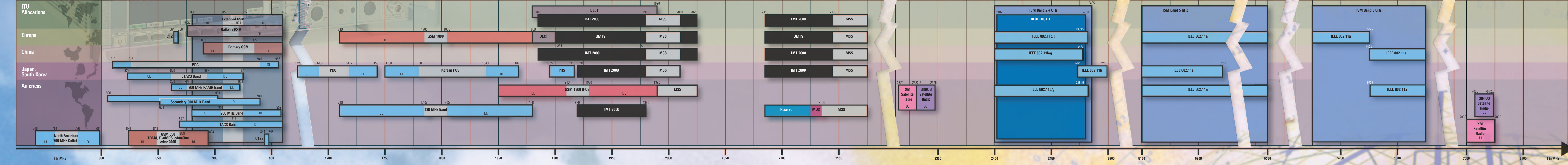
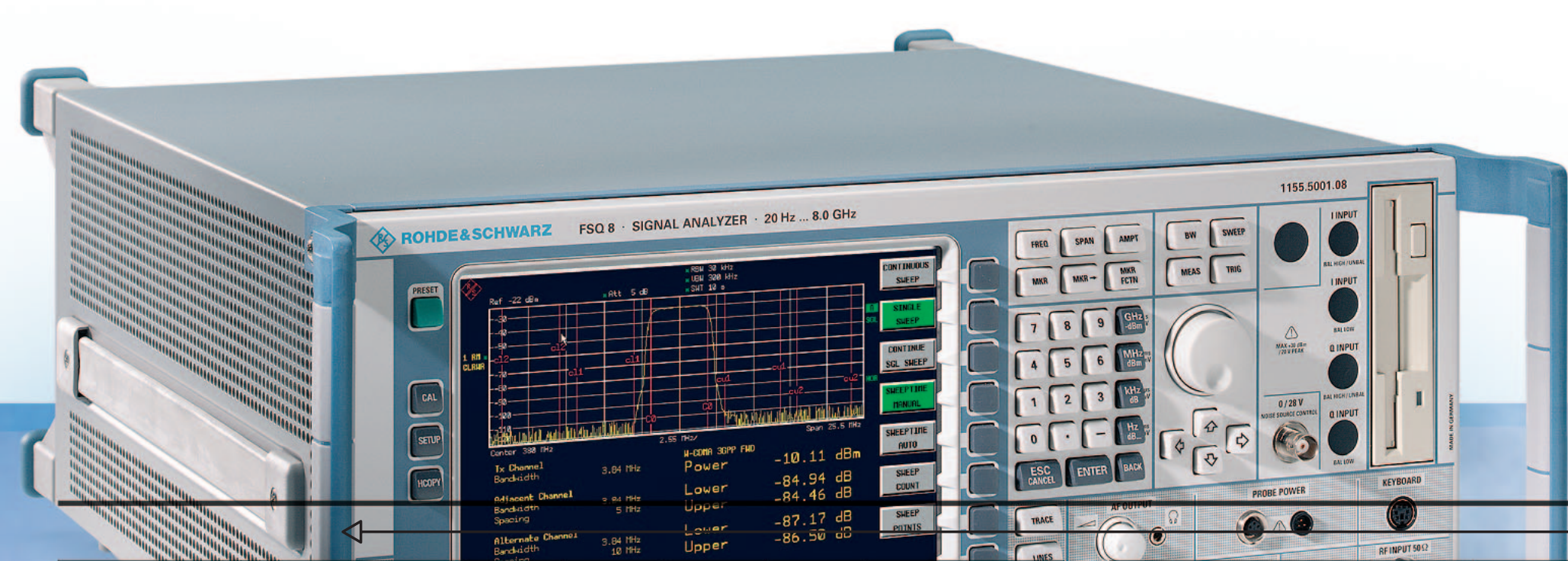


# Wireless Communication Standards



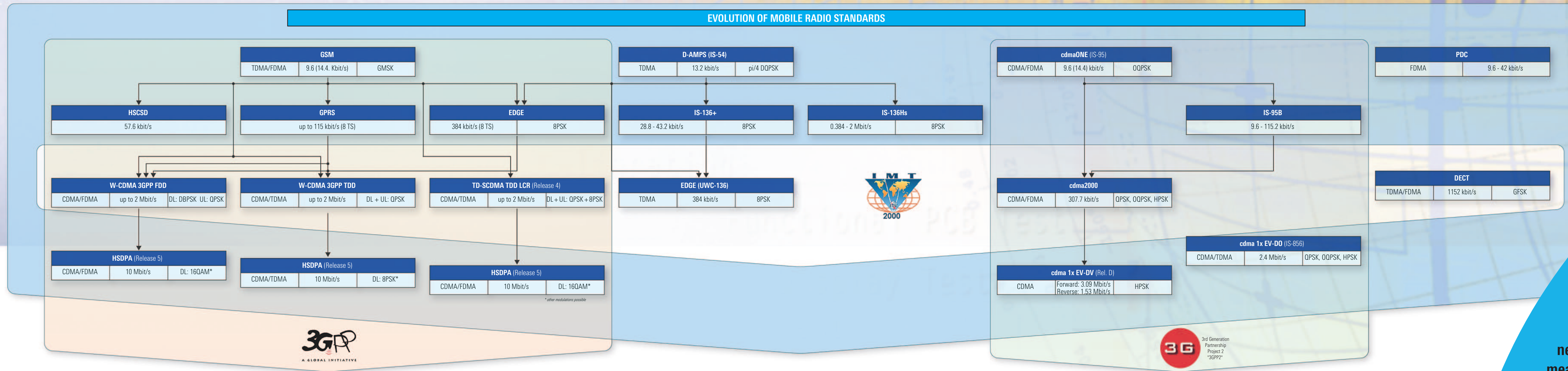
	DIGITAL CELLULAR PHONES/DATA							DIGITAL CORDLESS PHONES					WIRELESS LAN & BROADBAND WIRELESS ACCESS														
	GSM	PDC	IS-54 and IS-136	cdmaOne	cdma2000	1x EV-DO	1x EV-DV	WCDMA 3GPP/FDD	WCDMA 3GPP/TDD	TD-SCDMA	CT2	CT2+	DECT	PHS	Bluetooth	IEEE 802.11a	IEEE 802.11b	IEEE 802.11g	IEEE 802.15.3*	IEEE 802.15.3a*	IEEE 802.15.4*	IEEE 802.16*	IEEE 802.16a*	IEEE 802.16b*	IEEE 802.20*		
<b>Frequency Range</b>	DL: 889 - 894 MHz UL: 824 - 849 MHz	DL: 840 - 956 MHz UL: 810 - 826 MHz	DL: 869 - 894 MHz UL: 824 - 849 MHz	DL: 869 - 894 MHz UL: 824 - 849 MHz	DL: 410 - 458 MHz UL: 421 - 455 MHz	DL: 410 - 458 MHz UL: 421 - 455 MHz	DL: 410 - 458 MHz UL: 421 - 455 MHz	DL: 2110 - 2170 MHz UL: 1920 - 1980 MHz	DL: 2010 - 2025 MHz UL: 1900 - 1920 MHz	DL: 2010 - 2025 MHz UL: 1900 - 1920 MHz	DL: 1880 - 1900 MHz UL: 1880 - 1900 MHz	DL: 1880 - 1900 MHz UL: 1880 - 1900 MHz	DL: 1880 - 1900 MHz UL: 1880 - 1900 MHz	DL: 1880 - 1900 MHz UL: 1880 - 1900 MHz	DL: 2402 - 2480 MHz	DL: 5.15 - 5.35 GHz (USA)	DL: 2.4 - 2.4835 GHz (World)	DL: 2.4 - 2.4835 GHz (World)	DL: 2.4 - 2.4835 GHz (World)	DL: 2.4 - 2.4835 GHz (World)	DL: 2.4 - 2.4835 GHz (World)	DL: 2.4 - 2.4835 GHz (World)	DL: 2.4 - 2.4835 GHz (World)	DL: 2.4 - 2.4835 GHz (World)	DL: 2.4 - 2.4835 GHz (World)	DL: 2.4 - 2.4835 GHz (World)	DL: 2.4 - 2.4835 GHz (World)
