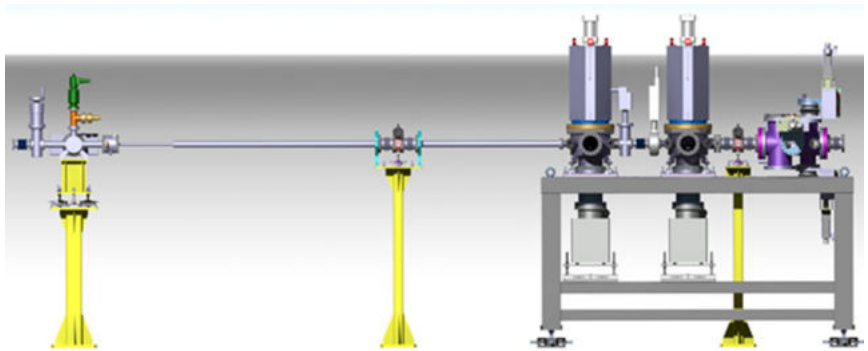
Sizes:
Elettra chamber scaled down by 2.7
⇒ 27 x 17 internal (1.5 mm thickness)

Material:
Cu (45% of the 259 m),

Al (20% of the 259 m),

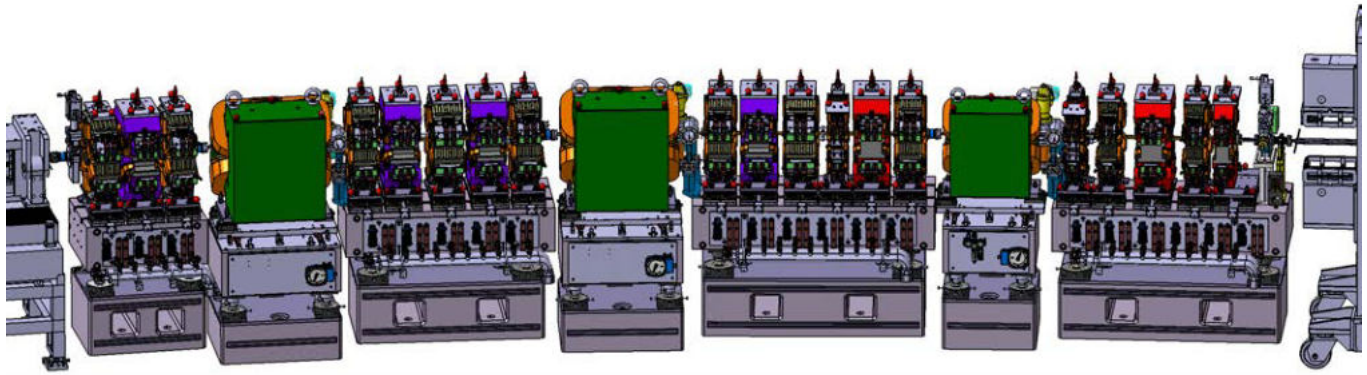
S. Steel (35% of the 259 m)

0.5 μm **NEG-coated** (90%)

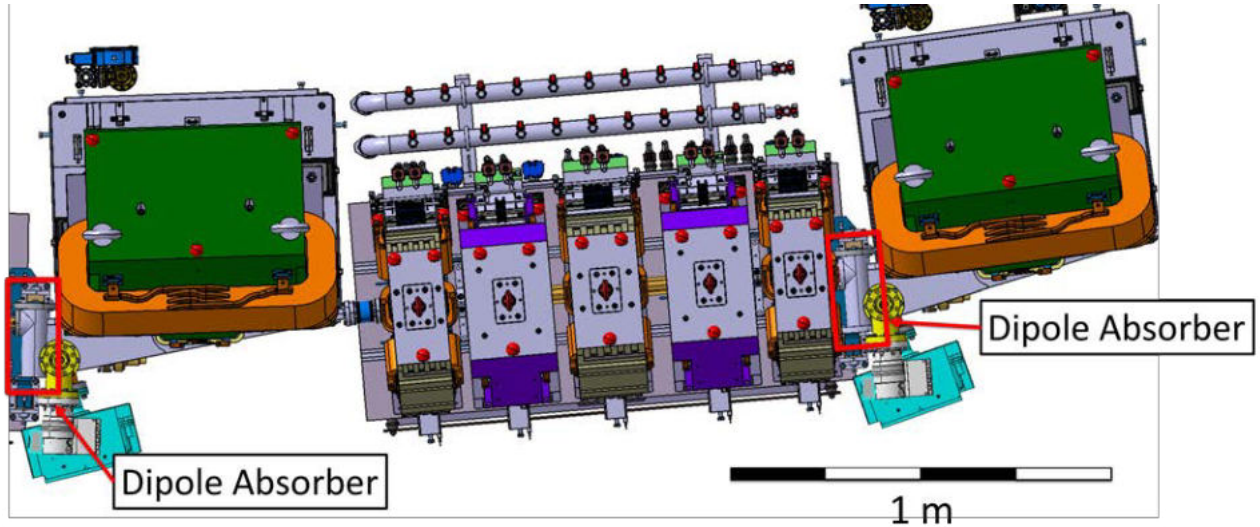


The procurement of the chambers and all chamber related material is scheduled from second half of 2023 to the first half of 2024

Girders and Photon Absorbers



8 Granite slab (1.5 x 0.6 x 0.3 m) + 6 dipole girders per achromat



Tight layout

High spatial power density (SPD):
620 W mm^{-2}

New absorber design needs:

- Able to spread incoming power
- Resilience to misalignments

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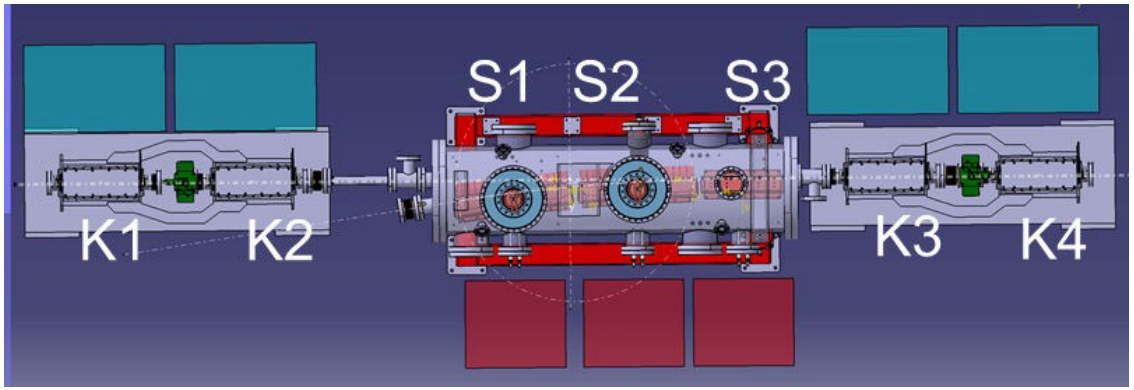
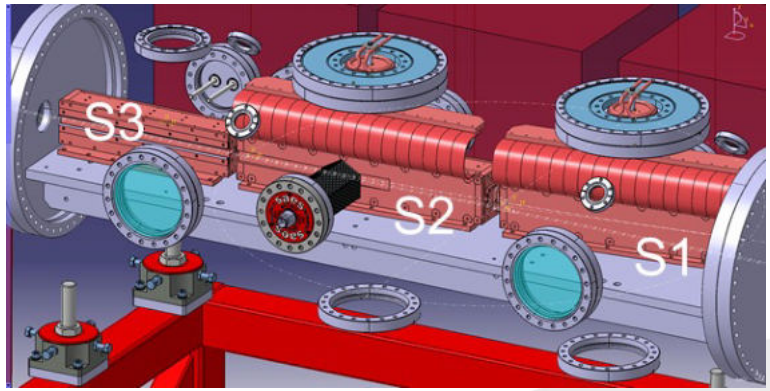
Injector and Injection

