



Radio Test Plan for the introduction of RM2 1900MHz (FCC & 3GPP)

Document number:	PCS/BTS/DPL/023530
Document issue:	V01.01 / EN
Document status:	Standard
Date:	28/04/08

Confidential document - Not to be circulated outside Nortel Networks

Copyright © 2008 Nortel Networks, All Rights Reserved

Printed in France

NORTEL NETWORKS CONFIDENTIAL:

The information contained in this document is the property of Nortel Networks. Except as specifically authorized in writing by Nortel Networks, the holder of this document shall keep the information contained herein confidential and shall protect same in whole or in part from disclosure and dissemination to third parties and use same for evaluation, operation and maintenance purposes only.

The content of this document is provided for information purposes only and is subject to modification. It does not constitute any representation or warranty from Nortel Networks as to the content or accuracy of the information contained herein, including but not limited to the suitability and performances of the product or its intended application.

The following are trademarks of Nortel Networks: *NORTEL NETWORKS, the NORTEL NETWORKS corporate logo, the NORTEL Globemark, UNIFIED NETWORKS. The information in this document is subject to change without notice. Nortel Networks assumes no responsibility for errors that might appear in this document.

All other brand and product names are trademarks or registered trademarks of their respective holders.

PUBLICATION HISTORY

28/04/08

Issue 01.01 / EN ,

Status : standard - Creation

Author : Alain CAILLE

CONTENTS

1.	INTRODUCTION	4
1.1.	OBJECT	4
2.	RELATED DOCUMENTS	5
2.1.	APPLICABLE DOCUMENTS	5
3.	BTS 18000 RF QUALIFICATION TESTS FOR 3GPP PERFORMANCES	6
3.1.	INDOOR 18000 BTS: 3GPP TS11.21 RF TESTS IN NORMAL CONDITION	6
3.2.	GSM 1800 BTS: 3GPP TS11.21 RF TESTS IN EXTREME CONDITIONS.....	7
4.	BTS 18000 RF QUALIFICATION TESTS FOR FCC REGULATORY	9
4.1.	FCC PART24 (PCS1900) AT AMBIENT TEMPERATURE – BTS18000 INDOOR.....	9
4.2	.FCC PART24 (PCS1900) IN EXTREME CONDITIONS : FREQUENCY STABILITY	11
5.	BTS HARDWARE CONFIGURATION.....	13
5.1	.BTS18000 OUTDOOR & BTS6000 HARDWARE (UNDER TEST AT LCIE LAB).....	13
5.2	.BTS18000 INDOOR & BTS9000 HARDWARE (UNDER TESTS AT GDNT LAB).....	14
6.	TEST BENCH RADIO CONFIGURATION.....	15
6.1.	TX TEST BENCH	15
6.2.	RX TEST BENCH	15
7.	ABBREVIATIONS AND DEFINITIONS.....	16
7.1.	ABBREVIATIONS	16

1. INTRODUCTION

1.1. OBJECT

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

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

Hereafter is the PEC code list to be introduced:

PEC CODE	TITLE	COMMENT
NTN050PP	MOD: RM2 1900 50/30 ROHS VERSION	Manufacturer: Nortel
NTN050CP	MOD: RM2 1900 30/30 ROHS VERSION	Manufacturer: Nortel

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

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

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

- At ambient temperature, Radio tests will be performed in Indoor 18000 BTS.
- At extreme temperature, Radio tests will be performed in GSM Outdoor & Indoor 18000 BTS, GSM6000 BTS, GSM9000 BTS.

Radio Tests will be performed in GMSK & 8PSK modulation

2. RELATED DOCUMENTS

2.1. APPLICABLE DOCUMENTS

[A1]	3GPP TS 05.05 – V8.7.1	Release 1999 Digital Cellular Telecommunication System Phase 2+ Radio Transmission and Reception
[A2]	3GPP TS 11.21 – V8.9.0	Release 1999 Base Station System (BSS) Equipment Specification – Radio Aspects
[A3]	47 CFR Part 24	PERSONAL COMMUNICATIONS SERVICES

3. BTS 18000 RF QUALIFICATION TESTS FOR 3GPP PERFORMANCES

The RF performances are performed at BTS18000 antenna connector.

