

ETSI TS 151 026 V17.0.0 (2022-05)



**Digital cellular telecommunications system (Phase 2+) (GSM);
Base Station System (BSS) equipment specification;
Part 4: Repeaters
(3GPP TS 51.026 version 17.0.0 Release 17)**

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Foreword

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1 Scope

The present document describes the Radio Frequency (RF) tests for GSM repeaters (frequency bands according to clause 4.1) which receive, amplify, and retransmit a received Mobile Station (MS) signal in the GSM MS transmit band and simultaneously receive, amplify and retransmit a received Base Transceiver Station (BTS) RF signal in the GSM BTS transmit band.

The present document is applicable to repeaters meeting the requirements of either GSM Phase 2 or GSM Phase 2+. Unless otherwise stated, all tests are applicable to repeaters meeting Phase 2 and/or Phase 2+ GSM requirements, because the requirements of the Phase 2 and Phase 2+ core GSM specifications which are referenced in the test are consistent. Most differences between Phase 2 and Phase 2+ requirements represent Phase 2+ features which are optional for the BSS to support.

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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] ETS 300 019-1-0: "Equipment Engineering (EE): Environmental conditions and environmental tests for telecommunications equipment Part 1-0; Classification of environmental conditions; Introduction". [ETSI TS 151 026 V17.0.0 \(2022-05\)](https://standards.iteh.ai/catalog/standards/sist/081b8c4b-711f-4907-81a5-6c0c9c9c2ae3/etsi-ts-300-019-1-0-2022-05)
- [3] ETS 300 019-1-3: "Equipment Engineering (EE): Environmental conditions and environmental tests for telecommunications equipment Part 1-3; Classification of environmental conditions, Stationary use at weather-protected locations". <https://standards.iteh.ai/catalog/standards/sist/081b8c4b-711f-4907-81a5-6c0c9c9c2ae3/etsi-ts-300-019-1-3-2022-05>
- [4] ETS 300 019-1-4: "Equipment Engineering (EE): Environmental conditions and environmental tests for telecommunications equipment Part 1-4; Classification of environmental conditions, Stationary use at non-weather-protected locations".
- [5] ITU-R Rec. SM.329: "Spurious emissions".
- [6] void.
- [7] IEC 60068-2: "Basic environmental testing procedures: Part 2 Tests".
- [8] IEC 721: "Classification of environmental conditions".
- [9] 3GPP TS 51.010-1: "Mobile Station (MS) conformity specification".
- [10] 3GPP TS 51.021: "Base Station System (BSS) equipment specification; Radio aspects".
- [11] ETSI ETR 027: "Methods of measurement for private mobile radio equipment".
- [12] ETSI ETR 028: "Uncertainties in the measurement of mobile radio equipment characteristics".
- [13] 3GPP TS 45.005: "Radio transmission and reception".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

broadband repeater: repeater which is designed for operation on any combination of ARFCNs (up to a specified maximum number) within the operating band of the repeater.

channelized repeater: repeater which is designed for operation on a specified subset of ARFCNs within the operating band of the repeater. The subset of ARFCNs may be determined during the manufacture of the repeater, or may be programmable.

GSM: Unless otherwise specified, references to GSM include all radio frequency bands according to clause 4.1.

operating band: the frequency range in which GSM operates.

pass band: frequency range that the repeater operates in with operational configuration.

NOTE 1: This frequency range can correspond to one or several consecutive nominal channels. If they are not consecutive each subset of channels shall be considered as an individual pass band.

NOTE 2: A repeater can have one or several pass bands.

repeater: bi-directional Radio Frequency (RF) amplifier which can amplify and transmit a received Mobile Station (MS) signal in the GSM MS transmit band, simultaneously it can amplify and transmit a received Base Transceiver Station (BTS) RF signal in the GSM BTS transmit band.

repeater system using frequency shift: repeater system consisting of two different elements, a master unit close to the BTS and at least one remote unit close to the area to be covered.

NOTE 3: The master unit amplifies the channels from the BTS and shifts them to different GSM channels. In the remote unit the shifted channels from the master unit will be transferred back to the original channels and amplified. This is valid for the downlink signals as well as for the uplink signals.

spurious emissions: emissions at frequencies other than those of the carrier and sidebands associated with normal modulation and switching.

subchannel power imbalance ratio on downlink: as defined in 3GPP TS 45.004 [21].

3.2 Abbreviations

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

BTS	Base Transceiver Station
MS	Mobile Station
RF	Radio Frequency
SCPIR_DL	Subchannel Power Imbalance Ratio on DownLink

Abbreviations used within the GSM specifications are given in 3GPP TR 21.905 [1].

4 General

A repeater can be designed to amplify the whole transmit RF band or just a part of the band. In the latter case the repeater can be either Broadband, with frequency band selective filtering, or channelized, with channel selective filtering.

