

Radiation Heat Transfer in Imaging Infrared Spectrometer

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Abstract

Imaging Infrared Spectrometer (IIRS) is a Hyperspectral optical imaging instrument which measures the spectra of a scene in high resolution within spectral bands covering Near Infrared (NIR) to Mid Infrared (MIR) regions. Radiation entering the spectrometer assembly governs the temperature of different internal parts and hence plays an important role in determining the desired spectral resolution of the scene. Here an effort has been made to closely speculate the temperatures and heat fluxes inside the spectrometer assembly and understand their inter-dependency using COMSOL Multiphysics® software. Heat generated in the semi-transparent media due to attenuation of rays and induction of surface-to-surface radiation has been studied in detail. Geometrical Ray Optics coupled with Heat Transfer physics has been used to simulate the system assembly operating at cryogenic temperatures. The current simulation investigates the variation of dependent parameters for radiative sources of 10 W and 20 W.

Keywords: Spectrometer, Ray Optics, Heat Transfer, Radiation

Reference

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Figures used in the abstract

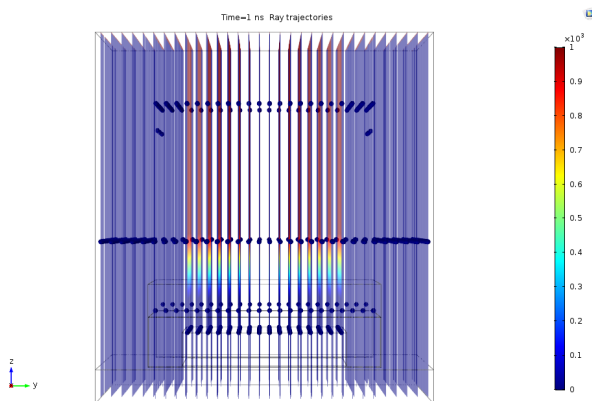


Figure 1: Ray trajectories.

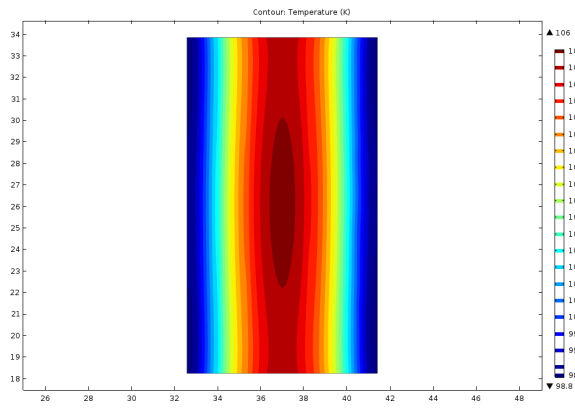


Figure 2: Temperature distribution.

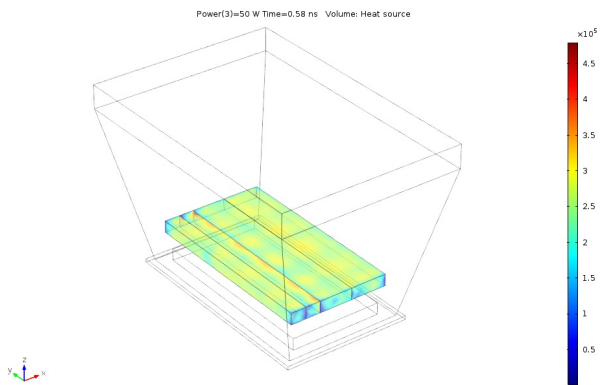


Figure 3: Domain heat source.