

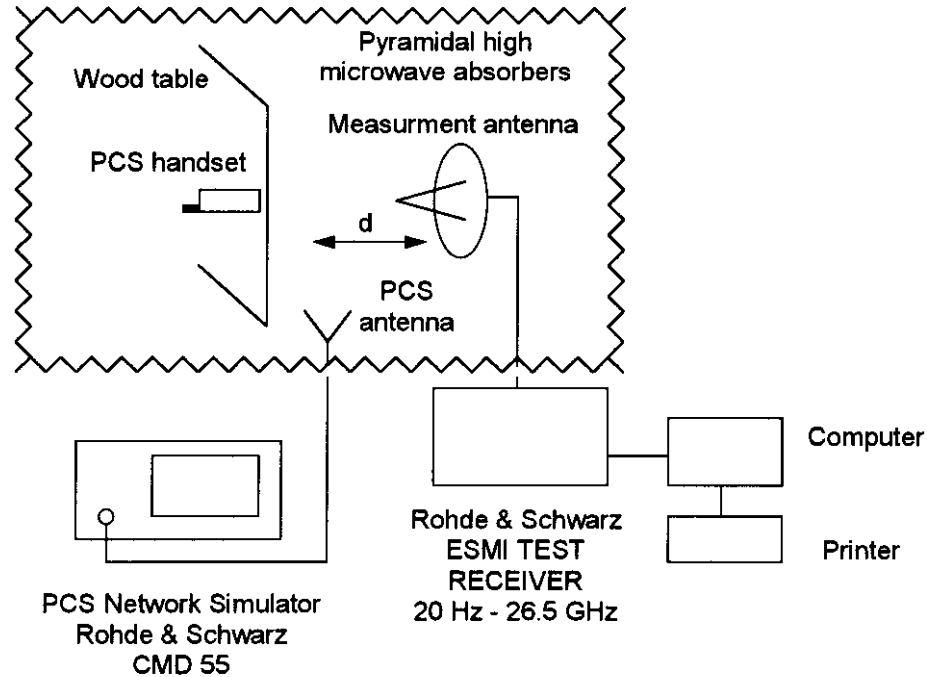
6. RADIO FREQUENCY EMISSIONS AND MEASUREMENTS RESULTS.

6.1. FIELD STRENGTH OF SPURIOUS RADIATION.

Emission limits measurements in anechoic chamber at SAGEM EMC Test Laboratory according to FCC part 24.238.

6.1.1. Configuration of the measurement.

Dimensions: anechoic chamber 6.6 x 5 x 2.5m.



The measurements are made from :

- 30 MHz - 1 GHz with a LPB2520/A Bilog antenna from ARA ($d = 3\text{m}$).
- 1 GHz - 10 GHz with a MTA - 50 dish antenna from Electro Metrics ($d = 1\text{ m}$).
- PCS antenna.

CMD 55 Rohde & Schwarz Network Simulator

Control channel number:	600 (1947.8 MHz)
Control channel RF level:	-63 dBm
Traffic channel number:	depends on the frequency block
Traffic channel timeslot :	0
Traffic channel RF level:	-61 dBm
Free space attenuation compensation	RFin2 -57 dB RFout2 -60 dB

6.1.2. Principle of the measurement.

First of all the antenna is calibrated and the losses in free space propagation related to the distance from the antenna to the PCS handset are taken into account. Then the PCS handset is put in communication with the Network Simulator via a PCS antenna.

The measurements are made for the 6 frequency blocks according to FCC part 24.229:

Block A: 1850 MHz - 1865 MHz paired with 1930 MHz - 1945 MHz

Corresponds to channel 512 (1850.2 MHz paired with 1930.2 MHz) to channel 586 (1865 MHz paired with 1945 MHz).

Block B: 1870 MHz - 1885 MHz paired with 1950 MHz - 1965 MHz

Corresponds to channel 611 (1870 MHz paired with 1950 MHz) to channel 686 (1885 MHz paired with 1965 MHz).

Block C: 1895 MHz - 1910 MHz paired with 1975 MHz - 1990 MHz

Corresponds to channel 736 (1895 MHz paired with 1975 MHz) to channel 810 (1909.8 MHz paired with 1989.8 MHz).

Block D: 1865 MHz - 1870 MHz paired with 1945 MHz - 1950 MHz

Corresponds to channel 586 (1865 MHz paired with 1945 MHz) to channel 611 (1870 MHz paired with 1950 MHz).

Block E: 1885 MHz - 1890 MHz paired with 1965 MHz - 1970 MHz

Corresponds to channel 686 (1885 MHz paired with 1965 MHz) to channel 711 (1890 MHz paired with 1970 MHz).

Block F: 1890 MHz - 1895 MHz paired with 1970 MHz - 1975 MHz

Corresponds to channel 711 (1890 MHz paired with 1970 MHz) to channel 736 (1895 MHz paired with 1975 MHz).

For each frequency block we measured the emission limits in anechoic chamber from 30 MHz to 10 GHz with is the actual limit of measurement in free space propagation.

6.1.3. Result of the measurements.**6.1.3.1. Measurement from 30 MHz - 1 GHz.**

The measurement results, a summary of the measurement configuration and antenna calibration follow.

We also made a measurement without the PCS handset to get the ambient level of noise for the configuration of test.

SCAN TABLE: "FCC15 RE Globale*"

Unit: dBµV/m

Detector: Mode:

Curve 1: MaxPeak ClearWrite
Curve 2: QuasiPeak ClearWrite

Subrange 1:

Start Frequency: 25.0 MHz Step Size: 60.0 kHz
Stop Frequency: 1.0 GHz
Measure Time: 5.0 ms
IF Bandwidth: 120 kHz

Receiver: ESXI Transducer: ANT BILOG LPB-2520/A
Signal Path: None System Transducer: None
Meas. Mode: Lin Add. Transd. 1: None
Tracking Gen.: Off Add. Transd. 2: None
Input: 2DC Add. Transd. 3: None

Preamplifier: 10 dB Demodulation: FM Broad
RF Att.: Coupled Volume: 0 %
Ref. Level: -10.0 dBm Squelch: --
Min. RF Att.: 0 dB Option: None
IF Att.: --
Autorange: On

Curve 1: On Repetition: Single
Curve 2: On Stop Mark: On
Stop Message: On
Stop Message: Antenne Bilog

TRANSDUCER: "ANT BILOG LPB-2520/A"

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Source Unit: dBµV

Frequency MHz	Correction dBµV/m
25.000000	19.20
30.000000	17.70
35.000000	16.80
40.000000	16.30
45.000000	15.00
50.000000	13.90
60.000000	11.50
70.000000	7.00
80.000000	7.60
90.000000	8.80
100.000000	9.80
120.000000	11.40
140.000000	9.00
160.000000	9.00
180.000000	11.00
200.000000	10.10
250.000000	12.40
300.000000	13.90
400.000000	14.50
500.000000	16.30
600.000000	18.40
700.000000	19.10
800.000000	20.00
900.000000	21.10
1000.000000	21.70
1500.000000	25.10
2000.000000	25.60

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Equipement sous test: Field measurement without PCS 1900 MHz

N° de série:

