Poster Abstracts

Version 2

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Summary

J. AIRD ***: "Deeply Buried AGN"***

Authors : James Aird, Yoshihiro Ueda

Institute : University of California San Diego, Kyoto University

Suzaku follow-up of sources from the large area, high energy Swift/BAT survey has lead to the recent discovery of a new population of AGN in the local Universe. These appear to be deeply buried within geometrically-thick tori, giving rise to strong X-ray reflection and a low fraction of scattered X-ray light (Ueda et al. 2007, Eguchi et al. 2009). I will present new results from new Suzaku observations of a more moderately absorbed population. We find evidence for geometrically-thick tori in these sources. We use sophisticated spectral modelling to probe the torus geometry and assess the contribution of reflection from the accretion disk. We conclude that these sources reside within thick, patchy tori, but are NOT intrinsically Compton-thick. Such sources may represent a crucial evolutionary stage in the lifetimes of AGN. I will then discuss how future observations with IXO, with its wide energy coverage, huge collecting area and fantastic energy resolution of the iron line, will enable further study of this population, probing the torus geometry in greater detail, and push such investigations out to higher redshifts.

M. BACHETTI ***: "kHz QPO studies with IXO: testing the Moving Hotspots Model"***

Authors : M. Bachetti(1)

Institute : (1) CESR, France

According to the moving hotspots hypothesis, kHz QPOs are originated at the surface of the star from the movement of hotspots formed during accretion. In this scenario, the lower peak corresponds to hotspots created by the funnel flow in a hot region around the magnetic pole and moving around it, while the upper peak to hotspots created through instabilities closer to the equatorial zone, moving at a greater velocity than the polar ones. This model predicts that if the star is not almost perfectly aligned (misalignment angle much smaller than the polar hot region), the same movement originating the lower kHz QPO should also produce a dimmer feature at the frequency of the star. Low and high frequency phenomena should also be correlated, the red noise being influenced by the duration and frequency of appearance of the hotspots. The unprecedented collecting area of IXO, increasing the countrate by a factor of ~10, would be an extraordinary tool to study the lightcurves of LMXBs and look for features at the frequency of the star in observations where the lower QPO is present. Moreover, it would help study LMXB variability on shorter timescales, helping the investigation of the short-term coherence of QPOs and correlations between high and low-frequency phenomena.

D. BARRET ***: "The High Time Resolution Spectrometer on board the International X-ray Observatory"***

Authors : Didier Barret on behalf of the international HTRS instrument consortium

Institute : Centre d'Etude Spatiale des Rayonnements, Toulouse

The High Time Resolution Spectrometer (HTRS) is currently undergoing a technical assessment study. We will present the electrical, mechanical and thermal design of the instrument, whose detector is an array of Silicon drift detectors operated out of focus. The performance of the HTRS for timing and spectroscopy of the brightest X-ray sources of the sky, estimated though extensive simulations will also be presented.

V. BECKMANN ***: "AGN at hardest X-rays and the perspectives for IXO "***

Authors : V. Beckmann et al.

Institute : François Arago Centre, APC, Université Paris 7

The current hard X-ray missions like Suzaku, Swift, and INTEGRAL have given us detailed insight into the hard X-ray spectrum of AGN. We have shown that the intrinsic spectrum of the different Seyfert types is identical, when effects of reflection and absorption are taking into account. In addition, we were able to identify a fundamental plane of black hole activity, connecting the bulge of the host galaxy with the accretion processes. This fundamental plane seems to hold for all AGN, independent of the intrinsic absorption. A puzzling result from the current hard X-ray missions is the unexpectedly low fraction of Compton thick AGN. With only about 5%-10% Seyfert type objects showing intrinsic absorption in excess of 1.5e24 1/cm**2, questions arise that will be answered by IXO through hard X-ray band deep surveys: what is the true fraction of Compton thick AGN? Did the absorption evolve with time, i.e. do we detect more absorbed sources at higher redshifts? Which sources contribute to the peak of the cosmic X-ray background at 30 keV? We will outline the potential of IXO observations to answer these fundamental open issues.

M. BRIGHTMAN ***: "Finding high redshift Compton thick AGN with IXO"***

Authors : Murray Brightman (1) Kirpal Nandra (1)

Institute : (1) Imperial College London

One of the main science goals of IXO will be to study the growth of super-massive black holes across cosmic time. A key requirement for this is to be able to detect obscured accretion, particularly with Compton thick obscuration, at high redshift, much of which is likely to be missing from our current deep surveys. Compton thick AGN are identified either below rest-frame 10 keV by a flat ‘reflection’ spectrum, or above 10 keV, where the photo-electric absorption cut-off can be observed. We use Monte-Carlo X-ray transmission calculations, as well as observational data above 10 keV from Suzaku of local Compton thick AGN and existing deep X-ray survey data to determine how IXO will best identify Compton thick AGN. This will have important implications for the sensitivity requirements of IXO above 10 keV and its effective area at 1 keV.

J.S.KAASTRA ***: "Polarized X-ray synchrotron emission from SNR shells: IXO XPOL perspective"***

Authors : A.M.Bykov, Yu.A.Uvarov, J.B.G.M.Bloemen, J.W. den Herder, J.S.Kaastra

Institute : Ioffe Institute for Physics and Technology, 194021 St.Petersburg, Russia SRON Netherlands Institute for Space Research, Utrecht, The Netherlands

Synchrotron X-ray emission components were recently detected in many young supernova remnants (SNRs). There is an emerging class - SN1006, RXJ1713.72-3946, Vela Jr, and others - that is dominated by non-thermal emission in X-rays, also most likely of synchrotron origin. Such emission results from electrons/positrons accelerated well above TeV energies in the spectral cut-off regime. In the case of diffusive shock acceleration, which is the most promising acceleration mechanism in SNRs, very strong magnetic fluctuations with amplitudes well above the mean magnetic field must be present. Starting from that scenario, we have simulated images of polarized X-ray emission of synchrotron SNR shells and show that these are highly clumpy with high polarizations up to 50% (see MNRAS v.399, p.119, 2009). A distinct characteristic of this emission is the strong intermittency, resulting from the fluctuating field amplifications. The details of this "twinkling" polarized X-ray emission of SNRs depend strongly on the magnetic-field fluctuation spectra, providing a sensitive diagnostic tool. We demonstrated that the predicted characteristics can be studied with the proposed IXO performance. The polarization observations can give unique information on strong magnetic-field amplification and high-energy particle acceleration in SNRs.

R. CAPELLI ***: "The nature of Fe Ka line emission from Molecular Clouds in the Galactic Center."***

Authors : Renzo Capelli(1), Stefan Gillessen(1), Peter Predehl(1), Robert Warwick(2)

Institute : (1) Max Planck Institute fur Extraterrestrische Physik. (2) Department of Physics and Astronomy, University of Leichester.

