Before the

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Comments of Hughes Networks Systems, LLC and EchoStar Global Australia, LLC on the Long-Term Spectrum Outlook for South Africa

Hughes Network Systems, LLC ('Hughes') and EchoStar Global Australia, LLC ('EchoStar Global') (collectively, 'EchoStar') submit these comments in response to the Independent Communications Authority of South Africa's (ICASA) consultation request on the long-term spectrum outlook for the country. Hughes is the global leader in high-speed satellite Internet, with over 7 million systems shipped to customers in over 100 countries. Hughes has worked to develop a strong presence in Africa and has partnered with Al Yah Satellite Communications ('Yahsat') to provide reliable high-speed Internet service. Utilizing Hughes' JUPITER™ System on its two Ka-band satellites, Yahsat's satellites reach 60% of Africa's population. Additionally, EchoStar Global is an Australian subsidiary of EchoStar Corporation and holds International Telecommunications Union (ITU) spectrum rights through its Australian Sirion-1 ITU filing that will bring into use a Mobile Satellite Service (MSS) S-Band satellite network. It will provide global connectivity and 5G services through a network of global satellites to South Africa and the world.

EchoStar supports ICASA's desire to develop a spectrum plan and set goals for the future. As broadband technologies continue to advance, it is important for ICASA to ensure that its framework includes all technologies, including satellite, in order to meet the diverse needs of its citizens. Additionally, any determinations of spectrum allocations should be made in accordance with international standards, such as those of the ITU, in order to mitigate the risks of a harmful interference environment for providers operating in currently allocated bands. Accordingly, EchoStar is well qualified to provide comment on this consultation and respectfully provides its input on the following questions.

1. ***Please comment on whether the above captures the relevant regulatory and policy aspects of long-term spectrum planning.***

   Comment: While there are many good components to these proposals, there is a major absence of recognition for the need for technology neutrality in South Africa's spectrum plans. There are many spectrum uses in South Africa today—including fixed, mobile, and satellite—and over time, these uses are likely to grow in importance. Therefore, it is critical that South Africa recognize this in their spectrum planning and policies. This is especially true with 5G and beyond. No longer is a single technology likely to be used to meet user needs; multiple technologies and networks can be used, both terrestrial and space-based. Accordingly, the spectrum planning and policies of South Africa should be revised to reflect this reality.

2. ***Are there services, in addition to broadband, that ought to be considered as important for economic growth? If so, please explain what these services might be and what the trade-offs are between using spectrum for broadband and alternative services. Please provide any evidence from other countries that may be relevant.***

   Comment: South Africa must include narrowband services, such as those required for Internet of Things (IoT) and Machine-to-Machine (M2M) communications. As noted in a number of reports, IoT is likely to bring significant benefits; see, for example, How IoT Impacts the Economy (iotforall.com) and Unlocking the potential of the Internet of Things | McKinsey. As these and other data indicate, narrowband services have significant potential to bring benefits to users in South Africa, including economic value. Similarly, South Africa must also look at non-terrestrial and terrestrial services. For instance, with 5G (and soon, 6G), in order to meet the visions of these services, both terrestrial and non-terrestrial services will be required. This is being demonstrated in 3GPP, where both terrestrial and non-terrestrial 5G standards are being set.

3. ***Please comment on the above assessment of the status quo on broadband penetration in South Africa, and what role spectrum may play in addressing the gaps identified.***

   Comment: For South Africa to successfully increase broadband access through spectrum use, it must adopt technology neutral policies that provide access to spectrum for many different technologies, both terrestrial and non-terrestrial. There must be a balance (not necessarily equity) in access to spectrum to meet many different needs. For instance, it is highly unlikely that terrestrial technologies are economically feasible in rural areas to support broadband; accordingly, satellite technologies must have long-term access to sufficient spectrum resources as well.

