Elettra Sincrotrone Trieste

Elettra
Sincrotrone
Trieste

DEELS 2025: Welcome and Introduction

G. Brajnik on behalf of Elettra’s DEELS 2025 committee

Trieste

- Trieste belonged as Triest to the Habsburg monarchy from 1382 until 1918. In the 19th century, the monarchy was one of the Great Powers of Europe and Trieste was its most important seaport. As a prosperous trading hub in the Mediterranean region, Trieste grew to become the fourth largest city of the Austro-Hungarian Empire (after Vienna, Budapest, and Prague). This explains the multicultural soul of the city, still present today.
- After WWI, the city became part of Italy, and after WWII was a neutral zone under Allied control (Free Territory of Trieste). The final return to Italy was in 1954.
- In the last 30-40 years, Trieste hosted a lot of national and international scientific research organizations. This have led to the highest percentage of researchers, per capita, in Europe.
- Città della Barcolana ("City of the Barcolana"), Città della bora ("City of the bora"), Città del vento ("City of Wind"), "Vienna by the sea" and "City of Coffee" are epithets used to describe Trieste.


Piazza Unità d'Italia


Canal Grande with Sant'Antonio Taumaturgo Church


Saint Spyridon Church


Arco di Riccardo


Miramare Castle


view of Trieste from Molo Audace

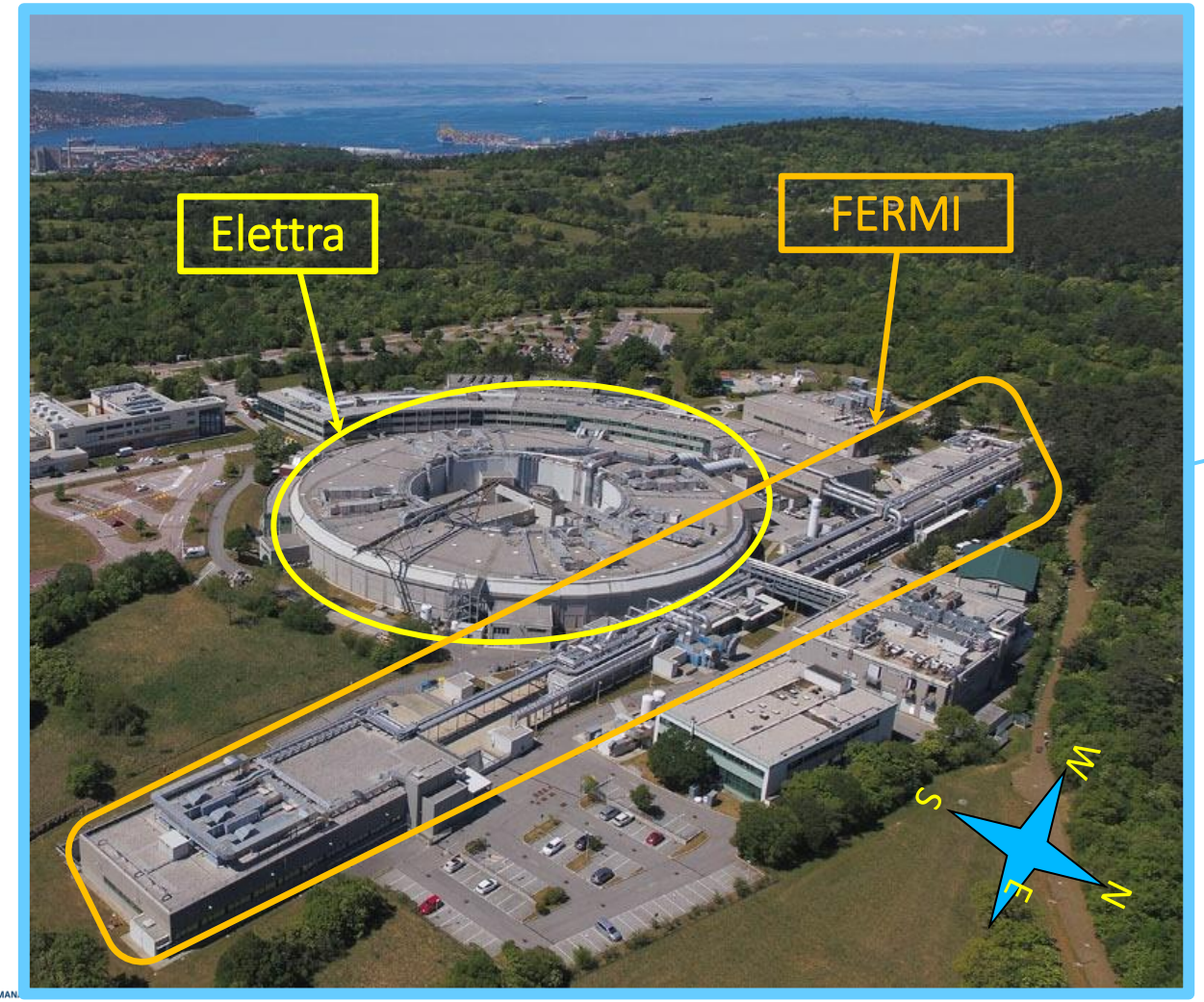
Trieste - Barcolana

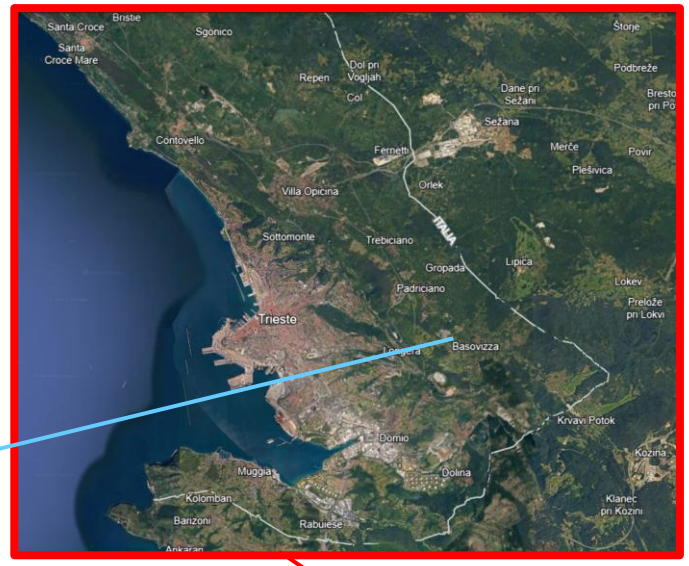
- International sailing regatta in the Gulf of Trieste
- Takes place on the second Sunday of October
- One of the most crowded regattas: world record in 2019 with 2689 boats

A unique place to order coffee

- Trieste is famous for its coffee,
  as the result of commercial exchanges
- There are many famous and historic coffee shops
  - Caffè Tommaseo (the oldest one, dated back to 1825)
  - Caffé degli Specchi (nice place on the left of Piazza Unità)
  - Caffè San Marco (founded in 1914, with a bookstore inside)
  - Caffè Pasticceria Pirona (famous pastries)
- But ordering coffee in Trieste can be confusing:
  - If you want a regular Espresso, ask for a “Nero”
  - Espresso with milk -> “Capo”
  - Espresso with milk in a glass -> “Capo in B”
  - Cappuccino -> “Caffelatte”

