



e-newsletter

Issue 1, 2014

Australian X-ray Analytical Association

President's Address

Welcome to the first AXAA newsletter for 2014! First and foremost, the new AXAA National Council was formed at the AGM, held at our recent 2014 Workshops, Conference and Exhibition (AXAA-2014). I am honoured to have been elected President, and will endeavour to serve the AXAA community with the enthusiasm, passion and commitment that our outgoing President, Vanessa Peterson, brought to the role during her six year tenure.

I am very happy that Vanessa isn't going far as the new Vice President of council, and that Natasha Wright (CSIRO) and Gordon Thorogood (ANSTO) remain in their roles of Secretary and Treasurer, respectively. I also welcome Mark Styles (CSIRO) as our new Newsletter Editor. I certainly enjoyed the role, and I'm sure Mark will also. Please keep your contributions to the Newsletter coming!

Things will be a bit quieter for the rest of the year as we have a break from AXAA-2014, which I think everyone who attended will agree was a huge success. Read on for a wrap-up.

To all of those who took part in AXAA-2014, thank you for helping to make the event what it was, and for completing the post-conference survey which will go a long way to ensuring the next AXAA conference will be even better. A special thank you to the organisers of the pre-conference workshops, to the members of the Conference Program Committee who helped shape the conference, and of course to all of our sponsors.

We will begin ramping up our activities again in 2015 with state events which, after recent discussions with the Australian Microscopy and Microanalysis Society (AMMS), may be joint AXAA/AMMS events. Keep an eye out for further details in future Newsletters.

Nathan Webster
AXAA President

AXAA-2014 Workshops, Conference & Exhibition — Wrap Up

9-14 February 2014
Pan Pacific Hotel, Perth, WA

As the closest city to many of the continent's resource industries, Perth has proudly hosted another successful

international conference, organised by the National Council of the Australian X-ray Analytical Association and Tulips Meeting Management. I am sure all the AXAA-2014 delegates appreciated their successful planning and tireless efforts.

The educational role of AXAA was once again achieved through two days of pre-conference workshops. Many research students and early career practitioners gratefully gained basic knowledge from the XRF workshops led by Ken Turner and Gary Pritchard, the XRD workshops led by Brian O'Connor and Ian Madsen, and the ICDD workshop led by Cyrus Crowder and Tom Blanton. Their great lectures and behind-the-scenes work were heartily acknowledged by the AXAA president, Vanessa Peterson, at the Welcome Reception sponsored by PANalytical, at the Royal Perth Yacht Club.

Together with the intrinsic topics of materials characterisation, this conference featured the latest advances of mineral processing and characterisation, not only of earth but also of extraterrestrial samples. Prof. David Bish (Indiana University, USA) shared the exciting landing moment of the Mars rover, Curiosity, and demonstrated XRD patterns of Martian samples, which contain smectite, a water-bearing clay mineral.



Left) Prof. David Bish presenting the diffraction patterns of smectite collected by the CheMin Analyser on the Mars rover, Curiosity. Right) Delegates enjoying the poster session with refreshments in the exhibition hall.

The plenary talks were of a very high standard, and highlighted several advances in mineral processing and analysis. John Fowler, Vice President of Intertek Minerals, shared his experience in analytical services for the mining industry and described the current trend of automation and integration for analytical processing. Pamela Whitfield, Chair of the IUCr CPD, outlined, through several case studies, how the methodologies developed from materials analysis could help in mineral structural determinations.



Above) Robert Von Dreele, describing the developments included in the GSAS-II software package. Left) William David, encouraging young scientists to pursue combined structural analysis.

University) and Henry Spratt (Queensland University of Technology) for Best Poster Presenter. I am sure their exceptional works will inspire and encourage other young people to pursue excellence in various fields of X-ray analysis.



Above Left) Vanessa Peterson presenting the AXAA Award for Excellence in Analysis by an Early Career Scientist to Joel O'Dwyer. Above) Samuel Liu (University of Sydney), Marek Rouillon (Macquarie University), and Nathan Nagle (Macquarie University) holding their awards. Left) Henry Spratt (Queensland University of Technology) accepting the award from Tom Blanton (ICDD).

