



**FOUR-QUADRANT POWER SUPPLIES
FOR STEERING ELECTROMAGNETS
FOR ELECTRON-POSITRON COLLIDER**

O. Belikov V. Kozak A. Medvedko

BINP SB RAS



BENDING MAGNETS

The field instability: **10ppm/K**

Current accuracy **10^{-5}**

STEERING MAGNETS

flatness 1%

Current accuracy **10^{-3}**

POWER

Cooling: Air Natural

DIPOLE CORRECTORS

MULTI-POLE CORRECTORS

$$P \leq 500\text{W}$$

$$P \leq 2\text{kW}$$

$$I \leq 6\text{A}, U \leq 100\text{V}$$

$$P = U \cdot I$$

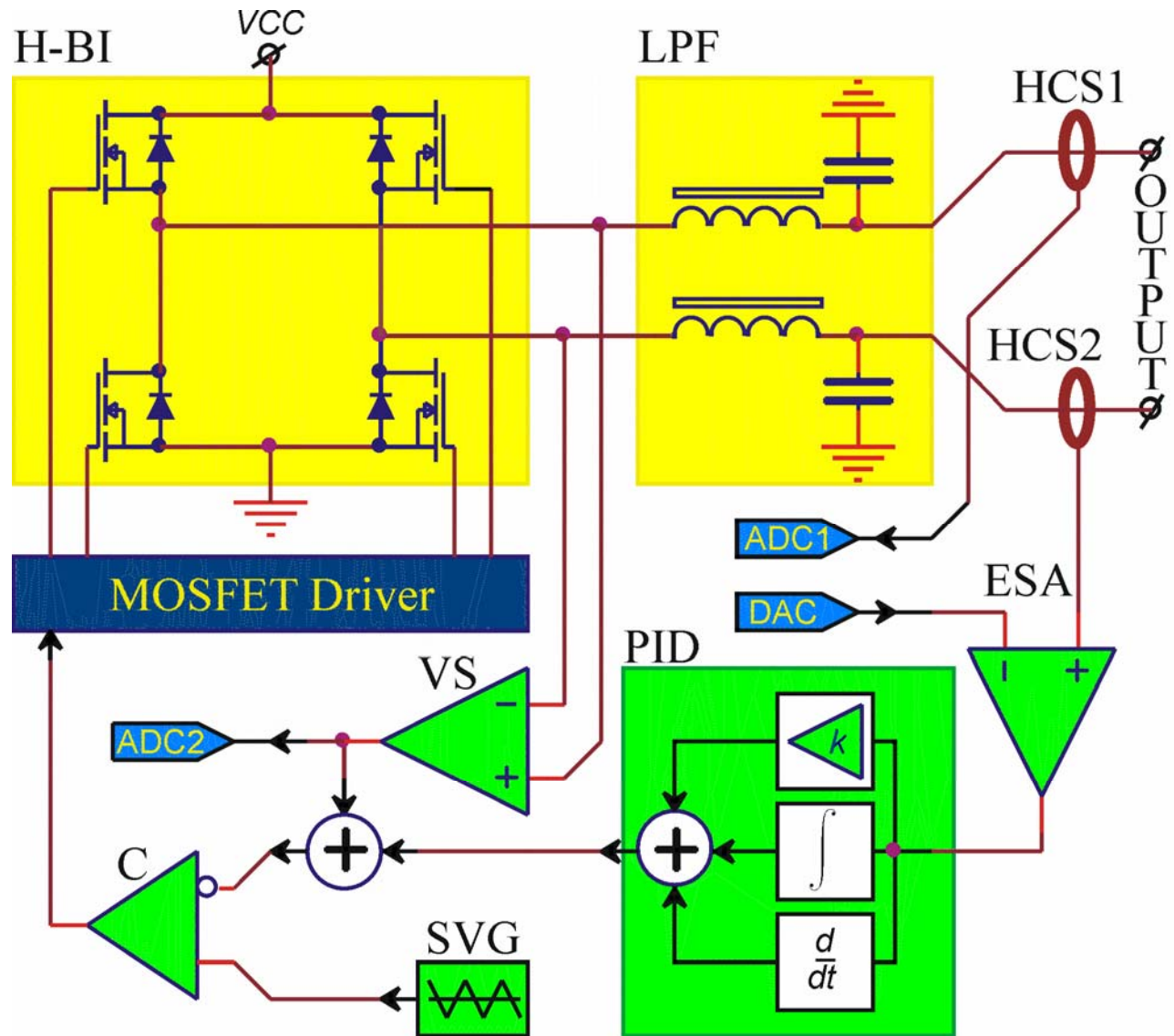
$$I \leq 25\text{A}, U \leq 100\text{V}$$

