# NEW ZEALAND SYNCHROTRON GROUP LIMITED



**ANNUAL REPORT 2018** 

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## **CHAIRMAN'S REPORT**

The year under review was the twelfth 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 first under a new funding and access arrangement that has given a substantial increase in the amount of beamtime that New Zealand researchers can get. This led to an immediate increase in demand, with the entitlement being fully allocated with no loss in the quality of projects going forward. Researchers from every institution providing funding have used the Synchrotron this year.



In Australia the campaign to generate funds for the new beamlines has resulted in more than A\$94 million being raised enabling eight new beamlines to be planned. Design work started on the first three this year and a start will be made on the remaining five over the next two years. New Zealand is contributing A\$12 million to the beamline fund which has secured 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 funds are being provided jointly by the New Zealand government and ten of the company's shareholders.

The company had budgeted for a small surplus of \$15,168 for the year and achieved a final result of a loss of \$475. This result was better than it might have been as the budget for the year provided only for a loss in value of the financial derivatives held by the company of \$50,000 whereas the actual loss in value was \$150,405. The impact of that \$100k difference was largely absorbed through cost savings made from not purchasing as much commercial beamtime as had been intended and from other minor savings.

In last year's Annual Report, the susceptibility of the company's financial operations to movements in the exchange rate between the New Zealand and Australian currencies was highlighted. The risk for the medium-term future has 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. In August 2017 a large vanilla option covering the full value of the MBIE contribution to the payment to ANSTO until 2020 was taken at a cost of \$260,000. The fall in value of that particular instrument (to \$89,038 as at 30 June 2018) was the major contributor to the overall loss in value of all the financial derivatives over the year.

There was a small decrease in shareholder equity from \$487,072 to \$486,597. Although there is continued uncertainty in currency exchange rate movements, with the options and forward contracts taken to cover the next two year's payments to ANSTO and the funding arrangements in place for the long-term, the directors believe that the financial position is secure.

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 make by Dr Don Smith in assisting the board, administering the New Zealand Synchrotron Support Programme and looking after our interests in Australia and on the Asia Oceania Forum for Synchrotron Radiation Research. I would also like to acknowledge the contribution from the Chair of the Access Committee, 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 to particularly to acknowledge the contribution from Professor Ian Shaw who is retiring from the board at the next AGM in November. The board welcomes Professor Catherine Day as a new director to replace Professor Shaw.

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## **BUSINESS REVIEW**

### Investment in the Australian Synchrotron and Access Rights

Through the original investment in the Australian Synchrotron in October 2007, NZSG became a member of the Australian Synchrotron Company (ASCo) and a shareholder in the Australian Synchrotron Holding Company (ASHCo). As part of the restructuring of the Australian Synchrotron operations and funding in 2012, responsibility for operating the Synchrotron was transferred from ASCo to the Australian Nuclear Science and Technology Organisation (ANSTO) on 1 January 2013. ASCo was deregistered in June 2013, however NZSG remained a shareholder in ASHCo which leased the facility and equipment to SLSA to operate. The 5 million A\$1 shares in ASHCo held by NZSG were fully paid, however their value was written down to zero as at 30 June 2013 to reflect the cessation of access rights to all foundation investors in the Australian Synchrotron after August 2013. Those shares were transferred at no cost to ANSTO in July 2016 as part of the new ownership arrangement.

Under arrangements set in place at that time to establish access rights to the Australian Synchrotron until 2019 and provide funding for the operating costs of the facility, New Zealand researchers have been entitled to a guaranteed amount of merit beamtime in return for an annual payment of A\$1.5 million, half of which has been collectively contributed by NZSG's shareholders, supplemented by equal funding from the New Zealand government. The payments are channelled through NZSG. AgResearch, Plant & Food Research and Lincoln University did not have access to merit beamtime as they did not contribute to the sector's funding pool. Callaghan Innovation has given notice that it will withdraw from July 2019.

New Agreements were entered into in July 2017 which extended the period of guaranteed access to 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 are to be added to the Synchrotron over the next 6 years. The annual payment remains at A\$1.5 million and New Zealand will contribute A\$12 million towards the cost of the new beamlines, the cost of which is being equally shared by the research sector and the government. The government's A\$6 million contribution was paid to ANSTO during the past year. The sector's share will be paid in 5 instalments commencing in 2019.

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 provide advice to ANSTO. The NZSG board has appointed Dr Don Smith to be 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.

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

The funding and access Agreement with ANSTO also provides for the company to decide the way in which the entitlement to merit beamtime is allocated to give the best advantage for New Zealand. This includes being able to decide on the distribution of beamtime between beamlines and on the ranking of the New Zealand proposals to each beamline. New Zealand researchers from the ten 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 as required 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 2017 onwards, and where applicable, 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 and since then all the 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. The Australian Synchrotron makes calls every four months for merit access to the beamlines. Applications are made directly to the Australian Synchrotron, however 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 last year, 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 however be noted that real access is approximately 50% greater than shown in the graph as a significant number of New Zealand researchers are co-applicants on proposals from Australian colleagues that 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.

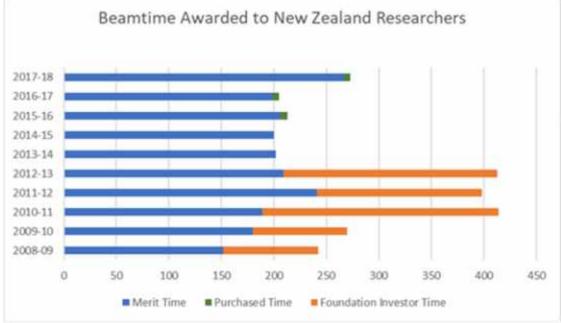


Figure 1: Historical record of beamtime awarded to New Zealand applications

The research community has quickly adjusted to the increased level of access. There was a 7% increase in the number of proposals submitted in 2017/18 (up from 55 the previous year to 55, with a 15% increase in the number of shifts requested (up from 423 to 486). The increased number of shifts available has enabled a higher proportion of the proposals submitted to be given beamtime (68% in 2017/18 compared with 60% in 2016/17). Table 1 gives a breakdown of the application statistics by beamline.

