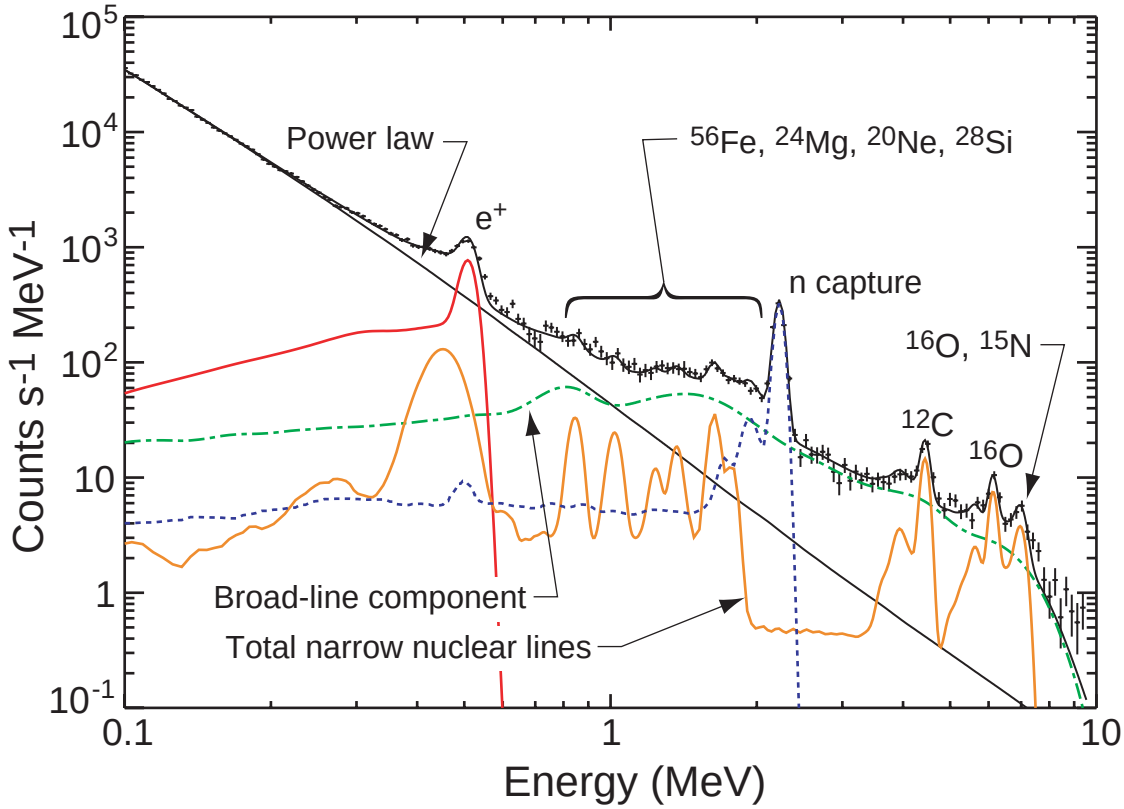
FITTING γ-RAY LINE SPECTRA



Forward-folding, χ^2 minimization analysis

Analytic photon models:

- **power law**
- **broken power law**
- **Gaussians**

Determine:

- **line amplitudes, central energies & widths (under the Gaussian assumption)**
- **continuum parameters**

