

Tune-up Procedure

During manufacturing each phone will be individually calibrated.

The measurement is done in a fully calibrated setup, which is based on Anritsu MT8820C (adjustment of gain factors) or Agilent 8960 or RS CMU200 or RS CMW500 (control of power levels).

Furthermore, the highest power level is verified afterwards in a call or data measurement on three channels (low, mid and high).

Procedure:

1. Set the phone to operational voltage and on one certain channel in a special service mode by means of company proprietary software.
2. The actual power is measured at several power levels.
3. The gain factors of each individual phone are adjusted via the Board-test SW using automatic adjustment arithmetic until the Tune-up value is met.
- 4 . The Tune-up value is below:

1) GSM Normal Power

GSM850		dBm	±
GSM 850	GSM Speech	32.5	1
	GPRS 1 Txslot	32.5	1
	GPRS 2 Txslots	30.5	1
	GPRS 3 Txslots	28.5	1
	GPRS 4 Txslots	26.5	1
	EGPRS GMSK 1 Txslot	32.5	1
	EGPRS GMSK 2 Txslots	30.5	1
	EGPRS GMSK 3 Txslots	28.5	1
	EGPRS GMSK 4 Txslots	26.5	1
	EGPRS 8PSK 1 Txslot	26.5	1
	EGPRS 8PSK 2 Txslots	24.5	1
	EGPRS 8PSK 3 Txslots	22.5	1
	EGPRS 8PSK 4 Txslots	20.5	1
	PCS1900		dBm
PCS 1900	GSM Speech	30	1
	GPRS 1 Txslot	30	1
	GPRS 2 Txslots	28	1
	GPRS 3 Txslots	26	1
	GPRS 4 Txslots	24	1
	EGPRS GMSK 1 Txslot	30	1
	EGPRS GMSK 2 Txslots	28	1
	EGPRS GMSK 3 Txslots	26	1
	EGPRS GMSK 4 Txslots	24	1
	EGPRS 8PSK 1 Txslot	25.5	1
	EGPRS 8PSK 2 Txslots	23.5	1
	EGPRS 8PSK 3 Txslots	21.5	1
	EGPRS 8PSK 4 Txslots	19.5	1

2) WCDMA Normal Power

B2		dBm	±
WCDMA	RMC	24	1
HSUPA	subtest1	21	1
	subtest2	21	1
	subtest3	22	1
	subtest4	20.5	1
	subtest5	22	1
HSPA+	\	22	1
DC-HSDPA	subtest1	22.5	1

	subtest2	22.5	1
	subtest3	22.5	1
	subtest4	22.5	1

B4		dBm	±
WCDMA	RMC	24	1
HSUPA	subtest1	21	1
	subtest2	21	1
	subtest3	22	1
	subtest4	20.5	1
	subtest5	22	1
HSPA+	\	22	1
DC-HSDPA	subtest1	22.5	1
	subtest2	22.5	1
	subtest3	22.5	1
	subtest4	22.5	1

B5		dBm	±
WCDMA	RMC	23	1
HSUPA	subtest1	20.0	1
	subtest2	20.0	1
	subtest3	21.0	1
	subtest4	19.5	1
	subtest5	21.0	1
HSPA+	\	21.5	1
DC-HSDPA	subtest1	22.0	1
	subtest2	22.0	1
	subtest3	21.5	1
	subtest4	21.5	1

WCDMA Reducation Power

WCDMA		dBm	±
B2	RMC	23.0	1
HSUPA	subtest1	21	1
	subtest2	21	1
	subtest3	22	1
	subtest4	20.5	1
	subtest5	22	1
HSPA+	\	22	1
DC-HSDPA	subtest1	22.5	1
	subtest2	22.5	1
	subtest3	22.5	1
	subtest4	22.5	1

Receiver off(0mm/15mm, 0mm simultaneous)

WCDMA		dBm	±
B4	RMC	22.0	1
HSUPA	subtest1	20.5	1
	subtest2	20.5	1
	subtest3	20.0	1
	subtest4	20.0	1
	subtest5	20.5	1
HSPA+	\	21.0	1
DC-HSDPA	subtest1	21.5	1
	subtest2	21.5	1
	subtest3	21.0	1
	subtest4	21.0	1

Receiver off(0mm/15mm, 0mm simultaneous)

WCDMA		dBm	±
B2	RMC	23	1
HSUPA	subtest1	21	1
	subtest2	21	1
	subtest3	22	1
	subtest4	20.5	1
	subtest5	22	1
HSPA+	\	22	1
DC-HSDPA	subtest1	22.5	1
	subtest2	22.5	1
	subtest3	22.5	1

	subtest4	22.5	1
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Hotspot mode(10mm)

WCDMA		dBm	±
B4	RMC	20	1
HSUPA	subtest1	17	1
	subtest2	17	1
	subtest3	18	1
	subtest4	16.5	1
	subtest5	18	1
HSPA+	\	18	1
DC-HSDPA	subtest1	18.5	1
	subtest2	18.5	1
	subtest3	18.5	1
	subtest4	18.5	1

Hotspot mode(10mm)