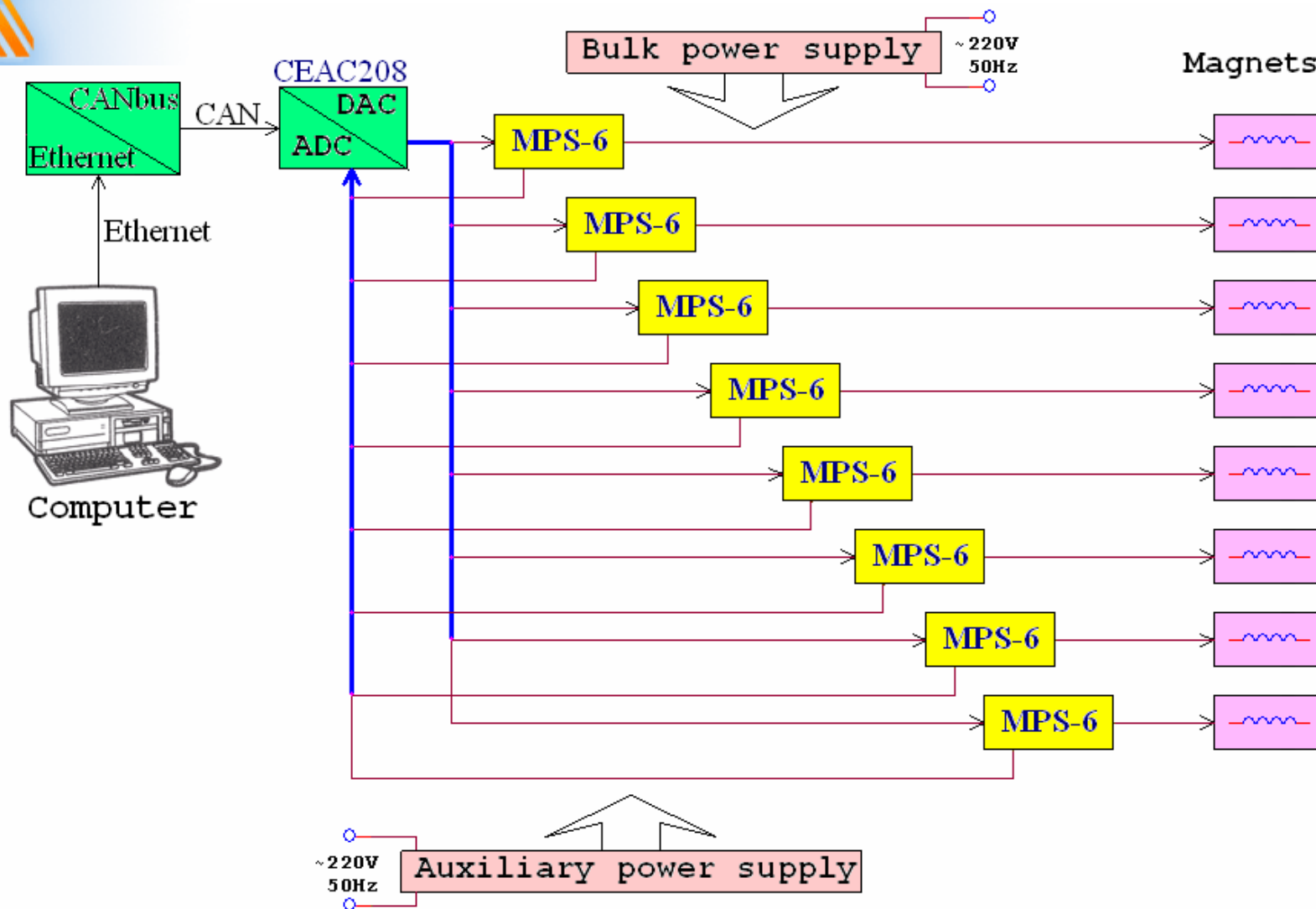
MPS-6

MPS-25



- H-BI** – *H-Bridge inverter*
- LPF** – *Low-pass filter*
- HCS** – *Hall Current Sensors*
- PID** – *Proportional-Integral-Derivative Controller*
- ADC** – *Analog-to-digital converter*
- VS** – *Voltage sensor*
- C** – *comparator*
- ESA** – *Error-signal amplifier*
- SVG** – *Sawtooth-voltage generator*
- DAC** – *Digital-to-analog converter*



