



# **Selected Licensed Bands Review and Approval Items**

Office of Engineering and Technology  
Laboratory Division



# Scope

- Frequency listings on Form-731 applications and FCC-731A grants (aka “grant frequencies”)
  - Following up from the other frequency, power, and emissions listings basic topics covered in the Apr. 2016 FCC-TCB meeting
  - Review which LTE bands overlap and how with FCC spectrum allocations and service rules
- Recent updates of 700 MHz and 800 MHz PS Radio Pool Part 90 rules



# Grant Frequencies (1)

- FCC has regulatory jurisdiction only for U.S. non-Federal spectrum
  - Therefore grants are not routinely available for device operations in numerous frequency bands that are used only outside of the U.S. and/or do not fit within the FCC allocations and the FCC radio service rules
  - For example, for most FDD modes and devices, both the transmit band and the paired receive band must fit within the same radio service and the same rule sections or subparts
    - Selected examples are reviewed below



## Grant Frequencies (2)

- For devices intended to be marketed and / OR operated in the U.S., compliance must be addressed for transmit modes in operating bands that overlap with and fit within FCC allocations and radio service rules
  - Regardless whether any commercial mobile networks are deployed in U.S.
- Addressing compliance for LTE bands that overlap FCC requirements means filings shall include test data and operational details for such band-specific modes
  - Apply KDB Pub. 634817 for channels tested and grant frequency listings
  - Alternatively, demonstrate how such band-specific operations within a device are blocked in the U.S.
    - For example, provide details about MCC/MNC (country code, network code) blocking, and with addressing KDB Pub. 594280 software configuration control provisions



# LTE in FCC Bands and Services

E-UTRA Operating Band	Uplink (UL) operating band BS receive UE transmit		Downlink (DL) operating band BS transmit UE receive		Duplex Mode	Remarks about FCC rule overlaps, etc. – FOR INFO ONLY  Refer to 47 CFR for specific allowed US operations.
	$F_{UL\_low}$	$F_{UL\_high}$	$F_{DL\_low}$	$F_{DL\_high}$		
2	1850 MHz	– 1910 MHz	1930 MHz	– 1990 MHz	FDD	24.229(a), 24.229(b); blocks A-F; subset of band 25
4	1710 MHz	– 1755 MHz	2110 MHz	– 2155 MHz	FDD	27.5(h); subset of band 66
5	824 MHz	– 849 MHz	869 MHz	– 894 MHz	FDD	22.905(a), 22.905(b); subset of band 26
7	2500 MHz	– 2570 MHz	2620 MHz	– 2690 MHz	FDD	27.5(i)(2)
10	1710 MHz	– 1770 MHz	2110 MHz	– 2170 MHz	FDD	blocks A-I; superset of band 4; subset of band 66 <sup>a</sup>
12	699 MHz	– 716 MHz	729 MHz	– 746 MHz	FDD	27.5(c) Blocks A, B, C (Lower 700 MHz Band); SMH=seven hundred MHz
13	777 MHz	– 787 MHz	746 MHz	– 756 MHz	FDD	27.5(b) Block C (Upper 700 MHz Band)
14	788 MHz	– 798 MHz	758 MHz	– 768 MHz	FDD	90.531(g) PS BB, 90.19
17	704 MHz	– 716 MHz	734 MHz	– 746 MHz	FDD	27.5(c) Blocks B, C (Lower 700 MHz Band); subset of band 12 <sup>a</sup>
18	815 MHz	– 830 MHz	860 MHz	– 875 MHz	FDD	non-US allocation pair; subset of band 26
19	830 MHz	– 845 MHz	875 MHz	– 890 MHz	FDD	non-US allocation pair; superset of band 6; subset of band 26 <sup>a</sup>
23	2000 MHz	– 2020 MHz	2180 MHz	– 2200 MHz	FDD	NOTE 1: Band ... 23 is not applicable (superseded by band 70); 27.5(j)
25	1850 MHz	– 1915 MHz	1930 MHz	– 1995 MHz	FDD	24.229(c), 24.229(a), 24.229(b); blocks A-G; superset of band 2 <sup>a</sup>
26 <sup>b</sup>	814 MHz	– 849 MHz	859 MHz	– 894 MHz	FDD	90.614(c) contiguous 22 H; superset of bands 5, 6, 18 and 19 <sup>a</sup> ; ESMR; 817-824/862-869; 90.614, 90.635, 90.691
29	N/A		717 MHz	– 728 MHz	FDD	27.5(c)(2) Blocks D, E (Lower 700 MHz Band) See also 3GPP TS 36.101 V14.0.0 Table 5.5-1 NOTE 2.
30	2305 MHz	– 2315 MHz	2350 MHz	– 2360 MHz	FDD	27.5(a)(1) Blocks A, B
35	1850 MHz	– 1910 MHz	1850 MHz	– 1910 MHz	TDD	24.229(a), 24.229(b)
36	1930 MHz	– 1990 MHz	1930 MHz	– 1990 MHz	TDD	24.229(a), 24.229(b)
38	2570 MHz	– 2620 MHz	2570 MHz	– 2620 MHz	TDD	(China); 27.5(i)(2); subset of band 41
40	2300 MHz	– 2400 MHz	2300 MHz	– 2400 MHz	TDD	maybe 27.5(a) for 2305-2320 & 2345-2360 (2305-2315/2350-2360 paired; 2315-2320 & 2345-2350 unpaired)
41	2496 MHz	– 2690 MHz	2496 MHz	– 2690 MHz	TDD	27.5(i)(2)
42	3400 MHz	– 3600 MHz	3400 MHz	– 3600 MHz	TDD	maybe 96.11 for 3550-3600 (Part 90 Radiolocation 3300-3550 MHz)
43	3600 MHz	– 3800 MHz	3600 MHz	– 3800 MHz	TDD	maybe 96.11 for 3600-3700 (former 90 subpart Z 3650-3700) [FIXED 101.147(a) 3700-4200; probably not available for MOBILE LTE]
46	5150 MHz	– 5925 MHz	5150 MHz	– 5925 MHz	TDD	15.407; 90 & 95 for 5850-5925 See also 3GPP TS 36.101 V14.0.0 Table 5.5-1 NOTES 8, 9.
66	1710 MHz	– 1780 MHz	2110 MHz	– 2200 MHz	FDD	27.5(h)(1) 1710-1780/2110-2180, 27.5(j) 2180-2200 See also 3GPP TS 36.101 V14.0.0 Table 5.5-1 NOTES 4, 5, 6, 7.
70	1695 MHz	– 1710 MHz	1995 MHz	– 2020 MHz	FDD	27.5(h)(3) 1695-1710, 27.5(k) 1995-2000, 27.5(j) 2000-2020 See also 3GPP TS 36.101 V14.0.0 Table 5.5-1 NOTE 10.

