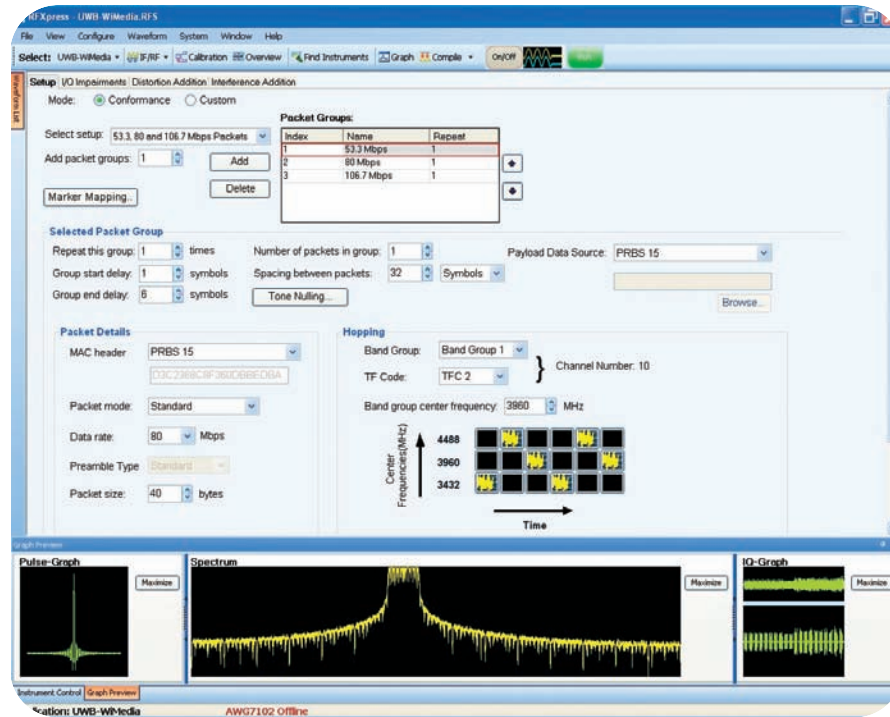


RFXpress – Advanced RF/IF/IQ Waveform Creation and Editing Software for Tektronix AWG

► RFX100



RF Signal Generation Made Easy

RF signals are becoming more and more complex, making the job of RF engineers, who need to accurately conformance and margin test their designs, more difficult. To solve this design challenge, Tektronix' RFXpress delivers advanced RF/IF/IQ creation and editing tools.

RFXpress is a software package that synthesizes digitally modulated base band, IF and RF signals. It takes IQ, IF and RF signal generation to the next level and fully exploits the wideband signal generation capabilities of Tektronix Arbitrary Waveform Generators (AWGs).

Supporting a wide range of modulations, as well as the symbol map functions, the software allows you to define your own modulation.

RFXpress allows for replicating waveforms from Tektronix oscilloscopes, as well as the IQ waveforms of a real-time spectrum analyzer. To thoroughly test a design, these can then be modified by adding impairments, distortion or interferences.

UWB-WiMedia signal creation, a software module for RFXpress, has the capability to digitally synthesize and generate RF signals in Band Groups 1 and 2 of the UWB spectrum. As per the latest WiMedia specification, signals will band hop in real-time over 1.5 GHz modulation bandwidth including all the different preamble synchronization sequences, cover sequences, TFCs and band groups. All six band groups (BG1 to BG6) can be generated with band hopping in either IQ or IF. The conformance mode enables you to generate all signals that conform to WiMedia's specifications, while the custom mode allows you to adjust the signals for stress and margin testing.

RFXpress runs on a PC or as an integral part of Tektronix AWG5000 and AWG7000 Series arbitrary waveform generators.