Over seventy parallel talks and poster presentations prove that this year's AXAA meeting was richly informative. The diverse topics ranged from mining to environments, from bio-crystallography to new energy. Particularly impressive to me were the examination of thermal behaviours of Mirabilite, a supposed mineral on icy satellites of Jupiter, under conditions simulated by Helen Brand, and the applications of XRD, ND and XANES in designing new Sillen-Aurivillius phases for enhanced ferroelectric and magnetic properties, presented by Samuel Liu. A particular highlight of the conference was the presentation of an IUCr video for the International Year of Crystallography 2014. The activities on www.iucr2014.org partly sponsored by UNESCO and IUCr are worth noting by every crystallographer.

The conference concluded with a visit to TSW Analytical at Bibra Lake, which is one of the leading suppliers of forensic and analytical services in Australia and abroad. Needless to say, AXAA-2014 was a great success and definitely will be remembered for its depth of scientific presentations and the joyful social functions within the beautiful city of Perth. Thanks go to the organisers of AXAA-2014 and let's meet again at AXAA-2017!

To acknowledge significant long term contributions in the field of X-ray Diffraction and X-ray Florescence, the Bob Cheary Award and Keith Norrish Medal, respectively are presented triennially at the AXAA Conference. At AXAA-2014, the Bob Cheary Award was presented to Rod Clapp by Brian O'Connor (Curtin University). Professor Bruce Chappell (ANU and Macquarie University) was posthumously awarded the Keith Norrish Medal.



Left) Acknowledgement of the previous AXAA committee at the conference dinner sponsored by Bruker. Right) The new AXAA National Council would like to welcome you at AXAA-2017.



Left) Rod Clapp receiving the Bob Cheary Award from Prof. Brian O'Connor. Right) Andrew Treloar accepting the Keith Norrish Medal from Ken Turner on behalf of the late Prof. Bruce Chappell.

Xiaodong (Tony) Wang
Curtin University

Also exciting was the establishment of the AXAA Award for Excellence in Analysis by an Early Career Scientist, to encourage outstanding development in, or application of, analytical methodologies to understand minerals or materials, with an emphasis on industrially relevant processes and technologies. The first laurel went to Joel O'Dwyer (CSIRO Process Science and Engineering). In the sections of minerals and materials, respectively, the student prizes were awarded to Samuel Liu (University of Sydney) and Nathan Nagle (Macquarie University) for Best Oral Presenter and to Marek Rouillon (Macquarie

Testimonial: AXT at AXAA-2014

AXT were proud to be a gold sponsor of this year's AXAA conference. As a company that specialises in x-ray related products, AXAA is a must-attend event and this year represented AXT's highest level of involvement to date.

Exhibiting at AXAA offers us the opportunity to showcase our related products to a relevant audience all in one location. It also provides buyers with the opportunity to

see the instruments in the flesh which is often not possible. This year we had on show solutions from sample preparation, all the way to analytical instruments to detectors. Our inventory included:

- Spex X-Press 3635 – Automated 35-ton hydraulic pellet press
- Katanax K2 Prime – Automated electric fusion machine for producing fusion beads for XRF analysis
- Oregon Labware Labor Accura – Automated flux weighing machine
- Rigaku NEX QC – Compact self-contained EDXRF spectrometer
- Rigaku Supermin200 – Benchtop WDXRF spectrometer
- Rigaku Miniflex 600 – Benchtop XRD
- Rigaku D/teX Ultra 250 silicon strip detector – fastest 1D XRD detector

We were also promoting the all new Rigaku nano3DX high-resolution, high-contrast x-ray microscope which had only been released the week before as well as our range of replacement x-ray tubes.

AXAA-2014 gave us the opportunity to re-establish old contacts, re-invigorate existing contacts and make new ones as well. It also gave us the opportunity to catch up with many of our suppliers from overseas that we only get to catch up with periodically.



AXT Crew at AXAA-2014 (L to R) Marina Serano and Anselmo Luis Guimaraes from Oregon Labware, Stephan Siniscalco from Spex, Richard Trett and Jon Forsyth from AXT, Laura Oelofse from Rigaku, Fred Hoetmer from AXT and Kubo Tomikatsu from Rigaku.

