



# Introducing 5G in Portugal



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# Contents

- 01. Foreword
- 02. Technology
- 03. Opportunities: room for new entrants
- 04. Clearing frequency bands
- 05. Auction prices
- 06. Evolutionary
- 07. Auction timetable
- 08. Use of spectrum
- 09. About Us

# Foreword

Since early 2000s, when data-based services began replacing voice as the “killer application” in telecommunications services, seamless mobility and increasing bandwidth became the industry’s holy grail.

As key industries rely directly and indirectly on information and communication technologies (“**ICT**”), economic growth as a whole is directly correlated to development in the ICT market. Consequently, developments on mobile networks are not only an improvement on communication services and social and institutional cohesiveness, but also a transformative agent of infrastructure and industry and a plus on an economy’s competitiveness.

The more successful an economy and a community is, the more it will rely on its electronic communications infrastructure. A clear example of the strategic importance of the dominance over next-generation mobile communications is the ongoing dispute between the US and China, with the EU as an interested, albeit hesitant, close participant.

Developments in telecoms are generally pushed for by the lack of efficiency of previous technologies. 4G/LTE networks are not reliable nor efficient enough to keep up with existing demand, and much less to cater to new market

opportunities such as enhanced cloud computing services, the Internet of Things (“**IoT**”), or vehicle-to-everything technology (“**V2X**”).

As 5G connections are expected to grow at a compound annual growth rate of 217.2% until 2023, according to IDC, governments are pushing for 5G spectrum granting procedures. Economically, 5G has its own chain of value which comprises at least original equipment manufacturers, carriers, software developers and end-customers, and it is expected to potentially impact most industries, from retail, to transportation and entertainment.

In April 2020, following the rearrangement of certain spectrum frequencies, the Portuguese national regulatory authority (“**ANACOM**”) will auction frequency spectrum that is key to kick off 5G in Portugal.

In an unprecedented attempt to level the playing field, new entrants will be given priority over incumbents to bid for certain portions of the available spectrum. It is the first time in the Portuguese mobile telecommunications market such thing will occur and the overall second: in the late 1990s, the incumbent Portugal Telecom (“**PT**”) was banned from bidding in the fixed wireless access (FWA) spectrum granting procedure.

This is arguably the best opportunity in years to reshape and reshuffle the communications market.

# Technology

5G technology essentially means transmitting massive amounts of data to and from anywhere at an extremely fast rate or, in a less enthusiastic terminology, the ubiquitous availability of massively wide bandwidths with extremely low latency.

Data transfer rates are faster – up to several gigabits per second, compared with current LTE downlink peak rates of only 300 Mbit/s –, which enable an enhanced mobile broadband experience (eMBB) when coupled with lower costs for such data (cost-per-bit) and lower latency. This is particularly relevant e.g. for video streaming, cloud computing and *smartization* of mobile stations.

As devices become increasingly connected and capable of sharing information gathered via a multitude of embedded sensors, 5G networks will be particularly suited to enable massive machine type communications (mMTC).

There are plenty of examples worldwide, and even in Portugal, that this time around is not an early adopter of mobile telecommunications technology, there are already small scale trials, such as the agreement between the Municipality of Cascais and Dense Air Limited for a smart city proof of concept supported by 5G technology.

5G pierces through several industries, and its enabling capabilities are so broad,

because of its reliability and ultra-low latency communication system (URLLC).

Latency is responsiveness, it is the time it takes for a device to receive information it asked for. Although this is relevant for entertainment applications, such as mobile real time television or to avoid motion sickness to a user of augmented reality, it will be critical for industrial applications. Availability and reliability at low costs – when compared with previous mobile generations – will enable the so-called mission critical applications and next-generation industries such as driverless vehicles.

In April 2020, both lower (under 2 GHz) and higher (up to 6 GHz) 5G frequencies will be auctioned. This is relevant because different applications require the usage of different portions of the spectrum in order to achieve satisfactory results, namely in terms of coverage and capacity.

