Radio frequency interference (RFI) detection based on cyclic spectrum analysis

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Mitigating RFI contamination of scientific data is predicated first and foremost on its identification. While contemporary schemes for RFI detection and mitigation have been successful to some degree - particularly for strong signals whose localization in time, space, or frequency is well characterized - current limitations in spectral sensing and signal classification capabilities usually lead to insufficient interference cancellation, inability to adapt to rapid changes in the interference signal, partial removal of wanted data, or excessive computational requirements for post-processing of the accumulated data. This issue has been addressed by several techniques, most of them based on thresholding operations in the frequency and/or time domain, correlation of the signal of interest with a reference antennae signal, use of the spatial information to null RFI in certain directions in interferometers or multi-feed systems, among others. In this context, we will describe our efforts to develop a new strategy for RFI detection based on cyclic spectrum analysis, a technique used by the communications industry to detect periodic signals in terms of the correlation/autocorrelation of their Fourier spectra. We will demonstrate the feasibility of this technique using passive astronomy data, which is often subject to quasi-periodic interference arising from nearby long-range air surveillance systems or broadcast television signals.