Observation Preparation for KMOS with KARMA



Web page: <u>http://www.eso.org/sci/observing/phase2/SMGuidelines/KARMA.html</u> User Manual: <u>http://www.eso.org/sci/facilities/paranal/instruments/kmos/doc/VLT-MAN-KMO-146606-002_P96.pdf</u>

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What you need:

- A predefined KARMA catalogue in ASCII format
- A sky (FITS) image (preferentially in the infrared), which covers at least the KMOS Field of View (FoV)
- A network connection (optional)

What you get:

- One or more ASCII file(s) in the ESO-specific proprietary ('PAF') format, so-called 'KMOS set up files' or 'PAF files'
- One or two jpeg KMOS finding charts created with the "Finding Chart" plug-in of Skycat



Main steps of a typical KMOS observation



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Typical sequence of steps in a KARMA session



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Starting KARMA

Use the command: ./karma_bin_<machine>_<os>_<version>/bin/karma & Then select 'New' from the 'KMOS' submenu.





Mandatory columns:

- **ID**: The name of the object or position.
- **RA and Dec**: Right ascension (α) and declination (δ) of the object or position (in decimal degrees or sexigesimal).
- **Type**: Indicated by (at least) one or multiple character flags:
- + **O** Scientific target (except *Mosaic* mode)
- R Reference target (at least two) [J<14]
 - □ **S** Sky background position (optional)
- G Potential telescope guide star (at least one) [8<R<12]
- **B** Object brighter than a certain limiting magnitude (opt.)
- ⊕ C Field centre (mandatory)
- ☆ M Marker position (optional)





Mandatory columns (cont'd):

- **Magnitude**: The apparent magnitude (if applicable) of the entry (mandatory for reference and guide stars).
- Wavelength band: This column refers to the previously given apparent magnitude (if any). It is mandatory for reference targets (preferably in NIR band) and guide stars (in R band).
- **Target priority**: Only applicable for targets. An integer between 1 (high) an 3 (low).

Optional column:

• **Any comment**: Since this is (if existing) always the last column, it can be arbitrarily long and can include spaces.



Most important: all entries in the catalogue (targets, reference and guide stars) have to be on the same astrometric system and should have a relative positional accuracy of <0.2". Moreover, coordinates of high proper motion stars have to be corrected to the epoch of observation.

Example lines of a catalogue:

# # ID #	RA(J2000)	Dec(J2000)	Туре	mag	Band	Pri	Comment
# M4_000 M4_001 M4_002	16:23:35.410 16:23:34.772 16:23:23.058	-26:31:31.90 -26:31:35.00 -26:33:32.26	C D D	* 10.21 10.32	* J J	* 1 1	field centre of M4
M4_052	16:23:39.398	-26:34:54.33	R	8.46	J	1	
M4_053	16:23:36.577	-26:30:20.04	R	9.35	J	1	
M4_067	16:23:22.720	-26:22:16.86	G	9.72	R	*	
M4_068	16:23:18.690	-26:23:43.28	G	10.60	R	*	
M4_087	16:23:23.819	-26:34:29.76	B	7.01	LJ	*	
M4_088	16:23:38.470	-26:33:19.25	B	6.97	J	*	

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Step 1: Prepare and load catalogue

Load a catalog with the 'Load' button in the control panel:

~			KARMA Control	oanel				/////			
(Catalogue	Image Bright	Mode Scienc	e Acqu	isition		Y	heck/			
	<u></u>	00/00/00	1 1								
	Step 1: Load catalogue.										
Catalogue file											
		М	4.cat			Load		Clear			
	Catalogi	ie entries									
	ID	RA(J2000)	Dec(J2000)	Туре	mag	Band	Pri	C			
	M4_000	16:23:35.410	-26:31:31.90	С	*	*	*	fΔ			
	M4_001	16:23:34.772	-26:31:35.00	0	10.21	J	1				
	M4_002	16:23:23.058	-26:33:32.26	0	10.32	J	1				
	M4_003	16:23:21.150	-26:31:59.89	0	10.45	J	1				
	M4_004	16:23:33.861	-26:34:19.81	0	9.72	J	1				
	M4_005	16:23:28.460	-26:32:54.14	0	10.41	J	1				
	M4_006	16:23:33.130	-26:30:56.88	0	10.14	J	1				
	M4_007	16:23:27.082	-26:33:29.70	0	10.54	J	1				
	M4_008	16:23:26.942	-26:31:31.32	0	9.51	J	1				
	M4_009	16:23:36.453	-26:30:43.37	0	9.98	J	1				
	M4_010	16:23:38.571	-26:30:38.07	0	10.16	J	1				
	M4_011	16:23:20.899	-26:31:36.88	0	10.54	J	1				
	M4_012	16:23:27.418	-26:30:59.56	0	10.23	J	1				
	M4_013	16:23:34.940	-26:31:58.48	0	10.54	J	1				
	M4_014	16:23:40.986	-26:31:30.20	0	9.92	J	1				
	M4_015	16:23:31.959	-26:31:45./4	U	10.35	J	1				
	M4_016	16:23:23.543	-26:33:41.28	U	10.29	J	1				
	M4_017	16:23:27.006	-26:30:44.45	U	10.59	J	1				
	M4_018	16:23:35.639	-26:31:54.48	0	9.87	J	1				
	M4 019	16:23:22.783	-26:30:00.16	UM	10.56	ж	1	- mi V			
								\geq			
l	Back		Abort					Next			



