SMARTSATNEWS

ISSUE 19 - January 2023

SMARTSAT COOPERATIVE RESEARCH CENTRE

Australian Government
Department of Industry, Science and Resources

AusIndustry
Cooperative Research Centres Program

Contents

Front image: (L-R) Founder of Safety In Space Dr Mark Rice, SmartSat Chief Research Officer Dr Carl Seubert, NASA Search and Rescue Mission Manager Dr Lisa Mazzuca, SmartSat CEO Professor Andy Koronios, and NASA Deputy for National Affairs Cody Kelly exploring the Australian Space Discovery Centre

Message from the CEO

Dear colleagues,

Welcome our summer Newsletter. We do hope that everyone has had a wonderful summer break.

Although 2022 was a great year for SmartSat, it also brought to us much shock and sadness when we learned of the passing of our Chair, Dr Peter Woodgate, on Saturday, 24 December 2022. Peter has been an inspiring supporter of space in Australia and one of the foundational pillars of SmartSat from its inception back in 2019. We are determined to ensure that we continue Peter's legacy by delivering value to our partners and impact for Australia - an endeavour in which I ask for your continued support in.

We are all quite proud of our 2022 accomplishments. I would like to thank the SmartSat Team for their enthusiasm, dedication, and professionalism in helping SmartSat achieve so much. Many of our achievements when in late September we held our first 'in-person' SmartSat Conference in Sydney. We received some excellent feedback on our conference through a survey circulated to all attendees which will guide us in the planning of our 2023 Conference.

Towards the end of the year, we held our Annual General Meeting where our stakeholders were presented with highlights of our achievements over the past year. Among the highlights were our over 130 strong partner and collaborator network, more than 100 funded projects, over 60 PhD students and an increased overall budget of more than $270 million. These highlights were captured in an excellent video developed by the Marketing and Communications team, which can be watched on our YouTube channel. The meeting followed the release of our 2021-2022 Annual Report, which is now available to read on our website.

I look forward to working together with everyone in 2023 to continue to advance Australia's space innovation ecosystem.

Professor Andy Koronios
Chief Executive Officer &

"We are determined to ensure that we continue Peter's legacy by delivering value to our partners and impact for Australia."

***1** SmartSat Chair Dr Peter Woodgate will be greatly missed by the space and spatial community **2** Dr Peter Woodgate (far right) with members of the SmartSat Board (L-R) Professor Andy Koronios, Kris Trott, Mikaela Jade, Danielle Wuchenich, Dr Michele Allan, Dr Rosalind Dubs and Dr Jackie Craig **3** Dr Peter Woodgate (right) with SmartSat CEO Professor Andy Koronios*

Vale, Dr Peter Woodgate

Inspiring leader, strategic thinker, advocate for the Australian space sector, Board Chair par excellence, gentle human being…a friend.

SmartSat CRC is deeply saddened by the sudden passing of our Chair, Dr Peter Woodgate, on Saturday, 24 December 2022.

Peter was integral in leading the initial CRC Bid and was instrumental in the establishment of the SmartSat's structure and governance framework. He was appointed the Chair of the SmartSat Board in August 2019, bringing with him a wealth of experience and connections from the space and spatial industry, as well as from the broader CRC sector.

Peter has been involved with the space and spatial industries for over 30 years, helping to create several companies and managing an industry cluster of over 100 companies, translating applied research into commercial outcomes. He was an Honorary Fellow of the Surveying and Spatial Sciences Institute, a life member of the International Society for Digital Earth and a graduate of the Institute of Company Directors. Peter held a Doctorate of Business Administration from the Royal Melbourne Institute of Technology, a Masters of Applied Science from the University of New South Wales, and a Bachelor of Forest Science from the University of Melbourne.

Peter's impact in the space, spatial and science areas is immeasurable and will leave a lasting legacy in our country well into the future. He lent his enthusiasm and dedication to many organisations, including as President of the Geospatial Council of Australia; a board member of Geoscape Australia; a Member of the Nominations and Renumeration Committee at Charles Sturt University; a Principal Fellow at the University of Melbourne; Chair of the Australian Urban Research Infrastructure Network; Chair of Canthera Discovery; and as the chair and founding driver of the 2030 Space + Spatial Industry Growth Road Map.

All those who worked with Peter will remember how he treated each person he met with the utmost respect, his high level of ethics and the passion he put into everything that he did. Most of us within the broader SmartSat family were honoured to not only call him a colleague, but a friend. We will all miss his leadership, vision, compassion, ethics, and his tireless commitment to the advancement of the space and spatial industries.

Our thoughts and deepest sympathies are with Peter's wife Janet, family, and friends at this difficult time.

Staff News

(L-R) Her Excellency the Honourable Frances Adamson AC, Senior Communications Advisor Alison Bowman and Leaders Institute of South Australia Chair Todd Roberts at the Governor's Leadership Foundation graduation ceremony

Alison Bowman graduates from Governor's Leadership Foundation program

SmartSat Senior Communications Advisor, Alison Bowman, recently graduated from the Governor's Leadership Foundation (GLF), the flagship program hosted by the Leaders Institute of South Australia.

