Researchers develop oversampled channelization technology for radio astronomy wideband digital signal

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The wideband receiving system of large radio observation equipment obtains a great number of real-time astronomical signals, and the signal

preprocessing, transmission, processing and storage have become urgent issues in their operation.

Channelization technology decomposes the wideband signal into several adjacent sub-bands and then realizes signal processing separately. It can effectively reduce system pressure and improve efficiency of wideband signal processing.

Recently, researchers led by Dr. Zhang Meng and Dr. Zhang Hailong from the Xinjiang Astronomical Observatory (XAO) of the Chinese Academy of Sciences designed a 2× oversampled polyphase filter bank to realize channelization and solve the problems of sub-bands edge signal attenuation, spectral leakage, and aliasing encountered in wideband signal channelization. The study was published in *Research in Astronomy and Astrophysics* on July 10.

Using the wideband baseband data generated by the Collaboration for Astronomy Signal processing and electronics research Parkes Swinburne Recorder (CASPSR), the researchers implemented sub-band division and multi-band output. In addition, they confirmed that a flatter overall passband was obtained by removing the redundant data at the edge of each sub-band in oversampling channelization.

The researchers channelized the 400MHz baseband data of J0437-4715, and compared the pulse profile obtained by direct processing of the original baseband data with the pulse profile obtained after the channelization and recombination. The results verified the correctness of the oversampled channelization algorithm, since the phase and amplitude information of the pulse profiles are consistent.

According to the researchers, applications of the oversampled polyphase filter bank related technologies can effectively improve the quality of radio astronomical observation data.

More information: Meng Zhang et al, Research on Channelization Techniques of Radio Astronomical Wideband Signal with Oversampled Polyphase Filter Banks, *Research in Astronomy and Astrophysics* (2023). DOI: 10.1088/1674-4527/acd73b