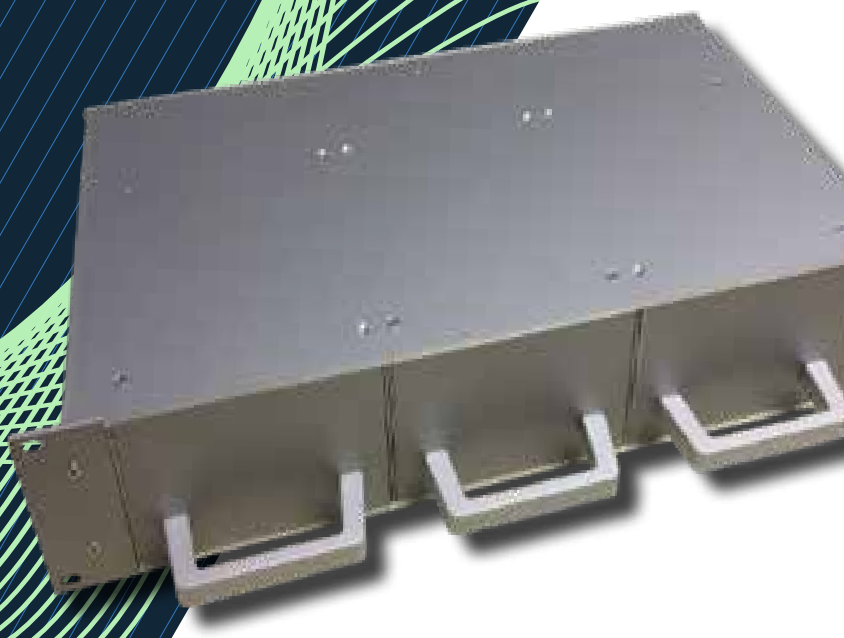
MTS Systemtechnik

SIMCard Switching

An overview of the systems from
MTS Systemtechnik GmbH

Individual high-frequency technology



Concepted and build in Germany.

Your partner for customised solutions -
„Development, Production & Service“
all from a single source.

// High frequency technology
// EMC technology
// CNC milling technology

// Content

// About MTS Systemtechnik

Tailor-Made Solutions for High-Frequency Technology, EMC, Electronics, and Mechanics

Our customers include manufacturers of highly sensitive equipment across various market segments, including mobile communications, telecommunications, aerospace, defense, medical, automotive, and electronics. Our devices, systems, and components are used worldwide by leading, internationally active companies.

For over 25 years, MTS Systemtechnik has been synonymous with state-of-the-art technology, absolute reliability, discretion, transparent processes, and certified quality according to DIN EN ISO 9001.

With approximately 50 employees, we develop and manufacture individual, high-quality devices, systems, and components “Made in Germany,” as well as customer-specific products.

Our electronic product range includes coax relays, attenuators, power splitters, systems for the distribution of LF, video, and RF signals, RF matrices, and assembled coax cables. Our expertise in complex switching and distribution tasks in the high-frequency range has established us as a leading manufacturer of relay switching units, air interface emulators, power splitter units, and matrices.

For the mobile radio and telecommunications industry, we supply customised Shielding Boxes, air interface emulators for various test scenarios, and smart antenna simulators.

With our modern CNC production centre, we manufacture customer-specific precision-milled parts for the aerospace, optical and high-frequency industries.

The distribution of coaxial connectors from IMS Connectors and the assembly of coaxial cables complete our product range.

