GSM 9000 INDOOR BTS RADIO TEST REPORT PCS1900 & GSM850 FCC PART24&PART22

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1. INTRODUCTION

This document presents the measurement results of tests performed on this report presents the test data in accordance with FCC Part 24 and also the test data in accordance with FCC Part 22, for the Nortel Networks GSM 9000 Indoor BTS in Dual Band GSM850 / PCS1900 band.
This report presents test data for GMSK and 8PSK modulation (EDGE functionality).

1.1 SCOPE OF THIS DOCUMENT

This document applies to the Nortel Networks GSM 9000 Indoor BTS.

GSM 9000 Indoor BTS can integrate a maximum of 3 Radio-Modules (RM).

This report presents the test data in accordance with FCC Part 24 for the S9000 Indoor Base-stations in PCS1900 band configured with:

- Radio module PCS1900 30W for GMSK & Edge

This report presents also the test data in accordance with FCC Part 22, for the S18000 Indoor Base-stations in 850 Band configured with:

- New radio module HPRM GSM850 (GMSK 60W / Edge 45W)

These results can be applied for Dual Band GSM850 / PCS1900 GSM9000 BTS configuration.

1.2 AUDIENCE FOR THIS DOCUMENT

This document is to be used by any person needing a view on Nortel Networks GSM 9000 Indoor BTS.

2. RELATED DOCUMENTS

2.1 APPLICABLES DOCUMENTS

[A1]	47CFR Part 24	PERSONAL COMMUNICATION SERVICES , January2003
[A2]	CFR 47 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] PE/BTS/DPL/ S9K_RF-TP01 RF test plan for GSM 9000 BTS

[R2] Radio Test Report for FCC Regulatory in extreme conditions of GSM 9000 Indoor BTS 1900MHz

[R3] PE/BTS/DJD/021878 GSM 18000 Indoor BTS Radio Test Report according to FCC Part 24 & FCC Part 22 (FCC ID AB6BTS18IND)

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

BTS9000: 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
PGSM900: $F_{B\ downlink}$ = 935.2MHz ; $F_{B\ uplink}$ = 890.2 MHz
EGSM900: $F_{B\ downlink}$ = 925.2MHz ; $F_{B\ uplink}$ = 880.2 MHz
DCS1800: $F_{B\ downlink}$ =1805.2 MHz ; $F_{B\ uplink}$ =1710.2 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:

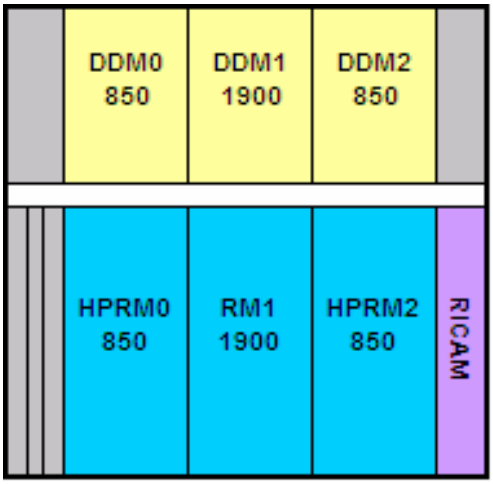
GSM 850 : $F_{M\ downlink}$ = 881.4 MHz ; $F_{M\ uplink}$ = 836.4 MHz
PGSM900: $F_{M\ downlink}$ = 947.4 MHz ; $F_{M\ uplink}$ = 902.4 MHz
EGSM900: $F_{M\ downlink}$ = 937.4 MHz ; $F_{M\ uplink}$ = 892.4 MHz
DCS1800: $F_{M\ downlink}$ = 1842.4 MHz ; $F_{M\ uplink}$ = 1747.4 MHz
PCS1900: $F_{M\ downlink}$ = 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
PGSM900: $F_{T\ downlink}$ = 959.8 MHz ; $F_{T\ uplink}$ = 914.8 MHz
EGSM900: $F_{T\ downlink}$ = 949.8 MHz ; $F_{T\ uplink}$ = 904.8 MHz
DCS1800: $F_{T\ downlink}$ = 1879.8 MHz ; $F_{T\ uplink}$ =1784.8 MHz
PCS1900: $F_{T\ downlink}$ = 1989.8 MHz ; $F_{T\ uplink}$ =1909.8 MHz

4. TEST CONFIGURATION

4.1 BTS CONFIGURATION UNDER TESTS



Tests are performed on Radio Module (RM) in first slot RM0 for GSM850 & in second slot for PCS1900.

Radio Module is equipped with three identical RF ways Tx0, Tx1, and Tx2.
For the RM of GSM850, each Tx path includes a 60W Power amplifier.
For the RM of GSM1900, each Tx path includes a 30W Power amplifier.

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
BTS CABINET	NTLE01AA	01	NNTM78901QKA	-
RICAM	NTN024AA	04	NNTMGWF3006R	-
ALPRO	NTQA11CA	01	NNTM7890WE32	-
SICS	NTN071GM	V1	-	-
HPRM 0	NTN050JA	01	NNTM78901Q5Y	GSM850
RM 1	NTN050PM	02	NNTM78901QDD	PCS1900
HPRM 2	NTN050JA	01	NNTM78901Q65	GSM850
DDM 0 W/VSWR	NTN063HA	D1	MANT01X00002	GSM850
DDM 1 W/VSWR	NTN063AA	04	FICT03002DXL	PCS1900
DDM 2 W/VSWR	NTN063HA	D1	MANT01X00005	GSM850

Interconnect Digital board

HARDWARE EQUIPEMENT UNDER TEST		
Description	**Hardware code**	**Comment**
Interconnect board		
Logical board		
IFM 0 - IFM 1	NTN025AA NTN025AF	
ICM 0 - ICM 1	NTN023AA NTN023AF	
ABM 0 – ABM 1	NTN029AA NTN029AA	
RICAM	NTN024AA	

4.3 TEST EQUIPMENT

Equipment	Model	S/N	Last Cal.	Cal. due
PSA series spectrum analyzer	E4443A	MY46181134	2007-6-14	2008-6-14
VSA series spectrum analyzer	E4406A	US40062090	2007-10-29	2008-10-29
Spectrum Analyzer	FSEA30	100054	2007-10-29	2008-10-29

4.4 BTS SOFTWARE

BTS Load software version : v15e3e05
Test bench software version : Integration Test v4.04

4.5 TEST SOFTWARE

TIL_alarm: V01f 205
TIL_COAM: V15e404
WINTOOL: V04B4_E09.0
WIN TMI: V03D306

5. TEST REPORT: HPRM 60W GSM850

5.1 INTRODUCTION

The following information is to introduce GSM 9000 BTS for Nortel Network., in accordance with FCC Part 22 and Part 2 of the FCC Rules and Regulations.

The measurement procedures were in accordance with the requirements of Part 2.999

5.2 MEASUREMENT RESULTS

Measurement Results Summary:

Test Case	GMSK	8PSK	RESULT	Note
RF Power Output	B,M,T	B,M,T	Complies	Vmin (-40V) / Vmax (-57V) From -5°C to +45 °C by 10°C step
Frequency Stability	B,M,T	NT	Complies	
Occupied Bandwidth	B,M,T	B,M,T	Complies	
Spurious Emissions at Antenna Terminals	B,M,T	B,M,T	Complies	

5.3 NAME OF TEST: RF POWER OUTPUT

5.3.1 FCC REQUIREMENTS – FCC PART 22.913L

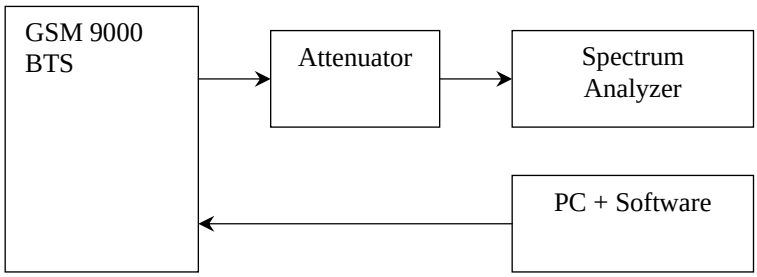
(a) Base stations are limited to 1640 watts peak equivalent isotropicaly radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. See 24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power. In no case may the peak output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

DDM Duplexer configuration:		
GMSK:	46.8dBm	± 2.5 dB
8PSK:	45.5dBm	± 2.5 dB
DDM H2 configuration:		
GMSK:	42.8dBm	± 2.5 dB
8PSK:	41.5dBm	± 2.5 dB

5.3.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (static level 0):
- for GMSK modulation, in mode GMSK no synchro,
- for 8PSK modulation, in mode logical PDCH, Type GPRS, coding MCS5.

Measurements were carried on frequencies which are C128 (B), C131, C183, C190 (M), C231, 241, and 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

5.3.3 TEST RESULTS

The Table shows the test results of RF Output Power for **GMSK & 8PSK** modulation with several coupling configurations:

5.3.3.1 TESTS AT TEMPERATURE -5 °C

5.3.3.1.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.96dBm	Pass
	8PSK	41.96dBm	Pass
C131	GMSK	43.05dBm	Pass
	8PSK	42.19dBm	Pass
C183	GMSK	43.12dBm	Pass
	8PSK	42.06dBm	Pass
C190	GMSK	43.15dBm	Pass
	8PSK	42.08dBm	Pass
C231	GMSK	43.41dBm	Pass
	8PSK	42.38dBm	Pass
C241	GMSK	43.43dBm	Pass
	8PSK	42.34dBm	Pass
C251	GMSK	43.39dBm	Pass
	8PSK	42.37dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.93dBm	Pass
	8PSK	45.78dBm	Pass
C131	GMSK	46.95dBm	Pass
	8PSK	45.86dBm	Pass
C183	GMSK	46.84dBm	Pass
	8PSK	45.67dBm	Pass
C190	GMSK	46.86dBm	Pass
	8PSK	45.72dBm	Pass
C231	GMSK	47.28dBm	Pass
	8PSK	46.18dBm	Pass
C241	GMSK	47.22dBm	Pass
	8PSK	46.14dBm	Pass
C251	GMSK	47.15dBm	Pass
	8PSK	46.03dBm	Pass

5.3.3.1.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.95dBm	Pass
	8PSK	41.90dBm	Pass
C131	GMSK	43.05dBm	Pass
	8PSK	41.91dBm	Pass
C183	GMSK	43.06dBm	Pass
	8PSK	41.98dBm	Pass
C190	GMSK	43.11dBm	Pass
	8PSK	41.93dBm	Pass
C231	GMSK	43.44dBm	Pass
	8PSK	42.34dBm	Pass
C241	GMSK	43.41dBm	Pass
	8PSK	42.33dBm	Pass
C251	GMSK	43.36dBm	Pass
	8PSK	42.40dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.91dBm	Pass
	8PSK	45.67dBm	Pass
C131	GMSK	46.97dBm	Pass
	8PSK	45.86dBm	Pass
C183	GMSK	46.85dBm	Pass
	8PSK	45.71dBm	Pass
C190	GMSK	46.95dBm	Pass
	8PSK	45.75dBm	Pass
C231	GMSK	47.23dBm	Pass
	8PSK	41.46dBm	Pass
C241	GMSK	47.19dBm	Pass
	8PSK	46.10dBm	Pass
C251	GMSK	47.15dBm	Pass
	8PSK	45.96dBm	Pass

5.3.3.2 TESTS AT TEMPERATURE +5 °C

5.3.3.2.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.94dBm	Pass
	8PSK	41.93dBm	Pass
C131	GMSK	43.03dBm	Pass
	8PSK	41.88dBm	Pass
C183	GMSK	43.02dBm	Pass
	8PSK	41.87dBm	Pass
C190	GMSK	43.07dBm	Pass
	8PSK	41.88dBm	Pass
C231	GMSK	43.33dBm	Pass
	8PSK	42.36dBm	Pass
C241	GMSK	43.33dBm	Pass
	8PSK	42.29dBm	Pass
C251	GMSK	43.31dBm	Pass
	8PSK	42.28dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.81dBm	Pass
	8PSK	45.73dBm	Pass
C131	GMSK	46.91dBm	Pass
	8PSK	45.87dBm	Pass
C183	GMSK	46.80dBm	Pass
	8PSK	45.80dBm	Pass
C190	GMSK	46.80dBm	Pass
	8PSK	45.72dBm	Pass
C231	GMSK	47.20dBm	Pass
	8PSK	46.19dBm	Pass
C241	GMSK	47.15dBm	Pass
	8PSK	46.03dBm	Pass
C251	GMSK	47.12dBm	Pass
	8PSK	46.01dBm	Pass

5.3.3.2.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.96dBm	Pass
	8PSK	41.96dBm	Pass
C131	GMSK	43.02dBm	Pass
	8PSK	41.93dBm	Pass
C183	GMSK	43.00dBm	Pass
	8PSK	41.98dBm	Pass
C190	GMSK	43.09dBm	Pass
	8PSK	42.09dBm	Pass
C231	GMSK	43.35dBm	Pass
	8PSK	42.39dBm	Pass
C241	GMSK	43.34dBm	Pass
	8PSK	42.18dBm	Pass
C251	GMSK	43.30dBm	Pass
	8PSK	42.28dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.84dBm	Pass
	8PSK	45.74dBm	Pass
C131	GMSK	46.89dBm	Pass
	8PSK	45.84dBm	Pass
C183	GMSK	46.78dBm	Pass
	8PSK	45.68dBm	Pass
C190	GMSK	46.78dBm	Pass
	8PSK	45.70dBm	Pass
C231	GMSK	47.19dBm	Pass
	8PSK	46.19dBm	Pass
C241	GMSK	47.17dBm	Pass
	8PSK	46.15dBm	Pass
C251	GMSK	47.10dBm	Pass
	8PSK	46.08dBm	Pass

5.3.3.3 TESTS AT TEMPERATURE +15 °C

5.3.3.3.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.91dBm	Pass
	8PSK	41.87dBm	Pass
C131	GMSK	42.96dBm	Pass
	8PSK	41.95dBm	Pass
C183	GMSK	42.99dBm	Pass
	8PSK	41.92dBm	Pass
C190	GMSK	43.06dBm	Pass
	8PSK	41.95dBm	Pass
C231	GMSK	43.31dBm	Pass
	8PSK	42.25dBm	Pass
C241	GMSK	43.31dBm	Pass
	8PSK	42.34dBm	Pass
C251	GMSK	43.28dBm	Pass
	8PSK	42.28dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.80dBm	Pass
	8PSK	44.07dBm	Pass
C131	GMSK	46.87dBm	Pass
	8PSK	45.78dBm	Pass
C183	GMSK	46.75dBm	Pass
	8PSK	45.67dBm	Pass
C190	GMSK	46.74dBm	Pass
	8PSK	45.62dBm	Pass
C231	GMSK	47.16dBm	Pass
	8PSK	46.05dBm	Pass
C241	GMSK	47.13dBm	Pass
	8PSK	46.09dBm	Pass
C251	GMSK	47.07dBm	Pass
	8PSK	46.12dBm	Pass

5.3.3.3.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.90dBm	Pass
	8PSK	41.80dBm	Pass
C131	GMSK	42.99dBm	Pass
	8PSK	42.04dBm	Pass
C183	GMSK	42.97dBm	Pass
	8PSK	41.96dBm	Pass
C190	GMSK	43.04dBm	Pass
	8PSK	41.87dBm	Pass
C231	GMSK	43.31dBm	Pass
	8PSK	42.29dBm	Pass
C241	GMSK	43.28dBm	Pass
	8PSK	42.24dBm	Pass
C251	GMSK	43.23dBm	Pass
	8PSK	42.18dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.76dBm	Pass
	8PSK	45.74dBm	Pass
C131	GMSK	46.82dBm	Pass
	8PSK	45.76dBm	Pass
C183	GMSK	46.72dBm	Pass
	8PSK	45.64dBm	Pass
C190	GMSK	46.75dBm	Pass
	8PSK	45.73dBm	Pass
C231	GMSK	47.15dBm	Pass
	8PSK	46.16dBm	Pass
C241	GMSK	47.13dBm	Pass
	8PSK	46.03dBm	Pass
C251	GMSK	47.05dBm	Pass
	8PSK	46.07dBm	Pass

5.3.3.4 TESTS AT TEMPERATURE +25 °C

5.3.3.4.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.86dBm	Pass
	8PSK	41.80dBm	Pass
C131	GMSK	42.93dBm	Pass
	8PSK	41.83dBm	Pass
C183	GMSK	42.95dBm	Pass
	8PSK	41.97dBm	Pass
C190	GMSK	43.02dBm	Pass
	8PSK	41.90dBm	Pass
C231	GMSK	43.24dBm	Pass
	8PSK	42.23dBm	Pass
C241	GMSK	43.24dBm	Pass
	8PSK	42.26dBm	Pass
C251	GMSK	43.21dBm	Pass
	8PSK	42.23dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.70dBm	Pass
	8PSK	45.80dBm	Pass
C131	GMSK	46.79dBm	Pass
	8PSK	45.81dBm	Pass
C183	GMSK	46.69dBm	Pass
	8PSK	45.67dBm	Pass
C190	GMSK	46.69dBm	Pass
	8PSK	45.66dBm	Pass
C231	GMSK	47.14dBm	Pass
	8PSK	46.25dBm	Pass
C241	GMSK	47.12dBm	Pass
	8PSK	46.12dBm	Pass
C251	GMSK	47.04dBm	Pass
	8PSK	46.04dBm	Pass

5.3.3.4.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.83dBm	Pass
	8PSK	41.84dBm	Pass
C131	GMSK	42.93dBm	Pass
	8PSK	42.25dBm	Pass
C183	GMSK	42.98dBm	Pass
	8PSK	41.95dBm	Pass
C190	GMSK	43.03dBm	Pass
	8PSK	41.97dBm	Pass
C231	GMSK	43.26dBm	Pass
	8PSK	42.19dBm	Pass
C241	GMSK	43.24dBm	Pass
	8PSK	42.20dBm	Pass
C251	GMSK	43.23dBm	Pass
	8PSK	42.34dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.75dBm	Pass
	8PSK	45.74dBm	Pass
C131	GMSK	46.80dBm	Pass
	8PSK	45.76dBm	Pass
C183	GMSK	46.70dBm	Pass
	8PSK	45.58dBm	Pass
C190	GMSK	46.72dBm	Pass
	8PSK	45.68dBm	Pass
C231	GMSK	47.13dBm	Pass
	8PSK	46.06dBm	Pass
C241	GMSK	47.10dBm	Pass
	8PSK	46.08dBm	Pass
C251	GMSK	46.73dBm	Pass
	8PSK	46.03dBm	Pass

5.3.3.5 TESTS AT TEMPERATURE +35 °C

5.3.3.5.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.71dBm	Pass
	8PSK	41.82dBm	Pass
C131	GMSK	42.87dBm	Pass
	8PSK	41.85dBm	Pass
C183	GMSK	42.88dBm	Pass
	8PSK	41.82dBm	Pass
C190	GMSK	42.94dBm	Pass
	8PSK	41.87dBm	Pass
C231	GMSK	42.15dBm	Pass
	8PSK	42.10dBm	Pass
C241	GMSK	43.15dBm	Pass
	8PSK	42.16dBm	Pass
C251	GMSK	43.16dBm	Pass
	8PSK	42.13dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.68dBm	Pass
	8PSK	45.73dBm	Pass
C131	GMSK	46.75dBm	Pass
	8PSK	45.74dBm	Pass
C183	GMSK	46.63dBm	Pass
	8PSK	45.63dBm	Pass
C190	GMSK	46.64dBm	Pass
	8PSK	45.62dBm	Pass
C231	GMSK	47.04dBm	Pass
	8PSK	46.05dBm	Pass
C241	GMSK	47.00dBm	Pass
	8PSK	46.02dBm	Pass
C251	GMSK	46.97dBm	Pass
	8PSK	46.01dBm	Pass

5.3.3.5.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.77dBm	Pass
	8PSK	41.76dBm	Pass
C131	GMSK	42.84dBm	Pass
	8PSK	41.80dBm	Pass
C183	GMSK	42.84dBm	Pass
	8PSK	41.76dBm	Pass
C190	GMSK	42.90dBm	Pass
	8PSK	41.83dBm	Pass
C231	GMSK	43.16dBm	Pass
	8PSK	48.14dBm	Pass
C241	GMSK	43.15dBm	Pass
	8PSK	42.15dBm	Pass
C251	GMSK	43.16dBm	Pass
	8PSK	42.13dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.69dBm	Pass
	8PSK	45.60dBm	Pass
C131	GMSK	46.69dBm	Pass
	8PSK	45.62dBm	Pass
C183	GMSK	46.58dBm	Pass
	8PSK	45.65dBm	Pass
C190	GMSK	46.60dBm	Pass
	8PSK	45.52dBm	Pass
C231	GMSK	47.05dBm	Pass
	8PSK	46.04dBm	Pass
C241	GMSK	47.01dBm	Pass
	8PSK	46.08dBm	Pass
C251	GMSK	46.97dBm	Pass
	8PSK	45.95dBm	Pass

5.3.3.6 TESTS AT TEMPERATURE +45 °C

5.3.3.6.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	44.63dBm	Pass
	8PSK	43.73dBm	Pass
C131	GMSK	44.71dBm	Pass
	8PSK	43.63dBm	Pass
C183	GMSK	44.74dBm	Pass
	8PSK	43.74dBm	Pass
C190	GMSK	44.79dBm	Pass
	8PSK	43.80dBm	Pass
C231	GMSK	45.06dBm	Pass
	8PSK	44.06dBm	Pass
C241	GMSK	45.04dBm	Pass
	8PSK	44.04dBm	Pass
C251	GMSK	45.02dBm	Pass
	8PSK	44.01dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	47.00dBm	Pass
	8PSK	45.67dBm	Pass
C131	GMSK	47.08dBm	Pass
	8PSK	45.65dBm	Pass
C183	GMSK	47.00dBm	Pass
	8PSK	45.64dBm	Pass
C190	GMSK	47.02dBm	Pass
	8PSK	45.50dBm	Pass
C231	GMSK	47.49dBm	Pass
	8PSK	46.07dBm	Pass
C241	GMSK	47.41dBm	Pass
	8PSK	45.96dBm	Pass
C251	GMSK	47.38dBm	Pass
	8PSK	45.96dBm	Pass

5.3.3.6.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	44.61dBm	Pass
	8PSK	43.68dBm	Pass
C131	GMSK	44.72dBm	Pass
	8PSK	43.77dBm	Pass
C183	GMSK	44.70dBm	Pass
	8PSK	43.76dBm	Pass
C190	GMSK	44.77dBm	Pass
	8PSK	43.71dBm	Pass
C231	GMSK	45.05dBm	Pass
	8PSK	44.05dBm	Pass
C241	GMSK	45.03dBm	Pass
	8PSK	44.07dBm	Pass
C251	GMSK	45.02dBm	Pass
	8PSK	44.05dBm	Pass

- **Diplexer configuration:**

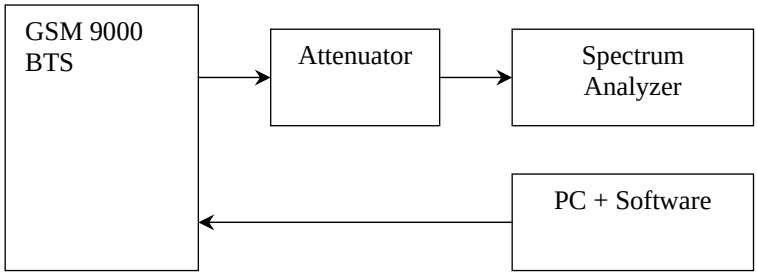
ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.58dBm	Pass
	8PSK	45.48dBm	Pass
C131	GMSK	46.62dBm	Pass
	8PSK	45.71dBm	Pass
C183	GMSK	46.52dBm	Pass
	8PSK	45.55dBm	Pass
C190	GMSK	46.54dBm	Pass
	8PSK	45.62dBm	Pass
C231	GMSK	46.97dBm	Pass
	8PSK	46.01dBm	Pass
C241	GMSK	46.96dBm	Pass
	8PSK	45.89dBm	Pass
C251	GMSK	46.90dBm	Pass
	8PSK	45.99dBm	Pass

5.4 NAME OF TEST: PHASE AND MEAN FREQUENCY ERROR

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 C128 (B), C190 (M), & C251 (T).

5.4.3 TEST RESULTS

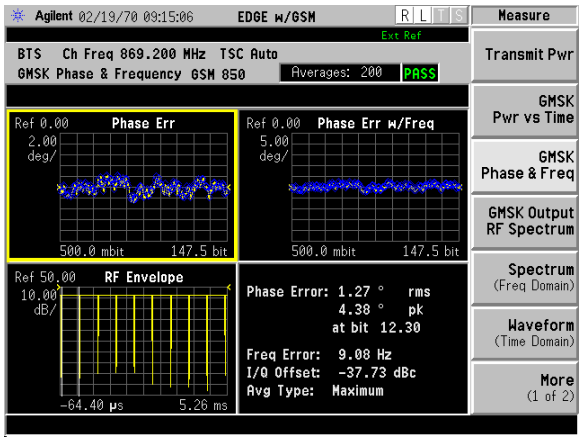
The Table shows the test results of Phase and Mean Frequency for **GMSK** modulation with several coupling configurations:

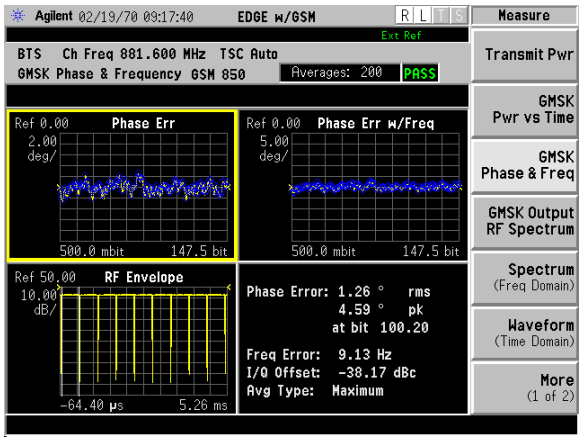
5.4.3.1 TESTS AT TEMPERATURE -5 °C

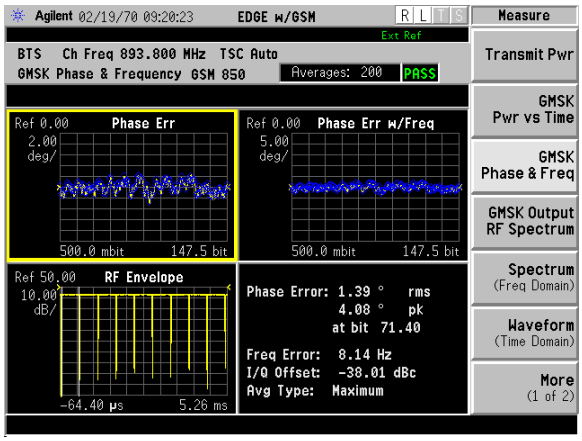
5.4.3.1.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase PK	4.38	Pass
	Phase RMS	1.27	Pass
	Freq. Error	9.08	Pass
M	Phase PK	4.59	Pass
	Phase RMS	1.26	Pass
	Freq. Error	9.13	Pass
T	Phase PK	4.08	Pass
	Phase RMS	1.39	Pass
	Freq. Error	8.14	Pass

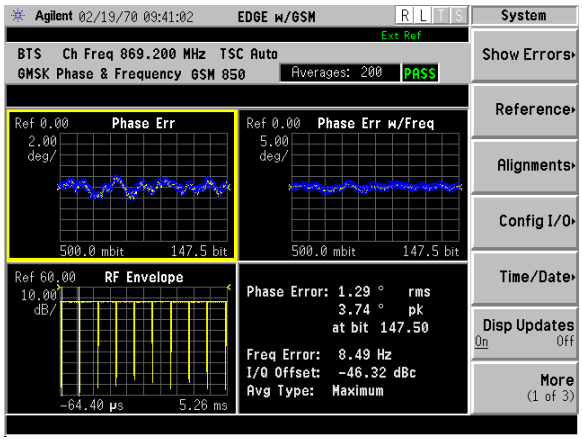


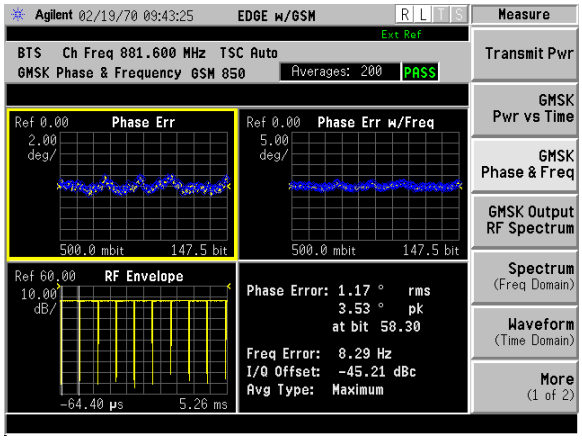


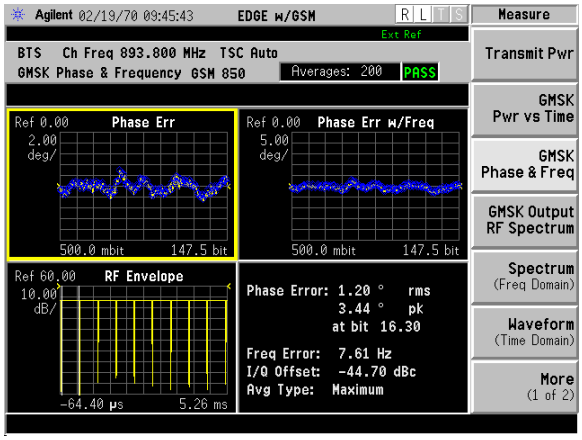


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.29	Pass
	Phase PK	3.74	Pass
	Freq. Error	8.49	Pass
M	Phase RMS	1.17	Pass
	Phase PK	3.53	Pass
	Freq. Error	8.29	Pass
T	Phase RMS	1.20	Pass
	Phase PK	3.44	Pass
	Freq. Error	7.61	Pass



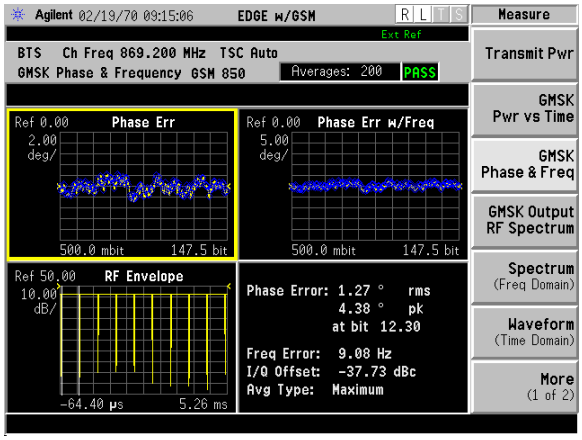


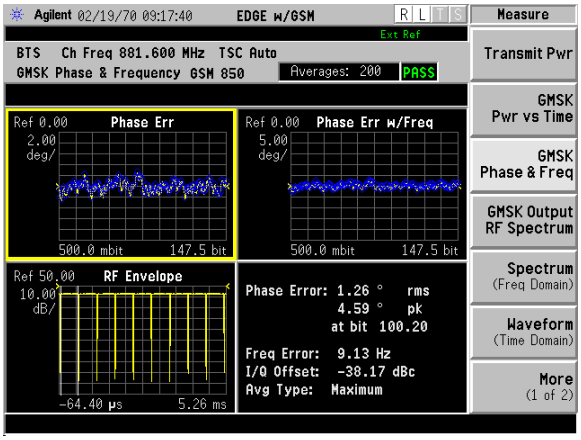


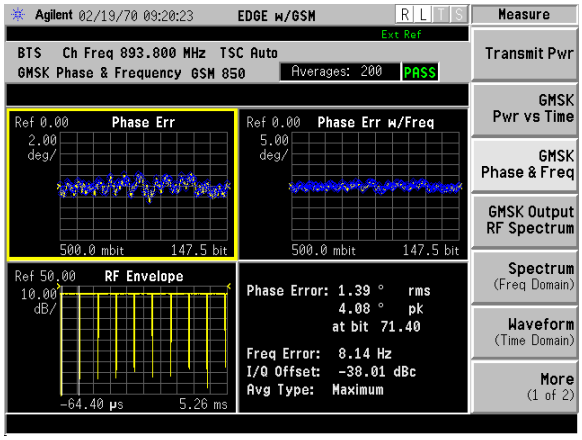
5.4.3.1.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.27	Pass
	Phase PK	4.38	Pass
	Freq. Error	9.08	Pass
M	Phase RMS	1.26	Pass
	Phase PK	4.59	Pass
	Freq. Error	9.13	Pass
T	Phase RMS	1.39	Pass
	Phase PK	4.08	Pass
	Freq. Error	8.14	Pass

