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Phase curves of Saturn's main rings in the thermal infrared: the Cassini-CIRS point of view

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Since the Saturn Orbit Insertion (SOI), the Composite Infrared Spectrometer (CIRS) on-board the Cassini spacecraft has acquired a wealth of measurements of the Saturn main ring system. The spectra obtained with the far-infrared channel (FP1, 100-600 /cm) are of particular interest as the bulk of the thermal energy emitted by the ring's particles lies in this wavelength range. As a result, physical temperatures can be retrieved, as well as a filling factor that takes into account the finite optical thickness of the ring and the superposition of different blackbody temperatures within the field-of-view.

Previous data analysis has shown a strong dependency of the measurements upon observation geometry. However, a sensitivity study of the measured values against relevant geometrical parameters provides a separation of first order from higher order effects, which facilitates the elaboration of forward thermal models. We present a short review of the effects observed so far. We focus in particular on the strong variations of the measured temperatures with the azimuth component of the phase angle and on the existence of a thermal surge in the B ring.

An attempt of modeling these effect using the Hapke's shadowing function is presented. While the limitations of this approach to yield meaningful physical properties are highlighted, the resulting analytic curves describe well the quantities that upcoming forward models will have to reproduce.