Recognized by the
Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: 3463 (IC)
TCB ID: BE 0012

Accredited by the
German Accreditation Council
DAR–Registration Number
DAT–P-176/94-D1

Independent ETSI
compliance test house

Accredited Bluetooth® Test Facility (BQTF)

Test report no.	**:**	**4-1607-20-10/05**
Applicant	**:**	**SAGEM Communication**
Type	**:**	**B2005+ outdoor**
Test Standard	**:**	**FCC Part 15.247 / Canada RSS-210**
FCC ID	**:**	**M9HB2005BO**
Reg. No. IC	**:**	

Table of contents

1. ADMINISTRATIVE DATA 3

1.1. ADMINISTRATIVE DATA OF THE TEST FACILITY 3
1.1.1 Identification of the testing laboratory 3
1.1.2 Organizational items 3
1.1.3 Applicant´s details 4
1.2 ADMINISTRATIVE DATA OF MANUFACTURER / MEMBER 4
1.3 DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT) 5
1.3.1 EUT: Type, S/N etc. 5
1.3.2 If RF component testing only, describtion of additional used HW/SW 5
1.3.3 Additional EUT information For IC Canada (appendix 2) 6
1.3.4 EUT operating modes 7
1.3.5 Extreme conditions testing values 7

2. TESTSTANDARD & SUMMARY LIST OF ALL PERFORMED TEST CASES 8

3. RF MEASUREMENT TESTING 9

3.1 DESCRIPTION OF TEST SET-UP 9
3.1.1 Radiated measurements 9
3.1.2 Conducted measurements 9
3.2 REFERENCED DOCUMENTS 10
3.3 ADDITIONAL COMMENTS 10
3.4 ANTENNA GAIN 10
3.5 MAX. PEAK OUTPUT POWER (RADIATED) § 15.247 (B) (1) 11
3.6 BAND-EDGE COMPLIANCE OF RADIATED EMISSIONS §15.205 12
3.7 SPURIOUS EMISSIONS > 30 MHZ- RADIATED (TRANSMITTER) § 15.247 (C) (1) 16
3.8 SPURIOUS EMISSIONS - RADIATED (RECEIVER) § 15.109 21
3.9 SPURIOUS EMISSIONS < 30 MHZ - TRANSMITTER RADIATED § 15.209 23

3 PHOTOGRAPHS OF TEST SET-UP 26

4 PHOTOGRAPHS OF THE EUT 28

ANNEX 1: TECHNICAL PRODUCT DESCRIPTION

1. Administrative data

1.1. Administrative data of the test facility

1.1.1 Identification of the testing laboratory

Company name:	Cetecom ICT Services GmbH
Address:	Untertürkheimerstr. 6-10 D-66117 Saarbruecken Germany
Laboratory accreditation:	DAR-Registration No. DAT–P-176/94-D1 Bluetooth Qualification Test Facility (BQTF)
Responsible for testing laboratory:	Harro Ames / Dirk Hausknecht Phone: +49 681 598 0 Fax: +49 681 598 9075 email: info@ict.cetecom.de

..... / .....
Responsible for testing laboratory
(Harro Ames / Dirk Hausknecht)

1.1.2 Organizational items

Reference No.:	4-1607-20-10/05
Order No.:	
Responsible for test report and project leader:	Harro Ames / Dirk Hausknecht
Receipt of EUT:	2005-08-23
Date(s) of test:	2005-08-24 to 2005-08-25
Date of report:	2005-08-24
Number of report pages:	36
Number of diagram pages (annex):	
Version of template: 1.8	

..... / .....
Responsible for test report
(Harro Ames / Dirk Hausknecht)

Note:
The test results of this test report relate exclusively to the item tested as specified in this report. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

During the test no hardware and software changes are allowed to be performed at the EUT.

1.1.3 Applicant´s details

Applicant´s name:	SAGEM Communication
Address:	2, rue du Petit Albi 95800 Cergy Saint-Christophe France
Contact person:	Mr. Jean Marquet Phone: +33 1 58 11 91 72 Fax: +33 1 58 11 14 11 email: jean.marquet@sagem.com

1.2 Administrative data of manufacturer / member

Manufacturer´s name:	see 1.1.3
Address:	

1.3 Description of the Equipment under test (EUT)

1.3.1 EUT: Type, S/N etc.

Product name	Product ID	Description	S/N serial number	HW hardware status	SW software status
B2005+ outdoor	B2005+ outdoor	Triband 900/1800/1900 mobile phone with *Bluetooth*	356700000103 4-2	V0x	L 5,4E L 5,4F
Frequency Band [MHz]	**Type of Modulation**	**Number of channels**	**Antenna**	**Power Supply**	**Temperature Range**
ISM 2400 – 2483.5	FHSS	79	integral	LiIon Battery	-10°C to +55°C

Max. power radiated: - 0.20 dBm EIRP
Max. power conducted: +2.67 dBm

FCC ID: M9HB2005BO
IC: --

Remark: **B2005+, B2005a+ and B2005+ outdoor use the same Bluetooth RF module. Therefore only radiated tests were performed**
For conducted Results see test report 4-1607-16-5/05

1.3.2 If RF component testing only, describtion of additional used HW/SW

	Product name	Product ID	Description	S/N serial number	HW hardware status	SW software status
1						
2						
3						
4						

1.3.3 Additional EUT information For IC Canada (appendix 2)

not applicable

1.3.4 EUT operating modes

EUT operating mode no.*)	Description of operating modes	Additional information
Op. 0	Normal mode	Normal temperature and power source conditions
Op. 1		low temperature, low power source conditions
Op. 2		low temperature, high power source conditions
Op. 3		high temperature, low power source conditions
Op. 4		high temperature, high power source conditions

*) EUT operating mode no. is used to simplify the testplan

1.3.5 Extreme conditions testing values

Description	Shortcut	Unit	Value
Nominal Temperature / humidity	T_{nom}	°C / %	20 / 40
Nominal Power Source	V_{nom}	V	3,90
Type of powersource: V DC			

Deviations from this values are reported in chapter 2

2. Teststandard & summary list of all performed test cases

TC identifier	Description	verdict	date	Remark
RF-Testing	FCC Part 15 §15.247 - CANADA RSS-210	PASS	2005-08-24	---

Test Specification Clause	Test Case	Pass	Fail	Not applicable	Not performed
None	Antenna Gain	Yes			
§15.247(a1)	Carrier frequency separation				Yes
§15.247(a1)	Number of hopping channels				Yes
§15.247(a1 iii)	Time of occupancy (dwell time)				Yes
§15.247(e)	Power Spectral density (Hybrid system in Inquiry mode/Page scan)				Yes
§15.247(a1)	Spectrum Bandwidth of a FHSS System / 20dB Bandwith				Yes
§ 15.247 (b) (1)	Maximum output power (conducted)				Yes
§ 15.247 (b) (1)	Max. peak output power (radiated)	Yes			
§15.247 (d)	Band-edge compliance of conducted emissions				Yes
§15.205	Band-edge compliance of radiated emissions	Yes			
§ 15.247 (d)	Spurious Emission - conducted (Transmitter)				Yes
§ 15.247 (d)	Spurious Emission - radiated (Transmitter) >30 MHz	Yes			
§ 15.109	Spurious Emissions - radiated (Receiver)	Yes			
§ 15.209	Spurious Emissions - radiated (Transmitter) <30 MHz	Yes			
§ 15.107/207	Conducted Emissions <30 MHz				Yes

3. RF measurement testing

3.1 Description of test set-up

3.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform with specifications ANSI C63.2-1987 clause 15 and ANSI C63.4-2003 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-2003 clause 4.2.

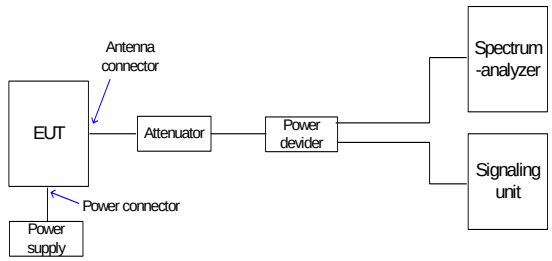
Antennas are conform with ANSI C63.2-1996 item 15.
150 kHz - 30 MHz: Quasi Peak measurement, 9kHz Bandwidth, passive loop antenna.
30 MHz - 200 MHz: Quasi Peak measurement, 120KHz Bandwidth, biconical antenna
200MHz - 1GHz: Quasi Peak measurement, 120KHz Bandwidth, log periodic antenna
1GHz: Average, RBW 1MHz, VBW 10 MHz, waveguide horn

All measurements are done in accordance with the Filing and Measurement Guidelimes for Frequency Hopping Spread Spectrum Systems DA 00-705 and Appendix A “BLUETOOTH APPROVALS”

The EUT is powered by an external power supply with nominal voltage. The signaling is performed from outside the chamber with a signaling unit (CMU200 or other) by airlink using signaling antenna.

3.1.2 Conducted measurements

The EUT´s RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). One of the signal path is connected to the communication base Station (CMU200 or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measuerment readings on the signaling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signaling unit and the spectrum analyzer are impedance matched on 50 Ohm.



