Radio Test Report UMTS 1900 iBTS for the iModules according to FCC Part 24

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PUBLICATION HISTORY

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Value error correction of the Mono Maximum Output Power on T channel in Table 2.

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Standard

01/Sept/2003 **S. BALE**

Document creation.

Issue V01.01 / EN

Standard

CONTENTS

1. INTRODUCTION

1.1. OBJECT

This document presents the measurement results of tests performed on Nortel Networks UMTS iBTS according to FCC specifications.

1.2. SCOPE OF THIS DOCUMENT

This document applies to Nortel FDD

UMTS Indoor 2 iBTS

UMTS Outdoor iBTS

UMTS Mono iBTS

1.3. AUDIENCE FOR THIS DOCUMENT

This document is to be used by any person needing a view on Nortel FDD UMTS 1900 iBTS.

2. RELATED DOCUMENTS

2.1. APPLICABLE DOCUMENTS

[A1]	UMT/BTS/APP/0022	Methodology of UMTS BTS validation under 25.141 specifications
[A2]	UMT/BTS/DD/0017	e-mobility iBTS platform/UMTS/GSM product specification
[A3]	UMT/BTS/DPL/07135	1900 MHz UMTS Project Qualification Plan
[A4]	UMT/BTS/DPL/7917	Radio Test Plan for the qualification of the 1900 iBTS with iModules

2.2. REFERENCE DOCUMENTS

[R1]	47CFR Part 24	PERSONAL COMMUNICATIONS SERVICES January 2001
[R2]	47CFR Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS October 2001

3. TEST RESULTS

3.1. INTRODUCTION

This document presents the RF tests performed for the qualification of the 1900 iBTS with iModules.

UMTS Indoor2 iBTS is feeded with -48V DC as standard configuration.
As an option, UMTS Indoor2 may be feeded with +24V DC, through an additional DC to DC converter (+24 V to -55 V).
UMTS Outdoor iBTS is feeded with 220V AC split phase.
UMTS Mono iBTS is feeded with -48V DC.

The following information is submitted to introduce a Certification of the UMTS 1900 iBTS for Northern Telecom, Inc:

- According to 47CFR Part 24, Subpart E
- According to 47CFR Part 2, Subpart J

of the FCC Rules and Regulations. The measurement procedures were in accordance with the requirements of Part 2.947.

3.2. MEASUREMENT RESULTS

Table 1 is a summary of the measurement results performed in this report.

Description & Configuration code		Measurement Specification	Limit Specification	Test	Result
A	UMTS Indoor2 iBTS 45W STSR	FCC 2.1046	24.232	Maximum Output Power	Complies
		FCC 2.1049	-	Occupied Bandwidth	Complies
		FCC 2.1051, 2.1057	24.238	Spurious Emission at Antenna Terminals with three carriers	Complies
B	UMTS Indoor2 iBTS 30W STSR	FCC 2.1046	24.232	Maximum Output Power	Complies
		FCC 2.1051, 2.1057	24.238	Spurious Emission at Antenna Terminals with single carrier and three carriers	Complies
C	UMTS Indoor2 iBTS 45W STSR TMA	FCC 2.1046	24.232	Maximum Output Power	Complies
		FCC 2.1051, 2.1057	24.238	Spurious Emission at Antenna Terminals with single carrier	Complies
D	UMTS Indoor2 iBTS 45W STSR with DC/DC converter	FCC 2.1046	24.232	Maximum Output Power	Complies
		FCC 2.1051, 2.1057	24.238	Spurious Emission at Antenna Terminals with three carriers	Complies
E	UMTS Outdoor iBTS 45W STSR	FCC 2.1046	24.232	Maximum Output Power	Complies
F	UMTS Mono iBTS DC 30W	FCC 2.1046	24.232	Maximum Output Power	Complies

Table 1. Measurement results performed for the qualification of the 1900 MHz

Test conditions in all the performed tests (temperature and nominal voltage) remain the same as the maximum output power test. For more details, please refer to the table 2.

3.3. MAXIMUM OUTPUT POWER

3.3.1 FCC REQUIREMENTS

(a) Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. See 24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power. In no case may the peak output power of a base station transmitter exceed 100 watts.

(b) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

3.3.2 TEST RESULTS

The table 2 summarizes the maximum output power performed according to the iBTS configuration code as described in the section above.

CONFIGURATION CODE	TEST CONDITIONS		Base Station Maximum Output Power (dBm)			Nominal Output Power (dBm)
			Channel B 1932.4 MHz	Channel M 1960 MHz	Channel T 1987.6 MHz	
			Sector 1	Sector 2	Sector 3	
A	T_{nom}(25°C)	V_{nom}(49.8V)	45.2	45.65	45.6	45.2 ±2.7dB
C	T_{nom}(25°C)	V_{nom}(49.8V)	41.8	42.3	42.2	41.7 ±2.7dB
D	T_{nom}(25°C)	V_{nom}(24.03V)	45	45.55	45.5	45.2 ±2.7dB
E	T_{nom}(25°C)	V_{nom}(223.1V)	45.35	45.8	45.8	45.2 ±2.7dB
F	T_{nom}(25°C)	V_{nom}(48V)	43.55	43.9	43.95	43.4 ±2.7dB

Table 2. Measurements result for Maximum output power

For equivalent isotropically radiated power requirement, the sum of the antenna gain and the feeder losses should not be higher than 17.05dB.

3.3.3 TEST PROCEDURE

The equipment was configured as shown in Figure 1. A power meter has been used to perform the maximum output power test.

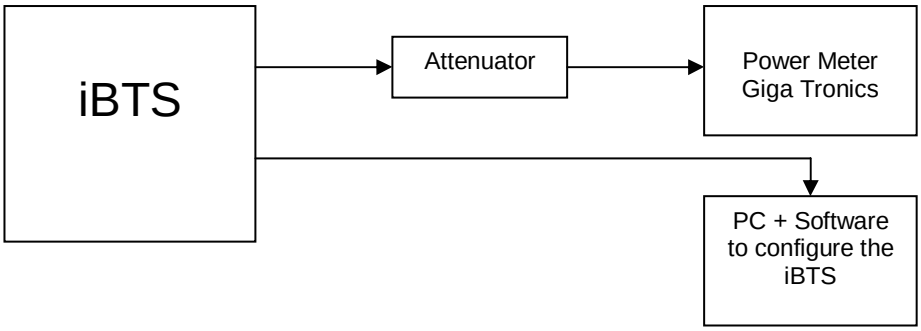


Figure 1. Test configuration to measure RF Output Power

The iBTS was configured to transmit at maximum power with 64 dedicated channels on the single carrier.

3.4. OCCUPIED BANDWIDTH

3.4.1 FCC REQUIREMENTS

The occupied bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated of at least 26 dB.

3.4.2 TEST RESULTS

The table 3 summarizes the occupied bandwidth test performed in 45W mode (Configuration code A).

OBSERVED CHANNEL	Occupied bandwidth (MHz)		
	Channel B 1932.4 MHz	Channel M 1960 MHz	Channel T 1987.6 MHz
	Sector 1	Sector 2	Sector 3
Occupied bandwidth	4.65 MHz	4.65 MHz	4.66 MHz

Table 3. Measurements result for Occupied Bandwidth

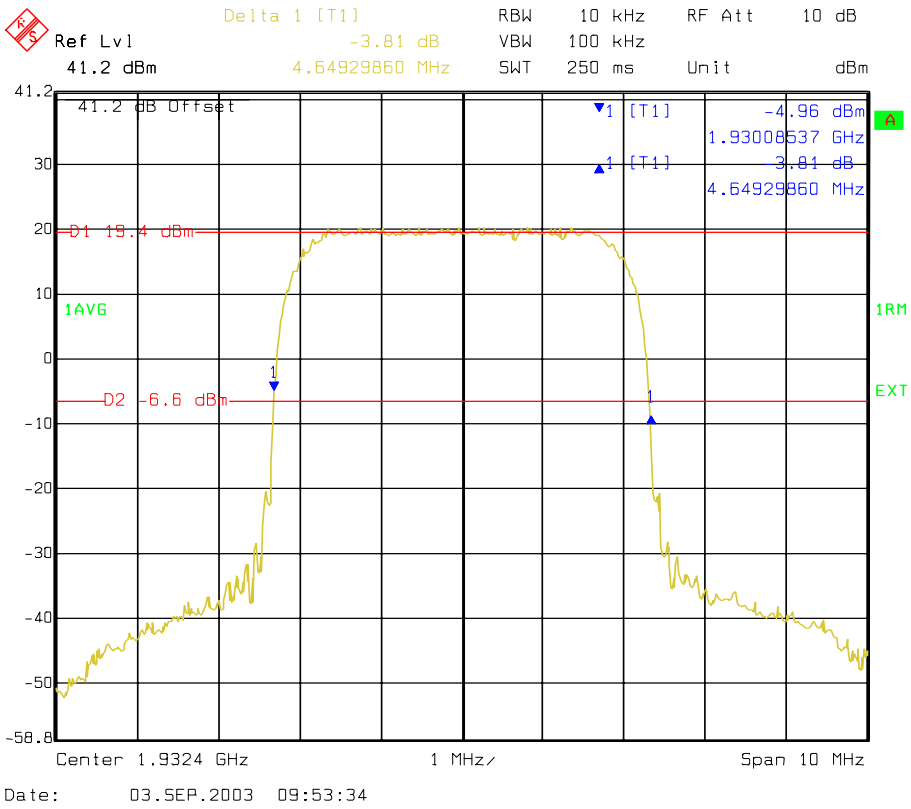


Figure 2. Sample plot for Occupied Bandwidth @ 1932.4 MHz

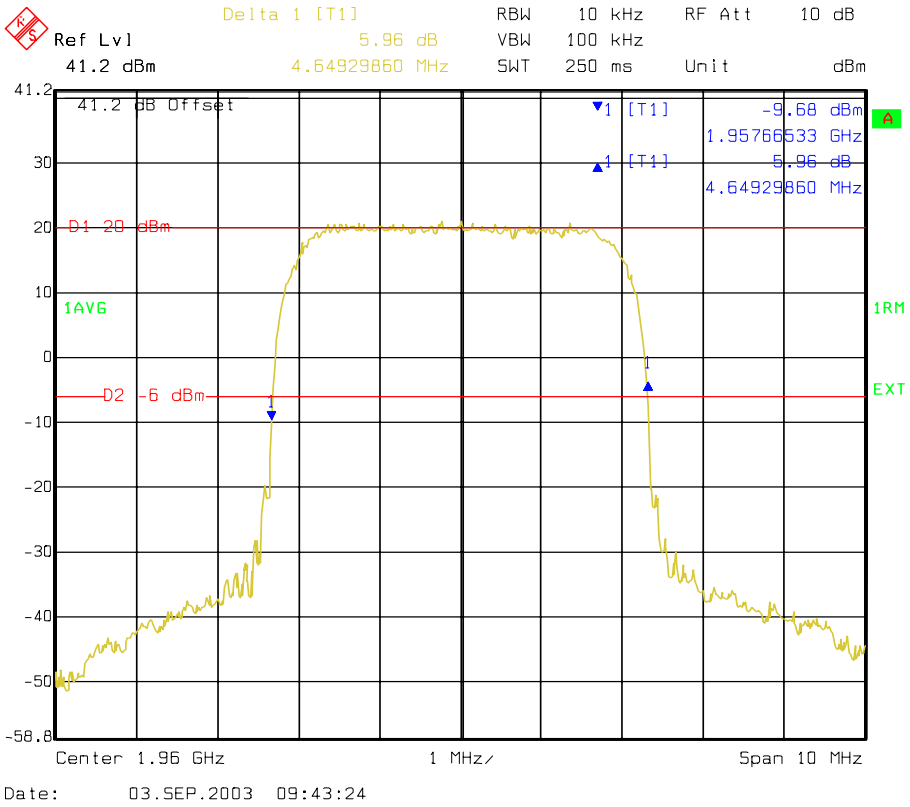


Figure 3. Sample plot for Occupied Bandwidth @ 1960 MHz

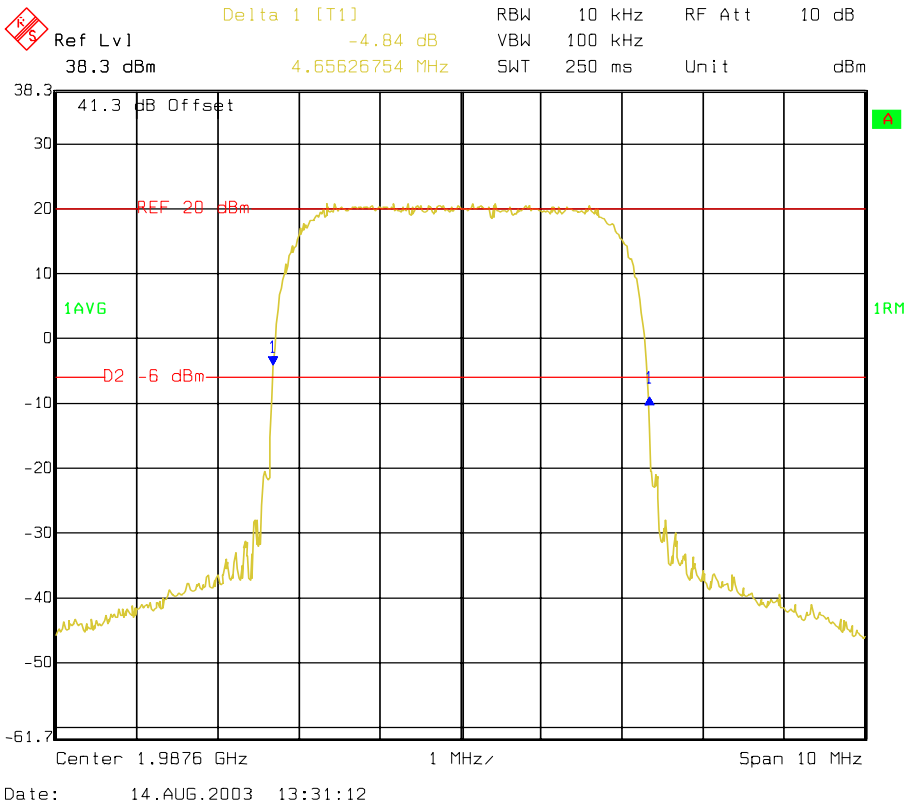


Figure 4. Sample plot for Occupied Bandwidth @ 1987.6 MHz

3.4.3 TEST PROCEDURE

The equipment was configured as shown in Figure 5.

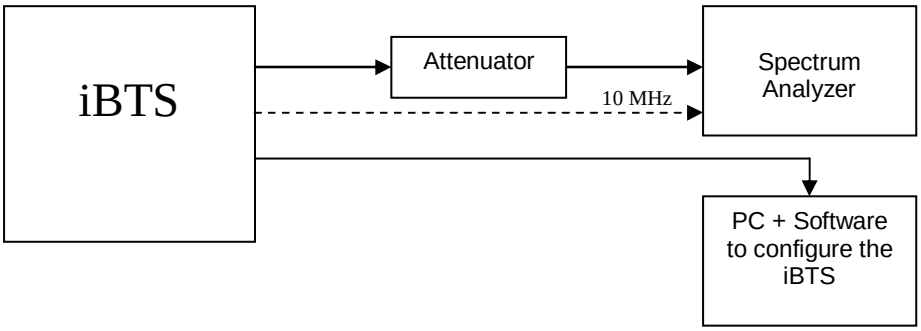


Figure 5. Test configuration for Occupied Bandwidth

The iBTS was configured to transmit at maximum power (45W). Measurements were performed at bottom, middle and top frequency of the transmit channel on each sector.

The spectrum analyzer had the following setting:

Resolution Bandwidth	10 kHz
Video Bandwidth	100 kHz
Span	10 MHz
Sweep time	250 ms
Reference Level Offset	Corrected to take into account cables and attenuator losses

3.5. SPURIOUS EMISSIONS AT ANTENNA TERMINALS

3.5.1 FCC REQUIREMENTS

(a) At any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB.

(b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 23 dB below the transmitter power.

(c) When measuring the emission limits, the nominal carrier frequency shallbe adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(d) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

3.5.2 TEST RESULTS

The reference level for spurious emissions at the antenna terminals is taken from the measured output power (45 dBm => 31.6 W).

Therefore the spurious emissions must be attenuated by at least:

43 + 10*Log(31.6) = 58 dB

The measured output power was 45 dBm, therefore the limit is -13 dBm.

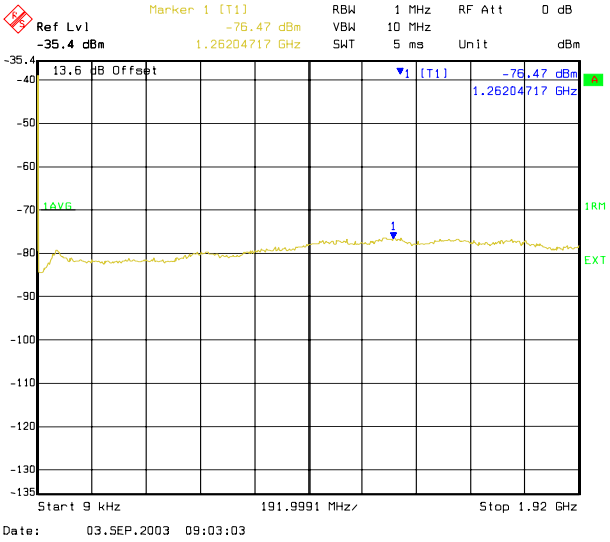
1. UMTS INDOOR2 IBTS, TMA, 45W MODE WITH SINGLE CARRIER

Tables 4 to 6 show the results for Spurious Emissions at Antenna Terminals for the configuration C.

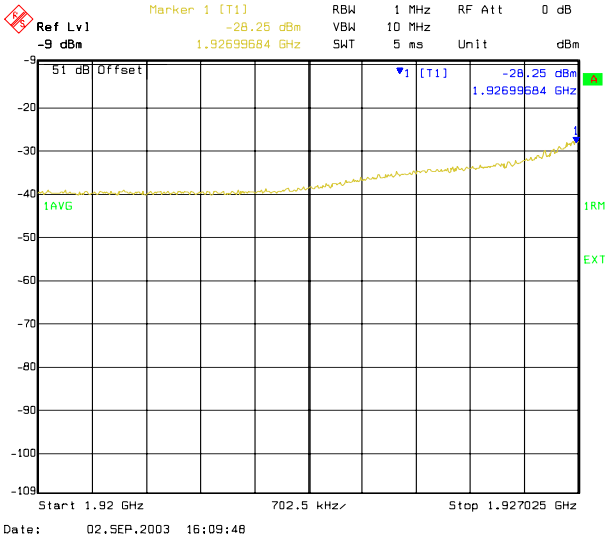
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel B 1932.4 MHz Sector 1	Margin (dB)	Limit (dBm)
9 kHz to 1.92 GHz	-76.47	63.47	-13
1920 MHz to 1927.025 MHz	-28.25	15.25	
1927.025 MHz to 1928.025 MHz	-29.85	16.85	
1928.025 MHzto 1929.025 MHz	-25.95	12.95	
1929.025 MHz to 1929.975 MHz	-19.94	6.94	
1935.025 MHz to 1935.975 MHz	-28.93	15.93	
1935.975 MHz to 1936.975 MHz	-25.54	12.54	
1936.975 MHz to 1937.975 MHz	-29.2	16.2	
1937.975 MHz to 3000 MHz	-25.96	12.96	
3 GHz to 20 GHz	-49.27	36.27	

Table 4. Measurements result for Spurious Emission in B channel

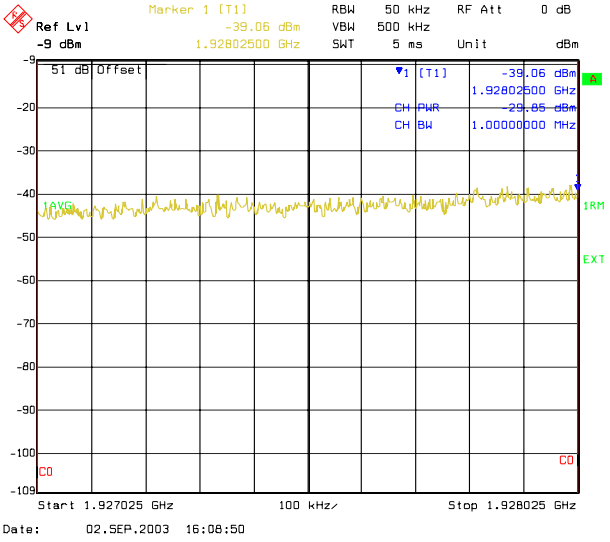
9 kHz-1920 MHz[1]



