

## Minutes of the Magellan SAC Meeting

University of Arizona, 21-22 April 2004, Tucson, AZ

**SAC members** and other attendees:

Alan Dressler (SAC chair; OCIW)  
Paul Schechter (SAC recorder; MIT)  
Laird Close (SAC; UA)

Miguel Roth (LCO)  
Mike Gladders (OCIW)  
Gus Oemler (OCIW)

John Mulchaey (SAC; OCIW)  
Matt Holman (SAC; CfA)  
Ian Thompson (SAC; OCIW)  
Mario Mateo (SAC; UM)

Mark Phillips (Magellan)  
Alan Uomoto (Magellan)  
Steve Shectman (OCIW)  
Bill Hoffman (Arizona)  
Michael Meyer (Arizona)  
Chris Impey (Arizona)  
Phil Hinz (Arizona)  
Peter Strittmatter (Arizona)

attending via video link  
Frank Perez (Magellan)  
absent  
Dan Fabricant (CfA)

Dave Osip (Magellan)

**April 21, 2004**

### **Preliminaries**

Chairman Dressler called the meeting to order and invited the SAC members and other attendees to introduce themselves. There was discussion of where the minutes of previous meetings might be posted.

The minutes from the previous meeting [DATE AND LOCATION: ??] were amended as follows: Parra and Pizarro's positions had been inadvertently switched; the Shack-Hartmann on IMACS was not performing according to "expectations" rather than "specifications;" the need for someone on site for roughly a year was for commissioning a *complex* instruments.

There was discussion of setting up mailing lists for distribution of relevant news to Magellan at the partner institutions. Uomoto said that this would be done (by Paul Collison) at OCIW. It would be easiest if each institution were to create an alias on the order of magellan\_users@partner.edu. Mateo wanted to ensure that the server would not be a conduit for spam.

At the [SPRING 2003 ???] SAC meeting it was agreed that the the scheduling subcommittee would reconvene. This didn't happen because the block schedule was needed earlier than anticipated. Mateo moved (and Holman seconded) a resolution calling for the

scheduling subcommittee to meet and report back to the SAC before the next block schedule is produced. The motion passed unanimously.

### **Observatory Report**

Phillips began by reporting on personnel matters. Felix Quiroz has moved from construction to the permanent position of mechanical technician. This balances Miguel Mendez on opposite shift. Henry Cortez likewise moved from construction to the permanent position of electrician. Discussions of a long range staffing plan are underway. Mountain superintendent Luis Garviso and [POSITION ??] Carlos Callejas no longer work for LCO.

Phillips noted a number of accomplishments since the last SAC meeting:

- Mirrors M1, M2 and M3 on Baade were recollimated; much of IMACS' commissioning was carried out;
- commissioning was begun on MIKE/fibers;
- detents were installed on the Clay Cassegrain rotator (although new software is still needed – the goal is to have the system operative early June);
- safety interlocks were installed on the lifts and on the IMACS (rotation) pin;
- a Galil power amplifier was installed on the Clay West Nasmyth instrument rotator, replacing the Glentek amplifier – if it works as hoped replacements will be carried out on other rotators starting with IMACS;
- the brakes removed from all of the instrument rotators;
- Renishaw encoders were activated [ON THE CASS ROTATOR AT CLAY??];
- an error alarm system [FOR THE ROTATORS??] was installed;
- control software for the Racal video switches was installed in the guide probe and M3 computers;
- the seeing tower was completed, with installation of the differential image motion monitor (DIMM) and the [MULTI-APERTURE SEEING SENSOR??] (MASS) expected in May.

In the course of discussing accomplishments it was noted that there was low level high frequency noise [DOES THIS MEAN  $\approx$  60 HZ ??] on 4 Clay instruments. But the guiders see nothing coming from the [MAIN DRIVE??] amplifiers. Thompson volunteered to help diagnose the source of the noise and remedy the problem.

**Instrument statistics:** On the Baade Telescope time was split roughly 60/40 between PANIC and IMACS with no significant instrument changes. The staff notice and appreciate not having to change instruments. On the Clay Telescope MIKE was the primary instrument, used for 60% of the time. MagIC was used 20% of the time, with LDSS2 and the Boller and Chivens (B&C) each in use for 10% of the time. MagIC was often used secondarily, so the actual time used may be somewhat larger. Usage of the B&C has dropped – there is

a seasonal increase in demand for the B&C when the Galactic Center is up. The B&C is a candidate for retirement. IMACS usage is ramping up. LDSS2 usage is heading downward.

**Weather statistics:**

- Time open: 92%.
- Time lost to weather: 4.5% (apparently all Mulchaey)
- Downtime: 3-4% on Baade after allowance for more more complicated instruments; 3% on Clay despite additional problems due to the short commissioning period. There were substantial image problems with IMACS' 27 arcminute field of view – problems not obvious in a smaller field become obvious with the larger field. Some improvement is expected with the installation of the WF/AD/C in May.
- Observers find a median of 4% downtime and an average 8%. A plot of downtime reported by observers against that reported by operators has a slope of 3.2. There are no points in lower right corner. In half of all reports difference is less than 2%. The impact of problems is greater than time lost would indicate. IMACS image quality was often the problem – it wasn't good enough for the program. In one example the TO reported 12 hours were OK and Dressler reported 12h lost.

Observers seem not to appreciate that the TO's report can be edited. It is important that the observer gets copy: does the observer agree or not? Mark Phillips said that the mountain personnel would work on this.

