NASA/ORNL Fourier Imaging System for High Energy Radiation Sensing, Imaging, and Spectral Analysis

A new approach for identification and 3-D location of radioactive sources and for medical diagnostics.

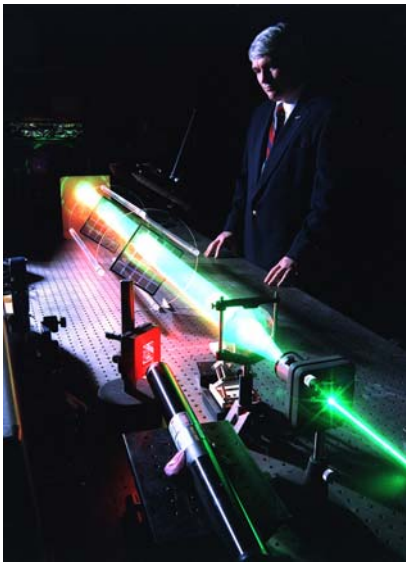

Figure 1. Dr. Jonathan W. Campbell (NASA/MSFC) with optical Fourier Imaging System.

The NASA/ORNL Fourier Imaging system gives the 3-D location of a radiation source, using the same principles as a CAT scanner. It is an ideal method for discerning the position and type of a weak or partially shielded radioactive source at large stand-off distances. Only 500 photons and/or decay particles in the detector are required to ascertain the 3-D position of a source at stand-off distances from 30 to 300 meters.

Advantages

- High Spatial Resolution
- Large stand-off distances and/or weak sources
- Multiple Images at Various Energies
- Multiple radiation types:
  Hard X-ray, Gamma Ray, Neutrons
- Potential for Compact Packaging

Description

A source is viewed through properly structured apertures (grids) that measure intensity distributions in Fourier space. A two-dimensional inverse transform yields the image. Figure 1 shows a model using visible radiation for illustration of Fourier Imaging modalities. Figure 2 is a demonstrator unit with top and bottom disks that rotate in sync while separation varies.

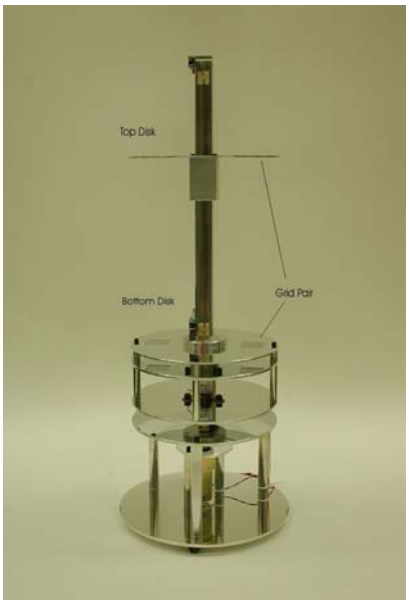

Figure 2. Fourier Imaging System for Gamma and X-rays and
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