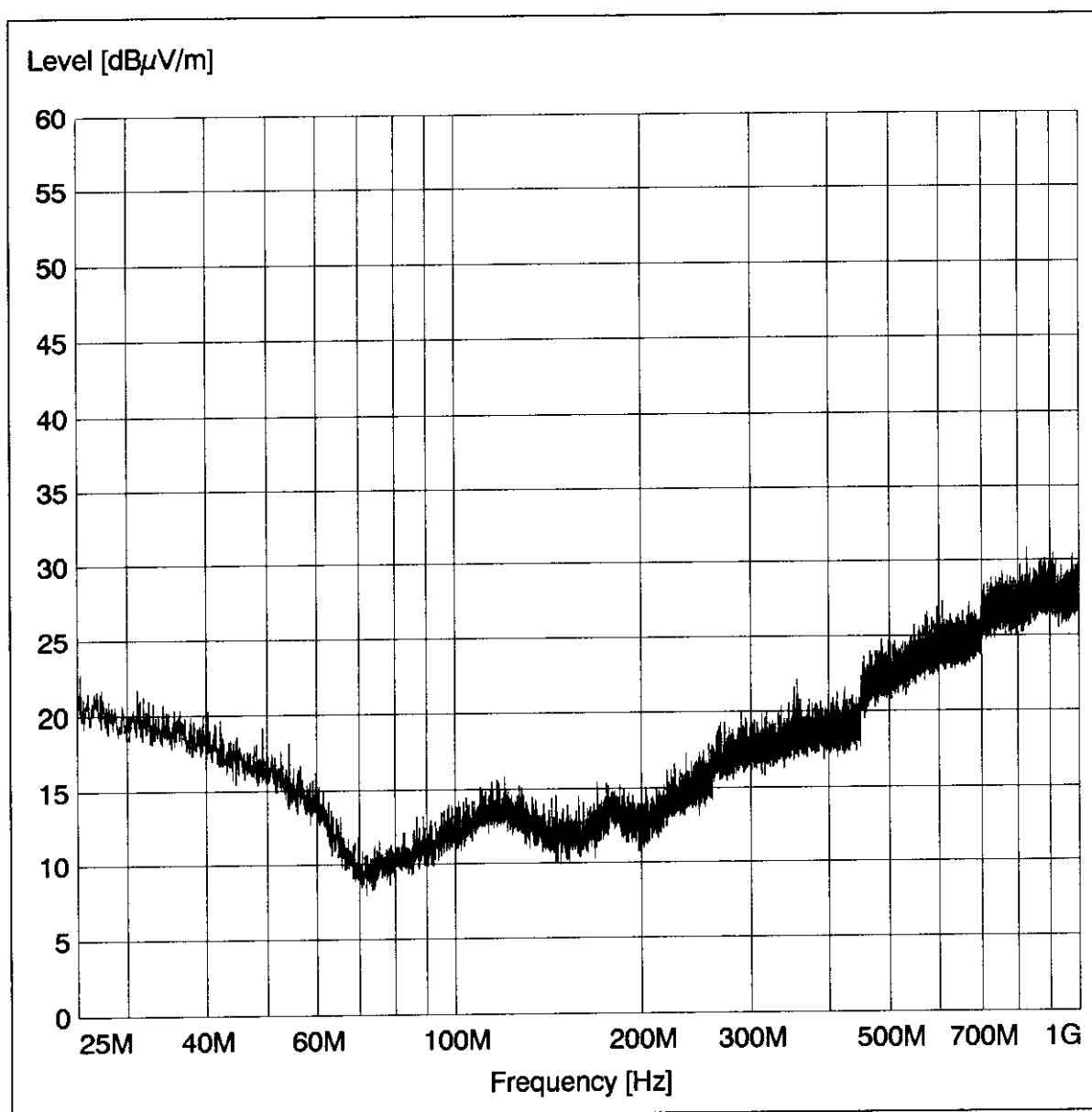
Observations: Ambient noise level

Vertical polarisation

3m test in anechoic chamber

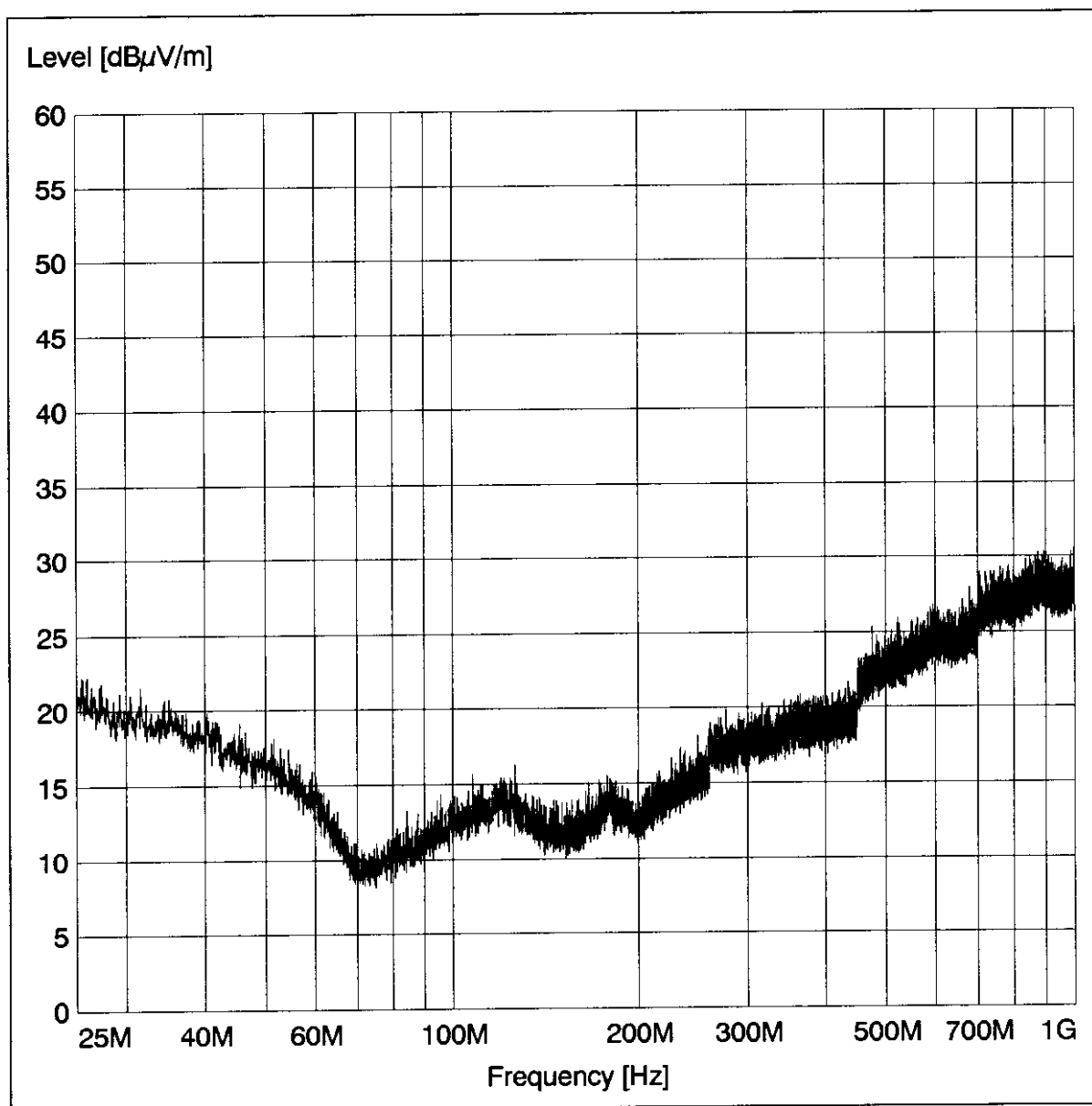
Opérateur: J. BOUSQUET

No de compte rendu: CF32/CR-052-03-98



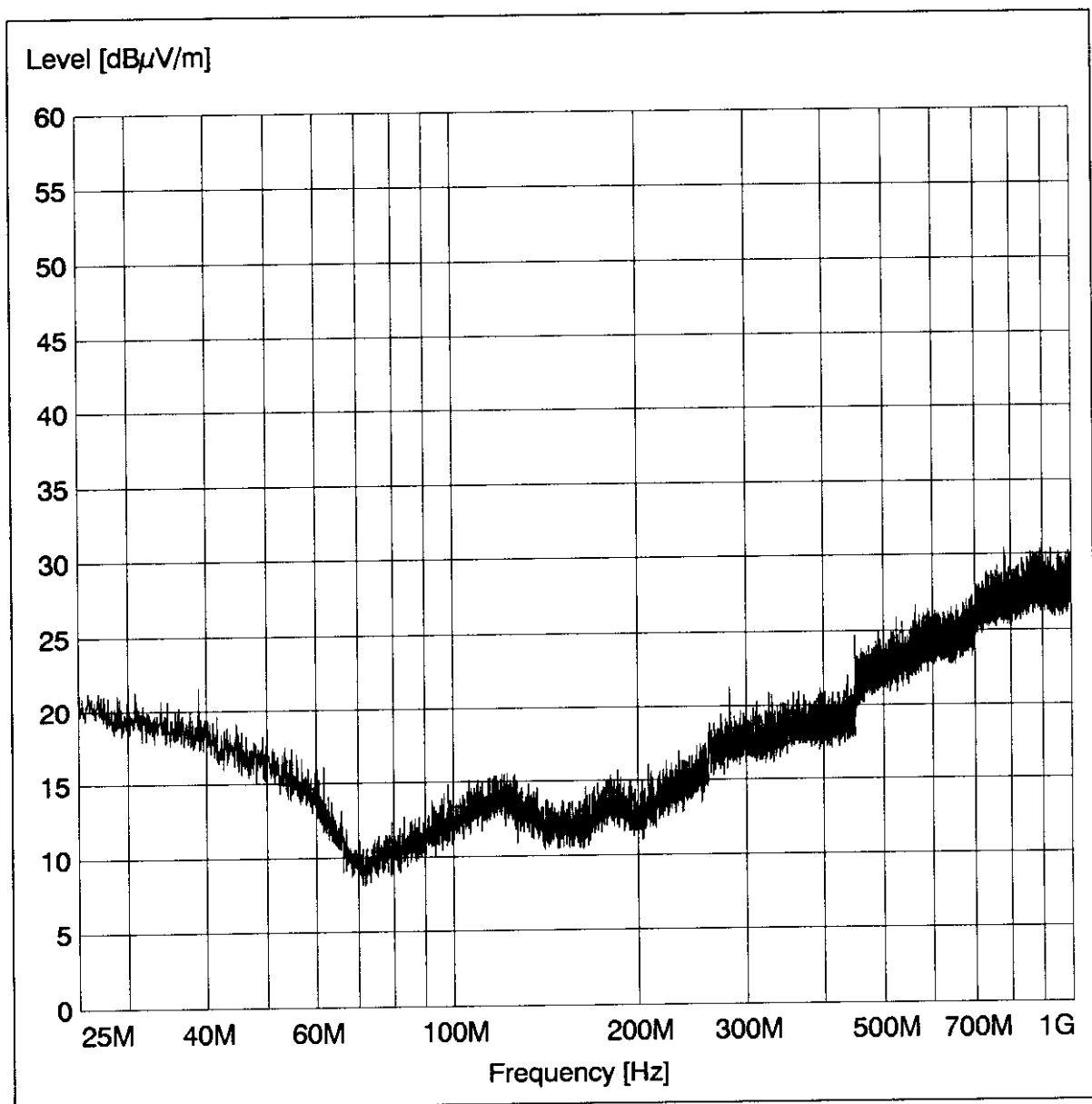
SAGEM - EMC Test laboratory

Equipement sous test: PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 512
Peak Power 1 Watt
Vertical polarisation
3m test in anechoic chamber
Opérateur: J. BOUSQUET
No de compte rendu: CF32/CR-052-03-98



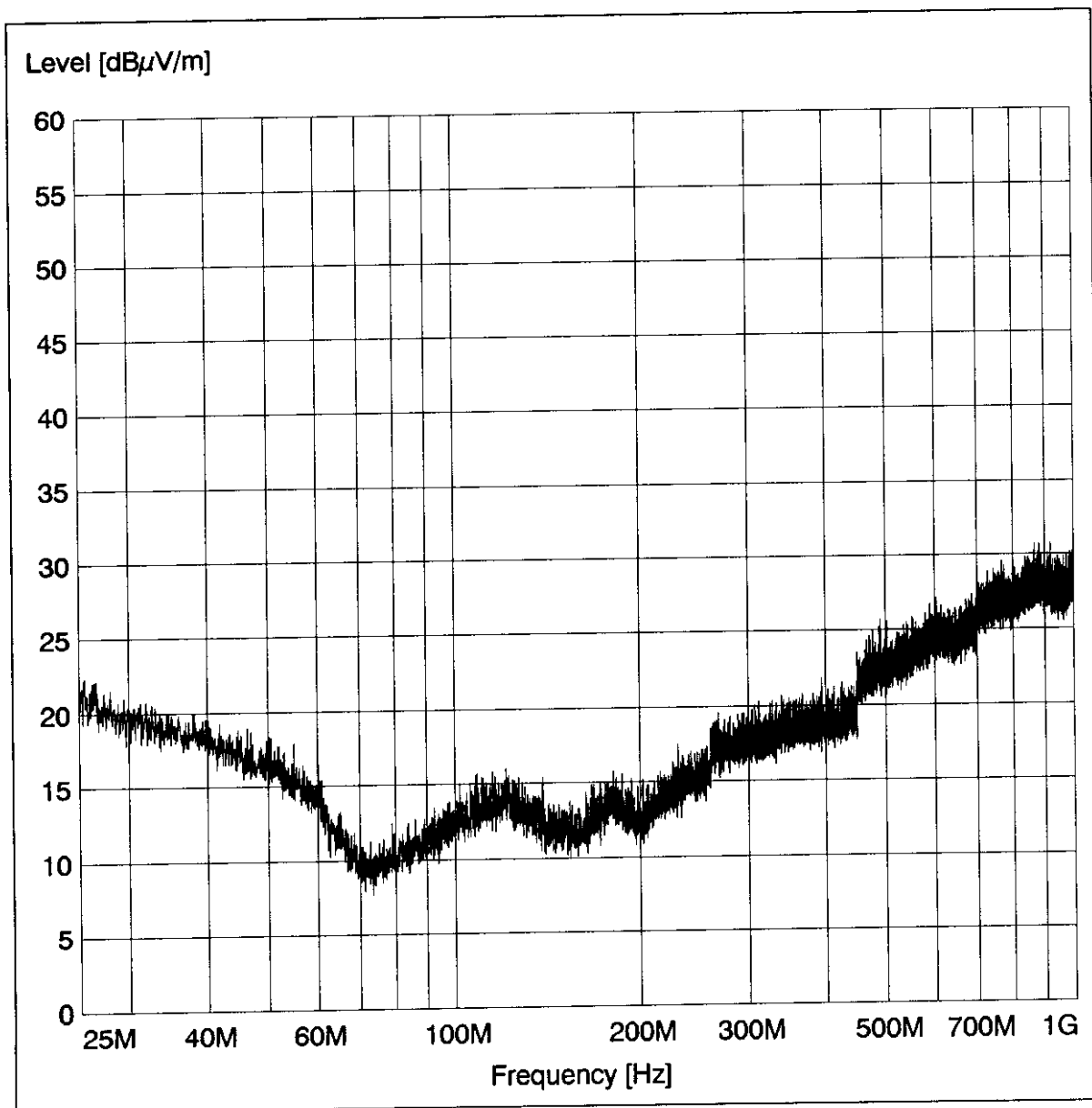
SAGEM - EMC Test laboratory

Equipement sous test: PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 586
Peak Power 1 Watt
Vertical polarisation
3m test in anechoic chamber
Opérateur: J. BOUSQUET
No de compte rendu: CF32/CR-052-03-98



