

THE MIDAS-MOBILE SOFTWARE RADAR SYSTEM

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Recent advances in software radio technology have laid the basis for the development of software radio systems which can be used to make multi-role radio science observations. Software radio systems for radio science have somewhat different requirements and characteristics from those applied to communications or defense. In particular there is an emphasis on the coherence of the receiving systems (global stability in time and frequency) and a much greater tolerance for latency in the signal processing. These properties lead directly to radio science systems where the coherent voltage level representation of RF energy is transmitted over high speed computer networks and processed using parallel supercomputing techniques. Traditional radio science systems observe the environment using a variety of techniques including active radar, passive radar, scintillation, tomography, interferometric imaging, and spectrum monitoring. Modern software radio systems can implement these techniques in a common framework where the primary differences are in the antennas used and the software chains used for signal processing and data analysis.

At MIT Haystack Observatory we have developed the MIDAS-Mobile system (Millstone Data Acquisition System). MIDAS-M is a software radar platform designed to operate as a flexible multi-role radio science instrument for making observations of the near space environment. Seven MIDAS-M nodes have now been constructed as part of the Intercepted Signals For Ionospheric Science project (ISIS). Testing is ongoing and initial deployment of the ISIS Array will occur over the next year with the primary focus of early experiments being on multistatic active and passive radar observations of the mid-latitude ionosphere. I will discuss the MIDAS-Mobile system design and its place in an overall software radar architecture. I will also show examples of data for a variety of signal types and discuss plans for early experiments involving both coherent and incoherent scatter radar applications.

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