Norwegian Communications Authority

18 June 2019

Public consultation regarding frequencies for mobile communication and 5G

Introduction

Norway wants an early introduction of 5G, and access to this spectrum is an important part of this process. The Norwegian Communications Authority (Nkom) has recently conducted an auction of the 700 MHz band that has been identified as one of the pioneer bands[1] for 5G, and there are large quantities of frequency resources to be awarded over the next few years. The next award are planned for 2021. These are frequency resources that will be decisive for the introduction of 5G in Norway.

Nkom wants input on central issues related to the awards and use of frequency resources for mobile communication and 5G, including, among other things, stakeholders' needs for frequency resources in the future and what Nkom should take into account in its preparation for the awards.

Background

In the Digital Agenda for Norway[2], the government has described the main objectives for coverage and data capacity of mobile and broadband services in the national plan for electronic communication. Among others, the following main objectives are mentioned:

- 90 per cent of all households shall have access to at least 100 Mbit/s by 2020
- Mobile coverage must be available where people live, work and travel
- In the long term, the objective is that all households shall have access to high-speed broadband

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[1] *The frequency bands 700 MHz, 3400-3800 MHz and 26 GHz are identified by the EU as the main bands for early introduction of 5G, so-called pioneer bands.*
[2] *Meld. St. 27 (2015- 2016) Report to the Storting - Digital Agenda for Norway – ICT for a simpler everyday life and increased productivity.*

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- Electronic communication service providers shall have fast access to available frequency resources to meet their needs

Nkom works to achieve these objectives by ensuring that a sufficient proportion of resources for 5G is awarded at the right time and according to the overall political objectives, among other things.

Nkom refers to the Spectrum Roadmap[3] for more detailed information on plans for the awarding of spectrum for mobile communication and 5G.

Input from stakeholders

The overall objective of awarding frequency resources is to ensure an efficient utilisation of the frequency resources for society. To achieve this there are different issues Nkom needs to consider. At a later stage of the award process, Nkom will conduct public consultations on the regulations for the award. What Nkom wants now is the industry's view of Nkom's initial assessments. The input received by Nkom will be important for the future work of facilitation and preparation for the future awards.

Nkom plans to award more frequency bands for mobile communications and 5G during the next few years. Nkom's opinion is that these bands, to some extent, will be substitutable in the long term and there are therefore synergies in assigning several of the frequency bands in the same award. The amount of spectrum is large in these bands. To award several of these bands at the same time may provide more stakeholders with the opportunity to acquire large contiguous quantities of spectrum, something that in Nkom's opinion is important so as to offer adequate 5G services. In addition, multiband awards will be a resource saving for both the stakeholders and the electronic communications authority.

However, Nkom's assessment of the current operators of the commercial mobile networks is that they are already in possession of relatively large spectrum portfolios. This suggests that these stakeholders have no need that dictates that all the available spectrum planned for mobile communication and 5G is made available in a combined award as early as 2021, but that frequency resources are awarded in several rounds over time. However, there might be other stakeholders requiring spectrum.

Nkom would like input for our evaluation of how much spectrum should and must be awarded. Nkom would also like input from stakeholders who might be interested in local/regional spectrum licences, so that we are able to assess whether spectrum should be set aside for such

[3] *Nkom points out that the Spectrum Roadmap is updated at regular intervals.*

use, and if this is the case, what frequency bands. Nkom presents its introductory assessments in more detail in the sections below.

Combined awards of frequency bands

In the Spectrum Roadmap, it is estimated that the frequency bands 2300-2400 MHz (2.3 GHz), 2500-2690 MHz (2.6 GHz), 3400-3800 MHz (3.6 GHz), 24250-27500 MHz (26 GHz), and SDL[4] bands 738-758 MHz (700-SDL) and 1427-1518 MHz (1500-SDL) will be awarded in 2020. Nkom has amended the schedule and these frequency bands will be awarded in the middle of 2021 at the earliest.

700 MHz-SDL, 1500 MHz-SDL and 26 GHz

On the basis of previous input received by Nkom as well as international developments, there is reason to believe that there is no demand for 700 MHz-SDL, 1500 MHz-SDL and 26 GHz bands in the short-term. The ecosystem for the bands is scarcely developed and there is still ongoing international work regarding the 26 GHz band, among other things to ensure coexistence with other services. Given this background, it is Nkom's opinion that it is too early to award these bands in 2021.

