

Project and Study Scientist Reports for AWG # 141

10-12-2010

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

1 Status Report on assessment study activities

1.1 IXO: David Lumb

The internal Technical Review has been conducted through October and November, with several working meetings and site visits and participation of SPC members. The review team has been very constructive in challenging some requirements, and identifying potential simplifications and improvements in margins. The draft review report is in preparation.

Compilation of the Assessment Study Report (Yellow Book) has essentially finished, following a final review by the Science Definition Team. Preparations are being made to compile documentation. A second IXO science workshop is planned for March 2011 at CNR headquarters in Rome.

1.2 LISA: Oliver Jennrich

The LISA scientific community is preparing for the public presentation on 3 February in Paris. A science team meeting takes place on 10/11 December in Heidelberg to discuss the content of the presentation and nominate a speaker.

Preparation of the Assessment Study report (Yellow Book) is on schedule. A final draft has been circulated in the community and the last comments are being received; completion is foreseen in mid-January 2011. The internal Technical Review ended in November, with the final report issued in December 2010.

The Mock LISA Data Challenge (MLDC) is in the fourth round. The original deadline for submissions was in late fall and has been moved back to June 2011 upon consensus of the participating groups, as further work has to be conducted to prepare meaningful entries. Many groups waited for the outcome of the Decadal Survey before committing more resources. This round focuses on the global-fit problem of detecting and analyzing sources of different types superposed in the LISA data.

The technology programme for LISA is picking up again, with the development of the optical bench and of the telescope structure now in full swing. Unfortunately, the contractor selected for the development of high power lasers retracted its bid. The laser activity is currently re-scoped and alternative suppliers are being approached.

1.3 SPICA: Kate Isaak

The first meeting of the ESA SPICA Study Science Advisory Team (christened E3SAT) was held at the beginning of December. Team members include Prof. Bruce Swinyard (UK), Marc Ferlet (UK), Eckhard Sturm (DE) and Ewine van Dishoeck (NL), with the appointment of a 5th member - an expert in MIR coronagraphy/high contrast imaging - anticipated in the very near future.

Updated proposals describing the revised instrument concepts for the hybrid MIR instrument (JPN), the SPICA Coronagraphic Instrument (JPN) and the Korean Focal Plane Guidance camera/science channel have been submitted to ISAS-JAXA. Proposals will be presented to the Japanese community for scrutiny and comments at a Japanese SPICA science workshop in mid-December. Final iterations are being made with ISAS-JAXA on the ISAS-JAXA-led International Focal Plane Instrument review procedure, with the second stage of the review scheduled to start in January. Scientific review will be undertaken by members of E3SAT, with technical assessment to be made by ESA experts and Marc Ferlet, an optics expert on E3SAT.

Preliminary discussions on the scope of the European contributions to the SPICA Science Ground Segment and Operations started in early November. The guiding philosophy is to maximise benefits to the European Scientific community and to raise the visibility of Europe in the SPICA project.

A successful, three-way (ESA, JAXA and SAFARI consortium) interface meeting was held in Japan in early November. The definition of interfaces pertaining to the telescope and to SAFARI is progressing.

The SAFARI Science Verification Review Board released its draft report to the consortium, with a list of items for concern and risks. The final report with recommendations will be issued before the end of 2010. A delta-review is being proposed for the summer of 2011 to verify that all actions and recommendations have been properly implemented.

The 6-month duration industrial studies of the SPICA telescope assembly will be kicked-off in early January 2011. A subset of the E3SAT will participate in progress meetings with Industry as well as in the mid-term and end-of-study reviews.

Discussion between ISAS-JAXA and NASA on a possible US participation in SPICA is ongoing.

2 Status report of missions in definition phase

2.1 Euclid: René Laureijs

The first part (Phase-A1) of the Phase-A study for Euclid was formally completed with the Mission Definition Reviews (MDR) on 16-19 November. The MDR objectives were to verify that the Euclid concepts proposed by the 2 industrial contractors are in line with ESA requirements, feasible and compatible with the second part of the Phase A study. The system requirements, together with the sky survey scenario, the payload and service module design concepts and the mission profile were critically examined. It was verified that the preliminary system budgets are compatible with available resources with adequate margins and that the mission performances are consistent with ESA requirements. The mission designs proposed by the two contractors are sufficiently different as to be incompatible with each other. For instance, the telescope is made of zerodur in one case and in silicon carbide in the other; one contractor uses cold gas technology for the actuators whereas the other uses reaction wheels. The thermal designs are also quite different. In both cases, the review board noted that more work is required to confirm that the stringent requirements on the stability of the point spread function - in particular its ellipticity – can be met by the proposed designs.

