

MUSE Outreach Activities

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General Meeting, 28-30 September 2016, Pisa

MUSE WP5 - Dissemination and outreach

The objective of WP5 is to promote communication between the MUSE scientific community and the general public in order to increase science awareness and to inspire the next generation of scientists. This WP also works to ensure the results of the MUSE collaboration are disseminated via participation in professional conferences and publication in professional journals.

Tasks and Deliverables

Tasks

Task 5.1: MUSE Workshop day (ALL) At the same time as the MUSE annual general meeting, we will organize a one-day workshop. The target of the seminars and lectures given by the MUSE researchers will be university students in physics, engineering and computing science and, possibly, technical high school students at the last year. MUSE laboratories will be open for demonstrations.

Task 5.2: MUSE Open day (INFN, HZDR) The MUSE partners already take part in the "European Researchers Night" and "Night of Science". To coincide with this event, all the MUSE laboratories at INFN and HZDR will be open to the general public to show and discuss the results of our research. We will prepare posters and brief interactive simulations on the computer.

Task 5.3: Annual Physics Meeting at LNF (INFN) The target of this three-day event is high school teachers and the goal is to give information on the recent advancements in the field of sub-nuclear and nuclear physics and detector developments. A special effort will be made to prepare experiments which involve the new detector components developed by the MUSE project.

Task 5.4: Coordination of UK outreach activities (UCL, LIV) Liverpool and UCL MUSE collaborators organize "masterclasses" for high-school students, with tour of the laboratory facilities and hands-on measurement using prototypes of the g-2 straw trackers, exhibits for the annual Royal Society Show and Big Bang Fair, dedicated work-experience placements for high-school students on detector development and high-level software.

Task 5.5: Summer School at Fermi National Accelerator Laboratory (ALL) The MUSE researchers seconded at FNAL will organize a three-day training on the MUSE research activities for all the students of the FNAL European Master Degree, organized by INFN and the University of Pisa. We will make an effort to give the students the opportunity to meet CAEN and PRISMA researchers and discuss the prospects of working on research and development in European private companies.

Task 5.6: Outreach web site (ALL) We will develop a public section of the web site with a detailed description of the MUSE project and with all the information for the general public. This work package foresees one secondment for each year, to coordinate the activities connected to the Summer School at FNAL.

Deliverables

D5.1 : MUSE @ HZDR open day [month 9] MUSE laboratories opened to the general public

D5.2 : Annual Physics Meetings [month 22] Experiments prepared for the LNF three-day event for high school teachers

D5.3 : Masterclasses [month 28] Masterclasses for high-school students, with tour of the laboratory facilities and hands-on measurement using prototypes of the g-2 straw trackers

D5.4 : FNAL Summer School [month 44] Three-day training on the MUSE research activities for all the students of the FNAL European Master Degree

Activities

The MUSE web site has been established, <http://muse.lnf.infn.it/>

MUSE HOME THE PROJECT DISSEMINATION OUTREACH PARTNERS ORGANIZATION CONTACTS

Muon Campus in US and Europe contribution

January 1, 2016 - December 31, 2019

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 the 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 M&D, for the search of the yet unobserved conversion of a muon to an electron.

TALKS

A Rare Opportunity - the MUSE experiment at Fermilab

September 30 (9:30 am - 3:35 pm)

Hosted by:

Speaker: G. Gianola (INFN)

[VIEW ALL](#)

OUTREACH

MUSE @ European Researcher's Night

September 30 (18:00 - 20:00)

Hosted by:

[VIEW ALL](#)

MEETINGS

MUSE General Meeting

September 28 - September 30 (18:00 - 19:00)

Facebook

Contribution event

[VIEW ALL](#)

MUSE - Muon Campus in US and Europe contribution

The project has received funding from the European Union's Horizon 2020 programme for research and innovation under the Marie Skłodowska Curie grant agreement. INFN is partially supported by the Italian Ministry of University and Research.

