

aMUSE: advanced Muon Campus in US and Europe contribution



SAPIENZA
UNIVERSITÀ DI ROMA

Temi per tesi di dottorato in Fisica degli acceleratori

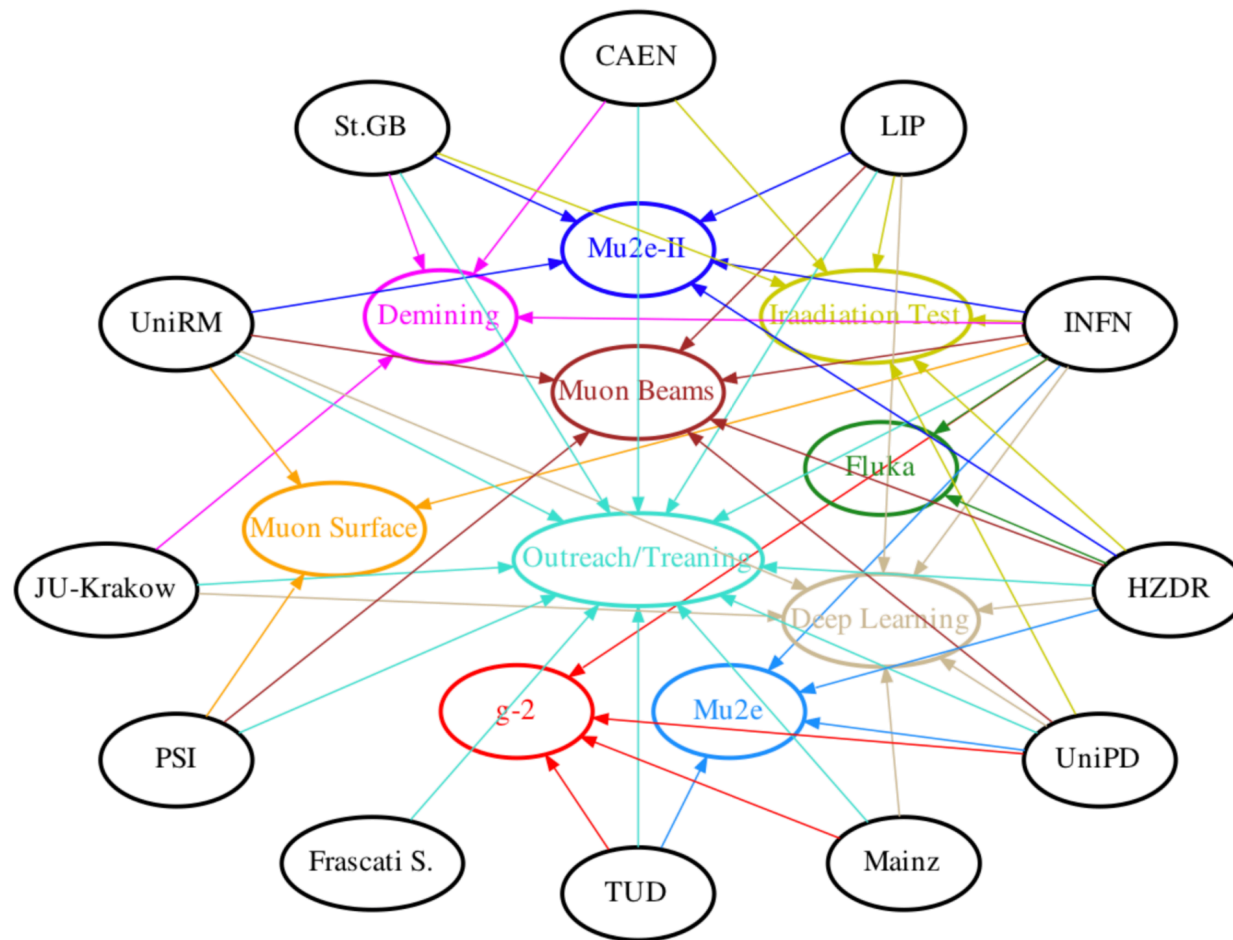
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Nov 18th 2020

aMUSE

- aMUSE is **MSCA-RISE** project.
- RISE projects are meant to foster the researcher exchanges (both staff and students) and are focused on collaborations with extra-EU laboratories.
- **aMUSE** wants to promote the development of the next generation **muon beams** to search for New Physics either in the muon sector (*charged Lepton flavour violation*) or/and with high energy muons (*muon collider*).
- **Fermilab Muon Campus** will be central.
 - **SLAC** and **BNL** in the network too.
- **Start date : Apr 2021 (4 years duration)**

