8 March 2013

Submission by SKA South Africa on the Draft Update of the Terrestrial Broadcasting Frequency Plan 2013

1. Background and purpose of the written submission

1.1. The South African SKA Project Office (SASPO) made several written submissions in response to the public consultations carried out by the Authority in the period 2008-2009 on the drafts of the Terrestrial Broadcasting Frequency Plan 2008. The submissions were followed up with participation in hearings or workshops held by the Authority.

1.2. The written and oral submissions addressed the matter of protection for radio astronomy in the Northern Cape Province in terms of the Astronomy Geographic Advantage Act that was promulgated on 17 June 2008 and made operational on 24 April 2009. The submissions addressed, in particular, the protection required for the SKA radio telescope for which South Africa had submitted a hosting bid with the core and central portions located within the Northern Cape Province.

1.3. The Minister of Science and Technology declared the whole of the territory of the Northern Cape Province excluding Sol Plaatje Municipality for radio astronomy purposes in terms of section 5(1)(a) of the Astronomy Geographic Advantage Act on 19 February 2010.

1.4. After the Final Terrestrial Broadcasting Frequency Plan 2008 was published on 18 November 2009, SASPO submitted a draft request to ICASA during 2010 for the amendment of the Frequency Plan. The Draft Amendment Request dealt in detail with the frequency assignments in the plan that would cause substantial radio frequency interference to radio astronomy observations in the Karoo Core Astronomy Advantage Area declared on 20 August 2010 and in the Karoo Central Astronomy Advantage Area 1 that is currently receiving attention to be declared. Meetings of the ICASA Special Committee on the Astronomy Geographic Advantage Areas were attended.

1.5. The South African SKA Project Director sent the Request for the Amendment of the ICASA Final Terrestrial Broadcasting Frequency Plan 2008 to the Chairman of ICASA on 6 June 2011. ICASA proceeded to draft a document containing the amendments requested for certain assignments in the Frequency Plan with the intent to publish the document for public comment.

1.6. The Minister of Communications published the Amendment of the Broadcasting Digital Migration Policy in Government Gazette No. 35051 on 17 February 2012. The Amendment includes certain statements with that affects the position of broadcasting signal distribution in the Northern Cape Province and that of radio astronomy for which the Province has been declared. Two statements are significant on this matter:

1.6.1. Extract from page 8, item 2.1.4 in the Gazette:

The government will also consider extending the incentive schemes to households that can only experience free-to-air digital services via DTH platform, to ensure close to 100% coverage, which include the following signal distribution realities

a) Self-help Stations;

b) Low Power Stations;

c) Northern Cape Astronomy Geographic Advantage Act 21 of 2007;

d) Areas that may be deemed difficult or uneconomical.

1.6.2. Extract from page 12, item 2.1.4 in the Gazette:

Areas that are difficult to reach will be covered through DTH by satellite means.

1.7. When the hosting of the major portion of the SKA was awarded to South Africa during 2012, the amendment requirements submitted by the SKA Project Office were adjusted to accommodate the outcome of the award. The lower frequency part of the SKA was awarded to Australia and therefore the lower frequency end of the protection required South Africa was moved from 70 to 100 MHz and with the retention of the existing use of the radio frequency spectrum between 100 and 200 MHz.

1.8. The Draft Update of the Terrestrial Broadcasting Frequency Plan 2013 has excluded some of the assignments requested to be restricted, in particular the “theoretical” assignments and the spare television frequency assignments at the Carnarvon station. Annexure L includes lists of frequency assignments as “Proposals to create the “radio quiet zone”” that needs to be restricted in order to obtain the required radio astronomy protection with respect to these assignments.

1.9. The Draft Update of the Terrestrial Broadcasting Frequency Plan 2013, on the other hand, includes many new frequency assignments related to digital audio broadcasting and digital terrestrial television broadcasting of which many of those within the Northern Cape will cause substantial radio frequency interference to radio astronomy. These assignments will impact the position of the SKA in South Africa quite negatively and will breach a position of good faith established in the award of the hosting of the major portion of the SKA to South Africa. It is a pity that such a situation may be allowed to develop as the volume of the assignments made for terrestrial digital broadcasting in the Northern Cape Province cannot be economically justified and would not be affordable.

