The drift rate of solar radio bursts

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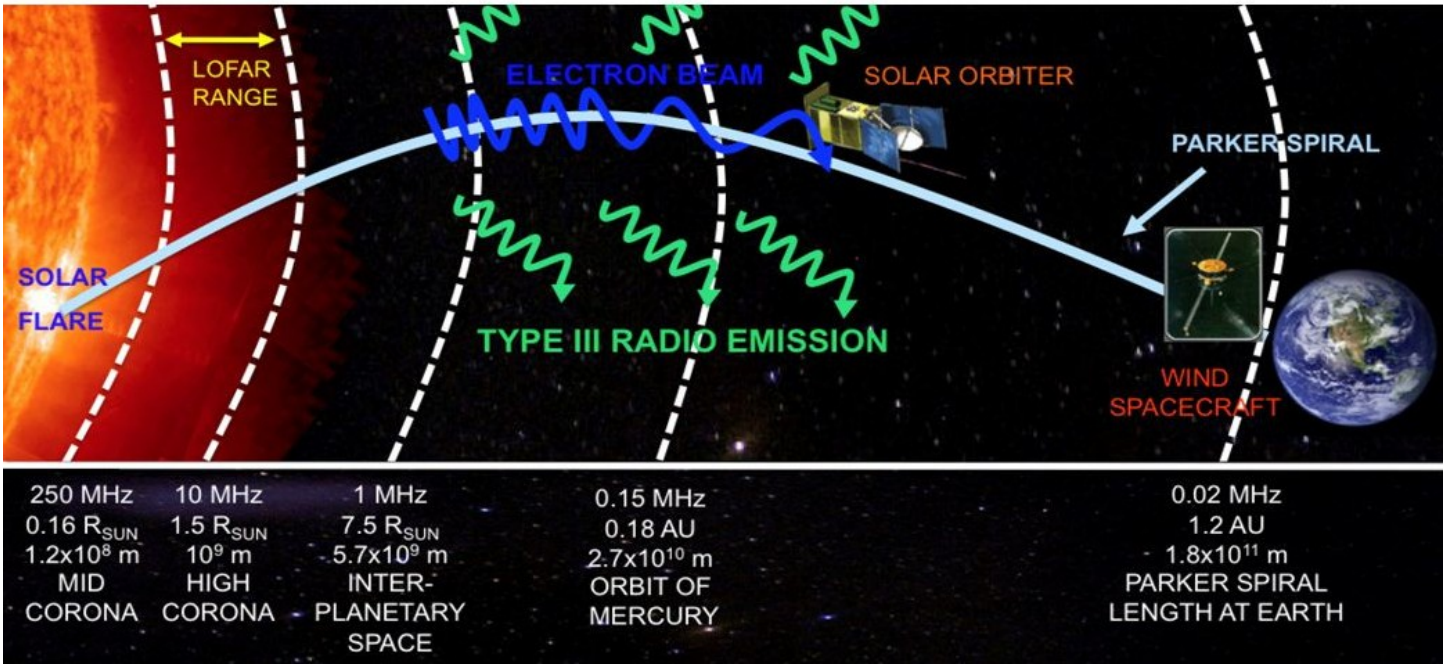

Fig: Schematic representation of solar radio emission.

Project statement:

During transient solar phenomena, electrons are accelerated to form anisotropic electron beams. The acceleration can occur either through magnetic re-connection in solar flares or diffusive shock acceleration at outward propagating coronal mass ejections. These electron beams can trigger plasma instabilities which can, in turn, decay into electromagnetic waves. These electromagnetic waves can be observed on ground level by radio telescopes.

In this project the student will:

1. Study the formation of electron beams.
2. Study the so-called ‘bump-on-tail’ instability where electron beams can trigger plasma oscillations (Langmuir waves).
3. Study how stationary plasma oscillations can be transformed into propagating electromagnetic waves.
4. Apply the above theory to an observed Type I and II radio burst, using data obtained at Nooitgedacht.
5. Use these observations to study the drift rate of radio bursts which give an indication of how fast the burst source is moving through the solar corona.

Student development and recommended skills:

During this project, the student will become familiar with the theory of particle acceleration, particle transport, and plasma physics. Much of this work will be theoretical and an aptitude for theoretical plasma physics and mathematics is a requirement.