



## Description

HMS II.5 is a HEAD acoustics artificial head measurement system ideally suited for all measurements in sending direction in the field of telecommunications under realistic conditions. It comprises an artificial mouth and can easily be upgraded with one or two ear simulators.

HMS II.5 is applicable to any scenario that requires only talking, e.g.:

- Testing automatic speech recognition systems
- Testing ANC talk-through functionality
- Tests requiring a second/external talker

## Pinnae & mouth

HMS II.5 is delivered with two anatomically shaped pinnae compliant with the type 3.3 ear simulator laid out in Recommendation ITU-T P.57 (06/2021). The artificial mouth of HMS II.5 is compliant with Recommendation ITU-T P.58 in its free-field emission characteristics. Combined with diffraction and reflection at shoulders and torso, it realistically reproduces the acoustic behavior of a talking person. The two-way loudspeaker design of the

mouth provides an excellent frequency response even without software equalization. The wide frequency range is superior to existing one-way designs in the market, making it ideally suited for measurements in super-wideband and fullband applications. The mouth is optimized for use with the *labCORE* hardware extension board *coreOUT-Amp2*. The board provides two class-D-amplified channels for one or two artificial mouths. In this constellation, the artificial mouth of HMS II.5 offers high performance without any notable self-noise.

## Key Features

- Geometric and acoustic characteristics according to ITU-T P.58
- Modular design for easy retrofitting with compatible HMS components

## Artificial mouth:

- Low-distortion two-way design with very wide frequency range for super-wideband & fullband applications
- Acoustic characteristics according to ITU-T P.58
- Digital equalization is supported by ACQUA
- Noise-free operation with *coreOUT-Amp2*

## DATA SHEET

### HMS II.5 (Code 1705)

#### HEAD Measurement System, with 3.3 Pinna & Artificial Mouth (without Ear Simulators)

## Overview

HMS II.5 is an artificial head measurement system with an artificial mouth. The system is ideally suited for measurements in sending direction, e.g. as a complementary HATS acting as a second/external talker.

By replicating the relevant structures of the human anatomy, HMS II.5 realistically reproduces the acoustic behavior of a talking person.

The anatomically shaped pinnae delivered with HMS II.5 are compliant with the type 3.3 ear simulator laid out in Recommendation ITU-T P.57 (06/2021). Interchangeable ear simulator components allow flexible upgrading of the system with one or two ear simulators as well as other pinnae.

The P.58-compliant artificial mouth of HMS II.5 is a two-way loudspeaker design. It is capable of reproducing the full spectrum of human voice with lowest distortion, allowing high-quality measurements in super-wideband and fullband applications.

## Modularity

The modular design of HMS II.5 allows to add impedance simulator(s) and change pinnae. This can be used to equip HMS II.5 with one or two ear simulators. The delivered pinnae type 3.3 can be used with the impedance simulator(s) of the regular HMS II.3 as well as the low-noise variant of HMS II.3 LN. As the pinnae are exchangeable as well, it is possible to equip HMS II.5 with other viable combination of ear simulators and pinnae (see page 4). Replacing a pinna or ear simulator requires only the 2.5 mm Allen key that is included in the delivery.

## Applications

- Testing of:
  - Automatic Speech Recognition (ASR) systems
  - ANC talk-through functionality
  - Other tests requiring a second/external talker

## Playback

For measurements, HMS II.5 connects to the communication analysis system ACQUA via the hardware platform *labCORE*. The artificial mouth of HMS II.5 is powered by the *labCORE*'s optional power amplifier board *coreOUT-Amp2*. ACQUA allows comfortable and precise equalization of the mouth. All connections are established at the bottom panel of HMS II.5. It offers a 4-pin Speakon socket for the artificial mouth as well as two 7-pin LEMO sockets prepared for one or two optional ear simulator(s).

The delivered microphone fixture is designed for ease of use. It can be inserted into a dedicated flange at the throat of HMS II.5. Flexible rubber bands allow fixing of arbitrary measurement microphones in front of the mouth for quick and convenient equalization.

