LNS in prospettiva

S. Gammino

Piano Triennale, Bari, 9/11/2019

Sottotitolo: INFN-LNS nel XXI secolo

S. Gammino

Piano Triennale, Bari, 9/11/2019

976 The Laboratorio Nucleare del Sud was established in Catania

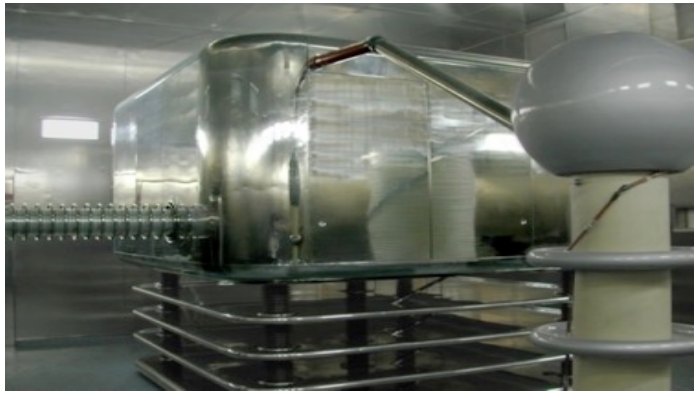
eginning of '80s : the Laboratory has been built "around" the Tandem; more or less in the same period
he decision to install the Superconducting Cyclotron (CS) designed by Prof. Resmini team in Milan is take
→ Drift of Nuclear Physics students to cover the needs of Accelerator construction.

985: M.Sc. Thesis about the bunching of ion beams to be injected in the CS

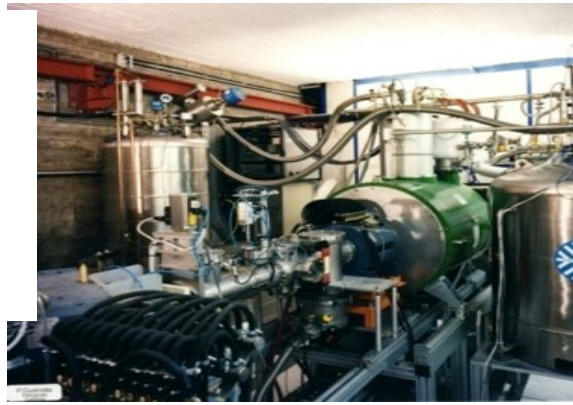
The LNS initiative was perceived at that time by many people as a "cathedral in the desert" because the lack of experienced people and because it was established in a reg without industrial hinterland.

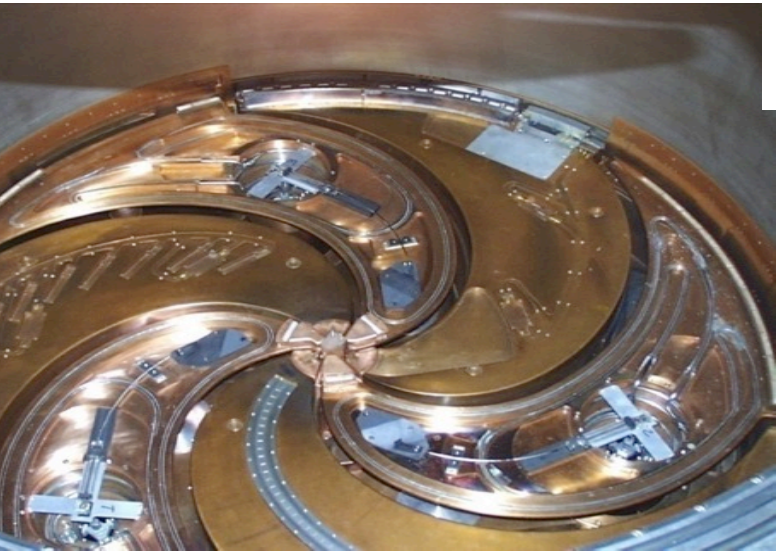
These comments were right but disappointing and they were a stro incentive for LNS team to become successful.

Accelerator equipment for ion beam production



Many national and international collaborations with experienced team permitted to complete in 10 years the construction of the facility, which has been working until now with good performances.





1 – 15 MV upgrade of the Tandem/higher transmission + belt replaceme
2 – Superconducting Cyclotron commissioning
3 – 450kV injector for the Tandem
4 – SERSE source
5 – CAESAR source and integration of the axial beamline

2019

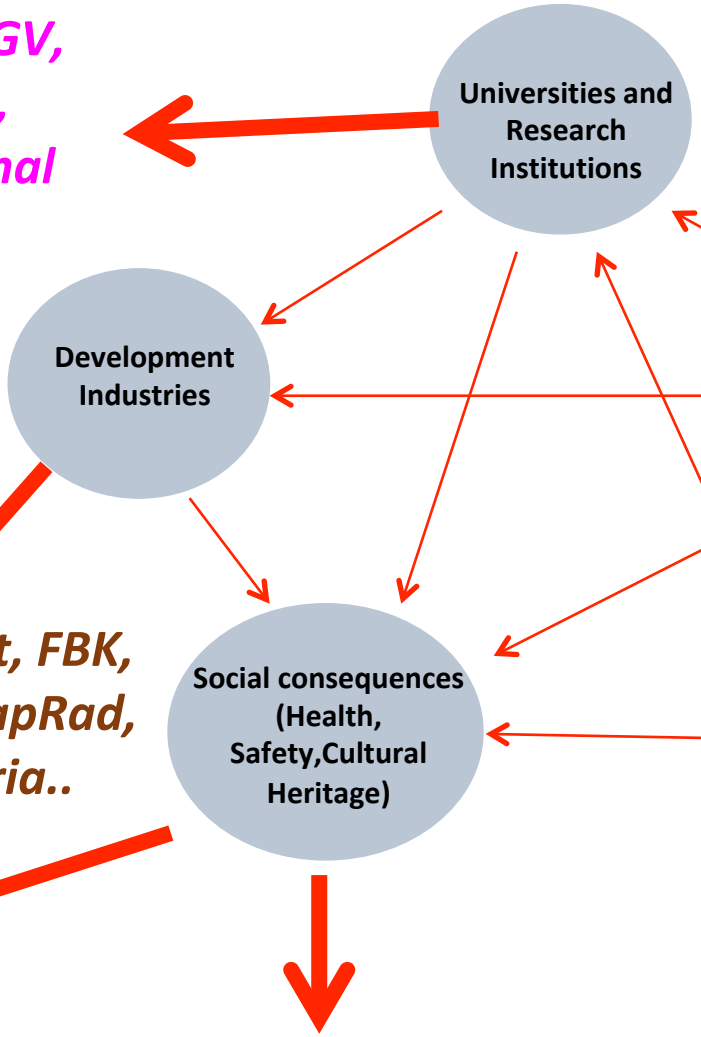
Laboratori Nazionali del Sud of INFN

Ai Laboratori Nazionali del Sud siamo oggi in 266 : 133 con contratto TI, 15 con contratto TD, 118 fra associati, borsisti e assegnisti.

Stuttura molto più stabile dal punto di vista del personale a tempo indeterminato!!!

The LNS development model to an European Research Infrastructure

Uni CT, CNR, INGV, INAF, ASI ISPRA, CSFNSM, Regional Inst.



STM, IBA, Best, FBK, Caen, IMT, MapRad, Confindustria..

EU Master in nuclear physics and PhD School with UNICT and INFN Master.

aboration
h CNAO
ources +
AISHa,
amlines)

- CATANA: 500 patients, 95% success
- LANDIS: Coll. with CNR-IBAM (Misurata Coins, Dead Sea Scrolls…)
- Radioactive Waste Management: Sogin
- Enviromental Radioactivity Lab
- Radiobiology Lab

IDMAR
POT-LNS
PRIN Medical Physics
H2020 Km3Net IR-

S are substantially committed for the realization of KM3Net (not less than 5
€ in the next 4-5 years). This is part of the ESFRI project in the framework of
e European Collaboration Km3NeT.
was remarked during last Review, this week, that 2020 will be a moment of
th, and that the pace of the construction is expected to increase significant

the same time the upgrade of the SC Cyclotron will be realized by using the
UR-PON budget (POTLNS).The LNS upgrade consists of the upgrade of the
perconducting Cyclotron, of the installation of the new fragment separator
AISE for in-flight radioactive beams production, and of the upgrade of the
perimental apparatus MAGNEX for the experiment NUMEN.
e scope of the project is to accelerate and deliver high intensity light ion
ams with power of several kW and intensity up to 10^{14} pps.

n of these activities is going to make the LNS better and in order to obtain the expected results we need
e care of **different actions**:

nvolve each LNS member into the actions to be done and spend some time to describe the scope
"**ownership**" by coworkers will be essential for the success of these initiatives in such a short time lapse)
mprove the osmosis within the organizational chart, by **enhancing the interactions** among the LNS Servic
his process yet started a few years ago and it is now enhanced).

avour the participation of **other teams from INFN, and elsewhere**, to the LNS activities and **share the go**
ith them, including the peer review of the different steps (yet started).

implify the procedure for the purchases (meeting with Central Administration officers are frequent and
ctions are under way).

olve the problems linked to the **generational change** (it means that the technical staff that supported th
uperconducting Cyclotron construction will be soon close to the retirement, so we may **keep the pace** of
he new construction phase only by providing an adequate **transfer of technical know-how** to new
ersonnel → action under way: hiring with temporary contracts some new technicians, M.Sc. and M.Eng.
who may "absorb" the know-how, adapting it to the new technologies and to the new challenges.

ncrease the **role of IT service** to decrease the pressure on human resources.

r KM3NET the contributions of the **improvements to LNS infrastructures** will be sential for the success of the project, while the construction of the detector will be don KM3NET collaboration, i.e. LNS will have a major role but we are not the only player.

nversely the **POTLNS initiative is completely depending on INFN-LNS personnel** and en a significant fraction of the scientific themes that motivated such a strong vestment have grown up there.

, before coming into more details the POTLNS, something needs to be said about the JMEN project, the science case initially driving the CS upgrading.

The ββ decay

1) 2ν double β-decay

1) Does not distinguish between Dirac and Majorana

2) Experimentally observed in several nuclei since 1986

ν and anti-ν can be distinguished

ν and anti-ν are the same

2) 0ν double β-decay

Neutrino has mass

Neutrino is Majorana particle

Violates the leptonic number conservation

Experimentally not observed

Beyond the standard model

The NUMEN project

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collaboration updated @ 31/07/2019

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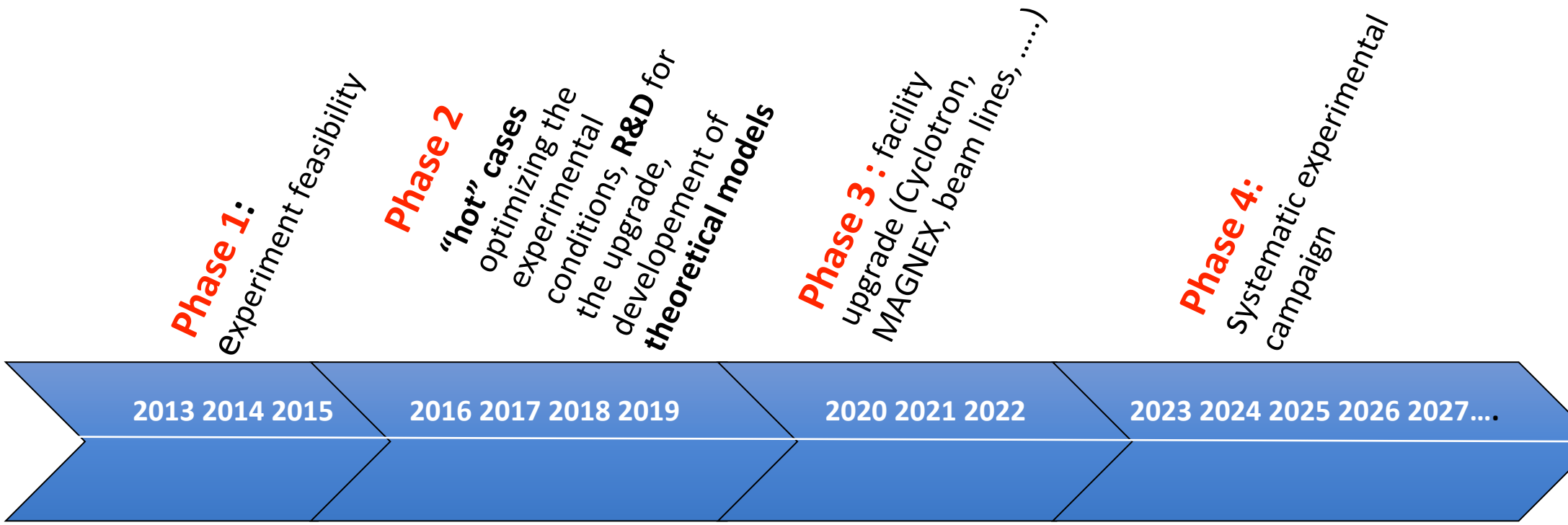
106 Researchers
36 Institutions
16 Countries

Leadership role f
INFN-LNS and
UNICT-DFA

Italy
Mex
Brazil
Turk
Germany
Chi
Morocco
Gre
Romania
Isra
France
US
Finland
Spa
Chile

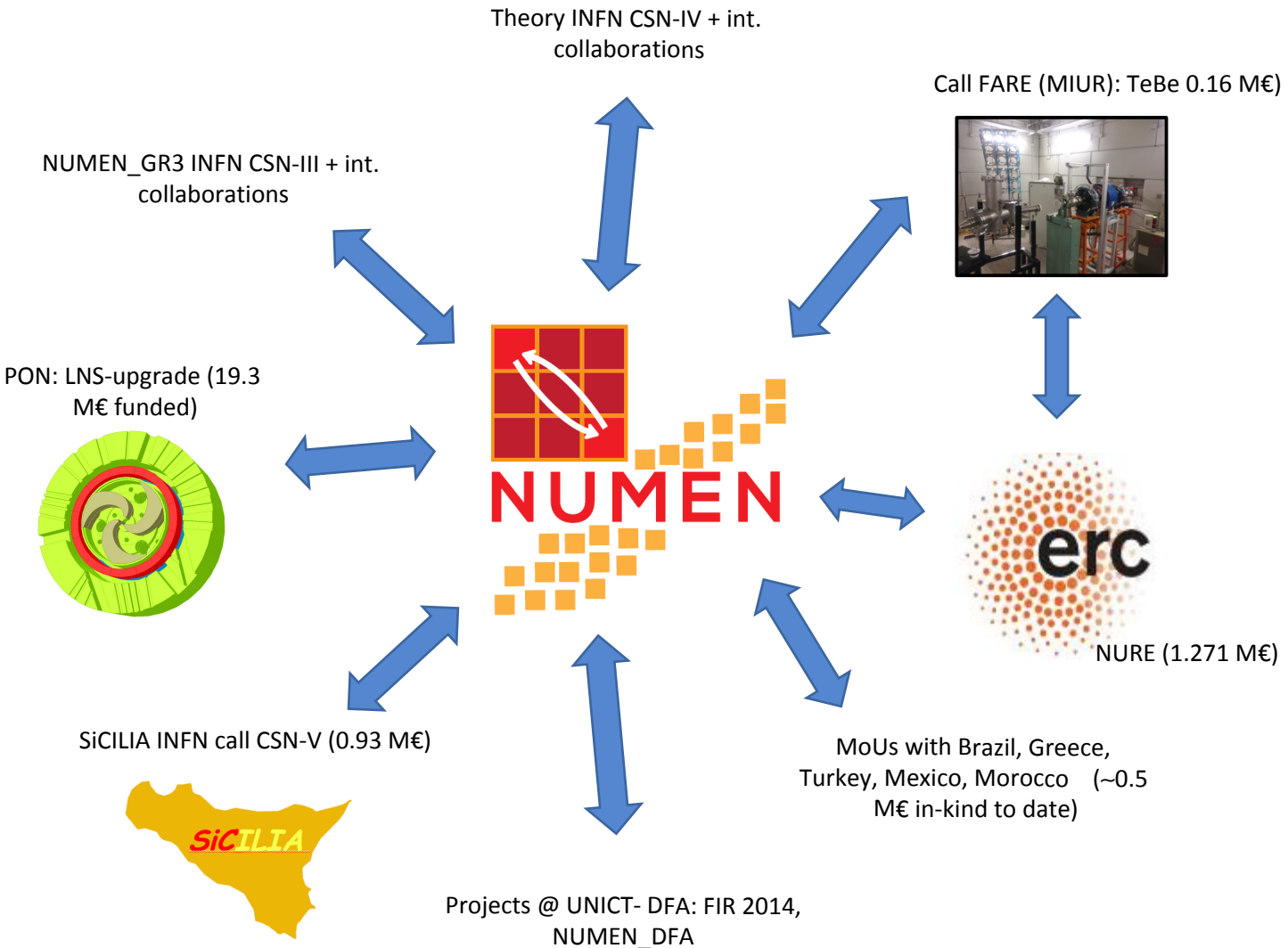
➢ Eur. Phys. J. A (2018) 54: 72 The NUMEN project: NUclear Matrix Elements for Neutrinoless double beta decay