Systems for the distribution of LF, video and RF signals in the fields of tele- and satellite communication and radio surveillance

Production of mechanical components for the aerospace, optical and high-frequency industries

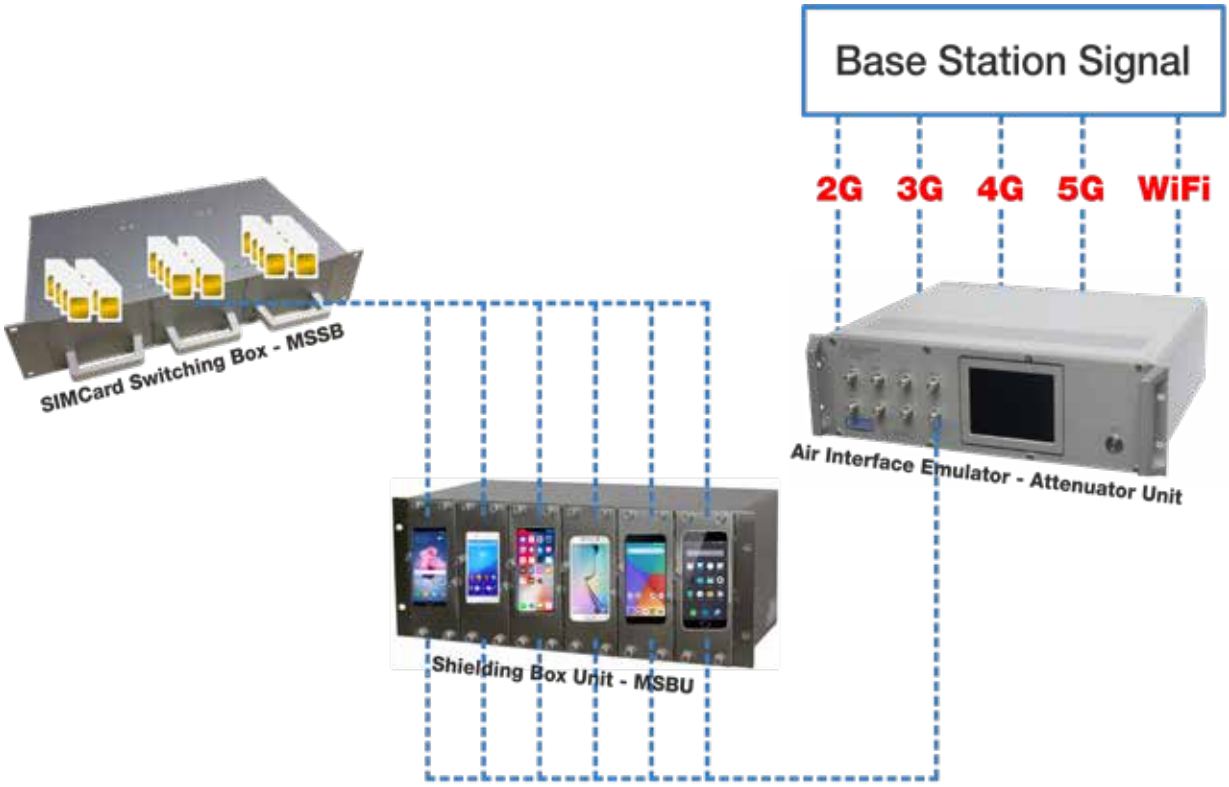
Development and production of active and passive components for high frequency technology

// Introduction

The test setup for implementing automated software tests on mobile devices is a co-operation between MTS Systemtechnik GmbH and QUALIGON GmbH.
The system supports you in implementing automated software tests on mobile devices that require SIM card multiplexing or roaming tests of cell phones.

The test setup consists of:

// Matrix SIM Switchbox MSSB (Remote SIM Switchbox QVSS possible)
// Radio field simulation Air Interface Adapter (attenuator unit)
// Shielding box slide-in system MSBU



Compact solution

Air Interface Emulation - Shielding Box Solution - SIMCard Switchbox

Air interface emulators like Air Interface Adapter (AIAD) and Standard Coupling Field (SCF) from MTS Systemtechnik offer the possibility of testing mobile radio base stations and mobile stations in the lab via the air interface.

If you want to develop, test, or compare in the field of radio transmission, an ideal setup is a room that is completely free of radio signals. This allows you to observe how your test object behaves under spcific conditions. Nearby mobile cells or in-house WiFi can significantly impact results or even measurements impossible. For this reason, we have developed a specialised Shielding Box.

