RADIO TEST REPORT

FOR
FCC REGULATORY IN EXTREME CONDITIONS
OF GSM 18000 MCPA BTS

N°151014FB

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1. INTRODUCTION

This objective of this document is to present the test report for Radio qualification in extreme conditions on the system GSM 18000 MCPA BTS configured in 1900 MHz with the GSMK modulation.
The tests in extreme conditions have been realized in accordance with FCC Part 24.235 and Part 2.1055 of FCC Rules and Regulation.

These tests are performed on 14 & 15 October 2004 in LNE laboratory.

Product description:

- GSM 18000 MCPA BTS

Manufactured:

- NORTEL NETWORKS
  Parc d'Activité de Magny Chateaufort
  Chateaufort
  78928 Yvelines Cedex 9
  FRANCE

Product type:

- GSM 18000 MCPA BTS in S999 configuration configured in 1900 MHz

Item definition	Designation	Comments
Base :	NTT916AAD1	NNTMGRR0012XS
Manual:	none	
Power supply:	230V/60Hz,	tested at 195, 230, 265V
FCC ID :	AB6BTS18000MCPA	
FCC Emission designator:	300KGXW	
Operating Frequency Range:	Tx :1930.2 to1989.8 MHz Rx : 1850.2 to 1909.8 MHz	

2. APPLICABLES DOCUMENTS

[A1]	47CFR Part 2 (2003)	FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations - Frequency allocations and radio treaty matters; general rules and regulations.
[A2]	47 CFR Part 24 (2003)	FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations - Personal communications services.

3. REFERENCES DOCUMENTS

[R1]	PCS/BTS/DPL/12219	GSM 1900 BTS MRM 18000 Outdoor & BTS MCPA PWW : RF Qualification test plan
[R2]	151014FB	Radio Test Report for External Laboratory

4. HARDWARE AND SOFTWARE CONFIGURATION

See Nortel document below:

ARTICLE	PEC code	Release	Serial number	Comment
BARE CABINET & ECU	NTT91600	D2	NNTMGT001KIY	
ABM	NTN029AA	D2	NNTMGR0090LJ	IP 136.147.44.130 MAC : 00 60 38 14 2A 2E
ABM	NTN029AA	D2	NNTMGR0090LK	MIR 4 IP 136.147.44.129 MAC : 00 60 38 14 2A 2D
ABM	NTN029AA	D2	NNTMGR0090KK	MIR 4 IP 136.147.44.128 MAC : 00 60 38 B9 60 6D
ICM	NTN023AA	D1	NNTMGR008WJ3	MIR 03.1 IP 136.147.44.37 MAC : 00 60 38 B9 40 E0
ICM	NTN023AA	D1	NNTMGR008WHF	MIR 03.1 IP 136.147.44.53 MAC : 00 60 38 B9 41 11
IFM	NTN025AA	D1	NNTMGR009H6R	
IFM	NTN025AA	D1	NNTMGR009H65	
MRM 0	NTN050BA	D1	NNTM75047EZ0	IP : 136.147.44.126 MAC : 00 60 38 14 30 A4
MRM 1	NTN050BA	D1	NNTM75047EYU	IP : 136.147.44.66 MAC : 00 60 38 14 30 22
MRM 2	NTN050BA	D1	NNTM75047EYX	IP : 136.147.44.101 MAC : 00 60 38 14 31 5F
MRM 3	NTN050BA	D1	NNTM75047EYP	IP : 136.147.44.104 MAC : 00 60 38 14 2D 21
MRM 4	NTN050BA	D1	NNTM75047EZ3	IP : 136.147.44.124 MAC : 00 60 38 14 31 A6
MRM 5	NTN050BA	D1	NNTM75047EYW	IP : 136.147.44.123 MAC : 00 60 38 14 31 8A
MRM 6	NTN050BA	D1	NNTM75047EYV	IP : 136.147.44.103 MAC : 00 60 38 14 30 2C
MRM 7	NTN050BA	D1	NNTM75047EYQ	IP : 136.147.44.31 MAC : 00 60 38 14 30 A0
MRM 8	NTN050BA	D1	NNTM75047EZ4	IP : 136.147.44.127 MAC : 00 60 38 14 31 AC
TX Coupler	NTN055CA	01	R434.443.480 002	
TX Coupler	NTN055CA	01	R434.443.480 003	
TX Coupler	NTN055CA	01	R434.443.480 004	
RX Splitter	NTN055BA	01	R434.423.480 004	
RX Splitter	NTN055BA	01	R434.423.480 005	
RX Splitter	NTN055BA	01	R434.423.480 006	
DBP	NTN030AA	D1	NNTMGR008H73	
DBP	NTN030AA	D1	NNTMGR008H7M	
DBP	NTN030AA	D1	NNTMGR008H81	
IBP	NTN027AA	D1	NNTMGR00996J	

