

PUBLIC CONSULTATION WITH REFERENCE TO THE
GRANTING OF SPECTRUM USAGE RIGHTS IN THE 700
MHz, 2 GHz, 3400 - 3800 MHz AND 26 GHz FREQUENCY
BANDS

Marousi, February 2020

Hellenic Telecommunications & Post Commission (EETT)

Practicalities of the public consultation

This Public Consultation text has been prepared by the National Telecommunications and Post Commission (EETT) in accordance with its responsibilities under Law 4070/2012 and concerns issues related to the granting of rights to use radio frequencies for the provision of services and / or electronic communications networks.

With this public consultation, EETT wishes to receive views and comments from the relevant market for the provision of electronic communications services and networks and all other interested parties regarding EETT's intention to initiate the process of granting Radio Frequency Usage Rights for terrestrial systems capable of providing wireless broadband electronic communications services in the 700 MHz, 2 GHz, 3400 - 3800 MHz and 26 GHz bands.

The opinions of all interested parties are being sought on the entirety of this document. To facilitate the feedback process, interested parties are requested to submit their replies in Greek, both in print and electronically, no later than 31th March, 2020 at 3:00 PM, at:

- National Telecommunications and Post Commission
- 60 Kifissias Avenue, 151 25 Maroussi
- Email address: 5G@eett.gr

In the interests of transparency, EETT will publish all of the responses it has received, with the exception of any information that is protected by confidentiality. Contributors' responses with confidential elements will be placed in a discrete annex in order not to be published. In any event, EETT's obligation to respect confidentiality does not affect its competence to disclose information necessary for the performance of its duties or when this is required by relevant Greek or Community authorities.

Participants in EETT's public consultations take knowledge and agree that any personal information mentioned in their response may be published with it.

See EETT's Privacy and Privacy Statement here:

<https://www.eett.gr/opencms/opencms/EETT/privacy.html>

The answers should include the following title:

“Public Consultation on the Granting of Radiofrequency Usage Rights in the 700 MHz, 2 GHz, 3400 - 3800 MHz and 26 GHz bands”

Additional information can be obtained by sending your questions to: 5G@eett.gr.

This text does not bind EETT as to the content of the subsequent regulatory decisions.

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1. Greek mobile telecommunications market

The currently allocated spectrum for mobile telecommunications in Greece is summarized as follows:

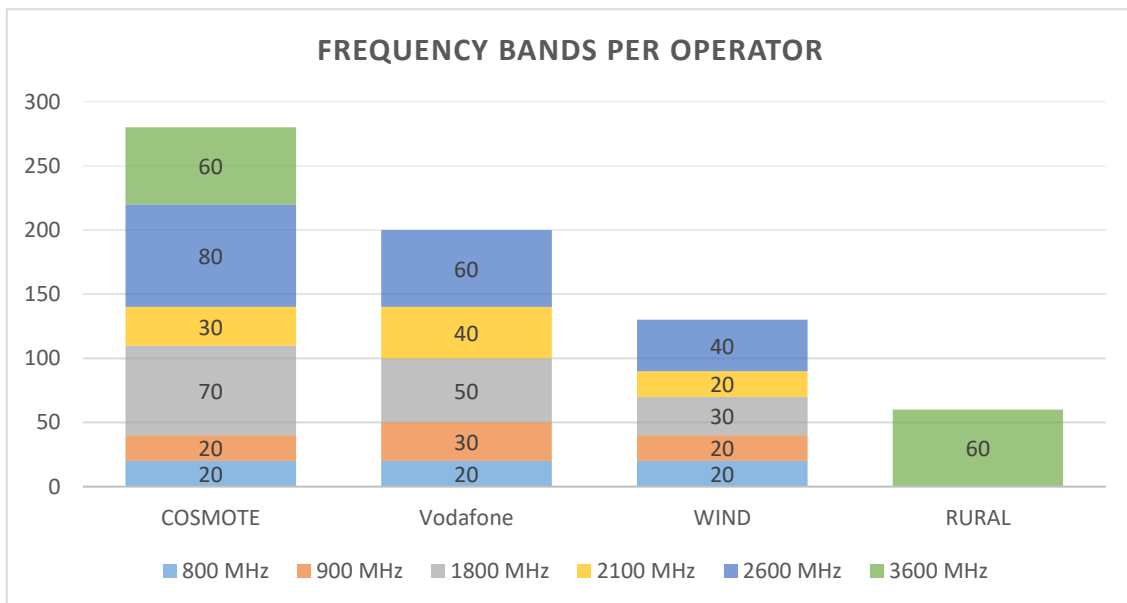
900 MHz: 880-915 MHz paired with 925-960 MHz band

