

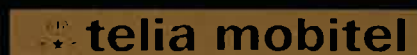
**NMT DOC.900-5**  
**Nordic Mobile Telephone group**

**1994-03-22**

**Automatic Cellular Mobile Telephone System**

# **NORDIC NMT-900**

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## **TECHNICAL SPECIFICATION FOR THE SYSTEM SIMULATOR**

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## 1. INTRODUCTION

NMT 900, the Nordic Mobile Telephone System in the 900 MHz CEPT-band, is developed jointly by the Telecommunications Administrations of Tele Danmark Mobil, Denmark, Telecom Finland, Finland, Tele Mobil, Norway, and Telia Mobitel, Sweden in order to establish a compatible automatic public mobile telephone system in the Nordic countries.

This document specifies the requirements for the system simulator (SS) in the system. For detailed information about the system, the system components, and the interfaces between the system components, reference is made to NMT Doc. 900-1, "System Description", NMT Doc. 900-3, "Technical specification for the mobile station", and NMT Doc. 900-4, "Technical specification for the base station", which are necessary for the use of this document.

This requirement specification is mainly directed towards the testing of mobile stations. However, testing of the Mobile Telephone Exchange (MTX) and the Base Station (BS) shall also be foreseen. When a part of the system is tested, the SS simulates the other parts.

When a Mobile Station is tested, the SS must perform the same kind of signalling procedures as the MTX.

The procedures are specified to include

- fixed signalling procedures with fixed frames;
- fixed signalling procedures but frames can be changed;
- possibilities to change signalling procedures and frames;
- timing facilities for measuring time differences and operation times.

The MS shall be monitored in order to

- assess whether or not the signalling procedure was handled correctly by the MS;
- measure the timing of the MS during signalling procedure;
- observe the data sent by the MS.

The MS-response shall be controlled according to Paras 3, 4, 5 and 6 regarding:

- number and type of frames;
- all hexa-decimal digits in each frame;
- time skew;
- speech path through connection;
- Ø-signal detection;
- visual signals from MS;
- acoustic signals from MS.



Both for the testing of mobile stations, base stations, and mobile telephone exchanges, the system simulator must be flexible to allow changing of existing signalling schemes and procedures, and to make it possible to introduce new procedures.

## 1.1 SYSTEM COMPONENTS UNDER TEST

The figure below shows the structure of the NMT-900 system.

MTX Mobile Telephone Exchange  
 BS Base Station  
 MS Mobile Station

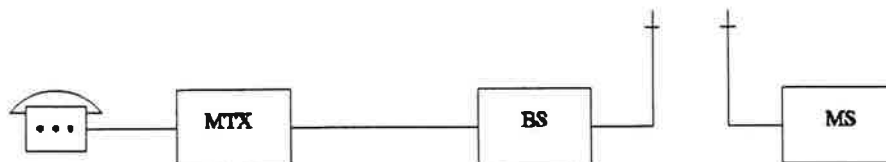


Fig. 1

### 1.1.1 Test of MS

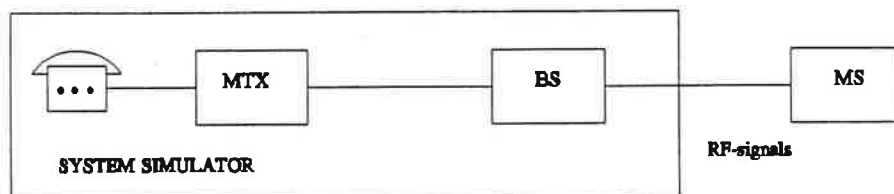


Fig. 2

The mobile station, i.e. the subscriber equipment, will be available at least as vehicle-borne, portable, handportable, coin-box or as prioritized. The MS may be divided into transceiver unit, logic unit, and operational control unit. The station can be manufactured in parts or as an integrated unit.

When the SS is used for testing an MS, the SS shall simulate both the MTX and the BS (RF-interface).

### 1.1.2 Test of BS

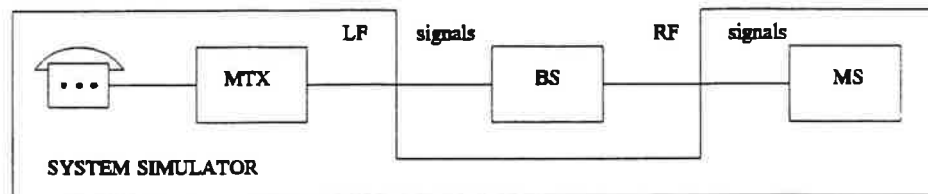


Fig. 3

The base station is an intermediary link without switching function between the wire and radio transmission path. The BS also supervises the radio connection between the BS and the MS.

When the SS is used for testing a BS, the SS shall simulate both an MS (RF-interface) and MTX (LF-interface).

### 1.1.3 Test of MTX

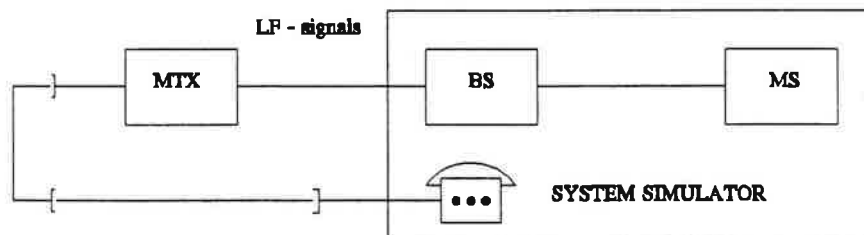


Fig. 4

The mobile telephone exchange controls the traffic between the mobile stations and the fixed telephone network. The MTX also controls and supervises its subordinate base stations.

When the SS is used for testing an MTX, the SS shall simulate the LF-interface between MTX and BS on one or more lines.

The SS shall also be used to monitor the signalling between MTX and BS/MS (LF-interface), and between MTX and MS (RF-interface), see fig. 5.

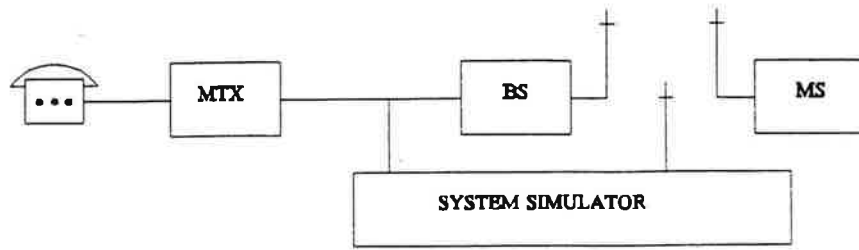


Fig. 5

## 2. FUNCTIONAL DESCRIPTION OF THE SS

### 2.1 USER INTERFACE

#### 2.1.1 Command language

For the system simulator a special easy-to-use language shall be developed to enable the operator to modify tests or create new ones and combine them. Frames and parameters shall have the same names and symbols as in the NMT documents. The simulator program shall contain ready-made tests for testing the signalling procedure requirements. There shall also be room for user-defined tests, signalling procedures, and frames which can be saved in the mass memory when desired.

Several program packages are necessary for the simulator, one for testing the MS, one for MTX, and one for the BS. The MS tests are described in para 3-6. Tests for the MTX and BS will be specified later.

##### 2.1.1.1 **Commands**

The following elementary operative commands are required as a minimum:

<u>Command</u>	<u>Parameter</u>
TR	Name of the frame to be sent
EX	Procedure to be loaded and immediately executed
LOAD	Procedure to be loaded first
ADD	Procedure to be loaded next
RUN	Procedure to be run
DEFP	Procedure definition string
EDITP	Procedure to be edited
DELP	Name of procedure to be deleted
DEF	Combined command-definition string
EDIT	Name of the combined command to be edited
DEL	Name of the combined command or test file to be deleted
GET	Name of the test file to be read from mass memory
SAVE	(to save the previous test in mass memory)
MS FREQ	(RF-generator simulates MS transmitter)
BS FREQ	(RF-generator simulates BS transmitter)
FR	Name of the frame to be displayed or modified
WT	Desired delay in seconds
ENABLE	(enables remote-controlling of hardware)
DISABLE	(disables remote-controlling of hardware)
STATUS	(status information request)
STORE	(own definitions to be stored in mass memory)
RECALL	(recalls your own definitions from the mass memory)
MS	The new mobile station number

DUMP	(Received frames are displayed)
SELFTTEST	(to initiate a self-test sequence)
ASK	The mnemonic of the question to be presented
HELP	(gives a list of available commands)
COUNT	(simulator sends repeated call attempts)
SPON	(disconnect FFSK, connect SS, LF and TH)
SPOFF	(disconnect FFSK, disconnect SS, LF and TH)
SCANTIME	Tests 3.1.4.1, 3.1.4.2, and 3.3.2
LAMPS	(to check the functioning of photodetectors)
TIMEMEAS	Transmitter start-up and decay time measurement
LOOP	(to establish the selftest loop)
DUPLEX	(to restore the 45 MHz frequency offset)
GROUPDEL	+, -, +- or OFF (group delay filter)
RF	ON, OFF or generator level (dBm)
TIME	(the real-time clock is displayed)
FADING	ON, OFF (to connect/disconnect the fading simulator) or vehicle speed (km/h)
CCBAND	Lower limit, upper limit of signalling channel band
TCBAND	Lower limit, upper limit of traffic channel band
HOOK	ON, OFF (the HOOK position)
MSPOWER	H, M, or L (MS power level)
RANDOM	(to transmit pseudorandom bit sequences)
BER	(Bit error rate calculation)
PR	(To choose print mode for printing test document on paper)
CO-CHANNEL	(Co-channel data rejection), test 5.2
ADJACENT	(Adjacent RF-signal decoding degradation), test 5.3
INTERMOD	(RF intermodulation decoding degradation), test 5.4
SWITCHTIME	(Switching time to precommanded TC), test 5.8.2.2
CRP	(Call Reception Probability), test 5.1
RPT	(to repeat the procedure just executed)
PHASE	Give the phase shift between the channels in bits (0,...166)
COPY	(to copy the complete test program to new disc)
REPORT	(to copy test document from screen to printer)
CHECK	(to compare the previous test with the requirements defined in the checklist)

The parameter names given in 2.1.1.2 can also be used as commands when changing their values. In addition to the commands mentioned above and the test commands, there shall be room for at least 50 user-defined combined commands.

2.1.1.2 **Parameters**

Parameters which can be used in both signalling procedures and combined commands are as follows:

<u>name</u>	<u>definition</u>	<u>allowed parameter values</u>	<u>default value</u>
J	See the NMT Doc.900-1	integer 0.....15, +,- for all	0
V1			10
V2			15
V3			1
V4			4
V5			5
V6			6
L			1
A			0
P			8
S			10
Q1			3
Q2			3
r1			2
r2			2
Y1 (excl.channel no.part)			4
Y2			5
N1 (excl. power bits)			6
N2			0
N3			B
IL			4
IH			4
Z			4
X1			8
X2			8
X3			8
X4			8
X5			8
X6			8
Na			0
Nb			0
Nc			C
K1	password		0
K2	"		4
K3	"		9
B1	BS identity		1
B2	"		2
B3	"		3
H1	additional info		0
H2	"		0

H3	"		0
H4	"		0
H5	"		0
H6	"		0
H7	"		0
H8	" 1)		0
H9	" 1)		0
H10	" 1)		0
AR	area info.	0,1,2,3,4	0
t1	area info.bit	0,1	0
t2	" 2)	0,1	
t3	" 2)	0,1	
t4	" 2)	0,1	
fø		0,1,2,3,4	1
X	transmitter number	1,2,+,-	1
P1	power bits on transm. 1	0,1,2,3,+,-	3
P2	power bits on transm. 2	0,1,2,3,+,-	3

- 1) - in frames 1b, 2a, 2e, 3b, and 4, 4b and 30:  
coding according to area information
- in frames 2c and 2f:  
coding according to queuing information
- in frame 2d coding according to channel scanning order
- 2) - in frames 10b, 10c, 11a, 11b, and 12:  
coding according to area information

Parameters which can only be used in command level:

T1	transmitter 1 channel number	1-1000,1025-2023,+,-	11
T2	transmitter 2 channel number	1-1000,1025-2023,+,-	12
R1	receiver 1 channel number	1-1000,1025-2023,+,-	11
R2	receiver 2 channel number	1-1000,1025-2023,+,-	12
R3	receiver 3 channel number	1-1000,1025-2023,+,-	1
R4	receiver 4 channel number	1-1000,1025-2023,+,-	2

Frames not defined in the NMT documents:

<u>Frame name</u>	<u>contents</u>
0	only binary zeros, 166 bits
1	only binary ones, 166 bits
2	alternating binary ones and zeros, 166 bits
R	166 random bits
User-defined frames (minimum 50)	defined on bit(166) or hexadecimal level

### 2.1.1.3 Procedures

The signalling tests are defined as procedures using the commands (and parameters) given below. It shall be possible to define a procedure of at least 10 \* 80 characters. In addition to predefined procedures there shall be room for at least 50 user-defined procedures.

<u>name</u>	<u>definition</u>	<u>parameter</u>
X	transmitter number	1,2,+,-
T	transmit command	frame name or other action
N	minimum number of received consecutive frames	integer 1,..255
U	maximum number of trans- mitted frames and after that stop FFSK or maximum number of received conse- cutive frames	integer 1,..255
F	filler frame command	frame name
W	response command	frame name or other response
D	SS delay after response frame reception in frame periods	integer 1,..255
E	response waiting time in frame period	integer 1,..10.000 or 0 for infinite waiting time



P	exact number of transmitted frames and after that stop FFSK or exact number of received consecutive frames	integer 1,..225
M	mask number for response frame investigation	integer 0,..10
B	error burst, inverted bits	m,n (integer 1,..166)
V	non-desired response frame command	frame name
C	time measuring point within the procedure	integer 1,..15
G	gap between frames, see example 1	N,b,P,U,
b	number of bits of a frame gap to be transmitted, see example 1	integer 1,..166 or 0.5 for half a bit
I	conditional frame response command, see example 2	frame name or other response
*	end of conditional part in the procedure	
-	no expected response within waiting time	

example 1: T 1a N 10 G b 80 T 1a W 10b P 2 E 20

example 2: T 4 I 10b T 3b W 10b L 3 T 5a P 2 I 10c T 3b W 10c  
L 9 T 5a P 4 I - T FSO N 50 \* E 100 T 6 A 3 T 20 P 1

- There are three possible procedures in example 2 depending on the response (10b, 10c or no response):

response

procedure

10b T 4 W 10b E 100 T 3b W 10b L 3 T 5a P 2 T 6 A 3 T 20 P 1

10c T 4 W 10c E 100 T 3b W 10c L 3 T 5a P 4 T 6 A 3 T 20 P 1

- T 4 N 100 T FSO N 50 T 6 A 3 T 20 P 1

example 3: T 1a P 100 G C 1 P 3 T 2a W 10b C 2 P 2

- After running the procedure, C 2 - C 1 indicates the time between the start of the gap and start of frame 10b.

The procedure commands can also contain multiactions and multiresponses in connection with T and W commands. If these are multiactions or multiresponses, they are preceded by the "&" character. Alternative responses in connection with the W command are preceded by "or".

example: T SS0 & FS0 & TH0 W SS0 & TH0 or RM1 & SI1

It shall be possible to interrupt any procedure manually.

The action and response parameters are listed in the following.

a) parameter definition of W command:

LF1	300 Hz signal on (LF-detector 3a in blockdiagram), signal from MS
LF0	300 Hz signal off
SS1	supervisory signal on
SS0	supervisory signal off
TH1	test head on (500 Hz) (LF-detector 3b in blockdiagram, signal from SS)
TH0	test head off (500 Hz)
SI1	service indicator lamp on
SI0	service indicator lamp off
CR1	call received indicator lamp on
CR0	call received indicator lamp off
RA1	roaming alarm indicator lamp on
RA0	roaming alarm indicator lamp off
AU1	auxiliary lamp indicator on
AU0	auxiliary lamp indicator off
RM1	ringing signal/malfunction alarm on
RM0	ringing signal/malfunction alarm off
RF1	RF carrier received
RF0	no RF carrier received
P11	power level 0 on (00)
P10	power level 0 off (00)
P21	power level 1 on (01)
P20	power level 1 off (01)
P31	power level 3 on (10)
P30	power level 3 off (10)
P31	power level 3 on (11)
P30	power level 3 off (11)

b) parameter definition of T command:

FS1	switch on FFSK-modem
FS0	switch off FFSK-modem

LF1	switch on 500 Hz, signal from SS
LF0	switch off 500 Hz, signal from SS
SS1	switch on supervisory signal
SS0	switch off supervisory signal
TH1	switch on test head (300 Hz)
TH0	switch off test head (300 Hz)
HK1	Hook on
HK0	Hook off
C11	compressor 1 on
C10	compressor 1 off
C21	compressor 2 on
C20	compressor 2 off
E11	expander 1 on
E10	expander 1 off
E21	expander 2 on
E20	expander 2 off
E31	expander 3 on
E30	expander 3 off
E41	expander 4 on
E40	expander 4 off

Example: T FS0 W TH1

## 2.1.2 Output information and format

### 2.1.2.1 **Test report**

Every action of the SS and every response from the MS shall be displayed as well as the corresponding times using at least 1 ms resolution. The frames from MS shall be represented both in hexadecimal form and using frame symbols (1a, 10b etc.). The frames transmitted by the SS are only indicated by frame symbols.

The following information shall be displayed on the screen:

- test name
- date and time
- a short description of the test or the combined commands
- test object
- operator name or initials
- main parameters
- RF levels
- channel numbers
- procedure names
- manual and automatic operations during the test
- time difference between successive actions and responses
- number of corrected bit errors in the frame received
- real time clock readings corresponding to actions and responses on transmitter 1 and 2/receiver 1 and 2

In case no correct response is obtained, a fault indication is given and the test sequence is continued when possible. If not possible, the next test in the series of the tests is initiated.

It shall be possible to scroll one complete test report on the screen and also make a printed copy. The scrolling shall be continuous and smooth.

Pre-defined keys giving at least 32 separate functions shall be provided.

#### 2.1.2.2 **Automatic Control of Test Results**

After each test it shall be possible by command to compare automatically following items in the test report with the check list requirements given to the computer. (See check list for test of NMT-900 mobile stations).

- time intervals between chosen responses and actions
- minimum, maximum, and exact number of received frames or other responses according to frame type and position in the procedure
- calculations concerning time intervals

It shall also be possible to save some test results to be used in other tests.

### 2.2 **EQUIPMENT AND BLOCKDIAGRAM OF THE SS**

In fig. 6 the block diagram shows a functional set-up for the SS.

The measuring instruments and other functional blocks in the block diagram are described in the following.

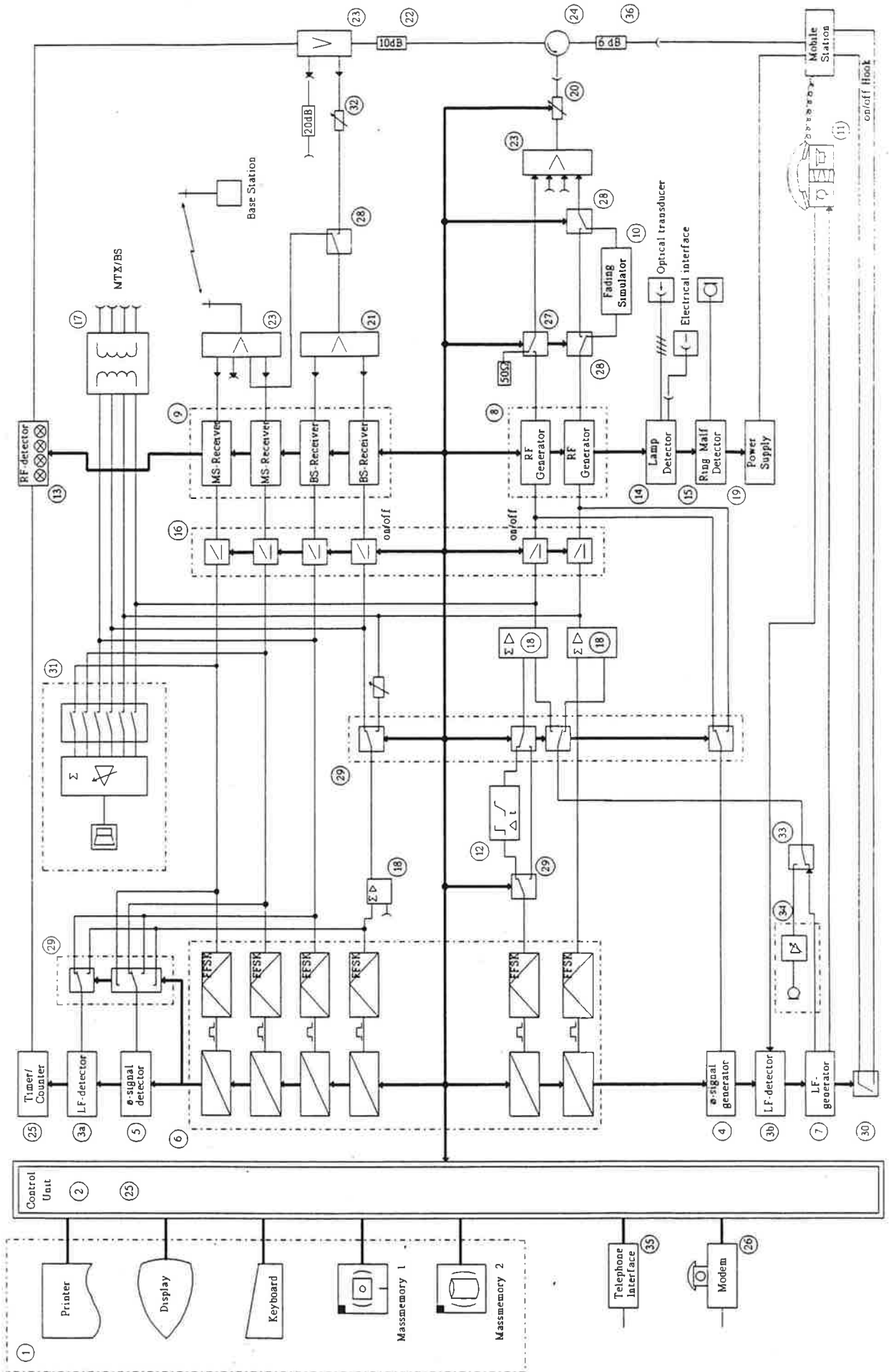


Fig. 6 FUNCTIONAL SETUP FOR THE NMT-900 SYSTEM SIMULATOR

The equipment shall be mounted in a rack. Precaution shall be taken to insure proper operation under influence of external RF-fields. The radiation from each RF-component shall be negligible.