As an example, the 700 MHz frequency band is not suited to provide higher data transfer rates, it is crucial in order overcome attenuation, i.e., to reach indoor environments, thus being very relevant for specific uses of mMTC and eMBB, namely IoT. Higher frequencies, the so-called millimetre waves, have higher attenuation coefficients, i.e., do not penetrate walls or vegetation very well, and they are generally not as reliable as lower frequencies currently used today.

# Technology

This is a practical limitation of higher frequencies used today even in more recent versions of current 3G and 4G technologies: the higher they are, the more they become susceptible to deterioration, and consequently the shorter the travel distances they can take up to and the weaker they get, the reason why low frequencies are best suited for dense penetration: the radius of cells emitting higher frequencies is lower than those emitting lower ones.

The availability of network relies on the availability of spectrum in the first place: the larger the amount of spectrum available, the more data can be sent through.

As regards the upcoming auction, while ANACOM capped limitations on bidding both in low and medium frequency bands, namely the 700 MHz and the 3,6 GHz (C-Band), which could potentially hinder network efficiencies, limitations still ensure that each bidder may acquire at least 100 MHz of contiguous spectrum in C-Band, in accordance with recommendations of the 3<sup>rd</sup> Generation Partnership Project (“**3GPP**”) for 5G.

Most likely the carriers will be the first to benefit from 5G capabilities. Because 5G uses Internet Protocol (IP), networks will be able to support multiple concurrent

applications: the so-called network slicing. This allows carriers to provide dedicated virtual networks for specific services or customers over a common network infrastructure.

V2X requires low latency levels but it does not necessarily require a high data transfer rate, carriers will be able to respond differently to different usage enabling efficiencies across the spectrum. Since a 5G network is capable of processing more data per portion of the spectrum they will be far more efficient than previous mobile generations.

Unlike existing networks, 5G networks will be primarily software-based meaning that cybersecurity risks will increase to unprecedented levels.

In order to manage these risks, carriers will be subject to European guidelines on cybersecurity, such as the EU toolbox for 5G security, published this year by the European Commission (the “**EC**”). It is expected that the EC will continue monitoring the situation and it has already set up a calendar for member-states to comply with key measures on network cybersecurity.

# Opportunities: room for new entrants

Until March 25<sup>th</sup>, 2020, a public consultation procedure for a spectrum auction scheduled for April 2020 is open for comments. ANACOM set the objective to ensure greater competition in telecoms, in order to aid users extract maximum benefits and encourage telcos to use effectively and efficiently the spectrum.

It reads from the regulatory outline that ANACOM believes that levelling the playing field for new entrants and further development of existing operations is critical for choice, price and quality of service.

The calendar is set for the first semester of the year. The auction of 5G spectrum actually comprises spectrum from 700 MHz bands to 3,6 GHz and everything in between. Although not all frequency bands are adequate for 5G networks, this means that, unlike previous spectrum award procedures, ANACOM is deeply invested in ensuring an all-out entry point for new market players.

When bidding for the 700 MHz band each bidder will be attributed a maximum of two blocks of spectrum, which amounts to a total 20 MHz portion.

Likewise, when bidding for the 3,6 GHz band each bidder will be attributed a maximum of ten blocks of spectrum, amounting to a total of 100 MHz.

Bidders are limited to a third and a quarter of the frequency bands when bidding for the 700 MHz and the 3,6 GHz bands, respectively, which prevents cases of “spectrum hoarding”. Considering that there are only three MNO’s in Portugal, this ensures that there is room for new entrants. Nevertheless, in case there are not enough bids, ANACOM will waive these limitations.

By limiting the acquisition of spectrum, ANACOM intends to guarantee that, at least from the outset, there are opportunities for new entrants.

This will be followed by a set of rules binding current players to enable access to the network: incumbent carriers must enable access to the network to all sorts of mobile virtual network carriers (MVNOs) and national roaming arrangement will benefit new entrants.

