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TECHNICAL REPORT

Mobile and portable DVB-T/H radio access – Part 3: Measurement Interface

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FOREWORD

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IEC 62002-3, which is a technical report, has been prepared by technical area 1: Terminals for audio, video and data services and contents, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
100/1397/DTR	100/1443/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62002 series, under the general title *Mobile and portable DVB-T/H radio access,* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

MOBILE AND PORTABLE DVB-T/H RADIO ACCESS –

Part 3: Measurement Interface

1 Scope

This Technical Report is defining the minimum requirements for a terminal measurement interface to be used in test systems designed to verify the terminal conformance according IEC 62002-1 and IEC 62002-2. The interface is especially designed to be used with terminal category c), hand-held portable convergence terminals, but can obviously be used with other terminal categories as well (see IEC 62002-1, Clause 4). The measurement interface is used to control the terminal and read the degradation information from the terminal. The test signal interface (terminal input) is specified in the IEC 62002-2 and is not part of this Technical Report.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62002-1, *Mobile and portable DVB-T/H radio access – Part 1: Interface specification*

IEC 62002-2, *Mobile and portable DVB-T/H radio access – Part 2 Interface conformance testing*

3 Abbreviations

For the purposes of this document, the following abbreviations apply.

B	Bandwidth
BER	Bit error ratio
BT	Bluetooth
C	Carrier power [in band carrier power including any echoes]
C/N	Carrier to noise ratio
CR	Code rate
CR	Carriage return, ASCII code 0x0d
dB	Decibel
dB(mW)	Power in dB compared to 1 mW
DVB, DVB-T	Digital video broadcasting, terrestrial digital video broadcasting
DVB-H	Digital video broadcasting to hand-held terminals
ESR_5	Erroneous Second Ratio 5 %
F	Frequency in Hz
FER	Frame error rate
GI	Guard interval
IR	Infrared
LF	Line feed, ASCII code 0x0a
MFER	MPE-FEC frame error rate
MHz	Megahertz
MPE-FEC	Multi Protocol Encapsulation Forward Error Correction
PER	Packet error ratio
PSI/SI	Program specific information, service information
QAM16, QAM64	Quadrature amplitude modulation, 16-level and 64-level versions
QEF	Quasi error free
QPSK	Quaternary phase shift keying
SFP	Subjective failure point
TPS	Transmission Parameter Signalling
TS	Transport stream
TS-PER	Transport stream packet error ratio
UART	Universal asynchronous receiver transmitter
UI	User interface
USB	Universal serial bus
WLAN	Wireless local area network

4 Interface description

4.1 General

The purpose of the interface is to allow the test system to

- control the terminal so that it can be set to the different operating modes and frequencies required by the conformance test procedures,
- read degradation information from the terminal.

The terminal can also output additional useful information, e.g. signal strength, modulation parameters etc. This information can be used in other measurements like field tests.

This interface will support the use of degradation criteria a), b), c) and d) as specified in IEC 62002-2.

a) Reference BER, defined as $BER = 2 \times 10^{-4}$ after Viterbi decoding.

b) Picture failure point (PFP). ESR_5 for entire Transport Stream based on the reported $TS\text{-}PER$.

c) Subjective failure point in mobile reception SFP. ESR_5 for entire Transport Stream based on the reported $TS\text{-}PER$.

d) DVB-H error criterion with 5 % $MFER$.

Depending on the specific conformance measurement one of these will be used according to IEC 62002-2.

The terminal should support one of the following measurement methods.

- Manual measurement
- Test system controlled measurement

Although a manual measurement mode is included in the recommendation the main purpose of the recommendation is to describe the interface to be used in an automatic test system, where the test system is controlling the terminal and reading the measured values from the terminal.

4.2 Manual measurement

The terminal should provide interfaces to read out the degradation criteria manually as required by the specific conformance measurement. The measured values should be displayed on the terminal display after the measurement.

4.3 Test system controlled measurement

The terminal should provide an external serial interface to allow control of the terminal by the test system and read back of measured information by the test system. Communication over the interface is done with ASCII character messages. This interface should support for example one of the following physical interfaces.

- USB
- UART (RS-232) Port
- Bluetooth
- WLAN (telnet)
- IR

ASCII messages should be mapped to the physical interface. A possible test setup is presented in the Figure 1.

