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The Terzina Cherenkov telescope onboard the NUSES space mission

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Terzina is a satellite base Cherenkov telescope designed to operate at ˜535 km altitude with sun-synchronous orbit. Its primary goal is to probe the new concept of detecting ultra high energy cosmic rays and neutrinos by observing Cherenkov light from an extensive shower produced in the atmosphere. It is part of the NUSES space mission with a wide scientific program. Also, the mission includes the ZIRE apparatus for flux measurements of electrons, protons, light nuclei with energies spanning from a few to hundreds of MeV's and MeV gamma rays.

The telescope is composed of a spherical primary mirror, a small spherical mirror, a corrector lens, and Photon detection plane. The optical system can fit the tube-like envelope with 394 mm diameter and 350˜mm length. It is inclined by 67.5 deg. with respect to nadir, having an optical axis pointing towards the Earth limb. The photon detector plane is conceived to detect the photons from below and above the limb. It has a rectangular shape with a 2×5 aspect ratio. The camera is composed of 10 SiPM arrays (8 x 8) pixel each and 3 x 3 mmˆ2 pixel size. The telescope have 7 deg. Field-of-View this corresponds to 0.18 deg. per pixel. It can observe the vast volume of the atmosphere with 140 x 360 km in cos-section.

To estimate expected signal we develop full Geant4 based simulation of the Terzina telescope. It takes into account mirror and corrector lens reflectivity and transparency, quantum efficiency and geometry of the photon sensitive camera. We use Emission for Extensive Air Showers Cherenkov Simulation (EASCherSim) as event generator.

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