Executive Summary

The Commonwealth Telecommunication Organisation is the oldest Commonwealth membership organisation working in the field of Information and Communication Technology. As part of their ongoing mission to support member countries in developing ICT initiatives a forum was held for its key stakeholders, including members, titled the Commonwealth Spectrum Management Forum ’19, with a theme of *World Radio Conference (WRC)-19 and the Spectrum Challenge: Achieving Wireless Capacity for Digital Transformation*. The aim is to provide a platform where member countries share experiences for preparation towards the WRC-19 which will take place in Egypt, Sharm El Sheikh from the 21 October 2019. The WRC-19 occurs every four years and its complexity requires each region to work straight after the last meeting, in 2015 preparations were started for 2019 and once WRC-19 concludes preparations will start forWRC-23.

The conference was held in London, UK from the 19 – 21 June 2019. There were many agenda items discussed and most of the discussions were high level because of the time allocated to each session. Some Agenda Items where discussed in detail such as Satellite, High-Altitude Platform Stations (HAPS), Radio Local Area Network (LAN) (RLAN) and International Mobile Telecommunications (IMT). In addition, there was progress reports from national and regional organisations followed by group discussion with regards to preparations towards WRC-19. Two WRC-19 agenda items needed to be highlighted and these were HAPS and RLAN - Agenda Item 1.14 and Agenda Item 1.16 respectively where application and use cases were critical to support digital transformation in most Commonwealth countries. Furthermore, the C-band was discussed with reference to least developing countries, Small Island Developing States (SIDS) and landlocked developed countries are impacted given the strong push for these bands for 5G services. SIDS in particular are pushing to protect C band because this is the only band that is very clear in island countries dispersed across vast oceans. It is the clarity of the C band that is also supported by the wider African countries stating that it is the only band that remains very clear in forested areas.

The three day forum was helpful not only to share ideas but also to promote awareness on best practises and experiences, to provide clarity and improve the level of understanding but nations and regions.

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Introduction

The Commonwealth Spectrum Management 19 meeting was held in London, United Kingdom from the 19th – 21st June 2019 with the theme '*WRC-19 and the Spectrum Challenge: Achieving Wireless Capacity for Digital Transformation*'. The conference was guided by objectives under broad areas for policy and regulatory strategies, spectrum harmonisation, connectivity applications, technology and innovation, commercial opportunities and preparations for the WRC-19. The conference was attended by two high level delegations with the Ministers from Ghana and Montserrat in attendance, while the majority were from member countries and CTO development partners from the region. The conference was a successful meeting given that the agenda and discussions made provided CTO a better position for supporting the Commonwealth countries in their proposals to the WRC-19.

The purpose of this report is to provide an account of the conference deliberations and discussions on the Agenda (Refer to Annex C – Conference Agenda).

Opening Session

The Honourable Vincent Odotei Sowah, Deputy Minister, Ministry of Communication, Republic of Ghana started off with a message from the President and Minister of Communication who are championing the provision of Information Technology in Ghana. There are many issues concerning spectrum management such as 5G's expectations, coordination, and how Ghana's WRC-19 preparations are shared and revised after participating in forums such as the CTO conference on Spectrum prep for WRC-19. It is expected that after the 3-day meeting, everyone will be well informed.

Secondly, Honourable Paul Lewis, Ministry of Communications, Works, Energy and Labour, Montserrat congratulated the CTO for bringing the Commonwealth regions together. Different regions imply that spectrum management needs differs in each region with their concerns and positions. However, CTO has a banner for its member countries for an opportunity to colate their commonalities as a way forward. The absence of commonalities requires some level of engagement and support for each other with the hope of supporting the proposals of commonwealth countries, regions that may influence the WRC-19 in October 2019 as another positive outcome.

Diana Tomimura thanked the CTO for the invitation, she spoke as the representative of the International Telecommunication Unio (ITU), and on behalf of the Director of the Radio Bureau. She emphasised the importance of 2019, since it is the year of WRC-19. It is a great opportunity to realise and learn how policies and directions from WRC-15 have impacted on radio communication and the development goals. WRC-19 agenda is huge but have shared some of the areas that will be of interest to the forum such as the 5G, IMT2020, HAPS, transport systems, satellites and orbits and many other topics. UK have advanced a few months ago when one of the operators announced the launching of its 5G in six cities in UK. The eco-system is fully developed for harmonisation of spectrum which will enable more affordable services. She also mentioned that the WRC is a four year process and it is a cycle that provides resolutions on common proposals trying to find commonalities and provide more economy of scale from the harmonisation of spectrum.

Gisa Fuatai Purcell, Acting Secretary General, CTO, thanked those who travelled far to attend the conference with special thanks to the Honourable Minister and Deputy Minister. A special greeting was extended to all participants welcoming them to London as the CTO headquarter is based in the UK. Gisa also touched on the objectives for CTO's Strategic Plan 2016-2020 and the newly developed plan for 2020-2024 that will continue, in principle, to maintain the 6 goals as previously, and adding other strategies suggested by the CTO membership that included issues such as licensing, cybersecurity as endorsed by the Commonwealth Heads of Government (CHOGM), Quality of Service and Over-the-Top (OTT) among others. For Spectrum Management, issues include the protection of the C-Band, generating more bands for IMT and others. Gisa also spoke on the new goals for the

Secretariat and the continuous support for CTO members and the wider Commonwealth of Nations. She later declared the conference open.

Session One - Planning for WRC-19: Progress and regional preparations

Chair Roberto Ercole – Auction Design Policy Specialist, OFCOM, United Kingdom of Great Britain and Northern Ireland,Spectrum Strategy, Telecom Regulation, Public Policy, Training and Advocacy

Status Preparations for the WRC-19
Diana Tomimura – Spectrum Regulation and Policy Officer, (ITU)

The following is summary of the presentation.

- WRC-15 and the WRC-19 – 4-year cycle
- WRC structure, processes, communication and stakeholders involved
- Accessibility to tools such as CPI, Logistics for WRC-19 such a proposal structure
- Agenda Items IMT (5G) A.I 1.13, HAPS A.I 1.14, RLAN A.I 1.16

Panel Discussions – What are the key outcomes of the CPM-2, and to what extend have positions around the world become clearer as we enter the final preparatory period for WRC-19?
Commonalities in the agenda that can be supported by Commonwealth

1. **Kirk Sookram** – Executive Officer – Technology and Engineering, Telecommunications Authority of Trinidad and Tobago and Chairman of the CTU Spectrum Management Task Force.
2. **Sonia Carrera** – Head of International Spectrum Policy, Mobile Infrastructure and Spectrum | Digital Infrastructure Directorate, United Kingdom of Great Britain and Northern Ireland (UK)

Key points

- Radiocommunication Assembly 2019 (RA19) is from the 21-25 October 2019 while the WRC-19 is on the 28 October 2019 to the 22 November 2019.
- The WRC processes work on a 4-year cycle and CPM, Study Group are planned in terms of proposals and tools available for preparations which leads to the final discussions of WRC-19.
- Regional organisation also works in parallel to this process and they can also provide proposals to the WRC at the regional or for others that cannot find a place in these regional preparations they can also raise proposals at the national level.
- There was a strong collaboration from ITU for preparation to make sure there is consistency and confident for members by overcoming challenges such as high costs and capacity.
- During the 4-year cycle since the WRC-15, ITU provided seminars on every level to understand where each region stands compared to ITU preparations on WRC-19. This has been recognised and have been effective.
- lhttps://www.itu.int/en/ITU-R/conferences/wrc/2019/Pages/default.aspx link will assist with logistics and attending WRC-19 as well as provision of assistance in terms of proposal structure and organisation.
- Some of the agenda items presented and discussed – IMT (5G) A.I 1.13, HAPS A.I 1.14, RLAN A.I 1.16 with others that needs more understanding on issues relating also to C-Band and Ku-Band as well as A.I 10. (This is further elaborated at Annex A – WRC19 Agenda Items.)
- CTO continues to advocate for member countries on any Agenda Item both at the national or regional level for the WRC-19. There is need to improve communications between the CTO and commonwealth countries at all levels to understand issues and promote them.

