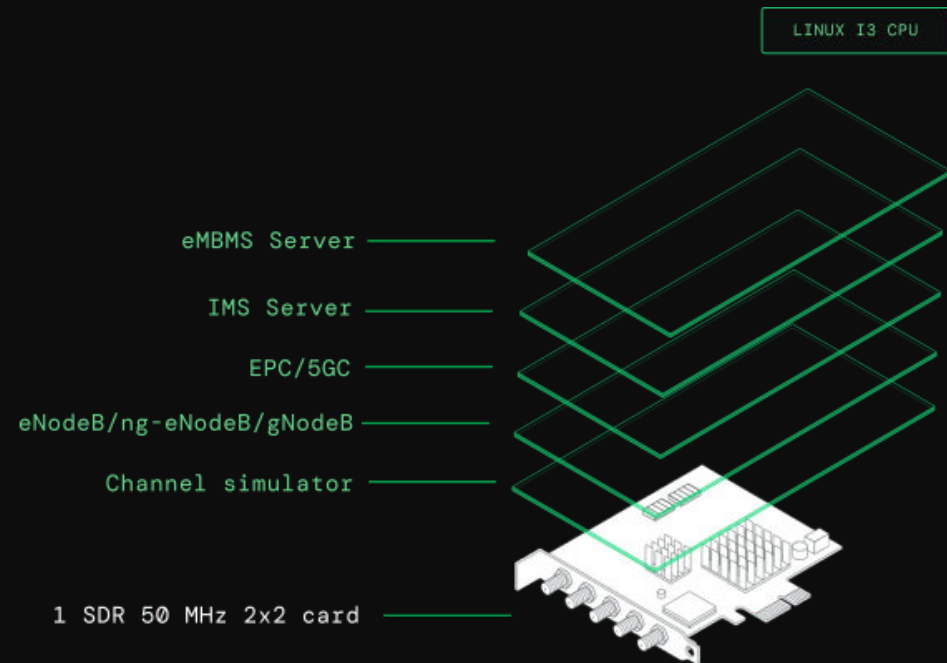
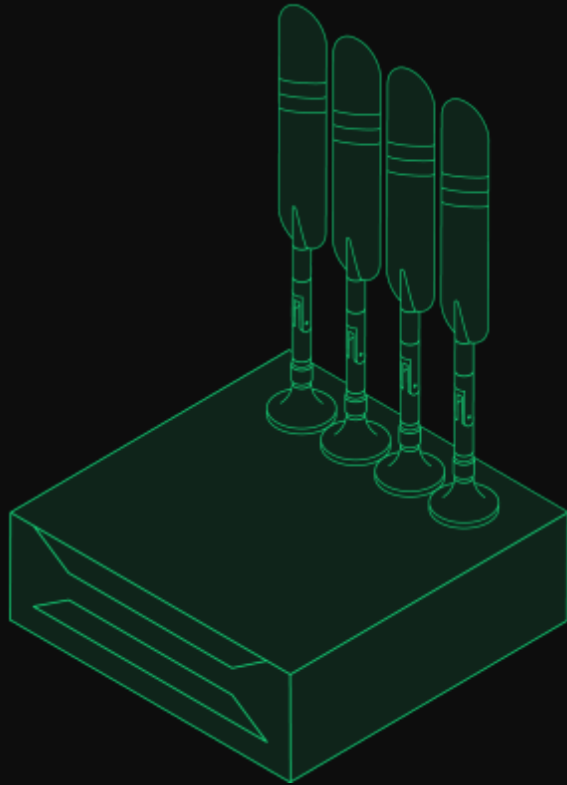


AMARI Callbox Mini

Overview

The AMARI Callbox serves as the optimal solution for testing both 4G and 5G devices, functioning as a 3GPP compliant eNB/gNB and EPC/5GC to facilitate functional and performance testing. Powered by a carrier-grade software suite, the AMARI Callbox Mini, the smallest among the AMARI Callboxes, is specifically designed for IoT applications.

This compact callbox offers a single cell with a configuration of up to 20MHz 2x2, catering to the connectivity needs of NB-IOT, LTE-M, LTE, RedCap, and 5G SA devices. It's important to note that the Mini does not support NSA mode, as this would require two cells. For higher configurations, options are available using AMARI Callbox Classic, Advanced, Ultimate, and Extreme.