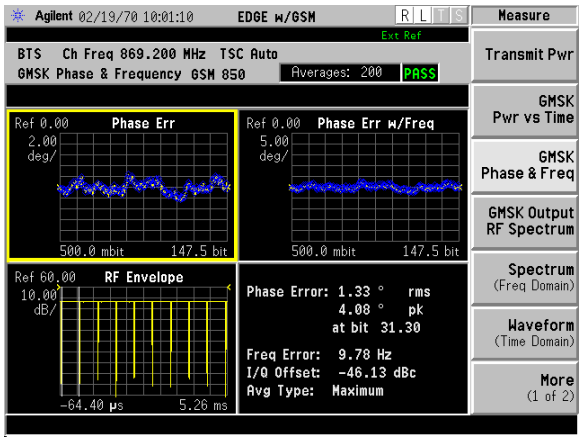


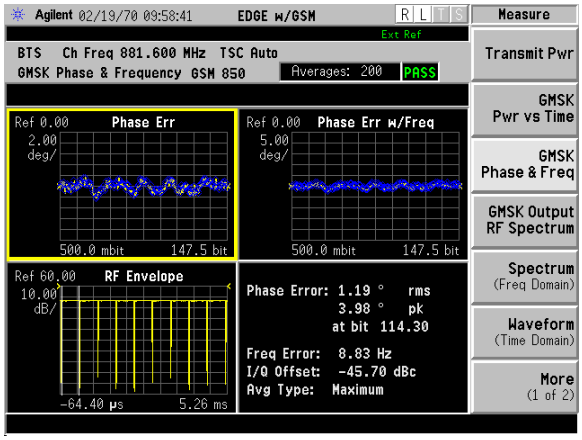


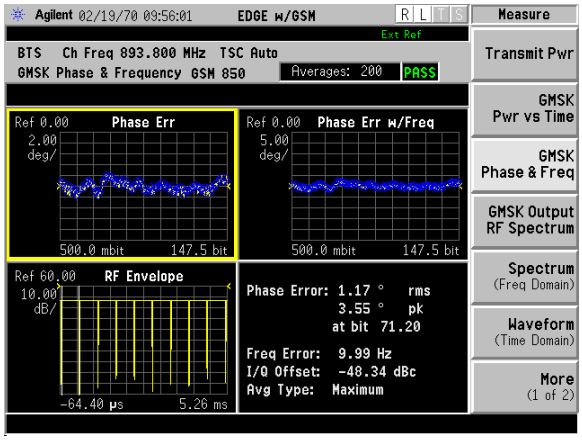


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.33	Pass
	Phase PK	4.08	Pass
	Freq. Error	9.78	Pass
M	Phase RMS	1.19	Pass
	Phase PK	3.98	Pass
	Freq. Error	8.83	Pass
T	Phase RMS	1.17	Pass
	Phase PK	3.55	Pass
	Freq. Error	9.99	Pass





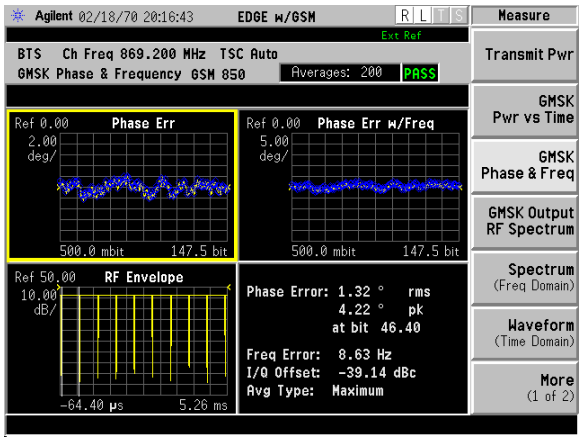


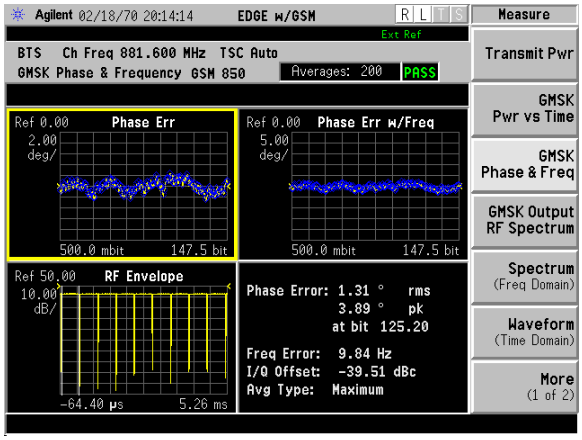
5.4.3.2 TESTS AT TEMPERATURE +5 °C

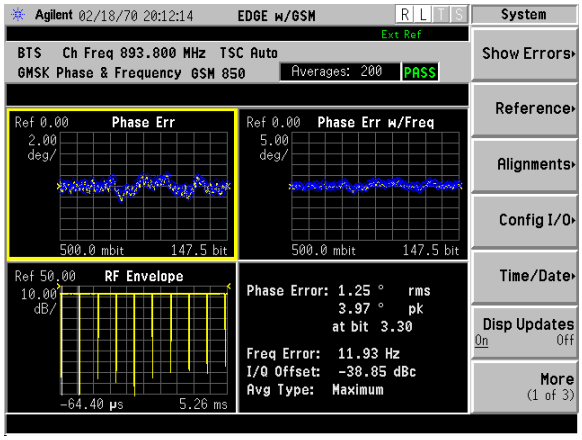
5.4.3.2.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.32	Pass
	Phase PK	4.22	Pass
	Freq. Error	8.63	Pass
M	Phase RMS	1.31	Pass
	Phase PK	3.89	Pass
	Freq. Error	9.84	Pass
T	Phase RMS	1.25	Pass
	Phase PK	3.97	Pass
	Freq. Error	11.93	Pass

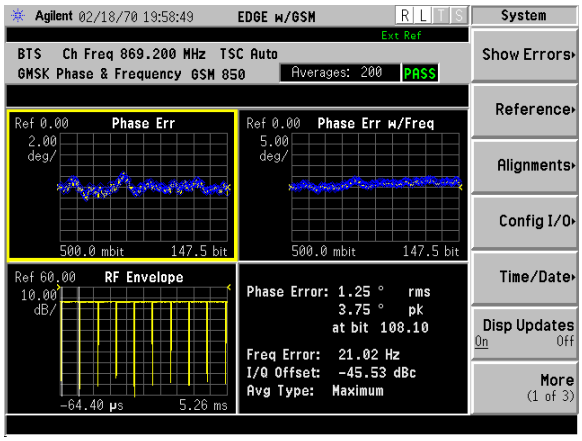


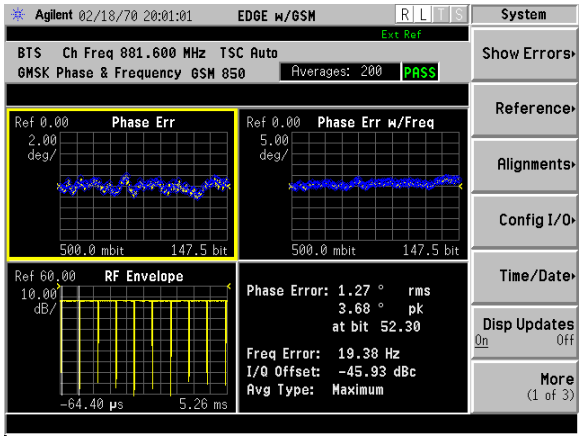


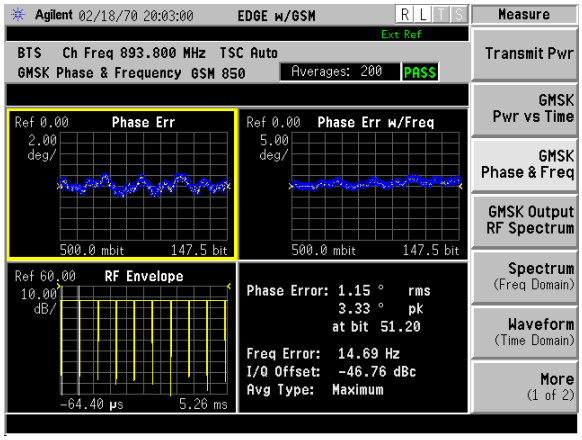


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.25	Pass
	Phase PK	3.75	Pass
	Freq. Error	21.02	Pass
M	Phase RMS	1.27	Pass
	Phase PK	3.68	Pass
	Freq. Error	19.38	Pass
T	Phase RMS	1.15	Pass
	Phase PK	3.33	Pass
	Freq. Error	14.69	Pass



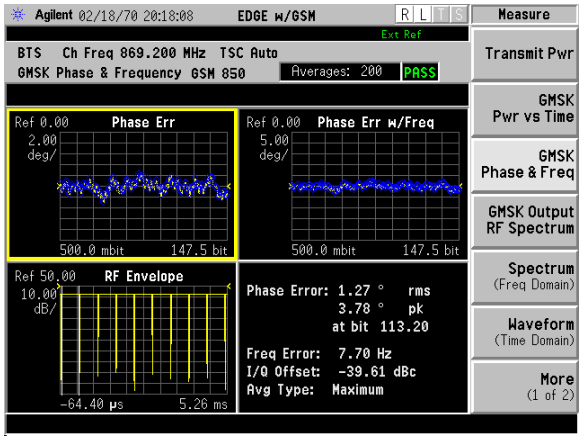


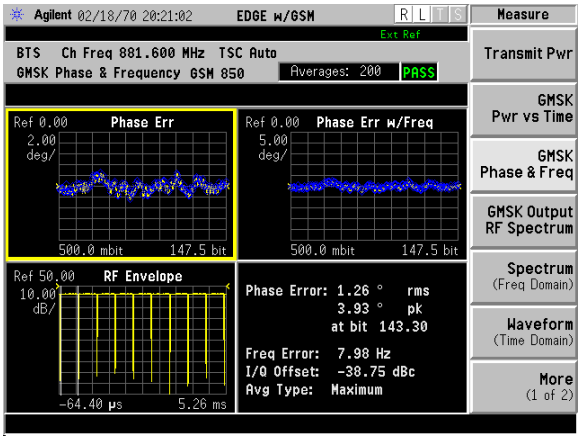


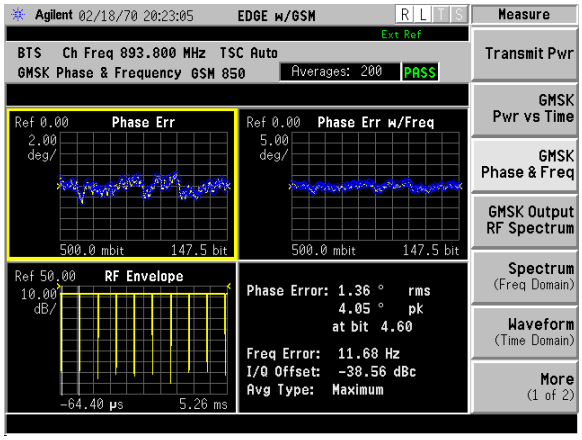
5.4.3.2.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.27	Pass
	Phase PK	3.78	Pass
	Freq. Error	7.70	Pass
M	Phase RMS	1.26	Pass
	Phase PK	3.93	Pass
	Freq. Error	7.98	Pass
T	Phase RMS	1.36	Pass
	Phase PK	4.05	Pass
	Freq. Error	11.68	Pass

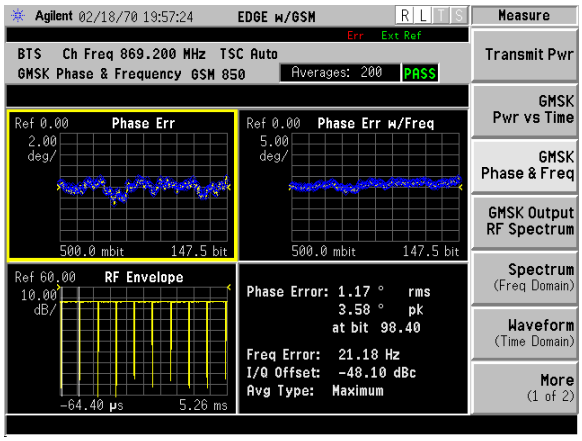


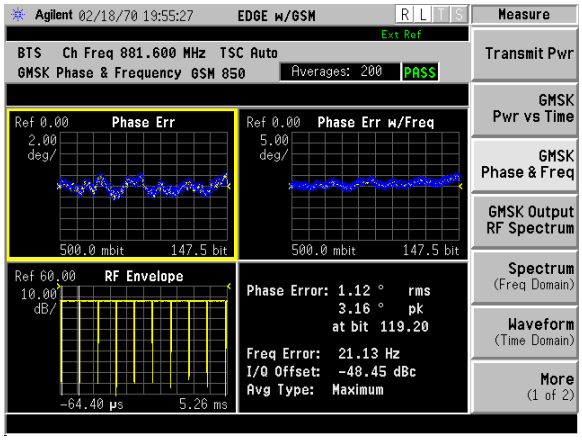


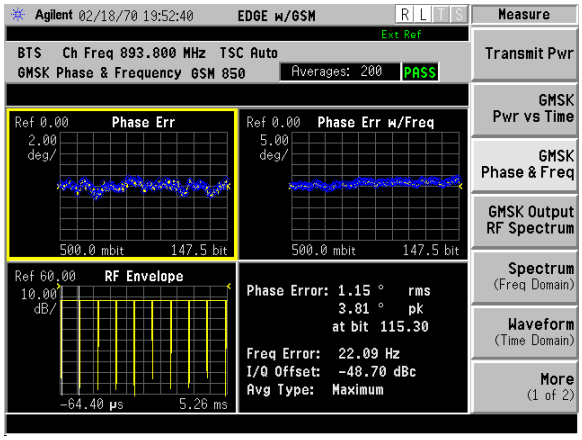


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.17	Pass
	Phase PK	3.58	Pass
	Freq. Error	21.18	Pass
M	Phase RMS	1.12	Pass
	Phase PK	3.16	Pass
	Freq. Error	21.13	Pass
T	Phase RMS	1.15	Pass
	Phase PK	3.01	Pass
	Freq. Error	22.09	Pass





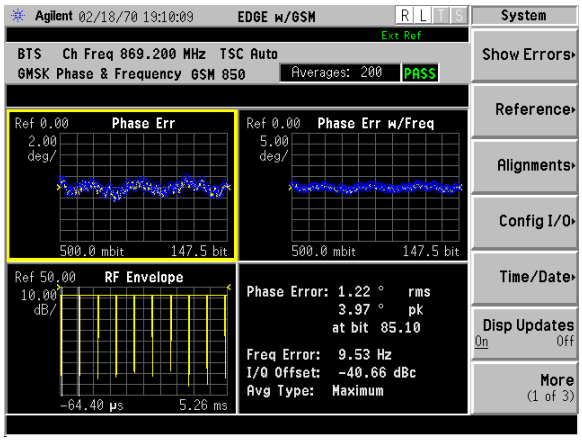


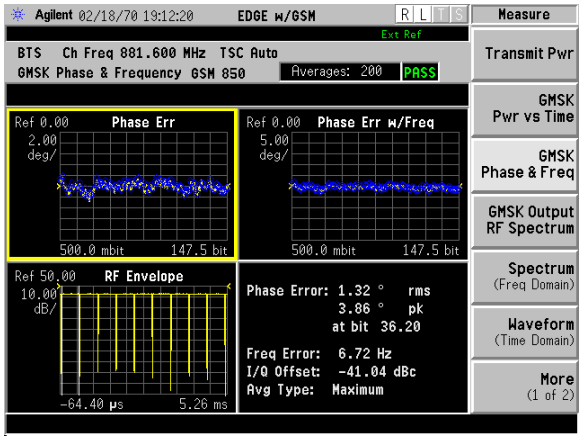
5.4.3.3 TESTS AT TEMPERATURE +15 °C

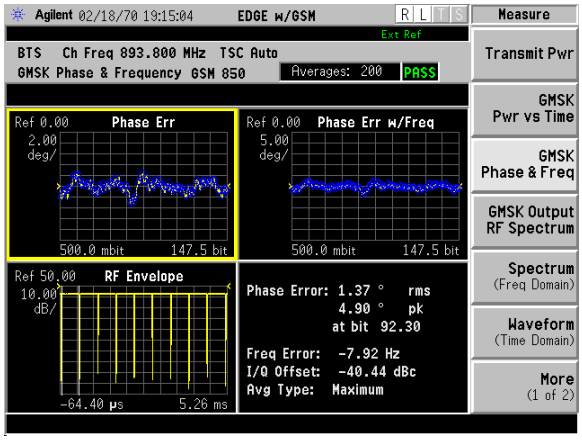
5.4.3.3.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.22	Pass
	Phase PK	3.97	Pass
	Freq. Error	9.53	Pass
M	Phase RMS	1.32	Pass
	Phase PK	3.86	Pass
	Freq. Error	6.72	Pass
T	Phase RMS	1.37	Pass
	Phase PK	4.30	Pass
	Freq. Error	-7.92	Pass

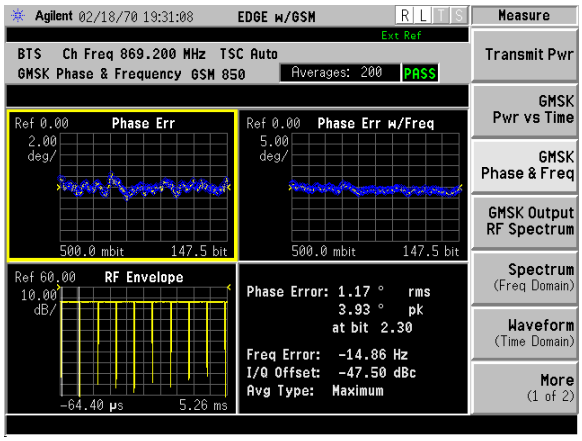


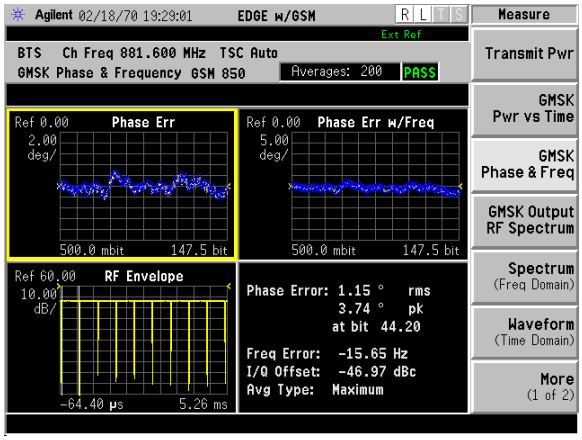


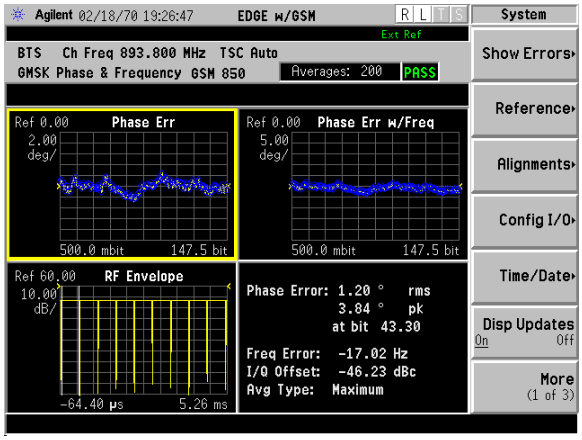


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.17	Pass
	Phase PK	3.93	Pass
	Freq. Error	-14.86	Pass
M	Phase RMS	1.15	Pass
	Phase PK	3.74	Pass
	Freq. Error	-15.65	Pass
T	Phase RMS	1.20	Pass
	Phase PK	3.04	Pass
	Freq. Error	-17.02	Pass



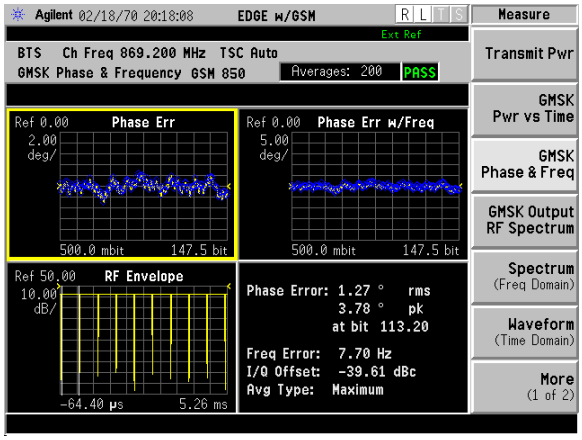


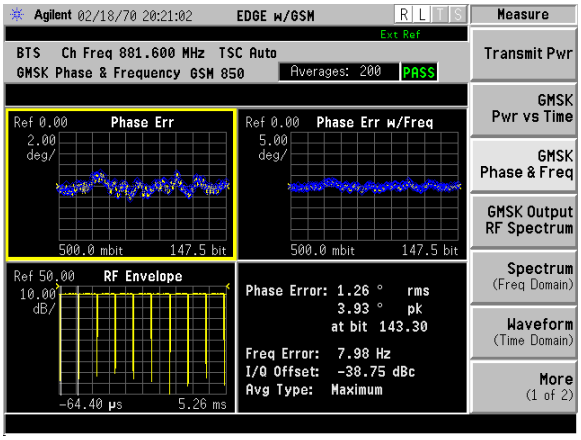


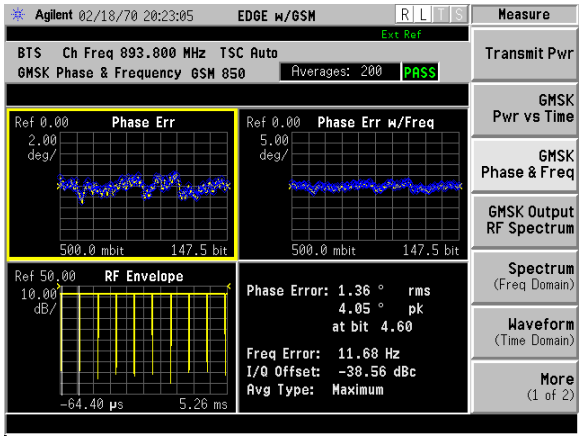
5.4.3.3.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.27	Pass
	Phase PK	3.78	Pass
	Freq. Error	7.70	Pass
M	Phase RMS	1.26	Pass
	Phase PK	3.93	Pass
	Freq. Error	7.98	Pass
T	Phase RMS	1.36	Pass
	Phase PK	4.05	Pass
	Freq. Error	11.68	Pass

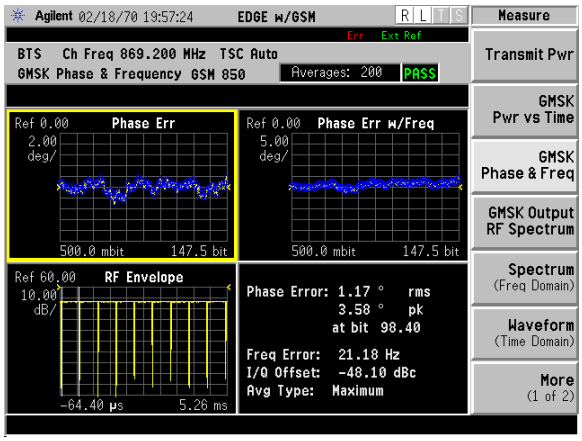


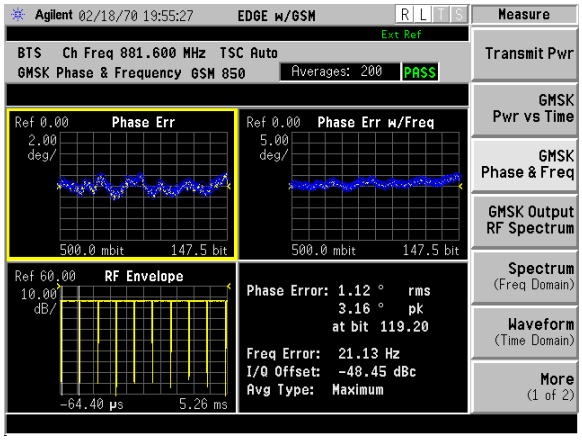


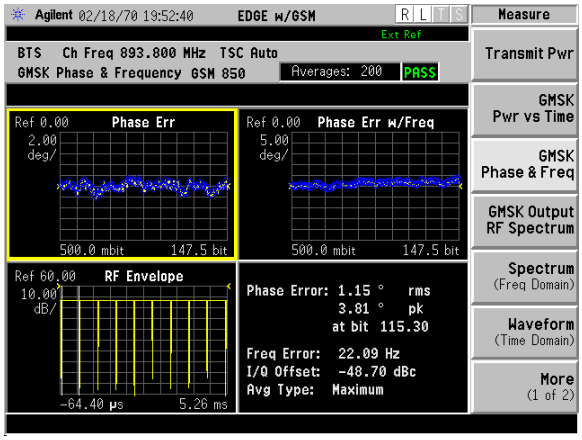


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.17	Pass
	Phase PK	3.58	Pass
	Freq. Error	21.18	Pass
M	Phase RMS	1.12	Pass
	Phase PK	3.16	Pass
	Freq. Error	21.13	Pass
T	Phase RMS	1.15	Pass
	Phase PK	3.01	Pass
	Freq. Error	22.00	Pass





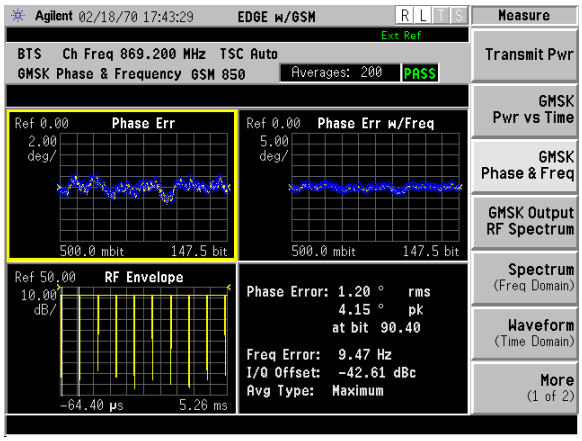


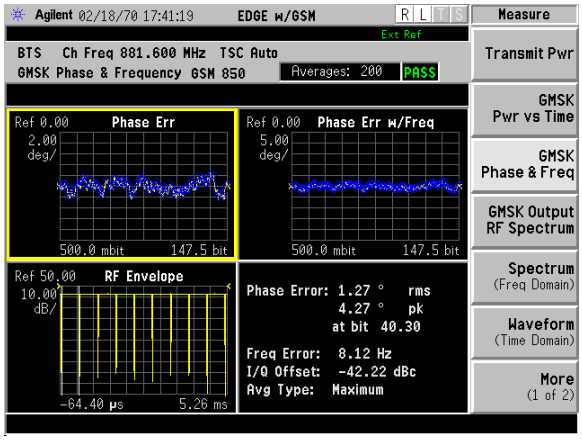
5.4.3.4 TESTS AT TEMPERATURE +25 °C

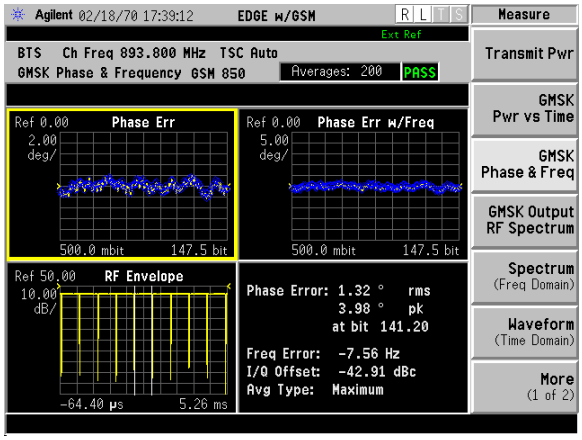
5.4.3.4.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.20	Pass
	Phase PK	4.15	Pass
	Freq. Error	9.47	Pass
M	Phase RMS	1.27	Pass
	Phase PK	4.27	Pass
	Freq. Error	8.12	Pass
T	Phase RMS	1.32	Pass
	Phase PK	3.98	Pass
	Freq. Error	-7.56	Pass

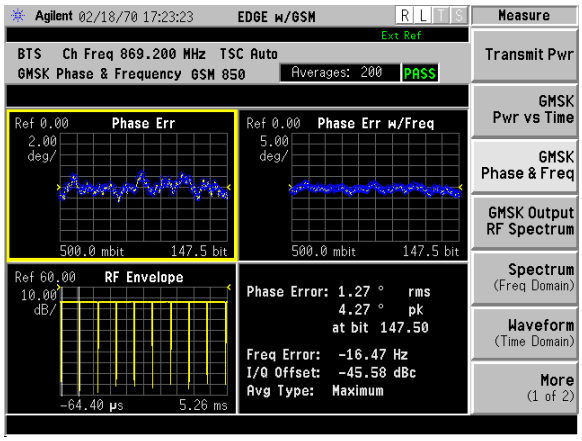


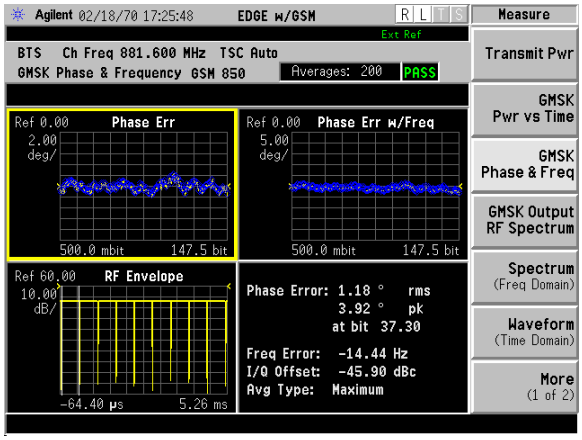


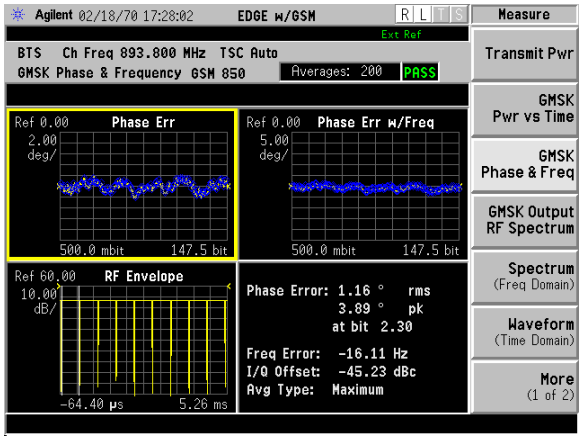


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.27	Pass
	Phase PK	4.27	Pass
	Freq. Error	-16.47	Pass
M	Phase RMS	1.18	Pass
	Phase PK	3.92	Pass
	Freq. Error	-14.44	Pass
T	Phase RMS	1.16	Pass
	Phase PK	3.89	Pass
	Freq. Error	-16.11	Pass



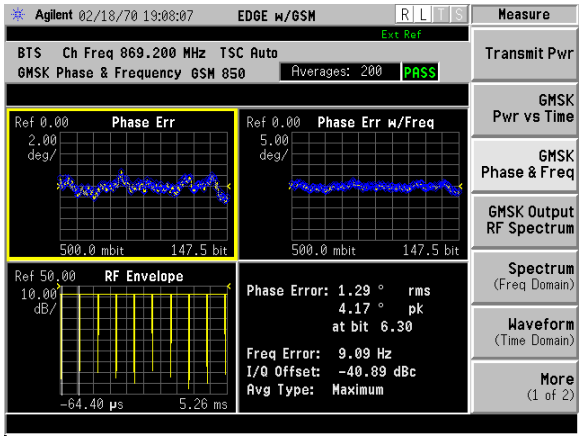


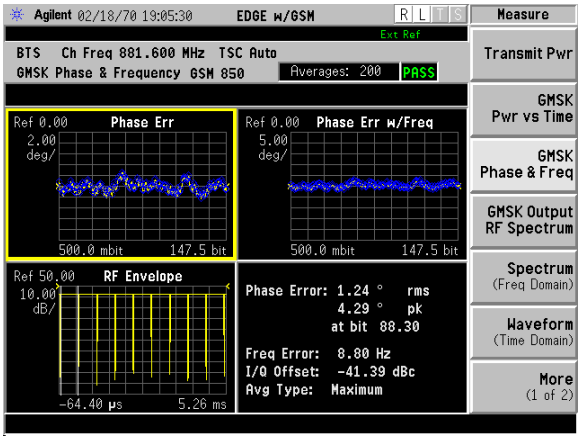


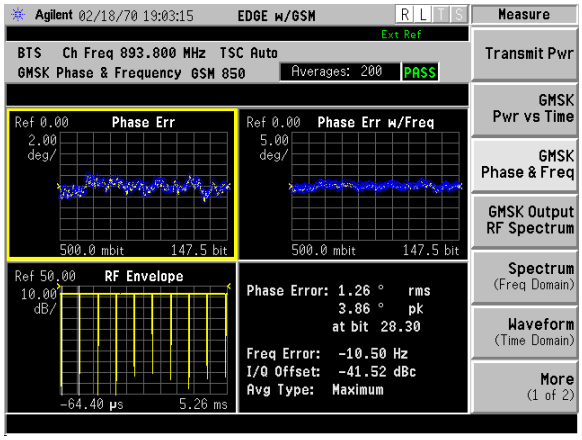
5.4.3.4.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.29	Pass
	Phase PK	4.17	Pass
	Freq. Error	9.09	Pass
M	Phase RMS	1.24	Pass
	Phase PK	4.29	Pass
	Freq. Error	8.80	Pass
T	Phase RMS	1.26	Pass
	Phase PK	3.86	Pass
	Freq. Error	-10.50	Pass

