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| **The Meeting of the SATRC Working Group**  **on Spectrum** | **SAPIX-SPEC1/ OUT-02** |
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Working Group on Spectrum

**QUESTIONNAIRE ON**

**Spectrum Approaches and Regulatory Requirements for**

**NGSO Satellite Constellations for Space-based**

**Communication Services**

1. **BACKGROUND AND PURPOSE**

The increasing demand for high-speed internet access, remote sensing, and other space-based communication services has led to a growing interest in Non-Geostationary Satellite Orbit (NGSO) constellations. These constellations, comprising multiple satellites orbiting the Earth at various altitudes and inclinations, offer advantages such as global coverage, low latency, and enhanced capacity compared to traditional geostationary satellites.

However, the deployment and operation of NGSO satellite constellations are subject to complex technical, regulatory, and policy challenges. Spectrum allocation, in particular, is a critical issue, as it determines the frequencies at which these satellites can operate without causing harmful interference to other services.

The purpose of this study is to conduct a comprehensive assessment of spectrum approaches and regulatory requirements for NGSO satellite constellations, with a focus on supporting space-based communication services. By examining existing literature, engaging with stakeholders, and conducting technical and regulatory analyses, the study aims to:

1. Identify the spectrum requirements of NGSO satellite constellations for various communication services, including broadband internet, satellite-based navigation, disaster management communication system, etc.
2. Review prevailing regulations in SATRC countries governing spectrum allocation and coordination for NGSO satellite systems.
3. Study the socio-economic impact of NGSO satellite services over other prevailing services.
4. Develop policy recommendations to optimize spectrum allocation and regulatory frameworks, ensuring the efficient and equitable use of the radio frequency spectrum while promoting innovation and competition in the space-based communication sector.
5. Provide insights and best practices through case studies of existing NGSO satellite constellations, highlighting regulatory challenges and success factors for deployment and operation.
6. Disseminate findings and recommendations to regulatory bodies, policymakers, industry associations of SATRC countries, to facilitate informed decision-making and promote dialogue on spectrum management in the context of NGSO satellite constellations.

Overall, the study aims to contribute to the development of informed policies and regulatory frameworks that balance the interests of stakeholders, promote technological innovation, and maximize the socioeconomic benefits of NGSO satellite constellations for space-based communication services.

1. **SCOPE**

The scope of this study encompasses a range of technical, regulatory, and policy considerations related to the deployment and operation of NGSO satellite constellations for communication services.

The scope of this study includes the following:

1. Spectrum Approaches

* Evaluate the spectrum requirements for NGSO satellite constellations, considering various communication services such as broadband internet, remote sensing, satellite-based navigation, and other emerging applications.
* Assess the bandwidth, frequency bands, and any other technical parameters needed to support efficient and reliable communication links within NGSO constellations and between satellites and ground stations.

1. Regulatory Framework Review

* Examine international, regional, and national regulations governing spectrum allocation, coordination, and licensing for NGSO satellite systems.
* Identify key regulatory bodies and stakeholders involved in spectrum management for space-based communication services.
* Analyze regulatory trends and developments, including initiatives aimed at facilitating the deployment of NGSO constellations while ensuring spectrum efficiency and interference avoidance.

1. Policy Recommendations and Best Practices:

* Develop policy recommendations to optimize spectrum allocation and regulatory frameworks for NGSO satellite constellations, balancing the need for spectrum access, innovation, and spectrum efficiency with the protection of incumbent users and spectrum integrity.
* Propose best practices for spectrum sharing, licensing processes, coordination mechanisms, and spectrum monitoring and enforcement to promote fair competition, investment certainty, and regulatory compliance in the space-based communication sector.

1. Case Studies and Comparative Analysis:

* Conduct case studies of existing NGSO satellite constellations, analyzing their regulatory approval processes, spectrum management strategies, and operational performance in different geographical regions and market segments.
* Compare and contrast regulatory approaches and spectrum policies adopted by SATRC countries and international organizations to identify lessons learned, success factors, and areas for improvement in supporting NGSO satellite constellations for space-based communication services.

By addressing these aspects within the scope of this study, stakeholders can gain valuable insights into the spectrum-related challenges and opportunities associated with NGSO satellite constellations and inform evidence-based decision-making for policy development, regulatory reform, and technology innovation in the space communication sector.