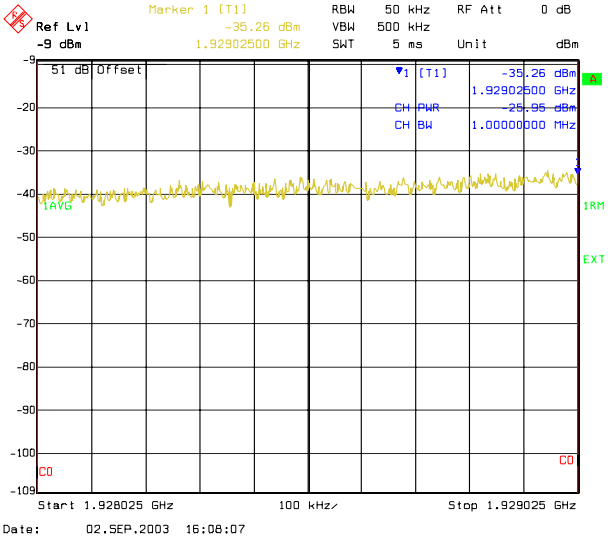
1920 MHz- 1927.025 MHz



1927.025 MHz-1928.025 MHz

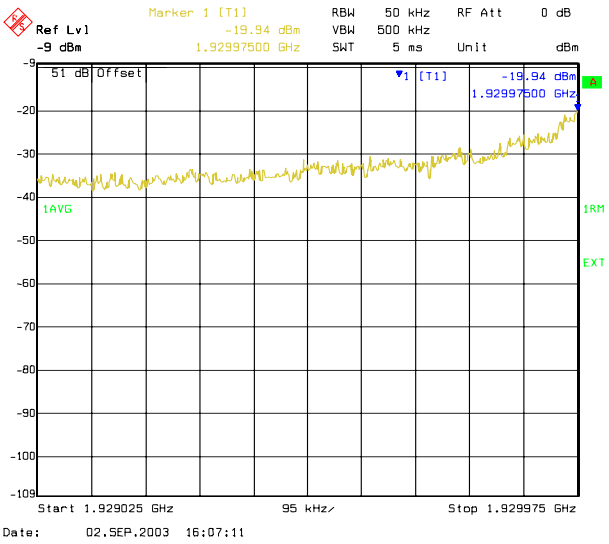


1928.025 MHz-1929.025 MHz

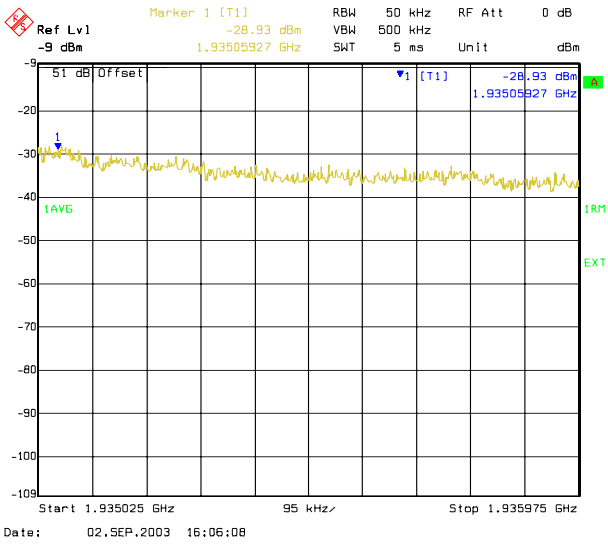


[1] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

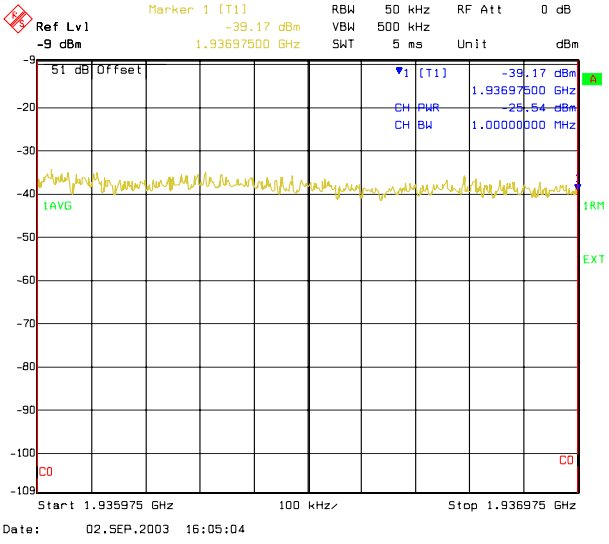
1929.025 MHz-1929.975 MHz



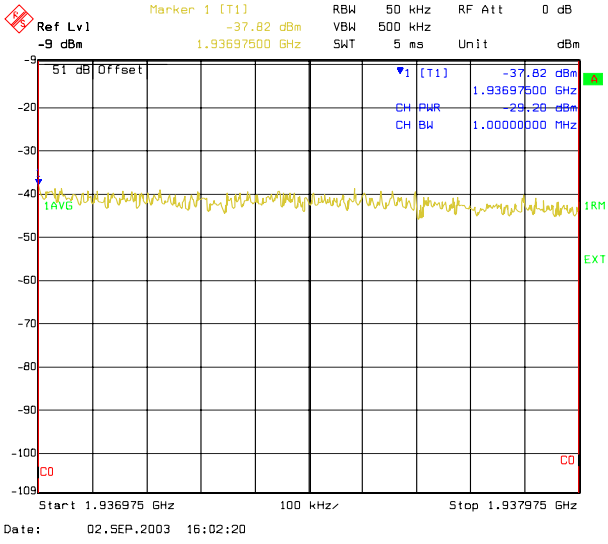
1935.025 MHz-1935.975 MHz



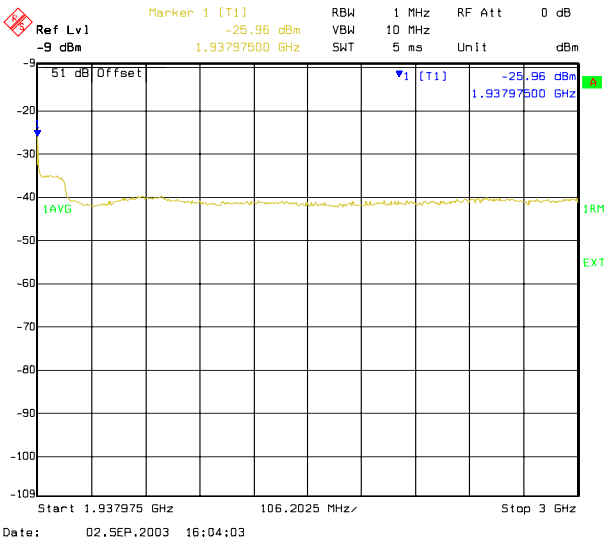
1935.975 MHz-1936.975 MHz



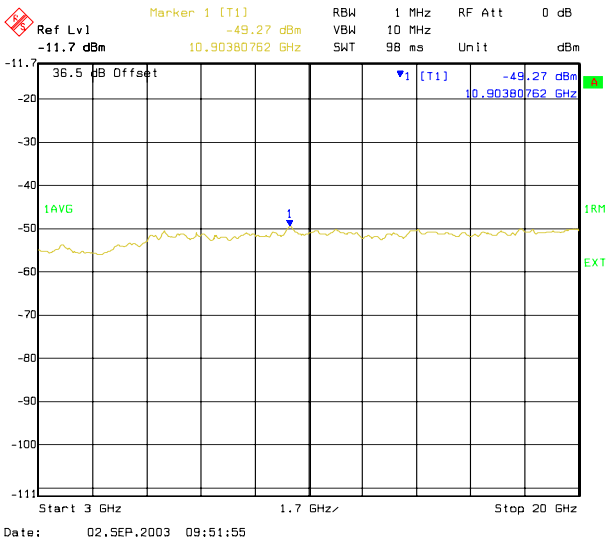
1936.975 MHz-1937.975 MHz



1937.975 MHz-3000 MHz



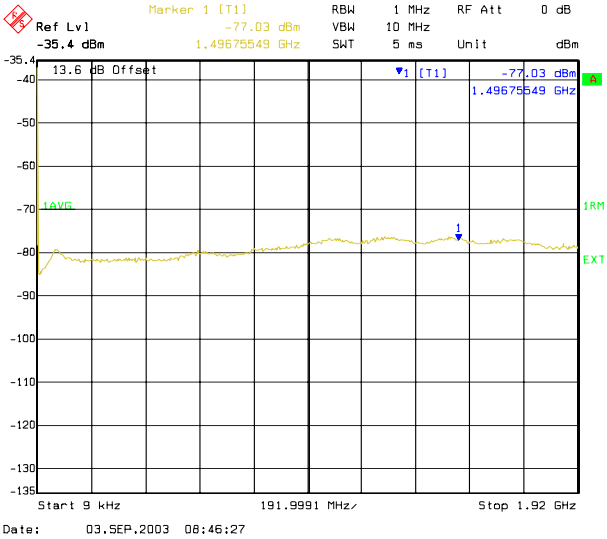
3 GHz-20 GHz



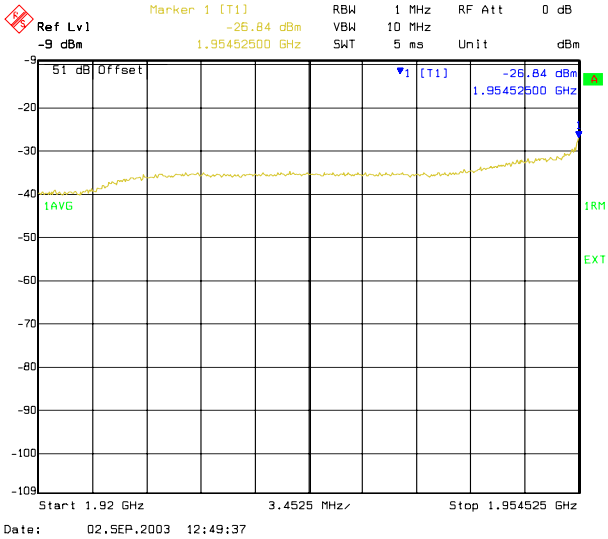
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel M 1960 MHz Sector 2	Margin (dB)	Limit (dBm)
9 kHz to 1.92 GHz	-77.03	64.03	-13
1920 MHz to 1954.525 MHz	-26.84	13.84	
1954.525 MHz to 1955.525 MHz	-29.46	16.46	
1955.525 MHzto 1956.525 MHz	-25.6	12.6	
1956.525 MHz to 1957.475 MHz	-25.22	12.22	
1962.525 MHz to 1963.475 MHz	-24.90	11.9	
1963.475 MHz to 1964.475 MHz	-25.33	12.33	
1964.475 MHz to 1965.475 MHz	-28.70	15.7	
1965.475 MHz to 3000 MHz	-24.49	11.49	
3 GHz to 20 GHz	-49.14	36.14	

Table 5. Measurements result for Spurious Emission in M channel

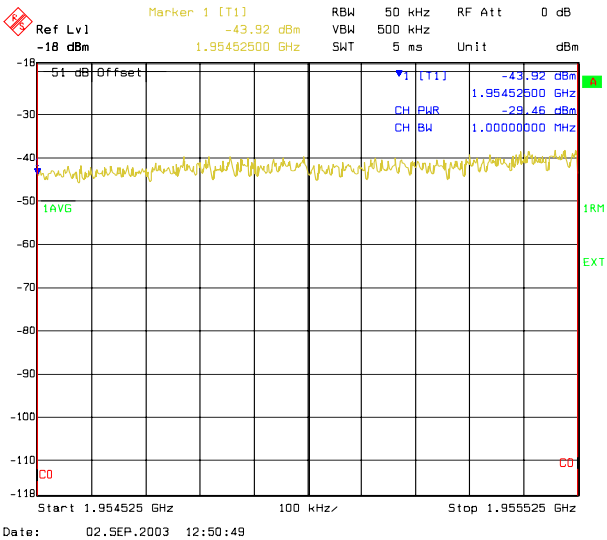
9 kHz-1920 MHz[2]



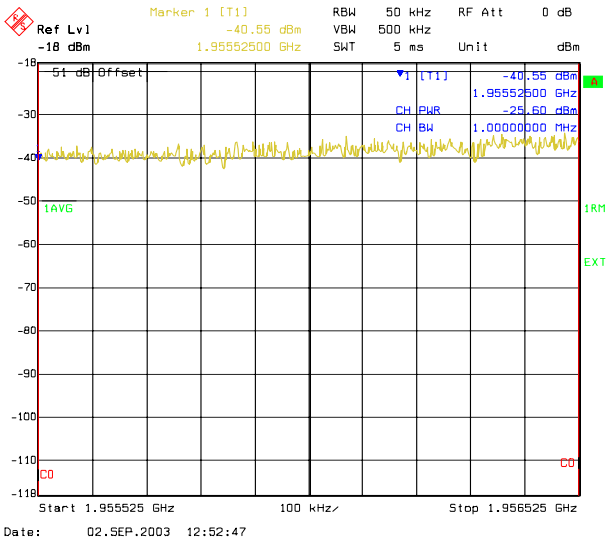
1920 MHz- 1954.525 MHz



1954.525 MHz-1955.525 MHz

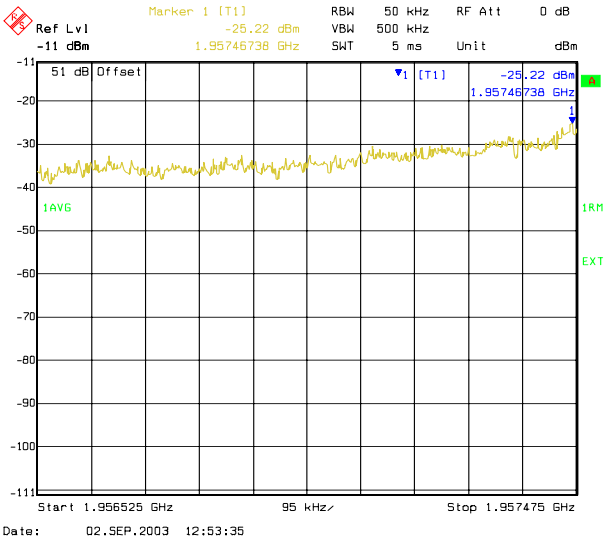


1955.525 MHz-1956.525 MHz

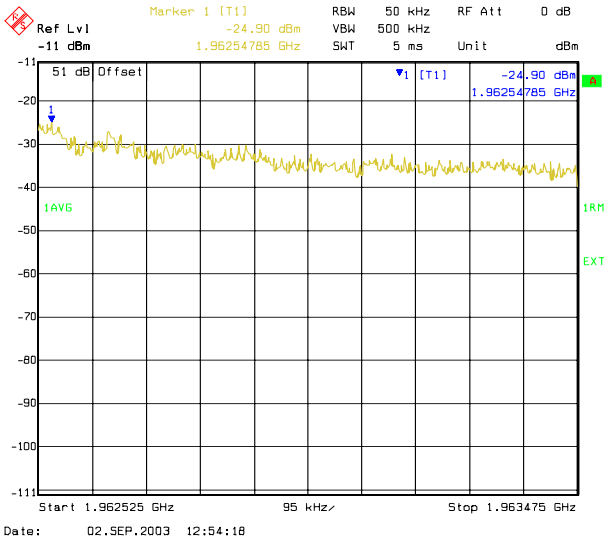


[2] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

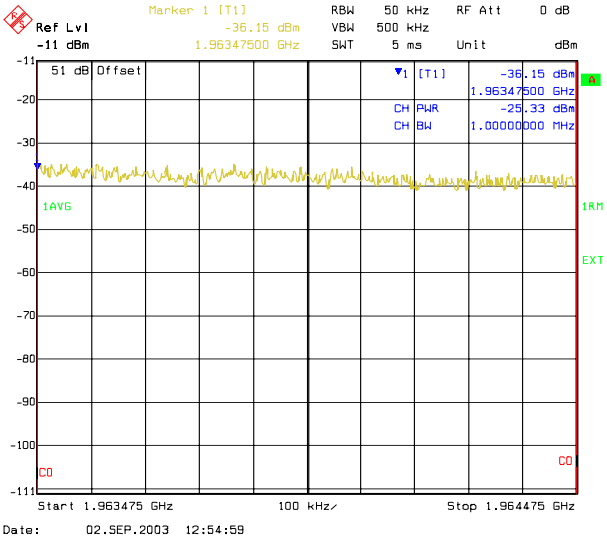
1956.525 MHz-1957.475 MHz



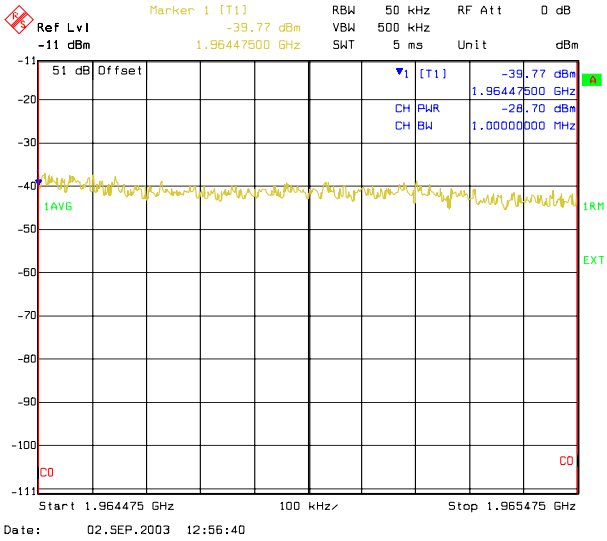
1962.525 MHz-1963.475 MHz



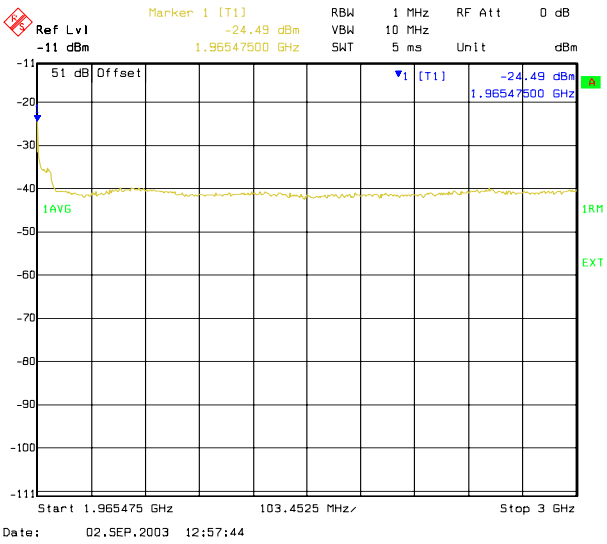
1963.475 MHz-1964.475 MHz



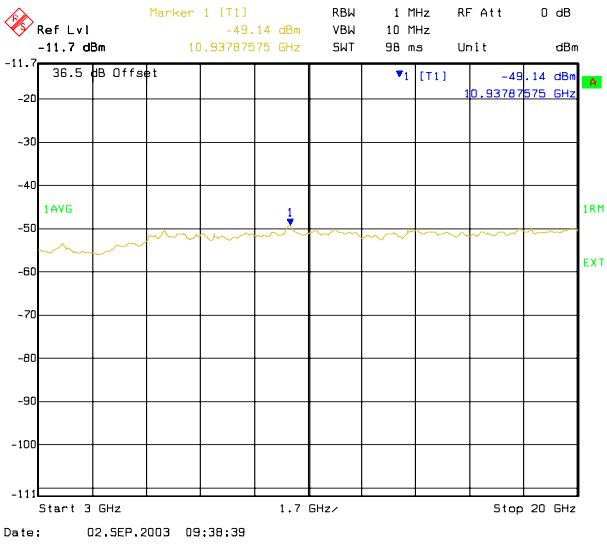
1964.475 MHz-1965.475 MHz



1965.475 MHz-3000 MHz



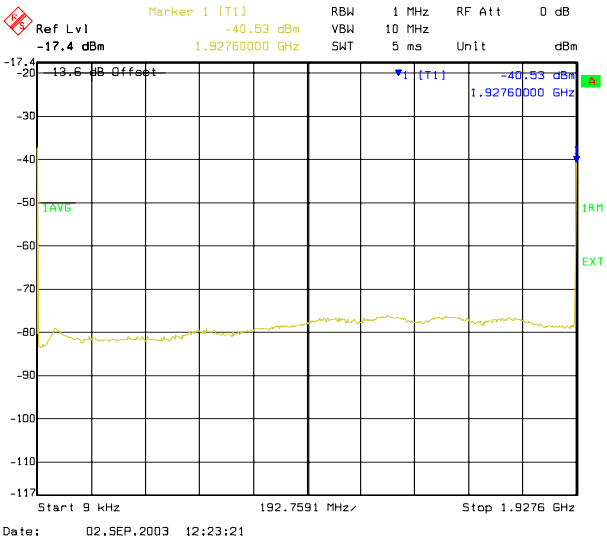
3 GHz-20 GHz



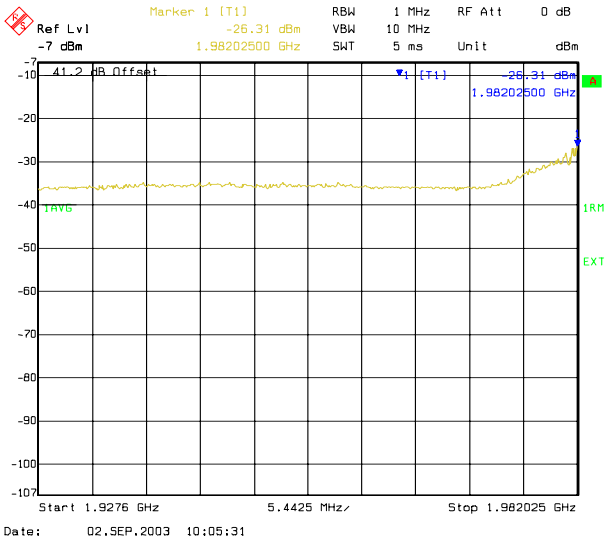
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel T 1987.6 MHz Sector 3	Margin (dB)	Limit (dBm)
9 kHz to 1927.6 MHz	-40.53	27.53	-13
1927.6 MHz to 1982.025 MHz	-26.31	13.31	
1982.025 MHz to 1983.025 MHz	-26.22	13.22	
1983.025 MHzto 1984.025 MHz	-25.49	12.49	
1984.025 MHz to 1984.975 MHz	-29.37	16.37	
1990.025 MHz to 1990.975 MHz	-21.48	8.48	
1990.975 MHz to 1991.975 MHz	-26.27	13.27	
1991.975 MHz to 1992.975 MHz	-28.37	15.37	
1992.975 MHz to 3000 MHz	-22.37	9.37	
3 GHz to 20 GHz	-49.13	36.13	

Table 6. Measurements result for Spurious Emission in T channel

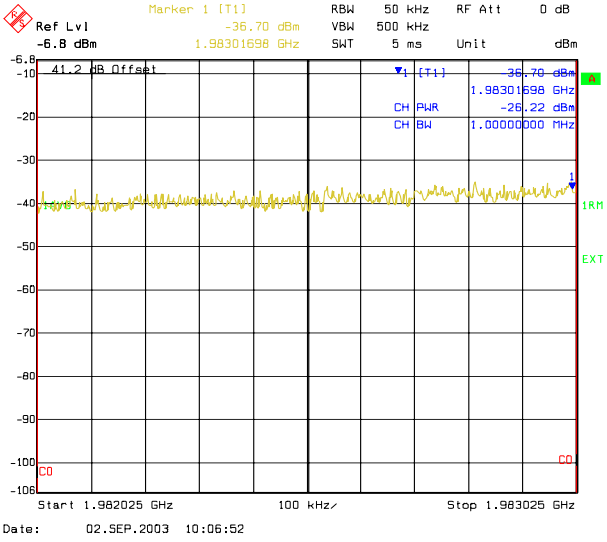
9 kHz-1.927.6 GHz [3]



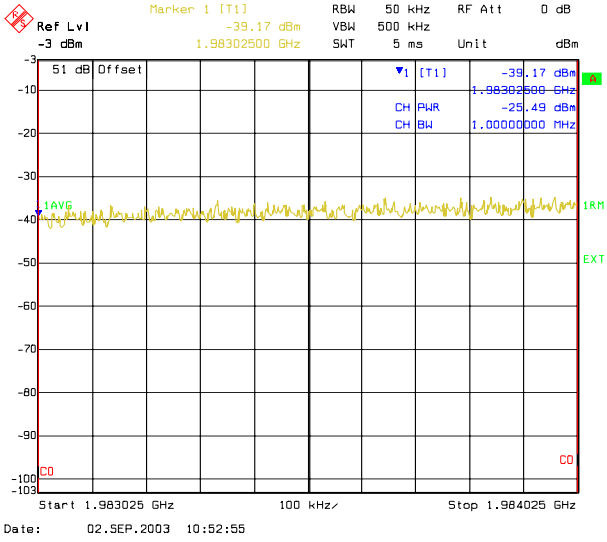
1927.6 MHz- 1982.025 MHz



1982.025 MHz-1983.025 MHz

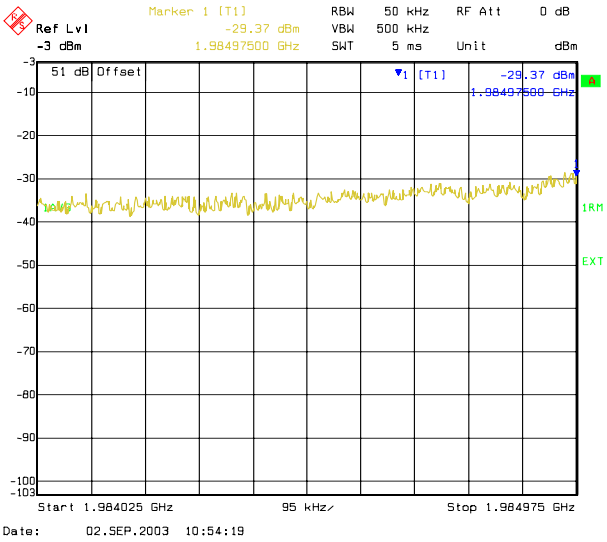


1983.025 MHz-1984.025 MHz

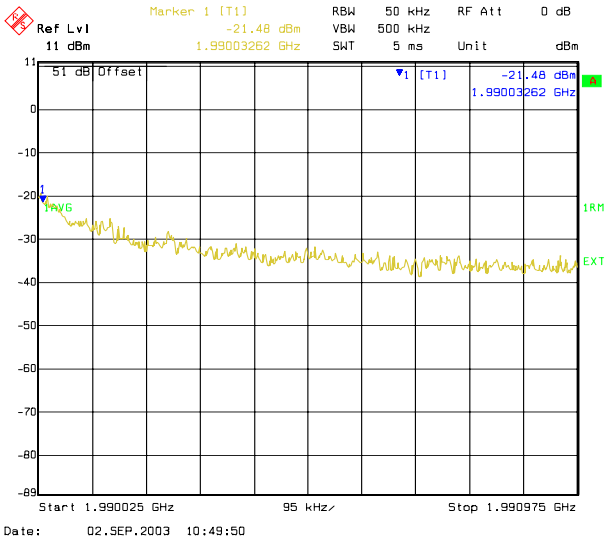


[3] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

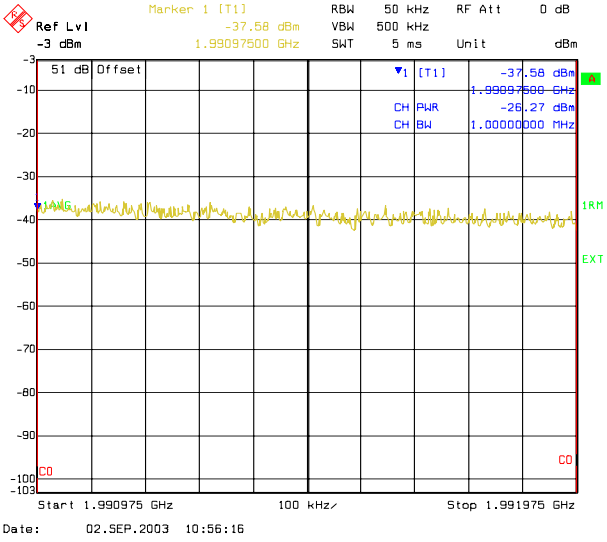
1984.025 MHz-1984.975 MHz



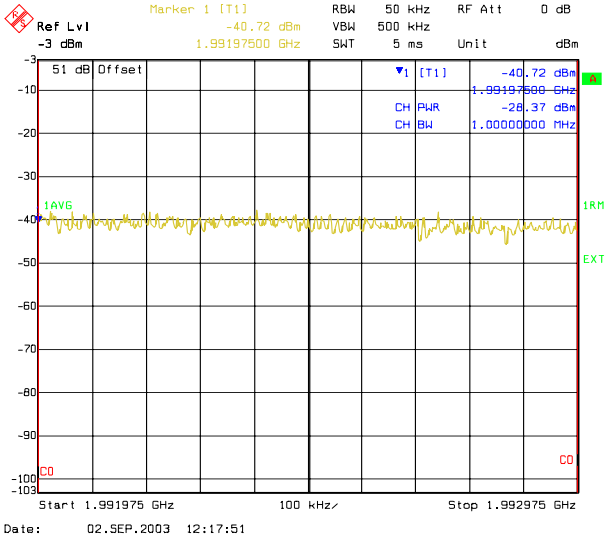
1990.025 MHz-1990.975 MHz



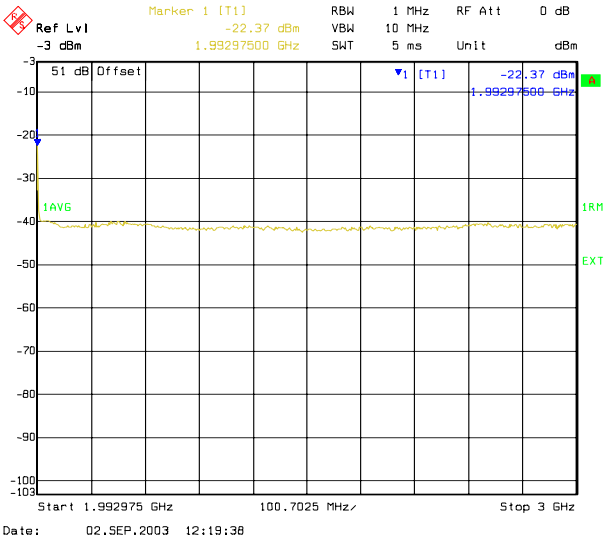
1990.975 MHz-1991.975 MHz



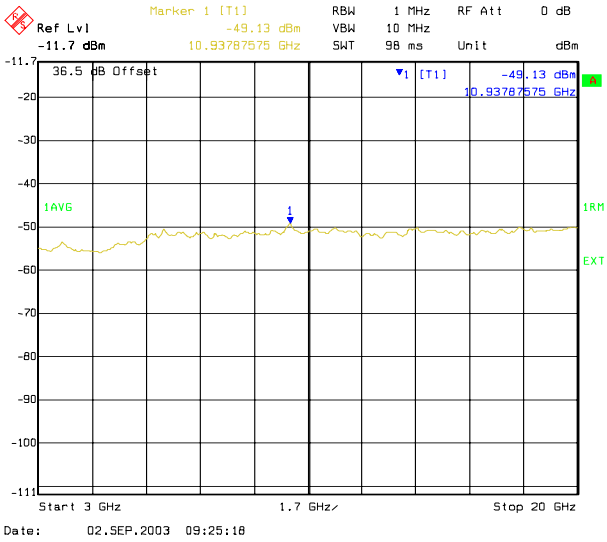
1991.975 MHz-1992.975 MHz



1992.975 MHz-3000 MHz



3 GHz-20 GHz



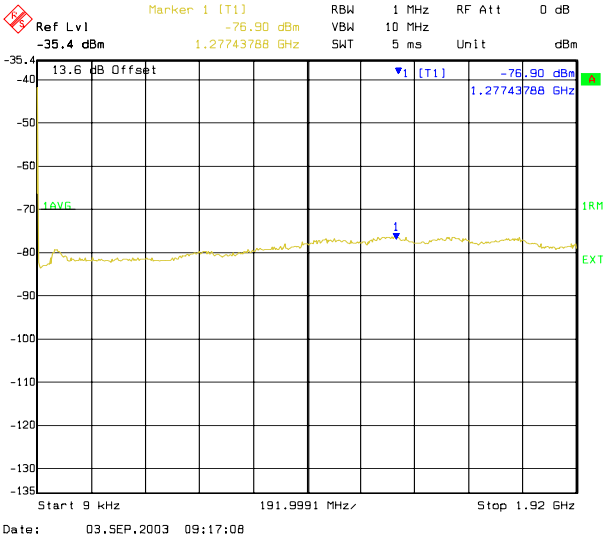
2. UMTS INDOOR2 IBTS, 30W MODE WITH SINGLE CARRIER

Tables 7 to 9 show the results for Spurious Emissions at Antenna Terminals for the configuration B.