What kind of tests can be performed?

This setup enables automated testing of applications and devices/user equipment (UEs) using various SIM cards, such as those with different profiles and roaming szenarios, alongside network parameter tuning. All systems are fully controllable via API calls, enabling the creation of fully automated test cases for continuos testing.

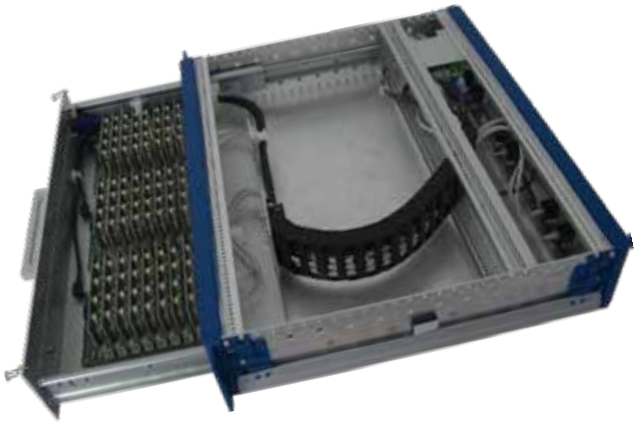
// Matrix SIM Switchbox

Matrix SIM Switchbox MSSB

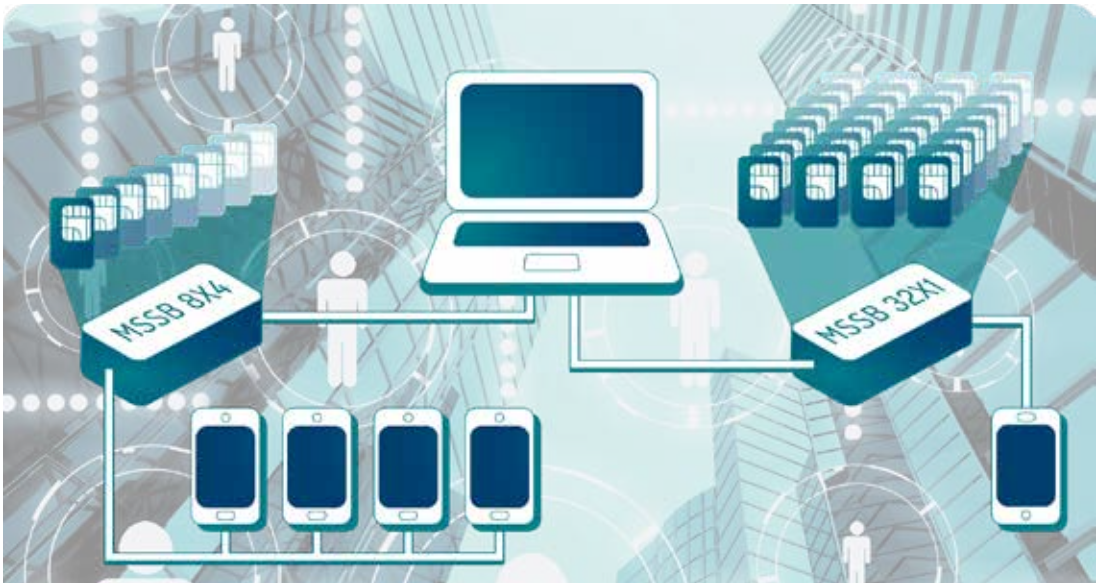
With the Matrix SIM Switchbox (MSSB), up to 32 SIM cards can be automatically connected to up to 4 mobile devices or terminals. Switching is managed via a graphical user interface (Web-GUI) or through the REST-API with HTTP commands. The system enables automated software testing on mobile devices requiring SIM card multiplexing or cell phone roaming tests.
The MSSB uses physical SIM cards rather than SIM virtualisation, providing complete and transparent access to SIM cards, along with simplified accessibility. The MSSB 4x1 model can also be controlled via Bluetooth, particularly useful for mobile use cases.

