



1222·2022  
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UNIVERSITÀ  
DEGLI STUDI  
DI PADOVA

**PhD course of National Interest in Technologies for  
Fundamental Research in Physics and Astrophysics**

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## Annual report

**Name and surname:** AJAY SHARMA  
**Cycle and a.a.:** XXXIX Cycle  
**Supervisor:** Riccardo Campana, Enrico Virgilli

- **Research activity carried out during the year**

Due to visa issues, I could reach Italy only in June 2024, with a delay of several months.

In addition to becoming acquainted with the general laboratory procedures and its facilities, the first-year research effort was centered around evaluating existing literature and software frameworks for FPGA programming and examining and testing a prototype high-energy detector and its front-end electronics (developed in the framework of the HERMES project), which includes GAGG:Ce scintillator material read out by Silicon Drift Detectors for detection of both X-ray and gamma-ray events using as a front-end electronics a custom-made ASIC (LYRA).

The Xilinx Zynq 7200 platform, an FPGA board, serves as the foundation for the test equipment and manages event acquisition and ASIC configuration. This platform is similar to the one anticipated for the LEM-X ASIC testing activities, which will serve as the primary focus of the PhD study.

We successfully calibrated and tested the LYRA ASIC board after carefully examining each electrical connection. We are currently setting up experimental data collecting and analysis in preparation for the next phase of data gathering, in which we will perform measurements at different temperatures using a climatic chamber to fully characterize the detector system.

The goal is to have a well-tested "training" prototype and procedures by the end of the first year and to begin testing and debugging the LEM-X ASIC test boards.

In the second year, the primary focus will be the debugging and experimental verification phases for the LEM-X ASIC, detector, and test equipment prototypes.



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● **List of attended courses and passed exams**

Course Title	Status
High-Energy Particle Physics Detectors In Space.	Approved
Photodetection: Scintillators and Silicon Photomultipliers.	Need to schedule the exam
Gaseous Detectors for Experimental Particle Physics.	Ongoing
Design of read-out integrated circuits for particle detectors.	Start from 4th November (2nd year)
Programmable System on Chip (SoC) for data acquisition and processing.	Unannounced
Cosmic radiations and radiation hardness assessments.	Unannounced

● **List of attended conferences, workshops and schools, with mention of the presented talks**

N/A

● **List of published papers/proceedings**

N/A

● **Thesis title (even temporary)**

Experimental testing of a new front-end electronics for the LEM-X experiment.

**Date: September 7, 2024**

**Signature:**

*May Sharma*

**Seen, the supervisor**

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