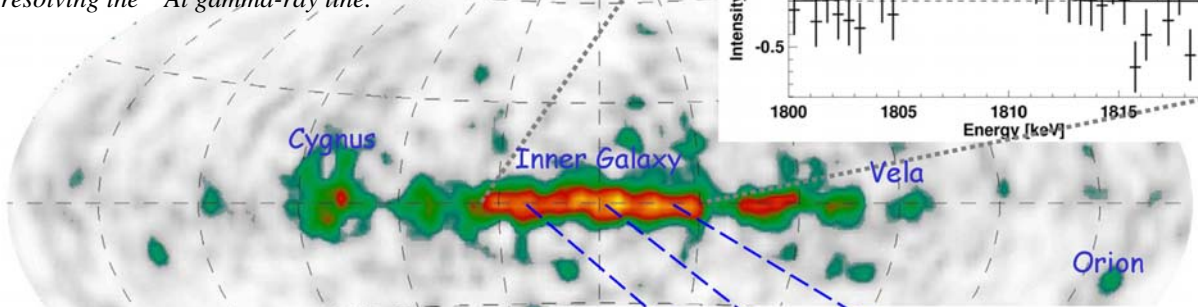
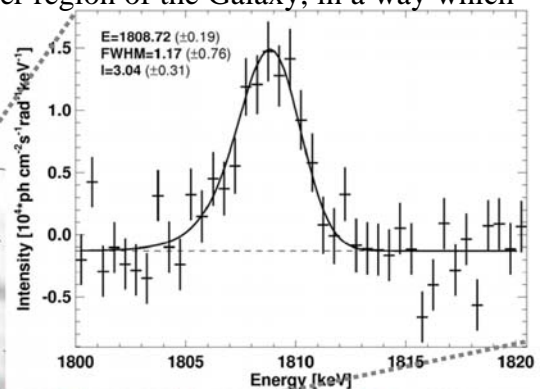


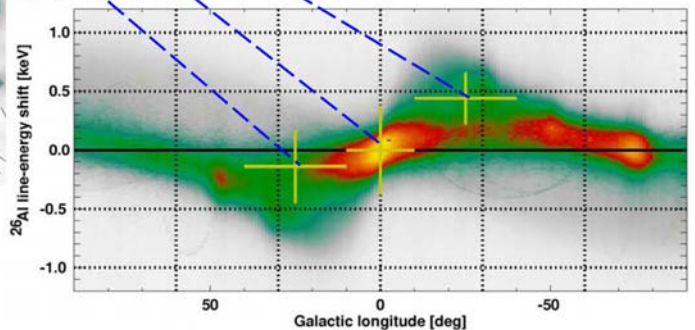
Recent massive-star nucleosynthesis is traced throughout the Galaxy with radioactivity gamma-rays of  $^{26}\text{Al}$  and now also  $^{60}\text{Fe}$ . Precision spectroscopy measurements of  $^{26}\text{Al}$  gamma-rays with the SPI spectrometer on INTEGRAL along the plane of the Galaxy reveal Doppler shifts and broadenings. The large-scale Galactic rotation and the kinematics of interstellar gas in the massive-star regions are responsible for these signatures. Different magnitudes of Doppler shifts and broadenings for different parts of the Galaxy can provide new information on in the inner spiral-arm and bar regions of the Galaxy.

The imaging resolution of the SPI Ge spectrometer instrument ( $\sim 2.7^\circ$ ) allows space-resolved spectroscopy. SPI's Ge detectors maintain a record spectral resolution of  $\sim 3$  keV at 1809 keV over years of measurements. From data of the first two mission years, we found that the gamma-ray line is not significantly broadened, in contrast to an earlier measurement which had suggested kinematic broadening corresponding to ISM velocities of  $\sim 500$  km  $\text{s}^{-1}$ . Furthermore, we found that the  $^{26}\text{Al}$  line centroid varies across the inner region of the Galaxy, in a way which was expected from the Galaxy's large-scale rotation.

*$^{26}\text{Al}$  radioactivity is seen along the plane of the Galaxy, and attributed to massive star nucleosynthesis within the last few Myr ( $\tau_{^{26}\text{Al}} \sim 1$  My). The best image still is from the COMPTEL 9-year measurements. INTEGRAL/SPI now made a precision measurement resolving the  $^{26}\text{Al}$  gamma-ray line.*



*$^{26}\text{Al}$  gamma-ray line spectra for three viewing directions towards the inner Galaxy indicate Doppler shifts as expected from Galactic rotation (colors=model, crosses=measurement). Bottom-right: top view of the Galaxy indicating viewing directions and Galactic rotation).*



This demonstrates that  $^{26}\text{Al}$  gamma-rays sample massive-star nucleosynthesis throughout the Galaxy. Thus, a new and independent massive-star census is obtained. It translates into a core-collapse supernova rate of  $1.9 \pm 1.1$  SN per century. With more exposure, separation into finer directional pixels will allow to study the structure of inner-Galaxy spiral arms and bar through  $^{26}\text{Al}$  radioactivity.

- Diehl R., Halloin H., Kretschmer K., et al., 2006. Radioactive  $^{26}\text{Al}$  from massive stars in the Galaxy. Nature, 439, 45

