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Ministry of transport's public consultation on the allocation of frequencies in the 800 MHz band including issues relating to the allocation of frequencies in the 900 and 1800 MHz bands.

Qualcomm Response

May 2011

Executive summary

Qualcomm welcomes the opportunity to provide a response to the Ministry of Transport (Samferdselsdepartementet) consultation paper on the allocation of frequencies in the 800 MHz band including issues relating to the allocation of frequencies in the 900 and 1800 MHz bands.

Qualcomm applauds the government for its decision to secure the future of mobile broadband in Norway by allocating the 800MHz to mobile broadband. Qualcomm also welcomes the Ministry of Transport's concerns with securing the optimal use of the 900MHz band.

First and foremost, Qualcomm believes that a spectrum policy framework based on technology neutrality through standards competition, application neutrality and pan-European implementation of harmonized technical spectrum usage rights enables an efficient use of spectrum, innovation, competition and the successful commercial development of wireless technologies in Norway and in Europe.

Qualcomm invites the Ministry to focus on two key objectives:



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- Ensure the fast availability of a mobile broadband to all citizens (nationwide coverage of quality service). This can be easily achieved by leveraging the very large HSPA 900 ecosystem.
- Secure the long term evolution of mobile broadband and prevent the emergence of a new digital divide, by enabling the optimum use of the 800 MHz band for the future evolution of networks. The 800 MHz band is critical to extend the coverage of LTE networks, which are currently restricted to the 2600 MHz band.

Qualcomm believes that the 900 and 800 MHz bands are the two most important bands for the mobile broadband infrastructure and applauds the government and the Ministry of Transport for their current proposal which will secure the availability and expansion of mobile broadband services in Norway.

Introduction

Mobile broadband is both a large opportunity for operators and a life changing experience for users. The digital divide, i.e. the inability for a significant percentage of the population to benefit from digital services such as Internet access, is rightfully identified as a key challenge for both society and the economy. Mobile broadband is the key to bridging the digital divide as it allows cost-efficient Internet connectivity over a wide coverage of sparsely populated areas.

Mobile broadband does not only provide internet access to rural areas but also provides *mobile internet access*, which in itself is becoming more and more important to citizens and companies. Services such as e-health or automotive services inherently require mobility and are expected to play a major role, particularly to cater for the need of an aging society, but also as a general infrastructure for the society. Already today, advanced users expect to have a high quality mobile internet access anywhere and everywhere, with a serious impact on the competitiveness of a region when it is not the case.

From a business perspective, mobile broadband has a growing importance in operator's business models, with a clear trend of data revenues increasing among operators. Fast connection and ubiquitous coverage are two key components to drive the usage of data services.

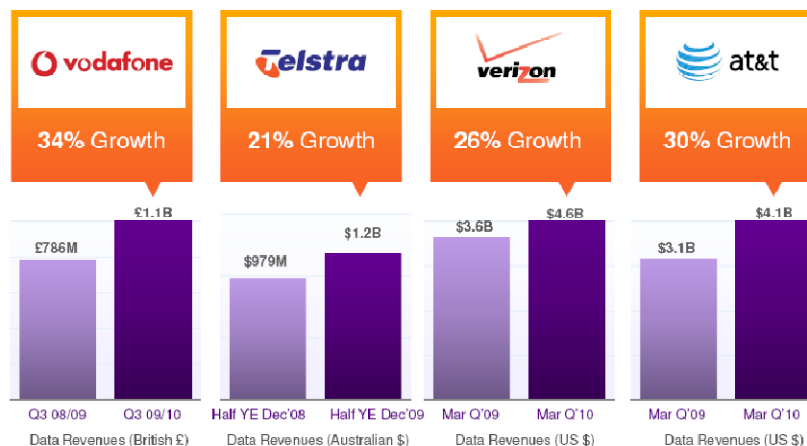


Figure 1: Operators' data revenues are growing worldwide.

