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## GSM Power Control and Power Class

- tutorial, overview of the GSM power control, GSM power levels, power class and power amplifier design.

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The power levels and power control of GSM mobiles is of great importance because of the effect of power on the battery life. Also to group mobiles into groups, GSM power class designations have been allocated to indicate the power capability of various mobiles.

In addition to this the power of the GSM mobiles is closely controlled so that the battery of the mobile is conserved, and also the levels of interference are reduced and performance of the basestation is not compromised by high power local mobiles.

## GSM power levels

The base station controls the power output of the mobile, keeping the GSM power level sufficient to maintain a good signal to noise ratio, while not too high to reduce interference, overloading, and also to preserve the battery life.

A table of GSM power levels is defined, and the base station controls the power of the mobile by sending a GSM "power level" number. The mobile then adjusts its power accordingly. In virtually all cases the increment between the different power level numbers is 2dB.

The accuracies required for GSM power control are relatively stringent. At the maximum power levels they are typically required to be controlled to within +/- 2 dB, whereas this relaxes to +/- 5 dB at the lower levels.

The power level numbers vary according to the GSM band in use. Figures for the three main bands in use are given below:

POWER LEVEL NUMBER	POWER OUTPUT LEVEL DBM
2	39
3	37
4	35
5	33
6	31
7	29
8	27
9	25
10	23
11	21
12	19
13	17
14	15
15	13
16	11
17	9
18	7
19	5

**GSM power level table for GSM 900**

POWER LEVEL NUMBER	POWER OUTPUT LEVEL DBM
29	36
30	34
31	32
0	30
1	28
2	26
3	24
4	22
5	20
6	18
7	16

8	14
9	12
10	10
11	8
12	6
13	4
14	2
15	0

**GSM power level table for GSM 1800**

POWER LEVEL NUMBER	POWER OUTPUT LEVEL DBM
30	33
31	32
0	30
1	28
2	26
3	24
4	22
5	20
6	18
7	16
8	14
9	12
10	10
11	8
12	6
13	4
14	2
15	0

**GSM power level table for GSM 1900**

## GSM Power class

Not all mobiles have the same maximum power output level. In order that the base station knows the maximum power level number that it can send to the mobile, it is necessary for the base station to know the maximum power it can transmit. This is achieved by allocating a GSM power class number to a mobile. This GSM power class number indicates to the base station the maximum power it can transmit and hence the maximum power level number the base station can instruct it to use.

Again the GSM power classes vary according to the band in use.

GSM POWER CLASS NUMBER	GSM 900		GSM 1800		GSM 1900	
	Power level number	Maximum power output	Power level number	Maximum power output	Power level number	Maximum power output
1			PL0	30 dBm / 1W	PL0	30 dBm / 1W
2	PL2	39dBm / 8W	PL3	24 dBm/ 250 mW	PL3	24 dBm / 250 mW

3	PL3	37dBm / 5W	PL29	36 dBm / 4W	PL30	33 dBm / 2W
4	PL4	33dBm / 2W				
5	PL5	29 dBm / 800 mW				

## GSM power amplifier design considerations

One of the main considerations for the RF power amplifier design in any mobile phone is its efficiency. The RF power amplifier is one of the major current consumption areas. Accordingly, to ensure long battery life it should be as efficient as possible.

It is also worth remembering that as mobiles may only transmit for one eighth of the time, i.e. for their allocated slot which is one of eight, the average power is an eighth of the maximum.

By Ian Poole (<https://plus.google.com/104687638164370436625?rel=author>)

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