

**NEW ZEALAND**  
SYNCHROTRON GROUP



**ANNUAL REPORT 2019**



## Contents

Chairman’s Report .....	3
Business Review .....	3
Investment in the Australian Synchrotron and Ongoing Access Rights.....	3
Decisions on Access and Funding Support.....	3
Use of the Australian Synchrotron by New Zealand Researchers .....	4
Science Achievements .....	7
Support for Synchrotron Scientists .....	7
Examples of Recent New Zealand Use of the Australian Synchrotron .....	8
New Zealand Research Groups Awarded Beamtime.....	10
Australian Synchrotron .....	20
Corporate Governance .....	24
Board Composition .....	24
Indemnities and Insurance .....	24
Attendance at Board Meetings.....	24
Donations .....	24
Interests Register.....	24
Financial Statements .....	26

## CHAIRMAN'S REPORT

The year under review was the thirteenth year during which the New Zealand Synchrotron Group Ltd (NZSG) has provided support for New Zealand researchers using the Australian Synchrotron.

The past year was the second under the new funding and access arrangement negotiated in 2017 which substantially increased the amount of beamtime that New Zealand researchers can get. An expanded entitlement of 267 merit beamtime shifts for the year was fully taken up by groups from all but one of our shareholder funding institutions visiting the Synchrotron during the year. There has also been interest from institutions that are not part of the merit funding and access scheme in using the Synchrotron on an *ad hoc* basis. The company has also facilitated the purchase of 4 blocks of commercial time on their behalf during the year.



Callaghan Innovation and GNS Science withdrew from the funding and access scheme on 30 June 2018 by prior arrangement, having fulfilled their funding obligations from the previous funding agreement. The board is concerned about the difficulties faced by those institutions outside the university sector in making decisions about supporting long-term infrastructure investments, and is considering ways to assist small or intermittent users obtain beamtime.

In Australia, the programme to expand the Synchrotron by adding eight new beamlines is now well under way. Design and construction of five of the beamlines has already commenced. New Zealand is contributing A\$12 million to the beamline fund, securing a significant proportion of time for New Zealand researchers on the new beamlines and favourable treatment in the way in which it will be allocated. The contributed funds are provided jointly by the New Zealand government and eight company shareholders. With new measurement techniques and the additional beamtime that will become available with the commissioning of each of the new beamlines in mind, the company held a series of workshops around New Zealand in March 2019 to raise awareness among the current and potential new user community.

The company had budgeted for a small surplus of \$174 for the year but achieved a final result of a surplus of \$10,823. This result was influenced by the strengthening of the New Zealand dollar during the year. This affected the value of the derivative financial instruments held by the company as a protection against future currency levels which fell in value by \$122,927 whereas only \$60,000 had been provided for in the budget. This additional expense was offset by additional interest income received and purchasing less beamtime to supplement and balance out the merit beamtime awards during the year.

In previous Annual Reports, the susceptibility of the company's financial operations to movements in the exchange rate between the New Zealand and Australian currencies has been highlighted. The risk for the medium-term future has so far been managed by purchasing vanilla options to preserve the value of future payments to ANSTO of the government's share of the annual access payment in the event of a dramatic fall in the value of the New Zealand dollar, and by taking forward contracts to purchase Australian currency at favourable exchange rates. The New Zealand dollar has been quite volatile over the past 18 months, so Directors are taking independent advice on the best options to cover the risk between now and 2026 when the present funding arrangement ceases. The component of the next two payments to ANSTO that will be made from New Zealand dollar funds are covered by forward contracts already held. There was a small increase in shareholder equity from \$486,597 to \$497,420.

The board has been very well supported by the Royal Society of New Zealand who provide secretariat services to NZSG. In particular, I would like to acknowledge the contribution made 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, Professor Geoff Jameson and its members Professor Vic Arcus, Dr Vladimir Golovko and Associate Professor Geoff Waterhouse who have evaluated all requests for access.

Finally, I would like to thank my fellow directors, Professors Geoff Jameson, Jim Metson and Mike McWilliams and especially Professor Catherine Day who joined the board as a new director in November 2018.



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 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 will be constructed over the next 5 years. New Zealand makes an annual payment of A\$1.5 million towards the cost of access and is contributing 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 is being paid in 5 instalments, the first of which was made in 2018/19.

Callaghan Innovation and the Institute of Geological and Nuclear Sciences Ltd withdrew from the previous funding and access arrangement, with effect from June 2019. The institutions that have access to merit beamtime on the Synchrotron going forward are all New Zealand universities (except Lincoln University) and AgResearch Ltd. NZSG purchased a small number of paid access shifts on the Synchrotron through the year on behalf of Scion and Massey University.

### **Decisions on Access and Funding Support**

The funding and access Agreement with ANSTO allows the company to decide how our entitlement to merit beamtime 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. 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:

Professor Geoff Jameson, Massey University (Chair)  
Professor Vic Arcus, University of Waikato  
Dr Vladimir Golovko, University of Canterbury  
Associate Professor Geoff Waterhouse, University of Auckland

The Committee met by teleconference throughout the year to make their selections. The table at the end of this section of the Annual Report lists the New Zealand researchers who have gained beamline access to the Australian Synchrotron from July 2018 onwards, and where applicable, summarises the travel funding support provided to them.

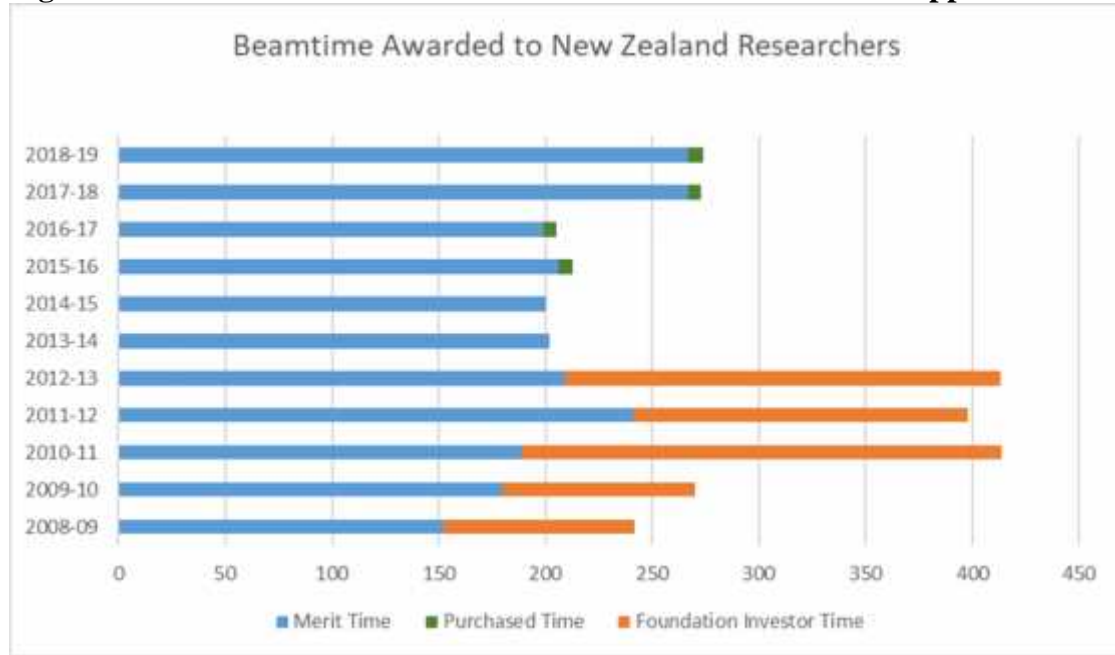
### **Use of the Australian Synchrotron by New Zealand Researchers**

The first of the beamlines was successfully commissioned in mid-2007. Since then, all originally planned beamlines have become operational. Approximately 80% of the available beamline time is assigned to the "merit access" pool and competitive applications are sought from researchers worldwide, including from New Zealand. Every four months, the Australian Synchrotron makes calls for merit beamline access. Applications are made directly to the Australian Synchrotron, but as explained above, NZSG oversees the ultimate selection of which New Zealand applicants receive beamtime.

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 have been entitled to receive 267 shifts of merit beamtime which is approximately 6.6% of the available beamtime. This is considerably more than was received under the former funding (but less than occurred in the early years when there was no upper limit to the level of New Zealand access to beamtime). Figure 1 shows this change in graphical format. New Zealand now receives approximately 200 shifts of beamtime each year. It should be noted that real access is approximately 50% greater than shown in the graph, because a significant number of New Zealand researchers are co-applicants with Australian colleagues who have been awarded merit beamtime. Figure 1 also includes shifts purchased by the company in 2015/16 for AUT, in 2016/17 for a multi-institutional group, and in 2017/18 for AgResearch to supplement the merit shifts.

