Abstract: I will discuss a basic model of passive intermodulation (PIM). PIM occurs when multiple signals are active in a passive device that exhibits a nonlinear response. It is known that certain nonlinearities (e.g. the electro-thermal effect) which are fundamental to electromagnetic wave interaction with matter should be accounted for. In this talk, I will discuss existence, uniqueness, and regularity of solutions to a simple model for PIM. This in particular includes a temperature dependent conductivity in Maxwell’s equations, which themselves are coupled to a nonlinear heat equation. I will also discuss challenges related to a similar problem when the permittivity \( \varepsilon \) also depends on temperature. This is joint work with Niklas Wellander and Elena Cherkaev.