Annual Equipment Report

Public version

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1 Introduction

This report provides the global status of the 410 MHz and 450 MHz ecosystem with focus on the devices and network systems currently available. There are currently twenty-six LTE operations and another fifteen licenses in consultation. CDMA networks are still dominant technology in the 410 MHz and 450 MHz and the regulatory work for converting the licenses is an obstacle in the progress of evolving to 4G. Europe is currently leading the evolution from CDMA to LTE with Asia and South America moving. The aim with this report is to enable operators a simple entry to the 450 MHz ecosystem for their business and enable market opportunities for the supplier to provide equipment to the operators.

2 Market Overview

The major developments in the last twelve months have been the deployment in Germany and procurement in Poland, which are currently two of the main markets driving LTE progress for the lower bands. Countries where license are awarded or open for local permit that are expected to progress this year are Indonesia, Nigeria and Brazil. The license consultations in the Kingdom of Saudi Arabia and South Africa are also a big step in the global trend of private spectrum allocations. Most operators that have the spectrum licenses in the 400 MHz bands are still not technology neutral and require regulatory changes to be able to implement LTE. The trend is that the 400 MHz spectrum band are allocated to private networks typical Utilities, Public Safety and Transport. The advantage is the predictability of the operation, it will be stable and controlled since the network is deployed with a dedicated business as a base. Due to the conversion of the business model the number of operators will decrease temporarily before new allocation have been awarded. There are more than twenty networks actively investing in LTE globally.



Figure 1. The world map of 380MHz, 410 MHz and 450 MHz deployment.



Region	Deployments	LTE	Consultation	Not in use
		Deployments		
Africa	22	5	3	1
Americas	9	3	2	1
Asia and Oceania	18	3	6	4
Europe	26	15	4	9
Total	75	26	15	15

Table 1. Number of countries per region and globally with 380 MHz, 410 MHz and 450 MHz.

3 Spectrum overview

The LTE bands available in the 380 MHz to 512 MHz are currently:

- Band 31 (450 MHz)
- Band 72 (450 MHz)
- Band 73 (450 MHz), not in use.
- Band 87 (410 MHz)
- Band 88 (410 MHz)

All bands are standardized to support LTE, LTE-M and LTE-NB (NB-IoT). Ongoing strategic work with TCCA, EUTC, UTC, UTCAL and other parties in the ecosystem are progressing to identify spectrum allocation in the 380 MHz and 470 MHz bands.

Spectrum bands allocated for private and dedicated networks globally that are considered as complementary band and to be part of the chipset ecosystem to enable business models for the critical and dedicated business segment.

- » Broadband spectrum bands
 - AG bands 3, US8, 25, 26, 31, 38, 40, 42, 43, 48, 50, 68, 72, 87, 88
 - » 5G bands 3, 25, 38, 40, 48, 71, 77, 79, 258
- » IoT spectrum bands
 - » 4G bands 3, US8, 25, 26, 31, 68, 72, 87, 88
 - » 5G bands 3, 25, 38, 40, 48, 71, 77, 79, 258

450 MHz Alliance is continuously monitoring new spectrums allocated for dedicated networks and are updating the requirements for the ecosystem.

4 The 400 MHz Eco System

The range of devices in the 410 MHz and 450 MHz is good in relation to the number of commercial operations and fairly limited in relation to the total global mobile industry with main volumes in different router devices. Other types of devices are meters and handhelds mobiles, these have increased in availability during the last twelve months. The router types available range from simple consumer product to advance specialized industrial routers. The handheld devices are mainly rugged and robust smartphones. Most of devices supports multiple spectrum bands. To give complete view of the ecosystem this report also includes eNB, chipset, modules and antennas for both network and devices. Modules are the enabler of many devices and the devices suppliers are to a high degree sourcing this from third parties. Currently NB-IoT and LTE-M are the dominant technologies for chipsets and modules and therefore narrowband devices, but router and handheld devices are still mainly based on Cat.4 modules.



