Project and Study Scientist Reports for AWG # 134

18-12-2008

Report compiled, using inputs from Study and Project Scientists by Jean Clavel, head Astrophysics & Fundamental Physics Missions Division,

1 Ongoing studies

1.1 IXO (formerly XEUS): Arvind Parmar

The CDF study of the International X-ray Observatory (IXO) mission concept has been completed with the support of NASA and JAXA. The study focussed on the High-precision Pore Optics (HPO) assembly, the mechanisms - including the extendable optical bench, the payload and grating accommodation and the Ariane 5 launcher interface. In contrast to the earlier NASA Mission Design Laboratory (MDL) study, the payload also included two potential European led instruments – the High Time Resolution Spectrometer (HTRS) and the X-ray Polarimeter (XPOL). The conclusions of the CDF study are remarkably similar to those of the MDL – both designs appear feasible, with mass being the ultimate limiting factor. This means that increasing the high-energy effective area by increasing the focal length for instance, can only be achieved by reducing the mass of other sub-systems.

Upon completion of the CDF study, the IXO Study Coordination Group met in Paris to review the outcome and to finalise the science requirements. The requirements will be put forward into the NASA Decadal review and will serve as input into the upcoming European industrial assessment studies. It was agreed that:

1. The ESA and NASA mission concepts will both be maintained and presented to the Decadal Survey as they illustrate the robustness of the overall concept.
2. A fixed grating with an area of 1000 cm^2 and a resolution of 3000 will be included in the baseline configuration.
3. The HTRS and XPOL instruments will also be in the baseline configuration.
4. There should not be a separate hard X-ray telescope.

In addition the top-level scientific requirements were agreed:

1 A mirror area of 3 m^2 @1.25 keV, 0.65 m^2 @ 6 keV (goal of 1 m^2) and 150 cm^2 @ 30 keV with a goal of 350 cm^2
2 FWHM spectral resolution of 2.5 eV within 2 x 2 arcmin (0.3–7 keV), 10 eV within 5 x 5 arcmin (calorimeter) and 150 eV within a diameter of 18 arcmin (Wide Field Imager; 0.1-15 keV)
3 An angular resolution of <5 arcsec HPD below 7 keV and 30 arcsec HPD between 7-40 keV, with a goal of 5 arcsec HPD.
4 A count capability such that the Crab Nebula can be observed with a >90% throughput and an energy resolution of <150 eV at 6 keV.
5 The ability to detect a 1% degree of polarisation in a 1 mCrab source in 100 ksec (2-6 keV) at 3σ confidence.
6 An astrometric accuracy of 1 arcsec at 3σ confidence.
7 An absolute timing accuracy of 50 μsec

There was a general consensus that the concepts studied in the MDL and CDF may be able to provide the above requirements. There was also an agreement to investigate whether the 6 keV and 30 keV effective areas could be improved with a better optics assembly design or by increasing slightly the focal length.

1.2 Lisa: Oliver Jennrich

The last quarter of 2008 has been dominated by the preparation for the upcoming Astronomy and Astrophysics Decadal Survey (Astro2010) of the US National Academy of Sciences. The chair (R. Blandford, Stanford) has been named, committee members have been appointed and there are indications that the survey committee will issue requests for information in February; the LISA International Science Team (LIST) and the LISA Project are working towards an internal deadline of end of January 2009 for completion of the documentation.

When round-3 of the Mock LISA Data Challenge was issued in March, the deadline for decomposing the signal and recovering individual sources was 30 November 2008. Upon request of the groups which participate in the competition, the deadline was extended to 30 April 2009 to allow more time for a thorough investigation of the stochastic background signals.

A proposal for developing the optical bench technology has been received from industry. The proposal was clarified at a meeting with the proposing consortium on 9 December, such that a formal Tender Evaluation can now proceed.

1.3 Plato: Malcolm Fridlund

Baseline Selection Reviews (BSR) have been held in late November and early December for both Thales-Alenia and Astrium, with the objective of selecting a baseline design for the remainder of the study. However, the selection has been put on hold pending clarification of a potentially serious problem with the scientific objectives as explained below.

In mid-November, the Science & Payload Consortium notified ESA that there was a significant error in their original proposal whereby the density of F, G and K dwarf stars per square degree had been overestimated by a factor of ~6. The density had been derived from a relative fraction of 60% taken from the Kepler literature. Such a fraction however, is only valid if the faint end of the magnitude range extends to $m_V = 14$, as is the case for the Kepler mission. Since PLATO only reaches magnitude 11 - because of the requirement to characterize host stars by astroseismology - the appropriate figure should have been 17% (there are relatively more giants and super-giants among brighter stars). In addition, the total number of stars per field of view had been overestimated by a factor ~2. With the current design, PLATO will only sample 9,000 F, G & K dwarf stars instead of the 60,000 envisaged in the original proposal. Since only about 1 % of the planetary systems will have a favorable orientation, this reduces the number of planets that can be fully characterized to <100.

