

# IQMASTER

**IQ6400 – Vector Signal Transceiver**

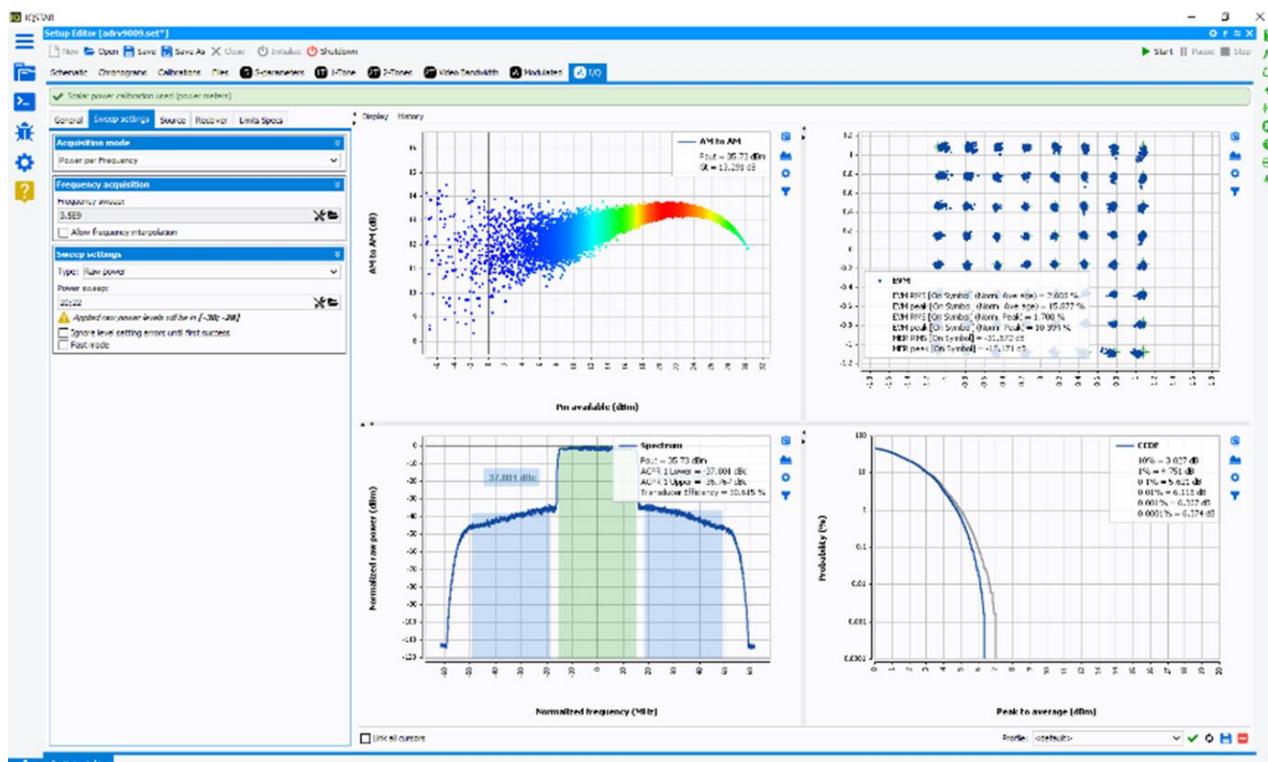
**75MHz-6000MHz (BW 400MHz)**



# AMCAD

# Applications

- **75MHz-6GHz Vector Signal Transceiver (VST) based on Radio Unit SoC Technologies**
- **Turnkey solution for IQSTAR measurement software**
- **Dedicated firmware to run the VST like a benchtop instrument grade solution**
- **Measurement of RF Power Amplifier in 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**
  - **IQ signal generation and analysis with Digital Predistortion capabilities - 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)**



