August 2021

ESOA response to Nkom consultation on 3800-4200 MHz for local 5G networks

ESOA thanks Nkom for the opportunity to comment on this important consultation for the introduction of local 5G networks in the 3800-4200 MHz band in Norway.

1. ESOA first notes that, in the 3800-4200 MHz frequency band, Nkom proposes to license new users for local 5G networks, by granting

> *low-power permit […] intended for private mobile networks, for example for private mobile networks* ***indoors"*** and *"high-power permit intended for* ***outdoor*** *use for, for example, fixed, wireless broadband, and to cover larger areas such as industrial parks, harbors and homes*

ESOA reminds that the band is not allocated to mobile services in ITU and ECA allocation tables: it is indeed instrumental that IMT consumer services (for national mobile broadband) are *not* introduced within 3800-4200 MHz, otherwise it will become impossible to ensure coordination with Fixed Satellite Service ("FSS") sites (or with any Fixed links) and guarantee the continuation of satellite services in this band.

It is to be reminded that, as a result of the refarming of spectrum users below 3800 MHz and the resulting reduction in the amount of C-band spectrum available for satellite services, the 3800-4200 MHz frequency band will have to accommodate an increased FSS traffic in an environment that might also see an enormous densification of traffic in FWA links.

ESOA also believes that increased satellite data traffic may need to be served, either by additional frequency assignments at FSS existing sites or possibly by FSS new sites. We urge Nkom to take the resulting frequency needs into account and allow frequency expansion to support this increased traffic, thereby maintaining priority of FSS spectrum usage across the whole 3800-4200 MHz band.

ESOA further seeks clarity on how Nkom plans to treat the existing satellite earth station sites within 3800-4200 MHz after the expiration of their current licenses, and if the renewal of the licenses for existing satellite earth station sites will be automatically granted.

Satellite solutions have been used to support 4G and are being developed to support 5G. Increased interest and participation in 3GPP from the satellite communication industry implies that the 5G ecosystem is convinced of the market potential for an integrated satellite and terrestrial network infrastructure in the context of 5G. Satellite solutions remain ideally suited for expanding the reach of terrestrial communications networks to rural and remote areas.

ESOA believes that Nkom has the opportunity to remain at the forefront of regulation to ensure that the Norwegians citizens and consumers have access to new broadband services and do not suffer from the dis-benefits associated with 'not spots' by continued reliance on a mix of technologies including satellite. Satellite usage of C-band spectrum to deliver state-of-the-art connectivity and provide universal coverage of communications services around the world, including in Europe, is a well-established reality. [See SES in Greenland (https://www.ses.com/case-study/tele-greenland) or Intelsat in Japan (https://www.intelsat.com/resources/case-studies/mno-broadens-4g-connectivity-landscape-to-include-japans-remote-regions/)]

In order to harvest the potential to improve the reach of terrestrial networks by satellite solutions, adequate spectrum resources are thus required for satellites in both the uplink and downlink in various frequency bands including in C-band.

In this context, it is envisaged that there will be demand for existing FSS teleport services to continue operating in the 3800-4200 MHz band in the future. Several FSS earth stations which are based in Europe and Norway are used for intercontinental links and links with high reliability requirements (including broadcast distribution and TT&C). Satellite operators again rely heavily on C-band, because it has many advantages over other frequency bands in terms of coverage with global beams and resilience. The maritime sector is also increasingly using C-band earth stations, some of which is connecting while in the Norwegian territorial waters.

To enable such services to continue operating, ESOA indeed expects Nkom to implement adequate measures to protect incumbent services and ensure their commitment and quality of services to their customers: as much as other spectrum users, satellite operators need long term stability within this band.

ESOA thus seeks an assurance from Nkom that licences for existing and planned satellite earth stations will continue to be renewed and granted and that the protection afforded to satellite operations through these licences will not be reduced if Nkom implements its proposal to grant new licences for local 5G networks in the 3 800-4 200 MHz frequency band.

2. ESOA secondly notes that Nkom considers granting two different types of permits for local networks under the following conditions:

- ***Low power license*** *with flexibility to locate base stations within a defined geographical area*
- ***High power license*** *with defined base station locations*

The low-power permit is intended for private mobile networks, for example for private mobile networks ***indoors****. Within a radius of 50 meters from a pre-approved center location, the holder is free to set up base stations as required,* ***with a maximum radiated power of up to 24 dBm EIRP, and a maximum average spectral power density of 18 dBm / 5 MHz****.*

The high-power permit is intended for ***outdoor*** *use for, for example, fixed, wireless broadband, and to cover larger areas such as industrial parks, harbors and homes. This permit applies to the approval of a single base station* ***with a maximum radiated power of 42 dBm EIRP, and a maximum average spectral power density of 36 dBm / 5 MHz****.*

The usage within the licensed area can consist of multiple base stations, and it can take place either indoor or outdoor depending on the license type. Massive deployment and aggregated power of terrestrial transmitters may thus create the conditions of a serious increase in interference levels overall.

Depending on the use case for 5G local networks considered, there could be much higher density of base stations required, as in traditional mobile cell structure. For example, the number of devices could be extremely high, e.g. for massive IoT, or alternatively the required bitrate could be high, e.g. for autonomous industry applications, requiring several base stations per license area.

As a reminder, satellite LNAs and LNBs are designed for reception of very low satellite signals and the dynamic range is set accordingly. Even for local networks under these conditions, high-power signals of BWA or IMT type can produce much higher power (e.g. 45dB higher) than the satellite signals at the LNA/LNB input and can thus overdrive or bring it into non- linear operation. This can block reception

of signals anywhere in the entire 3 800-4 200 MHz band, even if the terrestrial signal is not overlapping with the FSS signal.

Traditionally, the terrestrial applications were microwave links providing connectivity for a limited number of stations at fixed, well defined locations and using directional antennas with controlled emissions and well-designed ground equipment. However, the new applications, which now are threatening C-band FSS gateway stations, are different in nature in that they are deployed ubiquitously, using non-directional antennas and often without individual licensing of stations, in particular user terminals. As a result, the interference scenario and the capability for satellite systems to take into account and co-exist with these is completely different from that of the earlier terrestrial applications using the same band.

Satellite C-band earth stations, designed to receive signals over very long distances, are very sensitive to interference. These critical links need to be secured if there is reduction in the availability of spectrum for satellite reception at some locations in the future because of sharing with local networks, including for nomadic usage. Because of the frequency limitation resulting from nomadic use, there will very likely be a reduction of locations for FSS operations resulting from Nkom's proposals, and it is unclear how Nkom will treat the existing satellite earth station sites after their current license expires.

ESOA finally seeks an assurance from Nkom that any costs arising from Nkom's proposals to grant licenses to new users will be met by these new users. This includes the costs of any new coordination arrangements, considering the operational costs to be largely endorsed by the satellite industry. Nkom should not use the introduction of new sharing and coordination arrangements as a reason for increasing the cost of satellite earth station icences.