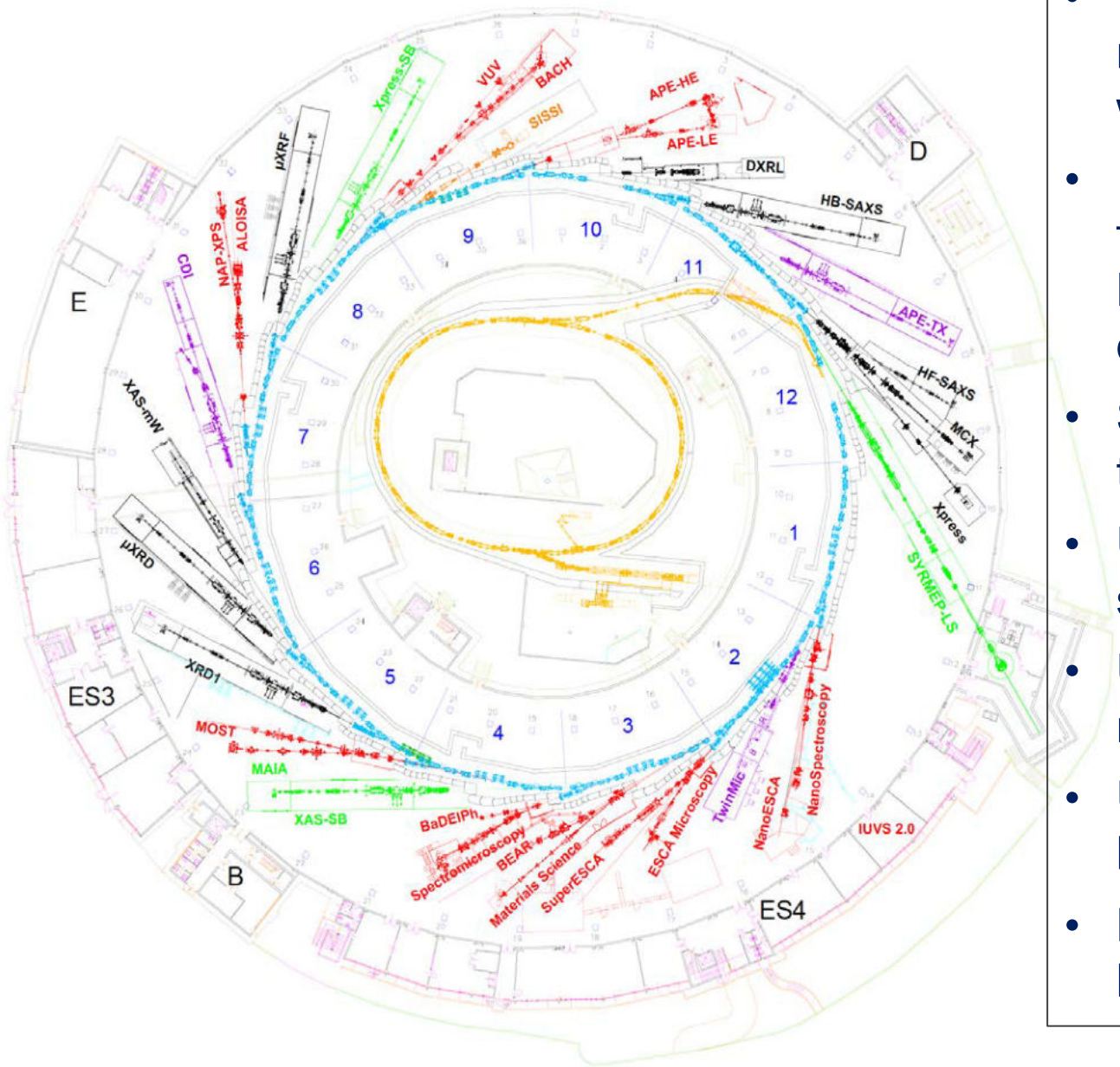
- **New gun 90 kV , new HV modulators (stability)**
- **Renewal of Booster ring PSs & diagnostics**

Beam separation 4 mm, pulse 3-5 μs half sine wave for kickers and septa , thin septum separation thickness 1 mm.