It was also confirmed that the required 20,000 square-degree sky coverage can be achieved with the required image quality but not in 5 years. The board recommended sizing the mission consumables for 7 years such that the whole 20,000 square-degrees can be mapped at a constant Solar Aspect Angle (SAA). It also recommended investigating alternative thermal designs that would permit small SAA variations without triggering thermoelastic distortions and variations of the PSF. If feasible, such a design would reduce the mission duration.

By the deadline of October 29, a single proposal had been received in response to the AO for components of the payload and Science Ground Segment (SGS). The proposal emanated from the Euclid Mission Consortium (EMC) led by Alexandre Réfrégier (F). It was reviewed by 3 panels, concentrating on the payload, the SGS and the scientific aspects, respectively. The science panel included members from the AWG. The review report and recommendations are not available at the time of writing but will be presented to the advisory structure in January 2011.

The 20% US participation to Euclid is contingent upon a positive recommendation to NASA by an ad-hoc committee formed by a subset of the National Research Council Board that oversaw the Astro2010 Decadal Survey. The final confirmation is not expected before early 2011 at best. In anticipation of a positive recommendation, NASA has already appointed a Euclid project office and designated IPAC as the Euclid Science Centre.

A Phase-A study report (the “Red Book”) will be prepared to summarise the scientific case, the design and the performances of the mission concept emerging from the definition studies. This report will be provided to the Advisory Structure in June 2011 to support their selection of the M1 and M2 missions.

2.2 PLATO: Malcolm Fridlund

The two industrial development studies by Thales (I) and Astrium (F) are progressing well. The two designs successfully passed the Preliminary Critical Design Reviews (PCDR) during the week of 18-22 October.

By the deadline of October 29, a single proposal had been received in response to the AO for components of the payload and Science Ground Segment (SGS). The proposal emanated from a consortium led by Claude Catala (F). It was reviewed by 3 panels, concentrating on the payload, the SGS and the scientific aspects, respectively. The science panel included members from the AWG. The review report and recommendations are not available at the time of writing but will be presented to the advisory structure in January 2011.

Manufacturing of the 136 CCD (and spares) which will equip the PLATO focal plane will take several years and is on the critical path of the mission schedule. In order to meet a 2018 launch date, a program has therefore been initiated to design, assemble and qualify prototype units in advance of the mission selection. The CCD design proposed by e2v (UK) successfully passed its Baseline Design Review (BDR) on December 1 and the company has been authorised to manufacture 9 test units. Four of these units will be used by e2v for their own (destructive) testing, while the remaining 5 will be delivered to ESA in January 2012 for independent verification.

3 Projects under development

3.1 JWST: Peter Jakobsen

The so-called Independent Comprehensive Review Panel (ICRP) convened by US Senator Barbara Mikulski to identify the root causes of JWST's cost and schedule overruns and recommend possible paths forward issued its report on 10 November. In its findings, the panel shared blame between NASA Headquarters for consistently assigning unrealistically low budgets to JWST with little or no contingency, and the NASA JWST Project at GSFC for playing along with this by systematically underestimating costs and pushing needed work into future years. In response to the ICRP report, NASA GSFC replaced the JWST Project Manager, and now has the project reporting directly to the GSFC Centre Director. At NASA HQ, JWST was taken out of the Astrophysics Division and is now a division in its own right, with a new JWST Program Manager reporting directly to the NASA Assistant Administrator.

The ICRP found that the earliest conceivable launch date is September 2015 – a delay of more than a year compared to the previous official launch date of June 2014. However, meeting this date would require the project receiving an additional 200-250 M\$ in funding already in fiscal years 2011 and 2012. Since JWST already consumes ~40% of the annual NASA Astrophysics budget it is not clear where the additional money would come from. Whether JWST receives extra funding will most likely not be known before February when the 2011 US budget is made public.

Despite the above US fiscal problems, excellent technical progress continues to be made with the mission, and especially with the assembly and testing of the flight Instruments.

Post-vibration inspection of the assembled MIRI flight model is proceeding nominally. The JPL-supplied flight Focal Plane Array has now been delivered. It has been decided to carry-out the MIRI cryo-testing and calibration campaign with the repaired flight Focal Plane Electronics, after it is delivered by JPL in January. Start of cool-down is scheduled for mid-February.