Cameron Chai
AXT PTY LTD

The meeting program included a diverse range of topics from quantitative phase analysis to structure solution on materials ranging from clays and minerals to synthetic organics. As presenters, we found it interesting to see how different users apply Topas to their research areas. The meeting was comprised mainly of user presentations; however, a special session run by XRD Product Manager Arnt Kern (Bruker, Germany) presented an in-depth look at the latest version of TOPAS, Version 5, which is to be released soon. An open discussion into the future of TOPAS was also held, allowing users to have direct input into new features for future versions of TOPAS.

We look forward to seeing many more users at future user meetings and growing this small but dedicated community.

Martin Duriska
Bruker

Tech Note: Reporting of Portable XRF (pXRF) Results

The following paper is highly relevant to those using Portable XRF instruments: *“What Reporting Portable XRF Data to 2012 JORC Code Guidelines Means”*, AIG News, Australian Institute of Geoscientists, No 115, Feb 2014 – authors: D Arne, G Jeffress, N Surgeev & A Margereson (CSA Global).

The following points summarise: Advice is given by the authors for users of pXRF instruments, noting that the use of pXRF is now commonplace within the mining and exploration industry. In providing advice, the authors refer extensively to the “2012 JORC Code Guidelines” which is the Australasian Code for the Reporting of Exploration Results, Minerals Resources and Ore Reserves published by the authoritative Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, the Australian Institute of Geoscientists and the Minerals Council of Australia (JORC).

1. Usually, it is better to wait for laboratory results before public reporting given the better representativeness of the sample analysed by the lab and the improved analytical and QA/QC methods available compared to field instruments.
2. The inherent technical limitations of pXRF and the lack of internal QA/QC means that raw pXRF data should be generally treated as semi-quantitative and preliminary.
3. Reporting of stand-alone pXRF data requires rigorous validation of the results including checks on detection limits and matrix effects, review of procedures and QA/QC analysis.

Brian O'Connor
10-March-2014

12th Topas User’s Meeting

8-9 February 2014
Pan Pacific Hotel, Perth, WA

The TOPAS user’s meeting was held in Perth prior to the AXAA-2014 conference and was highly informative and enjoyed by all who attended. The attendees included a mix of both expert and beginner users. The invited international speakers were Pamela Whitfield from Oak Ridge National Lab and Bill David from ISIS.

Vale Gérald R. Lachance

24 Feb 1926 – 10 May 2013

Gérald Lachance was a respected research scientist in the field of quantitative x-ray fluorescence analysis with the Geological Survey of Canada. He died peacefully on May 10, 2013 at the age of 87. All of us who use his matrix correction model for influence coefficients in our daily analytical work, and those of us who were fortunate enough to know him and to be taught by him about influence coefficients and theoretical X-ray intensities, will miss him greatly. Gerry and paper serviettes were synonymous! I will be forever grateful for all he taught me. He was one of nature's true gentlemen and was one of the giants of modern XRF spectrometry.

James P Willis
(c/o) Ken Turner

Vale Richard (Dick) Coyle, AXAA Life Member

31 May 1922 – 18 Jan 2014

Dick Coyle was one of the founding fathers of the Australian X-ray Analytical Association. Dick, from Melbourne, and fellow AXAA Life Member Vince Manners, from Sydney, are remembered as the two tyros who established strong AXAA branches in their respective States.



Progressively over his working career, Dick became an internationally recognized X-ray diffractionist. He was widely regarded as the foremost Australian expert on residual stress assessments of engineering components, such as aircraft parts. He was known especially for his expertise in equipment development, not being one for buying analytical equipment off-the-shelf.

As a young man, Dick commenced studies in Applied Science at Melbourne Technical College (later to be RMIT University), but these were interrupted by World War II. He joined the Royal Australian Navy and served as an officer in New Guinea waters on HMAS Manoora. Subsequently, he graduated from Melbourne Technical College with a Fellowship Diploma.