NUMEN project phases



...a long range time perspective

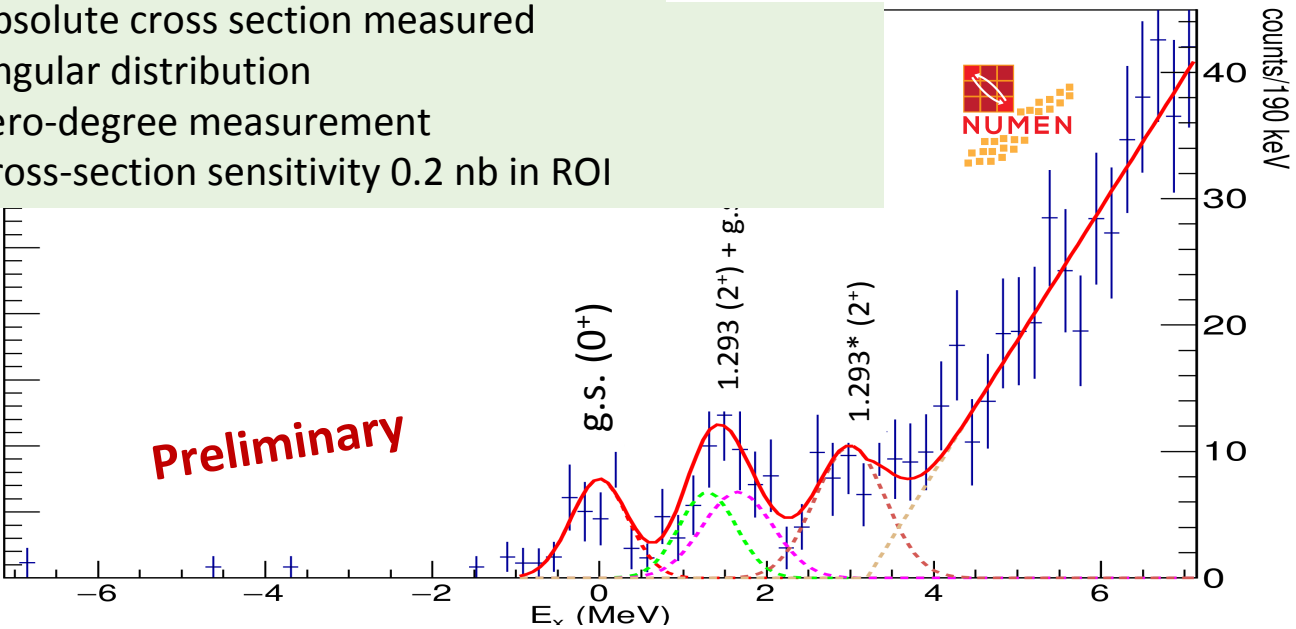
A broader view

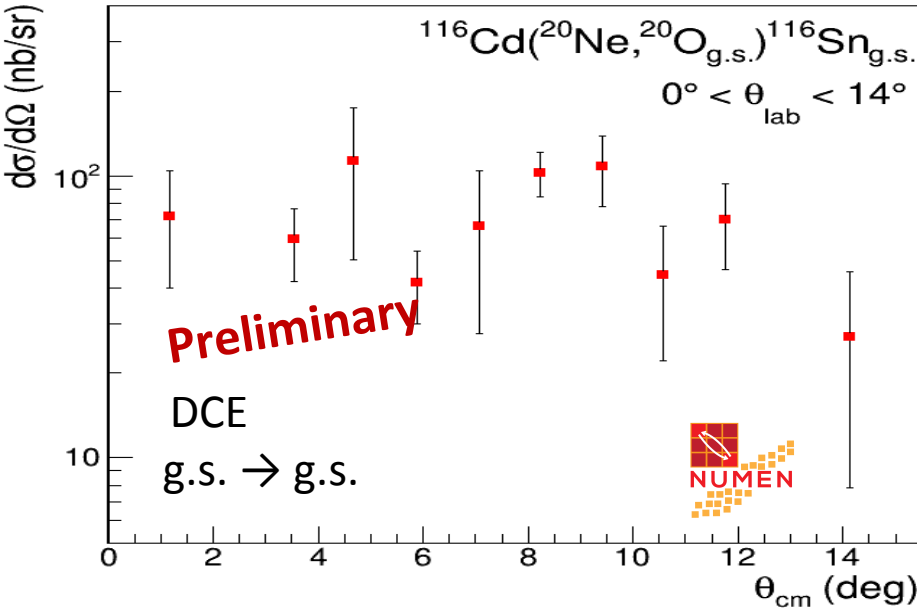


Results

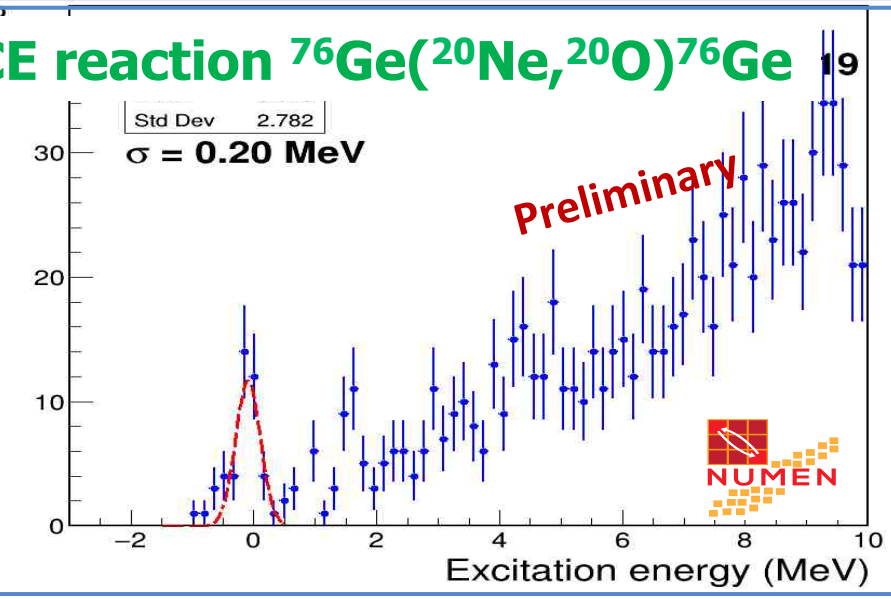
DCE reaction $^{116}Cd(^{20}Ne,^{20}O)^{116}Sn$

s. → g.s. transition isolated
bsolute cross section measured
ngular distribution
ero-degree measurement
ross-section sensitivity 0.2 nb in ROI

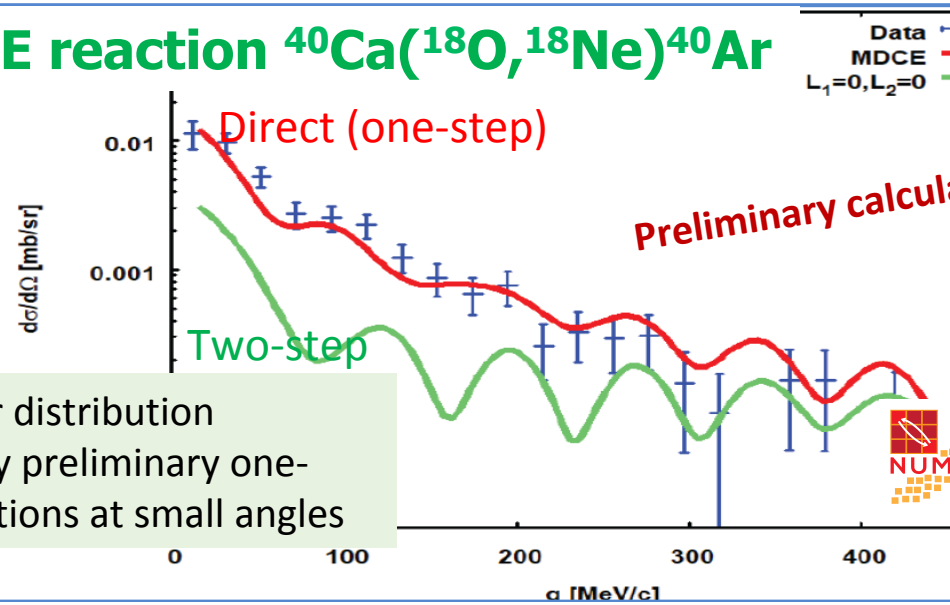




CE reaction $^{76}Ge(^{20}Ne,^{20}O)^{76}Ge$



DCE reaction $^{40}Ca(^{18}O,^{18}Ne)^{40}Ar$



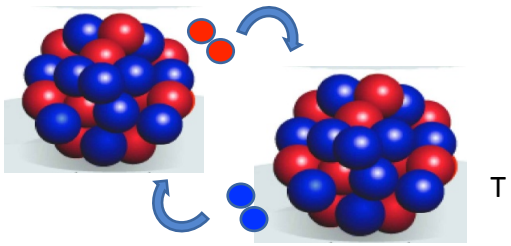
Exp. angular distribution described by preliminary one-step calculations at small angles

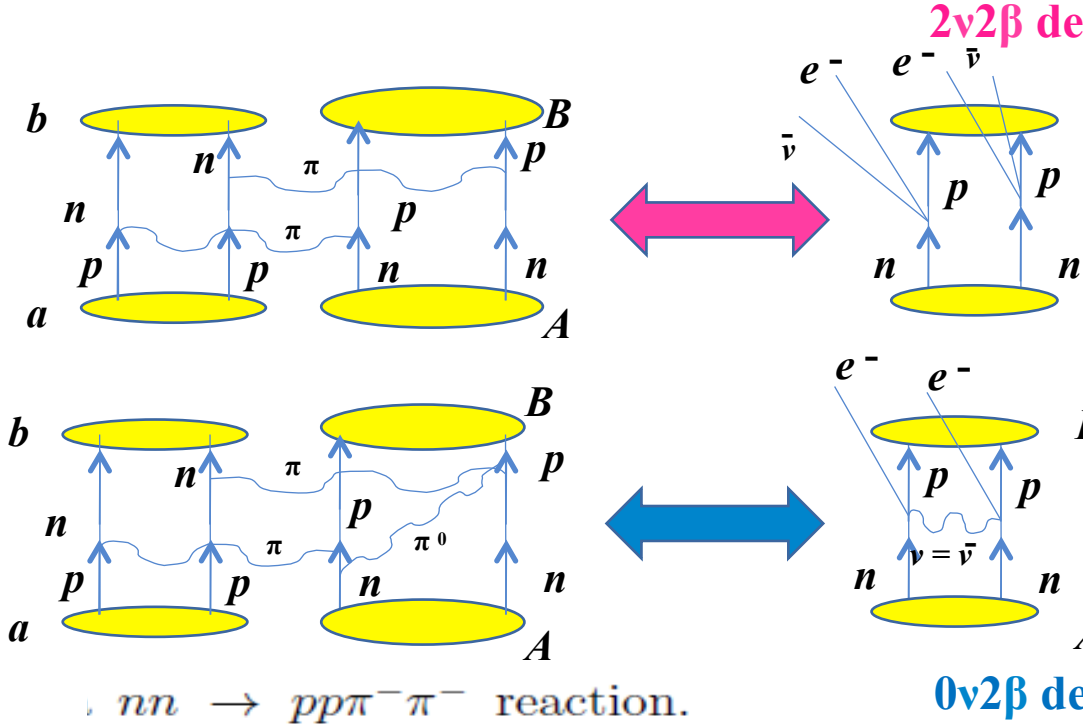
Schematic theoretical description of DCE

RRENT STUDY
vo-step (uncorrelated) process:
consecutive Single CE (SCE)
alogies with **2ν2β decay**

SPECTIVE
ne-step (correlated) process:
alogies with **0ν2β decay**

TESSARY CHECK
udy of competing processes:
ultinucleon **transfer**





$nn \rightarrow pp\pi^-\pi^-$ reaction.

in the target

Nuclear ← → Weak

Main collaborations:

- *H.Lenske* Giessen Univ. – Germany
- *N.Auerbach* Tel Aviv Univ. – Israel
- *J.Ferreira, J.Lubian* Niteroi – Rio de Janeiro – Brazil
- *J.A. Lay Valera* University of Sevilla – Spain
- *E. Santopinto and coll.* Genoa Univ. and INFN - Italy

New developments

a systematic study ⟶ **two or three orders of magnitude higher current t**
present, is necessary

- Beams intensity up to 10^{14} pps
- Energy range 15-70 MeV/u
- Beam power range 1-10 kW

Substantial change in the technologies used

e challenge: to detect with **good energy, mass and angular resolutions rare events**
ry high rates of heavy ions!

PON 2014-2020 (MIUR-EU)

The PON finances projects aimed at *strengthening* the *research infrastructures* identified by the MIUR as priorities in the 2014-2020 PNIR. These are functional to the implementation of projects that respond to one or more areas of the European Strategy Forum on Research Infrastructures (ESFRI)

Driving physics case:

Research proposed by NUMEN

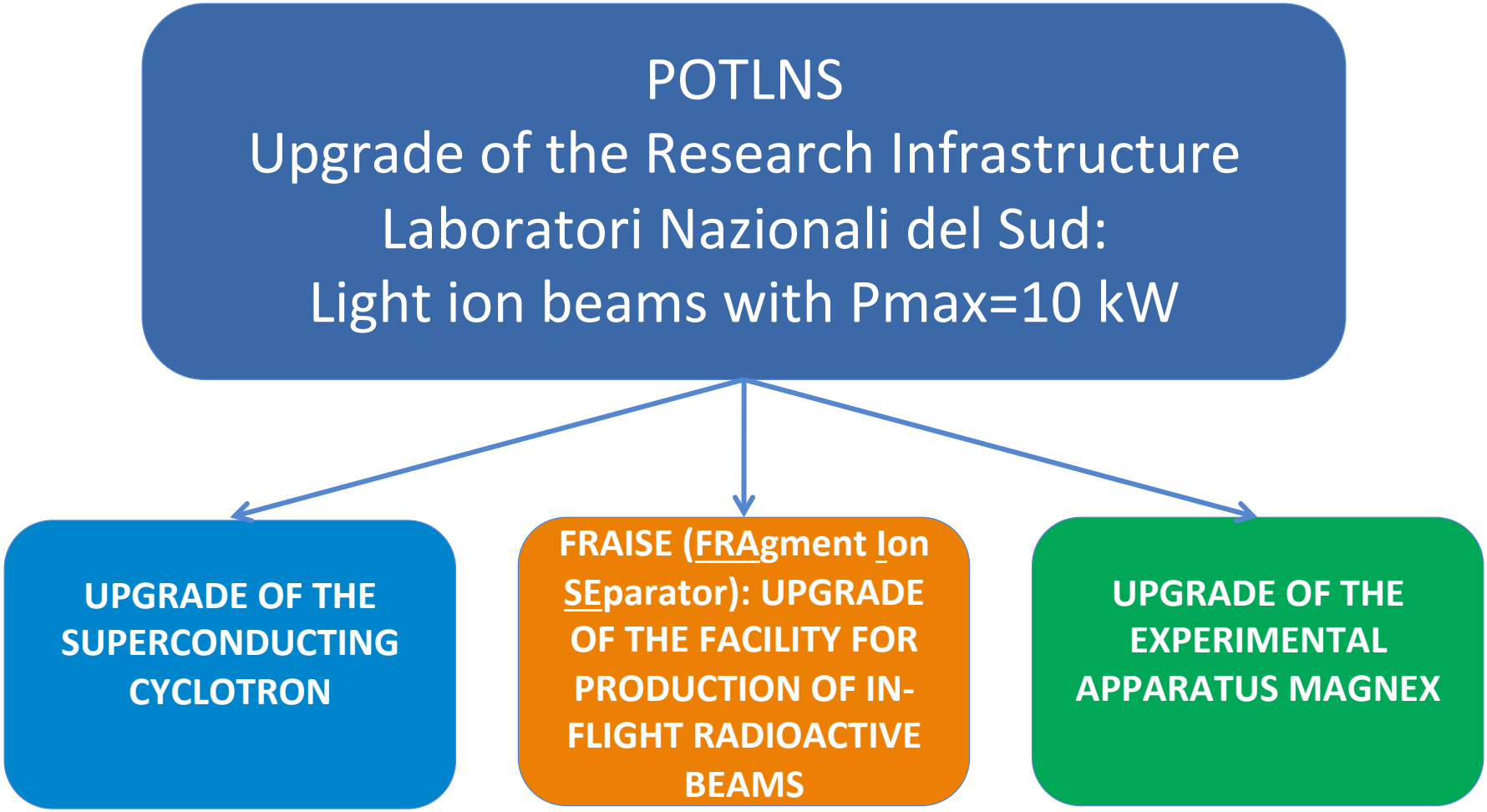
POTLNS € 19.352.300

32 months

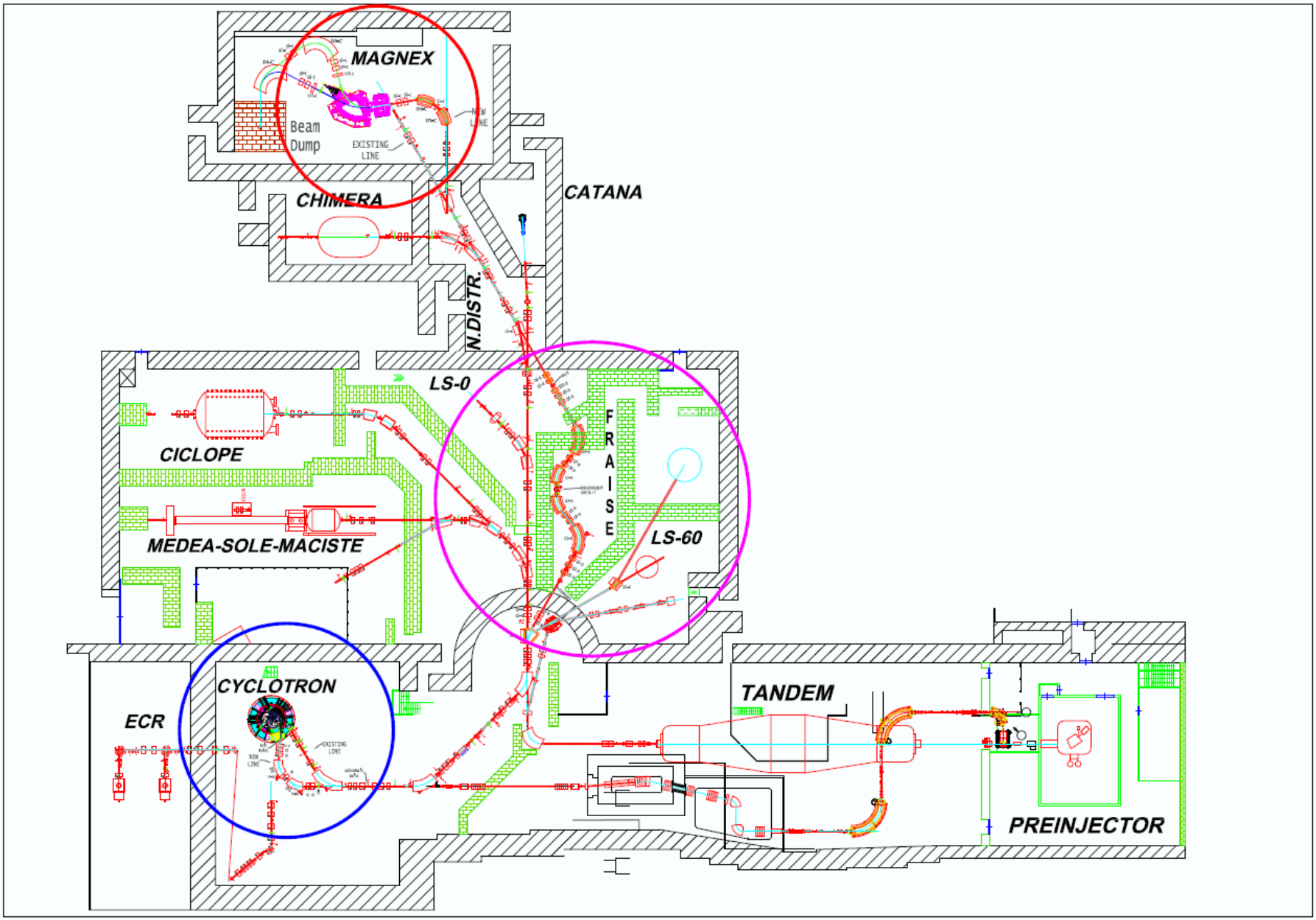
CS – INTENSITY UPGRADE

FRIBs – UPGRADE
(FRAISE with CHIMERA)

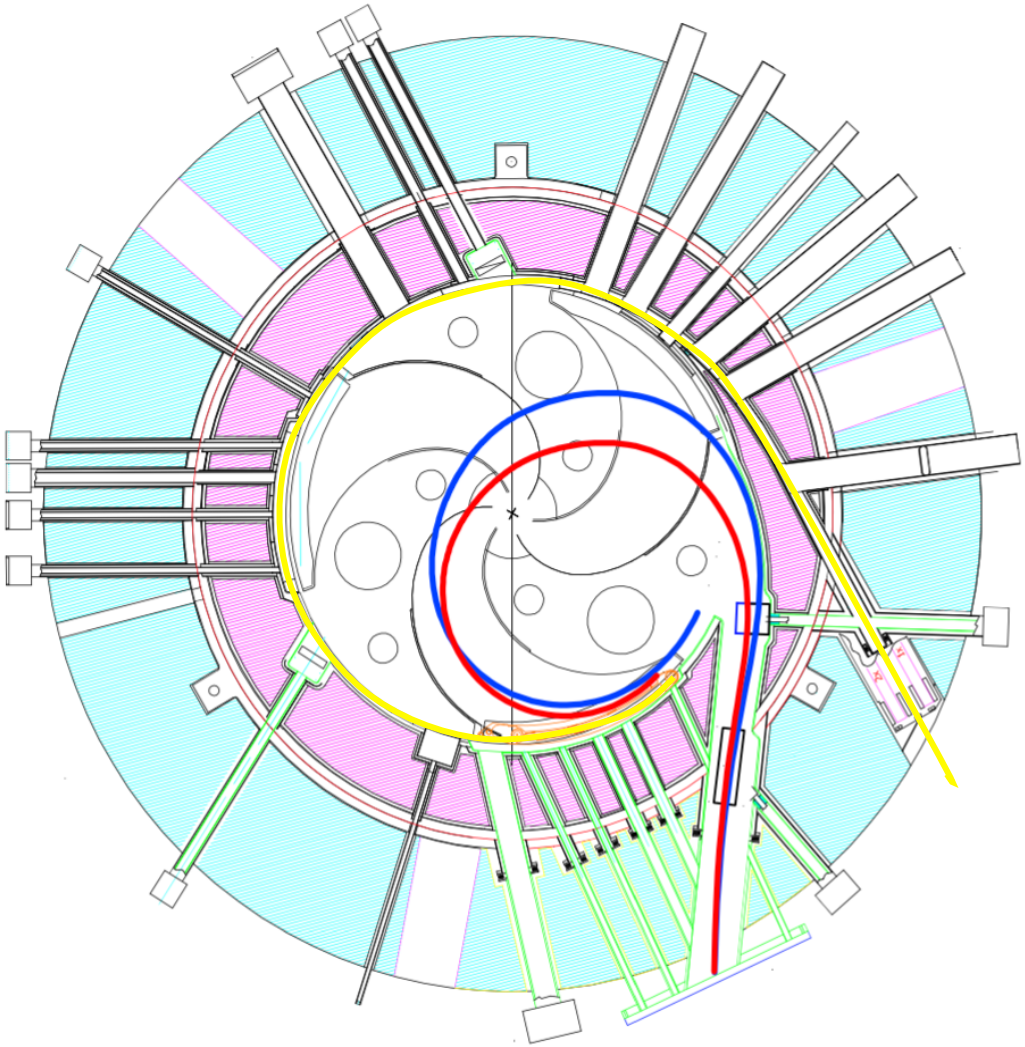
POTLNS: POTenziamento Laboratori Nazionali del Sud