Main window after having loaded an input catalogue (KARMA package example)





Step 2: Load image

KARMA Control panel	KARMA Control panel
Catalogue Image Bright Mode Science Acquisition Guide Check/	Catalogue Image Bright objects Mode Science Acquisition Guide stars Check/ save
Step 2: Load image.	Step 2: Load image.
FITS file	FITS file
undefined Load Clear	M4.fits Load Clear
Image size and position with respect to the field of view	Image size and position with respect to the field of view
Back Abort Next	Back Abort Next

Control panel before and after having loaded the example image

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Step 2: Load image

Use skycat options to adjust cut levels and zoom factor



Main window after having loaded the example image





Step 3: Identify bright objects

Set the bright object parameters and click the 'Search' button:

	KAF	MA Conti	rol panel		
Catalogue Image	Bright objects	lode Sc	ience Acquisition		Check/ save
Step 3: Identify	bright obje	cts.			
Search 2MASS ca	talog				
Search radius (arcm	in): 5.00	🔶 P	oint		[
J band magnitude lin	nit: 12.00	♦ E	xtended	L	Search
Bright objects					
ID	RA(J200	00)	Dec(J2000)	Туре	mag I
16233927-26330	59 16:23:	39.274	-26:33:05.97	В	6.97 🔼
16233846-26331	.92 16:23:	38.470	-26:33:19.25	В	6.97
M4_088	16:23:	38.470	-26:33:19.25	В	6.97 🔳
M4_090	16:23:	39.274	-26:33:05.97	В	6.97
M4_087	16:23:	23.819	-26:34:29.76	В	7.01
16232381-26342	297 16:23:	23.819	-26:34:29.76	В	7.01
16233088-26270	40 16:23:	30.884	-26:27:04.02	В	7.40
16233594-26310	08 16:23:	35.942	-26:31:00.90	В	7.51
M4_089	16:23:	35.942	-26:31:00.90	в	7.51
16234980-26335	16:23:	49.804	-26:33:58.91	в	8.34
16233939-26343	16:23:	16 EE0	-26:34:34.33	Б	8.46
16231633-26320	93 16:23:	10.330	-26:32:09.37	D D	0.50
16234079-26300	93 10:23:	40./99 78 171	-26:33:09.30	D P	0.57
16232912-20302	.97 10.23. 190 16.23.	39 969	-26.28.49 08	B	8 61
16233142-26331	10 16.23	31 427	-26:33:11.04	в	8.63
16234010-26313	97 16:23:	40.101	-26:31:39.77	в	8.71
16233535-26322	25 16:23:	35.355	-26:32:22.53	В	8.75
16234405-26300	161 16.77.	1/ 05/	-26.30.06 14	R	<u> </u>
Back		Abort			Next



Main window after having retrieved additional bright object positions from the 2MASS online catalogue.



Step 4: Choose observing mode







Step 4: Choose observing mode

Switching between modes:

•				KARMA	Contro	ol panel						
Ca	talogue	Image	Brig obje	ht Mode	Sci	ence Acquisi	tion Guidi	e Check/ save				
S	Step 1. Chouse observing mode.											
	Observation mode											
	♦ Not	l to Sky										
	🔷 Sta	re 										
	Mo:	saic (large	e field) Il field)									
	V MU	sau: (sma	n neid)									
	Mappir	ng areas										
			#	y offset		z offset						
		Γ	1	+32.40	arcsec	+21.60	arcsec					
		Γ	2	-32.40	arcsec	+21.60	arcsec					
			3	+32.40	arcsec	-21.60	arcsec					
			4	-32.40	arcsec	-21.60	arcsec					
	Back				Abort			Next				

Creating 2x2 mosaics in *Mosaic* mode:



× KAR	MA Control panel	KAR
Catalogue Image Bright objects M	ode Science Acquisition Guide	Catalogue Image Bright objects N
Step 5: Define "Science" and	d "Sky" arm configuration.	Step 5: Define "Science" an
Science by a second sec		Science Sky position position
Telescope position / rotator angle-		Telescope position / rotator angle-
Ω↑ 12 ← ⊕ → Ω↓ 12	RA: 16:23:35.4 Dec: -26:31:31.9 Rot. angle (deg): +0.0	
Algorithm	Rules	ctionAlgorithm
A Hungarian	🗖 Avoid vignetting	Allocate
◆ Stable Marriage	🗖 Avoid bright objects	Reset
Anual		→ Manual
🔷 Mosaic		→ Mosaic
Statistics		Statistics
Arms	Prio1 Prio2 Prio3 Total	Arms
on science target:	s 0 0 0 0	on science target
on reference targ	ets 0 0 0 0	on reference targ
on sky tamets	0 0 0 0	on sky targets
on sky talgets		