After the war, Dick joined the Division of Tribophysics, CSIRO, Carlton where he built instruments for metallurgical research. He then moved to the Munitions Supply Laboratory, Maribyrnong, where he designed and operated X-ray diffraction equipment for materials research and identification. Next came a very productive period at the British National Physical Laboratory, Teddington, UK where he assembled one of the first modern computers and an X-ray diffractometer for the

study of metallic solid solutions. On his return to Australia, Dick joined the Aeronautical Research Laboratory (ARL), Fishermans Bend, specialising in X-ray diffraction evaluation of aircraft instrumentation. With B.E. Williams he co-authored "Demonstrating X-ray diffraction", a training text for non-specialist users. At ARL, he studied metal fatigue, fibre patching of metals and carbon fibre technology, and worked on seatbelt design. Later he moved to the Physics Department at Monash University where he remained until his retirement, focusing on the use of X-ray diffraction in stress and texture assessments. His time at Monash included a productive collaboration with Rod Clapp of Diffraction Technology on the automation of residual stress and texture measurements. Dick's excellence in X-ray analytical science is gauged by his authorship of some 50 publications, on which basis Dick was awarded a RMIT University masters degree by research.

The Australian X-ray Analytical Association (AXAA) was formed in the early 1970's and from those early days Dick was a strong contributor, both at conferences and as an office bearer, the latter at both State and National levels. An account of the Fifth Australasian Schools and Conference (Victorian Pharmacy College, 1983) notes that R.A. Coyle won the Rockwell prize for a new automated drive to a microdensitometer.

The awards received by Dick included AXAA Life Membership and the Florence Taylor Medal awarded by the Australian Institute of Metals. He was a founding member of AXAA, the Australian Institute of Physics, and the Society of Crystallographers in Australia. On retirement from Monash in 1986, Dick became an honorary research fellow in the Physics Department, and he also contributed to restoration of the WW2 naval corvette HMAS Castlemaine, which is moored at Williamstown.

Those who were fortunate to work with Dick valued greatly his sense of fairness, his warmth and wry humour; criticism of others was non-existent except for his intolerance of pomposity. His trademark comment on 'experts' was a classic - "X being the unknown substance while 'spurt' is a drip under pressure". Dick rarely talked about the breadth of his rich life beyond X-rays. For example, few were aware that in his youth he had been a prominent athlete, being a nationally ranked walker.

Above all, he was devoted to his wife Ruth and their large family, as well as their grandchildren. Ruth accompanied Dick to many AXAA functions. The essence of the man is evident from the loving obituary crafted for the Melbourne Age by his family – see 19 February 2014 issue <http://www.theage.com.au/comment/obituaries/physicist-who-loved-family-and-fairness-20140218-32yd4.html>

His legacy for many is very considerable.

Brian O'Connor, David Hay
and Rod Clapp

AXAA Membership

Following the AXAA-2014 conference, it is worthwhile reminding everyone of the process for becoming an AXAA member. All registered participants of the AXAA-2014 conference are automatically granted AXAA membership for 3 years. Alternatively, new memberships can be obtained free of charge, by making an application to the National Council. Candidates should provide their CV, a nomination letter from an existing AXAA member, and a short sentence about how they intend to contribute to the organisation. Please send these to the National Council Secretary Natasha Wright (see AXAA contacts) if you would like to apply.

AXAA Website and Contacts

AXAA has a new-look website! Please come and have a look at: www.axaa.org

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Please email contributions for Issue 2 of the 2014 AXAA Newsletter to Mark Styles by Friday the 1st of August. Any comments or feedback about the Newsletter are welcome.

Upcoming Events

Internet XRD (Basic) Course: Series 2, 2014

This course has been developed primarily in response to industry requests. It provides XRD analysts, particularly those new to the field, with on-site instruction on the practical principles of powder XRD for materials analysis.

Features of the course include -

- Start at any time.
- Self-paced instruction to accommodate the needs of busy people.
- Study materials transmitted as e-mail attachments in the form of 9 modules, with an assignment being set for each module.
- Feedback on the assignments provides excellent mentoring.
- May be used as a vehicle for in-house XRD training.

Overview: The course has been designed to give new XRD practitioners a grounding in the use of powder XRD for materials analysis, with particular reference to data measurement, phase identification and quantitative phase composition analysis. It provides an excellent foundation for those wishing to proceed to more advanced XRD characterisation methods using techniques such as Rietveld analysis, indexing and structure solution.

