

# MUSE overview

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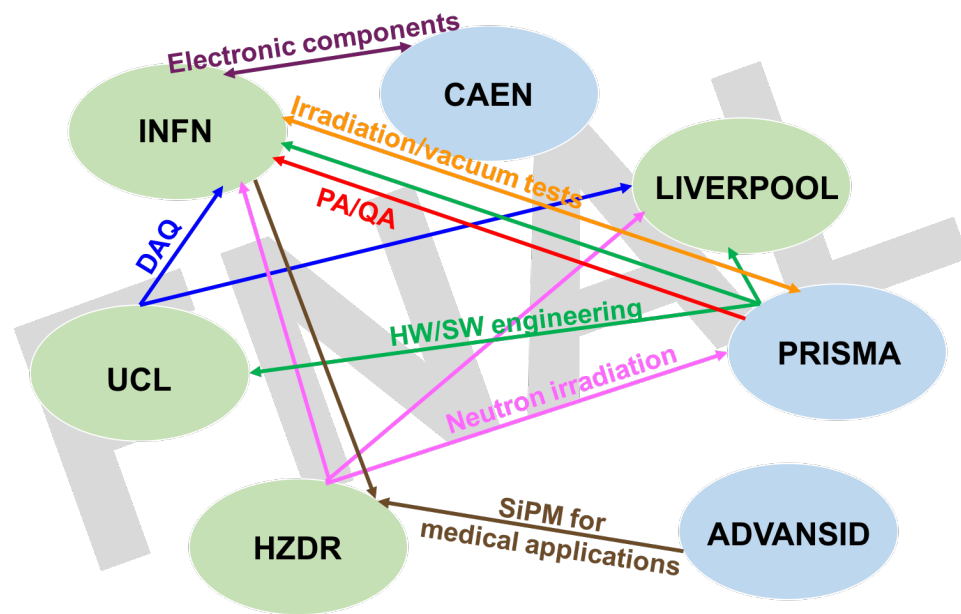
MUSE General Meeting  
Fermilab, 22-24 October 2018

# MUSE and the Muon Campus

Last General Meeting was ~ 1.5 year ago. In the meanwhile:

- ✗ The outcome of the Mid-Term Meeting was positive for us
  - ✗ We closed the First Progress Report, focused on the 2016-2017 activities
  - ✗ Muon Campus activities are progressing steadily, as well as MUSE tasks
  - ✗ Governing boards meetings regularly done
  - ✗ Dissemination
  - ✗ Outreach
  - ✗ Networking
- Several events organized

MUSE website is the right place where to find documentation for all of this



## Muon Campus in US and Europe contribution

Public section for the general public to maximize the visibility of the project:

- ↻ General information on the project and its organization
- ↻ Dissemination and outreach events being kept updated on the web site  
As of today: 83 talks/posters/seminars, 32 publications, 22 outreach events

### ABOUT MUSE PROJECT

The MUSE project coordinates the activities of about 70 researchers from various European research institutes and industries for the participation to the experiments at the Muon Campus of the Fermi National Laboratory, USA. It promotes international and intersectoral collaboration by means of secondments of personnel, thus enhancing European contribution and visibility in this activity.

The duration of the MUSE project is of four years, thus well adapting to the Muon Campus schedule that will host in the same period two world class experiments dedicated to the search of new physics: Muon g-2, for a ten-fold improvement on the measurement of the muon magnetic anomaly, and Mu2e, for the search of the yet unobserved conversion of a muon to an electron.



## Muon Campus in US and Europe contribution

Private section to share documents and information among participants:

- ~ Grant Agreement
- ~ Status of deliverables and milestones
- ~ Meetings with presentations and minutes
- ~ Mailing lists
- ~ Biannual reports
- ~ Useful tools

### INTERNAL MENU

- Grant Agreement
- Deliverables
- Milestones
- Meetings
  - Internal
  - Management Board
  - Scientific Board
- Mailing lists
- Reports
- MUSE logo
- Acknowledgements
- Templates
- Logout

# Recommendations from MTM

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Received end 2017. Positive comments on the running of the project. Two main recommendations:

1. Develop a strategy to exploit as much as possible the physics impact of the project: be ready to emphasize and communicate properly potential discoveries ahead on  $a_\mu$ , EDM to inspire the general public, especially junior people
2. Exploit the collaboration with ELBE facility to create an European network of irradiation experts. This will transcend MUSE, having an impact beyond the objectives of the network

# First Progress Report

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## Technical Part:

- ✗ Summary for publication for non-experts
- ✗ Risk assessment
- ✗ Deliverables/Milestones (all due completed)
- ✗ Dissemination/Communication/Publications
- ✗ Gender information
- ✗ Technical Report  Available on the MUSE web site
  - ↪ description/impact of the work carried on
  - ↪ deviations from the GA planning