Beamline	No. Shifts	No. Shifts		No. Appl'ns.	No. A	warded
	Requested	Awarded		Received	Bear	ntime
IMBL	75	24	32%	6	4	67%
IRM	42	39	93%	5	4	80%
PD	15	12	80%	2	2	100%
SAXS	37	33	89%	13	9	69%
SXR	75	30	40%	6	2	33%
THz	54	36	67%	13	3	23%
XAS	33	3	9%	6	1	17%
XFM	18	6	33%	2	1	50%
Subtotal	359	183	51%	52	33	63%
MX (CAPs)	137	84	61%	7	7	100%
Overall	486	267	55%	59	40	68%

Table 1: Success	Rate for N7	<b>Reamtime</b>	Annlications .	_ 2017/18*
Table 1. Success	Nate IVI 112	Deamune	Applications -	- 401 // 10

\* A description of the beamlines and the abbreviations used in given on pages 19-20

The following two graphs demonstrate the variability in demand for beamtime over the past four years between beamlines. The greatest demand has been for time on 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 a substantial increase in interest in the imaging and medical (IMBL) and the terahertz/Far Infrared (THz) beamlines compared with previous 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 of the new beamlines 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 take some of the pressure off the MX and SAXS beamlines.

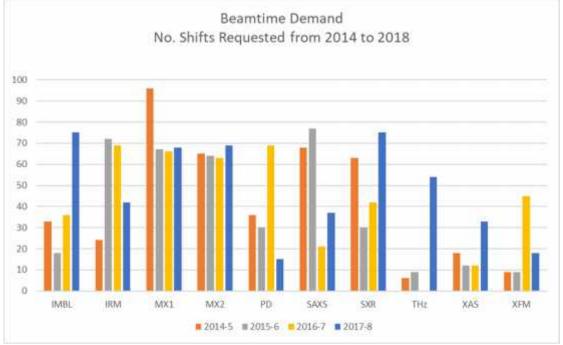
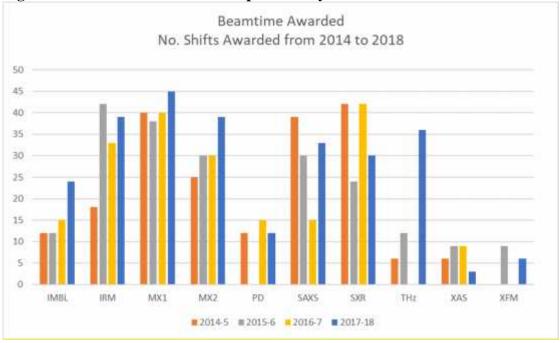


Figure 2: Beamtime demand for the past four years

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 given on pages 10 to 18. These projects cover a very broad range of science topics. Many have involved the training of young researchers. Six examples that illustrate the wide applicability of synchrotron science to New Zealand's research needs and the benefit of having access to the Australian Synchrotron are given on page 8.

## Support for Synchrotron Scientists

Apart from overseeing the access of New Zealand researchers to the Synchrotron, NZSG also provides support by administering the travel funding available from the Australian Synchrotron to which all groups with merit access are entitled. During the year, the company also purchased six shifts of MX2 beamtime for researchers from AgResearch. As AgResearch had recently re-joined the funding group, their researchers were not associated with any of the Collaborative Access Programmes (CAPs) through which access to the MX beamlines is managed, so the company purchased beamtime on their behalf. AgResearch has joined one of the CAPs for the coming year.

Support has also been provided for students or emerging researchers to further develop their knowledge of synchrotron science techniques through attendance at the annual User Meeting held at the Australian Synchrotron and at the annual Synchrotron Radiation School run by the Asia Oceania Forum for Synchrotron Radiation Research (AOFSRR) of which NZSG is a member. The most recent User Meeting was held in Melbourne in November 2017 and the AOFSSR School will be held at the Pohang Radiation laboratory in Korea in September 2018.

The table below provides details of the students who were selected to attend the User meeting in November 2017 and AOF Synchrotron Radiation School being held in September 2018.

Name	Institution	Details	Comment
Oliver Sterritt	University of Canterbury	PhD student	User Meeting
Susyn Kelly	Massey University	PhD student	User Meeting
Bishwa Subedi	Massey/AgResearch	PhD student	User Meeting
Aubrey Dosado	University of Auckland	PhD student	User Meeting
Andrew Chan	University of Auckland	PhD student	User Meeting
Rakesh Arul	University of Auckland	PhD student	AOF School
Qing Wang	University of Auckland	PhD student	AOF School

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

Ionic liquids consist entirely of charged particles, like regular table salt, however, unlike table salt they melt at low temperatures meaning that many are liquid at room temperature. This allows ionic liquids to conduct electricity and means that ionic liquids are generally non-flammable and don't emit fumes unlike other commonly used liquids. For these reasons ionic liquids are being explored for wide-ranging applications such as safer non-flammable electrolytes for batteries, solvents for biotechnology and the processing of biomass such as forestry or agricultural waste into fuels and chemicals.

When used in any of these applications, ionic liquids form mixtures with other substances present. However, most of the studies used to understand the properties of ionic liquids focus on the pure ionic liquid rather than how their structure and properties will change when they form mixtures. To address this, Dr Cameron Weber from AUT in collaboration with researchers from The University of Auckland and RMIT University in Australia have used the Australian Synchrotron to explore how the nanostructures of ionic liquids change when they form mixtures. Their research will allow new, improved ionic liquid formulations to be predicted and developed for myriad applications, with the potential to create new advanced manufacturing opportunities.

Molecular mimics of the antioxidant enzyme glutathione peroxidase have shown promise as drugs to treat a range of diseases including cancer, stroke and dementia. However, the mechanisms underlying their activity are largely unknown. The drug ebselen is one such molecular mimic, as in test tube assays it possesses similar antioxidant activity to the glutathione peroxidase enzyme. However, ebselen can also potentially interact with a spectrum of biological targets, which provides a barrier to the understanding of its therapeutic effects within living cells. Dr Gregory Giles and a team from the University of Otago have used the high resolution of the infrared microscope at the Australian Synchrotron to map the effects of ebselen administration on cancer cells. This work provides insight into the way in which enzyme mimics can preserve cellular function, and points the way towards developing new therapeutic agents, based upon ebselen, for treating diseases such as cancer.

A large current or magnetic field is near universally bad news for superconductivity. This fact is a key performance limitation for the promising industrialisation of superconductor technology currently underway in New Zealand. However, recently it was discovered that the opposite case is true for a superconductor when sandwiched between a particular magnetic compound. Experiments by Dr Ben Mallett and a team from The University of Auckland using the intense THz light from the Australian Synchrotron are part of a wider research project underway to reveal the physics behind this fundamentally interesting effect and potentially useful performance enhancement.