3.2 Referenced documents

none

3.3 Additional comments

Hardware / software changes during testing (only for pretesting)

Setup revision	Description of change	Change referenced to setup revision	Already perf. testcases influenced yes (reapeted) / no
1.0	Start setup	-	-

3.4 Antenna gain

The antenna gain of the complete system is calculated by the difference of conducted power of the module and the radiated power in EIRP.

	low channel	mid channel	high channel
Conducted power [dBm]	2.67	1.02	-0.59
Radiated power [dBm]	-1.70	-1.60	-0.20
Gain [dB]	-4.37	-2.62	0.39

3.5 Max. peak output power (radiated) § 15.247 (b) (1)

Results:

Test conditions		Max. peak output power EIRP [dBm]		
Frequency [MHz]		2402	2442	2480
T_{nom}	V_{nom}	-1.70	-1.60	-0,20
Measurement uncertainty		±3dB		

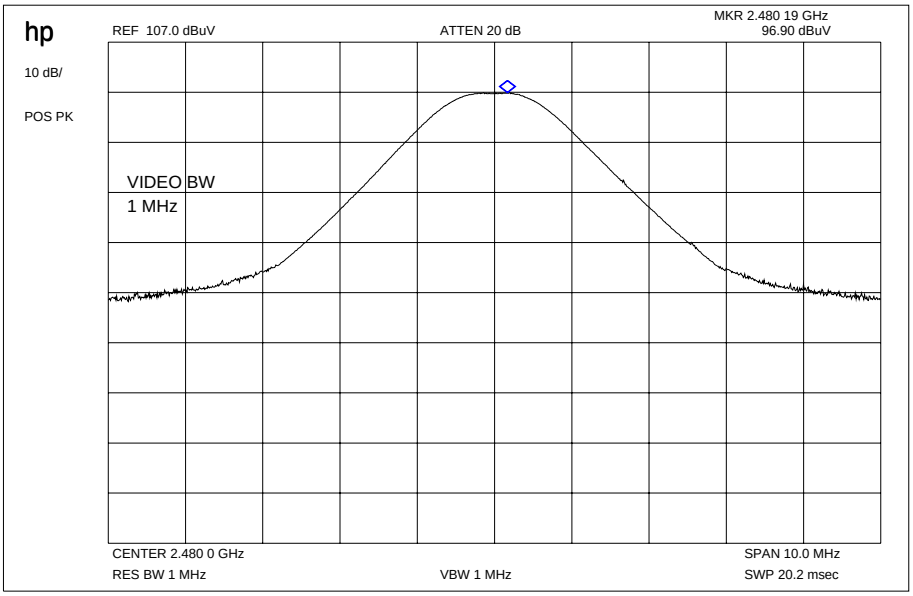
RBW / VBW : 3 MHz
Measured at a distance of 3m

Limits:

Under normal test conditions only, for frequency range 2400-2483.5 MHz	Max. 1.0 Watt

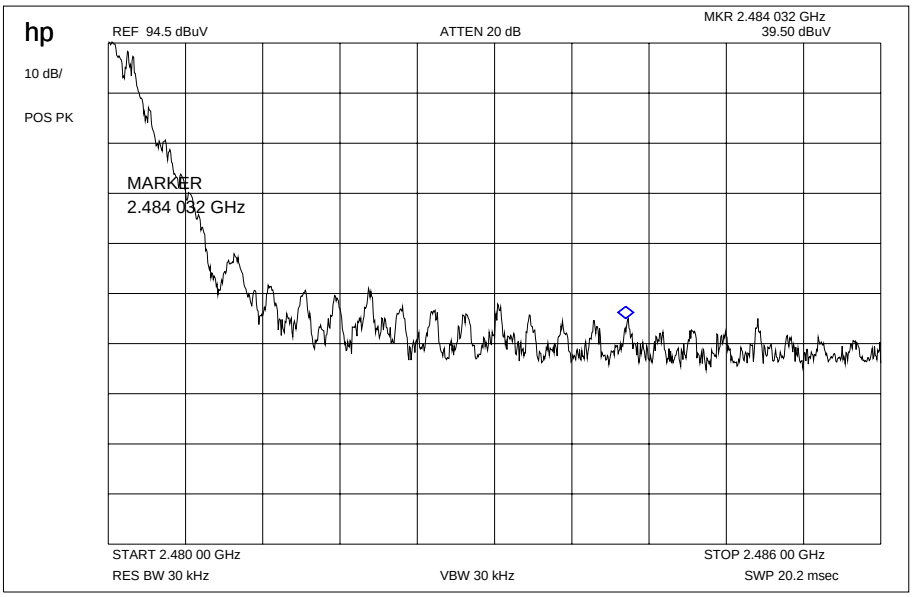
3.6 Band-edge compliance of radiated emissions §15.205

Plot 1 : Max field strength in 3m distance (single frequency)



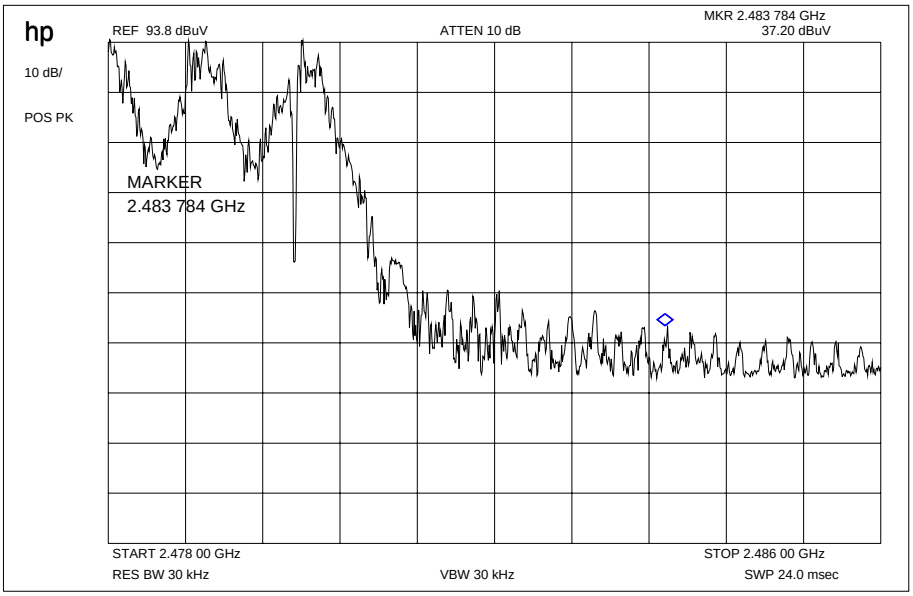
Result: 96.9 dBµV/m

Plot 2: Marker-Delta Method (single carrier)



Marker-Delta-Value : 55.00 dB
This measurement was made to show that the behavior of the system is conform to FCC 15.205 (restricted bands)

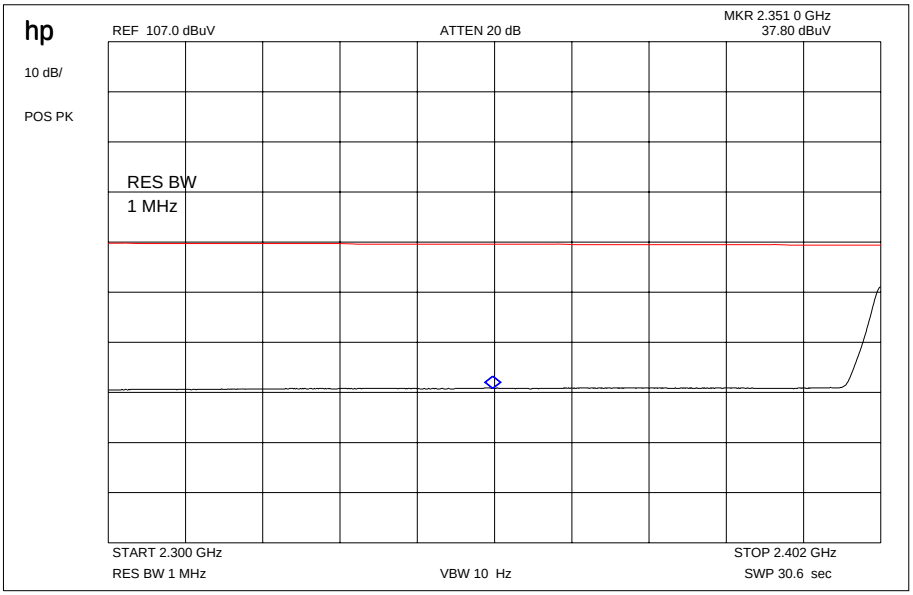
Plot 3: Marker-Delta Method (hopping)



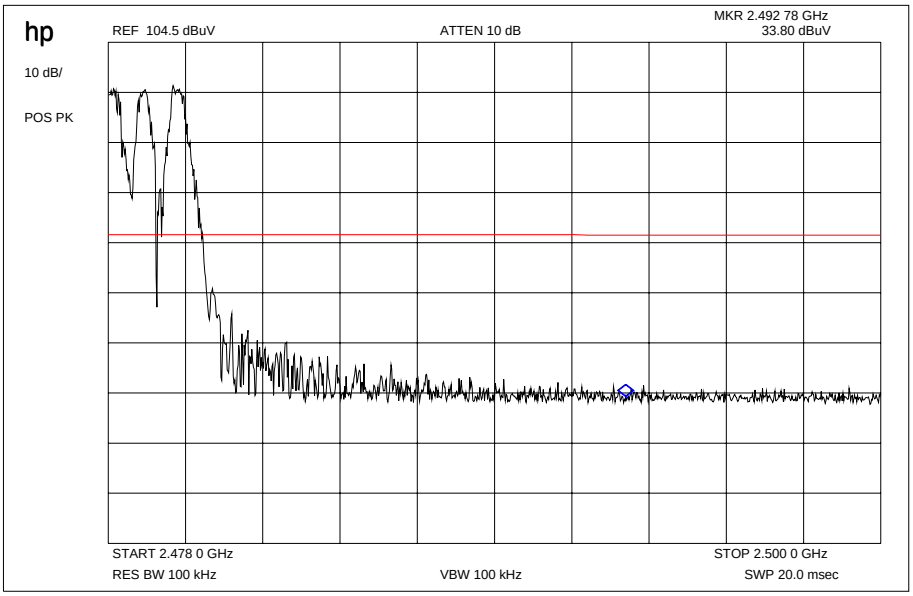
Result:

Marker-Delta-Value : 56.60 dB
This measurement was made to show that the behavior of the system is conform to FCC 15.205 (restricted bands)

Plot 4: Restricted Bands low



Plot 5: Restricted Bands high



Results & Limits:

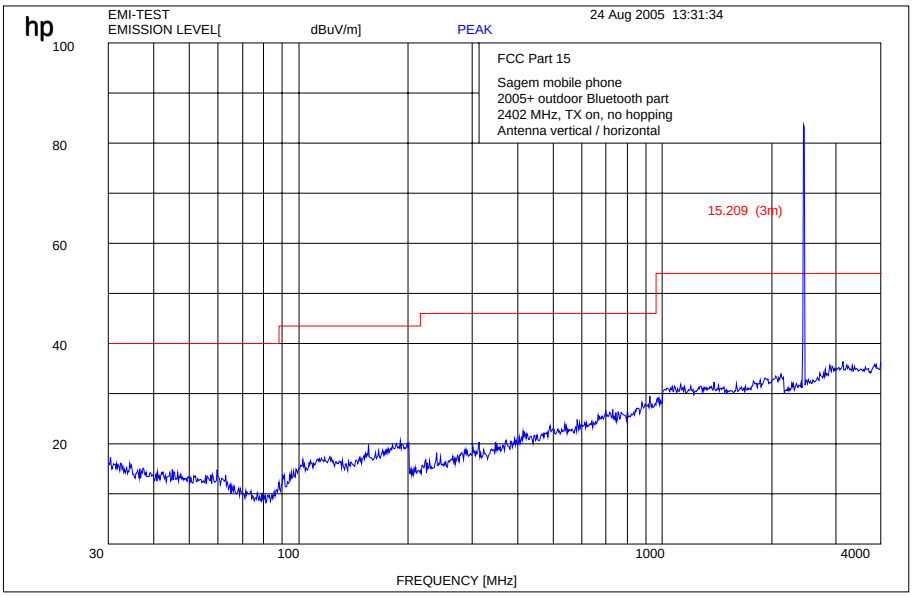
Radiated field strength

The field strength was measured with an EMI measuring receiver and 1 MHz RBW / VBW for peak and with 1MHz RBW / 10Hz VBW for average at a distance of 3m.

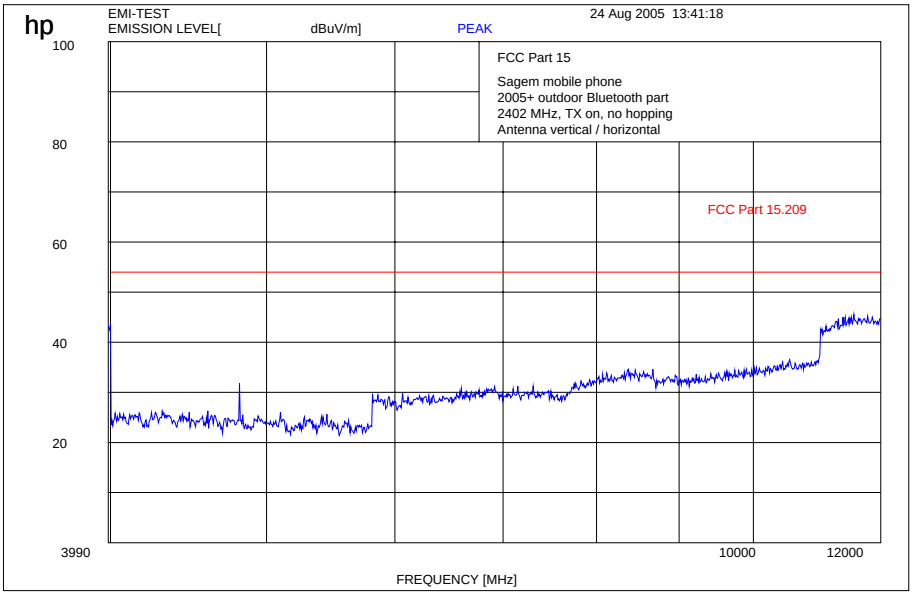
high channel	setup	measured value (3m)	correction factor (3m)	calculated value (3m)
Max. peak value	1 MHz RBW 1 MHz VBW	96.90 dBµV/m	--	96.90 dBµV/m
Max. average value	Calculated with duty cycle correction factor	96.90 dBµV/m peak	-1,07dB duty cycle correction factor (worst case DH5)	95.83 dBµV/m
Delta value	Peak 30 kHz RBW/VBW	55.00 dB (single carrier) 56.60 dB (hopping mode)	-	55.00 dB - 56.60 dB
Value at band edge	limit 54 dBµV/m			40.83 dBµV/m (single carrier) 39.23 dBµV/m (hopping mode)
Statement:				Complies

3.7 Spurious Emissions > 30 MHz- radiated (Transmitter) § 15.247 (d)

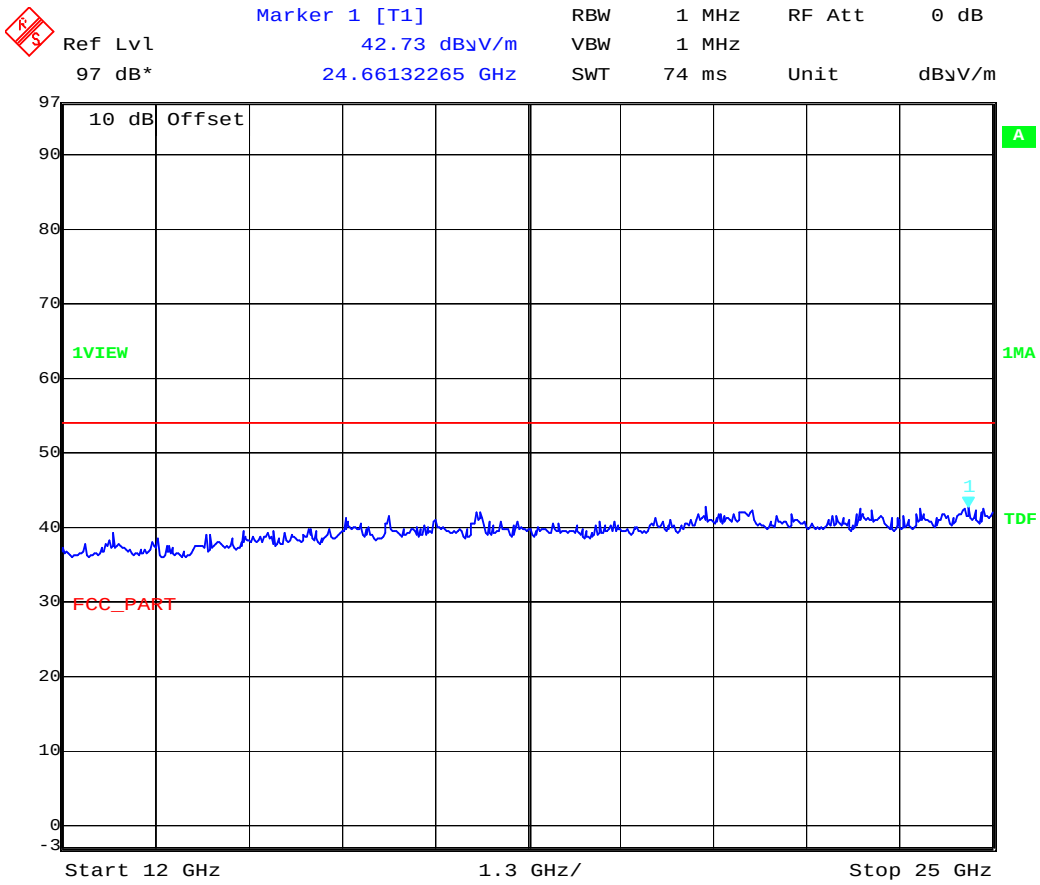
Plot : 0.03 - 4 GHz vertical/horizontal (lowest channel)



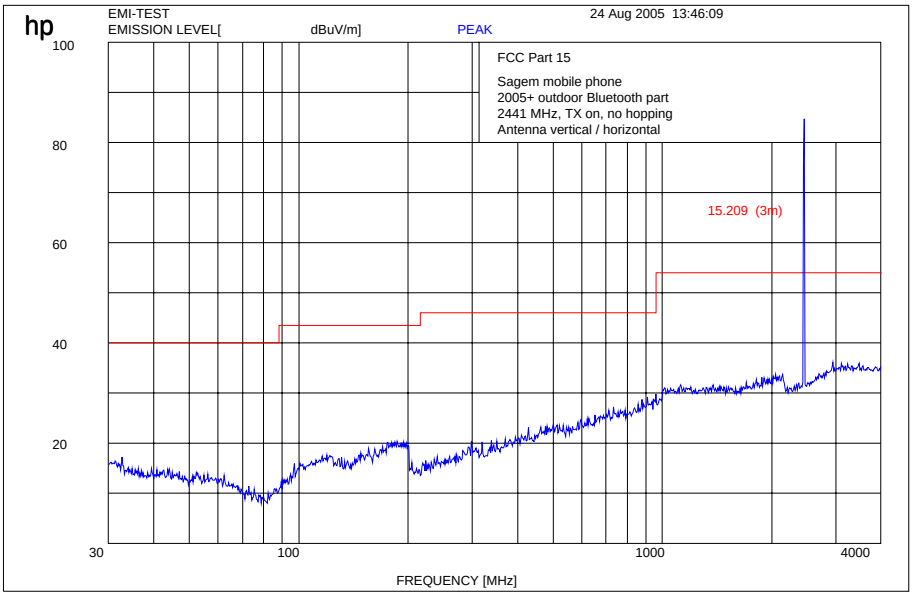
Plot : 4- 12 GHz vertical/horizontal (lowest channel)