Our customers include mobile phone companies, professional app developers, test houses, cell phone manufacturers, and business consultancies.

Matrix SIM Switchbox integrates seamlessly with your test automation processes. You can control the MSSB directly from your testing frameworks or systems.



The easy way of SIM switching



Available versions

QUALIGON's Matrix SIM SwitchBox (MSSB) incorporates intelligent technology to control and switch up to 32 SIM cards, as well as up to four modems or handsets via USB or LAN. Choose from different versions to suit your specific needs.

Powered by a microprocessor, the MSSB operates with real SIM cards, avoiding any SIM virtualisation. All versions are universally applicable for standalone scenarios, fully drive-test capable, and offer a cost-efficient solution for a variety of applications requiring SIM switching.

Switching X SIMs		To Y Devices
4	X	1
8	X	4
16	X	2
32	X	1

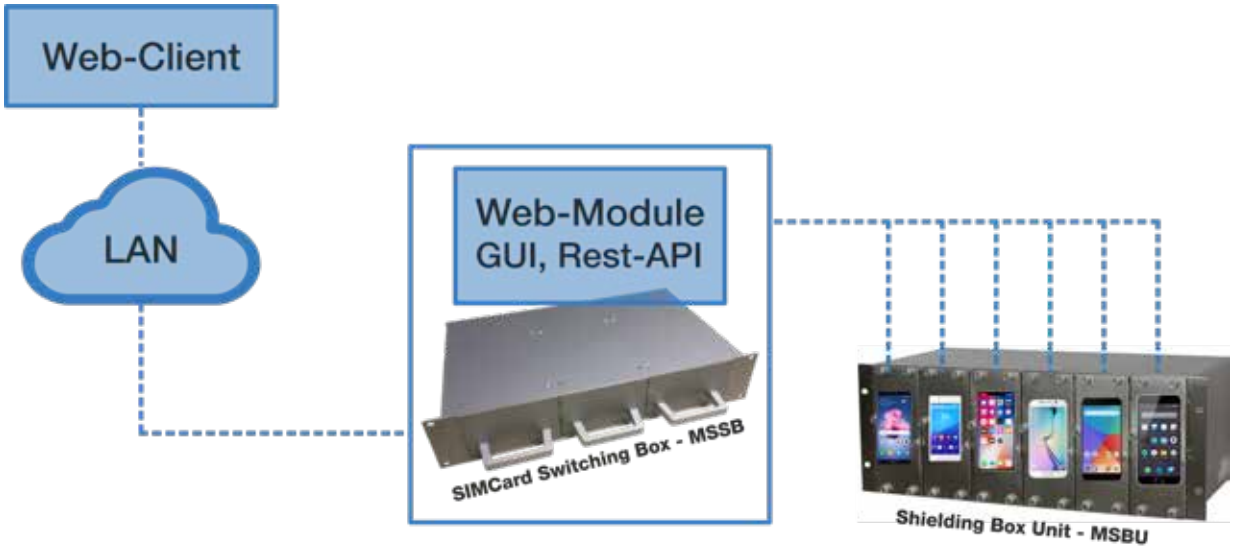
MATRIX SIM SWITCHBOX - The easy way of SIM switching

Benefit from MSSB in the following scenarios:

// Testing interworking between SIM cards and mobile devices
// Testing SIM profiles across different network technologies
// Integration-ready for automated test systems
// Enabling “always-on” functionality with redundant mobile network access
// Optimising data connectivity by switching between mobile networks
// Ensuring machine-to-machine (M2M) communication through network selection