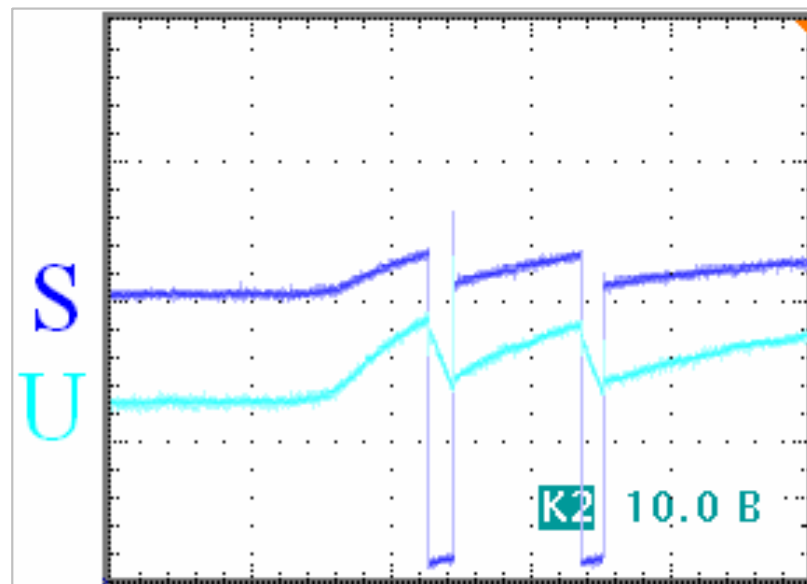
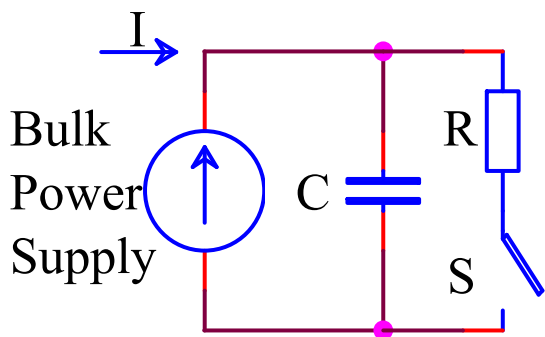
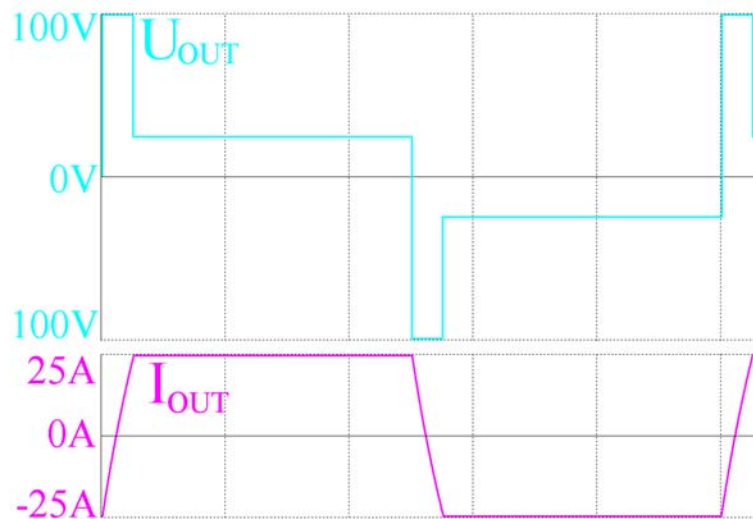
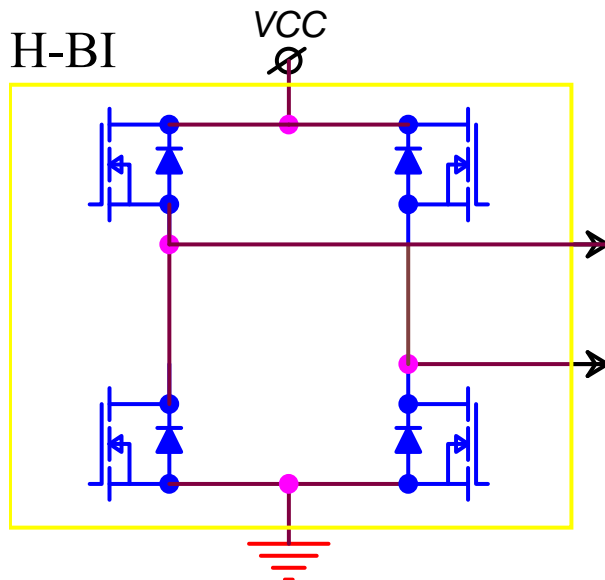