The system Simulator shall at least consist of the following parts.

- (1) Input/output peripherals.  
Printer, Video display, Keyboard, 2 mass memories e.g. flexible disc and winchester.
- (2) The device chosen for use as control unit shall be able to control programmable measuring instruments with built-in bus interface according to IEC 625.1. At a later stage, it will probably be desirable to expand the SS so as to enable it to test the transceiver part of the Mobile Station. Therefore, the control unit must have either sufficient software capacity for such tests as well, or a modular memory, capable of sufficient expansion for such tests.
- (3) The LF-detector shall give information about the audio path status in the MS via an interface to the control unit. The frequencies will be 300 Hz (3a) and 500 Hz (3b).
- (4) The  $\emptyset$ -signal generator shall be able to transmit any of the four frequencies used for the supervisory signal.
- (5) The  $\emptyset$ -signal receiver shall detect and give information about the  $\emptyset$ -signal and frequency number.
- (6) Bit generators, frame generators, encoders and modulators are used to generate the FFSK signal. The FFSK frequencies shall be according to (NMT Doc. 900-1) paras 4.6.3 and 4.6.7. FFSK modulators, decoders and frame storage are used to receive the FFSK signal. The equipment shall fulfil the requirements in (NMT Doc. 900-1) chapter 4.6 and para 4.7.1.
- (7) The LF generator shall be able to transmit a 300 Hz signal for the test head and a 500 Hz signal for the RF generator simultaneously. The level shall be adjustable.
- (8) The RF generator shall be able to transmit the RF signals. For this purpose, equipment with IEC bus interface shall be used.
- (9) The RF receivers shall be able to detect the RF signal from the equipment under test. Two MS receivers (935-960 MHz) and two BS receivers (890-915 MHz), according to NMT Doc. 900-3 and 900-4, shall be available.
- (10) The two fading simulators shall be designed in accordance with NMT Doc. 900-3 para 6.1.5. The fading simulators shall be equipped with facility for simulating speeds of 3, 10, 50 and 90 km/h, and the correlations factor between the two simulators shall be adjustable between 0-1. The use of the two simulators is according to (NMT Doc. 900-4) Addendum 1988-04-01 para 5.26.

- (11) The test head shall be used to ensure that the speech path in the mobile station is through connected. The audio level shall be adjustable.  
  
To ensure separate operation, acoustic isolation must be between loudspeaker and microphone.
- (12) A filter acting as a distortion circuit with a group delay characteristic as shown in (NMT Doc. 900-3) para 6.1.7 shall be provided.
- (13) The RF-detectors together with necessary timing equipment shall be able to measure the transmitter start-up time, awake time and other time constants specified in (NMT Doc. 900-3) para 6.2.
- (14) Four lamp detectors and electric detectors with TTL-level shall give information to the control unit concerning status of the visual indicators in the MS. The sensitivity shall be adjustable.
- (15) A ringing signal/malfunction alarm detector with adjustable sensitivity shall inform the control unit about the acoustic signals generated by the mobile station.
- (16) The expander/compressor equipment shall be according to (NMT Doc. 900-3) paras 2.5 and 2.6.
- (17) Line interface SS-MTX/BS, impedance 600 ohm balanced, line level to MTX/BS, 0 to -40 dBm, receiving level from MTX/BS, -11 to -17 dBm.
- (18) Analog adder.
- (19) Power supply, 0-48V, 10A.
- (20) Adjustable attenuators, 0-100 dB, 1 dB, 2 GHz, setting time < 100 ms.
- (21) 2-way power divider, 2 GHz.
- (22) Fixed 10 dB attenuator, min. 10 W, 4 GHz.
- (23) 4-way power divider, 2 GHz.
- (24) 3 circulators, isolation min. 60 dB, min. 50 W.
- (25) Real time clock with battery back-up and necessary timing equipment shall be included in the control operation unit.
- (26) Telephone modem, V24, for remote operation of the SS.
- (27) Coax-switch, accuracy  $\pm 1$  ms, 2 GHz.
- (28) Coax-switch, 2 GHz.
- (29) LF-switch.

- (30) ON/OFF Hook Switch.
- (31) Monitoring loudspeaker.
- (32) Adjustable manual attenuator, 0-120 dB, 10 dB step 2 GHz.
- (33) Manual switch.
- (34) Microphone, amplifier.
- (35) Telephone line interface for detecting and answering of calls. The 300 Hz audio signal generator and the 500 Hz audio signal detector shall be connected. (Used for MTX tests).
- (36) Fixed 6 dB attenuator, min. 50 W, 4 GHz.

All RF-connectors shall be terminated.



### 3. FUNCTIONAL TESTS, IDEAL CONDITIONS

The functional tests of the MS shall test the logic operations in the MS depending on the 1200 Baud signalling from the system simulator, and manipulations on the MS Operational Control Unit.

Before the testing, the user informs the SS whether the optic and acoustic indicators are to be checked by the SS. If not, the commands regarding these indicators are not reacted upon.

All these tests shall be executed at an RF level of more than 30 dB $\mu$ V (E.M.F.) from the system simulator to ensure that no misoperation due to the radio equipment shall occur. However, during the test where channel locking capability is tested (para 3.1.2), e.g. the RF level from the system simulator shall be changed accordingly.

All the signalling sequences in NMT Doc. 900-1 shall be tested according to the paragraphs below:

Further acceptance criteria is given in the checklist for test of NMT-900 mobile stations.

- Parameters not specified are chosen random by e.g. channel numbers, power levels.

The mobile station is tested during the normal test conditions.

If a contradiction is found in this document it is superseded by NMT Doc 900-1 and Doc 900-3.

The progress of each test and the test result shall be reported in such a way that the operator can immediately determine how the MS under test fulfils the acceptance criterias of the test. The contents and format of the test reports are specified in para 2.1.2.

#### 3.1 TEST OF THE MAIN STATES FOR LCU IN MS

##### 3.1.1 Power off

It is tested that the information described in (NMT Doc. 900-3) para 5.2.1.1 has not been changed after the MS has been in power "OFF" state. Before the MS is tested according to paras 3.1.2 - 3.1.3, the power is switched off and on again.

##### 3.1.2 Standby

The function tested is the capability of the MS to enter the state search for CC, see (NMT Doc. 900-3) para 5.2.1.2, if:

- a) The received RF level is too low.
- b) The frame 2a has been received twice without receiving frame 2b, 2c, 2d or 2f.
- c) When more than two frames are lost between two correct frames.

### 3.1.2a1 **Staying on a CC when a short reduction in RF-level occurs, MS**

Procedure a1:

Power bit "10" and "11"

Transmitter 1 sends frame 1a continuously with a level greater than 14 dBuV. When service indicator has been activated for 150 s, the level of transmitter 1 is reduced to a level less than 6 dBuV during a period of 70 s. The variation in RF-level is indicated in fig 7.

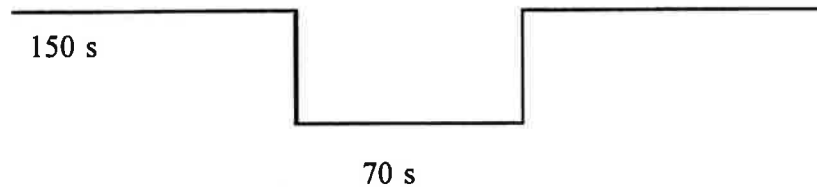


Fig 7a.

Acceptance criterion:

- MS shall not start searching for CC.

### 3.1.2a1H **Staying on a CC when a short reduction in RF-level occurs, HMS (handheld)**

Same as 3.1.2a1 except that all RF-levels are 8 dB higher. This test is used for handheld and portable 1 W stations. The test is carried out for high power bits ("11" and "10").

Medium and low power bit ("01" and "00") same as 3.1.2a1.

### 3.1.2a1BMS **Staying on a CC when a short reduction in RF-level occurs, BMS**

Procedure a1:

Power bit "10" and "11".

Transmitter 1 sends frame 1a with BSO information ( $H_3$  equal to 1 and  $H_7$  corresponding to correct group in  $X_6$ ) continuously with a level greater than 22 dB $\mu$ V. When service indicator has been activated for 150 s, the level of transmitter 1 is reduced to a level less than 14 dB $\mu$ V during a period of 63 s.

After reduction in the RF-level, the BSO signal is transmitted alternating with normal frame 1a.

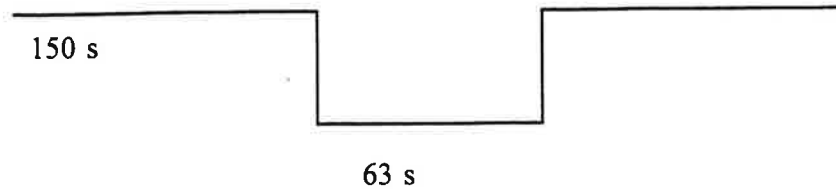


Fig. 7b.

Acceptance criterion:

- BMS shall not start searching for CC.

### 3.1.2a2 **Search for CC, when the RF-level is too low, MS**

Procedure a2:

Power bit "10" and "11".

Transmitter 1 sends frames 1a continuously with a level greater than 14 dBuV. 150 s after service indicator is activated the level of transmitter 1 is reduced to a level less than 6 dBuV.

Acceptance criterion:

- MS shall start searching for a CC after 75 - 105 s.

### 3.1.2a2H **Search for CC when the RF-level is too low, HMS (handheld)**

Same as 3.1.2a2 except that all RF-levels are 8 dB higher. This test is used for handheld and portable

1 W stations.

Medium and low power bit ("01" and "00") same as 3.1.2a2

### 3.1.2a2BMS **Search for CC when the RF-level is too low, BMS**

Procedure a2:

Power bit "10" and "11".

Transmitter 1 sends frames 1a with BSO information ( $H_3$  equal to 1 and  $H_7$  corresponding to correct group in  $X_6$ ) continuously with a level greater than 22 dB $\mu$ V. 150 s after the service indicator is activated, the level of transmitter 1 is reduced to a level less than 14 dB $\mu$ V. Before reduction in RF-level, the BSO signal is transmitted continuously in frame 1a.

Acceptance criterion:

- BMS shall start searching for CC after 68 - 112 s.

**3.1.2b1 Search for CC when two call attempts are made with less than 10 s interval**

Procedure b1:

Transmitter 1 sends frame 1a continuously with a level greater than 14 dB $\mu$ V. When service indicator is activated, transmitter 1 sends one frame 2a, then frame 1a (in a period of less than 9 seconds), one frame 2a, and then continuously frame 1a.

Acceptance criterion:

- MS shall start search for CC after second call attempt.

**3.1.2b2 Staying on a CC when two call attempts are made with more than 10 s interval**

Procedure b2:

Transmitter 1 sends frame 1a continuously with a level greater than 14 dB $\mu$ V. When service indicator is activated, transmitter 1 sends one frame 2a, then frame 1a (in a period of more than 11 seconds), one frame 2a, and then continuously frame 1a.

Acceptance criterion:

- MS shall not start searching for a new CC.

**3.1.2c1 Remain on CC when two frames are lost between two correct frames**

Procedure c1:

Transmitter 1 sends frames 1a continuously. When service indicator is "on", the frame sending is stopped for two frames, then one frame 2a and frame 1a continuously.

Acceptance criterion:

- Service indicator "on" continuously. Frame 10a received.

**3.1.2c1BMS Staying on a CC, when two frames are lost in the awake period, BMS****Procedure:**

Transmitter 1 sends frame 1a continuously.  $H_7$  does not correspond to an active group for  $X_6$ . After service indicator has switched on, 2 frames 1a are transmitted with  $H_7$  corresponding to correct group for  $X_6$ , and  $H_3$  equal to 1.

Frame 1a is sent in 24 frames, corresponding to the value of  $H_3$  in the BSO frame.  $H_7$  is changed during these frames.

Frame sending is stopped during a period of two frames.

One frame 2a with the correct MS information is transmitted to the BMS.

**Acceptance criteria:**

- Service indicator "on" continuously
- Frame 10a is received

**3.1.2c2 Start searching for a new CC when 3 frames are lost between two correct frames****Procedure c2:**

Transmitter 1 sends frames 1a continuously. When service indicator "on", the frame sending is stopped for 3 frames and then one frame 2a and frame 1a continuously.

**Acceptance criterion:**

- Service indicator "off" frame 10a not received.

**3.1.2c2BMS Search for CC, when 3 frames are lost in the awake period, BMS****Procedure c2:**

Transmitter 1 sends frame 1a continuously.  $H_7$  does not correspond to an active group for  $X_6$ . After service indicator has switched on, 2 frames 1a are transmitted with  $H_7$  corresponding to correct group for  $X_6$ , and  $H_3$  equal to 1.

Frame 1a is sent in 24 frames corresponding to the value of  $H_3$  in the BSO frame.  $H_7$  is changed during these frames.

Frame sending is stopped during a period of 3 frames.

One frame 2a with the correct MS information is transmitted to the BMS.

Acceptance criterion:

- Service indicator "off", frame 10a not received.

### 3.1.3 **The MS power supply is interrupted during conversation**

The conversation state (see (NMT-Doc. 900-3) para. 5.2.1.3) is tested in tests 3.4 - 3.7. Additionally, the capability of the MS to withstand short power interruptions is tested.

Procedure:

The MS power supply is interrupted for 3-5 seconds.

Acceptance criterion:

- The MS shall stay in the conversation state.

### 3.1.4 **Search for calling channel**

#### 3.1.4.1 **Measuring the scan time in the basic band**

Transmitter 1 sends frame 1a continuously on a channel in the basic band. A call is made to the MS according to scheme B. The system simulator sends clearing and the frame sending of transmitter 1 is stopped for a period of 3 frames, and after that frame 2a is transmitted. The MS shall start searching for CC on previous CC. After one scan time the MS shall lock to the CC on the previous channel and respond with frame 10a. The scan time is calculated from end of last frame 13a(L=1) to start of 10a minus 308 ms.

Acceptance criterion:

- The scan time in the basic band shall be less than 20 ms x (number of channels in the basic band).

#### 3.1.4.2 **Measuring the scan time in a given CC-band**

Transmitter 1 sends frame 1a continuously on one channel, and transmitter 2 sends frame 4 continuously on another channel in the CC-band. The parameters  $H_3$ ,  $H_4$ ,  $H_5$ , and  $H_6$  in frame 1a contain information about the start and end points of the CC-band (see (NMT Doc.900-1) para. 4.3.3.13.3 ).  $H_1$  has the value 14 and  $H_2$  is 0, which inform the MS that it shall use the CC-band given by the H-parameter. A call is made to the MS according to scheme B. The system simulator sends clearing and the frame sending of transmitter 1 is stopped for a period of 3 frames and after that frame 2a is transmitted.

The MS shall lock to the CC on the previous channel and respond with frame 10a. The scan time is calculated from end of last frame 13a(L=1) to start of 10a, minus 308 ms.

Acceptance criterion:

- The scan time in the CC-band shall be less than 20 ms x (number of channels in the CC-band).

### 3.1.4.3 Channel acceptance procedure for CC

Transmitter 1 sends frame 1a continuously on one channel and transmitter 2 sends frame 4 continuously on another channel.

The parameters  $H_3$ ,  $H_4$ ,  $H_5$ , and  $H_6$  in frame 1a contain information about start and end points of the CC-band (see (NMT Doc.900-1) para. 4.3.3.13).  $H_1$  has the value 14 and  $H_2$  is 0, which inform the MS that it shall use the CC-band given by the H-parameter. A call is made to the MS according to scheme B. The system simulator sends clearing.

The MS shall start searching for CC on previous CC. The number of scans depends on the RF-level, previous power bit, and actual power bit (NMT Doc. 900-3 para. 5.2.1.4.2). After these scans the MS shall lock to the CC. The test is carried out for different combinations of RF-power, previous power bits, and actual power bits. Transmitter 1 is then converted to a combined calling/traffic channel and the test is repeated.

Acceptance criteria:

- The number of scans shall be in accordance with the table in (NMT Doc. 900-3) para. 5.2.1.4.2.
- The result shall be clearly shown in a table. It shall be possible to run a small part of the complete test procedure.

### 3.1.4.4 Control of the channels scanned in scan 8

The parameters  $H_1$  -  $H_6$  are given in such a way that the CC-band is not similar to the basic band.

Procedure:

Transmitter 1 sends frame 1a continuously on one channel in the CC-band. After the service indicator is activated, transmitter 2 starts to transmit frame 1a on one channel outside the CC-band but inside basic bands with  $H_1$  equal to 14, and  $H_2$  equal to 0. Frame sending is stopped of transmitter 1. The MS shall search for CC in 7 scans in the CC-band before it includes the rest of the basic band.

Acceptance criterion:

- The MS shall be locked to the CC after a period of:  
7 x (scan time in the CC-band), and before  
8 x (scan time in the CC-band) + (scan time in the basic-band).

**3.1.4.5a Acceptance of calling channel (MS group A)**

MS belonging to group A must not go to standby on the calling channel 1a".  
See (NMT Doc. 900-1) para 4.3.2.

Procedure:

Different combinations of the basic- and the CC-band should be tested ( $H_1$ - $H_6$ ).  
Transmitter 1 sends frame 1a' or 1a" continuously in the basic- or the CC-band.

Acceptance criterion:

- MS group A must accept frame 1a' but reject frame 1a".

**3.1.4.5b Acceptance of calling channel (MS group B)**

MS belonging to group B must not go to standby on the calling channel 1a'.

Procedure:

Different combinations of the basic- and the CC-band should be tested ( $H_1$ - $H_6$ ).  
Transmitter 1 sends frame 1a' or 1a" continuously in the basic- or the CC-band.

Acceptance criterion:

- MS group B must accept frame 1a" but reject frame 1a'.



## 3.2 ROAMING

The logic function tested is the capability of the MS to compare a new traffic area (TA) number  $Y_1Y_2'$  with the previously stored traffic area  $Y_1Y_2$ . Also the specified delayed activation of the roaming updating shall be tested.

Signalling scheme: see (NMT Doc. 900-1) para. 4.4.1.5.

### 3.2.1 Successful roaming updating

#### 3.2.1aA **Successful roaming updating in basic band, level A**

CC-band = TC-band( $H_1-H_{10}=0$ )

Procedure:

- Transmitter 1 sends frame 1a with high power indication continuously on a channel in the basic band. A call is made to the MS according to scheme B.
- Transmitter 1: CC with frames 1a,  $Y_1Y_2'$ , RF-level A.
- Transmitter 2 sends clearing and after that frames 4 with new  $Y_2$  is transmitted.
- Signalling scheme (NMT Doc. 900-1) para. 4.4.1.5.

#### 3.2.1aB **Successful roaming updating in basic band, level B**

CC-band = TC-band ( $H_1-H_{10}=0$ ).

The procedure is the same as 3.2.1aA except that RF-level is changed from level A to level B.

#### 3.2.1aC **Successful roaming updating in basic band, level C**

CC-band = TC-band ( $H_1-H_{10}=0$ )

The procedure is the same as 3.2.1aA except that RF-level is changed from level A to level C.

#### 3.2.1b **Successful roaming procedure on a TC outside basic band**

It is tested that the MS can update itself if the TC band in the new  $Y_2$  area is outside the basic band. The procedure is the same as 3.2.1aA except that additional information about a TC band outside basic band is transmitted.

**3.2.1c Successful roaming procedure on an AC outside basic band**

It is tested that the MS can update itself if the TC/AC band in the new  $Y_2$  area is outside the basic band. The procedure is the same as 3.2.1aA except that additional information about a TC/AC band outside basic band is transmitted. The procedure is described in (NMT Doc. 900-1) para. 4.4.1.11.

**3.2.2 Unsuccessful roaming updating****3.2.2.1 Unsuccessful roaming updating and then updating with DDM not empty**

Procedure:

- Transmitter 1: CC with frames 1a,  $Y_1Y_2$ .
- Transmitter 2: TC with frames 4,  $Y_1Y_2'$  continuously.

When service indicator is "ON".

- Transmitter 1: CC with frames 1a,  $Y_1Y_2'$ .
- Transmitter 2 does not send frame 3b but frame 4 continuously.