3.1. INDOOR 18000 BTS: 3GPP TS11.21 RF TESTS IN NORMAL CONDITION

3GPP TS11,21 performances			
	Tests	RM2 PCS1900 (50W/30W) + DDM PCS1900	RM2 PCS1900 (30W/30W) + DDM PCS1900
		Tx0 (B) ,Tx1(M) ,Tx2(T)	Tx0 (B) ,Tx1(M) ,Tx2(T)
	Mean RF power	C512 , C661, C810	C512 , C661, C810
	Static /dynamic steps	C512 , C661, C810	C512 , C661, C810
	Power vs time (graph)	C512 , C661, C810	
	phase frequency & mo	C512 , C661, C810	
GMSK modulation	Modulation spectrum (curves)	C512 , C661, C810	
	Switching transient spectrum	C512 , C661, C810	
	Spurious emission (Tx band)	C512 , C810	
	Spurious emission (outsideTx band)	NFH_SFH(C512-C810)	
	Intermodulation Tx	C661 (>6MHz)	
	Intramodulation Tx	Rx & C661 (>6MHz)	
	Static layer NER NFH/ SFH	C512 , C661, C810	
	Static sensitivity TCH/FS	C512 , C661, C810 Full Rx PCSBand	
	Rxlev measurement	C512 , C661, C810	
	Blocking characteristic		
	Intermodulation Rx		
	Mean RF power	C512 , C661, C810	C512 , C661, C810
	Static /dynamic steps	C512 , C661, C810	C512 , C661, C810
	Power vs time (graph)	C512 , C661, C810	
	EVM	C512 , C661, C810	
EDGE modulation	Modulation spectrum (curves)	C512 , C661, C810	
	Switching transient spectrum	C512 , C661, C810	
	Intermodulation Tx		
	Intramodulation Tx		
	Static layer NER	C512 , C661, C810	
	Static sensitivity TCH/FS	C512 , C661, C810	
	Rxlev measurement	C512 , C661, C810	
	Blocking characteristic	C661	
	Intermodulation Rx	C512 , C661, C810	

3.2. GSM 1800 BTS: 3GPP TS11.21 RF TESTS IN EXTREME CONDITIONS

		GSM 18000 BTS Indoor	GSM 18000 BTS Outdoor
		T=-5°C	T=50°C
		RM2 PCS1900 (50W/30W) + DDM PCS1900	RM2 PCS1900 (50W/30W) + DDM PCS1900
		Minimum configuration VDCmin= -40,5V Tx0 RM at Pmax-12dB one way under test successively at Pmax	Maximum configuration VACmin= 187V All Tx at Pmax
		Tx0: 512 - Tx1: C661 - Tx2: C810	
GMSK modulation	Modulation accuracy - phase & freq	C512, C661, C810	C512, C661, C810
	Mean RF power	C512, C661, C810	C512, C661, C810
	Static step	C512, C661, C810	C512, C661, C810
	Dynamic Step	C512, C661, C810	C512, C661, C810
	Power vs time	C512, C661, C810	C512, C661, C810
	Modulation spectrum	C512, C661, C810	C512, C661, C810
	Switching transient spectrum	C512, C661, C810	C512, C661, C810
	Static sensitivity TCH/FS	C512, C661, C810	C512, C661, C810
EDGE modulation	Modulation accuracy- EVM	C512, C661, C810	C512, C661, C810
	Mean RF power	C512, C661, C810	C512, C661, C810
	Static step	C512, C661, C810	C512, C661, C810
	Dynamic Step	C512, C661, C810	C512, C661, C810
	Power vs time	C512, C661, C810	C512, C661, C810
	Modulation spectrum	C512, C661, C810	C512, C661, C810
	Switching transient spectrum	C512, C661, C810	C512, C661, C810
	Static layer NER NFH	C512, C661, C810	C512, C661, C810
	Rxlev measurement	C512, C661, C810	C512, C661, C810

➤ **Radio performance Tests :**

Measurement will be performed on each way for RM2 PCS1900
The other Tx way will be configured at maximum power on frequencies no used for measurement.