γ-RAY LINE CODE

Ramaty, Kozlovsky & Lingenfelter 1979

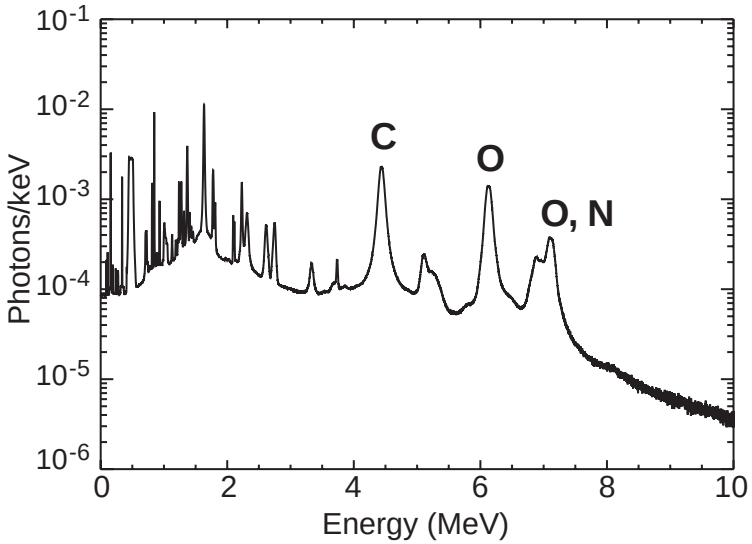
Monte Carlo code

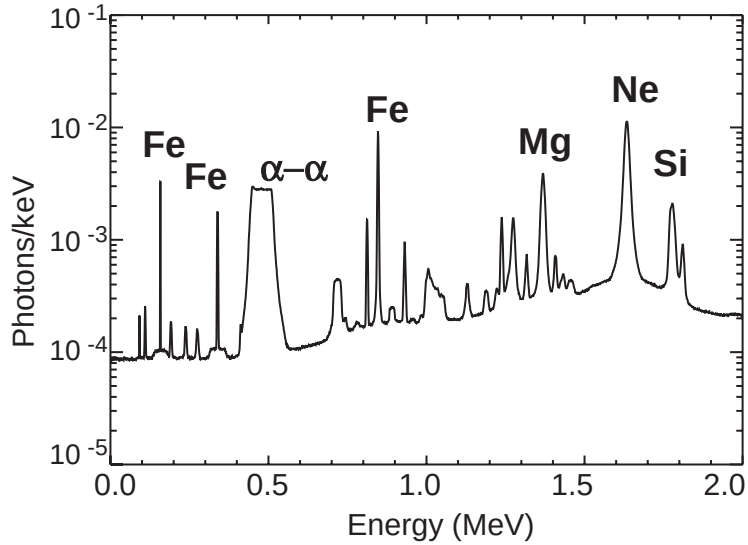
Incorporates measured and synthesized energy- and angle-dependent cross sections and exact relativistic kinematics

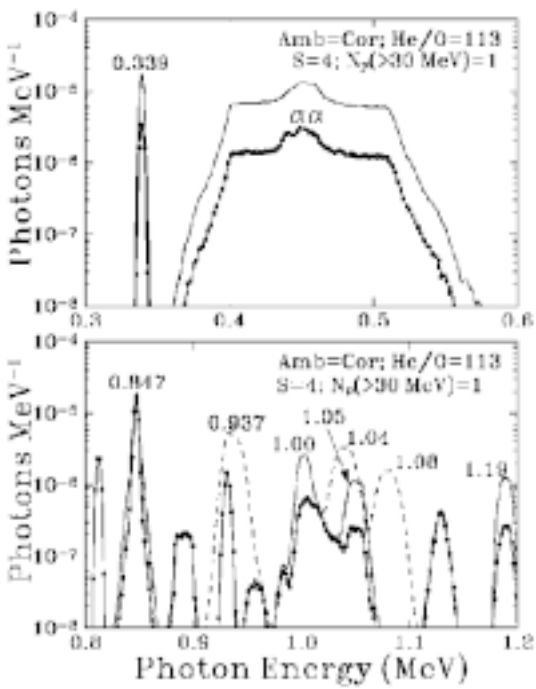
Input parameters:

- **ambient abundances (He, C, N, O, Ne, Mg, Al, Si, S, Ca & Fe)**
- **accelerated abundances (^{3}He, α, C, N, O, Ne, Mg, Al, Si, S, Ca & Fe)**
- **accelerated-particle energy spectrum (power law, Bessel function, rigidity exponential and appropriate parameters)**
- **thin or thick target**
- **accelerated-particle angular distribution***

