Elettra Sincrotrone Trieste

Elettra
Sincrotrone
Trieste

XVI International Conference on Science, Arts and Culture

International Conference on SESAME

In Honour of Paolo Budinich

Veli Lošinj, August 31st, 2016

Elettra
Sincrotrone
Trieste

The role of ELETTRA In International Projects

Mauro Zambelli

Elettra-Sincrotrone Trieste S.C.p.A.

- ✓ A nonprofit shareholder company of national interest:
  - AREA Science Park 53.7%
  - FVG Regional Government 37.6%
  - CNR 4.9%
  - Invitalia Partecipazioni S.p.A. 3.8%

- ✓ Established in 1987 to construct and manage synchrotron light sources, as an international facility

->Promote cultural and socio-economic growth at the regional, national and international level

->State-of-the art research facilities, technical leadership, skill development and technology transfer

Elettra
Sincrotrone
Trieste

Elettra at a glance

Elettra 2.0-2.4 GeV 3rd generation Synchrotron Light

FERMI 1.5 GeV seeded Free Electron Laser Facility

Elettra Sincrotrone Trieste

Elettra Sincrotrone Trieste

- 400 employees
- 33 beamlines
- 12 support lab
- 5.000 hours /year
- more than 1.000 Users from more than 50 countries

Elettra Sincrotrone Trieste

MISSION

To use the facilities of the centre for the promotion of the cultural, social and economic growth through:

- basic and applied research
- **technology and know-how transfer**
- technical, scientific and management education
- **role of reference in the national and international scientific networks**

VISION

To be a strategic node for the research networks attracting top intelligences and contributing to the definition and implementation of scientific policies, at the European and international levels.

Elettra Sincrotrone Trieste

Elettra partners

Elettra is part of

AREA SCIENCE PARK

- Multi-sector Technology
- 62 tenants
- 21 Research Centers

Elettra is part of

ceric

- multidisciplinary and multiprobe
- Materials, Biomaterials and Nanotechnology.
- single entry point to 9 European Countries.

Elettra is part of

CONFINDUSTRIA

- General Confederation of Italian Industry
- 150000 Company
- More than 5 Million of employees

Elettra is associated with:

FONDAZIONE BRUNO KESSLER

Airi

nanotec IT

kilometro rosso parco scientifico tecnologico

Elettra Sincrotrone Trieste

Network of International Infrastructures

- Elettra is part of a network of international laser, synchrotron and neutron facilities for the study of materials and for bio and nano science.

- Elettra industrial Liaison Office is an entry point for specific industrial and technological projects.

SESAME

ESRF
The European Synchrotron

SOLARIS
NATIONAL SYNCHROTRON RADIATION CENTRE

MaTeRiA
ricerca avanzata

ess EUROPEAN SPALLATION SOURCE

diamond

eli delivery consortium

European XFEL

ThomX

CERN

ALBA

SLAC
NATIONAL ACCELERATOR LABORATORY

PAUL SCHERRER INSTITUT
PSI

PAL POHANG ACCELERATOR LABORATORY

DESY

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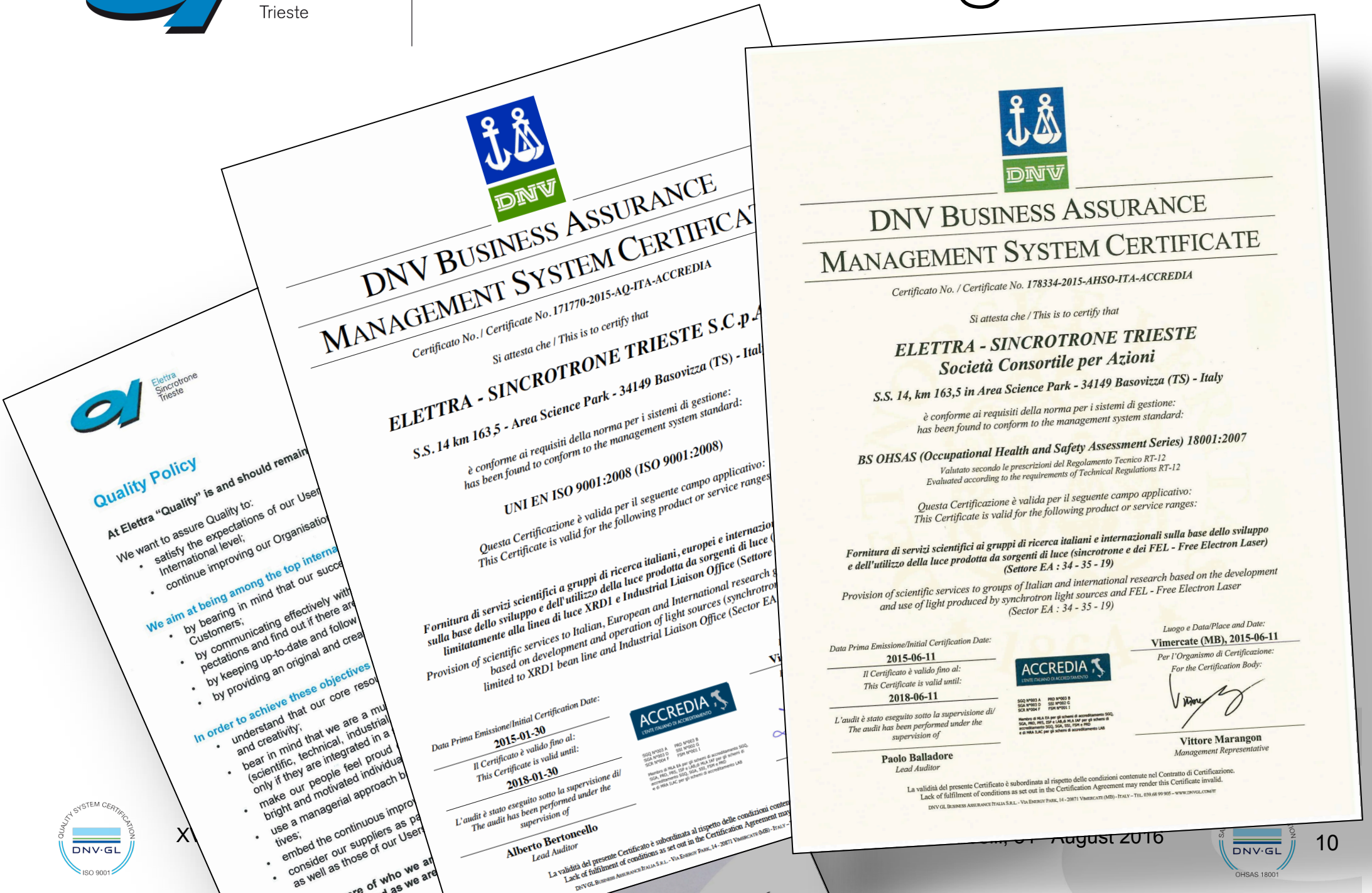
ISO Certifications @ Elettra



Quality Policy

At Elettra "Quality" is and should remain

We want to assure Quality to:
- satisfy the expectations of our Users
- International level;
- continue improving our Organisation

We aim at being among the top interna
- by bearing in mind that our succe
- Customers;
- by communicating effectively with
- pectations and find out if there are
- by keeping up-to-date and follow
- by providing an original and crea

In order to achieve these objectives
- understand that our core reso
- and creativity;
- bear in mind that we are a mu
- (scientific, technical, industrial
- only if they are integrated in a
- make our people feel proud
- bright and motivated individua
- use a managerial approach b
- tives;
- embed the continuous impro
- consider our suppliers as pa
- as well as those of our User

re of who we ar
d as we are

DNV BUSINESS ASSURANCE

MANAGEMENT SYSTEM CERTIFICAT

Certificato No. / Certificate No. 171770-2015-AQ-ITA-ACCREDIA

Si attesta che / This is to certify that

ELETTRA - SINCROTRONE TRIESTE S.C.p.A

S.S. 14 km 163,5 - Area Science Park - 34149 Basovizza (TS) - Ital

è conforme ai requisiti della norma per i sistemi di gestione:
has been found to conform to the management system standard:

UNI EN ISO 9001:2008 (ISO 9001:2008)

Questa Certificazione è valida per il seguente campo applicativo:
This Certificate is valid for the following product or service ranges:

Fornitura di servizi scientifici a gruppi di ricerca italiani, europei e internazio
sulla base dello sviluppo e dell'utilizzo della luce prodotta da sorgenti di luce (
limitatamente alla linea di luce XRD1 e Industrial Liaison Office (Settore
Provision of scientific services to Italian, European and International research g
based on development and operation of light sources (synchrotron
limited to XRD1 bean line and Industrial Liaison Office (Sector EA

Data Prima Emissione/Initial Certification Date: 2015-01-30

Il Certificato è valido fino al: / This Certificate is valid until: 2018-01-30

L'audit è stato eseguito sotto la supervisione di/ The audit has been performed under the supervision of

Alberto Bertoncello
Lead Auditor

La validità del presente Certificato è subordinata al rispetto delle condizioni conten
Lack of fulfilment of conditions as set out in the Certification Agreement may
DNV GL Business Assurance Italia S.r.l. - Via Energy Park, 14 - 20871 Vimercate (MB) - Italy

DNV BUSINESS ASSURANCE

MANAGEMENT SYSTEM CERTIFICATE

Certificato No. / Certificate No. 178334-2015-AHSO-ITA-ACCREDIA

Si attesta che / This is to certify that

ELETTRA - SINCROTRONE TRIESTE
Società Consortile per Azioni

S.S. 14, km 163,5 in Area Science Park - 34149 Basovizza (TS) - Italy

è conforme ai requisiti della norma per i sistemi di gestione:
has been found to conform to the management system standard:

BS OHSAS (Occupational Health and Safety Assessment Series) 18001:2007

Valutato secondo le prescrizioni del Regolamento Tecnico RT-12
Evaluated according to the requirements of Technical Regulations RT-12

