

SAG 4 : ISM

Alain Abergel, Jean-Paul Baluteau

Evolution of interstellar dust : 163 hours allocated : 115 h (SPIRE) + 48 h (PACS)

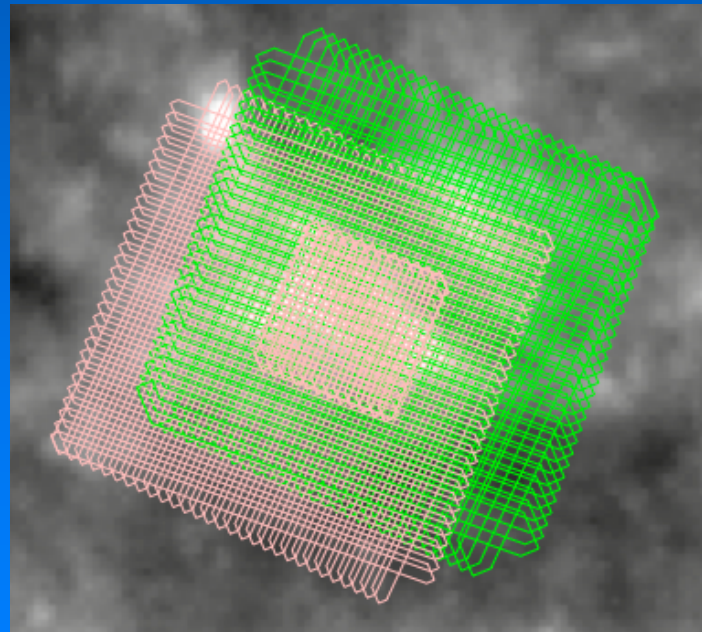
17 hours were given to SAG 3 for two common fields

	SPIRE mapping	PACS mapping	SPIRE HR + LR	PACS spectro	Total
Schock Processed Dust and Cirrus to Molecular clouds					
HSPOT v3	22.48 h (+ PACS //)	13.41 h	no	no	35.89
Diffuse Galactic Medium					
HSPOT v3			5.7 h	1.3 h	7
Classical PDRs					
HSPOT v3	4.49 h	6.91 h	28.49 h	26.71 h	66.3
Hot PDRs					
HSPOT v3	3.1 h		11.5		15.0
Prestellar Cores and Protostars					
HSPOT v3	no	no	39 h		39
TOTAL	30.1 h	20.3 h	84.7 h	28 h	163.00 h

SPIRE consortium meeting, October 31, 2007

Diffuse clouds: Mapping with PACS + SPIRE //, and PACS

Sources	I_{100} MJy/sr	PACS+ SPIRE // Slow, 1 nominal + 1 orthogonal Sensitivity per AOR PACS : 10.3 - 11.0 - 15.6 mJy SPIRE : 7.4- 10.2- 8.6 mJy	PACS mapping Scan maps, Homogenous coverage	Total
Spica HII	1-4	75 + 170 mic , 57' X 57', 8458+8329 s	110 + 170 mic , 7.9 - 11.1 mJy per map 29'X29' 45° R2 +135° R1 : 5175 + 2535 s	



Diffuse clouds: SPIRE and PAC mapping

Sources	I_{100} MJy/sr	PACS+ SPIRE // Slow, 1 nominal + 1 orthogonal Sensitivity per AOR PACS : 10.3 - 11.0 - 15.6 mJy SPIRE : 7.4- 10.2- 8.6 mJy	PACS mapping Scan maps, Homogenous coverage	Total
Spica HII	1-4	75 + 170 mic, 57' X 57 ' , 8458+8329 s	110 + 170 mic, 7.9 - 11.1 mJy per map 29'X29' 45° R2 +135° R1 : 5175 + 2535 s	
IVC G86.5+5 9.6	1-2	110 + 150 mic, 58'X58' 8860 + 8747 s	75 + 170 mic, 7.3 - 11.1 mJy per map 30'X30' 45° R2 + 135° R1 : 5755 + 2805 s	
Ursa Major	4-8	110 + 150 mic, 50'X100'+100X50' 12780+11376 s	75 + 170 mic, 7.3 - 11.1 mJy per map W:34'X34' 45° R2 + 135° R1 : 7270 + 3355 s E: 34'X34' 45° R2 + 135° R1 : 7270 + 3355 s	
G300-17 Cham III	8-18	75 + 170 mic, 68 ' X 68 ' 11460 + 10911 s	110 + 170 mic, 7.0 - 9.9 mJy per map 80'X6legs R2 : 6726 s 9X46 legs R1 : 3952 s	
Total		22.48 h	13.41 h	35.89 h