Example calculations



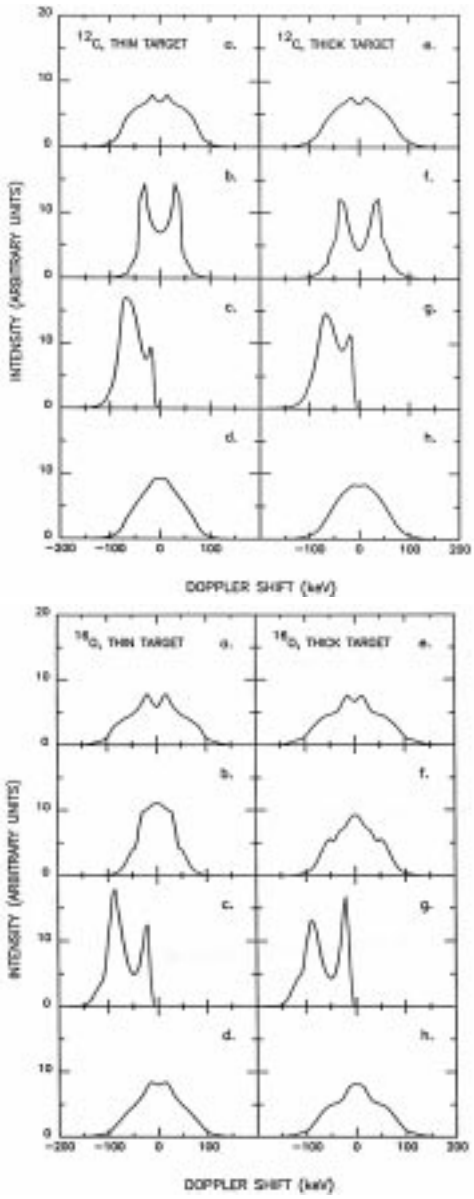




Provides:

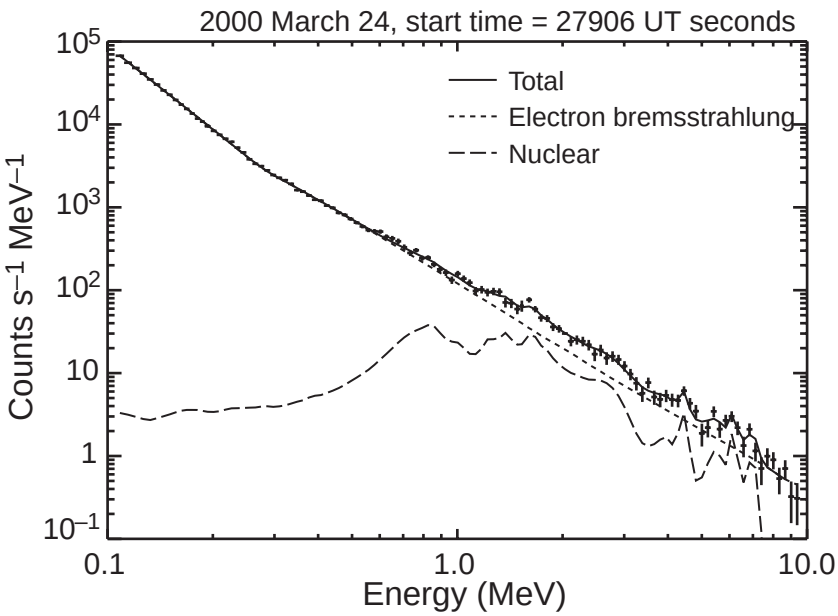
relative line intensities
detailed line shapes
fitting templates for weak flares