Session Two - 5G and 5G WRC Spectrum

Chair – Joseph Torres – Head of Spectrum and Operations, Gibraltar Regulatory Authority.

Presentation: How can the rollout of 5G infrastructure and networks be coordinated with the continued roll out of 3G and 4G services?
Dr Yao Wenbing – Vice-President for Business Development and Partnership, Huawei.

- C-Band/TDD2.3/2.6GHz becoming industry consensus as 5G primary band, while mmWave mainly suitable for ultra-capacity scenario in long term.
- 80-100MHz contiguous spectrum on mid-band (C-band/TDD 2.3/2.6GHz) is important for 5G investment efficiency.
- 5G@C-Band/TDD 2.6GHz is mature in the early 2019, while 5G@2.3GHz will be mature only one year later, in the early 2020.
- Affordable 5G spectrum price with reasonable obligations is suggested, which will encourage mobile network operator (MNO) investment in network construction and service quality improvement.
- Auction block size should be delicately designed to prevent fragmentation and drive reasonable competition
- Network synchronization is mandatory for 5G New Radio (NR) network to ensure spectrum efficiency.
- Network criteria and benchmark is key to stimulate the healthy market competition for higher network quality and users' experience. It's suggested the regulator to consider and implement.

Presentation: What can we learn from the roll out of 5G and Internet of Things (IoT) in advanced economies?

Dr Huan Nguyen – Head of 5G network and Internet of Things, Middlesex University, United Kingdom of Great Britain and Northern Ireland.

- Fast changes to the development of 5G
- Handsets and CPE are available before the deployment of 5G network – $300US for a smartphone
- South Korea as a case study for its high demand for 5G technologies comes from using of Augmented and Virtual (AR/VR) applications
- The early deployment of 5G in advance economies uses frequencies from Mid-band, C-band, TDD 2.3/2.6 GHz, mmWave

Panel Discussion- How is 5G likely to change approaches to spectrum policy and pricing?
Oliver Chapman – Policy Director, GSMA
Jerome Louis – Director of Engineering Information and Communication Technologies Authority, Republic of Mauritius
Stuart Cooke – Director Regulatory & Industry Affairs at Samsung and Vice Chair GSA Spectrum Group

Key points

- The different roll out strategies in USA, Korea, China, Europe, Japan, Singapore was noted and this roll out depends on each country's policy, business model and use cases.
- The spectrums that were heavily discussed included 3GPP, mmWave, C-Band, and TDD2.3. These spectrums depend on each use case and country's policy in terms of costs and technology for deployment.
- Looking at investment management and resources optimisation, Regulators need proper strategies for criteria and benchmarking to develop quality and good user experiences.

- The prediction of high demand for 5G experience is that there should be an equivalent preparation for supply. Preparation towards headsets, CPE and eco-systems at very affordable costs for the first time. Korea was referred to as a case study based on the demand from AR/VR applications for consumption.
- Manufacturing specification on energy consumption especially for the rural networks and solutions are a must.
- Challenges with spectrum policy development on small scale economies in terms of cost recovery, keeping up with the changes and traditional vs auctioning spectrum allocation.
- Huawei developed all in one solution for easy 5G deployment solutions, this includes energy solutions plus the new technologies. Furthermore, they also suggest the use of existing sites with 4G capability for 5G services.

Session Three - Spectrum Sharing and Future Trends

Chair – Professor H Sama Nwama **–** Managing Partner at Cenerva Ltd and Director at Atlantic Telecoms and Media

Presentation: Spectrum Sharing and exclusive use; Challenges, future developments and impact on business models.

Anna Coast – Director, Telcoconsulting, UK

- Experiments and trials will develop market impact and benefits to consumers
- Impact on business models = Commercial sharing and measurement of value, costs and investment
- Changes to licences needs and spectrum sharing will increase

Presentation: Use-cases & International perspectives on spectrum sharing: The role of neutral – host networks and enterprise cellular.

Dean Bubley - Director, Disruptive Analysis, UK

- There will be a high demand for 5G given the many use cases such as managing utilities such as transportation, power, water and other business model for connectivity to better manage and deliver the services.
- New markets and opportunities for niche areas will increase
- New indoor/enterprise-centric spectrum models & bands, [Potentially relevant near-term and Macro / outdoor / longer term]

Presentation: How important will frequency bands such as the 2.3GHz, 2.6GHz and 3.4-3.8GHz be in providing a solution?

Davood Molkdar – Wireless Network Solutions Architect and Spectrum Management Consultant, CASiTEL Ltd

Key Points:

- Spectrum sharing has been taking place in different markets and in different forms; they have been the catalyst for better connectivity and user experience.
- Spectrum sharing needs to be considered more systematically to cover wider forms and address various traffic demands, geography, diverse industries, connectivity, KPIs and others.
- It is the provision of *"Practical Services"* which is important rather than trying to account for every possible *sharing* scenario.

Panel Discussion: The role of dynamic spectrum access and dynamic access licensing regime as codified in wireless telegraph act in 2017, to what extend this regime has facilitated the spectrum sharing in UK and future evolution of spectrum sharing

Roberto Ercole – Consultant – Spectrum Strategy, Telecom Regulation, Public Policy, Training and Advocacy

- Spectrum is a very valuable resource and contributes to gross domestic product (GDP) of all countries.
- Transactional costs have implications on the marginal costs when managing spectrum sharing.
- Rural areas connectivity provides the most benefits when dealing with sharing infrastructure for commercial opportunity.

Key Points:

- Sharing reduces marginal cost for spectrum usage which in turn promotes the efficiency of using spectrum.

- Exclusivity of spectrum does not work hand in hand with competition
- Disruptive technologies promote the demand for 5G, hence there is a demand for 5G and their different use cases. Especially looking at different sectors such as power sector, research and health sector
- Prediction of different markets and different set of players and there is a need for careful observation and commitments.
- Indoor vs rural areas and how they will provide areas of focus for service provision.
- There is a need to make sure there are conversations with everyone on how spectrum and technologies are transforming lifestyle every day. It will provide a level of engagement for future planning.

