



Full Energy Storage Fast-cycling Pulse Power Supply



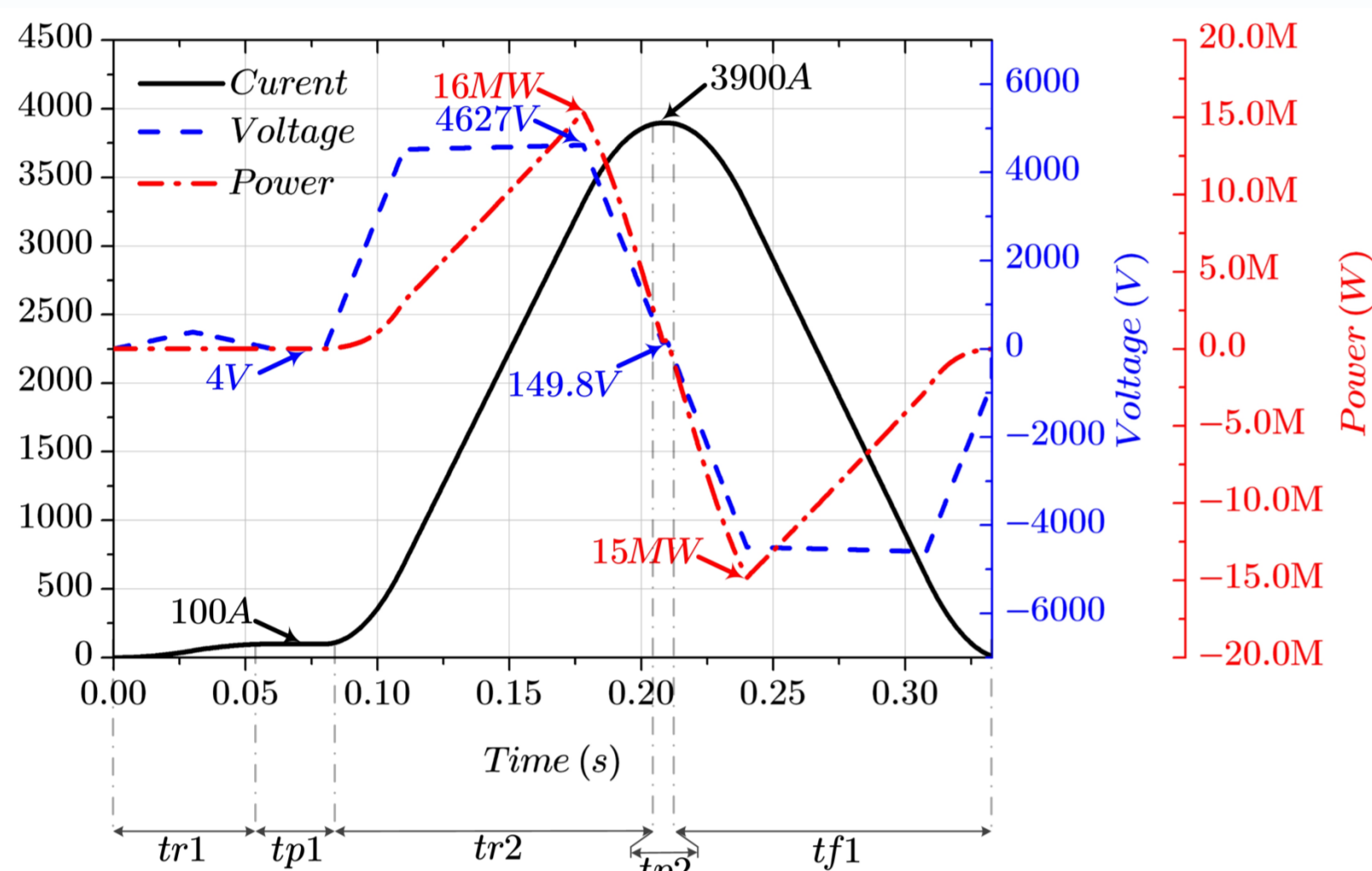
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Background

The HIAF project is a new international advanced accelerator in China, which needs a new type of high power, high precision, fast-cycling pulse power supplies to provide excitation current for the magnets of its B-Ring system.

