BINP SBRAS

Pulse power system for new industrial accelerator ILU-14

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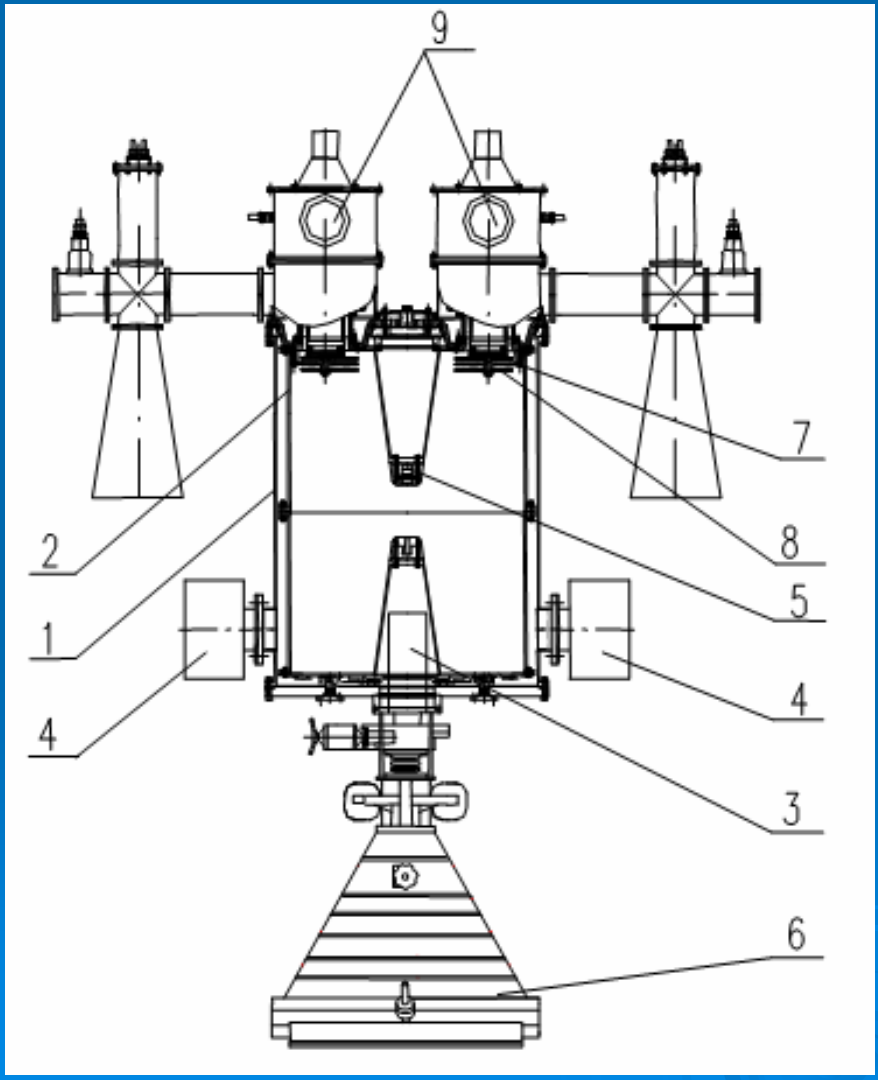
Introduction

- Accelerators of ILU type.
- Pulse power source of ILU Accelerators.
- Accelerator ILU-14.
- HF generator structure of Accelerator ILU-14.
- Control system of pulse power source structure.
- Key features of three pulse power source structure.

ILU accelerators produced by BINP.

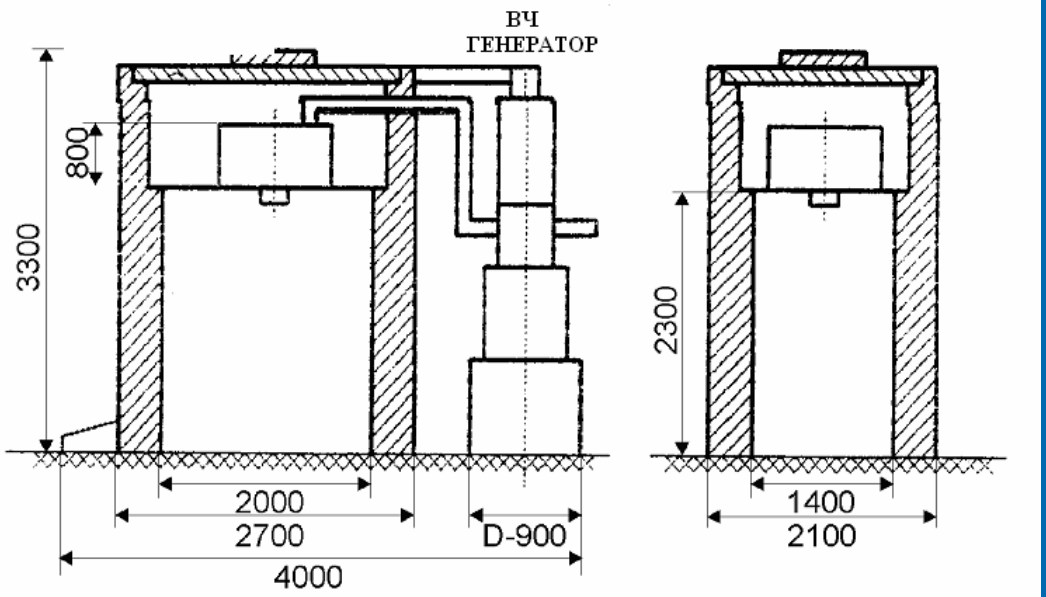
Model	Energy range, MeV	Beam power, kW	Productivity (2.5MRad), kg/h
ILU-8	0.6-1	20	200-600
ILU-6	1.7-2.5	20	500-1500
ILU-10	4-5	50	1300-3500
ILU-14 (project)	7.5-10	100	2500-7000

ILU-10 ACCELERATOR

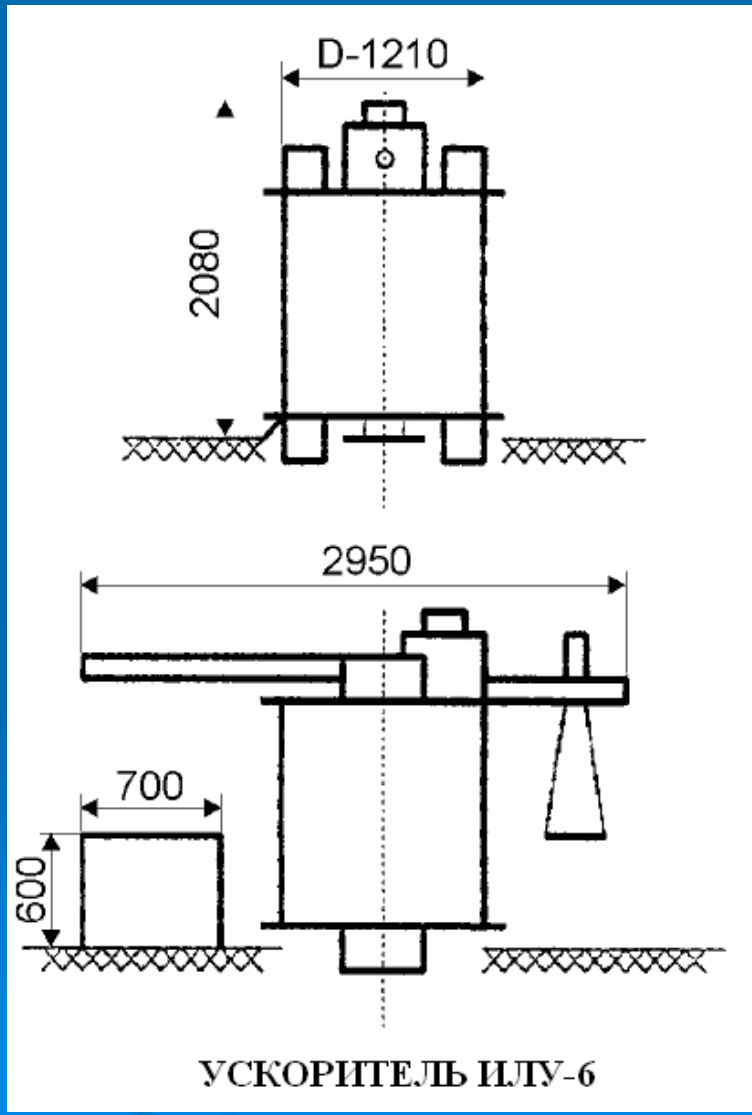


- 1 - vacuum tank
- 2 - resonator
- 3 – magnet lens
- 4 – high vacuum pumps
- 5 - electron gun
- 6 – beam scanning system
- 7- support
- 8 - separating vacuum capacitor
- 9 - HF autogenerators