4. ***What future changes, if any, should ICASA examine with regard to the existing licensing regime to better plan for innovative new technologies and applications and allow for benefits that new technology can offer, such as improved spectrum efficiency?***

   Comment: ICASA needs to ensure that there is adequate spectrum to allow for the further development of satellite technologies. For example, 5G and 6G will be dependent on both terrestrial and non-terrestrial services. ICASA must consider the benefits of such technologies when making spectrum allocation decisions. Globally, there are certain frequency bands that are critical for providing broadband and narrowband services using satellite, such as the Ka-, Q-, and V-bands for broadband and the 2 GHz band for narrowband services (e.g., 1980–2010 MHz and 2170–2200 MHz). Failure to take this into account in making spectrum use and licensing decisions will hamper South Africa, especially as it seeks to address the digital divide.

5. ***What future emerging technologies are to be taken into consideration and which technologies will have a significant impact? When are these technologies expected to become available?***

   Comment: While many technologies are still in the early stages of development it is clear that the advance broadband and narrowband satellites and systems are among the cutting edge. Broadband satellites, such as Hughes' Jupiter 3 satellite, will bring speeds of 100/20 Mbps to users later this year, helping to address the digital divide. In addition, EchoStar Global's planned non-geostationary orbit satellite systems in the 2 GHz band (1980-2010 MHz and 2170-2200 MHz) will provide a variety of narrowband innovative services including IoT and urban air mobility. These and other systems will provide important connectivity to users everywhere – including on the ground, in the air or on the sea.

6. ***What and how will technology developments and/or usage trends aid in relieving traffic pressures? When are these technologies expected to become available?***

   Comment: As traffic demands are continuing to grow, EchoStar and other operators have developed and are continuing to develop systems that make the most efficient use of the spectrum resource. In addition, satellite has an important role in providing backhaul for 4G and 5G networks for mobile networks.

7. ***Are there any IoT applications that will have a large impact on the existing licence-exempt bands? If so, what bands will see the most impact from these applications?***

   Comment: No comment.

8. ***Please provide your views regarding the standardization of the naming of applications in the NRFP in accordance with CEPT ECC decision 1(03) approved 15 November 2001 and its subsequent revisions.***

   Comment: No comment.

9. ***What are your forecasts for data traffic and radio frequency spectrum needed over the next 5, 10 and 20 years for each of the EFIS application layers?***

   Comment: No comment.

10. ***How much spectrum is allocated to each of the EFIS application layers, and what is the economic value of spectrum used in each of the above EFIS application layers? What are the opportunity costs***

for current spectrum allocations for EFIS these application layers (what is the value to alternative users of these allocations)?

Comment: No comment.

11. ***How should demand for commercial mobile services and IMT in the next few years be determined? What traffic model should be used in South Africa for traffic demand expectations? What are your comments on the spectrum requirements set out on Table 2? What are your views on using the Recommendation ITU-R M.1768-1 methodology to forecast IMT spectrum demand in South Africa? Please complete the input parameters in the attached spreadsheet for the market study information needed to apply the Recommendation ITU-R M.1768-1.***

    Comment: The demand for all radiocommunication services, not just mobile services and IMT, should be determined based on the relevant reports, recommendations, and handbooks of the ITU-R. Additionally, and specifically for the terrestrial mobile services and IMT, the demand has not been what was expected, at least in one of their most pushed frequency bands (26/28 GHz). To illustrate this, we can take the example of South Korea, a significant proponent of 5G terrestrial networks. In this country, all combined mobile operators have deployed only 161 base stations in the 26/28 GHz bands (as of the end of August 2021). This suggests that the demand for IMT in these bands is not high and not what was expected, especially considering that the licenses were issued in 2018 and their rollout obligation was to deploy ~45,000 base stations by the end of 2021. (For more information, see the following article: Telcos lag in mmWave 5G equipment installation: lawmaker.)

    We urge ICASA to use traffic spectrum models issued by international organisations, such as the ITU, and avoid models projected by private stakeholders, such as mobile terrestrial organisations, because their demand predictions may be biased.

