TETRA SwMI Interoperability Certificate

13 September 2002

R&S BICK Mobilfunk GmbH

Telelaboratoriet (TDC Mobil A/S) has witnessed that the R&S BICK Mobilfunk GmbH infrastructure is operating in accordance with

TETRA Interoperability Profile – (TIP) Ver 2.1.1, March 2000

for the following features:

Features	Tested (Yes/No)
• Registation / de-registration	Yes
• Individual call	Yes
• Group management	Yes
• Group call	Yes
• Emergency call	Yes
• Cell re-selection	Yes
• Short data service	Yes
• PSTN interconnect	Yes

The tests have been performed on R&S BICK Mobilfunk GmbH ACCESSNET-T infrastructure during the period 5th-9th February 2001 with hardware V.1.00.01 (DMX-500 + 4*DTX-500) and software package V.1.00.21 and during the period 24th-28th September 2001 with hardware release 1.01.01 and software release 1.51.04.

The test results for the tested features can be found in table 1 and 2 of this certificate.

Authorised IOP test engineer

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Information about the equipment used for testing

Testing on the 5th-9th February 2001:

The tests performed on 5th-9th of February 2001 were performed using the following terminals:

Manufacturer	Terminal Type	Software/Hardware Release No.
Motorola	MTM300	SW: R35.03.29 HW: M12QCN6TZ5BN
Nokia	THR600	SW: HZ12.03-2 HW: HRU 600-04
Marconi / OTE	Puma-T1	HW: 02.01 SW: 2.1.A
Simoco Digital Systems	SRM1000	SW: 4313 327 84994 HW: MD1TZ001T20C01000
Cleartone	CM9000P	SW: TMD 0.33 HW:1-00

They were used on R&S BICK Mobilfunk GmbH ACCESSNET-T infrastructure with hardware V.1.00.01 (DMX-500 + 4*DTX-500) and software package V.1.00.21.
The testing were performed at the premises of R&S BICK Mobilfunk GmbH.

Testing on the 24th-28th September 2001:

The tests performed on 24th-28th of September 2001 were performed using the following terminals:

Manufacturer	Terminal Type	Software/Hardware Release No.
Motorola	MTM 300	SW: R35.40.12 HW: M12PCN6TZBN
Motorola	MTH 300	SW: R50.40.12 HW: H14QCH6TZ5AN
Nokia	THR 850	SW: 2.16-0 HW: JL1-11
Marconi / OTE	Puma T1	HW: 774-0013/02.01 SW: HB23017F
Marconi / OTE	Puma T2	HW: 774-0162/01.01 SW: TB23817F
Sepura	SRM1000	SW: 4313 327 73043 HW: MS1TT001T20C0000

They were used on R&S BICK Mobilfunk GmbH ACCESSNET-T infrastructure with hardware release 1.01.01 and software release 1.51.04.

Additional information about the test performed

Testing on the 5th-9th February 2001:

The tests for the Cleartone and Marconi/OTE terminals were performed in the 380-400 MHz band. The SwMI was operating with the following configuration:

MCC	238
MNC	6
Colour code	45
LA3 carrier frequency (BS Tx)	391.6125 MHz
LA4 carrier frequency (BS Tx)	392.6125 MHz
PSTN gateway	Hicom PABX, 82xxx
Subscriber classes	$FFFF_{16}$

The tests for the Nokia, Motorola and Simoco terminals were performed in the 410-430 MHz band. The SwMI was operating with the following configuration:

MCC	238
MNC	6
Colour code	45
LA1 carrier frequency (BS Tx)	423.3750 MHz
LA2 carrier frequency (BS Tx)	422.4750 MHz
PSTN gateway	Hicom PABX, 82xxx
Subscriber classes	$FFFF_{16}$

Testing on the 24th-28th September 2001:

The tests for the Motorola MTM 300, Sepura SRM1000 and the Marconi/OTE terminals PUMA T1 and PUMA T2 were performed in the 380-400 MHz band.
The tests for the Nokia THR850 and Motorola MTH 300 terminals were performed in the 410-430 MHz band.