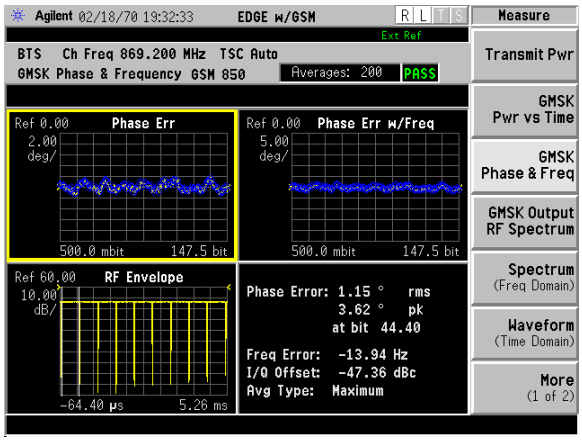


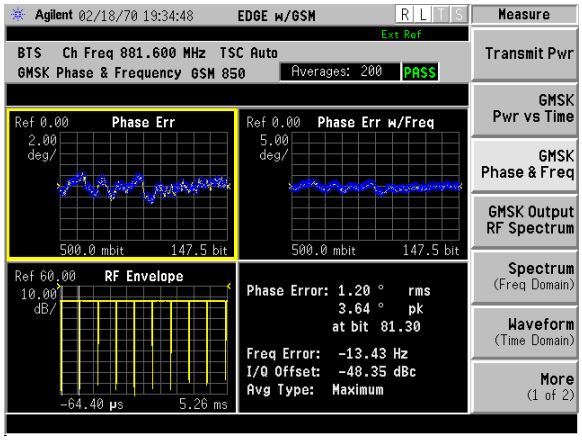


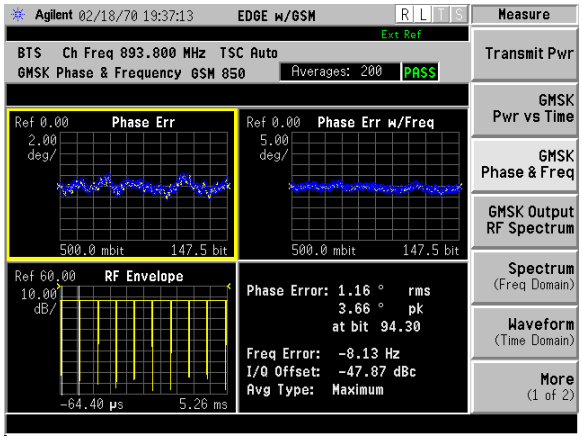


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.15	Pass
	Phase PK	3.62	Pass
	Freq. Error	-13.94	Pass
M	Phase RMS	1.20	Pass
	Phase PK	3.64	Pass
	Freq. Error	-13.43	Pass
T	Phase RMS	1.16	Pass
	Phase PK	3.66	Pass
	Freq. Error	-8.13	Pass





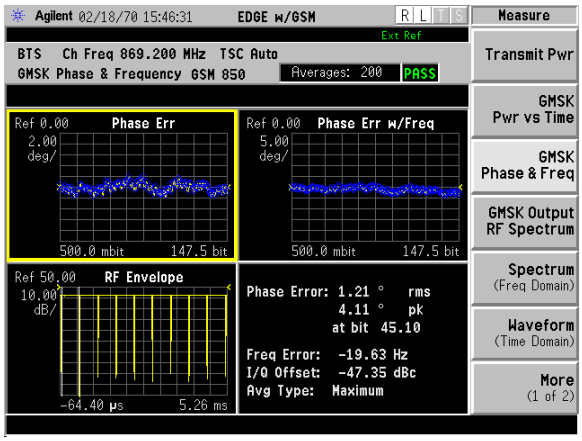


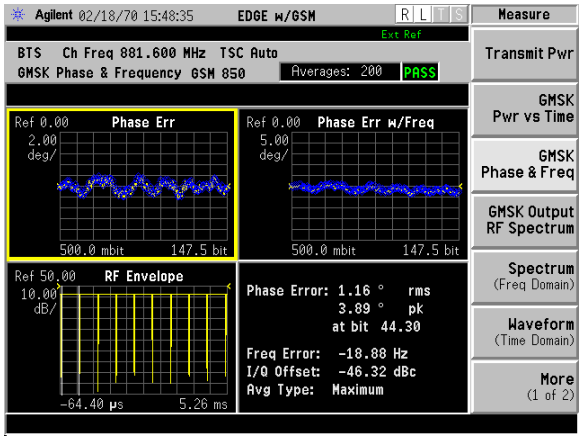
5.4.3.5 TESTS AT TEMPERATURE +35 °C

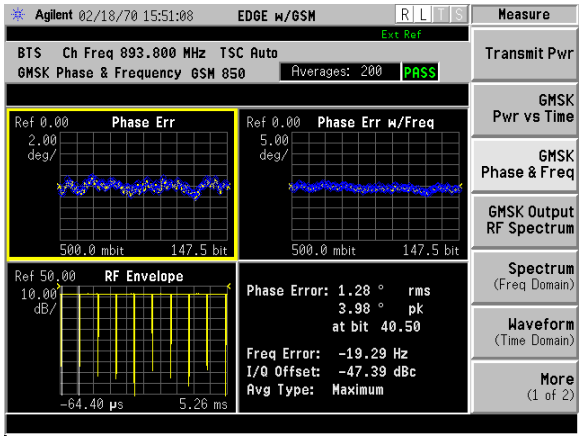
5.4.3.5.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	121	Pass
	Phase PK	4.11	Pass
	Freq. Error	-19.63	Pass
M	Phase RMS	1.16	Pass
	Phase PK	3.89	Pass
	Freq. Error	-18.88	Pass
T	Phase RMS	1.28	Pass
	Phase PK	3.98	Pass
	Freq. Error	-19.29	Pass

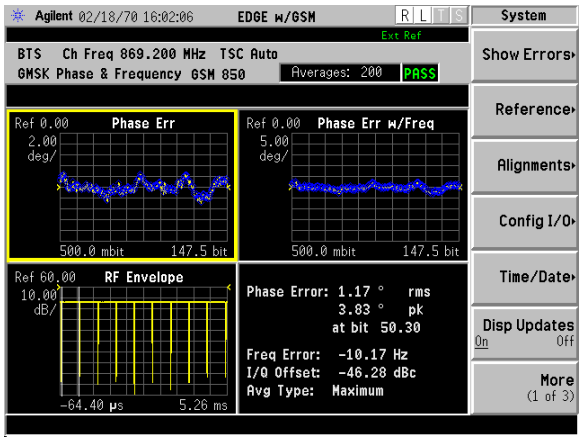


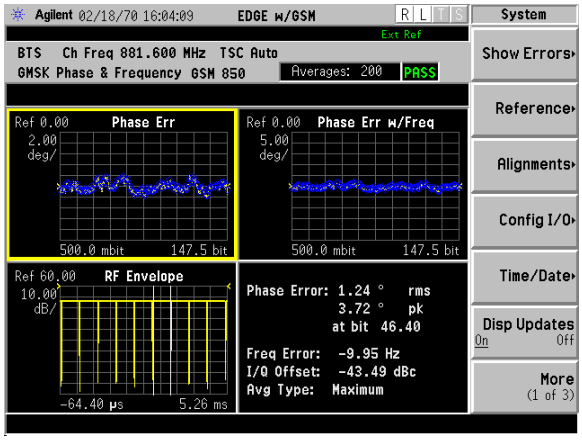


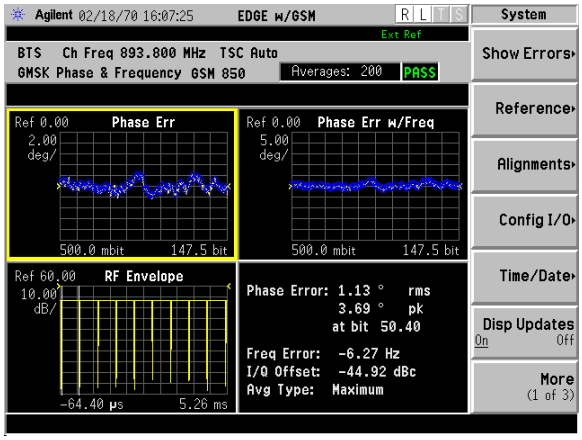


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.17	Pass
	Phase PK	3.03	Pass
	Freq. Error	-10.17	Pass
M	Phase RMS	1.24	Pass
	Phase PK	3.72	Pass
	Freq. Error	-9.95	Pass
T	Phase RMS	1.13	Pass
	Phase PK	3.69	Pass
	Freq. Error	-6.27	Pass



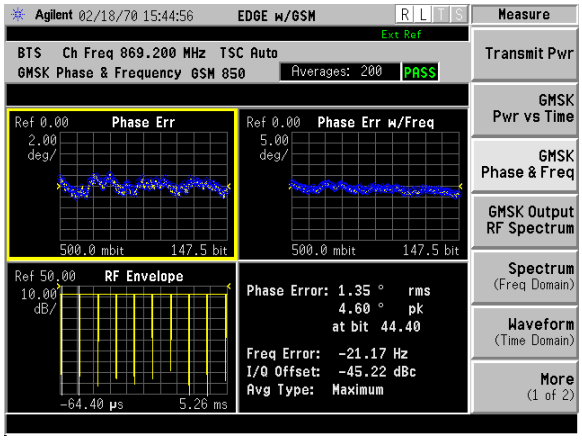


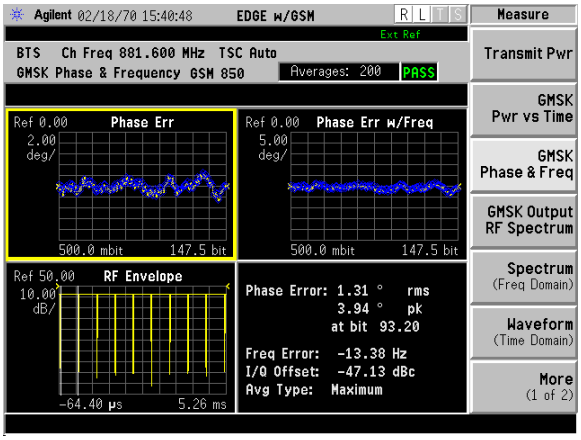


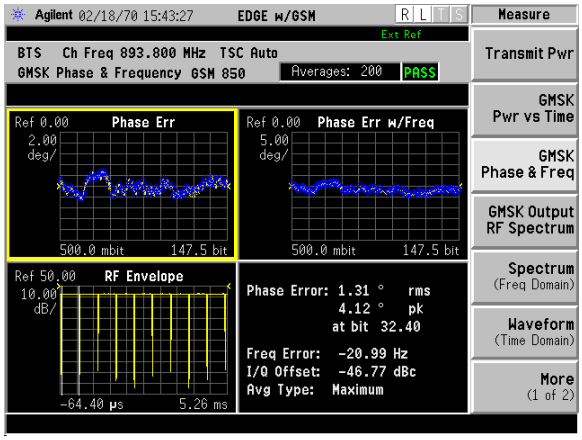
5.4.3.5.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.35	Pass
	Phase PK	4.60	Pass
	Freq. Error	-21.17	Pass
M	Phase RMS	1.31	Pass
	Phase PK	3.94	Pass
	Freq. Error	-13.38	Pass
T	Phase RMS	1.31	Pass
	Phase PK	4.12	Pass
	Freq. Error	-20.99	Pass

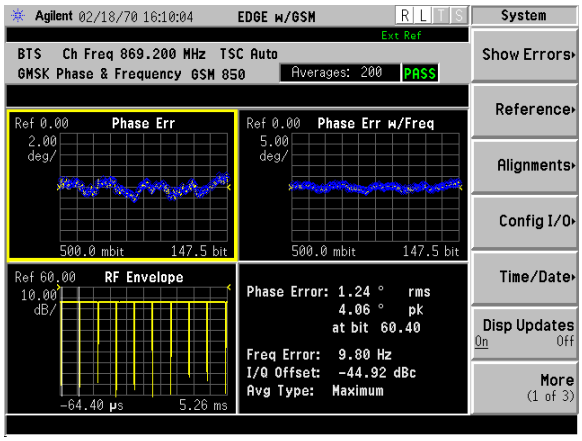


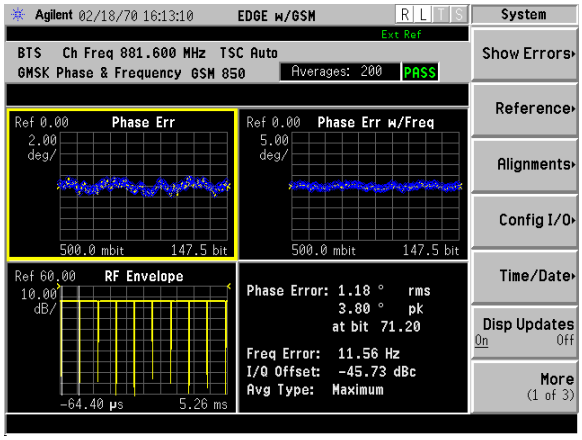


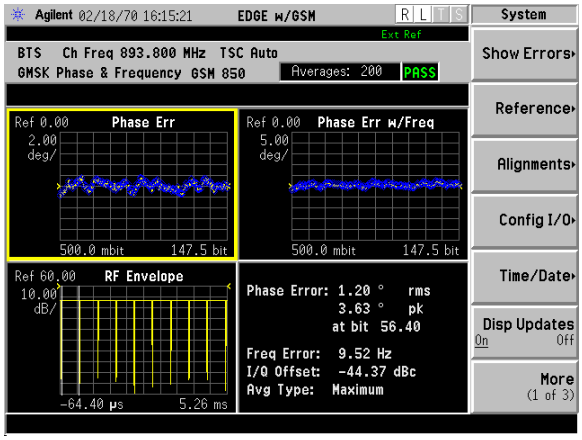


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.24	Pass
	Phase PK	4.06	Pass
	Freq. Error	9.80	Pass
M	Phase RMS	1.18	Pass
	Phase PK	3.80	Pass
	Freq. Error	11.56	Pass
T	Phase RMS	1.20	Pass
	Phase PK	3.60	Pass
	Freq. Error	9.52	Pass





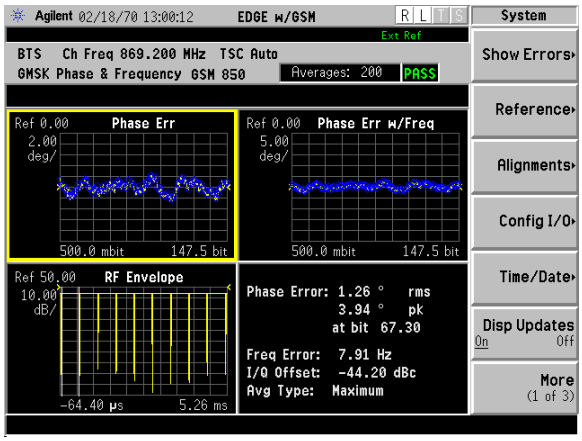


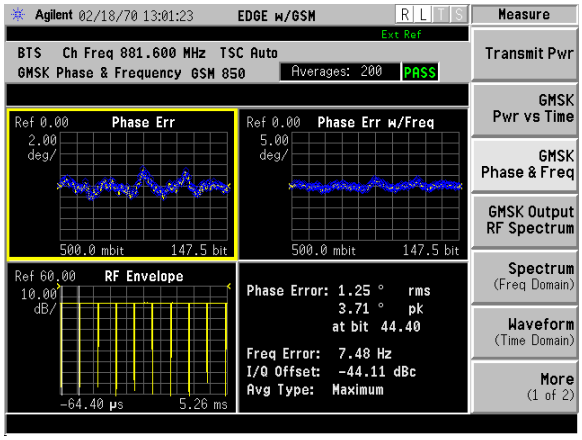
5.4.3.6 TESTS AT TEMPERATURE +45 °C

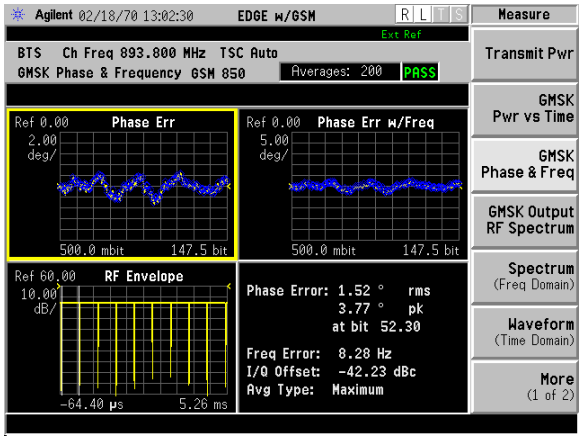
5.4.3.6.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.26	Pass
	Phase PK	3.94	Pass
	Freq. Error	7.91	Pass
M	Phase RMS	1.25	Pass
	Phase PK	3.71	Pass
	Freq. Error	7.48	Pass
T	Phase RMS	1.52	Pass
	Phase PK	3.77	Pass
	Freq. Error	8.28	Pass

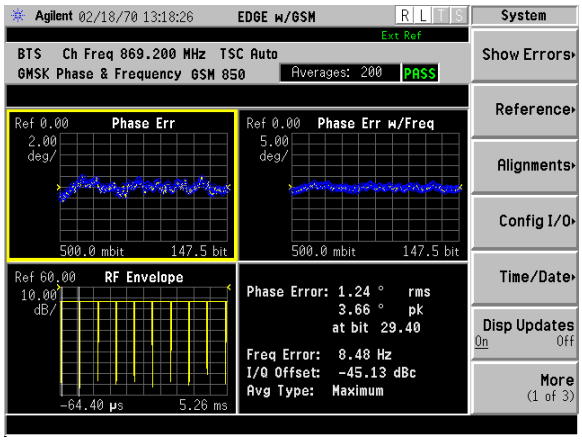


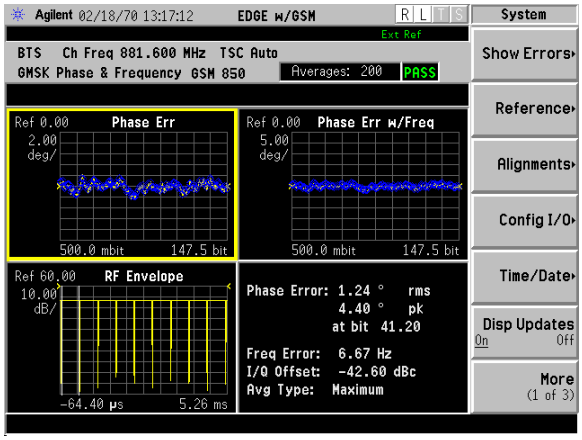


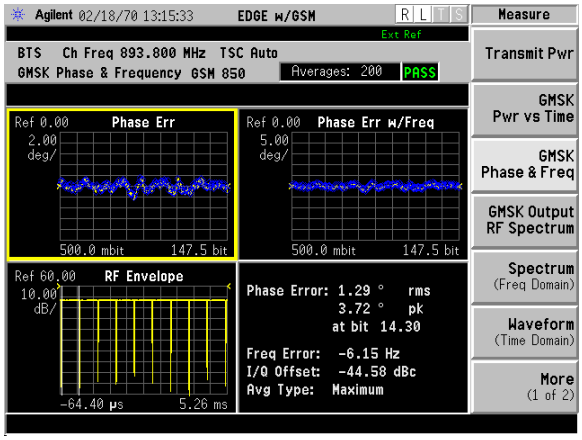


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.24	Pass
	Phase PK	3.66	Pass
	Freq. Error	8.48	Pass
M	Phase RMS	1.24	Pass
	Phase PK	4.40	Pass
	Freq. Error	6.67	Pass
T	Phase RMS	1.29	Pass
	Phase PK	3.72	Pass
	Freq. Error	-6.15	Pass



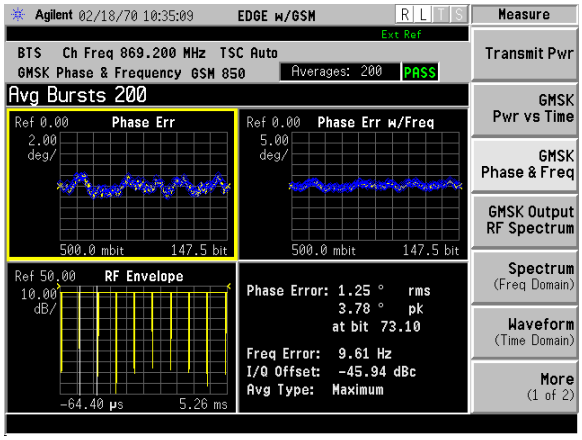


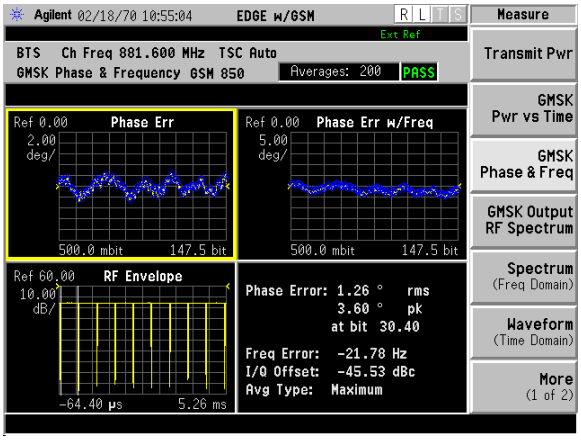


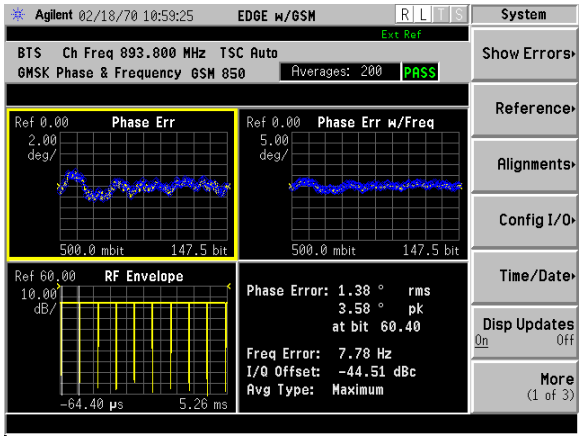
5.4.3.6.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.25	Pass
	Phase PK	3.78	Pass
	Freq. Error	9.61	Pass
M	Phase RMS	1.26	Pass
	Phase PK	3.60	Pass
	Freq. Error	-21.78	Pass
T	Phase RMS	1.38	Pass
	Phase PK	3.58	Pass
	Freq. Error	7.78	Pass

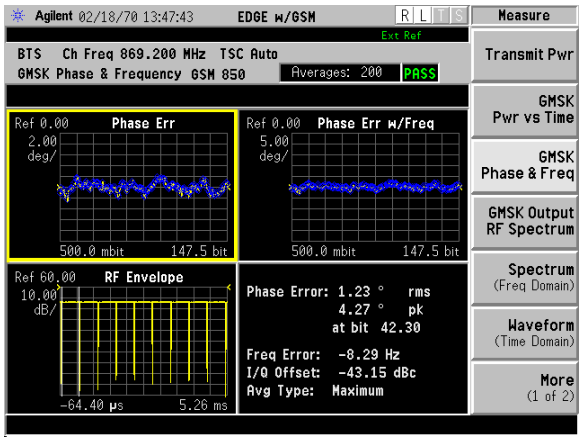


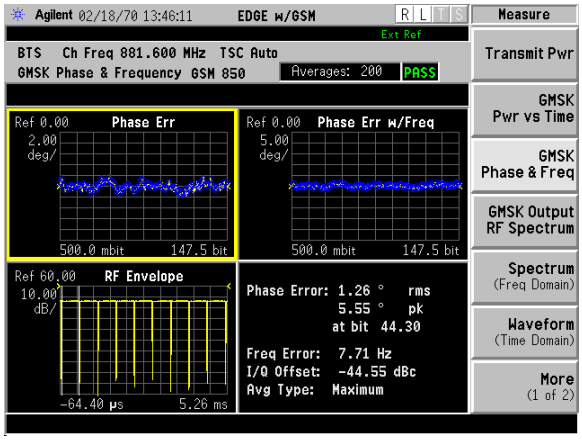


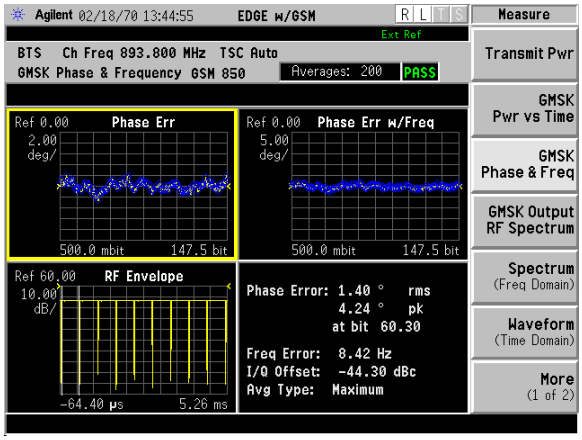


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	1.23	Pass
	Phase PK	4.27	Pass
	Freq. Error	-8.29	Pass
M	Phase RMS	1.26	Pass
	Phase PK	5.55	Pass
	Freq. Error	7.71	Pass
T	Phase RMS	1.40	Pass
	Phase PK	4.24	Pass
	Freq. Error	8.42	Pass







5.5 NAME OF TEST: SPURIOUS EMISSION AT TERMINALS

5.5.1 FCC REQUIREMENTS LIMITS

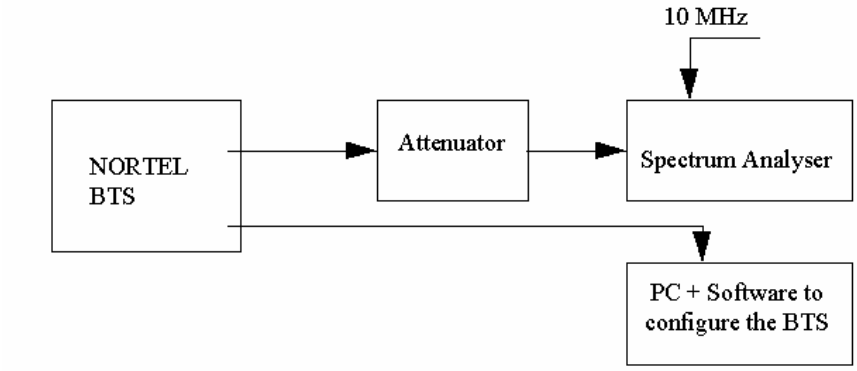
(a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB.

(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 26 dB below the transmitter power.

(c) When measuring the emission limits, the nominal carrier frequency shall be 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.

5.5.2 TEST PRINCIPLE



For adjacent channels emissions, the BTS nominal carrier frequency was adjusted to each block edge channel.

Channels 128 and 251 are those channels which are at the lower and upper edges of the 850 band respectively.

The BTS was configured to transmit at maximum power (static level 0) or a reduced power:
· For GMSK modulation, in mode GMSK no synchro.
· For 8PSK modulation, in mode logical PDCH, Type GPRS, coding MCS5.

Initially the transmitter was set to operate to maximum power. Then in case of out of limits, the power has been decreased by 2 dB.

For these measurements, the resolution bandwidth was of the spectrum analyzer was set to at le ast 1% of the emission bandwidth. In this case the emission bandwidth measured was closed to 300 kHz. Therefore, the resolution bandwidth was set to 3 kHz. The spectrum analyzer had the following settings for adjacent band:

Resolution bandwidth:	3 kHz
Video bandwidth:	10 kHz
Span:	1 MHz
Reference level:	30 dBm
Reference Level Offset:	Corrected to account for cable(s), filter and attenuator losses
Level range:	100 dB
Sweep time:	Coupled
Detector:	Sample
Trace:	Average
Sweep count:	200

The spectrum analyzer had the following settings for out of block emissions.

Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz

The emissions were investigated up to the twentieth harmonic of the fundamental emission (20 GHz).

The measured level of the emissions was recorded and compared to the -13 dBm limit.

5.5.3 CONCLUSION

GSM850 Radio Modules used with 60W Power Amplifier configuration

Description	Hardware code	Comment
Radio Modules GSM 850		
HPRM 3T 60W GSM850	NTN050JA	Radio Module 850Mhz (GMSK 60W / 8PSK 45W)
GSM850 Coupling module		
DDM 850 H2	NTN063HA	With TOS meter
	NTN063HM	With out TOS meter
DDM 850	NTN063JA	With TOS meter
	NTN063JM	With out TOS meter
Tx Filter 850 H2	NTN064HA	With TOS meter
	NTN064HM	Without TOS meter
Tx Filter 850	NTN064JA	With TOS meter
	NTN064JM	Without TOS meter

Power limitation to comply with Adjacent Band spurious at antenna connector GSM850:

BTS Antenna Power	**GMSK modulation**	**8PSK modulation**
DDM Dp configuration	**47.1 dBm / 51.3W**	**46 dBm / 39.8W**
DDM H2 configuration	**43.2 dBm / 12.6W**	**42.2 dBm / 12.6W**

Coupling configuration	**System Power limitation GMSK modulation**	**System Power limitation 8 PSK modulation**
DDM Diplexer Tx Filter (w/oH2)	Power Limitation : Pmax – 6 dB Except ARFCN 238 , 241 : Pmax	Power Limitation : Pmax – 4 dB Except ARFCN 238 , 241 : Pmax
DDM H2 TXF H2	Power Limitation : Pmax – 2 dB Except **ARFCN 238, 241 : Pmax**	**Pmax**

For Edge Channel ARFCN 128, 131, 133, 181, 183, 231, 233, 251, power has to be reduced by 6dB (GMSK) or 4dB (8PSK) in order to meet spurious emission requirement.

For Edge Channel ARFCN 238, 241, maximum power has allowed to meet spurious emission requirement.

5.5.4 TEST RESULTS

- **TEST RESULTS WITH DDM DIPLEXER CONFIGURATION FOR GMSK MODULATION**

The reference level for spurious emissions at the antenna terminals is taken from the measured output power (47.1 dBm = 51.3 Watts).
Therefore the spurious emissions must be attenuated by at least 43 + 10*Log (51.3) = 60.1 dB
The measured output power was 47.1 dBm therefore the limit is 47.1 – 60.1 = -13 dBm.
Spurious measurement is performed with the DDM diplexer configuration.
The Nominal power at antenna connector: $P_{GMSK\ diplexer}$ Max = 47.1 dBm

Test result for GMSK Modulation HD Configuration

Channel	Spurious Emission Level (dBm)				Margin (dB)
	Power Level (Pmax)	Power Level (Pmax-2)	Power Level (Pmax-4)	Power Level (Pmax-6)	
C128			-13.14		-0.14
C131				-13.05	-0.05
C133				-14.48	-1.48
C181				-13.27	-0.27
C183				-14.49	-1.49
C231				-13.01	-0.01
C233				-14.17	-1.17
C251				-14.33	-1.33

Power limitation Pmax –6 dB ensures the Adjacent Band spurious compliance at antenna connector GSM850 for Diplexer configuration.
H2D configuration introduces additional 4dB losses for Tx path and involves the Power limitation Pmax –2dB for Adjacent Band spurious compliance.

- **TEST RESULTS WITH DDM DIPLEXER CONFIGURATION FOR 8PSK MODULATION**

The reference level for spurious emissions at the antenna terminals is taken from the measured output power (46 dBm = 39.8 Watts).
Therefore the spurious emissions must be attenuated by at least 43 + 10*Log (39.8) = 59 dB
The measured output power was 46 dBm therefore the limit is 46 – 59 = -13 dBm.
Spurious measurement is performed with the DDM diplexer configuration.
The Nominal power at antenna connector: $P_{8PSK\ diplexer}$ Max = 46.4 dBm

Test result for 8PSK Modulation HD Configuration

Channel	Spurious Emission Level (dBm)			
	Power Level (Pmax)	Power Level (Pmax-2)	Power Level (Pmax-4)	Margin (dB)
C128			-14.06	-1.06
C131			-14.90	-1.90
C183			-14.06	-1.06
C231		-13.16		-0.16
C251		-13.17		-0.17

Power limitation Pmax –4 dB ensures the Adjacent Band spurious compliance at antenna connector GSM850 for Diplexer configuration.