    Finally, we invite ICASA to use Report ITU-R M.2290 (depicted in Table 2, *Total spectrum requirements for both RATG 1 and RATG 2 in the year 2020*) and relevant ITU-R Recommendations, such as ITU-R M.1768-1, to calculate domestic demand for mobile terrestrial services, as both reflect an appropriate spectrum demand calculation and methodology.

12. ***Provide your support or reasons for objections on the bands being considered internationally for 5G commercial mobile allocations.***

    Comment: We believe that the only bands that should be considered for 5G commercial mobile use are those allocated for mobile service and appropriately identified for IMT in ITU-R's Radio Regulations (RR) and where harmful interference will not affect co-primary and adjacent band co-primary services. Failure to do so could result in unacceptable interference into service operating in adjacent bands or geographies.

13. ***Are the spectrum allocations comprehensive enough for spectrum demand projections for commercial mobile services in South Africa for the next 10 to 20 years?***

    Comment: No comment.

14. ***Is there a demand for more flexible frequency licensing and frequency assignment/allotments processes on a regional basis required to complement the national frequency licensing and frequency assignments/allotments in the next 10 to 20 years?***

    Comment: No comment.

15. ***Are there any other frequency bands that should be considered for release in the next 10 to 20 years for commercial mobile that are not discussed? Provide motivations for your proposal.***

    Comment: No comment.

16. ***Which vertical markets will require the most secured licensed spectrum to overcome their current interference and congestion issues?***

    Comment: No comment.

17. ***Assuming that South Africa follows the ITU's recommendations to assign up to 1,940MHz of spectrum for IMT-2000 and IMT-advanced services, and that South Africa follows trends in Europe for potentially another 2,000 MHz of spectrum for IMT-2020, what bands would need to be freed up?***

    Comment: While we do not have a view on which bands are required, we would note that ICASA should carefully balance the impact of the identification of bands on existing services.

    For example, taking into account WRC-23 Agenda Item 1.2, there are certain bands considered for a potential IMT identification that need to be carefully examined to demonstrate that such identification will not produce harmful interference to existing services and systems. This is the case for frequency bands 6425–7025 MHz (for Region 1) and 7025–7125 MHz (global), which are currently considered for RLANs around the world for the deployment of Wi-Fi 6 systems—there is also the operation of feeder links for non-geostationary MSS systems in accordance with RR footnote 5.458B.

18. ***What are your views on reallocating the following bands for IMT over the next years?[44]***

    Table 3: List of possible future IMT bands (please supplement or delete as your organisation considers reasonable)

    - ***450-470 (20MHz)***
    - ***617-698 (70MHz)***
    - ***1 427-1 518 (91MHz)***
    - ***1 710-2 025 (315MHz)***
    - ***3 300-3 400 (100MHz)***
    - ***3 400-3 600 (200MHz)***
    - ***3 600-3 800 (200MHz)***
    - ***4 800-4 990 (190MHz)***
    - ***24 250-27 500 (3250MHz)***
    - ***37 000-43 500 (6500MHz)***
    - ***45 500-47 000 (1500MHz)***
    - ***47 200-48 200 (1000MHz)***
    - ***66 000-71 000 (5000MHz)***

    Comment: We have serious concerns about the 1980–2010 and 2170–2200 MHz bands (S-band) and the 37–42 GHz and 47.2–48 GHz bands (Q/V-bands) being made available for IMT. First, the S-band is being used in an increasing number of countries for MSS and in some countries for MSS with a complementary ground component. This has resulted in the development of global standards and a global ecosystem in this band. If South Africa fails to enable these bands for this use, South Africa will be left out of the benefits of this global ecosystem.

    The Q/V-bands are important bands that are currently allocated for broadband satellite service and are being deployed accordingly throughout much of the world. For example, our own JUPITER™ 3 satellite will be launching in 2022 and is operating in the Q/V-bands. Similarly, Hughes and several other satellite operators—including Inmarsat, Inc.; Kuiper Systems, LLC; Telesat LEO, Inc.; The Boeing Company; and WorldVu Satellites Limited—are planning to deploy Non-Geostationary (NGSO) systems in the Q/V-bands. These satellite systems will add to the capacity that is so critical to meeting broadband needs across the country, including in rural and remote areas.