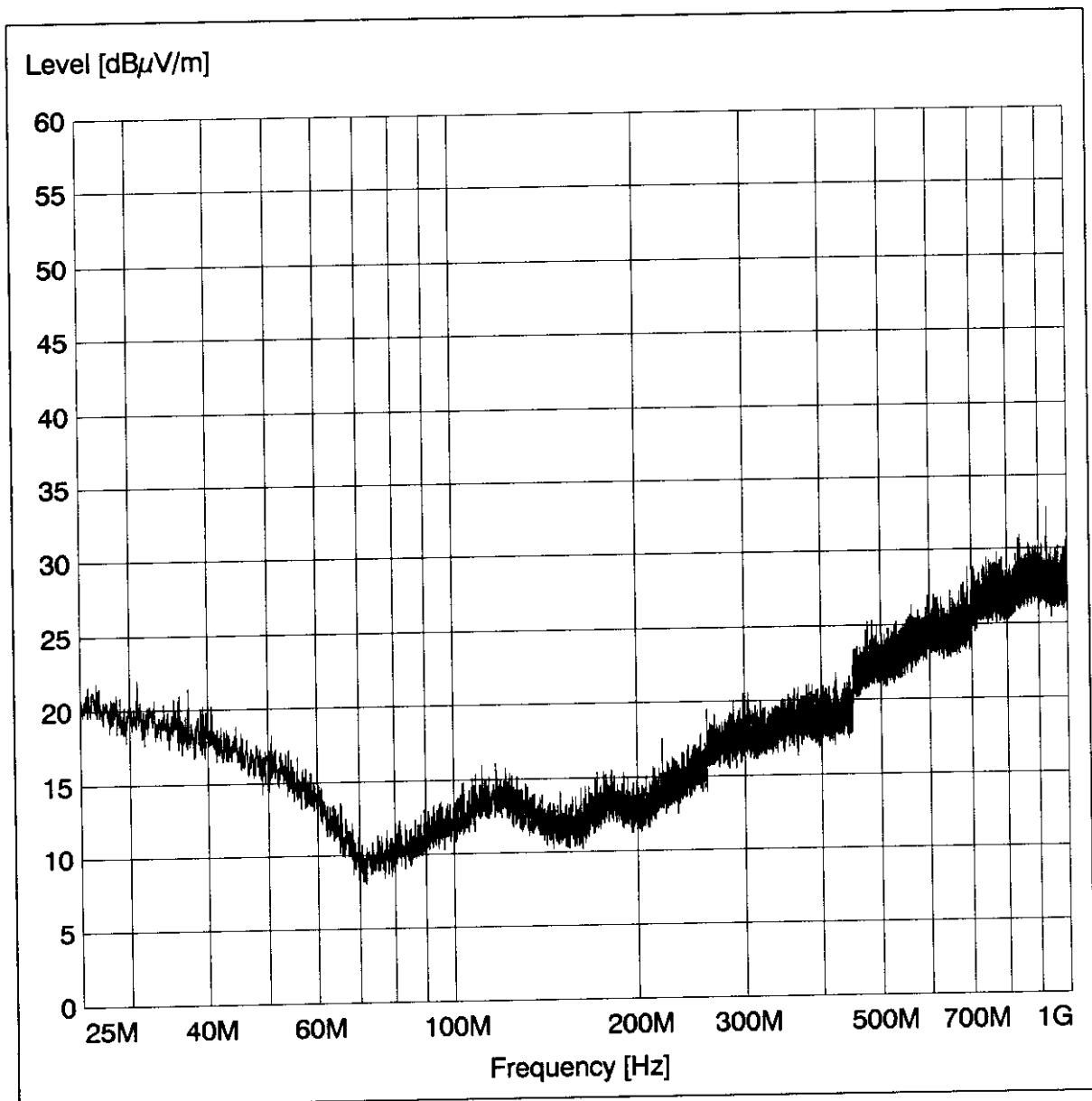
SAGEM - EMC Test laboratory

Équipement sous test: PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 611
Peak Power 1 Watt
Vertical polarisation
3m test in anechoic chamber
Opérateur: J. BOUSQUET
No de compte rendu: CF32/CR-052-03-98

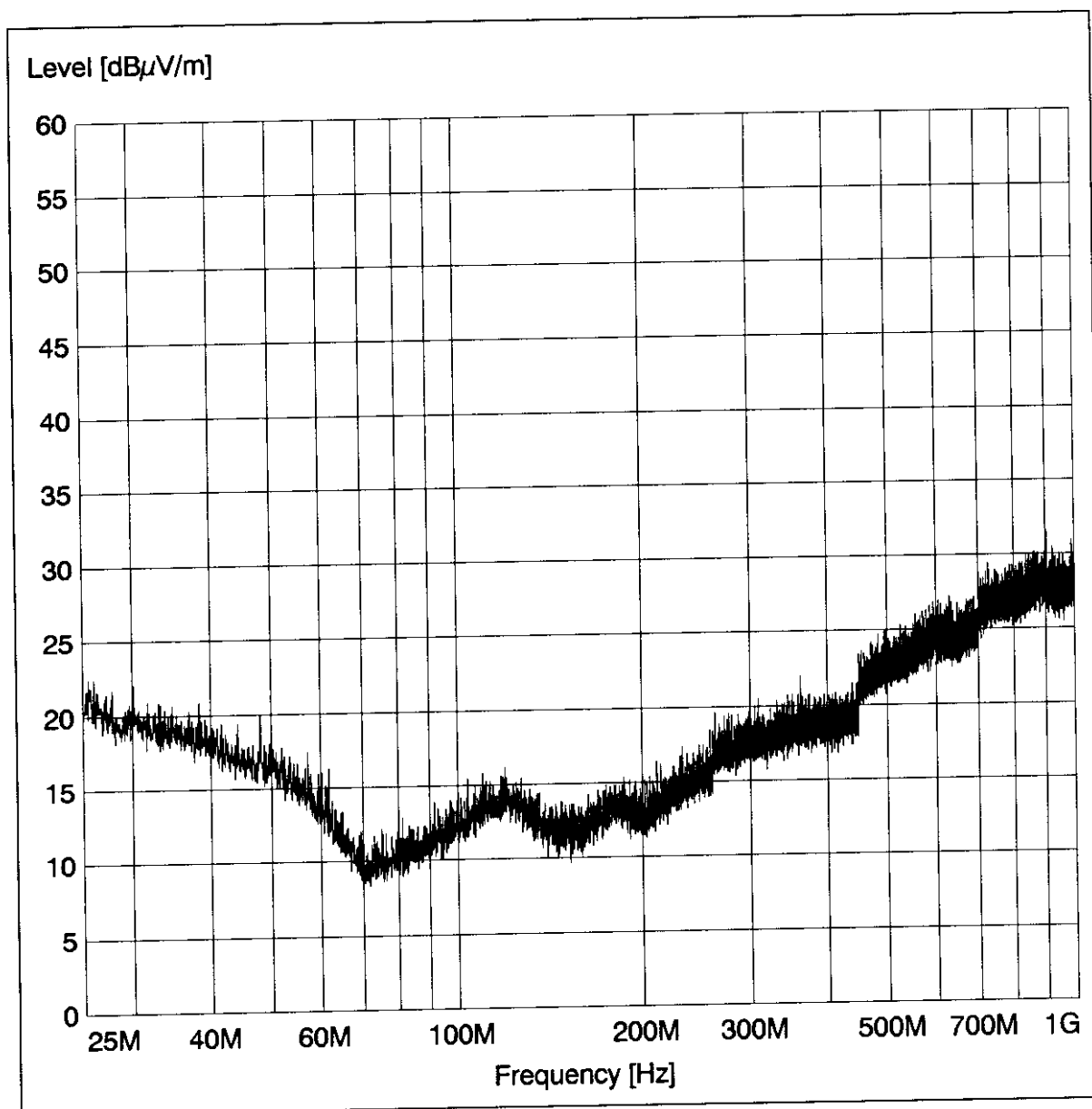


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Équipement sous test: PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 686
Peak Power 1 Watt
Vertical polarisation
3m test in anechoic chamber
Opérateur: J. BOUSQUET
No de compte rendu: CF32/CR-052-03-98

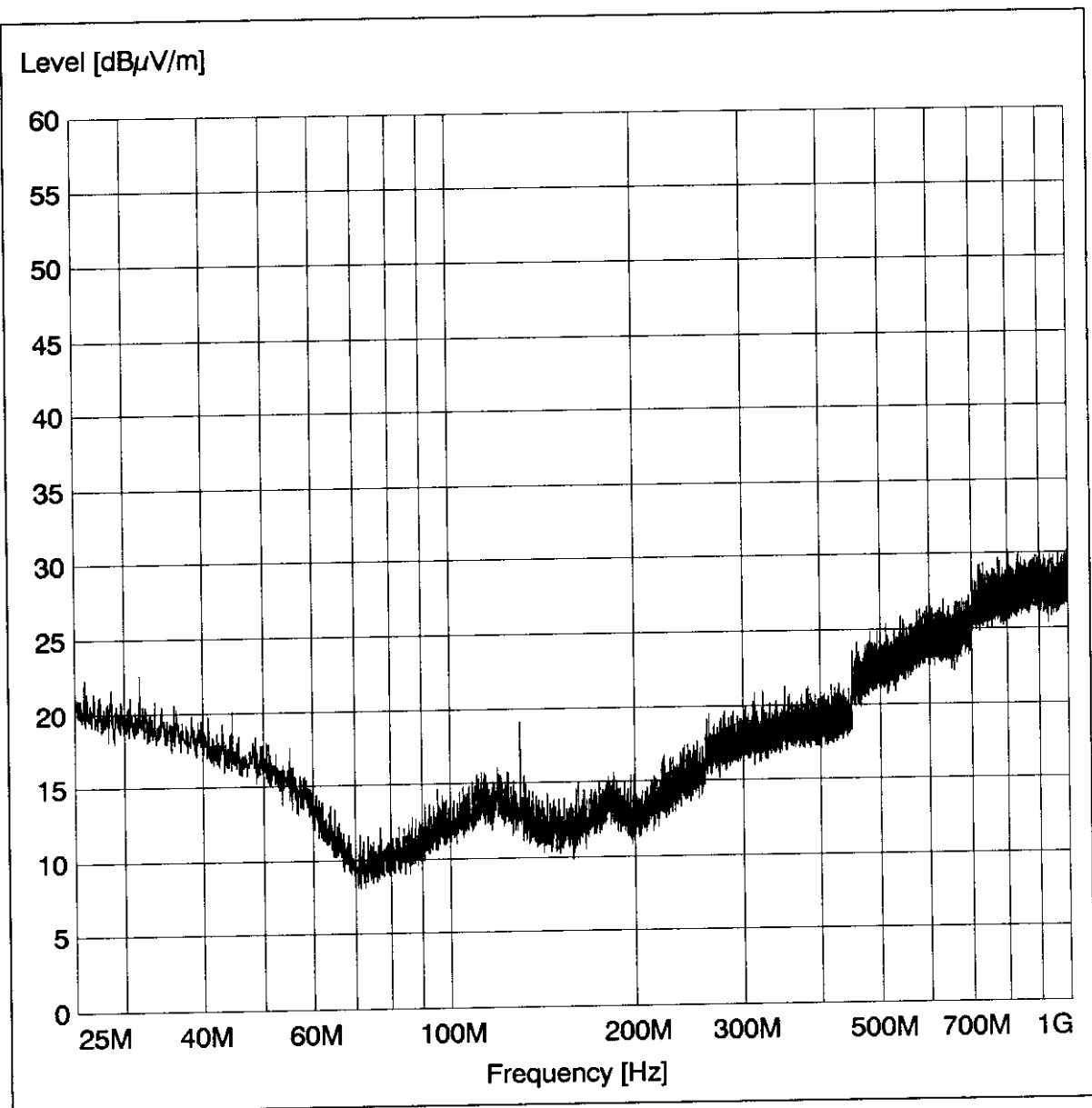


Equipement sous test: PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 711
Peak Power 1 Watt
Vertical polarisation
3m test in anechoic chamber
Opérateur: J. BOUSQUET
No de compte rendu: CF32/CR-052-03-98



