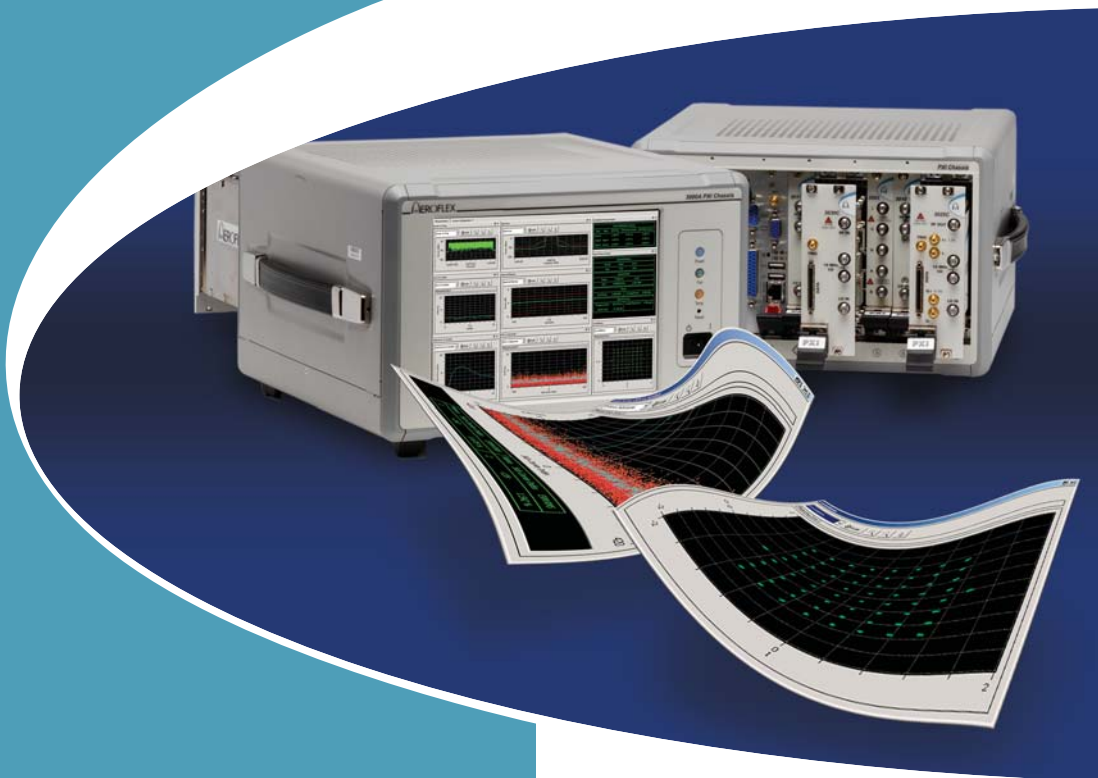


AEROFLEX

A passion for performance.

PXI Modular RF Test System



Plan
eXecute
Integrate
3000 Series

3000 Series

RF test challenges, Aeroflex's solution



The Challenges of RF Test

In advanced wireless communications the speed of technological developments demand test solutions to continually evolve in performance, functionality and speed while remaining completely flexible. The demand for accelerated time to market and increased product complexity challenge both design and production engineers. Any investment in test equipment must be made with complete confidence. Wherever your market takes you, your test solution must have the flexibility, power and accuracy to follow.

"The market need is for flexible test systems that can track fast changing market requirements, accelerate time to market and lower the cost of manufacture."

The Aeroflex Solution

With over 70 years of experience producing high performance test equipment for RF communications, Aeroflex has unparalleled expertise in overcoming the challenges of developing and manufacturing electronic equipment to very high standards. The Aeroflex solution is the 3000 Series, a modular RF test system based on PXI technology, a robust modular open standard for high performance low cost instrumentation. Aeroflex has applied its vast experience in RF testing combined with the flexibility and speed benefits of PXI to produce a powerful solution to accelerate throughput in manufacturing and time to market in R&D while catering for current and future RF test needs.

The Aeroflex solution adapts to today's demanding production environments putting the user at the heart of the instrument and enabling easy customization.



"Modularity provides flexibility, flexibility enables optimization, optimization results in cost reductions."

think it, design it, build it.

Benefits and key features

Future-proofed Modular Design

Scalability by test module allows building the system based on frequency requirements of up to 3 GHz , 6 GHz or 13 GHz with a bandwidth of up to 90 MHz and progressively upgrade as needs evolve. By decoupling signal processing and RF sub systems, the 3000 platform can leverage from rapid advances in processing power at any stage during the life of the equipment.

Maximize Return on Investment

PXI technology delivers integrated test systems at lower cost than conventional box instruments. A complete range of medium and high performance open standard RF modules is available to suit all budgets. Additionally, software reconfiguration and integration of discrete field replaceable modules further maximize return on investment by extending the system's life and scope of applications. The value delivered by the solution is enhanced by unlimited access to freely downloadable software updates expanding waveform generation support for new communication standards and technologies.

Dramatic Reduction in Test Times

The PXI 3000 Series achieves up to five times higher throughput than conventional instrumentation leading the market in terms of test speed. Low test times are the result of very fast responding hardware and the performance gains derived from the use of multi-core processors. Multiple simultaneous measurements and multi-device testing becomes a reality when realizing the benefits of multi-core processing through the inherent open software architecture.

An Established, Respected Solution

With systems deployed in manufacturing the world over, the Aeroflex PXI 3000 Series is the leading modular solution in handset manufacturing. A solid customer base of the leading mobile handset manufacturers and their supply chain demonstrates an enviable track record of meeting the most stringent requirements for continued support, servicing and evolution of the product portfolio.

