

AIE-W5LR

5 Port Air Interface Emulator, 500 ... 9000 MHz

Features

- 127 dB attenuation range
- High power capability
- LAN and USB Remote Interface
- Trigger interface
- Compact 19", 1 U device

Applications

- Air interface emulation
- Multipoint radio fading simulation
- Mesh network testing
- Wi-Fi (802.11 a/h, ac, b, g, n, p)
- LTE 5G, 6G
- V2X, V2V



At a Glance

The AIE-W5LR radio field emulator enables the realistic simulation of RF levels for wireless communication between mobile devices and wireless networks such as Wi-Fi or LTE. The device features 5 RF ports that can be used for base stations or DUTs (Devices Under Test), such as mobile phones. Each of the 5 ports can be configured with an individual combination of signals from the other 4 ports. The signal levels can be varied within a wide dynamic range using internal precision attenuators.

Due to the device's high-frequency bandwidth, it can be flexibly used for almost all common wireless transmission standards, including GSM900, GSM1800, UMTS, LTE 4G, LTE 5G FR1, LTE6G, IEEE 802.11a/b/g/n/ac/ax (Wi-Fi 6E), and 802.11be (Wi-Fi 7). The reproducible emulation of air interface scenarios in a laboratory environment saves time and costs in product development and verification.

Matrix function

The AIE-W5LR can also be used as a non-blocking matrix switch. Each input and output can be connected to the other ports in any way. Attenuators between the signal paths also allow the emulation of fading effects. Due to the fast response time of the attenuators, the device is ideal for efficient and fast solutions in automatic test systems.

Wideband

The operating frequency range is 500MHz to 9000MHz. Therefore, the AIE-W5LR is usable for all Wi-Fi standards including 802.11p for V2X and V2V communication.

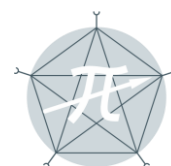
High Dynamic

The adjustment range of the digitally controlled attenuator is 127.0 dB and can be freely adjusted in 0.25 dB steps. This enables use in test applications with the highest demands on dynamics and accuracy. The high attenuation range allows RF signal levels to be reduced below the sensitivity limit of connected devices. All RF connections of the device allow power levels of up to 2 watts.

Synchronous Operation

The AIE-W5LR can be conveniently and efficiently remotely controlled via LAN and USB interfaces and an additional TRIGGER-IO port. With each execution of switching commands, the trigger interface delivers a precise voltage pulse that can be used for the synchronous execution of switching commands from other devices in the compound. In addition, external pulses can be applied to this port in order to synchronously trigger the execution of pending switching commands. The emulator's attenuator configuration can be preloaded with SCPI-oriented ASCII strings in a queue over the LAN interface. After a positive TTL pulse edge at the trigger input, the preloaded damper configuration is then executed by the hardware without delay.

Principle diagram



RF Specifications

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition |
|-----------------------------------|-----------------------------------|---------------|--------|-------|------|------------------------------------|
| impedance | Z _{IN} /Z _{OUT} | | 50 | | Ω | |
| low frequency | f _{min} | | 400 | 500 | MHz | |
| high frequency | f _{max} | 8000 | 9000 | | MHz | |
| number of RF ports | n _{RF} | | 5 | | | bi-directional |
| return loss* ² | S ₁₁ , S ₂₂ | | -14 | -10 | dB | f ≤ 4 GHz |
| | S ₁₁ , S ₂₂ | | -14 | -7 | dB | f > 4 GHz |
| insertion loss* ¹ | S ₂₁ | -24 | -21 | | dB | f = 1 GHz |
| | S ₂₁ | -26 | -23 | | dB | f = 2 GHz |
| | S ₂₁ | -33 | -30 | | dB | f = 5 GHz |
| | S ₂₁ | -40 | -37 | | dB | f = 7 GHz |
| | S ₂₁ | -42 | -39 | | dB | f = 8 GHz |
| attenuation dynamic* ³ | dATT | | -30 | | dB | |
| attenuation range | ΔS ₂₁ | 0.00 | | 127.0 | dB | |
| attenuation resolution | dS ₂₁ | | 0.25 | | dB | |
| attenuation accuracy | ATT _{ERR} | | ± 0.50 | | dB | @ 3 GHz, ATT = 63.5 dB |
| | t _{ASET} | | 1 | | μs | |
| atten. response time | t _{ARSP} | | 1 | | ms | |
| DC voltage | U _{DC} | | | 20 | V | |
| ESD discharge resistor | R _{ESD} | | 4.7 | | kΩ | all inputs and outputs |
| input power | P _{RF} | | | +33 | dBm | CW |
| RF connector | X _{RF} | N female | | | | rear side |
| trigger input | X _{TRIG} | BNC female | | | | internal 1 kΩ pull up, active high |
| trigger level | U _{TRIG} | TTL (0 / 5 V) | | | | |
| trigger offset | t _o | | 0.5 | | μs | 50% trigger → 50% RF |
| attenuator settling time | t _{RISE} | | 0.3 | | μs | 10% → 90% RF |