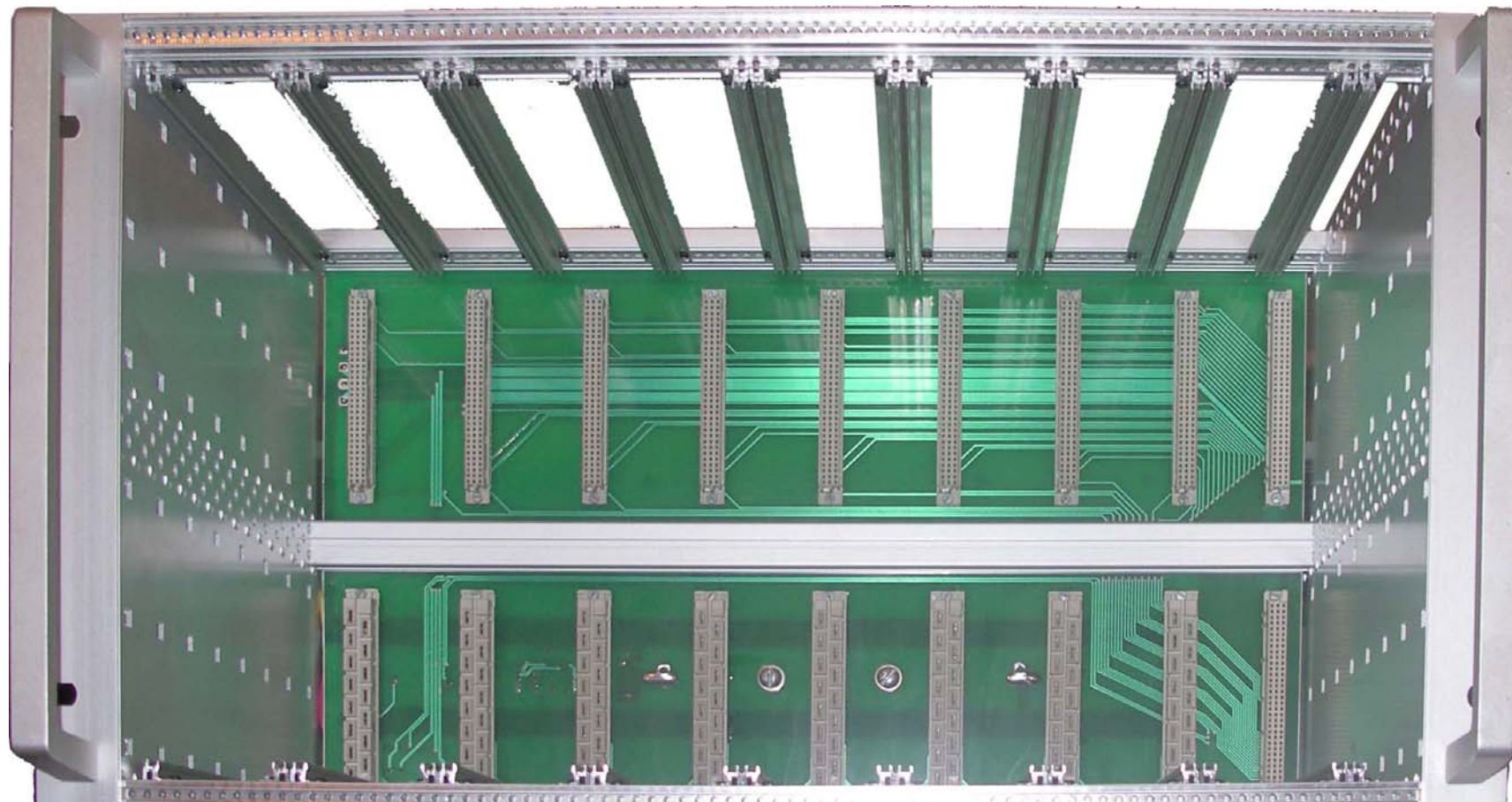
RECUPERATION

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**FOUR-
QUADRANT
POWER
SUPPLIES**









