



**CSIRO Astronomy and Space Science Comments on  
“Legislative Proposals Consultation Paper – Radiocommunications Bill 2016”**

**29 April 2016**

**Introduction**

CSIRO Astronomy and Space Science (CASS) welcomes this opportunity to comment on the consultation paper in relation to changes to the Radiocommunications Act. CASS builds and operates national facilities for radio astronomy and for the space research service, which are recognised, for the purposes of spectrum management, as radiocommunication services by the ITU and the Radiocommunications Act 1992. Annexes 1 and 2 provide more information about radio astronomy and the space research service, respectively.

The radio astronomy and space research facilities operated by CASS represent substantial national and international investment and involve international commitments and obligations in spectrum management. Research in support of technology for these services has led to new technologies such as WiFi and improved antenna designs for the wider radiocommunications industry. We therefore have an interest not only in protecting our existing facilities but in facilitating the introduction of technologies which are more efficient in their use of spectrum. We appreciate the need to manage spectrum efficiently, as well as the challenge in finding the right balance between flexibility and certainty for incumbents.

**Spectrum management issues of concern for radioastronomy**

**Recognition of radioastronomy as a radio service**

Radioastronomy, although formally recognised as a radiocommunication service in spectrum management both internationally and nationally, has unusual requirements which are not always obvious to the wider spectrum management community. As a passive (non-transmitting) service with extremely sensitive receivers, operating at frequencies determined by natural processes, radioastronomy is particularly vulnerable to interference from active (transmitting) radio systems.

The current Radiocommunications Act identifies radio astronomy in somewhat convoluted terms, which have the potential for misinterpretation. For example, (with emphasis added)

**20 Radio transmissions for the purpose of measurement**

- (1) This Act applies in relation to:
  - (a) a **measurement transmission** made in the course of, or in relation to:
    - ... (ix) the making of astronomical or meteorological observations;  
in the same way as it applies in relation to radiocommunication.
- (2) This Act applies in relation to:
  - (a) a **measurement transmitter used** in the course of, or in relation to:
    - ... (ix) the making of astronomical or meteorological observations; or  
in the same way as it applies in relation to a radiocommunications transmitter.

Radio telescopes do not transmit; they receive emissions “transmitted” by astronomical objects such as stars or gas clouds. The wording “measurement transmission (or transmitter) in relation to the making of astronomical observations” is an awkward way of conveying the sense that radio astronomy systems are covered in the Act in the same way as more familiar radiocommunication systems. In particular, it does not make any reference to radio astronomy receivers. There is similar text in sections 157, 158 and 188A about non-standard devices and labelling.

Section 21 is more helpful:

## 21 Astronomical and meteorological observations

This Act applies to a **radio emission in connection with making astronomical or meteorological observations** in the same way as it applies to a radiocommunication.

In the case of radio astronomy, the emissions are from a distant astronomical object such as a star or gas cloud, which will occur regardless of any terrestrial legislation. Protection of such emissions does not necessarily equate to protection of the radio telescope receivers which are designed to detect those emissions.

The ITU Radio Regulations expresses the concept more clearly in 4.6: “For the purpose of resolving cases of harmful interference, the radio astronomy service shall be treated as a radiocommunication service.”

CASS requests that the description of radio astronomy observations in the revised Act be clearer in identifying that the radio astronomy service is considered a radiocommunications service for the purposes of the Act.

The “Legislative Proposals Consultation Paper” notes in section 1 that the proposed approach for the object of the Bill includes “provision of spectrum for public or community purposes.” Although the next paragraph extends the sense of “public or community” to include “defence or national security, law enforcement, meteorology and the provision of emergency services”, there is no mention of radio astronomy specifically, or of science services (including space research, earth exploration or others) in a general sense.

Also, the Consultation Paper refers on numerous occasions to “industry”, (for example, in section 5, “...improving certainty for industry.” and section 16 “devolving functions to industry.”) Following discussions with the Department of Communications, we understand that “industry” is meant to represent not just commercial entities but the whole range of spectrum users including community, government and science users. However, some stakeholders have expressed concern that in using the word “industry”, the Paper appears to give priority to commercial users of spectrum over non-commercial users, particularly science applications.

CASS requests that the current object of “protection for public and community services” be expanded to include, as a minimum, “science services” and provide specific examples. CASS further requests that the term “industry”, if used in further explanatory material, be clearly defined as encompassing all spectrum users, not just commercial entities.

### ***Continuity of protection for the radioastronomy service in Australia***

Radioastronomy is currently protected in Australia through a number of mechanisms. One is the allocation, in the Australian Radiofrequency Spectrum Plan, of particular frequency bands related to specific chemical signatures. These allocations are based on the international framework in the ITU Radio Regulations and, while important, do not cover the full range of frequencies used for radio astronomy.

Further protection for radio telescopes in New South Wales, South Australia, Tasmania and the ACT is provided in the ACMA Radiocommunications Assignment and Licensing Instruction (RALI) MS 31 (2006).