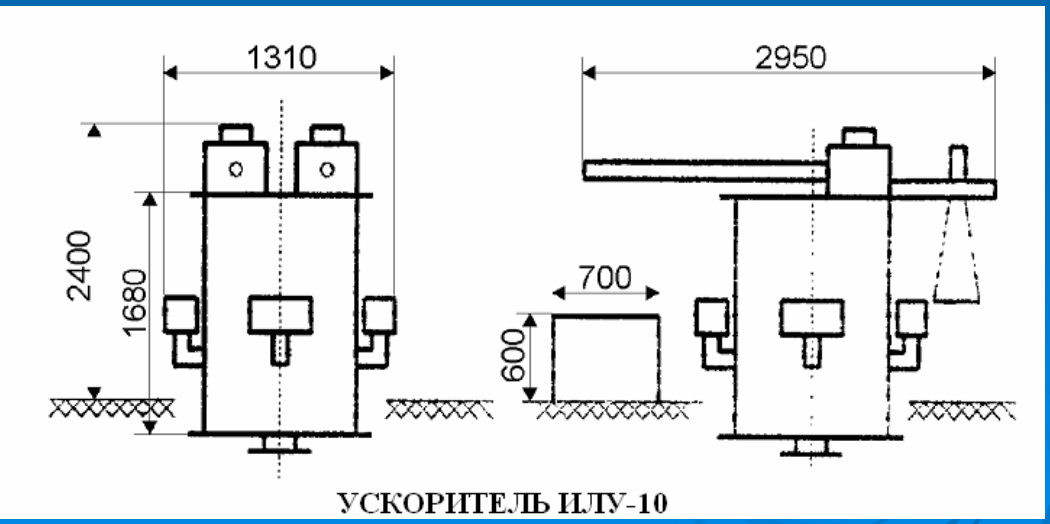
Basic ILU Accelerators Dimensions



УСКОРИТЕЛЬ ИЛУ-8 В МЕСТНОЙ ЗАЩИТЕ

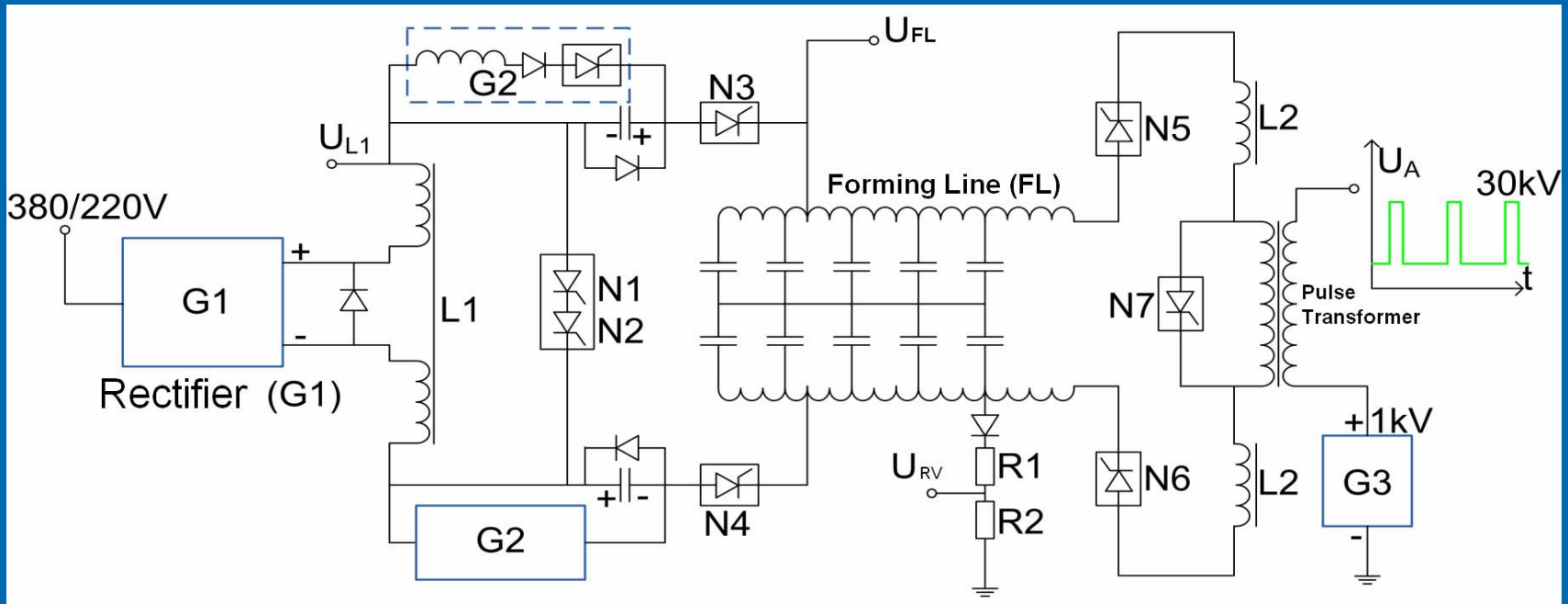


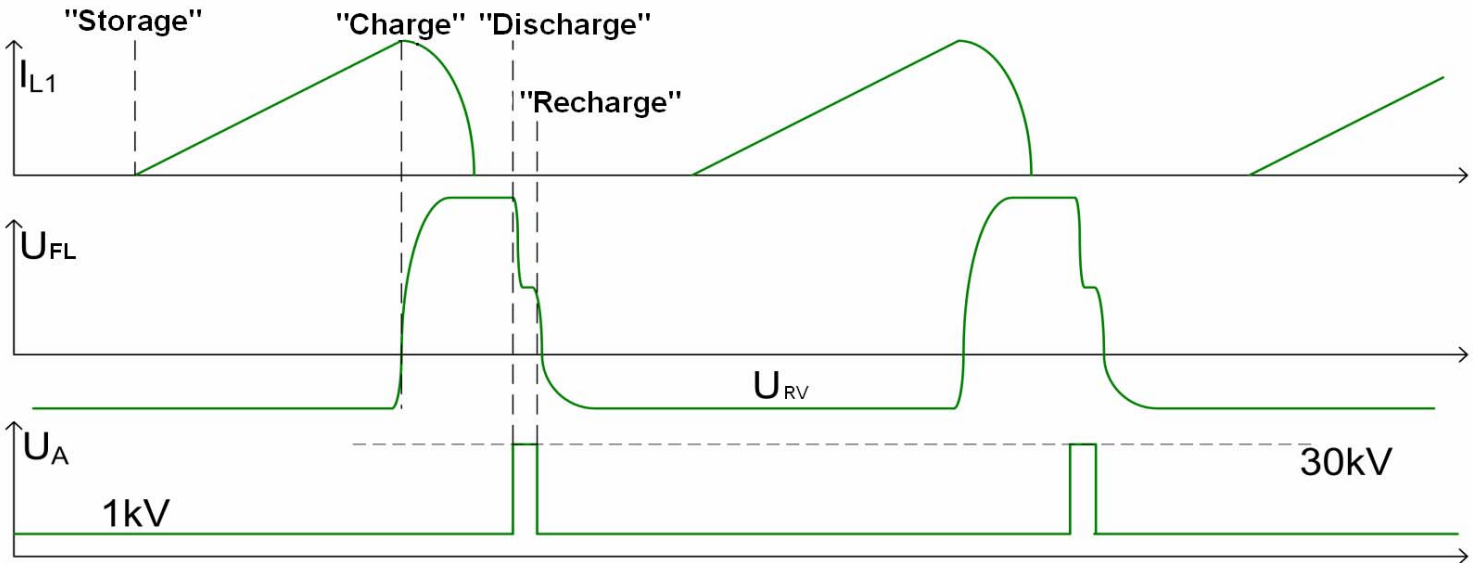
