

Open Day Imprese – Laboratori Nazionali di Frascati

Studio di resistenza alle radiazioni di componenti elettronici per applicazioni in aerospazio G. Cucinella - IMT srl

15/06/2017



IMT at glance

IMT, over 20 employers

IMT

Main Activities

System Engineering

Parts Engineering

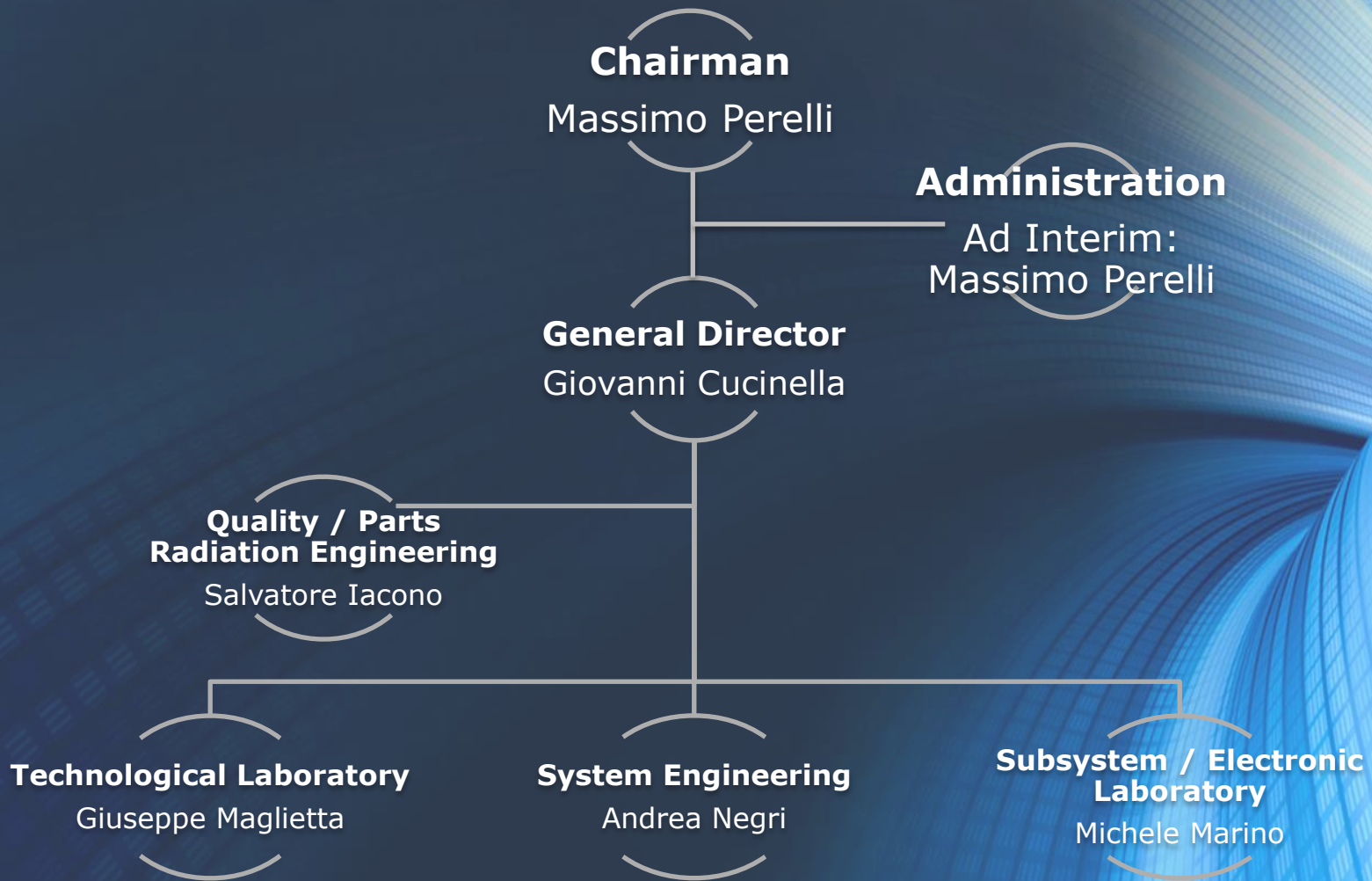
System Engineering

- Employers: 12
- Main location: Rome
- Capabilities:
 - Cubesat Platform
 - Cubesat Subsystems
 - SmallSat subsystems
 - Mission and System Design

Parts Engineering

- Employers: 8
- Main location: Valenzano / Rome
- Capabilities:
 - DPA - Destructive Physical Analysis
 - Radiation Test – TID / DD / SEE
 - Re-life, Electrical Tests
 - Others (see our website)

Company Organization



IMT's Main Customers



IMT Plants



Roma

Valenzano (BA)



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Radiation Tests

Devices used on spacecraft are subjected to cosmic radiation depending on orbit and mission duration. The absorbed radiation can cause damages that, in most cases, can be as catastrophic.