<b>Modulation</b>	GMSK	π/4 DQPSK	π/4 DQPSK	QPSK/DOQPSK	QPSK/DOQPSK	HPSK	QPSK/DOQPSK/HPSK	DL: Dual BPSK UL: DL: BPSK (HSDPA only)	DL: BPSK (HSDPA only)	DL: BPSK (HSDPA only)	GFSK	GFSK	GFSK	π/4 DQPSK	GFSK	BPSK, QPSK, 16QAM, 64QAM, OFDM	BPSK, QPSK, 16QAM, 64QAM, OFDM	BPSK, QPSK, 16QAM, 64QAM, OFDM	BPSK, QPSK, 16QAM, 64QAM, OFDM	BPSK, QPSK, 16QAM, 64QAM, OFDM	BPSK, QPSK, 16QAM, 64QAM, OFDM	BPSK, QPSK, 16QAM, 64QAM, OFDM	BPSK, QPSK, 16QAM, 64QAM, OFDM	BPSK, QPSK, 16QAM, 64QAM, OFDM	BPSK, QPSK, 16QAM, 64QAM, OFDM		
<b>Multiple Access</b>	TDMA/FDMA	TDMA/FDMA	TDMA/FDMA	CDMA/FDMA	CDMA	CDMA	CDMA	CDMA/TDMA	CDMA/TDMA	CDMA/TDMA	FDMA/TDMA	FDMA/TDMA	FDMA/TDMA	FDMA/TDMA	FSS	CSMA/CA	CSMA/CA	CSMA/CA	CSMA/CA	CSMA/CA	CSMA/CA	CSMA/CA	CSMA/CA	CSMA/CA	CSMA/CA	CSMA/CA	CSMA/CA
<b>Duplex (Uplink/Downlink)</b>	FDD	FDD	FDD	FDD	FDD	FDD	FDD	FDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD
<b>Channel Bandwidth</b>	200 kHz	25 kHz	30 kHz	1.25 MHz	1.25 MHz	1.25 MHz	1.25 MHz	5 MHz	5 MHz	1.6 MHz	100 kHz	100 kHz	1.78 MHz	300 kHz	1 MHz	20 MHz	20 MHz	20 MHz	15 MHz	5 MHz	5 MHz	20 MHz/25 MHz (USA)	20 MHz/25 MHz (USA)	20 MHz/25 MHz (USA)	20 MHz/25 MHz (USA)	20 MHz/25 MHz (USA)	
<b>Number of Channels</b>	GSM: 850 / 900 / E / R / 1800 / 1900 124 / 124 / 174 / 194 / 374 / 299 (8 users per channel)	1600 (3 users per channel)	832 (3 users per channel)	depends on service	depends on service	depends on service	depends on service	depends on service	depends on service	depends on service	40	40	10 (12 users per channel)	300 (4 users per channel)	79	12	3 (non overlapping)	3 (non overlapping)	4 (or 3)	-	-	CSMA/CA	Single Carrier	TDMA/OFDMA	under definition	under definition	