Norway has already reached several milestones in the deployment of mobile broadband and is positively positioned to pursue excellence in mobile broadband infrastructure in the future. In particular, Norway recognised early the importance of future mobile broadband systems by awarding the 2500-2690 MHz band well in advance of other European countries. In order to maintain this leadership position, Norway should focus on two separate issues:

- the extension of the mobile broadband coverage area, both for rural areas and for deep indoor locations,
- the deployment of a coverage layer for the new high capacity systems currently deployed in the 2600MHz band.

These two goals are related respectively to the 900 MHz band and to the 800 MHz band, as will be presented in the following sections.

HSPA900 can bridge the digital divide today

A successful mobile broadband deployment relies on both the availability of cost-efficient equipment and the availability of low frequency spectrum in order to achieve ubiquitous coverage. HSPA900 fulfils both of these key requirements. HSPA900 allows significant coverage at reasonable cost by reusing the current 2G network topology. France, a sparsely populated country by European standards, will achieve 98 percent mobile broadband coverage in 2011 with HSPA900, and 99.3 percent of the population will be covered by the end of 2013. Furthermore, users can benefit from HSPA900 immediately following deployment as a significant share of existing terminals already supports HSPA900.

HSPA900:

- Delivers a true mobile broadband user experience
- Allows cost-effective ubiquitous coverage
- Enables fast service availability to users
- Is future-proof

HSPA900 is commercially deployed in 27 networks (including in France, UK, Germany, Poland, Sweden, Belgium, Finland, Romania, Croatia, Latvia, Estonia and Iceland). At least 34 countries across the world currently permit UMTS/HSPA900. Spain, for instance, has recently adopted a royal decree to enable the deployment of UMTS900 as early as possible. 526 HSPA900 devices have been launched by 81 suppliers¹, including the Iphone4. In fact, a vast majority of 3G handsets sold today already support HSPA900 (see Figure 2 below). In addition, HSPA+ has also now been made available to the 900 MHz frequencies allowing peak rates of more than 21 Mbps on HSPA+900 dongles, and first commercial network rollouts have been completed on HSPA+ 900 in Poland and Romania.

