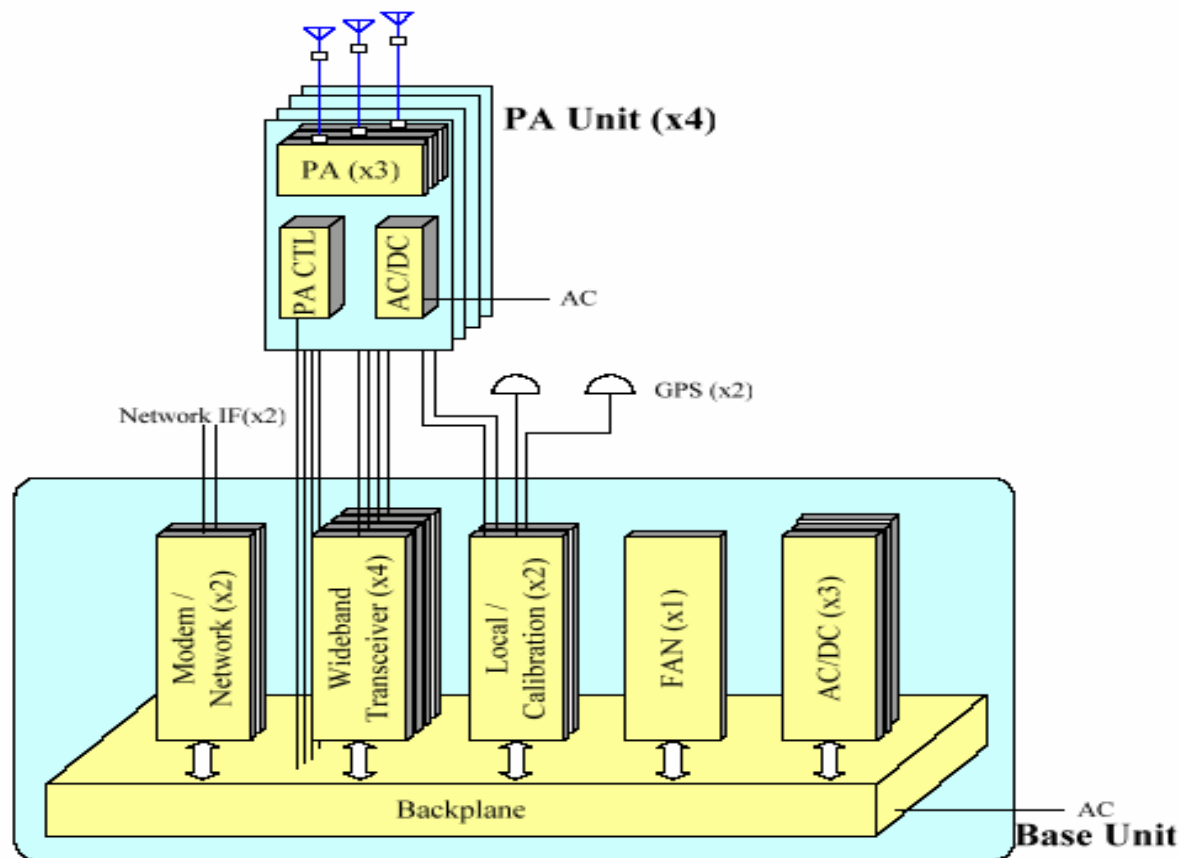


BTS Main Specifications

Base Station Redundancy Diagram

2

- *iBurst* Commercial Base Station
 - 1 x Base Unit & 4 x PA Unit
 - N+1, N-1 & Hot Swap Redundancy



- **Session** : (Network level)
 - » Maximum number of user registrations: 2000
- **Stream** : System resource, basically one time slot, on a SDMA channel (In fact it should be one pair of time slots). A user may have an allocation of the 3 streams in a frame, each stream having a different channel frequency.
- **Rated Stream Power Level** (cf. next slide)
- **Transmission modes**
 - TCH (Max under power control-PC): SDMA
 - PCH (no PC) :SDMA /SS
 - BCH (no PC): Broadcast /Shared with 8 Cells
 - » **EIRP Level:**
 - TCH (Max under power control): 54 dBm
 - PCH (no Array gain, no PC): 44dBm
 - BCH (no Array gain, no PC): 44 dBm