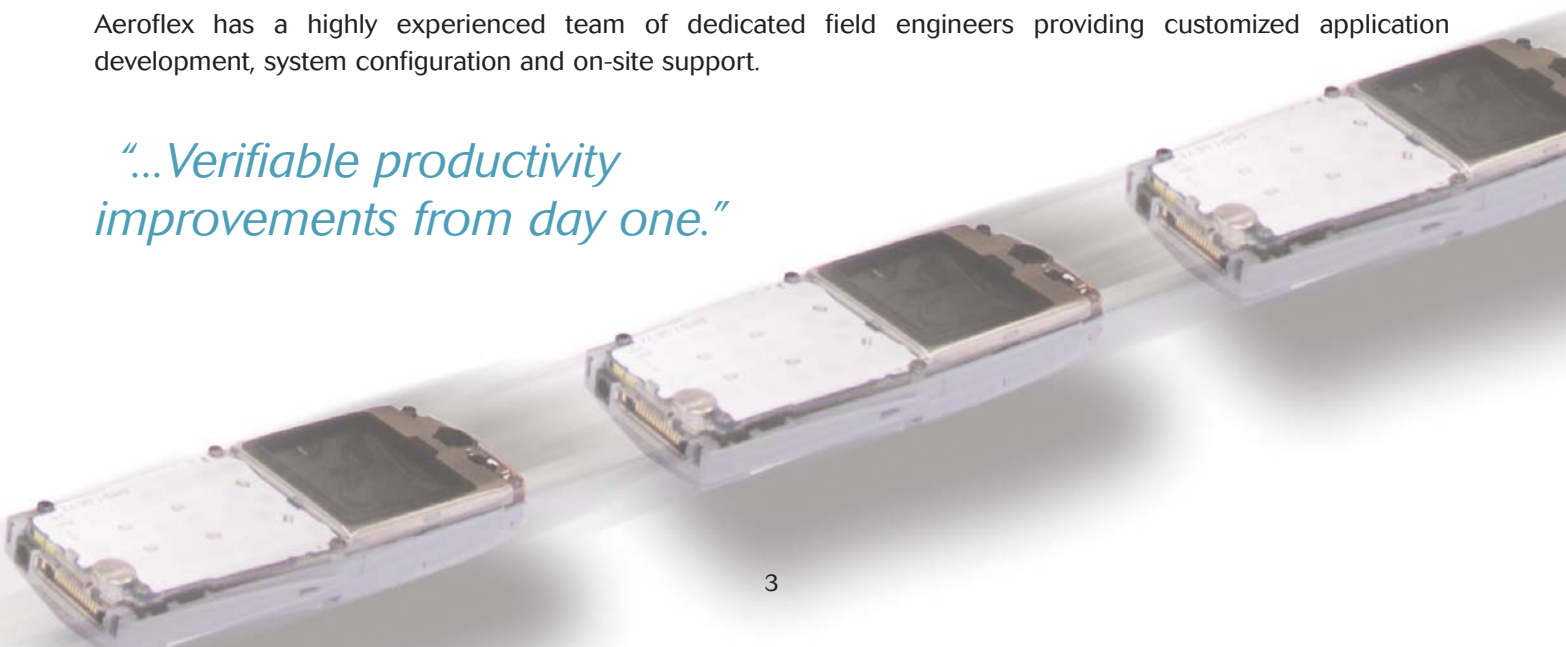
High Accuracy, Reliability, and Repeatability

The Aeroflex expertise in design and manufacturing of RF systems is translated into every PXI module providing uncompromising performance, accuracy, reliability and repeatability enhancing confidence in test results.

Dedicated Customer Support Teams

Aeroflex has a highly experienced team of dedicated field engineers providing customized application development, system configuration and on-site support.

"...Verifiable productivity improvements from day one."



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Performance Highlights



Unparalleled Speed

The PXI system operates on a high speed PCI bus, over 100 times faster than conventional instrumentation buses such as GPIB. The 3000 Series modules harness this speed by incorporating List Mode and Fast Sequence Tuning features to accelerate hardware setup times. Implementation of application-specific multi-threaded algorithms enables the concurrent test of multiple devices transferring speed advantages to the production line.

"Measurement of multiple parameters in a single measurement cycle"

- Frequency settling times of 250 μ s
- 100 times faster than GPIB
- Multi-core processing
- List mode and fast sequence tuning
- Simultaneous multiple DUT testing

Enhanced Flexibility

An industry standard modular platform based on 'plug and play' modules that support easy setup and field upgrades. The open software interfaces enable rapid integration and adaptation as test requirements change using standard programming interfaces. To validate measurements the system is supported by user friendly Measurement Suites covering a broad range of RF modulation standards. Triggering facilities maximize flexibility for synchronous measurements.

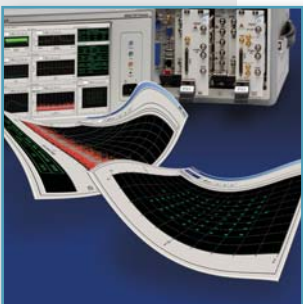


- Modular architecture
- User friendly measurement suites
- Open software architecture
- Versatile triggering
- Standard programming interfaces (C, VB and .NET)

Low Cost

The modular nature of the solution reduces cost by discarding all redundant components allowing you to only purchase what you need. The 3000 Series offers considerable cost savings based on shared use of common power supplies, instrument bus, chassis and elimination of the front panel user interface. However, remain confident that when requirements change, little or no additional investment is required to reconfigure your existing system. In most cases all that is required is a simple software change.

"Purchase only what you need"



Excellent Accuracy

The 3000 Series is uncompromising in terms of accuracy. It equals or exceeds equivalent rack and stack instrumentation. With a total measurement uncertainty of typically ± 0.3 dB, accurate, repeatable RF power measurements in high volume manufacturing are made possible.

- *Level accuracy typically ± 0.3 dB*
- *Repeatability of < 0.05 dB*

Precision and Stability

The output level is electronically variable in fine 0.01 dB increments with a 1Hz frequency resolution. An all digital leveling control loop ensures that even with complex modulated signals the output signal is accurately set. Leveling control is combined with an electronic high speed RF attenuator for high reliability in volume manufacturing.