Features

// Combined SIM multiplexer with software-controlled switching of up to 32 SIM cards and up to 4 devices
// Supports testing and implementation of two-factor authentication (2FA) use cases
// Easy access to SIM cards
// Enhanced support for smartphones and USB devices
// Simple integration in existing systems
// Control via Terminal (Linux, Mac OS) or PowerShell (Windows)
// Combination with Shielding Boxes and automated attenuators for network property influence
// Integrated display for system status
// Customised software-controlled network access and login procedures based on your requirements
// Easy integration into test frameworks such as Perfecto, Digital.ai, Segron, QiTASC etc.
// Rack system for server room integration
// Portable desktop system available
// MSSB 4x1 with Bluetooth control



MSSB Admin

// MSSB Admin offers host-based control of the MSSB
// The software interface provides external control of all MSSB functionalities and key features using HTTP commands
// User-friendly and cost-efficient integration in existing systems

Do you want to include MSSB Admin in your architecture?
Our team is ready to support you. Please contact us.

// Remote SIM Switchbox

Remote SIM Switchbox QVSS

QVSS supports the implementation of automated software tests on mobile devices requiring **SIM card multiplexing** or roaming tests. It is specifically designed for use cases where **remote testing** is essential. SIM and terminal devices can be placed in **different physical locations,** such as cities or countries**, and are interconnected via IP.** Switching can be performed through a graphical interface (web GUI) or by using the REST API with HTTP commands.
The system uses physical SIM cards, providing complete and transparent access to them, along with simplified SIM management.
QVSS is fully customisable and available in **different symmetric and asymmetric configurations, supporting up to 500 SIM cards based on your requirements**.

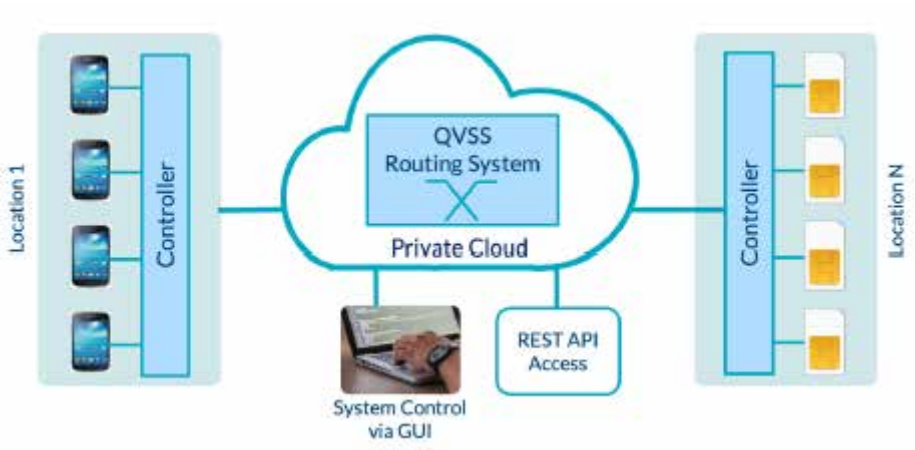
Selected configurations are:

// QVSS 16x8 to multiplex 16 SIM to 16 terminals
// QVSS 64x64 to multiplex 64 SIM to 64 terminals
// QVSS 128x64 to multiplex 128 SIM to 64 terminals

Systems with a higher number of SIM cards or terminals are also possible. Our customers include **mobile network operators, phone companies**, professional **app developers, test houses, cell phone manufacturers and business consultancies**.
QVSS integrates seamlessly with your test **automation processes**. You can control QVSS directly from your testing frameworks or systems using commands.

Architecture

SIM cards and terminals are connected to a controller and can be placed in multiple locations. The controllers are connected via IP to the QVSS Routing System, which can be deployed either in a private cloud or within the customer‘s network. SIM switching can be managed through the browser-based GUI or integrated into automated test systems and scripts using our REST API.



