GSM 18000 Indoor BTS (FCC extreme condition) Radio Test Report for RM2 1900 introduction

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APPROVALS

Approved By: _____

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CONTENTS

1. INTRODUCTION

This document presents the measurement results of tests performed on this report presents the test data in accordance with FCC Part 24 (PCS1900 band) and Part 22 (GSM850 Band), for the Nortel Networks GSM 9000 Indoor BTS.
This report presents test data for GMSK.

1.1 SCOPE OF THIS DOCUMENT

This document presents the radio qualification plan of following modules introduction:

- Introduction of RM2 PCS1900 (GMSK 50W / 8PSK 30W) Radio module
- Introduction of RM2 PCS1900 (GMSK 30W / 8PSK 30W) Radio module

The main tests of Qualification will be performed on RM2 1900 (50W /30W) because the RM2 50W is the worst critical module concerning consumption, thermal, RF power features.

Only some tests will be performed on RM2 30W (listed in the document), for the others tests RM2 50W compliance will ensure the RM2 30W compliance.

Following RF performances tests will be performed to check FCC compliance and 3GPP TS11.21 compliance:

- At extreme temperature, Radio tests will be performed in Indoor 18000 BTS.

Radio Tests will be performed in GMSK modulation.

1.2 AUDIENCE FOR THIS DOCUMENT

This document is to be used by any person needing a view on Nortel Networks GSM 18000 Indoor BTS.

2. RELATED DOCUMENTS

2.1 APPLICABLES DOCUMENTS

[A1]	47 CFR Part 24	PERSONAL COMMUNICATION SERVICES , January2003
[A2]	47 CFR Part22	PUBLIC MOBILE SERVICES
[A3]	47 CFR Part2	FREQUENCY ALLOCATION AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS , October 2003
[A4]	IC RSS-133	Spectrum Management and Telecommunication Policy – Radio Standard Specifications, Issue 3- June 2005

2.2 REFERENCE DOCUMENTS

[R1]	PCS/BTS/DPL/02350	Radio Test Plan for the introduction of RM2 1900 MHz(FCC &3GPP)
[R2]	PE/BTS/DJD/021878	GSM 18000 Indoor BTS Radio Test Report according to FCC Part 24 & FCC Part 22 (FCC ID AB6BTS18IND)
[R3]	PE/BTS/DJD/021883	GSM 18000 Outdoor BTS Radio Test Report according to FCC Part 24 & FCC Part 22 (FCC ID AB6BTS18OUT)

3. ABBREVIATIONS AND DEFINITIONS

3.1 ABBREVIATIONS

RM	Radio Module
BCF	Base Common Function
BTS	Base Transceiving Station
DDM	Dual Diplexer Module
GSM	Global System for Mobile Communications
GPRS	General Packet Radio Service
EDGE	Enhanced Data for GSM Evolution
PDTCH	Packet Data Logical Channel
PA	Power Amplifier
e-SCPA	EDGE Single Carrier PA
HePA	Edge High Power Amplifier
LNA	Low Noise Amplifier
OMC	Operation and Maintenance Center
TCU	Trans-Coding Unit
MSC	Mobile Switching Center
RF	Radio Frequency
Tx	Transmitter
TxF	Emission Filter

3.2 DEFINITIONS

BTS18000: Nortel product line

B Bottom ARFCN. Downlink (BTS Tx) and Uplink (BTS Rx) frequencies are given as follow:

GSM 850 : $F_{B\ downlink}$ = 869.2MHz ; $F_{B\ uplink}$ = 824.2 MHz

PCS1900: $F_{B\ downlink}$ =1930.2 MHz ; $F_{B\ uplink}$ =1850.2 MHz

M Middle ARFCN. Downlink (BTS Tx) and Uplink (BTS Rx) frequencies are given as follow:

GSM 850 : $F_{M\ downlink}$ = 881.4 MHz ; $F_{M\ uplink}$ = 836.4 MHz

PCS1900: $F_{M\ downlink}$ = 1960.0 MHz ; $F_{M\ uplink}$ = 1880.0 MHz

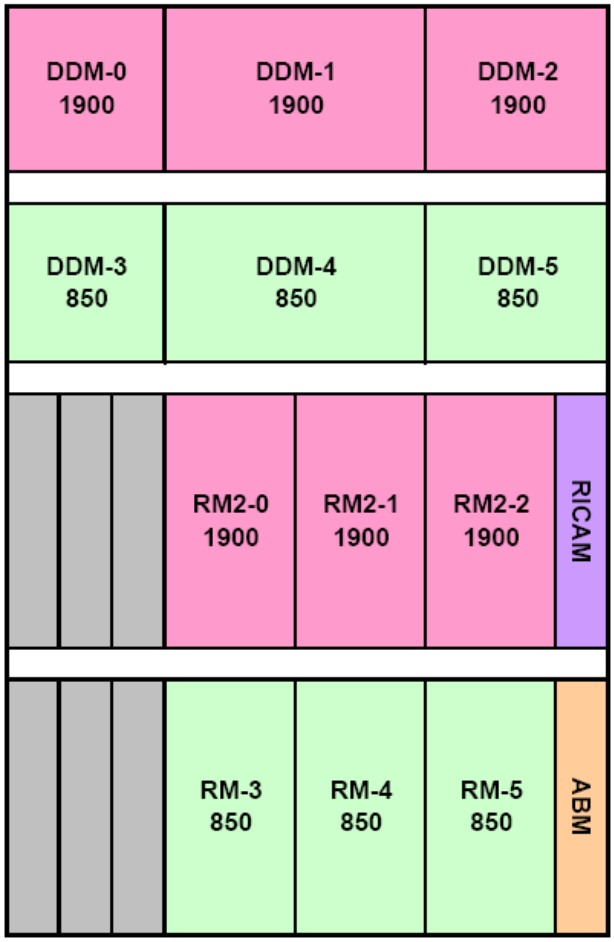
T Top ARFCN. Downlink (BTS Tx) and Uplink (BTS Rx) frequencies are given as follow:

GSM 850 : $F_{T\ downlink}$ = 893.8 MHz ; $F_{T\ uplink}$ = 848.8 MHz

PCS1900: $F_{T\ downlink}$ = 1989.8 MHz ; $F_{T\ uplink}$ =1909.8 MHz

4. TEST CONFIGURATION

4.1 BTS CONFIGURATION UNDER TESTS



Radio Module is equipped with three identical RF ways Tx0, Tx1, and Tx2.
For the RM of PCS1900, MPRM2 and RM2 were configured in BTS.
For the RM of GSM850, HPRM and MPRM were configured in BTS.

Two types of coupling device are tested:
- DDM H2 on way Tx0 & Tx1.
- Diplexer on way Tx2.

Diplexer is the worst case for spurious level.

H2 combiner introduces additional 3dB losses

4.2 MODULE CONFIGURATION UNDER TEST

Designation	Hardware code PEC Code	Release	Serial number	comments
Cable Cabinet	NTN016AF	03	NNTM7880Y829	
RICAM	NTN024AA	05	NNTMGWF304EG	
ABM	NTN029AF	05	NNTMJR001HPR	
ALPRO	NTQ811CA	01	NNTM7880YB2G	
SICS	NTN071GM	02	NNTMLA08H5GA	
DDM	NNT063AM	04	FICT06000HTG	PCS 1900
DDM	NNT063AM	04	FICT06000HTK	PCS 1900
DDM	NNT063AM	04	FICT06000GE7	PCS 1900
DDM	NTN063HM	02	FICT03002MJG	GSM 850
DDM	NTN063HM	02	FICT03002MH6	GSM 850
DDM	NTN063HM	02	FICT03002MJH	GSM 850
RM2 50W/30W	NTN050PP	D1	NNTM7880Y9R3	PCS 1900
RM2 50W/30W	NTN050PP	D1	NNTM7880Y9Q6	PCS 1900
RM2 30W/30W	NTN050CP	D1	NNTM7880Y9RQ	PCS 1900
HPRM	NTN050JA	01	NNTM7880WJC1	GSM 850
HPRM	NTN050JA	01	NNTM7880WT5G	GSM 850
HPRM	NTN050JA	01	NNTMJR0001HPR	GSM 850

4.3 TEST EQUIPMENT

Equipment	Model	S/N	Last Cal.	Cal. due
PSA series spectrum analyzer	E4443A	MY46181134	2008-03-17	2009-03-17

- PC, RF cables, attenuators

4.4 BTS SOFTWARE

BTS Load software version : V16_B1

Test bench software version : Integration Test v4.08

RM2 Load software version : V16_A4

4.5 TEST SOFTWARE

TIL_alarm: V01f 205

TIL_COAM: V16e403

WINTOOL: V05A2_E19.0

WIN TMI: V03D306

5. TEST REPORT: RM2 50/30W PCS1900

5.1 INTRODUCTION

The following information is to introduce GSM 18000 indoor BTS for Nortel Network, in accordance with FCC Part 24 of the FCC Rules and Regulations.

5.2 MEASUREMENT RESULTS

Measurement Results Summary:

Test Case	Modulation	RESULT	Note
Mean RF Power	GMSK	Complies	Vmin (-40V) / Vmax (-57V) From -5°C to +45°C by 10°C step
Modulation accuracy-phase & freq	GMSK	Complies	

5.3 NAME OF TEST: MEAN RF POWER

5.3.1 FCC REQUIREMENTS – FCC PART 22.913L

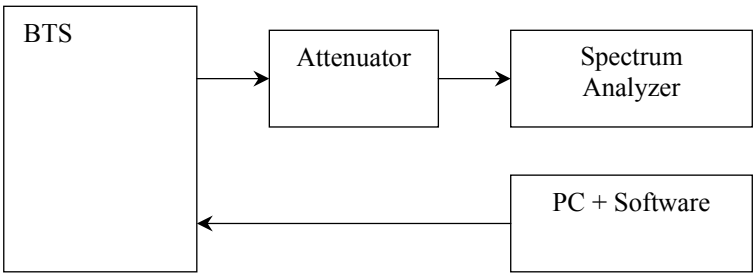
(a) Base stations are limited to 1640 watts peak equivalent isotropicaly radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. See 24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power. In no case may the peak output power of a base station transmitter exceed 500 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.

Specification for Radio Modulation Test:

Band	Modulation	Power	DDM Diplexer		DDM H2	
			Low Limit	Up Limit	Low Limit	Up Limit
PCS1900	GMSK	30w	42.5	45.1	38.5	42.4
	8PSK	30w	42.5	45.1	38.5	42.4
PCS1900	GMSK	50w	44.7	47.2	40.7	44.0
	8PSK	30w	42.5	45.1	38.5	42.4

5.3.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (static level 0 & Dynamic level 0):
- for GMSK modulation, in mode GMSK no synchro,

Measurements were carried on frequencies which are C512 (B), C661 (M), C810 (T).