Rated Power Per Data Stream

Definition: The rated power per data stream P_{RAT} is defined as the highest SRRC-filtered power level such that when the base station opens a data stream with a user terminal, the power available to the new stream is at least P_{RAT} , while meeting all *HC-SDMA* specifications. For the case of a multi-antenna base station, P_{RAT} is the incoherently summed power of signal for the new data stream from all antennas.

$$P_{RAT} = 33.8 \text{ dBm}$$

Output RF Power Characteristics / 2

5

Composite Output Power	44.6 dBm	} Avg. power over an active time slot
Maximum Stream Power per Antenna	30.0 dBm/stream/antenna	
Rated Stream Power	33.8 dBm/stream	
Minimum Stream Power	13.8 dBm/stream	
Transmit Power Error		
Composite Output Power	+1.2 / -2.0 dB	
Rated Stream Power	±3.0 dB	
Transmit Power Control Step Size	1.0 dB Max.	
Transmit Power Control Non-Linearity	1.0 dB _{p-p}	

- Rated Stream Power per Antenna is : 23 dBm or 200 mW!
- Power control has a 20 dB range

- Thermal Noise level: KTB
 - » $K = -198.6 \text{ dBmW/ } ^\circ\text{K}$
- Receiver Noise factor: 6 dB
- Antenna noise : Neglected
- Noise bandwidth: 500 kHz (57 dB)
- T : Receiver temperature $\sim 300^\circ \text{ K}$ (24.8 dB)
 - » Noise level: -110.8 dBm
 - » Mod class 0 CNR: 0.2 dB
 - » Receiver sensitivity: -110.6 dBm
 - » Receiver Specification: -109.8 dBm Typical

Definition of BTS EIRP (for TCH)

7

- Rated Stream power: 33.8 dBm (this is the aggregate power available at the BTS)
- Cable loss between PA and antennas: typically 0.5 dB (depends on antenna installation setup. The total loss may be higher, e.g. if an RF cavity filter is inserted, by typically 0.5 dB)
- Antenna Gain: peak antenna gain around 10 dBi for an omni antenna
- Array Gain $G = 10 \cdot \log 12 = 10.8$ dB
- EIRP/TCH = $(10 + 10.8) - 1 + 33.8 = \mathbf{53.6 \text{ dBm}}$

Note : Sometimes the RF power is defined per transmit chain, and the array gain is then $20 \times \log 12$

