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ACMA Consultation: IFC 19/2020 – 26 GHz band spectrum licence draft legislative instruments.

Dear Manager,

CSIRO welcomes the opportunity to comment on the ACMA consultation IFC 19/2020 **"26 GHz band spectrum licence draft legislative instruments".**

CSIRO is responsible for the management and operation of the Canberra Deep Space Communication Complex (CDSCC) and other NASA facilities in Australia under a government to government treaty between Australia and the USA as well as a Cooperating Agency Agreement between CSIRO and NASA. CSIRO is also responsible to manage the operations of the European Space Agency (ESA) space research activities in Australia, including the operation of the Space Research Services (SRS) earth station at New Norcia in W.A. under the provisions of a long-standing Treaty between the Australian government and ESA. CDSCC and New Norcia are both integral and vital parts of the respective global networks represented as NASA's Deep Space Network (DSN) and ESA's tracking network (ESTRACK), respectively. Each provide ongoing and invaluable contributions to international space exploration. They both comprise substantial earth station assets developed over 50 years of cooperation including very large antennas at the NASA CDSCC facility and ESA New Norcia facility, enabling tracking of dozens of international Near-Earth and Deep-Space missions representing spacecraft assets in excess of $35 Billion dollars. Additionally, both NASA and ESA continue to invest substantial sums of money in expansion and upgrade projects to maintain a world leading space research and exploration capability in Australia. The capability for these stations to continue their space research work, under local management by CSIRO, is critically dependent on the ongoing interference-free access to the requisite radiocommunications frequency spectrum, as has been the case for over 50 years.

Concerning the ACMA's invitation to comment, CSIRO is pleased to hereby submit the following comments, against the specific questions presented in the two consultation documents. CSIRO's inputs, presented in red text, are as follows:

Issues for Comment

The ACMA invites comments on the issues set out in the two consultation papers:

Questions (from the 26 GHz licence technical framework consultation paper):

Draft spectrum marketing plan (26 GHz band)

We seek stakeholder views on the sample licence conditions set out in the draft marketing plan, including the uplink/downlink configuration to be used when the fallback synchronisation requirement is invoked (two options are included in section 3.4 of the draft RALI [new] at Attachment E).
The technical framework consultation paper recognises that (page 12) on the issue of higher TRP limits that concerns remained within the 26 GHz band TLG and that discussions were progressing and there were no agreed proposals. CSIRO presents detailed comments on our concerns regarding the proposed higher TRP limits (of up to 45 dBm/200 MHz) in a separate section (at the end of this submission).

The draft Radiocommunications (Unacceptable Levels of Interference - 26 GHz Band) Determination 2020

The ACMA seeks stakeholder views on the draft section 145 determination at Attachment A. No comment

The draft Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters - 26 GHz Band) 2020 (the RAG Tx)

The ACMA seeks stakeholder views on the draft RAG Tx at Attachment B.
CSIRO proposes (refer separate section at the bottom of this submission for details) that Part 3 Clause 9 "Protection Requirements" should specify that:

1. The spectrum licensee in the Perth region in specifically identified HCIS cells must limit the EIRP power spectral density To 48dBm/200MHz in the direction to the North towards the ESA Earth Station located at New Norcia.
2. The spectrum licensee in the Canberra region in specifically identified HCIS cells must limit the EIRP power spectral density to 48dBm/200MHz in the direction of the HCIS cell containing the NASA Earth Station located at Tidbinbilla.

The draft Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers - 26 GHz Band) 2020 (the RAG Rx)

The ACMA seeks stakeholder views on the draft RAG Rx at Attachment C. Not applicable.

The draft amendment determination

The ACMA seeks stakeholder views on the draft amendment determination at Attachment D. Not applicable.

Questions (from the Draft allocation instruments consultation paper): CSIRO has no comments on the questions in this consultation paper.

CSIRO comments regarding TRP, Coordination and Interference Protection

CSIRO, as manager of both the ESA New Norcia and the NASA Canberra Deep Space Communication Complex (CDSCC) at Tidbinbilla, has concerns due to some technical criteria and co-existence issues stemming from the details presented in the consultation documents released for public consultation under IFC 19/2020.

These concerns are fundamentally related to a number of proposals in the documents which are regarded as presenting potential co-existence issues related to sharing of the proposed new spectrum licensed IMT-2020 transmitters, including Base Stations (BS) and their client User Equipment (UE) and the existing, long established Space Research Service Earth stations at NASA's CDSCC and ESA New Norcia. These concerns relate to TRP's, UE registration and coordination zones.

