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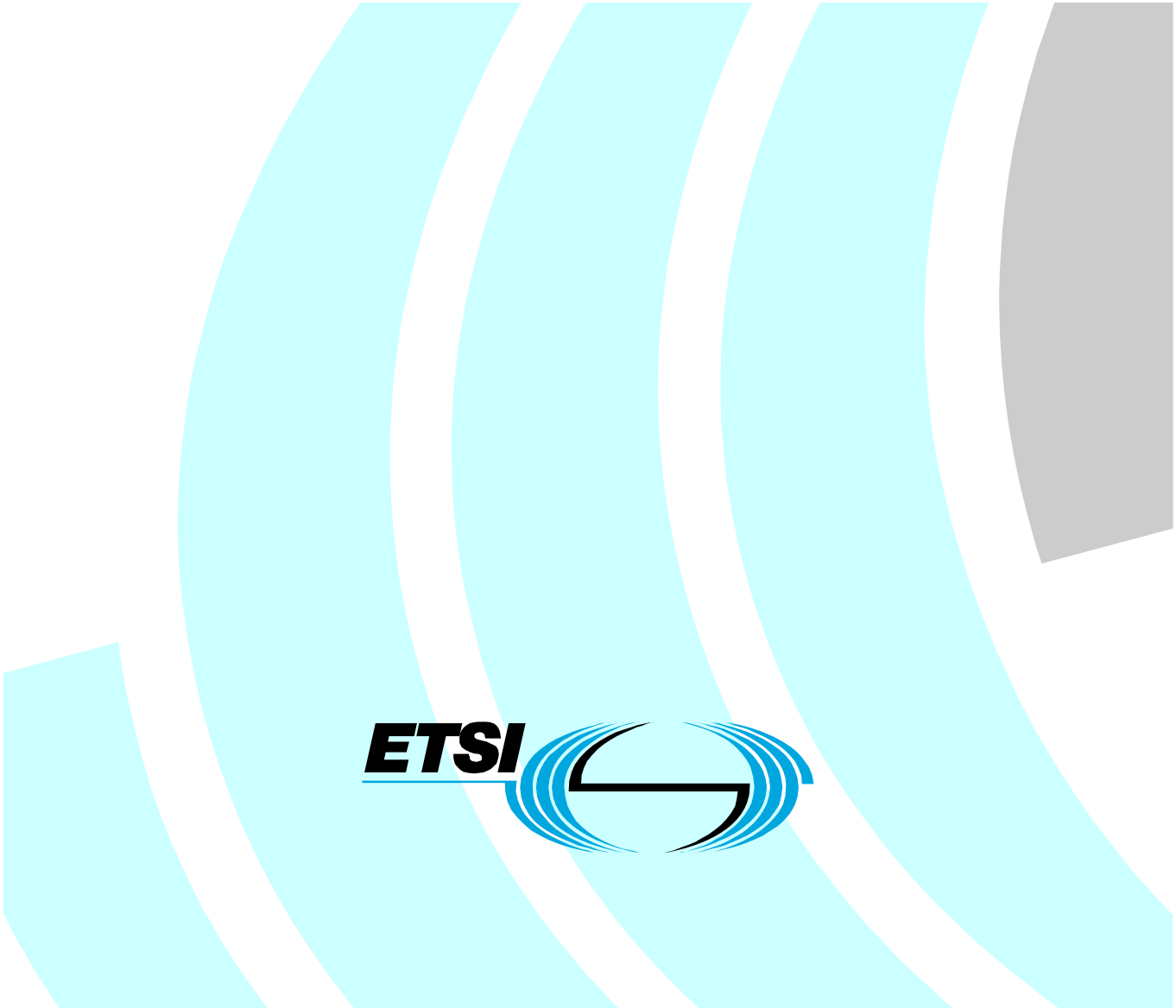
Technical Specification

Speech Processing, Transmission and Quality Aspects (STQ); QoS aspects for popular services in GSM and 3G networks; Part 4: Requirements for Quality of Service measurement equipment



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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Speech Processing, Transmission and Quality Aspects (STQ).

The present document is part 4 of a multi-part deliverable covering the QoS aspects for popular services in GSM and 3G networks, as identified below:

Part 1: "Identification of Quality of Service criteria";

Part 2: "Definition of Quality of Service parameters and their computation";

Part 3: "Typical procedures for Quality of Service measurement equipment";

Part 4: "Requirements for Quality of Service measurement equipment";

Part 5: "Definition of typical measurement profiles";

Part 6: "Post processing and statistical methods".