19. ***Provide your support or reasons for objections on the bands being considered internationally for 5G commercial mobile, fixed, satellite, or licence-exempt allocations.***

    Comment: Bands considered for 5G services should operate in accordance with their respective allocation—mobile, fixed, satellite, or licence-exempt—and always protect operation of the existing services. As for 5G in satellite networks, there are numerous emerging use-cases powered by high-throughput Geostationary (GEO) satellites, such as extended coverage for end user devices, transportation, content delivery in multicast mode to mobile terminals or IoT devices, and any other capability compared to the terrestrial

component of IMT-2020. The standardization body 3GPP is also supporting 5G satellite access in its technical specification TS22.261, *Service requirements for the 5G system*, by assuring that new technology such as satellite will increase the coverage and availability of 5G systems.

20. ***Provide your support or reasons for objections on the bands being considered internationally for fixed applications. Please provide a list of such bands for potential fixed use***

    Comment: According to the RR, there are numerous frequency bands allocated to the fixed service. Recommendation ITU-R F.758-7 contains several considerations for the development of sharing criteria of systems in the fixed service. It also contains information on representative technical characteristics and typical system sharing parameters of digital fixed wireless systems in the fixed service for use in sharing studies.

    It is worth mentioning that during the final days of the WRC-19 of the ITU-R, some administrations proposed that the study of the use of IMT in fixed wireless broadband systems in some frequency bands allocated to the fixed service on a primary basis should be considered for the next World Radiocommunication Conference. Consequently, these discussions are currently being developed within the ITU-R in the framework of Agenda Item 9.1, Topic C. This is relevant because any use of mobile or IMT systems in frequency bands allocated to the fixed service will produce an environment of harmful interference that could affect not only all the existing and future bands allocated to the FS but also other radiocommunication services, such as the fixed satellite service, which will also be impacted if IMT is deployed under fixed applications. We urge ICASA to take this situation into account when determining frequency bands for the FS and the operation characteristics and parameters.

21. ***Are the spectrum allocations comprehensive enough for spectrum demand projections for fixed services in South Africa for the next 10 to 20 years?***

    Comment: No comment.

22. ***Is there a demand for more flexible frequency licensing and frequency assignment/allotments processes for fixed services on a regional basis required to complement the national frequency licensing and frequency assignments/allotments in the next 10 to 20 years?***

    Comment: No comment.

23. ***Are there any other frequency bands that should be considered for release in the next 10 to20 years for fixed services that are not discussed? Provide motivations for your proposal.***

    Comment: No comment.

24. ***Will the demand for commercial mobile, licence-exempt, satellite, or fixed wireless services/applications impact the demand for backhaul spectrum? If so, how and which of these***

    Comment: Yes. As the demand for wireless services increases, the demand for backhaul will increase exponentially.

25. ***Are there adequate spectrum allocations for video backhaul for broadcast and security services in South Africa? What is the realistic demand for these services in the next 10 to 20years?***

    Comment: No comment.

26. ***How much will transmission technology improve the volume of traffic in the next 10 to 20years?***

    Comment: No comment.

27. ***What and how will technology developments and/or usage trends aid in relieving traffic pressures and addressing spectrum demand for backhaul services? When are these technologies expected to become available?***

    Comment: No comment.

28. ***How much bandwidth for backhaul will be saved due to the deployment of fibre networks in South Africa for the next 5, 10 to 20 years?***

    Comment: No comment.

29. ***What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequatespectrum allocations for Aeronautical services in South Africa?***

    Comment: No comment.

30. ***What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequatespectrum allocations for Broadcasting services in South Africa?***

    Comment: No comment.

