Sloan Digital Sky Survey
Quarterly Progress Report
Second Quarter 2001

July 30, 2001

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1. OBSERVATION STATISTICS

1.1 Summary

All of the data collected in 2001-Q2 were obtained in the North Galactic Cap. Table 1.1 gives the amount of data obtained compared to the baseline projection for this quarter. Despite the shorter nights in Q2 compared to Q1, we obtained more square degrees of imaging data. However, we obtained fewer spectroscopic plates (due to the number of hours available).

Table 1.1. Comparison of Baseline Projection with Actual Performance – Q2 of 2001

	Imaging Hours	Squares Degrees	Spectroscopic Hours	Number of Plates
Baseline	45	651	61	82
Actual	43[1]	481[2]	52[3]	56[4]

Notes:
1. Sum of time exposing on sky for all runs in the list of runs contributing to the gross. Same as “Imaging/good” in Table 1.2.
2. "Unique" category (to be consistent with baseline).
3. All exposures in sdss-speclog mail list; spectroscopic hours = total no. of exposures x 0.25 hr/exposure. Same as “Spectroscopy/good” in Table 1.2.
4. All plates in sdss-speclog mail list with (S/N)^2 > 13

The baseline imaging hours listed in Table 1.1 include time factored into the baseline plan for inefficiencies in our observing operations such as ramp-ups, ramp-downs, and overlaps between runs. Using this value allows us to more accurately compare actual performance against the baseline, since these factors are also included in the time accounted for under “actual imaging hours.” We note that although actual imaging hours in Q2 were close to the baseline forecast, the amount of new “Unique” imaging data fell short of the baseline. This is because the 43 hours shown indicates the time on the sky collecting imaging data, and although the weather conditions appeared suitable for imaging, not all of the data met data quality requirements when processed through the pipelines. The primary cause for this was that a fair fraction of so-called "good" weather still had moments of bad weather interspersed (i.e., periods of bad seeing in an imaging run).

1.2. Time Use and Efficiency

The observing hours and time usage for Q2 are shown in Table 1.2. As before, these numbers have been derived mostly by inspection of the night logs. In the June dark run, we tested a system for automated tracking of these categories of time use. Our intention is to develop a system that will make tracking and reporting of time usage consistent and straightforward.

Table 1.2. Observing Time – Q2 2001 (units are in hours)

Dark Run	Apr 12-29	May 12-28	Jun 11-27
Scheduled dark hours	123	108	95
Hours lost to weather	51	31	61
Engineering time	2	3	1
Equipment down time	5	7	4
Setup & calibration	18	22	7
Imaging/good	12	23	8
Imaging/poor	2	2	2
Spectroscopy/good	24	17	11
Spectroscopy/poor	9	3	1

Table 1.2 contains the new lines "Imaging/poor" and "Spectroscopy/poor." The intent is to capture time when data were being collected but sky conditions were so poor that the data do not meet quality requirements when processed. This time should more properly be attributed to the "lost to weather" category. On this basis, in Q2 we lost 162 hours due to weather out of a total of 326 hours, or 50%, to be compared to the baseline assumption of 40%.

A total of 22 hours are assigned to the sum of engineering and down time, which is less than the 10% assumed by the baseline. The sum of all of the imaging (good + poor) and spectroscopy (good + poor) was 114 hours. The sum of all of the setup and calibration time was 47 hours. This indicates that the ratio of setup/calibration time to actual observing time was 47/114, or 41%. This is one measure of efficiency and an area in which improvements in setup/calibration may result in increases in the time spent observing on the sky.

1.3. Summary of Imaging Observations to Date

A more detailed accounting of the categories of imaging data, including history-to-date, is presented in Table 1.3 (the categories are defined in previous reports). This table shows that we obtained 481 square degrees of new imaging data in Q2 in the "Unique" category, to be compared with 434 square degrees in Q1. Figure 1.1 graphically shows the imaging progress in the Northern Survey Region in Q2. Although the area of new imaging data acquired increased over last quarter, the rate of obtaining new imaging data was not adequate to stay ahead of the baseline curve. Since there is little we can do about the weather, we are focusing our attention on efficiencies to ensure that we optimize all of the available time that we have on the sky.

Table 1.3. Summary of Imaging Data to Date

	Gross	Net	Good	Unique	Footprint
North Galactic Cap					
through 1999 Apr 01	422	393	320	259	223
through 1999 Jul 01	422	393	320	259	223
through 1999 Oct 01	422	393	320	259	223
through 2000 Jan 01	422	393	320	259	223
through 2000 Apr 01	631	580	439	365	317
through 2000 Jul 01	1545	1312	1138	1044	906
through 2000 Oct 01	1545	1312	1138	1044	906
through 2001 Jan 01	1826	1479	1276	1168	1006
through 2001 Apr 1	2748	2117	1817	1610	1367
through 2001 Jul 01	3512	2811	2374	2091	1764
Delta in 2001-Q2	764	694	557	481	397

