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C-BAND SPECTRUM AND 5G: A COMPARATIVE INTERNATIONAL ANALYSIS

By Ricardo Barretto Ferreira and Isabella De Castro Satiro Aragão

One of the most important bands for the deployment of 5G - considered "ideal" for fifth generation technology, mainly due to the combination of capacity and reach/penetration - is the 3.5 GHz band. Adjacent to the commercial C band, which starts at 3.4 GHz and goes up to 4.2 GHz, used for the transmission of satellite TV (TVRO), its use could cause "side effects", such as interferences in signal reception on satellite dishes.

In Brazil, in 2014, the Center for Research and Development in Telecommunications (CPqD) published a research regarding the coexistence of the Digital TV system with the mobile radiocommunication service in the 700 MHz band, presenting techniques to mitigate interferences. In addition, from 2018, complementary field tests were being prepared to assess the impact of coexistence relationships between terrestrial systems and the reception of TVRO.

Specifically with regard to 5G, according to the Ministry of Science, Technology, Innovations and Communications (MCTIC), an eventual cleaning in the 3.5 GHz band due to interferences in TVRO transmission could also involve the migration of service users to the Ku band. The proposed migration for the solution of the interference problem, defended by representatives of television stations and associations of broadcasters, was severely criticized by telecommunications operators.

According to the tests sponsored by the telecommunications operators Claro, Vivo, TIM and Oi, conducted by CPqD, the coexistence between 5G transmissions and C-band TVRO receptions would be possible, there being also filters capable of mitigating possible interferences. In addition, the migration from the TVRO infrastructure to the Ku band would imply disproportionate complexity and a high financial impact, generating delays and other negative consequences for the development of 5G technology in Brazil.

In view of all the concern resulting from the theme, at the end of 2019, ANATEL and the International Telecommunication Union (ITU) established a cooperation agreement to carry out studies and analyses on interferences in satellite networks, through tests of coexistence between radiocommunication systems.

From the ANATEL's Public Consultation No. 9, which proposed the bidding for the 700 MHz, 2.3 GHz, 3.5 GHz and 26 GHz bands in the 5G Public Notice and brought, as a novelty, the inclusion of another 100 MHz in the 3.5 GHz band (extended C band), the discussion about the possible interferences caused by 5G in the reception of TVRO was highlighted once again. Although field tests organized by telecommunications operators and CPqD have been resumed to confirm which solution would be the most viable in the case, such coexistence tests were suspended due to the COVID-19 pandemic and the Public Consultation was concluded without the field stage report.

Based on preliminary tests, ANATEL was not convinced of the possibility of coexistence between satellite transmission and 5G in the 3.5 GHz band, even with the use of filters to mitigate interferences, and it is currently prioritizing the migration from the C band to the Ku band.

In addition, the indemnity calculations of C band in the 5G auction have already been initiated by satellite operators, taking into account components such as special non-depreciated assets, pro rata costs of rights granted and paid, expected revenues and actual costs of the migration of bands, which would not be related to the possible value of migration of TVRO services from C band to Ku band.

In the international scope, according to a report issued by the Global Mobile Suppliers Association, the first 23 countries to auction or allocate C-band spectrum for 5G include Australia, Austria, Czech Republic, Finland, Germany, Hong Kong, Hungary, Ireland, Italy, Latvia, Norway, Romania, Slovakia, South Korea, Spain and the United Kingdom.

Bundesnetzagentur, the German federal regulatory agency of networks, has published minimum conditions for the concession of 5G frequencies in the 3.7-3.8 GHz band for local use, reserving the 100 MHz for private companies. The winners must coordinate with mobile network operators to ensure efficient use and no interference with other applications. The allocation of the blocks does not depend on auction and the private companies can request the exclusive right to use some of the 100 MHz of the aforementioned spectrum in their networks, based on frequency tariffs.

In Netherlands, the 3.4-3.45 GHz and 3.75-3.8 GHz spectrum shall also be made available for local use. However, the auction of the 3.5 GHz spectrum is scheduled for 2022, considering that the

band is currently used for satellite communications.

Also in the European context, the Belgian regulatory agency (BIPT), in 2017, intended to auction 400 MHz of spectrum at frequencies of 3.4-3.8 GHz as soon as possible; however, as the multi-band auction was postponed in the country, the Belgian government recently decided to issue temporary 5G experimental licenses, prior to holding spectrum auctions for the 3.4-3.8 GHz bands.

Despite some delay in the 5G auction due to the COVID-19 pandemic (as occurred in several other European countries, such as Spain, Portugal, Austria and the Czech Republic, for example), the French regulatory agency Arcep (Autorité de Régulation des Communications Électroniques et des Postes) has recently confirmed the auction of spectrum licenses in the 3.4-3.8 GHz band, to begin in September 2020, signaling the beginning of the 5G era in the country.

Regarding the countries in which the auction of frequencies of C band for 5G has already taken place, it is possible to mention the Austrian regulatory agency RTR, which finished the auction for regional licenses of 5G frequencies in the pioneer bands of 3.4-3.8 GHz, with 7 successful bidders, with the total amount collected of approximately 188 million euros; and the Hong Kong OFCA regulator, which auctioned a total of 200 MHz of the 3.5 GHz spectrum for 4 mobile network operators, in a total of approximately 120 million euros.

In Hong Kong, to avoid interferences of 5G on satellite ground stations, OFCA has established restriction zones in some territories to restrict the development of mobile base transceiver stations operating in the 3.5 GHz band.

Finally, in the USA, the use of the 3.5 GHz band was guided by a Report issued by the Federal Communications Commission (FCC), which modified the licensing and operation rules in the 3.5 GHz band, known as "Citizens Broadband Radio Service" (CBRS), allowing the establishment of rules for the use of 150 MHz of this relevant spectrum. In January 2020, the regulatory agency FCC authorized the complete commercial release of the CBRS 3.5 GHz band for 5G, providing for shared and dynamic management of the spectrum, enabling both priority for government services and the general authorized access of the spectrum.

The entire proposal of the notice for the bid of the 3.5 GHz band in the USA also included the relocation of the C band, with accelerated cleaning and financial compensation of the satellite operators for the spectrum migration, to be paid for by the bidding operators. The FCC initiative in C band is an important part of the 5G FAST plan, prepared by the agency, which is a

comprehensive strategy to promote American leadership in 5G band.

The auction for the 3.5 GHz band, scheduledfor June 2020, has been postponed due to the COVID-19 pandemic, and should take place in July of this year. In addition, within the 3.7-4.2 GHz band, FCC is allocating the 3.7-4.0 GHz portion of the band for mobile use and 280 MHz (3.7-3.98 GHz band) will be auctioned by the FCC for wireless services in the contiguous United States. The auction of the C band spectrum will take place in December 2020, with no plans of postponement.

The solutions for the interferences caused by 5G in satellite reception vary between the migration of spectrum to another band and the coexistence between the fifth generation technology and the channels of the extended band, through the reallocation of channels in other frequencies or by the development of filters that mitigate these effects. Although there is no single answer to this challenge, one thing is certain: investment in the C band is essential for the fast development of 5G with high quality and capacity globally.

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Ricardo Barretto Ferreira da Silva - Senior Partner
barretto@azevedosette.com.br

Isabella de Castro Satiro Aragão - Associate
iaragao@azevedosette.com.br