

# Curriculum Vitae

## Personal information

First name / Surname	<b>Fabio Fuschino</b>
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Nationality	Italian
Date of birth	29.07.1978
Gender	Male

## Education

March 2008	PhD in Astronomy Thesis title: "The Minicalorimeter of the AGILE satellite from design to in orbit operations" Space Science and Astronomy Department – Faculty of Mathematical, Physical and Natural Science – University of Florence (Italy) Level in international classification (ISCED 2011) 8
March 2004	Master Degree in Astronomy Thesis title: "Focal plane detector development for hard X-ray concentrators" (in Italian) Graduation mark: 109/110 Astronomy Department - Faculty of Mathematical, Physical and Natural Science - University of Bologna (Alma Mater Studiorum) Level in international classification (ISCED 2011) 6

## Prizes

2012	Bruno Rossi Prize The 2012 Rossi Prize has been awarded to Prof. Marco Tavani (the AGILE PI) and the AGILE team for the discovery of gamma-ray flares from the Crab Nebula. Long thought to be a steady source of energy - from optical to gamma rays - this finding has changed the understanding of this very important cosmic object.
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## Work experience

01.08.2017 – 30.11.2018	Short-term Research Scientist (ricercatore a tempo determinato) at INAF/IASF-Bo (now OAS), within “The Pixel Drift Detector – PixDD” project;
01.06.2017 – 30.06.2017	Fellowship (Co.co.co) at C.I.F.S. – Torino, within “Analisi ed eventuale aggiornamento delle calibrazioni di volo della strumentazione a bordo della missione AGILE” project;
01.06.2014 – 31.05.2017	Fellowship (Assegno di Ricerca) at Alma Mater Studiorum DIFA (Department of Physics and Astronomy) cofunded DIFA 33% INAF/IASF-Bo 67%, within “Study of State-of-the-art of nuclear radiation detectors” project;
07.01.2014 – 31.05.2014	Contract for occasional work at C.F.R. – Ferrara within “Sviluppo Software per controllo strumentazione” project, funded by INAF/IASF-Bo;
07.01.2013 – 06.01.2014	Short-term Research Scientist (ricercatore a tempo determinato) at INAF/IASF-Bo, Fiber-SPAD project fellowship within the “Sviluppo di nuove tecnologie per osservazioni dallo spazio” research line;
02.12.2012 – 06.01.2013	Contract for occasional work at C.I.F.S. – Torino within the “Studio dei fenomeni transienti Terrestrial Gamma Flashes TGF scoperti da AGILE” project, funded by INAF/IASF-Bo;
02.08.2011 – 01.12.2012	Short-term Research Scientist (ricercatore a tempo determinato) at INAF/IASF-Bo, AGILE project fellowship within the “Sviluppo di nuove tecnologie per osservazioni dallo spazio” research line;
02.11.2004 – 01.08.2011	Fellowship (Assegno di ricerca) at INAF/IASF-Bo within the project “The Instrument Minicalorimeter (MCAL) of the AGILE mission” founded by ASI-I/R/045/04 and ASI-I/089/06/0,1,2 contracts;

## Positions held

2004 – today	Core Team member of the AGILE (Astro-rivelatore Gamma ad Immagini LEggero) ASI space mission
2004 – today	Design, integration, optimization and test of X and Gamma ray detector prototypes with high spatial, timing and spectroscopic capabilities for on-ground nuclear physics and space-based astrophysical experiments. Details of the experiments/projects, scientific purposes and funding institutions can be found in the “Research Activities – Prototyping Activity/Innovative Architecture” sections
2011 – today	Core Team member of the LOFT (Large Observatory For X-ray Timing) ESA mission (assessment Phase at M3 call)
2015 – today	Core Team member of the e-XTP (X-ray Timing and Polarimetry Mission) in collaboration with CAS and CNSA, China and LOFT-P / STROBE-X in collaboration with NASA, USA
2014 – today	Core Team member of the e-ASTROGAM proposed at M4 and M5 ESA calls
2014 – today	Core Team member of the THESEUS (Transient High Energy Sky and Early Universe Surveyor) ESA mission, selected for assessment Phase at M5 call (in progress)
2016 – today	Core Team member of the HERMES (High Energy Rapid Modular Experiment Scintillator) nano-satellites constellation project
2008 – today	Core Team member of the XDXL (X-ray Drift eXtra Large) and ReDSOX (Research Detectors for Soft X-rays) collaboration funded by INFN CSN 5. Main focus on R&D and realization of SDD sensors
2014 – today	Core Team member of the FLARES (Flexible scintillation Light Apparatus for Rare Event Searches) collaboration funded by INFN CSN 5. Main focus on neutrinoless double Beta decay
2014 – today	Core Team member of the FAMU (Fisica degli Atomi MUonici) collaboration funded by INFN CSN 3. Main focus on the proton Zemach Radius measurement

