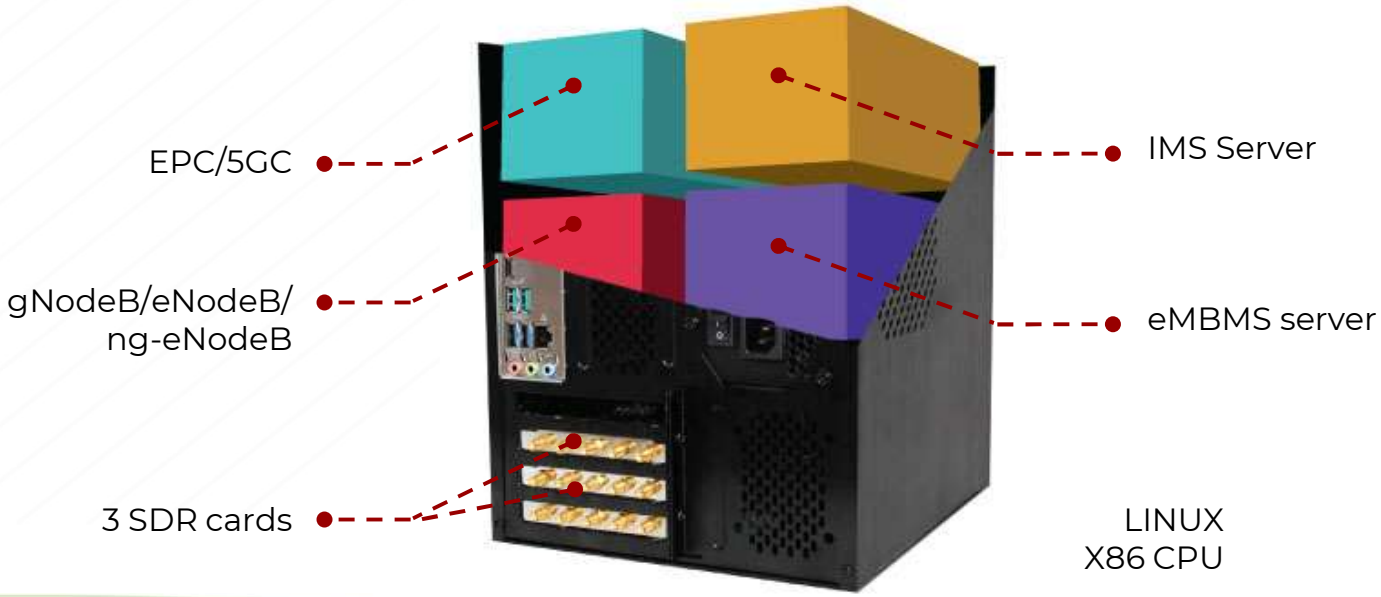
AMARI Callbox *Classic*

Packaged in a plug and play integrated PC, AMARI Callbox Classic is an ideal solution for LTE and NR testing of all types of user equipment with advanced configuration.

It acts as a 3GPP compliant eNodeB, ng-eNodeB, gNodeB, EPC and 5GC allowing functional and performance testing of NR, LTE, LTE-A, LTE-M and NB-IoT devices. The offer is completed by an integrated IMS server as well as an eMBMS gateway for VoLTE/VoNR and eMBMS testing.

The Callbox is powered by a deployment quality LTE and NR software suite offering the same level of baseband functionality as an indoor/outdoor network.

The LTE/NR Network on your desk



Do you have any question? E-mail us at sales@amarisoft.com or visit www.amarisoft.com

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

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.

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.

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

High Performance
- Highly optimized software supporting multiple UEs and cells.
- High data rates supporting downlink and uplink rates of 600 Mbps and 150 Mbps.

Frequency Agnostic
Support of all FDD and TDD frequency bands even non standard ones to test custom frequencies in sub-6GHz.

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

AMARI Callbox *Classic*

PC Specifications

Dimensions H × W × D	**30 cm × 27 cm × 35 cm**
Weight	**11 kg**
Number of PCIe SDR Cards	**3**
Power supply voltage	**230 V AC input**
CPU	**X86 architecture**
Operating System	**Linux Fedora**

PCIe SDR Specifications

Dimensions H × W × D	**2 cm × 11.5 cm × 12.8 cm**
Weight	**0.1 kg**
Power supply voltage	**12 V DC input**
RF Coverage	**500 MHz to 6.0 GHz**
RF bandwidth	**200 KHz to 56 MHz**
Wireless range	**10 meters**
Operation mode	**FDD and TDD**
MIMO	**DL 2x2**

eNodeB/ng-eNodeB Technical Specifications

3GPP release	**LTE release 16**
Frequency bands	**All FDD and TDD bands in sub-6GHz**
Bandwidth	**1.4, 3, 5, 10, 15 and 20 MHz in LTE** **200 KHz for NB-IoT supporting all operation modes (in-band, guard band and standalone).**
Number of active UEs	**Up to 1000 UEs distributed within the configured cells**
Carrier aggregation	**Up to 3 carriers in DL and 3 in UL allowing mixed FDD/TDD combinations in DL**
Transmission modes	**1 (single antenna) to 10 (MIMO 4x4)**
Modulation schemes	**Up to 1024QAM in DL and 256QAM in UL**
AS encryption and integrity protection	**AES, SNOW3G, ZUC**
Handover	**Intra eNodeB, S1, X2 , Intra ng-eNodeB, NG, Xn and EPS to 5GS handover support**
eNodeB network interfaces	**S1AP and GTP-U to EPC** **X2AP between eNodeBs** **M1 and M2 for eMBMS**
ng-eNodeB network interfaces	**NGAP and GTP-U to 5GC** **XnAP between ng-eNodeBs**
IoT	**LTE category 0 and 1** **LTE-M cat M1 FDD, HD-FDD and TDD support** **NB-IoT single-tone and multi-tone cat NB1 and NB2**
NB-IoT subcarrier spacing	**15 kHz and 3.75 kHz**

