Handset PA ValiFire

EDGE/3GPP
Power Amplifier
Design Verification System

*Speeding
power amplifier design
to the marketplace*

- *A smoother road* —
  pre-configured pass/fail
  verification system replaces
  one-of-a-kind, custom-engineered
  test set-ups

- *No detours* —
  simulated and measured
  results on one display

- *No dangerous curves* —
  standardized measurements
  for you *and* for your customers

Agilent Technologies
Innovating the HP Way

No speed limit —
with Handset PA ValiFire

If you're a handset power amplifier designer, you are on a fast track to the consumer. To reach the marketplace ahead of the competition, turn to Handset PA ValiFire, the EDGE/3GPP Power Amplifier Design Verification System from Agilent Technologies.

Handset PA ValiFire provides pre-configured EDGE and 3GPP simulation and testing, along with correlation between simulation and measurement results.
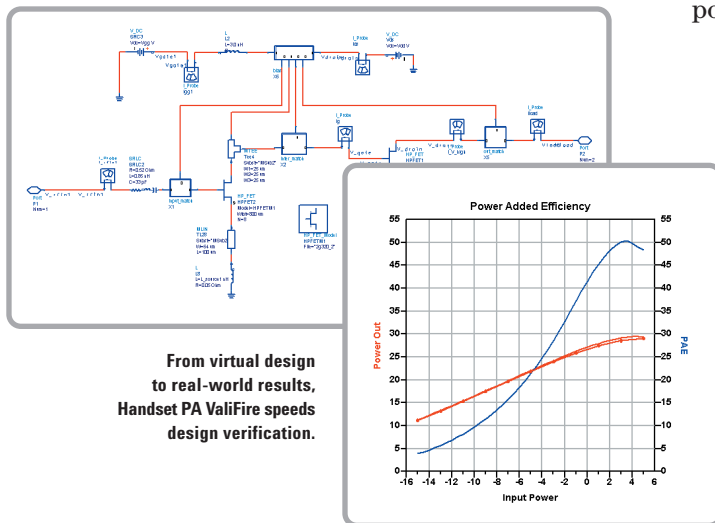
Until now, no pre-configured system existed, and design teams often spent valuable days or weeks creating one-of-a-kind, custom-engineered PA test and verification systems. Handset PA ValiFire guides both inexperienced and expert designers through the PA design and verification process. Pre-configured tests make it easy to quickly confirm compliance with EDGE and 3GPP standards. Test automation lets you rapidly sequence through multiple measurements or devices.

What is Handset PA ValiFire?

The Handset PA ValiFire system is a unique combination of hardware, software, and test expertise that comes pre-configured to perform the EDGE and 3GPP simulations and tests you need — in both the virtual design and physical worlds.

Handset PA Valifire consists of:

• Agilent ADS (Advanced Design System), with its complete design environment, design libraries, and data display capabilities

• PA Design Director, the integration software that guides you through the process of setting up and correlating simulation and measurement tests

• Agilent E4433B Signal Generator
• Agilent E4406A VSA (Vector Signal Analyzer)
• Three Agilent 66319D Power Supplies
• Agilent E4416A Power Meter with E9323A Power Sensor

Only Agilent Technologies has the necessary combined design software and test and measurement expertise to seamlessly integrate this system for fast and successful power amplifier design.

From virtual design to real-world results, Handset PA ValiFire speeds design verification.

Take the twists and turns out of EDGE and 3GPP

EDGE and 3GPP specifications are both complex and ever-changing. Designers often struggle to understand the spectrum emission mask requirements for the different classes of PAs, or seek confirmation that PA's ACPR (Adjacent Channel Power Ratio) performance will meet spec. Handset PA ValiFire and its planned enhancements focus on the latest EDGE and 3GPP standards, relieving you of the chore of keeping up with changes when you'd rather be designing.
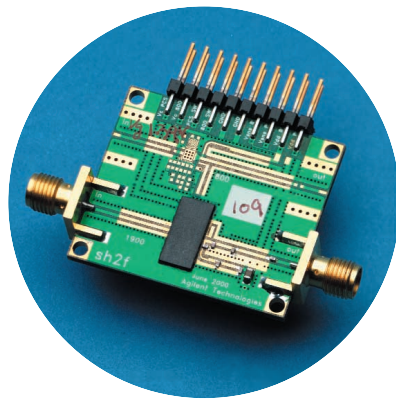
EDGE

Power out versus time — measures the rise time of the RF envelope as the RF time burst happens. Rise time and fall time specifications are from the EDGE standards. You compare measured and simulated data on one display. The measurement also gives pass/fail information.

