G7M-06 vector signal generator

Features

— Frequency range from 10 MHz to 6 GHz

— Wide output signal power setting range from −90 dBm to +12 dBm

— Low phase noise −130 dBc/Hz at 20 kHz offset from 1 GHz carrier

— Analog modulation types: amplitude, frequency, phase and pulse modulations

— Custom digital modulation

— Built-in modulation signal generator

— Modulated signal band at 100 MHz

Description

G7M-06 signal generator is designed to generate continuous harmonic signals, analog-modulated and digital-modulated signals. Signal generators are used for analyzing, tuning, testing and monitoring for manufacture of high-frequency and microwave devices and equipment used in communications, radar location, instrument engineering and measuring equipment. G7M-06 signal generator is controlled through universal SCPI commands by external PC with VEGA software installed, which allows integrating the device into automated instrumentation systems.

Main capabilities

Available operating modes:

- continuous generation of harmonic signal with fixed frequency and power;
- frequency sweep, power sweep and arbitrary frequency/power list sweep;
- continuous generation of modulated signal;
- continuous generation of modulation signals (I and Q).

Features and options

Output microwave connector type

Output microwave connector type as per GOST RV 51914-2002 is defined by G7M-06 generator options:

- 01R option — type III connector (female);
- 11R option — type N connector (female).

Analog modulation

G7M-06 provides generation of amplitude, frequency and phase modulated signals with internal modulation signal generator with typical waveforms (sinus, sawtooth, triangle, square, noise).

Pulse modulation

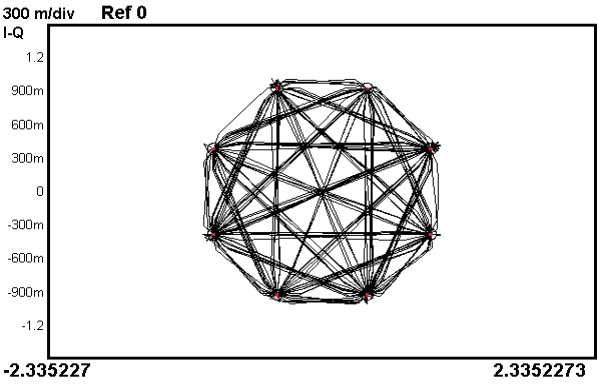
Pulse modulated signal may be generated with internal or external pulse modulator. Internal or external pulse modulator may be controlled with internal pulse oscillator that generates periodic pulse sequence and 2 to 255 pulses bursts.

Digital modulation

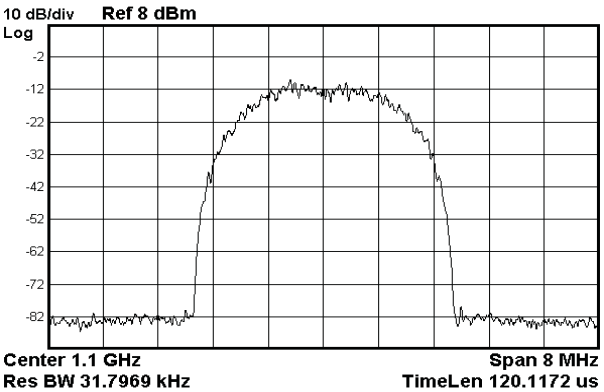
G7M-06 signal generator allows you to use internal or external quadrature modulator to generate modulated signal. Internal quadrature modulator may use internal or external oscillator as modulation signal source. For this purpose, front panel of the device is provided with I and Q modulation signal inputs. G7M-06 signal generator may be used also as modulation signal source for external quadrature modulator, using I and O outputs at the rear panel of the device.

Star pattern and signal spectrum at 1.1 GHz with 8PSK modulation, 16 Mbit/sec data transmission rate and Nyquist filter with β equal to 0.9.

Star pattern diagram



Spectrum



Built-in generator of modulation signals (I and Q)

Two-channel generator is used as internal source of modulation signals, which allows to:

- reproduce pre-calculated and saved signals from memory with sampling rate up to 125 MHz;
- reproduce signal sequences from memory (a few associated signal segments with predetermined number of repetitions);
- correct and distort modulation signals;
- create event markers (markers are defined by user during signal generation).

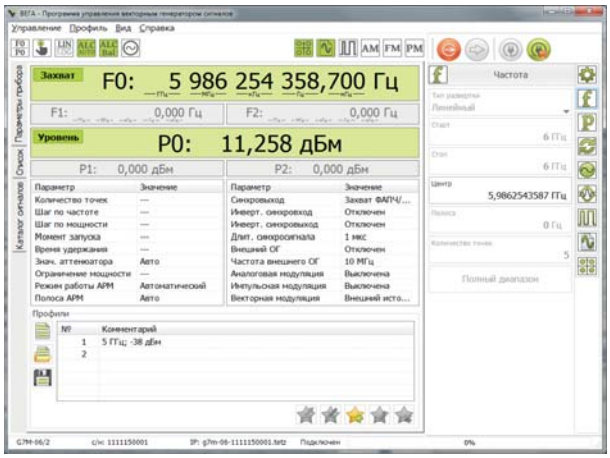
Synchronization system

G7M-06 signal generator can stabilize frequencies of 10 MHz, 50 MHz or 100 MHz output signal of external reference oscillator, and stabilize frequencies of external devices by 10 MHz signal of internal reference oscillator. Flexible digital synchronization system provides joint operation of signal generator and external devices, which allows using G7M-06 in various measuring systems without developing additional software.