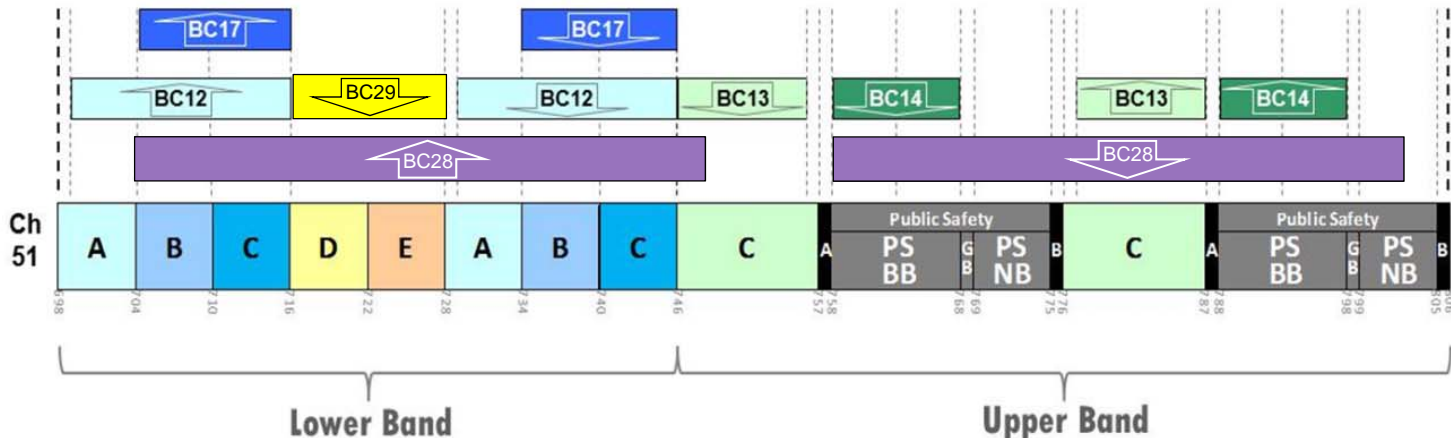


# LTE not in FCC Bands and Services

E-UTRA Operating Band	Uplink (UL) operating band BS receive UE transmit		Downlink (DL) operating band BS transmit UE receive		Duplex Mode	Remarks about FCC rule overlaps, etc. – FOR INFO ONLY  Refer to 47 CFR for specific allowed US operations.
	F <sub>UL low</sub>	F <sub>UL high</sub>	F <sub>DL low</sub>	F <sub>DL high</sub>		
1	1920 MHz	1980 MHz	2110 MHz	2170 MHz	FDD	non-US allocation pair (Europe/Asia); subset of band 65
3	1710 MHz	1785 MHz	1805 MHz	1880 MHz	FDD	non-US allocation pair
6	830 MHz	840 MHz	875 MHz	885 MHz	FDD	NOTE 1: Band 6 ... is not applicable; replaced by band 19 <sup>a</sup>
8	880 MHz	915 MHz	925 MHz	960 MHz	FDD	non-US allocation pair
9	1749.9 MHz	1784.9 MHz	1844.9 MHz	1879.9 MHz	FDD	non-US allocation pair; subset of band 3 <sup>a</sup>
11	1427.9 MHz	1447.9 MHz	1475.9 MHz	1495.9 MHz	FDD	non-US allocation pair
15	Reserved		Reserved		FDD	ETSI
16	Reserved		Reserved		FDD	ETSI
20	832 MHz	862 MHz	791 MHz	821 MHz	FDD	non-US allocation pair (Europe); UL & DL reversed compared to 90.613
21	1447.9 MHz	1462.9 MHz	1495.9 MHz	1510.9 MHz	FDD	non-US allocation pair
22	3410 MHz	3490 MHz	3510 MHz	3590 MHz	FDD	non-US allocation pair (Part 90 Radiolocation 3300-3550 MHz)
24	1626.5 MHz	1660.5 MHz	1525 MHz	1559 MHz	FDD	25.202(a)(4)(iii) allocation, only for L-band MSS
27	807 MHz	824 MHz	852 MHz	869 MHz	FDD	non-US; 90.614(a) prohibits cellular systems below 817 MHz / 862 MHz
28	703 MHz	748 MHz	758 MHz	803 MHz	FDD	non-US allocation pair
31	452.5 MHz	457.5 MHz	462.5 MHz	467.5 MHz	FDD	non-US (Europe, Central/South America)
