

# LU-10M LINAC SYNCHRONIZATION SYSTEM

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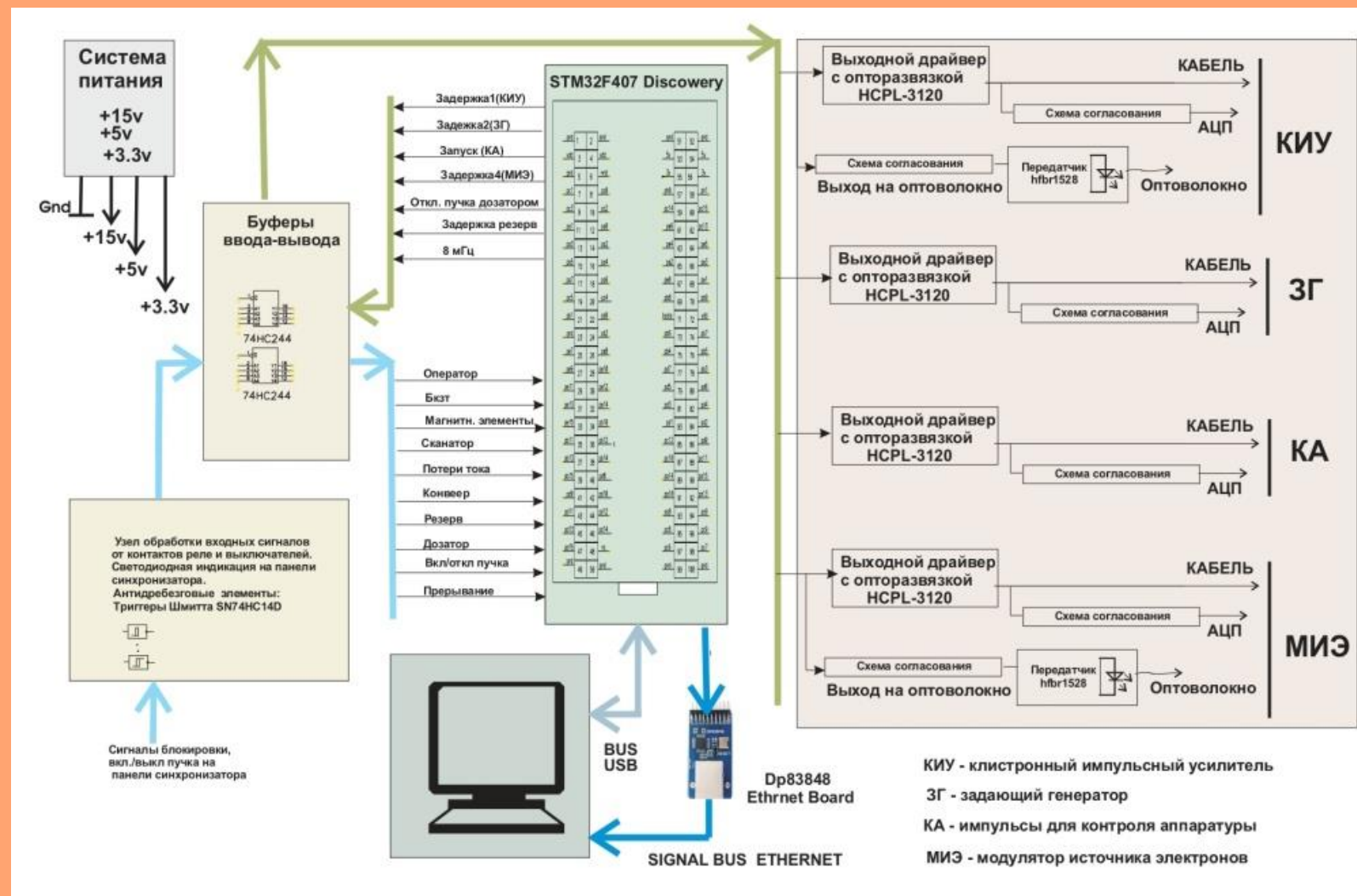