This development also seems to be in contradiction to the Amendment of the Broadcasting Digital Migration Policy referred to in 1.6 above.

1.10. It is the purpose of this written submission to address the adequacy of the provisions in the Draft Update of the Terrestrial Broadcasting Frequency Plan 2013 to contain the impact of the frequency assignments previously identified as detrimental to radio astronomy and the new assignments for digital broadcasting, all within the declared or yet to be declared areas. The matter will be addressed in detail in the items that follow.

2. Position of the Draft Update of the Terrestrial Broadcasting Frequency Plan 2013

2.1. Under Introduction and Background in Chapter 1, it is merely stated that: *This document is to be read in conjunction with the National Radio Frequency Plan*.

2.2. The Final Terrestrial Broadcasting Frequency Plan 2008 published on 18 November 2009, stated under Introduction and Background in Chapter 1 that: *The Authority is publishing final terrestrial broadcasting frequency plan 2008 in terms of sections 30 (1) and 34 of the ECA, as an annexure to the National Radio Frequency plan. This document should thus be read together with the National Radio Frequency plan.* (Correction made in quote with regard to duplicated words).

2.3. It considered essential that the Terrestrial Broadcasting Frequency Plan 2013 is published as an annexure to the National Radio Frequency Plan in order to determine its validity in terms of the Electronic Communications Act.

2.4. As an annexure of the National Radio Frequency Plan, the measures prescribed in the National Radio Frequency Plan will also be applicable to the Terrestrial Broadcasting Frequency Plan 2013.

2.5. As far as radio astronomy in the Northern Cape Province and compliance with the Astronomy Geographic Advantage Act is concerned, the provisions in the current Draft Update of the National Radio Frequency Plan, in particular Chapter 4, are necessary to be applicable to the Terrestrial Broadcasting Frequency Plan 2013.

3. Chapter 2 on Guiding Principles

3.1. The first sub item on Categorization of Services apparently provides for the guiding principles to be applied in the categorization of frequency assignments into the different categories of broadcasting services, i.e. public, commercial and community.

3.2. If that is the case, then it seems that the factors listed are those to be considered when frequencies are assigned and categorised. The order in which they are listed may then be an indication of their priority in the decision making process.

3.3. On the assumption that the foregoing statements are correct, it not considered to be correct that the *Restrictions prescribed by the Astronomy Geographic Advantage Act* would be the least important or a deciding factor. The protection required by a restriction on a frequency assignment may be the most critical factor in a declared astronomy advantage area.

3.4. The bullet item on restrictions should rather be deleted and a paragraph inserted below the bullet items, as follows: “The availability of frequencies to be assigned within astronomy advantage areas declared in terms of the Astronomy Geographic Advantage Act may be affected by restrictions on radio frequency spectrum use within the declared areas”.

4. Chapter 2 on Guiding Principles, section 2.4 on Other Pertinent Issues

4.1. The intent of the statements under the sub title "Square Kilometre Array (SKA)" is appreciated; however, some rephrasing is required to correct certain aspects, as set out in the following sub items.

4.2. First sentence: *All existing and future assignments/allotments in the broadcasting frequency bands depicted in Table 1 ~~for the Northern Cape Province~~, that are located within the declared core or central astronomy advantage areas within the Northern Cape Province and within the radio frequency spectrum to be protected, will be subjected to the restrictions prescribed by the Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007)(AGA Act).*

4.3. Second sentence: *In the plan all theoretical sites within the Northern Cape Province have been excluded to ensure compliance to the AGA Act requirements.*

4.4. Third sentence: *The Authority endeavoured to initiate a separate process for further engagement of affected broadcasting licensees to devise alternative broadcasting transmission facilities/means for the SKA demarcated area.* This sentence should be deleted as it does not seem to serve any particular purpose and as some affected broadcasting licensees could argue about their non-involvement in the endeavours.