Areas involved in the project



Extraction by stripping - high efficiency: >99%



Extraction by stripping is based on the instantaneous change of the magnetic rigidity of the accelerated ion, when its charge state increases after crossing a thin stripper foil

For ions with A<40, and energies higher than 15 MeV/u, the abundance of q=Z exceeds 99%

Extraction trajectories
Electrostatic deflection
Stripping in the hill
Stripping in the valley

IS upgrade

POTLNS

PIR01_00005

on extraction by
ng and beam
ics
om MIT about a
uperconducting
t

2016

- Start of the purchase procedure for the new SC magnet
- Project planning kick-off

2018

- Call for PON grant
- Application

2015

- White book on CS upgrade

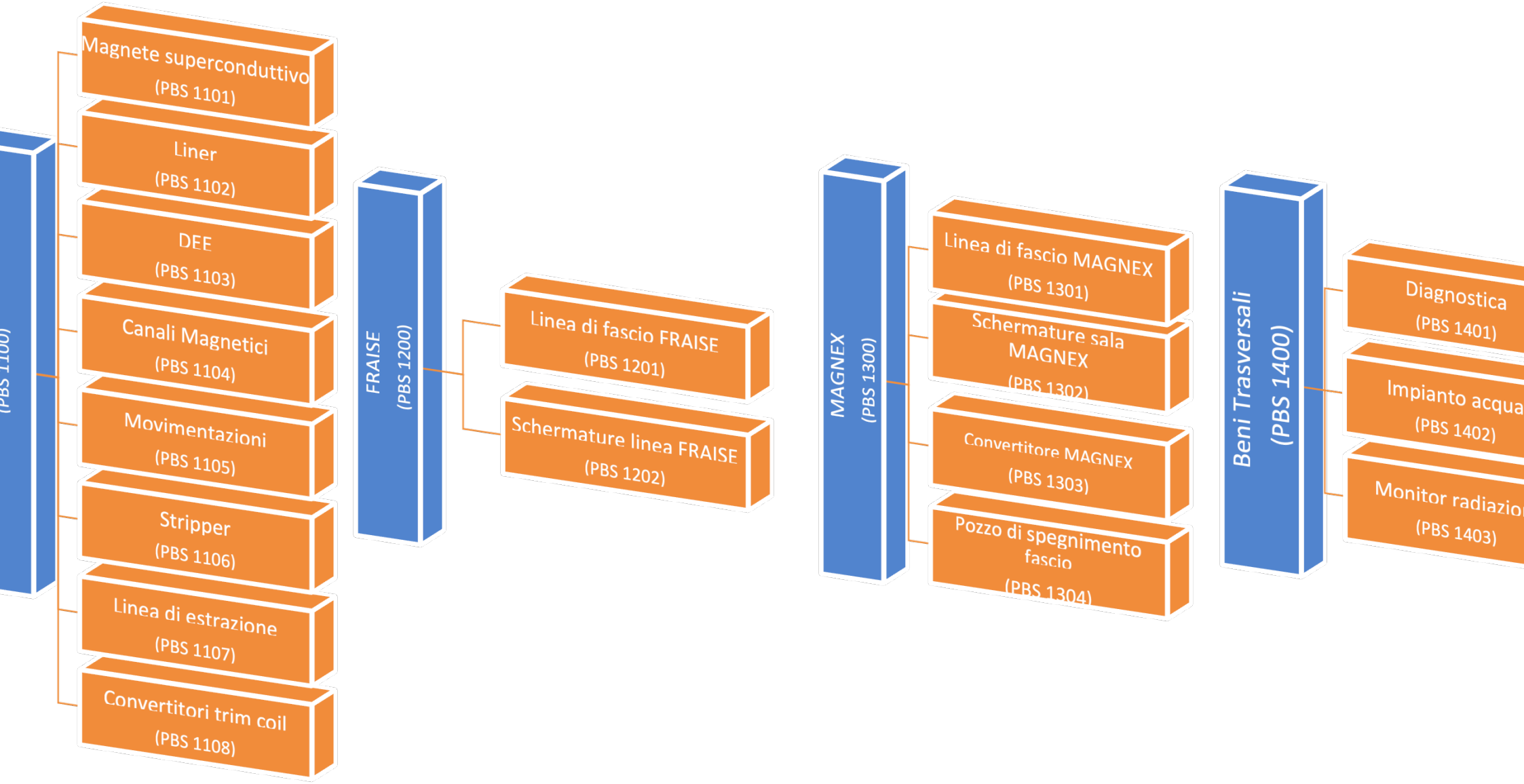
2017

- Project Planning, definition of PBS, WBS and OBS
- Internal check with the internal expert and evaluation of the costs

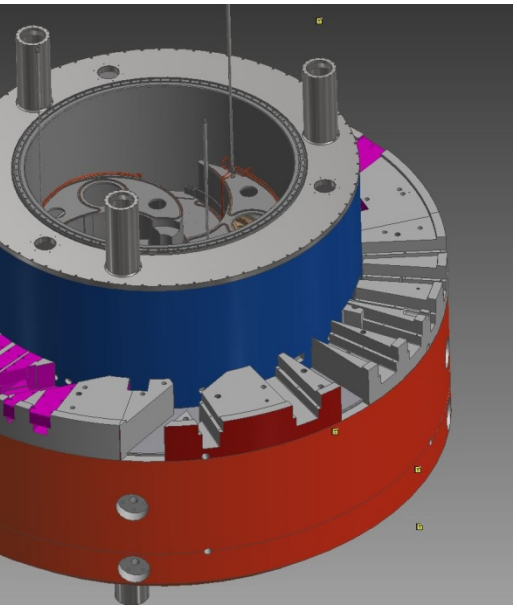
2019

- June 14th , project starts (32 months for completion)

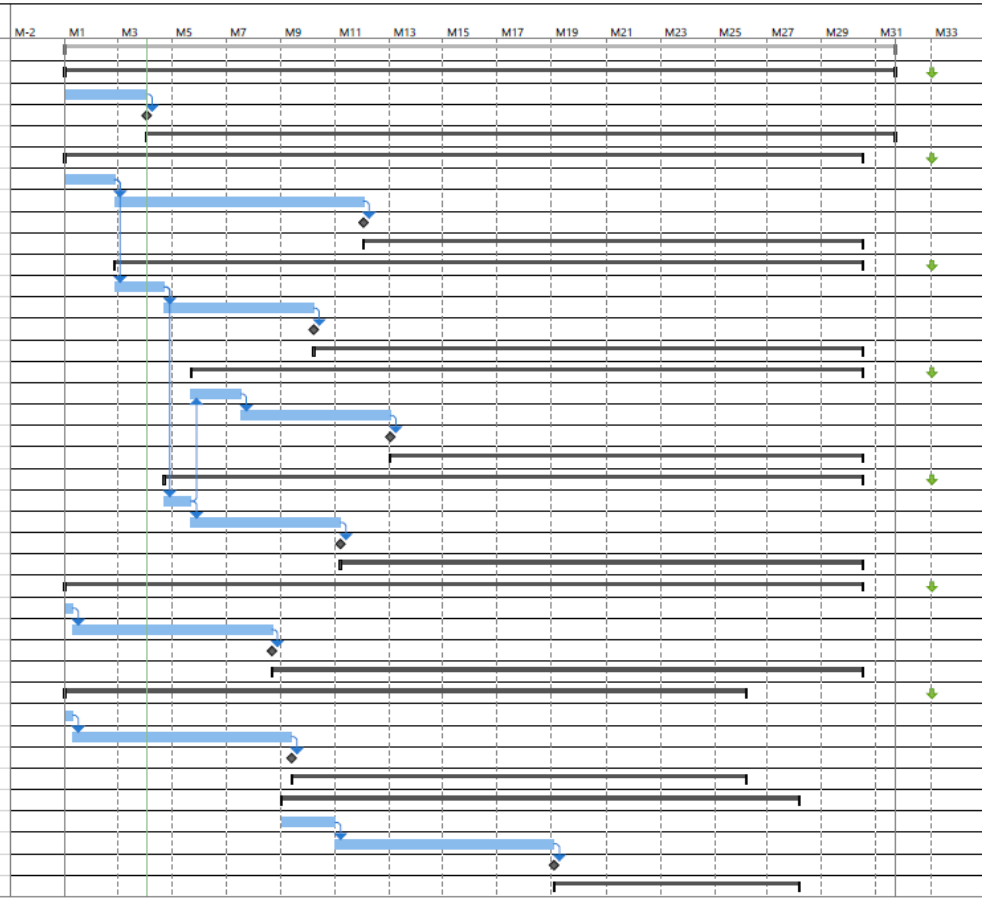
PBS according to the PON scheme



Planning Task CS upgrade (the others are not mentioned for sake of brevity



ID	PBS	WBS	Nome attività	Durata	Mese	Costo
1	**1100**	**1100**	**Ciclotrone Superconduttore**	**668 g**		**€ 9.143.900,00**
1	**1101**	**1101**	**Magnete supercond**	**668 g**		**€ 5.026.400,00**
2		1101.ga	gara d'appalto	66 g		€ 0,00
3		1101.sc	stipula contratto	0 g	4	€ 0,00
4		**1101.ea**	**esecuzione appalto**	**602 g**		**€ 5.026.400,00**
25	**1102**	**1102**	**Liner**	**641 g**		**€ 793.000,00**
26		1102.rc	redazione capitolato	40 g		€ 0,00
27		1102.ga	gara d'appalto	200 g		€ 0,00
28		1102.sc	stipula contratto	0 g	12	€ 0,00
29		**1102.ea**	**esecuzione appalto**	**401 g**		**€ 793.000,00**
39	**1103**	**1103**	**DEE**	**601 g**		**€ 85.400,00**
40		1103.rc	redazione capitolato	40 g		€ 0,00
41		1103.ga	gara d'appalto	120 g		€ 0,00
42		1103.sc	stipula contratto	0 g	10	€ 0,00
43		**1103.ea**	**esecuzione appalto**	**441 g**		**€ 85.400,00**
53	**1104**	**1104**	**Canali magnetici**	**539 g**		**€ 122.000,00**
54		1104.rc	redazione capitolato	40 g		€ 0,00
55		1104.ga	gara d'appalto	120 g		€ 0,00
56		1104.sc	stipula contratto	0 g	13	€ 0,00
57		**1104.ea**	**esecuzione appalto**	**379 g**		**€ 122.000,00**
67	**1105**	**1105**	**Movimentazioni**	**561 g**		**€ 115.800,00**
68		1105.rc	redazione capitolato	22 g		€ 0,00
69		1105.ga	gara d'appalto	120 g		€ 0,00
70		1105.sc	stipula contratto	0 g	11	€ 0,00
71		**1105.ea**	**esecuzione appalto**	**419 g**		**€ 115.800,00**
80	**1106**	**1106**	**Stripper**	**641 g**		**€ 1.067.500,00**
81		1106.rc	redazione capitolato	7 g		€ 0,00
82		1106.ga	gara d'appalto	160 g		€ 0,00
83		1106.sc	stipula contratto	0 g	8	€ 0,00
84		**1106.ea**	**esecuzione appalto**	**474 g**		**€ 1.067.500,00**
94	**1107**	**1107**	**Linea di estrazione**	**548 g**		**€ 1.117.600,00**
95		1107.rc	redazione capitolato	7 g		€ 0,00
96		1107.ga	gara d'appalto	176 g		€ 0,00
97		1107.sc	stipula contratto	0 g	9	€ 0,00
98		**1107.ea**	**esecuzione appalto**	**365 g**		**€ 1.117.600,00**
107	**1108**	**1108**	**Convertitori TC**	**416 g**		**€ 816.200,00**
108		1108.cap	redazione capitolato	44 g		€ 0,00
109		1108.ga	gara d'appalto	176 g		€ 0,00
110		1108.sc	stipula contratto	0 g	19	€ 0,00
111		**1108.ea**	**esecuzione appalto**	**196 g**		**€ 816.200,00**



Progetto: POT LNS

Attività
Divisione
Cardine
Riepilogo
Riepilogo progetto
Attività inattiva
Cardine inattiva
Riepilogo inattiva
Attività manuale
Solo-durata
Riporto riepilogo manuale
Riepilogo manuale
Solo inizio
Solo-fine
Attività esterne
Cardine esterno
Scadenza
Avanzamento
Avanzamento manuale

POTLNS status

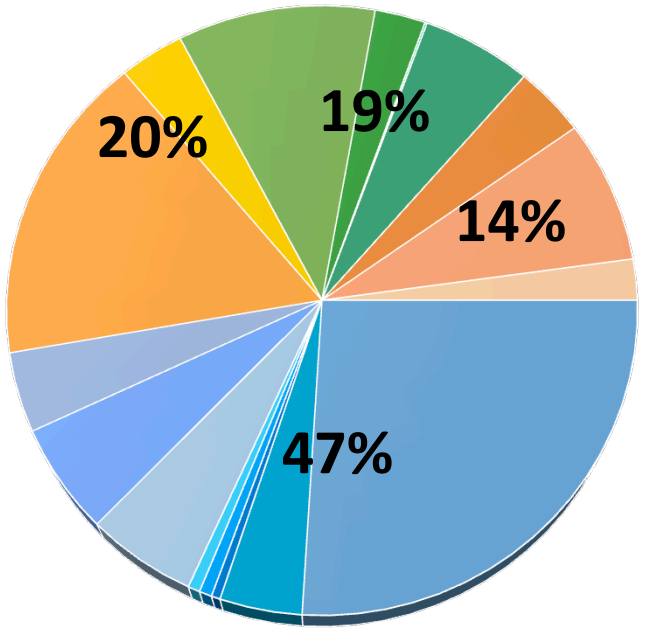
- *Call for tender:*
  - *SC magnet contract ready for signature. 5M€;*
  - *Technical specifications for the beamline ready. Call for tender to be launched before the end of the year. 6,5M€;*
  - *Technical specifications for the stripper ready. Call for tender to be launched before the end of the year. 1M€;*
  - *Shielding drawings almost ready. Technical specifications ready for submission to Central Administration officers in a few weeks. Call for tender to be launched before the end of the year. 2M€;*
  - *Civil work and technical service upgrade may start at the beginning of 2020 1,2+1,6M€;*

Mid-term planning

- *Once that the tenders will be launched, the management team will focus onto the detailed planning of the disassembly/assembly phase.*
- *Complex logistics, shortage of space → mitigation measures under preparation.*
- *This part of the project will be done by LNS personnel with minor outsourcing.*

Assets of the project POTLNS and their costs

COD. PBS	DESCRIPTION	COST
1100	OR: SUPERCONDUCTING CYCLOTRON	9.143.900,00 €
1101	Superconducting magnet	5.026.400,00 €
1102	Liner	793.000,00 €
1103	DEE	85.400,00 €
1104	Magnetic channels	122.000,00 €
1105	Movement Actuations	115.800,00 €
1106	Stripper	1.067.500,00 €
1107	Extraction beam line	1.117.600,00 €
1108	Power converters Trim Coils	816.200,00 €
1200	OR: FRAISE	3.885.200,00 €
1201	Beam lines FRAISE	3.219.200,00 €
1202	Shielding structures FRAISE	666.000,00 €
1300	OR: MAGNEX	3.694.200,00 €
1301	Beam lines MAGNEX	2.026.000,00 €
1302	Power converters MAGNEX	519.000,00 €
1303	Beam dump	21.900,00 €
1304	Shielding structures MAGNEX	1.127.300,00 €
1400	COMMON ASSETS	2.629.000,00 €
1401	Diagnostics	735.400,00 €
1402	Water cooling plants	1.472.600,00 €
1403	Radiation monitors	421.000,00 €
	TOTAL	19.352.300,00 €



19.352.300 €
VAT included

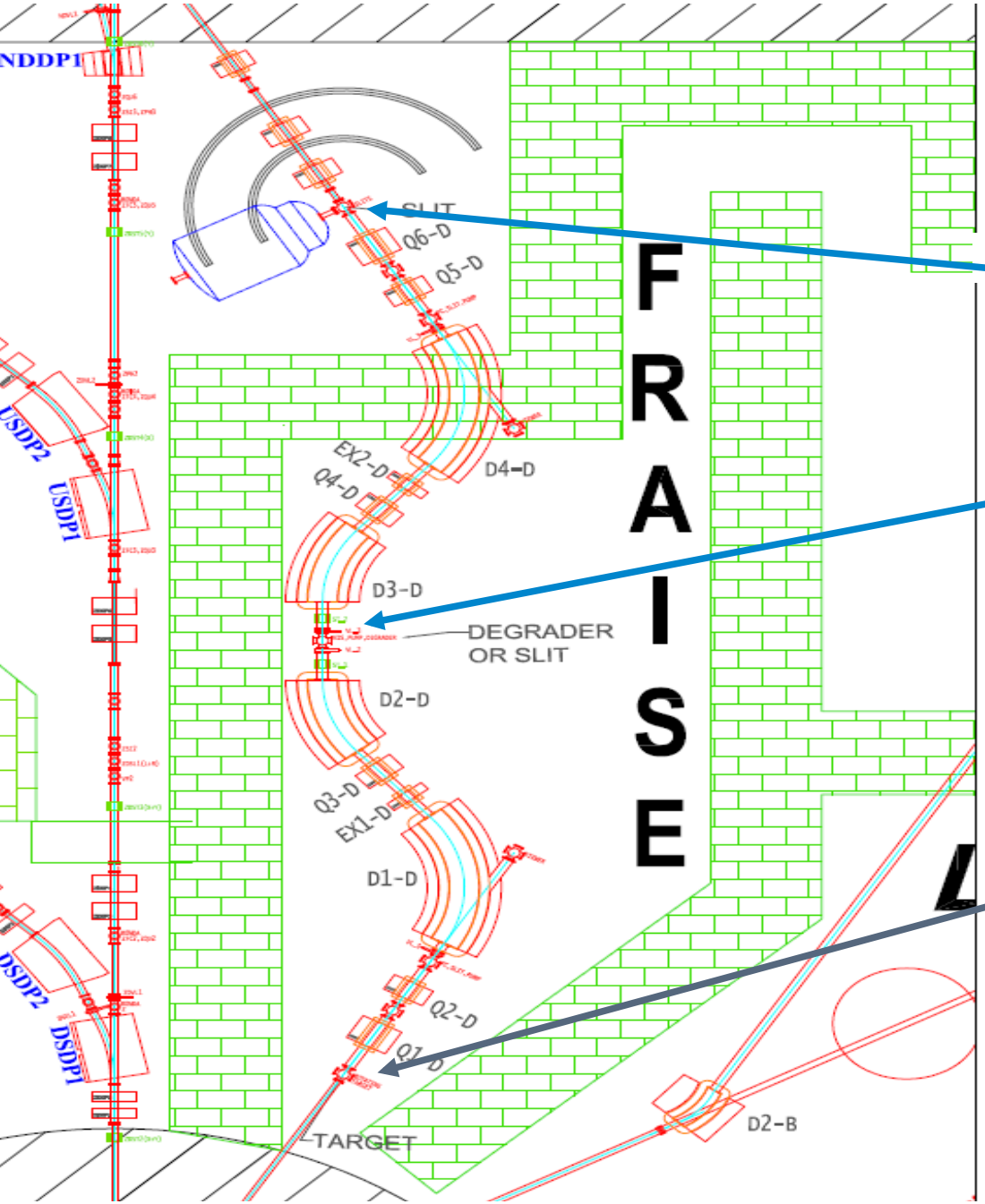
Expected intensity

Ion	Energy	Isource	Iacc	Iextr	Iextr	Pextr
	MeV/u	eμA	eμA	eμA	pps	watt
^{12}C q=5+	30	200	30 (4+)	45 (6+)	$4.7 \cdot 10^{13}$	2700
^{12}C q=4+	45	400	60 (4+)	90 (6+)	$9.4 \cdot 10^{13}$	8100
^{12}C q=4+	60	400	60 (4+)	90 (6+)	$9.4 \cdot 10^{13}$	10800
^{18}O q=6+	20	400	60 (6+)	80 (8+)	$6.2 \cdot 10^{13}$	3600
^{18}O q=6+	29	400	60 (6+)	80 (8+)	$6.2 \cdot 10^{13}$	5220
^{18}O q=6+	45	400	60 (6+)	80 (8+)	$6.2 \cdot 10^{13}$	8100
^{18}O q=6+	60	400	60 (6+)	80 (8+)	$6.2 \cdot 10^{13}$	10800
^{18}O q=7+	70	200	30 (7+)	34.3 (8+)	$2.7 \cdot 10^{13}$	5400
^{20}Ne q=7+	28	400	60 (7+)	85.7 (10+)	$5.3 \cdot 10^{13}$	4800
^{20}Ne q=7+	70	400	60 (7+)	85.7 (10+)	$5.3 \cdot 10^{13}$	10280
^{40}Ar q=14+	60	400	60 (14+)	77.1 (18+)	$2.7 \cdot 10^{13}$	10280