- **TEST RESULTS WITH DDM H2 CONFIGURATION FOR 8PSK MODULATION**

The reference level for spurious emissions at the antenna terminals is taken from the measured output power (42.2 dBm = 16.6 Watts).
Therefore the spurious emissions must be attenuated by at least 43 + 10*Log (16.6) = 55.2 dB
The measured output power was 42.2 dBm therefore the limit is 42.2 – 55.2 = -13 dBm.
Spurious measurement is performed with the DDM H2 configuration.
The Nominal power at antenna connector: $P_{8PSK\ H2}$ Max = 42.2 dBm

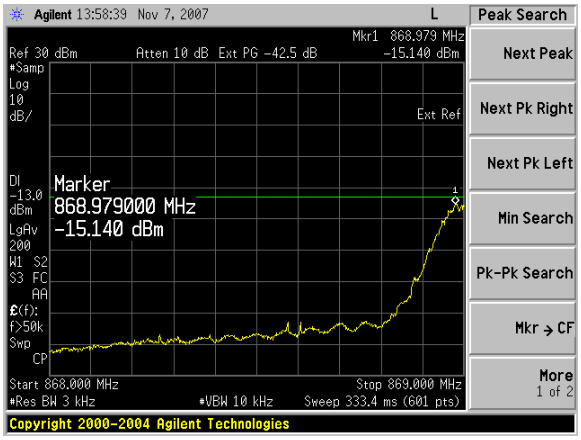
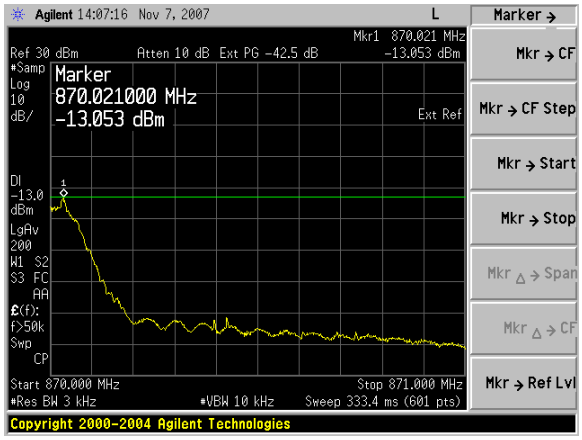
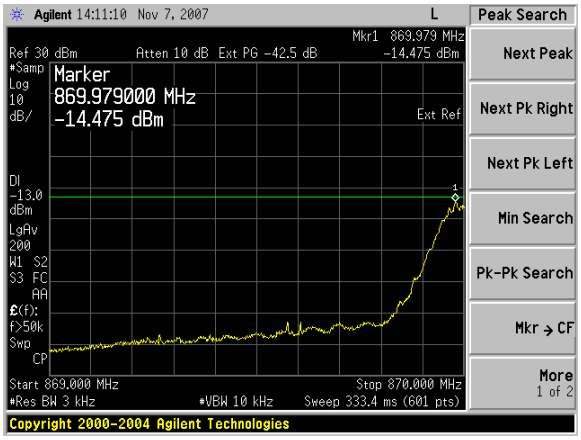
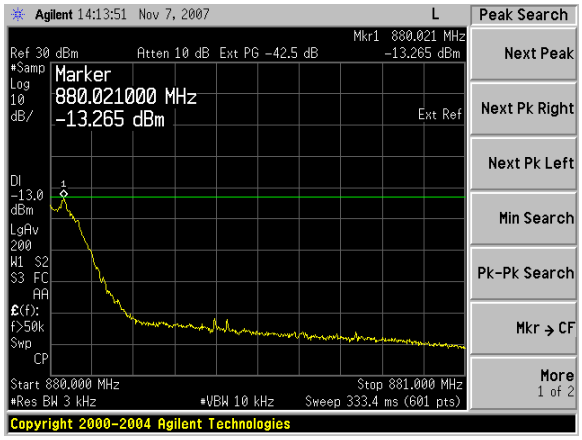
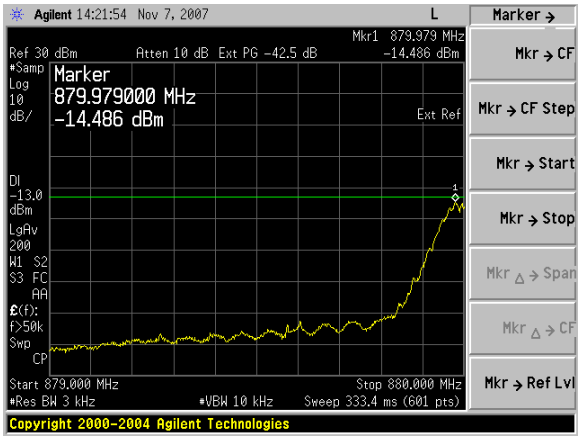
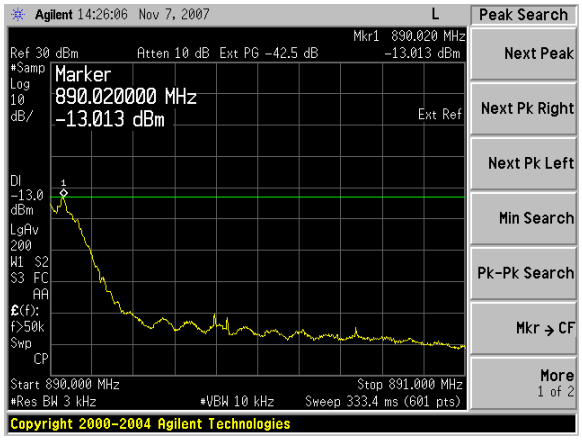
Test result for 8PSK Modulation H2 Configuration

Channel	Spurious Emission Level (dBm)			
	Power Level (Pmax)	Power Level (Pmax-2)	Power Level (Pmax-4)	Margin (dB)
C128	-13.63			-0.63
C131	-14.64			-0.64
C183	-13.17			-0.17
C231	-14.60			-1.60
C251	-14.43			-1.4

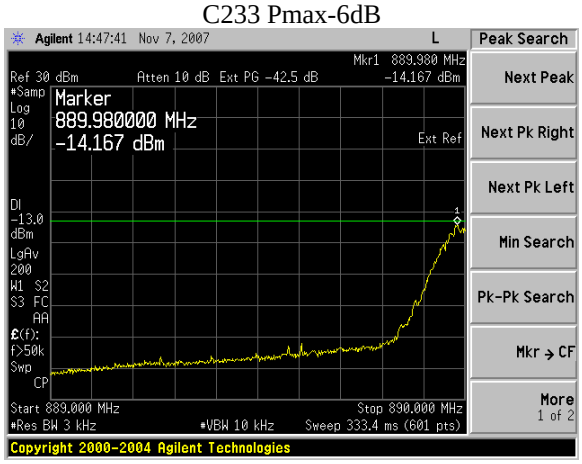
- **Test result for Out of block spurious emission – Channel 189 HD Configuration**

Power (dB)	Frequency MHz	Spurious Emission Level - GMSK	Spurious Emission Level – 8PSK
Pmax -	100 kHz – 50MHz	-42	-43
	50 MHz -500 MHz	-41	-41
	500 MHz – 880.2 MHz	-37	-38
	882.6 MHz – 1970.2 MHz	-27	-27
	1970.2 MHz – 1994.8 MHz	-42	-42
	1994.8 MHz – 3 GHz	-37	-37
	3 GHz – 10 GHz	-38	-38
	10 GHz – 20 GHz	-35	-35
Margin		> 10 dB	> 14 dB

Figure: In Band – Edge block channel – 1MHz adjacent band
GMSK Modulation –HD Configuration

-1 MHz adjacent band	+1MHz adjacent band
C128 Pmax-6dB	C131 Pmax-6dB
	
C133 Pmax-6dB	C181 Pmax-6dB
	
C183 Pmax-6dB	C231 Pmax-6dB
	

C233 Pmax-6dB



C251 Pmax-6dB

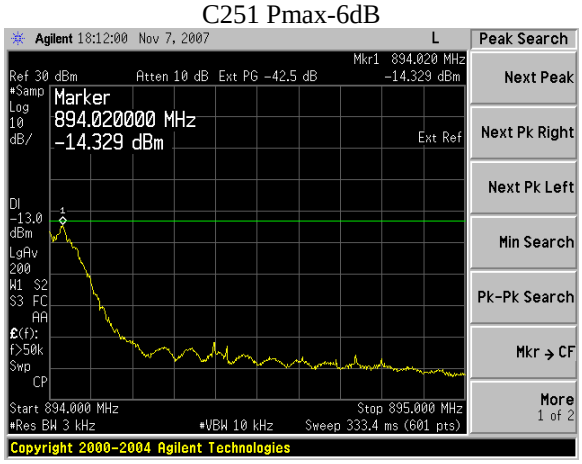


Figure: In Band – Edge block channel -1 MHz adjacent band
8PSK Modulation – H2 Configuration

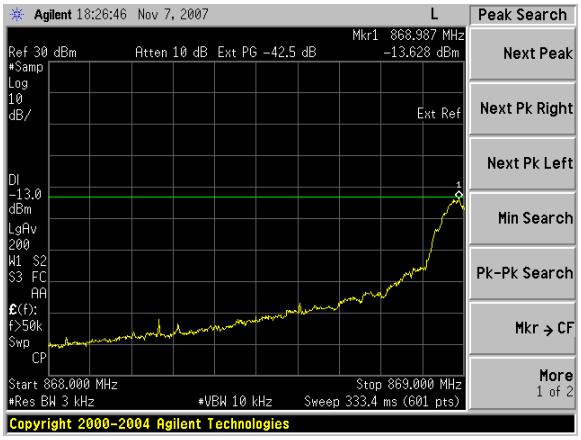
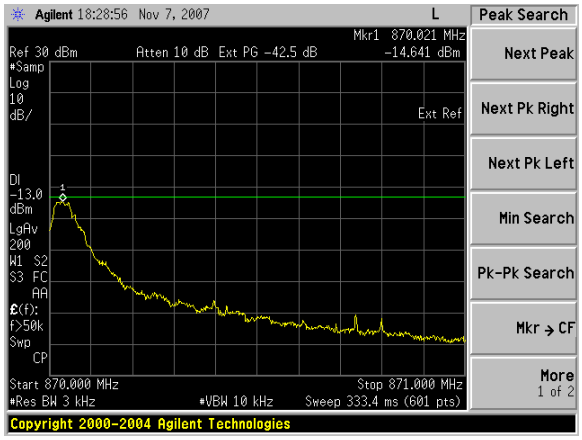
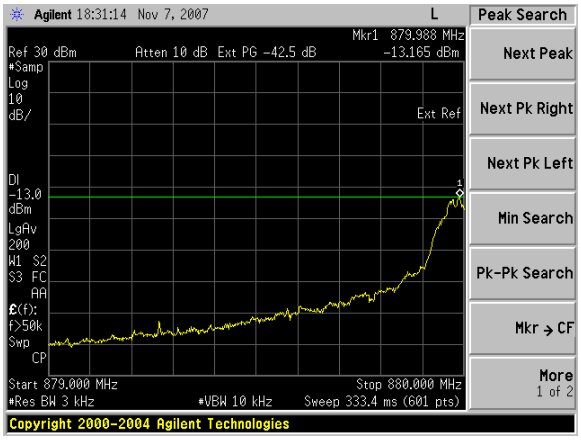
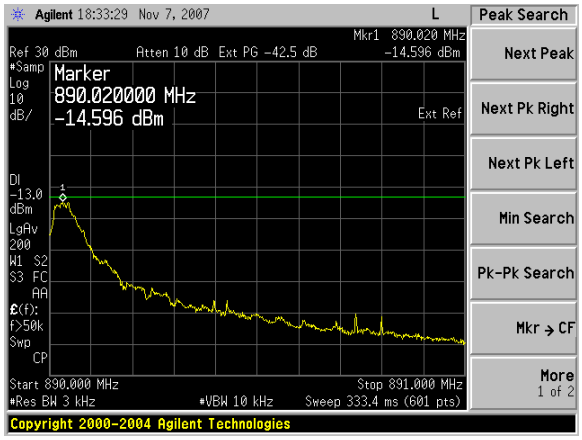
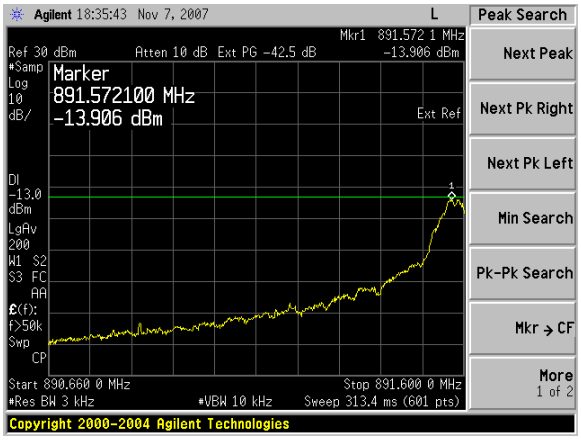
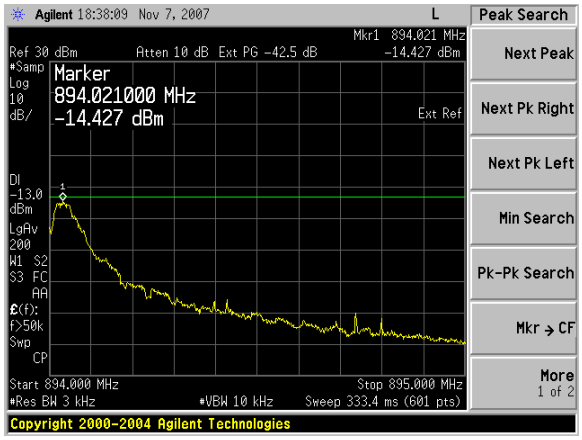
-1 MHz adjacent band	+1MHz adjacent band
C128 Pmax	C131 Pmax
	
C183 Pmax	C231 Pmax
	
C241 Pmax	C251 Pmax
	

Figure: In Band – Edge block channel –1MHz adjacent band
8PSK Modulation –HD Configuration

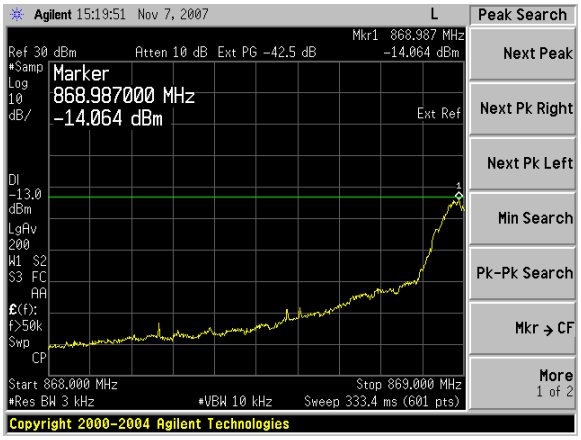
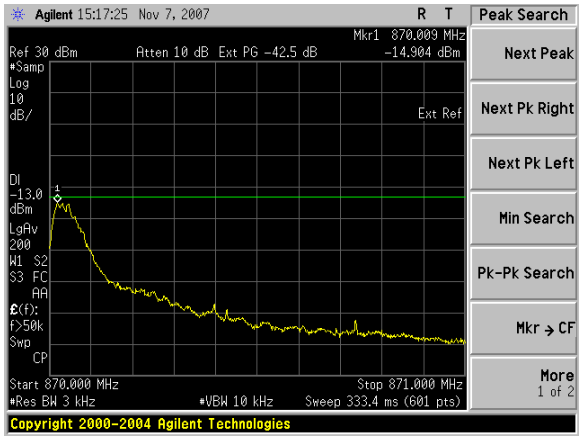
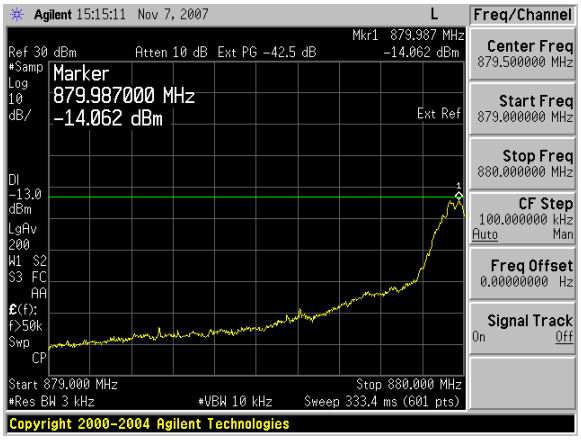
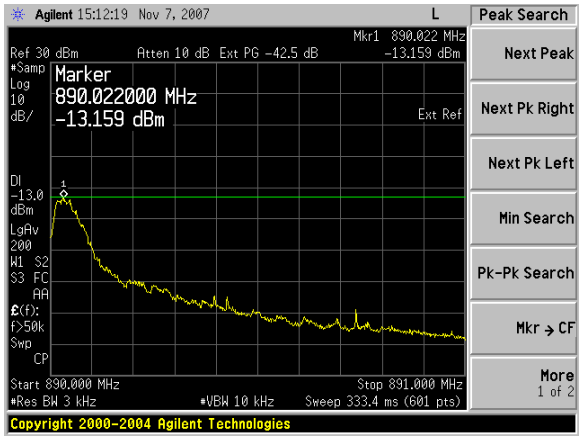
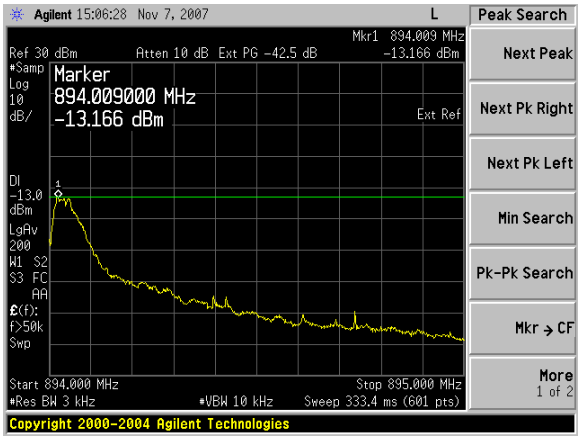
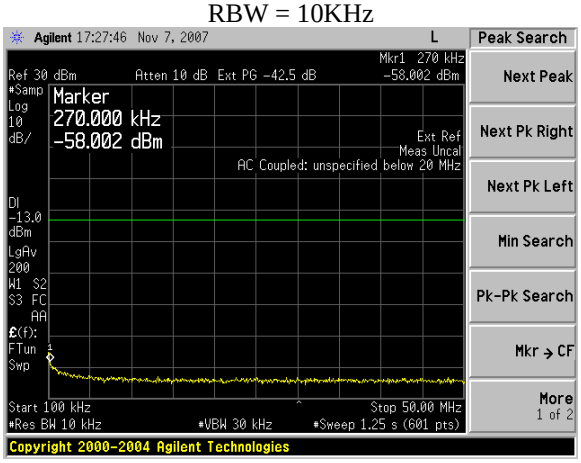
-1 MHz adjacent band	+1MHz adjacent band
C128 Pmax-4dB	C131 Pmax-4dB
	
C183 Pmax-4dB	C231 Pmax-4dB
	
C251 Pmax-4dB	
	

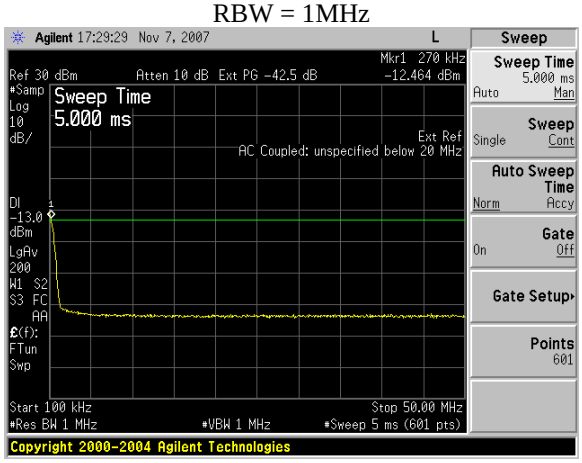
Figure: Out of block emission (Channel 189, Pmax)
GMSK Modulation – HD Configuration

Band 100 KHz – 50MHz

RBW = 10KHz

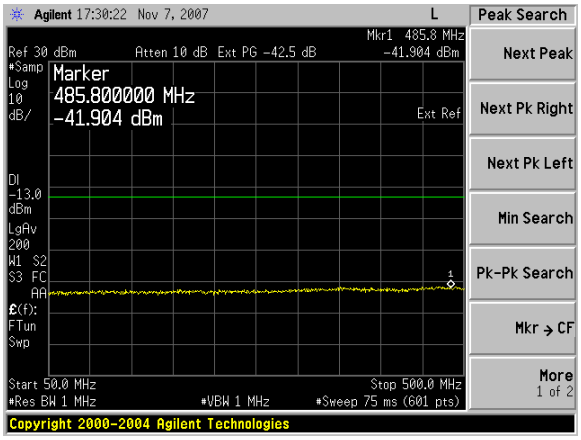


RBW = 1MHz



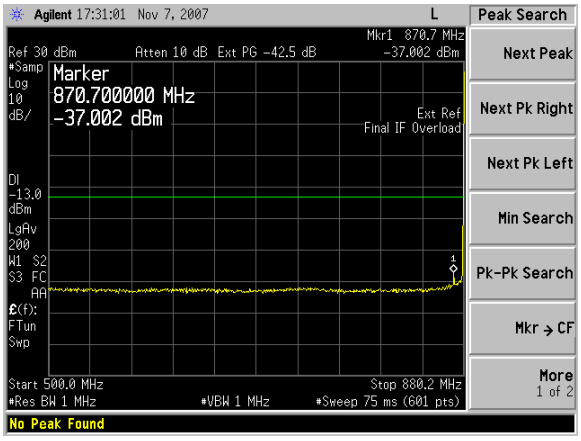
Note: spectrum line at 100KHz are internal DC spectrum line of Analyzer

Band 50MHz – 500MHz

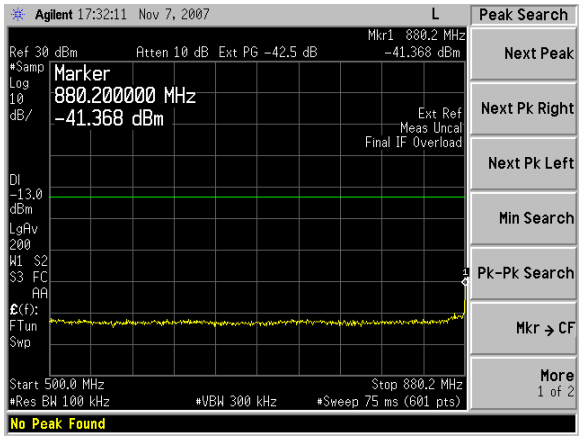


Band 50MHz – 880.2MHz

RBW = 1MHz

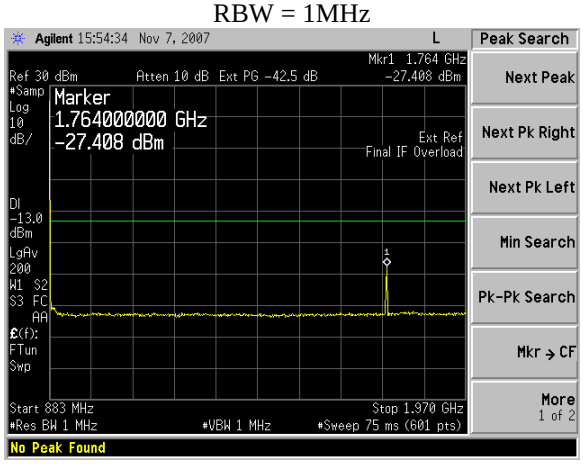


RBW = 100KHz

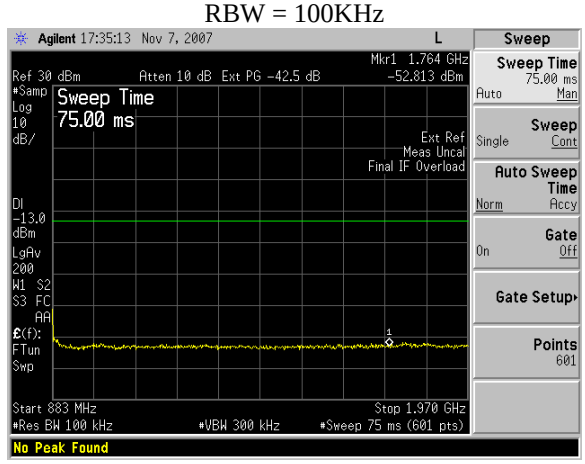


Band 882.6MHz – 1970.2MHz

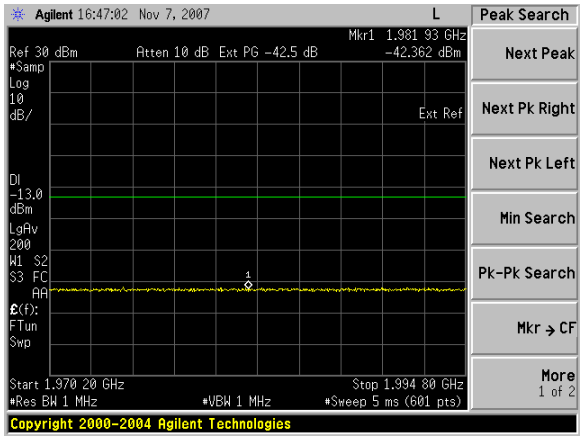
RBW = 1MHz



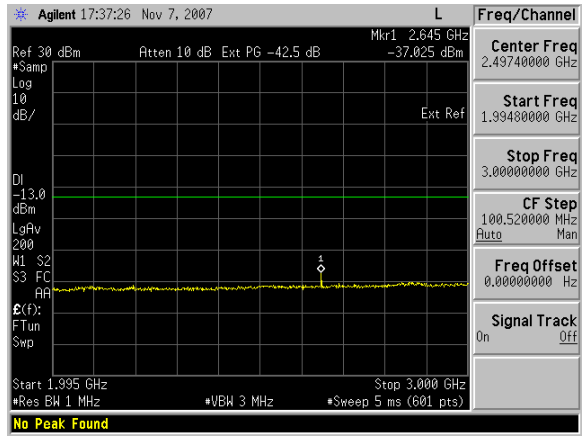
RBW = 100KHz



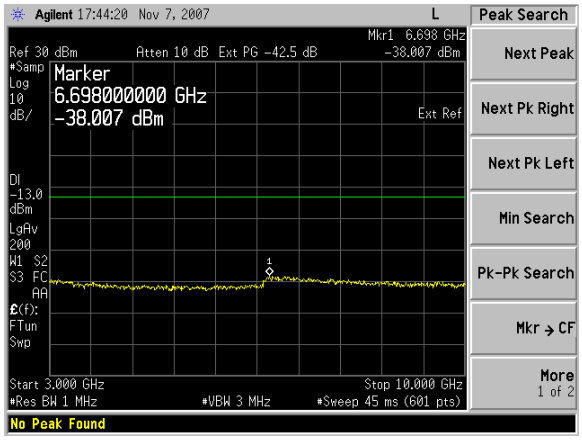
Band 1970.2MHz – 1994.8MHz



Band 1994.8MHz – 3GHz



Band 3GHz – 10GHz



Band 10GHz – 20GHz

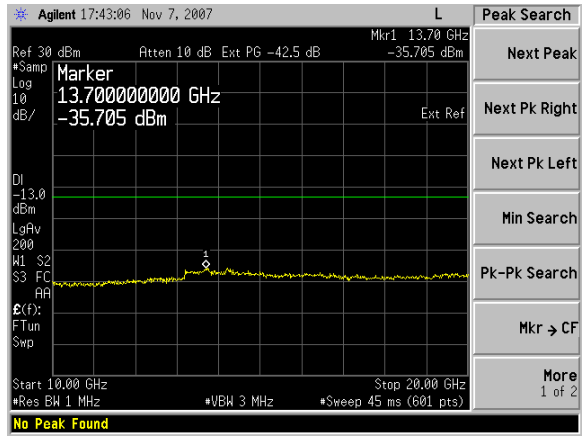
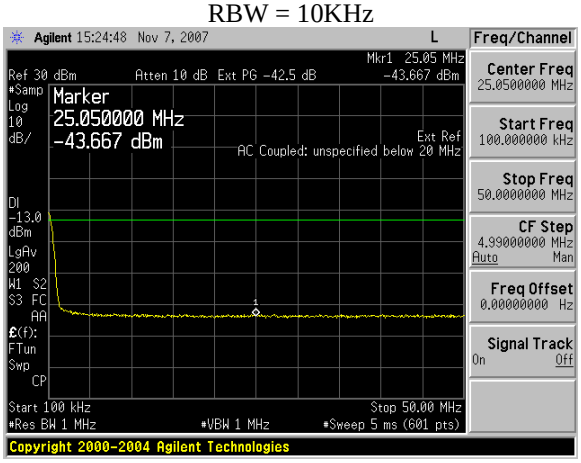


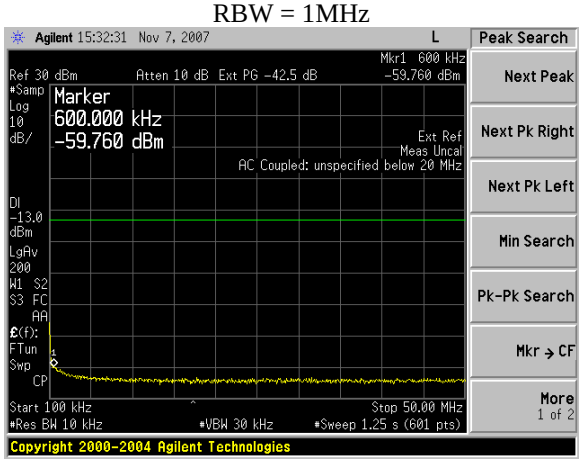
Figure: Out of block emission (Channel 189, Pmax)
8PSK Modulation – HD Configuration

Band 100 KHz – 50MHz

RBW = 10KHz

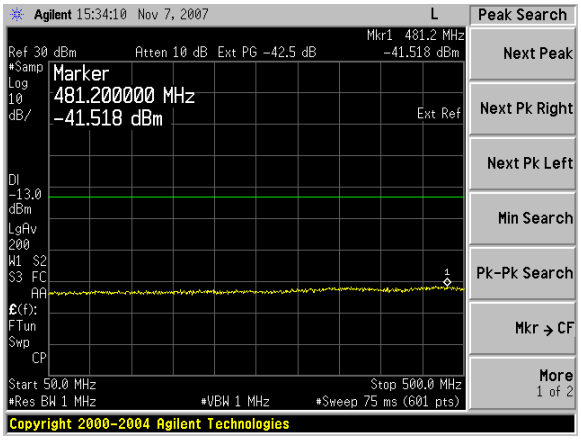


RBW = 1MHz



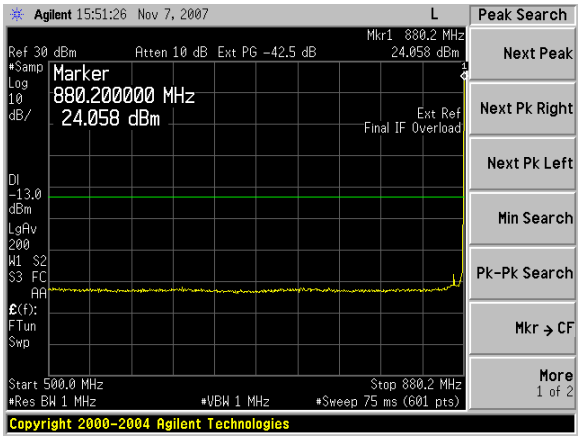
Note: spectrum line at 100KHz are internal DC spectrum line of Analyzer