Problems sometimes get recorded in comments but not in statistics. There are "learning losses." Sometimes this is due to engineering, as with time Chen lost using the IFU. Adelberger had bad images and lost half his time. Sometimes items are incorrectly recorded on the form.

Substantial effort went into supporting IMACS. The most time consuming items were image quality, the filter servers, the disperser server and the TV cameras. A switch on chip amplifiers would help.

Work that needs doing includes a) communicating port changes to the guiders, b) reworking or replacing the air cylinders in the guiders, c) [IMS ???], d) complete refurbishment of primary mirror actuators, sealing of leaks in the compressed air system and e) improving the performance of the rotators.

**Priorities for software:** a) M3 positioning, b) ADC and c) rotator guiding. Skip Schaller can only test [ROTATOR GUIDING??] only on the two ports that have servo control (IMACS and MagIC). Tests take 4-5 hours. Concern was expressed that we have not been converging toward a resolution. Part of the problem is that the SH probe must be used for both wavefront sensing and guiding. There was a question as to whether atmospheric

dispersion is incorporated in the rotator guiding. It was agreed that adequate engineering time would be scheduled for Skip Schaller to complete his work. There are guide probe control problems at slowest speeds. What works on some probes and not to work on others. Jose Soto is working on M3 control software. A question for the user community is what tracking rates are most needed? Additional functions are needed for the guide camera software, in particular slit guiding.

Many new options and improvements are coming soon: implementation of the ADC; the IMACS echellette; the Maryland-Magellan Tunable Filter; the blue CCD for MIKE; a control system upgrade for MagIC; general availability of MIKE fibers; the upgrade of LDSS2; the MASS/DIMM; and the GLAO wavefront sensing system. Data from our DIMM will be cross-compared with Tololo.

Miguel Roth supplemented Phillips' presentation with a brief discussion of contractual and legal/labor issues and additions to the office facility at El Pino.

**Labor code changes:** A complaint was filed at CTIO exposing them to a possible steep fine. The contracts were changed [AT TOLOLO??]. ESO claims they are not required to abide by the labor laws but they do so voluntarily. [ROTH USED RED LETTERS ON A BLUE BACKGROUND IN HIS PRESENTATION SO I MAY HAVE MISSED SOMETHING IMPORTANT]. A small change in the interpretation of the law changes the work day from 11.5 hours to 11.25 and the week to a maximum of 45h. Negotiations are underway, but some additional money must be spent. Support on the mountain will be the same until midnight. Overtime must be paid to technical staff after midnight. A time will be established (4am has been suggested) beyond which the staff will not respond to emergencies which result only in the loss of telescope time. None of the SAC members found this unreasonable.

Plans for an addition of 1200 square feet to the El Pino office has been drawn up. Some rationalization of trips up and down the mountain is needed. A bus [MAY BE??] rented. Some flexibility will be asked of visitors. The suggestion box on the mountain has never been used. A Chilean observer developed acute appendicitis, requiring surgery. His comment to the mountain EMTs was "you guys saved my life."

### **Technical Manager's Report**

Alan Uomoto noted that the staff were preparing for ADC and and new instruments on horizon, and that they were hoping to make progress on chronic minor problems;

**Operations:** Tasks have been prioritized with the letters *A*, *B* and *C*. Items designated *A* are deemed urgent. Those designated *B* will be dealt with as opportunities arise. Items designated *C* will not be forgotten. This list is not getting shorter as new items arise. An advertisement has been placed for a mechanical engineer who would assist Frank Perez and stand in for Frank in his absence. There is a need for CCD support – in essence another Ian Thompson. A new system has been set up for IMACS mask. A web-based track-

ing system, GNATS is being [CONSIDERED OR IMPLEMENTED??] to track [MASKS OR TASKS??] Tololo and APO use this system.

Oscar Saa of CTIO participated in a safety walkthrough. Saa noted several conditions that he thought warranted action: there are heavy monitors perched over the heads of observers and operators; there is no kiosk to intercept unwanted visitors (Tololo has had problems in this regard). A sign warning people about the 24 km mountain road with no services was discussed.

f/5 secondary: Carnegie and Arizona have signed a contract to figure the f/5 secondary. Discussion is underway regarding fixturing. There is concern about flexure. SAO has asked for a 5500 lb limit rather than 4500 lbs. Uomoto is working on a schedule; the f/5 secondary itself is the pacing item. One question faced by the SAC is how much engineering time it is willing to make available. The f/5 must go on and off of several times. The earliest date at which the corrector might be installed is August 2005. The earliest date at which Megacam might be available is September 2005. The earliest date at which the MMT-Magellan InfraRed Spectrometer might be available is June 2007. Gus Oemler recalled that the sense of the council was that we wouldn't use the f/5 until there were two instruments (one for dark time and one for bright). He noted that this allows for somewhat more leisurely commissioning. Mateo would like to know how long campaigns will be – we need to know how long the f/5 would be on the telescope for each of the commissioning activities. The per surface reflectivity of a solgel witness sample is zero at 500nm, 0.5% at 400nm, 1.5% at 350nm, 1% at 800nm and 1.5% at 950nm. We have 4 surfaces.

**Improvements:** Detents were installed on the Clay tertiary. Jose Soto is working on software to control it. Repeatability tests have not yet been done. There have been problems with LDSS2 [UPGRADE??], but AU is optimistic. All but one of the new dome trucks has been installed at Baade, with a noticeable difference in the noise. The last one “is a problem.”

