Report on the KMOS Instrument Science Team meeting held on 10 May 2006 at ESO Headquarters

Minutes (courtesy of Markus Kissler-Patig)

Room 232 ESO Garching

Attendees:
Ralf Bender, USM, bender@usm.uni-muenchen.de, KMOS Co-PI
Mark Casali, ESO, mcasali@eso.org, ESO KMOS responsible
Stéphane Charlot, IAP, charlot@iap.fr, IST member
Andrea Cimatti, Arcetri, cimatti@arcetri.astro.it, IST member
Fernando Comerón, ESO, fcomeron@eso.org, IST member (chair)
Markus Kissler-Patig, ESO, mkissler@eso.org, ESO KMOS instrument scientist
Jean-Paul Kneib, OAMP, jean-paul.kneib@oamp.fr, IST member
Koenraad Kuijken, Leiden, kuijken@strw.LeidenUniv.nl, IST member
Matt Lehnert, MPE, mlehnert@mpe.mpg.de, KMOS project scientist
Alan Moorwood, ESO, amoor@eso.org, ESO Head of Instrumentation
Bernard Muschielok, USM, mbernard@usm.uni-muenchen.de, KMOS instrument software responsible
Suzie Ramsay Howat, UKATC, skr@roe.ac.uk, KMOS instrument scientist
Ray Sharples, Durham, r.m.sharples@durham.ac.uk, KMOS PI
Michael Wegner, USM, wegner@usm.uni-muenchen.de, KMOS instrument software

Agenda:
10:00 Welcome
10:15 - 11:00 General overview of the Instrument (Sharples, Instrument PI)
11:00 - 11:30 Question and Answer session on instrument
11:30 - 12:00 Presentation of the Science Case and expected performances (Ramsay Howat / Lehnert)
12:00 - 12:30 Question and Answer session on science case
12:30 - 13:30 Lunch
13:30 - 14:00 Presentation of KARMA: the KMOS ARM Assignment software
14:00 - 15:00 Review of the instrument characteristics, explicitly highlighting which options are fixed by technical constraints or baseline design, and which trade offs are possible + presentation of the proposal to extend KMOS to shorter wavelength (Sharples / Ramsay Howat / Lehnert)
15:00 - 15:30 Discussion / possible changes of specifications, confirmation of goals, ...
15:30 - 16:00 Review/comparison of project competing with KMOS in 2010 (Kissler-Patig)
16:00 - 17:30 IST closed session / draft recommendations
17:30 end of meeting.Ê

Meeting Minutes:
(presentations are available on the KMOS web pages)

- introduction by F. Comerón, round of presentation, welcome by M.Casali

- presentation by R.Sharples (Instrument Overview)

  questions/answers:

  - (Cimatti) estimated efficiency of KMOS? / (Sharples) about 80% of SINFONI in the current model
  - (Kuijken/Kissler-Patig) remove K-mirrors in arms? (Sharples) would need to be replaced by lens doublet: no gain in efficiency

- (Kissler-Patig) number of pixels + resolution + fixed grating freezes the wavelength range? (Ramsay Howat) yes, to Iz 0.8-1.05, J 1.05-1.37, H 1.45-1.85, K 1.95-2.50, to be confirmed
- (Kuijken) calibration sphere use / (Ramsay Howat)

- presentation by M.Lehnert (Science Cases updated)

questions/answers:

- (Comerón) survey speed of mapping mode vs SINFONI? (Lehnert/Sharples) 3 KMOS detectors vs 1 SINFONI detector: about factor of 3-4
- (Cimatti) study science cases with wider wavelength coverage - spectrophotometry? / (Lehnert) see grating trade offs - H+K on the list of potential gratings
- (Kneib) possibility to work all 3 spectrographs at different wavelength? / (Ramsay Howat) technically possible but only one detector controller (one read-out time) and not operation baseline

- presentation by S.Ramsay Howat (Operation scheme)

questions/answers:

- (Kissler-Patig) extensions to shorter wavelength relies on substrate being removed / (Lehnert) no, just substrate thinned [info from G.Finger, ESO]