The diffuse structure and the variability of Fe Ka line emission from molecular clouds in the Galactic Center (GC) region is an important key to the understanding of the history of Sgr A*. Recently, it has been discovered that the Fe Ka flux is variable in Sgr B2 and Sgr C molecular complexes, and in some sub-pc scale structures in the inner galaxy; this has been interpreted as observational evidence for a past AGN activity of Sgr A* (X-ray Reflection Nebulae scenario, XRN). We have analyzed archival XMM-Newton observations within 15' of Sgr A*. We have studied the variability of the 6.4 keV line by spectrally fitting the MOS spectra derived for specific cloud regions, modeling the background. The Fe Ka line shows a peculiar behavior in the filaments; while some regions show a noticeable variability of the 6.4 keV line flux, some others have constant Fe Ka flux over a time interval of more than 8 years. We stacked the PN spectra to look for the reflection imprintings in the GC molecular clouds. Although the 6.4 keV line Equivalent Width is always higher than 0.5 keV, an Fe K absorption edge has been measured only in two molecular clouds; its values are not consistent with the theoretical predictions for Fe fluorescence yield. We considered dynamical arguments to figure out the distribution of the blobs Fe Ka emitters; we argue that most of the Fe Ka bright filaments are likely to be high density regions within a much larger complex of clouds and filamentary material. We interpret the results in the Cosmic Rays bombardment scenario, showing that this model, besides the XRN one, can also account for all the X-ray features identified from the GC molecular clouds. IXO will unambiguously identify the energizing source of Fe fluorescence, measuring the line width broadening (typical feature of the bombardment scenario) and the polarization of the underlying continuum; this is expected in the XRN scenario, because Thomson scattering polarizes the incident photon flux.

S. CHATY ***: "Towards an understanding of the High Mass X-ray Binaries"***

Authors : S. Chaty

Institute : Université Paris Diderot - Paris 7 & Service d'Astrophysique CEA Saclay

The observed population of High Mass X-ray Binaries has increased a lot with the advent of new high energy satellites such as INTEGRAL, XMM, Chandra and Swift, however our understanding of accretion phenomena in these systems are still matter in the debate. I will review observations of these sources and show how the IXO satellite will be extremely useful to unravel the mysteries of these celestial objects.

E. COSTA ***: "XPOL: a polarimeter for IXO"***

Authors : Ronaldo Bellazzini(1), Alessandro Brez(1), Massimo Minuti(1), Michele Pinchera (1), Gloria Spandre (1), Enrico costa (2), Fabio Muleri (2), Paolo Soffitta (2),

Institute : (1) Sezione di Pisa, INFN (2) IASF-Roma, INAF

XPOL at the focus of IXO can perform angular, time and energy resolved polarimetry with unprecedeted sensitivity. It is based on the Gas Pixel detector which is capable to visualize the ionization track produced in a gas by the photoelectron. From the analysis the angular distribution of photoelectrons is derived and from this the amount and angle of linear polarization of the beam. The GPD includes a beryllium window, 50um thick, a gas cell acting as a conversion/drift gap, a Gas Electron Multiplier, that amplifies the track, in a proportional way, while preserving the shape, and a collection plane with 105600 metal pads acting both as anodes and as input to electronic analysis chains. The pad matrix (on an hexagonal pattern) is the top layer of an ASIC VLSI chip that in lower layers has a complete electronic chain for each pad. The ASIC has self triggering capability and only the data within a region of interest around pixels that triggered is fetched to the output. With a filling of

DME (80%) and He (20%) at 1 atmosphere and a drift gap of 10 mm we expect at 3 keV images of the order of 50 pixels with a detected charge content. The detector and its polarimetric capabilities have been extensively studied and the readiness level is high. A challenge is introduced by the high event rate expected with IXO: e.g. from the Crab we expect around 6000 events per second. This requires an improvement of the existing ASIC to cope with these high rates. A development activity is in progress to produce a new version of the chip. Fortunately the needed gain should be achieved with a limited number of changes for which no major criticality is expected. Another problem is the huge amount of data to be transmitted while observing bright sources. To this purpose the Control Electronics includes a powerful DSP capable to perform onboard analysis so that only essential data are transmitted for each detected photon: energy, time, position in the field and polarization angle. To ensure the correct functionality during the mission, calibration sources, both polarized and unpolarized will be mounted on a filter wheel. As a result the XPOL will have the capability to detect polarizations of 1% in sources of one millicrab. Thanks to the good resolution and to the focal length XPOL will be capable to perform angular resolved polarimetry with a resolution of the order of 5 arcseconds, namely to utilize the whole performance of the telescope.

D. CSEH ***: "Intermediate-mass black hole in globular cluster NGC 6388?"***

Authors : D. Cseh(1), P. Kaaret(2), S. Corbel(1), M. Coriat(1), E. Körding(1), A. Tzioumis(3), B. Lanzoni(4)

Institute : (1)CEA SAp & Univ. Paris Diderot, France (2)Univ. of Iowa, US (3)ATNF, CSIRO, Australia (4)INAF, Italy

We present the results of deep radio observations (with the Australia Telescope Compact Array) and of Chandra observation of the X-ray-detected globular cluster NGC 6388. We show that there is no radio source detected at the cluster center of gravity and at the location of the Chandra X-ray sources of the cluster. Based on the fundamental plane of accreting black holes -- a relationship between X-ray luminosity, radio luminosity and black hole mass-- , we place constraints (upper limit of ~1300 solar masses) on the mass of the putative intermediate-mass black hole located at the center of NGC 6388. We outline our results and discuss the prospectives for International X-ray Observatory on intermediate-mass black holes in globular clusters and/or in Ultra-luminous X-ray Sources.

D. DE MARTINO ***: "Probing accretion in white dwarf binaries with IXO"***

Authors : D. de Martino(1), M.Orio(2,3), K.Mukai(4)

Institute : (1) INAF Capodimonte Astronomical Observatory Naples Italy (2) INAF Padua Observatory Italy (3) University of Wisconsin USA (4) GSFC/NASA and University of Maryland USA

Accreting white dwarf binaries (CVs, Symbiotic) represent key systems to probe accretion effects in non-relativistic strong gravitational enviroment. There are still many open issues that need to be addressed. We will show the potentials of IXO mission in this field to 1) determine the mass of different types of systems to infer those potentially growing to the Chandrasekhar limit; 2) map the accretion flow structure in magnetic systems to test modification of Aizu model; 3) probe the conditions of disk boundary layer in non-magnetic systems; 4) infer the presence of warm absorbers; and to 5) identify the origin of fluorescence iron line.