**Rotator & guider problems:** These continue, with no single cause obvious. Fuses have been blowing. The rotators spontaneously change direction. The Glentek [ENCODERS?] are being replaced. The [STEPPER MOTOR] pulse widths are being modulated. Over-current and short-circuit protections are being installed. These have been tested on the LDSS2 port and seem to work. The guiders a half dozen non-catastrophic problems. One is noise [CAMERA OR BOGUS ENCODER AND STEPPER PULSES?]. A second is the fogging up of camera window. We still have not succeeded in tracking moving objects. There are problems driving an object down a slit. Uomoto is of the opinion that these should not be addressed piecemeal but with a “concerted re-definition of requirements.” He recommends that all of the guiders be overhauled, one at a time, and is requesting improvement funds. It was noted [BY DAVE OSIP??] that the problems with guide cameras on one hand and guiders on the other are distinct. Ian Thompson expressed unhappiness with physical packaging of present cameras, noting that this could be a couple \$K

each. Uomoto said that the camera work is parallel to and independent of the work on the guiders. There have no more hose problems.

**New instruments:** The partners have been enormously successful in coming up with funds for new instruments, in contrast to other observatories. We face the curse of having gotten what we wanted. The SAC plays an important role, both in giving an initial go-ahead for and in final acceptance of facility instrumentation. Particular items needing SAC action include Simcoe's proposed spectrometer and upgrades to existing instruments: MMTF and the IMACS echellette (McWilliam's). The LDSS2 upgrade does not need SAC or Council approval.

Instrument commissioning presents a major challenge. There is insufficient staff to do the commissioning. Between now and 2008 something new every quarter. Staff is needed to accommodate instruments. Schechter noted that while to first order it is the responsibility of the partner institutions to carry out commissioning, telescope modifications (hopefully small) are almost always needed to accommodate a new instrument.

Engineering time allocations have not been adequate. Some Magellan time has been used for instrument commissioning. Every engineering night allocated has needed a matching night of science time. Laird Close noted that commissioning of the AO secondary might easily consume Steward's entire telescope allocation. Typically there are two long runs per semester (one for each telescope) and 2-3 nights per lunation, alternating telescopes (except for December). By contrast Gemini's target is 30%. Altogether this represents 30 nights between two telescopes. Mario Mateo and Ian Thompson suggested modest increases to the present approach.

**User instrument policies:** Uomoto noted that user (aka PI) instruments are no different from facility instruments in their impact on the mountain, and possibly worse. We will have examples in the near future. Planet Finder is a user instrument. Uomoto says the mountain will need to know a lot beforehand to accommodate. The MMTF [IS THIS USER OR FACILITY??] commissioning run has already scripted - what must happen by which date.

"Visiting" instruments are no different from user instruments. There is a proposal by [KEVIN LUHAN??] to bring CORMASS, a low resolution ( $R \sim 300$ ) IR [CROSS??] dispersed spectrometer to Magellan. It weighs 100 lbs.

Ian Thompson noted that we no longer have a project scientist. There was some confusion as to whether Sackett still held this title. Schechter asked why a Magellan Instrument Scientist would report on the LCO side (to Phillips) and not the SBS side (to Uomoto). He noted that a number of management issues related to organization and reporting have yet to be resolved.

**MMTF:** Sylvain Veilleux [WAS HE THERE?? VIDEO??] spoke on MMTF. It covers 5000-9200Å with 5-50 Å resolution. It is a collaborative effort with Joss Bland-Hawthorn,

Alan Dressler, Michael Rauch, Stuart Vogel, Bruce Bigelow, Patrick Shopbell, Brian Sutin, Ian Thompson, Ray Weymann and now Ben Weiner. It received an MRI grant of \$780K/3years. It will be installed in the disperser wheel and used with short focal length camera. The ET150FS100 etalon is manufacture by IC Optical Systems (nee Queensgate). It is 150 mm in diameter and is polished to  $\lambda/\lambda 100$ . It has a finesse of 40, 80% throughput, and a monochromatic field of view of 22' at 50Å or 10' at 10Å. The electronics go on the Nasmyth platform. It is temperature controlled and works with order blocking filters:  $R \sim 25$  is needed for its high resolution mode. There are three modes: fixed gap, scanning and charge shuffling/frequency switching. In the last case there are two or three discrete gaps, with a field of view of  $2 \times 4.5' \times 27' = 3D$  250 square arcminutes. Multiple exposures are needed for the full field of view. Fabry-Perots are now very stable. This is a clone of the AAO's Taurus Tuneable Filter. Wavelength calibration is done 2-3 times/night.

Possible science would include anything with emission lines; cooling flows; PNae; groups; galactic nebulae. The limiting flux is  $10^{-18}$  erg/s/cm<sup>2</sup> in 1 hour at 6000 Å. Mechanical integration [WAS/WILL BE] done by Tyson Hare. There are 5 small cables that have already installed. Data acquisition is being carried out with Christoph Birk's help. IMACS commands the etalon controller and queries state of etalon. There will be a web page. It takes roughly a half night of training. There will be a manual with step-by-step instructions for observing and data reduction tips. The instrument will arrive at LCO in August or September 2004 arrival for (northern) fall engineering and will be generally available in the 2005B semester. A high order etalon is possibility, as Ray Weymann may have money for it. There were questions about what the impact would be on the mountain. Veilleux said that there was an installation plan. Phillips said that the instrument was likely to be likely to be confusing and "we're not available for hand-holding."

Mulchaey made the following motion, seconded by MMateo: "The SAC recommends that the Council approve the upgrade of IMACS to accept the MMTF."