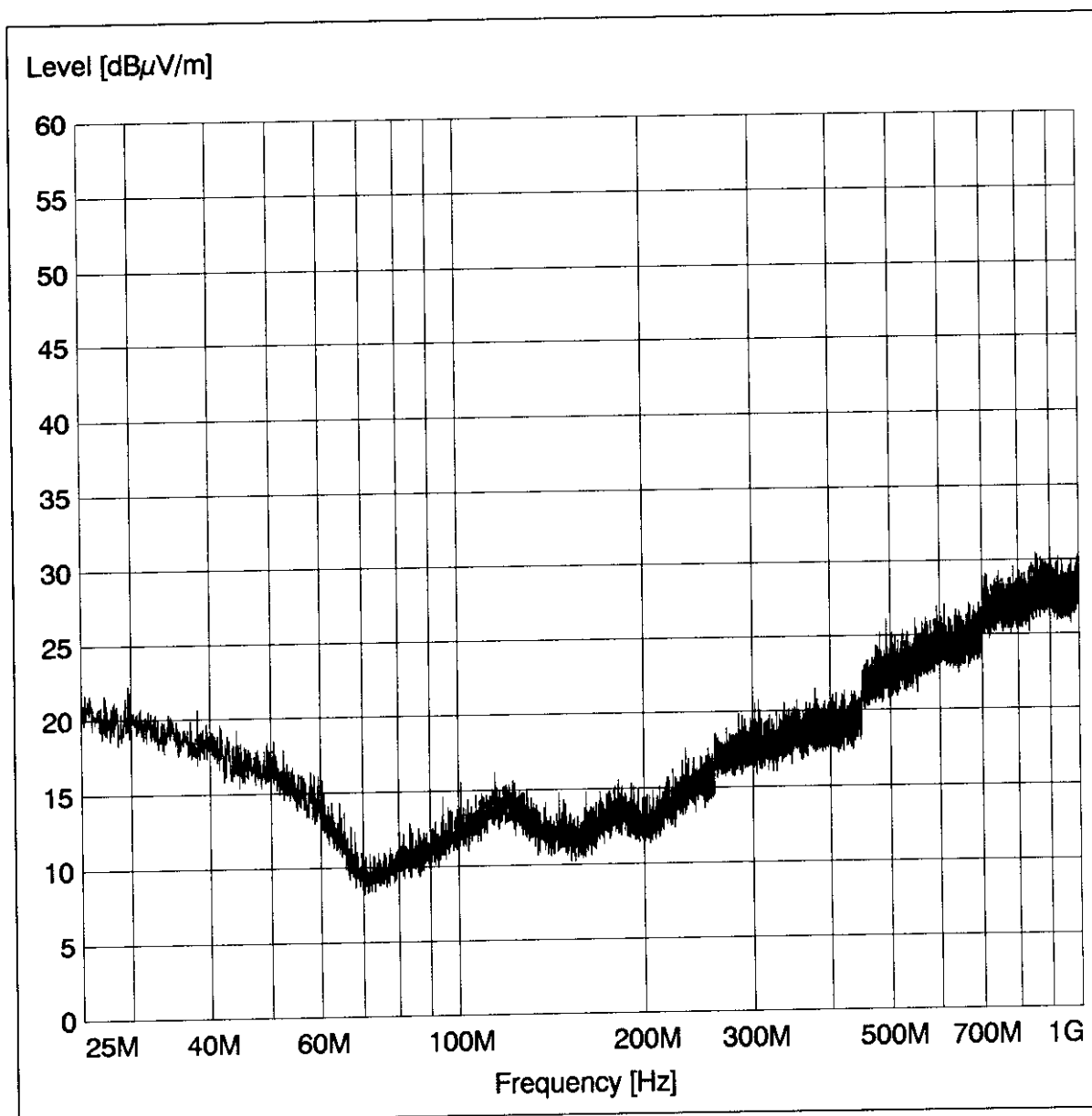
SAGEM - EMC Test laboratory

Equipement sous test: PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 736
Peak Power 1 Watt
Vertical polarisation
3m test in anechoic chamber
Opérateur: J. BOUSQUET
No de compte rendu: CF32/CR-052-03-98



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Equipement sous test: PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 810
Peak Power 1 Watt
Vertical polarisation
3m test in anechoic chamber
Opérateur: J. BOUSQUET
No de compte rendu: CF32/CR-052-03-98



6.1.3.2. Measurement from 1 GHz - 10 GHz.

The measurement results, a summary of the measurement configuration and antenna calibration follow.

We also made a measurement without the PCS handset to get the ambient level of noise for the configuration of test.

SCAN TABLE: "PCS1900"

Unit: dBµV/m

Detector:

Mode:

Curve 1: MaxPeak

ClearWrite

Curve 2: RMS

ClearWrite

Subrange 1:

Start Frequency: 1.0 GHz Step Size: 800.0 kHz
 Stop Frequency: 10.0 GHz
 Measure Time: 10.0 ms
 IF Bandwidth: 1 MHz

Receiver: ESXI Transducer: ANT PAR MTA50-1
 Signal Path: None System Transducer: None
 Meas. Mode: Lin Add. Transd. 1: None
 Tracking Gen.: Off Add. Transd. 2: None
 Input: 2DC Add. Transd. 3: None

Preamplifier: Off Demodulation: FM Broad
 RF Att.: Coupled Volume: 0 %
 Ref. Level: -10.0 dBm Squelch: --
 Min. RF Att.: 0 dB Option: None
 IF Att.: --
 Autorange: On

Curve 1: On Repetition: Single
 Curve 2: Off Stop Mark: Off
 Stop Message: Off
 Stop Message:

TRANSDUCER: "ANT PAR MTA50-1"

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Source Unit: dBµV

Frequency GHz	Correction dBµV/m
1.000000000	25.30
1.500000000	23.50
2.000000000	23.50
2.500000000	23.50
3.000000000	24.40
3.500000000	23.40
4.000000000	24.20
4.500000000	25.70
5.000000000	28.20
5.500000000	29.20
6.000000000	28.90
6.500000000	27.70
7.000000000	28.20
7.500000000	26.70
8.000000000	30.10
8.500000000	28.70
9.000000000	29.60
9.500000000	31.60
10.010000000	26.40

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Equipement : Field measurement without PCS 1900 MHz

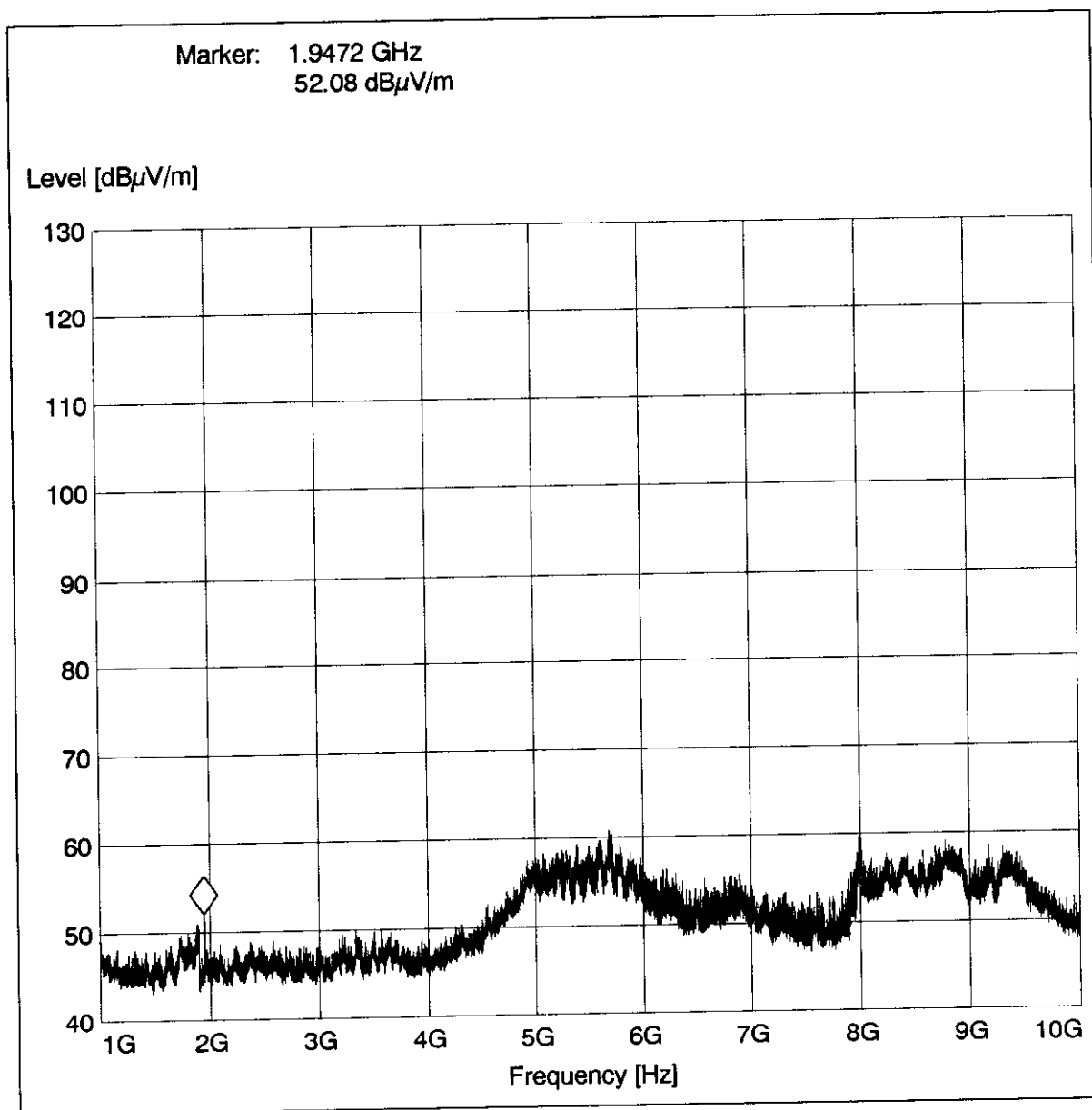
N° de série:

