

NEW ZEALAND
SYNCHROTRON GROUP



ANNUAL REPORT 2021

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CHAIRMAN'S REPORT

The past year, the fifteenth in which the New Zealand Synchrotron Group Ltd (NZSG) has provided support for New Zealand researchers using the Australian Synchrotron, has been the most unusual yet. The ongoing effects of the COVID-19 pandemic have restricted operations at the Australian Synchrotron and prevented travel to Melbourne to use the facility. The research sector in New Zealand has been presented with financial and operational challenges that have led to a decrease in research activity with a consequential reduction in the previous high demand for synchrotron beamtime.



Despite those issues, it was still possible to select and award beamtime to high quality research projects from the proposals submitted. More than 300 shifts of beamtime were delivered by the Australian Synchrotron to New Zealand researchers during the past year, almost all by remote access where samples were shipped to Melbourne and facility staff undertook the measurements. Some work has not been able to be undertaken that way, so a small backlog of work remains to be completed when international travel is again possible.

ANSTO and the staff at the Australian Synchrotron have given priority to ensuring that New Zealand has received as much beamtime as possible. In particular, they have been extremely helpful in rescheduling around lockdowns and making extra time available to undertake the experiments. ANSTO also agreed to a proposition from NZSG to alter the timetable for annual payments, a move which lowered the cash demand for institutions for 2020/21 and the following two years.

COVID has also affected the timetable for the construction of the new beamlines at the Australian Synchrotron. A year ago, only small delays were indicated, however, ongoing manufacturing delays with equipment suppliers, shipping and staff recruitment delays and lockdowns in Melbourne have meant that completion of the first three new beamlines is likely to be delayed by nine months and similar delays are expected on the remaining beamlines. New Zealand is a major contributor of funding for the new beamline programme and NZSG has committed to providing A\$12 million towards the programme, A\$9.6 million of which has already been paid.

Last year the securing of funding from MBIE to enable the establishment of a Capability Build Fund was announced. The Fund will seed new projects and travel to enable researchers to be ready for the new beamlines as each is commissioned. This is important as the new beamlines offer new measurement techniques and for some beamlines it is likely that researchers who are unfamiliar with synchrotron science techniques will be potential new users. After a small delay caused by COVID, the Fund was launched in February 2021 and the first eight projects with a value of \$183k have been funded. The travel grant component of the Fund in which researchers travel

to other synchrotrons to learn the new techniques has been postponed until international travel resumes.

The company had budgeted for a small operating loss of \$32,022 for the year, arising mainly from a decision to waive \$120k of income that would normally have been received from the funding institutions to support the company's operations. However, because many of the usual synchrotron science support activities were not able to be undertaken during the year, further expenditure savings were possible, and the company produced a final result of a \$29,467 surplus. The surplus will be used to boost the Capability Build Programme by supplementing the income received from MBIE and to strengthen future synchrotron science support activities such as student attendance at workshops and training schools. Shareholder equity rose from \$602,928 to \$632,395.

As indicated in previous reports, changes in the exchange rate are one of the largest challenges the company faces. This has been managed by taking a series of forward contracts to lock in and provide certainty around future cash flow. Last year, the company took three additional forward contracts that cover the annual payments to ANSTO until 2024 and consideration is now being given to taking similar steps for the remaining two years of the contract with ANSTO.

The board has been very well supported by the Royal Society Te Ap rangi 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 Catherine Day, Geoff Jameson and Jim Metson.



GA Carnaby
Chair

BUSINESS REVIEW

COVID-19 Impact

As mentioned in the Chairman's Report, the ongoing outbreaks of COVID infections and consequent lockdowns or work restrictions in both Melbourne and New Zealand have had a significant impact on the way in which ANSTO and NZSG have been able to deliver the expected amount of beamtime to New Zealand researchers. Because there was a backlog of work from earlier facility closures, ANSTO decided not to make the usual call for proposals for beamtime for the 2020/3 period, and instead scheduled the experiments that had been postponed. They did, however, offer NZSG the opportunity to have extra shifts in that end of year period, which the company took advantage of on behalf of the New Zealand research community by selecting additional proposals from the 2020/2 round that had missed out on earlier selection because of the strong competition for beamtime in that round.

ANSTO has given priority to rescheduling the postponed New Zealand beamtime and has provided extra support to maximise the amount of beamtime that could be undertaken by "remote access". At the start of the year, 80 shifts of beamtime from the preceding year were outstanding. All that work has since been completed, except for one experiment involving 9 shifts of beamtime.

In New Zealand the impact of the ongoing travel restrictions, the reduced number of overseas students and postdoctoral researchers and the reorganisation of workloads so that universities could continue teaching during lockdowns was a reduction in the number of proposals for beamtime being prepared and submitted. As a result, only 248 shifts of beamtime were awarded for the 2020/21 year, most of which was able to be completed with only 32 shifts not scheduled as at the end of the 2021/2 period. The annual entitlement from ANSTO is 267 shifts. It is expected that ANSTO will allow the shortfall to be carried forward to the coming year. Taking the backlog from the previous year into account, the Australian Synchrotron delivered 287 shifts to New Zealand researchers in the period from August 2020 to August 2021.

ANSTO also demonstrated its support by agreeing to a proposal from NZSG to modify the timetable for the annual payments over the remaining life of the Bright Funding Agreement to recognise the financial impact of COVID on institutions. Variations were made to both the Bright Funding Agreement and the Funders' Agreement which meant that institutions did not have to make any access payment for 2020/21 and will only be required to make them at the 50% level for the following two years. Increased payments will be made in the subsequent three years to reinstate the overall payment amounts. By then, the annual contribution to the new beamlines will have been completed, so the change agreed to more evenly balances the cash flow for institutions from the 2021/22 year until the end of the contract period.

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 third of which was made in 2020/21.

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

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 held Zoom meetings 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 2020 onwards and summarises any travel funding or sample shipping support provided.

Use of the Australian Synchrotron by New Zealand Researchers

Approximately 80% of the available beamline time on the ten beamlines is assigned to a “merit access” pool and competitive applications are sought from researchers worldwide, including from New Zealand. Every four months, the Australian Synchrotron makes calls for proposals. Applications are made directly to the Australian Synchrotron, but as explained above, NZSG oversees the ultimate selection of which New Zealand applicants receive beamtime. 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. During the past year when travel has not been possible, the funds have instead been used to reimburse the cost of shipping samples to Australia.

Under the access regime agreed with ANSTO in 2017, New Zealand researchers are entitled to receive 267 shifts of merit beamtime which is approximately 6.6% of the available beamtime. In recent years there has been significant demand for beamtime and the number of shifts requested has substantially exceeded the entitlement and in 2019/20 only 61% of the beamtime requested was able to be awarded. But, as mentioned above, the 2020/21 has been different. The 2020/3 round call for proposals by the Australian Synchrotron was cancelled and the number of shifts requested by New Zealand researchers for the 2021/1 and 2021/2 rounds was lower than usual, with the result that only 248 shifts of the available 267 were actually awarded. All applicants whose proposals met the quality standard received beamtime. The statistics for the past year are summarised in the table and graphs below.