Diffuse clouds in SAG 3 (common fields)

Sources	I_{100} MJy/sr	PACS+ SPIRE // Fast, 1 nominal + 1 orthogonal Sensitivity per AOR PACS 75-170: 17.7 - 26.9 mJy SPIRE : 12.8-17.6-14.9 mJy	PACS mapping Scan maps, Homogenous coverage Sensitivity per AOR 110-170: 10.9 - 15.3 mJy	Total
Polaris Flare	5-10	110' X110' nominal + orthogonal: 9837 s + 9708 s	60'X60' 45° + 135°: 5609 s + 5489 s	8.5 h
Taurus	10-20	90' X39' nominal: 3957 s 45 ' X 94 'orthogonal: 5648 s	90'X20 legs 45° 6319 s 50X36 legs 135° 6807 s	6.3 h
Total from SAG3				14.8 h

Diffuse Galactic medium

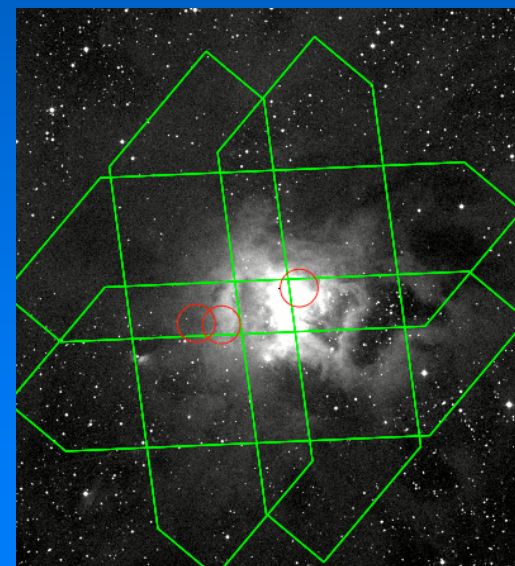
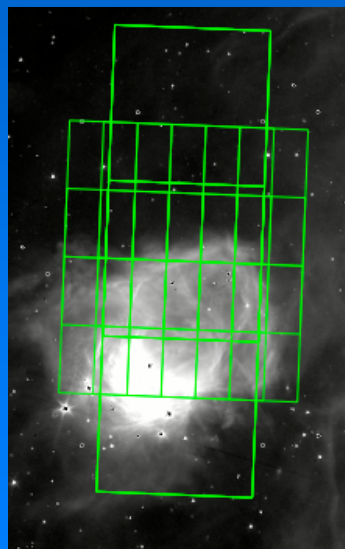
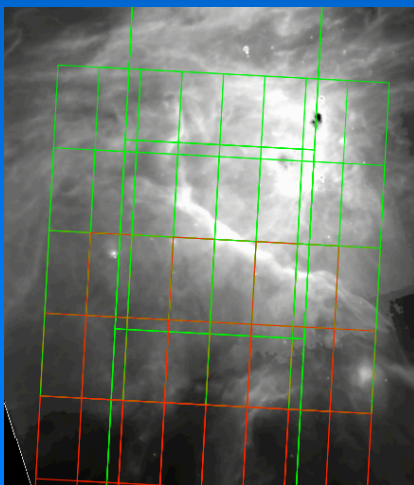
SPIRE + PACS Spectroscopy:

Sources	I_{ν} 100 μm MJy/sr	LR+ HR SPIRE FTS R32+R32, Sparse sampling	PACS line spec. [ClI] 158 μm [OI] 63 and 145.5 μm NII 121 μm
$l= 26.46^\circ$, $b= 0.09^\circ$	1850	5152 s	1 cycle: 815 s
$l= 26.46^\circ$, $b= -0.3^\circ$	2150	5152 s	1 cycle: 815 s
$l= 28.59^\circ$, $b= 0.83^\circ$	700	5152 s	1 cycle: 815 s
$l= 30^\circ$, $b= 3^\circ$	150	5152 s	4 cycles: 2122 s
Total HSPOT v3		5.7 h	1.3 h

Classical PDRs : SPIRE Mapping

SPIRE Mapping	Requested RMS	Strategy, RMS S/L: Small/Large Map	Repetition	RMS mJy	HSPOT v3.0.5
Orion Bar	10 mJy	S	1	4.7	687 s
NGC2023	10 mJy	S	1	4.7	687 s
NGC7023	10 mJy	L: 8'X8': dir A+B	4	4.8	1666 s

Small and Large maps:



SPIRE consortium meeting, October 31, 2007

Classical PDRs : SPIRE Mapping

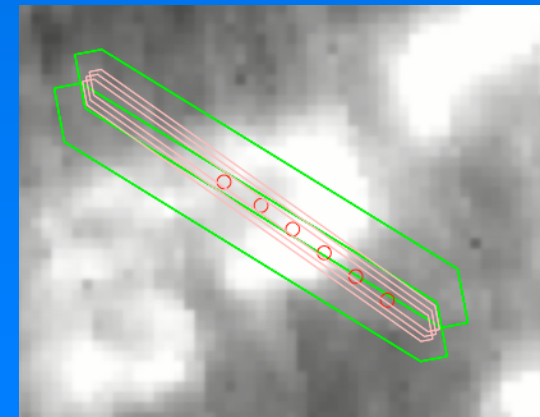
SPIRE Mapping	Requested RMS	Strategy, RMS S/L: Small/Large Map	Repetition	RMS mJy	HSPOT v3.0.5
Orion Bar	10 mJy	S	1	4.7	687 s
NGC2023	10 mJy	S	1	4.7	687 s
NGC7023	10 mJy	L: 8'X8': dir A+B	4	4.8	1666 s
IC 63	10 mJy	S	1	4.7	687 s
Rho Oph	10 mJy	S	1	4.7	687 s
Horsehead	10 mJy	L: 8'X8' : dir A+B	4	4.7	1650 s
NGC7023 E	10 mJy	see NGC7023		4.7	0
IC 59	10 mJy	S	1	4.7	1650 s
Ced 201	10 mJy	S	1	4.7	687 s
L1721	10 mJy	L: 50X8 ': dir B	8	4.8	2831 s
California	10 mJy	3X L: 8'X 8' : dir A+B	4	4.8	4950 s
All PDRs					4.49 h

Classical PDRs : SPIRE Mapping

SPIRE Mapping	Requested RMS	Strategy, RMS S/L: Small/Large Map	Repetition	RMS mJy	HSPOT v3.0.5
Orion Bar	10 mJy	S	1	4.7	687 s
NGC2023	10 mJy	S	1	4.7	687 s
NGC7023	10 mJy	L: 8'X8': dir A+B	4	4.8	1666 s
IC 63	10 mJy	S	1	4.7	687 s
Rho Oph	10 mJy	S	1	4.7	687 s
Horsehead	10 mJy	L: 8'X8' : dir A+B	4	4.7	1650 s
NGC7023 E	10 mJy	see NGC7023		4.7	0
IC 59	10 mJy	S	1	4.7	1650 s
Ced 201	10 mJy	S	1	4.7	687 s
L1721	10 mJy	L: 50X8 ': dir B	8	4.8	2831 s
California	10 mJy	3X L: 8'X 8' : dir A+B	4	4.8	4950 s
All PDRs					4.49 h