J.W. DEN HERDER ***: "The X-ray Microcalorimeter Spectrometer"***

Authors : J.W. den Herder, R. Kelley, K. Mitsuda, L. Piro on behalf of the XMS collaboration

Institute : SRON, Netherlands Institute for Space Research

The X-ray Microcalorimeter Spectrometer is one of the instruments onboard IXO. It will provide imaging with high spectral resolution. The instrument is an array of microcalorimeters which are operated at 50 mK. The field of view is 5 x 5 arcmin with a central core of 2 x 2 arcmin for which the resolution will be better than 2.5 eV. We will discuss the present status and limitations of its current design (e.g. response to high countrates)

M. DIAZ TRIGO ***: "The origin of winds in LMXBs and their study with the IXO calorimeter"***

Authors : Maria Diaz Trigo

Institute : XMM-Newton Science Operations Centre, ESA

The presence of winds (and jets) is ubiquitous from young stellar objects (YSOs) to X-ray binaries and super-massive black holes (SMBHs). We expect these outflows to carry both energy and angular momentum away from the associated accretion disc material and, as such, to play a key role in processes as diverse as stellar evolution or AGN feedback. However, the source of the wind is still unknown. In the last decade we have witnessed a wealth of discoveries of hot atmospheres and winds in low-mass X-ray binaries (LMXBs). Made up of a normal star and a collapsed star, LMXBs bridge the gap between YSOs and SMBHs and may hold the answers to the driving mechanism of winds. However, observations of winds in black hole LMXBs occur preferentially in the bright (soft) state of an outburst, at luminosities ~500 mCrab. For neutron star LMXBs disc winds are observed at luminosities ~250 mCrab. Observations of such winds with the calorimeter on-board IXO are not possible with the current specifications, which set a limit in intensity of 100 mCrab even after the use of a diffuser. I will present here the current status of observations of winds in LMXBs and the improvement of our knowledge in this area if such winds are observable with the IXO calorimeter.

D. MICHAL ***: "Polarization in lamp-post model of black-hole accretion discs"***

Authors : M. Dovciak(1), F. Muleri(2,3), R. W. Goosmann(4), V. Karas(1), G. Matt(5)

Institute : (1) Astronomical Institute AS CR, Czech Republic (2) Istituto di Astrofisica Spaziale e Fisica Cosmica, Italy (3) Dipartimento di Fisica, Universita di Roma Tor Vergata, Italy (4) Observatoire Astronomique de Strasbourg, France (5) Dipartimento di Fisica, Universita degli Studi "Roma Tre", Italy

We re-visit the lamp-post geometry of the black-hole accretion disc with a primary illuminating source on the rotational axis. The primary power-law radiation is Compton reflected from the disc towards the observer. The gravitational field of a rotating black hole influences the photon properties on its way from the primary source to the disc and from the primary source and accretion disc to a distant observer. We study the polarization properties of the radiation how they would be observed in this scenario. The degree and the angle of polarization are examined as functions of the black hole spin, observer's inclination angle and height of the primary source. We also show simulations of the observations with the polarimeter designed for the future X-ray mission IXO.

F. DURRET ***: "The clusters Abell 222 and Abell 223 seen with XMM-Newton and CFHT/Megacam"***

Authors : F. Durret, T.F. Lagana, C. Adami and E. Bertin

Institute : IAP (France), IAG/USP (Brazil), OAMP (France), IAP (France)

The Abell 222 and 223 clusters at redshift 0.21 are relatively bright in X-rays, and Abell~223 shows a double structure. A filament has been detected between the clusters both at optical and X-ray wavelengths. The X-ray temperature and metallicity maps show that this is a complex system, the two clusters being in very different dynamical states. Abell 222 is a smaller, less massive and almost isothermal cluster. On the other hand, Abell~223 is more massive, with two visible subclumps that have not yet had time to merge. The proposed scenario is that a small cluster has already crossed Abell 223, which is falling on to Abell 222. This is confirmed by the galaxy luminosity functions, which are smooth for Abell 222 and quite perturbed in Abell 223, with signs of more intense star formation. It is not possible to estimate the temperature and metallicity of the filament joining the two clusters from the present XMM-Newton data, but it should be possible with IXO.

S. ETTORI ***: "Where the wild baryons are: the outer regions of galaxy clusters"***

Authors : Ettori S. (1), Molendi S. (2), Balestra I. (3), Roncarelli M. (4) et al.

Institute : (1) INAF OA Bologna, (2) INAF IASF Milano, (3) MPE Garching, (4) CESR-Univ Toulouse France

Present observations of the ICM provide routinely estimates of the gas density and temperature up to about R2500 (~0.3 Rvir), with only few cases knownwith meaningful measurements at R500 and beyond. Consequently, more than two-thirds of the typical cluster volume, just where primordial gas is accreting and dark matter halo isforming, is still unknown for what concerns both its mass distribution and its thermodynamical properties. We discuss the physical properties of X-ray luminous galaxy clusters in the regions around Rvir as obtained both from a set of hydrodynamical simulations and the Chandra exposures of a dataset of massive objects at intermediate redshift. Perspectives for future X-ray missions to characterize the cluster outskirts are presented.

C. FERRARI ***: "Non-thermal component of galaxy clusters"***

Authors : Chiara Ferrari(1)

Institute : (1)UNS, CNRS UMR 6202 Cassiopée, Observatoire de la Côte d'Azur

Deep radio observations of galaxy clusters have revealed the existence of diffuse radio sources related to the presence of relativistic electrons and weak magnetic fields in the intracluster volume. Intracluster relativistic electrons can also give rise to hard X-ray emission through Compton scattering of CMB photons. I will show the importance of combining galaxy cluster observations by new-generation radio and X-ray instruments such as LOFAR and IXO. A deeper knowledge of the non-thermal cluster component, together with statistical studies of radio halos and relics, will allow to test the current cluster formation scenario and to better constrain the physics of large scale structure evolution.

R.FUSCO-FEMIANO ***: "PROBING GALAXY CLUSTERS FROM CORES TO OUTSKIRTS"***

Authors : R.Fusco-Femiano(1)1, A.Cavaliere(2) & A.Lapi(2,3)

Institute : (1)IASF-Roma/INAF, (2)Univ. Tor Vergata, Roma, (3)SISSA/ISAS, Trieste (Italy)

We interpret the morphology of galaxy clusters basing on our Supermodel, that expresses the entropy-modulated hydrostatic equilibrium of the ICM in the dark matter gravitational wells. With a few physical parameters for the entropy run, this provides for the X-ray brightness and temperature detailed profiles from center to outskirts, that we have successfully compared with several observed clusters. On this basis, we understand the CC vs. NCC cores in terms of age-related entropy feedback into the central ICM from AGNs and deep mergers. We also understand the outskirts structure in terms of the rate of entropy production at the boundary accretion shocks; steep temperature declines are traced back to the late slowdown of structure formation and entropy production in the accelerating Universe. These rich phenomena in the outskirts call for extensive probing even at $z>0.2$ with the next generation of X-ray telescope like IXO.