УСКОРИТЕЛЬ ИЛУ-6



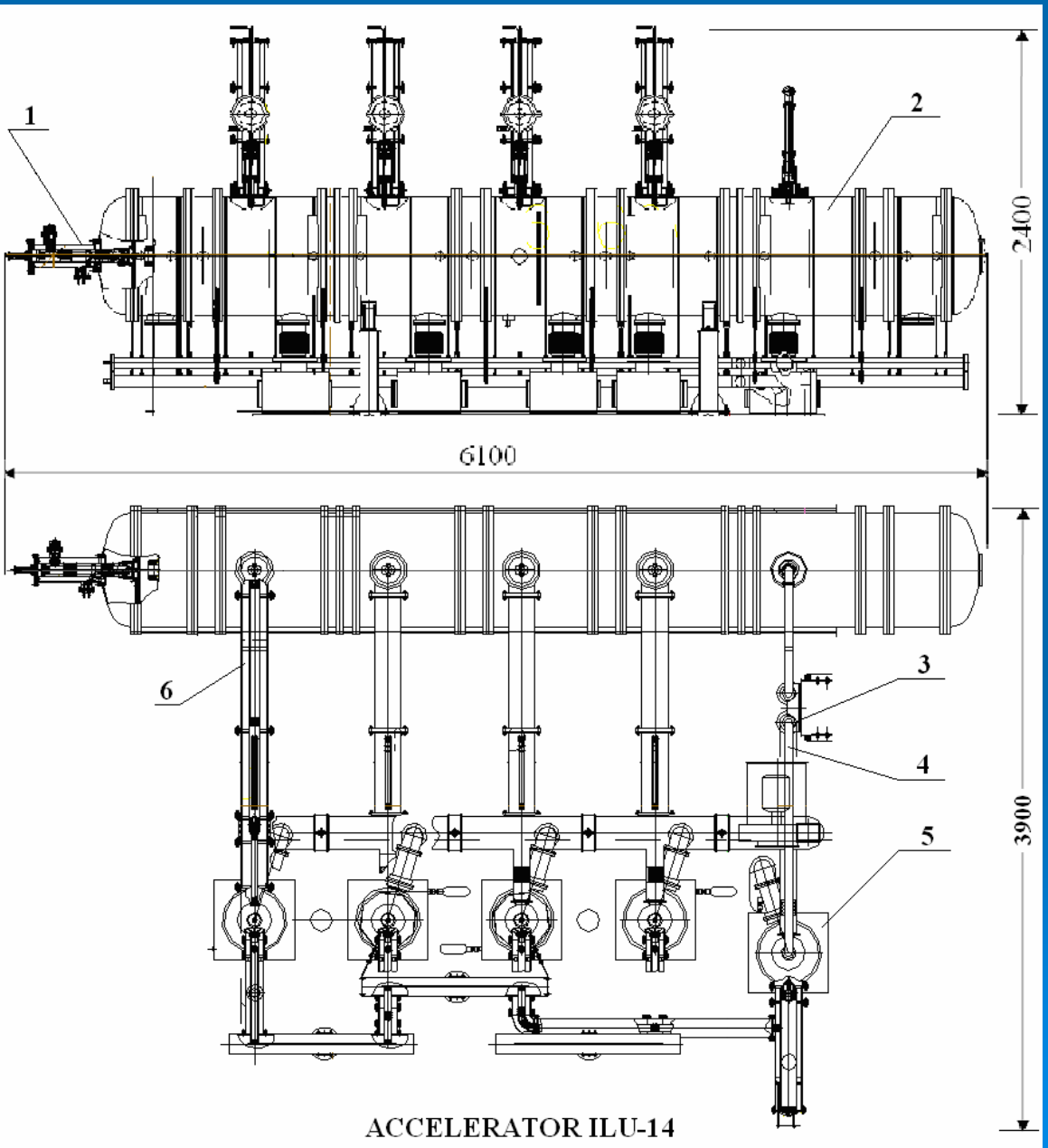
УСКОРИТЕЛЬ ИЛУ-10

PULSE MODULATOR



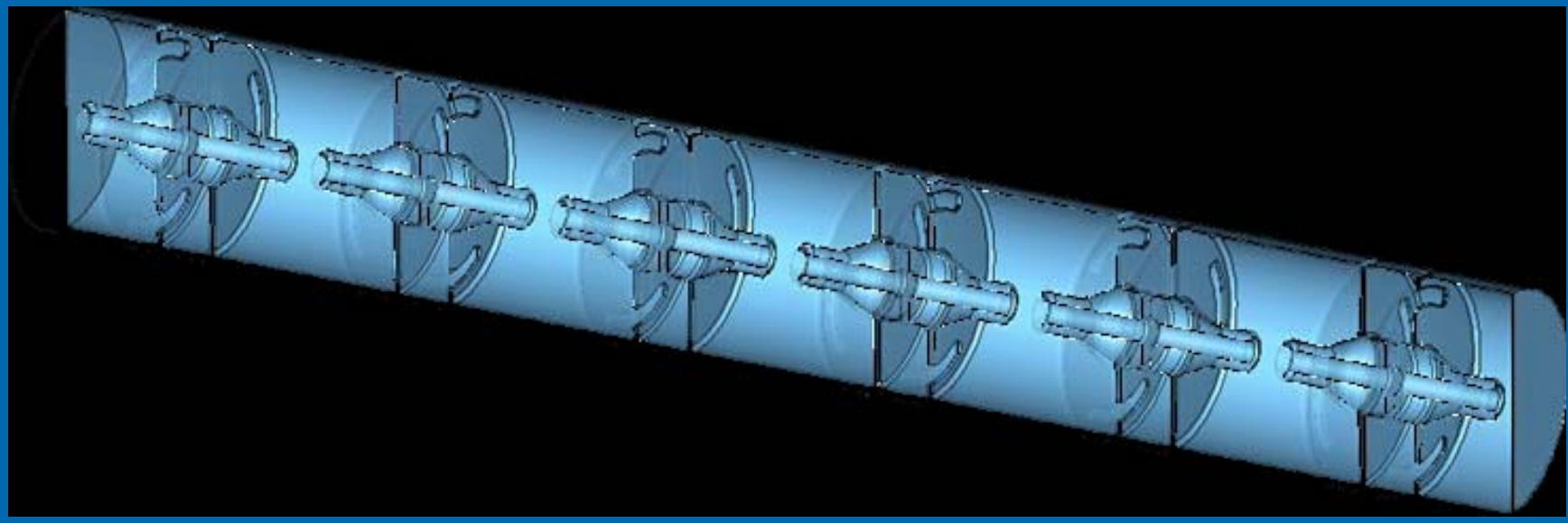


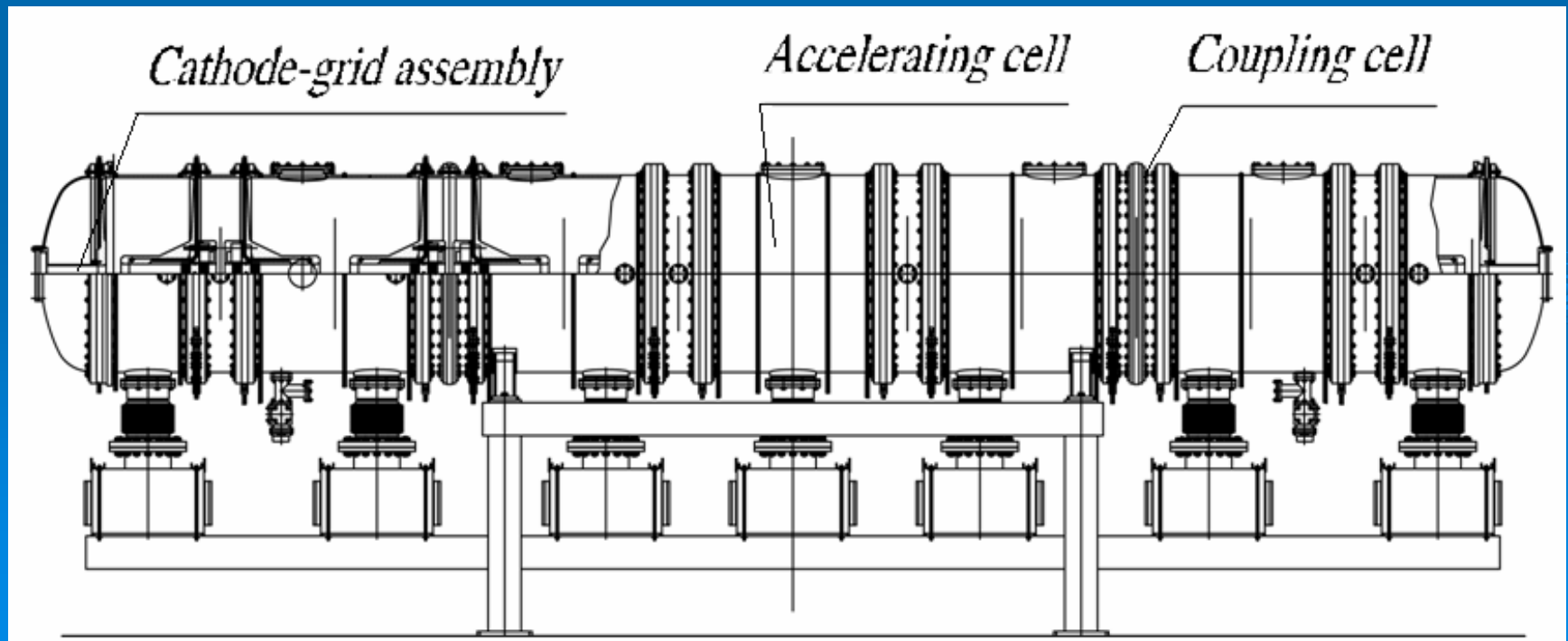
