

An Interactive Introduction to Incoherent Scatter - Outline

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NB: where possible, interactive concept demonstrations will take place using live radar data from the Millstone Hill MIDAS-W Software Radar system.

- Introduction and general comments
- List of web resources for incoherent scatter radar (ISR)
- Pictures and names of people at this meeting who are ISR experts. Seek them out for questions!
- Radar equation for incoherent scatter (beam filling target)
- Some ISR intuition: Debye length, plasma frequency, frequency range, Thomson scatter mechanism, classical e' cross section.
- Collective plasma behavior and the radar cross section
- Methods of approach: particle and macroscopic
- Deriving incoherent scatter: basic ideas behind the Nyquist fluctuation spectral approach for estimation of ionospheric density power spectrum
- Physical parameter information contained in the spectrum
- Fitting methods: nonlinear least-squares
- How the spectrum / autocorrelation function (ACF) is measured: signal processing steps
- Range/time diagrams and ACF estimation: Selecting the right transmitted waveform
- Special AMISR related topic: auroral zone challenges
 - a) thin layer resolving with long pulse and coded pulse
 - b) effect of range smearing on T_e , T_i
 - c) incorrect fitting due to parameter shears
 - d) spectral distortion (currents, etc.)
- [optional if not covered by J. D. Sahr] Antenna characteristics in ISR practice: steerable arrays and AMISR