## Financial Part:

- ✗ Derived from the list of secondments for the period 2016-2017



# WP6: Transfer of Knowledge

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- ✗ **Objectives:** coordination of the activities dedicated to the training of research and industry personnel to achieve a substantial ToK among participants and to increase the quality of the research and the competitiveness of the partners  
WP Leaders: F. Spinella  
A. Ferrari
- ✗ **Tasks:** (6.1) research-industry ToK; (6.2) medical applications; (6.3) training
- ✗ **Activities on research-industry Transfer-of-Knowledge:**
  - ↻ CAEN, WP1 → WP2: development of a prototype for the high current low voltage power supply of the calorimeter electronics
  - ↻ Two PRISMA → INFN secondments since last GM:
    - LNF (Sep 2017): SW engineer – Skeleton of DCS for handling FE chips and SiPMs + related DB
    - Pisa (Jun 2018): HW engineer - design of the new version of the calorimeter digitizer
  - ↻ PRISMA secondments to FNAL to be defined

# WP6: Transfer of Knowledge

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- X Objectives:** coordination of the activities dedicated to the training of research and industry personnel to achieve a substantial ToK among participants and to increase the quality of the research and the competitiveness of the partners  
WP Leaders: F. Spinella  
A. Ferrari
- X Tasks:** (6.1) research-industry ToK; (6.2) medical applications; (6.3) training
- X Training:**
  - ↗ training courses during General Meetings on specific advanced topics from research development in HEP or industry
    - 2018: PIP-II, talk+tour (Wed, Oct. 24, 9:00-12:00)
  - ↗ attendance of schools for PhD and postdocs
  - ↗ soft skills training courses (management, science communication, language...)

**46 events listed since MUSE started**



# WP6: Medical Applications

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Involved institutes: HZDR, ADVANSID, INFN

Goal: transfer of the INFN and ADVANSID expertize on SiPM to the HZDR group working on medical applications, both in PET nuclear imaging and in-vivo-dosimetry at proton and ion beams

- ✗ Medical Physics group of the Institute of Radiation Physics at HZDR was formally dissolved in 2017, following a general reorganization of the Institute
- ✗ Reemployment in other activities of the personnel involved in MUSE
- ✗ Impossible to benefit of the secondments to AdvanSid to advance in the characterization of SiPMs customized for medical applications
- ✗ A collaboration with the Dresden University Proton Therapy Center and the National Center for Radiation Research in Oncology (OncoRay) in Dresden personnel has continued.
- ✗ Deliverable D6.2, “SiPM characterization” (Report on SiPM characterization and optimization in medical applications – Month 36) will be prepared, even if the horizon of the activities will result smaller with respect to the original plan.

# MUSE irradiation network

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Existing European infrastructures used to carry on an irradiation program among MUSE participants (HZDR, INFN, LIVERPOOL, PRISMA), aiming to test radiation hardness and characterize detector components of the Mu2e detectors

The ELBE accelerator complex at HZDR provides both high dose neutron flux (pELBE) and high-intensity Bremsstrahlung radiation (gELBE)

- Several irradiation campaigns both for HPGe and calorimeter (SiPM, FEE)
- QA of SiPM for the Mu2e calorimeter: neutron irradiation for production components on random samples from each SiPM batch

# Dissemination and Outreach

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- X Lot of effort in dissemination and outreach activities
- X List of public events on the MUSE web site
- X MUSE results disseminated to the international scientific community through the participation to physics and instrumentation international conferences and the publication in professional journals:
  - ~ 83 talks delivered
  - ~ 32 publications produced (all gold/green open access)
- X Outreach events, promoting communication between MUSE scientific community and general public to increase science awareness and to inspire the next generations of scientists:
  - ~ Training courses for FNAL Summer Students
  - ~ MUSE General Meeting: Outreach event for University students
  - ~ Open Day and European Researchers' Night
  - ~ Other specific events in different MUSE institutions

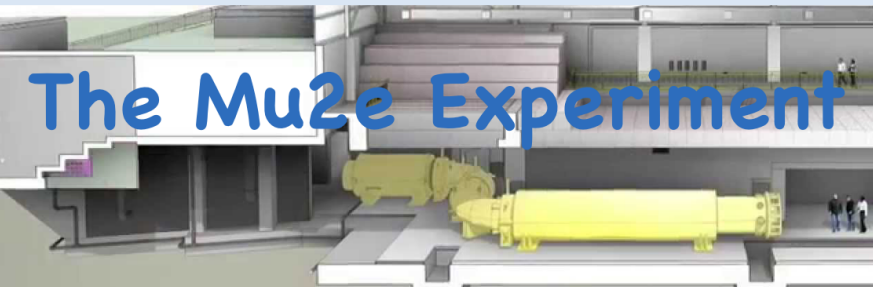
# Outreach: 2018 events

Organized by:

Young Mu2e



## The Mu2e Experiment



2018 Training Lectures for the students of the Summer School "Summer Students at Fermilab and other US laboratories" (Fermilab, INFN and the University of Pisa)