Runs obtained in Q2 2001: 2243 2247 2248 2259 2283 2298 2299 2304 2305 2326 2327 2328 2333 2334 2335 2336 2379 2385 2391 2392

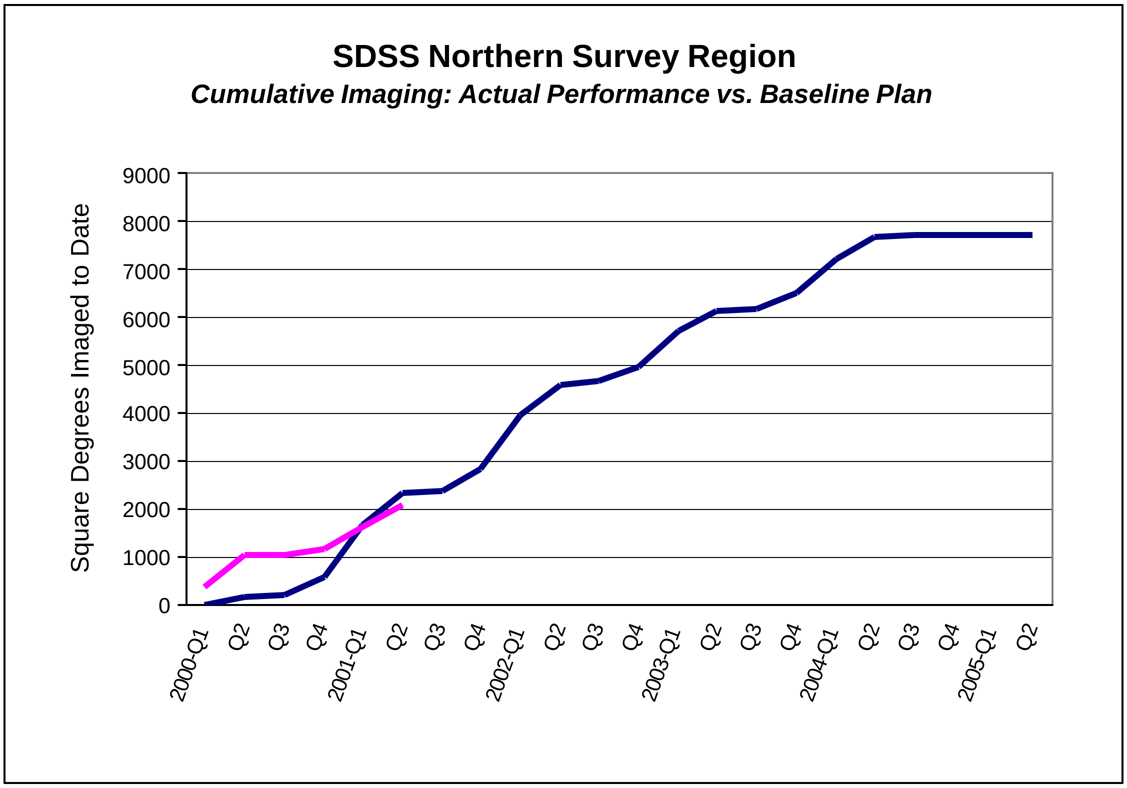

Figure 1.1. Cumulative Imaging Data vs. Baseline Plan

1.4 Spectroscopy in Q2

In Q2, we observed 56 new plates that met the exposure acceptance criteria of $(S/N)^2>13$. Figure 1.2 graphically shows the spectroscopic progress to date in the Northern Survey Region. Again, the rate at which we are observing plates is not adequate to keep our progress ahead of the baseline curve. As with imaging, we are focusing attention on understanding the efficiency of our observing operation in an attempt to maximize our output when weather conditions are favorable for observing.