This may force a significant redesign of the mission, though the options are limited by the overall mass and volume envelope set by the launcher. The problem is currently under investigation by the Science Consortium, the PLATO Science Study Team (PSST) and ESA. The schedule is extremely tight since a baseline design has to be agreed at the latest in early January in order not to delay the industrial assessment phase.

1.4 SPICA: Ana Heras

Baseline Selection Reviews for the SPICA Telescope Assembly industrial studies by EADS-Astrium-SAS and Thales-Alenia-Space (F) have taken place on 3 and 4 December, respectively, with the participation of JAXA/ISAS representatives and the Science Study Team. The first phase of the industrial study will be completed in early January with the selection of a baseline design for the telescope. At that point, the Science Requirements Document and the Telescope Requirements Document will also be updated to be fully in-line with the adopted design.

The JAXA/ISAS SPICA team for the pre-project phase has been appointed. Prof. Takao Nakagawa has been nominated Pre-project Team Leader and main contact points have been identified per sub-systems. JAXA/ISAS is preparing for the System Requirements Review that will take place in autumn 2009. The objectives are to fix the baseline requirements for the whole SPICA system and to prepare the invitation to tender to select the industrial partners. The preparation of the System Requirements Review documentation will be coordinated with ESA, the SPICA Telescope Science Study Team and the SAFARI consortium.

Telescope and instrument interfaces to the satellite as well as concepts for science operations were discussed at a joint JAXA-ESA-SAFARI meeting held on 4-5 November in Tokyo. JAXA is reviewing the baseline budget allocation for the Focal Plane Instruments. JAXA has proposed the creation of an Inter-Agency SPICA Steering Committee to oversee the management of the SPICA study phase.

A SAFARI Consortium meeting took place on 8-9 December at Leuven to review the technical progress of the instrument assessment study and the status of the science requirements. The SAFARI consortium is finalising an overall study plan which features a phase A1 Close-out Review shortly before the Cosmic Vision down-selection. This review is internal to the SAFARI consortium, but will have ESA and JAXA observers to provide full visibility on the technological readiness of the instrument and its interfaces with the SPICA satellite.

1.5 Euclid: René Laureijs

The Euclid assessment study went through a number of first progress meetings with industry and with the instrument consortia in October. They indicated that additional information is urgently needed from the scientists, in particular on backup slit-less spectroscopy, deep survey, and in-orbit calibration requirements. It also became clear that the continuous scanning or TDI mode for the visible imager is extremely difficult to implement while satisfying the requirements on the NIR imager and spectrometer. It was therefore decided to drop TDI in favour of a step-and-stare observing mode as the baseline for the remainder of the assessment study.

Both the industrial teams and the instrument consortia are working towards the first major study milestone, the Baseline Selection Review. The BSR, scheduled for mid-January, will formally close the requirements trade-off phase. By that time, a baseline mission design must be established and frozen for the rest of the study. The subsequent consolidation phase will focus on defining in more details the payload and the service module designs, the AIV plan and the project management plan.

Discussions have taken place with the Euclid community and the advisory structure regarding possible schemes of collaborations with NASA for a common Dark Energy mission. Discussions with NASA are planned in January. The consultation of the community has taken place through a meeting with the major European stakeholders in Euclid in mid-December. NASA and the US Dept. of Energy (DOE) are currently preparing an AO for a joint dark energy mission (JDEM) to be issued in early 2009.

2 Projects under development

2.1 Herschel: Göran Pilbratt

After execution of the System Operational Validation Test (SOVT-1) in early September, the cryostat was topped-up to perform the launch autonomy test. The test was successful and validated a credible and complete launch scenario despite the non-availability of the He-I tank (HOT); including a worst case roll-back scenario where the launch is aborted just before a second launch attempt, 25 hours after the nominal launch time. After the test, the He-II tank (HTT) was depleted and a partial warm-up to ~100 K was performed to evaporate any potential remaining contaminant (see previous report). In parallel, the PACS harness on the outside of the cryostat was re-routed to eliminate H-field sensitivity. Functional tests in He-I conditions subsequently confirmed that H-field had disappeared.

The Herschel spacecraft being hoisted and gently lowered into the Large Space Simulator at ESTEC. For more information, consult http://herschel.esac.esa.int/latest_news.shtml

Preparation then started for the thermal balance/thermal vacuum (TB/TV) test in the Large Space Simulator (LSS) at ESTEC. After partial warm-up, the cryostat was re-filled with helium certified clean from Dewars certified clean. The spacecraft was brought into the LSS on 28 October 2008. However, during He-II production on 8 November, a pump failure followed by a valve failure allowed air into the cryostat ventline where a blockage formed. The main helium tank was valved off, and everything else was allowed to slowly warm up. The blockage cleared on 11 November; however, some residual air could be trapped inside the cryostat. In order to "play safe" and remove as much potentially remaining air as possible, the cryostat was subjected to a sequence of activities similar to a worst case rollback scenario. This involved a cryostat warm-up to an optical bench temperature of 75 K, while keeping the HTT under the lambda point (thus in He-II conditions). Altogether, this added ~1 week delay to the schedule. The LSS was closed on 19 November, and the TB/TV tests have progressed on schedule since then.

