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Looking at Saturn's B ring over 6 decades of wavelength with old and new data

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The Saturn's rings are a complex medium that are composed of icy rocks (particles) covered by a regolith. The light scattering of the rings is not straightforward because a raylight can be scattered either by the individual particles themselves or by the regolith or by both. To better constrain these mechanisms, we try to cover the largest range of wavelength, from the ultraviolet (where the regolith and the smallest particles preponderantly interact with the light, see Bradley et al. 2010 Icarus, 206, p458) to the radio (where the biggest particles interact the most, see Zebker et al. 1985 Icarus, 64, p531).
We combine the Cassini data, that include images (ISS) and spectra (CIRS/FP1, FP3 and FP4) from the same observations along with old data (IUE, Voyager 2, HST, WMAP, IRTF and a compilation provided by Spilker et al. 2003, PSS, 51, p929) for the B ring. Most noticeably, we observe the solar reflexion with CIRS/FP4, i.e. a decrease of the spectral irradiance with increasing wavelength, from 7 to 9 microns.
Our study is one of the first to provide the B ring SED (Spectral energy distribution) from 0.1micron to 10cm, in spectral irradiance units (W.cm-2.sr-1/cm-1). This comparison of old and new data provides a good to excellent agreement depending on the viewing geometry of the different datasets. We fit the IR and radio data to a blackbody model (Planck function) and notice that the fit is not acceptable at the shortest IR wavelengths (< 20 microns, covered by CIRS/FP4 and FP3), the largest IR-wavelengths (> 300 microns, with CIRS/FP1) and the radio wavelengths. We explain these behaviors – usually called a "roll off" – as variations of the emissivity from the infrared to the radio domain (see also Epstein et al. 1980, Icarus, 58, p403 and Spilker et al. 2005, EMP, 96, p149). To better characterize this roll off, we use various datasets of refractive indices and a previous solution of the composition of the Saturn B ring found for a composite spectra from 0.4 to 4 microns (Poulet et al. 2003 A&A, 412, p305).

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