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**IMT cellular networks;
Harmonised Standard for access to radio spectrum;
Part 25: New Radio (NR) User Equipment (UE) Release 15**

Document Preview

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This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Mobile Standards Group (MSG), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI Standardisation Request deliverable Approval Procedure.

For non-EU countries, the present document may be used for regulatory (Type Approval) purposes.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.9] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU [i.2] on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in Tables A-1 to A-3 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

The present document is part 25 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.12].

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Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the Radio Equipment Directive [i.2]. The present document is produced following the guidance in ETSI EG 203 336 [i.3] as applicable.

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1 Scope

1.0 General

The present document applies to the following radio equipment type:

- User Equipment for New Radio (NR).

Requirements throughout the present document are in many cases defined separately for different Frequency Ranges (FR). The frequency ranges in which NR can operate according to this version of the present document are identified as described in Table 1-1.

Table 1-1: Definition of frequency ranges

Frequency range designation	Corresponding frequency range
FR1	450 MHz - 7 125 MHz
FR2	24 250 MHz - 52 600 MHz

1.1 Operating bands in FR1

This radio equipment type is capable of operating in all or any part of the frequency bands of FR1 given in tables from 1.1-1 through 1.1-5.

Table 1.1-1: NR operating bands in FR1

NR operating band	Uplink (UL) operating band UE transmit $F_{UL_low} - F_{UL_high}$	Downlink (DL) operating band UE receive $F_{DL_low} - F_{DL_high}$	Duplex Mode	Related EC/ECC Decision
n1	1 920 MHz - 1 980 MHz	2 110 MHz - 2 170 MHz	FDD	[i.19] and [i.20]
n3	1 710 MHz - 1 785 MHz	1 805 MHz - 1 880 MHz	FDD	[i.17] and [i.18]
n7	2 500 MHz - 2 570 MHz	2 620 MHz - 2 690 MHz	FDD	[i.23]
n8	880 MHz - 915 MHz	925 MHz - 960 MHz	FDD	[i.17] and [i.18]
n20	832 MHz - 862 MHz	791 MHz - 821 MHz	FDD	[i.6] and [i.7]
n28 (note 1)	703 MHz - 748 MHz	758 MHz - 803 MHz	FDD	[i.8] and [i.11]
n38	2 570 MHz - 2 620 MHz	2 570 MHz - 2 620 MHz	TDD	[i.22] and [i.23]
n40	2 300 MHz - 2 400 MHz	2 300 MHz - 2 400 MHz	TDD	[i.21]
n41 (note 2)	2 496 MHz - 2 690 MHz	2 496 MHz - 2 690 MHz	TDD	[i.22] and [i.23]
n50 (note 3)	1 432 MHz - 1 517 MHz	1 432 MHz - 1 517 MHz	TDD	[i.14], [i.15] and [i.16]
n51 (note 3)	1 427 MHz - 1 432 MHz	1 427 MHz - 1 432 MHz	TDD	[i.14] and [i.15]
n65 (note 6)	1 920 MHz - 2 010 MHz	2 110 MHz - 2 200 MHz	FDD	[i.19], [i.20] and [i.27]
n75	N/A	1 432 MHz - 1 517 MHz	SDL	[i.14], [i.15] and [i.16]
n76	N/A	1 427 MHz - 1 432 MHz	SDL	[i.14] and [i.15]
n77 (note 4)	3 300 MHz - 4 200 MHz	3 300 MHz - 4 200 MHz	TDD	[i.29] and [i.24]
n78 (note 5)	3 300 MHz - 3 800 MHz	3 300 MHz - 3 800 MHz	TDD	[i.29] and [i.24]
n80	1 710 MHz - 1 785 MHz	N/A	SUL	[i.17] and [i.18]
n81	880 MHz - 915 MHz	N/A	SUL	[i.17] and [i.18]
n82	832 MHz - 862 MHz	N/A	SUL	[i.6] and [i.7]
n83	703 MHz - 748 MHz	N/A	SUL	
n84	1 920 MHz - 1 980 MHz	N/A	SUL	[i.19] and [i.20]