For Tx measurements:

- Maximum Mean RF power step will be done with VSA
- Static & dynamic step will be done with VSA
- Spectrum will be done with Analyser FSE
 - Sweep number: 200 for modulation
 - Sweep number: 200 for switching

For receiver measurements:

- GMSK sensitivity (search rberII = 2%) will be performed on main / diversity way
- 8PSK sensitivity (& RXLEV) (for antenna level to obtain rberII = 10%) will be performed on main / diversity way .
- NER / Rxlev:
Measurement in 8PSK modulation .TCH 23.2 – Main way
Antenna Level: -26dBm, -50dBm, -55dBm, -60 dBm, -80dBm, -101dBm, -104dBm

Environmental Conditions:

INDOOR BTS =

For low Temperature T= -5°C
For Low temperature T=-5°C VDC min = -40.5V
Emission at Max Power on 1way for RM under test.
For others RM , one way at Pmin (Pmax-12dB) activated per RM.

OUTDOOR BTS =

For High temperature T=50°C VDC min = 187V
Temperature stabilization at least a minimum 1 hour at T=50°C before beginning RF tests.

4. BTS 18000 RF QUALIFICATION TESTS FOR FCC REGULATORY

4.1. FCC PART24 (PCS1900) AT AMBIENT TEMPERATURE – BTS18000 INDOOR

FCC Certification : Part 24				
FCC Specification	Title	GMSK	8PSK	Comment
2.1046 24.232	RF Power Output	X	X	Note 1 GSM1900 Band (GDNT Lab)
2.1049	Occupied Bandwidth	X	X	Note 2 GSM1900 Band (GDNT Lab)
2.1051 24.238	Spurious Emissions at Antenna Terminals	X	X	Note 3 GSM1900 Band (GDNT Lab)

PCS1900 Sub-band:

A (512 , 548 , 585) ; D (587 , 598 , 610) ; B (612 , 648 , 685) ; E (687 , 698 , 710) ;
F (712 , 723 , 735) ; C (737 , 773 , 810)

- **Note 1:**

PCS1900 Sub-band =

A (C512) ; D (C587) ; B (C661) ; E (C687) ; F (C735) ; C (C810)

- For RM2 PCS (50W/30W) DDM Dp and DDM H2 configuration

- For RM2 PCS (30W/30W) DDM Dp configuration

For 8PSK and GMSK modulation

- **Note 2 :** 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 (Measurement on Channel M)
Measurement power at M(661) Channel.

- o For RM2 PCS (50W/30W) DDM Dp (GMSK and 8PSK modulation)

- **Note 3:** Block Edge channel: Spurious measurement power at
A (512 , 585) ; D (587 , 610) ; B (612 , 685) ; E (687 , 710) ; F (712 , 735) ; C (737 , 810)

Configuration to be tested =

RM2 PCS (50W/30W) - GMSK and 8PSK - DDM Dp
RM2 PCS (50W/30W) - GMSK and 8PSK - DDM H2
RM2 PCS (30W/30W) - GMSK - DDM Dp

	Channel	Block Edge channel:
		Power level (Pmax, ..., Pmax –I)
A	512	
	585	
D	587	
	610	
B	612	
	685	
E	687	
	710	
F	712	
	735	
C	737	
	810	

Out of block emission: Spurious measurement power for T(C810) Channel.

4.2. FCC PART24 (PCS1900) IN EXTREME CONDITIONS : FREQUENCY STABILITY

FCC Certification : Part 24				
FCC Specification	Title	GMSK	8PSK	Comment
2.1055 24.235	Frequency Stability	X		<u>Note 4 :</u> (GDNT Lab / LCIE lab)