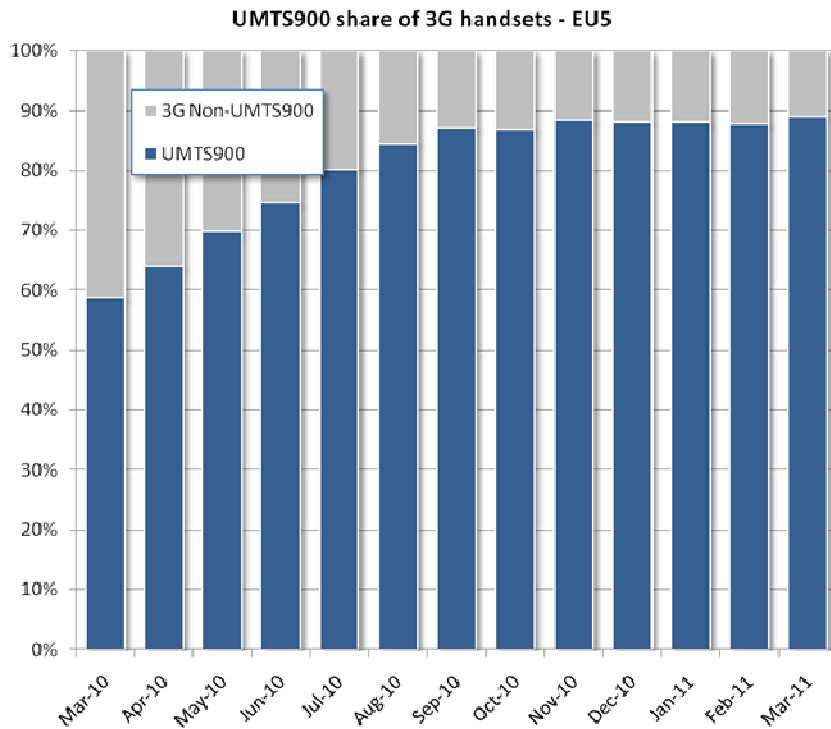


Figure 2: close to 90% of 3G handsets sold in EU5 support UMTS/HSPA900²

¹ Source: GSA

² Source: GFK

Finally, if HSPA900 is often contemplated as the optimum mobile broadband solution for suburban and rural 3G coverage, initial rollouts in urban areas have also demonstrated a superior indoor coverage and thus 3G quality of service experienced by customers with HSPA900 compatible terminals, both on voice (less incoming call failures and dropped calls) and data.

Due to the maturity of the technology and the large existing market seeding HSPA900:

- Addresses both fixed and mobile markets.
- Provides the right platform for services such as smart grids, ITS (transport and logistics solutions, pay as you drive insurance solutions, automotive maintenance and multimedia services, e-call based enhanced services) and m-health for the next decade.
- Is economically attractive to customers and operators.
- Immediately improves Norway citizen internet access.

LTE800 will provide coverage for the evolution of mobile broadband

Optimal deployment of LTE will require leveraging larger channel bandwidth (10MHz, 15MHz and 20MHz) and low and high frequency bands for coverage and capacity purposes in order not to recreate a new digital divide and maintain ubiquitous access to all citizens.

Throughout Europe, the 900 MHz band is used very intensively, supporting both GSM and UMTS/HSPA services. The 900 MHz seldomly offers the possibility to vacate 10 MHz of spectrum to introduce LTE. In the meantime, the 800MHz band is becoming available throughout Europe and, as a new frequency band, easily accomodates systems with 10 MHz bandwidth.

The 800 MHz band will therefore be the critical frequency band in order to deploy a coverage layer for the LTE networks deployed in the 2600 MHz band.

Qualcomm applauds Norway's decision to allocate the 800 MHz band to mobile broadband as this decision secures the future of LTE networks and prevents a new digital divide to appear, that is a digital divide between citizen benefiting from LTE

2600 MHz networks and citizen leaving outside of the LTE 2600 MHz network coverage. The 800 MHz band will allow the coverage of LTE networks to be comparable with the coverage of GSM and HSPA networks. Qualcomm approves the Ministry of transport’s decision to adopt coverage as one of the main goals for the upcoming 800 MHz allocation in Norway.

As highlighted in the previous sections, Qualcomm recommends the pan-European implementation of harmonized technical spectrum usage rights, which in turn leads to economy of scale and the availability of terminals. In terms of band plan for the 800 MHz band, Qualcomm recommends adopting a frequency allocation process that would allow the allocation to result in the award of three licences of 2x10MHz each, as represented in the Figure below:

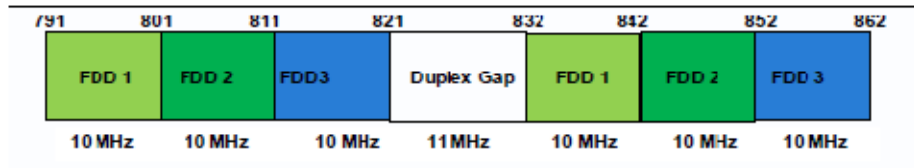


Figure 3: Optimal allocation outcome in the 800MHz band

This option was indeed the outcome reached in Germany and Sweden during the recent auctions of the 800MHz band, providing further support for its optimality. Qualcomm expects a very significant eco-system to develop around LTE800 terminals with 10MHz bandwidth.

The growing importance of the terminal ecosystem

The selection of a technology for the network infrastructure (base stations) is no longer the critical factor as most base stations are evolving to support various air interfaces enabling the operators to select at any given moment the appropriate technology for a specific band, depending on market demand. The availability and the price of terminals, i.e. the terminal eco-system in the band will remain however a key parameter.

As a result, a successful mobile broadband deployment relies mostly on the availability of cost-efficient terminal equipment. In this context, Qualcomm recommends ComReg to take into account both:

- The time constraints linked to the maturity of the technologies.
- The development of the European market at large.

