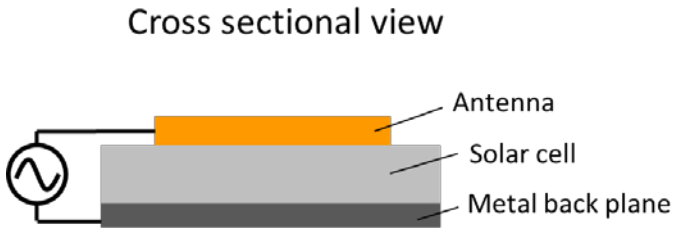
Quals 2016, Electromagnetism, Jonathan Fan

Something that people are developing for the Internet of Things is a module that integrates a radio frequency (RF) antenna on top of a solar cell. Both devices take up a lot of space, and the combining of an "optically transparent" RF antenna with a solar cell could significantly reduce the footprint of the module.



I am proposing to make an "optically transparent" radio frequency antenna by thinning its metal (for example, copper) to a thickness so thin, it becomes optically transparent.

a) Is it possible to make an optically transparent structure in this way? And can we make an effective RF antenna in this way? Present rigorous arguments using Maxwell's equations.

b) Propose alternative design schemes that will enable as much light to pass through the antenna into the solar cell