Observations: Ambient Noise Level

: Vertical Polarisation
1m test in anechoic chamber

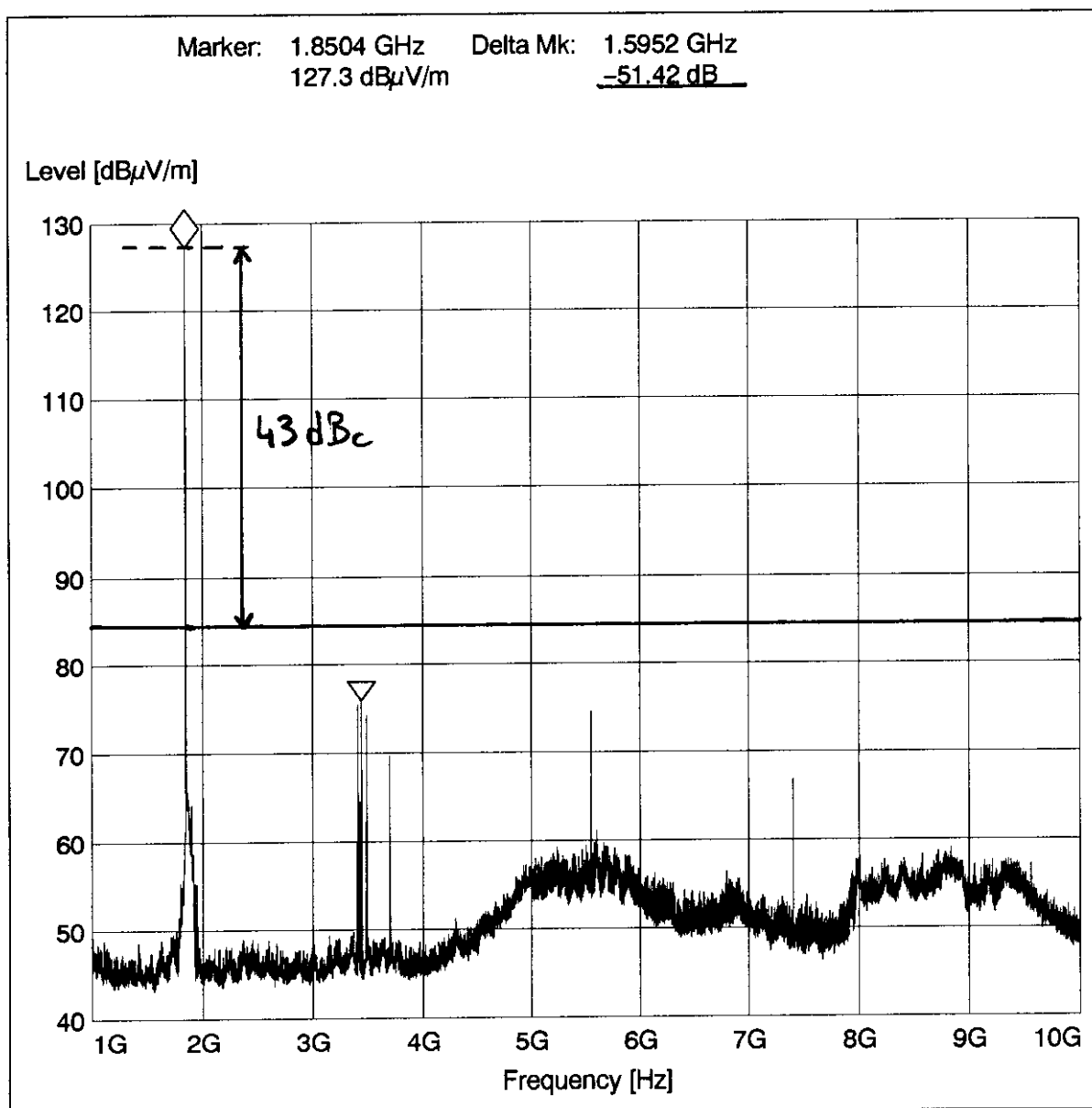
Opérateur: J. BOUSQUET

N° de CR: CF32/CR-052-03-98

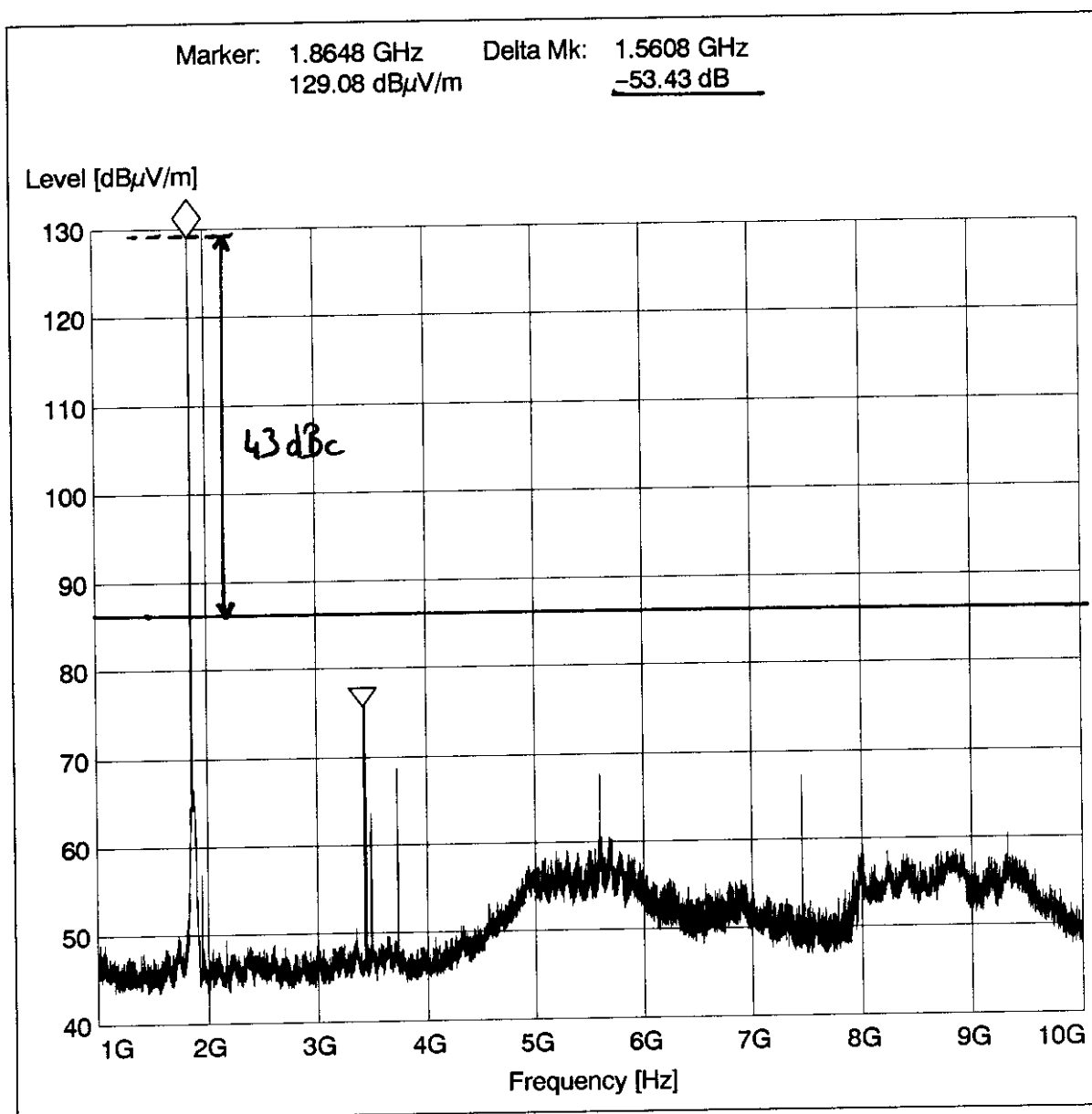


SAGEM - EMC Test laboratory

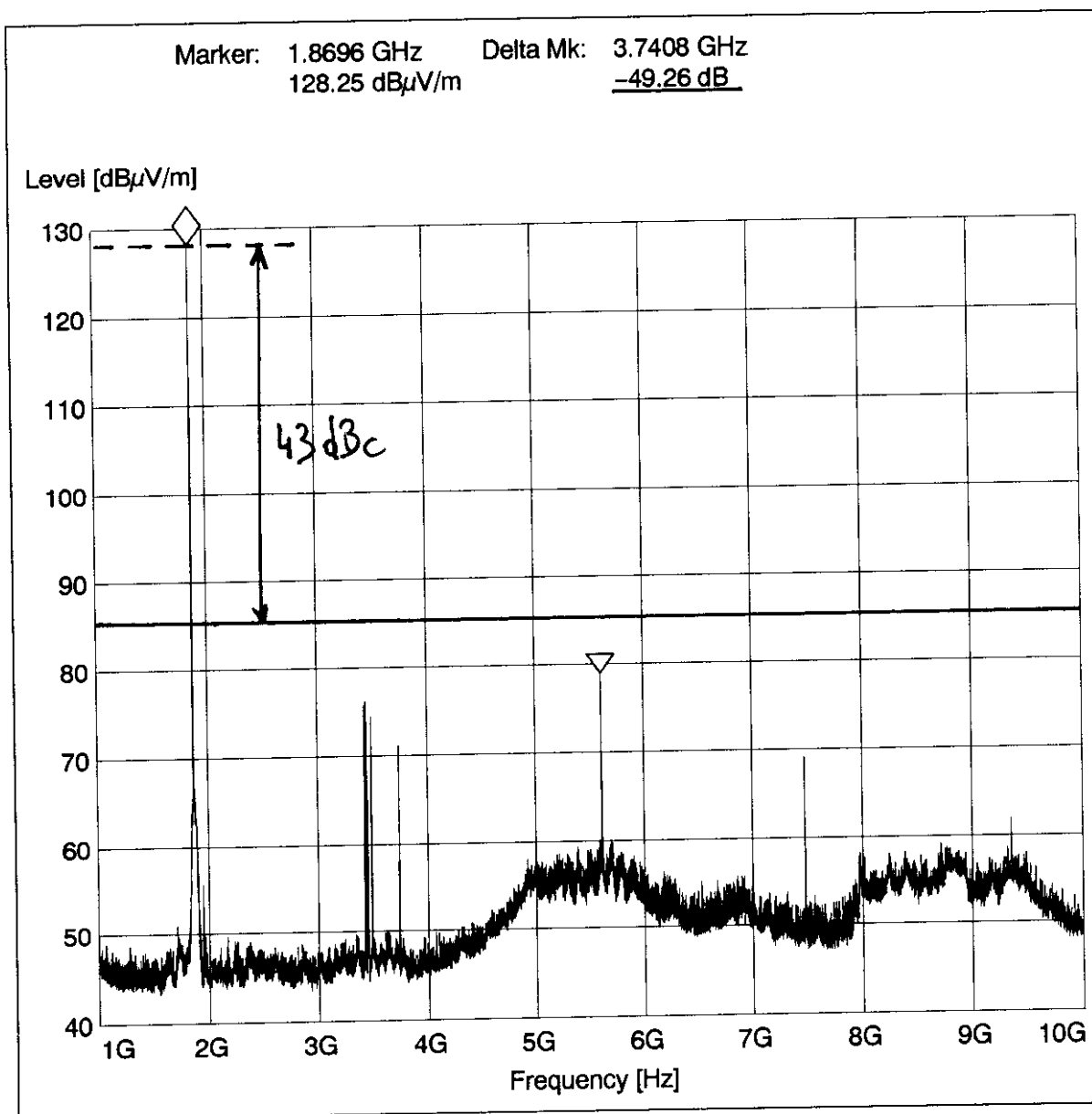
Equipement : PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 512
Peak Power 1 Watt
: Vertical Polarisation
①m test in anechoic chamber
Opérateur: J. BOUSQUET
N° de CR: CF32/CR-052-03-98