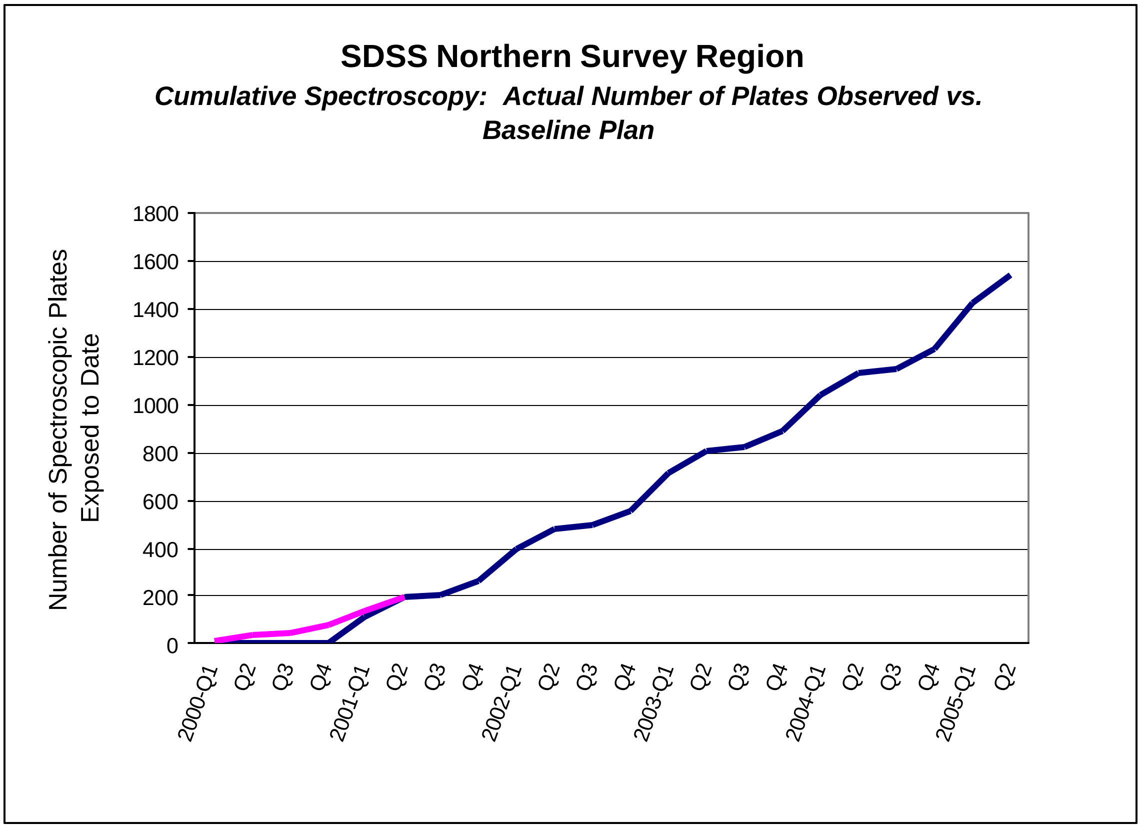

Figure 1.2. Cumulative Spectroscopy vs. Baseline Plan

1.5 Status of Photometric Telescope Secondary Patches

In Q2, we completed 119 secondary patches and reduced the number of "Not done but high priority" patches to 10. To date, we have completed 719 "unique" patches out of a total of 1528. A summary of the PT patches observed and classified as "Done, verified" is shown in Table 1.4. Patches classified as "Done, verified" have been successfully observed at APO and their quality verified through the data processing operation at Fermilab.

Table 1.4. Summary of PT Patches to Date

	All Patches	Unique Patches	Number of Observing Nights
Through 2000 Apr 01	80	0	9
Through 2000 Jul 01	199	0	23
Through 2000 Oct 01	306	107	34
Through 2001 Jan 01	585	386	59
Through 2001 Apr 01	799	600	81
Through 2001 Jul 01	918	719	93

The categories shown in Table 1.4 are defined as follows:

All Patches: Includes all of the patches that have been observed since the PT baffling was improved and the PT CCD cleaned to remove a contaminating film from the CCD surface.

Unique Patches: The number of patches under the current patch layout system that have been successfully observed without regard to overlap. This criterion is analogous to the "unique" criteria for imaging data.

Observing Nights: The cumulative number of nights over which good data has been obtained.

In addition to the patches that have successfully completed data processing, there are currently 46 patches that have been observed and declared "good" at APO, but that still require data processing confirmation. These patches are classified as "Done, not verified."

There are also 43 patches that have not been observed under the current layout scheme, but that were observed earlier. These patches are of sufficient quality, and their positions close enough to that in the current layout, that re-observing these patches is a lower priority. These patches are classified as "Not done, but old patches available." Table 1.5 sums together these various categories to present the gross number of secondary patches observed to date.

Table 1.5. Summary of Unique Secondary Patches Observed to Date

Unique Patches	
Done, verified	719
Done, not verified	46
Not done, but old patches available	43
Total observed to date:	808
Total number to be observed:	1528
Percent observed	53%

It should be noted that the "Total number to be observed" will increase by a small number over time due to the need to occasionally add "filler" patches to calibrate short imaging runs that did not cross enough of the main survey patches.

2. DATA PROCESSING AND DISTRIBUTION

2.1. Data Processing

In Q2, we spent time hiring and training three new personnel at Fermilab to support SDSS data processing operations. One individual will focus on Linux system administration, one will focus on infrastructure support, and one will focus on website support. Two of the new individuals replace personnel that left the data processing group in Q2. A final data analyst hire is pending visa approval, and Fermilab extended an offer to an individual to fill a vacant associate scientist position in the Fermilab Experimental Astrophysics Group, which support the data processing operation. We anticipate that this individual will start in the fall.

Eight additional IDL licenses were purchased for use in spectro processing and two new disk servers (sdssdp6 and sdssdp7) were purchased to support data processing and distribution operations. Problems with the hardware RAID controllers slowed progress on spectro processing, but we now understand the issues. These machines each have 750 Gbyte of disk space. One is dedicated to serving the Early Data Release (EDR) and the second is for general data processing use.