Band 50MHz – 500MHz

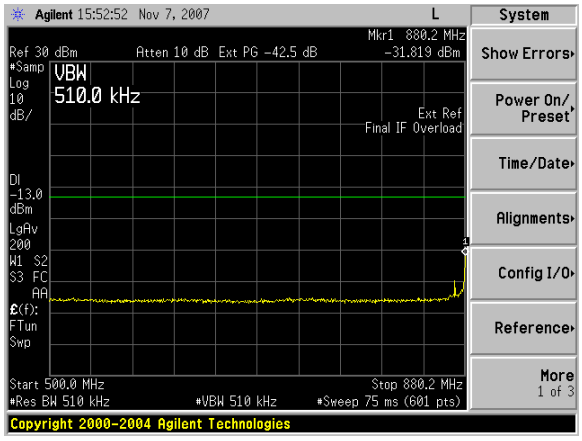


Band 50MHz – 880.2MHz

RBW = 1MHz

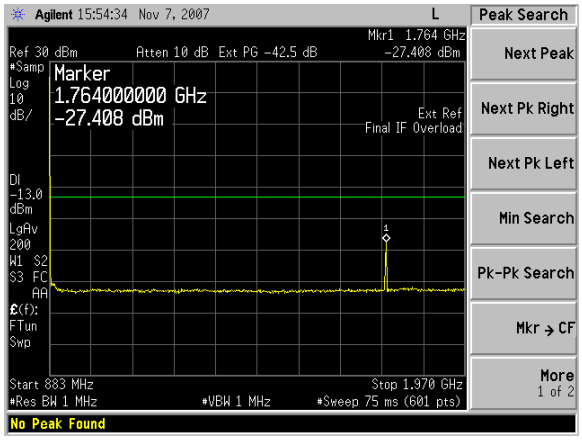


RBW = 100KHz

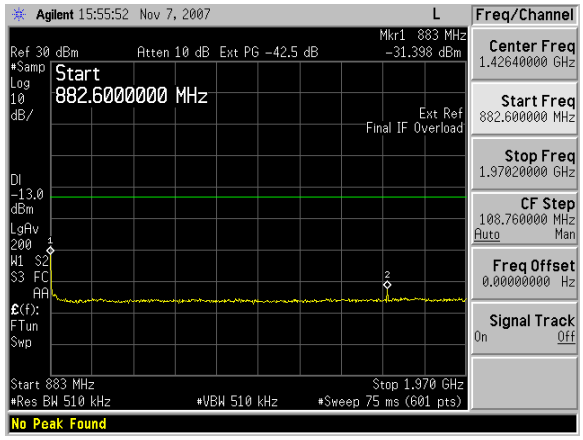


Band 882.6MHz – 1970.2MHz

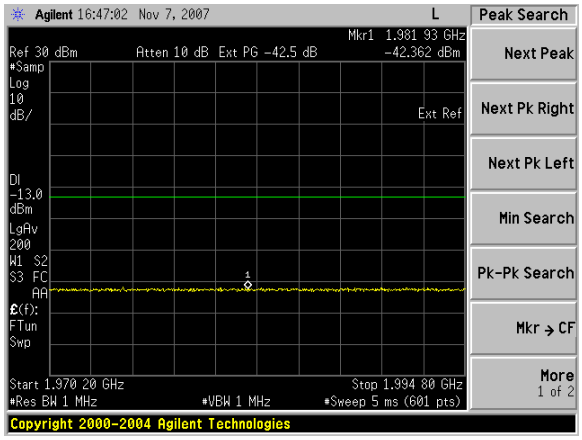
RBW = 1MHz



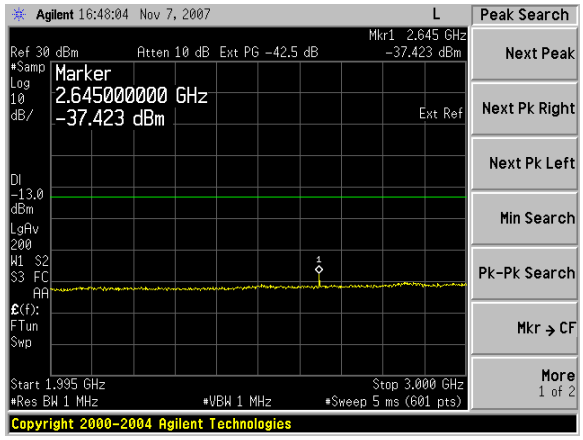
RBW = 100KHz



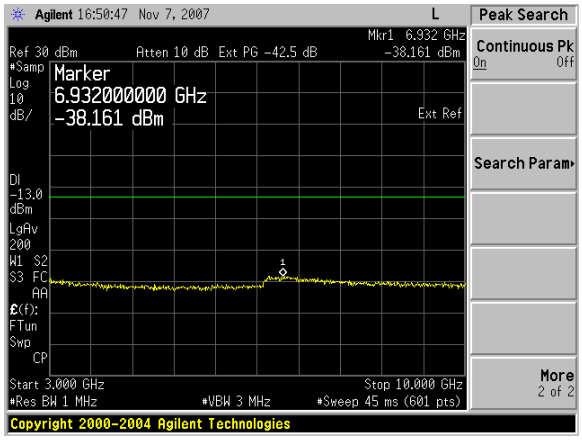
Band 1970.2MHz – 1994.8MHz



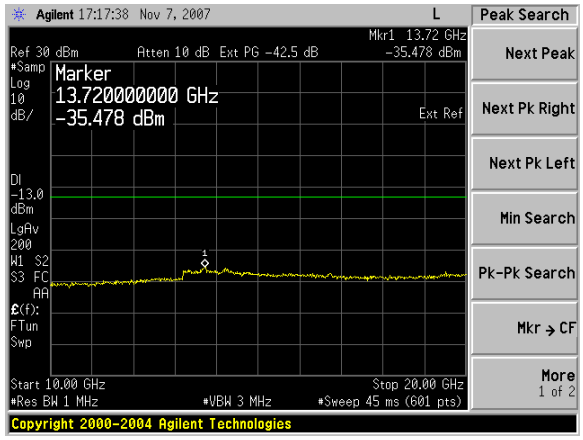
Band 1994.8MHz – 3GHz



Band 3GHz – 10GHz



Band 10GHz – 20GHz

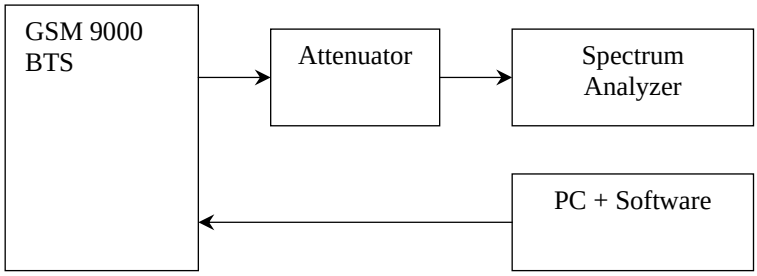


5.6 NAME OF TEST: OCCUPIED BANDWITH

5.6.1 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 at least 26 dB below the transmitter power.

5.6.2 TEST PRICIPLE



The BTS was configured to transmit at maximum power (Static Level 0). Measurements were made at frequencies which were at the bottom and top of the transmit band.

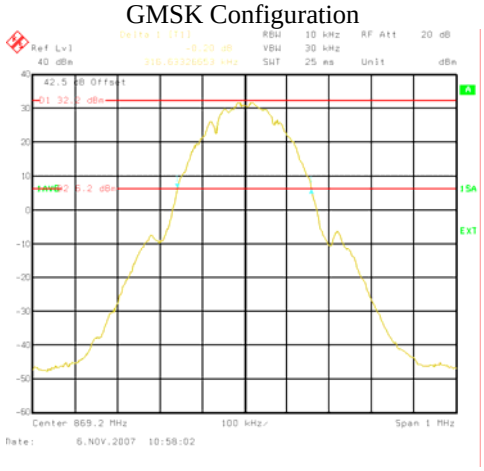
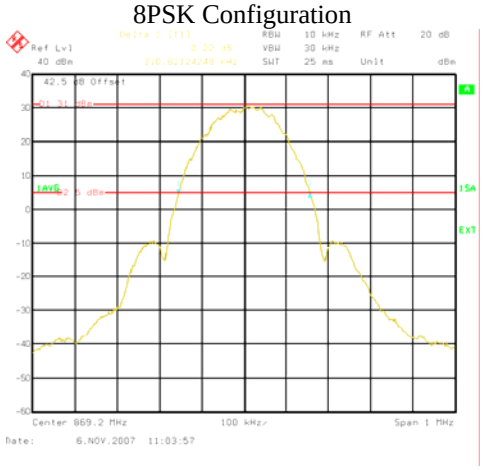
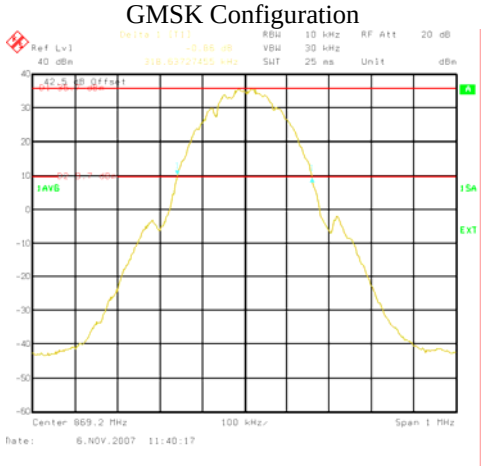
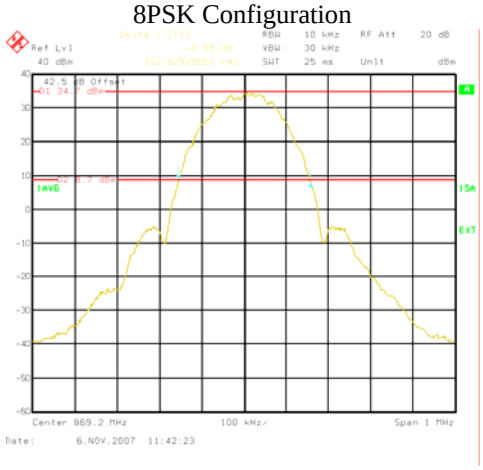
The occupied bandwidth was measured by determining the bandwidth out of which all emissions are attenuated at least 26 dB below the transmitter power.

The spectrum analyzer had the following settings:

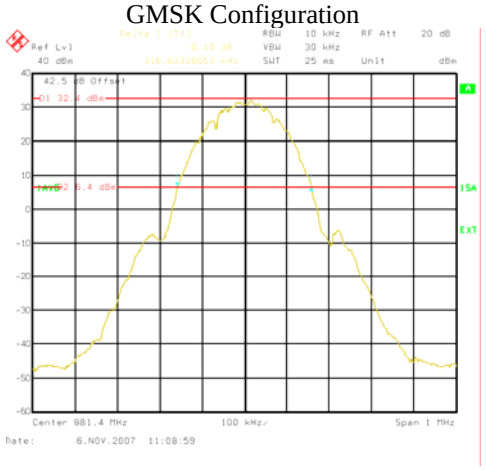
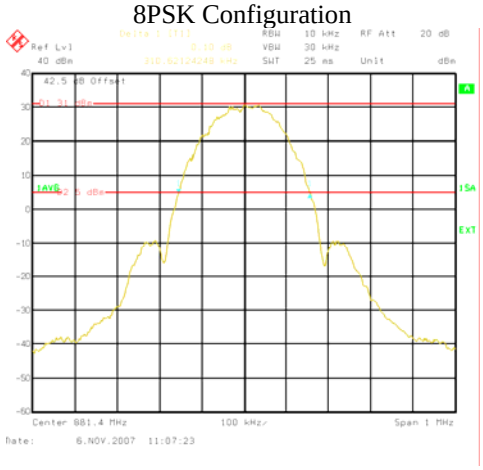
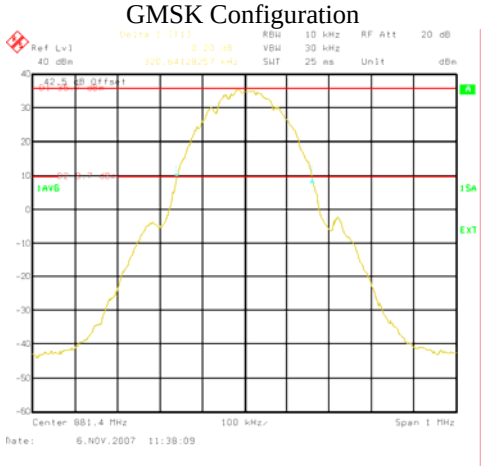
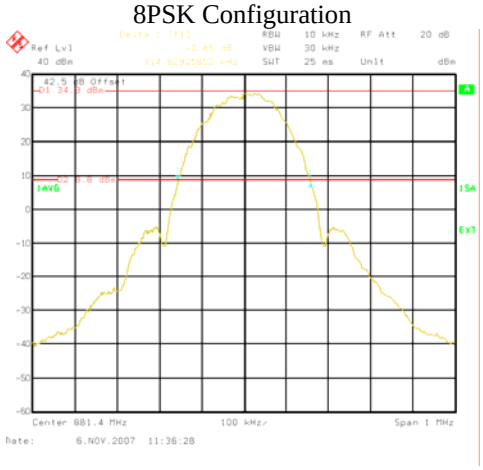
Resolution bandwidth:	10 kHz
Video bandwidth:	30 kHz
Span:	1 MHz
Reference level:	40 dBm
Reference Level Offset:	Corrected to account for cable(s) and attenuator losses
Level range:	100 dB
Sweep time:	25 ms

5.6.3 TEST RESULTS

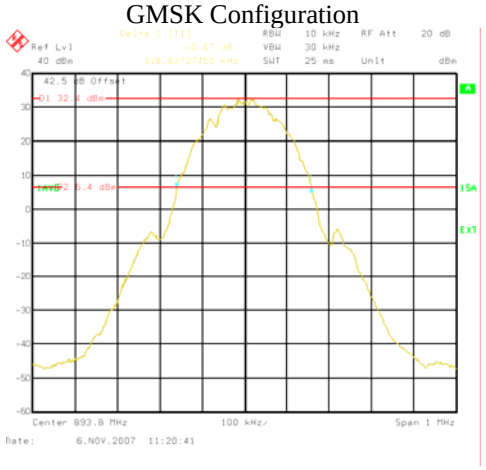
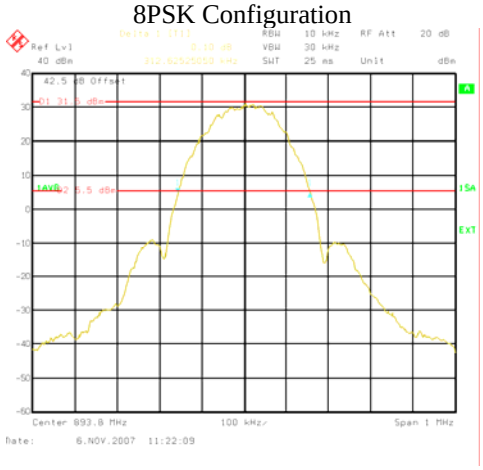
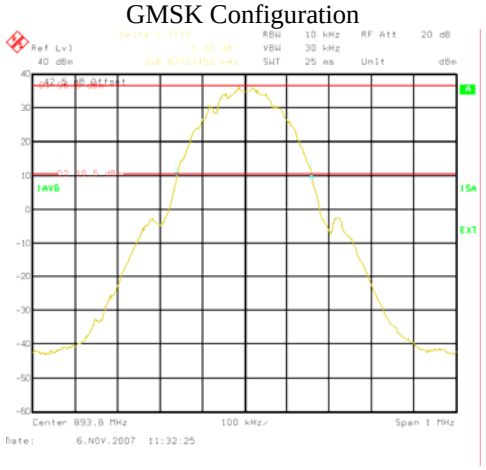
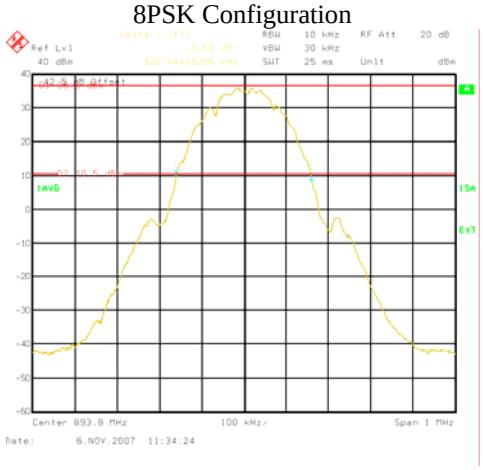
- **Channel B**

<table>
<tr><td colspan="2">HPRM850 H2D Configuration</td></tr>
<tr><td>GMSK Configuration</td><td>8PSK Configuration</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">HPRM850 HD Configuration</td></tr>
<tr><td>GMSK Configuration</td><td>8PSK Configuration</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">The maximum occupied bandwidth is 316KHz for GMSK at H2 Configuration.
The maximum occupied bandwidth is 310KHz for 8PSK at H2 Configuration.
The maximum occupied bandwidth is 318KHz for GMSK at HD Configuration
The maximum occupied bandwidth is 312KHz for 8PSK at HD Configuration</td></tr>
</table>

- **Channel M**

HPRM850 H2D Configuration	
GMSK Configuration	8PSK Configuration
	
HPRM850 HD Configuration	
GMSK Configuration	8PSK Configuration
	
The maximum occupied bandwidth is 316KHz for GMSK at H2 Configuration. The maximum occupied bandwidth is 310KHz for 8PSK at H2 Configuration. The maximum occupied bandwidth is 320KHz for GMSK at HD Configuration The maximum occupied bandwidth is 314KHz for 8PSK at HD Configuration	

➢ **Channel T**

HPRM850 H2D Configuration	
GMSK Configuration	8PSK Configuration
	
HPRM850 HD Configuration	
GMSK Configuration	8PSK Configuration
	

The maximum occupied bandwidth is 318KHz for GMSK at H2 Configuration.
The maximum occupied bandwidth is 312KHz for 8PSK at H2 Configuration.
The maximum occupied bandwidth is 318KHz for GMSK at HD Configuration
The maximum occupied bandwidth is 320KHz for 8PSK at HD Configuration

6. TEST REPORT: RM 30W PCS1900

6.1 INTRODUCTION

The following information is submitted for update of the type acceptance of a Broadband PCS Base Station for Northern Telecom, Inc., in accordance with FCC Part 22 and Part 2 of the FCC Rules and Regulations.

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The measurement procedures were in accordance with the requirements of Part 2.

6.2 MEASUREMENT RESULTS

Measurement Results Summary:

Test Case	GMSK	8PSK	RESULT	Note
RF Power Output	B,M,T	B,M,T	Complies	Vmin (-40V) / Vmax (-57V) From -5°C to +45 °C by 10°C step
Frequency Stability	B,M,T	NT	Complies	
Occupied Bandwidth	B,M,T	B,M,T	Complies	
Spurious Emissions at Antenna Terminals	B,M,T	B,M,T	Complies	

6.3 NAME OF TEST: RF POWER OUTPUT

6.3.1 FCC REQUIREMENTS – FCC PART 24.232

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.

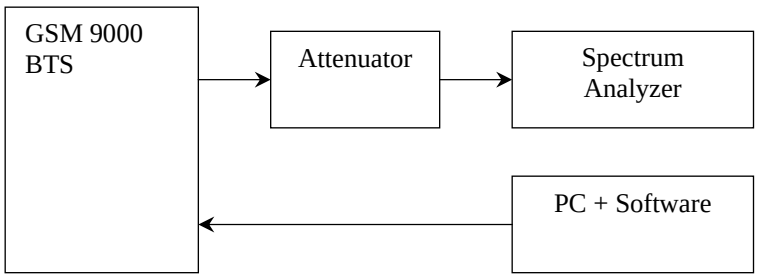
Specification for DDM H2configuration in GMSK:
DDM Duplexer configuration:

GMSK:	44.8dBm	± 2.5 dB
8PSK:	44.8dBm	± 2.5 dB

DDM H2 configuration:

GMSK:	40.8dBm	± 2.5 dB
8PSK:	40.8dBm	± 2.5 dB

6.3.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (static level 0) :
- For GMSK modulation, in mode GMSK no synchro,
- For 8PSK modulation, in mode logical PDCH, Type GPRS, coding MCS5.

Measurements were carried on frequencies which are C512, C661 and C810.

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 & 8PSK** modulation with several coupling configurations:

6.3.3.1 TESTS AT TEMPERATURE -5 °C

6.3.3.1.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.33dBm	Pass
	8PSK	39.40dBm	Pass
C661	GMSK	39.72dBm	Pass
	8PSK	39.81dBm	Pass
C810	GMSK	39.64dBm	Pass
	8PSK	39.68dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.74dBm	Pass
	8PSK	42.84dBm	Pass
C661	GMSK	43.13dBm	Pass
	8PSK	43.23dBm	Pass
C810	GMSK	43.08dBm	Pass
	8PSK	43.19dBm	Pass

6.3.3.1.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.37dBm	Pass
	8PSK	39.41dBm	Pass
C661	GMSK	39.73dBm	Pass
	8PSK	39.81dBm	Pass
C810	GMSK	39.66dBm	Pass
	8PSK	39.68dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.74dBm	Pass
	8PSK	42.82dBm	Pass
C661	GMSK	43.13dBm	Pass
	8PSK	43.24dBm	Pass
C810	GMSK	43.09dBm	Pass
	8PSK	43.22dBm	Pass

6.3.3.2 TESTS AT TEMPERATURE +5 °C

6.3.3.2.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.50dBm	Pass
	8PSK	39.61dBm	Pass
C661	GMSK	39.82dBm	Pass
	8PSK	39.93dBm	Pass
C810	GMSK	39.81dBm	Pass
	8PSK	39.87dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.85dBm	Pass
	8PSK	43.05dBm	Pass
C661	GMSK	43.28dBm	Pass
	8PSK	43.44dBm	Pass
C810	GMSK	43.22dBm	Pass
	8PSK	43.52dBm	Pass

6.3.3.2.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.48dBm	Pass
	8PSK	39.53dBm	Pass
C661	GMSK	39.89dBm	Pass
	8PSK	39.95dBm	Pass
C810	GMSK	39.80dBm	Pass
	8PSK	39.86dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.88dBm	Pass
	8PSK	43.01dBm	Pass
C661	GMSK	43.27dBm	Pass
	8PSK	43.42dBm	Pass
C810	GMSK	43.21dBm	Pass
	8PSK	43.41dBm	Pass

6.3.3.3 TESTS AT TEMPERATURE +15 °C

6.3.3.3.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.44dBm	Pass
	8PSK	39.45dBm	Pass
C661	GMSK	39.81dBm	Pass
	8PSK	39.84dBm	Pass
C810	GMSK	39.71dBm	Pass
	8PSK	39.70dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.86dBm	Pass
	8PSK	42.97dBm	Pass
C661	GMSK	43.22dBm	Pass
	8PSK	43.23dBm	Pass
C810	GMSK	43.17dBm	Pass
	8PSK	43.35dBm	Pass

6.3.3.3.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.48dBm	Pass
	8PSK	39.54dBm	Pass
C661	GMSK	39.78dBm	Pass
	8PSK	39.92dBm	Pass
C810	GMSK	39.72dBm	Pass
	8PSK	39.78dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.86dBm	Pass
	8PSK	42.97dBm	Pass
C661	GMSK	43.22dBm	Pass
	8PSK	43.34dBm	Pass
C810	GMSK	43.16dBm	Pass
	8PSK	43.31dBm	Pass

6.3.3.4 TESTS AT TEMPERATURE +25 °C

6.3.3.4.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.42dBm	Pass
	8PSK	39.55dBm	Pass
C661	GMSK	39.80dBm	Pass
	8PSK	39.92dBm	Pass
C810	GMSK	39.72dBm	Pass
	8PSK	39.82dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.83dBm	Pass
	8PSK	42.94dBm	Pass
C661	GMSK	43.21dBm	Pass
	8PSK	43.32dBm	Pass
C810	GMSK	43.16dBm	Pass
	8PSK	43.28dBm	Pass

6.3.3.4.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.44dBm	Pass
	8PSK	39.51dBm	Pass
C661	GMSK	39.78dBm	Pass
	8PSK	39.89dBm	Pass
C810	GMSK	39.72dBm	Pass
	8PSK	39.78dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.81dBm	Pass
	8PSK	42.93dBm	Pass
C661	GMSK	43.22dBm	Pass
	8PSK	43.33dBm	Pass
C810	GMSK	43.18dBm	Pass
	8PSK	43.32dBm	Pass

6.3.3.5 TESTS AT TEMPERATURE +35 °C

6.3.3.5.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.33dBm	Pass
	8PSK	39.47dBm	Pass
C661	GMSK	39.72dBm	Pass
	8PSK	39.72dBm	Pass
C810	GMSK	39.65dBm	Pass
	8PSK	39.71dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.77dBm	Pass
	8PSK	42.92dBm	Pass
C661	GMSK	43.13dBm	Pass
	8PSK	43.24dBm	Pass
C810	GMSK	43.09dBm	Pass
	8PSK	43.25dBm	Pass

6.3.3.5.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.37dBm	Pass
	8PSK	39.47dBm	Pass
C661	GMSK	39.75dBm	Pass
	8PSK	39.85dBm	Pass
C810	GMSK	39.68dBm	Pass
	8PSK	39.70dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.75dBm	Pass
	8PSK	42.90dBm	Pass
C661	GMSK	43.13dBm	Pass
	8PSK	43.23dBm	Pass
C810	GMSK	43.09dBm	Pass
	8PSK	42.86dBm	Pass

6.3.3.6 TESTS AT TEMPERATURE +45 °C

6.3.3.6.1 MEAN RF POWER @ -40VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.33dBm	Pass
	8PSK	39.40dBm	Pass
C661	GMSK	39.72dBm	Pass
	8PSK	39.81dBm	Pass
C810	GMSK	39.64dBm	Pass
	8PSK	39.68dBm	Pass

- **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.74dBm	Pass
	8PSK	42.84dBm	Pass
C661	GMSK	43.13dBm	Pass
	8PSK	43.23dBm	Pass
C810	GMSK	43.08dBm	Pass
	8PSK	43.19dBm	Pass

6.3.3.6.2 MEAN RF POWER @ -57VDC

- **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	39.37dBm	Pass
	8PSK	39.41dBm	Pass
C661	GMSK	39.73dBm	Pass
	8PSK	39.81dBm	Pass
C810	GMSK	39.66dBm	Pass
	8PSK	39.68dBm	Pass

- **Diplexer configuration:**

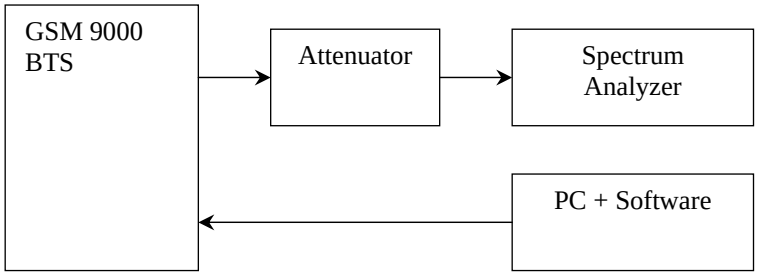
ARFCN	Modulation	Mean Power	Sanction
C510	GMSK	42.74dBm	Pass
	8PSK	42.82dBm	Pass
C661	GMSK	43.13dBm	Pass
	8PSK	43.24dBm	Pass
C810	GMSK	43.09dBm	Pass
	8PSK	43.22dBm	Pass

6.4 NAME OF TEST: PHASE AND MEAN FREQUENCY ERROR

6.4.1 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 at least 26 dB below the transmitter power.

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 C512 (B), C661 (M), & C810 (T).

6.4.3 TEST RESULTS

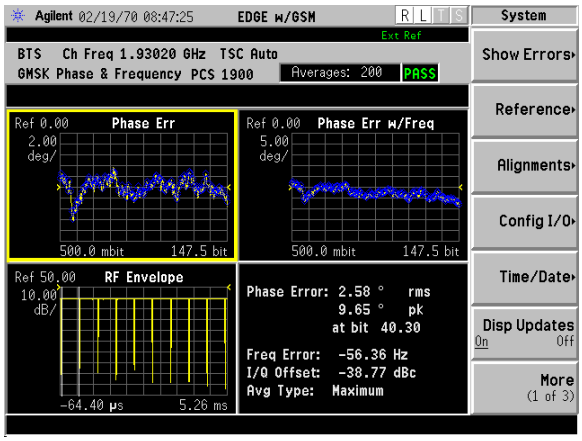
The Table shows the test results of Phase and Mean Frequency for **GMSK** modulation with several coupling configurations:

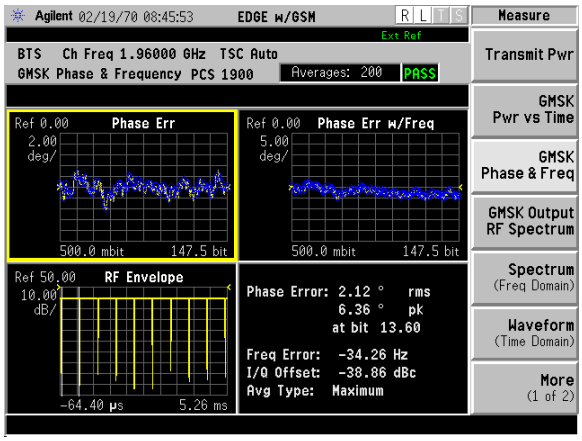
6.4.3.1 TESTS AT TEMPERATURE -5 °C

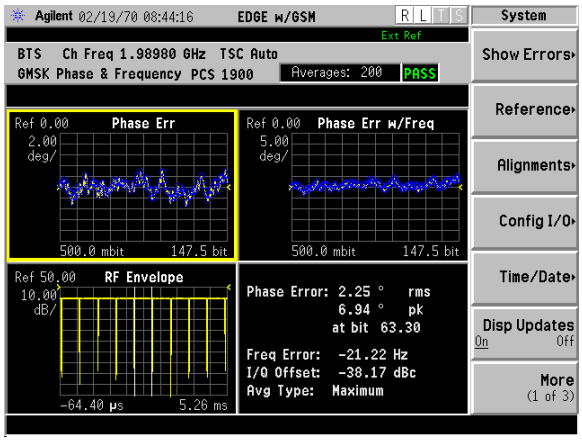
6.4.3.1.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase PK	2.58	Pass
	Phase RMS	9.65	Pass
	Freq. Error	-56.36	Pass
M	Phase PK	2.12	Pass
	Phase RMS	6.36	Pass
	Freq. Error	-34.26	Pass
T	Phase PK	2.25	Pass
	Phase RMS	6.94	Pass
	Freq. Error	-21.22	Pass

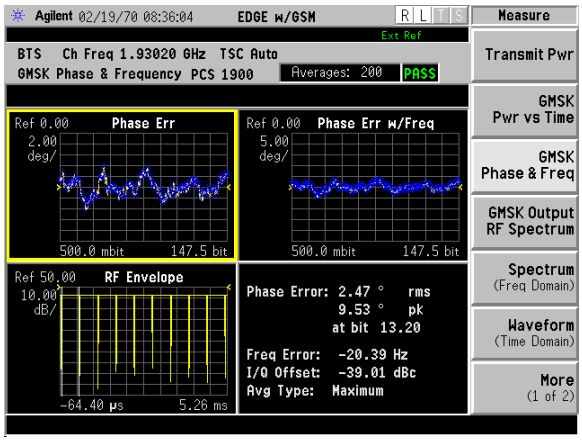


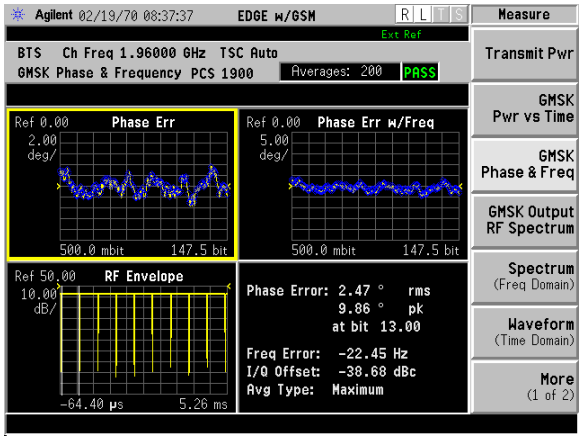


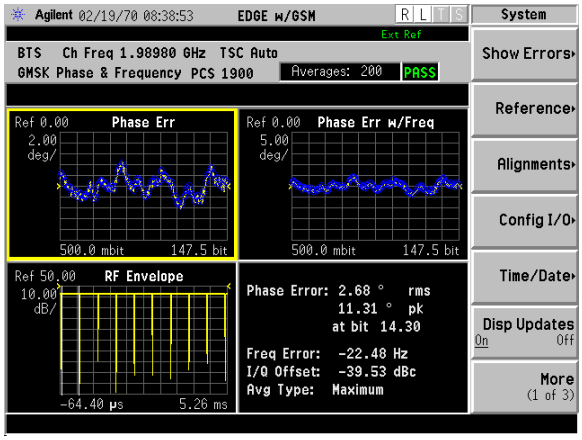


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.47	Pass
	Phase PK	9.53	Pass
	Freq. Error	-20.39	Pass
M	Phase RMS	2.47	Pass
	Phase PK	9.86	Pass
	Freq. Error	-22.45	Pass
T	Phase RMS	2.68	Pass
	Phase PK	11.31	Pass
	Freq. Error	-22.48	Pass



