Design of the U12IR Beamline for Solid State Infrared Spectroscopy*	U12IR

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The new infrared beamline U12IR is designed to serve the solid state physics community's needs for performing IR spectroscopy from wavelengths of a few microns out to several millimeters. The beamline uses a 90x90 milliradian mirror extraction system similar to beamline U4IR (see Figure 1), bringing the light from the ring's UHV environment through a wedged diamond window. However a number of special design features have been incorporated in order to reach such long wavelengths efficiently, such as a large beamline diameter and a tapered light cone preceding the diamond window. When the long wavelength (lamellar grating) interferometer is used, quasi-optic lightpipe is placed immediately after the diamond window and brings the light to this fast interferometer, thus minimizing diffraction losses. Otherwise conventional mirror optics are used collimate the infrared and transport it to the other spectrometer - a Bruker IFS 113v. Figure 2 shows the collimating mirror chamber and spectrometer endstations with the lightpipe in place. The beamline's spectral range is expected to reach from about 1 cm^{-1} up to 40,000 cm^{-1}, although the spectrometer endstations will reach to only 10,000 cm^{-1}. A spectral resolution of $\sim$0.1 cm^{-1} is anticipated.

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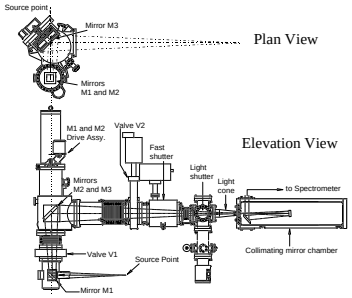

Figure 1. Schematic of the U12IR UHV beamline section. A set of three mirrors extract the beam and focus it onto a wedged CVD diamond window. A cone immediately upstream of the window is used to couple wavelengths beyond 1mm into lightpipe.

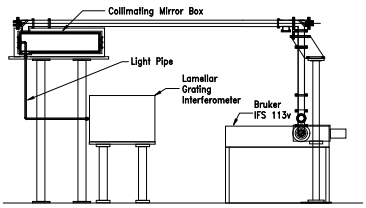

Figure 2. Schematic of the two spectrometer endstations. The collimating chamber just downstream of the diamond window is at left. Either lightpipe or conventional mirrors are used to transport the infrared beam to a spectrometer.