

Amendment 2 to  
Technical Specification of the  
Broadband-Access-Interfaces  
in the network of  
Deutsche Telekom

1 TR 112 Version 14



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## Summary

Amendment 2 to 1 TR 112 specifies requirements for G.fast (ITU-T G.9700 and G.9701).

## Amendment 2 to 1 TR 112 Version 14

### 2 References

- [65] ITU-T G.9700: Fast access to subscriber terminals (G.fast) – Power spectral density specification
- [66] ITU-T G.9701: Fast access to subscriber terminals (G.fast) – Physical layer specification
- [67] BBF ATP-337 G.fast Certification Abstract Test Plan

### 7.3 G.fast (U-RF interface)

#### 7.3.1 Requirements

- a) All mandatory requirements of ITU-T G.9700, Amendment 2 [65], must be supported. This includes mandatory support of Profile 212a.
- b) All mandatory requirements of ITU-T G.9701 [66], must be supported. This includes mandatory support of
  - Profile 212a
  - Profile 212c (Annex X) and carrier set F43c according [8]
- c) Devices compliant to this amendment must support:
  - Transparent transport of Ethernet packets at an aggregate (sum of upstream and downstream) data rate of up to 2 Gbit/s
  - In-band spectral usage up to 212 MHz
  - Configurable start and stop frequencies, PSD shaping and notching;
  - Time-division duplexing (sharing time between upstream and downstream transmission) with configurable TDD ratio
  - Vectoring (self-FEXT cancellation), where this edition of the Recommendation uses linear precoding
  - Discontinuous operation where not all of the time available for data transmission is used
  - Online reconfiguration (OLR) for adaptation to changes of the channel and noise characteristics, including fast rate adaptation (FRA).

d) Devices compliant to this amendment must support ITU-T G.9701, amendment 1. This includes

- all mandatory test-parameter, incl. ALN
- all per subcarrier test parameter which have been TBD in the first version of G.9701

Note: Support of low power states are not required.

e) Devices compliant to this amendment must support ITU-T G.9701, amendment 2. This includes

- test parameter HLOG
- test parameter XLOG
- Increased Bitloading

f) Devices compliant to this amendment must support ITU-T G.9701, amendment 3. This includes

- Profile 212a
- Annex X and profile 212c

Note: The requirements for mechanical properties of the U-RF interface (see 7.2.7) also apply in case of Annex X is used. The adaptation for coaxial cables is provided by the network operator.

g) Devices compliant to this amendment must support ITU-T G.9701, amendment 4. This includes

- robust management channel recovery (RMCR)
- performance monitoring parameter ANDEFTR

h) Devices compliant to this amendment must support flexible Mds setting within the range defined in ITU-T G.9701 for MF = 36, in order to change the upstream/downstream rate ratio.

i) Interoperability between FTU-O and FTU-R must be verified according Broadband Forum ATP-337 [67].

j) At the interface described herein, neither narrowband service signals (such as POTS or ISDN) nor splitters or in-line filters are provided or expected.

k) Support of NTR/ToD is not required.

### 7.2.2 Vectoring

Vectoring must be supported according ITU-T G.9701. The following requirements apply:

- a) Disorderly leaving events (line interruption) must be detected within a short period (e.g. < 10 ms) and appropriate means need to be provided to limit the impact on other lines within the same vectoring group. This can be achieved e.g. by stopping any transmit signal immediately.

### 7.2.3 Performance Requirements

Performance requirements are for further study.

## 7.2.4 Electrical Characteristics of the U-RF Interface

### 7.2.4.1 Safety

The relevant safety regulations are met at the U-RF interface of the Deutsche Telekom Network [DIN EN 41003 [38], DIN EN 60950-1 [39], (as applicable)].

### 7.2.4.2 Electromagnetic Compatibility

#### 7.2.4.2.1 Basic Conditions

Equipment, deployed within the area of responsibility of Deutsche Telekom as Network Operator, complies with the "Gesetz über die elektromagnetische Verträglichkeit von Geräten" (EMVG [37]).

#### 7.2.4.2.2 Interference with External Voltages

##### Longitudinal Voltages

Due to interference from adjacent electric power lines (power supply, railway) into the local loop longitudinal voltages may be induced. The access interface is designed such that induced longitudinal voltages of

- $U_{eff} = 60 \text{ V}$  during long term interference and
- $U_{eff} = 430 \text{ V}$  during short term interference or
- $U_{eff} = 650 \text{ V}$  during short term interference from power systems with high reliability

are not exceeded (DIN VDE 0228 [33]).

##### Atmospherical Discharges

Due to atmospherical discharges (lightning) short-time voltages may occur. Deutsche Telekom has normally not provided protection measures against such voltages. In areas with high lightning risk protection measures may be provided (e. g. insertion of over-voltage protection). Protection measures of terminal equipment connected at the U-RF interface require a potential equalisation.

NOTE: The function of terminal equipment may be disturbed during the ignition of over-voltage protection elements.

The U-RF interface is designed such that the probability of exceeding longitudinal voltages of 1500 V, induced due to atmospherical discharges, is low (ITU-T Recommendation K.11 [34]; DIN EN 41003 [31]; DIN VDE 0845 part 4-2 [35]).

## 7.2.5 Signature

The following scheme represents a signature network which must be present at the U-RF-Interface, independent from the xTU-R state (e.g. switched off, training, show time, low power mode, etc.).

The signature network must be designed in a way that all applicable requirements of this specification (e.g. performance, safety, LCL) are fulfilled.

NOTE: The purpose is to enable a test system, connected to the line at the far end, to recognize the modem at the U-RF interface.

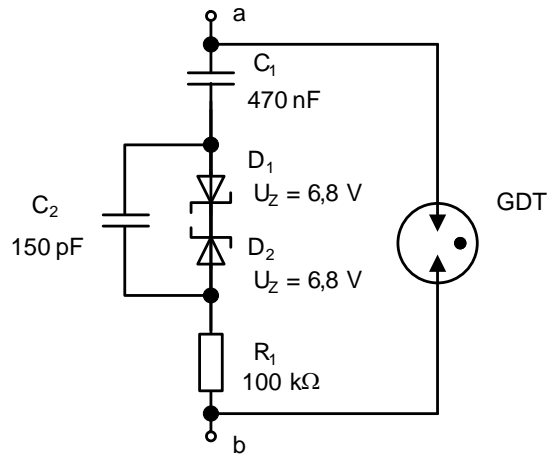


Figure 7.2-1: Signature Network at the U-RF interface

### 7.2.6 Common mode voltage limits and measurement method

The device must comply with recommendation ITU-T G.995.2 [63].

NOTE: CM voltage limits beyond 30 MHz are for further study.

### 7.2.7 Mechanical Properties of U-RF Interface

At the customer side the U-RF interface is provided at a separate RJ45 socket. The pins in the RJ45 socket are allocated as follows:

Pin	Allocation
1	U-RF a U-RF b
2	
3	
4	
5	
6	
7	
8	