The start of the System Operational Validation Test #2 (SOVT-2) was advanced from January to December 13, immediately after TB/TV. Since the spacecraft is already in the LSS under He-II conditions, this offers a much more realistic environment which greatly

enhances the scope of the tests compared to SOVT-1. The SOVT-2 rescheduling created a resource conflict in the preparation of the Data Processing (DP) workshop planned for 4-5 December at ESAC. In the end, the DP workshop could be held successfully as planned, with about 100 participants, but without "hands-on" sessions. For further information see the workshop webpages at http://herschel.esac.esa.int/DP_wkshop.shtml.

The Herschel Science Ground Segment was reviewed as part of the Ground Segment Readiness Review (GSRR). It passed the review with flying colours. It is now the turn of the science payload which is being scrutinised as part of the Instrument Flight Acceptance Review (IFAR). The GSRR and the IFAR both feed into the Flight and Qualification Acceptance Review (FQAR) which started on 24 November. The FQAR should provide clearance for shipping Herschel to Kourou (by air) in early February 2009. The launch campaign is geared toward launch readiness on 10 April 2009, the first day in the 1-month launch slot agreed with Arianespace.

2.2 Planck: Jan Tauber

The Planck Flight-Model satellite has completed its extensive campaign of tests. The major remaining activities are related to fixing the two cooler problems that were encountered during recent cryogenic tests:

- A global leak test of the 4-K cooler in mid-December, to verify that the leak has been correctly repaired
- Integration and verification of the repaired dilution-cooler panel, scheduled in early January 2009

When these two activities are completed, Planck will be prepared for shipment to Kourou, in early February. The launch slot opens on 10 April.

The Instrument Flight Acceptance Review has been completed. As anticipated, the instruments have met all requirements and are now considered ready for flight (pending completion of the repair of the dilution cooler pressure regulator). The Herschel-Planck Ground Segment Readiness Review has also been successfully completed. The satellite Flight Qualification and Acceptance Review (FQAR) started in early December and should be completed in late January.

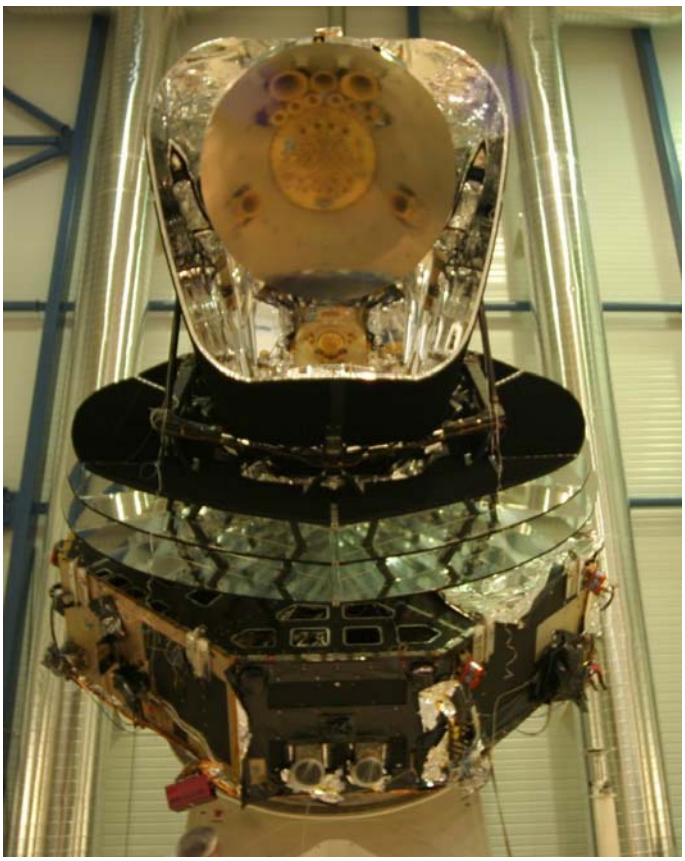


Figure caption: The Planck satellite in November 2008. An image of the focal plane is reflected on the telescope's primary mirror.

2.3 JWST: Peter Jakobsen

The NIRSpec Critical Design Review (CDR), which started on 8 October is now nearing completion. Replies to the 177 "Review Item Discrepancies" (RID) raised by the board and the five technical panels were submitted on 26 November. The vast majority of the RIDs are minor in nature. The CDR is scheduled to finish on 11 December with the meeting of the CDR Board.

The biggest challenge for the NIRSpec project is to keep the various subsystem providers on a schedule compatible with a 2010 delivery of the instrument to NASA. The main areas of concern remain the Zeiss supplied Grating and Filter Wheels, the Galileo Avionica supplied Focussing Mechanism and the NASA supplied Micro-Shutter Array (MSA).