4.5. Fourth sentence: *The level of acceptable interference from Broadcasting services are clearly defined in the Protection Level Regulations promulgated in terms of the AGA Act , and the necessary measures are to be taken to ensure that ~~noise level of the Transmissions surrounding the Quiet Zone" will be at, or below, the required level specified~~ the radio frequency interference from transmissions located within declared central or coordinated astronomy advantage areas are within the protection levels at locations prescribed in AGA Act regulations on the use of the radio frequency spectrum and the restriction of detrimental activities.*

4.6. Last sentence: *The proposals to modify the TBFP 2009 are as per* ***Annexure L.*** The purpose of this statement is not clear. The position of Annexure L will be addressed in the following item but it will be proposed that Annexure L is removed from the Draft Update of the Terrestrial Broadcasting Frequency Plan 2013.

5. Annexure L: Proposals to the "Radio Quiet Zone"

5.1. A radio quite zone is not defined or used in the AGA Act or any publication regarding the protection of radio astronomy in South Africa.

5.2. The AGA Act defines "Astronomy Advantage Areas" as a core astronomy advantage area; a central astronomy advantage area; or a coordinated astronomy advantage area. Section 6 of the AGA Act describes that the purposes of the declaration of astronomy advantage areas are, inter alia, to ensure that the geographic areas in the Republic which are suitable for astronomy and related scientific endeavours due to, among other things, atmospheric transparency, low levels of light

pollution, low population density or minimal radio frequency interference are protected, preserved and properly maintained.

5.3. The purpose to include Annexure L and the proposals in the Draft Update of the Terrestrial Broadcasting Frequency Plan 2013 is not stated. It is also not clear whether Annexure L will be retained in the Final Terrestrial Broadcasting Frequency Plan 2013 due to the uncertainty of its position and purpose.

5.4. The contents of Annexure L reflects those items included in the Request for the Amendment of the ICASA Final Terrestrial Broadcasting Frequency Plan 2008 sent to the Chairman of ICASA by the South African SKA Project Director on 6 June 2011, except those items requested to be removed from the frequency plan that had been removed.

5.5. The sequence of the entries in item 2 was changed to group them respectively for DTT1 and DTT2 but the latitude geographical coordinates in the table are not aligned with the relevant items.

5.6. The geographical coordinates for the Karoo Core Centre are not up to date. An update was sent to ICASA. The coordinates are at 30.66014 degrees South and 21.36688 degrees East within the declared Karoo Core Astronomy Advantage Area. The note at the bottom of the relevant table in the Amendment Request that deals with the need for the Williston assignments to be a part of the two-frequency assignment restriction within the Karoo Central AAA1 was not reflected.

5.7. The Amendment Request to ICASA and Annexure L are based on the contents of the Final Terrestrial Broadcasting Frequency Plan 2008. The Draft Update of the Terrestrial Broadcasting Frequency Plan 2013 includes a large number of new frequency assignments in Annexures D, G, H, I and J for digital terrestrial broadcasting. Many of these new assignments in the Northern Cape Province will be detrimental for radio astronomy.

5.8. The assignments for the Northern Cape Province in each of the annexures to the Draft Update of the Terrestrial Broadcasting Frequency Plan 2013 that is relevant or has an impact on radio astronomy in the Northern Cape will be addressed in the analysis of the relevant annexures in the items that follow.

5.9. The conclusion on the position of Annexure L is that it and references to it should be removed from the Draft Update of the Terrestrial Broadcasting Frequency Plan 2013.

6. Criteria to be applied for the protection of astronomy advantage areas

An overview of protection criteria to be applied that are related to the broadcasting frequency assignments will follow. The criteria will be prescribed in regulations to be made in terms of the AGA Act in accordance with the public participation procedures prescribed in the AGA Act. The protection criteria will be based on the provisions in Part 3 of Chapter 3 of the AGA Act. This overview is provided only for information purposes. The declarations and regulations as finally published in a Government Gazette by the Minister of Science and Technology will have legal effect.

6.1. The restriction on the use of radio frequency spectrum to be protected within the Karoo Central Astronomy Advantage Areas to be declared in the Northern Cape Province, within one year after the regulations are promulgated, is initially the spectrum from 100 MHz to 10 GHz. At a later stage, not less than one year later, the protected spectrum will be extended to 25.5 GHz.