But not only 5G relevant bands will be prevented from being hoarded by incumbent carriers. Learning from previous experiences, namely the cumbersome result of 3G procedures in the early 2000s, other frequency bands will be reserved for new entrants, namely 10 and 30 MHz blocks of spectrum in the 900 and 1800 MHz bands, respectively.

# Clearing frequency bands

Due to existing usage rights, there are limitations on spectrum availability for 5G. This means a spectrum “reframing” process will take place over the near future.

A total 400 MHz of the 3,6 GHz band will be auctioned. However, 100 MHz have already been attributed to Dense Air Limited, a mobile network extension services company, until 5 August 2025, which means that the 3,6 GHz band will be partially limited until mid-2025. This was, indeed, the greatest concern revealed by market players in the public consultation: that the frequency spectrum was insufficient to meet all interested carriers' needs and that the license attributed to Dense Air Limited should be revoked. Instead of revoking the license, ANACOM opted to reconfigure it.

Also, the 700 MHz band is also in use, but for purposes of digital terrestrial television (DVB-T, “TDT”), which is licensed to MEO/Altice (the former incumbent PT Group).

As it reads from Decision (EU) 2017/899 of the European Parliament and of the Council of 17 May 2017, “[t]he 700 MHz frequency band represents an opportunity for globally harmonised and coordinated spectrum for wireless broadband that offers economies of scale”, which is in line with the digital single market strategy for Europe. Because TDT uses a frequency band within 694–790 MHz,

ANACOM will clear the band that is currently in use and transfer TDT to the 470–694 MHz band until June 2020, dividing the country in 7 regions, and according to the following schedule:

|                           |  |
|---------------------------|--|
| Region 1                  | Migration process to start between the 3rd week of January 2020 and the 1st week of February                                 |
| Region 2                  | Migration process to start within one month after the beginning of the migration process in Region 1                         |
| Region 3                  | Migration process to start within one month after the beginning of the migration process in Region 2                         |
| Region 4                  | Migration process to start within one month after the beginning of the migration process in Region 3                         |
| Region 5                  | Migration process to start within one month after the beginning of the migration process in Region 4                         |
| Region 6                  | Migration process to start within one month after the beginning of the migration process in Region 5, finishing by June 2020 |
| Region Açores and Madeira | Migration process to take place in June 2020   |

**Figure 1.** Migration process timetable. Source: ANACOM

# Auction prices

The auction has a total reserve price of 237,9 million Euros, however only 2/3 of which pertains to frequency bands that are relevant for 5G. The remainder will be relevant to, at least in theory, ensure the viability of other mobile network operators.

Current reserve prices are in line with the European average, at approximately 1,92 million Euros per MHz, but if compared with reservation prices for 5G-relevant bands announced for auctions yet to take place in Europe, prices in Portugal are significantly lower than other countries.

Within the 700 MHz band, prices are set at 19,2 million Euros per block of spectrum, in a total of 115,2 million Euros, and within the 3,6 GHz band, blocks of spectrum range from 840 thousand Euros to 1,23 million Euros, amounting to a total of 45,7 million Euros. As previously mentioned, a portion of the 3,6 GHz band is partially limited until 2025, the reason why the reservation is cheaper than the cleared 3,6 GHz frequency.