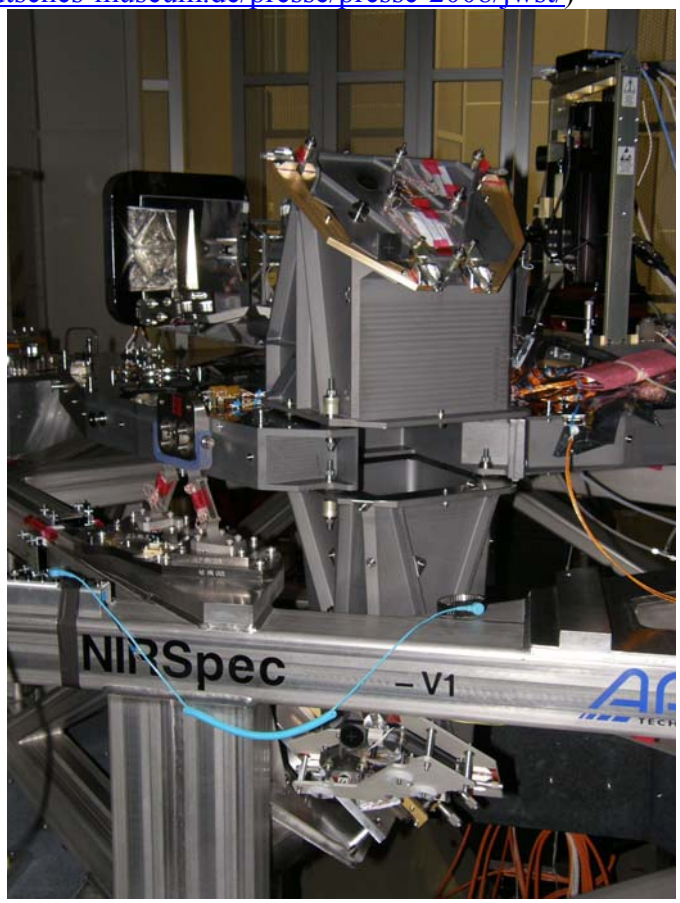
The first results from the ambient testing of the NIRSpec Demonstration Model (DM) - assembled from the Fore-optics and Focussing Mechanism Qualification Models, with a CCD detector in the MSA focal plane - have been analyzed by the NIRSpec Operations Team at ESTEC. The results are very encouraging, and nicely verify the functionality of the NIRSpec optical system. These DM tests will be repeated under cryogenic conditions in March.

In consultation with the NIRSpec Instrument Science Team, it has been decided to include a 1.6 arcsec square hole in the NIRSpec aperture plate to facilitate observations of transiting exoplanetary systems. Specifically, the implementation of such a large aperture will allow spectral resolution to be traded for reduced pointing-drift induced modulation of the signal, thereby facilitating the comparison and subtraction of in and out-of-eclipse spectra of exoplanet systems. The aperture will also be extremely useful for focusing and

aligning the instrument in orbit, and enables a simplified target acquisition approach for single target observations.

Progress on MIRI remains steady. A joint MIRI Consortium/NASA meeting took place at RAL on 2-3 December to review the results of the MIRI Verification Model test campaigns. The tests have demonstrated that the MIRI Optical Bench Assembly performs optically as designed and meets its power dissipation requirement of 68 mW. Nevertheless, the total heat-lift capacity of the NASA-provided MIRI cryo-cooler remains an area of concern. Two issues with the MIRI Telescope Simulator (MTS) were also uncovered. A malfunctioning baffle, which prevented full-field illumination with the flat-field source, is now fully understood and will be corrected in time for Flight-Model testing. The second issue, which concerns the focus position of the MIRI telescope, is still being investigated.

A NASA/ESA/CSA JWST Partners Workshop was hosted by the NIRSpec Prime contractor, Astrium on 13-16 October in Munich. In conjunction with this meeting, the JWST full-scale model was on display at the Deutsche Museum in Munich through to 28 October, where it formed the centrepiece for a number of outreach activities (for details, see http://www.deutsches-museum.de/presse/presse-2008/jwst/)



The NIRSpec Demonstration Model being prepared for optical testing.

2.4 GAIA: Timo Prusti

Progress is being made steadily in all technical areas of the Gaia development. Constant monitoring of the industrial contractors is nevertheless required to prevent erosion of the schedule. Most critical at the moment is the production of the many SiC components of the Gaia spacecraft, including the mirrors and the ultra-stable torus which supports the optical bench. Gaia is putting a significant load on the production capacity of Boostec (F), the only European company that has the capability for manufacturing SiC components. To

make matters worse, one of the primary mirrors had to be returned to Boostec for additional grinding. The grinding is necessary to remove excess material deposited near the centre of the mirror. The excess would have taken too long to remove by polishing. It was generated during the Carbon Vacuum Deposit (CVD) phase because the Gaia mirrors are too large to be accommodated horizontally into the deposit chamber and had to be coated in a vertical position.

The CCD production has resumed after resolution of the bond-lifting problem. More than half of the flight-CCDs have now been produced, the red sensitive CCDs being the last ones in the production line. Production of the Proximity Electronics Modules (PEM) attached to the CCDs has also started. The PEM went through a long optimization phase which permitted to achieve very low noise levels. This is good news, especially for spectroscopy of the faintest stars. On the other hand, a new problem of non-uniformity in the serial register reading has surfaced and is currently under investigation.

