



MFE IX front and rear view

DESCRIPTION

A typical setup for measuring VoIP and VoLTE devices (smartphones, gateways, etc.) always includes a nearly perfect transmission between the device under test (DUT) and the reference gateway (MFE VIII.1 in the best case). But in reality, this transmission between a device and the provider has a high (and often unknown) variance in bandwidth, delay, connections between different providers, etc. This leads to effects like variable delay of the packets, packet drops and other impairments, which may decrease the quality of the transmitted audio data.

The measurement frontend MFE IX offers the statistical simulation of an IP channel based on the network emulation (Netem) of the Linux Foundation with the following parameters:

- Base delay
- Jitter (variable delay), with first order correlation
- Duplication rate, correlated (cf. above)
- Drop rate, correlated (cf. above)
- Bit error rate, correlated (cf. above)

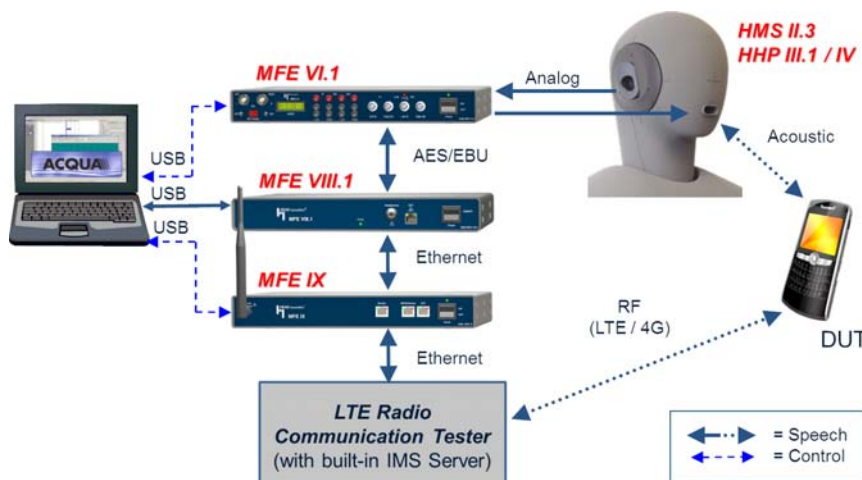
In addition to these statistical impairments, a limitation of the data bandwidth* to a certain rate is possible (e.g. 50 kbit/s or 20 kbyte/s).

MFE IX is placed between the DUT and the reference gateway to modify the IP traffic. To add it to an existing setup, the packet processing is carried out on two bridged Ethernet connectors (one for DUT, one for reference gateway/MFE VIII.1). Neither an IP configuration of the network connectors of MFE IX nor a subnet change is required.

To allow the integration of wireless devices, MFE IX also includes a WLAN access point (IEEE 802.11b/g). An optional WPA2 encryption* of the access point is possible. The network impairments in direction of the DUT are also applied to the WLAN interface, thus allowing to simulate typical wireless scenarios.

The device interacts with ACQUA, so each setting with certain impairments can be stored in ACQUA. In addition, impairment settings can be changed automatically for each measurement.

To trace the traffic which is passing the two Ethernet connectors, the MFE IX is equipped with a monitoring port.



Example of a VoLTE test setup

DATA SHEET

MFE IX (Code 6480)

IP Network Impairment Simulator & Monitor with WLAN Access Point

OVERVIEW

MFE IX is a light-weight and compact front end for simulation and monitoring of different VoIP and VoLTE network conditions. It is equipped with Ethernet, WLAN, Pulse and USB interfaces.

In conjunction with the communication quality analysis system ACQUA* and other HEAD acoustics front ends, MFE IX can be used for automated measurements according to international, user-defined or HEAD acoustics standards.

MFE IX itself does not use an IP address and can therefore easily be inserted into an existing IP connection without subnet change. The impairment of the IP data stream can be limited to a single voice data stream. For this purpose, each socket connection (IP number + port number) can be examined by means of heuristics whether it is a voice connection.

*requires ACQUA 3.2.100 or later and firmware 1.02 or later

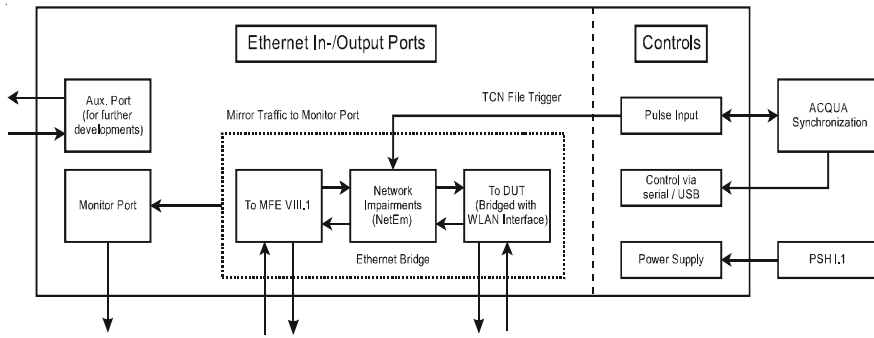
Another feature of the MFE IX is the ability to reproduce specific patterns of impairments during a measurement. For this purpose, an extension to the so-called "Trace Control for Netem" (TCN) was included in the software of the device. This add-on manipulates each incoming IP packet according to a pre-defined set of instructions, a so-called TCN-File. A single instruction for an IP packet of a TCN file may be:

