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Elliptical polarization of Saturn Kilometric Radiation observed from high latitudes

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Abstract

The high-inclination orbits of the Cassini spacecraft from autumn 2006 until spring 2007 allowed the Cassini/RPWS (Radio and Plasma Wave Science) instrument to observe Saturn Kilometric Radiation (SKR) from latitudes up to 60° for the first time. This has revealed a surprising new property of SKR: Above $\sim$ 30° in observational latitude a significant amount of SKR is strongly elliptically polarized, in marked contrast to previous observations from low latitudes which showed only circular polarization. There are transitional latitudes where the elliptical polarization occurs in ”patches” in the time-frequency spectrograms next to regions of still completely circularly polarized SKR. From $\sim$ 45° – 60° in northern latitude it is found that most of the SKR is elliptically polarized throughout its entire frequency range with an average degree of $\sim$ 0.7 in linear polarization. We also observe that the polarization of the SKR goes back to fully circular at very high latitudes (above 70°). We demonstrate the ellipticity of SKR by using the concept of ”apparent polarization” in case of 2-antenna measurements, but also show 3antenna measurements from which the polarization can be unambiguously determined. Possible reasons for the variation of SKR polarization with the observer’s latitude will be discussed.