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Prenos in multipleksiranje (TM) – Digitalni radiorelejni sistemi (DRRS) – Sinhrona digitalna hierarhija (SDH) – Parametri za nadzorovanje lastnosti sistemov SDH DRRS

Transmission and Multiplexing (TM); Digital Radio Relay Systems (DRRS); Synchronous Digital Hierarchy (SDH); System performance monitoring parameters of SDH DRRS

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Transmission and Multiplexing (TM).

The present document describes the performance monitoring functional architecture and requirements which are specific to the Digital Radio Relay System (DRRS) Network Elements (NE) that use the Synchronous Digital Hierarchy (SDH) multiplexing structure.

National transposition dates	
Date of adoption of this EN:	18 September 1998
Date of latest announcement of this EN (doa):	31 December 1998
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 1999
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1 Scope

The present document defines the additional specific performance monitoring functional architecture and requirements to be used for management of Digital Radio Relay Systems (DRRS) which use the Synchronous Digital Hierarchy (SDH).

Considering that:

- ETS 300 635 [4] and ITU-R Recommendation F.750 [3] define the SDH radio specific functional blocks for transmission at STM-n data rate;
- ETS 300 785 [5] and ITU-R Recommendation F.750 [3] define the SDH radio specific functional blocks for transmission at Synchronous Transport Module 0 (STM-0) data rate;
- EN 301 167 [6], ETS 300 417 [7], ITU-T Recommendations G.783 [1] and G.784 [2] define the performance monitoring architecture and requirements for generic functional blocks used on SDH DRRS and other SDH equipment;
- ITU-T Recommendation M.3010 [8] defines the standardized logical and functional Telecommunication Management Network (TMN) architecture.

The present document defines:

- the specific performance primitives and events to be used for performance management of radio specific functional blocks;
- the general requirements for history treatment associated to each performance event;
- the general requirements for thresholding treatment associated to each performance event;
- the specific transmission quality information which is required for maintenance purpose.

The present document does not define:

- the F interface performance monitoring;
- the performance monitoring related to non radio specific functional blocks;
- the information model to be used on Q interface which is on the study in TC TMN, (work item DEN/TMN-0006, see bibliography).
- the protocol stack to be used for the message communication function;
- any radio specific additional performance parameter to be used at network level management.

The present document applies on each SDH DRRS independently of the transmission data rate supplied (STM-n or STM-0).

The parameters defined in the present document are only intended to be used for radio equipment maintenance.

The present document should provide guidance and supporting information for the definition of object-oriented models within SDH DRRS.

It is not required for that equipment developed prior to the present document to be fully compliant with the present document.

2 References

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] ITU-T Recommendation G.783 (1994): "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".

[2] ITU-T Recommendation G.784 (1994): "Synchronous digital hierarchy (SDH) management".

[3] ITU-R Recommendation F.750: "Architectural and functional aspects of radio-relay systems for SDH-based networks".

[4] ETS 300 635: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); SDH Radio specific functional blocks for transmission of M x STM-N".

[5] ETS 300 785: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); SDH Radio specific functional blocks for transmission of M x sub-STM-1".

[6] EN 301 167: "Transmission and Multiplexing (TM); Management of Synchronous Digital Hierarchy (SDH) transmission equipment; Fault management and performance monitoring; Functional description".

[7] ETS 300 417: "Transmission and Multiplexing (TM); Generic functional requirements for Synchronous Digital Hierarchy (SDH) equipment".

[8] ITU-T Recommendation M.3010: "Principles for a Telecommunications management network".

[9] ITU-T Recommendation G.826: "Error performance parameters and objectives for international constant bit rate digital paths at or above the primary rate".

[10] ITU-T Recommendation G.EPMRS: "Error Performance Events for SDH Multiplex Sections".

[11] ETS 300 411: "Performance monitoring information model for the Network Element (NE) view".

[12] ITU-T Recommendation G.774.01: "Synchronous Digital Hierarchy (SDH) performance monitoring for the network element view".

[13] ITU-T Recommendation G.707 (1996): "Network node interface for the synchronous digital hierarchy (SDH)".

[14] Void.

[15] TR 101 035: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH) aspects regarding Digital Radio Relay Systems (DRRS)".