## Accessories

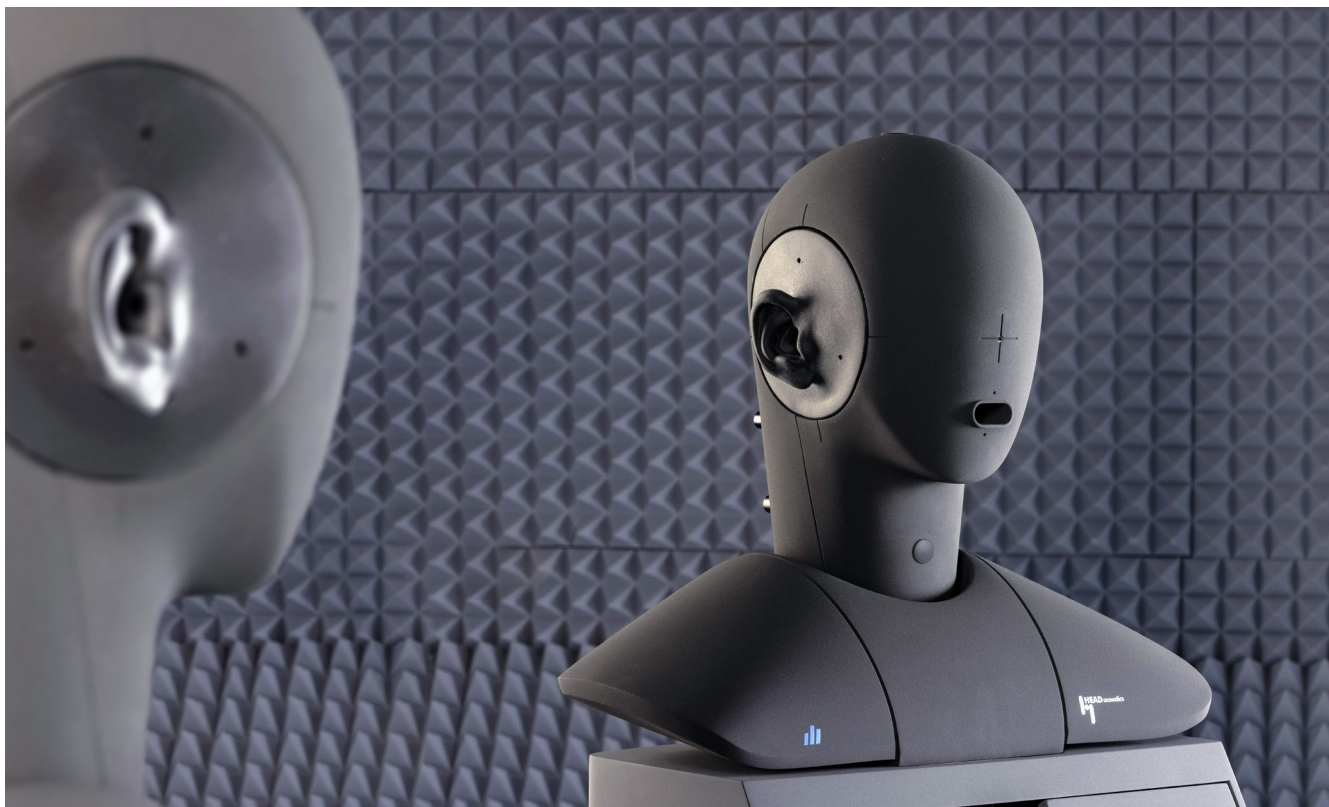
HMS II.5 is delivered with all mounting fixtures that may be required if the HATS is retrofitted with one or two ear simulator(s). This includes neck bolts to mount the optional handset positioners HHP IV

(motorized) or HHP III.1 (manual), a thread for the artificial nose AN HMS as well as a thread for top-mounted accessories such as the microphone arrays MSA I/II or the tri-axial laser pointer TLP. The supplied Torso Box HTB VI acoustically simulates a human torso. Its compact design allows easy handling and transportation of the complete system, e.g. for mobile applications. The bottom plate of HMS II.5 offers a quick-clamping mechanism for convenient mounting on HTB VI. For a more permanent connection, a screw thread allows fixation of HMS on the torso box.

In conjunction with the optional power box *labPWR 1.2* for *labCORE*, mobile application of this HATS (e.g. in vehicles) is also possible.

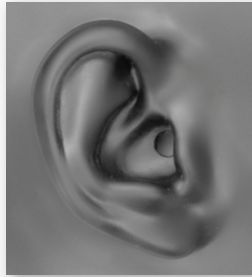


HMS II.5 mounted on the supplied torso box HTB VI



## Features of HMS II.5

The anatomically shaped pinna type 3.3 of HMS II.5 replicates the geometry of a human auricle. The modular design of allows to retrofit compatible ear simulators and pinnae (see next page).



