R&D for SPACE @ TIFPA

PNRR "Space it up", FLEXBOND, XRO, PRIN "Astrotor", PRIN "PHeSCAMI"

10 anni di TIFPA

SPACE IT UP!

Enhancing the space technology of Italy to be used for space exploration and exploitation for the benefit of planet Earth and the entire humankind (PNRR project)

1. ENABLING TECHNOLOGIES FOR NOVEL NEAR-EARTH AND EXPLORATION MISSIONS
2. ADVANCED DESIGN AND ANALYSIS OF SPACE MISSIONS AND SYSTEMS AND INNOVATIVE DIGITALIZATION - SYSTEM ENGINEERING AND DIGITAL TWIN
3. FUTURE IMAGING SYSTEMS FOR MICROWAVE AND OPTICAL REMOTE SENSING
4. NEXT GENERATION DETECTORS OF IONIZING RADIATION AND FIELDS FOR REMOTE SENSING

EARTH OBSERVATION

SYNERGY & PARTNERSHIP - TASKs, OBJECTIVES....

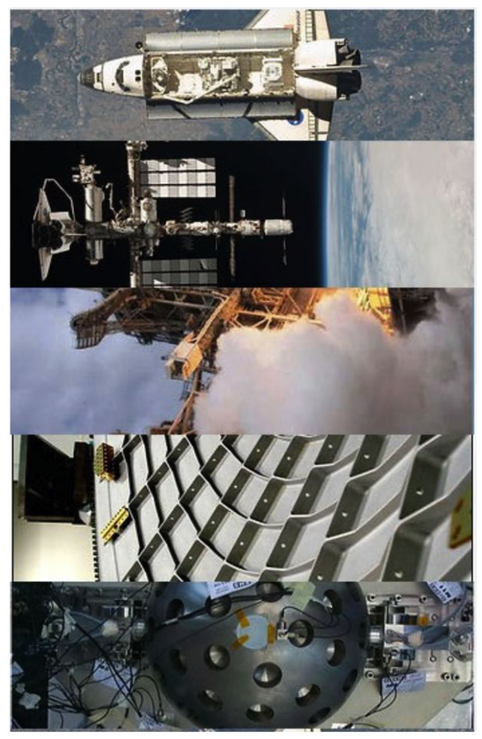
5. PLANETARY PROTECTION AND GEOHAZARDS MITIGATION
6. PROTECTION OF CRITICAL INFRASTRUCTURES AND SPACE WEATHER
7. SPACE FOR THE SUSTAINABLE DEVELOPMENT OF THE PLANET
8. ROBOTIC AND HUMAN EXPLORATION OF EXTRATERRESTRIAL HABITATS, ARCHITECTURES AND INFRASTRUCTURES
9. HABITAT SPACE AND SCIENCE

EXPLORATION

FUNDAMENTAL KNOWLEDGE

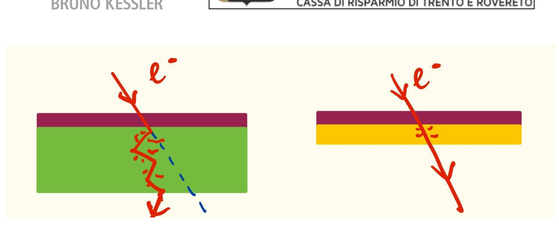
Finanziato dall'Unione europea NextGenerationEU