Elettra and Fermi Light Sources





Elettra Synchrotron

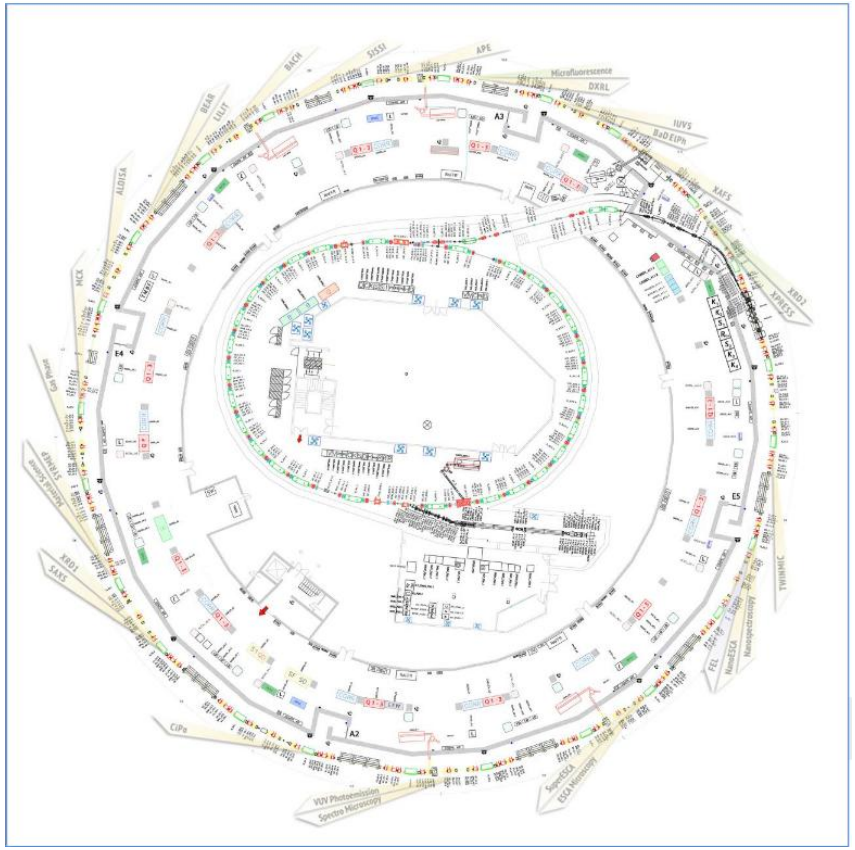
1988 – 1991
Parameters definition, design, call for tenders

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.

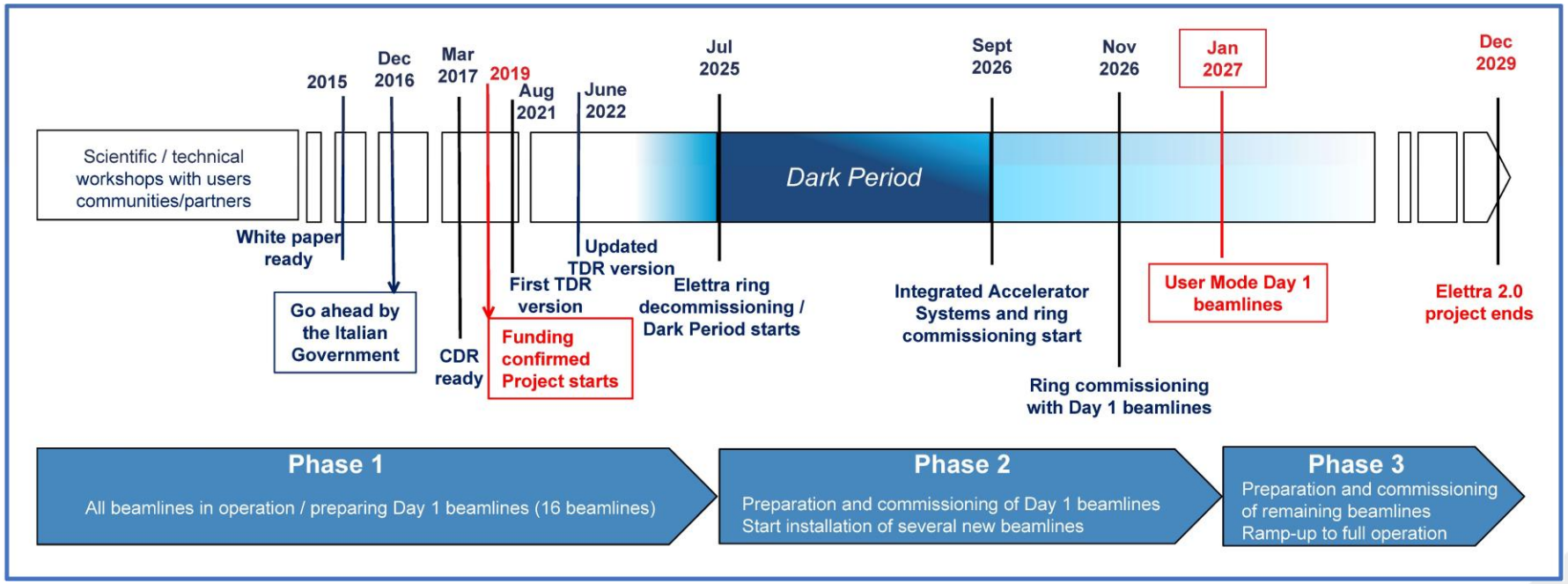
2005 – 2007
Major upgrade to full energy injection (Linac + Booster). Regular TopUp operation since 2010