AISHA has tested for beams of interest fo POTLNS. SERSE has refurbishe it is expec be fully operation about 2 w

Present performance $^{13}C^{4+}$ @ 45 MeV/u Pextr = 100 watt I= $1x10^{12}$ pps

FRAISE:a new FRAgment In-flight SEparator



Main features:

- 4 dipoles and 6 quadrupoles, arranged in a symmetrical configuration
- maximum magnetic rigidity 3.2 *Tm*
- momentum acceptance ±1.2%
- solid angle acceptance ±2.5 *msr*,
- energy resolution 2500 for a beam spot size of
- thanks to high energy dispersion value at the symmetry plane, it will allow to deliver stable b with an energy spread of 0.1 %

Element kinds	Name	Quantity	Features
Dipole	D1-D4	1	R=2m $\alpha = 70°$
Dipole	D2-D3	1	R=2m $\alpha = 40°$
Quadrupoles	Q1-Q6	2	ϕ =110 mm Gmax=1
Quadrupoles	Q2-Q5	2	ϕ=162 mm Gmax=5
Quadrupoles	Q3-Q4	2	ϕ=200 mm Gmax=7
Sexstupoles	EX*	3	ϕ=200 mm Gmax=30
Steerers	ST*	6	X and Y planes

Beams with the new fragment separator

FRAISE will be competitive in the production of medium-light (A<70) RIBs at Fermi energy

Some beams supposing 2 KW primary beam

Main Beam	Primary Beam/ Energy (AMeV)	Thickness Be target (um)	Thickness Al wedge (um)	Yield (kHz)	Beam energy after tagging (AMeV)	Purity (%)
14Be	18O/55	1500	0	2.6	46	2
14Be	18O/55	1500	1000	2.2	43	70
13N	16O/40	700	600	1230	4	54
14O	16O/40	700	600	807	4	36
18Ne	20Ne/60	1000	0	16700	43	16
18Ne	20Ne/60	1000	1000	3120	24	47
17F	20Ne/60	1000	1000	3300	23	49
34Si	36S/40	500	500	980	11	81
38S	40Ar/40	500	300	1840	17	66
34Ar	36Ar/50	250	0	2800	41	4
34Ar	36Ar/50	250	500	426	41	12
68Ni	70Zn/40 (1 kW)	250	200	490	18	50

Rate will increase by 2 order of magnitudes with respect to old FRIBs!

PANDORA: status and updates

basic idea of PANDORA (Plasmas for Astrophysics Nuclear Decays Observation and Radiation for Archaeometry) is th
mpact and flexible magnetic plasma traps (plasmas density: n_e=10^{11}-10^{14}cm^{-3}, temperature: T_e =0.1-30keV) are the plac
ere measuring, for the first time, nuclear β-decay rates in stellar-like conditions.

PANDORA is completing its feasibility study phase (supported by CSN5) which started in 2017 and will end in Dece
2019.

The full-scale experiment has been presented for funding from CSN3

Multi-diagnostics characterization of the plasma started in 2018, simultaneously measuring plasma emitted electromagnetic radiation over almost the whole e.m. spectrum.

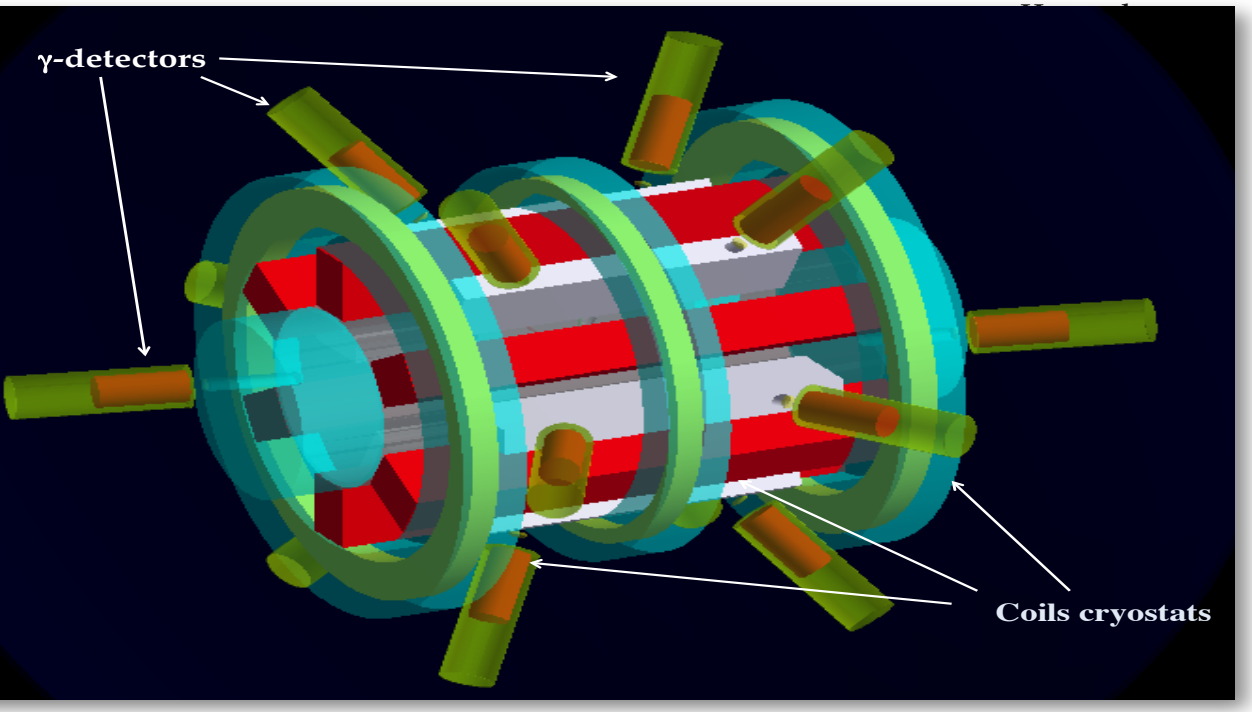
The results collected for quiescent and turbulent plasmas states are among the most complete in the field of magnetoplasmas generated in compact traps, as well as plasma density, temperature and fast radio/X ray emission during turbulences are among the most precise now available.

Physics cases and the overall project plan has been addressed during 2018 and early 2019

ore than 120 isotopes of astrophysical and nuclear physics interest were found, making PANDORA in perspective as v
g facility allowing systematic investigation of beta-decays in plasmas.

hree cases were selected for this first phase

PANDORA: How we want to measure β-decays in a plasma trap



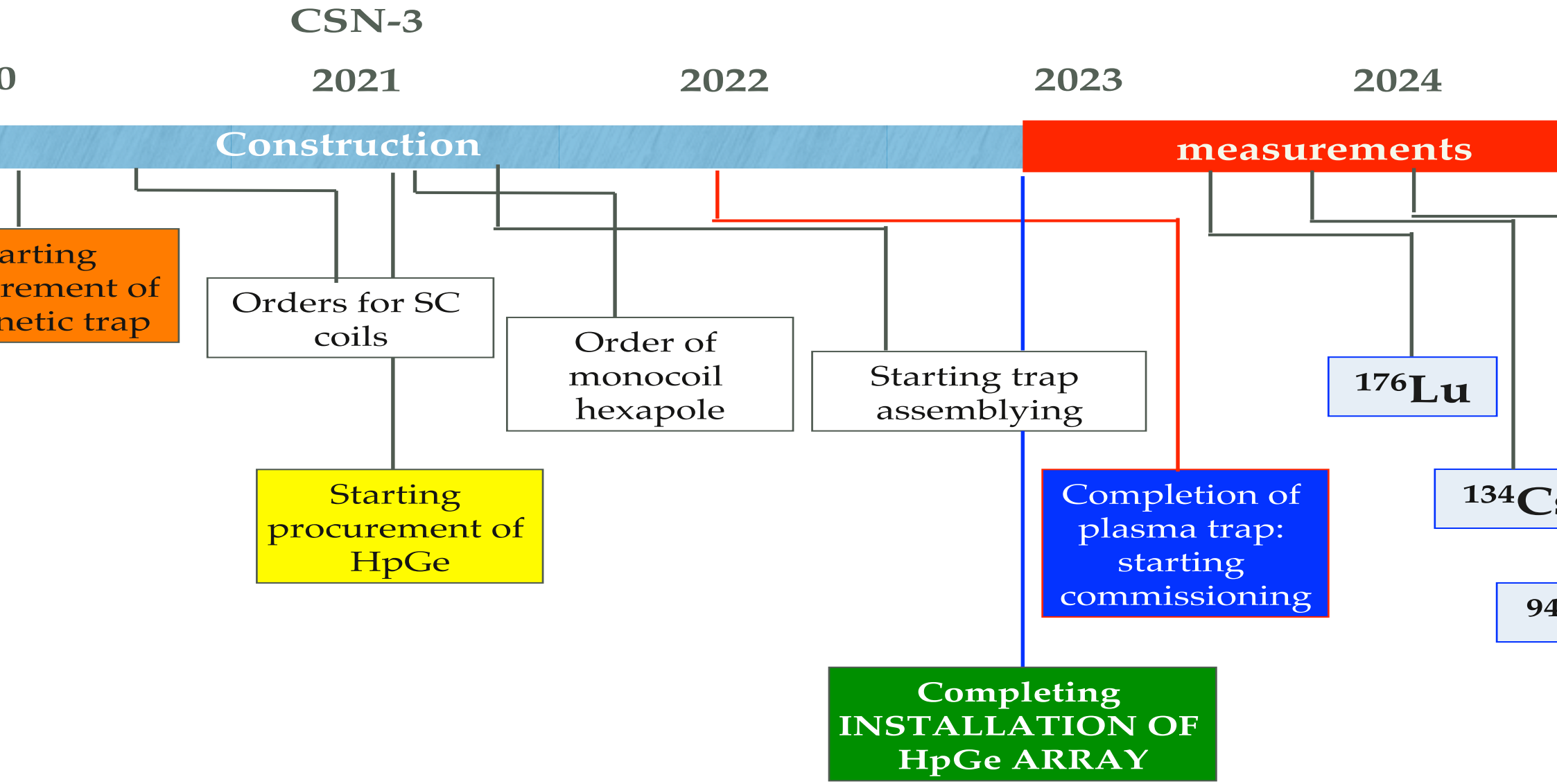
- **A "buffer plasma" is created by He, O o Ar** up to densities of 10^{13} cm^{-3}
- The isotope is then directly fluxed (if gaseous) or vaporized by appropriate ovens and then fluxed inside the chamb to be turned into plasma-state
- **Relative abundances of buffer vs. isoto densities range from 100:1 (if the isoto is in metal state) to 3:1 (in case of gaseous elements)**

C coils and a Cu monocoil hexapole are used as magnetic p

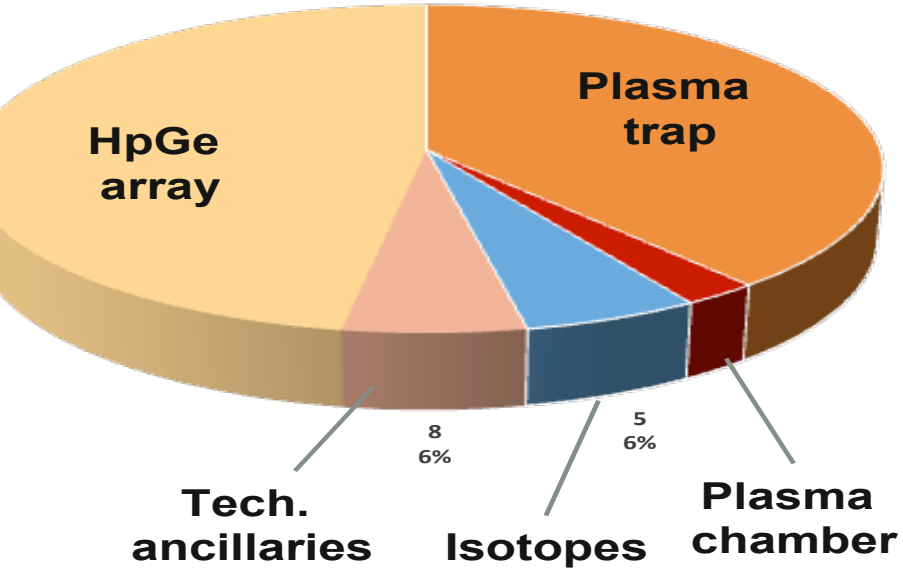
HpGe detectors are used for tagging β-decays by e γ-rays emitted from the decay-products in their excited tes

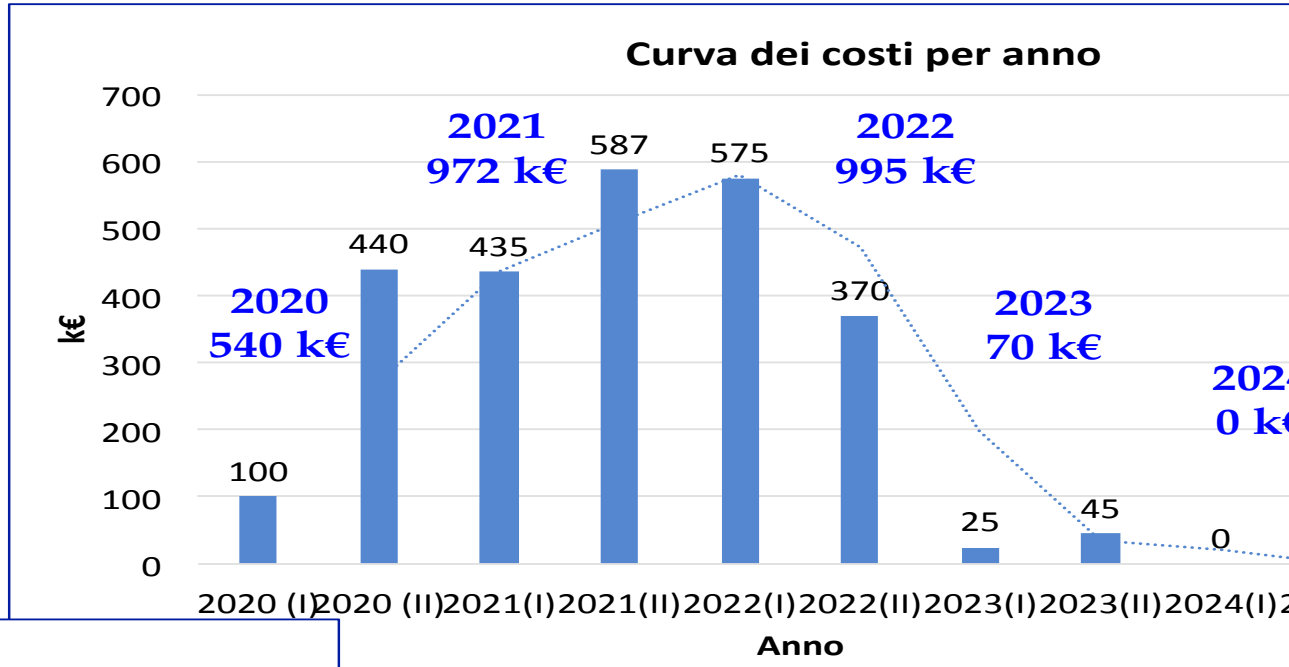
The plasma is maintained in dynamical equilibrium by equalizing input fluxes of particles to losses from the magnetic confinement

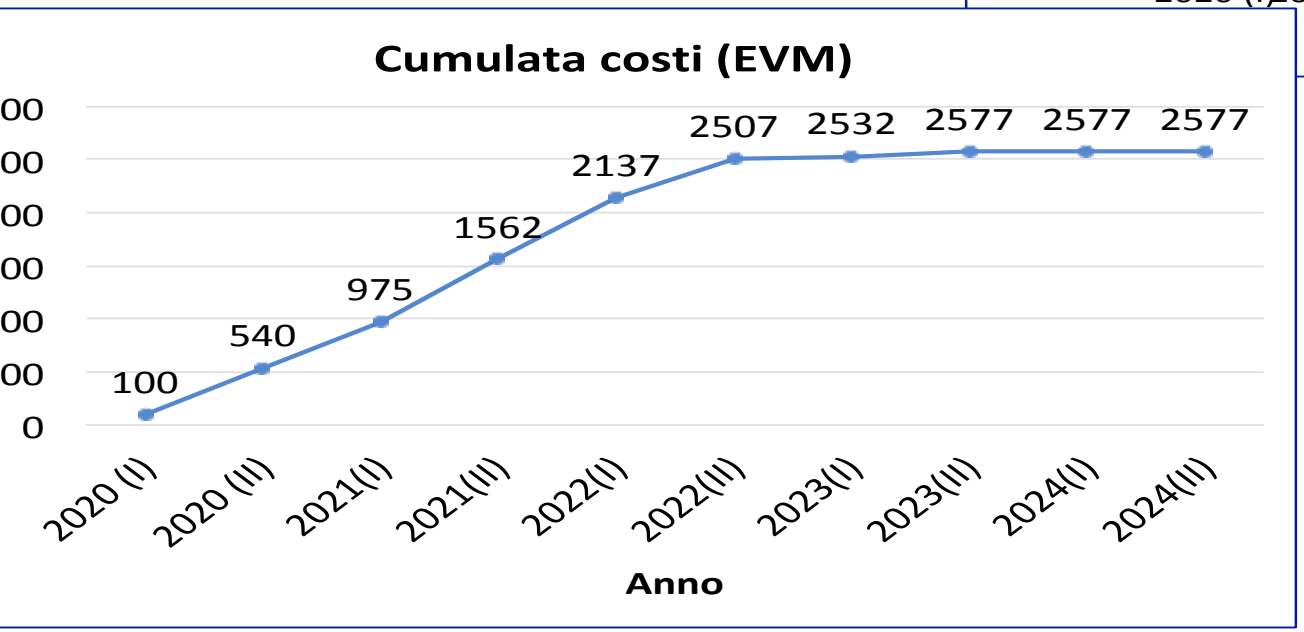
Sketch of timescale, derivelables, mileston



