450 MHz Alliance & 450 MHz Industry Brief

2023



Global update



promoting the advancement of 450 MHz worldwide.

» 450

- » Commercial operational 16
 - » Argentina, Ármenia, Austria, Denmark, Finland, Ghana, Germany, Hungary, Indonesia, Italy, Norway, Rumania, Russia, Singapore, Suriname, Sweden
- » In progress 10
 - » Botswana, Brazil, Latvia, Mexico, Mongolia, Namibia, Nigeria, Philippines, Poland, Spain, Tunisia
- » Waiting auction or allocation 13
 - » China, Colombia, Czech, Iceland, Malaysia, Pakistan, Portugal, Saudi Arabia, Senegal, Slovakia, South Africa, Thailand, Vietnam

» 410

- » Commercial operational 2
 - » Argentina, Bahrain
- » In progress 6
 - » Botswana, Cambodia, Denmark, Greece, Ireland, Poland
- » Waiting auction or allocation 8
 - » Brazil, Czech, Estonia, Norway, Russia, Saudi Arabia, Slovakia, UK

» 380

» Colombia, USA, Uganda, TCCA

General Update Vertical distribution

- » Utility, expanding» Public safety, stabile
- » Rural connectivity including Health care and Schools, stabile
- » Transport, stabile
- » Industrial, expanding
- » Agriculture, expanding
- » Bank and finance, expanding



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Applications 2022

General Update - Utilities evaluating 400MHz Worldwide as of Q2 2022





General update



- » Whitepaper on European harmonisation of the 400 MHz Band
- » 5G bands in progress n31, n72

» Focus on RedCap

» Initiation of 380 MHz 3GPP band waiting TCCA

Private Spectrum bands



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» Complementary band for private and dedicated networks
 » Complement to the commercial bands

» Broadband spectrum bands
» 4G 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

Deployment requirement

- » Keep it simple
- » Identified users
- » Clear use cases
- » Clear business model
- » Defined operational areas
- » Good technical knowledge
- » Execution in a mobile operator structure
- » Good partners



» Commercial networks, base coverage, multiband priority user





- » Commercial networks, base coverage, multiband priority user
- » Dedicated network and spectrum, base coverage, 5+5MHz-10+10MHz in Sub 1GHz bands





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- » Tactical networks and primary user of spectrum, 20+20MHz-30+30MHz in 600MHz to 3,7GHz bands





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- » Dedicated network and spectrum, base coverage, 5+5MHz-10+10MHz in Sub 1GHz bands
- » Tactical networks and primary user of spectrum, 20+20MHz-30+30MHz in 600MHz to 3,7GHz bands
- » Efficient use of spectrum and low carbon footprint





» Cloud core with eNB

» Tactical network, standalone and backhaul

» Local core breakout connect to cloud

» Standalone private network

Solution



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monogoto





ZTE

Druid





Members position in the ecosystem



450

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Partnerships





Ecosystem Update

Spectrum update

Equipment update

Spectrum update - 3GPP Band plan



410	412.5	415	417.5	420	422.5	425	427.5	<	450	452.5	455	457.5	460	462.5	465	467.5
В	and 88	1		B	and 88	ļ		$\langle -$		Band 31	1			Band 31	↓ ↓	r
Band 87	87 1		Band 87	↓ ↓			X	Band	72 1			Band 72		Ţ		
								X	Band 73	1			Band 73	↓ ↓		

- » Two bands in 410 MHz, one high and one low
- » Two bands in 450 MHz, one high and one low
- » Band 73 not in use
- » 380 MHz work in progress
- » Work item for n31, n72 in progress
- » WRC-23 monitoring for 470 MHz and above

450 Markets Worldwide as of Q4 2022





410 Markets Worldwide as of Q4 2022





380 Markets Worldwide as of Q4 2022





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» IoT spectrum bands

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Device update 2023



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» Device total 230 where of 180 commercially available



- » The listed devices are verified with the suppliers
- » Most devices multiband and multi technology

Device update 2023

» Chipset and Module per category

- » 50 percent of chipset support LTE-M and NB-IoT and 50 percent CAT1 or higher
- » 33 percent of modules support LTE-M and NB-IoT and 67 percent CAT1 or higher
- » 25 percent of modules supports 410 and 450 MHz and 100 percent supports 450 MHz

- » The listed devices are verified with the suppliers
- » Most devices multiband and multi technology







Growing LTE450 Ecosystem





- LTE450 ecosystem is maturing & further growing taking advantage of global LTE developments (e.g. LTE-M, NB-IoT, MC-PTT)
- Market is further growing due to spectrum refarming activities
- 450MHz ideally suited for M2M / IoT and critical voice applications
- There are a mature range of equipment for the networks
- Chipsets and Modules support for eMTC & NB-IoT with multiband capabilities from 410-2600MHz are commercially available

Growing LTE450 Ecosystem



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welorec

a hyte smarter

SYSTEM

- The device range is growing in line with global operations
- Handhelds are mainly supporting an industrial and rugged design
- Availability of routers are good and are growing with the implementation of modules within new router and gateway families
- eMTC and NB-IoT have extended the range of products to include meters for electricity, gas and water and other sensor and gateways with requirements for low power consumption

Growing LTE450 Ecosystem





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Equipment members position in the ecosystem

Core

NOKIA

3

ERICSSON

ZTE

ANKTION TECH

Druid



Telit

450

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SIM platform

Thank you!

Join the Alliance! info@450alliance.org



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