1800 MHz: 1710-1785 MHz paired with 1805-1880 MHz band

2100 MHz: 1920-1980 MHz paired with 2110-2170 MHz band and additional 1900-1920 MHz band

Table 1: Frequency bands per operator

Frequency Bands	Total Availability	COSMOTE/OTE	VODAFONE	WIND	Rural Networks	Valid until
800 MHz	2x30	2x10	2x10	2x10		Feb 2030
900 MHz	2x35	2x10	2x15	2x10		Sep 2027
1800 MHz	2x75	2x35	2x25	2x15		40 MHz Nov 2029 110 MHz Dec 2035
2.1 GHz FDD	2x60	2x15	2x20	2x10		Aug 2021
2.1 GHz TDD	15	5	5	5		Aug 2021
2.6 GHz FDD	2x70	2x30	2x20	2x20		Feb 2030
2.6 GHz TDD	40	20	20			Feb 2030
3.6 GHz FDD	400	60			60	OTE: Apr 2029 Rural: Apr 2037



Shape 1: Frequency bands per operator

2. Spectrum availability

The forthcoming tender involves the following frequency bands:

- a) 700 MHz: 60 MHz paired spectrum (2x30 MHz) in the frequency bands 703 - 733 MHz & 758 - 788 MHz,
- b) 2 GHz: a total of 120 MHz paired spectrum (2X60MHz) is planned to be included in the forthcoming tender, of which 30 MHz are readily available (1965-1980 MHz and 2155-2170 MHz), and 90 MHz (1920-1965 MHz and 2110-2155 MHz) are allocated to mobile networks operators as follows, VODAFONE (2x20 MHz), WIND (2x10 MHz) and COSMOTE (2x15 MHz). These spectrum rights expire on August 2021 and therefore will be included in the forthcoming tender.
- c) 3400-3800 MHz: 280 MHz readily available spectrum exist. Additionally, there are 2x30 MHz granted since 2014 to OTE (3440-3470 & 3540-3570) as well as another 2x30 MHz (3670-3700 MHz & 3770-3800 MHz), bound by the Greek State exclusively for the provision of electronic communications services to rural areas. EETT proposes OTE's spectrum rights, expiring in 2029, to be included in the forthcoming tender, for the period after 2029 and until the expiration date of the new spectrum rights in the band and at the same time make possible the reallocation of them within the same band to enhance effective planning and optimize spectrum use.
- d) 24.25 – 27.5 GHz: There are 2350 MHz readily available spectrum. In case of existing spectrum rights rearrangement, the available spectrum will increase to 3250 MHz.

The following table summarizes the spectrum availability and spectrum held by each provider in the radio frequency bands in question:

Table 2: Spectrum availability in the 700 MHz, 2 GHz, 3400-3800 MHz & 26 GHz frequency bands

Frequency Bands	Available	COSMOTE / OTE	VODAFONE	WIND	Rural Networks	TOTAL
700 MHz	2x30 MHz	-	-	-	-	60 MHz
2 GHz	2x15 MHz	2x15 MHz ⁺	2x20 MHz ⁺	2x10MHz ⁺	-	120 MHz
3400-3800 MHz	280 MHz	60 MHz			60 (Central Greece)	400 MHz
26 GHz	2.350	2x112 (FDD) [‡]	2x56 (FDD) [‡]	2x56 (FDD) [‡]		2350 MHz & 2x224 MHz

⁺ Expire in August 2021 and it is planned to be included in the forthcoming licensing tender

[‡] Only for Fixed Wireless Access

3. Allocation procedure

EETT is proposing an auction process, actually a multi-round clock auction with gradually increasing bid, as the most effective process in ensuring transparency and objectivity to award licenses for spectrum in the 700MHz, 2GHz, 3400-3800MHz and 26GHz. The proposed process is a fundamental competition-oriented practice as it is open to all concerned parties and allows the final price per spectrum segment to be determined by the market participants themselves.