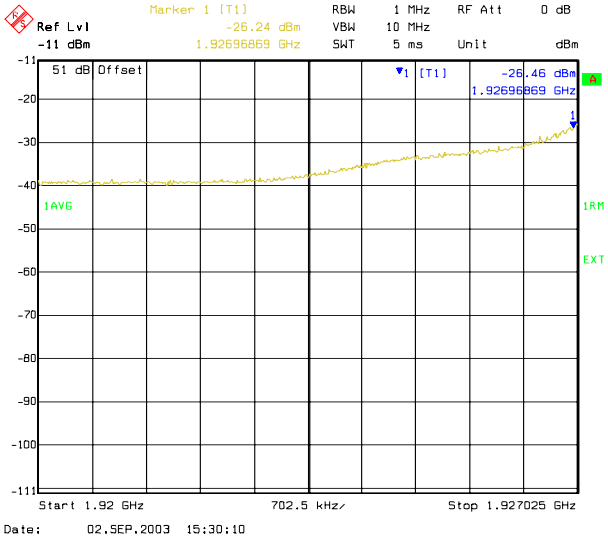
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel B 1932.4 MHz Sector 1	Margin (dB)	Limit (dBm)
9 kHz to 1.92 GHz	-76.9	63.9	-13
1920 MHz to 1927.025 MHz	-26.56	13.56	
1927.025 MHz to 1928.025 MHz	-28.34	15.34	
1928.025 MHzto 1929.025 MHz	-24.00	11	
1929.025 MHz to 1929.975 MHz	-18.45	5.45	
1935.025 MHz to 1935.975 MHz	-27.68	14.68	
1935.975 MHz to 1936.975 MHz	-23.95	10.95	
1936.975 MHz to 1937.975 MHz	-27.89	14.89	
1937.975 MHz to 3000 MHz	-24.43	11.43	
3 GHz to 20 GHz	-49.19	36.19	

Table 7. Measurements result for Spurious Emission in B channel

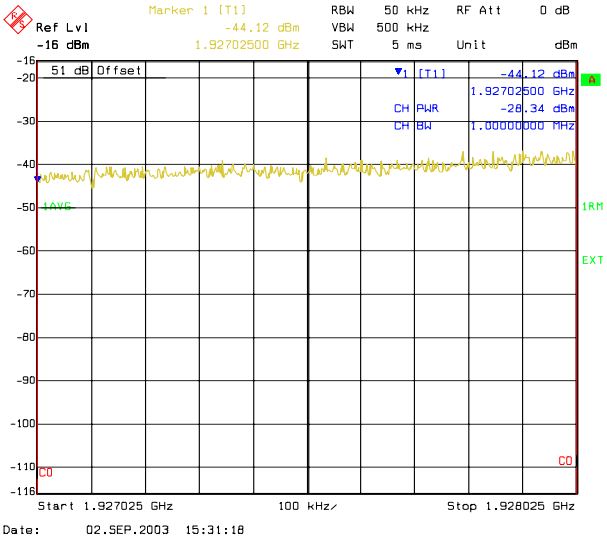
9 kHz-1920 MHz[4]



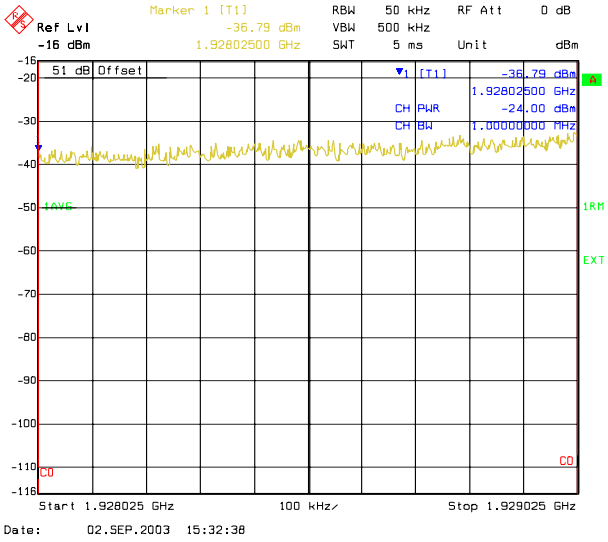
1920 MHz- 1927.025 MHz



1927.025 MHz-1928.025 MHz

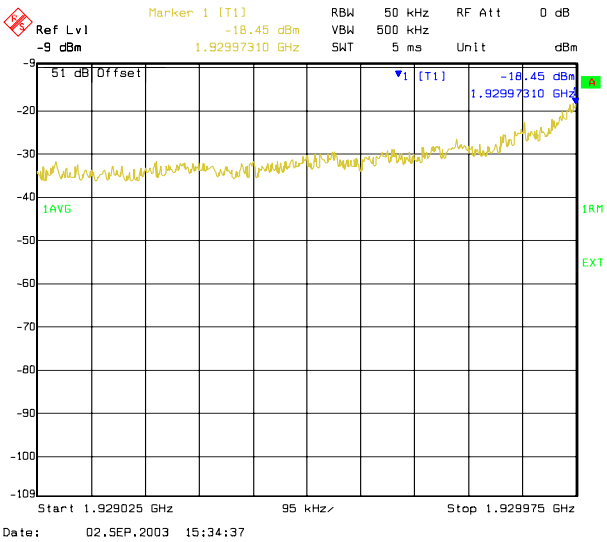


1928.025 MHz-1929.025 MHz

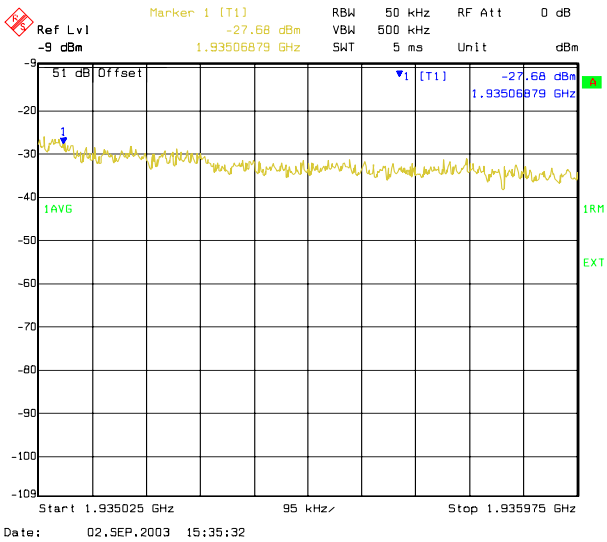


[4] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

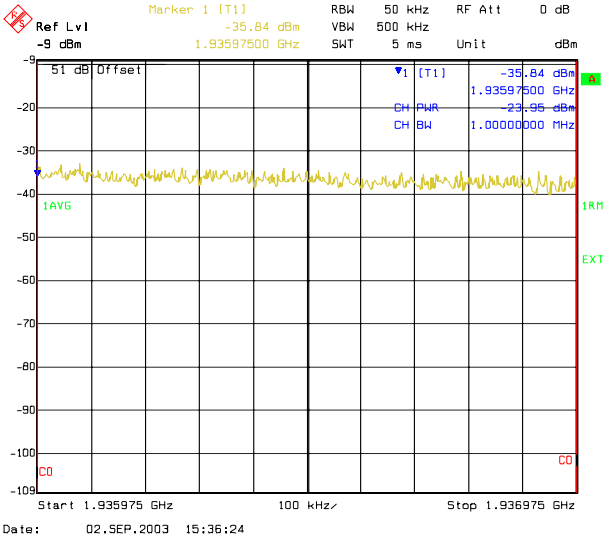
1929.025 MHz-1929.975 MHz



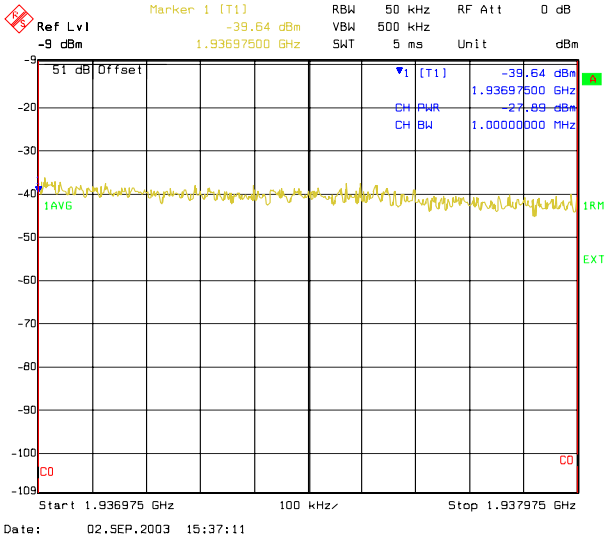
1935.025 MHz-1935.975 MHz



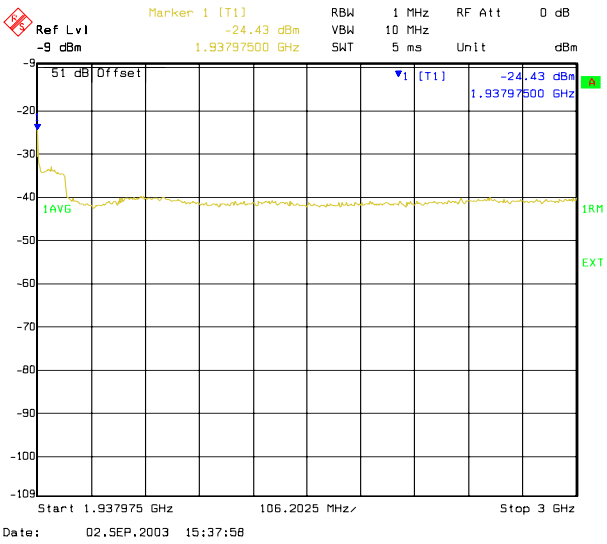
1935.975 MHz-1936.975 MHz



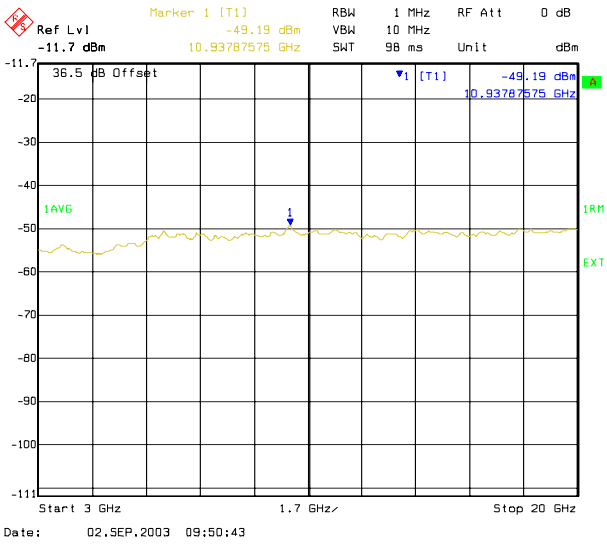
1936.975 MHz-1937.975 MHz



1937.975 MHz-3000 MHz



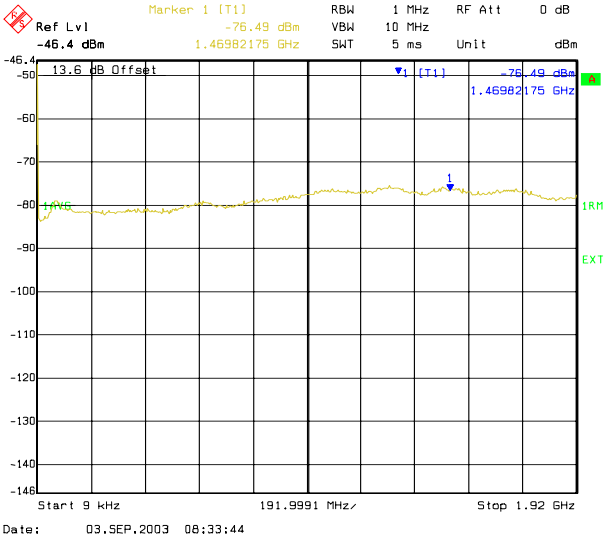
3 GHz-20 GHz



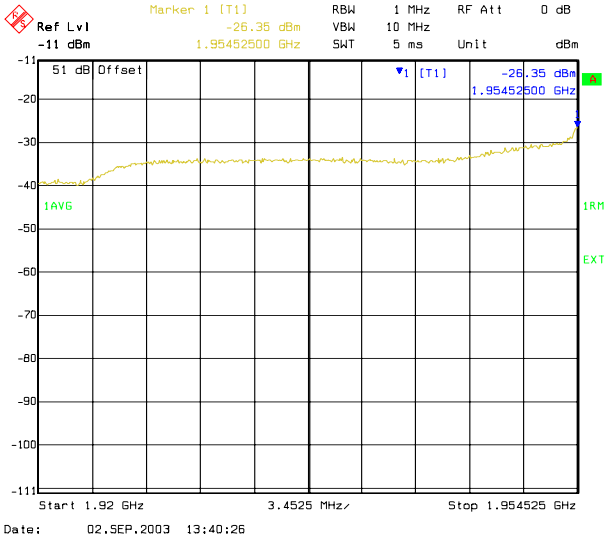
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel M 1960 MHz Sector 2	Margin (dB)	Limit (dBm)
9 kHz to 1.92 GHz	-76.49	63.49	-13
1920 MHz to 1954.525 MHz	-26.35	13.35	
1954.525 MHz to 1955.525 MHz	-28.24	15.24	
1955.525 MHzto 1956.525 MHz	-23.92	10.92	
1956.525 MHz to 1957.475 MHz	-26.30	13.3	
1962.525 MHz to 1963.475 MHz	-24.89	11.89	
1963.475 MHz to 1964.475 MHz	-23.19	10.19	
1964.475 MHz to 1965.475 MHz	-26.76	13.76	
1965.475 MHz to 3000 MHz	-23.42	10.42	
3 GHz to 20 GHz	-49.19	36.19	

Table 8. Measurements result for Spurious Emission in M channel

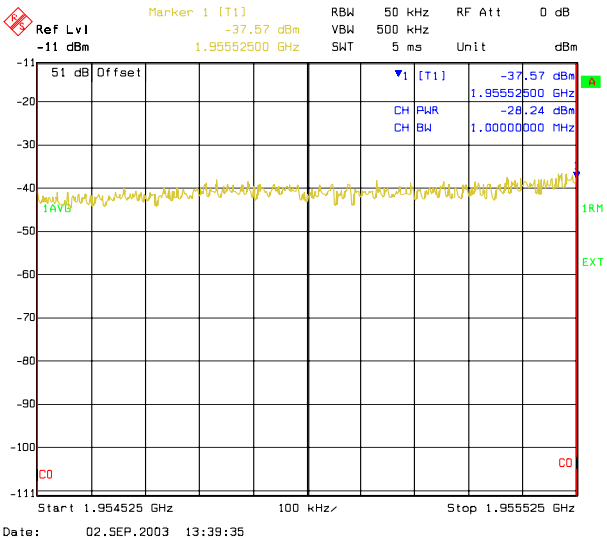
9 kHz-1920 MHz[5]



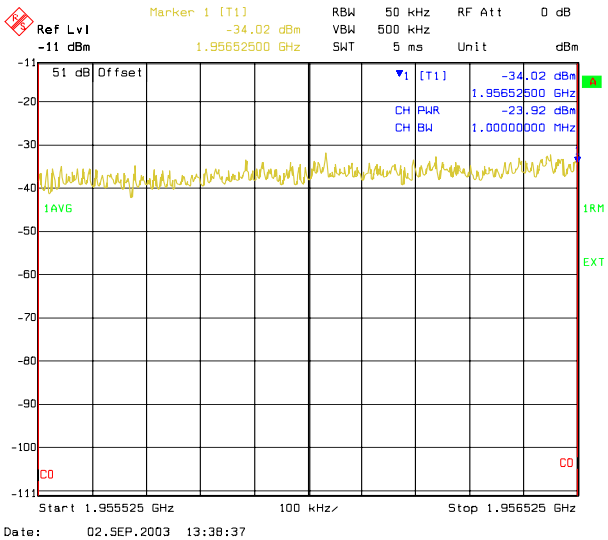
1920 MHz- 1954.525 MHz



1954.525 MHz-1955.525 MHz

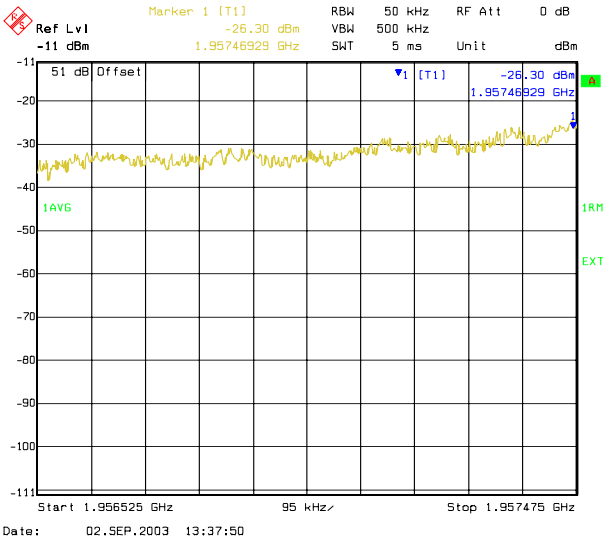


1955.525 MHz-1956.525 MHz

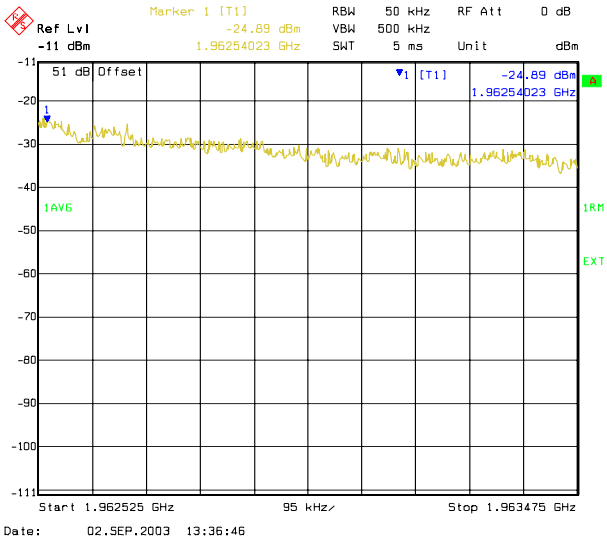


[5] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

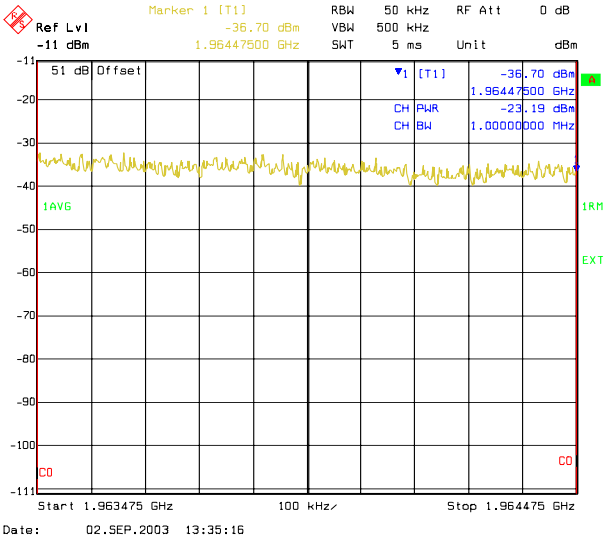
1956.525 MHz-1957.475 MHz



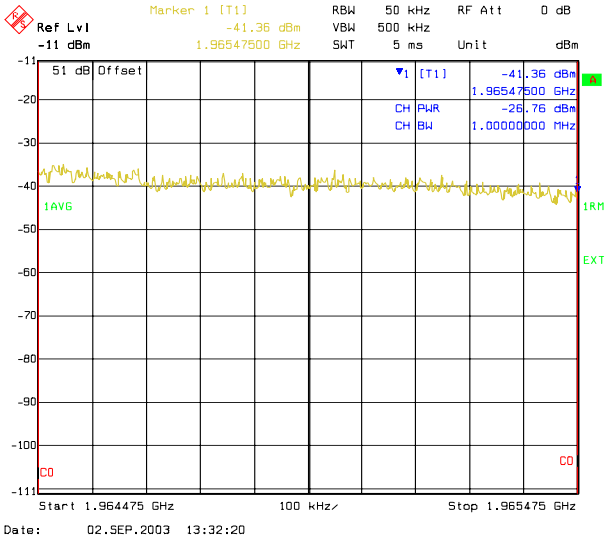
1962.525 MHz-1963.475 MHz



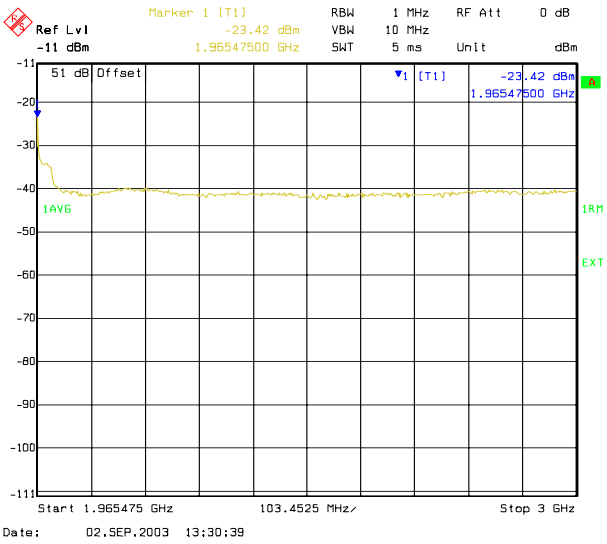
1963.475 MHz-1964.475 MHz



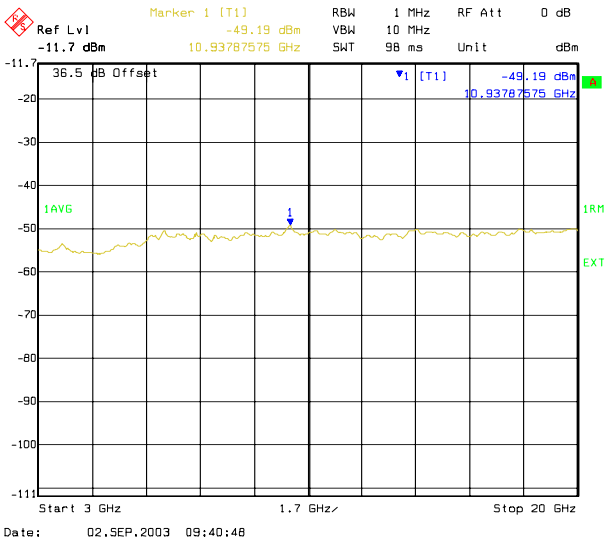
1964.475 MHz-1965.475 MHz



1965.475 MHz-3000 MHz



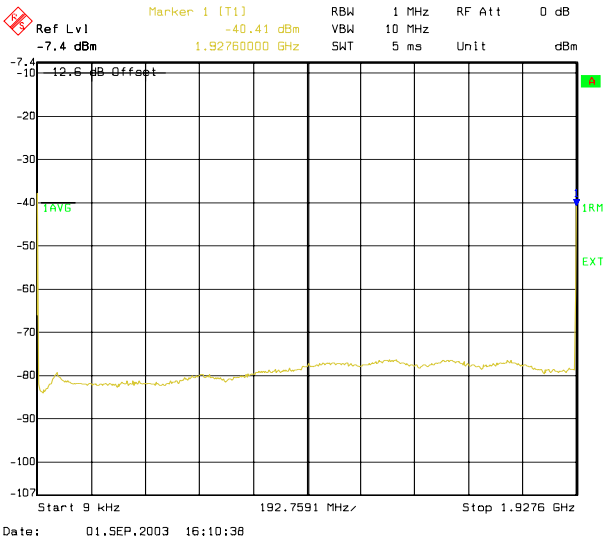
3 GHz-20 GHz



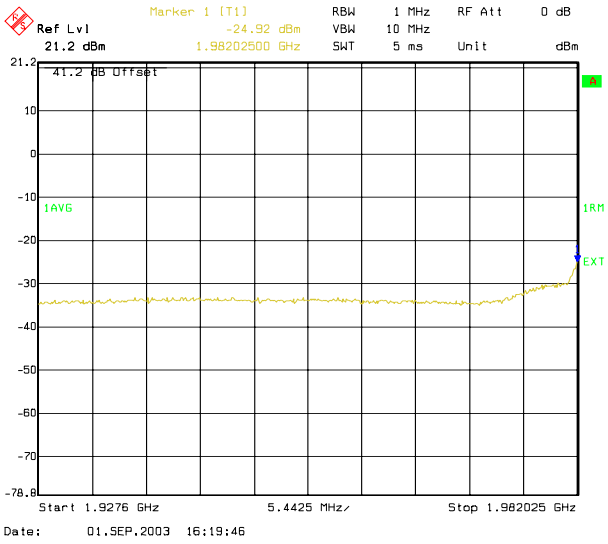
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel T 1987.6 MHz Sector 3	Margin (dB)	Limit (dBm)
9 kHz to 1927.6 MHz	-40.41	27.41	-13
1927.6 MHz to 1982.025 MHz	-24.92	11.92	
1982.025 MHz to 1983.025 MHz	-24.37	11.37	
1983.025 MHzto 1984.025 MHz	-23.44	10.44	
1984.025 MHz to 1984.975 MHz	-27.90	14.9	
1990.025 MHz to 1990.975 MHz	-19.28	6.28	
1990.975 MHz to 1991.975 MHz	-23.77	10.77	
1991.975 MHz to 1992.975 MHz	-26.18	13.18	
1992.975 MHz to 3000 MHz	-21.55	8.55	
3 GHz to 20 GHz	-49.18	36.18	