Features

// Remote, IP-based SIM multiplexer with software-controlled switching.
// Supports up to 500 SIM cards and terminals across multiple locations.
// Customisable configurations for SIM cards and terminals.
// Compatible with iOS, Android devices.
// Supports testing and implementation of two-factor authentication (2FA) use cases.
// Control via graphical user interface (GUI) and REST API.
// QVSS Routing System can be installed on-premises, in private networks, or as a cloud-based configuration.
// Compatible with test frameworks such as Selenium / Appium, as well as testing systems from various vendors.
// Tested with Shielding Boxes and automated attenuators for property influence analysis.
// Easy access to SIM cards.
// Modular rack system.

Services

// QVSS online demonstration (on-premise upon request).
// Implementation of pilot projects.
// Training and support
// Development of complete test cases as managed services.
// Integration of Shielding Boxes into your testing processes.

// Radio Field Simulation

Radio Field Simulation - Attenuator Unit

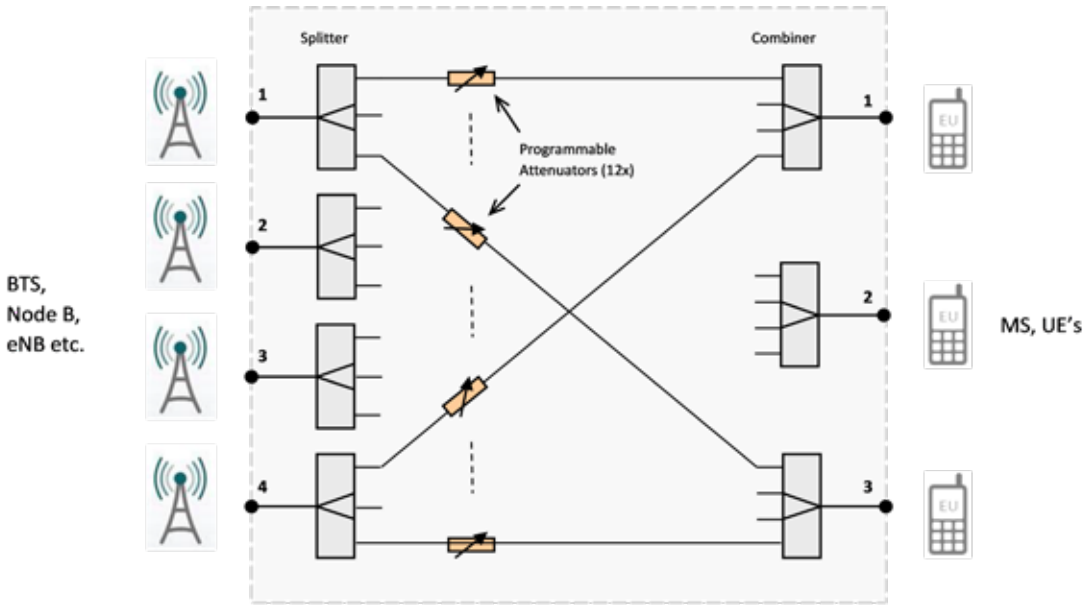
The Air Interface Emulator (AIAD) provides a testing solution for mobile radio base stations and mobile devices in the laboratory via the air interface. This allows for reproducible RF tests to be conducted independently of live networks and environmental radio interference.
With our AIAD devices, you can efficiently test a variety of specific handover scenarios. This enables quick and reliable localisation of errors within the laboratory. Our radio field simulations were developed for mobile phone testing from 2G to 5G FR1, but they can also be used for Wi-Fi, Bluetooth and other radio technologies (f.e. TETRA).

How does it work?

Using semiconductor switches, different attenuators (1 dB, 2 dB, 4 dB, 8 dB, etc.) can be integrated into the signal path, allowing for all attenuation values from 0 to 95 dB (up to 122 dB on request) in 1 dB or 0,5 dB steps. A built-in logic system selects the required attenuation steps. In these programmable attenuators, the RF signal is transmitted bidirectionally (uplink and downlink share the same attenuation).
The internal attenuator switchovers occur continuously and without interruptions. Several programmable attenuators are incorporated into the AIAD, along with various signal splitters and combiners, to emulate the radio field using an attenuation network. Control is facilitated through multiple interfaces (LAN, USB, etc.) using SCPI-like command strings.

