List of possible science grade sources for the GISMO run #3 at the Pico Veleta 30m telescope

A) TEST OF GISMO IMPROVEMENT AND INSTRUMENT COMPARISON: SOURCES OBSERVED IN PREVIOUS RUNS AND IN THE 1st RUN OF NIKA

Comparing the integration time and/or rms obtained on sources observed in previous GISMO runs and observed with NIKA would give a straightforward criterion to evaluate the improvements brought by the updates done on GISMO, and the difference in sensitivity with the 1st prototype of NIKA.

1. Sources observed in GISMO runs #1 and #2, and published in papers or reports (the sources with a flux ref are also in the GSFC list below)

Source Name	Type	Run #	Scan dim	t integr	Peak Flux	flux ref
0501-019 (Quasar)	point	1	?	?	0.3 Jy ; s/n ~ 70	
J1849+670	point	2	?	?	?	
J1148+5251	point	2	?	40 min	? but 2 mJy /beam, 0.9 mJy rms => <3.6 mJy @ 4σ	F1.2= 5.0mJy
3C454	point	2	?	<1s	30 Jy	
Crab Nebula	extended	1	81 am^2	10 min	2.6 Jy/beam ; 0.2 $Jy*s^{1/2}$ 1st contour	231. 0.30
Orion mol cloud	extended	1	?	3 min	?	extend
IRDC 43	extended	1	?	?	?	required rms 2mJy
W51	extended	1	?	?	?	
Cas A	extended	2	? but see t	80 min, 32s/9as^2	1.1 Jy/beam ; 6 mJy rms	peak=0.11K
Cygnus A	extended	2	?	?	?	~1Jy total
IRDC 30	extended	2	81 am^2	10 min	0.07 Jy/beam ; 0.01 $Jy*s^{1/2}$ 1st contour	required rms 2mJy
Arp220	extended	2	?	?	104 +/- 2 mJy (0.06 Jy/beam)	~0.01 Jy

2. Some sources observed with NIKA

Source Name	Scan dim (arcsec)	Integration time x number of scans	Measured flux (Jy)
3C345 (Quasar)	~ 70	210s x 5	4.35
MWC349 (Radio star)	~ 95	210s x 3	1.47
B1418+546 (BL Lac)	~ 80	210s x 8	1.17
B1800+440 (QSO)	~ 99	210s x 2	0.10
Arp 220 (ULIRG)	~ 140	110s x 32	0.07
M87 galaxy (AGN)		210 x 9 ?	0.31 centre point

3. Other possible types of sources not mentioned in the IRAM astro group science project listed in the following paragraphs: GRBs, Dwarf Planets…?

B) SCIENCE PROJECTS PROPOSED BY IRAM GRANADA

The sources in common with GSFC (paragraphs D below) are underlined.

1. Infrared dark clouds (IRDC's):

Local Contact: Helmut Wiesemeyer

Source: G25.0-0.2 (typical IRDC, massive cloud core, ~14000 solar masses, complementary data available, e.g,., JCMT)
Center position (J2000) RA 18:37:19.6, DEC -07:11:44.1
Field size: 8 arcmin x 8 arcmin
Peak flux estimate for optically thin dust emission, absorption coefficient varying as f1.5 in standard dust model), extrapolating from 850 micron SCUBA point: F(2mm) ~ 60 mJy.

Source GF9-3 (low-mass prestellar core, ISOCAM images where one core appears in absorption, and the other one strongly in emission, flux measurements with Planck-HFI available)
Center position (J2000) RA 20:53:21.6, DEC 60:14:36
Field size: 3 arcmin x 3 arcmin
Peak flux estimate (optically thin dust emission, absorption coefficient varying as f1.5 in standard dust model), rectangular bandbass centered at 150 GHz: F(2mm) ~ 30 mJy.