Acceptance criteria:

- Service indicator "OFF".
- MS must send two frames 11a in the first attempt and within one scan time two frames 11a in the second attempt.
- Roaming alarm in MS.
- Service indicator "ON".

Continued procedure: According to (NMT Doc. 900-1) para. 4.4.1.1 (Scheme A) with digits in DDM.

Acceptance criterion:

- Roaming alarm "OFF".

**3.2.2.2 Unsuccessful roaming updating and then updating with DDM empty**

Same as 3.2.2.1 except that DDM is empty.

**3.2.3 Control of the specified delay of roaming updating****3.2.3A Control of the specified delay of roaming updating, level A**

Transmitter 1 sends frame 1a with high power indication continuously on one channel and transmitter 2 sends frame 4 continuously on another channel. A call is made to the MS according to scheme B. The system simulator transmits clearing on transmitter 2 and after that frame 4 with new  $Y_2$  value is sent.

Transmitter 1 sends frame 1a with new  $Y_2$  value for a period of  $0.8 \times$  scan time. After that the old  $Y_2$  value is transmitted in frame 1a. The MS shall start searching for CC on previous CC. After one scan time the MS shall lock to the CC on the channel.

Acceptance criteria:

- No reception of frame 11a on TC.
- Service indicator "ON" after approx.  $T_x$  seconds.  
(tcc seconds if CC-band is used).

**3.2.3B Control of the specified delay of roaming updating, level B**

Transmitter 1 sends frame 1a with high power indication continuously on one channel and transmitter 2 sends frame 4 continuously on another channel. A call is made to the MS according to scheme B. The system simulator transmits clearing on transmitter 2 and after that frame 4 with new  $Y_2$  value and RF-level is changed from level A to level B on transmitter 1. Transmitter 1 sends frame 1a with new  $Y_2$  value for a period of  $2.5 \times$  scan time. After that the old  $Y_2$  value is transmitted in frame 1a. The MS shall start searching for CC on previous CC.

Acceptance criteria:

- No reception of frame 11a on TC.
- Service indicator "ON" after approx. 3 scan times.

**3.2.3C Control of the specified delay of roaming updating, level C**

Transmitter 1 sends frame 1a with high power indication continuously on one channel and transmitter 2 sends frame 4 continuously on another channel. A call is made to the MS according to scheme B. The system simulator transmits clearing on transmitter 2 and after that frame 4 with new  $Y_2$  value and RF-level is changed from level A to level C on transmitter 1. Transmitter 1 sends frame 1a with new  $Y_2$  value for a period of  $5.5 \times$  scan time. After that the old  $Y_2$  value is transmitted in frame 1a. The MS shall start searching for CC on previous CC.

Acceptance criteria:

- No reception on frame 11a on TC.
- Service indicator "ON" after approx. 6 scan times.

### 3.3 TRAFFIC CHANNEL OR COMBINED TC/CC

#### 3.3.1 Traffic channel or combined TC/CC seizure

The logic function tested is the capability to recognize a channel marked with frame 4.

Signalling scheme: (NMT Doc. 900-1) para. 4.4.1.1 states 1-3.

The function tested is detection of a free traffic channel or combined TC/CC channel.

Procedure:

- RF level on both channels 30 dB (1uV) E.M.F.
- Transmitter 1: frame 1a,  $Y_1 Y_2$ .
- Transmitter 2: frame 4, or frame 1b,  $Y_1 Y_2$ .
- A telephone number is dialled on the MS.

When service indicator is "ON" the MS goes "off hook".

Acceptance criteria:

- Service indicator "OFF".
- frame 4: two frames 10b received on Receiver 2 during first scan (TC-seiz1).
- frame 1b: two frames 10b received on Receiver 2 within one to two scans (TC-seiz2), see (NMT Doc. 900-3) para. 5.2.1.4.2.
- MS shall give malfunction alarm if the signalling is stopped after state 3.
- Dialled digits memory/display shall not be cleared before MS goes "on hook".

#### 3.3.2 Measurement of the scan time in the TC-band

In the frame 1a the parameter  $H_1$  is given the value 14 and  $H_2=0$ . The parameters  $H_7$ ,  $H_8$ ,  $H_9$ , and  $H_{10}$  inform the MS of the start and end channel of the traffic band according to (NMT Doc. 900-1) para. 4.3.3.13.4.

Roaming alarm indicator in MS is activated.

Transmitter 1 sends frame 1a continuously.

Transmitter 2 sends frame 4 continuously on a channel inside the TC-band. After service indicator has been switched on, the hook switch on the MS is activated.

The test is repeated for different TC-bands.

Acceptance procedure:

The MS shall send 10b within: (Switching time to next channel) x (number of channels in the TC-band).

### 3.3.3 **Control of the channels scanned in scan 8 and scan 15**

#### 3.3.3a **Control of the channels scanned in scan 8**

Roaming alarm indicator in MS is activated.

Transmitter 1 frame sends 1a continuously and transmitter 2 sends frame 4 continuously outside the TC-band, but in the basic band. After the service indicator has been activated the hook switch on the MS is activated.

Acceptance criterion:

- The MS shall send 10b after:  
(7 x scan time in the TC-band) and before  
(8 x scan time in the TC-band) + 1 x (scan time in the basic band).

#### 3.3.3b **Control of the channels scanned in scan 15**

Transmitter 1 sends frame 1a continuously and transmitter 2 sends frame 4 outside the basic band. Frame 1a is transmitted with  $H_1=0$  and  $H_2=0$ . After service indicator is on the hook switch is activated.

Acceptance criteria:

- The service indicator shall switch off and shall be activated again after:  
(15 x scan time in the basic band), and before  
(16 x scan time in the basic band).
- Malfunction alarm is activated after 15 scan time in the basic band.

#### 3.3.4 **Channel acceptance procedure for TC**

Transmitter 1 sends frame 1a continuously on one channel, and transmitter 2 sends frame 4 on another channel.

The parameters  $H_7$ ,  $H_8$ ,  $H_9$ , and  $H_{10}$  contain information about the start and the end points of TC-band see (NMT Doc. 900-1) para. 4.3.3.13.  $H_1$  has the value 14, and  $H_2$  has the value 0 which inform the MS that it shall use the TC-band given by the H-parameter.

Roaming alarm indicator is activated and a call is then made from the MS according to scheme A. The test is repeated for all different combinations of RF power, previous power bit of CC, actual power bit of TC, and different TC-bands.

Before a test the simulator shall ask the operator for the TC-band and the scan time in the TC-band. The results shall be clearly shown in a table. It shall be possible to run a small part of the complete test procedure. (The test is also run for  $H_1$  equal to 14 and  $H_2$  equal to 12).

### 3.4 CALL MTX-MS INCLUDING FIXED CLEARING

The function tested is the capability of the MS to recognize the subscriber number, perform all the handshaking between MTX and MS, and handle a clearing initiated from MTX.

#### 3.4.1 Call MTX-MS, scheme B with fixed clearing

##### 3.4.1.1a Call MTX-MS and clearing of the call before MS answers

The function tested is call set-up from MTX to MS, and clearing of the call before MS answers.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1, signalling states 1-12.
- Ordinary calling channel (frame 1a).

Acceptance criteria:

- Frame 10a on CC.
- 4 frames 10b on TC.
- Call received indicator "ON".
- Ringing signal.

Acceptance criteria is specified in the check list.

Procedure when ringing signal has been received is according to (NMT Doc. 900-1) para. 4.4.1.3. Fixed clearing, call transfer activated.

Acceptance criteria:

- Frame 13a(L=1).
- Ringing off.
- Service indicator "ON".
- Call received indicator stays "ON".
- Call transfer indicator "ON", if implemented.



**3.4.1.1b Call MTX-MS and clearing of the call before MS answers**

The function tested is call set-up from MTX to MS, and clearing of the call before MS answers. ( MS belong to group A )

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1, signalling states 1-12.
- Ordinary calling channel (frame 1a').

Acceptance criteria:

- Frame 10a on CC.
- 4 frames 10b on TC.
- Call received indicator "ON".
- Ringing signal.

Acceptance criteria is specified in the check list.

Procedure when ringing signal has been received is according to (NMT Doc. 900-1) para. 4.4.1.3. Fixed clearing, call transfer activated.

Acceptance criteria:

- Frame 13a(L=1).
- Ringing off.
- Service indicator "ON".
- Call received indicator stays "ON".
- Call transfer indicator "ON", if implemented.

**3.4.1.1c Call MTX-MS and clearing of the call before MS answers**

The function tested is call set-up from MTX to MS, and clearing of the call before MS answers. ( MS belong to group B )

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1, signalling states 1-12.
- Ordinary calling channel (frame 1a'').

Acceptance criteria:

- Frame 10a on CC.
- 4 frames 10b on TC.
- Call received indicator "ON".
- Ringing signal.

Acceptance criteria is specified in the check list.

Procedure when ringing signal has been received is according to (NMT Doc. 900-1) para. 4.4.1.3. Fixed clearing, call transfer activated.

Acceptance criteria:

- Frame 13a(L=1).
- Ringing off.
- Service indicator "ON".
- Call received indicator stays "ON".
- Call transfer indicator "ON", if implemented.

#### 3.4.1.2

#### **Call MTX -> MS on a combined TC/CC**

The function tested is call set-up from MTX to MS on a combined calling/traffic channel.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1, signalling states 1-12.
- Combined calling/traffic channel (frame 1b).
- The MS is called by frame 2a (COMB1).
- The MS is called by frame 2e (COMB2).

Acceptance criteria:

- The MS must acknowledge frame 2a by frame 10a.
- The MS must acknowledge frame 2e by frame 10d.
- Frame 10b is signalling state 9.
- Call received indicator.

- Ringing signal.

The test is continued as in para. 3.4.1.1.

### 3.4.2 **Call MTX -> MS with answer from MS**

The function tested is call set-up from MTX to MS, and with answer from MS. Also the malfunction alarm is tested.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.
- Ordinary calling channel (frame 1a).
- MS "off hook", on ringing signal.

Acceptance criteria:

- Frame 10a on CC.
- Service indicator "OFF".
- Frame 10b on TC.
- Call received indicator "ON".
- Ringing signal.

Upon answer (MS "off hook"):

- Call received indicator "OFF".
- Frame 13a(L=14).
- Speech path connection.

Procedure when speech path connection has been established according to (NMT Doc. 900-1) para. 4.4.1.3. Fixed clearing, call transfer not activated.

Acceptance criteria:

- Frame 13a(L=1).
- Speech path disconnected.
- Malfunction alarm.
- Service indicator "ON".
- Call transfer indicator "OFF", if implemented.

End of sequence: MS "on hook".

Acceptance criterion:

- Malfunction alarm off.

### 3.4.3 **Call MTX-MS, scheme B1**

The function tested is call set-up from MTX to MS during congestion on the base station used.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.2.
- Ordinary calling channel (frame 1a).
- Fixed clearing from MTX.

Acceptance criteria is given in the check list.

Procedure when ringing signal has been received according to (NMT Doc. 900-1) para. 4.4.1.3, Fixed clearing.

### 3.4.4 **Call MTX-BMS, battery saving period**

In the frame 1a the parameters  $H_1=14$  and  $H_2=11$ .  $H_3$  is chosen from 0-15.  $H_7$  is not equal to  $X_6$  in the subscriber number.

Procedure:

Transmitter 1 sends frame 1a continuously. After service indicator has been "on" during 3 frames 1a,  $H_7$  is equalled to  $X_6$ .

The SS clock is started when one frame 1a containing  $H_7(=X_6)$  has been sent. After this the SS transmits frame 2a continuously and waits for acknowledgement from MS, frame 10a.

Acceptance criterion:

- The MS must not send frame 10a before the time indicated by  $H_3$  according to (NMT Doc. 900-1) para. 4.3.3.14.4 has elapsed.

### 3.4.4.1BMS **Battery saving period, BMS**

It is tested that the BMS can receive a call after the end of the sleeping period. The sleeping periods must be checked by means of test 3.4.4.

Procedure:

- Transmitter 1 sends frame 1a continuously.  $H_1$  and  $H_2$  are equal to 0. After service indicator has switched on, the following frames are sent:
- 2 frames 1a with BSO information are sent ( $H_7$  corresponding to an active group for  $X_6$ , and  $H_3$  is equal to 1).
- Frames 1a are sent in number of frames, which is given by the value of  $H_3$  in the BSO frame. ( $H_7$  does not correspond to an active group for  $X_6$ ).
- One frame 2a with the correct BMS information is transmitted to the BMS.
- 80 frames 1a are sent to prevent the BMS from searching for CC.
- The test is repeated for all combinations of  $H_3$  according to (NMT Doc. 900-1) para. 4.3.3.14.4.

Acceptance criterion:

- The BMS shall send one frame 10a after each sleeping period.

### 3.4.4.2BMS **No calling channel present, BMS**

It is tested that the BMS starts searching for a CC if the CC channel has changed during the sleeping period and become a TC.

Procedure:

- Transmitter 1 sends frame 1a continuously.  $H_1$  and  $H_2$  are equal to 0. After service indicator has switched on, 2 frames 1a are transmitted with BSO information ( $H_7$  corresponds to an active group for  $X_6$ , and  $H_3$  is equal to 1).
- Frames 1a with BSO information are sent in 12 frames ( $H_7$  not corresponding to an active group for  $X_6$ ).
- frame 4 is transmitted to the BMS.
- Frames 1a are transmitted with BSO information ( $H_7$  not corresponding to an active group for  $X_6$ ).

Acceptance criteria:

- The BMS shall switch off the service indicator.
- The BMS shall switch on the service indicator less than 1 scan time later.

#### 3.4.4.3BMS Ignoring first BSO after locking to a CC, BMS

It is tested that the BMS after locking to a new CC ignores the first received BSO.

It is also tested that the BMS does not accept the first BSO after frame 2a.

##### Part 1 Ignoring first BSO after locking to a CC, BMS

Procedure:

- Transmitter 1 sends frame 1a continuously with  $H_1$  and  $H_2$  equal to 0. After service indicator has switched on, transmitter 1 is changed to another channel.
- Transmitter 1 sends frame 1a continuously with  $H_1$  and  $H_2$  equal to 0.
- After the service indicator is switched on, one frame 1a with BSO information is transmitted on transmitter 1.
- One frame 2a with the correct MS information is transmitted to the MS on transmitter 1.

Acceptance criterion:

- The BMS shall send one frame 10a.

The test is continued with the following to check that the BMS does not accept the first BSO after frame 2a.

##### Part 2 Ignoring first BSO after receiving 2a, BMS

Procedure:

- Frames 1a are transmitted with  $H_7$  not corresponding to an active group for  $X_6$ .
- One frame 2a is transmitted.
- Frame 1a with BSO information ( $H_3$  equal to 1, and  $H_7$  corresponding to an active group for  $X_6$ ).

- 5 frames 1a with  $H_7$  not corresponding to an active group for  $X_6$  are transmitted.

- One frame 2a is transmitted.

Acceptance criterion:

- The BMS shall send frame 10a twice.

### 3.5 CALL MS-MTX INCLUDING MS CLEARING

#### 3.5.1 Call MS-MTX on a traffic channel, including MS clearing

The function tested is the handshaking and the number sending performed when a call is initiated from MS.

Procedure:

- Roaming indicator on.
- According to (NMT Doc. 900-1) para. 4.4.1.1 and (NMT Doc. 900-3) fig. 5.7.
- Ordinary calling channel (frame 1a).
- Choose desired number before MS goes "off hook".

Acceptance criteria:

- Service indicator "OFF".
- Frame 10b (signalling state 3).
- Frame 10b second time (signalling state 5).
- Frame 14a, 14b, 14a.... according to dialled number.
- Frame 15.
- Ø-signal loop.
- Speech path connection.
- The MS must try a second time if the first 10b is not acknowledged by 3b, (MS-CALL2).

The SS does not send 5a(L=6) or continued procedure when speech path connection has been established. According to (NMT Doc. 900-1) para. 4.4.1.3, Mobile clearing.

Acceptance criteria:

- Frame 13a(L=1).
- Ø-signal loop disconnected.
- Speech path disconnected.



### 3.5.1.1AS Call from MS<sub>s</sub> on a traffic channel, including MS clearing, added security

The function tested is the handshaking and the number sending performed when a call is initiated.

The test 3.5.1.1AS is repeated with different combinations of frames 3b and 7.

The combinations are:

- (T 3b P 1 T 7 P 1) 1 time + T R P 6.
- (T R P 5 T 3b P 1 T 7 P 1 T R P 1).
- (T 3b P 1 T 7 P 1) 4 times.
- (T 3b P 1 T R P 6 T 7 P 1).

Procedure

- Roaming-indicator on.
- According to (NMT Doc. 900-1) para. 4.4.1.1, frames 3b and 7 are sent in consecutive frames, max. T ms in state 4.
- 5a(L=11) in state 6.
- Ordinary calling channel (frame 1a).
- Choose desired number before MS<sub>s</sub> goes "off hook".

Note: The random number: Rand in frame 7 RD2 contains at least two ones and RD1 three ones. Rand shall fulfil the requirement mentioned above.

Acceptance criteria:

- Service indicator "OFF".
- Frame 10b (signalling state 3).
- 4 frames 10b second time (signalling state 5).
- 2 frames 16 in signalling state 5a shall be transmitted according to RAND in frame 7.
- Frame 15 may be transmitted between frame 10b and 16.
- Calculation time of SRES shall be less than 600 ms.
- Frame 14a, 14b (encrypted) according to dialled number and RAND in frame 7.
- Frame 15 may be transmitted after fra 14a/14b.
- Ø-signal loop connected.

- Speech path connected.
- The MS must try a second time if the first 10b is not acknowledged by 3b, (MS-CALL2).

The SS does not send 5a(L=6) or continued procedure when speech path connection has been established, according to (NMT Doc. 900-1) para. 4.4.1.3, Mobile clearing.

Acceptance criteria:

- Frame 13a(L=1).
- Service indicator "ON".
- Ø-signal loop disconnected.
- Speech path disconnected.

#### 3.5.1.2AS **Call from MS<sub>as</sub> on traffic channel with incorrect frame 7, added security**

The test 3.5.1.1AS is repeated with incorrect information in frame 7.

The incorrect information in frame 7 is:

- wrong RD1 and/or RD2.
- wrong prefix.
- wrong channel number.
- wrong  $Y_1 Y_2$ .
- $JJJ \neq 000$ .

Note: RD1 contains less than 3 binary digits with ones and/or RD2 less than 2 digits with ones.

Procedure:

- Roaming-indicator on.
- According to (NMT Doc. 900-1) para. 4.4.1.1, frames 3b and 7 are sent in consecutive frames, max. T ms in state 4. Frame 7 contains incorrect information according to the above mentioned.
- 5a(L=3) in state 6.
- Ordinary calling channel (frame 1a).
- Choose desired number before MS<sub>as</sub> goes "off hook".

## Acceptance criteria:

- Service indicator "OFF".
- Frame 10b (signalling state 3).
- 4 frames 10b second time (signalling state 5).
- Ø-signal loop connected.
- Frame 14a, 14b according to dialled number.
- Speech path connected.
- MS shall not send frame 16.
- The MS must try a second time if the first 10b is not acknowledged by 3b, (MS-CALL2).

The SS does not send 5a(L=6) or continued procedure when speech path connection has been established, according to (NMT Doc. 99-1) para. 4.4.1.3, Mobile clearing.

## Acceptance criteria:

- Frame 13a(L=1).
- Ø-signal loop disconnected.
- Speech path disconnected.

## 3.5.1.3AS

**Unsuccessful call from MS<sub>s</sub> on a traffic channel with incorrect frame 7, added security**

The test 3.5.1.2AS is repeated with frame 5a(L=11).

The incorrect information in frame 7 is:

- wrong RD1 and/or RD2.
- wrong prefix.
- wrong channel number.
- wrong Y<sub>1</sub>Y<sub>2</sub>.
- JJJ ≠ 000.

Note: RD1 contains less than 3 binary digits with ones and/or RD2 less than 2 digits with ones.

**Procedure:**

- Roaming-indicator on.
- According to (NMT Doc. 900-1) para. 4.4.1.1, frames 3b and 7 are sent in consecutive frames, max. T ms in state 4.
- 5a(L=11) in state 6.
- Ordinary calling channel (frame 1a).
- Choose desired number before MS<sub>as</sub> goes "off hook".

**Acceptance criteria:**

- Service indicator "OFF".
- Frame 10b (signalling state 3).
- 4 frames 10b second time (signalling state 5).
- Frame 13a (L=1).
- MS shall not send frame 16.

**3.5.2 Call from MS via or on an access channel****3.5.2.1 Call MS-MTX via an access channel****Procedure:**

- According to (NMT Doc. 900-1) para. 4.4.1.1 and 4.4.1.11 and (NMT Doc. 900-3) fig. 5.4 and 5.7.
- Ordinary calling channel.
- Dialed digits memory in MS not empty.
- The allocated channel may be any of 1999.

**Acceptance criteria:**

- Service indicator "OFF" after "off hook".
- Frame 10a.
- 4 frames 10b in signalling state 6.
- The MS must try a second time if the first frame 10a is not acknowledged by frame 3d.

- Frame 14a, 14b according to dialled number.
- Ø-signal loop connected.
- Speech path connected.

The SS does not send 5a(L=6) or continued procedure when speech path connection has been established, according to (NMT Doc. 900-1) para. 4.4.1.3, Mobile clearing.

Acceptance criteria:

- Frame 13a(L=1).
- Ø-signal loop disconnected.
- Speech path disconnected.