ILU-14 Accelerator



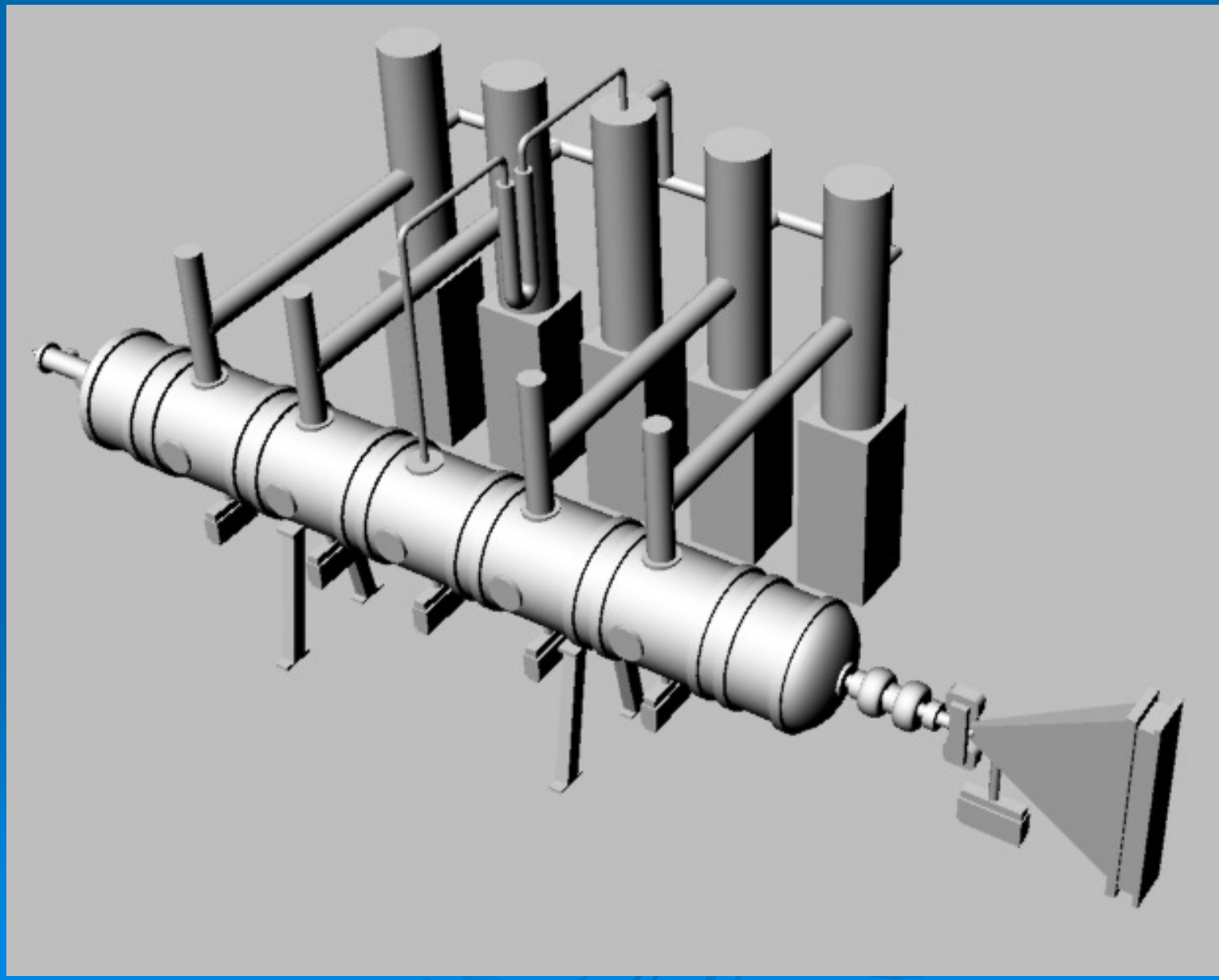
- 1 - electron gun
- 2 – accelerator cavity
- 3 – phase turner
- 4 – feedback feeder
- 5 - autogenerator
- 6 – power feeder

