POSSIBILITIES FOR OBSERVATIONS WITH THE INFRARED SPACE OBSERVATORY OF EMISSION FROM SHOCK–HEATED DUST IN SNRs

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Abstract: The possibilities for observing infrared emission from shock-heated dust in SNRs with the future Infrared Space Observatory (ISO) are illustrated with calculations of the ISOPHOT-P and ISOPHOT-C flux densities and integration times for radiation from six selected SNRs in eight wavelength bands between 4μm and 180μm.

The flux densities of infrared radiation in eight wavelength bands (4, 25, 35, 50, 75, 105, 140, and 180 μm) from four selected galactic SNRs (Tycho, Kepler, Cas A and G292.0+1.8) and two extragalactic SNRs (1E0102.2-7219 in the SMC and an SNR in NGC4449) are estimated using results derived from IRAS observations (Braun 1985) and calculations of infrared emission from shock-heated dust (Draine 1981). The integration times are determined from the expected sensitivities of the multiband-multiaperture photopolarimeter (ISOPHOT–P) and the far infrared camera (ISOPHOT–C) (see Tables 1 and 2). The data for the extragalactic SNRs were obtained from Inoue *et al.* 1983, Raymond 1984, Blair *et al.* 1983 and Blair *et al.* 1984. The range of acceptable individual integration times was taken to be between 2 seconds and 1 hour, the total integration time up to 24 hours, and the minimum required signal–to–noise ratio equal to 10.

With these restrictions it should be possible to map Cas A in all eight bands, Kepler in seven bands between 4μm and 140μm, Tycho in six bands between 4μm and 105μm, and G292.0+1.8 in five bands between 25μm and 105μm. Similarly, observations of 1E0102.2-7219 in five bands between 25μm and 105μm and of the SNR in NGC4449 in the 25μm band should be possible. Finally, observations can be made with ISOPHOT–P with different apertures in the 4μm and 25μm bands for Cas A and Kepler, and in the 25μm band only for the other SNRs. Total observing time would be about 15.5 hours. The detailed results are given in Table 3.

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Table 1 ISOPHOT-P (Multiband-Multiaperture Photopolarimeter)

Wavelength range (μm)	3 ... 30
Total number of spectral bands	10
Central wavelength (μm)	4, 6.5, 10, 16, 25, others TBD
Spectral resolution	2.5, 2.5, 2.5, 2.5, 2.5, others TBD
Total number of apertures	15
Field of view (arc sec)	5, 8, 12, 20, 30, 40, 60, 80, 110, 150, 180, others TBD
Polarization measurements	3 grid polarizers with 0^0, 60^0, 120^0
Min. detectable flux[1] (mJy)	
Photometry	
4 μm[2]	0.18
25 μm[3]	5.0
Polarimetry	
4 μm[2]	0.44
25 μm[3]	12.4

Table 2 ISOPHOT-C (Far Infrared Camera)

	Array I	Array II	Array III
Wavelength range (μm)	30 ... 60	60 ... 120	120 ... 200
Pixels	4 x 4	3 x 3	2 x 2
Broad bands, Central wavelength (μm)	45	90	160
Broad bands, $\lambda/\Delta\lambda$	2.5	2.5	2.5
Narrow bands, Central wavelength (μm)	35 , 50	75 , 105	140 , 180
Narrow bands, $\lambda/\Delta\lambda$	4	4	4
Min. detectable flux[1] (mJy)			
Photometry	21	32	140
Polarimetry	52	80	350
Polarisation Measurements	3 grid polarizers with 0^0, 60^0, 120^0		

[1] Integration time 100 s; S/N = 10; broadband filter
[2] NEP = $5 \cdot 10^{-18}$ W·Hz$^{-1/2}$
[3] NEP = $3 \cdot 10^{-17}$ W·Hz$^{-1/2}$

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Table 3

TYCHO:	4μ	25μ	35μ	50μ	75μ	105μ
Flux (Jy):	0.003	23	63	56	25	9
Time (s) :	225	2	2	3	9	64

5x5 matrix with spacing 2'

25μ:	180"	80"	40"	20"	12"	8"	5"
Time (s):	2	2	2	20	150	760	3600

KEPLER:	4μ	25μ	35μ	50μ	75μ	105μ	140μ
Flux (Jy):	0.0015	11	15	14	6	2	0.5
Time (s) :	23	2	2	2	4	33	2000

2x2 matrix with spacing 2'

4μ:	180"	80"
Time (s):	23	590

25μ:	180"	80"	40"	20"	12"	8"	5"
Time (s):	2	2	2	3	17	85	560

Cas A:	4μ	25μ	35μ	50μ	75μ	105μ	140μ	180μ
Flux (Jy):	0.015	190	170	150	80	26	7	1
Time (s) :	2	2	2	2	2	2	52	2540

3x3 matrix with spacing 2'

4μ:	180"	80"	40"
Time (s):	2	30	480

25μ:	180"	80"	40"	20"	12"	8"	5"
Time (s):	2	2	2	2	2	2	10

G 292.0 +1.8:	25μ	35μ	50μ	75μ	105μ
Flux (Jy):	15	56	50	25	12
Time (s) :	2	5	6	18	75

6x6 matrix with spacing 2'

4μ:	180"
Time (s):	1050

25μ:	180"	80"	40"	20"	12"	8"
Time (s):	2	2	6	95	730	3600

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Table 3 (cont'd)

1E0102.2-7219:	25μ	35μ	50μ	75μ	105μ
Flux (mJy):	120	150	140	60	20
Time (s) :	2	2	3	30	260

25μ:	20"	12"	8"	5"
Time (s):	2	5	23	150

in NGC 4449:	25μ
Flux (mJy):	3
Time (s):	280

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