➤ RF Test at LCIE Laboratory

GSM 18000 BTS Outdoor	Dual Band GSM850 / PCS 1900	
GSM850	Tx0: C128- Tx1: C190 - Tx2: C251	
Modulation accuracy - phase & freq	C128, C190, C251	Vmin (187V) / Vmax (265V) From -40°C to +50 °C by 10°C step
Mean RF power	C128, C190, C251	
PCS 1900	Tx0: C512 - Tx1: C698 - Tx2: 810	
Modulation accuracy - phase & freq	C512, C661, C810	Vmin (187V) / Vmax (265V) From -40°C to +50 °C by 10°C step
Mean RF power	C512, C661, C810	

GSM6000 BTS	Dual Band GSM850 / PCS 1900	
GSM850	Tx0: C128- Tx1: C190 - Tx2: C251	
Modulation accuracy - phase & freq	C128, C190, C251	Vmin (187V) / Vmax (265V) From -33°C to +50 °C by 10°C step
Mean RF power	C128, C190, C251	
PCS 1900	Tx0: C512 - Tx1: C698 - Tx2: 810	
Modulation accuracy - phase & freq	C512, C661, C810	Vmin (187V) / Vmax (265V) From -33°C to +50 °C by 10°C step
Mean RF power	C512, C661, C810	

➤ **RF Test at GDNT Laboratory**

GSM 18000 BTS Indoor	Dual Band GSM850 / PCS 1900	
GSM850	Tx0: C128- Tx1: C190 - Tx2: C251	
Modulation accuracy - phase & freq	C128, C190, C251	Vmin (-40V) / Vmax (-57V) From -5°C to +45 °C by 10°C step
Mean RF power	C128, C190, C251	
PCS 1900	Tx0: C512 - Tx1: C698 - Tx2: 810	
Modulation accuracy - phase & freq	C512, C661, C810	Vmin (-40V) / Vmax (-57V) From -5°C to +45 °C by 10°C step
Mean RF power	C512, C661, C810	

GSM 9000 BTS Indoor	Dual Band GSM850 / PCS 1900	
GSM850	Tx0: C128- Tx1: C190 - Tx2: C251	
Modulation accuracy - phase & freq	C128, C190, C251	Vmin (-40V) / Vmax (-57V) From -5°C to +45 °C by 10°C step
Mean RF power	C128, C190, C251	
PCS 1900	Tx0: C512 - Tx1: C698 - Tx2: 810	
Modulation accuracy - phase & freq	C512, C661, C810	Vmin (-40V) / Vmax (-57V) From -5°C to +45 °C by 10°C step
Mean RF power	C512, C661, C810	

Note 4 : Frequency stability

Frequency stability test is performed under following extreme conditions:

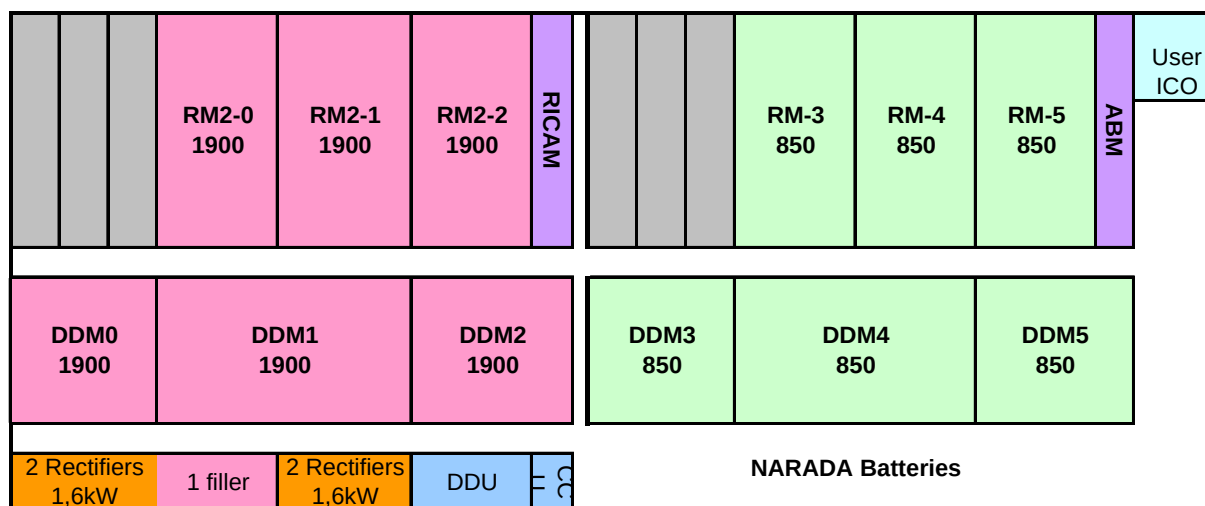
- From Minimum to maximum operational temperature by step temperature.
- With AC power supply variations: 187 VAC, 264 VAC.
- With DC power supply variations: -40 VDC, -57VDC.

