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DETECTION OF SETI SIGNALS FROM VLBI RAW DATA

Abstract

We have recently developed a new method to detect very short time scale transient signals from Extra-Terrestrial Intelligences () out of Very Long Baseline Interferometer (VLBI) raw data. This is a collaborative effort of University and Korea Institute of Science and Technology Information (KISTI), and also one of support programs for the International Year of Astronomy in Korea.

Since there are many kinds of natural electromagnetic signals in the nature, it is not easy to discriminate signals from the nature and from ETIs. It is plausible that ETIs also know this. So if ETIs want to communicate with other civilizations, they would select signals which get rarely produced in natural processes. Possible candidates of such signal are transient events of short time scale. In radio wavelength, events with duration time of less than several millisecond are rare except in some pulsars. Hence ETIs might emit this kind of transient signals to appeal their existence. Note that this approach is rather different from conventional SETI@home, which looks for signals in very narrow frequency band.

Modern VLBI systems record quantized radio signal with sampling rate of 1Gbps or faster. Usually the recorded raw data is processed in a correlator to take correlations for fringe detection, and then thrown away. Our approach is to use the raw data recorded in VLBI stations to detect ETI signals and other transient signals, extracting light curves directly.

We report the result of our simulations with artificial data sets mimicking 22GHz VLBI raw data. Extracted light curves are dominated by serious noise like actual VIBI data. In order to discriminate

signals, we applied auto-correlation algorithm (and additional methods to be added soon). Through experiments with various combination of signal duration and strength, it is shown that the detection efficiency of transient signal has dependency of predictable manner on these parameters of signals. For example, the detection of transient signal with duration time of 1 millisecond is possible for signal-to-noise ratio of 10^{-3}.

Our analysis system will also be useful for the investigation of other radio transient events by changing the settings of timescale search range. Our team plans to implement this algorithm to Korea@Home platform, a distributed computing platform by KISTI, and analyze a very large amount of VLBI raw data, typically over several terabytes per an observation.