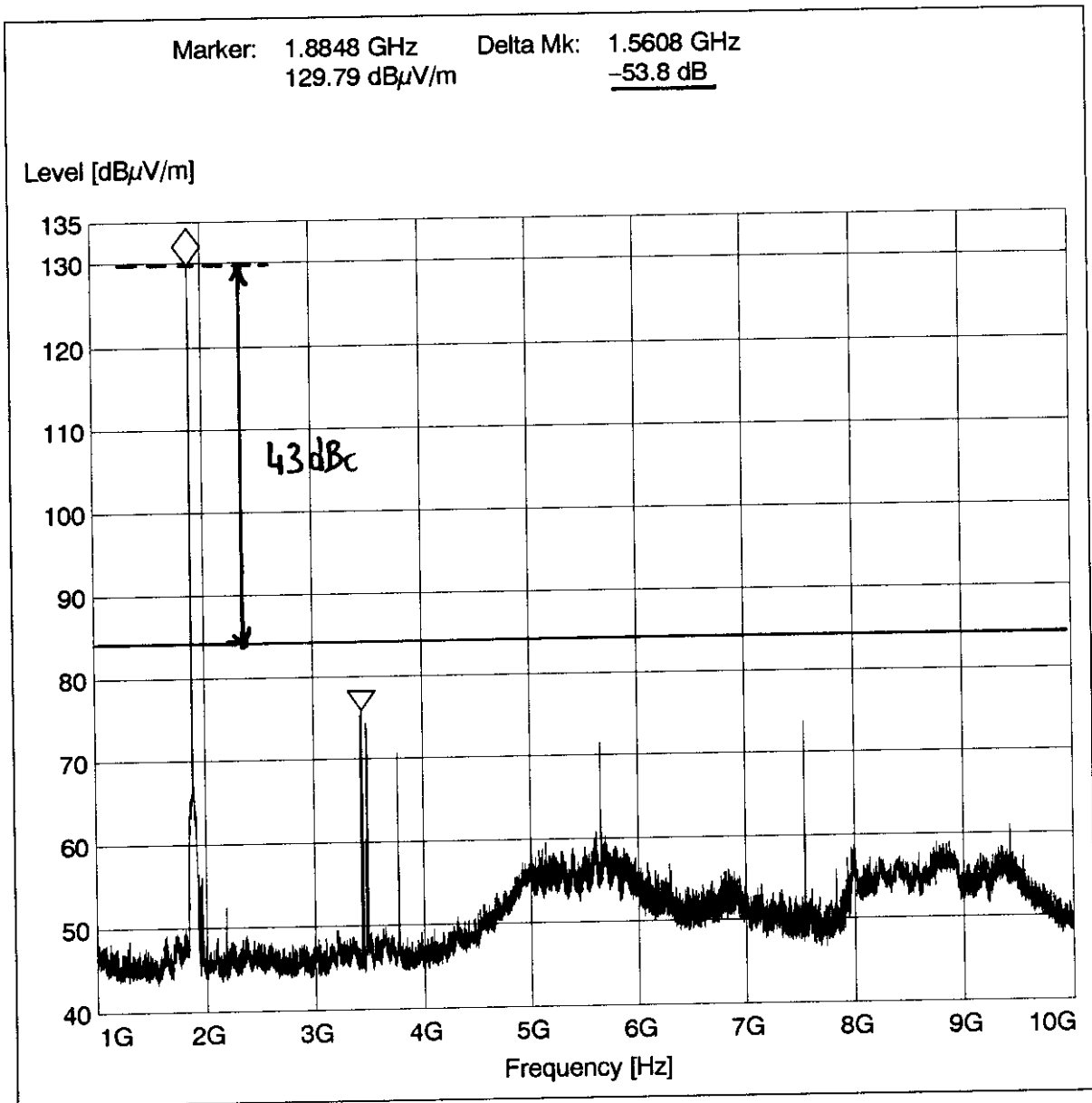
Equipement : PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 586
Peak Power 1 Watt
Vertical Polarisation
in test in anechoic chamber
Opérateur: J. BOUSQUET
N° de CR: CF32/CR-052-03-98



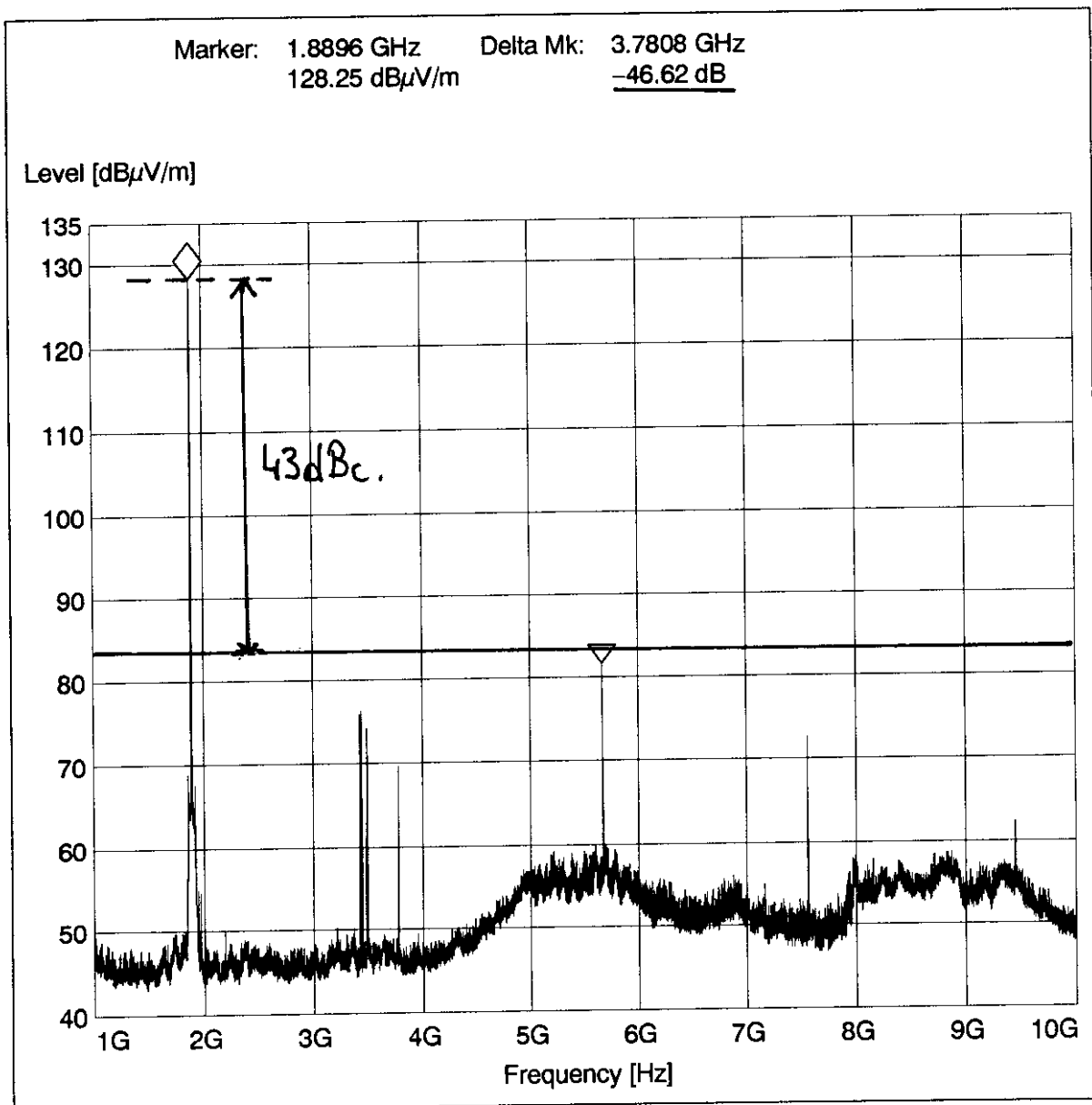
Equipement : PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 611
Peak Power 1 Watt
Vertical Polarisation
1m test in anechoic chamber
Opérateur: J. BOUSQUET
N° de CR: CF32/CR-052-03-98



Equipement : PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 686
Peak Power 1 Watt
Vertical Polarisation
1m test in anechoic chamber
Opérateur: J. BOUSQUET
N° de CR: CF32/CR-052-03-98

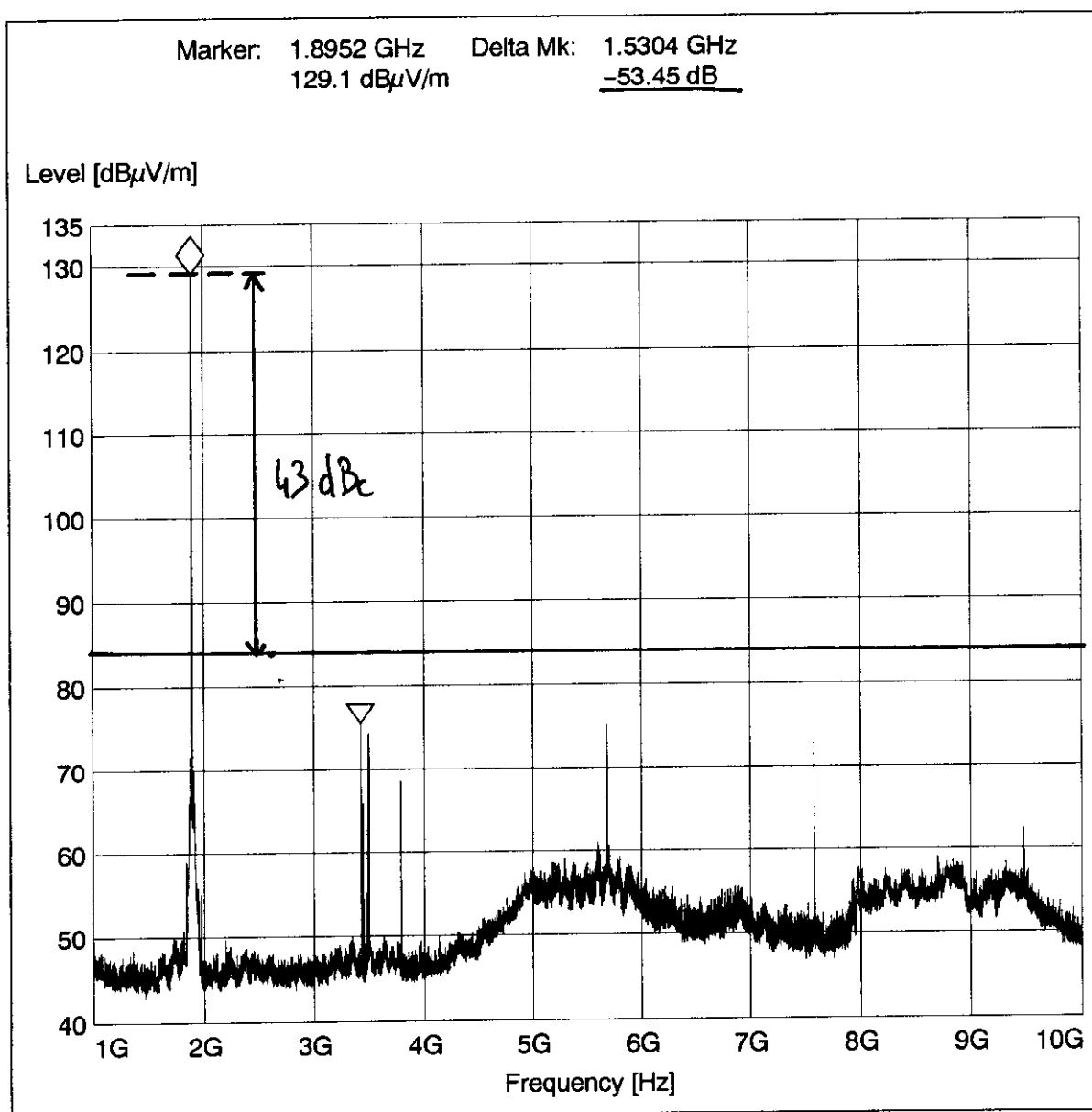


Equipement : PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 711
Peak Power 1 Watt
: Vertical Polarisation
1m test in anechoic chamber
Opérateur: BOUSQUET
N° de CR: CF32/CR-052-03-98