The program provides participants with immersive experiences alongside peers from diverse backgrounds to develop their leadership skills, connections and a deep awareness of how to effect genuine, widespread positive change. This includes site visits to a range of facilities participants would not ordinarily have the chance to experience including homeless and domestic violence shelters, prisons, farms, heavy industry workshops and more.

Over the 10-month program, participants are required to produce a group case study on an issue that needs attention. Alison worked with other participants on a case study investigating inefficiencies in transport funding for Supported Living Clients. This project was done in conjunction with Lighthouse Disability, a support organisation that works alongside adults living with complex and diverse disabilities across North and North-Eastern Adelaide.

Alison will continue to be involved with GLF as a member of the Alumni committee and hopes to use the new-found free time that come with completing the program to revisiting some of the topics covered and continuing her learning in these areas. Congratulations to Alison on this amazing achievement.

(L - R) SmartSat CEO Professor Andy Koronios, Adjunct Professor Nicola Sasanelli AM and Industry Advisory Board Chair Peter Nikoloff celebrate Nicola's retirement

Retirement of Adjunct Professor Nicola Sasanelli AM, Director of Partnerships & Outreach

SmartSat recently celebrated the retirement of one of our founding staff members, Adjunct Professor Nicola Sasanelli AM.

Nicola was instrumental in setting up SmartSat, working alongside Professor Andy Koronios, Michael Davis AO and Nova Systems's Peter Nikoloff to prepare the bid for government to establish the CRC. Since then, Nicola has worked at SmartSat as the Director of Partnerships & Outreach, bringing with him an enormous wealth of knowledge and experience in space research and development.

The team at SmartSat hope that Nicola will spend his well-earned retirement reflecting on his truly remarkable career developing the space industry in South Australia from near non-existence into a thriving, world-class sector comprising over 80 start-ups, a booming space precinct in Lot Fourteen, an Australian Space Discovery Centre and a headquarters for the Australian Space Agency, Additionally, Nicola also leaves as his legacy The Andy Thomas Space Foundation and its flagship event, the Australian Space Forum.

Nicola will be staying on with SmartSat one day per week in an advisory role. We wish Nicola all the best for the next stage of his journey and hope it brings him more time with family, friends and with his painting. Grazie mille e arrivederci!

Research

Dr Carl Seubert

Chief Research Officer

We have been focusing on top-down project development efforts with a holistic look at the portfolio and considering priorities. In the last quarter, SmartSat approved the second project under the SpaceCraft Autonomy Research Laboratory (SCARLET), SCARLET-β. This collaborative project between Defence Science and Technology Group (DSTG) and the University of Sydney is to develop the autonomy algorithms for a goal-oriented autonomy demo.

The autonomy will be experimentally tested using the DSTG Buccaneer Main Mission (BMM) spacecraft scheduled to launch later this year. BMM features a suite of payload capabilities including a controllable, deployable boom for self-inspection imaging. This project will leverage these variables along with timing the attitude and orbit of the craft to take an optimal image of itself against a backdrop of Australia. This is a practical application of spacecraft autonomy as an experimental pathfinder to build capability as well as confidence in autonomous systems.

(L-R) Deputy for National Affairs Cody Kelly and Mission Manager Dr Lisa Mazzuca from NASA's Search and Rescue office at the Australian Space Discovery Centre

Late last year, SmartSat were delighted to host two NASA collaborators from the Astronaut Search and Rescue office – Dr Lisa Mazzuca and Mr Cody Kelly. This visit further progressed the collaboration around the LunarSAR project as a possible Australian contribution to the Global Artemis efforts to return humans to the moon. Opportunities to utilise the technology in terrestrial applications were also explored in a workshop with South Australian emergency management stakeholders.

SmartSat Chief Research Officer Dr Carl Seubert hosting the Earth Observation panel at the 14th Australian Space Forum

A one-day SmartSat/DSTG workshop was held in November to look at opportunities to dovetail research into Resilient Multi-mission Space (RMS) STaR Shots and project transitions. The workshop was productive in laying out RMS mission concepts, payloads and SmartSat project opportunities – of which there are a number of projects identified.

I was very fortunate to have the honour of hosting the Earth Observation (EO) panel at the 14th Australian Space Forum in Adelaide. I was joined on stage with the leaders in EO for the European Space Agency and Australian government stakeholders from the Australian Space Agency, Bureau of Meteorology, CSIRO, and Geoscience Australia.

It was an optimistic discussion around the motivations, applications and end-user benefits of a sovereign space segment. We will continue to strive to have our partners innovative technology enable these Australian space missions.

Research cont.

(L-R) SmartSat Chief Research Officer Dr Carl Seubert, Founder of Saftey In Space Dr Mark Rice, SmartSat CEO Professor Andy Koronios, NASA Search and Rescue Mission Manager Dr Lisa Mazzuca and Deputy for National Affairs Cody Kelly at the Australian Space Discovery Centre

LunaSAR Technical Workshop with NASA

On Friday, 11 November 2022 SmartSat convened a technical workshop with representatives visiting from NASA's Search and Rescue (SAR) office at the Goddard Space Flight Center (GSFC) to discuss the next steps to build upon the research being undertaken in the SmartSat funded project P1.26 *Emergency Communications for LunaSAR*. LunaSAR represents a possible contribution of Australian-developed technology into the Artemis program, which is a multi-national effort to put humans on the Moon and Mars to conduct science and exploration.