Power out versus slope control — measures the output power at the specified power output control points. The power is tested against the specified range.

EVM (Error Vector Magnitude) — is part of the ADS EDGE design library and is supported by the Agilent E4406A. The VSA reads the EVM value and compares it to the simulation. The measurement also gives pass/fail information.

PAE (Power Added Efficiency) — is derived from knowing the RF power input into the device, measuring the RF power output by the device, and measuring the DC power used by the device. The measurement is made with the E4406A VSA (for RF) and the 66319D Power Supply (for DC).

3GPP

ACLR (Adjacent Channel Leakage Ratio) — measures the ratio of the power leaked into adjacent channels to the power in the transmitted channel. The offsets are measured above and below the transmitted channel at 5- and 10-MHz offsets. The data at the different offsets is read from the Agilent E4406A VSA and presented on the PC's data display, along with the simulated results. The measurement also gives pass/fail information.

Power Out — measures the maximum power output from the amplifier for any of the four power classes defined by the specification, ranging from 21 to 33 dBm. The power class is specified on the schematic, and that value is used in the data display to indicate a pass or fail result. The E4406A VSA can measure both the channel power and the power spectral density and display it with the simulated results.

PAE (Power Added Efficiency) — is derived from knowing the RF power input into the device, measuring the RF power output by the device, and measuring the DC power used by the device. This measurement is made with the E4406A VSA (for RF) and the 66319D Power Supply (for DC).

EVM (Error Vector Magnitude) — is part of the ADS 3GPP design library and is supported by the E4406A VSA. The VSA reads the EVM value and compares it to the simulation. The measurement also gives pass/fail information.
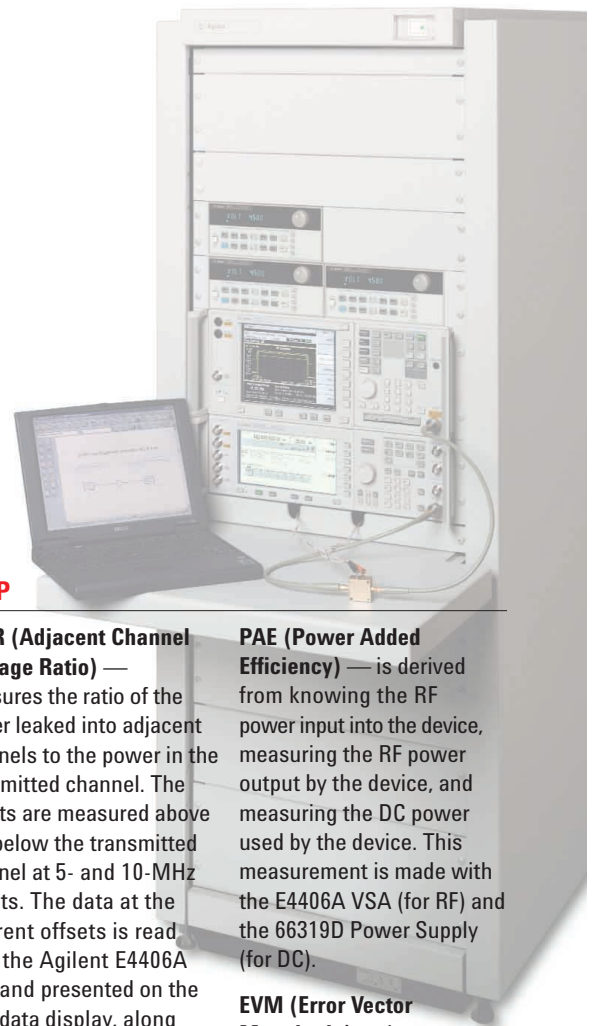
Where the rubber meets the road —
Software and hardware together