Questa Certificazione è valida per il seguente campo applicativo:
This Certificate is valid for the following product or service ranges:

Fornitura di servizi scientifici ai gruppi di ricerca italiani e internazionali sulla base dello sviluppo e dell'utilizzo della luce prodotta da sorgenti di luce (sincrotrone e dei FEL - Free Electron Laser) (Settore EA : 34 - 35 - 19)

Provision of scientific services to groups of Italian and international research based on the development and use of light produced by synchrotron light sources and FEL - Free Electron Laser (Sector EA : 34 - 35 - 19)

Data Prima Emissione/Initial Certification Date: 2015-06-11

Il Certificato è valido fino al: / This Certificate is valid until: 2018-06-11

L'audit è stato eseguito sotto la supervisione di/ The audit has been performed under the supervision of

Paolo Balladore
Lead Auditor

Luogo e Data/Place and Date: Vimercate (MB), 2015-06-11

Per l'Organismo di Certificazione: / For the Certification Body:

Vittore Marangon
Management Representative

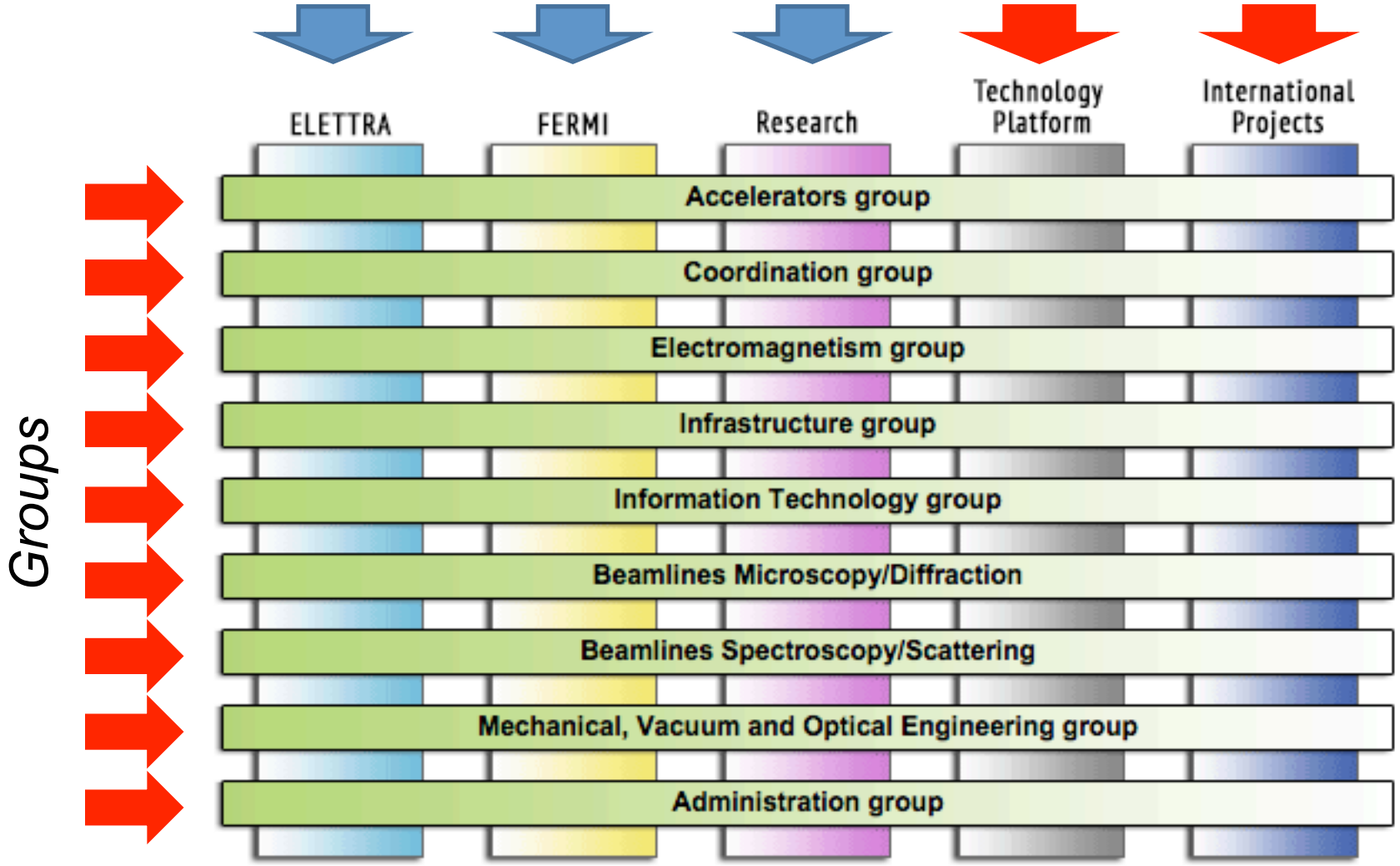
La validità del presente Certificato è subordinata al rispetto delle condizioni contenute nel Contratto di Certificazione.
Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.

DNV GL Business Assurance Italia S.r.l. - Via Energy Park, 14 - 20871 Vimercate (MB) - Italy - Tel. 039.68 99 905 - www.dnvgl.com/it

Elettra Sincrotrone Trieste

The Organization

Clusters/Strategic Initiatives



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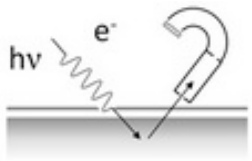
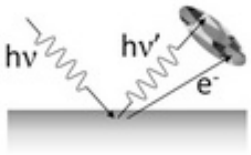
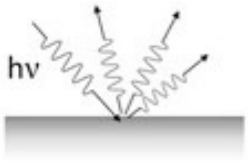
Analytical Techniques avaliable @Elettra



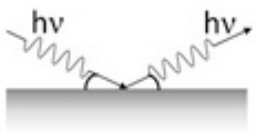
Photoelectron emission



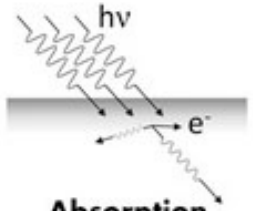
Imaging



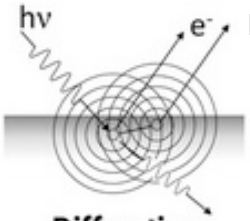
Scattering



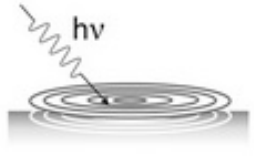
Reflection/ Emission



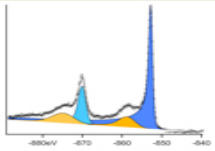
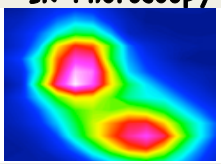
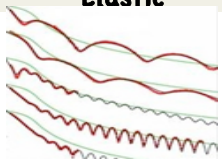
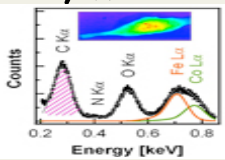
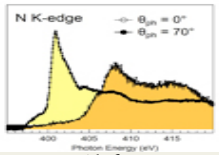
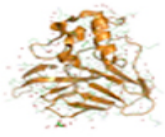
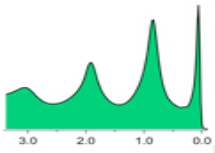
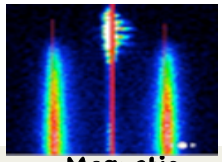
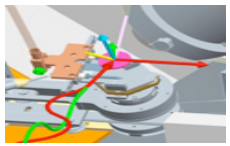
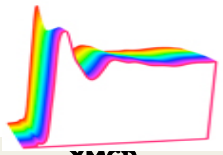
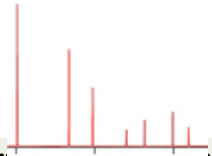
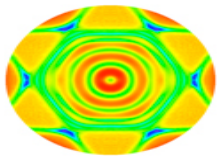
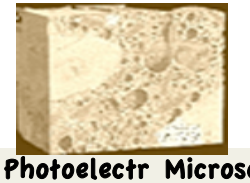
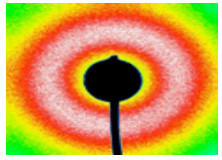
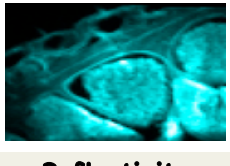
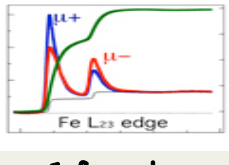
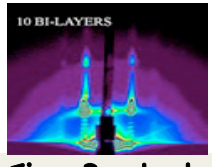
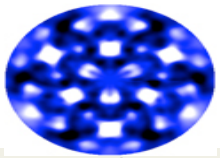
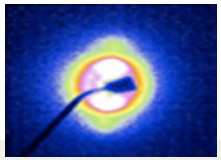
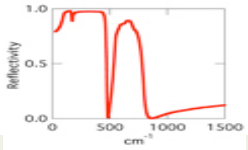
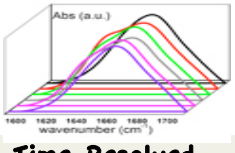
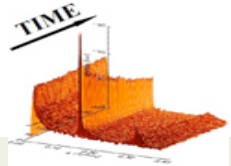
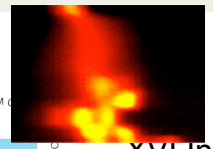
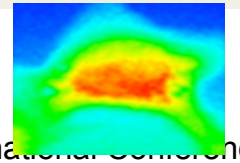
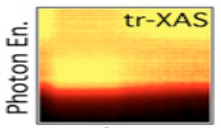
Absorption



