

**PICOSECOND  
PULSE GENERATOR MODULE  
PPM0731**

**USER MANUAL**

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# SAFETY MANUAL

## Electrical safety

- PPM0731 pulse generator module is high voltage equipment. Please be very careful and operate by qualified personnel only.
- There is a risk of electric shock, strong electromagnetic interference, damage of the generator, or other electronic equipment in case of improper use.
- It is strongly prohibited to switch on the generator without an output coaxial cable. We recommend using at least 50 centimeters length coaxial cable connected between the generator and the load (antenna or first attenuator) to prevent permanent damage to the generator. There is a risk of electrical arcing on the open HV coaxial connector and damage to the output circuit of the generator.
- When adding or removing the generator to or from the system, ensure that the power supply is unplugged (in OFF state). Please apply power supply only after connecting output and input coaxial cables.
- Please provide sufficient free space and allow free airflow around the generator for good cooling in case of long time operation at a high repetition rate.

## Operation safety

- Please read this manual before installing and using the generator.
- Before using the product, make sure that all the cables are applicable and not damaged. High voltage connectors should be clean and dry, free from dust, dirt, and any obstacles.
- To avoid short circuits, keep metal parts like clips, screws, and staples away from the generator.
- The generator is designed for operation in normal laboratory conditions. Avoid dust, humidity, and temperature extremes. Do not place the generator in any place where it may become wet.
- Place the generator on a stable surface.
- If you encounter any technical problem with the generator, please contact Megaimpulse Ltd. Do not try to repair the generator by yourself.

## PACKAGE CONTENT

Please check the package for the following items:

- ✓ PPM0731 picosecond pulse generator module (hereinafter "generator")
- ✓ Dual voltage AC/DC switching power converter:  
AC 85V..264V, 47Hz..63Hz / DC +24V, 0.6A; DC +160V, 0.3A;
- ✓ Semirigid coaxial cable assembly N connector/SM141 cable/open for the output pulses feeding and connection to the load by soldering or optional connector;
- ✓ Coaxial cable assembly SMA connector/RG316 cable/SMA connector for the input triggering signal feeding;
- ✓ User manual (printed or electronic version).



Fig.1. General view of PPM0731 picosecond pulse generator module.

## DESCRIPTION OF THE GENERATOR OPERATION

PPM0731 generates picosecond rise time unipolar high voltage pulses with up to 7kV amplitude and high repetition rate. It is made as a compact pulse generator module (head) with an external power supply and external triggering.

The external dual voltage DC power supply is included in the standard package together with four wires DC power supply cable. If the optional DC power supply with optional supply cable is used, then connect it according to the marks.

- ➔ **The ground wires of the power supply cable are marked by black color. Low voltage and high voltage supply wires are marked by the labels.**

The contact pins of the power supply connector are the following:

- Pin 1 – GND (ground return DC +24V)
- Pin 2 – DC +24V low voltage supply
- Pin 3 – GND (ground return DC +160V)
- Pin 4 – DC +160V high voltage supply

The typical output pulse waveform is shown in Fig.2. Normally the generator should operate with 50 Ohm matched load, for example, UWB antenna connected by 50 Ohm impedance coaxial cable.

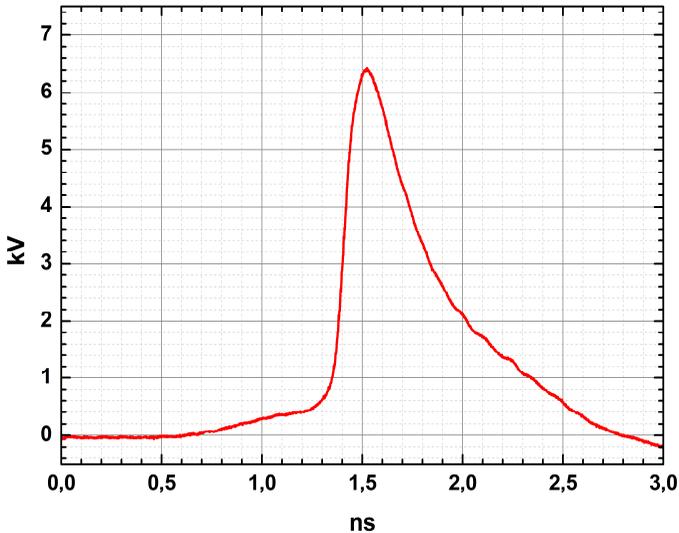


Fig.2. PPM0731 typical output pulse waveform on 50 Ohm matched load.

- **It is strongly prohibited to switch on the generator without the load (with open connector). We recommend using 50 centimeters length coaxial cable between the generator and the load (antenna or first attenuator) to prevent damage to the generator in case of load breakdown.**

Operation on unmatched load inevitably results in reflection from the load; part of the pulse energy returns back to the generator and may overheat it. PPM0731 has overheating protection. If the temperature exceeds 55 °C, then the red LED "OVERHEAT" lights on and the triggering is blocked. Please cool down the generator and reduce the repetition rate if required.