Software

G7M-06 signal generator is controlled by VEGA software providing the following advantages:

- user-friendly interface;
- wide capabilities for signal parameter setting;
- saving and downloading profiles;
- signal waveform library that allows creating waveform sequences;
- sweep list editor that allows saving and downloading the list;
- pulse burst editor.



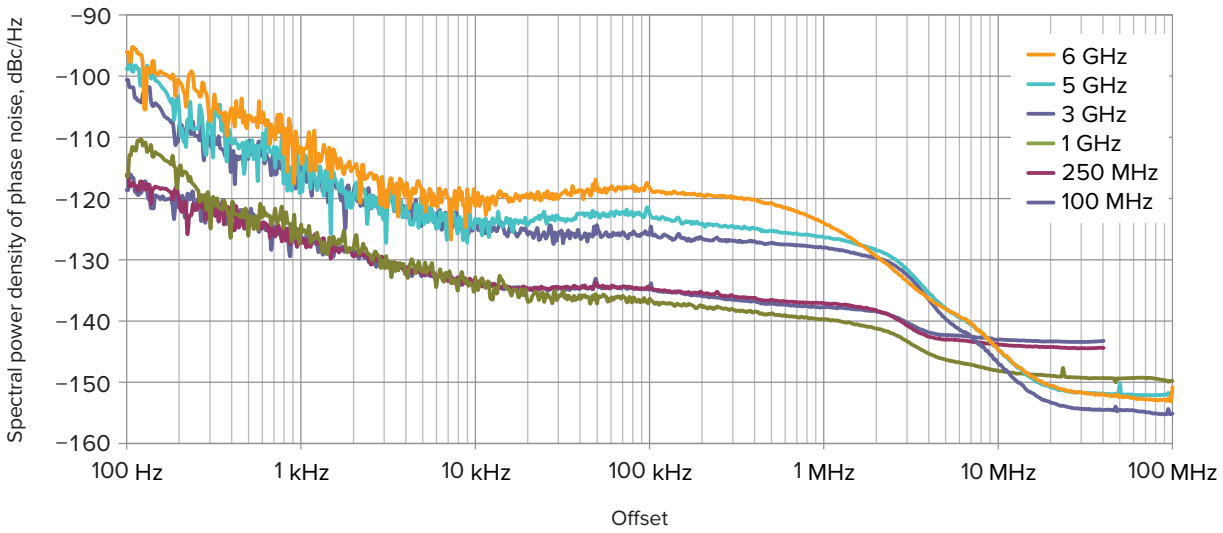
Specifications

Operating frequency range	**10 MHz ... 6 GHz**
Output frequency step	0.1 Hz
Relative frequency setting error for operation with built-in reference oscillator	$\pm 1 \times 10^{-6}$
Time required to set a new frequency	< 2 ms
Output signal power setting range	−90 ... +12 dBm
Output signal power setting increment	0.1 dB
Relative spectral power density level of phase noise at 20 kHz offset	
250 MHz	< −130 dBc/Hz
500 MHz	< −130 dBc/Hz
1 GHz	< −130 dBc/Hz
2 GHz	< −125 dBc/Hz
3 GHz	< −120 dBc/Hz
4 GHz	< −120 dBc/Hz
6 GHz	< −115 dBc/Hz
Relative level of harmonic components at 12 dBm output signal power	< −30 dBc
Relative level of nonharmonic components	< −50 dBc
Microwave signal modulation	
Frequency modulation	
FM deviation	0 ... 10 MHz
FM deviation setting increment	1 Hz
Phase modulation	
PM index	0 ... 3.14 radian
PM index setting increment	0.01 radian
Amplitude modulation	
AM depth	0 ... 100 %
AM depth setting increment	0.1%
Internal analog modulation source (amplitude modulation, frequency modulation, phase modulation)	
Modulation waveform	sinus, sawtooth, triangle, square, noise
Modulation signal frequency	0.1 Hz ... 10 MHz*
Modulation signal frequency setting increment	0.1 Hz
Pulse modulation	
Pulse envelope front/tail time	< 10 ns
Minimum pulse duration	20 ns
Pulse modulator	> 50 dB
Pulse modulation source	internal or external
Internal pulse oscillator	
Pulse duration	20 ns ... 3.99999998 sec
Pulse repetition period	40 ns ... 4 sec
Pulse duration and pulse repetition period setting increment	10 ns
Number of pulses per pulse burst	up to 255
Digital modulation specifications	
Modulation signal source (I and Q).	internal, external, sum
External modulation signal source	
Signal band at high-frequency (I + Q)	up to 200 MHz
Input resistance	50 Ohm
Allowable signal level	0.5 V
Fixed bias correction	±100 mV with 0.1 mV step
Internal modulation signal source	
Number of channels	2 (I and Q)
DAC resolution	16 bit
Sampling rate	100 Hz ... 125 MHz
Sampling rate setting increment	0.1 Hz
Signal band at high-frequency (I + Q)	100 MHz
Maximum memory capacity per channel	32×10^6 samples
Waveform sequence	
Maximum number of segments per sequence	1024

* 10 MHz for sine waveform of modulation signal, 1 MHz for other waveforms.