Part 1 identifies QoS aspects for popular services in GSM and 3G networks. For each service chosen QoS indicators are listed. They are considered to be suitable for the quantitatively characterization of the dominant technical QoS aspects as experienced from the end-customer perspective.

Part 2 defines QoS parameters and their computation for popular services in GSM and 3G networks. The technical QoS indicators, listed in part 1, are the basis for the parameter set chosen. The parameter definition is split into two parts: the abstract definition and the generic description of the measurement method with the respective trigger points. Only measurement methods not dependent on any infrastructure provided are described in the present document. The harmonized definitions given in the present document are considered as the prerequisites for comparison of QoS measurements and measurement results.

Part 3 describes typical procedures used for QoS measurements over GSM, along with settings and parameters for such measurements.

Part 4 defines the minimum requirements of QoS measurement equipment for GSM and 3G networks in the way that the values and trigger-points needed to compute the QoS parameter as defined in part 2 can be measured following the procedures defined in part 3. Test-equipment fulfilling the specified minimum requirements, will allow performing the proposed measurements in a reliable and reproducible way.

Part 5 specifies test profiles which are required to enable benchmarking of different GSM or 3G networks both within and outside national boundaries. It is necessary to have these profiles so that when a specific set of tests are carried out then customers are comparing "like for like" performance.

Part 6 describes procedures to be used for statistical calculations in the field of QoS measurement of GSM and 3G networks using probing systems.

Introduction

All the defined quality of service parameters and their computations are based on field measurements. That indicates that the measurements were made from customers point of view (full End-to-end perspective, taking into account the needs of testing).

It is assumed that the end customer can handle his user equipment and the services he wants to use (operability is not evaluated at this time). For the purpose of measurement it is assumed that:

- the service is not barred for any reason;
- routing is defined correctly without errors; and
- the target subscriber equipment is ready to process the service request.

Voice and video quality values measured should only be applied by calls ended successfully for statistical analysis.

However, measured values from calls ended unsuccessfully (dropped) should be available for additional evaluations and therefore, must be stored.

Further preconditions may apply when reasonable.

1 Scope

The present document defines the minimum requirements of QoS measurement equipment for digital wireless networks in the way that the values and trigger-points needed to compute the QoS parameter as defined in TS 102 250-2 [3] can be measured following the procedures defined in TS 102 250-3 [4].

Test-equipment fulfilling the specified minimum requirements, will allow performing the proposed measurements in a reliable and reproducible way.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

[1] ETSI TS 100 910: "Digital cellular telecommunications system (Phase 2+); Radio transmission and reception (3GPP TS 05.05)".

[2] Void.

[3] ETSI TS 102 250-2: "Speech Processing, Transmission and Quality Aspects (STQ); QoS aspects for popular services in GSM and 3G networks; Part 2: Definition of Quality of Service parameters and their computation".

[4] ETSI TS 102 250-3: "Speech processing, Transmission and Quality Aspects (STQ); QoS aspects for popular services in GSM and 3G networks; Part 3: Typical procedures for Quality of Service measurement equipment".

[5] ETSI TS 102 250-5: "Speech Processing, Transmission and Quality Aspects (STQ); QoS aspects for popular services in GSM and 3G networks; Part 5: Definition of typical measurement profiles".

[6] Void.

[7] Void.

3 Abbreviations

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

3GPP	3rd Generation Partnership Project
CI	Cell Identity
CS	Circuit Switched
FQT	Fixed QoS Test equipment
FQT	Fixed QoS Test
FTP	File Transfer Protocol
GPS	General Positioning System
GSM	Global System for Mobile communication

HTTP	HyperText Transfer Protocol
IMAP	Internet Message Access Protocol
IMEI	International Mobile Equipment Identity
ISDN	International Subscriber Digital Network
KPI	Key Performance Indicator
LAC	Location Area Code
MCC	Mobile Country Code
MMI	Man Machine Interface
MNC	Mobile Network Code
MQT	Mobile QoS Test equipment
MQT-LC	Mobile QoS Test-equipment Local Control
MQT-RC	Mobile QoS Test-equipment Remote Control
MS	Mobile Station
MSC	Mobile Switching Centre
PDN	Packet Data Network
PMN	Public Mobile Network
POP3	Post Office Protocol Version 3
PSTN	Public Switching Telephone Network
PWR	PoWer Supply
QoS	Quality of Service
RF	Radio Frequency
SMS	Short Message Service
SMSC	Short Message Service Centre
SMTP	Simple Mail Transfer Protocol
TS	Timeslot
UE	User Equipment
WAP	Wireless Application Protocol
WGS-84	World Geodetic System 1984

4 Overview

4.1 General Aspects

All tests are based on emulation of a typical customer using services provided in a Public Mobile Network (PMN). All of the services to be tested (see TS 102 250-2 [3]) can be emulated by the Mobile QoS Test-equipment (MQT) which can be installed in a vehicle, can be carried around by a pedestrian or is installed for semi-stationary use (e.g. office environment).