NR operating band	Uplink (UL) operating band UE transmit $F_{UL_low} - F_{UL_high}$	Downlink (DL) operating band UE receive $F_{DL_low} - F_{DL_high}$	Duplex Mode	Related EC/ECC Decision
NOTE 1:	In Europe, according to [i.8] and [i.11], NR UE in Band n28 operates between 703 MHz and 736 MHz ($F_{UL_low} = 703$ MHz and $F_{UL_high} = 736$ MHz) for the transmitter and between 758 MHz and 791 MHz ($F_{DL_low} = 758$ MHz and $F_{DL_high} = 791$ MHz) for the receiver.			
NOTE 2:	In Europe, according to [i.22] and [i.23], NR UE in Band n41 operates between 2 500 MHz and 2 690 MHz ($F_{UL_low} = 2 500$ MHz and $F_{UL_high} = 2 690$ MHz).			
NOTE 3:	NR UE operation in Band 50 and Band n51 is restricted to downlink only.			
NOTE 4:	In Europe, according to [i.29] and [i.24], NR UE in Band 77 operates between 3 400 MHz and 4 200 MHz ($F_{UL_low} = 3 400$ MHz and $F_{UL_high} = 3 800$ MHz).			
NOTE 5:	In Europe, according to [i.29] and [i.24], NR UE in Band 78 operates between 3 400 MHz and 3 800 MHz ($F_{UL_low} = 3 400$ MHz and $F_{UL_high} = 3 800$ MHz).			
NOTE 6:	This band includes two frequency ranges that are harmonised in Europe:			
(a)	According to [i.19] and [i.20], radio equipment in band n65 operates between 2 110 MHz and 2 170 MHz for the transmitter ($F_{DL_low} = 2 110$ MHz and $F_{DL_high} = 2 170$ MHz), and between 1 920 MHz and 1 980 MHz for the receiver ($F_{UL_low} = 1 920$ MHz and $F_{UL_high} = 1 980$ MHz).			
(b)	Based on [i.27], radio equipment in band n65 operates between 2 170 MHz and 2 200 MHz for the transmitter ($F_{DL_low} = 2 170$ MHz and $F_{DL_high} = 2 200$ MHz) and between 1 980 MHz and 2 010 MHz for the receiver ($F_{UL_low} = 1 980$ MHz and $F_{UL_high} = 2 010$ MHz) as the Complementary Ground Component (CGC) of a Mobile-satellite service by reference to the present document.			

Table 1.1-2: Void

Table 1.1-3: Void

Table 1.1-4: Void

NR supplementary uplink is designed to operate in the operating band combination defined in Table 1.1-5, where all operating bands are within FR1.

Table 1.1-5: Operating band combination for SUL in FR1

NR Band combination for SUL	NR Band (Table 1.1-1)
SUL_n78-n80 (note 2)	n78, n80
SUL_n78-n81 (note 2)	n78, n81
SUL_n78-n82 (note 2)	n78, n82
SUL_n78-n83 (note 2)	n78, n83
SUL_n78-n84 (note 2)	n78, n84
NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0us.	
NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory.	

The requirements for FR1 in the present document apply to the combination of channel bandwidths, SCS and operating bands shown in Table 1.1-6. The channel bandwidths are specified for both the TX and RX paths.

Table 1.1-6: Channel Bandwidths for Each NR band in FR1

NR Band	NR band / SCS / UE Channel bandwidth												
	SCS kHz	5 MHz	10 ^{1,2} MHz	15 ² MHz	20 ² MHz	25 ² MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 ⁴ MHz	100 MHz
n1	15	Yes	Yes	Yes	Yes	Yes ⁴	Yes ⁴	Yes ⁴	Yes ⁴				
	30		Yes	Yes	Yes	Yes ⁴	Yes ⁴	Yes ⁴	Yes ⁴				
	60		Yes	Yes	Yes	Yes ⁴	Yes ⁴	Yes ⁴	Yes ⁴				
n3	15	Yes	Yes	Yes	Yes	Yes	Yes						
	30		Yes	Yes	Yes	Yes	Yes						
	60		Yes	Yes	Yes	Yes	Yes						