- presentation by M.Wegner (KARMA prototype)

questions/answers

- (Moorwood) image required? (Wegner) no, blind mode possible, no info from image used
- (Cimatti) coordinates in input catalog on one astrometric system? (Bender) yes, but possibility to refine coordinates during process [at cost of updating input catalog]
- (Comerón) multiple arm configurations in 1 OB? (Muschielok) not foreseen, requires new acquisition each time

- presentation by M.Kissler-Patig (Competition/complement to KMOS in 2010)

discussion:

- redshift machines will exist (FMOS, EMIR, Lucifer, MOIRCS, ...), follow-up by single IFUs will happen (SINFONI, OSIRIS, GNIRS, NIFS, ...), uniqueness of KMOS reside in multiple IFUs and deep follow-up of physical properties of high-z galaxies.
- stressed the fact that program is needed to populate target list of KMOS (many redshifts are needed to produce few objects falling between OH lines)

- *general discussion*

- does the extension to shorter wavelength come for free? warning to keep this as goal without setting tight specifications that might end up driving the instrument design.
- reminder that the computed efficiency might be overestimated given the number of individual surfaces that need to be summed up to estimated it.
- considering more or larger detectors to allow full band coverage and slightly higher resolution? appear to be overkill given how close to optimal the current design is.

Recommendations of the KMOS Instrument Science Team

The Instrument Science Team (IST) wishes to express its favorable impression by the progress made at this stage by the consortium in all the areas of the instrument, and by the sound responses given to the points raised during the meeting.

The IST recommends that the following points are taken into account in the further design of the instrument:

1- The capabilities of the instrument will significantly gain from an extension of the wavelength range to 0.82 microns, enabling the overlap between visible and infrared redshift surveys and extending the range of redshifts at which important spectral diagnostic features can be observed. The IST understands that there is a high probability that the detectors provided to ESO will have high quantum efficiency down to this wavelength, and thus recommends making the extension to 0.82 microns a part of the baseline design. An extension towards even shorter wavelengths would be desirable if there were no technological risks involved, but the IST feels that the availability of complementary instrumentation like FORS2 does not make the scientific case for this further extension sufficiently compelling.

2- The IST recognizes several important science cases, both in the galactic and extragalactic domains, which will greatly benefit from the simultaneous coverage of the zJ and HK bands, even if at somewhat lower resolution. Therefore, it recommends that the gratings needed to provide this capability are made part of the baseline design. The IST will be pleased to produce a recommendation on the relative priorities of these additional elements if needed.

3- The IST takes note of the possible availability of larger format detectors than the currently planned 2k x 2k HgCdTe detectors by the time that KMOS enters operations. The IST recognizes that the science cases can be carried out with the 2k x 2k detectors, and that the enhancement of capabilities provided by large detectors would be only moderate. However, the IST suggests that an upgrade path to a large detector is considered, provided that it is compatible with the current optical design and capabilities.

4- Based on current experience with observation preparation software tools for current VLT instruments, the IST recommends that the final implementation of KARMA is carried out in a programming language that ensures its portability to a number of operating systems as large as possible.

5- The IST recommends that further efforts are invested in the development of algorithms for the optimization of the object allocations to the arms, in particular in those situations in which the number of targets of scientific interest requires the definition of more than one configuration of the arms on the same field.

6- The IST recommends that specific pipeline modules to deal with mosaics be developed, under the general principle that pipeline modules should be able to process data obtained in all modes up to a degree that is as close as possible to being suitable for scientific analysis.

7- The IST recommends that further consideration is given to the astrometric information contained in the headers of the output images, in particular to deal with cases in which the positions of the arms do not exactly correspond to the input catalog positions. The guiding principle should be that the astrometric information on the position of the arms should reflect as closely as possible the actual observed position on the sky.

8- While considering that the implementation of the mosaic mode is useful for a number of science cases, the IST feels that its priority is not high enough to deserve an overall decrease of throughput due to constraints in the arm design. The IST thus recommends reducing the number of the optical surfaces in the arms if a significant gain in throughput is achieved in this way, even if this comes at the cost of preventing a common orientation of the fields of view of all the IFUs.

The KMOS Instrument Science Team:

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