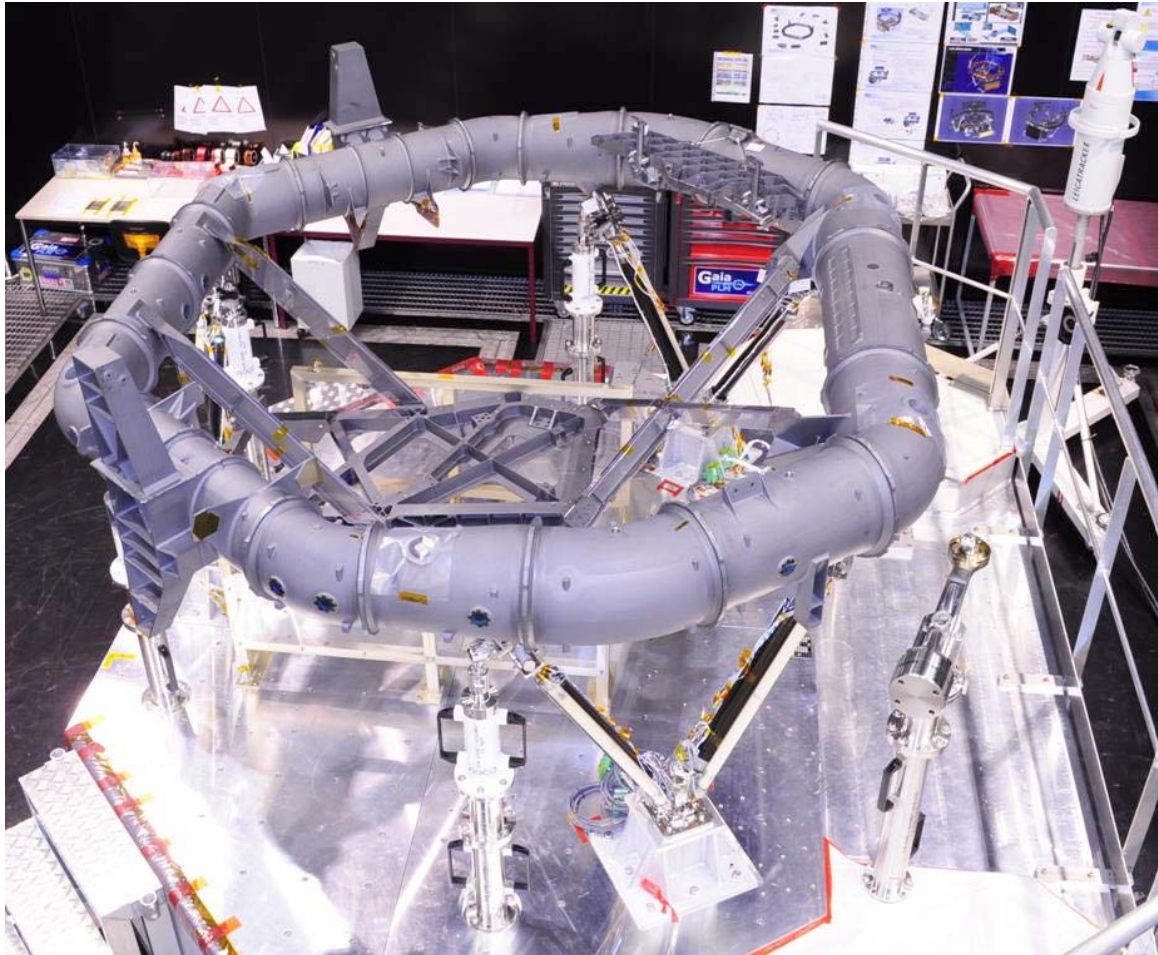
Post vibration inspection of the assembled NIRSpec flight instrument did not reveal any anomaly. Testing of the NIRSpec flight model will continue with the non compliant Focal Plane Assembly currently in place. The two selected replacement Sensor Chip Arrays that will make up the new flight detector are in the process of being integrated together. The two matching replacement Application Specific Integrated Circuits (ASIC) have also been selected. NASA plans to deliver the integrated and characterized replacement Focal Plane Assembly in the period late-February to mid-March. The NIRSpec cryogenic calibration campaign has accordingly been split into two segments to enable the detector change-out between the two planned cryogenic cycles.

Development of NIRSpec and MIRI operations is progressing nominally at STScI, with routine support being given by the ESTEC team to all standing working groups.

3.2 GAIA: Timo Prusti

With the successful completion of the spacecraft Critical Design Review (CDR), all attention has now turned toward the assembly, integration and testing activities. The “heart” of Gaia, the SiC Torus, is currently in a clean room at the premises of the prime industrial contractor, Astrium Toulouse. Delicate integration of payload elements onto the

torus is in progress. The bipods connecting the payload module with the service module have been attached to the torus as well as the folding optics structure that will carry the folding mirrors and the Radial Velocity Spectrometer (RVS). The bars that will support the Basic Angle Monitor (BAM) have recently been fixed onto the torus as well. The BAM is a critical device that will measure with sub-microarcsec precision the fundamental angle between the two lines of sight of Gaia.