Large maps: not always A+B directions

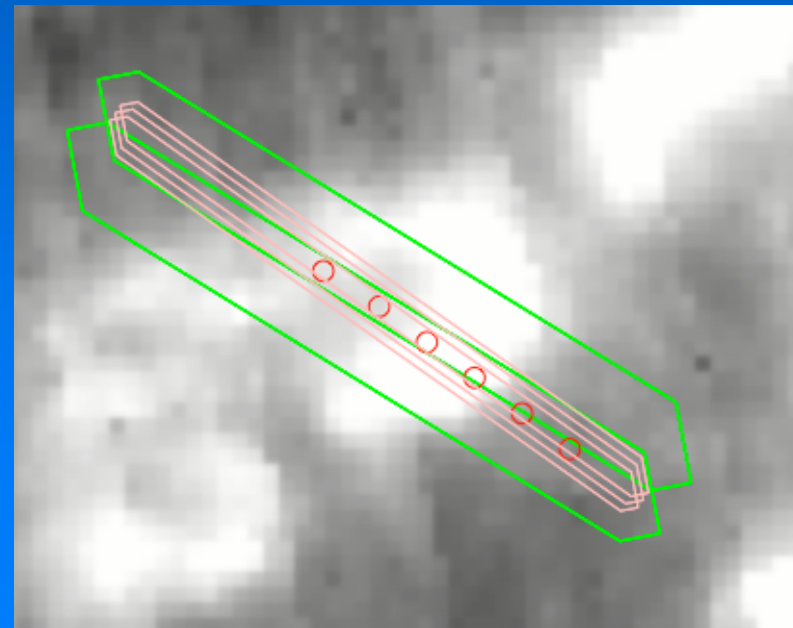
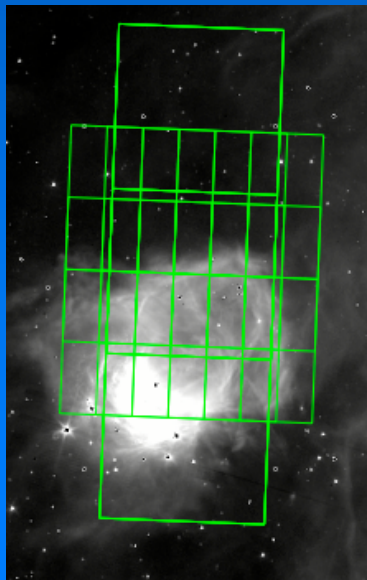
SPIRE consortium meeting, October 31, 2007



Classical PDRs : PACS Mapping

PACS Mapping	Requested	Strategy Chopped Raster: CR Scan map: SM	Repetition	RMS mJy	HSPOT v3.0.5
Orion Bar	7 mJy	CR: 3X7	1	3.4	2107 s
NGC2023	7 mJy	CR: 3 X 6	1	3.4	2107 s
NGC7023	7 mJy	CR: 5 X 11	1	3.4	5287 s

Chopped raster and Scan maps (60' or 80' X 3 legs):

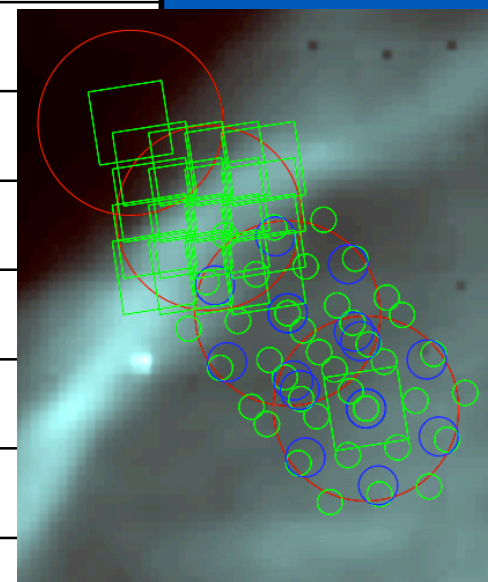
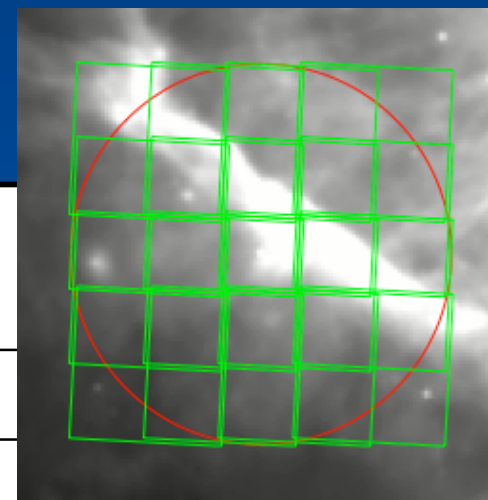