4.1 Device supplier ecosystem

The range of devices are focus on industrial solutions many with advanced device management platform. The most active suppliers are Advantech, Andra, Baeris, Cyrus, Digi, Digicomm, Garderos, GE, Hitachi Energy, INSYS, Intelliport, Nokia, Notion, RAD, RugGear, Sierra Wireless, Telit, Unitac, Westermo, WMsystems and ZTE. Supported by chipset providers like Qualcomm and GCT semiconductors.

4.2 Network and systems supplier ecosystem

Contributors and supporters to the ecosystem includes the big network vendors and niche suppliers in specific. The macro eNB suppliers Ericsson, Nokia, Airbus, ZTE and Anktion with the complement of small cells from Anktion and Ubiik provides the fundament for the 400 MHz ecosystem. Core network supplier Druidsoftware, Ericsson, Nokia and ZTE supported by software and connectivity from operators and service providers like Elisa and Monogoto or supplier Telit.

4.3 Alignment with GSA on private networks (the Global mobile Suppliers Association)

The GSA provides reports for Sub 1 GHz Spectrum for LTE and 5G and lists the spectrum allocations and the number of devices in each spectrum. For this report 450 MHz Alliance have reviewed the information in the GSA reports and can conclude that data is aligned. 450 MHz Alliance can conclude that the 400 MHz bands are well utilized in the private and dedicated networks around the world and are part of driving the development of this segment.



Figure 2. GSA the world map of private and dedicated network deployments.

4.4 410 MHz and 450 MHz devices listed by 450 MHz Alliance

The annual inventory by 450 MHz Alliance collects information from all operator and supplier which wants to contribute to the organization. This year more than fifty companies have contributed with their input. The categories selected to structure this report are listed below:

- Handheld mobiles
- Routers and MiFi's
- Utility meters (Electricity, gas, water...)
- Modules



- Chipset
- eNB/NR
- eNB antennas
- Device antennas
- Other (including wearables, cameras, dongles etc.)

The products and devices reported to 450 MHz Alliance can be seen in figure 3 and include both the commercially available, engineering sample availability and the devices in road map.



Figure 3. Global 450 MHz device status.

There are more device antenna manufactures that have provided input to this year's report in comparison to earlier reports which have given a big increase that are not related to significant growth rather that the information has previously been missing.

The first generation of LTE450 devices are most replaced with new version or terminated, but the number of devices still increase year over year. The variety of devices are increasing as well as the number of use cases that can be supported by the devices.

5 General outlook

The evolvement toward LTE of the spectrum in 380 MHz to 512 MHz is expected to increase. Bandwidth and coverage requirements for private and dedicated network as well as public network for rural communication are getting more interest and with this also an increased interest for the lower spectrum bands. With only twenty active operations and spectrum allocated in over seventy countries the expansion can be very fast. The ongoing consultations and the interest from government and companies are likely to drive the ecosystem even faster. There is a great interest from Utilities to evolve smart grid, smart meters and smart cities, including charging poles, especially with more and more local production of energy via typical solar power and windmills.



During 2022 about one and half million devices were ordered and delivered globally, the main volume was utility meters. It is expected that the annual volume of connection will grow to about ten million within three years. The number of base stations delivered per year is still unclear due to that the solutions to be deployed with different antennas and areas rollout have not been communicated. It can be assumed to be in the range of thousands base station per years.

Service provided in the networks are focused on LTE-M and Cat-1 in the initial phases. It is likely that the development will follow the evolution of other networks in the world, which would be that additional capacity will be required overtime and the Cat-4 and higher categories in combination with additional spectrum in high-capacity areas. This trend is already reality in the 400 MHz networks that have been in service for more than four to five years. For the long term delivery of broadband services support for RedCap will be important within the 400 MHz bands. The work for 3GPP standardization of 5G bands in the 400 MHz spectrum are progressing.