**Organization chart:** Schechter raised the issue, saying that there were two reasons for having responsibility and lines of communication clearly spelled out – first so that people understood with whom they should interact under various circumstances, and second so that everyone understood who was responsible for the various parts of the Magellan enterprise. Uomoto said that it was best to err on the side of going too high up the organization chart in contacting the Magellan staff. The brief description of division of labor is that Roth has responsibility for logistics, Phillips has responsibility for science operations and Uomoto has responsibility for engineering.

**IMACS:** Dressler reported that there were mechanical issues: The mask server was not repeatable at the level of a few pixel level; there were intermittent disperser server failures; and that a loose drive coupling on the filter server caused it to fail some rotation angles, especially with the f/4 camera. There appears to have been a leak in the oil coupling of the f/2 elements and some coatings are fogged or hazy. The last elements in the

f/2 and f/4 cameras were damaged by water. They were replaced in April by Tyson Hare and Bruce Bigelow. The large element S04 is hazy – a replacement has mounted but not yet installed. The problem may have cleared up. There is a potential haze problem with asphere S08.

The typical IMACS throughput is 20-30% including telescope and detector; this is perhaps 0.1-0.2 mag less [THAN WOULD BE THE CASE THAN WITHOUT THE HAZE??]. The filters are colored glass, with throughputs of 60%. The question was raised as to whether we need interference or Sloan filters (at \$15K each) or blocking filters (at \$2500 each).

Dressler discussed a number of operational issues. The mask design program works as does the cutting. The alignment works. Observers are asked to prepare by selecting a guide star and wavefront star in advance of the run to put their coordinates in the catalog file. The “cookbooks” are mostly in good shape, but one is needed for the IFU. Clardy’s [MASK DESIGN??] software needs some work. Re-collimation of the telescope cleared up some of the wavefront sensing problems. There is still a problem with tilt in focal plane – it may be the tertiary flexing, especially at low elevation angles. The “wing chips” will be installed in May.

The control software associated with the guider and rotator still need work. The top priorities are a coordinated offset and guided (as opposed to open loop) rotator motion. The rotator accumulates a few hundredths of a degree error over the course of an exposure. Atmospheric dispersion correction remains to be implemented. Nod and shuffle will not work until rotator guiding is implemented. Modified controller boards were installed with no readout failures. The same holds true for MIKE. A new window was installed on the dewar.

Gus Oemler’s “Cosmos” software continues to develop. There is as yet no flux calibration. John Mulchaey will work with Gus to make it user friendly and will write a software cookbook. Dan Kelson has written a sky subtraction routine that does not rebin. IFU reduction is possible (at least in principle). Much work remains to be done. Phillips could not get Oemler’s [IFU??] reassembly/reconstruction to work. I must be tried in different modes. It was noted that the reconstruction *had* worked with f/2 and now f/4. The IFU has been observed to move along a chip gap. Someone inquired about IDL. There is one computer in each dome with an IDL license. The IDL software written by Hsiao-Wen Chen and Adam Bolton apparently needed libraries that were not (at the time) available. Mark says [HE??] is working on mask file submission. Someone asked when the WF/AD/C would be available. Uomoto replied that masks shouldn’t be cut to use the WF/AD/C until July – there is no time to do tests and analyze them. Dressler will cut an “as-built” mask for test purposes. Direct imaging should work. We’ll know more on May 10th (and we do). Atmospheric dispersion compensation will take a little more time. Uomoto will report back to the SAC after the big engineering run. There will be a cookbook for the WF/AD/C within a week.

On the subject of guider control software, Skip Schaller believes that his software is good enough for MIRAC but not for slow moving objects. Bill Hoffman note that he has promised to make MIRAC available as a facility instrument. MIRAC 4 is being started. It will have mechanical cooling (a Sumitomo refrigerator) and a more robust dewar.

### **Instrument reports (Mark Phillips and Dave Osip)**

**B&C:** This has received limited use and has presented no problems. The changeover is easy. There is a noise problem attributed to the fact that it is the only CCD using an “old” CCD controller. In response to the question of whether it was time to retire the B&C, Thompson suggested that we wait for the echellette.

**LDSS2:** There have been intermittent problems. The aperture and filter wheels fail. Both of these are balance issues. There have been shutter failures and there are elongated images. There have been coordinated offset problems – the guiders sometimes don’t go where directed. Schechter asserted that the image elongation problem was not due de-collimation of the secondary but internal optics – the collimation was checked using two SH probes.

**MagIC:** The support agreement is very nearly done. There is still a 3.5-s error in the time recorded in the header. LOIS very occasionally drops frames - perhaps 1/500. The continue to be LOIS problems with aborted exposures, (especially when executing scripts). There is still crosstalk in the four amplifier mode and low level herringbone. Binning 2x2 doesn’t work properly. MagIC will be upgraded with a new LOIS system. This may permit single amp mode, and binning, and a graceful exit from scripts.

**MIKE:** The problem with “lost” frames has been fixed. Henceforth MIKE will be used exclusively at Clay. A problem with the blue dewar CCD was traced to a bad capacitor. The red CCD shows the old blue problem [WHATEVER THAT WAS!!] There have been requests for encoding of slit position. There is now remote switching of comparison lamps. Upgrades in the near future include single fiber communication, a new blue CCD and a new dichroic A mini-ADC is being produced. The elements have fabricated and need coating. Charlie Hull is working on modifications to the guider to permit motion of the ADC into and out of beam. A rotation mechanism has not [AS YET??] been designed.