Test scenarios need to distinguish the following principal user cases.

1) user-to-user services (typically telephony);

2) store-and-forward services (e.g. SMS);

3) information services (e.g. accessing the internet or FTP download);

4) push services.

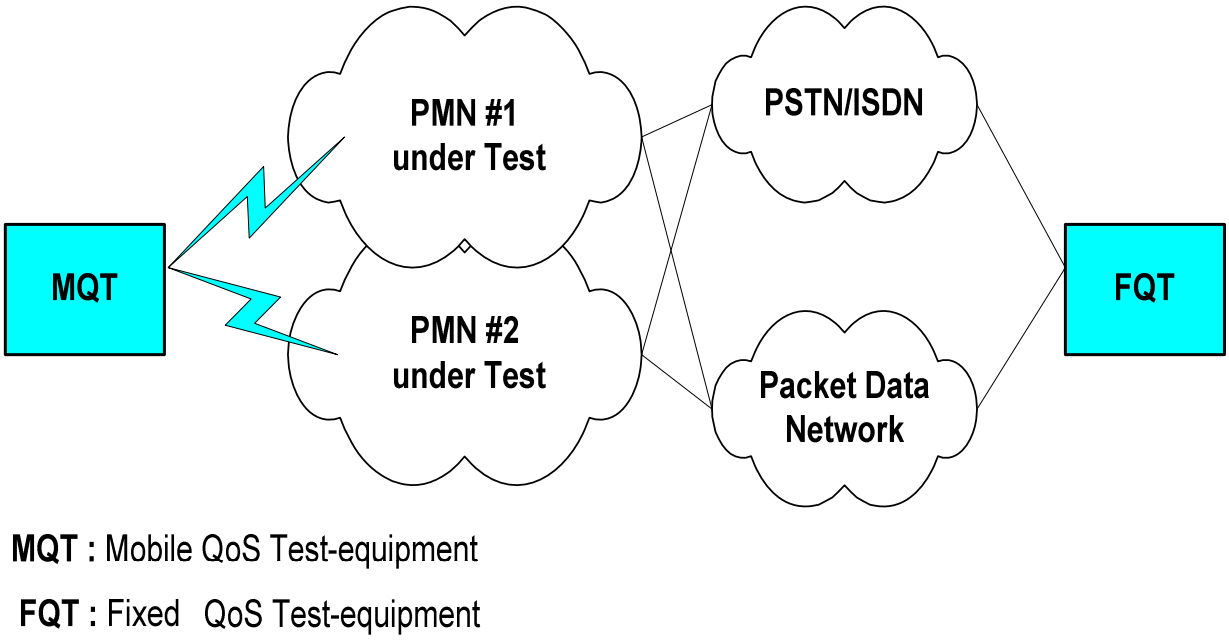


Figure 1

Some of the services require test-equipment connected to a non-mobile network emulating the counterpart of the typical mobile customer or the host offering the service. This part will be called Fixed QoS Test-equipment (FQT). The FQT may be connected via a public network (PSTN, ISDN, PDN) or via a network internal connection point (e.g. at MSC). The FQT for type (3) and (4) services could be composed as a (virtual) Internet Service Provider.

Below, requirements will be described on a per scenario basis. Those requirements not belonging to a specific scenario, e.g. antenna requirements will be grouped together.

Depending on how far the MQT can be automated or not, we can distinguish between:

- MQT-LC: local control and operation; or
- MQT-RC: remote control and operation.

Although the same type of classification (-LC or -RC) can be made for FQT, most of the FQT are remote controlled.

4.2 Considerations on trigger points

Without loss of generality it can be assumed that any feasible test equipment will contain some kind of communication terminal (UE) which may be a special type (e.g. a Trace Phone) or a standard UE. Also, it can be assumed that each such device will provide information from different communication layers, from Application Layer (close to the user interface) down to lower layers, e.g. operating-system events, TCP/IP layer, or Layer 3 signalling information, which is used as trigger points for KPI processing.

When considering the event chain, action is typically triggered by some emulated user action which finally causes some action on the air interface. This process of event propagation is deterministic - allowing some kind of mapping between layers, in the limits of available information - but will inevitably be associated with some communication and processing delay in each stage.

