Vodafone Kabel Deutschland pNTP Interface Specification

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Schnittstellenkonform sind Endgeräte ausschließlich, wenn diese durch geeignete technische Maßnahmen so gesichert werden, dass diese weder durch Software- oder Hardware-Manipulationen in einer Weise verändert werden können, dass sie den Anforderungen dieser Schnittstellenbeschreibung nicht mehr entsprechen. Insbesondere ist das Einspielen veränderter Firmware wirksam zu unterbinden.

Mit der Veröffentlichung einer neuen Version dieser Schnittstellenbeschreibung verlieren vorherige Versionen Ihre Gültigkeit.

Zur technischen Erprobung behält sich die Vodafone Kabel Deutschland vor, in räumlich begrenzten Regionen jederzeit abweichende Implementierungen vorzunehmen.

Vodafone Kabel Deutschland übernimmt keine Haftung für die Richtigkeit der im Dokument aufgeführten Referenzspezifikationen.

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Conventions

Throughout this document, the words that are used to define the significance of particular requirements are capitalized. These words are:

"MUST, SHALL"	This word means that the item is an absolute requirement of this specification.
"MUST NOT"	This phrase means that the item is an absolute prohibition of this specification.
"SHOULD"	This word means that there MAY exist valid reasons in particular circumstances to ignore this item, but the full implications SHOULD be understood and the case carefully weighed before choosing a different course.
"SHOULD NOT"	This phrase means that there MAY exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications SHOULD be understood and the case carefully weighed before implementing any behavior described with this label.
"MAY"	This word means that this item is truly optional. One vendor MAY choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor MAY omit the same item.

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1 Scope

This document describes the DOCSIS protocol requirements for the Internet Service over the Vodafone Kabel Deutschland cable network at the dedicated data RF Interface and the main characteristics of the dedicated data RF interface in the Vodafone Kabel Deutschland cable network at the user's coaxial passive network termination point. This document describes the typical limits or values within which the RF characteristics can be expected to remain for networks that are built according to Vodafone Kabel Deutschland specifications at installation time.

The interface specification does not apply under abnormal operating conditions such as:

- operating conditions arising as a result of operating services other than DOCSIS 3.0 over the dedicated data RF interface.
- operating conditions arising as a result of a fault, maintenance and construction work or to minimize the extend of interruption of service.
- operating conditions arising as a result of force majeure or third party interference.
- operating conditions arising as a result of test signal injection governed by regulation.
- In case of non-compliance of a network user's installation or non-compliance of equipment with the relevant standards or non-compliance with the technical requirements for connection, established either by this interface specification or the public authorities including the relevant limits for electromagnetic compatibility.

The characteristics given in this interface specification are intended to be used to derive and specify requirements for equipment such as coaxial cables and cable modems to connect them to the dedicated data RF interface. The values in this interface specification take precedence over requirements in equipment product standards and in installation standards. The given characteristics are not intended to be used as electromagnetic compatibility levels or user emission limits in the Vodafone Kabel Deutschland network.

This interface specification may be changed at any time. The user of this interface specification has to check for the newest version available from Vodafone Kabel Deutschland GmbH. This interface specification may be superseded in total or in part by the terms of a contract between the individual network user and Vodafone Kabel Deutschland GmbH.

2 References

In the case of a conflict between specific requirements in this document with requirements in any of the directly or indirectly referenced documents, the specific requirements of this document are applicable.

2.1 Normative References

RFC6333	Dual-Stack Lite Broadband Deployments Following IPv4 Exhaustion
RFC6334	Dynamic Host Configuration Protocol for IPv6 (DHCPv6) Option for Dual-Stack Lite
RFC3633	IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) version 6
ANGA 100 001	ANGA 100 001 v1.01: Specification for the passive Network Termination Point in DOCSIS 3.0 Environment Network and Provisioning requirements

2.2 Informative References

See ANGA 100 001

2.3 Reference Acquisition

- Internet Engineering Task Force (IETF) RFCs, http://www.ietf.org
- ITU Recommendations: http://www.itu.int
- CableLabs specification: http://www.cablelabs.com
- ANGA specification: http://www.vodafone.de/hersteller-info
- Excentis specification: https://www.excentis.com/system/files/resources/eurodocsis.bpireq_v7.pdf

3 Definitions and Abbreviations

3.1 Definitions

The definitions in ANGA 100 001, subclause 3.1 apply.

