Developments in RFI monitoring and mitigation using ASKAP

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To ensure the sustainability of ground-based radio astronomy amid a constantly evolving radio spectrum – in particular the proliferation of satellite transmitters beyond the protection of geographic radio quiet zones – there is a growing need for more proactive strategies in mitigating Radio Frequency Interference (RFI). The phased array feeds (PAFs) of the Australian SKA Pathfinder (ASKAP) telescope [1] provide unique spatial information about the RFI that can be used to mitigate it [2] by modifying PAF beamformer weights.

This talk presents an overview of recent and current developments toward active RFI mitigation using spatial nulling. Specifically, it considers the selection process of RFI candidates that the ASKAP will most realistically be able to mitigate as well as how regularly the RFI affects ASKAP continuum science observations. The talk is divided into two parts: monitoring and mitigation.

A new observatory led project, "Survey and Monitoring of ASKAP's RFI environment and Trends" (SMART) will be introduced. SMART routinely aggregates flagged data [3]. Based on flagged data from over 1,000 hours of observations the probability of RFI as a function of time-of-day and frequency will be presented. We also show that ASKAP is discarding more data year-on-year for some primary radio service allocations. An additional goal of SMART is to monitor the amount of data recovered by active RFI mitigation techniques.

Mitigation of self-generated interference via spatial nulling has already been presented and realized with ASKAP [4, 5]. One challenge for implementing active projection based RFI mitigation arises from relative motion between the telescope and the interferer. The oblique projector's effectiveness is constrained by how accurately a spatial signature vector (SSV) may be estimated. Based on monitoring data (as described above) and beamforming Array Covariance Matrices (ACM) – the pairwise correlation of all ports – we will present how we identify RFI in the ACM and determine its suitability for RFI mitigation via spatial nulling using the oblique projector [2].

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