31. ***How much spectrum should be maintained for terrestrial broadcasting in the band 470MHzto 694MHz in the next 10 to 20 years?***

    Comment: No comment.

32. ***What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequatespectrum allocations for Defence services in South Africa?***

    Comment: While EchoStar/Hughes will not comment on what the defence needs of South Africa are, we will comment on a growing global trend: the increasing reliance of defence forces on commercial satellite networks. As the market has shown, there is very little reason for government users to rely on government networks where commercial networks can meet their needs. This is another reason to ensure that satellite operators have access to sufficient allocations of spectrum.

33. ***What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequatespectrum allocations for Maritime services in South Africa?***

    Comment: No comment.

34. ***What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequatespectrum allocations for Meteorological services in South Africa?***

    Comment: No comment.

35. ***What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequatespectrum allocations for PMSE services in South Africa?***

    Comment: No comment.

36. ***What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequatespectrum allocations for PPDR services in South Africa?***

    Comment: No comment.

37. ***Can mobile broadband currently be used for PPDR purposes? If not, will this be possible inthe future with better quality of service and lower prices?***

    Comment: No comment.

38. ***Are there any reasons to consider further spectrum from broadcasting in the band 470MHz to 694MHz to public protection and disaster relief (PPDR) services in the next 10 to 20 years?***

    Comment: No comment.

39. ***What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequatespectrum allocations for Satellite services in South Africa?***

    Comment: There is increasing demand for both broadband and narrowband services for South Africa.

40. ***Which applications and allocations will require the most frequency spectrum demand in the following frequency bands?***
    - ***C-band***
    - ***Ku-band***
    - ***Ka-band***

    Comment: The Ka-band is a critical band for broadband satellite service and should be preserved for this important service on a primary basis. Demand for broadband satellite service continues to increase and preserving this band for this use is critical to address the digital divide.

41. ***What and how will technology developments and/or usage trends aid in relieving traffic pressures and addressing spectrum demand for satellite services? When are these technologies expected to become available?***

    Comment: While these technologies continue to help address spectrum requirements, user demands keep increasing. So, just like terrestrial services, satellite services, while becoming more spectrally efficient, will still require growing access to spectrum to meet user demands.

42. ***What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequatespectrum allocations for Astronomy services in South Africa?***

    Comment: No comment.

43. ***What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequatespectrum allocations for Short-range services in South Africa?***

    Comment: No comment.

44. ***Which vertical markets will require most secured licensed spectrum to overcome theircurrent interference and congestion issues?***

    Comment: No comment.

45. ***How much will spectrum management and orderly frequency planning improve theinterference situations in certain frequency bands?***

    Comment: This is a continuing need. It requires preservation and re-examination of the latest developments in terms of regulation and technological evolution of the radiocommunication systems. Adequate spectrum management will derive from preventing harmful interference environments and undesirable congestion of frequency bands. ITU has some reports that are useful in terms of spectrum management and frequency planning, such as Report ITU-R SM.2093-4, *Guidance on the regulatory framework for national spectrum management*. We recommend that ICASA follow best practices to continue fostering investments in the telecommunication sector in South Africa.

46. ***Please provide input on future spectrum requirements for the different service allocations as well as the urgency for such additional frequency allocations for such a service.***

    Comment: As discussed above, the 2 GHz band is critical to support MSS, including with a complementary ground component. As satellite network planning and deployments are ongoing in this band globally, it is important that South Africa act quickly so it can be included in this global ecosystem. Similarly, the Q/V-bands are critical for broadband satellite services to help solve the digital divide. As systems are being deployed now and additional systems being planned and licensed globally, it is critical that ICASA act now to allocate and license these bands for satellite broadband.

47. ***Which Service allocations require RFSAP's and for which frequency bands. Also specifythe urgency for the creation of such RFSAP's.***

    Comment: No comment.

48. ***Please provide your organisations strategy and suggestions on how the Authority can ensure that spectrum outlook and demand studies can contribute to stimulation of the South African economy.***

    Comment: No comment.