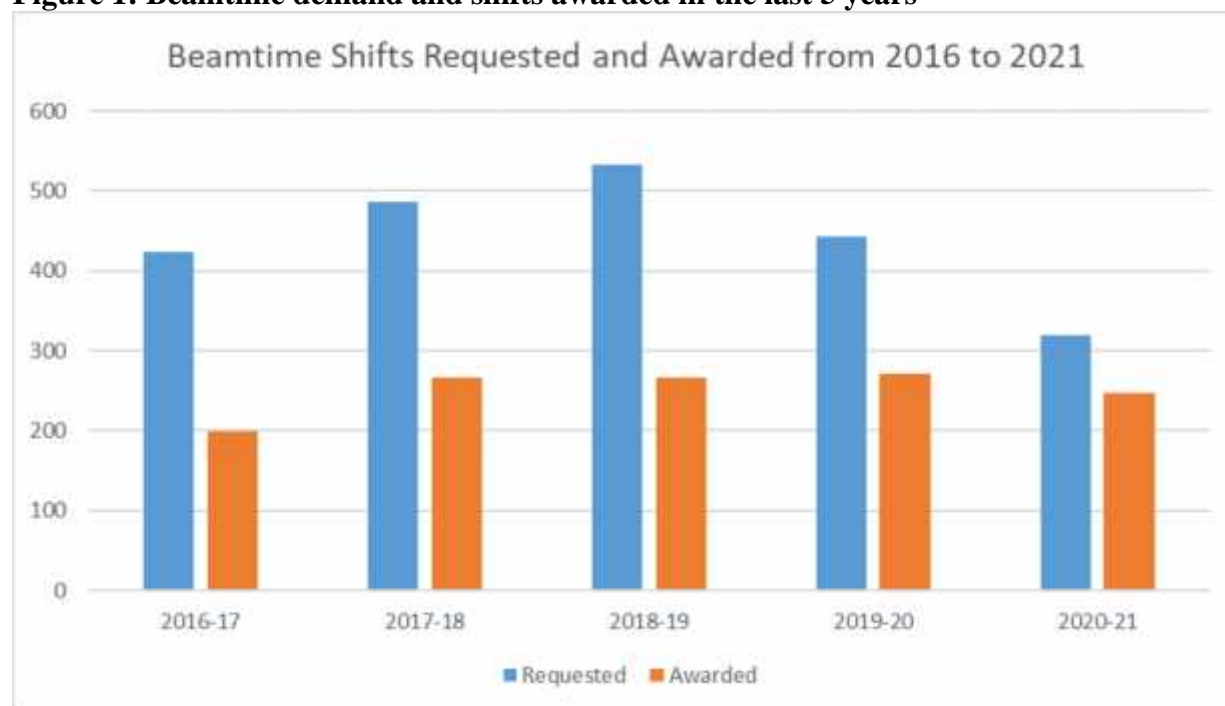
Table 1: Success Rate for NZ Beamtime Applications – 2020/21

Beamline*	No. Shifts Requested	No. Shifts Awarded†		No. Appl'ns. Received	No. Awarded Beamtime	
IMBL	30	30	100%	3	3	100%
IRM	42	42	100%	3	3	100%
PD	0	0	-	0	0	-
SAXS	35	35	100%	8	7	88%
SXR	42	45	107%	3	3	100%
THz	15	15	100%	2	2	100%
XAS	3	3	100%	1	1	100%
XFM	6	6	100%	1	1	100%
Subtotal	173	176	59%	22	21	95%
MX (CAPs)	146.4	71.5	49%	8	8	100%
Overall	319.4	247.5	77%	30	29	97%

† In two instances, more beamtime was awarded than was requested

* A description of the beamlines and the abbreviations used are given on pages 17-18

Figure 1: Beamtime demand and shifts awarded in the last 5 years



Science Achievements

New Zealand researchers are strong contributors to the scientific output of the Australian Synchrotron. In the past year 54 refereed papers arising from previous work at the Synchrotron were published (8% of the total output of papers from all sources), 28 of which were in high-impact journals (impact factor > 7). This is a considerable increase on the previous year when 40 papers were produced, 5 of which were in high impact journals.

One of the recent papers was *Molten NaCl-Assisted Synthesis of Porous Fe-N-C Electrocatalysts with a High Density of Catalytically Accessible FeN₄ Active Sites and Outstanding Oxygen Reduction Reaction Performance*. Qing Wang, Yuqi Yang, Fanfei Sun, Guangbo Chen, Jian Wang, Lishan Peng, Wan-Ting Chen, Lu Shang, Jiaqi Zhao, Dongxiao Sun-Waterhouse, Tierui Zhang, Geoffrey I. N. Waterhouse. *Advanced Energy Materials*, (2021), 11(19), 2100219.

Carbon supported metal single atom catalysts (SACs) with a MN₄ coordination (where M = Fe or Ni) show excellent performance for the four electron reduction of O₂ in alkaline media (i.e. O₂ + 2H₂O + 4e⁻ → 4OH⁻), a key reaction in alkaline fuel cells and Zn-air batteries. Recently the group discovered that metal SACs with the MN₂O₂ coordination were highly selective for hydrogen peroxide production via a two electron reduction pathway (O₂ + H₂O + 2e⁻ → H₂O₂ + 2OH⁻). They used the XPS and NEXAFS capability of the SXR beamline at the Australian Synchrotron to characterise a series of metal SACs with the novel MN₂O₂ coordination.

Owing to the high impact of this journal article containing data collected at the Australian Synchrotron, Qing has been awarded the New Zealand Institute of Chemistry JEOL Brian Halton Award (for an outstanding paper in the field of

chemistry published by a New Zealand University student) and nominated for the Royal Society of New Zealand Hatherton Award (best scientific paper by a student registered for the degree of PhD at any New Zealand University).

Publicity material produced by ANSTO highlighting the science undertaken at the Australian Synchrotron included the paper *Developing better biodegradable chemicals to reduce heavy metals in farmed shellfish*. Daniel R McDougal, Shinji Kihara, Juliane Reinhardt, Gordon M Miskelly, Duncan J McGillivray, Andrew G Jeffs. *Aquatic Toxicology*, (2020) Nov;228:105645.

The New Zealand green-lipped mussel (*Perna canaliculus*) aquaculture industry has enormous potential, however the presence of heavy metal ions in the environment of *P. canaliculus* is known to cause multiple problems for their growth and development. Research using synchrotron X-ray Fluorescence Microscopy was used to assess the effect of biodegradable chelating agents on the distribution of heavy metals within *P. canaliculus* larvae.

A full list of the researchers who received merit beamtime over the past year is presented on pages 9-16. These projects cover a very broad range of science topics, and many have involved training of young researchers.

Capability Build Funding and Other Support for Synchrotron Scientists

In 2022 the first of the new beamlines at the Australian Synchrotron will be commissioned and become available for user access. New Zealand has preferred access rights to all 8 new beamlines and it will be important to take up the full entitlement. Recognising that some of the new beamlines offer new techniques and that there will opportunities for researchers who are not currently familiar with the Synchrotron, NZSG has created a Capability Build Fund to provide seed funding for projects that will generate samples for researchers to use on the new beamlines and also to provide travel funding, either for travel during the commissioning period or for researchers to use similar beamlines at other synchrotrons. The purpose of the Fund is to introduce and upskill New Zealand researchers in the techniques which will become available on the new beamlines and extend the range and quality of science New Zealand is able to undertake. NZSG has secured \$300,000 funding from MBIE through an extension to the existing SIFF contract and will contribute \$100,000 from reserve funds. After a delay caused by COVID-19, the Fund was launched in February 2021 for project seed funding only. The 8 proposals selected, together with the funding awarded, are listed in Table 2.