KARM	KARMA Control panel									
Catalogue Image Bright Mo	de Science Acquisition State Check/									
Step 5: Define "Science" and	"Sky" arm configuration.									
Science Sky position position										
Telescope position / rotator angle										
	RA: 16:23:35.224									
	Dec: -26:31:19.40									
D ↓ B	Rot. angle (deg): +7.50									
Algorithm	Rules									
🛇 Hungarian	Allocate									
🛇 Stable Marriage	Avoid bright objects Reset									
🔶 Manual	Print									
♦ Mosaic										
Statistics										
Arms	Prio1 Prio2 Prio3 Total									
on science targets	1 0 0 1									
on reference target	S 0 0 0 0									
on sky targets	23 0 0 23									
free	0									

Control panel before and after having performed telescope adjustment and arm allocation

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= | | b= += += | | **==** | | **==** | **=** | **0 == | +** | **|**|| | **S** | **|**



	KARM	A Control panel	×
Left-, right-, up-,	Catalogue Image Bright Mod	e Science Constant Conte Check	
down movement	Step 5: Define "Science" and '	'Sky" arm configuration.	
	Science Sky position position	Manual input	
Left-, right- rotation of FOV	Telescope gosition / rotator angle	RA: 16:23:35.410 22 Dec: -26:31:31.90	possible
Lock position		Rot. angle (deg): +0.00	
when satisfied	Algorithm	Rules Action	
	 ♦ Hungarian ♦ StableMarriage 	Avoid bright objects	
	🔶 Manual	Print	
	♦ Mosaic		
	Statistics		
	Arms	Prio1 Prio2 Prio3 Total	
	on science targets	0 0 0 0	
	on sky targets	0 0 0 0	
	free	24	
	Back	Abort	1





		KARM	A Control panel	1	/////// X		
	Catalogue Image	Bright objects Mode	e Science	equisition Gu	ide Check/ urs save		
	Step 5: Define	"Science" and "	Sky" arm conf	figuration.			
	Science Sky position position						
	Telescope position	on / rotator angle			[
Unlock position	(금)↑	Q	RA:	16:23:35	j.224		
IT NOT SATISTIED	₩ 🔶	•	Dec:	-26:31:19	9.40		Further options
with pointing	Rot. angle (deg): +7.50						
	Algorithm		Rules		Action		
Choice of arm	🔷 Hungarian		Avoid vign	etting	Allocate		Allocate arms or
allocation algorithm	 ♦ Stable Marriag ♦ Manual 	le l	- Avoia brigi	n objects	Reset		reset
	♦ Mosaic						
	Statistics						
		Arms on science targets	Prio1 Prio2 Pr	rio3 Total			
Result table ———	\rightarrow	on reference targets	0 0	0 0			
		on sky targets free	23 0	0 23			
							Continue with sky
	Back		Abort		Next	->	positions when
							science positions
							are tine

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Main window after automatic allocation with Hungarian Algorithm



Step 6: Define arm configuration for acquisition

Acquisition from science targets

Acquisition from reference targets







Step 6: Define arm configuration for acquisition

KARMA Control panel	KARMA Control panel
Catalogue Image Bright Objects Mode Science Acquisition	Catalogue Image Bright objects Mode Science Acquisition Clock/ Catalogue
Step 6: Define arm configuration for "Acquisition".	Step 6: Define arm configuration for "Acquisition".
Acquisition Sky position position	Acquisition Sky position position
Telescope position / rotator angle	Telescope position / rotator angle
₽ • • • • • • • • • •	RA: 16:23:35.410
← ⊕ → Dec: -26:31:31.90	→ Dec: -26:31:21.90
Rot. angle (deg): +0.00	P Image: Height and Heigh
Algorithm	Algorithm Action Action
Allocate	Allocate
♦ StableMarriage	♦ StableMarriage
♦ Manual	◆ Manual
◆ Mosaic	◆ Mosaic
Statistics	Statistics
Arms Prio1 Prio2 Prio3 Total	Arms Prio1 Prio2 Prio3 Total
on science targets 0 0 0 0	on science targets 0 0 0 0
on reference targets 0 0 0 0	on reference targets 0 0 0 0
on sky targets 0 0 0 0	on sky targets 19 0 0 19
free 24	free 5
Back Abort Next	Back Abort Next

Control panel before and after having performed telescope/instrument adjustment and arm allocation in a dedicated acquisition preparation step

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Step 6: Define arm configuration for acquisition



Main window after automatic allocation of reference targets





Step 7: Select telescope guide star



Main window ready for telescope guide star selection

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Step 7: Select telescope guide star



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Step 7: Select telescope guide star

