AMERICAN ASTRONOMICAL SOCIETY
HIGH ENERGY ASTROPHYSICS DIVISION

NEWSLETTER

May 2015

HEAD Division & Meeting News

Nick White (HEAD Chair)

The 225th AAS meeting in Seattle was productive for all, with strong attendance at the two HEAD special sessions celebrating the 100th year of General Relativity. Another highlight of the meeting was NASA Astrophysics Director Paul Hertz calling for input from various analysis groups regarding recommendations about potential large mission concepts to consider for the 2020 Decadal Review.

To help address this question, HEAD is organizing a special meeting on "High-Energy Space Missions in the 2020s" from June 29-July 1st in Chicago, IL. This meeting will include invited science reviews, talks about NASA, ESA, and JAXA plans, and of course plenty of time set aside for contributed talks about proposed new high-energy missions. All areas of high-energy science are enthusiastically invited to participate, including soft and hard X-rays, gamma-rays, cosmic rays, and gravitational wave detectors. Registration and abstract submission is open at the meeting website, https://aas.org/meetings/high_energy_decadal, which also includes the schedule and invited speaker list.

Beyond the special HEAD meeting, planning for the next winter AAS will begin in just a few months as well. If you have suggestions for special topic sessions for HEAD to sponsor, please send them to me (head.chair@aas.org) or the HEAD secretary (head.secretary@aas.org). Remember as well that nominations for the Rossi prize will be due, as always, on October 15.

High-energy astronomy remains vibrant, as you'll see from this 13 page newsletter, the longest in recent memory. But we must as a community continue to advocate to Congress and in our communities the great science and future potential of high energy missions of all types. Please let me know if you wish to participate in these efforts.

News from the Secretary

Randall Smith (HEAD Secretary)

The job of the HEAD secretary is to communicate, a task whose details have changed many times over the years as technology improves. HEAD now has a Facebook page (maintained by HEAD EC member Daryl Haggard) and a twitter account (@AAS_HEAD). I'm pleased to highlight our latest change, to the HEAD web pages at http://head.aas.org/. We thanked our long-time volunteer webmaster Peg Wargelin at the Chicago HEAD meeting for keeping the old system alive, but thanks to the efforts of the AAS IT team and HEAD Treasurer Keith Arnaud we now have a far simpler and modern system that uses the same back-end as the main AAS site. Please let us know if you find any bad links or mistakes; fortunately they are now much easier to fix.

HEAD membership continues to hover around 900, but I would like to encourage all members to alert their non-AAS member colleagues who have HEAD interests to the new 'affliate' program that allows scientists to join HEAD without being members of the AAS. Membership brings discounts at meetings and the not-to-be-missed HEAD bulletins.

Chandra image of the SNR G299.2-2.9, a Type Ia SNe that nonetheless shows distinct signs of asymmetry, possibly in the explosion itself. See Post et al. (2014, ApJ, 792, 20) for all the details.

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HEAD in the News

Megan Watzke, HEAD Press Officer

From galaxy clusters to neutrinos, from dark matter to black holes, the full suite of high-energy missions continues to produce exciting results for the press and public. Many of the press releases listed below highlight discoveries that were made possible only through the combined efforts of multiple telescopes. By underscoring the complementary nature of astronomical missions, this helps communicate the possibilities that exist when astronomers have different telescopes with different capabilities.

If you think you have a potentially newsworthy result, please contact the press officer for that mission, ideally before the paper is scheduled for publication. For any questions or advice on this topic, please feel free to contact me at mwatzke@cfa.harvard.edu and I will do my best to assist you.

- March 26, 2015, "NASA's Hubble, Chandra Find Clues That May Help Identify Dark Matter" http://www.chandra.si.edu/press/15_releases/press_032615.html
- March 25, 2015, " Suzaku, Herschel Link a Black-hole 'Wind' to a Galactic Gush of Star-forming Gas" http://www.nasa.gov/content/goddard/suzaku-herschel-link-a-black-hole-wind-to-a-galactic-gush-of-star-forming-gas
- March 4, 2015, "NASA's Chandra Observatory Find Cosmic Showers Halt Galactic Growth" http://www.chandra.si.edu/press/15_releases/press_030415.html
- February 19, 2015 (NuSTAR), "NASA, ESA Telescopes Give Shape to Furious Black Hole Winds" http://www.nasa.gov/press/2015/february/nasa-esa-telescopes-give-shape-to-furious-black-hole-winds
- January 8, 2015, "Will the Real Monster Black Hole Please Stand Up?" http://www.nasa.gov/jpl/nustar/will-the-real-monster-black-hole-please-stand-up
- January 5, 2015, "NASA's Chandra Detects Record-Breaking Outburst from Milky Way's Black Hole" http://www.chandra.si.edu/press/15_releases/press_010515.html
- December 19, 2014, "XMM-Newton Spots Monster Black Hole Hidden in Tiny Galaxy" http://sci.esa.int/xmm-newton/55114-xmm-newton-spots-monster-black-hole-hidden-in-tiny-galaxy/
- December 18, 2014, "NASA's Chandra Weighs Most Massive Galaxy Cluster in the Universe" http://www.chandra.si.edu/press/14_releases/press_121814.html
- December 15, 2014, "NASA's Fermi Mission Brings Deeper Focus to Thunderstorm Gamma-rays" http://www.nasa.gov/content/goddard/nasas-fermi-mission-brings-deeper-focus-to-thunderstorm-gamma-rays
- November 13, 2014, "NASA X-ray Telescopes Find Black Hole May Be a Neutrino Factory" http://www.chandra.si.edu/press/14_releases/press_111314.html
- October 21, 2014 "NASA's Fermi Satellite Finds Hints of Starquake in Magnetar 'Storm'" http://www.nasa.gov/content/goddard/nasas-fermi-satellite-finds-hints-of-star-quakes-in-magnetar-storm

XMM-Newton Mission News

Steve Snowden & Lynne Valencic (GSFC)

Successful submissions from the Fourteenth Call for Proposals for XMM-Newton were announced in December 2014, and observations will begin in May. The Fifteenth Call for Proposals will open August 25, and the final date to submit proposals will be October 9.

The SOC is hosting a workshop June 8-10, at ESAC in Madrid, Spain. It will focus on the topic of "The Extremes of Black Hole Accretion", particularly the structure of accretion flow on the smallest scales and its relation to the launching mechanisms of relativistic jets and winds. The deadline for registration is May 21.More information can be found here: http://xmm.esac.esa.int/external/xmm_news/news_list/ xmm_news-2015-02-12.shtml.

The XMM SOC has released an update for the Serendipitous Source Catalog, 3XMM (DR5), available at http://xmm.esac.esa.int/external/xmm_news/news_list/xmm_news-2015-04-28.shtml. DR5 contains 396910 unique sources with a total of 565,962 detections. The sources are drawn from the 7781 public observations as of 31 December 2013.

Swift Mission News

Eleonora Troja (UMCP/GSFC),
Lynn Cominsky (Sonoma State), & Neil Gehrels (GSFC)

The Swift mission continues to operate flawlessly. The mission was ranked number one in the 2014 Senior Review of NASA operating astrophysics missions (excluding Chandra and HST). The mission continues to support about 3 Target of Opportunity requests per day in addition to observing gamma-ray bursts (GRBs) and Guest Investigator targets. Below is an update on recent science findings, GI program and news from the EPO program.

Swift: Ten years of discovery

A conference was held to celebrate Swift 10 years of scientific discovery at La Sapienza University in Rome December 2-5, 2014. It was a highly successful event with 200 attendees and outstanding presentations on advances in studies of the high energy sky by Swift.