Network of European universities, research centers and companies



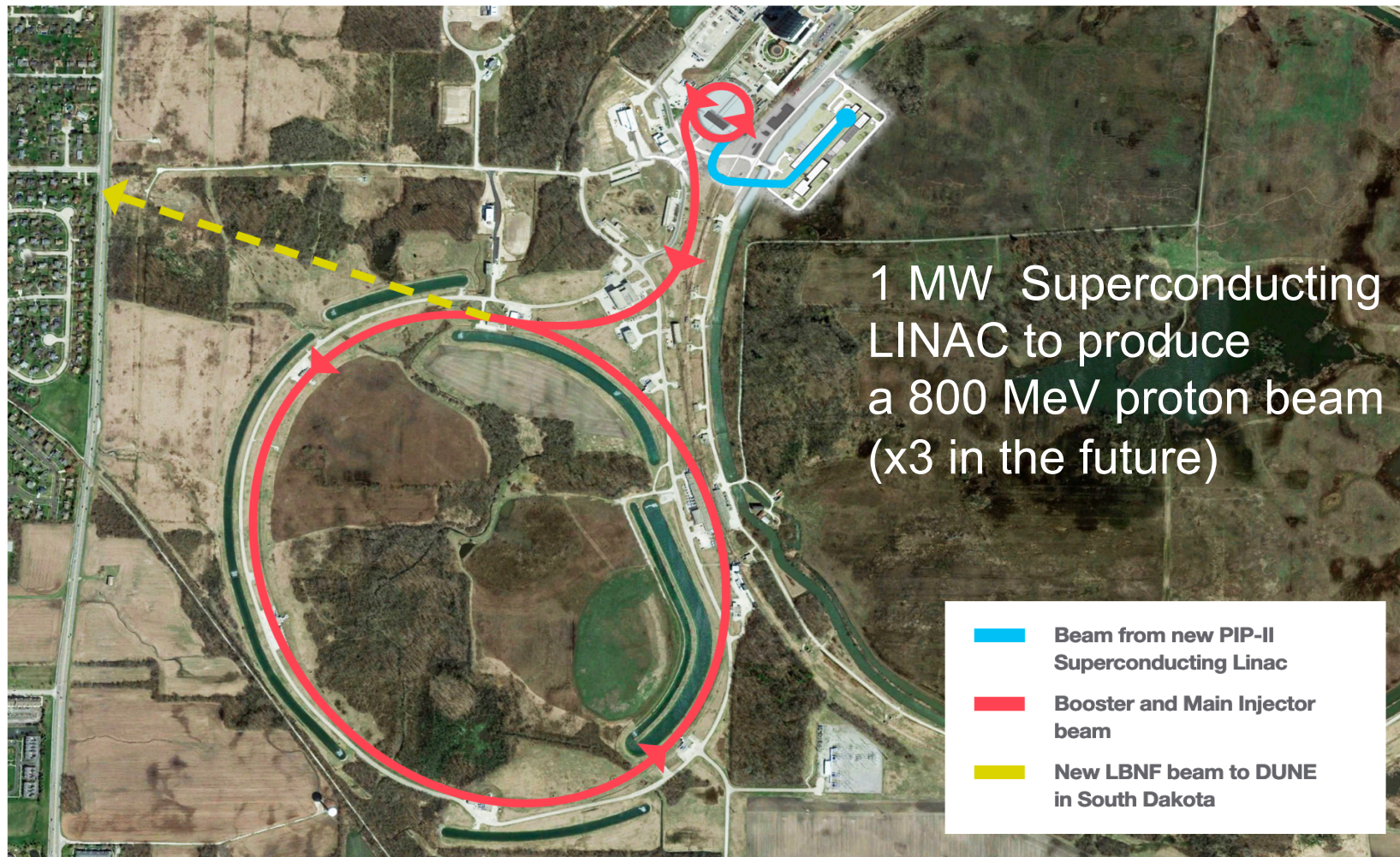
How it works

- Coordinator: INFN (LNF) – Sapienza UniRm is a node

Work Package No	Work Package Title	Activity Type	person-months involved per secondment	Lead Beneficiary	Start Month	End month
1	Muon Campus Experiments	Research, Training, Dissemination	168	INFN	1	48
2	Muon Campus Upgrade	Research, Training, Dissemination	93	UniRM	1	48
3	Muon Beams	Research, Training, Dissemination	62	UniPD	1	48
4	Software Tools	Research, Training, Dissemination	55	LIP	1	48
5	Communication & Outreach	Communication, Training	4	Frascati Scienza	1	48
6	Transfer of Knowledge	Research, Training, Dissemination	28	HZDR	1	48
7	Management	Management, Communication, Dissemination	3	INFN	1	48