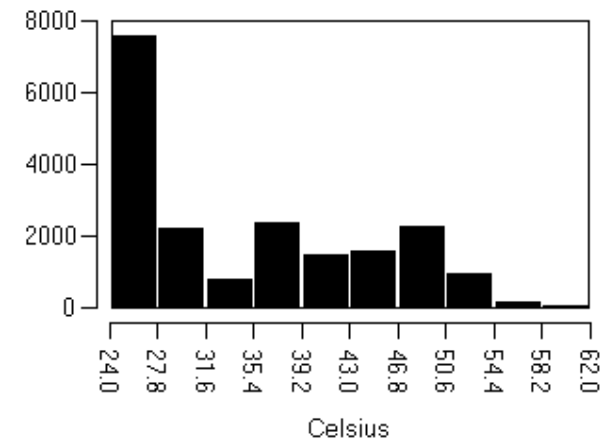
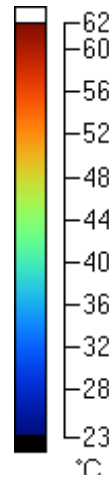
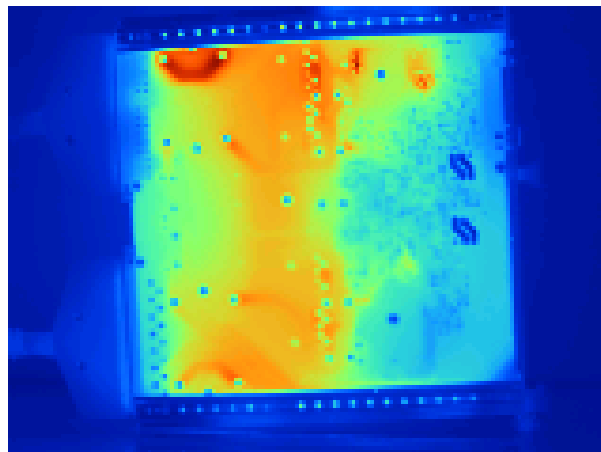
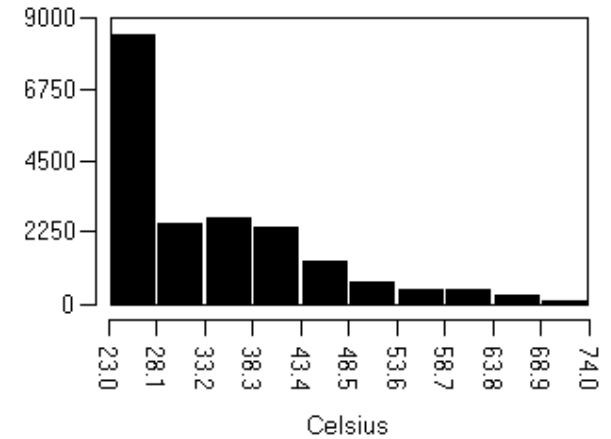
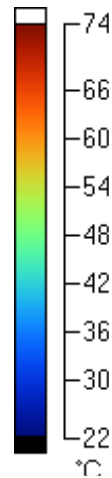
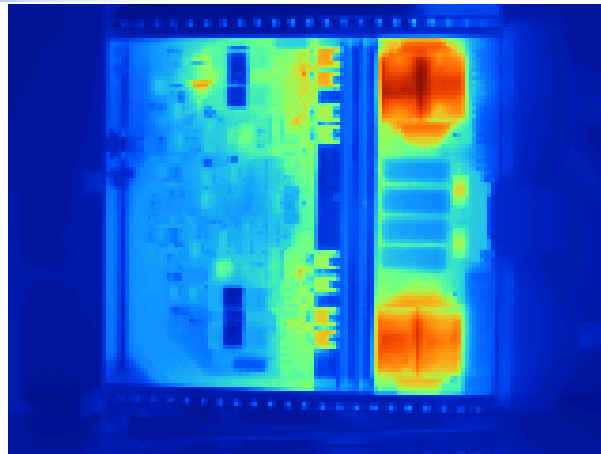