Swift Workshop at Clemson

A Swift science workshop will be held on October 19-21, 2015 at Clemson University. It will be hosted by the Swift User Group Chair Dieter Hartmann. The workshop will review current science programs with Swift and discuss future prospects in preparation for the 2016 Senior Review.

Swift observes flares from Sgr A*

Using data from a University of Michigan program to observe the galactic plane and center, Nathalie Degenaar has studied the X-ray emission for Sgr A*. Despite its relative quiescence, the X-ray emission of Sgr A* occasionally flares up by 1-2 orders of magnitude for tens of minutes to a few hours. These X-ray flares originate very close to the black hole, within ~10 Schwarzschild radii, and are

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Chandra X-ray Observatory Report

Roger Brissenden (SAO) & Martin C. Weisskopf (MSFC)

Chandra has carried out more than 15 years of highly successful and productive science operations. The Chandra X-ray Observatory is unique in its capability for producing the sub-arcsecond X-ray images that are essential to accomplish the science goals of many key X-ray and multi-wavelength investigations in current astrophysical research. A symposium, 15 Years of Science with Chandra, was held in Boston in November to highlight current Chandra science results. Astronauts who served on STS-93, the Space Shuttle Columbia flight that launched Chandra, participated, and the symposium featured a special session focusing on how Chandra might address some of the high priority science objectives identified by the science panels in the New Worlds, New Horizons decadal study.

The committee that reviewed the Chandra program as part of NASA's biennial Senior Review of operating missions provided its report in the spring of 2014. In addition to strongly supporting Chandra's scientific productivity (writing "The prospects for further compelling science return in the future are excellent. This panel enthusiastically endorses the extension of the Chandra mission"), the committee made several programmatic and budgetary recommendations, among them the suggestion that the Chandra X-ray Center (CXC) explore the possibility of adapting to budget constraints by modifying mission operations procedures. In response, the CXC has invited a panel of highly experienced aerospace engineers and managers to review Chandra mission operations. The review will take place at the CXC's Cambridge, Massachusetts, Operations Control Center in May 2015.

The Observatory continues to operate with only minor incremental changes in performance, due primarily to the gradual accumulation of molecular contamination on the UV filter that protects the ACIS detector, and to slow degradation of the spacecraft's thermal insulation. Condensation on the filter reduces the detection of low-energy x-rays by ACIS (but not by the HRC), while the decline in insulation effectiveness requires extra effort in scheduling observations and the use of special strategies to ensure continued safe operation in the thermal environment. In addition, two systems – the Fine Sun Sensor, and the thrusters that are used to unload accumulated angular momentum – have been swapped to their duplicate backup systems to mitigate non-impacting declines in performance. Science data processing, archiving, and distribution proceeds smoothly, with average time from observation to data delivery to observers remaining at about a day.

Chandra's overall observing efficiency has been high, due to the evolution of Chandra's orbit, which has reduced the non-observing time spent in Earth's radiation belts. However, as the orbit continues to evolve, the observing efficiency is beginning to decline toward prior levels. After several years of very low solar radiation, the sun has become more active, resulting in Chandra observing being interrupted three times during the period to protect the instruments from solar particles.

In December 2014 the CXC issued a call for proposals for Cycle 17 observations, with a deadline for proposals in March 2015, and the peer review to be held in June. Scientists worldwide submitted 578 proposals (including archive and theory research), requesting 4.8 times the observing time available.

The CXC will conduct a workshop on The Universe in High-Resolution X-ray Spectra, in Cambridge on 19-21 August 2015. More information is available at http://cxc.harvard.edu/cdo/hrxs2015/.

The Chandra Press Office has been active in issuing image releases, science press releases and other communications of Chandra research results. A complete listing is available at http://chandra.harvard.edu/press. Information about the Chandra Observatory and the Chandra X-ray Center can be found at http://cxc.harvard.edu/.

To celebrate the International Year of Light (IYL), a year-long initiative in 2015 endorsed by the United Nations, a new exhibit of spectacular images is being unveiled. This collection, called "Light: Beyond the Bulb," will allow individuals and organizations around the globe to freely host their own exhibit. "Light: Beyond the Bulb" (LBTB) is an open-source international exhibition program that showcases the incredible variety of light-based science being conducted today. Accompanied by brief and informative captions, the images in the collection include examples from across the electromagnetic spectrum, across different scientific disciplines, and across technological platforms.

This is the latest incarnation of a "public science" project being led by the same team that created the "From Earth to the Universe" (FETTU) project for the International Year of Astronomy 2009, and others. "Through the incredible work of organizers around the world, FETTU appeared in over 1,000 locations across the globe," said Kimberly Arcand of the Chandra X-ray Center who is one of the leads of LBTB. "We hope that many people will also be interested in hosting an exhibit that marks the wonders of light in all of its forms."

LBTB is being made possible by a collaboration between the Chandra X-ray Center, which runs science and operations for NASA's Chandra X-ray Observatory, and SPIE, the international society for optics and photonics. Additional support is being provided by the International Astronomical Union, which recognizes LBTB as one of its cornerstone projects for IYL 2015.

Fermi Gamma-Ray Space Telescope

Julie McEnery, Chris Shrader, Dave Thompson,
Liz Hays (GSFC) & Lynn Cominsky (Sonoma State)

The Fermi Gamma-ray Space Telescope continues to operate nominally. The all-sky survey observing strategy continues to be the primary observing mode, with Target of Opportunity requests welcome for interesting phenomena. Observers who are undertaking multiwavelength observations that would benefit from Fermi simultaneous coverage are reminded to tell the Fermi Project about plans, using the Web form at http://fermi.gsfc.nasa.gov/ssc/observations/multi/reporting/, so that Fermi will avoid any interruptions to observing during such campaigns.

The Sixth International Fermi Symposium will be held in the Washington D.C. area, from November 2-6, 2015. See http://fermi.gsfc.nasa.gov/science/mtgs/symposia/2015/

Recent Fermi Highlights

The third Fermi Large Area Telescope Catalog, 3FGL, containing 3033 sources, has been released. See http://fermi.gsfc.nasa.gov/ssc/data/access/lat/4yr_catalog/.

The Fermi Gamma-ray Burst Monitor (GBM) detected a rapid-fire "storm" of high-energy blasts from a magnetar on Jan. 22, 2009. Now astronomers analyzing this data have discovered underlying signals related to seismic waves rippling throughout the magnetar. See http://www.nasa.gov/content/goddard/nasas-fermi-satellite-finds-hints-of-starquakes-in-magnetar-storm/

GBM studies of terrestrial gamma-ray flashes have shown that any thunderstorm can produce gamma rays, not just the most powerful ones. See http://www.nasa.gov/content/goddard/nasas-fermi-mission-brings-deeper-focus-to-thunderstorm-gamma-rays/

Fermi Guest Investigator Program

A total of 190 Guest Investigator proposals were received in response to the Cycle 8 solicitation. Proposals have been peer reviewed, and selections are expected to be announced by NASA Headquarters in the near future. Due to cutbacks in the Fermi Guest Investigator funding, the GI program is very heavily oversubscribed.

The long anticipated "Pass-8" event-level data reprocessing has now been completed by the Fermi LAT team and its public release through the FSSC is imminent. Pass 8 is expected to lead to improvements that include a reduction in background contamination coupled with an increased effective area, an improved point-spread function, a better understanding of the systematic uncertainties and an extension of the useful energy range for photon analysis to below 100 MeV and above a few hundred GeV. Key details can be found in Atwood et al 2013.

