Appendix ERP / EIRP & 26 dBc Bandwidth Measurement

1.1 ERP / EIRP Measurement

Equivalent isotropic radiated power measurements by substitution method according to ANSI/TIA/EIA-603-B-2002.

1.1.1 Measurement Instruments

As described in chapter 5 of this test report.

1.1.2 Test Procedure

The phone was tested in an anechoic chamber with a 3-axis position system that permits taking complete spherical scans of the EUT's 3-axis radiation patterns. For all tests, the phone was supported in a free space type environment, vertically oriented in the chamber. Tests were done for GPRS 850three frequencies (824.2, 836.6 and 848.8 MHz) and EGPRS 1900 three frequencies (1850.2, 1880.00, and 1909.80 MHz).
GSM measurements were made with the phone placed in a call using the CMU200 mobile station test set. The phone was weakly coupled to the test set and configured to transmit in full data rate mode.
The radiated power was measured using ETS-LINDGREN OTA Chamber in "Peak" mode. From these measurements, the software calculates the angle at which maximum radiated power occurs for each case, and the radiated power at this angle was extracted from the data.

Each individual data point in a radiated power or sensitivity measurement is referred to as the effective isotropic radiated power or effective isotropic sensitivity. That is, the desired information is how the measured quantity relates to the same quantity from an isotropic radiator. Thus, the reference measurement must relate the power received or transmitted at the EUT test equipment (spectrum analyzer or communication tester) back to the power transmitted or received at a theoretical isotropic radiator. The total path loss then, is just the difference in dB between the power transmitted or received at the isotropic radiator and that seen at the test equipment (see follow Figure 1).

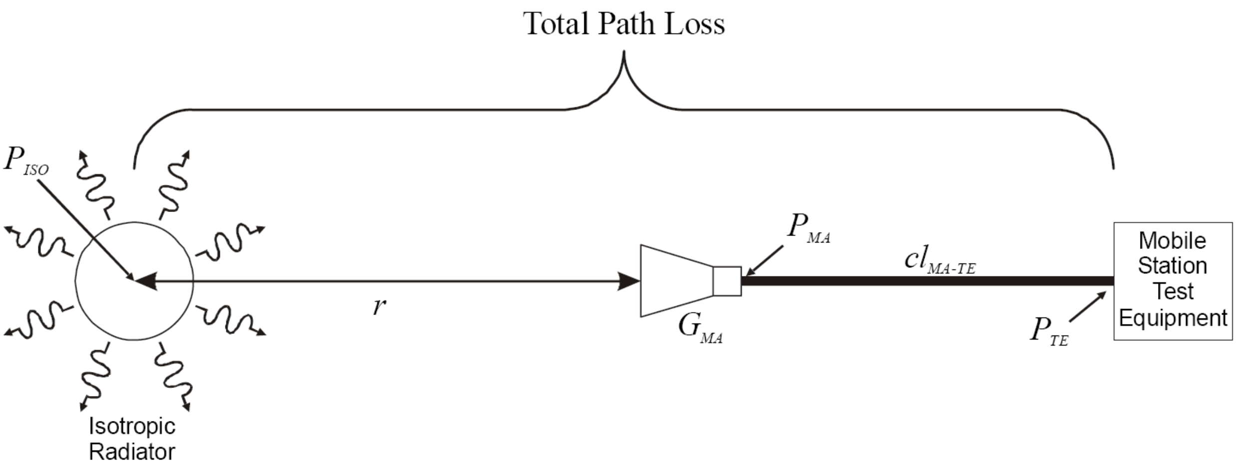


Figure 1. THEORETICAL CASE FOR DETERMINING PATH LOSS

In equation form, this becomes:

Equation 1

$$PL = P_{ISO} - P_{TE} ,$$

where PL is the total path loss, P_{ISO} is the power radiated by the theoretical isotropic radiator, and P_{TE} is the power received at the test equipment port. As can be seen in Figure 1, this quantity includes the range path loss due to the range length r, the gain of the measurement antenna, and any loss terms associated with the cabling, connections, amplifiers, splitters, etc. between the measurement antenna and the test equipment port.