Accelerating structure ILU-14



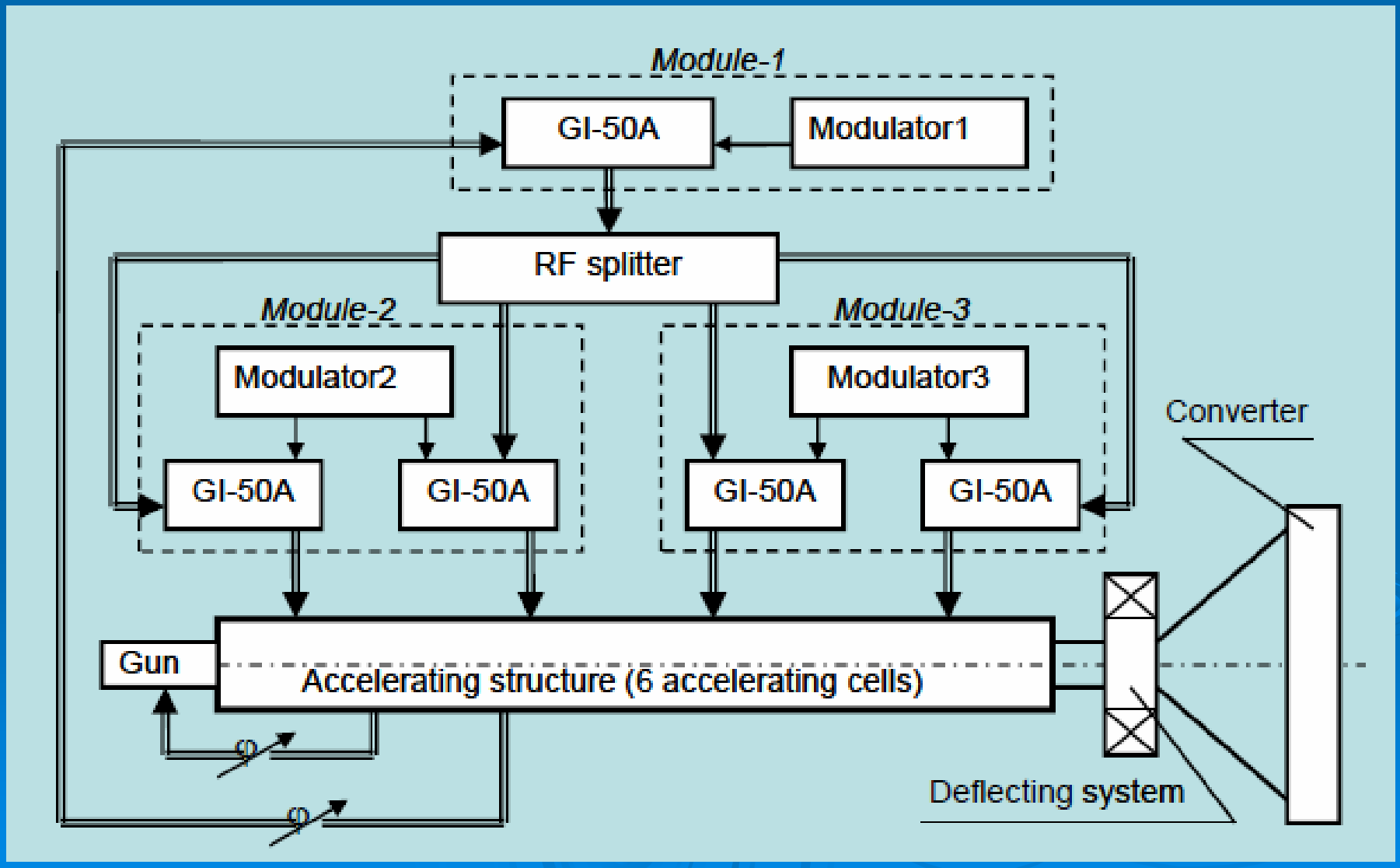


ILU-14 Accelerator

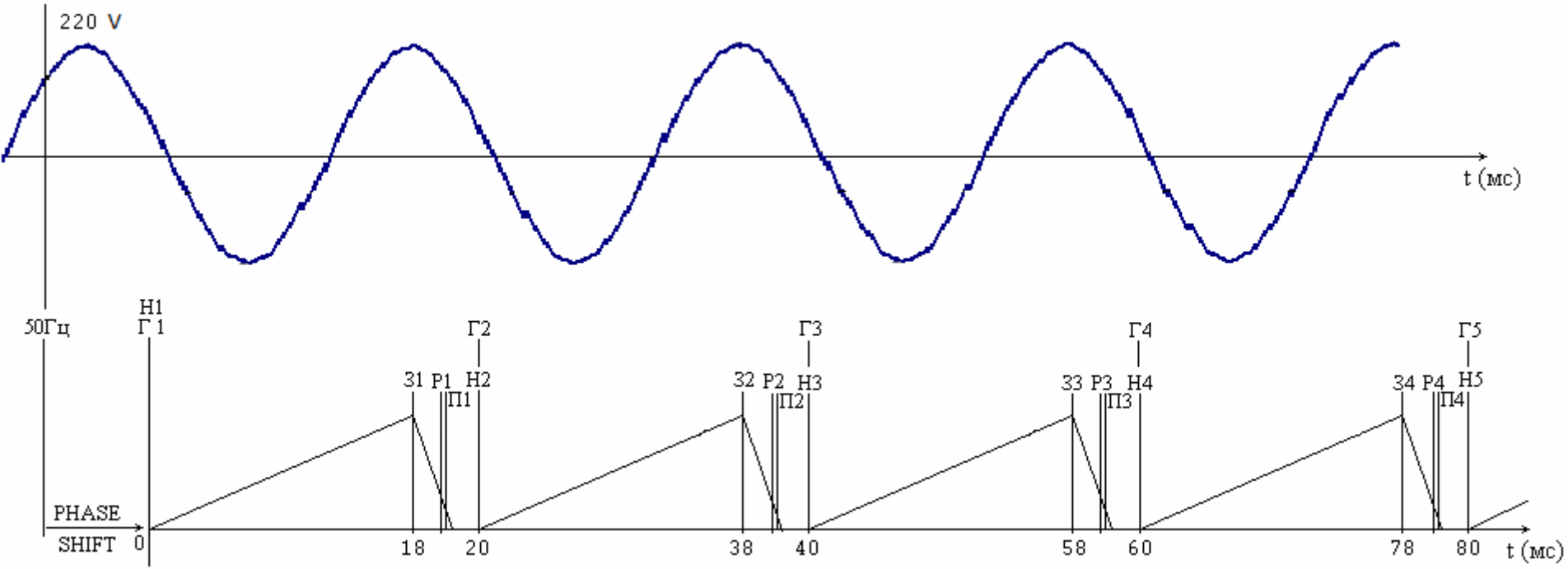


ILU-14 ACCELERATOR

Diagram of ILU-14 structure

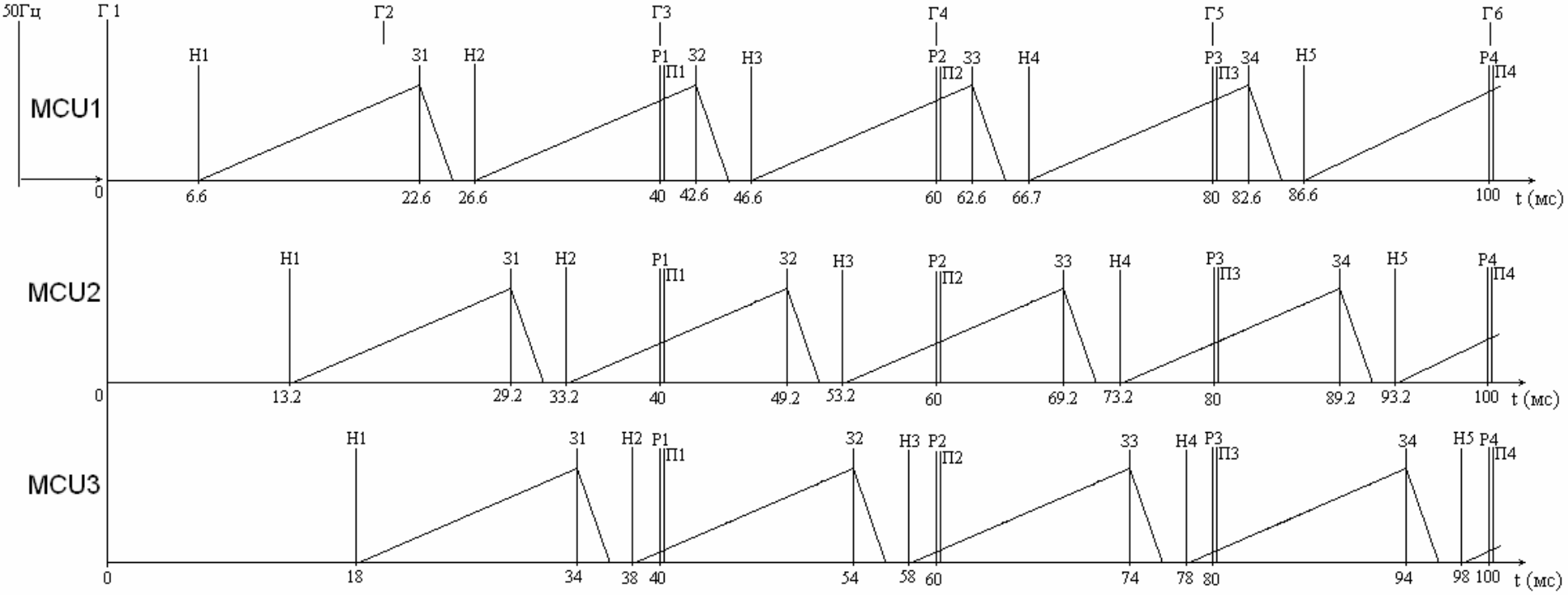


Time diagram of modulator control pulses



Abbreviation: 50Гц – Synchronization pulse of 50Hz power line,
Г – “GENERATOR” pulse,
Н – “STORAGE” pulse,
З – “CHARGE” pulse,
Р – “DISCHARGE” pulse,
П – “RECHARGE” pulse.

