

FDD Bands

LTE BAND NUMBER	UPLINK (MHz)	DOWNLINK (MHz)	BW (MHz)	MAIN REGIONS OF USE
1	1920-1980	2110-2170	60	Asia, Europe
2	1850-1910	1930-1990	60	Americas, Asia
3	1710-1785	1805-1880	75	Americas, Asia, Europe
4	1710-1755	2110-2155	45	Americas
5	824-849	869-894	25	Americas
6	830-840	875-885	10	Japan
7	2500-2570	2620-2690	70	Asia, Europe
8	880-915	925-960	35	Asia, Europe
9	1749.9-1784.9	1844.9-1879.9	35	Japan
10	1710-1770	2110-2170	60	Americas
11	1472.9-1474.9	1475.9-1485.9	20	Japan
12	699-716	729-746	17	USA
13	777-787	746-756	10	USA
14	788-798	758-768	10	USA
17	704-716	734-746	12	USA
18	815-830	860-875	15	Japan
19	830-845	875-890	15	Japan
20	832-862	791-821	30	Europe
21	1447.9-1462.9	1495.9-1510.9	15	Japan
22	3410-3490	3510-3590	80	USA
23	2000-2020	2180-2200	20	USA
24	1626.5-1660.5	1525-1559	34	USA
25	1850-1915	1930-1995	65	USA
26	814-849	859-894	35	USA
27	802-824	852-869	17	USA
28	703-748	759-803	45	Japan, Americas

TDD Bands

LTE BAND NUMBER	UPLINK (MHz)	DOWNLINK (MHz)	BW (MHz)	MAIN REGIONS OF USE
33	1900-1920	1900-1920	20	Asia (incl. Japan), Europe
34	2010-2025	2010-2025	15	Asia, Europe
35	1850-1910	1850-1910	60	Americas
36	1930-1990	1930-1990	60	Americas
37	1910-1930	1910-1930	20	Europe
38	2570-2620	2570-2620	50	Europe
39	1880-1920	1880-1920	40	China
40	2300-2400	2300-2400	100	Asia, Europe
41	2485-2690	2485-2690	194	USA
42	3600-3600	3600-3600	200	USA
43	3600-3800	3600-3800	200	USA
44	703-803	703-803	100	USA

Release 10 Enhancements

3GPP LTE RELEASE 10	Feature
Carrier Aggregation for LTE	
Enhanced Downlink Multiple Antenna Transmission for LTE	
Uplink Multiple Antenna Transmission for LTE	
Relays for LTE (LTE Relay)	
Security for LTE (Relay Nodes (Stage 2))	
Enhanced ICG for non-CM based deployments of heterogeneous networks for LTE	
LTE TDD in 2600 MHz for US	
Adding 2 GHz band LTE for ATC of MSS in North America	
Adding 1.8 GHz band LTE for ATC of MSS in North America	
LTE Self-Optimizing Networks (SON) enhancements	
Further enhancements to MBMS for LTE	

Release 11 SA1 Features

3GPP LTE RELEASE 11	Name	Acronym	Resource
Advanced IP Interconnection of Services	IPXS	S1, S2, C1, C3	
System Improvements to Machine-Type Communications	SMTC	S1, S2, S3, S5, C1, C3, C4, C6, R2, R3	
Unstructured Supplementary Service Data (USSD) simulation service in IMS	USSS	S1, C1, C3	
QoS Control Based on Subscriber Spending Limits	QoS SSL	S1, S2, S5, C3	
Optimized Service Charging and Allocation of Resources in IMS whilst Roaming	OSCAR	S1, S2	
Inclusion of Media Resource Broker (Stage 2/3)	MRB	C1, C3, IETF	
Non-Voice Emergency Services	NOVES	S1, S2	
Support for 3GPP Voice Interworking with Enterprise IP-PBX	VINE	S1, C1	
Anonymous Call Rejection in the CS domain	ACR, CS	S1, C4, C3	

LTE User Equipment Categories

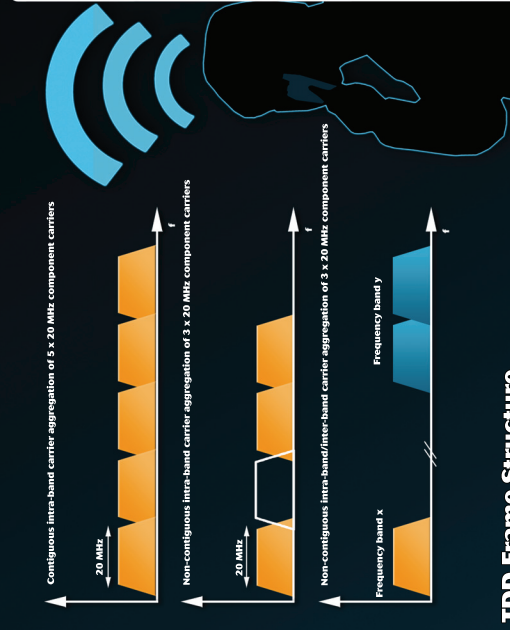
3GPP Release	UE Category	Max L1 DL data rate (Mbps)	Max L1 UL data rate (Mbps)	Channel Features (20 MHz bandwidth max)	Max DL MIMO layers	Max DL Transport Block size (bits/TTI)	Max UL Transport Block size (bits/TTI)
Rel-8	Category 1	10.3	5.2	56Q	1	10296	5100
Rel-8	Category 2	51.0	25.5	2x2 MIMO DL	2	10296	25456
Rel-8	Category 3	102.0	51.0	2x2 MIMO DL	2	10296	51024
Rel-8	Category 4	153.6	76.8	2x2 MIMO DL	2	15392	51024
Rel-8	Category 5	299.6	149.8	4x4 MIMO DL, 4QAM UL	4	29952	7536
Rel-10	Category 6	301.5	150.7	CA, 12 carriers DL, 16QAM UL	2 or 4	30164	10296
Rel-10	Category 7	301.5	150.7	CA, 12 carriers, 16QAM UL	2 or 4	30164	10296
Rel-10	Category 8	299.6	149.8	8x8 MIMO DL, CA 5 carriers, 16QAM UL	8	299560	1897960