M. GITTI ***: "The large-scale shock and cold filaments in Hydra A: a Chandra study and IXO prospects"***

Authors : M. Gitti (1,2), P. Nulsen (2), L. David (2), B. McNamara (2,3), M. Wise (4)

Institute : (1) INAF OA Bologna, Italy (2) SAO, USA (3) University of Waterloo, USA (4) University of Amsterdam, The Netherlands

We present a Chandra study of the Hydra A galaxy cluster, where a powerful AGN outburst created a large-scale cocoon shock. We investigate possible azimuthal variations in shock strength and shape, finding indications for a weak shock with Mach number varying between ~ 1.2-1.3. We attempt a measure of the temperature variation across the shock front. However, the detection of a temperature rise in the regions immediately inside of the front is complicated by the underlying rising temperature profile of the global cluster atmosphere. We measure the global temperature profile of the cluster up to 700 kpc, which represents the farthest measurement obtained with Chandra data in this cluster. The temperature profile peaks around 190 kpc, just inside the shock front. However, such a temperature feature is unlikely to be produced by the shock as it is consistent with the general shape of the temperature profiles observed for relaxed galaxy clusters. A "plateau" in the temperature profile between 50-150 kpc indicates the presence of cold gas, which is likely the result of central uplift by the AGN outburst. We study the spectral properties of the cold filaments and estimate its volume filling factor. We also attempt a mapping of the emission measure distribution, finding limitation by the Chandra spectral resolution. Finally, we briefly discuss possible prospects of IXO for the study of AGN feedback in galaxy clusters and groups.

A. GOLDWURM ***: "The Glorious Past of the Supermassive Black Hole at the Galactic Center Unveiled by the Variable Molecular Cloud X-ray Emission"***

Authors : A. Goldwurm (1,2), G. Ponti (2,3), R. Terrier(2), G. Belanger (4), G. Trap(1,2)

Institute : 1) SAp/IRFU/CEA - Saclay, France 2) APC - Paris, France 3) School of Physics, Univ. of Southampton, UK 4) ESAC/ESA - Villanueva de la Canada, Spain

The 8 year XMM-Newton and INTEGRAL monitoring of the Galactic Centre have provided new crucial measurements of the past activity of Sgr A*, the supermassive black hole (SMBH) at the galactic center. We indeed discovered the decrease over the years of the hard X-ray emission from the Sgr B2 giant molecular cloud and a superluminal propagation of the neutral iron Kalpha line emission at 6.4 keV through the molecular clouds (MC) located close, in projection, to Sgr A*. These variability and spectral measurements trace the recent history of Sgr A*, since they are likely due to reflection and fluorescence excitation of cold molecular material by high-

energy radiation emitted by the central SMBH in the past. The MC emission variations, besides to exclude alternative models for the 6.4 keV line emission and the hard continuum based on particle interactions, can indeed be explained assuming that Sgr A* underwent a single outburst that rose its luminosity at a level of 10E39 erg/s (10E6 times higher than its present X-ray luminosity but still 10E-5 times its Eddington limit) about 400 year ago, stayed luminous till about 100 years back and then decayed to the present level of very weak activity. These results seem to show then that Sgr A* activity was, only 100 years ago, comparable to the one of the typical quiescence state of low-luminosity AGN.

S. HAUF ***: "Monte-Carlo Simulations of Wide Field Imager aboard the International X-Ray Observatory and Validation of the GEANT4 radioactive decay simulation"***

Authors : S. Hauf (1), M. Kuster (1), Z. Bell (2), D.H.H Hoffmann (1), M.G. Pia (3, 8), A. Stefanescu (4, 5), L. Strüder (5), G. Weidenspointner (6), A. Zoglauer (7)

Institute : (1) IKP,TU Darmstadt, Germany (2) Oak Ridge National Labs, USA (3) CERN, Switzerland (4) Johannes Gutenberg University, Germany (5) MPI HLL, Germany (6) MPE, Germany (7) SSL, University of California, USA (8) INFN, Italy

The International X-ray Observatory - IXO is a joint X-ray mission of NASA, ESA and JAXA. The observatory will provide high resolution imaging, spectroscopy and high time resolution in the energy range between 0.1 and 40 keV. In order to fulfill the mission goals a high sensitivity is essential, especially to study faint and extended sources. Thus a detailed understanding of the detector background induced by cosmic ray particles is crucial. During mission design generally extensive Monte-Carlo simulations are used to estimate the detector background in order to optimize shielding components and software rejection algorithms. The Geant4 tool-kit is frequently the tool of choice for this purpose. We present recent results of our estimates for the IXO WFI cosmic ray induced background, which demonstrate that DEPFET-technology based detectors are able to achieve the required low background rates. We also present different optimization possibilities for the mechanical detector design, data post-processing as well as first results of experimental verification of GEANT4 radio active decay physics.

R. HEILMANN ***: "Critical-Angle Transmission grating spectrometer for the IXO"***

Authors : R. K. Heilmann et al.

Institute : MIT

High-resolution spectroscopy at energies below 1 keV covers the lines of C, N, O, Ne and Fe ions, and is central to studies of the Interstellar Medium, the Warm Hot Intergalactic Medium, warm absorption and outflows in Active Galactic Nuclei, coronal emission from stars, etc. The large collecting area, long focal length, and 5 arcsecond telescope point-spread function of the International X-ray Observatory will present unprecedented opportunity for a grating spectrometer to address these areas at the forefront of astronomy and astrophysics. We present the current status of a transmission grating spectrometer based on recently developed high-efficiency critical-angle transmission (CAT) gratings that combine the traditional advantages of blazed reflection and transmission gratings. The optical design merges features from the Chandra HETGS and the XMM-Newton RGS, and provides spectral resolution $R = E/\Delta E > 3000$ and effective area > 1,000 cm2 in the soft x-ray band. We shall discuss recent results on grating fabrication and diffraction efficiency, as well as on the design of the readout camera and grating array structures.

A. HOLLAND ***: "The Off Plane X-ray Grating Spectrometer for IXO"***

Authors : Andrew Holland (1), Randall McEntaffer(2), Webster Cash(3), Mat Page (4), Neil Murray(1), James Tutt(1), Suzanne Casement(5), Chuck Lillie(5), Peter Pool(6), James Endicott(6)

Institute : (1) Open University (2) Iowa University (3) Colorado University (4) University College London (5) Northrop Grumman (6) e2v technologies

This poster describes the off-plane X-ray grating spectrometer (OP-XGS) instrument concept for IXO and presents the new baseline configuration for the instrument. At the current time the instrument concept is being completely reviewed as part of the ESA pre Phase-A study for the mission, and this has resulted in adoption of a "tower" design fir the instrument, placing the gratings at 5m from the detector focal plane. We present the new design concept which achiever R>3000 and an effective area >1000 cm2 over most of the 0.3-1 keV band. We will show results from detailed ray-tracing which demonstrate the instrument performance.