Time diagram of 3 modulator control pulses



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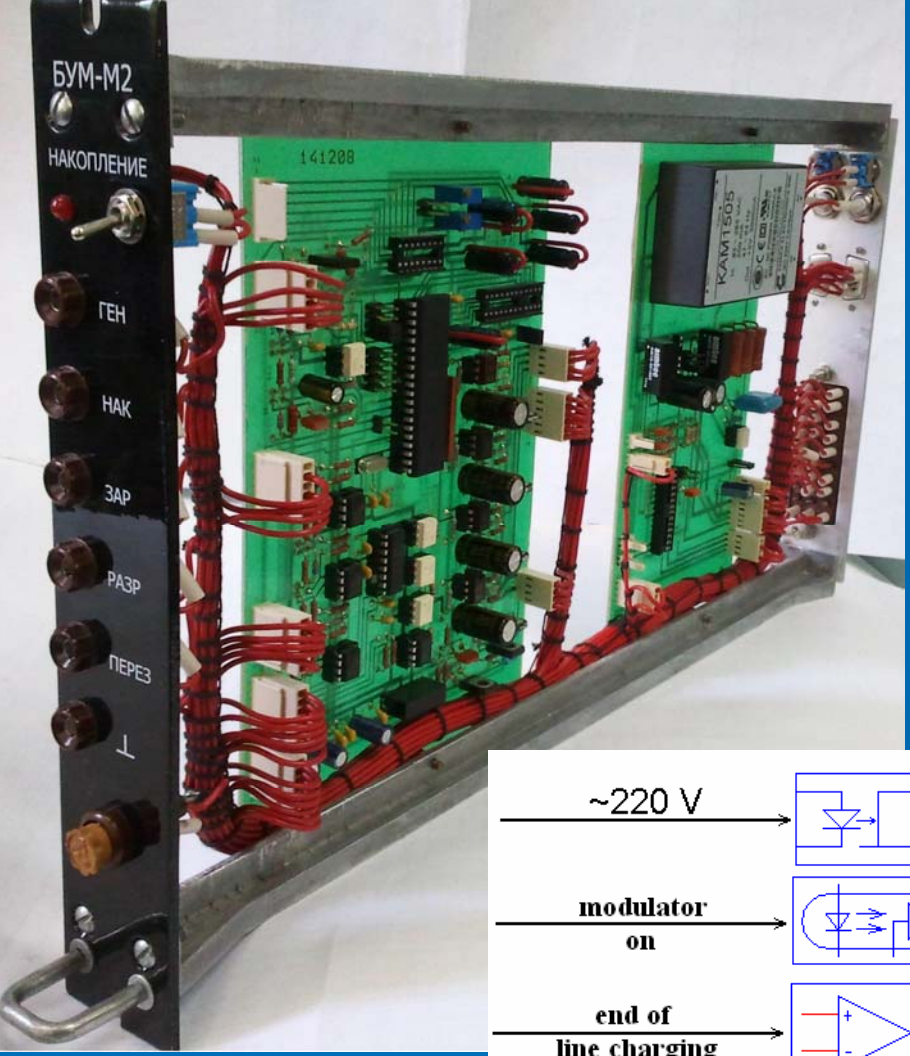
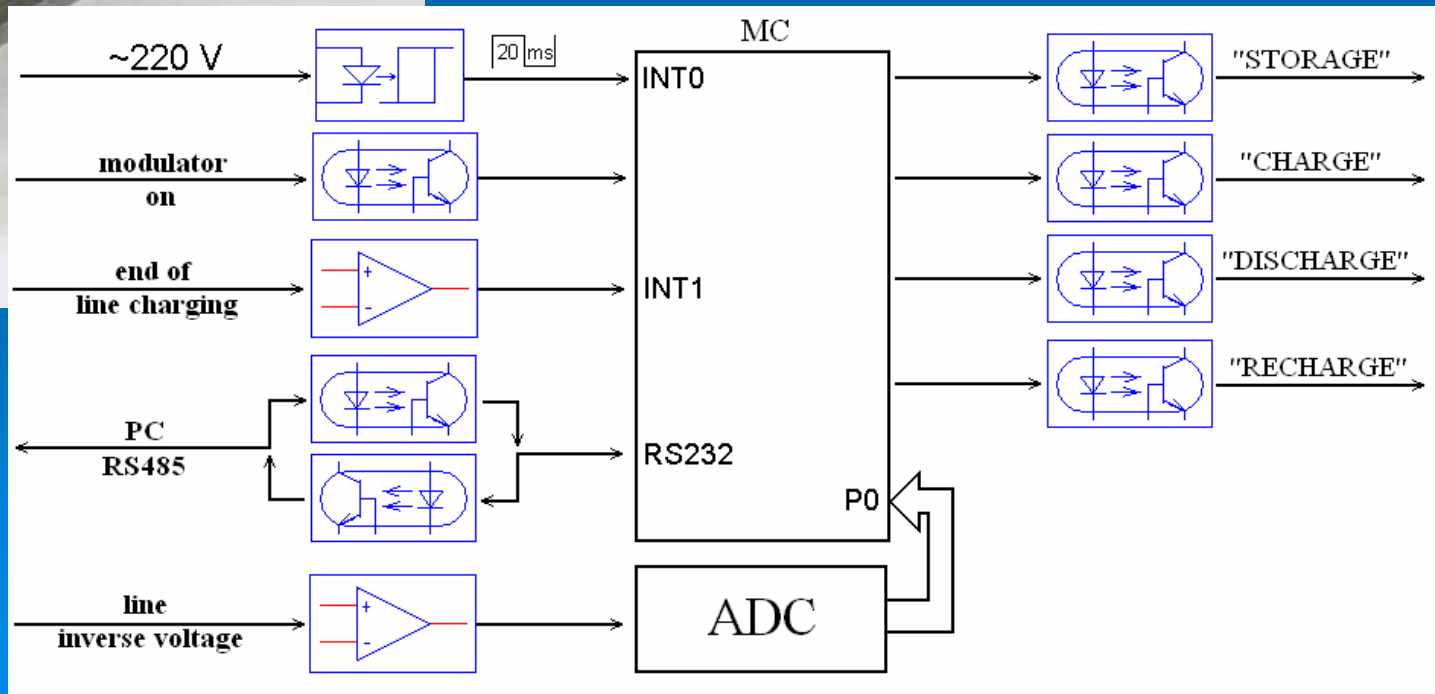
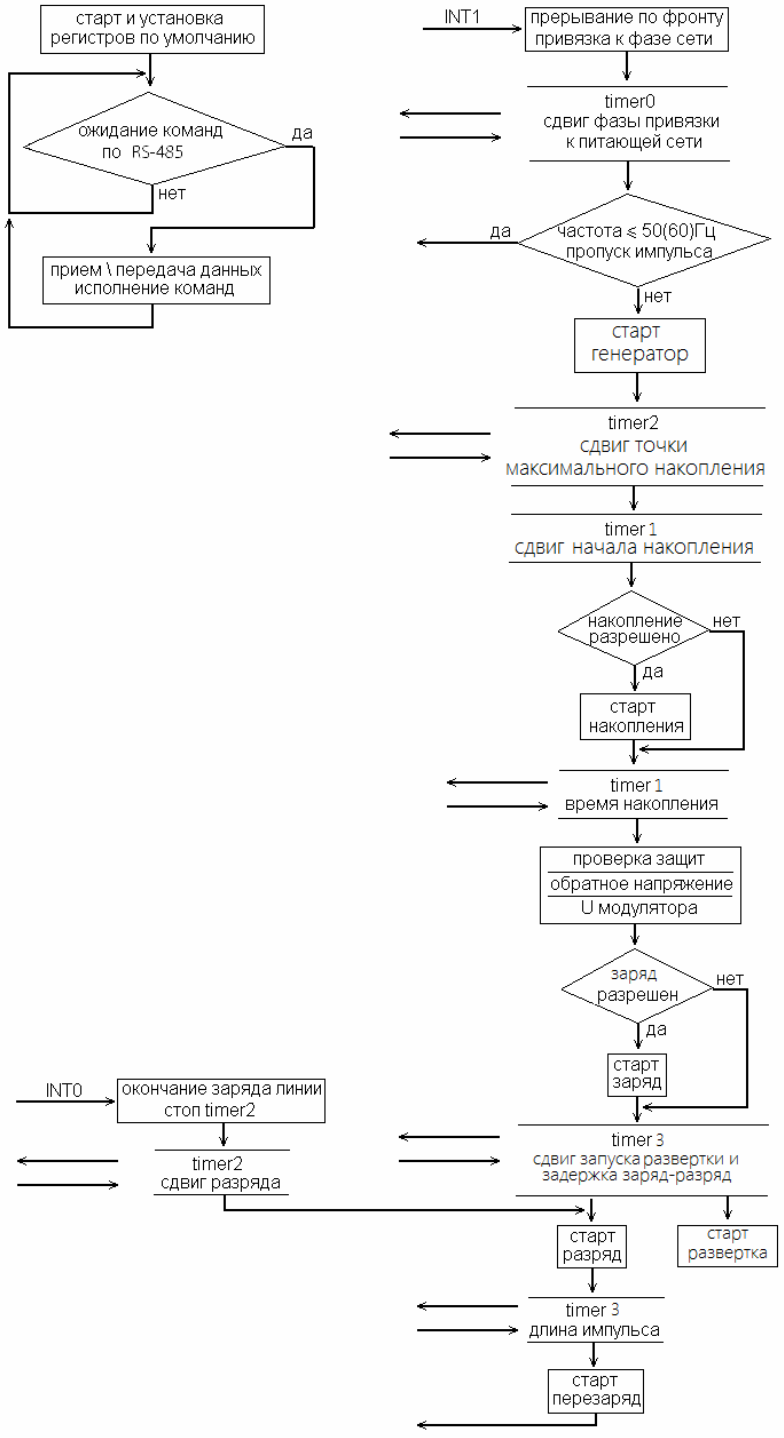
Modulator Control Unite (MCU)