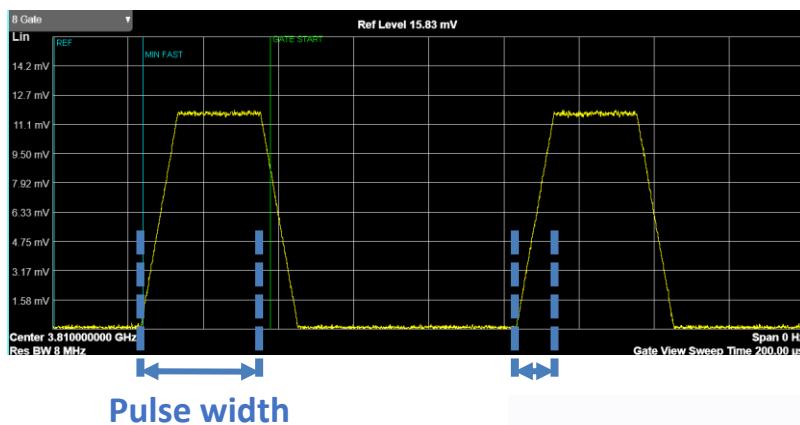
## Application example

**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 Amplifiers.

The hardware allows evaluating performances of many circuit topologies and amplifier technologies like GaN and LDMOS in a single test bench.

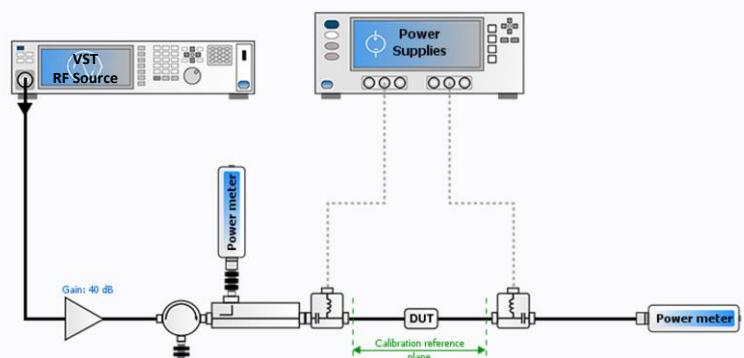
- CW and pulsed signal generation to measure power, gain and added efficiency
- 2-tone characterization to evaluate the Power Amplifier video bandwidth
- LTE/5G modulated signal characterization of power amplifiers to evaluate the linearity under Digital Pre-Distortion (DPD) conditions
- ACPR, EVM, power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

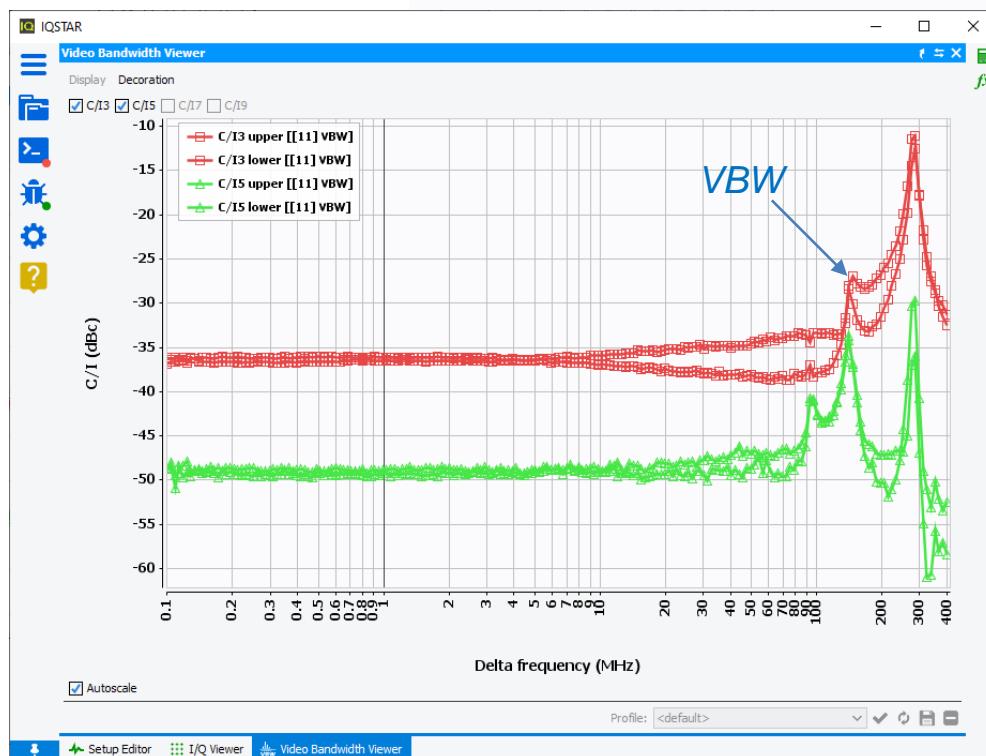
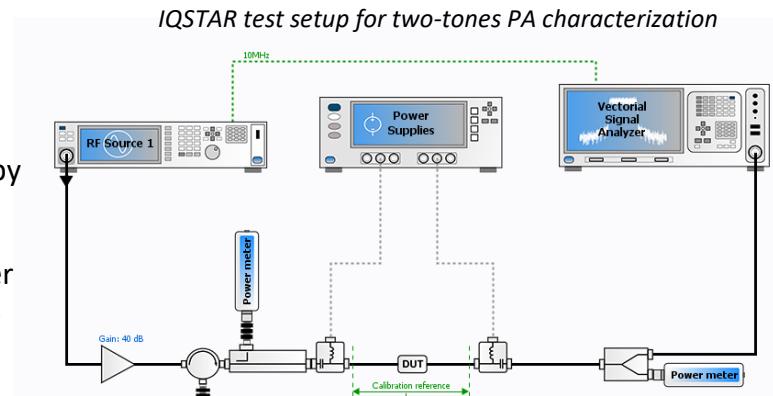
### 2-Tones Characterization