		KARMA Control	panel				×	C	· /////////		KARMA Control	oanel	
talogue	Image Bright objects	Mode Science	ce Acqui	sition	Guide stars	Chec	;k/ e		Catalogue	Image Bright objects	Mode Scienc	e Acqu	uisition
ep 7: 3	Select telescop	e guide stars.							Step 7:	Select telescop	e guide stars.		
Available telescope guide stars								- 1	Available	e telescope guide sta	rs		
D	RA(J2000)	Dec(J2000)	Туре	mag	Band	Pri C		- 1	ID	RA(J2000)	Dec(J2000)	Туре	mag
4_071	16:23:21.030	-26:37:11.58	G	9.70	R	*	\Box		M4_067	16:23:22.720	-26:22:16.86	G	9.72
_085	16:23:01.210	-26:23:30.71	G	9.70	R	*			M4_073	16:24:03.010	-26:24:03.39	G	10.30
_067	16:23:22.720	-26:22:16.86	G	9.72	R	*			M4_068	16:23:18.690	-26:23:43.28	G	10.60
073	16:24:03.010	-26:24:03.39	G	10.30	R	*			M4_074	16:23:56.560	-26:39:01.21	G	11.40
076	16:23:14.430	-26:36:05.54	G	10.50	R	*			M4_086	16:24:12.930	-26:36:19.02	G	11.60
_068	16:23:18.690	-26:23:43.28	G	10.60	R	*			M4_077	16:24:15.870	-26:35:06.62	G	11.60
_074	16:23:56.560	-26:39:01.21	G	11.40	R	*			M4_082	16:22:50.110	-26:28:24.78	G	11.70
_075	16:24:06.540	-26:28:17.72	G	11.60	R	*			M4_072	16:24:09.050	-26:30:57.27	G	11.90
077	16:24:15.870	-26:35:06.62	G	11.60	R	*			M4_081	16:23:19.460	-26:39:56.95	G	12.00
086	16:24:12.930	-26:36:19.02	G	11.60	R	*							
32	16:22:50.110	-26:28:24.78	G	11.70	R	*	∇						
						\geq		- 1					
Selected	d telescope guide sta	rs						- 1	Selected	d telescope guide sta	rs		
D	RA(J2000)	Dec(J2000)	Туре	mag	Band	Pri C		- 1	ID	RA(J2000)	Dec(J2000)	Type	mag
							\Box		M4_071	16:23:21.030	-26:37:11.58	G	9.70
									M4_076	16:23:14.430	-26:36:05.54	G	10.50
									M4_069	16:23:53.890	-26:26:44.24	G	11.90
									M4_075	16:24:06.540	-26:28:17.72	G	11.60
							$\overline{\neg}$		M4_085	16:23:01.210	-26:23:30.71	G	9.70
Back		Abort				May			Book		About		

Control panel before and after 5 potential guide stars have been selected

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Guide stars

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Step 8: Save configuration (PAF) file

✓		KARMA	Control panel	×			KARM	A Control pa	nel						
Catalogue	e Image	Bright objects Mode	Science	isition	Guide stars	Check, save		Catalogu	e Image	Bright objects Mod	e Science	Acquis	ition		
Step 8	Step 8: Check and save configuration.								Step 8: Check and save configuration.						
Scier	Science Sky Acquisition Acquisition Sky							Scie	nce	Sky Acqu	isition Acqui	sition S	iky)		
Arm	ID	RÂ	Dec	Type	Prio		\square	Arm	ID	RÂ	Dec		Тур		
1	M4_037	16:23:38.605	-26:29:15.95	0	1			1	M4_037	16:23:38.60	5 -26:29:1	5.95	0		
2	M4_009	16:23:36.453	-26:30:43.37	0	1			2	M4_009	16:23:36.45	3 -26:30:4	3.37	0		
3	M4_034	16:23:30.676	-26:29:39.06	0	1			3	M4_034	16:23:30.67	6 -26:29:3	9.06	0		
4	M4_025	16:23:31.449	-26:30:24.73	0	1			4	M4_025	16:23:31.44	9 -26:30:2	4.73	0		
5	M4_017	16:23:27.006	-26:30:44.45	0	1			5	M4_017	16:23:27.00	6 -26:30:4	4.45	0		
6	M4_022	16:23:33.974	-26:31:12.66	0	1			6	M4_022	16:23:33.97	4 -26:31:1	2.66	0		
7	M4_019	16:23:22.783	-26:30:00.16	0	1	maı		7	M4_019	16:23:22.78	3 -26:30:0	0.16	0		
8	M4_033	16:23:33.023	-26:31:34.76	0	1	mai		8	M4_033	16:23:33.02	3 -26:31:3	4.76	0		
9	M4_003	16:23:21.150	-26:31:59.89	0	1			9	M4_003	16:23:21.15	0 -26:31:5	9.89	0		
10	M4_015	16:23:31.959	-26:31:45.74	0	1			10	M4_015	16:23:31.95	9 -26:31:4	5.74	0		
11	M4_016	16:23:23.543	-26:33:41.28	0	1			11	M4_016	16:23:23.54	3 -26:33:4	1.28	0		
12	M4_001	16:23:34.772	-26:31:35.00	0	1			12	M4_001	16:23:34.77	2 -26:31:3	5.00	0		
13	M4_007	16:23:27.082	-26:33:29.70	0	1		$\overline{\Delta}$	13	M4_007	16:23:27.08	2 -26:33:2	9.70	0		
\triangleleft						\geq		\triangleleft							
PAF f	PAF file undefined					Save	>		file KARMA_20)14-11-24_Nod7	oSky_M4_de	mo.in	IS		
Back			Abort			Next		Back			Finish				

Summary of the arm allocations in the 4 telescope positions

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Save...

