



Direction finding applied to Cassini RPWS data

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The Saturn kilometric radiation (SKR) as observed by the Cassini RPWS experiment is investigated, using an analytical method of direct inversion for the direction finding algorithm. This algorithm yields the polarization state of SKR, i.e. the Stokes parameters, and the direction of incidence of the radiation. It is found that the polarization of SKR seen in the data strongly depends on the signal-to-noise ratio. Weak SKR close to the background has a strong linear component, whereas intensive SKR, which is much stronger than the background, approaches 100% circular polarization. These findings are interpreted on the basis of theoretical simulation studies, which reveal that a linear component seen in a 100% circularly polarized signal is mainly due to the influence of the background noise. Thus, we conclude that the Saturn kilometric radiation analyzed in our study is naturally 100% circularly polarized. The additional linear component is introduced by a low signal-to-noise ratio and other effects like superposition of signals with opposite sense of polarization (originating in Saturn's northern (RH) and southern (LH) hemispheres) or an unfavourable direction of incidence with regard to the orientation of the antenna system.