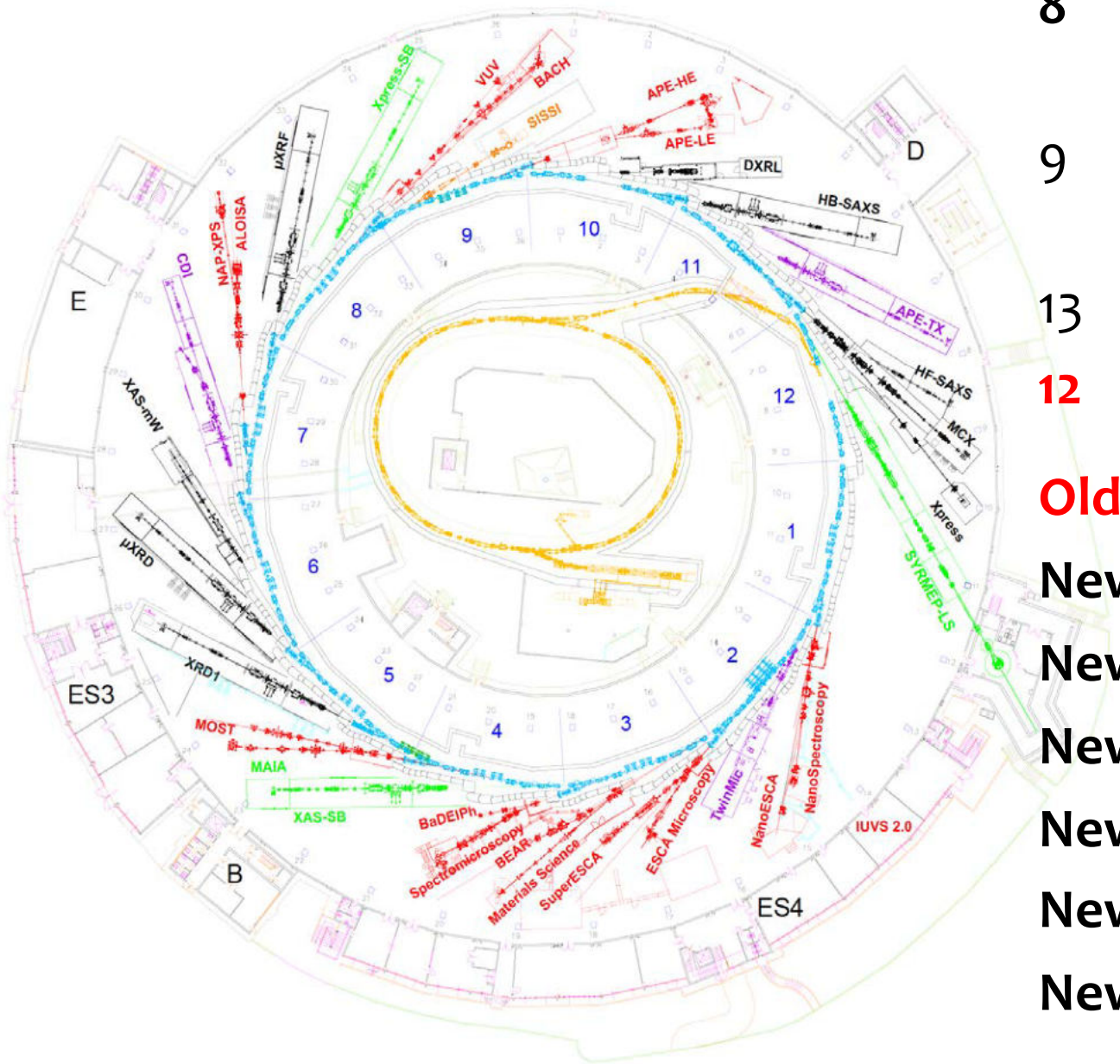


Beamline Upgrade Plan



- Increase the offer of hard X-ray, micro-spot techniques with **new beamlines**
- Install Super Bend sources for high energy (>50 keV) BLs (imaging, absorption, diffraction)
- Strengthen the capacities in the soft X-rays
- Upgrade the VUV/soft X spectroscopy beamlines
- Upgrade the VUV/soft X microscopy beamlines
- Upgrade the hard X-ray beamlines
- Maintain the IR/THz beamlines

Beamline Upgrade Plan



8 **BLs will be permanently removed**

9 BLs will keep the same position

13 BLs will be moved

12 **New BLs**

Old and New BLs will need:

New Detectors

New Diffractometers

New UHV Chambers

New UHV Maipulators

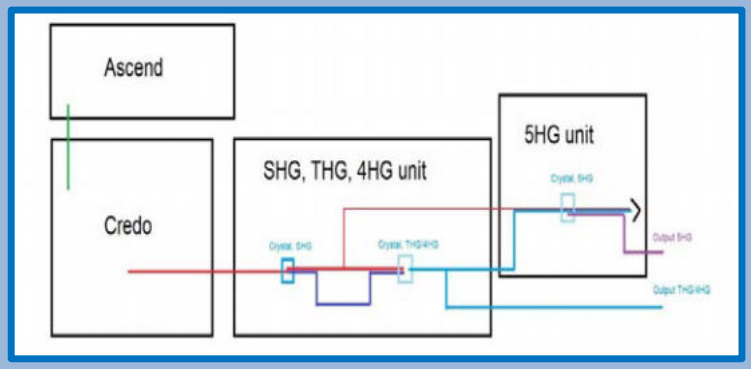
New Analyzers

New …

IUVS 2.0 Laboratory

The very low energy UV beamline moved to laser source: IUVS 2.0

Credo Tisa 1-3kHz
(Spectra-Physics Ascend-40T laser pump
+ Ti:Sapphire CREDO-TISA ns laser +
harmonic generation and mixing units)



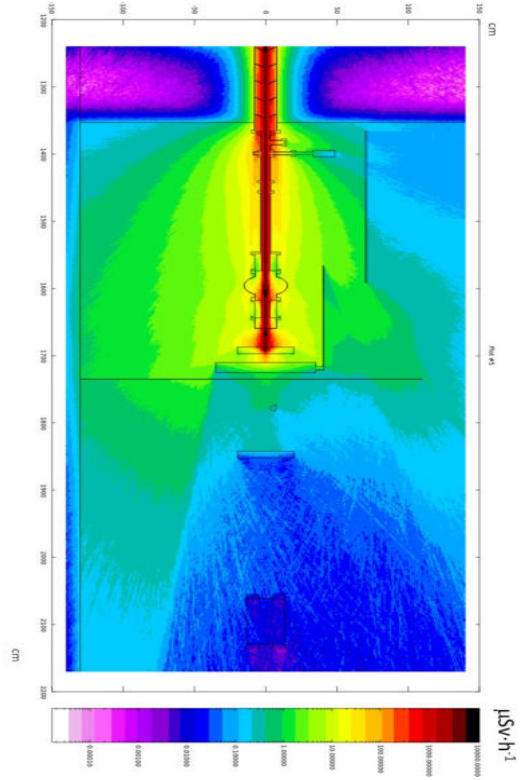
High flux (mW)
Extended DUV range
Spectral linewidth < 0.5 cm^{-1}

New lab ready, final installation and tests of the laser completed in September 2023

Radiation Safety Hutches Upgrade Program

➢ Cases to be defined:

- Definition of the safety level for the new hutches (walls thickness, roof, etc.):
- Verification of the safety level of existing hutches of the beamlines which will keep the same position (mostly soft-X and VUV)

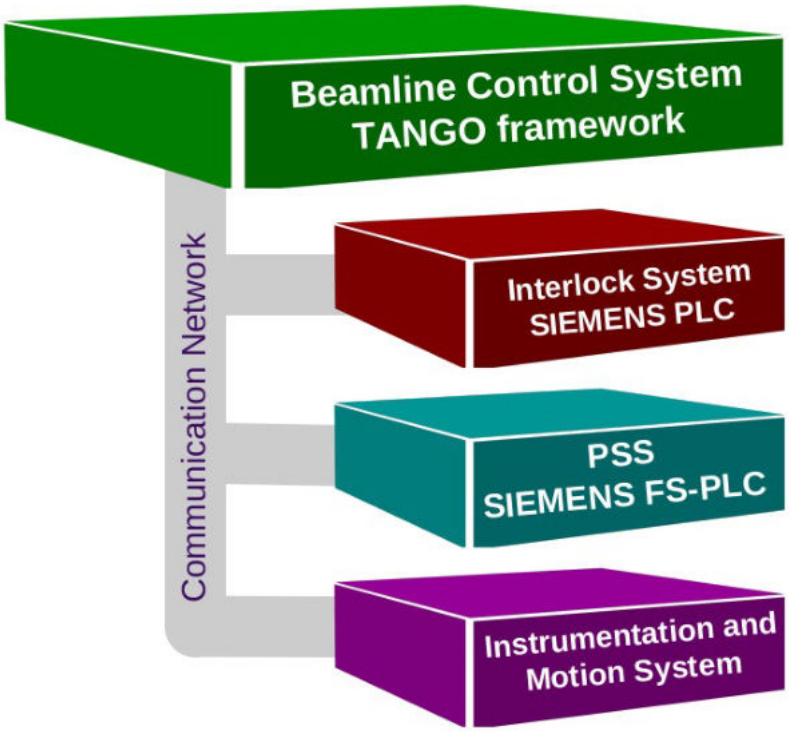


Simulations output

Cat. 1: Heavy hutches for the SBM beamlines
Cat. 2: Standard hutches for hard and tender X-ray beamlines
Cat. 3: Standard hutches for soft X-ray and VUV beamlines

Upgrade of the Beamlines Control System

- **TANGO** control and supervisor framework as for the storage ring
- Interlock and PSS based on **Siemens PLC** as for the storage ring *(Better communication, logging and diagnostics)*
- Motion controller **YAMS** standardization



GE.CO. INTERLOCK SYSTEM

- Vacuum control and beam transport
- Based on Siemens PLC S7-1500
- Modular and reusable architecture
- Distributed system over private PROFINET network
- **Tango** ready