Capabilities



5G

The callbox can act as a 5G standalone mode (SA) network. 5G Non Terrestrial Network (NTN) and 5G Reduced Capacity (RedCap) are also supported.



NB-IOT

The callbox supports standalone, in-band and guard-band NB-IOT to connect NB1 and NB2 devices. It also supports Non Terrestrial Network (NTN) NB-IOT.



Handover

On a single callbox, intra eNB/gNB handover is supported. Inter eNB/gNB handover is supported using two callboxes.



LTE

Even if it is designed for 5G, this callbox provides with the best of Amarisoft LTE technology.



Up to 500 UEs

Powered by a macro base station software, depending on the callbox model and configuration, it can handle up to 500 concurrent active UEs.



Carrier aggregation

The callbox can aggregate multiple TDD and FDD LTE, NR FR1 and NR FR2 cells for high throughput testing.



LTE-M

The callbox supports LTE-M in both FDD and TDD to connect CAT-M1 devices.



200 Mbps - 75 Mbps

Depending on the callbox configuration and the UE capabilities, the callbox can deliver up to 200 Mbps in downlink and 75 Mbps in uplink.



VoLTE VoNR VoWiFi

The embedded IMS Server allows VoLTE, VoLTE, VoNR, VoNR, SMS and emergency call testing. The embedded N3IWF allows VoWiFi by connecting an external WiFi access point.

Highlighted features



Logging and Measurements

Selective logging and display of all layers of 3GPP LTE and NR stacks as well as useful graphs and analytic tools.

[LOG EXAMPLE](#) ↗



Automatic Test Setup and Scripting

Extensive WebSocket API allowing to send remote commands to eNodeB, ng-eNodeB, gNodeB, EPC and 5GC to ease test automation.

[TUTORIAL](#) ↗



Easy Configuration

Easy configuration thanks to JSON files with example configurations already included in each software release for eNodeB, ng-eNodeB, gNodeB, EPC and 5GC.



End to End Data Testing

Running on top of standard Linux in user space mode allowing easy integration with IP services.



Channel Simulation

Simulation of different DL channel types as per 3GPP models specified in 36.101 and 38.141 specifications.

[TUTORIAL](#) ↗



Feature testing

Test features to override the nominal protocol behavior in order to simulate error cases.



High Performance

Highly optimized software supporting multiple UEs and cells and high data rates in LTE and NR.



3GPP Features

Early access to 3GPP features for rapid validation of features under development.