European Commission

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Activities

UK masterclasses, each 7 hours delivered to about 100 students

- February 15, 2016, University College London (UCL)
- February, 2016, Liverpool
- June, 2016, Liverpool

Work-experience placements

- from June to August 2016, with the UCL group, 2 students did work-experience placement activities on the construction of the Gm2 tracker, spending one month in Fermilab
- in June 2016, with the Liverpool group, 4 students did work-experience placement activities on the Gm2 tracker
- in August 2016, with the Liverpool group, 4 students did work-experience placement activities on the Gm2 tracker

Article in the German-language in-house HZDR magazine INSIDER, April 2016

The HZDR collaborators have published an article about MUSE in the German-language in-house HZDR magazine INSIDER, titled "Europäische Detektoren für Myonen-Campus am Fermilab" ("European Detectors for the Muon Campus in Fermilab")

(<https://www.hzdr.de/db/Cms?p0id=46807>)

FORSCHUNG

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EUROPÄISCHE DETEKTOREN FÜR MYONEN-CAMPUS AM FERMILAB

Myonen sind so etwas wie ein zu wohl genährter Zwilling der Elektronen: Sie zählen ebenfalls zu den negativ geladenen Elementarteilchen, haben sogar die gleichen Eigenschaften, sind aber rund 200 Mal schwerer. Zwar sind die kleinen Schwergewichte nur eine von mittlerweile über zwei Dutzend Teilchenarten im Standardmodell der Teilchenphysik, doch sie haben das Potential, das bewährte Modell kräftig ins Wanken zu bringen. Sollte nämlich eine Umwandlung von Myonen zu Elektronen nachgewiesen werden, ohne dass dabei ein weiteres Tochterteilchen entsteht, könnte dies nicht mehr im Standardmodell erklärt werden.

Im neuen EU-Projekt *MUSE - Muon campus in US and Europe* arbeiten deshalb europäische und US-amerikanische Forscher intensiv zusammen, um diese Myonen-Umwandlung zu erforschen. Diese Suche nach „neuer Physik“ erfolgt in der Nähe von Chicago am *Fermi National Accelerator Laboratory* - kurz Fermilab. Mit insgesamt sechs weiteren europäischen Einrichtungen beteiligt sich auch das HZDR an MUSE. Die Experimente am Fermilab ergänzen die europäische Forschung im Bereich der Teilchenphysik. Das Projekt soll Netzwerke für Detektortechnologien in Europa aufbauen und Kooperationen mit den USA stärken. Es läuft über das EU-Programm für Personalaustausch

im Bereich Forschung und Innovation RISE und geht bis Ende 2019.

Für ihren Beitrag zu MUSE erhalten die HZDR-Wissenschaftler um Dr. Anna Ferrari EU-Fördergelder in Höhe von rund 110.000 Euro. Im Fokus steht dabei die Entwicklung und Charakterisierung hochsensibler Detektoren sowie die Auswertung der gewonnenen Daten. Am ELBE-Zentrum für Hochleistungs-Strahlenquellen gibt es dafür ideale Voraussetzungen: Eine starke Neutronenquelle ermöglicht es, die empfindlichen Detektoren auf Langlebigkeit zu testen. Diese Detektoren bestehen aus einem Kristall und einem Halbleiter-Fotodetektor. Sie werden somit nicht von Magnetfeldern beeinflusst und lassen sich sehr gut verkleinern, weshalb auch ein Wissenstransfer in die medizinische Physik angestrebt wird: Bildgebungsverfahren wie die Positronen-Emissions-Tomographie könnten damit verbessert werden.

Parallel zur MUSE-Kooperation zwischen der EU und den USA entsteht mit COMET ein zweites Forschungsprojekt zur Myonen-Elektron-Umwandlung am japanischen Forschungszentrum J-PARC. Durch eine Kooperation mit dem Institut für Kern- und Teilchenphysik der TU Dresden unterstützen auch dieses Projekt Dresdner Forscher. CD

Activities

HZDR Open Day, May 28, 2016, <http://www.hzdr.de/db/Cms?p0id=41069&pNid=2828>

The open day was attended by 3400 visitors. Two posters were presented for MUSE:

- “Das mu2e Experiment am FERMILAB in Chicago” (“The mu2e experiment at FERMILAB in Chicago”)
- “Von der Teilchenphysik zur medizinischen Anwendung” (“From particle physics to medical applications”), showed how research on detector technology for particle physics can improve diagnostic instruments for cancer therapy.

Sensoren für das Mu2e Experiment
 Atomkollidator (SPM) für Mu2e sollen in einem sehr starken Strahlungsfeld...
 Leistung der SPW über der...
 Neutronenfluss am SPW...
 Neutronenfluss am SPW...

Motivation
 Im Rahmen des Standardmodells der Teilchenphysik werden zwei...
 Lediglich für die geladenen Leptonen e, μ und τ werden bis heute keine direkten...
 Es gibt jedoch verschiedene Erweiterungen des Standardmodells, die den Übergang...

