

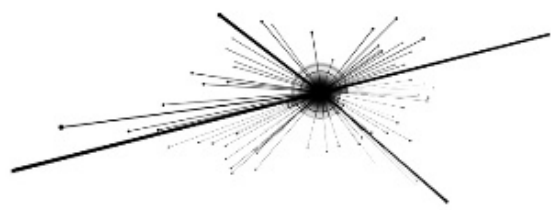


Lucia Sabbatini

Coordinator of the LATINO team

*D. Alesini, A. Gallo, V. Pettinacci, A. Falone*

*with support of Administration, Technical Division, SIDS, ...*



# LATINO

a Laboratory for Advanced Technologies for INnOvation

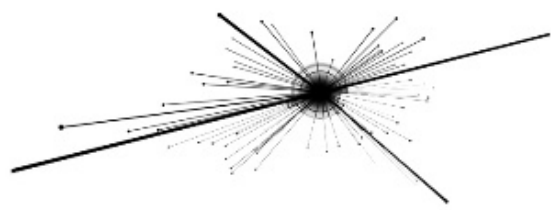
a Research Infrastructure hosted at INFN open to external users for both research and economic activities

- Winner of the call «Open Research Infrastructure» (Regione LAZIO) – POR FESR 2014-2020
- Main goal: reindustrialization of the Region
- KET (Key Enabling Technologies): Advanced Manufacturing System
- Roadmap: **24 months**: installation of the infrastructure  
5 years: monitoring of economic sustainability
- Cofunding: total budget of the project **2.5M€** (1.6 RL + 0.9 INFN)  
(to be used for instrumentation and civil engineering)



REGIONE  
LAZIO





# LATINO

a Laboratory for Advanced Technologies for INnOvation

**focus on technologies developed for particle accelerators**

- First phase: set up the infrastructure (July 2018 – June 2020)
- Beginning of activities: one year from now
- Organized in 4 Laboratories:
  - Radio Frequency
  - Magnetic Measurements
  - Vacuum and Thermal Treatments
  - Mechanical Integration



REGIONE  
LAZIO



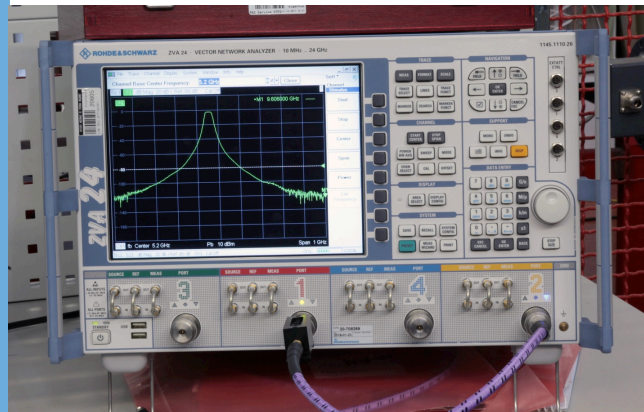
# RADIO FREQUENCY LAB

RESP: A. GALLO

X band high power plant to test and characterize accelerating structures and components at 12 GHz

1  $\mu$ s pulses at peak power of 50MW

100 ns pulses at peak power of 200MW with pulse compressors



A network analyser to characterize devices and components up to 100 GHz

- RF structure high power test
- High frequency RF measurements
- RF devices characterization

(main applications: medical accelerators, telecommunications, material science)