**Figure 1: Historical record of beamtime awarded to New Zealand applications**



The research community has quickly adjusted to the increased level of access. Although there has not been a change in the number of proposals submitted, more beamtime is being requested. There was an immediate increase in 2017/18 (from 423 to 486 shifts) and a further increase in 2018/19 (to 533 shifts). The proportion of shifts awarded to those requested has remained at approximately 50% since the new access range was introduced. Table 1 breaks down the application statistics by beamline:

**Table 1: Success Rate for NZ Beamtime Applications – 2018/19\***

Beamline	No. Shifts Requested	No. Shifts Awarded		No. Appl'ns. Received	No. Awarded Beamtime	
IMBL	21	9	43%	4	2	50%
IRM	63	30	48%	6	3	50%
PD	54	15	28%	6	2	33%
SAXS	33	30	91%	11	10	91%
SXR	111	66	59%	9	5	56%
THz	21	0	0%	2	0	0%
XAS	30	9	30%	6	2	33%
XFM	63	24	38%	6	3	50%
<b>Subtotal</b>	<b>396</b>	<b>183</b>	<b>51%</b>	<b>50</b>	<b>27</b>	<b>63%</b>
MX (CAPs)	137	84.5	62%	7	7	100%
<b>Overall</b>	<b>533</b>	<b>267.5</b>	<b>50%</b>	<b>57</b>	<b>34</b>	<b>60%</b>

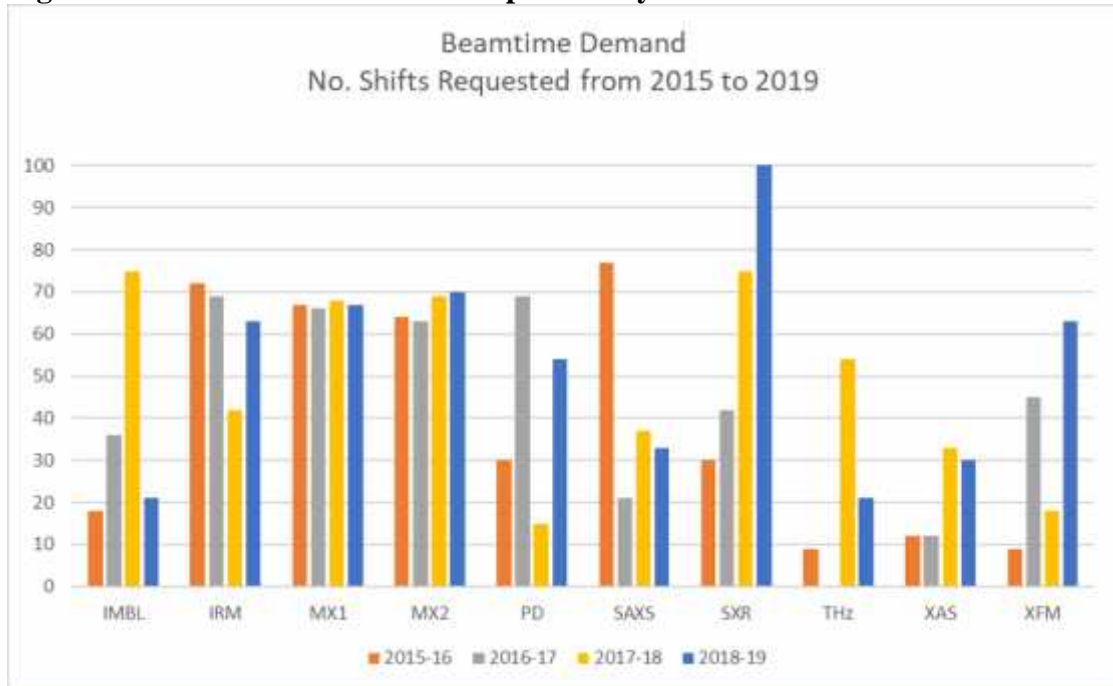
\* A description of the beamlines and the abbreviations used in given on pages 20-21

The following graphs demonstrate the variability in demand for beamtime over the past four years by beamline. The greatest demand has been for the crystallography (MX) beamlines with heavy demand most years for the small/wide angle x-ray scattering (SAXS), the infra-red (IRM) and the soft x-ray spectroscopy (SXR) beamlines. In the past year, there was more interest in the X-ray fluorescence microscopy beamline (XFM) but less in the imaging and sensing beamline (IMBL) than in recent years. The flexibility provided under the funding and access agreement

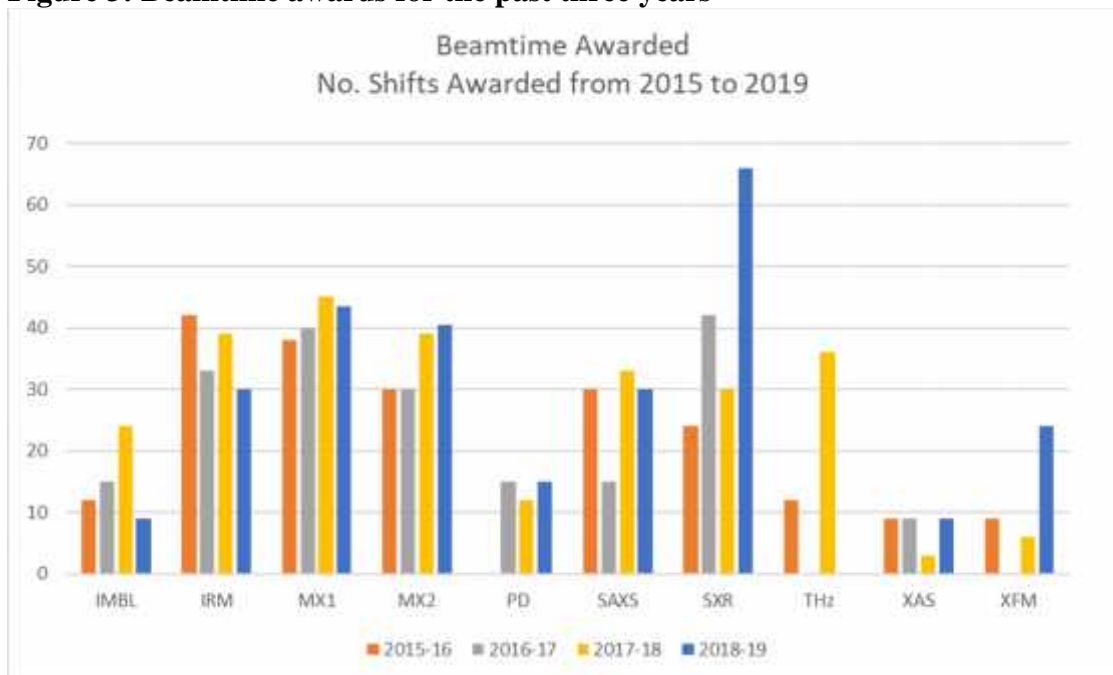


with ANSTO to having a pool of beamtime from which to make awards to New Zealand researchers is particularly helpful. One new beamline being designed and soon to be constructed is a biological small angle scattering (BIOSAXS) beamline. The company pushed for the early construction of this beamline as it will reduce pressure on the MX and SAXS beamlines.

**Figure 2: Beamtime demand for the past four years**



**Figure 3: Beamtime awards for the past three years**



## Science Achievements

A full list of the researchers who received merit beamtime over the past year is presented on pages 10–189. These projects cover a very broad range of science topics, and many have involved training of young researchers. Four projects are described on pages 8 and 9 illustrating the wide applicability of synchrotron science to New Zealand’s research needs and the benefit of having access to the Synchrotron.

## Roadshow to Raise Awareness in the Synchrotron’s Capabilities

In March 2019, five workshops were held throughout the country to raise awareness about existing and potential user communities and the capabilities of the Australian Synchrotron. Staff from Melbourne were accompanied by the NZSG secretariat and gave presentations alongside local users highlighting the capabilities of the existing beamlines and provided an introduction to the new beamlines being constructed at the Synchrotron. The workshops were attended by more than 170 existing and potential new users.

## Support for Synchrotron Scientists

Apart from 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 (AOFSSR), of which NZSG is a member. The most recent User Meeting was held in Melbourne in November 2018 and the AOFSSR School was held at the Pohang Radiation laboratory in Korea in September 2018.

The table below provides details of the students who were provided with travel funding to attend the User meeting in November 2018 and those selected to participate in the AOF Synchrotron Radiation School in September 2018.