Therefore, choice of the layer to get trigger point information from determines the view expressed in a KPI. Generally, choosing lower-level events such as Layer 3 gives a more network-centric view, while events on higher levels tend to produce views more user-related. From this, the following guidelines result:

- Within the same QoS KPI, the source layer for events used as trigger points should be the same.
- In benchmarking, all networks under test should be tested using the same type of UE, and KPI for all networks under test should use trigger points from the same layer.

- When changing the source layer for a given trigger point, changes in KPI should be expected, and respective calibration measurements should be taken to assess influence on KPI both quantitatively and qualitatively.

5 General requirements

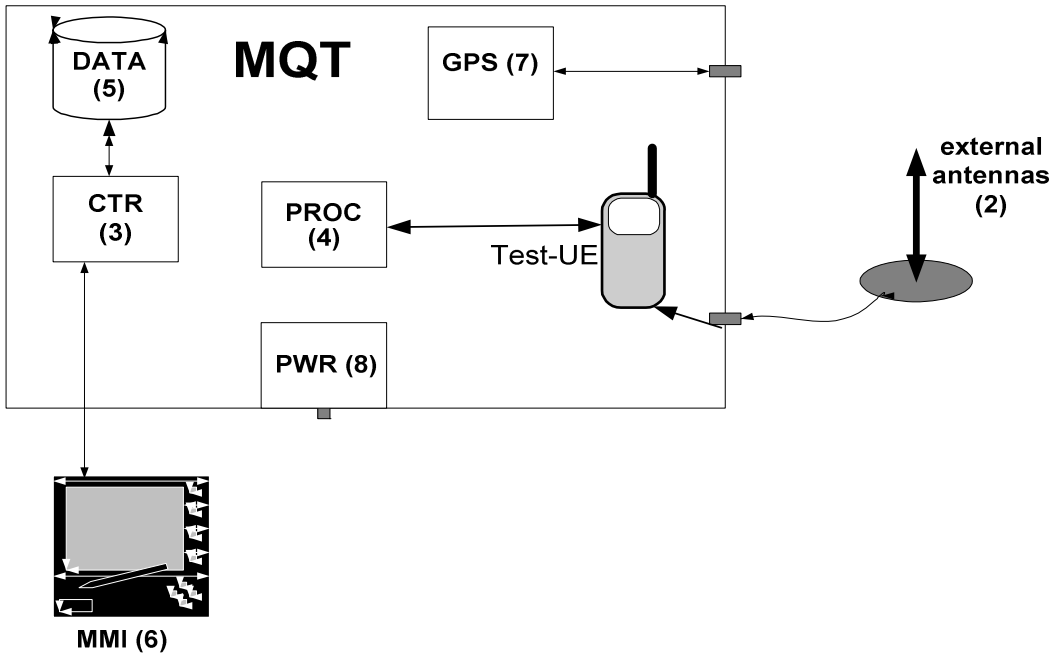
5.1 General requirement for data logging

The measurement system must provide means to collect and store reliably all relevant measurement data. Additionally all configuration parameters have to be stored to be able to reproduce the test.

The system has to provide means to detect and sort out invalid measurement cycles to avoid misrepresenting statistics. The evaluation of the measured values is typically done during post processing. Measurement cycles which are removed from the measured data have to be reported.

5.2 Overview

The typical components of the Mobile QoS Test-equipment (MQT) will be as illustrated in figure 2.



(1) Test-UE: Mobile Station emulating the typical customer MS (1…n).
(2) Antenna: Test-UE antenna or external antenna.
(3) Controller: Controls all the active parts in MQT.
(4) Processor: Controlling the Test-UE and Pre-processing measurement data.
Optionally the tasks of the processor can be moved into controller.
(5) Storage: Storage of measurement data and programs.
(6) MMI: Man Machine Interface for control and configuration of a MQT-LC or for diagnostics in case.
of a MQT-RC.
(7) PS: Positioning System (GPS or Indoor Navigation)
(8) PWR: Power Supply.

Figure 2

5.3 Required information for logging

5.3.1 Information on Measurement Setup

Measurement setup needs to be reproduced if necessary. This requires that the configuration of the measurement equipment, with which the measurement has been done needs to be recorded.

NOTE: However, the measurement results not only depend on the configuration of the measurement equipment, also other circumstances like day of the week and time of day influence the measurement results considerably.

5.3.1.1 General Information

The following list is considered to be a required minimum.

Information automatically collected:

- Versions of measurement equipment:
  - Hardware Version.
  - Software Version of Measurement Application.
  - Operating System Version (Operation System and Service Pack).
- Date, time of day (UTC time + time zone).