All spectro and imaging data are processed, with the final few imaging runs from the last dark run in progress. We also met all deadlines for the three drilling runs that occurred in Q2: April, runs 2125, 2126/Chunk 16 and runs 1478, 2190/Chunk 17; May, runs 1345, 2134, 2248, 1412, 1453, 2206, 2201, 2078, 2189/Chunk 18; June, runs 1659,1737/Chunk 19; runs 1729, 1659, 1740, 1741, 1869, 1891, 1893/Chunk 20, for a total of 107 plates designed for drilling.

In the upcoming quarter (Q3), strong authentication will be implemented on all computers at FNAL. On August 9th, the Kerberos authentication scheme will be installed. For two months, access will be allowed using Kerberos or the existing methods. On October 11th, access to FNAL computers will be denied to everyone not using Kerberos. Anticipating this, collaboration members who need login access to FNAL computers are being issued “CRYPTOCards.”

It is our goal to have a “collaboration” data release finished by October 1, 2001. The stages are:

1. All data that has been used to design plates (100 hours) will be loaded into a catalog archive server, called the “chunk” database;
2. Remaining imaging data (100 more hours) will be loaded into a separate catalog archive server, called the “staging” database;
3. All spectro data will be loaded into the “chunk” catalog archive server;
4. All atlas images and spectra will be loaded into a data archive server.

We also want to have photo v5_3 validated by October 1, 2001. To accomplish this, we need to:

1. Implement data model changes required for the "weak lensing" shape parameters;
2. Implement (potential) changes to astrom methodology to improve absolute astrometry;
3. Use better flats, generated from "oblique" scans or from nfcalib residuals;
4. Change the photometric calibration procedures to reduce the problem to a set of "delta zero points" to simplify the eventual transformation to a true AB system while not confusing target selection algorithms and parameters;
5. Satisfy existing testbed and regression tests.

Finally, we want to reprocess all spectro data with at least v4_7 of spectro 2d. We are currently considering precisely which versions of 2d and 1d should be used for the re-processing.

2.2. Data Distribution

A significant milestone was reached on June 5 when the first large set of SDSS data was made available to the astronomy community at the AAS meeting in Pasadena. The successful execution of the EDR required processing the data for the EDR; developing and loading the catalog archive server, data archive server, skyServer, and supporting hardware and software systems; and developing the web pages and documentation to provide user interfaces and support. The EDR required an enormous amount of work and coordination, and was accomplished through the dedicated efforts of personnel from many institutions, including Fermilab, Johns Hopkins, Princeton, the Space Telescope Science Institute, the University of Washington, the United States Naval Observatory, and the Microsoft Bay Area Research Center.

The Early Data Release contains 460 square degrees of imaging data and 58,004 spectra. The sdssdp5.fnal.gov serves the catalog archive server, sdssdp6.fnal.gov serves the data archive server, and skyServer.fnal.gov serves the skyServer. http://archive.ststi.edu/sdss is the main web page for SDSS data releases, with links to http://www.sdss.org as appropriate.

In the upcoming quarter, we will continue to provide support for the EDR and the loading of data for the release to the collaboration in October. We will also continue development work on SX v2_4. Among other things, major features will include integration of the ProxList server into the main server in response to increased usage over the past year, a rewrite of major parser elements to address a number of long-standing bugs, and modifications to accommodate data model changes associated with tiling and target selection information and the handling of "best/all/target" reruns.

2.3. Collaboration Meeting

Fermilab hosted a collaboration meeting on March 30- April 2. Approximately 100 SDSS collaborators attended. The Early Data Release was described to the collaboration and many got a chance to test the prototype interfaces. All of the science working groups had sessions. The QSO and LSS working groups prepared their presentations for the AAS meeting in Pasadena. The SDSS Director described the role of the Spokesperson and the process for electing a new Spokesperson. Regarding the election, the collaboration voted for the new Spokesperson in early July. Dr. Richard Kron was elected by the collaboration to serve a 2-year term as Spokesperson.

3. OBSERVING SYSTEMS

During the past quarter, we experienced very few problems with the systems and equipment that support observing operations at APO. In general, all systems worked well. We experienced no problems with the camera u3 chip and the spectrographs continued to perform well. We made substantial progress towards abating the long-standing thermal problems with the telescope by completing all of the Phase I thermal work. We also made significant progress towards the installation of a refrigeration system that will deal with cold winter weather. We finished a great deal of work in preparation for the summer shutdown and the new PT filters were acquired and their throughput measured. Finally, an off-site planning meeting was held by the engineering team to determine priorities and develop a task list and plan for the remainder of the year.

3.1. The Instruments

We noted in the 2001-Q1 report that intermittent problems with the u3 chip in the mosaic camera had caused the loss of some imaging data. During the past quarter, we did not experience any problems with the u3 chip. This doesn't mean the problem has been solved, rather, that it simply did not re-occur during Q2. A significant effort is planned during the summer shutdown to disassemble the camera in an attempt to identify and hopefully solve the u3 problem.

The spectrographs worked well throughout the quarter and continue to cause no problems. During the upcoming summer shutdown, the only work scheduled for the spectrographs is to pump down the spectrograph camera dewars as a preventive maintenance task.