Qualcomm observes that a very strong HSPA900 ecosystem is already in place and can support an immediate extension of mobile broadband services to sparsely populated areas.

Qualcomm fully expects a strong LTE800 ecosystem to develop over the coming year and to mature as the traffic develop on networks and LTE becomes a widely adopted standard.

Conclusion

Qualcomm believes that the mobile broadband infrastructure is one of the country's most critical asset for economical and sociological reasons. Qualcomm strongly approves Norway's decision to consider both the 900 MHz and the 800 MHz band in order to secure a far reaching coverage of mobile broadband services, reduce the current digital divide and prevent the appearance of a new divide.

Qualcomm observes that the 900 MHz and 800 MHz bands align with two complementary time schedules. While the 900 MHz band allows the availability of mobile broadband in the short term, the 800 MHz band will support the evolution towards higher bandwidth in the future. The combination of spectrum in both the 800 MHz and 900 MHz band is necessary for an operator in order to be in the position to:

- Offer ubiquitous mobile broadband services in the near future.
- Secure the long term evolution of its network towards larger bandwidth.



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Qualcomm regards the framework proposed by the ministry of transport as excellent and hopes that the Ministry of transport will be in a position to implement it as soon as possible.

Question 1.: Samferdselsdepartementet ber om høringsinstansenes syn på foreslaget om at det fastsettes dekningskrav som enten

a) knyttets til den øverste 5 MHz-blokken (alternativt de to øverste blokkene) i 800 MHz-båndet eller

b) ses i sammenheng med et frekvenstak utformet ut fra en vurdering av tilbyders samlede spektrumsinnnehav i 800 og 900 MHz-båndene.

Det bes også om høringsinstansenes syn på en auksjon der dekningskrav lyses ut som et eget objekt tilbyderne kan gi tilbud på.

Departementet ønsker høringsinstansenes syn på forslaget om et krav om befolkningsdekning på inntil 97 prosent.

Ministry requests feedback on the options for the establishment of coverage requirements, which can be either

a) only applicable to the upper 5 MHz block (or alternatively, the top two blocks) in the 800 MHz band or

b) determined through an auction design that would assess the provider's overall spectrum holdings in the 800 and 900 MHz bands.

The respondent views are also requested on an auction design where the coverage requirements are advertised as a separate object that providers can bid for.

The Ministry finally requests the respondent's views on the proposal for a requirement of population coverage of up to 97 percent.

Qualcomm would like to limit its current response to mobile broadband market, technology and spectrum policy considerations.

Qualcomm approves the Ministry of Transport's decision to focus on, and adopt in the auction design, coverage requirements, as Qualcomm believes that the 900 MHz band and the 800 MHz bands are the two most critical bands to secure a near-ubiquitous coverage of mobile broadband networks.

Qualcomm observes that the 900 MHz and 800 MHz bands align with two complementary time schedules. While the 900 MHz band allows the availability of mobile broadband in the short term, the 800 MHz band will support the evolution towards higher bandwidth in the future. The combination of spectrum in both the 800 MHz and 900 MHz band is necessary for an operator in order to be in the position to:

- Offer ubiquitous mobile broadband services in the near future.
- Secure the long term evolution of its network towards larger bandwidth.

Qualcomm does not believe that the 800 MHz and 900 MHz bands are equivalent and fully substitutable and we are of the view that the 800 MHz and 900 MHz bands should not be treated in an undifferentiated manner.

Question 2.: Samferdselsdepartementet ber om høringsinstansenes syn på foreslaget om at et dekningskrav skal oppfylles innen fire år etter tildeling.

Videre foreslår departementet at tilbyder(e) som ikke er pålagt dekningskrav gjennom tildelingen, skal sørge for en reell anvendelse av tildelte frekvensressurser innen fire år etter tildeling. Departementet ber spesielt om synspunkter på et slikt krav og hvordan dette best kan etterprøves.