Education/Public Outreach

Sonoma State student assistant Aman Gill participated in the SLAC-KIPAC Open House held on April 11, 2015. She helped many visitors build their own pulsars. Pulsar building was also a great hit at the January AAS winter meeting, where the activity engaged about 100 visiting school children at the Fermi/Swift joint exhibition booth.

The new Fermi lenticular postcards were also distributed from the AAS booth. If anyone would like to receive one, contact lynnc@universe.sonoma.edu.

Athena: Revealing the hot and energetic Universe

Kirpal Nandra (MPE), Xavier Barcons (CSIC-UC),
Didier Barret (IRAP), and Randall Smith (CfA)
for the Athena Science Study Team

ESA's selection of Athena to accomplish the science theme of "the hot and energetic Universe" has moved the mission into a study phase. An "Invitation to Tender" (ITT) has been released to obtain bids for the mission assesment (Phase A), and the first instrument AO is expected in mid-2016. Once the mission design (Phases A & B1) and costing have been completed, it will eventually be proposed for adoption in early 2020. More information about the Athena mission and timeline is available at the website http://sci.esa.int/cosmic-vision/54517-athena/.

Focus on Athena: The X-IFU

The Athena focal plane instrumentation consists of two cameras: an X-ray Integral Field Unit (calorimeter), X-IFU, and a Wide Field Imager, WFI. The X-IFU is cryogenic X-ray spectrometer, based on Transition Edge Sensors, sensitive between 0.2 and 12 keV, and providing a 2.5 eV spectral resolution up to ~7 keV, over a field of view of an equivalent diameter of 5' in its baseline configuration. The Principal Investigator (PI) of the X-IFU is Didier Barret of the Institut de Recherche en Astrophysique et Planétologie (IRAP, France), with the project management, the system level activities, the integration and testing of the instrument led by the Centre National d'Etudes Spatiales (CNES), the French space agency. The two Co-PIs are Jan-Willem den Herder (SRON, Netherlands) and Luigi Piro (IAPS/INAF, Italy). In addition to the 10 ESA member states planning to contribute to the X-IFU, namely France, Netherlands, Italy, Belgium, Finland, Germany, Poland, Spain, Switzerland, United Kingdom, the United States and Japan have recently joined the X-IFU consortium, bringing in teams currently involved in ASTRO-H. The prime contribution from NASA is expected to be the TES front-end science array of the X-IFU, through a GSFC/NIST/Stanford team led by Richard Kelley (GSFC). This contribution was determined based on a NASA issued RFI seeking possible US contributions to the Athena instrumentation. Similarly, the prime contribution from JAXA is focused on the procurement of the shield coolers of the X-IFU cryogenic chain. The latter contribution is led by Kazuhisa Mitsuda (JAXA). Possible optimized versions of the TES array, in view of improving the performance of the X-IFU with respect to the current baseline are being analyzed. In parallel to the Phase A activities, significant technology developments as required for the X-IFU demonstration

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Swift Mission News (con't)

thought to be either related to accretion or magnetic reconnection and electron acceleration processes. Starting in 2006, Swift has been taking quasi-daily ~1-ks long XRT images of the center of our Galaxy. The excellent base line provided by Swift's Galactic center monitoring campaign allowed the detection of six bright flares (during which the X-ray emission increased by a factor of ~100) between 2006-2011. This more than doubled the number of such bright X-ray flares observed at the time. Most importantly, Swift's program allowed for an estimate of the recurrence time of these bright events (~once every week) and revealed that X-ray flares of similar brightness can have different spectral shapes.

Swift Guest Investigator Program

The Swift Guest Investigator (GI) program will continue to solicit proposals in GRB and non-GRB research during Cycle 12. NASA's Research Opportunities in Space and Earth Sciences (ROSES) 2015 and the Swift Appendix D.5 were released on February 13, 2015. The deadline for submitting Swift Cycle 12 GI Program proposals is September 25 at 4:30PM.

A new "Key Projects" category will be added in Cycle 12. Key Projects are intended to greatly advance the Swift science program, enhance its breadth of impact, and represent an enduring legacy of Swift results. Cycle 12 will continue to offer joint program with XMM-Newton, INTEGRAL, Chandra, and NRAO. More details about the GI Program will be posted on the Swift proposer web site: http://swift.gsfc.nasa.gov/proposals/

Swift E/PO News

Lynn Cominsky presented a poster entitled "10 years of Swift Communications and Outreach" at the "Swift: Ten Years of Discovery" conference in Rome, Italy in December 2014 and has written a conference proceedings paper summarizing this work. The SSU group also created a new Swift lenticular that includes two images: a labeled drawing of the Swift satellite and its instruments, and the UVOT image of M31. Although most of the Swift lenticulars were handed out at the Rome conference and the January AAS meeting, there are still a few of these lenticulars available. If you would like one, send email to lynnc@universe.sonoma.edu.

Spektrum Roentgen Gamma Update

A. Merloni, M. Pavlinski, P. Predehl, S. Sazonov
for the SRG, eROSITA, and ART-XC teams

The SRG launch from Baikonour is now scheduled for December 2016. It is still unclear whether the already purchased Ukrainian Zenit launcher will be used for SRG. Discussions are undergoing between Russian Space Agency Roscosmos and Ukrainian officials, with realistic hopes that all remaining issues can be solved soon.

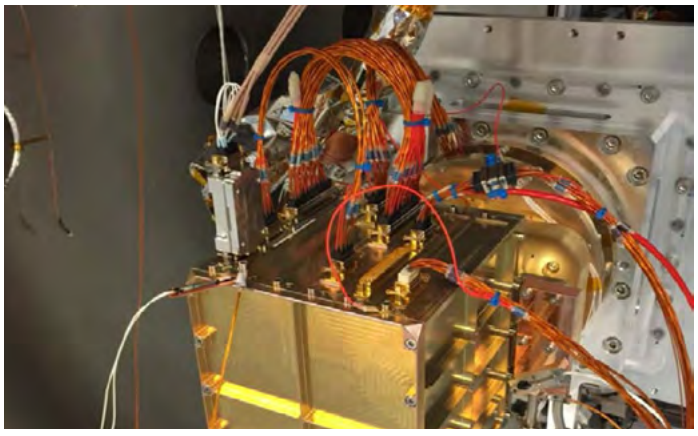
eROSITA

The final calibration of the eight mirror assemblies (integrated mirror and baffles) will resume next month at the PANTER facility, near Munich. In the meantime, the QM (Qualification Model) Electronics of the eROSITA camera has been fully qualified. The performances of the QM camera even surpass those of the EM, which was already defined as "the best pnCCD camera ever built". In particular, a spectral resolution of 133 eV was achieved for a monochromatic Mn Kα line (5.89 keV), with a read-out noise of 2.4 electrons ENC. At higher energies, a resolution of 174 eV was measured for the Copper Kα line (8.04 keV).

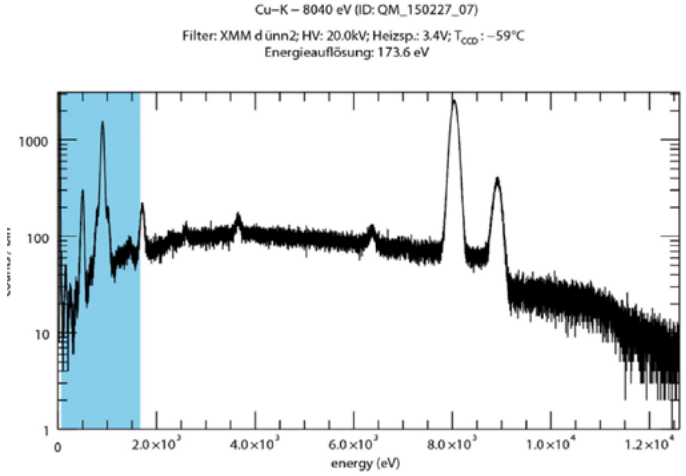
Half of all FM boards of the camera electronics are produced and tested; the completion is expected for July 2015, when also all the CCD modules will be mounted. On the other hand, due to the delayed interface tests between eROSITA and the SRG spacecraft (successfully completed last year), the completion of the ITC electronics ("Interface and Thermal Controller") is lagging slightly behind the other eROSITA parts. All other telescope components (structure, mechanics, cooling system with radiators and cryogenic heat-pipes, all 7 filter wheels, front cover mechanism, etc.) are ready for integration at MPE.