### Lectures

Friday, August 10 – Wilson Hall

Morning Session: Black Hole (WH2NW)

10:00 – 10:40 M. Kargiantoulakis, "The Mu2e Experiment at Fermilab"

10:40 – 11:20 M. Yucel, "The Mu2e tracker system"

11:20 – 12:00 A. Edmonds, "Mu2e software tools"

Afternoon Session: Curia II (WH2SW)

14:00 – 14:40 D. Caiulo, "The Mu2e crystal calorimeter"

14:40 – 15:20 Y. Oksuzian "The Mu2e Cosmic Ray Veto"

15:20 – 16:00 G. Pezzullo "The Mu2e Trigger"

### Visits

- meeting point: Wilson Hall atrium
- visitors must wear closed shoes
- visitors will be provided with clean room garments to wear

Friday, August 17, 11:00 – Mu2e tracker development and construction @ Lab3

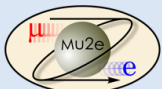
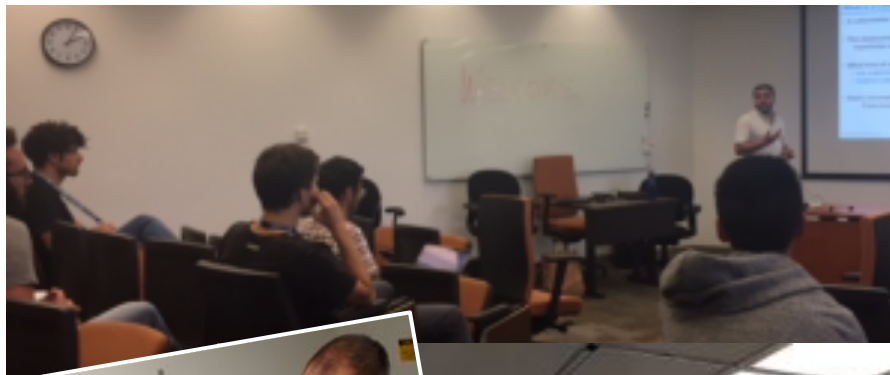
Friday, August 24, 11:00 – Clean room of the Mu2e calorimeter @ SiDet-LabA

2018 Lectures from Summer Students

Co-organized with "Young Mu2e"

Thanks to Manolis and to all the speakers!

Tours of the tracker/calorimeter lab





# Outreach: 2018 events

## International Day of Women and Girls in Science



Tag des offenen Labors

## Masterclasses @ Liverpool University



ERN 2018, University of Tor Vergata

# Secondments: Jan 2016 - Jun 2018

Institution	Scheduled in GA (Months)	Fraction (days)
ADVANSID	1	--
CAEN	2	128%
HZDR	18	29%
INFN	181	76%
LIVERPOOL	44	65%
PRISMA	13	54%
UCL	29	53%
<b>Total</b>	<b>288</b>	<b>70%</b>

- ❖ ADVANSID secondments will not be done
- ❖ CAEN secondments completed

# 2018 Milestones and Deliverables

All deliverables and milestones due in 2016-2017 completed/submitted

Number	WP	Name	Lead Beneficiary	Due date	Status
<b>MS4</b>	<b>3</b>	<b>Mu2e laser assembled</b>	<b>INFN</b>	<b>30 Jun 2018</b>	<b>Completed</b>
MS5	3	Muon g-2 calibration commissioned	UCL	31 Dec 2018	
<b>D2.3</b>	<b>2</b>	<b>Mu2e HPGe design</b>	<b>LIVERPOOL</b>	<b>31 Mar 2018</b>	<b>Submitted</b>
<b>D5.3</b>	<b>5</b>	<b>Masterclasses</b>	<b>LIVERPOOL</b>	<b>30 Apr 2018</b>	<b>Submitted</b>
<b>D4.1</b>	<b>4</b>	<b>Mu2e code</b>	<b>INFN</b>	<b>31 Aug 2018</b>	<b>Submitted</b>
<b>D7.6</b>	<b>7</b>	<b>3<sup>rd</sup> MUSE General Meeting</b>	<b>INFN</b>	<b>30 Sep 2018</b>	<b>Submitted</b>
D6.1	6	Irradiation tests	INFN	31 Nov 2018	
D6.2	6	SiPM characterization	HZDR	31 Dec 2018	Downgraded scope w.r.t. GA
D2.2	2	Production DB	INFN	31 Dec 2018	
D7.2	7	Second Progress Report	INFN	31 Dec 2018	



# Conclusions

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- x Third year of the project almost completed
- x MUSE activities are progressing very well:
  - ↗ several achievements on the scientific side
  - ↗ a large fraction of the planned secondments done
  - ↗ deliverables and milestones completed in due time
  - ↗ several irradiation campaigns performed, new planned
  - ↗ very active networking and transfer of knowledge among different institutions
  - ↗ a lot of dissemination and outreach events

A big thank to all MUSE participants for their efforts to achieve all of this