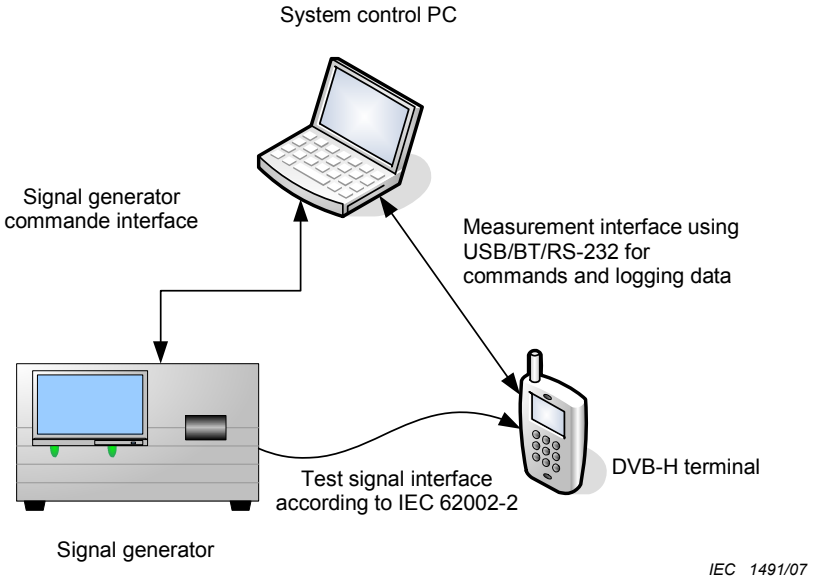

Figure 1 – Example of a test set up in test system controlled measurement

5 Measurement interface commands

5.1 General

The message consists of a single line starting with TEST command followed by START, RESTART or STOP command and necessary parameters. The parameters are separated with space. The parameter name and value are separated by a character : i.e. colon. The end of line mark is <CR> <LF> Carriage Return Line Feed i.e. ASCII 0x0d 0x0a.

The message can be sent either via terminal UI or via remote link connection.

The parameters for START command are given in Table 1.

Table 1 – Parameters for start command

Abbreviation	Parameter description
FRE	Frequency in Hz, example (498000000)
BDW	Bandwidth in MHz, example (8)
PID	PID value in decimal. If PID or IP is omitted *BER* measurement mode is started.
PRI	Hierarchical modulation, 0 = Low priority, 1 = Hi priority (= No hierarchy)
ROW	MPE-FEC rows , 0 = 256(0,5M), 1 = 512(1M), 2 = 768(1,5M), 3 = 1024(2M)
MBD	Maximum burst duration of burst in tens of milliseconds, example 50 equals 500 ms
IPV	IP version, 6 = Ipv6, 4 = ipv4
IPA	IP address e.g •FF15::0002:0001 for IPv6 •225.6.7.8 for IPv4 If PID or IP is omitted *BER* measurement mode is started

RESTART or STOP commands do not have any parameters.

5.2 Starting BER measurement

5.2.1 General

The terminal is set to *BER* measurement mode by sending the following message:

TEST START *FRE*:Frequency[Hz] *BDW*:Bandwidth[MHz] *PRI*:LP/HP[0/1] <CR><LF>

Above <CR> means Carriage Return, <LF> means Line Feed.

Frequency and the signal bandwidth are given to the receiver. The receiver must discover automatically the rest of the modulation parameters using TPS information etc.

An example for starting a BER measurement at a frequency of 586MHz is given below.

TEST START FRE:586000000 BDW:8 PRI:1

5.2.2 Start *MFER* measurement mode

The terminal is set to *MFER* measurement mode by sending the following message:

TEST START *FRE*:Frequency[Hz] *BDW*:Bandwidth[MHz] *PRI*:LP/HP[0/1] *PID*:PID[decimal] *ROW*:MPE-FEC rows *MBD*:Burst duration[10ms] *IPV*:IP-version[6/4] *IPA*:IP-address <CR><LF>

Frequency and signal bandwidth are given to the receiver. The receiver must discover automatically the rest of the modulation parameters using TPS information, etc.

If the used test stream has valid PSI/SI and if the terminal supports automatic detection based on PSI/SI information, only parameters frequency, priority and IP address are needed. There should be only one platform available in transport stream used for testing.

An example for *MFER* measurement at a frequency of 586 MHz is given below.

TEST START *FRE*:586000000 *BDW*:8 *PRI*:1 *PID*:254 *ROW*:2 *MBD*:50 *IPV*:6 *IPA*:FF15::0001:0300

An example with automatic detection based on PSI-SI information is given below.

TEST START *FRE*:586000000 *BDW*:8 *PRI*:1 *IPV*:6 *IPA*:FF15::0001:0300

5.3 Stop measuring

The measurement is stopped by the following message:

TEST STOP <CR><LF>

5.4 Restart counters

The measurement counters (*BER*, *FER* etc.) are restarted, i.e. set to zero with the following message:

TEST RESTART <CR><LF>

5.5 Signal quality reporting

The terminal should respond first with Initial Report Header. This header contains the signal parameters and lock information. A parameter name is separated from parameter value with = character. The parameters are separated from each other with a space character. The line ends to Carriage Return <CR>, Line Feed <LF>.

The parameters for the initial report header are described in Table 2.