► Features & Benefits

Define Base Band I and Q Signals Using a Variety of Modulation Schemes

Create Single- and Multi-carrier Signals where Each Carrier Is Independently Defined

Apply Impairments such as Quadrature Error and Imbalance or Non-linear Impairments

Add Interferences During Waveform Creation

Visually Confirm Setup in Time and Frequency Domain

Remotely Connect and Configure to Tektronix Oscilloscopes or to a PSG^{*1}

UWB-WiMedia

- Direct RF Generation of WiMedia BG1 and BG2 Waveforms²
- Ability to Generate IQ and IF Waveforms for All Band Groups Including Band Hopping
- User-defined IF Frequency Including TFC Pattern
- Optional Application and Standard Support for MB-OFDM UWB (WiMedia)
- Comprehensive WiMedia Signal Generation Support for MAC and PHY Layers
- Ability to Create UWB-WiMedia Correction Files, which Can Be Automatically Applied as Compensation to Accurately Generate RF/IF Signals
- Gated Noise Feature Can Be Used to Define Noise Profiles, which Can Be Defined Individually for Each Section of the UWB Packet (Pre-amble, PPDU Header and PSDU)
- Creation of Tone Nulling with Intermediate Values (20 dB to -100 dB) for OFDM Carriers Mapping

► Applications

Design and Debug Wideband Wireless Communications Receivers

General-purpose Digitally Modulated IQ, IF and RF Signal Generation

UWB-WiMedia Conformance and Custom Signal Generation

^{*1} PSG[®] is a registered trademark of Agilent Technologies.

^{*2} Using a Tektronix AWG7102 with Option 06.

► Characteristics

► Software Applications

RFXpress for General-purpose IQ, IF and RF Signal Creation	General Purpose Signal Creation
RFXpress Plug-In for UWB-WiMedia IQ, IF and RF	Conformance Signal Creation
	Custom Signal Creation

User Interface

Resides and runs on Windows XP Professional.

► Compatibility for Import and Replication of Waveform Files

Oscilloscopes	Tektronix TDS6000, DPO70000 and DPO7000 Series
Arbitrary Waveform Generators	Tektronix AWG400, AWG500, AWG600 and AWG700 Series
Real-time Spectrum Analyzers	Tektronix RSA3000 and RSA6000 Series

Instrument Control

Tektronix Arbitrary Waveform Generators.

RFXpress runs on an external PC or an integral part of the AWG7000 and AWG5000 Series. Waveform transfer and control of the AWG5000 and AWG7000 Series can be performed directly from RFXpress.

Controls

Analog	Sampling Rate, Interleave and Zeroing On/OFF, Amplitude, Offset, Run, Stop and Channel Output On/Off
Digital Markers	Amplitude High, Low and Delay

Tektronix Oscilloscopes

Remote control Tektronix oscilloscope parameters from RFXpress.

Controls

General Settings	Run, Stop, Single and Autoset
Vertical Settings	Channel, Scale
Horizontal Settings	Scale, Record length, Sampling rate

IQ Modulators

Remote control PSG^{®1} – E8267D modulator parameters from RFXpress.

Controls	Frequency, Frequency Offset, Amplitude, Amplitude Offset, Output RF On/Off, Output Mod On/Off, Source type, Frequency mode, ALC On/Off, ALC mode, ALC band width, ALC levels, Attenuation hold On/Off, ALC power, Attenuation
Carrier Leakage Suppression	IQ state, IQ adjustment, I offset and Q offset

¹ PSG[®] is a registered trademark of Agilent Technologies.

► RFXpress for General Purpose IQ, IF and RF Signal Creation

Carrier Definition	Single Carrier, Multi-carrier (1 to 512)
Amplitude	IF/RF –100 dBm to +30 dBm; IQ to 0 V _{RMS} to 0.5 V _{RMS}
Base Data	All 0 (Zero), All 1 (One), PRBS (7, 9, 15, 16, 20, 21, 23, User Defined), Pattern and file input
Modulation Schemes	No Modulation, QPSK, BPSK, Pi/4-DQPSK, O-QPSK, 8PSK, O-8PSK, QAM16, QAM32, QAM64, QAM128, QAM256, QAM512, QAM1024, GMSK, 2-FSK, 4-FSK, 8-FSK, 16-FSK, 32-FSK, ASK, AM, FM, PM, File1 (I and Q Samples), File2 (I and Q Symbols), File3 (Symbol maps)

