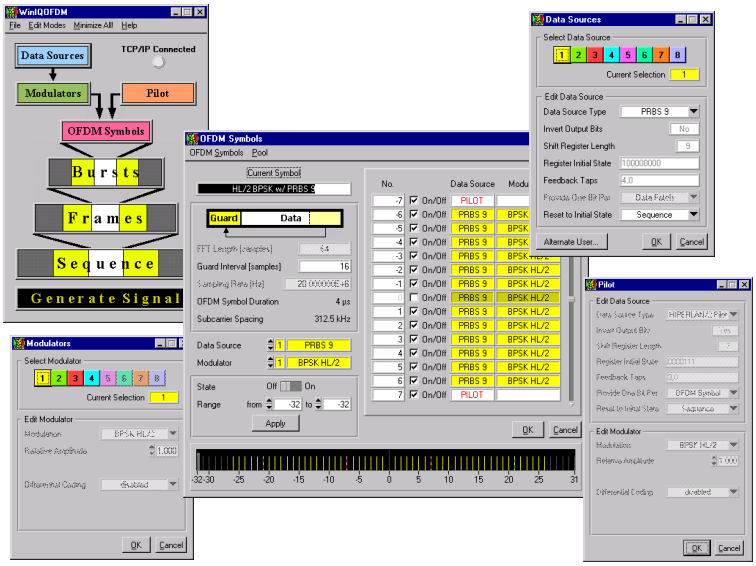
Technical Information



Simulation Software WinIQOFDM – AMIQK15/SMIQK15

Generating OFDM signals (Generic / HIPERLAN/2)

The WinIQOFDM software package is for simulating OFDM signals as eg in wireless LANs. Besides the generic mode, a HIPERLAN/2 mode is also available to simulate the HIPERLAN/2 and IEEE 802.11a systems.

- Generic and HIPERLAN/2 modes
- Connection to WinIQSIM via a TCP/IP interface
- Data transfer to I/Q Modulation Generator AMIQ or to the SMIQ's internal arbitrary waveform generator (SMIQB60)
- User-friendly operation
- Context-sensitive help system

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WinIQOFDM and WinIQSIM

WinIQOFDM defines and calculates the complete frame structure of OFDM signals. WinIQOFDM is connected to WinIQSIM via the TCP/IP import system. WinIQSIM is used to process the generated signal further (eg by adding filtering, channel distortion or oversampling) and display it. The calculated signal can then be sent from WinIQSIM to I/Q Modulation Generator AMIQ (requires option AMIQK15) or to the SMIQ's internal arbitrary waveform generator SMIQB60 (requires option SMIQK15).

Generating signals with WinIQOFDM

Eight data sources are available to generate OFDM signals. These data sources are standardized PN generators, user-defined generators or generators using data from ASCII files.

There are eight modulators covering all common PSK and QAM constellations with optional differential modulation, PSK rotation or non-uniform QAM.

The data sources and modulators can be combined in any way.

Many OFDM systems use pilot subcarriers to provide a phase reference within the system. Therefore, WinIQOFDM provides a ninth, fixed combination of a data source / modulation block that represents the pilot.

The data sources can be set up to specify when new data bits are generated. This means that complex pilot definitions can be implemented.

Generating OFDM symbols, bursts, frames and sequences

The OFDM symbol editor is a convenient tool for entering the symbol structure you want. Each OFDM symbol subcarrier is assigned an arbitrary combination of one of the eight data sources and modulators (or the pilot signal). The guard interval (GI) length can be set.

Most OFDM signals have a TDMA frame structure. WinIQOFDM has a two-level frame hierarchy to generate these time structures. First, a number of OFDM symbols is combined to form bursts and then a preamble and a postamble, which are both loaded directly from IQ files in ASCII float format, are added.

These bursts are then used as the building blocks for the frames which form the sequence, ie the signal that is finally generated.

