### **BECOMING 5G-ADVANCED:** the 3GPP 2025 Roadmap





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The work done by 3GPP in Release 17 improved 5G New Radio (NR) by adding support for new services, reduced-capability user equipment, non-terrestrial networks, frequency bands beyond 52GHz, and the multicast and broadcast service (MBS).

He further added, "The next few years will see initial work on Release18, the 5G-Advanced standard, which will offer a boost to network performance and create even more opportunities."

#### **Chris Pearson, President, 5G Americas**



#### 3GPP Rel-18 sets off the 5G Advanced **Evolution**.



3GPP Release 18 sets off the 5G Advanced Evolution

Approved package has a wide range of projects – nominal work to start in Q2 2022

#### Strengthen the end-to-end 5G system foundation



Advanced

Mobile IAB,

smart repeater

AI/ML data-driven

designs

**DL/UL MIMO** 



Evolved duplexing

RG)

Green

networks

MH

æ

Enhanced

mobility



Boundless

4

extended reality



Drones & expanded satellites comm.

X

Proliferate 5G to virtually all devices and use cases



10 NR-Light (RedCap)

evolution

0

Expanded

positioning

*Source:* Qualcomm, Jan 2022.

#### Ongoing Release timelines (March 2022)







#### Illustration of the concept of SBFD comparing with FDD/TDD



#### Road map to evolution of full duplex technologies





#### Scenarios for UE-to-Network Relay



# Release 17 RedCap targets the requirement space between eMBB, URLLC and mMTC





# Requirements of wearables, industrial wireless sensors, and video surveillance use cases

	Data rate	Latency	Availability/ reliability	Battery lifetime	Device size
Wearables	5-50Mbps DL, 2-5 Mbps UL	Relaxed	N/A	up to 1-2 weeks	Compact form factor
Industrial wireless sensors	< 2Mbps	<100ms	99.99%	At least a few years	N/A
Video surveillance	2-4 Mbps for economic video, 7.5-25 Mbps for high- end video	<500ms	99% - 99.9%	N/A	N/A



### Comparison of device capabilities

	R15/16 NR EMBB	R17 NR REDCAP	R18 NR REDCAP (EXPECTED)	LTE-M (CAT M1)	NB-IOT (CAT NB1)
UE BW	100MHz (FR1) <i>,</i> 200MHz (FR2)	20MHz (FR1), 100MHz (FR2)	20MHz or 5MHz (FR1 only)	1.4 MHz	180 KHz
Duplex	FD-FDD, TDD	FD/HD- FDD, TDD	FD/HD- FDD, TDD	FD/HD- FDD, TDD	HD-FDD, TDD
UE Antenna	1T2R(FDD)/1T4R(TDD )	1T1R/1T2R	1T1R/1T2R	1T1R	1T1R
Max Modulation Order	256QAM for DL, 64QAM for UL	64QAM (256QAM optional)	64QAM (256QAM optional)	16QAM	QPSK
Peak Data Rate – DL	2.3 Gbps	220Mbps	10 Mbps	588 kbps	26 Kbps
Peak Data Rate – UL	468 Mbps	120Mbps	10 Mbps	1119 kbps	66 Kbps



Self-scheduling, cross-carrier scheduling, and multi-cell scheduling





	<1GHz 30	iHz 4G	Hz 5GHz 60	GHz	24-30GHz	37-50GHz 64	4-71GHz	>95GHz
•	900MHz 2.5/2.6(3Hz 600MHz (2x35MHz) (2x3MHz) (841/n41)	3.1-3.453Hz 3.45-3.55GHz 3.7. 3.55-3.7GHz 3.98GHz	4.94- 4.99GHz <u>5.9-71GHz</u>	Po	24.25-24.45(3Hz 24.75-25.25(3Hz 27.5-28.35(3Hz	37-37.609Hz 37.64009Hz 47.248.209Hz 57-6409Hz	64-71(3Hz	якана 🚭
٠	600 <u>MHz (2x3</u> 5MHz)	3.475-3.65 (3+2 3.65-4.03+	tz <u>5.9-7.10Hz</u>	tent	26.5-27.50Hz 27.5-28.350Hz	37-37.6GHz 37.6-40GHz 57-64GHz	64-71GHz	•
	700MHz (2x30 MHz)	3.4-3.89Hz	5.96.4042	a n	24 <u>.5-27.59</u> Hz	57-69	artz.	
#	700MHz (2x30 MHz)	3.4-3.80Hz	5.96.4042	ews	<u>263Hz</u>	57-69	3H2	4
-	700MHz (2x30 MHz)	3.4-3.8GHz	5.9 6.4 GHz	spec	263Hz	57-66	<u>9+2</u>	
	700MHz (2x30 MHz)	3_46-3.8/3Hz	5.96.4GHz	strun	26GHz	57-66	GH2	
	700MHz (2x30 MHz)	3. <u>6-3.80</u> 44	5. <u>9-6.4GH</u> 2	n fo	26 <u>.5-27.50</u> Hz	57-69	GH2)	
۲	2.5/2.6GHz 700MHz 2GHz (n1) (841/n41)	3 <u>3369</u> 4	4.8-50942	- 5G	24.7 <u>5-27.5</u> 3Hz	40.5-43.5GHz		<u> </u>
۲	7 <u>00/800MHz</u> 2.3-2_393Hz	3.4- 3.42 3.7- 3.42GHz 3.7GHz 4.0GHz 4	4.72- 82GHz 5.9-7.1GHz	ad	25.7- 26.5- 28.9- 26.53+2 28.93+2 29.53+2	37GHz 57-64	3-12	۲
•	7 <u>00/800MHz</u> 2.3 GHz	<u>3.64.10Hz</u> 4	54.90Hz 596.40Hz	/anc	2 <u>7-29.5</u> GHz	57-6	sara	
	600MHz (2x40 MHz) 700MHz (2x30 MHz)	3. <u>3.3.670</u> Hz		ced	24.25-27.5342			
*		3.4 <u>-3.70H</u> z	5. <u>9.6.4GH</u> z		2 <u>4.25-29.53Hz</u>	<u>39GHz</u> 57-66	artz:	*

#### Global snapshot of allocated/targeted 5G spectrum

5G is being designed for diverse spectrum types/bands

Note for JapanAll cellular bands are available for 5G; 5.9-6.4 GHz is in the final stage of regulatory process for the update expected in August 2022

5G band Licensed Unlicensed/shared Existing band