The output power was measured using the PSA which has the following settings:
Mode: Average
Reference Level Offset: Corrected to account for cable(s) and attenuator losses

5.3.3 TEST RESULTS

The Table shows the test results of RF Output Power for **GMSK** modulation with several coupling configurations:

5.3.3.1 OUTPUT POWER AT ANTENNA @ -5°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C512	42.34	Pass
	C661	42.90	Pass
	C810	42.67	Pass
-57VDC	C512	42.28	Pass
	C661	42.92	Pass
	C810	42.68	Pass

5.3.3.2 OUTPUT POWER AT ANTENNA @ +5°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C512	42.23	Pass
	C661	42.87	Pass
	C810	42.62	Pass
-57VDC	C512	42.24	Pass
	C661	42.88	Pass
	C810	42.62	Pass

5.3.3.3 OUTPUT POWER AT ANTENNA @ +15°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C512	42.26	Pass
	C661	42.88	Pass
	C810	42.55	Pass
-57VDC	C512	42.25	Pass
	C661	42.82	Pass
	C810	42.54	Pass

5.3.3.4 OUTPUT POWER AT ANTENNA @ +25°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C512	42.24	Pass
	C661	42.88	Pass
	C810	42.52	Pass
-57VDC	C512	42.25	Pass
	C661	42.86	Pass
	C810	42.53	Pass

5.3.3.5 OUTPUT POWER AT ANTENNA @ +35°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C512	42.25	Pass
	C661	42.78	Pass
	C810	42.18	Pass
-57VDC	C512	42.26	Pass
	C661	42.82	Pass
	C810	42.52	Pass

5.3.3.6 OUTPUT POWER AT ANTENNA @ +45°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C512	42.35	Pass
	C661	42.73	Pass
	C810	42.15	Pass
-57VDC	C512	42.31	Pass
	C661	42.67	Pass
	C810	42.21	Pass

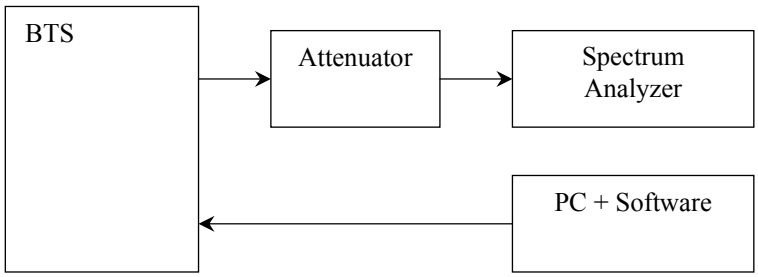
Conclusion: The mean RF power test is compliant with the FCC part 24 specification.

5.4 NAME OF TEST: MODULATION ACCURACY-PHASE & FREQ

5.4.1 FCC REQUIREMENTS

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

5.4.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (static level 0) :
- for GMSK modulation, in mode GMSK synchro.

Measurements were carried on frequencies which are C512 (B), C661 (M), & C810 (T).

5.4.3 TEST RESULTS

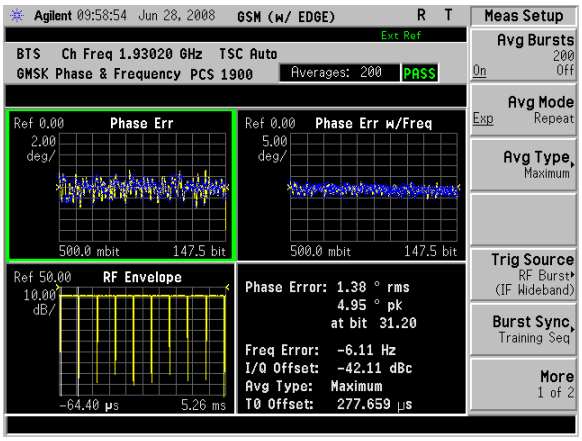
The Table shows the test results of Phase and Mean Frequency for **GMSK** modulation with several coupling configurations:

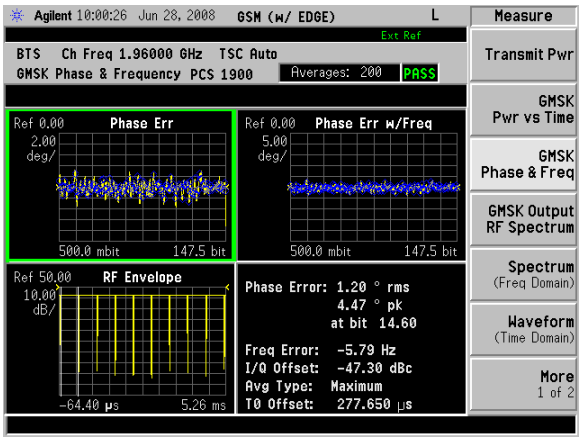
5.4.3.1 TESTS AT TEMPERATURE -5 °C

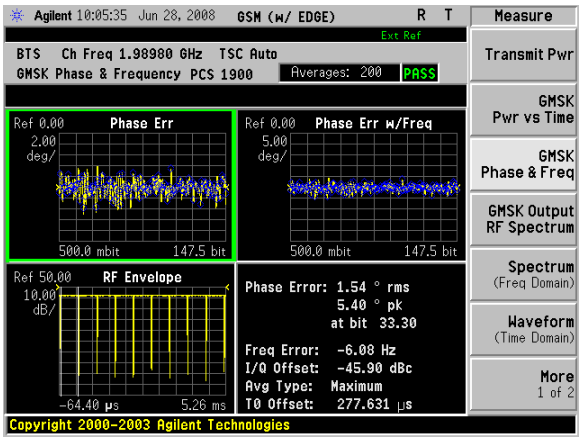
5.4.3.1.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	4.95	Pass
	Phase RMS	1.39	Pass
	Freq. Error	-6.11	Pass
C661	Phase PK	4.47	Pass
	Phase RMS	1.20	Pass
	Freq. Error	-5.79	Pass
C810	Phase PK	5.40	Pass
	Phase RMS	1.54	Pass
	Freq. Error	-6.08	Pass



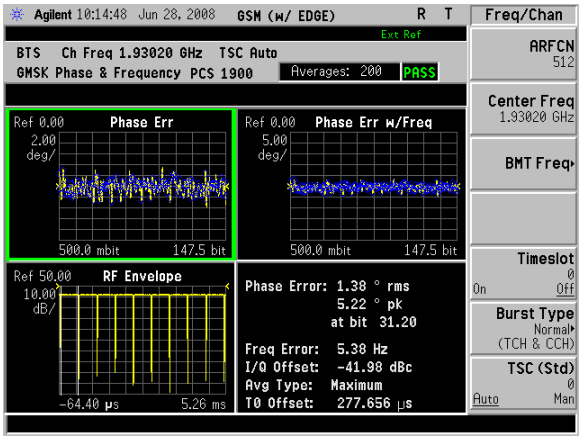


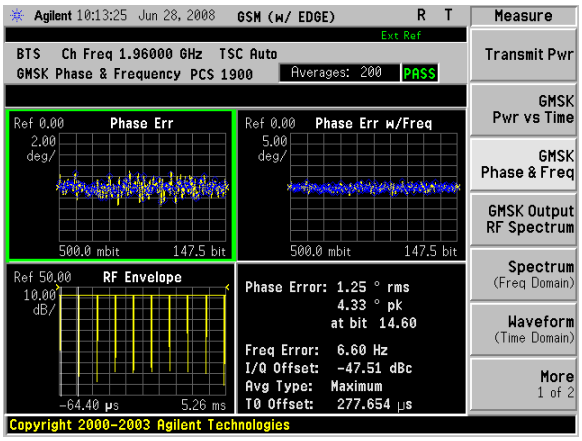


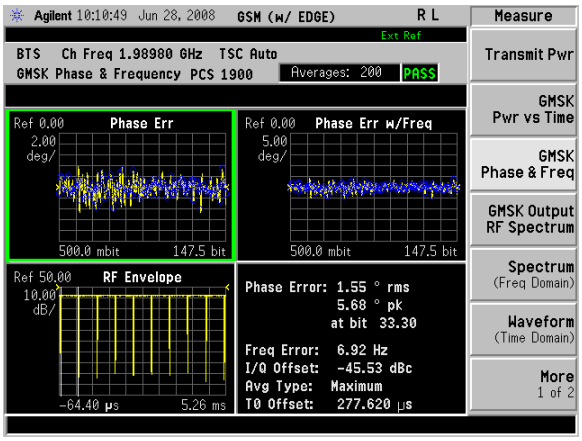
5.4.3.1.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	5.22	Pass
	Phase RMS	1.38	Pass
	Freq. Error	5.38	Pass
C661	Phase PK	4.33	Pass
	Phase RMS	1.25	Pass
	Freq. Error	6.60	Pass
C810	Phase PK	5.68	Pass
	Phase RMS	1.55	Pass
	Freq. Error	6.92	Pass





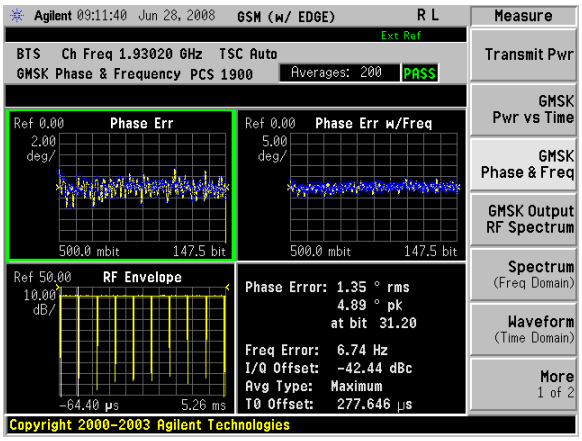


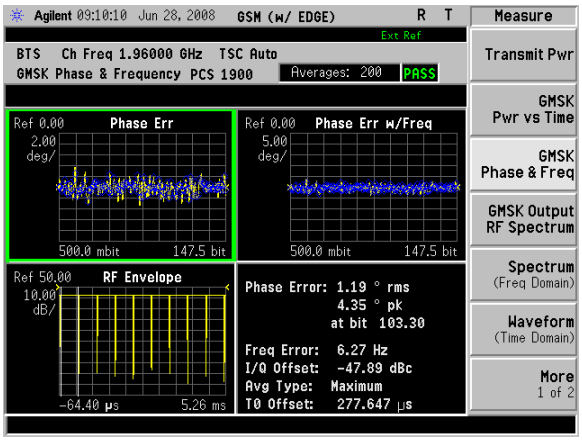
5.4.3.2 TESTS AT TEMPERATURE +5 °C

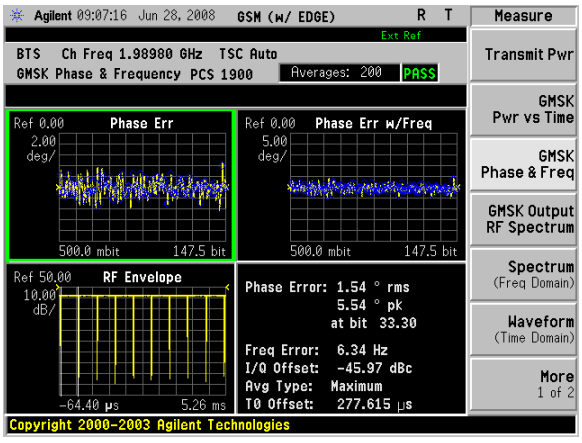
5.4.3.2.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	4.89	Pass
	Phase RMS	1.35	Pass
	Freq. Error	6.74	Pass
C661	Phase PK	4.35	Pass
	Phase RMS	1.19	Pass
	Freq. Error	6.27	Pass
C810	Phase PK	5.54	Pass
	Phase RMS	1.54	Pass
	Freq. Error	6.34	Pass



