

IAF EARTH OBSERVATION SYMPOSIUM (B1)
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TOTORO PROJECT: STUDENT MISSION SHOWING FEASIBILITY OF STUDYING EARTH'S
MAGNETOSPHERE ON BOARD A STRATOSPHERIC BALLOON

Abstract

TOTORO (Test Observations Of Transient Objects and RadiO) is a student project that aims to register natural emissions in the Earth's magnetosphere called Auroral Kilometric Radiation (AKR) during a stratospheric balloon flight. AKRs are yet not fully understood phenomenon that is a result of the interaction of the solar wind with the Earth's magnetosphere. Those emissions originate above the ionosphere and are mainly studied by satellites. TOTORO aims to prove that an alternative, much cheaper channel of acquiring scientifically relevant AKR data is possible on board a stratospheric balloon. It will be achieved by the use of a low noise, sensitive system that registers AKR electromagnetic waves despite the attenuation of the ionosphere.

The project is taking part in the 14th cycle of the REXUS/BEXUS programme run by the German Aerospace Centre (DLR) and Swedish National Space Agency (SNSA) with the support of the European Space Agency (ESA). The programme gives students an opportunity to carry out scientific experiments on rockets or stratospheric balloons. TOTORO together with several other student experiments is part of the 33rd BEXUS stratospheric balloon mission. Launch takes place in Kiruna, Sweden in the polar circle - the most active region of the Earth's magneto and ionosphere, which is the best place for AKR investigation.

This paper describes the design of the TOTORO project. The Radio System records electromagnetic waves in the spectrum of 10-1000 kHz, which covers the spectrum of the strongest AKR events. The

system consists of two different acquisition subsystems - one recording the magnetic field, with the use of a ferrite antenna, and the other, recording the electrical field, with the use of an active electrical antenna. The mechanical interfaces allow for flexible placements of shielded electronics components and the ferrite antenna, that ensure the minimal noise picked up by the measuring system. The active electrical antenna is hanging on a string below the gondola. The mechanical structure allows for easy integration with the BEXUS gondola and protects the experiment from harsh environment.

The participation in REXUS/BEXUS programme enables students to familiarize themselves with space project development process. The TOTORO must complete milestones such as PDR, CDR, EAR, etc. At all phases, projects are supervised and must be approved by experts, which creates additional challenges for university students.