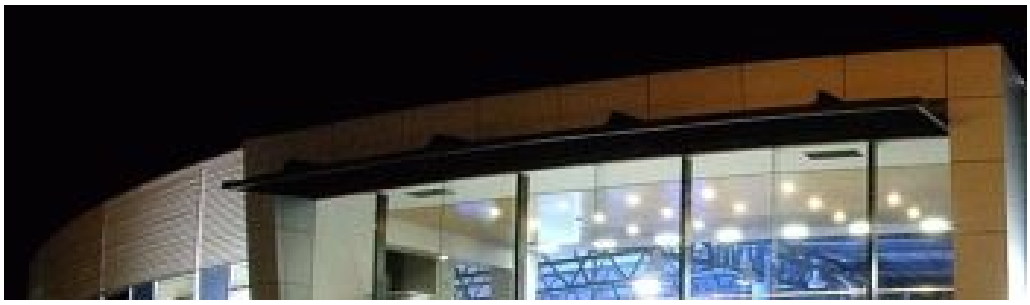
NEW ZEALAND
SYNCHROTRON GROUP



ANNUAL REPORT 2023

Contents

CHAIRMAN'S REPORT

The past year was the seventeenth in which the New Zealand Synchrotron Group Ltd (NZSG) provided support for New Zealand researchers using the Australian Synchrotron It also saw a full return to normality after the Covid pandemic. Researchers have had full and uninterrupted access to the Australian Synchrotron. A significant milestone was also reached with the commencement of user operations on the first four of the eight new beamlines that are being added to the Synchrotron.

During the Covid period and immediately afterwards when only remote use of the Synchrotron was possible, there was a fall in demand for beamtime. The demand has steadily increased over the past year as research activity has resumed. During the 2022/23 year, researchers were awarded 291 shifts on the existing beamlines from 336 shifts requested. In addition, 48 shifts were awarded to researchers on the new beamlines. The remaining small Covid related backlog of experiments from the previous year was cleared and all newly awarded shifts were able to be completed within the year.

One of the consequences of the Covid and post-Covid period was the lost opportunity to provide ongoing training and experience in synchrotron science to students and early career researchers. Once travel recommenced and student numbers began to increase again, the company instituted a programme of support to enable new researchers to gain experience at the Synchrotron. Additional funding was provided so that researchers could take larger teams to Melbourne and travel grants were made available to students presenting papers or posters at the Annual User Meeting in December 2022. The Asia Oceania Forum for Synchrotron Radiation Research, of which NZSG is a member, also resumed its annual Synchrotron Radiation School. NZSG selected two students to attend the School in Thailand in June 2023.

COVID also affected the timetable for the construction of the new beamlines at the Australian Synchrotron. Ongoing manufacturing delays with equipment suppliers, shipping issues and staff recruitment delays have meant that there have been further delays in the completion of all the new beamlines. Nevertheless, substantial progress has been made and the first of them, the MCT beamline, commenced its User Programme in November 2022 and the MEX-1 and MEX-2 lines commenced in early 2023. The BioSAXS beamline will start user operations in September 2023 and the remaining four beamlines are now expected to be ready for operation in 2024 and 2025. New Zealand is a major contributor of funding for the new beamline programme. NZSG has provided A$12 million towards the programme, all of which has been paid.

In 2020 the company secured funding from MBIE to establish a $400k Capability Build Fund to support the investment in the new beamlines at the Australian Synchrotron by seed-funding new projects and travel to enable researchers to be ready

for the new beamlines as each is commissioned. This is important as the new beamlines offer new measurement techniques and for some beamlines it is likely that researchers who are unfamiliar with synchrotron science techniques will be potential new users. The Fund was launched in February 2021 with the first eight projects with a value of $183k being funded. A second round was held in February 2022 and a further ten projects with a value of $179k were selected. The third and final round was held in February 2023 with three more projects with a value of $60k funded. These projects will be run for up to two years and have already been the basis of some applications to use the new beamlines. The travel grant component of the Fund was delayed because of the Covid travel restrictions but was finally launched in May 2022. Four grants have been awarded to enable researchers to travel to other synchrotrons to learn the new techniques.

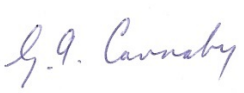
The company had budgeted for a small operating surplus of $221 for the year. The budget had included a provision for expenditure of $63k on purchasing additional beamtime during the year, but that was unnecessary because there was sufficient beamtime available to meet the demand. Income from interest was also greater than anticipated with the rise in interest rates during the year. Exchange rate fluctuations resulted in a reduction in value of the financial derivates held by $39.5k, giving the net effect of a surplus of $47,484 being achieved.

With this unexpected surplus, the company's cash position at the end of the year was nearly $700k. Shareholder equity rose from $761,533 to $809,018. Directors have considered what level of reserves might be sufficient to cover any sudden crisis, and took the view that the reserves were above a level needed for prudent governance. Accordingly, a decision was made to waive 50% of the charge to institutions set out in the funding contract for the 2023/24 year and to maintain a greater than usual level of expenditure to strengthen future synchrotron science support activities such as student attendance at workshops and training schools.

As indicated in previous reports, changes in the exchange rate are one of the largest challenges the company faces. This has been managed by taking a series of forward contracts to lock in and provide certainty around future cash flow. The company holds a forward contract to cover the annual payment to ANSTO in 2024. In October 2021 vanilla options were purchased to provide protection against a substantial fall in the exchange rate for the final payments of the current funding and access agreement in 2025 and 2026.

The Board has been very well supported by the Royal Society Te Apārangi who provide secretariat services to NZSG. In particular, I would like to acknowledge the contribution make by Dr Don Smith in assisting the board, administering the New Zealand Synchrotron Support Programme and looking after our interests in Australia and on the Asia Oceania Forum for Synchrotron Radiation Research. I would also like to acknowledge the contribution from the Chair of the Access Committee, Emeritus Professor Geoff Jameson and its members Professor Vic Arcus, Associate Professor Vladimir Golovko and Associate Professor Geoff Waterhouse who have evaluated all requests for access. Finally, I would like to thank my fellow directors, Dr Brett Cowan, Professor Catherine Day, Emeritus Professor Geoff Jameson and Professor Jim Metson.

This will be my final report as Chair of the New Zealand Synchrotron Group. I have given notice of my intention to retire at the upcoming Annual General Meeting in November. It has been a great privilege to be involved in this project for the last 17 years, and in a small way to be part of the success which has been achieved at the Australian Synchrotron. The Board has appointed Dr Brett Cowan as Chair Elect, and I wish him and the Board every success in taking New Zealand's synchrotron science contributions forward in the years to come.



GA Carnaby
Chair

BUSINESS REVIEW

Investment in the Australian Synchrotron and Access Rights

The New Zealand research community has been a significant stakeholder in the Australian Synchrotron since its inception in 2007. At that time, the Synchrotron was predominantly owned by the Victorian government. Through NZSG, New Zealand held shares in both the ownership and operating companies set up at the time. In 2016, ownership of the Australian Synchrotron was transferred to the Australian government and was vested in the Australian Nuclear Sciences and Technology Organisation (ANSTO).

Although the Synchrotron is now operated by an entity independent of the original foundation investors, its operations are overseen by a Stakeholders Committee that monitors the Synchrotron's operations, budget and development and provides advice to ANSTO. New Zealand, as the largest single contributor towards the cost of the new beamlines being added to the facility and a significant user group, is a key stakeholder. The NZSG board appointed its Executive Officer, Dr Don Smith, as the company's representative on the Stakeholders Committee. Dr Smith is also the contact person for day-to-day matters associated with access arrangements and user liaison with ANSTO.

New funding and access arrangements were negotiated in 2017 which gave New Zealand an extended period of guaranteed access until June 2026, increased the number of merit shifts on the existing beamlines from 201 to 267 per year, and established access rights to both merit and preferred access beamtime on the new beamlines that were to be added to the facility. New Zealand makes an annual payment of A$1.5 million towards the cost of access and has contributed A$12 million towards the cost of the new beamlines. Access and capital costs are equally shared by the New Zealand research sector and the government. The government's A$6 million contribution was paid to ANSTO during the 2017/18 financial year. The sector's share was paid in 5 instalments, the last of which was made in 2022/23.

By virtue of their participation in the joint funding arrangement with the government, researchers and students from the Universities of Auckland, Canterbury, Otago and Waikato, Auckland University of Technology, Massey University, Victoria University of Wellington and AgResearch Ltd are eligible to apply for merit beamtime on the Australian Synchrotron.

Post COVID-19 Recovery

As mentioned in the Chairman's Report, the past year has marked a return to near normal activity following the interruptions and restrictions of the Covid and post Covid periods. All remaining experiments that had had to be postponed have now been undertaken and all unallocated merit time has also been awarded and used. Demand for beamtime, which had only just been sufficient to fully cover the 267 shift per year entitlement that New Zealand has by virtue of the Bright Funding Agreement

with ANSTO, has slowly increased and is expected to be back at pre-Covid levels by 2024. In the past year, in addition to receiving 291 shifts of merit time to the existing beamlines, New Zealand researchers also received 30 shifts of merit time and 18 shifts of preferred access time on the new beamlines.

The commencement of user operations on the new beamlines is expected to alter the pattern of demand on the existing beamlines. This has already been seen with some work previously undertaken on the SAXS beamline being assigned to the new BioSAXS beamline in the 2023/24 year. This creates more opportunities for work that might previously not have been awarded beamtime to be supported. The new beamlines also offer opportunities for new users and new types of work. The company will therefore expand its activities to promote the Synchrotron to the wider research community. While the majority of users during the past year had been previous users, it was pleasing to see some new groups using the facility.

The staff of the Australian Synchrotron have maintained the extremely cooperative approach to NZSG and New Zealand users in general. This has been particularly helpful during the period when new arrangements were introduced for the allocation of merit time on the new beamlines and the establishment of the "Preferred Access" regime for those, such as New Zealand, who have contributed to the building of the new beamlines.

The last of the five annual contributions of A$1.2 M from the research sector towards the cost of the new beamlines was made in early 2023. The annual contribution towards the Synchrotron's operating costs had also been reduced to assist with cash flow during the Covid pandemic. By agreement with ANSTO, and now that the payments towards the new beamlines have ceased, the annual operating cost payment will be increased for the final three years of the funding and access agreement.

Decisions on Access and Funding Support

The funding and access agreement with ANSTO allows the company to decide how our entitlement to merit beamtime on the existing beamlines is allocated, giving best advantage to New Zealand. This includes being able to decide the distribution of beamtime between beamlines, and on the ranking of the New Zealand proposals to each beamline. The process for awarding beamtime on the new beamlines is slightly different. Decisions on the allocation of merit time are made by the Synchrotron's Program Advisory Committees where the applicants from Australia and New Zealand are in open competition for the beamtime. However, for the first five years after each new beamline comes into operation, New Zealand also receives a dedicated amount of beamtime based on the size of the financial contribution made towards the cost of the new beamlines and the company selects which proposals receive the beamtime.

New Zealand researchers from the institutions that are providing funding are eligible to apply to the Australian Synchrotron for beamtime. Their applications are first assessed on a merit basis by the Synchrotron's beamline panels and the final selections are made by an Access Committee that was established by the board to make the decisions on applications for beamline access.

The members of the Committee for the past year were:

Emeritus Professor Geoff Jameson, Massey University (Chair)

Professor Vic Arcus, University of Waikato
Associate Professor Vladimir Golovko, University of Canterbury
Associate Professor Geoff Waterhouse, University of Auckland

The Committee held Zoom meetings throughout the year to make their selections. The table on page 13 lists the New Zealand researchers who have gained beamline access to the Australian Synchrotron from July 2022 onwards and summarises any travel funding or sample shipping support provided.

Use of the Australian Synchrotron by New Zealand Researchers

Approximately 80% of the available beamline time on the beamlines is assigned to a "merit access" pool and competitive applications are sought from researchers worldwide, including from New Zealand. Every four months, the Australian Synchrotron makes calls for proposals. Applications are made directly to the Australian Synchrotron, but as explained above, NZSG oversees the ultimate selection of which New Zealand applicants receive beamtime on the existing beamlines and the "Preferred Access" time on the new beamlines. Since late 2008, in recognition of the contribution New Zealand makes to operating costs, the Australian Synchrotron began contributing towards the travel costs for New Zealand researchers who obtained beamtime at the Australian Synchrotron on an equal basis with Australian researchers. These funds are administered through NZSG.