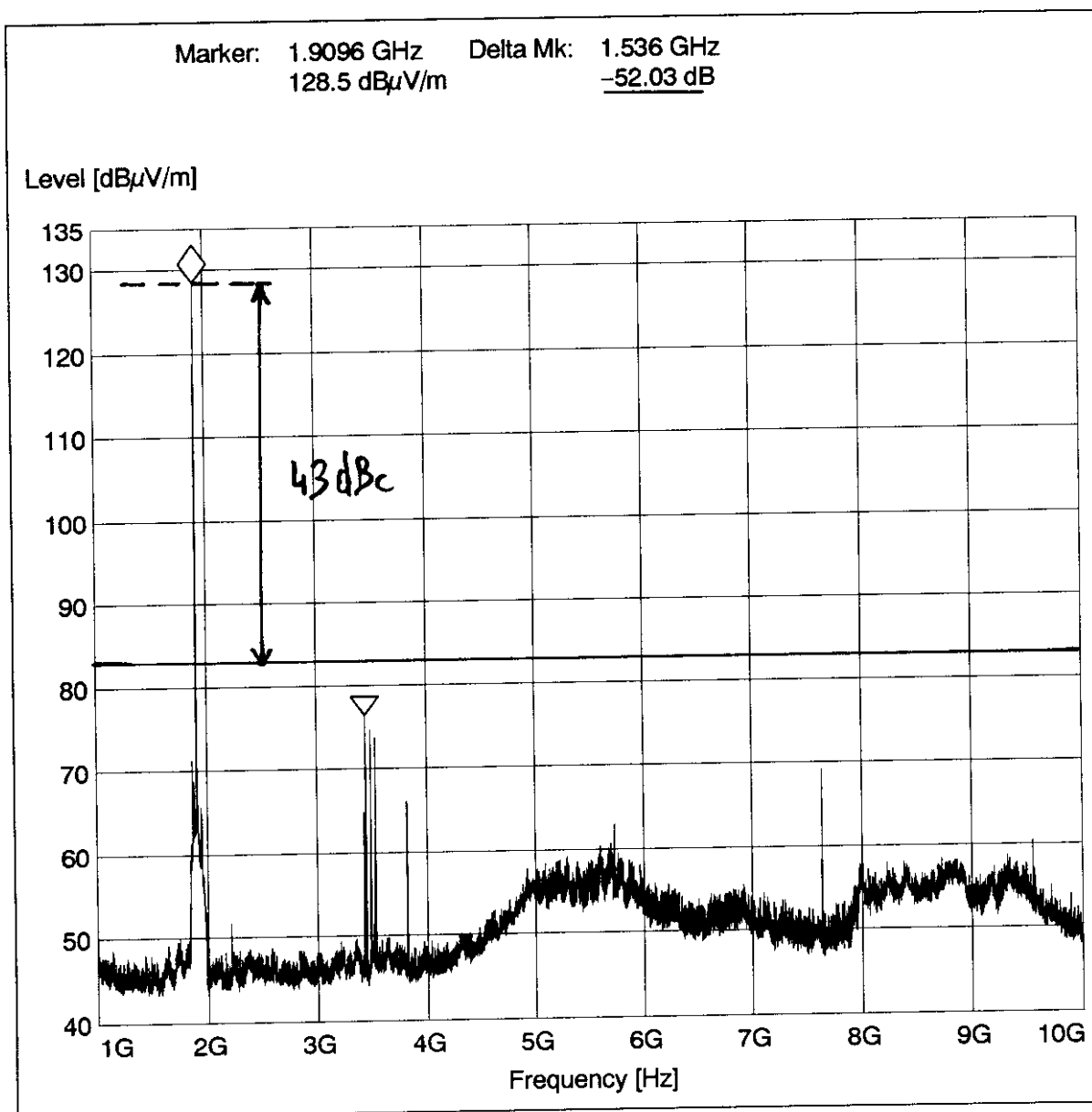


SAGEM - EMC Test laboratory

Equipement : PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 736
Peak Power 1 Watt
Vertical Polarisation
1m test in anechoic chamber
Opérateur: J. BOUSQUET
N° de CR: CF32/CR-052-03-98



Equipement : PCS 1900 MHz - P21 V70
N° de série: 001007950010090
Observations: Channel 810
Peak Power 1 Watt
Vertical Polarisation
1m test in anechoic chamber
Opérateur: J. BOUSQUET
N° de CR: CF32/CR-052-03-98



6.2. TRANSMITTED PEAK POWER.

Transmitted peak power measurement performed at the Laboratoire Central des Industries Electriques (LCIE) on March the 12nd 1998.

Principe of measurement.

The apparatus under test was placed in a shielded anechoic room measuring 11.8 m * 8.1 m * 9.5 m high.

Calibrated horn antenna is mounted on a mast with the same height as the mobile handset (2 m).

The phone is placed on a support which rotates from 0° to 360° by steps of 15° (anti-clockwise rotation).

The phone is measured in two different positions :

1. Handset is vertical.
2. Handset is horizontal.

The distance between the measurement antenna and the phone is 3 meters.

The phone is measured on the three following channels :

- the low channel (channel 512 - 1850.2 MHz),
- the middle channel (channel 661 - 1880.0 MHz),
- and the high channel (channel 810 - 1909.8 MHz).

The output peak power is set to the power Control Level P0 (equivalent to 1 Watt).

The results are shown on a graph for each channel and each position. On the graphs we indicated the limit of 2 Watts EIRP (FCC limit) and the total equivalent radiated power of the phone (to be compared with 1 Watt ERP). The total equivalent radiated power (P_{tot}) is the result of both the equivalent radiated power of the measurement with antenna in horizontal polarisation (P_H) and vertical polarisation (P_V).

$$P_{Tot} = \sqrt{P_H^2 + P_V^2} \text{ avec } P_H, P_V \text{ et } P_{Tot} \text{ in Watts.}$$

The value 0 in the graph corresponds to 1 Watt ERP. The 2 Watts EIRP limit (FCC limit) is 5.15 dB higher :

- 2.15 dB for the gain of the dipole antenna : difference between EIRP and ERP.
- 3 dB for the difference between 1 Watt EIRP and 2 Watts EIRP.

Conclusion.

The maximum transmitted radiated power complies with the FCC limit of 2 Watt EIRP in all the positions.

Configuration

Position of the phone : horizontal

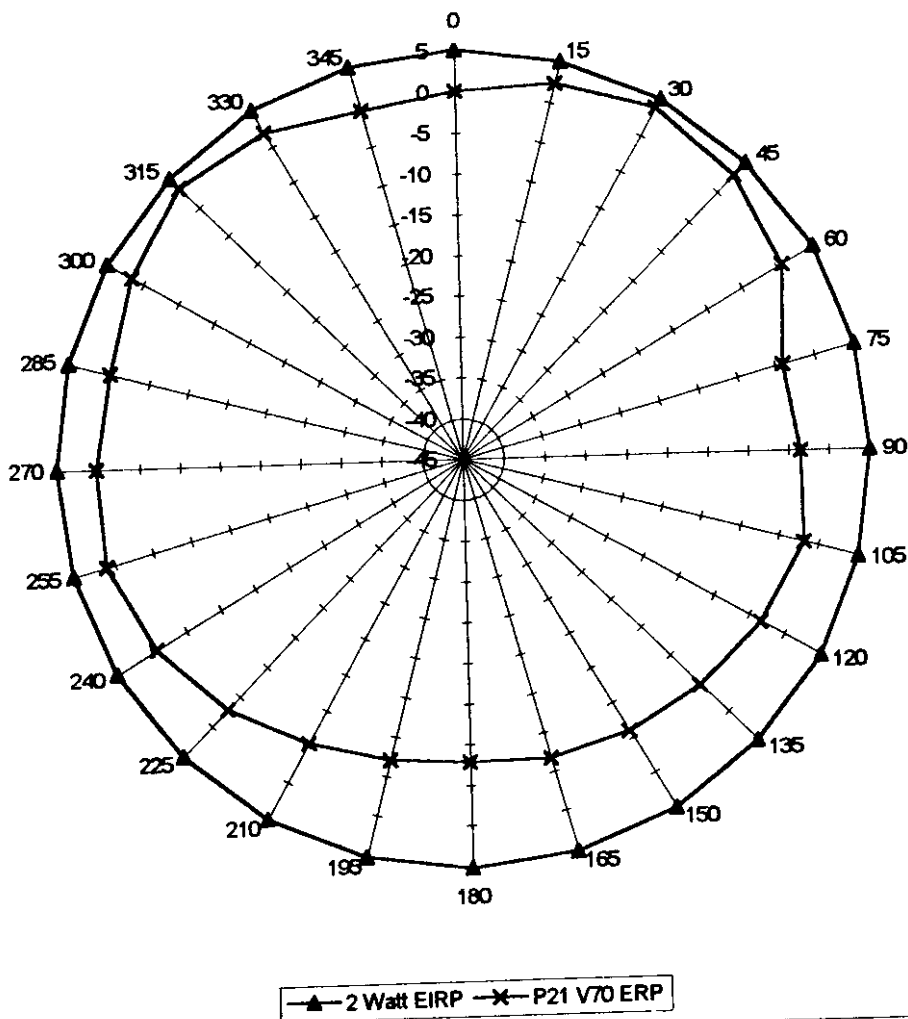
Channel : 512 (1850.2 MHz)

Power Control Level P0 (1 Watt ERP)

Antenna Polarization : Vertical / Horizontal

Distance between antenna and phone : 3 m

**Total equivalent radiated power of P21 V70 phone
Limit 2 Watt EIRP for FCC**



Configuration

Position of the phone : horizontal

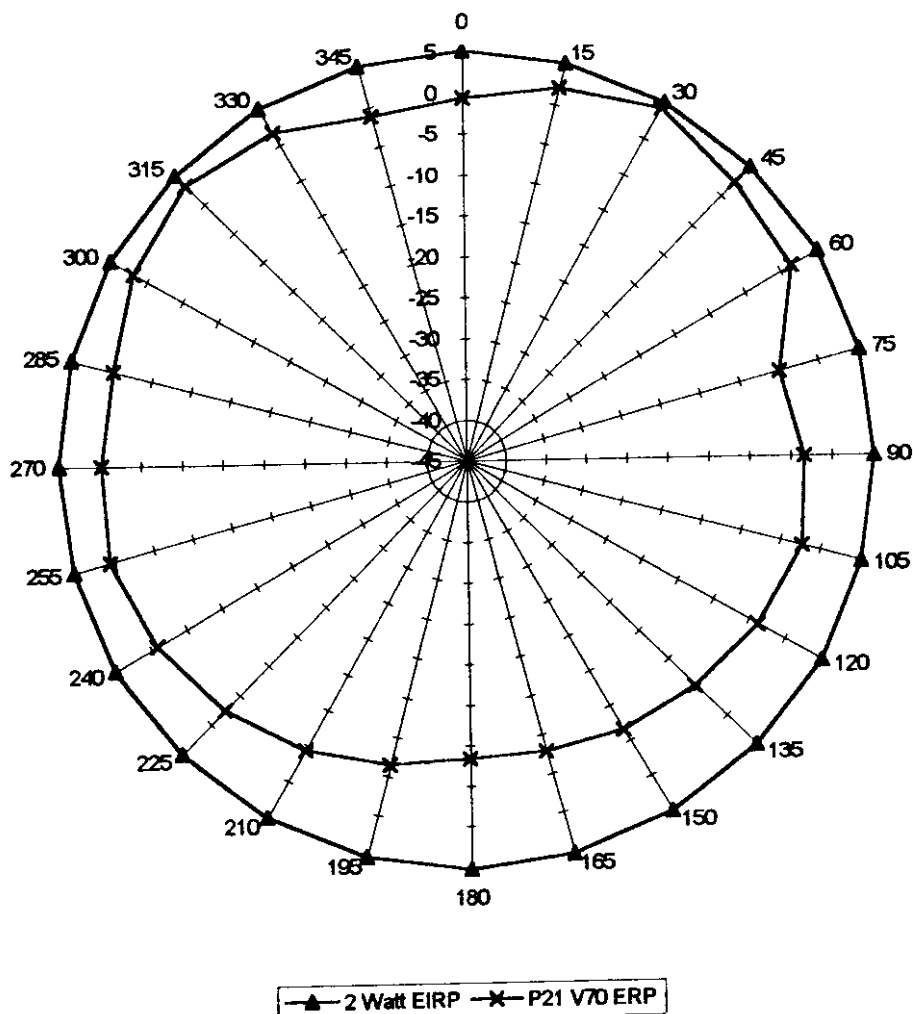
Channel : 861 (1880.0 MHz)