Manually entered information:

- User.
- Comment.
- All other information, which can not be collected automatically, on test case control parameters required to, re-run the test case under the same conditions.

5.3.1.2 Information on User Equipment in use

For the setup of the User Equipment in use, the following list of parameters is required as a minimum.

Information automatically collected:

- Type of User Equipment.
- Firmware version.
- Unique UE ID (e.g. IMEI, Serial Number, MAC etc.).
- IMSI (configuration of SIM card can have a significant influence on the measurement result).
- Software Version of driver for operating system, if used.
- All settings of the control software.

Manually entered information:

- Antenna:
  - Type.
  - Extra attenuation.
  - Total Cable loss (Cables, RF combiners, etc.).

5.3.1.3 Information on Store-And-Forward Setups

The following information has to be logged:

- Number of Service Centre.
- Access Parameters.
- Transmitted Message, Video and/or Audio.
- Timeout Values.

5.3.1.4 Information on Data Test Setups

For Data Tests the following list represents the minimum required parameters.

Information automatically collected:

- Any stack parameter configuration or difference to the standard of the used operating system, e.g. information about TCP stack parameter changes.
- Servers.
- All settings of the control software concerning the Data Test Setup, e.g. FTP Settings.

5.3.2 Measurement Data

Each measured item has to be stored with the corresponding timestamp.

Additional to the trigger points as specified in [3], the measurement equipment shall collect the following list of data.

- Network ID (MCC, MNC, CI, LAC), respective data items with a rate sufficient to track the User Equipments behaviour.

5.3.3 Status Information

The system has to record information about the status and progress of the current measurement.

5.3.4 Trigger Points

The system has to record all necessary trigger points. See [3].

5.3.5 KPIs

If possible, KPIs shall be calculated during the measurement and be shown on the MMI.

For test cases on distributed systems the calculation process for KPIs has to be done in a post process.

5.4 Test-UE

Basic requirements on the Test-UE:

- Compliant to 3GPP specifications.
- Remote controllable to initiate the QoS tests with required parameter settings.
- Test UE delivers the necessary data, which is required for the QoS test.
- For benchmark tests only User Equipments with the same capabilities can be used. (e.g. max. number of TS allowed, best type of speech codec, etc.).

- Depending on the test case additional requirements may be relevant.

5.5 Antennas

Depending on the test case, the Test-UE' own antenna or an external antenna has to be used.

Where applicable, the antennas have to be arranged in a well defined fixed way with a minimum distance to each other reducing RF-influence on an acceptable level in an equal radio environment. The coupling loss between 2 UEs should be min. 40,5 dB (as specified in clause 2 of TS 100 910 [1]).

NOTE 1: Certain types of system integration will not allow satisfying these requirements, due to the limitation of space (e.g. backpack system). However, the antennas should be mounted on pre-determined points of the system which guarantee a minimum RF-influence.

External antennas are typically used for measurements in vehicles (car, train, ship). Two RF scenarios can be defined for vehicles:

1. User with car kit and external antenna:
    - car mounted antenna with no extra attenuation has to be used.
2. User without car kit, using the User Equipment only (In-car use):
    - internal antenna of User Equipment can be used; or

NOTE 2: Simulation without body loss.

- external antenna connected with an over all attenuation of app. 13 dB (cable loss plus extra attenuation) should be used.

NOTE 3: More information about antenna attenuation is to be found in TR 102 581.

5.6 Controller/processor/storage

The performance of the unit should be high enough and have no measurable impact on the correctness of the data collection. If the unit runs out of any resources it shall inform the user on the MMI.

5.7 Man Machine Interface (MMI)

5.7.1 Local Controlled Systems

The MMI has to allow full operation of the system by the operator. The main functionalities can be monitored and the operator is alerted in case of main failures. Some basic failure diagnostic is possible.

5.7.2 Remote Controlled Systems

An MMI can be connected to perform basic tests and some failure diagnostics. Unattended systems should provide means to generate alarms upon operational faults in the system.

5.8 Time sources

The clocks on the measurement systems have to be synchronized periodically. The required accuracy of the timestamps of the measurement item is:

- Relative: 20 ms.
- Absolute: 250 ms.

5.9 Environnemental conditions

The measurement system has to meet at least the minimal environmental conditions requirements defined in clauses 6.4 and 7.5.

6 Fixed QoS Test-equipment (FQT)

6.1 General

Depending on the test-scenarios defined in clause 4 of the present document, there will be different requirements for the FQT and MQT.

