

Astropulse: Search for Microsecond Transient Radio Signals Using Distributed Computing

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We use the Arecibo telescope to search for communications from extraterrestrial intelligence, in the form of brief, wideband pulses on timescales of microseconds to milliseconds. Our data comes from a seven-year and continuing commensal sky survey, of which the most recent data uses Arecibo's new multibeam receiver. The survey covers 30% of the whole sky and comprises 200 terabytes of data. We search for both single pulses and regularly repeating pulses. This experiment represents a new strategy for SETI, postulating microsecond timescale pulses as opposed to longer pulses or narrowband signals. We may also discover pulsars and exploding primordial black holes, both of which would emit brief wideband pulses. We utilize the distributed computing power of SETI@home, delegating computational sub-tasks to hundreds of thousands of volunteers' computers, to gain advantages in sensitivity and time resolution over previous surveys. Wideband pulses would be "chirped" by passage through the interstellar medium; that is, high frequencies would arrive earlier and lower frequencies would arrive later. Thus, for pulses with wideband frequency content, dispersion hints at a signal's extraterrestrial origin. We search for pulses with dispersion measures ranging from 50 pc cm⁻³ to 800 pc cm⁻³ (chirp rates of 7000 Hz to 400 Hz per microsecond) allowing detection of sources almost anywhere within the Milky Way.