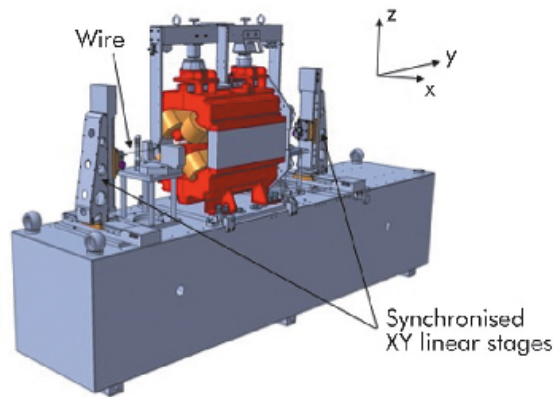
# MAGNETIC MEASUREMENTS LAB

RESP: L. SABBATINI

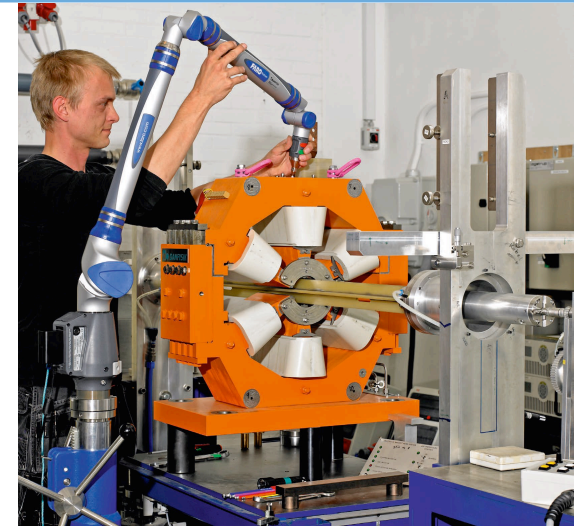
A rotating coil for accurate magnetic field measurements of multipoles

Relative accuracy of integrated main harmonic  $3 \cdot 10^{-4}$

Positioning accuracy  $30 \mu\text{m}$



Stretched wire measurement bench



A stretched wire bench for magnet fiducialization, integral field measurements, higher order multipoles

Centering accuracy  $2 \mu\text{m}$ , Integrated field precision  $0.2 \text{ G m}$

- Harmonic analysis of multipolar fields
- Field maps with Hall probe
- Integral magnetic field measurements and fiducialization
- Magnetic design of electromagnets

(main application: medical and research accelerators)

# VACUUM AND THERMAL TREATMENTS LAB

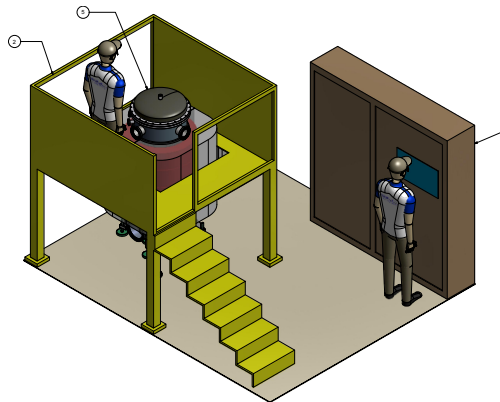
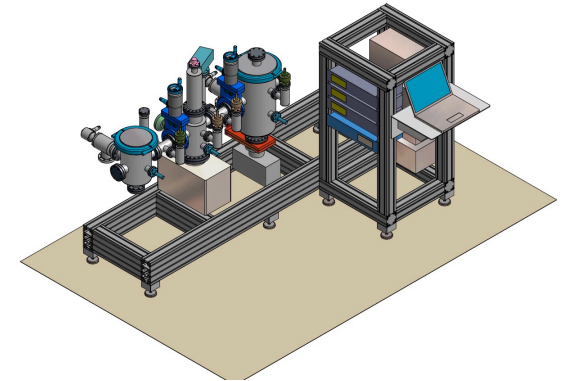
RESP: D. ALESINI

An outgassing measurement system to characterize vacuum materials

UHV, low outgassing: diameter 250mm, height 500mm

HV, high outgassing: diameter 200mm, height 300mm

Residual gas analyzer: 200 amu, sensitivity up to  $2 \cdot 10^{-14}$  mbar



An ultra-high vacuum furnace for thermal treatments and brazing

Diameter 50cm, length 1.5m

$T \approx 900^\circ\text{C}$ ,  $p \approx 10^{-7}$  mbar

External heater

- Ultra high vacuum or controlled atmosphere thermal treatments
  - Brazing in ultra-high vacuum
  - Specific outgassing measurements of samples
- (main application: aerospace, treatment of superconducting material)