## Research Activities

### AGILE Project

The MCAL instrument onboard the AGILE satellite was designed, developed, commissioned and is now operated in orbit by a small group of four people to which I belong since the early phase B (design) and through all the other phases of the project (C/D/E). My main tasks inside this group, in strong synergy with the whole AGILE team, concern:

Main Responsibilities:

Experimental Activities:

- In charge of the MCAL Sub-system during data handling functional test to qualify the on-board trigger logic devoted to the transient event detection (LABEN - Milano);
- Responsible during characterization and calibration of flight model individual detector elements of MCAL;
- Responsible of software development and data analysis during AIT/AIV activities (instrument, payload, satellite) of MCAL instrument;

Scientific Activities:

- Responsible of development and maintenance of automatic procedures (with e-mail alert) for preliminary scientific analysis of the MCAL data;
- Responsible of scientific studies concerning correlation of Terrestrial Gamma-ray Flashes (TGFs) detected by MCAL and lightning distribution;
- Responsible for optimization of MCAL on-board configuration during in-orbit operations;
- Responsible for scientific data analysis concerning transient events (GRBs and TGFs) detected by MCAL;

Main Activities:

- Test plan and test procedure definition for MCAL instrument characterization and calibration;
- Characterization and calibration through radioactive sources of the flight model individual detector elements;
- Custom software developing for automatic test procedures;
- Test procedure definition, management and data analysis of MCAL instrument during the payload and satellite Assembly/Integration/ Verification and Test activities (AIV/AIT) in LABEN (now ThalesAleniaSpace) laboratories in Milano and in Carlo Gavazzi Space laboratories in Tortona;
- Characterization and calibration of integrated flight model MCAL instrument at the LABEN – Milano and at INAF/IASF-Bo laboratories;
- Participation in the scientific calibration campaign of the whole integrated flight model AGILE payload through particle beams at INFN test facility in Frascati (LNF-INFN);
- Test procedure definition and data analysis of MCAL instrument during environmental tests;
- Management of MCAL qualification thermal vacuum test at IABG laboratories, Munich;
- Test plan and definition of MCAL instrument procedures during the launch campaign;
- MCAL Sub-system responsible during data handling functional test to qualify the on-board trigger logic devoted to the transient event detection (LABEN - Milano);
- Definition of plan and procedures and management of the MCAL in-orbit commissioning and preliminary on-board configuration at Telespazio, Avezzano;
- Optimization of MCAL on-board configuration during in-orbit operations;
- Software development for in-flight engineering monitoring and engineering data analysis for the MCAL instrument;
- Development and responsibility for automatic procedures (with e-mail alert) for scientific preliminary analysis of the MCAL data;
- Study and development of automatic procedures to reject systematic components in MCAL data to optimize scientific results;
- Study and development of algorithms devoted to the on-ground transient events detection, with particular reference to sub-millisecond events detected by MCAL;
- Scientific studies on Terrestrial Gamma-ray Flashes (TGFs) detected by MCAL and correlation studies with lightning and meteorological data;
- Scientific data analysis of MCAL data, particularly concerning Gamma-ray Bursts (GRBs) and TGFs;

