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Issues of Electromagnetic Compatibility and Protection of the Orbital-Frequency Resource of Space Complexes and Systems

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Abstract. The article considers problematic issues of international legal protection of the orbital-frequency resource of the Russian Federation. The paper outlines problematic issues of radio frequency support for ground-based command and measurement systems on command and measurement stations (CMS) with regard to the decisions taken at international conferences on radio communications. The state of international legal protection of the orbital-frequency resource of existing and prospective domestic Earth remote sensing spacecraft is systematized and presented. Problematic issues of electromagnetic compatibility arising in connection with the deployment of mobile communications of the fifth and sixth generations (5G, 6G), Wi-Fi 7 (802.11be) communications are set forth. It is concluded that the ground and space infrastructure of space-based Earth remote sensing requires verification in order to place new requirements for radio frequency support and international legal protection of the orbital-frequency resource when developing technical specifications for space complexes, as well as to put forward proposals for protecting the interests of the Russian Federation in matters of the orbital-frequency resource.

The authors find it necessary to carry out international legal protection of the most demanding Earth remote sensing space systems along with existing and prospective technical means of the ground-based space infrastructure in critical areas (Western CMS, Medvezhyi Ozero, Baltic CMS, Kaliningrad, Eastern CMS, Tsiolkovsky, “Sakhalin” measuring station, “Shkolnoye” (Crimea) and “Evpatoria” (Crimea) deep space communication centers) as soon as possible.

Keywords: orbital-frequency resource, ground-based space infrastructure, mobile communications, Earth remote sensing spacecraft, high frequency radio link, command and measurement system, radio frequency spectrum, electromagnetic compatibility, WRC-2023

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References

1. Permyakov R.V. Itogi zapuskov kosmicheskikh apparatov DZZ v 2023 godu i perspektivy 2024 goda [Results of launches of remote sensing spacecraft in 2023 and prospects for 2024]. Available at: https://racurs.ru/upload/iblock/77c/c9iyuparwhwufcm1c3iqm4o4odbquqdx/Zapuski-sputnikov-DZZ_2023_final2.pdf (accessed September 26, 2024). (in Russian)
2. Roskosmos rasskazal o vvode v ekspluatatsiyu sputnikov dlya s"yemki i monitoringa Zemli v blizhayshiye gody [Roscosmos spoke about the commissioning of satellites for surveying and monitoring the Earth in the coming years]. Available at: <https://rspectr.com/novosti/roskosmos-rasskazal-o-vvode-v-ekspluatatsiyu-sputnikov-dlya-semki-i-monitoringa-zemli-v-blizhajshie-gody> (accessed September 26, 2024). (in Russian)
3. Sputniki vsepogodnogo monitoringa Zemli dlya programmy “Sfera” poluchili nazvaniye “Berkut” [All-weather Earth monitoring satellites for the “Sfera” program have been named “Berkut”]. Available at: <https://tass.ru/kosmos/9912259> (accessed September 26, 2024). (in Russian)

4. Rossiyskiye kosmicheskiye sistemy i NPO im. Lavochkina sozdatut DZZ “Avtograf” [Russian Space Systems and Lavochkin Research and Production Association to Create Remote Sensing System “Avtograf”]. Available at: <https://tass.ru/kosmos/21251167> (accessed September 28, 2024). (in Russian)

5. NPO mashinostroyeniya sozdayet sputniki mini-klassa s AFAR X-diapazona [NPO Mashinostroyeniya creates mini-class satellites with X-band APAA]. Available at: https://nauka.tass.ru/nauka/16899609?utm_source=yandex.ru&utm_medium=organic&utm_campaign=yandex.ru&utm_referrer=yandex.ru (accessed September 28, 2024). (in Russian)

6. Tityanechko R. Roskosmos sozdist novuyu mnogosputnikovuyu gruppirovku dlya nablyudeniya Zemli [Roscosmos to create new multi-satellite constellation for Earth observation]. Available at: <https://prokosmos.ru/2024/07/02/roskosmos-sozdist-novuyu-mnogosputnikovuyu-gruppirovku-dlya-nablyudeniya-zemli> (accessed October 16, 2024). (in Russian)