4.1 Radio frequency bands

A repeater, as having a bi-directional amplifier capability, can amplify and transmit a received MS signal in the MS transmit band, simultaneously it can amplify and transmit a received BTS signal in the BTS transmit band. The relevant MS and BTS transmit bands for the present document are the MS and BTS transmit bands as defined in 3GPP TS 45.005 [13], clause 2. A repeater is designed to operate in one or several pass bands within the MS and BTS transmit bands as defined in 3GPP TS 45.005 [13], clause 2. In this document, such MS and BTS relevant bands are herein referred as the repeater operating bands, as defined in clause 3.1. Repeater operating band(s) and repeater pass band(s) are part of clause 4.3 Manufacturers declarations.

Table 1: void

NOTE: In some circumstances, for instance when an operator (or more than one operator who co-ordinate the use of repeaters), is not allocated a complete band, it may be necessary to restrict the frequency range of operations of repeaters. In these circumstances, the test of "Gain outside pass band" in annex A may be used to verify the performance of the repeater.

4.2 Test environments

For each test in the present document, the environmental conditions under which the repeater is to be tested are defined.

4.2.1 Normal test environment

When a normal test environment is specified for a test, the test should be performed under any combination of conditions between the minimum and maximum limits stated in table 2.

Table 2: Limits of conditions for Normal Test Environment

Condition	Minimum	Maximum
Barometric pressure	86 kPa	106 kPa
Temperature	15°C	30°C
Relative Humidity	20 %	85 %
Power supply	Nominal, as declared by the manufacturer	
Vibration	Negligible	

The ranges of barometric pressure, temperature and humidity represent the maximum variation expected in the uncontrolled environment of a test laboratory. If it is not possible to maintain these parameters within the specified limits, the actual values shall be recorded in the test report.

NOTE: This may, for instance, be the case for measurements of radiated emissions performed on an open field test site.

4.2.2 Extreme test environment

The manufacturer shall declare one of the following:

- the equipment class for the equipment under test, as defined in ETS 300 019-1-3 [3];
- the equipment class for the equipment under test, as defined in ETS 300 019-1-4 [4];
- for equipment that does not comply to an ETS 300 019-1 [2] class, the relevant classes from IEC 721 [8] documentation for temperature, humidity and vibration shall be declared.

NOTE: Reduced functionality for conditions that fall out side of the standard operational conditions are not tested in the present document. These may be stated and tested separately.

4.2.3 Extreme temperature

When an extreme temperature test environment is specified for a test, the test shall be performed at the standard minimum and maximum operating temperatures defined by the manufacturer's declaration for the equipment under test.

Minimum temperature:

- the test shall be performed with the environmental test equipment and methods of inducing the required environmental phenomena into the equipment, conforming to the test procedure of IEC 60068-2-1 [7]. The equipment shall be maintained at the stabilized condition for the duration of the test sequence.

Maximum temperature:

- the test shall be performed with the environmental test equipment and methods of inducing the required environmental phenomena into the equipment, conforming to the test procedure of IEC 60068-2-2 [7]. The equipment shall be maintained at the stabilized condition for the duration of the test sequence.

NOTE: It is recommended that the equipment is made fully operational prior to the equipment being taken to its lower operating temperature.

4.3 Manufacturers declarations

The manufacturer shall declare:

- a) the operating band or bands of the repeater;
- b) for each operating band, the pass band or bands within the operating band;
- c) the maximum rated output power per channel;
- d) the number of channels supported by the repeater;
- e) the supported modulation methods.

4.4 Methods of measurement

The general methods of measurement and measurement uncertainty shall be according to ETSI ETR 027 [11] and ETSI ETR 028 [12] except where they conflict with the present document.

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5 Spurious emissions

5.1 Test purpose

This test measures the conducted spurious emissions (see clause 3.1) at the antenna ports and the effective power of spurious emissions radiated by the cabinet and structure.

5.2 Test case

The repeater shall be set to maximum gain. All measurement steps, as described in this clause, apply to all antenna ports of the repeater.

- a) Spurious emissions from the antenna port:
 - one antenna port of the repeater shall be connected to a selective RF measurement device presenting to the repeater a load with an impedance of 50 ohms. An average power measurement of spurious emissions shall be performed for frequency offsets from the carrier frequency greater than 600 kHz under the following two conditions:
 - i) without any RF input signal. The relevant input antenna port of the repeater shall be terminated with 50 ohms;
 - ii) with an RF input signal. The relevant antenna input port of the repeater shall be connected to an RF signal generator. A continuous sinusoidal RF signal shall be input at a level which will result, when measured, in the maximum rated RF output power per channel, as declared by the manufacturer. The RF input signal