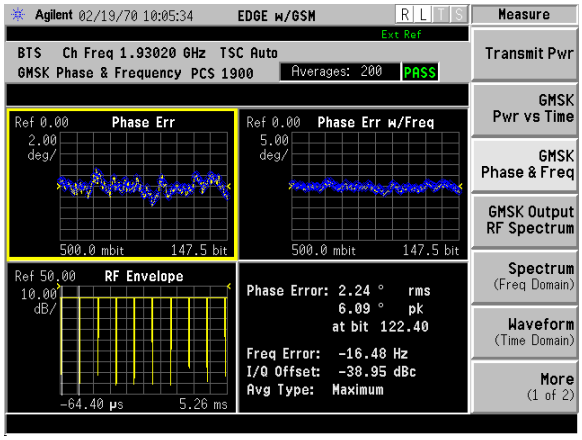


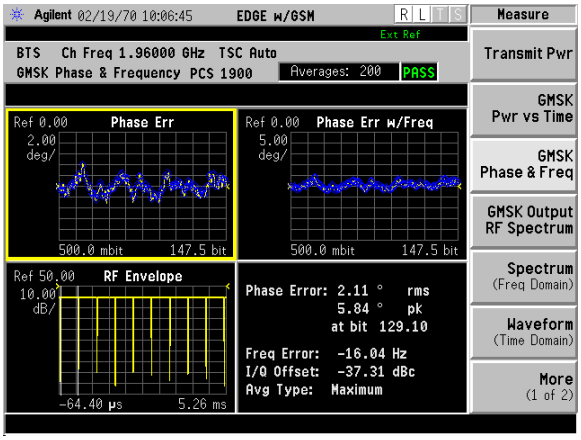


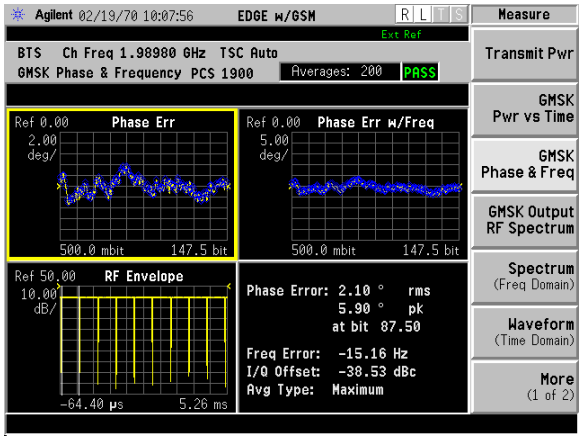
6.4.3.1.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.24	Pass
	Phase PK	6.09	Pass
	Freq. Error	-16.48	Pass
M	Phase RMS	2.11	Pass
	Phase PK	5.84	Pass
	Freq. Error	-16.84	Pass
T	Phase RMS	2.10	Pass
	Phase PK	5.90	Pass
	Freq. Error	-15.16	Pass

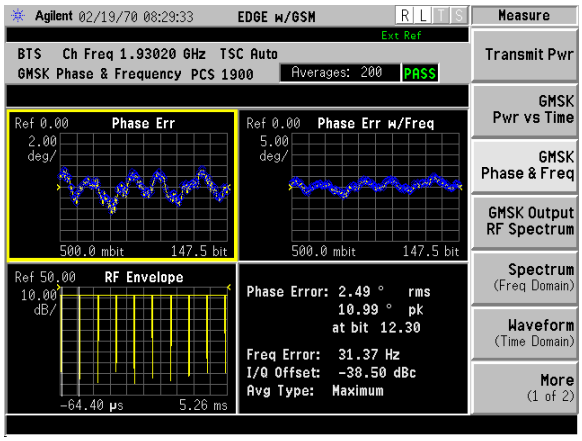


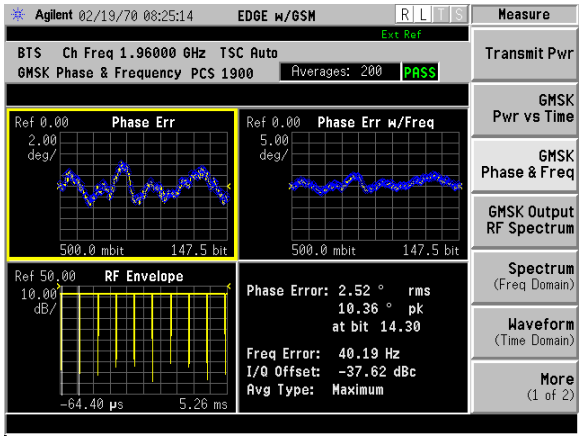


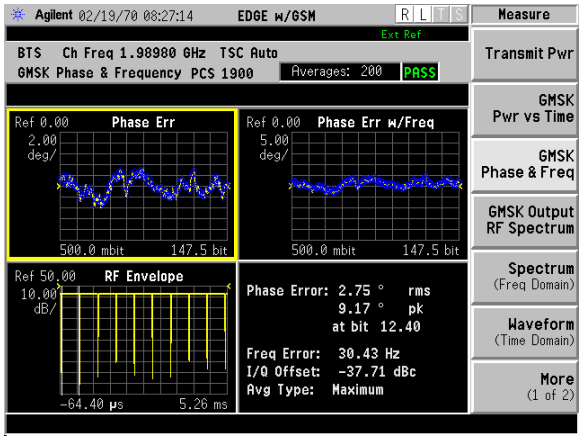


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.49	Pass
	Phase PK	10.99	Pass
	Freq. Error	31.37	Pass
M	Phase RMS	2.52	Pass
	Phase PK	10.36	Pass
	Freq. Error	40.19	Pass
T	Phase RMS	2.75	Pass
	Phase PK	9.17	Pass
	Freq. Error	30.43	Pass





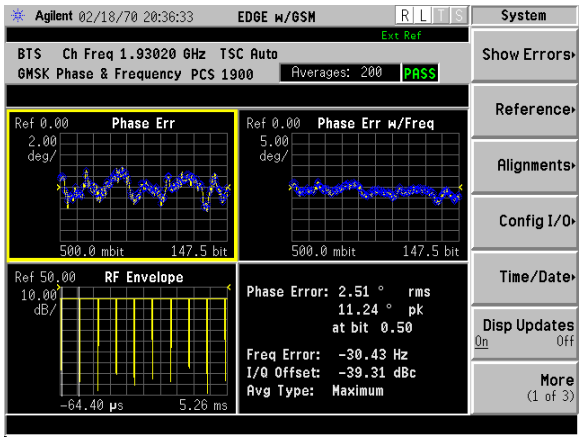


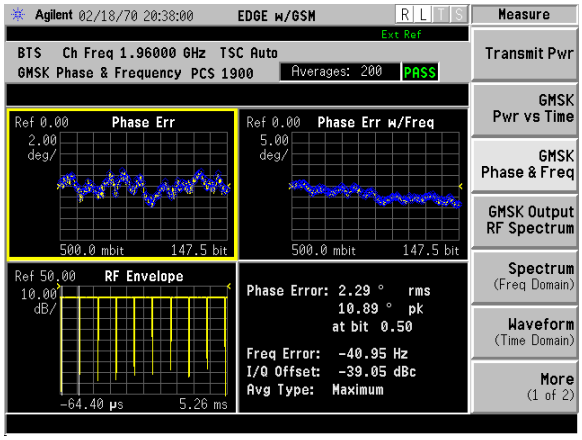
6.4.3.2 TESTS AT TEMPERATURE +5 °C

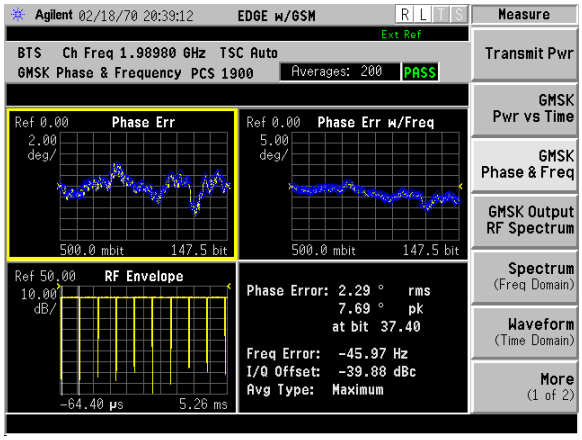
6.4.3.2.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.51	Pass
	Phase PK	11.24	Pass
	Freq. Error	-30.43	Pass
M	Phase RMS	2.29	Pass
	Phase PK	10.89	Pass
	Freq. Error	-40.95	Pass
T	Phase RMS	2.29	Pass
	Phase PK	7.69	Pass
	Freq. Error	-45.97	Pass

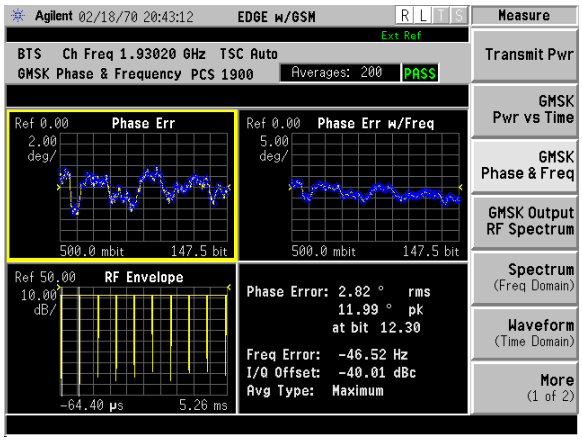


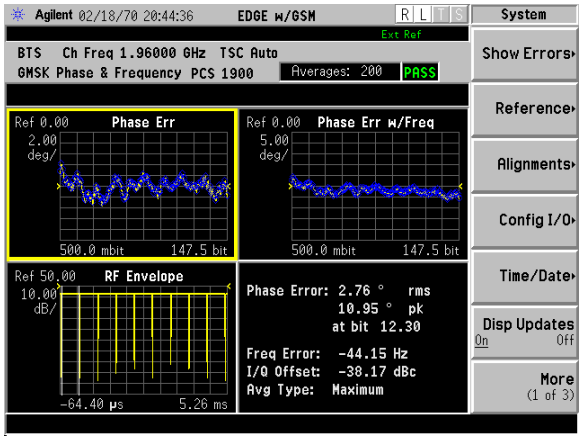


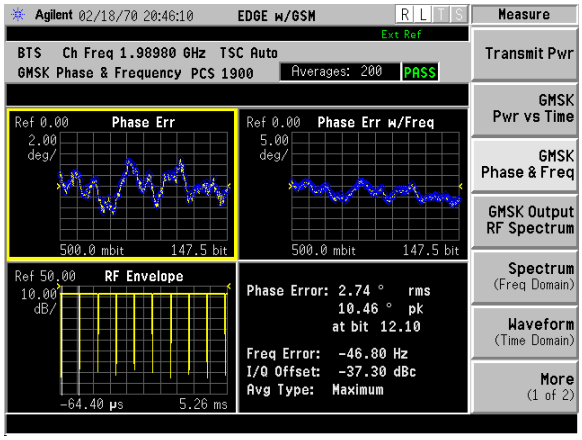


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.82	Pass
	Phase PK	11.99	Pass
	Freq. Error	-46.52	Pass
M	Phase RMS	2.76	Pass
	Phase PK	10.95	Pass
	Freq. Error	-44.15	Pass
T	Phase RMS	2.74	Pass
	Phase PK	10.46	Pass
	Freq. Error	-46.80	Pass



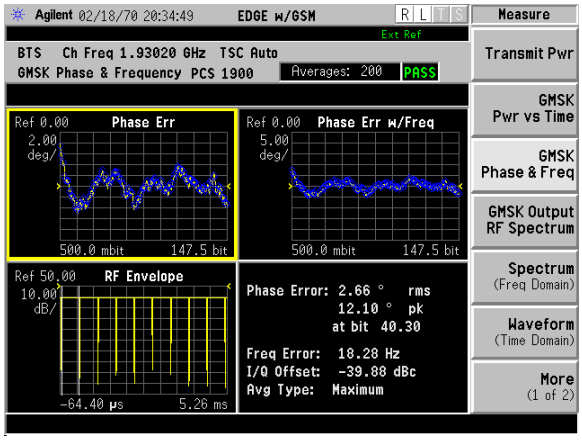


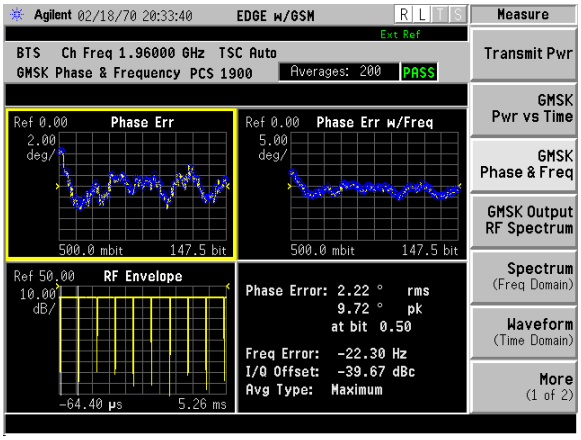


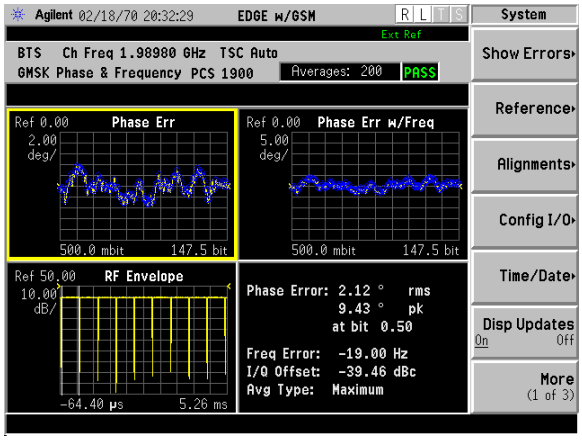
6.4.3.2.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.66	Pass
	Phase PK	12.10	Pass
	Freq. Error	18.28	Pass
M	Phase RMS	2.22	Pass
	Phase PK	9.72	Pass
	Freq. Error	-22.30	Pass
T	Phase RMS	2.12	Pass
	Phase PK	9.43	Pass
	Freq. Error	-19.00	Pass

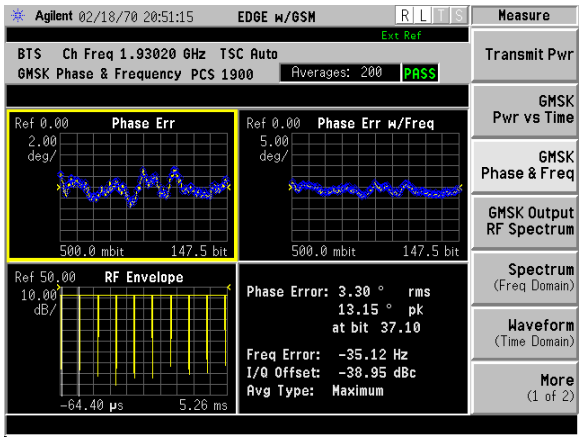


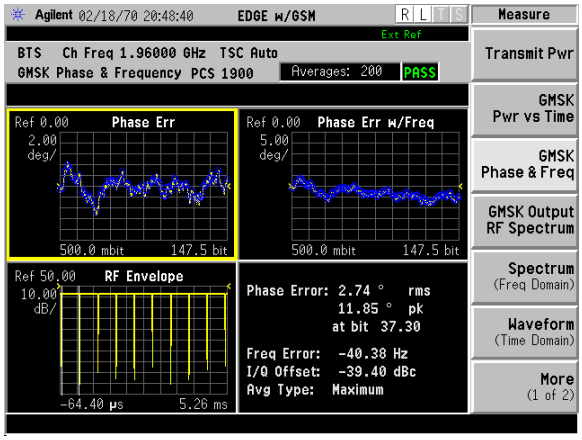


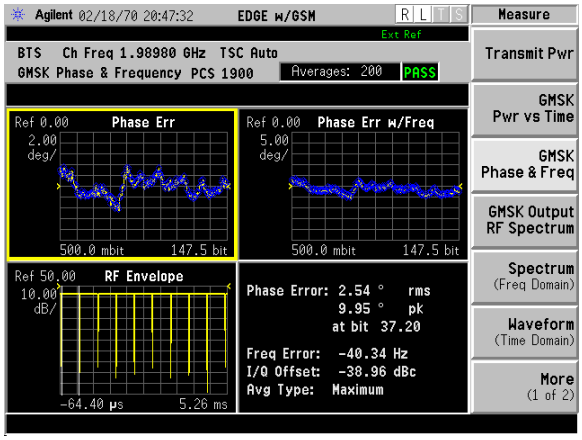


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	3.30	Pass
	Phase PK	13.15	Pass
	Freq. Error	-35.12	Pass
M	Phase RMS	2.74	Pass
	Phase PK	11.85	Pass
	Freq. Error	-40.38	Pass
T	Phase RMS	2.54	Pass
	Phase PK	9.95	Pass
	Freq. Error	-40.34	Pass





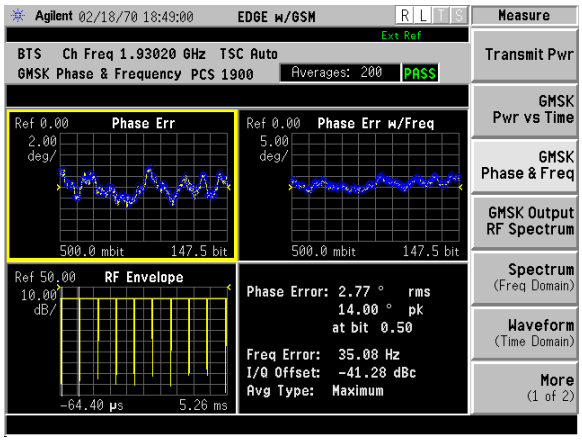


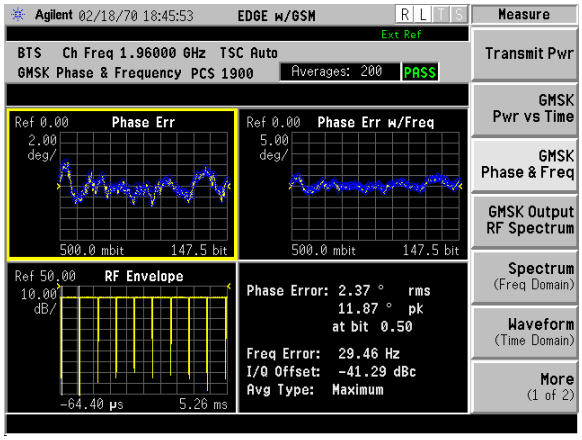
6.4.3.3 TESTS AT TEMPERATURE +15 °C

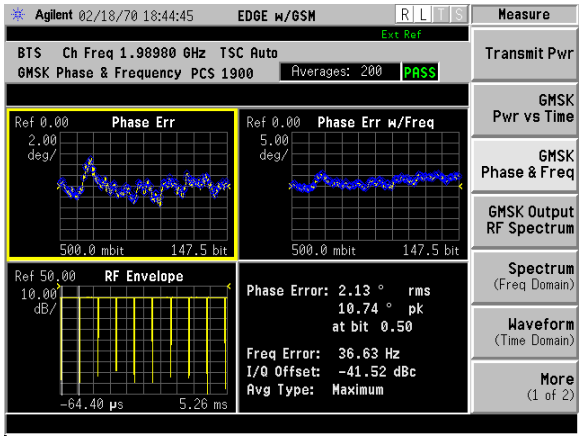
6.4.3.3.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.77	Pass
	Phase PK	14.00	Pass
	Freq. Error	35.08	Pass
M	Phase RMS	2.37	Pass
	Phase PK	11.87	Pass
	Freq. Error	29.46	Pass
T	Phase RMS	2.13	Pass
	Phase PK	10.74	Pass
	Freq. Error	36.63	Pass

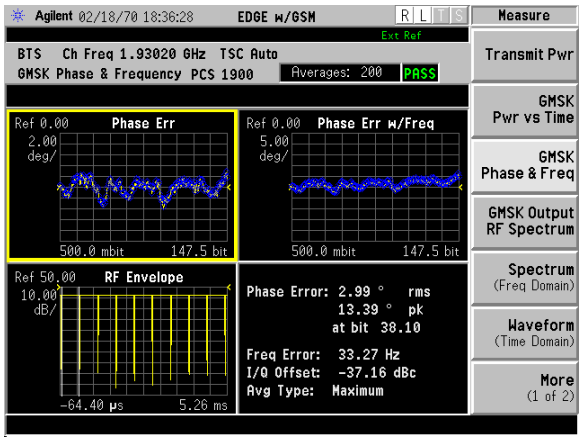


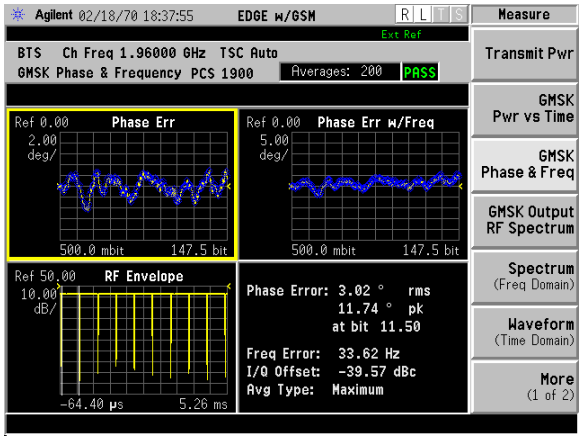


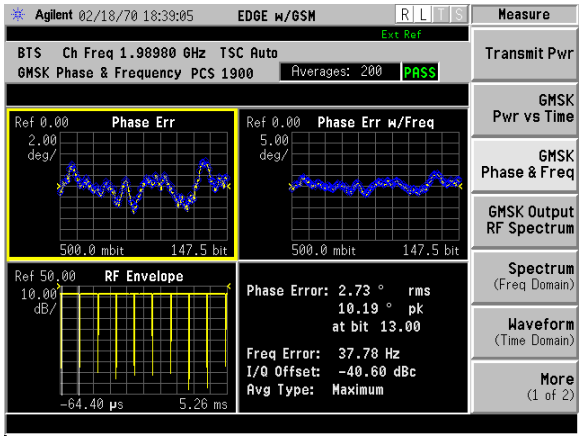


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.99	Pass
	Phase PK	13.39	Pass
	Freq. Error	33.27	Pass
M	Phase RMS	3.02	Pass
	Phase PK	11.74	Pass
	Freq. Error	33.62	Pass
T	Phase RMS	2.73	Pass
	Phase PK	10.19	Pass
	Freq. Error	37.78	Pass



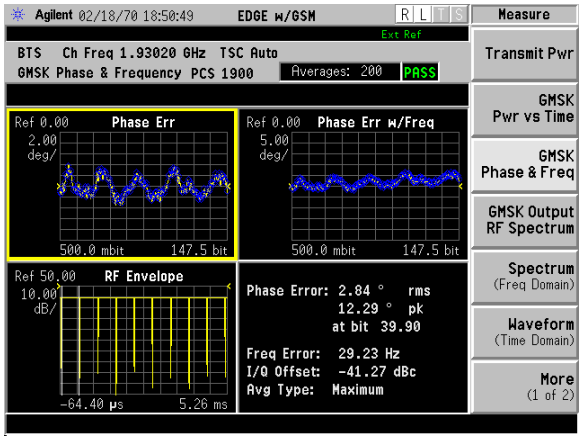


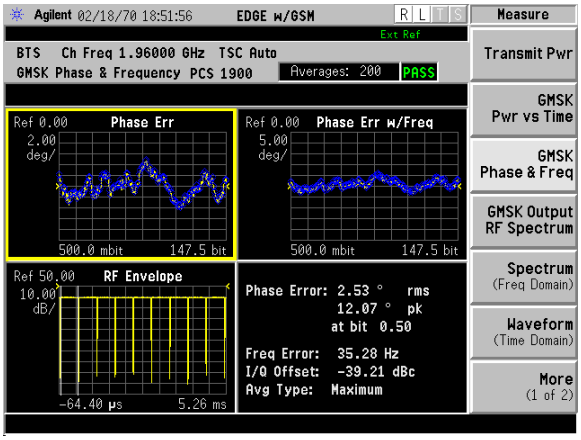


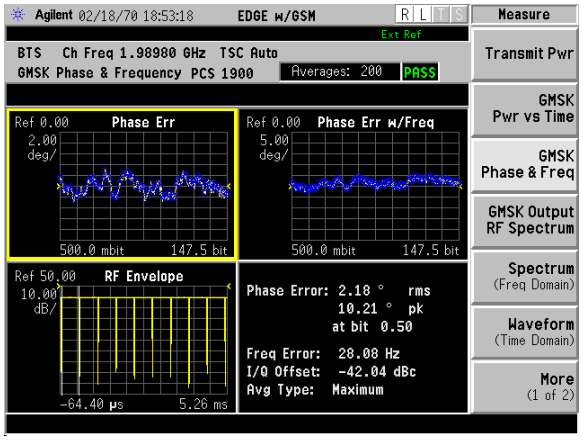
6.4.3.3.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.84	Pass
	Phase PK	12.29	Pass
	Freq. Error	29.23	Pass
M	Phase RMS	2.53	Pass
	Phase PK	12.07	Pass
	Freq. Error	35.28	Pass
T	Phase RMS	2.18	Pass
	Phase PK	10.21	Pass
	Freq. Error	28.08	Pass

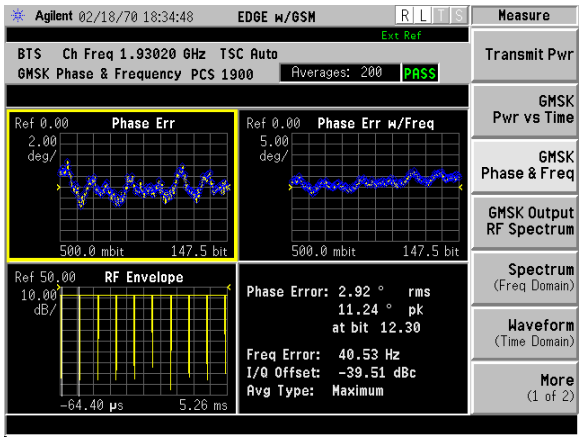


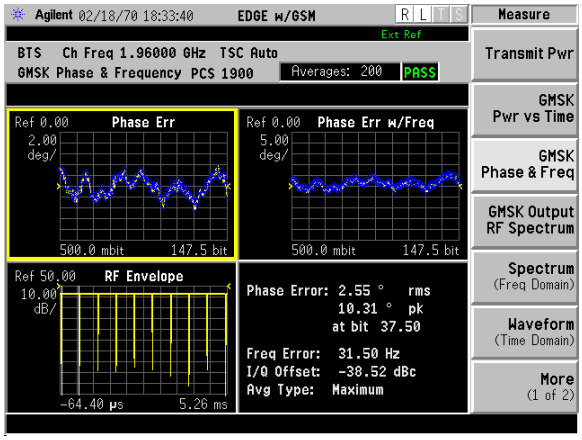


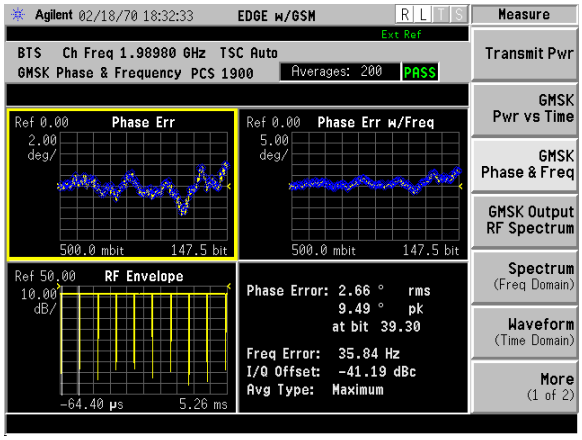


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.92	Pass
	Phase PK	11.24	Pass
	Freq. Error	40.53	Pass
M	Phase RMS	2.55	Pass
	Phase PK	10.31	Pass
	Freq. Error	31.50	Pass
T	Phase RMS	2.66	Pass
	Phase PK	9.49	Pass
	Freq. Error	35.84	Pass





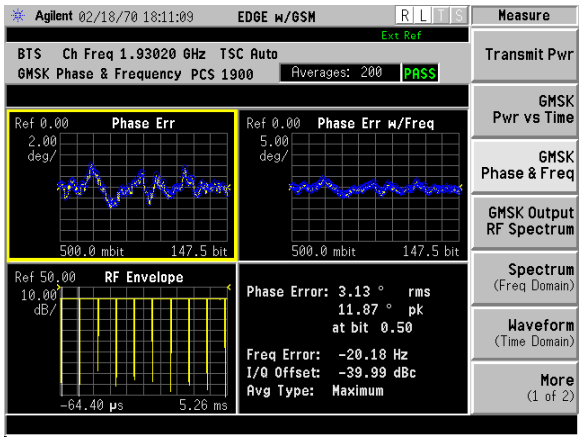


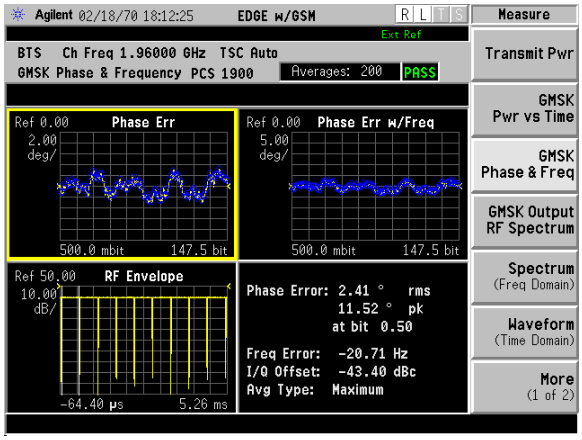
6.4.3.4 TESTS AT TEMPERATURE +25 °C

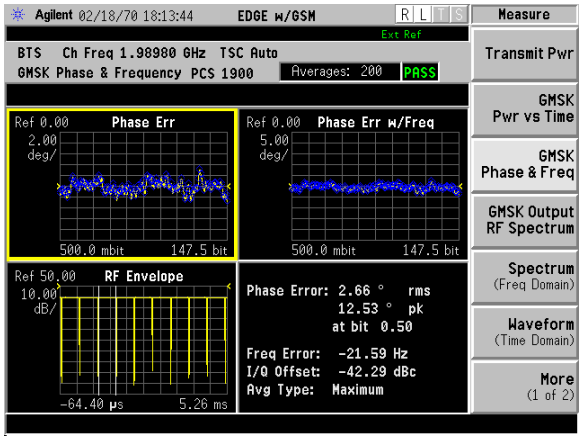
6.4.3.4.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	3.13	Pass
	Phase PK	11.87	Pass
	Freq. Error	-20.18	Pass
M	Phase RMS	2.41	Pass
	Phase PK	11.52	Pass
	Freq. Error	-20.71	Pass
T	Phase RMS	2.66	Pass
	Phase PK	12.53	Pass
	Freq. Error	-21.59	Pass

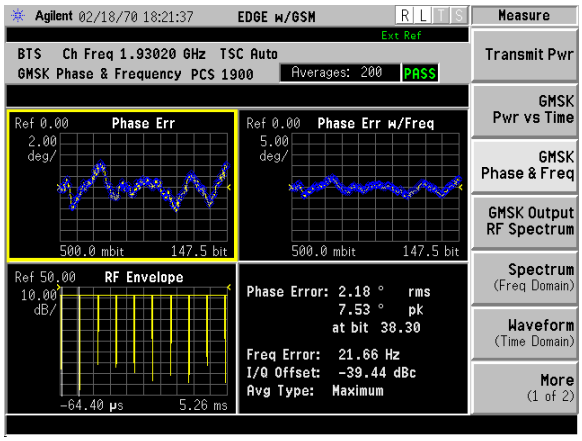


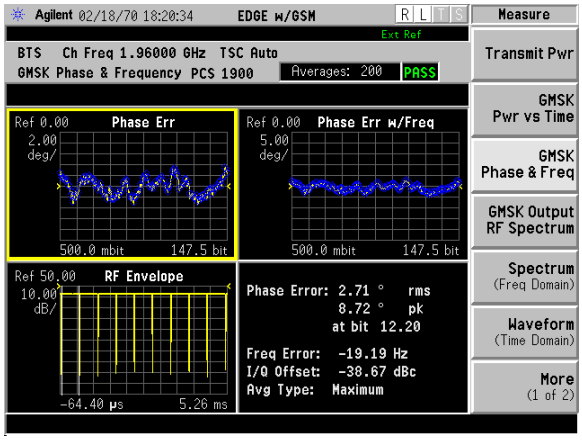


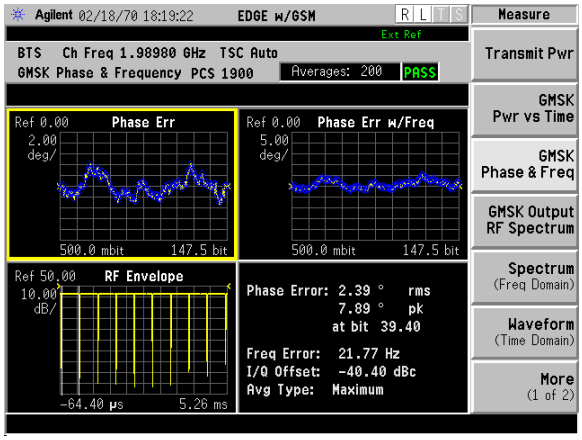


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.10	Pass
	Phase PK	7.53	Pass
	Freq. Error	21.66	Pass
M	Phase RMS	2.71	Pass
	Phase PK	8.72	Pass
	Freq. Error	-19.19	Pass
T	Phase RMS	2.39	Pass
	Phase PK	7.89	Pass
	Freq. Error	21.77	Pass