3) LTE Normal Power

LTE	Band	dBm	±
	2/25	24	1
	4/66	24	1
	5/26	24.5	1
	12	24.5	1
	13	24.5	1
	71	24.5	1
	41	23	1
	41 (HPUE)	26	1

LTE MPR							
Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4	3	5	10	15	20	
	MHz	MHz	MHz	MHz	MHz	MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	3

LTE Reducation Power

LTE	Band	dBm	±
	25	23	1
	2	23	1

Receiver off(0mm/15mm, 0mm simultaneous)

LTE MPR							
Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4	3	5	10	15	20	
	MHz	MHz	MHz	MHz	MHz	MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	0
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	1
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	2

Receiver off(0mm/15mm, 0mm simultaneous)

LTE	Band	dBm	±
	66	22	1
	4	22	1

Receiver off(0mm/15mm, 0mm simultaneous)

LTE MPR							
Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4	3	5	10	15	20	
	MHz	MHz	MHz	MHz	MHz	MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	0
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	0
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	1

Receiver off(0mm)

LTE	Band	dBm	±
	25	22	1

	2	22	1
	41_PC2	24	1

Hotspot mode(10mm)

LTE MPR							
Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4	3	5	10	15	20	
	MHz	MHz	MHz	MHz	MHz	MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	0
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	0
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	1

Hotspot mode(10mm)

LTE	Band	dBm	±
	41_PC3	22	1

Hotspot mode(10mm)

LTE MPR							
Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4	3	5	10	15	20	
	MHz	MHz	MHz	MHz	MHz	MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	0
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	1
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	2

Hotspot mode(10mm)

LTE	Band	dBm	±
	66	19	1
	4	19	1

Hotspot mode(10mm)

LTE MPR							
Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4	3	5	10	15	20	
	MHz	MHz	MHz	MHz	MHz	MHz	

QPSK	> 5	> 4	> 8	> 12	> 16	> 18	0
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	0
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	0

Hotspot mode(10mm)

4) WiFi

WiFi 802.11b (2.4GHz) 1Mbps-11Mbps			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	19.5	19.5	19.5
Tune-up(dB)	±1	±1	±1
WiFi 802.11g (2.4GHz) 6Mbps-18 Mbps			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	16.5	18.5	16.5
Tune-up(dB)	±1	±1	±1
WiFi 802.11g (2.4GHz) 24Mbps-36 Mbps			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	15.5	17.5	15.5
Tune-up(dB)	±1	±1	±1
WiFi 802.11g (2.4GHz) 48Mbps-54 Mbps			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.5	16.5	14.5
Tune-up(dB)	±1	±1	±1
WiFi 802.11n-20 (2.4GHz) MCS0~2			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	16.5	18.5	16.5
Tune-up(dB)	±1	±1	±1
WiFi 802.11n-20 (2.4GHz) MCS3~4			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	15.5	17.5	15.5
Tune-up(dB)	±1	±1	±1
WiFi 802.11n-20 (2.4GHz) MCS5~7			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.5	16.5	14.5
Tune-up(dB)	±1	±1	±1

WIFI DAC Value

The DAC value means the transmitting power level of wifi, for example-

the DAC 21 means the wifi tx power at the IC output is 21dbm.

	Date Rate	DAC
11b	1M	21
	2M	21
	5.5M	21
	11M	21
11g	6M	20
	9M	20
	12M	20
	18M	20
	24M	19
	36M	19
	48M	18
	54M	18
11n-20M	mcs0	20
	mcs1	20
	mcs2	20
	mcs3	19
	mcs4	19
	mcs5	17.5
	mcs6	17.5
	mcs7	17.5

WIFI Reducation Power

	Band	dBm	±
WIFI	11b	16.7	1
	11g (6Mbps-18 Mbps)	16.5	1
	11g (24Mbps-36 Mbps)	15.5	1
	11g (48Mbps-54 Mbps)	14.5	1
	11n MCS0~2	16.5	1
	11n MCS3~4	15.5	1
	11n MCS5~7	14.5	1

Receiver on

WIFI	Band	dBm	±
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	11b	18.5	1
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Receiver off(0mm/15mm)

WIFI	Band	dBm	±
	11b	16.7	1
	11g (6Mbps-18 Mbps)	16.5	1
	11g (24Mbps-36 Mbps)	15.5	1
	11g (48Mbps-54 Mbps)	14.5	1
	11n MCS0~2	16.5	1
	11n MCS3~4	15.5	1
	11n MCS5~7	14.5	1

Receiver off(0mm simultaneous)

5) Bluetooth BR+EDR

GFSK			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	5.3	5.3	5.3
Tune-up(dB)	±1	±1	±1
DQPSK			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	4.5	4.5	4.5
Tune-up(dB)	±1	±1	±1
8DPSK			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	4.5	4.5	4.5
Tune-up(dB)	±1	±1	±1

6) Bluetooth LE

GFSK			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	-2.0	-2.0	-2.0
Tune-up(dB)	±1	±1	±1

The appropriate gain control settings are stored in RF table (a special section in Flash marked with Read only and untouchable for end user) each phone individually (for each power level).

The user has no possibility to change these settings later on.