ARTICLE	PEC code	Release	Serial number	Comment
IBP	NTN027AA	D1	NNTMGR009975	
RICO	NTN020CA	D1	NNTMGR001GZZ	
ECU CONTROL CARD	NTT971CM	D2	NNTMGT001KJU	As a part of NTT91600
UCPS	NTW703AA	N2	ATSNZH000008	
DDU	NTN070DA	N2	ATSNZH000005	
CCU	NTW703CC	N3	ATSNZH000021	Firmware 2.06
Rectifier 1000W	NTW703BB	N3	ATSNZH000011	AC 04-06-044
Rectifier 1000W	NTW703BB	N3	ATSNZH000015	AC 04-06-044
Rectifier 1000W	NTW703BB	N3	ATSNZH000032	AC 04-06-044
Filler Rectifier	NTW70301	P2	ATSNZH000026	
Filler Rectifier	NTW70301	P2	ATSNZH000024	
ADU	NTT970AA	P1	ATSNTA000004	MIR 01
USER ICO	NTU737AM	D1	NNTMGT001KKK	

5. TEST EQUIPMENT LIST

List of all of the measurement equipment used in this report.

Equipment description	Manufacturer	Model	Serial No.	V/A date
Spectrum Analyzer	R&S	FSEA	842655/0027	23/04/2004
Advanced Networks System	W&G	ANT20	P41591	09/12/2003
HF Signal Generator	HP	8657B	X278975	28/07/2004
AC/AC Power System	Elgar		57220215	29/04/2003
Voltmetre	Agilent	34970A		
LNE Climatic room	Sapratin	ECK 6 m^3	CT101088/4	22/04/2004

6. MEASUREMENT PRINCIPLE AND CONFIGURATION FOR FREQUENCY STABILITY TEST

Standard Coverage: FCC Part 2.1055, FCC Part 24.235

Objective: This measurement evaluates frequency and phases errors during the active part of the timeslot.

Intend:
(a) The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From -30 deg. to +50 deg. centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.
(2) From -20 deg. to +50 deg. centigrade for equipment to be licensed for use in the Maritime Services under part 80 of this chapter, except for Class A, B, and S Emergency Position Indicating Radio beacons (EPIRBS), and equipment to be licensed for use above 952 MHz at operational fixed stations in all services, stations in the Local Television Transmission Service and Point-to-Point Microwave Radio Service under part 21 of this chapter, and equipment licensed for use aboard aircraft in the Aviation Services under part 87 of this chapter.
(3) From 0 deg. to +50 deg. centigrade for equipment to be licensed for use in the Radio Broadcast Services under part 73 of this chapter.
(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10 deg. centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.
(c) In addition to all other requirements of this section, the following information is required for equipment incorporating heater type crystal oscillators to be used in mobile stations, for which type acceptance is first requested after March 25, 1974, except for battery powered, hand carried, portable equipment having less than 3 watts mean output power.
(1) Measurement data showing variation in transmitter output frequency from a cold start and the elapsed time necessary for the frequency to stabilize within the applicable tolerance. Tests shall be made after temperature stabilization at each of the ambient temperature levels; the lower temperature limit, 0 deg. centigrade and +30 deg. centigrade with no primary power applied.
(2) Beginning at each temperature level specified in paragraph (c)(1) of this section, the frequency shall be measured within one minute after application of primary power to the transmitter and at intervals of no more than one minute thereafter until ten minutes have elapsed or until sufficient measurements are obtained to indicate clearly that the frequency has stabilized within the applicable tolerance, whichever time period is greater. During each test, the ambient temperature shall not be allowed to raise more than 10 deg. centigrade above the respective beginning ambient temperature level.
(3) The elapsed time necessary for the frequency to stabilize within the applicable tolerance from each beginning ambient temperature level as determined from the tests specified in this paragraph shall be specified in the instruction book for the transmitter furnished to the user.
(4) When it is impracticable to subject the complete transmitter to this test because of its physical dimensions or power rating, only its frequency determining and stabilizing portions need be tested.
(d) The frequency stability shall be measured with variation of primary supply voltage as follows:
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