To simulate the effect of radiation on EEE parts (in particular on semiconductor, more sensible), Laboratory test are performed by using:

- ^{60}Co sources to study ionizing radiation effects
- Particle accelerators to study cosmic electrons, protons and heavy ions effects

Radiation Tests

- In the frame of the activity of Characterisation and Testing of EEE (Electrical, Electronic, Electro-Mechanical) parts for Space applications., IMT is involved also in Radiation Tests (TID, SEE, Displacement Damage) performed for many Customers in Italy, Europe and Far East, too.
- So far, several hundreds of Radiation tests have been performed

Radiation Tests

The impact of radiation effects is growing more critical with the advent of newer technologies in space. The effects which are important to consider for spacecraft design fall into two categories:

- long term effects expressed in the:
 - **Total Ionizing Dose (TID) - ^{60}Co**
 - **Displacement Damage Dose (DDD) – Neutrons and Protons**
- and the short term effects expressed in:
 - **Single Event Effects (SEEs) – Heavy Ions, Protons and High Energy Electrons**

Radiation Facilities for Protons testing

- ❑ INFN – Laboratori Nazionali del Sud (LNS) – Catania - <http://www.lns.infn.it/>
- ❑ Paul Scherrer Institute, Switzerland - <http://pif.web.psi.ch/>
- ❑ CYCLONE 110, Universite catholique de Louvain, Louvain-la-Neuve, Belgium - www.cyc.ucl.ac.be

Radiation Facilities for Neutrons testing

- ❑ TAPIRO – ENEA Casaccia (currently out of service)
- ❑ INFN - Laboratori Nazionali di Frascati (LNF) – in the near future
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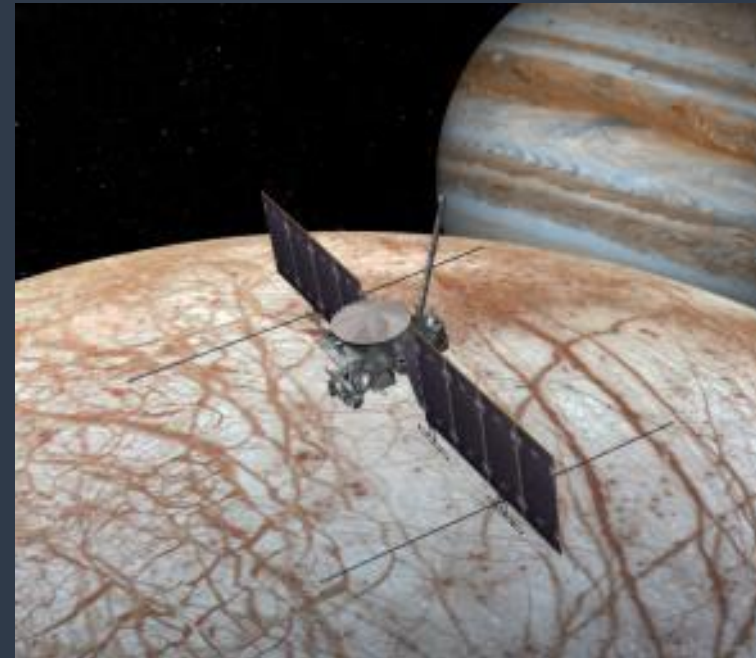
Radiation Facilities for Heavy Ions testing

- ❑ INFN – Laboratori Nazionali del Sud (LNS) – Catania - <http://www.lns.infn.it/>
- ❑ RADEF (Finland) - Accelerator Laboratory at the University of Jyväskylä - www.jyu.fi/fysiikka/en/research/accelerator/radef
- ❑ CYCLONE 110 , Universite catholique de Louvain, Louvain-la-Neuve, Belgium - www.cyc.ucl.ac.be
- ❑ TAMU - Texas A&M University Cyclotron Institute - <https://cyclotron.tamu.edu/>