A multi-national collaboration between Callaghan Innovation, the University of Auckland, Qatar University and Imperial College, together with Shell Qatar, has been using the Australian Synchrotron to study corrosion processes that occur in oil and gas pipelines. Dr Bridget Ingham and her team developed a custom-made test cell and the Powder Diffraction beamline at the Australian Synchrotron to explore the effect of solution flow rate and solution chemistry on a range of different steels. The results explain why some steels are more corrosion-resistant than others under certain conditions, and help to inform companies regarding which type of steel should be used for various applications.

The rapid rise in efficiencies of hybrid organic-inorganic perovskite solar cells has led to an explosion of work worldwide on these promising absorber materials. Efficiencies have risen from 3.8% to over 20% certified efficiency in less than 5 years. Such a high photovoltaic performance is attributed to optically high absorption characteristics and balanced charge transport properties with long diffusion lengths. Improvements in film uniformity and smoothness have mainly been a current compromise of CH<sub>3</sub>NH<sub>3</sub>PbI<sub>3</sub> polycrystalline films between morphology and optoelectronic performance.

Dr Saifang Huang and a team from the University of Auckland together with collaborators from the Xi'an Jiaotong University in China have discovered that the MAPbI<sub>3</sub> film quality can be substantially enhanced by low levels of doping with the small metal cation  $Zn^{2+}$ . It is essential to study the local structural environment of  $Zn^{2+}$  to understand its effect on the microstructure and properties of perovskite materials. In this project, they utilised the Expanded X-ray Absorption Fine Structure (EXAFS) spectroscopy capabilities of the X-ray Absorption Spectroscopy beamlines at the Australian Synchrotron to probe the local structure around Zn atoms to help understand the mechanism of optoelectronic performance enhancement of perovskite solar cells.

A group of University of Otago scientists led by Professor Catherine Day have used the Australian Synchrotron's MX beamlines to probe the innermost secrets of the complex protein signalling mechanisms that regulate inflammation in human cells. Inflammation is supposed to be an acute protective response that keeps the body's tissues in a steady state and cells in good health. However, when the inflammatory response is not closed off, or the signalling involved otherwise goes awry it can lead to cancers and other diseases. Their crystallography studies have determined the shape of one of the key proteins in this signalling process. The protein, known as TNF receptor-associated factor 6, or TRAF6 receives a signal from sensors on the outside of a cell that inflammation is required.

TRAF6 then transfers the inflammation signal to other parts of the cell – much like how a relay transfers a baton from start to finish. The group's research has now shown how parts of TRAF6 help it to bind to other TRAF6 proteins, and similar TRAF5 proteins, to pass on that signal. New immunotherapies, which harness the body's own immune mechanisms rather than rely on traditional "carpet-bombing" approaches such as chemotherapy or radiotherapy, have been successful recently in the treatment of cancers such as melanoma and autoimmune diseases such as rheumatoid arthritis.

## 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 2017 and June 2018.

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
Dr Alex Nichols Elodie Saubin Assoc Prof Ben Kennedy Dr Hugh Tuffen Kim Berlo Tamiko Watson Dr Ian Schipper Dr Felix von Aulock	Canterbury Canterbury Canterbury Lancaster U. McGill U. Canterbury Victoria Liverpool U.	2017-2	Infrared Microscope (IRM) "Evolution of magmatic H <sub>2</sub> O and CO <sub>2</sub> during drilling into cooling molten magma"	Merit Access 4 days 6-10 July	\$1,901
<b>Dr Bridget Ingham</b> Dr Mobbassar Hassan Prof David Williams Dr Karl Dahm Trish Shaw Dr Monika Ko	Callaghan Qatar U. Auckland Callaghan Callaghan Quest Integrity	2017-2	Powder Diffraction (PD) "In situ monitoring of FeCO <sub>3</sub> scale nucleation and growth in an electrochemical flow cell"	Merit Access 2 days 14-16 July	\$2,344
Dr Chris Squire 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	Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2017-2	Macromolecular Crystallography (MX1) "Auckland Structural Biology CAP"	Merit Access 1 day 19-20 July	\$0
Dr Peter Mace Prof Kurt Krause Dr Joel Tyndall Dr Sigurd Wilbanks Prof Greg Cook Prof Catherine Day Dr Jodi Brewster Dr Wayne Patrick	Otago Otago Otago Otago Otago Otago Otago Otago	2017-2	Macromolecular Crystallography (MX1) "University of Otago Structural Biology Group"	Merit Access 1 day 27-28 July	\$3,710 (incl for travel in June)
Prof Emily Parker Prof Geoff Jameson Prof Vic Arcus Dr Gillian Norris Dr Andrew Sutherland- Smith Oliver Sterritt Heng Zhang Preeti Kundu	VUW Massey Waikato Massey Massey Canterbury Waikato Canterbury	2017-2	Macromolecular Crystallography (MX1) "Protein Structure and Function: Waikato, Canterbury and Massey Universities"	Merit Access 1 day 2-3 August	\$4,875 (incl for travel in June)

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
Dr Chris Squire Dr Jeremy Keown Dr Paul Young Yuliana Yosaatmadja Dr Ghader Bashiri Dr Jason Busby	Auckland Auckland Auckland Auckland Auckland Auckland	2017-2	Small/Wide Angle X-ray Scattering (SAXS) "Cooperativity of folding and nanotechnology application of bacterial surface adhesins"	Merit Access 1 day 9-10 August	\$1,922
Dr Chris Squire 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 Jeremy Raynes	Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2017-2	Micro Crystallography (MX2) "Auckland Structural Biology CAP"	Merit Access 1 day 15-16 August	\$4,214 (incl for travel in June)
Prof Emily Parker Yu Bai Prof Geoff Jameson Yifei Fan Dr Gillian Norris Dr Elena Harjes Fareeda Barzak	Victoria Canterbury Massey Canterbury Massey Massey Massey	2017-2	Small/Wide Angle X-ray Scattering (SAXS) "Complex Formation and Conformational Change"	Merit Access 1 day 16-17 August	\$2,668
Dr Chris Squire Assoc Prof Peter Metcalf Dr Tet Verne Lee Professor Ted Baker Dr Richard Kingston Dr Shaun Lott Dr Jodie Johnston Assoc Prof Alok Mitra Dr David Goldstone Prof Juliet Gerrard Dr Ghader Bashiri Dr Jason Busby	Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2017-3	Micro Crystallography (MX2) "Auckland Structural Biology CAP"	Merit Access 2 days 21-22 Sep 7-8 Dec	\$3,844 (incl MX1 travel)
Prof Emily Parker Prof Geoff Jameson Prof Vic Arcus Dr Andrew Sutherland- Smith Dr Vince Carbone Oliver Steritt Dr Scott Cameron	VUW Massey Waikato Massey AgResearch Canterbury VUW	2017-3	Macromolecular Crystallography (MX1) "Protein Structure and Function: Waikato, Victoria and Massey Universities"	Merit Access 1 day 21-22 Sep	\$7,078 (incl MX2 travel)

