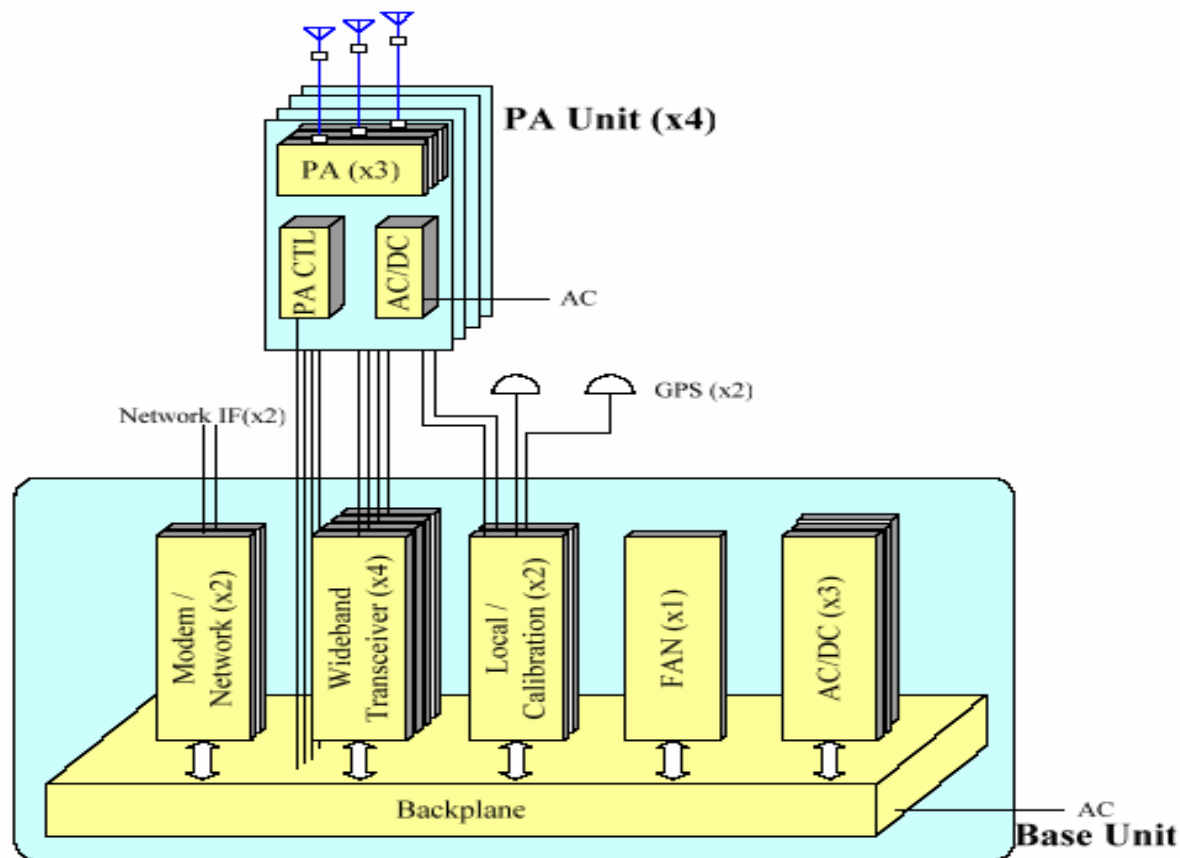


BTS Main Specifications

Base Station Redundancy Diagram

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- *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

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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

Definition of BTS Receiver Noise Floor

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- 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)

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- 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 $G = 10 \times \log 12 = 10.8$ 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

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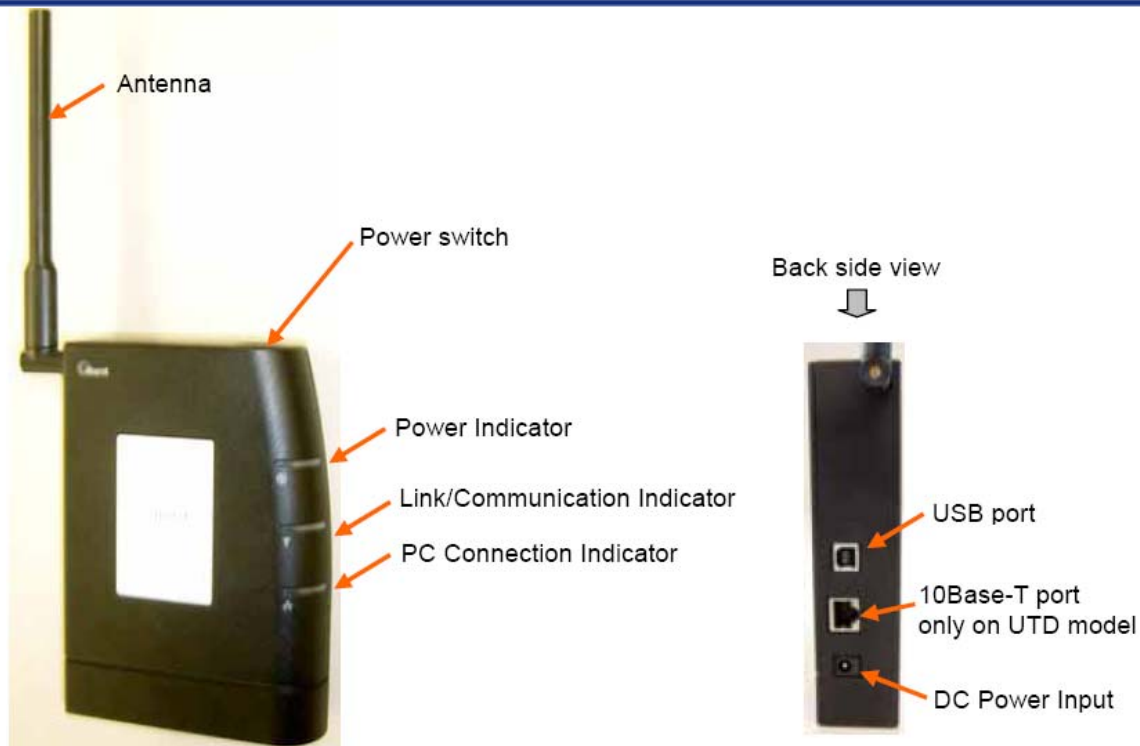
Table 4.5: Reference sensitivity for FER = 10^{-4}

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

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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

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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

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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

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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.
Note: the specified level of OOB Spurious Emissions is too high. Additional measurements are required	

Hardware Link Budgets

Downlink Hardware Budget

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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

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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

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- 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

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- 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

