



L C I E

Radio Test Report in extreme conditions for the qualification of GSM 1900Mhz BTS 6000 Cabinets (FCC)

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Parc d'Activités de Magny-Châteaufort
78928 Yvelines Cedex 09

Product: GSM 6000 BTS

Author: Marc CANCOUËT

Technical Manager: Didier PRADON

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PUBLICATION HISTORY

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1. INTRODUCTION

The objective of this document is to present the tests report of the FCC Radio qualification in extreme temperature on the GSM 6000 Outdoor BTS & GSM 6000 Indoor BTS (PCS 1900) for the qualification of GSM 1900 MHz BTS 6000 Cabinets.

For North America, applicable standard for Radio of GSM 1900 MHz Base stations are the FCC Part 24 /RS133.

This document is addressed to Nortel Product Integrity team.

2. RELATED DOCUMENTS

3. RELATED DOCUMENTS

3.1. APPLICABLE STANDARDS

[A1]	CFR 47 Part 2	Code of Federal Regulations - Part 2 - Frequency Allocations and Radio Treaty Matters. General Rules and Regulations. Date : June 1996.
[A2]	CFR 47 Part 22	Code of Federal Regulations - Part 24 - PERSONAL COMMUNICATIONS SERVICES.
[A3]	RSS 132	Industry Canada - Personal Communication Services in the 2GHz band.

3.2. REFERENCE DOCUMENTS

[R1]	PE/BTS/DPL/019851	GSM BTS 6000 Project Qualification Plan For 1900MHz Cabinet and Additional Introduction on 900/1800MHz Cabinet
[R2]	PE/BTS/DPL/020395	Radio Test Plan for the qualification of GSM 1900Mhz BTS 6000 Cabinets (FCC & 3GPP)
[R3]	PE/BTS/DJD/020820 01.01/EN	GSM 6000 outdoor BTS 1900MHz hardware delivery notice
[R4]	PE/BTS/DJD/020820 02.01/EN	GSM 6000 outdoor BTS 1900MHz hardware delivery notice

4. IDENTIFICATION OF EQUIPMENT UNDER TEST

4.1. GSM 6000 INDOOR BTS

This document applies to:

Product: GSM 6000 INDOOR BTS (AC Version)
Manufacturer: NORTEL NTEWORKS
Frequencies: PCS 1900
Configuration: -
Option: -

Remark: AC version of GSM 6000 Outdoor BTS transformed in Indoor version (without cosmetic)

AVLM Recipient: LCIE	Date of delivery: 11/OCT/2006
Product: GSM 6000 Outdoor BTS	
Article delivered: AC version of GSM 6000 Outdoor BTS AC OUT S222 Mode S111 900 H2D T1	Article code: NTQ610FA D1
Section transmitting: 8K34	Designer name: Chenet Stéphane
Cabinet Serial Number: NNTMGT004KG1 / 434143	
Documents related to the Hardware Design Specifications - PE/BTS/DD/016672 V01.05/EN BTS 6000 Product Specification	
Documents dealing with specifications:	
Issues fixed on the cabinet:	
Missing Equipment:	
Software compatibility: Modules software version : - Load BTS : v15e3e03 / CDI114389 ➤ ICM/ABM : v15e303 / CDI113946 ➤ RM : v15e302 / CDI114293 PI software tools : - WINTMI: v03d306 - TIL COAM: v15e204 - TIL Alarm: v01f205 - WINTOOL: v04b4e09	