32	N/A		1452 MHz	1496 MHz	FDD	non-US (Europe)
33	1900 MHz	1920 MHz	1900 MHz	1920 MHz	TDD	non-US (Europe); subset of band 39
34	2010 MHz	2025 MHz	2010 MHz	2025 MHz	TDD	non-US (Europe); 2000-2020 is part 25
37	1910 MHz	1930 MHz	1910 MHz	1930 MHz	TDD	mix of part 24, 15 D, AWS-2; probably not available for eqpt. auth.; no deployments <sup>a</sup>
39	1880 MHz	1920 MHz	1880 MHz	1920 MHz	TDD	non-US (mix of several FCC rules) (China)
44	703 MHz	803 MHz	703 MHz	803 MHz	TDD	non-US
45	1447 MHz	1467 MHz	1447 MHz	1467 MHz	TDD	non-US
64	Reserved		Reserved			
65	1920 MHz	2010 MHz	2110 MHz	2200 MHz	FDD	non-US
67	N/A		738 MHz	758 MHz	FDD	non-US
68	698 MHz	728 MHz	753 MHz	783 MHz	FDD	non-US; 700MHz band for Arab Region
69	N/A		2570 MHz	2620 MHz	FDD	Supplemental DL band (2570-2620 MHz) and LTE CA (2DL/1UL) with Band 3 for region 1. See also 3GPP TS 36.101 V14.0.0 Table 5.5-1 NOTE 3.



# Example – LTE B28



- For LTE B12, B17, B13, B14, each UL (UE tx) and paired DL (UE rx) band IS allocated for the same service rule —
- For LTE B28, the UL (UE tx) and paired DL (UE rx) bands are NOT allocated for the same service rules — 
  - Therefore FCC equipment authorization is NOT applicable for 3GPP E-UTRA (LTE) Band 28 (B28)

For reference only, the separate allocations (MHz) with differing service rules overlapped by B28 (703-748 MHz / 758-803 MHz) are:  
 703-716, 27.5(c)(1); 716-728, 27.5(c)(2); 728-746, 27.5(c)(1); 746-748, 27.5(b)(3); 758-768, 90.531(g); 768-769, 90.531(f);  
 769-775, 90.531(b); 777-776, 27.5(b)(2); 776-787, 27.5(b)(3); 787-788, 27.5(b)(1); 788-798, 90.531(g); 798-799, 90.531(f); 799-803, 90.531(b)