The 2.3 GHz band

The frequency licences for the 2.3 GHz band used for video PMSE[5] were extended to the end of 2022 in 2018. Nkom has stated that it plans to use the band for mobile communications after 2022. The interest in this band is increasing in Europe and several countries have awarded, or plan to award, this band for mobile communications in the near future. The ecosystem for this band has been established for a long time and the harmonised terms have much in common with the 3.6 GHz band, the use of Time Division Duplexing (TDD) among other things. Nkom assesses the 2.3 GHz band as a potential substitute for the 3.6 GHz band as a 5G band in the long term. Nkom is also looking at awarding local/regional licences in this band as an alternative to local/regional licences in the 3.6 GHz band. The effective accessible spectrum in the 2.3 GHz band is estimated to be 80-90 MHz.

The 2.6 GHz band

The 2.6 GHz band is established for mobile communication in Norway and Europe and existing licences for the band expire on 31/12/2022. In Nkom's opinion, it is important that the award are made in sufficient time prior to the expiry of the licences to ensure predictability for existing users and future use. Nkom wishes to facilitate as much as possible a future-orientated utilisation of the band and recommends that the band is awarded in 2021.

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[4] *Supplementary Downlink.*
[5] *Programme Making and Special Events.*

The 2.6 GHz band is likely to be the next band that is brought forward as a 5G band. As a starting point, it appears that this will be used as a 5G band for countries outside Europe, where the whole of the band is used as a TDD band, but the ecosystem with support for 5G in the 2.6 GHz band in Europe (FDD and TDD) is under development. Nkom assesses that the 2.6 GHz band might be applicable for being used for 5G in Norway in the long term.

The 3.6 GHz band

190 MHz in the 3.6 GHz band is currently awarded to operators of commercial mobile networks, divided between two licences that expire in 2022. It is important to award more spectrum within the 3.6 GHz band and award licences of longer duration in order to achieve the objective of early introduction of 5G. The frequency band consists of large contiguous frequency resources (400 MHz) and will meet the requirements set for 5G in the IMT-2020 Standard[6].

Combined awards

Nkom believes that the frequency bands 2.3 GHz and 2.6 GHz are well suited to 5G in the future. Therefore, there will be synergies in awarding the 2.3 GHz and 2.6 GHz bands together with the 3.6 GHz band. The current use of the 2.3 GHz band in Europe is somewhat varied, but outside Europe the band is used for mobile communication in many countries and the ecosystem is well developed. Nkom also believes that it will be natural to award the 2.6 GHz frequency band together with the 2.3 GHz and 3.6 GHz bands in 2021 because the licences in the 2.6 GHz band expire in 2022, among other things.

Nkom would like to have input on our assessment to award the 2.3 GHz, 2.6 GHz and 3.6 GHz bands in a joint award process, and the amount the stakeholders deem necessary to have as continuous spectrum. We specifically ask that the industry expresses its demand for spectrum in the 26 GHz band and when they envisage taking this into use.

Nkom's assessment:

There are grounds for a joint award process of the 2.3 GHz, 2.6 GHz and 3.6 GHz frequency bands by the end of 2021.

Grounds do not exist for awarding the 700 MHz-SDL, 1500 MHz-SDL and 26 GHz frequency bands in the next few years. Nkom will therefore not consider the issues in connection with these frequency bands any further in this consultation.

[6] *The requirements established for 5G networks, equipment and services of the International Telecommunication Union (ITU).*

Requirement for regional/local licences

Nkom wishes to survey the need for regional/local licences in order to evaluate if spectrum should be set aside for this purpose. While several other countries in Europe are reporting a great interest in local/regional licences, little demand for test licences has been registered by Nkom from regional/local stakeholders. Nkom assumes that, to a great extent, this is due to an immature market rather than lack of interest in the market.

The 5G technology allows for achieving a very low latency, something that facilitates taking private networks into use for industrial automation in industry verticals[7]. Nkom believes that private networks may also be of interest to other types of users such as hospitals, power companies, airports, municipalities, wind farms, oil companies, local broadband providers (to FWA[8]) and the like.

Based on the current mobile market, Nkom assesses the situation such that sufficient spectrum within the 3.6 GHz band will be available so that spectrum can be set aside for both regional/local and national licences.

