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Attention
Mr Manyapelo Richard Makgotlho
Email: rmakgotlho@icasa.org.za

Date: 27 August 2021

Dear Mr. Makgotlho

**RE: NOTICE INVITING COMMENTS ON THE DRAFT UPDATE OF THE NATIONAL RADIO
FREQUENCY PLAN 2021**

This submission is made by the South African Radio Astronomy Observatory (SARAO) in response to the invitation by the Authority for interested stakeholders to submit written representations of the Draft Update of the National Radio Frequency Plan 2021. SARAO is a business unit of the National Research Foundation and it is responsible for overseeing radio astronomy in South Africa as well as coordinating Africa's involvement in the African VLBI Network (AVN).

Our submission is made up of three parts as follows:

Part A provide our general comments on the draft plan and suggest ways in which improvement can be done or confusion can be illuminated.

Part B addresses some of the issues that affect radio astronomy due to decision taken in previous world radiocommunication conferences and also identify potential threads to RAS in the current WRC agenda items.

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The South African Radio Astronomy Observatory (SARAO) is a National Facility managed by the National Research Foundation and incorporates all national radio astronomy telescopes and programmes. SARAO is responsible for implementing the Square Kilometre Array (SKA) in South Africa.

Part C addresses the modification to section 5 of the Draft Update National Radio Frequency Plan 2021 to include the developments in the establishment of the Karoo Central Astronomy Advantage Area regulations and the establishment of a Radio Quiet Zone.

We thank the Authority for the opportunity to make our written representation, which are made in the spirit of improving the quality of the document as well as the protection of radio astronomy in south Africa and in Africa. Furthermore, we would like to indicate our intention to participate in public hearings or any other public participation process that the Authority may undertake regarding the update to the band plan.

Regards,



Mr Selaelo Matlhane

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Annexure A: General comments on the draft plan

Part A

General Comments of the Draft Update of the NRFP 2021

This section of SRAO's submission consist of general comments aimed at improving the quality and providing clarity of the draft NRFP2021. More details are included in the comments section of Annexure 1 to Part A of SRAO's submission.

SRAO would like to propose that in the future, either the Authority publishes several drafts of the draft update of the NRFP or develops plan together with interested stakeholders before draft publication. Some of the issues that are not clear on this draft publication may be significant and of material nature and important in informing stakeholder's response to the draft publication.

For example, in section 8 of the draft publication, the Authority provides a list of frequency bands used for Maritime Services. There are many Maritime allocations that are not included in the list, for example, the bands 14 – 19.95 kHz, 20.05 – 70 kHz, 1625 – 1635 kHz and many others are allocated to Maritime services on a primary basis. It is possible that the Authority's intention was to provide a list of Global Maritime Distress and Safety Systems (GMDSS). But, this simple omission informs how the stakeholder responds to the draft update of the NRFP.

In many instances, the draft NRFP2021 makes explicit allocations to services that are allocated through the Radio Regulations footnotes. There are instances where this is desirable, especially in allocations that makes explicit mention of SA in the footnote. But in many other cases, this is not desirable as it clutters the document and makes it very difficult to compare the plan with the Radio Regulations. This format was also considered in the development of the AfriSAP but the challenges were discovered during the meeting sessions. There are several instances, where the footnote does not mention if the allocation is secondary or primary and in other instances the draft NRFP allocates a service on a Primary basis when it is actually allocated on a secondary basis through the footnote. It is, therefore, proposed that unless if it is really necessary, the NRFP2021 follows the Radio Regulations. Care should also be exercised when deleting footnotes that are not applicable to SA. Footnotes that does not include SA but includes a neighbouring country should be retained to highlight a possible different use in one of our neighbours.