- 3rd generation light source
- Energy: 2.0 or 2.4 GeV
- Current: 310 or 160 mA
- RF frequency: 499.654 MHz
- Harmonic number: 432
- Rev. period: 864 ns
- 12 sections, total length ~260 m
- 26 beamlines
- 3 modes of operation: uniform, hybrid, single bunch
- 2024 operation: 97% of user uptime
- **Shutdown ceremony: 2nd July 2025**



Elettra 2.0 upgrade

- First approval by the government in 2016, official approval in 2019
- Dark period from July 2025 to September 2026
- Full replacement of Storage Ring and ancillary systems, keeping the same building and tunnel
- Commissioning starts at end of 2026



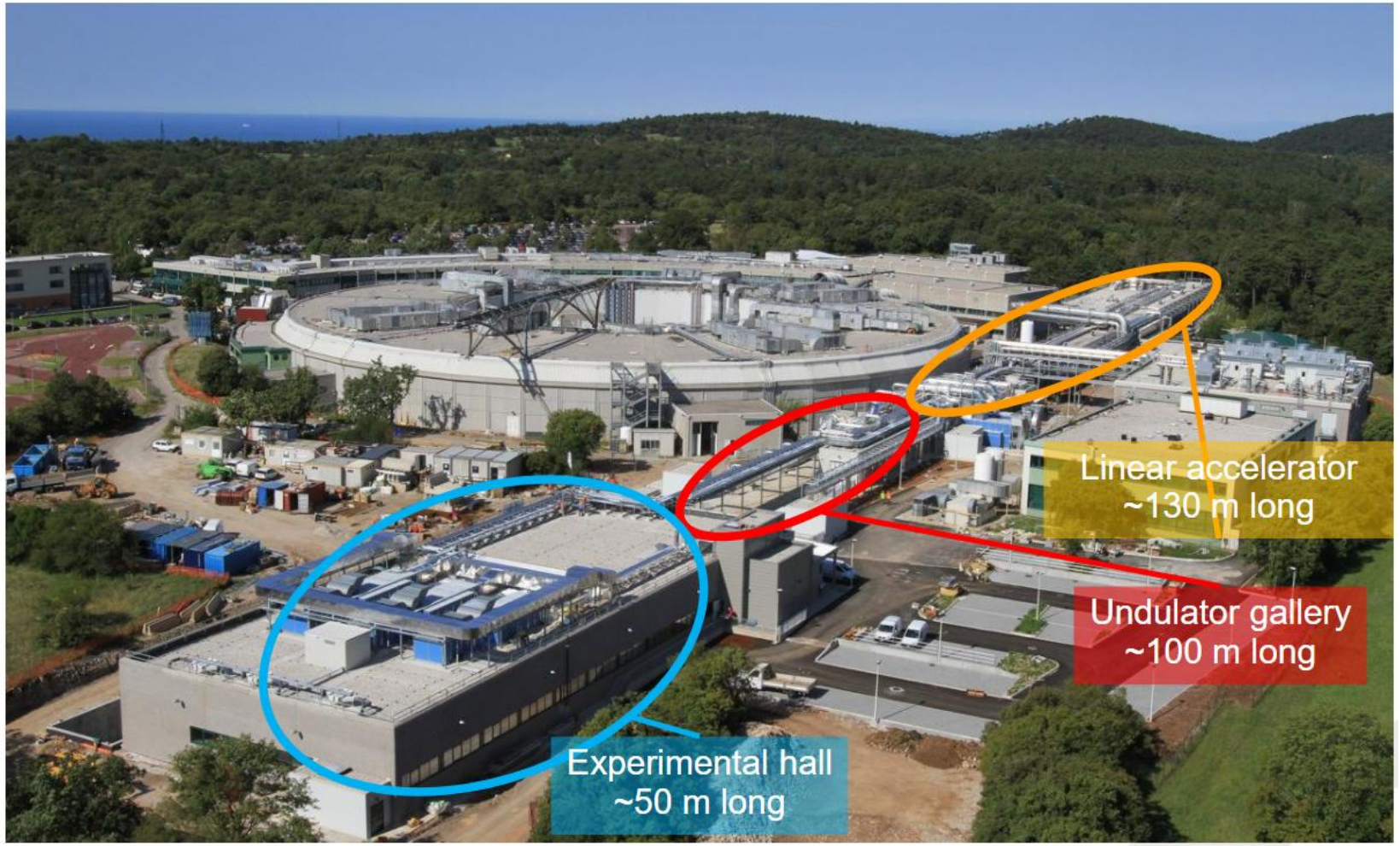
Elettra 2.0 upgrade

- 150 pm-rad emittance as goal
- Small rhomboidal NEG-coated vacuum chamber (~10 mm)