Italiadomani – PIANO NAZIONALE DI RIPRESA E RESILIENZA

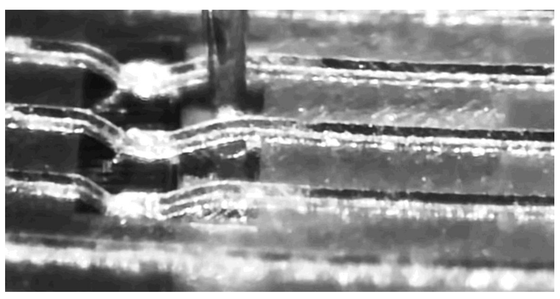


FLEXBOND: FLEXible PCBs with TAB BONDing

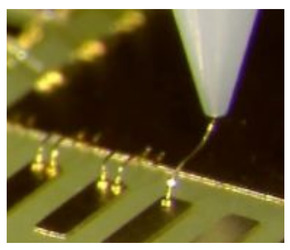
Ultra-lightweight flexible PCBs, first used in projects like ALICE ITS and STAR tracker, offer low-mass solutions with excellent properties. Their adaptability and reliability make them indispensable for space-constrained environments in particle detection. Our study introduces innovative fabrication methods and initial integration results, promising for future experiments.



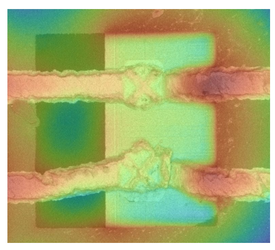
Standard PCB **FLEXBOND**



Minimizing material budget and rendering the PCB highly flexible, conducive to curved chip designs, and adaptable to innovative packaging solutions.



Standard Wire Bonding



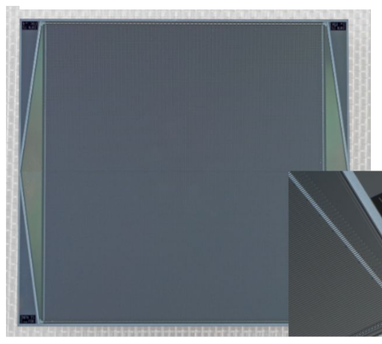
Tape Automated Bonding (TAB)

Enhancing flexibility and adopting area-efficient packaging techniques to mitigate wire-related challenges and strengthen the connection between the package and the chip.

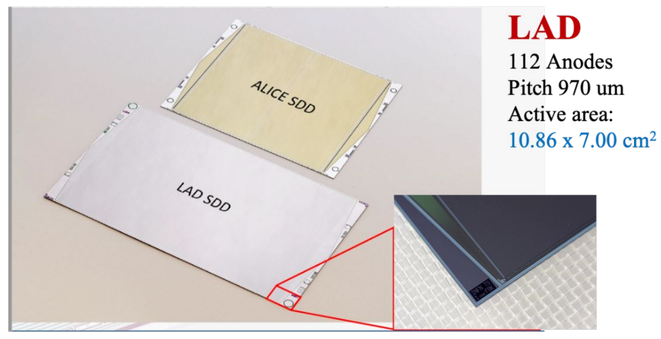
XRO X-RAY OBSERVATORIES

eXTP enhanced X-ray Timing and Polarimetry

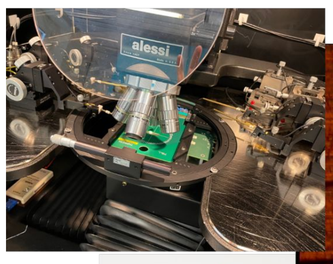
Test and electric characterization of the Silicon Drift Detectors produced by FBK.



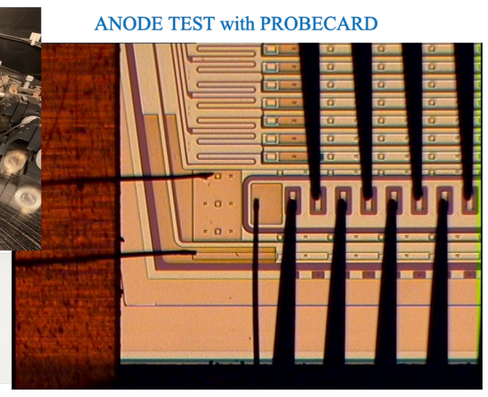
WFM
384 Anode
Pitch169 um
Active area:
6.5 ×7.0 cm²