R. HUDEC ***: "Alternative Designs and Technologies for IXO X-Ray Optics"***

Authors : R. Hudec (1,2), L. Pina(1,3), V. Marsikova (3), M. Skulinova (1), A. Inneman (3), M. Mika (4)

Institute : Astronomical Institute Ondrejov (1) Czech Technical University in Prague, Prague (2) Rigaku Innovative Technologies Europe, Prague (3) Institute of Chemical Technology, Prague (4)

We will report on ongoing activities in design, development, and tests of alternative designs and technologies for IXO X-ray optics. The alternative design is based on Kirkpatrick-Baez arrangement, and the technologies studied include precisely shaped glass foils and silicon wafers, but also further alternatives are under study such as glassy carbon.

R. HUDEC ***: "Hard X-ray observations of cataclysmic stars and related objects"***

Authors : Rene Hudec (1,2) Martin Blazek (1,2) Rudolf Galis (1) Matus Kocka (1)

Institute : 1 Astronomical Institute Ondrejov, Czech Rep. 2 Czech Technical University in Prague, Czech Rep.

Hard X-ray observations of cataclysmic stars and related objects based on Integral IBIS data will be presented and discussed.

R HUDEC ***: "High Energy Sources and ESA Gaia"***

Authors : R. Hudec (1,2) V. Simon (1) L. Hudec (2)

Institute : 1 Astronomical Institute Ondrejov, Czech Rep. 2 Czech Technical University in Prague, Czech Rep.

The possibilities of investigations of astrophysical high-energy sources with ESA Gaia will be presented and discussed. The main power is based on detection of transients and spectro-photometry.

D. HUENEMOERDER ***: "Stellar Flare Dynamics from High-Resolution X-rays"***

Authors : D.P. Huenemoerder (1) N. S. Schulz (1) R. A. Osten (2) R. K. Heilmann (1) M. L. Schattenburg (1)

Institute : (1) MIT (2) STScI

Stellar flares on cool stars are a ubiquitous phenomenon in the X-ray spectral region. This most dynamic aspect of coronal activity is possibly a primary source of coronal heating. On the Sun, flares are known to be a manifestation of the reconnection of magnetic fields and are accompanied by particle beams, chromospheric evaporation, rapid bulk flows, mass ejection, and heating of plasma confined in loops. Modeling the dynamic behavior allows us to constrain loop properties in ways that cannot be done from analysis of quiescent coronae that necessarily require a spatial and temporal average over some large ensemble of structures. Hard X-rays (7-20 keV) cause Fe K fluorescence whose presence and time profile can also be a powerful diagnostic of flare loop geometry. The International X-Ray Observatory (IXO) promises unprecedented advances in effective area and resolution for X-ray spectroscopy. We present simulations to explore opportunities IXO might offer for studying high-energy dynamics in the outer atmospheres of stars. In particular, we will explore the ability to obtain time-resolved spectral diagnostics from flares of cool, coronally active stars. We expect IXO to obtain both quantitative improvements (more sources, better sensitivity) and qualitative advances (new constraints on hydrodynamic models). This work was supported by SAO contract SV3-73016 to MIT/CXC under NASA contract NAS8-03060 to SAO.

R. IPING ***: "Wind collision in O + O Binaries"***

Authors : Rosina Iping, Doug Gies, George Sonneborn

Institute : the Catholic University of America, Georgia State University, NASA/GSFC

We present a study of the most massive known binaries comprised of O-type stars to determine the nature and the geometry of the colliding winds bow shock. We compare observations of Magellanic Clouds systems with little reddening and foreground gas, with Galactic counterparts. The spectra provide quantitative and systematic studies of phase-dependent stellar wind properties, wind collision effects in O + O binaries and spectro-photometric changes as a function of orbital phase.

M. G. F. KIRSCH ***: "IXO-operations with a special view on ToO"***

Authors : Marus G. F. Kirsch (1), Rainer Timm (1)

Institute : (1)ESA, European Space Operations Centre, Darmstadt, Germany

The operations concept of the International X-ray observatory is in its definition phase. It has to satisfy two opposing requirements: quick reaction to Targets of Opportunity (ToO) on the one hand and cost effective operations (i.e. preplanned and minimised coverage) on the other hand. We present a possible scenario of operations combining the mission requirements with the gained expertise from missions like Herschel/Planck with respect to L2 operations as well as XMM-Newton and Integral expertise evaluating the possibility and feasibility of special operations for ToO. In order to satisfy the reaction time for a ToO of 24 h additional Ground Station passes would need to be pre-booked which is considered to be too costly. As an alternative we consider the possibility of best effort based uplink slots with any available ESTRACK X-band station or any other station as a kind of Ground Station pass on demand and describe the resulting ToO operations flow.

P. KRETSCHMAR ***: "X-raying absorbing material in Vela X-1"***

Authors : Peter Kretschmar(1), Pedro Quintana(2), Martin Stuhlinger(1), Ingo Kreykenbohm(3), Felix Fuerst(3), Laura Barragan(3), Joern Wilms(3), Ruediger Staubert(4)

Institute : (1) ESA/ESAC, Spain (2) Universidad Complutense de Madrid, Spain (3) Dr. Karl Remeis-Sternwarte & ECAP, FAU Erlangen-Nuremberg, Germany (4) IAAT, University of Tübingen, Germany

Vela X-1 is a well-known wind-accreting X-ray pulsar, known to have a clumpy stellar wind with strong variations on different timescales. We have (re-)analyzed available data from RXTE, XMM-Newton, and EXOSAT in a systematic fashion in order to measure the amount of absorbing material at a large number of times and orbital phases. The results are compared with expectations from wind models and other historical measurements.

D. LIN ***: "IXO/HTRS Study of Neutron Star Low-mass X-ray Binaries"***

Authors : Dacheng Lin(1), Didier Barret(1), Ronald Remillard(2), Jeroen Homan(2), David R. Ballantyne(3)

Institute : (1)Centre d'Etude Spatiale des Rayonnements (2)MIT Kavli Institute for Astrophysics and Space Research (3)Georgia Institute of Technology

IXO/HTRS is very suitable for study of neutron-star low-mass X-ray binaries (NS LMXBs), due to its special features: high time and energy resolutions, broad energy band, large effective area, and capability to observe bright sources. Using simulation data based on the fit results of Suzaku data from NS LMXBs, we show that IXO/HTRS can provide great constraints on the inner disk radii from both the relativistic Fe line and the disk continuum emission. They can be compared with simultaneous detection of kHz QPOs, which are often seen in NS LMXBs and IXO/HTRS is able to detect at very low signal levels. This can put great constraint on the models for kHz QPOs, and possibly also the equation of state for NSs. Using simulation of NS LMXBs in the low hard state, we find that the disk continuum in this state can also be well constrained using IXO/HTRS, which is of great importance for understanding the accretion process in this state.