Test Results

Table 1 Test results from 5th-9th February 2001 and table 2 Test results from 24th-28th September 2001:

The tables indicates whether or not tests addressing a specific requirement of the TIP specification have been performed, whether or not the requirement is applicable for the combination of the SwMI and the terminal, and the result of the test if executed. Each entry of the table may take one of six values: -: No test performed, N/A: Not applicable, P: Pass , F: Fail, I: Inconclusive or NTA: No test case being available. NTA will only be allocated if both SwMI and terminal has indicated that they support (comply with) the corresponding feature (requirement); if either has indicated the feature (requirement) as not being supported then the entry will be N/A. In case of all entries of a row being N/A it should be assumed that this feature is not supported by the SwMI.
The test results have been derived from examining the behaviour of a live system. The verdicts indicated are based on the log evaluation of the information exchange between

the SwMI and the terminals indicated in table 1 and table 2. The verdicts reflect the fact that at the time of the IOP testing it was/was not possible to demonstrate a behaviour that was in accordance with the related requirement.

Table 1: Test performed on the 5th- 9th February 2001

Abbreviations:

-:	Not performed.	F:	Fail
N/A:	Not applicable	I:	Inconclusive
P:	Pass	NTA:	No test case available

R&S BICK SwMI	Marconi-OTE Puma-T1	Motorola MTM300	Nokia THR600	Simoco Digital Systems SRM1000	Cleartone CM9000P
6 Registration					
6.1 ITSI attach	P	N/A	P	P	N/A
6.2 ITSI attach including group attachment	N/A	P	N/A	N/A	P
6.3 Roaming location updating	P	P	P	P	P
6.4 De-registration	P	P	P	P	P
7 Individual call					
7.1 Call setup	P	P	P	P	P
7.1 Call setup(Queuing)	P	P	P	P	P
7.1.1 Hook signalling (simplex)	P	P	P	P	P
7.1.1 Hook signalling (Duplex)	P	N/A	P	P	P
7.1.2 Direct through-connect (Simplex)	P	-	P	P	P
7.1.2 Direct through-connect (Duplex)	-	N/A	-	-	-
7.1.3 Call setup Modifications					
7.1.3 (Duplex to Semi duplex)	P	-	P	N/A	P
7.1.3.2 Setup modification by called party					
7.1.3.2.1 Direct to hook	-	-	-	-	-
7.2 Transmission control					
7.2.1 End of transmission	P	P	P	P	P
7.2.2 Request to transmit	P	P	P	P	P
7.2.3 Request for speech item	N/A	P	P	N/A	P
7.3 Call maintenance	NTA	NTA	NTA	NTA	NTA
7.4 Call disconnection	-	-	-	-	-
7.5 Emergency individual call	P[1,2]	N/A	P[2]	F[4]	P
7.5.1 Emergency speech item request	P[1,2]	N/A	P[2]	F[4]	P
7.5.2 Emergency individual call modification	P[1,2,3]	N/A	P[2,3]	N/A	P[3]
8 Group management					
8.4 MS Attachment of the selected group	P	P	P	P	P
8.4 MS Attachment of the selected group (Rejection)	P	-	P	P	-
8.4 MS Attachment of the Null group	P	P	P	P	P
8.4 MS Change of the selected group	P	F[5]	P	P	P
8.5 Multiple group attachment	P	N/A	P	P	N/A
8.6 MS initiated detachment	P	-	N/A	N/A	N/A
8.7 SwMI initiated group attachment and detachment					
8.7.1 SwMI initiated detachment	P	F[6]	P	N/A	P
8.7.2 SwMI initiated attachment	P	F[7]	P	N/A	P
8.7.3 SwMI initiated group reporting	-	-	-	-	-
8.7.4 SwMI initiated registration with group report request	P	P	P	P	P