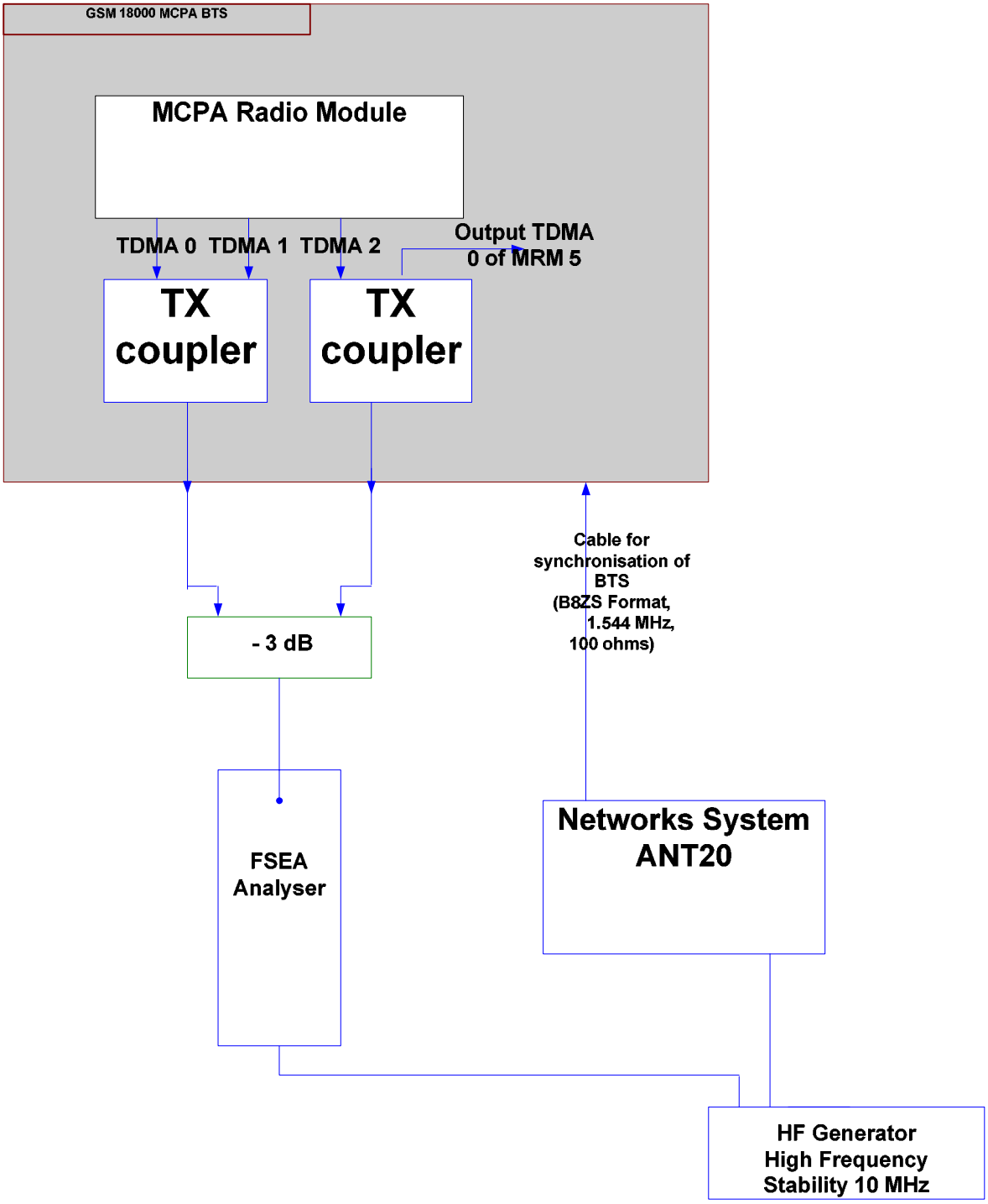
(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.
(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c), and (d) of this section. (For example measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