Table 2: Recipients of Capability Build Fund project funding

Applicants	Institution	Beamline	Project Title/Topic	Funding
Matthew Fellner	Otago	BioSAXS	Characterisation of newly discovered biofilm-related virulence factors of <i>Staphylococcus aureus</i>	\$30k
Joanna Hicks	Waikato	BioSAXS	Structural rearrangement and interaction of the transcriptional regulator CysB with DNA	\$18k
Jodie Johnston	Canterbury	BioSAXS	Understanding the interplay of complex formation, substrate	\$15k

Applicants	Institution	Beamline	Project Title/Topic	Funding
			binding and allostery	
William Kelton	Waikato	BioSAXS	Structural characterisation of unique natural antibody variants	\$25k
Vanessa Morris Claudia Meissrimler Christoph Goebel	Canterbury	BioSAXS	1. Host-pathogen interactions 2. Ligan interactions of immune receptor TREM2 3. Insights into p16 amyloid formation	\$15k
Daniel Holland	Canterbury	MCT	Understanding maple sap exudation using micro computed tomography	\$30k
Ian Schipper Ben Kennedy	VUW Canterbury	MCT	Micro computed tomography image processing capability	\$25k
Vladimir Golovko	Canterbury (with some funding to Auckland)	MEX1&2	Studies of novel catalysts for H ₂ production and utilisation and NZ rock samples from potential H ₂ storage reservoirs	\$25k
TOTAL				\$183k

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 as a virtual meeting in November 2020. The last AOFSSR School was held at the National Synchrotron Radiation Research Center in Tawian in November 2019. Due to COVID-19, the School was not held in 2020 and the 2021 School has also been postponed.



D K W Smith
Executive Officer
Secretariat

New Zealand Research Groups Awarded Beamtime (July 2019 – June 2020)

The following New Zealand research groups were awarded or received merit time at the Australian Synchrotron between July 2020 and June 2021 and value of any travel or sample shipping funding provided.

Researchers	Institution	Cycle	Beamline	Access	Funding
Assoc Prof Chris Squire Dr Shaun Lott Dr Ivanhoe Leung Dr Ghader Bashiri Dr David Goldstone	Auckland Auckland Auckland Auckland Auckland	2020-1	Macromolecular Crystallography (MX1) “2019/3 CAP Program”	Merit Access 3 shifts COVID Affected Rescheduled to 16-17 July	\$3,170
Dr Courtney Ennis Dr Nicholas White	Otago ANU	2020-2	THz/Far Infrared (THz) “Surveying the low frequency vibrational modes of hydrogen-bonded frameworks.”	Merit Access 6 shifts 23-27 July	\$0
Assoc Prof Ren Dobson Chris Horne Amanda Board Dr Grant Pearce Michael Currie Dr Vanessa Morris	Canterbury Canterbury Canterbury Canterbury Canterbury	2020-1	Small/Wide Angle X-ray Scattering (SAXS) “University of Canterbury SAXS Proposal 2020/1”	Merit Access 2 shifts COVID Affected Rescheduled to 29-30 July	\$1,460
Prof Emily Parker Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland-Smith Assoc Prof Wayne Patrick	VUW Massey AgResearch Waikato Massey VUW	2020-2	Macromolecular Crystallography (MX1) “Protein Structure and Function: AgResearch NZ and Waikato, Victoria and Massey Universities”	Merit Access 3 shifts 30 Sep-1 Oct	\$12,152
Dr Adam Middleton Prof Kurt Krause Dr Yoshio Nakatani Prof Catherine Day Assoc Prof Sigurd Wilbanks Dr Peter Mace Assoc Prof Brian Monk Dr Matthias Fellner Assoc Prof Brian Monk	Otago Otago Otago Otago Otago Otago Otago Otago Otago	2020-2	Micro Crystallography (MX2) “University of Otago Structural Biology Group”	Merit Access 3 shifts 2-3 October	\$14,730
Assoc Prof Aaron Marshall Prof Sally Brooker Assoc Prof Vladimir Golovko Johan Hamonnet	Canterbury Otago Canterbury Canterbury	2020-2 Suppl.	X-ray Absorption Spectroscopy (XAS) “XAS analysis of molecular catalysts adsorbed to carbon black supports”	Merit Access 3 shifts 3-5 October with 3 addl. ANSTO shifts	\$0

Researchers	Institution	Cycle	Beamline	Access	Funding
Assoc Prof Chris Squire Dr Shaun Lott Dr Ivanhoe Leung Dr Ghader Bashiri Dr David Goldstone	Auckland Auckland Auckland Auckland Auckland	2020-2	Macromolecular Crystallography (MX1) “2019/3 CAP Program”	Merit Access 6 shifts 3-4 October 7-8 November	\$11,844
Prof Emily Parker Prof Geoff Jameson Dr Joanna Hicks Prof Vic Arcus Dr Emma Summers Dr Yifei Fan Dr Yu Bai Dr Stefan Harjes Dr Gerd Mittelstaedt Dr Elena Harjes Ruby Roach Tracy Hale	VUW Massey Waikato Waikato Waikato VUW VUW Massey VUW Massey Massey Massey	2020-2	Small/Wide Angle X-ray Scattering (SAXS) “Protein Complex and Conformational Change”	Merit Access 6 shifts 3 shifts delivered 6-7 October COVID Affected	\$2,400
Prof Ren Dobson Dr Grant Pearce Michael Currie Dr Vanessa Morris Dr Christoph Goebel Amanda Board David Wood	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2020-2	Small/Wide Angle X-ray Scattering (SAXS) “University of Canterbury SAXS Proposal 2020/2”	Merit Access 3 shifts 7-8 October With 3 addl. ANSTO shifts COVID Affected	\$2,465
Prof Geoff Jameson Prof Vic Arcus Dr Gerd Mittelstaedt Dr Yu Bai Prof Emily Parker Dr Joanna Hicks Dr Emma Summers Dr Yifei Fan Ruby Roach Dr Tracey Hale Dr Elena Harjes Dr Stefan Harjes Assoc Prof Vyacheslav Filichev	Massey Waikato VUW VUW VUW Waikato Waikato VUW Massey Massey Massey Massey Massey	2020-1	Small/Wide Angle X-ray Scattering (SAXS) “Protein Complex and Conformational Change”	Merit Access 3 shifts COVID Affected Rescheduled to 8-9 October	\$1,196
Assoc Prof Geoff Waterhouse Wan-Ting Chen	Auckland Auckland	2020-2 Suppl.	Soft X-ray Spectroscopy (SXR) “NEXAFS and XPS characterization of metal single atom catalysts (SACs) for selective electrocatalytic O ₂ reduction to hydrogen peroxide”	Merit Access 18 shifts 13-19 October	\$1,714
Dr Wan-Ting Chen Assoc Prof Geoff Waterhouse Qing Wang	Auckland Auckland Auckland	2020-1	X-ray Absorption Spectroscopy (XAS) “XAS characterization of porphyrin-like single Fe and Mn atom sites in MOF-derived N-doped porous carbons: Towards oxygen reduction reaction (ORR)”	Merit Access 6 shifts COVID Affected Rescheduled to 14-17 October with 3 addl. ANSTO shifts	\$0