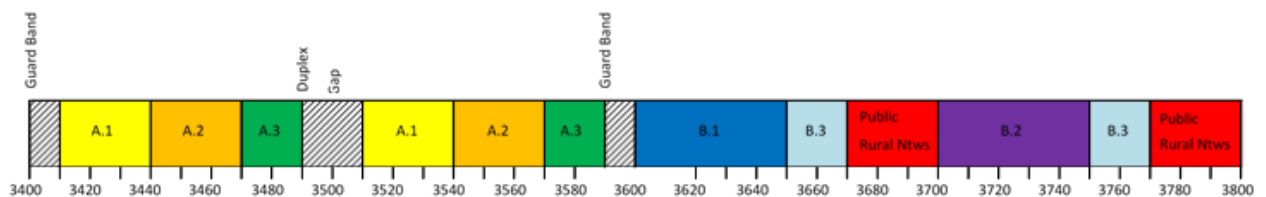
According to the public consultation the proposed process is organized as follows:

- **First Part:** Allocate spectrum through a multi-round clock auction for the 700MHz, 2 GHz, 26 GHz band and specific blocks in the 3400-3800 MHz band, subject to the possible rearrangements of the band via two alternatives:
 - Either a two-phase process of multi-round clock auction. In the first phase pre-determined blocks of 100 MHz in the 3400-3800 MHz band will be allocated and in the second phase the remaining spectrum in the 3400-3800 MHz band will be allocated to any participant interested in additional spectrum (within the cap limit),
 - Or a one phase process for two (2) blocks of 130 MHz and one (1) block of 140 MHz in the 3400-3800 MHz band
- **Second Part:** Allocate all remaining spectrum which has not been allocated in the previous parts mainly due to spectrum caps limitations.

All auction participants may bid for a spectrum in any frequency band they wish, provided that the defined spectrum caps are not exceeded.

3.1. Allocation methods for 3400 – 3800 MHz band

The 3400-3800 MHz band presents specific limitations due to its current uses. Specifically, EETT had granted rights of use of radio frequencies in the 3400-3600 MHz band, valid until 2029. In addition, the Greek Government has granted certain rights of use of radio frequencies in the 3600-3800 MHz band exclusively for the provision of electronic communications services to rural areas, valid until 2037.

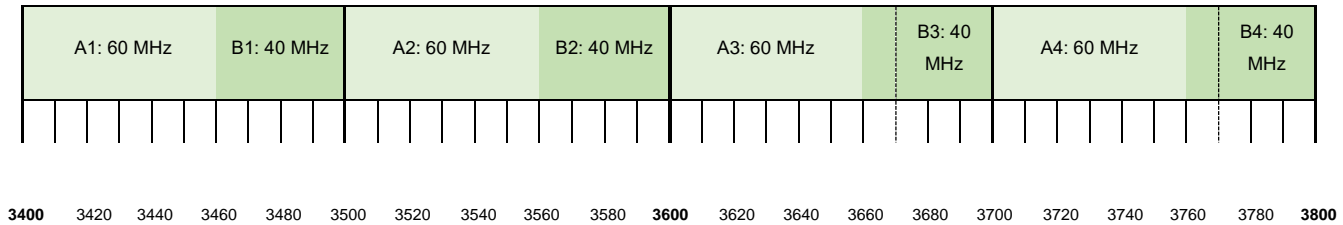


Shape 2: 3400-3800 band current uses

EETT is proposing the following alternatives for the allocation of spectrum in the 3400-3800MHz band:

3.1.1. Case of 4 participants

- Multi round clock auction for four (4) discrete blocks of 40 MHz of pre-determined positioning (Bi), accompanied by their continuous 60 MHz at reserve price (Ai).
- Existing rights of use (owned by OTE) are proposed to be included in the process in order to be extended and be given the opportunity for rearrangement at a proportionate price of reserve price.