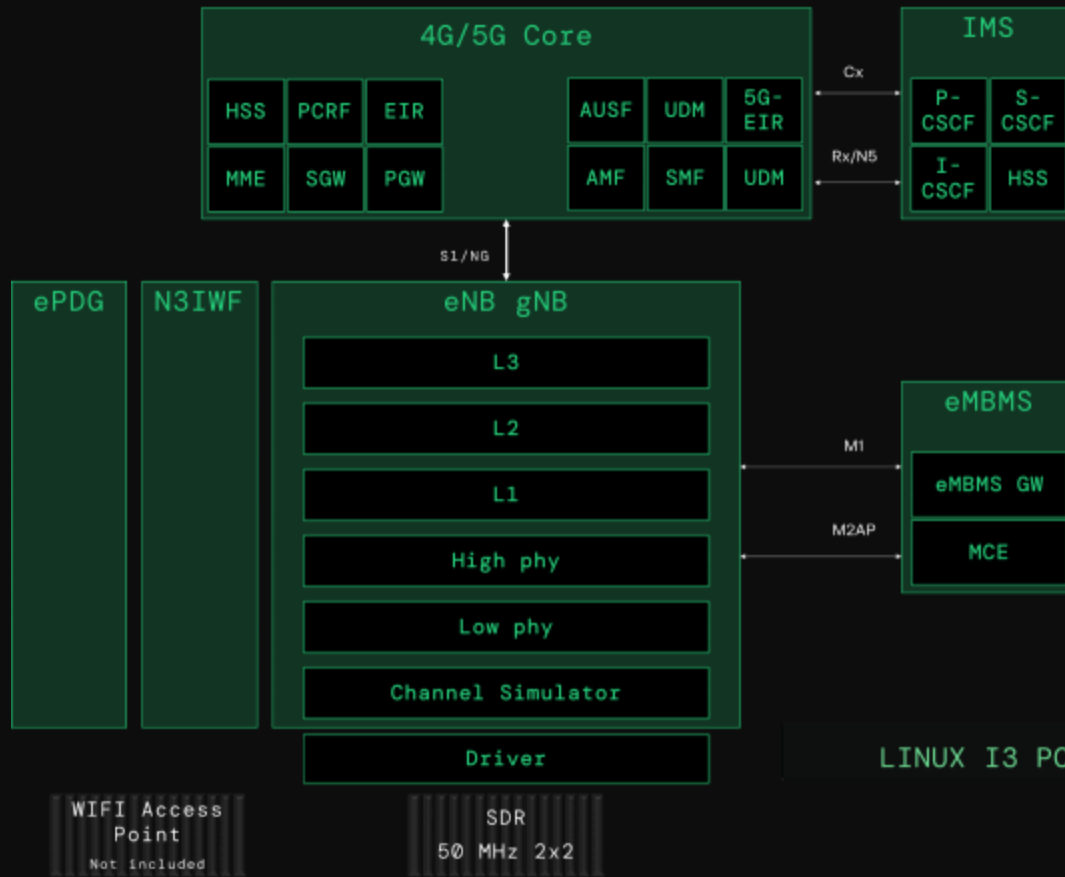


Frequency Agnostic

Support of a wide range of FDD and TDD frequency bands even nonstandard ones allowing to test in Sub-6GHz and mmWave. mmWave available on the AMARI Callbox Advanced, Ultimate and Extreme as an option.

[TUTORIAL](#) ↗

Architecture



Possible RAN Configurations

RAN Configuration constraints

The AMARI Callbox Mini is capable of operating only one cell at a time (NB-IoT, LTE, LTE-M or 5G FR1). The product of cell bandwidth multiplied by the number of MIMO layers shall not exceed 40MHz.

RAN Configuration examples

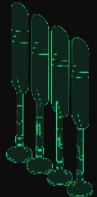
4G LTE	1 cell 20 MHz 2x2
5G NR SA Mode	1 cell 20 MHz 2x2 or 40 MHz SISO
NB-IOT	1 NB-IoT cell in standalone, in-band or guard-band mode
LTE-M	1 LTE cell with CAT M1 support

Hardware components


Callbox and accesories

Callbox Specification	
Dimensions H × W × D	7.8 cm × 20 cm × 25 cm
Weight	2 kg
# AMARI PCIe SDR 2x2 Cards	1
Power supply voltage	100 - 240V AC
CPU	Intel i3

Accesories

Four antennas are shown, each with a green SMA connector at the base and a silver, cylindrical antenna element on top.

4 antennas are included and connect to callbox SDRs through standard SMA port for over the air testing.

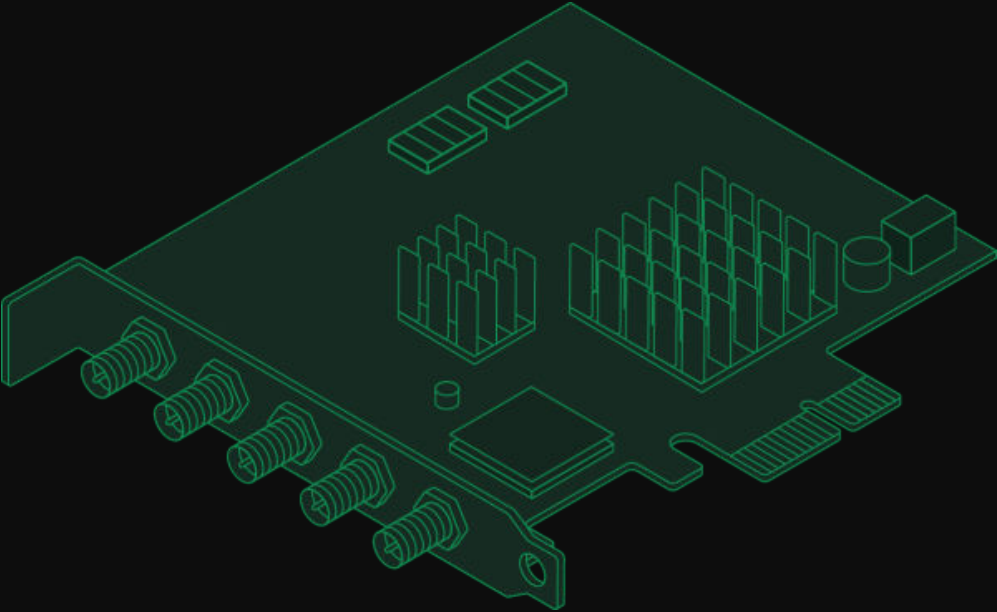
A small, rectangular SIM card with a gold-colored contact area and a blue and white label.