H. L. MARSHALL ***: "Adapting the IXO Grating Spectrometer for Polarimetry"***

Authors : H. L. Marshall(1), K. Murphy(1), N. S., Schulz(1), R. Heilmann(1), and K. Jenks(1)

Institute : (1) MIT Kavli Institute

A novel approach for measuring linear X-ray polarization over a broad-band using conventional imaging optics and cameras is described. The International X-ray Observatory's grating spectrometer is used to disperse soft X-rays radially from the telescope axis. A set of laterally graded multilayer-coated flat mirrors redirect the dispersed X-rays to the spectrometer's readout detectors at large angle to the incoming beam. The intensity variation with position angle is measured to determine three Stokes parameters: I, Q, and U. The multilayer optics are laterally graded in order to match the dispersion of the gratings, taking advantage of high multilayer reflectivities to achieve modulation factors over 50% over the entire 0.2 to 0.8 keV band. Polarizations as low as 1% can be measured as a function of wavelength when observing sources with mCrab level fluxes.

R. MCENTAFFER ***: "Reflection Gratings for IXO Soft X-ray Spectroscopy"***

Authors : Randall McEntaffer, Ted Schultz, Webster Cash, Chuck Lillie, Suzanne Casement, Andrew Holland, Neil Murray, Simeon Barber, James Tutt, Mat Page, Dave Walton

Institute : University of Iowa, University of Colorado, Northrop Grumman Aerospace Systems, Open University, Mullard Space Sciences Laboratory

We present a reflection grating concept for the X-ray Grating Spectrometer on the International X-ray Observatory. One of several designs studied places the gratings on a tower extended from the instrument platform. This solution offers several advantages including low mass, small beam obscuration, and relative calibration ease, while offering possible system advantages. The latter includes a structure for a common baffle, mounting for particle scrubbers, surfaces for getters, and MLI wrapping for decreased stray light. The mechanical design will be presented as well as predicted performance of the spectrometer and simulations of key science targets.

F. MIRABEL ***: "Stellar black holes at the dawn of the universe"***

Authors : I.F. Mirabel^1, Ph. Laurent^1, A. Loeb^2, M. Disktra^2

Institute : ^1. CEA-IRFU-Sap ^2. Harvard University

Based on current theoretical models of the formation and collapse of primordial stars, and on the multiple observations of compact stellar remnants in the near and distant universe, we propose that a relatively large fraction of the first generations of massive stars may have imploded, ending as stellar black holes in high mass x-ray binaries. Monte Carlo simulations show that the x-ray radiation and energetic outflows from microquasars may have played a complementary role to the UV radiation from their massive stellar progenitors, heating and reionizing the intergalactic medium over large volumes of space, preventing the collapse of ordinary matter onto low mass dark matter haloes. We propose to test this hypothesis with IXO.

F. NICASTRO ***: "Growing Evidence for the WHIM in X-rays (and FUV)"***

Authors : F. Nicastro, L. Zappacosta, R. Maiolino, Y. Krongold

Institute : INAF-OAR/FORTH

Five years after the first tentative and controversial discovery of the WHIM in the X-rays, recently additional pieces of evidence for the existence of the WHIM have been gathered by several authors (Buote et al., 2009; Fang et al., 2010; Nicastro et al., 2010; Zappacosta et al, 2010). Here we present these new WHIM detections, and show the first differential measurement of the number density of OVII filaments per unit redshift. We also present new methodologies to search for WHIM in emission in wide-field X-ray survey, and discuss the consequences of our preliminary findings for IXO.

L. M. OSKINOVA ***: "What we don't know yet about massive stars but can learn with IXO"***

Authors : L. M. Oskinova

Institute : University of Potsdam, Germany

X-ray emission is ubiquitous among massive stars. X-ray observations in the last decade revolutionized our perception of stellar winds but opened a Pandora's box of urgent problems. Among the most pressing questions is what are the parameters of wind clumping. This is pre-requisite to obtain correct stellar mass-loss rates - a key ingredient of massive-star feedback. High S/N high-resolution spectra are needed to address this problem. Another question is what is the role of magnetic field and rotation in the physics of massive stars. IXO observations are needed to study these stellar properties. We still do not understanding the X-rays from some core-collapse SNe and GRB progenitors, especially the Wolf-Rayet stars. IXO observations will be perfectly apt to study these evolved stars and their circumstellal environment.

G. PARESCHI ***: "Hot slumping glass technology in Europe for the grazing incidence IXO optics"***

Authors : Stefano Basso (1), Marcos Bavdaz (2), Paolo Conconi (1), Oberto Citterio (1), Marta Civitani (1), Peter Friedrich (3), Mauro Ghigo (1), Benedikt Guldimann (2), Giovanni Pareschi (1), Laura Proserpio (1), Anita Schael (3), Daniele Spiga (1), Giampiero Tagliaferri (1), Monika Vongehr(3), Alberto Zambra (1)

Institute : (1)INAF/Osservatorio Astronomico di Brera, Milano-Merate, Italy (2) European Space Agency, ESTEC Netherlands (3) Max-Planck-Institut für Extraterrestrische Physik, Garching, Germany

The mirrors of the International X-ray Observatory (IXO) consist of a large number of high quality segments delivering a spatial resolution better than 5 arcsec. A study concerning the slumping of thin glass foils for the IXO mirrors is under development in Europe, financed by ESA and led by the Brera Observatory. We are investigating two approaches, the Direct Slumping that needs a convex mould, or the Indirect Slumping that needs a concave mould. In the first case the optical surface of the glass is in direct contact with the surface of the mould during the thermal cycle, while in the second case the back of the optical surface is in contact with the mould. Then, the slumped MPs will be characterized to define their optical quality and micro-roughness. We will assess which of these processes offers the best performances and present the results, including X-ray tests, obtained for a demonstrative module consisting of 3+3 (parabola+hyperbola) MPs fabricated with the selected approach.

P.O. PETRUCCI ***: "The pertinence of Jet Emitting Discs in Microquasars"***

Authors : P.O. Petrucci(1), J. Ferreira(1), G., Henri(1), C. Foellmi(1), J. Malzac(2)

Institute : (1)LAOG/CNRS France (2)CESR/CNRS France

Based on the complete calculation of the full accretion-ejection set of equations, we developped since a few years a model that aims at explaining the spectral states of BH binaries as well as their spectral evolution during outbursts. In our view, the accretion flow is pervaded by a large scale magnetic field of bipolar topology. In the hard state, the field is large enough for a new class of accretion flow to set in where most of the released accretion power feeds self-collimated jets. Such a Jet Emitting Disc (JED) has dynamical properties quite different from both the standard and advection dominated discs. It also exhibits three different thermal equilibrium branches at a given radius: two stable (cold and hot) and one intermediate unstable. The hot solution has all the characteristics of the so-called "hot corona" generally invoked in XrB sytems in the Low/Hard states. We will detail the energetics and radiative expectations of our model and show their good agreement with those observed in Cygnus X-1, the proptotype of microquasars.

