MIR polarimetric mapping of the Crab Nebula *

R.J. Tuffs[1], R. Siebenmorgan[2] and Y.A. Gallant[3]

[1]Max-Planck-Institut für Kernphysik, Heidelberg, Germany
[2]ISO Data Centre, ESA Astrophysics Division, Villafranca del Castillo, Spain
[3]Astronomical Institute, Utrecht University

The Crab Nebula is the prototype of a young pulsar-powered supernova remnant (SNR). Although strong UV and optical line emission is seen from photo- and (probably) shock- excited stellar ejecta in the system of filaments, the radio, NIR/optical/UV and X-ray spectral regimes are dominated by diffuse synchrotron emission. A puzzling feature of the nebula's synchrotron spectrum is that it shows two breaks, one in the MIR at about $2\,10^{13}$ Hz and the other in the EUV at about 10^{16} Hz. While the EUV break is commonly interpreted as being due to synchrotron losses (eg Kennel & Coroniti (1984)), the nature of the MIR break is unknown. Another interesting feature of the IR emission is the expected dust emission from condensates in the filaments detected in absorption in narrow-band optical continuum observations. Indeed, the IR spectral "bump" (discovered by IRAS - see Marseden et al. 1984, Mezger et al. 1986, Strom& Greidanus 1992) as an excess in the integrated broad-band spatially integrated emission over extrapolations of the synchrotron power laws from the radio and optical/UV regimes) showed that the luminosity of thermal emission in the IR, either from condensates, and/or from fine-structure IR line emission from gaseous ejecta, may rival that of the IR synchrotron emission.

In order to investigate the spatial and spectral characteristics of the synchrotron component near the MIR break we have mapped the polarised emission from the nebula using the C05 AOT with ISOCAM in the LW2 and LW3 filters (with bandpasses of ca. 5–8.5 and 12-18μm respectively). The 6 arcsec pixel scale on the camera was used. A preliminary map of the polarised emission in the LW3 band is shown in the figure as vectors overlaid on contours of total intensity. The internal calibration of the data is in line with the polarisation weight factors (as described in Siebenmorgan et al., this volume), and the polarised signal is consistent between the two polariser cycles used for the observations. The pattern of spatially coherent vectors shows some similarity to that seen in the radio and optical regimes, though there are detailed differences on scales of both the beam and the remnant. The results will be discussed in detail elsewhere.

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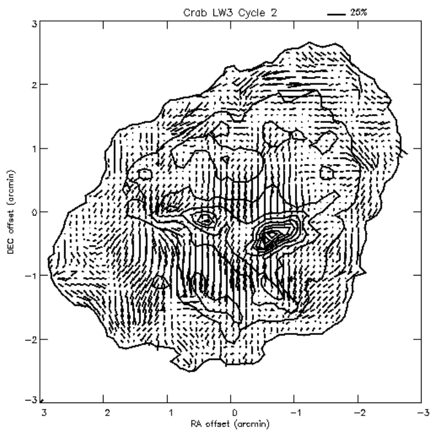

Figure 1. Electric Vectors of polarised intensity overlaid on linear contours of total intensity as seen by ISOCAM through the LW3 filter and the 6 arcsec PFOV. Vector length is proportional to percentage polarisation. The peak in the contours at an offset of ca. (+0.7, -0.3) arcmin coincides with the peak in the optical [OIII] emission, so is likely to be due to line emission.

REFERENCES

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