HIPERLAN/2 with WinIQOFDM

WinIQOFDM is ideal for generating HIPERLAN/2 signals. A special editing mode is available to configure these signals. In this mode, program operation is even more user-friendly than configuring general OFDM systems. Conformity with the standard is guaranteed for all settings – up to the OFDM symbol definition.

At the OFDM symbol level, WinIQOFDM itself determines, say, the number of subcarriers and whether they are to be data or pilot carriers. Pilot configuration is also automatic. Since in HIPERLAN/2 the same data source and modulation mode are always assigned to all a symbol's data carriers, there is no need to edit each OFDM subcarrier separately. The HIPERLAN/2 edit mode makes global assignments, all modulation modes defined in the standard being made available by WinIQOFDM. Also, a pool with all the OFDM symbol structures used in HIPERLAN/2 is created when you select this mode.

Bursts can still be defined as the user requires, but a file with examples of HIPERLAN/2 bursts from which MAC frames can be directly constructed has been provided as an aid. The relatively large degree of freedom with which bursts and frames can be configured means that very complex signal sequences can be generated. For simple applications, setup examples make it easy to create the HIPERLAN/2 signals you want.

Technical data

User interface			Windows interface with context-sensitive help
Systems			HIPERLAN/2, Generic (OFDM systems in general)
Generic			User-configurable, general OFDM system
User groups			2 (main user and alternate user) WinIQOFDM has two complete sets of data generators, modulators and a pilot that are assigned to the main user and the alternate user respectively. Apart from the data sources, the configurations are identical. When frames are constructed, which of the two fictitious users will generate a burst is defined for each burst. This facilitates simple and quick simulation of multi-user scenarios.
Data sources			
	Number		8 for the main user + 8 for the alternate user (separately configurable)
	Types		All 0s, All 1s, PRBS (7, 9, 11, 15, 16, 20, 21, 23), HIPERLAN/2 pilot (standardized, preset PN generators)
			User (user-defined PN generator)
			Pattern (user-defined bit sequence)
			File (user-definable data sequence via file interface)
	Parameters: Data-bit assignment		- Exactly one new bit is generated for every active subcarrier irrespective of whether and how often this bit is read by the modulators when signals are generated. - Whenever a bit is read by a modulator, the next bit is generated. - Exactly one new bit is generated for each OFDM symbol irrespective of whether and how often this bit is read by the modulators when signals are generated.
	Data source reset		- at the beginning of an OFDM symbol - at the beginning of a burst - at the beginning of a frame - only at the beginning of the simulation The various operating modes are necessary to generate special reference signals (eg pilots) as used in many OFDM systems.
Modulators			
	Number		8 for the main user + 8 for the alternate user
	Modulation modes		
		PSK	BPSK, BPSK HIPERLAN/2, QPSK, QPSK HIPERLAN/2, QPSK DVB, 8 PSK

			Parameters: Relative amplitude Differential modulation PSK rotation Reset event for the differential modulation	 0.0 to 999.9 - off - between adjacent subcarriers - separately for each subcarrier 0 to 15 x π/8 in conjunction with differential modulation - at the beginning of a new OFDM symbol - at the beginning of a new burst - at the beginning of a new frame - at the beginning of the simulation
		QAM		16 QAM and 64 QAM each with the constellations for HIPERLAN/2 and DVB with α = 1, α = 2 and α = 4
			Parameters: Relative amplitude Non-uniformity parameter Differential encoding Reset event for the differential modulation	 0.0 to 999.9 α = 1.0 to 999.9 - off - between adjacent subcarriers - separately for each subcarrier - at the beginning of a new OFDM symbol - at the beginning of a new burst - at the beginning of a new frame - at the beginning of the simulation
Pilots				A pilot is an additional, fixed pair of a data source and modulator.
	Number			1 for the main user, 1 for the alternate user
	Data generator types and modulation modes			See data sources and modulators
OFDM coding unit				Configuration via any number of symbol prototypes which define the structure of the OFDM symbols to be generated.
	Parameters			
		Common for all OFDM symbol prototypes		FFT length = 1 to 2^{15} samples Sampling rate ≤ 100 MHz
		Separately for each OFDM symbol prototype		Name Guard interval = 0 to FFT length samples
		Separately for each subcarrier within an OFDM symbol prototype		State = on (modulated) / off (inactive) Each subcarrier is assigned either a data source and a modulator or the pilot. The pilot's bit sequence can also be inverted.
Bursts				The user can generate a pool with any number of burst prototypes each consisting of a preamble, a number of OFDM symbols and a postamble (without any gaps). The preamble and the postamble are read from a file (*.pbl).