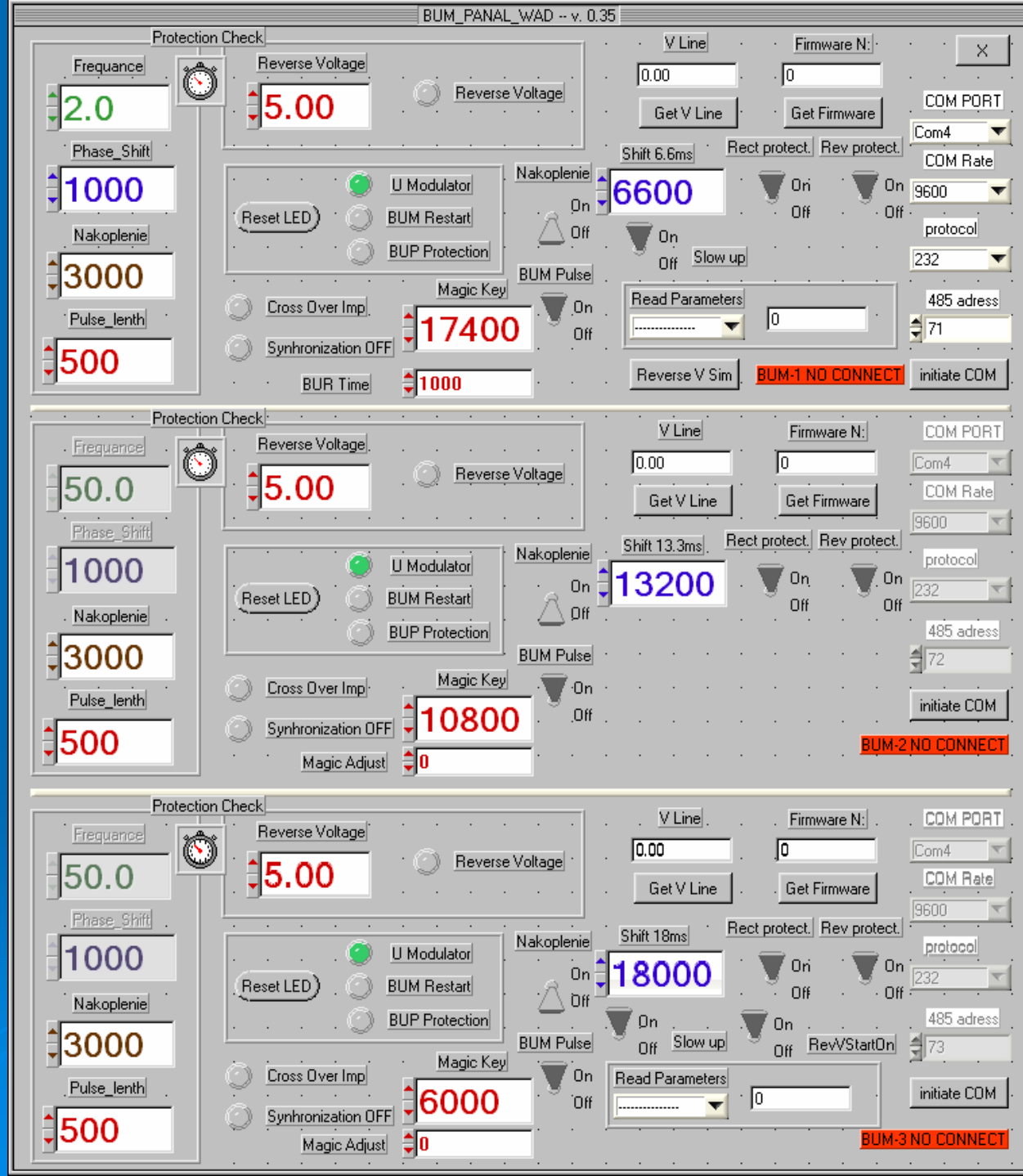
MCU Program Diagram

- 4 independent timers to each MCU.
- +\- 2 mcs to each pulse accuracy.
- Working of 3 MCU together possibility
- Shift of first modulator is 6.6 ms to avoid double discharge pulse.
- Three MCU on RS-485 line.
- Jumper choice of MCU number.
- Frequency of accelerator pulses is controlled by first MCU.
- BUR pulse (scanner system).
- Any MCU to any modulator.
- All parameters is loading automatically

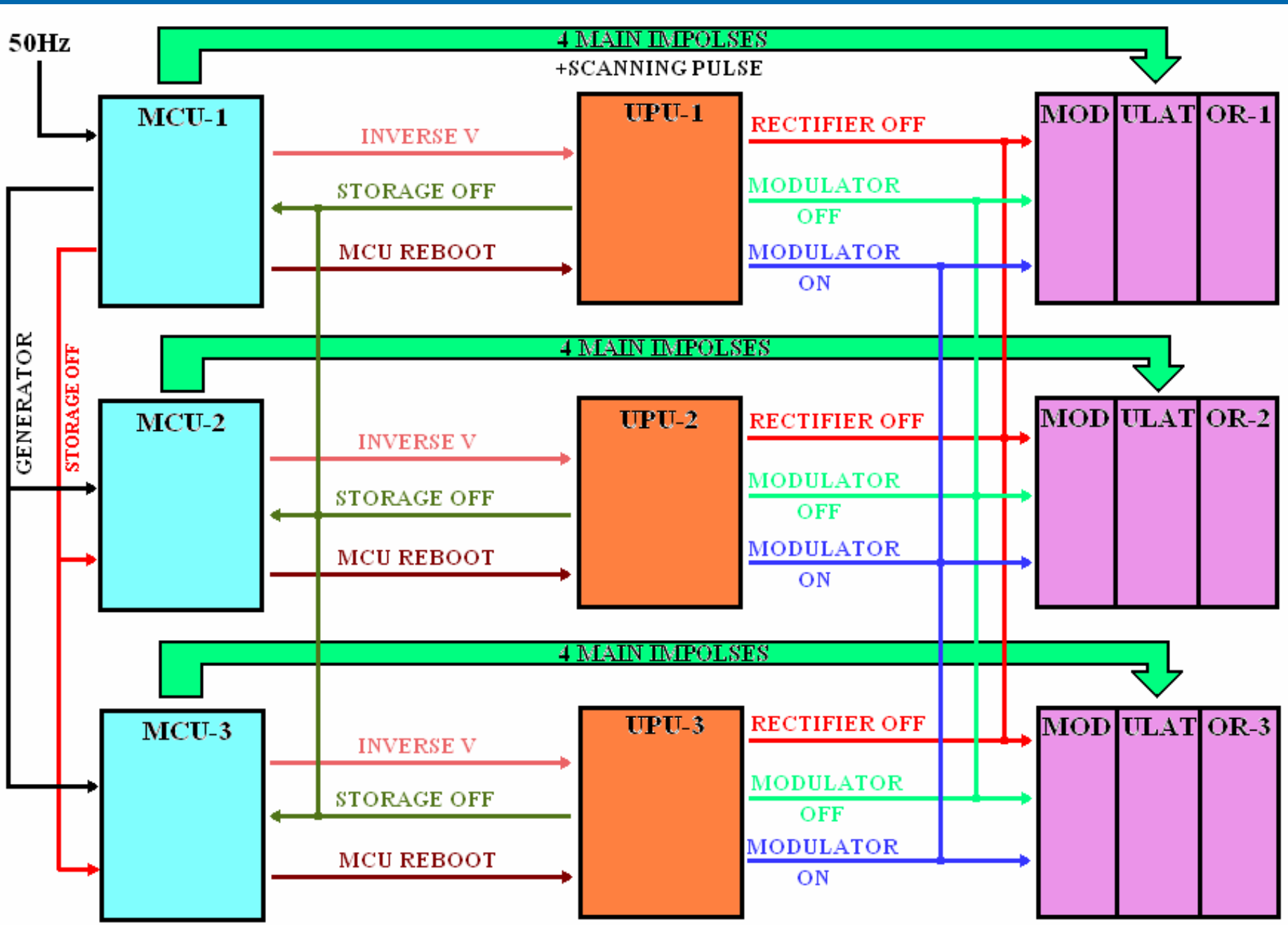


Control Program of 3 MCU System

- MODULATOR-1 Control Varibles
- MODULATOR-2 Control Varibles
- MODULATOR-3 Control Varibles