Session Four - 5G & Universal Connectivity

Chair - Honourable Paul Lewis, Ministry of Communications, Works, Energy and Labour, Montserrat

Presentation: Studies on development of regulatory framework for earth stations in motion operating in 27.5 – 29.5 GHz (E-s) and 17.7-19.7 (s-E)

Ular Kaldassaun – Spectrum Engineer, Inmarsat

- WRC-19 Agenda item 1.5 - to facilitate the operation of ESIM in GSO FSS networks in the Ka-band
- Demand rests on two big pillars
    - [1) Connectivity -> 5G paradigm - everywhere and anytime2) More bandwidth]

Presentation: Satellite issues relating to regulation

Theo Bougouin – Regulatory and space development engineer, Avanti Communications Group plc

Key Points:

- The GSC/ESOA position shows that there is a need for access to sufficient spectrum for connectivity for terrestrial and satellite broadband services
- In the 26GHz (Band A) they are support sharing with IMT with constraints on IMT equipment deployment such as the provision to adopt and enable deployment of future FSS earth stations
- There are different region positions on 37-43.5 GHz (Band C, D and E)
    - 47.2-50.2 GHz and 50.4-52.6 GHz (Band H and I)
        - No Change to RR as IMT and HDFSS not compatible
    - 66-71 GHz, 71-76 GHz and 81-86GHz (Band J, K and L)
        - Support sharing with IMT with appropriate regulatory measures for the protection of satellite services

Panel discussion: Satellite regulatory issues

Daniel Mah – Vice President, Legal & Regulatory Affairs, EMEA and APAC, SES

- Satellites will accelerate the deployment of 4G, 5G and legacy data networks worldwide, including also to hard-to-serve, under-served and un-served areas
- 5G satellite technology builds on SES's existing business experience and customer base. SES's end-to-end managed services approach mitigate / reduce mobile operators' risks associated with deploying 5G use cases.
- SES is working with all stakeholders to ensure integration of satellite into the overall 5G ecosystem, enabling a range of vertical applications
- SES is making significant investments in new satellite, network and service capabilities to support those opportunities (GEO, O3b, mPOWER)
- Satellite needs to retain and expand sufficient spectrum resources (in C/Ku/Ka as well as Q/V bands) to serve broad range of applications, including 5G

Key points

- There is a strong argument that there is a complementary role for satellite connectivity. Satellite needs to retain and expand sufficient spectrum resources (C/Ku/Ka band as well as Q/V bands) to serve broad range of applications, including 5G.
- There is a strong argument to facilitate the operation of ESIM in GSO FSS networks in the Ka-band to promote quality of services and accessibility.
- There are not many people benefiting from satellite services because they are not controlling the value chain. Availability of satellite services are only for B2B and B2G compare to the mobile industry where affordable services is experience for remote areas such as Africa, and

other small island nations because they control the value chain. It is believed that controlling the value chain will provide affordable services.

- Unserved areas where satellite is a solution and Jamaica encouraged partnership with local Telcos to deliver services such as education. They also have Universal Access Fund where they collect money from the Operators for these areas and use it as a framework to provide more affordable costs at these unserved areas.

Session Five - Spectrum Re-farming

Chair – **Cathy Westcott**, Communications Regulations Specialist, British Broadcasting Company (BBC) World Service

Presentation: What role can re-farming of spectrum play as an alternative to spectrum reassignment?

Tebogo Ketshabile – Senior Engineer Spectrum Management, Botswana Communications Regulatory Authority (BOCRA)

- Radio spectrum is a finite resource and new assignments may not be supported at all times. The use of re-farming presents endless opportunities.
- Technologies are evolving rapidly and to make use of spectrum from obsolete technologies, re-farming seems to be the best option going forward
- The benefits of re- farming are fully realised when there is emphasise on neutral licensing policies.

Panel Discussion: Cross-border frequency coordination – to what extent can regulatory approaches as adopted in spectrum framework be borrowed across different member states?

Joseph Torres – Head of Spectrum and Operations, Gibraltar Regulatory Authority
Dr Maria Myers-Hamilton – Managing Director, Spectrum Management Authority, Jamaica
Ronnie Aiolupotea – Assistant Regulator, Spectrum Manager, Office of the Regulator, Independent State of Samoa

Key points

- ITU definition is not specific to mobile, but aims to remove technological barriers and use spectrum more efficiently.
- The concept of technology neutrality leads to lack of duty of care from regulators because different generations will have different technical parameters; for example the out of band emissions are increased.
- The discussion at cross border and regional coordination and communications seen as essential but also challenging because of technical, political, legal and logistic challenges.
- Important to recognize different requirements of different countries but collaborate to find where there is commonality. Also looking to re-establish, and strengthen relationships with all Commonwealth coutries, locally and regionally in which CTO is happy to support.

Session Six - Spectrum Auctions

Chair – Geoff Varrall, Director, RTT Programmes

Presentation: Analysis of auction formats

Marc Eschenburg, Partner, Aetha Consulting

- The efficiency and outcome of auctions is dependent on many factors such as
  Auction format, Balance between supply and demand, Pro-competition measures such as reservations and caps, Detailed rules (e.g. information policy)

Presentation: Spectrum auction failure and how to avoid.

Ade Ajibulu, Regulatory Economist, Telecoms Industry Specialist and Spectrum Auction Advisor, Coleago

- Consider the wider economic benefit instead of short-term license revenue
- Set reserve prices conservatively to avoid unsold spectrum
  - Consider cash flows and ability to pay of the industry
- Consider the impact of other objectives, e.g. coverage and quality on spectrum value

Panel Discussion: Are auctions still the way forward?

Professor H Sama Nwana, Managing Partner at Cenerva Ltd & Director at Atlantic Telecoms and Media, United Kingdom of Great Britain and Northern Ireland

Roberto Borello, Auction Design Policy Specialist, OFCOM, United Kingdom of Great Britain and Northern Ireland

Key points

- Areas of concern with regards to cost of spectrum allocation by regulator. This concern includes the change in market technology for networks, entrance for new comers with regards to complexity of auction rules and format which changes the outcome. Spectrum cost depends on supply and demand, number of spectrum available i.e the less the higher the price and the more available the lower the price.
- Roberto focused on the examples as to why auctions fail. In terms of failure it is mainly failure to achieve objectives set up such as revenue, efficient use of spectrum in terms of economic, providing quality service coverage
- The case of Bangladesh was given as an example. Failure is meeting expectation of spectrum and the economy. Common reason for failure in auction is related to setting the minimum price.
- Participants shared experience in auctions that have failed including those relating to change in auction rules along the way. It was noted that there are many spectrums available but if many service providers are interested in a particular spectrum then that will impact on the auction.
- Applications are assessed against the credibility of their business cases (inclusive/exclusive criteria) once you're in, then the price is the main term, one can make it more complex by including cultural rules, and commitment to financial rolling. These complexities can be integrated into the auction format, but it is important to be more careful as they can make the auction more complex.
- Low GDP countries perhaps need a rule of thumb as to what auctions may be better since countries have different values for spectrum. They should not expect same spectrum costs across countries.
- CTO thanked the panel for the discussions and participation. There is a reminder to put forward expectations and perspectives from the layman's point of view in which they do not need to know if spectrum was auctioned or how it was distributed as the main interest lies with the quality of service. The consumer expects to turn the phone on and it works, the

same for the Internet. It would be interesting to read about any study that proves the interrelationship between the quality of service to whether or not the spectrum was auctioned and, the distribution process.

