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Spectral Structure of Low Frequency Radiation from U12IR

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Beamline(s): U12IR

The long-wavelength spectral range for most synchrotron radiation sources has not been explored in any detail, especially at high spectral resolution. Our previous measurements at beamline U12IR detected an interference fringe pattern in the spectral output. The cause of the fringe pattern was traced to a secondary reflection of light from the outside wall the electron beam chamber. This light interferes with the directly propagating light. Since then, we have used the new spectrometer installed at infrared beamline U12IR to study the spectral content at even higher spectral resolution. The results are shown in the figure below. To eliminate any artifacts due to the spectrometer and detector, the synchrotron spectral intensity was normalized to the intensity for the spectrometer's internal Hg arc lamp source. At moderate spectral resolution (red curve), the fringe pattern previously described is readily observed. At higher spectral resolution (0.01 cm^{-1}), additional sharp spectral features are observed for frequencies below 10 cm^{-1}. Some of these features are extremely narrow. The cause of this complex behavior is not understood, but may be due to resonance modes of the metal beam pipe.

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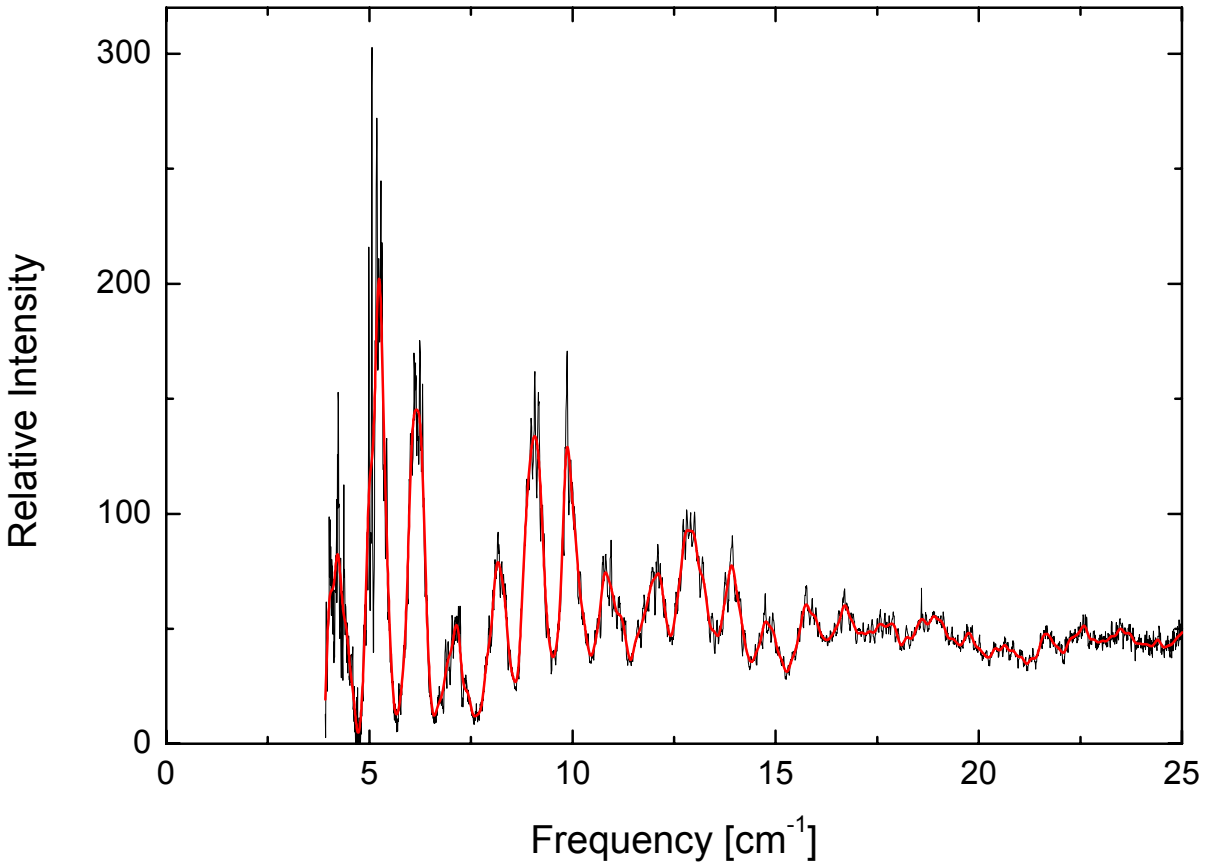

Figure 1. Medium (red curve) and high-resolution (black curve) spectra from the U12IR beamline. The data have been normalized to the spectral intensity from a high pressure Hg arc lamp source.