Name	Institution	Details	Comment
Fareeda Barzak	Massey University	PhD student	User Meeting
Susyn Kelly	Massey University	PhD student	User Meeting
Rakesh Arul	University of Auckland	PhD student	AOF School
Qing Wang	University of Auckland	PhD student	AOF School



D K W Smith  
Executive Officer  
Secretariat

## Examples of Recent New Zealand Use of the Australian Synchrotron

*Power electronics - devices that switch, convert, and regulate electrical energy - are predicted to control up to 80% of all energy usage by 2035. They are essential to the conversion and distribution of renewable energy that now accounts for 85 % of New Zealand's power generation.*

*A team from the University of Canterbury led by Associate Professor Martin Allen, together with a collaborator at the Royal Melbourne Institute of Technology, have used Soft X-ray Spectroscopy at the Australian Synchrotron to help develop new high-efficiency power electronic components that can operate continuously without any performance degradation at high-temperatures up to 350°C. These new devices use Gallium Oxide, an exciting electronic material that is the subject of major worldwide interest as a potential high-efficiency replacement for existing power electronics technologies. Researchers at the University of Canterbury currently lead the world in the fabrication of rectifying contacts to Gallium Oxide – vital components in making high-efficiency power electronic devices – and the information gained at the Australian Synchrotron has allowed them to further extend this advantage by understanding how to control the surface electrical properties of this material*

*Chemical catalysis is present in our everyday lives: it is used to produce our clothes, our fuels and our medicines. It continually occurs in our bodies. Indeed, some 80-90% of industrial-chemical processes utilize a catalyst and scientists relentlessly seek to find better ones. If we imagine current catalysts as being analogous to a house, our research seeks to find catalysts that use just a single brick, or in our case, single-metal atoms. By shrinking catalysts in this way, we can save energy, costs and the environment; all whilst maintaining effectiveness.*

*In a recent collaborative trip to the Australian Synchrotron, part of ANSTO, researchers led by Prof. Shane Telfer (Massey University) and A/Prof. Geoff Waterhouse (University of Auckland) participated in experiments at the X-ray Absorption Spectroscopy beamline to characterise rhodium-based single-atom materials. Through careful data analysis and supporting experiments, they demonstrated that they can exert control over whether single-atom or aggregated materials are produced. The insights gained in these studies will allow the team to produce a wide variety of these materials and fine tune their properties for more effective chemical catalysis.*

*Ethylene, which arguably is the most important plant hormone, regulates all aspects of plant growth and development, from germination to fruit ripening to senescence. In a nation like New Zealand, the ability to control precisely events such as fruit ripening would be a game changer. A team led by Dr Ivanhoe Leung from The University of Auckland has a Marsden Fund project to better understand the catalytic mechanism of the enzyme 1-aminocyclopropane-1-carboxylic acid (ACC) oxidase catalyse at both the molecular and protein levels.*

*Using the Small and Wide Angle Spectroscopy (SAXS) beamline at the Australian Synchrotron, the team has gained important knowledge about how the ethylene-forming enzyme recognises its substrate for catalysis. They have also elucidated the mechanism that regulates ethylene production at the protein level. Such information is highly important for the agricultural industry since their data will enable the development of new and specific inhibitors of the ethylene-forming enzyme to prevent fruit spoilage in this multimillion dollar export sector.*

*Gonorrhoea is now a global health problem due to the high number of strains resistant to all front line antibiotics and isolates with reduced susceptibility to current frontline antibiotics have been detected in New Zealand. Targeting the synthesis of amino acids is a new and promising route for the development of antibiotics. Synthesis of the amino acid cysteine is the primary pathway for the incorporation of sulphur into cellular components necessary for the establishment of infection.*

*A group led by Professor Vic Arcus and Dr Joanna Hicks from the University of Waikato has used the Macro-crystallography (MX) and Small and Wide Angle Spectroscopy (SAXS) beamlines to investigate and better understand the biochemistry of the synthesis pathway. This could lead to targeted inhibitor design of the key cysteine synthesis enzymes and ultimately provide new antimicrobials for the treatment of gonorrhoea.*

## New Zealand Research Groups Awarded Beamtime (July 2017 – June 2018)

The following New Zealand research groups were awarded merit time at the Australian Synchrotron between July 2018 and June 2019.

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
<b>Dr Peter Mace</b> Prof Kurt Krause Dr Joel Tyndall Assoc Prof Sigurd Wilbanks Prof Greg Cook Prof Catherine Day Dr Yoshio Nakatani	Otago Otago Otago Otago Otago Otago Otago	2018-2	Micro Crystallography (MX2) “University of Otago Structural Biology Group”	Merit Access 3 shifts 3-4 July	\$3,794
<b>Dr Michael Rowe</b> Elaine Smid A/Prof Jan Lindsay	Auckland Auckland Auckland	2018-2	Infrared Microscope (IRM) “Countdown to Eruption: Estimating Magma Ascent Rates in the Auckland Volcanic Field, New Zealand, Using Volatile Diffusion through Melt Embayments”	Merit Access 9 shifts 6-9 July	\$2,121
<b>Dr Virginia Toy</b> Katrina Sauer Rachel Baxter Marcel Mizera	Otago Otago Otago Otago	2018-2	Infrared Microscope (IRM) “Do fluids cause deformation localisation in New Zealand’s continental plate boundary fault zone??”	Merit Access 9 shifts 11-14 July	\$2,531
<b>Dr Chris Squire</b> Assoc Prof Alok Mitra Assoc Prof Peter Metcalf Dr David Goldstone Professor Ted Baker Dr Shaun Lott Dr Jason Busby Dr Tet Verne Lee Dr Richard Kingston Prof Juliet Gerrard Dr Ghader Bashiri Dr Jodie Johnston Maria Kalyukina	Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2018-2	Micro Crystallography (MX2) “Auckland Structural Biology CAP”	Merit Access 6 shifts 13-14 July 2-3 August	\$3,692 (incl for travel in June)
<b>Prof Emily Parker</b> Prof Geoff Jameson Prof Vic Arcus Dr Andrew Sutherland-Smith Dr Scott Cameron Dr Emma Andrews Dr Emma Summers	VUW Massey Waikato Massey  VUW Waikato Waikato	2018-2	Micro Crystallography (MX2) “Protein Structure and Function: Waikato, Canterbury and Massey Universities”	Merit Access 3 shifts 18-19 July	\$4,047 (incl for travel in June)
<b>Dr Geoff Kilgour</b> Dr Ian Schipper Dr Anya Seward Ffion Robb	GNS Science VUW GNS Science VUW	2018-2	Imaging and Medical (IM) “Single clasts or a lava flow? Quantifying the thermal properties of scoria”	Merit Access 6 shifts 31 Jul-2 Aug	\$2,320

<b>Researchers</b>	<b>Institution</b>	<b>Cycle</b>	<b>Beamline</b>	<b>Access</b>	<b>Travel Funding</b>
<b>A/Prof Tilo Soehnel</b> A/Prof Clemens Ulrich Natalija Vyborna Dr Grant McIntosh Sneh Patel Joseph Vella	Auckland Uni NSW Auckland Auckland Auckland Auckland	2018-2	THz-Far Infrared (THz) “Far-IR studies on Sn based spinel phases”	Merit Access 12 shifts 7-11 August	\$1,835
<b>Dr Jenny Malmstrom</b> Prof David Williams Dr Nadine van der Heijden Sesha Manuguri A/Prof Duncan McGillivray	Auckland Auckland Auckland Auckland Auckland	2018-2	Small/Wide Angle X-ray Scattering (SAXS) “GISAXS study of block copolymer thin films with magnetic cargo”	Merit Access 3 shifts 8-9 August	\$1,840
<b>Dr Peter Mace</b> Prof Kurt Krause Dr Joel Tyndall Assoc Prof Sigurd Wilbanks Prof Greg Cook Prof Catherine Day Dr Yoshio Nakatani	Otago Otago Otago Otago Otago Otago Otago	2018-2	Macromolecular Crystallography (MX1) “University of Otago Structural Biology Group”	Merit Access 3 shifts 10-11 August	Incl in MX2 travel above
<b>Prof Richard Haverkamp</b> Dr Katie Sizeland Dr Hannah Wells	Massey Austr Synch Massey	2018-2	Imaging and Medical (IM) “Integration of collagen surgical mesh”	Merit Access 3 shifts 15-16 August	\$2,097
<b>Dr Shakila Rizwan</b> Dr Andrew Clulow Richard Prentice	Otago Monash U. Otago	2018-3	Small/Wide Angle X-ray Scattering (SAXS) “Structural kinetics of cubosomes in plasma”	Merit Access 3 shifts 18-19 Sept	\$1,866
<b>A/Prof Geoff Waterhouse</b> Dr Wan-Ting Chen Dr Hui Yang Prof Shane Telfer Qing Wang Dr John Clements	Auckland Auckland U. Sth Florida Massey Auckland Massey	2018-3	X-ray Absorption Spectroscopy (XAS) “XAS characterization of porphyrin- like single metal atom sites in MOF-derived N-doped porous carbons: Towards improved electrocatalysts for the oxygen reduction reaction (ORR)”	Merit Access 6 shifts 18-20 Sept	\$2,519
<b>Professor James White</b> Arran Murch Dr Alex Nichols Dr Tobias Durig	Otago Otago Canterbury Otago	2018-3	Infrared Microscope (IRM) “Magmatic volatile evolution during the 2012 deep subaqueous eruption of Havre volcano and its constraints on eruption dynamics”	Merit Access 9 shifts 19-22 Sept	\$2,759

