

**PhD in Information Technology and Electrical Engineering**  
Università degli Studi di Napoli Federico II

**PhD Student: Davide Cuneo**

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**Cycle: XXXVIII**

**Training and Research Activities Report**

**Year: First**



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**Tutor: prof. Pasquale Arpaia**



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**Co-Tutor: None**

**Date: December 08, 2023**

# Training and Research Activities Report

PhD in Information Technology and Electrical Engineering

Cycle: XXXVIII

Author: Davide Cuneo

## 1. Information:

- **PhD student:** Davide Cuneo
- **DR number:** 996967
- **Date of birth:** 16-09-1998
- **Master Science degree:** Mechanical Engineering **University:** University of Tuscia
- **Doctoral Cycle:** XXXVIII
- **Scholarship type:** PNRR IRIS Innovative Research Infrastructure on applied Superconductivity
- **Tutor:** Prof. Pasquale Arpaia
- **Co-tutor:** None

## 2. Study and training activities:

Activity	Type <sup>1</sup>	Hours	Credits	Dates	Organizer	Certificate <sup>2</sup>
Towards teleporting quantum images	Seminar	1	0.2	24-01-2023	Domenico Montemurro	Y
NIST on a Chip: bringing precision metrology out of the lab and into the field	Seminar	1	0.2	23-03-2023	INRiM	Y
Multi-robot Control of Heterogeneous Herds	Seminar	1	0.2	16-02-2023	Francesco Bajardi	Y
Discrete De Giorgi Theory: Analysis and Applications	Seminar	1	0.2	23-02-2023	Giacomo Ascione	Y
Printable Thermoelectric devices	Seminar	1	0.2	27-02-2023	INRiM	Y
Research activities	Research		4.0	01-01-2023 / 28-02-2023		
Nuove Frontiere dell'Esplorazione lunare e delle comunicazioni quantistiche via satellite	Seminar	1	0.2	13-03-2023	INRiM	N

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Phenomenology of Planck Scale Physics	Seminar	1	0.2	30-03-2023	Francesco Bajardi	Y
How to publish under the CARE-CRUI agreement	Seminar	1	0.3	05-04-2023	Prof. Nino Grizzuti	Y
Grad-Shafranov equations	Seminar	1	0.2	15-03-2023	Prof. Flavio Crisanti	Y
Workshop in Paestum called "2 <sup>nd</sup> Instrumentation and diagnostic for superconducting magnets	Seminar	15	3	26-04-2023 / 28-04-2023	INFN Istituto Nazionale di Fisica Nucleare	Y
Research activities	Research		4	01-03-2023 / 30-04-2023		
Statistical Data Analysis for Science and Engineering Research	Courses		3		Prof. Roberto Pietrantuono	Y
Lectures for Superconducting Magnets Test stands, Magnet Protections and Diagnostics	Courses		6	30-05-2023 / 12-06-2023	Marta Bajko	Y
Research activities	Research		4	01-05-2023 / 30-06-2023		
Data Uncertainty	Courses		6		Prof. Leopoldo Angrisani	Y
Introduction of Computational Fluid Dynamics	Courses		6		SSM, Prof. Alessandro Veneziani	Y
Research activities	Research		4	01-07-2023 / 30-08-2023		
Ph.D. school Italo Gorini	Courses	20	4	04-09-2023/ 08-09-2023	GME & MMT	Y
Research activities	Research		4			
CERN Accelerator School: Course on "Normal- and Superconducting Magnets"	Course	67	13	19-11-2023 / 02-11-2023	CERN	Y

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<b>Simulation, AI &amp; beyond</b>	<b>Seminar</b>	<b>1</b>	<b>0.2</b>	<b>22-11-2023</b>	<b>CERN</b>	<b>Y</b>
<b>Research activities</b>		<b>4</b>		<b>01-11-2023 / 31-12-2023</b>		

- 1) Courses, Seminar, Doctoral School, Research, Tutorship
- 2) Choose: Y or N

## 2.1. Study and training activities - credits earned

	<b>Courses</b>	<b>Seminars</b>	<b>Research</b>	<b>Tutorship</b>	<b>Total</b>
Bimonth 1	<b>0</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>5</b>
Bimonth 2	<b>0</b>	<b>3.9</b>	<b>4</b>	<b>0</b>	<b>7.9</b>
Bimonth 3	<b>9</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>13</b>
Bimonth 4	<b>12</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>16</b>
Bimonth 5	<b>4</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>8</b>
Bimonth 6	<b>13</b>	<b>0.2</b>	<b>4</b>	<b>0</b>	<b>17.2</b>
<b>Total</b>	<b>38</b>	<b>5</b>	<b>20</b>	<b>0</b>	<b>63</b>
<b>Expected</b>	<b>30 - 70</b>	<b>10 - 30</b>	<b>80 - 140</b>	<b>0 - 4.8</b>	

## 3. Research activity:

Study on applied superconductivity: fundamentals, HTS cables and magnets, diagnostic and monitoring techniques for quench detection on HTS cables and magnets. Literature research to prepare a paper on instrumentation and measurement techniques for superconducting magnets for particle accelerators. A deep study on numerous different quench detection techniques for HTS magnets and cable has been conducted. In particular, fiber optic techniques (continuous and distributed), passive and active acoustic approaches, capacitance monitoring techniques, and magnetic measurement methods. Moreover, critical current measurements techniques have been investigated, in particular V-I characterization of HTS cables using transport and pulsed current methods. Moreover, the student has been involved in a cycle of twenty lectures by CERN in which he enhanced his skills on instrumentation and measurement for superconducting magnets. The student moved at Laboratori Nazionali di Frascati, Istituto Nazionale di Fisica Nucleare (LNF – INFN) to learn different approaches for magnetic measurement for normal and superconducting magnets. In particular he enhanced his own background learning different approaches to measure magnetic field, integrated magnetic field/gradient for normal conducting (electromagnets and permanent) dipoles and quadrupoles. The methods that have been studied are the Single Stretched Wire (SSW), Harmonic coil (rotating coil), Hall probe and Pulsed wire technique. The student had the chance of measuring using the SSW technique and the Hall probe some permanent quadrupoles. Magnetic measurement using the Hall probe test bench to determine the magnetic field of two dipole magnets have also been carried out. Moreover, he participated in an experimental campaign where fiber Bragg gratings (FBGs) were used to determine the strains in an undulator at different locations. He conducted a study to determine the components of a pulsed-wire test bench to be installed in the LNF-INFN magnetic measurement laboratory. Finally, he participated at the two weeks CERN Accelerator School: Course on “Normal- and Superconducting magnets” where he deepened his knowledge on HTS cables and magnets through frontal lessons (43 hours) and hands on sessions (24 hours).

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## 4. Research products:

*None*

## 5. Conferences and seminars attended

1. *2<sup>nd</sup> Instrumentation and diagnostic for superconducting magnets, 2<sup>nd</sup> IDSM, Paestun (NA), 26-04-2023 / 28-04-2023;*
2. *Lectures for Superconducting Magnets Test stands, Magnet Protections and Diagnostics, Streaming cycle of lectures, 30-05-2023 / 12-06-2023*
3. *Ph.D. School Italo Gorini, IGO, Firenze (FI) 04-09-2023 / 08-09-2023;*
4. *CERN Accelerator School: Course on Normal- and Superconducting Magnets, CAS, St.Polten (Austria), 19-11-2023 / 02-12-2023.*

## 6. Activity abroad:

*None*

## 7. Tutorship

*None*