6.2. Frequency bands within the restricted spectrum that will be required for essential services (broadcasting and electronic radio communications) will be exempted and could be used subject to a permit being granted with prescribed conditions of use; however, no saturation level radio frequency interference at any radio astronomy stations within the area would be permitted.

6.3. Existing transmissions between 100 and 200 MHz will be allowed to continue subject to the acquisition of a permit.

6.4. In the case of terrestrial television transmissions, only two 8 MHz channels in the UHF/TV band will be exempted to be used as low power co-channel assignments.

6.5. Declared activities within the Karoo Central Astronomy Advantage Areas to be declared, that would be subject to prescribed standards and conditions include the construction, expansion or operation of any fixed radio frequency interference source; activities capable of causing radio frequency interference and any other activity which may detrimentally impact on astronomy and related scientific endeavours.

6.6. The prescribed standards and conditions for transmissions located within the Karoo Central Astronomy Advantage Areas to be declared will include the following measures:

6.6.1. Terrestrial analogue television transmissions must be terminated by the end of the dual illumination period or by the end of December 2015, whichever date occurs first.

6.6.2. Within one year from the date that the regulations are promulgated all transmissions are subject to the possession of a permit and must comply with the conditions in the permit.

6.6.3. Any new installation, or upgrade or expansion will be subject to the acquisition of a permit in advance.

6.6.4. An effective radiated power level of 60 dBm is not to be exceeded.

6.6.5. The protection levels as applied at the Karoo Core Centre are not to be exceeded unless an exemption has been granted. Exemptions will be granted for terrestrial broadcasting transmissions that are essential and where the radio frequency interference impact has been minimised.

6.6.6. Saturation level radio frequency interference at any radio astronomy station within the area is not to be exceeded.

6.7. The prescribed standards and conditions for transmissions located within the Karoo Coordinated Astronomy Advantage Areas to be declared will include the following measures:

6.7.1. Any fixed radio frequency interference source located within the Karoo Coordinated Astronomy Advantage Area 1 that operates within the frequency band 100 MHz to 2 170 MHz and exceeds the protection levels prescribed in the Radio Astronomy Protection Levels Regulations as applied at the Karoo Core Centre is an identified activity.

6.7.2. Identified activities will be subject to prescribed standards and conditions.

6.7.3. If the effective radiated power level of an identified activity exceeds 60 dBm, the effective radiated power level within the tangents to the borders of the Karoo Central Astronomy Advantage Area 1 may not exceed 60 dBm, and

6.7.4. In the direction of the Karoo Core Centre must be limited to a level that will not produce radio frequency interference that exceeds the applicable prescribed protection levels at the Karoo Core Centre.

6.7.5. Terrestrial analogue television transmissions must be terminated by the end of the dual illumination period or by the end of December 2015, whichever date occurs first.

7. Annexure A: VHF/FM Frequency Assignments 2013 (87.5 to 108.0 MHz)

7.1. All the VHF/FM Frequency Assignments in Annexure A above 100 MHz within the Karoo Central Astronomy Advantage Area 1 to be declared have been identified and are listed in the table below. All transmissions from the Carnarvon station, also those below 100 MHz, were included in the table because of the likelihood that saturation level radio frequency interference will occur.

Transmitting station	Location latitude (DMS)	Location longitude (DMS)	Frequency assignments (MHz)	Effective radiated power (kW)	Comments
Carnarvon	30S54 14	22E22 29	Spare 89.4, 92.5 & 99.0. Operational 95.7, 102.5 & 106.1	Spare 2 x 30 & 1 x 6 Operational 3 x 10	Saturation level RFI probable
Gamoep	30S04 00	18E49 00	102.4 & 106.0	1.0	Theoretical

7.2. All the VHF/FM Frequency Assignments in Annexure A above 100 MHz and exceeding 60 dBm (1 kW) within the Karoo Coordinated Astronomy Advantage Area 1 to be declared have been identified and are listed in the table below.