<b>Researchers</b>	<b>Institution</b>	<b>Cycle</b>	<b>Beamline</b>	<b>Access</b>	<b>Travel Funding</b>
<b>Assoc Prof Chris Squire</b> Dr Nikki Moreland Dr Shaun Lott Dr Jodie Johnston Assoc Prof Alok Mitra Dr Richard Kingston Prof Juliet Gerrard Dr Ivanhoe Leung Dr Ghader Bashiri Dr Jason Busby Dr David Goldstone Henry Tang Matthew Sullivan	Auckland Auckland Auckland Canterbury Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2018-3	Macromolecular Crystallography (MX1) “Auckland Structural Biology CAP”	Merit Access 6 shifts 26-27 Sep 17-18 Nov	\$3,544
<b>Prof Emily Parker</b> Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland-Smith	VUW Massey AgResearch Waikato Massey	2018-3	Macromolecular Crystallography (MX1) “Protein Structure and Function: Waikato, Victoria and Massey Universities and AgResearch NZ”	Merit Access 3 shifts 12-13 October	\$4,869
<b>Assoc Prof Chris Squire</b> Dr Nikki Moreland Dr Shaun Lott Dr Jodie Johnston Assoc Prof Alok Mitra Dr Richard Kingston Prof Juliet Gerrard Dr Ivanhoe Leung Dr Ghader Bashiri Dr Jason Busby Dr David Goldstone Stephen Stuteley Sandesh Deshpande	Auckland Auckland Auckland Canterbury Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2018-3	Micro Crystallography (MX2) “Auckland Structural Biology CAP”	Merit Access 6 shifts 16-17 Oct 11-12 Dec	Incl in MX1 travel above
<b>Dr Peter Mace</b> Prof Kurt Krause Dr Yoshio Nakatani Dr Joel Tyndall Assoc Prof Sigurd Wilbanks Prof Catherine Day	Otago Otago Otago Otago Otago Otago	2018-3	Macromolecular Crystallography (MX1) “University of Otago Structural Biology Group”	Merit Access 3 shifts 17-18 October	\$2,737
<b>A/Prof Geoff Waterhouse</b> Dr Wan-Ting Chen Qing Wang Ewan Fisher Yusong Don Chao Liu Sam Brooke	Auckland Auckland Auckland Auckland Auckland Auckland Massey	2018-3	Soft X-ray Spectroscopy (SXR) Novel photocatalysts derived from layered double hydroxide nanosheets for CO hydrogenation to olefins under visible light”	Merit Access 12 shifts Paid Access 3 shifts 30 Oct-4 Nov	\$2,386

<b>Researchers</b>	<b>Institution</b>	<b>Cycle</b>	<b>Beamline</b>	<b>Access</b>	<b>Travel Funding</b>
<b>Prof Emily Parker</b> Prof Geoff Jameson Prof Vic Arcus Dr Yifei Fan Wanting Jiao Ruby Roach Fareeda Barzak Erica Prentice Dr Joanna Hicks	VUW Massey Waikato VUW VUW Massey Massey Waikato Waikato	2018-3	Small/Wide Angle X-ray Scattering (SAXS) “Protein Complex Formation and Conformational Change”	Merit Access 3 shifts 7-8 November	\$2,242
<b>Prof Emily Parker</b> Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland-Smith	VUW Massey AgResearch Waikato Massey	2018-3	Micro Crystallography (MX2) “Protein Structure and Function: Waikato, Victoria and Massey Universities and AgResearch NZ”	Merit Access 3 shifts 10-11 Nov	Incl in MX1 travel above
<b>Dr Ivanhoe Leung</b> A/Prof Chris Squire Dona Gunawardana Henry Tang Praveen Vadakkedath	Auckland Auckland Auckland Auckland	2018-3	Small/Wide Angle X-ray Scattering (SAXS) “Unravelling the structural basis of ethylene biosynthesis in plants”	Merit Access 3 shifts 15-16 Nov	\$2,335
<b>Duane Harland</b> Dr Katie Sizeland Dr Jitraporn Vongsvivut Dr Marina Richena Dr Santanu Deb-Choudhury Dr Jeffrey Plowman	AgResearch Aust Synch Aust Synch AgResearch AgResearch AgResearch	2018-3	Infrared Microscope (IRM) “Distribution of mechanically disrupted disulfide bonds and protein structures in tensile stressed wool fibres observed using synchrotron-IR microspectroscopy”	Merit Access 9 shifts 28 Nov-1 Dec	\$2,260
<b>Dr Peter Mace</b> Prof Kurt Krause Dr Yoshio Nakatani Dr Joel Tyndall Assoc Prof Sigurd Wilbanks Prof Catherine Day Andrej Paluda Dr Jodie Brewster Dr Matthias Felner Dr Adam Middleton	Otago Otago Otago Otago Otago Otago Otago Otago Otago	2018-3	Micro Crystallography (MX2) “University of Otago Structural Biology Group”	Merit Access 3 shifts 4-5 December	Incl in MX1 travel above
<b>Dr Ben Mallett</b> Andrew Chan Rakesh Arul A/Prof Tilo Sohenel	Auckland Auckland Auckland Auckland	2018-3	Soft X-ray Spectroscopy (SXR) “Understanding Interfacial Orbital Order in Cuprate-Manganite Multilayer Thin Film Sandwiches”	Merit Access 15 shifts 4-9 December	\$602



<b>Researchers</b>	<b>Institution</b>	<b>Cycle</b>	<b>Beamline</b>	<b>Access</b>	<b>Travel Funding</b>
<b>A/Prof Ren Dobson</b> Dr Tim Ryan Dr Grant Pearce James Davies Dr Rachel North Michael Currie Chris Horne Serena Watkin Jenna Gilkes	Canterbury Aust Synch Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2018-3	Small/Wide Angle X-ray Scattering (SAXS) “Ad hoc SAXS CAP: Caught in a TRAP and evolving enzymes”	Merit Access 3 shifts 5-6 December	\$1,968
<b>Dr James Scott</b> Stephanie Junior Stephanie Tay Rachel Baxter	Otago Otago Otago Otago	2019-1	X-ray Fluorescence Microscopy (XFM) “Deep-Earth Gold; Exploring Au in Mantle Rock”	Merit Access 9 shifts 7-10 February	\$3,022
<b>Assoc Prof Chris Squire</b> Dr Nikki Moreland Dr Shaun Lott Dr Jodie Johnston Assoc Prof Alok Mitra Dr Richard Kingston Prof Juliet Gerrard Dr Ivanhoe Leung Dr Ghader Bashiri Dr Jason Busby Dr David Goldstone Jamie Taka	Auckland Auckland Auckland Canterbury Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2019-1	Macromolecular Crystallography (MX1) “Auckland Structural Biology CAP”	Merit Access 6 shifts 17-18 February 10-11 April	\$3,922 (Incl MX2 travel)
<b>Dr Peter Mace</b> Prof Kurt Krause Dr Yoshio Nakatani Dr Joel Tyndall Assoc Prof Sigurd Wilbanks Prof Catherine Day	Otago Otago Otago Otago Otago Otago	2019-1	Macromolecular Crystallography (MX1) “University of Otago Structural Biology Group”	Merit Access 3 shifts 21-22 February	\$3,745 (Incl MX2 travel)
<b>Prof Emily Parker</b> Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland-Smith Vince Carbone Claire Mulholland Elizabeth Oldham Dr Gerd Mittelstaedt	VUW Massey Massey Waikato Massey AgResearch Waikato  VUW	2019-1	Macromolecular Crystallography (MX1) “Protein Structure and Function: Waikato, Victoria and Massey Universities and AgResearch NZ”	Merit Access 3 shifts 23-24 February	\$6,167 (Incl MX2 travel)
<b>Prof Emily Parker</b> Prof Geoff Jameson Prof Vic Arcus Dr Yifei Fan Wanting Jiao Ruby Roach Fareeda Barzak Erica Prentice Dr Joanna Hicks	VUW Massey Waikato VUW VUW Massey Massey Waikato Waikato	2018-3	Small/Wide Angle X-ray Scattering (SAXS) “Protein Complex Formation and Conformational Change”	Merit Access 3 shifts 26-27 February Additional time awarded because of instrument issues in 2018/3 period. <b>Postponed due to beamline maintenance</b>	