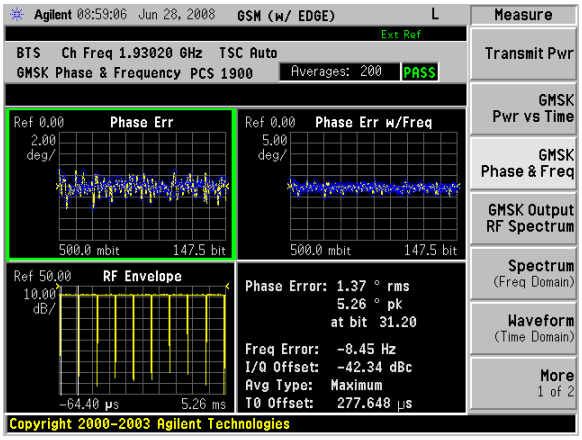


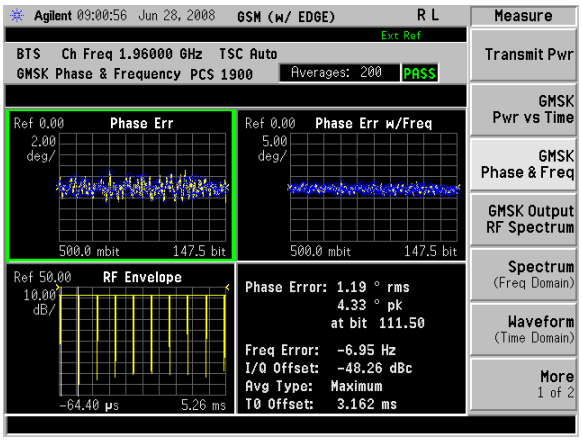


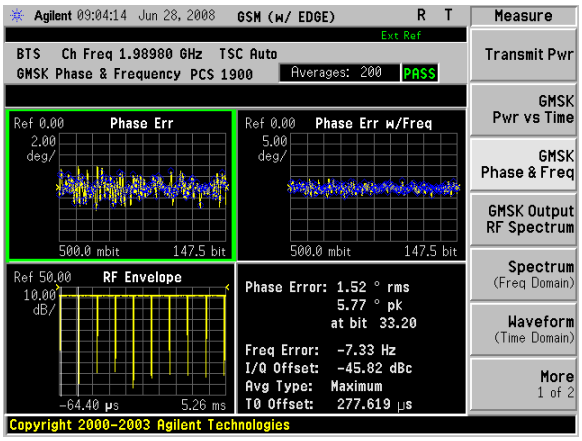
5.4.3.2.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	5.26	Pass
	Phase RMS	1.37	Pass
	Freq. Error	-8.45	Pass
C661	Phase PK	4.33	Pass
	Phase RMS	1.19	Pass
	Freq. Error	-6.95	Pass
C810	Phase PK	5.77	Pass
	Phase RMS	1.52	Pass
	Freq. Error	-7.33	Pass





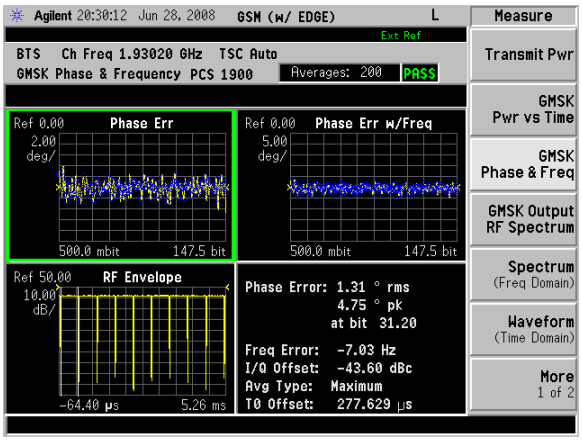


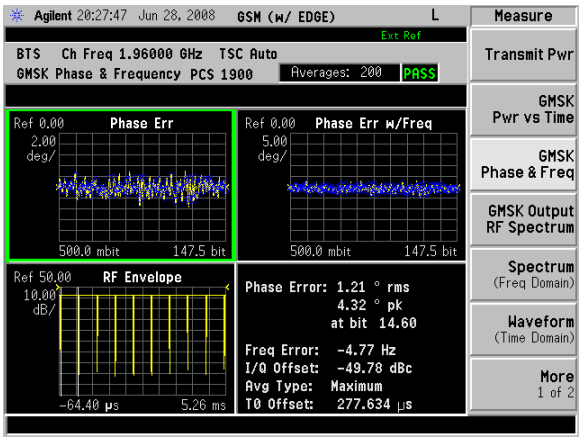
5.4.3.3 TESTS AT TEMPERATURE +15 °C

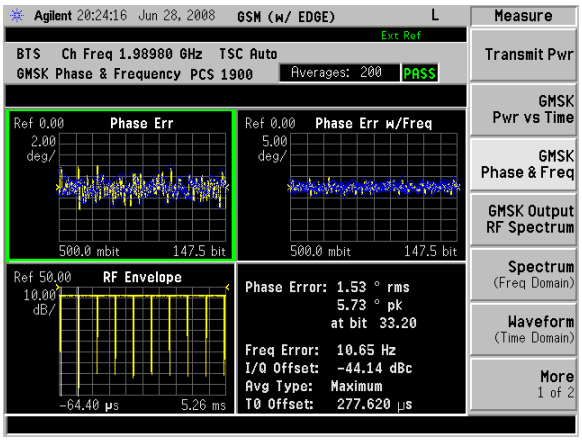
5.4.3.3.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	4.75	Pass
	Phase RMS	1.31	Pass
	Freq. Error	-7.03	Pass
C661	Phase PK	4.32	Pass
	Phase RMS	1.21	Pass
	Freq. Error	-4.77	Pass
C810	Phase PK	5.73	Pass
	Phase RMS	1.53	Pass
	Freq. Error	10.65	Pass



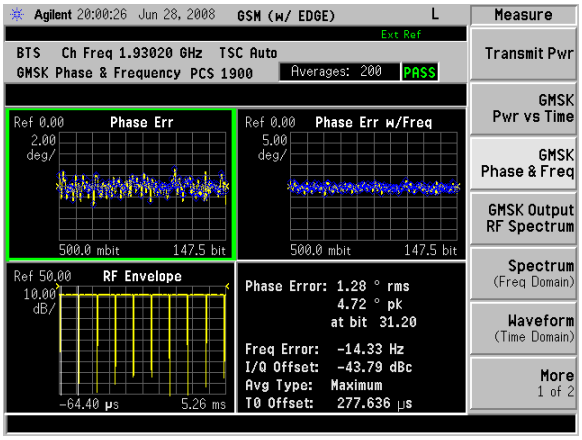


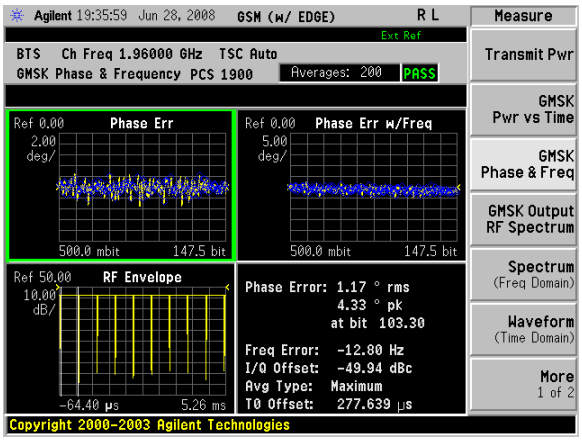


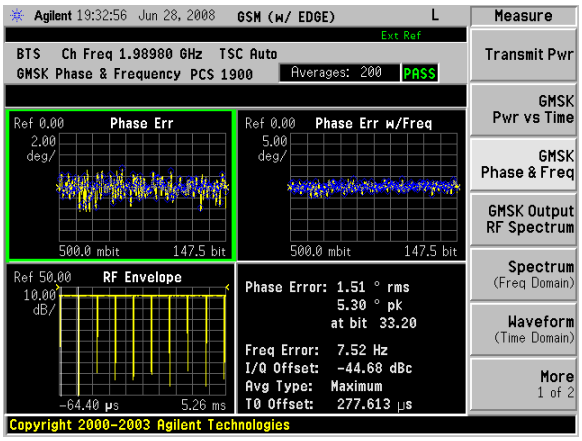
5.4.3.3.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	4.72	Pass
	Phase RMS	1.28	Pass
	Freq. Error	-14.33	Pass
C661	Phase PK	4.33	Pass
	Phase RMS	1.17	Pass
	Freq. Error	-12.80	Pass
C810	Phase PK	5.30	Pass
	Phase RMS	1.51	Pass
	Freq. Error	7.52	Pass





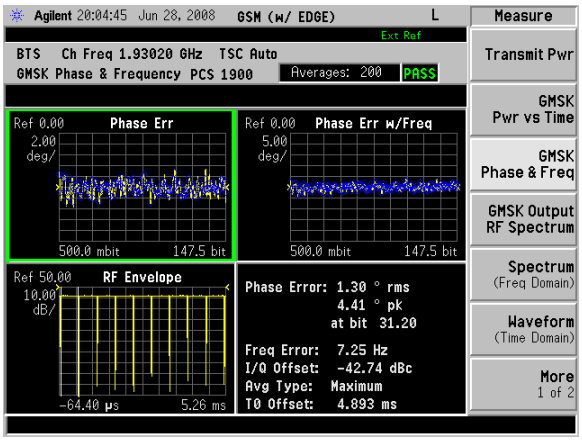


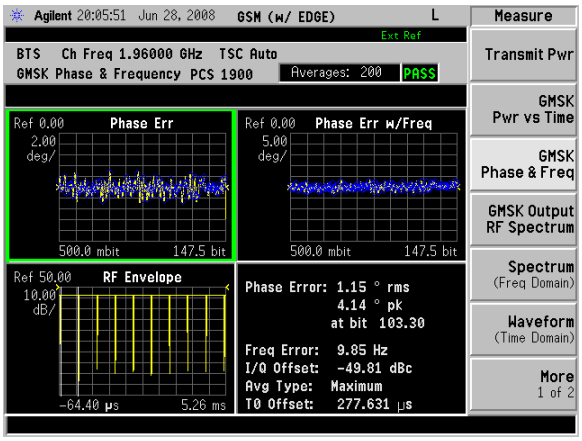
5.4.3.4 TESTS AT TEMPERATURE +25 °C

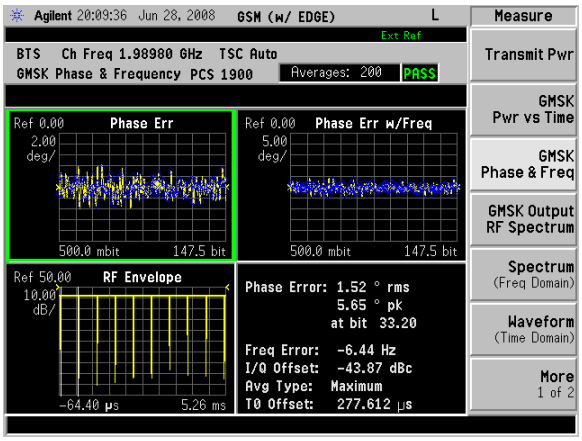
5.4.3.4.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	4.41	Pass
	Phase RMS	1.30	Pass
	Freq. Error	7.25	Pass
C661	Phase PK	4.14	Pass
	Phase RMS	1.15	Pass
	Freq. Error	9.85	Pass
C810	Phase PK	5.65	Pass
	Phase RMS	1.52	Pass
	Freq. Error	-6.44	Pass