Figure 1. Synchronization system scheme

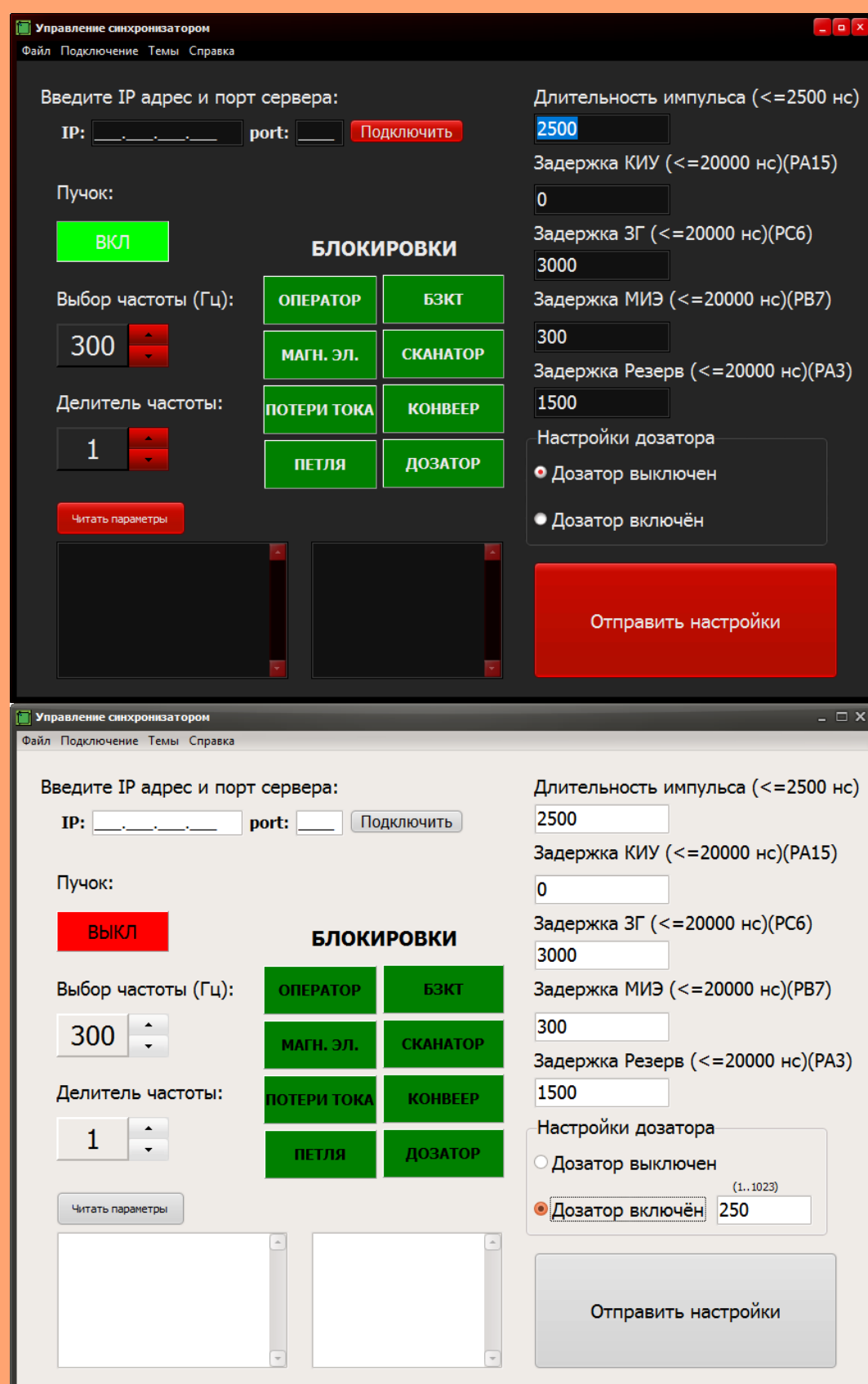


Figure 2. Operators client application

The synchronization system is based on the Discovery STM32F407VG module. The system generates pulses with a frequency from 1 Hz to 594 Hz to synchronize the operation of the klystron modulator, the master oscillator, the source modulator and the control equipment of the linear electron accelerator. The setting of the delays of the synchronization pulses is adjustable from 0.012 to 20  $\mu$ s.