R&S BICK SwMI	Marconi-OTE Puma-T1	Motorola MTM300	Nokia THR600	Simoco Digital Systems SRM1000	Cleartone CM9000P
9 Group call					
9.1 Call setup	P	P	P	P	P
9.1 Call setup (Queuing)	P	P	P	P	P
9.1.1 Call setup modifications	NTA	NTA	NTA	NTA	NTA
9.2.1 End of transmission	P	P	P	P	P
9.2.2 Request to transmit	P	P	P	P	P
9.2.3 Request for speech item	N/A	P	I[8]	N/A	P
9.3 Call disconnection	P	P	P	P	P
9.4 Late entry	P	P	P	P	P
9.5 Emergency group call	P	P	I[2,9]	N/A	P
9.5 Emergency group call(Setup to busy group)	P	P	I[2,9]	N/A	P
9.5.1 Emergency speech item request	P	P	I[9]	N/A	P
9.5.2 Emergency group call modification	F[3,10]	F[3,10]	F[2,3,10]	N/A	F[3,10]
10 Cell re-selection					
10.1 Undeclared cell re-selection	P	P	P	P	P
10.2.1 Unannounced cell re-selection with call restoration					
10.2.1 (Group call)	N/A	N/A	N/A	N/A	N/A
10.2.1 (Queuing, group call)	N/A	N/A	N/A	N/A	N/A
10.2.1 (individual call)	N/A	N/A	N/A	N/A	N/A
10.2.1 (Queuing, individual call)	N/A	N/A	N/A	N/A	N/A
10.2.2 Announced cell re-selection without Preferred Neighbour Selected with call restoration					
10.2.2 (Group call)	N/A	N/A	N/A	N/A	N/A
10.2.2 (Queuing, group call)	N/A	N/A	N/A	N/A	N/A
10.2.2 (Pre-emption, group call)	N/A	N/A	N/A	N/A	N/A
10.2.2 (individual call, traffic)	N/A	N/A	N/A	N/A	N/A
10.2.2 (individual call, inactivity)	N/A	N/A	N/A	N/A	N/A
10.2.2 (Queuing, individual call, traffic)	N/A	N/A	N/A	N/A	N/A
10.2.2 (Queuing, individual call, inactivity)	N/A	N/A	N/A	N/A	N/A
11 Short data service					
11.1 Status messages (to dispatcher)	I[11]	P	P	P	P
11.1 Status messages (Text messaging)	P	-	P	P	P
12 Telephone call					
12.1 Gateway Addresses	NTA	NTA	NTA	NTA	NTA
12.2 Call Set-up	I[12]	I[12]	I[12]	I[12]	I[12]
12.2.1 MS Originated, Late Through-Connect	-	-	-	-	-
12.2.2 MS Originated, Early Through-Connect	-	-	-	-	-
12.2.3 MS Originated, Call Queued	P[12]	P[12]	P[12]	P[12]	P[12]
12.2.4 MS Terminated	P	P	P	P	P
12.3 Call Maintenance	NTA	NTA	NTA	NTA	NTA
12.4 DTMF Over-dial	N/A	N/A	N/A	N/A	N/A
12.5 Disconnect Causes	NTA	NTA	NTA	NTA	NTA
12.6 Emergency telephone call	NTA	NTA	NTA	NTA	NTA

Comments:

1) It was observed that the SwMI queues the emergency call while resources are being released.
2) It was observed that the request to transmit element was set to “request that other MS may transmit/send data”. Therefore the SwMI sets the transmission grant element to “Transmissions not granted” in the D-CONNECT.
3) In D-CALL-PROCEEDING communication type element is missing.
4) More than the necessary resources are released in order to be able to handle the emergency call.
5) The MS log indicates that it is attempting to attach a group, which should be known to the SwMI. The SwMI rejects this group. The SwMI log does not contain any information about the MS attempting to attach a group.
6) The MS rejects the SwMI initiated group detachment.
7) The SwMI attempts to reattach the group with class of usage 4. No response is received from the MS.
8) The logs do not contain the necessary information to draw a conclusion.
9) The log from the SwMI does not match the log from the MS.
10) In D-CALL-PROCEEDING and D-CONNECT the Hook method element is set to “Direct”, expected value is “Hook signalling”.
11) No D-STATUS shown in the log from the SwMI or the terminal.
12) The call is established. The Hook selection method element is set to hook signalling all through the setup phase, but no D-ALERT is sent from SwMI. Due to ambiguity in the specification it can not be determined whether or not this signalling is correct.

In a number of tests an incorrect transmission grant value were observed in downlink messages (D-SETUP, D-CONNECT etc). E.g. in a test of an individual call the transmission grant value of the D-SETUP was set to “Transmission granted” where the expected value was “transmission not granted”.

Table 2: Test performed during the period 24th-28th September 2001

Abbreviations:

-:	Not performed.	F:	Fail
N/A:	Not applicable	I:	Inconclusive
P:	Pass	NTA:	No test case available