HERMES Project	<p>The HERMES (High Energy Rapid Modular Experiment Scintillator) project is aimed at the construction of a constellation of nanosatellites devoted to transient detection in high energy range (2keV-2MeV). My contribution within INAF/OAS (ex IASF-Bo) team was mainly focused on the activity concerning the study/optimization/realization/integration of the payload unit (10x10x10cm<sup>3</sup>), with special focus on the detector system.</p> <p>Main Responsibilities:</p> <ul style="list-style-type: none"> <li>- HERMES Detector Manager;</li> <li>- Responsible for architecture definition of detector on-board HERMES nanosatellites;</li> <li>- Responsible for requirement specification of integrated (ASICs) readout electronics;</li> <li>- Responsible for requirement specification of silicon sensors (SDD technology);</li> <li>- Responsible for requirement specification of scintillator crystal;</li> <li>- Responsible of SDD passivation and optical coupling;</li> <li>- Responsible for requirement specification of Front-End-Electronics (FEE) board hosting SDDs and readout electronic ICs (Rigid-flex technology);</li> <li>- Responsible for requirement specification of Back-End-Electronics (BEE)</li> <li>- Responsible for requirement specification of Payload Data Handling Unit (PDHU)</li> <li>- Responsible of detector prototype characterization (SDD +Scintillator)</li> </ul> <p>Main Activities:</p> <ul style="list-style-type: none"> <li>- Architecture definition of detector system on board HERMES nanosatellites;</li> <li>- Requirement specification for all elements of the detector system (Silicon sensors, Readout Electronics, FEE-board, etc.);</li> <li>- Requirement specification for Back-End Electronics (BEE), Payload Data Handling Unit (PDHU) and Power System Unit (PSU);</li> <li>- Requirement specification for transient search algorithm (real-time) on-board HERMES nanosatellites;</li> <li>- Identification of Mechanical, Thermal and Electrical interfaces at detector subsystem level and at payload unit level;</li> <li>- Identification and optimization of weight, power and telemetry budgets;</li> <li>- Planning of radiation damage test campaign at TIFPA to characterize Silicon sensors (SDDs) and scintillators (GAGG);</li> <li>- Development and characterization of timing and spectroscopic performances of detector prototype;</li> <li>-</li> </ul>
THESEUS Project	<p>The THESEUS space mission was selected last May for the Assessment Phase study (3 years) during the M5 ESA call. My contribution within INAF/OAS team was mainly focused on the XGIS instrument.</p> <p>Main Responsibilities:</p> <ul style="list-style-type: none"> <li>- Responsible for architecture definition of the XGIS detector plane on-board THESEUS;</li> <li>- Responsible for requirement specification (preliminary) of integrated (ASICs) readout electronics;</li> <li>- Responsible for requirement specification (preliminary) of silicon sensors (SDD technology);</li> <li>- Responsible for requirement specification (preliminary) of scintillator crystal;</li> <li>- Responsible for requirement specification (preliminary) of SDD passivation and optical coupling;</li> <li>- Responsible for requirement specification (preliminary) of Back-End-Electronics (BEE)</li> <li>- Responsible for requirement specification (preliminary) of Payload Data Handling Unit (PDHU)</li> <li>- Responsible of detector prototype characterization (SDD +Scintillator)</li> </ul> <p>Main Activities:</p> <ul style="list-style-type: none"> <li>- Architecture definition of XGIS instrument on board THESEUS space mission;</li> <li>- Preliminary requirement specification for all elements of the detector system (Silicon sensors, Readout Electronics, FEE-board, etc.);</li> <li>- Preliminary requirement specification for Back-End Electronics (BEE), Payload Data Handling Unit (PDHU) and Power System Unit;</li> <li>- Preliminary requirement specification for transient search algorithm (real-time) with XGIS instrument on-board THESEUS;</li> <li>- Preliminary identification and optimization of weight, power and telemetry budgets;</li> <li>- Responsibility of development/integration/characterization of timing and spectroscopic performances of XGIS detection plane prototype;</li> </ul>

LOFT Project  
(e-XTP, STROBE-X)

The LOFT space mission was selected for the Assessment Phase study (3 years) during the M3 ESA call. LOFT was not selected for ESA M3 launch opportunity, but the development of instruments on-board LOFT (LAD and WFM) are still under study with China (e-XTP) and USA (LOFT-P and STROBE-X). My contribution within INAF/IASF-Bo team was mainly focused on the experimental activity concerning the integration of the multichannel low noise and low power consumption Front-End Electronic (FEE) with the Large Area SDD, and its full characterization.

**Main Responsibilities:**

- Supervision of requirements specification and design of the hybrid circuit board hosting a large area SDD and multichannel ASICs;
- Responsible for requirement specification of hybrid board Test Equipment;
- Responsible of full characterization of stand-alone ASICs prototypes;
- Responsible of full characterization of large area SDD coupled with multichannel Front-End Electronics;

**Main Activities:**

- Definition of technical requirement specification of both Silicon detector and readout electronics;
- Basic sub-systems requirement specification;
- Studies and optimization of the detector prototypes (SDD technology);
- Functional tests and full calibration of the large area SDD;
- Requirement specification of interfaces between hybrid board and Test Equipment;
- Requirement specification of whole integrated hybrid board Test Equipment;
- Studies and optimization of the low noise and low power integrated readout electronics (ASIC);
- Functional tests on different ASICs prototypes;
- Requirement specification for final integrated readout electronics (ASIC) on board LOFT;
- Requirement specification of the hybrid board for the first prototype integrating SDD and ASICs;
- Functional tests on the hybrid prototype board;
- Integration activity of SDD devices with ASICs;
- Functional tests on the integrated prototype;
- Full characterization of large area SDD coupled with multichannel Front-End Electronics as technology demonstrator for LOFT Phase A activity;

In the framework of X and gamma ray prototyping activities:

Main Responsibilities:

- Responsible of characterization of the optical properties of SDDs through quantum efficiency, reflectance and transmittance measurements (ReDSOX Collaboration);
- Responsible of integration process of SDD and readout electronics (ICs), in collaboration with CNR/IMM-Bologna (ReDSOX Collaboration);
- Responsible of innovative SDD layout definition (e.g. geometries and physical properties), realized by ReDSOX Collaboration, optimizing the scientific performances of prototypes;
- Responsible of full characterization of SDD prototypes allowing a feedback process during design and realization of SDDs (ReDSOX Collaboration);
- Responsible of requirements specification, assembly/integration/verification (AIT/AIV) and characterization of X/gamma rays prototypes (low noise FEE, SDD and/or scintillating crystal) for ground and space based instruments;

Main Activities:

- Study and development of nuclear physics detectors, particularly concerning scintillating crystals coupled with Silicon devices like PIN diodes, Silicon Drift Detectors (SDD), Charge Coupled Device (CCD), Silicon Photo-multiplier (SiPM) and Single Photon Avalanche Diode (SPAD);
- Development of very innovative X and gamma ray detector prototypes with very high spatial and spectroscopic resolution for space based instruments (INAF, ASI, INFN funds);
- Development and characterization of SDD-based detector prototypes with extremely low noise integrated front-end electronics (ASICs);
- Full characterization of SDD prototypes aimed to give feedback contribution for both design and realization process (ReDSOX collaboration);
- Definition of custom SDDs (e.g. geometries, physical characteristics), produced by ReDSOX collaboration, aimed to optimize prototypes scientific performances;
- Optical characterization of SDDs (quantum efficiency, reflectance and transmittance measurements) produced within ReDSOX collaboration;
- Design, optimization and characterization of high energy resolution gamma detectors (SDD coupled with scintillators) operated at cryogenic temperatures (FLARES project);
- Development, optimization and characterization of gamma-ray spectrometers optimized to be operated in extremely high multiplicity environments (FAMU project);
- Coordination of integration process of SDDs and readout electronics (ICs), in collaboration with CNR/IMM-Bologna (ReDSOX Collaboration);
- Extensive experience in the Assembly/integration/test/verification (AIT/AIV) of X/Gamma ray detector prototypes;
- Developing and realization of Test Equipment for X and gamma ray detector prototypes;
- Data analysis of scientific instruments for detecting ionizing radiation, in particular of solid state detectors and scintillator-based systems;
- Extensive experience in characterization of Silicon photodetectors (PIN, SDD, SiPM, SPAD);
- Characterization of X and gamma ray detector prototypes through radioactive sources, X-ray tube, particle beams;
- Extensive experience in the optimization and characterization of scintillating systems (e.g. photodetector passivation, optical coupling, crystal wrapping);

**Instrument architectures definition**

In the framework of X and gamma ray instrument architecture definition:

**Main Responsibilities:**

- Responsible for HERMES detector architecture definition (nanosatellites constellation);
- Responsible for technological demonstrator (i.e. prototype) integration and characterization for HERMES detector prototype;
- Responsible for XGS/XGIS instruments architecture definition on board THESEUS space mission (M4 and M5 ESA calls);
- Responsible for technological demonstrator (i.e. prototype) integration and characterization for XGS/XGIS instrument on board THESEUS space mission;
- Reference person for the architecture definition of a modular calorimeter on board the e-ASTROGAM space mission;
- Responsible for a technological demonstrator (i.e. prototype) integration and characterization for the calorimeter on board e-ASTROGAM space mission;
- Responsible of requirements specification, integration and characterization of X/gamma rays prototypes (low noise FEE, SDD and/or scintillating crystal) for space based instruments on board astrophysical missions;

**Main Activities:**

- Development of very innovative X and gamma ray detector prototypes with very high spatial and spectroscopic resolution for space based instruments (INAF, ASI, INFN funds);
- Characterization of X and gamma ray detector prototypes through radioactive sources, X-ray tube, particle beams;
- Data analysis of scientific instruments for detecting ionizing radiation, in particular of solid state detectors and scintillator-based systems;
- Development and characterization of multichannel Si-based detector prototypes with high time capabilities and very fast trigger logic for Space Astrophysics applications;
- Extensive experience in X and gamma ray detector optimization for satellite use;
- Extensive experience in the definition of innovative architecture and prototype realization/characterization as technological demonstrator for space-based astrophysical missions, proposed to international Space Agencies (see *Founded Projects* and *Proposal Preparation* lists below);

**Employers**

Istituto Nazionale di Astrofisica (INAF) – IASF - Bologna branch office  
c/o Area della Ricerca – CNR  
Via Piero Gobetti 101, 40129 Bologna, Italy

Alma Mater Studiorum – University of Bologna - Department of Physics and Astronomy – DIFA  
viale Berti Pichat 6/2, 40127 - Bologna - Italy

**Trainings**

04-08.04.2005 National School “Rivelatori ed Elettronica per Fisica delle Alte Energie, Astrofisica ed Applicazioni Spaziali”

Istituto Nazionale di Fisica Nucleare – Laboratori Nazionali Legnaro –INFN/LNL

17-20.11.2009 Training course “Rivelatori ed Elettronica per Fisica delle Alte Energie, Astrofisica ed Applicazioni Spaziali”

Istituto Nazionale di Fisica Nucleare – INFN

**Supervising/Teaching**

05.2018

Organizing of high energy laboratories tutorials organized at INAF/IASF-Bo for UniFe master’s degree students under the responsibility of Prof. Filippo Frontera and Dr. Enrico Virgili