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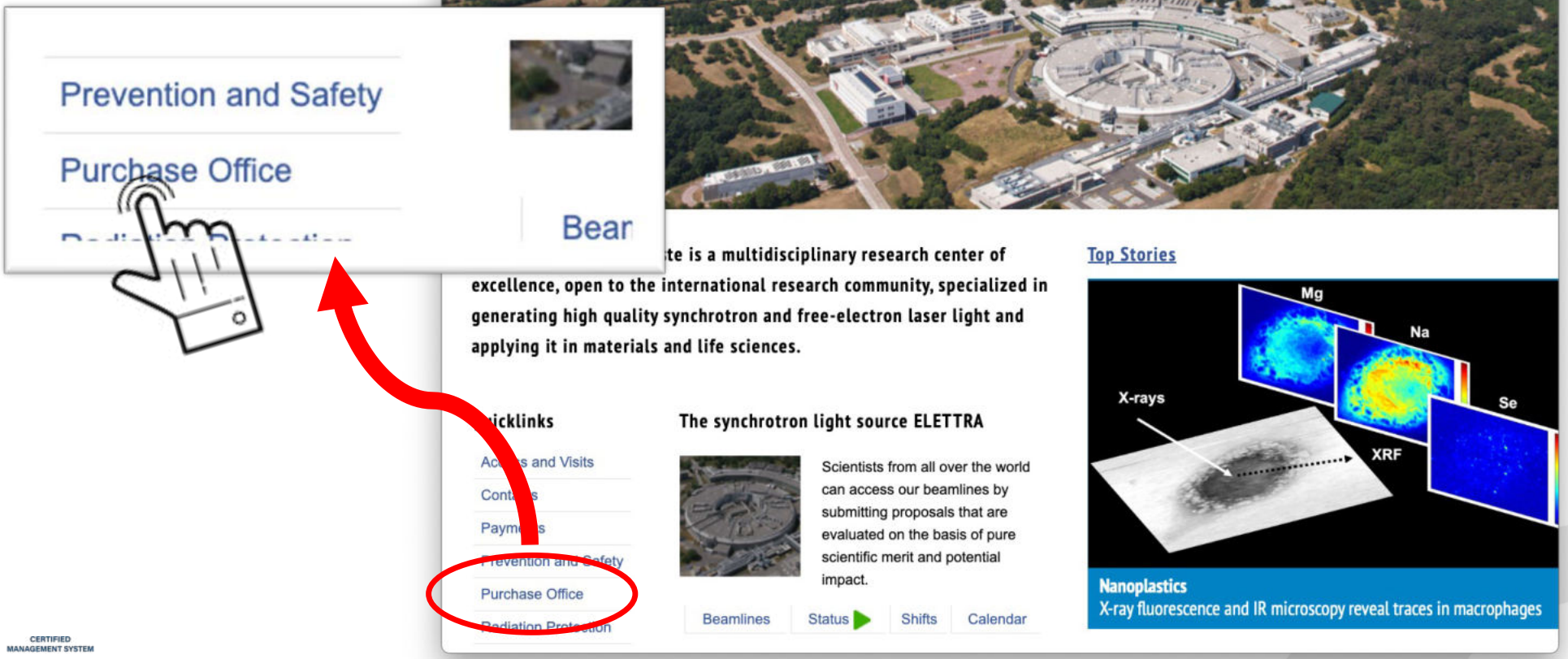
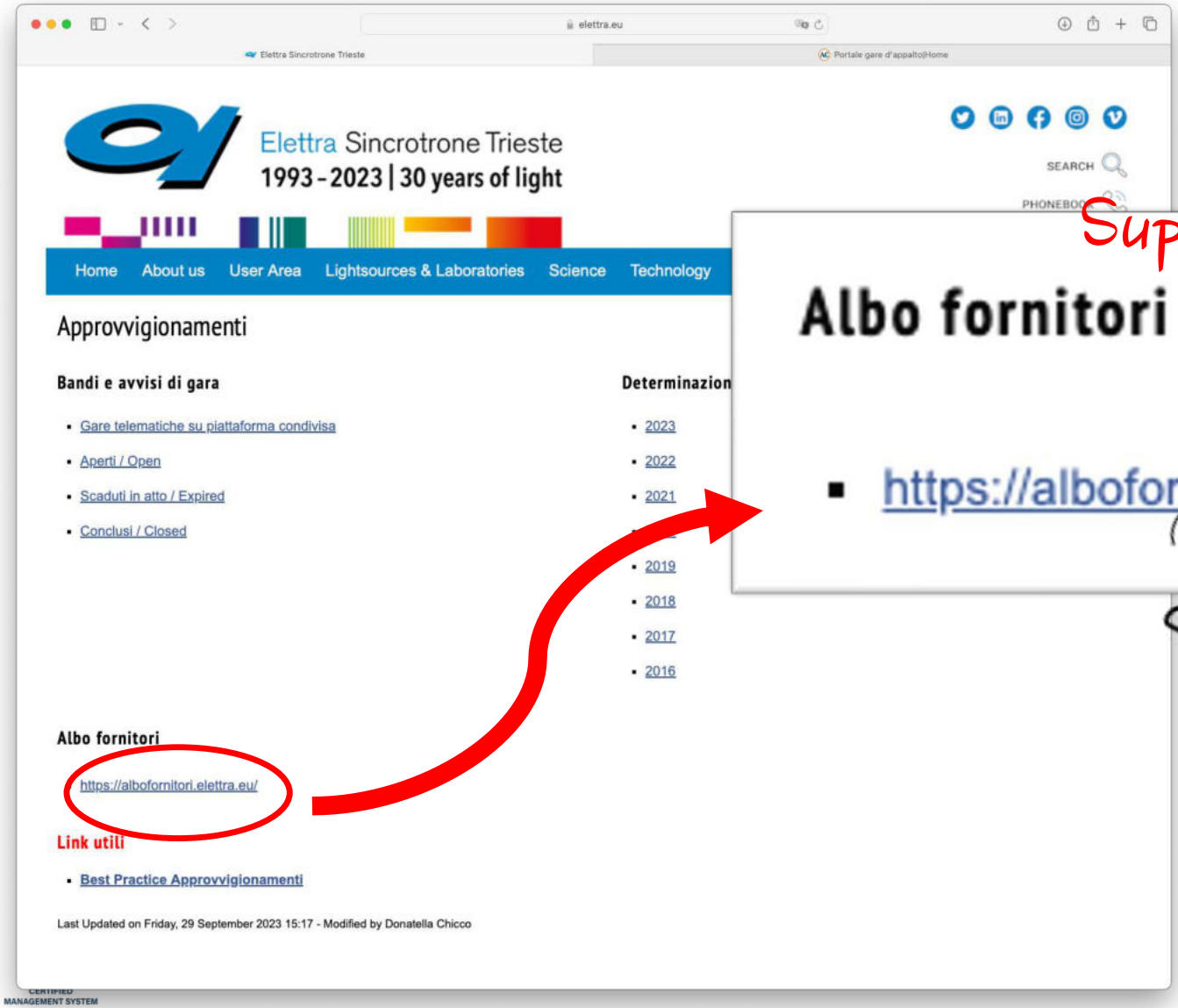
Procurement for Elettra 2.0