The Gaia torus current status as the Payload Module Structural Model

Although there are no unresolved technological obstacles, integration is proceeding at a slower pace than anticipated. The Payload Module is on the critical path of the project schedule, with no margin for contingency. The technical problems recently encountered with the Service Module - the transponder and the phased array antenna - have been resolved and integration now proceeds at full speed.

The scientific performance estimates presented to the AWG at its last meeting have now been communicated to the Gaia scientific community in various meetings and workshops of the Data Processing and Analysis Consortium (DPAC). Despite the small loss of astrometric accuracy for bright ($V < 12$) stars and the impact this will have on the number of exoplanets that Gaia will discover, the overall performance estimates have been received favourably by the community.

3.3 Lisa Pathfinder: McNamara

The first System Performance Tests (SPT) have taken place at LPF prime contractor facilities (Astrium UK). The aim of the SPTs is to verify correct communication between

the various spacecraft subsystems in the different operating modes of the mission. So far the attitude and orbit control (AOCS) and telemetry and telecommand (TTC) tests have been successfully concluded.

The spacecraft is currently being prepared for the first Integrated System Test (sine test) scheduled to take place on the 4th January 2011. Following the sine test, the Thermal and Optical Qualification Model (TOQM) of the payload will be integrated to the flight spacecraft in preparation for the Electro-Magnetic Compatibility (EMC) and thermal-vacuum test campaigns that will take place shortly thereafter.

Significant changes have been made to the caging mechanism launch lock. Due to the numerous non-conformances encountered during tests, the decision was taken to stop manufacturing the hydraulic launch-lock mechanism, and to pursue an alternative design proposed by Astrium (D). ESA has now authorised Astrium to manufacture and test an elegant breadboard of their proposed launch lock assembly. Test results will be available in April 2011. In parallel, ESA appointed a Task Force to investigate means of optimising the sequence of payload integration and test activities in order to reduce the schedule impact caused by such a late design change. The Task Force have proposed two ways forward, both of which involve breaking the serial integration of the payload by splitting the caging mechanism launch lock into two units: the blocking fingers, and the actuator. In both cases, the fingers are used to hold the test mass during the integration of the inertial sensor and during the integration of the inertial sensor onto the optical bench. Compared to the current serial sequence where the fully integrated caging mechanism is one of the first subsystems to be integrated to the payload, this would allow delaying the integration of the launch lock actuator to a much later stage thereby reducing the schedule impact. The two solutions differ in the design of the actuator and of the vacuum enclosure; one design in particular gets rid of the vacuum enclosure altogether. Detailed assessment of the Task Force recommendations is in progress.

The Field Emission Electric Propulsion (FEPP) thrusters suffered another setback during the most recent endurance test. The test started well with the caesium (Cs) reservoir tank rupturing as prescribed, the Cs flowing to, and filling, the slit, and finally the thruster firing in a textbook fashion. However, after several days of successful operation, a series of electrical discharges occurred between the slit emitter and the accelerator plate. Several days after the discharge bursts had subdued the current between the emitter and accelerator increased dramatically. This is not unusual at the beginning of such a test, and normally only lasts a few hours to a few days. In this case however, the current did not drop and the test had to be stopped. Investigation into the anomaly is ongoing. The likely explanation is a spillage of Cs out of the end of the slit. The CS overflow then becomes a source of secondary emission, leading to the high impedance short circuit causing the increased current. ESA, Astrium and Alta are jointly investigating processes to control the flow of Cs inside the thruster and to prevent such a spillage from occurring in future tests.

4 Satellites in orbit

4.1 Herschel: Göran Pilbratt

As of early December, Herschel has executed ~60% of the Guaranteed Time (GT) and ~50% of the Open Time (OT) Key Programmes (KP), as well as ~25% of the GT-1 programmes selected in the spring of 2010 as part of the first in-flight Announcement of

Opportunity. The size of GT-1 is ~10% of that of KP-GT and KP-OT, each of which represents ~5500 hours of observing time.

At its meeting of 11-14 October, the Herschel Observing Time Allocation Committee (HOTAC) recommended the allocation of observing time to 241 of the 576 proposals received in response to the first in-flight announcement of opportunity for open time proposals (OT-1). Observers have been notified and confirmation and/or updating of the observation requests is in progress.

The OT-1 programme represents almost 6600 hours of observing time. It is divided into two categories: priority 1 observations the execution of which is guaranteed and priority 2 observations or “gap fillers” which maximise the overall observing efficiency. Priority 1 observations account for nearly 5,000 hours of the OT-1 observing time. Exact statistics will only be known when “phase 2” is concluded. Interstellar medium proposals - including star formation and solar system – received 42% of the OT-1 time; stars and stellar evolution got 11%, while galaxies and AGNs received 35% and cosmology was allocated 12%. Almost 2/3rd of the allocated time is for spectroscopy. The very first OT-1 observations have already been scheduled, but in the coming months the emphasis will still remain on the Key Programmes.