This workshop was convened to discuss the possible Low Earth Orbit (LEO) payload flight for a LunaSAR demonstrator in order to gain early flight heritage on the LunaSAR waveform that is under development in project P1.26. The workshop participants reviewed the latest program considerations, including current planning and staging of the phases. The discussion covered numerous technical aspects of a LEO demonstrator mission for LunaSAR including onboard processing requirements, SAR Message types, geolocation methods and expected performance, as well as different test cases and use of the MEOSAR satellite system.

The workshop also progressed the definition of developmental test objectives, including identifying specific objectives which will maximise value from engineering and project outreach to stakeholder communities. Opportunities were discussed for cooperative testing between Australia and the United States, including both ground testing and communications with the LEO demonstration. The ground testing might include Moon/Mars 'analogue' field testing campaigns, potentially in either country.

The pros and cons were discussed for SmartSat of developing new SDR hardware for the LEO demonstration, rather than using a flight-qualified Commercial-Off-The-Shelf (COTS) Software Defined Radio (SDR).

The NASA representatives at the workshop, Dr Lisa Mazzuca and Mr Cody Kelly, expressed their gratitude that SmartSat and Safety from Space committed so much energy into the workshop.

Project P1.26 is led by Safety from Space, which includes the University of South Australia and Flinders University, has the aim to develop a concept design proposal for Australian communications technology to help shape NASA's LunaSAR requirements. NASA is in the pre-formulation phase of the LunaSAR program to provide lunar-surface distress messaging. LunaSAR will provide communications from astronaut suit telemetry and lunar terrain vehicle telemetry via lunar orbit communication assets for Earth-based monitoring. LunaSAR is planned to function as part of the broader LunaNet architecture, NASA is developing to support the Artemis program with networking, navigation, detection and information, and science services.

The NASA SAR office previously collaborated with SmartSat on the *Resilient Emergency and Search and Rescue Communication (RESARC)* Project commencing in 2020 under a cooperative agreement, to research beacon technologies applicable for Earth and LunarSAR. The RESARC project successfully demonstrated the feasibility of a set of new and alternative communications technology using Medium Earth Orbiting Satellites, including advanced low power digital radio waveforms, secure messaging protocol, signal processing for detection and localisation, and an extremely compact vehicle mounted low profile antenna. Building on the RESARC project, the P1.26 project will provide options for distress messaging system components in the challenging lunar environment.

NASA Search and Rescue Mission Manager Dr Lisa Mazzuca presenting a workshop on the LunarSAR project

Education & Training

Dr Ady James

Education and Training Director, Industry Training

Following the second Phase of the Skills Gap Analysis, SmartSat developed a series of masterclasses to fill some of the knowledge and skills gaps identified in the report. These masterclasses were held in Sydney and Adelaide in October. Topics included:

- Space law Applicable to Mission Planning;
- Radiation Protection for Space;
- Designing Space Missions and Systems; and
- Applied Space Systems Engineering

These course attracted over 60 attendees in total hailing from industry, government and academia.

Emeritus Professor Steven Freeland presents to attendees at the Space Law Applicable to Mission Design Master Class

Many thanks to the Masterclass presenters Emeritus Professor Steven Freeland and Donna Lawler from Azimuth Advisory, Dr Bruce Chesley from Teaching Science & Technology, Inc (TSTI) and representatives from ANSTO, The Australian National University, the University of Adelaide, Saber Astronautics, Defence Science and Technology Group (DSTG) and the Bureau of Meteorology.

SmartSat is planning on hosting more Master Classes later this year, including the second and third module of Space Law Applicable to Mission Planning hosted by Azimuth Advisory.

Diversity, Equity & Inclusion

Dr Sarah Cannard

Industry Director

Since the previous update, the Diversity and Inclusion Committee has been renamed the Diversity, Equity and Inclusion (DEI) Committee to include equity as one of its three key areas.

The Committee has made great strides over the past few months, focusing on updating the DEI Plan and 2023-2025 DEI Action Plan. It is anticipated that these will be finalised in the first quarter of 2023.

Our plans to participate in the Diversity Council Australia's Inclusive Employer Index was unable to proceed due to not meeting the minimum numbers required for confidentiality. This opened alternative options for the DEI Committee to explore that would assist with both employee engagement and benchmarking against similar organisations and not-for-profits. The Culture Amp platform has since been assessed by the DEI Committee to be a useful measurement and benchmarking tool, and more information about the platform will be communicated in the coming weeks.

There have been some changes to the membership of the DEI Committee over the past few months. SmartSat Board Director Professor Margaret Harding took over the role of Chair from CEO Professor Andy Koronios, who remains on the Committee as a member. The committee also welcomed Dr Roshni Sharma and Dr Daysi Ruvalcaba as industry representatives, each bringing their own set of skills to the Committee.