02.2018	Advisor during practical training session for scientific data analysis on TGF detected by MCAL, with PhD student (Alessandra Tiberia), under the responsibility of Prof. Stefano Dietrich – CNR-ISAC-Roma
11.2017	Teacher during “lab-X: frontal lessons and tutorial” organized at INAF/IASF-Bo for Astronomy- DIFA master’s degree students under the responsibility of Prof. Cristian Vignali
09.2015 – 12.2016	Advisor for experimental activities and supervisor for Master thesis (second level italian degree) with title “High resolution Gamma-ray detection with LaBr3(Ce) scintillator coupled with Silicon Drift Chamber” by Gabriele Carmelo Gangemi from University of Bologna – DIFA
11.2013	Teacher during an advanced training program (theoretical and experimental activities in lab) organized at INAF/IASF-Bo for a post-graduate student delegation from the Moscow State University under the responsibility of Prof. Anatoly Iyudin (Skobeltsyn Institute for Nuclear Physics)
09.2011 – 03.2012	Advisor for experimental activities and supervisor for bachelor thesis (first level italian degree) with title “Caratterizzazione di un rivelatore di raggi Gamma con matrici di camere al silicio a deriva di carica ed elettronica ad alta integrazione” by Andrea Spadano from University of Ferrara
09.2011 – 03.2012	Advisor for experimental activities and supervisor for bachelor thesis (first level italian degree) with title “X-ray detection with Silicon Drift Detectors (SDDs): system study and optimization” by Enrico Zanazzi from University of Ferrara
<b>Consulting</b>	
2014 – Now	TNX – S.r.l.  Collaboration for integration of commercial X-ray diffractometers; Study of innovative core detection systems to upgrade performances of commercial diffractometers;
2014 – Now	2 Effe Engineering S.r.l.  Consultant for reconditioning, commissioning and startup of RHODOTRON electron beam accelerator (up to 10 MeV) for industrial applications;
<b>Founded Projects</b>	
	My personal contribution to the following projects is to be considered as a factual contribution within a more extended collaboration with responsibilities described in detail above (“Prototyping activity and innovative architecture” section) Most of SDD used in the following projects are produced within the ReDSOX collaboration.
2018-Now	The HERMES (High Energy Rapid Modular Experiment Scintillator) project is aimed at the realization of three additional nanosatellites for high energy transients detection (2 keV – 2 MeV). The Payload unit is of ~1 Kg and ~50 cm <sup>2</sup> effective area, require $\Delta E/E \cong 15\%$ at 30 keV and a temporal resolution of 10/100 ns will be realized coupling fast scintillator (GAGG) with SDDs to ensure requirements satisfactions for nanosatellites applications. This project is funded within the “Horizon 2020 Space” EU call (Kick-off expected next November). PI F. Fiore INAF/OATs
2018-Now	The ADAM (Advanced Detectors for x-ray Astronomy Missions) project is devoted to the development of advanced technology including X/Gamma rays telescopes for space applications. One of the main streams of the project is aimed at the PiXDD sensor and his readout electronic (ASIC), with special focus on the edge-less technology, for both sensor and electronics, and his integration process (ball bonding and flip-chip technologies). This project is funded within the “Progetti premiali” MIUR call (ASI-INAFN-INAF). PI M. Feroci INAF/IAPS



