

- **75MHz-6GHz Vector Signal Transceiver (VST) based on ADI ADRV9009 Radio Frequency Front End**
- Turnkey solution for IQSTAR measurement software
- Dedicated firmware to run the VST like a benchtop instrument grade solution
- Characterization of RF Power Amplifier in the base station-like conditions
 - LTE/5G PA Tests with signal generation and analysis bandwidth up to 400MHz
 - 1-tone measurements: CW and pulsed CW characterization with configurable rise/fall time
 - 2-tone measurements for video bandwidth analysis



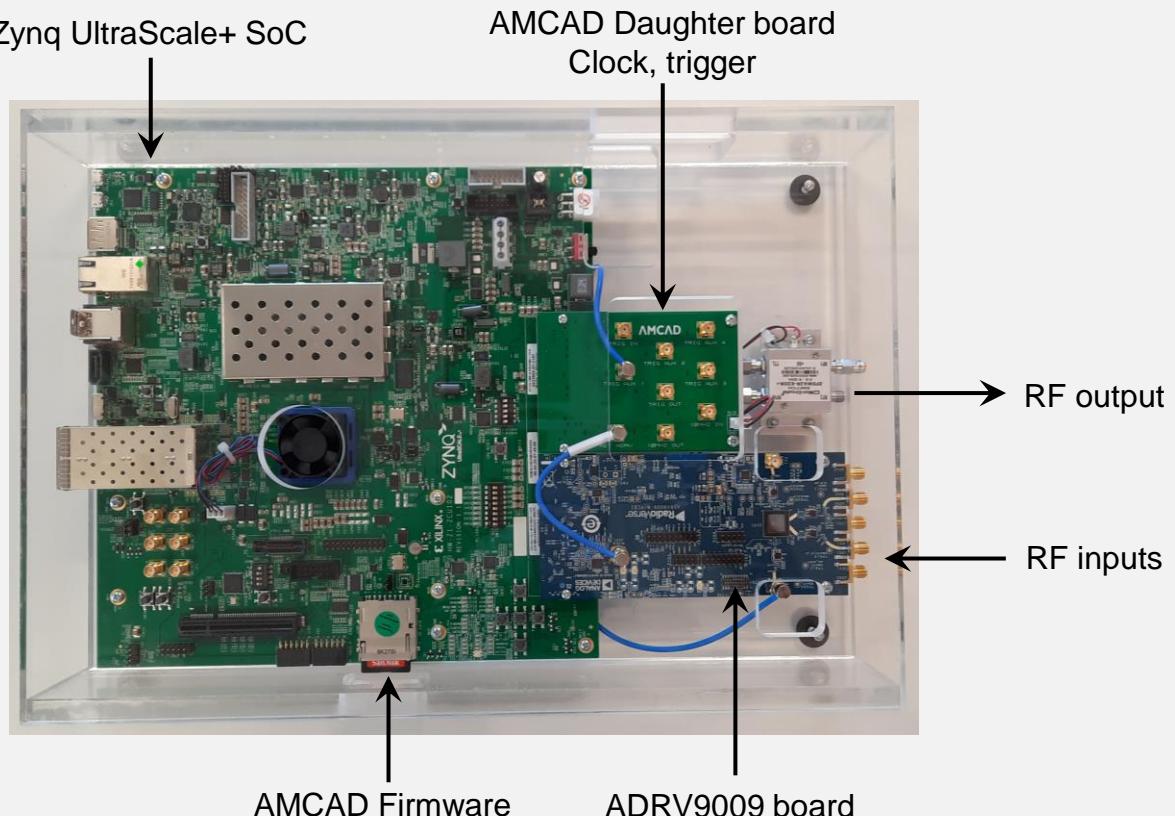
AMCAD

75MHz-6GHz Vector Signal Transceiver for Power Amplifier Test

Vector Signal Transceiver main features

- RF frequency: 75 MHz - 6 GHz
- Maximum instantaneous bandwidth: 400 MHz
- Integrated vector signal generator and vector signal analyzer
- Enable 1-tone CW and pulse, 2-tones, IQ modulation for PA test
- Absolut source power settings (calibrated)
- Configurable pulse rise/fall timings in pulsed CW mode
- Automatic attenuator settings on Tx and Rx interface for high accuracy measurements
- Acquisition averaging up to 8192 in IQ modulation mode for high dynamic range characterization
- Trigger and 10 MHz IN/OUT available to connect power meters, multimeter or spectrum analyzer
- High data transfer rate (Gigabit LAN interface)