ART-XC

At Progress continues with testing and integrating ART-XC elements, all FM mirrors manufactured in NASA Marshall labs are in Moscow now, and we expect a delivery of the complete instrument in Spring 2016. More news in the next HEAD Newsletter issue.



The eROSITA QM camera in the PUMA X-ray test facility at MPE during the qualification test run.



eROSITA QM camera spectral response to Cu Kα emission line

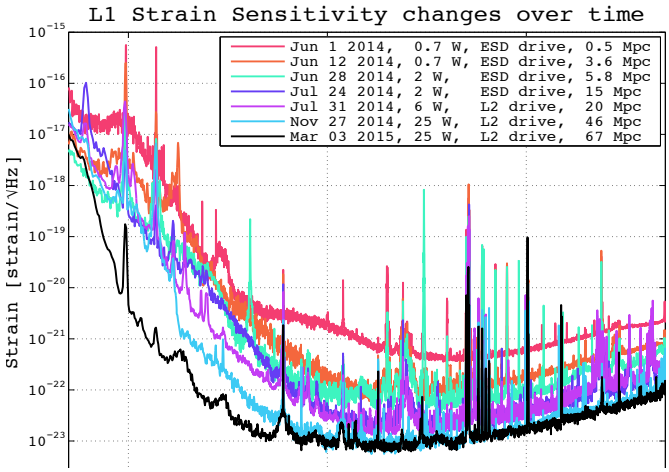
Gravitational-wave news

Guido Mueller (U-Florida), James Ira Thorpe (NASA/GSFC), Paul McNamara (ESA)

Gravitational waves are a unique opportunity to gain a completely new perspective on many of the most exciting processes in the universe. They are generated by the coherent bulk motion of compact objects such as compact binary systems, neutron star and black hole mergers, supernovae explosions and all other processes which involve highly accelerated large masses. The detection of these waves will allow us to test general relativity, measure the equation of state of neutron stars, study the compact binary distribution in our milky way and map out the growth history of black holes to the beginning of their existence.

Laser Interferometry has long been known as one of the most promising methods to detect gravitational waves. Using laser interferometry, the NSF-funded LIGO Observatories together with the Virgo and GEO Observatories have produced many interesting upper limits in the 50 Hz to 5 kHz frequency range. The initial LIGO interferometers ceased operations in 2010/11 to make room for the Advanced LIGO (aLIGO) interferometers which are predicted to routinely measure gravitational waves by the end of this decade. The aLIGO construction project formally began in the summer of 2008 with the procurement of long lead items as well as final design work and experimental tests at the component level. Installation started in 2011 and was finished late 2014. The project successfully ended on March 31st 2015 after both Advanced interferometers reached the criterion for 'success' for the aLIGO construction project – operation for more than two hours in the final configuration. The LIGO Livingston Observatory (LLO) near Baton Rouge, Louisiana, reached this state already end of May 2014 and the LIGO Hanford Observatory (LHO) in southeastern Washington followed early February this year.

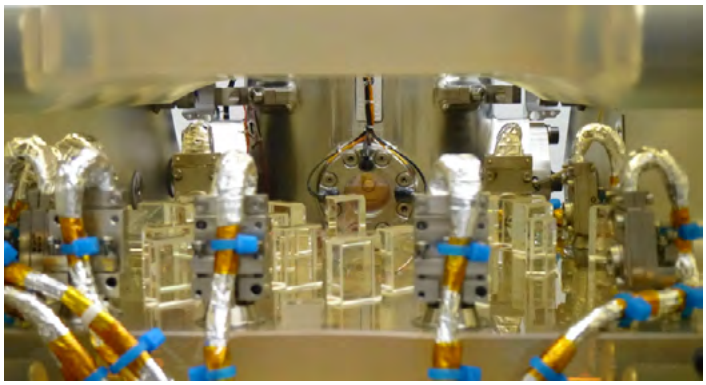
The commissioning of both detectors also progresses very well. The LLO interferometer has already reached a range well above 60 Mpc for binary neutron star inspirals, a factor three larger than enhanced LIGO and well above the minimum sensitivity goal of 40 Mpc originally set for the first aLIGO science run. LHO is in close pursuit and has achieved a range of more than 36 Mpc this April, just short of the 40 Mpc threshold for the first aLIGO observing run planned for Fall 2015.



Strain sensitivity and range of the Advanced LIGO Livingston Observatory. Credit: LIGO

At the same time the LISA Pathfinder (LPF) mission continues its march towards a Fall launch, currently scheduled for October from Korou, French Guiana. The primary instrument, the LISA Technology Package (LTP), was successfully integrated this spring and is being prepared to be shipped to the Industrie Anlagen Betriebsgesellschaft in Munich. There it will be integrated with the LPF Spacecraft which already contains the NASA-provided ST7 Disturbance Reduction System (DRS) payload. Both the LTP and DRS teams are ramping up efforts to finalize experiment designs, operational sequences, and data analysis tools and are participating in a series of pre-launch operations exercises. After launch on a VEGA rocket, LPF will take 60 days to reach its operational orbit around Sun-Earth L1. After a 15 day commissioning period, science operations will begin with 90 days of LTP operations followed by 90 days of DRS operations. A possible extended mission including joint LTP/DRS operations and perhaps a precision test of alternative gravity theories is in the early stages of planning.

This critical test of LISA technology will pave the way for a future LISA-like space observatory which will open the signal-rich mHz frequency range in the early 2030s. The planning for such a detector continues with the ESA appointed Gravitational Observatory Advisory Team (GOAT) which includes US scientists and observers from NASA and JAXA. The GOAT evaluates technologies and mission designs for a future detector under ESA's L3 scenario, while NASA's Gravitational Wave Science Interest Group discusses the future of GW space science in the U.S.



A camera placed inside the LISA Technology Package (LTP) payload during integration captures the view that one of the LTP test masses will have during the mission. Visible are the optics on the ultra-stable optical bench, a window in the vacuum system housing the test mass, and a small hole in the electrode housing where the laser beam will probe the test mass position.