**PANIC:** There is as yet no facility instrument agreement. There was intermittent noise in one quadrant that was traced to a bad ADC board. There have been filter wheel de-ent failures. There has been a startup problem that Miguel Roth called “a feature.” The sensitivity reported in the documentation seems too optimistic. Mark Phillips hoped to obtain better zeropoints for the exposure time calculator. In what may be another manifestation of the above, the efficiency appears to be, with limiting magnitudes 0.3-0.5 mag brighter than expected from DuPont. Someone asked whether additional baffling would help. Mark Phillips pointed to PANIC as an example of an instrument that doesn’t quite work as expected and where it has fallen to the mountain staff to make it work.

There have been requests for reduction software to which the response had been “we don’t

provide reduction software.” It was suggested that this be stated explicitly. There was violent agreement among the members of the SAC.

There have requests for the following:

1. better chairs,
2. an mp3 player,
3. a clearer explanation of the angles and modes in the catalog files,
4. optical mice,
5. cross mounted disks,
6. a larger hard drive,
7. fewer default high memory applications,
8. a 24 bit display,
9. IDL
10. SuperMongo
11. PIRAF
12. DVD/CD burning
14. hot swappable portable hard drives;

**MIKE fibers:** Mateo reported briefly on the instrument. There are no robots and the plates are non-renewable, although many setups can be stored on a single plate. The price is \$80 for the plate and \$200 for the holes. Each plate is 1/4” thick and 28” diameter. A thorium-argon lamp has been permanently mounted to provide comparison lines. There are 14 parts per fiber, each of which has a 1.4 arcsec aperture. The beam exits at f/5. There is a telecentrator lens and a Shack-Hartmann periscope that works on a star in the central hole. A new GUI is needed to move the SH motor and lenslet array in and out. Mateo doesn’t recommend one-person operation. Two can work together plugging fibers. Field alignment is accomplished with two coherent fibers. There are 128 fibers each on the blue and red sides. There is  $45\text{\AA}$  of common coverage and some unexpected curvature of the spectra. It takes 2 people 15 minutes to insert 128 fibers. The first field alignment with a plate takes 15 minutes (with practice). If a plate is used a second time, alignment takes 5 minutes. The science efficiency is roughly 80%. Mateo obtained 1900 spectra to V=3D21 in 7 nights.

On the blue side one gets 1 photon/sec/ $\text{\AA}$  at 18.1 at Mg. The red side down by a factor of 2. Mateo has a “punchlist” including the following items: standard reduction; a fiber assignment GUI; an astrometric code; and a S-H motor control system. Mg b, CaT and H-alpha order isolation filters are available. There are spare fibers and thinner plates are

possible which would make it possible to drill them with a laser. Working at Nasmyth with [OUT??] the WFC one gets a 20 arcmin diameter field. The losses at the edge of the field are a few tenths of a magnitude at most. One fiber tip is lost every 3 days. A fiber can be replaced in 5 hours. A facility instrument agreement has not yet been worked out.

**LDSS2:** Mike Gladders reported that roughly 8 months will be need for engineering. Throughput with the medium red grism is slightly worse than with the medium blue. The “red upgrade” camera will be slower, f/2.5 rather than f/2, and will have higher throughput (due in part to new VPH grisms). The focus [ON THE PRESENT CAMERA??] has a chromatic term. The pixel size will better suited to the image quality than with the old SITE1, 0.189” per pixel compared with the old 0.378” per pixel. There will be nod and shuffle mode. Distortion will be smaller than 10%. Image quality will improve from 0.2-0.3” to 0.10-0.15” and the FOV will increase from 6.5’x4.5’ to a 8.25’ diameter circle.

There is a new 8-inch collimator. The optics were expected in a few weeks, and will have a hard broad band anti-reflection coating – a hybrid of solgel and MgF2. This is intended to be a “plug and play” replacement. The new masks will be curved and will be cut out of IMACS blanks. There will be 2 new grisms with, one red and one blue, delivering  $R \sim 1700$  with a 4 pixel/0.75” slit. The grisms cost less than \$10K each and cross over roughly at 6500Å. They are double prisms with VPH gelatin. Similar grisms have been incorporated into LDSS1 and [MARS??], so there is reason to think they will to work.

The detector is a single Dalsa 4k×4k device with 15μm pixels in a cryotiger dewar. Lesser will thin the device – this is Arizona’s contribution. The theoretical throughput will be 60% in direct imaging mode.

### Scheduling

PANIC and IMACS are the default instruments at the Nasmyth ports on Baade and MIKE and LDSS2 are likewise the defaults on Clay. [THOMPSON??] reports a large oversubscription for Baade with both PANIC and IMACS very much in demand, and some of the PANIC requests are for dark time. Moving PANIC to Clay might make more darktime available on Baade. Relatively few programs intended for IMACS can be carried out with LDSS2.

Schechter reported greater demand for Clay and suggested waiting for the LDSS2 before deciding to move instruments. Perhaps time trades will suffice for the near future. It was asked whether will Mag-E will be a folded port instrument? Mateo expressed increasing uneasiness about moving instruments, which was seconded by others.

Will PANIC move to a folded port? It’s “on the list” but it is given priority B. A cablewrap is needed. Frank has done some of the work necessary to move PANIC. The questions are the mounting of its electronics and filling the dewar. Dave Osip spoke for the need for an automated filling system.