# Examples – LTE within FCC (1)

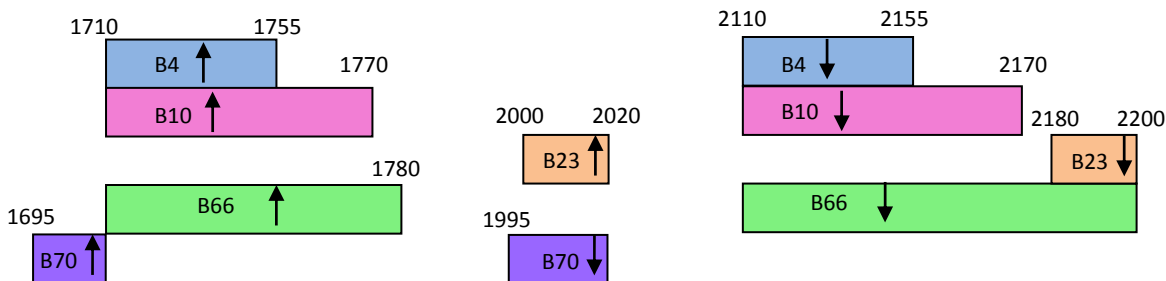
- 3GPP TDD band 38 (2570-2620 MHz)
  - Band 38 device applications can be processed by TCBs as long as compliance is demonstrated for all applicable rules [2.911(b), 2.1033(a), 2.1033(c), part 27, 2.962(f)(1), 2.962(f)(5)(i), 2.962(c)(4)]
  - Similar as that equipment authorizations have been allowed for 3GPP FDD band 7 (2500-2570 MHz / 2620-2690 MHz); see also general requirement about addressing compliance or disabling transmit modes (e.g., using MCC/MNC)
- 3GPP TDD band 40 and FDD band 30
  - Within the 2300-2400 MHz band, some but not all frequencies are allocated and licensable; applicable requirements are in Part 27
  - Part 95 allocation and service rules in the 2300-2400 MHz band are not available for 3GPP LTE band 40 operations
  - For these WCS operations, the emission limits apply to all frequencies below 2285 MHz and above 2370 MHz, respectively
    - The limits are not relaxed at any frequency below 2285 MHz or above 2370 MHz
- 3GPP band 3 (1710-1785 MHz / 1805-1880 MHz)
  - LTE band 4 (1710-1755 MHz / 2110-2155 MHz) devices and LTE band 10 (1710-1770 MHz / 2110-2170 MHz) devices could fit within the 1710-1780 MHz / 2110-2180 MHz bands of part 27
  - However LTE band 3 does not fit within any transmit/receive paired bands and associated service rules defined in part 27 or part 24
    - Band 3 UL overlaps part 27, but the band 3 DL does not – not valid in U.S.





# Examples – LTE within FCC (2)

- 3GPP LTE band 66
  - 1710-1780/2110-2180, 27.5(h)(1); 2180-2200, 27.5(j)
  - 3GPP NOTE: 2180-2200 MHz of DL is for E-UTRA (LTE) operation with carrier aggregation configured
- **REMINDER:** Fixed station equipment (e.g., booster, CPE) is prohibited for the 1755-1780 MHz range (also the 1695-1710 MHz range)
  - Per the text of rulemaking Order FCC-14-31
  - Fixed station: station not intended or capable to be used while in motion
- 3GPP LTE band 70
  - 1695-1710, 27.5(h)(3); 1995-2000, 27.5(k); 2000-2020, 27.5(j)
  - 3GPP NOTE: 2010-2020 MHz and 2005-2020 of DL are for E-UTRA (LTE) operation with carrier aggregation configured and duplex spacings of 300 MHz and 295 MHz, respectively





# Test Frequencies, e.g. LTE

- Concerning EMC and radio parameter testing of “subset” and “superset” 3GPP bands:
  - FCC rules generally are not based on specific technologies such as LTE
  - Where RF paths, components, and duplex (FDD or TDD) mode are the same in a device, some but not necessarily all test frequencies and test data can apply for both subset and superset overlapping 3GPP bands
- KDB Publication 634817 D01 v04 II) f) Test guidance.
  - KDB Publication 634817 D01 v04r01 II) f) 1) “Test only on the allowed frequencies.”
  - KDB Publication 634817 D01 v04r01 II) f) 2) “Test at least one frequency in each band for each rule part applied under and ensure the device is capable of operating on the frequency under each rule part. This requirement may result in testing on multiple frequencies. ...”
- For each applicable 3GPP band that is a subset of another 3GPP band supported by a device, OOBE test data should be submitted for each  $F_{\text{low}}$  and  $F_{\text{high}}$  of the subset that falls within the superset 3GPP band
  - See also KDB Publication 971168 D02 about testing at edges of allocation and/or operating bands
  - 3GPP TS 36.508 Reference Test Frequencies may be used