The major concern relates to the proposal of ACMA to allow a variance of the initially defined TRP provided to the TLG participants for sharing consideration of 30dBm/200MHz to a level as high as 45dBm/200MHz. This change, (as

proposed in the draft Marketing Plan) if incorporated by ACMA, effectively invalidates the extensive sharing studies conducted on CSIRO's behalf by its space tracking Treaty partners, ESA and NASA and is cause for serious concern. Both ESA and NASA plan to support human space exploration missions in this band, demanding that the integrity of communication at CDSCC and New Norcia in this 26GHz band is fully protected and assured through regulation from the risk of interference as a safety of life matter. CSIRO presents below the issues that are identified, in turn, for both the ESA New Norcia Space Research Service Earth station and the NASA CDSCC Earth station.

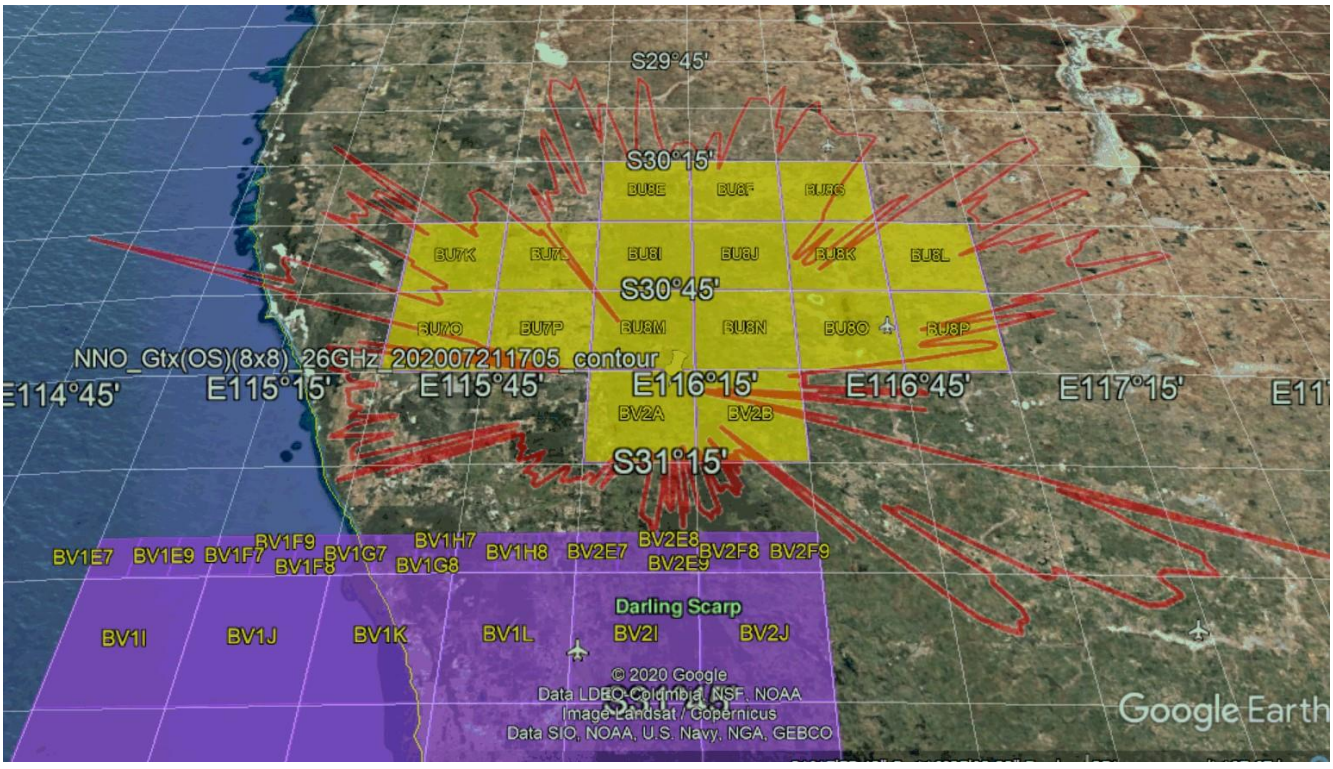
1. ESA New Norcia

Compatible TRP Limits for Co-Existence with New Norcia

For the ESA New Norcia SRS station, the sharing analysis conducted by ESA during the TLG was based on 25dBm/200MHz TRP in line with the TG 5/1 defined sharing study criteria. It was on this basis that the exclusion zone around New Norcia were determined and sharing with the spectrum licensees within the Greater Perth area and New Norcia was shown to be feasible. The ACMA's initial TLG assumptions already exceeded by 5 dB the studies done in ITU TG 5/1 leading to WRC-19 decisions.