Specification:
The phase error shall not exceed:

- **5 degrees rms**
- **20 degrees peak**

The mean frequency error across the burst shall not exceed **0.05 ppm or 90 Hz.**
Number of bursts: 200

Measurement principle:



Test configuration:

Frequency stability test is performed under following extreme conditions:

- Temperature from –40°C to +50°C at intervals of 10 degrees.
- With AC power supply variations: 195 VAC, 230 VAC, 265 VAC.

All MRM Modules run with nominal power regulation at maximum power in GMSK modulation. The MRM were configured to transmit at maximum power (Static level 0).

GSM 18000 MCPA BTS is equipped with MRM in slots 0, 1, 2, 3, 4, 5, 6, 7 and 8 with following emission configuration:

MRM 0	TDMA 0	TCH	(B) 512@ 1930.2 MHz
	TDMA 1	BCCH	540 @ 1935.8 MHz
	TDMA 2	BCCH	545 @ 1936.8 MHz
MRM 1	TDMA 0	BCCH	550 @ 1937.8 MHz
	TDMA 1	BCCH	560 @ 1939.8 MHz
	TDMA 2	BCCH	575 @ 1942.8 MHz
MRM 2	TDMA 0	BCCH	590 @ 1945.8 MHz
	TDMA 1	BCCH	600 @ 1947.8 MHz
	TDMA 2	BCCH	611 @ 1950.0 MHz
MRM 3	TDMA 0	BCCH	612 @ 1950.2 MHz
	TDMA 1	BCCH	625 @ 1952.8 MHz
	TDMA 2	BCCH	640 @ 1955.8 MHz
MRM 4	TDMA 0	BCCH	645 @ 1956.8MHz
	TDMA 1	TCH	(M) 661 @ 1960.0 MHz
	TDMA 2	BCCH	680 @ 1963.8 MHz
MRM 5	TDMA 0	BCCH	690 @ 1975.8 MHz
	TDMA 1	BCCH	700 @ 1967.8 MHz
	TDMA 2	BCCH	711 @ 1970.0 MHz
MRM 6	TDMA 0	BCCH	712 @ 1970.8 MHz
	TDMA 1	BCCH	725 @ 1972.8 MHz
	TDMA 2	BCCH	740 @ 1975.8 MHz
MRM 7	TDMA 0	BCCH	750 @ 1977.8 MHz
	TDMA 1	BCCH	760 @ 1979.8 MHz
	TDMA 2	BCCH	775 @ 1982.8 MHz
MRM 8	TDMA 0	BCCH	780 @ 1983.8 MHz
	TDMA 1	BCCH	790 @ 1985.8 MHz
	TDMA 2	TCH	(T) 810 @ 1989.8 MHz

Frequency deviation is measured in MRM 0 (TDMA0), MRM 4(TDMA1) and MRM 8 (TDMA2) on channel C512, C 661 and C 810.

7. TESTS RESULTS

Remark: All measurements have been realized without slow frequency hopping and after thermal stabilization.