2. Disks around classical T Tauri (CTTS) and Herbig Ae/Be (HAeBe) stars:

Local Contact: Helmut Wiesemeyer

Extensively observed, with flux measurements available across a large range of frequencies. Some of them have extended structure (e.g., circumbinary disks or edges of nearby molecular cloud complex):
All CTTS except for V892 (HAeBe).
Coordinates (J2000) and estimated 2mm fluxes (estimated from their 1.3mm flux densities, Beckwith et al., 1990, AJ 99, 924, using (1) the spectral index measured by these authors, (2) spectral index 3.5, i.e., optically thin standard dust model):

GMAur	RA 04:55:10.977	DEC +30:21:59.38	42 mJy (2)
HLTau	RA 04:31:38.471	DEC +18:13:58.11	210 mJy (1)
DGTau	RA 04:27:04.70	DEC +26:06:16.3	160 mJy (1) (extended emission underneath)
TTau	RA 04:33:54.708	DEC +26:13:27.70	66 mJy (1)
GGTau	RA 04:32:30.326	DEC +17:31:40.67	142 mJy (1)
V892Tau	RA 04:18:40.611	DEC +28:19:15.52	48 mJy (2)

3. IRC+10216 (C-rich AGB star):

Local Contact: Guillermo Quintana-Lacaci

Center position: 09:47:57.2915 +13:16:42.864 (J2000)
Size: 12'x12'
Extensively observed for a wide range of frequencies. The closest evolved star, perfectly suited for a detailed study of the formation and evolution of dust grains. The

expected flux ranges from 280 mJy/beam in the center of the star to 2.1mJy/beam at 45'' (Knapp et al. 1994 -Td=1000K, beta=0.6).

4. L1157 (protostellar Core):

Local Contact: Guillermo Quintana-Lacaci

Center position: 20:39:06.24 68:02:15.6 (J2000)

Size: 9'x 7'

This protostellar core is one of the few which have been detected in the continuum submm and mm emission. It has been observed in a wide number of wavelengths, and recently with PACS within the WISH program. In the last summer school we derived Td=22K and beta = 1.4 using MAMBO, SCUBA, SHARC-II and ISOPHOT data. The expected flux at 2mm is 100mJy/beam for the central source, while the emission of the outflows and the disk fluxes are expected to range between 15 mJy/beam and 2.5 mJy/beam.

5. M33 (nearby Galaxy):

Local Contact: Guillermo Quintana-Lacaci

Center position: 01:33:50.0 30:38:44 (J2000)

Size: 60' x 40'

Nearby galaxy. From MAMBO maps it has been shown that a cold component is needed. We have mapped the entire galaxy in 5 bands between 100 and 500micron using Herschel, and this has been used for the 2mm predictions. We expect 2mm peak fluxes of 30mJy/beam from the full 1.2mm map by Komugi et al. (2010) (Td=10K, beta=2). Mapping this complex source will also be helpful to check how GISMO recovers the extended emission. This emission has been observed with MAMBO, and thus we expect a flux at 2mm of 1.5-1mJy/beam.

6. DR21 (massive star forming region):

Local Contact: Carsten Kramer

Center position: 20:39:01.1 42:19:43.0 (J2000)

Size: 5'x15'

360mJy/beam @ 2mm from 8.5Jy/beam @ 1.2mm peak flux of the MAMBO map of Motte et al. 2007 (Td=20K, beta=2). See also Jakob et al. 2007, Ossenkopf et al. 2010

7. IC5146 (cold filament with embedded prestellar cores):

Local Contact: Carsten Kramer

Center position: 21:46:32.5 47:33:55.0 (J2000)

Size: 14'x3'

8mJy/beam @ 2mm from SCUBA 850mu peak flux of 140mJy/beam in Kramer at al. 2003 (Td=10K,beta=2)

8. M87

Local Contact: Albrecht Sievers

Center position 12:28:17.6 12:40:00.6 (B1950)

Flux density about 1.4 Jy for the nucleus, radio lobes stronger at 2mm than at 1.3 mm. A map at 1.3 mm with the 30m you can find (Salter, C.J. et. al., A&A 220, 42-48 (1989))

C) <u>SCIENCE PROJECTS PROPOSED BY IRAM GRENOBLE</u>

The sources in common with GSFC (paragraphs D below) are underlined.