Researchers	Institution	Cycle	Beamline	Access	Funding
Assoc Prof Chris Squire Dr Shaun Lott Dr Ivanhoe Leung Dr Ghader Bashiri Dr David Goldstone	Auckland Auckland Auckland Auckland Auckland	2020-2	Micro Crystallography (MX2) “2019/3 CAP Program”	Merit Access 6 shifts 17-18 Oct 28-29 Nov	Incl in MX1 funding above
Dr Mark Waterland Dr Saeedah Afsar Dr Brad Mansel	Massey Plant & Food National Tsing Hua Uni. Taiwan	2020-2	Infrared Microscope (IRM) “Investigating the mode of action of insect fumigants through infrared mapping of insect organ tissue”	Merit Access 9 shifts 21-25 October with 3 addl. ANSTO shifts	\$201
Prof Shane Cronin Asst. Prof Ingrid Ukstins Dr Marco Brenna	Auckland Uni Iowa Otago	2020-2 Suppl.	Infrared Microscope (IRM) “Statistical analysis of OH diffusion profiles in olivine crystals from Pupuke Maar, Auckland Volcanic Field, to quantify magma ascent rates”	Merit Access 12 shifts 27 Oct-1 Nov with 3 addl. ANSTO shifts	\$0
Dr Adam Hartland Sebastian Hoepker	Waikato Waikato	2020-2	X-ray Fluorescence Microscopy (XFM) “Novel insights into South Pacific hydroclimate and seasonality from stalagmite trace Elements”	Merit Access 6 shifts 27-29 October	\$61
Dr Adam Middleton Prof Kurt Krause Dr Yoshio Nakatani Prof Catherine Day Assoc Prof Sigurd Wilbanks Dr Peter Mace Assoc Prof Brian Monk Dr Matthias Fellner Assoc Prof Brian Monk	Otago Otago Otago Otago Otago Otago Otago Otago Otago	2020-2	Macromolecular Crystallography (MX1) “University of Otago Structural Biology Group”	Merit Access 3 shifts 29-30 October	Inc in MX2 funding above
Prof Emily Parker Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland- Smith Assoc Prof Wayne Patrick	VUW Massey AgResearch Waikato Massey VUW	2020-2	Micro Crystallography (MX2) “Protein Structure and Function: AgResearch NZ and Waikato, Victoria and Massey Universities”	Merit Access 3 shifts 15-16 Nov	Incl in MX1 funding above
Prof Emily Parker Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland- Smith Assoc Prof Wayne Patrick Dr David Comoletti	VUW Massey AgResearch Waikato Massey VUW VUW	2021-1	Micro Crystallography (MX2) “Protein Structure and Function: AgResearch NZ, Ferrier Institute and Waikato, Victoria and Massey Universities”	Merit Access 5 shifts 12-13 February and 10-11 March	\$10,285

Researchers	Institution	Cycle	Beamline	Access	Funding
Dr Adam Middleton Prof Kurt Krause Dr Peter Mace Prof Catherine Day Assoc Prof Sigurd Wilbanks Assoc Prof Brian Monk Dr Matthias Fellner Bahram Pooreydy	Otago Otago Otago Otago Otago Otago Otago Otago	2021-1	Micro Crystallography (MX2) “University of Otago Structural Biology Group”	Merit Access 5 shifts 13-14 February and 27-28 April	\$9,801
Dr Lauren Macreadie Prof Bronwyn Fox Dr Helen Brand PI now at Sydney	Massey Swinburne Aust Synch	2020-1	Powder Diffraction (PD) “High Pressure Endurance and Flexibility of Multicomponent Metal Organic Frameworks”	Merit Access 6 shifts COVID Affected Rescheduled to 16-18 February	\$0
Assoc Prof Chris Squire Dr Ghader Bashiri Dr Richard Kingston Assoc Prof Shaun Lott Dr David Goldstone Dr Ivanhoe Leung	Auckland Auckland Auckland Auckland Auckland	2021-1	Macromolecular Crystallography (MX1) “2021 CAP Program”	Merit Access 6 shifts 23-24 February and 23-24 April	\$7,034
Dr Grant Pearce Assoc Prof Ren Dobson Dr Jodie Johnston Dr Ali Nazmi David Wood Michael Currie	Canterbury Canterbury Canterbury Canterbury Canterbury	2021-1	Small/Wide Angle X-ray Scattering (SAXS) “University of Canterbury SAXS Proposal 2021/1”	Merit Access 3 shifts 10-11 March	\$1,573
Prof Geoff Jameson Prof Vic Arcus Dr Yifei Fan Dr Yu Bai Prof Emily Parker Dr Joanna Hicks Dr Emma Summers Dr Andrew Sutherland-Smith Ruby Roach Tracy Hale Dr Gerd Mittelstaedt Dr Elena Harjes	Massey Waikato VUW VUW VUW Waikato Waikato Massey Massey Massey VUW Massey	2021-1	Small/Wide Angle X-ray Scattering (SAXS) “Protein Complexes and Conformational Change”	Merit Access 6 shifts 12-14 March	\$1,220
Dr Courtney Ennis Dr Aaron Tay Assoc Prof Carla Meledandri	Otago Otago Otago	2021-1	THz/Far Infrared (THz) “Far-infrared spectroscopy for characterising metal- carboxylate coordination in MOF-type porous materials”	Merit Access 9 shifts 16-19 March	\$0
Assoc Prof Chris Squire Dr Ghader Bashiri Dr Richard Kingston Assoc Prof Shaun Lott Dr David Goldstone Dr Ivanhoe Leung	Auckland Auckland Auckland Auckland Auckland	2021-1	Micro Crystallography (MX2) “2021 CAP Program”	Merit Access 3 shifts 17-18 March	Incl in MX1 above