G. PONTI ***: "Discovery of a super-luminal Fe K echo at the Galactic center "***

Authors : G. Ponti(1,2), R. Terrier(1), A. Goldwurm(3),

Institute : (1) APC, Paris, France (2) University of Southampton, UK (3) CEA Saclay, France (4) ESA/ESAC Madrid, Spain

The study of the X-ray emission from the Galactic Centre (GC) Molecular Clouds (MC), within 15 arcmin from SgrA*, will be presented. We use XMM-Newton data (about 1.2 Ms of observation time) spanning about 8 years. The MC spectra show all the features characteristic of reflection: intense FeKα, with EW of about 0.7-1 keV, and the associated Kβ line; flat power law continuum and significant FeK edge. The diffuse lowly ionised FeK emission follows the MC distribution, nevertheless not all MC are FeK emitters. The long baseline monitoring allows the characterisation of the temporal evolution of the MC emission, showing a complex pattern of significant variations. In particular, we observe an apparent super-luminal motion of a light front illuminating a Molecular nebula. This might be due to a source outside the MC (such as SgrA* or a bright and long outburst of a X-ray binary), while it can not be due to low energy cosmic rays or a source located inside the cloud. We also observe a decrease of the X-ray emission from G0.11-0.11, behaviour similar to the one of SgrB2. The line intensities, clouds dimensions, columns densities and positions with respect to SgrA*, are consistent with being produced by the same SgrA* flare. The required high luminosity (about 1.5×10^39 erg s−1) can hardly be produced by an binary system, while it is in agreement with a flare of SgrA* fading about 100 years ago. The low intensity of the FeK emission coming from the 50 and the 20 km s−1 MC places an upper limit of 3×10^35 erg s−1 to the mean luminosity of SgrA* in the last 60-90 years. The FeK emission and variations from these MC might have been produced by a single flare of SgrA*.

A. PTAK ***: "IXO Observations of Starburst Galaxies"***

Authors : Andrew Ptak (1) Dave Strickland (2)

Institute : (1) NASA/GSFC (2) Johns Hopkins University

We will present IXO simulations of hot gas and individual binaries in nearby starburst galaxies. These simulations show that IXO will detect hot gas outflows in ~ 30 local starburst galaxies with the XMS, where the 2.5 eV spectral resolution is crucial. We will also discuss simulations of simultaneous soft (E<10 keV) and hard (E>10 keV) X-ray detections of bright X-ray binaries in nearby galaxies, most notably ULXs. These observations should unambiguously detect Fe-K emission from the ULXs and very hot gas, and determine whether ULXs or hot gas (or some other diffuse emission mechanism) is likely dominating the hard X-ray emission.

G. RAUW ***: "High-resolution X-ray diagnostics of stellar winds and their interactions in massive stars"***

Authors : G. Rauw (1), L. Mahy (1), Y. Nazé (1) and the GAPHE team (1)

Institute : (1) Institut d'Astrophysique & Géophysique, Liège University

We discuss the possibilities of using high-resolution X-ray spectrometers such as XMS onboard IXO to investigate the morphology of wind-wind interactions in massive binaries. Colliding wind interactions often produce a hard thermal X-ray component with a prominent Fe K-alpha line and we propose to use the Doppler tomography technique, already widely applied in the optical domain, to map the X-ray emitting plasma in these systems. This approach yields fundamental information about the properties of the stellar winds.

P. ROSATI ***: "The Wide Field X-ray Telescope Mission"***

Authors : P. Rosati(1) and the WFXT Team

Institute : (1) ESO, Garching, Germany

The Wide Field X-Ray Telescope (WFXT) is a medium-class mission designed to be 2-orders-of-magnitude more sensitive than any previous or planned X-ray mission for large area surveys and to match in sensitivity the next generation of wide-area optical, IR and radio surveys. Using an innovative wide-field X-ray optics design, WFXT provides a field of view of 1 square degree with an angular resolution of 5″ (Half Energy Width) nearly constant over the entire field, and a large collecting area (0.5-1 sq.meter) over the 0.1-7 keV band. In five years of operation, WFXT will perform three extragalactic surveys that will cover most of the sky to ~500 times the sensitivity of the ROSAT All Sky Survey, ~3000 deg^2 to deep Chandra or XMM-Newton sensitivity, and 100 deg^2 to the deepest Chandra sensitivity. This will generate a vast legacy data set, including >~5×10^5 clusters of galaxies to z~2, >10^7 AGN to z > 6, with direct physical characterization for a significant fraction of them via X-ray spectroscopy. WFXT is a scientifically broad mission which will shed new light on outstanding questions ranging from the formation and evolution of large scale structure and black holes, to cosmology and fundamental physics.

R. SAMBRUNA ***: "Discovery of ultra-fast outflows in a sample of Broad Line Radio Galaxies"***

Authors : R. Sambruna, F. Tombesi, J. Reeves, V. Braito, L. Ballo, M. Cappi, R. Mushotzky

Institute : NASA/GSFC, NASA/GSFC, Keele Univ., Leicester Univ., CSIC-UC, INAF-IASF, UMD

We present the results of a uniform and systematic search for blue-shifted Fe K absorption lines in the X-ray spectra of five bright Broad-Line Radio Galaxies (BLRGs) observed with Suzaku. We detected, for the first time in radio-loud AGN, several absorption lines at energies greater than 7~keV in three out of five sources, namely 3C~111, 3C~120 and 3C~390.3. The lines are detected with high significance according to both the F-test and extensive Monte Carlo simulations. Their likely interpretation as blue-shifted Fe XXV and Fe XXVI K-shell resonance lines imply an origin from highly ionized gas outflowing with mildly relativistic velocities, in the range $v$$simeq$0.04--0.15c. A fit with specific photo-ionization models gives ionization parameters in the range log$xi$$simeq$4--5.6~erg~s^{-1}~cm and column densities of $N_H$$simeq$$10^{22}$--$10^{23}$~cm^{-2}. These characteristics are very similar to those of the Ultra-Fast Outflows (UFOs) previously observed in radio-quiet AGN. Their estimated location within sim0.01--0.3pc from the central super-massive black hole suggests a likely origin related with accretion disk winds/outflows. Depending on the absorber covering fraction, the mass outflow rate of these UFOs can be comparable to the accretion rate and their kinetic power can correspond to a significant fraction of the bolometric luminosity and is comparable to their typical jet power. Therefore, these UFOs can play a significant role in the expected feedback from the AGN on the environment and can give us further clues on the relation between the accretion disk and the formation of winds/jets in both radio-quiet and radio-loud AGN.