Course availability: 5 places currently available

Course Director: Dr Brian O'Connor

Course fee: \$2,695 including GST

For further information and enrolment:
brian_oconnor@iprimus.com.au (Tel 08 9291 7067)

Rigaku Launch New X-Ray Microscope at ACMM23/ICONN2014

Sydney, Australia, February 3, 2014 – Rigaku and AXT are pleased to announce the simultaneous release of the nano3DX x-ray microscope in Australia and America. In Australia this new product was launched at ACMM23/ICONN2014 (the 23rd Australian Conference on Microscopy and Microanalysis and the International Conference on Nanoscience and Nanotechnology) which was held in Adelaide.

The nano3DX is a new product for Rigaku who have a long history and significant expertise in analytical x-ray related technologies such as x-ray diffraction (XRD), x-ray fluorescence (XRF) and non-destructive testing (NDT). It is a true x-ray microscope (XRM) with the ability to measure relatively large samples at high resolution.

As an x-ray microscope, the nano3DX images the entire sample from multiple angles. In doing so it can reconstruct a 3D image at 0.27 μ m resolution. The computer model allows the user to view sections on any plane, at any point providing valuable insights into the structure of the sample.

The secret behind the Rigaku XRM is the high power rotating anode and high-resolution optics coupled with sub micron CCD technology. This combination is capable of both fast data collection and the ability to switch anode materials rapidly to optimise data acquisition. Furthermore, the magnification occurs in the detector which uses true microscope elements.

The geometry of the system allows the sample to be located very close to the high-resolution detector which provides near-parallel beam optics. This design results in improved instrument stability which prevents smearing, faster data collection times and ultimately the highest resolution x-ray microscope in its class.

One of the other advantages of the nano3DX over other instruments is its ultra-wide field of view. The nano3DX is able to deliver measurable volumes up to 25 times larger in a single scan compared to other systems at similar resolutions in comparable time frames.

Primary anode materials used in the nano3DX are copper, chromium and molybdenum. The choice of these anode materials gives the system the flexibility to optimise the x-rays for penetration and contrast based on the varying atomic weights of materials present in the sample.

X-ray microscopy is suited to all kinds of different materials from low density materials such as biological samples to high density materials such as ceramics and steels. XRM is even suitable for those materials with low absorption contrast like CFRPs and pharmaceuticals.

Applications for the nano3DX are many and varied from materials science, to electronics and semiconductors, to mining and minerals exploration, all the way to life sciences and pharmaceuticals.

The Rigaku nano3DX is now available in Australia and New Zealand through AXT and will also be promoted at AXAA 2014 next week in Perth. For more information, please visit www.axt.com.au.

About AXT

AXT are Australia's leading supplier of analytical instruments and sample preparation equipment for the mining, life science and materials analysis industries. Their product range caters for academic and industrial clients. Established in 1991 as a manufacturer of x-ray tubes, AXT now have exclusive agencies for a range of international brands of high technology equipment.



The Rigaku nano3DX x-ray microscope

PANalytical's Epsilon 3^X bench top spectrometers outperform light element analysis

PANalytical presented their upgraded Epsilon 3^X benchtop X-ray fluorescence (XRF) spectrometers to the public at AXAA 2014 conference (9–13 February, Perth, Australia). Built upon the experience and success of the first generation Epsilon 3 spectrometers, the new Epsilon 3^X instruments are powered by the latest advances in excitation and detection technology. They have been designed for reliable and simple operation and deliver outstanding analytical performance right across the periodic table.

Latest excitation and detection technologies

Epsilon 3^X is equipped with 50 kV excitation and the latest high-resolution silicon drift detector enabling analysis of elements from sodium up to americium. Whereas, the Epsilon 3^{XLE} is configured with the even more powerful SDD^{Ultra} silicon drift detector that makes analysis of ultra-light elements like carbon, nitrogen and oxygen possible. As inherent to XRF analysis elements can be present in concentrations ranging from ppm to 100 %, with little or no sample preparation required.

State-of-the-art software

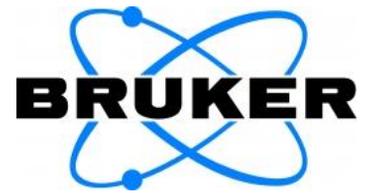
Advanced spectrum processing and state-of-the-art algorithms provide highly accurate and precise, fully traceable data. A variety of software options for standardless analysis, fingerprinting, regulatory compliance or multi-layer analysis is available. And last but not least, customers can benefit from PANalytical's support and expertise via our service network worldwide.

