Tune Up Procedure

Tune-up procedure

During manufacturing each device is individually calibrated. Measurement is performed in a fully calibrated setup using an Agilent 8960 base station simulator (system tester). Measurement procedure is outlined below:

Measurement Procedure:

1. Set the device to operational voltage and on a predefined channel in a special test mode.
2. The actual output power is measured at several power levels.
3. The gain factors of each individual device are adjusted until the target value is met. The appropriate gain control settings for each output power level are stored in each device individually (for each power level). The user has no possibility to change these settings later on.
4. The maximum gains of each individual device are adjusted and measured until the target value is met. The production target power with tolerance compiles with the maximum power in test report.

Maximum Target Power for Production Unit (Burst Average power)

Mode	Burst average power(dBm)	
	GSM 850	GSM 1900
GSM (GMSK, 1 Tx slot)	31.5+/-1	27.5+/-1
GPRS (GMSK, 1 Tx slot)	31.5+/-1	27.5+/-1
GPRS (GMSK, 2 Tx slots)	31.5+/-1	27.5+/-1
GPRS (GMSK, 3 Tx slots)	31.5+/-1	27.5+/-1
GPRS (GMSK, 4 Tx slots)	31.5+/-1	27.5+/-1
EDGE (8PSK, 1 Tx slot)	26.5+/-1	25.0+/-1
EDGE (8PSK, 2 Tx slots)	26.5+/-1	25.0+/-1
EDGE (8PSK, 3 Tx slots)	26.0+/-1	25.0+/-1
EDGE (8PSK, 4 Tx slots)	26.0+/-1	24.5+/-1

Power unit: dBm

Tolerance: -1.0 dB ~ +1.0 dB

Maximum Target Power for Production Unit (Average power)

Mode	Average power (dBm)		
	WCDMA Band V	WCDMA Band II	WCDMA Band IV
AMR 12.2Kbps	23.0+/-1	22.5+/-1	22.5+/-1
RMC 12.2Kbps	23.0+/-1	22.5+/-1	22.5+/-1
HSDPA Subtest-1	21.5+/-1	20.5+/-1	21.5+/-1
HSDPA Subtest-2	21.5+/-1	21.0+/-1	21.5+/-1
HSDPA Subtest-3	21.0+/-1	20.5+/-1	21.0+/-1
HSDPA Subtest-4	21.0+/-1	20.5+/-1	21.0+/-1
HSUPA Subtest-1	21.5+/-1	20.5+/-1	21.5+/-1
HSUPA Subtest-2	20.5+/-1	20.0+/-1	20.5+/-1
HSUPA Subtest-3	20.0+/-1	20.0+/-1	20.0+/-1
HSUPA Subtest-4	20.5+/-1	19.5+/-1	20.5+/-1
HSUPA Subtest-5	21.5+/-1	20.5+/-1	21.5+/-1

Power unit: dBm

Tolerance: -1.0 dB ~ +1.0 Db

Maximum Target Power for Production Unit (Average power)

LTE Band 4				
Average Power (dBm)				
Modulation	BW (MHz)	RB size	MPR	Target Power
QPSK	20	≤ 18	0	23.0+/-1
QPSK	20	> 18	1	22.0+/-1
16QAM	20	≤ 18	1	22.0+/-1
16QAM	20	> 18	2	21.0+/-1
QPSK	15	≤ 16	0	23.0+/-1
QPSK	15	> 16	1	22.0+/-1
16QAM	15	≤ 16	1	22.0+/-1
16QAM	15	> 16	2	21.0+/-1
QPSK	10	≤ 12	0	23.0+/-1
QPSK	10	> 12	1	22.0+/-1
16QAM	10	≤ 12	1	22.0+/-1
16QAM	10	> 12	2	21.0+/-1
QPSK	5	≤ 8	0	23.0+/-1
QPSK	5	> 8	1	22.0+/-1
16QAM	5	≤ 8	1	22.0+/-1
16QAM	5	> 8	2	21.0+/-1
QPSK	3	≤ 4	0	23.0+/-1
QPSK	3	> 4	1	22.0+/-1
16QAM	3	≤ 4	1	22.0+/-1
16QAM	3	> 4	2	21.0+/-1
QPSK	1.4	≤ 5	0	23.0+/-1
QPSK	1.4	> 5	1	22.0+/-1
16QAM	1.4	≤ 5	1	22.0+/-1
16QAM	1.4	> 5	2	21.0+/-1