Following the departure of Emily White earlier in the year, Business Administration Officer Laura Fries has taken on the role of the Committee's Executive Officer, having joined SmartSat in August.

The committee is in the process of putting into place a communications strategy with the aim that the work being undertaken by the DEI Committee is communicated effectively to all SmartSat staff, contractors and partners more broadly.

Node Updates

New South Wales Node

Dr Tim Parsons

Chair, Aurora Space Cluster
NSW Node Coordinator

In 2022 the NSW Node of SmartSat approved five new demonstrator projects, three mobility projects and our first infrastructure project, all industry-led and all carefully evaluated for their novelty and impact.

Altrum RF, Extraterrestrial Power, GaiaPOD, Mawson Rovers, Seaskip Systems, Sperospace, Spiral Blue and Sydney Water join Arlula, HEO Robotics and SpaceOps as successful industry applicants in 2022, working with research providers CSIRO, Macquarie University, Royal Melbourne Institute of Technology, the University of Sydney, the University of New South Wales Sydney, Western Sydney University and new SmartSat partner, the University of Technology Sydney.

Two of the NSW Nodes successful demonstrator projects will be flying 1U-sized payloads on the NSW backed Waratah Seed Rideshare Mission funded in partnership with the NSW Chief Scientist and Engineer. More details of these exciting projects will follow in a planned series of showcase team interviews early this year, with our next industry and R&D matching workshop later in 2023, where Primes and major SMEs will be invited to attend alongside new research partner organisations.

For more information contact:
Dr Tim Parsons
NSW Node Coordinator, SmartSat CRC
Chair, Aurora Space Cluster
tim.parsons@smartsatcrc.com
smartsatcrc.com/key-initiatives/new-south-wales-node

Victorian Node

Milica Symul

Vic Node Coordinator
Associate Director, RMIT Space Industry Hub

The Vic Node recently opened up a call for applications for Round Two of Demonstrator Project grants. Similarly to Round One, the grants aim to empowering Victoria's space industry, creating state-based opportunities for industry-led R&D in collaboration with SmartSat's current partner base and beyond.

The Vic Node has identified the following applicants to be funded through the Round One Demonstrator Grant:

- **Hyperspectral Microwave Sounder (HYMS)**
  Lead Chief Investigator: Professor Peter Moar, Swinburne University of Technology
  Industry Partner: ESS Weather
- **Real-time Online Nutrient Analyzer with Adaptive Sampling and Predictive Modelling**
  Lead Chief Investigator: Professor Wei Zhang, La Trobe University
  Industry Partner: Eco Detection
- **Advanced Cooperative Tasking and Intelligent Visualisation Environment for Space Domain Awareness (ACTIVE-SDA)**
  Lead Chief Investigator: Professor Christopher Fluke, Swinburne University of Technology and Associate Professor Brett Carter, Royal Melbourne Institute of Technology
  Industry Partner: CGI

So far, this round has identified one successful applicant for funding:

- **Investigation into space-based data streams for updating and enriching Victoria's Foundation Spatial Data**
  Lead Chief Investigator: Professor Matt Duckham, Royal Melbourne Institute of Technology
  Industry Partners: FrontierSI and Victorian Government Department of Environment, Water, Land and Planning

For more information contact:
Milica Symul
Vic Node Coordinator, SmartSat CRC
Associate Director, RMIT Space Industry Hub
milica.symul@rmit.edu.au
smartsatcrc.com/key-initiatives/victoria-node

Node Updates cont.

Queensland Earth Observation Hub

Professor Stuart Phinn

Queensland Earth Observation Hub Director

Recently the Queensland Earth Observation Hub (EO Hub) issued a new open call for Industry to submit expressions of interests for its Partnering, Calibration/ Validation and Mobility programs. The EO Hub's core goal is to grow Queensland's Earth observation industry by enabling product and service development or expansion through knowledge transfer between Australian research organisations and Earth observation businesses.

Both the Partnering and Calibration/Validation programs are seeking industry led applications that translate research into business operations with the aim to demonstrate technology, create a new product or service, or improve business operations with an aim to improving the deployment of a current product or service. The EO Hub's Mobility Scheme provides opportunities for industry representatives to work within a university, or for university researchers, academic or professional staff to work within a business, for up to six months. The Mobility Scheme can facilitate the transfer of expertise, provide training and skill development, or assist with projects that require additional skilled personnel.

The EO Hub is seeking Industry led applications which seek to achieve this through research and development partnerships with a research partner.