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
<b>Dr Peter Mace</b> Prof Kurt Krause Dr Yoshio Nakatani Dr Joel Tyndall Dr Sigurd Wilbanks Prof Catherine Day Helen Opel-Reading Elham Tobati	Otago Otago Otago Otago Otago Otago Otago Otago	2017-3	Macromolecular Crystallography (MX1) "University of Otago Structural Biology Group"	Merit Access 1 day 6-7 October	\$3,977 (incl MX2 travel)
Dr Chris Squire Assoc Prof Peter Metcalf Dr Tet Verne Lee Professor Ted Baker Dr Richard Kingston Dr Shaun Lott Dr Jodie Johnston Assoc Prof Alok Mitra Dr David Goldstone Prof Juliet Gerrard Dr Ghader Bashiri Dr Jason Busby Michael Barnett	Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2017-3	Macromolecular Crystallography (MX1) "Auckland Structural Biology CAP"	Merit Access 2 days 14-15 Oct 10-11 Nov	Incl in MX2 travel above
Assoc Prof Tilo Soehnel Dana Goodacre Natalija Vyborna Malin Grete Ludicke Martin Spasovski Sneth Patel Andrew Ching	Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2017-3	X-ray Absorption Spectroscopy (XAS) "XANES studies on Cu <sub>5-x</sub> Mn <sub>x</sub> Sb <sub>2</sub> SiO <sub>12</sub>	Merit Access 1 day 17-18 Oct	\$1,949
<b>Dr Nanette Schleich</b> Dr Stewart Midgely Dr Jacqueline Donoghue Marzieh Anjomrouz	Otago Flinders Univ. RMIT Otago	2017-3	Imaging and Medical Beamline (IM) "A modular cryogenic mouse holder system for synchrotron CT"	Merit Access 2 days 24-26 October	\$1,869
Prof Emily Parker Prof Geoff Jameson Prof Vic Arcus Dr Andrew Sutherland- Smith Oliver Steritt Dr Scott Cameron Dr Emma Summers Claire Mulholland	VUW Massey Waikato Massey Canterbury VUW Waikato Waikato	2017-3	Micro Crystallography (MX2) "Protein Structure and Function: Waikato, Victoria and Massey Universities"	Merit Access 1 day 31 Oct -1 Nov	Incl in MX1 travel above
<b>Dr Pauline Calloch</b> Dr Bridget Ingham Dr Ian Brown Nigel Ross	Callaghan Callaghan Callaghan Callaghan	2017-3	Powder Diffraction (PD) "Reduction of Metal Oxides for Light Metal Alloy Fabrication"	Merit Access 2 days 1-3 November	\$2,744

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
<b>Dr Ben Mallett</b> Rakesh Arul Margaux Airey Lucy Ingram Dr Michel Nieuwoudt Nina Novikova Liam Barber	Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2017-3	THz/Far Infrared (THz) "Using THz spectroscopy to understand the unique electrical-current induced superconducting transition in cuprate-manganite multilayer films"	Merit Access 3 days 8-11 November	\$2,247
Dr Peter Mace Prof Kurt Krause Dr Yoshio Nakatani Dr Joel Tyndall Dr Sigurd Wilbanks Prof Catherine Day	Otago Otago Otago Otago Otago Otago	2017-3	Micro Crystallography (MX2) "University of Otago Structural Biology Group"	Merit Access 1 day 15-16 Nov	Incl in MX1 travel above
Dr Saifang Huang Assoc Prof Tilo Soehnel Meidan Que Natalija Vyborna Andrew Ching Hongzhou Zhang	Auckland Auckland Xi'An Jiaotong Univ. Auckland Auckland Auckland	2017-2	X-ray Absorption Spectroscopy (XAS) "EXAFS investigation on the impact of Zn as dopant in organo- metallic perovskite MAPbI <sub>3</sub> films"	Merit Access 1 day 16-17 Nov (Rescheduled from 26-27 July)	\$2,935
Assoc Prof Andrew Sutherland-Smith Subedi Bishwa Dr Gillian Norris Dr Ron Ronimus	Massey Massey Massey AgResearch	2017-3	Micro Crystallography (MX2) "Structural analysis of pseudomurein peptide ligases of methanogenic archaea"	Merit Access 1 day 28-29 Nov	\$1,133
Dr Duncan McGillivray Raymond Shahlori Shinji Kihara Praveen Vadakkedath Gayan Heruka DeZoysa Dr Viji Sarojini	Auckland Auckland Auckland Auckland Auckland	2017-3	Small/Wide Angle X-ray Scattering (SAXS) "Mechanistic study of antimicrobial activity of battacin analogues using liposome models - evaluating the structure-activity relationship using synthetic derivatives	Merit Access 1 day 30 Nov - 1 Dec	\$1,927
<b>Dr Grant McIntosh</b> Prof Jim Metson Hasini Wijayaratne Gordon Agbenyegah Prof Margaret Hyland Andrew Chan Natalija Vyborna	Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2017-3	THz/Far Infrared (THz) "Probing alumina bulk/surface chemistry with THz/Far-IR spectroscopy: distinguishing spinel and non-spinel models and perturbations due to fluorine and sodium"	Merit Access 5 days 5-10 Dec	\$1,947
<b>Prof Geoff Jameson</b> Prof Emily Parker Dr Gillian Norris Yifei Fan Yu Bai Elena Harjes Fareeda Barzak Ruby Roach	Massey VUW Massey Canterbury Canterbury Massey Massey Massey	2017-3	Small/Wide Angle X-ray Scattering (SAXS) "Complex Formation and Conformational Change"	Merit Access 2 days 12-14 Dec	\$3,205