7. Kosmicheskiy kompleks “Kanopus-V” [“Kanopus-V” space complex]. Available at: https://www.vniim.ru/ru/index.php?option=com_content&view=article&id=468:-l-r&catid=37:spaceprograms&Itemid=62 (accessed October 10, 2024). (in Russian)

8. Zaytsev E.M. Nazemnaya infrastruktura DZZ kolektivnogo ispol'zovaniya [Ground-based remote sensing infrastructure for shared use]. Available at: http://conf.rse.geosmis.ru/files/pdf/22/10724_02_%D0%97%D0%B0%D0%B9%D1%86%D0%B5%D0%B2%20%D0%95.%D0%9C..pdf (accessed October 16, 2024). (in Russian)

9. Postanovleniye Pravitel'stva RF ot 14 noyabrya 2014 g. N 1194 “O mezhdunarodno-pravovoy zashchite prisvoyeniya (naznacheniya) radiochastot ili radiochastotnykh kanalov i poryadke ispol'zovaniya na territorii Rossiyskoy Federatsii sputnikovyykh setey svyazi, nakhodyashchikhsya pod yurisdiksiyey inostrannykh gosudarstv, a takzhe o vnesenii izmeneniy v nekotoryye akty Pravitel'stva Rossiyskoy Federatsii” (s izmeneniyami i dopolneniyami) [Resolution of the Government of the Russian Federation of November 14, 2014 No. 1194 “On the international legal protection of the assignment (designation) of radio frequencies or radio frequency channels and the procedure for using satellite communication networks under the jurisdiction of foreign states on the territory of the Russian Federation, as well as on amendments to certain acts of the Government of the Russian Federation” (with amendments and additions)]. Available at: <https://base.garant.ru/70799822/?ysclid=lwwbubxzc880221385> (accessed November 09, 2024). (in Russian)

10. Postanovleniye Pravitel'stva RF ot 1 fevralya 2000 g. N 88 “Ob utverzhdenii Osnovnykh polozheniy gosudarstvennoy politiki v oblasti raspredeleniya, ispol'zovaniya i zashchity orbital'no-chastotnogo resursa Rossiyskoy Federatsii” (s izmeneniyami i dopolneniyami) [Resolution of the Government of the Russian Federation of February 1, 2000 No. 88 “On approval of the Basic Provisions of State Policy in the Sphere of Distribution, Use and Protection of the Orbital-Frequency Resource of the Russian Federation” (with amendments and additions)]. Available at: <https://base.garant.ru/12118193/?ysclid=lwwbw6bpw316895533> (accessed November 09, 2024). (in Russian)

11. Ministerstvo tsifrovogo razvitiya, svyazi i massovykh kommunikatsiy Rossiyskoy Federatsii, Zasedaniye GKRCh ot 24 aprelya 2023 g. (protokol № 23-66) [Ministry of Digital Development, Communications and Mass Media of the Russian Federation, SCRF Meeting of April 24, 2023 (Protocol No. 23-66)]. Available at: <https://digital.gov.ru/ru/documents/8969/> (accessed November 09, 2024). (in Russian)

12. Prilozheniye № 1 k resheniyu GKRCh ot 24.04.2023 № 23-66-02 [Электронный ресурс Appendix No. 1 to the decision of the State Commission on Radio Frequencies dated 24.04.2023 No. 23-66-02]. Available at: <https://digital.gov.ru/uploaded/files/2-reshenie-23-66-02-prilozhenie1-prilozhenie-roskosmos.pdf> (accessed November 09, 2024). (in Russian)

13. Resheniye Gosudarstvennoy komissii po radiochastotam ot 24 maya 2013 g. № 13-18-06-9 “O vydelenii polos radiochastot, vnesenii izmeneniy v resheniya GKRCh i ustanovlenii sroka deystviya resheniy GKRCh v sootvetstviy s informatsionnym listom” [Decision of the State Commission on Radio Frequencies dated May 24, 2013 No. 13-18-06-9 “On the allocation of radio frequency bands, amendments to decisions of the State Commission on Radio Frequencies

and the establishment of the validity period of decisions of the State Commission on Radio Frequencies in accordance with the information sheet”]. Available at: <https://www.garant.ru/products/ipo/prime/doc /70302978/?ysclid=lwwc2gvrmg 11508659> (accessed November 09, 2024). (in Russian)

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