*1: ch. attenuator setting: 0.00 dB

*2: ch. attenuator setting: 127.00 dB

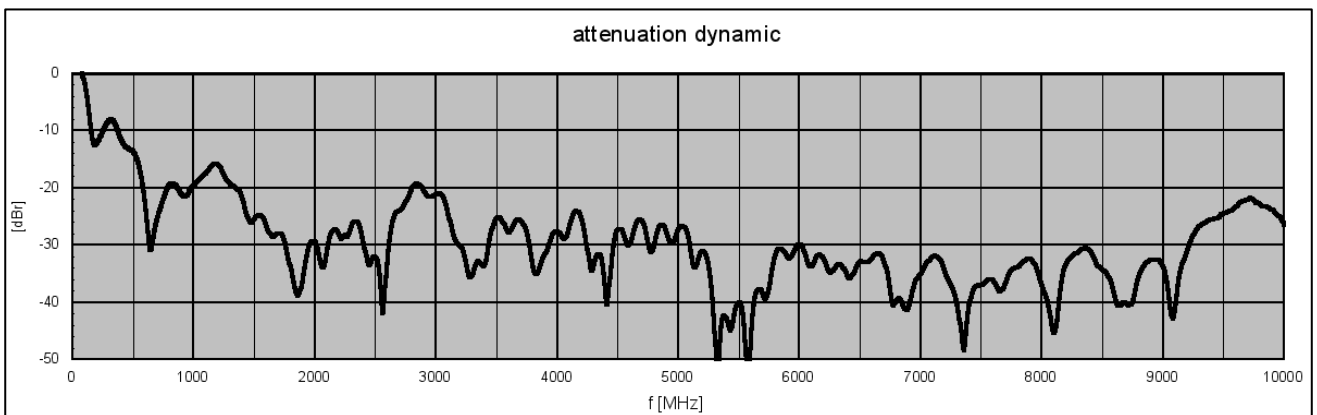
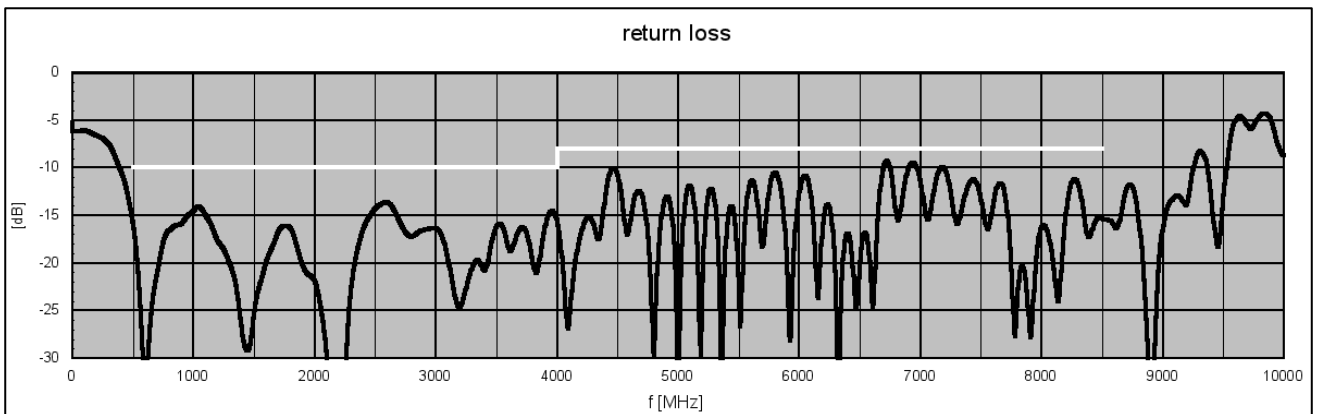
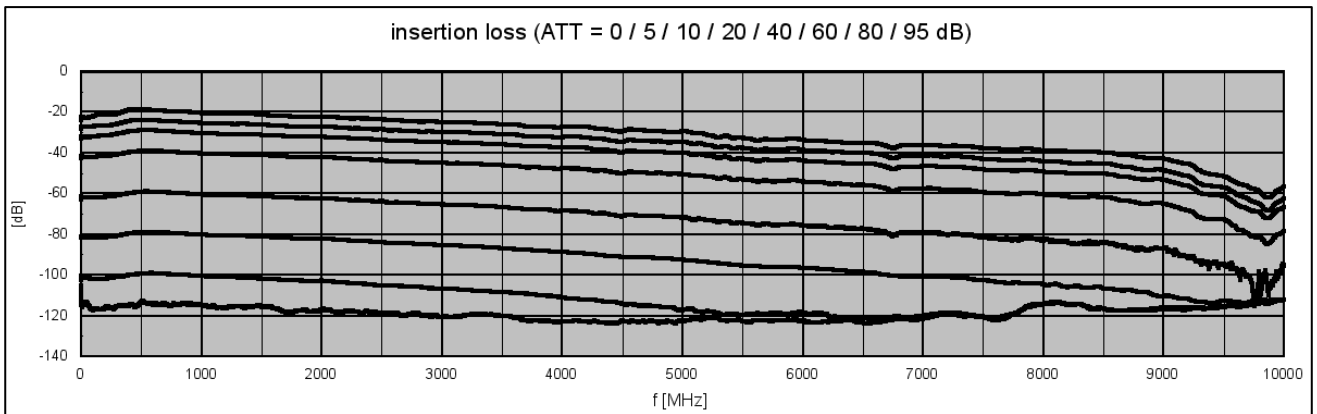
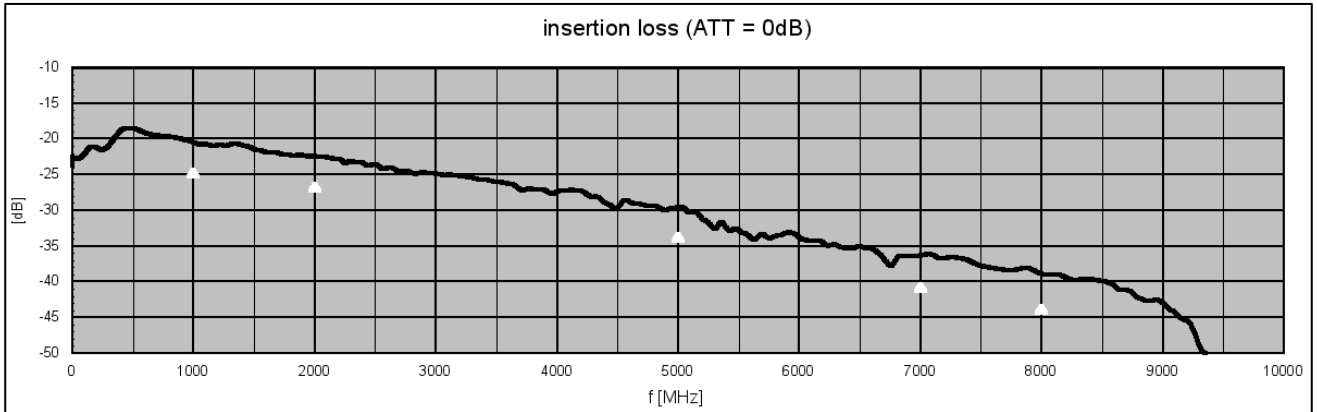
*3 ch.. attenuator setting 127.00, all other ch. attenuator setting 0.00 dB, referred to insertion loss