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
<b>Dr Grant Pearce</b> Assoc Prof Ren Dobson Dr Timothy Ryan James Davies Dr Rachel North Michael Currie	Canterbury Canterbury Aust. Synch. Canterbury Canterbury Canterbury	2019-1	Small/Wide Angle X-ray Scattering (SAXS) “Ad hoc SAXS CAP: Biomolecular Interactions”	Merit Access 3 shifts 5-6 March <b>Postponed due to beamline maintenance</b>	
<b>Prof Shane Cronin</b> Assoc Prof Ian Smith Dr Marco Brenna Assoc Prof Ingrid Uktstins	Auckland Auckland Otago Univ of Iowa	2019-1	Infrared Microscope (IRM) “Estimating eruption warning times using hydrogen diffusion in olivine from the Auckland Volcanic Field”	Merit Access 12 shifts 6-10 March	\$2,400
<b>Dr Adam Hartland</b> Ingrid Lindeman Dr Andrea Borsato Prof David Hodell Dr Sebastian Breitenbach	Waikato Waikato Newcastle Cambridge Rhur-Uni Bochum	2019-1	X-ray Fluorescence Microscopy (XFM) “Expression of seasonality through the Mayan terminal classic drought in stalagmite trace elements”	Merit Access 6 shifts 12-14 March	\$1,772
<b>Prof Geoff Jameson</b> Prof Vic Arcus Dr Yifei Fan Prof Emily Parker Gerd Mittelstaedt Ruby Roach	Massey Waikato VUW VUW VUW Massey	2019-1	Small/Wide Angle X-ray Scattering (SAXS) “Protein Complex Formation and Conformational Change”	Merit Access 3 shifts 16-17 March <b>Postponed due to beamline maintenance</b>	
<b>Assoc Prof Chris Squire</b> Dr Nikki Moreland Dr Shaun Lott Dr Jodie Johnston Assoc Prof Alok Mitra Dr Richard Kingston Prof Juliet Gerrard Dr Ivanhoe Leung Dr Ghader Bashiri Dr Jason Busby Dr David Goldstone Maria Kalyukina Henry Tang	Auckland Auckland Auckland Canterbury Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2019-1	Micro Crystallography (MX2) “Auckland Structural Biology CAP”	Merit Access 6 shifts 20-21 March 4-5 May	Incl in MX1 travel above
<b>Dr Peter Mace</b> Prof Kurt Krause Dr Yoshio Nakatani Dr Joel Tyndall Assoc Prof Sigurd Wilbanks Prof Catherine Day	Otago Otago Otago Otago Otago Otago	2019-1	Micro Crystallography (MX2) “University of Otago Structural Biology Group”	Merit Access 3 shifts 5-6 April	Incl in MX1 travel above
<b>Assoc Prof Ajit Sarmah</b> Ali Akhtar Venkata Sai Praneeth	Auckland Auckland Auckland	2019-1	Imaging and Medical (IM) “Biochar’s role in the void evolution of cementitious composites as a binder replacement” <b>Samples not ready – beamtime not used</b>	Merit Access 6 shifts 24-26 April	

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
<b>Dr Grant McIntosh</b> Prof Jim Metson Hasini Wijayaratne Luis Camacho Gordon Agbenyegah Wan-Ting Chen	Auckland Auckland Auckland Auckland Auckland Auckland	2019-1	Soft X-ray Spectroscopy (SXR) “Cation migration and the evolution of surface acidity/basicity in aluminates”	Merit Access 12 shifts 30 Apr-3 May	\$2,321
<b>Prof Emily Parker</b> Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland-Smith Emma Summers Dr Scott Cameron Carlin Hamill	VUW Massey AgResearch Waikato Massey Waikato VUW	2019-1	Micro Crystallography (MX2) “Protein Structure and Function: Waikato, Victoria and Massey Universities and AgResearch NZ”	Merit Access 3 shifts 1-2 May	Incl in MX1 travel above
<b>Dr Nadine van der Heijden</b> Dr Duncan McGillivray Dr Jenny Malstrom Dr Simon Granville Andrew Chan Sesha Manuguri	Auckland Auckland Auckland VUW Auckland Auckland	2019-1	Small/Wide Angle X-ray Scattering (SAXS) “Magnonic crystal bottom-up synthesis through self-assembly”	Merit Access 3 shifts 9-10 May	\$2,451
<b>Dr Saifang Huang</b> Assoc Prof Tilo Soehnel Timothy Christopher Tingxuan Yang	Auckland Auckland Auckland Auckland	2019-1	Powder Diffraction (PD) “In situ synchrotron powder diffraction study of 114-type cobaltites during the oxygen intake/release process at elevated temperatures”	Merit Access 9 shifts 10-13 May	\$2,400
<b>Prof Emily Parker</b> Prof Geoff Jameson Prof Vic Arcus Gerd Mittelstaedt Dr Yu Bai Joanna Hicks Dr Emma Summers Yifei Fan Ruby Roach	VUW Massey Waikato VUW VUW Waikato Waikato VUW Massey	2019-2	Small/Wide Angle X-ray Scattering (SAXS) “Protein complex and conformational change”	Merit Access 3 shifts 31 May-1 Jun	No claim yet
<b>Assoc Prof Martin Allen</b> Prof Roger Reeves Liam Carroll Dr James Partridge Caixia Hou	Canterbury Canterbury Canterbury RMIT Canterbury	2019-2	Soft X-ray Spectroscopy (SXR) “Controlling the surface chemistry and surface electronic properties of $\gamma$ -Ga <sub>2</sub> O <sub>3</sub> for high-efficiency power electronic devices	Merit Access 15 shifts 4-9 June	No claim yet
<b>Prof Emily Parker</b> Prof Geoff Jameson Prof Vic Arcus Dr Yifei Fan Wanting Jiao Ruby Roach Fareeda Barzak Erica Prentice Dr Joanna Hicks	VUW Massey Waikato VUW VUW Massey Massey Waikato Waikato	2018-3	Small/Wide Angle X-ray Scattering (SAXS) “Protein Complex Formation and Conformational Change”	Merit Access 3 shifts 5-6 June <b>Additional time awarded because of instrument issues in 2018/3 period</b>	No claim yet

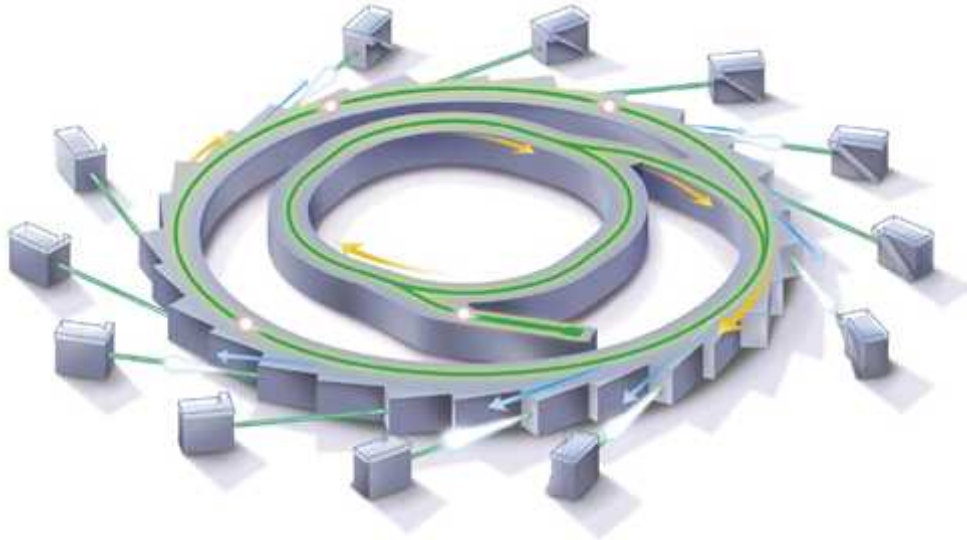
<b>Researchers</b>	<b>Institution</b>	<b>Cycle</b>	<b>Beamline</b>	<b>Access</b>	<b>Travel Funding</b>
<b>Dr Grant Pearce</b> Assoc Prof Ren Dobson Dr Jodie Johnson Dr Vanessa Morris Christopher Horne Michael Currie David Coombes	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2019-2	Soft X-ray Spectroscopy (SXR) “Biomolecular interactions”	Merit Access 3 shifts 6-7 June	No claim yet
<b>Assoc Prof Duncan McGillivray</b> Daniel McDougall Shinji Kihara Andrew Chan Craig Norrie Charlotte Vandermeer	Auckland  Auckland Auckland Auckland Auckland	2019-2	X-ray Fluorescence Microscopy (XFM) “Benefits of EDDS for NZ green-lipped mussel D-larvae development. A study of its potential to reduce metal toxicity”	Merit Access 9 shifts 6-9 June	\$2,035
<b>Dr John Clements</b> Assoc Prof Geoff Waterhouse Dr Wanting Chen Prof Shane Telfer Nisansala Bandara	Massey Auckland Auckland Auckland Auckland	2019-2	X-ray Absorption Spectroscopy (XAS) “XAS characterisation of atomically dispersed materials derived from MOFs for efficient heterogeneous catalysis Part 1: Rh”	Merit Access 3 shifts 7-8 June	No claim yet
<b>Assoc Prof Chris Squire</b> Dr Nikki Moreland Dr Shaun Lott Dr Jodie Johnston Assoc Prof Alok Mitra Dr Richard Kingston Prof Juliet Gerrard Dr Ivanhoe Leung Dr Ghader Bashiri Dr Jason Busby Dr David Goldstone	Auckland Auckland Auckland Canterbury Auckland Auckland Auckland Auckland Auckland Auckland	2019-2	Micro Crystallography (MX2) “Auckland Structural Biology CAP”	Merit Access 6 shifts 16-17 June 10-11 August	No claim yet
<b>Dr Nadine van der Heijden</b> Dr Duncan McGillivray Nur Maizura Mohd Darbi Jitendra Mata	Auckland Auckland Auckland ANSTO	2019-2	Small/Wide Angle X-ray Scattering (SAXS) “Probing intermediate action of linear battacin analogues using SAXS.”	Merit Access 3 shifts 20-21 June	No claim yet
<b>Assoc Prof Aaron Marshall</b> Assoc Prof Matthew Watson Nic Weaver Assoc Prof Catherine Bishop Samuel Martin Treceno Johan Hamonnet	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2019-2	Powder Diffraction (PD) “Analysis of crystalline phases present in complex solid-molten oxide systems at high Temperature”	Merit Access 6 shifts 25-27 June	\$1,526