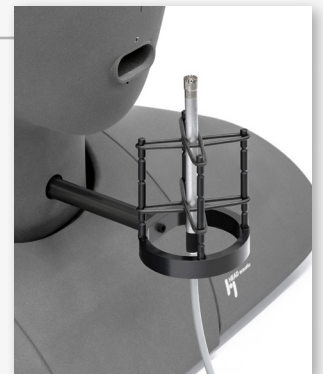
A dedicated thread at the facial crosshair of HMS II.5 is prepared to hold the optional artificial nose AN-HMS. The artificial mouth's two-way loudspeaker design provides excellent frequency coverage.



The bottom plate offers a Speakon connector for the artificial mouth and two 7-pin LEMO connectors for the optional left and right ear simulator(s). A quick-clamping mechanism allows easy and fast attaching of HMS to the supplied torso box HTB VI. The thread below allows to fasten HMS to the torso box.



A flange at the throat of HMS II.5 can accommodate the delivered microphone mount for calibration of the mouth. The mount holds the microphone between durable rubber rings and thus allows to insert microphones of different sizes.



## General Requirements

### Hardware

- **labCORE (Code 7700)**  
Modular multi-channel hardware platform
- **coreBUS (Code 7710)**  
I/O bus mainboard
- **coreOUT-Amp2 (Code 7720)**  
Power amplifier board, for sending direction

### Software

- **ACQUA (Code 6810 etc.)**  
Advanced Communication Analysis System, Version 4.3.100 or later  
**or**
- **VoCAS (Code 6985)**  
Voice Control Analysis System

### Options

- **AN HMS (Code 1418)**  
Extension for HEAD measurement system HMS: Artificial nose

- **HSM V (Code 1520)**

HEAD Seat Mount adapter for artificial head measurement systems or a head-shoulder unit

- **HSC IV-V5 (Code 1524-V5)**

Carrying case for HMS II.x

- **HMT III (Code 1961)**

Height-adjustable tripod for HMS

- **TLP (Code 1967)**

Triaxial laser pointer for HMS/HSU positioning incl. two batteries and carrying case

### Ear Simulator retrofitting

All ear simulators are delivered with a cable LEMO I 7-pin male ↔ LEMO I 7-pin male, black, 2.95 m (Code 1721-3)

- **HIS L (Code 1701)**, HEAD impedance simulator, left, for HMS II.3/4/5
- **HIS L LN (Code 1701.1)**  
HEAD impedance simulator, left, low-noise version, for HMS II.3/4/5

- **HIS L LN HEC (Code 1701.1)**

HEAD impedance simulator, left, low-noise, for HMS II.3/4/5, human-like ear canal version

- **HIS R (Code 1702)**, HEAD impedance simulator, right, for HMS II.3/4/5

- **HIS R LN (Code 1702.1)**

HEAD impedance simulator, right, low-noise version, for HMS II.3/4/5

- **HIS R LN HEC (Code 1702.2)**

HEAD impedance simulator, right, low-noise, for HMS II.3/4/5, human-like ear canal version

### Pinna retrofitting

- **HEL 3.4 (Code 1713)**, Flexible pinna for HMS II.3/4, left ear, according to ITU-T P.57 type 3.4
- **HER 3.4 (Code 1714)**, Flexible pinna for HMS II.3/4, right ear, according to ITU-T P.57 type 3.4
- **HEL 4.4 (Code 1715)**, Flexible pinna for HMS II.3/4/5, left ear, according to ITU-T P.57 Type 4.4



## Ear Simulator and Pinna Options

HMS II.5 is delivered with a left & right anatomically shaped pinna type 3.3 according to ITU-T P.57. The system is prepared for retrofitting with one or two ear simulator(s) as well as other pinnae types. Thanks to the modular design, HMS II.5 can be retrofitted to become equivalent with HMS II.3, HMS II.3 LN or HMS II.3 LN HEC. All options for this HMS model are listed below for the right ear. The left ear can be equipped likewise.