All Modules run with nominal power regulation at maximum power in GMSK modulation.

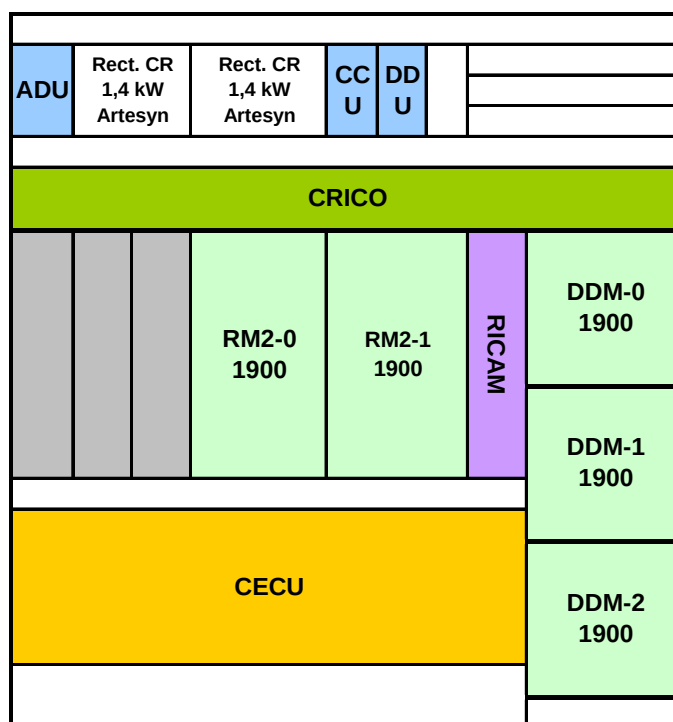
5. BTS HARDWARE CONFIGURATION

5.1. BTS18000 OUTDOOR & BTS6000 HARDWARE (UNDER TEST AT LCIE LAB)

➤ NG GSM 18000 outdoor BTS



➤ GSM 6000 outdoor BTS



5.2. BTS18000 INDOOR & BTS9000 HARDWARE (UNDER TESTS AT GDNT LAB)

➤ GSM 18000 indoor BTS

DDM-0 1900			DDM-1 1900			DDM-2 1900		
DDM-3 850			DDM-4 850			DDM-5 850		
			RM2-0 1900	RM2-1 1900	RM2-2 1900	RICAM		
			RM-3 850	RM-4 850	RM-5 850	ABM		