6.2 Controller

The performance of the unit should be high enough and have no measurable impact on the correctness of the data collection.

6.3 Time-sources

See clause 5.8.

6.4 Environmental conditions

The FQT has to meet the following environmental conditions:

- Temperature: 5°C - 40°C.
- Humidity: max. 90 %.

6.5 FQT for Telephony Measurements

6.5.1 Common Aspects

For the user-to-user services different FQTs can be used. Also the connection point to the network can vary between an ISDN or PSTN line and a direct link at the MSC/RNC.

However, the used type of server and the connection have to be stored in the final measurement result.

The topology of the distributed system (MQT and FQT) results in the necessity of merging the measurement results made on the FQT and on the MQT. The result will be merged on the time base.

A unique identifier has to be included in measurement files to be able to identify what files belong to the same measurements. This identifier has to be generated automatically by the measurement system.

6.5.2 Telephony Voice

Calculating Telephony KPIs including Voice Quality requires a counterpart on the fixed network. This is typically a PC which is connected to the PSTN. An application on the PC answers the incoming calls from the MQT or generates calls to the MQT.

A FQT application for Telephony Voice Service handles the CS connections of the voice calls, like an answering machine. It controls 1 to n MSN(s). Each MSN has its own profile for incoming or outgoing calls. The FQT application has to have the following capabilities:

- Auto answering of incoming calls.
- Speech Quality Assessment of the incoming voice calls (uplink).
- Providing speech samples for the downlink.
- Generating MT calls.

6.5.3 Telephony Video

For telephony video different types of connection points are available:

- ISDN line/direct connection at MSC/RNC.
- UMTS User Equipment with video telephony application.
- UMTS User Equipment used as modem with a video telephony stack on the PC.

A FQT application for Telephony Video handles the CS connections of the video calls. It controls 1 to n connection points. Each connection point has its own profile for incoming calls. The FQT application has to have the following capabilities:

- Auto answering of incoming video calls.
- Providing speech/video samples for the downlink.

6.6 FQT for store-and-forward services

Store and forward services typically transports information between two User Equipments. Therefore the typical difference between MQT and FQT does not apply for store-and-forward services. The quality of store-and-forward services depend on one side on the RF coverage and on the other side, much more than other services, on the network internal infrastructure like the SMSC.

The measurement system shall be able to measure all specified KPIs using User Equipments only.

6.6.1 Common Aspects

A general problem is that the A-party does not get a confirmation if the message was received successfully to the B-party. Also the network internal infrastructure can change the order of messages. The B-party of the measurement system has to be able to handle this effect.

6.7 FQT for Data Measurements

The FQT is the measurement server as the physical machine plus the service application.

It shall serve the service requests from the MQT in order to achieve the QoS parameter defined [3]. The server has to support the user profiles defined in [5].

It has to be ensured, that the highest possible throughput on the measurement server is higher than the expected throughput for the measurements.

7 Mobile QoS Test-equipment (MQT)

7.1 General

Depending on the test-scenarios defined in clause 4 of the present document, there will be different requirements for the MQT.

7.2 Controller

The performance of the unit should be high enough and have no measurable impact on the correctness of the data collection.

7.3 Geographical positioning

Geographical data (position, speed, and heading) shall be collected during a mobile measurement. The geographical position can be retrieved by the following alternatives:

- Geographical information shall be taken from GPS whenever possible.
- If no GPS signal is available other tools have to be used, e.g. navigation on a geo-referenced bitmap.

7.3.1 Format of geographical co-ordinates

- Out-door: WGS-84.
- In-door: Fixed reference points on a geographical referenced map and WGS-84 positions calculated by the software.

7.3.2 Accuracy

The accuracy of the geographical positioning has to meet the following requirements:

- Outdoor: < 15 m.
- Indoor: < 10 m.

7.4 Time-sources

See clause 5.8.

7.5 Environmental conditions

The FQT has to meet at least the following environmental conditions:

- Temperature: 5°C - 40°C.
- Humidity: max. 90 %.

Information about the necessary power supply has to be available.

7.6 MQT for Telephony Measurements

7.6.1 Common Aspects

For the user-to-user services different MQTs can be used. The topology of the distributed system (MQT and FQT) results in the necessity of merging the measurement results made on the MQT and on the FQT. The result will be merged on the time base.

Due to the fact, that these systems will operate in moving vehicles or are carried around, they have to be ruggedizedly constructed. However, all local leys concerning industrial and/or road safety regulations have to be satisfied.