LTE-A and IMT Advanced Comparison

Peak Data Rate	Downlink	Uplink	Release 8 LTE	LTE-Advanced	IMT Advanced Target
300 Mbps	300 Mbps	1 Gbps	300 Mbps	1 Gbps	1 Gbps*
75 Mbps	75 Mbps	500 Gbps	75 Mbps	500 Gbps	1 Gbps*
15 (6x4 MIMO)	15 (6x4 MIMO)	30 (8x8 MIMO)	15 (6x4 MIMO)	30 (8x8 MIMO)	15 (6x4 MIMO)
3.75 (6x4QAM SISO)	3.75 (6x4QAM SISO)	15 (up to 4x4 MIMO)	3.75 (6x4QAM SISO)	15 (up to 4x4 MIMO)	6.75 (2x4 MIMO)

*100 Mbps for high mobility and 1 Gbps for low mobility

Carrier Aggregation in LTE Advanced



TDD Frame Structure

UPLINK/DOWNLINK CONFIGURATION	DOWNLINK TO UPLINK SWITCH PERIODICITY	Subframe Number	0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	D	S	U	D	S	U	D	S
1	5 ms	D	S	U	D	S	U	D	S	U	D	S
2	5 ms	D	S	U	D	S	U	D	S	U	D	S
3	10 ms	D	S	U	D	S	U	D	S	U	D	S
4	10 ms	D	S	U	D	S	U	D	S	U	D	S
5	10 ms	D	S	U	D	S	U	D	S	U	D	S
6	5 ms	D	S	U	D	S	U	D	S	U	D	S

3GPP Specifications

3GPP SPECIFICATIONS	Feature
TS 36.101	E-UTRA, UE radio transmission and reception
TS 36.104	E-UTRA, BS radio transmission and reception
TS 36.133	E-UTRA, Requirements for support of radio resource management
TS 36.141	E-UTRA, BS conformance testing
TS 36.201	E-UTRA, UE physical layer, General description
TS 36.211	E-UTRA, Physical channels and modulation
TS 36.212	E-UTRA, Multiplexing and channel coding
TS 36.213	E-UTRA, Physical layer procedures
TS 36.214	E-UTRA, Physical layer, Measurements
TS 36.216	E-UTRA, Physical layer for relaying operation
TS 36.300	E-UTRA and E-UTRAN, Overall description, Stage 2
TS 36.302	E-UTRA, Services provided by the physical layer
TS 36.304	E-UTRA, UE procedures in idle mode
TS 36.307	E-UTRA, Requirements on UEs supporting a release-independent frequency band
TS 36.314	E-UTRA, Layer 2 - Measurements
TS 36.321	E-UTRA, Medium Access Control (MAC) protocol specification
TS 36.322	E-UTRA, Radio Link Control (RLC) protocol specification
TS 36.323	E-UTRA, Packet Data Convergence Protocol (PDCP) specification
TS 36.331	E-UTRA, Radio Resource Control (RRC) protocol specification
TS 36.401	E-UTRAN, Architecture description
TS 36.440	E-UTRAN, General aspects and principles for interfaces supporting Multimedia Broadcast Multicast Service (MBMS) within E-UTRAN
TS 36.441	E-UTRAN, Layer 1 for interfaces supporting Multimedia Broadcast Multicast Service (MBMS) within E-UTRAN
TS 36.442	E-UTRAN, Signaling Transport for interfaces supporting Multimedia Broadcast Multicast Service (MBMS) within E-UTRAN
TS 36.508	E-UTRA and EPC, Common test environments for UE conformance testing
TS 36.521	E-UTRA, UE conformance specification, Radio transmission and reception, Part 1 - Conformance testing
TS 36.521-2	E-UTRA, UE conformance specification, Radio transmission and reception, Part 2 - Implementation Conformance Statement (ICS)
TS 36.521-3	E-UTRA, UE conformance specification, Radio transmission and reception, Part 3 - Radio Resource Management (RRM) conformance testing
TS 36.523-1	E-UTRA and EPC, UE conformance specification, Part 1: Protocol conformance specification
TS 36.523-2	E-UTRA and EPC, UE conformance specification, Part 2: Implementation Conformance Statement (ICS) conforma specification
TS 36.523-3	E-UTRA and EPC, UE conformance specification, Part 3: Test suites
TS 24.301	Non-Access Stratum (NAS) protocol for Evolved Packet System (EPS)