- *1 Hz frequency resolution*
- *0.01 dB level resolution*
- *Stable OCXO ± 1 in 10^9 /year*

Reduced Footprint

The 3000 Series is the most compact solution of its kind and a fraction of the size of conventional rack and stack instrumentation. This enables easier integration into the production floor, field transportation or bench use. Using a high capacity 19-inch 4U rack-mountable chassis allows up to 6 RF signal generator or signal analyzer instruments to be populated in any combination enabling simultaneous multiple device testing.

“Test up to 3 RF transceivers simultaneously with one single chassis”

Low Power Consumption

The Aeroflex solution boasts the lowest levels of power consumption in the market. Minimizing the environmental impact of operations is a key issue for all our customers. The Aeroflex PXI 3000 Series supports these efforts, minimizing our customer’s carbon footprint by offering low energy consumption alongside higher throughput and yield. This translates into a reduced number of instruments in the production line consuming less energy individually and collectively.

“Power consumption of a standard set of PXI 3000 Series modules is under 100 W.”

Reduced Down-time

Experience in the field has proven the Aeroflex PXI 3000 Series achieves close to 100% uptime with servicing downtime reduced to minutes if ever required. The simplicity in module replacement allows this task to be performed confidently by Aeroflex or plant technicians. A 24 month calibration cycle, optional on-site calibration and 24 hour helpdesk further reduce down-time. Additionally, every unit is backed up by a 2 year unlimited warranty with the available option to extend to a 5 year period.

- *Small servicing window*
- *Close to 100% uptime*
- *24 month calibration cycle*
- *On-site calibration*
- *24-hour helpdesk*

Aeroflex

The Solution in Detail



In addition to a broad selection of modules and software measurement libraries, Aeroflex can supply everything needed to create an entire PXI-based test solution. Either **Plan**, **eXecute** and **Integrate** your own test solution or purchase a complete fully functioning, turnkey solution with complete confidence that your new system can easily track your future testing requirements.



The built-in flexibility of the PXI approach allows the 3000 Series to support a variety of application areas. It is particularly suited to modern cellular and wireless data communications and critical testing in a high volume manufacturing environment. The modules are categorized into groups: stimulus, response and signal conditioning which are combined with test software to produce fast, accurate test solutions - that are future-proof and cost effective.

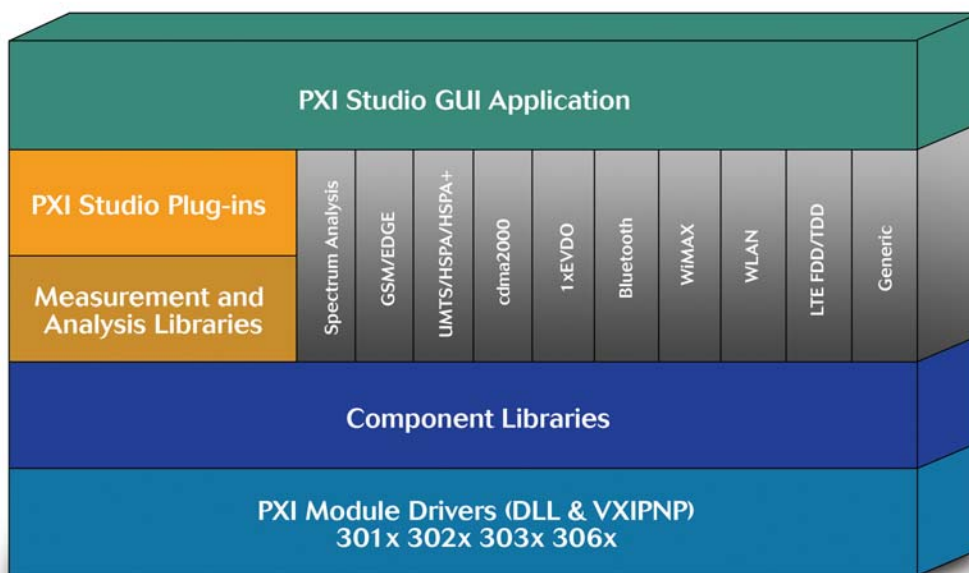


Aeroflex is committed to customizing every solution to meet the particular needs of its customers. The PXI 3000 Series product portfolio encompasses portable solutions allowing for dynamic allocation of resources or high capacity rack-mountable chassis solutions to manage high volume testing requirements.



PXI 3000 Software Architecture

The PXI 3000 Series software platform allows multiple approaches to RF testing. Low-level hardware manipulation is completely managed by dedicated libraries which can be used for implementing customized solutions for automated environments. The optional measurement libraries present an interface to control standard-specific functions. These measurement libraries are complemented by their corresponding GUI plug-ins for use within the PXI Studio application software.



PXI Studio Application Software

PXI Studio is a Windows™ based software application featuring a single integrated graphical user interface enabling control of any configuration of PXI 3000 Series modules. As standard it provides signal generator and RF digitizer control with general purpose spectrum or time domain analysis for RF component testing or alignment of radio communications transceivers.

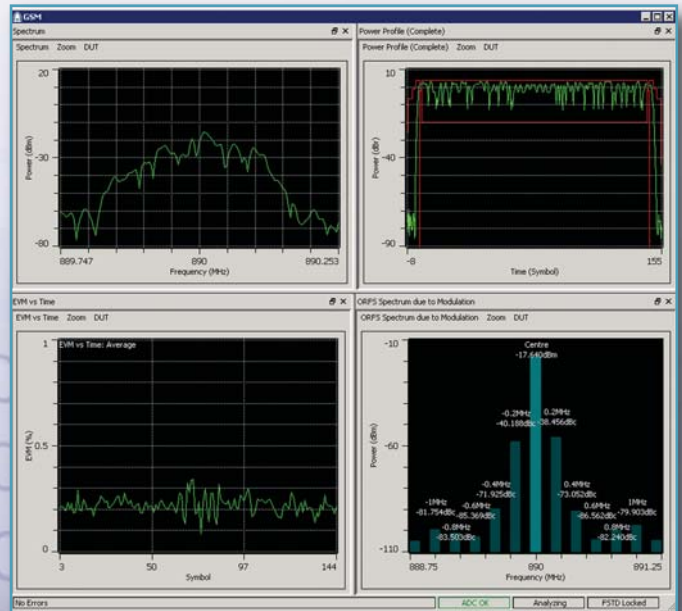
PXI Studio connects your bench-top PC with your PXI hardware to form a tightly coupled high performance laboratory test instrument or system. Performance is therefore directly enhanced as PC processing power improves and prolongs the productive life of the system. Optional Measurement Suites extend measurement support to cater for a variety of communication standards.



