AMARI Callbox **PRO**

Packaged in a plug and play integrated PC, AMARI Callbox Pro 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, 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 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 Gbps LTE/NR Network on your desk

EPC/5GC

eNodeB/gNodeB

6 SDR cards

IMS Server

eMBMS server

LINUX
Intel Core i9

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, 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, 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 and using of native Linux tools for throughput testing.

Channel Simulation
Simulation of different DL channel types as per 3GPP models specified in 36101 specification.

Test Features
Test features 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 in LTE supporting downlink and uplink rates of 1.2 Gbps and 150 Mbps

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

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

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

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PC Specifications

Dimensions H × W × D	**45,5 cm × 40 cm × 20,5 cm**
Weight	**12 kg**
Number of PCIe SDR Cards	**6**
Power supply voltage	**230 V AC input**
CPU	**Intel Core i9**
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 Technical Specifications

3GPP release	**LTE release 14**
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).**
Supported number of UEs	**Up to 1000 UEs distributed within the configured cells**
UE category	**0/1/2/3/4/5/6/7/9/10/11/12** **DL category up to 18** **UL category up to 13**
Carrier aggregation	**Up to 5 carriers in DL and 3 in UL allowing mixed FDD/TDD combinations in DL**
Transmission modes	**1 (single antenna) and 2 to 10 (MIMO 4x4)**
Modulation schemes	**Up to 256QAM in DL and 64QAM in UL**
AS encryption and integrity protection	**AES, SNOW3G, ZUC**
Handover	**Intra eNodeB, S1 and X2 handover support**
IoT	**LTE category 0 and 1** **LTE-M cat M1** **NB-IoT cat NB1 and NB2**
NB-IoT subcarrier spacing	**15 kHz and 3.75 kHz**
Network interfaces	**S1AP and GTP-U to EPC** **X2AP between eNodeBs** **M1 and M2 for eMBMS**

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gNodeB Technical Specifications

3GPP release	**Release 15**
Frequency bands	**FDD/TDD FR1 (< 6 GHz)**
Bandwidth	**Up to 50 MHz**
MIMO	**Up to MIMO 4x4 in DL**
Subcarrier spacing	**All SSB/data subcarrier spacing combinations**
Modulation schemes	**Up to 256QAM in DL and 64QAM 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**

Supported number of cells

Max number of LTE cells	**6**
Max number of 5G cells	**6**
Max total number of cells	**6**
$\Sigma(Bi*Li)$	**400**

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

Configuration examples

LTE Only	**6CC 20MHz 2x2, 3CC 20MHz 4x4**
5G	**NSA: 1 5G NR 50MHz 4x4 + 1 LTE 20MHz 4x4, 2 5G NR 40MHz 4x4 + 1 LTE 20MHz 4x4** **SA: 2 5G NR 50MHz 4x4**
NB-IoT	**6 NB-IoT standalone cells, 6 LTE cells with 6 in-band or guard-band NB-IoT cells**
LTE-M	**6 LTE cells with CAT M1 support**

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EPC Technical Specifications

Network elements	Mobility Management Entity (MME), Serving Gateway (SGW), Packet Data Network Gateway (PGW), and Home Subscriber Server (HSS) all integrated within the same software component
3GPP release	Release 14
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	S1 based support
Network interfaces	S1AP and GTP-U to eNodeB RX for external IMS server S6a for optional external HSS
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

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5G Core Technical Specifications

Network elements	**Access and Mobility Management Function (AMF), Authentication Server Function (AUSF), Session Management Function (SMF) and User plane Function(UPF) all integrated within the same software component**
3GPP release	**Release 15**
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 RX for external IMS server**

Web GUI interface for logging and analysis

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