Guide

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Type Prio



This file has been generated by the KARMA tool. Do not attempt to edit it by
hand. Modified files will be rejected by P2PP3 tool.
#-----# PAF Header

PAF.HDR.START;			
PAF.TYPE	"Paramfile";		
PAF.ID	"KARMA_2015-02-12_NodToSI	ky_M4_demo.ins";	
PAF.NAME	"KARMA_2015-02-12_NodToS	ky_M4_demo.ins";	
PAF.DESC	"KARMA PAF output";		I I a a da a
PAF.CRTE.NAME	"KMOS OSS";		Header
PAF.CRTE.DAYTIM	"2015-02-12T12:15:40";		
PAF.LCHG.NAME	"";		
PAF.LCHG.DAYTIM	"";		
PAF.CHCK.NAME	"KMOS OSS";		
PAF.CHCK.DAYTIM	"2015-02-12T12:15:40";		
PAF.CHCK.CHECKSUM	"2163840165";		
PAF.HDR.END;			
#			
# Primary Keywords	3		
TEL.TARG.NAME	"M4.cat"	;# name of the catalogue	
TEL.TARG.EQUINOX	2000.0	;# epoch	Primary
TEL.TARG.ALPHA	162335.410000	;# initial telescope pointing RA	konnordo
TEL.TARG.DELTA	-263131.900000	;# initial telescope pointing Dec	keywords
TEL.ROT.OFFANGLE	0.00000	;# initial rotator angle	(pointing
OCS.OSS.VEB	"2.6"	:# KARMA release number	(pointing,
OCS.OSS.REVISION	"264822"	;# KMOS SVN revision number	mode)
IPL.MODE.OBS	"NUD_IU_SKY"	;# sky background subtraction mode	
IPL.MUDE.ACU	"FRUM_REFERENCE"	;# acquisition mode	
# Path for PAF fil	le within INS		

_ ____ _ ___



F ;# Initialise arms (T) or just park (F) OCS.ARMS.INIT # Potential Instrument Guide Stars TEL.GS1.ALPHA 162321.030000 ;# RA TEL.GS1.DELTA -263711.580000 ;# Dec TEL.GS1.MAG 9.70 ;# magnitude as given in catalogue OCS.GS1.BAND "R" ;# wavelength band as given in catalogue TEL.GS2.ALPHA 162314.430000 ;# RA TEL.GS2.DELTA -263605.540000 ;# Dec TEL.GS2.MAG 10.50 ;# magnitude as given in catalogue "R" ;# wavelength band as given in catalogue OCS.GS2.BAND TEL.GS3.ALPHA 162353.890000 ;# RA TEL.GS3.DELTA -262644.240000 ;# Dec TEL.GS3.MAG 11.90 ;# magnitude as given in catalogue "R" ;# wavelength band as given in catalogue OCS.GS3.BAND







Bright objects in field

OCS.BRGH1.NAME	"M4_087"	;#	name/id of bright object 1
OCS.BRGH1.ALPHA	162323.819000	;#	RA
OCS.BRGH1.DELTA	-263429.760000	;#	Dec
OCS.BRGH1.MAG	7.01	;#	magnitude as given in catalogue
OCS.BRGH1.BAND	"ן"	;#	wavelength band as given in catalogue
OCS.BRGH1.COMMENT		;	
OCS.BRGH2.NAME	"M4_088"	;#	name/id of bright object 2
OCS.BRGH2.ALPHA	162338.470000	;#	RA
OCS.BRGH2.DELTA	-263319.250000	;#	Dec
OCS.BRGH2.MAG	6.97	;#	magnitude as given in catalogue
OCS.BRGH2.BAND	"J"	;#	wavelength band as given in catalogue
OCS.BRGH2.COMMENT		;	
OCS.BRGH3.NAME	"M4_089"	;#	name/id of bright object 3
OCS.BRGH3.ALPHA	162335.942000	;#	RA
OCS.BRGH3.DELTA	-263100.900000	;#	Dec
OCS.BRGH3.MAG	7.51	;#	magnitude as given in catalogue
OCS.BRGH3.BAND	"J"	;#	wavelength band as given in catalogue
OCS.BRGH3.COMMENT		;	

Bright objects





Arm configuration at acquisition/target position

162335.410000 ;# telescope pointing RA OCS.TARG.ACQ.ALPHA -263131.900000 ;# telescope pointing Dec OCS.TARG.ACQ.DELTA OCS.ROT.ACQ.OFFANGLE 0.000000 ;# rotator angle