Symbol Map

Total Symbols	2 to 512
Modulation Modes	Normal, Diff (Continuous), Diff (Alternate)
Rotation Angle	–180 to +180 degrees
Offset Modulation	On/Off
Pre-defined Map	None, BPSK, QPSK, QAM16, QAM32, QAM64, QAM128, QAM256
Filter	No Filter, Raised Cosine, Rectangular, Triangular, Square Root Raised Cosine, Gaussian (Dirac Delta), Gaussian (Rectangular), EDGE, User Defined Filter (from a file)
Window	No Window, Triangular, Hamming, Kaiser, Hamming, Chebyshev, Ripple, Blackman, Blackman-Harris, Tapered Cosine, Exact Blackman and Flat Top

Window Parameters

Kaiser Parameter	1 to 10
Chebyshev Ripple	10 db to 80 dB
Coding	Gray, Differential, Gray differential, GSM differential

Power Ramp

Ramp Functions	None, Linear and Cosine
Ramping Time	0 to 1 second
Power Level for the Symbols	–100 dB to +20 dB

IQ Impairments

Carrier Leakage	I: –50% to +50%; Q: –50% to +50%
Quadrature Error	–30 degrees to +30 degrees
IQ Imbalance	30% to +30%
AM/AM Conversion	k2: –3 dB +3 dB k3: –3 dB to +3 dB
AM/PM Conversion	k2: –30 degrees to +30 degrees k3: –30 degrees to +30 degrees
Hardware Skew	–100 ps to +100 ps (AWG 7000) –5 ns to +5 ns (AWG 5000)

Distortion Addition

Amplifier Distortion	Amplifier – Non linear, soft limiting, hard limiting
AM/AM Conversion	k3: –3 dB + 3 dB k5: –3 dB to +3 dB
AM/PM Conversion	k3: –30 degrees to +30 degrees k5: –30 degrees to +30 degrees

▶ RFXpress for General Purpose IQ, IF and RF Signal Creation (continued)

Interference Addition

Offset	Frequency: –2.9 GHz to +2.9 GHz (AWG7000 Option 02/06) –1.75 GHz to +1.75 GHz (AWG7000 standard option) –185 MHz to +185 MHz (AWG5000)
Sinusoidal Interference	C/I: –3 dB to +80 dB Frequency Offset: –2.9 GHz to +2.9 GHz (AWG7000 Option 02/06) –1.75 GHz to +1.75 GHz (AWG7000 standard option) –185 MHz to +185 MHz (AWG5000)
Signal Addition	Software, Hardware IQ and RF/IF
Graphs	In-phase i(t) and quadrature q(t) component vs. time Eye diagram I Eye diagram q Constellation (Vector q (t) vs. i (t)) Spectrum for both RF/IF and I/Q signals (magnitude spectrum of the I/Q signal vs. frequency) Pulse Shape CCDF

System Requirements

The following PC configuration is required to install the offline version.

Note: The hardware requirements detailed here are the minimum required. Additional processing power and memory will increase the performance of the generation software.

- ▶ PC with genuine Intel Pentium class >1.2 GHz processor recommended
- ▶ Intel or 100% compatible motherboard chipset
- ▶ Windows 2000 Operating System or Windows XP Operating System
- ▶ 256 megabytes (MB) RAM
- ▶ 500 MB of available hard disk space for the applications and documentation
- ▶ SVGA (800x600) resolution video adapter and monitor (XVGA (1024x768) or higher resolution recommended)
- ▶ CD-ROM or DVD drive
- ▶ Keyboard and Microsoft mouse or compatible pointing device

► RFXpress Plug-In for UWB-WiMedia Signal Generation (continued)