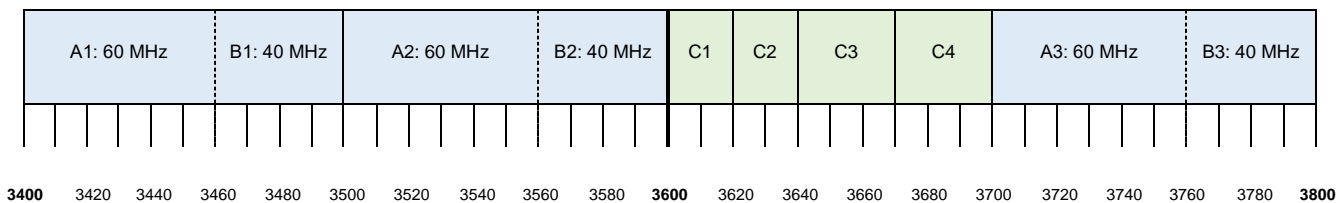


Shape 3: 3400-3800 band grant of 4 rights

3.1.2. Case of 3 participants – Two alternatives

Alternative A: Two-phase process of multi-round clock auction of

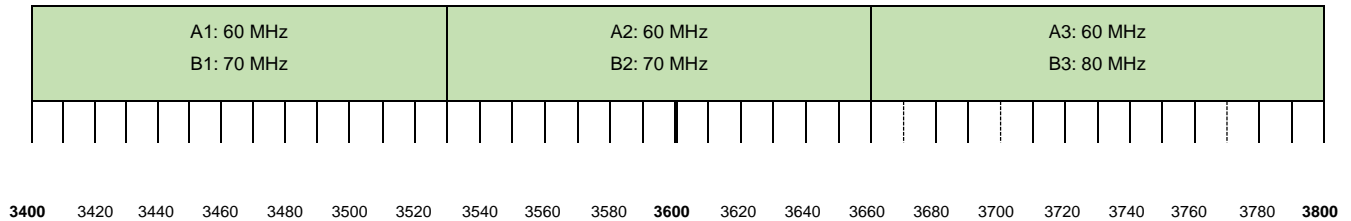
- three (3) discreet blocks of 40 MHz of pre-determined positioning (Bi), accompanied by their continuous 60 MHz at reserve price (Ai) and
- subsequent process for remaining 100 MHz spectrum, four (4) pre-determined blocks C1 (20 MHz), C2 (20 MHz), C3 (30 MHz) and C4 (MHz).
- Existing rights of use (owned by OTE) are proposed to be included in the process in order to be extended and be given the opportunity for rearrangement at a proportionate price of reserve price.



Shape 4: 3400-3800 band grant of 3 rights – Alternative A

Alternative B: One-phase process of multi-round clock auction of

- two (2) blocks of 70 MHz and one (1) block of 80 MHz, of pre-determined positioning (Bi), accompanied by their continuous 60 MHz at reserve price (Ai).
- Existing rights of use (owned by OTE) are proposed to be included in the process in order to be extended and be given the opportunity for rearrangement at a proportionate price of reserve price.


Shape 5: 3400-3800 band grant of 3 rights – Alternative B

3.2. Spectrum Caps

In order to ensure optimum use of spectrum and deter excessive spectrum concentration by one or more bidders, EETT is considering imposing a restriction on the maximum spectrum granted in the 700 MHz band, in the 2 GHz band and in the 3400-3800 MHz band per provider (spectrum cap). In addition, EETT will consider the possibility of imposing relevant restrictions on the 26 GHz band, depending on the results of this public consultation and provided that relevant market interest is expressed.