5 programmable SIM Cards are included and already registered in the Callbox core user database.

AMARI PCIe SDR 2x2 Card

AMARI PCIe SDR 2x2 is a software defined radio (SDR) card using AD9361 2x2 RF transceiver. It supports MIMO 2x2, FDD and TDD operations in any frequency between 500 MHz and 6GHz. It has an integrated GPS for precise time and frequency synchronization. The cards can be easily chained thanks to a provided cable allowing clock and PPS propagation in between the cards. This will facilitate testing of higher MIMO layers and carrier aggregation. The total bandwidth of the card is 56 MHz, and its output power is around 0 dBm depending on the used frequency. The card requires at least gen 2 PCIe slot. This RF is used in AMARI Callbox Mini, AMARI Callbox Classic and AMARI UE Simbox LTE Series products.

[TECHNICAL DOC](#)



AMARI PCIe SDR 2x2 Card technical specification

Dimensions H × W × D	2 cm × 11.5 cm × 12.8 cm
Weight	0.1 kg
Frequency range	500 MHz to 6.0 GHz
RF bandwidth	200 KHz to 56 MHz
Power supply voltage	12 V DC input
Operation mode	FDD and TDD
MIMO	2x2
ADC/DAC sample rate	61.44 MS/s
ADC/DAC resolution	12 bits
Frequency accuracy	2 ppm
PCIe minimum requirements	1x / Gen 2
LTE 20MHz 64QAM EVM	<4% RMS (f<3.5 GHz) <2% RMS (f<2.6 GHz)
Synchronization	Internal clock , PPS signal, GPS , Reference external clock (LVDS)