CSIRO is concerned that these sharing arrangements will now be invalidated if the changes being suggested of a maximum TRP of 45dBm/200MHz Australia-wide are implemented towards the ESA New Norcia Earth station. Concerning the higher TRP, there is no obvious point at which the TRP of 45dBm/200MHz was accepted and agreed by consensus within the TLG. Rather, there is a suggestion in the final TLG document that if this higher TRP were to be implemented, then the spectrum licensees would be required to propose/implement appropriate emission mitigation measures. No mitigation measures below 5 degrees elevation have been proposed, but are needed to protect the Space Research Service Earth stations at New Norcia.

In response to this stated higher TRP, ESA conducted a recent sharing study which demonstrated an interference problem at New Norcia if the 45dBm/200MHz TRP (68dBm/200MHz EIRP spectral density) is implemented. The figure below extracted from that study illustrates the large area that could result in interference above the -156 dB(W/MHz) protection level at this proposed higher TRP (without mitigation measures).



As the bidders for the spectrum licenses will (if approved by ACMA) be assuming a baseline nation-wide approval of 45dBm/200MHz TRP within the spectrum license conditions, CSIRO believes that it is incumbent on ACMA to recognise and acknowledge the protection level exceedance demonstrated by the most recent ESA studies and to include in the

license conditions (as stated in Table 2 (page 13) of the 26GHz Spectrum License Technical Framework) the requisite mitigation measures that will be required to be applied by the IMT-2020/5G operators (including UE) to avoid this exceedance and preserve (through legislation) the current (ITU-R specified) protection criteria of -156dB(W/MHz) necessary for the protection of the operating environment at New Norcia.

It is noted that the justification presented by the prospective spectrum licensees to the TLG for this high TRP was that the spectrum licensees would implement mitigation techniques through modern beam-forming technologies to avoid potential interference to other apparatus licensed services. Therefore, if ACMA accept this higher TRP above those upon which the initial sharing studies with the Space Research stations were based, CSIRO believes that ACMA now need to formally impose as a license condition the strict use of the touted mitigation measures to ensure a reduced EIRP directed towards the New Norcia Earth station to that level initially stated by the ACMA upon which the TLG (and TG 5/1) sharing studies were based. This is a similar activity to those measures adopted within these technical and regulatory documents by ACMA for the protection of the FSS services.

The imposition of such regulatory (mitigation) protection measures are consistent with the obligations articulated in the current ESA/Australian government Agreement (dated 5 October 2011) which extends to ESA the protection of New Norcia from harmful interference within the 26 GHz band (and other bands).

Accordingly, consistent with these Treaty commitments, CSIRO believes pre-emptive measures are required by ACMA prior to the issuance of the spectrum licenses rather than the seemingly proposed blanket approval of the 45dBm/200MHz TRP Australia-wide and leaving the onus to ESA/CSIRO to coordinate with the spectrum licensees in a rear-guard defensive activity. This latter option is unacceptable and would also impose an unnecessary and onerous obligation on ESA/CSIRO to assign assets and effort to ongoing coordination, environmental RFI monitoring and interference source detection/identification.

In the spirit of proposing a cooperative resolution and to restore the acceptable sharing arrangements established within the TLG (studied by ESA on the basis of a TRP of 25dBm/200MHz), CSIRO therefore proposes that ACMA include in the associated spectrum license conditions (Under “Additional Conditions”) the following mitigation measures:

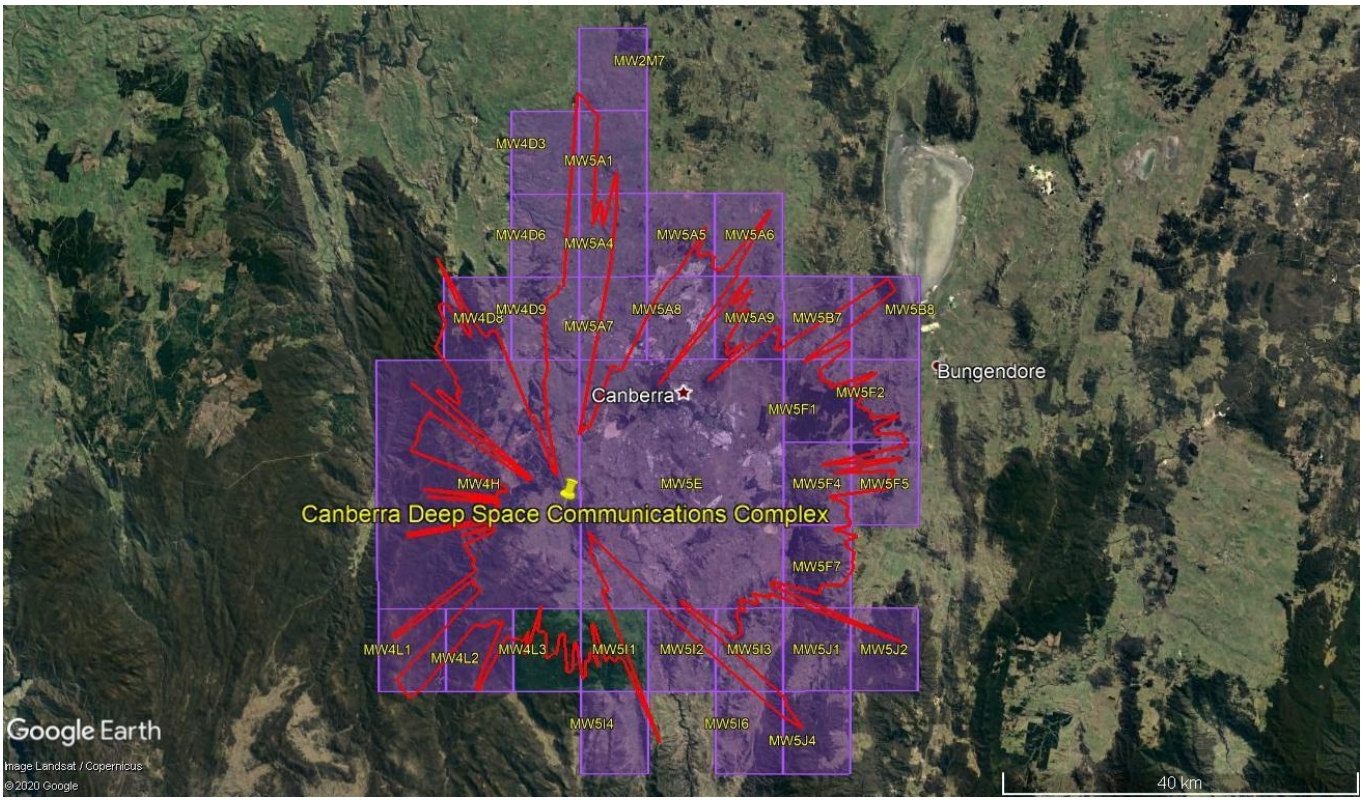
“For HCIS cells BV1H8, BV1H9, BV2E7, BV2E8, BV2E9, BV2F7, BV2F8, BV2F9 the maximum EIRP power spectral density is limited to 48dBm/200MHz radiated below 5 degrees elevation in a Northerly direction above these HCIS zones.”

2. NASA CDSCC

Compatible TRP Limits for Co-Existence with CDSCC

CSIRO has very similar concerns (to those described above for ESA/New Norcia) regarding the protection of the NASA CDSCC Earth Stations from interference in this band.

In response to the proposed higher base station TRP of 45dBm/200MHz, NASA conducted a recent sharing study which demonstrated an interference problem at CDSCC if the 45dBm/200MHz TRP (68dBm/200MHz EIRP power spectral density) is implemented. The figure below extracted from that study illustrates the large area that would result in interference above the -156 dB(W/MHz) protection level at this proposed higher TRP (without mitigation measures).



As the bidders for the spectrum licenses will (if approved by ACMA) be assuming a baseline nation-wide approval of 45dBm/200MHz within the spectrum license conditions, CSIRO believes that it is incumbent on ACMA to recognise and acknowledge the level of exceedance demonstrated by the most recent NASA studies and to include in the license conditions (as stated in Table 2 (page 13) of the 26GHz Spectrum License Technical Framework) the requisite mitigation measures that will be required to be applied by the IMT-2020/5G operators (including UE) to avoid this exceedance and preserve (through legislation) the current (ITU-R specified) protection criteria of -156dB(W/MHz) necessary for the protection of the operating environment at CDSCC.