R&S BICK SwMI	Marconi-OTE PUMA T2	Marconi-OTE PUMA T1	Motorola MTH 300	Motorola MTM 300	Nokia THR 850	Sepura SRM1000	Cleartone CM9000P
6 Registration							
6.1 ITSI attach	P	-	N/A	N/A	P	-	-
6.2 ITSI attach including group attachment	N/A	N/A	P	-	N/A	N/A	-
6.3 Roaming location updating	P	P	P	P	P	P	-
6.4 De-registration	P	-	P	-	P	-	-
7 Individual call							
7.1 Call setup	P[1]	-	P[1]	-	P[1]	-	-
7.1 Call setup(Queuing)	P	-	P	-	P	-	-
7.1.1 Hook signalling (simplex)	P	-	P	-	N/A	-	-
7.1.1 Hook signalling (Duplex)	P	-	P	-	P	-	-
7.1.2 Direct through-connect (Simplex)	P	-	-	-	P	-	-
7.1.2 Direct through-connect (Duplex)	-	-	N/A	-	-	-	-
7.1.3 Call setup Modifications							
7.1.3 (Duplex to Semi duplex)	P[2]	-	N/A	N/A	F[2,3]	-	-
7.1.3.2 Setup modification by called party							
7.1.3.2.1 Direct to hook	-	-	-	-	-	-	-
7.2 Transmission control							
7.2.1 End of transmission	P	-	F[4]	-	P	-	-
7.2.2 Request to transmit	P	-	P	-	P	-	-
7.2.3 Request for speech item	N/A	-	P	-	P	-	-
7.3 Call maintenance	NTA	NTA	NTA	NTA	NTA	NTA	NTA
7.4 Call disconnection	P[5]	P[5]	P[5]	-	P[5]	P[5]	-
7.5 Emergency individual call	P	-	N/A	N/A	-	F[8]	-
7.5.1 Emergency speech item request	-	-	N/A	N/A	-	-	-
7.5.2 Emergency individual call modification	P[6,7]	-	N/A	N/A	-	N/A	-
8 Group management							
8.4 MS Attachment of the selected group	P	-	P	P	P	-	-
8.4 MS Attachment of the selected group (Rejection)	P	-	P	P	P	-	-
8.4 MS Attachment of the Null group	N/A	-	-	-	P	-	-
8.4 MS Change of the selected group	P	-	P	P	P	-	-
8.5 Multiple group attachment	P	-	N/A	N/A	P	P	-
8.5 Multiple group attachment (Rejection)	-	-	N/A	N/A	-	-	-
8.6 MS initiated detachment	P	-	N/A	N/A	-	-	-
8.7 SwMI initiated group attachment and detachment							
8.7.1 SwMI initiated detachment	P	-	F[9]	F[9]	P	P	-
8.7.2 SwMI initiated attachment	F[10]	-	P	P	P	P	-
8.7.3 SwMI initiated group reporting	P	-	F[11]	-	P	P	-
8.7.4 SwMI initiated registration with group report request	P	-	P	-	F[12]	-	-

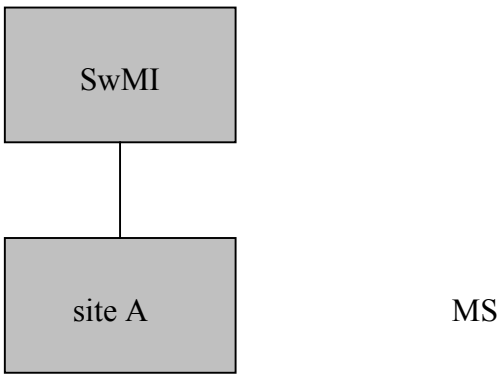
R&S BICK SwMI	Marconi-OTE PUMA T2	Marconi-OTE PUMA T1	Motorola MTH 300	Motorola MTM 300	Nokia THR 850	Sepura SRM1000	Cleartone CM9000P
9 Group call							
9.1 Call setup	P	-	P	-	P	-	-
9.1 Call setup (Queuing)	P	-	P	-	P	-	-
9.1.1 Call setup modifications	NTA	NTA	NTA	NTA	NTA	NTA	NTA
9.2.1 End of transmission	P	-	F[4]	-	P	-	-
9.2.2 Request to transmit	P	-	P	-	P	-	-
9.2.3 Request for speech item	N/A	-	P	-	P	-	-
9.3 Call disconnection	P	-	P	-	P	-	-
9.4 Late entry	P	-	P	-	P	-	-
9.5 Emergency group call	P[7]	-	P	-	N/A	P	-
9.5 Emergency group call(Setup to busy group)	P[7]	-	F[13]	-	N/A	P	-
9.5.1 Emergency speech item request	P	-	P	-	N/A	P	-
9.5.2 Emergency group call modification	F[1,6,14]	-	N/A	N/A	N/A	N/A	-
10 Cell re-selection							
10.1 Undeclared cell re-selection	P	-	P	-	P	-	-
10.2.1 Unannounced cell re-selection with call restoration							
10.2.1 (Group call)	P	P	P	P	P	P	-
10.2.1 (Queuing, group call)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10.2.1 (individual call)	N/A	N/A	P	P	N/A	N/A	-
10.2.1 (Queuing, individual call)	N/A	N/A	F[15]	F[15]	N/A	N/A	-
10.2.2 Announced cell re-selection without Preferred Neighbour Selected with call restoration							
10.2.2 (Group call)	P	P	P	P	P	P	-
10.2.2 (Queuing, group call)	P	P	P	P	P	P	-
10.2.2 (Pre-emption, group call)	P	P	F[16]	F[16]	N/A	P	-
10.2.2 (individual call, traffic)	P	P	P	P	P	P	-
10.2.2 (individual call, inactivity)	P	P	N/A	N/A	P	P	-
10.2.2 (Queuing, individual call, traffic)	P	P	I[17]	I[17]	P	P	-
10.2.2 (Queuing, individual call, inactivity)	P	P	N/A	N/A	P	P	-
11 Short data service							
11.1 Status messages (to dispatcher)	P	-	P	-	I[18]	-	-
11.1 Status messages (Text messaging)	P	-	P	-	P	-	-
12 Telephone call							
12.1 Gateway Addresses	NTA	NTA	NTA	NTA	NTA	NTA	NTA
12.2 Call Set-up	I[19]	-	I[19]	-	I[19]	-	-
12.2.1 MS Originated, Late Through-Connect	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12.2.2 MS Originated, Early Through-Connect	-	-	-	-	-	-	-
12.2.3 MS Originated, Call Queued	P[19]	-	P[19]	-	P[19]	-	-
12.2.4 MS Terminated	P[1]	-	P[1]	-	P[1]	-	-
12.3 Call Maintenance	NTA	NTA	NTA	NTA	NTA	NTA	NTA
12.4 DTMF Over-dial	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12.5 Disconnect Causes	NTA	NTA	NTA	NTA	NTA	NTA	NTA
12.6 Emergency telephone call	NTA	NTA	NTA	NTA	NTA	NTA	NTA