### 3.5.2.1AS

#### **Call from MS<sub>ss</sub> via an access channel, added security**

It is tested that the MS with added security can make a call via an access channel.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.11 in sign. state 5, frames 3b and 7 are sent in consecutive frames, max. T ms.
- When SS is ready to receive, encrypted digits frame 5a(L=11) is transmitted.
- Dialled digits memory is not empty.
- The allocated channel may be any of 1999.

Acceptance criteria:

- Service indicator "off" after "off hook".
- Frame 10a.
- 4 frames 10b in signalling state 6.
- 2 frames 16 in signalling state 6a.
- Frame 14a, 14b (encrypted) according to dialled number.
- The MS may transmit idle frames between frames 10b and 16.
- Calculation time less than 600 ms.

- The MS must try a second time if the first 10a is not acknowledged by 3d, (Access1AS).

The SS does not send 5a(L=6) or continued procedure when speech path connection has been established, according to (NMT Doc. 900-1) para. 4.4.1.3, Mobile clearing (Access 2).

- Frame 13a(L=1).
- Ø-signal loop disconnected.
- Speech path disconnected.

### 3.5.2.2

#### **Call from MS on an access channel**

Same tests as test 3.5.2.1 except that access channel is used as traffic channel.

## 3.6 SWITCHING CALL IN PROGRESS

### 3.6.1 Successful switching call in progress

#### 3.6.1.1 Successful switching call in progress, ordinary procedure

The function tested is a successful switching call in progress.

Procedure:

- MS established in conversation state according to para. 3.4 or 3.5 above.
- According to (NMT Doc. 900-1) para. 4.4.1.4.1, but power bits in  $N_1'$  are changed.

Acceptance criteria:

- Frame 10b on new channel with correct power level indication.
- Ø-signal loop.
- Speech path open on new channel.
- Correct measured power level.

End of sequence: MS "on hook".

#### 3.6.1.2 Successful switching call in progress, improved procedure

The function tested is successful switching call in progress.

Procedure:

- MS established in conversation state according to para. 3.4 or 3.5 above.
- According to (NMT Doc. 900-1) para. 4.4.1.4.2 but power bits in  $N_1'$  are changed.
- Ø-signal sent together with frame 20 ( $A=14$ ).

Acceptance criteria:

- Frame 10b on new channel with correct power level indication.
- Ø-signal loop.

- Speech path open on new channel.
- Correct measured power level.

End of sequence: MS "on hook".

### 3.6.1.3 Short procedure with high RF-level

The function tested is successful switching call in progress with RF-level > 24 dB(1 $\mu$ V)E.M.F. to MS on new channel.

Procedure:

- MS established in conversation state according to para. 3.4 or 3.5 above.
- According to (NMT Doc. 900-1) para. 4.4.1.4.3 but power bits in N<sub>1</sub>' are changed.
- Ø-signal sent together with frame 20 (A=14).

Acceptance criteria:

- Frame 10b on new channel with correct power level indication.
- Ø-signal loop.
- Speech path open on new channel.
- Correct measured power level.

End of sequence: MS "on hook".

### 3.6.1.4 Successful switching call in progress with RF-level < 16 dB(1 $\mu$ V)EMF, short procedure

The function tested is successful switching call in progress with RF-level < 16 dB(1 $\mu$ V)E.M.F. to MS on new channel.

Procedure:

- MS established in conversation state according to para. 3.4 or 3.5 above.
- According to (NMT Doc. 900-1) para. 4.4.1.4.3 but power bits in N<sub>1</sub>' are changed.
- Ø-signal sent together with frame 20 (A=14).



Acceptance criteria:

- Four frames 10b on new channel with correct power level indication.
- Ø-signal loop.
- Speech path open on new channel.
- Correct measured power level.

End of sequence: MS "on hook".

### 3.6.2 **Unsuccessful switching call in progress**

#### 3.6.2.1 **Unsuccessful switching call in progress, ordinary procedure**

The function tested is the capability to go back to the old channel and re-establish the conversation when the switching call in progress sequence fails.

Procedure:

- MS established in conversation state on transmitter 1 according to para. 3.4 or 3.5 above.
- Transmitter 1: Frame 3a (channel order to Transmitter 2 in T' ms).
- Transmitter 2: Not activated.

Acceptance criteria.

- No reception of frame 10b on Receiver 2.
- Ø-signal loop on previous channel.
- Speech path open on previous channel.
- Correct measured power level on previous channel.

End of sequence: MS "on hook".

#### 3.6.2.2 **Unsuccessful switching call in progress, short procedure**

The function tested is the capability to go back to the old channel and re-establish the conversation when the switching call in progress sequence fails.

**Procedure:**

- MS established in conversation state on transmitter 1 according to para. 3.4 or 3.5 above.
- Transmitter 1: Frame 3c (channel order to Transmitter 2 in T' ms).
- Transmitter 2: Not activated.

**Acceptance criteria:**

- No reception of frame 10b on Receiver 2.
- Ø-signal loop on previous channel.
- Speech path open on previous channel.
- Correct measured power level on previous channel.

**End of sequence: MS "on hook".**

### 3.7 CHANGE OF OUTPUT POWER LEVEL

#### 3.7.1 Change of MS output power level on same channel during conversation

The function checked is the changing of MS output power level on same channel during conversation.

Procedure:

- MS established in conversation state on transmitter 2 according to para. 3.4 and 3.5 above.
- According to (NMT Doc. 900-1) para. 4.4.1.8, the power change shall be carried out in every combination, with conversation states between.

Acceptance criteria:

- Frames 10b with correct power level indication  $N_1$ .
- Change of MS output power corresponding to new  $N_1$ .
- Ø-signal loop open.
- Speech path open.

#### 3.7.2 Change of MS output power level on TC

The function is checked during different power indication on CC and TC.

Procedure:

- Power indication is low on CC and high on TC when the mobile initiates a call, the SS shall not react on the call.

Acceptance criteria:

- Service indicator "OFF".
- Frame 10b on TC, with correct high power level indication in  $N_1$ .
- Service indicator "ON".

Acceptance criteria level 2 is given in the check list.

### 3.8 COUNTRY SELECTOR

The bits  $Y_1Y_2$  are changed in order to simulate a country different from the home country. The function tested is the operation with corresponding change in the country selector.

#### 3.8.1 Change of country selector (no valid $Y_1Y_2$ )

Procedure:

- Transmitter 1: Frames 1a,  $Y_1Y_2$  continuously. When service indicator "on" change country selector on MS to new nationality ( $Y_1'$ ).

Acceptance criteria:

- Service indicator "off" after change of country selector.

#### 3.8.2 Change of country selector (valid $Y_1Y_2$ )

##### 3.8.2a Change of country selector (valid $Y_1Y_2$ )

(TC-band is inside the basic band)

Procedure:

- Transmitter 1: Frames 1a,  $Y_1Y_2$  continuously. When service indicator "on" change country selector on MS to new nationality ( $Y_1'$ ).
- Transmitter 1: Frame 1a,  $Y_1'Y_2$  where  $Y_1'Y_2$  belongs to the new country selected.
- Transmitter 2: Frame 4  $Y_1'Y_2$ .
- Signalling scheme (NMT Doc. 900-1) para. 4.4.1.5.

Acceptance criteria is given in the check list.

##### 3.8.2b Change of country selector when TC/AC band is outside basic band, update on a TC

It is tested that the MS can update itself on a TC if the new TC-band is outside the basic band.

The procedure is the same as 3.8.2a except that the new TC band is outside the basic band.

Acceptance criteria is given in the check list.

3.8.2c **Change of country selector when TC/AC band is outside basic band, update on an AC**

It is tested that the MS can update itself on an AC if the new TC-band is outside the basic band.

The procedure is the same as 3.8.2a except that the new TC band is outside the basic band.

Acceptance criteria is given in the check list.

### 3.9 AUTONOMOUS TIME-OUT OF MS

#### 3.9.1 Switch off all power in MS after complete loss of RF input signal

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.
- Close TC transmitter approx. 40 s.

Acceptance criteria:

- MS clearing before switch off.
- All power of MS switched off.

#### 3.9.2 Autonomous time-out of MS power during burst of RF input signal

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.
- Close transmitter for 20 s.
- Open transmitter for 5 s.
- Close transmitter for 20 s.
- Open transmitter.

Acceptance criterion:

- No power switch-off. Conversation state.

End of sequence: MS "on hook".

#### 3.9.3 Autonomous time-out of MS power during short bursts of RF input signal

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.
- Close transmitter for 12 s.
- Open transmitter for 500 ms.

- Close transmitter for 12 s.
- Open transmitter for 500 ms.
- Close transmitter for 12 s.

Acceptance criteria:

- MS clearing before switch off.
- All power of MS switched off.

#### 3.9.4

#### **Autonomous time-out of MS power during FFSK-signalling continuously**

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.
- Frame 6 on TC transmitter approx. 40 s.

Acceptance criteria:

- MS clearing before switch off.
- All power of MS switched off.

### 3.10 MFT CONVERTER

#### 3.10.1.1 Push button data transmission, manual transmission

The function tested is the capability of MS to enter MFT converter state and to transmit data according to digits pushed and to go back to conversation state.

Procedure:

- MS established in conversation state according to para. 3.4 or 3.5 above.
- According to (NMT Doc. 900-1) para. 4.4.1.9.1.

Acceptance criteria:

- Frame 13a(L=8) from MS.
- MFT visual indicator.
- Frames 15, 14a, 14b.
- Speech connection.

#### 3.10.1.2 MS clearing during manual MFT transmission

The function tested is to enter MS clearing state during manual MFT transmission.

Procedure:

- As in para. 3.10.1.1, but MS clearing in MFT-converter state.

Acceptance criteria:

- As in para. 3.10.1.1, but frame 13a(L=1) clearing.

#### 3.10.2 Push button data transmission, automatic transmission

The function tested is the capability of MS to enter the MFT converter state and to send automatically the data previously stored in the dialled digits memory and then leave the MFT converter state.



**Procedure:**

- MS established in conversation state according to para. 3.4 or 3.5 above
- According to (NMT Doc. 900-1) para. 4.4.1.9.2

**Acceptance criteria:**

- Frame 13a(L=8) from MS.
- MFT visual indicator.
- Frames 15, 14a, 14b...13a(L=7) automatically.
- Speech condition.

**3.11 SUBSCRIBER WITH PRIORITY**

The function tested is the priority call attempt and roaming updating on CC from mobiles with priority facility.

**3.11.1 Priority call with idle TC available at once**

Procedure:

- Dial desired number.
- According to (NMT Doc. 900-1) para. 4.4.1.7.

Acceptance criteria:

- Frame 11b on CC only when CC is free.
- Frame 10b on TC.
- Call received indication.
- Ringing signal.

On answer:

- Frame 13a(L=14).
- Frame 14a/b.

End of sequence: According to (NMT Doc. 900-1) para. 4.4.1.3.

**3.11.1AS Call from MS<sub>n</sub>, with priority (PMS), idle TC available at once, added security**

Procedure:

- Dial number requested.
- According to (NMT Doc.900-1) para. 4.4.1.7, frame 7 is sent in state 11a.
- In signalling state 14, frame 5a(L=11).

Acceptance criteria:

- Frame 11b on CC only when CC is free.
- Frame 10b on TC.

- Call received indicator.
- Ringing signal.

On answer:

- Frame 13a (L=14) in signalling state 13/-2.
- 2 frames 16, SRES in signalling state 13a.
- Frame 14a/b encrypted.

Note: Idle frame 15 may be transmitted between 13 and 13a. Check calculation time.

### 3.11.2 **Priority call with no idle TC available at once (queued)**

Procedure:

- Dial desired number.
- According to (NMT Doc. 900-1) para. 4.4.1.7.

Acceptance criteria:

- Frame 11b on CC only.
- Visual priority queue indicator "ON".
- Frame 10b on TC.
- Call received indication.
- Ringing signal.

On answer:

- Frame 13a(L=14).
- Frame 14a/b.

End of sequence: According to (NMT Doc. 900-1) para. 4.4.1.3.

### 3.11.2AS **Priority call with no idle TC available at once (queued), added security**

Procedure:

- Dial number requested.
- According to (NMT Doc. 900-1) para. 4.4.1.7, frame 7 is sent in state 11a.

- In signalling state 14, frame 5a(L=11).

Acceptance criteria:

- Frame 11b on CC only.
- Visual priority queue indicator "ON".
- Frame 10b on TC.
- Call received indication.
- Ringing signal

On answer:

- Frame 13a(L=14).
- 2 frames 16, SRES in signalling state 13a.
- Frame 14a/b encrypted.

End of sequence: According to (NMT Doc. 900-1) para. 4.4.1.3.

Note: Idle frames 15 may be transmitted between 13 and 13a. Check calculation time.

**3.12 COIN BOX MS**

The function tested is especially the tariff information interchanged between MTX and MS.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.6.
- Ordinary calling channel (frame 1a).
- Dial desired number before MS goes "off hook".

Acceptance criteria:

- Service indicator "OFF".
- Frame 12.
- Frame 12 second time.
- Frame 14a, 14b, 14a ... according to dialled number.
- Frame 15.
- Ø-signal loop.
- Frame 13b(L=2)  $Q_1Q_2$ .
- No speech condition before  $Q_1Q_2$  is correctly received in the system simulator.

End of sequence: According to (NMT Doc. 900-1) para. 4.4.1.3 MTX clearing.

**3.12AS Call coin box, added security**

The function tested is especially the tariff information interchanged between MTX and MS.

Procedure:

- According to (NMT Doc.900-1) para. 4.4.1.6. Frames 3b and 7 are sent in consecutive frames, max. T ms in state 4.
- 5a(L=11) in state 6.
- Ordinary calling channel (frame 1a).
- Dial desired number before  $MS_{AS}$  goes "off hook".

Acceptance criteria:

- Service indicator "OFF".
- Frame 12.
- Frame 12 second time.
- 2 frames 16 in signalling state 5a shall be transmitted according to RAND in frame 7.
- Frames 15 may be transmitted between frames 12 and 16.
- Calculation time of SRES shall be less than 600 ms.
- Frame 14a, 14b, 14a encrypted according to dialled number and RAND in frame 7.
- Frame 15 may be transmitted after frame 14a/14b.
- Ø-signal loop.
- Frame 13b(L=2)  $Q_1Q_2$ .
- No speech condition before  $Q_1Q_2$  is correctly received in the system simulator.

End of sequence: according to (NMT Doc. 900-1) para. 4.4.1.3, MTX Clearing.

### 3.12.1 Coin box with register recall

The function tested is especially the tariff information interchanged between MTX and MS.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.6 and 4.4.1.10.
- Ordinary calling channel (frame 1a).
- Dial desired number before MS goes "off hook".

Acceptance criteria:

- Service indicator "off".
- Frame 12.
- Frame 12 second time.
- Frame 14a, 14b, 14a ... according to dialled number.
- Frames 15.

- Ø-signal loop.
- Frame 13b(L=2)  $Q_1Q_2$ .
- No speech condition before  $Q_1Q_2$  is correctly received in the system simulator.
- When R button activated, 4 frames 13a(L=5).
- Sensitive to frame 5a(L=3).
- RR indicator function (if equipped).
- Frames 14a/b according to dialled number.
- Continuous sending of frames between digits.
- Sensitive to frame 5a(L=6).
- Speech condition.
- Frame 13b(L=2) with new  $Q_1Q_2$ .
- No speech condition before  $Q_1Q_2$  is correctly received in the system simulator.

End of sequence: According to (NMT Doc. 900-1) para. 4.4.1.3, MTX Clearing.

### 3.13 REGISTER RECALL FUNCTION

#### 3.13.1 Register recall function

The function tested is the capability of MS to send register recall signal and to proceed to send digit information as required and to enter back into conversation state.

Procedure:

- MS established in conversation state according to para. 3.4 or 3.5 above.
- According to (NMT Doc. 900-1) para. 4.4.1.10.

Acceptance criteria:

- When R button activated, 4 frames 13a(L=5).
- Sensitive to frame 5a(L=3).
- RR indicator function (if equipped).
- Frames 14a/b according to dialled number.
- Continuous sending of frames between digit.
- Sensitive to frame 5a(L=6).
- Speech condition.
- MS clearing.

#### 3.13.1AS Register recall, added security

The function tested is the capability of MS to send register recall signal and to proceed to send digit information as required and to enter back into conversation state.

Procedure

- MS established in conversation state according to para. 3.4 or 3.5 above.
- According to (NMT Doc. 900-1) para. 4.4.1.10.1.
- 3 frames 7 are sent in state 3.
- 5a(L=11) is sent in state 6.

Acceptance criteria:

- Frames 14a/14b (encrypted) according to digits sent.
- No frame 16 shall be transmitted.



#### 4. FUNCTIONAL TESTS, NON-IDEAL CONDITIONS

This test shall check the MS response under non-ideal conditions.

##### 4.1 Acceptance of signals

The function of this test is to check the capability of the MS to interpret the content in the frames when some of the characters are faulty.

##### 4.1.1 **Control of the error-correcting code**

In this test, bit error according to (NMT Doc. 900-1) para. 4.6.2 is implemented in the transmitted frames to MS. The error bursts are placed in characters checked in the MS according to (NMT Doc. 900-1) para. 4.7. The bursts sequences are described below.

[6 ... [19 ... [6 ... [19 ... [6 ...

6 inverted bits followed by 19 errorfree bits etc. The first error burst is implemented in character Z.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1 signalling states 1-10 followed by (NMT Doc. 900-1) para. 4.4.1.3 fixed (MTX) clearing state 2-3. In this test the errors are implemented in frames 2b and 5a. The test is repeated 3 times in which the error bursts are sequentially shifted 6 bits to the right.

Acceptance criteria:

- Ringing in MS.
- Release-guard, 13a(L=1) from MS.

It shall be possible to implement bit error manually, i.e. by the procedure command B.

##### 4.1.2 **Control of acceptance of signals**

In this test the SS controls the acceptance criteria described in (NMT Doc. 900-1) para. 4.7.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1 signalling state 1-3. In state 5 the SS sends frame 2f. Then state 1-10 is repeated with frame 2b in state 5.

Acceptance criteria:

- Frame 10a on CC, twice.
- Frame 10b on TC.
- Ringing in MS.

In this test the characters not controlled by the MS shall be random.

#### 4.1.3 **False frame synchronization**

The function of the test is to check the capability of handling false frame synchronization according to (NMT Doc. 900-1) para. 4.7.1.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1, state 1-5.
- In state 7 the characters  $H_8H_9H_{10}$  in the first frame 3b are modified to generate false frame synchronization.
- State 8-11.

Acceptance criteria:

- The response time, end of second frame 3b to end of first frame 10b, shall not be affected by adjusting the phase shift between CC and TC. The phase shift is varied between 0 and 166 bits.

#### 4.1.3a **False frame synchronization, improved test**

20 special frames are produced to generate three false frame synchronizations each, F1A to F10A and F1B to F10B.

FXA is a random frame (R) with false frame sync in positions as below.

FXB is the same as FXB except for correct bit-, frame sync and first informationbit.

Location of false frame synchronizations:

Frame	startbit	stopbit	informationbit number
F1	13-23	53-63	93-103
F2	17-27	57-67	97-107
F3	21-31	61-71	101-111

F4	25-35	65-75	105-115
F5	29-39	69-79	109-119
F6	33-43	73-83	113-123
F7	37-47	77-87	117-127
F8	41-51	81-91	121-131
F9	45-55	85-95	125-135
F10	49-59	89-99	129-139

**Procedure:**

- MS established in conversation state according to para. 3.4 or 3.5 above.
- Frame FXA is transmitted once followed by four FXB and one frame 3a. This is done for X=1 to 10.

**Acceptance criterion:**

- MS shall switch channel after each channel order (RF0 received).

**4.1.3b****False frame synchronization, improved test**

Same test as 4.1.3a except for second part of procedure.

**Procedure:**

- MS established in conversation state according to para. 3.4 or 3.5 above.
- Frame FXA is transmitted once followed by one frame 3a. This is done for X=1 to 10.

**Acceptance criterion:**

- MS shall switch channel after each channel order (RF0 received).

**4.2****SAFETY FROM LOCKING IN ABNORMAL STATE**

This test shall check that the MS shall not lock in any abnormal state whether the signal input may be.

A Rayleigh fading simulator in combination with an attenuator is used in the direction toward the MS. During the test the simulated speed and mean RF level shall be changed. The MS must not behave abnormally in any way when the tests 3.2.1 + 3.4.2 + 3.5 + 3.6.1 + 3.7.1 are carried out.

## 5. **PERFORMANCE TEST**

The function of the performance test is to test how the behaviour of the MS is affected by the radio path with and without interference and to check some vital parameters, see (NMT Doc. 900-3) Chapter 6. The tests 5.1 - 5.7 correspond to (NMT Doc. 900-3) System Test 6.1.1 - 6.1.7.

For each test the SS gives as measuring result the number of trials and reception probability. From the outset the number of trials shall be 1000. By using the RF-command the RF-level may be changed.

### 5.1 **SIGNALLING SENSITIVITY MEASURED BY CALL RECEPTION PROBABILITY**

The test procedure is described in (NMT Doc. 900-3) para. 6.1.1.

### 5.2 **CO-CHANNEL DATA REJECTION**

The test procedure is described in (NMT Doc. 900-3) para. 6.1.2.

The unwanted signal shall be modulated with random FFSK.