## **Staffing: transition from construction to observing**

Alan Uomoto discussed the need for 9 new hires as follows:

2004

1. Frank2;
2. Electronics engineer specialist;
3. Computer admin 1/2 time; have Skip concentrate on programming;

2005

4. instrument scientist;
5. telescope operator

2006

6. engineer/technician troubleshooting new instruments
7. instrument specialist/scientist for f/5 and new instruments

2007-8

8. instrument scientist new instruments keep arriving; prep for f/5
9. f/5

Schechter noted that to the extent that we do any handholding (but see Mark Phillips' remarks above) it would seem be the job of an instrument specialist. Someone commented that "Carnegie is no longer operating in the Carnegie mode." Schechter pointed to what he called hidden manpower costs of the f/5 secondary and instruments. Extra effort is need to change back and forth. The apparent increase in the operations budget to accommodate f/5 is roughly roughly 10% (to Miguel Roth added "at least"), with both extra maintenance costs and extra operations costs.

Uomoto also said there were additional needs at Santa Barbara Street, for an electronics engineer and a mechanical design engineer.

The SAC adjourned until Thursday.

### **April 21, 2004**

additional attendees

Jill Bechtold (Arizona)  
Ann Zabudoff (Arizona)  
Gus Oemler (OCIW)  
attending via video link  
Andy McWilliam (Carnegie)  
Eric Persson (OCIW)

Joshua Bloom (CfA)  
Dennis Zaritsky (Arizona)  
Matt Johns (GMT)  
Rob Simcoe (MIT)

## Magellan Echellette Spectrometer

[SHECTMAN??] reported on the echellette spectrometer. In no particular order, its characteristics are as follows. It is designed to fit on an auxiliary port. It would be cryotiger cooled. The order separation will be 12" and the only moving part will be the slit. The camera will be a prime focus Schmidt. There are two prisms cross dispersers, one double pass and one single pass. The anamorphic factor is 0.8. The camera has an aspheric CaF plate. The CCD attached to the dewar window. The collimator, mirror and grating in are all in hand. The scale is 0.25"/pixel. It will use a 1kx2k CCD. The central obscuration will be 10-12% with some "carving" of the CCD package. The camera allows two adjustments lateral movement of the first surface and mirror tilt. It will be focused by moving the collimator. It will cover orders 7 (or 8) to 19.

The bluest wavelength will be 3100Å. Resolution  $R \sim 4000$  with a 1 arcsec slit. The images are very close to one pixel. It will be similar to MagIC in ease of use. A bit of spectrum is lost from the lowest orders. The prisms must be coated, perhaps with Mg2/solgel. It is being funded with an MRI grant, of \$739K, split 2 to 1 between MIT and OCIW.

Shectman said that it would take 2 years "on the optimistic side." Ian Thompson thought this was pessimistic, saying the box won't be that complicated, saying 18 month seemed reasonable. Scott Burles will be working full time on this.

Do we want it always at parallactic angle? Do we want to rotate? It would appear to be headed for Clay.

Dressler noted that it looked low on "care and feeding." He added that acceptance is contingent on use at an auxiliary focus, and noted that it commits the project project to a guider and a rotator. It was pointed out that the rotator and guider already exist – we have six. Is there money for additional guiders? The question of moving PANIC to a folded port was raised again. It was noted that this was a B-task and that there was no hurry. Cooling lines must be plumbed for PANIC.

## IMACS Multiobject Echellette (MOE)

Andy McWilliam reported on the IMACS multiobject echellette. The prism and cross disperser in packaged in a single 5kg module. It works with the long camera. The back corner of the grating is lopped off. The resolution is  $R \sim 21000$  with a 2.4 pixel/0.5" slit. The resolution ranges from 17000 to 26000. The slit length is 5" and it covers a 15x15' field, always giving greater than 50% [SPECTRAL??] coverage. It works in orders 4 to 14, covering 3130 – 10000Å. It allows 12-13 objects per full frame, with more objects if order blocking filters are used. A throughput roughly 50-80% that MIKE (0.12-0.20) is expected. A signal to noise ratio,  $S/N \sim 50$  per pixel at 6000Å for a  $V=3D18$  star can be obtained in 1 night. Depending upon apparent magnitude and spectral coverage can observe 10 or 100 objects per night. Projects in mind include spectroscopy of giants in Local Group dwarf spheroidals and the integrated light and internal dynamics of extragalactic

globular clusters. Where does MOE fit in? MIKE has  $R \sim 20-60000$ ; MIKE fibers 20-40000. MOE permits sky subtraction. IMACS has  $R \sim 1200$ . The grating and prism in house for 1 year. Finite element analysis is complete. MOE will need a mask cutting software upgrade. Funding for the optics comes from grants to McWilliam. OCIW has provide mechanical and optical design. Wavelength calibration question has not yet been resolved. the existing ThAr doesn't fill the pupil, but it is less of a problem for MIKE fibers than for MOE. McWilliam would like a night of engineering time because it's a facility instrument upgrade.

Schechter made the the following motion, seconded by Mateo. The SAC recommends the acceptance of MOE as an upgrade to the as yet unaccepted IMACS.

### **IR echellette**

Rob Simcoe of MIT described a design for an infrared echellette that would provide sufficient resolution,  $R \sim 6000$ , to permit work between the OH lines but low enough to keep read noise under control. [As Simcoe attended via video, the recording secretary assisted with the slide presentation and did not take notes. Simcoe's writeup is appended.]