Elettra web site



Approvvigionamenti

Procurement page



Supplier register

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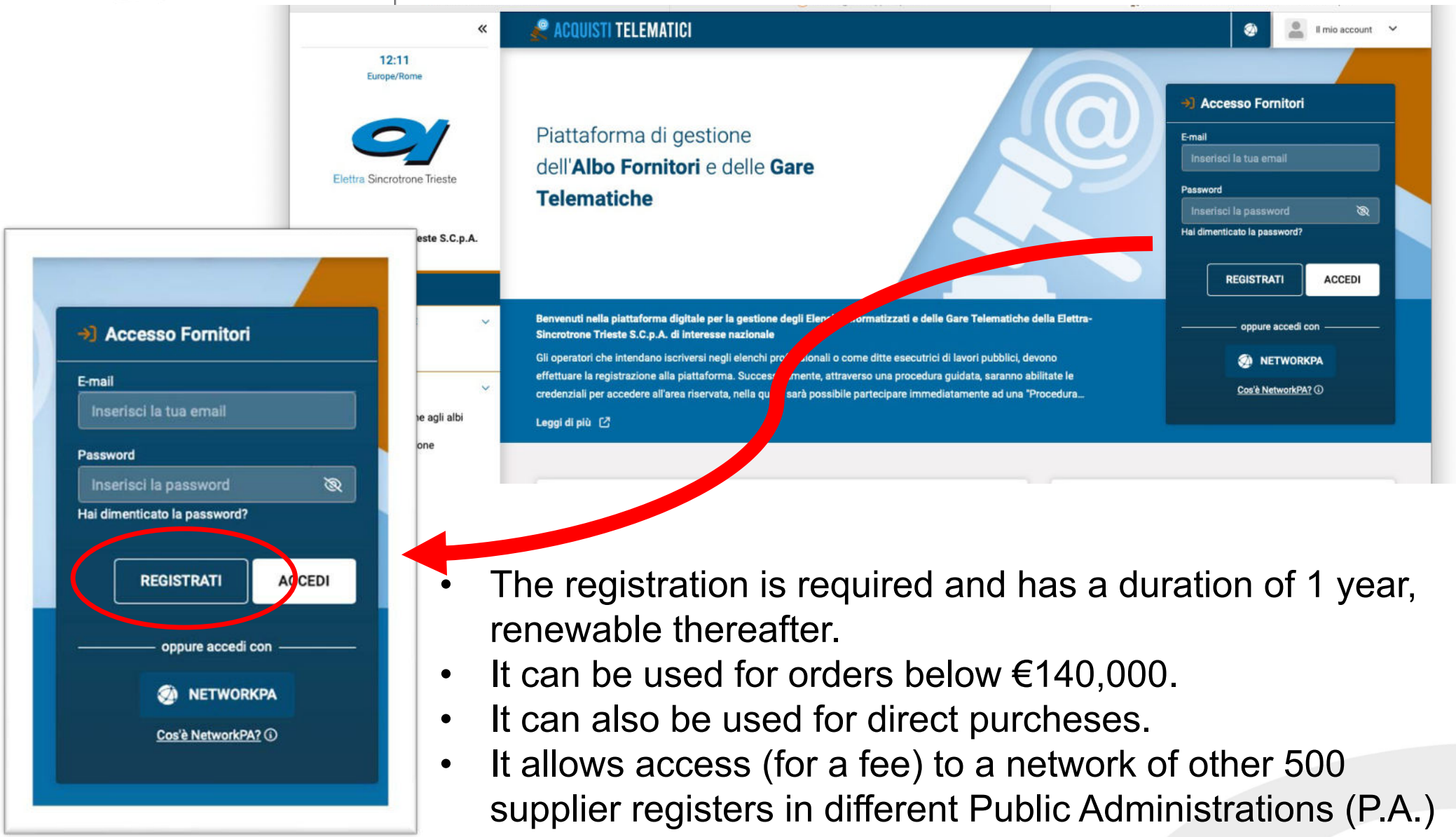
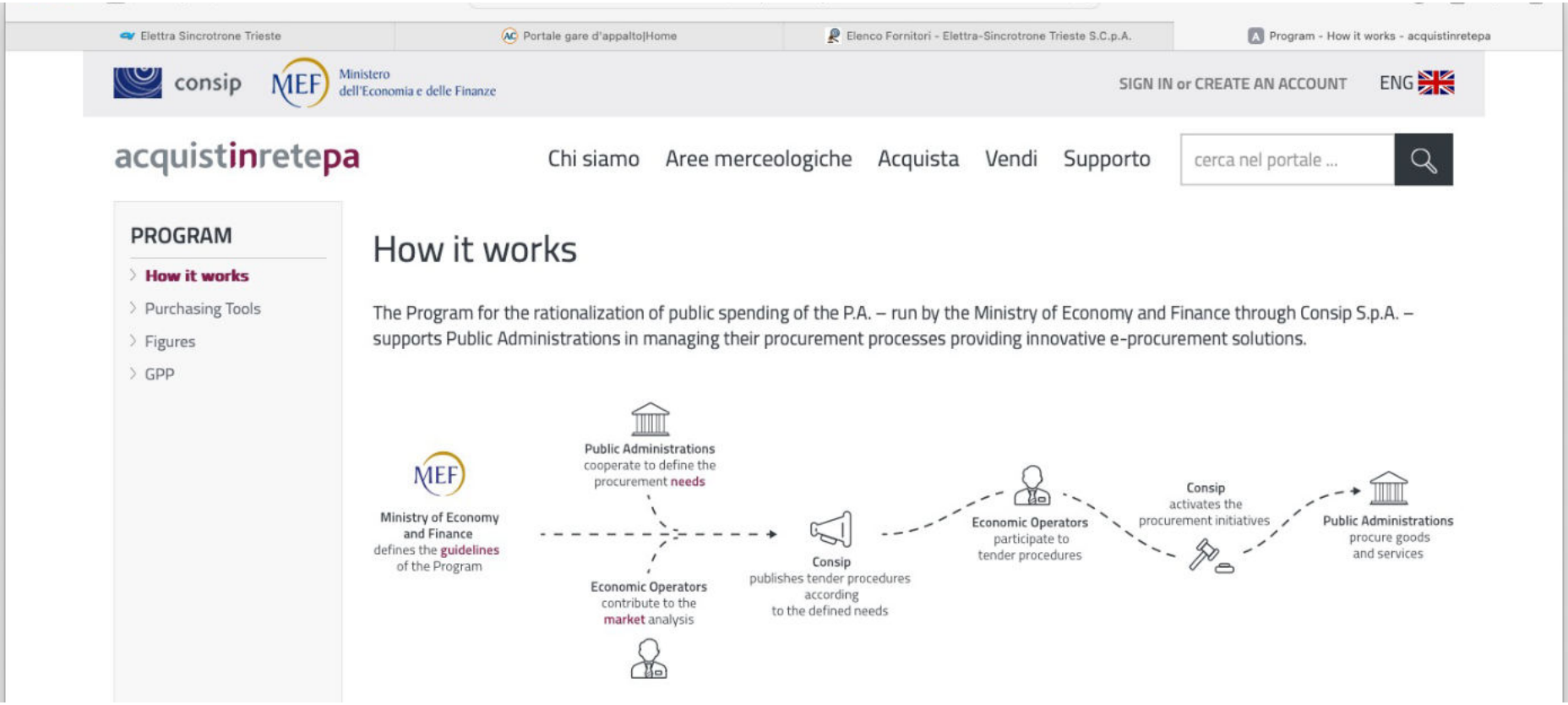
Albo Fornitori