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.



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

## Application example

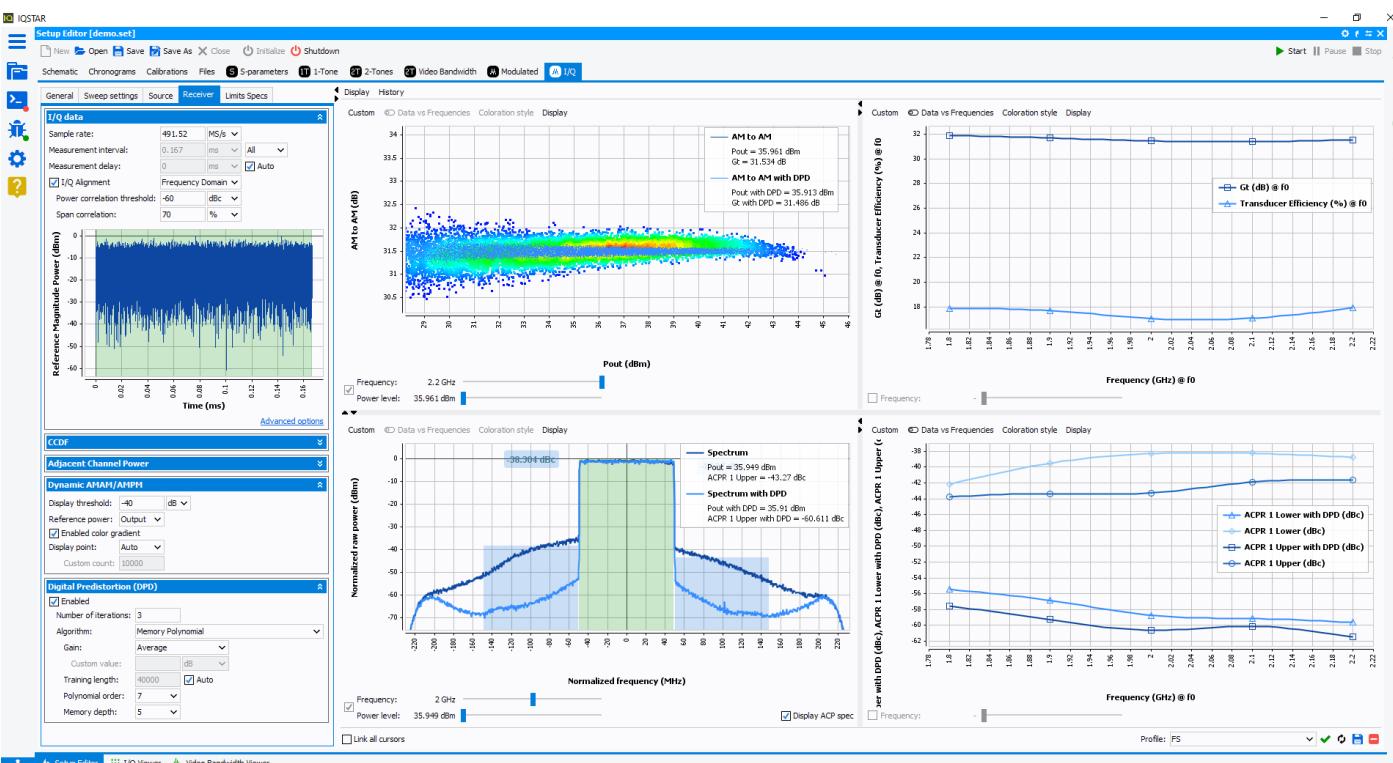
### Modulated Signal Characterization

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

# Specifications

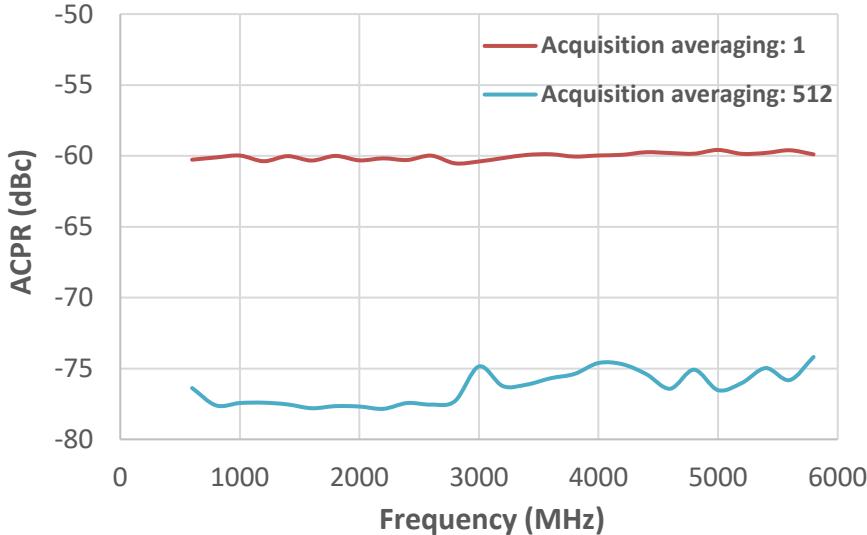
Vector Signal Generator and Vector Signal Analyzer - IQ waveform mode		
<b>Sampling rate</b>		<b>122.88MSa/s, 245.76MSa/s, 491.52MSa/s</b>
<b>Capture depth</b>		<b>64MSa, 136ms @ 491.52MSa/s</b>
Maximum signal generation and analysis bandwidth		