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
<b>Dr Peter Mace</b> Prof Kurt Krause Dr Yoshio Nakatani Dr Joel Tyndall Assoc Prof Sigurd Wilbanks Prof Catherine Day	Otago Otago Otago Otago Otago	2019-2	Macromolecular Crystallography (MX1) “University of Otago Structural Biology Group”	Merit Access 3 shifts 26-27 June	No claim yet
<b>Assoc Prof Daniel Holland</b> Assoc Prof Matt Watson Tenaya Driller	Canterbury Canterbury Canterbury	2019-2	Imaging and Medical (IM) “Capturing the Microscopic Processes involved in Maple Sap Exudation: An in-situ experiment on maple saplings.”	Merit Access 3 shifts 26-27 June	\$1,645
<b>Dr Ivanhoe Leung</b> A/Prof Chris Squire Dona Gunawardana Henry Tang Praveen Vadakkedath	Auckland Auckland Auckland Auckland	2018-3	Small/Wide Angle X-ray Scattering (SAXS) “Unravelling the structural basis of ethylene biosynthesis in plants”	Merit Access 3 shifts 28-29 June <b>Additional time awarded because of instrument issues in 2018/3 period</b>	\$1,697
<b>New Zealand Researchers with Projects in Australian Based Collaboration Access Programs</b>					
<b>Tim Allison</b>	Canterbury	2018/3 to 2019/2	Macromolecular Crystallography (MX1) “Tuning talented transferases: how a common structure leads to different functions”	Merit Access 1.5 shifts Various dates	
<b>Tim Allison</b>	Canterbury	2018/3 to 2019/2	Micro Crystallography (MX2) “Tuning talented transferases: how a common structure leads to different functions”	Merit Access 1.5 shifts Various dates	
<b>Assoc Prof Ren Dobson</b> Dr Rachel North James Davies Michael Currie Rina Hudson-King Santosh Panjekar Christopher Horne David Coombes Anthony Weatherhead	Canterbury Canterbury Canterbury Canterbury Canterbury Aust Synch Canterbury Canterbury Canterbury	2018/3 to 2019/2	Macromolecular Crystallography (MX1) “Structural Biology Projects for the Dobson group (Uni Canterbury)”	Merit Access 1.5 shifts Various dates	
<b>Assoc Prof Ren Dobson</b> Dr Rachel North James Davies Michael Currie Rina Hudson-King Santosh Panjekar Christopher Horne David Coombes Anthony Weatherhead	Canterbury Canterbury Canterbury Canterbury Canterbury Aust Synch Canterbury Canterbury Canterbury	2018/3 to 2019/2	Micro Crystallography (MX2) “Structural Biology Projects for the Dobson group (Uni Canterbury)”	Merit Access 1.5 shifts Various dates	

<b>Researchers</b>	<b>Institution</b>	<b>Cycle</b>	<b>Beamline</b>	<b>Access</b>	<b>Travel Funding</b>
<b>Prof Paul Kruger</b> Lily Hermansplan Dr Hayley Scott Dr Colm Healy Ben Wilson Carline Klenjan Dr Daniel Preston Ben Howard	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2018/3 to 2019/2	Macromolecular Crystallography (MX1) “Spin- Crossover Materials, Spin Clusters and Metal Organic Frameworks”	Merit Access 1.5 shifts Various dates	
<b>Prof Paul Kruger</b> Lily Hermansplan Dr Hayley Scott Dr Colm Healy Ben Wilson Carline Klenjan Dr Daniel Preston Ben Howard	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2018/3 to 2019/2	Micro Crystallography (MX2) “Spin-Crossover Materials, Spin Clusters and Metal Organic Frameworks”	Merit Access 1.5 shifts Various dates	
<b>Dr Shane Telfer</b> Dr John Clements David Perl	Massey Univ Sydney Massey	2018/3 to 2019/2	Macromolecular Crystallography (MX1) “Multicomponent Metal- Organic”	Merit Access 3 shifts Various dates	

## 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 currently has ten beamlines that have been operating for some time with a further eight approved for design and construction over the next six years. 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).
- ) 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 the September-December 2008 cycle. 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 existing protein 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 (IMBL) 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 is being used by geoscientists for tomography studies.



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\$90 million which will be used to add a further eight beamlines to the facility. Design work on the first three beamlines commenced in July 2017 and will continue with a further two or three beamlines being added each year. New Zealand has contributed A\$12 million towards the new beamlines with a 50:50 contribution from the New Zealand research sector and the government.



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 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 will become 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.

Details of the new beamlines are:

**Medium Energy XAS (MEX1 and MEX2) Year 1 (design commenced July 2017)**

The MEX beamline will have two independently operated end-stations and provide medium energy absorption spectroscopy optimised for cutting-edge applications in biological, agricultural and environmental science. They will cover an energy range not currently 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. Focusing optics will include a microprobe

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.

**Micro-Computed Tomography (MCT) Year 1 (design commenced July 2017)**

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 MCT beamline will enable high-throughput and dynamic micro-CT down to submicron resolution. A key feature will be 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.

**BioSAXS Year 2 (design commenced July 2018)**

The BIOSAXS beamline will be 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) Year 2 (design commenced July 2018)**

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 (HMX) Year 3 (design to commence July 2019)**

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-5 $\mu$ m 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 (design to commence July 2019)**

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 (80nm), high-flux mapping (160nm resolution) and spectroscopy (160nm 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 of 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 2018 to 30 June 2019 were:

Dr Garth Carnaby, Chair  
Professor Catherine Day, University of Otago (from 30 November 2018)  
Professor Geoffrey Jameson, Massey University  
Professor Michael McWilliams, formerly CSIRO  
Professor James Metson, The University of Auckland  
Professor Ian Shaw, University of Canterbury (until 30 November 2018)

### Indemnities and Insurance

The board has taken Directors and Officers Liability Insurance with Lumley General Insurance Limited. Coverage of up to \$5 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	6	6	\$9,000
Professor Catherine Day	4	3	
Professor Geoffrey Jameson	6	5	-
Professor Michael McWilliams	6	6	-
Professor James Metson	6	6	-
Professor Ian Shaw	3	3	-

### Donations

The company did not make any donations during the period from establishment up to 30 June 2019.