Radio telescopes (including the SKA) at the Murchison Radioastronomy Observatory (MRO) in Western Australia are protected by several ACMA regulations and policy. Details are given in Annex 3. These are essential not only for protection of current telescopes on the MRO, but to Australia’s role in hosting the international SKA project.

It is vital that the protections currently afforded to radioastronomy continue under the new Radiocommunications Act. In relation to the MRO, this is particularly important so that Australia can meet its commitments to the international community and gain the full benefit of the investment in SKA scientific infrastructure. In practice, this will require that the ACMA continues to have the authority to prepare frequency band plans (section 32), the authority to place conditions on transmitter licences under the proposed single licensing framework, and the authority to place conditions on the spectrum authorisations

which are proposed to replace class licences. It will also require that the technical limits (frequency, geographic, power spectral density, etc.) of the current instruments are maintained under the new spectrum management system.

The ACMA protection measures described above and in Annex 3 were subject to extensive public consultation in the past five years, and it would be impractical and inconsistent with our international commitments to go through another consultation process at this time.

CASS requests that the regulation and policy protecting radio astronomy, with the current technical limits, be maintained in the transition to the new spectrum management regime. CASS further requests that these measures be transferred to equivalent instruments as an administrative process, rather than being treated as new regulation or policy.

### ***Policy guidance***

Policy guidance needs to continue to be provided to the ACMA on radio astronomy, particularly in the ARQZWA, reflecting Australia's national and international commitments to protect radio astronomy. It is understood that, within the framework of the new Bill, policy guidance may be provided through Ministerial Policy Statements.

CASS requests that relevant Policy Statements are available during the transitional period so that the ACMA can make informed decisions about any changes which might affect radio astronomy.

### ***Interference management***

The Consultation Paper proposes “the Bill would provide enhanced scope for licensees to resolve interference and disputes, without recourse to the ACMA in the first instance” and “the ACMA may develop non-legislative interference management guidelines ... . The guidelines would encourage stakeholders to directly implement dispute resolution options without involving the regulator” but “the Bill will continue to provide the ACMA with the discretion and power to investigate and take action against interference, particularly where the interference is most serious (e.g. it relates to safety of life).”

Radio astronomy, while not a safety of life service, is particularly vulnerable to interference from other services. As noted above, continuing protection from interference is essential to meeting Australia's international obligations, particularly in relation to the MRO.

CASS seeks confirmation that the ACMA will continue to be available to investigate and take action against interference in regard to radio astronomy

### ***Spectrum management issues of concern for the space research service***

Many of the issues discussed above are also of concern to the space research service.

### ***Continuity of protection for the SRS in Australia***

The SRS is currently protected in Australia through a number of mechanisms. One is the allocation, in the Australian Radiofrequency Spectrum Plan, of particular frequency bands to the SRS for communications with space vehicles for scientific or technological research. These allocations are based on the international framework in the ITU Radio Regulations and may include additional Australian footnotes. Additional protection procedures for SRS facilities operating in Australia are specified in several ACMA documents including the Television Outside Broadcast (1980-2110 MHz and 2170-2300 MHz) Frequency Band Plan 2012 and in ACMA RALI FX21 (2015), RALI MS33 (2015), RALI MS37 (2013), RALI MS38 (2015) and RALI MS43 (2016). Various class licences also contain conditions related to the protection of SRS facilities.

CASS is responsible for the management and operation of the Canberra Deep Space Communication Complex (CDSCC) under a government to government treaty between Australia and the USA which specifies that the “Australian Government shall take all reasonable steps to protect the radio receiving facilities of the stations from harmful radio frequency interference from sources outside the stations”. It is vital that protections currently afforded to the SRS continue under the new framework. CDSCC is an

integral part of NASA's Deep Space Network (DSN) providing invaluable contributions to international space exploration including tracking of dozens of international Near-Earth and Deep-Space missions representing spacecraft assets in excess of \$35 billion dollars. SRS facilities in Australia have also been critical to safety of life issues related to manned space missions and this is expected to increase in future with multiple future plans for international manned space missions.

CASS requests that the regulation and policy protecting SRS, with the current technical limits, be maintained in the transition to the new spectrum management regime. CASS further requests that these measures be transferred to equivalent instruments as an administrative process, rather than being treated as new regulation or policy.

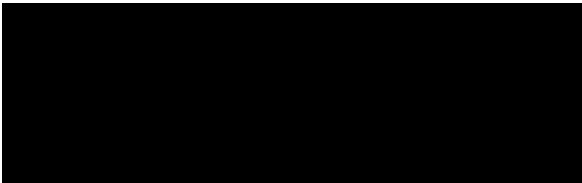
### ***Interference management***

CASS seeks confirmation that the ACMA will continue to be available to investigate and take action against interference in regard to the Space Research Service.

### **Conclusion**

CSIRO values the opportunity to provide input to the consultation process and the development of the revised Bill. We thank the Department and the ACMA for their hard work to date and look forward to continued opportunities for consultation and feedback during the detailed development of the new Bill and associated documents.