3.2 Abbreviations

The abbreviations in ANGA 100 001, subclause 3.2 apply.

AD	Frequency dependent Amplitude Distortion (Peak to Peak)
C/(N+IM)	Carrier (C) to Noise (N) and Intermodulation (IM) ratio
PD	Frequency dependent Phase Distortion (Peak to Peak)
VF KD	Vodafone Kabel Deutschland GmbH

4 RF Interface connector

The mechanical coaxial connector and the connection requirements at the customer's pNTP in ANGA 100 001, clause 4 apply.

5 Network RF characteristics

5.1 Downstream RF characteristics

5.1.1 Downstream frequency range

The Downstream Frequency Range specification at the customer's pNTP in ANGA 100 001, subclause 5.1.1 applies. Nominal minimum DS channel count for DOCSIS 3.0 services is 16.

5.1.2 Downstream RF performance

If not listed otherwise in this subclause the Downstream RF performance characteristics at the customer's pNTP in ANGA 100 001 subclause 5.1.2 apply.

The following table defines specific values different from in ANGA 100 001 subclause 5.1.2:

Table 1: Specific Downstream Performance characteristics at the pNTP

Parameter	Nominal ratings and characteristics	Absolute maximum ratings and characteristics during normal operation
signal tilt (full range)	N/A	≤ 16 dB
channel signal tilt	N/A	N/A
carrier level backoff between DS channels	≤ 6 dB	N/A
carrier level DS channels	≤ 76 dB(µV)	N/A
carrier level backoff between adjacent channels	≤ 10 dB	N/A
carrier level adjacent channel	≤ 92 dB(µV)	N/A
64 QAM signal level	50 to 67 dB(µV)	N/A
64 QAM BER	$< 1 \times 10^{-6}$	$\leq 1 \times 10^{-4}$
64 QAM MER	≥ 29,2 dB	≥ 23 dB
256 QAM signal level	56 to 73 dB(µV)	N/A
256 QAM BER	$< 1 \times 10^{-6}$	$\leq 1 \times 10^{-4}$
256 QAM MER	≥ 32,7 dB	≥ 29 dB

Table 4 in ANGA 100 001 is augmented by table 2 below.

Table 2: Micro reflections at the pNTP

time	nominal value
≤ 35 ns	-12 dBc
35 ns to 0,3 µs	-12 to -42 dBc
0,3 µs to 0,5 µs	-42 dBc

5.2 Upstream RF characteristics

5.2.1 Upstream Frequency Range

The upstream frequency range at the customer's pNTP in ANGA 100 001, subclause 5.2.1 applies. The usable Frequency Range is 15 MHz to 65 MHz. Minimum US channel count is 4.

5.2.2 Upstream RF Performance

If not listed otherwise in this subclause the Upstream RF Performance characteristics at the customer's pNTP in ANGA 100 001, subclause 5.2.2 applies. The reference channel bandwidth is 3.2 MHz. Nominal values valid for 99,5 % of time.

Table 3: 862 MHz Network Upstream Characteristics at the pNTP

Parameter	Nominal ratings and characteristics at installation time	Absolute maximum ratings and characteristics
single upstream level range	98.1 to 110 dB(µV)	≤ 114 dB(µV)
C/(N+IM)	≥ 64.5 dB	≥ 62.5 dB
MER[1]	≥ 32 dB	≥ 30 dB
AD	≤ 1.1 dB_{PP}	≤ 2.0 dB_{PP}
PD	≤ 1.1 $°_{PP}$	≤ 2.4 $°_{PP}$
[1]: for 16 QAM		

Table 4: Spurious Emissions in 5.12 MHz upstream channel

Parameter	During Burst transmission	Between Bursts
Inband	-43 dBc	-72 dBc

6 DOCSIS 3.0 Physical Interface Requirements

The Network RF interface requirements at the customer's pNTP in ANGA 100 001, Clause 6 applies.

