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# Deployment of Advanced Digital Ionosonde System (ADIS) for ionospheric and space weather studies at KSKGRL, Prayagraj: Initial Results

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## ABSTRACT

The Ionosonde is a powerful radio system that has many applications in the field of ionosphere, space weather and radio wave communication. It is a crucial tool to identify the causes for the radio communication blackouts. The system has been advanced tremendously over the years and now these systems are very sophisticated, versatile and complex systems that utilize knowledge of many fields like ionosphere, radio wave propagation, advanced signal processing algorithms to extract meaningful scientific information that is buried in the noise.

Advanced Digital Ionosonde System (ADIS) with advanced features like Dual polarization transmission (Tx) and reception (Rx) has been developed under collaborative project between Indian Institute of Geomagnetism (IIG) & Society for Applied Microwaves Electronics Engineering & Research (SAMEER). The system has been recently deployed at KSKGRL, Prayagraj, a regional centre of IIG to investigate Ordinary (O-Mode) and Extra-Ordinary (X-mode) traces in the conventional ionograms. Extraction of altitude profiles of O-Mode traces are useful to investigate the altitude variation of electron density profiles. Prayagraj being located at the transition region between equator and mid latitude, it is envisaged that this system can be used to investigate the role of electric fields vis-à-vis neutral winds. While the system is located beyond Equatorial Ionization Anomaly (EIA) crest, the system can be used to monitor northern crest movements under high electric field conditions such as high solar activity periods and severe space weather conditions. It is a sweep frequency vertically looking radar operating in the range of 0.5-30 MHz. The reflected signals will be identified to characterize the overhead and oblique echoes from ionosphere. The transmitted power is 1 kW (2 nos. of 500 W Transmitters feeding the two crossed delta antennas) with solid state power amplifiers. Four number of orthogonal magnetic loop turnstile antennas are used for receiving the returned echoes. Polarization tagging of the received echoes will be obtained after processing the data by complex FFT and phase of the echo. The following information shall be obtained from this system: ionograms, O and X polarization, angle of arrivals, Doppler velocities, echo intensities, true height and vertical electron density profiles, ionospheric parameters like hmF2, NmF2, MUF and 3D plasma drifts. We will present few initial results in the conference.