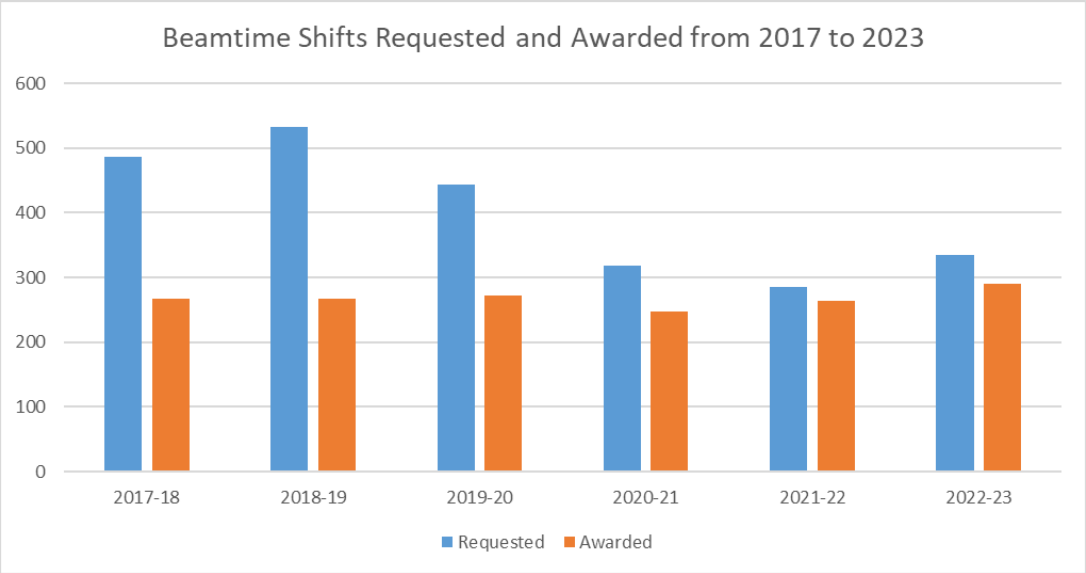
Under the access regime agreed with ANSTO in 2017, New Zealand researchers are entitled to receive 267 shifts of merit beamtime on the existing beamlines which is approximately 6.6% of the available beamtime. Prior to Covid there was significant demand for beamtime and the number of shifts requested substantially exceeded the entitlement. During Covid and the immediate post-Covid period there was a reduction in research activity, particularly in the universities. That, and restrictions on travel, resulted in fewer applications for beamtime being received allowing most of the requested beamtime to be awarded. Demand for beamtime has begun to increase again and during the past year and it was only possible to award 82% of the beamtime requested. The statistics for the past year are summarised in the table and graphs below.

Table 1: Success Rate for NZ Beamtime Applications – 2022/23

Beamline*	**No. Shifts Requested**	**No. Shifts Awarded†**		**No. Appl'ns. Received**	**No. Awarded Beamtime**	
IMBL	24	15	63%	2	1	50%
IRM	12	12	100%	1	1	100%
PD	33	15	45%	3	2	67%
SAXS	43	42	98%	12	10	83%
SXR	24	24	100%	2	2	100%
THz	9	12	133%	1	1	100%
XAS	27	27	100%	4	4	100%
XFM	51	45	88%	5	5	100%
Subtotal	**223**	**192**	**86%**	**38**	**34**	**89%**
MX (CAPs)	133	99	74%	7	7	100%
Overall	**356**	**291**	**82%**	**45**	**41**	**91%**

† In four instances, more beamtime was awarded than was requested
* A description of the beamlines and the abbreviations used are given on pages 22-23

Figure 1: Beamtime demand and shifts on the existing beamlines awarded in the last 6 years



Science Achievements

New Zealand researchers are strong contributors to the scientific output of the Australian Synchrotron. In the past year 37 refereed papers arising from previous work at the Synchrotron were published (6% of the total output of papers from all sources). This is a further reduction on last year when 44 papers (7% of the total output) were published, continuing the trend which has been seen across all Synchrotron users due to the reduction in research activity during Covid. It expected that the trend will reverse within the next two years now that “normal” levels of synchrotron use has resumed.

A full list of the researchers who received merit beamtime over the past year is presented on pages 12-20. These projects cover a very broad range of science topics, and many have involved training of young researchers. Some examples, to illustrate the breadth of research undertaken at the Australian Synchrotron during the year, are described below.

Professor Peng Cao from The University of Auckland and his collaborators, Dr Ying Xu from Victoria University of Wellington and Assoc Prof Neeraj Sharma and Dr Uttam Mittal from the University of New South Wales have used the X-ray Adsorption Spectroscopy (XAS) beamline to investigate the oxidation state and local structures of titanium nanoparticles.

> In a captivating scientific quest, they have delved into the world of tiny titanium particles, each less than 100 nanometres in diameter, using a special chemical reduction method to make them. Through this exploration, they've uncovered a remarkable transformation – these particles change into something what is referred to as "oxidized titania." This newfound material holds tremendous promise for crafting eco-friendly Lithium-Ion batteries that power our everyday gadgets like phones and laptops. By

closely examining the behaviour of these particles, scientists have unveiled the secrets behind how they can effectively store and release energy.

Additionally, they've scrutinized how these particles react with organic protective layers on their surface, revealing the formation of strong covalent bonds. The journey of discovery continues as scientists now delve into the electronic structures of these particles through computer modelling and simulations, building upon the insights gained from this research.

A team led by Associate Professor Vyacheslav V Filichev, Dr Elena Harjes and Emeritus Professor Geoffrey B Jameson from Massey University has been investigating DNA and RNA-binding proteins implicated in genome stability and cancer progression.

As part of the innate immune system, APOBEC3 enzymes hydrolyse cytosine to uracil scrambling single-stranded DNA of viral pathogens. In cancer cells, however, these enzymes, and especially APOBEC3A, turn on their host and thereby allow cancer cells to evolve resistance to anticancer therapies. The tell-tale signatures of APOBEC3 activity have also been found in variants of SARS-Cov2, the causative virus of Covid-19, and the new human-transmissible monkey pox virus. The team led by Associate Professor Vyacheslav V Filichev, Dr Elena Harjes and Professor Geoffrey B Jameson has developed and recently PCT-patented highly potent inhibitors that are specific against the most active member of the APOBEC3 family, APOBEC3A, which generates genetic diversity in cancer cells and evolution of resistance to anticancer therapies. The path to a drug based on our inhibitors that will enhance efficacy of anticancer therapies across a range of common cancers is, however, long and full of potholes. Crucially, we now have very recent proof that our inhibitors, modified to enhance cellular stability and showing low cytotoxicity, specifically inhibit gene-editing/mutagenic activity of APOBEC3A on chromosomal DNA in cells (preprint Harjes et al. *bioRxiv*; *Nature Communications*, in press). There is a potential market worth ~USD20b should drugs that inhibit mutagenic activity of APOBEC3A/B emerge. Structural knowledge of substrate binding revealed by our single-crystal X-ray diffraction studies conducted by remote robotic-facilitated access at the Australian Synchrotron and by solution-state small-angle X-ray scattering (SAXS) is essential to the design and understanding the mode of action of these molecules (preprint Harjes et al. *bioRxiv*; *Nature Communications*, in press).

Converting the PCT patent to patents in several key individual countries is in progress.

Professor Shane Cronin and Dr Ingrid Ukstins from The University of Auckland together with Dr Alex Nichols from the University of Canterbury and Dr Geoff Kilgour from GNS Science have used the Infra-red Microscopy (IRM) beamline to track magma mingling during the most violent volcanic eruption of the last 30 years, Hunga, Tonga.

The 2022 eruption of the Hunga volcano represents the most violent volcanic eruption of the last 30 years. The unprecedentedly well-documented eruption history along with systematic collected samples allow a fine detailed study of the magma processes and eruption mechanism for such an andesitic submarine volcano. The synchrotron-sourced FTIR analyses yielded water content data for the Hunga magma with high-quality and high-spatial resolution. The highest water content (2.71 wt.%) measured in the Hunga glasses is lower than the global average value (3.91 wt.%) for arc magmas, suggesting

that volatiles in the magma cannot explain the eruption intensity alone. This, along with other data is showing us that the critical interaction of the structure of the caldera and water that soaks into the volcano during eruption was the key driver for its explosivity and major tsunami generation potential.

In addition, several contrasts in water content were recorded, between texturally different parts of glass within single particles. This shows micro-scale mixing. For each of the zones we could measure different water contents. This is remarkable because water diffuses rapidly through glass at eruptive temperatures. Hence the water concentration contrast indicates mingling of two or more magmas. From the results of this research visit, we were able to map these water content boundaries using FTIR and then model the diffusion processes of water across the boundaries. The average of our measurements suggest that contrasting magmas came in to contact with each other only ~30 seconds before the eruption. They were "frozen" in this state by chilling against seawater and air. This is an astonishing result and allows us to track for the first time the very short real-timescales involved in excavating magma to feed large and extremely violent submarine eruptions.

Dr Adam Hartland and his team from The University of Waikato have been investigating the Hikurangi subduction margin, eastern North Island, New Zealand.

The Hikurangi subduction margin, offshore of New Zealand's eastern North Island, is a major source of seismic hazard for New Zealanders with the potential of generating substantial (MW > 8.0) subduction earthquakes and associated tsunamis. However, determining the exact timing of past seismic events in conventional natural records, such as raised beaches or tsunami deposits, is typically challenged by centennial-scale uncertainties in dating methods. This in turn prevents a reliable assessment of temporal and spatial patterns in earthquakes, and their drivers.

To improve our understanding of the seismic hazard in this region, we explore an alternative natural archive of past earthquakes using cave carbonate deposits (speleothems) from a cave system in Hawke's Bay. Speleothems, such as stalagmites, are exceptional at recording past environmental conditions through their structural and chemical composition. Moreover, their incremental growth at typical rates of ca. 5 and 100 µm/year often allows for comparably accurate and precise age determination, which is key to studying Earth's natural history. Although these growth laminations are often not visible, most speleothems contain annual variations in the distribution of certain trace elements (e.g., strontium; Sr), which are included in the calcium carbonate crystals. Counting such growth laminae can help to substantially improve age models (i.e. the relationship between depth and age in a sample) of speleothem records, which are generally constructed around discrete sections of the sample, for which absolute ages are estimated via radiometric dating techniques (e.g., Uranium-series dating). With the advanced capability of the Australian Synchrotron's X-ray fluorescence microscopy (XFM) beamline, we are able to resolve individual growth laminae expressed in the trace element chemistry, which is not achievable with most conventional analytical methods. The refined age model is expected to underpin a high-resolution stalagmite record of inferred earthquakes associated with the Hikurangi subduction margin over the last ca. 5000 years, and help us further develop a novel approach to studying seismic activity from cave deposits.

Professors Michael Rowe and Kathy Campbell from The University of Auckland have used the XFM beamline at the Australian Synchrotron to study the biogenicity and preservation of trace metals in hot springs utilising hot spring digitate material from New Zealand, Chile, and the USA.

This research underpins the scientific rationale of ongoing efforts of a consortium of countries (New Zealand, Japan, Australia, and USA) to create a multi-national Mars sample return mission (www.lifespringsmars.com). The basis of this effort is a targeted, small (and therefore relatively inexpensive compared to larger NASA-scale missions) sample return mission to Gusev Crater on Mars where the Spirit rover identified deposits of silica in 2007 very similar to what forms in terrestrial hot springs, such as those found throughout the Taupo volcanic zone. Based on years of research, our team argues this site is the best chance for identifying evidence of ancient life, that we know of. However, we need to have an understanding of how we can identify traces of life in these ~3.6 billion year old Martian materials - when any organic material would have long ago broken down. In essence, what do we look for when we get them back? This study has identified and mapped out the relationship between trace metals and organic material in hot springs silica to understand how we can use these geochemical tracers to interpret evidence of life. In particular, we have identified a unique enrichment in the trace metal gallium, an element toxic to bacteria, zoned around particular types of microbial organisms- and importantly, the preservation of this enriched chemical indicator back through geologic time to at least the Jurassic era (~160 million years ago).