Power Amplifier test platform description

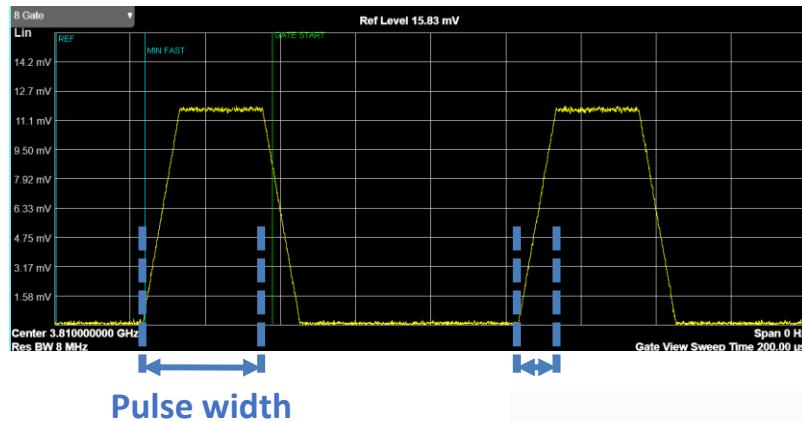


Application example

IQSTAR software associated with the **VST PA test platform** enables multiple power amplifier measurements with a single test bench to **shorten the PA circuit design cycle**. The PA test platform is the perfect fit to test Doherty/ Class AB/balanced Power Amplifier. The hardware allows evaluating performances of many circuit topologies and amplifier technologies like GaN and LDMOS in a single test bench.

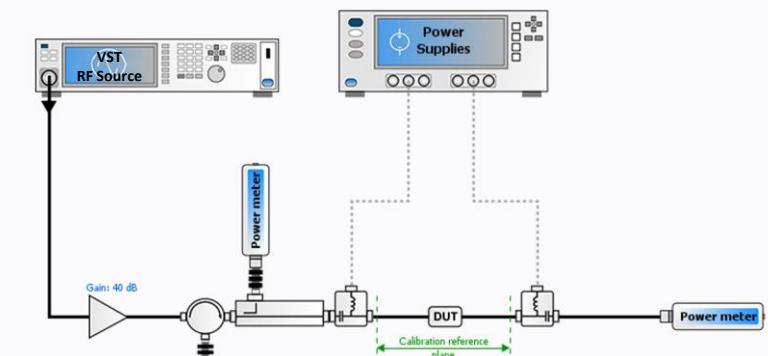
- CW and pulsed signal generation to measure power, gain and added efficiency
- 2-tone characterization to evaluate the Power Amplifier video bandwidth
- LTE/5G modulated signal characterization of power amplifiers to evaluate the linearity under Digital Pre-Distortion (DPD) conditions
- ACPR, EVM, power and efficiency measurement with complex modulated signal.

Pulsed CW Power Amplifier Characterization



RF pulse Rise/fall time can be easily adjusted in IQSTAR software within the 8ns to 66 μ s range.

The VST PA test platform provides pulsed CW signals in the 75MHz–6GHz frequency range with adjustable rise/fall time capability. This feature is useful for high-power amplifier characterization.



