# Range imaging by single pulse FDI - heater induced FAIs observed by SuperDARN and EISCAT

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Dual-frequency FDI (Frequency Domain Interferometer) technique as well as raw IQ time series analysis technique (TMS mode) [1] was successfully applied firstly to SuperDARN observation to improve range and height resolution of meteor echoes [2]. The TMS mode has also been applied to ionospheric studies [3,4]. At the last SuperDARN meeting, more generalized multi-frequency FDI technique with TMS technique was applied firstly to SuperDARN ionospheric observation to resolve structures within each range bin or to image inside each range bin in the range direction, i.e., to perform "range imaging" [5]. This technique is mathematically equivalent to SDI (Spatial Domain Interferometer) technique [e.g., 6] using multiple antennas with multiple receivers to image inside each beam in the azimuth (beam) direction. This time, to improve the temporal resolution of the range imaging technique and to resolve small structures related to FAIs with shorter correlation time, single-pulse (as well as double-pulse) version of TMS/FDI code has been developed and tested while multi-pulse TMS/FDI mode was utilized last time.

Artificial ionospheric FAIs induced by EISCAT Tromso heater facility were observed with EISCAT Tromso UHF radar and CUTLASS SuperDARN radars with this new technique this year. Last time, from single-frequency and multi-pulse TMS heater data combined with multi-pulse and multi-frequnecy FDI/TMS data led us to conclude that there coexist at least 2 or 3 spectral components in FAIs observed within a single range bin and FAIs with shorter correlation time might be created and decayed repeatedly or intermittently in a time scale of a hundred to several hundreds of msec, but it was difficult to see such temporal evolutions from FDI data yet. Single-pulse TMS/FDI observation is an attempt to overcome these difficulties. The first result as well as another difficulty and possible solution related to initial phase determination for FDI analysis will be shown and discussed to contribute to understand physical mechanisms of creation and decay processes of FAIs.

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