- **Please provide free airflow around the generator in case of long time operation at high frequency, especially in case of an unmatched load.**

The generator is triggered by the leading edge of the external triggering pulse. There is no internal triggering mode. Acceptable triggering pulse amplitude is +3.5V ... +5V at 50 Ohm; low triggering pulse amplitude leads to unstable triggering and higher output pulse jitter. Recommended triggering pulse duration is 10 ns ... 200 ns. Pulse rise time should be no more than 1 ns. Longer rise time may result in increasing the output pulse jitter. Orange LED "SYNC IN" lights on in case of successful triggering.

The generator has internal over frequency protection. If the frequency of the triggering pulses exceeds the maximum, then the generator blocks the triggering and red LED "OVERLOAD" lights on. The same occurs in the case of a very long triggering pulse. Please reduce the frequency of the triggering pulses and/or triggering pulse width.

Two fans are used for the cooling of the generator. If the temperature is low, then the fans are stopped. The rotation speed of the fans increases with increasing the temperature. Therefore, the cooling system stabilizes the temperature of the generator; this improves the stability of the output pulse waveform and reduces temperature drift.

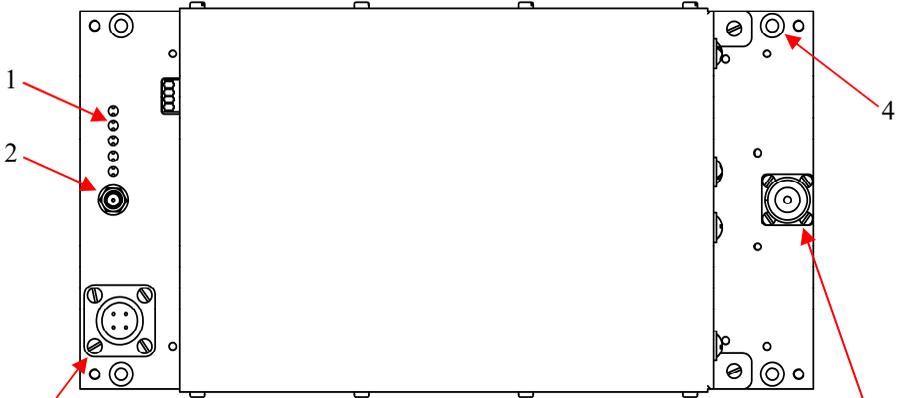
## TECHNICAL SPECIFICATION OF PPM0731 PICOSECOND PULSE GENERATOR MODULE <sup>1)</sup>

Output pulse amplitude <sup>2)</sup>	6 ... 7 kV
Pulse polarity and waveform	Positive, fast rise, short peak, exponential decay
Output connector and load impedance	50 Ohm
Pulse rise time (fast part)	< 200 ps
Pulse width (FWHM)	< 500 ps
Max repetition rate (continuous)	10 kHz
Jitter (RMS)	< 20 ps
Jitter (peak-to-peak)	< 100 ps
Internal delay (from leading edge of triggering pulse to output pulse)	~ 170 ns
Triggering	External only
Input triggering pulse connector	SMA
Triggering pulse parameters	+5V amplitude on 50 Ohm, 10 ns ... 200 ns width, 1ns rise time
Power supply	+24V, 0.3A; +160V, 0.3A
Size	250 x 130 x 80 mm <sup>3</sup>
Operation temperature	0 °C.. +50°C

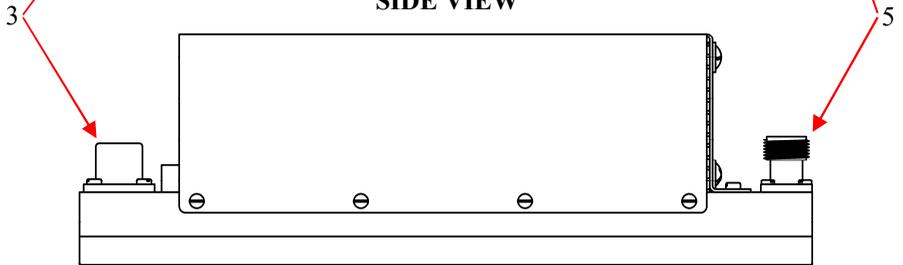
<sup>1)</sup> All the parameters are measured after the operation of the generator within 10 minutes at 5 kHz repetition rate.

<sup>2)</sup> Output pulse amplitude increases with increasing of the repetition rate and may change within  $\pm 10\%$  depending on the temperature and operation regime.

