InSpace
ANU INSTITUTE FOR SPACE

The Manager
Economics Advisory
Australian Communications and Media Authority
PO Box 13112 Law Courts
Melbourne Victoria 8010

Dear Madam / Sir,

This document contains the Australian National University Institute for Space's (InSpace) response to ACMA document IFC-39-2020-Response-to-implementation-of-SPR-paper.docx

T +61 2 6125 4629
inspace@anu.edu.au

Mt Stromlo, Weston Creek
Canberra ACT 2611 Australia

InSpace.anu.edu.au

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Comments on Focus Area 4: Geographic areas and bands

A disparity in the definition of radio emission

InSpace welcomes that ACMA will exploring a range of options to recognise the different values and incentives that can apply across different locations and frequency ranges and we seek to actively engage with ACMA during the described Work Program for this area on page 22-23.

In particular, there is a major concern about the current disparity between ACMA's treatment of optical communications compared to that of other countries and the International Telecommunications Union (ITU). ACMA regulates and taxes spectrum up to 420 THz, whereas the ITU only regulates for frequencies up to 3 THz. A detailed examination of the regulations of some other countries yields the following:

Country	Maximum Frequency Regulated
Australia	420 THz
International Telecommunications Union (ITU)	3 THz
USA	3 THz
UK	999GHz
France	3 THz
Germany	3 THz
New Zealand	3 THz
Brazil	3 THz

InSpace believes it would be beneficial to remove frequencies above 3 THz from the definition of radio emission. Only regulating spectrum up to 3 THz would bring Australia in line with global standards.

Optical communication links don't suffer from interference

Optical communications is an emerging communications technology that takes place at frequencies greater than 190 THz. Due to the larger frequency, optical communication transmissions behave very differently to traditional radio frequency (RF) transmissions making regulation of the optical communications spectrum unnecessary.

- Optical beams are highly directional and undergo a much smaller amount of divergence as they propagate than RF transmissions. In addition, optical signals are detected by optical telescopes which collect and focus light with apertures many orders of magnitude larger than the wavelength being received. Optical signals are only detected as intensity, as the wavelengths are too small for direct measurement of electric field. In these regimes, optical signals differ significantly from RF signals, with optical signals being practically immune from interference in the same manner as RF signals. This means that even closely spaced transmitters can easily be spatially separated at a detector with zero interference.
- Due to the low beam divergence, satellite-based optical communications signals are likely to cover ground spot sizes of hundreds of meters to several kilometres from Low Earth Orbit (LEO) and Geostationary Orbit (GEO), with potential to cover thousands of kilometres from deep-space. Even if signals from satellites overlap on the ground, the transmitter sources would have to be angularly closer than the diffraction limit of the receiver (typically milli to micro radians), which translates to very close proximity in orbit (tens of metres in LEO to hundreds of metres in GEO).

Interference between these optical signals is simply not possible unless it is intentional

A negative impact to optical communications research and development in Australia

The proposed license taxes for frequencies above 51.4 GHz, right up to 420 THz, could have significant impact on optical communications where large bandwidths are common. For a 100 GHz bandwidth optical communication signal, the proposed reduced High and Medium Density tax figures of $0.0003 per kHz would result in an annual tax of $30,000 for both uplink and downlink transmission. This total tax of $60,000 per year could have a large negative impact to universities and businesses developing optical communications technology.

Optical communications is one of the key focus areas highlighted in the Australian Space Agency's (ASA) recent Communications Technologies and Services (CTS) Roadmap with a potential to deliver advantage to Australia over the next decade. Continued regulation and taxing at optical frequencies contrary to that of other countries could make commercial activities in this area less competitive in Australia and prevent Australia from realising the advantage targeted in the ASA CTS Roadmap.