Power Control Level P0 (1 Watt ERP)

Antenna Polarization : Vertical / Horizontal

Distance between antenna and phone : 3 m

Total equivalent radiated power of P21 V70 phone
Limit 2 Watt EIRP for FCC



Configuration

Position of the phone : horizontal

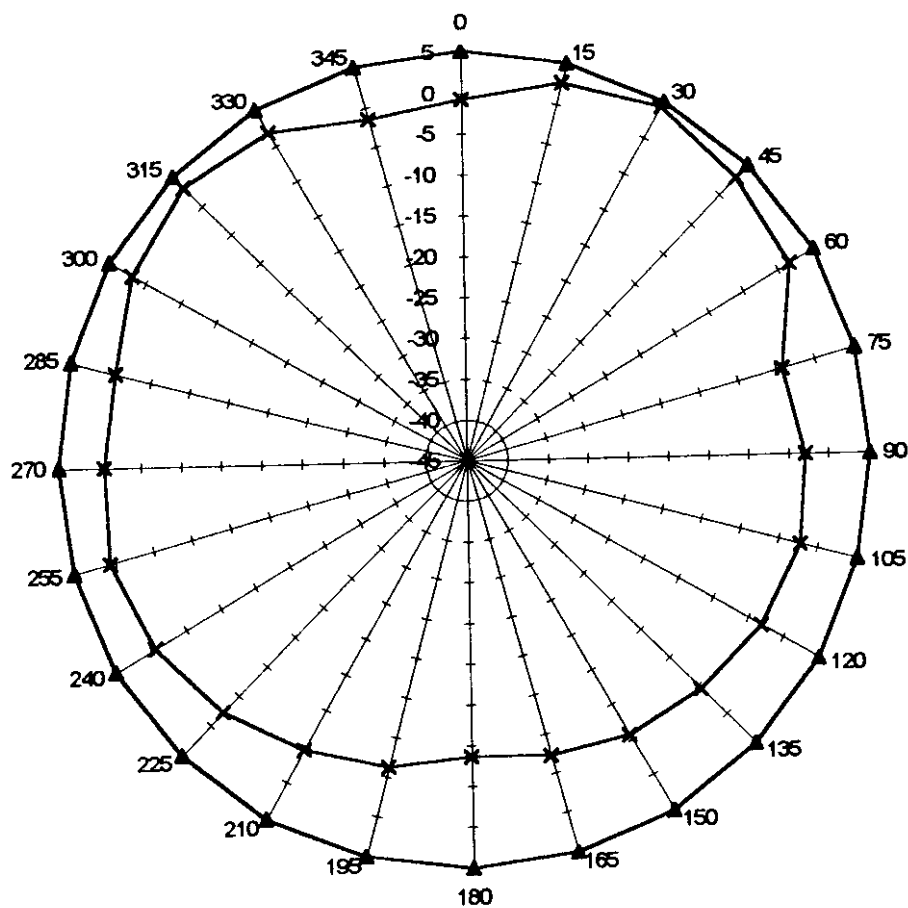
Channel : 810 (1909.8 MHz)

Power Control Level P0 (1 Watt ERP)

Antenna Polarization : Vertical / Horizontal

Distance between antenna and phone : 3 m

**Total equivalent radiated power of P21 V70 phone
Limit 2 Watt EIRP for FCC**



—▲— 2 Watt EIRP —x— P21 V70 ERP

Configuration

Position of the phone : vertical

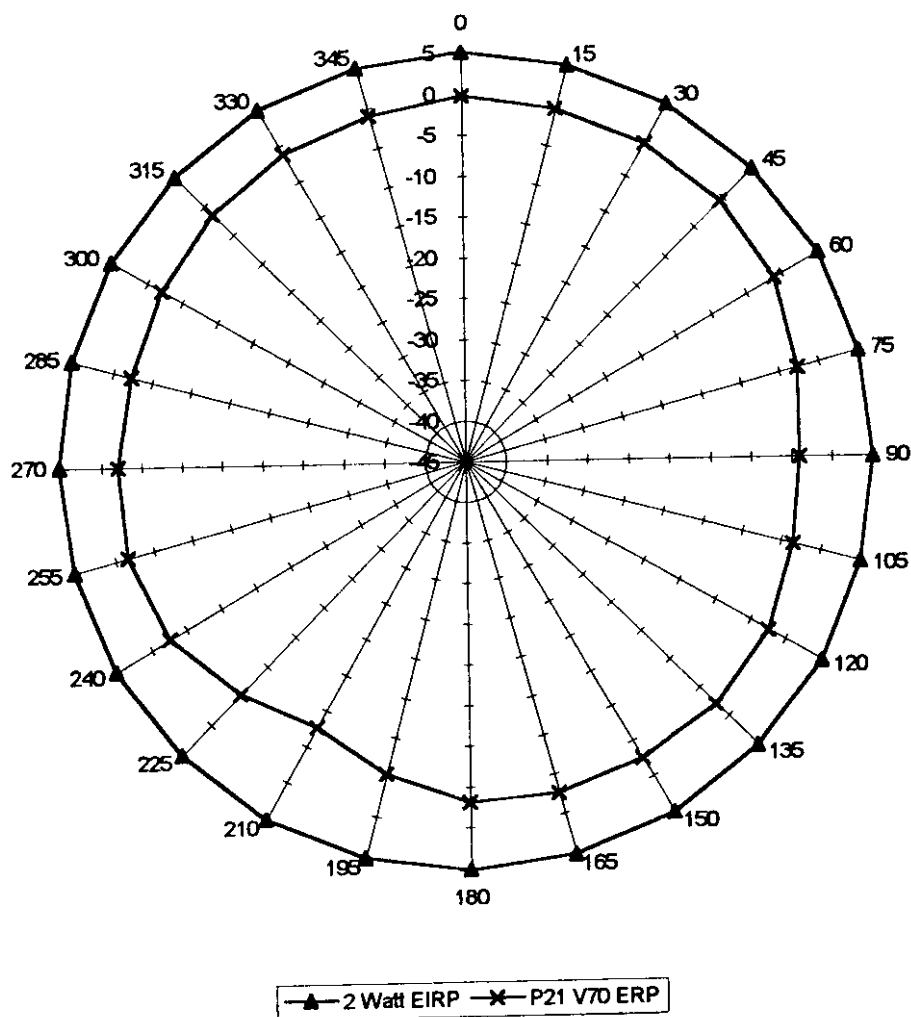
Channel : 512 (1850.2 MHz)

Power Control Level P0 (1 Watt ERP)

Antenna Polarization : Vertical / Horizontal

Distance between antenna and phone : 3 m

**Total equivalent radiated power of P21 V70 phone
Limit 2 Watt EIRP for FCC**



Configuration

Position of the phone : vertical

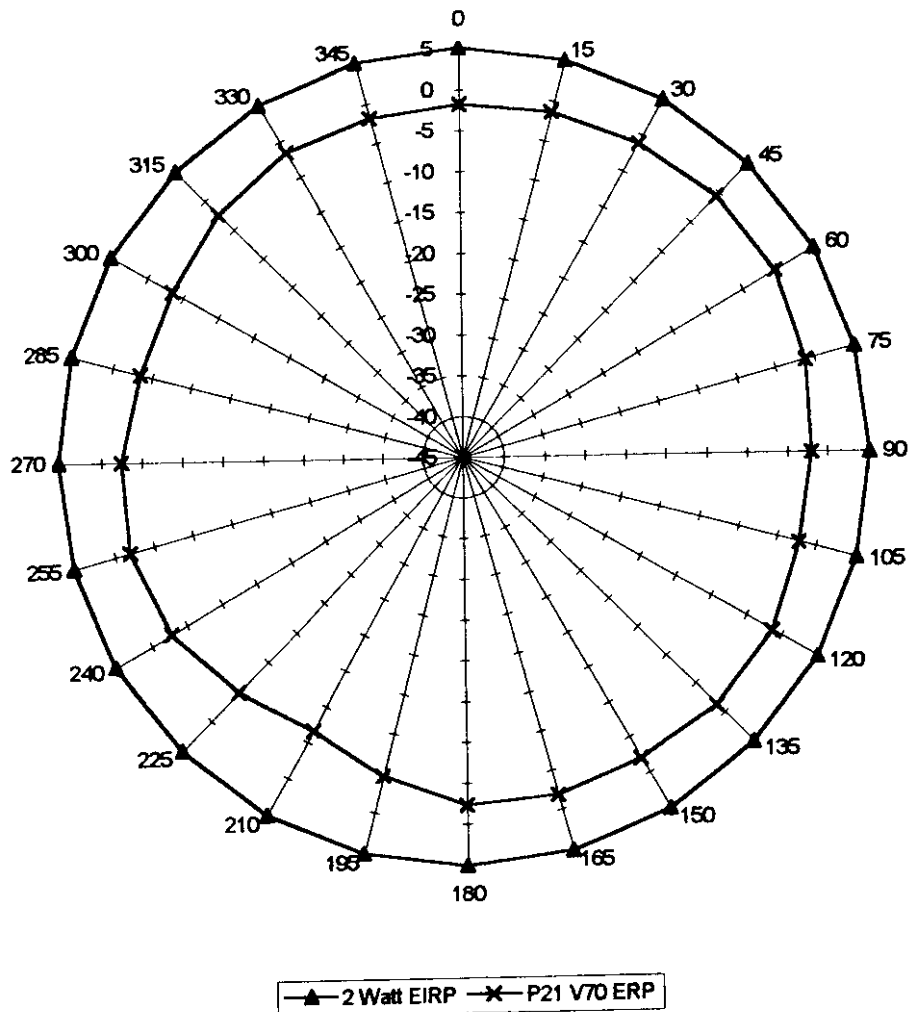
Channel : 861 (1880.0 MHz)

Power Control Level P0 (1 Watt ERP)

Antenna Polarization : Vertical / Horizontal

Distance between antenna and phone : 3 m

**Total equivalent radiated power of P21 V70 phone
Limit 2 Watt EIRP for FCC**



Configuration

Position of the phone : vertical

Channel : 810 (1909.8 MHz)

Power Control Level P0 (1 Watt ERP)

Antenna Polarization : Vertical / Horizontal

Distance between antenna and phone : 3 m

**Total equivalent radiated power of P21 V70 phone
Limit 2 Watt EIRP for FCC**