[16] ITU-T Recommendation M.20: "Maintenance philosophy for telecommunications networks".

[17] ITU-T Recommendation G.861: "Principles and guidelines for the integration of satellite and radio systems in SDH transport networks".

3 Symbols and abbreviations

3.1 Symbols

For the purposes of the present document, the following symbols apply:

dB	decibel
dBm	decibel relative to 1 milliWatt

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ATPC	Automatic Transmit Power Control
BBE	Background Block Error
DRRS	Digital Radio Relay System
ES	Errored Second
EW	Early Warning
FEC	Forward Error Correction
FSRD	Failed Switch Request Duration
FSRC	Failed Switch Request Count
HBER	High Bit Error Rate
HO	High Order
IF	Intermediate Frequency
LBER	Low Bit Error Rate
LOS	Loss of Signal
MCF	Message Communication Function
MS	Multiplex Section
MSA	Multiplex Section Adaptation
MST	Multiplex Section Termination
NE	Network Element
OS	Operating System
POH	Path OverHead
PM	Performance Monitoring
PSA	Protection Switch Actual
PSAC	Protection Switch Actual Count
PSAD	Protection Switch Actual Duration
PSR	Protection Switch Request
RF	Radio Frequency
RL	Received Level
RLTD	Received Level Tide Mark
RLTM	Received Level Tide Mark
RLTS	Received Level Threshold Second
ROHA	Radio OverHead Access
RPS	Radio Protection Switching
RRR	Radio Relay Regenerator
RRT	Radio Relay Terminal
RS	Regenerator Section
RSOH	Regenerator Section OverHead
RSPI	Radio Synchronous Physical Interface
RST	Regenerator Section Termination
SDH	Synchronous Digital Hierarchy
SES	Severely Erorred Second
SEMF	Synchronous Element Management Function
SF	Signal Fail
STM-n	Synchronous Transport Module n
Sub-STM-1	Sub-Synchronous Transport Module 1 (also defined as STM-0 in ITU-T Recommendation G.861 [17])
TL	Transmitted Level

TLTD	Transmitted Level Tide Mark
TLTM	Transmitted Level Tide Mark
TLTS	Transmitted Level Threshold Second
TMN	Telecommunication Management Network
UAS	UnAvailable Second
UAT	UnAvailable Time
VC-n	Virtual Container n

4 Introduction

The SDH multiplexing frame structure allows in-service quality transmission monitoring at different levels such as regenerator and multiplex sections and low/high order paths.

SDH Performance Monitoring (PM) is described starting from the definition of the performance primitives, events and parameters and defining the PM data collection and history treatment together with the way to present PM information to a managing system at a Q3 interface.

The whole matter is covered by several ITU-T Recommendations and ETSI standards e.g. ITU-T Recommendations G.783 [1], G.784 [2], G.826 [9], G.EPMRS [10], and G.774.01 [12]; EN 301 167 [6], ETS 300 411 [11] and ETS 300 417 [7].

SDH radio Network Elements (NE) may terminate, depending on applications, regenerator and multiplex sections and also high/low order paths. For each one of the above SDH layers implemented inside a SDH radio NE, the associated standardized PM shall be implemented.

Signal transmission on microwave radios may be affected by mid-air propagation phenomena that may result in transmission quality degradation. In order to counteract such typical radio feature several counter measures are or may be implemented inside radio transmission equipment.

The close relationship between transmission quality and radio link propagation cannot be well understood if the PM is limited only to quality of service.

In particular it is not possible, for a given measured quality, to discriminate among errors due to equipment degradations, countermeasure unefficiency and unusual or unpredicted bad propagation.

From such a reason the present document covers the need to have radio specific performance parameters to be used in close conjunction with the ordinary ones related to quality transmission: Severely Errored Second (SES), Errored Second (ES), Background Block Error (BBE) and UnAvailable Second (UAS).

Radio specific PM defines new radio specific performance primitives, events and parameters with associated requirements for data collection, threshold and history treatment.

Radio specific PM deals with monitoring of the radio specific functional blocks Radio Synchronous Physical Interface (RSPI) and Radio Protection Switching (RPS) as defined in ETS 300 635 [4], ETS 300 785 [5] and ITU-R Recommendation F.750 [3].

Clause 5 describes the general architecture of the radio specific PM process.