This product:  
**HMS II.5**

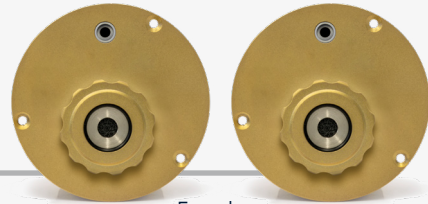
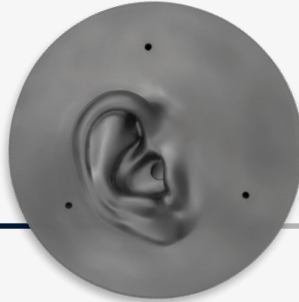
Anatomically shaped pinna type 3.3 with straight ear canal

**combinable with**

Impedance simulator with straight ear canal

**or with**

Low-noise impedance simulator with straight ear canal



**HMS II.3**

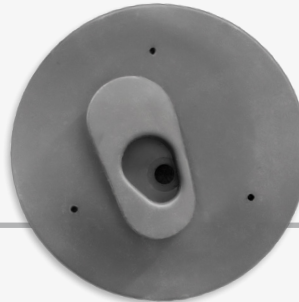
Equal to:

**HMS II.3 LN**

Simplified pinna type 3.4 with straight ear canal

+

Impedance simulator with straight ear canal

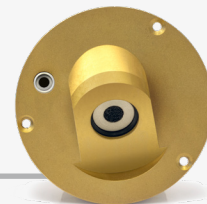


**or**

Anatomically shaped pinna type 4.4 with human-like ear canal

+

Low-noise Impedance simulator with human-like ear canal



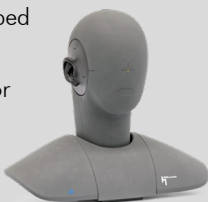
**or**

Equal to:  
**HMS II.3 LN HEC**

## Other HMS Models

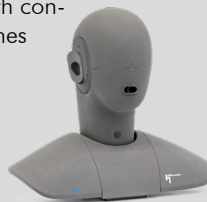
### HMS II.4

- Anatomically shaped pinnae type 3.3
- Right ear simulator



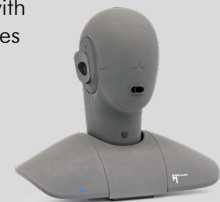
### HMS II.6

- Free-field ears with condenser microphones
- Artificial Mouth



### HMS II.7

- Free-field ears with ICP® microphones
- Artificial Mouth

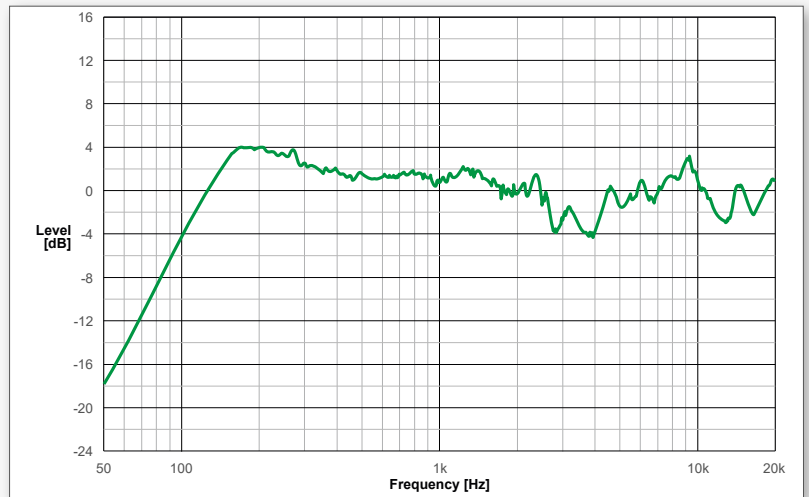


- **HER 4.4 (Code 1716)**, Flexible pinna for HMS II.3/4/5, right ear, according to ITU-T P.57 Type 4.4
- **HEL 4.4-V1 (Code 1715-V1)**, Flexible pinna for HMS II.3/4/5, left ear, according to ITU-T P.57 Type 4.4, gray color
- **HER 4.4-V1 (Code 1716-V1)**, Flexible pinna for HMS II.3/4/5, right ear, according to ITU-T P.57 Type 4.4, gray color