It is noted, that the justification presented by the prospective spectrum licensees to the TLG for this high TRP was that the spectrum licensees would implement mitigation techniques through modern beam-forming technologies to avoid potential interference to other apparatus licensed services. Therefore, if ACMA accept this higher TRP above those upon which the sharing studies with the Space Research stations were based, then it is incumbent on ACMA to formally impose as a license condition the strict use of the touted mitigation measures to ensure a reduced EIRP directed towards the Tidbinbilla Earth stations to that level initially stated by the ACMA upon which the TLG (and TG 5/1) sharing studies were based. This is a similar activity to those measures adopted within these technical and regulatory documents by ACMA for the protection of the FSS services.

The imposition of such regulatory (mitigation) measures are consistent with the obligations articulated in the current government-to-government Treaty between the United States of America and Australia (dated 17 October 2017) which requires the Government of Australia to take all reasonable necessary steps to protect the NASA facilities (including CDSCC) from harmful radiofrequency interference. Consistent with these Treaty commitments, CSIRO believes pre-emptive measures are required by ACMA prior to the issuance of the spectrum licenses rather than the seemingly proposed blanket approval of the 45dBm/200MHz TRP Australia-wide and leaving the onus to NASA/CSIRO to coordinate with the spectrum licensees in a rear-guard defensive activity. Due to the potentially large number of base stations deployed around CDSCC, this would also impose an unacceptable, unnecessary and onerous obligation on NASA/CSIRO to assign assets and effort to ongoing coordination, environmental monitoring and interference source identification.

In the spirit of proposing a cooperative resolution and to restore the acceptable sharing arrangements established within the TLG (studied by NASA on the basis of a TRP of 25dBm/200MHz), CSIRO therefore proposes that ACMA include in the associated spectrum license conditions (Under “Additional Conditions”) the following mitigation measures:

"For HCIS cells MW4D3, MW4D6, MW4D8, MW4D9, MW4L1, MW2M7, MW5A1, MW5A4, MW5A5, MW5A6, MW5A7, MW5A8, MW5A9, MW5B7, MW5B8, MW5E, MW5F1, MW5F2, MW5F4, MW5F5, MW5F7, MW5I2, MW5I3, MW5I4, MW5I6, MW5J1, MW5J2, MW5J4, the maximum EIRP power spectral density radiated below 5 degrees elevation from Spectrum licensed emitters in a direction that would intersect HCIS zone MW4H6 (containing CDSCC) is limited to 48dBm/200MHz."

3. High Powered UEs for both New Norcia and CDSCC

Further, it is not clear at this stage the restrictions that will apply to the IMT-2020/5G high power UEs outside the current New Norcia and CDSCC exclusion zones. For instance, on page 13 of the technical Framework Paper, it is stated that "It is proposed that the TRP limits in Table 2 will apply to all transmitters (for example, base stations and user equipment)". This appears to allow high powered UEs to transmit at up to 45dBm/200MHz TRP, rather than the previously specified limit of 35dBm/200 MHz. CSIRO seeks assurance that ACMA studies indicate that under the proposed regulations, that geographical constraints will be imposed on the location of the UEs (mobile and fixed) to prevent (through geographic and EIRP limitations) exceedance of the requisite protection criteria at New Norcia and CDSCC.

The matter of CSIRO concern over the change by ACMA at the TLG to not require registration of high powered UE's (TRP >23dBm) has been raised several times, with the concerns still unresolved. For instance on 22 April 2020 the following comments were lodged with ACMA – "*Thank you for your email response (below), clarifying some of the points raised. While you have kindly elaborated on a number of matters raised, the one significant point of concern (raised in both the CSIRO submission and my email of 15 April 2020) relates to the proposal that appeared in the version 3 consultation documents which effectively presents as a fate accompli that high power UE's not be registered. CSIRO and their partner clients ESA and NASA firmly believe that if these high powered UE's (fixed and mobile) are not registered, this will present a heightened risk/uncertainty to control, monitoring and oversight of the deployment of the high-powered UE's. Unregistered devices prima facie increases potential for surreptitious, loosely constrained deployments (particularly for mobile high-powered UE's) in the vicinity of the SRS earth stations, which could well manifest as periodic, unaccountable bursts of interference (or worse) which will be difficult (and time consuming) for the SRS station to attribute to a particular device, locate it and engage ACMA in correcting the problem. It also appears that the decision of the high-power UE operators to coordinate is the unilateral prerogative of the new UE operator, with no identifiable trigger other than the operator's decision to initiate coordination. The current exclusion zones were of course established based on the characteristics of UE's with a TRP <23dBm.*

Registration would assure (through a formal, legislated process) that the requisite technical and operations coordination is properly undertaken between the high powered UE operators and respective SRS Earth station in all instances (say, for all high powered UE's within a TBD coordination radius of the respective SRS earth station). Accordingly, CSIRO, ESA and NASA requests a mandatory registration of high-powered UE's that facilitates coordination with SRS earth stations (to ensure that the coordination is not forgotten) and the associated geographic boundaries and operations parameters are clearly documented as approved outcomes in each case.