Common Specification

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition |
|-------------------------------|---|------------------------|-------------|--------|------|---|
| voltage supply range | U _{AC} | 90 | 230 | 260 | V | 50 / 60 Hz AC |
| power consumption | P _{AC} | | 3 | | W | |
| power socket | X _{AC} | IEC-60320 C14 | | | | country specific mains cable |
| Dimensions and weight | | | | | | |
| dimensions | W x H x D | approx. 482 x 44 x 460 | | | mm | 19" 1 U, without connectors and handles |
| weight | m | | 6 | | kg | |
| Environment conditions | | | | | | |
| operating temp. range | T _o | +5 | | +45 | °C | |
| storage temp. range | T _s | -40 | | +70 | °C | |
| Remote interfaces | | | | | | |
| remote ports | LAN | 10/100BaseT | | TCP/IP | | RJ45 |
| | USB | 2.0 (high speed) | | | | USB type B |
| Product conformity | | | | | | |
| Electromagnetic compatibility | EU: in line with EMC directive (2014/30/EC) | | | | | applied harmonized standards: EN 61326-1 (for use in industrial environment), EN 61326-2-1, EN 55011 (class B), EN 61000-3-2, EN 61000-3-3 |
| Electrical safety | EU: in line with low voltage directive (2014/35/EC) | | | | | applied harmonized standard: EN 61010-1 |
| Ordering information | AIE-W5LR | | 2109.4002.1 | | | |