Requirements

Output Waveforms and Parameters

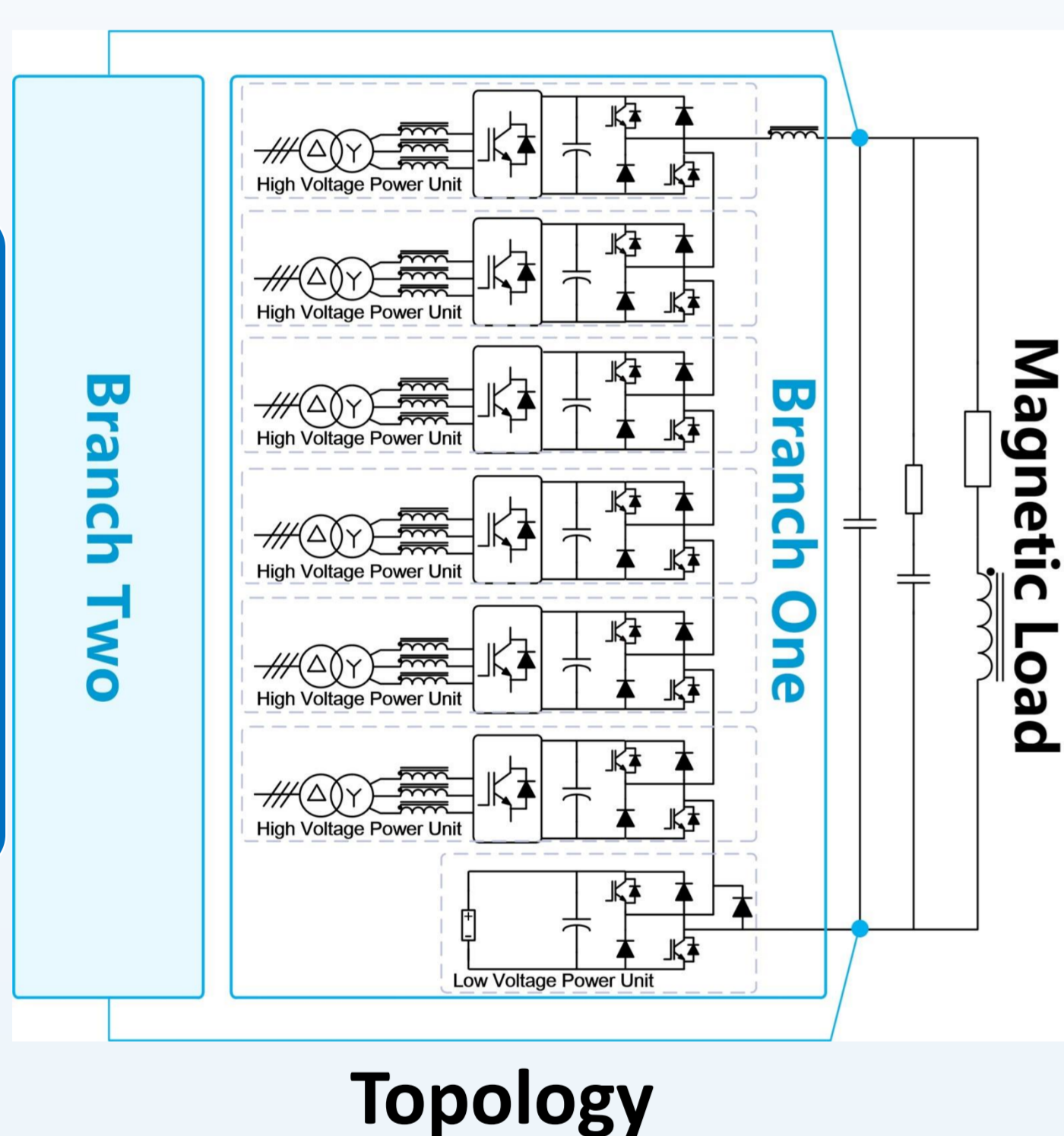


Parameters	Value
Load resistance	36.4mΩ
Load inductance	116mH
Maximum output current	3900A
Maximum output voltage	4627v
Maximum output power	16MW
Maximum ramping speed	38000A/s
Tracking error	≤±0.2A
Current ripple bandwidth	≤±0.2A