3.2. Thermal Work

In the last report, we outlined the need for a number of projects aimed at improving the thermal environment around the telescope. We made significant progress in this area in Q2 by completing several major projects and starting another.

During the second quarter, we:

a. Completed the installation of a heat exchanger system that ties into the APO ground loop liquid system in the telescope enclosure. We also completed the installation of plumbing and cooling jackets on the two telescope cone fan motors and the three fractional horsepower motors. The former increase airflow through the primary mirror and the latter drive the cooling fans on the instrument thermoelectric chillers. Installing these water jackets results in approximately 1.5 kW of power being carried away from the lower telescope enclosure.

b. Installed DC/DC converters on the flat field lamp controllers, which completed the installation of the DC distribution system designed to eliminate inefficient linear AC/DC power supplies. We estimate that implementation of the DC distribution system eliminated approximately 1 kW of heat from the lower enclosure.

c. Contracted with a subcontractor to modify the ductwork in the telescope enclosure; the objective was to eliminate stratification in the upper level of the enclosure. The subcontractor re-routed ductwork and installed additional floor vents to improve airflow and circulation in the enclosure. Prior to these modifications, we measured a vertical temperature gradient of 10 deg. F from the floor to a height of approximately 8 feet, which is the height at the top of the primary mirror when the telescope is at stow position. After completing the modifications, the temperature gradient was reduced to less than 1 deg. F over the same distance.

d. Completed the design, fabrication, and installation of a plenum to bring outside air into the intake ports for the instrument thermoelectric chillers. Without this plenum, the intake air was being taken from the lower enclosure, which caused the camera and spectrographs to run significantly warmer than ambient, which is the design temperature. With the reduction of heat in the lower enclosure and the plenum installed, the instruments now operate at ambient temperature.

e. Specified and purchased a commercial refrigeration unit that we plan to install on the telescope enclosure in Q3. The commercial unit will allow us to cool the enclosure, telescope, and mirrors to the outside opening temperature on the coldest winter nights, thereby increasing the number of hours the telescope assembly will be in equilibrium with ambient temperature. In preparation for the Q3 installation, we completed the design work on the necessary enclosure modifications, prepared a bid package for the work, and are now reviewing subcontractor quotes.

A project is planned to investigate the replacement of the very inefficient Glentec power servo amplifiers that run the telescope with much more modern and efficient PWM units. An amplifier has been identified, but performance and electrical noise tests must be completed before proceeding. We have identified an electrical engineer to lead this effort, but no further progress was made during Q2.

3.3. The Photometric Telescope

The Photometric Telescope (PT) was operated throughout the quarter with relatively little problem, although the on-going problem with the filter wheel controller did show up on a few occasions. While not seriously impacting observing operations, the controller-positioning problem is a nuisance and will be addressed as part of the PT maintenance work planned during the summer shutdown.

The Japan Participation Group (JPG) ordered and received new filters for the PT, measured their response function, and found them all to be within specification. The data have been sent to the Project Scientist for further analysis. The filters were shipped from Japan and have arrived safely at APO. They will be installed during the summer shutdown.

The PT primary mirror was scheduled for re-aluminizing early in the summer shutdown, and this work has already been done. The mirror was coated in the aluminizing facility at the Solar Observatory (Sunspot) and received a very nice coat. In preparation for the aluminizing task, a new mirror removal system was designed and fabricated to make removal and installation of the mirror much safer. The new system uses a hydraulic lift mechanism to safely raise and lower the mirror cell in a very controlled manner. It should be noted that we used an existing hydraulic forklift assembly as the core for this system, which resulted in a significant cost savings over our earlier cost estimate for this system, which was based on fabricating all components.

3.4. Operations Software

During Q2, we lost essentially no time to software problems. The operations software continues to evolve based on operating experience and the need to increase operational efficiency and track performance. Many of the code changes involved minor bug fixes to improve observing efficiency or to eliminate long-standing problems that have required "work-arounds." The configuration control system we have put into place works well to ensure that only upgrades that have been tested and verified by the observers, are used during operations. We also began writing and testing code that will allow for the automated time tracking of observing operations, as noted in Section 1. This will help us to more accurately compare actual operating experience against our baseline performance plan and identify areas in which improvements can be made to ensure that our baseline plan is met. A prototype version of the time-tracking code was used during the June run and we expect to have a more complete version in place and functioning when we begin observing again in August.

Finally, a planning phone-con was held between the observers' program developers and the observers to review the list of outstanding Problem Reports (PRs) and prioritize the work to be done over the summer shutdown. The objective is to make sure that development effort is being applied where it will have the most benefit in terms of data quality and operating efficiency.

3.5. Efforts to Improve Efficiency and Communication

In an effort to improve operational efficiency, we have implemented processes to improve the communication between the engineering and observing teams at APO. A number of engineering tasks are typically completed during each bright time (the time between dark runs). The Telescope Engineer now posts a written report at the end of each bright time summarizing the work completed and noting areas that may be of particular concern to the observing staff. This helps ensure that all of the observers are aware of the changes that were made and the systems that were worked on.