Table 9. Measurements result for Spurious Emission in T channel

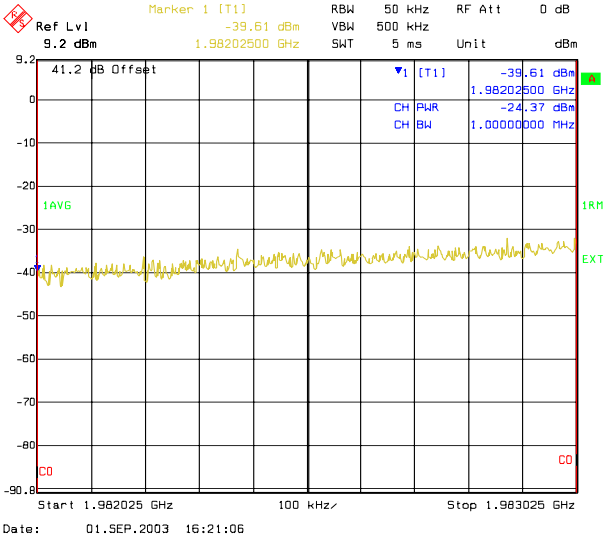
9 kHz-1.927.6 GHz [6]



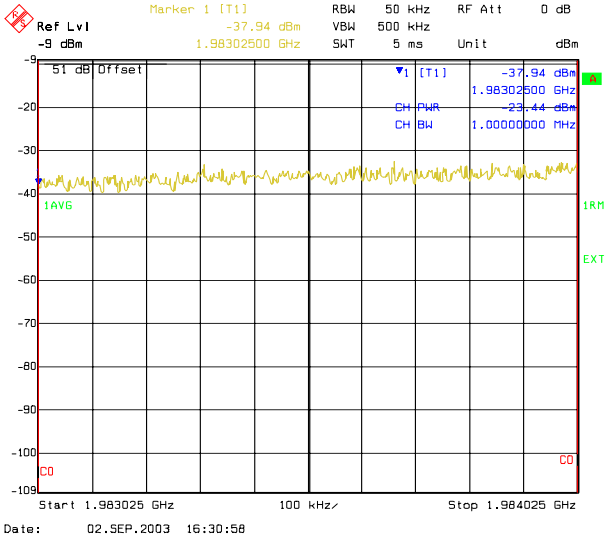
1927.6 MHz- 1982.025 MHz



1982.025 MHz-1983.025 MHz

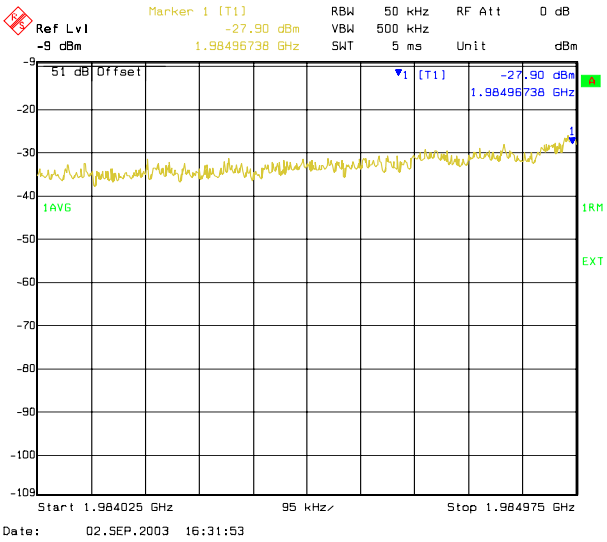


1983.025 MHz-1984.025 MHz

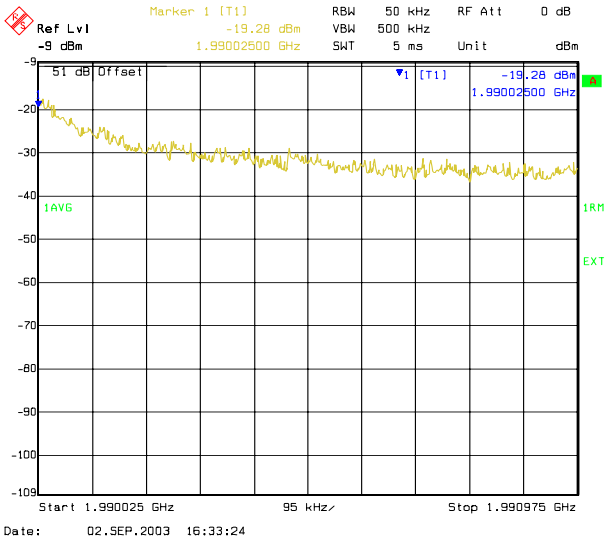


[6] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

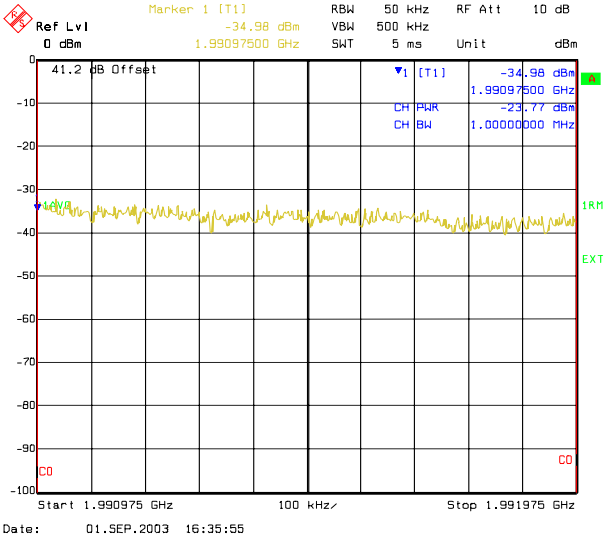
1984.025 MHz-1984.975 MHz



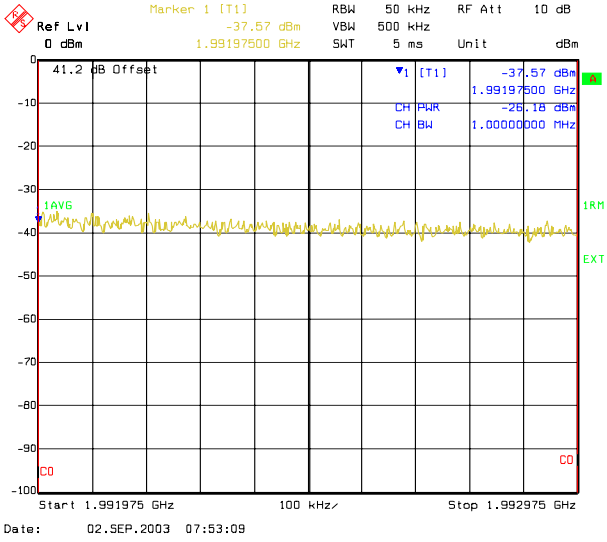
1990.025 MHz-1990.975 MHz



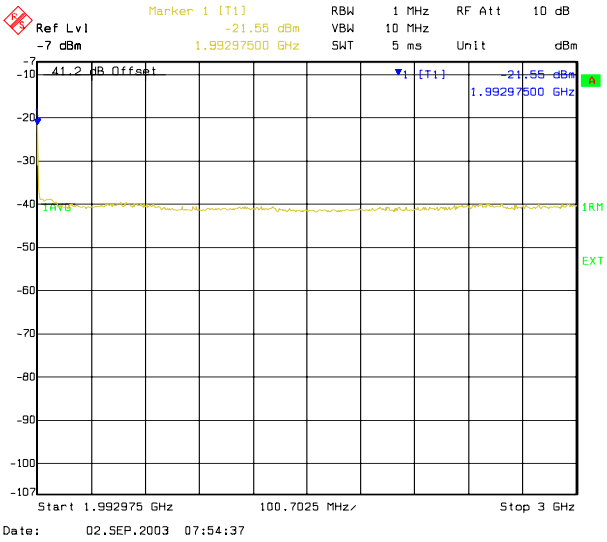
1990.975 MHz-1991.975 MHz



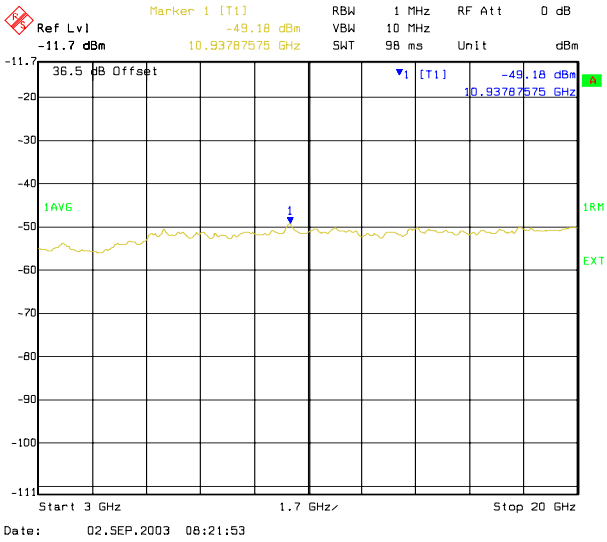
1991.975 MHz-1992.975 MHz



1992.975 MHz-3000 MHz



3 GHz-20 GHz



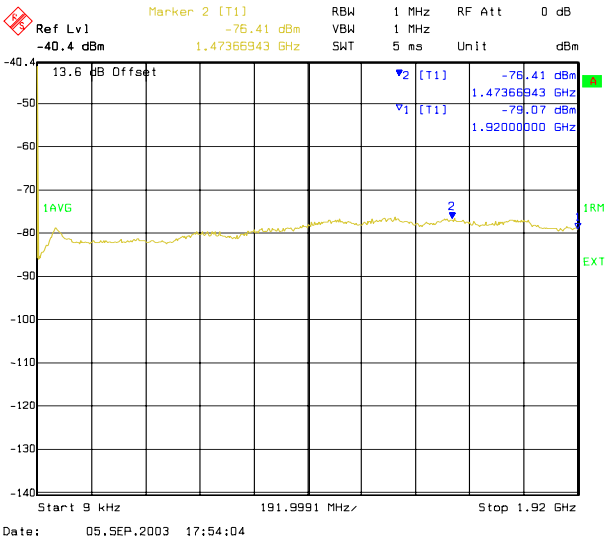
3. UMTS INDOOR2 IBTS, 30W MODE WITH 3 CARRIERS

Tables 10 to 12 show the results for Spurious Emissions at Antenna Terminals for the configuration B.

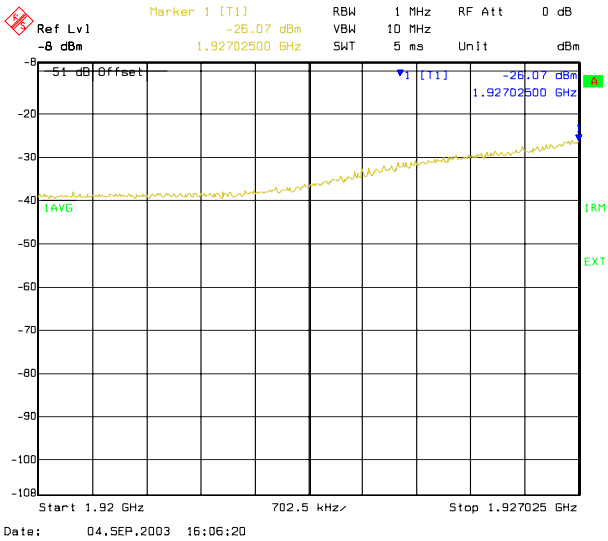
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel B 1932.4 MHz Sector 1	Margin (dB)	Limit (dBm)
9 kHz to 1.92 GHz	-76.41	63.41	-13
1920 MHz to 1927.025 MHz	-26.07	13.07	
1927.025 MHz to 1928.025 MHz	-27.87	14.87	
1928.025 MHzto 1929.025 MHz	-26.34	13.34	
1929.025 MHz to 1929.975 MHz	-22.14	9.14	
1945.025 MHz to 1945.975 MHz	-32.06	19.06	
1945.975 MHz to 1946.975 MHz	-25.75	12.75	
1946.975 MHz to 1947.975 MHz	-26.94	13.94	
1947.975 MHz to 3000 MHz	-25.62	12.62	
3 GHz to 20 GHz	-49.41	36.41	

Table 10. Measurements result for Spurious Emission in B channel

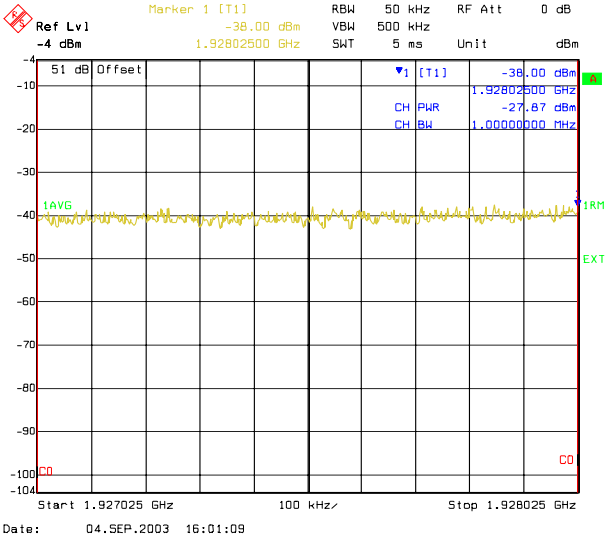
9 kHz-1.92GHz[7]



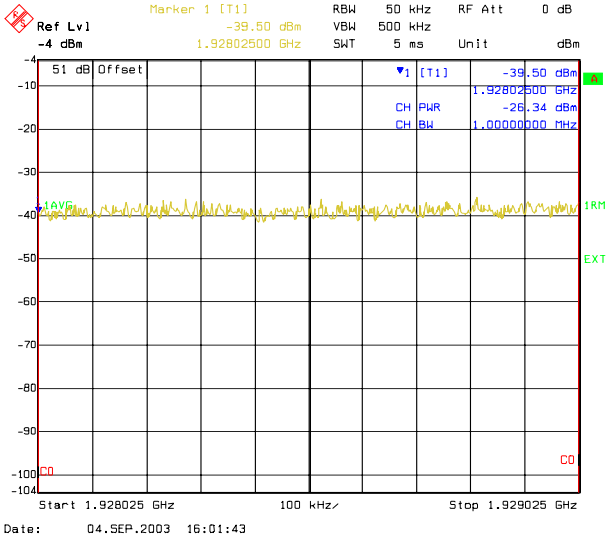
1920 MHz- 1927.025 MHz



1927.025 MHz-1928.025 MHz

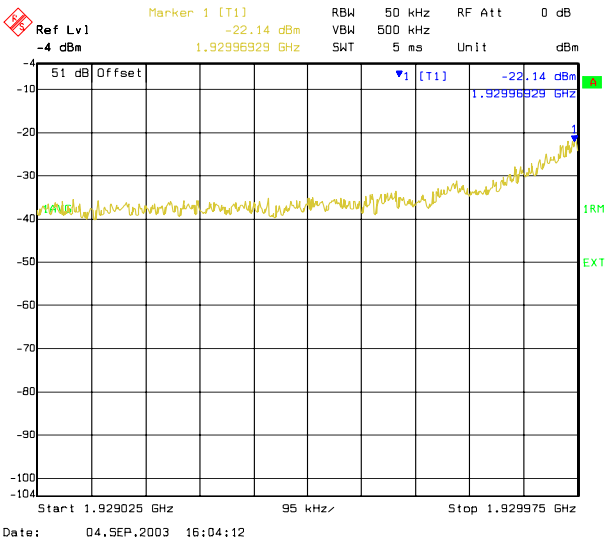


1928.025 MHz-1929.025 MHz

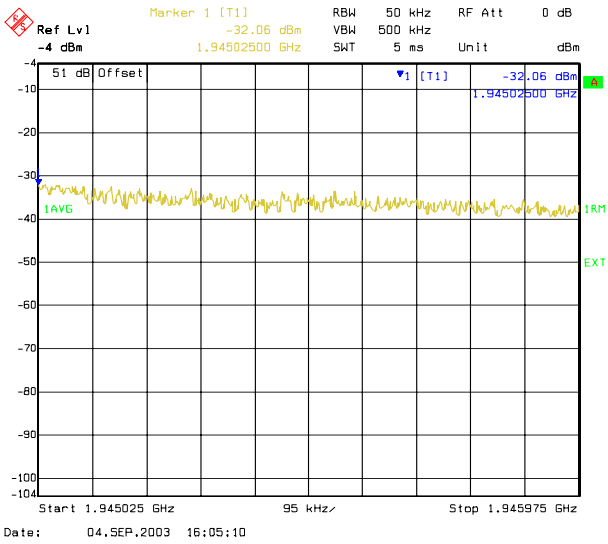


[7] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

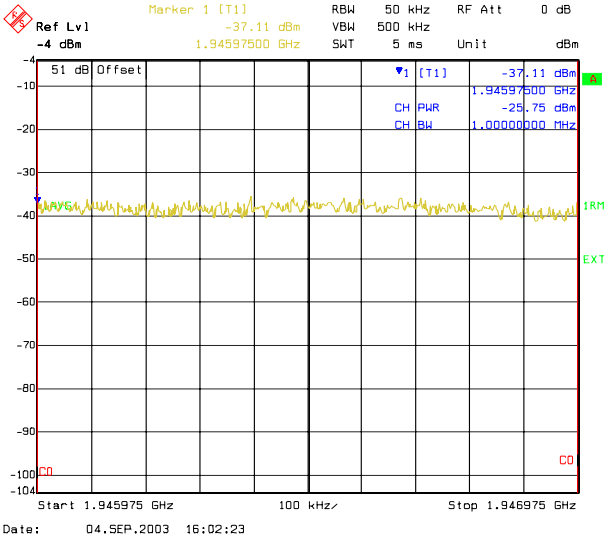
1929.025 MHz-1929.975 MHz



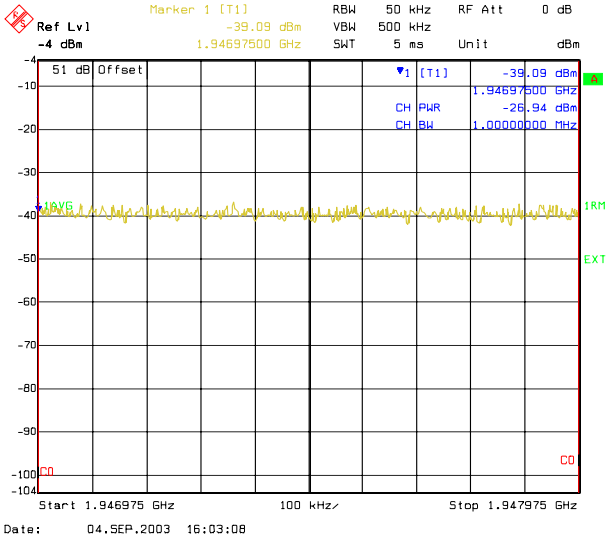
1945.025 MHz-1945.975 MHz



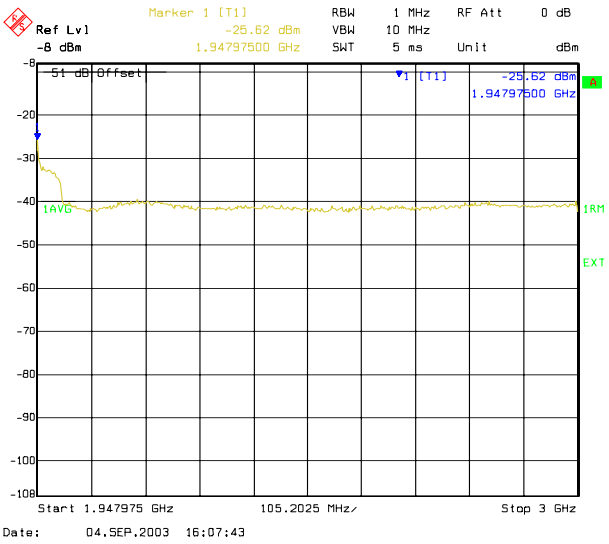
1945.975 MHz-1946.975 MHz



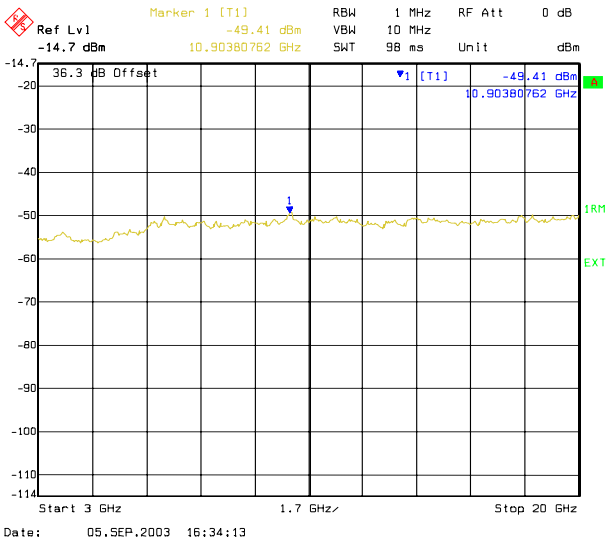
1946.975 MHz-1947.975 MHz



1947.975 MHz-3000 MHz



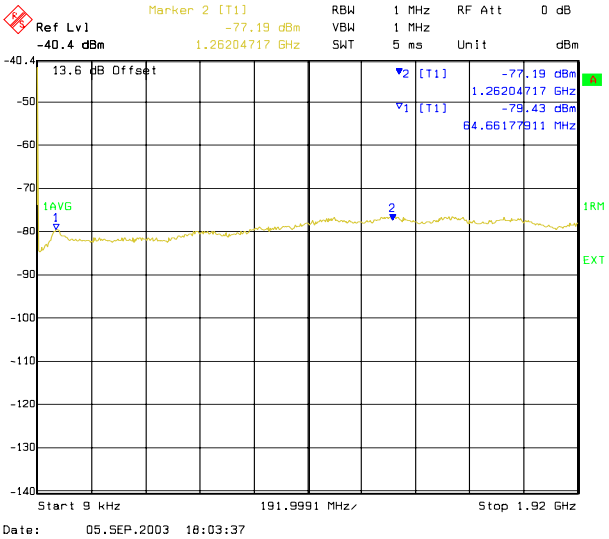
3 GHz - 20 GHz



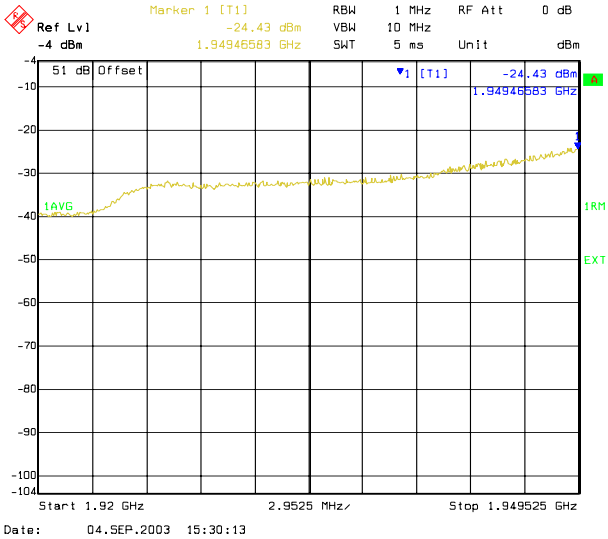
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel M 1960 MHz Sector 2	Margin (dB)	Limit (dBm)
9 kHz to 1.92 GHz	-77.19	64.19	-13
1920 MHz to 1949.525 MHz	-24.43	11.43	
1949.525 MHz to 1950.525 MHz	-26.09	13.09	
1950.525 MHzto 1951.525 MHz	-25.72	12.72	
1951.525 MHz to 1952.475 MHz	-27.17	14.17	
1967.525 MHz to 1968.475 MHz	-27.76	14.76	
1968.475 MHz to 1969.475 MHz	-24.61	11.61	
1969.475 MHz to 1970.475 MHz	-26.17	13.17	
1970.475 MHz to 3000 MHz	-23.46	10.46	
3 GHz to 20 GHz	-49.20	36.2	