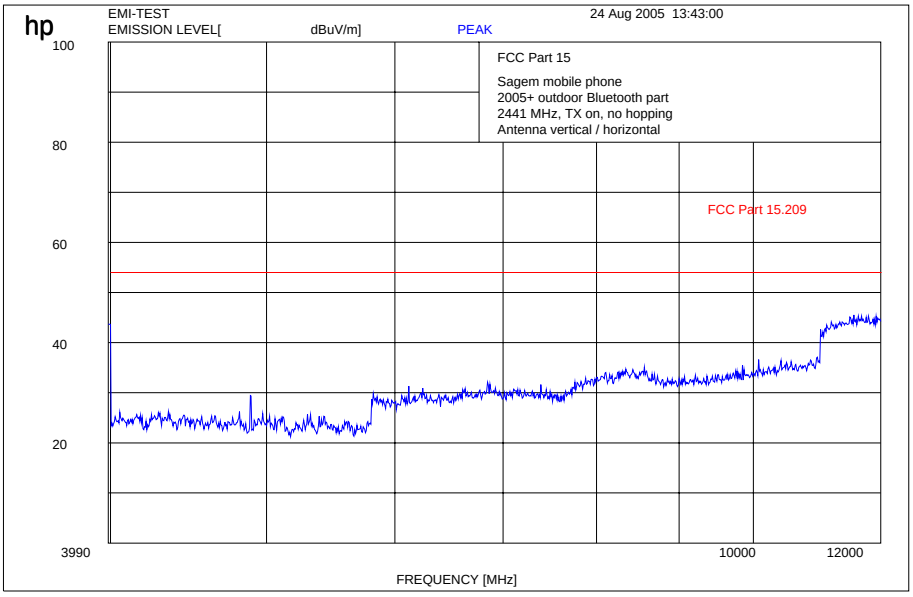
Plot : 12- 25 GHz vertical/horizontal (valid for all channels)



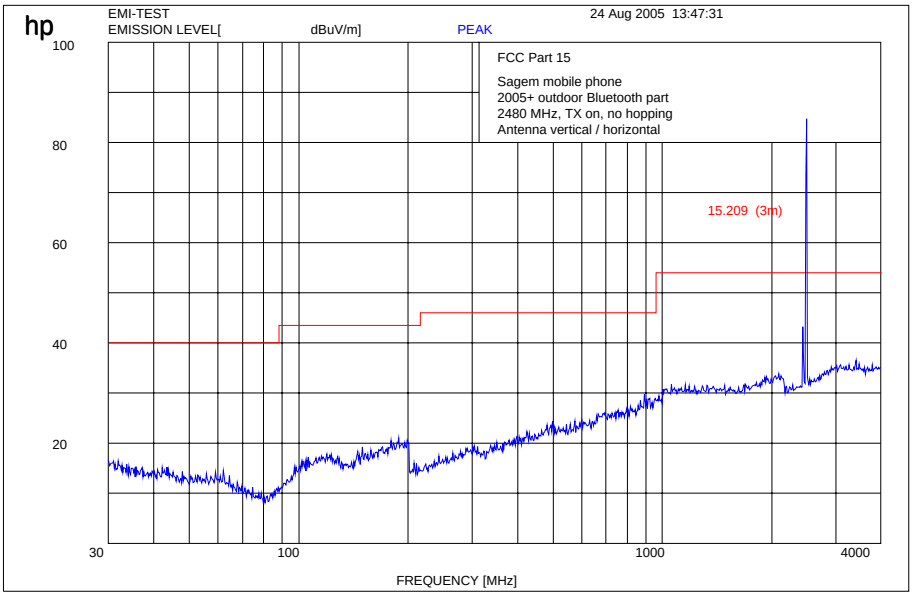
Plot : 0.03 - 4 GHz vertical/horizontal (middle channel)



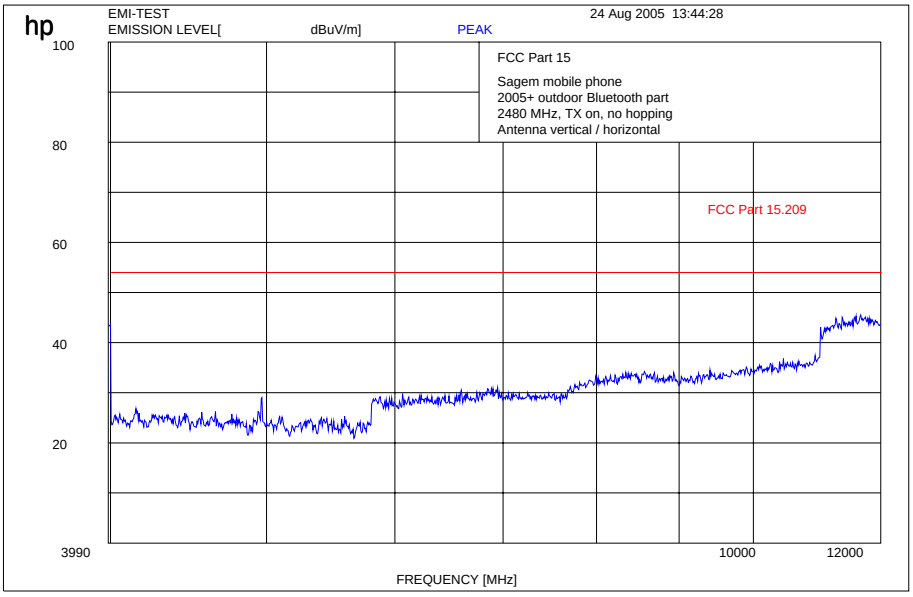
Plot : 4- 12 GHz vertical/horizontal (middle channel)



Plot : 0.03 - 4 GHz vertical/horizontal (highest channel)



Plot : 4- 12 GHz vertical/horizontal (highest channel)



Results:

SPURIOUS EMISSIONS LEVEL (µV/m)								
2402 MHz			2441 MHz			2480 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Level [dBµV/m]	Level [µV/m]
4804	Peak	34.2	4882	Peak	30.6	4960	Peak	29.4
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz

Limits: § 15.247 (d)

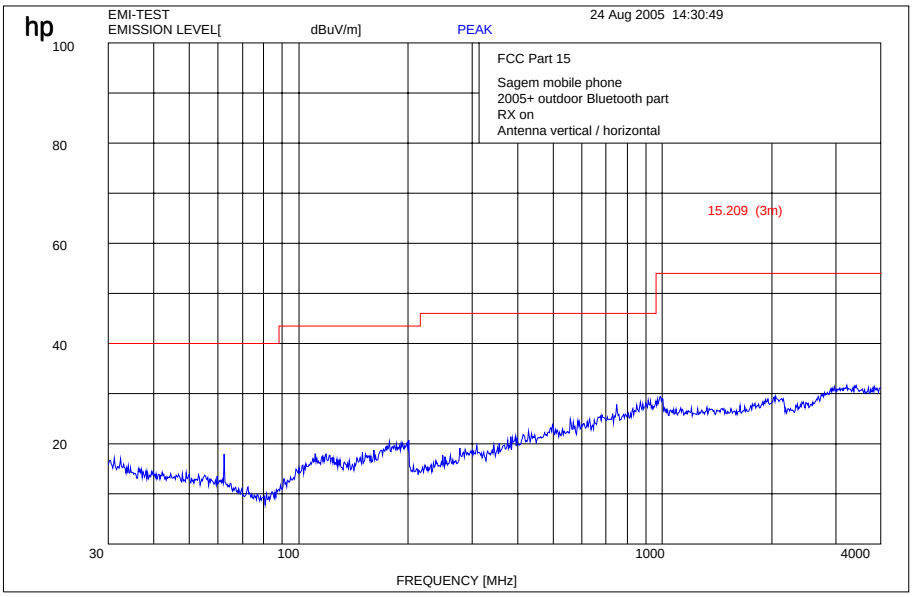
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Limits: § 15.209

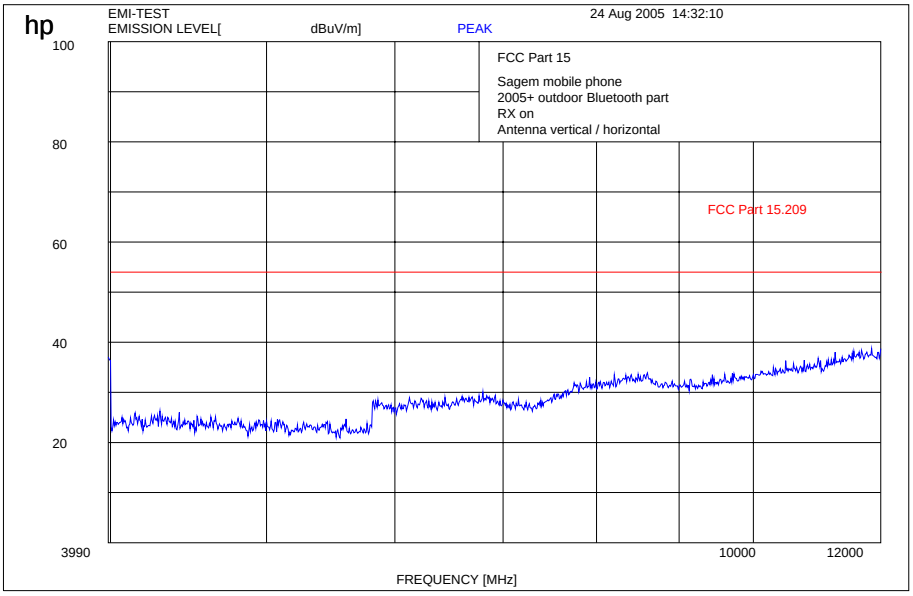
Frequency [MHz]	Field strength [µV/m]	Measurement distance (m)
30 - 88	100 (40 dBµV/m)	3
88 - 216	150 (43.5 dBµV/m)	3
216 - 960	200 (46 dBµV/m)	3
above 960	500 (54 dBµV/m)	3