IQSTAR test setup for CW and pulsed CW PA characterization

Application example

2-Tones Characterization

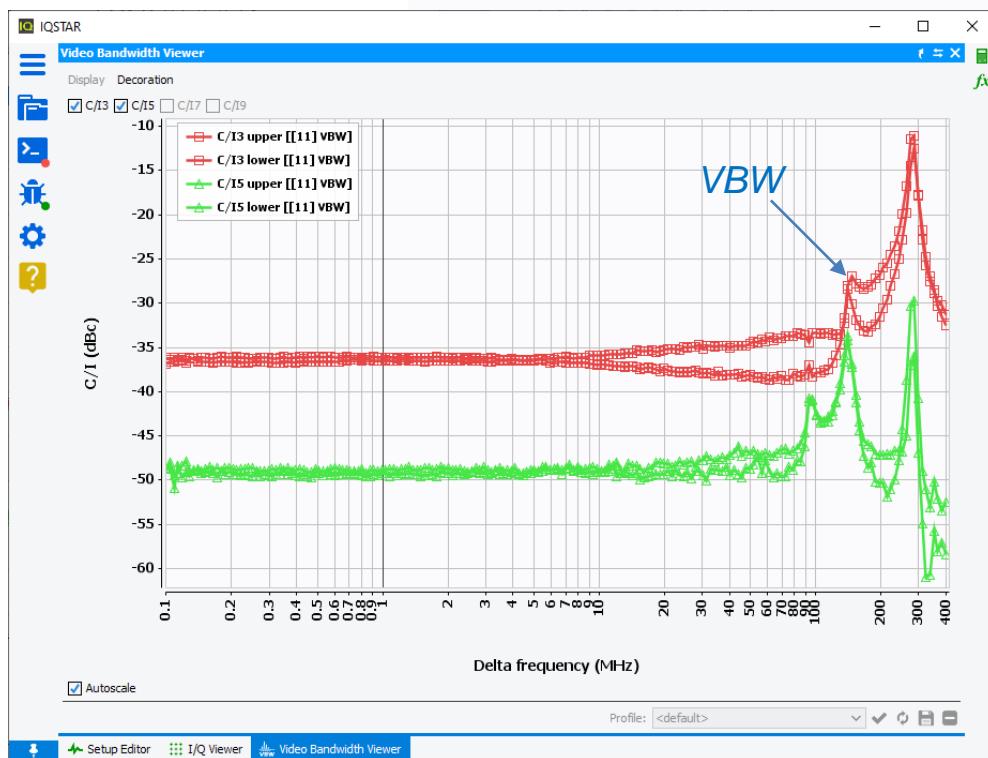
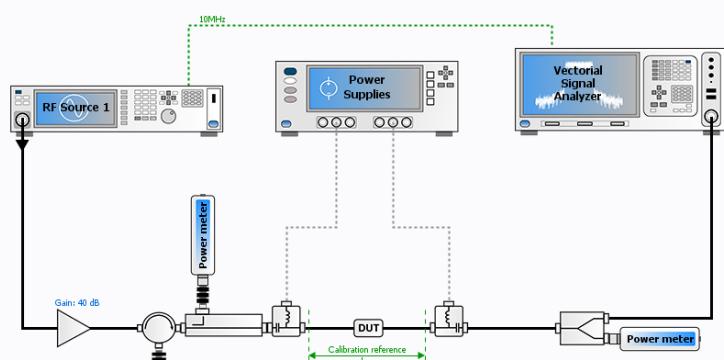
IQS100B-20 software module enables two-tone PA characterization to evaluate Power Amplifier video bandwidth.

The RF VST PA test platform generates two-tone signal for 5G FR1 applications. Tones spacing can be adjusted from 100kHz to 400MHz.

Intermodulation tones (IMD) are measured by an additional basic spectrum analyzer.

In the example below, a 50W power amplifier is characterized. The two-tone spacing range exhibits a PA's video bandwidth of 150MHz.

