SCaN/ANU Collaboration for LCOT

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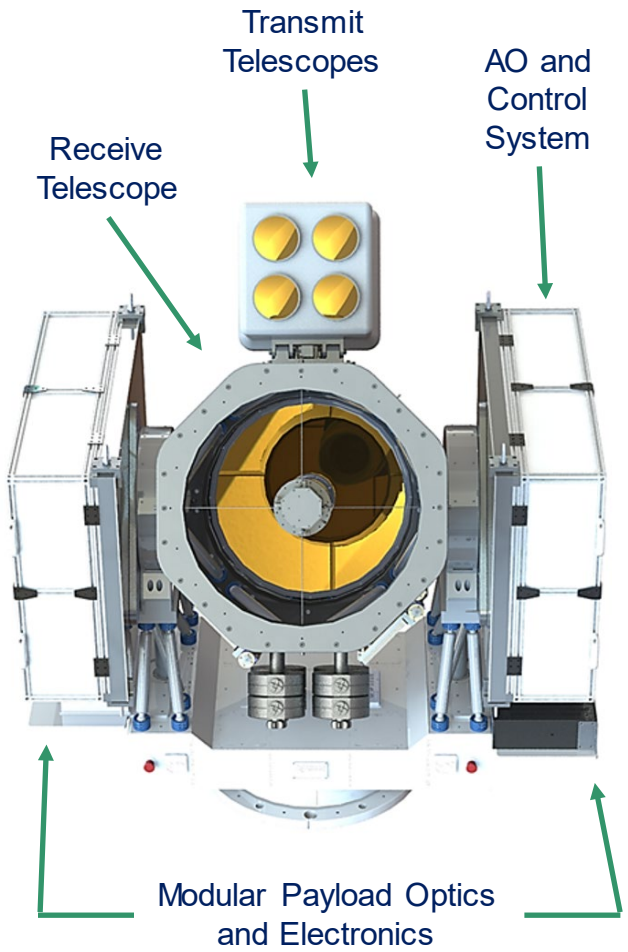
LCOT Program Objectives

- Design an optical communication ground system architecture with the flexibility to support a range of use cases while leveraging industry capabilities to the maximum extent possible
- Create a prototype for a modular, repeatable, multi-mission optical ground station
- Establish the infrastructure for proving and demonstrating advanced optical communications technologies and capabilities
- Cultivate a range of commercial vendors to provide specialized optical communications components
- Conduct experiments with optical communications flight projects to demonstrate evolving LCOT capabilities
- Collaborate with universities and other research entities to advance optical communication capabilities

LCOT System Description

- LCOT brings an unprecedented level of optical test capability to the Space Communication and Navigation (SCaN) and NASA
  - Modular, interchangeable optics, electro-optics, and modems
  - 70cm Receive aperture and custom gimbal for fast tracking and high stability with large receive area
  - Adaptive optics (AO) enables some technologies (esp. coherent and quantum comms) and improves the performance of all
  - Common test platform available for free space IR systems

LCOT Provides an Accessible, Powerful, and Affordable Platform for Optical Communication



- Current investments have provided telescope, AO, gimbal, infrastructure, and control software development
- Additional support of materials and personnel will:
  - Complete base LCOT system
  - Build and/or install following to support experiments with ground station including:
    - Transmitter telescope
    - Transceiver
    - Facility work
  - Prepare LCOT for future NASA, industry, and academia missions

LCOT Timeline

Built a shelter and 16' diameter dome at the Goddard Geophysical and Astronomical Observatory (Area 200).

Receiving non-coherent low rate optical comm

Received greenlight from SCaN to include adaptive optics, transmit telescopes, and modem

Receive Telescope FAT and Install

LCRD Phase A – Demonstration of AO capability for atmospheric conditions with downlink

LCRD Phase C – Demonstration of the NFOV/FSM state machine and fine tracker. Establish connection with the LCOT SCPPM modem.

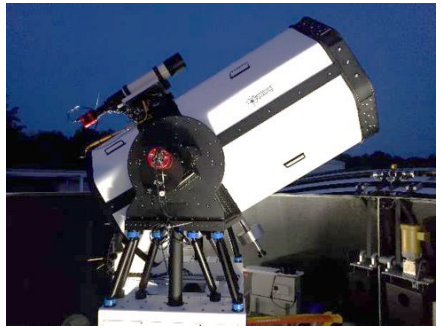
O2O Demo

LCRD Phase D

Calendar Year

2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024

Tracking LEO and GEO satellites



Received SCaN funding for large telescope to serve as an optical communications ground terminal.

Planewave Instruments (PWI) was selected to build a 70cm diameter telescope modified to meet the needs of optical communications

Received funding for Adaptive Optics (AO) and optical benches.