OCS.ARM1.ACQ.NAME "M4_062" ;# name/id of catalogue entry OCS.ARM1.ACQ.ALPHA 162339.969000 ;# target RA OCS.ARM1.ACQ.DELTA -262849.080000 ;# target Dec OCS.ARM1.ACQ.Y 35.888012 ;# y position of arm tip in device system 95.459355 ;# z position of arm tip in device system OCS.ARM1.ACQ.Z 168.107181 ;# distance of arm tip from arm axis OCS.ARM1.ACQ.R -1.150209 ;# angular move of arm OCS.ARM1.ACQ.THETA OCS.ARM1.ACQ.PRIOR 1 ;# target priority "R" ;# target type: reference OCS.ARM1.ACQ.TYPE 8.61 ;# magnitude as given in catalogue OCS.ARM1.ACQ.MAG "J" ;# wavelength band as given in catalogue OCS.ARM1.ACQ.BAND "" ;# bright object(s) hitting the arm OCS.ARM1.ACQ.HIT ""; OCS.ARM1.ACQ.COMMENT OCS.ARM3.ACQ.NAME "M4_053" ;# name/id of catalogue entry OCS.ARM3.ACQ.ALPHA 162336.577000 ;# target RA OCS.ARM3.ACQ.DELTA -263020.040000 ;# target Dec OCS.ARM3.ACQ.Y 9.184491 ;# y position of arm tip in device system 42.131627 ;# z position of arm tip in device system OCS.ARM3.ACQ.Z 229.892040 ;# distance of arm tip from arm axis OCS.ARM3.ACQ.R 3.642493 ;# angular move of arm OCS.ARM3.ACQ.THETA OCS.ARM3.ACQ.PRIOR 1 ;# target priority "R" ;# target type: reference OCS.ARM3.ACQ.TYPE 9.35 ;# magnitude as given in catalogue OCS.ARM3.ACQ.MAG "J" ;# wavelength band as given in catalogue OCS.ARM3.ACQ.BAND OCS.ARM3.ACQ.HIT "" ;# bright object(s) hitting the arm ""; OCS.ARM3.ACQ.COMMENT

Acquisition: reference star positions





Arm configuration at acquisition/sky position

OCS.TARG.SKA.ALPHA162335.410000 ;# telescope pointing RAOCS.TARG.SKA.DELTA-263121.900000 ;# telescope pointing DecOCS.ROT.SKA.OFFANGLE0.0000000 ;# rotator angle

"ARM1_SKA" ;# name/id of catalogue entry OCS.ARM1.SKA.NAME 162339.968890 ;# target RA OCS.ARM1.SKA.ALPHA -262839.080001 ;# target Dec OCS.ARM1.SKA.DELTA OCS.ARM1.SKA.Y 35.888012 ;# y position of arm tip in device system OCS.ARM1.SKA.Z 95.459355 ;# z position of arm tip in device system 168.107181 ;# distance of arm tip from arm axis OCS.ARM1.SKA.R -1.150209 ;# angular move of arm OCS.ARM1.SKA.THETA OCS.ARM1.SKA.TYPE "S" ;# target type: sky background "" ;# bright object(s) hitting the arm OCS.ARM1.SKA.HIT OCS.ARM1.SKA.COMMENT "corresponds to M4_062" ;

Acquisition: sky positions

OCS.ARM3.SKA.NAME "ARM3_SKA" ;# name/id of catalogue entry OCS.ARM3.SKA.ALPHA 162336.576972 ;# target RA -263010.040000 ;# target Dec OCS.ARM3.SKA.DELTA OCS.ARM3.SKA.Y 9.184491 ;# y position of arm tip in device system 42.131627 ;# z position of arm tip in device system OCS.ARM3.SKA.Z 229.892040 ;# distance of arm tip from arm axis OCS. ARM3. SKA. R 3.642493 ;# angular move of arm OCS.ARM3.SKA.THETA OCS.ARM3.SKA.TYPE "S" ;# target type: sky background "" ;# bright object(s) hitting the arm OCS.ARM3.SKA.HIT OCS.ARM3.SKA.COMMENT "corresponds to M4_053";





Arm configuration at first ("Science") position

OCS.TARG.SCI.ALPHA162335.410000 ;# telescope pointing RAOCS.TARG.SCI.DELTA-263131.900000 ;# telescope pointing DecOCS.ROT.SCI.OFFANGLE0.0000000 ;# rotator angle