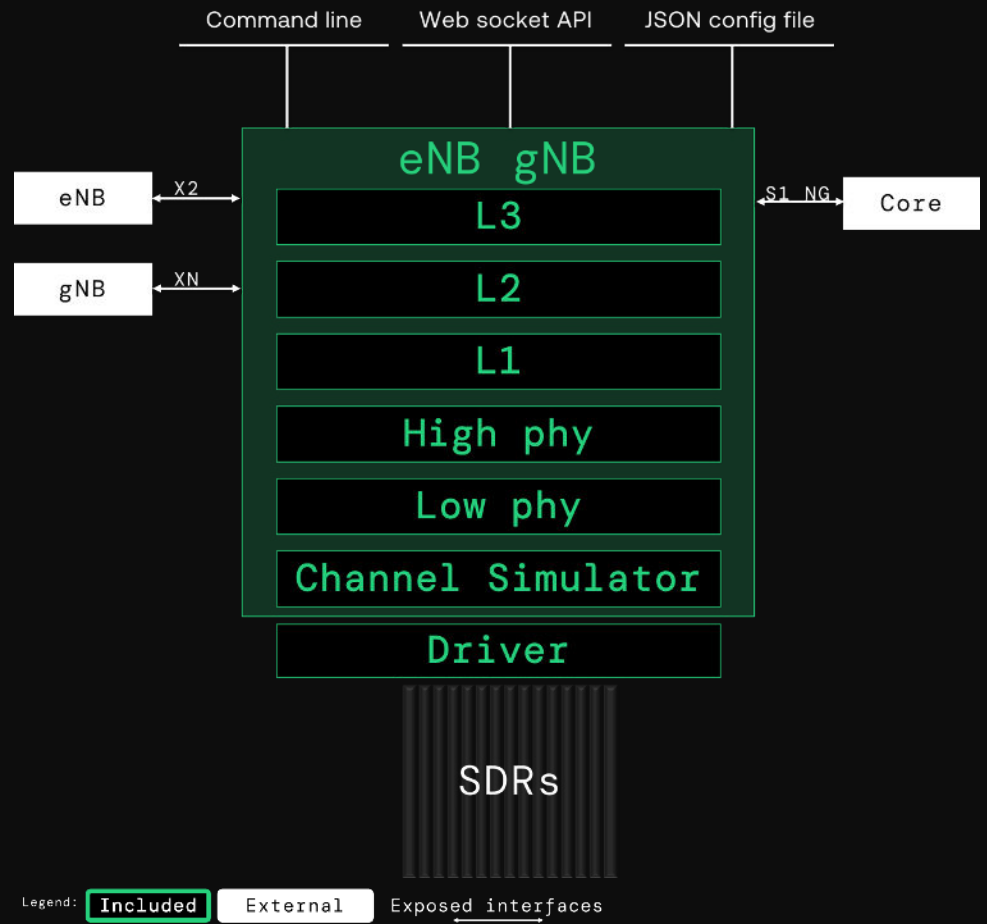
Software components

vRAN eNodeB gNodeB

A release 17 full software eNodeB gNodeB including layer3, layer 2, layer1 and physical layer. It also includes a channel simulator. It connects to a split 8 or split 7.2 radio front end through an open API via a driver. It supports a standard S1/NG interface to connect a 4G or 5G core network. The eNodeB gNodeB is configurable through hundreds of parameters in a text file in JSON format. It has a WebSocket API for automation, and a command line interface.

[DETAILED SPEC](#)

[TECHNICAL DOC](#)

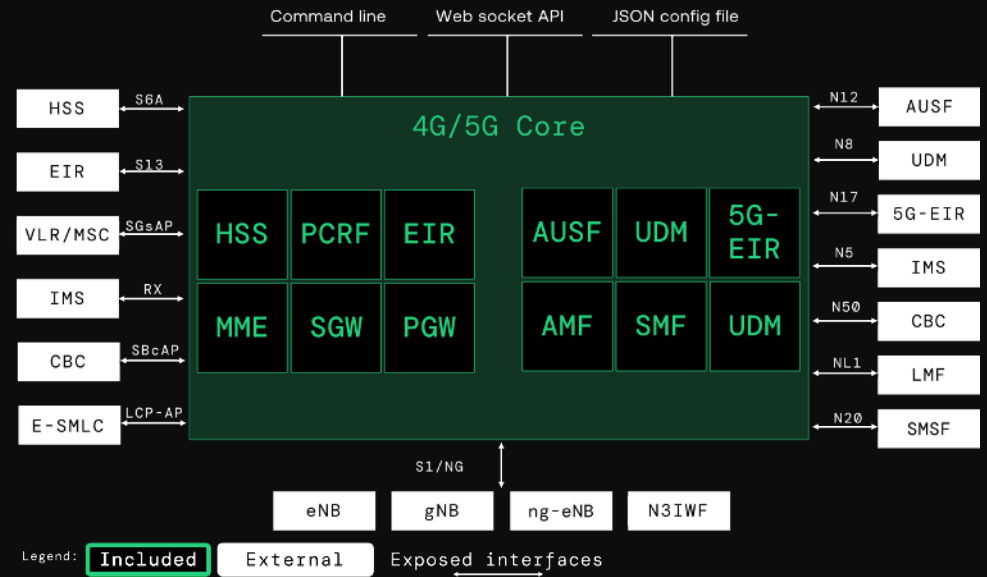


4G 5G CORE

A compact release 17 core network with built-in MME, SGW, PGW, PCRF, HSS, EIR, ePDG, AMF, AUSF, SMF, UPF, UDM and 5G-EIR.