# MECHANICAL INTEGRATION LAB

RESP: V. PETTINACCI

An architectonic laser scanner for environment and plants

Range of measurements >140m

Positioning precision @10m: 1.5 mm



A stereoscopic laser scanner for mechanical components

Cameras with 6Mpixel

Field of view 460mm

Best accuracy <0,05mm

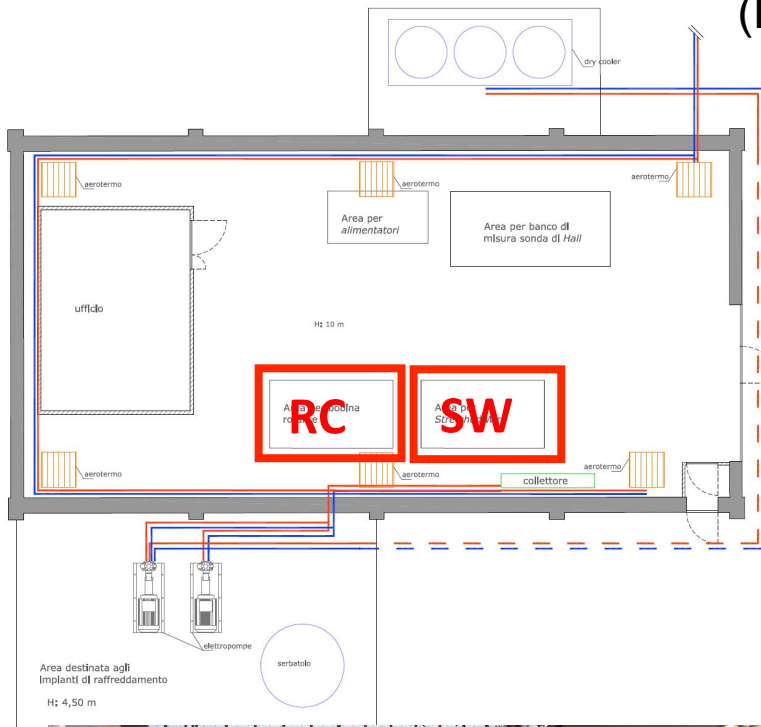
- Building and utilities CAD reconstruction for space management and integration analysis
  - Mechanical components quality inspection and dimensional survey
  - Reverse engineering applications
- (main application: industrial plants, high precision mechanics)





# CIVIL ENGINEERING

## (BUILDING #38)

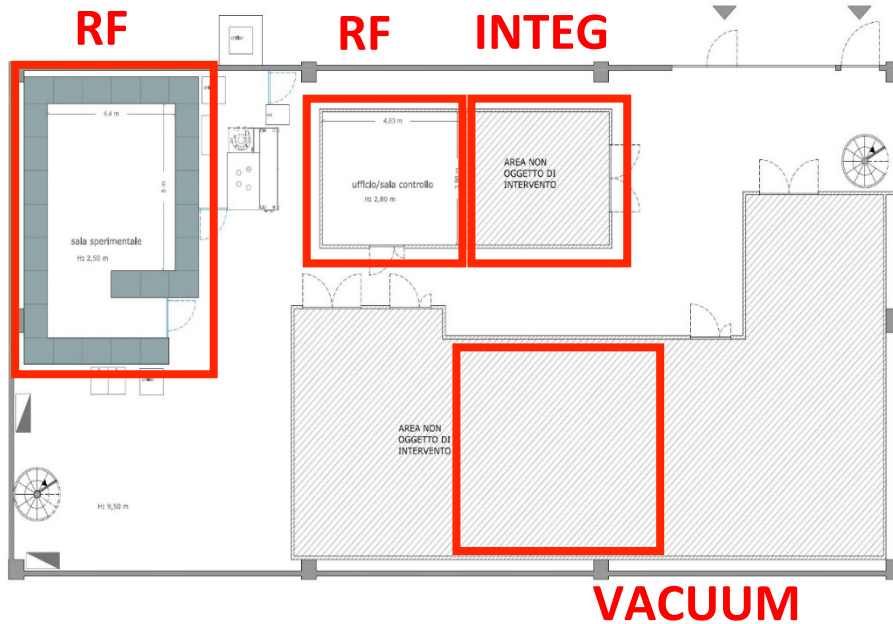


- New magnet cooling system (improve efficiency and performances)
- Replacement of the main doors
- Renewal of the floor