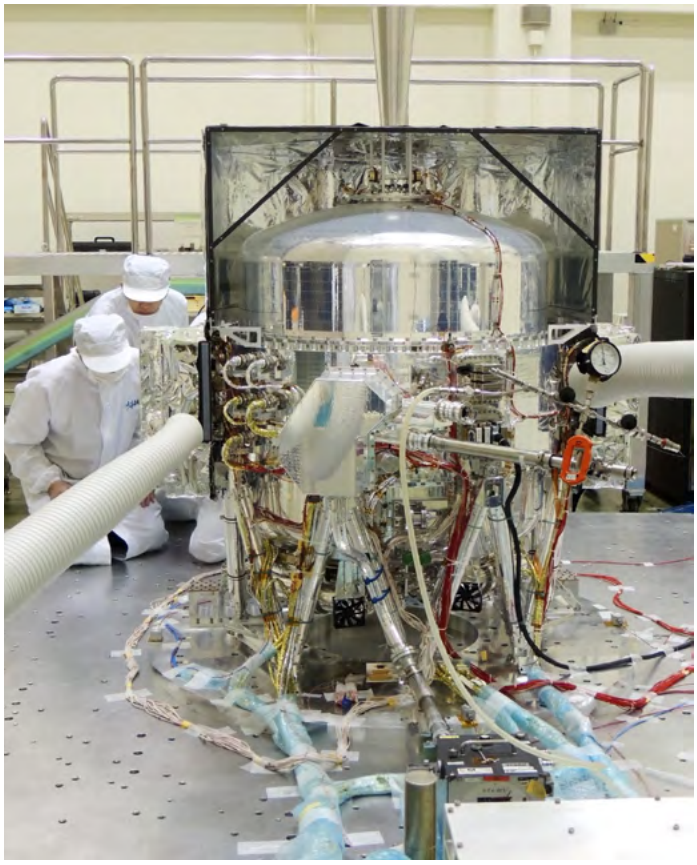
Credits: Airbus Defence and Space, U. Glasgow, CGS.

Progress Towards the Astro-H Mission

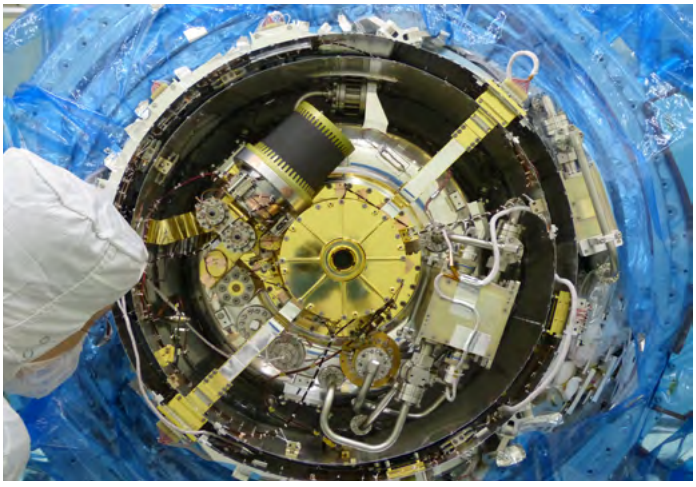
Richard Kelley, Takashi Okajima,
Lorella Angelini, Rob Petre (NASA/GSFC)

Major activities and milestones have been accomplished over the last six months. All of the flight instruments are complete, have been calibrated, and have been integrated with the spacecraft. Astro-H is now undergoing final assembly and will go through extensive testing at the Tsukuba Space Center between now and November. The Soft X-Ray Spectrometer, with its microcalorimeter array, has been operated on numerous occasions starting in October 2014. The intrinsic performance of the detector system is excellent, with an energy resolution of 4.5 eV across the array. As reported previously, when tested with the Stirling cycle cryocoolers running at nominal power, the energy resolution was significantly degraded and variable depending on other details of the dewar state. This was attributed to mechanical vibrations causing time-variable heating of the 50 mK detector stage, which needs to be very stable. Fortunately, the JAXA SXS team has successfully obtained and qualified mechanical isolators designed to be installed between the cooler compressors and the dewar, and these work extremely well. With the isolators installed, the energy resolution performance is essentially identical to the intrinsic performance (~ 4.5 eV) measured during subsystem level tests at Goddard, and is stable.

Calibration measurements for determining the energy gain scale were made in March 2015 just before spacecraft integration. Initial work indicates that it should be possible to obtain absolute energies to about 0.5 eV if the overall temperature stability of the internal dewar components are as stable in orbit as they were during ground operations.



The finished SXS dewar undergoing vibration testing at the Tsukuba Space Center in Japan.



The completed forward end of the SXS dewar prior to the next phase of close out and aperture installation.

Both X-ray mirrors have been extensively characterized and calibrated in Japan, including off-axis measurements. The point spread functions of the SXS mirror is ~1.2 arcmin and the end-end effective area is about 250 cm^2 at 1 keV and 310 cm^2 at 6 keV.

A key feature of the SXS is that it is designed to operate with and without liquid helium. The cryogen mode (with liquid helium) is the default initial mode, and should last for about four years after launch based on careful heat load measurements. The cryogen-free mode has also been tested and will allow use of the instrument as long as the mechanical coolers continue to operate (expected for many years based on similar life test units). The only practical difference is that in cryogen mode, the operational temperature (50 mK) is maintained for about 43 hours before the first-stage refrigerator must be recharged (which takes about 50 min), whereas in cryogen-free mode, the hold time is about 15 hours, with the same recycle time. Hence, the operational live-time of the SXS is about 98% and 94%, respectively, in the two modes. [The overall observing efficiency will be limited by observatory operations in low-earth orbit, and is expected to be ~40%, so not significantly affected by the SXS operation.] The energy resolution performance is the same in both cases. This is the first time a cryogen free x-ray calorimeter spectrometer qualified for spaceflight has been demonstrated and operated, and is the basis for future missions such as Athena.

The next steps are full testing at the spacecraft level, a comprehensive thermal-vacuum test of the observatory, mechanical vibration, final performance tests, and shipping of the observatory to the Tanegashima launch complex in the autumn of 2015 for an anticipated launch in early 2016.

The Astro-H Science Enhancement Option includes ac-

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The Astro-H Mission (con't)

tivities related to data analysis, the GO program and user support. The pre-launch activities are focused on pipeline data processing, instrument software, collection of calibration information and preparing the necessary documentation and simulation software to support the GO program for all four Astro-H instruments. The Astro-H U.S. data center will be the liaison between GOs and the Astro-H program, with a help desk that will open at times near launch.

Finally, the larger Astro-H international science team published 17 white papers on arXiv.org that describe the science scope that will be addressable using Astro-H. The Announcement of Opportunity for the general community will be released several months after launch.

The X-ray mirrors produced for the Astro-H Soft X-Ray Imager (left) and SXS (right). The mirrors have 203 concentric reflectors, so contain 1624 individual, precisely aligned mirror segments. They are 45 cm in diameter and have a mass of 43 kg each.

Suzaku Mission News

Koji Mukai (GSFC / CRESST)

The spacecraft was in a safe hold for the month of January, 2015, while the operations team tweaked the battery parameters. Subsequently, Suzaku resumed routine guest observer observations, usually only with the 3 XIS units in operation, with the HXD instrument turned off. Occasionally, under favorable solar illumination circumstances, the HXD can be turned on but in this case, 2 of the 3 XIS units need to be turned off to stay within the power limit. Most of the Cycle 9 priority A and B observations will be completed by the end of April, 2015, although some targets whose observations were to have been carried out in January will be observed during their next visibility window in the summer.

The Cycle 10 call for proposals was issued in December 2014, for observations during a 6-month period starting in May, 2015. The national and international reviews are now complete and the accepted target list has been published. If the power situation worsens still, further countermeasures may have to be taken that would impact the accepted observations. For example, the Sun angle range may be reduced, potentially compromising the ability to carry out some time-constrained observations. Another possibility is that the number of XIS units in use may be reduced.