IQSTAR test setup for two-tones PA characterization



Two-tones measurement results in the 100kHz – 400MHz range

Application example

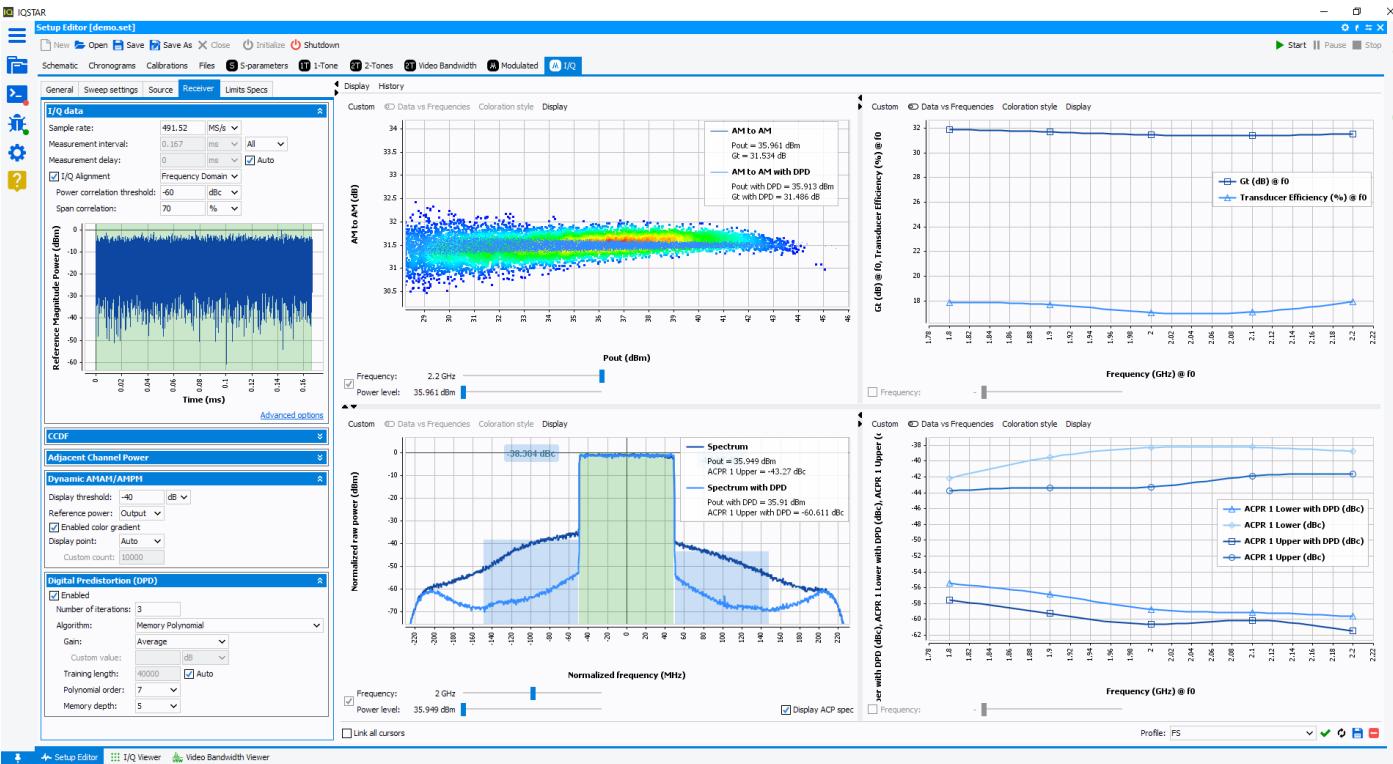
Modulated Signal Characterization

When the IQS100B-40 module drives the VST PA test platform, it enables high-speed and high-quality measurements of modulated signals to evaluate Power Amplifier performances with the LTE/5G modulation scheme.

With the software module IQS100B-41, IQSTAR uses several DPD techniques and algorithms to verify that the Power amplifier under test can be linearized with more or less complexity. The VST PA test platform allows ACPR, EVM, power and efficiency measurements.

The instantaneous bandwidth can go up to 400 MHz to address the performances of the 5G Power Amplifier under linearity constraints. The hardware with integrated attenuator auto-range feature and real-time averaging can easily measure ACPR down to -60dBc with 100 MHz modulation bandwidth.

The example below shows a 2-stage power amplifier linearization in the 1.8 GHz – 2.2 GHz frequency range. A 5G 100 MHz signal is used, the amplifier operates at constant output power (36dBm) and is pre-distorted thanks to Memory Polynomial DPD algorithms.



IQSTAR IQ DATA CONTROL & MEASUREMENTS control panel / 2-stage Power Amplifier evaluation

