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Constraints for electron acceleration models in solar flares from microwave observations with high spatial resolution

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Abstract. Nobeyama Radioheliograph observations show a variety of types of the microwave brightness, polarization and spectral slope distributions along flaring loops. On the other hand, different theoretical models of particle acceleration in solar flares predict different acceleration/injection sites in flaring loops, as well as different pitch-angle distributions of accelerated electrons. In this study we solve the non-stationary Fokker-Plank kinetic equation with different assumptions on the injection properties of energetic electrons in order to find their spatial, energy, and pitch-angle distributions, and calculate corresponding gyrosynchrotron emission properties. We show that different locations of acceleration/injection sites in flaring loops may produce very different types of pitch-angle distributions of accelerated electrons and, as a consequence, different spatial, spectral and polarization properties of the loop microwave emission. It is shown that these properties can be detected using spatially resolved microwave observations of specific flaring loops and be used to choose the most suitable electron acceleration model. The conclusion is illustrated by Nobeyama Radioheliograph observations.