PXI Studio Measurement Suites

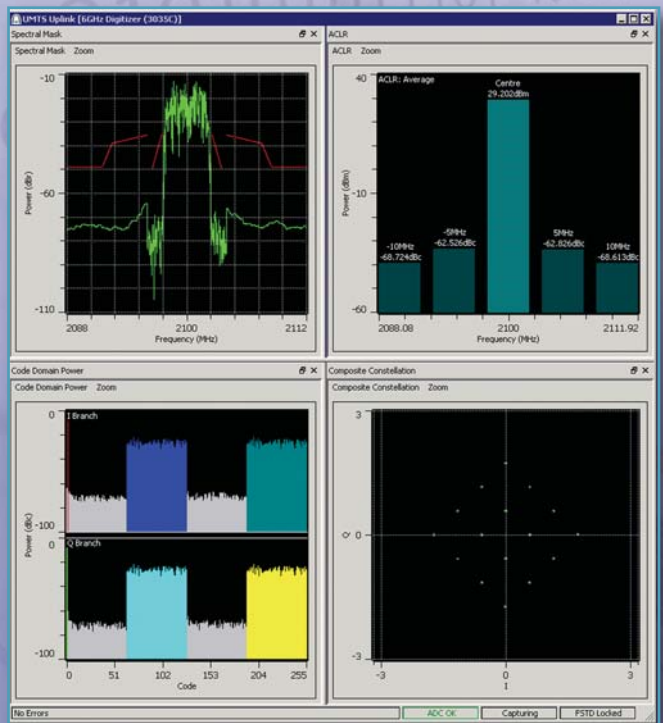
GSM/EDGE

- TX average power and single/multi slot burst power profile
- GSM phase error
- EGDE EVM and origin offset suppression
- Frequency error
- Output radio frequency spectrum
- Rx sensitivity (BER/BLER) measurement
- Fast Sequence Tuning (FST)



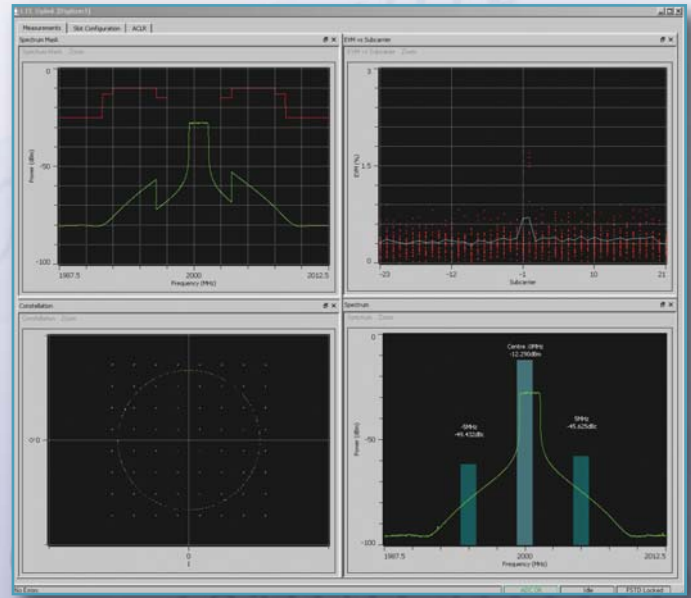
UMTS/HSUPA/HSPA+

- Tx output power max and min with drive to level
- Inner loop power control (ILPC)
- Frequency stability
- Out of band spectral emissions (ACLR/SEM)
- Occupied bandwidth
- CCDF
- Phase discontinuity
- EVM (Peak and RMS)
- Phase and amplitude errors
- IQ skew and gain imbalance
- Origin offset
- Tx slot timing error
- Code domain power/code domain error
- Demodulated symbol data for active channels
- Enhanced physical channels and HS-DPCCH
- Receive sensitivity (BER/BLER) using loopback
- Per-channel code domain error and relative code domain error measurements
- Fast sequence tuning



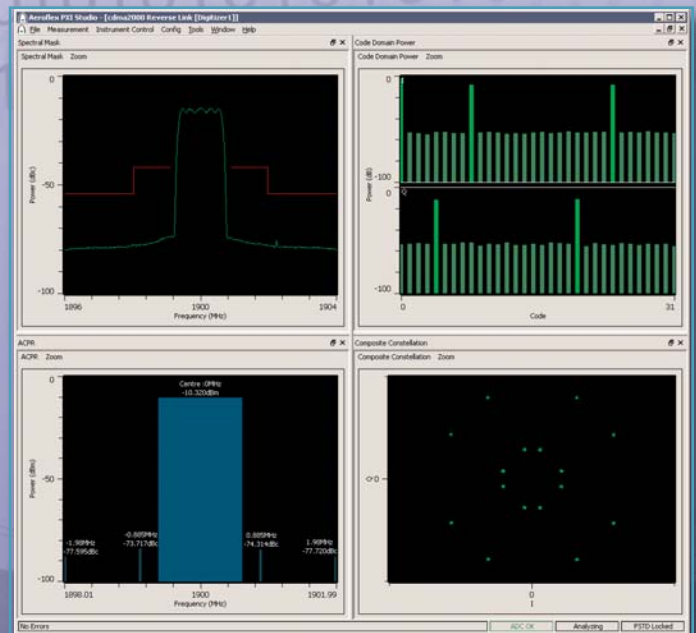
LTE FDD/TDD

- Transmit power
- PRACH time mask
- Transmit signal quality:
 - Frequency error
 - Error Vector Magnitude (EVM)
 - Spectrum flatness
 - Carrier leakage (IQ origin offset)
 - In-band emissions for non allocated RB
 - IQ skew/gain imbalance
 - Symbol clock error
- Output RF spectrum emissions:
 - Occupied bandwidth
 - Spectrum Emission Mask (SEM)
 - Adjacent Channel Leakage power Ratio (ACLR)
- CCDF
- Fast Sequence Tuning (FST)
- Rx BLER