Angular Distributions



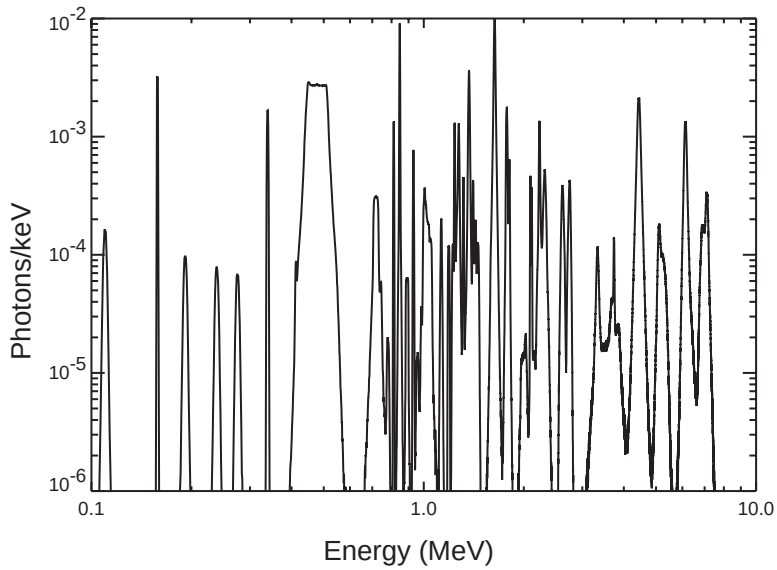
Werntz, et al. 1990

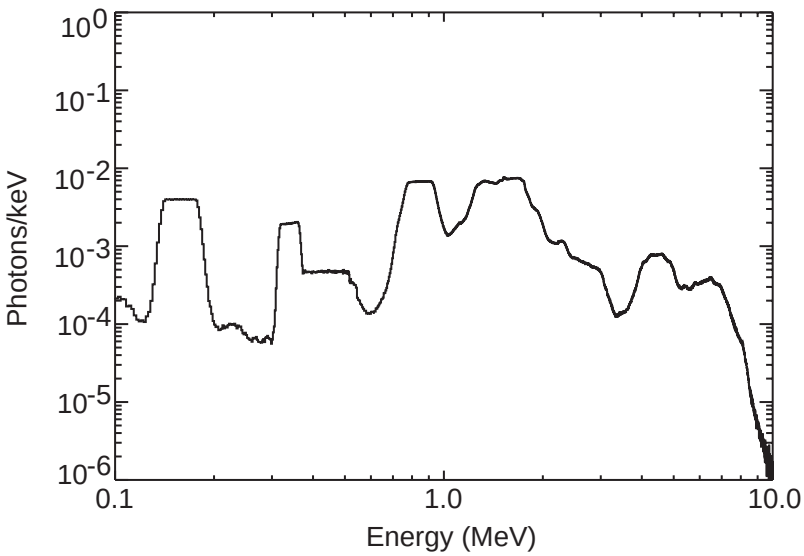
Fitting Templates



OSSE flare

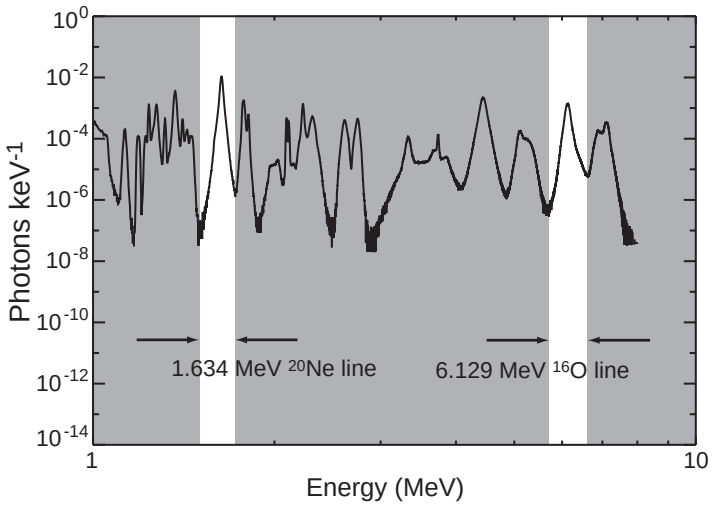
Narrow lines

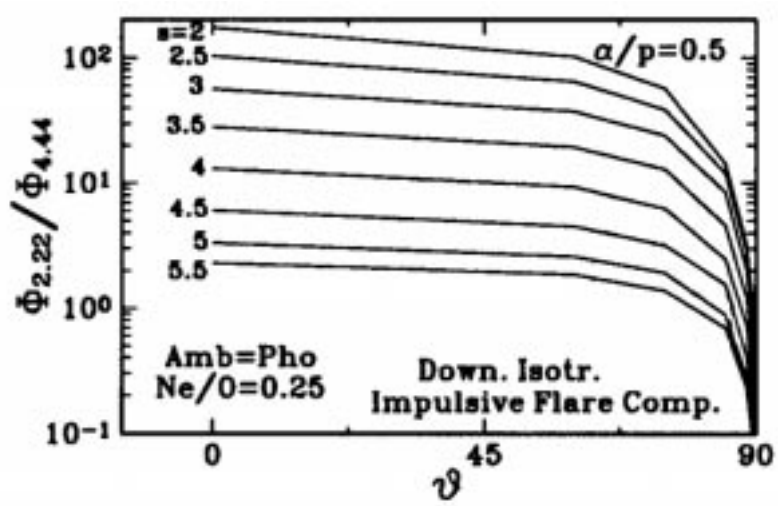