Cost distribution and planning



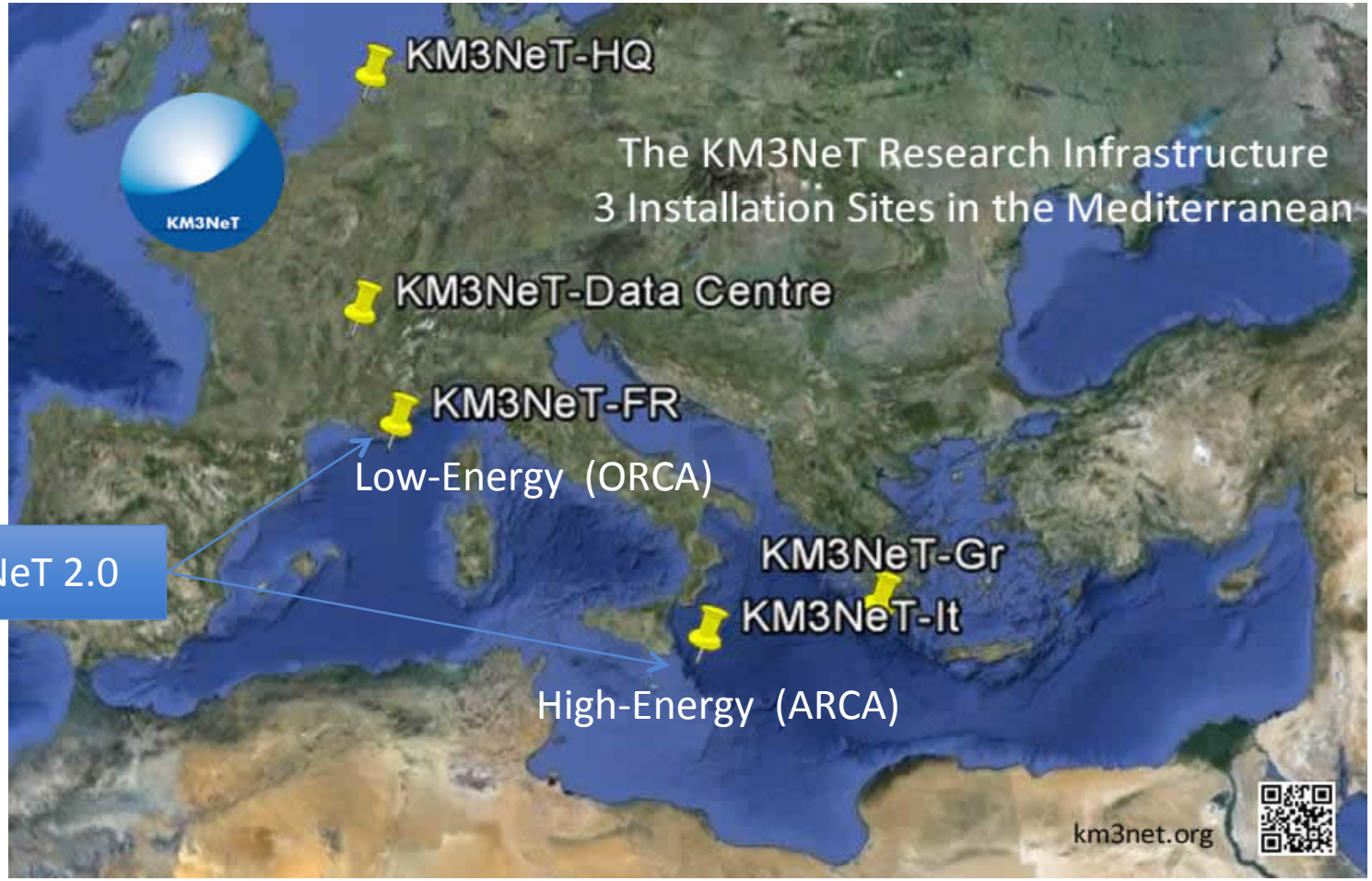




For yearly management we have to consider also around 30k€/year of travels

- 2020 & 2021 for contacts with companies and meeting
- 2022-2024 for experiment's shifts

KM3NeT 2.0


KM3NeT-HQ
KM3NeT
The KM3NeT Research Infrastructure
3 Installation Sites in the Mediterranean
KM3NeT-Data Centre
KM3NeT-FR
Low-Energy (ORCA)
KM3NeT 2.0
KM3NeT-Gr
KM3NeT-It
High-Energy (ARCA)
km3net.org

The KM3NeT/ARCA detector

ARCA: Astronomy Research with Cosmics in the Abyss

To be installed in the Italian site of the KM3NeT infrastructure

115 detection units per building block

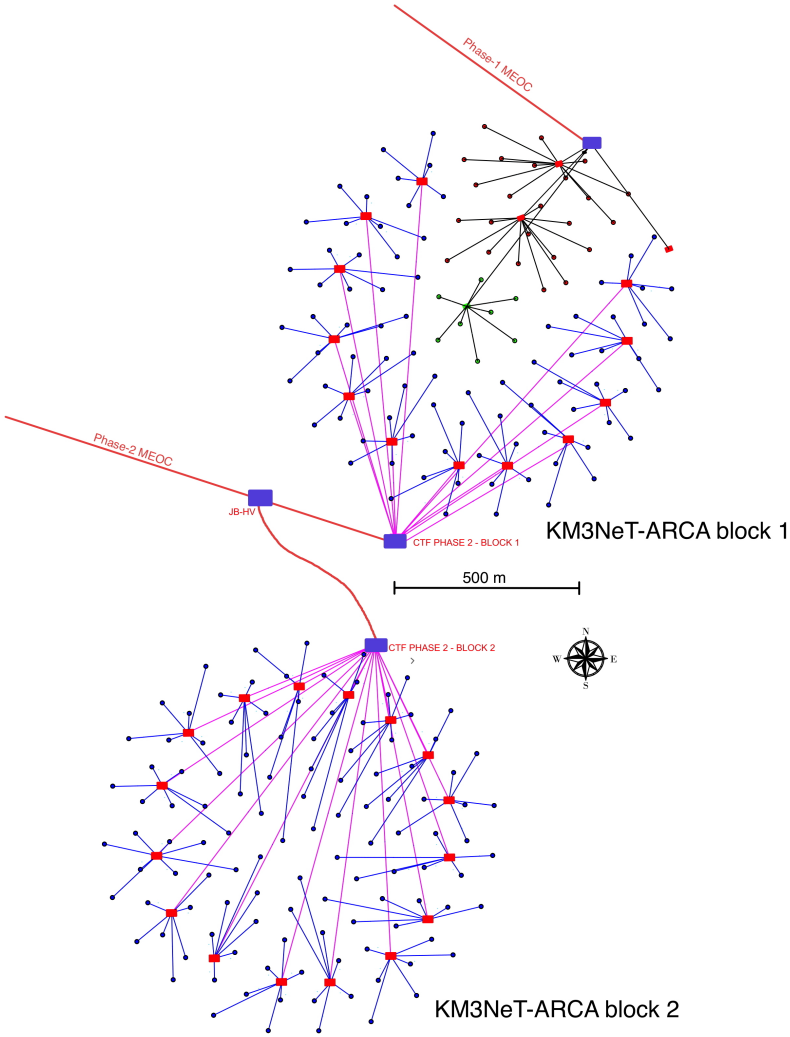
18 DOM per DU

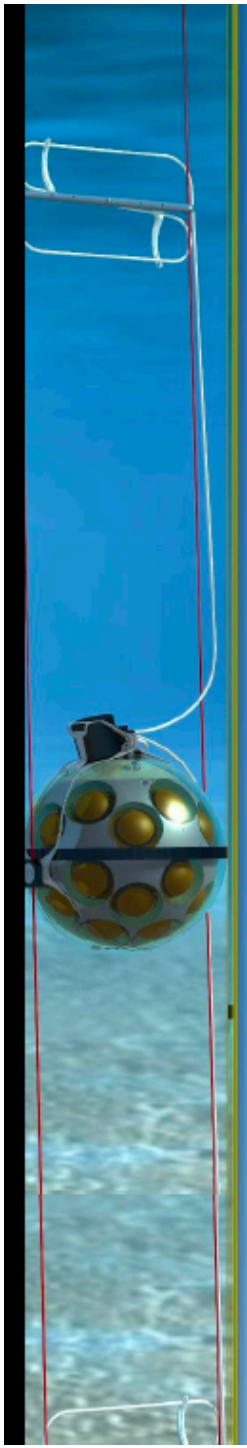
Vertical DOM spacing 36 m

Inter-DU spacing 90 m

2 building blocks

Total volume ≈1 km^3





Short Term Plan - ARCA

- What is the impact on the construction
  - Together with the TJB we can deploy 6 DUs
  - Together with the replacement of TJB with JB1.1 we plan to deploy additional 6 DUs
- According to integration plan we could have 12 working DUs before summer 2021 and 20 more right after summer 2021 corresponding to a total of 32 connected DUs

Sicilian Regional Funds

D.D.G. n. 25/5.S

Unione Europea
REPUBBLICA ITALIANA
Regione Siciliana
Assessorato Regionale delle Attività Produttive
Dipartimento Regionale delle Attività Produttive

UNIONE EUROPEA
Fondo Europeo di Sviluppo Regionale

P FESR SICILIA 2014-2020

RAG. C.LE ASSESSORATO DELLE ATTIVITÀ PRODUTTIVE
VISTO
Preso nota al n. 11
Scheda n.
Palermo li 10 FEB. 2018
Il Direttore Capo della Ragioneria Centrale

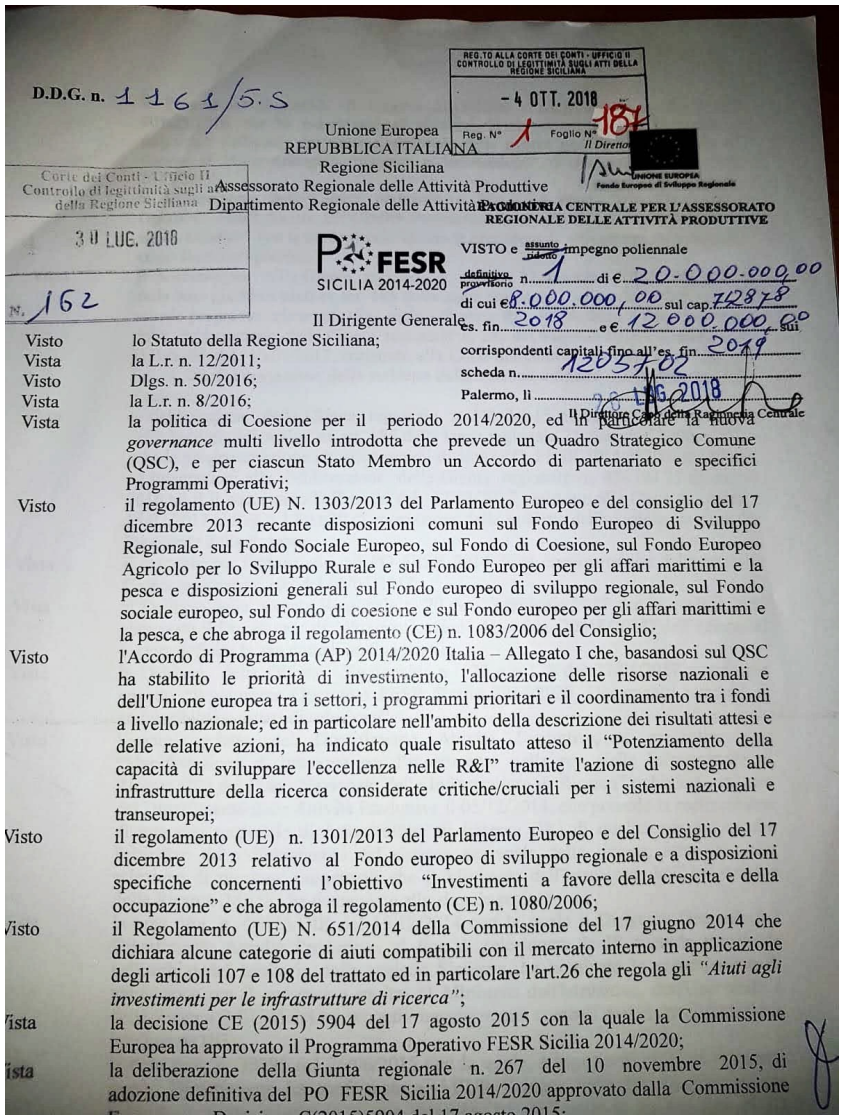
Il Dirigente Generale

to lo Statuto della Regione Siciliana;

to il regolamento (UE) N. 1303/2013 del parlamento europeo e del consiglio del 17 dicembre 2013 recante disposizioni comuni sul Fondo europeo di sviluppo regionale, sul Fondo sociale europeo, sul Fondo di coesione, sul Fondo europeo agricolo per lo sviluppo rurale e sul Fondo europeo per gli affari marittimi e la pesca e disposizioni generali sul Fondo europeo di sviluppo regionale, sul Fondo sociale europeo, sul Fondo di coesione e sul Fondo europeo per gli affari marittimi e la pesca, e che abroga il regolamento (CE) n. 1083/2006 del Consiglio;

la nota prot.AOO_LNS-2017-0000163 trasmessa a mezzo pec del 9.02.2017 dell'Istituto Nazione di Fisica Nucleare -Laboratori del Sud (INFN) acquista al prot.n. 8829 del 15.02.2017 di questo Dipartimento con la quale è stato trasmesso la proposta progettuale denominata *"Infrastruttura Distribuita del Mare"* per un importo complessivo di € 40.000.000,00 a fronte di un cofinanziamento di € 20.000.000,00 secondo il seguente quadro economico:

1)	Spese tecniche	€ **2.050.000,00**
2)	Opere edili di realizzazione,adeguamento e ristrutturazione	€ **3.740.000,00**
3)	Acquisto attrezzature e strumentazioni	€ **30.060.000,00**
4)	Prestazioni di terzi per consulenze scientifiche ed applicazioni tecnologiche	€ **4.000.000,00**
5)	Costi specifici di progetto	€ **150.000,00**
	TOTALE	**€40.000.000,00**



D.D.G. n. 1161/5.S

REG.TO ALLA CORTE DEI CONTI - UFFICIO II CONTROLLO DI LEGITTIMITÀ SUGLI ATTI DELLA REGIONE SICILIANA
- 4 OTT. 2018
Reg. N° 1 Foglio N° 187

Unione Europea
REPUBBLICA ITALIANA
Regione Siciliana
Assessorato Regionale delle Attività Produttive
Dipartimento Regionale delle Attività Produttive

Corte dei Conti - Ufficio II Controllo di legittimità sugli atti della Regione Siciliana
30 LUG. 2018
N. 162

UNIONE EUROPEA
Fondo Europeo di Sviluppo Regionale

P FESR SICILIA 2014-2020

RAGIONERIA CENTRALE PER L'ASSESSORATO REGIONALE DELLE ATTIVITÀ PRODUTTIVE
VISTO e assunto ridotto impegno poliennale
definitivo provvisorio n. 1 di € 20.000.000,00
di cui € 8.000.000,00 sul cap. 742878
es. fin. 2018 e € 12.000.000,00 sui
corrispondenti capitali fino all'es. fin. 2019
scheda n. 12037/02
Palermo, li 26 SET. 2018
Il Direttore Capo della Ragioneria Centrale

Il Dirigente Generale

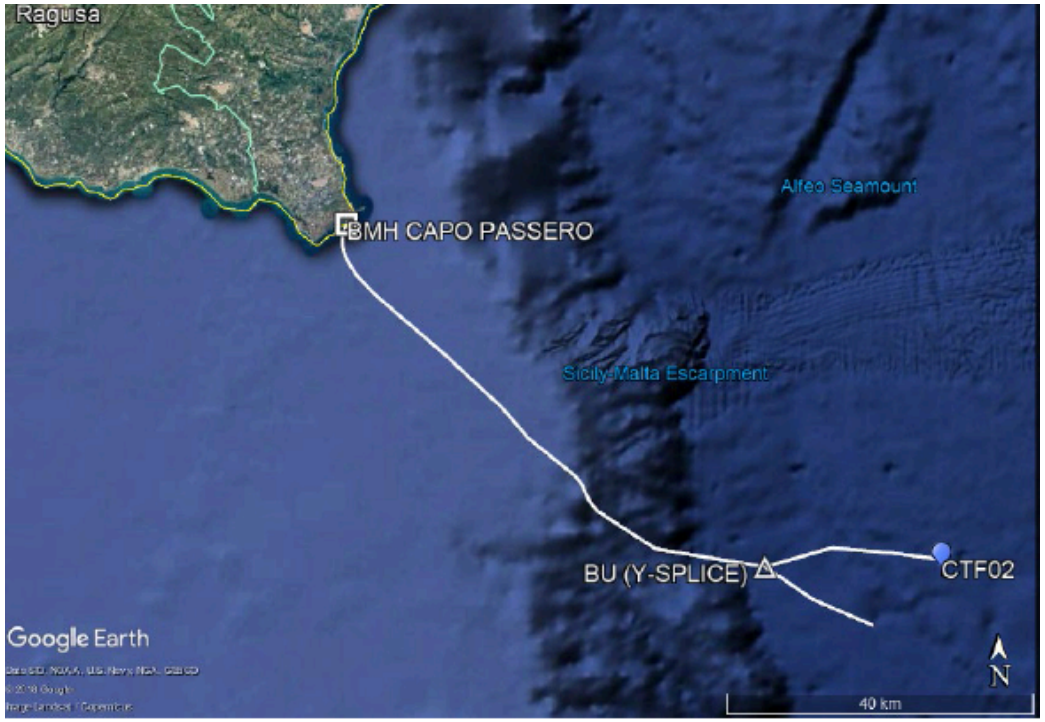
Visto lo Statuto della Regione Siciliana;
Vista la L.r. n. 12/2011;
Visto Dlgs. n. 50/2016;
Vista la L.r. n. 8/2016;
Vista la politica di Coesione per il periodo 2014/2020, ed in particolare la nuova *governance* multi livello introdotta che prevede un Quadro Strategico Comune (QSC), e per ciascun Stato Membro un Accordo di partenariato e specifici Programmi Operativi;
Visto il regolamento (UE) N. 1303/2013 del Parlamento Europeo e del consiglio del 17 dicembre 2013 recante disposizioni comuni sul Fondo Europeo di Sviluppo Regionale, sul Fondo Sociale Europeo, sul Fondo di Coesione, sul Fondo Europeo Agricolo per lo Sviluppo Rurale e sul Fondo Europeo per gli affari marittimi e la pesca e disposizioni generali sul Fondo europeo di sviluppo regionale, sul Fondo sociale europeo, sul Fondo di coesione e sul Fondo europeo per gli affari marittimi e la pesca, e che abroga il regolamento (CE) n. 1083/2006 del Consiglio;
Visto l'Accordo di Programma (AP) 2014/2020 Italia – Allegato I che, basandosi sul QSC ha stabilito le priorità di investimento, l'allocazione delle risorse nazionali e dell'Unione europea tra i settori, i programmi prioritari e il coordinamento tra i fondi a livello nazionale; ed in particolare nell'ambito della descrizione dei risultati attesi e delle relative azioni, ha indicato quale risultato atteso il "Potenziamento della capacità di sviluppare l'eccellenza nelle R&I" tramite l'azione di sostegno alle infrastrutture della ricerca considerate critiche/cruciali per i sistemi nazionali e transeuropei;
Visto il regolamento (UE) n. 1301/2013 del Parlamento Europeo e del Consiglio del 17 dicembre 2013 relativo al Fondo europeo di sviluppo regionale e a disposizioni specifiche concernenti l'obiettivo "Investimenti a favore della crescita e della occupazione" e che abroga il regolamento (CE) n. 1080/2006;
Visto il Regolamento (UE) N. 651/2014 della Commissione del 17 giugno 2014 che dichiara alcune categorie di aiuti compatibili con il mercato interno in applicazione degli articoli 107 e 108 del trattato ed in particolare l'art.26 che regola gli *"Aiuti agli investimenti per le infrastrutture di ricerca"*;
Vista la decisione CE (2015) 5904 del 17 agosto 2015 con la quale la Commissione Europea ha approvato il Programma Operativo FESR Sicilia 2014/2020;
Vista la deliberazione della Giunta regionale n. 267 del 10 novembre 2015, di adozione definitiva del PO FESR Sicilia 2014/2020 approvato dalla Commissione