Transmitting station	Location latitude (DMS)	Location longitude (DMS)	Frequency assignments (MHz)	Effective radiated power (kW)	Comments
Debeersrus	26S36 00	22E12 00	102.5 & 106.1	10.0	Theoretical, in Northern tip of NCP
Kalahari	27S21 00	21E40 00	104.9	10.0	Theoretical, North of Upington
Kuruman	27S21 05	23E18 49	105.5	10.0	
Noenieput	27S48 50	20E08 35	105.9	10.0	Existing transmission on 102.3 at 0.01 kW

7.3. Comments on the assignments listed in the two tables above are as follows:

7.3.1. The existing FM transmissions at Carnarvon will have to be closely examined to determine whether saturation level radio frequency interference will occur or not.

7.3.2. The remaining theoretical assignments at Gamoep, Debeersrus and Kalahari should be removed.

7.3.3. The effective radiated power at Noenieput need to be reduced so as not to not exceed 1 kW.

8. Annexure D: Digital Audio Broadcasting (DAB) Frequency Allotments 2013 (216 to 230 MHz)

8.1. For the Northern Cape, two frequency bands have been allotted, i.e. 221.296 to 222.832 MHz and 228.304 to 229.840. No indication of the permissible effective radiated power is given but it is expected to be in the order of 10 kW.

8.2. These allotments, and any eventual assignments, would be subject to compliance with the protection criteria for the Karoo Central and Coordinated Astronomy Advantage Areas.

9. Annexure E: Analogue Television Frequency Assignments 2013 (VHF: 174 to 254 MHz and UHF: 470 to 854 MHz)

9.1. All the Frequency Assignments in Annexure E within the Karoo Central Astronomy Advantage Area 1 to be declared have been identified and are listed in the table below.

Transmitting station	Location latitude (DMS)	Location longitude (DMS)	Frequency assignments (MHz)	Effective radiated power (kW)	Comments
Brandvlei	30S27 28	20E29 14	21, 25 & 29	0.002	
Carnarvon	30S54 14	22E22 29	623.25	10.0	Termination by 2015. Saturation level RFI probable.
Williston	31S19 30	20E55 04	639.25	0.5	Termination by 2015.

9.2. All the Frequency Assignments in Annexure E exceeding 60 dBm (1 kW) within the Karoo Coordinated Astronomy Advantage Area 1 to be declared have been identified and are listed in the table below.

Transmitting station	Location latitude (DMS)	Location longitude (DMS)	Frequency assignments (MHz)	Effective radiated power (kW)	Comments
Beaufort West	32S15 30	22E30 23	175.25, 199.25 & 223.25	1.6, 4 & 13	Coordinates may be incorrect
Calvinia	31S23 03	19E46 56	479.25	10.0	Directional restriction required
De Aar	30S27 50	23E59 13	183.25 & 231.25	100.0 & 10.0	Directional restriction required
Douglas	29S04 09	23E31 43	759.25	10.0	
Garies	30S18 52	18E04 43	207.25	8.0	

Kuruman	27S21 05	23E18 49	751.25 & 783.25	5.0	
Kuruman Hills	27S53 13	23E33 38	183.25, 207.25 & 231.25	10	
Pofadder	29S14 31	18E56 22	223.25	2.5	Directional restriction required
Prieska	29S40 52	22E36 57	191.25	10.0	Directional restriction required
Springbok	29S35 04	17E48 27	191.25 & 215.25	10.0	
Upington	28S52 58	21E44 11	223.25	100.0	Directional restriction required

9.3. Comments on the assignments listed in the two tables above are as follows:

9.3.1. There are no statements in the Draft Update of the Terrestrial Broadcasting Frequency Plan 2013 about the removal of the analogue television frequency assignments when the digital migration dual illumination period is over.

9.3.2. It expected at this stage that all the analogue television transmissions listed in the tables will be terminated by 2015 according to Government Policy on DTT migration.

10. Annexure G: Digital Terrestrial Television Frequency Networks

10.1. All frequency assignments for Digital Terrestrial Television Frequency Networks DTT1, DTT2 and DTT3 in Annexure G that are destined to be located within the Karoo Central Astronomy Advantage Area 1 have been identified and are listed in the table below.

