						1.0- 0.5-	Gi	aphics (t), q(t)	
ile Or	timize Crest Factor	Help							
Pulse P	atamelers	2.14				0.5-			
	Pulse Amplitude	Pulse Duration/s	Pulse Repetition/s	Pulse Fill / s	P	1.0-	50000	100000	150000 1800
1	1.0000	0.0002500	0.0010000	0.0007500	Inc Pulses	Zoom	Untroom	t/Taym	Color [
2	0.8000	0.0001000	0.0010000	0.0009000		1.0			
3	0.4000	0.0007500	0.0010000	0.0002500	Dec Pulses	0.5-			
Burst P	arameters	Runt Duratio	o/+ But	Banetition / +	P	0.0-			
-	2	0.002000	n s Dais	0050000	Inc Burte	0.5-			
2	2	0.002000		0060000	mg burne	1.0			
3	1	0.001000	0 0	0.0070000	Dec Bursts	Zoom	50000 Urtoom	100000 I/Tsym	150000 1800 Color
Samp 1 Total	ale Rate / Hz Cun 0000000.0 ∰ Repetition / s San 0.0180000	rent Burst Data 1 Data 180000 Conr	Valid Calc	Plandom S Crest Facto 15.3	a 10 //d8 804 Ouit	# arsor State toor 1: X	UT: UD: UD: UT: UD:	8 0000 0665 Si Clos	ACP Meas: Color MIQ Cut DIT Color

Products: R&S[®]AFQ100A, R&S[®]AFQ100B, R&S[®]SMU, R&S[®]FSL, R&S[®]FSP, R&S[®]FSQ, R&S[®]FSU, R&S[®]FSV, R&S[®]AMU

DVB-T Bursted Noise Signal Generation

Application Note

DVB-T Bursted Noise is a tool for generation of DVB-T compatible noise signals. The IQ data can be transferred to WinIQSIM / WinIQSIM2[™] for further processing and transmission to an R&S[®]AMU, R&S[®]AFQ or R&S[®]SMU.



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The following abbreviations are used in this Application Note for Rohde & Schwarz test equipment:

- The IQ Modulation Generators R&S[®]AFQ100A and R&S[®]AFQ100B are referred to as AFQ.
- The Baseband Signal Generator R&S[®]AMU is referred to as AMU.
- The IQ Modulation Generator R&S[®]AMIQ is referred to as AMIQ.
- The Vector Signal Generator R&S[®]SMU200A is referred to as SMU.
- The Vector Signal Generator R&S[®]SMIQ is referred to as SMIQ.
- The Spectrum Analyzer R&S[®]FSL is referred to as FSL.
- The Spectrum Analyzer R&S[®]FSP is referred to as FSP.
- The Spectrum Analyzer R&S[®]FSQ is referred to as FSQ.
- The Spectrum Analyzer R&S[®]FSU is referred to as FSU.
- The Spectrum Analyzer R&S[®]FSV is referred to as FSV.
- The Spectrum Analyzer R&S[®]FSIQ is referred to as FSIQ.

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1 Overview

DVB-T Bursted Noise is a tool for generating DVB-T (Terrestic Digital Video Broadcasting) compatible noise signals. The IQ data can tranferred to WinIQSIM for further processing and transmission to an SMU, AMU, AFQ and AMIQ.

2 Software Features

The software offers:

- TCP/IP interface to WinIQSIM / WinIQSIM2[™] using one or two separate computers
- load and save program and device configuration

3 Hardware and Software Requirements

Hardware Requirements

The software runs on a PC with

- CPU: Pentium 500 MHz or better
- RAM: 128 MBytes or more
- Monitor: VGA color monitor

Software Requirements

- Windows 2000/XP/Vista
- optional WINIQSIM v4.40 and WINIQSIM2[™] 2.x (or higher) installed. This software tool is capable of receiving IQ data via TCP/IP software interface and calculating and transferring it to an SMU Vector Signal Generator or AMU, AFQ, AMIQ I/Q modulation generator. DvBTBN and WINIQSIM must run simultaneously to enable data transfer. Download latest WINIQSIM / WINIQSIM2[™] version from <u>http://www.rohdeschwarz.com</u>.

4 Connecting the Computer and Instrument

Connecting the instruments

Connect the computer running **DVB-T BURSTED NOISE** to an AFQ, AMU, AMIQ, SMU, SMIQ and optionally an FSQ, FSP, FSU, FSV or FSIQ spectrum analyzer.