cdma2000/1xEVDO

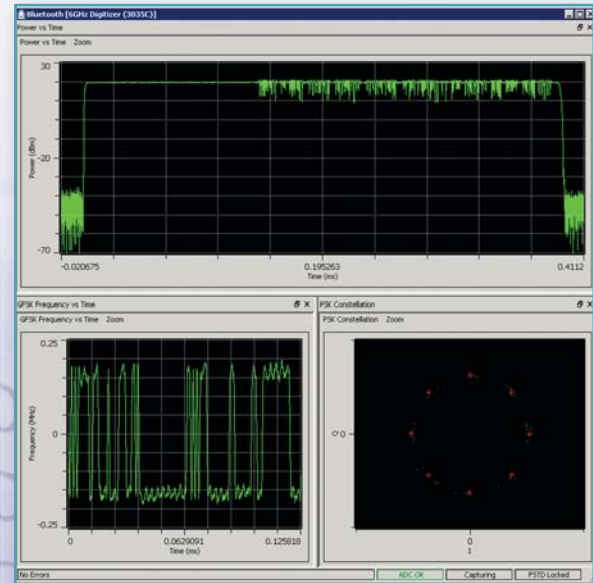
- cdma2000 RC1 to RC4 reverse link analysis
- 1xEV-DO rev 0, rev A and rev B (No Feedback Multiplexing mode) reverse link analysis
- Channel power
- Total power
- ACPR
- Phase error and magnitude error
- Spurious emissions (spectral emission mask)
- Composite modulation accuracy (RHO and EVM)
- Carrier leak (carrier feed through)
- QPSK origin offset(1)
- Code domain powers and PCDE
- Frequency error
- CCDF
- Fast Sequence Tuning (FST)
- Rx SER



PXI Studio Measurement Suites

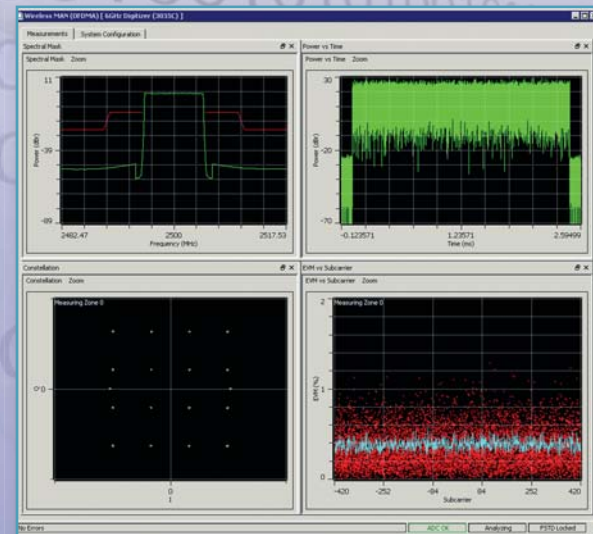
Bluetooth® (BR+EDR+LE)

- Spectrum
 - -20 dB bandwidth
 - Power density
 - Adjacent channel power
 - Occupied bandwidth
 - EDR spurious emissions
 - LE in-band emissions
- Burst position and output power
 - GFSK burst position and length
 - PSK burst position and length (EDR only)
 - Burst power (-3 dB)
 - GFSK burst power (based on bit p0)
 - PSK burst power (EDR only)
 - EDR relative Tx power
- Modulation characteristics
- Carrier accuracy
 - Initial carrier frequency tolerance
 - Carrier frequency drift and drift Rate
- Receiver sensitivity (BER) using loopback



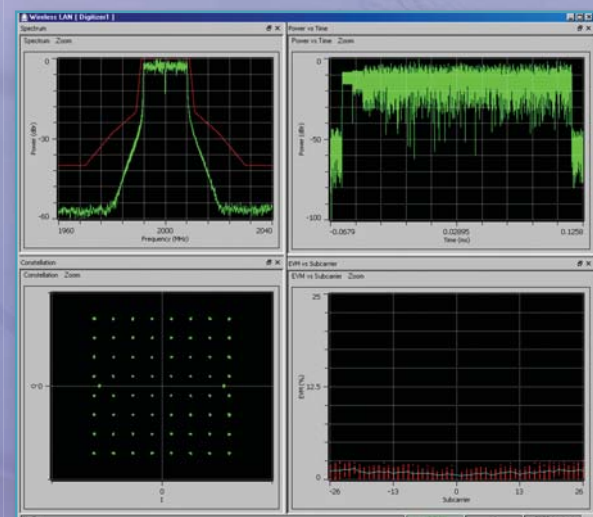
WiMAX

- Transmit power
- Spectral mask
- Occupied bandwidth
- EVM (all, data only, pilots only)
- Frequency error
- Gain imbalance, Skew
- Symbol/chip clock frequency error
- Carrier leakage
- Spectral flatness
- CCDF