Capability Build Funding and Other Support for Synchrotron Scientists

In late 2022 the first of the new beamlines at the Australian Synchrotron was commissioned and became available for user access. New Zealand has preferred access rights to all 8 new beamlines and it is important that the full entitlement is taken up. Recognising that some of the new beamlines offer new techniques and that there will opportunities for researchers who are not currently familiar with the Synchrotron, two years ago NZSG created a Capability Build Fund to provide seed funding for projects that will generate samples for researchers to use on the new beamlines and also to provide travel funding, either for travel during the commissioning period or for researchers to use similar beamlines at other synchrotrons. The purpose of the Fund is to introduce and upskill New Zealand researchers in the techniques which will become available on the new beamlines and extend the range and quality of science New Zealand is able to undertake.

NZSG secured $300,000 funding from MBIE through an extension to the existing SIFF contract and has contributed $147,450 from reserve funds. After a delay caused by COVID-19, the Fund was launched in February 2021 for project seed funding only with 8 projects being selected. A second small project round was held in February 2022 and a further 10 projects were selected. The travel funding component of the Fund was launched in April 2022 and 3 travel grants have since been awarded. The total value of awards made through the Fund is $447.45k

The small project awards made in 2022/23 are listed in Table 2 and the travel grants made in Table 3.

Table 2: Recipients of Capability Build Fund project funding

Applicants	Institution	Beamline	Project Title/Topic	Funding
Small Project Grants – Round 3				
Mace	Otago	MX3	Establishing routine crystallographic fragment screening for MX3 Use	$20k
Arcus	Waikato	MX3	Structural mechanisms of DNA binding and chromatin organisation of Lsr2 from Mycobacterium tuberculosis	$20k
Marshall	Canterbury	ADS	Unveiling the Structure of Heterogeneous Catalysts using Advanced Diffraction and Scattering Methods	$20k
Total				**$60k**

Table 3: Recipients of Capability Build Fund travel funding

Applicants	Institution	Beamline	Host Synchrotron	Funding
Travel Funding Grants				
Fellner	Otago	MX3	Beamtime at SSRL (USA)	$7.5k
Haverkamp	Waikato	MEX	Beamtime at MAX IV (Sweden)	$7.5k
Pavlov	Canterbury	MCT	Beamtime at ESRF (France)	$7.5k
Alloo	Canterbury	MCT		$3.75k
Total				**$26.25k**

Some of the early recipients of grants from the Fund have already used the new beamlines.

As well as overseeing New Zealand researcher access to the Synchrotron, NZSG provides additional support by administering the travel funding available from the Australian Synchrotron, to which all groups awarded merit access are entitled.

Support was provided for students or emerging researchers to further develop their knowledge of synchrotron science techniques through attendance at the annual User Meeting held at the Australian Synchrotron and at the annual Synchrotron Radiation School run by the Asia Oceania Forum for Synchrotron Radiation Research (AOFSRR), of which NZSG is a member. The most recent User Meeting was held in December 2022 and travel funding was provided to assist three students attend. The AOF Synchrotron Radiation School was held at the Synchrotron Light Research Institute in Thailand in June 2023. Two students (Samantha Alloo from the University of Canterbury and Jie Wu from The University of Auckland) were selected to attend.

D K W Smith
Executive Officer
Secretariat

PREPARING FOR THE FUTURE

The current funding and access arrangements cease on 30 June 2026. Until that time, directors expect that the company will be able to function normally and deliver the usual range of support to the research sector. The most significant risk faced, apart from another Covid-like event and a catastrophic fall in the value of the New Zealand dollar is the impact the financial status of some universities could have on their ability to maintain and participate in the access programme. Contractually, the eight funding institutions must meet their collective financial obligations, but the impact at researcher level is also important. Some regular users of the Australian Synchrotron are affected by the measures being taken to control costs. While no institutions have prevented their researchers from applying for beamtime in order to minimise costs, there have been situations where departmental budget constraints have resulted in reduced demand for beamtime.

The company is beginning to plan for the renewal of the access arrangement with ANSTO. By 2026, all the new beamlines will be in operation and although there will be some carry-over of access rights to the new beamlines, access to merit beamtime on both the existing and new beamlines will be dependent on a new agreement. The Board is conscious of the changes in the research sector that have taken place in the 8 years since the existing agreement was first proposed. One aspect of the current arrangement that is disappointing is that most of the CRIs and other research establishments are not included. There has been little use of the paid access facility that NZSG coordinates for the country, yet there is interest from individual researchers in those organisations.

Any new arrangement will need to take into account changes or initiatives arising from Te Ara Paerangi – Future Pathways. Access to and investment in key research infrastructure is part of the reform. NZSG made a submission to MBIE during the early consultation period. Some revision of the funding model will be needed with a greater proportion of government support being essential.

New Zealand Research Groups Awarded Beamtime (July 2022 – June 2023)

The following New Zealand research groups were awarded or received merit time at the Australian Synchrotron between July 2022 and June 2023. The table also shows the value of any travel or sample shipping funding provided.

Researchers	Institution	Cycle	Beamline	Access	Funding
Professor Shane Cronin Dr Alex Nichols David Adams Dr Geoff Kilgour Dr Ingrid Ukstins	Auckland Canterbury Auckland GNS Science Auckland	2022-2	Infrared Microscope (IRM) "Tracking magma mingling during the most violent volcanic eruption of the last 30 years, Hunga, Tonga"	Merit Access 12 shifts 6-10 July	$0
Assoc Prof Chris Squire Dr Ghader Bashiri Dr Richard Kingston Assoc Prof Shaun Lott Dr David Goldstone	Auckland Auckland Auckland Auckland Auckland	2022-2	Micro Crystallography (MX2) "2021 CAP Program"	Merit Access 6 shifts 7-8 July and 21-22 August	$11,351
Dr Cameron Weber Assoc Prof Tamar Greaves Navjot Kaur Kahlon Emma Matthewman	Auckland RMIT Auckland Auckland	2022-2	Small/Wide Angle X-ray Scattering (SAXS) "Understanding the Effect of Co-Solvents and Composition on the Amphiphilic Nanostructures of Ionic Liquids and Deep Eutectic Solvents"	Merit Access 3 shifts 14-15 July	$3.034
Dr Greg Giles Adirah Coulter-Jeffrey	Otago Otago	2020-2	Infrared Microscope (IRM) "Manganese Porphyrin Drugs as Protective Agents Against Radiation Damage" **COVID Affected Rescheduled from 2020**	Merit Access 9 shifts 19-22 July	$3,550
Assoc Prof Chris Squire Dr Ghader Bashiri Dr Richard Kingston Assoc Prof Shaun Lott Dr David Goldstone	Auckland Auckland Auckland Auckland Auckland	2022-2	Macromolecular Crystallography (MX1) "2022 CAP Program"	Merit Access 3 shifts 26-27 July	Incl in MX2 claim above
Dr Joanna Hicks Prof Geoff Jameson Prof Vic Arcus Prof Emily Parker Dr Gerd Mittelstaedt Dr Elen Harjes Dr Stefan Harjes Ruby Roach Tracy Hale Adele Williamson William Kelton Hannah Klaus Carlin Hamill Annemaree Warrender Jack McGarvie	Waikato Massey Waikato VUW VUW Massey Massey Massey Massey Waikato Waikato Waikato Waikato Waikato Waikato	2022-2 and 2022-1	Small/Wide Angle X-ray Scattering (SAXS) "Protein Complexes and Conformational Change"	Merit Access 9 shifts 5-7 August and 7-8 August	$5,919

Researchers	Institution	Cycle	Beamline	Access	Funding
Dr Adam Middleton Prof Kurt Krause Dr Peter Mace Prof Catherine Day Assoc Prof Brian Monk Dr Matthias Fellner Bahram Pooreyde Dr Ashley Campbell Dr Prasanth Padala Alex Bohles	Otago Otago Otago Otago Otago Otago Otago Otago Otago Otago	2022-2	Micro Crystallography (MX2) "University of Otago Structural Biology Group"	Merit Access 3 shifts 11-12 August	$6,870
Prof Emily Parker Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland-Smith Assoc Prof Wayne Patrick Dr David Comoletti	VUW Massey AgResearch Waikato Massey VUW VUW	2022-2	Micro Crystallography (MX2) "Protein Structure and Function: AgResearch NZ, Ferrier Institute and Waikato, Victoria and Massey Universities"	Merit Access 3 shifts 12-13 Aug	$1,512
Prof Tilo Soehnel Timothy Christopher Rosanna Rov Thomas Callaghan	Auckland Auckland Auckland Auckland	2022-2	Powder Diffraction (PD) "High resolution structural analysis of Kagome structures in magnetically frustrated complex transition metal oxide systems"	Rapid Access 3 hours 16 August	$0
Daniel McDougall Prof Duncan McGillivray Robert Deas Assoc Prof Quinn Fitzgibbon	Auckland Auckland Auckland U. Tasmania	2022-3	X-ray Fluorescence Microscopy (XFM) "Which metals are problematic for baby lobsters? A study of the distribution and concentrations of heavy metals in phyllosoma larvae"	Merit Access 9 shifts 29 Sep-2 Oct	$3,010
Assoc Prof Chris Squire Dr Ghader Bashiri Dr Richard Kingston Assoc Prof Shaun Lott Dr David Goldstone	Auckland Auckland Auckland Auckland Auckland	2022-3	Macromolecular Crystallography (MX1) "2022 CAP Program"	Merit Access 6 shifts 5-6 October and 15-16 Nov	$9,221
Dr Adam Middleton Prof Kurt Krause Dr Peter Mace Prof Catherine Day Assoc Prof Brian Monk Dr Matthias Fellner	Otago Otago Otago Otago Otago Otago	2022-3	Micro Crystallography (MX2) "University of Otago Structural Biology Group"	Merit Access 6 shifts 6-7 October and 1-2 December	$5,939
Dr Grant Pearce Dr Jodie Johnston Prof Ren Dobson Dr Tim Allison Dr Fiona Given Dr Ali Reza Nazmi Dr Vanessa Morris Christoph Goebl Dr Fiona Given	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2022-3	Small/Wide Angle X-ray Scattering (SAXS) "University of Canterbury SAXS Proposal 2022/3"	Merit Access 3 shifts 13-14 October	$3,130

Researchers	Institution	Cycle	Beamline	Access	Funding
Prof Peng Cao Kumar Debajyoti Jena Assoc Prof Neeraj Sharma Dr Uttam Mittal Yuguang Pu Dr Ying Xu Keemi Lim	Auckland Auckland U. NSW U. NSW Auckland VUW Auckland	2022-3	X-ray Absorption Spectroscopy (XAS) "Investigating the oxidation state and local structures of titanium nanoparticles made via a chemical reduction method"	Merit Access 6 shifts 13-15 October	$3,095
Prof Ren Dobson David Wood Dr Grant Pearce Sophie Eccersell Michael Newton-Vesty	Canterbury Canterbury Canterbury Canterbury Canterbury	2022-3	Small/Wide Angle X-ray Scattering (SAXS) "Enzymes of the Sialic acid pathway"	Merit Access 3 shifts 14-15 October	$3,130
Prof Emily Parker Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland-Smith Assoc Prof Wayne Patrick Dr David Comoletti Dr Gerd Mittelstaedt Keely Oldham Alexandra Perry	VUW Massey AgResearch Waikato Massey VUW VUW VUW Waikato Waikato	2022-3	Micro Crystallography (MX2) "Protein Structure and Function: AgResearch NZ, Ferrier Institute and Waikato, Victoria and Massey Universities"	Merit Access 6 shifts 20-21 October and 2-3 December	$7,694
Dr Joanna Hicks Prof Geoff Jameson Prof Vic Arcus Prof Emily Parker Dr Elen Harjes Ruby Roach Tracy Hale Dr Gerd Mittelstaedt Yu Bai Keely Oldham Hannah Klaus Jack McGarvie	Waikato Massey Waikato VUW Massey Massey Massey VUW VUW Waikato Waikato Waikato	2020-3	Small/Wide Angle X-ray Scattering (SAXS) "Protein Complexes and Conformational Change" **COVID Affected** Rescheduled from 2021	Merit Access 3 shifts 21-22 October	$2,080
Assoc Prof Chris Squire Dr Ghader Bashiri Dr Richard Kingston Assoc Prof Shaun Lott Dr David Goldstone	Auckland Auckland Auckland Auckland Auckland	2022-3	Micro Crystallography (MX2) "2021 CAP Program"	Merit Access 6 shifts 22-23 October and 8-9 December	Incl in MX1 claim above
Dr Roberto Calvelo-Pereira Prof Jonathan Procter Shannen Mills	Massey Massey Massey	2022-3	Micro-Computed Tomography (MCT) "Linking high-resolution 3D soil architecture with carbon storage in paleosols"	Merit Access 6 shifts 27-29 October	$2,842
Prof Richard Haverkamp Grace van Cingel Andrea Matinong	Massey Massey Massey	2022-3	X-ray Absorption Spectroscopy (XAS) "Mitigation of toxicity of waste CCA treated timber"	Merit Access 3 shifts 2-3 November	$4,209