	Center frequency	
	75 MHz – 526 MHz	<b>100 MHz</b>
	526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

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

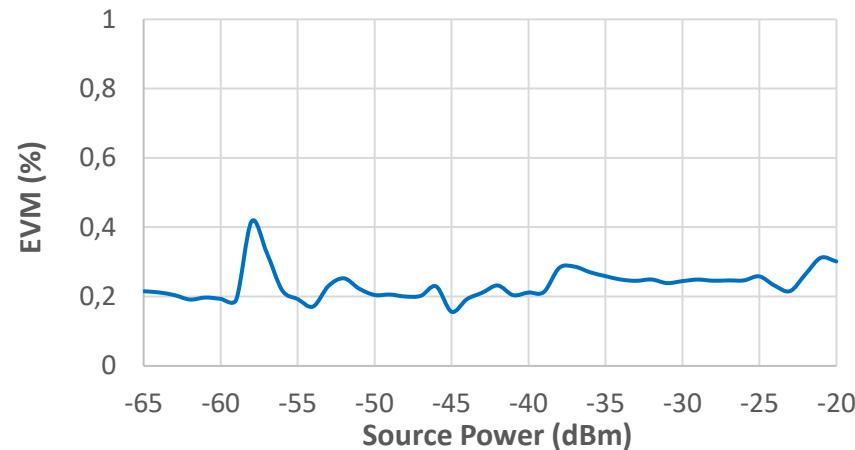
2-tones mode		
<b>Frequency spacing</b>		
	Center frequency	
	75 MHz – 526 MHz	<b>100 kHz to 100 MHz</b>
	526 MHz – 5835 MHz	<b>100 kHz to 400 MHz</b>
	5836 MHz – 5948 MHz	<b>100 kHz to 200 MHz</b>
	5948 MHz – 6000 MHz	<b>100 kHz to 100 MHz</b>
<b>Frequency resolution between tones</b>		<b>57 mHz</b>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