Ministry requests comments on the proposal to fix the target date to fulfill coverage requirement within four years after the award.

Furthermore, the Ministry is proposing that the provider(s) that are not imposed coverage requirements through the award, should demonstrate the actual use of the frequencies within four years after the award. Ministry specifically requests views on such a claim and how this can best be tested.

Qualcomm approves the Ministry's decision to ensure that the spectrum awarded is actually put in use, as a situation where the spectrum would be allowed to stay idle would be extremely negative for the country.

Qualcomm stresses that it believes that the 900 MHz and 800 MHz bands align with two complementary but distinct time schedules. In particular, the actual service to

customers and citizen depends not only on the mobile broadband infrastructure but also on the state of the relevant ecosystem. A significant ecosystem is required to ensure the availability of a wide ranging choice of attractive and adequately priced terminals.

Qualcomm observes that a very strong HSPA900 ecosystem is already in place and can support an immediate extension of mobile broadband services to sparsely populated areas.

Qualcomm fully expects a strong LTE800 ecosystem to develop over the coming year and to mature as the traffic develop on networks and LTE becomes a widely adopted standard.

Therefore, Qualcomm recommends the Ministry to acknowledge in its final decision the difference and complementarity of the 900 and 800 MHz bands.

Question 3.: Det bør fastsettes et frekvenstak for å unngå at en for stor andel av de tilgjengelige frekvensressursene blir konsentrert på én eller to tilbydere.

For det tilfellet at et mulig dekningskrav knyttes til bestemt(e) frekvensblokk(er) i 800 MHz-båndet, foreslår departementet at det fastsettes et frekvenstak på 2 x 10 MHz i 800 MHz-båndet.

For det tilfellet at et mulig dekningskrav knyttes til et tak for en tilbyders samlede spektrumsinnhav i sammenlignbare frekvensbånd, foreslår departementet at: det i utgangspunktet innføres et samlet frekvenstak i 800 og 900 MHz-båndene på 2 x 20 MHz; erverv i 800-MHz båndet utover ovennevnte tak likevel tillates på vilkår og at slikt erverv utløser krav til befolkningsmessig dekning (se nærmere omtale i kapittel 4.1); det i denne kontekst fastsettes et tak på 2 x 10 MHz i 800 MHz-båndet for henholdsvis NetCom og Telenor; det i denne kontekst fastsettes et tak på 2 x 20 MHz i 800 MHz-båndet for øvrige tilbydere.

A spectrum cap should be introduced in order to avoid that excessive amount of spectrum are concentrated in the hands of one or two providers.

With regards to potential competition distortion in the 800 MHz band, the Ministry is proposing the establishment of a frequency cap of 2 x 10 MHz in 800 MHz band.

The Ministry is also proposing a 2 x 20 MHz total spectrum cap for the 800 and 900 MHz bands; acquisition of 800-MHz band in excess above this spectrum cap may still be permitted under certain conditions and such acquisition would trigger requirements in terms of population coverage (see further discussion in Section 4.1); in this context a spectrum cap of 2 x 10 MHz in 800 MHz band is proposed for respectively NetCom and Telenor, while a spectrum cap of 2 x 20 MHz in 800 MHz band is proposed for other providers.

Qualcomm would like to limit its current response to mobile broadband market, technology and spectrum policy considerations.

Optimal deployment of LTE requires leveraging larger channel bandwidth (minimum 10MHz), while the performance limits of the duplexing filters will restrict the overall performance of LTE terminals in the 800MHz band for bandwidths higher than 10MHz, as indicated 3GPP 36.101 (LTE) specifications³. Therefore, Qualcomm recommends adopting a frequency allocation process that would allow the allocation to result in the award of three licences of 2x10MHz each, as represented in the Figure below:

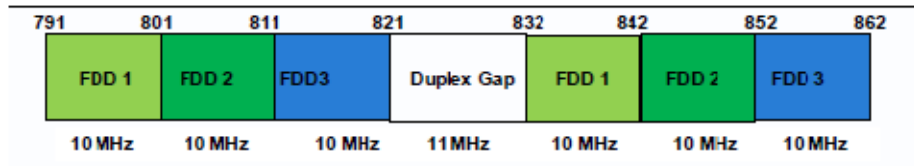


Figure 4: Optimal allocation outcome in the 800MHz band

³ Using terminals with bandwidth larger than 10MHz in 800 MHz bands would require advances in radio-frequency components technology.