@ - 40°c

MRM tested	TX tested	Voltage	Channel	Max frequency error (Hz)	Max peak phase error (°)	Max rms phase error (°)	Result
MRM0	TDMA0	195 V AC	512 (B)	-16.72	7.13	2.20	PASS
	TDMA0	230 V AC	512 (B)	14.21	7.50	2.48	PASS
	TDMA0	265 V AC	512 (B)	19.69	7.66	2.38	PASS
MRM4	TDMA1	195 V AC	661 (M)	-14.59	7.07	2.28	PASS
	TDMA1	230 V AC	661 (M)	-13.75	7.87	2.29	PASS
	TDMA1	265 V AC	661 (M)	-14.66	7.21	2.40	PASS
MRM8	TDMA2	195 V AC	810 (T)	18.53	8.56	2.67	PASS
	TDMA2	230 V AC	810 (T)	22.54	8.28	2.58	PASS
	TDMA2	265 V AC	810 (T)	24.86	9.40	2.76	PASS

@ - 30°c

MRM tested	TX tested	Voltage	Channel	Max frequency error (Hz)	Max peak phase error (°)	Max rms phase error (°)	Result
MRM0	TDMA0	195 V AC	512 (B)	-18.02	7.20	2.41	PASS
	TDMA0	230 V AC	512 (B)	16.79	7.67	2.55	PASS
	TDMA0	265 V AC	512 (B)	-17.69	7.52	2.44	PASS
MRM4	TDMA1	195 V AC	661 (M)	-14.01	7.12	2.38	PASS
	TDMA1	230 V AC	661 (M)	16.72	7.33	2.47	PASS
	TDMA1	265 V AC	661 (M)	18.98	7.26	2.34	PASS
MRM8	TDMA2	195 V AC	810 (T)	23.44	8.20	2.61	PASS
	TDMA2	230 V AC	810 (T)	19.44	7.68	2.58	PASS
	TDMA2	265 V AC	810 (T)	24.09	8.00	2.47	PASS

@ - 20°c

MRM tested	TX tested	Voltage	Channel	Max frequency error (Hz)	Max peak phase error (°)	Max rms phase error (°)	Result
MRM0	TDMA0	195 V AC	512 (B)	-19.18	7.12	2.25	PASS
	TDMA0	230 V AC	512 (B)	19.82	7.67	2.27	PASS
	TDMA0	265 V AC	512 (B)	16.85	7.23	2.31	PASS
MRM4	TDMA1	195 V AC	661 (M)	19.95	8.17	2.69	PASS
	TDMA1	230 V AC	661 (M)	17.69	8.41	2.44	PASS
	TDMA1	265 V AC	661 (M)	19.31	7.22	2.44	PASS
MRM8	TDMA2	195 V AC	810 (T)	17.43	8.62	2.57	PASS
	TDMA2	230 V AC	810 (T)	20.92	7.83	2.48	PASS
	TDMA2	265 V AC	810 (T)	18.47	8.40	2.57	PASS

@ - 10°c

MRM tested	TX tested	Voltage	Channel	Max frequency error (Hz)	Max peak phase error (°)	Max rms phase error (°)	Result
MRM0	TDMA0	195 V AC	512 (B)	18.98	7.67	2.34	PASS
	TDMA0	230 V AC	512 (B)	14.85	7.70	2.60	PASS
	TDMA0	265 V AC	512 (B)	-15.30	7.40	2.40	PASS
MRM4	TDMA1	195 V AC	661 (M)	19.44	7.06	2.27	PASS
	TDMA1	230 V AC	661 (M)	12.98	7.10	2.26	PASS
	TDMA1	265 V AC	661 (M)	15.63	8.01	2.44	PASS
MRM8	TDMA2	195 V AC	810 (T)	25.76	8.76	2.68	PASS
	TDMA2	230 V AC	810 (T)	23.50	7.59	2.54	PASS
	TDMA2	265 V AC	810 (T)	24.34	7.93	2.44	PASS