Frames		The user can generate a pool with any number of frame prototypes which, in turn, contain a burst sequence with arbitrary starting points. The bursts can be generated either by the main user or the alternate user.
Sequence		Contains a frame sequence with user-selectable starting points
HIPERLAN/2		Similar to *Generic*, but all parameters up to the OFDM symbol level are limited to HIPERLAN/2-compliant settings. Also, the frame length is set to 40 000 samples.
User groups		2 (main user and alternate user) WinIQOFDM has two complete sets of data generators, modulators and a pilot that are assigned to the main user and the alternate user respectively. Apart from the data sources, the configurations are identical. When frames are constructed, which of the two fictitious users will generate a burst is defined for each burst. This facilitates simple and quick simulation of multiple-user scenarios.
Data sources		
	Number	8 for the main user + 8 for the alternate user (separately configurable)
	Types	All 0s, All 1s, PRBS (7, 9, 11, 15, 16, 20, 21, 23), HIPERLAN/2 pilot (standardized, preset PN generators)
		User (user-defined PN generator)
		Pattern (user-defined bit sequence)
		File (user-definable data sequence via file interface)
	Parameters: Generating a new data bit Data–source reset	 Whenever a bit is read by a modulator, the next bit is generated. - at the beginning of an OFDM symbol - at the beginning of a burst - at the beginning of a frame - at the beginning of the simulation
Modulators		
	Number	4 for the main user + 4 for the alternate user
	Modulation modes	BPSK, QPSK, 16 QAM and 64 QAM, for the HIPERLAN/2 configurations, and the four modulators have a fixed assignment and cannot be edited.
Pilots		A pilot is an additional, fixed pair of a data source and modulator. The settings for the HIPERLAN/2 pilot are fixed.
	Number	1 for the main user, 1 for the alternate user

OFDM coding unit	Configuration by means of any number of symbol prototypes (pool) defining the structure of the OFDM symbols to be generated.
	The HIPERLAN/2 symbol structure is fixed, ie FFT length, sampling rate and the assignment of the pilots to the individual subcarriers cannot be edited. All other subcarriers in the symbol are assigned the same combination of data source and modulator. Guard interval = 8 or 16 samples. A pool with all HIPERLAN/2 symbol structures is provided and can be added to by the user. Each and every active subcarrier can be deactivated for test purposes.
Bursts	The user can generate a pool with any number of burst prototypes consisting of a preamble and a number of OFDM symbols (without any gaps). The preamble is read from a file (*.pbl). All HIPERLAN/2 preambles are available as files. All HIPERLAN/2 burst structures can be generated. A setup file with HIPERLAN/2 PDUs is provided.
Frames	The user can generate a pool containing any number of frame prototypes which, in turn, contain a burst sequence with arbitrary starting points. The bursts can be generated either by the main user or the alternate user. Any HIPERLAN/2 MAC frame can be generated.
Sequence	Contains a sequence of frames with arbitrary starting points.

Ordering information

Options

OFDM Signal Generation HIPERLAN/2 and user specific; supplemental prog. to WinIQSIM	AMIQK15	1122.2803.02
OFDM Signal Generation HIPERLAN/2 and user specific; Option B60 with WinIQSIM req.	SMIQK15	1105.1531.02

Application software

PC Software: Generation of OFDM Signals	WinIQOFDM	available on www.rohde-schwarz.com