- Lattice: 6 dipoles per section (2+4) plus a future superbend
- 3 In-Vacuum Undulators

	ELETTRA	ELETTRA 2.0
Beam energy (GeV)	2.4 (25%) --- 2.0 (75%)	2.4 (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 3-4 from 3SB)
e-beam size at LS (σx , σy) (μm)	286, 16	36, 6
Brilliance (ph / s / mm^3 / mrad^2 / 0.1%bw)	2 x 10^{19}	10^{22}
Coherence ratio at 1keV (%)	0.5	30
e-intensity (mA)	160 --- 310	400
Lattice-symmetry	2BA – 12fold	S6BA-E(nhanced) – 12fold
Fill patterns	Multi-bunch, single or few bunch, hybrid	Any

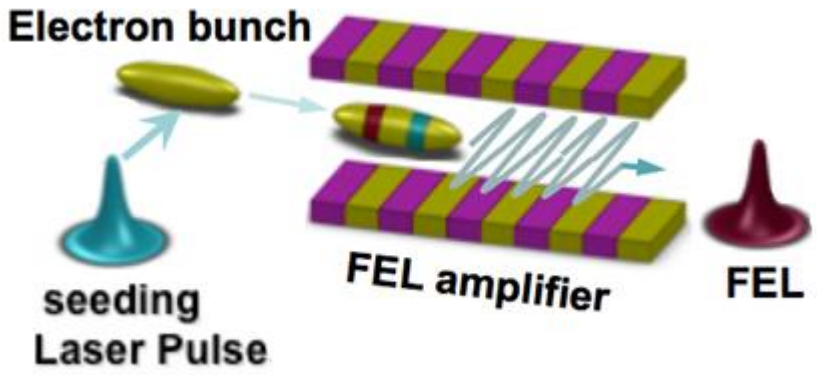
Elettra Sincrotrone Trieste

Fermi Free Electron Laser



Fermi Free Electron Laser

- Installation started in 2009, users operation since 2012
- Seed laser pulse technique
- Ultra-short, ultra-bright pulses (EUV)