The manufacturer shall provide a system manual, which shows the setup of the system. For easy identifying, elements of the system have to be labelled. Labels on all cables and connectors shall simplify the operation of the system.

7.6.2 Telephony Voice

The MQT for Voice has to provide software, which provides the means to generate the necessary calls or to answer automatically incoming calls from the FQT.

The received voice is measured via the analogue output of the User Equipment, as consequence the hardware setup of the system has to include the necessary electrical adaptation between certain User Equipments and the controller (soundcard).

The call generator of the MQT shall establish voice call as specified in [5].

The hardware setup of such a system is essential for the correctness of the measured KPIs. The system includes a UE specific part, which is responsible for the electrical adaptation of the audio output of the handset to the input of the soundcard of the controller.

7.6.3 Telephony Video

The MQT for Video has to provide a call generator, which generates automatically calls as specified in [5] or to answer automatically incoming calls from the FQT. The system has to be capable to provide the following measurement methods:

- Video Telephony using the User Equipments application; or
- Video Telephony using a Video Telephony Stack on the PC.

7.7 MQT for store-and-forward services

See clause 6.6.

7.8 MQT for Data Measurements

7.8.1 Common Aspects

Data Measurements require a client on the MQT side for the different applications. These clients can be either part of the MQT application or an external application, remote controlled by the MQT. However, the MQT has to log the type and configuration of the client used for the measurement.

7.8.2 MQT for FTP

The used FTP client has to support the following points:

- Active/Passive Mode.
- Common Firewall support.

- Downloading from subdirectories.
- Uploading to subdirectories.

7.8.3 MQT for E-Mail

The E-Mail Client has to support POP3 and SMTP or IMAP for sending and receiving E-Mails.

7.8.4 MQT for HTTP

The used HTTP client (browser) has to support all common HTTP versions. The client has to download the specified Copernicus page. The used HTTP version and all other settings have to be logged.

7.8.5 MQT for WAP

The WAP client shall support all common WAP versions. The used WAP version has to be logged.

7.8.6 MQT for streaming services

The MQT has to support the required streaming clients.

8 Mobile based measurement equipment

The functionalities of the MQT as described in the previous clause can also be realized on a single mobile phone. In such mobile based measurement equipment different types of QoS tests can run and test results can be logged for postprocessing. Mobile based measurement equipment may be controlled by an application, remotely or may be operated by a person.

This type of equipment is for further study.

Annex A (informative): QoS parameter export

For further study.

Annex B (informative): RF COMBINER

B.1 What is blocking?

Definition (ETS 300 607-1).

Blocking is a measure of the ability of the receiver to receive a wanted input signal in the presence of an unwanted input signal, without exceeding a given degradation. The degradation is measured in reduction of sensitivity of the receiver (up to complete loss). In case of GSM, the effect only happens if the two test mobiles use the same time slot or fractions of it.

B.2 Which parameters have an impact on the effect of blocking?

- The selectivity of the receiver (Hardware).
- Minimum requirements for selectivity are defined in the corresponding standards. Better selectivity of a receiver increases the costs of the receiver.
- The level of the unwanted signal.
- The level of the wanted signal.

The wanted signal is transmitted from the base station to the test mobile. The level of the received signal depends on propagation.

B.3 The standards

Rx blocking analysis for ETS 300 607-1 (GSM 11.10-1 V4.19.1).

Frequency	Blocking Level GSM900 in dB	Blocking Level GSM1800 in dB
835 MHz to < 915 MHz	0	
> 1 000 MHz to 12,75 GHz	-23	
100 KHz to 1 705 MHz		0
> 1 920 MHz to 1 980 MHz		-10

Rx blocking analysis for WCDMA TS 125 101 (V 4.9.0 Rel. 4) Tab. 7.7 Out of Band blocking (extract).

Parameter	Unit	Frequency Range 3
DPCH_Ec	dBm/3,84 MHz	-114
Îor	dBm/3,84 MHz	-103,7
I blocking (CW)	dBm	-15
Fuw	MHz	1<f<2 025 2 255<f<12 750
UE transmitted mean power	dBm	20/18 (for Power class 3/2)

Possible interactions:

Receiver Wanted Signal	Transmitter Unwanted Signal	Rec. blocking at dBm	Transmit. Pwr. dBm	Min att. no blocking dB
GSM 900	GSM 900	0	33	33
GSM 900	GSM 1800	-23	30	53
GSM 900	UMTS	-23	18	41
GSM 1800	GSM 900	0	33	33
GSM 1800	GSM 1800	-10	30	40
GSM 1800	UMTS	-10	18	28
UMTS	GSM 900	-15	33	48
UMTS	GSM 1800	-15	30	45
UMTS	UMTS	-15	18	33

B.4 The Situation

B.4.1 One test mobile transmits, the other one receives.

