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# The RADICALS High Energy Particle Telescope (RADHEPT) Instrument Suite

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The RADiation Impacts on Climate and Atmospheric Loss Satellite (RADICALS) mission will explore the precipitation of high energy electrons and protons from the Van Allen belts into the thermosphere and mesosphere. These high energy electrons and protons are believed to have important impacts on the generation of NOx and HOx free radicals in these regions leading to the catalytic destruction of ozone in the upper stratosphere, ultimately leading to impacts on the Earth's climate all the way to the troposphere due to changes in whole atmosphere energy transfer. Such precipitating energetic particles can also affect the transmission and reflection of radio waves in the ionosphere, with impacts for aircraft operations over the poles. An increased understanding of the mechanisms leading to energetic particle precipitation, particularly during solar storms, and the distribution of particle flux as a function of pitch angle is important in order to fully predict the energy input and therefore the effect of such radiation on these processes. The High Energy Particle Suite of instruments for RADICALS is designed to measure the trapped and precipitating particle distribution functions as a function of pitch angle using a pair of directional telescope detectors based on dE/dx silicon stacks mounted on the spinning RADICALS plaform. This will consist of the high energy RADHEPT-HE instrument, which will measure the electron and proton fluxes in the energy ranges of 0.8 to 4.0 MeV and 7 to 40 MeV respectively, and the low energy RADHEPT-LE instruments, which will measure the electron and proton fluxes in the energy ranges of 0.2 to 1.0 MeV and 2 to 10 MeV respectively. In addition, a faster, omni-directional detector, based on scintillator/SiPM sensors, will be used to measure Micro Burst radiation with a 10 ms time resolution. Two separate sets of instruments will have two look directions, 180 degrees apart, allowing for a complete 360 degree angular scan of particle distribution functions every 15 seconds for a satellite spin rate of once every 30 seconds. The current design and specifications for the instruments will be presented.

## Keyword-1

Electrons

## Keyword-2

Protons

## Keyword-3

Satellite

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