The third CCD irradiation test campaign is under way. It concentrates on characterising the effect of radiations on the performances of the Radial Velocity Spectrometer (RVS). The preliminary results are encouraging; spectral lines remain clearly visible even at flux levels corresponding to the faintest stars detectable by Gaia. Spectra are mostly affected in their "front" part, i.e. that section to be readout first, while the "tail" is relatively unaffected due to charge self-injection. Unfortunately, the "front" part contains the Ca triplet lines, which is critical for the determination of the star radial velocity. A detailed analysis of the test results is in progress to properly quantify the effect of radiation on RVS science.

All elements of the ground segment - MOC, SOC and DPAC - are also progressing. The next milestones are the Design Reviews scheduled for the first semester of 2009, with the MOC review in January followed by the SOC & DPAC Review in May. The first member of the DPAC Project Office, the Project Controller, took-up duty on December 1; the Project Coordinator will start on January 15. The DPAC Project Office will take care of the daily management of the Data Processing & Analysis Consortium, thereby freeing scientists' time for more scientifically oriented tasks.

The Gaia Science Team is working together with the DPAC Executive in establishing the requirements on the 9th DPAC Coordination Unit (CU). CU-9's role is to design and implement the Gaia catalogue access system. It is not required now and will only be established closer to launch. The requirements are needed to precisely define the tasks and responsibilities of CU-9.

2.5 Lisa Pathfinder: McNamara

Project activities have focussed on the Critical Design Review. The CDR will conclude with the board meeting on the 12th December. The main technical risk which has been identified relates to CPU over-loading of the on-board computer (currently at 101%). A Tiger Team has been established to investigate ways of reducing the processor load. Solutions have been identified, which consist in optimising on-board handling of data and reducing the sampling frequency of the Drag Free Attitude Control System (DFACS) signal. The results of the Tiger Team are expected in early 2009.

Several milestones have been achieved during the test campaign of the science-craft and propulsion module structures. Acoustic testing of the launch composite was completed in September, while separation shock tests were successfully carried-out in November. The latter tested simulated the shocks that will be incurred by the spacecraft when it separates from the launcher and when the propulsion module is jettisoned. The refurbished

engineering model of the science-craft structure (accidentally broken in earlier tests – see previous report) is currently undergoing sine-dwell tests at ESTEC that are due for completion at the end of December. The Flight Model of the science-craft structure was delivered by ASTRIUM on the 9th of December. It will undergo sine dwell testing in early 2009.

Real-time test-bed activities are also progressing both at Astrium GmbH and Astrium UK. As flight hardware is being delivered, these test-beds are gradually upgraded toward a full hardware-in-the-loop validation of the DFACS.

Development of the Science Operations Ground Segment is also progressing well. The first official release of the science operations simulator was delivered and accepted at ESAC in mid November. Also of note is the delivery of the science Mission Planning and Data Ingestion software. Finally, version 2 of the Data Analysis client software was installed at ESAC in November.

The launch date has slipped to the second half 2011.

