

# **Proposal for ionospheric tomography technique using a new HF radio source**

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Ionospheric tomography has developed near 20 years from a theoretical concept to a powerful experimental method and it has been used successfully to image a wide range of ionospheric structures over altitude-versus-latitude planes. Measurements of the line integral of the electron density along ray paths from ground transmitter to satellite (i.e. TEC) are inverted in a reconstruction algorithm to create an image of the spatial distribution of the density over the region of interest.

Recent ionospheric tomography experiments use VHF/UHF signals transmitted from NNSS or GPS satellite networks. We propose a new signal source using transmission from ground HF radar networks and received by a satellite. HF signals carry rich information about the ionosphere and sensitive to small changes. HF measurements such as: signal amplitude, group delay, DOA and Doppler frequency shift provide *a priori* knowledge for the tomographic image reconstruction. The initial phase problem inherent in the phase or TEC measurement can be eliminated by Faraday rotation measurements and the relative rotations on two adjacent frequencies solves the ambiguity problems at HF frequencies.

We are currently working on the simulations and the transmitter design. A great opportunity to implement this idea will come from the launch of the CASSIOPE, a multi-purpose small satellite that receives HF signals from ground radar facilities, in 2007.