The draft NRFP2021 has several errors, that makes it difficult for stakeholders to make necessary comments in the time frame that is afforded. In the example for the allocation below,

ITU Region 1 allocations and footnotes	South African Allocation and footnotes	Typical Applications	Additional information
<p>14 – 19.95 kHz</p> <p>FIXED</p> <p>MARITIME MOBILE 5. 57</p> <p>5.55 5.56</p>	<p>14 – 19.95 kHz</p> <p>FIXED</p> <p>MARITIME MOBILE 5. 57</p> <p>STANDARD FREQUENCY AND TIME SIGNAL</p> <p>5.56</p>	<p>Maritime Mobile communication</p> <p>Inductive Loop Systems (9 – 135 kHz) SRDs – inductive short-range radiocommunication (9 kHz-135 kHz)</p>	<p>Radio Frequency Spectrum Régulations as amended (Annex B)</p>

The allocation above is copied from the draft NRFP2021. The Authority provided the colour coding in page 5 of the draft NRFP2021 and yellow signifies general changes between RR 2016 Edition and RR 2020 Edition. But the Radio Regulations 2020 did not make any changes to this allocation, it looks exactly the same as the Radio Regulations 2016. The colour coding, editorial errors, table of frequency allocation missing other lines to separate adjacent allocations and the many changes that are done on the footnotes make it very difficult to read the document and respond appropriately within the timeframe provided.

SARAO, therefore, proposes that the Authority present the table of frequency allocation as provided in Annexure 1 to Part A. The table (Annex 1) proposes that the Table of Frequency Allocation to be aligned with the ITU-R Region 1 allocation as much as possible and without unjustified deviations. It is proposed that services permitted for use through footnotes, remains in the footnote and not allocated separately as it has been done in the draft NRFP2021. The table as it is in the draft NRFP2021 contains onerous details, where perhaps, readers of the document can be referred to a separate publication.

Comparing the draft NRFP2021 with other international best practices, column four, containing general comment should be used to give further clarity, but column 3 for typical application, should remain fairly simplistic giving only the service/application being used while column 1 and column 2 should contain only basic information relating to the allocation.

SARAO has updated the draft NRFP2021 and attached the update as Annexure 1 to this Part A. However, due to time constraint, it could only be done in detail up to 1000 MHz. Beyond 1000 MHz only column 1 and column 2 of the NRFP2021 has been updated, with exceptions to bands allocated RAS. In cases of RAS, SARAO has also provided proposed updates to column 3 and column 4 of the draft NRFP, up to 50 GHz.

Annexure B: Issues that affect radio astronomy

Part B

Impact of WRC decisions on protected radio astronomy services

The purpose of this section is to highlight the impact of WRC decisions on radio astronomy observatories that are located in areas that are not declared as radio astronomy advantage areas. No. 5.149 of the Radio Regulations offers satisfactory local protection in listed frequency for observatories not located in protected areas.

The following table provides a list of WRC Resolution, the affected frequency band and the impact on radio astronomy allocations. Telescopes such as MeerKAT and other that are located inside KCAA benefit from the established RQZ. However, telescopes such as HartRAO, which are located in non-RQZ areas, should be protected on the established provisions of the radio regulations.

WRC Resolution	IMT band (MHz)	Impacted RAS band (MHz)
Resolution 223 (Rev. WRC-15)	1 710 – 1 785	1 718 – 1 722
Resolution 223 (Rev. WRC-12)	2 500 - 2690	2 655 – 2 690
Resolution 223 (Rev. WRC-15)	3 300 – 3 400	3 332 – 3 339 and 3 345 – 3 352.5

The above mentioned RAS bands are protected under No. 5.149 which reads as urges administrations to take all practicable steps to protect the radio astronomy service from harmful interference. As a result, recent discussions in national preparatory meetings for WRC-23 concluded that the Authority shall establish means to offer satisfactory protection for all radio astronomy stations that are notified to the ITU operating in these RAS bands.

The Authority has not proposed any protection measures on the draft NRFP2021. SRAO has three radio astronomy stations notified to the ITU-R that are located near the Hartebeestport dam and that undertakes observations in the aforementioned bands.

It is proposed that, until adequate technical studies can be established to determine the separation distance between a radio astronomy station and IMT stations, all IMT stations located within 15-km radius of notified radio astronomy earth stations, coordinate their operations and technical parameters with SRAO, so that satisfactory conditions can be established for RAS observations. The separation distance is based on the practicality, given the location of the observatory. However, a technically determined separation distance will have to be established before the next development of the band plan.