Also, it should be noted new entrants will be granted a 25% discount for 900 MHz and 1800 MHz bands and all bidders, incumbent and newcomers, may defer one third of the final price over a period of five years.

| Categories | Blocks of Spectrum available                                      | Blocks of Spectrum amount       | Reserve prices per block of spectrum (M€) | Reserve prices (total amount) in M€ without discounts |
|------------|---|---------------------------------|---|---|
| 700 MHz    | 703-733 MHz/ 758-788 MHz  | 6 blocks of spectrum of 2x5 MHz | 19,20                                     | 115,20  |
| 900 MHz    | 880-885 MHz/ 925-930 MHz  | 1 block of spectrum of 2x5 MHz  | 30,00                                     | 54,00   |
| 900 MHz    | 895,1-898,1 MHz/ 940,1-943,1 MHz<br>914-915 MHz/ 959-960 MHz      | 4 blocks of spectrum of 2x1 MHz | 6,00                                      |   |
| 1800 MHz   | 1770-1785 MHz/ 1865-1880 MHz                                      | 3 blocks of spectrum of 2x5 MHz | 4,00                                      | 12,00   |
| 2,1 GHz    | 1955-1960 MHz/ 2145-2150 MHz                                      | 1 block of spectrum of 2x5 MHz  | 2,00                                      | 2,00  |
| 2,6 GHz    | 2500-2510 MHz/ 2620-2630 MHz                                      | 2 blocks of spectrum of 2x5 MHz | 3,00                                      | 6,00  |
| 2,6 GHz    | 2595-2620 MHz   | 1 block of spectrum of 25 MHz   | 3,00                                      | 3,00  |
| 3,6 GHz    | 3,4-3,46 GHz (1-8 regions with restrictions until 5 August 2025)* | 6 blocks of spectrum of 10 MHz  | 0,84                                      | 8,80  |
| 3,6 GHz    | 3,46-3,5 GHz (1-2 regions with restrictions until 5 August 2025)* | 4 blocks of spectrum of 10 MHz  | 0,94                                      |   |
| 3,6 GHz    | 3,5-3,8 GHz   | 30 blocks of spectrum of 10 MHz | 1,23                                      | 36,90   |

Total: 237,9

Figure 2. Reserve prices. Source: ANACOM.



# Evolutionary

The introduction of 5G networks in the telecommunications markets in 2020 is only comparable to the introduction of 3G in the beginning of the 2000s.

Leaping from peak data rates of 300 Mbits/s and latency of up to 12 milliseconds to peak data rates of several gigabits per second and latency below five milliseconds is surely the most disruptive development in telecoms in 20 years.

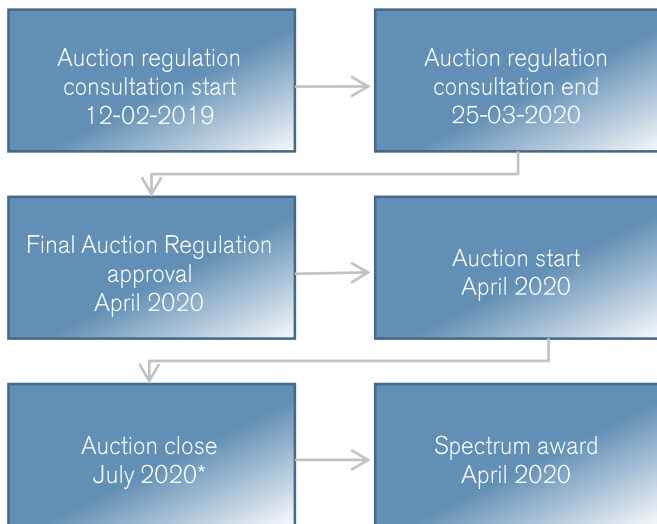
An interesting side to 5G is that its potential is not as relevant for currently known use cases as it is for realities and needs that are yet to know, namely mainstream driverless traffic and robotics.

But, as the former FCC chairman Tom Wheeler referred, *"the race to 5G is more of a process rather than a race, as the fifth generation of mobile communications is an ensemble of protocols and technologies that are currently in progress, the telcos upgrade their infrastructure and users buy new 5G-compatible gear"*. In this sense, rather than a race to be won by one or a few carriers, it is a stance towards the telecommunications market. It is *evolutionary*, rather than revolutionary.