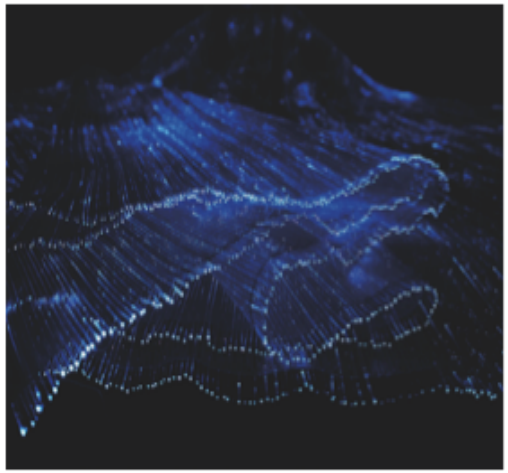
Diffraction



Lithography

XPS	IR Microscopy	Elastic	X ray fluorescence	NEXAFS	Crystallography
					
UPS	X-Ray Microscopy	Inelastic	Reflectometry	EXAFS	Powder Diffraction
					
ARPES	X- Ray Tomography	Magnetic	Micro XRF	XMCD	Surface Diffraction
					
XPD	Photoelectr Microsc	SAXS / WAXS	Reflectivity	Infrared	Time Resolved
					
TR	Fluorescent Imaging			Time Resolved	
					

Technology Transfer Activities



Primary Activities

- Networking & Marketing
- Business Development
- Project Management

Support Activities

- Processes and Procedures
- Legal & Administration
- Scouting and IPR Management

Elettra Industrial Liaison Office

- ILO operations since 2004
- Management of industrial relations, commercial activities and IPR of Elettra Sincrotrone Trieste
- Exploitation of available know how for industrial application
- Team of 6 people with both scientific and business background

Examples of industrial oriented activities

- Materials and devices for energy applications:
  - *Photovoltaics, Energy storage, Fuel Cells, Hydrogen production*
- Atomic and plasma physics radiation effects
- Catalysis and Sensors
- Characterization of Materials
  - *Chemical, morphological, structural, …*
- Instrumentation and detectors design
- Life Science
- Lithography

Know how to be exploited

Elettra, among the 400 employees, has electronic and software engineers, physicists and a number of technicians experts in many fields that:

- ✓ Designed and built the Elettra storage ring more than 20 years ago
- ✓ Upgraded Elettra during the years and built a number of Beamlines in the experimental hall
- ✓ Designed and built Fermi facility in last 10 years…

Competences, Know-how, Expertise that can be exploited in industrial activities and international projects

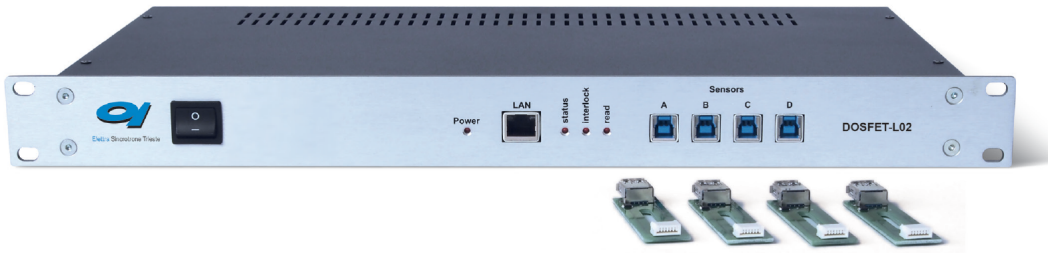
Elettra Sincrotrone Trieste

Development and Sale of scientific instrumentation

Picoammeters: PSI (CH); Australian Synchrotron, ESRF (FR)
Dectris, ANL (USA), Campinas (BR), Bruker (DE),
EMBL (DE)

Power Supplies: Kyma (I), Soleil (FR), Canadian Light Source,
Diamond (UK), ANL (USA), INFN (I), SESO (FR)

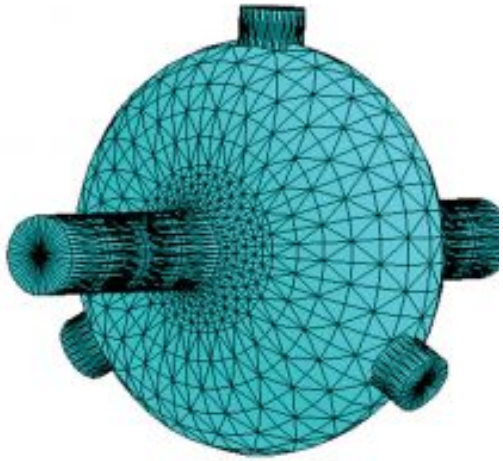
Other instrum. Diamond (UK), ANKA, Changun Insitute of Optics (CN),
Toyota (JP), Campinas (BR), INFN (I)

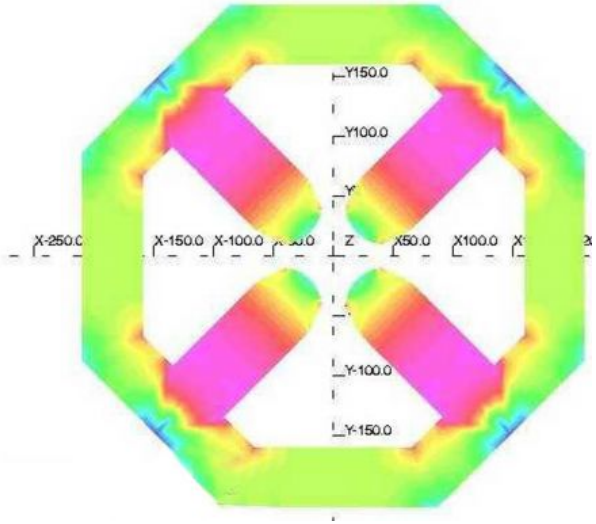


Elettra Sincrotrone Trieste

Development and Sale of FEL and Synchrotron Building Blocks

- Design and Study of RF and Microwave structures
- Elettra Type RF Cavities
- Design and Study of 3D Magnetic Structures
- Bunch Length Magnetic Compressors
- Beamlines





Elettra Sincrotrone Trieste

Elettra RF Cavities

In the last years 15 Elettra type cavities have been supplied to:

- SLS (Switzerland),
- ANKA (Germany),
- LNS (Brazil)

Current projects:

- SESAME (Jordan)
- Indus II (India)

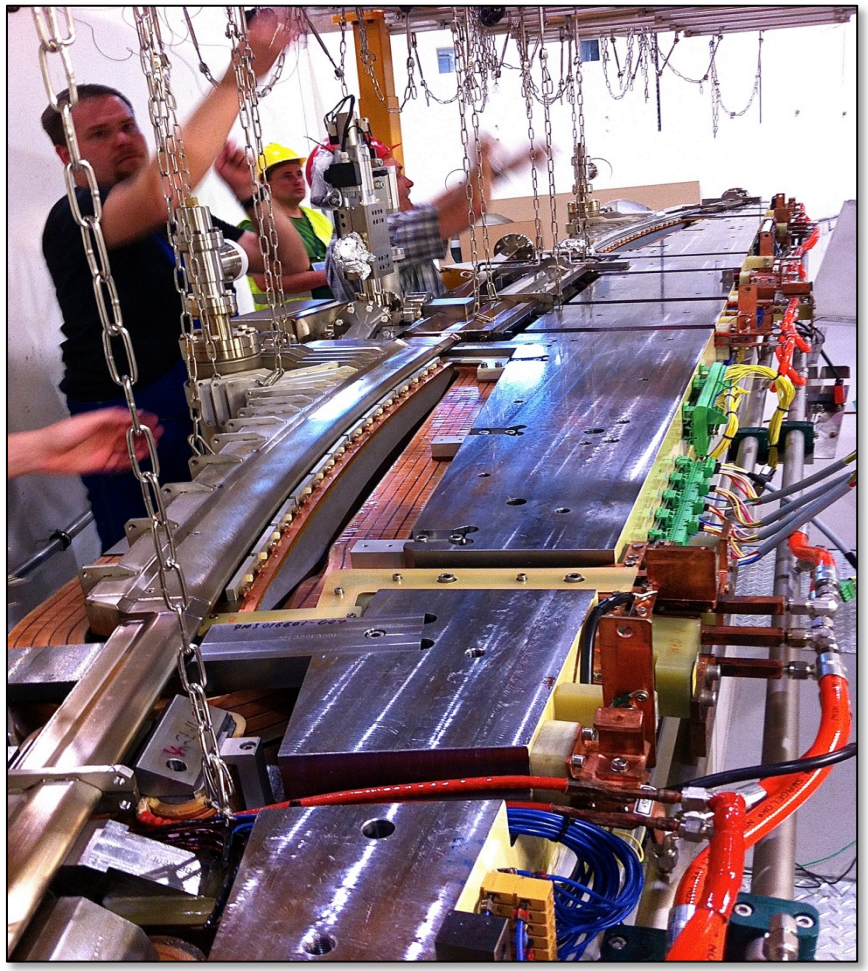
500 MHz Elettra RF cavity

Elettra Sincrotrone Trieste

Facility Building Blocks

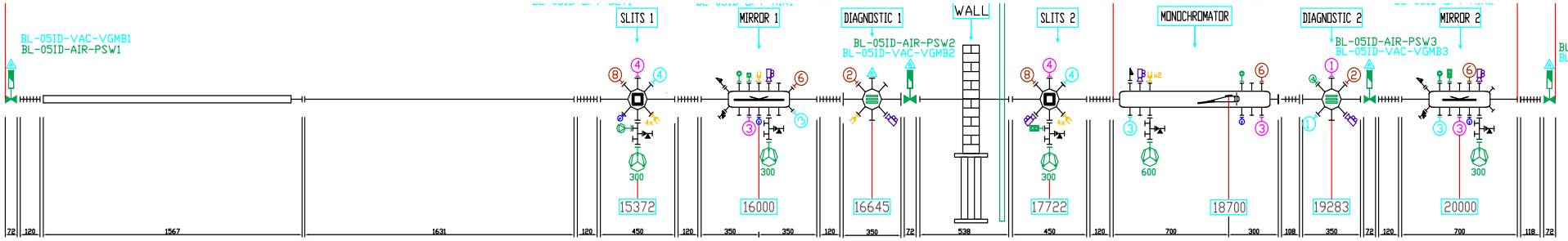
Elettra can provide expertise for

- ✓ Design
- ✓ Technical documentation
- ✓ Supply Chain Management
- ✓ Building
- ✓ Installation
- ✓ Test and commissioning
- ✓ Reporting, User manuals



