TIFPA

Trento Institute for Fundamentals
Physics and Applications

TIFPA is a joint initiative of the

- **National Institute of Nuclear Physics, INFN** · www.infn.it
- **University of Trento, UNITN** · www.unitn.it
- **Bruno Kessler Foundation, FBK** · www.fbk.eu
- **Trento Province Healthcare Agency, APSS** · www.apss.tn.it

TIFPA

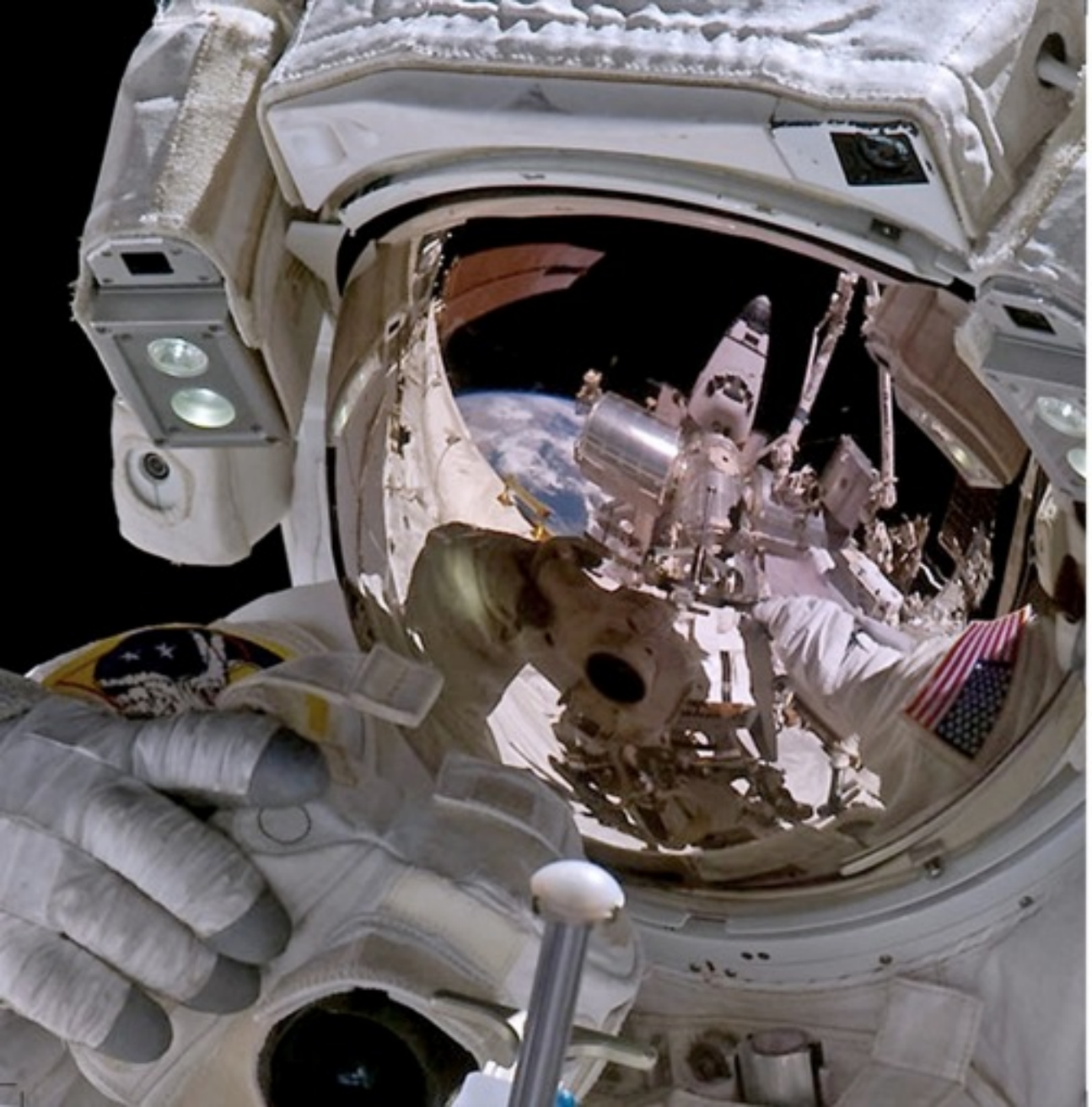
a collaborative center for translational physics research

TIFPA is a Science and Technology National Center for research in fundamental physics and state-of-the-art development of related technologies. It is embedded in the fertile substrate offered by the Trento Province research and technology context, and capitalizes on the collaborations already established across the past 20 years with UNITN and FBK.