gNodeB Technical Specifications

3GPP release	**Release 16**
Frequency bands	**FDD/TDD FR1 (< 6 GHz)**
Bandwidth	**Up to 50 MHz**
MIMO	**Up to MIMO 4x4 in DL**
Subcarrier spacing	**Data subcarrier spacing: 15, 30, 60 or 120 KHz** **SSB subcarrier spacing: 15, 30, 120 or 240 KHz**
Modulation schemes	**Up to 256QAM in DL and 256QAM in UL**
Supported modes	**NSA, SA**
NR Split Bearer	**3, 3a and 3x**
Use case	**eMBB**
Network interfaces	**NG interface (NGAP and GTP-U) to 5GC** **XnAP between gNodeBs**
Carrier Aggregation	**Up to 3 DL carriers in SA and NSA**
Handover	**Intra gNodeB, NG, Xn and 5GS to EPS handover support**

Supported number of cells

Max number of LTE cells	**3**
Max number 5G cells	**3**
Max total number of cells	**3**
Σ(Bi*Li)	**120**

Bi is the bandwidth in MHz of cell i Li is the number of dl MIMO layer for cell i

Configuration examples

4G LTE	**3CC 20MHz 2x2, 1CC 20 MHz 2x2 + 1CC 20MHz 4x4**
5G NR	**NSA: 1 5G NR 50MHz 2x2 + 1 LTE 10MHz 2x2** **SA: 1 5G cell 50MHz 2x2 or 3 cells 20MHz 2x2**
NB-IoT	**3 NB-IoT standalone cells, 3 LTE cells with 1 in-band or guard-band NB-IoT cell**
LTE-M	**3 LTE cells with CAT M1 support**

EPC Technical Specifications

Network elements	Mobility Management Entity (MME), Serving Gateway (SGW), Packet Data Network Gateway (PGW), Home Subscriber Server (HSS), Evolved Packet Data Gateway(ePDG), Policy and Charging Rules Function (PCRF) and Equipment Identity Registe (EIR) all integrated within the same software component
3GPP release	Release 16
NAS encryption and integrity protection	AES, SNOW3G, ZUC
USIM authentication	XOR, Milenage, TUAK
IP version	IPv4 and IPv6
QoS	Support of all LTE QCIs as well TFT and dedicated bearers
Handover	Intra-MME and and EPS 5GS IRAT handover support
Network interfaces	S1AP and GTP-U to eNodeB Rx to external IMS server, S6a to external HSS S13 to external EIR, SGsAP to external VLR/MSC SBcAP to external CBC
RAT	NR, LTE, NB-IoT
CIoT features	control plane CIoT optimization, Non IP data delivery, Attach without PDN connectivity
Power saving features	PSM and extended DRX

IMS Server Technical Specifications

Network Elements	Proxy-CSCF (P-CSCF), Interrogating-CSCF (I-CSCF), Serving-CSCF (S-CSCF), and Home Subscriber Server (HSS) all integrated within the same software component
ISIM authentication	XOR, Milenage, TUAK
Security features	MD5, AKAv1 and AKAv2 for authentication and IPSec at transport level
Network interfaces	Rx interface for support of precondition and dedicated bearer Cx interface for external authentication
IP versions	IPv4 and IPv6
Services	Voice call, Video call, Voice echo test, Call hold, SMS over SIP and SMS over SG

eMBMS Gateway Technical Specifications

Network Elements	LTE eMBMS Gateway (eMBMS-GW) and Multi-cell Coordination Entity (MCU)
Network interfaces	M1 interface to eNodeB for user plane M2AP interface to eNodeB for control plane

5G Core Technical Specifications

Network elements	**Access and Mobility Management Function (AMF), Authentication Server Function (AUSF), Session Management Function (SMF), User plane Function(UPF), UDM (Unified Data Management) and 5G-EIR (5G Equipment Identity Register) all integrated within the same software component**
3GPP release	**Release 16**
NAS encryption and integrity protection	**AES, SNOW3G, ZUC**
USIM authentication	**XOR, Milenage, TUAK 5G-AKA**
IP version	**IPv4, IPv4v6, IPv6 and unstructured PDUs support**
QoS	**Configurable QoS flows**
PDU	**Multi PDU sessions support**
Network interfaces	**NG interface (NGAP and GTP-U protocols) to several gNodeBs, ng-eNodeBs or N3IWFs Rx to external IMS server, N12 to external AUSF N8 to external UDM, N17 to external 5G-EIR, N50 to external CBC**
RAT	**NR, LTE, NB-IoT and non-3GPP RAT**
Handover	**intra-AMF and 5GS EPS IRAT support**

Web GUI interface for logging and analysis