Supplier register



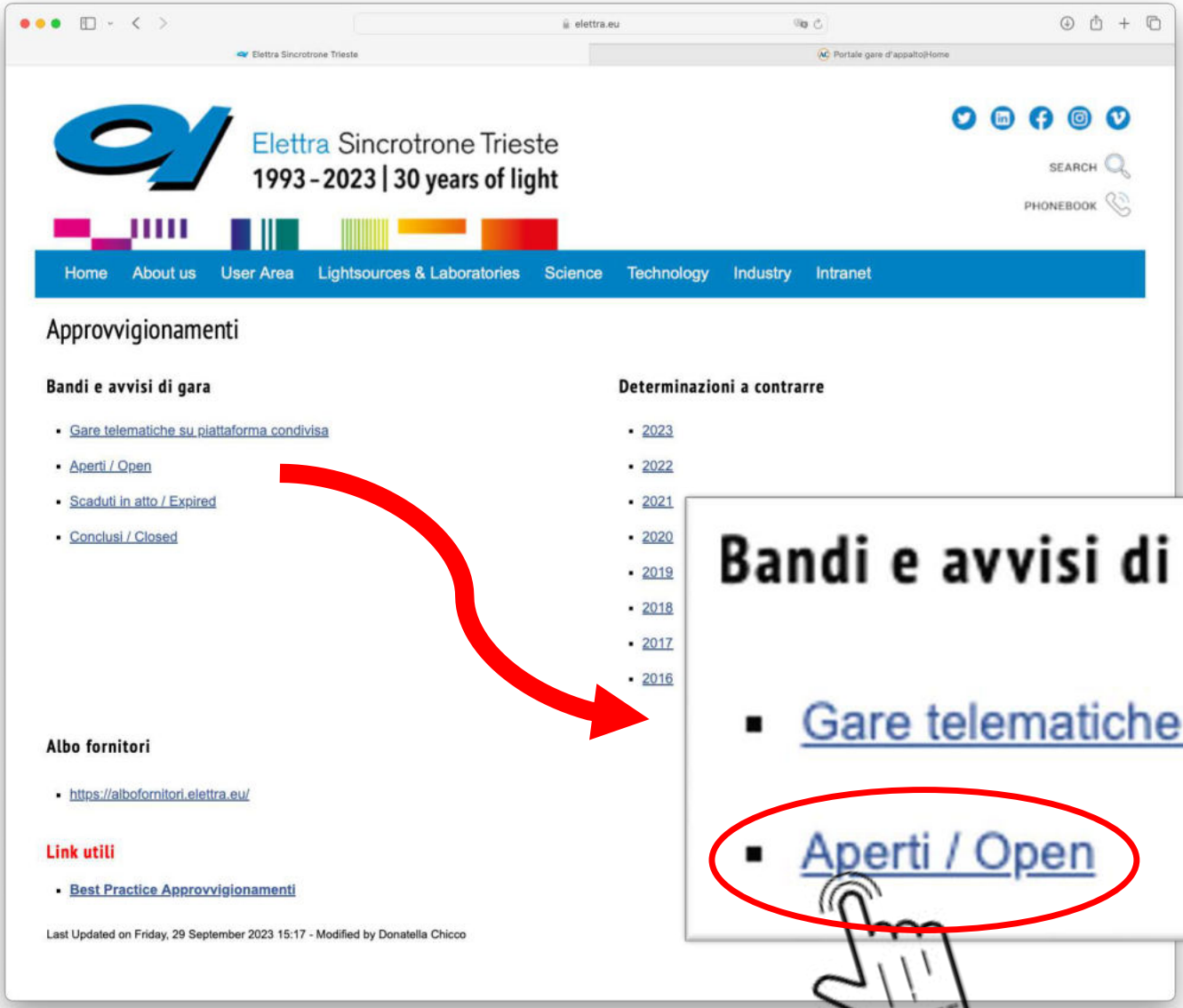
- The registration is required and has a duration of 1 year, renewable thereafter.
- It can be used for orders below €140,000.
- It can also be used for direct purcheses.
- It allows access (for a fee) to a network of other 500 supplier registers in different Public Administrations (P.A.)

M.E.P.A. - www.acquistinretepa.it

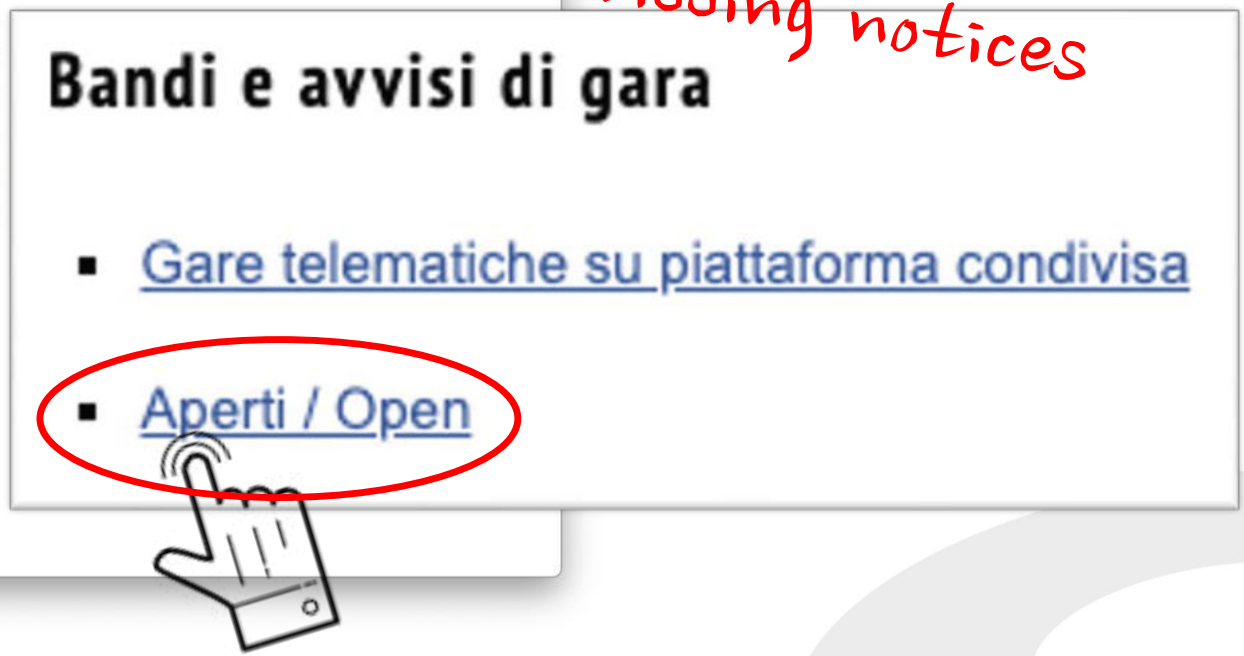


For computer purchases (SW and HD), Elettra is required to make them through the M.E.P.A. (Electronic Market for Public Administrations) if the product is available there; otherwise, a resolution from the Board of Directors is needed to go to the market.

