

Introduction to the Special Section on RFI Mitigation for Radio Astronomy

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Abstract:

The papers contained in this special section are extended versions of some of the papers presented at the *Workshop on the Mitigation of Radio Frequency Interference in Radio Astronomy* (“RFI2004”), held in Penticton, BC, Canada in July 2004.

Index terms:

6954 – Radio astronomy

6914 – Electromagnetic noise and interference

6994 – Instruments and Techniques

Radio astronomy has been plagued by man-made radio frequency interference (RFI) since its earliest days. Traditionally, problems with RFI are managed primarily by a strategy of avoidance; that is, by building radio telescopes at locations far from population centers, and observing at frequencies which are less prone to interference. When observations are corrupted by interference anyway, the most common solution is simply to throw away the affected data, and maybe to try again. This has never been a very satisfactory state of affairs, especially taking into account the increasing cost and limited availability of observing time. As sources of interference continue to proliferate, and as the requirements of astronomical observations become increasingly demanding in terms of frequency range and bandwidth, it is becoming clear that the avoidance strategy by itself cannot satisfy the requirements for new telescopes, or even for future observations with existing telescopes.

Fortunately, the same technological advances which fuel the proliferation of interference may also enable technical solutions to mitigation of RFI in radio astronomy. Although work on this topic has been intermittently published in the past, papers representing the current wave of interest in RFI mitigation for radio astronomy began appearing in the late 1990s. Since then, the field of RFI mitigation for radio astronomy has continued to expand and mature. The *Workshop on the Mitigation of Radio Frequency Inteference in Radio Astronomy* (“RFI2004”) was held in Penticton, BC, Canada on July 16-18, 2004 to discuss the evolving RFI problem and to assess the current state of the art in technical methods for RFI mitigation. The workshop was attended by 79 delegates – about four times the number originally expected – who made 31 oral presentations and 4 poster

presentations. Many of these presentations represented significant advances in the field, and 18 of these presentations have been expanded into full, peer-reviewed papers which appear in this special section. All of the presentations, posters, and original informal papers associated with the workshop are available at the workshop website (currently: <http://www.ece.vt.edu/~swe/rfi2004/>). Also included at this web site are papers and presentations representing some authoritative work in the area of spectrum management and regulatory issues which, while closely related to the problem of RFI mitigation technology, are outside the scope of this journal. Readers interested these aspects of RFI mitigation are encouraged to visit the web site.

An important goal of the workshop was outreach; specifically, to encourage the dissemination of technology from the engineers and signal processing theorists to the astronomer/practitioners, and conversely for the later to educate the former on present day “best practices” and requirements for new technology in light of evolving science goals. To this end, two papers may be of particular interest, especially to those unfamiliar with either RFI mitigation technology or radio astronomy. The first is the kick-off paper in this special section by Briggs & Kocz (“Overview of Technical Approaches to RFI Mitigation”), which aims to be a Rosetta Stone, explaining the emerging modern view of RFI mitigation in language that can be understood by both astronomers and engineers. A second paper (S.W. Ellingson, “RFI Mitigation and the SKA”) is a summary of the findings of workshop in the context of the preexisting state-of-the-art, and also in terms of the implications for the Square Kilometer Array (SKA), a next-generation radio telescope that will be about two orders of magnitude more sensitive

than any existing instrument at centimeter wavelengths. This paper appears in a special issue on the SKA in the journal *Experimental Astronomy* (in press).

The following special section of *Radio Science* is presented with the goal of facilitating and inspiring further research in this emerging area of interest. A follow-on workshop is tentatively planned for the summer of 2006.

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