Two Targets of Opportunity were recently observed, the blazar 3C454.3 during a particularly large flare and the FU Ori object HBC 722. During a four-week period in October-November, all three instruments were affected in different ways by particle radiations. Thanks to the effort of operational teams at ESAC, ESOC and in the Instrument Control Centres, the total loss of observing time could be limited to less than 5 days.

The second measurement of the remaining quantity of superfluid helium was successfully executed on November 2. The results agree within $\pm 2\%$ with the predictions from the thermal modelling presented at the in-orbit commissioning review in July 2009. The error on each measurement is estimated to be $\pm 5\%$. The thermal model predicts an End-of-Life (EoL) in March 2013 with a ± 3 months uncertainty, while a straight linear extrapolation of the two measurements yield an EoL in November 2012 ± 6 months.

4.2 Planck: Jan Tauber

Planck continues to operate very smoothly and is now well into its third all-sky survey. The nominal mission ended on 27 November 2010, and Planck is now in its first extension period.

Sorption cooler #1 continues to work very well and should be able to support Planck operations until HFI runs out of Helium supply, in early 2012. Studies are in progress to optimise the sorption cooler regeneration process and extend its life as much as possible beyond that point so as to support Planck operations during the 1-year LFI-only extension phase recently approved by the SPC.

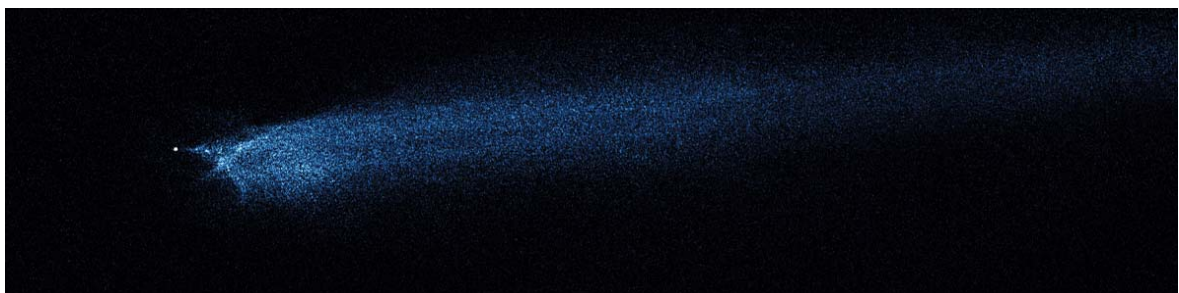
The two Planck Data Processing Centres recently delivered the Early Release Compact Source Catalogue (ERCSC) to ESA by. The catalogue contains over 9,000 sources detected in one or more of the nine Planck Frequency channels. Among these, 769 have been reliably identified as cold cores of molecular clouds and 189 as Cluster of galaxies. A formal review held on November 4 concluded that the ERCSC is a valuable scientific product that will be quite useful to the astronomical community. The catalogue is currently being ingested into ESA archives and will be released to the public on 11 January 2011.

The first Planck public conference (“The millimetre and sub-millimetre sky in the Planck mission era”) will be held in Paris, Cité des Sciences between 10 and 14 January 2011 (web site <http://www.planck2011.fr>). The ERCSC will be released during the conference and 25 (TBC) scientific articles will be posted simultaneously on the astro-ph web site. These articles are all related to non-cosmological issues and showcase the type of investigations that can be carried-out on Planck foreground sources. Communication activities are being prepared to highlight the release of the ERCSC.

