Title: A Survey of the Galactic Plane for SETI

Authors: Jill Tarter, Mike Davis, Seth Shostak, Sam Gulkis, Dayton Jones, Mike, Klein, Steve Levin, and Robert Preston, Dan Werthimer

Abstract: If detectable extraterrestrial technologies exist close to the Earth, then targeted searches of nearby stars is the most sensitive way to find them. But if the nearest detectable technology is at a very large distance, the targeted star search should become a sky survey for two reasons 1) so many stars will need to be interrogated that the number of telescope pointings will effectively tessellate the sky, and 2) very distant stars will be obscured by interstellar dust, and the particular stars of interest (those giving rise to technologies) may not be known in our existing stellar catalogs. Since we do not know whether other extraterrestrial technologies exist within our galaxy, and have no idea whether they might be nearby or very distant, and how powerful their transmitters might be, it makes sense to adopt a search strategy that encompasses both modes of searching. This is precisely what NASA's High Resolution Microwave Survey (HRMS) did when it began observations in 1992. The resources of NASA's Deep Space Network (DSN) satellite tracking facilities were to be used in an all sky survey, while the largest telescopes of the international science community were lined up for use in the targeted search. When Congress terminated the funding for HRMS in 1993, lack of access to the DSN 34 m telescope network meant that the sky survey had to be abandoned, although the targeted search continued as Project Phoenix using philanthropic funding and scientific facilities in the US and Australia.

Since 1992, the pressure on DSN resources has increased considerably, as a growing number of spacecraft missions require tracking and support. It is no longer realistic to consider proposing to use 16 hours per day of observing time on one of the DSN 34 m beam-waveguide antennas at the Goldstone, Tidbinbilla, or Madrid stations as HRMS did. However, that may not be necessary for a successful SETI survey. Approximately 90% of the stars in the Milky Way Galaxy lie in the galactic plane that subtends approximately 10% of the sky. Recent design studies have shown that a survey of the galactic plane visible from Goldstone CA (~85% of the plane) could be accomplished within five years with amounts observing time likely to be available on DSS13 (the R&D 34 m antenna). Installation of additional reflectors in the base of DSS13, implementation of wideband cryogenic receivers and feeds (based on the designs of the Allen Telescope Array), and construction of a spectrometer with 2^{30} channels of varying bandwidth would enable an unprecedented frequency coverage from 2 to 23 GHz for this search. This paper summarizes the results of the design study and the initial observing plans for a galactic plane survey.