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

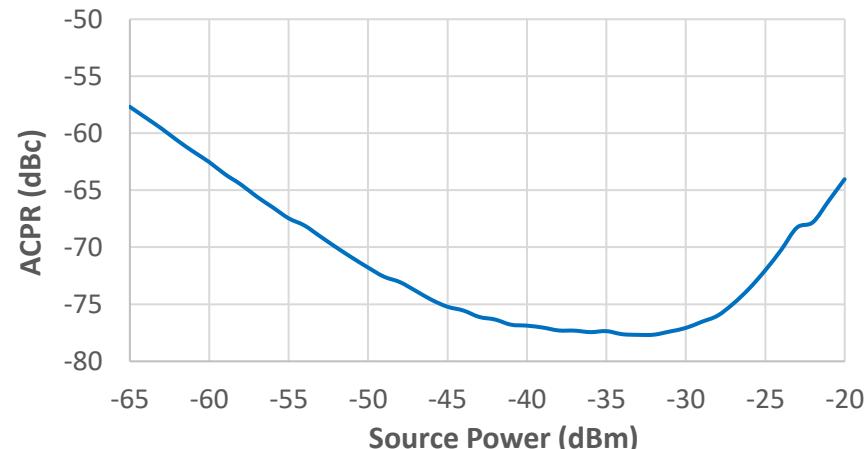
## LTE Typical Performances



LTE performances vs. frequency with 20MHz bandwidth

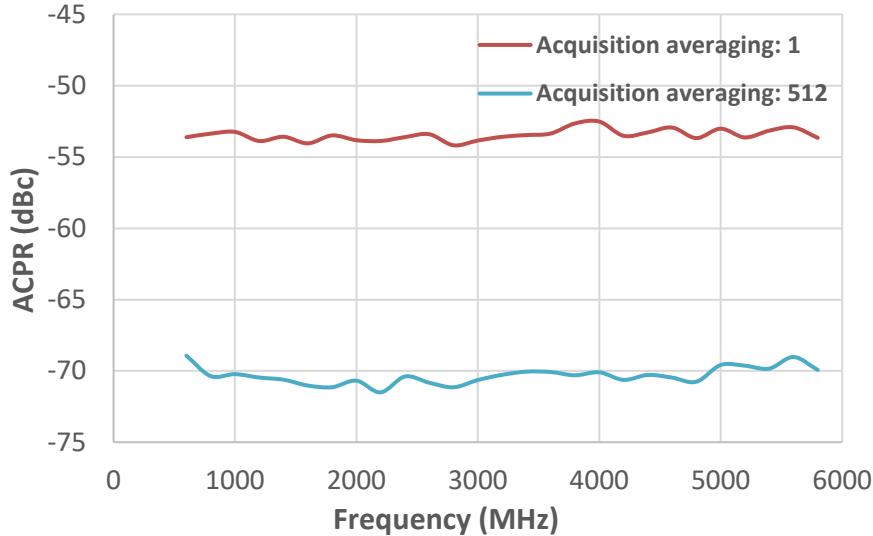


LTE performances vs. source power at 2.6GHz with 20MHz bandwidth

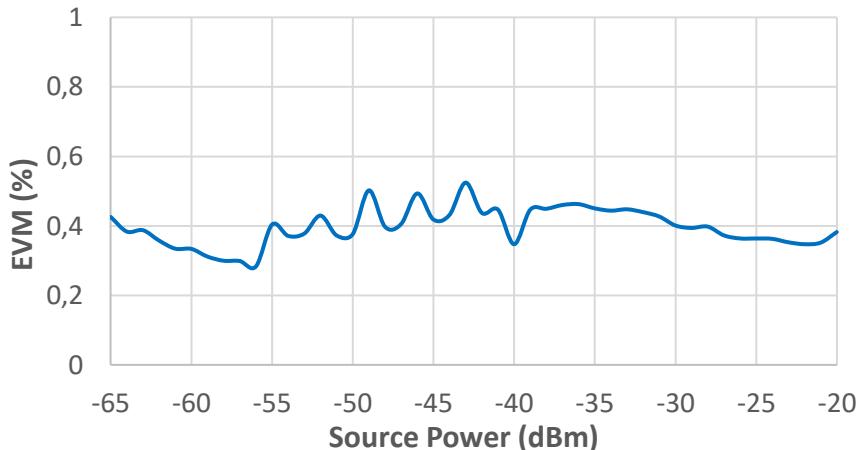


Note: RF output loopback to RF input.  
Recommended external gain stage is used at source output. Acquisition averaging set to 512.