The delivery includes :				
ARTICLE	PEC code	Release	Serial number	Comment
CAB: PRECA	NTQ610FA	D1	NNTMGT004KG1	
UCPS Rectifier 1.4KW	NTN070BF	01	ATSNZH085318	ARTESYN
UCPS Rectifier 1.4KW	NTN070BF	01	ATSNZH085320	ARTESYN
UCPS CCU UMTS/GSM	NTUM44AF	01	ATSNZH093053	
DDU	NTN066AA	D1	ATSNZH096635	
ADU	NTQ666CA	D1	ATSNZH096597	
SAFT Battery	NTQ675AA	0D	07445L000010	
CRICO	NTQ620CA	D1	NNTMGT004KVL	
CECU	NTQ675JG	D1	NNTMGT004KGD	
CECU Control Board	NTQ629AA	01	NNTMGTROMAIN	
IFM1	NTN025BF	01	NNTMGR00MFR7	
ICM	NTN023AF	01	NNTMGR00MFX2	ip 136.147.44.93
ICM	NTN023AF	01	NNTMGR00MFY6	ip 136.147.44.210
ABM	NTN029AF	01	NNTMGR00MFKW	
RM 1900	NTN050PM	03	NNTM7504MV/SQ	ip 136.147.44.190
RM 1900	NTN050PM	D1	CDN200428013	ip 136.147.44.132
DDM 1900 W/VSWR W/HYBRIDS ROHS	NTN063AA	03	FICT03000N7C	
DDM 1900 W/VSWR W/HYBRIDS ROHS	NTN063AA	01	FICT030000TU	MIR02
DDM 1900 W/VSWR W/HYBRIDS ROHS	NTN063AA	D3	FICT030000MS	MIR03-1
CALPRO2	NTQ675CA	D1	NNTMGT004MHX	
CUSERICO	NTQ650AA	D1	NNTMGT004L79	

Additional delivery:				
ARTICLE	PEC code	Release	Serial number	Comment
CPRIPRO2	NTQA675SA	D1	NNTMGT004MZ7	
UCPS - Rectifier 1kW ROHS	NTW703BF	01	ATSNZH055897	
UCPS - Rectifier 1kW ROHS	NTW703BF	01	ATSNZH055899	
AC Power cable				
Diplexeur 1900 Mhz				For Base/Base loopback

Remark: The exact configuration used during tests is described in § 5.3

4.2. GSM 6000 OUTDOOR BTS

This document applies to:

Product: GSM 6000 Outdoor BTS (DC version)
Manufacturer: NORTEL NTEWORKS
Frequencies: PCS 1900
Configuration: -
Option:

AVLM Recipient: LCIE	Date of delivery: 13/OCT/2006
Product: GSM 6000 Outdoor BTS	
Article delivered: DC version of GSM 6000 Outdoor BTS DC OUT S222 Mode S111 1900 HD T1	Article code: NTG610AA D1
Section transmitting: 8K34	Designer name: Chenet Stéphane
Cabinet Serial Number: NNTMGT004R9N / 445082	
Documents related to the Hardware Design Specifications - PE/BTS/DD/016672 V01.05/EN BTS 6000 Product Specification	
Documents dealing with specifications:	
Issues fixed on the cabinet:	
Missing Equipment:	
Software compatibility: Modules software version : - Load BTS : v15e3e03 / CD1114389 ➤ ICM/ABM : v15e303 / CD1113946 ➤ RM : v15e302 / CD1114293 PI software tools : - WINTMI: v03d306 - TIL COAM: v15e204 - TIL Alarm: v01t205 - WINTOOL: v04b4e09	

The delivery includes :

ARTICLE	PEC code	Release	Serial number	Comment
CAB: PRECA	NTQ610AA	D1	NNTMGT004R9N	
FILLER RECTIFIER	NTW70351	01	ATSNZH056166	
FILLER RECTIFIER	NTW70351	01	ATSNZH056166	
UCPS DCU UMTS/GSM	NTUM44AF	01	ATSNZH065723	
DCU	NTND66AA	D1	ATSNZH066624	
DCU	NTQ666BA	D1	ATSNZH101660	
CRICO	NTQ620CA	D1	NNTMGT004KVO	
CECU	NTQ675JA	D1	NNTMGT004R9J	
CECU Control Board	NTQ629AA	01	NNTMGT004D0G	
IFM1	NTN025BF	01	NNTMGR00DMFPT	
ICM	NTN023AF	01	NNTMGWC300KK	IP 136.147.42.74
ICM	NTN023AF	02	NNTMGWC3021R	IP 136.147.42.75
ABM	NTN029AF	01	NNTMGR00DMFMR	IP 136.147.42.76
RM 1900	NTN050PM	07	NNTM75051UHR	IP 136.147.42.77
RM 1900	NTN050PM	07	NNTM75051UI8	IP 136.147.42.78
DDM 1900 W/SWR W/O HYBRIDS	NTND63BA	04	FICT03001E81	
DDM 1900 W/SWR W/O HYBRIDS	NTND63BA	04	FICT03001F5X	
DDM 1900 W/SWR W/O HYBRIDS	NTND63BA	04	FICT03001F61	
GALPRO2	NTQ675CA	D1	NNTMGT004MHT	
CUSERICO	NTQ650AA	D1	NNTMGT004L78	