### 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.

<b>Director</b>	<b>Organisation/Entity</b>	<b>Nature of Interest</b>
<b>Dr GA Carnaby</b>		
Shares Held	GA Carnaby & Associates Ltd	Controlling majority
Beneficiary of Trusts	Carnaby Trust	Trustee and discretionary beneficiary
Offices Held	National Provident Fund	Annuity/Defined benefit
	Dodd-Walls Centre of Research Excellence	Chair
	BioResource Processing Alliance	Chair
	Wool Industry Research Ltd	Chair
<b>Prof GB Jameson</b>		
Shares Held	Tower Ltd	Minority shareholder
Beneficiary of Trusts	Estate of MEB Jameson	Discretionary beneficiary
Offices Held	Massey University	Employee
Other Interests	Te Manawa Museums Trust Board	Board member
	Science Centre Trust, Palmerston North	Trustee
<b>Prof MO McWilliams</b>		
Offices Held	CSIRO	Employee
<b>Prof JB Metson</b>		
Shares Held	Vector Energy	Minority shareholder
Offices Held	University of Auckland	Deputy Vice-Chancellor
	Brain Research New Zealand	Board Member
	Maurice Wilkins Centre for Molecular Biodiscovery	Board Member
	Medical Technologies Centre of Research Excellence	Board Member
	Te P naha Matatini	Board Member
	Dodd Walls Centre	Board Member
	Ng Pae o te Maramatanga	Board Member
	High Value Nutrition National Science Challenge	Board Member
	A Better Start National Science Challenge	Board Member
	Auckland UniServices Ltd	Director
<b>Prof IC Shaw</b>		
Offices Held	University of Canterbury	Employee
Other Interests	Sandoz GmbH, Austria	Consultant
	New Zealand Pharmaceuticals	Consultant
<b>Professor CL Day</b>		
Offices Held	University of Otago	Employee
	RSNZ Academy Executive Council	Member
	Healthier Lives Leadership Team	Member
	Maurice Wilkins CoRE	Member - AI
Shares Held	Birchwood Farming Ltd	Minority shareholder
	Fairholm Farming Ltd	Minority shareholder

**New Zealand Synchrotron Group  
Limited  
Financial statements  
for the year ended 30 June 2019**

## Contents

	Page
Directory	3
Board report	4
Auditors' report	5-6
Statement of comprehensive revenue and expenses	7
Statement of changes in net assets	8
Statement of financial position	9
Statement of cashflows	10
Notes to the financial statements	11-18
Note 1. General information	11
Note 2. Significant accounting policies	11-14
Note 3. Revenue for Australian operations	14
Note 4. Revenue for New Zealand operations	14
Note 5. Australian Synchrotron Group costs	14
Note 6. Other operating costs	14
(a) Remuneration of auditor	14
(b) Foreign exchange (gains) / losses	14
(c) Support for Synchrotron Science	15
(d) Secretariat and other operating costs	15
Note 7. Cash and cash equivalents	15
Note 8. Trade and other receivables	15
Note 9. Derivative financial instruments	16
Note 10. Commitments	16
Note 11. Trade and other payables	16
Note 12. Contingent liabilities	17
Note 13. Related parties	17
Note 14. Events occurring after balance date	17
Note 15. Share capital	17
Note 16. Financial instruments	18
Note 17. Reconciliation of profit with cash flows from operating activities	18

Directors

G A Carnaby (Chair)  
C L Day  
G B Jameson  
M O McWilliams  
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

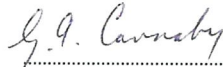
New Zealand Synchrotron Group Limited  
Board Report  
for the year ended 30 June 2019

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 2019.

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 18 for issue on 18 October 2019.

For and on behalf of the Board



G A Carnaby  
Chair

18 October 2019



M O McWilliams  
Director

18 October 2019



## INDEPENDENT AUDITOR'S REPORT

### TO THE SHAREHOLDERS OF NEW ZEALAND SYNCHROTRON GROUP LIMITED

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 Partnership, 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 18, that comprise the statement of financial position as at 30 June 2019, 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 18:
  - present fairly, in all material respects:
    - its financial position as at 30 June 2019; 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 Tier 2 - Public Benefit Entities International Public Sector Accounting Standards Reduced Disclosure Regime ('PBE IPSAS RDR'); and

Our audit was completed on 25 October 2019. 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.

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.

For the budget information reported in the financial statements, our procedures were limited to checking that the information agreed to the company's operational budget 2018-2019.

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 pages 3 to 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.

#### **Restriction of use of our report**

This report is made solely to the Company's shareholders, as a body. Our audit work has been undertaken so that we might state to the Company's shareholders, as a body those matters which we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the Company and the Company's shareholders, as a body, for our audit work, for this report or for the opinion we have formed.



**B Kennerley**  
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 2019

		2019 (Unaudited) Budget	2019 Actual	2018 Actual
	Note	\$	\$	\$
<b>Revenue from non exchange transactions</b>				
Revenue for Australian Operations	3	3,059,565	2,990,849	8,358,925
<b>Revenue from exchange transactions</b>				
Revenue for NZ Operations	4	123,600	123,600	123,600
Other revenue	4	134,457	212,256	146,184
<b>Total Revenue</b>		<u>3,317,622</u>	<u>3,326,705</u>	<u>8,628,709</u>
<b>Expenses</b>				
Australian Synchrotron Group costs		1,630,435	1,601,531	1,614,208
(Gain) / Loss on fair value of derivatives		60,000	122,927	150,405
Other operating expenses	6	1,627,013	1,591,424	6,864,571
<b>Operating expenditure</b>		<u>3,317,448</u>	<u>3,315,882</u>	<u>8,629,184</u>
<b>Total surplus/(deficit) for the year</b>		<u>174</u>	<u>10,823</u>	<u>(475)</u>
Other comprehensive income		-	-	-
<b>Total comprehensive revenue and expense</b>		<u><u>174</u></u>	<u><u>10,823</u></u>	<u><u>(475)</u></u>

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 18



New Zealand Synchrotron Group Limited  
Statement of changes in net assets  
for the year ended 30 June 2019

	Notes	Share capital \$	Accumulated losses \$	Total equity \$
Balance as at 30 June 2017		2,912,162	(2,425,090)	<b>487,072</b>
Net surplus		-	(475)	(475)
Other comprehensive income		-	-	-
Total comprehensive revenue and expenses		-	(475)	(475)
<b>Balance as at 30 June 2018</b>		<u>2,912,162</u>	<u>(2,425,565)</u>	<u>486,597</u>
Net surplus		-	10,823	<b>10,823</b>
Other comprehensive income		-	-	-
Total comprehensive revenue and expenses		-	10,823	<b>10,823</b>
<b>Balance as at 30 June 2019</b>		<u><u>2,912,162</u></u>	<u><u>(2,414,742)</u></u>	<u><u>497,420</u></u>


These financial statements should be read in conjunction with the accompanying notes on pages 11 - 18



New Zealand Synchrotron Group Limited  
Statement of financial position  
as at 30 June 2019

ASSETS	Note	2019 \$	2018 \$
<i>Current assets</i>			
Cash and cash equivalents	7	489,699	321,214
Trade and other receivables from exchange transactions	8	79,927	96,144
Prepayments	8	1,850	6,575
Derivative financial instruments	9	-	104,025
<b>Total current assets</b>		<b>571,475</b>	<b>527,958</b>
<b>TOTAL ASSETS</b>		<b>571,475</b>	<b>527,958</b>
<b>LIABILITIES</b>			
<i>Current liabilities</i>			
Trade and other payables	11	55,153	41,361
Derivative financial instruments		18,902	-
<b>Total current liabilities</b>		<b>74,055</b>	<b>41,361</b>
<b>TOTAL LIABILITIES</b>		<b>74,055</b>	<b>41,361</b>
<b>Net assets</b>		<b>\$ 497,420</b>	<b>\$ 486,597</b>
<b>EQUITY</b>			
Share capital	15	2,912,162	2,912,162
Accumulated losses		(2,414,742)	(2,425,565)
<b>TOTAL EQUITY</b>		<b>\$ 497,420</b>	<b>\$ 486,597</b>

For and on behalf of the Board

  
.....  
G A Carnaby  
Chair

18 October 2019  
.....

  
.....  
M O McWilliams  
Director

18 October 2019  
.....

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 18



New Zealand Synchrotron Group Limited  
Statement of cash flows  
for the year ended 30 June 2019

	Notes	2019 \$	2018 \$
<b><i>Cash flows from operating activities</i></b>			
<u>Receipts</u>			
Receipts from non exchange transactions		2,990,849	8,358,925
Receipts from exchange transactions		332,896	169,117
Interest	4	19,178	15,418
<b>Net cash flows from operating activities</b>		<b>3,342,923</b>	<b>8,543,460</b>
<u>Payments</u>			
Australian Synchrotron Group Costs		(1,601,531)	(1,614,208)
Less: Cash applied to Derivative Asset		0	(260,000)
Other expenses		(1,572,907)	(6,844,420)
<b>Total cash applied</b>		<b>(3,174,438)</b>	<b>(8,718,628)</b>
<b>Net cashflows from operating activities</b>	17	<b>168,485</b>	<b>(175,168)</b>
<b><i>Cash flows from financing activities</i></b>			
<u>Receipts</u>			
Contributions from shareholders		-	-
<b>Net cash flows from financing activities</b>		-	-
Net (decrease)/increase in cash and cash equivalents		168,485	(175,168)
Cash and cash equivalents at 1 July	7	321,214	496,382
<b>Cash and cash equivalents at 30 June</b>	7	<b>489,699</b>	<b>321,214</b>

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 18



**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 18 October 2019.

**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) Trade receivables**

Trade receivables are recognised initially at fair value and subsequently measured at amortised cost, less provision for doubtful debts.