Jill Bechtold mentioned another possibility for infrared spectroscopy – triplespec – of which 3 copies have been made by people at the University of Virginia (in particular John Wilson). The sampling by triplespec would be 0.8" with a resolution  $R \sim 2700$ .

Mateo said there was interest in Simcoe's echellette at Michigan and that an InSb detector would be available. Mark Phillips expressed a concern arising from the fact that Simcoe is a postdoc: what do we do about people leaving the circle of Magellan institutions. Miguel Roth noted that this might be easier to maintain than MagIC, with fewer moving parts – only the slit must change. There might also be a low resolution  $R \sim 1000$  mode, with a mechanism to permit prism only mode – dropping a mirror in front of the echellette.

Dressler was unsure about the need for an  $R \sim 1000$  mode. It was pointed out that MMIRS will not be on the telescope for much of the time. Simcoe noted that the detector (most likely a Hawaii 2k $\times$ 2k) is an area MIT is going to need help with – that it was a simple design with a complex chip.

Dave Osip noted that the low resolution mode would be good for solar system work, in particular studying ices on Kuiper belt objects. Eric Persson [THAT WAS VIA VIDEO, NO??] echoed Rob's detector comment. This will be the same as detector as in 4star, and an area of commonality interest.

Ian Thompson asked about field acquisition. Simcoe would like a slit viewer with a small IR array. Mark Phillips expressed a personal interest in using the instrument, but noted that we too often make the mistake of wishful thinking. Things break and we must think about long term support. Dressler continued on this point saying one can't just "drop things off."

Alan Uomoto commented that Simcoe has identified “exactly the right instrument for Magellan” – there is more science to be opened up and nothing in the world like this nothing else can get there. Dressler argued the instrument builder must stay with the instrument at least two years after commissioning. Phillips expressed the hope that we could find a way for Simcoe and someone else to build the instrument. Ian Thompson commented that there was unanimous interest but concern about support. At the same time he wishes to encourage Simcoe.

Mateo requested more information, in particular about cryogenics, as Michigan was a potential partner. Schechter agreed to address the support issues. Simcoe agreed to address the cooling issues.

### **Adaptive Optics for Magellan**

Laird Close reported on AO plans for Magellan. He began by reporting on the MMT adaptive secondary: it works. It has been mounted on the telescope every 3 months. Magellan’s secondary would be bigger and concave.

Close showed two 1.3-m mirror options, with 336 and 672 actuators. (He commented that this was “the most technically savvy SAC I’ve ever served on”). The secondary is 3mm thick and produces an f/11 beam. A cooled f/15 reimager is planned. The secondary cage will be sky baffled. A laser launch pad would be on the back end. There would be a Ground Layer Adaptive Optics (GLAO) guider designed to use natural stars. An MRI grant includes \$1.4M from the NSF, \$0.4M from Arizona, \$0.4M from the Magellan project and \$0.2M from MIT.

Mateo wondered whether 336 actuators wasn’t too many, if only 70 modes were needed for GLAO. (The recorder takes the liberty of answering that the secondary will also be used for high-order AO on bright stars and could accommodate laser guide stars). It was noted that the GLAO secondary would replace the existing f/11 secondary. The GLAO target is quarter arcsecond imaging at J.

The MRI proposal described an f/15 secondary, but for a variety of reasons f/11 now seems the better choice. A new AODP proposal will be submitted, in an attempt to raise an additional \$2.5-5M. Bechtold asked about best Strehl ratio achieved at the MMT. Close’ answer was 20% at H, with 36% if one takes out jitter [WHAT’S JITTERING??] The Gregorian f/11 would permit an easy measurement of an on-telescope interaction matrix and would give better correction than the f/15 at the MMT.

Meyer asked about the mid-IR, where thermal is huge. A 98% Strehl ratio is expected. Close presented a timeline (with a 1 year delay in starting) whose highlight was shipping to the mountain in 2009. Roth asked about personnel requirements. The MMT is not a good model for LCO. Close emphasized the fact that the Gregorian permitted closed dome operation. Actuator death is non-critical – you want to replace dead ones but the system operates fine with a dead actuator (much like Magellan’s primary). A major intervention

is planned every two years. Dust between the mirror and the plate is a potential problem. Bias magnets should prevent dust [MAGNETIC GRAINS?? SHADES OF DAVIS-GREENSTEIN?]. Dust has not been a problem on the last two MMT runs.

The average astronomer can't run the system, and neither can the average operator. The manpower needs are grim. Close says an instrument scientist and two instrument specialists would be needed if it is on the telescope all the time.

Shectman returned to the question of 336 versus 672 actuators at \$2000 each one ought to ask exactly what one was gaining. Close noted that the system must run at some level to just to hold the static shape of the mirror. Close gave the rationale for putting it on Clay: IMACS is on Baade and cannot take advantage of GLAO – it has an integrated guider.

### **Ground Layer Adaptive Optics**

Shectman reported on GLAO efforts at Magellan. Alex Athey has developed a Shack-Hartmann wavefront sensors that works at 100-200/Hz with 11 subapertures across the mirror, 88 of which are within the pupil. The sensors “plug” into a plate system. The cameras are cheap. They work only on 7th magnitude stars. The idea is to take data fast on multiple stars and write it to disk. The system will get first light in early May with 2 cameras and no lenslets. Additional cameras have been purchased. A scheme for alignment of subapertures is needed. Phase 2 will have up to 8 cameras across the unvingetted field and will use the same cheapo cameras. A plate will be constructed for each open cluster.