Session Seven - High Altitude Platform Stations (HAPS)
Chair – **Daniel Mah** – Vice President, Legal & Regulatory Affairs, EMEA and APAC, SES

Studies for considering appropriate regulatory actions for HAPS

Ogbonnaya Anicho, Researcher (Computer Science): Autonomous Multiple HAPS/UAV (Swarm) Coordination using AI based techniques, Liverpool Hope University, United Kingdom of Great Britain and Northern Ireland

- HAPS definition is well addressed by the ITU and presenter provided a more technical and concise definition for the conference. Where it considers different domain for operations from Satellite and others.
- HAPS should be considered for providing affordable prices at areas where Satellite is non - existent and there is strong business case for this technology.
- There is a case study where aircrafts and man HAPS are considered for the technology, but costs are other factors that needed to be considered.
- Satellite can coexist with HAPS to deliver a good experience with broadband especially everyone has one goal to connect as many unconnected people as possible.
- Spectrum management lacks technology which can assist in the future management of frequency allocation

Panel Discussion: Regulatory actions for HAPs
Gurvinder Singh Baicher, Visiting Professor, Liverpool Hope University, United Kingdom of Great Britain and Northern Ireland
Juan Cacace, Senior Analyst, Access Partnership, United Kingdom of Great Britain and Northern Ireland

Key points

- Use cases for HAPS included disaster management and recovery such as recent events such as those that happened in Indonesia for early warning systems. There is a compelling reason why there is a need to follow this technology. There is commitment to provide resources, if, one follows such technology.
- A.I 1.14 discussion in a different meeting where it led to a possibility to have HAPS fly before WRC-19. This discussion reminds the importance of looking for technologies to better equipped users.
- The issue for Satellite is whether HAPS should be on the same allocation and perhaps might have to have their own allocation. It seems that Satellite have the same use cases compared to use cases presented and discussed. The proposal would be for Satellite and HAPS to work together and extend areas of coverage especially in bands discussed.
- This session was referred to as the ‘Clash of the Titans’ because of the discussion between the use of both technology and how their sponsors plays a huge role for their existence compared to the technical solutions it provides to determine if they can coexist.
- The presentations and panel discussions initiated sharing of experience and lessons learned amongst the participants. Advice was also provided by participants with experience in the area of discussions.

Session Eight - Future of Spectrum Management

Chair – Dr Maria Myers-Hamilton, Managing Director, Spectrum Management Authority, Jamaica

Presentation: Spectrum Management - Use of technology to make it more efficient
Peter Curnow Ford - Managing Partner, Viatec, United Kingdom of Great Britain and Northern Ireland

- Many technologies in use, many more being explored (university and R&D) and Regulators can benefit from online automation of licensing
- MNO's and regulators exploring Dynamic Spectrum Access to share spectrum more efficiently. They also both need and are using systems to manage down complexity and improve spectrum efficiency
- AR/VR bringing spectrum planning to life – see propagation in "real life"
- AI and other techniques being explored

Presentation: What role can technologies, such as AI, play in creating more efficient spectrum management systems?

Colin Thomson, Director, Technical Advisory and Regulatory Engineering, Access Partnership, United Kingdom of Great Britain and Northern Ireland

- Spectrum management and using ITU rules and standards
- Process of data and how it can be of informed decision, using AI in all the areas of data processing [transmission, storage, processing and analysis]

Panel Discussion: Are the Commonwealth members making the most of the digital dividend opportunity?

Honourable Vincent Odotei Sowah, Deputy Minister, Ministry of Communication, Republic of Ghana
Kirk Sookam, Executive Director – Technology and Engineering Telecommunications Authority of Trinidad and Tobago and Chairman of CTU Spectrum Management Task Force
Stephen Talbot, Head of International Spectrum Policy, OFCOM, United Kingdom of Great Britain and Northern Ireland

Key points

- Online spectrum licensing for managing spectrum application and how it provides easy access and execute processes.
- Type approval process and having to reconcile what is available on the field and where they are is a challenge for Regulators however, there is paper work accompanying this process and if this paperwork can be moved to a computerized system such a move will help make decisions and understanding better.
- KPI can be used to improve efficiency and quality of services for networks and using spectrum efficiently but there is a policy point of view where Government can provide policies for minimum standards for licenses to benefit users and satisfy the Regulators.
- Ghana have witness some of the benefit from digital dividend with different technology where it has also created a new digital civilisation. The government services and stakeholders are now enjoying from many projects such as accessibility to mobile technologies 95% coverage), e-transform the Ghana society, online services and many more transformations for Ghana citizen to participate and contribute to the Ghana digital economy.
- Spectrum management for SIDS countries such as the ones in the Caribbean need a harmonise approach to make sure there is coordination for e-services.
- UK have seen many benefits since early 2000 where successful outcomes such as mobile technologies, various operators and transformation in the communication sector. UHF and 800 MHz band and auctions where services are making more opportunities.

- There is a need to make sure there is a balance for a market verses non-market driven area where unserved areas are properly covered. Such example was referred to the UK’s experienced from the 700MHz band where there is difference in calculation.
- Combining Satellite and other solution provided a more economical ways to complete the coverage in Benin as the complete solutions to successfully achieve coverage and digital divide.
- Costa Rica connected all schools in the country which in turn provided connectivity for everyone in the community. The technology is very robust that there is consistency using WIFI when moving from one village to the other.
- Future profits must be invested into skills development to encourage growth. Ghana is able to provide free education up to the college level. Students only pays when attending at University and Ghana is building more connectivity to make sure technology promote skills which will also create surplus of digital skills. Investment in the young is the best way to promote literacy and Ghana is looking at introducing coding in schools. This is where the profit will come from
- There is a need for political will to promote investment and improve development in countries.

Session Nine - Connecting the Unconnected

Chair – Martin Koyabe, Manager, Technical Support and Consultancy, Commonwealth Telecommunications Organizations

Presentation: Universal free connectivity
Geoff Varrall, Director, RTT Programmes, United Kingdom of Great Britain and Northern Ireland

- A model where its parts can produce results for political decision with the expectation to deliver an almost free connectivity at the same time add value to the competition
- Find some mechanism whereby we can deliver close free connectivity as there is no such thing as free lunch as discussed in the previous days there is always a cost. We have a new model that will last in the next 10 years that adds value to the competition.

Panel Discussion: What options exist to deliver the required backhaul services in rural areas?
Fabio Leite, Vice President, Global Spectrum Regulatory Policy, Inmarsat
Robert Abbil, Technical and Universal Access Policy Manager, Republic of Vanuatu
Herman Schepers, Spectrum Strategist, Regulatory Affairs, Microsoft Corporation
Dr Abhaya Sumanasena, Managing Consultant, Real-Wireless

Key points

- Microsoft (MS) perspective is to make sure there is a combination of unlicensed and license spectrum under GHz bands for exclusive and non-exclusion basis to solve connectivity challenges. MS is a catalyst and want to share with operators on how to improve investment in the future. MS is doing researches on combination of technologies such as fixed wireless and other technologies to improve big challenges.
- There is a need to make sure accessible to affordable and high quality backhaul.
    - Each country has a specific and unique characteristic which is needed to be included in the simulation to better understand different obligations in terms of service delivery. Rural areas were used as there are many challenges in providing a more affordable and quality network in terms of coverage and services. Sometimes a combination of technologies is used to make sure there is feasible solution.
    - Power, costs and other factors are very important to determine connectivity however there is a need of what is practical and how it works on the ground. Sierra Leone and Benin where border provides connectivity from the other country's infrastructure despite theory of coverage and advance technologies.
    - Pushing for more coverage in Vanuatu, relies on policies and regulations to promote challenges that it faced in terms of costs and land issues. Most of the land in Vanuatu are customary lands and while power is very poor in rural communities the backhaul are not well supported. However, through a combination of technologies Vanuatu is able to provide a reasonable solution for backhaul connection in Vanuatu.
    - Ghana collaborate with operators and land owners to use pole powered with solar and set tripartite agreements to co-share the profit to bring 1500 villages to connect.
    - Solar as a solution for energy because of its sustainable nature towards low maintenance and initial setup costs support for backhaul connection however, there are high maintenance for these types of solutions.
    - Satellites are also very necessary in regions that are remote and dispersed, ensuring connectivity in remote areas such as the Pacific.