1. **METHODOLOGY FOR CARRYING OUT THE STUDY**

The study will be carried out by the Experts of Working Group on Spectrum nominated by the SATRC Members. Therefore, in order to pursue the study, the following questions have been developed to obtain necessary information from the SATRC Members on the subject matter of the Work Item. Based on the information, the Experts will develop a draft Report on the Work Item for consideration of SATRC-26.

1. **QUESTIONS**
2. **General Information**
   1. Are any NGSO satellite currently providing communication services to your country?
   2. If your answer to Ques # A.1 is ‘NO’:

If you foresee any NGSO satellite to provide any sort of space-based communication services in your country in near future, please specify the types of communication services expected to be provided.

* 1. If your answer to Ques # A.1 is ‘YES’:

1. What are the primary communication services currently being provided by NGSO satellite(s) in your country? (e.g., broadband internet, satellite-based navigation, backhaul links, point-to-point services etc.)
2. Please name the service providers and the associated satellite constellation service provider(s) which are providing those services?
   1. Does your country have any plans to deploy any NGSO satellite constellation in near future?
3. **Spectrum Approaches**
   1. What spectrum bands are currently or planned to be allocated for NGSO satellite constellations in your country (if any)?
   2. What spectrum bands do you consider most suitable for NGSO satellite constellations for communication services, and why?
   3. What are the national approaches for licensing NGSO satellite constellations in your country?
   4. How do you view the conventional spectrum allocation mechanisms (e.g., administrative allocation, auctions, licensing etc.) for NGSO constellations?
   5. Are there alternative spectrum management approaches you believe would be beneficial for NGSO constellations?
   6. How do you think spectrum approaches can be improved to accommodate the growing number of NGSO satellite constellations?
   7. Are there any specific spectrum sharing rules in place in your country for NGSO satellite constellations?
   8. How can spectrum sharing between NGSO constellations and other users be effectively facilitated?
   9. Are there any specific requirements or criteria that NGSO satellite operators need to fulfill to obtain a license in your country?
   10. How do you think the market entry process can be streamlined to encourage innovation and competition in the NGSO satellite industry?
   11. How do you foresee the spectrum requirements of NGSO satellite constellations evolving in the next 5 to 10 years, considering technological advancements and market demand?
4. **Regulatory Framework and Challenges**
   1. Are there specific regulatory guidelines for NGSO satellites in your country? If yes, please provide details.
   2. What are the current regulatory frameworks governing NGSO satellite systems including its spectrum allocation and coordination issues in your country?
   3. What are the key regulatory challenges or barriers hindering the deployment and operation of NGSO satellite constellations from your country’s perspective, if any?
   4. What improvements or reforms do you suggest to enhance the regulatory environment for NGSO satellite systems, particularly regarding spectrum management?
   5. What are the key regulatory challenges you see for NGSO constellations in terms of spectrum access and utilization?
   6. How can regulations be streamlined to encourage innovation and deployment of NGSO constellations?
   7. Do the current regulations adequately address issues like space debris mitigation and orbital management for large constellations?
   8. What role, do you think, can international/regional cooperation play in establishing harmonized regulations for NGSO constellations?
5. **Interference Mitigation**
   1. Are there any specific interference management mechanisms in place in your country for NGSO satellite constellations? If yes, provide details.
   2. How do NGSO satellite system parameters (e.g., orbit configurations, frequency reuse schemes) impact spectrum utilization efficiency and interference mitigation?
   3. What technical measures or technologies can be employed to minimize interference between NGSO satellites and terrestrial or other satellite systems sharing the same frequency bands?
6. **Policy Recommendation and Best Practices**
   1. What are the key policy recommendations or best practices for optimizing spectrum allocation and regulatory frameworks to support NGSO satellite constellations?
   2. How can stakeholders collaborate effectively to implement these recommendations and ensure the sustainable development of NGSO satellite systems?
   3. Do you think the prevailing regulations regarding Quality of Services are sufficient enough to address NGSO satellite-based services? If not, kindly suggest what others aspects needed to be covered in this respect.
7. **Additional Comments**
   1. Is there any additional information or insights you would like to share regarding spectrum management and regulatory requirements for NGSO satellite constellations?
   2. How do you envision the future of NGSO satellite constellations and their role in space-based communication services?
   3. Are there any emerging trends/ innovations/ technologies that can have significant influence or impact on NGSO satellite constellations?

Please share any other suggestions or feedback for this study, if you have any?

**N.B. You may provide any relevant data or case studies to support your responses.**

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