Design and realization of all beamline components

Starting from user oriented specifications, conceptual design is provided and discussed with the customer.
All components are designed and realized: from the Undulator to the Experimental chamber



- Design of Soft X-ray Spectroscopy beamline (Solaris, 2013)
- Design and construction of UARPES beamline (Solaris, 2014-2015)
- Design and construction of MATERIA imaging beamline (UniCal, 2015)

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The role of ELETTRA In International Projects

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Elettra for SESAME

- ✓ General support on scientific and technical aspects
- ✓ Machine components
  - RF cavities
  - Undulators?
- ✓ Software environment for management of scientific and organizational activities (VUO)
- ✓ Training of personnel hosted at Elettra

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Elettra-type RF Cavities

Elettra Sincrotrone Trieste

Elettra-type RF cavities

	Cavities installed at ELETTRA	Upgraded cavities
Resonant frequency	499.654	499.654
Shunt impedance	3.3 Mohm	3.3 Mohm
Quality factor Q_0	39000	39000
Maximum accelerating voltage	510 kV	630 kV
Maximum power wasted in the cavity	40 kW	60 kW
Maximum power through the coupler	60 kW	120 kW

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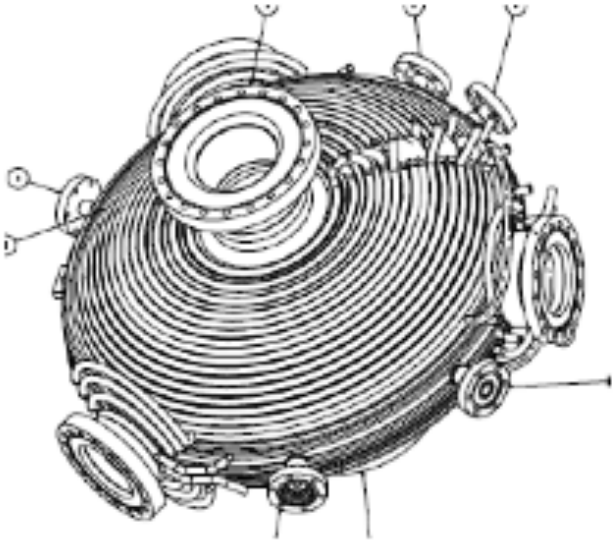
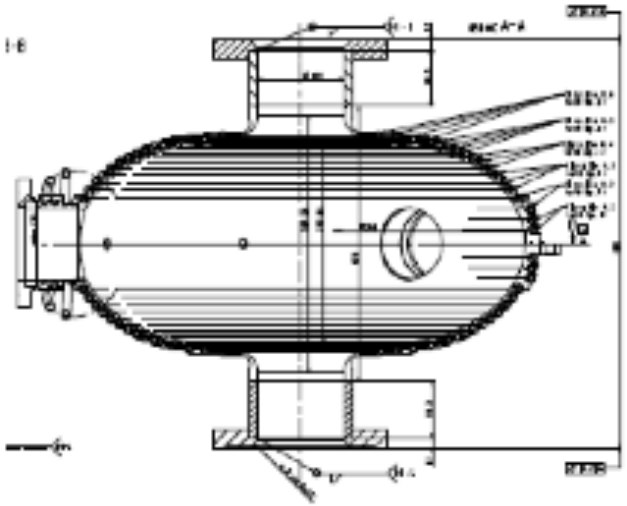
1.250.000 € collaboration contract signed with SESAME on May 12, 2014





The main characteristics of the RF cavity accelerating will be:

f_0	499.654 MHz ± 1 MHz
V_{acc} maximum	650 kV
Power losses	≤ 66 kW
R_{shunt}	≥ 3.2 MΩ

Elettra role:

- ✓ Supply of 4 improved RF cavities
- ✓ Training SESAME personnel in RF

Elettra-type RF cavities

- ELETTRA cavities are used as the main accelerating system at:
  - ELETTRA
  - LNLS, Brazil
  - ANKA, Germany
  - SLS, Switzerland
  - INDUSII, India (machine in construction).
- One ELETTRA cavity is used as a fifth harmonic system at Lure, France.

RF systems for SESAME

- Each RF system is **completely independent** and is made of:
  - A bell-shaped 500 MHz cavity (ELETTRA type cavity)
  - A 60 kW power amplifier, decoupled to the cavity by a Y-junction circulator
  - The power transmission line (rigid coaxial lines)
  - The low level system (frequency, amplitude and phase loops, interlock switch, plant phasing, vacuum measurement)
  - A dedicated cooling rack for high precision stabilisation and setting of the cavity temperature
- Basic design choices were:
  - **Independent systems** ⇨ to allow the possibility of operating the machine even with less cavities in operation
  - **Components** ⇨ As much as possible take advantage of adopting standard components used in the broadcast field

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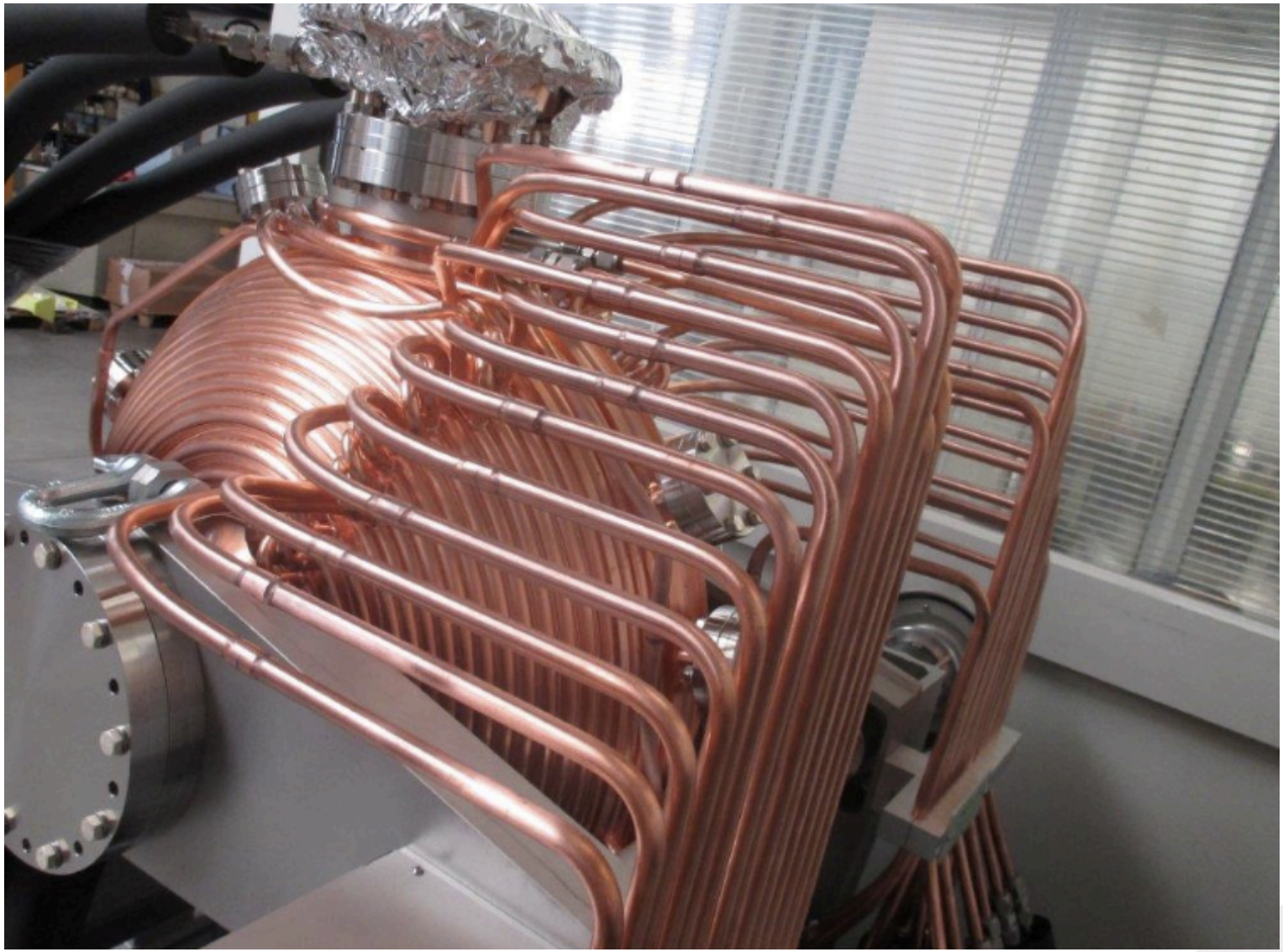
Elettra-type RF Cavities



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Elettra-type RF Cavity @ SESAME

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Cooling rack

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The role of ELETTRA In International Projects

EUROPEAN
SPALLATION
SOURCE

Elettra Sincrotrone Trieste

ESS @ Lund

- One of Europe' largest research infrastructure
- Under construction in Lund, in the southern part of Sweden.
- World leading for research using neutrons.

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European Spallation Source ERIC

- On August 31, 2015, the ESS project was established as a European Research Infrastructure Consortium: European Spallation Source ERIC.
- ESS officially became an ERIC on October 1, 2015
- The Founding Members of the European Spallation Source ERIC are the Czech Republic, Denmark, Estonia, France, Germany, Hungary, Italy, Norway, Poland, Sweden and Switzerland. Founding Observers of the European Spallation Source ERIC are Belgium, the Netherlands, Spain and the United Kingdom

Courtesy of M. Lindroos

European Spallation Source ERIC

Host Countries of Sweden and Denmark

Construction	47.5%	In-kind Deliverables	~ 3%
Operations	15%	Cash Investment	~ 97%

Non Host Member Countries

Construction	52.5%	In-kind Deliverables	~ 70%
Operations	85%	Cash Investment	~ 30%

Courtesy of M. Lindroos

Elettra Sincrotrone Trieste

Italy for ESS

Italy is a founding member of European Spallation Source ERIC with a total contribution of 110.186 M€ which includes 6.186 M€ of preconstruction.

