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ACTIVITY REPORT 2016

Communication and Outreach

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SIDS - Scientific Information and Documentation Service

Gravitational waves was the fundamental discovery of the year 2016.
Thanks to the measurement made with the twin LIGO interferometers, the LIGO and VIRGO scientific cooperation open up a new window on the universe, directly detecting the gravitational waves produced by the collision of two black holes. The Frascati National Laboratories have played a pioneering role in this type of research, hosting the first generation NAUTILUS experiment that constituted the starting point for the development and construction of modern interferometers.

Most of the 2016 LNF outreach programs are dedicated to this theme: seminars, public lectures, courses for students and teachers both inside LNF and at school were organized for explaining the importance of this last discovery of the international research community.

The events are organized both at the LNF (Visits, Open Day, Public Lectures, European Researchers' Night and special appointments addressed to high school teachers and students such as Incontri di Fisica and Stages) and outside the Laboratories (Seminars at schools, local libraries, etc).

1) **Visits** edu.lnf.infn.it/guided-tours/?lang=en to LNF are a well-established tradition. They consist of a brief historical presentation of the Laboratories and their activities, on site and abroad, and of a guided tour of the experimental areas and the open air museum. Visits are organized for both students in their last high school year and pupils (age: 10-14) and they usually last about 3 hours.
In 2016 [edu]kids program hosted about 800 kids.
Not just Italian schools but also schools from all over the world book visits.
During 2016 about 10000 people came in LNF.

2) The **OpenLabs 2016 Segui l’Onda** www.lnf.infn.it/edu/openlabs/2016 consisted of a full day program of guided tours inside the LNF, conferences, public lectures, expositions, scientific videos and a very rich program for kids. Most LNF employees were in action to present their research centre, answer questions and take care of their guests. About 2500 people visited the LNF on Saturday May 14th, 2016.

109 Students of Roman high schools and surroundings helped out the LNF Staff in ensuring the success of the event.

OpenLabs 2016 (INFN-LNF Photo)

4) **Seminars and Public Lectures "Appuntamenti con la scienza"**
http://edu.lnf.infn.it/seminari-divulgativi-2016/ aimed to high school students and the general public were held every month by important personalities of the scientific field at the LNF's Bruno Touschek Auditorium.

Pierre Curie, mio marito: (P. Mattei); Hiroschima e il nostro senso morale (P. Agnoli, Pangea Formazione); Onde gravitazionali (V. Fafone, Univ. Roma Tor Vergata); Il fantasma dell'universto (L. Votano, INFN-LNF); La terra incognita della fisica moderna (C. Curceanu, INFN-LNF).

Upon request, many LNF researches also held lessons in schools and libraries.

In 2016 the Seminars programs involved about 1000 people (schools and general public) from all over Italy.

6) **European Researchers' Night** http://edu.lnf.infn.it/notte-dei-ricercatori-2016

Friday September 30th, from 3 to 9 pm the National Laboratory of Frascati took part in the 2016 European Researchers' Night. Researchers, technicians and LNF staff collaborated at the realization of an all ages events. The program included seminars and activities about Science and its Technologies, with a special focus on the Web, in collaboration with the GARR Consortium, partner of the event.
The LNF hosted a series of public lecture: INFN Highlights: scienza, rete e tecnologia (D. Domenici, INFN-LNF); Curare a distanza per essere più vicini (M. Bartolo, Ospedale San

Giovanni, Roma); 5 Chiacchiere col CERN, in connection with the five control rooms of CERN LHC experiments Alice, Atlas, CMS and LHCb; Distr-Active Works: il dialogo tra arte e scienza in rete, A. Barchiesi (GARR); Dalle stelle a casa nostra: perchè studiare il cosmo aiuta un po' tutti noi M. Razzano (Univ. Pisa).
35 students of Roman high schools and surroundings helped out the LNF Staff in ensuring the success of the event.

The European Researchers' Night hosted about 450 people.

TEACHERS PROGRAMS

7) High school teachers course - **Incontri di Fisica** http://www.lnf.infn.it/edu/incontri/2016/ has been organized since 2001.

200 high school teachers from all over Italy, could attend the XVI edition of a refresher course on Modern Physics. This year the course presented a brand new approach: the 200 teachers who enrolled had the chance to choose among two different paths:
– IDF course 2.0 (e-learning + attendance at LNF)
– IDF course (attendance at LNF)
The goal is to stimulate the teachers' professional training and provide an occasion for interactive and hands-on participation in the latest developments in physics.

The online course includes 6 items: Pedagogy; Didactic Laboratory; Classical Physics Multimedial Laboratory; Physics Laboratory for schools; Modern Physics.

The program proposed in presence at LNF consists of plenary lessons, presentations of INFN-LNF activities, visits to LNF experimental area and discussions. The peculiarity of this course is represented by the group work (15 in 2016 edition) focused on a theoretical lesson followed by hands-on activity or data analysis of a real experiment. This way, teachers have a direct contact with researchers and get to use typical experimental instrumentation employed in contemporary physics.