Maximum number of a segment repetitions	65535
Digital modulation settings of internal modulation signal generator	
Amplification balance	±1 dB with 0.001 dB step
Phase balance	±10° with 0.01° step
Permanent offset in I channel	±20 % with 0.01 % step
Permanent offset in Q channel	±20 % with 0.01 % step
Relative delay between I and Q channels	±400 ns with 1 ns step
Modulation signal output (I and Q).	
Peak-to-peak signal output for 50 Ohm load	up to 1 V
Band	50 MHz
Fixed bias	±1 V
Output signal type	symmetrical and asymmetrical

Phase noise



Ordering information

Basic supply set	
1) G7M-06 vector signal generator. 2) Ethernet cable. 3) Power cable. 4) VEGA software for vector generator signal control. 5) Carrying case.	
Versions	
G7M-06/1	Vector signal generator, 0.01 ... 6 GHz with 01R option
G7M-06/2	Vector signal generator, 0.01 ... 6 GHz with 11R option
Additional accessories	
On your request, the device may be supplied with additional coaxial adapters and cable assemblies.	

Ordering example

- Vector signal generator G7M-06/1 — 1 pcs.
- Control and data display device PKU-11 — 1 pcs.

Signal Lab software

Signal Lab is a software for generation of complex signals, including signals modulated according to QPSK, BPSK and other techniques. Signal Lab extends capabilities of Micran vector signal generators, and may be used as an independent product.

Quick signal modeling

Flexible tools of Signal Lab software allow you to save your time spent for generation of test signals, and to test accessories, transmitters and receivers with better quality. Signal Lab is a ready-made solution which requires no mathematical model development or specific software. Quick change of parameters and signal generation, automatic addition of files to the library of Vega software will help you save your time.

Possible functionality enhancement

We work on enhancement of Signal Lab functionality considering requests of our clients. The software supports generation of typical digital modulation signals. Signal Lab allows you to use a single software for work with various signals.

Intuitive interface

In order to generate signals of conventional digital modulation types, we have arranged the elements with signal parameters in sequence of operations performed with them. User can see the results on diagrams and evaluate the generated signal immediately. The signal may be displayed in time and frequency domains, and on vector diagram. Signal Lab software can display the signal with the specified number of points.

In contrast to other software, Signal Lab is a universal program capable to display signal and download previously created files to view and edit them.

Menu structure

Convenient menu of Signal Lab allows you to select type of generated signal or modulation group with further adjustment of individual parameters, or select the predefined modulation parameters. Amplitude, phase, frequency and quadrature amplitude modulations are available.

Signal Lab offers you:

- Quick presets for Bluetooth, DECT, GSM, NADC, PDC, PHS, TETRA, WCDMA 3GPP, Worldspace, TFTS;
- Display of vector diagrams, signal spectrum and I and Q components vs. time graphs.
- Possibility to define coding type, symbol rate, parameters of generating filter and data source;
- View and edit of previously created files;
- Creation of user markers.

Signal Lab capabilities

Modulation type

ASK / modulation index	ASK, 2ASK, 4ASK, 8ASK / 0 ... 100 % with 0.1 % step
FSK / frequency deviation	MSK, 2FSK, 4FSK, 8FSK, custom / 10 Hz ... 3 × fsym
PSK	BPSK, π/2-DBPSK, QPSK, OQPSK, QPSK EDGE, QPSK π/4 offset, π/4-DQPSK, π/8-D8PSK, 8PSK, 8PSK EDGE, D8PSK, 16PSK
QAM	16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM, 1024QAM, custom

Generating filter

Filter type	none, Nyquist, square root of raised cosine, Gauss, square
Oversampling factor	2, 4, 8, 16
Filter order	16 ... 1024
Nyquist filter coefficient square root of raised cosine	0.05 ... 1.00
Gauss filter coefficient	0.10 ... 1.00

Data source parameters

Data source	" all ones", "all zeros", pseudorandom sequence, sequence and data file
Number of symbols	2 to 1 000 000
Pseudorandom sequence	9, 11, 16, 20, 21
Sequence, bit	1 ... 16

Other specifications

Symbol rate	1 kHz ... 62.5 MHz with 0.1 Hz step
Coding type	none, Gray, differential, differential + Gray, GSM, NADC, PDC, PHS, TETRA, TFTS
Presets	Bluetooth, DECT, GSM, NADC, PDC, PHS, TETRA, WCDMA 3GPP, Worldspace, TFTS