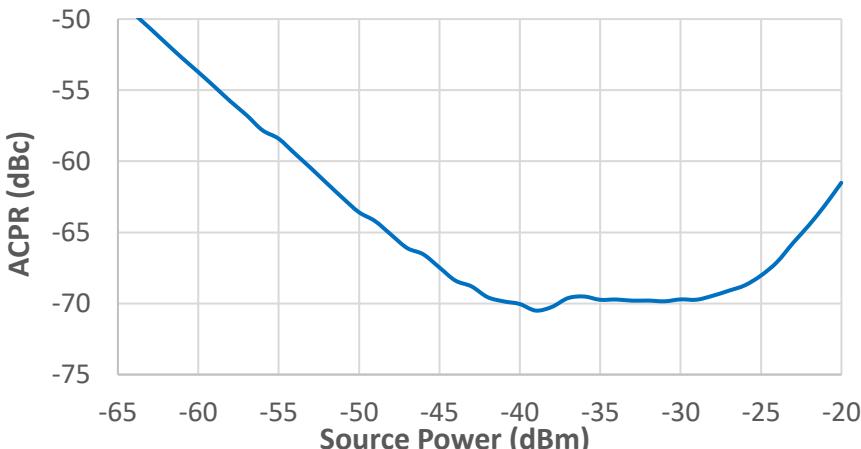
## 5G Typical Performances



5G performances vs. frequency with 100MHz bandwidth



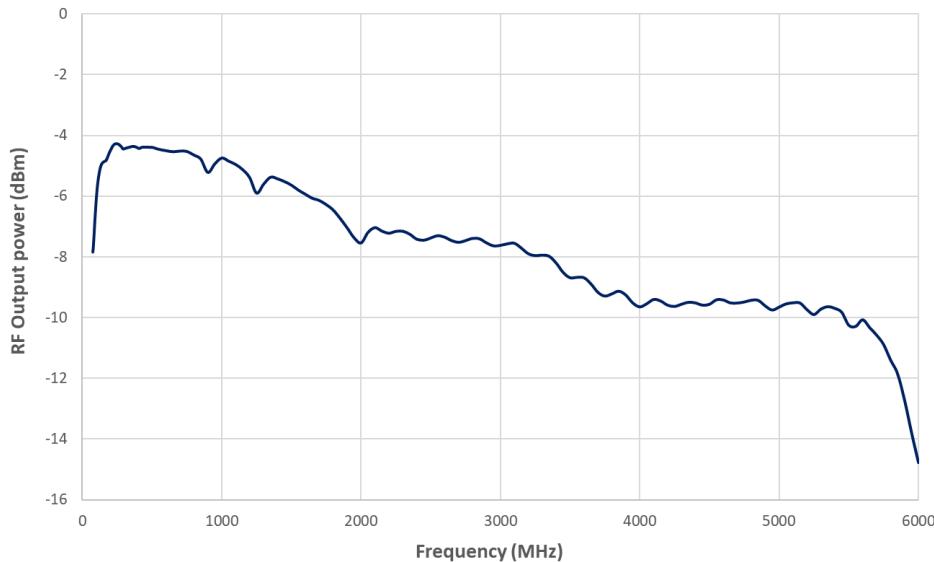
5G performances vs. source power at 3.6GHz with 100MHz bandwidth



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.

## **Contact AMCAD Engineering**

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