Developing a VLF transmitter for LEO satellites:

Probing Of Plasmasphere and RADiation Belts

- the POPRAD proposal

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Recent advances in the monitoring of the plasmasphere (e.g. the PLASMON FP7-Space project,http://plasmon.elte.hu, Lichtenberger et al., *Space Weather Space Clim.* **3** 2013, A23 DOI: 10.1051/swsc/2013045) http) makes the continuous monitoring of the plasmasphere possible. But this monitoring capability totally depends on natural and sporadic phenomena, preventing systematic monitoring required for operational Space Weather models and forecasts.
The limiting factor in the physics-based models of the radiation belts is not due to inadequacies of the model but rather due to the quality and availability of inputs and drivers.
To overcome of this bottleneck, we proposed a project to develop a VLF transmitter for polar orbiting LEO satellites for a) **systematic** probing of the plasmasphere by transmitting impulses in the range of 1-10kHz that are powerful enough to reach the other hemisphere propagating along the magnetic field lines; b) s**ystematic** probing of energetic electron populations by generating frequency steps in the range of 1-10kHz by pitch-angle scattering the counter-streaming electrons and precipitate them; c) **systematic** probing of the ionosphere by VLF impulses propagating from the LEO satellites downward to the ground. As the wave propagation is strongly affected by the electron density distribution, it allows to map the densities similarly to TEC or even with higher accuracy. This data can complement TEC and ionosonde measurements and can also be used to inprove the ionospheric correction in GNSS data.
The proposal intends to complete the development with a successful launch of the instrument as payload on satellite(s). During the operation of such a satellite, the transmitted impulses is planned to received by the global, ground based Automatic Whistler Detector and Analyzer Network (AWDANet, Lichtenberger et al., *J. Geophys. Res.,* **113**, 2008, A12201, doi:10.1029/2008JA013467) to obtain the lectron densities along the propagation paths of the impulses. The precipitated energetic electrons are

planned to be measured by the very same or by the SEM/MEPED instruments on polar orbiting satellites.