9. Cold dust in a filamentary Infrared Dark Cloud

Local Contact: Francesco Fontani

Center position: RA(2000)=18:57:06, Dec(2000)=02:09:00

Size: 4' x 9' (whole filament)

NB: If mapping such a large field requires too much observing time, we ask to map the smaller region observed in the molecular tracers:

Center position: RA(2000)=18:57:08, Dec(2000)=02:10:30

Size: 2' x 4' (partial filament)

Sensitivity: an rms of 5mJy/beam to achieve a similar sensitivity to Rathborne et al. in their 1.2mm map

We have recently carried out a comprehensive study of the molecular line emission toward the very filamentary Infrared Dark Cloud IRDC G035.39-00.33 with the IRAM 30m telescope. These objects host the initial conditions of massive star and star cluster formation. Moreover, filamentary morphologies are predicted to represent the initial stages of Giant Molecular Clouds in several classes of dynamical formation models (e.g. van Loo et al. 2007, A&A, 471, 213). Thus, G035.39-00.33 is believed to be an IRDC in its early stages of evolution and the ideal candidate where to find cold pre-stellar cores. We have mapped the emission of molecular species such as 13CO, C18O, N2H+, N2D+ and NH2D over a large fraction of the cloud. While 13CO and C18O traces the large-scale low-density gas in the cloud, N2H+, N2D+ and NH2D have revealed the regions where high-mass pre-stellar cores could potentially be present. Interesting variations between N2D+ and NH2D have been found, suggesting that surface chemistry is playing an active role for the formation of NH2D (unlike in low mass star forming regions). To shed light on this, it is crucial to know dust properties toward IRDCs. Therefore, we propose to map the continuum dust emission at 2mm with GISMO. Comparing these data to the available 1.2mm map (from IRAM-30m; Rathborne et al. 2006, ApJ, 641, 389) and to the extinction map (from Spitzer data; Butler & Tan 2009, ApJ, 696, 484), we will put constraints on the dust temperature and emissivity across the cloud and measure dust property variations from quiescent regions to "more active" ones (i.e. with on-going star formation activity). This will allow us to better quantify gas-grain chemical processes in IRDCs as compared to low-mass star forming regions and check if surface grain chemistry is the dominant mechanism of deuteration in IRDCs.

10. Dust emission in active galaxies

Local Contact: Melanie Krips

We propose to map the dust emission at 2mm in a variety of nearby active galaxies, including prominent SB and/or Seyfert galaxies and ULIRGs. For most of the proposed sources, complementary maps of the continuum emission at 850um or 1.3mm and the CO emission are available from the literature, allowing a detailed study of the star formation activity in them. The list of the proposed sources is in order of priority - sizes and requested sensitivities (RMS) are in columns 3 and 4:

Antennae galaxies	RA 12:01:53.3, Dec +18:52:37 (J2000)	1.5' x 1.5'	~2 mJy
<u>NGC6240</u>	RA 16:52:58.9, Dec +02:24:37 (J2000)	-	~1 mJy
Arp299	RA 11:28:30.4, Dec +58:34:10 (J2000)	1' x 1'	~1 mJy
M82	RA 09:55:52.7, Dec +69:40:46 (J2000)	1.5' x 1'	~20 mJy

NGC253	RA 00:47:33.1, Dec -25:17:18 (J2000)	1' x 1'	~10 mJy
IC342	RA 03:46:48.5, Dec +68:05:46 (J2000)	1' x 1'	~10 mJy
NGC6946	RA 20:34:52.3, Dec +60:09:14 (J2000)	6' x 6'	~10 mJy
M51	RA 13:29:55.7, Dec +47:13:53 (J2000)	2' x 2'	~10 mJy

11. Mapping a dense star forming filament in Serpens

Local Contact: Sascha Trippe

Position (J2000): RA: 18:28:44.13, DEC: +00:52:36.4

Size: 2' x 11'

Fluxes: ~10 mJy/beam, strong variations throughout the source to be expected!

We propose to map a dense star forming filament in the Serpens cloud. This object is known for its peculiar geometry: it is exceptionally slim (dimensions are 0.5'x9') and therefore probably compressed. Recent 93GHz PdBI+30m N2H+ line data (Trippe et al.) find a clumpy, filamentary gas structure; from analysing the line widths it appears that most of the gas concentrations are actually starless. In recent years this filament has been observed at wavelengths of 8 microns (Spitzer), 0.87mm (APEX), and 1.1mm (Bolocam), though not very deep. "Deep" mapping of this filament at 2mm with GISMO allows searching for sub-filament structure in the dust continuum and to identify possible dusty counterparts of the structure observed in the spatial gas distribution. In combination with published continuum maps from other wavelengths, it should also be possible to construct temperature maps of the filaments.