Session 10 - WRC – 19 Commonwealth Preparatory Meeting

Chair - Stephen Talbot, Head of the International Spectrum Policy, OFCOM, United Kingdom of Great Britain and Northern Ireland

Presentation: Thinking points for WRC preparations

Richard Womersley, Director Spectrum Consulting LS Telecom

- Ensure that all IMT bands identified by the ITU are available (or are in the process of becoming available) for mobile services, i.e.: that the National Frequency Allocation Table is updated that discussions have commenced with incumbents about re-farming
- License as much IMT spectrum as possible (~1000 MHz) in particular the sub-1 GHz bands which are essential for affordable coverage
- Make plans for 5G in the bands in which it will develop first [700, 1400, 2300, 2600 MHz]
- Recognize that identifying more spectrum for IMT at WRC-19 will not necessarily ameliorate the situation even more spectrum may be identified that will not be used for another 10-20 years mmWave bands will not supply the affordable coverage that is needed in African countries

Presentation:

Theo Bougouin – Regulatory and space development engineer, Avanti Communications Group plc

- improving satellite regulation (agenda item 7)
- BIU AND DEPLOYMENT OF NGSO (AI7: ISSUE A)
- NGSO SHORT DURATION MISSION (AI7: ISSUE M)

Presentation: Highlight of the WRC-15 Commonwealth Preparatory Meeting

Leonard Obonyo, Senior Programme Officer, CTO

- Progressing developments
- Successful coordination during in WRC-15 from CTO

Panel discussion: Current Status/Position ITU WRC-19

Jerome Louis – Director of Engineering Information and Communication Technologies Authority, Republic of Mauritius

Dr Maria Myers-Hamilton – Managing Director, Spectrum Management Authority, Jamaican

Robert Abbil, Technical and Universal Access Policy Manager, Republic of Vanuatu

Tebogo Ketshabile – Senior Engineer Spectrum Management, Botswana Communications Regulatory Authority (BOCRA)

Renell Alamilla Sr, Spectrum Management Officer, Public Utilities Commision, Belize

Kirk Sookam, Executive Director – Technology and Engineering Telecommunications Authority of Trinidad and Tobago and Chairman of CTU Spectrum Management Task Force

Stephen Talbot, Head of International Spectrum Policy, OFCOM, United Kingdom of Great Britain and Northern Ireland

It was noted that during the discussions there were commonalities among positions from each individual country (Refer to Annex B – Country's Position). However, it was more important that CTO should focus on two main agenda items. These are;

1. Agenda Item 1.14 and
2. Agenda Item 1.16. (Refer to Annex A – WRC-19 Agenda Items)

Session 11 - Regional Status and Preparation for WRC-19

Chair - Gisa Fuatai Purcell, Acting Secretary General and Director, ICT Development Department, Commonwealth Telecommunication Organisation.

Panel Discussion: Overview of Various Regional preparations toward WRC-19

John Lewis, International Spectrum Management Consultant on behalf of Dr Kyu-Jin Wee, Chairman of APG, Republic of Korea.

Peter Faris, Spectrum Expert, European Conference of Postal and Telecommunications Administrations

Kirk Sookram – Executive Officer – Technology and Engineering, Telecommunications Authority of Trinidad and Tobago and Chairman of the CTU Spectrum Management Task Force.

The speakers discussed different regions positions and how their preparations were in terms of progress and what they think should be in the Agenda for 2023. Bear in mind that during WRC-19 discussions will be held to decide agenda items for WRC2023.

Conclusion

WRC is a very complex system and it is a four-year cycle. The long period provides time for having different proposals with correct formats and right level of support. ITU acknowledged that these challenges exist and reaffirmed that counter measure are implemented such as conducting seminars and awareness programmes to make sure there is support both at the national and regional level. CTO have also echoed the same support and was glad that there are commonalities among the discussion during the meeting. The meeting was a success as participants were in a better position rather than day one of the meeting.

The 3 days meeting identified the needed support for Agenda Item 1.14 and 1.16. The importance of understanding each member countries developments, different use cases and challenges each faced which hindered the progressive implementation of a full digital transformation from these Agenda Items and others were noted. Furthermore, the successfully completion of the meeting confirmed that CTO is clear of their mission for the WRC-19 at this level.

Lastly, the shared case studies were useful knowledge sharing such as the developments in Ghana, UK and Caribbean to assist struggling member countries to gain confidence and how to deal with their challenges. Developed countries continue to lead the development and hopefully with innovations and research, will narrow the digital divide and will provide everyone with an opportunity to enjoy the benefits of these technologies. After all, as some in the conference claimed, it is a new civilisation. The Digital Civilisation.

Improving Rapporteur Role for CTO's Conferences

The following are additional recommendations for future rapporteur to make sure tasks are carried out efficiently and to improve productivity during and after the meeting.

- Presentations are available preferably before each session. There are many cloud services available and having these presentations uploaded online makes it easier to access them on the go. There was limited access to these files and has caused a lot of downtime to provide the overall report straight after the meeting. All conference files should be stored in this folder for future conferences.
- Use of conference venue with proper recording facilities so that it is easier to access recordings after the meeting. Some of the speakers spoke very low and sometime discussion were very hard to understand. Especially trying to understand the acronyms used during the meetings and different Agenda Items. Each speaker should be able to provide a concise written summary for their positions.

Overall, the conference was a success in terms of discussions and agenda items especially guiding questions.