Difficulties:

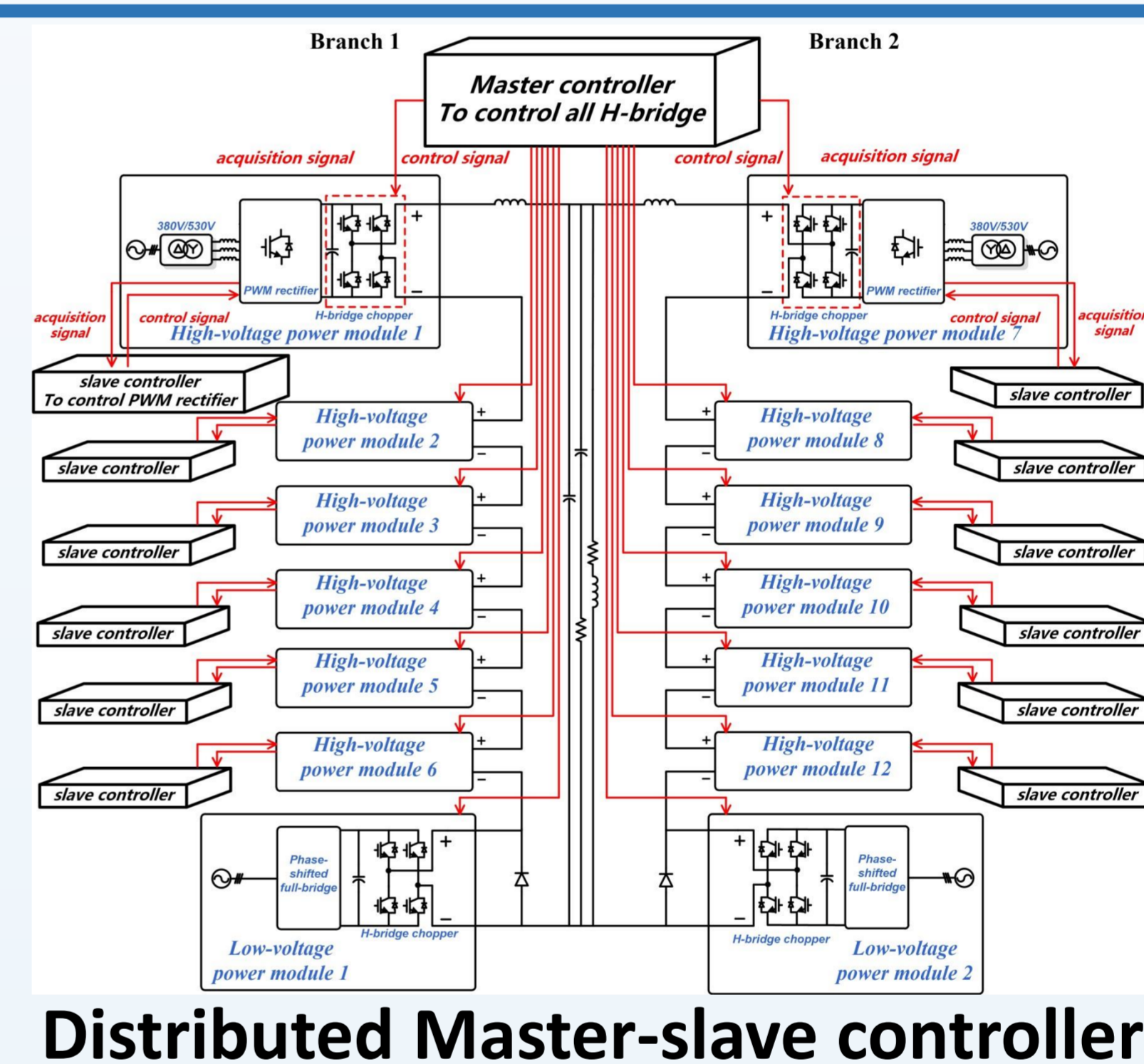
1. High current and power
2. Extremely wide voltage range
3. High current ramping speed
4. Huge reactive power
5. High output current accuracy