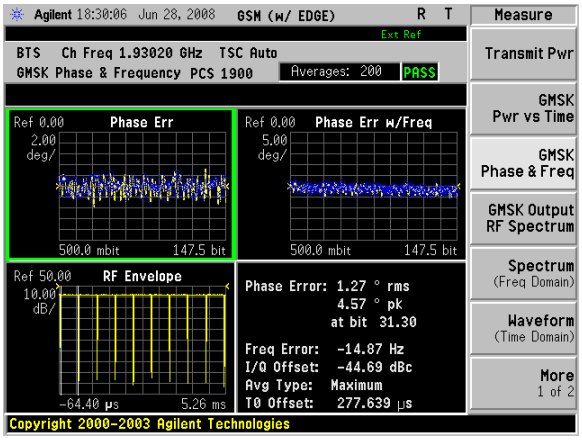


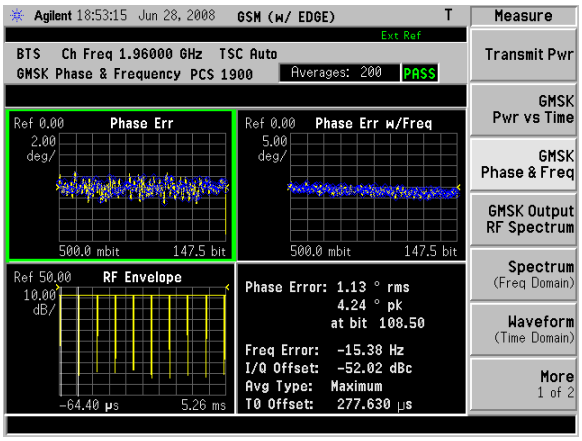


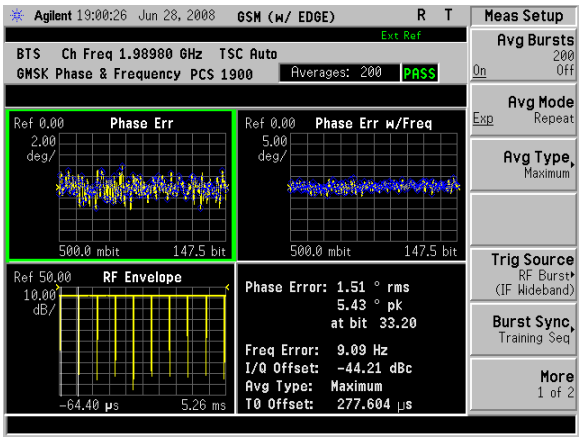
5.4.3.4.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	4.57	Pass
	Phase RMS	1.27	Pass
	Freq. Error	-14.87	Pass
C661	Phase PK	4.24	Pass
	Phase RMS	1.13	Pass
	Freq. Error	-15.38	Pass
C810	Phase PK	5.43	Pass
	Phase RMS	1.51	Pass
	Freq. Error	9.09	Pass





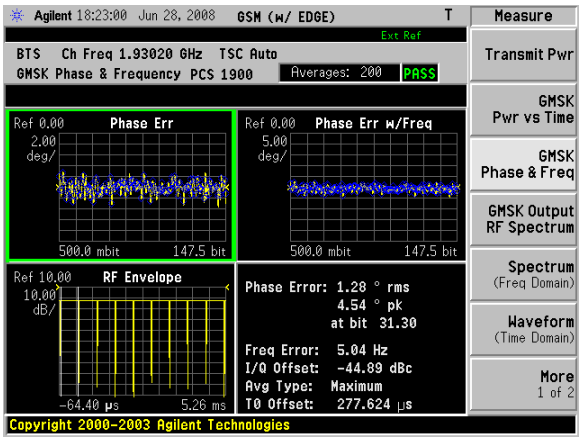


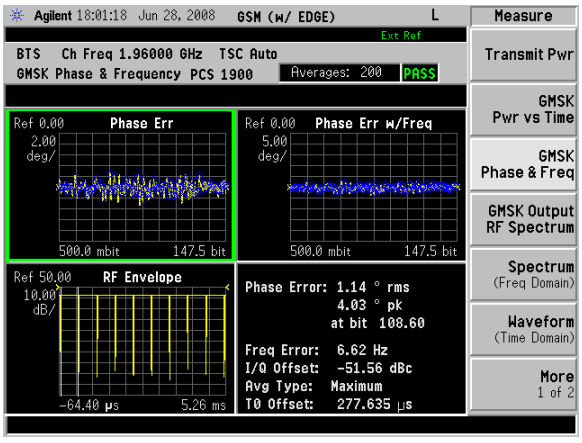
5.4.3.5 TESTS AT TEMPERATURE +35 °C

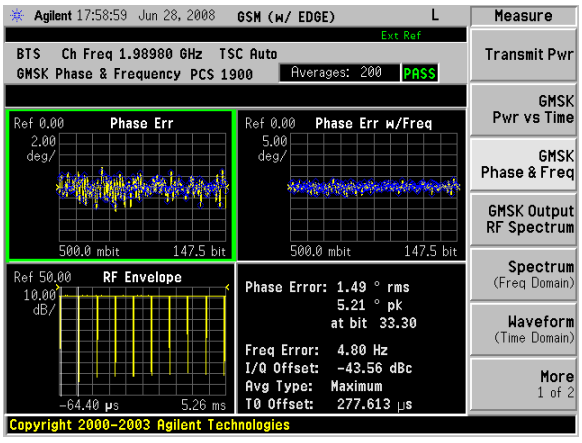
5.4.3.5.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	4.54	Pass
	Phase RMS	1.28	Pass
	Freq. Error	5.04	Pass
C661	Phase PK	4.03	Pass
	Phase RMS	1.14	Pass
	Freq. Error	6.62	Pass
C810	Phase PK	5.21	Pass
	Phase RMS	1.49	Pass
	Freq. Error	4.80	Pass



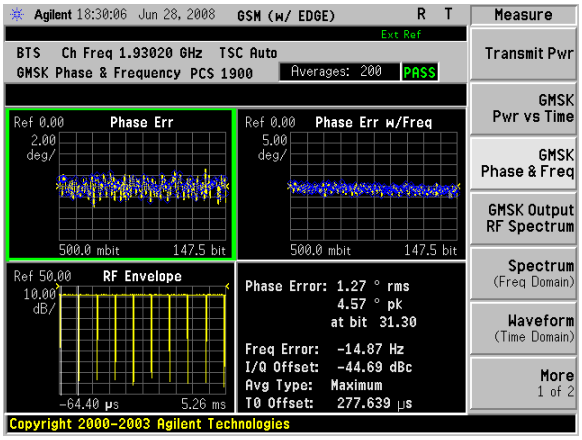


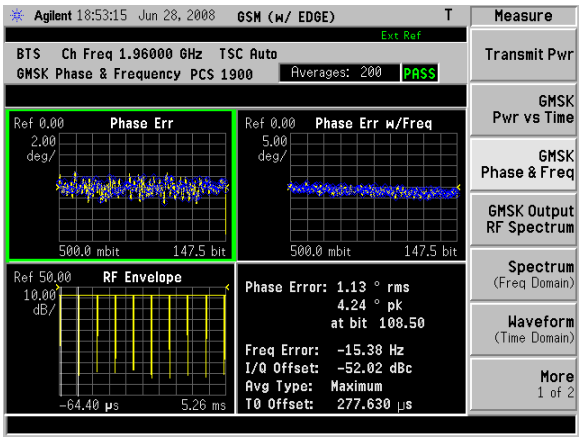


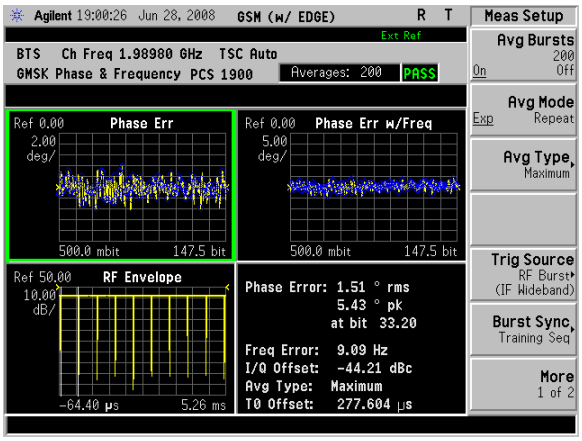
5.4.3.5.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	4.57	Pass
	Phase RMS	1.27	Pass
	Freq. Error	-14.87	Pass
C661	Phase PK	4.24	Pass
	Phase RMS	1.13	Pass
	Freq. Error	-15.38	Pass
C810	Phase PK	5.43	Pass
	Phase RMS	1.51	Pass
	Freq. Error	9.09	Pass





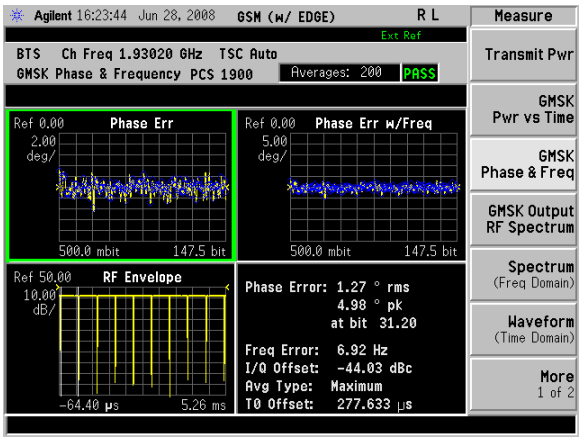


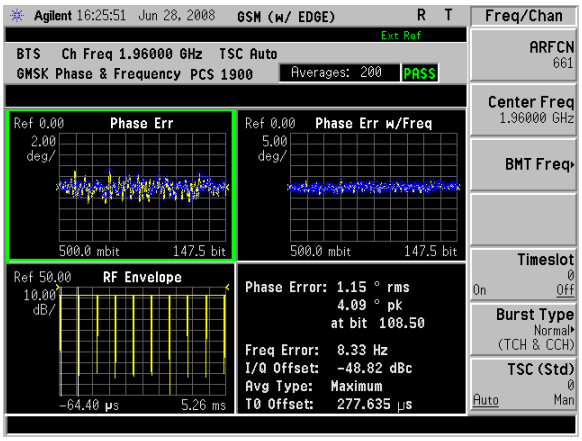
5.4.3.6 TESTS AT TEMPERATURE +45 °C

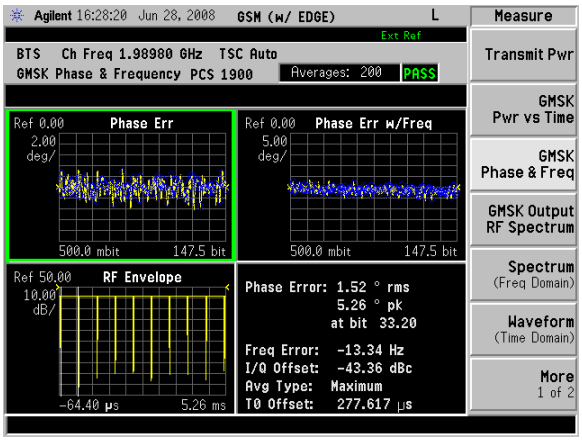
5.4.3.6.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	4.98	Pass
	Phase RMS	1.27	Pass
	Freq. Error	6.92	Pass
C661	Phase PK	4.09	Pass
	Phase RMS	1.15	Pass
	Freq. Error	8.33	Pass
C810	Phase PK	5.26	Pass
	Phase RMS	1.52	Pass
	Freq. Error	-13.34	Pass