3.8 Spurious Emissions - radiated (Receiver) § 15.109

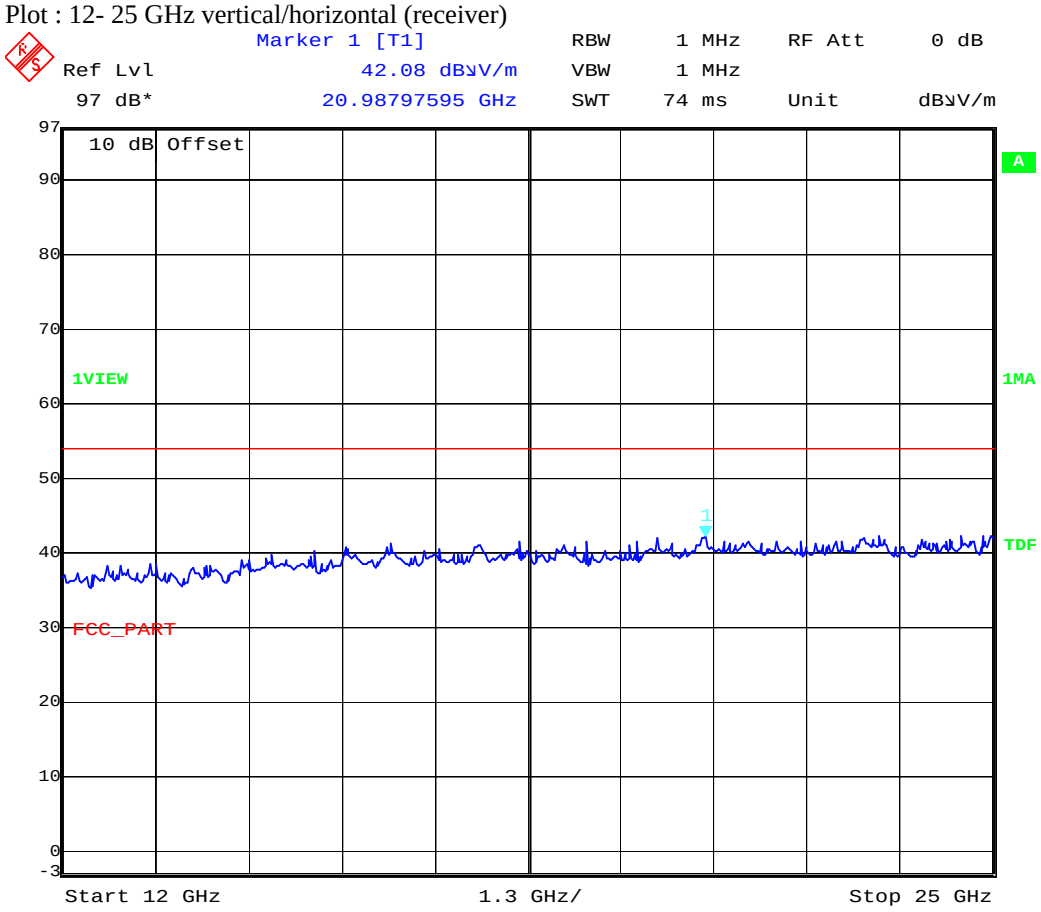
Plot : 0.03 - 4 GHz vertical/horizontal (receiver)



Plot : 4- 12 GHz vertical/horizontal (receiver)



Plot : 12- 25 GHz vertical/horizontal (receiver)



Spurious Emissisons level [µV/m]								
Receiving Mode								
f[MHz]	Detector	Level [dBµV/m]	f[MHz]	Detector	Level [dBµV/m]	f[MHz]	Detector	Level [dBµV/m]
No peaks found								
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz
see above plots

Measurement distance see table

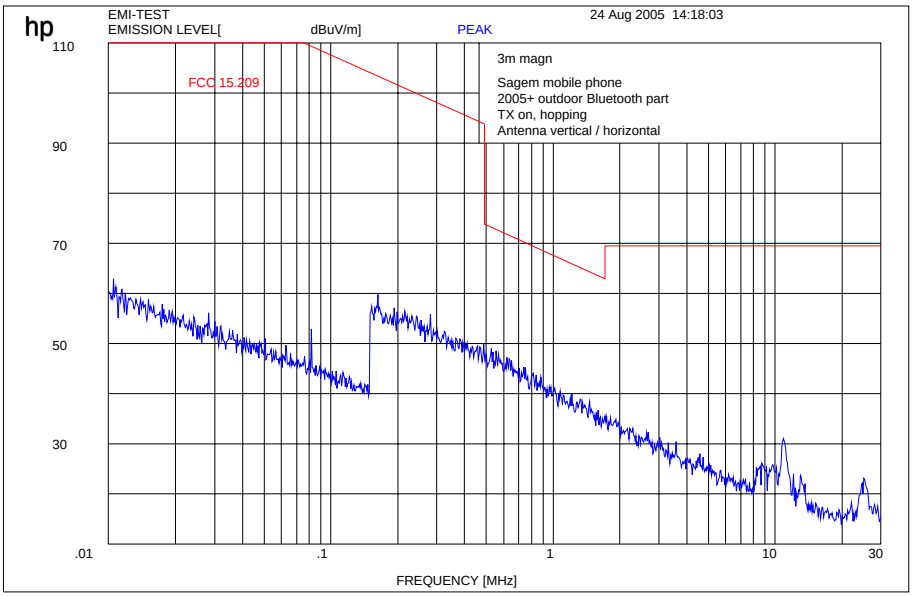
Limits : § 15.109

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100 (40 dBµV/m)	3
88 - 216	150 (43.5 dBµV/m)	3
216 - 960	200 (46 dBµV/m)	3
above 960	500 (54 dBµV/m)	3

3.9 Spurious Emissions < 30 MHz - Transmitter radiated § 15.209

Measured at 10 m distance.
Values recalculated with 40 dB/decade according to FCC rules.

Plot 1:



Limits:

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dBµV/m	30

3.10 Used Testequipment

Anachoic chamber C:

Device	Manufacturer	Type	S/N Number	Inv. No. Cetecom
Spektrum Analyser	HP	8566B	2747A05306	300001000
Spektrum Analyser Display	HP	85662A	2816A16541	300002297
Quasi-Peak-Adapter	HP	85650A	2811A01131	300000999
Power Supply	HP	6032A	2818A03450	300001040
Power Attenuator	Byrd	8325	1530	300001595
Bikonical Antenna	EMCO	3104	3758	300001602
Log. Period. Antenna	EMCO	3146	2130	300001603
Double Ridged Antenna	EMCO	HP 3115P	3088	300001032
Active Loop Antenna	EMCO	6502	2210	300001015
Antenna VDE/FCC		HP11965B		300002298
SRM-Drive	HP	9144A	2823e46556	300001044
Software	HP	EMI		300000983
Busisolator	Kontron			300001056
Absorberhalle	MWB		87400/02	300000996
Salzsäule	Kontron			300001055
Antenna	R&S	HMO20	832211/003	300002243
Indukt.Tast Antenna	R&S	HFH 2 Z4	881468/026	300001464
System-Rack	HP I.V.	85900	*	300000222
Spectrum Analyzer	HP	8566B	2747A05275	300000219
Quasi-Peak-Adapter	HP	85650A	2811A01135	300000216
RF-Preselector	HP	85685A	2837A00779	300000218
Rahmen Antenne	R&S	HFH2-Z2	891847-35	300001169
Leitungsteiler	HP	11850C		300000997
Breitband-Hornantenne EMI	HP	35155P		300002300
PC	HP	Vectra VL		300001688
VHF Meßantenne	Schwarzbeck	VHA 9103		300001778
Spectrum Analyzer Display	HP	85662A	2816A16497	300001690
VHF Meßantenna	Schwarzbeck	VHA 9103		300001780
Biconical Antenna	EMCO	3104 C	9909-4868	300002590

SRD Laboratory: (Bluetooth System)

No	Equipment/Type	Manufact.	Serial Nr.	Inv. No. Cetecom
1	System Controller PSM 12	R&S	835259/007	3000002681
2	Memory Extension PSM-K10	R&S	To 1	3000002681
3	Operating Software PSM-B2	R&S	To 1	3000002681
4	19'' Monitor		22759020-ED	3000002681
5	Mouse		LZE 0095/6639	3000002681
6	Keyboard		G00013834L461	3000002681
7	Spectrum Analyser FSIQ 26	R&S	835540/018	3000002681
8	Tracking Generator FSIQ-B10	R&S	835107/015	3000002681
10	RF-Generator SMIQ03 (B1 Signal)	R&S	835541/056	3000002681
11	Modulation Coder SMIQ-B20	R&S	To 10	3000002681
12	Data Generator SMIQ-B11	R&S	To 10	3000002681
13	RF Rear Connection SMIQ-B19	R&S	To 10	3000002681
14	Fast CPU SM-B50	R&S	To 10	3000002681
15	FM Modulator SM-B5	R&S	835676/033	3000002681

16	RF-Generator SMIQ03 (B2 Signal)	R&S	835541/055	3000002681
17	Modulation Coder SMIQ-B20	R&S	To 16	3000002681
18	Data Generator SMIQ-B11	R&S	To 16	3000002681
19	RF Rear Connection SMIQ-B19	R&S	To 16	3000002681
20	Fast CPU SM-B50	R&S	To 16	3000002681
21	FM Modulator SM-B5	R&S	836061/022	3000002681
22	RF-Generator SMP03 (B3 Signal)	R&S	835133/011	3000002681
23	Attenuator SMP-B15	R&S	835136/014	3000002681
24	RF Rear Connection SMP-B19	R&S	834745/007	3000002681
25	Power Meter NRVD	R&S	835430/044	3000002681
26	Power Sensor NRVD-Z1	R&S	833894/012	3000002681
27	Power Sensor NRVD-Z1	R&S	833894/011	3000002681
28	Rubidium Standard RUB	R&S	6197	3000002681
29	Switching and Signal Conditioning Unit SSCU	R&S	338864/003	3000002681
30	Laser Printer HP Deskjet 2100	HP	N/A	3000002681
31	19'' Rack	R&S	11138363000004	3000002681
32	RF-cable set	R&S	N/A	3000002681
33	IEEE-cables	R&S	N/A	3000002681
34	Sampling System FSIQ-B70	R&S	835355/009	3000002681
35	RSP programmable attenuator	R&S	834500/010	3000002681
36	Signalling Unit	R&S	838312/011	3000002681
37	NGPE programmable Power Supply for EUT	R&S	192.033.41	3000002681

