

We describe a method by which it is possible to find the dynamics of a spin current in a spintronic terahertz emitter or other emitters derived from it. This method takes an experimental emission measurement from time-domain terahertz spectroscopy and removes the effects of the experimental setup, providing direct access to studying phenomena in the emitter. We implement it by simulating the process of optical rectification in a nonlinear crystal and measuring reference signals for a variety of emitters and setups. The transfer functions thus obtained for different emitters have good agreement among themselves and with theory, though the process is sensitive to the crystal refractive index. We then use the transfer function to reconstruct the dynamics of spin currents in two spintronic emitters, finding good agreement with previous measurements. We can discern multiple stages of the current dynamics: a sharp rise and fall, a dip into negative values and a slow relaxation. For further measurements, we recommend the use of thin crystals as references and detectors and the use of a dry air atmosphere, and we provide a Python script that automates the method.