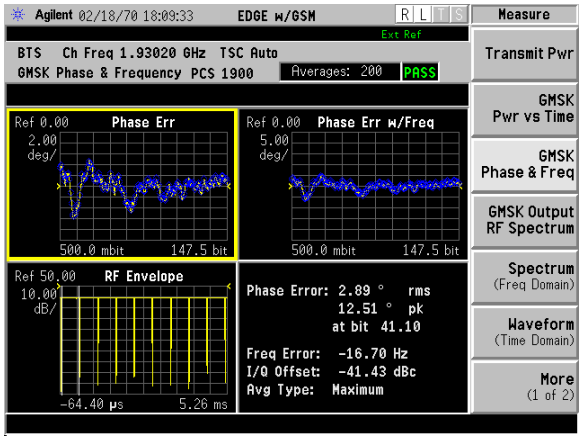


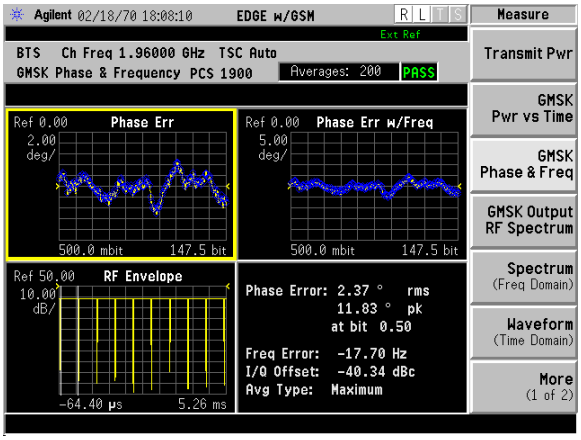


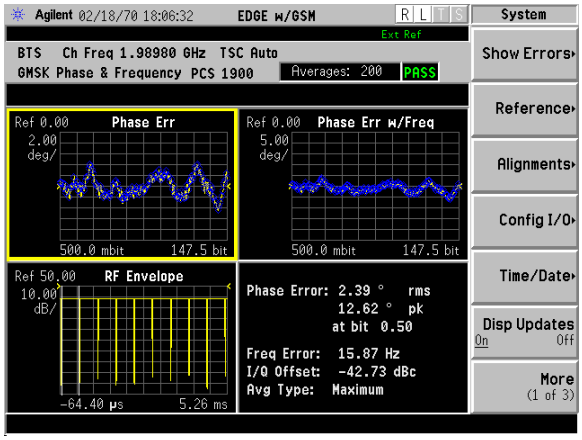
6.4.3.4.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.89	Pass
	Phase PK	12.51	Pass
	Freq. Error	-16.70	Pass
M	Phase RMS	2.37	Pass
	Phase PK	11.03	Pass
	Freq. Error	-17.70	Pass
T	Phase RMS	2.39	Pass
	Phase PK	12.62	Pass
	Freq. Error	15.87	Pass

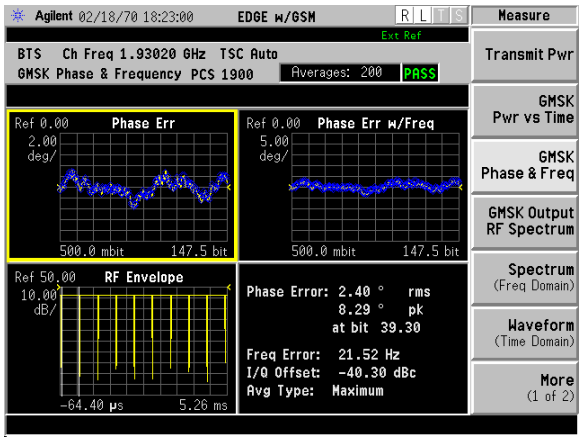


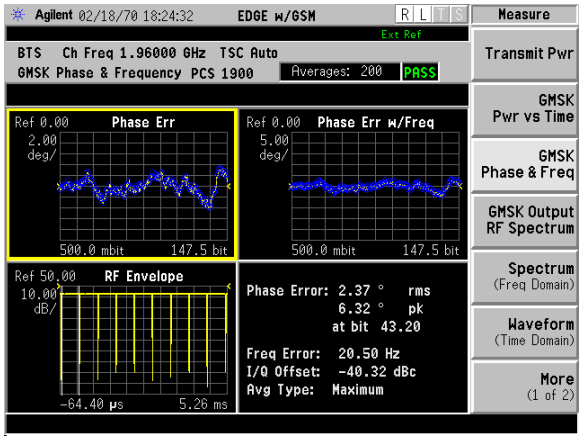


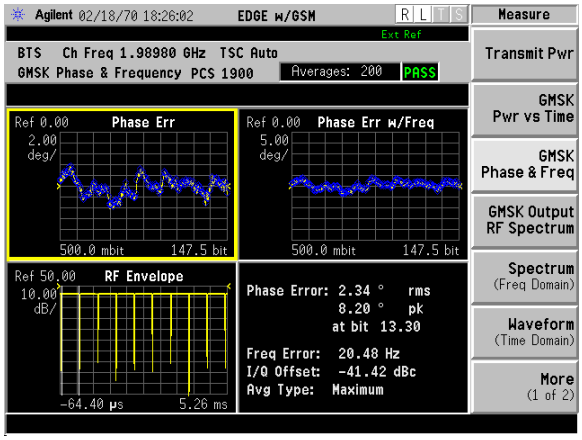


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.40	Pass
	Phase PK	8.29	Pass
	Freq. Error	21.52	Pass
M	Phase RMS	2.37	Pass
	Phase PK	6.32	Pass
	Freq. Error	20.50	Pass
T	Phase RMS	2.34	Pass
	Phase PK	8.20	Pass
	Freq. Error	20.48	Pass





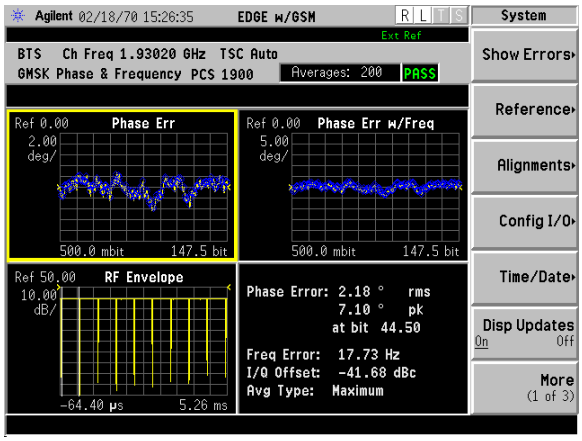


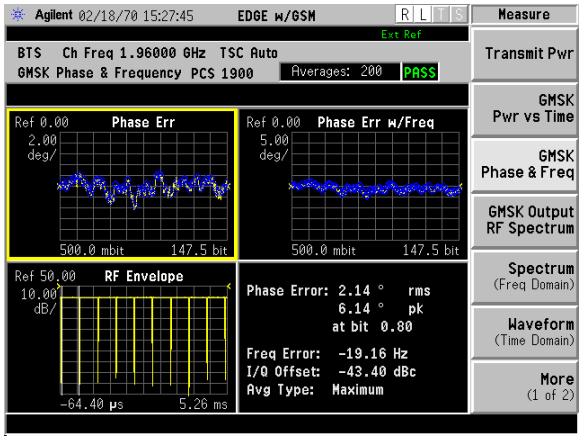
6.4.3.5 TESTS AT TEMPERATURE +35 °C

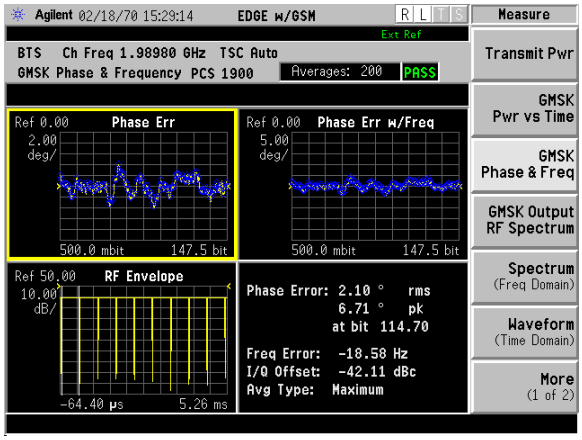
6.4.3.5.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.18	Pass
	Phase PK	7.10	Pass
	Freq. Error	17.73	Pass
M	Phase RMS	2.14	Pass
	Phase PK	6.14	Pass
	Freq. Error	-19.16	Pass
T	Phase RMS	2.10	Pass
	Phase PK	6.71	Pass
	Freq. Error	-18.58	Pass

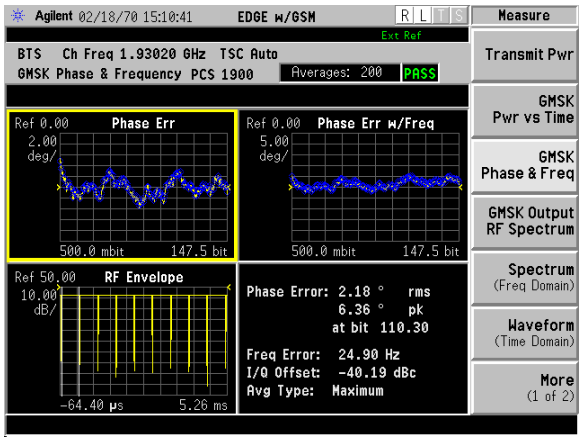


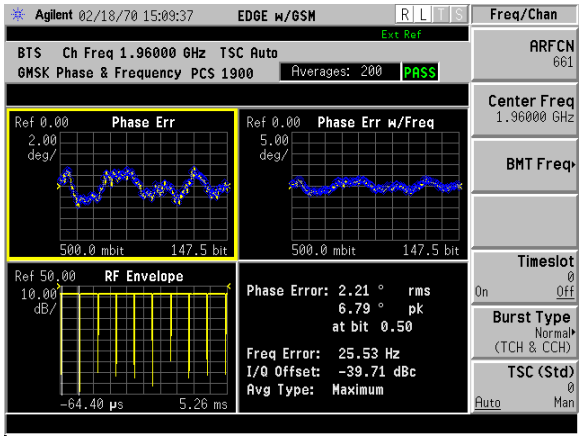


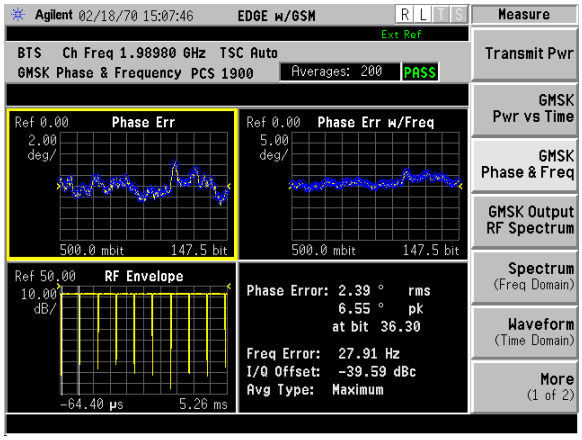


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.10	Pass
	Phase PK	6.36	Pass
	Freq. Error	24.90	Pass
M	Phase RMS	2.21	Pass
	Phase PK	6.79	Pass
	Freq. Error	25.53	Pass
T	Phase RMS	2.30	Pass
	Phase PK	6.55	Pass
	Freq. Error	27.91	Pass



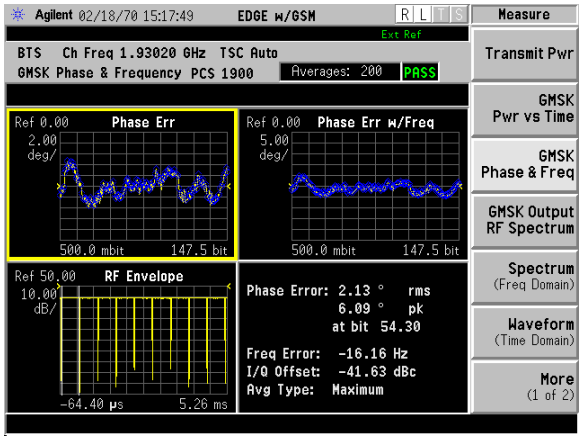


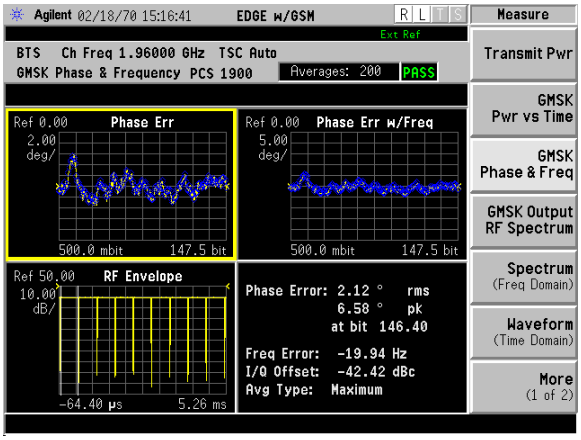


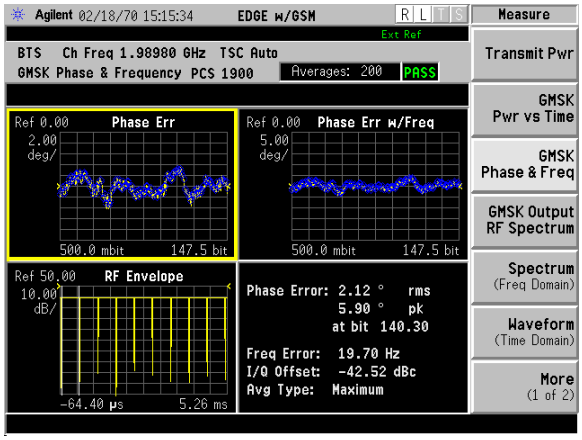
6.4.3.5.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.13	Pass
	Phase PK	6.09	Pass
	Freq. Error	-16.16	Pass
M	Phase RMS	2.12	Pass
	Phase PK	6.58	Pass
	Freq. Error	-19.94	Pass
T	Phase RMS	2.12	Pass
	Phase PK	5.90	Pass
	Freq. Error	19.70	Pass

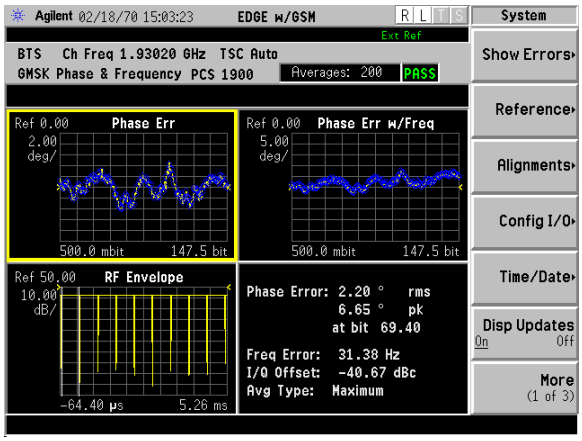


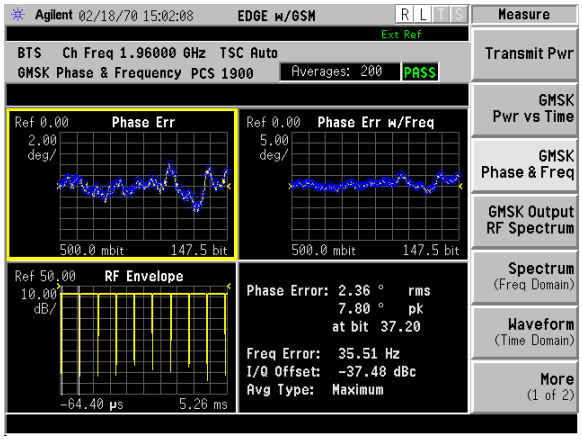


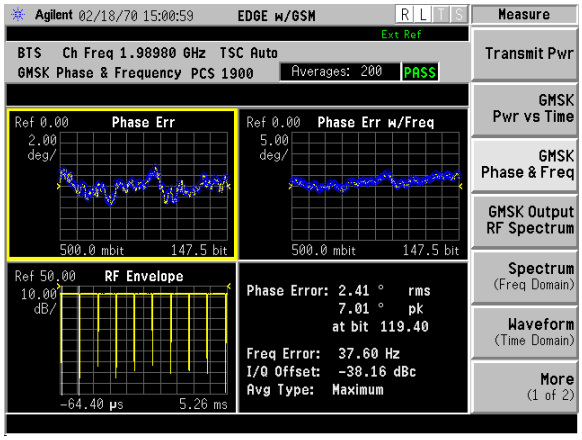


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.20	Pass
	Phase PK	6.65	Pass
	Freq. Error	31.30	Pass
M	Phase RMS	2.36	Pass
	Phase PK	7.80	Pass
	Freq. Error	35.51	Pass
T	Phase RMS	2.41	Pass
	Phase PK	7.01	Pass
	Freq. Error	37.60	Pass





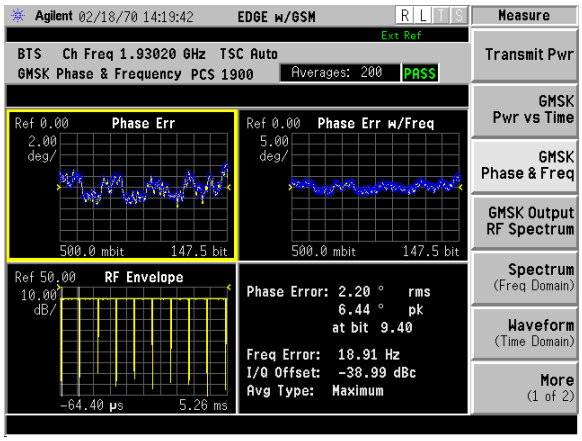


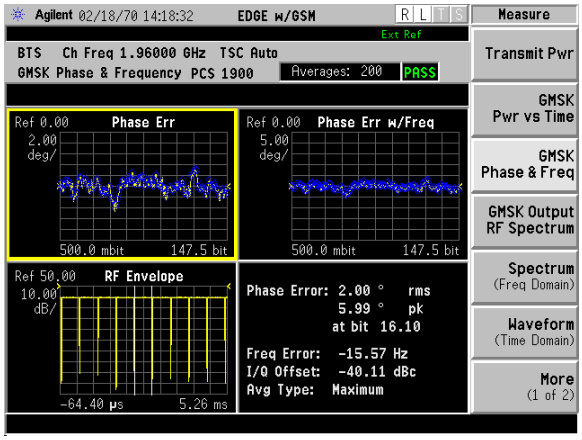
6.4.3.6 TESTS AT TEMPERATURE +45 °C

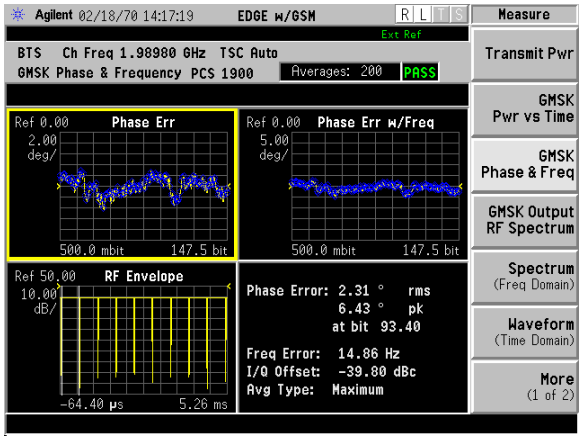
6.4.3.6.1 PHASE AND FRENQUENCY ERROR @ -40VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.20	Pass
	Phase PK	6.44	Pass
	Freq. Error	18.91	Pass
M	Phase RMS	2.00	Pass
	Phase PK	5.99	Pass
	Freq. Error	-15.57	Pass
T	Phase RMS	2.31	Pass
	Phase PK	6.43	Pass
	Freq. Error	14.86	Pass

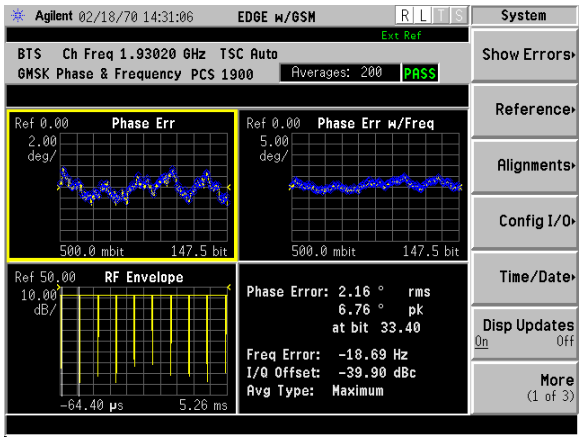


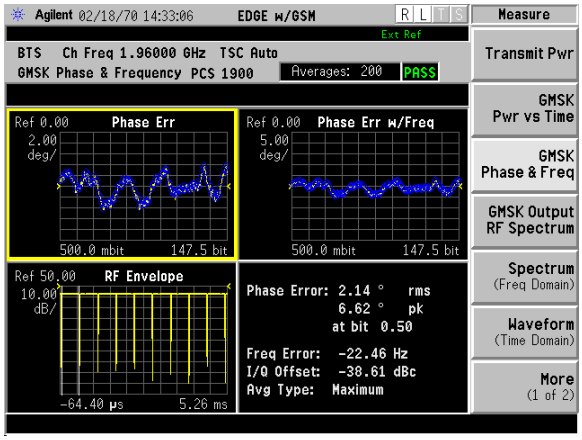


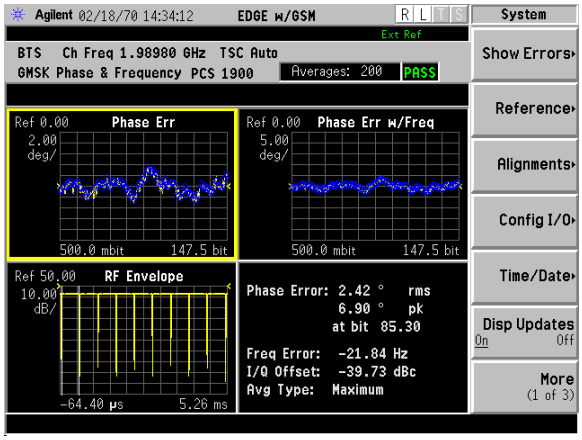


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.16	Pass
	Phase PK	6.76	Pass
	Freq. Error	-18.69	Pass
M	Phase RMS	2.14	Pass
	Phase PK	6.62	Pass
	Freq. Error	-22.46	Pass
T	Phase RMS	2.42	Pass
	Phase PK	6.90	Pass
	Freq. Error	-21.84	Pass



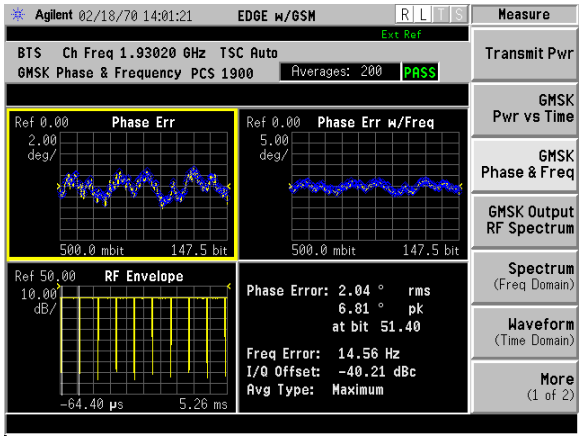


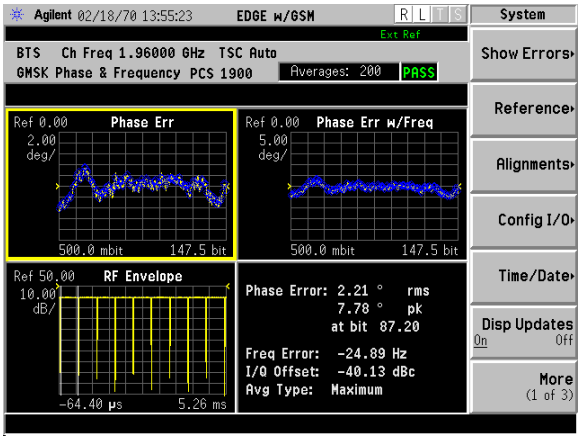


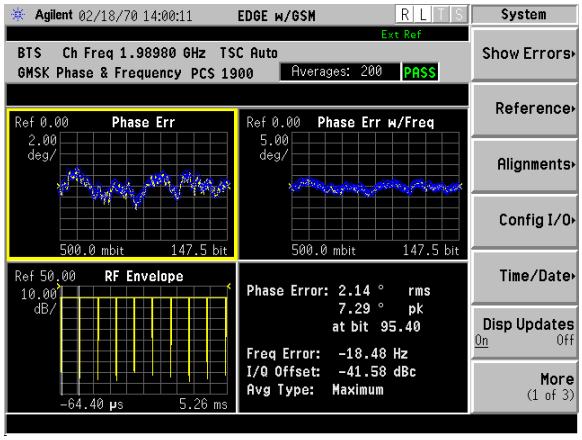
6.4.3.6.2 PHASE AND FRENQUENCY ERROR @ -57VDC

- **H2D configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.04	Pass
	Phase PK	6.81	Pass
	Freq. Error	14.56	Pass
M	Phase RMS	2.21	Pass
	Phase PK	7.70	Pass
	Freq. Error	-24.89	Pass
T	Phase RMS	2.14	Pass
	Phase PK	7.29	Pass
	Freq. Error	-18.48	Pass

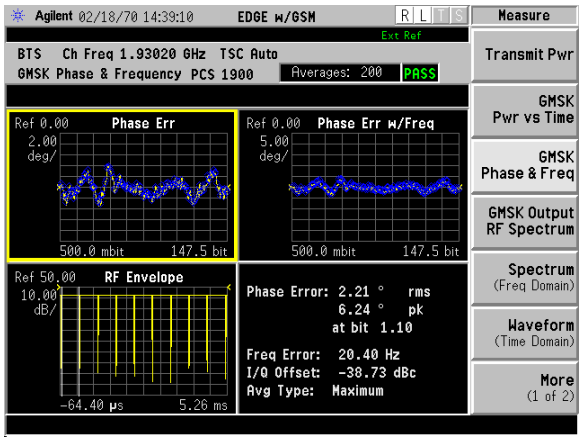


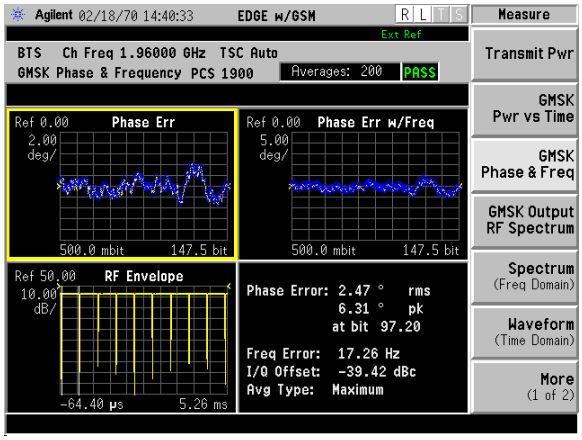


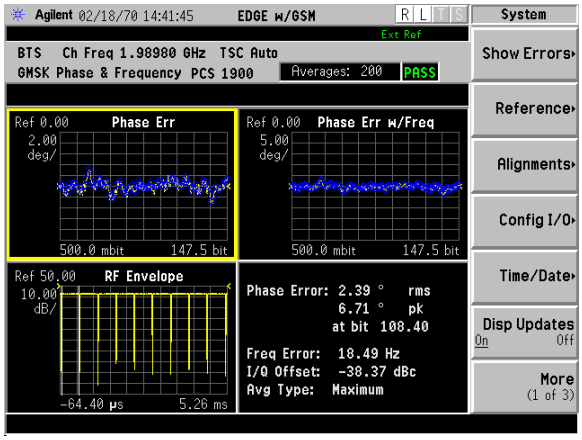


➢ **Diplexer configuration:**

CHN	Measure	Average	Sanction
B	Phase RMS	2.21	Pass
	Phase PK	6.24	Pass
	Freq. Error	20.40	Pass
M	Phase RMS	2.47	Pass
	Phase PK	6.31	Pass
	Freq. Error	17.26	Pass
T	Phase RMS	2.39	Pass
	Phase PK	6.71	Pass
	Freq. Error	18.49	Pass







6.5 NAME OF TEST: SPURIOUS EMISSION AT TERMINALS

6.5.1 FCC REQUIREMENTS LIMITS

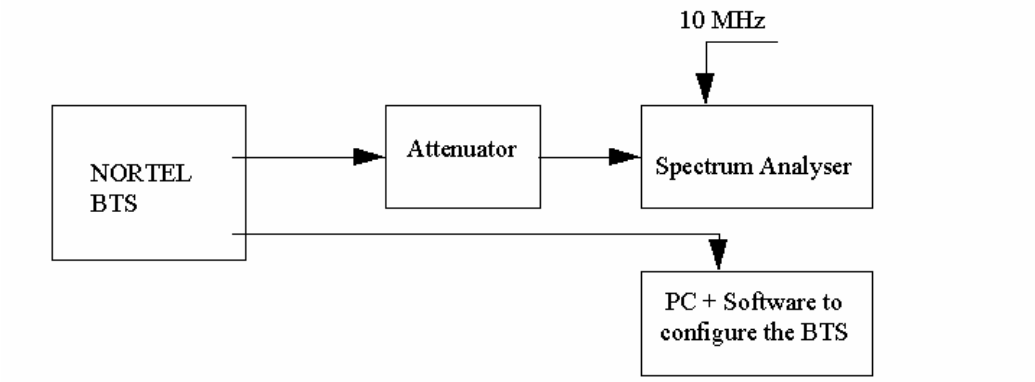
(a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB.

(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 26 dB below the transmitter power.

(c) When measuring the emission limits, the nominal carrier frequency shall be 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.

6.5.2 TEST PRICIPLE



For adjacent channels emissions, the BTS nominal carrier frequency was adjusted to each block edge channel.

Channels 512 and 810 are those channels which are at the lower and upper edges of the PCS 1900 band respectively.

The BTS was configured to transmit at maximum power (static level 0) or a reduced power:
· For GMSK modulation, in mode GMSK no synchro.
· For 8PSK modulation, in mode logical PDCH, Type GPRS, coding MCS5.

Initially the transmitter was set to operate to maximum power. Then in case of out of limits, the power has been decreased by 2 dB.

For these measurements, the resolution bandwidth was of the spectrum analyzer was set to at le ast 1% of the emission bandwidth. In this case the emission bandwidth measured was closed to 300 kHz. Therefore, the resolution bandwidth was set to 3 kHz. The spectrum analyzer had the following settings for adjacent band:

Resolution bandwidth:	3 kHz
Video bandwidth:	10 kHz
Span:	1 MHz
Reference level:	30 dBm
Reference Level Offset:	Corrected to account for cable(s), filter and attenuator losses
Level range:	100 dB
Sweep time:	Coupled
Detector:	Sample
Trace:	Average
Sweep count:	200

The spectrum analyzer had the following settings for out of block emissions.

Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz

The emissions were investigated up to the twentieth harmonic of the fundamental emission (20 GHz).
The measured level of the emissions was recorded and compared to the -13 dBm limit.

6.5.3 CONCLUSION

GSM1900 Radio Modules used with 30W Power Amplifier configuration

Radio modules PCS1900	Hardware Code	Comment
RM 30W PCS1900	NTN050PM	
PCS1900 Coupling module		
PCS1900 DDM H2	NTN063AA NTN063AM	DDM 1900 W/VSWR W/HYBRIDS DDM 1900 W/O VSWR W/HYBRIDS
PCS1900 DDM	NTN063BA NTN063BM	DDM 1900 W/VSWR W/O HYBRIDS DDM 1900 W/O VSWR W/O HYBRIDS
TXF H2D	NTN064AA NTN064AM	TX FILTER 1900 W/VSWR W/HYB TX FILTER 1900 W/O VSWR W/HYB
TXF HD	NTN064BA NTN064BM	TX FILTER 1900 W/VSWR W/O HYB TX FILTER 1900 W/O VSWR W/OHYB

Power limitation to comply to Adjacent Band spurious at antenna connector PCS1900:

BTS Antenna Power	**GMSK modulation**	**8PSK modulation**
DDM Dp configuration	43.3 dBm / 21.4W	43 dBm / 20W
DDM H2 configuration	39.8 dBm	39.9 dBm

Coupling configuration	System Power limitation GMSK modulation	System Power limitation 8 PSK modulation
DDM Duplexer Tx Filter (without H2)	Power Limitation : Pmax – 2 dB	Power Limitation : Pmax – 2 dB
DDM H2 Tx Filter H2	Pmax	Pmax

Note = For GMSK modulation, Power limitation Pmax-2dB ensures the FCC compliance to Adjacent Band spurious.