Construction Contribution is 104 M€

- estimated 80 % in-kind and 20 % cash.
- funding allocation is planned to be 8 M€/year for 13 years.

Elettra, INFN and CNR are the three Institutions committed to the realization of the Italian in-kind contribution for the construction of ESS.

- Elettra: accelerator for 30.012 M€.
- INFN: accelerator for 33.141 M€.
- CNR: beam lines and experimental stations for 20.047 M€.

According to the agreements between MIUR and the three Institutions

- INFN is the Representing Entity for Italy in the ERIC.
- INFN has the financial responsibility, including carrying out the tendering procedures, reporting to MIUR and funds anticipation.
- Each institutions has the technical responsibility of the realization of the contribution.
- A coordination committee has been established:
  - S. Gammino (INFN), C. Vasi (CNR) and A. Fabris (Elettra).

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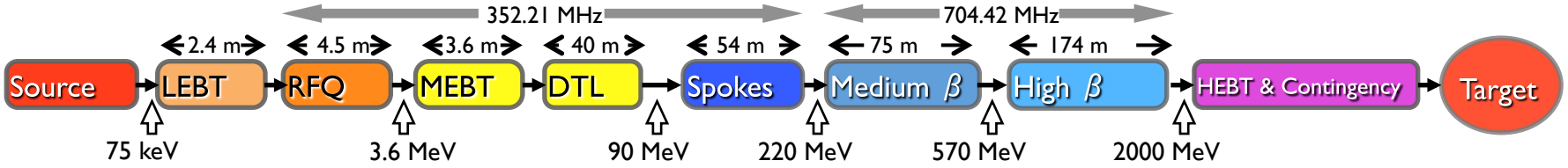
Elettra for ESS



Elettra in-kind contributions for the accelerator are identified in various specific technological areas:

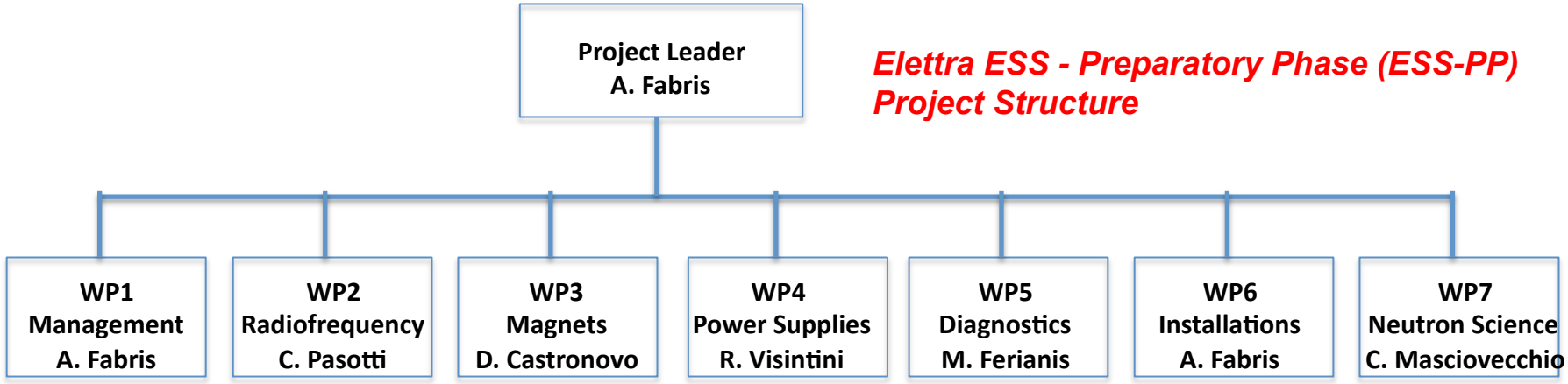
- ***RF systems (power stations for the spoke cavities)***
- ***Magnets for the sc linac and transfer lines***
- ***Magnet Power Converters***
- ***Diagnostics (wire scanner acquisition system)***
- ***Installations***

The total value of the Elettra contribution is quantified to 30.012 M€ according to ESS costbook.

In August 2015 Elettra has signed the Accession Agreement to Collaboration Agreement for Design, Development and Construction of the ESS Accelerator.

Elettra Organization for ESS Activities

An internal project has been started to manage the activities related to the involvement of Elettra in ESS in this preparatory phase.



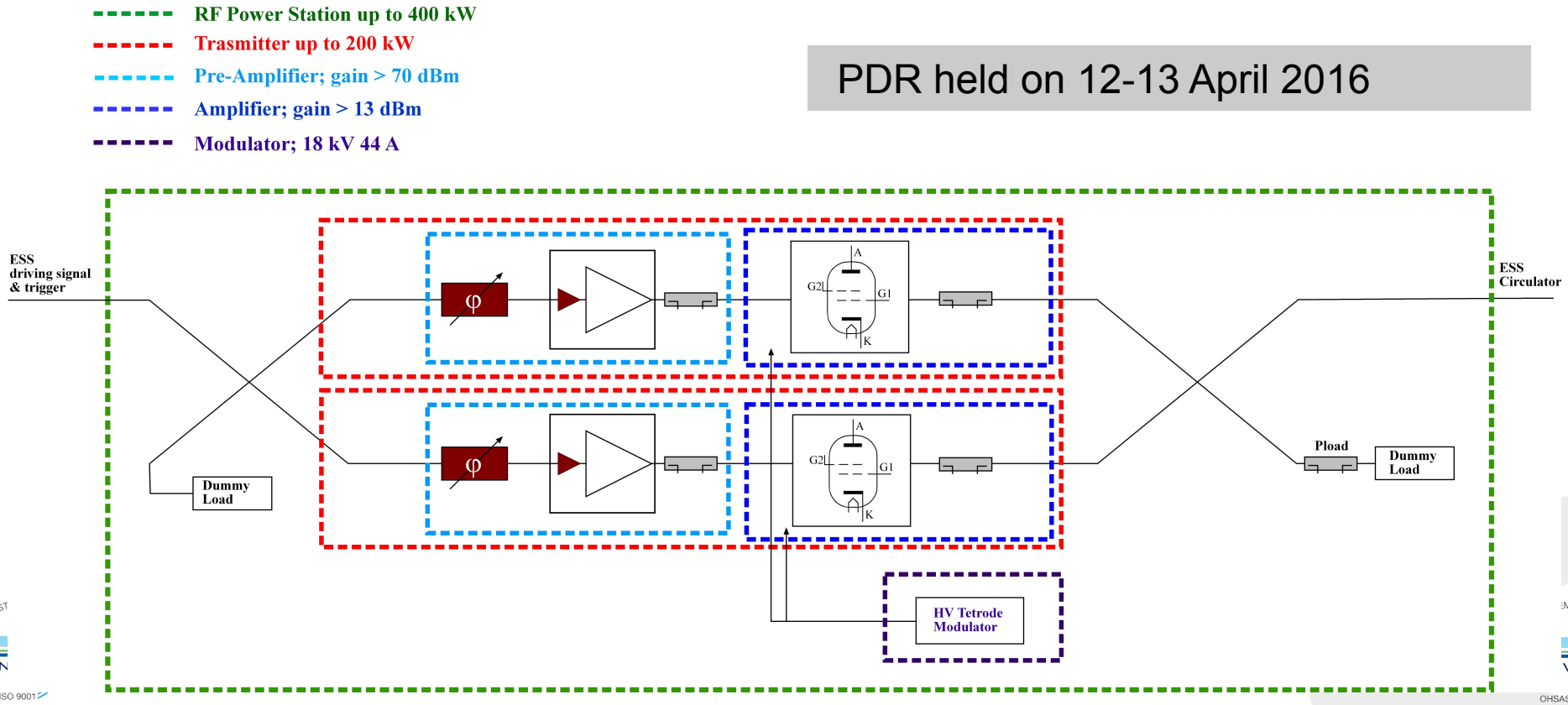
In the next months a project idea will be submitted in view of the transition to the realization phase.

Spoke Cavities RF Power Stations

Reference: C. Pasotti

SCOPE: build twenty-six pulsed 400 kW@352 MHz RF power stations for the spoke cavities (WP11.8.5.5 and WP11.17.4)

- One power source/one cavity scheme. Each spoke cavity fed by one Radio Frequency Power Station (RFPS).
- RF power requirements range between 260 kW and 330 kW. Power size standardised to 400 kW to take into account distribution losses and provide some safety margin.
- Baseline design: combination of two tetrodes.