SRD Laboratory:

Device	**Manufacturer**	**Type**	**S/N Number**	**Inv. No. Cetecom**
Climatic box	Heraeus Vötsch	VT 4002	--	300003019
Signaling Unit	R&S	CMU200	832221/0055	300002862
Power Splitter	Inmet Corp.	6005-3	none	300002841
SMA Cables	Insulated Wire	SPS-1151-985-SPS	different	different

4 Photographs of Test Set-up

Photo 1: Radiated Emission

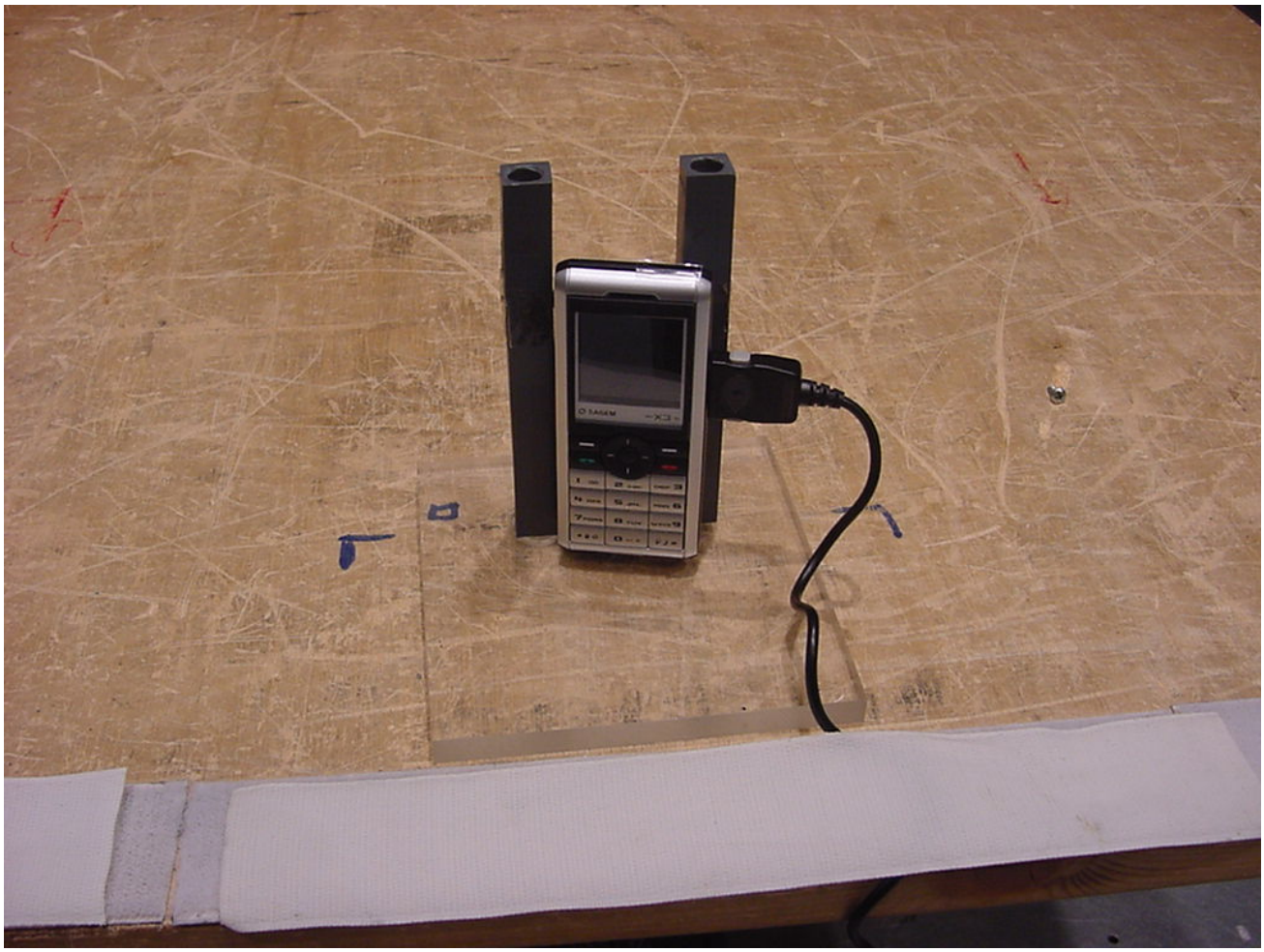
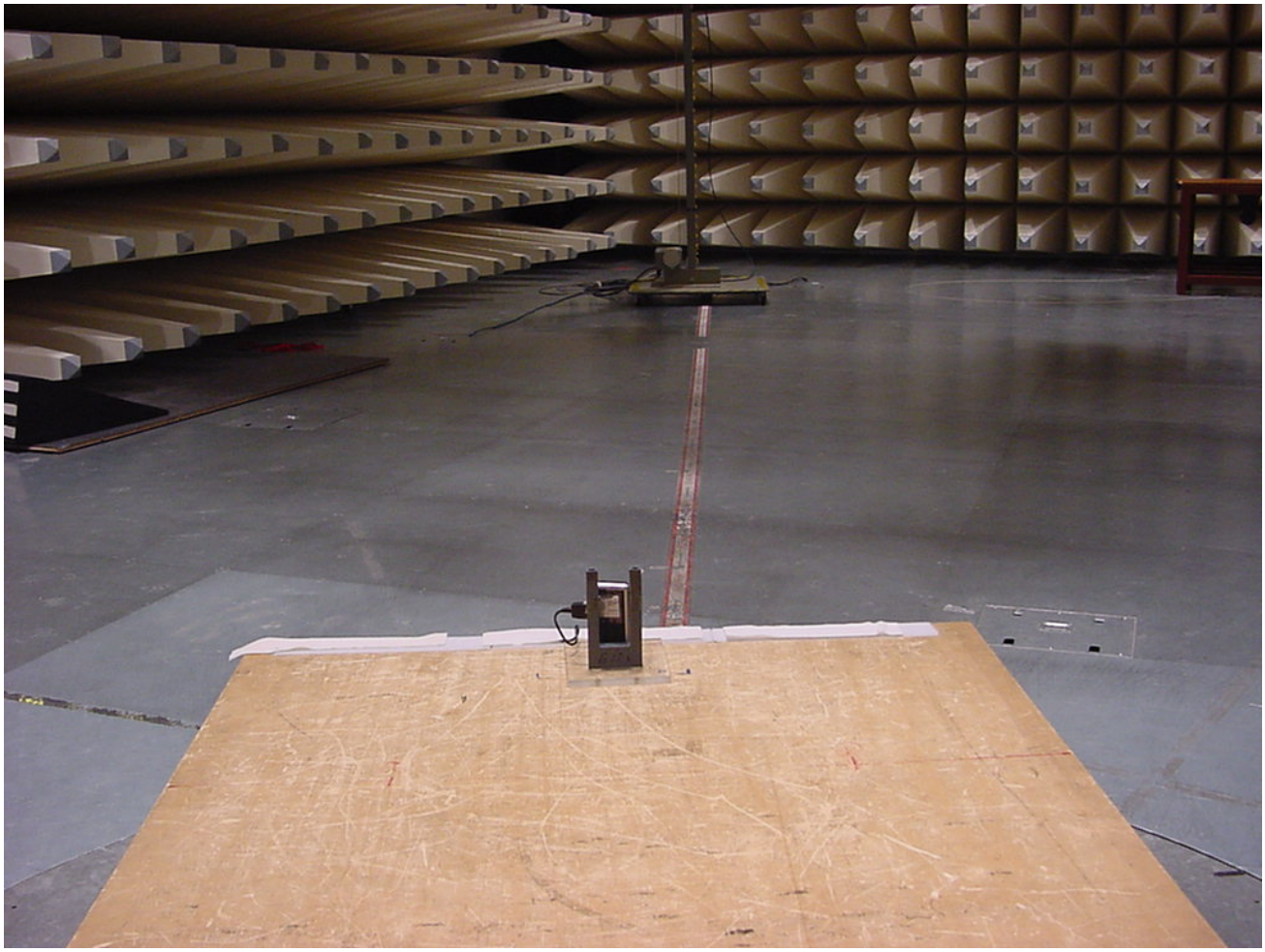


Photo 2: Radiated Emission



5 Photographs of the EUT

Photo 1:

Photo 2:

Photo 3:

BATTERIE RECHARGEABLE
NE PAS DEMONTER
ATTENTION :
- UTILISER LE CHARGEUR PREVU A CET EFFET
- NE PAS COURT-CIRCUITER
- ELIMINER DE FACON APPROPRIEE
- NE PAS BRULER MEME APRES USAGE
RECHARGEABLE BATTERY
DO NOT DISASSEMBLE
CAUTION :
- USE SPECIFIED CHARGER ONLY
- DO NOT SHORT-CIRCUIT
- MUST BE DISPOSED OF PROPERLY
- MAY EXPLODE IF DISPOSED OF IN FIRE
188875307 SA9A-SN2 186/05
Li-ion
SAGEM
MADE IN EUROPE
3567100000 10342
252231890 / B2005
my302X
SIM 3V
F222/05 N1
Made in EU

Photo 4:

BATTERIE RECHARGEABLE
NE PAS DEMONTER
ATTENTION :
• UTILISER LE CHARGEUR PREVU A CET EFFET
• NE PAS COURT-CIRCUITER
• ELIMINER DE FACON APPROPRIEE
• NE PAS BRULER MEME APRES USAGE
RECHARGEABLE BATTERY
DO NOT DISASSEMBLE
CAUTION :
• USE SPECIFIED CHARGER ONLY
• DO NOT SHORT-CIRCUIT
• MUST BE DISPOSED OF PROPERLY
• MAY EXPLODE IF DISPOSED OF IN FIRE
188875307 SA9A-SN2 186/05
Li-ion
SAGEM
MADE IN EUROPE
356710000010342
252231890 / B2005
my302X
SIM 3V
F222/05 N1
Made in EU