Fig. 1 Instrument Connection

5 Installing DVB-T Bursted Noise Software

Execute DVBTBN_1.x.x.EXE and select the installation directory. A new menu item R&S DVB-T BURSTED NOISE will be created in START -> PROGRAM FILES. The installation directory will contain the files named below:

DVBTBN.EXE	DVB-T Bursted Noise executable
DVBTBN.CFG	DVB-T Bursted Noise configuration file
DVBTBN.PDF	This file
DVBTBN.IQS	WinIQSIM configuration file

6 **Basics**



The bursted noise signals have following structure.

Fig 2 Basics

The variation of these parameters allows to simulate reproductable DVB-T signal interferences in order to test receiver capabilities.

7 Starting the Software / Measurement

Execute **DVBTBN.EXE** first. Then start WinIQSIM and load the **DVBTBN.IQS** configuration file. The program will come up with following or similar (depending on **DVBTBN.CFG** configuration file) start window.

DVB-t Bursted Noise v1.31									
File Optimize Crest Factor! Help									
Pulse Pa	Pulse Parameters								
	Pulse Amplitude	Pulse Duration/s	ion/s Pulse Repetition/s F		Pulse Fill / s	<u>ل</u>			
1	1.0000	0.0002500	0.001	0000	0.0007500	Inc Pulses			
2	0.8000	0.0001000	0.001	0000	0.0009000	Dec Pulses			
3	0.4000	0.0007500	0.001	0000	0.0002500				
Burst Pa	arameters								
	Number of Pulses	Burst Duratio	Duration / s Burst		st Repetition / s	l ⁴			
1	3	0.003000)	0.0050000		In <u>c</u> Bursts			
2	2	0.002000)	0.0060000		Dec Bursts			
3	1	0.001000)		0.0070000				
	1					<u></u>			
Samp 1 Total	le Rate / Hz Curi 0000000.0 Repetition / s Sarr 0.0180000	rent Burst Data	Valid 📃 nected 📃	Calc TCP/IP F	Port 15.3	ieed 10 n/dB 904 Quit			

Fig. 3 Main Window

- BURST PARAMETERS
 - Number of Pulses Indicator only (grey) for pulse count of specified burst. This value is affected by INC PULSES and DEC PULSES. <u>Range:</u> 1 to +inf.
 - BURST DURATION Indicator only (grey) for sum of PULSE REPETITIONS.
 - BURST REPETITION User control for time period between two consecutive bursts. Minimal value BURST DURATION. Upper limit restricted by AMIQ memory size.
 - INC/DEC BURSTS Increments / decrements number of bursts. Minimal value: 1.

- PULSE PARAMETERS
 - PULSE AMPLITUDE Range: 0.0 to 1.0.
 - **PULSE DURATION** Effective pulse width. <u>Range:</u> 0.0 to upper limit restricted by AMIQ memory size.
 - **PULSE REPETITION** Total time between current and consecutive pulse. <u>Range:</u> **PULSE DURATION** to upper limit restricted by AMIQ memory size.
 - **PULSE FILL** Indicator only for time span between end of current pulse and start of next pulse. It is calculated as follows:

PULSE FILL = PULSE REPETITION – PULSE DURATION

- INC/DEC PULSES Add/delete pulse to/from end of list. Minimal value: 1
- **SAMPLE RATE** Specifies the sampling rate of the AMIQ. Valid range: 10 kHz to 105 MHz.
- **CURRENT BURST** Active burst. Pulse parameters are updated accordingly. <u>Range:</u> 1 to **NUMBER OF BURSTS**.
- **TOTAL REPETITION** Indicator only for total time span of bursted noise signal. Is calculated as:

TOTAL REPETITION = BURST REPETITION₁ + ... + BURST REPETITION_N

• **SAMPLE COUNT** – Indicator only for number of samples. Is calculated as:

SAMPLE COUNT = SAMPLE RATE * TOTAL REPETITION

If SAMPLE COUNT exceeds maximum AMIQ memory size (16000000 samples for AMIQ-04) a red frame appears around it, indicating an AMIQ memory overrun.

- **CONNECTED** indicator LED turns green when TCP/IP link to WinIQSIM is active.
- **CALC** calculates two time domain arrays (I and Q data) for further processing with WinIQSIM.
- **DATA VALID** indicator LED turns green when valid IQ data has been generated by pressing CALC.