OCS.ARM1.SCI.NAME	"M4_037"	;#	name/id of catalogue entry
OCS.ARM1.SCI.ALPHA	162338.605000	;#	target RA
OCS.ARM1.SCI.DELTA	-262915.950000	;#	target Dec
OCS.ARM1.SCI.Y	25.149100	;#	y position of arm tip in device system
OCS.ARM1.SCI.Z	79.706718	;#	z position of arm tip in device system
OCS.ARM1.SCI.R	186.877826	;#	distance of arm tip from arm axis
OCS.ARM1.SCI.THETA	-2.228802	;#	angular move of arm
OCS.ARM1.SCI.PRIOR	1	;#	target priority
OCS.ARM1.SCI.TYPE	"0"	;#	target type: science
OCS.ARM1.SCI.MAG	10.46	;#	magnitude as given in catalogue
OCS.ARM1.SCI.BAND	יי די	;#	wavelength band as given in catalogue
OCS.ARM1.SCI.HIT		;#	bright object(s) hitting the arm
OCS.ARM1.SCI.COMMENT		;	
OCS.ARM2.SCI.NAME	"M4_009"	;#	name/id of catalogue entry
OCS.ARM2.SCI.ALPHA	162336.453000	;#	target RA
OCS.ARM2.SCI.DELTA	-263043.370000	;#	target Dec
OCS.ARM2.SCI.Y	8.208126	;#	y position of arm tip in device system
OCS.ARM2.SCI.Z	28.453191	;#	z position of arm tip in device system
OCS.ARM2.SCI.R	240.759504	;#	distance of arm tip from arm axis
OCS.ARM2.SCI.THETA	1.052884	;#	angular move of arm
OCS.ARM2.SCI.PRIOR	1	;#	target priority
OCS.ARM2.SCI.TYPE	"0"	;#	target type: science
OCS.ARM2.SCI.MAG	9.98	;#	magnitude as given in catalogue
OCS.ARM2.SCI.BAND	"J"	;#	wavelength band as given in catalogue
OCS.ARM2.SCI.VIGNET	F	;#	IFU vignetted (T) or not vignetted (F)
OCS.ARM2.SCI.COMMENT		:	

Science: target positions



Arm configuration at second ("Sky") position

OCS.TARG.SKY.ALPHA162335.224000 ;# telescope pointing RAOCS.TARG.SKY.DELTA-263119.400000 ;# telescope pointing DecOCS.ROT.SKY.OFFANGLE7.500000 ;# rotator angle

OCS.ARM1.SKY.NAME "ARM1_SKY" ;# name/id of catalogue entry OCS.ARM1.SKY.ALPHA 162339.713329 ;# target RA OCS.ARM1.SKY.DELTA -262910.209717 ;# target Dec 25.149100 ;# y position of arm tip in device system OCS.ARM1.SKY.Y 79.706718 ;# z position of arm tip in device system OCS.ARM1.SKY.Z OCS.ARM1.SKY.R 186.877826 ;# distance of arm tip from arm axis -2.228802 ;# angular move of arm OCS.ARM1.SKY.THETA "S" ;# target type: sky background OCS.ARM1.SKY.TYPE "" ;# bright object(s) hitting the arm OCS.ARM1.SKY.HIT OCS.ARM1.SKY.COMMENT "corresponds to M4_037";

Science: sky positions

"ARM2_SKY" ;# name/id of catalogue entry OCS.ARM2.SKY.NAME OCS.ARM2.SKY.ALPHA 162336.729960 ;# target RA OCS.ARM2.SKY.DELTA -263033.112260 ;# target Dec 8.208126 ;# y position of arm tip in device system OCS.ARM2.SKY.Y OCS.ARM2.SKY.Z 28.453191 ;# z position of arm tip in device system OCS.ARM2.SKY.R 240.759504 ;# distance of arm tip from arm axis 1.052884 ;# angular move of arm OCS.ARM2.SKY.THETA "S" ;# target type: sky background OCS.ARM2.SKY.TYPE F ;# IFU vignetted (T) or not vignetted (F) OCS.ARM2.SKY.VIGNET OCS.ARM2.SKY.COMMENT "corresponds to M4_009";



Finding Charts for KMOS observation

File menu: *Make finding chart…*





Finding Charts for KMOS observation



KARMA finding chart in JPEG





Looping through a KARMA session



State chart illustrating the different ways to start and finish a KARMA session

NEON School | Dr. Michael Hilker (ESO/Garching) | Garching,9-13 May 2016



Creating KMOS OBs with P2PP

P2PP tutori account: P2PP ID: 52052 password: tutorial

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Observing Runs										
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Obs/Calib Blocks Schodulo										
Name	ocal Id ES	Old Status	Tarc	et		CS	Acau	isition	Finding	Chart Enher
060 A-9252(M)/SM/CRAVITY		Jiu Jiaius	ាងថ្ងៃ	ei	00	6	Acqu	ISITION	Thiang	chary cpher
a = 000.A - 9252(M)/SM/GRAVITT										
= 60.A-9232(C)/SM/SOFI										
= 00.7 - 3232(D)/3W/FORS1										
= 00.A - 92.52(E)/SM/FORS2										
= 60.4 - 92.52(F)/5M/FOR52										
= 00.A-9232(G)/SM/UVES										
= 00.A-9232(1)/SM//FLAMES										
= 00.A-9232(N)/3M/WFI										
= 00.7 - 3233(A)/3M/CL33.0										
= 60.4 - 92.53(C)/SW/EF05C2										
= 00.A - 3233(C)/3M/THVIMIZ										
$= 60 \Delta_{-9253(I)}/SM/AMREP$										
= 60 A - 9233(K)/3W/CKIKES										
= 00.A-9233(L)/3W/ HAWKI										
= 60.A - 92.53(N)/SN/(COND)										
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= 60 A - 9253(B)/SM/MUSE										
a = 60.A - 9253(K)/3KI/KIOSE										