Classical PDRs : PACS Mapping

PACS Mapping	Requested	Strategy, RMS Chopped Raster: CR Scan map: SM	Repetition	RMS mJy	HSPOT v3.0.5
Orion Bar	7 mJy	CR: 3X7	1	3.4	2107 s
NGC2023	7 mJy	CR: 3 X 6	1	3.4	2107 s
NGC7023	7 mJy	CR: 5 X 11	1	3.4	5287 s
IC 63	7 mJy	CR: 2X4	1	3.4	897 s
Rho Oph	7 mJy	CR: 3X6	1	3.4	1829 s
Horsehead	7 mJy	CR: 4 X 9	1	3.4	3509 s
NGC7023 E	7 mJy	See NGC 7023	1	3.4	0 s see NGC 7023
IC 59	7 mJy	CR: 3X8	1	3.4	2385 s
Ced 201	7 mJy	CR: 2X4	1	3.4	897 s
L1721	7 mJy	L: 60', Medium speed, 3 legs	2	6	1618 s
California	7 mJy	L: 80', Low speed, 3 legs	2	4.2	3301 s
All PDRs	7 mJy				6.91 h

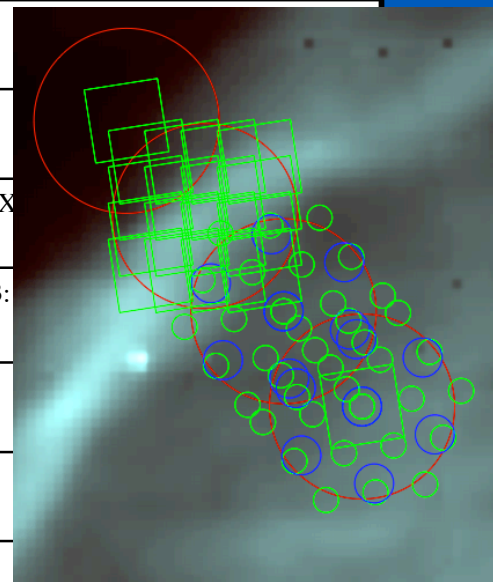
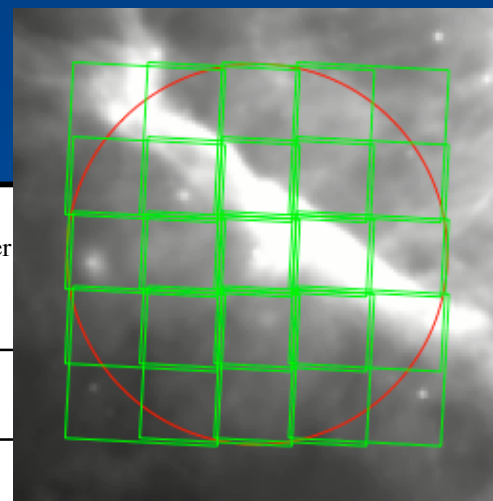
Classical PDRs : SPIRE Spectroscopy