**You are about to begin a PA design cycle.
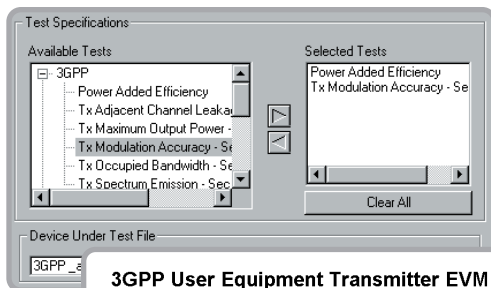How can Handset PA ValiFire help?**

Follow this typical scenario.
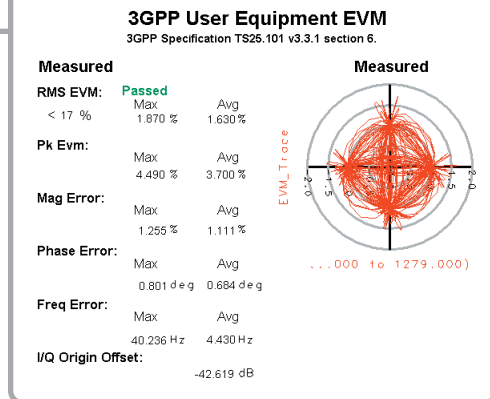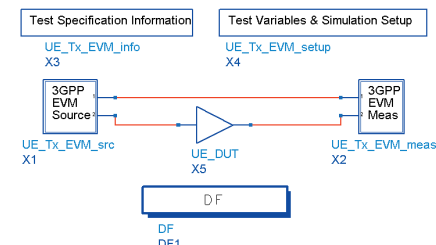
1 Quick tests on starting designs

One way to decide on a design is to leverage existing PA designs and see if any of them perform adequately for the new standard. Whether you have hardware prototypes or ADS schematics, you can use Handset PA ValiFire to quickly choose and perform key measurements. Simple pass/fail data and tabulated measurement results help you determine where to go from here.

Test Specifications

Available Tests
- 3GPP
  - Power Added Efficiency
  - Tx Adjacent Channel Leaka
  - Tx Maximum Output Power -
  - **Tx Modulation Accuracy - S**
  - Tx Occupied Bandwidth - Se
  - Tx Spectrum Emission - Sec

Selected Tests
- Power Added Efficiency
- Tx Modulation Accuracy - Se

Clear All

Device Under Test File

3GPP_a

3GPP User Equipment Transmitter EVM Test

Test Specification Information — UE_Tx_EVM_info X3

Test Variables & Simulation Setup — UE_Tx_EVM_setup X4

3GPP EVM Source — UE_Tx_EVM_src X1

UE_DUT X5

3GPP EVM Meas — UE_Tx_EVM_meas X2

DF — DF DF1

3GPP User Equipment EVM
3GPP Specification TS25.101 v3.3.1 section 6.

Measured   **Measured**

RMS EVM: **Passed**
	Max	Avg
< 17 %	1.870 %	1.630 %

Pk Evm:
	Max	Avg
	4.490 %	3.700 %

Mag Error:
	Max	Avg
	1.255 %	1.111 %

Phase Error:
	Max	Avg
	0.801 deg	0.684 deg

Freq Error:
	Max	Avg
	40.236 Hz	4.430 Hz

I/Q Origin Offset:
-42.619 dB

EVM_Trace

...000 to 1279.000)

Virtual prototyping lets you try out different components and meet spec before you go to fabrication.
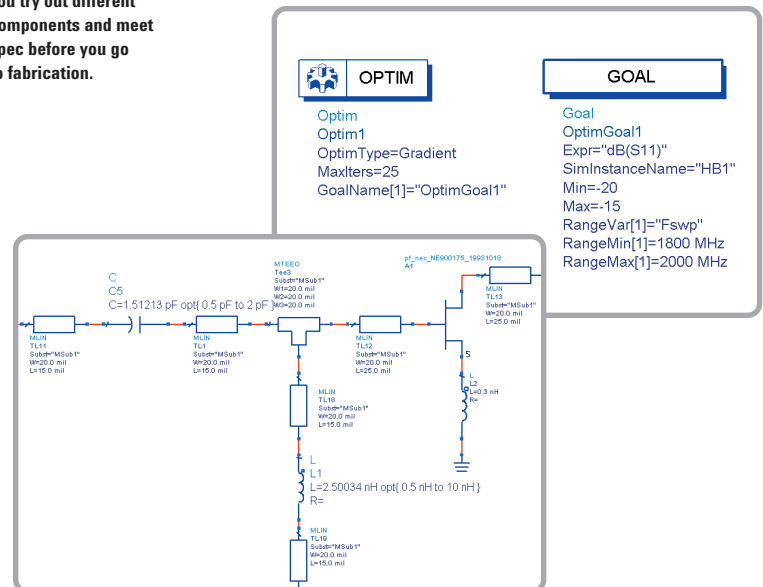
2 Dig in, modify, optimize, and iterate