Researchers	Institution	Cycle	Beamline	Access	Funding
Prof Tilo Soehnel Rosanna Rov Dr Samuel Yick Marco Vas Assoc Prof Clemens Ulrich	Auckland Auckland Auckland Auckland U. NSW	2022-3	Powder Diffraction (PD) "Investigating the low temperature structural anomaly in the multiferroic system Cu_2OSeO_3"	Merit Access 6 shifts 9-11 November	$3,035
Dr Greg Giles Adirah Coulter-Jeffrey Ansa Thomas Dr Andrew Clarkson	Otago Otago Otago Otago	2022-3	X-ray Fluorescence Microscopy (XFM) "tDodSNO - A Nitric Oxide Releasing Drug for Stroke Therapy"	Merit Access 6 shifts 15-17 Nov	$3,243
David Adams Prof Shane Cronin Dr Joali Paredes-Marino Dr Ingrid Ukstins	Auckland Auckland Auckland Auckland	2022-3	X-ray Fluorescence Microscopy (XFM) "Oxidation state and water content of the January 2002 Hunga Tonga–Hunga Ha'apai mineral melt inclusions and erupted glasses; indicators of the magma generation process?"	Merit Access 12 shifts 17-21 Nov	$2,062
Dr Ingrid Ukstins Prof Shane Cronin David Adams Dr Jie Wu Kyle Hamilton	Auckland Auckland Auckland Auckland Auckland	2022-3	Infrared Microscopy (IRM) "H_2O and CO_2 diffusion in high Mg olivine from the 15 January 2022 Tonga eruption as a tracer of magma ascent rates."	Merit Access 12 shifts 23-27 Nov	$2,464
Dr Ian Schipper Dr Jenni Hopkins Briar Pawson Mila Huebsch	VUW VUW VUW Auckland	2022-3	Micro-Computed Tomography (MCT) "Experimentally Investigating the Surface Reactivity of Volcanic Ash - Implications for Health and Environmental Impacts of Large Eruptions"	Merit Access 6 shifts 1-3 December	$3,150
Prof Martin Allen Prof Roger Reeves Kate Wislang Ryan Adams	Canterbury Canterbury Canterbury Canterbury	2023-1	Soft X-ray Spectroscopy (SXR) "Surface Modification Strategies to Improve the Efficiency of β-Ga_2O_3 Power Electronic Devices"	Merit Access 15 shifts 14-19 February	$3,135
Assoc Prof Chris Squire Dr Ghader Bashiri Dr Richard Kingston Assoc Prof Shaun Lott Dr David Goldstone	Auckland Auckland Auckland Auckland Auckland	2023-1	Micro Crystallography (MX2) "Auckland Structural Biology 2023 CAP Program"	Merit Access 6 shifts 22-23 Feb and 21-22 Apr	$10,459
Dr Joanna Hicks Prof Geoff Jameson Prof Vic Arcus Prof Emily Parker Dr Gerd Mittelstaedt Dr Elena Harjes Dr Stefan Harjes Ruby Roach Tracy Hale Keely Oldham Dr Jack McGarvie Florian de Pol	Waikato Massey Waikato VUW VUW Massey Massey Massey Massey Waikato Waikato VUW	2023-1	Small/Wide Angle X-ray Scattering (SAXS) "Protein complexes and conformational change"	Merit Access 6 shifts 24-26 February	$2,590

Researchers	Institution	Cycle	Beamline	Access	Funding
Dr Matthias Fellner Prof Kurt Krause Assoc Prof Brian Monk Dr Peter Mace Dr Adam Middleton Prof Catherine Day Dr Ashley Campbell Dr Prasanth Padala Abigail Burgess Helen Opel-Reading Bahram Pooreydy	Otago Otago Otago Otago Otago Otago Otago Otago Otago Otago Otago	2023-1	Micro Crystallography (MX2) "University of Otago Structural Biology Group"	Merit Access 5 shifts 28 Feb-1 Mar and 27-28 April	$13,428
Prof Emily Parker Prof Geoff Jameson Dr Ron Ronimus Dr Andrew Sutherland-Smith Assoc Prof Wayne Patrick Dr David Comoletti Prof Vic Arcus Dr Joanna Hicks Chelsea Vickers	VUW Massey AgResearch Massey VUW VUW Waikato Waikato VUW	2023-1	Micro Crystallography (MX2) "Protein Structure and Function: AgResearch NZ, Ferrier Institute and Waikato, Victoria and Massey Universities"	Merit Access 5 shifts 7-8 March and 28-29 April	$7,025
Dr Adam Middleton Prof Kurt Krause Dr Peter Mace Prof Catherine Day Assoc Prof Sigurd Wilbanks Assoc Prof Brian Monk Dr Matthias Fellner Bahram Pooreyde Dr Ashley Campbell Dr Prasanth Padala	Otago Otago Otago Otago Otago Otago Otago Otago Otago Otago	2021-3	Micro Crystallography (MX2) "University of Otago Structural Biology Group"	Merit Access 5 shifts 6-7 Nov and 26-27 Nov	Incl in MX1 claim above
Dr Grant Pearce Prof Ren Dobson Dr Jodie Johnston Dr Tim Allison Dr Christoph Goebl Dr Ali Reza Nazmi Dr Vanessa Morris Amanda Broad Sophie Eccersell Jovarn Sullivan Gayan Abeysekera	Canterbury Canterbury Canterbury Canterbury Otago Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2023-1	Small/Wide Angle X-ray Scattering (SAXS) "University of Canterbury SAXS Proposal 2023/1"	Merit Access 6 shifts 8-10 March	$4,672
Dr Dorisel Torres-Rojas Franco Gonzalez Dr Rachel Hestrin Dr Mei Bai Dr Thea Whitman	Waikato Waikato U. Mass. Melb. U. Wisc. U.	2023-1	Soft X-ray Spectroscopy (SXR) "Soil organics matter: exploring abiotic pathways to mitigation of agricultural nitrous oxide emissions"	Merit Access 9 shifts 9-12 March	$0

Researchers	Institution	Cycle	Beamline	Access	Funding
Dr Ghader Bashiri Dr Richard Kingston Yuliana Yosaatmadja George Randall Stephanie Stuteley Daniel Body Evie Mansfield	Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2023-1	Small/Wide Angle X-ray Scattering (SAXS) "Solution investigation of proteins with biomedical significance"	Merit Access 6 shifts 10-12 March	$2,065
Assoc Prof Michael Rowe Prof Kathy Campbell Dr Diego Guido Ema Nersezova Barbara Lyon Amanda Galar	Auckland Auckland INREMI Auckland Auckland Uni Nacional La Plata	2023-1	X-ray Fluorescence Microscopy (XFM) "Biogenicity and preservation of trace metals in hot springs: preparing for a Mars sample return mission"	Merit Access 12 shifts 15-19 March	$2,979
Assoc Prof Chris Squire Dr Ghader Bashiri Dr Richard Kingston Assoc Prof Shaun Lott Dr David Goldstone	Auckland Auckland Auckland Auckland Auckland	2023-1	Macromolecular Crystallography (MX1) "Auckland Structural Biology 2023 CAP Program"	Merit Access 3 shifts 18-19 March	Inc in MX2 claim above
Dr Adele Williamson Dr William Kelton Annmaree Warrender Alexandra Perry	Waikato Waikato Waikato Waikato	2023-1	Small/Wide Angle X-ray Scattering (SAXS) "Structural dynamics of DNA-repair proteins from Antarctica and immune-system components from Humans"	Merit Access 3 shifts 18-19 March	$1,796
Prof Daniel Holland Dr James Robinson Matt Rennie Matt Watson Assoc Prof Mike Clearwater Abby van den Berg	Canterbury Canterbury Canterbury Canterbury Waikato U. Vermont	2023-1	Micro Computed Tomography (MCT) "MCT Preferred Access Time"	Preferred Access 6 shifts 24-26 March	$2,751
Dr Matthias Fellner Prof Kurt Krause Assoc Prof Brian Monk Dr Peter Mace Dr Adam Middleton Prof Catherine Day Dr Ashley Campbell Dr Prasanth Padala Abigail Burgess Helen Opel-Reading Bahram Pooreydy	Otago Otago Otago Otago Otago Otago Otago Otago Otago Otago Otago	2023-1	Macromolecular Crystallography (MX1) "University of Otago Structural Biology Group"	Merit Access 3 shifts 30-31 Mar	Inc in MX2 claim above
Prof Emily Parker Prof Geoff Jameson Dr Ron Ronimus Dr Andrew Sutherland-Smith Assoc Prof Wayne Patrick Dr David Comoletti Prof Vic Arcus Dr Joanna Hicks Chelsea Vickers	VUW Massey AgResearch Massey VUW VUW Waikato Waikato VUW	2023-1	Macromolecular Crystallography (MX1) "Protein Structure and Function: AgResearch NZ, Ferrier Institute and Waikato, Victoria and Massey Universities"	Merit Access 6 shifts 31 Mar- 1 Apr	Incl in MX2 claim above