Specifications

General Specifications		
Frequency range		75MHz to 6GHz
RF OUTPUT PORT		
RF Output port connector		SMA female, 50 Ω nominal
RF Output port max. reverse input power level		+15dBm
RF Output port max. DC voltage input level		TBD
RF Output port setting level range		130dB relative to max power
RF Output port accuracy	Power Level = max power	< ± 0.15dB
	Overall power range	< +1dB
RF Output port setting resolution		0.01 dB
RF INPUT PORT		
RF Input port (ORx1, Rx1 and Rx1)		
	Connector	SMA female, 50 Ω nominal
	Max. safe input power level	+17 dBm
	Damage input power level	+23 dBm (peak)
	Max. DC voltage input level	+30V
RF Input port accuracy		NA (uncalibrated)
Harmonics		Rejected by external low pass filter
Frequency accuracy		± (Output frequency x 61.5ppm + 1.832)
Triggering		Internal, External, Free Run
INPUTS AND OUTPUTS		
10 MHz OUT		SMA female, 50 Ω nominal Output level: +5dBm (square waveform)
10 MHz IN		SMA female, 50 Ω nominal Input level range: -30 to +13dBm (sine or square waveform) Lock range: ± 30 ppm
TRIG IN		SMA female, >100 kΩ nominal Accepts +3.3V TTL Min. pulse width: 20 ns
TRIG OUT		SMA female, 50 Ω nominal +0.8Vpp into 50 Ω
TRIG AUX 2, TRIG AUX 3, TRIG AUX 4		SMA female, 30 Ω nominal +3.3Vpp into >100 kΩ +2.1Vpp into 50 Ω
DIMENSIONS AND WEIGHT		
Dimensions		88 mm (H) x 394 mm (L) x 274 mm (W)
Weight		

Specifications

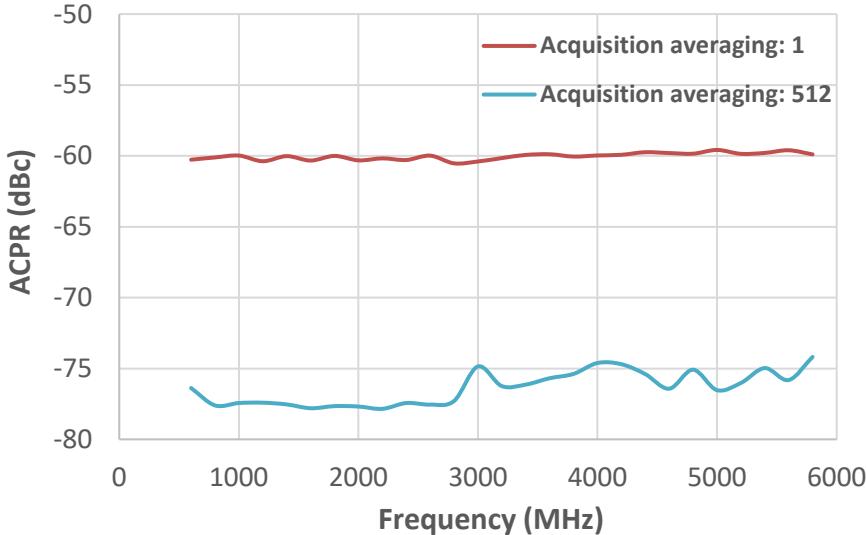
Vector Signal Generator and Vector Signal Analyzer - IQ waveform mode		
Sampling rate		122.88MSa/s, 245.76MSa/s, 491.52MSa/s
Capture depth		64MSa, 136ms @ 491.52MSa/s
Maximum signal generation and analysis bandwidth		
	Center frequency	
	75 MHz – 526 MHz	100 MHz
	526 MHz – 5835 MHz	400 MHz
	5836 MHz – 5948 MHz	200 MHz
	5948 MHz – 6000 MHz	100 MHz
Waveform transfer rate	Read	87.5MB/s
	Write	62.5MB/s

1-tone CW and pulsed modes		
Sampling rate (only applicable with 1-tone pulsed mode)		122.88MSa/s, 245.76MSa/s, 491.52MSa/s
ON/OFF ratio		> 80dB
Pulse period¹	Min.	1.83 µs
	Max.	17.47 µs
Pulse width¹	Min.	32.55 ns
	Max.	17.47 s
Pulse delay¹	Min.	0 ns
	Max.	8.74 s
Rise/fall time¹	Min.	8.14 ns
	Max.	66 µs
Resolution¹ (applicable to period, width, delay, rise/fall time)		4.07 ns

