

# Communications Systems

## WORKING WITH DEFENCE

### About UTS

The University of Technology Sydney (UTS) is one of Australia's leading universities, delivering research solutions and new technologies to the Defence and Aerospace industries. Our researchers work closely with Australia's Defence Science and Technology Group (DSTG), Australian Defence Force, Office of National Intelligence, U.S. Department of Defense, international Primes and local small-to-medium enterprises. We're proud to host the NSW Defence Innovation Network and co-host the NSW Space Research Network.

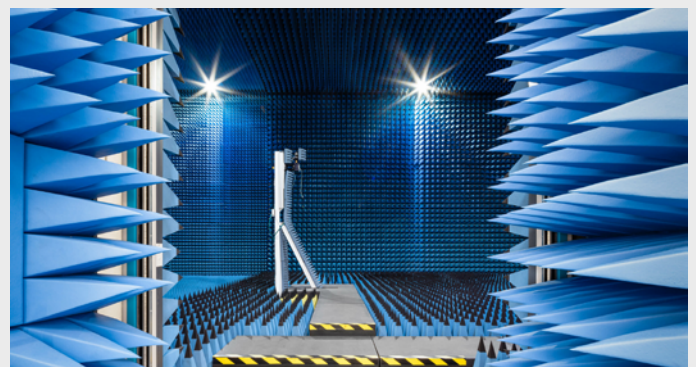


### Our Communications Systems Team

**UTS is ranked 13th in the world** in the field of Telecommunications. Our team of 10 professors and 15 academic staff includes renowned researchers including four IEEE Fellows and one former CTO of a major international antenna company. Our academics have won numerous awards, including the Engineers Australia Professional Engineer of the Year title in 2022 for Dist Prof Karu Esselle. He was also awarded both the Excellence Award and the Academic of the Year Award at 2022 Australian Space Awards, and the same two awards at 2021 Australian Defence Industry Awards. The MetaSteerers Team led by Dist Prof Esselle has been selected as one of the two Finalists for the 2023 national Eureka Prize for Outstanding Science in Safeguarding Australia for our collaborative research in Defence.

### Capabilities

- **Antennas and RF Technologies**  
We have world-class capabilities in antennas, millimetre-wave (mm-wave) and Terahertz (THz) devices and circuits. We have modern antenna measurement laboratories that provide and support cutting-edge RF, mm-wave and THz testing facilities.
- **Wireless Communications and Sensing**  
We have world-class capabilities in high speed and high-fidelity data acquisition, transmission and distribution. Our R&D expertise covers wireless communications and sensing including: wireless communication and signal processing; real-time implementation of various communication protocols and standards; prototyping of high-speed microwave, millimetre wave and terahertz communications devices and systems; self-interference cancellation for full duplex radio; MIMO anti-jamming communication; joint communication and sensing; radar imaging, mm-wave and THz capabilities; wireless and network cybersecurity; and non-invasive sensors for brain-computer interfaces.
- **Photonics and Optics**  
Photonics and optics technologies are vital to next-generation communications systems by enabling high-speed data transmission, secure information encryption, and advanced sensor technologies, enhancing the efficiency, security, and capabilities of modern military communication networks. Our expertise includes the development of complex photonics materials (integrated metamaterials and optical metasurfaces) and nanostructures, sensing, spectroscopy and photonic information processing.



Australia's largest fully anechoic chamber at UTS Tech Lab



## Some of our recent Defence research

### 5G and 6G Military Communications

We have recently undertaken a detailed analysis for DSTG of the challenges and vision of 5G and 6G communication technologies including MIMO, Network Slicing, mMTC, URLLC, Mobile Edge Computing, 5G Non-Terrestrial Networks and Satellite Communications in tactical military environments.

### Massive MIMO for Tactical Communications

We are working with DSTG on a development of a massive MIMO communication system with jamming suppression capabilities. A demonstrator and a lab trial has been successfully conducted.

### Cognitive Satellite Radios

We have been working with SmartSat CRC on the development of advanced cognitive radio technologies that maximise the throughput and availability of critical satellite communication systems in congested and contested environments.

### Millimeterwave intersatellite links

We have worked with DSTG to develop millimeter-wave phased array antenna systems for intersatellite links.

### Floating radars

We have worked with DSTG on the development of a floating radar prototype for reconnaissance missions to detect on-water surface target detection.

## Facilities

### – Antennas, RF Technologies and Wireless Communications and Sensing

Our anechoic antenna chamber is unique in the Southern Hemisphere with a size of 15m by 10m by 6m (high), a frequency range from 700MHz to 50GHz which can conduct both far-field and near-field measurement. Our mini compact range antenna chamber has frequency ranges of 8GHz to 26.5GHz and from 60GHz to 90GHz. Our ultra-compact EMC chamber allows fast and efficient EMC radiated tests without interference from the ambient electromagnetic environment, it has an operating frequency of 80MHz- 40GHz. It is suitable for CubeSats 4.2m x 3m x 2.5m. We also have mm-wave/THz equipment with a frequency of 20GHz to 600GHz for ultra-sensitive receivers employing high-temperature superconductors as well as ultra-fast wireless communication, high-resolution imaging, non-destructive testing and hyper-spectroscopy.

### – Fabrication

We have RF PCB prototyping machine, RF multilayer press machine for up to 8 layers, a SMT component placement machine (pick and place) and highly integrated electronic 3D devices with laser direct structuring (LDS). The LDS machine provides a unique way of integrating mechanical and electronic functions on moulded parts.

### – Electrical Facilities

We have various equipment for EMC testing, a real-time digital simulator (OPAL-RT), multi-time-scale computation capability, FPGA for microsecond operation such as power electronics and IoT devices; DSP for system level simulation. We also have a grid simulator and battery emulator.

### – Microstructural Analysis Unit (MAU)

Our MAU has several characterisation and fabrication tools including scanning and transmission electron microscopes, nanophotonics laboratories for the fabrication of single photon emitters, photonic crystal cavities and resonators for wideband gap semiconductors. Other capabilities available through the ANFF OptoFab Node at UTS include reactive ion beam etching (Intlvac Ion Beam Etcher and Trion ICP-RIE), diamond deposition and doping (Seki Diamond CVD reactors), cathodoluminescence SEM (Delmic SECOM CLEM) and tube furnaces (Labec 1500 and STF 1200) for annealing and growth for photonically active materials.

## Contact us

For more information on our Defence and Space capabilities visit:  
[uts.edu.au/defence-space](https://uts.edu.au/defence-space)