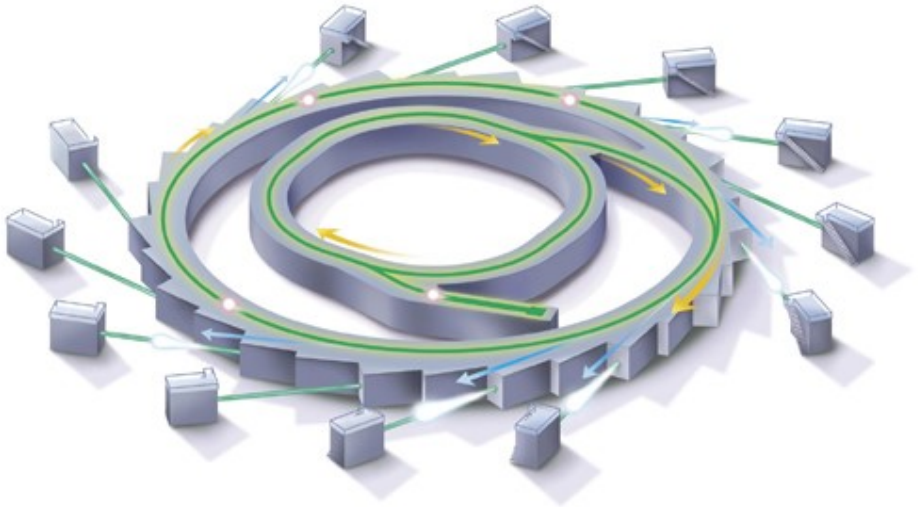
Researchers	Institution	Cycle	Beamline	Access	Funding
Dr Konstantin Pavlov Dr Andrew Stevenson Dr David Paganin Samantha Alloo Dr Kaye Morgan	Canterbury Aust Synch Monash Canterbury Monash	2023-1	Micro-Computed Tomography (MCT) "Directional Dark-field Tomography using Speckle-based X-ray Imaging"	Merit Access 6 shifts 4-6 April	$2,155
Dr Adam Hartland Dr Jeffrey Lang Sebastian Hoepker	Waikato Waikato Waikato	2023-1	X-ray Fluorescence Microscopy (XFM) "High-resolution stalagmite record of mid- to late-Holocene paleo-earthquakes at the Hikurangi subduction margin, eastern North Island, New Zealand"	Merit Access 6 shifts 4-6 April	$2,074
Prof Richard Haverkamp Thomas Sun Andrea Matinong Karla Wolmarans	Massey Massey Massey Massey	2023-1	Medium Energy X-ray Absorption Spectroscopy (MEX1) "Structural studies of iron substitution in ilmenite"	Merit Access 9 shifts 19-22 April	$4,100
Prof Richard Haverkamp Thomas Sun Olivia Buwalda Dr Maxence Plouviez Prof Benoit Guieysse	Massey Massey Massey Massey Massey	2023-2	Medium Energy X-ray Absorption Spectroscopy (MEX2) "Reactive trapping of metals on charcoal supported sulfur"	Merit Access 6 shifts 25-27 May	$2,850
Dr Grant Pearce Prof Ren Dobson Dr Robin Sharwood Michael Newton-Vesty	Canterbury Canterbury U. West. Syd Canterbury	2023-2	Small/Wide Angle X-ray Scattering (SAXS) "Conformational studies of plant proteins"	Merit Access 3 shifts 9-10 June	$2,643
Dr Grant Pearce Prof Ren Dobson Dr Jodie Johnston Dr Tim Allison Dr Christoph Goebl Dr Ali Reza Nazmi Dr Vanessa Morris Jovarn Sullivan Gayan Abeysekera Michelle Klein Pierre De Cordovez	Canterbury Canterbury Canterbury Canterbury Otago Canterbury Canterbury Canterbury Canterbury Canterbury Otago	2023-2	Small/Wide Angle X-ray Scattering (SAXS) "University of Canterbury SAXS Proposal 2023/2"	Merit Access 3 shifts 10-11 June	$2,755
Dr Joanna Hicks Prof Geoff Jameson Prof Vic Arcus Prof Emily Parker Dr Gerd Mittelstaedt Dr Elena Harjes Dr Stefan Harjes Ruby Roach Tracy Hale Jessicca Usu Florian de Pol	Waikato Massey Waikato VUW VUW Massey Massey Massey Massey Massey VUW	2023-2	Small/Wide Angle X-ray Scattering (SAXS) "Protein complexes and conformational change"	Merit Access 6 shifts 15-17 June	$2,979

Researchers	Institution	Cycle	Beamline	Access	Funding
Dr Chang Wu Assoc Prof Aaron Marshall Dr Jian Peng Laura Tetheridge	Canterbury Canterbury Wollongong Canterbury	2023-2	X-ray Absorption Spectroscopy (XAS) "Using In-situ XAS to probe the mechanism behind the superior stability of NiFeMn LDH in alkaline OER"	Merit Access 9 shifts 16-19 June	$2,983
Prof Tilo Soehnel Prof Peng Cao Dr Samuel Yick Dr Shanghai Wei Ryan Silk Marco Vas Mark Appletree	Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2023-2	Powder Diffraction (PD) "Investigating structural changes of Mg-ion battery cathode $Mo_6S_{(x-8)}Se_{(x)\ (x = 0 - 8)}$ during cycling.	Merit Access 9 shifts 22-25 June	$4,063
Dr Matthias Fellner Prof Kurt Krause Prof Brian Monk Dr Peter Mace Dr Adam Middleton Prof Catherine Day Helen Opel-Reading Dr Ashley Campbell Caleb Trimble Adrian Smith-Beech	Otago Otago Otago Otago Otago Otago Otago Otago Otago Otago	2023-2	Macromolecular Crystallography (MX1) "University of Otago Structural Biology Group"	Merit Access 3 shifts 25-26 June	$8,892
Prof Vladimir Golovko Prof Aaron Marshall Dr Shailendra Sharma Glen McClea Alex Heenan	Canterbury Canterbury Canterbury Canterbury Canterbury	2023-2	Medium Energy X-ray Absorption Spectroscopy (MEX-1) "Stability of pure and heteroatom substituted Au clusters under thermal and catalytic conditions"	Preferred Access 9 shifts 29 Jun-2 Jul	$4,242
New Zealand Researchers with Projects in Australian Based Collaboration Access Programs					
Prof Paul Kruger Nathan Harvey-Reid Sydney Koia Chris Fitchett Brooke Matthews	Canterbury Canterbury Canterbury Canterbury Canterbury	2023 Full Year	Macromolecular Crystallography (MX1) "Spin-Crossover Materials, Coordination Cages and Metal Organic Frameworks"	Merit Access MX1 3.0 shifts Various dates	$0
Dr Tim Allison Dr Ngoc Anh Thu Ho James Titterington	Canterbury Canterbury Canterbury	2023 Full Year	Macromolecular Crystallography (MX1) and Micro Crystallography (MX2) "Exposing the intricate interactions of membrane-associated bacterial machinery"	Merit Access MX1 1.5 shift MX2 4.5 shifts Various dates	$0
Dr Jodie Johnson Dr Ngoc Anh Thu Ho Dr Fiona Given	Canterbury Canterbury Canterbury	2023 Full Year	Macromolecular Crystallography (MX1) and Micro Crystallography (MX2) "Microbial Enzyme Studies: Understanding and Engineering Enzyme Allostery & Inhibiting Essential Enzymes from Human Pathogens"	Merit Access MX1 1.5 shift MX2 4.5 shifts Various dates	$0

Researchers	Institution	Cycle	Beamline	Access	Funding
Assoc Prof Ren Dobson Jordan Sullivan Dr Michael Currie David Wood Sarah Manners Mackenzie Aitken David Coombes Ashleigh Johns Amanda Board Michael Newton-Vesty Aimee Harper	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2023 Full Year	Macromolecular Crystallography (MX1) and Micro Crystallography (MX2) "Integral membrane proteins; Protein-DNA interactions; Enzymes for drug discovery; Alternative food proteins"	Merit Access MX1 1.5 shift MX2 4.5 shifts Various dates	$0
Dr Ali Reza Nazmi	Canterbury Canterbury	2023 Full Year	Macromolecular Crystallography (MX1) and Micro Crystallography (MX2) "Enzymatic synthesis of novel high-value biopolymers"	Merit Access MX1 1.5 shifts MX2 1.5 shifts Various dates	$0
New Zealand Researchers with Beamtime from Australian-based Applications for Merit Beamtime					
Dr Lauren Macreadie Dr Courney Ennis Prof Lyall Hanton Elliott Nicholson Nick Page	U. NSW Otago Otago Otago Otago	2023-1	THz/Far-infrared (THz) "Investigating vibrational modes diagnostic of negative thermal expansion in flexible MOFs"	Merit Access 9 shifts 24-27 Feb	$0
Dr Lucille Chapuis Dr Jenna Crowe-Riddell Dr Alice Clements Myoung Hoon Ha Prof Shaun Collins Hope Robins Caroline Kerr	Auckland La Trobe U. Flinders U. La Trobe U. La Trobe U. La Trobe U. La Trobe U.	2023-1	Imaging and Medical (IM) "Nervous and sensory systems of Australian reptiles and fishes: a neuroecological study"	Merit Access 6 shifts 3-5 March	$0
Prof James Murphy Dr Christopher Horne Alex Bohles Dr Peter Mace	WEHI WEHI Otago Otago	2023-2	Small/Wide Angle X-ray Scattering (SAXS) "Hold On: new mechanisms of protein kinase regulation by interacting proteins"	Merit Access 6 shifts 22-24 June	$0

The Australian Synchrotron

A synchrotron is a large research facility that generates an extremely intense beam of electromagnetic radiation ('light') that can be used for scientific experiments. The radiation is produced by taking a stream of electrons travelling at close to the speed of light, and deflecting them with magnetic fields. The light covers the electromagnetic spectrum from the infrared to the hard x-ray region.



Electrons are generated in the linear accelerator (linac), and progress into the smaller 'booster' ring, where they are further accelerated up to their final velocity (99.99% of the speed of light, a kinetic energy of 3.0 GeV). At this point they are 'injected' into the larger storage ring, where they circulate for a period of hours to days. The electron beam is steered and focused by magnetic fields. At each point where the beam is deflected, electromagnetic radiation is produced tangential to the beam path. 'Insertion devices', undulators and wigglers, are periodic magnet structures that serve to increase the radiation flux by up to five orders of magnitude. The radiation produced can be used in many different experiments and techniques. The light is channelled from the ring down a number of 'beam lines', each of which is optimised for a particular experimental technique.

The facility has thirteen beamlines, ten of which have been operating for some time and three which commenced operations during the year. A further five are under construction and will start user operations progressively from 2024 through to 2026.. The existing beamlines are:

- Protein crystallography (MX1) was the first beam line to become operational and began accepting general users in January 2008. This technique uses x-ray diffraction to determine the structure of proteins, used in drug design and understanding biochemical interactions.
- Infrared spectroscopy and microscopy (IR) also came online in early 2008. The beam line features two endstations: an FTIR spectrometer (THz) and an infrared microscope (IRM). The beamline is ideally suited to the analysis of microscopic samples, such as small particles and thin layers within complex matrices, or thin coatings on surfaces.
- Powder diffraction (PD) began taking general users in February 2008 and was fully operational by May 2008. This beam line is a general purpose diffraction

beam line with several sample environments for observing changes in materials structure as a function of temperature, pressure, time, etc.

- The Soft X-ray Absorption Spectroscopy (SXR) beamline was available for general users from late 2008. It operates at low x-ray energies and is most useful for surface studies.
- Final commissioning of the X-ray absorption spectroscopy (XAS) beam line was completed at the end of 2008 and became available to general users from January 2009. This technique is useful for probing elemental valence states and determining the local structure around an atomic species of interest.
- Small-angle x-ray scattering (SAXS), combined with wide-angle x-ray scattering (WAXS) is a useful technique for determining large scale (1-100 nm), short-range order in materials. This beamline came online at the beginning of 2009.
- The commissioning of the second protein crystallography and small-molecule crystallography beamline (MX2) was completed in mid 2009. It complements the original MX1 crystallography beam line and is able to measure micron-sized crystals and other weakly-scattering or hard to crystallise systems.
- The microspectroscopy beamline (XFM) construction was also completed in early 2009. This beamline combines the high spatial resolution of a microscope with the information that can be gleaned through x-ray fluorescence spectroscopy.
- The Imaging and Medical beamline (IM) came into full use in 2013. It was redesigned from its original concept to include a 150 m long enclosure which extends well outside the Synchrotron building. It has the world's widest x-ray beam and can provide dynamic 3D x-ray imaging at very high resolution. In addition to its medical applications, it has been used by geoscientists for tomography studies.
- The new Micro-Computed Tomography (MCT) commenced user operations in September 2022. Micro-computed tomography opens a window on the micron-scale 3D structure of a wide range of samples relevant to many areas of science including life sciences, materials engineering, anthropology, palaeontology and geology. The beamline delivers high-throughput and dynamic micro-CT down to submicron resolution. A key feature is the speed of data collection, focusing both on applications where many samples are imaged and experiments where a single specimen is imaged many times to observe dynamic responses to temperature, pressure, strain or other changing environmental conditions.
- The two new Medium Energy X-ray Absorption Spectroscopy beamlines (MEX1 and MEX2) commenced operation in November 2022 and April 2023 respectively. There are two independently operated end-stations which provide medium energy absorption spectroscopy optimised for cutting-edge applications in biological, agricultural and environmental science. They cover an energy range not previously available to Australian and New Zealand researchers, allowing X-ray absorption spectroscopy measurements of a group of very important elements such as sulphur, phosphorus, silicon and chlorine. Applications include environmental studies of inorganic, organophosphate and organochlorine pollutants, water pollution, plant growth, micro-nutrient transport and soil salinity, as well as studies of biomineralisation.

The New Zealand Synchrotron Group was one of ten foundation investors, each of whom has contributed A$5 million towards the initial suite of beam lines. This investment secured preferred (as-of-right) access for each foundation investor, spread over all the beam lines in addition to unrestricted access to the merit beamtime pool. The preferred access arrangements for foundation investors ceased in August 2013.