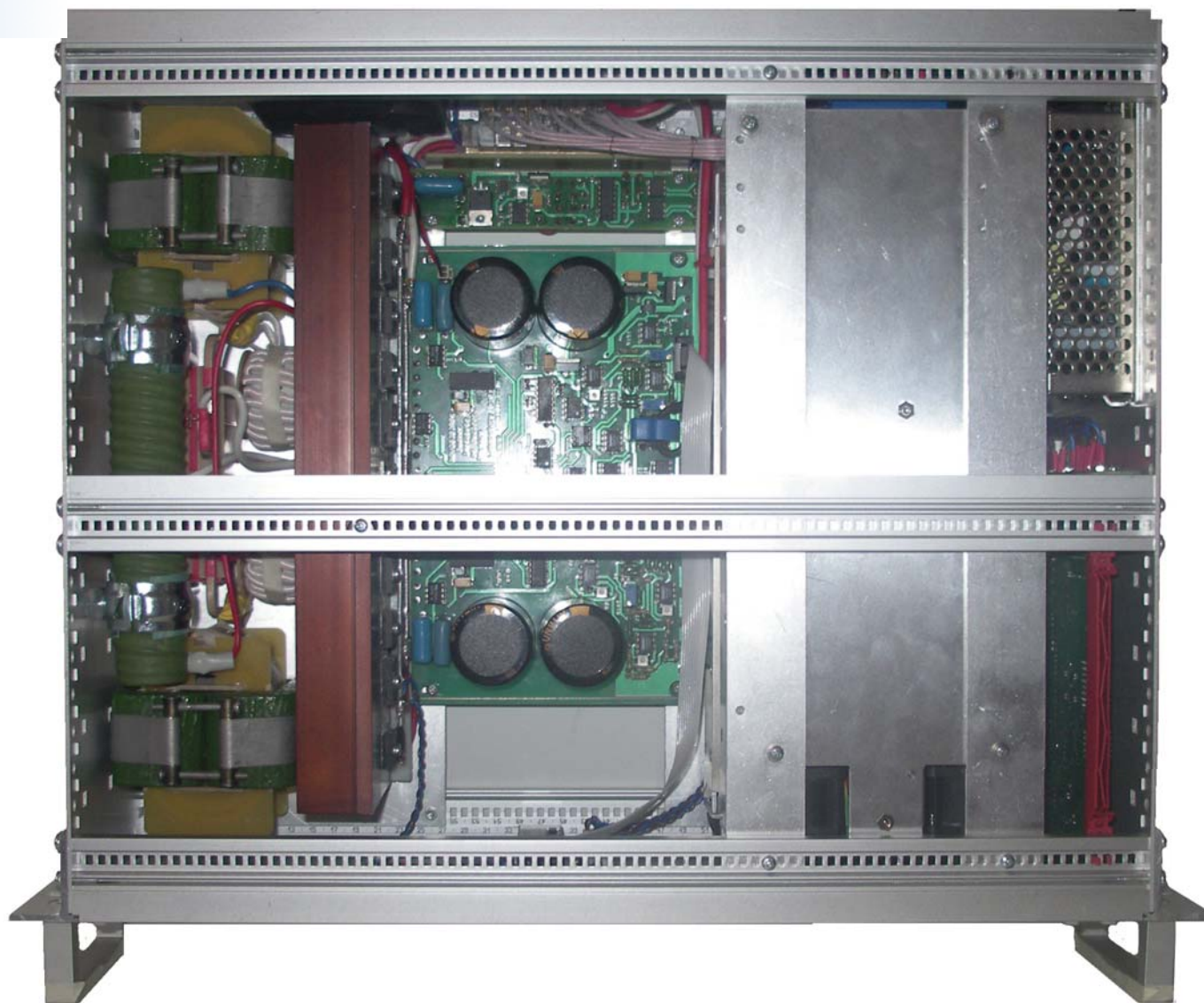
SUBRACK 432x415x266mm

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