

## Designing Dichroic Filters For Use In A Microwave Camera to Study Electron Cyclotron Resonance Ion Sources

The Electron Cyclotron Resonance (ECR) ion sources in use at many laboratories, including the Texas A&M University Cyclotron Institute, are well understood in their function, but better diagnostics are needed to study the details of ECR plasma dynamics. Previous studies have primarily focused on investigating the positive ions in the source. In contrast, our goal is directly to image the electrons that produce the ionization, in order to optimize the production of higher intensity and charge state beams. A microwave camera sensitive in the 15-65 GHz range is being designed to measure the Electron Cyclotron Emission from the plasma. The camera will include a set of dichroic filters to prepare the signal for reception by the antenna array and superheterodyne receiver electronics. The dichroic filters will be made up of arrays of aperture antennas and designed to switch electronically between passbands with 10 GHz bandwidths. This work explored potential designs and optimized various array geometries via MEEP, an electromagnetic simulation software that uses the finite difference time-domain method, and a hill climbing algorithm.