7 Upper Layer Requirements

7.1 MAC and Upper Layer

The MULPI interface requirements at the customer's pNTP in ANGA 100 001, clause 7 applies.

The following minimum requirements are applicable

- The cable modem MUST support at least 8 upstream service flows, 4 of which can be UGS-only.

7.2 Security Layer

- The cable modem MUST comply with CM-SP-SECv3.0-I15-130808 with the exception of the requirements defined in EuroDOCSIS BPI+ requirements.

- The cable modem certificate requirements are defined in EuroDOCSIS BPI+ requirements, requirements specified in this document take precedence over requirements in CM-SP-SECv3.0-I15-130808.

7.3 OSS Layer

The cable modem MUST comply with CM-SP-OSSIv3.0-I28-151210.

Note: SNMP may be used.

8 IP-addresses for devices behind the cable modem

IP-capable devices/interfaces behind the cable modem can be assigned with IP configuration in one of the three possible scenarios:

1. IPv4-only configuration – each allowed device/interface will receive an native IPv4 address and other corresponding configuration to use for inbound/outbound IPv4-based traffic
2. Dual-Stack – each allowed device/interface will receive an native IPv4 address and a global IPv6 address as well as a delegated prefix in the range of /56 to /64 to use for inbound/outbound IPv4- and IPv6-based traffic respectively
3. Dual-Stack Lite – each allowed device/interface will receive a global IPv6 address as well as a delegated prefix in the range of /56 to /64 to use for inbound/outbound IPv6-based traffic. In addition, DS-Lite configuration will be assigned to the device/interface for IPv4-based traffic.

As a result, the device/interfaces behind the cable modem MUST support IPv4 and IPv6 modes and SHOULD support DS-Lite mode.

If DHCPv4 is used for configuration, the following information MUST be requested by the DHCP client and will then be provided by DHCP server:

- IP-address
- DNS-server
- Subnet mask
- Gateway address (router)

If DHCPv6 is used for configuration, the following information MUST be requested by the DHCP client and thus will be provided by DHCPv6

- IPv6-address
- DNS-server
- DS-Lite option (if requested see section 8.1 below)
- Delegated prefix

In order to avoid a configuration conflict, the configuration of the devices/interfaces behind the cable modem MUST be done via respective DHCP and other procedures such as static configuration MUST NOT be used.

8.1 DS-lite

Dual-Stack-Lite SHOULD be supported by devices/interfaces connected behind the cable modem.

If Dual-Stack-Lite is supported, it MUST be implemented according to RFC6333. In particular, the device/interface behind the cable modem MUST support Dual-Stack Lite B4 functionality as specified in Section 5 of RFC6333.

The FQDN of the AFTR device is provided to the client-router according to RFC6334.

8.2 Prefix delegation

IPv6 Prefix delegation according to RFC3633 MUST be supported.

Annex A Example coaxial cable assemblies

The screening effectiveness requirements for cable assemblies in the VF KD network depend on the capabilities of the demodulator within the cable modem and the physical parameters like return loss and the length of the cable assembly itself.
Calculated example values for the minimum required screening effectiveness of cable assemblies within the VF KD network are given in the table below for an external disturbance field strength of 120 dB(µV/m) (EN 61000-4-3).

Table 3: Calculated screening effectiveness of coaxial cable assemblies

Frequency [MHz]	Value [dB]
30 to 80	75
698 (MER_{CM}=27 @64 QAM)	74
546 (MER_{CM}=32 @256 QAM)	76

Annex B Example cable modem RF port characteristics

A successful implementation of subclause 5.1.2 requires RCP CLAB-8M-016 (16 downstream channels, extended up to 1 GHz) or CLAB-8M-024 (24 DS channels, extended to 1 GHz).
Note: A 16 DS-channel CM will bond to 8 channels if no 16 channel bonding group is available.

History

Document history		
V1.0	21.07.2016	Ready for publishing
V1.01	22.07.2016	Version to be published