@ 0°c

MRM tested	TX tested	Voltage	Channel	Max frequency error (Hz)	Max peak phase error (°)	Max rms phase error (°)	Result
MRM0	TDMA0	195 V AC	512 (B)	15.69	7.15	2.37	PASS
	TDMA0	230 V AC	512 (B)	17.11	7.28	2.51	PASS
	TDMA0	265 V AC	512 (B)	-14.33	7.90	2.39	PASS
MRM4	TDMA1	195 V AC	661 (M)	16.11	8.07	2.29	PASS
	TDMA1	230 V AC	661 (M)	21.70	8.39	2.56	PASS
	TDMA1	265 V AC	661 (M)	19.37	8.44	2.37	PASS
MRM8	TDMA2	195 V AC	810 (T)	24.15	9.72	2.66	PASS
	TDMA2	230 V AC	810 (T)	24.92	8.31	2.56	PASS
	TDMA2	265 V AC	810 (T)	23.89	8.29	2.53	PASS

@ + 10°c

MRM tested	TX tested	Voltage	Channel	Max frequency error (Hz)	Max peak phase error (°)	Max rms phase error (°)	Result
MRM0	TDMA0	195 V AC	512 (B)	26.09	7.27	2.34	PASS
	TDMA0	230 V AC	512 (B)	-16.79	7.61	2.63	PASS
	TDMA0	265 V AC	512 (B)	-20.86	7.45	2.37	PASS
MRM4	TDMA1	195 V AC	661 (M)	20.99	8.17	2.49	PASS
	TDMA1	230 V AC	661 (M)	19.95	8.50	2.85	PASS
	TDMA1	265 V AC	661 (M)	23.37	8.93	2.51	PASS
MRM8	TDMA2	195 V AC	810 (T)	20.08	7.33	2.57	PASS
	TDMA2	230 V AC	810 (T)	20.73	9.00	2.64	PASS
	TDMA2	265 V AC	810 (T)	24.02	8.32	2.58	PASS

@ + 20°c

MRM tested	TX tested	Voltage	Channel	Max frequency error (Hz)	Max peak phase error (°)	Max rms phase error (°)	Result
MRM0	TDMA0	195 V AC	512 (B)	15.37	7.79	2.28	PASS
	TDMA0	230 V AC	512 (B)	18.02	8.50	2.33	PASS
	TDMA0	265 V AC	512 (B)	18.14	7.88	2.45	PASS
MRM4	TDMA1	195 V AC	661 (M)	19.31	8.34	2.60	PASS
	TDMA1	230 V AC	661 (M)	20.28	7.71	2.42	PASS
	TDMA1	265 V AC	661 (M)	22.08	7.90	2.70	PASS
MRM8	TDMA2	195 V AC	810 (T)	21.44	9.28	2.68	PASS
	TDMA2	230 V AC	810 (T)	19.76	9.31	2.81	PASS
	TDMA2	265 V AC	810 (T)	23.18	8.10	2.71	PASS

@ + 30°c

MRM tested	TX tested	Voltage	Channel	Max frequency error (Hz)	Max peak phase error (°)	Max rms phase error (°)	Result
MRM0	TDMA0	195 V AC	512 (B)	-19.69	7.64	2.35	PASS
	TDMA0	230 V AC	512 (B)	18.73	8.49	2.47	PASS
	TDMA0	265 V AC	512 (B)	-20.02	8.48	2.54	PASS
MRM4	TDMA1	195 V AC	661 (M)	19.76	8.10	2.43	PASS
	TDMA1	230 V AC	661 (M)	24.73	7.52	2.55	PASS
	TDMA1	265 V AC	661 (M)	14.33	7.80	2.35	PASS
MRM8	TDMA2	195 V AC	810 (T)	24.60	9.95	2.74	PASS
	TDMA2	230 V AC	810 (T)	22.41	9.79	2.71	PASS
	TDMA2	265 V AC	810 (T)	24.86	9.25	2.92	PASS