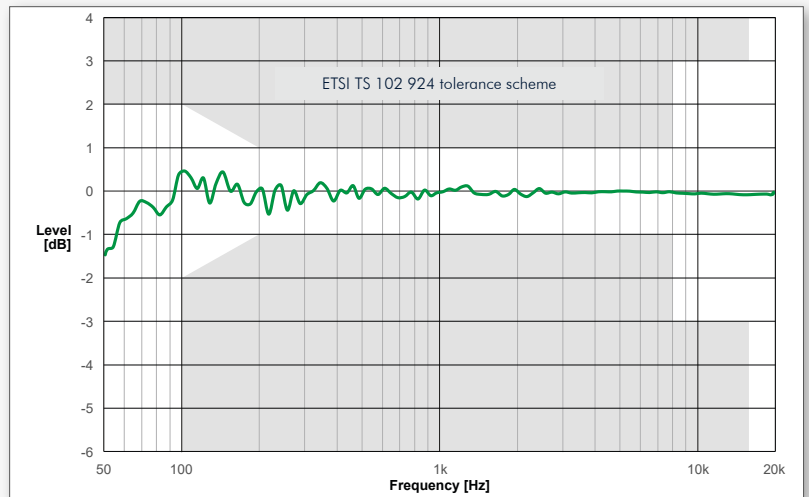
### Delivery items

- **HMS II.5 (Code 1705)**, HEAD measurement system, with 3.3 pinna & artificial mouth (without ear simulators)
- **HEL 3.3 (Code 1711)**, Flexible pinna for HMS II.3/4/5, left ear, according to ITU-T P.57 Type 3.3
- **HER 3.3 (Code 1712)**, Flexible pinna for HMS II.3/4/5, right ear, according to ITU-T P.57 Type 3.3
- **CSS V.3 (Code 1723-3)**, Cable Speakon plug ↔ Speakon plug, 2.95 m
- **CSB II (Code 9849)**, Adapter Speakon male ↔ Banana plug
- **HTB VI (Code 1574)**, HEAD Torso Box for HMS II/III/IV & HSU
- **HCC-HMS (Code 1741)**, Carrying case for accessory parts HMS II.x, containing:
  - Microphone holder
  - Lip ring & MRP pointer
  - Calibration adapter
  - 2.5 mm Allen key
  - Manual
  - Spare parts:
    - 2 × Throat blind cap