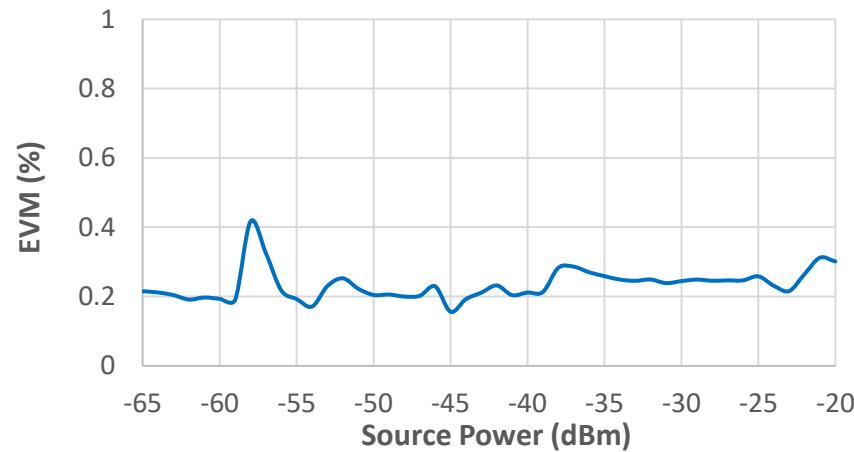
2-tones mode		
Frequency spacing		
	Center frequency	
	75 MHz – 526 MHz	100 kHz to 100 MHz
	526 MHz – 5835 MHz	100 kHz to 400 MHz
	5836 MHz – 5948 MHz	100 kHz to 200 MHz
	5948 MHz – 6000 MHz	100 kHz to 100 MHz
Frequency resolution between tones		57 mHz
Tone power range		95dB below average output power

¹ Data specified with 491.52MSa/s sampling rate, other values can be reach with different sampling rates.