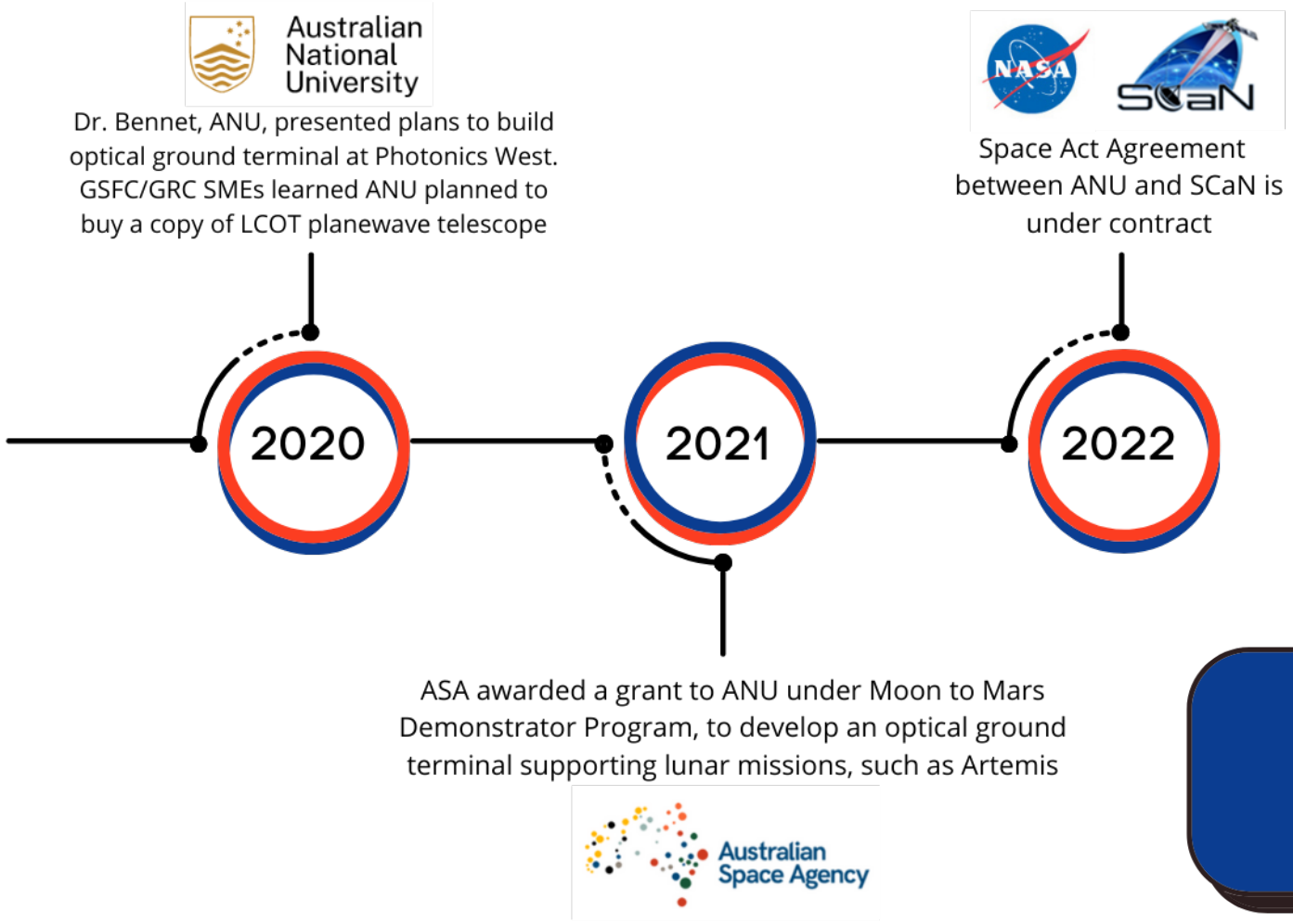
GuideStar was selected to develop AO system to meet need of optical communication. Design Interfaces Inc provide optics benches

Transmit Optical Assembly (XOA) Award

LCRD Phase B – Demonstration of the WFOV/Gimble state machine and coarse tracker

Future Coherent LEO, GEO and lunar optical and quantum communication

Background/Timeline of ANU Relationship



KEY POINTS

- LCOT is a blueprint for a future global network of optical ground terminals
- LCOT-based ground terminal deployment in the southern hemisphere expands the global optical network and increases coverage and availability for future Artemis missions
- ANU benefits from SCaN's optical comm expertise and technologies developed under LCOT
- The completion of the LCOT at GGAO is a catalyst for the completion of a companion system in the southern hemisphere

LCOT is a proving ground for SCaN technology developments in optical and quantum communications

Space Act Agreement
NASA/ANU Collaboration

Goals

- ANU-developed site based on LCOT GGAO design to facilitate interoperability.
- NASA can leverage and utilize this optical ground terminal with multi-mission capabilities in the future.

Scope of Collaboration

ANU

- Efficient tracking algorithm
- Remote operation monitor and control
- IOR optical ground station for future missions

NASA

- GSFC/GRC SME expertise
- GRC O2O-compatible transceiver
- GSFC transmit telescope design (TBD)

Both ANU and NASA will share test data and lessons learned throughout development and operations

LCOT Ground Terminal of the Future