PDR held on 12-13 April 2016

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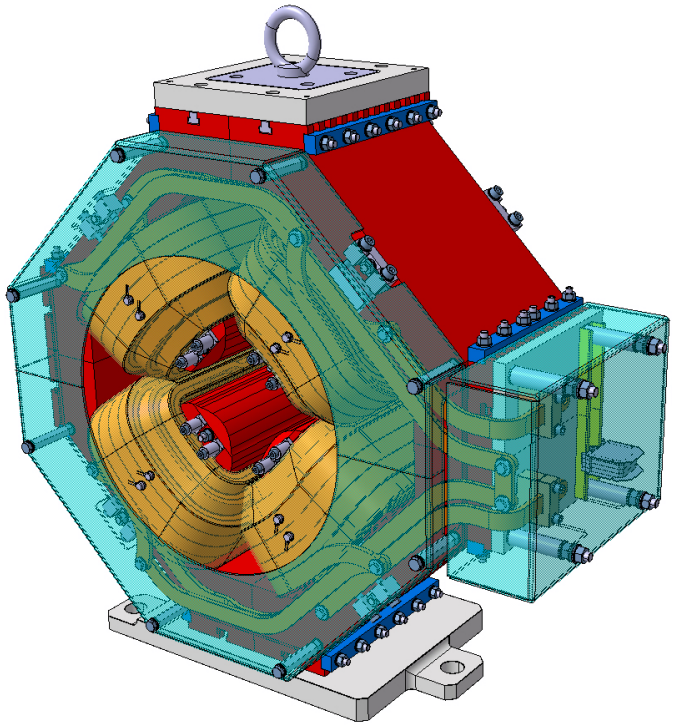
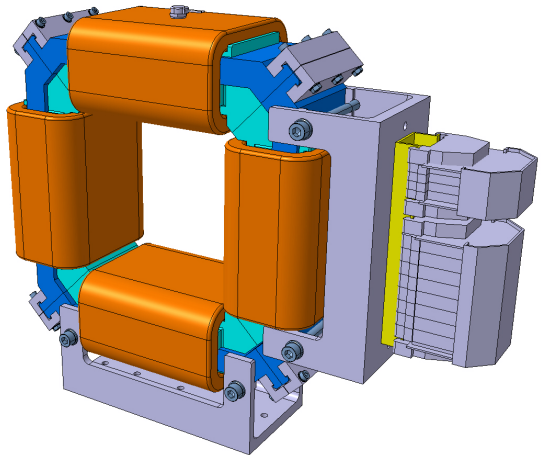
Magnets

Reference: D. Castronovo

SCOPE: design and build magnets for different parts of the machine (AIK2.1)

Type	Description	Operating mode	Quantity
Q5	Quadrupole magnet for SPK	DC, water cooled	26
C5	Dual-plane corrector magnet for SPK	DC, air-cooled	13
Q6	Quadrupole magnet for MBL, HBL, HEBT and DmpL	DC, water cooled	95
C6	Dual-plane corrector magnet for MBL, HBL, HEBT, A2Tramp and DmpL	DC, air-cooled	55
Q7	Quadrupole magnet for A2T ramp	DC, water cooled	12
D1	Vertical dipole magnet for HEBT and A2T	DC, water cooled	2
Q8	Quadrupole magnet for A2T	DC, water cooled	6
C8	Dual-plane corrector magnet for A2T	DC, air-cooled	4
Q6/7	Prototype pulsed quadrupole magnet	Pulsed, air -cooled	1





CDR for Q5, Q6, Q7, C5 and C6 held held on May 4, 2016

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Power Converters

Reference: R. Visintini

SCOPE: design and build power converters for the magnets (WP17.2)

Type	Description	Operating mode	Quantity
PCQ5	Power converters for the “Q5” quadrupoles	DC, air cooled	26
PCC5	Power converter for the “C5” dual-plane correctors	4Q, air cooled	26
PCQ6	Power converters for the “Q6” quadrupoles	DC, air cooled	95
PCC6	Power converter for the “C6” dual-plane correctors	4Q, air cooled	110
PCQ7	Power converters for the “Q7” quadrupoles	DC, air cooled	12
PCD1	Power converters for the “D1” dipoles	DC, water cooled	1
PCQ8	Power converters for the “Q8” quadrupoles	DC, air cooled	6
PCC8	Power converter for the “C8” dual-plane correctors	4Q, air cooled	8

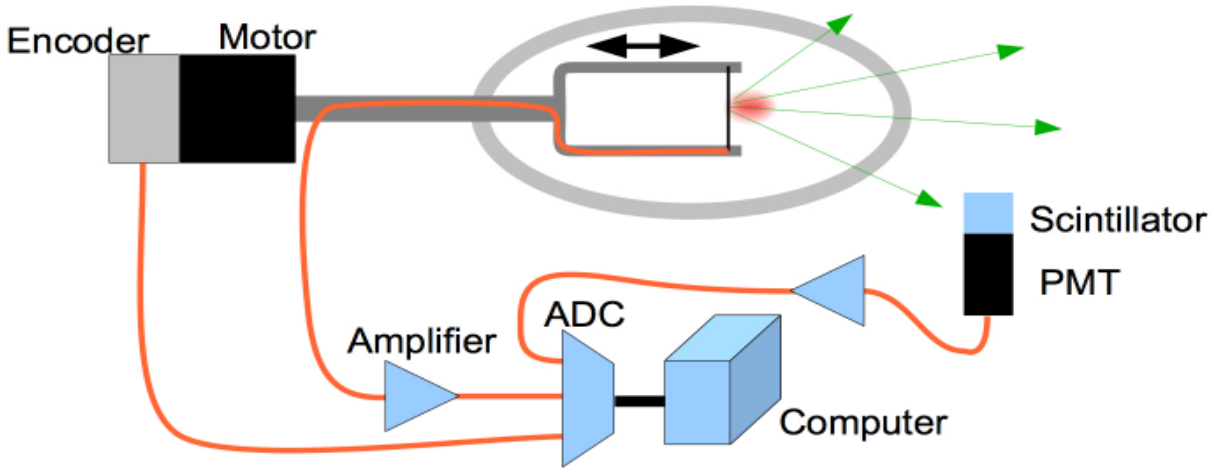
CDR for C5 and C6 and PDR for Q5,Q6 and Q7 held held on May 17-18, 2016

Diagnostics

Reference: M. Ferianis

SCOPE: Wire Scanner Acquistion System (WP7.4)

- The Elettra SoW for the IKC of the WS Acquisition System includes:
  - The front end electronic (FE) for both SEM current and scintillator readout
  - The front end electronics for the SCINT fast WS readout
  - The power supplies needed for wire polarization and photo detector biasing
- The total number of items included in the WS Acquisition System are:
  - 19 wire actuators
  - 22 SEM front ends
  - 30 PMT front ends



PDR -1 held on June 28, 2016

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The role of ELETTRA In International Projects

SOLARIS
NATIONAL SYNCHROTRON
RADIATION CENTRE

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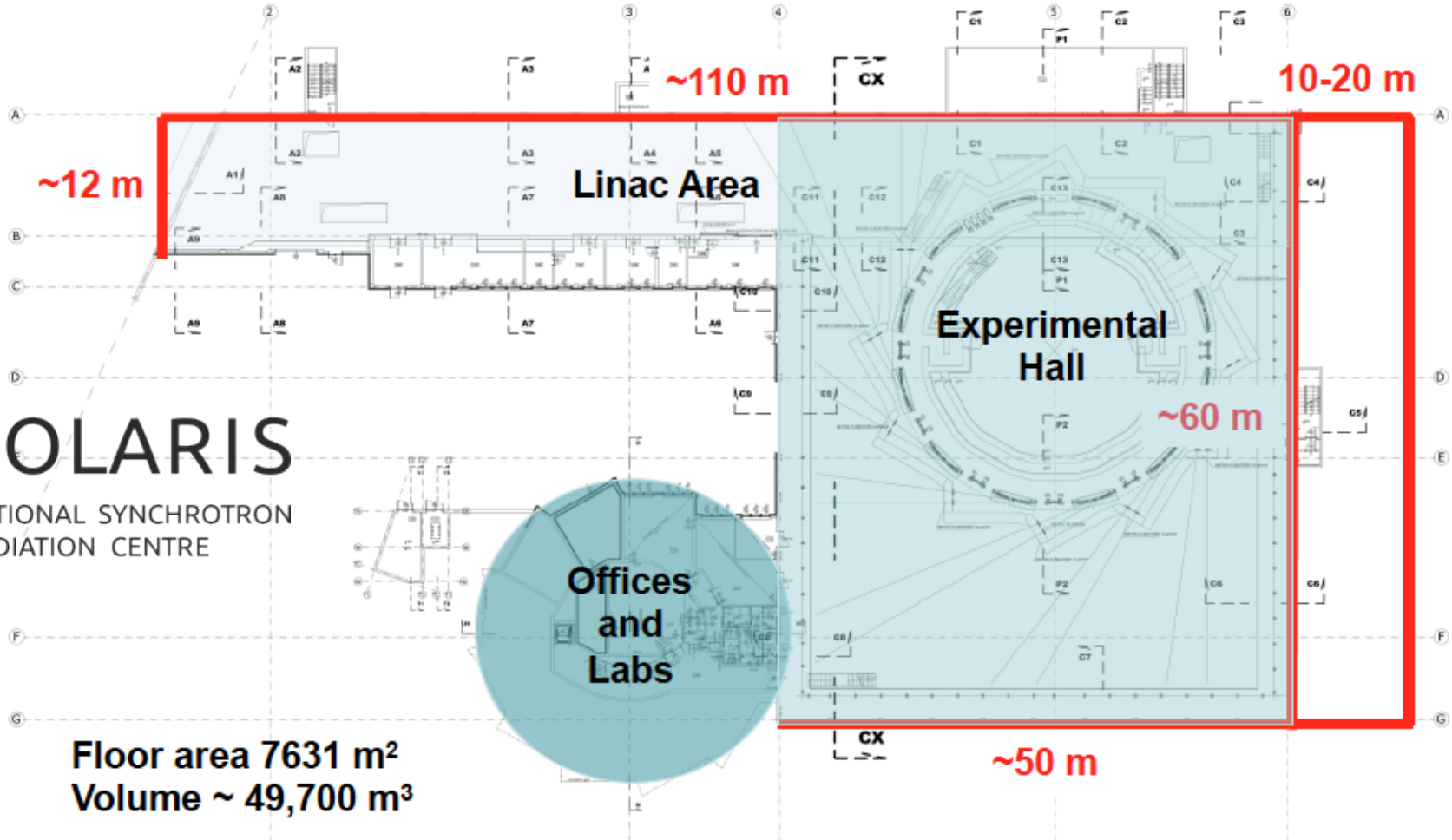
Solaris Building Overview