The simplest approach is to co-add the data from the cameras and average before centroiding. Some fine tuning of the lenslet illumination would be accomplished by a moving stage. The first question will be “is the seeing correlated across the field or not?” The next phase would be a GLAO guider. It would be just like the Magellan guiders but with 8 stages and would work at 100 Hz. It would use the more sensitive L3Vision devices at \$25K each. At first we would simply accumulate statistics.

The next question is what do you drive with the guider? Ultimately one would drive the Gregorian adaptive secondary, but one might want to build a reimaging camera with a deformable element downstream of the guider. A note of caution is necessary: all of the models regarding the feasibility of GLAO come from “true believers.” We'll have a better idea whether it works in 6-12 months.

### **Continuation of discussion on staffing**

Mateo expressed the concern that the AO secondary would need substantial on site attention. Close replied that he would provide 1 man-year on site. Schechter emphasized that the SAC was “endorsing” needs – the question remains how of how best to address them. Possibilities include

1. more mountain staff

2. fewer instruments
3. seconding staff
4. block scheduling
5. greater use of folded ports

Shectman noted that putting instruments on folded ports is the opposite of what Peter Strittmatter advocates – it means more instruments not fewer.

Bill Hoffmann noted block scheduling makes seconding easier.

Shectman commented that the the real problems would be with the f/5 and AO secondaries. They change the character of the operation. Mark Phillips would add 4star to the list. It was pointed out that 4star might be less of a problem if a Nasmyth port were dedicated to it.

Several SAC members (and several non-members) expressed second thoughts about the decision (made by the Council upon the SAC's recommendation) to implement the f/5 in campaign mode. A range of opinions were expressed, sometimes in strong language, regarding the additional demands the f/5 secondary would place on an already-stretched mountain staff. It was suggested that discussions with the MMT staff might help refine the estimates of the effort required. It was also suggested that the SAC might want to review its recommendation to the Council.

### **Engineering Time**

Instruments being brought to the mountain need more engineering time than has been available. Uomoto asked that the consortium match each engineering night contributed by the institution providing an instrument. Ian Thompson suggested that *all* instrument engineering time come from the consortium. Shectman said he doesn't use engineering – he expects to do some engineering with his own time.. Engineering time places an increased burden on the staff. The use of engineering time is to some extent limited by the availability of Frank Perez.

### **Interventions and GRBs**

Alan Dressler reports that Hsiao-Wen Chen of MIT went to him saying that she and a group wanted to advertise a voluntary program to obtain echelle spectroscopy of GRBs with minutes after the burst. Beyond that they were hoping for something of an endorsement hoping the SAC would play a more pro-active role. Apparently there is a competing Caltech group. Dressler asks the SAC what if anything, they want to do. Josh Bloom is one of the people working with Chen and he wants real (non-voluntary) TOO time. Is this the camel's nose under the tent? The VLT is having trouble organizing this and we can steal the march. Someone (not recorded) said he saw no problem with email being sent out. Is there anything politically sensitive in this?

There is a complication in that a new postdoc at Carnegie is interested in exactly this project, to be executed as an “internal” intervention only on Carnegie nights. The Carnegie Director would decide what to do for this program. The SWIFT lists are public. There will be as few as one per week suitable for MIKE. This reveals flaw in our intervention scheme. Suppose someone intervenes. Does that mean that the observer cannot cooperate with the voluntary program. Shectman suggested Magellan-wide access. “Don’t Balkanize things,” he said. Chen is proposing sharing data. Should we have peer review within consortium? This question was answered with a resounding no. Intervention is permitted only for MagIC. It was suggested that the consortium provide email distribution lists. Matt Johns urged that the data be available throughout the consortium, perhaps with a proprietary period. The SAC encourages collaboration and the members agree to provide distribution lists.

Mark Phillips addressed interventions as originally agreed to by the SAC. He says we are closer. It is viable for rapid switches of order 5 minutes, with a requirement of 10 minutes. M3 appears to be positioning reliably. A detent system has been installed. Jose Soto is working on software to implement rapid switching. There has been significant progress. But there have been problems reported on [SWITCHES TO??] LDSS2. “Soon” M3 will be positioning reliably – within a month.

Two more things are needed though. First one must rotate M3 and retilt it simultaneously and automatically, not manually. Soto has implemented this on Baade but not on Clay – there are different control systems. This is not top priority for Soto. The Raquel switch has been completed so that the hardware closer. Second, there is a need for some changes to the way in which LOIS scripts are handled. Abortion is currently illegal under LOIS. “We’re close.” Carnegie had planned a self-intervention. There is reason to hope that this will be ready by end of semester. On Baade switches are less than 5 minutes. Detents are functioning on Baade. Recent problems may be collimation. A recent PANIC/IMACS took 12 minutes. The goal is to implement this for next semester. This was deemed something to subject for a July telecon.

### **More discussion of f/5**

Mateo proposed a one-item telecon. Uomoto recommended that this be done before September, after which it would be too late to pull the f/5 out of the Steward queue. It was suggested that the SAC ask the Council for guidance.

It appears that the combination of one dark and one bright f/5 instrument cannot be ready before 2007. Should we go ahead with the contracts? There was no consensus. There is \$0.5M to be saved in polishing. But Harvard has spent already \$3M on corrector and Harvard has genuine interests in using f/5 at Magellan. How would Harvard be compensated?

Mateo suggests a Magellan Science meeting. Mulchaey volunteered to help. A website would be a major aspect of the meeting. The SAC adjourned at 16:42.

Respectfully submitted,

(signed)

Paul Schechter

2004 September 20