S-Parameters (typical responses)



Appearances

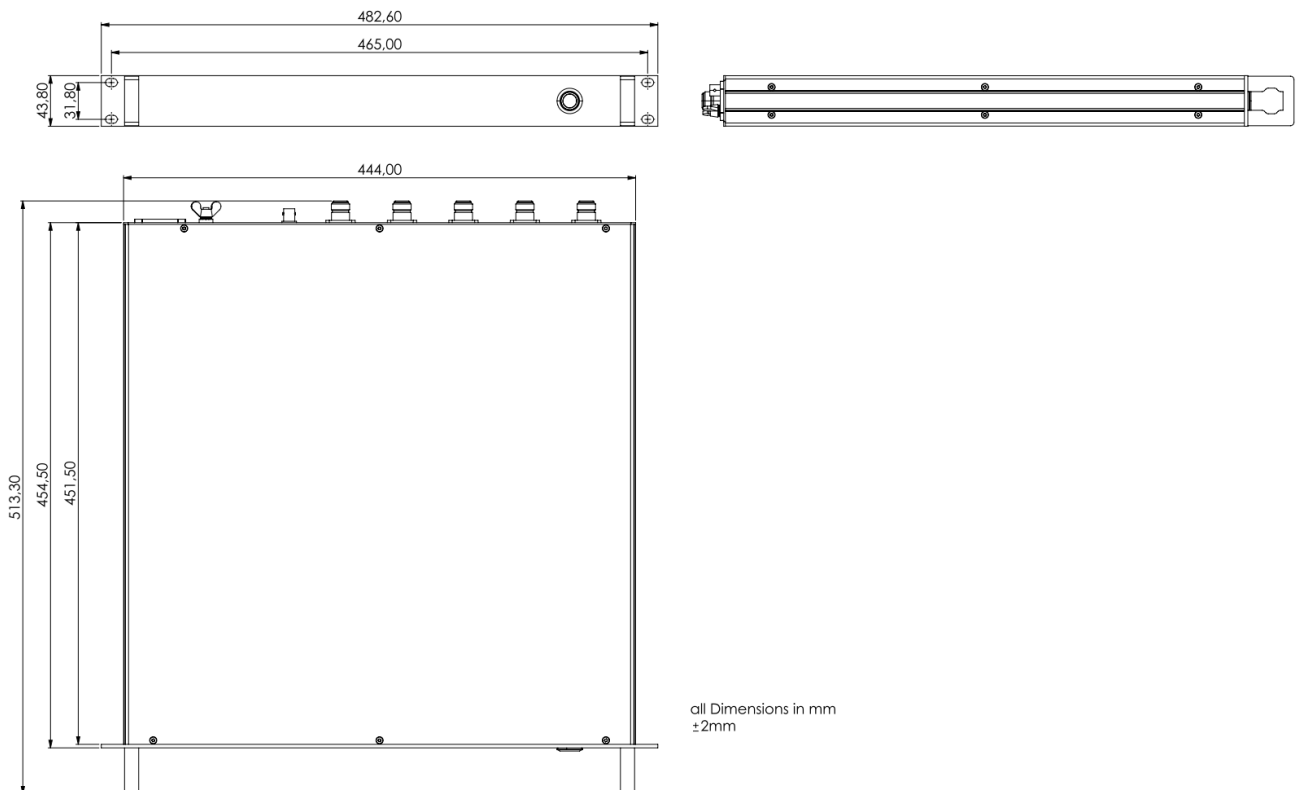
Front View



Rear View



Dimensions



Related Products

| Product | Description | P/N |
|-----------|--|-------------|
| AIE-W5LR | 5 Port Air Interface Emulator, 500...9000 MHz, 1U 19" Device | 2109.4002.1 |
| AIE-W8LR | 8 Port Air Interface Emulator, 500...8000 MHz, 2U 19" Device | 2109.4102.1 |
| AIE-4X4LR | 4X4 Channel Air Interface Emulator, 500...9000 MHz, 127 dB attenuation range, 1U 19" Device | 2109.4502.1 |
| AIE-4X4LR | 4X4 Channel Air Interface Emulator, 500...9000 MHz, 63.5 dB attenuation range, 1U 19" Device | 2109.4502.2 |
| AIE-4X8LR | 4X8 Channel Air Interface Emulator, 500...9000 MHz, 63.5 dB attenuation range | 2109.4602.2 |