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
Prof Shane Cronin Mirja Heinrich Shannen Mills Dr Natalia Pardo A/Prof Ingrid Ukstins	Auckland Auckland Auckland Univ Los Andes, Colombia U. of Iowa	2018-1	Imaging and Medical (IM) "Understanding an immature bubble foam from the largest eruptions of Mt. Tongariro, New Zealand."	Merit Access 9 shifts 8-11 February	\$1,966
Dr Chris Squire 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	Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2018-1	Micro Crystallography (MX2) "Auckland Structural Biology CAP"	Merit Access 6 shifts 16-17 February 29-30 March	\$4,079 (Incl MX1 travel)
Prof Emily Parker Prof Geoff Jameson Prof Vic Arcus Dr Andrew Sutherland- Smith Dr Emma Andrews Claire Mulholland Emily Grout Parastoo Khajeaian Dr Scott Cameron	VUW Massey Waikato Massey Waikato Waikato VUW VUW	2018-1	Macromolecular Crystallography (MX1) "Protein Structure and Function: Waikato, Canterbury and Massey Universities"	Merit Access 3 shifts 21-22 February	\$4,728 (Incl MX2 travel)
Assoc Prof Geoff Waterhouse Andrew Chan Wan-Ting Chen Daniel Clyde Qing Wang Ewan Fisher Jessica Hill	Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2018-1	Soft X-ray Spectroscopy (SXR) "Effect of Particle Size on the Local Electronic Structure of Layered Double Hydroxide Nanosheets for Photocatalytic Ammonia Synthesis"	Merit Access 15 shifts 27 Feb – 3 Mar	\$2,262
Dr Peter Mace Prof Kurt Krause Dr Joel Tyndall Assoc Prof Sigurd Wilbanks Prof Greg Cook Prof Catherine Day Dr Yoshio Nakatani Dr Yosuke Shimaki	Otago Otago Otago Otago Otago Otago Otago	2018-1	Macromolecular Crystallography (MX1) "University of Otago Structural Biology Group"	Merit Access 3 shifts 9-10 March	\$7,002 (Incl MX2 travel)

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
Dr Chris Squire 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 Matthew Sullivan Maria Kalyukina	Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2018-1	Macromolecular Crystallography (MX1) "Auckland Structural Biology CAP"	Merit Access 6 shifts 10-11 March 25-26 April	Incl in MX2 travel above
<b>Dr Greg Giles</b> Adirah Coulter-Jeffrey Niroshini Manthri Giles	Otago Otago Otago	2018-1	Infrared Microscope (IRM) "Prooxidant Versus Antioxidant Activity of Ebselen"	Merit Access 12 shifts 21-25 March	\$2,579
A/Prof Duncan McGillivray Daniel McDougall Andrew Chan Dr Rayomand Shahlori Shinji Kihara	Auckland Auckland Auckland Auckland Auckland	2018-1	X-ray Fluorescence Microscopy (XFM) "What does EDTA do for NZ green- lipped mussels? A study of the role of EDTA in reducing metal toxicity"	Merit Access 6 shifts 27-29 March	\$2,500
<b>Prof Nicolai Bovin</b> Dr Stephen Mudie Dr Andrew Hilton Dr Marcel Schaefer	AUT Aust Sync AUT AUT	2018-1	Small/Wide Angle X-ray Scattering (SAXS) "Supramolecular organization of thin layers formed by self- assembling small molecules – synthetic lipids and peptides"	Merit Access 1 shift 29 March	\$806
Dr Peter Mace Prof Kurt Krause Dr Joel Tyndall Assoc Prof Sigurd Wilbanks Prof Greg Cook Prof Catherine Day Dr Yoshio Nakatani Andrej Paluda Yasmeen Ruma	Otago Otago Otago Otago Otago Otago Otago Otago Otago	2018-1	Micro Crystallography (MX2) "University of Otago Structural Biology Group"	Merit Access 3 shifts 7-8 April	Incl in MX1 travel above
<b>Prof Emily Parker</b> Prof Geoff Jameson Prof Vic Arcus Dr Andrew Sutherland- Smith Emma Andrews Claire Mulholland	VUW Massey Waikato Massey	2018-1	Micro Crystallography (MX2) "Protein Structure and Function: Waikato, Canterbury and Massey Universities"	Merit Access 3 shifts 11-12 April	Incl in MX1 travel above

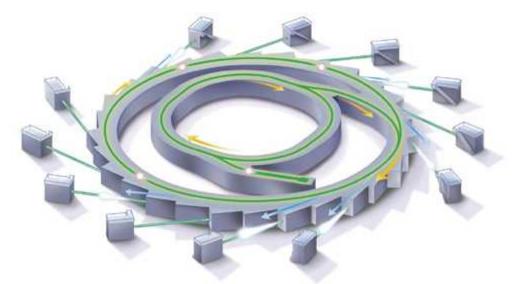
Researchers	Institution	Cycle	Beamline	Access	Travel Funding
A/Prof Renwick Dobson Dr Peter Mace Dr Timothy Ryan Dr Grant Pearce Dr James Murphy Christopher Horne James Davies Yanxiang Meng	Canterbury Otago Aust Synch Canterbury WEHI Canterbury Canterbury Canterbury	2018-1	Small/Wide Angle X-ray Scattering (SAXS) "Ad hoc NZ/Aus SAXS CAP"	Merit Access 5 shifts 12-13 April	\$2,605
Prof Geoff Jameson Prof Vic Arcus Prof Emily Parker Dr Gillian Norris Yu Bai Dr Elena Harjes Fareeda Barzak Erica Prentice	Massey Waikato VUW Massey Canterbury Massey Massey Waikato	2018-1	Small/Wide Angle X-ray Scattering (SAXS) "Conformational Change and Complex Formation"	Merit Access 6 shifts 14-16 April	\$0
<b>Dr Johan Verbeek</b> Dr Jim Bier Dr Mark Lay Matthew Smith Chanelle Gavin	Waikato Aduro Polymers Waikato Waikato Waikato	2018-1	Infrared Microscope (IRM) "Fracture mechanisms and phase morphology in thermoplastic protein/ionomer blends"	Merit Access 9 shifts 19-22 April	\$2,007
<b>Dr Cameron Weber</b> Dr Tamar Greaves Emma Matthewman Seongmin Paul Jun	AUT RMIT AUT Auckland	2018-1	Small/Wide Angle X-ray Scattering (SAXS) "Solvent- Solute Interactions on the Structure of Amphiphilic Aprotic Ionic Liquids"	Merit Access 3 shifts 26-27 April	\$2,097
<b>Prof Richard</b> <b>Haverkamp</b> Dr Katie Sizeland Dr Hannah Wells Joe McCartney	Massey Austr Synch Massey Massey	2018-2	Small/Wide Angle X-ray Scattering (SAXS) "Collagen Elasticity"	Merit Access 3 shifts 6-7 June	\$2,166
Prof Emily Parker Prof Geoff Jameson Prof Vic Arcus Dr Andrew Sutherland- Smith	VUW Massey Waikato Massey	2018-2	Macromolecular Crystallography (MX1) "Protein Structure and Function: Waikato, Canterbury and Massey Universities"	Merit Access 3 shifts 12-13 June	\$4,047 (Incl claim for MX2 time)
<b>Dr Pauline Calloch</b> Dr Bridget Ingham Dr Nigel Ross	Callaghan Callaghan Callaghan	2018-2	Powder Diffraction (PD) "Production of Light Metal Alloy Powders by Reduction of Metal Oxides"	Merit Access 3 shifts 13-14 June	\$2,215
Prof Emily Parker Prof Geoff Jameson Yifei Fan Yu Bai A/Prof Vyacheslav Filichev Fareeda Barzak Dr Elena Harjes Ruby Jean Roach Dr Scott Cameron Erica Prentice	VUW Massey Canterbury VUW Massey Massey Massey Massey VUW Waikato	2018-2	Small/Wide Angle X-ray Scattering (SAXS) "Complex formation and conformational change"	Merit Access 3 shifts 20-21 June	\$1,861