Following a transfer of ownership from the Victorian government and the other original foundation investors to ANSTO in 2016 and the securing of guaranteed operating funding for the next ten years, thoughts turned to the possibility of adding new beamlines to expand the facilities capabilities. Another campaign to raise funds was initiated which to date has raised in excess of A$94 million which is being used to add a further eight beamlines to the facility. The new beamlines will add significant capacity and new capability to the Australian Synchrotron.

As part of the re-financing of New Zealand's funding of the new beamlines and the ongoing operations of the Synchrotron, it was possible to secure an increase in the amount of merit beamtime on the original ten beamlines that were set aside for New Zealand researchers from 201 shifts to 267 shifts per year, as well as receiving proportionate rights to the merit and preferred access shifts that are becoming available as each new beamline is commissioned. The agreement does not expire until June 2026. The agreement also guaranteed that the new BioSAXS beamline, which has capability of particular interest to New Zealand researchers, would be one of the first beamlines to be added to the facility. New Zealand has contributed A$12 million towards the new beamlines on a 50:50 shared basis by the New Zealand research sector and the government.

Prior to COVID, all the new beamlines were on track to be completed on time. However, shutdowns in Melbourne from early 2020 resulted in the periodic closure of the Australian Synchrotron. Similar shutdowns in Europe where important components were being manufactured also caused delays. There have been restrictions on people coming to Australia which has affected equipment installation and more recently a contract to source an insertion device from Russia as originally intended has further complicated construction plans. The net effect is that the first four beamlines have been about 9 months behind the original completion date and the remaining four beamlines will be 12-18 months late.

Details of the five new beamlines still under construction are:

BioSAXS (BSX)
Expected User Program Start Date: Oct 2023
The BIOSAXS beamline has been specifically designed for structural biology and will have equal or better specifications than the current SAXS beamline, combined with specialised facilities for protein work, giving scientists and industry unprecedented access to the most sophisticated tools available.

Applications include a great impact in the study of the structure of larger biomedical molecules involved in the critical functions of human cells, such as proteins and the nucleic acids that comprise the genetic material within cells, and the study of interactions between biological molecules and new drugs.

Advanced Diffraction and Scattering (ADS1 and AD2)
Expected User Program Start Dates: ADS1 & ADS2 Sep 2024
The ADS beamline will also have two independent end-stations providing capabilities previously unavailable in Australasia with two high energy beamlines for polychromatic and monochromatic x-ray diffraction and imaging. Applications include: studies of mineral formation and recovery under extreme conditions of temperature and pressure; non-destructive detection of cracking, fractures, textures, strains and deformations in large manufactured objects across the energy, automotive, transport, defence and aerospace sectors; maintenance and component failure studies of engineering infrastructure; and studies of corrosion and cracking in aluminium alloys used in aircraft and marine platforms

High Performance Macromolecular Crystallography (MX3)
Expected User Program Start Date: May 2024
This ultra-high flux micro-focus macromolecular crystallography beamline is intended for small and/or poorly diffracting samples. The most important targets for the design of novel drugs include difficult large assemblies, which rarely produce crystals of sufficient size for analysis using traditional macro or micro-molecular crystallography beamlines. The HMX beamline will enable the study of sub-5μm crystals, providing a state-of-the-art high-throughput facility for researchers to study very small, weakly diffracting crystals of protein fragments and solution studies of protein fragments.

Applications include: in membrane proteins and receptors; virology; and materials science. The beamline will take advantage of the latest developments in high-throughput crystallography, including robot handling of 96-well crystallisation plates.

X-ray Fluorescence Nanoprobe
Expected User Program Start Date: Jun 2025
The multimodal nanoprobe beamline will be optimised for fluorescence detection, allowing the mapping of metals inside samples with extremely high resolution and sensitivity. It will have three operating modes: high resolution mapping (80 nm), high-flux mapping (160 nm resolution) and spectroscopy (160 nm resolution).

Applications will come from researchers in physics, chemistry, biology, nutrition and health, geosciences, engineering, environmental research, soil science, agriculture, cultural heritage, and materials science.

CORPORATE GOVERNANCE

Board Composition

The company operates with a board comprising up to 5 directors, including an independent chairman. Interim directors were appointed initially. These were replaced by a permanent board following elections which were held in April 2007.

The Directors during the period 1 July 2022 to 30 June 2023 were:

Dr Garth Carnaby, Chair
Dr Brett Cowan, Institute of Environmental Science and Research Ltd
Professor Catherine Day, University of Otago
Emeritus Professor Geoffrey Jameson, Massey University
Professor James Metson, The University of Auckland

Indemnities and Insurance

The board has taken Directors and Officers Liability Insurance with NZI. Coverage of up to $6 million has been obtained.

Attendance at Board Meetings

The following table shows the attendance at meetings of the board for each director and the fees paid.

Director	No. meetings held during the year	No. meetings attended	Fees paid
Dr Garth Carnaby	5	5	$9,000
Dr Brett Cowan	5	5	-
Professor Catherine Day	5	5	-
Emeritus Professor Geoffrey Jameson	5	5	-
Professor James Metson	5	5	-

Donations

The company did not make any donations during the period from establishment up to 30 June 2023.

Interests Register

During the course of undertaking its normal business activities in supporting the development of synchrotron science, the company provides assistance towards the travel costs for research staff from its shareholders. The practice at meetings of the board is for directors from organisations who are receiving financial support to declare an interest and to refrain from voting on that particular matter.
The following significant entries relating to the directors were recorded in the Interests Register during the year.

Director	Organisation/Entity	Nature of Interest
Dr GA Carnaby		
Shares Held	GA Carnaby & Associates Ltd	Controlling majority
Beneficiary of Trusts	Carnaby Trust	Trustee and discretionary beneficiary
	National Provident Fund	Annuity/Defined benefit
Offices Held	Dodd-Walls Centre of Research Excellence	Chair
	BioResource Processing Alliance	Chair
	Wool Industry Research Ltd	Chair
Dr BR Cowan		
Offices Held	ESR	GM and Chief Scientist
	Cowan Consulting Ltd	Director and shareholder
	Jatby Investments Ltd	Director and shareholder
	Matai Medical Research Institute	Trustee
	Atanga Trust	Trustee
Other	Financial Markets Authority	Daughter (Jenika Phipps) has a lead role in sustainability reporting
Professor CL Day		
Offices Held	University of Otgao	Employee
	Maurice Wilkins CoRE	Member - AI
Shares Held	Fairholm Farming Ltd	Minority shareholder
Emeritus Prof GB Jameson		
Shares Held	Tower Ltd	Minority shareholder
Offices Held	Massey University	Emeritus Professor
	Asian Crystallographic Association	Vice-President
Other Interests	Te Manawa Museums Trust Board	Board member
	Science Centre Trust, Palmerston North	Secretary
	Riddett Institute	Member - PI
	MacDiarmid Institute	Member - AI
	Maurice Wilkins Centre	Member - AI
Prof JB Metson		
Shares Held	Vector Energy	Minority shareholder
Offices Held	University of Auckland	Deputy Vice-Chancellor Research (until March 2023) Special Advisor Newmarket Campus (from March 2023)
	Maurice Wilkins Centre for Molecular Biodiscovery	Board Member
	Te Pūnaha Matatini	Board Member (until May 2023)
	Dodd Walls Centre	Board Member
	Ngā Pae o te Maramatanga	Board Member
	High Value Nutrition National Science Challenge	Board Member (until May 2023)
	Te Titoki Mataroa	Board Member
	Auckland UniServices Ltd	Chair
	Research and Education Advanced Network New Zealand (REANNZ)	Director
	Rotary Science & Technology Forum Trust	Trustee

New Zealand Synchrotron Group Limited
Financial statements
for the year ended 30 June 2023

Contents

Directors

G A Carnaby (Chair)
B R Cowan
C L Day
G B Jameson
J B Metson

Registered Office

11 Turnbull Street
Thorndon
Wellington

Nature of business

The purpose of the company is to provide research access in the Australian Synchrotron for researchers from New Zealand. The company also promotes synchrotron science, assists in the capability of New Zealand researchers in synchrotron science and manages the travel funding for New Zealand researchers using the Australian Synchrotron.

Company Registration number

1865516

Independent auditor

Grant Thornton New Zealand Audit Limited

New Zealand Synchrotron Group Limited
Board Report
for the year ended 30 June 2023

The Board has pleasure in presenting the annual report of the New Zealand Synchrotron Group Limited ("NZSG") incorporating the financial statements and the auditors' report, for the year ended 30 June 2023.

The Company has taken advantage of the reporting concessions available to it under sections 211(3) of the Companies Act 1993.

The Board of NZSG has authorised these financial statements presented on pages 7 to 20 for issue on 20 October 2023.

For and on behalf of the Board

G A Carnaby	J B Metson
Chair	Director
20-Oct-2023	20-Oct-2023

Grant Thornton

INDEPENDENT AUDITOR'S REPORT

Grant Thornton New Zealand Audit Limited
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TO THE SHAREHOLDERS OF NEW ZEALAND SYNCHROTRON GROUP LIMITED FOR THE YEAR ENDED 30 JUNE 2023

The Auditor-General is the auditor of New Zealand Synchrotron Group Limited (the Company). The Auditor-General has appointed me, Brent Kennerley, using the staff and resources of Grant Thornton New Zealand Audit Limited, to carry out the audit of the financial statements of the Company on his behalf.

Opinion

We have audited the financial statements of the Company on pages 7 to 20, that comprise the statement of financial position as at 30 June 2023, the statement of comprehensive revenue and expenses, statement of changes in net assets and statement of cash flows for the year ended on that date and the notes to the financial statements that include accounting policies and other explanatory information; and

In our opinion:

- the financial statements of the Company on pages 7 to 20:
  - present fairly, in all material respects:
    - its financial position as at 30 June 2023; and
    - its financial performance and cash flows for the year then ended; and
  - comply with generally accepted accounting practice in New Zealand in accordance with Public Benefit Entity International Public Sector Accounting Standards Reduced Disclosure Regime ('PBE IPSAS RDR'); and

Our audit was completed on 20 October 2023. This is the date at which our opinion is expressed.

The basis for our opinion is explained below. In addition, we outline the responsibilities of the Board of Directors and our responsibilities relating to the financial statements, we comment on other information, and we explain our independence.

Basis for our opinion

We carried out our audit in accordance with the Auditor-General's Auditing Standards, which incorporate the Professional and Ethical Standards and the International Standards on Auditing (New Zealand) issued by the New Zealand Auditing and Assurance Standards Board. Our responsibilities under those standards are further described in the Responsibilities of the auditor section of our report.

We have fulfilled our responsibilities in accordance with the Auditor-General's Auditing Standards.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Responsibilities of the Board of Directors for the financial statements

The Board of Directors is responsible on behalf of the Company for preparing financial statements that are fairly presented and that comply with generally accepted accounting practice in New Zealand. The Board of Directors is responsible for such internal control as it determines is necessary to enable it to prepare financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Board of Directors is responsible on behalf of the Company for assessing the Company's ability to continue as a going concern. The Board of Directors is also responsible for disclosing, as applicable, matters related to going concern and using the going concern basis of accounting, unless the Board of Directors intends to liquidate the Company or to cease operations or has no realistic alternative but to do so.

The Board of Directors' responsibilities arise from the Crown Entities Act 2004 and the Education Act 1989.

Responsibilities of the auditor for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements, as a whole, are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion.

Grant Thornton

Reasonable assurance is a high level of assurance but is not a guarantee that an audit carried out in accordance with the Auditor-General's Auditing Standards will always detect a material misstatement when it exists. Misstatements are differences or omissions of amounts or disclosures and can arise from fraud or error. Misstatements are considered material if, individually or in the aggregate, they could reasonably be expected to influence the decisions of readers taken on the basis of these financial statements.

We did not evaluate the security and controls over the electronic publication of the financial statements.

As part of an audit in accordance with the Auditor-General's Auditing Standards, we exercise professional judgement and maintain professional scepticism throughout the audit. Also:

- We identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- We obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control.
- We evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Board of Directors.
- We evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- We conclude on the appropriateness of the use of the going concern basis of accounting by the Board of Directors and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Company's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Company to cease to continue as a going concern.

We communicate with the Board of Directors regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Our responsibilities arise from the Public Audit Act 2001.

Other information

The Board of Directors are responsible for the other information. The other information comprises the information included on page 4, but does not include the financial statements and our auditor's report thereon.