3 Satellites in orbit

3.1 HST: Antonella Nota

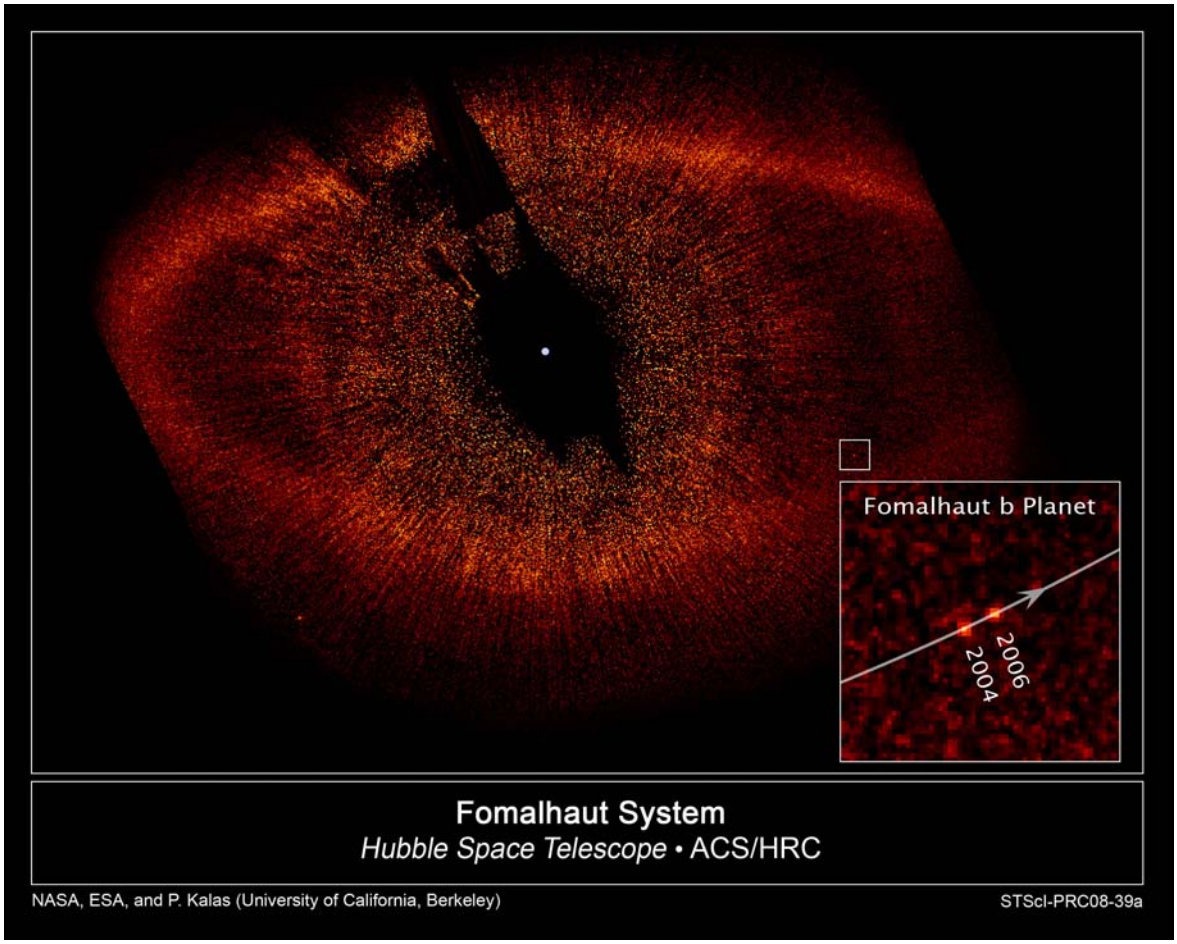
Since October 23, Hubble has resumed routine scientific operations after the successful switch to side B. Failure of Side-A CU/SDF (Command Unit/Science Data Formatter) has placed Hubble in the position of relying on the backup (B) electronics. As a result, there is no longer redundancy in the SI/C&DH (Science Instrument Command and Data Handling Unit). There is a spare SI/C&DH on the ground, and a decision has been made to postpone Servicing Mission 4 (SM4) and install the spare unit. This requires significant testing, re-planning, and astronaut training and, as a result, it is expected that SM4 will likely fly sometimes in May 2009.

Wide Field Camera 2 is, at present, fully operational and taking scientific data, and so are the Fine Guidance Sensors. The Solar Blind Channel of the Advanced Camera for Surveys is also operational. NICMOS is currently non operational. Although the NICMOS instrument has been recovered, attempts to cool the instrument down have failed so far, and the investigation of the anomaly is in progress.

In order to maintain the observing efficiency of Hubble, a supplemental solicitation for observing proposals using the operational instruments has been issued to the astronomical community, with a deadline of December 8, 2008. Two categories of proposals have been solicited: large programs, that request at least 75 orbits, and smaller programs that offer innovative ways of addressing high impact science issues and/or high science risk/high science return programs. Past examples of the latter category include searching for absorption features due to transiting (and non-transiting) exoplanets, observations of Jovian satellites to search for optical and ultraviolet fluorescence, and pilot investigations of novel techniques for identifying high redshift galaxies. The proposals will be reviewed by a subset of the Time Allocation Committee for Cycles 16 and 17. The successful proposals will be used to fill Hubble's observing schedule between now and SM4.

Hubble has taken the first visible-light snapshot of a planet circling another star. Estimated to be no more than three times Jupiter's mass, the planet, called Fomalhaut b, orbits the

bright star Fomalhaut, located 25 light-years away. Fomalhaut has been a candidate for planet hunting ever since an excess of dust was discovered around the star in the early 1980s by IRAS. In 2004, the coronagraph in the High Resolution Camera on Hubble's Advanced Camera for Surveys produced the first-ever resolved visible-light image of a large dust belt surrounding Fomalhaut. It clearly showed that this structure is in fact a ring of proto-planetary debris approximately 230 AU across with a sharp inner edge. This large debris disk is similar to the solar system's Kuiper Belt. Now, Hubble has actually photographed a point-source of light lying about 20 AU inside the ring's inner edge. ACS observations taken 21-months apart show that the object is moving around the star and is therefore gravitationally bound to it. The planet is 115 AU from the star, or about 10 times the distance of Saturn from the sun. The 3-M_J upper-limit to the planet's mass is inferred from the appearance of the ring: if it were more massive, it would distort the ring, and the effect would be observable in the ring's structure. The planet is brighter than would be expected for an object of three Jupiter masses. One possibility is that it has a huge Saturn-like ring of ice and dust reflecting starlight. The ring might eventually coalesce to form moons. The ring's estimated size is comparable to the region around Jupiter that is filled with the orbits of the four largest satellites.