Additional delivery:

ARTICLE	PEC code	Release	Serial number	Comment
MOD: ALTERNATIVE RM 1900	NTND50PM	D4	CDN200640006	IP : 136.147.45.187
MOD: ALTERNATIVE RM 1900	NTND50PM	D3	CDN200639007	IP : 136.147.45.68
DC Power cable				
DCU	NTQ666BA	P1	ATSNZH077028	Module 1W for CEM test

Remark: The exact configuration used during tests is described in § 5.4

5. TESTS RESULTS

5.1. TEST PROCEDURE

The BTS must operate under the following external extreme temperatures:

- BTS 6000 Outdoor : - 33°C / + 50 °C
- BTS S8000 Indoor: - 5°C / + 50 °C

Frequency stability are performed under following extreme conditions:

for Indoor 6000 BTS

Temperature from -33°C to +50°C at intervals of 10 degrees.

With AC power supply variations: 187 VAC , 230 VAC, 264 VAC

for Outdoor 6000 BTS

Temperature from -5°C to +50°C at intervals of 10 degrees.

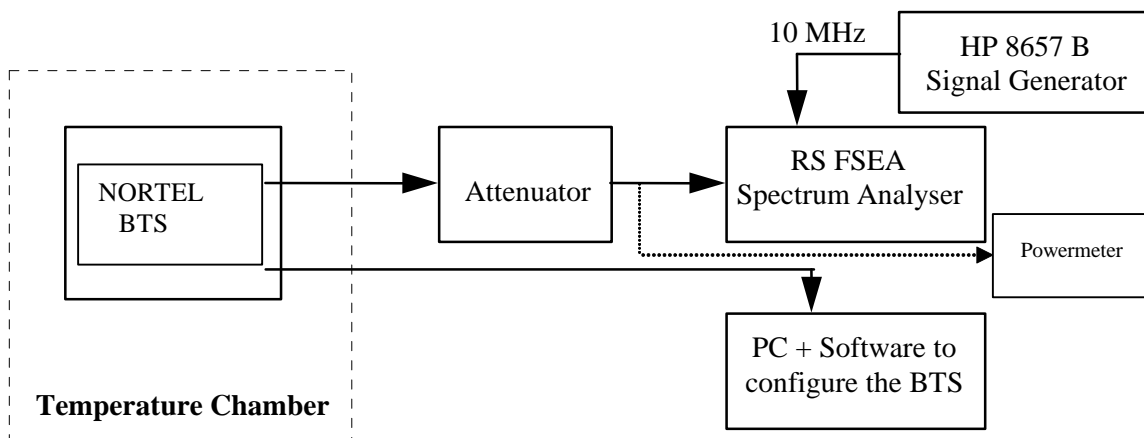
With DC power supply variations: -52V, -54,6V, -57V.

Modules GSM MPRM 1900MHz run with nominal power regulation at maximum power (30W) in GMSK modulation. The MPRM were configured to transmit at maximum power (Static level 0).

A period of at least one hour was allowed prior to measurement to ensure that all the components of the oscillator circuit was stabilized at each temperature.

The equipment was configured as shown in Schematic below.