Teachers, authorized by the Minister of Education, received a certificate of participation. In the case of IDF course 2.0 in blended modality, the University G. Marconi, partner of this event, also 6 university credits were released.
All the programs are published on the LNF web site (lessons, videos, photos).
LNF October 5th -7th, 2016.

Incontri di Fisica 2.0, 2016 - (INFN-LNF Photo)

Incontri di Fisica Moderna (IDFM). http://edu.lnf.infn.it/idfm-incontri-di-fisica-moderna-nei-licei-scientifici-201617/ . The course is a complement to Incontri di Fisica traditional one. It is structured in two modules and concerns Relativity and Quantum Mechanics for a total of 10 lessons. 60 high school teachers attended the course in the afternoons twice a month, from January to May 2016.

STUDENT PROGRAMS

8) **Stages for students – School-work alternation** www.lnf.infn.it/edu/stagelnf have been organized since 2000 for high school students in their last years. Students are selected by their teachers on the basis of their curriculum but, above all, on the basis of their interest and motivation. In direct contact with their tutors students are involved in theoretical lessons and practical operations. They acquire knowledge and understanding of INFN research activities in an interactive modality. At the end of the stage they get a Certificate of Participation.

The LNF offers a number of different stages and events:

- Stage Masterclass is organized in partnership with the IPPOG Masterclasses International Project. It lasts 5 full days. 56 Students follow lessons on modern physics and analyze data from the

CMS and LHCb experiment at CERN.
LNF March 15th – 19th, 2016.

- INSPYRE 2016 International School on Modern PhYsics and Research is open for 70 of the best students in their last year(s) of high school/college, from 8 European countries. It lasts 5 days and it involves lectures on Modern Physics and its applications in our society and activities to be performed in laboratories. The official language is english.
Participants have, as well, the opportunity to visit the main experiments and accelerating facilities of the LNF.
LNF February 16th – 20th, 2016.

- Summer Stages are organized in June, at the end of the school year, and last 10 days. Summer Stages – 120 students - LNF June 6th -17th, 2016. The students, divided in small groups, joined 13 different experimental activities (Quantum Mechanics, Superconductivity, Cosmic Rays, Electronics, Computing, Mechanics, Data Analysis, Theoretical activities, Bio-Nanotechnology, and Graphene, Synchrotron Light and its applications, Communication of Science, Administration).

- Matinées di Scienza. A series of lectures on Modern Physics with a scientific demonstration, are proposed to the last year high school students coming from all over Italy
http://edu.lnf.infn.it/matinees-di-scienza-2016/

Each lesson lasts 3 hours and students receive a certificate of attendance.

Arguments: Meccanica Quantistica, D. Babusci (INFN-LNF); Le Nanotecnologie nel mondo della biologia, S. Bellucci (INFN-LNF); Il mondo superconduttivo D. Di Gioacchino (INFN-LNF); Raggi cosmici: messaggeri dell'Universo (INFN-LNF); Gli acceleratori di particelle: dai microscopi subatomici a strumenti per la medicina, D. Alesini (INFN-LNF); Diagnostica per i Beni Culturali: metodi non distruttivi, A. Gorghinian (INFN-LNF); Circuitiamo? Dietro le quinte delle grandi scoperte della Fisica Moderna, C. Curceanu (INFN-LNF)

From January to May 2016

INSPYRE 2016 students – International School on Modern PhYsics and Resarch (INFN-LNF Photo)

Participation in the stages program has increased over the last 16 years: since 2000, **3070** students attended the stage. As shown in Tab. 1, in the year 2000 LNF hosted only 12 students from one local school, while in the year 2016, **411** students from over 131 different schools all over Italy and from abroad came to Frascati.

Tab. 1

Year	Students	Females	Males	School	INFN Tutors
2000	12	1	11	1	7
2001	14	3	11	1	14
2002	57	15	42	8	50
2003	56	11	45	14	22
2004	114	34	80	21	25
2005	154	42	112	29	56
2006	161	48	113	46	58
2007	163	45	118	51	55
2008	161	47	114	51	63
2009	177	40	137	54	67
2010	166	36	130	60	60

2011	184	61	184	60	70
2012	206	59	147	72	59
2013	288	78	210	90	84
2014	395	144	251	93	86
2015	351	173	178	133	96
2016	411	157	254	131	85

The LNF monitor the success of the various initiatives proposed, mostly through questionnaires (each one specific to the event) and keep track of the progresses using dedicated databases, thanks to whom it is possible to perform simple statistical analysis.

9) **Web page**

An important innovation was the restyling of LNF website which now show new graphics, new contents and insights at http://w3.lnf.infn.it.
The LNF researchers regularly publish contents, both in Italian and English, to explain their experiments and technologies to the general public. A whole section of the website is dedicated to the rich events programs, concerning both scientific research and science dissemination.
Special contents and press materials section is constantly updated, with pictures, videos and useful links.

Tab. 2 - Number of participants to LNF events during 2016

EVENTS (2016)	**PARTICIPANTS**
Visits	3000
OpenLabs	2000
Seminars and Public Lectures (at the LNF and outside)	3900
European Researchers' Night	450
Incontri di Fisica for high school teachers	200
Stages for high school students	411
Matinées di scienza for high school students	800

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