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
Dr Chris Squire 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 Michael Barnett Yuliana Yosaatmadja	Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland Auckland	2018-2	Macromolecular Crystallography (MX1) "Auckland Structural Biology CAP"	Merit Access 6 shifts 19-20 June 21-22 August	\$3,692 (Incl MX2 travel)
Prof Roger Reeves A/Prof Martin Allen Dr Rodrigo Gazoni Prof Alison Downard Jonty Scott Liam Carroll Caixia Hou	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2018-2	Soft X-ray Spectroscopy (SXR) "Modification of the surface chemistry of metal-oxide semiconductors by optical radiation"	Merit Access 15 shifts 26 June-1 July	\$2,078
<b>Dr Shane Telfer</b> David Perl	Massey Massey	2017-3 to 2018-2	Macromolecular Crystallography (MX1) "Multicomponent Metal- Organic Frameworks and Frameworks with Partial Degrees of Interpenetration" Project in Monash University led CAP "Chemical Crystallography for Functional Molecules, Complexes and Materials"	Merit Access 2 shifts Various dates	N/A
<b>Dr Shane Telfer</b> David Perl	Massey Massey	2017-3 to 2018-2	Micro Crystallography (MX2) "Multicomponent Metal- Organic Frameworks and Frameworks with Partial Degrees of Interpenetration" Project in Monash University led CAP "Chemical Crystallography for Functional Molecules, Complexes and Materials"	Merit Access 2 shifts Various dates	N/A
<b>Prof Paul Kruger</b> David Young Rob Staniland Dr Chris Fitchett Shane Verma	Canterbury	2017-3 to 2018-2	Macromolecular Crystallography (MX1) "Spin- Crossover Materials, Spin Clusters and Metal Organic Frameworks". Project in Monash University led CAP "Chemical Crystallography for Functional Molecules, Complexes and Materials"	Merit Access 2 shifts Various dates	N/A

Researchers	Institution	Cycle	Beamline	Access	Travel Funding
Dr Renwick Dobson Michael Love Dr Jennifer Crowther Jenna Gilkes James Davies Michael Currie Anthony Weatherhead Dr Rachel North Anna Smith Christopher Horne David Coombes Amanda Board	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2017-3 to 2018-2	Macromolecular Crystallography (MX1) "Structural Biology Projects for the Dobson group (Uni Canterbury)" Project in University of Melbourne led CAP "Macromolecular complexes for FRED (Fibrils, Receptors, Enzymes, DNA)"	Merit Access 4 shifts Various dates	N/A
Dr Renwick Dobson Michael Love Dr Jennifer Crowther Jenna Gilkes James Davies Michael Currie Anthony Weatherhead Dr Rachel North Anna Smith Christopher Horne David Coombes Amanda Board	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2017-3 to 2018-2	Micro Crystallography (MX2) "Structural Biology Projects for the Dobson group (Uni Canterbury)" Project in University of Melbourne led CAP "Macromolecular complexes for FRED (Fibrils, Receptors, Enzymes, DNA)"	Merit Access 3 shifts Various dates	N/A
<b>Dr Grant Pearce</b> Dr Renwick Dobson	Canterbury Canterbury	2017-3 to 2018-2	Macromolecular Crystallography (MX1) "Evolution of Protein Structure and Function in the DHDPS/NAL-Superfamily of Proteins" Project in University of Melbourne led CAP "Macromolecular complexes for FRED (Fibrils, Receptors, Enzymes, DNA)"	Merit Access 1 shifts Various dates	N/A
<b>Dr Grant Pearce</b> Dr Renwick Dobson	Canterbury Canterbury	2017-3 to 2018-2	Micro Crystallography (MX2) "Evolution of Protein Structure and Function in the DHDPS/NAL-Superfamily of Proteins" Project in University of Melbourne led CAP "Macromolecular complexes for FRED (Fibrils, Receptors, Enzymes, DNA)"	Merit Access 1 shift Various dates	N/A

## **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.
- J 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-5µm crystals, providing a state-of-the-art high-throughput facility for researchers to study very small, weakly diffracting crystals of protein fragments and solution studies of protein fragments.

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

### X-ray Fluorescence Nanoprobe (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 2017 to 30 June 2018 were:

Dr Garth Carnaby, Chair Professor Geoffrey Jameson, Massey University Professor Michael McWilliams, CSIRO Professor James Metson, The University of Auckland Professor Ian Shaw, University of Canterbury

### **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	4	4	\$9,000
Professor Geoffrey Jameson	4	4	-
Professor Michael McWilliams	4	4	-
Professor James Metson	4	3	-
Professor Ian Shaw	4	3	-

## **Donations**

The company did not make any donations during the period from establishment up to 30 June 2018.

## **Interests Register**

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

The following significant entries relating to the directors were recorded in the Interests Register during the year.