Radiation Facilities for Electrons

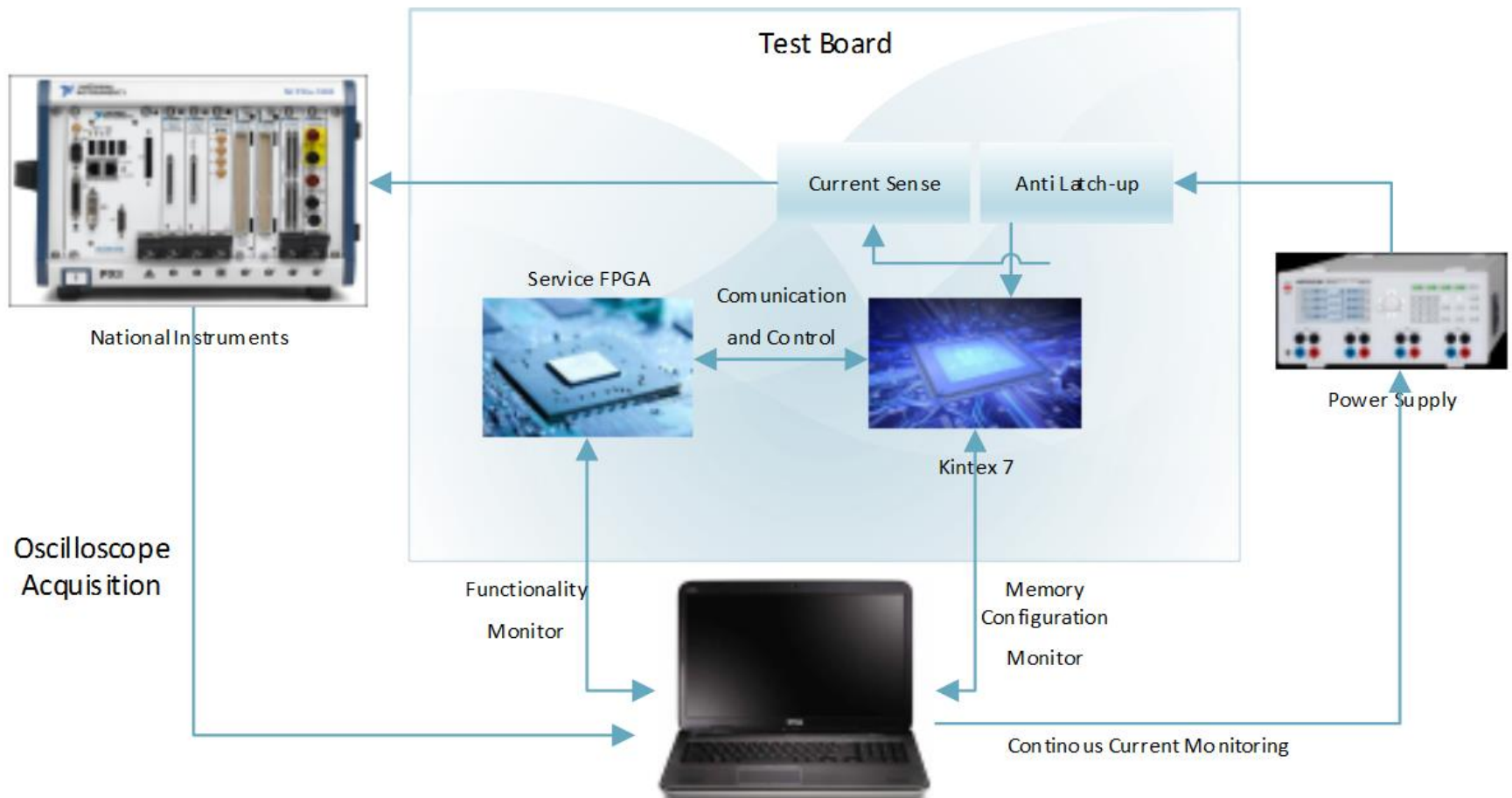
□ INFN - Laboratori Nazionali di Frascati (LNF) –
<http://www.inf.infn.it/acceleratori/btf/>

- Test with electrons is to simulate SEE events due to high energy electrons. This is very important for some space missions like JUICE that is designated to explore the **Jupiter system**.
- During this mission, the spacecraft and its equipment will be exposed to a more severe radiation environment than in the Earth's vicinity. High energy electrons are particularly significant since their energy spectrum, depending on the mission phase, spreads well beyond 100MeV, while the proton spectrum is not as dramatic as it expands up to several 10's MeV.

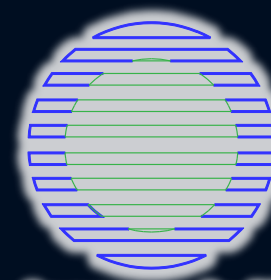


Typical Radiation SEE Test set-up

In general based on National Instruments Technologies



Thank You
for your attention



IMT

Ingegneria Marketing Tecnologia



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