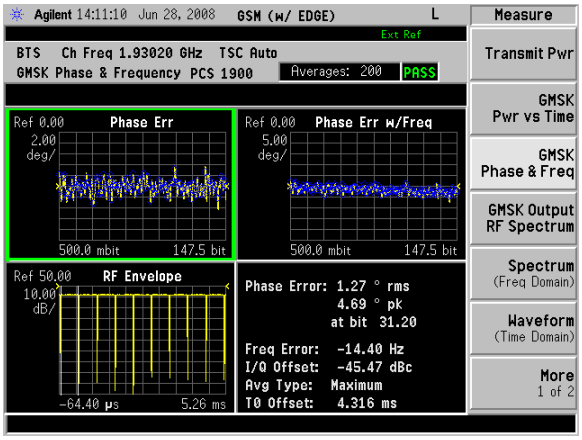


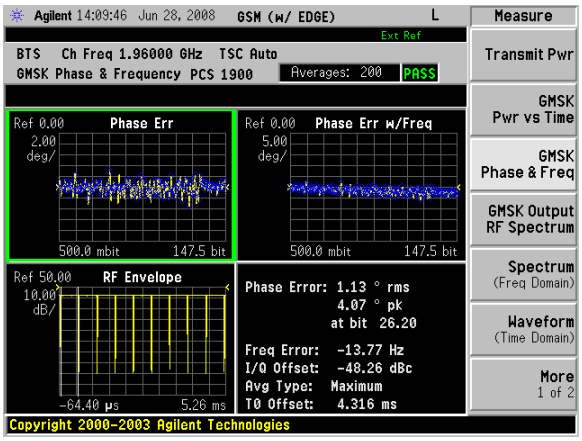


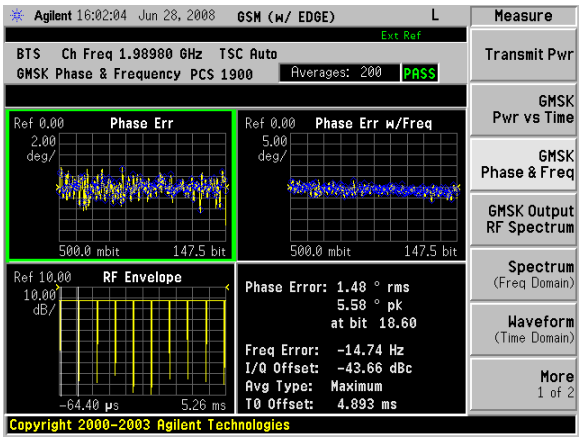
5.4.3.6.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C512	Phase PK	4.69	Pass
	Phase RMS	1.27	Pass
	Freq. Error	-14.40	Pass
C661	Phase PK	4.07	Pass
	Phase RMS	1.13	Pass
	Freq. Error	-13.77	Pass
C810	Phase PK	5.58	Pass
	Phase RMS	1.48	Pass
	Freq. Error	-14.74	Pass







Conclusion: In GMSK modulation, the phase & frequency error test is compliant with the FCC part 24 specification.

6. TEST REPORT: HPRM GSM850

6.1 INTRODUCTION

The following information is to introduce GSM 18000 indoor BTS for Nortel Network, in accordance with FCC Part 22 of the FCC Rules and Regulations.

6.2 MEASUREMENT RESULTS

Measurement Results Summary:

Test Case	Modulation	RESULT	Note
Mean RF Power	GMSK	Complies	Vmin (-40V) / Vmax (-57V) From -5°C to +45°C by 10°C step
Modulation accuracy-phase & freq	GMSK	Complies	

6.3 NAME OF TEST: MEAN RF POWER

6.3.1 FCC REQUIREMENTS – FCC PART 22.913L

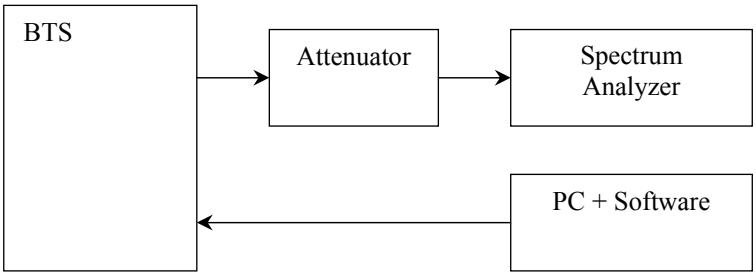
(a) Base stations are limited to 1640 watts peak equivalent isotropicaly radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. See 24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power. In no case may the peak output power of a base station transmitter exceed 500 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.

Specification for Radio Modulation Test:

Band	Modulation	Power	DDM Diplexer		DDM H2	
			Low Limit	Up Limit	Low Limit	Up Limit
GSM850	GMSK	60w	45.7	47.9	41.9	45.1
	8PSK	45w	44.4	46.6	40.6	43.8

6.3.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (static level 0 & Dynamic level 0):
- for GMSK modulation, in mode GMSK no synchro,

Measurements were carried on frequencies which are C128 (B), C190 (M), C251 (T).

The output power was measured using the PSA which has the following settings:
Mode: Average
Reference Level Offset: Corrected to account for cable(s) and attenuator losses

6.3.3 TEST RESULTS

The Table shows the test results of RF Output Power for **GMSK** modulation with several coupling configurations:

6.3.3.1 OUTPUT POWER AT ANTENNA @ -5°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C128	43.21	Pass
	C190	43.55	Pass
	C251	43.65	Pass
-57VDC	C128	43.16	Pass
	C190	43.54	Pass
	C251	43.61	Pass

6.3.3.2 OUTPUT POWER AT ANTENNA @ +5°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C128	43.20	Pass
	C190	43.50	Pass
	C251	43.56	Pass
-57VDC	C128	43.13	Pass
	C190	43.50	Pass
	C251	43.48	Pass

6.3.3.3 OUTPUT POWER AT ANTENNA @ +15°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C128	43.03	Pass
	C190	43.40	Pass
	C251	43.46	Pass
-57VDC	C128	43.05	Pass
	C190	43.42	Pass
	C251	43.44	Pass

6.3.3.4 OUTPUT POWER AT ANTENNA @ +25°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C128	42.98	Pass
	C190	43.31	Pass
	C251	43.29	Pass
-57VDC	C128	43.01	Pass
	C190	43.35	Pass
	C251	43.35	Pass

6.3.3.5 OUTPUT POWER AT ANTENNA @ +35°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C128	42.84	Pass
	C190	43.15	Pass
	C251	43.23	Pass
-57VDC	C128	42.90	Pass
	C190	43.18	Pass
	C251	43.27	Pass

6.3.3.6 OUTPUT POWER AT ANTENNA @ +45°C

- **H2D configuration:**

Power supply	ARFCN	Mean Power (dBm)	Sanction
-40VDC	C128	42.75	Pass
	C190	43.04	Pass
	C251	43.05	Pass
-57VDC	C128	42.89	Pass
	C190	43.15	Pass
	C251	43.18	Pass

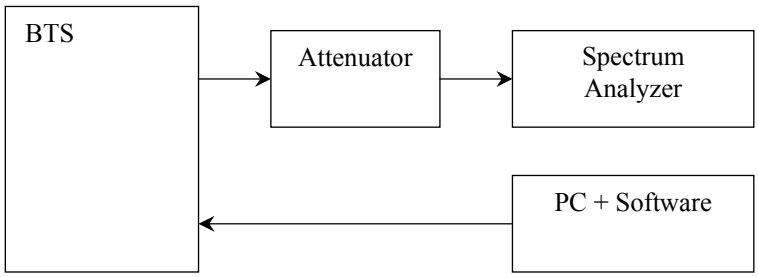
Conclusion: The mean RF power test is compliant with the FCC part 22 specification.

6.4 NAME OF TEST: MODULATION ACCURACY-PHASE & FREQ

6.4.1 FCC REQUIREMENTS

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

6.4.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (static level 0) :
- for GMSK modulation, in mode GMSK synchro.

Measurements were carried on frequencies which are C128 (B), C190 (M), & C251 (T).

6.4.3 TEST RESULTS

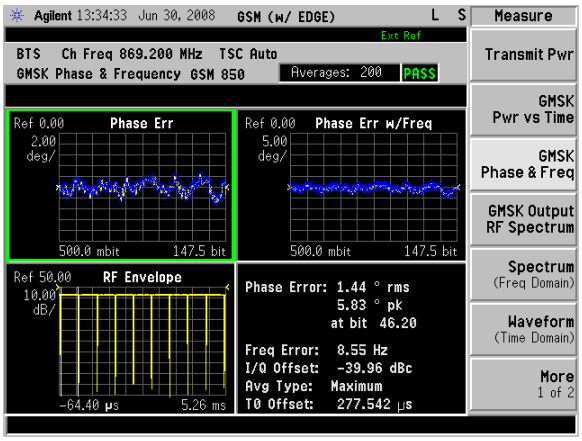
The Table shows the test results of Phase and Mean Frequency for **GMSK** modulation with several coupling configurations:

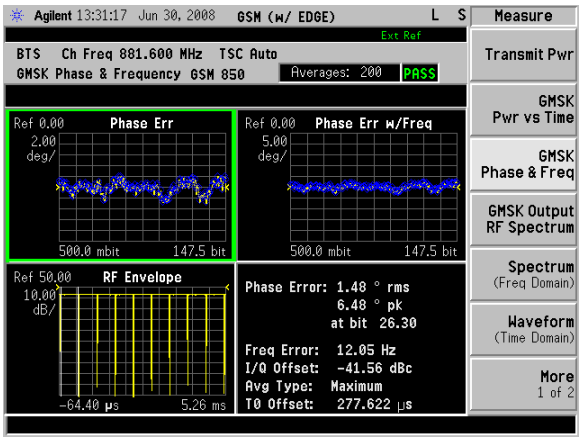
6.4.3.1 TESTS AT TEMPERATURE -5 °C

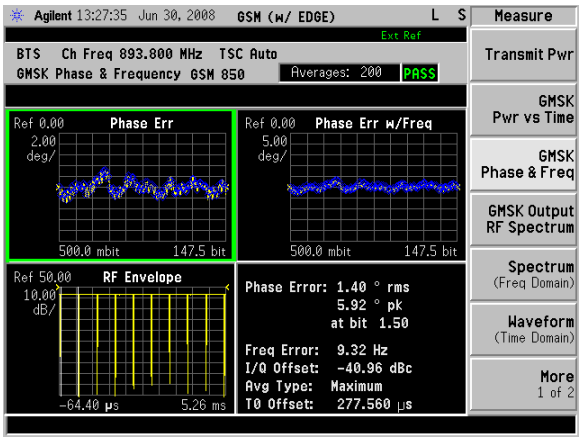
6.4.3.1.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	5.83	Pass
	Phase RMS	1.44	Pass
	Freq. Error	8.55	Pass
C190	Phase PK	6.48	Pass
	Phase RMS	1.48	Pass
	Freq. Error	12.05	Pass
C251	Phase PK	5.92	Pass
	Phase RMS	1.40	Pass
	Freq. Error	9.32	Pass



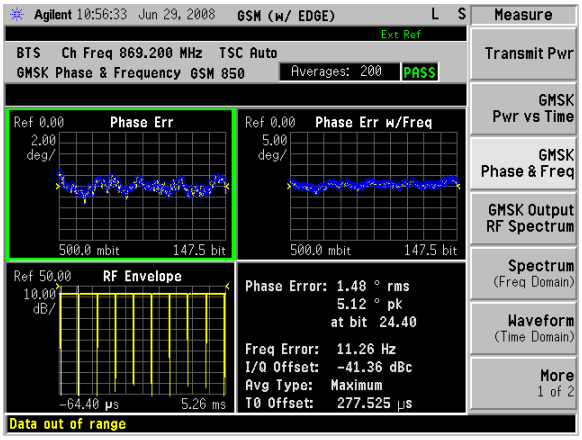


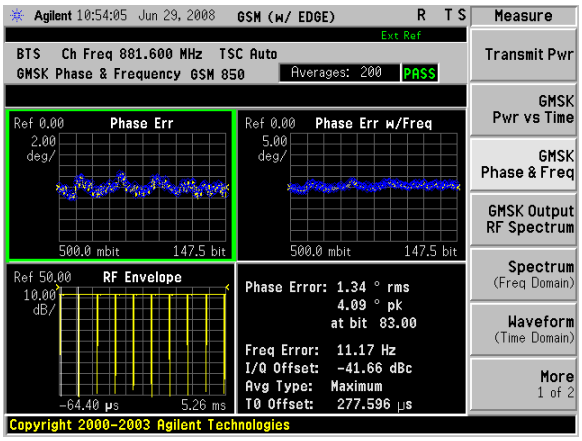


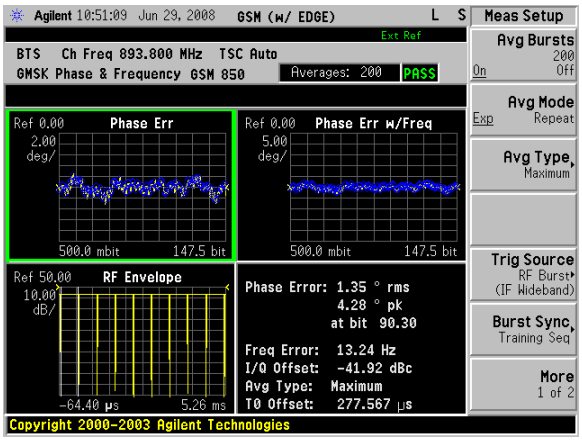
6.4.3.1.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	5.12	Pass
	Phase RMS	1.48	Pass
	Freq. Error	11.26	Pass
C190	Phase PK	4.09	Pass
	Phase RMS	1.34	Pass
	Freq. Error	11.17	Pass
C251	Phase PK	4.20	Pass
	Phase RMS	1.35	Pass
	Freq. Error	13.24	Pass





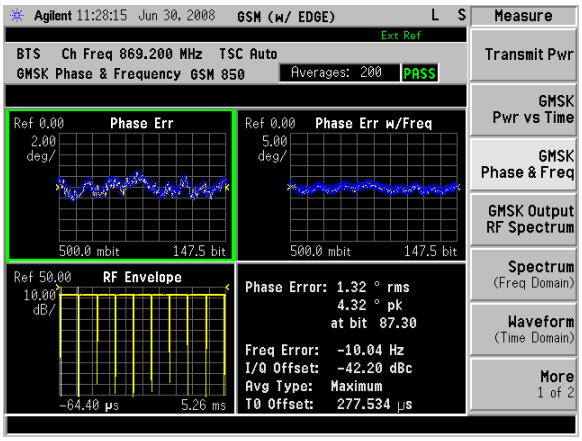


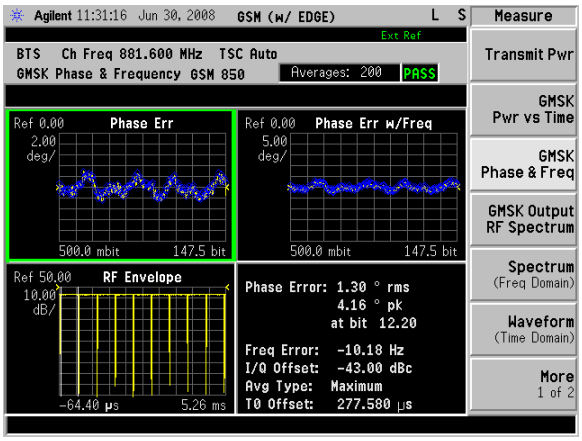
6.4.3.2 TESTS AT TEMPERATURE +5 °C

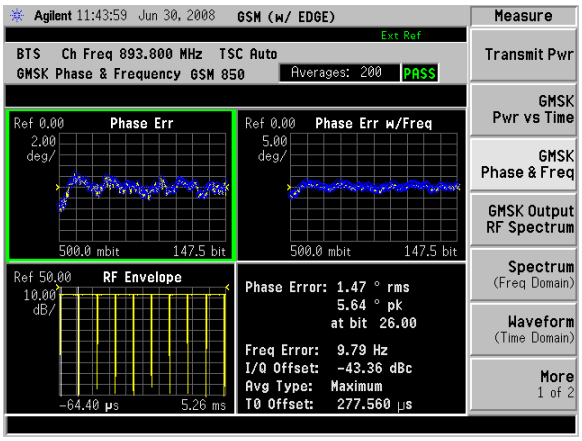
6.4.3.2.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	4.32	Pass
	Phase RMS	1.32	Pass
	Freq. Error	-10.04	Pass
C190	Phase PK	4.16	Pass
	Phase RMS	1.30	Pass
	Freq. Error	-10.18	Pass
C251	Phase PK	5.64	Pass
	Phase RMS	1.47	Pass
	Freq. Error	9.79	Pass



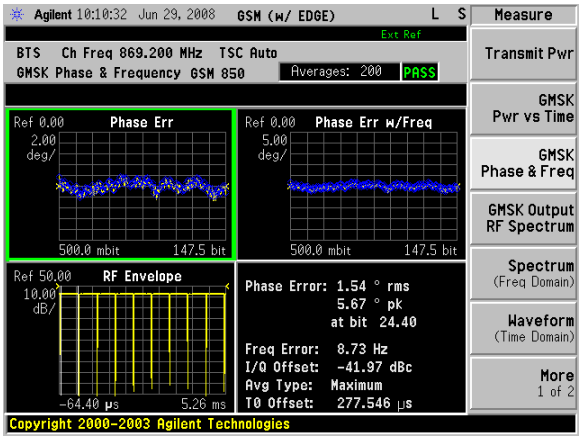


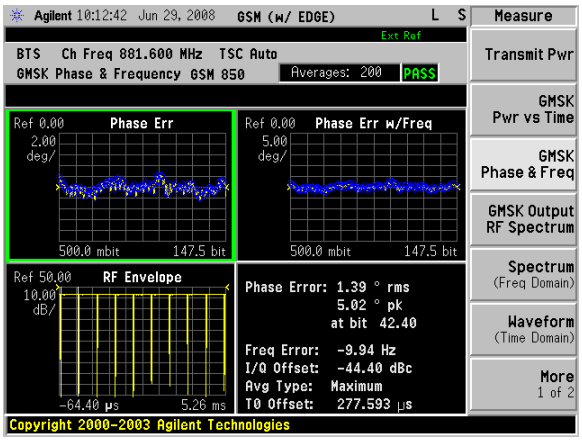


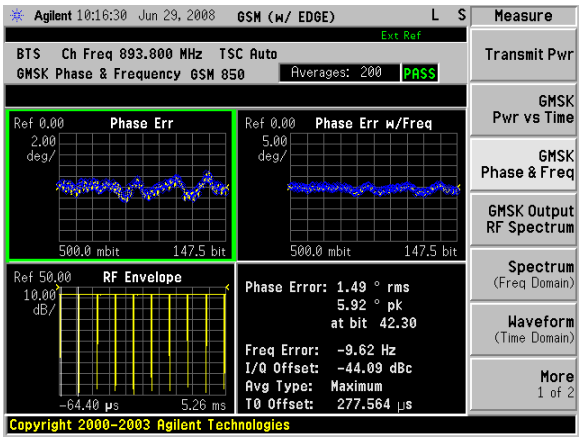
6.4.3.2.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	5.67	Pass
	Phase RMS	1.54	Pass
	Freq. Error	8.73	Pass
C190	Phase PK	5.02	Pass
	Phase RMS	1.39	Pass
	Freq. Error	-9.94	Pass
C251	Phase PK	5.92	Pass
	Phase RMS	1.49	Pass
	Freq. Error	-9.62	Pass