Annex A – WRC 19 - Agenda Items

Agenda Item 1.13 – IMT

*By some countries of the following Region	Frequency bands (GHz) mentioned in Resolution 238 (WRC-15) in which identification is being considered*											
	24.25-27.5	31.8-33.4	37-40.5	40.5-42.5	42.5-43.5	45.5-47	47-47.2	47.2-50.2	50.4-52.6	66-71	71-76	81-86
CEPT	MOD	NOC								MOD	NOC	NOC
ASMG	X	X		X	X							
RCC	MOD	NOC			NOC	NOC				NOC	NOC	NOC
APT	MOD	NOC	MOD	MOD	MOD	MOD M-C	MOD M-C	MOD M-C	MOD M-C	MOD M-C	MOD M-C	MOD M-C
ATU	MOD	NOC	MOD	MOD	MOD			MOD	MOD	MOD		
CITEL	MOD M-C	NOC M-C										

Grey color indicates:

- Support the studies in these bands
- Multi-country (M-C) proposal (not regional)
- Bands are still under consideration

Reference docs:
https://www.itu.int/en/ITU-R/conferences/wrc/2019/Pages/reg-prep.aspx

Agenda Item 1.14 – HAPS

	Frequency bands (GHz) being considered by **some** countries of the Region					
	6 440- 6 520 MHz	21.4-22 (Region 2 only)	24.25-27.5 (Region 2 only)	27.9-28.2 and 31-31.3	38-39.5	47.2-47.5 and 47.9-48.2
CEPT	MOD			MOD	MOD	MOD
ASMG	NOC	NOC	NOC	NOC	NOC	NOC
RCC	MOD	MOD	MOD	MOD	MOD	MOD
APT				MOD M-C	MOD M-C	
ATU				MOD	MOD	MOD
CITEL		MOD M-C	MOD M-C		MOD M-C	MOD M-C

Grey color indicates:

- Support in initiating studies in these bands
- Multi-country proposal (not regional)
- Bands are still under consideration

Reference docs:
https://www.itu.int/en/ITU-R/conferences/wrc/2019/Pages/reg-prep.aspx

Agenda Item 1.16 – RLAN

	Frequency bands (GHz) being considered by **some** countries of the Region				
	5 150-5 250 MHz	5 250-5 350 MHz	5 350-5 470 MHz*	5 725-5 850 MHz	5 850-5 925 MHz*
CEPT		NOC	NOC		NOC
ASMG		NOC	NOC		NOC
RCC	MOD	NOC	NOC	NOC	NOC
APT		NOC	NOC		NOC
ATU	NOC/MOD	NOC	NOC	NOC/MOD	NOC
CITEL	MOD M-C	NOC	NOC	NOC	NOC M-C

Grey color indicates:

- Support in initiating studies in these bands
- Multi-country proposal (not regional)
- Bands are still under consideration

Reference docs:
https://www.itu.int/en/ITU-R/conferences/wrc/2019/Pages/reg-prep.aspx

* Bands that would require additional mobile allocation

Annex B Country’s Positions

Agenda	Mauritius	Tobago and Trinidad
Agenda Item 1.2 - To consider in-band power limits for earth stations operating in the mobile-satellite service, meteorological-satellite service and Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz, in accordance with Resolution 765 (WRC 15)		
Agenda Item 1.3 - To consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460 470 MHz, in accordance with Resolution 766 (WRC 15)		
Agenda Item 1.4	Mauritius supports Method B Mauritius has planned allotments under Appendices 30 (20 degrees East) and 30 A for Broadcasts Satellite Service (BSS) and under Appendix 30 B (92.20 degrees East) for Fixed Satellite Service (FSS). These orbital positions have remained unused since their allotment and the equivalent protection margins have degraded due to the entry of operation of satellites in adjacent orbital slots. The SADC has initiated a Shared Satellite	

	Programme under which the orbital positions allotted to SADC countries may now be brought into use. The removal of some or all current limitations on the use of the orbital arc for Regions 1 and 3 BSS networks as contained in Annex 7 to RR Appendix 30 (Rev. WRC-15) will make new orbital positions available for those countries with degraded equivalent protection margin. These new orbital positions would enable the SADC to implement the Shared Satellite Programme	
Agenda Item 1.5 - To consider the use of the frequency bands 17.7 19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service and take appropriate action, in accordance with Resolution 158		DIAP: Canada, Mexico, USA Draft new Resolution [AI1.5] (WRC-19) includes regulatory and interference management mechanisms necessary for the operation of ESIMs, including provisions: for the protection of non-GSO FSS systems for the protection of non-GSO MSS feeder links
Agenda Item1.6 - To consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution 159 (WRC 15)		DIAP: USA, Canada Draft new Resolution [AI6] (WRC-19) - Protection of geostationary satellite FSS, MSS, and BSS networks from unacceptable interference from non-GSO satellite FSS systems in the 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz, and 50.4-51.4 GHz frequency bands and from non-GSO MSS systems in the 39.5-40.0 GHz and 40.0-42.5 GHz frequency bands DIAP: Argentina, [Canada], United States of America The band 495-505 kHz is reserved exclusively for the

		international NAVDAT system.
Agenda Item 1.8	Agenda item 1.8 (Resolution 359 (Rev.WRC-15)), concerns GMDSS. Resolves 1 addresses the modernization of the GMDSS while resolves 2 addresses the introduction of additional satellite providers into the GMDSS. Modernization of GMDSS – Supports Method A2 to assign frequency band 495 – 505 kHz for international MF NAVDAT system Supports the introduction of new GMDSS service provider to enhance coverage, increase redundancy and introduce competition (Method B1)	Agenda Item 1.8: Issue A - Preliminary Proposal: [Canada], United States of America Proposal for use of frequency bands 415-495 kHz and 505-526.5 kHz (505-510 kHz in Region 2) to also be used for the NAVDAT system (currently used for NAVTEX) Agenda Item 1.8: Issue B - IAP: Bahamas, Canada, Chile, Costa Rica, Dominican Republic, Ecuador, Honduras, Mexico, Panama, United States of America To identify the band 1616-1626.5 MHz as being available for the provision of GMDSS by mobile-satellite service systems.This is the Iridium platform which operates through a non-geostationary satellite system in the frequency range 1618.25-1626.5 MHz.
Agenda Item 1.9.1 - AMRD- a mobile station, operating at sea and transmitting independently of a ship station or a coast station (May 2017 meeting of ITU WP 5B) Two groups of AMRDs are identified: Group A: AMRDs that enhance the safety of navigation. Group B: AMRDs that do not		DIAP: Bahamas, Canada, Mexico, United States of America It is proposed to identify frequencies 161.975 MHz (AIS 1), 162.025 MHz (AIS 2), and 156.525 MHz (ch70) in Appendix 18 of the Radio Regulations for Group A devices. It is also proposed to identify frequency 160.900 MHz (channel 2006 in Appendix 18 of Radio Regulations) for operation of Group B AMRDs using AIS technology. This frequency has been selected

enhance the safety of navigation (AMRDs which deliver signals or information which do not concern the vessel can distract or mislead the navigator and degrade the safety of navigation)."				because it is not currently used for navigational purposes. Concerns portion of the maritime VHF band used for VHF public correspondence service (“link calls”); allows for ships to connect with the telephone network via the VHF band. - consider results of ITU-R studies of sharing and compatibility between VDES satellite components and services in the same (156.0125-157.4375 MHz and 160.6125-162.0375 MHz) and adjacent (154-156 MHz and 162-164 MHz) frequency bands to determine potential regulatory actions, including MMSS allocations, for VDES applications. Preliminary Proposals: Canada/ USA/ Mexico - new primary allocation to the maritime mobile-satellite service for the following frequency ranges: 157.1875-157.3375 MHz (Earth to space) and 161.7875-161.9375 MHz service (space-to-Earth).
Agenda Item 1.10	to consider spectrum needs and regulatory provisions for the introduction and use of the Global Aeronautical Distress and Safety System (GADSS), in accordance with Resolution 426 (WRC-15) Supports Method B			IAP: Brazil, Canada, Dominican Republic, Mexico, Paraguay, Uruguay, USA Proposal modifies the Radio Regulations to recognize GADSS as a distress and safety communication system in Chapter VII -Distress and safety communications introduces GADSS in Article 30, under Chapter VII, and establishes a new Article 34A (aligns with Method A of CPM text)
Agenda Item 1.11				IAP: Argentina, Brazil, Canada, Colombia, Costa Rica, Ecuador, United States, Guatemala, Mexico, Panama, Paraguay, Dominican Republic, and Uruguay