Likewise, the Lead Observer posts written reports at the beginning and end of each dark run that summarizes the results of tests performed during shake-downs and shake-ups. Shake-downs refer to the two-day period prior to a dark run in which modified systems and new versions of software are tested and verified for operational readiness. Shake-ups refer to the first night after a run that is reserved for testing any code that was modified offline during the run. The existence of written test plans and result summaries helps document changes that were made and provides prompt feedback to the developers regarding the success of their work.

3.6. Planning Meetings

An off-site planning meeting was held with members of the engineering and observing teams to review the existing list of projects, identify new projects, prioritize all projects, balance the workload, and develop a plan for the remainder of the calendar year. The projects scheduled for completion through the end of the year are discussed in section 3.7. We also reviewed the number of systems that were delivered to APO with insufficient documentation, identified individuals who would be responsible for developing or securing the documentation, and developed a schedule for delivering the documentation to APO. The schedule for engineering and documentation work is being managed and tracked by the Project Manager. Finally, we conducted a risk identification exercise in which the group identified, discussed, and prioritized areas of potential risk or concern for continued efficient operations. The Project Manager has collected this information and is in the process of preparing a Risk Management Plan to address, and where possible mitigate, each potential risk that was identified.

Subsequent planning meetings are being scheduled for the observing systems and data processing software. It is anticipated that these meetings will be held in Q3.

3.7. Engineering Tasks for the Next Two Quarters

Table 3.1 outlines the more significant engineering tasks that are scheduled for the remainder of 2001. The list is organized by quarter and includes the task description, person responsible for coordinating the work, the reason for undertaking the task (the driver), and the priority that the engineering team collectively assigned to the work.

Table 3.1. Engineering Tasks Through the Remainder of 2001

Task	Responsible	Driver	Priority
Q3 (Jul-Sep)			
Aluminize PT primary mirror	Leger	Data quality	High
Install enclosure refrigeration unit	Klaene	Thermal	High
Complete camera maintenance/repairs	Gunn	Data quality	High
Re-cable and organize MCP/TPM VME crate	Leger	Reliability	High
Install new PT filters and quantify performance	Gunn	Data quality	High
Troubleshoot/repair PT filter wheel controller	Brinkmann	Efficiency	High
Resolve cartridge concentricity questions	Leger	Efficiency	High
Install new instrument latch controller	Federwitz	Equip prot.	High
Finish implementation of slip detection system	Czarapata	Equip prot.	Medium
Complete M1 cell ventilation tests	Carey	Data quality	High
Develop PM program for telescope systems	Leger	Reliability	High
Procure and install emergency closing generator	Leger	Equip prot.	High
Design/fab/install secondary latch improvements	Gunn	Equip prot.	High
Design/fab/install M2 radiation shield	Carey	Data quality	High
Develop/implement inst. change interlocks	Anderson	Equip prot.	High
Design/fab improved plug plate drilling fixture	Carey	Efficiency	Medium
Design/fab improved plug plate QA fixture	Carey	Efficiency	Medium
Q4 (Oct-Dec)			
Design/install enclosure stair upgrade	Carey	Safety	High
Build new cartridge cart storage house	Klaene	Safety/Equip prot.	High
Aluminize 2.5m primary mirror	Leger	Data quality	High
Procure and install humidity sensor in enclosure	Gillespie	Equip prot.	Medium
Develop method to remove set in science fibers	Owen	Reliability	High
Mount DIMM on 2.5m telescope pier	Gunn	Efficiency	High
Design/fab/install tele. counterweight upgrade	Leger	Reliability	Medium
Design/install PT dome thermal control system	Klaene	Equip prot.	Medium
Assess Holloman scattered light sensitivity	Gunn	Data quality	High
Complete spare parts procurements	Leger	Reliability	Medium
Develop requirements for cloud camera upgrade	Gunn	Reliability	Medium

It should be noted that the list does not include the monthly plug plate drill runs, which require the effort of the UW engineering team, or the numerous documentation tasks that we have identified and assigned to individuals. It has become very evident that the lack of sufficient documentation at APO leads to operational inefficiencies and so we have developed a plan and schedule for developing and delivering documentation to the site staff.

4. SURVEY PLANNING

4.1. Observing Aids

Several programs used to aid in observing were updated.

1. HoggPT is a program that processes the data from the Photometric Telescope in near real time and provides feedback on the photometric quality of a night. Cloud camera images are now captured in real time and analyzed to provide a quantitative measure of the cloud cover. A plot is generated that assigns a quality of good or bad for all times during the night, which makes it easier to judge the quality of the PT and 2.5-meter telescope data in real time.

2. Son-of-Spectro is a program that analyzes spectroscopic exposures in near-real time and determines if they have adequate signal/noise. This program now runs on its own machine since it uses substantial amounts of CPU time and disk space.

3. The plate inventory database that tracks which plates have been observed has had small incremental improvements. A figure that shows which plates can be observed at any time during the night has been augmented to show times when a plate cannot be observed because it would require that the telescope track near the zenith. Code was added to create more complete reports of observations that have been collected.