<b>Peak Data Rate</b>	14.4 kbit/s 53.9 kbit/s (GPRS) 384 kbit/s (EDGE)	42 kbit/s	13.2 kbit/s (IS-54) 28.8 kbit/s (IS-95-A) 115.2 kbit/s (IS-95-B)	14.4 kbit/s (IS-95-A) 115.2 kbit/s (IS-95-B)	307.2 kbit/s (cdma2000 1x) 2.4 Mbit/s (cdma2000 3x)	153.6 kbit/s (reverse) 3.09 Mbit/s (forward)	2 Mbit/s (HSDPA) 10 Mbit/s (HSPA)	2 Mbit/s (HSDPA) 10 Mbit/s (HSPA)	2 Mbit/s (HSDPA) 10 Mbit/s (HSPA)	2 Mbit/s (HSDPA) 10 Mbit/s (HSPA)	72 kbit/s	72 kbit/s	1152 kbit/s	384 kbit/s	72.3 kbit/s	54 Mbit/s	11 Mbit/s	54 Mbit/s	up to 55 Mbit/s	480 Mbit/s (or 600 Mbit/s or 872 Mbit/s)	20 kbit/s (868 MHz) 40 kbit/s (915 MHz) 250 kbit/s (2.4 GHz)	134 Mbit/s (28 MHz channel bandwidth)	70 Mbit/s	70 Mbit/s	70 Mbit/s	70 Mbit/s	70 Mbit/s

Classification	Peak Data Rate	Channel Bandwidth	Number of Carriers	Carrier Spacing
<b>Wireless LAN</b>				
IEEE 802.11a	6 - 54 Mbit/s	20 MHz	64 (62 used)	312.5 kHz
IEEE 802.11g	6 - 54 Mbit/s	20 MHz	64 (62 used)	312.5 kHz
<b>Broadband Wireless Access</b>				
IEEE 802.16 WirelessMAN	134 Mbit/s (28 MHz channel bandwidth)	20 MHz (25 MHz (USA) 28 MHz (EU))	under definition	under definition
IEEE 802.16a WiMAX	70 Mbit/s	20 MHz (25 MHz (USA) 28 MHz (EU))	200	under definition
<b>IEEE 802.16b WirelessHUMAN</b>				
<b>Broadcasting</b>				
DAB	0.6 - 1.7 Mbit/s	1.538 MHz	192 / 384 / 768 / 1536	8 / 4 / 2 / 1 kHz
DVB-T	3.73 - 31.67 Mbit/s	8 MHz, 7 MHz, 8 MHz	1705 (2K Mode) 6817 (8K Mode)	0.84 kHz / 3.34 kHz (6 MHz CH) 0.97 kHz / 3.9 kHz (7 MHz CH) 1.1 kHz / 4.4 kHz (8 MHz CH)
<b>DRM</b>	6 - 55 kbit/s	9 kHz	88 to 228	42 / 47 / 68 / 107 Hz
<b>Wireless Communications</b>				
ADSL	DL: 8 Mbit/s (US) / 640 kbit/s	4.3125 kHz	DS: 256 US: 32	-
VDSL	DS: 52 Mbit/s (US) / 6.4 Mbit/s	4.3125 kHz	4048	-
<b>Satellite Radio</b>				
SIRIUS Satellite Radio (Repeater)	64 kbit/s (audio) / 0.5 - 64 kbit/s (service)	12.5 MHz	100 (music) / 30 (talk) 50 and 50 simultaneously	-