49. ***The spectrum outlook described above in Section 4, and in particular the substantial additional requirements for IMT and fixed-wireless spectrum, suggest that a number of additional bands will need to be assigned for the purposes of internet access, and incumbentusers will need to be migrated out of the bands mentioned in the list on Table 3 and on any bands your organisation suggests on Table 4. What are the costs of migrating these users so that radio frequency spectrum is allocated to its highest value use?***

    Comment: No comment.

50. ***What would the costs of freeing up spectrum for commercial fixed and mobile use be (considering the bands mentioned above on Table 3 and Table 4)? What would the economic benefits of doing so be, in respect of increase consumer surplus, and increased producer surplus?***

    Comment: No comment.

51. ***Assuming that South Africa follows the ITU's recommendations to assign up to 1,940MHz of spectrum for IMT-2000 and IMT-advanced services, and that South Africa follows trendsin Europe for potentially another 2,000 MHz of spectrum for IMT-2020, what would the costs of freeing up the various spectrum bands be? In this regard, please refer to Table 3 andTable 4, as explained above.***

    Comment: No comment.

52. ***Due to the scarcity of high demand spectrum and the consequential fact that Spectrum Sharing in certain bands are non-negotiable, how shall you describe the best sharing conditions for the South African scenario?***

    Comment: This is a band- and service-specific basis, but one thing is clear—it is very difficult for two widely deployed services, such as fixed satellite broadband and IMT, to coexist. Accordingly, appropriate protections need to be considered if there is a sharing of these bands.

53. ***Due to the convergence of technologies and the changes in regulatory licensing environment doyou believe that certain service allocations categories will or need to change?***

    Comment: We strongly recommend that spectrum allocations always be consistent with the ITU Table of Allocations. Additionally, any potential change to the service allocations must be based solely on the decisions made by a World Radiocommunication Conference. Any other motivation will not guarantee the adequate coexistence, compatibility, and protection of the existing services with new potential

allocations. Recently, some industries have pushed the use of certain services—for example, the use of IMT terrestrial systems in the 28 GHz band in a few countries—based on secluded, non-standardized domestic regulation. These decisions have proven short-sighted because the demand for mobile deployment is not what was expected (see the example of South Korea in Question 11). This has limited the use of the 28 GHz band for other critical services, such as satellite broadband, unnecessarily.

54. ***What existing licence-exempt frequency bands will see the most evolution in the next five years?***

    Comment: No comment.

55. ***How much spectrum, and in which bands, should be made available for licence-exempt purposes (such as Wi-Fi) over the 5, 10 and 20 years? What would the costs of freeing up these bands for IMT be? What would the economic benefits of doing so be, in respect of increase consumer surplus, and increased producer surplus? Which vertical markets will require most secured licensed spectrum to overcome their current interference and congestion issues?***

    Comment: No comment.

56. ***How much spectrum, and in which bands, should be made available for dynamic spectrum access over the next 5, 10 and 20 years? What would the costs of freeing up these bands for IMT be? What would the economic benefits of doing so be, in respect of increase consumersurplus, and increased producer surplus?***

    Comment: No comment.

57. ***What existing licence-exempt frequency bands will see the most evolution in the next five years?***

    Comment: No comment.

58. ***Are there any IoT applications that will have a large impact on the existing licence-exempt bands? If so, what bands will see the most impact from these applications?***

    Comment: No comment.

59. ***Will the trend for offering carrier-grade or managed Wi-Fi services continue to increase overthe next five years? If so, will this impact congestion in Wi-Fi bands and which bands wouldbe most affected?***

    Comment: No comment.

60. ***Are there specific frequency bands that will be in higher demand over the next 10 to 20 yearsand do you expect higher demands for spectrum in these frequency bands in South Africa? Are there any other frequency bands that should be considered for release in the next 10 to 20 years for commercial mobile, fixed, satellite, or licence-exempt that are not discussed above? Provide motivations for your proposal.***

    Comment: No comment.

Respectfully submitted,

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