This option was indeed the outcome reached in Germany during the recent auction of the 800MHz band, providing further support for its optimality. Qualcomm expects a very significant eco-system to develop around LTE800 terminals with 10MHz bandwidth.

Question 5.: Samferdselsdepartementet foreslår at FDD-båndplanen som fremgår av Figur 1 i kapittel 2 legges til grunn for tildelingen av 800 MHz-båndet i Norge.

Ministry proposes that the FDD band plan shown in Figure 1 in Chapter 2 the basis for the allocation of 800 MHz band in Norway.

Qualcomm supports the pan-European implementation of harmonized technical spectrum usage rights in order to enable harmonisation and in turn provide economies of scale.

Therefore, Qualcomm strongly supports the Ministry's proposal to adopt the harmonised preferred band plan for the 800 MHz band.

Question 6.: Samferdselsdepartementet foreslår at frekvenstillatelsene i 800 MHz-båndet utformes så teknologi- og tjenestenøytrale som mulig.

Ministry proposes that spectrum licenses in 800 MHz band should be as technology and service neutral as possible.

Qualcomm believes that a spectrum policy framework based on technology neutrality through standards competition, application neutrality and pan-European implementation of harmonized technical spectrum usage rights enables an efficient

use of spectrum, innovation, competition and the successful commercial development of wireless technologies in Norway and in Europe.

Therefore, Qualcomm fully supports the Ministry's proposal.

Question 8.: Etter departementets vurdering er det fordeler og ulemper med begge alternative auksjonsformater, og på det nåværende tidspunkt har ikke departementet noen klar preferanse.

Departementet ønsker høringsinstansenes syn på auksjonsformatene, herunder gjerne også forslag til hvordan det kan tas hensyn til potensiell forskjell i verdi på blokkene i auksjonen, og forslag til hvordan ønsket om å sikre sammenhengende spektrum til tilbyderne kan ivaretas.

Following its assessment, the Ministry does not have any clear preference, it is the pros and cons of each alternative auction formats, and at the present time.

The Ministry requests views on auction formats, including suggestions on how to take into account the potential differences in the value of the blocks in the auction, and suggestions for how the desire to ensure that contiguous spectrum allocation can be maintained.

Qualcomm would like to limit its current response to mobile broadband market, technology and spectrum policy considerations.

The optimal deployment of LTE requires leveraging larger channel bandwidth (minimum 10MHz). As a result, Qualcomm indicates that it is critical to obtain adjacent frequency blocks.

Question 9.: Samferdselsdepartementet foreslår at det legges til grunn en blokkstørrelse på 2 x 5 MHz for tildeling av frekvensene i 800 MHz-båndet.

Ministry proposes a block size of 2 x 5 MHz for the allocation of frequencies in the 800 MHz band.

Mobile broadband technologies (either HSPA or LTE) require 5MHz frequency blocks or multiple of 5MHz frequency blocks for deployment. Though LTE also supports lower bandwidth, the efficiency of the technology on bandwidth lower than 5MHz is very low. Therefore, Qualcomm does not expect a significant eco-system to develop for LTE on channel bandwidth lower than 5MHz. Furthermore, Qualcomm underlines that optimal deployment of LTE requires leveraging larger channel bandwidth (minimum 10MHz).