Even at this late phase of the mission, Suzaku continues to provide valuable data. This is highlighted by two recent papers. A team led by Francesco Tombesi (NASA/GSFC & UMD) recently published a paper in Nature (519, 436) on IRAS F11119+3257, an ultraluminous infrared galaxy (ULIRG). It was also the cover story of the March 26th issue of Nature. The high quality Suzaku XIS spectrum of this ULIRG reveals an absorption line at a rest-frame energy of 9.82 keV, indicative of an outflow velocity of 0.25 c. Herschel infrared observations of this ULIRG show a large-scale molecular outflow which is effectively removing the cold gas out of which stars form. The comparison of parameters derived for the accretion disk wind and the molecular outflow confirms that the former can drive the latter, thus favoring the wind mode of AGN feedback. https://www.nasa.gov/content/goddard/suzaku-herschel-link-a-black-hole-wind-to-a-galactic-gush-of-star-forming-gas/

A team led by Hiroya Yamaguchi (NASA/GSFC) recently published a paper in ApJ Letters (Volume 801, L31) on 3C 397, the remnant of a Type Ia supernova. K alpha lines of Cr, Mn, Fe and Ni are clearly detected in the combined XIS spectrum of 3C 397. The flux ratios of these lines suggest Ni/Fe and Mn/Fe mass ratios of ~0.17 (0.11-0.24) and ~0.025, respectively. Both the Ni/Fe and Mn/Fe ratios of 3C 397 are consistent with a near Chandrasekhar mass white dwarf progenitor. In particular, SNIa explosion models show that such high Ni/Fe mass ratio can only be produced in the neutron-rich nuclear statistical equilibrium (n-NSE), and the n-NSE regime is found only in the case of near Chandrasekhar mass white dwarf progenitors. This implies that the progenitor of 3C 397 was a single degenerate system. http://www.nasa.gov/content/goddard/suzaku-studies-supernova-crime-scene-shows-a-single-white-dwarf-to-blame/.

INTEGRAL Mission News

Erik Kuulkers (ESA) & Steven Sturner (UMBC/GSFC)

During a meeting on 19/20 November 2014, the ESA Science Programme Committee (SPC) approved the confirmation of science operations for INTEGRAL until 31 December 2016, as well the indicative extension of science operations until 31 December 2018, subject to a mid-term review in 2016. The goal is to reduce the allocated resources for 2017/2018 by approximately 10% as compared to 2016. Since a major cost-cutting exercise already took place in 2013 and has since been implemented, saving a further 10% is a difficult task. The Executive will report to the November 2015 SPC meeting on possible ways forward; this status report will be used as input into the decision of whether to propose this mission for confirmation in 2016. The task of cost savings has benefits from the view of external experts who currently have no strong link to the mission, and, therefore, have brought a fresh point-of-view to what INTEGRAL could or should be doing in 2017/2018 and beyond. This team was asked to review the scientific operations approach and to consider any possible changes to the set-up as well as the scientific roadmap for INTEGRAL - possibly indicating areas not yet addressed, possibly just reinforcing the existing plans and ideas. The high sensitivity and large FOV (IBIS) plus the excellent spectroscopic capabilities (SPI), as well as the ToO capabilities of INTEGRAL were recognized. The observatory aspect through issuing AOs is considered to be important for the community. Various suggestions for the cost cuts were presented. The IUG has been asked to evaluate the outcome.

For the first time at ESA, a spacecraft's orbit has been adjusted, after 12 years in space, to achieve a safe re-entry 15 years in the future, while maximizing valuable science return for the next 6-8 years. In January/February 2015 Delta-V manoeuvres were performed. INTEGRAL is now in its final revised orbit of 64 hours compared to the 72 hours before the manoeuvres. Nominal science observations started again on 15 February, and follow the newly released AO-12 long-term plan.

The IUG meeting #17 took place on 4 & 5 February 2015 at ESAC, Spain. Apart from the new cost cutting exercise, the instrument status and (cross)-calibration, de-orbit status/fuel usage/power consumption/long-term orbit evolution were discussed, as well as the (im)possibility of hibernating INTEGRAL. Furthermore, new ideas of improving the awareness of INTEGRAL in the overall community were discussed.

The Russian Advisory Committee (RAC) for INTEGRAL agreed with proposed changes to the data rights policy with regard to Russian Federation proposals. Data or science rights to the targets or science in the field of view (FOV) of the instruments proposed by the PIs from the Russian Federation and accepted by the TAC will be allocated to these PIs with the usual 1-year proprietary period. However, the rest of the field will be made public to the community at-large through the consolidated data programme, i.e., having a policy similar to that for non-Russian Federation proposals. Russian PIs still have exceptional access to the near-real time data of their observations. This policy change will be in effect already in AO-13. Note that the guaranteed return to the Russian science community from the open time programme stays 25%.

The 13th Announcement of Opportunity was released on 24 February 2014. Observations with non-standard, custom patterns, such as the GPS and Galactic scans, generally reduce scheduling efficiency, and increase workload for both the INTEGRAL Science Operations Centre (ISOC) and the Mission Operations Centre. Because of the overall reduced manpower in INTEGRAL operations, the use of non-standard patterns is now strongly discouraged. Hence, starting in AO-13, custom patterns will be considered only for the highest, A-grade, proposals, and their scheduling will be done on a best effort basis. ESA continues to provide the opportunity to propose for coordinated observations with XMM-Newton and Swift. By the deadline on 17 April 2015, 62 proposals were received (30 normal, asking for data rights on 292 sources, and 32 ToO). The total time requested is about 110 Msec (for all types of observation; only 10% of the requested total ToO time has been taken into account). Given that up to about 23 Msec of observing time will be available in AO-13, this corresponds to an oversubscription of about 4.8 (similar to the oversubscription in the previous AO). The INTEGRAL TAC meeting will be 26-28 May 2015.

A memo for a Fermi-INTEGRAL collaborative program was finalized in November 2014. One ToO proposal was received as part of the Fermi-INTEGRAL Joint Program Agreement, during the call for Fermi Cycle-8 Guest Investigator proposals.

The spacecraft, payload and ground segment are performing nominally. Routine annealing #24 of the SPI detectors occurred between 15 February and 3 March 2015. The recovery is not "perfect", but slightly better than annealing #23, mainly due the lowest level of degradation obtained pre-annealing. The energy resolution is still under control. Scientific observations during this period were performed using targets for which science goals did not depend on SPI. At ISOC a discussion has been initiated to identify a way forward now that it has a minimalistic structure.

Scientific observations of the AO-11 cycle in 2014 and AO-12 cycle in 2015 were performed mostly as planned. A public ToO observation was performed based on an out-of-TAC request on the transient IGR J17488-2018/SAX J1748.8-2021 on 23/24 February 2015. The Konus-Wind observation of a bright, intermediate burst from SGR 1935+2154 triggered another, dedicated, ToO observation from 17-19 April 2015. Three additional ToO requests were received in the reporting period; two on the same source (PNV J18365700-2855420 / Nova Sgr 2015 No.2) and one on Swift J1753.5-0127. Mainly, for the 1st source trigger

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INTEGRAL Mission News (con't)

Erik Kuulkers (ESA) & Steven Sturner (UMBC/GSFC)

criteria were not reached yet, while for the other source the scheduling times were too tight, and hence no observations were granted. During the reporting period, two Gamma-Ray Bursts (GRBs) were detected in the FOV of the high-energy instruments (GRB 150219A and GRB 150305A).

As of April 6, the total number of INTEGRAL refereed publications since launch is 849; during the total year 2015, 14 refereed papers have been published. Some recent INTEGRAL-related scientific highlights include:

- Hard X-ray emission of Sco X-1 (M.G. Revnivtsev, et al. 2014, MNRAS 445, 1205)
- SN2014J gamma rays from the 56Ni decay chain (R. Diehl, et al. 2015, A&A 574, A72)
- The 1.4 GHz radio properties of hard X-ray selected AGN (F. Panessa, et al. 2015, MNRAS 447, 1289)
- The Galactic 26Al emission map as revealed by INTEGRAL SPI (L. Bouchet, et al. 2015, ApJ 801, 142
- INTEGRAL discovery of unusually long broad-band X-ray activity from the Supergiant Fast X-ray Transient IGR J18483-0311 (V. Sguera+ 2015, MNRAS 449, 1228).