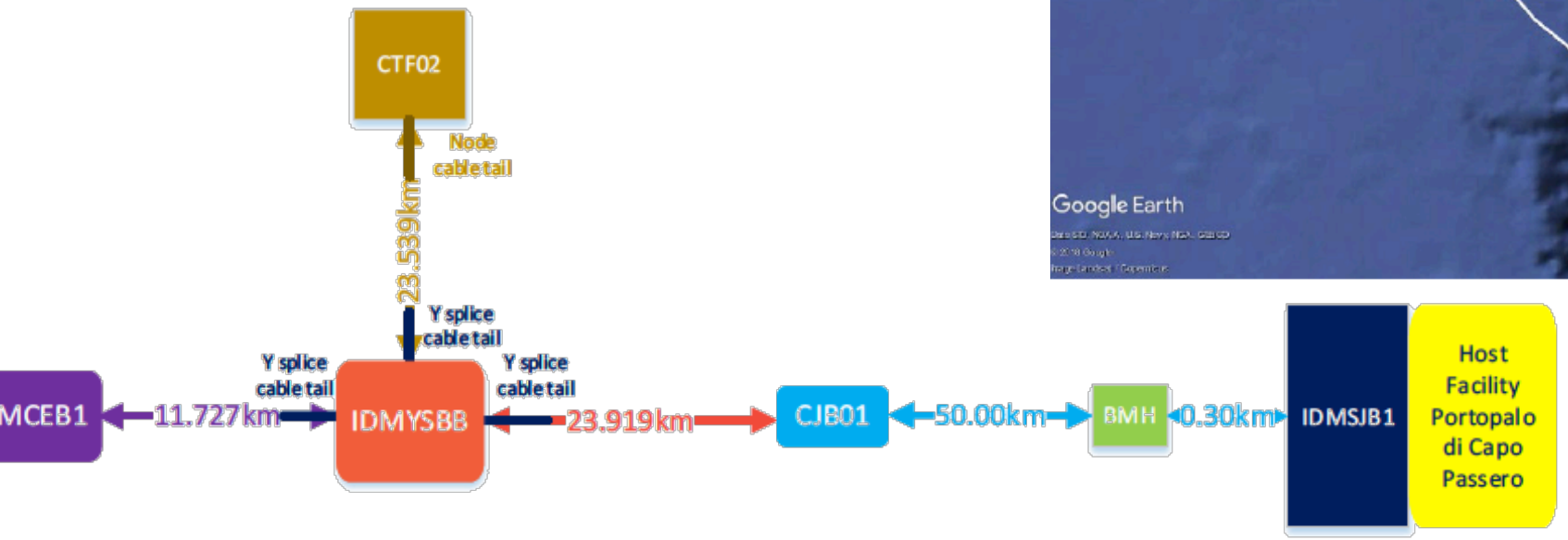
New Cable:	15 M€ (OK- Alcatel)
JB (phase 1 & 2)	5.0 M€ (OK-McArtny)
Marine Operations	3.6 M€ (OK- MTS)
LOM x 8	0.4 M€ (run)
24 Strings	7.0 M€ (PMT ok-Hamamatsu)
Buildings and plants	2.0 M€ (running)
Other Costs	1.5 M€

Route

Cable Desk Top Study
Seabottom analysis: Explora ship, Spring 2018
Shore part analysis: On site, Spring 2018

Cable production started
Permitting Activity Started



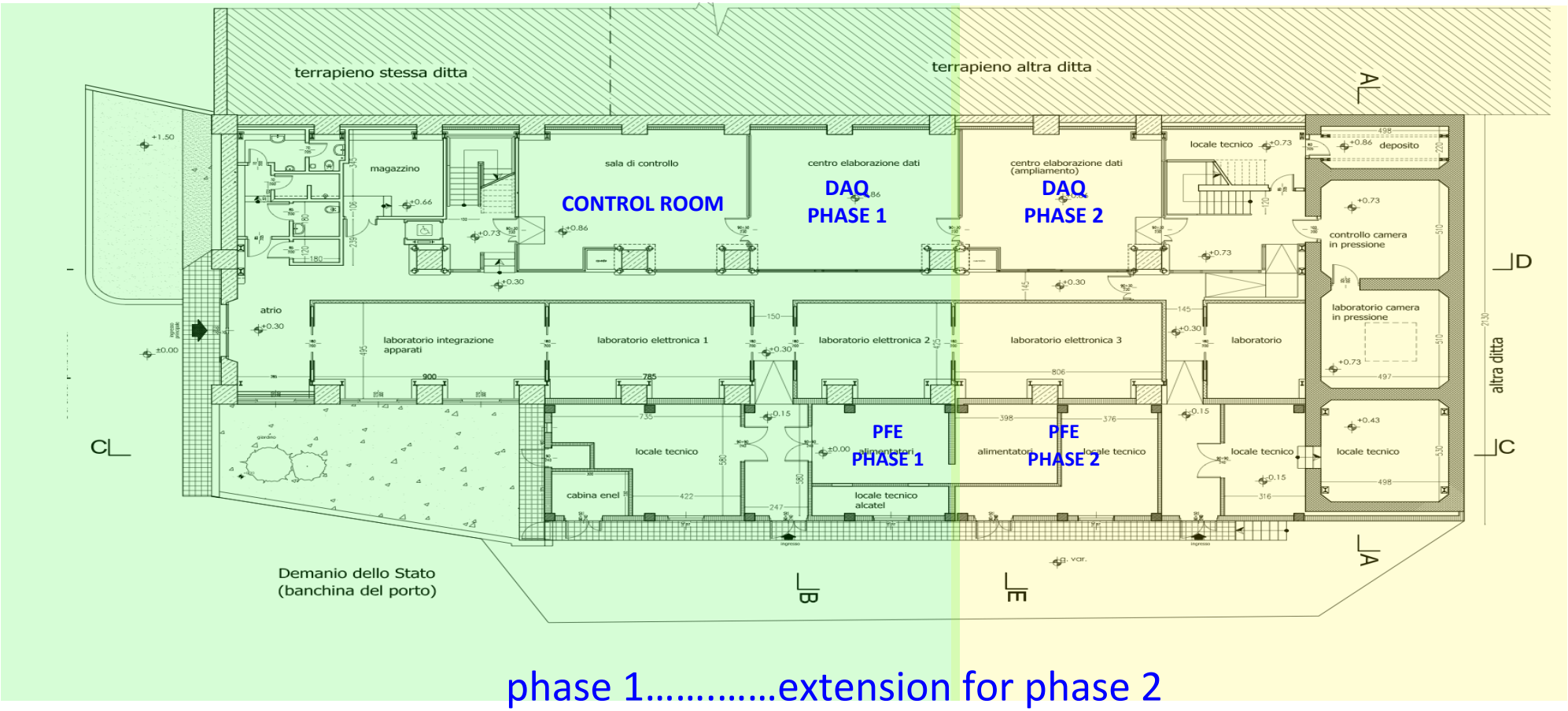


Phase 2

- Budget
  - France: 8 M€ secured, new request for 20 M€ ongoing
  - Italy: POR Sicilia 34.5M€ secured (50% INFN co-funded)
  - The Netherlands: 12.7 M€ secured in 2018
  - Italy: PON IR 17.8 M€ approved with PACK Project

Part of the **shore station building** to be refurbished:
will host the IDMAR cable power supply and control system

NeT - STATUS PHASE 2



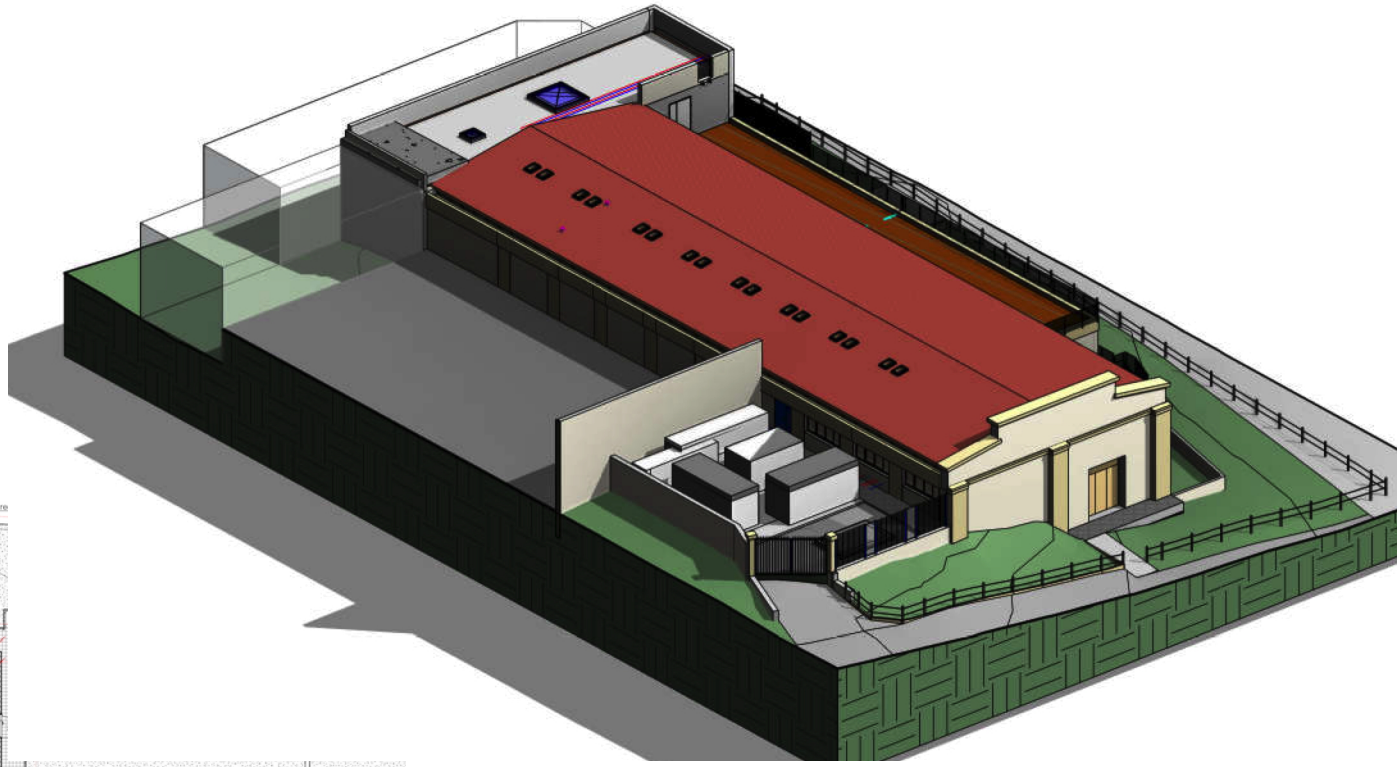
phase 1……extension for phase 2

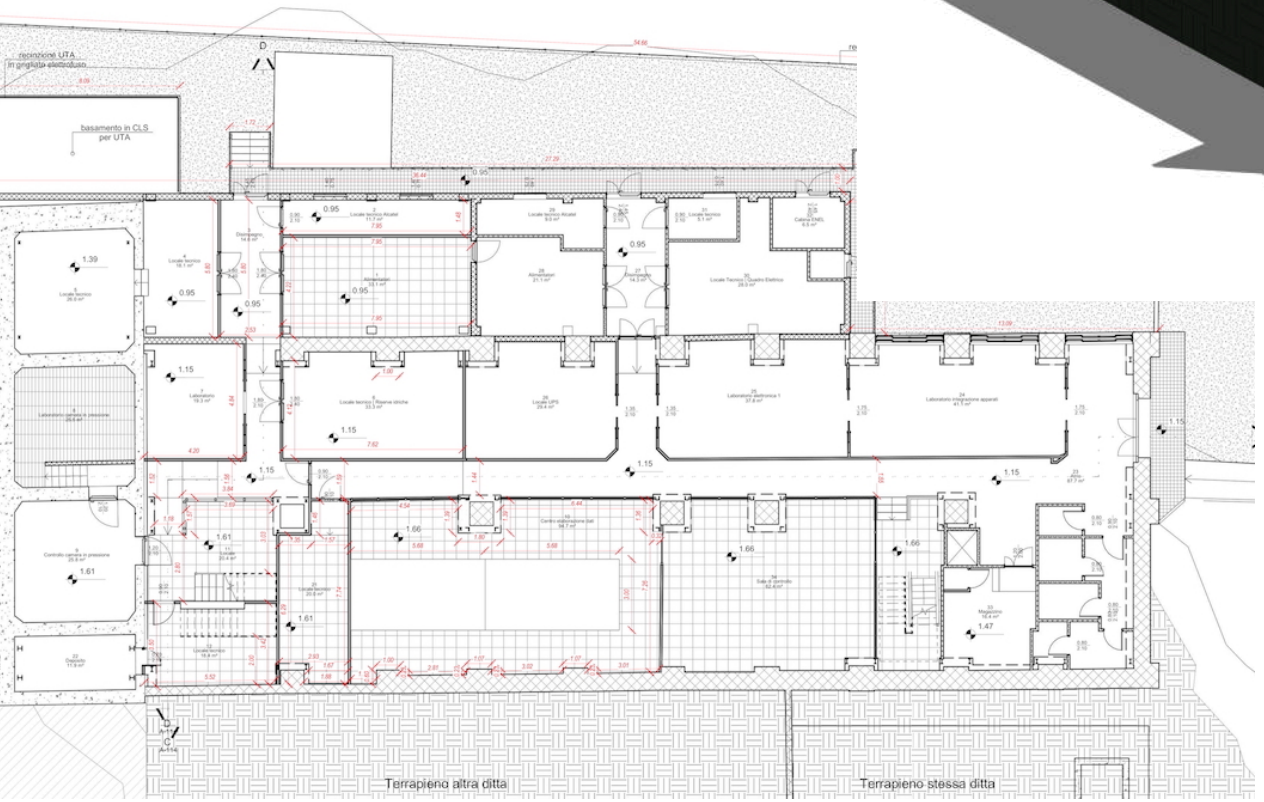
Extension to Phase 2

- More space for the PFE 2
- More space for DAQ 2
- Improve the power plant to fit the phase 2 requirements
- Improve the air treatment system to fit the phase 2 requirements
- 10 Gbps fiber connection to GARR-X (Italian network dedicated to University and research community)

rtopalo Laboratory upgrade (about 1.5 M€)

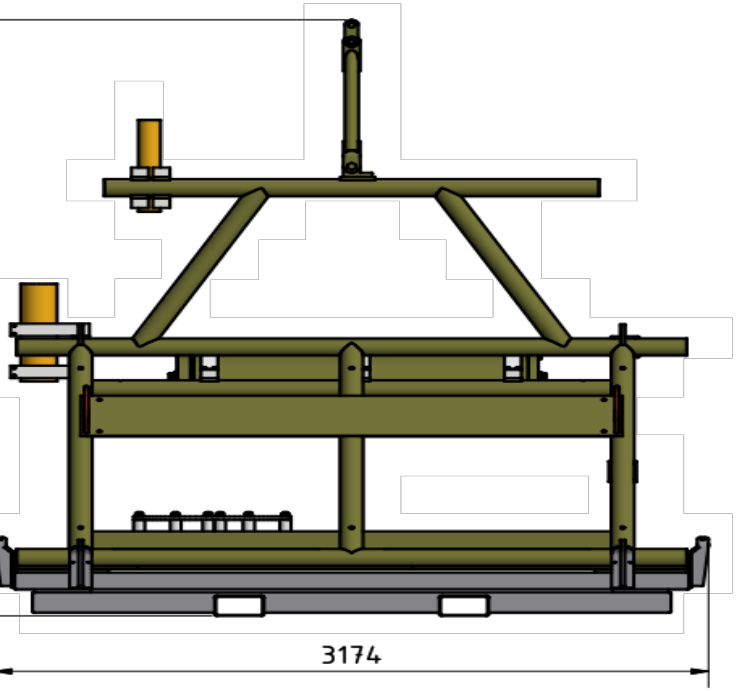
vil work will start on Monday Nov. 11th

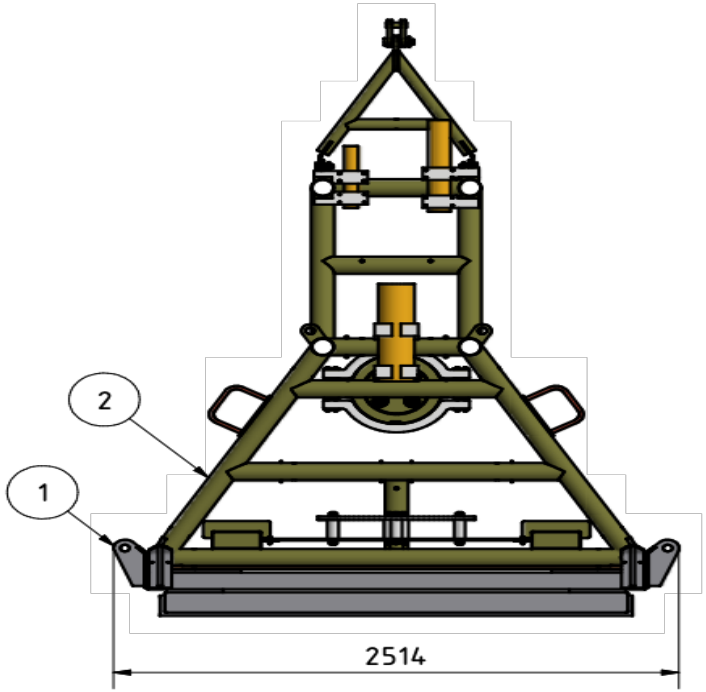


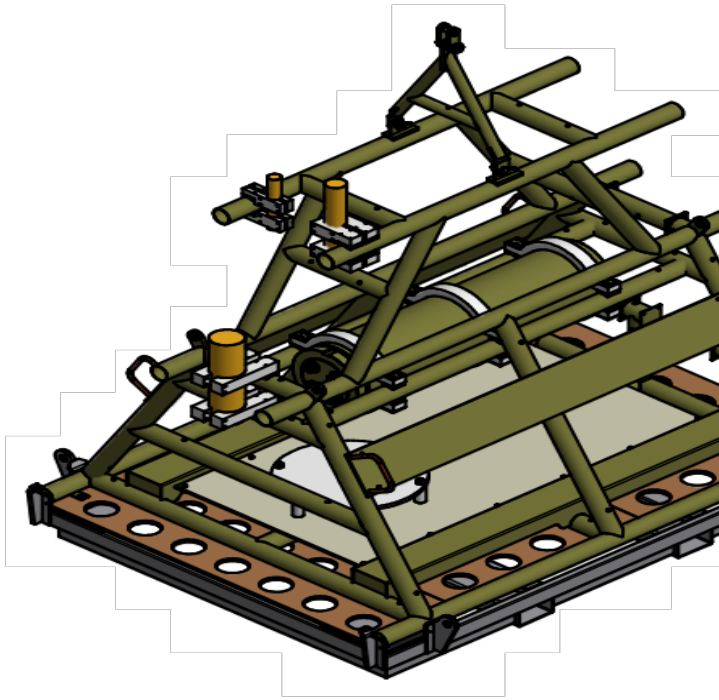


eT– IT JB 1.1 Progress of work

main frame will be built in titanium grade 2
l weight : about 1200 kg
put connections will be distributed on both side to avoid cables crossing
y one vessel in order to have all dry connection of the entire system







t connection from MVC and Output
ections to DUs will be done with
strial OIL&GAS standard stuff from ODI.