Design

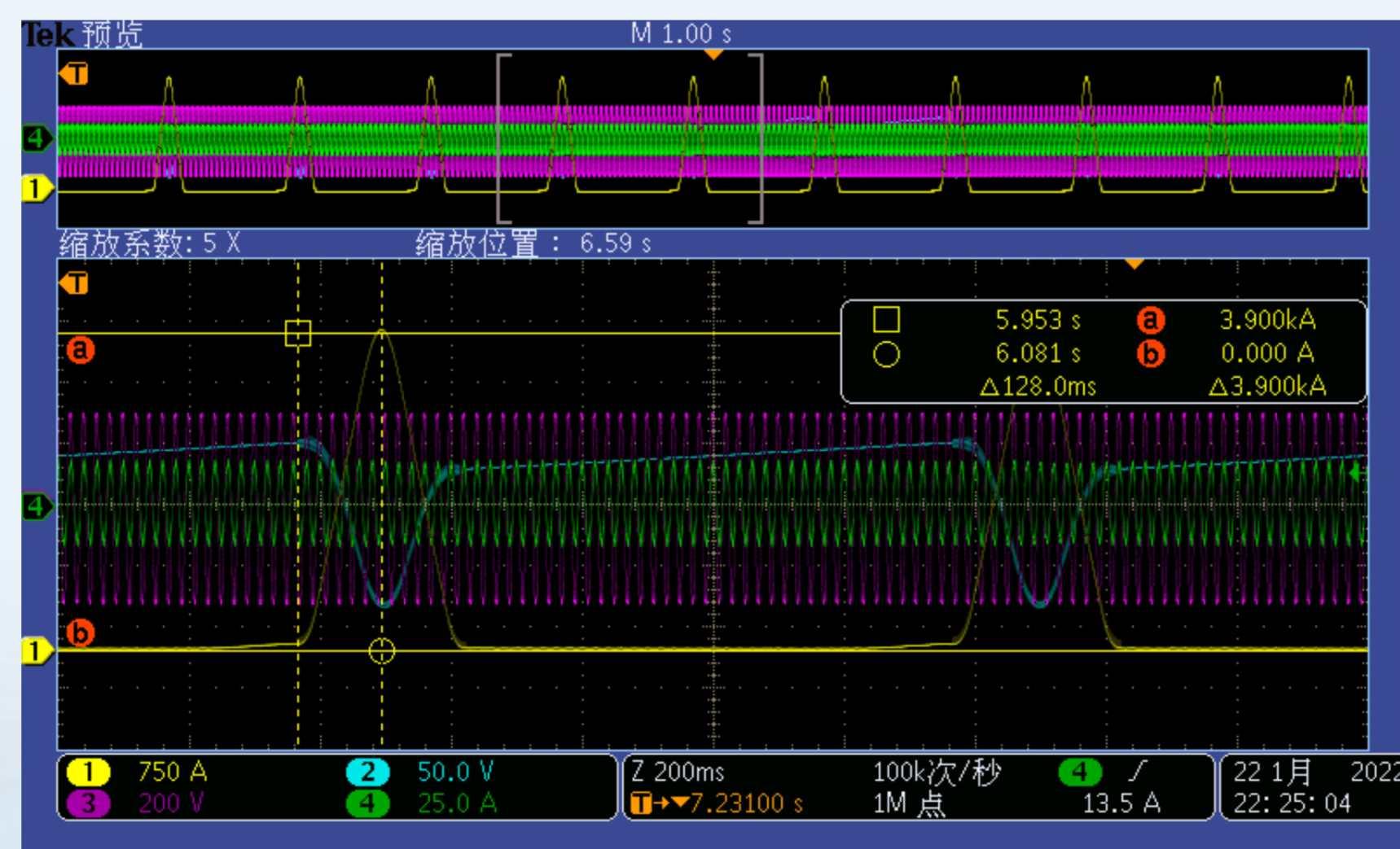