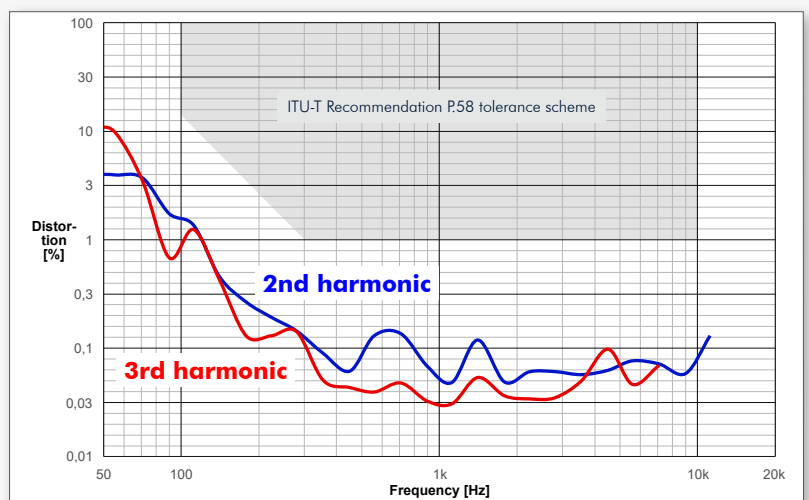
## Two-way Artificial Mouth of HMS II.5



Typical frequency response of two-way mouth – unequaled



Typical frequency response of two-way mouth – equalized



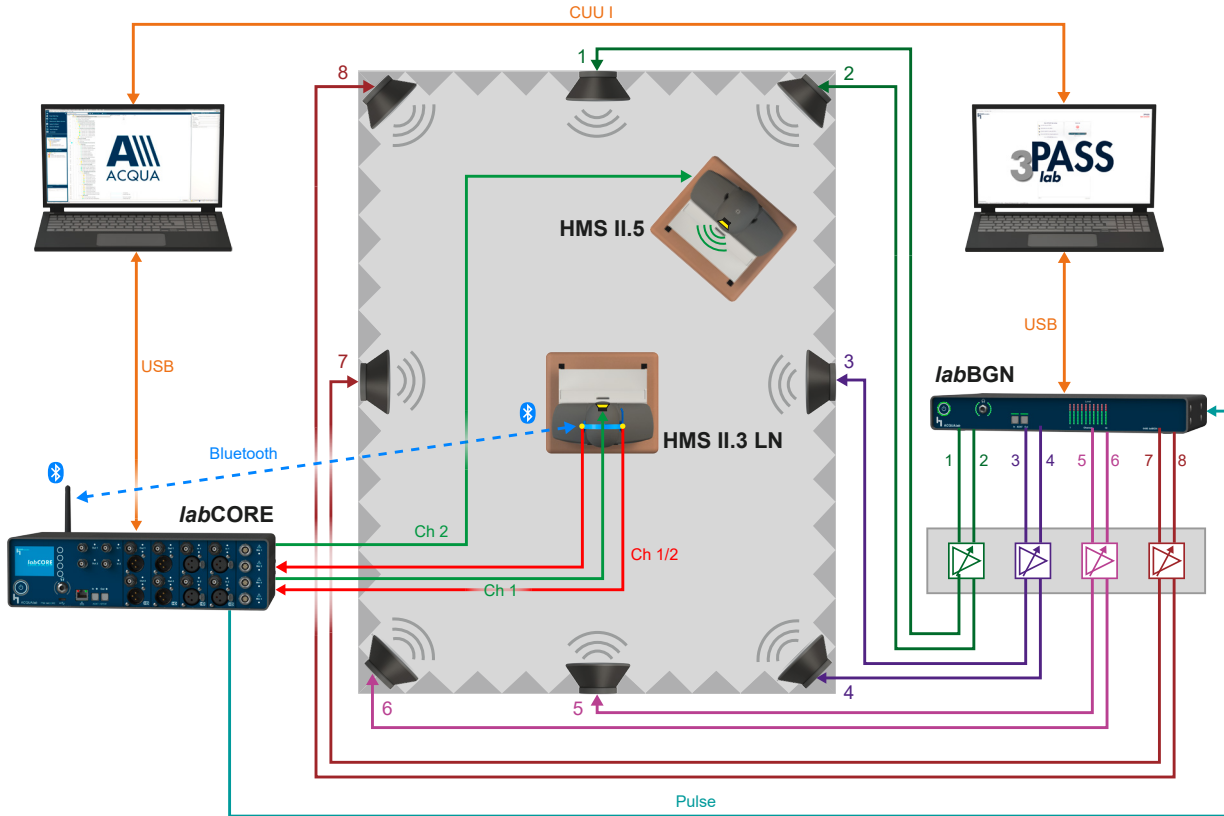
Harmonic distortion of equalized two-way mouth at 0 dB<sub>P<sub>0</sub></sub>

## Configuration example: HMS II.5 as Second Talker for Measurement of Bluetooth® Headset

This exemplary test scenario depicts testing a Bluetooth® on-ear headset with HMS II.3 LN. HMS II.5 simulates a second talker with external speech. This test scenario is part of the HEAD quality standard HQS-ANC-Headset.

labCORE connects to the headset via coreBT. The two HATS are connected to the hardware platform with core-IN-Mic4 (ears of HMS II.3 LN) and core-OUT-Amp2 (mouths of HMS II.3 LN & HMS II.5). Background noise is simulated

with 3PASS lab. For full repeatability of measurements, background noise playback is synchronized by labCORE through a pulse connection to the hardware platform labBGN. ACQUA operates as the central software tool to generate, receive and analyze signals.



### Technical Data

#### Artificial Mouth (sending direction)

|                                |                                                                                         |
|--------------------------------|-----------------------------------------------------------------------------------------|
| Loudspeaker configuration      | 2-way                                                                                   |
| Power limit                    | 20 W <sub>RMS</sub> , 50 W <sub>Peak</sub> , max. power is electrically limited > 6 kHz |
| Impedance                      | 4 Ω                                                                                     |
| Transmission range (equalized) | 50 Hz – 20000 Hz                                                                        |
| Frequency response (equalized) | Exceeds ETSI TS 102 924                                                                 |
| Distortion factor              | Exceeds ITU-T P.58                                                                      |
| Directivity characteristics    | According to ITU-T P.58                                                                 |

#### Environmental conditions

|                             |                                                          |
|-----------------------------|----------------------------------------------------------|
| Operating temperature range | 0°C – 50 °C, 32°F – 122°F                                |
| Storage temperature range   | -20°C – 70°C, -4°F – 158°F                               |
| Humidity                    | 20% – 80% relative humidity (non-condensing environment) |

#### Dimensions

|                                |                    |
|--------------------------------|--------------------|
| Overall dimensions (W x H x D) | 450 x 400 x 180 mm |
| Weight                         | Approx. 5.5 kg     |

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