Procurement Bids



Tenders and bidding notices



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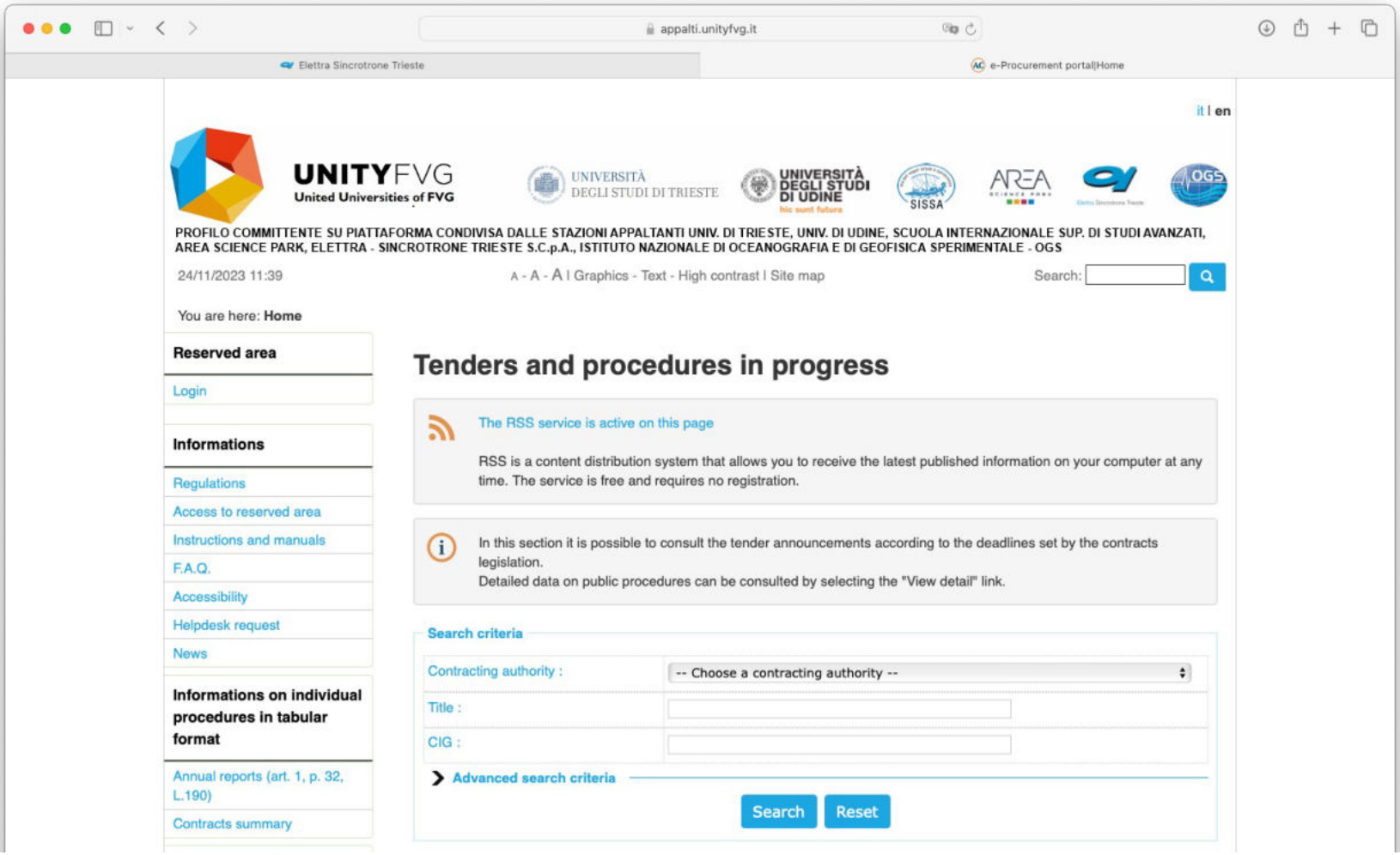
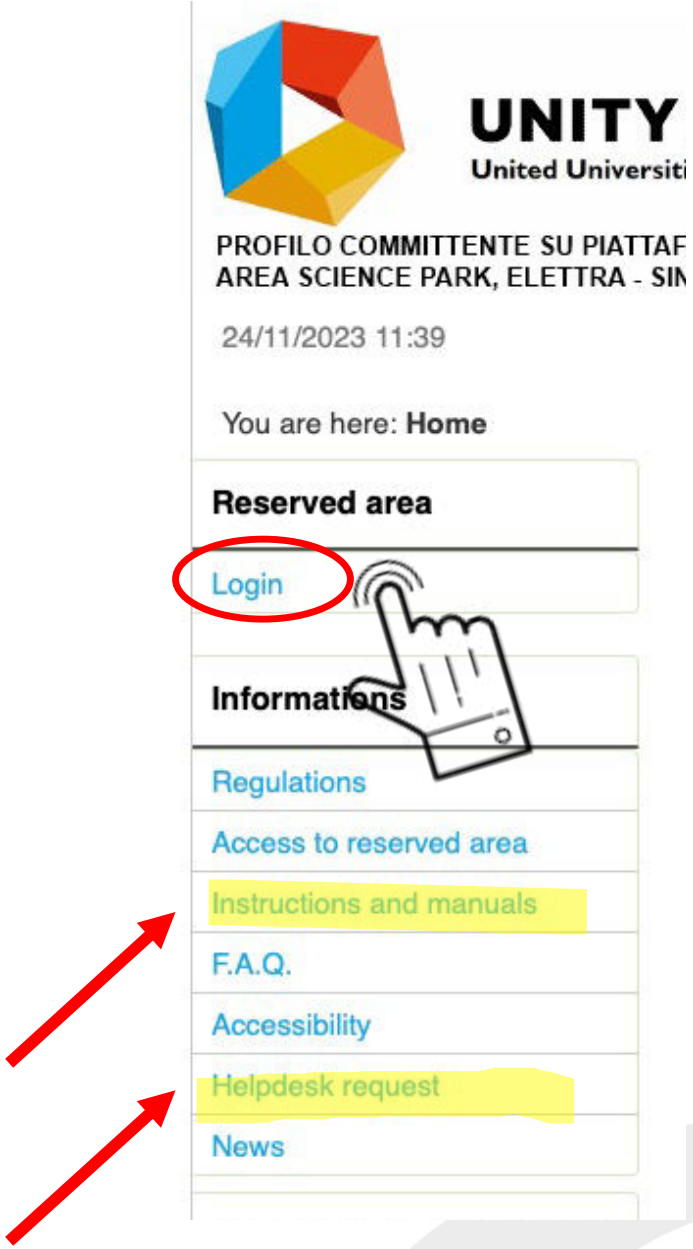
https://appalti.unityfvg.it/