At the same time, Nkom can see that the needs of the users of regional/local licences will be different from the needs of the holders of national licences. This might mean challenges in agreeing on a common framework structure (the relationship between uplink and downlink) and the synchronisation of regional/local networks and national networks within the same frequency band. Separating regional/local usage from national usage by using different frequency bands, for example regional/local licences in the 2.3 GHz band and national licences in the 3.6 GHz band, might offer a solution to this. Nkom believes that regional/local licences in the 2.3 GHz band may be interesting as an alternative to regional/local licences in the 3.6 GHz band.

As part of the assessment, Nkom will also take a closer look at the social benefits of setting aside spectrum for regional/local licences in comparison to awarding all the spectrum in the 3.6 GHz band as national licences.

Nkom would like input on how the different stakeholders think the access to 5G services can best be realised: either by purchase of access to 5G services by mobile operators or via their own private networks. Nkom would also like input on how much bandwidth will be required for the establishment and use of local/regional licences (including requirements for private networks).

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[7] *Market segments within different types of industry.*
[8] *Fixed Wireless Access – fixed broadband supplied via a mobile network.*

Nkom's assessment:
There are grounds for assessing the award of 300 MHz as national licences, and to set aside 100 MHz for regional/local licences in the 3.6 GHz frequency band. Alternatively, the entire 3.6 GHz can be awarded as national licences and 2.3 GHz can be used for regional/local licences.

Initial assessments of spectrum caps and the need for bandwidth

The objectives of efficient frequency utilisation, sustainable competition and at least three competing mobile networks in Norway suggest there may be grounds for limiting how much spectrum a single stakeholder can acquire, a so-called spectrum cap, when awarding the 2.3 GHz, 2.6 GHz and 3.6 GHz bands. The restriction can be regulated as a combined spectrum cap for these three bands, alternatively as part of an overall spectrum cap for all capacity frequencies. A band-specific spectrum cap might also be applicable.

Band-specific spectrum cap in the 3.6 GHz band

The 3.6 GHz band is considered the most important band for the roll-out of 5G in the short and medium terms. When it comes to the requirement for spectrum in this band, 80-100 MHz is the bandwidth that has been set as a prerequisite to accommodate the requirements stated in the IMT 2020 Standard. As things appear today, the first 5G equipment to appear on the market will be adapted to utilise a maximum bandwidth of 100 MHz. Nkom has understood that relatively large investments have to be made in order to utilise larger bandwidths than this. The reason for this is that the stakeholders need to invest in extra equipment if they are to be able to take advantage of, for example, 20-30 MHz bandwidth as well as 100 MHz bandwidth in this band. This indicates that a spectrum cap of 100 MHz may be appropriate.

In Nkom’s assessment, other frequency bands will not be suitable as direct substitution bands in the short and medium terms due to the status of the 3.6 band as the pioneer band for 5G, among other things. In Nkom’s assessment, access to resources in this band will influence stakeholders’ opportunities to provide complete 5G services and therefore also a stakeholder’s ability to compete in the market. Therefore, Nkom wishes to facilitate that at least three stakeholders can secure sufficient quantities of spectrum by setting a frequency cap in this band.

Nkom would like input on our assessment that there are no frequency bands suitable as a direct substitution to the 3.6 GHz band in the short and medium terms.

Nkom's assessment:
Nkom is considering setting a combined spectrum cap for the 2.3 GHz, 2.6 GHz and 3.6 GHz frequency bands or for capacity bands. In addition, Nkom is considering a band-specific spectrum cap for the 3.6 GHz frequency band of 100 MHz. A band-specific spectrum cap might also be applicable for other bands.

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About the consultation

Please send your input regarding this consultation by e-mail to firmapost@nkom.no with a copy to avi@nkom.no **by Tuesday 27 August 2019.** Please enter as the subject of the e-mail **"Consultation about frequency resources for mobile communication and 5G".**

Consultation responses will be published on Nkom's website. Interested parties must therefore formulate the answers so that they can be published. If the response to the consultation contains sensitive information, such as trade secrets, the whole or part of the document may be exempted from public disclosure, cf. the Freedom of Information Act and the Public Administration Act. To the extent that a consultation response might contain information that the addressee wish to be exempted from public disclosure, Nkom asks that this is clearly stated and justified.

Nkom also wishes to offer interested stakeholders the opportunity to present their views on the topics presented in this consultation and any other topics that can be related to future awards of spectrum for mobile communications and 5G, in a meeting with Nkom. Meetings will take place during the period September/October 2019. Interested parties can contact Anja Vimme Skadal (avi@nkom.no / 47477777).