Creating KMOS OBs with P2PP

			No name			
	Obs. Description Targe	et Constraint Set Time Intervals				
Selection of	Obs. Description					
occulation	OD Name	No name				
acquisition	User Comments					
template	Instrument Comments					
tomplato	Execution Time	00:00:00.000	Recalculate			
		L				
	TemplateType	acquisition	▼			
	Template	KMOS_spec_acq KMOS_spec_acq_mapping KMOS_spec_acq_skyflat KMOS_spec_acq_stdstar KMOS_spec_acq_stdstarscipatt	Add Duplicate Delete			
		KMOS_spec_acq				
	Integration time		10			
	Number of DITs		1			
	Suppress rotator optim	nization				
	Duration of SCI templa	te				
PAF file	KARMA target setup fil	۵				
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Creating KMOS OBs with P2PP

	No name Obs. Description Target Constraint Set								
Selection of science template	Obs. Description Targe Obs. Description OD Name User Comments Instrument Comments Execution Time	No name	.000			Recalculate			
	TemplateType Template	science KMOS_spec KMOS_spec KMOS_spec KMOS_spec	_obs_fi _obs_n _obs_n _obs_n _obs_s	freedither mapping24 mapping8 nodtosky stare	•	Add Duplicate Delete			
	KMOS_spec_ad	q	1			KMOS_spec_obs_nodtosky 1		1	
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	Suppress rolator optimization		3600			Number of dithers	5		
	GratingFilter		YI			Dither size 0.2			
	KARMA target setup file	e	KARMA 2014-12-10 NodToS				012		





Creating KMOS OBs with P2PP

Case of mosaic observation

			No n	ame	
Obs. Description	et Constraint Set) Time Intervals			
Obs. Description					
OD Name	No name				
User Comments					
Instrument Comments					
Execution Time	01:25:19.000		Recalculate		
TemplateType	science	-			
Template	KMOS_spec_obs_fr	reedither	Add		
	KMOS_spec_obs_n	napping24	Durkingto		
	KMOS_spec_obs_n	odtosky	Duplicate		
	KMOS_spec_obs_s	tare	Delete		
	a manning	1		KMOS spac obs manning24	1
GratingFilter	q_mapping	K		Integration time	90
KARMA target setup file	9	KARMA_2014-12-10_M	osaic24x1_n5	Number of DITs	1
				Exp. time for optional sky	0
				Part of mosaic to be observed	WHOLE
				Sky will be observed every X science e	1



Hints and tips for preparing KMOS observations

6 Summary of hints and tips for preparing observations

• Astrometry. Make sure that science targets, guide stars and reference stars are all on the same coordinate system. UCAC4 on Vizier can be used to find stars with accurate astrometry or use stars extracted from the same images as the science targets.

• Always correct for proper motion.

- Choose Telescope Guide stars with magnitudes in the R-band: $8 < R_{Vega} < 12$
- Choose at least 3-4 Reference stars in the magnitude range 8-14, in the same band as the science observations. However, the more stars you provide the better the alignment will be.
- If possible, use the same rotator angle for acquisition and science observations, since a significant difference in the rotator angle might introduce some positioning error (up to 2-3 pixels shift of the science targets on the IFU for large rotations).
- To avoid persistence, it is recommended to observe simultaneously only sources with similar magnitudes within a range of 3-4 magnitudes. Choose the DIT and NDIT using the ETC such that fluxes are at most 5,000 ADUs/DIT/pixel ($\approx 2,500e^{-}/DIT/pixel$), even for significantly better conditions than foreseen (e.g. using seeing 0.4'' in the ETC).



Hints and tips for preparing KMOS observations

- Do not observe sources brighter than 6th magnitude (Vega) in all bands, because that would saturate and cause severe persistence.
- For observations of faint targets (which will not be detected in each single exposure), it might be useful to have one or two IFUs dedicated to observe a brighter star, which will be detected in a single exposure and therefore can be used to cross-check the registration of the frames. For example if the main science targets are faint galaxies ($H_{AB} \approx 23$) observed with several 300sec exposures, it can be useful to dedicate one of the 24 IFUs to observe simultaneously a star of $H_{AB} \approx 19 20$ in the field.
- Use a [AB AB ...] or [ABA ABA ...] nodding pattern to obtain best sky subtraction (sky frequency 1 or 2).
- IZ observations in dark or grey time, YJ observations in grey time, or bright time if $> 90^{\circ}$ away from the moon; H and K observations in any conditions.
- Background dominated observations are reached for exposures longer than 300 sec.

Chapter 6 of the KMOS User Manual

Remember Giacomo's words: "Read the f..... Manual!"