2018-Now	<p>The HERMES (High Energy Rapid Modular Experiment Scintillator) project is aimed at the realization of three nanosatellites for high energy transients detection (2 keV – 2 MeV). The Payload unit is of ~1 Kg and ~50 cm<sup>2</sup> effective area, require <math>\Delta E/E \cong 15\%</math> at 30 keV and a temporal resolution of 10/100 ns will be realized coupling fast scintillator (GAGG) with SDDs to ensure requirements satisfactions for nanosatellites applications. This project is funded within the “Progetti premiali” MIUR call (ASI-INAF-INAF).</p> <p>PI F. Fiore INAF/OATs</p>
2018-Now	<p>The HERMES (High Energy Rapid Modular Experiment Scintillator) project is aimed at the realization of three nanosatellites for high energy transients detection (2 keV – 2 MeV). The Payload unit is of ~1 Kg and ~50 cm<sup>2</sup> effective area, require <math>\Delta E/E \cong 15\%</math> at 30 keV and a temporal resolution of 10/100 ns will be realized coupling fast scintillator (GAGG) with SDDs to ensure requirements satisfactions for nanosatellites applications. This project is funded within the “Progetti premiali” MIUR call.</p> <p>PI F. Fiore INAF/OATs</p>
2016-Now	<p>The PixDD (Pixel Drift Detector) project is aimed at realizing of pixelated focal plane detector for X-ray optics (0.5-10 keV) with nearly Fano-limited energy resolution and pixel size of ~0.3x0.3 mm<sup>2</sup>. The 32x32 pixel detector require a dedicated multichannel low noise and low power ASIC, developed in the context of the PixDD project. The ASIC will be coupled with sensor in a flip-chip configuration and then characterized. This project is funded within the “Progetti di sviluppo tecnologico” ASI call.</p> <p>PI M. Feroci INAF/IAPS</p>
2016-Now	<p>The HERMES (High Energy Rapid Modular Experiment Scintillator) is aimed at the construction of a prototype modular detector for photons in the energy band 2 keV – 30 MeV. The prototype of ~1 Kg and few tens cm<sup>2</sup> area, require <math>\Delta E/E \cong 15\%</math> at 30 keV and a temporal resolution of 10/100 ns will be realized coupling fast scintillator (GAGG) with SDDs to ensure requirements satisfactions for nanosatellites applications. This project is funded within the “Progetti di sviluppo tecnologico” ASI call.</p> <p>PI L. Burderi UniCa</p>
2014-Now	<p>The FLARES (Flexible scintillation Light Apparatus for Rare Event Searches) project is aimed to an innovative detector technology to be applied to rare event searches, in particular to neutrinoless double beta decay experiments. Its novelty is the enhancement and optimization of the collection of the scintillation light emitted by ultra-pure crystals through the use of arrays of high performance SDD coupled with low noise Front-end-electronics, operated close to cryogenic temperature (~100 K). This project is funded within the “Programma INFN CNS 5” call.</p> <p>PI E. Previtali INFN-MIB</p>
2013-Now	<p>The FAMU (Fisica degli Atomi MUonici) project is an experimental program for the precise determination of the Zemach radius <math>r_z</math> of the proton, the only observable parameter that characterizes both its charge and magnetic distributions. The hyperfine splitting of the muonic-hydrogen atom ground state characterization require careful technological choices of the detectors: beam hodoscope, high purity Germanium and Lanthanum Bromide crystals coupled with PMT as X-ray detectors. This project is funded within the “Programma INFN CSN 3” call.</p> <p>PI A. Vacchi INFN-Ts</p>
2014-2017	<p>The XGS (X and Gamma Spectrometer) project is aimed to the realization of a modular prototype composed by CsI(Tl) scintillator bars coupled at both ends to single-cell 25 mm<sup>2</sup> Silicon Drift Detectors, sensitive in the 1 keV-10 MeV energy range. Digital algorithms are used to discriminate between events absorbed in the Silicon layer and absorbed in the scintillator crystal using the consolidated pulse discrimination technics. The final integrated prototype will be characterized in the context of the THESEUS astrophysical mission. This project is funded within the call “Tecno PRIN INAF 2014”</p> <p>PI L. Amati INAF/IASF-Bo</p>

2014-2017	<p>The Pixel Drift Detector (PixDD) project is aimed at realizing a focal plane detector for X-ray optics, operating in the energy range 0.5-10 keV with nearly Fano-limited energy resolution and pixel size smaller than 0.5x0.5 mm<sup>2</sup>. Single channel SIRIO preamplifiers, surrounding the detector, will operate the read-out of the first 16 pixels (4x4) sensor. A complete characterization of the integrated prototype is on going. This project is funded within the call "Tecno PRIN INAF 2014"</p> <p>PI M. Feroci INAF/IAPS</p>
2013-Now	<p>The aim of the ReDSOX project (<i>Research Detectors for Soft X-rays</i>) is to optimize and customize the SDDs design responding to the needs of many applications such as X-ray astrophysics space-based experiments, Advanced Light Sources, environmental monitoring and medical diagnostics, where good energy resolution combined with position resolution and large sensitive area are needed. The activity of the ReDSOX also includes equipping the SDDs with dedicated low power and low noise integrated read-out circuits (ASICs). The "ReDSOX (<i>Research Detectors for Soft X-rays</i>)" project is funded within the "Programma INFN CSN 5" call.</p> <p>PI A. Vacchi INFN-Ts</p>
2014-2015	<p>The project is aimed at the characterization of a coded mask X-ray monitor for astrophysical applications (1-30 keV) based on multichannel low noise ASIC coupled with large area SDD proposed for LOFT mission. This activity was funded within a wider project "Progetto Premiale 2012 - Rivelatori criogenici superconduttivi per astrofisica spaziale" within the ASI/INAF agreement 2014-045-R.O.</p> <p>PI L. Piro INAF/IAPS</p>
2012-2014	<p>This project is aimed to sustain all activities carried out during the Assessment Phase of the LOFT space mission. The experimental activity at INAF/IASF-Bo was focused on the integration of the multichannel low noise and low power consumption Front-End Electronic (FEE) with the Large Area SDD. The integrated FEE (ASICs) coupled with final design of the SDD proposed for LOFT was fully characterised at representative temperature for space operations (~ -20°C) to experimentally demonstrate real performances better than the proposal stage requirements. The project "LOFT mission –Assesment Phase" was funded by the Italian Space Agency as national contribution to the european M3 ESA call.</p> <p>PI M. Feroci INAF/IAPS</p>
2012-2014	<p>The project is aimed at studying and prototyping X and gamma ray detectors with spectroscopic performance higher than the best cryogenic Ge systems but with higher efficiency, faster response, no cooling systems and a mechanical design that would allow to arrange different detectors in a position sensitive array (with 2 or 3D reconstruction). The project "High performance, wide band X/gamma ray detectors for next generation space projects" is funded within the call "Tecno PRIN INAF 2012"</p> <p>PI C. Labanti IASF-Bologna</p>
2012-2014	<p>The PICO project aims at the realization of novel detectors with picoseconds timing accuracy based on Single Photon Avalanche Diodes, for application in new generation Cherenkov telescopes and in active anti-coincidence shields with time-of-flight capabilities. This project is funded within the call "Tecno PRIN INAF 2012"</p> <p>PI M. Marisaldi INAF/IASF-Bo</p>
2011-2012	<p>The project is devoted to the construction of very fast SPAD devices (Single Photon Avalanche Diode) to be coupled to scintillating fibres. This application could be used to realize very large area trackers replacing the current Silicon technology (currently on board the AGILE and Fermi satellites). The project "Single Photon Avalanche Diode (SPAD) per la lettura di fibre scintillanti" is funded within the ASI-INAF n. I/039/09/0 contract.</p> <p>PI P. Maccagnani IMM-CNR-Bologna</p>
2011	<p>This "INAF technology transfer" project is devoted to develop new silicon-based detectors, which are more compact and robust, to be used for X diffractometry, replacing the currently used Position Sensitive Proportional Counters. The project "Rivelatori per diffrattometro-X" is funded within the call "Progetto di trasferimento tecnologico INAF 2010"</p> <p>PI C. Labanti IASF-Bologna</p>