Comments:

1) Incorrect value in the Transmission grant element in D-SETUP.
2) Incorrect value in the Simplex/duplex selection element in D-CALL-PROCEEDING.
3) In the D-CONNECT PDU the Transmission grant element is set to “Transmission granted” where the expected value is “Transmission granted to another user”.
   In the D-CONNECT-ACK PDU the Transmission grant element is set to “Transmission granted to another user” where the expected value is “Transmission granted”.
4) The log file indicates that the MS sends U-TX-CEASED several times, but no layer 2 acknowledgement is received.
5) Among several call disconnection causes, only ‘User requested disconnect’ is tested.
6) Communication type element is missing in D-CALL-PROCEEDING.
7) It was observed that the request to transmit element was set to “request that other MS may transmit/send data” in the U-SETUP PDU. Therefore the SwMI sets the transmission grant element to “Transmissions not granted” in the D-SETUP and D-CONNECT. Pressing PTT is required to establish audio.
8) The emergency call is established. However, the SwMI sends D-ALERT despite the fact that the Hook selection method element is set to direct signalling all through the setup phase.
9) The MS rejects the SwMI initiated group detachment.
10) When the SwMI detaches a group and re-attaches the same group, the MS rejects the re-attachment.
11) It is a single group mode MS. The value in the Group identity attach/detach mode element in U-ATTACH/DETACH GROUP IDENTITY is incorrect and the SwMI does not acknowledge the group reporting.
12) The SwMI requests for a group report, but the MS sends no report.
13) The SwMI does not clear the original group call before setting up the emergency call to the same group.
14) In D-CALL-PROCEEDING and D-CONNECT the Hook method element is set to “Direct”, expected value is “Hook signalling”.
15) Call restoration on the new cell fails. The SwMI sends D-CALL-RESTORE with incorrect value in Transmission grant element.
16) After registration on the new cell the MS sends U-STATUS with an “emergency request” and the SwMI acknowledge correctly. Subsequently the MS sends U-DISCONNECT with disconnection reason “User requested disconnection”.
17) The MS sends U-PREPARE several times, but neither the layer 2 acknowledgement or D-NEW-CELL is shown in the MS log file. This signalling may be caused by improper execution of the test. However, the call is established on the new cell.
18) No D-STATUS shown in the log from the terminal.
19) The call is established. The Hook selection method element is set to hook signalling all through the setup phase, but no D-ALERT is sent from SwMI. Due to ambiguity in the specification it can not be determined whether or not this signalling is correct.

Test setup description

All tests except the cell re-selection test are carried out on a single site system with one carrier using standard antenna configurations.



For the cell re-selection test, an additional site is activated and the roaming MS is connected to the system via RF cables as illustrated below.