				NOC (No change) Reasons: The Administrations believe it is unnecessary to identify spectrum specifically for railway radiocommunication systems. Regional and global harmonization can be satisfied by applicable ITU-R Reports and Recommendations. Therefore, no change to the Radio Regulations or regulatory action is required under this agenda item.
Agenda Item 1.12 - Intelligent Transport Systems - to consider possible global or regional harmonized frequency bands, to the maximum extent possible, for the implementation ofevolving Intelligent Transport Systems (ITS) under existing mobile-service allocations, in accordance with Resolution 237 (WRC-15)				IAP: Argentina, Brazil, Canada, Colombia, Costa Rica, Ecuador, United States of America, Guatemala, Mexico, Panama, Paraguay, Dominican Republic, Uruguay NOC (No change) Reasons: It is unnecessary to identify spectrum specifically for Intelligent Transport Systems. Regional and global harmonization can be satisfied by developing applicable ITU-R Reports and Recommendations. Therefore, no change to the Radio Regulations or regulatory action is required under this agenda item.
Agenda Item 1.13	**Item**	**Frequency Bands**	**Current Positions**	26 GHz Band:- 24.25-27.5 GHz - IAP: [Argentina], Brazil, Canada, Colombia, Costa Rica, United States, [Peru], Dominican Republic, Uruguay Identification of the band 24.25-27.5 GHz for IMT Radiated power limits identified in Resolution 750 (Rev. WRC-15) to ensure adjacent band compatibility with EESS (passive) in the band 23.6-24.0 GHz 32 GHz Band: - 31.8-33.4 GHz - IAP: Argentina,
	A	24.25 - 27.5 GHz	Supports allocation to MS with protection to EESS(pas)(A2, Alt 2, Condition A2a:	

			Option 1)	Canada, Colombia, United States, Guatemala, Mexico, Paraguay, Uruguay Proposal for no change due to incompatibility of IMT with other primary services to which the band is allocated. 40 GHz Band:37-40.5 GHz, 40.5-42.5 GHz, 42.5-43.5 GHz - DIAP: Brazil, United States, Uruguay Identification of the band 37-43.5 GHz to IMT 50 GHz Band: 45.5-47 GHz,47-47.2 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz - DIAP: Argentina, United States, Mexico No Change (NOC) is proposed for 47-47.2 GHz frequency band. DIAP: Canada, United States, Mexico Identification of the band 47.2-48.2 GHz to IMT No Change (NOC) is proposed for 48.2-50.2 GHz frequency band. 66 GHz Band:66-71 GHz - DIAP: Belize, Colombia, United States, Guatemala, Mexico No Change (NOC) is proposed for 66-71 GHz frequency band to allow for plans for implementation of licence-exempt technologies such as Multiple Gigabit Wireless Systems (MGWS) systems. 70-80 GHz Band:71-76 GHz, 81-86 GHz - IAP: Argentina, Canada, Colombia, United States, Guatemala, Mexico No change for 71-76 GHz and 81-86 GHz bands
	B	31.8 - 33.4 GHz	Method B1 (NOC)	
	C	37 - 40.5 GHz and 40.5 - 42.5 GHz	Supports identification for IMT in all regions. 37 – 40.5 GHz (Method C2, Alt 2 no additional conditions) 40.5 – 42.5 GHz (Method D2, Alt 2, no additional conditions)	
	D	42.5 - 43.5 GHz	Supports identification for IMT in all regions. (Method E2, Alt 2 no additional conditions)	
	E	45.5 - 47 GHz	Supports identification for IMT (terrestrial). (Method F4, Alt 2 no	

			additional condition)	
	F	47 - 47.2 GHz	Supports allocation to MS and identification for IMT (terrestrial). (Method G3, Alt 2 no additional conditions)	
	G	47.2 - 50.2 GHz	Supports identification for IMT. Method H2, Alt 2, Condition H2a: Option 2	
	H	50.4 - 52.6 GHz	Method I2, Alt 2, Condition I2a: Option 2, IMT terrestrial (not only LMS) with protection of EESS (pas)	
	I	66 - 71 GHz	Method J2 Alt 2: identification for terrestrial IMT not only	

			LMS	
	J	71 - 76 GHz	Method K1 (NOC)	
	K	81 - 86 GHz	Method L1 (NOC)	
Agenda Item 1.14				6 GHz Band: 6440–6520 MHz (HAPS-ground) 6560-6640 MHz (ground-HAPS) - DIAP: Bahamas, Canada Addition of new footnote and new Resolution A114 includes regulatory mechanism to protect incumbent services in the band 6 440-6520 MHz and facilitate the use of HAPS downlink (6440–6520 MHz) on a global level. 22 GHz Band: 21.4-22 GHz - IAP: Bahamas, Brazil, Canada, Dominican Republic, Guatemala, Mexico Addition of footnote and new Resolution B114 allowing HAPS to operate in the fixed service allocation in the 21.4-22 GHz band. 26 GHz Band: 24.25-27.5 GHz - DIAP: Bahamas, Brazil, Canada, Colombia, [Ecuador], Dominican Republic Addition of a primary fixed service allocation to the 24.25-25.25 GHz band and a new identification for HAPS in the band 24.25-27.5 GHz in Region 2.

Agenda Item 1.16	t	5150-5250 MHz - IAP: Belize, Colombia, Costa Rica, United States, Guatemala, Mexico, Nicaragua Revisions to Resolution 229 to enable RLAN outdoor deployments while ensuring protection of other operations in the 5150-5250 MHz band. 5250-5350 MHz - IAP: Argentina, Brazil, Canada, Colombia, Costa Rica, United States, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Dominican Republic, Uruguay No Change (NOC) is proposed for 5250-5350 MHz frequency band. Studies have shown that changing the RLAN operating conditions in the band 5 250-5 350 MHz would not ensure protection of incumbent radio determination services and EESS (active) sensors. 5350-5470 MHz - IAP: Argentina, Brazil, Canada, Colombia, Costa Rica, United States, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Dominican Republic, Uruguay No Change (NOC) is proposed for 5350-5470 MHz frequency band. Studies indicate that there are no viable mitigation techniques to facilitate sharing between Radio Local Area Networks (RLAN) and the Earth Exploration Satellite Service (active) or radiolocation systems in the band 5350-5470 MHz. 5725-5850 MHz - IAP: Brazil, Canada, Colombia, Costa Rica, United States, Paraguay No Change (NOC) is proposed for 5725-5850 MHz frequency band. In Region 2, the band 5725-5825 MHz is used

				by WAS/RLANs, under footnote 5.150 (identification for ISM applications) 5850-5925 MHz - IAP: Argentina, Brazil, Canada, Colombia, Costa Rica, United States, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Dominican Republic, Uruguay No Change (NOC) is proposed for 5850-5925 MHz frequency band. Mobile service is co-primary and applications are already implemented in this segment.
Agenda Item 9.1.1				IAP: Belize, Brazil, Canada, Mexico, Saint Lucia, United States No Change (NOC) is proposed for the 1885 - 2025 MHz and 2110 - 2 200 MHz bands. DIAP: [Brazil], Canada, United States Studies will be complete by WRC-19 Studies will document technical and operational measures to promote compatibility between the terrestrial and satellite components of IMT in different countries DIAP to be updated when studies are complete
Agenda Item 9.1.2				
Agenda Item 9.1.5				
Agenda Item 9.1.6 - Wireless Power Transmission (WPT) for electric vehicles ITU-R) identified two frequency ranges for WPT-EV charging that might be suitable for harmonization: 79-90 kHz frequency range (medium				IAP: Brazil, Canada, Colombia, Mexico, Paraguay, United States of America, Dominican Republic, Uruguay No Change (NOC) is proposed for the 79-90 kHz frequency range (medium power) and 19-25 kHz frequency range (high power) frequency bands.