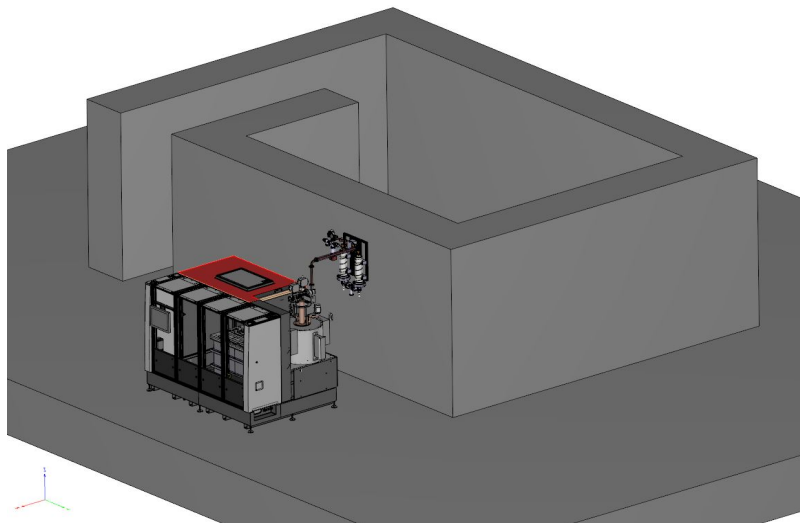


# CIVIL ENGINEERING

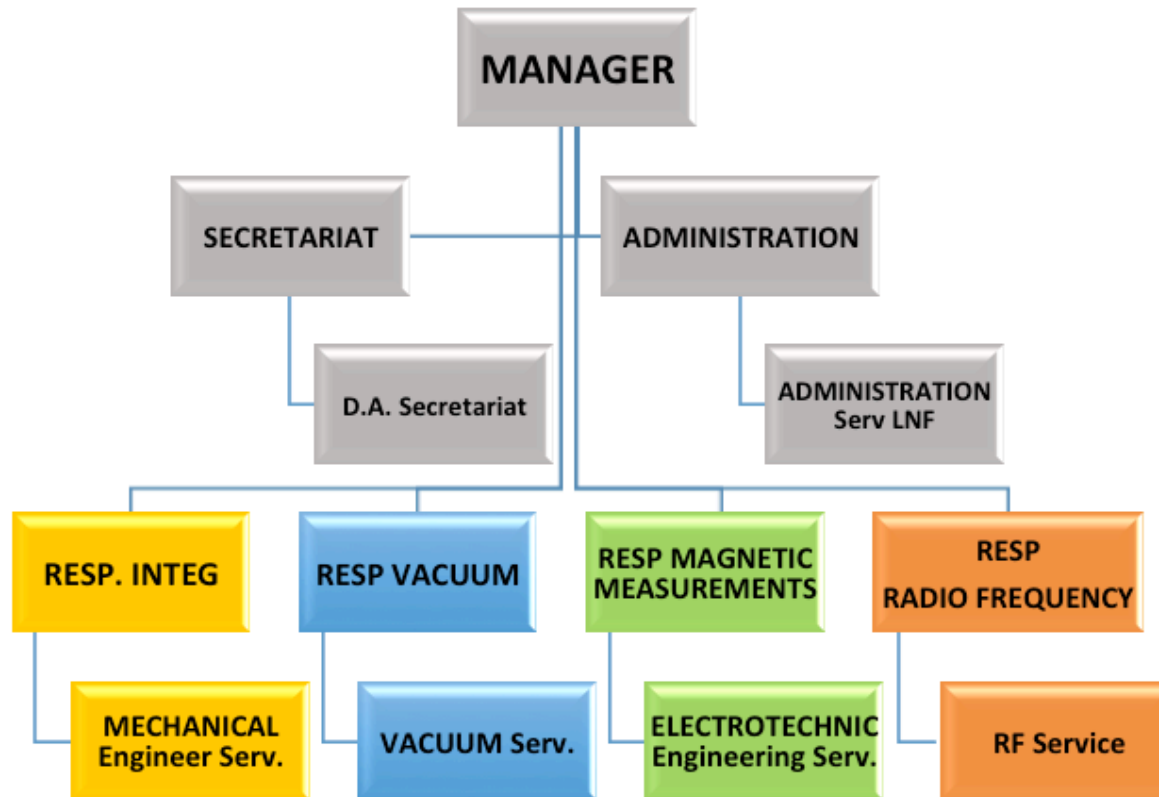
## (BUILDING #7)