SOLARIS
NATIONAL SYNCHROTRON RADIATION CENTRE

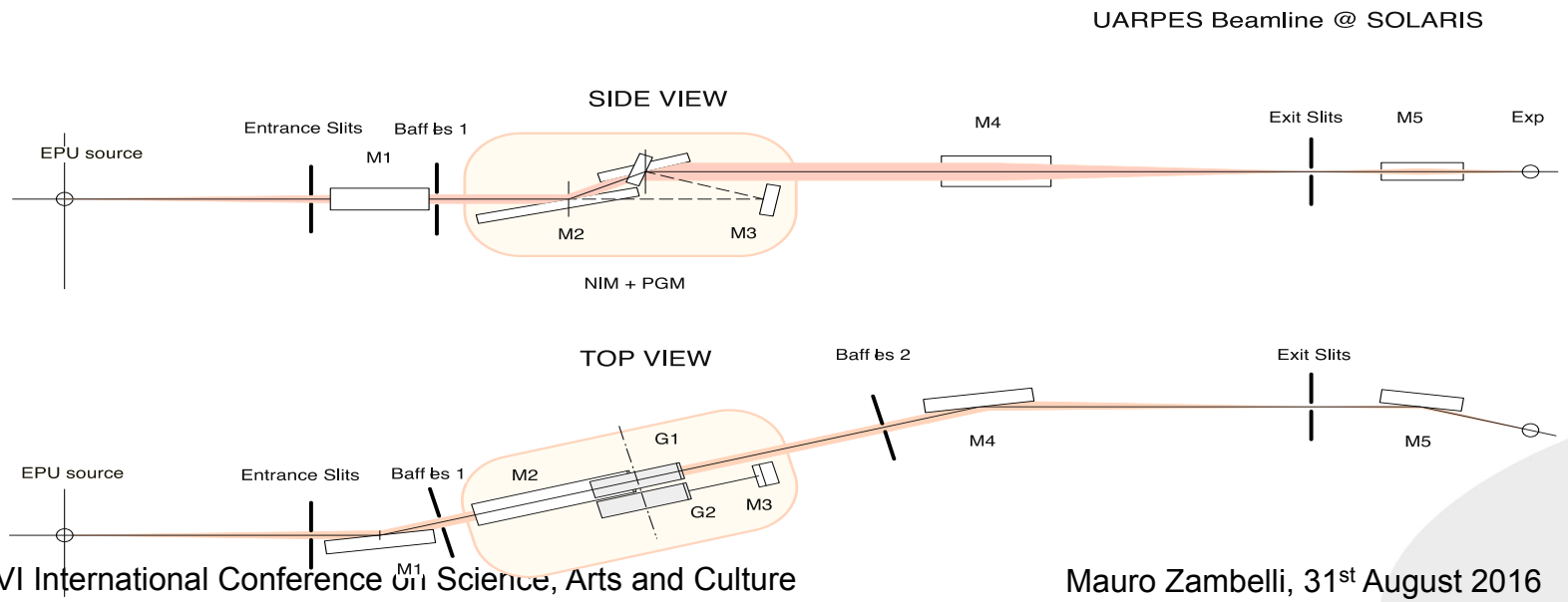
Floor area 7631 m²
Volume ~ 49,700 m³

Design of the UARPES BL

Starting from user oriented specifications:

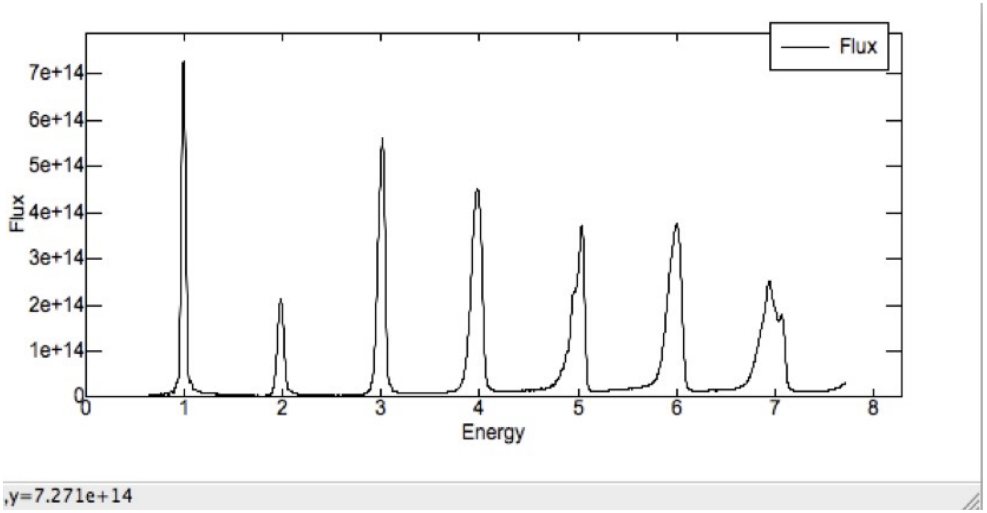
- energy range of 8-100 eV
- resolving power ≥ 20000 over the full energy range
- photon flux at the experiment ≥ $5x10^{11}$ photons/sec @ 20000RP
- presence of higher harmonics < 1%
- sample to source distance 28500 mm.
- excited spot size on the sample ≤ 500 x 500 μm^2

Design was provided and discussed with the customer

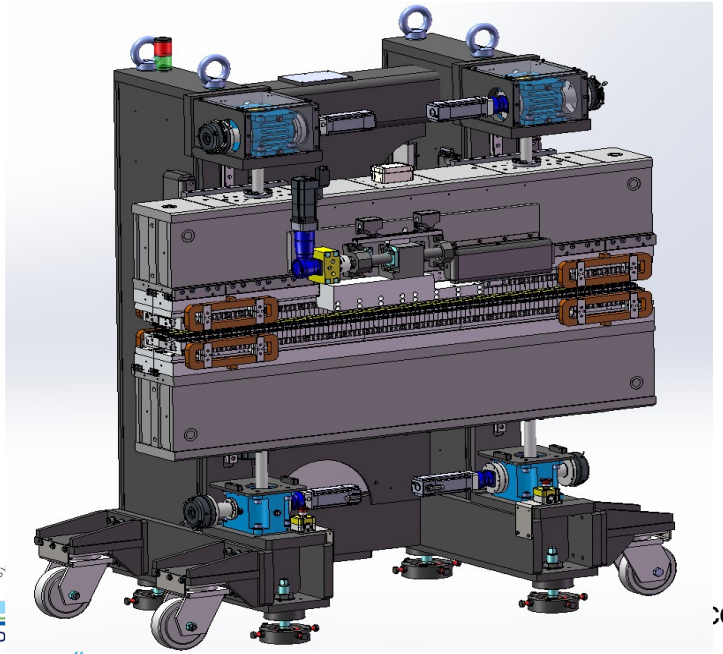


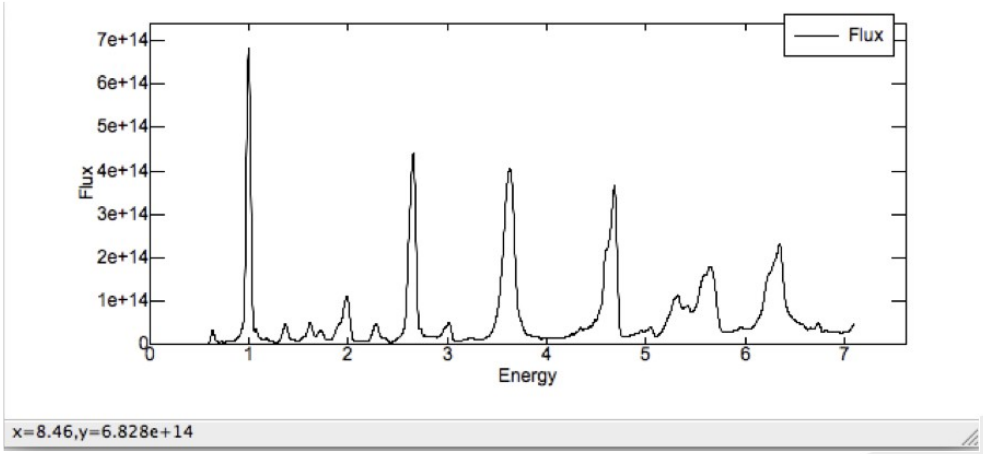
Undulator project and construction

A quasi periodic Elliptically Polarizing Undulator (EPU) capable to operate in parallel and antiparallel modes has been designed in order to maximize the performances of the ARPES beamline



Spectrum for linear horizontal polarization (energy scale is normalized to 8 eV).





Quasi-periodic spectrum for horizontal polarization (energy scale is normalized to 8 eV).