Our opinion on the financial statements does not cover the other information and we do not express any form of audit opinion or assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information. In doing so, we consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If, based on our work, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Independence

We are independent of the Company in accordance with the independence requirements of the Auditor-General's Auditing Standards, which incorporate the independence requirements of Professional and Ethical Standard 1 (Revised): *Code of Ethics for Assurance Practitioners* issued by the New Zealand Auditing and Assurance Standards Board.

Other than the audit, we have no relationship with or interests in the Company.

Brent Kennerley
Grant Thornton New Zealand Audit Limited
On behalf of the Auditor-General
Wellington, New Zealand

New Zealand Synchrotron Group Limited
Statement of comprehensive revenue and expenses
for the year ended 30 June 2023

	Note	*2023 (Unaudited) Budget*	2023 Actual	2022 Actual
		$	$	$
Revenue from non exchange transactions				
Revenue for Australian Operations	3	*2,803,841*	2,790,930	2,708,507
Revenue from exchange transactions				
Revenue for NZ Operations	4	*90,000*	93,500	193,650
Other revenue	4	*120,217*	245,179	133,596
Total Revenue		*3,014,058*	3,129,609	3,035,753
Expenses				
Australian Synchrotron Group costs	5, 18	*2,677,487*	2,640,515	2,578,979
(Gain) / Loss on fair value of derivatives		*10,000*	39,495	(54,769)
Other operating expenses	6	*326,350*	402,114	382,405
Operating expenditure		*3,013,837*	3,082,124	2,906,615
Total surplus/(deficit) for the year		221	47,485	129,138
Other comprehensive income		-	-	-
Total comprehensive revenue and expense		***221***	**47,485**	**129,138**

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 20.

New Zealand Synchrotron Group Limited
Statement of changes in net assets
for the year ended 30 June 2023

	Notes	Share capital $	Accumulated losses $	Total equity $
Balance as at 30 June 2021		2,912,162	(2,279,767)	**632,395**
Net surplus		-	129,138	129,138
Other comprehensive income		-	-	-
Total comprehensive revenue and expenses		-	129,138	129,138
Balance as at 30 June 2022		**2,912,162**	**(2,150,629)**	**761,533**
Net surplus		-	47,485	**47,485**
Other comprehensive income		-	-	-
Total comprehensive revenue and expenses		-	47,485	**47,485**
Balance as at 30 June 2023		**2,912,162**	**(2,103,144)**	**809,018**

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 20.

New Zealand Synchrotron Group Limited
Statement of financial position
as at 30 June 2023

ASSETS	**Note**	**2023**	**2022**
		$	**$**
Current assets			
Cash & cash equivalents	7	222,580	367,778
Investments	7	471,503	421,301
Trade and other receivables from exchange transactions	8	153,680	79,196
Prepayments	8	2,400	2,200
Derivative financial instruments	9	18,501	47,123
Total current assets		**868,664**	**917,598**
TOTAL ASSETS		**868,664**	**917,598**
LIABILITIES			
Current liabilities			
Trade and other payables	11	48,773	156,065
Derivative financial instruments		10,873	-
Total current liabilities		**59,646**	**156,065**
TOTAL LIABILITIES		**59,646**	**156,065**
Net assets		**$ 809,018**	**$ 761,533**
EQUITY			
Share capital	15	2,912,162	2,912,162
Accumulated losses		(2,103,144)	(2,150,629)
TOTAL EQUITY		**$ 809,018**	**$ 761,533**

For and on behalf of the Board

G A Carnaby
Chair

20-Oct-2023

J B Metson
Director

20-Oct-2023

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 20.

New Zealand Synchrotron Group Limited
Statement of cash flows
for the year ended 30 June 2023

	Notes	2023 $	2022 $
Cash flows from operating activities			
Receipts			
Receipts from non exchange transactions		2,790,930	2,708,507
Receipts from exchange transactions		196,126	275,548
Interest	4	68,069	14,163
Total cash received		**3,055,125**	**2,998,218**
Payments			
Australian Synchrotron Group Costs		(2,640,515)	(1,290,458)
Less: Cash applied to Derivative Asset		0	(49,000)
Other expenses		(509,606)	(1,869,932)
Total cash applied		**(3,150,121)**	**(3,209,390)**
Net cashflows from operating activities	17	***(94,996)***	***(211,172)***
Cash flows from investing activities			
Payments			
Purchase of investments		(50,202)	(421,301)
Total cash applied		**(50,202)**	**(421,301)**
Net cash flows from investing activities		***(50,202)***	***(421,301)***
Net (decrease)/increase in cash and cash equivalents		*(145,198)*	*(632,473)*
Cash and cash equivalents at 1 July	7	367,778	1,000,251
Cash and cash equivalents at 30 June	7	**222,580**	**367,778**

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 20.

Note 1. General information

New Zealand Synchrotron Group Limited ("the Company" or "NZSG") was incorporated on 13 September 2006. The Company is a Public Sector Public Benefit Entity. The purpose of the Company is to provide research access to the Australian Synchrotron for researchers from New Zealand. In addition, the Company also promotes synchrotron science, assists the development of capability of New Zealand researchers in synchrotron science and manages the travel funding for New Zealand researchers using the Australian Synchrotron. It has twelve shareholders who are all either New Zealand universities, Crown Research Institutes or Crown Entities. The company is managed by a five person board elected by the shareholders, including an independent Chair. The Chair receives remuneration; the other directors do not. The Royal Society of New Zealand has been contracted to provide secretariat services to the Board.

The Company's revenue consists of fees paid by both shareholders and the Ministry of Business Innovation and Employment ("MBIE") to provide support services and funds provided by the Australian Synchrotron for travel funding grants. Its registered office is 11 Turnbull Street, Thorndon, Wellington.

The financial statements are prepared on a going concern basis. The Company has entered into agreements for future access to the Australian Synchrotron up until 30 June 2026.

The Board has authorised the financial statements on 20 October 2023.

Note 2. Significant accounting policies

(a) Basis of preparation

The financial statements of the Company have been prepared in accordance with Generally Accepted Accounting Practice in New Zealand (NZ GAAP). They comply with Public Benefit Entity Standards Reduced Disclosure Regime (PBE Standards RDR) and authoritative notices that are applicable to entities that apply PBE Standards.
The Company is eligible and has elected to report in accordance with Tier 2 PBE Standards RDR on the basis that the Company has no public accountability and is not large as defined in XRB A1. The Directors have elected to report in accordance with Tier 2 PBE Accounting Standards and in doing so have taken advantage of all applicable Reduced Disclosure Regime ("RDR") disclosure concessions.
The significant accounting policies adopted in the preparation of the financial statements are set out below. These policies have been consistently applied to all the periods presented, unless otherwise stated.

Statutory base
New Zealand Synchrotron Group Limited ("NZSG" or the "Company") is a company registered under the Companies Act 1993.

The financial statements have been prepared in accordance with the Financial Reporting Act 2013.

Basis of measurement

These financial statements have been prepared under the historical cost convention, as modified by the revaluation of financial instruments at fair value through surplus or deficit.

(b) Changes in accounting policy

There have been no changes in accounting policy.

(c) Foreign currency translation

Functional and presentational currency
The financial statements are presented in New Zealand dollars, which is the Company's functional and presentation currency.

Foreign currency transactions are translated into the functional currency using the exchange rates prevailing at the dates of the transactions. Foreign exchange gains and losses resulting from the settlement of such transactions and from the translation at year end exchange rates of monetary assets and liabilities denominated in foreign currencies are recognised in the statement of comprehensive revenue and expenses.

(d) Revenue recognition

Revenue from exchange transactions

Revenue from exchange transactions comprises the fair value for the sale of goods and services, excluding Goods and Services Tax, rebates and discounts. Revenue is recognised when services are rendered.

Interest income

Interest income is recognised on a time proportion basis using the effective interest method. When a receivable is impaired, NZSG reduces the carrying amount to its recoverable amount, being the estimated future cash flow discounted at the original effective interest rate of the instrument, and continues unwinding the discount as interest income. Interest income on impaired loans is recognised using the rate of interest used to discount the future cash flows for the purpose of measuring the impairment loss.

Other funding

Other funding includes grants from shareholders, contributions from Australian Synchrotron and other kinds of funding that meet the definition of exchange transactions. Other funding is recognised as revenue when it becomes receivable in the accounting period in which the services or activities related to the funding are rendered or completed. This is by reference to completion of the specific transaction assessed on the basis of the actual service provided or the activity completed as a proportion of the total service to be provided or activity to be completed.

Revenue from non-exchange transactions

Revenue from non-exchange transactions comprises the fair value received from a third party without directly giving approximately equal value in exchange.

Government grants

Contract income from the Ministry of Business, Innovation and Employment is a primary source of income for the Company. Government grants and non-government grants are recognised as revenue when they become receivable unless there is an obligation to return the funds if conditions of the grant are not met. If there is such an obligation, the grants are initially recorded as grants received in advance and recognised as revenue when conditions of the grant are satisfied.

(e) Income Tax

From 1 July 2009 the NZSG has been granted a Tax Exemption under Section CW49 of the Income Tax Act 2007. As a consequence NZSG will have no ongoing liability for Income Tax.

(f) Goods and Services Tax (GST)

The statement of comprehensive revenue and expenses has been prepared so that all components are stated exclusive of GST. All items in the statement of financial position are stated net of GST, with the exception of receivables and payables, which include GST invoiced.

(g) Cash and cash equivalents

Cash and cash equivalents includes cash on hand, deposits held at call with financial institutions, and other short term highly liquid investments with original maturities of three months or less, that are readily convertible to known amounts of cash, and which are subject to an insignificant risk of changes in value.

(h) Financial Assets and Financial Liabilities

(h.1) Financial Assets

Initial recognition and measurement

Financial assets and financial liabilities are recognised when the Company becomes a party to the contractual provision of the financial instrument.

Financial assets are classified, at initial recognition, as financial assets at fair value through surplus or deficit, receivables, held-to-maturity investments, available-for-sale financial assets, and derivatives. All financial assets are recognised initially at fair value.

Purchases or sales of financial assets that require delivery of assets within a time frame established by regulation or convention in the marketplace (regular way trades) are recognised on the trade date, i.e. the date that the Company commits to purchase or sell the asset.

The Company's financial assets include: cash and short term deposits, trade and other receivables, held to maturity investments and derivative financial instruments.

(h.1) Financial Assets - *continued*

Subsequent measurement

For the purpose of subsequent measurement financial assets for NZSG are classified in three categories:
-Financial assets at fair value through surplus or deficit
-Trade Receivables
-Held-to-maturity investments

(h.1.1) Financial assets at fair value through surplus or deficit
Financial assets at fair value through surplus or deficit include financial assets held for trading and financial assets designated upon initial recognition at fair value through surplus or deficit. Financial assets are classified as held for trading if they are acquired for the purpose of selling or repurchasing in the near term. Derivatives, including separated embedded derivatives, are also classified as held for trading.
Financial assets at fair value through surplus or deficit are carried in the statement of financial position at fair value with net changes in fair value presented as other expenses (negative net changes in fair value) or other revenue (positive net changes in fair value) in the statement of financial performance.

(h.1.2) Trade receivables
This category of financial assets is the most relevant to the Company. Trade receivables are non-derivative financial assets with fixed payments. After initial measurement, such financial assets are subsequently measured at amortised cost using the effective interest rate method, less impairment. Amortised cost is calculated by taking into account any discount or premium on acquisition and fees or costs that are an integral part of the effective interest rate.
The recoverability of trade receivables is reviewed on an ongoing basis. Debts which are known to be uncollectible are written off. A provision for doubtful receivables is established when there is objective evidence that NZSG will not be

(h.1.3) Held-to-maturity investments
Financial assets with fixed or determinable payments and fixed maturities are classified as held to maturity when the Company has the positive intention and ability to hold them to maturity. After initial measurement, held-to-maturity investments are measured at amortised cost using the effective interest rate method, less impairment.
Amortised cost is calculated by taking into account any discount or premium on acquisition and fees or costs that are an integral part of the effective interest rate. The effective interest rate amortisation is included as finance income in the statement of financial performance.