Additionally, a Windows program is available as an accessory, enabling quick programming of ramps for handover tests.

Block diagram, example AIAD-4/3:



AIAD-X/Y (X/Y = number of inputs/outputs)

Many programmable attenuators are connected in a matrix configuration (full-fan-in, full-fan-out attenuation matrix) to simulate different radio conditions of the air interface. The AIAD connects on one side to various base station signals and, on the other side, to different mobile devices within a corresponding shielding box via an antenna (accessory). This setup allows for tests to be conducted without interference from the environment and without disturbing mobile subscribers in live networks. Desired attenuation values can be set independently for all signal paths between the base stations and the mobile devices.

PAH-X, Programmable Attenuator Unit

(X = number of paths) Several programmable attenuators are built into one device. All connections are accessible from the front or rear panel. Usually with built-in manual control.

Features

// Different types of handover test scenarios are possible.
// Switching time <10 ms (TTL version available with a 50 µs switching time)
// Supply of interference sources, e.g. noise for BER testing
// Robust design through semiconductor-switched attenuation
// No calibration required

// Shielding Box - MSB

EMC shielded boxes are essential for reliable testing of radio interfaces. These RF shielded boxes enable consistent and reproducible measurements when a shielded test environment is necessary.

In research and development laboratories, as well as in the testing, calibration, and manufacturing processes of electronic products, a shielded environment is crucial to prevent spurious emissions and interference from unwanted radio signals. Using the right equipment ensures an optimal environment, saving considerable time and reducing costs.

These processes necessitate an appropriate shielding box. We manufacture custom Shielding Boxes of various sizes, equipped with special interfaces and/or various filter components, in our own mechanical milling center and electronic production facility. With our extensive technological know-how and expertise in the design and manufacture of Shielding Boxes, we can flexibly implement our customers' requirements.

MTS Systemtechnik GmbH already offers a wide range of Shielding Boxes, allowing us to provide suitable solutions for nearly all areas where a defined RF environment is required. The robust and high-quality design ensures an exceptionally long service life without compromising operability.

Shielding Box Unit MSBU-6CA-4HU:

MTS Shielding Box - MSB-Series

The Shielding Box Unit (MSBU) is designed for measurements and tests of electronic devices, such as mobile phones, without electromagnetic interference from the environment.
MTS Systemtechnik GmbH has developed a compact EMC shielded plug-in housing to meet versatile requirements. The robust construction of the MSBU series makes it ideal for long-term industrial testing. To provide maximum flexibility and user-friendliness, the Shielding Box Unit consists of six independent shielding chambers (other configurations are available), each equipped with RF and communication interfaces. This design allows the shielding box unit to be utilized for different tests or by multiple users simultaneously. The operation of the devices under test (DUTs) can be managed independently for each chamber via the supplied communication interfaces.