Table 11. Measurements result for Spurious Emission in M channel

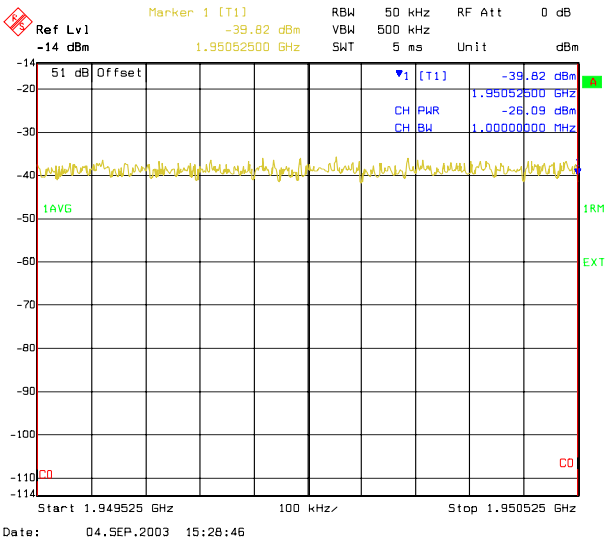
9 kHz -1.92 GHz



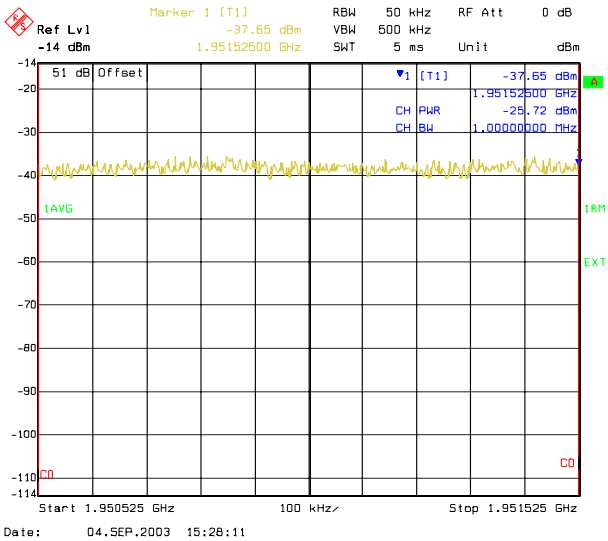
1920 MHz- 1949.525 MHz



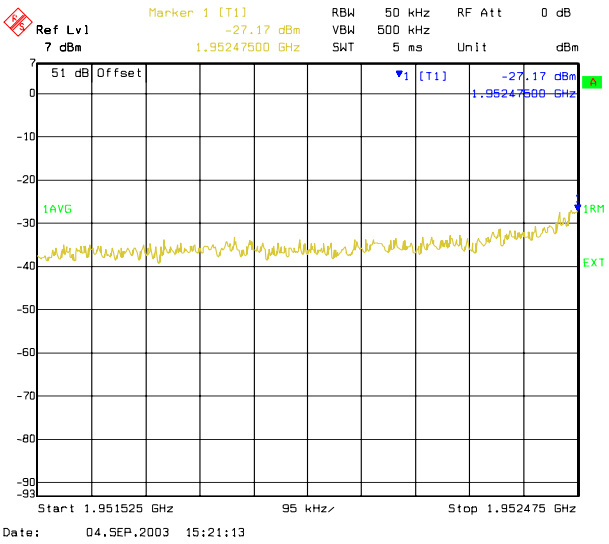
1949.525 MHz-1950.525 MHz



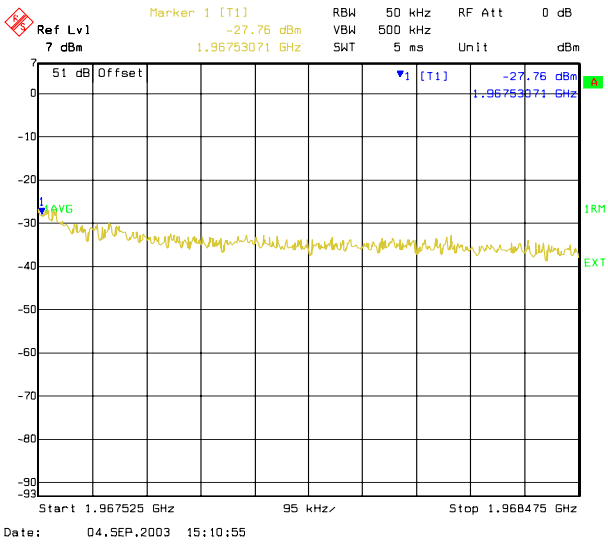
1950.525 MHz-1951.525 MHz



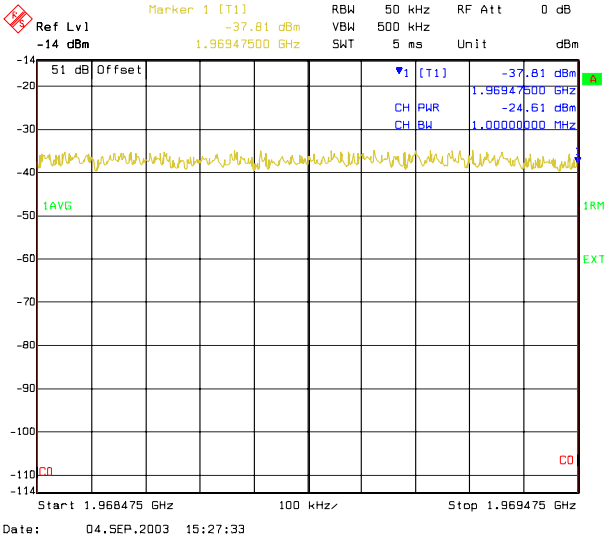
1951.525 MHz-1952.475 MHz



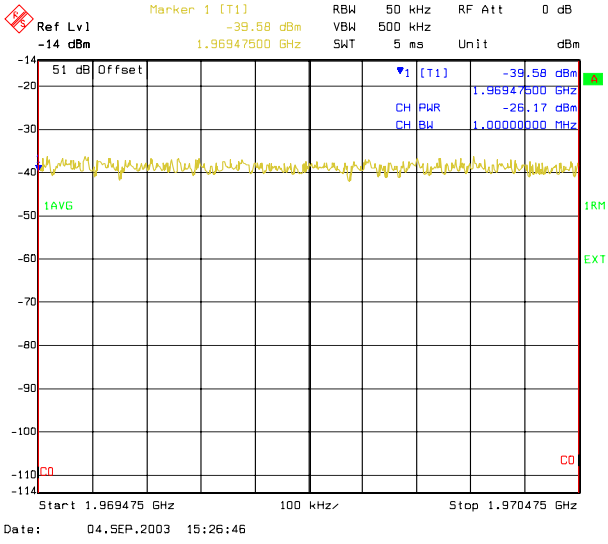
1967.525 MHz-1968.475 MHz



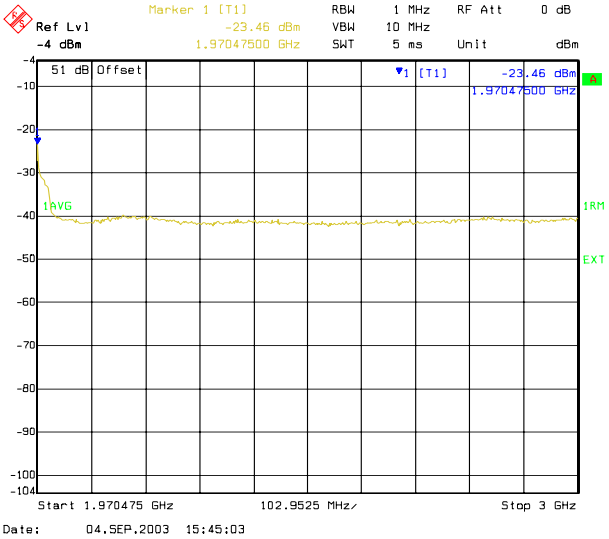
1968.475 MHz-1969.475 MHz



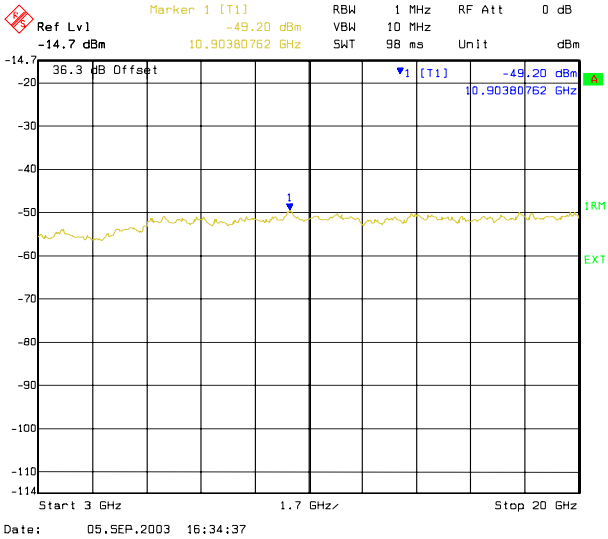
1969.475 MHz-1970.475 MHz



1970.475 MHz-3000 MHz



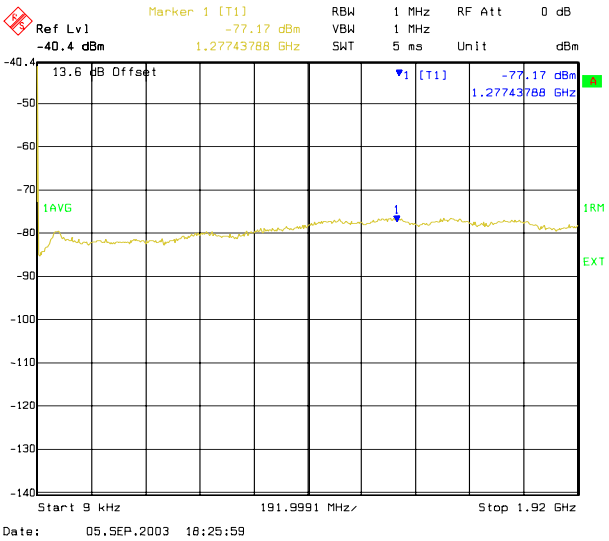
3 GHz- 20 GHz



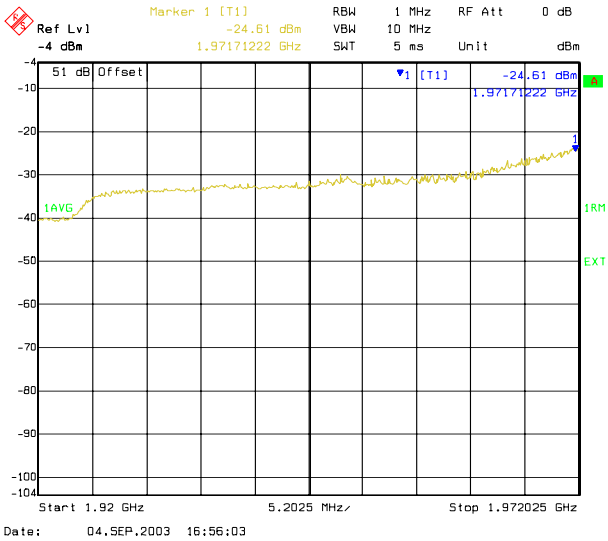
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel T 1987.6 MHz Sector 3	Margin (dB)	Limit (dBm)
9 kHz to 1920 MHz	-77.17	64.17	-13
1920 MHz to 1972.025 MHz	-24.61	11.61	
1972.025 MHz to 1973.025 MHz	-25.02	12.02	
1973.025 MHzto 1974.025 MHz	-24.45	11.45	
1974.025 MHz to 1974.975 MHz	-32.67	19.67	
1990.025 MHz to 1990.975 MHz	-20.69	7.69	
1990.975 MHz to 1991.975 MHz	-26.36	13.36	
1991.975 MHz to 1992.975 MHz	-27.61	14.61	
1992.975 MHz to 3000 MHz	-24.30	11.3	
3 GHz to 20 GHz	-49.21	36.21	

Table 12. Measurements result for Spurious Emission in T channel

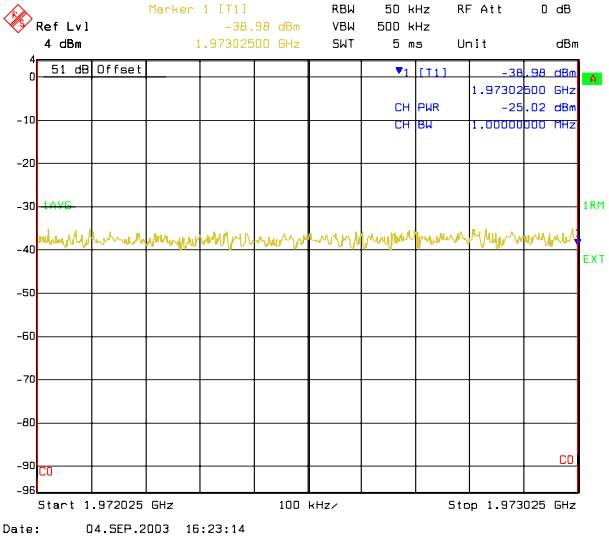
9 kHz-1920 MHz[8]



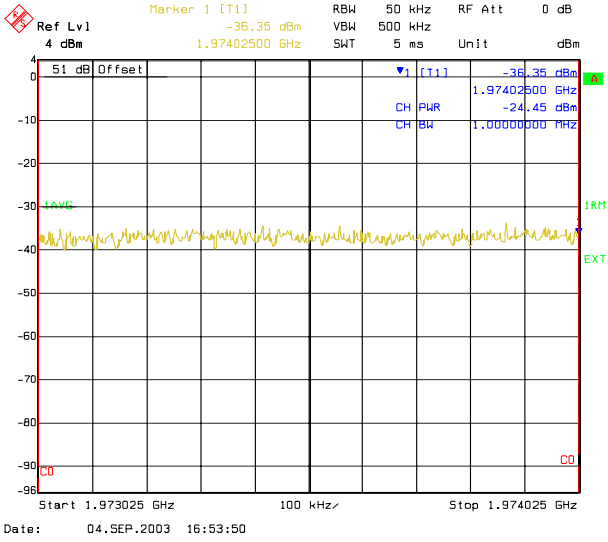
1920 MHz- 1972.025 MHz



1972.025 MHz-1973.025 MHz

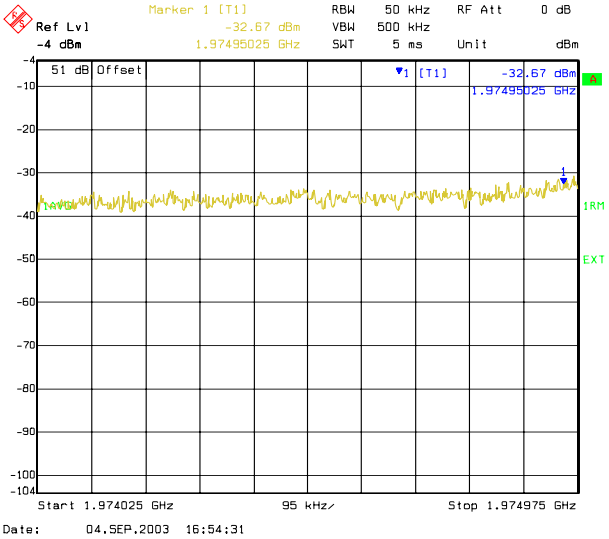


1973.025 MHz-1974.025 MHz

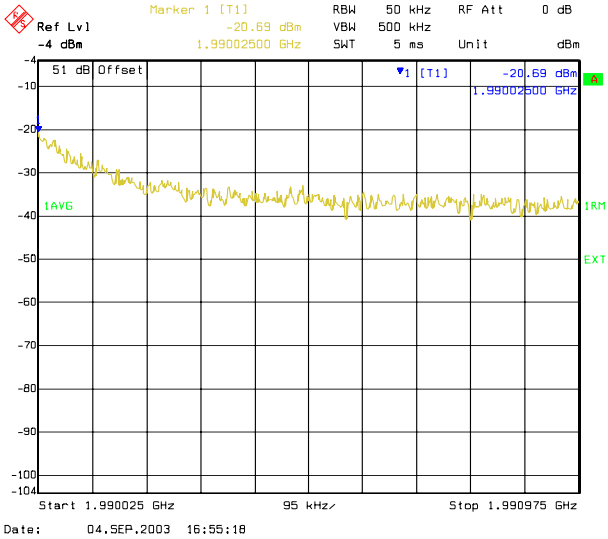


[8] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

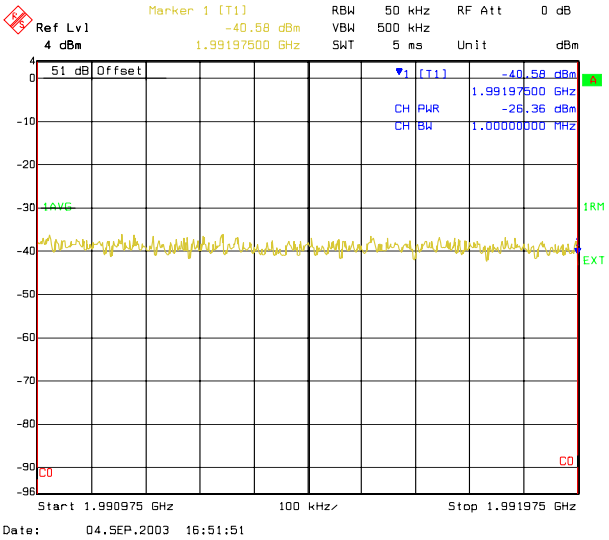
1974.025 MHz-1974.975 MHz



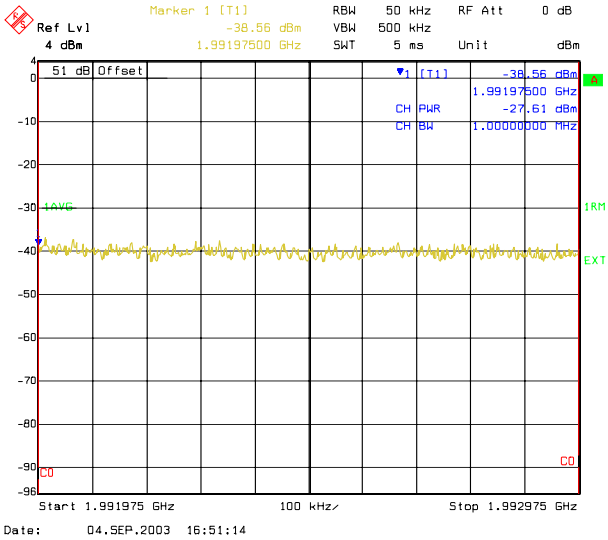
1990.025 MHz-1990.975 MHz



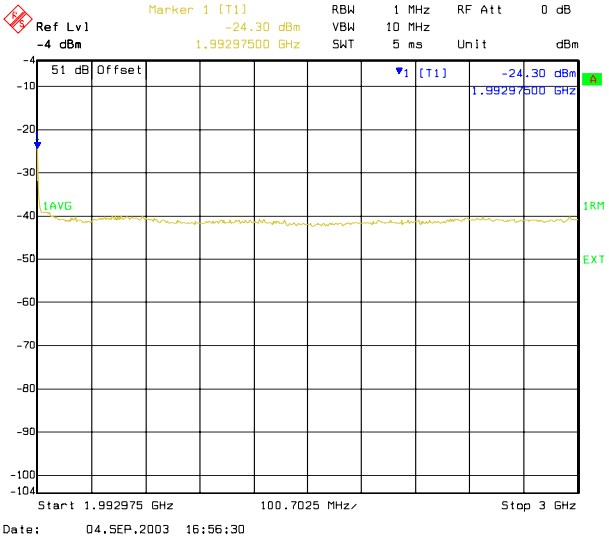
1990.975 MHz-1991.975 MHz



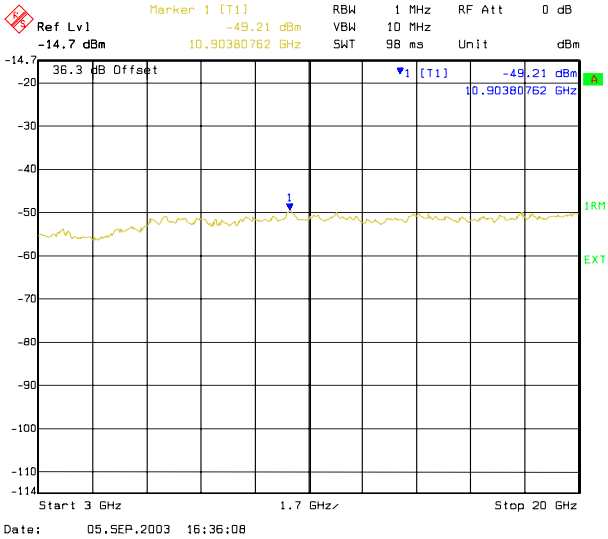
1991.975 MHz-1992.975 MHz



1992.975 MHz-3000 MHz



3 GHz- 20 GHz



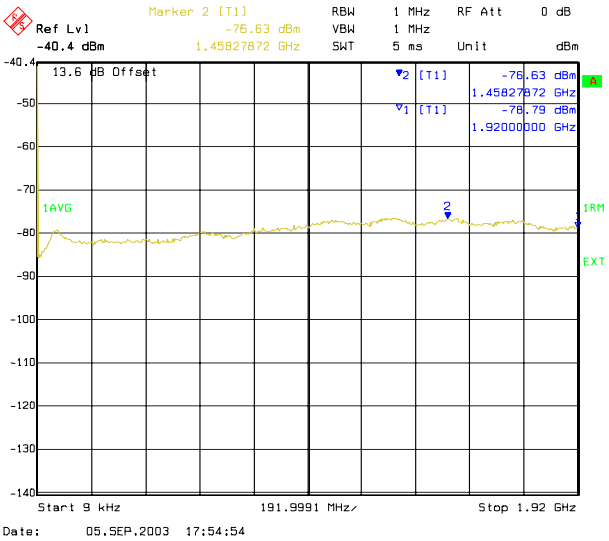
4. UMTS INDOOR2 IBTS, 45W MODE WITH 3 CARRIERS

Tables 10 to 12 show the results for Spurious Emissions at Antenna Terminals for the configuration A

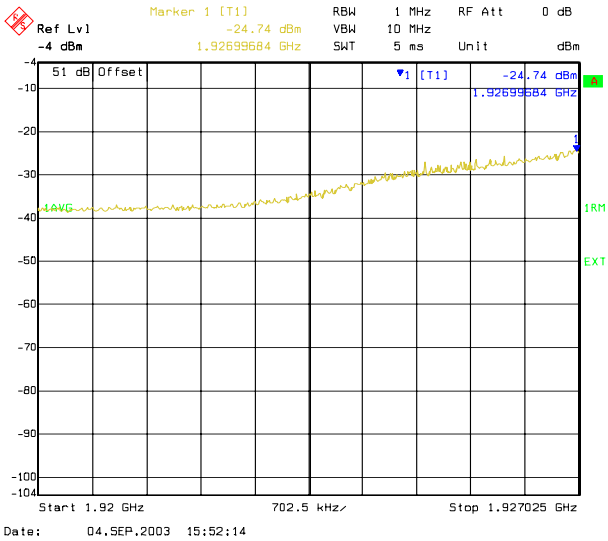
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel B 1932.4 MHz Sector 1	Margin (dB)	Limit (dBm)
9 kHz to 1.92 GHz	-76.63	63.63	-13
1920 MHz to 1927.025 MHz	-24.74	11.74	
1927.025 MHz to 1928.025 MHz	-26.25	13.25	
1928.025 MHzto 1929.025 MHz	-24.62	11.62	
1929.025 MHz to 1929.975 MHz	-20.35	7.35	
1945.025 MHz to 1945.975 MHz	-28.45	15.45	
1945.975 MHz to 1946.975 MHz	-22.32	9.32	
1946.975 MHz to 1947.975 MHz	-23.42	10.42	
1947.975 MHz to 3000 MHz	-21.94	8.94	
3 GHz to 20 GHz	-49.64	36.64	

Table 13. Measurements result for Spurious Emission in B channel

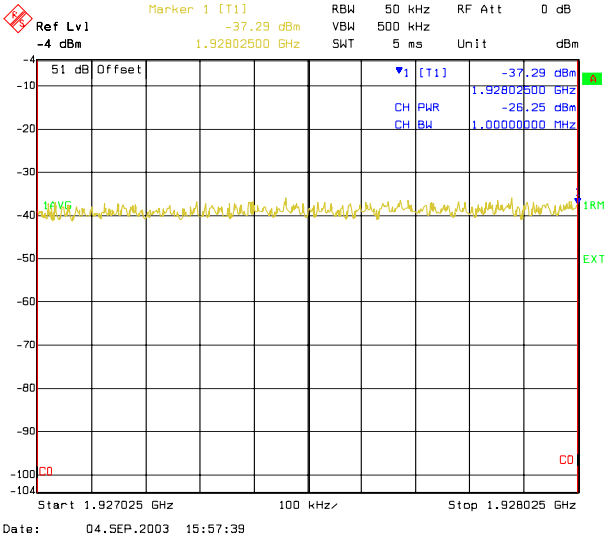
9 kHz-1.92GHz[9]