- drop a packet
- set delay of packet
- set delay and/or duplicate packet
- set delay and/or corrupt packet

With these instructions, nearly all complex IP networks can be reproducibly modelled. Also, systematic impairments based on a template (e.g. the source file of a measurement) can be realized with this solution (e.g. disturbance of single sections in a speech signal).

The beginning of a TCN file is synchronized with the beginning of a measurement in ACQUA by using a pulse connection between ACQUA and MFE IX.

VoIP and VoLTE data in IP networks are always transported via the RTP protocol, which itself is located in the payload of UDP data packets. To avoid manipulation on other traffic passing the Ethernet Bridge (which may falsify measurement results), a special IP filter can be applied, so that only active audio transmissions are marked for the use of Netem.



Block diagram MFE IX

Equipped with a network impairment bridge, monitoring port and WLAN access point, MFE IX offers a complete solution in combination with the communication analysis system ACQUA, the measurement frontend MFE VI.1, the reference gateway MFE VIII.1 and the artificial head measurement system HMS II.3.

Additional functionalities such as the import of Wireshark recordings as TCN files for the reproduction of real VoIP and VoLTE situations in laboratories are available. An automation via command line tools is also available.

KEY FEATURES

- Statistical IP channel simulation
- Deterministic channel simulation
- Limitation of bandwidth
- Reproducibility of network impairments for all measurements
- Specific and systematic impairments during a measurement at a specific point of time
- WLAN access point (e.g. for Wi-Fi phone testing) incl. WPA2 authentication
- Impairments also applicable to the wireless path
- Different impairments for each transmission direction (for DUT and gateway port)
- Insertion into existing IP connections without re-configuration (no subnet change)
- Impairment of IP data stream can be limited to a single voice data stream
- Automatic voice connection probability check for each socket connection (IP number + port number)
- UDP/RTP packet filtering based on IP address and port, including auto-detection of RTP streams
- Monitoring the impaired or unimpaired traffic to an additional monitoring port
- Full control and full automation in ACQUA, storage of impairment settings

Technical data – MFE IX

Measurement Unit	
Operation:	Control via ACQUA software (version 3.2.100 or later)
Power supply:	Desktop power supply PSH I.1 (cf. data sheet "PSH Overview")
Power consumption:	8 W max.
Interfaces & Connectors	
Ethernet	3x at front (Monitor, Gateway/MFE VIII.1, DUT), 1x at rear (AUX), RJ45, 10/100 Mbit/s
WLAN	1x at front, incl. screw-on turnable antenna (IEEE 802.11b/g)
Pulse In/Out	2x at rear, BNC, TTL level (absolute maximum ratings: min: -0.5V, max 5.5V), pulse inputs not galvanically separated
USB In/Out	1x at rear, USB 2.0, control and data exchange via ACQUA
DC In/Out	2x at rear, XLR 4 pin, DC-In looped through to DC-Out
Environmental Conditions	
Operating temperature range:	0°C - 50°C, 32°F - 122°F
Storage temperature range:	-20°C - 70°C, -4°F - 158°F
Air Humidity:	35 - 70 % (non-condensatory environment)
Housing	
Overall dimensions (WxHxD):	327 mm x 44 mm x 230 mm
Weight:	ca. 2 kg

APPLICATIONS

- Simulation and monitoring of different VoIP and VoLTE network conditions for objective, reproducible measurements of digital communication terminals and transmission systems
- Measurements according to specifications with network impairment scenarios, e.g.:
 - TS 26.131/132
 - ETSI ES 202 718
 - ETSI ES 202 737-740

SYSTEM REQUIREMENTS

- **ACQUA (Code 6810 etc.):** Advanced Communication Quality Analysis, Version 3.2.100 or later. *Note: Valid SMA (Software Maintenance Agreement) required!*
- **PC** (as specified by ACQUA data sheet; optional: with ethernet port for monitoring)
- Depending on measurement tasks, **additional components (e.g. MFE VIII.1, Code 6484)** may be required

DELIVERY ITEMS

- **MFE IX (Code 6480):** IP network impairment simulator & monitor with WLAN access point, incl. WLAN antenna; TCN file examples on internal memory card
- **PSH I.1 (Code 1364):** External power supply 110-250 V AC - > 15 V DC
- **PCC I.9x (Code 997x):** Mains cable (to local specification)
- **1x CUSB II.1.5 (Code 5478-1.5):** USB 2.0 cable, with ferrite, 1.5 m
- **1x Ethernet Cable,** short
- **1x Pulse Cable** (BNC)
- **Carrying case**
- **Manual**

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