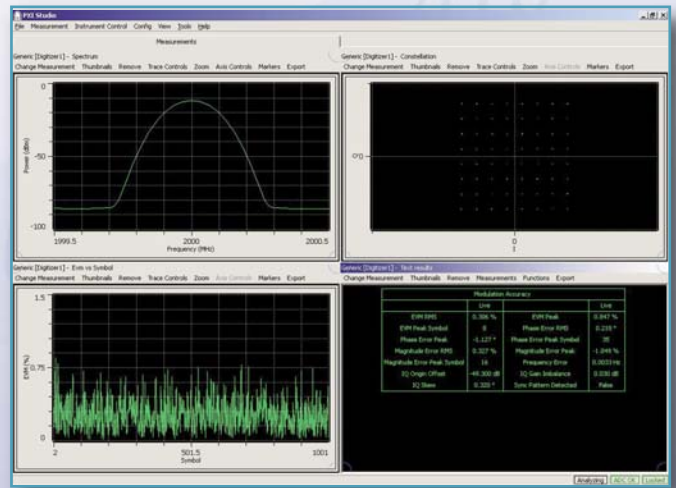
WLAN (802.11a, b, g, n and ac)

- Transmit power
- Transmit burst length
- Transmit power on, off timing
- Spectral mask
- Occupied bandwidth
- Frequency tolerance
- Symbol/chip clock frequency tolerance
- Carrier suppression/leakage
- Skew/gain imbalance
- Modulation accuracy (EVM and peak EVM)
- Spectral flatness
- 3x3 MIMO support
- DSSS and OFDM equalization
- CCDF
- Channel bandwidth support
- Rx BLER



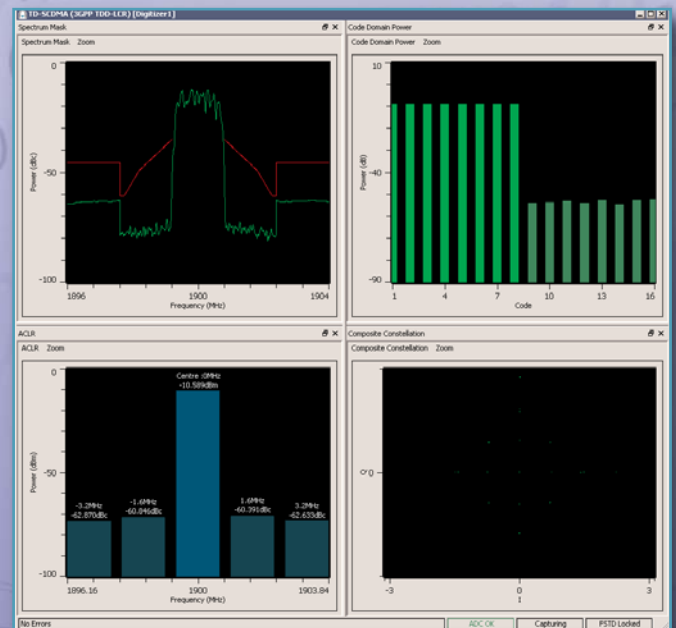
Generic measurement

- Transmit power (peak and average)
- Spectrum analysis
- EVM (peak and RMS)
- CCDF
- IQ skew/phase imbalance and gain imbalance
- Carrier leak (IQ origin offset)
- Phase and amplitude errors (peak and RMS)
- Frequency error
- FM frequency deviation
- Audio measurements
- Demodulated symbols and bits output
- User defined constellation to bit pattern mapping
- Ability to detect sync patterns (user defined or preset)
- Presets measurement settings for ZigBee®, UMTS (basic modulation accuracy), TETRA, VDL and APCO-25
- Modulation schemes supported:
 - FM
 - BPSK, QPSK, OQPSK, DQPSK, $\pi/4$ DQPSK, 8-PSK, D8PSK, $\pi/8$ D8PSK, 8-PSK EDGE
 - 16-QAM, 64-QAM



TD-SCDMA

- Total average power plus midamble/data power
- Transmit on/off time mask
- Transmit closed loop power control (CLPC)
- Spectrum analysis:
 - Occupied bandwidth
 - Spectrum Emissions Mask (SEM)
 - Adjacent Channel Leakage power Ratio (ACLR)
- Modulation accuracy:
 - Composite constellation
 - Data and midamble modulation accuracy
 - RHO
 - EVM
 - IQ skew, gain imbalance
 - IQ origin offset (carrier leakage)
 - Magnitude error
 - Phase error
 - Frequency error
 - Detected mid shifts (midamble only)
 - Timing error
 - Peak code domain error
 - Peak active code domain error
 - Detected code channel results
- CCDF
- Receiver sensitivity (BER)
- Fast Sequence Tuning (FST)





3020 Series Signal Generators

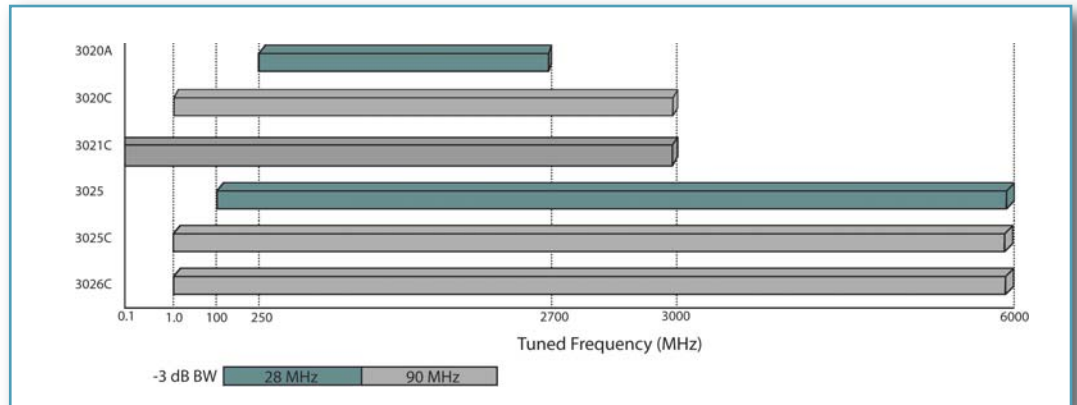
Use with 3010 RF synthesizer

- Frequency ranges spanning 100 kHz to 6 GHz
- Level range -121 dBm up to +17 dBm
- Excellent level accuracy of typically ± 0.3 dB
- Analog, digital and vector modulation
- Up to 90 MHz RF modulation bandwidth
- Low phase noise
- List mode for fast frequency and level switching