All the radio specific performance parameters defined in the present document are not required to meet quality objectives. Their meaning is consistent only in the hops or link which they refer to. Comparisons among different hops or links are not meaningful. A true performance comparison among different hops or links can be done only on the base of the generic SDH quality of service parameters like ES, SES, BBE and UAS.

From a management point of view the following applications may be envisaged:

- maintenance application:

  The presence of the 15 minutes register counters with associated threshold crossing control may be used to trigger threshold crossing notifications to a managing system. This process may be helpful to indirectly localize possible degradations of hardware devices like ATPC devices, feeders and antennas for example.

- SDH transmission quality parameters qualification:

  The presence of the 15 minutes and 24 hours current register counters like SES, ES, BBE and UAS associated for each regenerator and multiplex sections terminated in a Radio NE allows to have transmission quality monitoring of the same sections. The association of radio specific counters on registers of the same period allows to qualify them.

  In particular the values of radio specific counters may give indications on occurrence of propagation fading and switching activity during these periods helping in the distinction between quality degradation due to equipment or propagation.

- long term statistics:

  The presence of 24 hours history register radio specific counters together with the possibility to transfer their associated values to a managing system allows the collection at OS level of long term statistics.

  This information may also be used to verify the existing propagation prediction methods which are usually used for link design or develop new ones.

5 Functional architecture

The functional architecture of the radio specific PM (data collection, history and threshold treatment) is compliant to ITU-T Recommendation G.784 [2] and EN 301 167 [6].

This clause does not define any additional functional architecture requirements.

The functional architecture is reported in the informative annex C for the reader convenience.

6 Radio specific maintenance parameters

6.1 Radio Synchronous Physical Interface (RSPI) performance management

6.1.1 Performance primitives

6.1.1.1 Received Level (RL)

The RL is the level of the estimated received power at the input of the receiver and may be used to understand if a predefined period has been affected by fading activity. It may be also used to identify some permanent loss of received power due to hardware failures.

It must be outlined that this level is an estimation of the received power and that it may be affected by a certain amount of inaccuracy that is system dependent.

Moreover the interpretation of the associated values depends on several factors:

- the type of transmission used, i.e. bi-carriers, mono carrier systems;
- the fact that it is usually associated to a wide-band measure;
- the employed frequency.

The RL shall be a performance primitive available at the S50 reference point of the RSPI functional block.

This level shall be readable by a managing system on request.

The parameter unit shall be expressed in dBm and represented by the rounded nearest integer.

In the case that an Intermediate Frequency (IF) combiner is used as a fading countermeasure, only one performance primitive is required.

In this case this performance primitive is represented by either the level of the combined signal or by the level of the best single received input signals according to their availability.

In the case that STM-4 reception is implemented be several receivers (even if it is modelled by one single RSPI functional block) then one RL shall be monitored per each receiver implementing the block. On the consequence the S50 reference point may provide a multiple RL performance data table.

6.1.1.2 Transmitted Level (TL)

This subclause applies only when the Automatic Transmit Power Control (ATPC) is present. There are no requirements on TL when the ATPC is not present.

The TL is the level of the estimated transmitted power at the transmitter output. It may be used to monitor the ATPC of a transmitter.

It may also be used to identify periods of fading activity.

NOTE: Currently implemented ATPC controls are of two kinds:

Continuous power tracking where a control loop keeps the receiver level constant from the activation threshold down to a fading attenuation equal to the ATPC range, in this case the TL may assume any value within the ATPC range.

Step control power where only one or few power steps may be activated by the receiver level thresholds without any control loop, in the latter case the TL assumes discrete values within the ATPC range.

Similar considerations can be done for the TL as reported in subclause 6.1.1.1 for the RL.

The TL shall be a performance primitive available at S50 reference point of the RSPI functional block.

This level shall be readable by a managing system on request.

The TL level is represented by two values:

- an integer fixed value expressed in dBm defining the nominal i.e. the maximum transmitted power value which is equipment dependent;
- an integer offset value expressed in dB representing the variation with respect to the nominal value.

In the case that STM-4 transmission is implemented by several transmitters (even if it is modelled by one single RSPI functional block) then one TL shall be monitored per each transmitter implementing the block. On the consequence the S50 reference point may provide a multiple TL performance data table.