Researchers	Institution	Cycle	Beamline	Access	Funding
Dr Adam Middleton Prof Kurt Krause Dr Peter Mace Prof Catherine Day Assoc Prof Sigurd Wilbanks Assoc Prof Brian Monk Dr Matthias Fellner Bahram Pooreydy	Otago Otago Otago Otago Otago Otago Otago Otago Otago	2021-1	Macromolecular Crystallography (MX1) “University of Otago Structural Biology Group”	Merit Access 3 shifts 19-20 March	Incl in MX2 above
Assoc Prof Aaron Marshall Assoc Prof Vladimir Golovko Shailendra Kumar Sharma Gregory Metha Johan Hamonnet	Canterbury Canterbury Canterbury U. Adelaide Canterbury	2020-2	X-ray Absorption Spectroscopy (XAS) “Structure of atomically precise gold clusters under electrochemical condition”	Merit Access 12 shifts COVID Affected Rescheduled to 24-28 March	\$0
Prof Emily Parker Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland-Smith Assoc Prof Wayne Patrick Dr David Comoletti	VUW Massey AgResearch Waikato Massey VUW VUW	2021-1	Macromolecular Crystallography (MX1) “Protein Structure and Function: AgResearch NZ, Ferrier Institute and Waikato, Victoria and Massey Universities”	Merit Access 3 shifts 7-8 April	Incl in MX2 above
Assoc Prof Jonathan Procter Prof Shane Cronin Dr Stuart Mead Dr Anke Zernack Shannen Mills	Massey Auckland Massey Massey Massey	2021-1	Imaging and Medical (IM) “Exploring the textural characteristics of tephra clasts from Mt. Taranaki and Mt. Ruapehu”	Merit Access 6 shifts 13-15 April	\$0
Dr Konstantin Pavlov Dr Andrew Stevenson Darren Thompson Dr Sheridan Mayo Dr Thomas Li Dr Anton Maksimenko Prof Anthony Butler Dr Chris Hall Dr Timur Gureyev Yakov Nesterets Prof David Paganin Dr Marcus Kitchen Dr Daniel Hausermann Prof Phil Butler Dr Marzieh Anjomrouz	Canterbury Aust Synch CSIRO CSIRO Canterbury Aust Synch Otago Austr Synch Melb. Uni CSIRO Monash Monash Aust Synch MARS Bioimaging	2021-1	Imaging and Medical (IM) “Detector tests for propagation-based and speckle-based phase-contrast CT imaging”	Merit Access 12 shifts 15-19 April	\$157

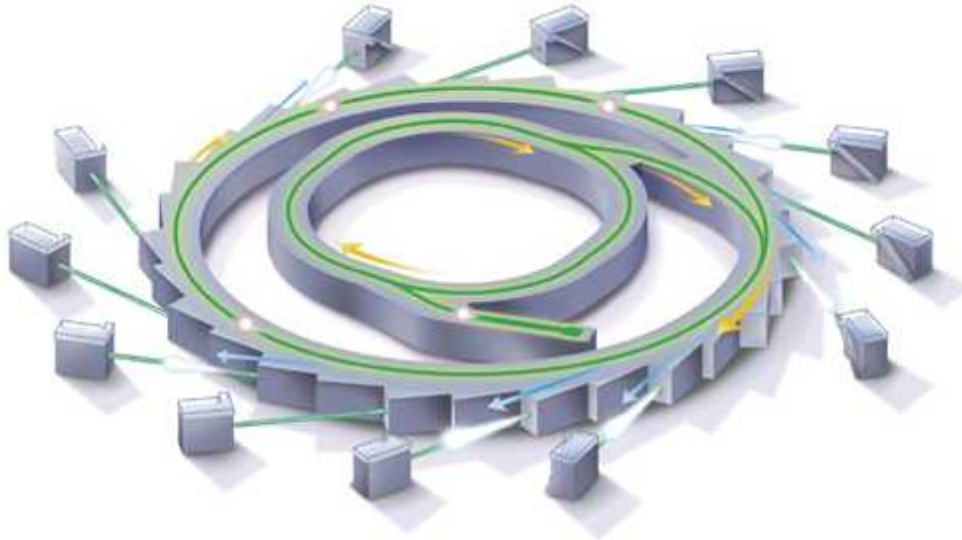
Researchers	Institution	Cycle	Beamline	Access	Funding
Prof Geoff Jameson Prof Vic Arcus Dr Yifei Fan Dr Yu Bai Prof Emily Parker Dr Joanna Hicks Dr Emma Summers Dr Andrew Sutherland-Smith Ruby Roach Tracy Hale Dr Gerd Mittelstaedt Dr Elena Harjes	Massey Waikato VUW VUW VUW Waikato Waikato Massey Massey Massey VUW Massey	2021-2	Small/Wide Angle X-ray Scattering (SAXS) “Protein Complexes and Conformational Change” COVID Affected Rescheduled to 26 June	Merit Access 6 shifts 5-6 June 8-9 June	\$1,472
Dr Adam Middleton Prof Kurt Krause Dr Peter Mace Prof Catherine Day Assoc Prof Sigurd Wilbanks Assoc Prof Brian Monk Dr Matthias Fellner Bahram Pooreydye Dr Ashley Campbell Dr Prasanth Padala	Otago Otago Otago Otago Otago Otago Otago Otago Otago Otago	2021-2	Micro Crystallography (MX2) “University of Otago Structural Biology Group”	Merit Access 5 shifts 15-16 June and 13-14 August	\$6,797
A/Prof Renwick Dobson Dr Grant Pearce Dr Jodie Johnston David Wood Michael Currie Ali Nazmi	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2021-2	Small/Wide Angle X-ray Scattering (SAXS) “University of Canterbury SAXS Proposal 2021/2”	Merit Access 6 shifts 16-18 June	\$2,624
Prof Emily Parker Prof Geoff Jameson Dr Ron Ronimus Prof Vic Arcus Dr Andrew Sutherland-Smith Assoc Prof Wayne Patrick Dr David Comoletti	VUW Massey AgResearch Waikato Massey VUW VUW	2021-2	Micro Crystallography (MX2) “Protein Structure and Function: AgResearch NZ, Ferrier Institute and Waikato, Victoria and Massey Universities”	Merit Access 5 shifts 22-23 June and 5-6 August	Claim not received yet
A/Prof Geoff Waterhouse	Auckland	2021-2	Soft X-ray Spectroscopy (SXR) “Mesoporous N-doped carbons supporting highly exposed metal single atom sites for efficient ORR/OER catalysis”	Merit Access 15 shifts 29 Jun-4 Jul	Claim not received yet
Assoc Prof Chris Squire Dr Ghader Bashiri Dr Richard Kingston Assoc Prof Shaun Lott Dr David Goldstone Dr Ivanhoe Leung	Auckland Auckland Auckland Auckland Auckland	2021-2	Macromolecular Crystallography (MX1) “2021 CAP Program”	Merit Access 6 shifts 30 Jun-1 Jul and 7-8 Aug	\$6,522