For PhD students : one year at Fermilab

Proton Improvement Plan II (PIP-II) at FNAL



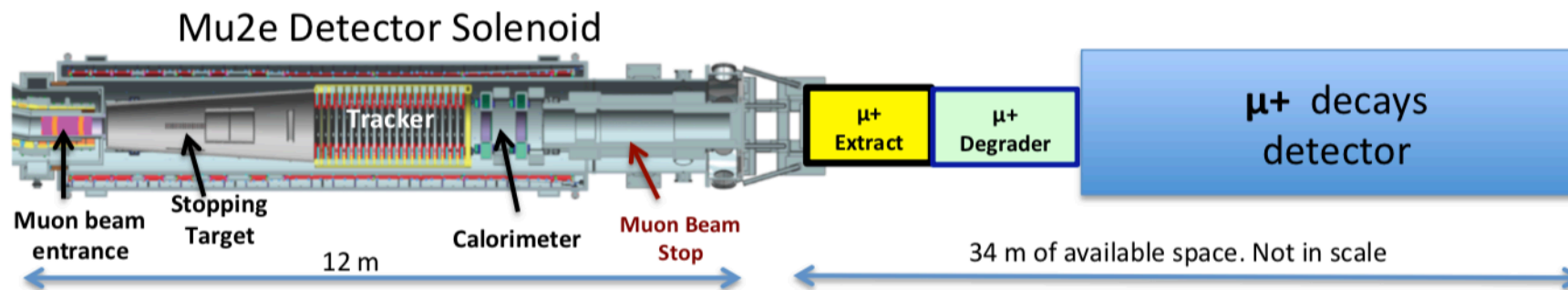
- Secondary particles: neutrinos (DUNE) and muons

Activities (for a PhD student in accelerator physics)

New higher intensity PIP-II beam for the Muon Campus

- the design of **beamline components** and **detectors** for the Mu2e upgrade (Mu2e-II)
- feasibility study to adapt the Mu2e beamline to a **muon surface** beam of world-highest intensity to search for **cLFV** muon decays (μ to $e\gamma$ and μ to eee) inside the Mu2e hall.

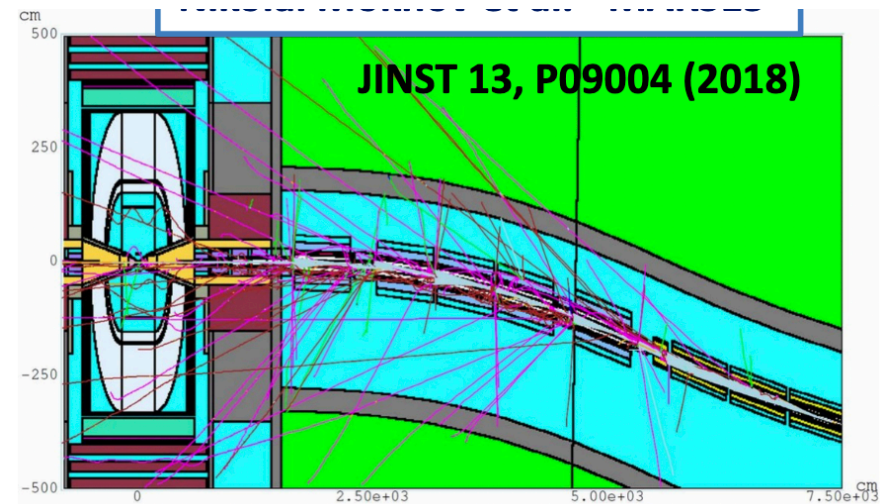
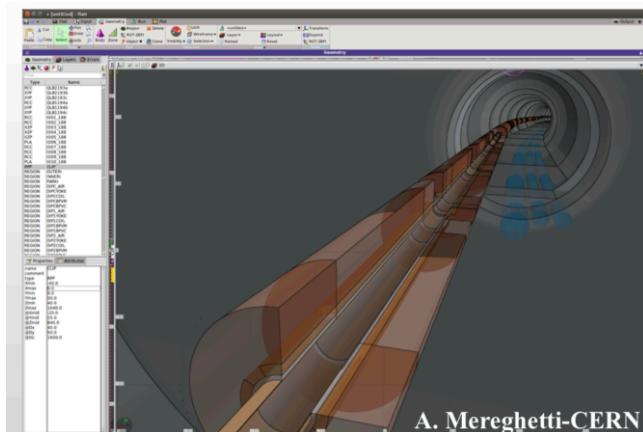
“Surface”: decay at rest of pions on the *surface* of the production target



Aim to exploit the full intensity of PIP-II to reach 10^{10} positive muons / second (Currently PSI muon beam max. intensity is $2 \cdot 10^8 \mu/s$)

Muon collider

- Muon Collider is a futuristic concept to be studied in the coming years for a high energy ($> \text{TeV}$) colliders
 - More [here](#) (seminars at INFN RM of Eur. Strategy)
- study **muon cooling techniques** (PSI /**BNL**)
- Beam induced background to experiment
 - **Optimization of the beam interaction point**
 - **Machine detector interface**
- Neutrino hazard



- People in Roma: M.Bauce, GC, F.Collamati, F.Renga, C.Voena.
- Very good opportunity for a PhD student to visit for a long period an international lab.
- Medium-term projects
 - Both muon physics (cLFV) and muon collider conceptual design will be lively projects during the next decade.