This image obtained with the ACS shows the newly discovered planet, Fomalhaut b, orbiting its parent star, Fomalhaut. The small white square at lower right pinpoints the planet's location. Fomalhaut b has carved a path along the inner edge of a 230 AU dusty debris ring encircling the star. The inset at bottom right is a composite image showing the planet's position during Hubble observations taken in 2004 and 2006. Fomalhaut b completes an orbit around its parent star every 872 years. The white dot in the centre of

the image marks the star's location. The region around it is black since the coronagraph blocks out the star's bright glare. Fomalhaut b is 1 billion times fainter than its star. The radial streaks are scattered starlight. The red dot at lower left is a background star.

3.2 XMM-Newton: Norbert Schartel

The XMM-Newton observatory continues to operate nominally. As of the 2nd of December 2008, the overall completion status of the observing programme is as follows:

- AO-7 programme: 71.9 % (A and B priority)
- AO-7 programme: 3.2 % (C priority)

The completion of the AO-7 programme is expected by end of April 2009, in line with the planned start of AO-8 observations.

Several Targets-of-Opportunity were observed during the reporting period, namely SAX J1808.4-36, EXO 0748-676 and SDSSJ1023+00.

During the evening of October 18, contact with XMM-Newton was lost. Nominal communications were re-established on 23rd of October using the NASA 34-metre Deep Space Network ground station in Goldstone (California). The problem is associated with the switch between the two onboard antennas, which almost certainly got stuck in an intermediate position. An overview of the problem and recovery can be found in two special press releases http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=43591 and http://www.esa.int/esaSC/SEM268RTKMF_index_0.html. XMM-Newton resumed scientific observations on November 2 using only one of the two onboard antennas. This only had a limited impact on the scientific performance since in November, the orbit part without S/C radio contact occurs around perigee where observations are impossible anyway because of the high level of background radiation. The anomaly resulted in the loss of 7 complete revolutions, with 230 hours of scheduled observations including several time-critical monitoring programs. The single-antenna operations resulted in an additional loss of about 15% of the science window at the beginning of November, rising to about 30% at the end of the month. On December 1, an amended version of the mission control system became operational which restored two-antenna operations and the full science window: each revolution reserves a 30-minute slot for antenna-switching during which no TC is allowed but TM continues to be received normally. This slot is “hidden” during an exposure such that no observing time is lost. A “manual” by-pass of the automatic schedule by the spacecraft controller is no longer allowed however, which prevents ultra-fast reaction to a Target-of-Opportunity. This restriction may be lifted in a few months time if experience proves it to be safe. The October 18 anomaly did not have a measurable impact on the instrument performances or calibration.

The time allocation process of the eighth Announcement of Opportunity (AO8) was completed on the 28th of November. Principal Investigators will be informed of the results before Christmas. Out of ten very large (> 1 Ms) programs submitted, only one was accepted with 1.5 Ms observing time (~10% of the total observing time available). It is the second and final part of the ultra-deep XMM-Newton exposure providing the most sensitive view of the hard X-ray sky ever.

A Scientific Workshop entitled "Super-soft X-ray Sources - New Developments" will take place at ESAC from 18 to 20 May 2009. The scientific organising committee is co-chaired by Dr. F. Haberl. As of December 2, 2008, 1943 articles based on XMM-Newton observations have been published in the refereed literature, of which 267 are from 2008.

3.3 Integral: Christoph Winkler

INTEGRAL operations continue smoothly with the spacecraft, instruments and ground segment all performing nominally. Routine AO-6 observations included, among others, Key Programmes on the Galactic Centre and Cygnus regions, interrupted by ToO observations of the black-hole binary H1743-322 and the anomalous X-ray pulsar 1E1547.0-5408. Data from H1743-322 are publicly available.

Although the XMM and INTEGRAL service modules are very similar in design, engineering modifications had been implemented in the INTEGRAL RF system which should prevent a failure similar to the one observed on XMM on 18 October 2008 (unless the antenna switch mechanism gets physically broken, which is unlikely).

The duration of AO-6 has been extended by 2 months, now ending mid October 2009. The next AO-7 (release 12 Jan 2009) will be extended by 2.5 months, ending end of December 2010. This change will allow to (i) fully absorb approximately 2 Ms of carry-over AO-5 observations, (ii) synchronize the AO-cycle with the mission extension intervals, and (iii) relax the working schedule of the Time Allocation Committee (TAC) and Integral Science Operations Centre (ISOC) who will have to handle two Calls in 2009, one for observing proposals and a second one for data right proposals (see previous AWG report).

The global properties of all INTEGRAL detected GRBs have been determined (S. Foley et al., A&A 484, 143, 2008). The rate over the whole sky is about 1400 per year above the trigger threshold of IBIS. Many GRBs exhibit a "spectral lag", i.e. a time delay between the arrival of the high energy (50-300 keV) and low energy (25-50 keV) photons. The spectral lag could be measured for 28 INTEGRAL GRBs and two groups could be identified in their distribution, one with short lags (< 0.75 s) and the other with longer lags. The long lag GRBs all have faint peak fluxes - close to the IBIS sensitivity limit – as well as faint optical and X-ray afterglows. They are observed preferentially along the direction of the "super-galactic" plane (Fig. 1) which traces nearby clusters of galaxies and the large scale structure of the local Universe. The rate of these long-lag low-luminosity GRBs is about 25% of all events related to core collapse supernovae of Type Ibc. If they are indeed intrinsically under-luminous local events, they could vastly outnumber classical GRBs..