12. Mapping cold dust emission in NGC 891

Local Contact: Robert Zylka and Roberto Neri

Position (J2000): RA: 02:22:32.90, DEC: +42:20:45.8

Size: 2' x 10'

Sensitivity: better than 1 mJy – estimated peak emission 15 mJy/beam @ 150 GHz

We propose to observe NGC891 to investigate GISMO’s (a) mosaicing capabilities, (b) calibration accuracy, and (c) dynamic range and image fidelity for mapping extended sources at flux density levels of 10 mJy and less. GISMO’s performance assessment will be made through comparison with unpublished, higher-resolution, high-quality data (dynamic range of 60, rms = 1 mJy) obtained with the 117 channel bolometer array (MAMBO – see Guélin et al. 1993, A&A 279, L37 for an earlier map obtained with the 7 channel array). The scientific goal is to investigate the contribution of the very cold dust component to the overall thermal dust emission – a study for which the 2mm and 1.3mm wavelength bands are perfectly suited.

D) SOURCES PROPOSED BY GSFC (JOHANNES STAGUHN)

The sources in common with IRAM (paragraphs A, B, and C above) are underlined.

1. Bright (≥10 mJy) targets to be used for early science results

Cygnus_A	19:59:28.3	40:44:02	! ~1Jy total, extended
HB0716+714	08:21:53.4	71:20:36	! BL Lac-type, 4 Jy?; variability
MonR2IRS2	06:05:20.00	-06:22:39.70	! peak ~0.5Jy, 0.01Jy depth
DR21			! 360mJy/beam @ 2mm
NGC660	01:43:02.4	13:38:43	! Cold Dust
NGC891	02:22:33.4	42:20:57	! Cold Dust IRAM also interested

Arp220	15:34:57.1	23:30:11	! ULIRG ~0.01 Jy
IIZw40	05:55:42.6	03:23:32	! Dwek ~0.02 Jy
IC342	03:46:48.5	68:05:46	! Dwek 0.01 - 0.06 Jy
NGC1068	02:42:40.7	00:00:48	! Dwek right at turnover syncr./dust
NGC6240	16:52:58.9	02:24:03	! Dwek ~ 0.01 Jy
Orion-IRC2	05:32:47.00	-05:24:24.00	! extend to North?
APM08279+5254	08:31:41.59	52:45:17.0	! J2000; 10mJy?
IRDC_43	18:53:18.5	01:25:4.6	! required rms 2mJy
IRDC_30	18:44:19.1	-04 00 2.6	! required rms 2mJy

2. SN Remnants

Tycho	00:25:18	+64:09:00	FLUX 2.63 0.61	! diam = 8'
3C58	02:05:41	+64:49:00	FLUX 20.0 0.10	! diam = 9x5'
Crab	05:34:31	+22:01:00	FLUX 231. 0.30	! diam = 7x5' peak=8mJy/asec2
Kepler	17:30:42	-21:29:00	LSR 0.0 FLUX 0.77 0.64	! diam = 3' peak=
Cas_A	23:23:26	+58:48:00	LSR 0.0 FLUX 69.9 0.77	! diam = 5' peak=0.11K

3. Selected Weak Science Sources

M104_Sombrero	12:39:59.4	-11:37:23	! 0.0034 Jy
IC5146 (cold filament with embedded presetallar cores): 8mJy/beam			
IRAS F10214+4724	10:24:34.54	+47:09:09.8	! z=2.2855 F1.2=24mJy? 850=50mJy
APM_08279+5255	08:31:41.64	+52:45:17.5	!RQQ z=3.9 F1.2=20mJy 850=80
Cloverleaf	14:15:46.23	+11:29:44.0	! z= 2.558 F1.2=18mJy 850=52
PSS_J2322+1944	23:22:07.25	+19:44:22.08	! z=4.1192 F1.2=9.6mJy 850=22.5
BR_1202-0725	12:05:22.98	-07:42:29.9	! z=4.69 F1.2=12.6mJy 850=42
PSS1418+4449	14:18:31.7	+44:49:37.6	! z=4.32 F1.2=6.3mJy 850=10.4
SDSS_J1148+5251	11:48:16.64	+52:51:50.3	! z=6.418 F1.2=5.0mJy

