

Uplink Budget Analysis:

Parameter	Unit	Value	Comment
<u>Transmitter (UE)</u>			
Maximum UE power output, Pt	dBm	23	3GPP specification
Handset margins, M		6	Mobile antenna losses, margins and human body losses.
UE EIRP	dB	17	Calculated: Pt - M
<u>Receiver (eNB)</u>			
eNB Antenna gain, Ge	dBi	17.3	Includes 0.5 dB coaxial line loss
Noise Figure, F	dB	3	
Thermal Noise Density, K	dBm/Hz	-174	
Target SINR, S	dB	-2.5	Based upon the Extended Pedestrian A (EPA) channel model at 3 km/h; 10% Block Error Rate (BLER) for the first HARQ transmission;
Data Rate	kbps	155	
Frequency Selective Scheduling, FSS	dB	2	
Receiver Diversity gain 4 branch, RxD	dB	3	
Approximate used Bandwidth, B	kHz	720	
Noise floor, NF	dBm	-112.4	Calculated: K + 10log(B) + F
Rx Sensitivity, RxS	dBm	-117.9	Calculated: NF + S - RxD
Total System Margin, TM	dB	4.9	Includes Interference margin + fade margin due to shadowing – handover gain
Uplink Maximum Allowable Path Loss, UL- MAPL	dB	149.3	Calculated: UE EIRP + Ge – RxS + FSS – TM

Downlink Budget Analysis:

Parameter	Unit	Value	Comment
<u>Transmitter (eNB)</u>			
Total transmitter power, P	dBm	43	
Channel bandwidth, BW	MHz	5	
Number of Resource Blocks, RB		25	
Losses, L	dB	0.5	Includes: feeder losses
Antenna Gain, G	dBi	17.8	
Number of Tx Antenna, T		4	
EIRP per RB	dBm	46.33	Calculated: $P - 10\log(RB) + G - L$
Average power per reference signal resource element, EPRE	dBm	12.2	Calculated: $P - 10\log(T) - 10\log(12*RB)$
EIRP of reference signal, EIRP	dBm	29.5	Calculated: EPRE + G - L
<u>Receiver (UE)</u>			
Target data rate	kbps	2430	
Noise Figure, F	dB	7	
Thermal Noise Density, K	dBm/Hz	-174	
Subcarrier Bandwidth, B	kHz	15	
Target SINR, S	dB	0.3	
Transmit Diversity gain 4branch, TxD	dB	4	
System margins, SM	dB	7.3	Includes shadowing margin, interference margin, handover gain etc.
Noise floor per resource block, NFB	dBm	-114.45	calculated: $K + 10\log(12*B*1000) + F$
Rx Sensitivity per resource block, RxS	dBm	-118.15	Calculated: NFB + S - TxD
UE losses (margins), UEloss	dB	5	
Maximum Allowable Path Loss, DL-MAPL	dB	152.2	Downlink MAPL Calculated: EIRP per RB – RxS – UEloss - SM
Effective MAPL- EMAPL	dB	149.3	Calculated: Minimum of (UL-MAPL, DL-MAPL)
RSRP (for coverage planning)	dBm	-119.8	Calculated: EIRP - EMAPL