"COSMIC WINDOWS" SKY SURVEYS

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Astronomical observations are degraded by dust and gas between the source and the telescope, expecially in the far-infrared, ultraviolet, and X-ray portions of the spectrum. The Earth's atmosphere is so bright and/or opaque that such observations must be made from space, and they are still affected by the interstellar medium of our Galaxy, which stands forever between us and all extragalactic sources. Fortunately the interstellar medium is quite patchy, and there are several "cosmic windows" covering $\sim 100\ \mathrm{deg}^2$ of sky having exceptionally low interstellar extinction and cirrus emission. Since the universe is nearly homogenous and isotropic on cosmological scales, these areas contain representative samples of cosmologically distant sources and will be the focus of most future multiwavelength studies. During the next few years, the major space observatories SIRTF, GALEX, and XMM-Newton will detect millions of galaxies, tens of thousands of quasars, and hundreds of clusters of galaxies at cosmological distances in the infrared, ultraviolet, and X-ray bands by making surveys covering the cosmic windows. The survey results will be used for evolutionary studies of star formation, supermassive black holes, and massive galaxy clusters. Complementary optical and radio surveys provide essential source identifications, redshifts, morphologies, and continuum spectra.

The first radio survey of this type complements the First-Look Survey (FLS) of the Space InfraRed Telescope Facility (SIRTF), which will cover about 5 deg^2 centered on J2000 $\alpha = 17^{\mathrm{h}}\,18^{\mathrm{m}}$, $\delta = +59^\circ\,30'$ in order to characterize the extragalactic infrared sky two orders-of-magnitude deeper than the IRAS survey. We expect that most of the FLS far-infrared ($\lambda = 160$, 70, and $24\,\mu$m) sources will be star-forming galaxies obeying the very tight far-infrared/radio correlation and will be continuum radio sources with flux densities $S \gtrsim 100\,\mu$Jy at $\nu = 1.4$ GHz. Conversely, radio sources stronger than $100\,\mu$Jy are usually powered by star-forming galaxies, plus some active galactic nuclei, and most should be detectable by the SIRTF FLS. Thus a sensitive radio survey can be used to select and identify most of the SIRTF FLS source population before launch. We used the B configuration of the NRAO Very Large Array to image the FLS area at $\nu = 1.4$ GHz with $\sigma_{\mathrm{n}} \approx 23\,\mu$Jy beam^{-1} noise, $\theta = 5$ arcsec resolution, and $\sigma_{\alpha,\delta} \lesssim 0.5$ arcsec position uncertainties. The resulting radio image and catalog of 3565 radio components brighter than $S_{\mathrm{p}} = 5\sigma_{\mathrm{n}} = 115\,\mu$Jy beam^{-1} have been posted on the web site `http://www.cv.nrao.edu/sirtf_fls/` to expedite follow-up optical identification and spectroscopy.