Test configuration for Frequency Stability & Power



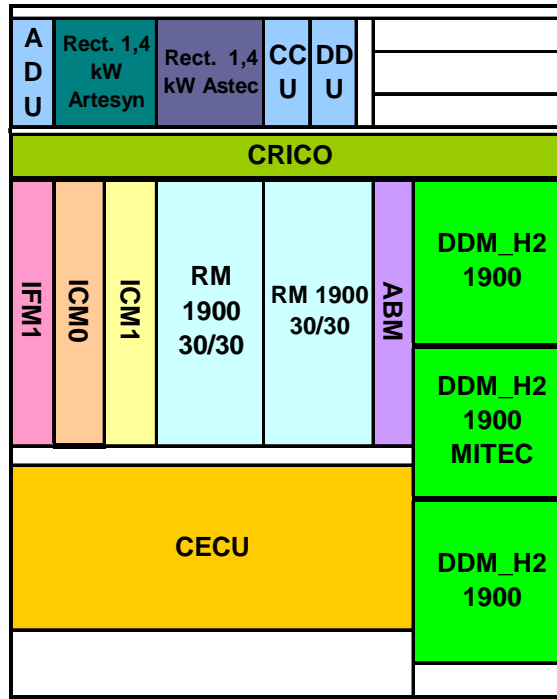
5.2. SOFTWARE CONFIGURATION

BTS type	S12000 Outdoor BTS	S8000 Indoor BTS
BTS	v15e3e03	v15e3e03
ICM/ABM	v15e303 / CDI113946	v15e303 / CDI113946
RM	v15e302 / CDI114293	v15e302 / CDI114293
WinTMI	v03d306	v03d306
Til COAM	v15e204	v15e204
Til Alarm	v01f205	v01f205
Win TOOL	v04b4e09	v04b4e09

5.3. TEST RESULTS GSM 6000 INDOOR BTS

5.3.1 BTS CONFIGURATION

GSM 6000 INDOOR BTS (AC version)



Tested modules

	ARTICLE	PEC code	Release	Serial number
MPRM 0	RM 1900	NTN050PM	03	NNTM7504MVSQ
DDM 0 1900	DDM 1900 W/VSWR W/HYBRIDS ROHS	NTN063AA	03	FICT03000N7C
DDM 1 1900	DDM 1900 W/VSWR W/HYBRIDS ROHS	NTN063AA	01	FICT030000TU
DDM 2 1900	DDM 1900 W/VSWR W/HYBRIDS ROHS	NTN063AA	D3	FICT030000MS

5.3.1.1 FREQUENCY STABILITY IN BTS 6000 INDOOR CONFIGURATION – CHANNEL 512

Table below shows the Frequency Stability power for channel 512 (F=1930,2 MHz) in BTS 6000 INDOOR (TX0) configuration under extreme conditions.

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)		
	82% Nominal Supply voltage 187 V AC	Nominal Supply voltage 230V AC	115% Nominal Supply voltage 264 V AC
-5	15.37	19.11	-16.40
0	-13.75	13.11	-19.44
10	-15.37	-15.05	-17.18
20	15.11	-19.11	-14.27
30	-16.85	-14.66	16.92
40	-14.08	15.95	-16.53
50	-15.69	-14.79	13.37

The maximum frequency deviation allowed is 95 Hz. The maximum deviation measured (19.44 Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

5.3.1.2 FREQUENCY STABILITY IN BTS 6000 INDOOR CONFIGURATION – CHANNEL 661

Table below shows the Frequency Stability power for channel 661 (F=1960 MHz) in BTS 6000 INDOOR (TX1) configuration under extreme conditions.

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)		
	82% Nominal Supply voltage 187 V AC	Nominal Supply voltage 230V AC	115% Nominal Supply voltage 264 V AC
-5	15.95	-15.95	17.37
0	-18.21	16.66	-19.31
10	18.27	-15.11	-13.50
20	16.59	14.92	14.33
30	20.53	16.72	-17.31
40	20.21	17.31	17.11
50	18.08	-16.98	-16.47

The maximum frequency deviation allowed is 95 Hz. The maximum deviation measured (20.53 Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

5.3.1.3 FREQUENCY STABILITY IN BTS 6000 INDOOR CONFIGURATION – CHANNEL 512

Table below shows the Frequency Stability power for channel 810 (F=1989,8 MHz) in BTS 6000 INDOOR (TX2) configuration under extreme conditions.