   A goal for next quarter is to incorporate code to feed back results from data processing and automatically update the plate inventory database. At present, the database is updated by hand. We note that automatic update code already exists in the patch database.

4. The patch database tracks the Photometric Telescope observing program. The database has been enhanced to allow new patches to be added by hand and then observed automatically as part of the normal observing program. These patches are occasionally needed to fill in gaps in coverage for short imager runs that miss existing patches.

Several programs are in various stages of development to aid in planning observations.

1. The plate layout program determines the exact parameters to be used for designing new plates. This program has been redesigned to make it much easier to run. More informative plots are now made to make it easier to assess the coverage of plates during future observing runs.

2. The plate planning program helps decide which areas of sky should be imaged next in order to maximize plate availability at all times during the night. A first version of this program has been designed.

4.2. Target Selection

No significant changes were made to the target selection code.

107 new plates were designed and drilled in three separate drill runs. These plates covered both the North and South survey areas.

A goal in the next quarter is to enable the design of new plates that include fainter objects in areas of the sky where plates have already been designed. The operational database will need to be made more flexible to handle this case.

5. COST REPORT

The approved SDSS project budget for 2001 consisted of two parts: $1,909K for Fermilab, US Naval Observatory (USNO), and Los Alamos National Laboratory (LANL) expenses, which are paid by these institutions and counted as in kind contributions; and $4,000K for ARC funded expenses. Actual ARC funded expenses in the second quarter were $877K against a baseline of $926K. The ARC funded budget is summarized in Table 3.1, which compares second quarter and annual expenses against the baseline. A more complete table comparing actual to baseline performance is included as an attachment to this report.

As noted in previous reports, final second quarter expenses were not available for all of the institutional budgets at the time this report was prepared, due to variations in the timeliness of the accounting systems for the various institutions performing work for the SDSS. In these instances, second quarter expenses have been estimated to the best of our ability. The reported expenses will be revised as final invoices are received from the supported institutions.

Table 3.1. ARC-Funded 2nd Quarter Expenses and Forecast for 2001 ($K)

	2001 – 2nd Quarter		2001 - Total	
Category	Baseline Budget	Actual Expenses	Baseline Budget	Current Forecast
1.1. Survey Management	57	56	274	249
1.2. Collaboration Affairs	0	0	0	0
1.3. Survey Operations				
1.3.1. Observing Systems	312	273	1,095	1,149
1.3.2. Data Processing and Distribution	176	150	696	661
1.3.3. Survey Coordination	0	0	0	0
1.3.4. Observatory Support	330	371	1,320	1,329
1.4. ARC Corporate Support	51	28	167	165
Sub-total	926	877	3,553	3,554
1.5. Management Reserve	113	0	447	446
Total	1,039	877	4,000	4,000

5.1. First Quarter Adjustments

Minor adjustments were made in Q1 actual expenses to reflect final expenses as they appeared in accounting reports. The total increase in ARC-funded expenses was $12K and increased actual Q1 expenses from $744K to $756K. There were no adjustments in the in-kind contribution.

5.2 Second Quarter Performance - In-kind Contributions

The sum of in-kind contributions for the second quarter was $466K against the baseline forecast of $492K, and was provided by Fermilab, Los Alamos, and USNO. Fermilab provided support for the data acquisition system at APO, the software programs used by the observers to operate the telescopes and instruments (the “Observers’ Programs”), and the data processing systems at Fermilab as agreed. The Fermilab in-kind contribution for software and data processing support was lower than forecast because one of the individuals in the data processing team started working half time early in the quarter, before a replacement was hired. Variations from the baseline for survey management support, observing systems support, and observers’ program support were described in the 2001-Q1 report and were in line with the revised forecast for Q2 contained in the Q1 report. Los Alamos provided programming support for the Telescope Performance Monitor and observing support for the Photometric Telescope as required, but the total level of support was less than anticipated when the baseline budget was prepared. USNO provided support as required for the software systems they provided and now maintain. As these systems are mature and stable, the level of support required in the second quarter was less than originally anticipated. Moreover, the forecast for the remainder of the year has been reduced since the level of support required will be lower than originally forecast.

5.3. Second Quarter Performance – ARC Funded Expenses

The sum of ARC-funded expenses for the second quarter was $877K, which is $49K below the second-quarter budget of $926K.

Survey management costs as a whole were within $2K of the Q2 baseline. Expenses related to the Collaboration Meeting held at Fermilab in April resulted in an increase in Fermilab survey management support costs. Since these costs were relatively small, they were included here as opposed to transferring funds from the ARC corporate account. For the year, survey management costs are forecast to be $25K below the baseline budget. This is mainly because the funds allocated to support software testing and validation at Johns Hopkins were less than was anticipated when the baseline budget was prepared.