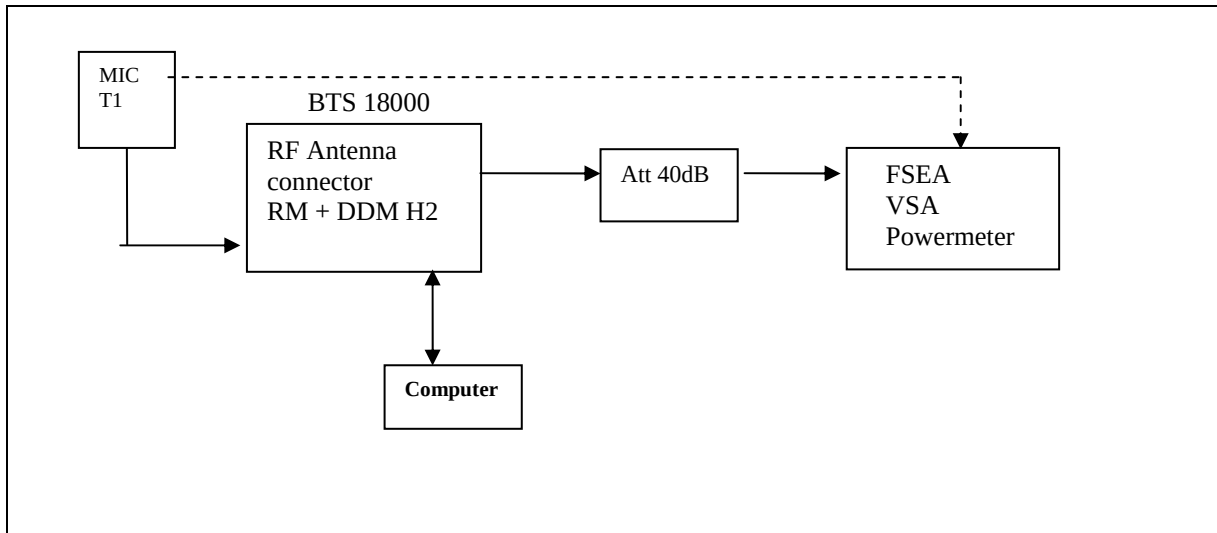
➤ GSM 9000 BTS

	DDM-0 1900	DDM-1 1900	DDM-2 1900	
	RM2-0 1900	RM2-1 1900	RM2-2 1900	RICAM

6. TEST BENCH RADIO CONFIGURATION

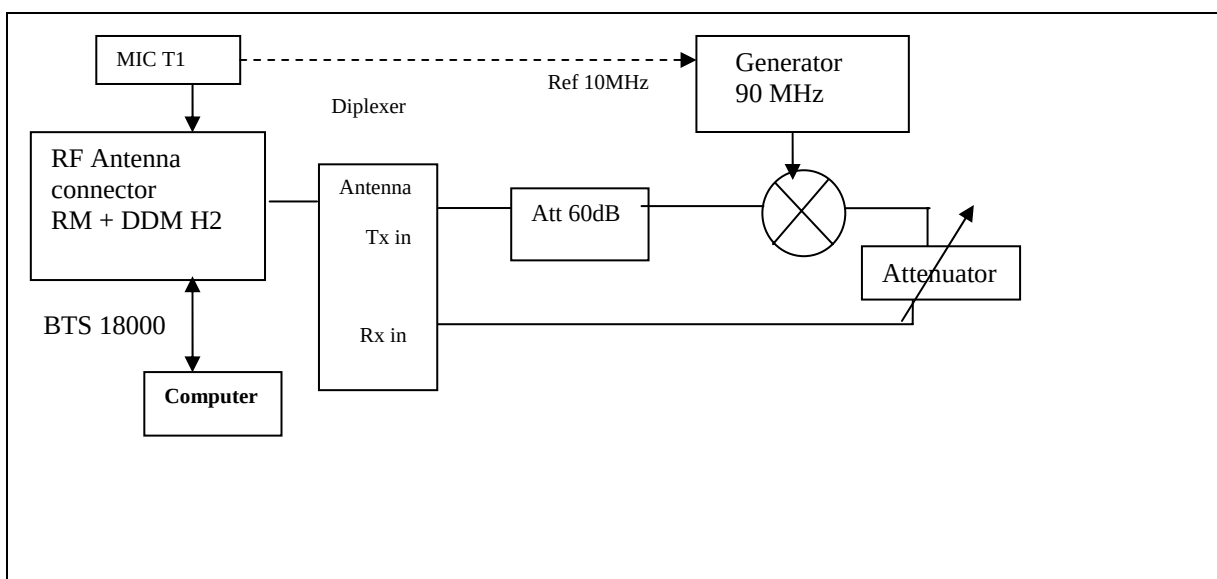
6.1. TX TEST BENCH

Bench for Tx measurement:



6.2. RX TEST BENCH

Base-base loop-back bench for RX measurement (NER, ber sensitivity).



7. ABBREVIATIONS AND DEFINITIONS

7.1. ABBREVIATIONS

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

❧ END OF DOCUMENT ❧