4.3 HST: Antonella Nota

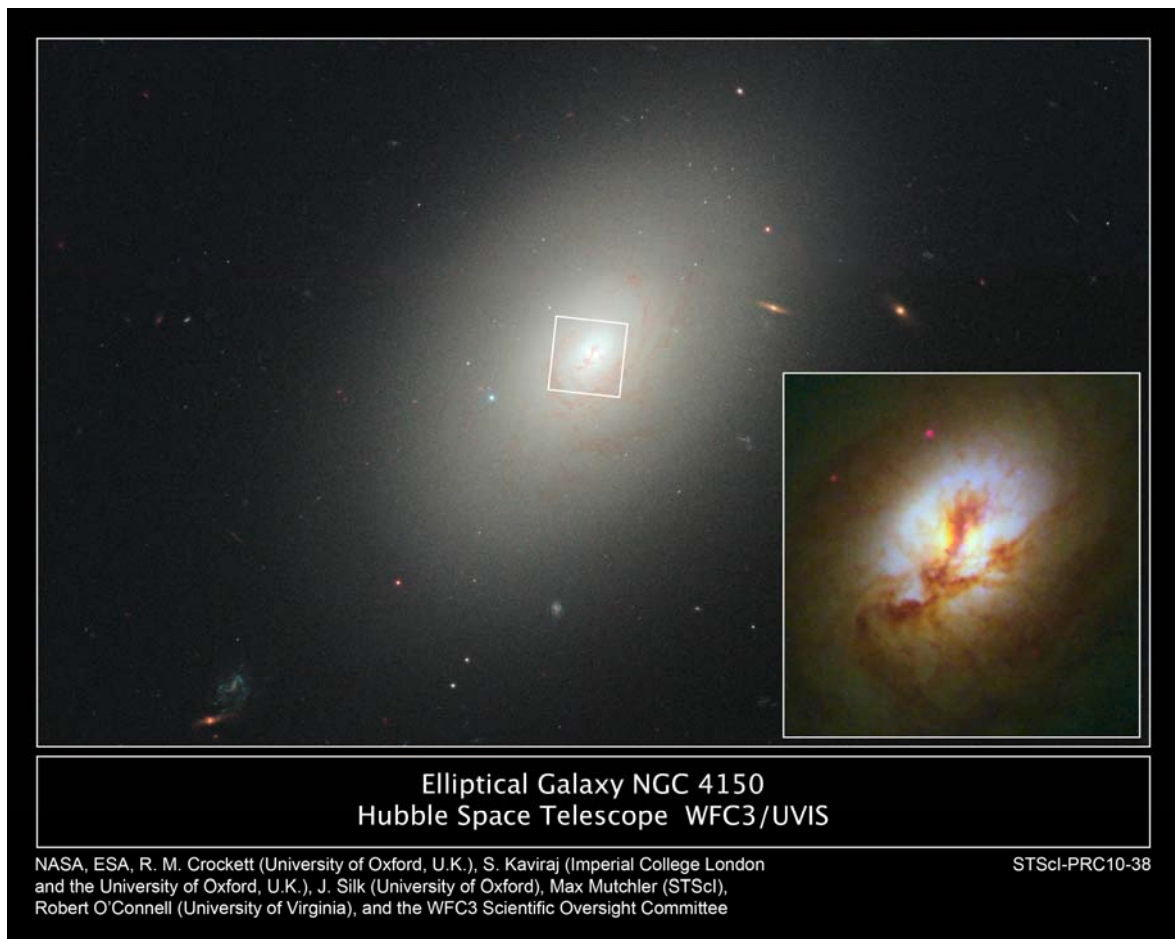
Hubble observations continue to proceed smoothly. All instruments are performing nominally, although NICMOS is still currently offline. The observatory efficiency remains high (~50%) with 84 orbits of scientific observations scheduled per week on the average. An effort has been made to minimize the observation time required for calibration in order to maximize the time available for scientific observations. In Cycle 18, only 284 external orbits were allocated to calibration programs. A practical decision has been taken to extend Cycle 18 by one month, to 30 September 2011. Members of the Cycle 19 Time Allocation Committee have been appointed, including 25 scientists from ESA member states. The TAC will meet at STScI in May 2011.

Hubble results continue appearing in scientific journals at a rate of almost two per day. Among those worth highlighting is the finding that a bizarre X-shaped object at the edge of a comet-like tail is actually the remnant of an asteroid collision which happened a year before. The Hubble images (see picture below), taken from January to May 2010 with Wide Field Camera 3, reveal an object about 120 meters wide, with a long, flowing dust tail behind an X-pattern feature. The observations also show that the object – christened P/2010 A2 - retained its X shape even as the debris cloud expanded. Particle sizes in the tail are estimated to vary from about a millimetre to 2.5 centimetres. The object in the Hubble image appears to be the remnant of a slightly larger precursor body. Astronomers think a smaller rock, perhaps 3 to 5 meters wide, slammed into the larger one. The pair



collided at a speed of about 18,000 km/h, which vaporized the small asteroid and stripped material from the larger one. Catching colliding asteroids is difficult, because large impacts are rare while small ones are exceedingly faint. The two asteroids whose remains make up P/2010 A2 were unknown before the collision because they were too faint to be detected. The collision itself was unobservable because it happened when the asteroids were in the same direction as the Sun. About 10 or 11 months later, in January 2010, the Lincoln Near-Earth Research (LINEAR) Program Sky Survey spotted the comet-like tail produced by the collision. But only Hubble was able to resolve the X pattern, offering unequivocal evidence that something stranger than a comet outgassing had occurred. Observations such as this one are crucial to estimate the frequency of asteroid collisions.