XM Satellite Radio (Repeater)	64 kbit/s (audio) / 0.5 - 64 kbit/s (service)	12.5 MHz	100 (music) / 30 (talk) 50 or 50	-
<b>IBOC (IABOC DAB / iDAB)</b>				
(AM / FM)	Hybrid AM IBOC: 36 - 56 kbit/s (audio) / 0.4 kbit/s (data) All Digital AM IBOC: 40 - 60 kbit/s (audio) / 0.4 kbit/s (data) Hybrid FM IBOC: 64 - 96 kbit/s (audio) / 33 - 51 kbit/s (data) Extended Hybrid FM IBOC: 64 - 96 kbit/s (audio) / 83 - 51 kbit/s (data) All Digital FM IBOC: 64 - 96 kbit/s (audio) / 213 - 181 kbit/s (data)	10 MHz & 2x 5 kHz (AM & 2x OFDM band) 10 MHz & 2x 5 kHz (AM & 2x OFDM band) 258 kHz & 2x 70 kHz (FM & 2x OFDM band) 258 kHz & 2x 70 kHz (FM & 2x OFDM band)	1 audio (digital, analog) min. / 1 data channel 1 audio (digital, analog) min. / 1 data channel 1 audio (digital, analog) min. / 1 data channel 1 audio (digital, analog) min. / 1 data channel	10 kHz 10 kHz 40 kHz 40 kHz

**Abbreviations:** CCK - Complementary Code Keying; CH - Channel; DL - Downlink; DS - Downstream; HUMAN - Highspeed Unlicensed Metropolitan Area Network; IBOC - In-Band-on-Channel; IMT 2000 - International Mobile Telecommunication 2000; JACS - Japanese Total Access Communication System; LCR - Low Chip Rate; MAN - Metropolitan Area Network; MBWA - Mobile Broadband Wireless Access; MDC - Multiplex Service; MDS - Mobile Data Service; MSC - Mobile Satellite Service; PAMR - Public Access Mobile Radio; PDC - Packet Binary Convolution Coding; TACS - Total Access Communication System; TS - Time Slot; UL - Uplink; US - Upstream; UWB - Universal Wireless Communication; UWB - Ultra Wideband; WiMAX - Worldwide Interoperability for Microwave Access.

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