### 5.3 **ADJACENT RF-SIGNAL DECODING DEGRADATION**

The test procedure is described in (NMT Doc. 900-3) para. 6.1.3.

### 5.4 **RF INTERMODULATION DECODING DEGRADATION**

The test procedure is described in (NMT Doc. 900-3) para. 6.1.4. For this test, an extra RF-generator will be available.

### 5.5 **SIGNALLING SENSITIVITY IN PRESENCE OF RF SIGNAL FADING MEASURED BY CALL RECEPTION PROBABILITY**

The test procedure is described in (NMT Doc.900-3) para. 6.1.5.

### 5.6 **DATA SIGNAL DISTORTION**

The test procedure is described in (NMT Doc.900-3) para. 6.1.6.

The procedure shall be initiated according to (NMT Doc. 900-1) para. 4.4.1.1 states 1-7.n. The SS shall not send 5a(L=6) which will cause the MS to transmit frame 15 continuously. The noise generator  $N_G$  and BP-filter 900-2100 Hz will be available.

### 5.7 **ABILITY TO INTERPRET DISTORTED DATA SIGNALS**

The test procedure is described in (NMT Doc. 900-3) para. 6.1.7.

## 5.8 TIME CONSTANTS

### 5.8.1 Start up and decay times

The SS shall include necessary software and hardware equipment to measure the time constants given in (NMT Doc, 900-3) fig. 6.3. The time constants shall be measured on frames 10a, 10b, 10c, 10d, 11a, 11b, and 12.

The test result shall be given as frame type and time constant.

The time  $t_4$  and  $t_5$  in frames 10b, 10c, 11a, and 12 include two frames.

In frames 10a, 10d, 11b, the SS shall also give as test result the number of bits.

### 5.8.2 Switching time

#### 5.8.2.1 Switching time to next channel

See para. 3.1.4.1.

#### 5.8.2.2 Switching time to ordered channel

The test procedures are described in (NMT Doc. 900-3) para. 6.2.5.

The test result shall be given as switching time.

The test procedures shall be given by order from the user.

In start of the test the two RF-channels will be given by the user.

### 5.8.3 Power reduction

It is checked that the MS reduces the output power if the MS receives a strong input signal. (NMT Doc. 900-3) para. 5.7.1.2)

Procedure:

- MS is in conversation and the RF-level is 46 dB $\mu$ V. The level is raised to 66 dB $\mu$ V for a period of 7 s and then reduced to the previous level.

## 5.9 RECEIVER DUPLEX SENSITIVITY DEGRADATION

The reduction in sensitivity is measured when the transmitter is on (NMT Doc. 900-3) para. 2.3.7.2.2.

First a reference RF-level E0 is found corresponding to ringing signal can be received with 95% probability. Two tests for establishment of this reference level shall be possible.

**5.9.E0.AUTO Receiver duplex sensitivity degradation, reference level, auto**  
Procedure:

- Number of call attempts are made according to (NMT Doc. 900-1) para. 4.4.1.2.1, state 1-7. The test shall be repeated for RF-level on the TC in the interval -10 to 0 dB $\mu$ V with 1 dB step. Only the number of successful attempts shall be printed.

**5.9.E0.MAN Receiver duplex sensitivity degradation, reference level, manual**

Procedure:

- The operator is asked to give the number of call attempts and the RF-level. Call attempt is made according to (NMT Doc. 900-1) para. 4.4.1.2.1, states 1-7.

Only the number of successful attempts shall be printed.

**5.9.ES Receiver duplex sensitivity degradation, second part**

Procedure:

- The operator is asked to give the reference level ES and number of call attempts.
- The MS shall be in conversation. Four frames 3a are transmitted. The RF-level on the TC is 3 dB higher than E0. The frame has been understood if the RF-power is reduced on the channel.

Acceptance criterion:

- The switching call in progress shall be successful in 95% of the attempts.

## 6. **MS RESPONSE IN ABNORMAL SITUATION**

To ensure that the MS response is correct when input to the MS (either from MTX or user) is not according to ordinary signalling procedure.

### 6.1 **MS off-hook while initiating a roaming procedure**

The function tested is a successful call MS-MTX when initiated roaming procedure.

Procedure:

- MS in standby state on transmitter 1.
- On transmitter 1 Y2 is changed to Y2' in frame 1a and transmitter 2 is switched off.
- Test 3.5.

Acceptance criterion:

- The MS shall be updated after the test.

### 6.2 **Waiting time for additional ringing order**

#### 6.2.1 **Waiting time for additional ringing order within 30 s**

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1, states 1-10.
- Between the two ringing orders frame 6 is sent for 25 s.
- MTX clearing (NMT Doc. 900-1) para. 4.4.1.3, states 2-3.

Acceptance criteria:

- Ringing in MS twice.
- Release guard from MS.

#### 6.2.2 **Not received ringing order within 30 s**

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1, states 1-10.
- After first ringing order frame 6 is now sent continuously.

Acceptance criterion:

- MS clearing within 35 s.

### 6.2.3 **Waiting time for first ringing signal**

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1, state 1-9.

Acceptance criterion:

- MS sends clearing after T ms from start of frame 10b.

### 6.3 **Sensitivity for MTX-clearing in signalling scheme A, call MS-MTX**

In this test the signalling scheme A is overruled by reception of forced release from MTX.

#### 6.3.1 **Sensitivity for MTX-clearing in signalling scheme A, call MS - MTX**

Procedure :

- According to (NMT Doc. 900-1) para. 4.4.1.1, states 1-5.
- In state 6 four frames 5a(L=15).

Acceptance criterion:

- Release-guard from MS.

#### 6.3.2 **Sensitivity for MTX-clearing in signalling scheme A, call MS - MTX**

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.1, states 1-7.3.
- After receiving frame 14a state 7.3.
- MTX clearing four frames 5a(L=15).

Acceptance criterion:

- Release-guard from MS.



**6.4 MS sensitivity of frame 5a(L=6) in signalling scheme A**

The function tested is the MS sensitivity to address complete during digit transmission.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.1, states 1-7.3.
- After receiving frame 14a state 7.3 goes to state 8.

Acceptance criterion:

- Digit frame transmission shall stop immediately after receiving frame 5a(L=6).

**6.5 MS switched off by on/off switch during conversation**

The function tested is transmitting of MS clearing when MS is switched off by ON/OFF switch.

Procedure:

- According to (NMT Doc. 900-1) para. 4.4.1.2.1, states 1-17.
- MS switched off by ON/OFF switch.

Acceptance criterion:

- Release-guard from MS before switch off.

## CHECKLIST FOR TEST OF NMT-900 MOBILE STATIONS

The test numbers correspond to the paragraph numbers of the system simulator specification. The purpose of the checklist is that it should be used together with the runnings of the NMT-900 system simulator at the type testing labs. Therefore, some of the limits are not the same as specified in NMT Doc. 900-3.

Time limits in the system simulator.

The lowest time limit is 0.833 ms.

Other time limits:

- A ms ~ 7 → 78 ms
- B ms ~ 6 → 70 ms
- C ms ~ 113 → 190 ms
- D ms ~ -50 → +25 ms

### Para. 3.1.2

#### Standby

#### Test 3.1.2a1

**Staying on a CC when a short reduction in RF-level occurs, MS**

1. The service indicator shall not switch off.

#### Test 3.1.2a1H

**Staying on a CC when a short reduction in RF-level occurs, HMS (handheld)**

1. The service indicator shall not switch off.
2. The service indicator shall not switch off.

#### Test 3.1.2a1BMS

**Staying on a CC when a short reduction in RF-level occurs, BMS (battery saving)**

1. The service indicator shall not switch off.

#### Test 3.1.2a2

**Search for CC, when the RF-level is too low, MS**

1. If the MS receives a signal lower than 6 dB (1 $\mu$ V) E.M.F., the service indicator shall switch off after 75-105 s.

- Test 3.1.2a2H Search for CC, when the RF-level is too low, HMS (handheld)**
1. If the MS receives a signal lower than 14 dB (1 $\mu$ V) E.M.F. the service indicator shall switch off after 75-105 s.
- Test 3.1.2.a2BMS Search for CC, when the RF-level is too low, BMS (battery saving)**
1. If the MS receives a signal lower than 14 dB (1 $\mu$ V) E.M.F, the service indicator shall switch off after 68-112 s.
- Test 3.1.2b1 Search for CC, when two call attempts are made with less than 10 s interval**
1. Start of frame 10a shall be delayed  $30 \pm 3.3$  ms with reference to end of first frame 2a. (If not fulfilled, compare with para. 5.8.1). Doc. 900-3 para. 5.6.3
  2. One frame 10a shall be received after each attempt.
  3. Service indicator shall switch off 2.2-2.7 s after end of second frame 2a.
- Test 3.1.2b2 Staying on a CC, when two call attempts are made with more than 10 s interval**
1. Start of frame 10a shall be delayed  $30 \pm 3.3$  ms with reference to end of first frame 2a. (If not fulfilled, compare with para 5.8.1). Doc. 900-3 para. 5.6.3
  2. One frame 10a shall be received after each attempt.
  3. Service indicator must not switch off.
- Test 3.1.2c1 Staying on a CC, when two frames are lost**
1. Start of frame 10a shall be delayed  $30 \pm 3.3$  ms with reference to end of frame 2a. (If not fulfilled, compare with para. 5.8.1). Doc. 900-3 para. 5.6.3
  2. Service indicator must not switch off.
  3. Only one frame 10a shall be received.

<b>Test 3.1.2c1BMS</b>	<b>Staying on a CC, when two frames are lost in the awake period, BMS</b>	
1.	Start of frame 10a shall be delayed $30 \pm 3.3$ ms with reference to end of frame 2a. (If not fulfilled, compare with para 5.8.1).	Doc. 900-3 para. 5.6.3
2.	Service indicator must not switch off.	
3.	Only one frame 10a shall be received.	
<b>Test 3.1.2c2</b>	<b>Start searching for a new CC when 3 frames are lost between two correct frames</b>	
1.	Service indicator switches off 0.27 - 1 s after start of gap.	Doc. 900-3 para. 3.9.2
2.	The time between "transmitted gap" to "received, W SII" shall be between 0 and $T_x + 1$ s. $T_x$ is the scan time.	
<b>Test 3.1.2c2BMS</b>	<b>Search for CC, when 3 frames are lost in the awake period, BMS</b>	
1.	Service indicator switches off 0.27 - 1 s after start of gap.	Doc. 900-3 para. 3.9.2
2.	The time between "transmitted gap" to "received, W SII" shall be between 0 and $T_x + 1$ s. $T_x$ is the scan time.	
<b>Para 3.2</b>	<b>ROAMING</b>	
<b>Test 3.2.1aA</b>	<b>Successful roaming updating, TC-band = basic band, level A</b>	
1.	Start of first frame 11a shall be received 2-3 $T_x$ after service indicator switches off.	Doc. 900-3 para. 5.2.1.5
2.	Start of first frame 11a shall be received $30 \pm 3.3$ ms after the end of frame 4.	Doc. 900-3 para. 5.6.3
3.	End of frame 3b shall be acknowledged by a frame 11a within $30 \pm 3.3$ ms.	
4.	The MS-transmitter shall be "off" between the two and four frames 11a.	

5. Start of the first frame 13a(L=1) shall be received within  $n \times 138.3 \text{ ms} + T_s$  (time skew) after end of first frame 5a(L=3).
6. Two and four frames 11a and four frames 13a(L=1) shall be transmitted by the MS
7. The time from the first frame 11a after "Transmitted frame 3b" to the last frame 13a(L=1) shall be a multiple of the frame time 138.33 ms.

**Test 3.2.1aB****Successful roaming updating, TC-band = basic band, level B**

- |    |   |                          |
|----|---|--------------------------|
| 1. | Start of first frame 11a shall be received $4-5 T_x$ after last frame 13a(L=1).   | Doc. 900-3 para. 5.2.1.5 |
| 2. | Start of first frame 11a shall be received $30 \pm 3.3 \text{ ms}$ after the end of frame 4.  | Doc. 900-3 para. 5.6.3   |
| 3. | End of frame 3b shall be acknowledged by a frame 11a within $30 \pm 3.3 \text{ ms}$ .   |                          |
| 4. | The MS-transmitter shall be "off" between the two and four frames 11a.  |                          |
| 5. | Start of the first frame 13a(L=1) shall be received within $n \times 138.33 \text{ ms} + T_s$ (time skew) after end of first frame 5a(L=3). |                          |
| 6. | Two and four frames 11a and four frames 13a(L=1) (in the roaming procedure) shall be transmitted by the MS.                                 |                          |
| 7. | The time from the first frame 11a after "Transmitted 3b" to the last frame 13a(L=1) shall be a multiple of the frame time 138.33 ms.        |                          |

**Test 3.2.1aC****Successful roaming updating, TC-band = basic band, level C**

- |    |  |                          |
|----|--|--------------------------|
| 1. | Start of first frame 11a shall be received $7-8 T_x$ after last frame 13a(L=1).              | Doc. 900-3 para. 5.2.1.5 |
| 2. | Start of first frame 11a shall be received $30 \pm 3.3 \text{ ms}$ after the end of frame 4. | Doc. 900-3 para. 5.6.3   |
| 3. | End of frame 3b shall be acknowledged by a frame 11a within $30 \pm 3.3 \text{ ms}$ .        |                          |

4. The MS-transmitter shall be "off" between the two and four frames 11a.
5. Start of the first frame 13a(L=1) shall be received within  $n \times 138.3 \text{ ms} + \text{TS}$  (time skew) after end of first frame 5a(L=3).
6. Two and four frames 11a and four frames 13a(L=1) shall be transmitted by the MS.
7. The time from the first frame 11a after "Transmitted frame 3b" to the last frame 13a(L=1) shall be a multiple of the frame time 138.33 ms.

**Test 3.2.1b****Successful roaming updating, TC-band outside basic band**

1. Start of frame 11a shall be received 17-19  $T_x$  after service indicator switches off.
2. Or same as test 3.2.1aA 1.

Doc. 900-3 para.  
5.2.1.5**Test 3.2.1c****Successful roaming procedure on an AC outside basic band**

1. Start of first frame 10a shall be received 17-19  $T_x$  after service indicator switches off.
2. Or same as test 3.2.1aA 1. but frame 10a.

**Test 3.2.2.1****Unsuccessful roaming updating, and then updating with DDM not empty**

1. The service indicator shall switch "off" between 277 ms - 1 s after the start of first frame 1a ( $Y_1 Y_2'$ ) was transmitted.
2. The roaming alarm indicator shall go "on" between eight frame-times after start of frame 11a and 2 s in the second attempt.
3. The time between first and second attempt (11a) shall be less than the scan time + 8 frames.
4. Deleted.
5. The roaming indicator must go "off" between 0 s and 1 s after end of first "transmitted 5a(L=3)".

Doc. 900-3 para.  
5.2.1.2

Doc. 900-3 fig. 5.11

**Test 3.2.2.2      Unsuccessful roaming updating, and then updating with DDM empty**

- |    |   |                          |
|----|---|--------------------------|
| 1. | The service indicator shall go "off" 277 ms to 1 s after the start of first frame 1a ( $Y_1 Y_2'$ ) was transmitted.      | Doc. 900-3 para. 5.2.1.2 |
| 2. | The roaming indicator shall go "on" between eight frame-times after the start of frame 11a and 2 s in the second attempt. | Doc. 900-3 fig. 5.11     |
| 3. | The time between first and second attempt (11a) shall be less than the scan time + 8 frames.                              |                          |
| 4. | Deleted.  |                          |
| 5. | The roaming indicator must go "off" between 0 s and 1 s after end of first "Transmitted frame 5a(L=3)".                   |                          |
| 6. | Malfunction alarm shall be given -1 to 6 s after the roaming indicator goes "off".  |                          |

**Test 3.2.3A      Control of the specified delay of roaming updating, level A**

- |    |  |
|----|--|
| 1. | No reception of frame 11a on TC.               |
| 2. | Service indicator goes on after $T_x \pm 1$ s. |

**Test 3.2.3B      Control of the specified delay of roaming updating, level B**

- |    |   |
|----|---|
| 1. | No reception of frame 11a on TC.                      |
| 2. | Service indicator goes on after 3.5 - 4.5 scan times. |

**Test 3.2.3C      Control of the specified delay of roaming updating, level C**

- |    |   |
|----|---|
| 1. | No reception of frame 11a on TC.                      |
| 2. | Service indicator goes on after 5.2 - 6.8 scan times. |

**Test 3.3.1 Traffic channel or combined TC/CC seizure****TC-SEITZ1**

1. The time from service indicator goes off to start of first frame 10b shall be less than the scan time in the basic band.
2. The time between first and second attempt (10b) shall be less than the scan time + 8 frames.
3. Malfunction alarm shall come 0 - 6 s after last frame 10b.

**TC-SEITZ2**

1. The time from service indicator off to start of first frame 10b shall be within one and two scan times in the basic band.
2. The time between first and second attempt shall be greater than one scan time and less than two scan times + 8 frames.
3. Malfunction alarm shall come 0 - 6 s after last frame 10b.

**Test 3.3.2 Control of the scan time in the TC-band**

1. The MS shall send frame 10b within (switching time to next channel) x (number of channels in TC-band).

**Test 3.3.3a Control of the channels scanned in scan 8**

1. The MS shall send frame 10b after (7 x scan time in the TC-band) and before ((8 x scan time in the TC-band) + 1 x (scan time in the basic band)).

**Test 3.3.3b Control of the channels scanned in scan 15**

1. The service indicator shall switch off and shall be activated again after: (15 x scan time in basic band), and before (16 x scan time in basic band).
2. Malfunction alarm is activated after 15 scan time in the basic band.



**Para 3.4****CALL MTX-MS INCLUDED FIXED CLEARING****Test 3.4.1.1a****Call MTX-> MS and clearing of the call before MS answers**

1. Start of frame 10a shall be delayed  $30 \pm 3.3$  ms with reference to end of frame 2a. (If not fulfilled, compare with para. 5.8.1.).
2. The time between the MS has received frame 3b (with ref. to start) and starts transmitting frame 10b shall be  $n * 138.33 \text{ ms} + T_s$  (time skew) ( $n=1$  or  $2$ ) ( $T_s=30 \pm 3.3$  ms).
3. The MS shall send four frames 10b after reception of frame 3b.
4. Check that "call received indicator" is flashing.
5. The pause between first and second ringing signal shall be 10-12 s. The pause between second and third ringing signal shall be 1-3 s. There shall be a ringing signal for each ringing order frame 5a(L=9).
6. The time from start of frame 5a(L=13/15) to frame 13a(L=1) shall be  $n * 138.33 \text{ ms} + T_s$  (time skew) ( $n=1$  or  $2$ ).
7. The MS shall send four frames 13a(L=1) after reception of frame 5a(L=13/15).

Doc. 900-3 para.  
5.6.3**Test 3.4.1.1b****Call MTX-> MS and clearing of the call before MS answers**

1. Start of frame 10a shall be delayed  $30 \pm 3.3$  ms with reference to end of frame 2a'. (If not fulfilled, compare with para. 5.8.1.).
2. The time between the MS has received frame 3b (with ref. to start) and starts transmitting frame 10b shall be  $n * 138.33 \text{ ms} + T_s$  (time skew) ( $n=1$  or  $2$ ) ( $T_s=30 \pm 3.3$  ms).
3. The MS shall send four frames 10b after reception of frame 3b.
4. Check that "call received indicator" is flashing.

Doc. 900-3 para.  
5.6.3

5. The pause between first and second ringing signal shall be 10-12 s. The pause between second and third ringing signal shall be 1-3 s. There shall be a ringing signal for each ringing order frame 5a(L=9).
6. The time from start of frame 5a(L=13/15) to frame 13a(L=1) shall be  $n * 138.33 \text{ ms} + T_s$  (time skew) (n=1 or 2).
7. The MS shall send four frames 13a(L=1) after reception of frame 5a(L=13/15).

**Test 3.4.1.1c****Call MTX-> MS and clearing of the call before MS answers**

1. Start of frame 10a shall be delayed  $30 \pm 3.3 \text{ ms}$  with reference to end of frame 2a''. (If not fulfilled, compare with para. 5.8.1.).
2. The time between the MS has received frame 3b (with ref. to start) and starts transmitting frame 10b shall be  $n * 138.33 \text{ ms} + T_s$  (time skew) (n=1 or 2) ( $T_s=30 \pm 3.3 \text{ ms}$ ).
3. The MS shall send four frames 10b after reception of frame 3b.
4. Check that "call received indicator" is flashing.
5. The pause between first and second ringing signal shall be 10-12 s. The pause between second and third ringing signal shall be 1-3 s. There shall be a ringing signal for each ringing order frame 5a(L=9).
6. The time from start of frame 5a(L=13/15) to frame 13a(L=1) shall be  $n * 138.33 \text{ ms} + T_s$  (time skew) (n=1 or 2).
7. The MS shall send four frames 13a(L=1) after reception of frame 5a(L=13/15).

Doc. 900-3 para.  
5.6.3**Test 3.4.1.2****Call MTX-MS on combined calling and traffic channel**

1. Start of frame 10a shall be delayed  $30 \pm 3.3 \text{ ms}$  with reference to end of frame 2a (COMB1).
- 1a Start of frame 10d shall be delayed  $30 \pm 3.3 \text{ ms}$  with reference to end of frame 2e (COMB2).