For more information contact:
Heather Christensen
Queensland Earth Observation Hub Business Manager
SmartSat CRC
stuart.phinn@smartsatcrc.com
smartsatcrc.com/key-initiatives/queensland-node

Aurora Space Cluster

Dr Tim Parsons

Chair, Aurora Space Cluster
NSW Node Coordinator

Last year was a solid growth year for the Aurora Space Cluster, with the following companies joining in 2022:

Start-up/ Scale-up Members

Supporting Members

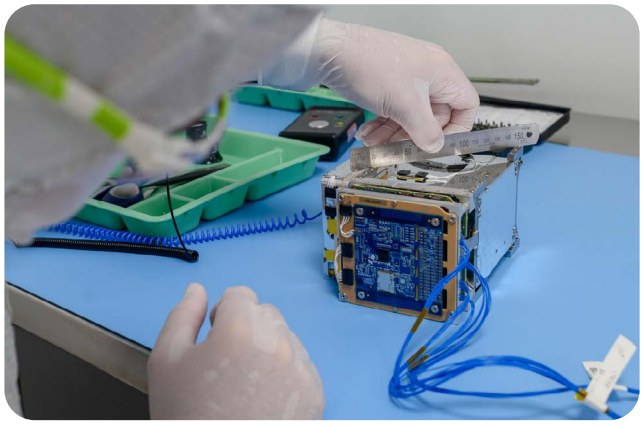
Aurora hosted its Annual General Meeting on Thursday, 8 December 2022. The start-up cluster has now moved from an early-stage governance to a new 'grow to sustainability' phase. The board has expanded from seven to nine members, with a total of four director seats for Aurora members, three for independent skills-based appointments, and two SmartSat staff.

Following an invitation circulated to all eligible members, a period of nominations saw two members nominate for positions on the board, both of whom where successfully voted in by Aurora members by ballot. Dr Sarah Cannard was appointed the new Chair of Aurora to lead this next phase of growth alongside returning directors Conrad Pires, Dr Tim Parsons and Professor Andy Koronios.

The Aurora leadership team also farewelled outgoing foundational directors Anastasia Volkova from Regrow, Troy McCann from Moonshot, and Peter Nikoloff and Andrew Barton from SmartSat. These members were recognised for their contribution to the early-stage development of Aurora, in particular during the difficulty of the COVID-19 pandemic.

Going forward, Aurora is excited to announce that member companies AICraft and Sensaweb have been selected to provide the primary and secondary payloads respectively onboard the Waratah Seed ride-share mission. The mission is scheduled to launch in October 2023.

(L-R) SmartSat Satellite Systems Engineer Nick Manser, SmartSat Graduate Engineer Nadia Sarunic , and Nova Systems Engineer Andrin Tomaschett overseen by SmartSat Education & Training Coordinator Dr Ady James in attendance as the Senior Test Engineer and Test Witness for the unboxing of the HyperScout 2 Flight Instrument under clean room conditions



Engineers working on the Kaniyini mission inspected the HyperScout 2 Flight Model

Andrin Tomaschett from Nova Systems unveiling the HyperScout 2 Flight Model

Kanyini Update

Testing continues on the Kanyini engineering model flatsat spacecraft in preparation for the first stages of integration into the flight spacecraft next year.

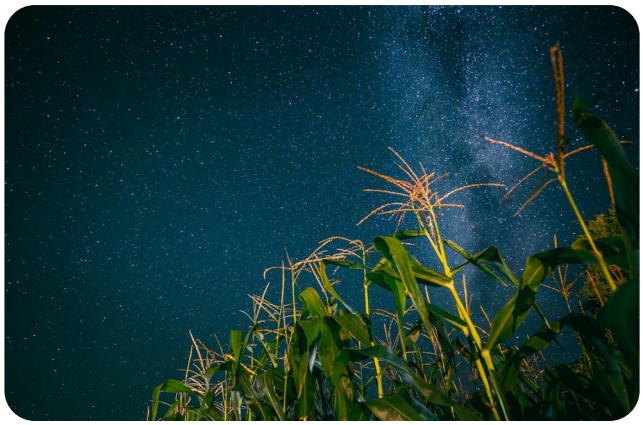
Recently, engineers from the Kanyini team took the Hyperscout 2 Flight Instrument, delivered by cosine, to a clean room following its arrival in the country. The million-dollar instrument was unboxed and inspected under sterile conditions and tested for compatibility with existing Kanyini flatsat elements.

The HyperScout 2 is a three-in-one instrument that combines hyperspectral and thermal imaging with high-level data processing and Artificial Intelligence (AI) capabilities. It provides hyperspectral imaging in the visible and near infrared to analyze the composition of the Earth, along with three thermal infrared bands to retrieve the temperature distribution, boosting and improving the number of Earth Observation applications possible.

It is expected that the HyperScout's advanced imagery capabilities will provide real-time information for bushfire detection, water quality monitoring, crop quality monitoring and data useful for Defence and national security.

Parallel to the testing of the physical model, the Kanyini team is engaging with end-users and researchers to develop use cases for the data expected to be collected by the satellite. This is assisting with defining the operations, data processing and data management strategies for the future mission.

Project Updates



Grain crops under a night sky

Project P3.25 Can satellites monitor crop and pasture quality across Australia?

Knowledge of crop and pasture quality can provide the industry with insights to assist with the grazing management of pastures and input management decisions for crops. Handheld and lab-based spectroscopy have been extensively employed to monitor quality-based plant attributes. The methods employed are time consuming and expensive to implement and do not provide the industry with insights into the temporal trends of the critical variables. High resolution and frequent return time can overcome numerous deficiencies affecting equivalent visible IR and SWIR platforms, that limit the ability to create a viable product around crop and pasture quality. Dr Ha Thanh Nguyen, Research Scientist with CSIRO Agriculture & Food provided a review of the research.

