

The Fluorescence Camera of the POEMMA-Balloon with Radio (PBR): Design and Scientific goals.

Thursday, 30 May 2024 09:04 (1 minute)

The POEMMA-Balloon with Radio (PBR) is a proposed payload to fly on a NASA Super Pressure Balloon. It will act as a pathfinder of the Probe Of Extreme Multi-Messenger Astrophysics (POEMMA).

PBR will consist of an innovative hybrid focal surface featuring a Fluorescence Camera (FC, based on Multi-Anode Photomultiplier Tubes (MAPMTs), 1 μ s time resolution) and a Cherenkov Camera (based on SiPMs, 10 ns time resolution), both mounted on the same tiltable frame that can point from nadir up to 12° above the horizon.

The FC's main scientific goal is to observe, for the first time, the fluorescence emission of Extensive Air Showers produced by Ultra-High Energy Cosmic Rays from sub-orbital altitudes. This measurement will validate the detection strategy for future space-based missions, such as POEMMA. As a secondary goal, the FC will perform a search for macroscopic dark matter through slowly evolving showers that will leave a signal similar to (but distinct from) a meteor.

The PBR FC design is based on the technology developed over the last decade within the JEM-EUSO collaboration. The optical system consists of a 1.1 m aperture Schmidt telescope, the focal plane will be made of 4 Photo Detection Modules (PDMs) arranged in a 2x2 configuration. A PDM is the base of the camera of JEM-EUSO detectors, consisting of a 6x6 array of 64-channel MAPMTs, for a total of 2304 pixels per PDM. A custom ASIC will perform single photo electron counting on each pixel as well as charge integration on groups of 8 pixels to measure extremely bright and/or fast signals. The two different data acquisition modes will run in parallel and will have independent dedicated trigger logics.

PBR targets a launch in 2027 as a payload of an ultra-long duration balloon flight with a duration of up to 100 days.

Collaboration

PBR Collaboration

Role of Submitter

I am the presenter

Primary author: BATTISTI, Matteo (APC - CNRS / IN2P3)

Co-authors: OLINTO, Angela (The University of Chicago); Dr OSTERIA, Giuseppe (INFN - Napoli); ESER, Johannes (University of Chicago)

Presenter: BATTISTI, Matteo (APC - CNRS / IN2P3)

Session Classification: Detector Techniques for Cosmology and Astroparticle Physics - Poster session

Track Classification: T1 - Detector Techniques for Cosmology and Astroparticle Physics