This PhD thesis is primarily dedicated to a study of type III radio bursts observed by the S/Waves instrument onboard Solar TErrestrial RElations Observatory (STEREO). These emissions are produced by beams of suprathermal electrons escaping the corona along open magnetic field lines during increased solar activity.
As fast electrons propagate in the interplanetary (IP) medium, Langmuir waves are generated at the local electron plasma frequency fpe by a bump-on-tail instability and can be afterwards converted by a non-linear process into radio emissions at fpe and/or 2fpe: type III radio bursts.
We have developed a goniopolarimetric (GP, also referred to as direction-finding) inversion using the Singular Value Decomposition (SVD) technique for electric measurements on three non-orthogonal antennas. It allows us to retrieve both wave vector directions and polarization properties of incident waves. We have also investigated the influence of extended sources (as a typical feature of type III radio bursts) on measured spectral matrices. We have found an empirical relation between apparent source sizes and spectral matrices decomposed by SVD. Abovementioned techniques have been extensively tested on data obtained by the High Frequency Receiver (HFR, a part of S/Waves).
We have performed statistical analysis of a large number of type III radio bursts observed by STEREO between May 2007 and September 2011. Only intense, simple, and isolated cases have been included in our data set. We have found that the maximum flux density occurs around 1 MHz. The apparent source size is very extended (40) for frequencies above 500 kHz while remaining almost constant (25) between 500 kHz and 2 MHz. Calculated positions of radio sources suggest that scattering of the primary beam pattern plays an important role in the propagation of type III radio bursts in the IP medium.