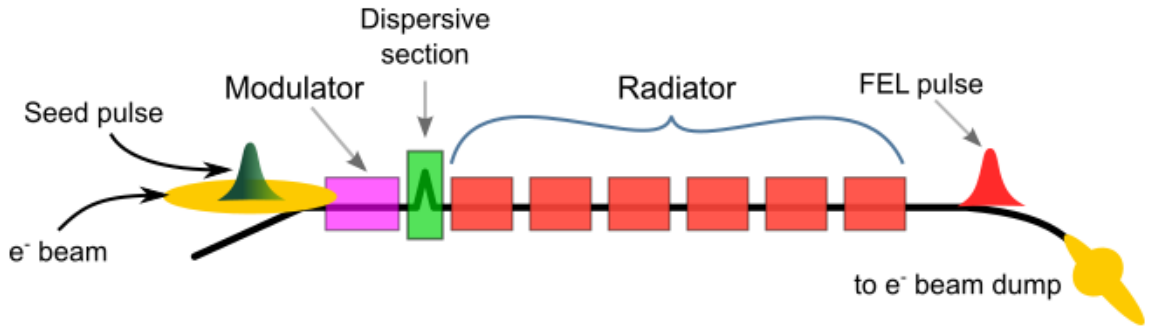


	Parameter	FEL1	FEL2	Units
photons	Output Wavelength (fundam.)	**100 – 20**	**20 – 4**	**nm**
	Output Pulse Length, rms	≤50	≤50	fs
	Peak Power	**1 – 5**	**> 0.3**	**GW**
	Photons per Pulse	> 10^{13}	> 10^{12}	
	Power Stability	<30	<50	%
	Transverse Stability	<10%		e-size
	Repetition Rate	**10**	**50**	**Hz**
electrons	Energy	**1.2**	**1.5**	**GeV**
	Charge	0.8		nC
	Slice Norm. Emittance, rms	**1.0**		**mm mrad**
	Slice Energy Spread, rms	**<0.20**	**<0.15**	**MeV**
	Total Energy Spread, rms	<1.2	<1.5	MeV
	Peak Current, flat region	**800**		**A**
	Bunch Length, fwhm	0.7		ps
	Energy Jitter, rms	0.1		%
	Timing Jitter, rms	<150		fs