Researchers	Institution	Cycle	Beamline	Access	Funding
Dr Greg Giles Adirah Coulter-Jeffrey	Otago Otago	2020-2	Infrared Microscope (IRM) “Manganese Porphyrin Drugs as Protective Agents Against Radiation Damage”	Merit Access 9 shifts COVID Affected Delayed until later in the year	
Dr David Everett Prof Ben Boyd Patrick Tai Dr Andrew Clulow	AgResearch Monash Massey Monash	2020-2	Small/Wide Angle X-ray Scattering (SAXS) “Liquid-ordered phases in milk fat globule membrane and its role in digestion”	Merit Access 9 shifts COVID Affected Delayed until later in the year	
Prof Richard Haverkamp Dr Peter Kappen Dr Katie Sizeland Dr Celia Kueh Prof Chris Cunningham	Massey Austr Synch ANSTO Massey Massey	2020-2	X-ray Absorption Spectroscopy (XAS) “Rhodium supported on carbon for the electrochemical reduction of nitrogen”	Merit Access 9 shifts COVID Affected Delayed until later in the year	
Assoc Prof Daniel Holland Tenaya Driller Assoc Prof Matthew Watson Dr Abby van den Berg Assoc Prof Michael Clearwater	Canterbury Canterbury Canterbury U. Vermont Waikato	2020-2 Suppl.	Imaging and Medical (IM) “Visualizing the microscopic changes in water status within a tree stem in response to induced freeze-thaw cycles: An in-situ experiment on maple saplings.”	Merit Access 12 shifts COVID Affected Delayed until later in the year	
Prof Richard Haverkamp Dr Celia Kueh Dr Katie Sizeland	Massey Massey ANSTO	2020-2 Suppl.	Small/Wide Angle X-ray Scattering (SAXS) “Mechanoselective enzymatic degradation of collagen”	Merit Access 5 shifts COVID Affected Delayed until later in the year	
Dr Courtney Ennis Dr Lauren Macreadie	Otago Sydney	2021-2	THz/Far-infrared (THz) “Surveying Negative Thermal Expansion in Metal-Organic Frameworks at Low Frequency”	Merit Access 9 shifts COVID Affected Delayed until later in the year	
Dr Ben Mallett Dr Andrew Chan	Auckland Auckland	2021-1	Small/Wide Angle X-ray Scattering (SAXS) “The role of granularity in ‘superconductor sandwiches’: a low-temperature resonant GIWAXS study”	Merit Access 6 shifts COVID Affected Delayed until later in the year	
New Zealand Researchers with Projects in Australian Based Collaboration Access Programs					
Prof Paul Kruger Lily Hermansplan Nathan Harvey-Reid Chris Fitchett Ben Howard	Canterbury Canterbury Canterbury Canterbury Canterbury	2021 Full Year	Macromolecular Crystallography (MX1) and Micro Crystallography (MX2) “Spin-Crossover Materials and Metal Organic Frameworks”	Merit Access MX1 1.5 shifts MX2 1.5 shifts Various dates	
Dr Tim Allison James Titterington	Canterbury Canterbury	2021 Full Year	Macromolecular Crystallography (MX1) and Micro Crystallography (MX2) “Exposing the intricate interactions of membrane-bound bacterial machinery”	Merit Access MX1 2 shifts MX2 2 shifts Various dates	

Researchers	Institution	Cycle	Beamline	Access	Funding
Dr Jodie Johnson Dr Tasmyn Stanborough Dr Ngoc Anh Thu Ho	Canterbury Canterbury Canterbury	2021 Full Year	Macromolecular Crystallography (MX1) and Micro Crystallography (MX2) “Understanding, Engineering and Inhibiting Enzymes Involved in Menaquinone Biosynthesis in Human Pathogens”	Merit Access MX1 2 shifts MX2 2 shifts Various dates	
Assoc Prof Ren Dobson Dr Joshua Wright Dr Jenna Gilkes Sarah Manners Michael Currie Michael Love David Wood David Coombes Amanda Board Michael Newton-Vesty	Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury Canterbury	2021 Full Year	Macromolecular Crystallography (MX1) and Micro Crystallography (MX2) “Protein-DNA interactions; Enzymes for drug discovery; Enzyme evolution; Alternative food proteins; Integral membrane proteins”	Merit Access MX1 2 shifts MX2 7 shifts Various dates	
Dr Ali Reza Nazmi Dr Ngoc Anh Thu Ho	Canterbury Canterbury	2021 Full Year	Macromolecular Crystallography (MX1) and Micro Crystallography (MX2) “Enzymatic synthesis of novel high-value sustainable polymers”	Merit Access MX1 2 shifts MX2 2 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\$93 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, three more in July 2018 and the final two in July 2019. New Zealand is contributing 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.

Prior to COVID, all the new beamlines were on track to be completed on time, however, the closure of the Australian Synchrotron in early 2020 and sites in Europe where the hutches that will contain the instrumentation for the MEX and MCT beamlines and restrictions placed on engineers from the manufacturer coming to Australia to install them has meant that the first three beamlines are likely to be up to 9 months late in being completed with similar delays expected on the remaining beamlines.

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 (MX3) Year 3 (design commenced 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 μ 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 commenced 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 4 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 2020 to 30 June 2021 were:

Dr Garth Carnaby, Chair
Professor Catherine Day, University of Otago
Professor Geoffrey Jameson, Massey University
Professor Michael McWilliams, formerly CSIRO (retired on 30 November 2020)
Professor James Metson, The University of Auckland

The vacancy created by Professor McWilliam's retirement is expected to be filled at the 2021 AGM.

Indemnities and Insurance

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

Attendance at Board Meetings

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

Director	No. meetings held during the year	No. meetings attended	Fees paid
Dr Garth Carnaby	6	6	\$9,000
Professor Catherine Day	6	6	
Professor Geoffrey Jameson	6	6	-
Professor Michael McWilliams	2	1	-
Professor James Metson	6	6	-

Donations

The company did not make any donations during the period from establishment up to 30 June 2021.

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 Beneficiary of Trusts	GA Carnaby & Associates Ltd	Controlling majority	
	Carnaby Trust	Trustee and discretionary beneficiary	
	National Provident Fund	Annuity/Defined benefit	
	Offices Held		
	Dodd-Walls Centre of Research Excellence	Chair	
	BioResource Processing Alliance	Chair	
	Wool Industry Research Ltd	Chair	
Professor CL Day Offices Held	University of Otago	Employee	
	RSNZ Academy Executive Council	Member	
	Healthier Lives Leadership Team	Member	
	Maurice Wilkins CoRE	Member - AI	
	Shares Held		
	Fairholm Farming Ltd	Minority shareholder	
Prof GB Jameson Shares Held Beneficiary of Trusts Offices Held Other Interests	Tower Ltd	Minority shareholder	
	Estate of MEB Jameson	Discretionary beneficiary	
	Massey University	Employee	
	Te Manawa Museums Trust Board	Board member	
	Science Centre Trust, Palmerston North	Trustee	
	Riddett Institute	Member - PI	
	MacDiarmid Institute	Member - AI	
	Maurice Wilkins Centre	Member - AI	
Prof JB Metson Shares Held Offices Held	Vector Energy	Minority shareholder	
	University of Auckland	Deputy Vice-Chancellor	
	Brain Research New Zealand	Research	
	Maurice Wilkins Centre for Molecular Biodiscovery	Board Member	
	Medical Technologies Centre of Research Excellence	Board Member	
	Te Pūnaha Matatini	Board Member	
	Dodd Walls Centre	Board Member	
	Ngā Pae o te Maramatanga	Board Member	
	High Value Nutrition National Science Challenge	Board Member	
	Auckland UniServices Ltd	Director	
	Research and Education Advanced Network New Zealand (REANNZ)	Director	
	Rotary Science & Technology Forum Trust	Trustee	
	Prof MO McWilliams Offices Held	National Academies Ad-hoc Committee of Experts	Member

**New Zealand Synchrotron Group
Limited
Financial Statements
for the year ended 30 June 2021**

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Directors

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

Registered Office

11 Turnbull Street
Thorndon
Wellington

Nature of business

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

Company Registration number

1865516

Independent auditor

Grant Thornton New Zealand

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 2021.

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 19 for issue on 15 October 2021.