Figure 2 shows a typical real world configuration for measuring the path loss. In this case, a reference antenna with known gain is used in place of the theoretical isotropic source. The path loss may then be determined from the power into the reference antenna by adding the gain of the reference antenna. That is:

Equation 2

$$P_{ISO} = P_{RA} + G_{RA} ,$$

where P_{RA} is the power radiated by reference antenna, and G_{RA} is the gain of the reference antenna, so that:

Equation 3

$$PL = P_{RA} + G_{RA} - P_{TE} ,$$

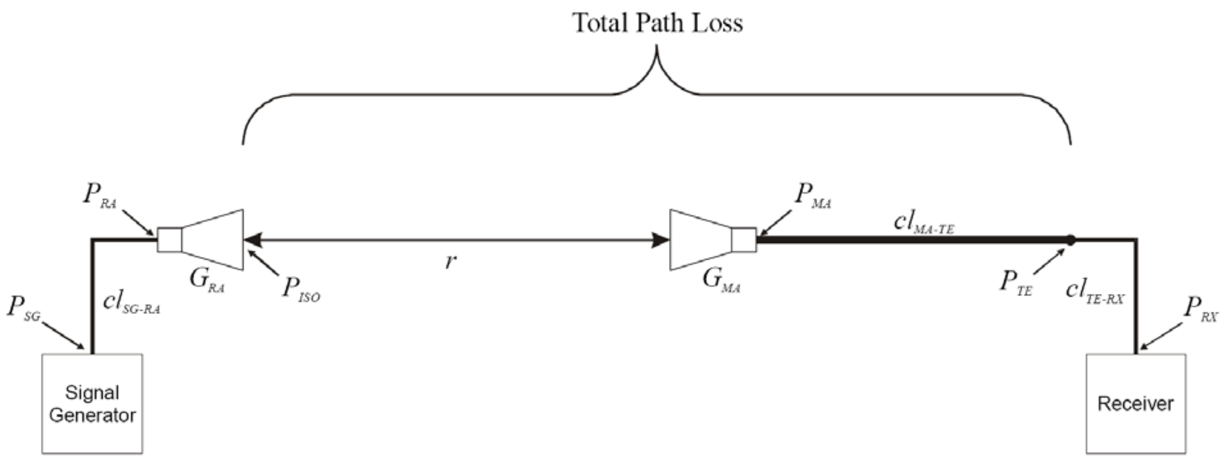


Figure 2. TYPICAL CONFIGURATION FOR MEASURING PATH LOSS

In order to determine P_{RA}, it is necessary to perform a cable reference measurement to remove the effects of the cable loss between signal generator and reference antenna, and between the test equipment port and the receiver. This establishes a reference point at the input to the reference antenna. Figure 3 illustrates the cable reference measurement configuration. Assuming the power level at the signal generator is fixed, it is easy to show that the difference between P_{RA} and P_{TE} in Figure 2 is given by:

Equation 4

$$P_{RA} - P_{TE} = P_{RX}' - P_{RX},$$

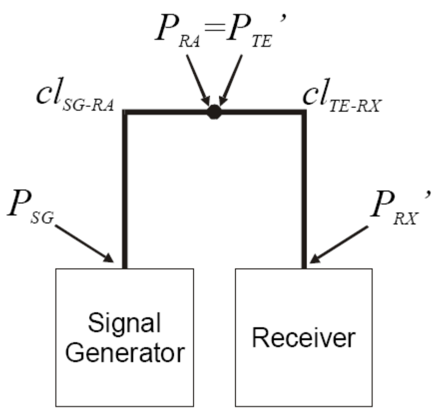


Figure 3. CABLE REFERENCE CALIBRATION CONFIGURATION

Where $P_{RX'}$ is the power measured at the receiver during the cable reference test, and P_{RX} is the power measured at the receiver during the range path loss measurement in Figure 2. Thus, the path loss is then just given by:

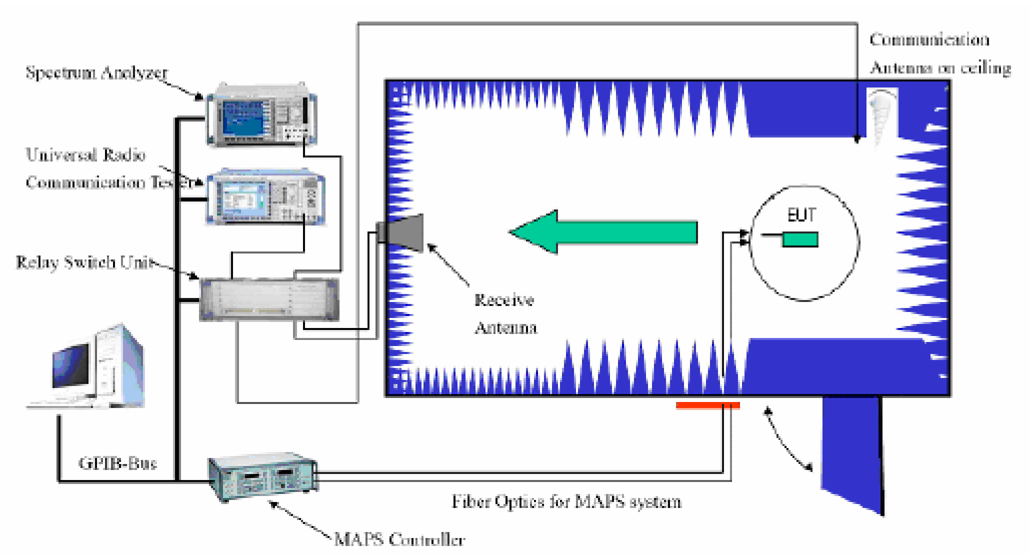
Equation 5

$$PL = G_{RA} + P_{RX}' - P_{RX'}$$

$$EIRP = P_t + P_L$$

P_t = Often referred to as antenna output power

1.1.3 Test Setup Layout of ERP/EIRP



1.1.4 Test Result

GPRS 850 Radiated Power ERP				
Maximum Output Power				
Frequency (MHz)	Read Level (dBm)	Correction factor (dBm)	ERP (dBm)	ERP (W)
824.2	69.05	-48.40	**20.65**	**0.116**
836.4	69.82	-49.50	**20.32**	**0.108**
848.8	69.82	-49.70	**20.12**	**0.103**

EGPRS 1900 Radiated Power EIRP				
Maximum Output Power				
Frequency (MHz)	Read Level (dBm)	Correction factor (dBm)	EIRP (dBm)	EIRP (W)
1850.2	80.94	-55.00	**25.94**	**0.393**
1880.0	81.13	-55.30	**25.83**	**0.383**
1909.8	81.17	-55.40	**25.77**	**0.378**

Note: ERP = Read Level + Correction factor

1.2 Occupied Bandwidth and Band Edge Measurement

1.2.1 Measurement Instruments

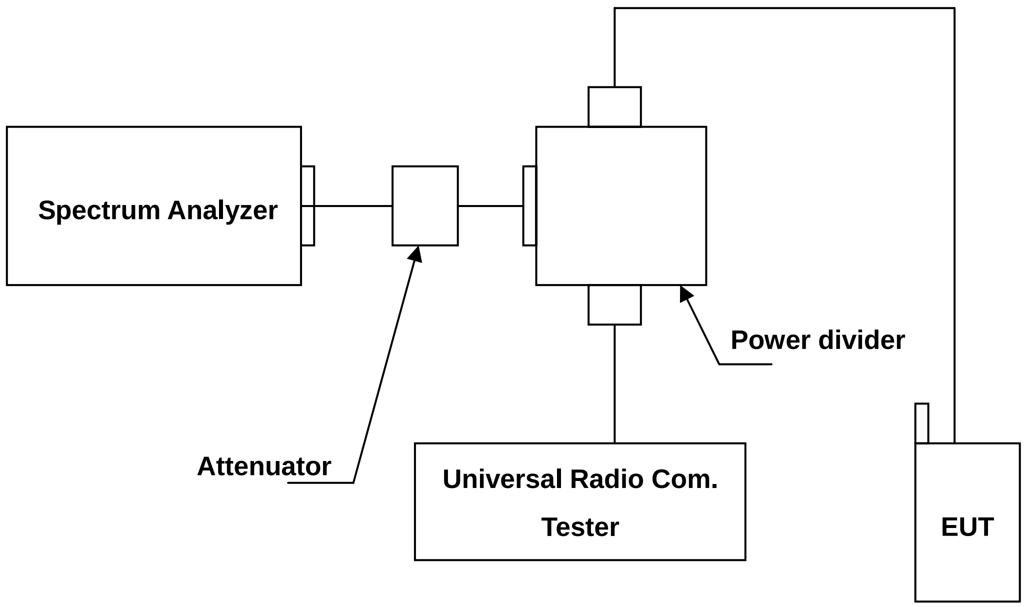
As described in chapter 5 of this test report.

1.2.2 Test Procedure

The measurement is made according to FCC rules part 22 and 24:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The occupied bandwidth of middle channel for the highest and lowest RF powers was measured.
3. The band edge of low and high channels for the highest RF powers within the transmitting frequency band were measured. Setting RBW as roughly BW/100.
4. The band edge setting RB=3kHz ; VB=3kHz.

1.2.3 Test Setup Layout



1.2.4 Occupied Bandwidth Test Result

GPRS 850		
Channel	Frequency (MHz)	Output Power -26 dBc Bandwidth (kHz)
128	824.2	243.6587
190	836.6	244.9462
251	848.8	247.7492
RB:3KHz , VBW:3KHz		

EGPRS 1900		
Channel	Frequency (MHz)	Output Power -26 dBc Bandwidth (kHz)
512	1850.2	241.8742
661	1880.0	242.3042
810	1909.8	246.9281
RB:3KHz , VBW:3KHz		