Annexure C: National Radio Frequency Plan – Section 5 on Radio Astronomy

Part C

Update to Section 5 of the National Radio Frequency Plan 2018

SARAO appreciates the support given by the Authority with the inclusion of section 5 in the National Radio Frequency Plan 2018 (NRFP2018). The inclusion of the section creates awareness to ICASA's radio frequency spectrum stakeholders on the possible restrictions and/or prohibition on spectrum use that may exist in the Northern Cape province. Such restrictions aimed at the protection of the observations undertaken by the SKA premier radio telescope and other radio astronomy instruments hosted in the established radio quiet zone.

Section 5 of the draft NRFP2021 is a bit outdated and since the publication of the NRFP2018, there have been several spectrum management and regulatory developments in the Karoo Central Astronomy Advantage Areas (KCAAs). Hence, this submission is made to request that the Authority considers update this section to reflect the development, ensure the protection of radio astronomy earth stations located outside KCAA, further strengthen awareness to interested spectrum users in the Northern Cape Province and support the government's effort in establishing a radio quiet zone for the observations undertaken by the SKA.

The following developments prompts the need to update this section to reflect the spectrum usage restrictions and/or prohibitions in the final publication of the National Radio Frequency Plan 2021.

- The Karoo Central Astronomy Advantage Areas regulations were only published in December 2017, which was several months after the public consultation process on the draft NRFP2018.
- The list of radio frequency bands permitted for use in the Karoo Central Astronomy Advantage Area was first published in 2019 and recently developed in 2021.
- The MeerKAT and HartRAO radio telescopes were published in the MIFR in 2018 and the SKA radio telescope is currently filed and is currently published "As Received" only and awaiting final publication by the BR.
- In September 2018, South Africa contributed to the development of Revision of Report ITU-R RA. 2259, which is now in the final stage. The establishment of the radio quiet zone in SA is regarded amongst international best practices for protection of radio astronomy areas.
- The impact of WRC-15 and WRC-19 decisions, particularly with the allocation of IMT in frequency band(s) or adjacent to frequency bands listed in No. 5.149 of the Radio Regulations.

On the basis of the above, we request that the Authority considered our request to update section 5 of NRFP2018, as provided in the next section, to reflect recent development in the country's effort to protect the SKA.

5 RADIO ASTRONOMY

The Astronomy Geographic Act, 2007 (AGA Act No. 21 of 2007) provides the legal basis and framework for the declaration of astronomy advantage area and protection of such areas from harmful radio frequency interference that may hamper the cosmic observations by scientific instruments located within those areas. The authority develops the national spectrum allocation, assign frequencies to licensees, and monitor compliance with licence terms. The Astronomy Management Authority (AMA) within the Department of Science and Innovation was assigned to management the declared Karoo Central Astronomy Advantage Areas (KCAAAAs). The Authority gave notice to all radio frequency spectrum licensees operating within the KCAAAAs to apply for a permit with the AMA in terms of KCAAAAs Regulations; through [GG No. 42080 under Notice No. 765 of 4 December 2018](#).

This section provides information on the regulatory framework established for the protection of radio astronomy in South Africa.

5.1 DECLARATION OF ASTRONOMY ADVANTAGE AREAS

The Minister responsible for science and technology may declare any area or part of an area in the Province of the Northern Cape as an astronomy advantage area to be protected, preserved and properly maintained in respect of radio frequency interference or interference in any other way.

- i. The whole of the territory of the Northern Cape Province excluding Sol Plaatje Municipality is declared for radio astronomy purpose, as Declared in [GG No. 32951 Notice No. 115](#) of 19 February 2010.
- ii. The Karoo Core Astronomy Advantage Area (KCoreAAA) is used for the purposes of radio astronomy and related scientific endeavours, as declared in [GG No. 33462 Notice No. 723](#) of 20 August 2010.
- iii. The Karoo Central Astronomy Advantage Area (KCAAAAs) is used for the purpose of radio astronomy and related scientific endeavours, as declared in [GG No. 37434 Notice No. 198](#) of 12 March 2014.

The purpose of the declaration of areas as astronomy advantage areas is to ensure that the geographic area, which are suitable for astronomy and related scientific endeavours is protected, preserved and properly maintained in accordance with good national and international practices.

5.2 REGULATIONS OF ASTRONOMY ADVANTAGE AREAS

The Minister responsible for science and technology may make regulations for the management and protection of astronomy advantage areas.