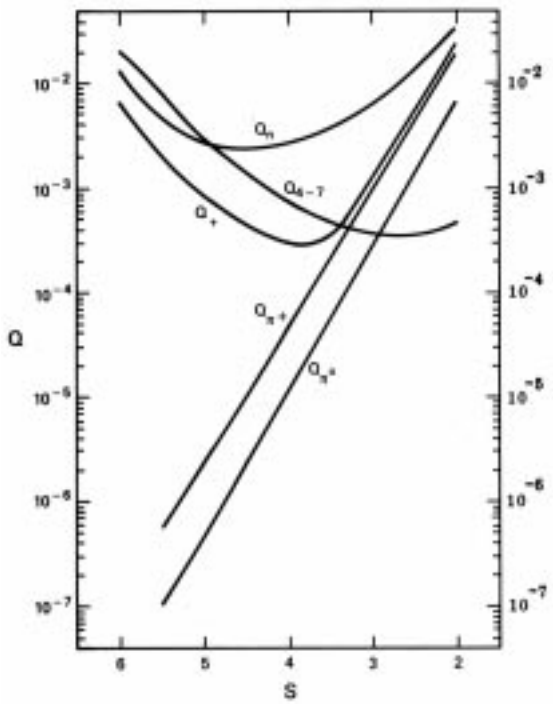


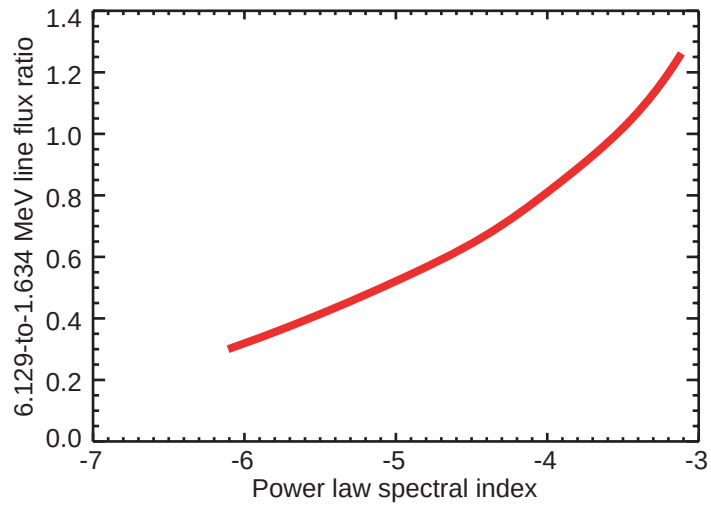
Broad lines

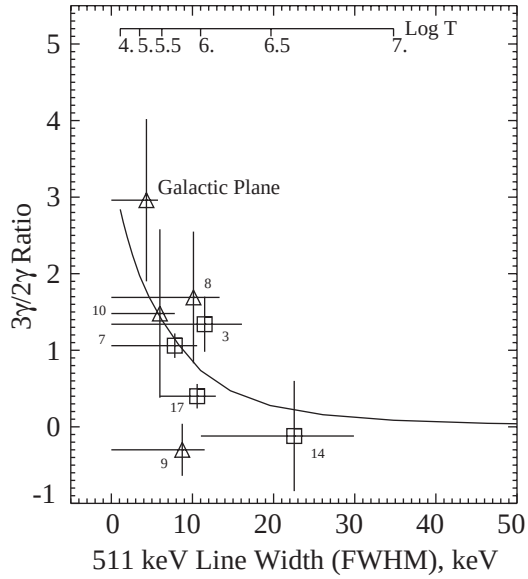
Additional Tools











Provides:

relative line intensities
accelerated-particle spectrum
annihilation region temperature
accelerated-particle numbers