To ensure that designs meet the requirements of the latest standards, use the powerful tool set in ADS to optimize designs and make quick trade-offs. Perhaps you need more power. It's easy to add another gain stage and simulate again. If you need better PAE, you can improve it while working from a detailed, consistent baseline.
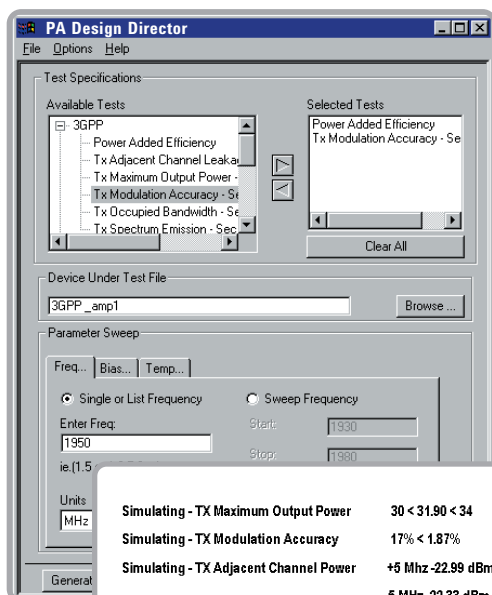
OPTIM

Optim
Optim1
OptimType=Gradient
MaxIters=25
GoalName[1]="OptimGoal1"

GOAL

Goal
OptimGoal1
Expr="dB(S11)"
SimInstanceName="HB1"
Min=-20
Max=-15
RangeVar[1]="Fswp"
RangeMin[1]=1800 MHz
RangeMax[1]=2000 MHz

C
C5
C=1.51213 pF opt{ 0.5 pF to 2 pF }

L1
L=2.50034 nH opt{ 0.5 nH to 10 nH }
R=

Powerful ADS optimization lets you make quick trade-offs to narrow down your design options.

3 Validate best designs

Your designs must perform over the full range of parameters such as frequency, bias, and temperature. When working with multiple designs, Handset PA ValiFire makes it easy to batch up your virtual tests and sequence through them without intervention.


PA Design Director

File   Options   Help

Test Specifications

Available Tests

3GPP
— Power Added Efficiency
— Tx Adjacent Channel Leaka
— Tx Maximum Output Power -
— Tx Modulation Accuracy - Se
— Tx Occupied Bandwidth - Se
— Tx Spectrum Emission - Sec

Selected Tests

Power Added Efficiency
Tx Modulation Accuracy - Se

Clear All

Device Under Test File

3GPP _amp1   Browse ...

Parameter Sweep

Freq... Bias... Temp...

○ Single or List Frequency   ○ Sweep Frequency

Enter Freq: Start: 1930
1950   Stop: 1980
ie.(1.5

Units
MHz

Generat

Simulating - TX Maximum Output Power	30 < 31.90 < 34	PASSED
Simulating - TX Modulation Accuracy	17% < 1.87%	PASSED
Simulating - TX Adjacent Channel Power	+5 Mhz -22.99 dBm	FAILED
	-5 MHz -22.33 dBm	FAILED
	+10 MHz -32.09 dBm	FAILED
	-10 MHz -31.96 dBm	FAILED
Simulating - TX Power Added Efficiency ...		

PA Design Director dialogs guide you through test set-up. Batching up sequences of tests frees your time for other tasks. Results output is ready for your electronic lab notebook.

4 Measure and correlate

When the wafers or chips come back from fabrication, you need a quick answer to the question, "does it work the way the simulation predicted?" All the equipment you need to test the prototype is right at your bench! Simply hook up the part and press the Measure button. You get measurement results over the same frequency, bias, and temperature ranges you used in simulation, and the results are shown on the same display for correlation. As you begin packaging and mounting the device on a prototype board, you can repeat the measurement and verification process.
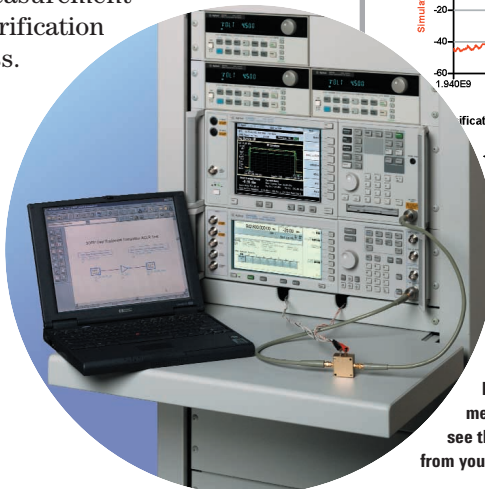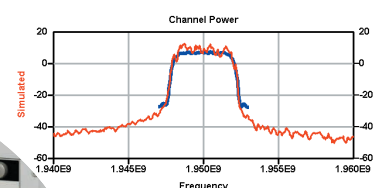

5 Ship it!

The handset PA protoboard and sample chips are off to the customer, in record time. Your customer can have complete confidence in your stated performance specs by verifying the received parts with a Handset PA ValiFire system at their site.

