

Project Details

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Project Title:

Development of high time resolution sensors for the detection of pulsed electron beams employed to measure electromagnetic fields

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Summary:

Electric fields are important agents of charged particle dynamics and acceleration in space. They influence many ionospheric, magnetospheric and heliospheric plasma processes. Yet, due to the difficulties inherent to classical electric field measurement techniques for spaceborne platforms, electric fields are still not well enough understood. New techniques like electron drift instruments (EDI) have been developed and successfully applied to overcome these shortcomings. More recently, multi-beam electron drift instruments (MEDI) have been proposed and studied to greatly enhance the capabilities of electron drift measurements while simultaneously significantly reducing the resource requirements compared to current EDI technology. We propose to study the sensor component of such a MEDI instrument. In departure from presently used devices, these instruments will use CDMA-style encoded electron beams emitted from spacecraft to determine the ambient electric fields and magnetic field gradients by measuring the travel time of electrons returning to the spacecraft with nanosecond accuracy. The technological requirements for this type of instrument suggest the use of avalanche photodiodes (APD) as detector technology for MEDI. We propose to study the feasibility of using APD sensors for this application. We will describe the technological framework under which their deployment will be possible, address issues relevant to operating under the influence of solar UV photons, and investigate any design requirements resulting from the use of APD sensors for the other components of a MEDI instrument.

Publication References:

no references