The synchronization system is designed for the hourly program of the accelerator LU-10M. The synchronization system is designed to run the following blocks and systems: Source modulator start unit (SMSU). Klystron modulator startup unit (KMSU). The master oscillator (MO). Measurement systems. Control equipment (CE).

The start channel of the source modulator provides the function of "beam shutdown" when protective locks are triggered.

When setting up the accelerator, the operating delays for the start pulses are set.

The beam is disconnected: from the UBS system, the process control system for irradiation programs and other systems. At the same time the light indication of object from where the beam is disconnected works.

After removing the locks “enable beam” the restoration of the operating mode is performed by the operator from the computer or from the front panel of the synchronizer.

The choice of frequency of parcels and delays on channels, and also disabling or enabling of a beam is made from the computer.

The synchronizer-computer connection is made via the USB interface or with the Ethernet network via a TCP connection. In the first case, without disseminating data to observers. The application requests information about the lock from the server every 100 ms, the device itself responds to the lock immediately by turning off the beam, then generates a report of the receipt of the lock and sends it to the server.

The application set is compatible with Windows XP / 7/10.

## CONCLUSIONS

New synchronization system is ready-to-use with the new modulators



Figure 5. Synchronization system interface

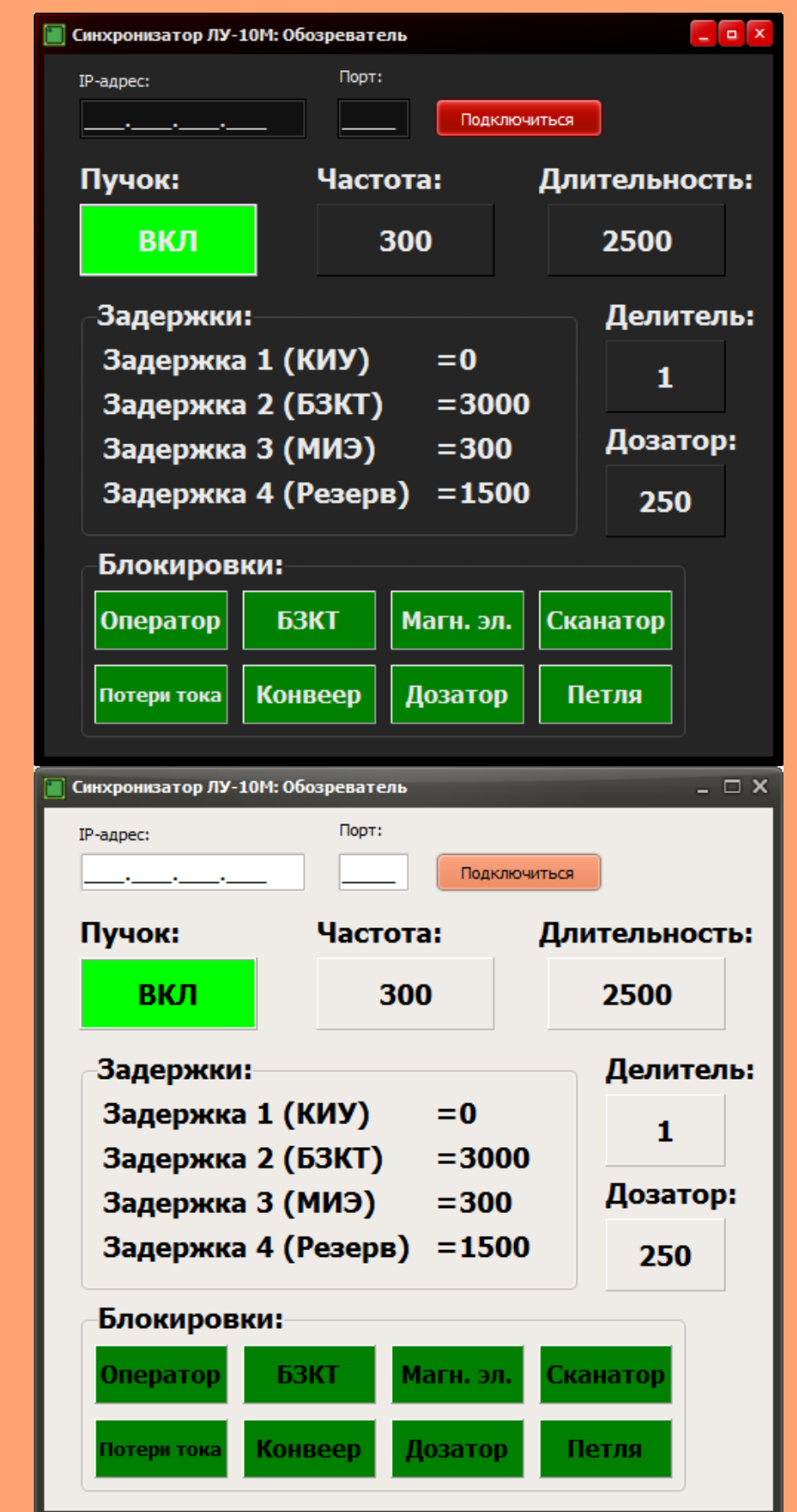


Figure 3. Observers client application

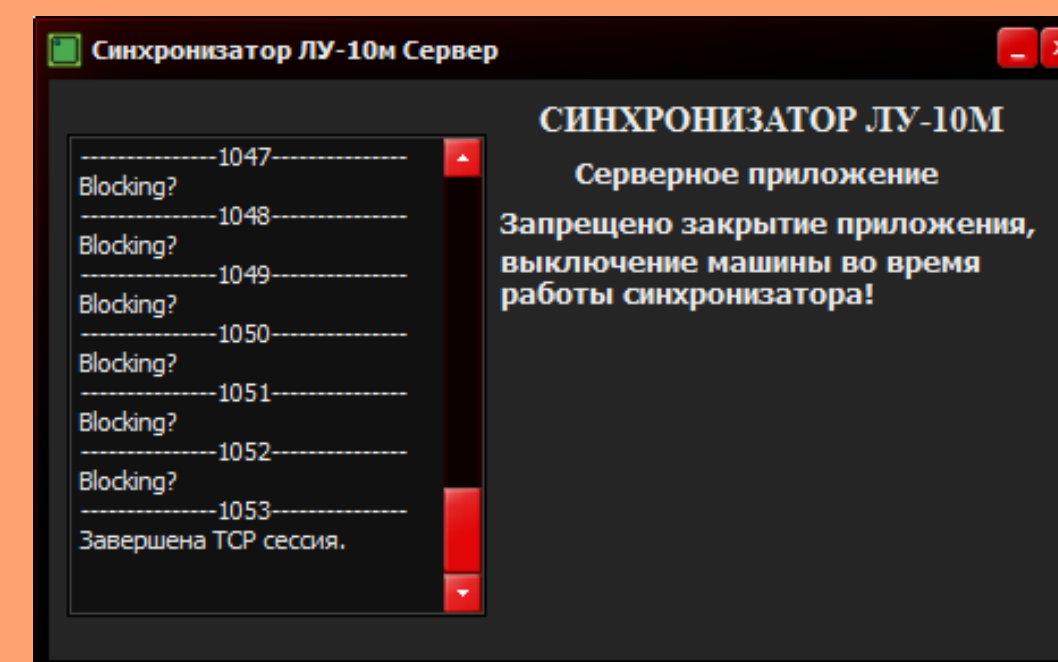


Figure 4. Server application