Observing Systems costs were below the second quarter budget by $39K. The budget to support the work associated with improving the thermal environment around the telescope is held in the ARC budget for Observing Systems Support. Costs incurred in the second quarter were associated with the modification of ductwork in the telescope enclosure and purchase of the enclosure refrigeration unit that will be installed in Q3. Unspent funds allocated for thermal improvement work have been moved forward into Q3 and Q4. The Fermilab budget for Observing Systems support was underspent partly because design and engineering resources were not available to work on the telescope drive amplifier replacement project. Since no design work was done, no procurements were made. This work is now planned for the third and fourth quarters and the budget moved forward accordingly. The UW budget for Observing Systems support was slightly overspent because of a new project that was not in the baseline plan. A study was started in Q2 to quantitatively assess the ventilation flow rate through the primary mirror due as a function of different vent tube and cap designs. A section of mirror was purchased from the Steward Mirror Laboratory for these tests, as was several pieces of necessary instrumentation. The JHU budget for PT commissioning was underspent because the baseline budget had included salary support through June for a post-doc who was serving as a PT observer. This individual received an early job offer and left the project in April, which resulted in budgeted salary expenses going unspent. The UC budget for Observing Systems was overspent due to the addition of funds to support the Imaging Scientist. These funds were transferred from the ARC Corporate account and do not reflect an increase in the budget, but only a re-allocation of funds.

Data Processing and Distribution costs were $26K below the second quarter budget. The baseline plan for 2001 called for hiring an additional data analyst at Fermilab to support data distribution activities. Fermilab was not able to find a suitable candidate for this ARC-funded position until late in the second quarter and so funds allocated to fund this position in both Q1 and Q2 went largely unspent. Since the position has now been filled, the forecast for Q3 and Q4 remains unchanged from the Q1 report. A similar situation occurred at Johns Hopkins. Funds were allocated to hire a computer professional to replace an individual who left the project in mid-March. A suitable candidate was found and started work in June 1. However, as a result of the later than anticipated start date, a portion of the funds allocated to support the JHU position went unspent in the second quarter. The unspent funds from Q1 and Q2 have been moved into the management reserve.

Observatory Support costs were $41K above the baseline budget for Q2. The Observatory Support budget appears overspent in Q2 but it actually contains encumbrances for future quarters for the housekeeping contract, NSO services, telephone maintenance, etc. There was nearly $15K spent in Q2 on non-consumables, such as for a new LN2 hose for the SDSS camera, replacement surge protection hardware, furniture and a small refrigerator for the engineering office trailer, replacement hardware for the DA system, and Clean Room certification, to name a few. Other items of note include LPG fuel, which is much more expensive this year than planned, and the purchase of a workstation for our seventh and final observer. No more equipment purchases are planned for the year. Salary costs were higher than normal in Q2 because salary adjustments for several NMSU staff members working on the SDSS were made retroactive to the beginning of the year. This made the monthly salary total for May about $20K higher than normal. However, the total salary projection for the year is virtually unchanged from the baseline, because the summer short nights and shutdowns allow for less overtime (and more vacation time) for the Observers and some of the day staff, which can reduce payroll costs by up to $20K/month. Also, the effective NMSU personnel benefits rate has been set at 26%--the baseline budget used 27% as the rate. The Q3-4 forecast has been reduced to reflect this change in the benefits rate. For the year, the Observatory Support budget is forecast to be within 1% of the baseline.

ARC Corporate Support costs were $23K below the second quarter budget. Funds are held in the ARC Corporate account and distributed evenly throughout the year to support personnel replacement costs. These funds were not needed in the second quarter and so they have been redistributed in quarters 3-4. In addition, funds are held in the ARC Corporate Support budget under the category "Additional Scientific Support" to provide for additional scientific support when needed to work on specific problems or areas of concern. This budget is also spread evenly throughout the year in the baseline plan. Since no support was required in the second quarter, the funds have been redistributed evenly in quarters 3-4.

No management reserve funds were distributed in the second quarter. Distributing them equally in quarters 3-4 has moved the unspent funds forward.

6. PUBLICATIONS

Galaxy Mass and Luminosity Scaling Laws Determined by Weak Gravitational Lensing
AJ submitted - Timothy McKay

Cataclysmic Variables from SDSS I. The First Results
AJ submitted - Paula Szkody

An Efficient Algorithm for Positioning Tiles in the Sloan Digital Sky Survey
AJ submitted - M. R. Blanton, et al.

Towards Spectral Classification of L and T Dwarfs: Infrared and Optical Spectroscopy and Analysis
AJ submitted - T.R. Geballe, et al.

Infrared Photometry of Late M, L, and T Dwarfs
AJ submitted - S.K. Leggett, et al.

Sloan Digital Sky Survey u' g' r' i' z' Observations of GRB010222
AJ accepted - Brian C. Lee, et al.

A photometricity and extinction monitor at the Apache Point Observatory
AJ accepted - David W. Hogg, et al.

Photometric Redshifts of Quasars
AJ accepted - Gordon T. Richards, et al.

A new method to find galaxy clusters in SDSS data using color
AJ submitted - Tomotsugu Goto, et al.