Therefore, Qualcomm recommends adopting a frequency allocation process that would allow the allocation to result in the award of three licences of 2x10MHz each, as represented in the Figure below:

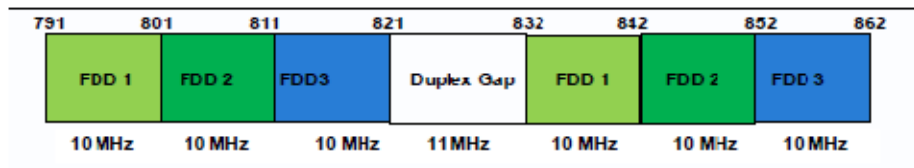


Figure 5: Optimal allocation outcome in the 800MHz band

This option was indeed the outcome reached in Germany during the recent auction of the 800MHz band, providing further support for its optimality. Qualcomm expects a very significant eco-system to develop around LTE800 terminals with 10MHz bandwidth.

Question 10.: Departementet ønsker synspunkter fra høringsinstansene på forslaget om samtidig tildeling av frekvensene i henholdsvis 800 og 1800 MHz-båndene.

Departementet ønsker synspunkter på om og eventuelt i hvilken grad disse to auksjonene for øvrig bør ses i sammenheng.

Ved tildeling av de ledige frekvensressursene i 1800 MHz-båndet, kan det være hensikts-messig også å tildele med virkning fra 1. januar 2014 blokken på 2 x 6,4 MHz som utløper i 2013. Departementet ber om høringsinstansenes synspunkt på dette.

Ministry requests the views of respondents on the proposal to conduct simultaneously the allocation of frequencies, respectively in the 800 and 1800 MHz bands.

Ministry wants views on whether and to what extent these two auctions in general should be viewed together as one single topic.

When allocating the available frequency resources in the 1800 MHz band, it might be also appropriate to award, with effect from 1 January 2014, the block of 2 x 6.4 MHz, which expires in 2013. The Ministry requests the consultative body's point of view on this.

Optimal deployment of mobile broadband requires a combination of a coverage band in low frequency bands (800 and 900 MHz bands) and a high capacity band, usually available only in high frequency bands (e.g. 1800, 2100, 2600 MHz).

The 1800 MHz band can play a critical role for providing mobile broadband capacity and operator should be allowed to adopt combined spectrum strategies for the roll-out of their mobile broadband networks.

As a result, Qualcomm supports the Ministry proposal to hold joint auction of 800 and 1800 MHz band, and further support that all spectrum available in the middle term in the 1800 MHz band should be auction at the same time, in order to enable joint strategies.

Question 11.: Departementet ber om synspunkter på hensiktsmessigheten av å inkludere også tre blokker (2 x 5 MHz) fra 900 MHz-båndet i den auksjonen som nå er under forberedelse. Slik tildeling vil ha virkning fra 1. januar 2014.

Ministry requests views on the appropriateness of including also three blocks (2 x 5 MHz) from 900 MHz band in the auction which is now under preparation. Such allocation will be effective from 1 January 2014.

The 900MHz band is probably today the most important frequency band for the mobile industry both nationally and internationally:

- The 900MHz band provides coverage in remote areas to GSM users in Norway.
- The 900MHz band provides coverage for both voice and data services internationally.
- The 900MHz band is very well harmonised internationally supporting roaming on an extended scale.

Furthermore, a successful mobile broadband deployment relies on both the availability of cost-efficient equipment and the availability of low frequency spectrum in order to achieve ubiquitous coverage.

As a result, the 900 MHz band will remain the most critical band for the coverage of mobile broadband networks for year to come, due to the very large HSPA900 ecosystem.

Therefore, Qualcomm fully supports the Ministry's proposal to include the 900 MHz band lots in the auction in order to:

- increase visibility for operator,
- allow more complex spectrum strategy,
- enable investment in the band
- and improve the availability of mobile broadband services to citizen and consumers.



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Qualcomm also recommends to include the 900 MHz frequency lots that will not be available before 2014. Such an early allocation will allow operators to deploy and apply optimal long term investment strategy. This is desirable for the consumers and citizen as they will enjoy the best service both in the short and long term.