Photo 5:

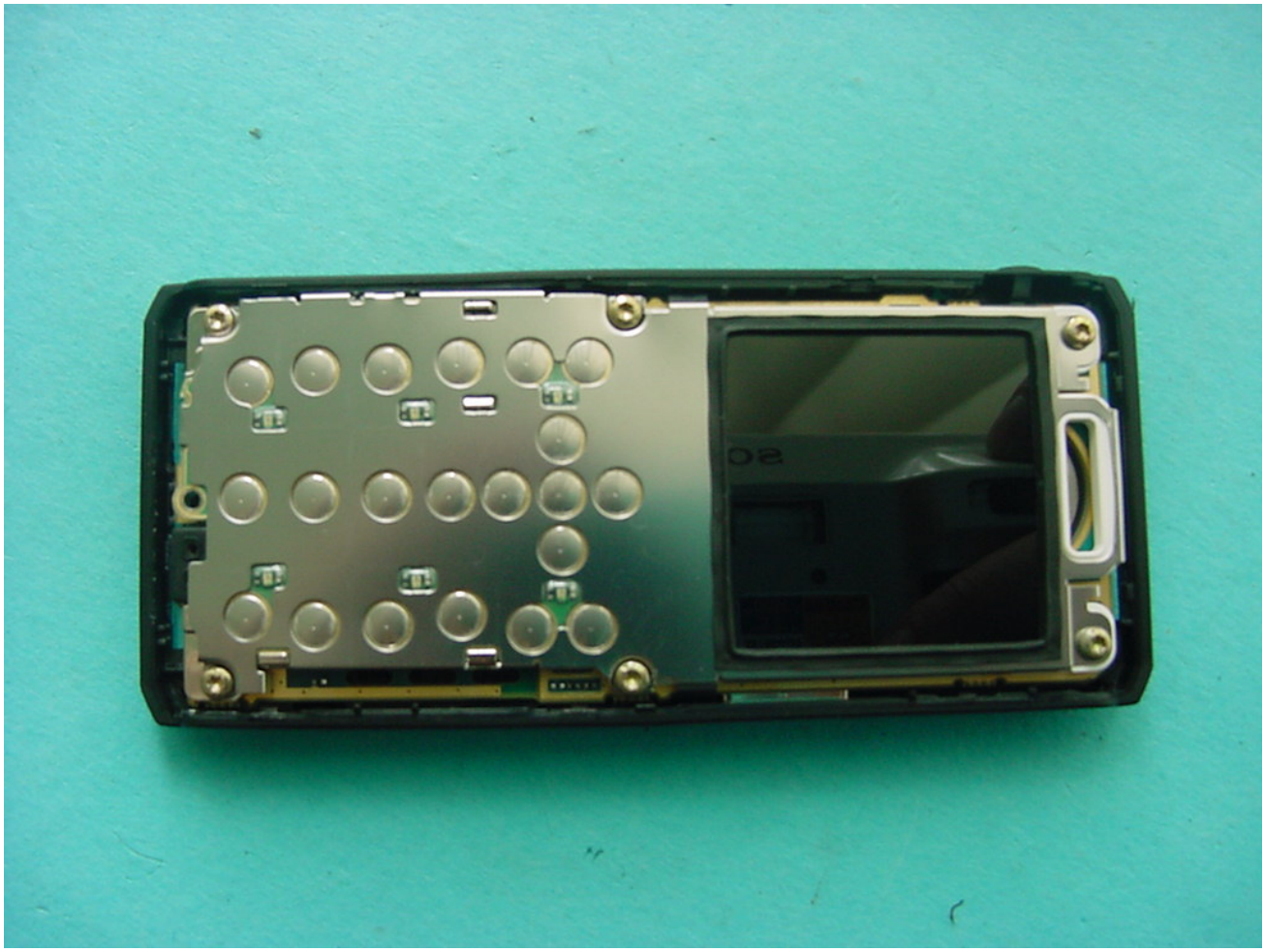


Photo 6:

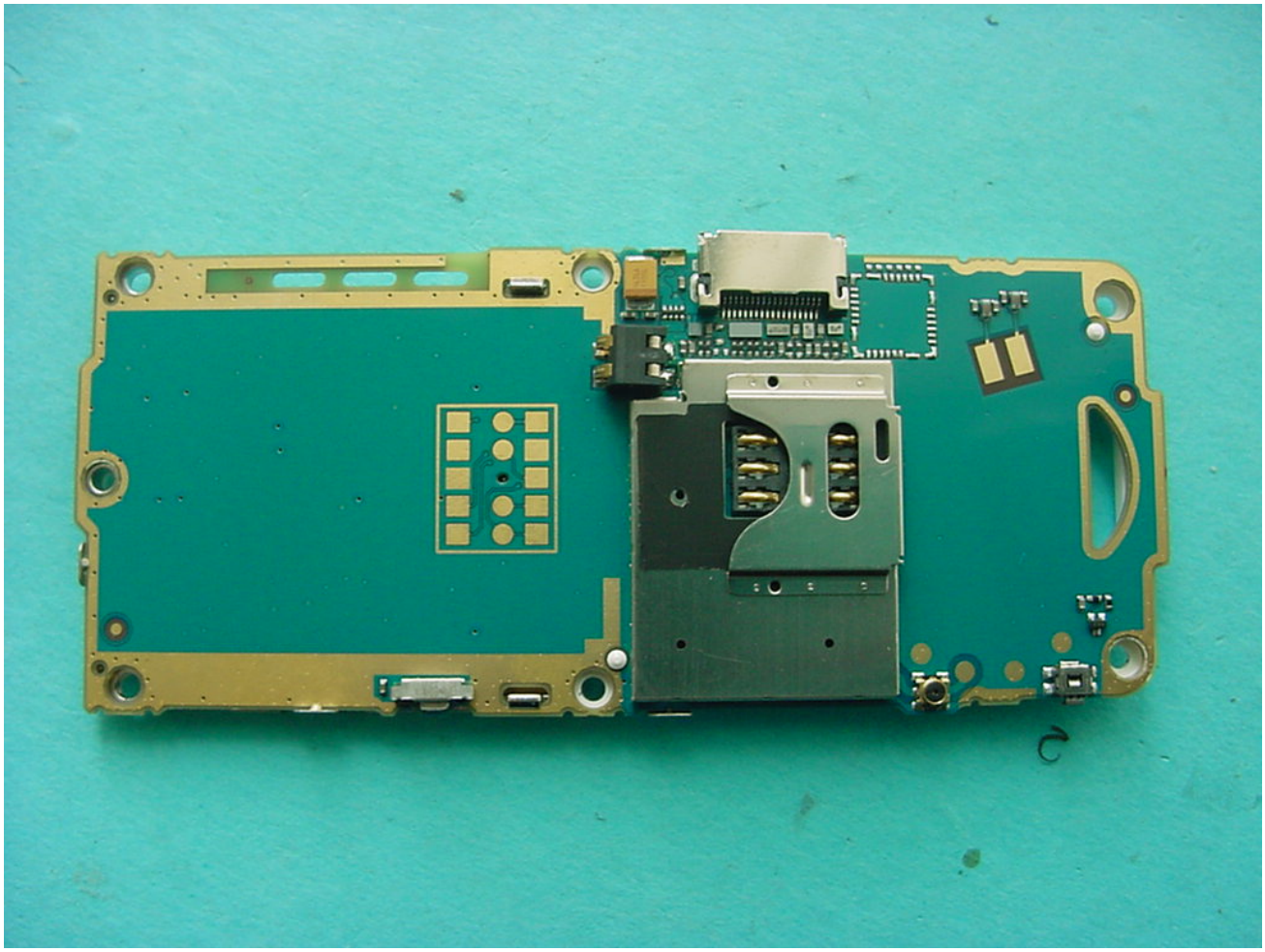


Photo 7:

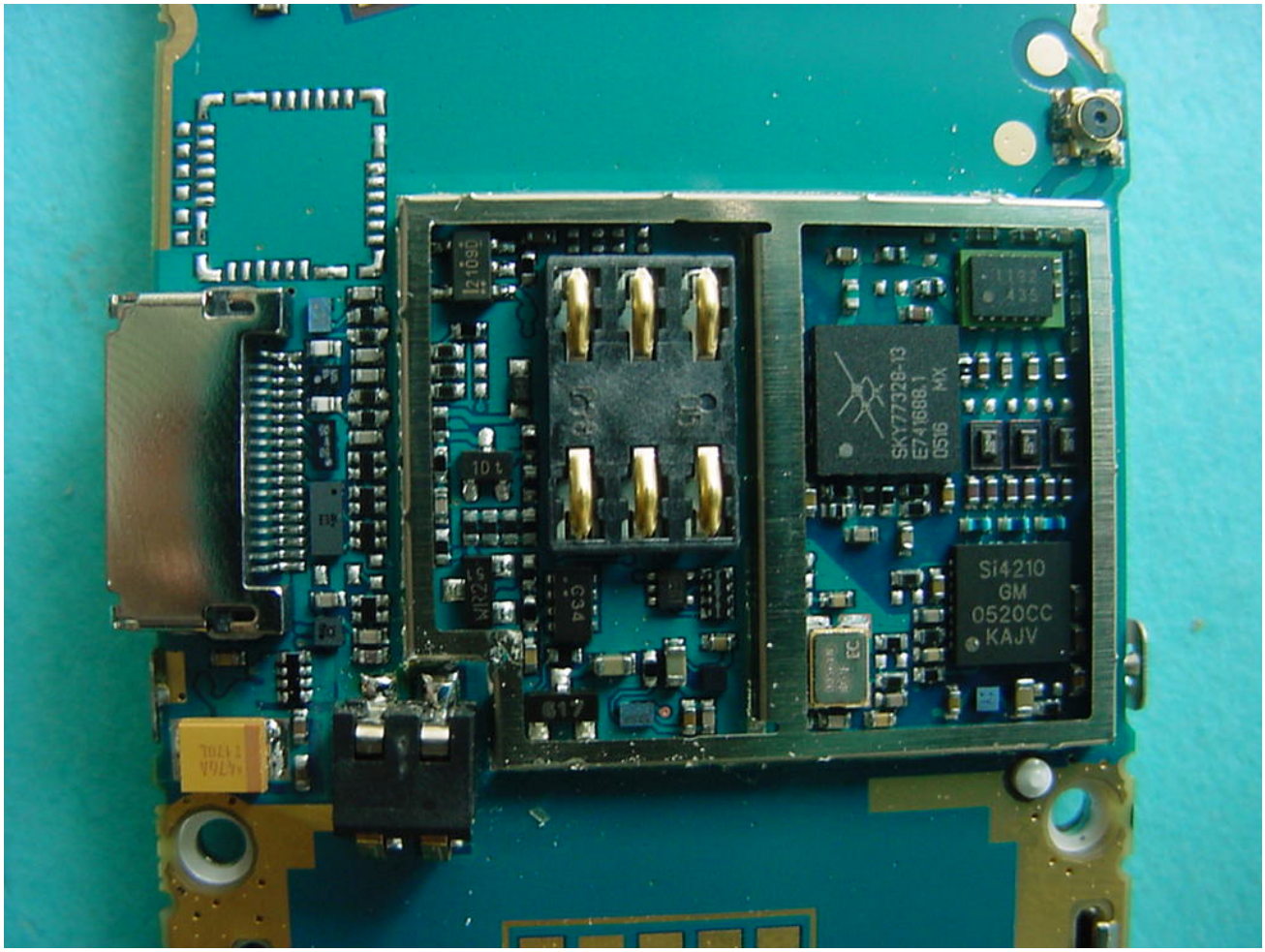


Photo 8:

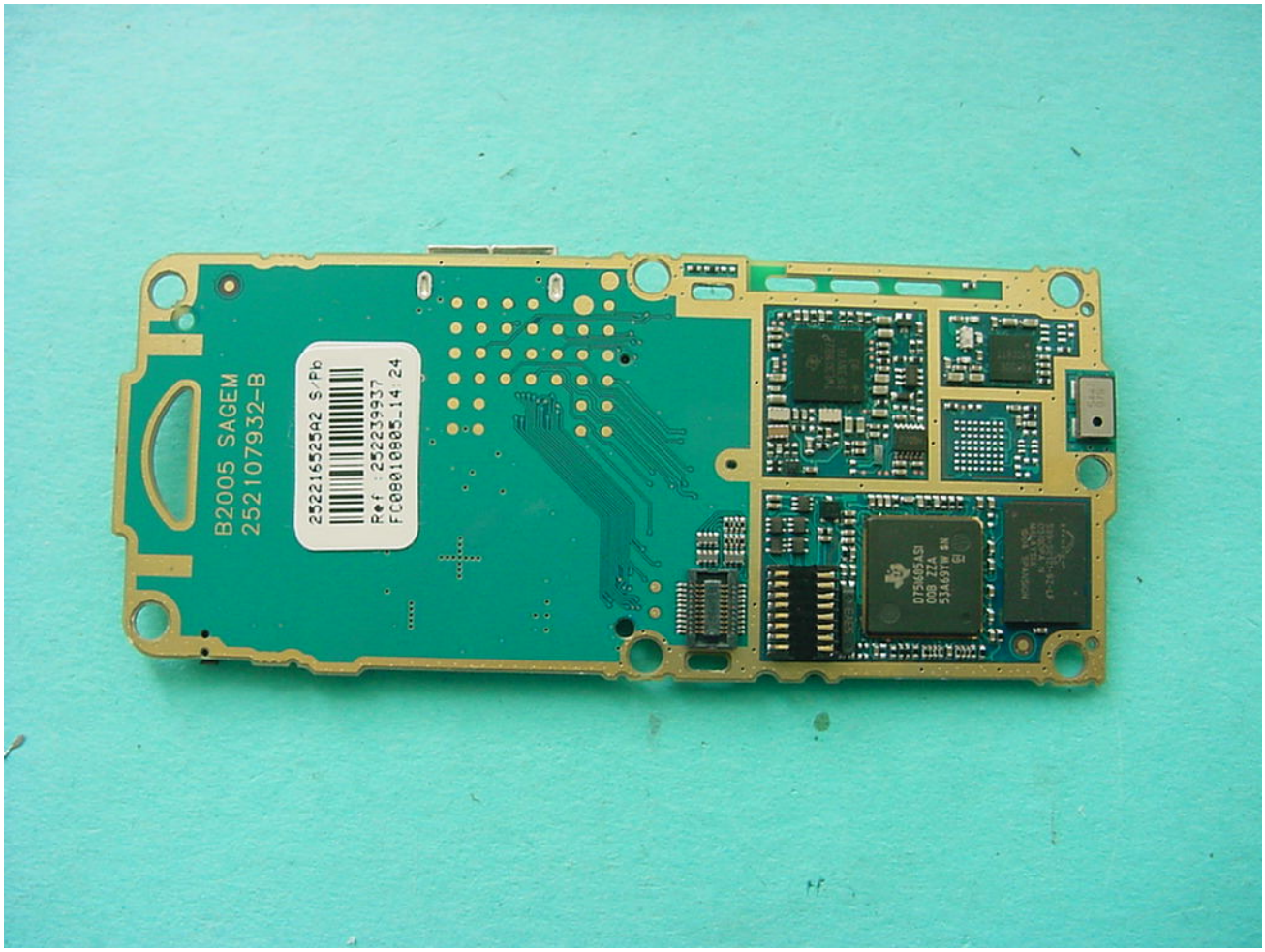
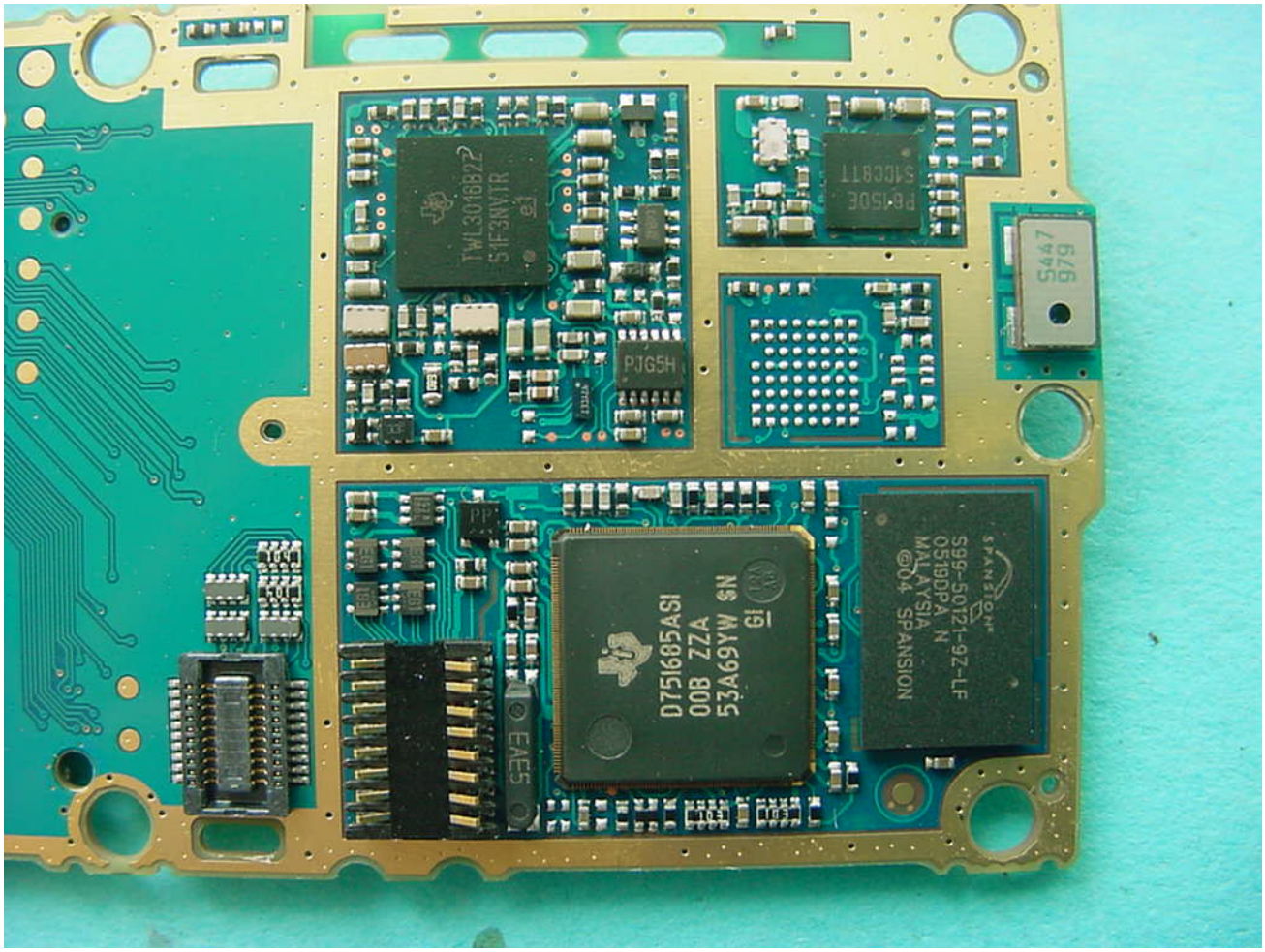

B2005 SAGEM
252107932-B
2522165252 S/Pb
Ref : 252239937
FC00010005_14 24

Photo 9:


TWL3016B2
51F3NYTR
PJG5H
S447
979
D751685ASI
00B ZZA
53A69YW $N
S99-50121-9Z-LF
MALAYSIA
©04 SPANSION