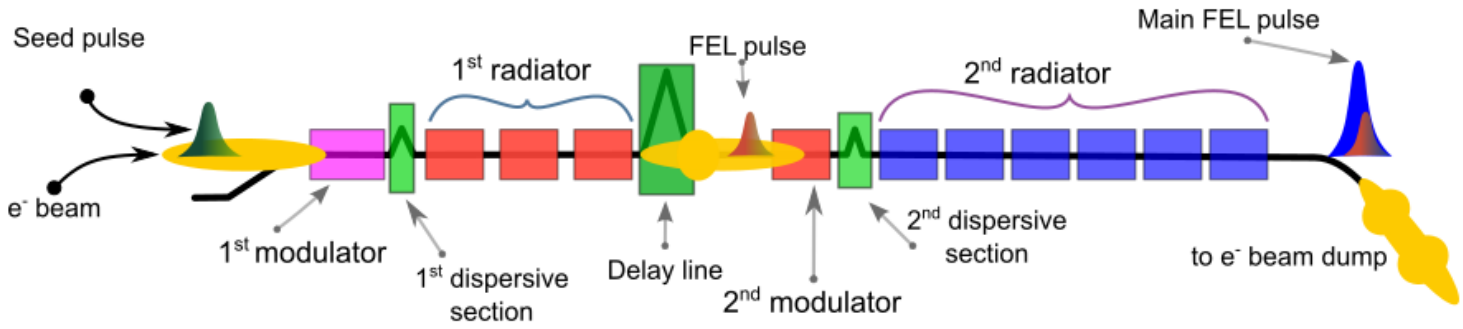
Fermi Free Electron Laser

- Two separate coherent radiation sources

FEL-1



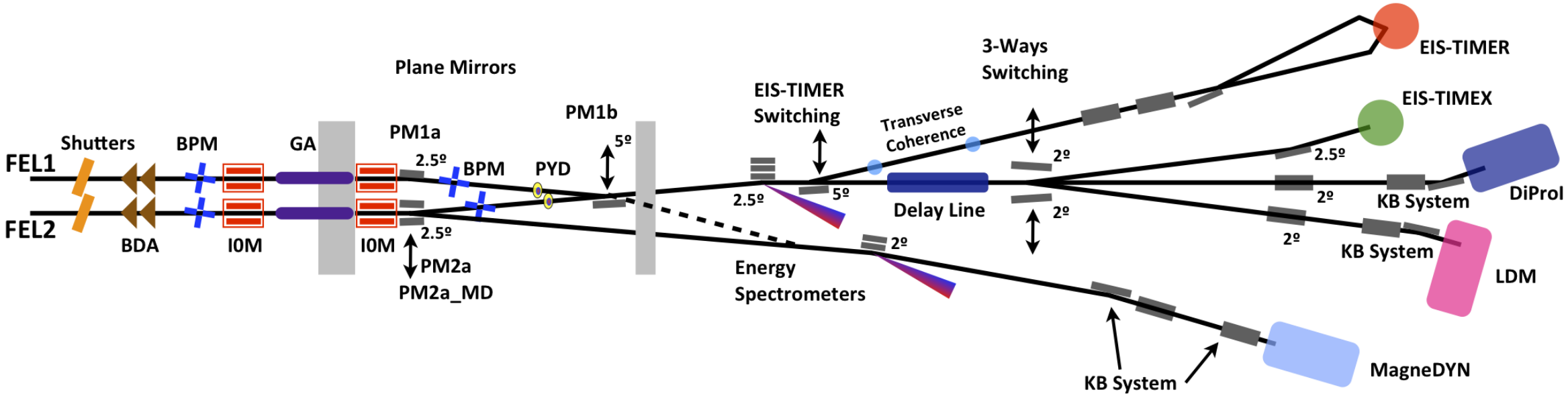
FEL-2



Fermi Free Electron Laser

Photon Beam Delivery System (PADReS)

5 beamlines



12th DEELS Workshop

- European annual meeting dedicated to diagnostics for light sources
  - Bring the diagnostics community together
  - Enhance synergies between facilities
  - Small format to stimulate discussions and share common problematics and solutions
- 25 participants from 11 institutes
- Reduction in number of contributions with respect to previous editions (15 vs 25)
  - 10 standard talks (20’ + 10’)
  - 5 discussion triggers (10’ + 20’)
- Travel restrictions by some institutes?

- DEELS 2025: Elettra
- DEELS 2024: Synchrotron SOLEIL
- DEELS 2023 DESY
- DEELS 2022 HZB
- DEELS 2021 SESAME Virtual Event
- DEELS 2020 Elettra Virtual Event
- DEELS 2019 ESRF
- DEELS 2018 Diamond Light Source
- DEELS 2017 Synchrotron SOLEIL
- DEELS 2016 DESY
- DEELS 2015 Alba
- DEELS 2014 ESRF

Timetable

09:00	**Registration** *Elettra-Sincrotrone Trieste*	09:00 - 09:30
	Welcome — *Gabriele Brajnik et al.* *Elettra-Sincrotrone Trieste*	09:30 - 10:00
10:00	**Beam Loss Monitors for Elettra 2.0** — *Sandi Grulja* *Elettra-Sincrotrone Trieste*	10:00 - 10:30
	Measurement at the ESRF of : a) injection efficiency and b) the time-resolved losses of these injections *Kees SCHEIDT*	
11:00	**Coffee break** *Elettra-Sincrotrone Trieste*	11:00 - 11:30
	New DOSFET plus — *Sandi Grulja* *Elettra-Sincrotrone Trieste*	11:30 - 12:00
12:00	**Effect of mechanical vibrations on beam stability at the ESRF** — *Benoit Roche* *Elettra-Sincrotrone Trieste*	12:00 - 12:30
	New Photon BPM setup using SiC devices in photoconductive mode — *Matija Colja* *Elettra-Sincrotrone Trieste*	12:30 - 13:00
13:00	**Lunch** *Elettra-Sincrotrone Trieste*	13:00 - 14:00
14:00	**Group Photo + Fermi Visit** *Elettra-Sincrotrone Trieste*	14:00 - 15:00
15:00	**Elettra Visit** *Elettra-Sincrotrone Trieste*	15:00 - 16:00
16:00	**Coffee Break** *Elettra-Sincrotrone Trieste*	16:00 - 16:30