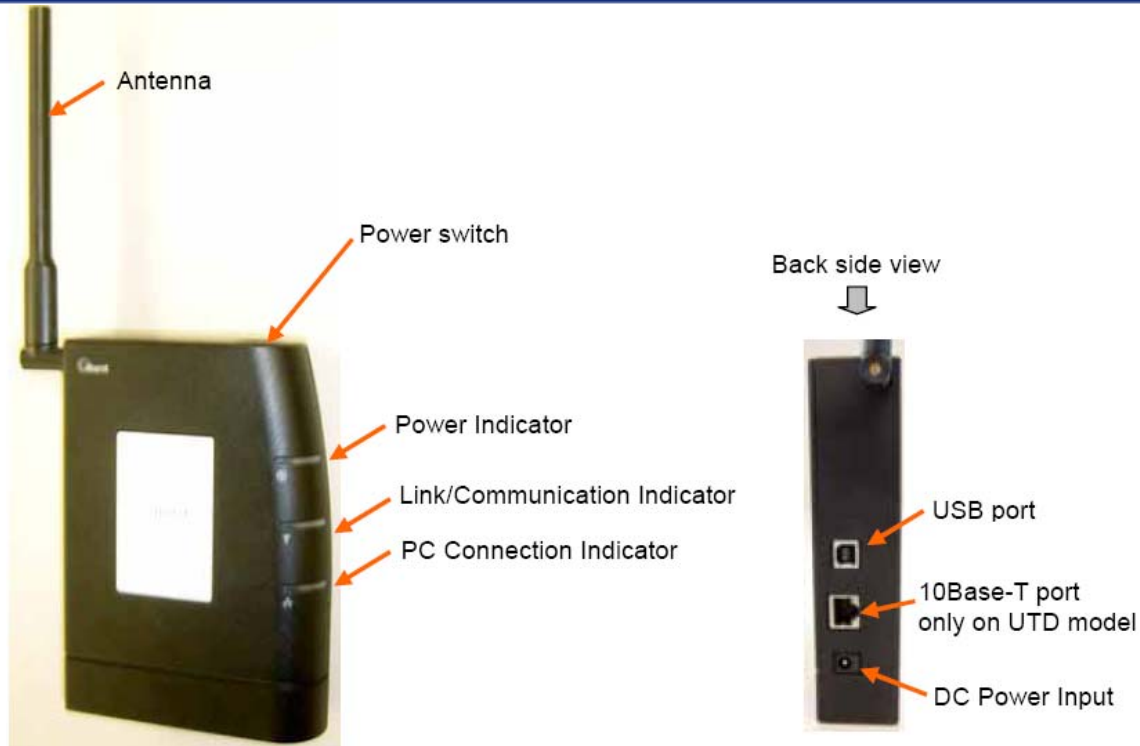
BTS TCH Reception

Table 4.5: Reference sensitivity for FER = 10⁻⁴

Mod Class	Reference Sensitivity (dBm)	
	Typical	Maximum
0	-109.8	-108.6
1	-108.2	-107.0
2	-106.5	-105.3
3	-103.6	-102.4
4	-101.4	-100.2
5	-99.1	-97.9
6	-97.1	-95.9
7	-95.8	-94.6

UTs Main Specifications

Kyocera Desktop UT



Item	Specification
Platform	Desktop PC
Data I/F	Ethernet/USB2.0
Antenna	Mono-Pole
Frequency Range	1.79 / 1.91 GHz
Transmission Power	26 dBm (Class 2 UT)
Size	110.0mm(L)x30.0mm(W)x180.0mm(T)
Weight	200g
Power Consumption	6.0 W (Max)

Kyocera PCMCIA UT

11



Item	Specification
Platform	Note PC
Card Type	Type II PCMCIA Card
Antenna	Mono-Pole
Frequency Range	1.79 / 1.91 GHz
Transmission Power	21 dBm (Class 3 UT)
Data I/F	PCMCIA
Size	54(W) x 5(T) x 125(L) mm
Weight	60g
Power Consumption	3.3W (Max)

UT Sensitivity

Table 3.5 Reference Sensitivity at FER = 10^{-2}

Mod Class	Reference Sensitivity (dBm)	
	Typical	Maximum
0	-108.5	-107.5
1	-106.7	-105.7
2	-105.2	-104.2
3	-102.3	-101.3
4	-100.1	-99.1
5	-97.9	-96.9
6	-95.8	-94.8
7	-94.5	-93.5
8	-92.6	-91.6

Table 3.1: Nominal UT transmit power per carrier for various modulation formats

Modulation Format	Nominal Output Power		
	Power class 1	Power class 2	Power class 3
16-QAM	30 dBm	25 dBm	20 dBm
12-QAM	30 dBm	25 dBm	20 dBm
8-PSK	31 dBm	26 dBm	21 dBm
QPSK	31 dBm	26 dBm	21 dBm
$\pi/2$ -BPSK	32 dBm	27 dBm	22 dBm

UT Spurious Emissions and Blocking

Blocking		
0.1 MHz -(X-15) MHz	> -23 dBm	X = 1785 MHz
(Y+15) MHz - 12.75 GHz	> -23 dBm	Y = 1805 MHz
Max In band input power	- 35 dBm	
ACLR1/ 2 /3	35/45/50 dBc	