For and on behalf of the Board



.....
G A Carnaby
Chair

15 October 2021
.....



.....
J B Metson
Director

15 October 2021
.....

INDEPENDENT AUDITOR'S REPORT

Grant Thornton New Zealand Audit Limited

L15, Grant Thornton House
215 Lambton Quay
P O Box 10712
Wellington 6143

T +64 4 474 8500

F +64 4 474 8509

www.grantthornton.co.nz

TO THE SHAREHOLDERS OF NEW ZEALAND SYNCHROTRON GROUP LIMITED FOR THE YEAR ENDED 30 JUNE 2021

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

Opinion

We have audited the financial statements of the Company on pages 7 to 19, that comprise the statement of financial position as at 30 June 2021, 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 19:
 - present fairly, in all material respects:
 - its financial position as at 30 June 2021; and
 - its financial performance and cash flows for the year then ended; and
 - comply with generally accepted accounting practice in New Zealand in accordance with Public Benefit Entity International Public Sector Accounting Standards Reduced Disclosure Regime ('PBE IPSAS RDR'); and

Our audit was completed on 19 October 2021. 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 2020-2021.

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.



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

New Zealand Synchrotron Group Limited
Statement of comprehensive revenue and expenses
for the year ended 30 June 2021

	2021 (Unaudited) Budget	2021 Actual	2020 Actual
Note	\$	\$	\$
Revenue from non exchange transactions			
Revenue for Australian Operations	3	2,413,890	2,241,868
Revenue from exchange transactions			
Revenue for NZ Operations	4	-	137,250
Other revenue	4	105,638	138,822
Total Revenue	2,519,528	2,517,940	3,220,839
Expenses			
Australian Synchrotron Group costs	5, 18	2,103,450	828,592
(Gain) / Loss on fair value of derivatives		-	(5,368)
Other operating expenses	6	448,100	1,665,249
Operating expenditure		2,551,550	2,488,473
Total surplus/(deficit) for the year	(32,022)	29,467	105,508
Other comprehensive income		-	-
Total comprehensive revenue and expense		(32,022)	105,508

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 19.



New Zealand Synchrotron Group Limited
Statement of changes in net assets
for the year ended 30 June 2021

	Notes	Share capital \$	Accumulated losses \$	Total equity \$
Balance as at 30 June 2019		2,912,162	(2,414,742)	497,420
Net surplus		-	105,508	105,508
Other comprehensive income		-	-	-
Total comprehensive revenue and expenses		-	105,508	105,508
Balance as at 30 June 2020		<u>2,912,162</u>	<u>(2,309,234)</u>	<u>602,928</u>
Net surplus		-	29,467	29,467
Other comprehensive income		-	-	-
Total comprehensive revenue and expenses		-	29,467	29,467
Balance as at 30 June 2021		<u><u>2,912,162</u></u>	<u><u>(2,279,767)</u></u>	<u><u>632,395</u></u>

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 19.



New Zealand Synchrotron Group Limited
Statement of financial position
as at 30 June 2021

ASSETS	Note	2021	2020
		\$	\$
<i>Current assets</i>			
Cash and cash equivalents	7	1,000,251	993,871
Trade and other receivables from exchange transactions	8	41,661	16,764
Prepayments	8	1,925	3,583
Derivative financial instruments	9	6,749	26,142
Total current assets		<u>1,050,586</u>	<u>1,040,360</u>
TOTAL ASSETS		<u>1,050,586</u>	<u>1,040,360</u>
LIABILITIES			
<i>Current liabilities</i>			
Trade and other payables	11	354,796	349,276
Derivative financial instruments		63,395	88,156
Total current liabilities		<u>418,191</u>	<u>437,432</u>
TOTAL LIABILITIES		<u>418,191</u>	<u>437,432</u>
Net assets		<u>\$ 632,395</u>	<u>\$ 602,928</u>
EQUITY			
Share capital	15	2,912,162	2,912,162
Accumulated losses		(2,279,767)	(2,309,234)
TOTAL EQUITY		<u>\$ 632,395</u>	<u>\$ 602,928</u>

For and on behalf of the Board

G. A. Carnaby
.....

G A Carnaby
Chair

15 October 2021
.....

J B Metson
.....

J B Metson
Director

15 October 2021
.....

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 19.



New Zealand Synchrotron Group Limited
Statement of cash flows
for the year ended 30 June 2021

	Notes	2021 \$	2020 \$
<i>Cash flows from operating activities</i>			
<u>Receipts</u>			
Receipts from non exchange transactions		2,241,868	3,013,633
Receipts from exchange transactions		241,106	254,765
Interest	4	10,069	15,604
Net cash flows from operating activities		2,493,043	3,284,002
<u>Payments</u>			
Australian Synchrotron Group Costs		(828,592)	(1,614,579)
Less: Cash applied to Derivative Asset		0	-
Other expenses		(1,658,071)	(1,165,251)
Total cash applied		(2,486,663)	(2,779,830)
Net cashflows from operating activities	17	6,380	504,172
<i>Cash flows from financing activities</i>			
<u>Receipts</u>			
Contributions from shareholders		-	-
Net cash flows from financing activities		-	-
Net (decrease)/increase in cash and cash equivalents		6,380	504,172
Cash and cash equivalents at 1 July	7	993,871	489,699
Cash and cash equivalents at 30 June	7	1,000,251	993,871

These financial statements should be read in conjunction with the accompanying notes on pages 11 - 19.



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 15 October 2021.

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
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for the year ended 30 June 2021

Note 3. Revenue for Australian operations	2021	2020
	\$	\$
<i>Revenue from non-exchange transactions</i>		
Ministry of Business Innovation and Employment	987,294	963,294
Shareholders - contribution to Aust. Synchrotron beamlines	1,254,574	1,258,086
Shareholders	-	792,253
	<u>2,241,868</u>	<u>3,013,633</u>

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

Note 4. Revenue for New Zealand operations	2021	2020
	\$	\$
<i>Revenue from non-exchange transactions</i>		
Ministry of Business Innovation and Employment	137,250	-
<i>Revenue from exchange transactions</i>		
Grants from shareholders for operating costs of NZSG	-	120,000
<i>Other Revenue</i>		
Contribution from the Australian Synchrotron towards travel costs	96,577	71,602
Foreign exchange gains / (losses)	32,176	-
Interest	10,069	15,604
	<u>138,822</u>	<u>87,206</u>
	<u>276,072</u>	<u>207,206</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

2021	2020
\$	\$
<u>6,610</u>	<u>6,610</u>

(b) Foreign exchange (gains) / losses

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

2021	2020
\$	\$
<u>0</u>	<u>0</u>



New Zealand Synchrotron Group Limited
Notes to the financial statements
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(c) Support for Synchrotron Science

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

	2021	2020
	\$	\$
Travel costs reimbursed to shareholders	94,150	72,984
Contribution to Australian Synchrotron for new beamlines	1,275,634	1,249,610
Capability Build expense	183,000	-
User Meetings	2,146	6,365
Asia Oceania Forum for Synchrotron		
Radiation Research Membership	-	15,115
	<u>1,554,930</u>	<u>1,344,075</u>

(d) Secretariat and other operating costs

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

	2021	2020
	\$	\$
Secretariat services from the Royal Society and Board costs	99,401	103,003
Insurance	4,125	3,700
Other	183	253
	<u>103,709</u>	<u>106,956</u>
Total other operating costs	<u>1,665,249</u>	<u>1,457,641</u>

Note 7. Cash and cash equivalents

	2021	2020
	\$	\$
Cash	693,161	732,644
Foreign currency - AUD	307,090	261,227
	<u>1,000,251</u>	<u>993,871</u>

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

Note 8. Other current assets

(a) Trade and other receivables

	2021	2020
	\$	\$
Trade receivables	36,853	16,764
Other receivables	-	-
Goods and Services Tax receivable	4,808	-
Total trade and other receivables	<u>41,661</u>	<u>16,764</u>

(b) Prepayments

	2021	2020
	\$	\$
Prepayments	1,925	3,583
Total Prepayments	<u>1,925</u>	<u>3,583</u>



Note 9.	Derivative financial instruments	2021	2020
		\$	\$
	Western Union Forward cover	(56,646)	(62,014)
	Derivative financial instruments	(56,646)	(62,014)

The following derivatives have been entered into with Western Union.