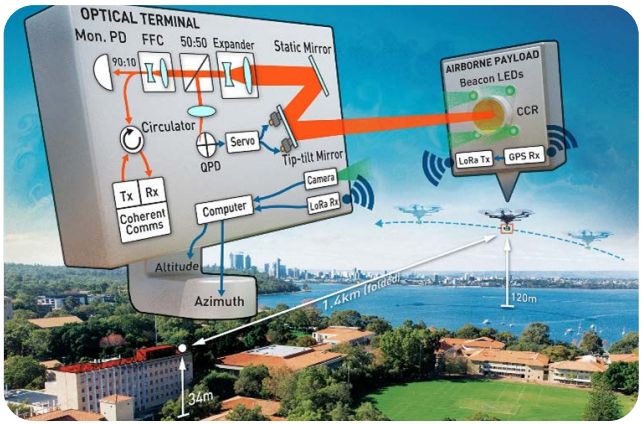
This project conducted a feasibility analysis capitalising on existing and planned satellite missions, including the Aquawatch satellites and precursors to test development of new high frequency products for crop and pasture quality across the Australian landscape.

The research found that Hyperspectral information on crop and pasture quality can provide early and important insights to assist with the grazing management of pastures and input management decisions for crops. The need for crop and pasture quality products within agriculture shares complementary user and observational requirements with other industrial sectors and therefore will contribute to the value proposition of AquaWatch satellites and precursors.

The trade-off in realising such potential for agriculture in terms of high spatial resolution, narrow bandwidth, high cadence, low latency and low cost is insufficient focus on product design due to the high computing requirement to process data, lack of precedent missions and short mission life.

It was found that a viable and globally operational hyperspectral imagery product needs to be of satisfactory signal-to-noise ratio, analytical ready, scientifically validated and of high utility to the end users. Given the short mission life, a fusion product such as one that takes advantage of the continuous narrow band reflectance information from hyperspectral and high revisit time from multispectral sensors such as Sentinel-2 should be considered a priority.

This project is led by Dr Roger Lawes, Principal Research Scientist at CSIRO Agriculture Flagship and includes participants from CSIRO and the Grains Research and Development Corporation.



Schematic of the deployable optical terminal and experiment outlined in the paper by Dr Sascha Schediwy

Project P1.18 Coherent Free-Space Optical Communications

Following a successful drone flight demonstration, a paper Demonstration of 100 Gbps coherent free-space optical communications at LEO tracking rates from the *Coherent Free-Space Optical Communications* project was recently published in the journal Nature Scientific Reports.

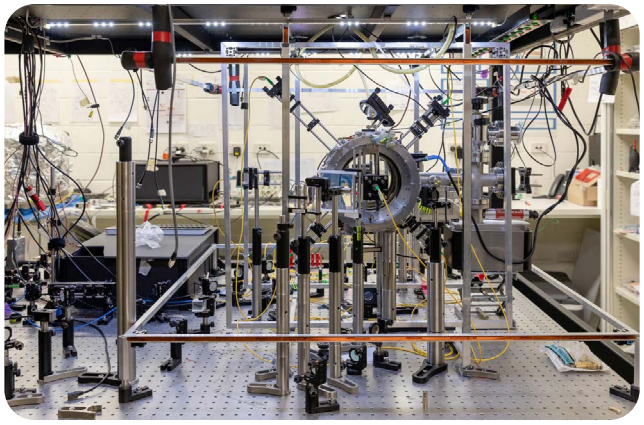
The *Coherent Free-Space Optical Communications* project is led by Dr Sascha Schediwy at the University of Western Australia in partnership with Defence Science and Technology Group. Following Phase One (P1.01), this next stage of the project further developed an advanced optical communications system shown to support optical fibre-like data transfer rates over atmospheric free-space communication links.

Phase Two involved a drone flight campaign to demonstrate 100 Gb/s (over a single WDM channel) coherent data transfer over free-space laser links between the transportable optical terminal and an airborne vehicle transiting at angular rates equivalent to orbiting satellites.

The project results represent a key steppingstone to validating technology that is capable of achieving >1 Tb/s downlink speeds from space to ground, as well as the optical ground station infrastructure to support this capability.

Read the full paper here.

Project Updates cont.



The Laboratory at QuantX Labs where the Compact Clock is being developed

QuantX Clock Engineering Model passes Mission Definition Review & System Requirements Review

In November, a Mission Definition & System Requirements Review (MDR/SRR) was conducted for the SmartSat project P2.31 *Compact Clock for Small Satellite Applications – Engineering Model*.

The review involved members of the project team at QuantX Labs presenting their progress to the independent review panel consisting of the Chair, Julia Mitchell from SITAEL, Dr David Pulford from the Australian National University and Defence Science and Technology Group (DSTG) and Sarah Cirillo from Inovor Technologies.

SmartSat research management personnel were also in attendance, including Chief Research Officer Dr Carl Seubert and Research Program Manager Dr Andrew Barton. Dr Carl Seubert also took the chance while in Adelaide to make an in-person tour of the QuantX facilities and discuss some of the company's plans for future expansion.