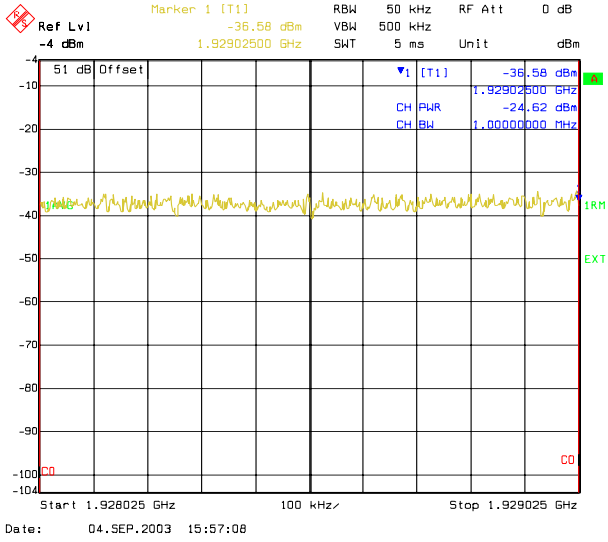
1920 MHz- 1927.025 MHz



1927.025 MHz-1928.025 MHz

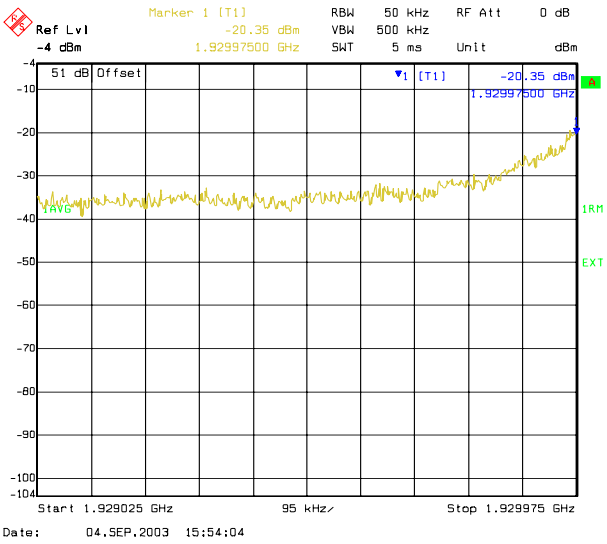


1928.025 MHz-1929.025 MHz

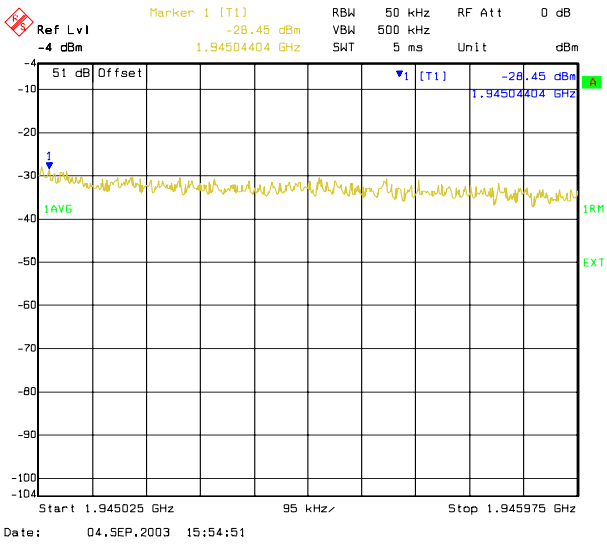


[9] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

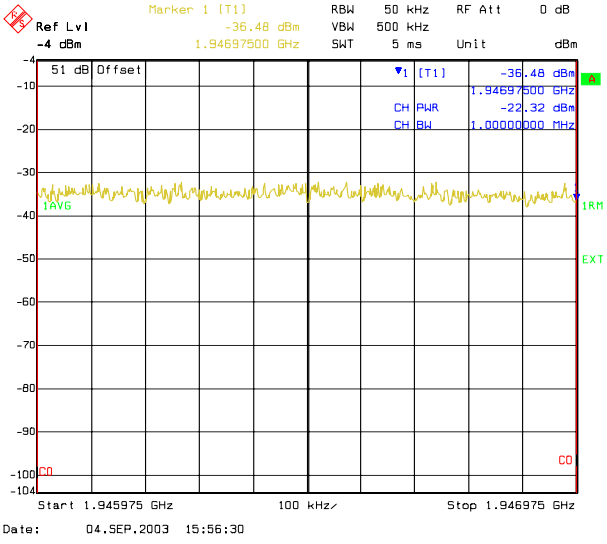
1929.025 MHz-1929.975 MHz



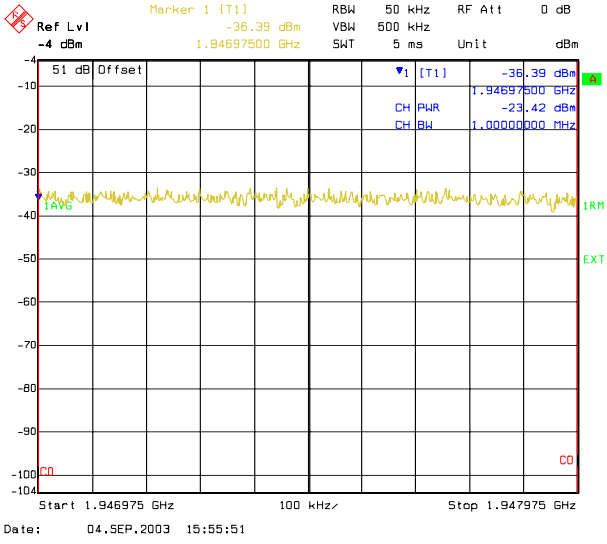
1945.025 MHz-1945.975 MHz



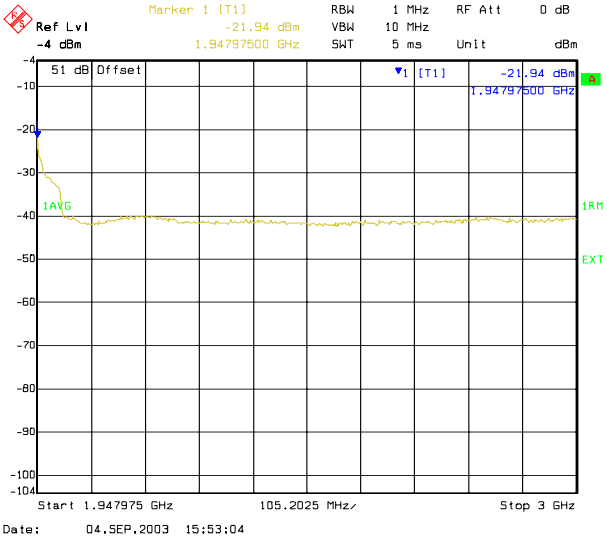
1945.975 MHz-1946.975 MHz



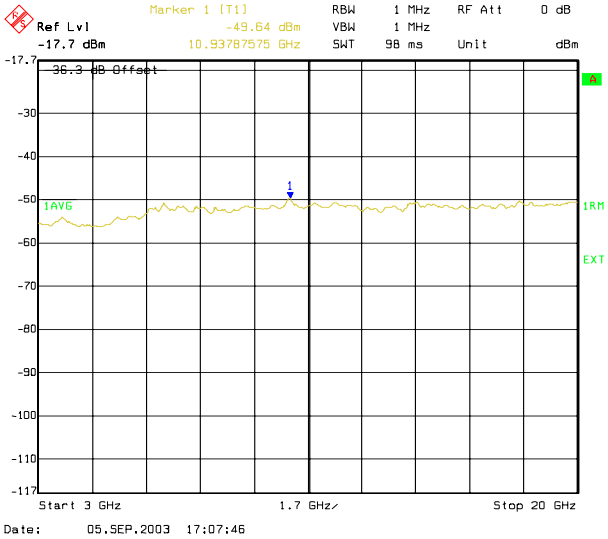
1946.975 MHz-1947.975 MHz



1947.975 MHz-3000 MHz



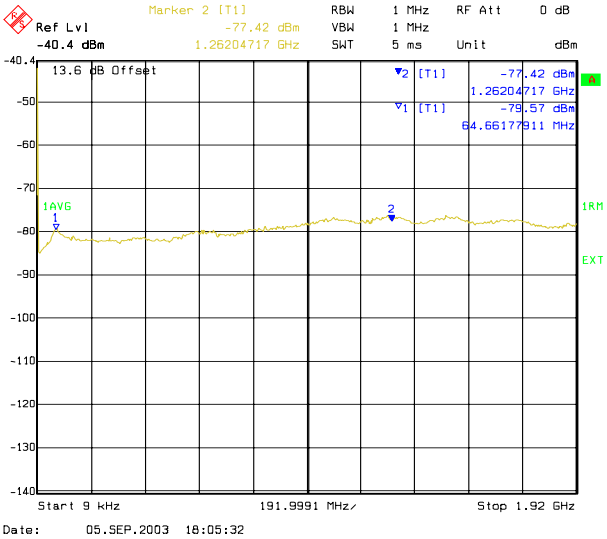
3 GHz - 20 GHz



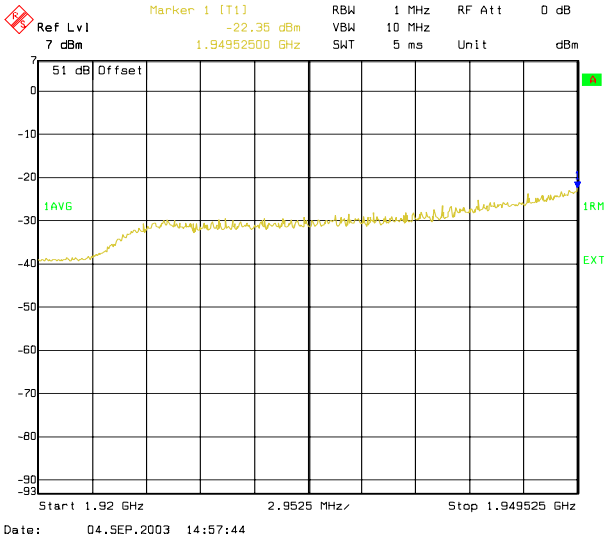
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel M 1960 MHz Sector 2	Margin (dB)	Limit (dBm)
9 kHz to 1.92 GHz	-77.42	64.42	-13
1920 MHz to 1949.525 MHz	-22.35	9.35	
1949.525 MHz to 1950.525 MHz	-24.22	11.22	
1950.525 MHzto 1951.525 MHz	-23.09	10.09	
1951.525 MHz to 1952.475 MHz	-26.47	13.47	
1967.525 MHz to 1968.475 MHz	-26.06	13.06	
1968.475 MHz to 1969.475 MHz	-22.27	9.27	
1969.475 MHz to 1970.475 MHz	-23.46	10.46	
1970.475 MHz to 3000 MHz	-21.35	8.35	
3 GHz to 20 GHz	-49.55	36.55	

Table 14. Measurements result for Spurious Emission in M channel

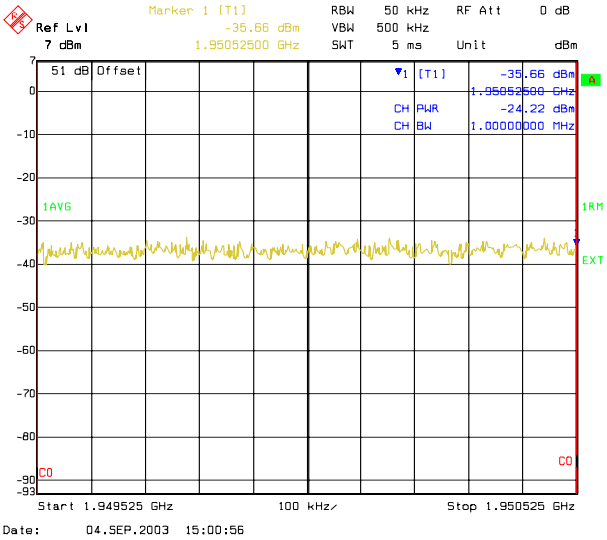
9 kHz -1.92 GHz



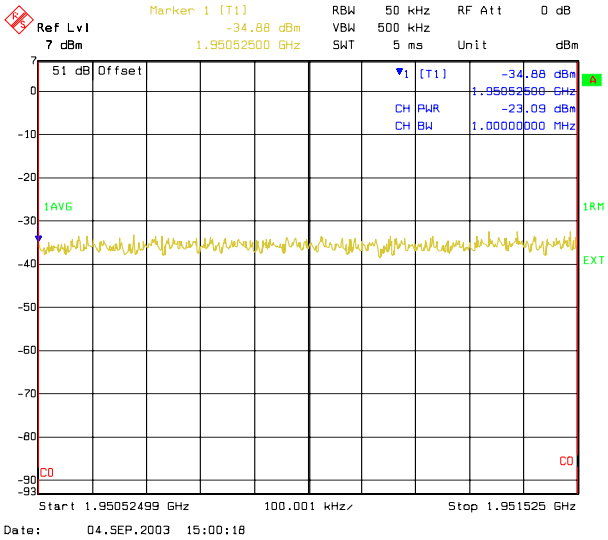
1920 MHz- 1949.525 MHz



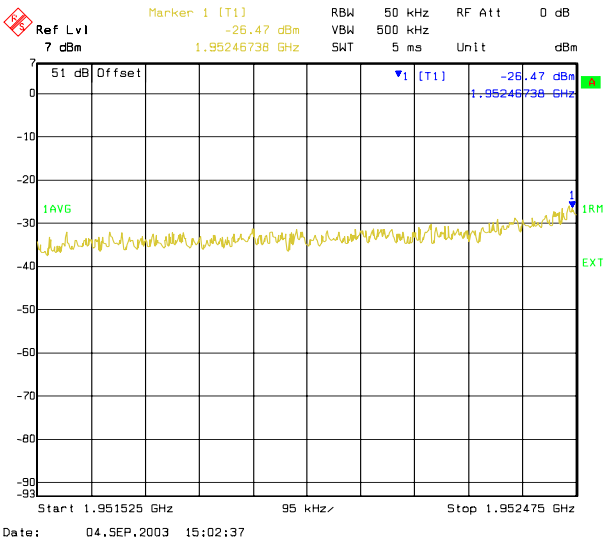
1949.525 MHz-1950.525 MHz



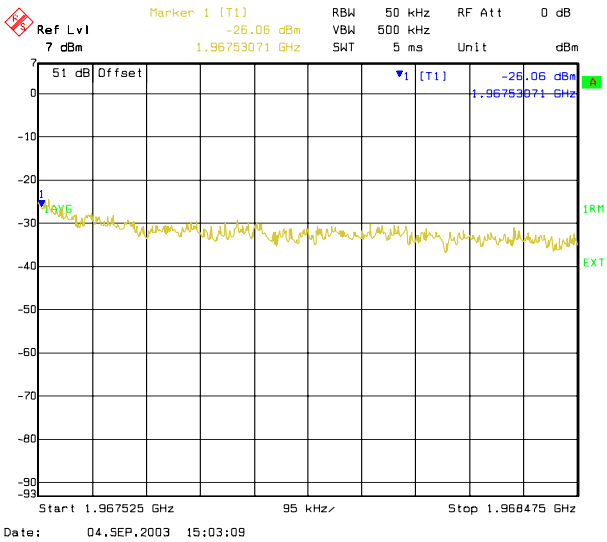
1950.525 MHz-1951.525 MHz



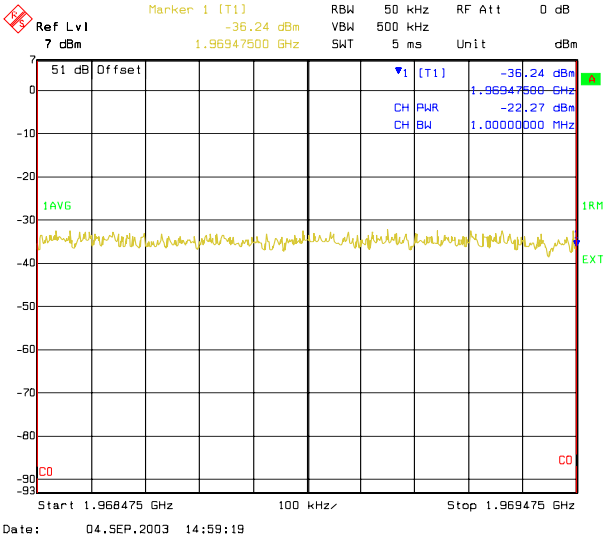
1951.525 MHz-1952.475 MHz



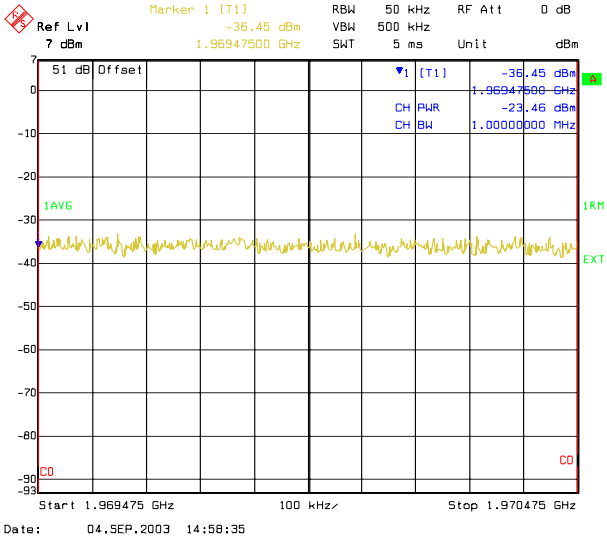
1967.525 MHz-1968.475 MHz



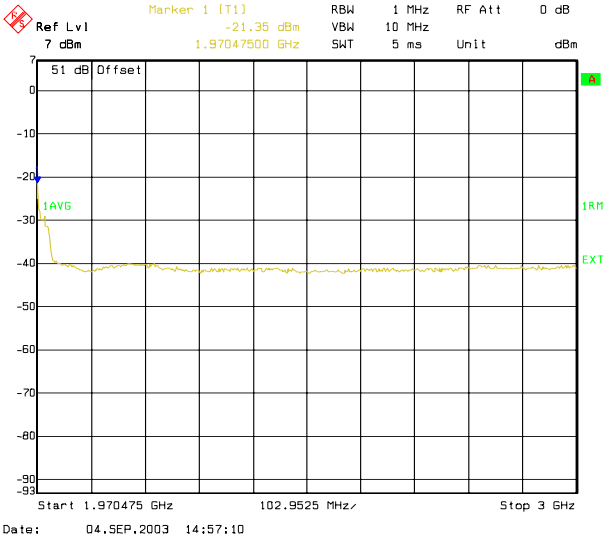
1968.475 MHz-1969.475 MHz



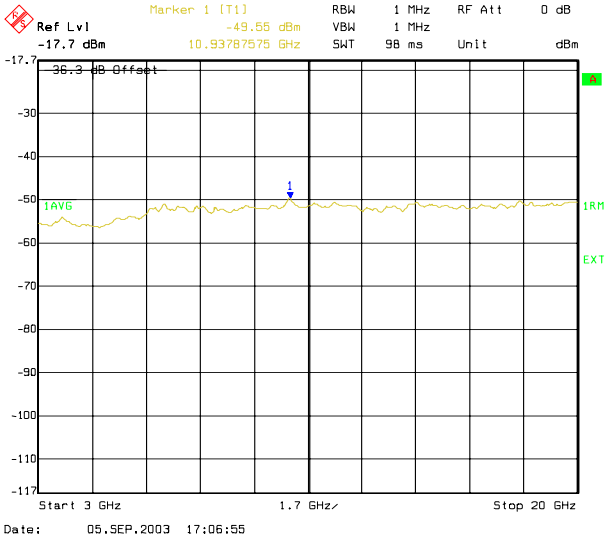
1969.475 MHz-1970.475 MHz



1970.475 MHz-3000 MHz



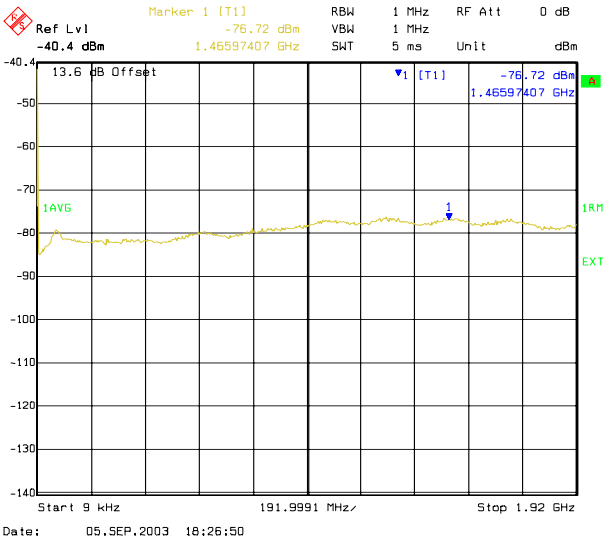
3 GHz- 20 GHz



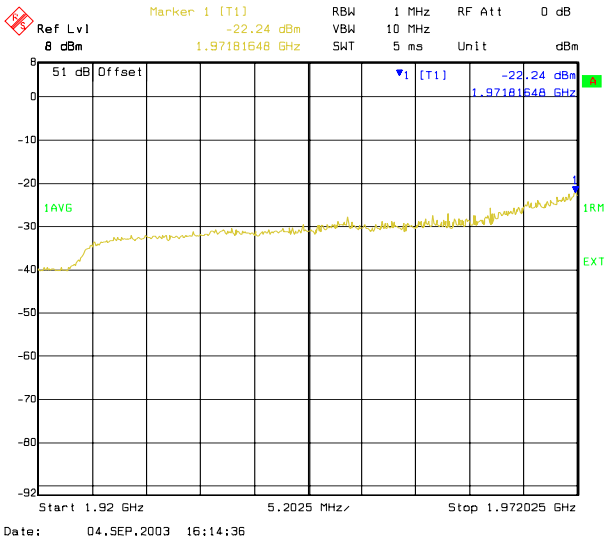
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel T 1987.6 MHz Sector 3	Margin (dB)	Limit (dBm)
9 kHz to 1920 MHz	-76.72	63.72	-13
1920 MHz to 1972.025 MHz	-22.24	9.24	
1972.025 MHz to 1973.025 MHz	-23.67	10.67	
1973.025 MHzto 1974.025 MHz	-22.96	9.96	
1974.025 MHz to 1974.975 MHz	-29.67	16.67	
1990.025 MHz to 1990.975 MHz	-20.12	7.12	
1990.975 MHz to 1991.975 MHz	-22.87	9.87	
1991.975 MHz to 1992.975 MHz	-24.17	11.17	
1992.975 MHz to 3000 MHz	-21.89	8.89	
3 GHz to 20 GHz	-49.69	36.69	

Table 15. Measurements result for Spurious Emission in T channel

9 kHz-1920 MHz[10]