Features

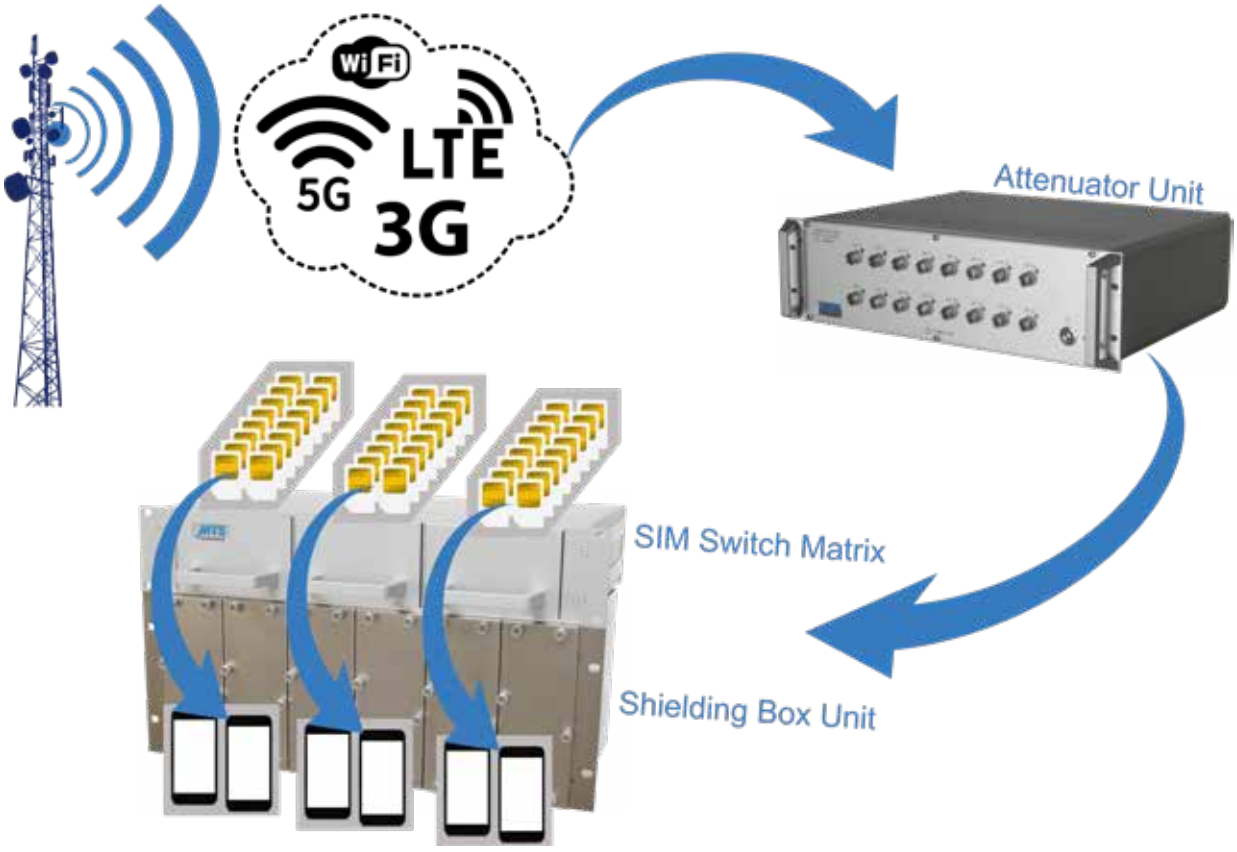
// Highest quality materials ensure extended service life + a high level of testing.
// Economical solution for high RF shielding and reproducible test scenarios, reducing time-consuming and expensive laboratory tests.
// Suitable for frequencies between 500 MHz and 6000 MHz.
// 19“ rack-mounted housing.
// A wide range of supply and communication interfaces is available.
// Changes and modifications can be made according to customer requirements.

// Summary

SIMCard Switching Test Solution

By combining the MTS Systemtechnik air interface emulation (Air Interface Adapter) with the Qualigon Matrix SIM Switchbox and the MTS Systemtechnik Shielding Box systems, you can perform highly flexible tests under various network conditions and with different SIM cards on multiple terminals. The systems can be remotely controlled and easily integrated into your automated test environment.

// Direct support in the test system platforms as Perfecto, Experitest, Segron, QiTASC etc.
// No software is required on the mobile device.
// Ready for integration into automated test systems.
// Software-controlled switching of SIM cards for incorporation into automated software tests.
// Highest quality materials ensure extended service life and a high level of testing.
// An economical solution.


Wi Fi
LTE
5G
3G
Attenuator Unit
SIM Switch Matrix
Shielding Box Unit

Do you want to include the SIMCard Switching Test Solution in your architecture?

Our team is ready to support you.

Please contact us.

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