4. sources from noRadio

GOODS_850-5 EQ 2000	12:36:33.45	+62:14:09.43	!no Radio, F1.2=5.0mJy
GOODS_GN24 EQ 2000	12:36:12.4	+62:12:17	!no Radio F850=13.7mJy

5. Astec sources from Younger

AzTEC1	EQ 2000	09:59:42.86	+02:29:38.2	!F1.1=10.7mJy
AzTEC2	EQ 2000	10:00:08.05	+02:26:12.2	!F1.1= 9.0mJy
AzTEC3	EQ 2000	10:00:20.70	+02:35:20.5	!no radio F1.1=7.6mJy
AzTEC4	EQ 2000	09:59:31.72	+02:30:44.0	!no radio F1.1=6.8mJy

6. from Ivison

SXDF850.45	EQ 2000	02:18:29.328	_05:05:40.71	!no radio F850=21.9mJy
SXDF850.48	EQ 2000	02:17:24.621	-04:57:17.68	!no radio F850=7.6

7. from Riechers

PSS_J2322+1944 EQ 2000 23:22:07.25 +19:44:22.08 !z~4, F850=22.5 mJy

8. from Fan

J1148+5251	*EQ 2000*	*11:48:16.64*	*+52:51:50.3*	*(doubloon, see above)*
J1048+4637	EQ 2000	10:48:45.05	+46:37:18.3	!z=6.23 F1.2=3.0
ARP220	*EQ 2000*	*15:34:57.22*	*+23:30:11.564*	*(doubloon, see above)*

9. Type II QSO from Sansiqre

AMS16	EQ 2000	17:19:42.07	+58:47:08.9	! z= 4.169 F1.2=2.27mJy
AMS17		17:20:45.17	+58:52:21.3	! z=3.137 F1.2= 1.60
AMS19		17:20:48.00	+59:43:20.7	! z=2.3 F1.2= 2.36
AMS18		17:20:46.32	+60:02:29.6	! z=1.6 F1.2= 1.44

10. New sources for 2010

LyA_27878	10:00:19.082	+02:25:23.8948	! z=3.1, F2.0=3.4mJy
GRB_090423	09:55:33.08	+18:08:58.9	! z=8.2

11. NGC6946

Nucleus	20 34 52.34	+60 9 14.2
Enuc4	20 34 19.17	+60 10 8.7

12. Bouwens et al. sources?

13. Schaerer Sources

A1689-zD1	13:11:29.73	-01:19:20.9	! z=7.9
A2390-zD1	21:53:34.09	17:41:41.1	! z=7
A2390-JD1	21:53:36.85	17:41:44.2	! z=9

14. Herschel Sources

Source	Ra (h)	Dec (deg)	! 1.2mm flux (mJy)
ID8109	03	+00	! 19.6+/-0.87 mJy
ID130	09	-00	! 11.2+/-1.24 mJy
ID17	09	-01	! 15.3+/-1.25 mJy
ID11	09	-00	! 12.2+/-1.25 mJy
ID9	09	-00	! 6.9+/-1.17 mJy

15. WISE DOGs sources

02034a148-000063	04h23m0.0s	20d28m54.5s
02037a130-000114	04h19m0.0s	24d03m36.8s

02014a183-000261	03h58m0.0s	42d21m34.9s
02017a136-000095	04h11m0.0s	27d24m17.3s
02033a170-000223	03h50m0.0s	48d34m18.9s

16. Berkeley S-Z cam sources

17. S-Z Clusters

RXJ1347-1145	13:47:30.6,	–11:45:09.3	
MACS0717.5+37	07:17:31.00s	Dec 37:45:39.60	! 5x5 arcmin, rms ~0.2 mJy

18. Chapman Sources

248/GN20	12:37:08.79	62:22:01.90	! SMG pair at z=4.05 S850=21mJy/11mJy
259	12:37:13.87	62:18:26.50	! z~4 S850=17mJy --> likely S2mm ~ 2mJy
349	12:38:23.77	62:07:07.80	! z=2.9 S850=15mJy --> likely S2mm ~2mJy ?
254	12:37:11.34	62:13:31.00	! S1.2mm=5mJy, z=1.99 S2mm ~ 1.5mJy