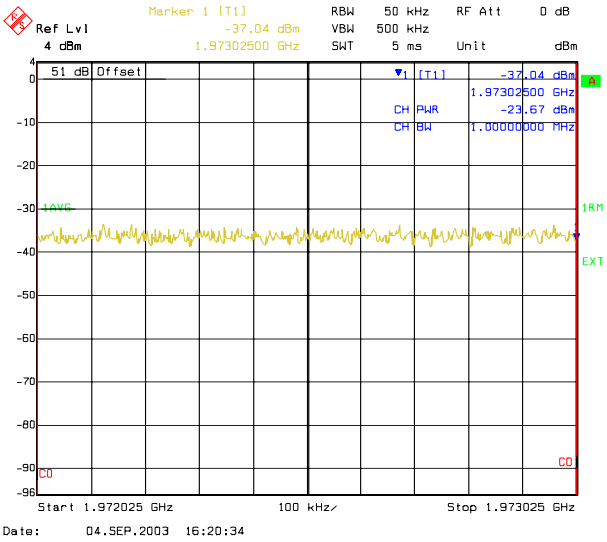


1920 MHz- 1972.025 MHz

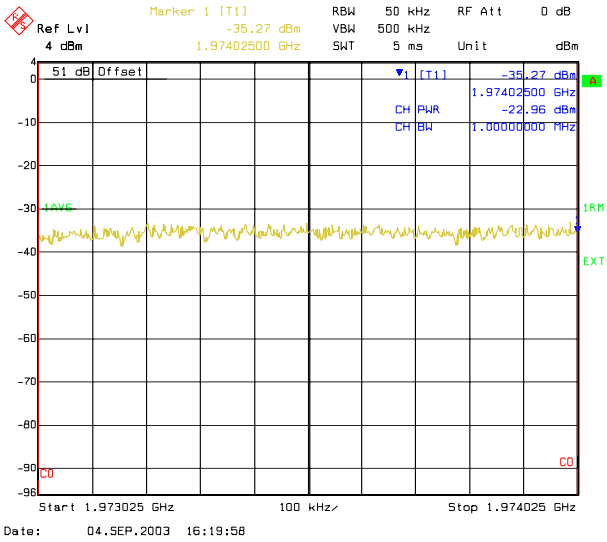


[10] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

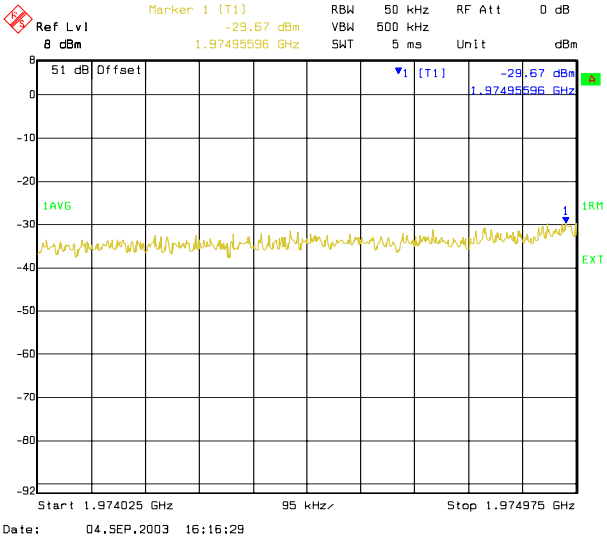
1972.025 MHz-1973.025 MHz



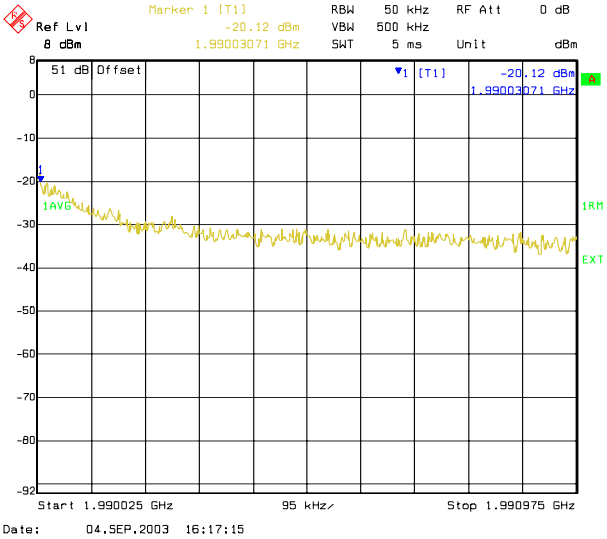
1973.025 MHz-1974.025 MHz



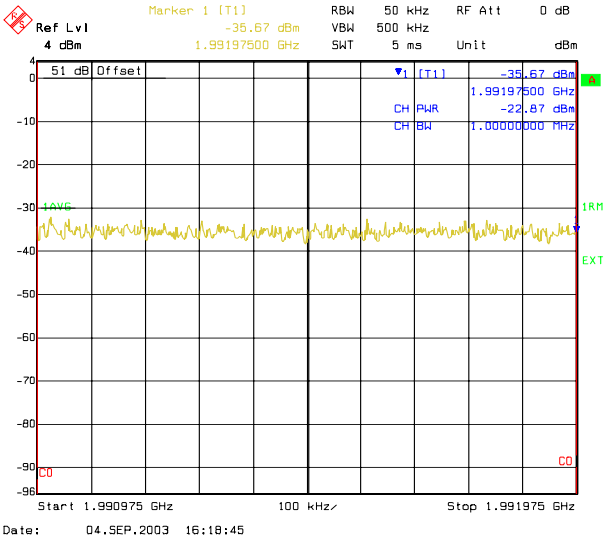
1974.025 MHz-1974.975 MHz



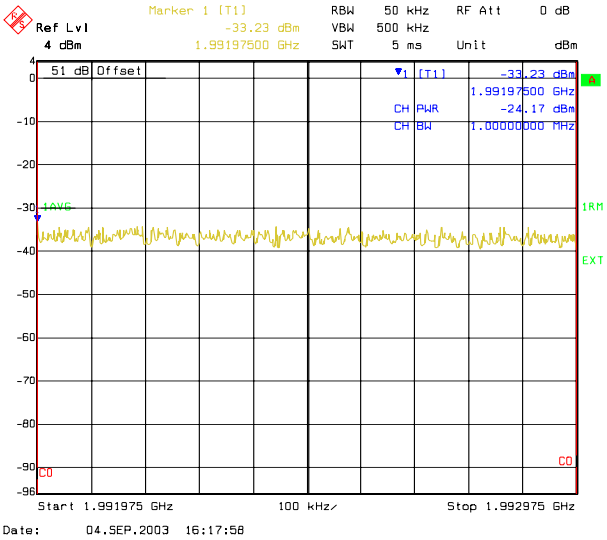
1990.025 MHz-1990.975 MHz



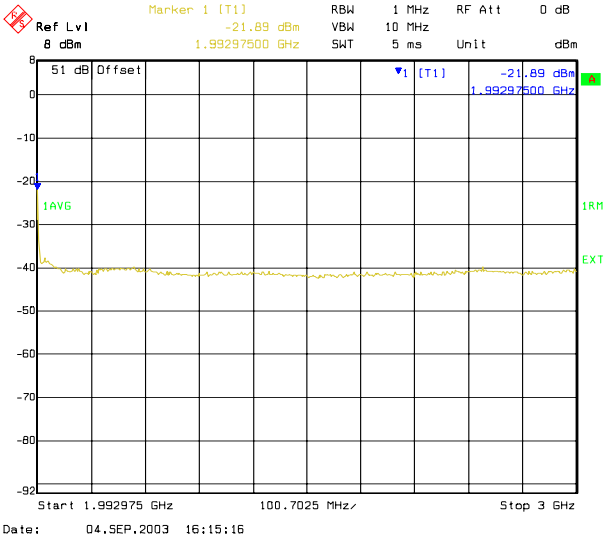
1990.975 MHz-1991.975 MHz



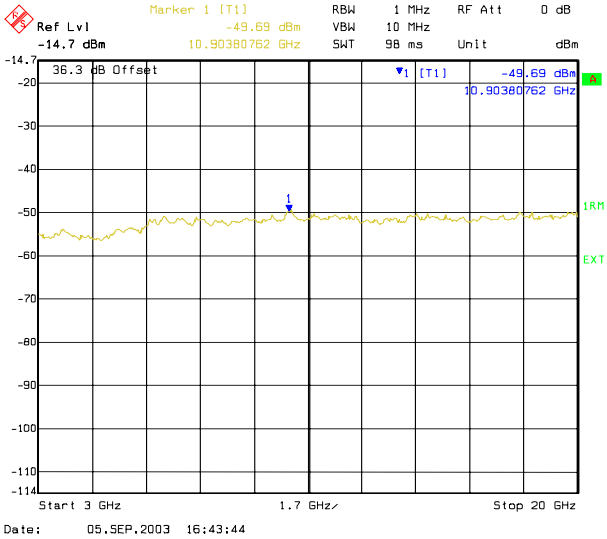
1991.975 MHz-1992.975 MHz



1992.975 MHz-3000 MHz



3 GHz- 20 GHz



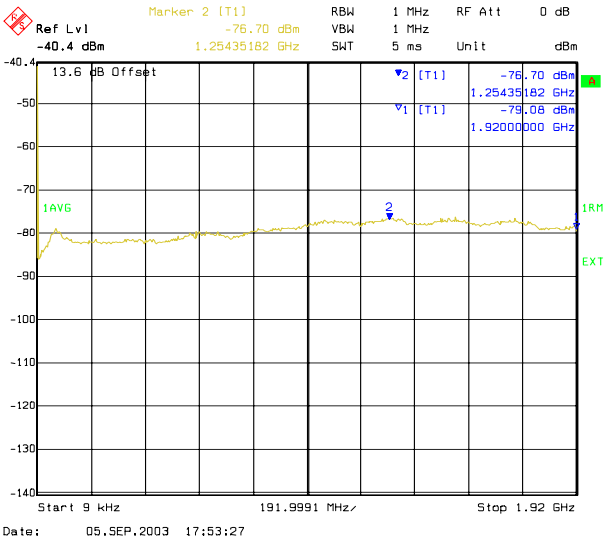
5. UMTS INDOOR2 IBTS, 45W MODE, 24V DC WITH 3 CARRIERS

Tables 10 to 12 show the results for Spurious Emissions at Antenna Terminals for the configuration D.

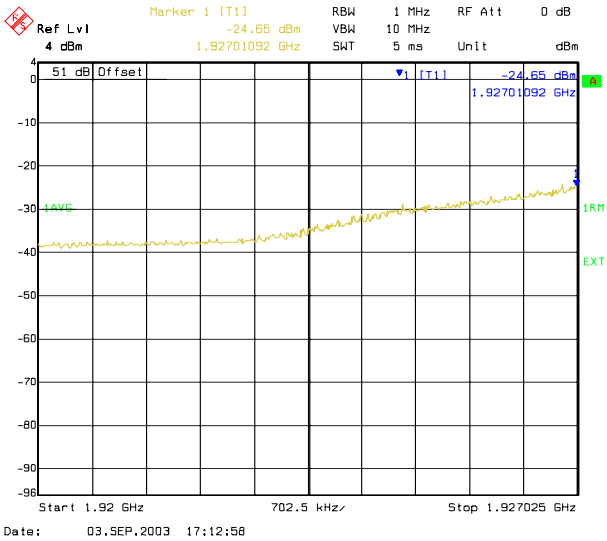
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel B 1932.4 MHz Sector 1	Margin (dB)	Limit (dBm)
9 kHz to 1.92 GHz	-76.70	63.7	-13
1920 MHz to 1927.025 MHz	-24.65	11.65	
1927.025 MHz to 1928.025 MHz	-26.31	13.31	
1928.025 MHzto 1929.025 MHz	-24.53	11.53	
1929.025 MHz to 1929.975 MHz	-21.17	8.17	
1945.025 MHz to 1945.975 MHz	-28.62	15.62	
1945.975 MHz to 1946.975 MHz	-22.4	9.4	
1946.975 MHz to 1947.975 MHz	-23.58	10.58	
1947.975 MHz to 3000 MHz	-21.81	8.81	
3 GHz to 20 GHz	-49.09	36.09	

Table 16. Measurements result for Spurious Emission in B channel

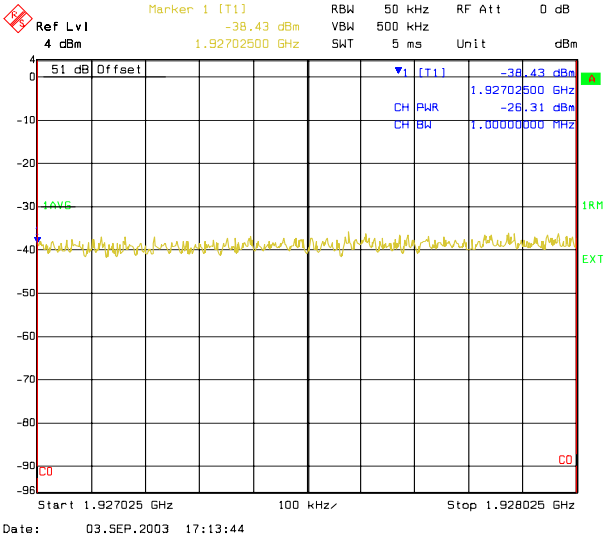
9 kHz-1.92GHz[11]



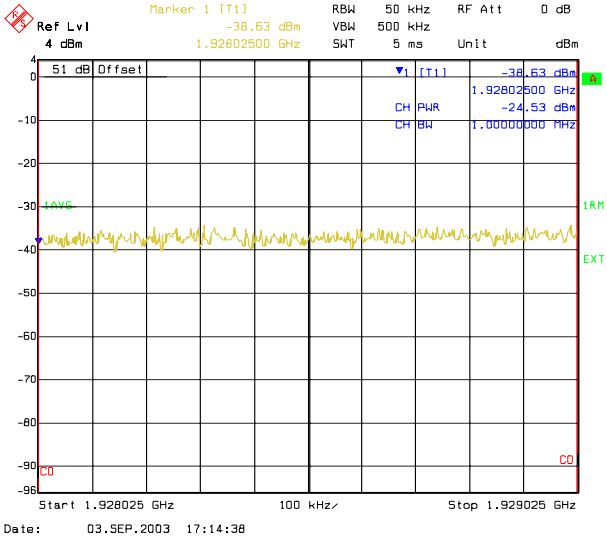
1920 MHz- 1927.025 MHz



1927.025 MHz-1928.025 MHz

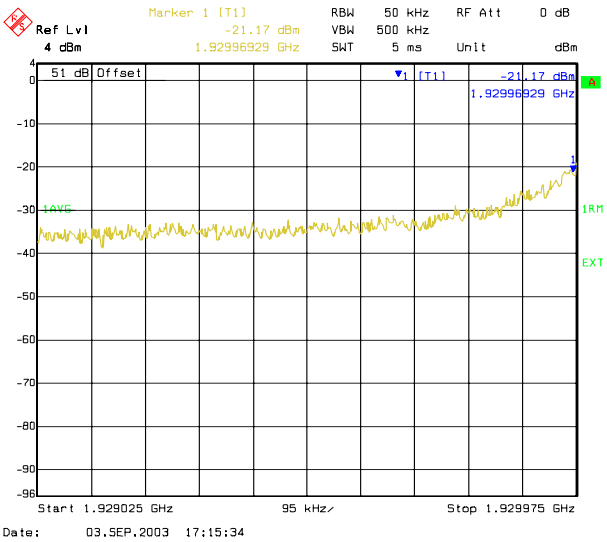


1928.025 MHz-1929.025 MHz

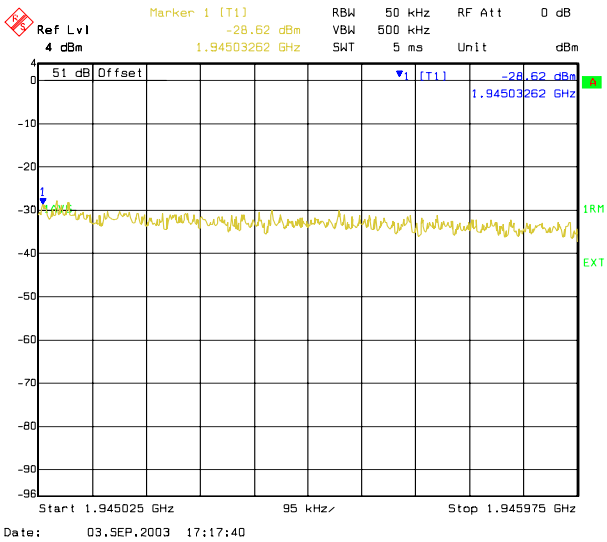


[11] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

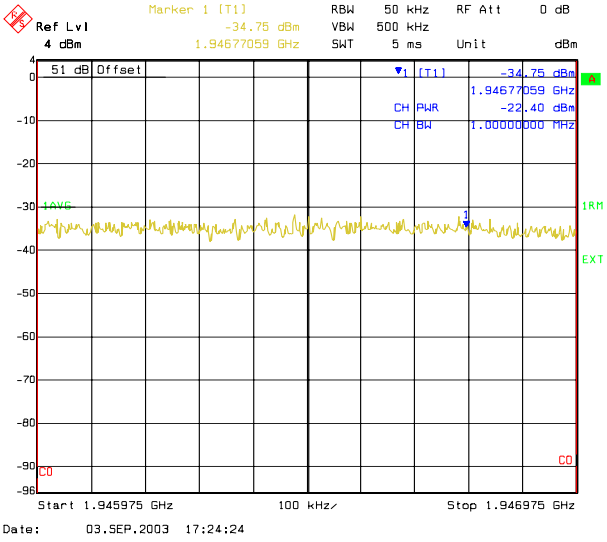
1929.025 MHz-1929.975 MHz



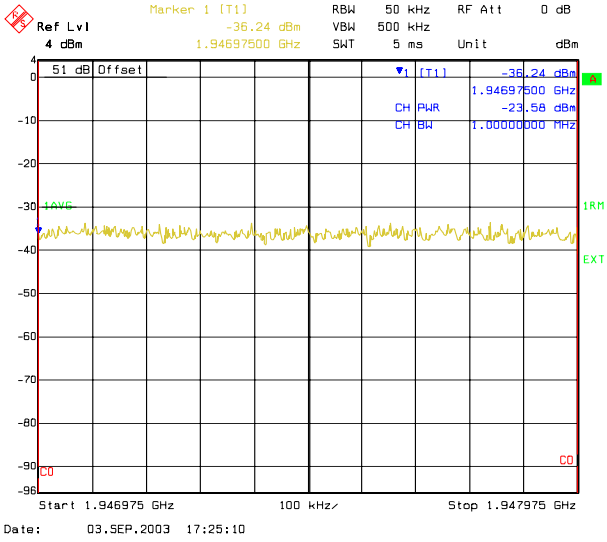
1945.025 MHz-1945.975 MHz



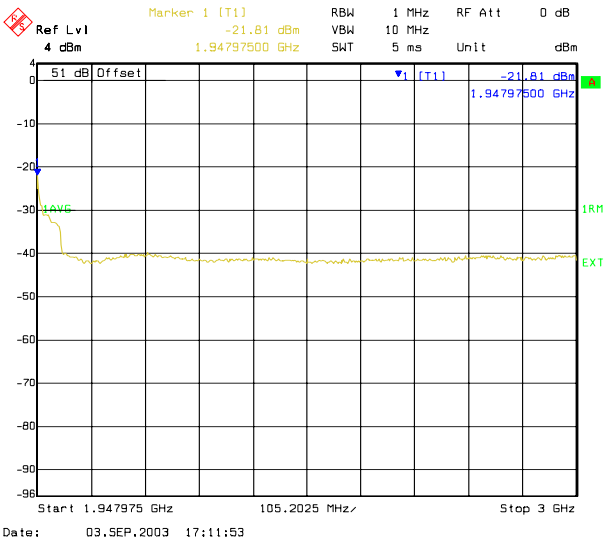
1945.975 MHz-1946.975 MHz



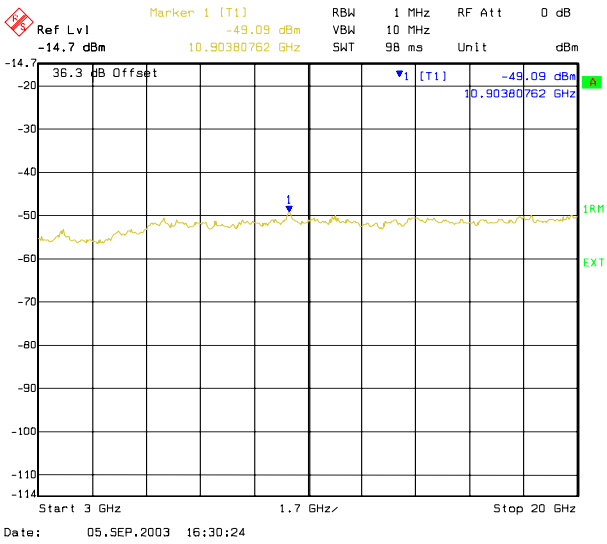
1946.975 MHz-1947.975 MHz



1947.975 MHz-3000 MHz



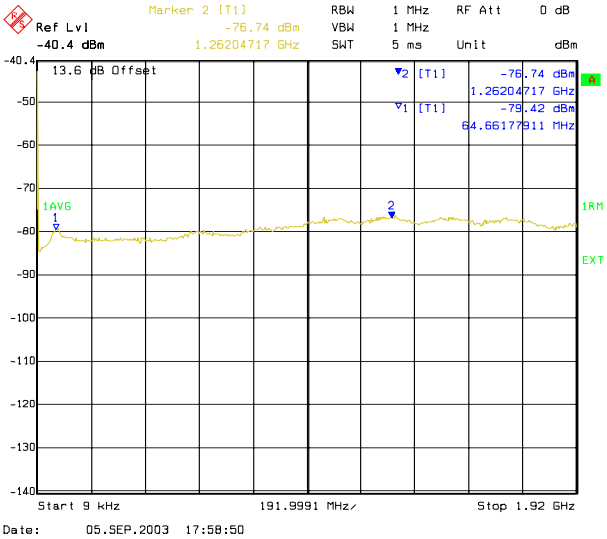
3 GHz - 20 GHz



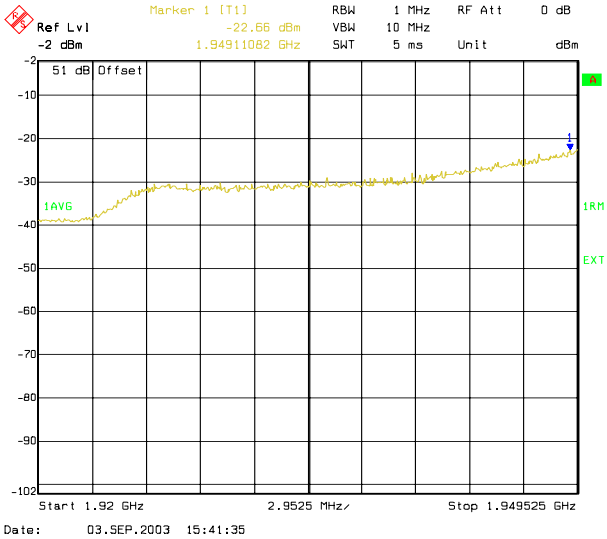
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel M 1960 MHz Sector 2	Margin (dB)	Limit (dBm)
9 kHz to 1.92 GHz	-76.74	63.74	-13
1920 MHz to 1949.525 MHz	-22.66	9.66	
1949.525 MHz to 1950.525 MHz	-24.75	11.75	
1950.525 MHzto 1951.525 MHz	-23.31	10.31	
1951.525 MHz to 1952.475 MHz	-26.31	13.31	
1967.525 MHz to 1968.475 MHz	-26.41	13.41	
1968.475 MHz to 1969.475 MHz	-22.35	9.35	
1969.475 MHz to 1970.475 MHz	-23.66	10.66	
1970.475 MHz to 3000 MHz	-21.46	8.46	
3 GHz to 20 GHz	-49.42	36.42	