- Built in dual-channel arbitrary waveform generator with up to 2 GB memory
- Digital interface for IQ streaming
- Optional analog IQ inputs and outputs

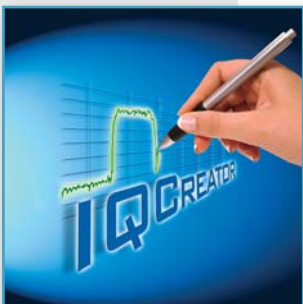
3010 RF Synthesizer

- 1.5 GHz to 3.0 GHz
- Resolution 1 Hz
- SSB phase noise typically -116 dBc/Hz at 20 kHz offset
- 250 μ s frequency settling times
- High stability variant with OCXO reference



IQCreator®

IQCreator® is a Windows™-based software application that enables a user to set up a modulation scheme and then create an ARB file for use in conjunction with 3020 PXI Series signal generators. Graphical displays of the waveform FFT, vector and constellation diagrams, among others can be viewed and exported for use in other Windows™ applications. The ARB file may be saved or downloaded into the ARB. User-defined configurations can also be saved. Consequently, it is possible to load previously saved setups to regenerate the ARB files quickly and easily.



2G	3G	4G	Wireless	Generic
GSM/EDGE cdmaone (IS95)	UMTS/HSPA TD-SCDMA cdma2000/ 1xEV-DO	LTE FDD/TDD WiMAX	WLAN Bluetooth® ZigBee® FM TETRA DECT VDL	PSK QAM FSK

The capabilities of IQCreator® include:

IQCreator® also includes a utility that allows the user generated files in binary or ASCII format to be converted and packaged into a form that can be downloaded into the ARB.

3030 Series RF Digitizers

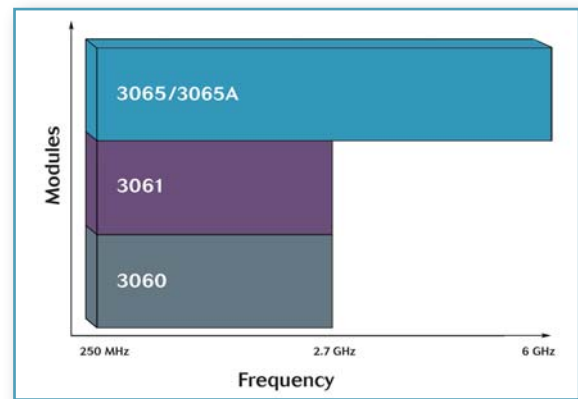


Use with 3010 RF synthesizer

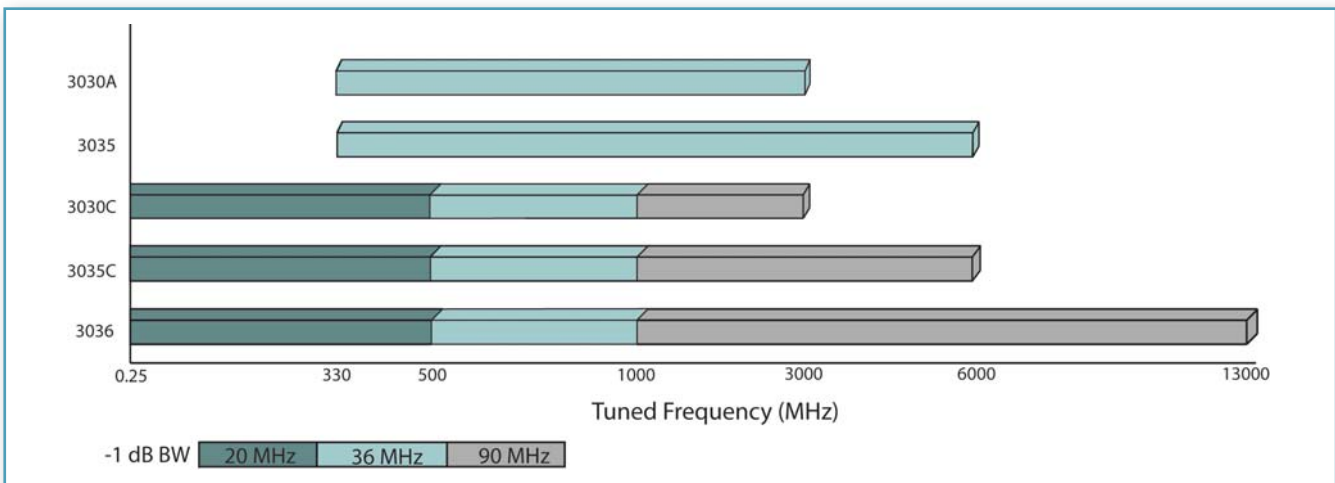
- Frequency ranges spanning 250 kHz to 13 GHz
- 36 MHz or 90 MHz bandwidth (-1 dB)
- 13 or 14 bit ADC resolution
- Variable sample rates up to 200 MSa/s
- 75 dB spurious free dynamic range
- 75 dB intermodulation free dynamic range
- Excellent level accuracy of typically 0.3 dB
- List mode for fast frequency settling
- Up to 512 MB sample memory
- Real time streaming output of sample data
- Precision conversion of RF signals into digital IF or I and Q data.
- Class leading vector signal analysis of RF signals
- Low noise

3060 Series RF Combiners

- Integrated RF switch and power combiners
- Frequency range up to 2.7 GHz or 6 GHz
- High speed electronic RF switching
- Internally stored calibration data



Used in conjunction with Aeroflex’s 3020 Series RF signal generators and 3030 Series RF digitizer modules. Together these modules enable the development of compact, high-performance, low-cost, modular RF test systems. The versatile 3060 Series RF combiners avoids the need for extraneous RF signal conditioning development in the test fixture, thereby simplifying test system design and calibration.