2009	Testing of large area silicon drift detectors (currently used within the tracker of the ALICE experiment at CERN-LHC) to be used as astrophysical X ray detectors. The project is funded within the "Astrofisica delle Alte Energie" ASI-INAF contract. PI E. Costa INAF/IAPS
2008-2012	The X-ray Drift eXtra Large (XDXL) experiment is devoted to the development of innovative detectors for X and gamma rays based on large area SDD devices. The further applications range over the space based astrophysical applications (e.g. all sky monitor, high energy timing experiments, gamma rays telescopes) and medical diagnostics, where the Compton architecture guarantee better performances respect the currently used devices. The Project "XDXL (X-ray Drift eXtra Large)" is funded within the "Programma INFN CSN 5" call. PI A. Vacchi INFN-Ts
2009-2010	Testing of monolithic arrays of Silicon Drift Detector to be used as X ray detectors and simultaneously as photo-detector when coupled with CsI(Tl) and LaBr3(Ce) scintillator crystals, within the project "Architetture Compton ad alte efficienza e basso fondo strumentale basate su tecniche innovative per la rivelazione dei raggi gamma dallo spazio", funded by ASI I/010/09/0 contract; PI C. Labanti IASF-Bologna
2009-2010	Study of a gamma astronomy mission (0.1-50 MeV) based on a Compton Camera telescope. The project "GRIP: GRB Investigation with Polarimetry & Spectroscopy" is funded within the ASI/INAF I/088/06/ WP 15300 contract. PI G. Di Cocco IASF-Bologna
2008-2010	The project is aimed to study an X ray monitor for astrophysical applications, sensitive in the 1-30 keV energy range realized with coded mask and large area Silicon detectors realized with Silicon Drift Chamber technology. The project "Toward a sensitive and efficient All Sky Monitor experiment for X-ray Astronomy missions" is funded within the ASI/INAF I/088/06/ WP 15300 contract. PI M. Feroci IASF-Roma
2006-2007	Testing of photodiodes (PD) realised with Silicon Drift Chamber (SDC) technology coupled to scintillating crystals to build a pixelated detector. The readout electronics was used custom highly integrated circuits deriving from the heritage of PICsIT-INTEGRAL. The project "Rivelatori X e gamma con cristalli scintillatori e fotodiodi a bassissimo rumore di lettura" was funded within the ASI I/066/06/0 contract. PI C. Labanti IASF-Bologna
2006	Studies about technological problems concerning a gamma telescope (50 MeV – 50 GeV) to be installed on the Moon surface. The basic architecture use a tracker realized with scintillating fibres with photo-detectors on both sides and a calorimeter built using the regolite available on the Moon surface. The project was funded within the "PIM (Plastic Imager on the Moon)" call. PI P. Caraveo IASF-Milano

## Proposal Preparation

"Impact of thunderstorms in the atmosphere"  
Submitted to: MIUR-FIRB 2010 call  
P.I.: E. Castelli (ISAC-CNR) – Unit Research Responsible: F. Fuschino (INAF/IASF)

"Spettrometro gamma per monitoraggio ambientale"  
Submitted to: Bando per progetti di trasferimento tecnologico – INAF call 2011  
P.I.: F. Fuschino (INAF/IASF)

"Gamma-ray and energetic particles from thunderclouds and lightning"  
Submitted to: MIUR-FIRB 2013 call  
P.I.: F. Fuschino (INAF/IASF)

