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The angular dependence of spectroscopic radio measurements using multi-spacecraft observations

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Injections of non-thermal electrons into the heliosphere often manifest as intense radio emissions, the most common of which are known as Type III solar radio bursts. The emission frequency of solar radio bursts is closely related to the local plasma frequency of the heliosphere, meaning that they can be used to probe the local conditions of the solar corona and interplanetary space. However, observations of these radio emissions do not represent the true nature of the radio sources due to the scattering of radio photons. Such radio-wave scattering is induced by anisotropic density fluctuations in the heliosphere and impacts both the imaging and spectroscopic properties of radio sources in a frequency-dependent manner, where lower frequencies are affected to a larger extent. Using a significant number of multi-spacecraft observations, including from Solar Orbiter and Parker Solar Probe, we investigate the angular dependence of spectroscopic radio observations due to the presence of anisotropic scattering. We present an improved estimation of the spectroscopic properties and probe whether the spacecraft position affects the recorded decay times. Comparing observations and state-of-the-art anisotropic scattering simulations introduces new constraints on the models used to describe heliospheric radio-wave scattering.