TIFPA means:

- **innovation:** synergism among the four partners and collaborations with International partners such as CERN, NASA and ESA
- **scientific excellence:** world-leading physics and interdisciplinary research
- **infrastructures:** ECT* in Villa Tambosi, the FBK Center for Materials and Microsystems in Povo, the APSS protontherapy center and others
- **translational research:** technological transfer, industrial and medical applications.

TIFPA participates in several experiments co-funded by INFN in particle physics (the ATLAS experiment at CERN, which discovered the Higgs boson), space research (e.g. AMS-02 and LISA-Pathfinder), nuclear physics (AEGIS experiment at CERN on anti-hydrogen), theoretical physics (with a unique expertise in ab initio methods to solve the quantum mechanical many-body problem) and applied physics (detectors and medical physics).



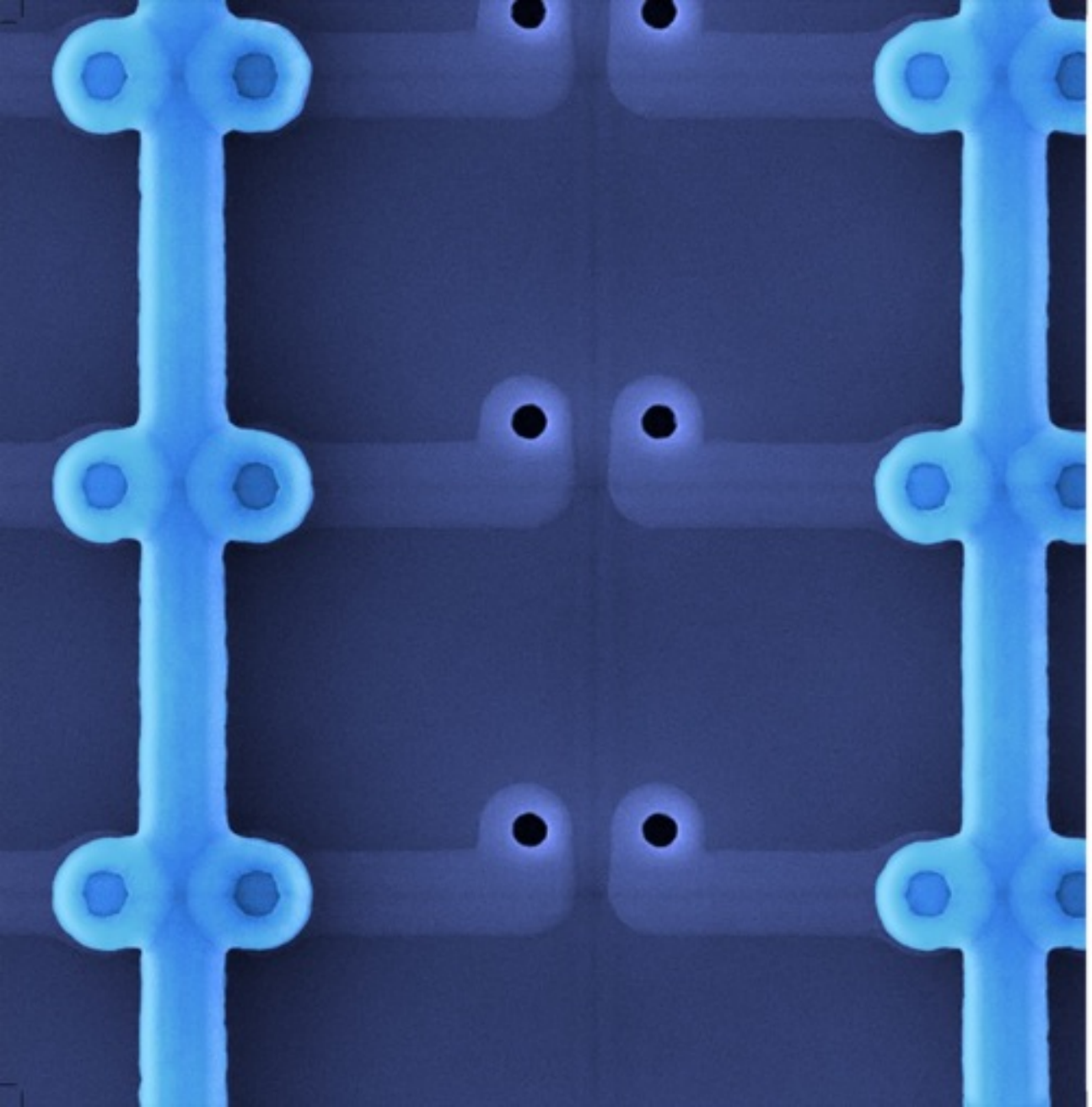
space research

TIFPA collaborates in large experiments to study matter and forces in space. The Alpha Magnetic Spectrometer (AMS-02) is a detector in operation as an external module of the International Space Station. AMS can detect antimatter in space and found hints of the presence of dark matter.
Sophisticated interferometers can detect gravitational waves in space (LISA) and on Earth (VIRGO) and satellite detectors observe particle precipitation from the inner radiation belts to monitor earthquakes on Earth (LIMADOU).
The proton beam used at APSS for treating cancer patients is also a tool to simulate space radiation on ground, and will be used to test shielding materials in spacecraft and cosmic radiation damage to microelectronics.

medical technologies

TIFPA is the research partner in the Trento protontherapy center. Built by IBA, this cutting edge therapy facility, unique in Italy, is treating patients affected by different solid cancers in two rooms equipped with rotating gantries. A third room, with two horizontal beamlines, is totally dedicated to research. Pre-clinical research in proton radiobiology, in collaboration with the Centre for Integrative Biology (CIBIO) of UNITN, will allow a rapid translation of the research results from bench-to-bed. Innovative detectors for in vivo beam monitoring during the treatment, developed in collaboration with FBK and UNITN, will be tested in the research room for applications in the clinical environment. Using a lithium target the beamline will become a source of quasi-monoenergetic fast neutrons, a facility unique in Europe for detector calibration and studies on microelectronics damage in space.

TIFPA people



sensors