Table 17. Measurements result for Spurious Emission in M channel

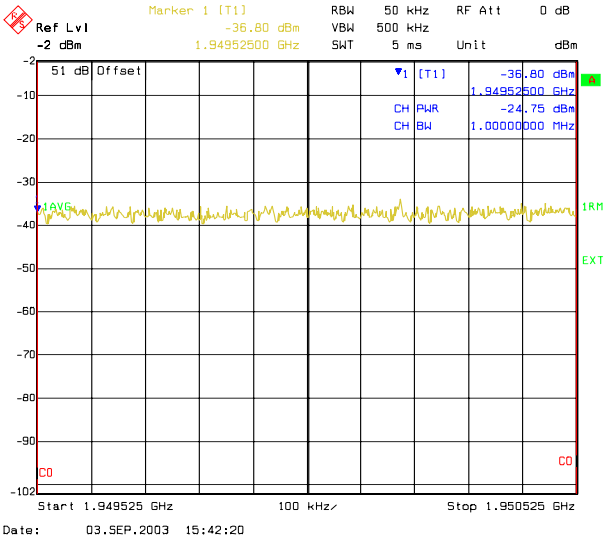
9 kHz -1.92 GHz



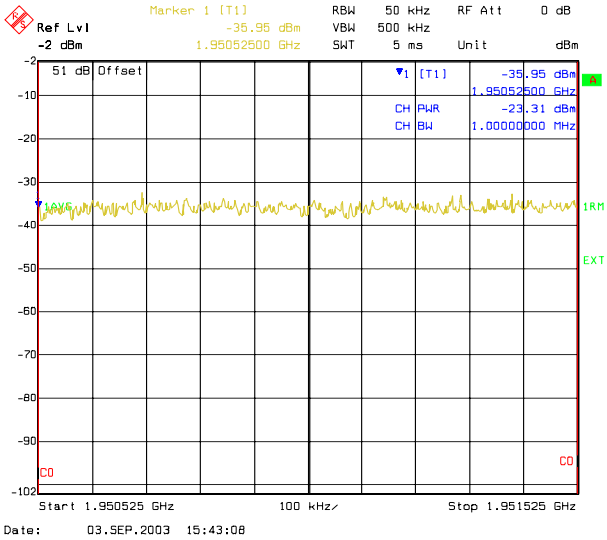
1920 MHz- 1949.525 MHz



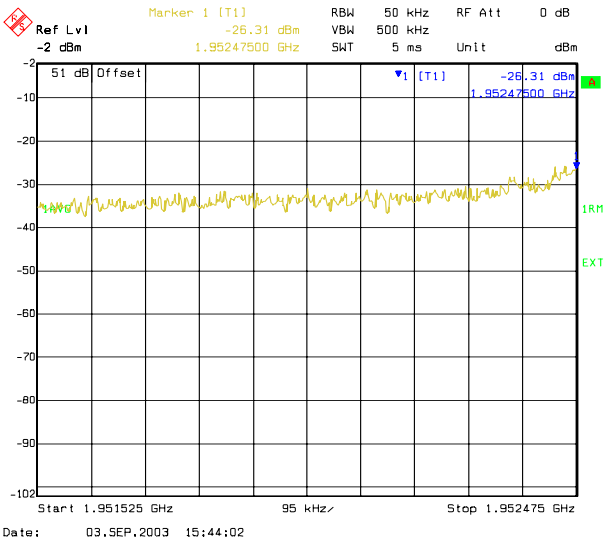
1949.525 MHz-1950.525 MHz



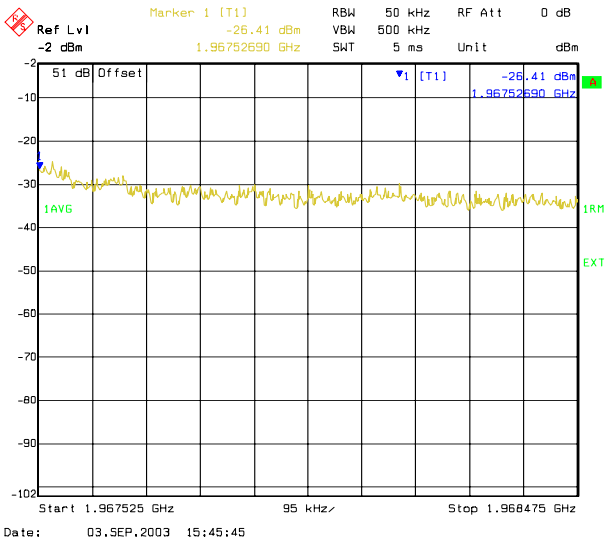
1950.525 MHz-1951.525 MHz



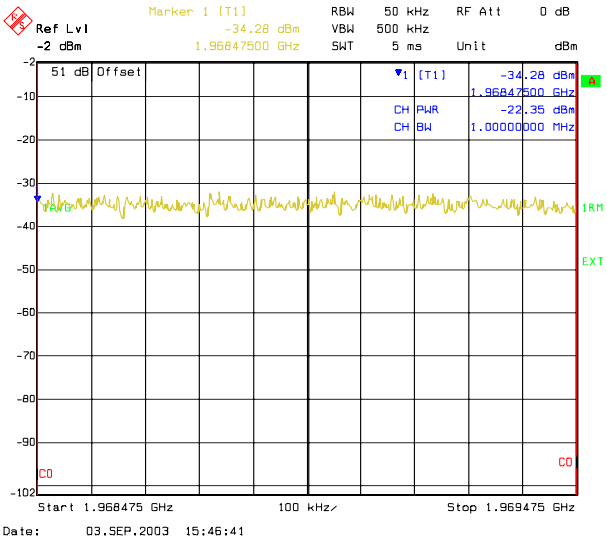
1951.525 MHz-1952.475 MHz



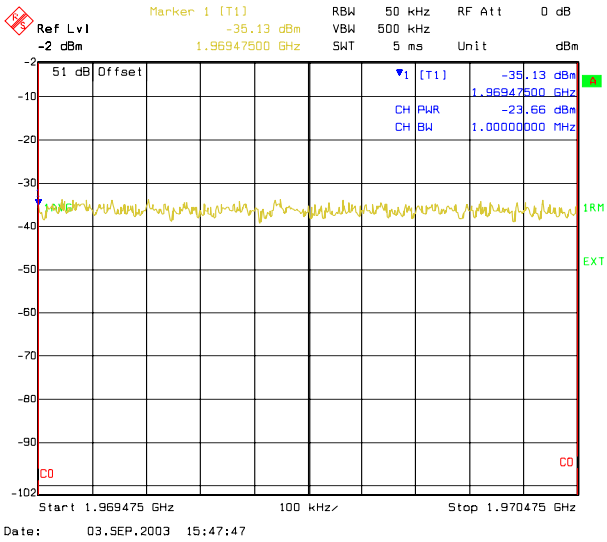
1967.525 MHz-1968.475 MHz



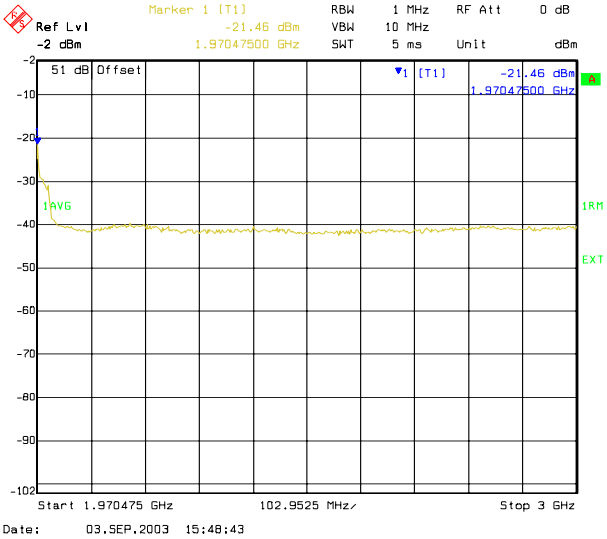
1968.475 MHz-1969.475 MHz



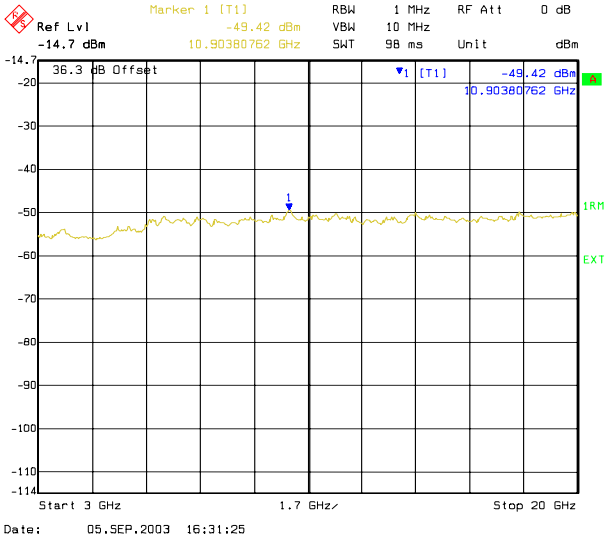
1969.475 MHz-1970.475 MHz



1970.475 MHz-3000 MHz



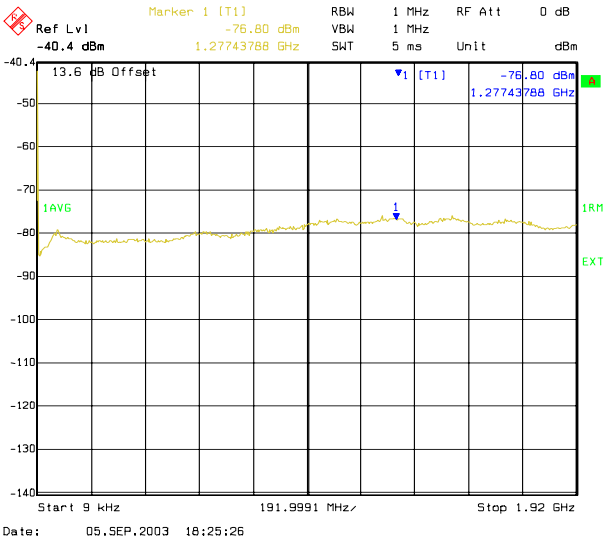
3 GHz- 20 GHz



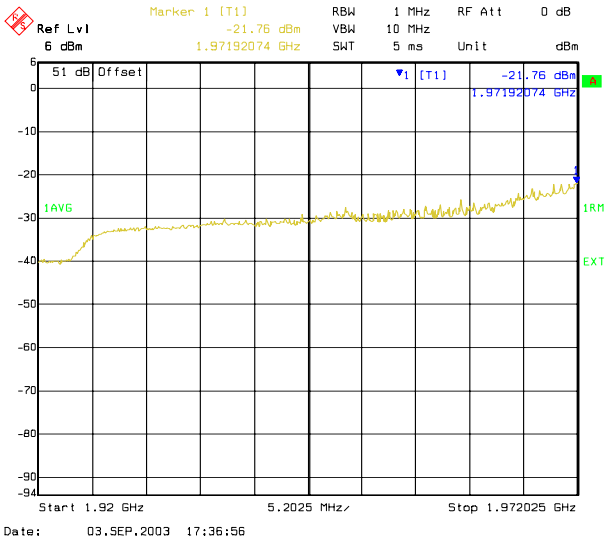
Frequency band	SPURIOUS EMISSION LEVEL (dBm) Channel T 1987.6 MHz Sector 3	Margin (dB)	Limit (dBm)
9 kHz to 1920 MHz	-76.8	63.8	-13
1920 MHz to 1972.025 MHz	-21.76	8.76	
1972.025 MHz to 1973.025 MHz	-23.17	10.17	
1973.025 MHzto 1974.025 MHz	-22.29	9.29	
1974.025 MHz to 1974.975 MHz	-28.75	15.75	
1990.025 MHz to 1990.975 MHz	-20.85	7.85	
1990.975 MHz to 1991.975 MHz	-22.46	9.46	
1991.975 MHz to 1992.975 MHz	-23.78	10.78	
1992.975 MHz to 3000 MHz	-20.95	7.95	
3 GHz to 20 GHz	-49.57	36.57	

Table 18. Measurements result for Spurious Emission in T channel

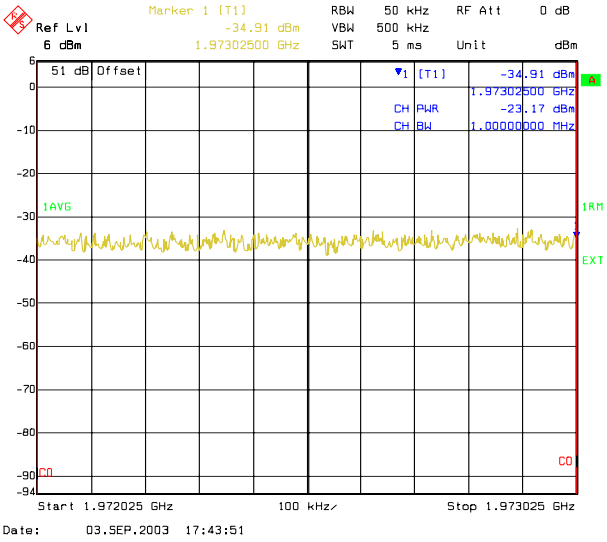
9 kHz-1927.6 MHz[12]



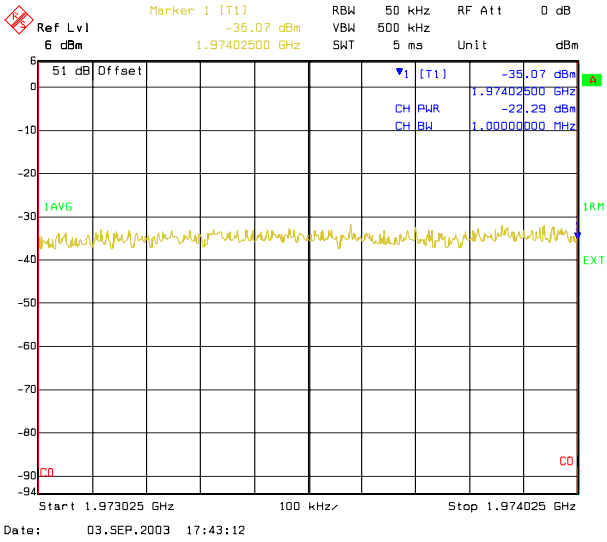
1927.6 MHz- 1972.025 MHz



1972.025 MHz-1973.025 MHz

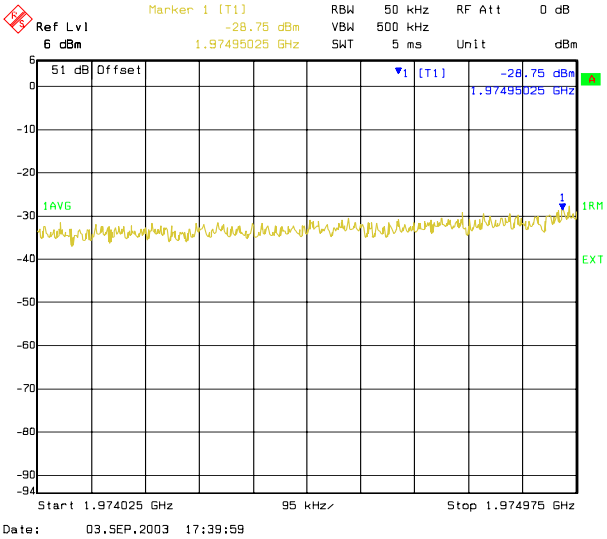


1973.025 MHz-1974.025 MHz

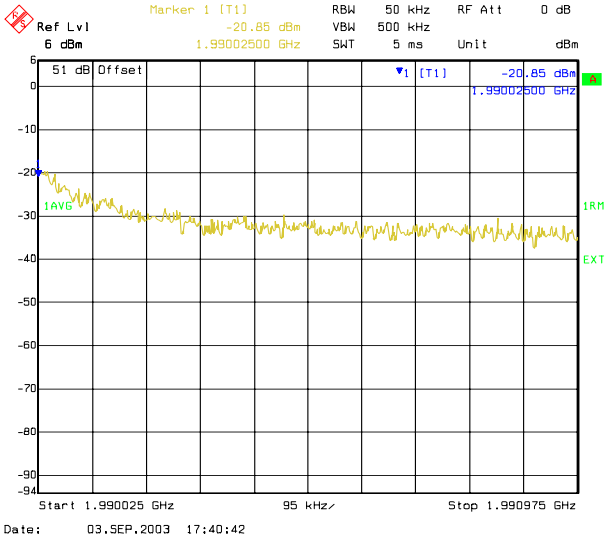


[12] Spectrum lines at 9 kHz are internal DC spectrum line of Analyzer

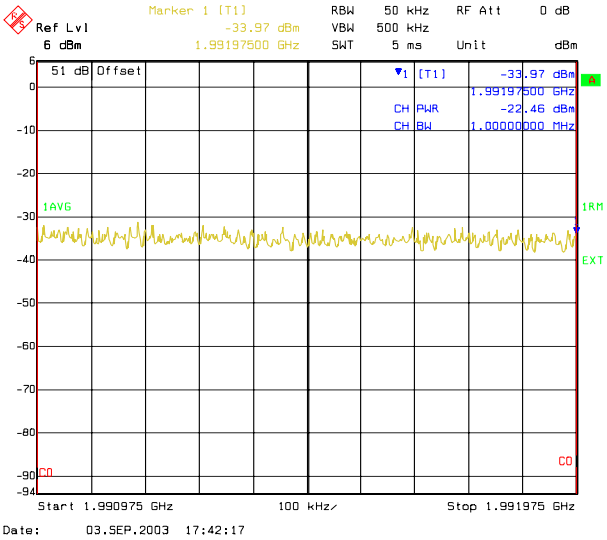
1974.025 MHz-1974.975 MHz



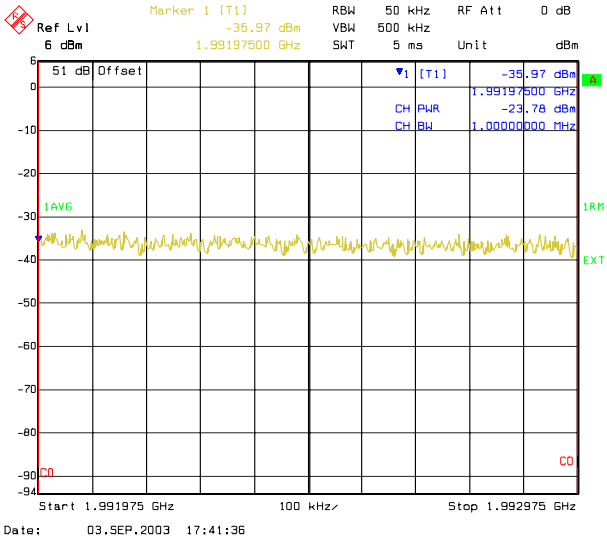
1990.025 MHz-1990.975 MHz



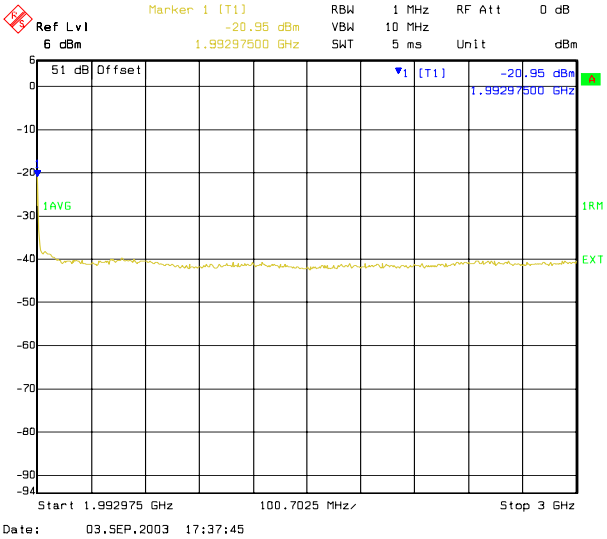
1990.975 MHz-1991.975 MHz



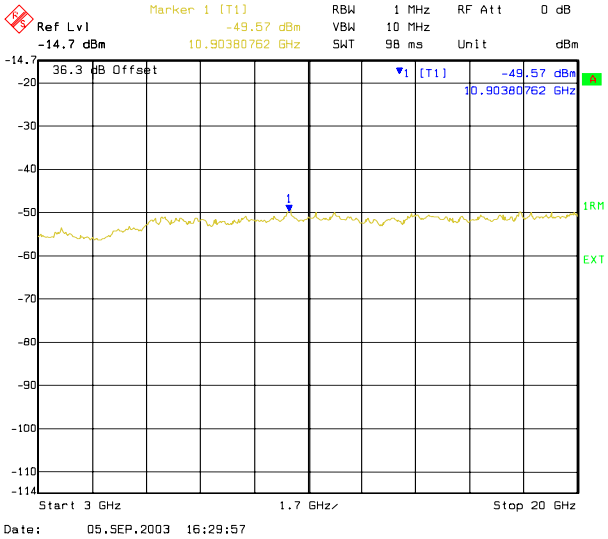
1991.975 MHz-1992.975 MHz



1992.975 MHz-3000 MHz



3 GHz- 20 GHz



3.5.3 TEST PROCEDURE

The equipment was configured as shown in Figure 6.

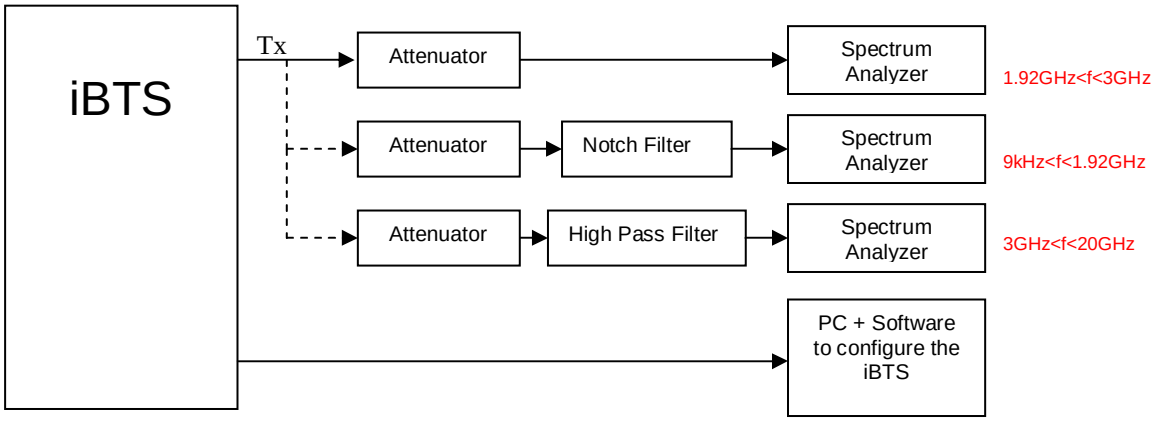


Figure 6. Test configuration for Spurious Emission

For these measurements, three benches have been used.

The bench 1 is used to measure spurious near the Tx band.

The bench 2 and 3 use respectively a stop band filter and a high pass filter in order to filter out the TX band of the iBTS and only measure the spurious created inside the iBTS.

The spectrum analyzer has the following setting in the 1 MHz bands immediately outside and adjacent to the frequency block:

Resolution Bandwidth	50 kHz
Video Bandwidth	5 / 500 kHz
Reference Level Offset	Corrected to take into account cables and attenuator losses

As regards to the other bands, the following setting is applied:

Resolution Bandwidth	1 MHz (see Note)
Video Bandwidth	10 MHz
Reference Level Offset	Corrected to take into account cables and attenuator losses

Note:

Just beside the 1 MHz bands immediately adjacent to the frequency block, the measure has been performed with 50kHz resolution bandwidth instead of 1 MHz. With this resolution bandwidth, **integrated over 1 MHz,** a better estimation of spurious power has been achieved (in the case of RBW 1MHz influence from the carrier power on the measurement has been observed)

3.6. CONCLUSION

FCC part 24 tests have been performed on the iModules. Test results comply with all the requirements.

3.7. MEASUREMENT EQUIPMENT LIST

Table 19 is a list of the measurement equipments used in these tests.

Equipment Description	Manufacturer	Model	Serial Number	Calibration
Spectrum Analyzer	Rohde & Schwarz	FSEM	525495	25/07/02
Vector Signal Analyzer	Agilent	E4406A	525201	31/01/03
Power Meter	Gigatronics	8542C	511322	27/11/01
Power sensor	Gigatronics	80401A	515344	20/05/03
Power Supply	Hewlett Packard	E3630A	511497	27/03/03
Network Analyzer	Hewlett Packard	8719D	521768	03/12/01
Network Analyzer	Rohde & Schwarz	ZVRE	500701	08/08/01
Calibration Kit	Hewlett Packard	85032B	-	21/05/01
High Pass Filter	Trilithic	4HC2800/13 G-3-KK 9745041	23042	N/A
Notch Filter	TEMEX	CRL 21304006A	-	N/A
40dB attenuator	BIRD	50-A-MFN-40	-	N/A
10dB attenuator	Radiall	R417010128	-	N/A
30dB attenuator HF	Hewlett Packard	8498A	519473	N/A
Catapult	SUN Microsystems	ULTRA 10	530797	N/A

Table 19. Measurement equipment list

4. TECHNICAL STATUS OF THE MODULES CONSTITUTING THE TESTED EQUIPMENT

Conf. #	Designation	Hardware code / ***Software version***	Release	Manufacturer	Serial number
A B C D	Indoor 2 iBTS	NTBY06AA / ***v03.D5.0***	D2	Nortel Networks	SNMN75007TZA
	iCU	NTBY58AA	D3	SANMINA	SNMN75007UCL
	MCA	NTBY90AA	D1	SANMINA	SNMN75007KT1
	Interconnect	NTBY76AA	P1	SANMINA	SNMN27000800
	iTRM (digital shelf slot 2)	NTUM17BA / ***V03D5.0_E07.0***	D1	Nortel Networks	CDN200314007
	iCCM Board (digital shelf slot 4)	NTUM25BA/ ***V03D5.0_E12.0***	D3	Nortel Networks	SLR200315001
	iCCM Shelf	NTUM26AA / ***V03D5.0_E12.0***	D1	Nortel Networks	CDN200315018
	iCEM (digital shelf slot 6)	NTUM00DA / ***V03D5.1_E17.0***	D2	Nortel Networks	CDN200316018
	iCEM (digital shelf slot 7)	NTUM00DA / ***V03D5.1_E17.0***	D2	Nortel Networks	CDN200316013
	GPSAM (digital shelf slot 10)	NTUM24AA	D3	Nortel Networks	NNTM7502E0HH
	DDM (slot 1)	NTUM42AA	D1	Forem	FORM01411850
	DDM (slot 2)	NTUM42AA	D1	Forem	FORM01411847
	DDM (slot 3)	NTUM42AA	D1	Forem	FORM01428023
	MCPA UMTS (slot 1)	NTUM30PA / **V1.16**	D2	Powerwave	PWWT03DC0NE9
	MCPA UMTS (slot 2)	NTUM30PA / **V1.16**	D2	Powerwave	PWWT03D9DJX9
	MCPA UMTS (slot 3)	NTUM30PA / **V1.16**	D2	Powerwave	PWWT03D9DJT6
C	TMA	NTUM35AA	D1	FOREM	FORM01429981
D	DC / DC Converter shelf	NTBY51AA	01	DELTA	K5033000103-A0
	DC / DC Converter Rectifier (slot 1)	NTBY5101	S1	DELTA Electronics	EN030900111
	DC / DC Converter Rectifier (slot 2)	NTBY5101	S1	DELTA Electronics	EN030900145
	DC / DC Converter Rectifier (slot 3)	NTBY5101	S1	DELTA Electronics	EN030900126
	DC / DC Converter Rectifier (slot 4)	NTBY5101	S1	DELTA Electronics	EN030900141
	DC / DC Converter External Alarm Kit	NTBY98AA	D2	SANMINA	SNMN75007DFC

Conf. #	Designation	Hardware code / ***Software version***	Release	Manufacturer	Serial number
E	Outdoor iBTS	NTUM70AA / ***v03.D5.0***	D3	Nortel Networks	SNMN750096AS
	iDACS	NTUM80AA	D3	LIEBERT	HIRSA200006E
	INTERCO	NTUM60AA	D1		FCIN25000315
	User ICO	NTUM37AA	D2	SANMINA	SNMN75004YW2
	AC main	NTUM39AA	D2	SANMINA	SNMN75004YNF
	Filtering box	NTUM90BA	D1	SANMINA	SNMN7500BGLF
	Rectifier shelf	NTUM87AA	D2	CHEROKEE	PITS01C30895
	LPPCM	NTUM98BA	D2	SANMINA	SNMN75005IYL
	SPCM (Rectifier control board)	NTUM85AA	D3	CHEROKEE	PITS01U31380
	Rectifier (rectifier slot 1)	NTUM86AA	D1	CHEROKEE	PITS01030217
	Rectifier (rectifier slot 2)	NTUM86AA	D2	CHEROKEE	PITS01030221
	Rectifier (rectifier slot 3)	NTUM86AA	D2	CHEROKEE	PITS01030225
	Rectifier (rectifier slot 4)	NTUM86AA	D1	CHEROKEE	PITS01030462
	Rectifier (rectifier slot 5)	NTUM86AA	D1	CHEROKEE	PITS01030560
	Rectifier (rectifier slot 6)	NTUM86AA	D1	CHEROKEE	PITS01H34417
	Rectifier (rectifier slot 7)	NTUM86AA	D1	CHEROKEE	PITS01030214
	Digital Shelf	NTUM20AA	D2	SANMINA	SNMN750050RX
	iTRM (digital shelf slot 2)	NTUM17BA / ***V03D5.0_E07.0***	D1	Nortel Networks	CDN200314007
	iCCM Board (digital shelf slot 4)	NTUM25BA/ ***V03D5.0_E12.0***	D3	Nortel Networks	SLR200315001
	iCCM Shelf	NTUM26AA / ***V03D5.0_E12.0***	D1	Nortel Networks	CDN200315018
	iCEM (digital shelf slot 6)	NTUM00DA / ***V03D5.1_E17.0***	D2	Nortel Networks	CDN200316018
	iCEM (digital shelf slot 7)	NTUM00DA / ***V03D5.1_E17.0***	D2	Nortel Networks	CDN200316013
	GPSAM (digital shelf slot 12)	NTUM24AA	D7	Nortel Networks	NNTM7503CVP9
	DDM (slot 1)	NTUM42AA	D1	Forem	FORM01411850
	DDM (slot 2)	NTUM42AA	D1	Forem	FORM01411847
	DDM (slot 3)	NTUM42AA	D1	Forem	FORM01428023
	MCPA UMTS (slot 1)	NTUM30PA / **V1.16**	D2	Powerwave	PWWT03DC0NE9
	MCPA UMTS (slot 2)	NTUM30PA / **V1.16**	D2	Powerwave	PWWT03D9DJX9
	MCPA UMTS (slot 3)	NTUM30PA / **V1.16**	D2	Powerwave	PWWT03D9DJT6

Conf. #	Designation	Hardware code / ***Software version***	Release	Manufacturer	Serial number
F	Mono iBTS	NTU721AA / ***V03D5.0***	D1	SANMINA	SNMN7500AV5Y
	DC Box	NTU754AA	D1	SANMINA	SNMN7500C9ZH
	AC Breaker	NTU734AA	D1	SANMINA	SNMN7500AV6N
	Cooling Unit	NTU752AA	D1	SANMINA	SNMN7500AV7U
	Control Board	NTU751AA	D1	SANMINA	SNMN7500AV7N
	MCA	NTU750AA	D1	SANMINA	SNMN7500AY7X
	Interconnect	NTU727AA	D1	SANMINA	SNMN7500AVY7
	iCCM Board (digital shelf slot 1)	NTUM25BA/ ***V03D5.0_E12.0***	D3	Nortel Networks	SLR200315001
	iCCM Shelf	NTUM26AA / ***V03D5.0_E12.0***	D1	Nortel Networks	CDN200315018
	iCEM (digital shelf slot 2)	NTUM00DA / ***V03D5.1_E17.0***	D2	Nortel Networks	CDN200316013
	iTRM (digital shelf slot 3)	NTUM17BA / ***V03D5.0_E07.0***	D1	Nortel Networks	CDN200314007
	cGPSAM (digital shelf slot 4)	NTA520AA	D1	SANMINA	NNTM7503LXHJ
	MCPA UMTS	NTUM30PA / **V1.16**	D2	Powerwave	PWWT03DC0NE9
	cDDM	NTU719AA	D1	Forem	FORM01437243

5. ABBREVIATIONS AND DEFINITIONS

5.1. ABBREVIATIONS

ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
ARFCN	Absolute Radio Frequency Channel Number
BER	Bit Error Ratio
BLER	Block Error Ratio
BTS	Base Transceiving Station
CDMA	Code Division Multiple Access
CW	Carrier Wave
DCH	Dedicated Channel
DPCH	Dedicated Physical Channel
EUT	Equipment Under Test
EVM	Error Vector Magnitude
FDD	Frequency Division Duplex
N/A	Not Applicable
OTSR	Omni Transmit, Sectored Receive
PHS	Portable Handset System
SA	Spectrum Analyzer
sanf	Spectrum analyzer noise floor
SG	Signal Generator
SSDT	Site Selection Diversity Transmission
STSR	Sectored Transmit, Sectored Receive
SUT	System Under Test
UARFCN	UTRA ARFCN
UMTS	Universal Mobile Telecommunication System
VSA	Vector Signal Analyzer
WCDMA	Wide-band CDMA

5.2. DEFINITIONS

Frequency Channel

	B	M	T
Tx (MHz)	1932.4	1960	1987.6
Rx (MHz)	1852.4	1880	1907.6

END OF DOCUMENT