Power unit: dBm

Tolerance: -1.0 dB ~ +1.0 dB

Maximum Target Power for Production Unit (Average power)

LTE Band 7				
Average Power (dBm)				
Modulation	BW (MHz)	RB size	MPR	Target Power
QPSK	20	≤ 18	0	21.0+/-1
QPSK	20	> 18	1	20.0+/-1
16QAM	20	≤ 18	1	20.0+/-1
16QAM	20	> 18	2	19.0+/-1
QPSK	15	≤ 16	0	21.0+/-1
QPSK	15	> 16	1	20.0+/-1
16QAM	15	≤ 16	1	20.0+/-1
16QAM	15	> 16	2	19.0+/-1
QPSK	10	≤ 12	0	21.0+/-1
QPSK	10	> 12	1	20.0+/-1
16QAM	10	≤ 12	1	20.0+/-1
16QAM	10	> 12	2	19.0+/-1
QPSK	5	≤ 8	0	21.0+/-1
QPSK	5	> 8	1	20.0+/-1
16QAM	5	≤ 8	1	20.0+/-1
16QAM	5	> 8	2	19.0+/-1

Power unit: dBm

Tolerance: -1.0 dB ~ +1.0 dB

Maximum Target Power for Production Unit (Average power)

LTE Band 17				
Average Power (dBm)				
Modulation	BW (MHz)	RB size	MPR	Target Power
QPSK	10	≤ 12	0	22.5+/-1
QPSK	10	> 12	1	21.5+/-1
16QAM	10	≤ 12	1	21.5+/-1
16QAM	10	> 12	2	20.5+/-1
QPSK	5	≤ 8	0	22.5+/-1
QPSK	5	> 8	1	21.5+/-1
16QAM	5	≤ 8	1	21.5+/-1
16QAM	5	> 8	2	20.5+/-1

Power unit: dBm

Tolerance: -1.0 dB ~ +1.0 dB

Maximum Target Power for Production Unit (Average power)

Mode			Maximum Average Power (dBm)
2.4GHz	802.11b	CH 1	14.0
		CH 6	12.0
		CH 11	14.0
	802.11g	CH 1	13.5
		CH 6	12.0
		CH 11	14.0
	802.11n-HT20	CH 1	12.0
		CH 6	10.5
		CH 11	12.5
	802.11n-HT40	CH 3	11.0
		CH 6	11.5
		CH 9	12.0
Bluetooth v3.0+EDR	CH 0		9.0
	CH 39		10.0
	CH 78		10.0
Bluetooth v4.0 LE			1.0

Power unit: dBm

Then these appropriate gain settings are stored in each device individually.

The user has no possibility to change these settings later on, and during manufacturing each device will be individual calibrated in this range. The measurement is done in a fully calibrated setup, which is based on the base station simulator. Furthermore, the highest power level is verified afterwards in a call measurement on three channels (low, middle and high).

HSPA Target MPR level

Based on the hardware characteristics and HSPA measurement error inherent in the 34.121 procedure, the MPR settings are permanently implemented configured into firmware and cannot be disabled by the end user or UMTS carrier network. The following table lists the target MPR level:

HSPA MPR Targets (dB)			
HSDPA 3GPP Subtest	Band V	Band II	Band IV
1	0	0	0
2	0.5	0.5	0.5
3	1.0	1.0	0.5
4	1.0	0.5	0.5
HSUPA 3GPP Subtest	Band V	Band II	Band IV
1	1.0	0.5	1.0
2	2.0	1.5	1.5
3	2.0	1.5	1.5
4	1.5	1.5	1.5
5	0	0	0

LTE Target MPR level

The device implements maximum power reduction per 3GPP 36.101 requirements where the MPR target is as below table. The MPR settings are permanently implemented configured into firmware and cannot be disabled by the end user or LTE carrier network. The following table lists the target MPR level:

For Band 4:

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

For Band 7:

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

For Band 17:

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]		MPR Target (dB)		3GPP MPR (dB)
	5 MHz	10 MHz	5 MHz	10 MHz	
QPSK	> 8	> 12	1	1	≤ 1
16 QAM	≤ 8	≤ 12	1	1	≤ 1
16 QAM	> 8	> 12	2	2	≤ 2