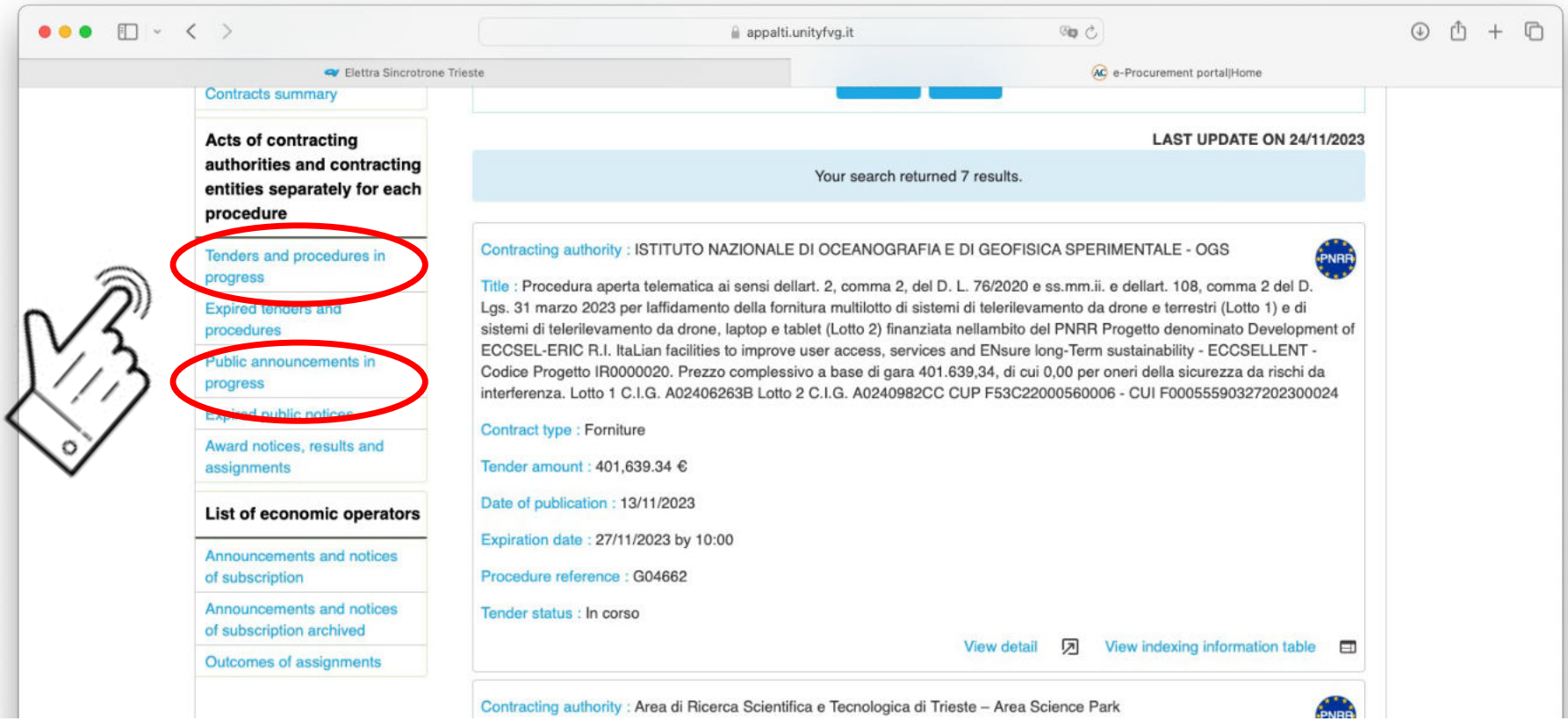
Telematic platform used by Elettra shared with other regional public administrations.

How to take part in bidding processes

- Registration is required even if you are already registered in Elettra's suppliers' register.
- Registration enables participation in tenders from other contracting stations.
- Manuals are available for registration and platform usage
- You can also contact the call center at +39 0422267755

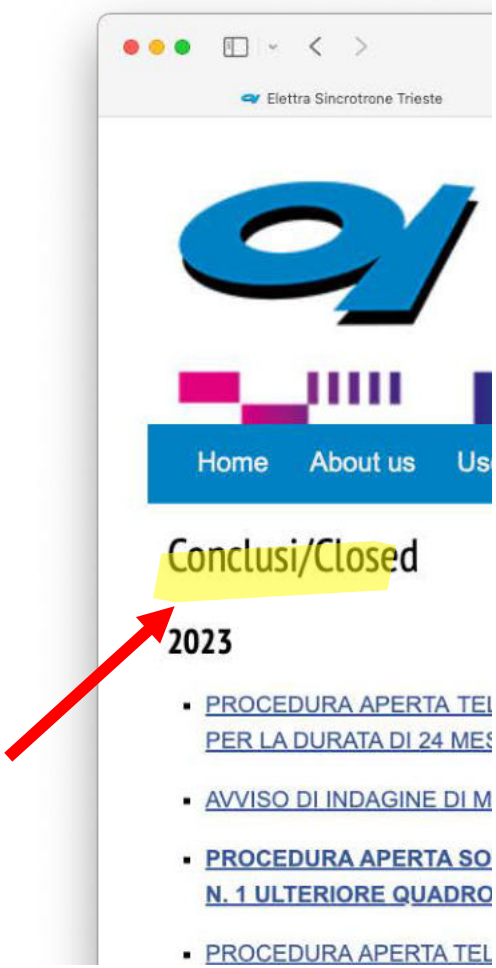


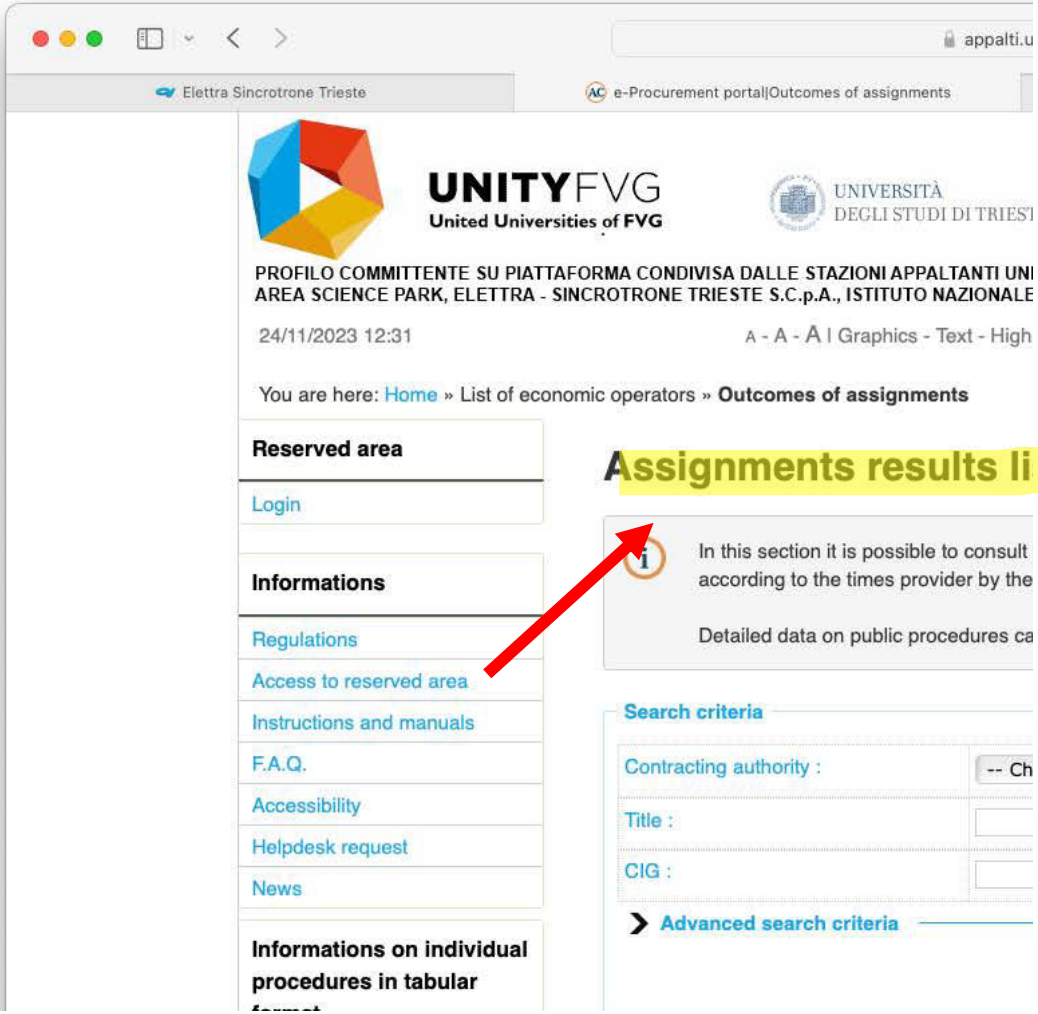
Where to find information about tenders/bidding processes



Elettra's tenders are also published on Elettra's website. Additionally, those above the EU threshold are published in the Official Journal of the European Union.

Assignments Results





The outcomes/results of Elettra's tenders are published on Elettra's website and on the UNITY FVG platform.

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