We expect 2020 to be a critical year – if not “the” year – of 5G in Portugal and worldwide: the auction of Portuguese spectrum will take place in April, the final international standards for 5G (Release 15) by 3GPP will also be set and Release 16 is expected to be released, which will include the key standards necessary for IoT.

As new entrants are given priority in a portion of the auctioned spectrum, the business opportunity is unprecedented, and it will surely shape the future of the electronic communications market in Portugal.

## Auction timetable



**Figure 3.** Indicative timetable released in October for the allocation of relevant licenses for 5G and others. Source: ANACOM.

## Use of spectrum

| Band               | 700 MHz                         | 800 MHz       | 900 MHz           | 1800 MHz                       | 2,1 GHz                        | 2,6 GHz (FDD)              | 2,6 GHz (TDD)              | 3,6 GHz                         |
|--------------------|---------------------------------|---------------|-------------------|--------------------------------|--------------------------------|----------------------------|----------------------------|---------------------------------|
| Available Spectrum | 60 MHz                          | 60 MHz        | 70 MHz            | 150 MHz                        | 120 MHz                        | 140 MHz                    | 50 MHz                     | 400 MHz                         |
| Allocated          | Adjacent use for DTT*           | MEO 20        | MEO 16            | MEO 40                         | MEO 40                         | MEO 40                     | Vodafone 25                | Dense Air 100**                 |
|                    |                                 | NOS 10        | NOS 16            | NOS 40                         | NOS 30                         | NOS 40                     |                            |                                 |
| Auction            | 60 MHz                          | 0             | 18 MHz            | 30 MHz                         | 10 MHz                         | 20 MHz                     | 25 MHz                     | 400 MHz***                      |
| Primary use        | Coverage (relevant range to 5G) | Coverage (4G) | Coverage (2G, 3G) | Coverage and capacity (2G, 4G) | Coverage and capacity (2G, 4G) | Coverage and capacity (4G) | Coverage and capacity (4G) | Capacity (relevant range to 5G) |

\* Digital Terrestrial Television migration until June 2020.

\*\* The company has, until 2025, 100 MHz in the areas of Lisbon and Porto and 55 MHz in all other regions, except for Madeira Island.

\*\*\* 100 MHz with restrictions until 2025 and 300 MHz without restrictions.

**Figure 4.** Use of Spectrum by Mobile Operators in Portugal. Source: ANACOM.



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ABOUT US

Who we are  
and what we do

# About us

In today's competitive global market, Macedo Vitorino & Associados provides a comprehensive commercial and corporate law advice to domestic and foreign clients. We have strong relationships with many of the leading international firms in Europe, the United States, Brazil and Asia, which enable us to handle effectively cross border transactions.

Since the incorporation of the firm we have been involved in several high profile transactions in all of the firm's fields of practice, including banking and finance, capital markets, corporate and M&A, etc. We have also acted on many complex disputes and corporate restructurings.

We are mentioned by The European Legal 500 in most of its practice areas, including Banking and Finance, Capital Markets, Project Finance, Corporate and M&A, Tax, Telecoms and Litigation.

Our firm is also mentioned by IFLR 1000 in Project Finance, Corporate Finance and Mergers and Acquisitions and by Chambers and Partners in Banking and Finance, Corporate and M&A, TMT, Dispute Resolution and Restructuring and Insolvency.

Macedo Vitorino & Associados has a truly international practice. We act in several domestic and cross-border transactions, including mergers and acquisitions, financings and foreign investments.

The multidisciplinary and integrated character of our corporate and commercial group allows us to efficiently solve the legal issues of our clients, in particular:

- Commercial contracts, distribution agreements and franchising
- Commercial litigation
- Competition and European law
- Copyright, intellectual property, IT, patents and trade marks
- Corporate and acquisition finance
- Employment
- Foreign investment
- Mergers, acquisitions and privatisations
- Tax

If you want to find out more about Macedo Vitorino & Associados please visit our website at [www.macedovitorino.com](http://www.macedovitorino.com)



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