Director	Organisation/Entity	Nature of Interest
Dr GA Carnaby		
Shares Held	GA Carnaby & Associates Ltd	Controlling majority Trustee and discretionary
Beneficiary of Trusts	Carnaby Trust	beneficiary
	National Provident Fund	Annuity/Defined benefit
Offices Held	Dodd-Walls Centre of Research Excellence	Chair
	BioResource Processing Alliance	Chair
	Wool Industry Research Ltd	Chair
Prof GB Jameson		
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
Prof MO McWilliams	5	
Offices Held	CSIRO	Employee
Prof JB Metson		
Shares Held	Vector Energy	Minority shareholder
Offices Held	University of Auckland	Deputy Vice-Chancellor
		Research
	Brain Research New Zealand	Board Member
	Maurice Wilkins Centre for Molecular Biodiscovery	Board Member
	Medical Technologies Centre of	Board Member
	Research Excellence	
	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

## New Zealand Synchrotron Group Limited Financial Statements

for the year ended 30 June 2018

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New Zealand Synchrotron Group Limited Directory as at 30 June 2018

Directors

G A Carnaby G B Jameson M O McWilliams J B Metson I C Shaw

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 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 2018.

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 31 October 2018.

For and on behalf of the Board

G. 9. Carnaby

G A Carnaby Chair

31 October 2018

momentians 

M O McWilliams Director

31 October 2018



#### INDEPENDENT AUDITOR'S REPORT

#### TO THE READERS OF NEW ZEALAND SYNCHROTRON GROUP LIMITED'S FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2018

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 2018, 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:
  - o present fairly, in all material respects:
    - its financial position as at 30 June 2018; 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 2 November 2018. 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.

#### Other matter

The financial statements of New Zealand Synchrotron Group Limited for the year ended 30 June 2017 was audited by another auditor who expressed an unmodified opinion on those statements on 20 October 2017.

#### 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 2017-2018.

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. A further description of the auditor's responsibilities for the audit of the financial statements is located on the External Reporting Board's website at: <a href="https://www.xrb.govt.nz/standards-for-assurance-practitioners/auditors-responsibilities/audit-report-8/">https://www.xrb.govt.nz/standards-for-assurance-practitioners/auditors-responsibilities/audit-report-8/</a>

#### Other information

The Board of Directors is 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

Grant Thornton New Zealand Audit Partnership

#### New Zealand Synchrotron Group Limited Statement of comprehensive revenue and expenses for the year ended 30 June 2018

		2018 (Unaudited)	2018	2017
		Budget	Actual	Actual
	Note	\$	\$	\$
<b>Revenue from non exchange transactions</b> Revenue for Australian Operations	3	8,198,065	8,358,925	1,754,362
<b>Revenue from exchange transactions</b> Revenue for NZ Operations	4	123,600	123,600	120,000
Other revenue	4	177,019	146,184	114,168
Total Revenue		8,498,684	8,628,709	1,988,530
Expenses				
Australian Synchrotron Group costs (Gain) / Loss on fair value of derivatives Other operating expenses	6	1,612,903 - 6,870,613	1,614,208 150,405 6,864,571	1,608,118 200,125 278,859
Operating expenditure		8,483,516	8,629,184	2,087,102
Total surplus/(deficit) for the year		15,168	(475)	(98,572)
Other comprehensive income		-	-	-
Total comprehensive revenue and expense		15,168	(475)	(98,572)

#### New Zealand Synchrotron Group Limited Statement of changes in net assets for the year ended 30 June 2018

Not	es Share capital \$	Accumulated losses \$	Total equity \$
Balance as at 30 June 2016	2,912,162	(2,326,518)	585,644
Net surplus Other comprehensive income Total comprehensive revenue and expenses	- 	(98,572) (98,572)	(98,572) (98,572)
Balance as at 30 June 2017	2,912,162	(2,425,090)	487,072
Net surplus Other comprehensive income Total comprehensive revenue and expenses	- - -	(475) (475)	(475) (475)
Balance as at 30 June 2018	2,912,162	(2,425,565)	486,597

#### New Zealand Synchrotron Group Limited Statement of financial position as at 30 June 2018

ASSETS	Note	2018 \$	2017 \$
Current assets			
Cash and cash equivalents	7	321,214	496,382
Trade and other receivables from exchange transactions	8	96,144	10,895
Prepayments	8	6,575	1,475
Derivative financial instruments	9	104,025	11,248
Total current assets		527,958	520,000
TOTAL ASSETS		527,958	520,000
LIABILITIES			
Current liabilities			
Trade and other payables	11	41,361	16,110
Derivative financial instruments		-	16,818
Total current liabilities		41,361	32,928
TOTAL LIABILITIES		41,361	32,928
Net assets		\$ 486,597	\$ 487,072
EQUITY			
Share capital	15	2,912,162	2,912,162
Accumulated losses		(2,425,565)	(2,425,090)
TOTAL EQUITY		\$ 486,597	\$ 487,072

For and on behalf of the Board

J. 9. Carnaby

G A Carnaby Chair

31 October 2018

momentians

M O McWilliams Director

31 October 2018

#### New Zealand Synchrotron Group Limited Statement of cash flows for the year ended 30 June 2018

	Notes	2018	2017
		\$	\$
Cash flows from operating activities			
Receipts			
Receipts from non exchange transactions		8,358,925	1,754,362
Receipts from exchange transactions		169,117	257,667
Interest	4	15,418	14,795
Net cash flows from operating activities		8,543,460	2,026,824
<u>Payments</u>			
Australian Synchrotron Group Costs		(1,614,208)	(1,619,334)
Less: Cash applied to Derivative Asset		(260,000)	-
Other expenses		(6,844,420)	(278,859)
Total cash applied		(8,718,628)	(1,898,193)
Net cashflows from operating activities	17	(175,168)	128,631
Cash flows from financing activities			
<u>Receipts</u>			
Contributions from shareholders			
Net cash flows from financing activities			
-			
Net (decrease)/increase in cash and cash equivalents		(175,168)	128,631
Cash and cash equivalents at 1 July	7	496,382	367,751
Cash and cash equivalents at 30 June	7	321,214	496,382