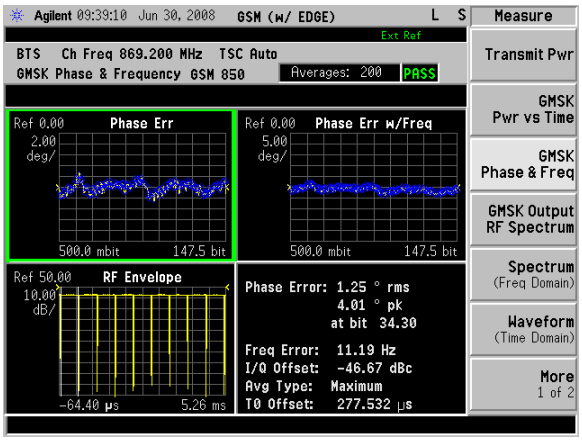


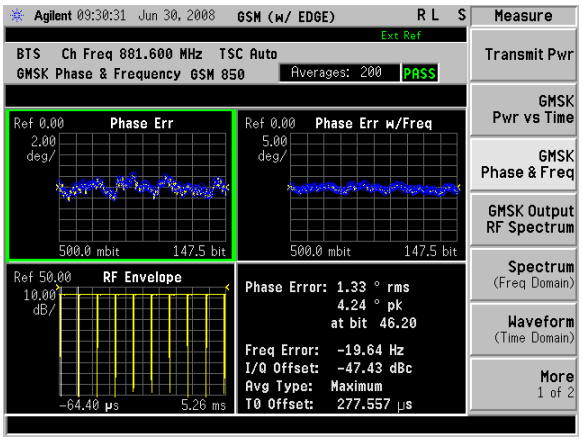
6.4.3.3 TESTS AT TEMPERATURE +15 °C

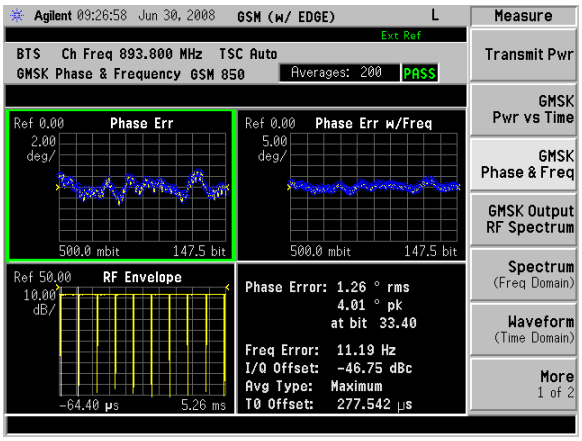
6.4.3.3.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	4.01	Pass
	Phase RMS	1.25	Pass
	Freq. Error	11.19	Pass
C190	Phase PK	4.24	Pass
	Phase RMS	1.33	Pass
	Freq. Error	-19.64	Pass
C251	Phase PK	4.01	Pass
	Phase RMS	1.26	Pass
	Freq. Error	11.19	Pass



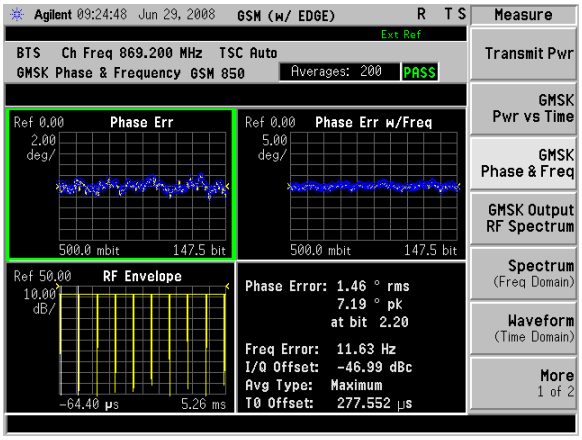


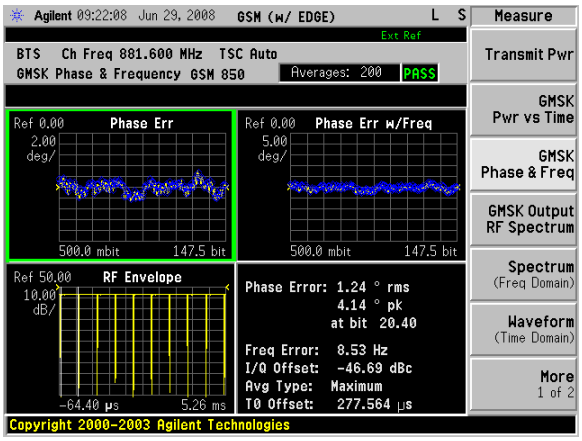


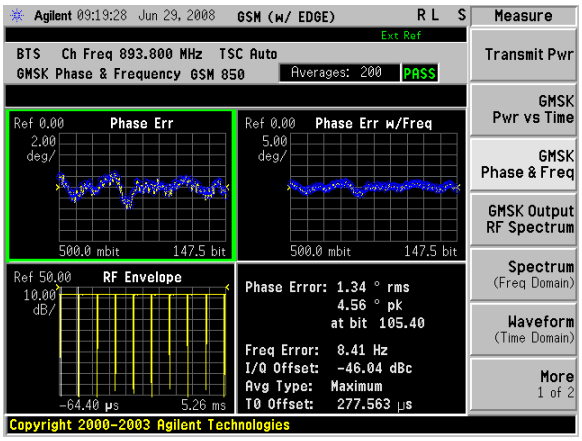
6.4.3.3.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	7.19	Pass
	Phase RMS	1.46	Pass
	Freq. Error	11.63	Pass
C190	Phase PK	4.14	Pass
	Phase RMS	1.24	Pass
	Freq. Error	8.53	Pass
C251	Phase PK	4.56	Pass
	Phase RMS	1.34	Pass
	Freq. Error	8.41	Pass





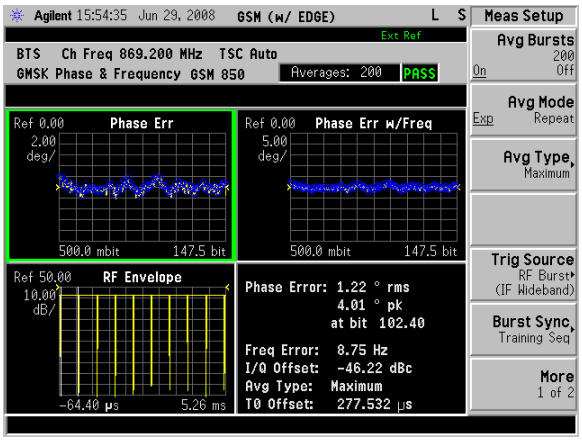


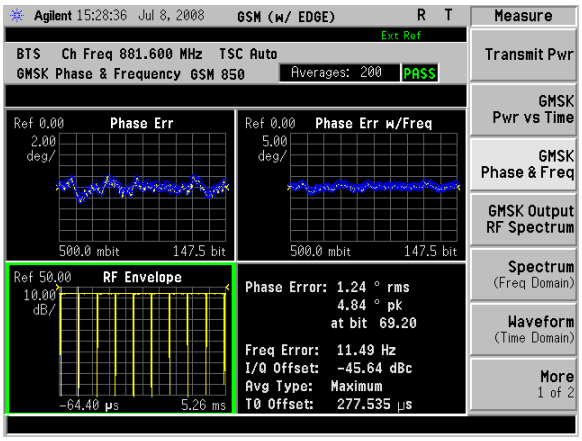
6.4.3.4 TESTS AT TEMPERATURE +25 °C

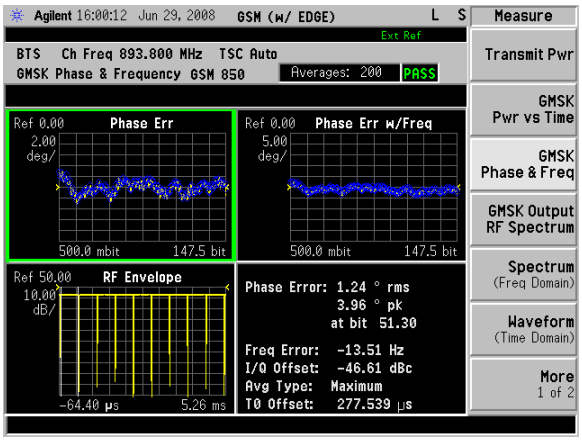
6.4.3.4.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	4.01	Pass
	Phase RMS	1.22	Pass
	Freq. Error	8.75	Pass
C190	Phase PK	4.84	Pass
	Phase RMS	1.24	Pass
	Freq. Error	11.49	Pass
C251	Phase PK	3.96	Pass
	Phase RMS	1.24	Pass
	Freq. Error	-13.51	Pass



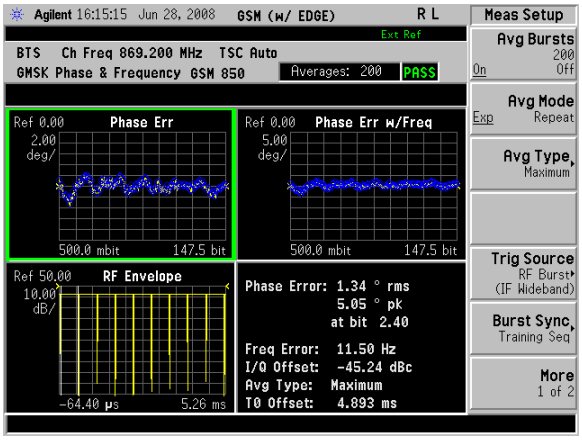


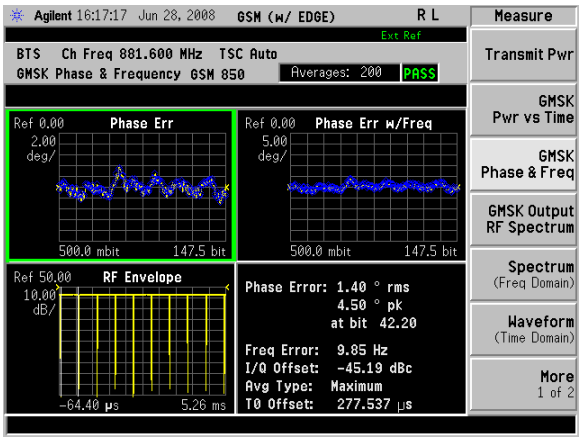


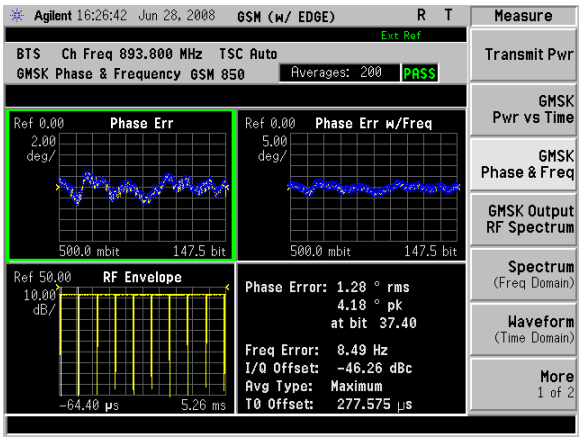
6.4.3.4.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	5.05	Pass
	Phase RMS	1.34	Pass
	Freq. Error	11.50	Pass
C190	Phase PK	4.50	Pass
	Phase RMS	1.40	Pass
	Freq. Error	9.85	Pass
C251	Phase PK	4.18	Pass
	Phase RMS	1.28	Pass
	Freq. Error	8.49	Pass