- Bunker for X band with ancillary systems
- X band cooling system
- HVAC for the building



# ORGANIZATION CHART



Manager: management, coordination, interaction with Users

Laboratories: leaded by INFN technologists

Personnel of Accelerator Division Services to support the activities

Support for Secretariat and Administration activities

# ECONOMIC ACTIVITIES

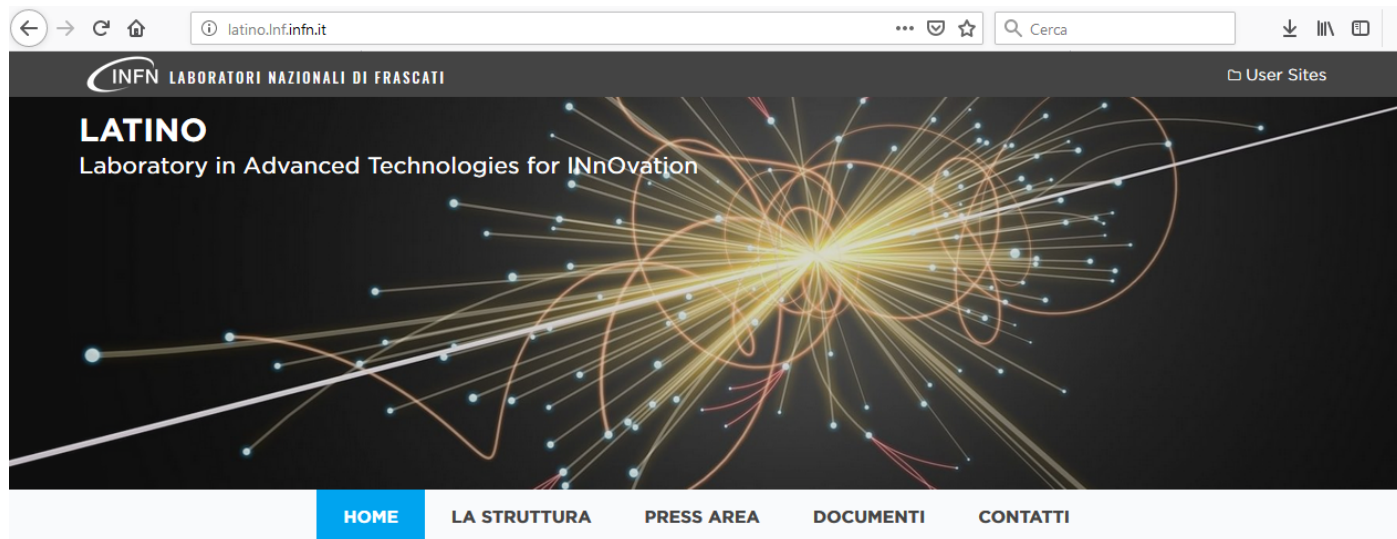
- Business plan (with the support of a consultant) to analyze:
  - Industrial areas of applications
  - Target users
  - Market approach
  - Economic feasibility (expected income, sustainability, operational costs)
  - Rules governing the access
- Letter of interest from small and medium enterprises
  - ASG superconductors, CECOM, COMEB, DG-Technology, Fantini Sud, ITEL, ITELCO, KYMA, MoriMeccanica, National Instruments, Ormet, SIT, TecnoAlarm, TSC, Zanon
- LNF Working group on separate accounting system (organized by External Funds Service)