6.5.4 TEST RESULTS

➢ TEST RESULTS WITH DDM H2 CONFIGURATION

The reference level for spurious emissions at the antenna terminals is taken from the measured output power (39.8 dBm = 9.5Watts).
Therefore the spurious emissions must be attenuated by at least 43 + 10*Log (9.5) = 54 dB
The measured output power was 39.8 dBm therefore the limit is39.8 – 52.8 = -13 dBm.
Spurious measurement is performed with the DDM H2 configuration.
The Nominal power at antenna connector: $P_{GMSK\ H2}$ Max = 39.8 dBm
The Nominal power at antenna connector: $P_{8PSK\ H2}$ Max = 39.9 dBm

Table shows the result for Spurious Emission at Antenna Terminal

- **Test result for GMSK Modulation H2 Configuration**

Channel	Spurious Emission Level (dBm)				Margin (dB)
	Power Level (Pmax)	Power Level (Pmax-2)	Power Level (Pmax-4)	Power Level (Pmax-6)	
C512	-15.57				-2.57
C810	-13.67				-0.67

- **Test result for 8PSK Modulation H2 Configuration**

Channel	Spurious Emission Level (dBm)				Margin (dB)
	Power Level (Pmax)	Power Level (Pmax-2)	Power Level (Pmax-4)	Power Level (Pmax-6)	
C512	-15.08				-2.08
C810	-14.52				-1.52

➢ TEST RESULTS WITH DDM DIPLEXER CONFIGURATION

The reference level for spurious emissions at the antenna terminals is taken from the measured output power (43.3 dBm = 21.4 Watts).
Therefore the spurious emissions must be attenuated by at least 43 + 10*Log (21.4) = 56.3 dB
The measured output power was 43.3 dBm therefore the limit is 43.3 – 56.3 = -13 dBm.
Spurious measurement is performed with the DDM diplexer configuration.
The Nominal power at antenna connector: $P_{GMSK\ diplexer}$ Max = 43.3 dBm
The Nominal power at antenna connector: $P_{8PSK\ diplexer}$ Max = 43 dBm

- **Test result for GMSK Modulation HD Configuration**

Channel	Spurious Emission Level (dBm)				Margin (dB)
	Power Level (Pmax)	Power Level (Pmax-2)	Power Level (Pmax-4)	Power Level (Pmax-6)	
C512	-13.23				-0.23
C810	-14.08				-1.08

- **Test result for 8PSK Modulation HD Configuration**

Channel	Spurious Emission Level (dBm)				Margin (dB)
	Power Level (Pmax)	Power Level (Pmax-2)	Power Level (Pmax-4)	Power Level (Pmax-6)	
C512	-13.53				-0.53
C810	-13.47				-0.47

➢ **Conclusion = For PCS1900 modules under tests, the maximum emission power Pmax (GMSK&8PSK) allows to meets the FCC spurious tests compliance.**

Test result for Out of block spurious emission – Channel 810 HD Configuration

Power (dB)	Frequency MHz	Spurious Emission Level – 8PSK
Pmax	100 kHz – 50MHz	-37
	50 MHz -500 MHz	-40
	500 MHz – 1970.2 MHz	-41
	1970.2 MHz – 1974 MHz	-55
	1974 MHz – 1975 MHz	-65
	1991 MHz – 1994.8 MHz	-31
	1994.8MHz – 4 GHz	-38
	4 GHz – 8 GHz	-37
	8 GHz – 12 GHz	-38
	8 GHz – 12 GHz	-37
Margin		> 18 dB

Figure: In Band – Edge block channel – 1MHz adjacent band
GMSK Modulation –H2 configuration

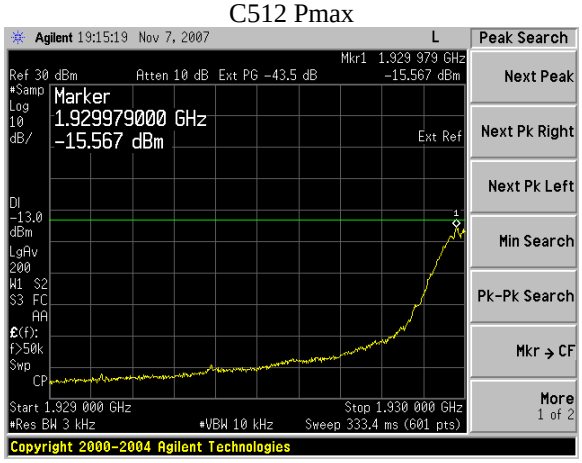
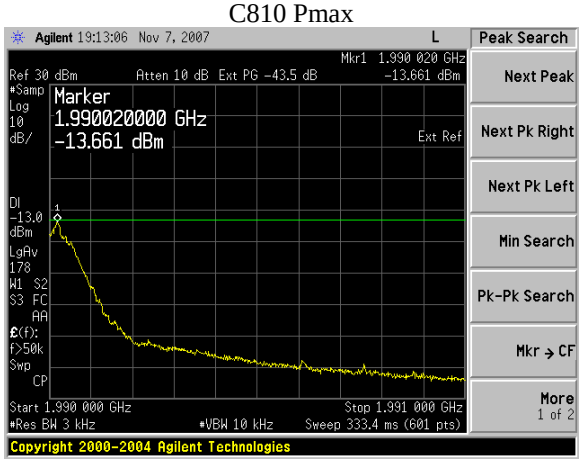
-1 MHz adjacent band	+1 MHz adjacent band
C512 Pmax	C810 Pmax
	

Figure: In Band – Edge block channel – 1MHz adjacent band
8PSK Modulation –H2 configuration

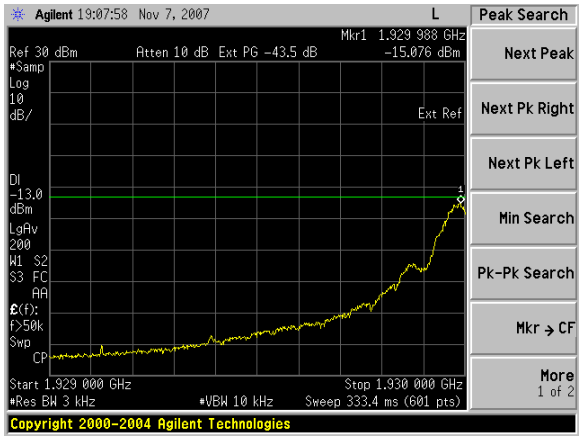
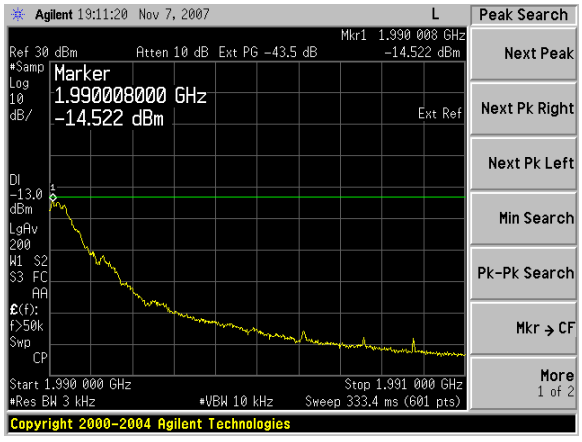
-1 MHz adjacent band	+1 MHz adjacent band
C512 Pmax	C810 Pmax
	

Figure: In Band – Edge block channel – 1MHz adjacent band
GMSK Modulation –HD configuration

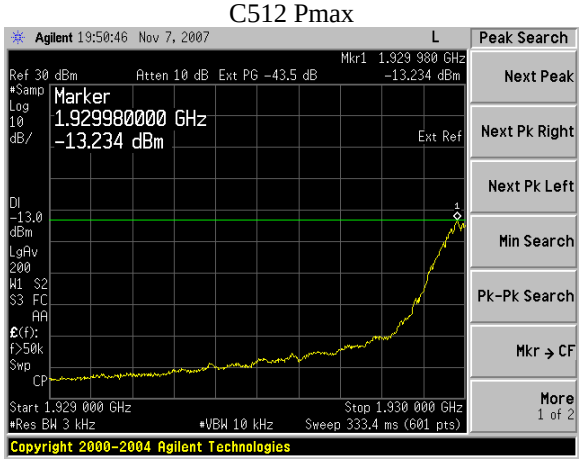
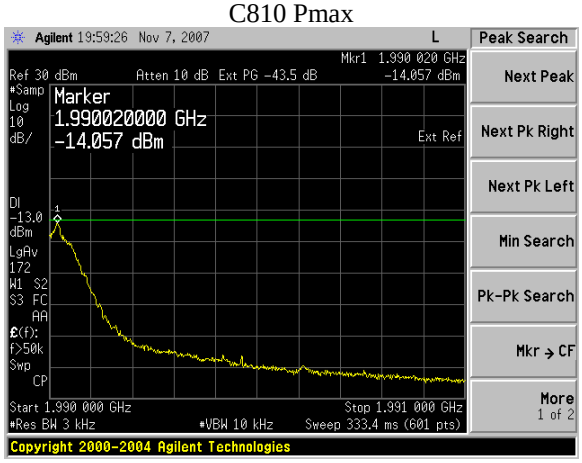
-1 MHz adjacent band	+1 MHz adjacent band
C512 Pmax	C810 Pmax
	

Figure: In Band – Edge block channel – 1MHz adjacent band
8PSK Modulation –HD configuration

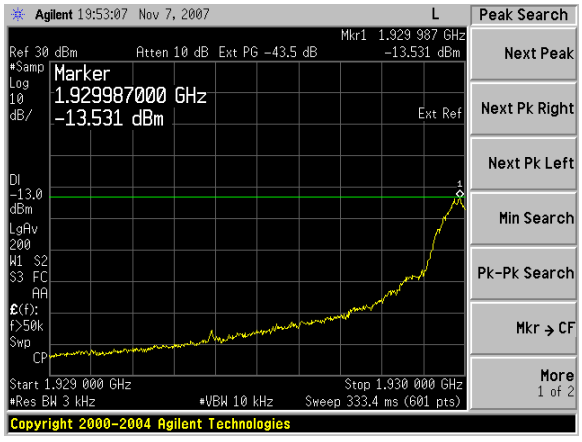
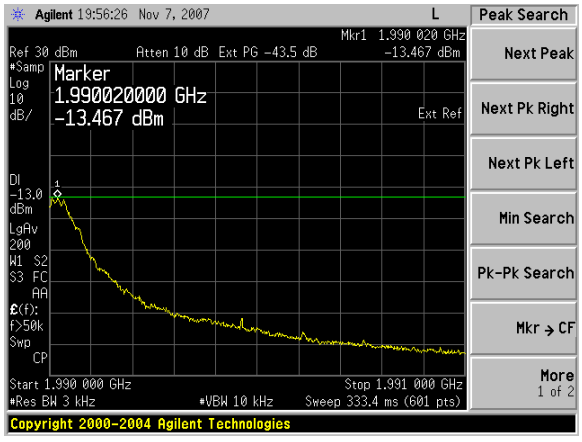
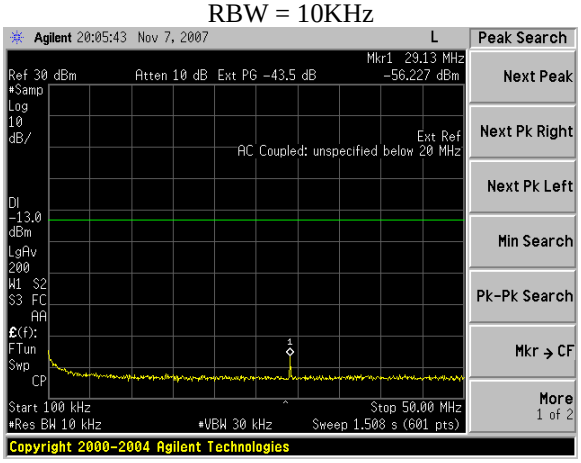
-1 MHz adjacent band	+1 MHz adjacent band
C512 Pmax	C810 Pmax
	

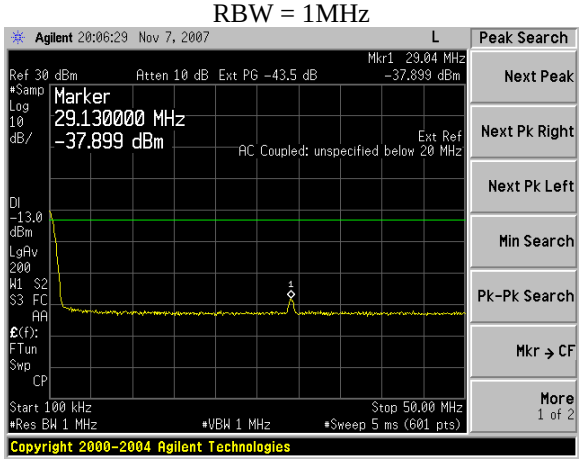
Figure: Out of block emission (Channel 810, Pmax)
8PSK Modulation – HD Configuration

Band 100 KHz – 50MHz

RBW = 10KHz

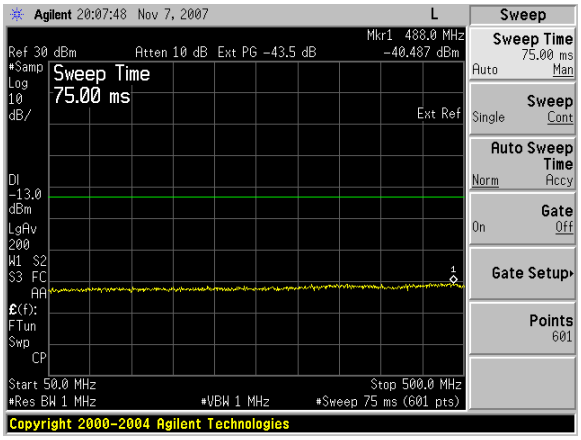


RBW = 1MHz

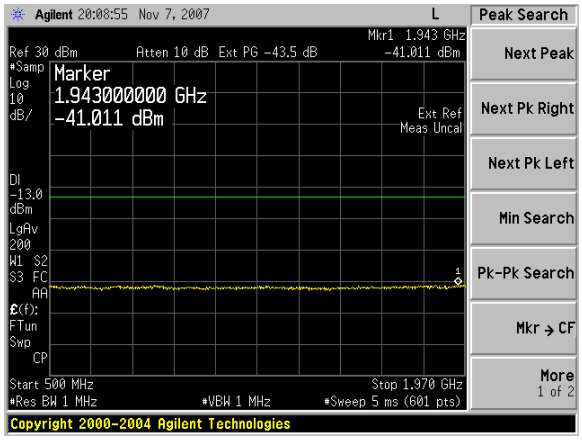


Note: spectrum line at 100KHz are internal DC spectrum line of Analyzer

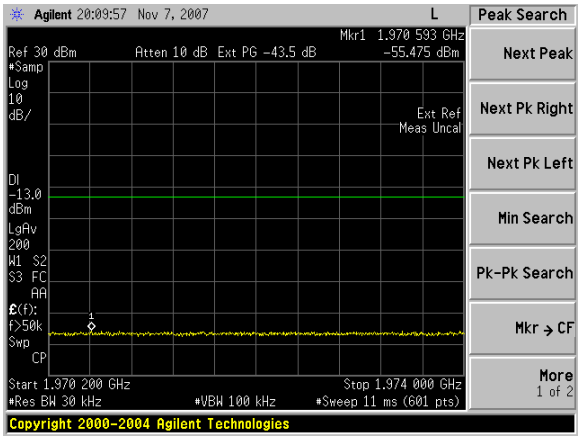
Band 50MHz – 500MHz



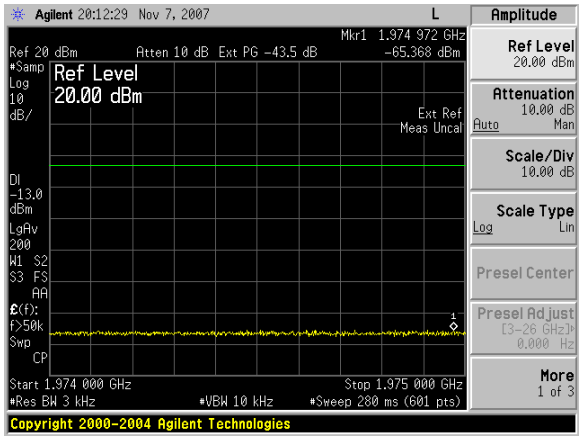
Band 500MHz – 1970.2MHz



Band 1970.2MHz – 1974 MHz

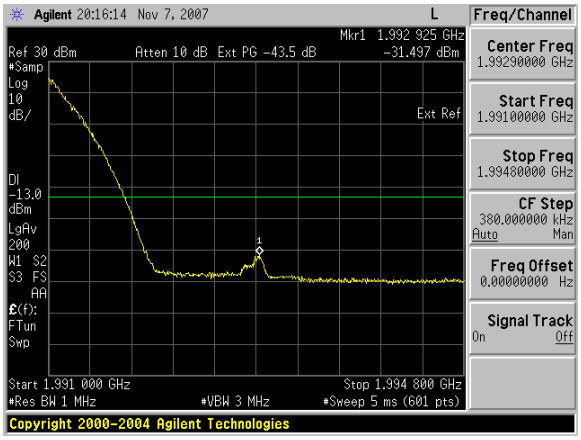


Band 1974 MHz – 1975 MHz



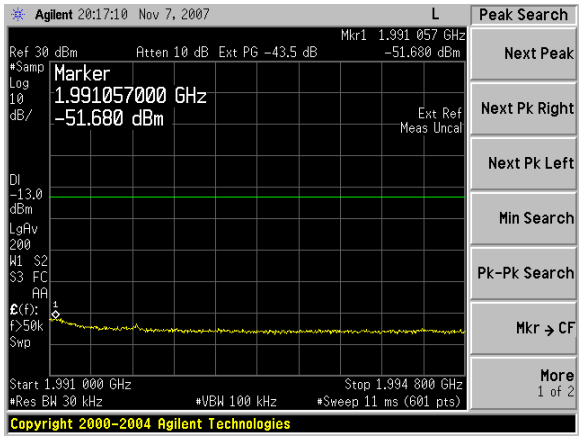
Band 1991 MHz – 1994.8MHz

RBW = 3MHz



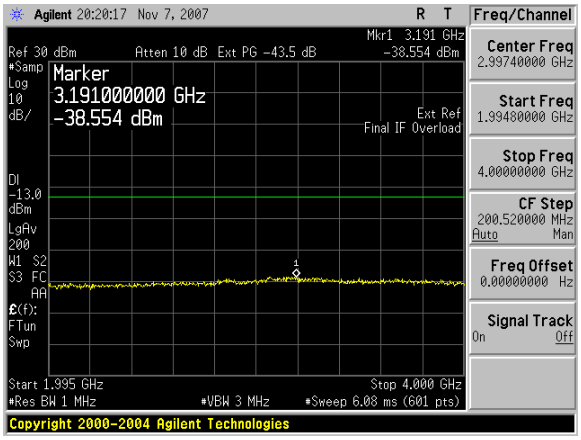
Note = Carrier (due to RBW=3MHz) appeared at 1991MHz

RBW = 100KHz

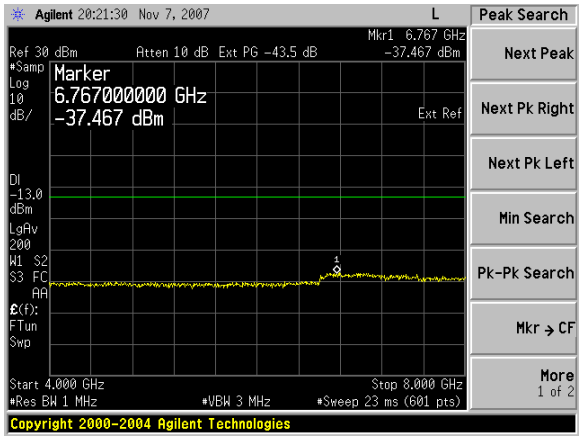


Note = No spurious for 1991-1994.8MHz

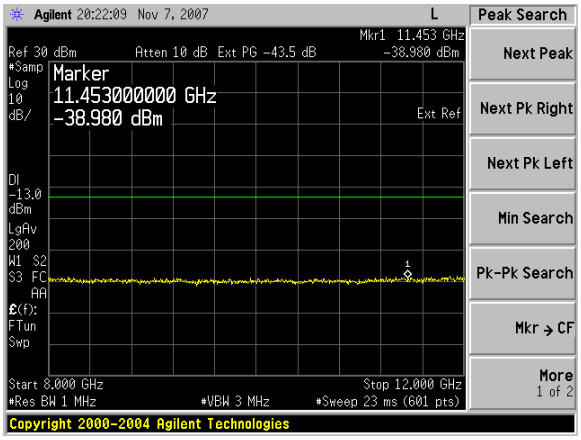
Band 1994.8MHz – 4GHz



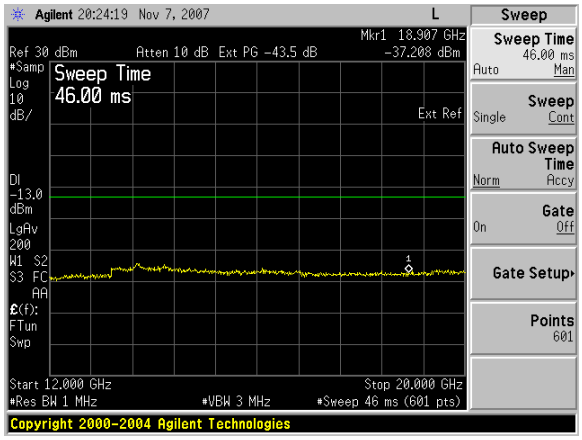
Band 4GMHz – 8GHz



Band 8GHz – 12GHz



Band 12GHz – 20GHz

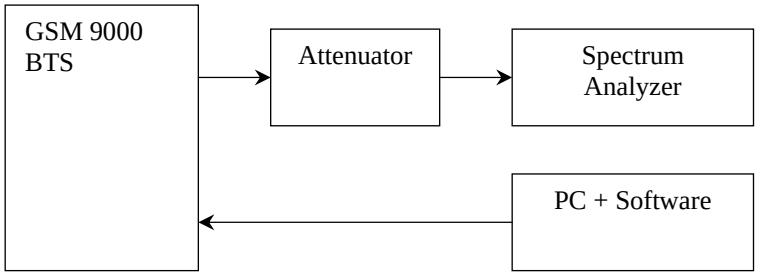


6.6 NAME OF TEST: OCCUPIED BANDWITH

6.6.1 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 at least 26 dB below the transmitter power.

6.6.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (Static Level 0). Measurements were made at frequencies which were at the bottom and top of the transmit band.

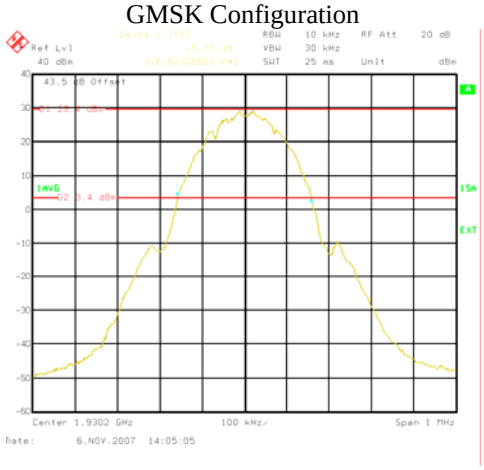
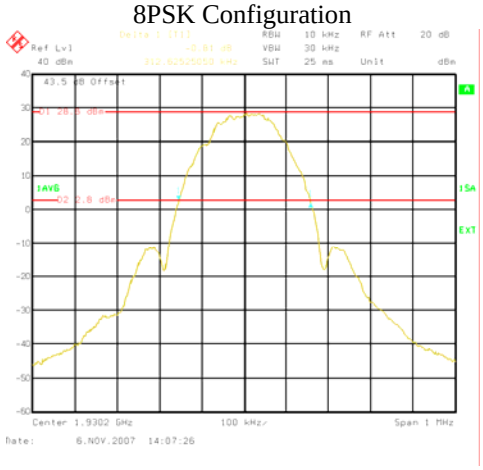
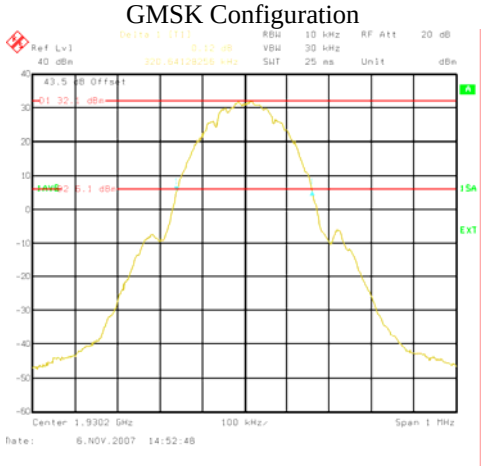
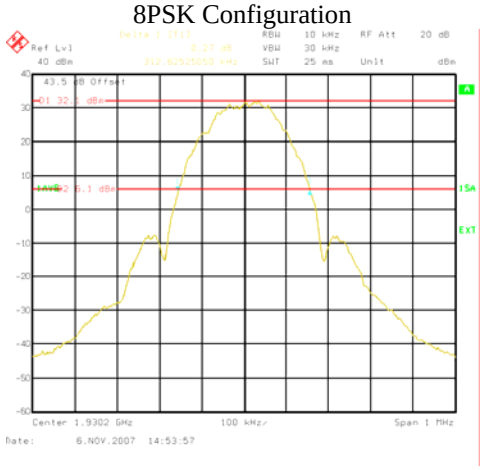
The occupied bandwidth was measured by determining the bandwidth out of which all emissions are attenuated at least 26 dB below the transmitter power.

The spectrum analyzer had the following settings:

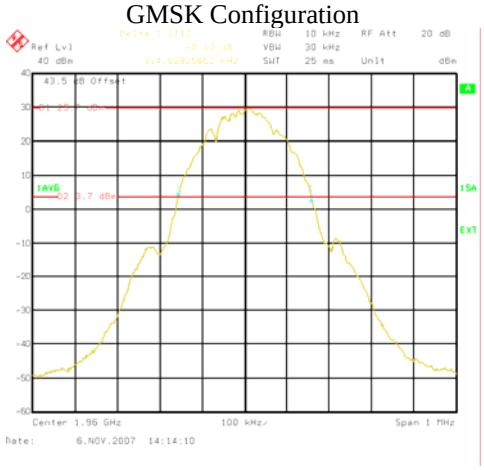
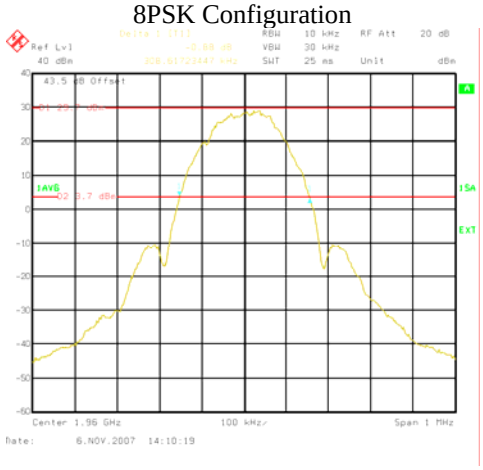
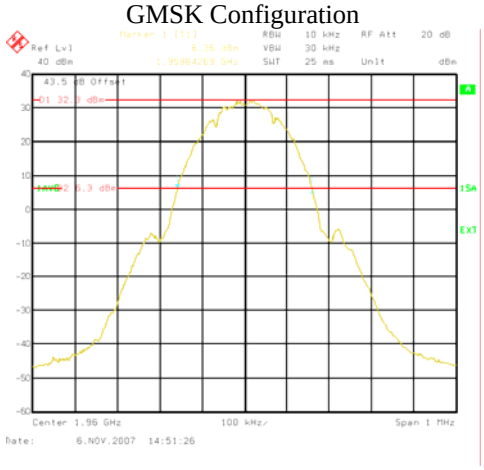
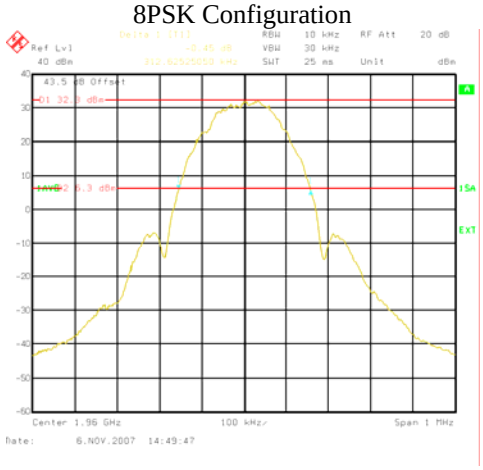
Resolution bandwidth:	10 kHz
Video bandwidth:	30 kHz
Span:	1 MHz
Reference level:	40 dBm
Reference Level Offset:	Corrected to account for cable(s) and attenuator losses
Level range:	100 dB
Sweep time:	25 ms

6.6.3 TEST RESULTS

- **Channel B**

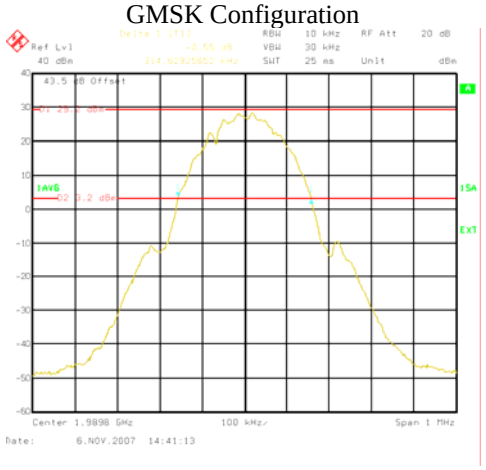
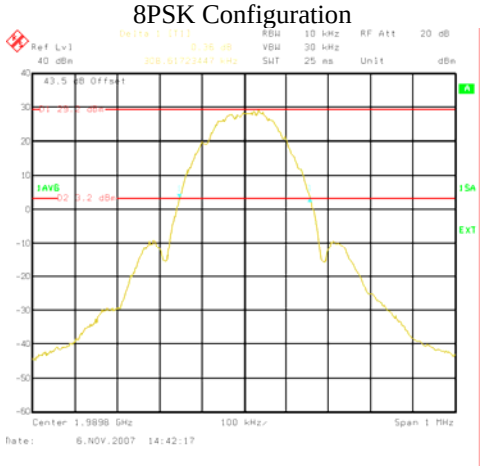
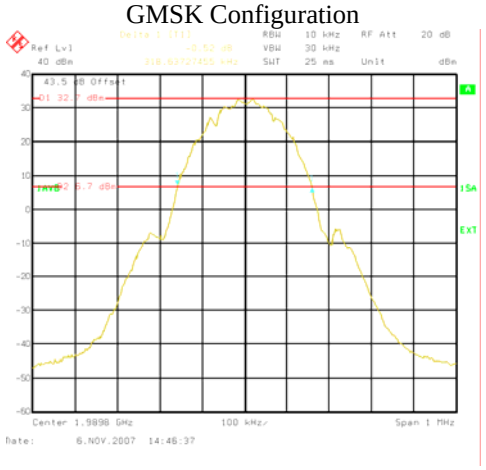
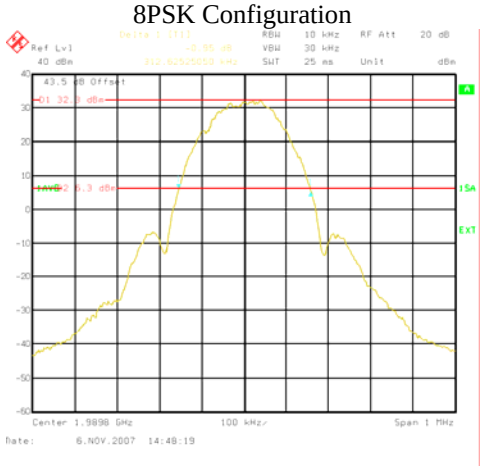
HPRM1900 H2D Configuration	
GMSK Configuration	8PSK Configuration
	
HPRM1900 HD Configuration	
GMSK Configuration	8PSK Configuration
	
The maximum occupied bandwidth is 316KHz for GMSK at H2 Configuration. The maximum occupied bandwidth is 312KHz for 8PSK at H2 Configuration. The maximum occupied bandwidth is 320KHz for GMSK at HD Configuration The maximum occupied bandwidth is 312KHz for 8PSK at HD Configuration	

- **Channel M**

HPRM1900 H2D Configuration	
GMSK Configuration	8PSK Configuration
	
HPRM1900 HD Configuration	
GMSK Configuration	8PSK Configuration
	

The maximum occupied bandwidth is 314KHz for GMSK at H2 Configuration.
The maximum occupied bandwidth is 308KHz for 8PSK at H2 Configuration.
The maximum occupied bandwidth is 318KHz for GMSK at HD Configuration
The maximum occupied bandwidth is 312KHz for 8PSK at HD Configuration

- **Channel T**

HPRM1900 H2D Configuration	
GMSK Configuration	8PSK Configuration
	
HPRM1900 HD Configuration	
GMSK Configuration	8PSK Configuration
	
The maximum occupied bandwidth is 314KHz for GMSK at H2 Configuration. The maximum occupied bandwidth is 308KHz for 8PSK at H2 Configuration. The maximum occupied bandwidth is 318KHz for GMSK at HD Configuration The maximum occupied bandwidth is 312KHz for 8PSK at HD Configuration	

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