[DETAILED SPEC](#)

[TECHNICAL DOC](#)

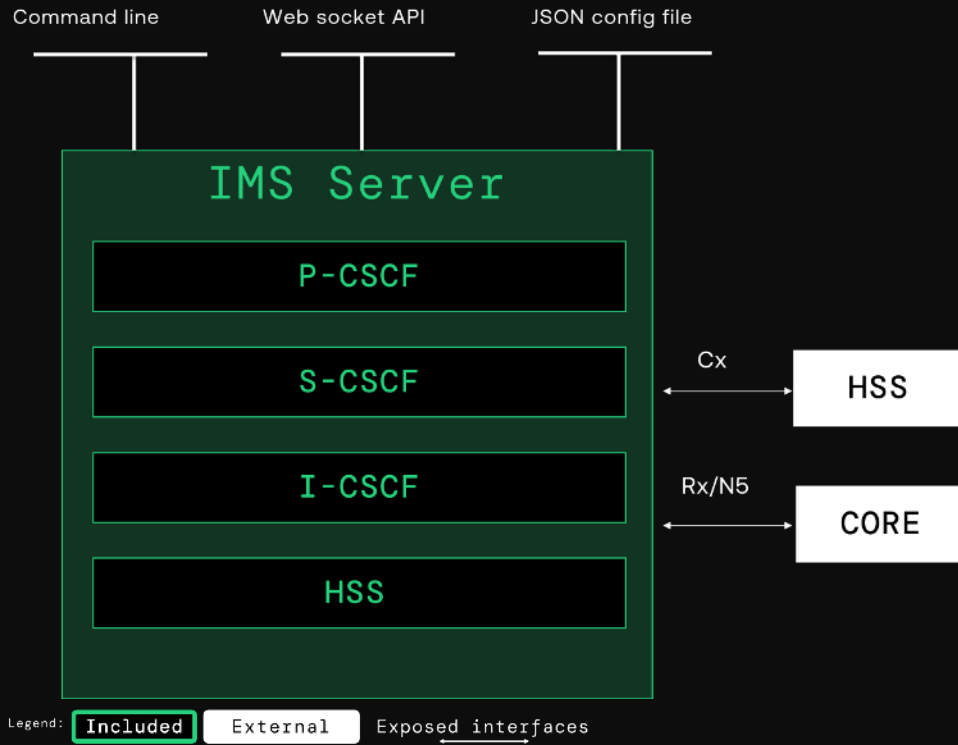


IMS Server

An IMS standalone simple server. It has a built-in P-CSCF, I-CSCF, S-CSCF, HSS.

[DETAILED SPEC ↗](#)

[TECHNICAL DOC ↗](#)

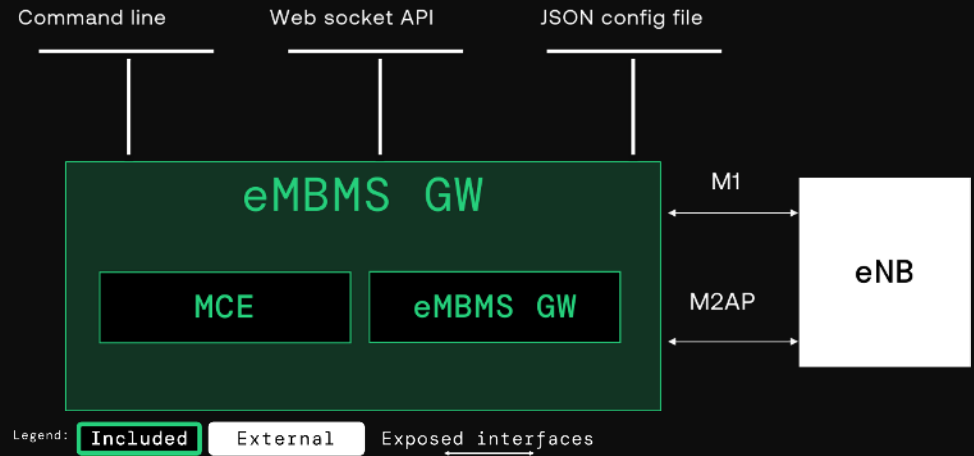


eMBMS Gateway

An LTE multimedia broadcast multicast services gateway with built-in MCE.

[DETAILED SPEC ↗](#)

[TECHNICAL DOC ↗](#)



End to end device testing



Specific feature device testing



4G 5G network element testing



Private network



Operator conformance testing



FTW gateway testing



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