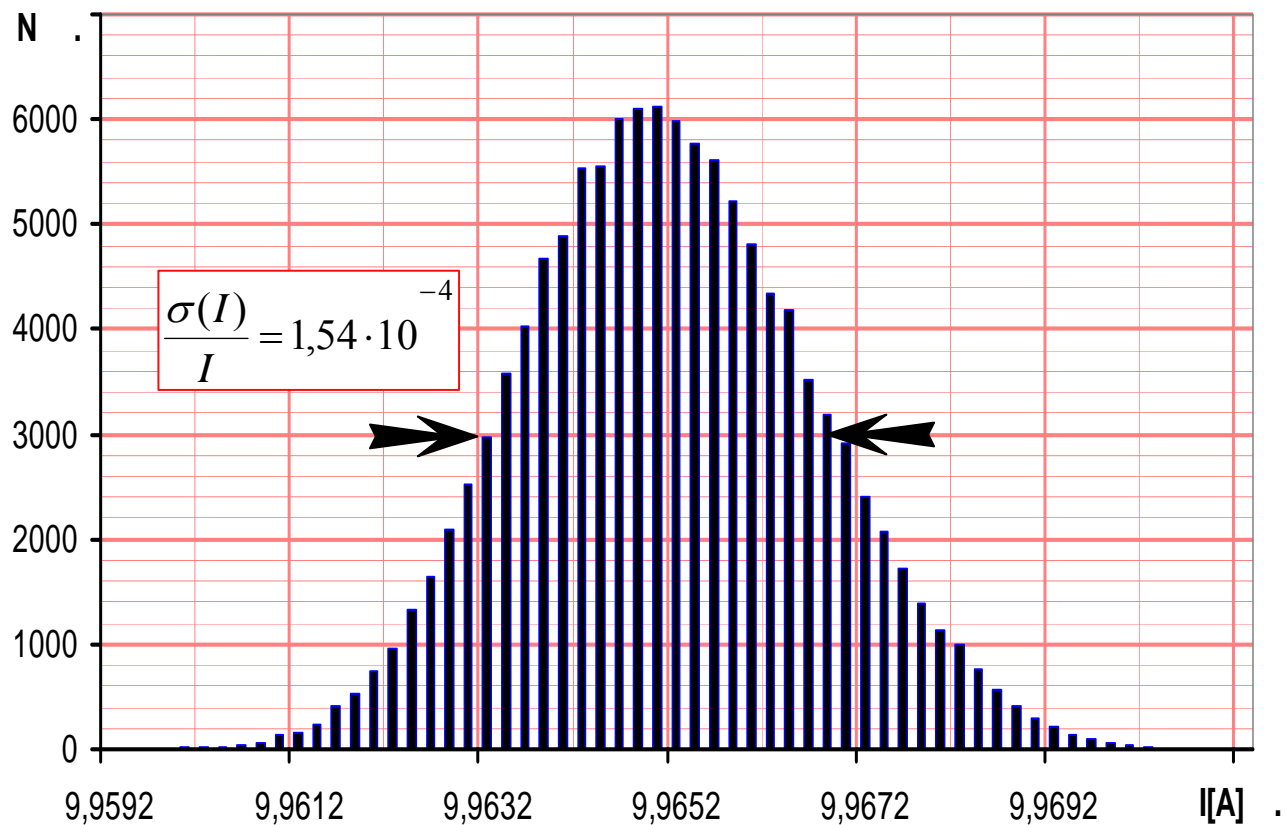
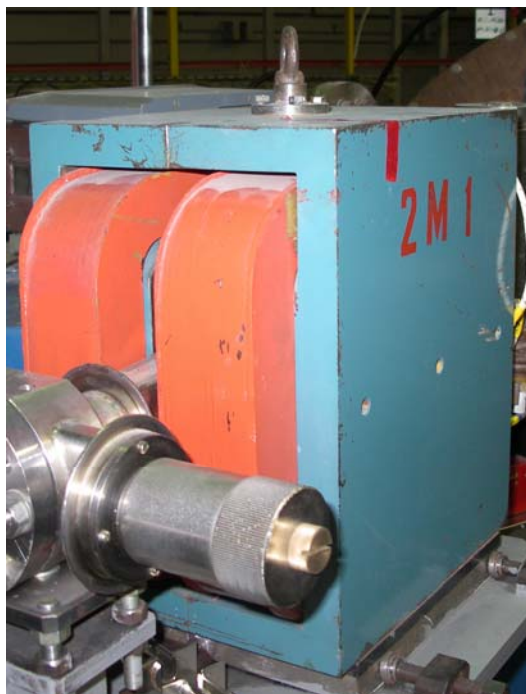