Simon Milner, product marketing manager X-ray spectrometry, enthuses: *"Smart combination of the latest excitation and detection technologies of the new Epsilon 3^X benchtop spectrometers provide ultimate light-element performance, matching – and sometimes even surpassing – the analytical performance of larger, more powerful spectrometers. These cost-effective and highly flexible analytical tools are suitable for applications in a wide range of industries such as cement production, mineral beneficiation or polymer production"*.

For further information, please visit [PANalytical – Epsilon 3^X spectrometers](#) or contact your local PANalytical representative.

Grade Control, Process Control - Why wait for laboratory results!

Real Time Online Elemental Analysis with the S2 Kodiak!



Bruker announces the new online multi-element analyzer **S2 KODIAK™**. This new tool uses X-ray fluorescence spectrometry to analyze the elemental concentrations in ores and other materials on conveyor belts in real time. Since information about the ore grade becomes immediately available with the **S2 KODIAK**, mineral beneficiation and ore blending can be optimized. This allows substantially higher product grades, better cost efficiency, and increased mine output. Based on **S2 KODIAK** results, miners and plant operators are able to instantly adjust process parameters and achieve higher recoveries without time consuming and costly sample preparation. There are no delays waiting for results from an off-site laboratory.

The **S2 KODIAK** operates completely autonomously. With the integrated auto-calibration functionality the **S2 KODIAK** starts the analysis of mined material instantly after powering up. The unit connects via TCP/IP to every plant control software and is remotely controlled. The integrated camera monitors the transported material on the belt.

The **S2 KODIAK** runs completely maintenance-free and operates in any environment using peltier-cooling. Its rugged design including an enclosed stainless steel container has been developed to endure the rough conditions in mining operations, including high shocks and vibrations, moisture and dust. The unit will operate in all conditions from arctic areas to tropical regions.



With its enhanced X-ray safety the **S2 KODIAK** can be flawlessly integrated into mining operations, a major competitive advantage compared to other analytical technologies in this field, e.g. neutron activation which use radioactive sources. There is no concern or compromises on working safely with the **S2 KODIAK**. High instrument uptime, quick maintenance, Bruker worldwide service and support network and the expertise in the analytical X-ray field ensures a continuous 24/7 operation.

With the **S2 KODIAK** online analyzer, Bruker extends its portfolio of laboratory and hand-held XRF instruments even further into the online process-control environment. We can now offer elemental analysis solutions for every step in the mining process. The positive feedback we have received from users at our first **S2 KODIAK** test installations demonstrate its power for enhancing mining operations and delivering increased yield in minerals beneficiation,” stated Dr. Karsten Knorr, Bruker AXS Division Market Manager for X-ray Mineralogy.

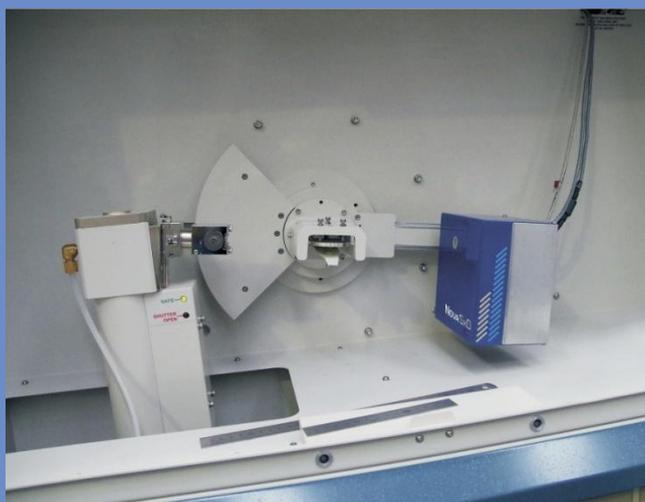
For further information, contact

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GBC Scientific Equipment Pty Ltd

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Specifications of SSD

Max Count Rate	5x10 ⁵ / pixel, 5x10 ⁷ global
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Angular Resolution	0.06 deg at 200 mm radius
Strip Pitch	120 μ m
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Angular Span	3.3 deg at 200 mm radius
Angular Accuracy	0.002 degrees
Energy Resolution	<10%
Energy Range	4.5 keV to 17 keV

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