

The 410 MHz opportunity for mission- and business-critical broadband

White paper

As the migration from narrowband to broadband continues, a valuable opportunity is opening up to deploy broadband LTE in 3GPP spectrum bands 87 and 88. This white paper describes the performance, coverage and cost benefits of using low frequency bands, as well as the business models that are already emerging.

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Introduction

The opportunity for mission-critical operators

Historically, governments have owned and operated narrowband mission-critical wireless communications networks that provide group voice capabilities. But with growing pressure to protect against natural disasters and threats to the security of communities, today's missions are becoming more complex. Consequently, governments now increasingly turn to new mobile broadband networks to put data applications in the hands of emergency responders. A multitude of industries that have long relied only on push-to-talk communications have also decided to implement today's well-known broadband technologies for greater efficiency in their operations. The transportation industry and energy companies, for example, have made this choice.

3GPP LTE-based mobile broadband takes advantage of advanced modulation techniques that boost spectrum efficiency and data transfer speeds, going beyond what narrowband communications can offer. By incorporating these broadband technologies, mission-critical networks gain the advantages of sending fast and reliable broadband data and real-time video services to and from incident command. Now that 3GPP has standardized historical mission-critical features such as push-to-talk (MC-PTT), LTE is considered to be the broadband technology of choice for mission- and business-critical needs. In fact, LTE has already been adopted for these purposes in the US, UK, UAE, South Korea and other countries.

The challenge of nationwide coverage and the need for low bands

One of the critical aspects of emergency services is coverage. Incidents that need emergency services can occur anywhere, and public safety users expect service coverage everywhere, all the time — whether they're outside populated areas or inside a home or office building. Implementing the required level of LTE coverage for mission-critical use in a cost-efficient way requires proper network planning before deployment, followed by a well-executed network implementation. Such coverage requirements are also important in other mission- and business-critical markets, such as energy (utility grid) and transportation.

LTE frequency bands range from 2.6 GHz down to 450 MHz and recently to 410 MHz. The sub-GHz frequency range is important because it offers a good compromise between coverage and capacity. The propagation characteristics of low frequencies make them the preferred choice for implementing wide coverage for mission- and business-critical services at lower costs. In addition, the sub-GHz frequency range generally matches the existing grid of radio towers used by current narrowband network operators, potentially optimizing the deployment costs.

These points explain why most public safety broadband networks are primarily using low frequency bands, as is the case of FirstNet in the US (700 MHz), in the UK (800 MHz), or the UAE (700 MHz) and so forth. In contrast, high-frequency bands that require high-density base station grids are more suitable for high-capacity use cases in cities.

The 410 MHz market

410-430 MHz spectrum use

Current use — The 410-430 MHz frequency range has been used for many years by critical communications organizations that have deployed narrowband technologies like digital mobile radio (DMR) for their voice and messaging requirements or WiMAX for wireless local loop services.

With LTE — The standardization process in 3GPP for the introduction of FDD Bands 87 and 88 (410-430 MHz) was accepted at the 3GPP R16 RAN plenary meeting in June, 2019. Initial LTE 410-430 MHz channel options are 2x1.4 MHz, 2x3 MHz and 2x5 MHz.

The flexible bandwidth capabilities open opportunities for use cases like Industrial Internet of Things (IIoT) or machine-to-machine communications (M2M), such as utility meters, real-time traffic information, security monitoring and reporting, location tracking, medical metering, temperature sensors, etc., as well as traditional wide area group voice and video communications.

Specially designed features such as enhanced Machine Type Communication (MTC), often referred to as LTE-M, and Narrowband Internet of Things (NB-IoT) were added to cellular LTE technology to satisfy the connectivity profiles and requirements of a massive number of connected devices. Those requirements include:

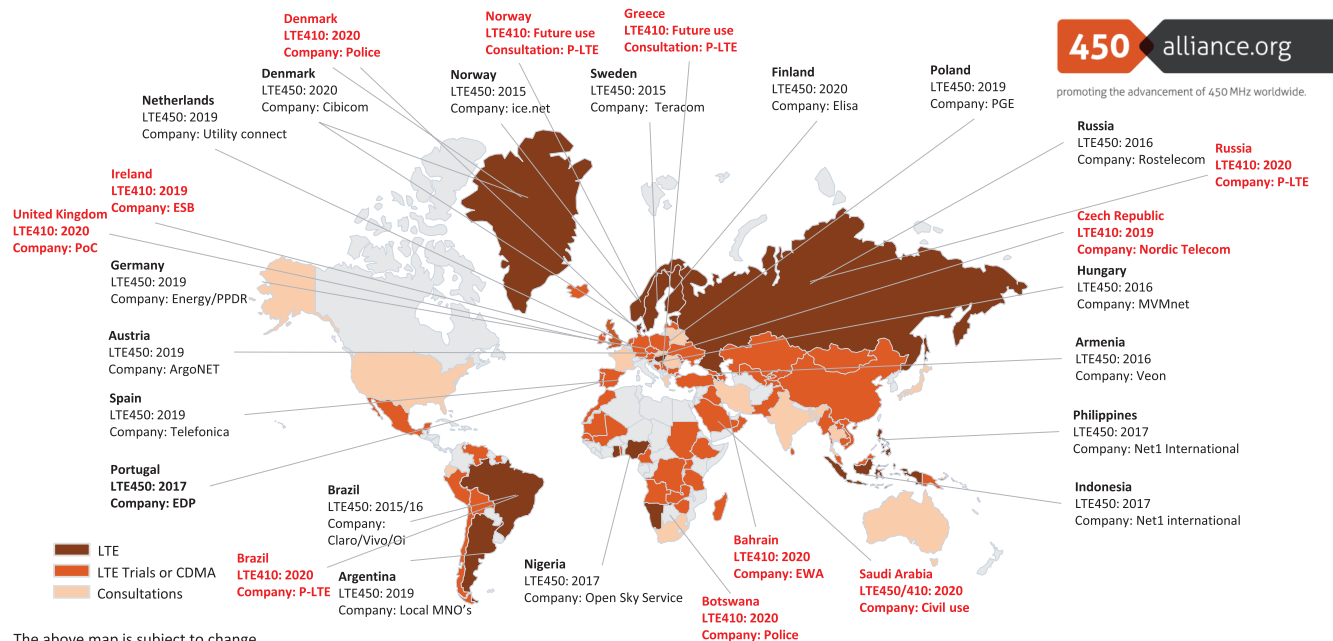
- Long battery life
- Low device cost
- Low deployment cost
- Extended coverage
- Support for a massive number of devices