KM3NET and IDMAR criticalities

- **Funding** (last tranche of funding for IDMAR arrived, the major call for tender are assigned or under way, **no criticalities in this phase**, **documentation** to be delivered to the funding agency may be an issue because of scarcity of HR)
- **Series constructions**: the ones done by external companies need a dedicated team of engineers and technician to verify that the delivered goods **comply with the technical specifications**, while the duties that are managed within the collaborations are certainly riskful, if we consider the length of the construction period and the complexity of HR issues in Italy, as well as the need to enlarge the areas for the assembly of modules (a meeting of LNS and Naples INFN unit Directors in Caserta was scheduled on Oct. 21th to look for positive actions, if any, but it was delayed).

Main Criticality at LNS :

when the Accelerators should be stopped ?
What is the timeline for the upgrade of the cyclotron and what will be the shutdown period in connection with the upgrade?

Shutdown: June 2020 (expected), but it may be moved to end of July, depending on tendering procedures.

Deadline: 32 months, i.e. February 2022 (4 months extension may be possible,i.e. June 2022).

Realistic date for the beam delivery to (internal) users: December 2022. **Opening as users' facility: summer 2023**.

Criticalities: will be the LNS able to support two huge activities in a so short time lapse ?

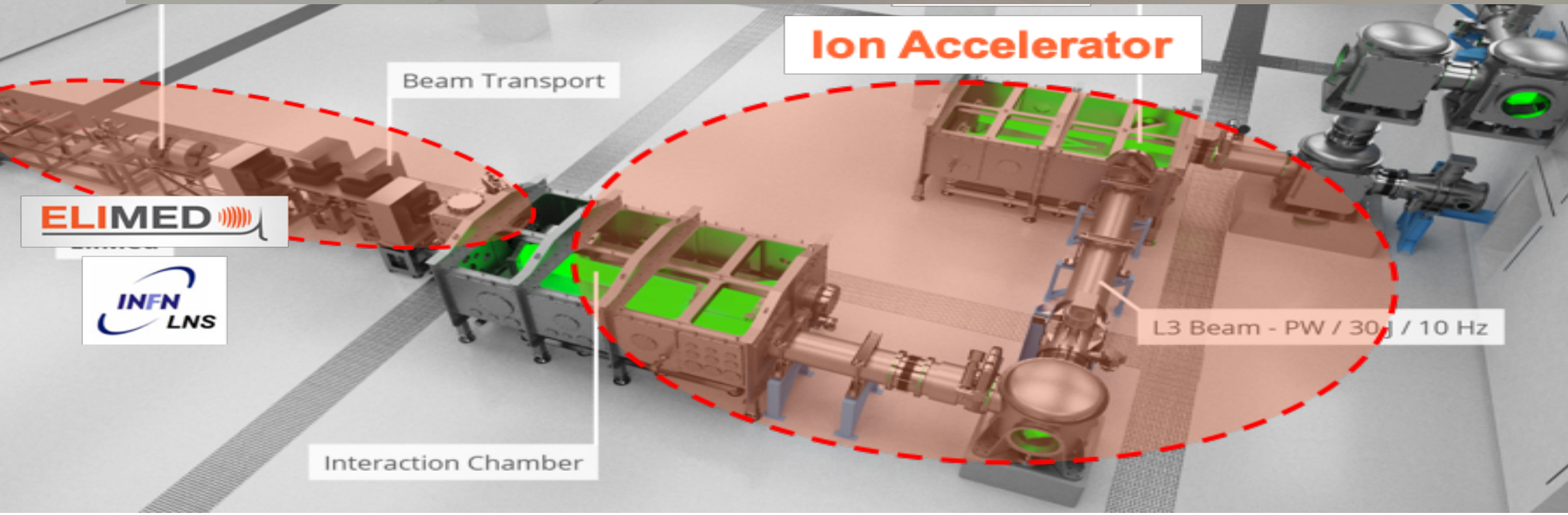
Project Management Office Service was established in summer 2019 which will be an asset to address such criticality; additionally previous positive experiences may help to find the best practices for the challenges that we have now to tackle.

It should be mentioned that in the period 2015-2018 we contemporarily completed (successfully) the AISHA contract, the ELIMED contract at ELI, Prague, and the INFN-LNS contribution to the European Spallation Source, while at the same time we guaranteed the beamtime for Nuclear Physics users and for Applications (ASI contract) and provided the needed support for the KM3NET.

An adequate involvement of external resources will be necessary and there are many different options that are under evaluation.

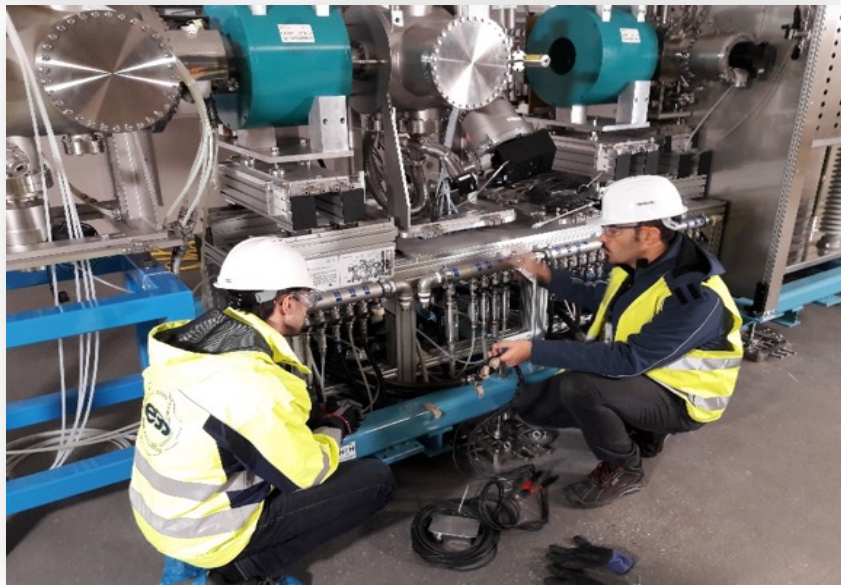
It is not an easy task but we expect to fulfill all these task.

ELI Multidisciplinary Applications of laser-Ion Acceleration



ELIMED inauguration, Prague 27/11/2018

Installation in Lund



Milestones 3/3

3/8/2018 Source ready for commissioning in Lund

INFN is providing a shared fol collecting:

- Drawings
- Diagrams
- Cable specifications
- Manuals
- Factory acceptance test
- Guides
- Certification of conformities
- Interface drawings
- Non conformity reports

The documentation is collected folders organized following the Product Breackdown Structure.

ESS Inauguration on Nov 15th, 2018

Harvesting time, but…

- End of 2018 was a good harvesting time: in 2 weeks two ceremonies were hosted in Lund and in Prague.

- The challenges for INFN-LNS personnel are coming from the success of different seeding initiatives in the past years.

- Funding available but for HR we are not in the same favourable conditions. It’s the main focus of my activity in this first part of my term as LNS Director.
- Meantime more opportunities are going to come from the “seeds” and from the achievements of the previous years.

INFN-LNS e Regione Siciliana

Po_Fesr 2014-2020

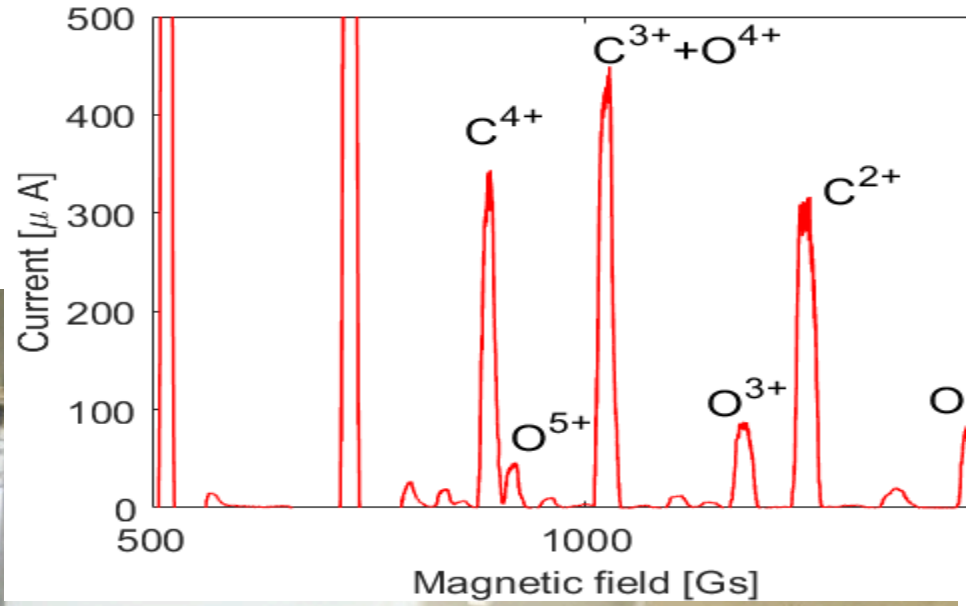
R (INFN-INGV-CNR) Potenziamento IR Marine	40 M€	INFN 34.5 M€
NFN-UNICT-A.O. Cannizzaro) Flash Radiotherapy & Breast Cancer Therapy	8 M€	INFN 3 M€
NFN-UNICT-CNR-PMI siciliane) Beam Line for Flash Protontherapy	5 M€	INFN 1 M€
n (CNR-INFN- PMI Siciliane) Studio di materiali in fibra di carbonio per Apparati sottomarini	5 M€	INFN 0.4 M€

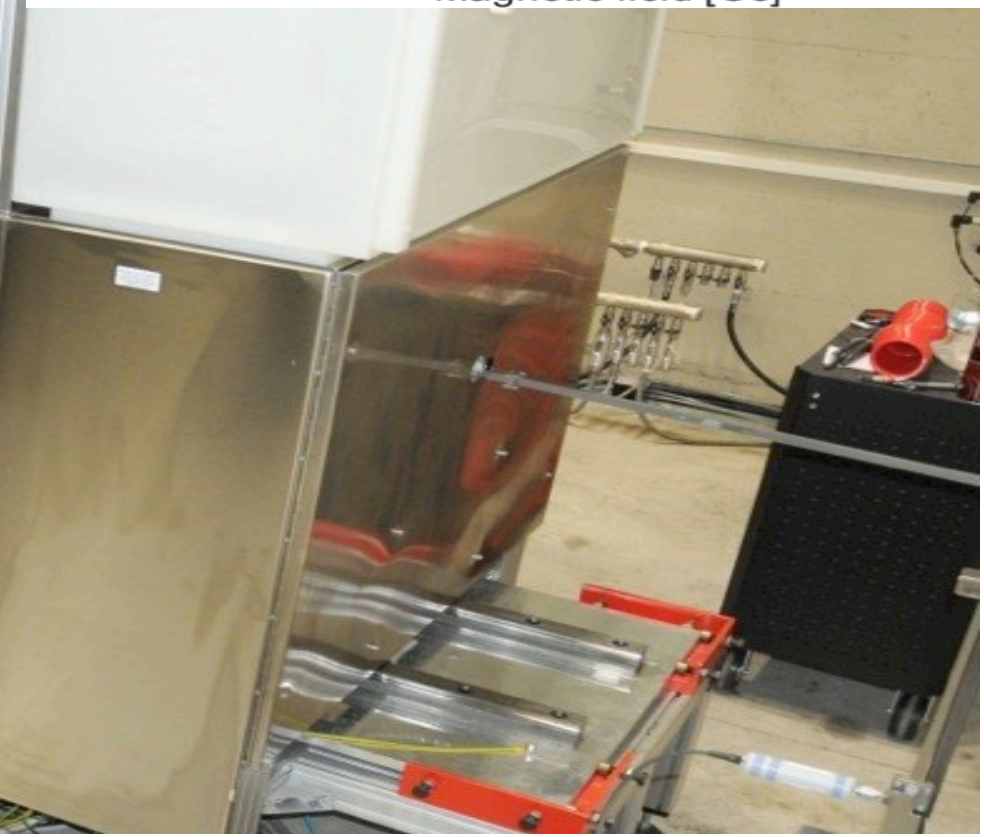
Discussion:

to Roosvelt (CNR-INFN-ISMETT-ARPA Sicilia):

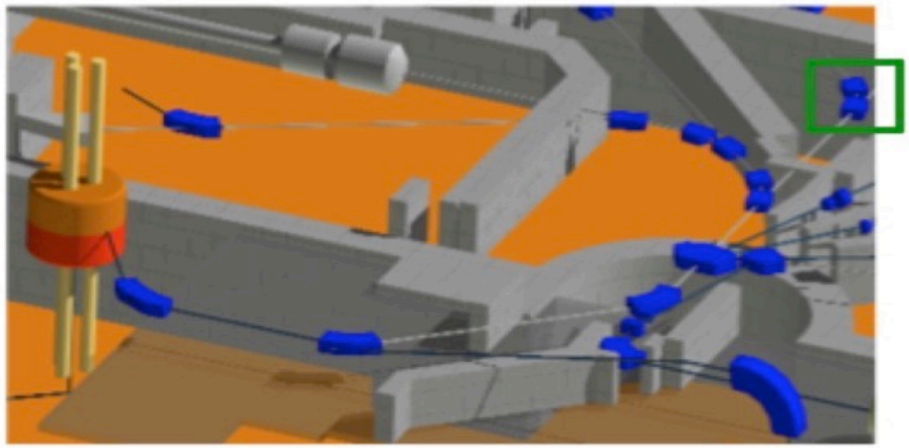
Regionale di Ricerca, Innovazione ed Alta Formazione per Ambiente e Salute	30 M€
erospaziale (INAF-INGV-INFN Ct e LNS-ASI-Ministero della Difesa-	
e Siciliana-Comune di Comiso-Imprese nazionali e regionali	30 M€

Second AISHa will be the third ion source for CNAO





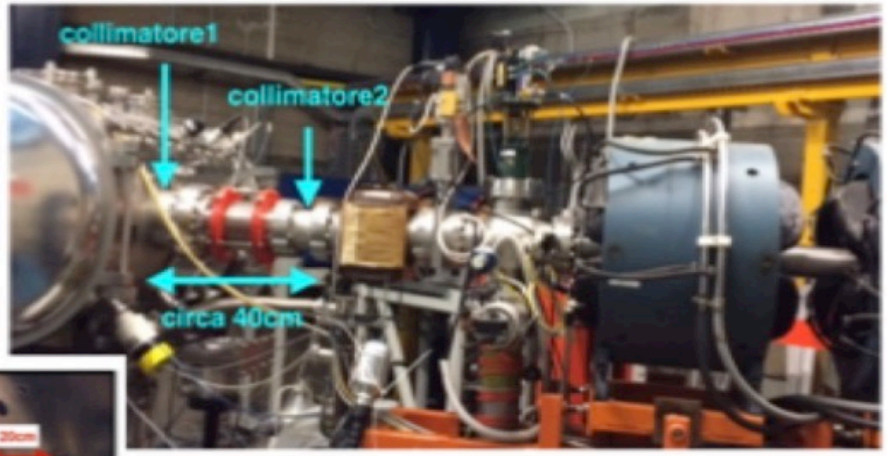
ASIF (ASI Supported Irradiation Facilities)

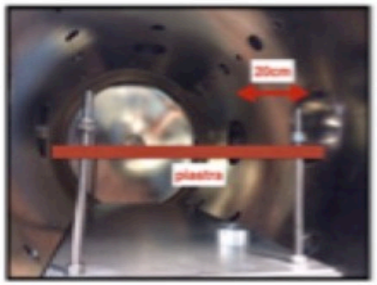


Sample irradiation beam-line

zero degree beam-lines

In-vacuum tests





In-air tests

ASIF (ASI Supported Irradiation Facilities)

standard and documentation

lity Assurance Plan;
Assessment Plan (by using the Failure Mode and Criticality Effect Analisys criteria);
minary Risk Analysis;
minary Maintenance Plan;
luct Breakdown Structure;
ter Plan Of Work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DocID: ASIF-LNS-QA-100.00 | Rev.: 0.0 | Validità:

Title: Quality Assurance Policy (QAP)

08-09-2017

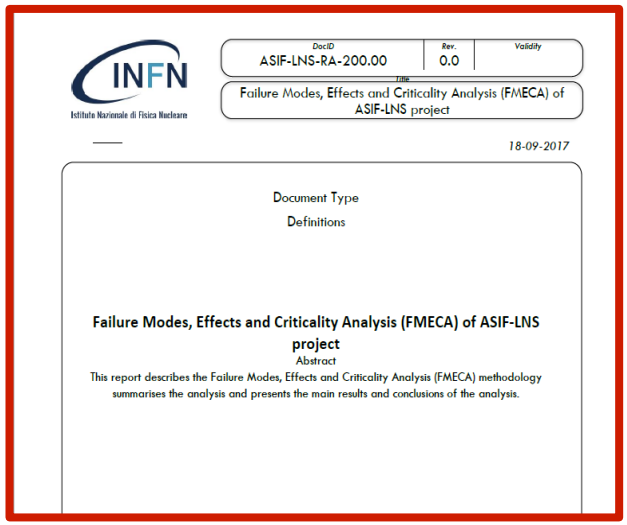
Document type
Policy

Quality Assurance Policy (QAP)

Abstract

This document defines the general policy for Quality Assurance to be used for the ASIF project and describes the main steps of the project management process.

Prepared by:	Checked by:	Approved by:
M. MUSUMECI	G. CUTTONE	S. FALCIANO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DocID: ASIF-LNS-RA-200.00 | Rev.: 0.0 | Validity:

Title: Failure Modes, Effects and Criticality Analysis (FMECA) of ASIF-LNS project

18-09-2017

Document Type
Definitions

Failure Modes, Effects and Criticality Analysis (FMECA) of ASIF-LNS project

Abstract

This report describes the Failure Modes, Effects and Criticality Analysis (FMECA) methodology summarises the analysis and presents the main results and conclusions of the analysis.