3GPP User Equipment Maximum Power

3GPP Specification TS 25.101 v3.3.1 section 6.2.1

ification	Simulated	Measured
	Passed	Passed
< 34	31.90	Channel Power: 30.85

Built-in pass/fail limits help you verify your design before you send it out for fabrication.

Perform physical measurements, and see the results, all from your PC display.

5

Driver's education —
Training, consulting, and support

Full-service training

Handset PA ValiFire includes interactive electronic training that guides the user through typical measurements and verification. System documentation is integrated into the training, providing the designer with a comprehensive education.

In addition, Agilent provides a full selection of instructor-led classroom training for designers who want in-depth instruction on Advanced Design System or on Agilent test and measurement instruments. Visit the Agilent Customer Education website for a complete training course listing.

http://contact.tm.agilent.com/ tmo/education/English/index.html

Support services

While Agilent systems are engineered to be reliable, problems sometimes do occur. Your Agilent sales representative will help you purchase the right kind of support for your ValiFire system. Should you have a problem or a question, this support service helps you keep your system up and running. Available support for the Handset PA ValiFire system includes:

- phone-in problem resolution with qualified ValiFire support engineers
- a three-year return repair service for all test equipment in the Handset PA ValiFire system
- a software patch/update service
- a defined escalation process for critical problem resolution
- electronic access to product information and support

Application and consulting services

Agilent Technologies possesses a unique accumulation of test, measurement, and electronic design automation expertise. If you desire consultation, Agilent consulting engineers offer knowledge and expertise to help improve your design processes and supplement in-house resources at critical times. Let your Agilent sales representative help you match your needs with Agilent services.

System characteristics

Frequency Range: 7 MHz to 4 GHz
Source Power:
   +13 dBm (7 MHz to 1 GHz), +10 dBm (1 to 3 GHz), +7 dBm (3 to 4 GHz)
WCDMA-3GPP Measurements:
   ACPR: −63 dBc (ESG: −67 dBc) (VSA: −68 dBc)
   EVM: 4% (ESG: 2.3%) (VSA: 3%)
EDGE Measurements:
   EVM: 2% (ESG: 0.75% 800 MHz, 1.75% 1900 MHz) (VSA: 0.6%)
   Bias: 0 to 15 V @ 3 A, 0 to 12 V @ 1.5 A
Individual Instrument Specifications

Ordering information

PA Design Director Software	**E5710A/AN**

Handset PA ValiFire Software Suite	**E5711A/AN**
Design Environment	E8900A/AN
Data Display	E8901A/AN
Linear Simulator	E8881A/AN
Harmonic Balance Simulator	E8882A/AN
Ptolemy Simulator	E8823A/AN
Circuit Envelope Simulator	E8883A/AN
PA Design Director Software	E5710A/AN
Specify:	
EDGE Design Library (E8879A/AN) or 3GPP Design Library (E8875A/AN)	

Handset PA ValiFire Hardware Suite	**E5730A**
Vector Signal Analyzer	E4406A*
Electronic Signal Generator	E4433B**
Three Dual Power Supplies	66319D
LAN-to-GPIB Converter	E2050A
EPM-P Series Power Meter	E4416A
50 MHz to 6 GHz Peak and Average Power Sensor	E9323A
1.6-m rack and all necessary racking hardware	
All necessary power cords, adapters, and connection cables	
3-year repair warranty on all equipment	
Factory integration	
Specify:	
3GPP personality or EDGE personality	
Specify:	
Line voltage (240 V, 100 V, 220 V, or 230 V)	

Handset PA ValiFire System	**E5700A/AN**
Handset PA ValiFire Software Suite	E5711A/AN
Handset PA ValiFire Hardware Suite	E5730A
EDGE Design Library	E8879A/AN
3GPP Design Library	E8875A/AN
3GPP and EDGE personalities for ESG, VSA	
Specify:	
Line voltage (240 V, 100 V, 220 V, or 230 V)	

 * Includes EDGE or W-CDMA personality
** Includes EDGE or W-CDMA personality, dual arbitrary waveform generator, improved ACP

For more information about
Agilent EEsof EDA visit:

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For more assistance with your
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Product specifications and descriptions in
this document subject to change without notice.

For more information about
Handset PA ValiFire visit:
www.agilent.com/find/valifire

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