- i. Regulations on radio astronomy protection levels in astronomy advantage areas declared for the purpose of radio astronomy were published in Government Gazette [No. 35007 under Notice No. R. 90](#) of 10 February 2012.
- ii. Regulations to prohibit or restrict certain activities in the core astronomy advantage areas declared for the radio astronomy purposes were published in Government Gazette No. [35450, under notice No. R. 465](#) of 22 June 2012.
- iii. Regulations on the protection of the Karoo central astronomy advantage areas declared for the purpose of radio astronomy were published in Government Gazette [No. 41321, under Notice No. 1411](#) of 15 December 2017.

The Minister obtained concurrence of ICASA when making regulations for prohibiting or restricting activities that have an adverse effect on astronomy and related scientific endeavours.

5.3 ASTRONOMY DEVICES

The Minister may declare any existing or proposed scientific endeavour to be astronomy and related scientific endeavours for the purpose of the Astronomy Geographic Advantage Act.

- i. The establishment and operation of MeerKAT telescope is declared a scientific endeavour in Government Gazette [No. 33614, under Notice No. 897](#) of 15 October 2010.
- ii. The establishment and operation of Square Kilometre Array (SKA) telescope is declared a scientific endeavour in Government Gazette [No. 33614, under Notice No. 897](#) of 15 October 2010.
- iii. The operation of C-BASS telescope within the spectrum between 4.5 GHz and 6.5 GHz is declared a scientific endeavour in Government Gazette [No. 36826, under Notice No. 684](#) of 13 September 2013.
- iv. The development and operation of PAPER telescope and HERA telescope within the spectrum between 100 MHz and 200 MHz is declared a scientific endeavour in Government Gazette [No. 36826, under Notice No. 684](#) of 13 September 2013.

5.4 SPECTRUM LIST EXEMPTED FROM PROHIBITION

From one (1) year after the date that KCAAs Regulations become operational, no licensee or licence exempted operator shall use, or continue to use the radio frequency spectrum from 100 MHz to 25.5 GHz to conduct radio transmissions within the declared KCAAs, unless the spectrum is exempted from prohibition. The Minister published a list of the radio frequency spectrum and applications that are exempted from the prohibition of use for transmissions located within the KCAAs in Government Gazette No. 45045, under Notice No. 753 of 26 August 2021.

5.5 ASTRONOMY FACILITIES WITHIN THE DECLARED AREAS

The use of radio frequency bands in the areas declared as Karoo Core and Central Astronomy Advantage Areas are regulated as follows:

Unless required for the purpose of radio astronomy and related scientific endeavours the use of the radio frequency spectrum in Table 1 is restricted within the declared as Karoo Core and Central Astronomy Advantage Areas.

Table 1: Restrictions on the use of radio frequency spectrum

Declared Area	Prohibited Band
KCoreAAA	9 kHz to 3 000 GHz
KCAAA 1	100 MHz to 2 170 MHz
KCAAA 2	100 MHz to 6 GHz
KCAAA 3	100 MHz to 25.5 GHz

In terms of section 22(6) of the Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007), read with section 30(1) and section 31 of the Electronic Communications Act, 2005 (Act No. 36 of 2005) ("ECA"), the Authority has an obligation not to issue Radio Frequency Spectrum Licences where frequency used could cause radio frequency interference ("RFI") in the KCAAA. As a result, the Authority has put measures in place to ensure that it fulfils its role of preventing RFI in the KCAAA when licensing radio communication and broadcasting spectrum licenses. The Authority shall apply the necessary enforcement steps in terms of section 31 of the ECA and relevant regulations pertaining to the failure by a Radio Frequency Spectrum Licensees to comply with the provisions of the ECA including Notice No. 765 in Government Gazette No. 42080 of 4 December 2018.

5.6 ASTRONOMY FACILITIES OUTSIDE THE DECLARED AREAS

The radio instruments located at Hartebeesthoek Radio Astronomy Observatory near Pretoria are registered in the ITU-R MIFR and they include HART15M, HARTRAO and HARTVGS. The observations undertaken by these instruments in RAS bands are globally recognised and internationally protected. The applications and services operating within a 15 km radius from the location; Latitude 25°53'24.06"S and Longitude 27°41'7.45"E; must coordinate with SARA0 and give due consideration when operating stations in frequency bands listed under No. 5.149, also identified in the NRFP2021 table of frequency allocation.