Curriculum Vitae

INFORMAZIONI PERSONALI

Nome LEONARDO

Cognome ABBENE

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FORMAZIONE TITOLI

- **CURRENT POSITION**

2020-today Associate Professor, Department of Physics and Chemistry, Emilio Segrè, University of Palermo, Italy.

- **PREVIOUS POSITIONS**

2011 –2020 Assistant Professor, Department of Physics and Chemistry, Emilio Segrè, University of Palermo, Italy.

2008 – 2011 Postdoc Fellow, Department of Physics and Chemistry, Emilio Segrè, University of Palermo, Italy.

2004– 2008 Post-lauream Fellow, Department of Physics and Chemistry, Emilio Segrè, University of Palermo, Italy.

- **EDUCATION**

2008 PhD in Experimental Physics

Science, Department of Physics, University of Bari, Italy, (07th April 2008)

2003 Master in Physics

Science/ Dipartimento di Fisica e Chimica, University of Palermo, Italy.

ATTIVITA' DIDATTICA

- **TEACHING ACTIVITIES**

2021 - today Programme Coordinator of Bachelor of Midwifery, University of Palermo, Italy.

2008 – today Professor – Physics II, Electromagnetism, University of Palermo, Italy.

2013 – today Professor – Ionizing Radiation Detectors, University of Palermo, Italy.

RICERCHE FINANZIATE

- **COORDINATION OF PROJECTS**

- Principal Investigator (P.I.) of the project: "*High-Resolution Digital 3D CZT Drift Strip Detectors for Emerging Applications in Nuclear Medicine*". Call PRIN-2022-PNRR MUR (P2022SE49Y); 2023-2025.

- Principal Investigator (P.I.) of the project: "AVATAR X: Advanced Energy Resolved Semiconductor Scanner for Next Generation X-ray Imaging Systems". PROOF OF CONCEPT MIUR 2019-2021.

- Principal Investigator (P.I.) of the project: "Development of advanced room temperature spectrometers for high flux X-ray colour imaging". PRIN2012 MIUR (2012WM9MEP), 2014-2017.

- **COORDINATION OF RESEARCH UNITS OF PROJECTS**

- 2018-2020: ASI Experiment; 3D-CZT Module for spectroscopic imaging, timing and polarimetry in hard X-/soft gamma-

rays satellite mission (3DCaTM). P.I. Ezio Caroli (IASF/INAF, Bologna). Role: Local Responsible of Research Unit of Palermo.

- 2017-2019: INFN Experiment; High performance 3D Cadmium-Zinc-Tellurium Spectro-imager for X and gamma-ray applications. P.I. Nicoletta Protti (INFN, Pavia). Role: Local Responsible of Research Unit of Palermo.

PROJECTS

-2023-today KAONNIS (KAOn Nuclear/Nuclei Interaction Studies) experiment. INFN-LNF Experiment. Role: Participant.

- 2023-2025. PRIN MUR project. Toward Next-Generation X-ray Imagers: a High Resolution Spectroscopic System with Ultra-High Photon Flux Capabilities. Role: Participant.

- 2020-2022: ESA Experiment; A BAlloon launched Detector for Gamma-rays with 3 dimensional

Resolution (BADG3R). P.I. Ezio Caroli (IASF/INAF, Bologna). Role: Co-investigator

- 2018-2020: ASI Experiment; 3D-CZT Module for spectroscopic imaging, timing and polarimetry in hard X-/soft gamma-rays satellite mission (3DCaTM). P.I. Ezio Caroli (IASF/INAF, Bologna). Role: Local Responsible of Research Unit of Palermo.

- 2017-2019: INFN Experiment; High performance 3D Cadmium-Zinc-Tellurium Spectro-imager for X and gamma-ray applications. P.I. Nicoletta Protti (INFN, Pavia). Role: Local Responsible of Research Unit of Palermo.

-2014-2017: PRIN2012 (MIUR); Development of advanced room temperature spectrometers for high flux X-ray colour imaging. Role: P.I.

-2007-2009: PRIN2007 (MIUR); Crystal growth techniques and spectroscopic optimization on CdTe/CZT detectors. Role: Participant.

-2007-2009: PRIN2007 (INAF); Development of an high efficiency wide band 3D CZT detector prototype for Laue telescope focal plane. Role: Participant.

-2006-2007: BCNanoLab (POR); Laboratory Networks for Cultural Heritage. Role: Participant.

-2004-2005: XPRESS experiment (INFN); development of portable systems (detectors and

electronics) for quality controls in mammography. Role: Participant.