Doc. 900-3 para.  
5.6.3

2. The time between the MS has received frame 3b (start) and starts transmitting frame 10b shall be  $n * 138.33 \text{ ms} + T_s$  ( $n=1$  or  $2$ ).
3. The MS shall send four frames 10b, after reception of frame 3b.
4. Check that "call received indicator" is flashing.
5. The pause between first and second ringing signal shall be 10-12 s. The pause between second and third ringing signal shall be 1-3 s. There shall be a ringing signal for each ringing order frame 5a(L=9).
6. The time from start of frame 5a(L=13/15) to frame 13a(L=1) shall be  $n * 138.33 + T_s$  (time skew) ( $n=1$  or  $2$ ).
7. The MS shall send four frames 13a(L=1) after reception of frame 5a(L=13/15).

**Test 3.4.2****Call MTX-MS with answer from MS**

- 1-4 Same as stated in test 3.4.1.1.
5. The MS shall give a ringing signal 0.5 - 2 s. Doc. 900-3 para. 3.7.1
6. The MS shall transmit four frames 13a(L=14).
7. LF1 (300 Hz) shall be received C ms after the start of the last frame 13a(L=14).
8. TH1 (500 Hz) shall be received A ms after transmitted frame 20(A=3). Doc. 900-1 para. 4.6.8
9. The MS shall send four frames 13a(L=1).
10. TH0 (500 Hz) shall be received B ms after start of first transmitted frame 5a(L=15). Doc. 900-1 para. 4.6.8
11. LF0 (300 Hz) shall be received within D ms with reference to start of the first frame 13a(L=1). Doc. 900-1 para. 4.6.9

**Test 3.4.3****Call MTX-MS Scheme B1**

1. Frame 10a shall be delayed  $30 \pm 3.3$  ms with reference to end of frame 2a. (If not fulfilled compare with para. 5.8.1). Doc. 900-3 para. 5.6.3

2. The MS shall send two frames 10c on the traffic channel. Doc. 900-1 para. 4.4.1.2.2
3. The time from start of frame 3b and start of transmitting frame 10c shall be  $n * 138.33 \text{ ms } T_s$  ( $n=1$  or  $2$ ).
4. The MS shall send four frames 10c after reception of frame 3b.
5. Check that "call received indicator" is flashing after end of frame 5a(L=9).
6. The pause between first and second ringing signal shall be 10-12 s. The pause between second and third ringing signal shall be 1-3 s.
7. The time from start of frame 5a(L=15) and start of transmitting frame 13a(L=1) shall be  $n * 138.33 \text{ ms } + T_s$  ( $n=1$  or  $2$ ).
8. The MS shall send four frames 13a(L=1) after start of frame 5a(L=15).

**Test 3.4.4.1BMS Battery saving period, BMS**

1. The BMS sends one frame 10a  $T_s$  after each frame 2a.

**Test 3.4.4.2BMS No calling channel present, BMS**

1. The BMS does not switch off the service indicator before 13 frames after end of frame 1a with BSO information, and not later than  $1 \text{ s } + 25$  frames after end of frame 1a with BSO information.
2. The BMS shall switch on the service indicator less than 1 scan time after the service indicator has been switched off.

**Test 3.4.4.3BMS Ignoring first BSO, BMS**

**Part 1 BMS ignoring first BSO after locking to a CC, BMS**

1. The MS sends frame 10a  $T_s$  after end of frame 2a.

**Part 2 Ignoring first BSO after receiving frame 2a**

1. The MS sends frame 10a Ts after end of first frame 2a.
2. The MS sends frame 10a Ts after end of second frame 2a.

**Para 3.5 CALL MS-MTX INCLUDING MS CLEARING****Test 3.5.1 Call from MS on traffic channel**

1. Frame 10b shall be delayed  $n * 138.33 + 30 \pm 3.3$  ms with reference to first frame 4 compare with para. 5.8.1. Doc. 900-3 para. 5.6.5
2. The MS shall send two frames 10b after receiving frame 4 and four frames 10b after receiving frame 3b.
3. The sequence of four frames 10b shall be delayed  $138.33 + 30 \pm 3.3$  ms with reference to start of frame 3b. For mobiles with added security (AS)  $2 * 138.33 + 30 \pm 3.3$  ms). Doc. 900-3 para. 5.4.2
4. Check of "no carrier" between the two sequences of frame 10b.
5. Frame 15 may be sent between frame 10b and 14a.
6. The RA0 shall be registered after end of frame 5a(L=3) when roaming alarm indicator is activated before the test.
7. The time from the first frame 10b in second sequence to the last frame 15 in the sequence shall be a multiple of the frame time.
8. Check that the MS sends two frames for each digit in the number and alternate marking (0 and 15). The frames must correspond to the keys activated on the MS.
9. TH0 (500 Hz) shall be received B ms after start of transmitted frame 5a(L=6). Doc. 900-1 para. 4.6.8
10. LF1 (300 Hz) shall be received C ms after the start of the last frame 15. Doc. 900-1 para. 4.6.8
11. TH1 (500 Hz) shall be received B ms after end of "transmitted frame 20(A=3)". Doc. 900-1 para. 4.6.8

12. LFO (300 Hz), TH0 (500 Hz), and SS0 (Ø-signal) shall come before start of the first frame 13a(L=1). Doc. 900-1 para. 4.6.9

**MS-CALL 2**

13. The MS must try to find a TC a second time if the first frame 10b is not acknowledged by frame 3b.

14. The MS shall send frame 15 during a period of 30 s if no frame 5a(L=6) is sent from the SS and then the MS shall give malfunction alarm and send clearing four frames 13a(L=1). Doc. 900-3 para. 5.3.16.2

**Test 3.5.1.1AS****Call from MS<sub>s</sub> on traffic channel including MS clearing, added security**

1. Frame 10b shall be delayed  $n * 138.33 + 30 \pm 3.3$  ms with reference to first frame 4 compare with para. 5.8.1. Doc. 900-3 para. 5.6.5
2. The MS shall send two frames 10b after receiving frame 4, and four frames 10b after receiving frame 3b.
3. The sequence of four frames 10b shall be delayed  $2 * 138.33 + 30 \pm 3.3$  ms with reference to start of frame 3b. Doc. 900-3 para. 5.4.2
4. Check of "no carrier" between the two sequences of frame 10b.
5. 2 frames 16 shall be transmitted between frames 10b and 14a. The time between the end of frame 7 and start of frame 16 shall be less than 600 ms. Frame 15 may be sent between frames 10b and 16.
6. The RA0 shall be registered after end of frame 5a(L=11) when roaming alarm indicator is activated before the test.
7. The time from the first frame 10b in second sequence to the last frame 15 in the sequence shall be a multiple of the frame time.
8. Check that the MS sends two frames for each digit in the number and alternate marking (0 and 15). The decrypted frames must correspond to the keys activated on the MS.
9. TH0 (500 Hz) shall be received B ms after start of transmitted frame 5a(L=6). Doc. 900-1 para. 4.6.8

- |     |   |                        |
|-----|---|------------------------|
| 10. | LF1 (300 Hz) shall be received C ms after the start of the last frame 15.                           | Doc. 900-1 para. 4.6.8 |
| 11. | TH1 (500 Hz) shall be received B ms after end of "transmitted frame 20(A=3)".                       | Doc. 900-1 para. 4.6.8 |
| 12. | LF0 (300 Hz), TH0 (500 Hz), and SSO (Ø-signal) shall come before start of the first frame 13a(L=1). | Doc. 900-1 para. 4.6.9 |

**MS-CALL 2**

- |     |   |                           |
|-----|---|---------------------------|
| 13. | The MS must try to find a TC a second time if the first frame 10b is not acknowledged by frame 3b.  |                           |
| 14. | The MS shall send frame 15 during a period of 30 s if no frame 5a(L=6) is sent from the SS and then the MS shall give malfunction alarm and send clearing four frames 13a(L=1). | Doc. 900-3 para. 5.3.16.2 |

**Test 3.5.1.2AS****Call from MS<sub>s</sub> on traffic channel with incorrect frame 7, added security**

- |    |  |                        |
|----|--|------------------------|
| 1. | Frame 10b shall be delayed $n * 138.33 + 30 \pm 3.3$ ms with reference to first frame 4 compare with para. 5.8.1).   | Doc. 900-3 para. 5.6.5 |
| 2. | The MS shall send two frames 10b after receiving frame 4 and four frames 10b after receiving frame 3b.   |                        |
| 3. | The sequence of four frames 10b shall be delayed $2 * 138.33 + 30 \pm 3.3$ ms with reference to start of frame 3b.   | Doc. 900-3 para. 5.4.2 |
| 4. | Check of "no carrier" between the two sequences of frame 10b.  |                        |
| 5. | No frame 16 should be sent.  |                        |
| 6. | The RA0 shall be registered after end of frame 5a(L=3) when roaming alarm indicator is activated before the test.  |                        |
| 7. | The time from the first frame 10b in second sequence to the last frame 15 in the sequence shall be a multiple of the frame time.                             |                        |
| 8. | Check that the MS sends two frames for each digit in the number and alternate marking (0 to 15). The frames must correspond to the keys activated on the MS. |                        |
| 9. | TH0 (500 Hz) shall be received B ms after start of transmitted 5a(L=6).  | Doc. 900-1 para. 4.6.8 |

- |     |   |                        |
|-----|---|------------------------|
| 10. | LF1 (300 Hz) shall be received C ms after the start of the last frame 15.                           | Doc. 900-1 para. 4.6.8 |
| 11. | TH1 (500 Hz) shall be received B ms after end of "transmitted frame 20(A=3)".                       | Doc. 900-1 para. 4.6.8 |
| 12. | LF0 (300 Hz), TH0 (500 Hz), and SS0 (Ø-signal) shall come before start of the first frame 13a(L=1). | Doc. 900-1 para. 4.6.9 |

**MS-CALL 2**

- |     |   |                           |
|-----|---|---------------------------|
| 13. | The MS must try to find a TC a second time if the first frame 10b is not acknowledged by frame 3b.  |                           |
| 14. | The MS shall send frame 15 during a period of 30 s if no frame 5a(L=6) is sent from the SS and then the MS shall give malfunction alarm and send clearing four frames 13a(L=1). | Doc. 900-3 para. 5.3.16.2 |

**Test 3.5.1.3AS****Unsuccessful call from MS<sub>1</sub> on a traffic channel, with incorrect frame 7, added security**

- |    |  |                        |
|----|--|------------------------|
| 1. | Frame 10b shall be delayed $n * 138.33 + 30 \pm 3.3$ ms with reference to first frame 4 compare with para. 5.8.1.  | Doc. 900-3 para. 5.6.5 |
| 2. | The MS shall send two frames 10b after receiving frame 4 and four frames 10b after receiving frame 3b.             |                        |
| 3. | The sequence of four frames 10b shall be delayed $2 * 138.33 + 30 \pm 3.3$ ms with reference to start of frame 3b. | Doc. 900-3 para. 5.4.2 |
| 4. | Check of "no carrier" between the two sequences of frame 10b.  |                        |
| 5. | No frame 16 shall be sent.   |                        |
| 6. | The RA0 shall be registered after end of frame 5a(L=11) when roaming alarm indicator is activated before the test. |                        |
| 7. | Check that the MS sends 4 frames 13a(L=1).   |                        |



**Test 3.5.2 Call from MS via or on an access channel****Test 3.5.2.1 Call from MS via an access channel**

1. Frame 10a shall be delayed  $n * 138.33 + 30 \pm 3.3$  ms with reference to start of frame 4b compare with para. 5.8.1. Doc. 900-3 para. 5.6.5
  2. The MS shall send one frame 10a after receiving frame 4b and four frames 10b after receiving frame 3b. Doc. 900-1 para. 4.4.1.11
  3. The sequence of four frames 10b shall be delayed  $138.33 + 30 \pm 3.3$  ms with reference to start of frame 3b. (For mobiles with added security (AS)  $2 * 138.33 + 30 \pm 3.3$  ms). Doc. 900-3 para. 5.4.2
  4. Check of "no carrier" between the frame 10a and frame 10b.
  5. More than one frame 15 shall be sent between frames 10b and 14a (SS sends frame 5a(L=3) delayed four frames time after reception of 10b).
  6. RA0 shall be registered After end of frame 5a(L=3) if roaming alarm indicator is activated before the test.
  7. The channel switching time must not exceed 40 ms.
  8. Check that the MS sends two frames for each digit in the number and alternate marking (0 and 15). The frames must correspond to the keys activated on the MS.
  9. Deleted.
  10. LF1 (300 Hz) shall be received C ms after the start of the last frame 15. Doc. 900-1 para. 4.6.8
  11. TH1 (500 Hz) shall be received A ms after end of "transmitted frame 20(A=3)". Doc. 900-1 para. 4.6.8
  12. LF0 (300 Hz), TH0 (500 Hz), and SSO (phi-signal) shall come before start of the first frame 13a(L=1). Doc. 900-1 para. 4.6.9
- ACCESS 1**
13. The MS must try to find an AC a second time if the first frame 10a is not acknowledged by frame 3d.
  14. Deleted.

**ACCESS 2**

15. The MS shall send frame 15 during a period of 30 s if no frame 5a(L=6) is sent from the SS and then the MS shall give malfunction alarm and send clearing four frames 13a(L=1).

**Test 3.5.2.1AS****Call from MS via an access channel, added security**

- |     |   |                           |
|-----|---|---------------------------|
| 1.  | Frame 10a shall be delayed $n * 138.33 + 30 \pm 3.3$ ms with reference to start of frame 4b compare with para. 5.8.1).  | Doc. 900-3 para. 5.6.5    |
| 2.  | The MS shall send one frame 10a after receiving frame 4b and four frames 10b after receiving frame 3b.  | Doc. 900-1 para. 4.4.1.11 |
| 3.  | The sequence of four frames 10b shall be delayed $2 * 138.33 + 30 \pm 3.3$ ms with reference to start of frame 3b.  | Doc. 900-3 para. 5.4.2    |
| 4.  | Check of "no carrier" between the frame 10a and frame 10b.  |                           |
| 5.  | Two frames 16 according to RAND in frame 7 shall be transmitted between frames 10b and 14a. The time between the end of frame 7 and start of frame 16 shall be less than 600 ms. Frames 15 may be sent between frames 10b and 16. |                           |
| 6.  | RA0 shall be registered after end of frame 5a(L=11) if roaming alarm indicator is activated before the test.  |                           |
| 7.  | The channel switching time must not exceed 40 ms.   |                           |
| 8.  | Check that the MS sends two frames for each digit in the number and alternate marking (0 and 15). The frames (decrypted) must correspond to the keys activated on the MS.   |                           |
| 9.  | Deleted.  |                           |
| 10. | LF1 (300 Hz) shall be received C ms after the start of the last frame 15.   | Doc. 900-1 para. 4.6.8    |
| 11. | TH1 (500 Hz) shall be received A ms after end of "transmitted frame 20(A=3).  | Doc. 900-1 para. 4.6.8    |
| 12. | LF0 (300 Hz), TH0 (500 Hz), and SS0 (phi-signal) shall come before start of the first frame 13a(L=1).   | Doc. 900-1 para. 4.6.9    |

**ACCESS 1**

13. The MS must try to find an AC a second time if the first frame 10a is not acknowledged by frame 3d.
14. Deleted.

**ACCESS 2**

15. The MS shall send frame 15 during a period of 30 s if no frame 5a(L=6) is sent from the SS and then the MS shall give malfunction alarm and send clearing four frames 13a(L=1). Doc. 900-3 para. 5.3.16.2

**Test 3.5.2.2****Call from MS on an access channel**

1. Frame 10a shall be delayed  $n * 138.33 + 30 \pm 3.3$  ms with reference to start of frame 4b compare with para. 5.8.1. Doc. 900-3 para. 5.6.5
2. The MS shall send one frame 10a after receiving frame 4b and four frames 10b after receiving frame 3b. Doc. 900-1 para. 4.4.1.11
3. The sequence of four frames 10b shall be delayed  $138.33 + 30 \pm 3.3$  ms with reference to start of frame 3b. For mobiles with added security (AS)  $2 * 138.33 + 30 \pm 3.3$  ms. Doc. 900-3 para. 5.4.2
4. Check of "no carrier" between the frame 10a and frame 10b.
5. Deleted.
6. RA0 shall be registered after end of frame 5a(L=3) if roaming alarm indicator is activated before the test.
7. Deleted.
8. Check that the MS sends two frames for each digit in the number and alternate marking (0 and 15). The frames must correspond to the keys activated on the MS.
9. TH0 (500 Hz) shall be received B ms after start of transmitted 5a(L=6). Doc. 900-1 para. 4.6.8
10. LF1 (300 Hz) shall be received C ms after the start of last frame 15. Doc. 900-1 para. 4.6.8
11. TH1 (500 Hz) shall be received A ms after end of "transmitted frame 20(A=3)". Doc. 900-1 para. 4.6.8

- |     |   |                        |
|-----|---|------------------------|
| 12. | LF0 (300 Hz), TH0 (500 Hz), and SS0 (phi-signal) shall come before start of the first frame 13a(L=1). | Doc. 900-1 para. 4.6.9 |
| 13. | The MS must try to find an AC a second time if the first frame 10a is not acknowledged by frame 3b.   |                        |
| 14. | Deleted.  |                        |

**Para 3.6****SWITCHING CALL IN PROGRESS****Test 3.6.1.1****Successful switching call in progress, ordinary procedure**

- |     |   |                             |
|-----|---|-----------------------------|
| 1.  | Control that MS sends frame 10a $T_s$ after end of frame 2a.  | Doc. 900-3 para. 5.6.5      |
| 2.  | The time from start of transmitted frame 3b to first frame 10b shall be $n * 138.33 \text{ ms} + T_s$ ( $n=1$ or $2$ ). $T_s$ and $n$ are recorded.   |                             |
| 3.  | Control that MS sends four frames 10b after "transmitted frame 3b".   | Doc. 900-1 para. 4.4.1.1    |
| 4.  | Control that "call received indicator" is flashing.   |                             |
| 5.  | Control that MS gives a ringing signal in a period of 0.5-2.0 s.  | Doc. 900-1 para. 3.7.1      |
| 6.  | Control that MS sends four frames 13a(L=14).  |                             |
| 7.  | Control that LF1 (300 Hz) should be C ms after transmission of last frame 13a(L=14) is started.   | Doc. 900-1 para. 4.6.9      |
| 8.  | Control that TH1 (500 Hz) should be A ms after end of "transmitted frame 20(A=3)".  | Doc. 900-1 para. 4.6.8      |
| 9.  | Control that start of the first frame 10b shall be 200-400 ms after end of transmitted frame 3a, with<br>- new correct power bit in $N_1$ , compare with power measuring<br>- new area information (based on received $H_8H_9H_{10}$ in frame 3b) | Doc. 900-1 para. 4.3.3.11.2 |
| 10. | Control that the time from start of "transmitted frame 3b" to first frame 10b shall be $n * 138.33 \text{ ms} + T_s$ . $T_s$ and $n$ are recorded. $T_s=30 \pm 3.3 \text{ ms}$ .  |                             |
| 11. | Control that MS sends four frames 10b.  |                             |
| 12. | Control that LF1 (300 Hz) and SS1 ( $\emptyset$ -signal) shall be C ms after start of last frame 10b.   | Doc. 900-1 para. 4.6.9      |

13.	Control that TH1 (500 Hz) should be B ms after end of "transmitted frame 20(A=3)".	Doc. 900-1 para. 4.6.8
14.	Control that SI1 shall be less than the scan time after end of last frame 13a(L=1).	Doc. 900-3 para. 5.2.1.5
<b>Test 3.6.1.2</b>	<b>Successful switching call in progress, improved procedure</b>	
1.	Control that MS sends frame 10a $T_s$ after end of frame 2a.	Doc. 900-3 para. 5.6.5
2.	The time from start of transmitted frame 3b to first frame 10b shall be $n * 138.33 \text{ ms} + T_s$ ( $n=1$ or $2$ ). $T_s$ and $n$ are recorded.	
3.	Control that MS sends four frames 10b after "transmitted frame 3b".	Doc. 900-1 para. 4.4.1.1
4.	Control that "call received indicator" is flashing.	
5.	Control that MS gives a ringing signal in a period of 0.5-2.0 s.	Doc. 900-1 para. 3.7.1
6.	Control that MS sends four frames 13a(L=14).	
7.	Control that LF1 (300 Hz) shall be C ms after transmission of last frame 13a(L=14) is started.	Doc. 900-1 para. 4.6.9
8.	Control that TH1 (500 Hz) should be A ms after end of "transmitted frame 20(A=3)".	Doc. 900-1 para. 4.6.8
9.	Control that start of the first frame 10b shall be 200-400 ms after end of transmitted frame 3a, with <ul style="list-style-type: none"> <li>- new correct power bit in <math>N_1</math>, compare with power measuring</li> <li>- new area information (based on received <math>H_8H_9H_{10}</math> in frame 3b)</li> </ul>	Doc. 900-1 para. 4.3.3.11.2
10.	Control that the time from start of "transmitted frame 3b" to first frame 10b shall be $n * 138.33 \text{ ms} + T_s$ . $T_s$ and $n$ are recorded.	
11.	Control that MS sends four frames 10b.	
12.	Control that LF1 (300 Hz) and SS1 (phi-signal) shall be C ms after start of last frame 10b.	Doc. 900-1 para. 4.6.9
13.	Control that TH1 (500 Hz) should be B ms after end of frame 3b.	Doc. 900-1 para. 4.6.8