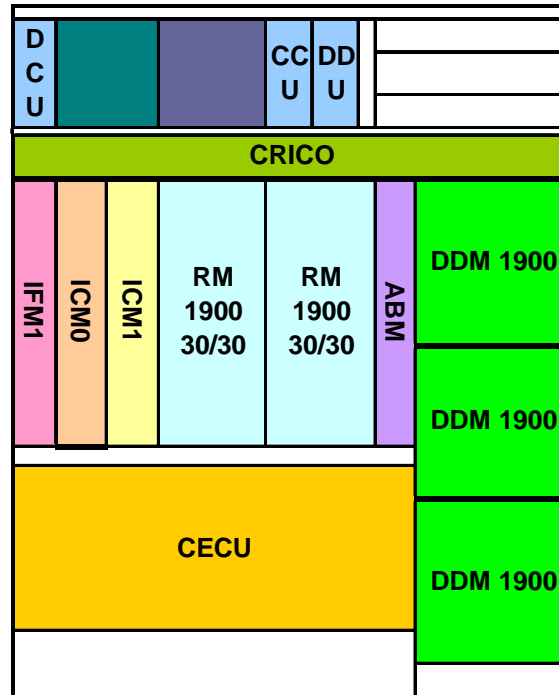
Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)		
	82% Nominal Supply voltage 187 V AC	Nominal Supply voltage 230V AC	115% Nominal Supply voltage 264 V AC
-5	19.95	-18.66	14.85
0	-23.12	21.89	-15.63
10	-20.86	-19.82	-17.89
20	18.34	-15.24	-15.17
30	16.53	14.98	17.43
40	20.99	13.04	17.24
50	18.27	17.24	-17.11

The maximum frequency deviation allowed is 95 Hz. The maximum deviation measured (-23.12 Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

5.4. TEST RESULTS GSM 6000 OUTDOOR BTS

5.4.1 BTS CONFIGURATION

GSM 6000 OUTDOOR BTS (DC version)



Tested modules

	ARTICLE	PEC code	Release	Serial number
MPRM 0	RM 1900	NTN050PM	D4	CDN200640006
DDM 0 1900	DDM 1900 W/VSWR W/O HYBRIDS	NTN063BA	04	FICT03001F5X
DDM 1 1900	DDM 1900 W/VSWR W/O HYBRIDS	NTN063BA	04	FICT03001E81
DDM 2 1900	DDM 1900 W/VSWR W/O HYBRIDS	NTN063BA	04	FICT03001F61

5.4.1.1 FREQUENCY STABILITY IN BTS 6000 OUTDOOR CONFIGURATION – CHANNEL 512

Table below shows the Frequency Stability power for channel 512 (F=1930,2 MHz) in BTS 6000 OUTDOOR (TX0) configuration under extreme conditions.

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)		
	Channel 512 @ DC supply voltage		
	-52V	-54.6V	57V
-33	14.21	-23.12	-22.92
-20	-25.12	-21.24	-19.24
-10	-17.24	-20.02	-23.25
0	-21.11	15.24	-16.79
10	23.12	20.21	16.66
20	29.96	17.69	20.08
30	22.28	13.82	-16.34
40	-19.82	-22.66	-20.47
50	-21.83	-18.98	-19.37

The maximum frequency deviation allowed is 95 Hz. The maximum deviation measured (29.96Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

5.4.1.2 FREQUENCY STABILITY IN BTS 6000 OUTDOOR CONFIGURATION – CHANNEL 661

Table below shows the Frequency Stability power for channel 661 (F=1960 MHz) in BTS 6000 OUTDOOR (TX1) configuration under extreme conditions.

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)		
	Channel 661 @ DC supply voltage		
	-52V	-54.6V	57V
-33	-23.89	-23.25	-25.76
-20	-19.05	-23.37	-22.73
-10	21.24	19.18	-22.92
0	19.59	-16.08	15.05
10	-24.15	-15.95	-18.53
20	18.34	-22.54	20.53
30	22.99	-26.02	19.05
40	-21.11	-19.89	-19.31
50	20.92	-22.74	-20.15

The maximum frequency deviation allowed is 95 Hz. The maximum deviation measured (-26.02 Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

5.4.1.3 FREQUENCY STABILITY IN BTS 6000 OUTDOOR CONFIGURATION – CHANNEL 810

Table below shows the Frequency Stability power for channel 810 (F=1989.8 MHz) in BTS 6000 OUTDOOR (TX2) configuration under extreme conditions.