power) 19-25 kHz frequency range (high power)				
Agenda Item 9.1.8				IAP: Argentina, Brazil, Canada, Colombia, Costa Rica, Ecuador, United States of America, Guatemala, Mexico, Panama, Paraguay, Dominican Republic, Uruguay NOC (No change) Analysis of the current and future spectrum use for narrowband and broadband machine type communications (MTC), also known as machine-to-machine (M2M) or Internet ofThings (IoT), concluded that there is no need to identify specific spectrum for those applications. Therefore, no change to the Radio Regulations or regulatory action is required.
Agenda Item 9.1.9 - Aim: to study the spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space), in accordance with Resolution 162 (WRC-15). Overlaps with 50.4-52.6 GHz band for IMT (1.13)				DIAP: Brazil, Canada, Mexico, [Uruguay] Allocation of the frequency band 51.4-52.4 GHz to FSS (Earth-to-space), limited to FSS gateway links for geostationary orbit use while protecting currently allocated services in the same frequency band and in adjacent frequency bands.

Agenda	Botswana	Jamaica	Vanuatu
Agenda Item 1.2 - To consider in-band power limits for earth stations operating in the mobile-satellite service,	Botswana supports the studies towards the establishment of in-	No Change postion	No Change postion

meteorological-satellite service and Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz, in accordance with Resolution 765 (WRC 15)	band power limits for MSS in the frequency band 399.9 – 400.05 MHz.		
Agenda Item 1.3 - To consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460 470 MHz, in accordance with Resolution 766 (WRC 15)	Botswana supports a new Resolution to provide the transitional measures for the existing Mestas/EESS frequency assignments. In order to protect terrestrial services, pfd limits are proposed for both non-GSO and GSO MetSat/EESS satellites.		No Change postion
Agenda Item1.4			
Agenda Item 1.5 - To consider the use of the frequency bands 17.7 19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service and take appropriate action, in accordance with Resolution 158	Botswana does not have a position yet for this item. Fixed and mobile service operators are expected to guide Botswana to formulate a position.		
Agenda Item1.6 - To consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution 159 (WRC 15)	Botswana does not yet have a position for this item		
Agenda Item1.8			

Agenda Item 1.9.1 - AMRD- a mobile station, operating at sea and transmitting independently of a ship station or a coast station (May 2017 meeting of ITU WP 5B)Two groups of AMRDs are identified:Group A: AMRDs that enhance the safety of navigation. Group B: AMRDs that do not enhance the safety of navigation (AMRDs which deliver signals or information which do not concern the vessel can distract or mislead the navigator and degrade the safety of navigation)."			
Agenda Item1.10		No Change postion	
Agenda Item 1.11	Botswana supports the harmonization of the following bands. Simplex: 138-140MHz, 150.05-153 MHz, 417- 418 MHz and 443-444 MHz; Duplex: 141-143 MHz // 146-148 MHz, 153-154 MHz // 158-159 MHz; GSM-R/LTE-R 450: 452.5-457.475 MHz (UL) and 462.5-467.475 MHz (DL) GSM-R/LTE-R 900: 876-880 MHz (UL) and 921-925 MHz (DL). This is in support of a No change in the Radio Regulation. Furthermore, Botswana supports the suppression of Resolution 236 (WRC-15).	No Change postion	No Change postion

Agenda Item 1.12 - Intelligent Transport Systems - to consider possible global or regional harmonized frequency bands, to the maximum extent possible, for the implementation ofevolving Intelligent Transport Systems (ITS) under existing mobile-service allocations, in accordance with Resolution 237 (WRC-15)	Currently Botswana is in support of methods B1 or A. depending on further outcome on studies that are still going on. Method A: No change to the Radio Regulations. Method B1: Establish a new Resolution XXX (WRC-19)	No Change postion	No Change postion
Agenda Item1.13	Botswana supports the 26 GHz band (i.e. 24.25-27.5 GHz), 40GHz band (37– 43.5GHz) and 66GHz band (66-71GHz) as priority candidate bands for IMT.	To consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 238 (WRC-15). For frequencies between 24.25 and 86 GHz**Need to finalise position**	PNG made a positon on this agenda item and Vanuatu supports it re- C-BandNOC to other bands proposed
Agenda Item 1.14	Botswana supports ITU-R studies in the frequency bands identified in accordance with Resolution 160 and will be guided by the results of the studies in assessing the suitability of any frequency band studied for HAPS. Botswana also acknowledges that HAPS could be a solution for the rural and underserved areas for providing backhaul and services. Botswana will, based on	Agenda Item 1.14: to consider, on the basis of ITU-R studies in accordance with Resolution 160 (WRC-15), appropriate regulatory actions for high-altitude platform stations (HAPS), within existing fixed-service allocations. (6 GHZ, 22 GHz, 26 GHz, 28 GHz, 38 GHz, 47/48 GHZ.)	

	favourable findings of the on-going studies, propose suitable methods for implementation of HAPS applications		
Agenda Item1.16	Botswana supports identification different technical conditions for RLANs to operate under an existing Mobile Service (MS) allocation either in a new or existing footnote and Method A, No Change, are supported for the band 5150-5250 MHz.Botswana also supports No change (Method A) is supported for the bands 5250 -5350 MHz, 5350-5470MHz, 5725-5850 MHz and 5850-5925MHz.	No Change postion	
Agenda Item 9.1.1	Botswana supports the ongoing studies for identifying IMT in this band. However, identification of this band should take into account the incumbent services and systems already deployed in the 1800Mhz and 2100 MHz band.	No Change postion	
Agenda Item 9.1.2		No Change postion	
Agenda Item 9.1.5	Botswana supports the ongoing studies.		
Agenda Item 9.1.6 - Wireless Power Transmission (WPT) for electric vehicles ITU-R) identified two frequency ranges for WPT-EV			

charging that might be suitable for harmonization: 79-90 kHz frequency range (medium power) 19-25 kHz frequency range (high power)			
Agenda Item 9.1.8	Botswana supports the ongoing studies.	No Change postion	
Agenda Item 9.1.9 - Aim: to study the spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space), in accordance with Resolution 162 (WRC-15). Overlaps with 50.4-52.6 GHz band for IMT (1.13)			

Annex C - Conference Agenda