C. SCHMID ***: "Simulations of the performance of the WFI, the HTRS, and the XMS"***

Authors : C. Schmid(1), J. Wilms(1), I. Kreykenbohm(1), M. Martin(2), E. Kendziorra(2), B. Mück(2), D. Barret(3), D. Rambaud(3)

Institute : (1) ECAP, Germany (2) IAAT, Germany (3) CESR/CNRS, France

We present a generic X-ray instrument simulation tool developed for studies of future X-ray missions. According to the concept of Monte Carlo simulations the software generates a sample of photons for different kinds of X-ray sources characterized by realistic spectra and light curves. The imaging by a Wolter telescope and

the detection process are modelled by means of standard calibration files like a point spread function and the detector response. The resulting event files have FITS format and can be analysed with standard tools. With this software we have studied the detector-specific pile-up behaviour of the Wide Field Imager, the High Time Resolution Spectrometer, and the X-ray Microcalorimeter Spectrometer on the International X-ray Observatory in order to estimate the bright source performance of these instruments. The alignment requirements for the HTRS have also been analysed based on the output of the simulation.

N. S SCHULZ ***: "Absorption Spectroscopy with the IXO-XGS"***

Authors : Norbert S Schulz, Glenn Allen, Mark W. Bautz, Claude R. Canizares, John Davis, Dan Dewey, David P. Huenemoerder, Ralf Heilmann, John Houck, Herman L. Marshall, Mike Nowak, Mark Schattenburg

Institute : MIT Kavli Institute for Astrophysics & Space Science

Understanding the origins and distribution of matter in the Universe is one of the most important quests in physics and astronomy. Themes range from astro-particle physics to chemical evolution in the Galaxy to cosmic nucleosynthesis and chemistry in an anticipation of a full account of matter in the Universe. Studies of chemical evolution in the early Universe will answer questions about when and where the majority of metals were formed, how they spread and why they appar today as they are. The evolution of matter in our Universe cannot be characterized as a simple path of development. In fact the state of matter today tells us that mass and matter is under constant reformation through on-going star formation, nucleosynthesis and mass loss on stellar and galactic scales. X-ray absorption studies have evolved in recent years into powerful means to probe the various phases of interstellar and intergalactic media. Future observatories such as IXO will provide vast new opportunities to study structure and distribution of matter with high resolution X-ray spectra. Specifically the capabilities of the soft energy gratings with a resolution of R=3000 below 1 keV onboard IXO will provide ground breaking determinations of element abundance, ionization structure, and dispersion velocities of the interstellar and intergalactic media of our Galaxy and the Local Group.

G. SONNEBORN ***: "The James Webb Space Telescope"***

Authors : G. Sonneborn (1)

Institute : (1) JWST Project Science Office, NASA Goddard Space Flight Center, USA

The James Webb Space Telescope (JWST) is a large aperture, cryogenic, infrared-optimized space observatory under development by NASA for launch in 2014. The European and Canadian Space Agencies are mission partners. JWST will find and study the first galaxies that formed in the early universe, peer through dusty clouds to see AGN environments and stars forming planetary systems at high spatial resolution. The breakthrough capabilities of JWST will enable new studies of star formation and evolution in the Milky Way, including the Galactic Center, nearby galaxies, and the early universe. JWST's instruments are designed to work primarily in the infrared range of 1 - 28 microns, with some capability in the visible. JWST will have a segmented primary mirror, approximately 6.5 meters in diameter, and will be diffraction-limited at wavelength of 2 microns (0.1 arcsec resolution). The JWST observatory will be placed in a L2 orbit by an Ariane 5 launch vehicle provided by ESA. The observatory is designed for a 5-year prime science mission, with propellant for 10 years of science operations. The instruments will provide broad- and narrow-band imaging, coronography, and multi-object and integral-field spectroscopy (spectral resolution of 100 to 3,000) across the 1 - 28 micron wavelength range. Science and mission operations will be conducted from the Space Telescope Science Institute in Baltimore, Maryland.

A. STEFANESCU ***: "The IXO Wide Field Imager"***

Authors : A. Stefanescu (1,2) M.W. Bautz (3) D.N. Burrows (4) L. Bombelli (5,6) C. Fiorini (5,6) G. Fraser (7) K. Heinzinger (8) K. Hermenau (1,11) S. Herrmann (1,9) M. Kuster (10) T. Lauf (1,9) P. Lechner (8) G. Lutz (1,11) P. Majewski (8) A. Meuris (1) S.S. Murray (12) M. Porro (1,9) R. Richter (1,11) A. Santangelo (13) G. Schaller (1,9) F. Schopper (1,9) H. Soltau (8) L. Strüder (1,9) J. Treis (1,14) H. Tsunemi (15) G. de Vita (1,9) J. Wilms (16,17)

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One of the instruments on board of IXO is going to be the Wide Field Imager (WFI), an imaging X-ray spectrometer with a Field-of-View of 18 arcminutes. It will be sensitive between 0.1-15 keV, and offer spectrally and time resolved photon counting and imaging with the full angular resolution of the mirrors with good energy resolution. The WFI will be implemented as a 6 inch wafer-scale monolithical array of 1024 x 1024 pixels of 100um x 100um size each. The WFI detector is fully depleted using the sideways depletion principle. Each individual pixel combines the functionalities of both detector and amplifier by use of the innovative DEpleted P-channel Field-Effect Transistor (DEPFET) concept. In a DEPFET, signal electrons are trapped in a potential minimum below a MOS transistor's gate, modulating the transistor current. Even when the device is powered off, the signal charge is collected and kept in the potential well below the gate until it is explicitly cleared. This makes flexible and fast read-out modes possible, allowing the high readout speeds necessary with the collecting area of IXO, and offers additional advantages in radiation hardness compared to CCDs.

M. WISE ***: "AGN Feedback in Clusters: Early LOFAR Results to Future Synergies with the SKA"***

Authors : M. Wise

Institute : ASTRON (Netherlands Institute for Radio Astronomy)

In recent years, the combination of high resolution X-ray data and radio data has been crucial in recognizing the impact of AGN feedback on the ICM in the cores of galaxy clusters. The observation of high and low frequency radio plasma filling the X-ray cavities now routinely seen in cluster cores is one of the main pieces of evidence, albeit circumstantial, connecting these cavities with the central AGN. Taken together these data allow estimates for the total AGN energy input into the ICM as well as provide constraints on the particle content of the jets and duty cycle for outburst activity. Recent work has shown that low frequency radio data in particular may provide an excellent proxy for the total cavity energy in the X_ray. By calibrating this relationship at lower redshifts in systems with good quality X-ray and radio data, we can use future low frequency radio surveys such as those planned with LOFAR and ultimately SKA constrain the amount of energy input into the ICM by AGN as a function of redshift. In this talk, we will show examples using current Chandra and VLA data to constrain the amount and location of AGN energy input into the ICM. We will show some early examples from LOFAR and discuss how this synergy between X-ray and radio will continue into the era of IXO and the SKA.