#### New Zealand Synchrotron Group Limited Notes to the financial statements for the year ended 30 June 2018

#### 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 31 October 2018.

#### 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.

#### (I) Sponsorship and donations expense

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

#### (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 2018

Note 3.	Revenue for Australian operations	2018 \$	2017 \$
	Revenue from non-exchange transactions		
	Ministry of Business Innovation and Employment	940,000	940,000
	MBIE - contribution to Australia Synchrotron beamlines	6,602,819	-
	Shareholders	816,106	814,362
		8,358,925	1,754,362

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

Note 4.	Revenue for New Zealand operations	2018 \$	2017 \$
	Revenue from exchange transactions		
	Grants from shareholders for operating costs of NZSG	123,600	120,000
	Other Revenue		
	Contribution from the Australian Synchrotron towards travel		
	costs	93,907	99,374
	Funding for paid access to the Synchrotron	36,859	-
	Interest	15,418	14,794
		146,184	114,168
		269,784	234,168

#### 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	2018	2017
auditor - Grant Thornton NZ.	\$	\$
Statutory audit services	7,130	7,750
(b) Foreign exchange (gains) / losses		
During the year the following exchange (gains) / losses were made on transactions between New Zealand and		
Australia.	2018	2017
	\$	\$
Foreign exchange (gains) / losses	(54,552)	55

#### (c) Support for Synchrotron Science

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

	2018 \$	2017 \$
Travel costs reimbursed to shareholders Payments for access to Australian	95,599	102,089
Synchrotron	33,347	36,433
Contribution to Australian Synchrotron for		
new beamlines	6,657,490	-
User Meetings Asia Oceania Forum for Synchrotron	12,523	7,659
Radiation Research Membership	2,839	4,423
	6,801,798	150,604

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

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

	2018 \$	2017 \$
Secretariat services from the Royal Society		
and Board costs	106,715	108,102
Preparation New Funders agreement	-	8,751
Insurance	2,950	2,950
Other	530	646
	110,195	120,450
Total other operating costs	6,864,571	278,859

#### Note 7. Cash and cash equivalents

	2018	2017
	\$	\$
Cash	100,371	361,494
Foreign currency - AUD	220,843	134,888
	321,214	496,382

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

#### Note 8. Other current assets

#### (a) Trade and other receivables

2018	2017
\$	Ş
Trade receivables 10,521	6,150
Other receivables 81,950	0
Goods and Services Tax receivable 3,673	4,745
Total trade and other receivables 96,144	10,895
(b) Prepayments	
2018	2017
\$	\$
Prepayments 6,575	1,475
Total Prepayments 6,575	1,475

#### New Zealand Synchrotron Group Limited Notes to the financial statements for the year ended 30 June 2018

#### Note 9. Derivative financial instruments

	2018	2017
	\$	\$
Western Union Forward cover	104,025	(5,570)
Derivative financial instruments	104,025	(5,570)

The following derivatives have been entered into with Western Union.

#### (a) Forward foreign exchange contracts

At 30 June 2017	Notional	Deal rate	Fair Value		
Forward exchange contract					
(Maturity: February 2018)	\$806,018	0.9305	(16,818)		
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) Forward foreign exchange options

At 30 June 2017	Notional	Strike Price	Fair Value		
Forward foreign exchange option					
(Maturity: February 2018)	\$852,273	0.88	\$2,068		
Forward foreign exchange option					
(Maturity: February 2019)	\$852,273	0.88	\$9,180		
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		

#### 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 11 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

	2018	2017
	\$	\$
Creditors	25,875	-
Accruals	15,486	16,110
Total trade and other payables	41,361	16,110

The amount owed to related parties was nil as at 30 June 2018. (2017: nil).

#### Note 12. Contingent liabilities

There were no significant contingent liabilities at 30 June 2018. (2017: 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 2018.

#### Directors

Transactions with board memebrs include payment of fees. During the year ended 30 June 2018, a total of \$9,000 was paid to the Chair (2017: \$9,000). As at 30 June 2018, there was no outstanding balances with board members (2017: \$0).

#### Shareholders

Transactions with shareholders during the year ended 30 June 2018 include grants, as per Note 4, amounting to \$123,600 (2017: \$120,000). Also, as per Note 10, under the agreement with ANSTO the 11 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. As at 30 June 2018, there was no outstanding balance with shareholders (2017: \$0).

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

There were no significant events occuring after balance date.

Note 15.	Share capital		
	Shareholding at cost	2018	2017
		\$	\$
	The University of Auckland	509,217	509,217
	The University of Waikato	190,357	190,357
	Massey University	428,317	428,317
	Victoria University of Wellington	237,966	237,966
	University of Canterbury	285,546	285,546
	Lincoln University	28,557	28,557
	University of Otago Holdings Ltd	285,546	285,546
	AgResearch Ltd	285,546	285,546
	Institute of Geological and Nuclear Sciences Ltd	190,357	190,357
	The New Zealand Institute for Plant and Food Research Ltd	190,357	190,357
	Callaghan Innovation	192,270	192,270
	Auckland University of Technology	88,126	88,126
		2,912,162	2,912,162
The sha	ares held at 30 June are:	2018	2017
		# 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
			462 404
	The New Zealand Institute for Plant and Food Research Ltd	163,104	163,104
	Callaghan Innovation	163,104 163,104	163,104 163,104

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 2018

#### Note 16. Financial instruments

Note 16.	Financial Instruments	Fair value	
Classificati	on of financial assets by category	through Profit	Loans and
Classificatio	on or mancial assets by category	or Loss	Receivables
	2018	\$	\$
	Cash and cash equivalents	-	321,214
	Trade & other receivables	_	96,144
	Prepayments	_	
	Derivative financial instrument	-	6,575
		104,025	
	Total	104,025	423,933
	2017		\$
	Cash and cash equivalents	-	496,382
	Trade & other receivables	-	10,895
	Prepayments	-	1,475
	Derivative financial instrument	11,248	
	Total	11,248	508,752
Classification	on of financial liabilities by category		
Measure	d at amortised cost		
		2018	2017
		\$	\$
	Trade & other payables	41,361	16,110
	Derivative financial instrument	-	16,818
	Total	41,361	32,928
Note 17.	Reconciliation of profit with cash flows from op	erating activities	
		2018	2017
		\$	\$
	Net (Deficit)/Surplus for the year	(475)	(98,572)
	Movement in working capital		
	Trade and other receivables Derivative financial instruments	(85,249)	38,294
		(109,595)	200,125
	Trade and other payables	25,251	(11,216)
	Prepayments	(5,100)	-
	Net Cash outflow from operating activities	(175,168)	128,631