RFXpress Plug-In for UWB-WiMedia IQ, IF and RF	Conformance Signal Creation Custom Signal Creation
Setup	In addition to user defined setup via “My setup,” three example setups are provided: WiMedia Specs Example Packet 53.3, 80 and 106.7 Mbps Packets 480 Mbps Burst Mode Packets
Marker Mapping	Two Markers can be mapped for each of the bands
Number of Packet Groups	1 to 100
Number of Packets in a Packet Group	1 to 30
Packet Group Repetition	1 to 100 times
Group Start Delay	0 to 200 symbols
Group End Delay	0 to 200 symbols
Spacing Between Packets	
Standard Mode	6 symbols to 200 symbols (can be defined in pSIFS and pMIFS)
Payload Source	WiMedia Spec Example ALL 0 (zero), ALL 1 (one) PRBS7, 9, 15, 16, 20, 21 and 23 User defined (by file input)
Tone Nulling	-100 dB to +20 dB
MAC Header	10 byte MAC header data can be selected from WiMedia Spec example ALL 0 (zero), ALL 1 (one) PRBS7, 9, 15, 16, 20, 21 and 23 User defined: wherein user can enter the MAC header pattern
Packet Mode	Standard, Burst
Preamble Type	Standard or Burst for data rates greater than 200 Mbps
Packet Size	
Standard Mode	0 to 4095
Burst Mode	1 to 4095
BandGroup	BandGroup1 to BandGroup6. (BandGroup3 and above: BandGroup center frequency is set to IF of 1000 M, which is editable by the user)
TF Code	TFC1 to TFC10
BandGroup Center Frequency	Can be defined by the user
Calibration – RF and IF	
IQ Impairments	
Carrier Leakage	I: -50% to +50%; Q: -50% to +50%
Quadrature Error	-30 degrees to +30 degrees
IQ Imbalance	30% to +30%
AM/AM Conversion	k2: -3 dB +3 dB; k3: -3 dB to +3 dB
AM/PM Conversion	k2: -30 degrees to +30 degrees; k3: -30 degrees to +30 degrees
Hardware Skew	-100 ps to +100 ps (AWG 7000); -5 ns to +5 ns (AWG 5000)

► RFXpress Plug-In for UWB-WiMedia Signal Generation (continued)

Calibration – RF and IF (continued)

Distortion Addition	
Amplifier Distortion Amplifier	Non linear, soft limiting, hard limiting
AM/AM Conversion	k3: -3 dB + 3 dB; k5: -3 dB to +3 dB
AM/PM Conversion	k3: -30 degrees to +30 degrees; k5: -30 degrees to +30 degrees
Interference Addition	
Offset Frequency:	-2.9 GHz to +2.9 GHz (AWG7000 Option 02/06)
	-1.75 GHz to +1.75 GHz (AWG7000 standard option)
	-185 MHz to +185 MHz (AWG5000)
Sinusoidal Interference C/I	-3 dB to + 80 dB
Frequency Offset:	-2.9 GHz to +2.9 GHz (AWG7000 Option 02/06)
	-1.75 GHz to +1.75 GHz (AWG7000 standard option)
	-185 MHz to +185 MHz (AWG5000)
Signal Addition Software, Hardware IQ and RF/IF	
Gated Noise	
Packets	Preamble S/N, PLCP header S/N, Payload S/N – "-100 dB to +100 dB"
Symbols S/N	-100 dB to +100 dB
Conformance Mode	
Data Rates	53.3, 80, 106.7, 160, 200, 320, 400 and 480 Mbps
Custom Mode	
TF Code	TFC1 to TFC10 and user-defined. User can define his/her own hopping sequence and number the TFC code from 1 to 15
User-defined Components in the PPDU Structure	Preamble Time domain base sequence, Cover sequence, Reserved bits, Tail bits, HCS, Channel Estimation, Frame Payload, Sequence, Length, Scrambler Init, Hopping pattern, Reed Solomon parity bits and FCS can either be calculated/taken from standard or can be defined by the user
Provision to Switch off the PLCP Header and the PSDU	

▶ Ordering Information

RFX100

RFX100 can be ordered separately or as an option with the AWG7000 and AWG5000 Series Arbitrary Waveform Generators.

▶ RFXpress — Ordered Separately (Including Base Software)

Part Number	Description
RFX100	Base Software: RFXpress for General-purpose IQ, IF and RF signal creation
Opt. UWBCF	RFXpress plug-In for UWB-WiMedia IQ, IF and RF conformance signal creation (requires RFX100 as prerequisite)
Opt. UWBCI	RFXpress plug-In for UWB-WiMedia IQ, IF and RF custom signal creation (requires RFX100 and RFX100-UWBCF as prerequisite)

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► RFX100

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Our most up-to-date product information is available at:

www.tektronix.com



Product(s) are manufactured in ISO registered facilities.

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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