

**Nokia's answer on the Dutch market consultation**

**BELEIDSVOORNEMEN UITGIFTEBELEID 3,5 GHZ-BAND**

The Nokia logo, consisting of the word "NOKIA" in a bold, blue, sans-serif typeface.

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## Introduction

Every 8 to 10 years a new mobile communication generation is introduced and today we are just before the Global commercial introduction of the 5<sup>th</sup> generation mobile networks. 2G was introduced to make global circuit switched calls possible. At the moment 4G is providing this same global calling services as 2G but then over IP, with VoLTE as well as adding on top a stable data connection to the same mobile devices. We must conclude that the current network generations have been oriented towards the use of mobile phones. This means that so far introduction of a new generation mobile network has always been an improvement of the mobile phone user experience. Now that 4.5G is launched successfully, we obtain even more broadband than 4G. Additionally, the first Low Power Wide Area (LPWA) IoT network solution has been introduced. NB-IoT and eMTC (LTE-M) are mobile network technologies available today to support the "non-mobile phone-oriented" connections also called IoT. This is what 5G will be all about and this is going to be the biggest challenge for the connectivity market. A shift will take place from connecting mobile phones towards connecting things in existing but also new markets for the Mobile Network Operators (MNO).

The current connected IoT devices are low data rate but the industry use cases already show that more data capacity is needed to serve the upcoming needs. To achieve this more spectrum is needed and the first 3GPP based spectrum for 5G available are the bands 42 and 43. To be efficient with 4G networks 20Mhz radio blocks resources are preferred, to be efficient with 5G in eMBB 100MHz radio blocks will be the standard. The question is who will use the spectrum where and serving what use cases.

5G technology supports different network requirements that match the enterprise demands. An MNO could fulfill these demands, while the enterprises may prefer a private wireless network initially.

To serve this, a balance must be made between private and operator use of the spectrum, and we believe that when the networks become more mature this balance might change.

Please refer also to the 5G-ACIA white paper <https://www.5g-acia.org/index.php?id=5125>

## Consultatievragen

Het ministerie van EZK nodigt (markt)partijen uit om te reageren op dit beleidsvoornemen. U kunt reageren op het gehele stuk. In het bijzonder ziet EZK graag een reactie op de volgende drie vragen:

- 1) Is de 100 MHz in de 3700 - 3800 MHz die beschikbaar wordt gesteld voor lokale netwerken voldoende om te voorzien in de behoefte aan eigenstandig spectrum voor bedrijfsspecifiek gebruik en welke eventuele andere frequentieruimte zou daar nog voor nodig zijn?

*The 5G technology is designed to also create more value for the smartphone users and expand the physical capacity limits of the current mobile network. Nokia recommends contiguous 80-100 MHz per MNO network for significant performance and capacity enhancements for eMBB services.*

*Important for the enterprise market is that the current wireless connection technologies often cannot provide the QoS levels required (e.g. in unlicensed bands) and are reaching the limit of operational complexity. This means that the industry is looking to new solutions and that enterprises will find the way to the 5G network technology; the question is when.*

*Initially, the MNOs are focusing on nationwide coverage to support the current market and these are the smartphone users. The introduction of 5G slicing to support verticals will take time. In parallel, enterprises will build their own network solutions to meet their very specific needs in terms of performance, availability etc. and for that spectrum is needed. The need for dedicated cellular technology for the enterprise market will be mainly on premises to support the optimization of the internal processes.*

*We also believe that MNOs can benefit from the investment into dedicated private networks by delivering their services over private infrastructure into the private premises. Such a scenario will have to follow the 3GPP specifications to guarantee interoperability. Regulation can support this by incentivizing shared use of local private infrastructure in private premises.*

*The reasons for enterprises to build own dedicated cellular network are of the business-critical aspects. To support this a multi-layer of spectrum is needed, given the radio propagation properties of the 3.5Ghz. As an example, in the Harbor of Rotterdam a successful setup is created using both the 3.5Ghz and 2.3Ghz. This latter spectrum has a large variety of devices available. Carrier Aggregation with two spectrum resources makes the connectivity more reliable and performant.*

*In the Netherlands the locations for large private enterprise networks can be easily identified. In most of the area's multiple enterprises are present and that means enough spectrum is needed to support these networks.*

*As a starting point 20 or 40 Mhz per enterprise will support the initial networks. For the simplification of planning 40 Mhz is preferred and can at a later stage provide the needed capacity. Enterprises will have to be able to share the spectrum resources with each other and borrow spectrum in case of short-term extra capacity needs. To support both efficient network planning in high dense area's and the capacity expansion based on short term needs, the 100Mhz in band 43 will be a good starting point. For the mid term future and given the local character of Enterprise Private Networks, we expect that the upper 100MHz of the current B43 will suffice. For the longer term, around 2025, we expect that Enterprise Private Network capacity demand may rise to the level where more spectrum is needed in e.g. the 26GHz band. Mutual access to spectrum of nationwide and local license owners may foster cooperative models sharing local RAN infrastructure in pooled spectrum and thus lead to good spectrum and economic efficiency.*

- 2) Bent u het eens met de gemaakte keuze om het spectrum dat respectievelijk beschikbaar komt in 2022 en 2026 in één keer te veilen? Welke manieren ziet u om een dergelijke verdeling vorm te geven?

*Nokia believes that a stable and predictable regulatory framework enables an investment climate that fosters innovation. As such it is essential that parties that invest in spectrum and networks have good visibility on the cost of the spectrum that the network investments will support. This applies also to the full 3.5GHz band, even if the availability of parts of the 3.5GHz band varies.*

*In addition, one can expect that early knowledge of future ownership of the 3400-3500 part of the 3.5GHz band will provide incumbent users and future licensees with enough lead time to reach agreements on migrations in the 2026 timeframe.*

*Regulation should provide both early deployment opportunities by opening available parts of the band as well as migration to wide contiguous carriers at a later stage when the full band becomes available. This could be done by rearranging earlier granted licenses into contiguous blocks per MNO. Such a procedure would require clear visibility for licensees to guide their investment into sufficiently flexible network infrastructure products.*

3) Welke vraagstukken rond synchronisatie zijn volgens u belangrijk om mee te nemen in onderzoek naar synchronisatie in de 3,5 GHz-band en welke relevante informatie is hierover beschikbaar?

*Band 42 and 43 for LTE as well as band n78 for 5G NR are 3GPP TDD band definitions addressing unpaired spectrum in the 3.4(3.3)-3.8 GHz range. TDD requires synchronization within a network to prevent DL to UL and UL to DL interference scenarios, primarily in macro-cellular scenarios, less so in small cell low power deployments. Synchronization is also beneficial to avoid guard bands between networks on adjacent channels, i.e. to allow for spectrally efficient network operation. Network synchronization can be implemented via local GPS receivers or the network e.g. over IEEE 1588.*

*MNOs typically have very similar requirements in terms of their DL/UL traffic split and therefore can easily agree on common patterns to their mutual benefit. This can be seen e.g. in China and Japan where MNOs agreed on such common patterns without specific regulatory measures.*

*New uses of e.g. a local user could require patterns different from those of MNOs or between different local uses, e.g. much more UL oriented, suggesting different DL/UL patterns. Still, Nokia believes that decisions on DL/UL patterns should be left to the market players, their technical means in terms of radio planning and optimization.*

*As a reference, BNetzA decided to leave that to the market players. Only at the edge 3700 MHz there is a rule that any local spectrum user above 3700 would need to provide guard from within his license in case he does not want to synchronise with the national license holder immediately below 3700 MHz.*