SPIRE HR + LR	[Cl], 370.4-609.1 μm + CO lines Expected W m^{-2} (in the beam)	Strategy Single Pointing RMS: $2\text{--}3 \cdot 10^{-17} \text{ W /m}^2$ 0.2-0.3 J Full/Interm/Sparse Sampling	F: 5869 s, I: 1657s , S: 613 s
Orion Bar	10^{-15} , 10^{-15} 10^{-18} - 10^{-16}	1XSP FS H+L R2	1 X 5869
NGC2023	$2 \cdot 10^{-16}$, $2 \cdot 10^{-16}$ 10^{-18} - 10^{-16}	2XSP FS H+L R2	2 X 5869
NGC7023	$2 \cdot 10^{-16}$, $2 \cdot 10^{-16}$ 10^{-18} - 10^{-16}	1XSP FS H+L R2	1 X 5869
IC 63	$2 \cdot 10^{-16}$, $2 \cdot 10^{-16}$ 10^{-18} - 10^{-16}	1XSP FS H+L R2	1 X 5869
Rho Oph	$2 \cdot 10^{-16}$, $2 \cdot 10^{-16}$ 10^{-18} - 10^{-16}	2XSP FS H+L R2 2XSP IS H+L R2	2 X 5869 + 2 X 1657 (off)
Horsehead	10^{-16} , 10^{-16} 10^{-18} - 10^{-16}	3XSP FS H+L R2	3 X 5869
NGC7023 E	$2 \cdot 10^{-16}$, $2 \cdot 10^{-16}$ 10^{-18} - 10^{-16}	2XSP FS H+L R2	2 X 5869
IC 59	10^{-16} , 10^{-16} 10^{-24} - 10^{-17}	1XSP FS H+L R2 5XSP IS H+L R2	1 X 5869 + 5X 613= 3065 s
Ced 201	$5 \cdot 10^{-17}$, 10^{-16} 10^{-24} - 10^{-17}	3XSP FS H+L R2	3 X 1657= 4971 s
L1721	10^{-16} , 10^{-16} 10^{-24} - 10^{-20}	1XSP IS H+L R2	6 X 1657 s= 9942 s
California	$5 \cdot 10^{-17}$, 10^{-16} 10^{-24} - 10^{-17}	1XSP IS H+L R2	3 X 1657= 4971 s
Total			13 X 5869+ 14 X 1657+ 5 X 613= 28.49 h