First movers and the segment addressed

Several countries have expressed interest in the use of 410–430 MHz for Private Wireless deployments, including the Czech Republic, Ireland, Greece, Norway, Denmark and Russia, as well as Bahrain, Botswana and Saudi Arabia in the Middle East and Africa. There has also been interest from Brazil. As illustrated in figure 1, additional countries worldwide have expressed an interest in the introduction of broadband in this frequency range.

LTE 410 MHz is relevant to several wide area mission- and business-critical networks such as energy (utility grids), public safety and transportation.

Figure 1. 450 MHz and 410 MHz markets worldwide, June 2020



Business models

Depending on the country-specific situation, various deployment and business models are being developed.

Original owners changing their business models — Incumbent CSPs and ISPs operating public access mobile radio (PAMR) or wireless local loop (WLL) networks are taking advantage of LTE to change their business models or upgrade networks to provide new services. For example:

- Nordic in the Czech Republic: The company's wireless local loop ISP is now using LTE to offer public safety services to government organizations, along with industrial-grade WAN IoT for enterprises.
- Claro in Brazil: This operator is including LTE in 450 MHz in its PAMR network to expand the use of it and bring new services.

New players acquiring spectrum (assigned/auctioned) — The main examples in this category include new ISPs, CSPs and enterprises that are deploying LTE 410 for wide area network-critical IoT:

- Ireland: The regulator allocated 2x3 MHz for energy and mission-critical uses.
- Greece: Regulators are being consulted on future use of 410-430 MHz.
- Norway: Regulators are being consulted on future use of 410-430 MHz.
- Bahrain: EWA is deploying 410-430 MHz network for use in an energy smart grid.

The ecosystem

Given today's standardized 3GPP mission-critical solution for the 410-430 MHz band, evolving business models, and new opportunities at global scale, there are now excellent reasons for an ecosystem to come together and provide end-to-end solutions that can deliver the services. To date, end-to-end network solutions for bands 87 and 88 are available, and devices are being brought to market. That means the conditions have been met to enable the deployment of mission-critical broadband communications services over band 87 and band 88 networks.

How can Nokia help?

Mission-critical broadband experience

Nokia is a trusted partner that understands mission-critical requirements, actively participating in TCCA, 450 MHz Alliance, EUTC and 3GPP for the standardization of mission-critical features, with a 60-year history of working with government customers, such as security agencies and other governmental departments. More than 120 organizations across the globe have chosen Nokia IP, optical, microwave or 5G-ready 4G LTE technology for their mission-critical public safety networks.

The end-to-end network, including 410 MHz ecosystem partners

4G LTE involves end-to-end technologies — including radio, core, cloud, high-bandwidth and programmable transport, management, automation, BSS, security and more — along with business and people capabilities. As an industry leader, Nokia can help on all these fronts, simplifying deployment.

Our end-to-end portfolio also includes mission- and business-specific applications, such as Nokia Integrated Operation Center, video analytics solutions and Nokia Group Communications, including push-to-video (PTV) capabilities that work with available mission- and business-critical 410 MHz terminals.



Nokia is also positioning a wide range of device form factors to support 3GPP spectrum band 87 requirements for the 410-430 MHz market. Form factors include ruggedized smartphones, tablets, dongles and routers. These devices are targeted to be available commercially in the Q1 2021 timeframe. Specific device form factors are currently being tested (at targeted operators) for band 87 needs.

Conclusion

Global deployments of broadband frequency division duplex LTE (FD-LTE) in 450-470 MHz have been underway over the past several years, and we see a similar market opportunity for deployments of broadband FD-LTE in 410-430 MHz with 3GPP spectrum bands 87 and 88, as the migration from narrowband to broadband continues. We recommend that regulators consider refarming this spectrum to meet multiple market requirements including the WLL, as well as critical communications markets such as public safety, energy and transportation. This will allow specialized operators to embrace this new opportunity to leverage the 3GPP worldwide ecosystem to serve their mission.

About Nokia

We create the technology to connect the world. Only Nokia offers a comprehensive portfolio of network equipment, software, services and licensing opportunities across the globe. With our commitment to innovation, driven by the award-winning Nokia Bell Labs, we are a leader in the development and deployment of 5G networks.

Our communications service provider customers support more than 6.4 billion subscriptions with our radio networks, and our enterprise customers have deployed over 1,300 industrial networks worldwide. Adhering to the highest ethical standards, we transform how people live, work and communicate. For our latest updates, please visit us online www.nokia.com and follow us on Twitter [@nokia](https://twitter.com/nokia).

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