09:00		
	Real time diagnostics and operation of SOLARIS — *Jacek Biernat* *Elettra-Sincrotrone Trieste*	09:30 - 10:00
10:00	**Characterization tests of cSTART's beam position monitor** — *Dima El Khechen* *Elettra-Sincrotrone Trieste*	10:00 - 10:30
	Home Made Button Type BPMs: simulations, real results and failures. — *Stefano Cleva* *Elettra-Sincrotrone Trieste*	10:30 - 11:00
11:00	**Coffee break** *Elettra-Sincrotrone Trieste*	11:00 - 11:30
	Button BPM Prototypes for ALBA II: Characterization Results — *Laura Torino* *Elettra-Sincrotrone Trieste*	11:30 - 12:00
12:00	**SOLEIL II BPMs development progress** — *moussa El ajjouri* *Elettra-Sincrotrone Trieste*	12:00 - 12:30
	Discussion Trigger: Reflective vs Reflectionless (Absorptive) RF filters in BPM front ends — *Gabriele Brajnik et al.* *Elettra-Sincrotrone Trieste*	12:30 - 13:00
13:00	**Lunch** *Elettra-Sincrotrone Trieste*	13:00 - 14:00
14:00	**Discussion Trigger: Early commissioning beam size measurement** — *cigdem ozkan loch* *Elettra-Sincrotrone Trieste*	14:00 - 14:30
	XDBL1 diagnostic beamline — *Silvano Bassanese* *Elettra-Sincrotrone Trieste*	14:30 - 15:00
15:00	**Discussion Trigger: Direct X-Ray imaging for the new pinhole diagnostics at BESSY II** — *Marco Marongiu* *Elettra-Sincrotrone Trieste*	15:00 - 15:30
	Discussion Trigger: Pinholes technologies — *Marco Veronese* *Elettra-Sincrotrone Trieste*	15:30 - 16:00
16:00	**Coffee break** *Elettra-Sincrotrone Trieste*	16:00 - 16:20

General announcements

- WLAN connection:
  - eduroam
  - Access request to STguestnet if needed (see Indico website)
- Lunches:
  - In AREA canteen (Q1 building)
  - **Voucher for each registered participant will be provided**
- Coffee breaks:
  - Outside T1 seminar room
- Group photo:
  - Today during accelerator visit
- Transfer to Solkan (SLO) for Libera workshop
  - Tuesday after coffee break – Follow I-Tech's crew

Accelerators visit

- Fermi and Elettra tour today after lunch
- **Meeting point at 14:00** (main entrance/reception)
- Machines are running so only some zones are allowed
  - Fermi Visitor Area
  - Fermi Undulator Service Area
  - Elettra Service Area
  - Magnets Testing Lab

Dinner

- **Workshop dinner** on Monday 12th (today) at "**Ciò che piace**" restaurant
- Via Armando Diaz, 22 - Trieste city centre https://maps.app.goo.gl/ryU9jLLYcPWFpmWV6
- **Transportation is not provided**
- Short walking distance from hotels
- Suggested parking zones (also in Indico):
  - Park S. Giusto (pay) - https://maps.app.goo.gl/QFsAmaEFnHyYfaxV9
  - Park in Piazzale Straulino (pay) - https://maps.app.goo.gl/AuuRbCBcugscgLQ76
  - Park in via Augusto (free) - https://maps.app.goo.gl/VrRcToB5qUyNCZEs8
- Meeting point at **19:50 in front of restaurant**

Acknowledgement

- Thanks to all participants for coming and for your contributions
- Special thanks to Roberta Casson and Annamaria Accettulli for the organization (social dinner, registration, etc.)
- Thanks to Elettra DEELS 2025 committee:
  - Raffaele De Monte
  - Silvano Bassanese
  - Stefano Cleva
  - Marco Veronese

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Thank you!

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