Aurorae offer a beautiful spectacle by painting the night sky in red and green colors. What is less well known is that aurorae are also X-ray emitters. Weak aurorae have a soft X-ray spectrum, which drops off at an energy around 10 keV. Occasionally, however, the emission can be much harder and can extend to more than 100 keV. This was the case on 20 November 2012, when INTEGRAL was performing one of its Earth observations (INTEGRAL POM Dec 2014). Whereas this fortuitous emission is a disturbance for measuring the cosmic X-ray background via occultation by the Earth, it is an interesting new source for INTEGRAL science. Intense auroral emission was first visible roughly around Iceland in the early evening, before reappearing on the opposite side of the pole with more steady emission over a wider area (in Siberia before dawn). One of the auroral sub-storm events showed strong hard X-ray emission detected up to about 100 keV. See INTEGRAL Picture of the Month (POM) December 2014 (credits: M. Türler, ISDC, Geneva & E. Churazov, IKI, Moscow & MPA, Garching).

The usual "off-year" INTEGRAL Workshop will be held from 5–9 October 2015 in Rome, Italy. It will bear the theme "The New High Energy Sky after a Decade of Discoveries" and is being organized by INAF, Rome, Italy. The central focus of this Workshop is to provide an up-to-date view of the high-energy sky. The goal is to present and discuss, via invited and contributed talks (and posters), the main results obtained during the last decade in the field of high-energy astrophysics using INTEGRAL, and place these results in the context of other observatory-like space-based missions, such as Herschel, Plank, Swift, Fermi, AGILE, NuSTAR, MAXI, etc., as well as ground-based observatories. Correlated studies in the Radio, IR, Optical, X-rays, etc., wavelength bands, as well as using neutrino and gravitational wave observations, will be presented. Final details on the location, registration, hotel, etc., will be available at the web site: http://www.iaps.inaf.it/sz/integral2015/registration.html.

The Proceedings of the 10th INTEGRAL Workshop "A Synergistic View of the High-Energy Sky", in Annapolis, USA, last year, has been published on-line in PoS.

Cherenkov Telescope Array Update

Werner Hofmann (MPIK) and Rene Ong (UCLA), for the CTA Consortium

The Cherenkov Telescope Array (CTA) will provide unprecedented sensitivity at the high-energy end of the electromagnetic spectrum. Construction will start on 2016, in locations to be pinned down during the present year, which include a northern (Mexico or Spain) and a southern (Chile or Namibia) site for full-sky coverage. CTA will be a powerful and unique instrument in the study of the most extreme environments in the Universe and in understanding the nature of dark matter.

Introduction

The field of Very High Energy (VHE, E > 50 GeV) gamma-ray astronomy has been firmly established by the discoveries of ground-based telescopes using the atmospheric Cherenkov technique (e.g. H.E.S.S., MAGIC and VERITAS) and the air-shower technique (e.g. Milagro and ARGO-YBJ). In particular, atmospheric Cherenkov telescope arrays have proven very successful in discovering new VHE sources and source classes and in providing detailed characterization of these sources in the broader multiwavelength context. The Cherenkov Telescope Array (CTA) is an initiative to capitalize on these results and on those from space-based gamma-ray telescopes (e.g. Fermi, AGILE) in order to take a major step forward in our understanding of the non-thermal, high-energy universe.

In addition to having full-sky coverage, CTA will be an order of magnitude more sensitive and have significantly improved angular and energy resolutions compared to present instruments. The wide energy range of CTA, from 20 GeV to 300 TeV, will permit overlap with space telescopes and deep exploration of the extreme universe to the highest energies. Equally important, CTA will serve as an open observatory to the astronomical community.

CTA is being proposed and developed by the CTA Consortium that currently consists of more than 1,000 scientists and engineers from approximately 200 institutes in 29 countries: Argentina, Armenia, Australia, Austria, Brazil, Bulgaria, Canada, Croatia, Czech Republic, Finland, France, Germany, Greece, India, Ireland, Italy, Japan, Mexico, Namibia, Netherlands, Norway, Poland, Slovenia, South Africa, Spain, Sweden, Switzerland, the UK and the US.

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Cherenkov Telescope Array (con't)

CTA Approaching Major Milestones

In 2015, the CTA project is approaching several milestones in what is a crucial year for its development. CTA is completing a full technical design report (TDR) and a Cost Book, both which will be made available to an external review committee and to the various funding agencies and institutions interested in contributing to its construction. A Critical Design Review (CDR) of the project by the review committee is scheduled for June 24-26. Subject to the successful completion of the CDR, together with the selection of sites and the creation of an international founding agreement, CTA will be well on its way to begin construction in 2016.

In preparation for implementation, teams around the world are developing and testing prototypes of CTA's key instruments and technology. Most recently, the Gamma-ray Cherenkov Telescope (GCT) team at the Observatoire de Paris completed the mechanical assembly of a Small-Size Telescope (SST) prototype in April with full assembly planned for June. The following prototypes are complete and are undergoing testing: Medium-Size Telescope (MST) in Germany, SST-1M in Poland and ASTRI SST-2M in Italy.

Site Selection Negotiations Underway

To achieve full-sky coverage, CTA will consist of about 100 imaging atmospheric Cherenkov telescopes located at one site in the southern hemisphere and a smaller array of about 20 telescopes at a site in the northern hemisphere. A rendering of the CTA southern hemisphere array is shown below. Extensive studies of the environmental conditions, simulations of the science performance and assessments of construction costs were conducted for the potential sites. On March 26, 2015, the CTA Resource Board, composed of representatives of ministries and funding agencies, voted to begin negotiations with Mexico and Spain for the northern hemisphere site. A site in the US was kept in consideration as a possible back-up site. Negotiations with the southern hemisphere site candidates, Chile and Namibia, began in 2014. Argentina is being considered as a back-up site for the southern hemisphere. Both the northern and southern hemisphere site negotiations are expected to end before 2016.

CTA Science Goals

CTA scientists have compiled the broad science case for CTA that will be delivered as part of the submission to the CDR. This document will provide an overview of the scientific motivations for the observatory and the baseline plans of the Consortium for the use of the guaranteed time. CTA's Key Science Projects (KSPs) are a large part of this document and an important piece in solidifying CTA's scientific goals. CTA will use its unprecedented accuracy and sensitivity to address a wide range of questions in both astrophysics and particle physics. These questions fall under three major themes:

- Understanding the Origin and Role of Relativistic Cosmic Particles
- Probing Extreme Environments
- Exploring Frontiers in Physics

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Rendering of CTA array in southern hemisphere

Cherenkov Telescope Array (con't)

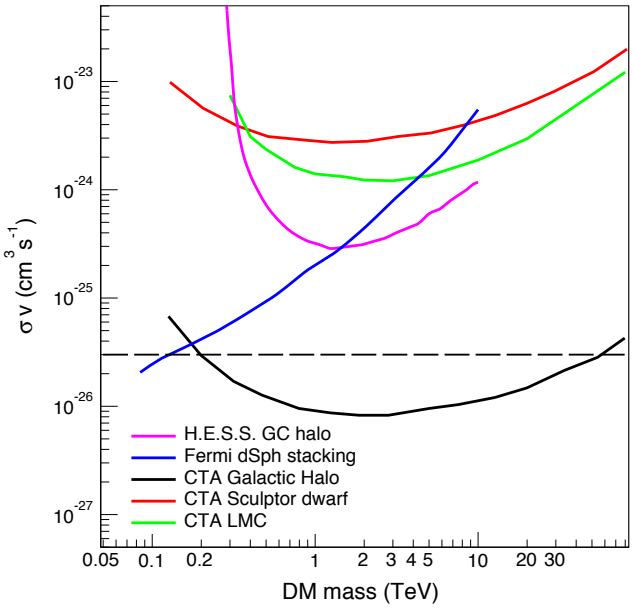
A key part of the third theme is the search for WIMP dark matter through its annihilation or decay signature. As shown in the plot at right, CTA's sensitivity will enable searches for WIMPs in the multi-TeV mass range, above the reach of the Large Hadron Collider and direct-detection experiments.