"ALEXANDRA - Artificial Lightning Experiment for X-ray AND Runaway electron Avalanche"  
Submitted to: MIUR-SIR 2014 call  
P.I.: F. Fuschino (INAF/IASF)

“Applicazioni spaziali di rivelatori al Silicio”  
 Submitted to: Fondazione CARITRO “Bando per progetti di ricerca scientifica svolti da giovani ricercatori” call (2014)  
 P.I.: F. Fuschino (INAF/IASF)

My personal contribution, in the following proposals, is an active contribution with partial or small responsibility on one or more between:

- instruments architecture definition;
- technical requirement specification;
- instrument/payload/satellite technical 3D design;
- Technological Readiness Level (TRL) definition of scientific instruments;

The PANGEA mission submitted to:  
 ESA Earth Explorer EE9 call (2016)

The e-ASTROGAM mission submitted to:  
 ESA M5 call (2016)  
 ESA M4 call (2014)

The THESEUS mission submitted to:  
 ESA M5 call (2016)  
 ESA M4 call (2014)

The LOFT mission submitted to:  
 ESA M4 call (2014)  
 ESA M3 call (selected for Assessment Phase – Phase A) (2010)

The GRIPS mission submitted to:  
 ESA M3 call (2010)

The GAME mission submitted to  
 ESA Small Mission Call (2012)

The GAMMA-LIGHT mission submitted to  
 ESA Small Mission Call (2012)

The ALADDIN project (ASIC and Large Area Drift Detector  
 for X and Gamma Ray ImagiNg)  
 submitted to FP7-Space call (PI P. Malcovati) (2012)

The ATMO-GAMMA project (Lightning and Terrestrial  
 Gamma-Ray Flashes at the highest energies and their impact)  
 submitted to ERC Advanced Grant (PI M. Tavani) (2011)

The AETHER project (Atmospheric Extreme THunderstorm with  
 Enhanced gamma-Ray)  
 submitted to ISS experiments for Climate Change call (PI M. Tavani) (2011)

The G-FLASH project (study of lightning and Terrestrial Gamma-Ray  
 Flashes at the highest energies)  
 submitted to FP7-Space call (PI M. Tavani) (2011)

The Italian contribution to MIRAX mission (funded by AEB-Brazil)  
 submitted as unsolicited Mission of Opportunity to ASI  
 (Endorsement received by INAF as required by ASI) (2011)

The “PANGEA: High-energy radiation and particles from the earth”  
 submitted as unsolicited technological project to ASI (PI M. Tavani) (2015)

The "FLASH project: high-energy radiation and particles in thunderstorms, lightning, and terrestrial gamma-ray flashes" submitted as unsolicited technological project to ASI (PI M. Tavani) (2013)

The "Fisica atmosferica terrestre con il satellite AGILE e progetto FLASH" submitted as unsolicited technological project to ASI (PI M. Tavani) (2010)

**Languages**

Mother Tongue Italian

		Understanding		Speaking				Writing		
		Listening		Reading		Spoken interaction		Spoken production		
<b>English</b>	C1	Independent User	C2	Proficient user	C1	Independent User	C1	Independent User	C1	Independent User
<b>French</b>	A2	Basic User	A2	Basic User	A2	Basic User	A2	Basic User	A2	Basic User

**Computer skills and competences**

Operating Systems: Windows, Linux, Unix, Mac OS;  
 Applications: Microsoft Office and OpenOffice;  
 Text formatting languages: HTML, Latex;  
 Scientific computing languages: IDL, Matlab, Ruby, Python;  
 Programming languages: C, C++, fortran, bash script, LabView, sql;  
 Libraries: Root CERN, LITRANI;

**Additional information**

Participation in 24 funded technological projects;  
 Author/co-author of 89 scientific publications in peer reviewed international journals;  
 Author/co-author of 60 non-refereed publications and conference proceedings;  
 Author/co-author of 13 technical reports (ten of which were presented to the Italian Space Agency as official deliverables of the AGILE project);  
 Author/co-author of 179 Astronomer's Telegrams (<http://www.astronomerstelegam.org/>);  
 Author/co-author of 81 GCN Circulars ([http://gcn.gsfc.nasa.gov/gcn3\\_archive.html](http://gcn.gsfc.nasa.gov/gcn3_archive.html));  
 Speaker for 11 talks in international conferences;  
 Author/co-author of 29 Posters in International conferences;  
 PI / Co-I of 5 proposal submitted to private or public funding agency;  
 Participation to 18 proposal preparation submitted to national/international space agencies;  
 h-index = 32 (source www.scopus.com - 13.08.2018)

Bologna, August 28, 2018

Fabio Fuschino



Le informazioni contenute nel presente Curriculum vitae et studiorum sono rese sotto la personale responsabilità del sottoscritto ai sensi degli artt. 46 e 47 del D.P.R. 28 Dicembre 2000 n. 445, consapevole della responsabilità penale prevista dall'art. 76 del medesimo D.P.R., per le ipotesi di falsità in atti e dichiarazioni mendaci.

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