Table 2 – Initial report header parameters (after start/restart)

Description	Syntax	Example	Mandatory / Optional
Relative time	*TIM*=hh:mm:ss	*TIM*=08:34:05	Mandatory
Frequency	*FRE*=[Hz]	*FRE*=498000000	Mandatory
FFT size	*FFT*=8K, 4K, 2K	*FFT*=8K	Optional
Guard interval	*GI*=1/32, 1/16, 1/8, 1/4	*GI*=1/32	Optional
Inner modulation	*MOD*=QPSK, 16QAM, 64QAM	*MOD*=16QAM	Optional
Coderate	*CR*=1/2, 2/3, 3/4, 5/6, 7/8	*CR*=1/2	Optional
Bandwidth	*BDW*=5, 6,7,8	*BDW*=8	Optional
Hierarchy	*PRI*=0 (LP), 1(HP)	*PRI*=1	Optional
Alpha	*ALP*=0, 1, 2, 4	*ALP*=0	Optional
Interleaving	*INT*=0 (native), 1(in-depth)	*INT*=1	Optional
Lock status	*LOC*=abc (a= Service lock status i.e. receiver knows the delta_T for next burst, b=Transport Stream lock status, c =TPS lock status. Lock=1, No-lock=0, Not implemented = n	*LOC*=111	Mandatory: Transport Stream lock status is mandatory, TPS and service lock status are optional

Example of initial report header is given below.

TIM=08:34:05 FRE=498000000 FFT=8K GI=1/32 MOD=16QAM CR=1/2 BDW=8 PRI=1 ALP=0 LOC=111

In case receiver is not able to acquire the signal at all, only **LOC=000** should be output.

Next the receiver should start outputting signal quality parameters according to the Table 3.

Table 3 – Signal quality parameters

Description	Syntax	Note	Example	Mandatory / Optional
Relative time	*TIM*=hh:mm:ss		*TIM*=08:34:05	Mandatory
Frame count	*CNT*=xxx	Number of received frames from start/restart of the measurement	*CNT*=5	Mandatory. In BER measurement mode number of reports from start/restart
Signal strength	*RSI*=[dB(mW]	Strength is estimated by the receiver	*RSI*=-55	Optional
Carrier to noise ratio	*CNR*=[dB]	C/N is estimated by receiver	*CNR*=25	Optional
Bit error rate	*BER*=x.xE-x (zero *BER* is 0.0E+0)	*BER* is only valid if *PER*=0.0E+0	*BER*=2.1E-4	Mandatory in BER mode, optional in MFER mode. In MFER mode the BER should be calculated from the selected burst only.
TS packet error rate	*PER*=x.xE-x (zero FER is 0.0E+0)		*PER*=1.5E-3	Mandatory in BER mode, optional in MFER mode. In MFER mode the PER should be calculated from the selected burst only.
Frame error indicator flag before MPE-FEC, FER	*FER*=0,1 (1 means erroneous frame)		*FER*=0	Mandatory in MFER mode
Frame error indicator flag after MPE-FEC, MFER	*MFR*=0,1 (1 means erroneous frame)		*MFR*=0	Mandatory in MFER mode
MPE-frame error rate in percents, cumulative number from start/restart	*FE%*=x		*FE%*=5	Optional

Table 3 *(continued)*

Description	Syntax	Note	Example	Mandatory / Optional
Frame error rate in percents, cumulative number from start/restart	*MF%*=x		*MF%*=4	Optional
Synchronization time for the last burst	*SYT*=[ms]		*SYT*=130	Optional
Lock status	*LOC*=abc (a= Service lock status i.e. receiver knows the delta_T for next burst, b=Transport Stream lock status, c =TPS lock status. Lock=1, No-lock=0, Not implemented = n		*LOC*=111	Mandatory: Transport stream lock status is mandatory, TPS and service lock status are optional

Example of signal quality report is given below. The line ends to Carriage Return <CR>, Line Feed <LF>.

TIM=08:34:05 CNT=50 RSI=-55 CNR=25 BER=2.1E-4 PER=1.5E-3 FER=0 MFR=0 FE%=5 MF%=4 SYT=130 LOC=111

In *BER* mode the reporting interval can be fixed.

In *MFER* mode it is preferable that the reporting interval is same as time slicing cycle time.

In *MFER* measurement complete frames can sometimes be lost. Receiver is not able to detect completely lost frames because in DVB-H time slicing delta-T is variable, however the lost frames can be detected from the time stamp when a known test stream is used.

If the receiver is not able to receive frames the receiver should still output signal quality report containing RSSI and no lock information. The reporting should be done every 1 s. This functionality is optional.

In *MFER* measurements the test stream parameters should not change. The test streams are already specified in 4.7 of IEC 62002-2.

The terminal vendor may add other commands and parameters to the interface. In that case the names must not overlap with the specified ones.

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