(a) *Forward foreign exchange contracts*

At 30 June 2020	Notional	Deal rate	Fair Value
Forward exchange contract (Maturity: February 2021)	\$787,402	0.9525	\$16,367
Forward exchange contract (Maturity: February 2022)	\$833,333	0.9000	(29,576)
Forward exchange contract (Maturity: February 2023)	\$833,333	0.9000	(29,156)
Forward exchange contract (Maturity: February 2024)	\$833,333	0.9000	(29,424)
At 30 June 2021			
Forward exchange contract (Maturity: February 2022)	\$833,333	0.9000	(26,015)
Forward exchange contract (Maturity: February 2023)	\$833,333	0.9000	(21,239)
Forward exchange contract (Maturity: February 2024)	\$833,333	0.9000	(16,141)

(b) *Forward foreign exchange options*

At 30 June 2020	Notional	Strike Price	Fair Value
Forward foreign exchange option (Maturity: February 2022)	\$735,294	1.02	\$2,687
Forward foreign exchange option (Maturity: February 2023)	\$735,294	1.02	\$3,099
Forward foreign exchange option (Maturity: February 2024)	\$735,294	1.02	\$3,989
At 30 June 2021			
Forward foreign exchange option (Maturity: February 2022)	\$735,294	1.02	\$242
Forward foreign exchange option (Maturity: February 2023)	\$735,294	1.02	\$2,166
Forward foreign exchange option (Maturity: February 2024)	\$735,294	1.02	\$4,341



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

	2021	2020
	\$	\$
Creditors	-	-
Accruals	192,046	8,074
Income in Advance	162,750	300,000
Goods and Services Tax payable	-	41,202
Total trade and other payables	354,796	349,276

The amount owed to related parties was nil as at 30 June 2021. (2020: nil).

Note 12. Contingent liabilities

There were no significant contingent liabilities at 30 June 2021 (2020: 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 2021.

Directors

Transactions with board members include payment of fees. During the year ended 30 June 2021, a total of \$9,000 was paid to the Chair (2020: \$9,000). As at 30 June 2021, there was no outstanding balances with board members (2020: \$0).

Shareholders

Transactions with shareholders during the year ended 30 June 2021 include grants, as per Note 4, amounting to \$0 (2020: \$120,000). Also, as per Note 10, under the agreement with ANSTO the Shareholders who are party to the Funders Agreement are required to contribute a total of AUD \$12.308m (GST exclusive) over the nine years of the agreement to 2026. In the year ended 30 June 2021, a total of AUD \$1.20m (2020: AUD \$1.9635m) was contributed by Shareholders who are party to the Funders Agreement and, as at 30 June 2021, there was no outstanding balance with shareholders (2020: \$0).

Note 14. Events occurring after balance date

There were no significant events occurring after balance date that affect the financial statements.



New Zealand Synchrotron Group Limited

Notes to the financial statements

for the year ended 30 June 2021

Note 15. Share capital

Shareholding at cost	2021	2020
	\$	\$
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:

	2021	2020
	# 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	163,104	163,104
The New Zealand Institute for Plant and	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.

Note 16. Financial instruments

Classification of financial assets by category	Fair value	
	through Profit or Loss	Loans and Receivables
2021	\$	\$
Cash and cash equivalents	-	1,000,251
Trade & other receivables	-	41,661
Prepayments	-	1,925
Derivative financial instrument	6,749	-
Total	<u>6,749</u>	<u>1,043,837</u>
2020		\$
Cash and cash equivalents	-	993,871
Trade & other receivables	-	16,764
Prepayments	-	3,583
Derivative financial instrument	26,142	-
Total	<u>26,142</u>	<u>1,014,218</u>



New Zealand Synchrotron Group Limited
Notes to the financial statements
for the year ended 30 June 2021

Classification of financial liabilities by category

Measured at amortised cost

	2021	2020
	\$	\$
Trade & other payables	354,796	349,276
Derivative financial instrument	63,395	88,156
Total	<u>418,191</u>	<u>437,432</u>

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

	2021	2020
	\$	\$
Net (Deficit)/Surplus for the year	29,467	105,508

Movement in working capital

Trade and other receivables	(24,897)	63,163
Derivative financial instruments	(5,368)	43,112
Trade and other payables	5,520	294,122
Prepayments	1,658	(1,733)
Net Cash outflow from operating activities	<u>6,380</u>	<u>504,172</u>

Note 18. COVID-19 Pandemic and impacts

The global COVID-19 pandemic that was declared in early 2020 persisted throughout the year and continues to affect the Company's operations. Although the Australian Synchrotron reopened in July 2020, it has been subject to periodic shutdowns or restrictions in operations and travel restrictions have prevented New Zealand researchers going to Melbourne to use the facility. Wherever possible, planned experiments have been carried out by Synchrotron staff using samples shipped to Australia. During the past 12 months most of the delayed work from the previous year and the work intended for 2020-21 has been able to be completed, but there has been a downturn in demand for beamtime on the facility due to the restricted nature of the work that can be undertaken and the reduced research effort in some institutions because of the pandemic. As at the date of this report the impact of the pandemic is ongoing and is expected to have a significant long lasting economic impact on New Zealand, with likely flow through to most businesses. Due to the inherent uncertainty of the duration and impact of the pandemic it is not practicable to determine the full impact that the virus will have on the Company going forward, however the Directors' assessment is that it is unlikely to be significant to its long-term operations and therefore the Board continues to consider it appropriate to apply the going concern basis of accounting to these financial statements.

In recognition of the reduced level of activity during 2020 and the financial impact the pandemic has had on the research community in New Zealand, especially universities, it was agreed with ANSTO that component of the annual payment for 2020-21 relating to the contribution towards operating costs would be reduced to 50% of the original requirement (final amount paid was \$828,592), and 75% for the 2021-22 and 2022-23 financial years, and increased to 133% of the original value for the following three years. With MBIE's agreement, the reductions (in earlier years) and increases (in latter years) are being met by adjusting the payments due from the Funding Institutions. The net effect was that for 2020/21 Institutions were not required to make any payment towards the contribution to Synchrotron operating costs and will make payments at 50% of original level for the next two years. The Company also adjusted its operating budget for the year to recognise the reduced level to travel and other synchrotron science support that could be provided during the pandemic and waived the usual requirement for a contribution of \$120,000 (refer Note 4) from Institutions towards the Company's operating costs.

