I/Q Modulation Generator AMIQ

New models 03 and 04 as well as digital I/Q output option

Since its successful market launch two years ago, I/Q Modulation Generator AMIQ [1] has undergone intensive upgrading, which considerably increased its versatility [2]. Together with the WinIQSIM software [3], the previous model enabled generation of a huge number of waveforms covering a wide range of applications. The new models AMIQ03 and 04 (FIG 1) once again substantially widen the spectrum of applications.

Photo 43 419/2

FIG 1 New AMIQ04 model with differential I/Q outputs and digital I/Q output options

New features in brief

- Digital I/Q Output option AMIQ-B3: This option adds the associated digital control signals to the analog outputs. The new models 03 and 04 come ready for integration of the digital I/Q output option.
- Models 03 and 04 may also work with an external clock via their CLK connector. This allows generators to be synchronized to a central system clock and avoid interference due to clock beats.
- The resolution of output signals can be selected between 8 and 16 bits. So DACs (digital/analog converters) with different bit widths, for example, can be used with the digital I/Q output option.
- Model 04 has even larger storage capacity, enabling it to store and output complex curves of up to 16 Msamples.

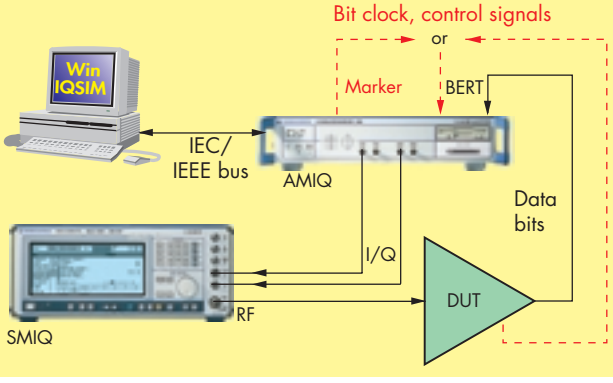
Digital I/Q output option

There is a marked trend towards digital signal processing. AMIQ's answer to this development is the new option AMIQ-B3, which makes digital control signals available together with the associated clock signals and offers highly convenient operation through WinIQSIM.

Example: bit-error-rate measurements on TDMA systems

Bit-error-rate measurements are normally performed using a pseudo-random binary sequence (PRBS). For a realistic test scenario, the PRBS to be evaluated must be continuously embedded in the TDMA data structure. Also, the PRBS should not be interrupted to guarantee smooth operation of the BER tester. This requires test signals with long data sequences. If a PRBS 9 sequence is used, 511 TDMA frames usually have to be generated (2^9-1). Its storage capacity of 16 Msamples makes AMIQ04 ideal for this kind of application. FIG 2 shows a typical test setup with AMIQ and the optional BER Measurement AMIQ-B1. AMIQ is also an excellent source of multicarrier signals, so signals in adjacent channels or other interference signals can be generated in addition to the useful carrier without the need for a second generator. This allows typical receiver tests like adjacent-channel rejection or blocking.

FIG 2 Measurement of bit error rate



This new option can supply a connected **DUT with a voltage of +3.3 V or +5 V**. The high levels of data and clock adjust automatically. A **special feature of the digital output** is that it outputs data and clock only for DUTs with the supply voltage applied. Otherwise all outputs are of high impedance to protect sensitive circuitry of the DUT.

To avoid reflection when operating AMIQ with clock frequencies >40 MHz, it is advisable to connect DUTs to the output using very short lines or to terminate them with the required impedance.

A host of new applications

The digital output allows a wide selection of applications. These range from measurements on DACs through tests of digital mobile-radio interfaces (see examples in boxes) to the use of low-voltage differential signalling (LVDS) links. With the latter, high-frequency digital links (several hundred MHz) can be made on long lines using differential signals of low amplitude. For this purpose AMIQ-B3 drives an LVDS transmitter component that converts the signals into a serial data stream of higher frequency. A cable up to 10 m long connects the transmitter output with an LVDS receiver, which converts the data back into their original parallel format. In this way the digital signals from AMIQ-B3 can be routed over long distances or the associated LVDS chips can be tested.

Through continuous product upgrading and especially thanks to the new AMIQ-B3 option, AMIQ once more emphasizes its role as a universal modulation generator meeting all requirements of the digital communication age.

Burkhard Küfner;
Dr Rene Desquiotz

Example: testing DACs

Digital/analog converters (DACs) link the digital to the analog world. High-resolution digital words at high sample frequency are needed to test new DAC designs. Its optional digital I/Q output makes AMIQ 03/04 ideal for this application due to word width of up to 16 bits per channel and a clock frequency up to 100 MHz (FIG 3).

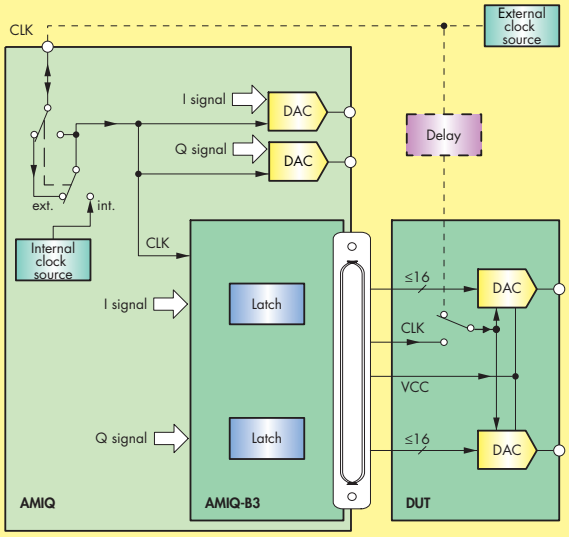


FIG 3 AMIQ with AMIQ-B3 option testing DACs

A critical aspect of these measurements is the spectral purity of the clock used. An impure clock signal causes a DAC to generate additional harmonics and nonharmonics, which in turn reduce the spurious-free dynamic range. To eliminate this source of error, the DUT can be supplied with a clock of extremely high spectral purity from an external source, eg a crystal oscillator or synthesizer, and the matching control signals obtained from the digital AMIQ output. AMIQ is driven by the same clock for the necessary synchronization of clock edges with the data from the option. For clock frequencies above approx. 40 MHz, the internal delay of AMIQ (max. approx. 25 ns) has to be taken into account by delaying the clock accordingly.

After loading of the desired trace into the AMIQ output memory by WinIQSIM (sinusoidal or multitone signal), a spectrum analyzer can be used to check the impact on spectral purity at the DUT output by varying bit width and clock frequency.

REFERENCES
[1] Kernchen, Wolfgang; Tiepermann, Klaus-Dieter: I/Q Modulation Generator AMIQ – Convenient generation of complex I/Q signals. News from Rohde&Schwarz (1998) No. 159, pp 10–12
[2] Küfner, Burkhard: I/Q Modulation Generator AMIQ – more applications through differential I/Q outputs. News from Rohde&Schwarz (1999) No. 162, pp 20–21
[3] Pauly, Andreas; Holzhammer, Jens: I/Q Simulation Software WinIQSIM – New approaches in calculating complex I/Q signals. News from Rohde&Schwarz (1998) No. 159, pp 13–15

Condensed data of AMIQ-B3

Output	68-pin connector (submin D, half pitch)
Number of channels	2 (one each for I and Q)
Resolution	selectable from 8 to 16 bits
Output impedance	approx. 50 Ω (typ.)
DC voltage output	selectable +3.3 V or +5 V
Clock frequency	max. 100 MHz (normal and inverted polarity)

Reader service card 166/08