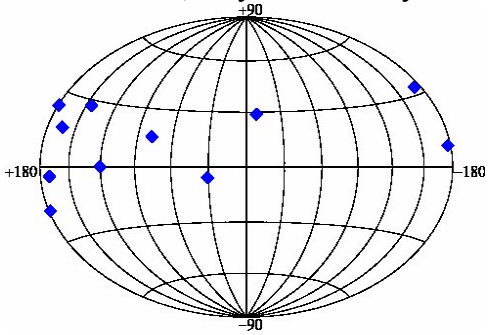


Figure 1: The 11 long lag GRBs detected by INTEGRAL in supergalactic coordinates (from Foley et al., 2008).

The total number of refereed publications using INTEGRAL scientific data since launch is 391, with 57 papers published in 2008.

3.4 Suzaku (ASTRO-E2): Arvind Parmar

Scientists from institutes located in the ESA Member States appear as authors of 38-refereed papers that make use of data from the Japanese-US X-ray astronomy mission Suzaku. ESA does not provide the only way for Europeans to access Suzaku data and the above number presumably includes papers resulting from archival studies and

involvements as co-investigators on Japanese or US proposals or though membership of the Science Working Group.

The ESA AO-4 for observing time on Suzaku closed on December 5. The AO covers one year of observations starting in April 2009 and JAXA have kindly offered to allocate 8% of the observing time to successful proposals from scientists in ESA Member States. A total of 31 proposals were received corresponding to an over-subscription in time of 3.6. For comparison, in AO-3 a total of 30 proposals were received with an oversubscription in time of 3.3. The new proposals are being reviewed by the ESA appointed TAC who will meet at the end of January. Their ranked list of top proposals will then be forwarded to JAXA for merging with those from Japan and the US in March 2009. The final allocation will be announced shortly afterwards.

3.5 Akari (ASTRO-F): Alberto Salama

AKARI continues routine operations in its Post-Helium phase. Open Time observations have started on 15 October and 117 European observations have been executed so far. The first All-Sky Survey catalogue has been released internally to the project teams. It contains 64,000 bright sources detected in the far infrared bands (65, 90, 140, 160 micron) with good quality in the 90 micron band. The public release is planned for October 2009. AKARI has so far produced 38 refereed papers. The first article presenting European Open Time results has been accepted for publication in the April 2009 PASJ issue. Many European observers plan to attend the first international AKARI conference to be held in Tokyo in February 2009.

3.6 CoRoT: Malcolm Fridlund

The CoRoT spacecraft continues to operate nominally. Repeated interruptions at the Alcantara ground-station in Brazil have led to the irretrievable loss of data over the last few weeks. These mostly impact astroseismology science which requires a higher duty cycle than the exoplanets programme. The problem is under investigation by CNES. Hopefully, the Kiruna ground station could partially substitute for Alcantara.

It is expected that CNES will approve a 2-3 years extension of the mission in early 2009. Consumables onboard are enough for at least 5 more years. The ultimate limit is set by the gradual degradation of the CCD resulting from their irradiation at each passage of the spacecraft through the South Atlantic Anomaly. The degradation takes the form of a complete loss of an increasing number of individual pixels, rather than a general decline in sensitivity across the focal plane. At the current loss rate, the detectors are expected to provide scientifically useful data for at least 3 more years.

The rate at which planetary candidates are confirmed by follow-up observations has increased to about 1 planet every 4 weeks. The number of candidates is however increasing faster and now reaches several hundreds. Lack of telescope time and shortage of manpower are the bottleneck, a lesson to be remembered for future exoplanets projects. The confirmation process takes anything from several months to over one year, depending on a combination of factors, ranging from celestial mechanics to the access to and schedule of ground based telescopes. The situation should improve somewhat thanks to the recent allocation of up to 60 nights on the Keck telescopes through collaboration with the University of Texas. The first Keck observation is scheduled on the 7th of January 2009.

Up to now, 4 CoRoT exoplanets have been published in the referred literature. Articles are in preparation for two additional planets. A further six are in the final stages of

confirmation and analysis. The most interesting object followed-up at the moment shows an eclipse depth of 0.0003. The star is classified as K0V. Pending final confirmation, this is probably a multi-planet system involving a low-mass (terrestrial) planet.

The first set of CoRoT data, obtained during the first 60 days of the science mission, became public on December 10. By the deadline of 24 November, 183 papers had been submitted for presentation at a CoRoT symposium to be held in Paris next February 2-5, 2009 The bulk of these articles will be refereed and published in a special issue of A&A. A total of 79 articles have been published to date, including the first detection of p-modes in Solar type stars, which made the front page of the 24 October 2008 issue of Science.