Specifically, EETT is considering the following segmentation and spectrum caps per frequency band:

Table 3: Suggested spectrum caps

Frequency Bands	Spectrum segmentation	Amount of blocks available	Spectrum Cap ¹ per provider
700 MHz	2x5 MHz	6	20 MHz (2x10 MHz) in the 700 MHz band

¹ Paired and non-paired spectrum

2 GHz	2x5 MHz	12	40 MHz (2x20 MHz) in the 2 GHz band
3400-3800 MHz	Restrictions of current uses impact	Restrictions of current uses impact	4 participants: 100 MHz with territorial restrictions 3 participants: 150 MHz or 140 MHz when 3 blocks of pre-determined positions are set (with territorial restrictions)
26 GHz	2350 MHz		No spectrum cap

4. Spectrum Usage Rights Characteristics

4.1. License duration

The European Code of Electronic Communications (EECC) stipulates that Member States shall ensure that spectrum use rights are valid for at least 15 years with a provision for an extension of another 5 years, to ensure regulatory predictability for right holders and foster infrastructure investing. EETT, accordingly, proposes that the underlying rights of frequencies use are allocated for a period of 15 years, with a possibility for another 5 years extension.

4.2. Coverage obligations

In view of the above, EETT's proposals on coverage obligations to accompany the rights in the radio frequency bands under consideration follow.

700 MHz and 2 GHz bands

(a) For the provision of voice and data services, using all the radio frequency bands to which each provider is entitled, within five (5) years from the entry into force of the right:

- Covering at least 99% of the population of each regional unit of the country,
- Covering 95% of the total land area of the country,
- Covering 95% of the marine area,
- Covering 99% of motorways², 90% of European roads³ and highways⁴ and 95% of the rail network.

(b) For the provision of broadband services, using all the radio frequency bands to which each provider is entitled, a nominal transmission rate of at least 100 Mbps on the downlink :

- within five (5) years from the entry into force of the right:
 - to cover the geographical areas where at least 60% of the country's population resides.
 - to cover 95% of highways⁵, of motorways⁶ and the rail network.
 - to cover, with a maximum delay (latency) of ten milliseconds (10 ms) between the terminal and the corresponding base station, 95% of the motorways below:

² Greek Motorways in accordance with Ministerial Decree 2015 (Government Gazette 253/2015 GDP)

³ Government Gazette 2631 / t. B ' / 2008, Codification and Numbering of the Greek Trans-European Road Network

⁴ List of highways (Government Gazette 319 / t B ' / 1963) and list of additional highways (http://dlib.statistics.gr/Book/GRESYE_02_2007_00001.pdf)

⁵ List of highways (Government Gazette 319 / t B ' / 1963) and list of additional highways (http://dlib.statistics.gr/Book/GRESYE_02_2007_00001.pdf)

⁶ Greek Motorways in accordance with Ministerial Decree 2015 (Government Gazette 253/2015 GDP)

Athens - Thessaloniki - Evzoni highway
Central Peloponnese (Morea) Motorway
Olympia Street
Ionian Street
Egnatia Street
Street of Central Greece
Attiki Odos
North Road Crete

- within ten (10) years from the entry into force of the right:
 - to cover the geographical areas where at least 90% of the country's population resides.

In the case of a new incoming provider, EETT proposes a coverage obligation for the provision of voice and data services in the geographical areas where at least 80% of the country's population resides within five (5) years from the entry into force of the right.

In addition, EETT is assessing whether an obligation for the provision of at least 100 Mbps nominal bitrate to cover 95% of the population living in the municipalities listed in [Annex III](#) should be imposed in the 700 MHz band. According to the information available to EETT, in the municipalities of [Annex III](#) broadband services of nominal rate of at least 100 Mbps in downlink is not provided in percentage greater than or equal to 95% of the population per municipality. EETT also examines whether this obligation should be imposed on all providers jointly, with each provider undertaking a part of it.

3400-3800 MHz band

(a) Radio coverage of at least 20% of the country's population and network development in at least two (2) administrative districts of the country, within two (2) years from the entry into force of the right.