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)		
	Channel 810 @ DC supply voltage		
	-52V	-54.6V	57V
-33	-26.35	-22.73	-19.11
-20	-21.63	-22.08	-18.47
-10	18.02	-15.95	-17.05
0	-19.69	20.53	16.66
10	16.66	-19.82	17.63
20	-18.14	-17.82	21.50
30	20.99	-19.63	-19.11
40	-19.37	-16.47	-16.85
50	-16,47	-14,98	22.86

The maximum frequency deviation allowed is 95 Hz. The maximum deviation measured (-26.35Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

6. CONCLUSION

The GSM 6000 Indoor BTS (AC version) & GSM 6000 Outdoor BTS (DC version) equipped with GSM 1900MHz MPRM 30/30 as described in this document complies with the FCC & IC radio requirements in extreme temperature.

7. MEASUREMENT EQUIPMENT LIST

Equipment description	Manufacturer	Model	Serial No.	LCIE No.
Spectrum analyser	R&S	FSEA	842655/02	A4060015
Spectrum analyser	Agilent	VSA	Nortel N° 571313	-
MIC analyseur	W&G	PA20	Y0075	A4040009
Signal generator	HP	8657B	3520U06355	A5442020
Signal generator	HP	8648A	3430V00370	-
Power Meter	Giga-tronics	8542C	1832488	A1503009
RF Probe	Giga-tronics	80401A	18330224	A1509027
40 dB 60 W attenuator	Diconex		02077	-
Temperature chambre	CLIMAT SAPRATIN	PV305C80F60H R	SV025470S	D1025026
Temperature chambre	CLIMAT SAPRATIN	PV140C80F60H R	SV025496S	D1025025

8. ABBREVIATIONS AND DEFINITIONS

8.1. ABBREVIATIONS

ARFCN	Absolute Radio Frequency Channel Number
BCCH	Broadcast Control Channel
BER	Bit Error Rate
BTS	Base Transceiver Station
C	Celsius
CPC	Common Product Code
DB	Decibel
dBc	Decibel referenced to the carrier level
dBm	Decibel ref 1 milliwatt
DOA	Dead On Arrival
DRX	Driver Receiver Board
DTX	Discontinuous Transmitter
EDGE	Enhanced Data for GSM Evolution
EFT	Electrical Fast Transient
EMC	Electro-Magnetic-Compatibility
EMI	Electro-Magnetic-Interference
ESD	Electrical Static Discharge
ESS	Environmental Screaming Test
FH Bus	Transmission bus between FP and TX
FMECA	Failures Mode Effect Critically Analysis
FP	Frame Processor
GMSK	Gaussian Minimum Shift Keying
GSM	Global System for Mobile Communications
HALT	Highly Accelerated Life Test
IF	Intermediate Frequency
LISN	Line Impedance Stabilization Networks
LNA	Low Noise Amplifier
MTBF	Mean Time Between Failure
N.A.	Not Applicable
NER	Nominal Error Rate
NFF	No Fault Found
NFH	No Frequency Hopping
NN	Nortel Networks
OEM	Original Equipment Manufacturer
PA	Power Amplifier
PAR	Peak to Average Ratio
PEC	Product Engineering Code
PMR	Peak to Minimum Ratio
PSU	Power Supply Unit
RBBER	Residual Bit Error Rate
RF	Radio Frequency
RMS	Root Mean Square

RX	Receiver
SFH	Slow Frequency Hopping
SPQL	Shipped Product Quality Level
SPR	Serial PEC Release
TBC	To Be Confirmed
TBD	To Be Defined
TCH	Traffic Channel
TDMA	Time Domain Multiple Access
TRX	Transmitter – Receiver
TS	Time slot
TX	Transmitter
UNL	Unit nominal Level
URG	Unit Reference Gain
UUT	Unit Under Test
VAD	Voice Activity Detection
VSWR	Voltage Standing Wave Ratio
VVA	Variable Voltage Attenuator

8.2. DEFINITIONS

None

❧END OF DOCUMENT❧