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## **Annex 1 – Background information on Radioastronomy**

Radioastronomy is the passive sensing of naturally-occurring emissions from objects in space, including stars, gas and dust, in order to understand the structure of the cosmos. These emissions are very faint in comparison to man-made radiocommunication signals, and radio astronomy telescopes are therefore extremely sensitive. The frequency of the emissions is determined by natural processes (such as chemical reactions or gas absorption) and then shifted in proportion to the distance of the object from Earth, so the frequencies of observation are determined by the nature of the object being observed and cannot be arbitrarily changed.

CASS operates radio telescopes at Parkes (NSW), Narrabri (NSW), Mopra (NSW), Tidbinbilla (ACT) and Murchison (WA). Radio astronomy is one of Australia's highest impact sciences, not only in science publications, but in technology development for radiocommunications in general. For example, the phased array feeds developed for the Australian Square Kilometre Array Pathfinder radio telescope have been awarded the Engineers Australia's national Engineering Excellence Award (2013) and the top prize in *The Australian Innovation Challenge* (2014).

CASS is also a leading participant in the Square Kilometre Array (SKA), an international mega-science project to build the world's largest radio telescope. Australia is a co-host of the SKA, along with South Africa. SKA is a 10 country project with an estimated operational lifetime of over 50 years. Phase 1 is expected to cost €650 Million, with a further Phase 2 as yet undefined. Participation in hosting the SKA represents a major opportunity for Australian industry to become deeply engaged in ground- breaking international radio communications technologies and big data computing challenges.

The Australian government, in recognition of the benefits that the SKA can bring to Australian industry and society, has set aside \$293.7 million under the National Innovation and Science Agenda to host SKA in Australia. This is in addition to the current investment in SKA-related radio astronomy infrastructure by various parties to date including:

- the Australian SKA Pathfinder (ASKAP), a pathfinder telescope already sited on the MRO, designed, constructed and managed by CSIRO;
- the Murchison Widefield Array (MWA), a low frequency radio telescope already sited on the MRO as a collaboration between Australia, USA and India; and
- Pawsey Centre, the supercomputer centre established in Perth to support data processing for ASKAP, MWA and ultimately the SKA.

## **Annex 2 – Background information on the Space Research Service**

The space research service (SRS) encompasses communication with spacecraft in Earth orbit, near Earth and those in deep space (for example, interplanetary or intergalactic probes). This communication includes telemetry, tracking and control of the spacecraft as well as reception of scientific data from the spacecraft's mission which can last for decades or more. Communications including "safety of life" functions have been provided for manned missions in the past and this is expected to become an increasingly important function in the future with multiple international plans for future manned space missions.

The frequencies used to communicate with spacecraft are based on international allocations under the Radio Regulations. While theoretically these could be varied, in practice it is difficult or impossible to retune the spacecraft after they have been launched. Continuity of protection for SRS frequencies is therefore important over the very long time frame of deep space missions.

CSIRO Astronomy and Space Science (CASS) is responsible for the management and operation of the Canberra Deep Space Communication Complex (CDSCC) under a government to government treaty between Australia and the USA as well as a Cooperating Agency Agreement between CSIRO and NASA.

CDSCC is an integral and vital part of NASA's Deep Space Network (DSN) providing invaluable contributions to international space exploration. It comprises substantial assets valued at many hundreds of millions of dollars developed over 50 years of cooperation including (in addition to its extensive real property assets) one 70m antenna and four 34m antennas including two new 34 metre antennas recently constructed involving an additional investment of over \$100 million dollars. The CDSCC facility enables tracking of dozens of international Near-Earth and Deep-Space missions representing spacecraft assets in excess of \$35 Billion dollars. The DSN through CDSCC also provides cross support for missions from many non-NASA agencies and countries including the European Space Agency, Japan and India. Additional SRS facilities in Australia with substantial investment include the ESA facility at New Norcia in Western Australia.

### **Annex 3 – Background information on the The Australian Radio Quiet Zone, Western Australia**

During its bid to host the SKA, Australia committed to actively protect the radio-quietness of the SKA site at the Murchison Radioastronomy Observatory in Western Australia. The effectiveness of the measures to protect the radio-quietness of the MRO was an important factor in the international decision that Australia would co-host the SKA. International treaty negotiations are currently underway to secure the arrangements for SKA in Australia. Under the treaty and associated hosting agreement, Australia will be required to formally confirm its commitment to ensuring radio-quiet conditions at the SKA site.

Mechanisms to protect the radio-quietness of the SKA site include radio frequency regulations implemented by Commonwealth Government under the Radiocommunications Act 1992:

- RALI MS32: Coordination of Apparatus Licensed Services Within the Australian Radio Quiet Zone Western Australia (2007, revised 2014);
- Radiocommunications (Mid-West Radio Quiet Zone) Frequency Band Plan 2011;
- Conditions on relevant spectrum licences;
- Conditions on relevant class licences.

Additional protection, particularly in relation to incidental radio emissions, is provided by measures implemented by the Western Australian Government and the Murchison Shire Council.

These mechanisms reflect the governments' commitment to protect the radio-quietness of the MRO as articulated in the 2011 intergovernmental MOU on radio-quiet.

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