(b) Obligation to install at least three hundred (300) base stations within five (5) years from the entry into force of the right.

c) Provision of broadband services with nominal transmission rate of at least 100 Mbps in downlink with a maximum delay (latency) between the terminal and the corresponding base station of ten milliseconds (10 ms), using all the frequency bands on which each operator holds the right, within five (5) years from the entry into force of the right, to cover 95% of the following motorways:

Athens - Thessaloniki - Evzoni highway
Central Peloponnese (Morea) Motorway

Olympia Street
Ionian Street
Egnatia Street
Street of Central Greece
Attiki Odos
North Road Crete

26 GHz band

For the 26 GHz band , EETT is considering imposing an obligation to install at least five (5) base stations in each municipality of more than 50,000 residents, with the exception of the Attica region and the Thessaloniki regional unit, within five (5) years from the entry into force of the spectrum usage rights.

Fixed Wireless Access obligation

EETT, in line with the provisions of the Electronic Communications Code for the inclusion of the fixed broadband internet service into the universal service, is considering to impose an obligation for the provision of fixed wireless access services at a rate of 100 Mbps for the 100% of the population living in rural and / or semi-urban areas where fixed broadband services are not currently provided, in the 3400-3800 MHz band.

EETT is assessing whether this obligation should be imposed on all providers jointly, so that each provider may undertake a certain part of it, or whether it should be included in only one right of frequency use, accompanied with specific economic incentive.

4.3. Network Sharing

Given the expected high capital expenditure for the 5G network deployment, the possibility of joint development and use of New Generation Access network infrastructures is considered.

EETT, similar to European practice, suggests that sharing of network equipment may be allowed and all sharing agreements should be considered and evaluated on a case-by-case basis.

4.4. Verticals

EETT is considering the possibility of making available reserved spectrum to industries or third party wholesalers to support vertical integration of applications within the industry. This exclusive spectrum allocation to vertical markets may hinder or delay 5G network deployment, by creating possible limitations to mobile network operators in obtaining continuous spectrum. Instead, EETT

is enquiring the possibility of a higher degree of integration of such services provided by MNOs to vertical industries, depending on the potential interest, by providing customized solutions or even lease out spectrum portions through flexible spectrum management (network slicing, Software Defined Networking).

4.5. MVNOs

EETT suggests that existing spectrum usage rights obligations regarding MVNOs' access to the network of mobile providers be included in the new rights granted in the 700 MHz and 2 GHz bands. Specifically, radio frequency rights owners are obliged to negotiate in good faith and provide access to their networks to any business wishing to operate as an MVNO, at reasonable terms, subject to the provisions of competition law.

4.6. Valuation method of reserve price

EETT proposes to adopt a benchmarking methodology taking into account data from bidding procedures of other European countries for the same or similar bands, in evaluating the reserve price per band.

Specifically, EETT considers applying a benchmarking of all types of tender procedures followed in other European countries, from 2015 onwards. In applying the benchmarking methodology, EETT will calculate the calculated value per MHz per population of a minimum 2x5 MHz spectrum block. This price will be further adjusted on key evaluation indexes, such as the duration of the spectrum right, the local currency, the country inflation by the date of each assignment and the purchasing power of Greece's GDP per capita (GDP PPP) in relation to each country of assignment.

4.7. Payment scheme

EETT proposes the following methods for the payment scheme of each right of frequency usage:

- Payment of the entire price in one installment. The successful tenderers are required to pay the full amount within a short time after the grant of the right to use radio frequencies.
- Payment of a specified percentage of the total proceeds at the end of the auction and the remaining portion in subsequent years (annual installments) by applying an appropriate interest rate. Specifically, EETT suggests that 70% of the auction proceeds be paid within ten (10) days of the EETT's decision declaring final winning bidders, in cash, and the remaining 30% of the Auction proceeds in three (3) annual installments, carrying interest rate of the 12-month Greek Government T-bills plus 25 basis points, with first installment four (4) years after the successful tenderers are announced.