DIRECTION FINDING MEASUREMENTS OF TYPE III BURSTS IN BOTH ELEVATION AND AZIMUTH

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Abstract. Direction finding measurements with the plasma wave experiments on the HAWKEYE 1 and IMP-8 satellites are used to find the source locations of type III solar radio bursts in elevation (geocentric solar ecliptic latitude) and azimuth (geocentric solar ecliptic longitude) in a frequency range from 31.1 kHz to 500 kHz. IMP-8 has its spin axis perpendicular to the ecliptic plane, hence by analyzing the spin modulation of the signals the location of the type III burst projected into the ecliptic can be found. HAWKEYE 1 has its spin axis nearly parallel to the ecliptic plane, hence the elevation of the source may also be determined. The trajectory of the electrons generating the burst, projected onto the ecliptic plane, follows an Archimedean spiral. Out of the ecliptic plane the trajectory is at a nearly constant heliographic latitude. The electrons originate from a region near a solar flare. With direction measurements of elevation and azimuth along with the modulation factor it is possible to determine the source size. Typical half angle source sizes range from ~60° at 500 kHz to ~40° at 56.2 kHz as viewed from the sun.

Discussion

Lin: Are you using a point source rather than an extended source for computing predicted elevation and azimuth?

Baumback: Yes, we are taking centroid of the source.

Kellogg: Can the source be outside 1 A.U.?

Baumback: Yes, an ambiguity of 180° is present with the spacecraft observations.

Alvarez: I wouldn't worry if the fit is not good at 56 kHz. Sometimes the fit suddenly stops working.

Baumback: That is true. I don't know whether it is due to scattering or refraction.

Kellogg: What kind of modulation do you see at 56 kHz?

Baumback: Less than 0.1 db.

Kellogg: You need average over a lot of points.

Alvarez: It's risky to take an average model. That's OK for a lot of events but unreliable for individual events. Usually we do not see any modulation at 56 kHz.

Baumback: At low frequency, we can average over long times.

Kellogg: When the source size is greater than 180° you are looking at the hole, not at the source.

Baumback: The direction can also be affected by polarization.

Kellogg: Do you see polarization?

Baumback: We have not yet looked into it. Does not seem to be linearly polarized.

Gurnett: We are hoping source is not polarized. Otherwise there are difficulties with interpretation of modulation.

Alvarez: Were electrons observed?

Baumback: Don't know.

Fainberg: We need stereo observations with 2 or more spacecraft.

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