Detektoren für die Spitzenforschung
 Jeungen mit sehr seltenen Kernen werden großflächige Detektoren mit einer...
 Detektor mit einer Zellenlänge von ungefähr 1/1000 Nanometern und bildet...
 Detektor mit einer Zellenlänge von ungefähr 1/1000 Nanometern und bildet...
 Detektor mit einer Zellenlänge von ungefähr 1/1000 Nanometern und bildet...

Das Experiment
 Die internationale Mu2e-Kollaboration hat sich...
 Hierzu wird ein 6-Protonenstrahl auf ein...
 Das System besteht aus dem Aluminium- und...
 Die Detektoren werden mittels einer aus einem...

$$R_{\mu/e} = \frac{N(\mu \rightarrow e \gamma)}{N(\mu \rightarrow e \nu \bar{\nu})}$$

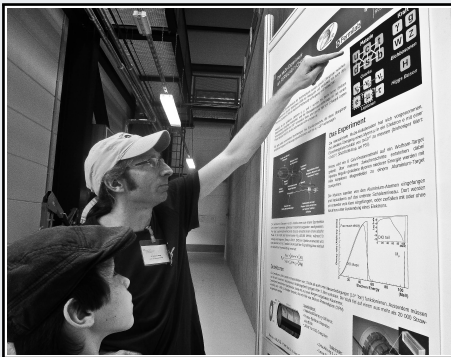
Detektoren
 Die Detektoren sollen speziell in Magnetspulen von 3 Tesla...
 Spezifikationen:
 • Ringdurchmesser ≈ 120 cm
 • Proton-Elektron-Separation...
 • 100% für DHD-Eingänge
 • Zirkularisierung ≈ 0.5 ns
 • Umkreisfrequenz ≈ 1 um
 • Energieauflösung $\approx 1 - 10$



Activities

“Lange Nacht der Wissenschaften”, HZDR, June 10, 2016

HZDR organizes a “Long Night of Science”. HZDR presented its research on particle and astroparticle physics at the “Felsenkeller” location, where currently a low-background laboratory for the study of rare nuclear reactions with a 5 MV pelletron accelerator is under construction. MUSE researchers D. Bemmerer and S. Müller used the occasion to present the two MUSE-posters, and received considerable attention despite the late hour.



Seminars on FNAL Gm2 experiment, for FNAL Summer students, August 2, 2016





“The Muon g-2 Experiment”

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

Tuesday, August 2 – Comitium – Wilson Hall

9:00 - 9:40 C. Polly, “Overview of the Muon g-2 experiment at FNAL”

9:40 - 9:50 questions and discussion

9:50 - 10:30 B. Casey, “The tracker of the Muon g-2 experiment at FNAL”

10:30 - 10:40 questions and discussion

10:40 - 10:55 Break

10:55 - 11:35 J. Kaspar, “The calorimeter of the Muon g-2 experiment at FNAL”

11:35 - 11:45 questions and discussion

11:45 - 14:30 Lunch break

14:30 - 15:00 C. Ferrari, “Calibration of the Muon g-2 calorimeter”

15:00 - 15:10 questions and discussion

Activities

Summer Students tour at the UK MUSE laboratories at FNAL, August 17, 2016

Three groups of 10 students each attended a guided tour of the UK Muon Gm2 UK laboratories at FNAL.




Activities

Posters on MUSE activities at the ICHEP 2016 conference, 3-10 August 2016

- 118. Study of the effect of solenoid field uncertainties on the physics goals of the Mu2e experiment, Federica Bradascio (University of Pisa)
- 1620. The track reconstruction software and performance studies of the Fermilab Muon g-2 straw tracking detectors, Tom Stuttard (UCL)

MUSE Workshop Day (T5.2) at MUSE annual meeting, September 28-30, Pisa



MUSE outreach program for University students

“The High Intensity Frontier at the Fermilab Muon Campus”

30 September 2016

Pisa University, Polo Didattico Fibonacci
Building C – Room 131

Program

14:30 D. Glenzinski (Fermilab)
“A Rare Opportunity - the Mu2e experiment at Fermilab”

15:30 F. Bedeschi (INFN Pisa)
“The Muon g-2 Experiment”

16:30 G. Taddei, I. Naranjo De Candido
“Our experience as Fermilab Summer Students”

Courtesy of F. Happacher

Activities

HZDR activities report (deliverable D5.1) has been prepared

Conclusions

- we are on track with the commitments on Outreach and Dissemination
- thanks for your attention!