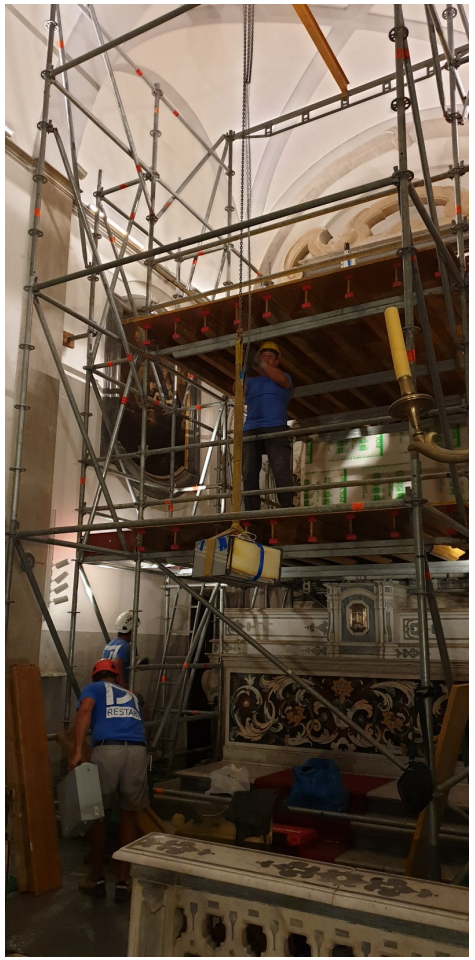
xternal projects of the LANDIS in the coll. with ISPC-CN

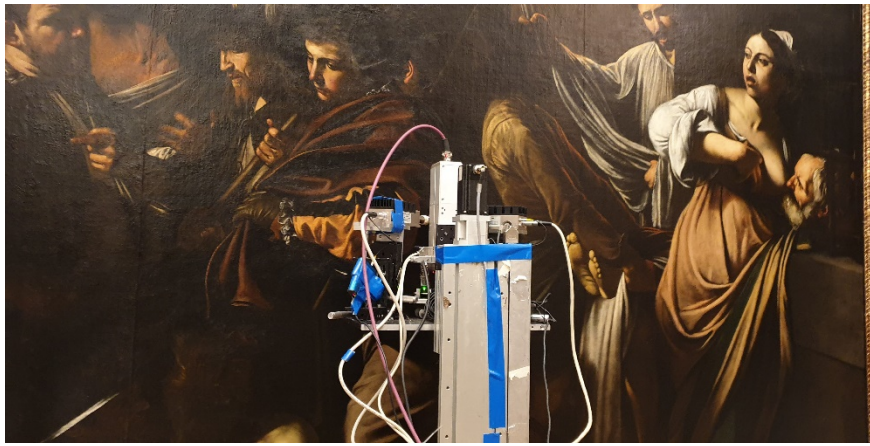
PON infrastructure: 3M€ investment of CNR for LANDIS to include the laboratory in the
European Infrastructure for Heritage Science. LANDIS will be the European node for X-r
spectrometry applied to Cultural Heritage
CH at ELIMAIA: 140 k€ + FTE for a know how transfer to ELIMAIA in developing a dedica
user station for PAA and FF-PIXE for applications to CH
MADEin4 H2020 project: 250 k€ by CNR in a coll. with ST microelectronics for industria
research

3rd Mission of the LANDIS in coll. with ISPC-CNR

Archeologia Invisibile: a temporary exhibition at the Museo Egizio in Torino
2nd MA-XRF international workshop. 24-25 October 2019, Catania
Joint ICTP-IAEA activity: Co-organization of the Advanced school on Portable X-Ray
Spectrometry Techniques for Characterization of Valuable Archaeological/Art Objects

ANDIS: Le sette opera di Misecordia by Caravaggio (Pi
Monte della Misericordia, Napoli)





25 scanning in 3 days on a scaffo to cover the area of 4mx3m by t real-time XRF imaging technolog developed by the LANDIS group (coll. LNS-INFN and ISPC-CNR Catania)

ANDIS: La Flagellazione di Cristo by Caravaggio (Museo di apodimonte, Napoli)

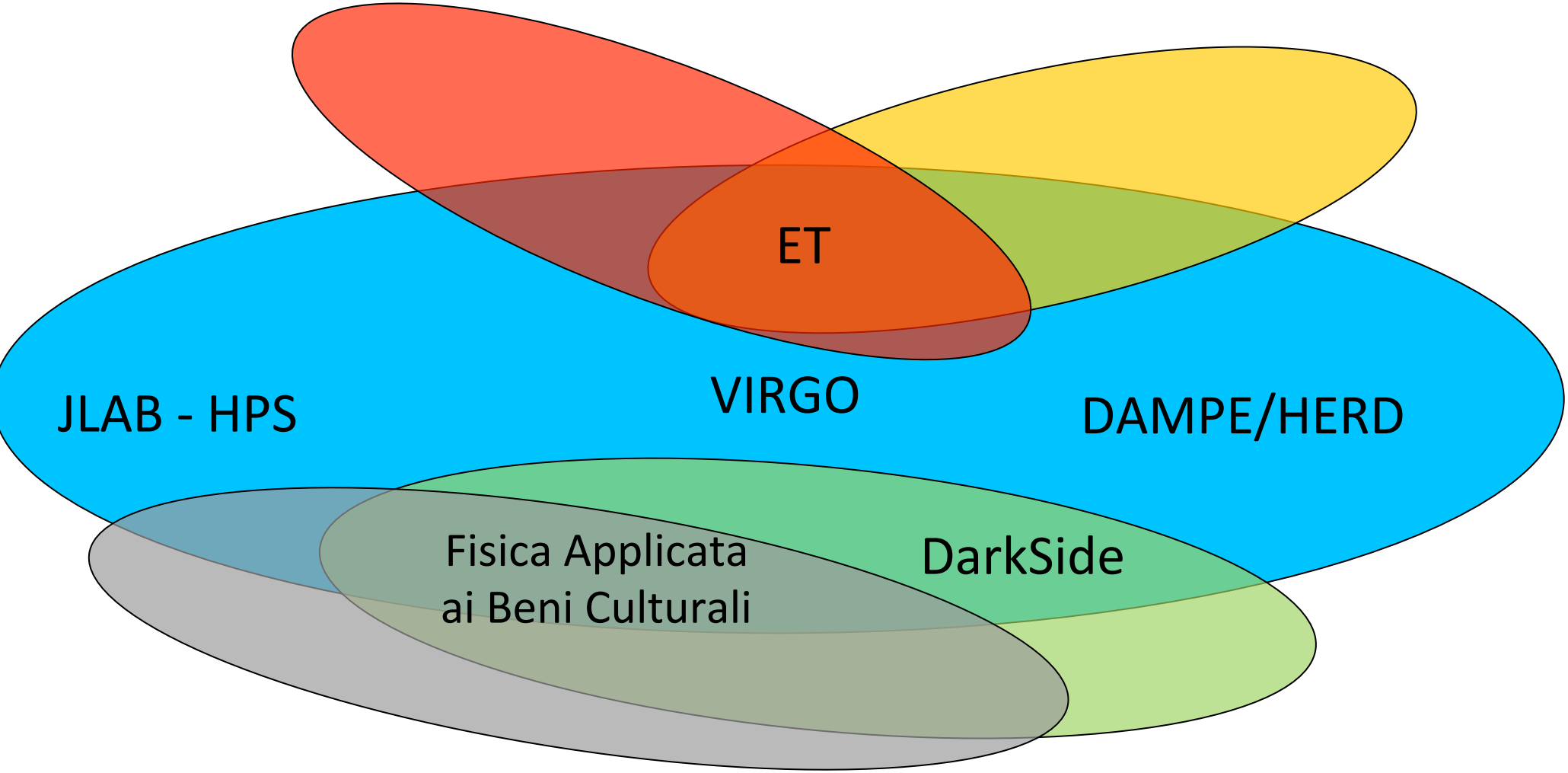
Scanning of the painting in front of the visitors for 3 days

UniSS

Fisici: M. Carpinelli, D. D'Urso, V. Scherini, V. Sipala, I. Tosta e Melo ***(in arrivo 3 RTD A***

- Einstein Telescope
  - Geologi: S. Cuccuru, G. Oggiano (Responsabile Studi di Caratterizzazione Geologica del Sito di Sos Enattos)
  - Economisti: L. Deidda (responsabile Studi di Impatto Economico-Sociale di ET)
- DarkSide
  - Chimici: P. Demontis, A. G Gabrieli, F. Pazzona
- Fisica Applicata ai Beni Culturali
  - Chimici: G. Mulas
  - Archeologi: M. Rendeli

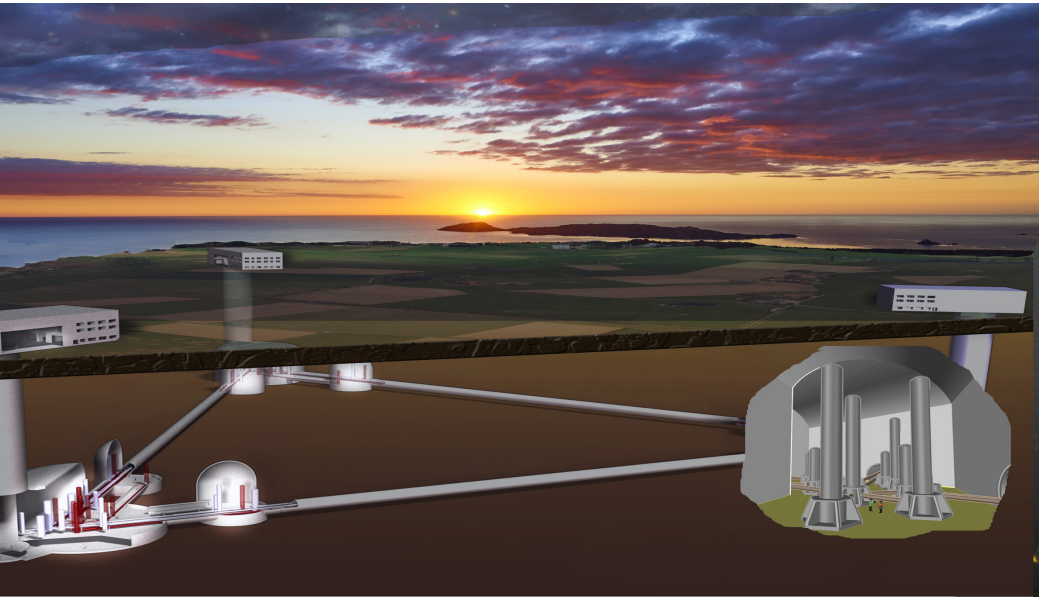
tività di ricerca



Attività di ricerca

Virgo, Einstein Telescope

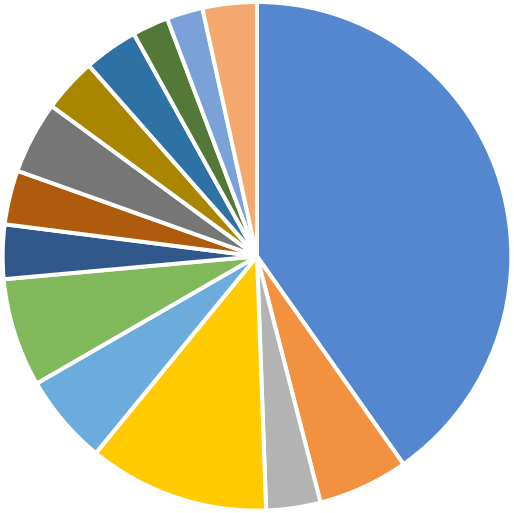
Costruzione Laboratorio Sotterraneo di Fisica della Gravitazione SAR-GRAV



Instrumental intermezzo

- During the accelerators' shutdown for POTLNS the technical and administrative staff will be overloaded while it will not be the case (apparently) for many researchers.
- A large number of upcoming activities is yet evident, even during this shutdown:
  - Preparation of detectors for the "day after" (an increase of 1-2 order of magnitude for the beam intensities and a larger variety of activities that will open up → great challenge).
  - R&D for the participation to next challenges after POTLNS.
  - Experimental activities in other Laboratories.
  - Contribution to the activities of other INFN units and other Institutions.

ASFIN : collaborazioni internazionali



talia
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ATTIVITA' 2020-2023 ALL'ESTERO DEL GRUP
ASFIN

Ruder Bošković Institute
Laboratory for nuclear physics

TRIUMF
Canada's particle accelerat
Centre canadien d'accélér
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Triangle Universities Nuclear Laboratory
A US department of Energy Center of Excellence in nuclear physics

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cnrs IN2P3 Les deux Infinis
Université Paris Sud
université PARIS-SACLAY
IPN Institut de Physique Nucléaire Orsay
MUST2

NRF National Research Foundation
iThem LABS
Laboratory for Acce
Based Sciences

TEXAS A&M UNIVERSITY
Cyclotron Institute

EURASIA NATION UNIVER
Основан в 1996 году

usive measurement of the cross sections of the ^{26}Al+n reactions by means of the THM

TRIUMF Canada's particle accelerator centre
Centre canadien d'accélération des particules
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^{26}Al is a key isotope in astrophysics:
g.s. $T_{1/2}$=7 10^5 y
i.s. $T_{1/2}$=6.35 s

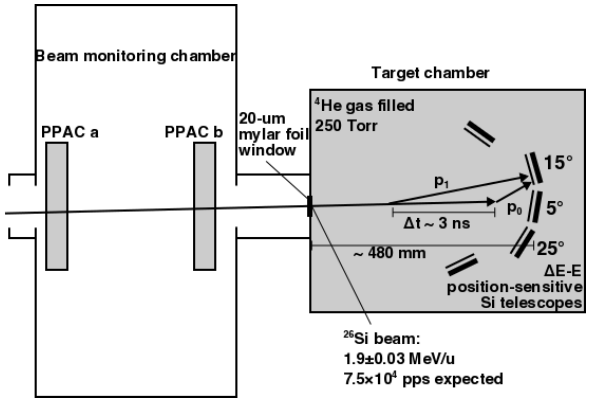
(1) probe of stellar nucleosynth
(2) index of NS formation rate
(3) heat source for Earth format

n,p)^{26}Mg and ^{26}Al(n,α)^{23}Na reactions will be studied using THM, using deuteron as n-virtual source
ing data are very poor or absent at astrophysical energies, especially for the reactions involving ^{26}Al isomeric stat

This measurement is of primary importance for the THM activity at SPES (LOI approved by LNL PAC)

NUCLEOSYNTHESIS @ RIKEN

^{26}Si(α,*p*)^{29}P reaction is very important in understanding the light curve and nucleosynthesis in x-ray bursts.
her importance of the ^{26}Si(α,*p*)^{29}P reaction rate comes from the galactic ^{26}Al.



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RADIOACTIVE ...TROJAN HORSE!

BBN NUCLEOSYNTHESIS & POLAR INVARIANC FOR THM

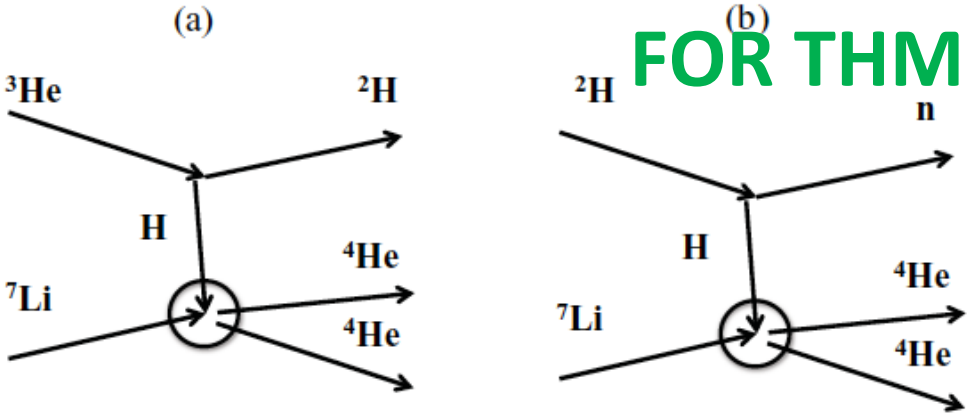


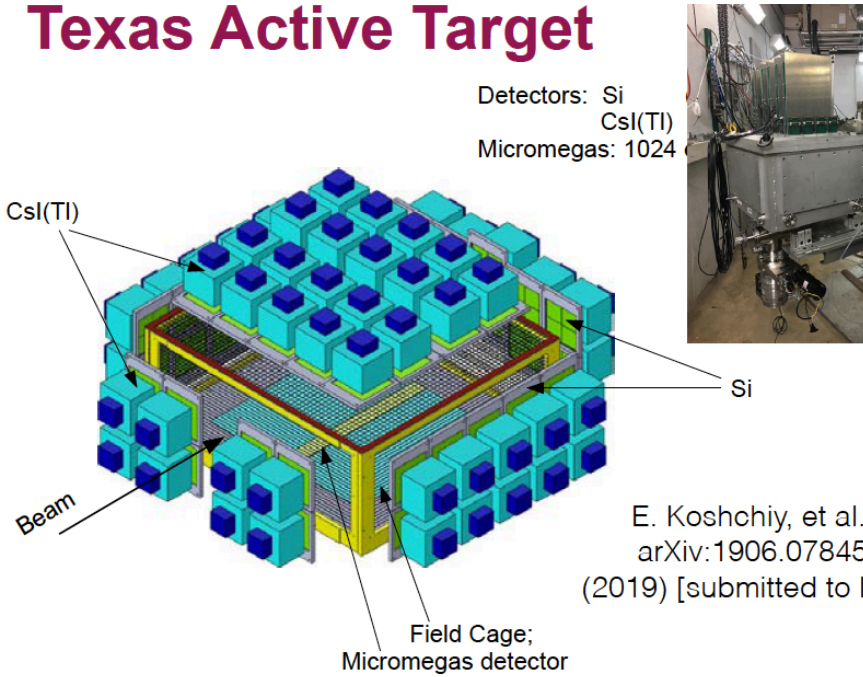
FIG. 12. Different breakup schemes adopted for studying the ^{7}Li(p,α)^{4}He reaction. In (a) the process is studied after ^{3}He breakup while in (b) after deuteron breakup.

TEXAS A&M UNIVERSITY
Cyclotron Institute

^{20}Ne break-up and inelastic scattering for future THM applications

asurement of THM activity at SPES
(LOI approved by LNL PAC)

Texas Active Target



E. Koshchiy, et al.
arXiv:1906.07845
(2019) [submitted to

Summary

- The status of INFN-LNS is quite in line with the expectations.
- Fundraising was successful.
- Preparation of the construction phase for POTLNS is under way.
- The progress of IDMAR and KM3NET is not far from milestones.
- PANDORA construction phase will begin soon.
- The organization issues are better understood by the LNS personnel.
- The turnover issues are not yet under control; new hiring phase has been started, within the existing rules. If solved, we may be optimistic for the mid-term goal achievement.

Conclusioni

- Facile guidare una squadra che fa risultati e promette di farne ancor più
- Non va tutto per il verso giusto, e qualche correttivo è necessario (lo spogliatoio è sempre “caliente” quando ci sono tanti fuoriclasse)
- Come diceva un mitico presidente del Catania calcio, è importante avere in squadra quel giocatore che si chiama “amalgama”
- Abbiamo rafforzato la squadra con donne e uomini che sanno fare e sanno organizzare: un’azione senza l’altra è insufficiente
- Il 2020 sarà l’anno della verità: aumentare il ritmo della costruzione di KM3NET è vitale per la credibilità della collaborazione e i LNS faranno tutto il possibile e di più per supportare tale sforzo (come disse Mario Draghi “whatever it takes”)
- Per POTLNS partire bene con la preparazione delle aree e mantenere i tempi per la costruzione è decisivo, in vista del mantenimento e del rafforzamento del ruolo dei LNS in Fisica Nucleare e Applicata

Conclusioni

Stiamo lavorando per preparare una tabella di azioni (Chi fa Cosa, Come, Quando e con Chi) che possa permettere di minimizzare l'Instrumental ntermezzo: non può e non deve essere un "pit stop" da Formula 1, ma neanche possiamo accettare tempi da Fabbrica del Duomo

n ogni occasione sto cercando di avviare momenti di condivisione delle decisioni. La Storia dell'INFN (e non solo) dimostra che i grandi risultati son ottenuti incrociando diversi punti di vista o addirittura in modo consociativo; l'uomo solo al comando non va da nessuna parte…

Si può fare di più? Sicuramente, semplificare molte procedure al nostro nterno, azzerare documenti cartacei, aumentare l'uso di strumenti nformatici ci può garantire un incremento, anche se le lunghe procedure per assunzione di personale e per gare d'appalto sono la vera palla al piede rispetto a colleghi di altri Stati, e non dipendono da noi.

Conclusioni

Soddisfatto della “shared ownership”? Abbastanza, alcuni colleghi non sono presenti oggi perché la loro assenza avrebbe comportato ritardi in fasi operative (menzione d’onore al senso di responsabilità); inoltre altri mi hanno chiesto di rendere pubblica questa presentazione, in modo che tutto il Personale sia partecipe di ciò che il Direttore dice. Smania di protagonismo di molti, forse, ma va bene così.

In 14 settimane da Direttore non ho avuto un minuto per annoiarmi, ma ho ricevuto più di quello che ho dato, in termini di soddisfazioni. Spero che sia così anche nei prossimi anni.

Ho incontrato giornalisti, imprenditori, responsabili istituzionali dal Sindaco di Catania al Ministro Provenzano, parlamentari nazionali ed Europei e persone comuni: tutti guardano ai LNS come un esempio di successi ottenuti nonostante una condizione ambientale difficile.

Ringrazio tutti i dipendenti e associati dei LNS perché le prospettive dei LNS sono ottime. Dopotutto per potersi permettere “futuro, strategia e visione” serve una base robusta e il nostro “cemento” è costituito dal Personale, forte in capacità e in qualità umane.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Thank you for your attention