14. Control that S11 shall be less than the scan time after end of last frame 13a(L=1). Doc. 900-3 para. 5.2.1.5

**Test 3.6.1.3****Successful switching call in progress, short procedure with RF level > 24 dB (1 $\mu$ V) E.M.F. to MS on new channel**

1. Control that MS sends frame 10a  $T_s$  after end of frame 2a. Doc. 900-3 para. 5.6.5
2. The time from start of transmitted frame 3b to first frame 10b shall be  $n * 138.33 \text{ ms} + T_s$  ( $n=1$  or  $2$ ).  $T_s$  and  $n$  are recorded.
3. Control that MS sends four frames 10b after "transmitted 3b". Doc. 900-1 para. 4.4.2.1
4. Control that "call received indicator" is flashing.
5. Control that MS gives a ringing signal in a period of 0.5-2.0 s. Doc. 900-1 para. 3.7.1
6. Control that MS sends four frames 13a(L=14).
7. Control that LF1 (300 Hz) shall be C ms after transmission of last frame 13a(L=14) is started. Doc. 900-1 para. 4.6.9
8. Control that TH1 (500 Hz) shall be A ms after end of "transmitted frame 20(A=3)". Doc. 900-1 para. 4.6.8
9. Control that frame 10b shall have  
- new correct power bit in  $N_1$ , compare with power measuring. Doc. 900-1 para. 4.3.11.2
10. Control that the time from end of first frame 3c to frame 10b shall be 80-150 ms. Doc. 900-1 para. 4.4.1.4.3
11. Control that MS sends one frame 10b.
12. Control that LF1 (300 Hz) and SS1 ( $\emptyset$ -signal) shall be C ms after start of frame 10b. Doc. 900-1 para. 4.6.9
13. Deleted.
14. Control that S11 shall be less than the scan time after end of last frame 13a(L=1). Doc. 900-3 para. 5.2.1.5

**Test 3.6.1.4****Successful switching call in progress, short procedure with RF level < 16 dB (1 $\mu$ V) E.M.F. to MS on new channel**

- |     |  |                             |
|-----|--|-----------------------------|
| 1.  | Control that MS sends frame 10a $T_s$ after end of frame 2a.   | Doc. 900-3 para. 5.6.5      |
| 2.  | The time from start of transmitted frame 3b to first frame 10b shall be $n * 138.33 \text{ ms} + T_s$ ( $n=1$ or $2$ ). $T_s$ and $n$ are recorded.  |                             |
| 3.  | Control that MS sends four frames 10b after "transmitted frame 3b".  | Doc. 900-1 para. 4.4.1.1    |
| 4.  | Control that "call received indicator" is flashing.  |                             |
| 5.  | Control that MS gives a ringing signal in a period of 0.5-2.0 s.   | Doc. 900-1 para. 3.7.1      |
| 6.  | Control that MS sends four frames 13a( $L=14$ ).   |                             |
| 7.  | Control that LF1 (300 Hz) shall be C ms after transmission of last frame 13a( $L=14$ ) is started.   | Doc. 900-1 para. 4.6.9      |
| 8.  | Control that TH1 (500 Hz) should be A ms after end of "transmitted frame 20( $A=3$ )".   | Doc. 900-1 para. 4.6.8      |
| 9.  | Control that start of the first frame 10b shall be $30 \pm 3.3$ ms after end of frame 3b <ul style="list-style-type: none"> <li>- new correct power bit in <math>N_1</math>, compare with power measuring</li> <li>- new area information (based on received <math>H_8H_9H_{10}</math> in frame 3b)</li> </ul> | Doc. 900-1 para. 4.3.3.11.2 |
| 10. | Deleted.   |                             |
| 11. | Control that MS sends four frames 10b.   |                             |
| 12. | Control that LF1 (300 Hz) and SS1 (phi-signal) shall be C ms after start of last frame 10b.  | Doc. 900-1 para. 4.6.9      |
| 13. | Control that TH1 (500 Hz) shall be A ms after end of last frame 3b.  | Doc. 900-1 para. 4.6.8      |
| 14. | Control that SI1 shall be less than the scan time after end of last frame 13a( $L=1$ ).  | Doc. 900-3 para. 5.2.1.5    |

**Test 3.6.2.1****Unsuccessful switching call in progress, ordinary procedure.**

- |     |   |                          |
|-----|---|--------------------------|
| 1.  | Control that MS sends frame 10a $T_s$ after end of frame 2a.  | Doc. 900-3 para. 5.6.5   |
| 2.  | The time from start of transmitted frame 3b to first frame 10b shall be $n * 138.33 \text{ ms} + T_s$ ( $n=1$ or $2$ ). $T_s$ and $n$ are recorded.                     |                          |
| 3.  | Control that MS sends four frames 10b after "transmitted frame 3b".   | Doc. 900-1 para. 4.4.1.1 |
| 4.  | Control that "call received indicator" is flashing.   |                          |
| 5.  | Control that MS gives a ringing signal in a period of 0.5-2.0 s.  | Doc. 900-1 para. 3.7.1   |
| 6.  | Control that MS sends four frames 13a( $L=14$ ).  |                          |
| 7.  | Control that LF1 (300 Hz) shall be C ms after transmission of last frame 13a( $L=14$ ) is started.  | Doc. 900-1 para. 4.6.9   |
| 8.  | Control that TH1 (500 Hz) shall be A ms after end of "transmitted frame 20( $A=3$ )".   | Doc. 900-1 para. 4.6.8   |
| 9.  | Control that TH0 (500 Hz) should be B ms after start of transmitted frame 3a.   |                          |
| 10. | Control that LF1 (300 Hz), SS1 ( $\emptyset$ -signal), and TH1 (500 Hz) shall be almost simultaneously 650-900 ms after start of "transmitted frame 3a", on receiver 1. | Doc. 900-3 para. 5.4.5   |
| 11. | Control that the transmitted power is as previously.  |                          |

**Test 3.6.2.2****Unsuccessful switching call in progress, short procedure**

- |    |   |                          |
|----|---|--------------------------|
| 1. | Control that MS sends frame 10a $T_s$ after end of frame 2a.  | Doc. 900-3 para. 5.6.5   |
| 2. | The time from start of transmitted frame 3b to first frame 10b shall be $n * 138.33 \text{ ms} + T_s$ ( $n=1$ or $2$ ). $T_s$ and $n$ are recorded. |                          |
| 3. | Control that MS sends four frames 10b after "transmitted frame 3b".   | Doc. 900-1 para. 4.4.1.1 |
| 4. | Control that "call received indicator" is flashing.   |                          |



- |     |  |                        |
|-----|--|------------------------|
| 5.  | Control that MS gives a ringing signal in a period of 0.5-2.0 s.   | Doc. 900-1 para. 3.7.1 |
| 6.  | Control that MS sends four frames 13a(L=14).   |                        |
| 7.  | Control that LF1 (300 Hz) shall be C ms after transmission of last frame 13a(L=14) is started.   | Doc. 900-1 para. 4.6.9 |
| 8.  | Control that TH1 (500 Hz) shall be A ms after end of "transmitted frame 20(A=3)".  | Doc. 900-1 para. 4.6.8 |
| 9.  | Control that TH0 (500 Hz) shall be B ms after start of transmitted frame 3c.   |                        |
| 10. | Control that LF1 (300 Hz), SS1 (phi-signal), and TH1 (500 Hz) shall be almost simultaneously 1220-1450 ms after "transmitted frame 3c", on receiver 1. | Doc. 900-3 para. 5.4.5 |
| 11. | Control that the transmitted power is as previously.   |                        |

**Para 3.7****CHANGE OF OUTPUT POWER LEVEL****Test 3.7.1****Change of MS output power level on same channel during conversation**

- |    |   |                          |
|----|---|--------------------------|
| 1. | Control that MS sends frame 10a $T_S$ after end of frame 2a.  | Doc. 900-3 para. 5.6.5   |
| 2. | The time from start of transmitted frame 3b to first frame 10b shall be $n * 138.33 \text{ ms} + T_S$ ( $n=1$ or $2$ ). $T_S$ and $n$ are recorded. |                          |
| 3. | Control that MS sends four frames 10b after "transmitted frame 3b".   | Doc. 900-1 para. 4.4.1.1 |
| 4. | Control that "call received indicator" is flashing.   |                          |
| 5. | Control that MS gives a ringing signal in a period of 0.5-2.0 s.  | Doc. 900-3 para. 3.7.1   |
| 6. | Control that MS sends four frames 13a(L=14).  |                          |
| 7. | Control that LF1 (300 Hz) shall be C ms after transmission of last frame 13a(L=14) is started.  | Doc. 900-1 para. 4.6.9   |
| 8. | Control that TH1 (500 Hz) shall be A MS after end of "transmitted frame 20(A=3)".   | Doc. 900-1 para. 4.6.8   |
| 9. | Control that TH0 (500 Hz) shall be B ms after "transmitted frame 3a".   | Doc. 900-1 para. 4.6.8   |

10. Control that LF0 (300 Hz) shall be max. D ms after start of first frame 10b.
11. Control that MS sends four frames 10b after "transmitted frame 3a" with
  - new correct power bit in  $N_1$ , compare with power measuring.
12. Control that TH1 (500 Hz) shall be A ms after end of last frame 3a.
13. Control that LF1 (300 Hz) shall be C ms after transmission of last frame 10b is started.
14. Control that SS1 (phi-signal) shall be less than  $\pm 25$  ms with reference to LF1.

Doc. 900-1 para.  
4.3.3.11.2

#### **Test 3.7.2 Change of MS output power level on TC**

1. Control that MS transmits two frames 10b with correct power bit in  $N_1$ , compare with power measuring.

#### **Para 3.8 COUNTRY SELECTOR**

##### **Test 3.8.2a Change of country selector (valid $Y_1, Y_2$ ), Tc band = basic band**

1. Control that MS sends two frames 11a after SI0.
2. Control that the first frame 11a in the second series is sent  $n * 138.33 + T_s$  after received frame 3b ( $n=0,1$ , or 2).  $T_s$  and  $n$  are recorded.
3. Check of "no carrier" between first and second series of frame 11a (measurement result from power meter, power supply, etc).
4. Control that MS sends four frames 11a after "transmitted frame 3b".
5. Control that first frame 13a(L=1) is received max. 277 ms after start of first "transmitted frame 5a"(L=15) or frame 5a(L=3). The MS shall be sensible to frame 5a(L=13/15).
6. Control that MS sends four frames 13a(L=1).
7. Control that the time from first frame 11a in second series until the last frame 13a(L=1) is equal to  $n * 138.33$  ms.  $n$  is recorded.

Doc. 900-1 para.  
4.4.1.5

8. Control that SII comes max. 600 ms after start of last frame 13a(L=1).
- Test 3.8.2b**                    **Change of country selector, TC/AC band outside basic band, updated on a TC channel**
1. Start of frame 11a shall come 17-19  $T_x$  or 2-3  $T_x$  after service indicator goes off.
- Test 3.8.2c**                    **Change of country selector, TC/AC band outside basic band, updated on an AC channel.**
1. Start of frame 10a shall come 17-19  $T_x$  or 2-3  $T_x$  after service indicator goes off.
- Para 3.9**                      **AUTONOMOUS TIME-OUT OF MS**
- Test 3.9.1**                    **Complete loss of RF input signal**
1. Time between disconnection of RF input to MS and autonomous time-out shall be measured. Requirement  $30 \pm 5$  s.
2. Control that MS is in off condition (= power consumption much less than in stand-by) or detect power off.
3. Control that LF (300 Hz) indicator in SS is on until start of frame 13a(L=1).
4. Manually switch the MS on. It shall go straight to STAND-BY state (SI indicator ON, RA indicator off).
- Test 3.9.2**                    **Burst of RF input signal**
1. Control that MS power stays on.
2. LF indicator shall be on until on hook.
3. Control low-frequency noise to ensure that MS is not equipped with RF-squelch.
- Test 3.9.3**                    **Short bursts of RF input signal**
1. Control that MS is in off condition (= power consumption much less than in stand-by or detect power indicator off).

2. Control that LF (300 Hz) indicator goes off after 25 s but before 35 s.
3. Manually switch the MS on. It shall go straight to STAND-BY state, SI indicator on, RA indicator off.

**Test 3.9.4 FFSK-signalling continuously**

1. Time between "transmitted frame 6" to MS and autonomous time-out shall be measured. Requirement  $30 \pm 5$  s.
2. Control that MS is in off condition (= power consumption much less than in stand-by) or detect power off.
3. Control that LF (300 Hz) indicator in SS is on until start of frame 13a(L=1).
4. Manually switch the MS on. It shall go straight to STAND-BY state (SI indicator ON, RA indicator off).

**Para 3.10 MFT CONVERTER**

**Test 3.10.1.1 Push-button data transmission, manual transmission**

1. Initial state: Conversation.
2. Control that MS sends four frames 13a(L=8).
3. Control that TH0 (500 Hz) shall be B ms after start of first "transmitted frame 6".
4. Control that MS ignores the received frame 20(A=4).
- 5a. Control that MS transmits frame 15 continuously when frame 5a(L=4) is received.
- 5b. Control that MFT indicator switches on 0-300 ms after end of first frame 5a(L=4).
6. Control that TH1 (500 Hz) comes B ms after end of last frame 5a(L=4).
7. Control that MS transmits two identical digit frames when a push button (0-9, \*, # A-D if equipped) is pressed.

Doc. 900-1 para.  
4.4.1.9.1

Doc. 900-1 para.  
4.6.8

8. Control that the even/odd-information is changed when a new push button is pressed.
9. Control that MS transmits frames (14a, 15, 14b) continuously.
10. Control that MS can transmit an "infinite" number of digits.
11. Control that MS sends four frames 13a(L=7) when the MFT button is pushed a second time.
12. Control that TH1 (500 Hz) is B ms after frame 20(A=10), and LF1 (300 Hz) is C ms after last frame 13a(L=7).

**Test 3.10.1.2 Push-button data transmission, manual transmission, but with MS clearing**

1. Initial state: Conversation.
- 2-10. As in test 3.10.1.1.
11. Control that MS transmits four frames 13a(L=1) and stops the transmitter when MS goes on hook.

**Test 3.10.2 Push-button data transmission, automatic transmission**

1. Initial state: Conversation.
- 2-6. As in test 3.10.1.1 except item 5.
7. Control that MS sends four frames 15.
8. Control that MS sends two identical digit frames.
9. Control that MS transmits frames 14a, 14b continuously.
10. Control that MS sends four frames 13a(L=7) continuously after last frame 14a or 14b.
11. Control that TH1 (500 Hz) is B ms after frame 20(A=10) and LF1 (300 Hz) is C ms after last frame 13a(L=7).

Doc. 900-1 para.  
4.4.1.9.2

**Para 3.11 SUBSCRIBER WITH PRIORITY****Test 3.11.1 Priority call with idle TC available at once**

1. Time between frame 1a and frame 11b shall be  $30 \pm 3.3$  ms. (Ref. also to test 5.8.1). Doc. 900-3 para. 5.6.3
2. Time between "transmitted 3b" and first frame 10b shall be  $n * 138.33$  ms +  $T_s$  ( $n=1$  or  $2$ ).  $T_s$  and  $n$  are recorded. Doc. 900-1 para. 4.4.1.10
3. Check that MS sends four frames 10b after "transmitted frame 3b".
4. Check that "call received indicator" is flashing.
5. Check that MS gives a ringing signal of approx. 1 s duration. Doc. 900-3 para. 3.7.1
6. Check that MS sends four frames 13a(L=14).
7. Check that priority indicator is turned off after MS off-hook.
8. TH1 shall be received A ms after end of last "transmitted frame 5a(L=3)". Doc. 900-1 para. 4.6.8
9. Check that two digit frames per digit are received with correct (0) and (15) markings and corresponding to dialled digits.
10. TH0 shall be received B ms after start of "transmitted frame 5a"(L=6). Doc. 900-1 para. 4.6.8
11. LF1 shall be received C ms after beginning of last frame 15.
12. TH1 shall be received C ms after end of "transmitted frame 20(L=3)".

**Test 3.11.1AS Call from MS<sub>s</sub> with priority (PMS), added security**

1. Time between frame 1a and frame 11b shall be  $30 \pm 3.3$  ms (Compare with para. 5.8.1). Doc. 900-3 para. 5.6.3
2. Time between "transmitted frame 3b" and first frame 10b shall be  $n * 138.33$  ms +  $T_s$  ( $n=1$  or  $2$ ).  $T_s$  and  $n$  are recorded. Doc. 900-1 para. 4.4.1.10
3. Check that MS sends four frames 10b after "transmitted frame 3b".

- |                    |  |                           |
|--------------------|--|---------------------------|
| 4.                 | Check that "call received indicator" is flashing.  |                           |
| 5.                 | Check that MS gives a ringing signal (approx. 1 s duration).   | Doc. 900-3 para. 3.7.1    |
| 6.                 | Check that MS sends four frames 13a(L=14).   |                           |
| 6a.                | Check that MS sends 2 frames 16 according to RAND in frame 7. Frames 15 may be transmitted between frame 13a(L=14) and frame 16.       |                           |
| 7.                 | Check that priority indicator is turned off after MS off-hook.   |                           |
| 8.                 | TH1 shall be received A ms after end of last "transmitted frame 5a(L=11)".   | Doc. 900-1 para. 4.6.8    |
| 9.                 | Check that two digit frames per digit are received with correct (0) and (15) markings and corresponding (decrypted) to dialled digits. |                           |
| 10.                | TH0 shall be received B ms after start of "transmitted frame 5a(L=6)".   | Doc. 900-1 para. 4.6.8    |
| 11.                | LF1 shall be received C ms after beginning of last frame 15.   |                           |
| 12.                | TH1 should be received C ms after end of "transmitted frame 20(L=3)".  |                           |
| <b>Test 3.11.2</b> | <b>Priority call with no idle TC available at once (queued)</b>  |                           |
| 1.                 | Time between frame 1a and frame 11b shall be $30 \pm 3.3$ ms. (Compare with para. 5.8.1).  | Doc. 900-3 para. 5.6.3    |
| 2.                 | Time between end of frame 2a and second frame 11b shall be $30 \pm 3.3$ ms. (Compare with para. 5.8.1).                                |                           |
| 3.                 | Time between "transmitted frame 3b" and first frame 10b shall be $n * 138.33$ ms + $T_s$ (n=1 or 2). $T_s$ and n are recorded.         | Doc. 900-1 para. 4.4.1.10 |
| 4.                 | Check that MS sends four frames 10b after "transmitted frame 3b".  |                           |
| 5.                 | Check that "call received indicator" is flashing.  |                           |
| 6.                 | Check that MS gives a ringing signal (approx. 1 s duration).   | Doc. 900-3 para. 3.7.1    |

7. Check that MS sends four frames 13a(L=14).
8. Check that priority indicator is turned off after MS off-hook.
9. TH1 shall be received A ms after end of last "transmitted frame 5a(L=3)". Doc. 900-1 para. 4.6.8
10. Check that two digit frames per digit are received with correct (0) and (15) markings and corresponding to dialled digits.
11. TH0 shall be received B ms after start of "transmitted frame 5a"(L=6). Doc. 900-1 para. 4.6.8
12. LF1 shall be received C ms after beginning of last frame 15.
13. TH1 shall be received C ms after end of "transmitted frame 20(L=3)".

**Test 3.11.2AS****Priority call with no idle TC available at once (queued)**

1. Time between frame 1a and frame 11b shall be  $30 \pm 3.3$  ms. (Compare with para. 5.8.1). Doc. 900-3 para. 5.6.3
2. Time between end of frame 2a and second frame 11b shall be  $30 \pm 3.3$  ms. (Compare with para. 5.8.1).
3. Time between "transmitted frame 3b" and first frame 10b shall be  $n * 138.33$  ms +  $T_s$  (n=1 or 2).  $T_s$  and n are recorded. Doc. 900-1 para. 4.4.1.10
4. Check that MS sends four frames 10b after "transmitted frame 3b".
5. Check that "call received indicator" is flashing.
6. Check that MS gives a ringing signal (approx. 1 s duration). Doc. 900-3 para. 3.7.1
7. Check that MS sends four frames 13a(L=14).
- 7a. Check that MS sends 2 frames 16 according to RAND in frame 7. Frames 15 may be transmitted between frame 13a(L=14) and frame 16.
8. Check that priority indicator is turned off after MS off-hook.