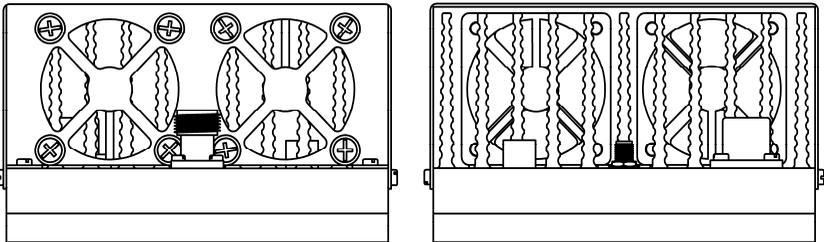
### TOP VIEW



### SIDE VIEW



### LEFT AND RIGHT VIEW



- 1 – control LED (from top to bottom)
  - +24V DC (green) – low voltage +24V DC power supply is applied
  - +HV DC (green) – high voltage +160V DC power supply is applied
  - SYNC IN (orange) – triggering of the generator
  - OVERHEAT (red) – too high temperature
  - OVERLOAD (red) – too high repetition rate
- 2 – Input triggering SMA connector
- 3 – Power supply connector
- 4 – 4x mounting holes 4.2 mm dia, 222x118mm footprint
- 5 – Output HV N-type connector

## PUTTING THE GENERATOR INTO OPERATION

➔ **Please follow strictly the described steps. It helps to prevent damage to the generator and other equipment.**

### Step 1.

Unpack the generator and check the presence into the package of the following items:

- PPM0731 pulse generator;
- Dual voltage AC/DC switching power supply converter with the power supply cables;
- Semirigid coaxial cable assembly N\_connector/SM141\_cable/open for the output pulses feeding;
- Coaxial cable assembly SMA/RG316\_cable/SMA for the input triggering pulses feeding.

### Step 2.

- ⇒ In case of using standard AC/DC switching power supply converter:  
Connect it to the generator and power supply outlet. Check the levels of the low voltage and the high voltage power supplies and adjust the voltage levels by the corresponding potentiometers, if required.
- ⇒ In case of using alternative power supply:  
Please set the external power supplies according to the recommended low voltage and high voltage levels before connecting to the generator.

### Step 3.

Connect the output semirigid coaxial cable and the load to the generator.

Connect the triggering pulse generator by input coaxial cable.

Attach four wires DC power supply cable in case of using the alternative power supply. The ground wires are marked by black color. Low voltage and high voltage supply wires are marked by the labels.

### Step 4.

Switch on (plug) power supply. Both green LED “+24V DC” and “+HV DC” should light on. Set the external triggering pulses frequency to 1 kHz, pulse amplitude set to +5V, pulse width set within 10ns ... 200ns. Apply triggering pulses, orange LED “SYNC IN” should light on.

High voltage output pulses should be generated. Please check them. Set the external triggering pulses frequency as required, but below or equal to the maximum repetition rate.

- **Please pay attention that most of the standard GHz range coaxial attenuators are not suitable for direct registration of output pulses because of extremely high peak power. Even 100W and more power attenuators will be broken inevitably. We recommend using of 142 series Barth Electronics attenuator (for the frequencies below 5 kHz) as the first attenuator connected just to the generator output or use a high voltage directional coupler.**

The generator is designed for the long time operation at a max repetition rate. But it can be overheated in case of unmatched load and high ambient temperature. Please provide free airflow around the generator for good cooling. The temperature of the generator should be below 55 °C. Reduce the repetition rate and/or improve the airflow in case of overheating.

If the frequency of the triggering pulses is too high, then the red LED “OVERLOAD” lights on and the generator stops the operation. Please reduce the frequency of the triggering pulses, LED “OVERLOAD” lights off and the generator continues the operation automatically.

## TRIGGERING OF THE GENERATOR

The recommended triggering pulse waveform is shown in Fig. 3. Nominal triggering pulse amplitude is +5V on 50 Ohm, pulse duration should be within 10 ns ... 200 ns, rise time should be 1 ns or less. Longer rise time may result in increasing of the output pulse jitter.

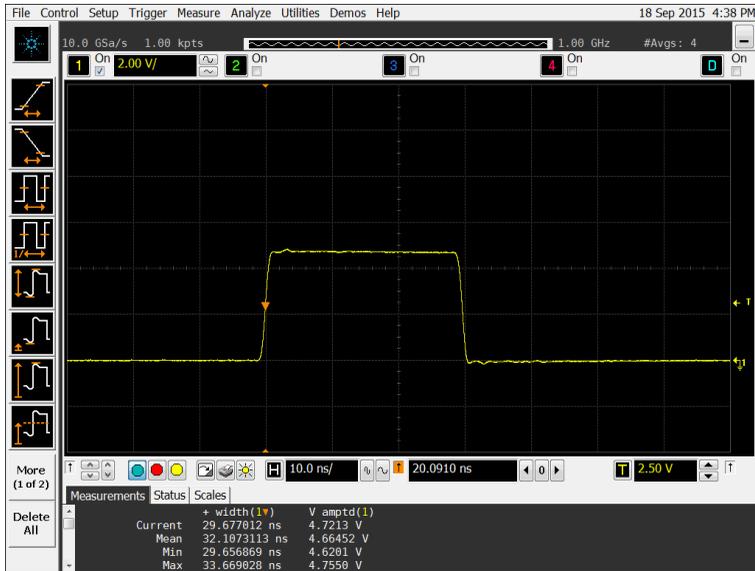


Fig. 3. Recommended triggering pulse waveform.

## **WARRANTY**

Please see your sales agreement to determine the warranty period and warranty terms. The generator has warranty seals.

- ➔ **Removing of the warranty seals terminates the warranty.**