The review focused on the envisioned demonstration mission for the clock, which is assumed to be a payload flight opportunity on the Resilient Multi-mission Space (RMS) STaR Shot mission. The project team presented system requirements for the clock (which was based on the concept of operations for the demonstration mission) and presented the project management plan, the system engineering management plan and the system verification plan.

The review team gave substantial feedback on all the presented documents, and the project team has undertaken to complete corresponding updates of all the presented documents. Some of the more notable discussions in the review included:

- How to account for spacecraft bus and launch vehicle interfacing requirements in the EM project, without those being formally provided by a platform provided (at this stage DSTG has made no commitment to flying this payload on an RMS mission although they are interested and following the project)
- The need to identify the necessary and planned system analysis models that will be created
- The rationale for key system architecture decisions made in the clock's design
- Aligning the development to appropriate system engineering standards (NPR7123.1 and NPR7120.5 were baselined)
- Possible methods for synchronisation and time transfer that could be likely supported in an RMS mission context
- Requirements for on-board environmental monitoring

QuantX lead for the project, Sebastian Ng, is meeting regularly with the review Chair to process the actions and the team expect to close-out the review before the end of the year.

The P2.31 project is led by QuantX Labs and also includes the University of Adelaide and DST-G. It builds on an earlier project, P2.08 *Compact Clock for Small Satellite Applications*, which was led by the University of Adelaide and included QuantX as the commercialisation partner. The project will develop and test a TRL5 proof-of-concept, Engineering Model of a precision space-based clock.

The project aims to develop one of the key technologies that is essential for the development of a sovereign timing capability for Australia. It may also offer a replacement for technologies used in other jurisdictions because of its potential for higher performance than the current state-of-the-art.

SmartSat and the research team are seeking external funding to proceed beyond the current P2.31 Project and achieve flight demonstration. Ultimately the goal is deployment as a sovereign Australian space-based precision timing service.

Other News

(L-R) Inovor Technologies Project Manager Nuala O'Neill, Myriota Space & Mission Engineer Andrew Meldrum, ISILaunch Project Manager & Systems Engineer Sander Voss, SmartSat Satellite Systems Engineer Nick Manser and South Australian Space Industry Centre Associate Director, Space Dr Catherine Grace with a model of Kanyini

South Australia's first satellite Kanyini booked to blast off in 2023

Myriota has announced an agreement with ISILAUNCH to send Kanyini into orbit to start its ambitious mission to help take care of people and planet. Under the Launch Services Agreement, Myriota has booked a spot for South Australia's home-grown satellite to blast off on a SpaceX Transporter mission later this year.

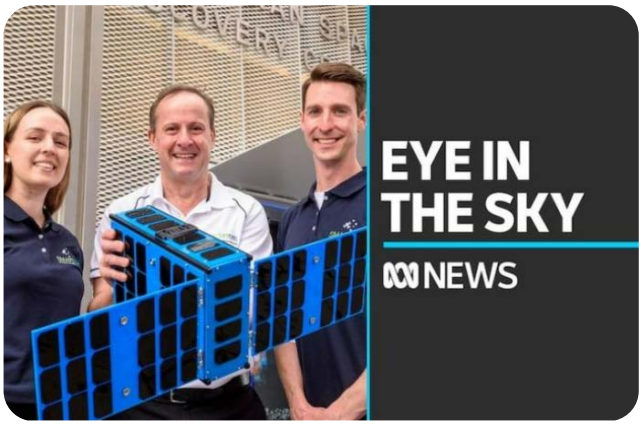
Dr David Haley, co-founder and CTO of Myriota said, "This is an exciting next step for this ground-breaking South Australian space services mission which is set to benefit the State when it launches next year. The IoT payload will add to the Myriota Network, communicating with devices and sensors on the Earth's surface, working together with hyperspectral imaging collected from the earth observation payload to enable a wide array of applications. Kanyini will provide access to critical data anywhere and everywhere it's needed to help improve and monitor water quality, crop health and bushfire resilience."

SmartSat has already factored the data collected by Kanyini and the HyperScout 2 into a number of projects which will drive further research and build experience in operating Earth observation payloads in space.

SmartSat CEO Professor Andy Koronios says, "Securing the launch with ISILAUNCH is another exciting step for the Kanyini mission which will pioneer sovereign technology in projects which will gather real-time data, monitor potentially hazardous conditions specific to Australia bushland, and improve our natural disaster preparedness, response and resilience. Other real-world applications of the data collectedby Kanyini include satellite image-based smoke detection for bushfire mitigation and monitoring inland and coastal water qualities."

South Australian Deputy Premier and Minister for Defence and Space Industries Susan Close says that, "South Australia is leading the charge in accelerating innovation and growth in the space sector and this mission presents an important opportunity for local industry to play a key role in furthering our national endeavours to build sovereign EO capability, provide secure access to data from space and expand our satellite design and manufacturing expertise."