Transmitting station	Location latitude (DMS)	Location longitude (DMS)	Frequency assignments (MHz)	Effective radiated power (kW)	Comments
Williston	31S19 30	20E55 04	610 & 674	1.0	Directional restriction required

10.2. All the frequency assignments for Digital Terrestrial Television Frequency Networks DTT1, DTT2 and DTT3 in Annexure G that are destined to be located within the Karoo Coordinated Astronomy Advantage Area 1 and where the effective radiated power exceeds 60 dBm (1 kW) have been identified and are listed in the table below.

Transmitting station	Location latitude (DMS)	Location longitude (DMS)	Frequency assignments (MHz)	Effective radiated power (kW)	Comments
Beaufort West	32S15 30	22E30 23	634 & 666	10 & 60	Coordinates may be incorrect. To be checked. Power on 2nd assignment excessive
Calvinia	31S23 03	19E46 56	498 & 514	10.0	Directional restriction required
De Aar	30S27 50	23E59 13	754 & 786	50.0	Directional restriction required
Douglas	29S04 09	23E31 43	746 & 778	10.0	
Garies	30S18 52	18E04 43	738 & 770	25.0	Power level excessive
Kuruman	27S21 05	23E18 49	490 & 522	5.0	
Kuruman Hills	27S53 13	23E33 38	490 & 522	20.0	
Pofadder	29S14 31	18E56 22	746 & 778	10.0	Directional restriction required.
Prieska	29S40 52	22E36 57	482 & 546	20.0	Directional restriction required. Power level excessive.
Springbok	29S35 04	17E48 27	474 & 506	10.0	
Upington	28S52 58	21E44 11	570 & 538	50.0	Directional restriction required

10.3. Comments on the frequency assignments listed in the two tables

10.3.1. All the above frequency assignments except Douglas, Kuruman and Springbok (subject to verification) require directional restrictions in their horizontal radiation patterns to comply with the protection level at the Karoo Core Centre.

10.3.2. Each of these assignments will, in due course, be subject to an assessment of the radio frequency interference produced at the Karoo Core Centre.

10.3.3. Transmissions located within the Karoo Central Astronomy Advantage Area 1 will require a permit with prescribed conditions.

11. Annexure I: VHF Digital Terrestrial Television Networks Post 2015

11.1. Identification of assignments in the Karoo Central Astronomy Advantage Area 1

There are no assignments within the Karoo Central Astronomy Advantage Area 1.

11.2. All the frequency assignments for VHF Digital Terrestrial Television Networks Post 2015 in Annexure I that are destined to be located within the Karoo Coordinated Astronomy Advantage Area 1 and where the effective radiated power exceed 60 dBm (1 kW) have been identified and are listed in the table below.

Transmitting station	Location latitude (DMS)	Location longitude (DMS)	Frequency assignments (MHz)	Effective radiated power (kW)	Comments
Beaufort West	32S15 30	22E30 23	178 & 202	1.6 & 39.8	Coordinates may be incorrect. To be checked. Power level for 2nd frequency higher than existing for analogue
De Aar	30S27 50	23E59 13	186 & 210	39.8	Directional restriction required
Garies	30S18 52	18E04 43	186 & 210	39.8	Power level higher than existing for analogue
Kuruman Hills	27S53 13	23E33 38	186 & 210	39.8	
Pofadder	29S14 31	18E56 22	178 & 202	39.8	Directional restriction required. Power level higher than existing.
Prieska	29S40 52	22E36 57	194	39.8	Directional restriction required. Power level

					higher than existing for analogue
Springbok	29S35 04	17E48 27	194	39.8	Power level higher than existing for analogue
Upington	28S52 58	21E44 11	178 & 202	39.8	Directional restriction required
Victoria West	31S41 15	23E13 50	178	1.99	

11.3. Comments on the frequency assignments listed in the table

11.3.1. The VHF/TV spectrum is in a very sensitive part of the radio spectrum used for radio astronomy observations. As there were no previous DTT frequency assignments in this frequency band, it was envisaged that this spectrum would be clear.

11.3.2. The strictest possible protection will have to be applied in this frequency band.

11.3.3. Many of the assignments require directional restrictions.

11.3.4. Some of the assignments have higher power levels than is presently used for analogue television transmissions. This seems to be unjustified.