NR Band	NR band / SCS / UE Channel bandwidth												
	SCS kHz	5 MHz	10 ^{1,2} MHz	15 ² MHz	20 ² MHz	25 ² MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 ⁴ MHz	100 MHz
n7	15	Yes	Yes	Yes	Yes								
	30		Yes	Yes	Yes								
	60		Yes	Yes	Yes								
n8	15	Yes	Yes	Yes	Yes								
	30		Yes	Yes	Yes								
	60												
n20	15	Yes	Yes	Yes	Yes								
	30		Yes	Yes	Yes								
	60												
n28	15	Yes	Yes	Yes	Yes ⁵								
	30		Yes	Yes	Yes ⁵								
	60												
n38	15	Yes	Yes	Yes	Yes	Yes ⁴	Yes ⁴	Yes ⁴					
	30		Yes	Yes	Yes	Yes ⁴	Yes ⁴	Yes ⁴					
	60		Yes	Yes	Yes	Yes ⁴	Yes ⁴	Yes ⁴					
n40	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
	30		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
	60		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
n41	15		Yes	Yes	Yes		Yes ⁴	Yes	Yes				
	30		Yes	Yes	Yes		Yes ⁴	Yes	Yes	Yes	Yes	Yes	Yes
	60		Yes	Yes	Yes		Yes ⁴	Yes	Yes	Yes	Yes	Yes	Yes
n50	15	Yes	Yes	Yes	Yes			Yes	Yes				
	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes ³		
	60		Yes	Yes	Yes			Yes	Yes	Yes	Yes ³		
n51	15	Yes											
	30												
	60												
n65	15	Yes	Yes	Yes	Yes								
	30		Yes	Yes	Yes								
	60		Yes	Yes	Yes								
n75	15	Yes	Yes	Yes	Yes								
	30		Yes	Yes	Yes								
	60		Yes	Yes	Yes								
n76	15	Yes											
	30												
	60												
n77	15		Yes	Yes	Yes			Yes	Yes				
	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
	60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
n78	15		Yes	Yes	Yes			Yes	Yes				
	30		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
	60		Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
n80	15	Yes	Yes	Yes	Yes	Yes	Yes						
	30		Yes	Yes	Yes	Yes	Yes						
	60		Yes	Yes	Yes	Yes	Yes						
n81	15	Yes	Yes	Yes	Yes								
	30		Yes	Yes	Yes								
	60												
n82	15	Yes	Yes	Yes	Yes								
	30		Yes	Yes	Yes								
	60												
n83	15	Yes	Yes	Yes	Yes								
	30		Yes	Yes	Yes								
	60												
n84	15	Yes	Yes	Yes	Yes								
	30		Yes	Yes	Yes								
	60		Yes	Yes	Yes								

NOTE 1: 90 % spectrum utilization may not be achieved for 30 kHz SCS.

NOTE 2: 90 % spectrum utilization may not be achieved for 60 kHz SCS.

NOTE 3: This UE channel bandwidth applies only to downlink.

NOTE 4: This UE channel bandwidth is optional in this version of the present document.

NOTE 5: For the 20 MHz bandwidth, the minimum requirements are specified for NR UL carrier frequencies confined to either 713 MHz - 723 MHz or 728 MHz - 738 MHz.

1.2 Operating bands in FR2

This radio equipment type is capable of operating in all or any part of the frequency bands of FR2 given in tables from 1.2-1 through 1.2-4.

NR is designed to operate in the FR2 operating bands defined in Table 1.2-1.

Table 1.2-1: NR operating bands in FR2

Operating Band	Uplink (UL) operating band UE transmit	Downlink (DL) operating band UE receive	Duplex Mode	Relevant EC/ECC Decision
	$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$		
n257 (note)	26 500 MHz - 29 500 MHz	26 500 MHz - 29 500 MHz	TDD	[i.25] and [i.26]
n258	24 250 MHz - 27 500 MHz	24 250 MHz - 27 500 MHz	TDD	[i.25] and [i.26]

NOTE: In Europe, according to [i.25] and [i.26], NR UE radio equipment in band n257 operates between 26 500 MHz and 27 500 MHz ($F_{UL_low} = 26\ 500\ \text{MHz}$ and $F_{UL_high} = 27\ 500\ \text{MHz}$).

Table 1.2-2: Void

Table 1.2-3: Void

NR UL-MIMO is designed to operate in the operating bands defined in Table 1.2-4.

Table 1.2-4: NR UL-MIMO operating bands in FR2

UL-MIMO operating band (Table 1.2-1)
n257
n258

The present document covers requirements for 5G NR User Equipment from 3GPP™ Release 15 defined in ETSI TS 138 101-1 [6], ETSI TS 138 101-2 [7], ETSI TS 138 101-3 [8]. This includes the requirements for 5G NR UE operating bands and 5G NR UE CA operating bands from 3GPP™ Release 15 defined in ETSI TS 138 101-1 [6], ETSI TS 138 101-2 [7], ETSI TS 138 101-3 [8]. Additionally, it includes requirements for selected NR operating bands from 3GPP Release 16.

Table 1.2-5: Void

The FR2 requirements in the present document apply to the combination of channel bandwidths, SCS and operating bands shown in Table 1.2-6. The channel bandwidths are specified for both the Tx and Rx paths.

Table 1.2-6: Channel bandwidths for each NR band

Operating band / SCS / UE channel bandwidth					
Operating band	SCS kHz	50 MHz	100 MHz	200 MHz	400 ² MHz
n257	60	Yes	Yes	Yes	N/A
	120	Yes	Yes	Yes	Yes
n258	60	Yes	Yes	Yes	N/A
	120	Yes	Yes	Yes	Yes

NOTE 1: For test configuration tables from the transmitter and receiver tests in clause 5.2 and clause 5.3 that refer to this table and indicate test SCS to use, if referenced SCS value is not supported by the UE in UL and/or DL, select the closest SCS supported by the UE in both UL and DL.

NOTE 2: This UE channel bandwidth is optional in this version of the present document.

NOTE: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.2] is given in annex A.