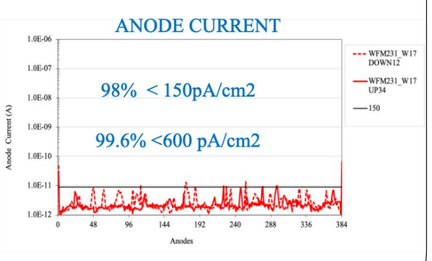
LAD
112 Anodes
Pitch 970 um
Active area:
10.86 x 7.00 cm²



ANODE TEST with PROBECARD



ANODE CURRENT

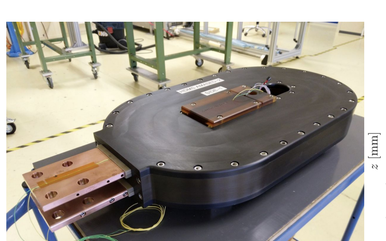


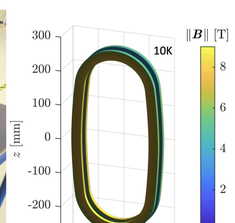
Batch **WFM231** fabricated at FBK in 2023 has excellent yield of WFM sensors.

ASTROTOR

"ASTROparticle TOroidal spectrometer" PRIN2022

The ASTROTOR project aims to demonstrate the possibility to directly measure cosmic antiparticles up to 100 TeV by exploiting **HTS magnets** and the **MAPS technology** in a space spectrometer.



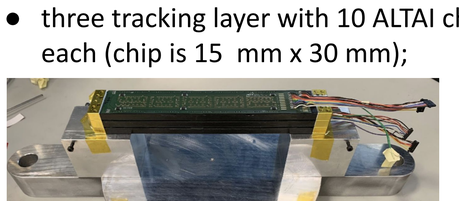


HDMS - AMaSED-2

- Conceptual design of toroidal HTS magnet for a spectrometer in space
- First coil manufactured and operated between 10 -77 K, 3 T @ center

MAPS tracking module

- Qualified for space, on board CSES-02 (HEPD-02)
- three tracking layer with 10 ALTAI chips each (chip is 15 mm x 30 mm);



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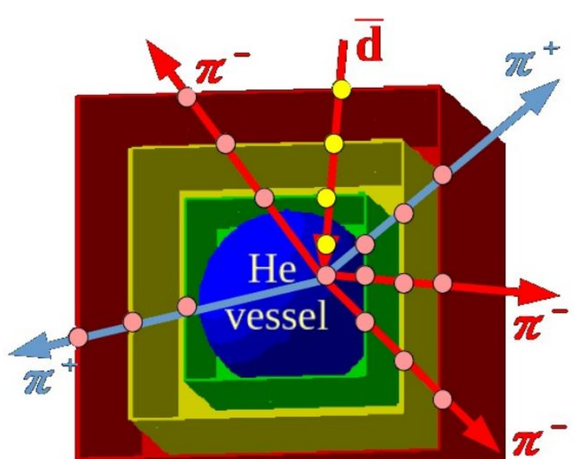
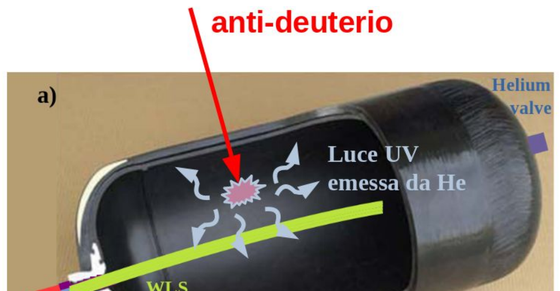
PHeSCAMI "Pressurized Helium Scintillating Calorimeter for AntiMatter Investigation" PRIN2022

Anti-deuteron identification in space is a "smoking gun" for Dark Matter annihilation
Thanks to metastable states (μs-) delayed annihilations are expected in He target
This is a new signature for anti-deuteron search with a circum-antarctic balloon exp.



Development and test of an He pressurized (40L - 300 Bar) scintillating calorimeter. The composite vessel (1.5g/cm² automotive) allows to reach a low (50MeV/n) threshold.



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https://doi.org/10.3390/instruments8010003