The RFI monitor system for the Dominion Radio Astrophysical Observatory [1] was designed to combine a standard integrating spectrometer commonly used in radio astronomy with machine learning (ML) and software-defined radio (SDR) features.

An analysis filterbanks output is integrated to produce power spectra such as is shown in fig. 2. Signal detections are done on this integrated power spectrum yielding predicted bounding boxes in time/frequency space (fig. 3).

RF signals can span multiple frequency channels of the analysis filterbank, as shown in fig. 4. The channels intersecting a bounding box are fed to a synthesis filterbank which reconstructs the times series of the signal. As per [4] the analysis filterbank is oversampled by a factor of 2 to enable perfect reconstruction.

As shown in fig. 1, the DDC pool of synthesis filterbanks is fed with the bounding boxes detected in the integrated spectra of fig. 3 along with the non-integrated channels of fig. 4. Figures 3 and 4 each show the same spectra containing two FM signals, wrapped near the edges of the synthesis filter banks FFT.

Table 1 gives information about each of the signals. The synthesized waveforms clearly correspond with the expected modulation types.

We apply the synthesis filterbank to extract short segments of complex baseband signals for further classification using ML methods. We have found segments of 128-1024 samples are suitable for this task, although longer segments could be synthesized.

The synthesized waveforms clearly correspond with the expected modulation types.

We have prototyped the DDC Pool concept in Python and used it to extract complex baseband waveforms from various wideband timeseries. The next steps are to:

- develop a GPU version of this and integrate with the existing GPU-based analysis channelizer,
- investigate fractional oversampling ratios,
- complete a rigorous performance analysis.

**References**