INCARICHI / CONSULENZE

- **COLLABORATION WITH COMPANIES**

- STmicroelectronics

- Xnext

- CAEN

- 2toLab

ASSOCIAZIONI SCIENTIFICHE

-2023/2023. INFN- LNF (Laboratori Nazionali Frascati, Istituto Nazionale di Fisica Nucleare)

-2022/2023. INAF (Istituto Nazionale di Astrofisica).

-2017/2019. INFN (Istituto Nazionale di Fisica Nucleare, Sezione Pavia)

-2017/2018. CNR(Consiglio Nazionale delle Ricerche)

-2004/2006. INFN (Istituto Nazionale di Fisica Nucleare).

-2009/2014. INAF (Istituto Nazionale di Astrofisica).

PUBBLICAZIONE

Key Papers and Books

-Abbene, L., Iniewski, K. Book Title: High-Z Materials for X-ray Detection: Material Properties and Characterization Techniques, 1st ed.; Springer Nature Switzerland AG: Cham, Switzerland, 2023; pp. 1-246.

Abbene, L., et al. Potentialities of high-resolution 3-D CZT drift strip detectors for prompt gamma-ray measurements in BNCT. *Sensors*, **2022**, *22 (4)*, 1502.

-**Abbene, L**., Gerardi, G., Principato, F., Bettelli, M., Seller, P., Veale, M. C., Fox, O., Sawhney, K., Zambelli, N., Benassi, G. & Zappettini, A. Recent advances in the development of high-resolution 3D cadmium–zinc–telluride drift strip detectors. *J. Synchrotron Rad.* **2020**, 27, 1564–1576.

-Abbene L, Principato, F., Gerardi G., Buttacavoli A., Cascio D., Bettelli, M., Sarzi Amade, N., Seller, P., Veale, M.C., Fox O., Sawhney K., Zanettini, S., Tomarchio, E., Zappettini, A. Room-temperature X-ray response of cadmium–zinc–telluride pixel detectors grown by the vertical Bridgman technique. J. Synchrotron Rad. (**2020**) 27, 319-328. ISSN: 1600-5775.

-Abbene L, Gerardi G., Principato, F., Bettelli, M., Seller, P.,Veale, M.C., Fox O., Sawhney K., Zambelli, N., Benassi, G., Zappettini, A. Dual-polarity pulse processing and analysis for charge-loss correction in cadmium–zinc–telluride pixel detectors. J. Synchrotron Rad. (**2018**) 25, 1078-1092. ISSN: 1600-5775.

- Abbene, L., Gerardi, G., Principato, F. Real time digital pulse processing for X-ray and gamma ray semiconductor detectors (**2013**) Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 730, pp. 124-128. DOI: 10.1016/j.nima.2013.04.053.ISSN: 0168-9002.

- Abbene, L., Gerardi, G., Principato, F., Del Sordo, S., Ienzi, R., Raso, G. High-rate x-ray spectroscopy in mammography with a CdTe detector: A digital pulse processing approach (**2010**) Medical Physics, 37 (12), pp. 6147-6156. DOI: 10.1118/1.3512804. ISSN: 0094-2405.

- Del Sordo, S., **Abbene, L.**, Caroli, E., Mancini, A.M., Zappettini, A., Ubertini, P. Progress in the development of CdTe and CdZnTe semiconductor radiation detectors for astrophysical and medical applications (**2009**) Sensors, 9 (5), pp. 3491-3526. DOI: 10.3390/s90503491.ISSN 1424-8220.

- Abbene, L., Del Sordo, S., Fauci, F., Gerardi, G., La Manna, A., Raso, G., Cola, A., Perillo, E., Raulo, A., Gostilo, V., Stumbo, S. Spectroscopic response of a CdZnTe multiple electrode detector (**2007**) Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 583 (2-3), pp. 324-331. DOI: 10.1016/j.nima.2007.09.015. ISSN: 0168-9002.

ATTIVITA' SCIENTIFICHE

Leonardo Abbene received his PhD degree in Experimental Physics, from University of Bari in 2008. Since 2020 he is Associate Professor in Applied Physics in the Department of Physics and Chemistry at University of Palermo. His research activities are mainly focused on the development and characterization of semiconductor radiation detectors (CdTe, CZT) and digital electronics for X-ray and gamma ray spectroscopy and imaging. Dedicated instrumentation has been developed for medical (mammography, computed tomography, BNCT) and astrophysical (focal plane detectors for X-ray telescopes) applications.

Currently he serves as Editor for the following journals:

- Sensors Journal. MDPI, Basel, Switzerland.

- Radiation Journal. MDPI, Basel, Switzerland.

Moreover, he is a referee for the following journals:

- Nature Communications (Springer Nature)

- Nucl. Instrum. Meth. A (Elsevier B.V.)