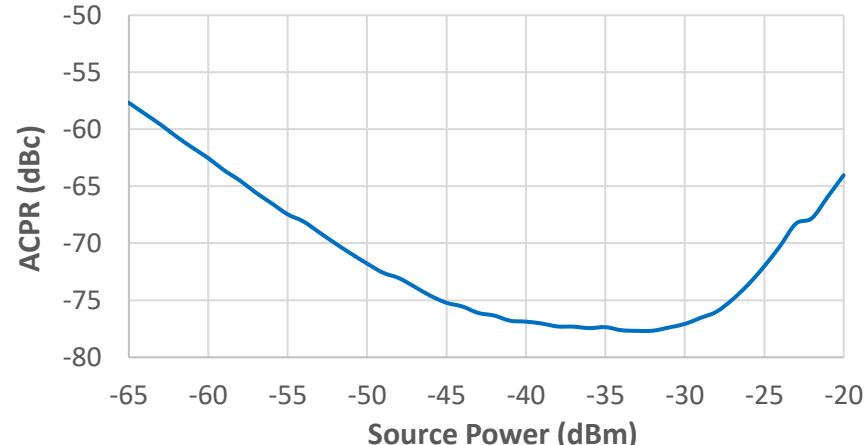
LTE Typical Performances



LTE performances vs. frequency
with 20MHz bandwidth

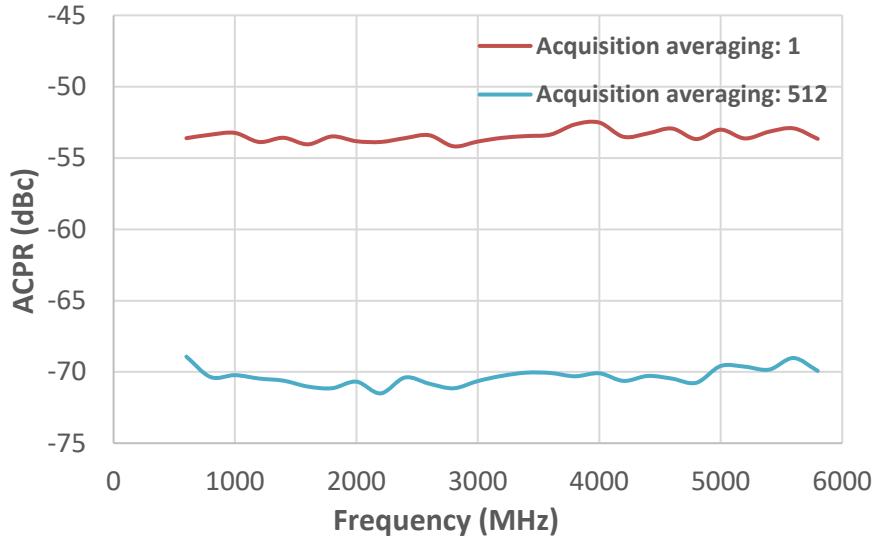


LTE performances vs. source power
at 2.6GHz with 20MHz bandwidth

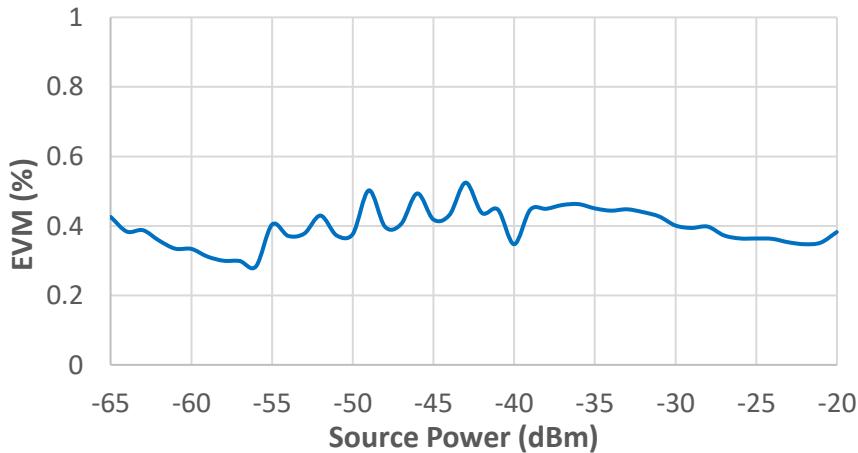


Note: RF output loopback to RF input.
Recommended external gain stage is
used at source output. Acquisition
averaging set to 512.

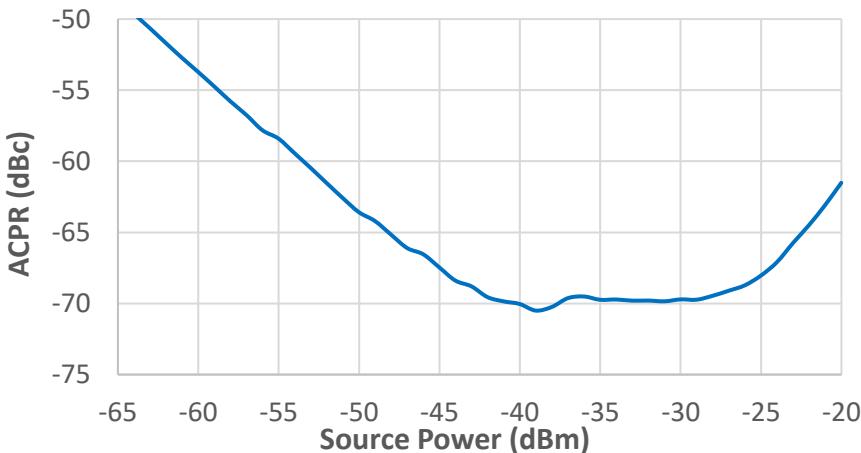
5G Typical Performances



5G performances vs. frequency
with 100MHz bandwidth



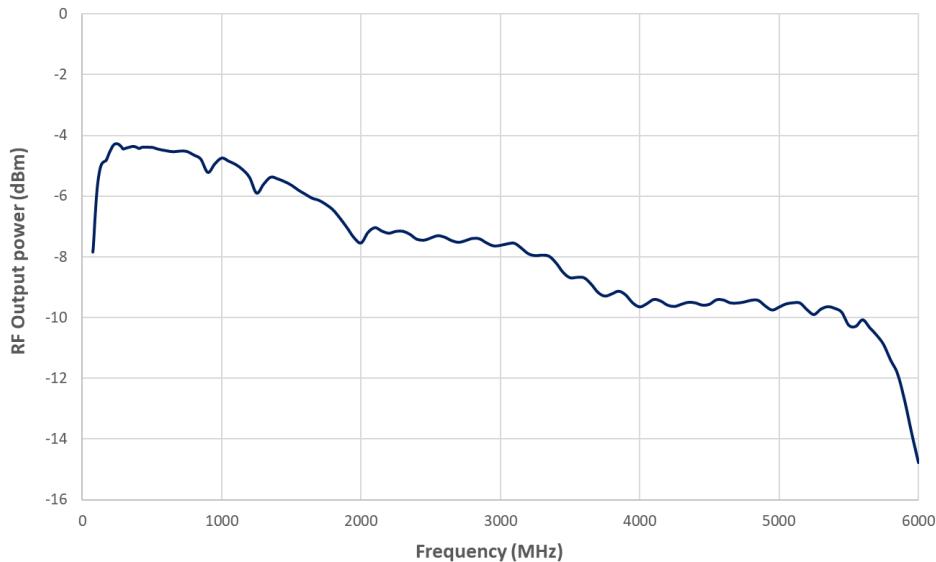
5G performances vs. source power
at 3.6GHz with 100MHz bandwidth