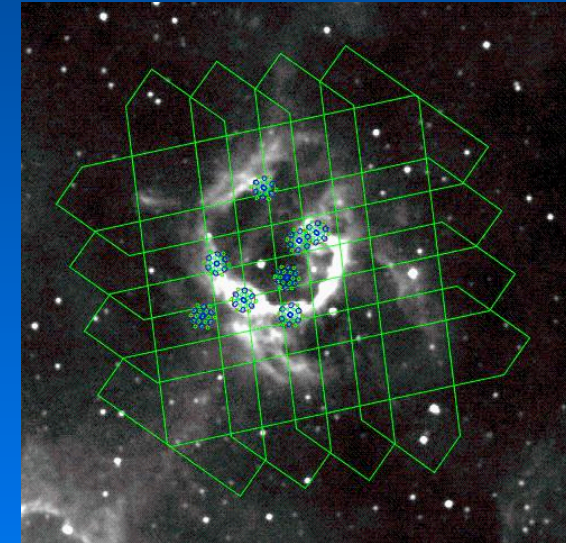
Classical PDRs : PACS Spectroscopy

PACS spectroscopy Mapping + wavelength switching	[CII] 158 μm [OI] 63 and 145.5 μm W m^{-2} (in 9"X9") +NII 121 mic	Raster point step= 1/2 pixel Raster line step= 1/2 pixel RMS (W m^{-2}) with R 4	Number
Orion Bar	10^{-12} $10^{-11}, 10^{-14}$	$1.7 \cdot 10^{-18}$ $7 \cdot 10^{-18}, 1.6 \cdot 10^{-18}$	4X4: 8990 s
NGC2023	$2 \cdot 10^{-13}$ $2 \cdot 10^{-12}, 6 \cdot 10^{-14}$	$1.5 \cdot 10^{-18}$ $6.5 \cdot 10^{-18}, 1.4 \cdot 10^{-18}$	5X3: 8445 s
NGC7023	10^{-13} $2 \cdot 10^{-12}, 8 \cdot 10^{-14}$	$1.7 \cdot 10^{-18}$ $7 \cdot 10^{-18}, 1.6 \cdot 10^{-18}$	3X3: 5175s
IC 63	$1.6 \cdot 10^{-13}$ $2 \cdot 10^{-12}, 6 \cdot 10^{-14}$	$1.7 \cdot 10^{-18}$ $7 \cdot 10^{-18}, 1.6 \cdot 10^{-18}$	3X3 5175 s
Rho Oph	10^{-13} $10^{-12}, 3 \cdot 10^{-14}$	$1.7 \cdot 10^{-18}$ $7 \cdot 10^{-18}, 1.6 \cdot 10^{-18}$	4X4= 8990 s + 2 X
Horsehead	10^{-13} $2 \cdot 10^{-13}, 2 \cdot 10^{-14}$	$1.7 \cdot 10^{-18}$ $7 \cdot 10^{-18}, 1.6 \cdot 10^{-18}$	7X3: 11715+ 3X3:
NGC7023 E	$7 \cdot 10^{-14}$ $8 \cdot 10^{-14}, 3 \cdot 10^{-15}$	$1.7 \cdot 10^{-18}$ $7 \cdot 10^{-18}, 1.6 \cdot 10^{-18}$	3X5 8445 s
IC 59	$8 \cdot 10^{-14}$ $8 \cdot 10^{-14}, 3 \cdot 10^{-15}$	$1.7 \cdot 10^{-18}$ $7 \cdot 10^{-18}, 1.6 \cdot 10^{-18}$	3X4 = 6810 s
Ced 201	$1.5 \cdot 10^{-15}$ $3 \cdot 10^{-17}, 10^{-21}$	$1.7 \cdot 10^{-18}$ $7 \cdot 10^{-18}, 1.6 \cdot 10^{-18}$	3X6: 10080 s
L1721	$3 \cdot 10^{-14}$ $10^{-14}, 5 \cdot 10^{-16}$	$1.7 \cdot 10^{-18}$ $7 \cdot 10^{-18}, 1.6 \cdot 10^{-18}$	Done with ISO-LWS
California	$3 \cdot 10^{-16}$ $2 \cdot 10^{-16}, 7 \cdot 10^{-18}$	$1.7 \cdot 10^{-18}$ $7 \cdot 10^{-18}, 1.6 \cdot 10^{-18}$	3 X 3X3: 5175 s
Total			26.71 h



Hot PDRs : SPIRE mapping and Spectroscopy

Sources	SPIRE mapping 1 Scan map	HR SPIRE FTS Sparse, R2: 562 s and R8: 1372 s
Sh2-104	12'X12' (A+B) R1: 790 s	562 X 6 + 1372 X 2= 6056 s
RCW 79	19'X19' (A+B) R1: 1080 s	562 X 5 + 1372 X 3= 5805 s
RCW 82	12'X12' (A+B) R1: 790 s	562 X 8 + 1372 X 2=7240 s
RCW 120	22'X22' (A+B) R1: 1372 s	562 X 5 + 1372 X 4= 8298s
RCW 71	6'X6' (A+B) R1: 544 s	562 X 2 + 1352 X 1= 2496 s
AFGL 4029	65'X65' (A+B) R1: 4770 s	562 X 5 + 1372 X 1= 4182 s
IRAS 16132-5039	10'X10' (A+B) R1: 765 s	562 X 3 + 1372 X 2= 4430 s
Sh 241	15'X15' (A+B) R1: 1013 s	562 X 3 + 1372 X 1= 3058 s
Total	3.1 h	11.55 h