The two are connected to the same combiner. Will there be any problems? The combiner isolates the two test mobiles by 20 dB and attenuates the wanted (and the transmitting) signal by 8 dB. In order to prevent blocking, the isolation between the units - using the same time slot - must be higher than 53 dB. When the wanted signal is weak the receiver will show blocking effects. The weak wanted signal will be suppressed by the strong unwanted and reception will no longer be possible. If another channel with sufficient radio level (RxLev) is available, then the test mobile may change the serving cell. If there is no stronger wanted signal available, then the call will drop.

B.4.2 Antennas on the roof of a car

Since the same technical specification of the receiver is applicable, the problem of potential blocking remains basically the same. In order to be on the safe side, the distance between two test mobiles should be 5 m to 10 m. (Interpreting the standards, the 53 dB). If the distance between two antennas is greater than approximately 1m, then the isolation of the test mobiles will be higher than the isolation by means of a combiner.

But: if there is no combiner used then the wanted and transmitted signals are not attenuated.

(Worst case: weak wanted signal, high transmitting power unwanted signal and overlapping GSM time slots.) In UMTS technology the necessary isolation has to be 48 dB. (2,5 m to 5m) There is no time slot overlap.

B.4.3 Conclusion

In the real world, distances of approximately 5 m between antennas are not practicable. Even at higher cost.

B.5 Possible Solutions

Depending on the purpose of the test (urban vs. rural, coverage vs. benchmarking), the method chosen for combining the test mobiles should be different. In case of benchmarking tests in urban areas, the use of combiners might not significantly influence the results due to the small cell design, resulting in very high dynamics of the network and many handovers. In rural areas, the range of the system is a dominant issue. Additional loss of the wanted signal in a combiner leads to a considerable risk of losing calls. This is due to the combination of a weak wanted signal with the high output power of the transmitting test mobile.

B.5.1 Attenuators

In order to simulate the behaviour of the passenger's phone in a car, customers introduce an attenuator of 10 dB to 15 dB between the test terminal and the external antenna. This represents just one particular situation but it is reproducible. However this additional attenuation is very helpful in order to avoid interferences/blocking of other Test-equipment in the same environment. On the other hand, an attenuation of 15 dB reduces the covered area by a factor 10. When combiner and attenuators are used, approximately 23 dB would be effective. The reduction of the covered area would decrease to 5 %.

B.5.2 Recommendations

B.5.2.1 Benchmarking tests

The most reliable results will be obtained if no combiners are used. However, when using combiners in an urban environment, no significant influence is to be expected.

B.5.2.2 Coverage tests

The use of combiners and/or attenuators is not recommended. (8 dB attenuation reduces the coverage down to 25 % to 50 %). In order to avoid time slot collisions, only one network should be tested at any one time.

B.5.3 Other equipment involved

B.5.3.1 Scanners

Although scanners delivered have an outstanding dynamic range, the filters used have limitations. This makes the scanner vulnerable to blocking.

B.5.3.2 GPS receiver 1,2/1,5 GHz

GPS receivers usually use high gain antennas. This fact makes them sensitive for blocking. (The distance between the satellite and the GPS receiver is approximately 20 000 km.)

B.5.3.3 Risk for Scanner and GPS receiver

Malfunction of scanner and GPS might be possible, depending on the transmit power of the test equipment. Antennas for scanners and GPS receiver should be spaced to the practical maximum.

B.5.4 Mixed Service GSM/WCDMA

We recommend separate antennas for GSM and WCDMA, with maximum possible spacing.

Annex C (informative): Bibliography

- ETSI TR 102 581: "Speech Processing, Transmission and Quality Aspects (STQ); A Study on the Minimum Additional Required Attenuation on the Antenna Path of the Field Test Equipment".
- ETSI TS 102 250-1: "Speech Processing, Transmission and Quality Aspects (STQ); QoS aspects for popular services in GSM and 3G networks; Part 1: Identification of Quality of Service criteria".
- IETF RFC 3339: "Date and Time on the Internet: Timestamps".
- W3C Note: "Date and Time Formats"; http://www.w3.org/TR/NOTE-datetime.
- ETSI ETS 300 607-1: "Digital cellular telecommunications system (Phase 2) (GSM); Mobile Station (MS) conformance specification; Part 1: Conformance specification".
- ETSI TS 125 101: "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (FDD) (3GPP TS 25.101 version 4.9.0 Release 4)".

History

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