# STATUS OF THE PROJECT

- ✓ First Milestone accomplished: “start” of the project within 6 months (i.e. *orders placed for 50% of the budget*)
- ✓ Overall Budget in line within expectation (*small variations allowed within items*)
- ✓ Manager

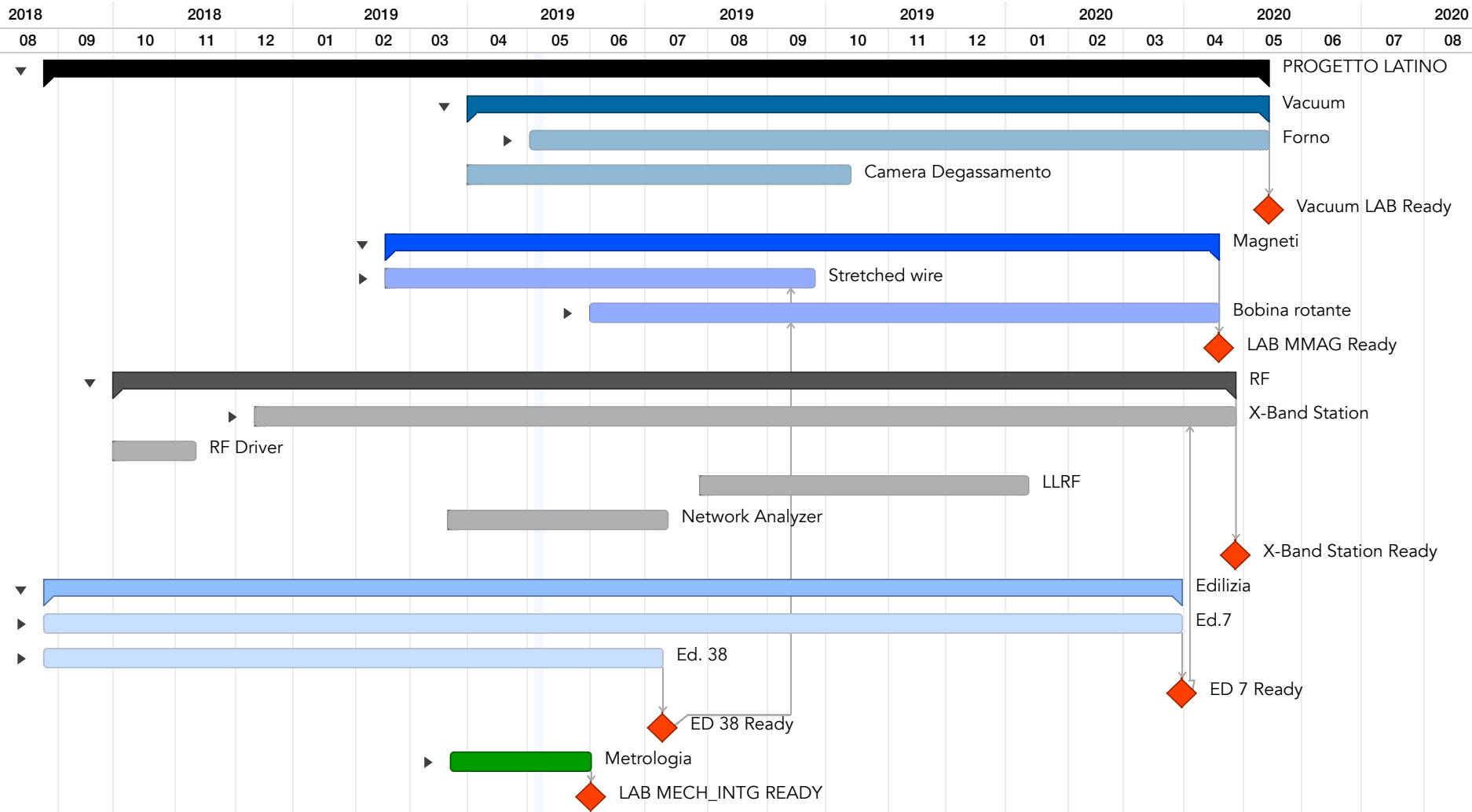
Work in progress on:

- Website <http://latino.inf.infn.it/>





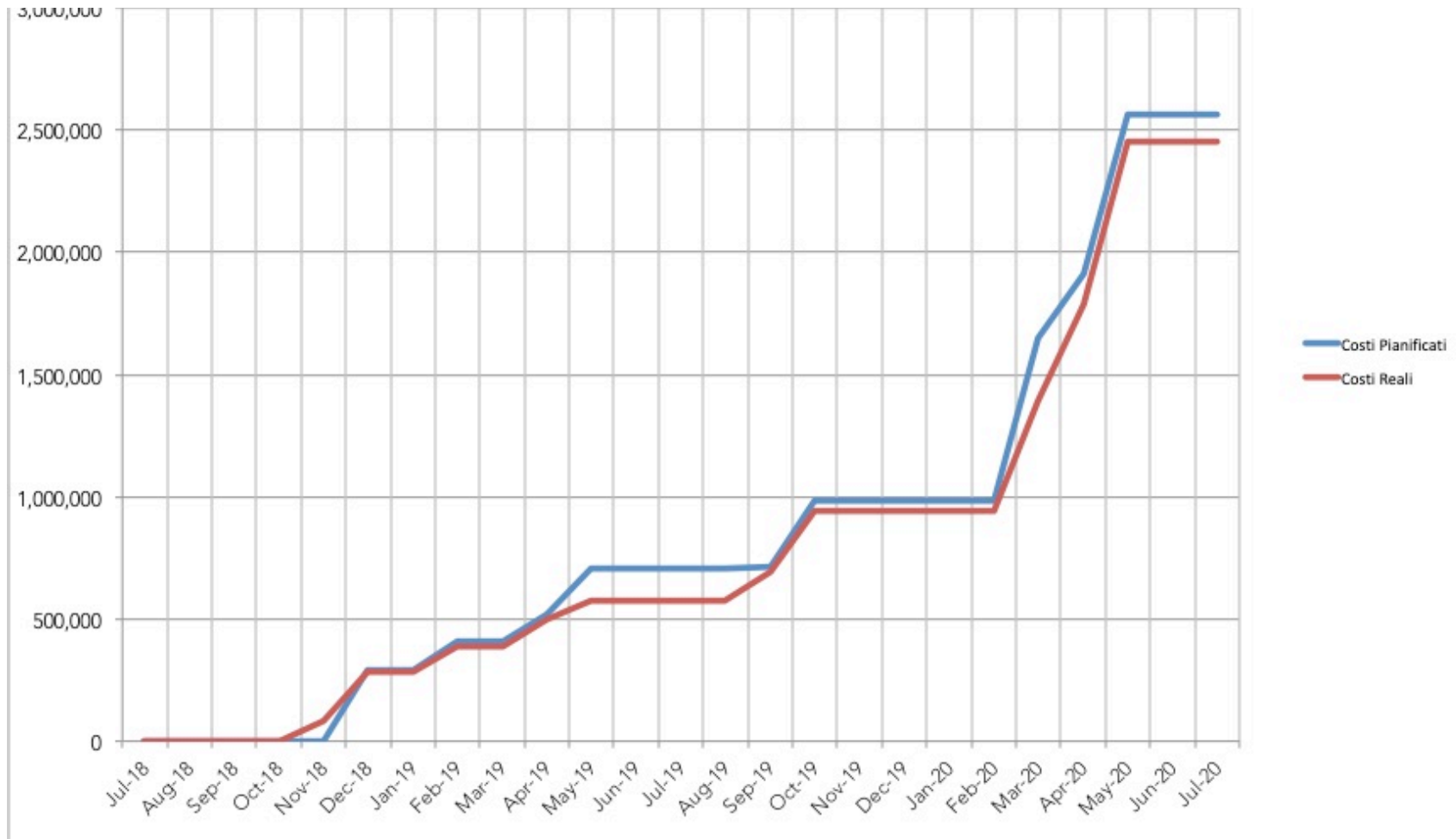
# GANTT



# BUDGET

LABORATORY	INSTRUMENT	Proposal (K€)	Current (K€)	Status
Radio Frequency	Modulator	583	592	Order placed (deliver 01/20)
	LLRF	84	74	
	Network analyser	293	200	Order placed (deliver 07/19)
Magnetic Measurements	Stretched wire	180	64	Order placed (deliver 09/19)
	Rotating coil	666	500	
Vacuum and Thermal Treatments	Ultra high vacuum oven	192	250	
	Outgassing system	185	163	Order placed (deliver 10/19)
Mechanical Integration	Architectonic laser scanner	56	50	Delivered
	Stereoscopic laser scanner	36	48	Delivered
Civil Engineering	Building #7	261	395	
	Building #38	105	109	Order placed (end 09/19)
<b>TOTAL</b>		<b>2.641</b>	<b>2.445</b>	

# S-CURVE



*courtesy A. Falone*

# NEXT FUTURE

- Items to be purchased (design and administrative issues ongoing): furnace, Low Level RF system, rotating coil
- Civil works: Start summer 2019, expected delivery spring 2020

## **Contributions at conferences and Dissemination:**

- IPAC 2019: Talk at the Industry Session (May)
  - IPAC 2019: Poster (May)
  - AIV (Associazione Italiana di Scienza e Tecnologia): Talk (May)
  - IOD (ILO Industrial Opportunities Days): 2 Talks (June)
  - NanoInnovation: Talk (June)
  - AMICI meeting (September)
  - Industrial Seminar (LNF): Vacuum and Magnets Technologies (May)
- Kickoff meeting with Industries: to be organized in 2020 with Regione LAZIO