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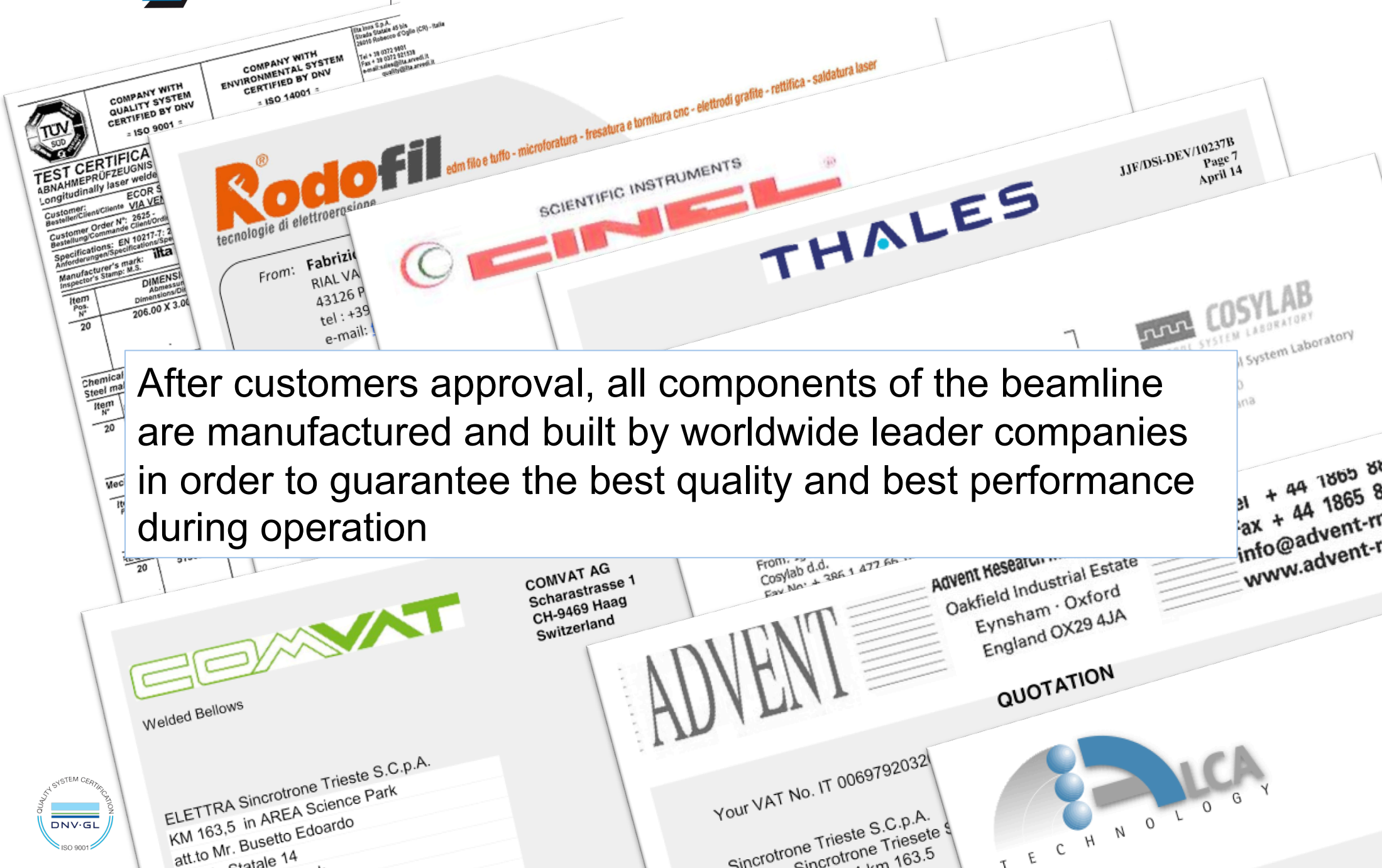
Manufacturing companies selection



After customers approval, all components of the beamline are manufactured and built by worldwide leader companies in order to guarantee the best quality and best performance during operation

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UARPES beamline @ SOLARIS

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Installation on site

A team of researchers and technicians is available for complete installation, SAT and Commissioning on site.

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The role of ELETTRA In International Projects

Elettra for CERIC-ERIC

The Partners

The founding members of CERIC-ERIC are **Austria**, the **Czech Republic, Italy, Poland, Romania, Serbia** and **Slovenia**. **Croatia** and **Hungary** participate as observers pending accession.

Member states appoint one **Representing Entity** each, which has the capacity to support the scientific and technical operation of CERIC-ERIC through a **Partner Facility**, complementary to all others in an overall multi-technique infrastructure. The Partner Facilities are the entry points and S&T outreach in the respective countries, while the Consortium activities and the access of users are coordinated through the statutory seat in Trieste, Italy.

An International Scientific and Technical Advisory Committee (ISTAC), composed of independent experts, periodically evaluates the Partner Facilities and the quality of the services and instruments provided by CERIC.

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CERIC-ERIC

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CERIC-ERIC

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The role of ELETTRA In International Projects

The ELI project

- ✓ The **Extreme Light Infrastructure** (ELI) is a new research infrastructure project which is part of the European ESFRI Roadmap, with an investment volume exceeding 850 million €
- ✓ ELI is the most advanced laser facilityin the world. Research projects studying the interaction of light with matter at intensity 10 times higher than currently achievable values with ultra-short laser pulses of a few femtoseconds (10-100 fs) duration
  and power up to 10 PW
- ✓ The facility will be based on four sites. Three of them are presently being implemented in Czech Republic, Hungary and Romania

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The ELI project

ELI-ALPS

eli attosecond

ELI-Beamlines

eli beamlines

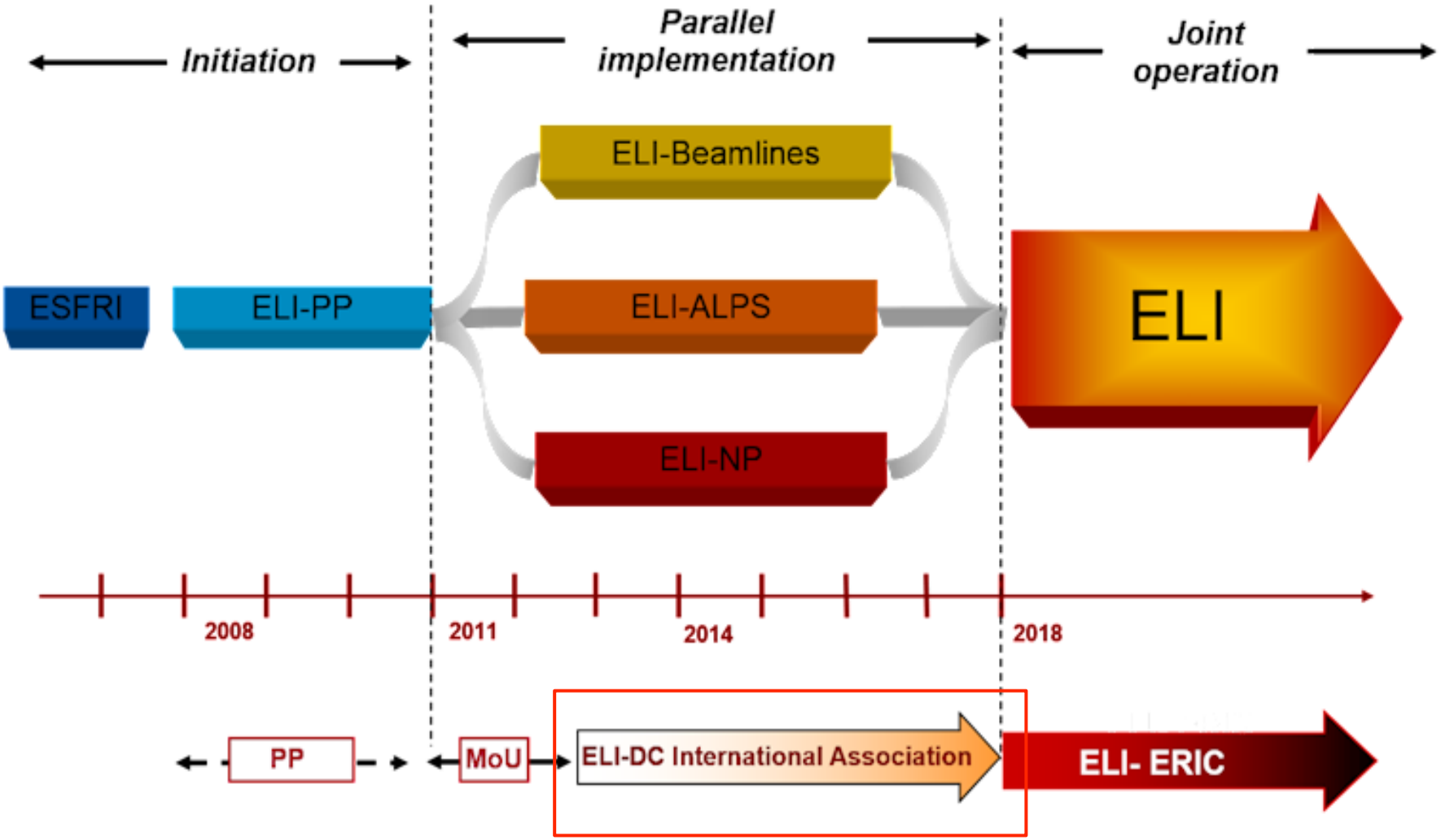
ELI-NP

eli Nuclear Physics

Italian Participation in ELI

- ✓ ELI-DC (Delivery Consortium) is a international non-profit association based on Belgian law (AISBL) that supports the three pillars during the constructions phase, conducts the negotiations towards the ELI-ERIC and prepares the field for a joint operation of the three facilities
- ✓ Elettra Sincrotrone Trieste is one of the six members of ELI-DC as representative of Italy
- ✓ CNR (Centro Nazionale delle Ricerche), INFN (Istituto Nazionale di Fisica Nucleare) and Elettra Sincrotrone Trieste have been and are actively collaborating with ELI in the following areas:
  - ELI Preparatory Phase (CNR and INFN)
  - development of technologies to be employed at ELI
  - design and development of systems and instrumentation
  - support and participation in the construction of the facilities

Italian Participation in ELI



Elettra Contribution to ELI

- ✓ Elettra has signed a Memorandum of Understanding for technical/scientific collaboration with each of the three ELI pillars
- ✓ Since 2014 Elettra has been collaborating with ELI in the following fields:
  - Technology Transfer
  - Setting up of an ERIC
  - Control systems
  - Safety systems
  - X-band RF technology
  - Experimental stations
  - Users office
  - Users management software

- ✓ Three contracts have been signed so far for training on technological transfer, construction of an experimental station and training on the TANGO Control System

Elettra Sincrotrone Trieste

Training

Elettra Sincrotrone Trieste was awarded with a public contract to provide its expertise:

- in the structuring and functioning of the **technology transfer activities** in the framework of **ELI-Beamlines and HiLASE** projects and in connection with the use of these systems, facilities and equipment.
  Timing: November 2014 – May 2015
- In the use of the control system TANGO for **ELI – Beamlines**
  Timing: November – December 2015

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Trieste

Thanks to my Colleagues

ALESSANDRO FABRIS

ANDREA LAUSI

MARCO LONZA

MARCO MARAZZI

CRISTINA PASOTTI

MARCO PELOI

ROBERTO PUGLIESE

For providing material for this presentation

Thanks for your kind attention

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The role of ELETTRA In International Projects