11.3.5. Each of these assignments will, in due course, be subject to an assessment of the radio frequency interference produced at the Karoo Core Centre.

11.3.6. These assignments do not seem to be aligned with the intensions of the Broadcasting Digital Migration Policy.

12. Annexure J: Digital Terrestrial Television SFN Networks Post 2015

12.1. All frequency assignments for Digital Terrestrial Television SFN Networks Post 2015 in Annexure J that are destined to be located within the Karoo Central Astronomy Advantage Area 1 have been identified and are listed in the table below.

Transmitting station	Location latitude (DMS)	Location longitude (DMS)	Additional frequency assignments (MHz)	Effective radiated power (kW)	Comments
Williston	31S19 30	20E55 04	490, 522, 554, 586, 618, 650, 682	10.0	Excessive power to be reduced and directional restriction applied

12.2. All the frequency assignments for Digital Terrestrial Television SFN Networks in Annexure J that are destined to be located within the Karoo Coordinated Astronomy Advantage Area 1 and where the effective radiated power exceeds 60 dBm (1 kW) have been identified and are listed in the table below.

Transmitting station	Location latitude (DMS)	Location longitude (DMS)	Additional frequency assignments (MHz)	Effective radiated power (kW)	Comments
Beaufort West	32S15 30	22E30 23	474, 506, 538, 570, 602, 634 & 666	60 More than existing power level	Coordinates may be incorrect. To be checked
Calvinia	31S23 03	19E46 56	490, 522, 554, 586, 618, 650 & 682	10.0	Directional restriction required
De Aar	30S27 50	23E59 13	498, 530, 562, 594, 626, 658 & 690	50.0	Directional restriction required
Douglas	29S04 09	23E31 43	490, 522, 554, 586, 618, 650 & 682	10.0	
Garies	30S18 52	18E04 43	490, 522, 554, 586, 618, 650 & 682	50.0	Excessive power higher than existing
Kuruman	27S21 05	23E18 49	482, 514, 546, 578, 610, 642 & 674	5.0	
Kuruman Hills	27S53 13	23E33 38	490, 522, 554, 586, 618, 650 & 682	80.0	
Pofadder	29S14 31	18E56 22	490, 522, 554, 586, 618, 650 & 682	30.0	Excessive power to be reduced and directional restriction required
Prieska	29S40 52	22E36 57	490, 522, 554, 586, 618, 650 & 682	50.0	Excessive power to be reduced and directional restriction required
Springbok	29S35 04	17E48 27	490, 522, 554, 586, 618, 650 & 682	10.0	
Upington	28S52 58	21E44 11	490, 522, 554, 586, 618, 650 & 682	50.0	Directional restriction required

Victoria West	31S41 15	23E13 50	498, 530, 562, 594, 626, 658 & 690	10	Excessive power to be reduced

12.3. Comments on the frequency assignments listed in the table

12.3.1. The assignments for such a large number of SFN DTT networks will make a drastic change to the frequency spectrum occupancy in the Karoo Coordinated Astronomy Advantage Area 1 and in the Karoo Core Astronomy Advantage Area and the Karoo Central Astronomy Advantage Area 1, and will have a substantial detrimental impact on radio astronomy.

12.3.2. Above normal effective radiated power is used for some of the frequency assignments.

12.3.3. With single frequency networks the effective radiated power used to determine the radio frequency interference must be aggregated and calculated from a “centre of gravity”.

12.3.4. The cumulative effect of these assignments and those in annexures G and I will have a very substantial detrimental impact on the SKA and on radio astronomy in the Northern Cape Province.

12.3.5. Each of these assignments will, in due course, be subject to an assessment of the radio frequency interference produced at the Karoo Core Centre.

12.3.6. Considering the economic conditions in the Northern Cape Province and the very high capital cost that these frequency assignments represent, the justification of making the assignments is questioned.

12.3.7. These assignments in the TBFP 2013 will give a bad picture of the potential RFI in the astronomy advantage areas and will pose a substantial risk to the SKA.

12.3.8. These assignments do not seem to be aligned with the intensions of the Broadcasting Digital Migration Policy.