US Involvement in CTA

(see also http://cta-us.physics.ucla.edu/)

Groups in the US have been actively involved in planning for CTA since 2006 and US participation in CTA was a ranked initiative in the 2010 Decadal Survey (in the large ground-based category). US groups have developed a Cherenkov telescope design that uses a secondary mirror for the first time, which both corrects optical aberrations and reduces the camera plate scale. The smaller plate scale allows the use of solid state silicon photomultipliers in lieu of traditional photomultiplier tubes and reduces the cost per channel, making higher resolution cameras practical. A prototype telescope will be assembled this year at the Whipple Observatory in Arizona (also the VERITAS site). US participants have been active in many other areas of CTA development, including science planning, data management, array control and site characterization. The proposed US contribution to CTA will encompass a number of items, including the construction of medium-size telescopes.

For more information, visit CTA's website, www.cta-observatory.org. You can also follow CTA on Facebook (www.facebook.com/ctaobservatory) and Twitter (@CTA_Observatory) for the latest news and project updates.



Comparison of sensitivity to WIMP dark matter for various instruments and astrophysical targets. The black, green and red curves correspond to the expected CTA sensitivity from observations of the Galactic center halo, LMC, and Sculptor dwarf galaxy, respectively, for the W+W- channel. The purple curve corresponds to limits from the currently operating H.E.S.S. telescope from observations of the Galactic center halo (b-bbar channel). The blue curve corresponds to limits from the Fermi-LAT telescope from observations on a set of dwarf galaxies (6-year, W+W- channel). The dashed line indicates the velocity-weighted thermal relic cross section.

Athena (cont'd)

model are now under way in Europe, the United States and Japan. This includes elements of the cryogenic chain, of the focal plane assembly and the associated readout electronics.

Working Groups and the Science Impact Exercise

The Athena Science Study Team (ASST) has completed organizing the 600+ community members interested in Athena science into three Science Working Groups (SWG), on the Hot Universe, the Energetic Universe, and Observatory science. Each SWG has a number of topical panels covering specific science goals of the mission. In addition, a Telescope Working Group and a Mission Performance Working group have also been established by the ASST. These panels recently responded to a request for information from the ASST about the impact of a smaller mirror area at 1 keV on Athena science. This is in response to a report requested by the ESA science advisory bodies, which will be submitted shortly.

Upcoming Events

The first scientific conference dedicated to the Athena X-ray observatory will be held September 8-10, 2015 at ESAC in Madrid, Spain. The purpose of this conference is to bring together the international astronomical community interested in Athena and to discuss the key science questions which will be addressed by the mission. Time will also be devoted to presenting the status of the project and exploring the synergies with other future large multi-wavelength facilities and missions. Registration and abstract submission is now open at http://www.sciops.esa.int/index.php?project=-CONF2015&page=ATHENA2015.

Gamma-Ray Interest Group (GammaSIG)

Mark McConnell (University of New Hampshire), Henric Krawczynski (Washington University of St. Louis)

On Feb 5-6 there was a workshop held at GSFC on the subject of "Future Space-Based Gamma Ray Observatories." About 100 people attended the meeting. Talks covered both science topics and possible instrumentation. Although the workshop focused on the medium energy gamma rays from 1-100 MeV, there were also talks that covered potential science down to 100 keV and as high in energy as several hundred GeV. At the end of the workshop there was also time set aside for open discussion about the future of gamma ray astronomy. It was agreed that the US community needs to focus in the coming months on the development of a community road map. As for future mission concepts, there was a general consensus that the next steps could likely be accomplished at the Probe level. No specific plans were discussed, although general types of missions based on instrumentation techniques were discussed (grazing incidence imagers, Compton telescopes, and pair production telescopes). Presentations from the workshop can be accessed online at : http://asd.gsfc.nasa.gov/conferences/future_gamma_obs/.

At the April APS meeting in Baltimore, there was a mini-symposium on Future MeV Gamma-Ray Science and MIssions. A special GammaSIG session is being organized for the June HEAD meeting in Chicago. Details will be announced as they become available. For more information about the GammaSIG, including how to be added to the mailing list, see http://pcos.gsfc.nasa.gov/sigs/gammasig.php.

X-ray Science Interest Group

Jay Bookbinder (CfA) & Mark Bautz (MIT)

The X-ray Science Interest Group (XRSIG) is discussing responses to NASA Astrophysics Divison Director Paul Hertz's white paper "Planning for the 2020 Decadal Survey," which is available at http://science.nasa.gov/media/medialibrary/2015/01/02/White_Paper_-_Planning_for_the_2020_Decadal_Survey.pdf.

This white paper requests community input, via NASA's Program Analysis Groups, on concepts for large missions that NASA should study in preparation for the 2020 Decadal Survey. We're in the midst of series of regular telecon discussions on this subject, and plan to meet face-to-face at the special HEAD meeting in Chicago.

Soon we will also be requesting your input in support of the NASA Physics of the Cosmos Program's annual effort to identify strategic technology development needs. Watch the XRSIG mailing list (which you can join at http://pcos.gsfc.nasa.gov/sags/xrsag/xrsag-maillist.php) for more information and for details of telecon and meeting dates and times.

For more information about the XRSIG, please contact the chair Jay Bookbinder (jay.a.bookbinder@nasa.gov) and/or the co-chair Mark Bautz (mwb@space.mit.edu).

Development of the Neutron Star Interior Composition Explorer (NICER)

Keith Gendreau (NASA/GSFC), Zaven Arzoumanian (GSFC/CRESST/USRA)

NICER – an Explorer Mission of Opportunity that will study neutron stars in the soft X-ray band from the International Space Station (ISS) – continues to meet its major development milestones on schedule, including Critical Design Review and an ISS Payload Safety Review in late 2014. NICER's launch date, tied to ISS resupply mission manifests, is likely to move up from October to August 2016. Hardware development remains on track to meet the new launch date. Among NICER's major subsystems, flight optics are complete and undergoing X-ray characterization; flight detectors and their readout electronics are nearly complete and undergoing screening and calibration at partner institution MIT; an engineering-model optical bench is undergoing environmental testing; flight command-and-data-handling electronics have been delivered and accepted; and the flight pointing system actuators are also in testing. A custom integration and alignment facility at GSFC is complete, with integration of the first flight optics expected to begin in June. A Science and Mission Operations Center at GSFC is in development and ready to support a test, also in June, of data acquisition through existing ISS data telemetry infrastructure.

During its 18-month baseline mission, NICER will be devoted to achieving its top-level science objectives to uncover the physics of neutron star structure, dynamics, and energetics. NASA recently approved a six-month extension of the mission to institute a brief, competitively-awarded Guest Observer program and enable NICER to participate in the 2018 Senior Review of astrophysics missions for possible further continuation. NICER data will be distributed to the public through the HEASARC after an initial 6-month calibration and validation period. Anticipated NICER response files are available for PIMMS and XSPEC (and their Web-based versions on the HEASARC site), but are subject to revision as integration and calibration activities continue.