Derecognition
The Company derecognises a financial asset or, where applicable, a part of a financial asset when the rights to receive cash flows from the asset have expired or are waived, or the Company has transferred its rights to receive cash flows from the asset or has assumed an obligation to pay the received cash flows in full without material delay to a third party; and either;
- the Company has transferred substantially all the risks and rewards of the asset; or
- the Company has neither transferred nor retained substantially all the risks and rewards of the asset but has transferred control of the asset.

(h.2) Financial Liabilities

The Companies financial liabilities include trade and other creditors. These amounts represent liabilities for goods and services provided to NZSG prior to the end of financial year which are unpaid. All financial liabilities are initially recognised at fair value and subsequently measured at amortised cost using the effective interest method. The amounts are unsecured and are usually paid within 30 days of recognition.

(h.3) Derivative financial instruments

Derivative financial instruments are initially recognised at fair value on the date on which a derivative contract is entered into and are subsequently remeasured at fair value. Derivatives are carried as financial assets when their fair value is positive and as financial liabilities when their fair value is negative.

Gains and losses arising from changes in the fair value of the derivative financial instruments are presented though the statement of financial performance. Any gains or losses arising from changes in the fair value of derivatives are taken directly to surplus or deficit. The fair value of derivative financial instruments are determined by using valuation techniques. Valuation techniques used include the use of comparable recent arm's length transactions, reference to other instruments that are substantially the same, option pricing models and other valuation techniques commonly used by market participants making the maximum use of market inputs and relying as little as possible on entity-specific inputs.

Financial assets at fair value through surplus or deficit are subject to review for impairment at each reporting date. Derivatives are then impaired when there is any objective evidence that the derivatives are impaired. Impairment losses are incurred if there is objective evidence of impairment as a result of one or more events that occurred after the initial recognition of the derivatives and that loss event has an impact on the estimated future cashflows of those derivatives that can be reliably estimated.

(i) Sponsorship and donations expense

Through the ordinary course of its activities the Company provides sponsorships and makes donations to advance its stated objectives. The Company recognises a liability for this expenditure when the recipient meets any eligibility criteria attached to a sponsorship or donation agreement.

(j) Statement of Cash Flows

The following are the definitions of the terms used in the Statement of Cash Flows:

i) Cash is considered to be cash on hand, cash in transit, bank accounts and deposits with a maturity of no more than 3 months from the date of acquisition;

ii) Investing activities are those relating to acquisition, holding and disposal of investment in ASHC and investments not falling within the definition of cash;

iii) Financing activities are those activities which result in changes in the size and composition of the capital structure of the Company. This includes equity, debt not falling within the definition of cash.

All other activities are classified as operating activities.

Note 3. Revenue for Australian operations	2023 $	2022 $
Revenue from non-exchange transactions		
Ministry of Business Innovation and Employment	1,052,052	1,012,000
Shareholders - contribution to Aust. Synchrotron beamlines	1,302,179	1,279,223
Shareholders	436,699	417,284
	2,790,930	2,708,507

The Company receives support from the Government and shareholders for Australian Synchrotron costs.

Note 4. Revenue for New Zealand operations	2023 $	2022 $
Revenue from non-exchange transactions		
Ministry of Business Innovation and Employment	-	133,650
Revenue from exchange transactions		
Grants from shareholders for operating costs of NZSG	93,500	60,000
Other Revenue		
Contribution from the Australian Synchrotron towards travel costs	165,939	96,106
Foreign exchange gains / (losses)	11,171	23,327
Interest	68,069	14,163
	245,179	133,596
	338,679	327,246

Note 5. Australian Synchrotron Group costs

Under the agreement with Australian Nuclear Science and Technology Organisation (ANSTO), and as detailed in note 10(a), the Company is required to make an annual contribution to the ongoing operating costs of the Australian Synchrotron.

Contribution to Australian Synchrotron for operating costs	1,330,400	1,290,458
Contribution to Australian Synchrotron for new beamlines	1,310,115	1,288,521
	2,640,515	2,578,979

Note 6. Other operating costs

(a) Remuneration of auditor

During the year the following fees were paid or payable for services provided by the Auditor General appointed auditor - Grant Thornton New Zealand Audit Limited.	2023 $	2022 $
Statutory audit services	8,450	6,825

(b) Foreign exchange (gains) / losses

During the year the following exchange (gains) / losses were made on transactions between New Zealand and Australia.	2023 $	2022 $
Foreign exchange (gains) / losses	0	0

(c) Support for Synchrotron Science

During the year the following fees were paid or payable for services provided.

	2023 $	2022 $
Travel costs reimbursed to shareholders	163,203	92,576
Capability Build expense	86,250	178,200
User Meetings	11,006	1,041
Asia Oceania Forum for Synchrotron Radiation Research Membership	9,924	-
	270,383	271,817

(d) Secretariat and other operating costs

During the year the following fees were paid or payable for services provided.

	2023 $	2022 $
Secretariat services from the Royal Society of New Zealand and Board costs	115,554	99,174
Insurance	4,400	4,308
Other	3,327	281
	123,281	103,763
Total other operating costs	**402,114**	**382,405**

Note 7. Cash & cash equivalents and Investments

	2023 $	2022 $
Cash	102,377	146,318
Foreign currency - AUD	120,203	221,460
Cash & cash equivalents	222,580	367,778

	2023 $	2022 $
Term Deposits > 3 months (NZD)	200,000	300,000
Term Deposits > 3 months (AUD)	271,503	121,301
Investments	471,503	421,301

All the bank balances and investments are held with the Bank of New Zealand.

Note 8. Other current assets

(a) Trade and other receivables from exchange transactions

	2023 $	2022 $
Trade receivables	133,491	59,440
Other receivables	6,923	2,581
Goods and Services Tax receivable	13,266	17,175
Total trade and other receivables	153,680	79,196

(b) Prepayments

	2023 $	2022 $
Prepayments	2,400	2,200
Total Prepayments	2,400	2,200

Note 9.	Derivative financial instruments	2023	2022
		$	$
	Western Union Forward cover	7,628	47,123
	Derivative financial instruments	**7,628**	**47,123**

The following derivatives have been entered into with Western Union.

(a) *Forward foreign exchange contracts*

At 30 June 2022	Notional	Deal rate	Fair Value
Forward exchange contract (Maturity: February 2023)	$833,333	0.9000	342
Forward exchange contract (Maturity: February 2024)	$833,333	0.9000	2,271

At 30 June 2023	Notional	Deal rate	Fair Value
Forward exchange contract (Maturity: February 2024)	$833,333	0.9000	(10,873)

(b) *Forward foreign exchange options*

At 30 June 2022	Notional	Strike Price	Fair Value
Forward foreign exchange option (Maturity: February 2023)	$735,294	1.02	$199
Forward foreign exchange option (Maturity: February 2024)	$735,294	1.02	$2,612
Forward foreign exchange option (Maturity: February 2025)	$882,353	0.85	$18,445
Forward foreign exchange option (Maturity: February 2026)	$882,353	0.85	$23,254

At 30 June 2023	Notional	Strike Price	Fair Value
Forward foreign exchange option (Maturity: February 2024)	$735,294	1.02	$233
Forward foreign exchange option (Maturity: February 2025)	$882,353	0.85	$6,769
Forward foreign exchange option (Maturity: February 2026)	$882,353	0.85	$11,499

Note 10. Commitments

(a) Agreement with Australian Nuclear Science and Technology Organisation (ANSTO)

Agreements have been signed on the 14th August 2017, between NZSG and ANSTO whereby NZSG undertakes to provide AUD $12.0m over six years towards the cost of new beamlines and AUD $1.5m per year for nine years (with an inflation adjustment) in return for 6.639% of the access. As part of the Funders' Agreement entered into with 10 of the shareholders and the SIFF Contract with MBIE, these funds will be received directly from the Participants or MBIE when required to fulfil these obligations.

New Zealand shareholders who are party to the Funders' Agreement are irrevocably committed to contribute a total of AUD $12.308m (GST exclusive).

(b) Agreement with Ministry of Business, Innovation and Employment (MBIE)

The company has entered into an agreement with MBIE for Crown Funding totalling AUD $6m plus NZD $10,552,364 over the period 1 July 2017 to 30 June 2026.

Note 11. Trade and other payables

	2023 $	2022 $
Creditors	-	-
Accruals	48,773	126,965
Income in Advance	-	29,100
Total trade and other payables	48,773	156,065

The amount owed to related parties was nil as at 30 June 2023. (2022: nil).

Note 12. Contingent assets and contingent liabilities

There were no significant contingent assets or contingent liabilities at 30 June 2023 (2022: nil).

Note 13. Related parties

Related parties comprise the shareholders identified in Note 15 and Board members identified in the Directory. There have been a number of related party transactions during the year ended 30 June 2023.

Directors

Transactions with board members include payment of fees. During the year ended 30 June 2023, a total of $9,000 was paid to the Chair (2022: $9,000). As at 30 June 2023, there were no outstanding balances with board members (2022: $0).

Shareholders

Transactions with shareholders during the year ended 30 June 2023 include grants, as per Note 4, amounting to $86,250 (2022: $178,200). Also, as per Note 10, under the agreement with ANSTO the Shareholders who are party to the Funders Agreement are required to contribute a total of AUD $12.308m (GST exclusive) over the nine years of the agreement to 2026. In the year ended 30 June 2023, a total of AUD $1.76m (2022: AUD $1.20m) was contributed by Shareholders who are party to the Funders Agreement and, as at 30 June 2023, there was no outstanding balance with shareholders (2022: nil).

Note 14. Events occurring after balance date

There were no significant events occuring after balance date that affect the financial statements (2022: nil).

Note 15. Share capital

Shareholding at cost	2023 $	2022 $
The University of Auckland	509,217	509,217
The University of Waikato	190,357	190,357
Massey University	428,317	428,317
Victoria University of Wellington	237,966	237,966
University of Canterbury	285,546	285,546
Lincoln University	28,557	28,557
University of Otago Holdings Ltd	285,546	285,546
AgResearch Ltd	285,546	285,546
Institute of Geological and Nuclear Sciences Ltd	190,357	190,357
The New Zealand Institute for Plant and Food Research Ltd	190,357	190,357
Callaghan Innovation	192,270	192,270
Auckland University of Technology	88,126	88,126
	2,912,162	2,912,162

The shares held at 30 June are:	2023 # of shares held	2022 # of shares held
The University of Auckland	436,319	436,319
The University of Waikato	163,104	163,104
Massey University	367,001	367,001
Victoria University of Wellington	203,897	203,897
University of Canterbury	244,668	244,668
Lincoln University	24,467	24,467
University of Otago Holdings Ltd	244,668	244,668
AgResearch Ltd	244,668	244,668
Institute of Geological and Nuclear Sciences Ltd	163,104	163,104
The New Zealand Institute for Plant and Food Research Ltd	163,104	163,104
Callaghan Innovation	163,104	163,104
Auckland University of Technology	163,104	163,104
	2,581,208	2,581,208

The amount recognised in the balance sheet as paid in capital is the New Zealand dollar equivalent at the date of issue.

Note 16. Financial instruments

Classification of financial assets by category	Fair value through Profit or Loss	Loans and Receivables
2023	$	$
Cash and cash equivalents	-	222,580
Investments	-	471,503
Trade & other receivables	-	153,680
Prepayments	-	2,400
Derivative financial instrument	18,501	-
Total	**18,501**	**850,163**
2022		$
Cash and cash equivalents	-	367,778
Investments	-	421,301
Trade & other receivables	-	79,196
Prepayments	-	2,200
Derivative financial instrument	47,123	-
Total	**47,123**	**870,475**

Classification of financial liabilities by category

Measured at amortised cost

	2023	2022
	$	$
Trade & other payables	48,773	156,065
Derivative financial instrument	10,873	-
Total	**59,646**	**156,065**

Note 17. Reconciliation of profit with cash flows from operating activities

	2023	2022
	$	$
Net (Deficit)/Surplus for the year	47,485	129,138
Movement in working capital		
Trade and other receivables	(74,484)	(37,535)
Derivative financial instruments	39,495	(103,769)
Trade and other payables	(107,292)	(198,731)
Prepayments	(200)	(275)
Net Cash outflow from operating activities	**(94,996)**	**(211,172)**