Another interesting result is direct observational evidence for a starburst episode in the



elliptical galaxy NGC 4150. Elliptical galaxies were once thought to have ceased forming stars billions of years ago. But new Hubble observations are helping to show that galaxy mergers might have a role in continuing star formation in elliptical galaxies. Ultraviolet images of the NGC 4150 core obtained with WFC3 reveal streamers of dust and gas and clusters of young, blue stars. Photometric data confirmed that the star-formation episode occurred about a billion years ago and that the star formation rate declined afterward. There is strong evidence that the starburst was triggered by a merger with a dwarf, metal rich galaxy, who supplied NGC4150 with the fuel necessary to make new stars. These observations support the theory that galaxies were gradually assembled over billions of years by collisions with smaller galaxies.

4.4 **XMM-Newton: Norbert Schartel**

The XMM-Newton observatory continues to operate nominally. As of December 1, the overall completion status of the observing programme is as follows:

- AO-9 programme: 71.1 % (A and B priority)
- AO-9 programme: 6.3 % (C priority)

Completion of the AO-9 programme is expected by end of April 2011, in line with the start of AO-10 observations.

The observing time allocation committees (OTAC) panel chairs met on the 17th and 18th of November 2010 at ESAC and recommended the observing programme for AO-10. The proposals Principal Investigators (PI) were informed on the 1st of December. Successful PIs have been asked to specify the observing details of their programme. This second phase of the proposal submission will open on January 10 and will close on February 4. From the 6 Very Large Programmes (> 1 Ms) which had been submitted, the OTAC selected only one with a total duration of 3 Ms. By padding existing archival data, the program aims at creating two areas of 25 square degrees each, which are homogeneously

observed to the same limiting flux for cosmological studies. The program will be carried-out over AO-10 and AO-11. In priority “C”, a further 1 Ms was granted to a second programme to survey the Large Magellanic Cloud (LMC). Since the LMC is always visible by XMM-Newton, the OTAC expects that a significant fraction of the programme will eventually be carried-out in the course of time. Both very large programs were submitted by PIs from a European institute.

The AO-11 schedule was established with the OTAC chair, Prof. C. Cesarsky. The Announcement of Opportunity will be released on the 23rd of August 2011, with a due date for proposals on October 7; the OTAC chairpersons will meet on 16 & 17 November and the approved programme will be announced in mid-December 2011. The schedule will be published in the next issue of the XMM-Newton Newsletter in early 2011 and simultaneously posted on the SOC web site.

In a letter to Science (2010, Science 330, 944), Rea and collaborators report the discovery of a soft gamma repeater (SGR) with an unusually low magnetic field. SGRs and anomalous X-ray pulsars form a group of X-ray sources that exhibit sporadic short bursts of intense emission. Collectively labelled magnetars, they are believed to be neutron stars powered by extreme magnetic fields, $B \sim 10^{14}$ to 10^{15} gauss. SGR 0418+5729 was recently detected after it emitted bursts similar to those of magnetars. X-ray observations with XMM-Newton and other satellites set an upper limit of 7.5×10^{12} gauss to the dipolar surface magnetic field of SGR 0418+5729, well in the range of ordinary radio pulsars. The implication is that a strong surface dipolar magnetic field is not a necessary pre-condition for magnetar-like activity. The magnetar population may thus include objects with a wider range of B-field strengths, ages, and evolutionary stages than previously thought.

As of December 1, 2584 papers based on XMM-Newton observations have appeared in the refereed literature, of which 297 are from 2010.

4.5 Integral: Christoph Winkler

The spacecraft, payload and ground segment are performing nominally. Following the last SPI annealing, which ended on 28 October, the Germanium detectors are now being operated with their high voltages (HV) lowered from 4 kV to 3 kV. This reduces the risk of high voltage flashes, believed to have caused the 27 May 2010 failure of Ge detector #1. Recent tests have shown that HV reduction has a negligible effect on the energy resolution.

Routine AO-7 scientific observations were executed as per the Long-Term Plan. Target of Opportunity observations were performed on the flat spectrum radio quasar PKS 1830-211 (26 – 28 October), and on the Blazar 3C 454.3 (21-27 November) at a time of a major outbursts first observed by Fermi/LAT and AGILE. The gamma-ray burst GRB 101112A was detected in the IBIS field-of-view. Almost instantaneously, afterglow detections were reported in the optical (BOOTES-2/TELMA, Liverpool), X-ray (Swift/XRT) and radio (EVLA) energy bands.

The Time Allocation Committee (TAC) recommended 57 out of 60 data-rights proposals submitted in response to the 2nd call of AO-8. The AO-8 cycle of observations begins on 01 January 2011.