Note: RF output loopback to RF input.
Recommended external gain stage is
used at source output. Acquisition
averaging set to 512.

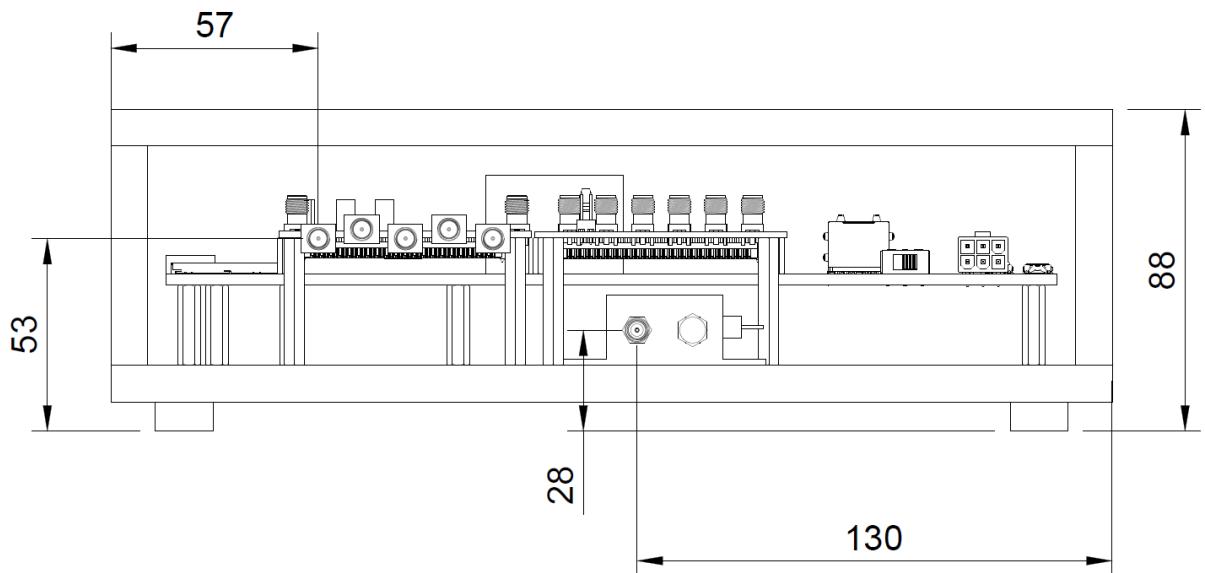
Typical Performances

CW Source Output power over frequency range



Mechanical Dimensions

Dimensions: 88 mm (H) x 394 mm (L) x 274 mm (W)



Warranty

Any AMCAD product comes with a two-year parts and labour warranty, when returned to our workshops. A phone support service is also available for the same period.

At the end of the initial two-year period, a further contract can be subscribed, including:

- a preventive functional check and calibration of the modules (on site or in our workshop)
- a further two-year warranty period

Quality Regulations & Environment

AMCAD Systems and all modules are compliant to the applicable European directive and hold the CE mark.

- Products are designed and manufactured in France.
- Serial number-based life cycle management
- All products are 100% tested (test reports on demand)
- AMCAD only uses RoHS compliant components and does not use substances banned by the COSHH regulation.
- AMCAD complies with the relevant national regulations related to the safety and health of its employees against hazardous substances.
- As we are always seeking to improve our products, the information in this document gives only a general indication of the product capacity, performance and suitability, none of which shall form part of any contract. We reserve the right to make design changes without notice.

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