<u>Note</u>: The maximum SAMPLE COUNT corresponds to the AMIQ-04. In case you have an AMIQ-03 or less, WinIQSIM will display a warning. The greyed table elements cannot be manipulated by the user.

See 'DVB-T Bursted Noise Measurement Example' for a description of setting up WinIQSIM.

Menu

File

All program and device specific data may can be loaded / saved from / to a configuration file.

🛄 DVB-t Bursted Noise v					
File	<u>H</u> elp				
Lo	ad Configuration				
Sa	ve Configuration				
<u>U</u> u					

Fig. 4 Menu Items

- LOAD CONFIGURATION the default file extension is *.cfg.
- **SAVE CONFIGURATION** the default file extension is *.cfg. Similar file dialog as Load Configuration.

Optimize Crest Factor

This menu item enables calculating IQ data with varying start seeds. The min/max indexes and values are displayed so the user can choose the desires start seed on the main window.

. #	🛛 Optimize Crest Factor 🛛 🗐 💶 🗆 🗙					
	Seed	Crest Factor/dB		Seed Count	Current Index	
	5	15.4347		10	11	
	6	15.3992		Seed Min CF	Min Crest Fact	
	7	15.3962		8	15.3904	
	8	15.3969		Seed Max CF	Max Crest Fact	
	9	15.4128			2	15.4691
	10	15.3904		Mean	StdDev	
	11	15.4498		15.4251	0.0277	
[
	<u>Start</u> <u>O</u> K					

Fig. 5 Optimize Crest Factor

<u>Note:</u> Since two different randons arrays are generated and the I-array always starts with seed=1 the seed of the Q-array begins with 2.

Help

- HELP Online help file
- **ABOUT** displays revision and copyright information.

8 DVB-T Bursted Noise Measurement Example

- Start **DVBTBN** and **WinIQSIM** as described above. The DvbtBN example configuration **DVBTBN.CFG** is automatically loaded at startup. Setup the signal / modulation generator analyzer as required and load the WinIQSIM configuration file **DVBTBN.IQS**.
- Make sure you have a valid TCP/IP connection and press CALC in DVBTBN.
 - Graphics: i(t), q(t) 1.0-0.5 Inphase i(t) 0.0 -0.5 -1.0 100000 50000 150000 180000 0 Color t/Tisym Zoom Uncoom 1.0 0.5Quadrature q(t) 0.0--0.5--1.0-100000 150000 180000 50000 n Zoom Uncoom t/Tsym Color ٠ ٠ t/T: 488.0000 Cursor State ACP Meas, Color 1: 0.9088 4 Cursor 1: X SMIQ Cut Off Color Q: 0.4294 Update Close
- Transfer the data by pressing the graphics button in WinIQSIM.

Fig. 6 WinIQSIM Graphics

• Then press the *AMIQ Transmission -> Transmit* button to transmit the data to the AMIQ. Be sure to check *Compensate Ouput Signal for* sin(x)/x Distortion.

AMIQ Transmission
User File Info
Source
Internal (Win IQSIM)
C File J\Amp_35dB\FFT1MB_CF10_8227_IQS.wv
Destination
AMIQ RAM
C AMIQ HD
C AMIQ Batch Floppy
C File Amp_35dB\FFT128kB_CF11_6301_IQS.wv
Compensate Output Signal for sin(x)/x Distortion
Add WinIQSIM setup to waveform file
🗖 IQ swap
<u>T</u> ransmit <u>C</u> ancel

Fig. 7 AMIQ Transmission

9 Additional Information

Please contact **TM-AppLiCATIONs@ROHDE-SCHWARZ.COM** for comments and further suggestions.

10 Ordering information

IQ Modulator		
R&S®AFQ100A	IQ Mod. Generator (200MHz)	1401.3003.02
R&S®AFQ100B	IQ Mod. Generator (528MHz)	1410.9000.02
R&S®AMU200A	Baseband Signal Generator	1402.4090.02
Vector Signal Generator		
R&S®SMU200A		1141.2005.02
Spectrum Analyzer		
R&S®FSPx	(9 kHz to 30 GHz)	1093.4495.xx
R&S®FSUxx	(20 Hz to 67 GHz)	1166.1660.xx
R&S®FSQxx	(20 Hz to 40 GHz)	1155.5001.xx
R&S®FSLxx	(9 kHz to 18 GHz)	1300.2502.xx
R&S®FSVxx	(9 kHz to 40 GHz)	1307.9002.xx



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