Spurious Emissions	
Out-of-Band Spurious Emission	
9 kHz to 150 kHz	-36.0 dBm/1 kHz Max.
150 kHz to 30 MHz	-36.0 dBm/10 kHz Max.
30 MHz to (f0 - 70) MHz	-40.0 dBm/1 MHz Max.
(f0 - 70) - (f0 - 28) MHz	-40.0 dBm/100 kHz Max.
(f0 - 28.0) - (f0 - 12.5) MHz	-40.0 dBm/10 kHz Max.
(f0 + 12.5) - (f0 + 28) MHz	-40.0 dBm/10 kHz Max.
(f0 + 28.0) - (f0 + 70) MHz	-40.0 dBm/100 kHz Max.
(f0 + 70) MHz to 10 GHz	-40.0 dBm/1 MHz Max.
<i>Note: the specified level of OOB Spurious Emissions is too high. Additional measurements are required</i>	

Hardware Link Budgets

Downlink Hardware Budget

16

BTS Transmit	Figure	Unit	Sensitivity	Budget
Number of antenna elements	12			
Gain of each element	11	dBi		
Array Gain	21,6	dBi		
Linear cable losses	0,1	dB/m		
Cable Length	2	m		
Cable Loss	0,2	dB		
Power/channel/user	23	dBm		
EIRP/channel/user	55,4	dBm		
UT Receive				
Antenna Gain	0	dB		
Noise Density	-173	dBm/Hz		
Noise Factor	7	dB		
Noise Bandwidth	500	kHz		
Noise Level	-109	dBm		
C/I REQUIRED@1.06Mb/s/Channel	16,6	dB	-92,4	147,8
C/I REQUIRED@921.6Kb/s/Channel	14,6	dB	-92,4	149,8
C/I REQUIRED@787Kb/s/Channel	13,2	dB	-95,8	151,2
C/I REQUIRED@595Kb/s/Channel	11,3	dB	-97,7	153,1
C/I REQUIRED@495Kb/s/Channel	8,8	dB	-100,2	155,6
C/I REQUIRED@379Kb/s/Channel	7	dB	-102	157,4
C/I REQUIRED@245Kb/s/Channel	4	dB	-105	160,4
C/I REQUIRED@149Kb/s/Channel	2,9	dB	-106,1	161,5
C/I REQUIRED@106Kb/s/Channel	1,1	dB	-107,9	163,3

Uplink Hardware Budget

17

UT Transmit	Figure	Unit	Sensitivity	Budget
POWER	27	dBm		
Antenna Gain	0	dBi		
Cable Loss	0	dBm		
EIRP	27	dBm		
BTS Receive				
Number of antenna elements	12			
Gain of each element	11	dBi		
Array Gain	10,8	dB		
Cable Loss	0,2	dB		
Noise Density	-173	dBm/Hz		
Noise Factor	6	dB		
Noise Bandwidth	500	kHz		
Noise Level	-110	dBm		
C/I REQUIRED@345.6Kb/s/Channel	14,2	dB	-95,8	144,4
C/I REQUIRED@292.8Kb/s/Channel	12,9	dB	-97,1	145,7
C/I REQUIRED@216.0Kb/s/Channel	10,9	dB	-99,1	147,7
C/I REQUIRED@173.0Kb/s/Channel	8,6	dB	-101,4	150
C/I REQUIRED@130.0Kb/s/Channel	6,4	dB	-103,6	152,2
C/I REQUIRED@77.0Kb/s/Channel	3,5	dB	-106,5	155,1
C/I REQUIRED@38.6Kb/s/Channel	1,8	dB	-108,2	156,8
C/I REQUIRED@19.0Kb/s/Channel	0,2	dB	-109,8	158,4

Standard Array Antenna Configuration

18

- 12 omni-directional antenna elements of about 11dBi gain
- May be fitted with (electrical) tilt angle
- Sector configuration can be provided by panel (array) antenna: Then peak gain is 15 dBi.
- Azimuth gain adequate for 90°, 120°, or 180° sectors



Power Amplifiers

Non-penetrating support base

BTS Antenna: OMNI Dipoles Stack

19

- Typical gain : 10 to 11 dBi
- Polarisation: Vertical
- Elevation Beamwidth (3dB): 7°
- Wideband antenna
- Power handling >50 w
- Elevation tuning: Electrical tilt (preset at factory)
- Manufacturers
 - » Japan/ Kyocera(?)
 - » Procom
 - » DAPA
 - » Distcom