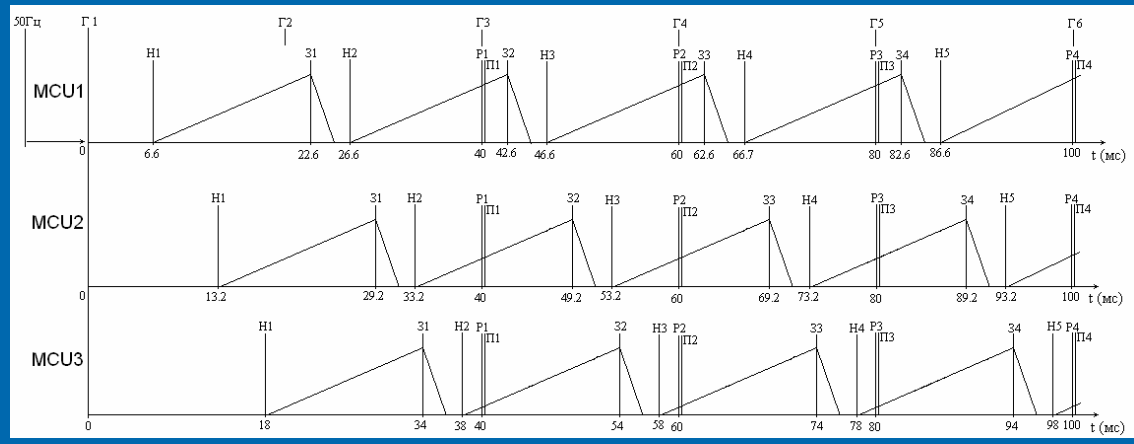


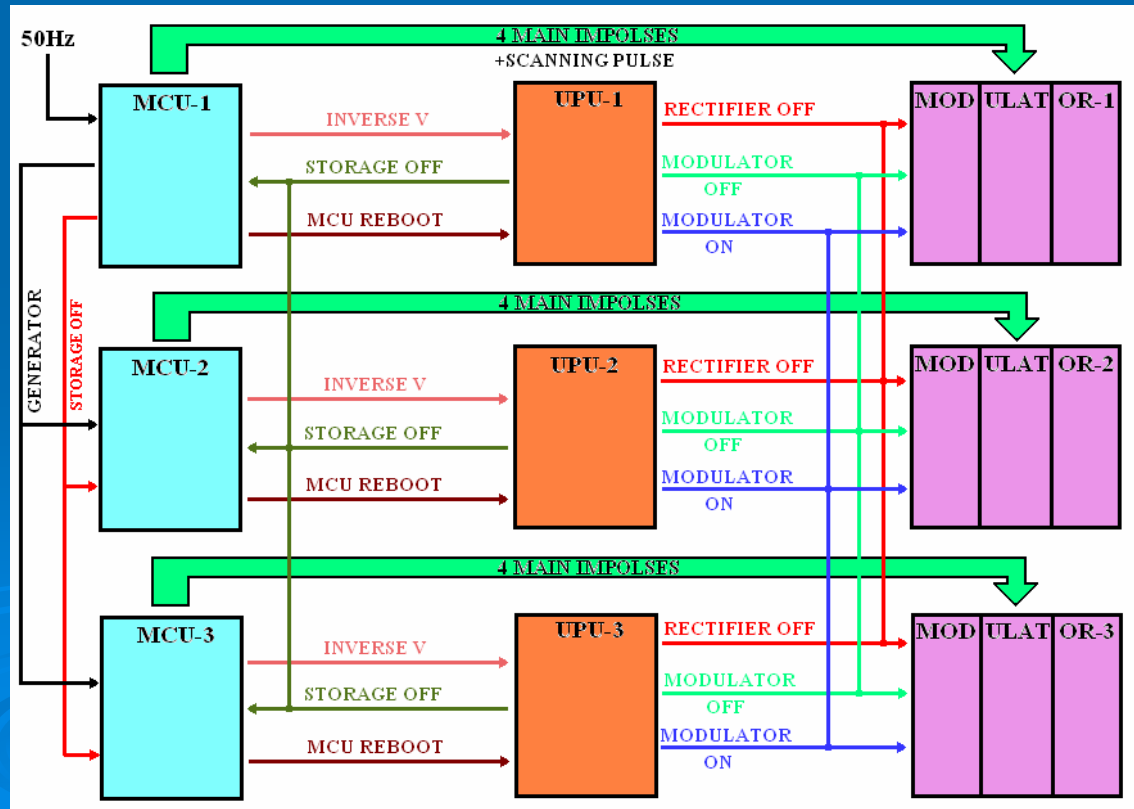
SIMPLIFIED BLOCK DIAGRAM OF THREE MODULATOR CONTROL SYSTEM CONNECTION



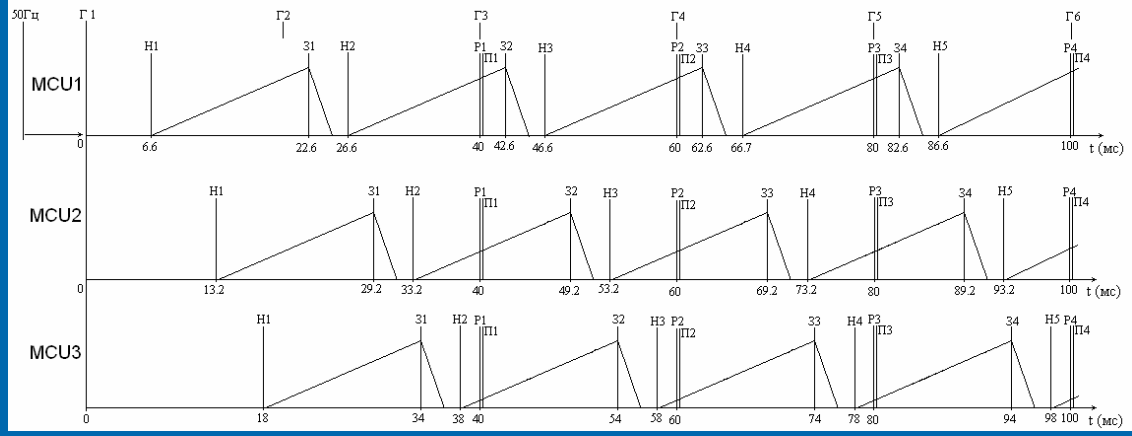
KEY FEATURES OF MODULATORS JOINING

- Adjusting of each pulse time place (+\- 2-200 mcs, accuracy +\- 2mcs)
- First time cycle and full cycle is 40 ms.
- All together rectifiers off.
- Storage off by first MCU.
- Storage off from any UPU to any MCU.
- Switch on\off all modulators together.
- Three pulses attached with 50Hz line.
- Shift of third modulator is 4.6 ms.





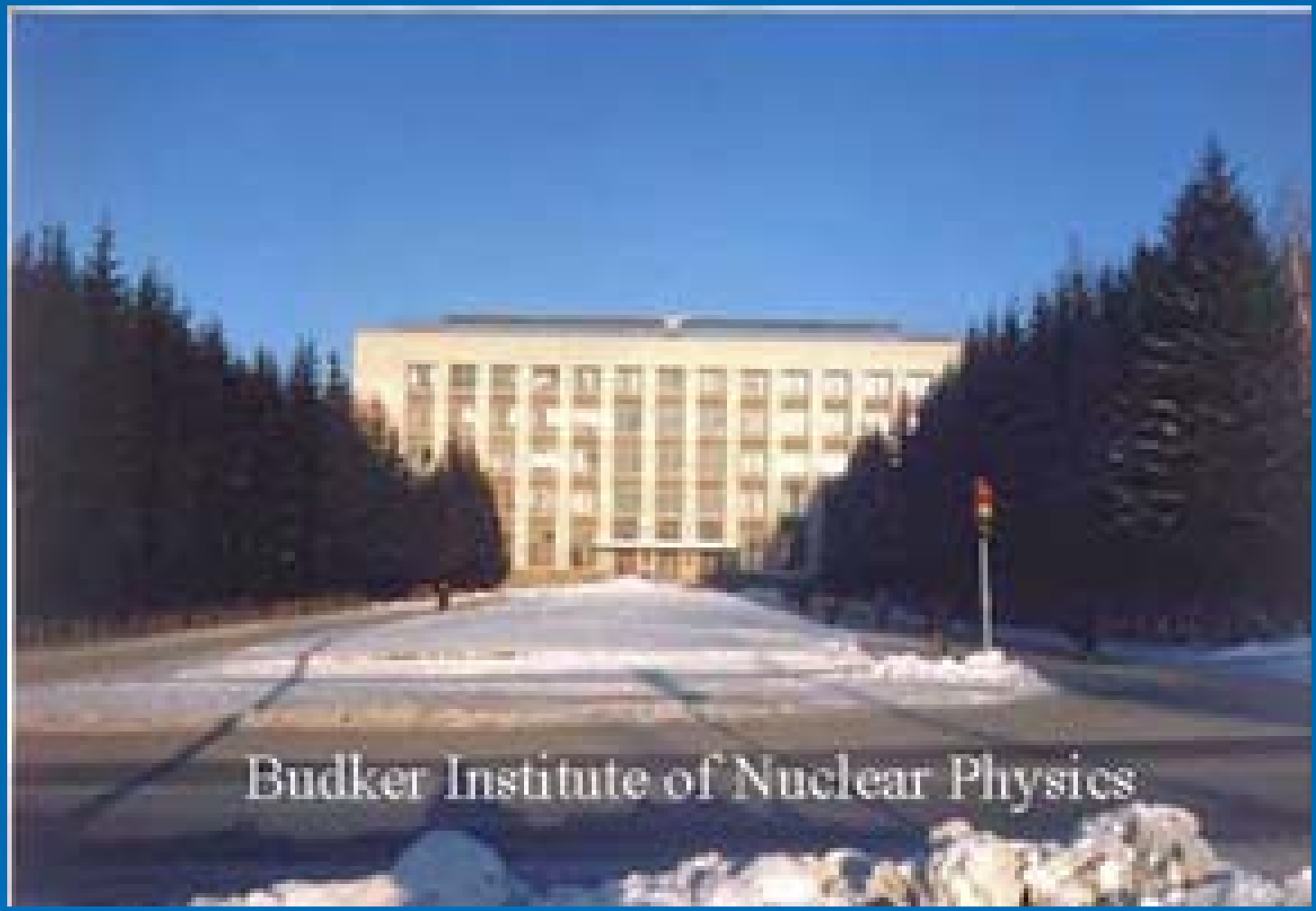
CONFIGURATION MAIN PROBLEMS



- Maximum time of charged modulator waiting is 17.4 ms.
- Pulse of the accelerator is placed in time when next storage process have started.
- Charge is off by inverse voltage protect.
- Rectifier is off by rectifier tiristors current stop.
- MCU rebut protect.
- Protection of anode overvoltage (UPUS).

Conclusion

- ILU-14 accelerator has finished preliminary tests and achieved pulse parameters.
- Storage shift conception has proved.
- 3 modulator control system was tested.



Thank you for your attention !!!