**LATINO is part of a broader Technology Transfer projects development at LNF**

# REFERENCES

1. M. Florio, S. Forte, E. Sirtori, Cost-Benefit Analysis of the Large Hadron Collider to 2025 and Beyond (2015)  
<http://arxiv.org/pdf/1507.05638v1.pdf>
2. EUCARD2 study group, Applications of Particle Accelerators in Europe (2015)  
[http://apae.ific.uv.es/apae/wp-content/uploads/2015/04/EuCARD\\_Applications-of-Accelerators-2017.pdf](http://apae.ific.uv.es/apae/wp-content/uploads/2015/04/EuCARD_Applications-of-Accelerators-2017.pdf)
3. Oxford Economics, The economic impact of physics research in UK: MRI scanners Case Study (2012)  
<http://www.stfc.ac.uk/files/the-economic-impact-of-physics-research-in-the-uk/>
4. Institute of Physics, UK Physics Research - Driving Innovation and Growth (2014) [https://www.iop.org/publications/iop/2014/file\\_63111.pdf](https://www.iop.org/publications/iop/2014/file_63111.pdf)
5. Società Italiana di Fisica, The impact of Physics on the Italian Economics - Final report by Deloitte, (2014) [https://www.sif.it/static/SIF/resources/public/files/report\\_2014/SIF-Final-Report.pdf](https://www.sif.it/static/SIF/resources/public/files/report_2014/SIF-Final-Report.pdf)
6. R. Crescenzi, S. Iammarino, A. Rodríguez-Pose – Multinazionali, Imprese Locali e Sviluppo Economico nella Regione Lazio (Luglio 2016)
7. Banca d'Italia: Roma. Economie regionali. L'economia del Lazio. (2015)
8. Banca d'Italia: Roma. Economie regionali. L'economia del Lazio. (2016)
9. <http://www.lazioinnova.it/bandi-post/sostegno-alle-infrastrutture-aperte-la-ricerca/>
10. <http://latino.lnf.infn.it/>