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 able to collect all amounts due according to the original terms of receivables. The amount of the provision is the difference between the asset's carrying amount and the present value of estimated future cash flows, discounted at the effective interest rate. The amount of the provision is recognised in the statement of comprehensive revenue and expenses.



**(i) Derivative financial instruments**

Derivatives are categorised as financial assets and liabilities held for trading. Derivatives are initially recognised at fair value on the date a derivative contract is entered into and are subsequently re-measured at their fair value. 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. Gains and losses arising from changes in the fair value of the derivative financial instruments are presented in the statement of comprehensive income and expenses within gain/(loss) on fair value of derivatives. 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.

**(j) Investments and other financial assets**

NZSG classifies its investments in the following categories: loans and receivables. The classification depends on the purpose for which the investments were acquired. Management determines the classification of its investments at the initial recognition and re-evaluates this designation at every reporting date.

Loans and receivables are non derivative financial assets with fixed or determinable payments that are not quoted in an active market. They arise when NZSG provides money, goods or services directly to a debtor with no intention of selling the receivable. They are included in current assets, except for those with maturities greater than 12 months after the balance sheet date which are classified as non-current assets. 'Trade and other receivables' and 'cash and cash equivalents' are classified as loans and receivables in the statement of financial position.

Loans and receivables are subsequently carried at amortised cost using the effective interest method.

**(k) Trade and other payables**

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

**(l) 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.

**(m) 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.

New Zealand Synchrotron Group Limited  
Notes to the financial statements  
for the year ended 30 June 2019

<b>Note 3. Revenue for Australian operations</b>	<b>2019</b>	<b>2018</b>
	\$	\$
<i>Revenue from non-exchange transactions</i>		
Ministry of Business Innovation and Employment	940,000	940,000
MBIE - contribution to Australia Synchrotron beamlines	-	6,602,819
Shareholders - contribution to Aust. Synchrotron beamlines	1,250,217	-
Shareholders	800,632	816,106
	<u>2,990,849</u>	<u>8,358,925</u>

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

<b>Note 4. Revenue for New Zealand operations</b>	<b>2019</b>	<b>2018</b>
	\$	\$
<i>Revenue from exchange transactions</i>		
Grants from shareholders for operating costs of NZSG	123,600	123,600
<i>Other Revenue</i>		
Contribution from the Australian Synchrotron towards travel costs	107,900	93,907
Funding for paid access to the Synchrotron	85,178	36,859
Interest	19,178	15,418
	<u>212,256</u>	<u>146,184</u>
	<u>335,856</u>	<u>269,784</u>

**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.

**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 NZ.  
Statutory audit services

<b>2019</b>	<b>2018</b>
\$	\$
<u>6,610</u>	<u>7,130</u>

**(b) Foreign exchange (gains) / losses**

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

<b>2019</b>	<b>2018</b>
\$	\$
<u>27,120</u>	<u>(54,552)</u>

**New Zealand Synchrotron Group Limited**  
**Notes to the financial statements**  
**for the year ended 30 June 2019**

**(c) Support for Synchrotron Science**

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

	<b>2019</b>	<b>2018</b>
	\$	\$
Travel costs reimbursed to shareholders	105,319	95,599
Payments for access to Australian Synchrotron	73,242	33,347
Contribution to Australian Synchrotron for new beamlines	1,250,391	6,657,490
User Meetings	14,742	12,523
Asia Oceania Forum for Synchrotron		
Radiation Research Membership	5,000	2,839
	<u>1,448,694</u>	<u>6,801,798</u>

**(d) Secretariat and other operating costs**

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

	<b>2019</b>	<b>2018</b>
	\$	\$
Secretariat services from the Royal Society and Board costs	105,048	106,715
Insurance	3,425	2,950
Other	527	530
	<u>109,000</u>	<u>110,195</u>
Total other operating costs	<u>1,591,424</u>	<u>6,864,571</u>

**Note 7. Cash and cash equivalents**

	<b>2019</b>	<b>2018</b>
	\$	\$
Cash	260,237	100,371
Foreign currency - AUD	229,462	220,843
	<u>489,699</u>	<u>321,214</u>

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

**Note 8. Other current assets**

**(a) Trade and other receivables**

	<b>2019</b>	<b>2018</b>
	\$	\$
Trade receivables	80,523	10,521
Other receivables	0	81,950
Goods and Services Tax receivable	(596)	3,673
<b>Total trade and other receivables</b>	<u>79,927</u>	<u>96,144</u>

**(b) Prepayments**

	<b>2019</b>	<b>2018</b>
	\$	\$
Prepayments	1,850	6,575
<b>Total Prepayments</b>	<u>1,850</u>	<u>6,575</u>



New Zealand Synchrotron Group Limited  
Notes to the financial statements  
for the year ended 30 June 2019

**Note 9. Derivative financial instruments**

	2019	2018
	\$	\$
Western Union Forward cover	(18,902)	104,025
<b>Derivative financial instruments</b>	<b>(18,902)</b>	<b>104,025</b>

The following derivatives have been entered into with Western Union.

(a) *Forward foreign exchange contracts*

At 30 June 2018	Notional	Deal rate	Fair Value
Forward exchange contract (Maturity: February 2019)	\$819,493	0.9152	(334)
Forward exchange contract (Maturity: February 2020)	\$755,124	0.9270	\$10,344
<b>At 30 June 2019</b>			
Forward exchange contract (Maturity: February 2020)	\$755,124	0.9270	(21,220)
Forward exchange contract (Maturity: February 2021)	\$787,402	0.9525	\$1,689

(b) *Forward foreign exchange options*

At 30 June 2018	Notional	Strike Price	Fair Value
Forward foreign exchange option (Maturity: February 2019)	\$852,273	0.88	\$4,977
Forward foreign exchange option (Maturity: February 2020)	\$6,825,985	0.85	\$89,038
<b>At 30 June 2019</b>			
Forward foreign exchange option (Maturity: February 2020)	\$6,825,985	0.85	\$629

**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**

	2019	2018
	\$	\$
Creditors	25,875	25,875
Accruals	29,278	15,486
<b>Total trade and other payables</b>	<b>55,153</b>	<b>41,361</b>

The amount owed to related parties was nil as at 30 June 2019. (2018: nil).



**Note 12. Contingent liabilities**

There were no significant contingent liabilities at 30 June 2019. (2018: 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 2019.

*Directors*

Transactions with board members include payment of fees. During the year ended 30 June 2019, a total of \$9,000 was paid to the Chair (2018: \$9,000). As at 30 June 2019, there was no outstanding balances with board members (2018: \$0).

*Shareholders*

Transactions with shareholders during the year ended 30 June 2018 include grants, as per Note 4, amounting to \$123,600 (2018: \$123,600). Also, as per Note 10, under the agreement with ANSTO the 10 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 2019, a total of AUD \$1.9725m (2018: AUD \$0.75m) was contributed by Shareholders who are party to the Funders Agreement and, as at 30 June 2019, there was no outstanding balance with shareholders (2018: \$0).

**Note 14. Events occurring after balance date**

There were no significant events occurring after balance date.

**Note 15. Share capital**

Shareholding at cost	2019	2018
	\$	\$
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
	<u>2,912,162</u>	<u>2,912,162</u>

The shares held at 30 June are:

	2019	2018
	# of shares held	# 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
	<u>2,581,208</u>	<u>2,581,208</u>

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



New Zealand Synchrotron Group Limited  
Notes to the financial statements  
for the year ended 30 June 2019

**Note 16. Financial instruments**

Classification of financial assets by category	Fair value through Profit or Loss	Loans and Receivables
<b>2019</b>	<b>\$</b>	<b>\$</b>
Cash and cash equivalents	-	489,699
Trade & other receivables	-	79,927
Prepayments	-	1,850
Derivative financial instrument	-	-
<b>Total</b>	<b>0</b>	<b>571,475</b>
<b>2018</b>		<b>\$</b>
Cash and cash equivalents	-	321,214
Trade & other receivables	-	96,144
Prepayments	-	6,575
Derivative financial instrument	104,025	-
<b>Total</b>	<b>104,025</b>	<b>423,933</b>

**Classification of financial liabilities by category**

**Measured at amortised cost**

	2019	2018
	<b>\$</b>	<b>\$</b>
Trade & other payables	55,153	41,361
Derivative financial instrument	18,902	0
<b>Total</b>	<b>74,055</b>	<b>41,361</b>

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

	2019	2018
	<b>\$</b>	<b>\$</b>
Net (Deficit)/Surplus for the year	10,823	(475)

**Movement in working capital**

Trade and other receivables	16,218	(85,249)
Derivative financial instruments	122,927	(109,595)
Trade and other payables	13,792	25,251
Prepayments	4,725	(5,100)
<b>Net Cash outflow from operating activities</b>	<b>168,485</b>	<b>(175,168)</b>