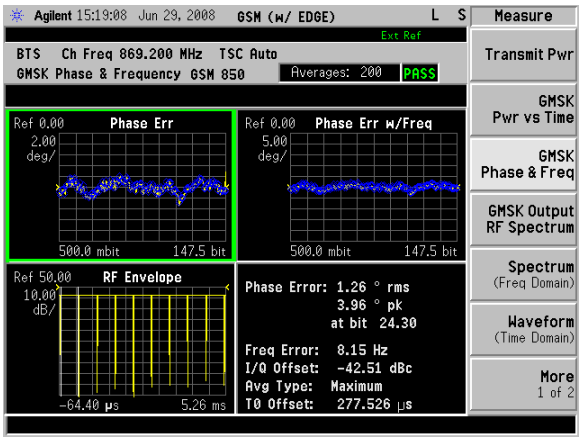


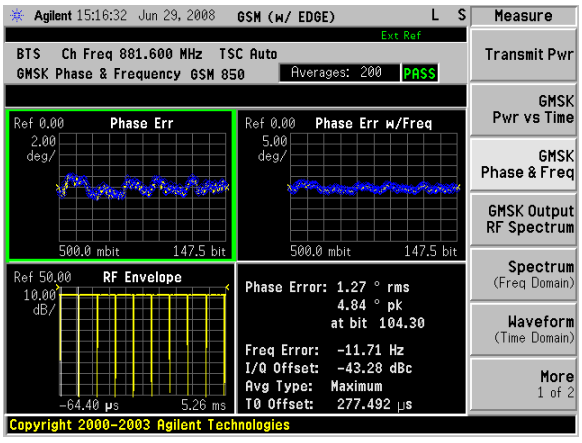
6.4.3.5 TESTS AT TEMPERATURE +35 °C

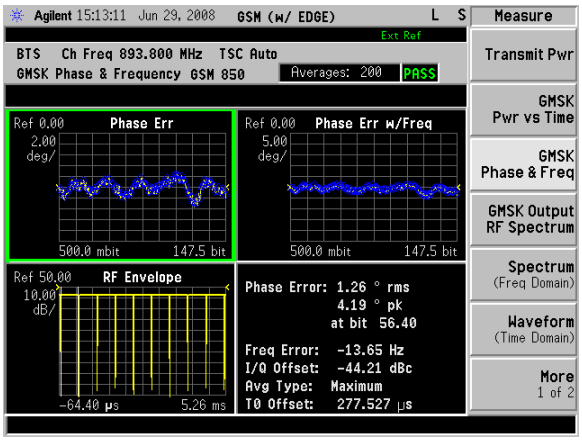
6.4.3.5.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	3.96	Pass
	Phase RMS	1.26	Pass
	Freq. Error	8.15	Pass
C190	Phase PK	4.84	Pass
	Phase RMS	1.27	Pass
	Freq. Error	-11.71	Pass
C251	Phase PK	4.19	Pass
	Phase RMS	1.26	Pass
	Freq. Error	-13.65	Pass



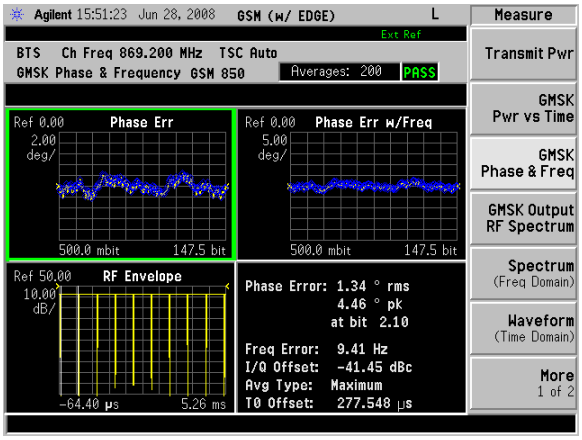


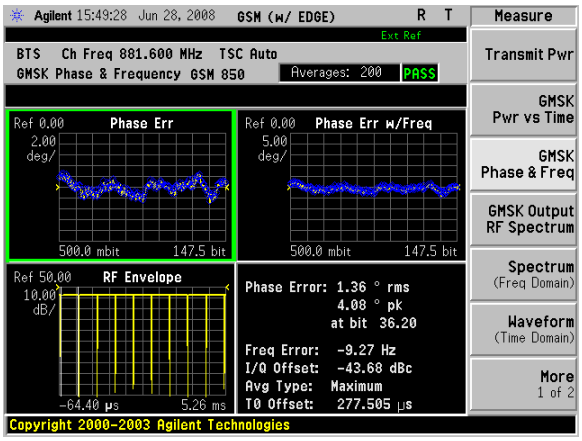


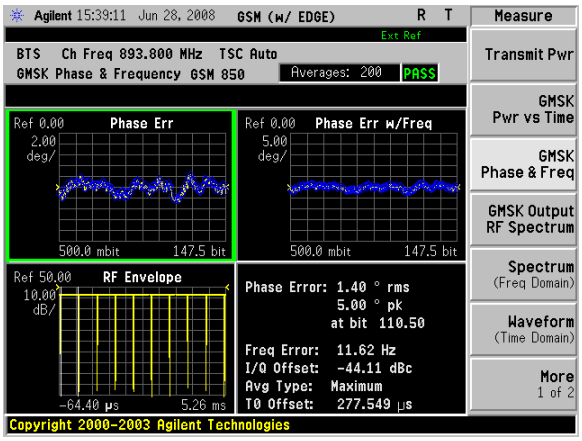
6.4.3.5.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	4.46	Pass
	Phase RMS	1.34	Pass
	Freq. Error	9.41	Pass
C190	Phase PK	4.08	Pass
	Phase RMS	1.36	Pass
	Freq. Error	-9.27	Pass
C251	Phase PK	5.00	Pass
	Phase RMS	1.40	Pass
	Freq. Error	11.62	Pass





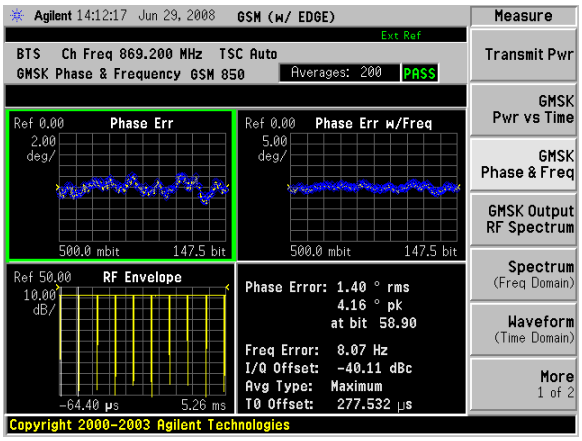


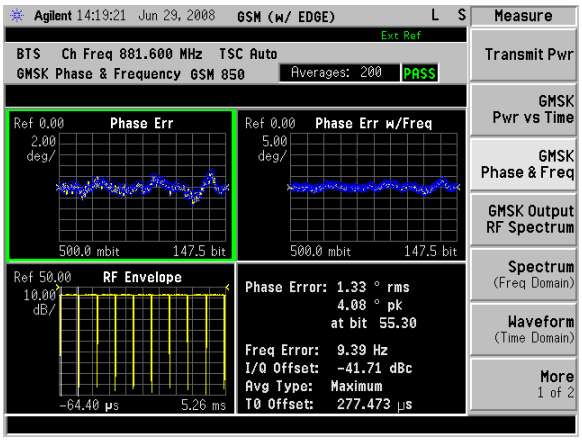
6.4.3.6 TESTS AT TEMPERATURE +45 °C

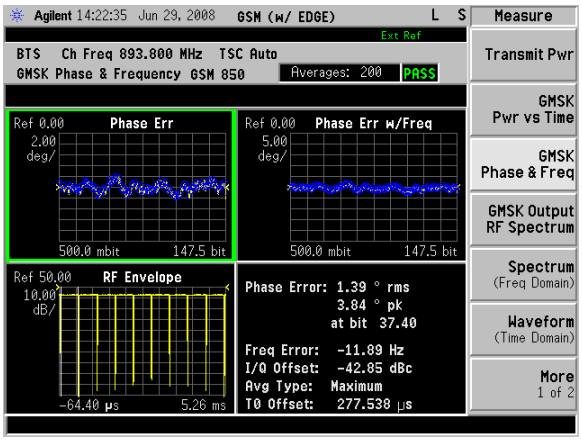
6.4.3.6.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	4.16	Pass
	Phase RMS	1.40	Pass
	Freq. Error	8.07	Pass
C190	Phase PK	4.08	Pass
	Phase RMS	1.33	Pass
	Freq. Error	9.39	Pass
C251	Phase PK	3.84	Pass
	Phase RMS	1.39	Pass
	Freq. Error	-11.89	Pass



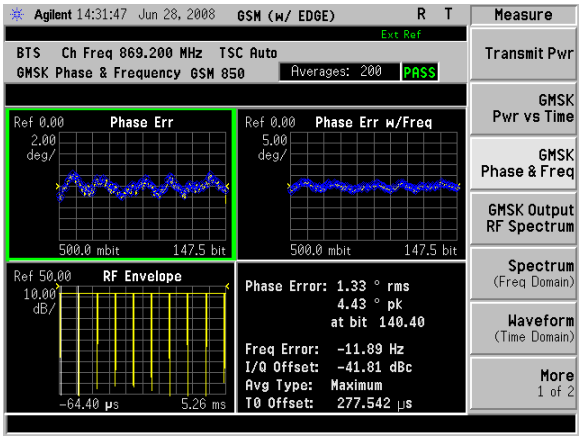


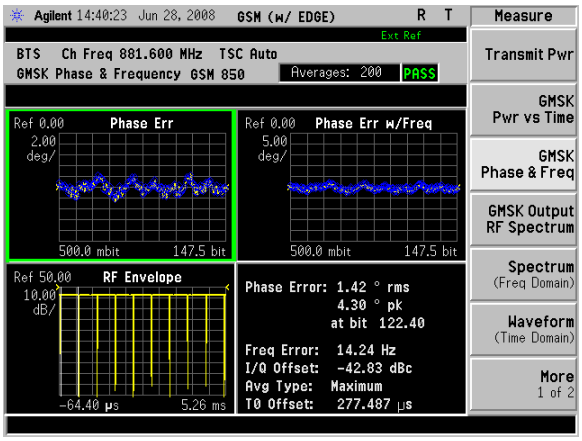


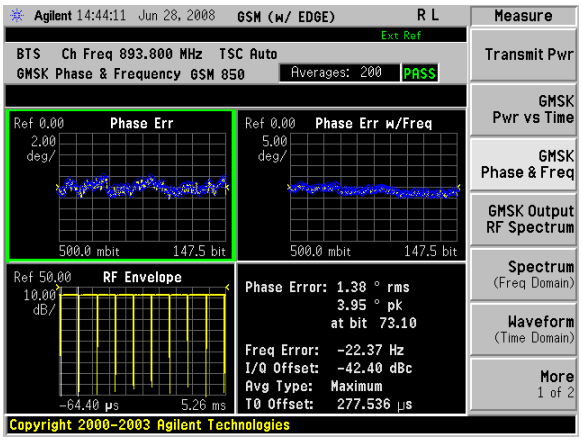
6.4.3.6.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
C128	Phase PK	4.43	Pass
	Phase RMS	1.33	Pass
	Freq. Error	-11.89	Pass
C190	Phase PK	4.30	Pass
	Phase RMS	1.42	Pass
	Freq. Error	14.24	Pass
C251	Phase PK	3.95	Pass
	Phase RMS	1.38	Pass
	Freq. Error	-22.37	Pass







Conclusion: In GMSK modulation, the phase & frequency error test is compliant with the FCC part 22 specification.

7. CONCLUSION

Table below lists all tests item during the GSM 18000 Indoor BTS qualification:

Band	Test Item	Modulation	RESULT
PCS 1900	Mean RF Power	GMSK	Pass
	Modulation accuracy-phase & freq	GMSK	Pass
GSM 850	Mean RF Power	GMSK	Pass
	Modulation accuracy-phase & freq	GMSK	Pass