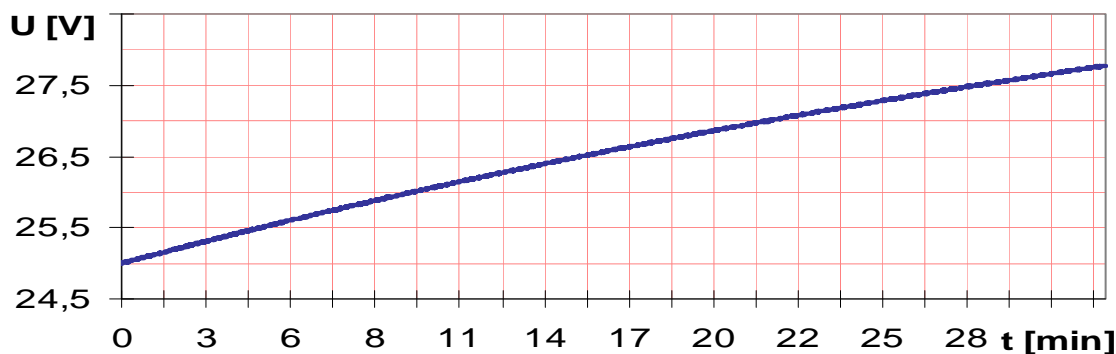
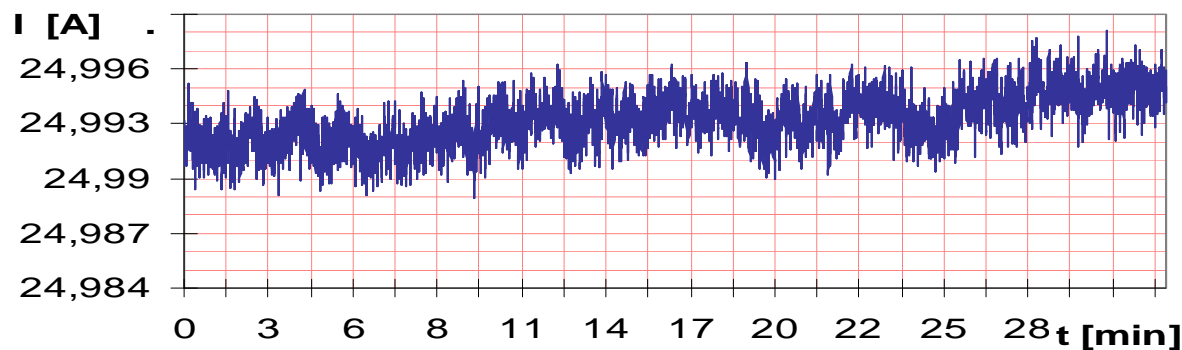
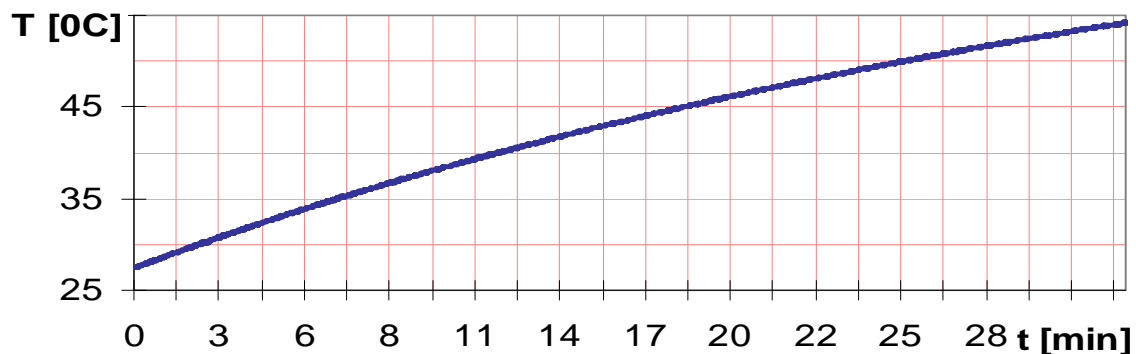
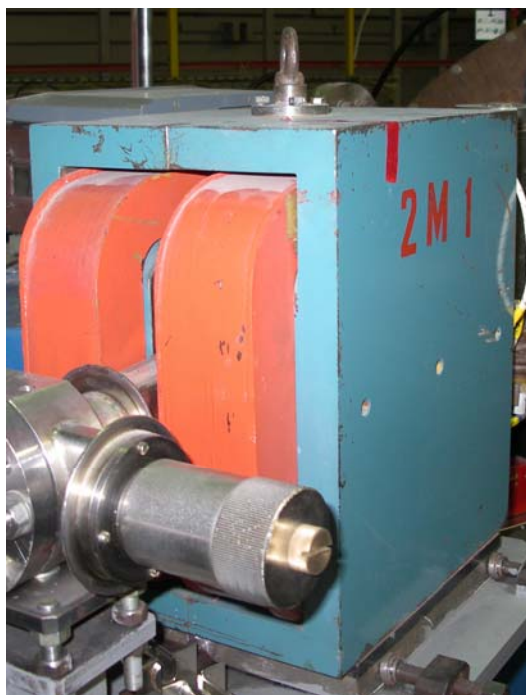
Instability / 24 hours



The industrial storage facility (TNK), Zelenograd, April 2008



Temperature instability



The industrial storage facility (TNK), Zelenograd, April 2008



← **MPS-6** →

← **MPS-25** →





Parameters		Values	
X_G	Current accuracy	<0,1 %	
σ	Output current precision (for 10 hours)	100 ppm	
ξ	Current ripple	50-300 Hz	50 kHz
		400 ppm	200 ppm
TCI_{OUT}	Thermal drift of I_{OUT}	40 ppm/K	
I_{OM}	Residual current	MPS-6	MPS-25
		5 mA	20 mA
P_D	Heat loss	MPS-6	MPS-25
		≤ 15 W	≤ 50 W



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Thanks for your attention