- Journal of Applied Physics (AIP Publishing LLC)

- Journal of Crystal Growth (Elsevier B.V.)

- Radiation Measurements (Elsevier B.V.)

- British Journal of Radiology (Springer Nature)

- Chinese Optics Letters (The Optical Society)

- Infrared Physics & Technology (Elsevier B.V.)

- Radiation Physics and Chemistry (Elsevier B.V.)

– Sensors (MDPI, Basel, Switzerland)

- Nuclear Science and Techniques (Springer)

- Materials Science in Semiconductor Processing (Elsevier B.V.)

- IEEE Transaction on Nuclear Science (IEEE NPSS)

- Applied Radiation and Isotopes (Elsevier B.V.)

- Review of Scientific Instruments (AIP Publishing LLC)

- IEEE Electron Device Letters (IEEE NPSS)

- Canadian Journal of Physics (Canadian Science Publishing)

– Crystals (MDPI, Basel, Switzerland)

– Journal of Synchrotron Radiation (International Union of Crystallography)

- Journal of the Korean Physical Society (The Korean Physical Society)

Invited Talks

-2019. Oral presentation (As Invited Speaker)

Authors: L. Abbene

Title: “Digital Performance Improvements of Sub-millimetre CZT Pixel Detectors.

Charles University in Prague (Repubblica Ceca), 6 Giugno 2019.

-2018. Oral presentation (As Invited Speaker)

Authors: L. Abbene

Title: “Radiation Detector Development at DiFC of University of Palermo.

CEA-MINATEC Grenoble (Francia), 17 Ottobre 2018.

-2018. Oral presentation (As Invited Speaker)

Authors: L. Abbene

Title: “Digital Semiconductor Systems for High-Rate High-Resolution X-ray Spectroscopy, Dosimetry and Imaging.

ESA-ESTEC NOORDWIJK (Olanda), 7 Giugno 2018.

-2018. Oral presentation (As Invited Speaker)

Authors: L. Abbene

Title: “Digital Semiconductor Systems for High-Rate High-Resolution X-ray Spectroscopy and Imaging.

Politecnico di Milano, 16 Maggio 2018.

-2018. Oral presentation (As Invited Speaker)

Authors: L. Abbene, F. Principato, G. Gerardi, D. Cascio, A. Buttacavoli, G. Benassi, N. Zambelli, M. Bettelli, P. Seller, M. C. Veale and A. Zappettini.

Title: “Charge loss correction in CZT pixel detectors at low and high fluxes: analysis of positive and negative pulses. 2018 IEEE Nuclear Science Symposium and Medical Imaging Conference 25ST SYMPOSIUM ON ROOM-TEMPERATURE SEMICONDUCTOR X-RAY AND GAMMA-RAY DETECTORS 10-16 November 2018, Sydney, Australia.

-2018. Oral presentation (As Invited Speaker)

Authors: L. Abbene,

Title: “Sistemi di rivelazione a semiconduttore per spettroscopia e imaging a raggi X e gamma.

La settimana del Dipartimento di Fisica e Chimica, 2-4 Maggio 2018, Palermo, Italia.

-2016. Oral presentation (As Invited Speaker)

Authors: L. Abbene,

Title: “Sistemi Spettroscopici a Semiconduttore per Energy-Resolved X-ray Imaging in Condizioni di Alto Flusso.

Ciclo Seminari Attività di Ricerca DIFC, 4-18 Aprile 2016, Palermo, Italia.

-2014. Oral presentation (As Invited Speaker)

Authors: L. Abbene, G. Gerardi,

Title: “Digital Techniques for High-Rate High-Resolution Radiation Measurements

1. IEEE Nuclear Science Symposium and Medical Imaging Conference 21ST SYMPOSIUM ON ROOM-TEMPERATURE SEMICONDUCTOR X-RAY AND GAMMA-RAY DETECTORS 8-15 November 2014, Seattle, WA USA.

- 2012. Oral presentation (As Invited Speaker)

Authors: L. Abbene, G. Gerardi, G. Raso

Title: “Digital pulse processing techniques for X-ray and gamma ray semiconductor detectors. CMOSET Emerging Technologies conference 2012 Vancouver, BC, Canada July 18 – 20, 2012.

AMBITI DI RICERCA

- X-ray and gamma ray detectors

- Semiconductor radiation detectors

- CdTe and CdZnTe detectors

- Digital Pulse Processing (DPP) systems

- Medical Applications (Mammography, Computed Tomography, Boron Neutron Capture Therapy)

- Astrophysical Applications (Instrumentation for X-ray telescopes)

- Applications in Nuclear Physics: Kaonic Atom X-ray Spectroscopy