Toward the end of their short life, massive stars release the products of nuclear-fusion into the interstellar medium either as winds or supernovae ejecta. One of these products is the radioactive isotope ^{26}Al which decays with a lifetime of ~ 1 My and emits a characteristic

line at 1,809 keV. The Scorpius-Centaurus association is the nearest group of young massive stars. Using data from the SPI spectrometer on board INTEGRAL, R. Diehl and collaborators (A&A 522, A51, 2010) report the detection of strong 1,809 keV emission originating from the Scorpius-Centaurus association. From the observed line flux of $6 \times 10^{-5} \text{ ph cm}^{-2} \text{ s}^{-1}$, they infer a mass of $\sim 1.1 \times 10^{-4} M_{\odot}$ of ^{26}Al roughly the amount expected from one supernova event provided the progenitor had a mass in the range 8 to 40 solar masses. However, since there are no signs of a recent ($< 5 \text{ M-yr}$) SN explosion in Scorpius-Centaurus, the author conclude that the ^{26}Al is more likely to be the result of cumulative mass loss by several O stars in their WR phases. The 1,809 keV line appears to be blue-shifted which suggests bulk streaming of the ejecta toward the Sun.

The total number of INTEGRAL refereed scientific publications until the end of October is 569 out of which 65 are from 2010.

4.6 Suzaku (ASTRO-E2): Arvind Parmar

Suzaku, the Japanese-US X-ray astronomy mission was launched in July 2005 and following the early failure of its prime spectroscopic instrument, is performing astronomical observations with the remaining X-ray CCD cameras and hard X-ray detector. Scientists from institutes located in the ESA Member States appear as authors of 104 refereed papers based on Suzaku observations. The data for many of these papers have been obtained through the annual European Suzaku Announcements of Opportunity.

The sixth Suzaku European Announcement (EAO-6) closed on 19 November 2010 and covers observations to be performed between April 2011 and March 2012. A total of 28 valid proposals were received for the 8% of observing time reserved for European scientists. The oversubscription in requested time is 3.2. The figures for the last AO were broadly similar – 30 proposals and a time oversubscription of 3.9. The European proposals will be ranked by an ESA appointed TAC and the results forwarded to JAXA for merging with the Japanese and US selected targets. The final results should be announced in late February or early March 2011.

4.7 Akari (ASTRO-F): Alberto Salama

The AKARI cryo-cooler curing operations have been operationally successful. From 22 to 24 November, a special attitude allowed AKARI to point toward the Earth once per revolution. The cryo-cooler cold head temperature increased to the expected values and the suspected water-ice contamination evaporated, thereby restoring nominal operating conditions. The nominal attitude pattern was subsequently re-established and the cold head temperature started to decrease as expected. About three months will be needed before the detectors cool back to their operational temperature and warm-phase observations can resume.

The AKARI All-sky survey imaging processing pipeline has reached a satisfactory status and images have been released internally for scientific validation. The AKARI LMC Large Area Survey point source catalogue has also been released internally to the AKARI team. The photometric catalogue, containing a million sources, covers about 10 square degrees of the LMC in 6 wavelengths bands, centred at 3, 7, 11, 15 and 24 microns. To date, 108 articles based on AKARI data have been published in the refereed literature, of which 42 are from 2010. In total, 14 articles have a European first author while about 30% of AKARI papers have European co-authors.

4.8 CoRoT: Malcolm Fridlund

On December 27, CoRoT will celebrate its 4th anniversary in orbit. The spacecraft is operating nominally, with the exception of the Data Processing Unit #1 which failed in April 2009.

There are now 25 internally confirmed exoplanets and brown dwarfs, although only 17 have been published so far. The ground based campaign to confirm and characterise planetary candidates with radial velocity, photometry and imaging observations continues. As an example, a dozen candidates will be observed with the VLT on the 25th and 26th of December. On the first night, images will be taken with the adaptive optics and the NIR Camera NACO in order to exclude variable background objects that could mimic planetary transits in the CoRoT data. On the second night, the surviving candidates will be observed with the IR Echelle spectrograph CRILES in order to exclude scenarios where a close late M-type binary system is the origin of the transit signature.

CoRoT is receiving continued support from NASA through the allocation of observing time on the Keck telescope. In the next two semesters, 4 nights have been reserved for radial velocity measurements of planetary candidates. The ESA Optical Ground Station in Tenerife (1m telescope) also supports CoRoT with photometric observations carried out at a rate of 1 hour per night for 10 nights per month.

Since entries enter and leave the list of exo-planet candidates at about the same rate, the number of planetary candidates remains roughly stable at ~200.