- |     |  |                        |
|-----|--|------------------------|
| 9.  | TH1 shall be received A ms after end of last "transmitted frame 5a(L=11)".   | Doc. 900-1 para. 4.6.8 |
| 10. | Check that two digit frames per digit are received with correct (0) and (15) markings and corresponding (encrypted) to dialled digits. |                        |
| 11. | TH0 shall be received B ms after start of "transmitted frame 5a(L=6)".   | Doc. 900-1 para. 4.6.8 |
| 12. | LF1 shall be received C ms after beginning of last frame 15.   |                        |
| 13. | TH1 shall be received C ms after end of "transmitted frame 20(L=3)".   |                        |

**Para 3.12****COIN BOX MS****Test 3.12****Call Coin MS - MTX**

- |    |  |                        |
|----|--|------------------------|
| 1  | Time between "transmitted frame 4" and first frame 12 must be $n * 138.33 + 30 \pm 3.3$ ms. (Compare with para. 5.8.1).  | Doc. 900-3 para. 5.6.5 |
| 2. | There shall be two frames 12 after "transmitted 4" and four frames 12 after "transmitted frame 3b".  |                        |
| 3. | Time between "transmitted frame 3b" and first frame 12 in the second series shall be $138.33 + 30 \pm 3.3$ ms. For mobiles with added security (AS) $2 \times 138.33 + 30 \pm 3.3$ ms. | Doc. 900-3 para. 5.4.2 |
| 4. | Check that carrier is turned off between first and second series of frames 12.   |                        |
| 5. | Maximum one frame 15 shall be received between frames 12 and 14a (SS transmits frame 5a(L=3)).   |                        |
| 6. | TH1 shall be received within A ms after end of "transmitted frame 5a(L=3)".  | Doc. 900-1 para. 4.6.8 |
| 7. | Time between first frame 12 after "transmitted frame 3b" and last frame 15 in the continuous stream of frames shall be equal to $n * 138.33$ ms.                                       |                        |
| 8. | Check that two digit frames per digit are received with correct (0) and (15) markings and with correct digit information.  |                        |
| 9. | TH0 shall be received within B ms after start of "transmitted frame 5a(L=6)".  | Doc. 900-1 para. 4.6.8 |

10. LFI shall be received within C ms after the start of last frame 15.
11. TH1 shall be received within A ms after end of "transmitted frame 20(A=3)".
12. TH0 shall be received within B ms after start of "transmitted frame 5b(L=0)".
13. LFI shall be received within C ms after the start of the last frame 13b(L=2).
14. Check that there are four frames 13b(L=2).

**Test 3.12AS****Call Coin MS<sub>as</sub> - MTX, added security**

1. Time between "transmitted 4" and first frame 12 must be  $n * 138.33 + 30 \pm 3.3$  ms (Compare with para. 5.8.1). Doc. 900-3 para. 5.6.5
2. There shall be two frames 12 after "transmitted frame 4" and four frames 12 after "transmitted frame 3b".
3. Time between "transmitted frame 3b" and first frame 12 in the second series shall be  $2 * 138.33 + 30 \pm 3.3$  ms. Doc. 900-3 para. 5.4.2
4. Check that carrier is turned off between first and second series of frames 12.
5. Two frames 16 according to RAND in frame 7 shall be sent between frames 12 and 14a. The time between the end of frame 7 and start of frame 16 shall be less than 600 ms. Frames 15 may be sent between frames 12 and 16.
6. TH1 shall be received within A ms after end of "transmitted frame 5a(L=11)". Doc. 900-1 para. 4.6.8
7. Time between first frame 12 after "transmitted frame 3b" and last frame 15 in the continuous stream of frames shall be equal to  $n * 138.33$  ms.
8. Check that two digit frames per digit are received with correct (0) and (15) markings and with correct digit information, encrypted according to RAND in frame 7.
9. TH0 shall be received within B ms after start of "transmitted frame 5a(L=6)". Doc. 900-1 para. 4.6.8

10. LF1 shall be received within C ms after the start of last frame 15.
11. TH1 shall be received within A ms after end of "transmitted frame 20(A=3)".
12. TH0 shall be received within B ms after start of "transmitted frame 5b(L=0)".
13. LF1 shall be received within C ms after start of the last frame 13b(L=2).
14. Check that there are four frames 13b(L=2) with correct  $Q_1, Q_2$  value.

### Test 3.12.1 Coin box with register recall

#### Part 1

1. Time between "transmitted frame 4" and first frame 12 must be  $n * 138.33 + 30 \pm 3.3$  ms. (Compare with para. 5.8.1). Doc. 900-5 para. 5.6.5
2. There shall be two frames 12 after "transmitted frame 4" and four frames 12 after "transmitted frame 3b".
3. Time between "transmitted frame 3b" and first frame 12 in the second series shall be  $2 * 138.33 + 30 \pm 3.3$  ms. Doc. 900-3 para. 5.4.2
4. Check that carrier is turned off between first and second series of frames 12.
5. More than one frame 15 may be received between frames 12 and 14a.
6. TH1 shall be received within A ms after end of "transmitted frame 5a(L=3)". Doc. 900-1 para. 4.6.8
7. Time between first frame 12 after "transmitted frame 3b" and last frame 15 in the continuous stream of frames shall be equal to  $n * 138.33$  ms.
8. Check that two digit frames per digit are received with correct (0) and (15) marking and with correct digit information.
9. TH0 shall be received within B ms after start of transmitted frame 5a(L=6). Doc. 900-1 para. 4.6.8

10. LF1 shall be received within C ms after start of the last frame 15.
11. TH1 shall be received within A ms after end of "transmitted frame 20(A=3)".
12. TH0 shall be received within B ms after start of "transmitted frame 5b(L=0)".
13. LF1 shall be received within C ms after start of the last frame 13b(L=2).
14. Check that there are four frames 13b(L=2).
15. Check the content of  $Q_1$  and  $Q_2$  in frames 5b and 13b(L=2).

## Part 2

16. Initial state: Conversation
17. Check that MS sends four frames 13a(L=5) when R-button is pressed. Doc. 900-1 para. 4.4.1.10
18. Check that MS ignores the received frame 20(A=4).
19. Check that MS transmits frame 15 continuously when frame 5a(L=3) is received.
20. Check that TH1 shall be A ms after end of last frame 5a(L=3). Doc. 900-1 para. 4.6.8
21. Check that MS transmits two identical digit frames when a push button (0-9, \*, # and A-D if equipped) is pressed.
22. Check that the even/odd-information is changed when a new push button is pressed.
23. Check that MS transmits frames (14a, 15, 14b) continuously.
24. Check that MS can transmit an "infinite" number of digits.
25. Check that MS stops transmission of frames when frame 5a(L=6) is received.
26. Check the value of  $Q_1$  and  $Q_2$  in frame 5b(L=0) and frame 13b(L=2).

27. Check that MS transmits clearing and stops the transmitter when MS goes on hook.
28. Check that MS stops transmission of frames when frame 5a(L=13) or frame 5a(L=15) are received and that MS then transmits four frames 13a(L=1). The "call transfer activated indicator" shall be activated if frame 5a(L=13) is received. Control that MS switches off the transmitter and returns to the previous calling channel.
29. Check that TH1 shall be A ms after end of last frame 20(A=10).

**Para 3.13****REGISTER RECALL FUNCTION****Test 3.13.1****Register recall function**

1. Initial state: Conversation
2. Control that MS sends four frames 13a(L=5) when R-button is pressed. Doc. 900-1 para. 4.4.1.10
3. TH0 (500 Hz) shall be B ms after start of first frame 6.
4. Control that MS ignore the received frame 20(A=4).
5. Control that MS transmits frame 15 continuously when frame 5a(L=3) is received.
6. Control that TH1 should be A ms after end of last frame 5a(L=3). Doc. 900-1 para. 4.6.8
7. Control that MS transmits two identical digit frames when a push button (0-9, \*,# and A-D if equipped) is pressed.
8. Control that the even/odd-information is changed when a new push button is pressed.
9. Control that MS transmits frames (14a, 15, 14b) continuously.
10. Control that MS can transmit a "infinite" number of digits.
11. Control that MS stops transmission of frames when frame 5a(L=6) is received.
12. Control that TH1 shall be A ms after end of last frame 20(A=10).

13. Control that MS transmits clearing and stops the transmitter when MS goes on hook.
14. Control that MS stops transmission of frames when frame 5a(L=13) or frame 5a(L=15) is received and that MS then transmits four frames 13a(L=1): The "call transfer activated indicator" shall be activated if frame 5a(L=13) is received. Control that MS switches off the transmitter, and returns to previous calling channel.

**Test 3.13.1AS****Register recall function, added security**

1. Initial state: Conversation
2. Check that MS sends four frames 13a(L=5) when R-button is pressed. Doc. 900-1 para. 4.4.1.10
3. TH0 (500 Hz) shall be B ms after start of first frame 7.
4. Check that MS ignores the received frame 20(A=4).
5. Check that MS transmits frame 15 continuously when frame 5a(L=11) is received.
6. Check that TH1 shall be A ms after end of last frame 5a(L=11). Doc. 900-1 para. 4.6.8
7. Check that MS transmits two identical digit frames when a push button (0-9, \*, # and A-D if equipped) is pressed. The digits in the frames (decrypted) shall correspond to the keys activated on the MS. No frame 16 shall be sent.
8. Check that the even/odd-information is changed when a new push button is pressed.
9. Check that MS transmits frames (14a, 15, 14b) continuously.
10. Check that MS can transmit an "infinite" number of digits.
11. Check that MS stops transmission of frames when frame 5a(L=6) is received.
12. Check that TH1 shall be A ms after end of last frame 20a(A=10).
13. Check that MS transmits clearing and stops the transmitter when MS goes on hook

14. Check that MS stops transmission of frames when frame 5a(L=13) or frame 5a(L=15) are received and that MS then transmits four frames 13a(L=1). The "call transfer activated indicator" shall be activated if frame 5a(L=13) is received. Control that MS switches off the transmitter and returns to the previous calling channel.

**Para. 5.8 TIME CONSTANTS**

**Test 5.8.3 Power reduction**

1. The RF-level from the MS is reduced 4-6 s after the RF-level is raised.
2. The RF-level from the MS is raised after 4-6 s from the level is reduced.

**Para. 6. MS RESPONSE IN ABNORMAL SITUATION**

**Test 6.1 MS off-hook while initiating a roaming procedure**

1. Frame 10b shall be delayed  $n * 138.33 + 30 \pm 3.3$  ms with reference to first frame 4 (Compare with para. 5.8.1). Doc. 900-3 para. 5.4.2
2. The MS shall send two frames 10b after receiving frame 4 and four frames 10b after receiving frame 3b.
3. The sequence of four frames 10b shall be delayed  $138.33 + 30 \pm 3.3$  ms with reference to start of frame 3b. For mobiles with added security (AS)  $2 * 138.33 + 30 \pm 3.3$  ms. Doc. 900-3 para. 5.4.2
4. Check of "no carrier" between the two sequences of frame 10b.
5. More than one frame 15 may be sent between frames 10b and frame 14a.
6. The RA0 shall be registered after end of frame 5a(L=3) if roaming alarm indicator is activated before the test.
7. The time from the first frame 10b in second sequence to the last frame 15 in the sequence shall be a multiple of the frame time.
8. Check that the MS sends two frames for each digit in the number and alternate marking (0 and 15). The frames must correspond to the keys activated on the MS.

- |                   |  |                        |
|-------------------|--|------------------------|
| 9.                | Deleted.   |                        |
| 10.               | LF1 (300 Hz) shall be received C ms after the start of the last frame 15.  | Doc. 900-1 para. 4.6.8 |
| 11.               | TH1 (500 Hz) shall be received B ms after end of "transmitted frame 20(A=3)".  | Doc. 900-1 para. 4.6.8 |
| 12.               | LF0 (300 Hz), TH0 (500 Hz), and SS0 (Ø-signal) shall come before start of the first frame 13a(L=1).  | Doc. 900-1 para. 4.6.9 |
| 13.               | Deleted.   |                        |
| 14.               | Deleted.   |                        |
| <br>              |  |                        |
| <b>Test 6.2.1</b> | <b>Waiting time for additional ringing order within 30 s</b>   |                        |
| 1.                | Frame 10a shall be delayed $30 \pm 3.3$ ms with reference to frame 2a. (If not fulfilled, compare with para. 5.8.1).   | Doc. 900-3 para. 5.6.3 |
| 2.                | The time between the MS has received frame 3b and starts transmitting frame 10b shall be $n * 138.33 + T_s$ (time skew) (n=1 or 2).  |                        |
| 3.                | The MS shall send four frames 10b after reception of frame 3b.   |                        |
| 4.                | Check that "call received indicator" is flashing.  |                        |
| 5.                | The pause between first and second ringing signal shall be 24-26 s.  |                        |
| 6.                | The time between the MS has received frame 5a and starts transmitting frame 13a(L=1) shall be $n * 138.33 + T_s$ (time skew) (n=1 or 2).<br><br>If n=2, modify the test and use only one frame 5a(L=15) from SS. The MS shall respond as before modifying. |                        |
| 7.                | The MS shall send four frames 13a(L=1) after reception of frame 5a(L=15).  |                        |
| <br>              |  |                        |
| <b>Test 6.2.2</b> | <b>Not received ringing order within 30 s</b>  |                        |
| 1.                | Frame 10a shall be delayed $30 \pm 3.3$ ms with reference to frame 2a. (If not fulfilled, compare with para. 5.8.1).   | Doc. 900-3 para. 5.6.3 |



2. The time between the MS has received frame 3b and starts transmitting frame 10b shall be  $n * 138.33 + T_s$  (time skew) ( $n=1$  or  $2$ ).
  3. The MS shall send four frames 10b after reception of frame 3b.
  4. Check that "call received indicator" is flashing.
  5. Only one ringing signal shall be received.
  6. The time between the MS has received frame 5a(L=9) and starts transmitting four frames 13a(L=1) shall be 25 - 35 s.
- Test 6.2.3      Waiting time for first ringing signal**
1. MS sends four frames 13a(L=1) 6.5-8.5 frames times after end of first frame 10b.
  2. Service indicator shall be activated 400-1000 ms after end of first frame 13a(L=1).
- Test 6.3.1      Sensitivity for MTX-clearing in signalling scheme A, Call MS-MTX**
1. MS sends frame 13a(L=1) within  $30 \pm 3.3$  ms after end of first frame 5a(L=13/15).
- Test 6.3.2      Sensitivity for MTX-clearing in signalling scheme A after transmission of 3 digits**
1. MS transmits frame 13a(L=1) within 26 - 277 ms after end of first frame 5a(L=13/15).
- Test 6.4      MS sensitivity of frame 5a(L=6) in signalling scheme A**
1. No frame transmission of frame 14a or 14b from MS takes place  $138.33 + 30 \pm 3.3$  ms after end of first frame 5a(L=6).
- Test 6.5      MS is switched off by on/off switch during conversation**
1. Four frames 13a(L=1) is transmitted from the MS.

## **ANNEX TO DOC 900-5**

### **ANNEX A**

#### **NMT FUNCTION TESTS DURING DMS CONNECTION**

**The main purpose of the additional NMT function tests for the DMS is that the FFSK user data facility does not disturb the normal operation of a mobile station, because the DMS function is active simultaneously with the NMT functions. First a short check is made that the DMS is able to receive and transmit data and that no errors appear on the display in fading conditions.**

#### **1. Operation during Reception of Data**

The FFSK input and output of the NMT FFSK Data test equipment are connected to the speech path of the NMT System Simulator. Continuous data transmission from the test equipment is started and the following tests are made using an RF input level of at least 30 dBuV to the MS.

##### **1.1 Call SS -> MS**

SS tests 3.4.2 and 3.4.3 are modified so that automatic answer will be possible. Data reception during the call, fixed clearing after and during data reception.

##### **1.2 Switching call in progress**

Switching call in progress is checked using tests 3.6.1.1, 3.6.1.2, 3.6.1.3, 3.6.1.4, 3.6.2.1, and 3.6.2.2 modified if necessary, depending on needs of the wanted degree of automation. Each test should be run twice at least.

##### **1.3 Power change**

Power level of the MS is changed 5 times using tests 3.7.1 and 5.8.3 to test power change during data reception.

##### **1.4 Clearing of the call**

Any procedure can be used for establishing a call and then during data reception, procedure MTX-CLEAR is executed.

##### **1.5 Autonomous Timeout during Reception of Data**

Tests 3.9.1, 3.9.2, 3.9.3, and 6.5 are used to test right operation of the DMS during data reception.

## 2. Operation during Transmission of Data

The data transmission from the FFSK data test equipment is stopped and a conversation state is established.

### 2.1 **Data Transmission**

Data transmission from the MS is started using a text length of at least 40 characters. The FFSK data test equipment is inactive during this test which means that the MS will transmit data in 20 seconds and then stop. The data transmission must be restarted manually before each test sequence below.

The conversation state may be started by test 3.5.1, 3.5.1.1AS, 3.5.2.1 or 3.5.2.1AS which test call establishment in direction MS -> MTX. Longer conversation state duration for checking data transmission capabilities may be modified if necessary.

### 2.2 **Switching Call in Progress**

The same tests are used as in data reception i.e. 3.6.1.1, 3.6.1.2, 3.6.1.3, 3.6.1.4, 3.6.2.1, and 3.6.2.2. Data is transmitted from the DMS during these tests. Each test should be run twice at least.

### 2.3 **Power change**

While data is transmitted from the DMS, tests 3.7.1 and 5.8.3 are run twice at least.

### 2.4 **Clearing of the Call**

Any procedure is used to make a call and then during data transmission, procedure MTX-CLEAR is executed.

### 2.5 **Autonomous Time-out and Switch-off during Transmission Data**

Tests 3.9.1, 3.9.2, 3.9.3, and 6.5 are run while data is transmitted from the DMS.

## 3. Data reception during Fading Conditions

A conversation state is established using the fading simulator. The MS input average RF level is set to 10 dBuV and a vehicle speed of 50 km/h is selected. Command FADING 50 connects the fading simulator set the simulated vehicle speed 50 km/h.

### 3.1 **Data Reception**

Test 3.4.2 is run to make call SS -> MS and then, during conversation state, data transmission from the FFSK data test equipment is started. The RF-level is manually or automatically decreased to the limit of data reception capability and it is again checked that no errors appear in the received characters.

### 3.2 **Clearing of the call**

With the decreased RF-level and during data reception, fixed clearing is initiated from the SS using procedure MTX-CLEAR.

**ANNEX B****DMS FUNCTION TESTS VIA SPEECH PATH**

When the NMT functions are tested, it is checked simultaneously, that the NMT functions do not disturb the DMS function, when activated.

**Scrambling Tests for the DMS Type Approval, RF input level of at least 30 dB $\mu$ V to the DMS**

**1. Checking of the Main Functions**

Check that it is possible to:

- a) give the scrambling key for outgoing calls in the format XXXXXXXX where X = 0, ...9,A...F. It shall be possible to select the key freely for each telephone number called.
- b) use the default key 3Y3Y3Y3Y for outgoing calls where YYYY = four last digits in the dialled number.
- c) select the scrambling key for incoming calls in the format XXXXXXXX where X = 0,...9,A,...F.
- d) disable scrambling for incoming calls.
- e) make a call without scrambling to a number where scrambling is not used.

**2. Running the Tests****2.a Outgoing Call, Any Key, 7-bit Format**

Set the scrambling key in the Test PC and in the DMS (for outgoing call) to 6789ABCD. Make a call to the Test PC and check that scrambling is on and that text is received correctly in both directions.

Change the key in the Test PC only to 7789ABCD. Make a call and check that scrambled text (random characters) is received in both directions.

**2.b Outgoing Call, Default Key , 7-bit Format**

Set the scrambling key in the Test PC to 35363738. See that no scrambling key is given to the DMS so that default scrambling key will be used. Make a call to the Test PC by dialling 12345678 and check that scrambling is on and that text is received correctly in both directions.

Change the key in the Test PC only to 35363739. Make a call and check that scrambled text (random characters) is received in both directions.

2.c **Incoming Call, Any Key, 7-bit Format**

Set the scrambling key in the Test PC to 1234CDEF and the key for incoming calls in the DMS to 1234CDEF. Make a call from the Test PC to the DMS and check that scrambling is on and that text is received correctly in both directions.

Change the key in the Test PC to 2234CDEF. Make a call and check that scrambled text (random characters) is received in both directions.

2.d **Incoming Call no Scrambling, 7-bit format**

Disable scrambling in the Test PC (and in the DMS if required). Make a call from the Test PC to the DMS and check that scrambling is off and that text is received correctly in both directions.

2.e **Outgoing Call, no Scrambling, 7-bit Format**

Disable Scrambling in the Test PC. Make a call from the DMS to the Test PC and check that scrambling is off and that test is received correctly in both directions.

3. **8-bit Format**

If 8-bit format (option) is implemented in the DMS, activate the 8-bit format in the DMS (if necessary), make a call to a number where 8-bit format is used and check that 8-bit characters can be received. Transmitting 8-bit characters might be possible only by using the external connector (RS232) and a PC connected to the DMS. (Depending on the number called the 8-bit characters may be echoed back as 8-bit characters or as 7-bit characters).

Check if it is possible to use 8-bit format between two DMS's (not required).

4. **Reliability of Scrambling**

4.a **Fading, Start of Call**

Use a fading simulator towards the DMS and set the speed to 50 km/h and the level to a value where the text transfer speed is clearly reduced but practical.

With the settings above make 20 calls to the DMS using key 6789ABCD as described in paragraph 2.a.

It is required that, for each (successful) consecutive call to the DMS, scrambling will be activated and text completely free of errors can be sent and received. If errors appear in the text, there is an error in the algorithm or in the scrambling activation procedure of the DMS.

**4.b Fading, Large Amount of Data**

Use a fading simulator towards the DMS and set the speed to 50 km/h and the level to a value where the text transfer speed is clearly reduced but practical.

With the settings above make a call to the DMS using key 6789ABCD as described in paragraph 2.a. See that scrambling is activated.

Send the test text from the Test PC to the DMS 10 times minimum and see that no errors in the text can be seen (does not suddenly switch to random characters for the rest of the text).

**5. Other Functions**

Check that a correct response is given by the DMS to `*?MSI?*` and `*?DSZ?*` in the 7-bit format. If possible, set the DMS to 8-bit format but make a call to the Test PC which is operating in 7-bit format and check that the responses can be received to the strings above.

Check that the MASK and RAND received by the Test PC are different ('random') for each call.

Check that the DMS sends the ID when initiating a call but not when receiving the call.