@ + 40°c

MRM tested	TX tested	Voltage	Channel	Max frequency error (Hz)	Max peak phase error (°)	Max rms phase error (°)	Result
MRM0	TDMA0	195 V AC	512 (B)	-16.47	7.76	2.33	PASS
	TDMA0	230 V AC	512 (B)	14.66	7.50	2.37	PASS
	TDMA0	265 V AC	512 (B)	17.43	8.91	2.49	PASS
MRM4	TDMA1	195 V AC	661 (M)	16.47	9.81	2.57	PASS
	TDMA1	230 V AC	661 (M)	13.95	8.44	2.37	PASS
	TDMA1	265 V AC	661 (M)	17.11	8.47	2.80	PASS
MRM8	TDMA2	195 V AC	810 (T)	24.41	9.25	2.85	PASS
	TDMA2	230 V AC	810 (T)	21.18	8.43	2.78	PASS
	TDMA2	265 V AC	810 (T)	-22.99	8.69	2.63	PASS

@ + 50°c

MRM tested	TX tested	Voltage	Channel	Max frequency error (Hz)	Max peak phase error (°)	Max rms phase error (°)	Result
MRM0	TDMA0	195 V AC	512 (B)	17.43	8.95	2.57	**PASS**
	TDMA0	230 V AC	512 (B)	-17.63	7.58	1.85	**PASS**
	TDMA0	265 V AC	512 (B)	-18.40	7.83	2.67	**PASS**
MRM4	TDMA1	195 V AC	661 (M)	13.95	7.42	2.41	**PASS**
	TDMA1	230 V AC	661 (M)	22.15	8.83	2.53	**PASS**
	TDMA1	265 V AC	661 (M)	12.33	7.87	2.35	**PASS**
MRM8	TDMA2	195 V AC	810 (T)	23.25	10.12	2.80	**PASS**
	TDMA2	230 V AC	810 (T)	25.25	9.45	3.04	**PASS**
	TDMA2	265 V AC	810 (T)	23.96	10.91	2.95	**PASS**

8. CONCLUSION

The phase error and mean frequency in extreme conditions is fully compliant with the specification of FCC requirements.

The maximum deviation measured **26.09 Hz** is sufficient to ensure that the fundamental emission stays within the authorized frequency block.

The GSM 18000 MCPA BTS configured in 1900 MHz complies with the requirements FCC Part 24.235 and Part 2.1055 of FCC Rules and Regulation.

9. ABBREVIATIONS & DEFINITIONS

9.1 ABBREVATIONS

ARFCN	Absolute Radio Frequency Channel Number
BCCH	Broadcast Control Channel
BER	Bit Error Rate
BIST	Built In Self Test
BTS	Base Transceiver System
C/I	Carrier to Interferer ratio
dBm	Ratio in decibel with respect to 1 milliwatt
dBc	Ratio in decibel with respect to the carrier level
FER	Frame Erasure Rate
FP	Frame Processor
FH bus	Transmission bus between FP and TX
IF	Intermediate Frequency
IP3	3rd order interception point
LNA	Low Noise Amplifier
NER	Nominal Error Rate
NFH	NO Frequency Hopping
OL	Local Oscillator
PA	TX Power Amplifier
PCM	Pulse Coded Modulation
RF	Radio Frequency Channel
RX	Receiver
SFH	Slow Frequency Hopping
TCH	Traffic Residual Bit Error Rate
TDMA	Time Division Multiple Access
TS	Time Slot
TX	Transmitter
TRX	Transmitter - Receiver

9.2 DEFINITIONS

PCS1900 Frequency Band and Channels

PCS 1900	C512	C661	C810
F Tx (MHz)	1930.2	1960	1989.8
F Rx (MHz)	1850.2	1880	1909.8

For 512 < n <810

$F_{Rx}(n) = 1850.2 + 0.2*(n-512)$

$F_{Tx}(n) = F_{Rx}(n) + 80$

“END OF DOCUMENT”