Aeroflex Customer Support



Aeroflex delivers end-to-end customer support from identifying the best solution to fit test requirements, to troubleshooting technical issues during ongoing operations. Fully integrated turn-key solutions can be custom-made based on specific requirements with the assistance of the Aeroflex systems integration teams.



solution-minded



performance-driven



customer-focused

The experience gained from test operations in hundreds of locations world-wide is within grasp through the Aeroflex Customer support group. The group has a clear understanding of the challenges faced by manufacturers of RF devices offering an added value when designing and implementing test solutions that seamlessly integrate to the production chain. Aeroflex is able to offer regional and international support to customers in almost every location around the globe.

Supporting the PXI 3000 integration into existing test systems is a team of applications engineers. Applications engineers are capable of delivering solutions for integration with most industry leading software applications LabVIEW, LabWindows/CVI, Visual Basic, Visual C/ C++, and Microsoft .NET. No matter how ambitious your goals, the broad experience of Aeroflex engineers in the field of RF testing is available to implement the best solutions in record time.



Configurations

The table below illustrates how the PXI 3000 Series modules and options may be used as essential building blocks in RF test system development.

Application	Module Type Required				3030 opt	3020 opt	PXI slots (min)		
	3010/ 3011	3020 Series	3030 Series	3060 Series					
LTE (FDD)	One per 3020 or 3030 series module.. Minimum of one 3011 recommended			Recommended to provide full duplex antenna connection	107		6		
LTE (TDD)					108				
UMTS/HSPA/HSPA+					101				
GSM/EDGE					100				
TD-SCDMA					109				
cdma2000 & 1x EV-DO					* + ★	◆ ■		102	
WiMAX M2300T-01 – M2500T-01								104	
WLAN IEEE 802.11 b/g					●			103	100
Bluetooth								106	100
ZigBee								111	100
WiMAX M3300T-01 – M3500T-05						+ ★		104	
WLAN IEEE 802.11 a/n							103	100	
WLAN IEEE 802.11 ac		★	113	100	7				

Key

RF Synthesizer Modules

3010 or 3011
(one per VSA/VSG module)



VSG Modules

3020A, 3020C¹ or 3021C²



3025



3025C¹ or 3026C²



RF Combiner Modules

3060 or 3061



3065 or 3065A²



Notes

¹ Preferred

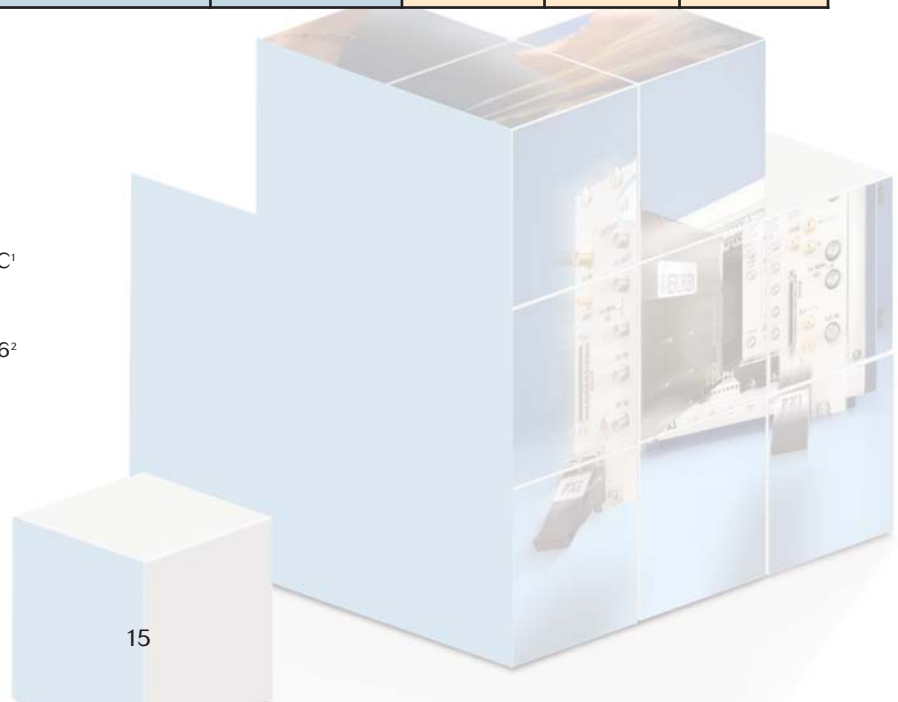
² additional PXI slot required

VSA Modules

3030A or 3030C¹

3035

3035C^{1,2} or 3036²



CHINA Beijing Tel: [+86] (10) 6539 1166 • Fax: [+86] (10) 6539 1778

CHINA Shanghai Tel: [+86] 21 2028 3588 • Fax: [+86] 21 2028 3558

CHINA Shenzhen Tel: [+86] (755) 3301 9358 • Fax: [+86] (755) 3301 9356

FINLAND Tel: [+358] (9) 2709 5541 • Fax: [+358] (9) 804 2441

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JAPAN Tel: [+81] 3 3500 5591 • Fax: [+81] 3 3500 5592

KOREA Tel: [+82] (2) 3424 2719 • Fax: [+82] (2) 3424 8620

SCANDINAVIA Tel: [+45] 9614 0045 • Fax: [+45] 9614 0047

SINGAPORE Tel: [+65] 6873 0991 • Fax: [+65] 6873 0992

TAIWAN Tel: [+886] (2) 2698 8058 • Fax: [+886] (2) 2698 8050

UK Tel: [+44] (0) 1438 742200 • Fax: [+44] (0) 1438 727601
 Freephone: 0800 282388 (UK only)

USA Tel: [+1] (316) 522 4981 • Fax: [+1] (316) 522 1360
 Toll Free: 800 835 2352 (US only)



Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.