Finally, the summary points at the end of your email of 17 April 2020 provided a succinct clarification of two of the critical elements in the AWL operations criteria when operating in the vicinity of the SRS Earth stations at New Norcia and CDSCC. There may be great value in adding the following two dot points to the Apparatus License and Spectrum License consultation documents at the very end of the Section related to "Coexistence with SRS earth stations in 25.5 - 27 GHz" and in the related Appendices (such as Appendix A - Draft RALI [NEW] Section 3.4 titled "Coordination Requirements with SRS earth stations"). The dot points for inclusions are:

In summary:
- *all outdoor transmitters in 25.5-27 GHz with a TRP > 23 dBm will be required to directly coordinate with SRS earth stations*
- *no transmitters in 25.5-27 GHz (of any type) will be permitted to operate in an exclusion zone*

As the work of the 26GHz TLG has been terminated, it appears that (unless ACMA agree to amend the consultation documents to revert to include registration) this will need to be pursued by CSIRO, ESA and NASA during the public consultation phase."

CSIRO therefore requests ACMA reconsider the registration of high-powered UE's and their deployment restrictions, if higher TRPs of 45dBm/200MHz are now proposed.

4. Coordination

Finally, concerning coordination, the current proposed spectrum license documentation and associated draft legislation states that all spectrum licensed operators (Australia-wide) coordinate with CSIRO concerning sharing with the ESA New Norcia and NASA CDSCC Space Research Service Earth stations. As this will impose an avoidable and large coordination overhead, CSIRO proposes that instead, ACMA include in the spectrum license documentation the conditions currently articulated in RALI MS 43, concerning coordination with the current CSIRO apparatus-licensed 26 GHz band. In this regard, the RALI MS43 states:

"**3.1.2 Earth station receiver bands**

Co-Channel

Services that wish to operate in the earth station receive bands within:

- 400 km of New Norcia Earth station below 10 GHz (8400-8500 MHz); and
- 200 km of New Norcia Earth station for bands above 10 GHz (25.5-27.0 GHz and 31.8-32.3 GHz)

must coordinate their use by using the procedure set out in section 3.1.3 of this RALI. All services wishing to operate in these bands must assume co-channel operation. Additional guidance on coordinating with earth stations can be found in Appendix 7 of the Radio Regulations of the ITU."

Note: an update to RALI MS43 is currently in draft format with the ACMA that proposes the same coordination distance (200 km) for CDSCC as New Norcia. Therefore the same coordination distance is requested for CDSCC (Tidbinbilla).

5. Summary

Accordingly, in summary, CSIRO proposes that ACMA implement the following measures for ESA New Norcia and NASA CDSCC:

ESA New Norcia:

a. Stipulate in the 26GHz spectrum license suite of legislative and auction package that the EIRP power spectral density of emissions within all sectors to the North above the Northern boundary of the greater Perth HCIS IMT-2020/5G area be strictly limited to 48dBm/200MHz or less across the 25.5 – 27.0 GHz band.
b. A coordination zone centred on New Norcia and extending out with a radius of 200km be specified as a licensing condition and obligation on the successful 5G broadband Spectrum Licensees.
c. High-powered UE's (TRP>23dBm/200MHz) be registered with ACMA and coordinated with the SRS Earth stations and additionally no UE's be allowed to emit within the exclusion zone around New Norcia.

NASA CDSCC:

d. Stipulate in the 26GHz spectrum license suite of legislative and auction package that the EIRP power spectral density of emissions in a direction that would intersect HCIS zone MW4H6 (containing CDSCC) be strictly limited to 48dBm/200MHz or less across the 25.5 – 27.0 band.
e. A coordination zone centred on CDSCC and extending out with a radius of 200km be specified as a licensing condition and obligation on the successful 5G broadband Spectrum Licensees.
f. High-powered UE's (TRP>23dBm/200MHz) be registered with ACMA and coordinated with the SRS Earth stations and additionally no UE's be allowed to emit within the exclusion zones around CDSCC.

Thank you for the opportunity to consider and comment on the ACMA IFC 19/2020.

Yours Sincerely,

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