"Soon we will be the first State Government to send a locally manufactured small satellite to low Earth orbit and we're excited to be partnering with ISILAUNCH to secure a launch date for Kanyini on SpaceX in 2023." ISILAUNCH director Abe Bonnema stated: "We're grateful to have been selected by Myriota to get Kanyini in orbit to start its ambitious mission through our reliable, integrated launch services. Building on our knowledge, expertise and our track record of more than 570 satellites successfully sent into orbit, we are keen to provide Myriota with the launch services that best fits their mission needs. Our team, which includes local representation in Australia for smooth and fast interaction with the customer, is looking forward to completing all the necessary launch activities to get Kanyini to space."



(L-R) Graduate Engineer Nadia Sarunic, Kanyini Mission Director Peter Nikoloff and Satellite Software Engineer Nick Manser featured on ABC News

Kanyini on the ABC

South Australian state satellite Kanyini was featured on ABC News recently in a great segment by reporter Gladys Serugga.

The report explores how the collaborative effort lead by SmartSat, incorporating work by local companies Myriota and Inovor Technologies and overseen by the South Australian Space Industry Centre, will provide essential data to increase bushfire preparedness and improve the management of natural disasters.

Watch the full report here.

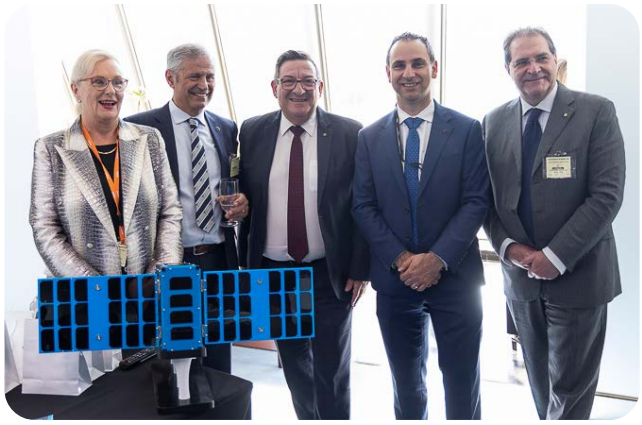
Upcoming Events

Look out for our 2023 events program at www.smarsatcrc.com. To stay up-to-date with all things SmartSat, follow us at www.linkedin.com/smartsatcrc

Past Events

Pyne & Partners Taste of Space at Parliament House

Late last year, the inaugural Taste of Space mini-exhibition initiative at Parliament House was held, with the aim of showcasing Australia's domestic space capability to Parliamentarians. SmartSat was represented at the event by SmartSat Board Director Dr Michele Allan, CEO Professor Andy Koronios and Adjunct Professor Nicola Sasanelli.



(L-R) SmartSat Board Director Dr Michele Allen, SmartSat CEO Professor Andy Koronios, Chair of Joint Standing Committee on Trade and Investment Growth Steve Georganas MP, Head of the Australian Space Agency Enrico Palermo and Adjunct Professor Nicola Sasanelli at the Taste of Space event

The event featured a welcome from Steve Georganas MP and Mr James Stevens MP, Co-Chairs of the Parliamentary Friendship Group followed by an address from The Hon Ed Husic MP, Minister for Industry and Science. All exhibitors then had the opportunity to showcase their product or expertise to over forty parliamentarians.

A Taste of Space participants also attended a private lunch with Senator for South Australia, Senator Marielle Smith, Parliament House Question Time and a Parliamentary Space Policy Roundtable with the Hon Paul Fletcher MP, Shadow Minister for Government Services and the Digital Economy, and Shadow Minister for Science and the Arts.

A number of SmartSat partners also participated in the event, including Fleet Space Technologies, Saber Astronautics and Spiral Blue.

SA Water staff at a Kanyini workshop at Lot Fourteen

Kanyini: one small satellite, one giant leap for our South Australian customers.

Over 20 innovators from SA Water came together at Stone & Chalk at Lot Fourteen this month to explore a new frontier for utilising space technology in a session facilitated by SmartSat Research Program Director, Craig Williams.

SA Water representatives discussed their role in the Kanyini mission, providing industry applications for SmartSat to develop use cases for int he hopes of solving some of the agency's most complex problems. Kanyini is the very first state-based satellite, scheduled to be launched into low Earth orbit in October 2023 as part of South Australia's Space Sector Strategy. The applications that space technology can assist with include water quality, vegetation and land management, climate impacts and emissions, water quantity and security.

Innovation Manager Megan Short and Innovation Adviser Alexis Kuchel designed and facilitated the event involving an expert panel, technical presentation, and an interactive User Experience workshop. The collaborative event involved experts from SA Power Networks, the Department for Environment and Water, Water Research Australia, Myriota, SmartSat and space experts from EY Melbourne.

The workshop generated over 30 use cases, which the SA Water Innovation Team will develop before presenting to SmartSat for evaluation to be incorporated into a payload onboard Kanyini.

SMARTSAT
COOPERATIVE RESEARCH CENTRE

USER INFORMED

INDUSTRY DRIVEN

RESEARCH POWERED

For more information:
info@smartsatcrc.com
smartsatcrc.com

SmartSat CRC Head Office:
Lot Fourteen, Level 2, McEwin Building
North Terrace, Adelaide, SA

@smartsatcrc