TIFPA will benefit from the FBK expertise in silicon-based systems for detection of radiation, and their application in areas ranging from the analysis of biomedical materials to high-energy physics.
New research and development programs cover optimization of silicon photomultipliers for dark matter detection, hybrid detectors for neutrons, graphene-based thermal detectors, sensor integration, rapid thermal processing, Cherenkov detectors, silicon carbide detector technologies, and pixel sensors for tracking applications.

infrastructures

The success of TIFPA depends on the availability of innovative, cutting-edge laboratories and infrastructures. TIFPA can exploit the APSS protontherapy center, with the high-energy proton beam line and the research cave; the clean rooms of the FBK Center for Materials and Microsystems, where sensors are produced with the six inch wafer micro-fabrication facility; the European Centre for Theoretical Studies in Nuclear Physics and Related Areas (ECT*), a European Research Infrastructure and an institutional member of NuPECC, the ESF Associated Nuclear Physics European Collaboration Committee; the slow positron beam at UNITN; the modern biology laboratories at CIBIO; and the new 33 m² class 10,000 (ISO7) clean room in the TIFPA headquarters, including a small 2 m² corner in class 100 (ISO5).

TIFPA organization

• **Director.** The first center director since April 2015 is Prof. Marco Durante, President of the International Association for Radiation Research, a worldwide recognised expert in biophysics of energetic charged particles, with applications in cancer therapy and space radiation protection.

• **Partners Committee (CPR).** This board co-ordinates the collaboration of the partner institutions. CPR is chaired by the center Director and is composed by one representative each from INFN, UNITN, FBK, and APSS.

• **Center Council (CC).** The CC is the center governance and represents approximately 100 INFN associates in Trento. It is composed by the five INFN group coordinators, three representatives of Technological Sectors (virtual laboratories: space, medical, and sensors), representatives of the personnel and of the technical services.

• **Technical-Scientific Committee (CTS).** CTS monitors the implementation of the research programs and their position in the International context, advises the CC in its scientific and technological strategy, and supervises the evaluation of the center.

TIFPA

TIFPA • INFN
c/o Dipartimento di Fisica
Università di Trento
Via Sommarive, 14
38123 Povo (Trento) • Italy

tel: +39 0461 281500
fax: +39 0461 282000

email: info@tifpa.infn.it
www.tifpa.infn.it

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find out more at

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