Dense cores & protostars : SPIRE Spectroscopy

Sources	LR Stage 3	HR Stage 3	LR SPIRE FTS R55, Sparse	LR+ HR SPIRE FTS R9+R4, Full + Sparse sampling
Cores				
L1544	8100		1106 + 2 X 3587	No
L1521 E	8100		1106 + 2 X 3587	No
L1521F	8100		1106 + 2 X 3587	No
L1689B	8100		1106 + 2 X 3587	No
Total	9 h		9.2 h	
Cl. 0				
IRAM0491	2700	3X3600		1 F 11907 s
IRAS16293	2700	3X3600		1 F 11907 s + 2 S: 2 X 987 s
N1333-IRAS4	2700	3X3600		1 F 11907 s + 2 S: 2 X 987 s
N6334I(N)	2700	3X3600		1 F 11907 s + 1 S: 987 s
Cl.1				
IRAS04191	2700	3X3600		1 F 11907 s + 2 S: 2 X 987 s
L1489-IRS	2700	3X3600		1 F 11907 s + 2 S: 2 X 987 s
EL29	2700	3X3600		1 F 11907 s + 2 S: 2 X 987 s
N6334I(N)	2700	3X3600		1 F 11907 s + 1 S: 987 s
Total protostars	6 h	24h		29.75 hours
Total HSPOT v3			15 h	24 h

Observing modes in SAG 4

SPIRE mapping

- Small Maps
- Large maps, A+B directions, 1 direction in one case

SPIRE +PACS // mapping, A+B directions

SPIRE Spectroscopy

- Sparse, Intermediate, Full Samplings
- High resolution, Low Resolutions, High + Low Resolutions

PACS mapping

- Scan maps, 2 perpendicular directions
- Chopped Rasters

PACS Spectroscopy

- 4 lines
- Mapping + Wavelength switching

Scientific validation of the AORs, for our wide range of sources (intensity and spatial structure)?

Scientific organization

Shock processed dust

A. Abergel
P. Ade
J.-P. Bernard
F. Boulanger
M.A Miville-Deschênes
P. Martin
G. White

Cirrus/Molecular Clouds

A. Abergel
J.-P. Bernard
F. Boulanger
M. Cohen
E. Dartois
G. Lagache
P. Martin
M.A.Miville-Deschênes
D. Naylor
E. Polehampton
G. White

Classical PDRs

A.Abergel
J.-P. Baluteau
F. Boulanger
M. Cohen
E. Dartois
C. Joblin
E. Habart
P. Martin
D. Naylor
E. Polehampton
G. White

Hot PDRs

A. Abergel
J.-P. Baluteau
C. Joblin
E. Habart
D. Naylor
D. Russeil
G. White
A.Zavagno

Dense cores

A. Abergel
P. Ade
P. André
J.-P. Bernard
S. Bontemps
J. Kirk
F. Motte
D. Naylor
D. Ward-Thomson
G. White

Class-0 Protostars

P. Ade
P. André
S. Bontemps
J. Kirk
F. Motte
D. Naylor
D. Ward-Thomson
G. White

Class-1 Protostars

P. André
S. Bontemps
J. Kirk
D. Naylor
D. Ward-Thomson
G. White

Technical organization

Data processing : SPIRE photometry	A. Abergel P. Ade J.-P. Bernard M. Cohen G. Lagache T. Lim P. Martin M.A. Miville-Deschênes F. Motte F. Orieux T. Rodet S. Sidher L. Spencer B. Swinyard D. Ward-Thompson G. White
Data processing : SPIRE spectroscopy	A. Abergel P. Ade J.-P. Baluteau E. Dartois C. Joblin T. Lim D. Naylor F. Orieux T. Rodet E. Polehampton S. Sidher B. Swinyard D. Ward-Thompson A. Zavagno
Data processing : PACS	A. Abergel F. Motte K. Okumara F. Orieux T. Rodet M. Sauvage A. Zavagno

Expected resource after launch

Institute	FTE/year
Cardiff University	1.5
CEA, Saclay	1
CESR, Toulouse	1
CITA, Toronto	4
IAS, Orsay	4
IFSI, Roma	0.2
IPAC, Pasadena	0.05
IRAM, Grenoble	0.05
LAM, Marseille	3
NASA Goddard	0.05
Obs. de Bordeaux	0.15
RAL, Chilton and Univ. of Kent	1
Univ. British Columbia	0.05
Univ. of Lethbridge	4
UC Berkeley	0.1

Total : Around 20 FTE / year, including post-doc and PhD students