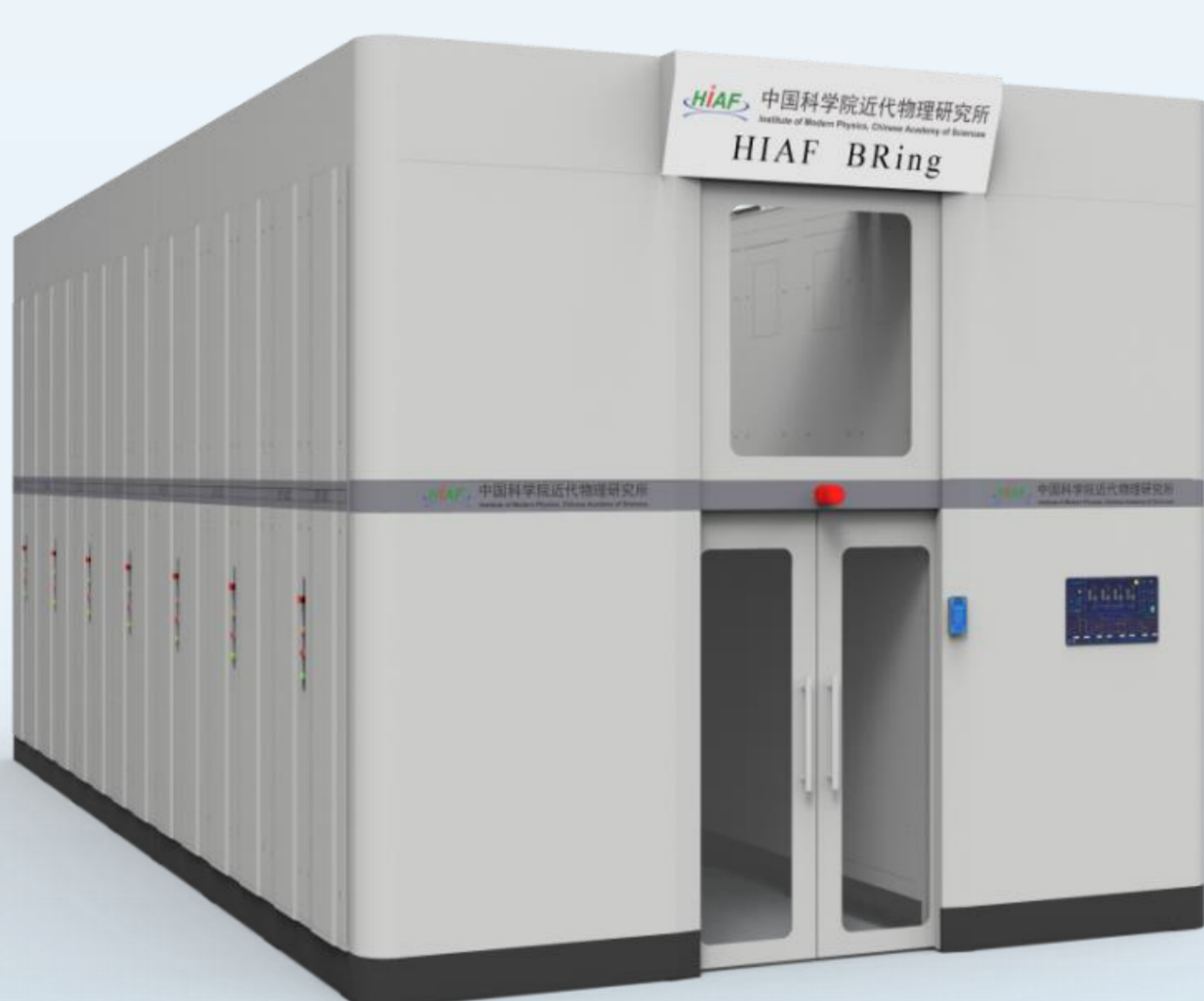


What's new:

1. PWM rectifier with power control
2. Asymmetric cascade of high and low voltage power units
3. Phase-shift frequency doubling control
4. Full digital distributed control system
5. Modular design

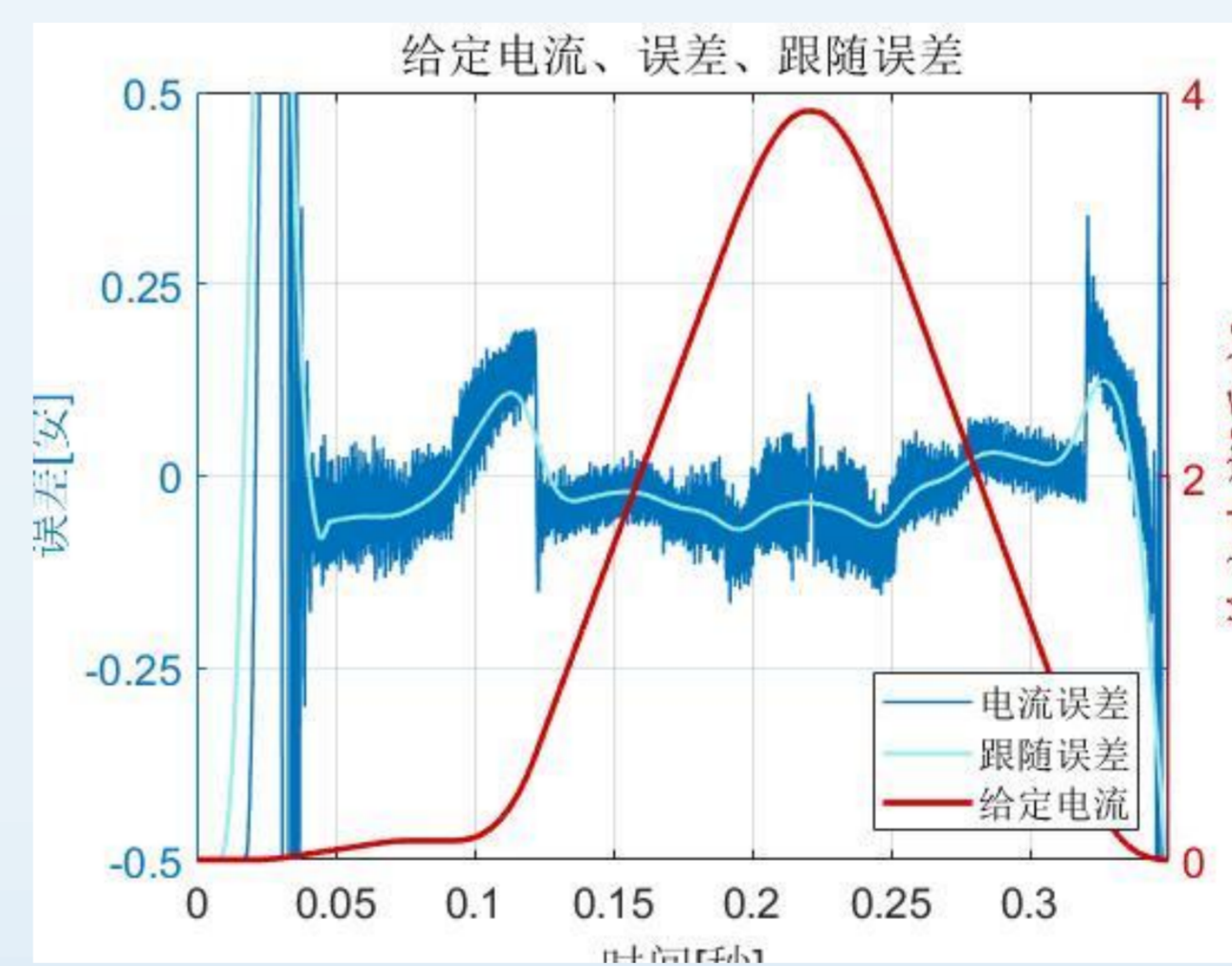


Test results

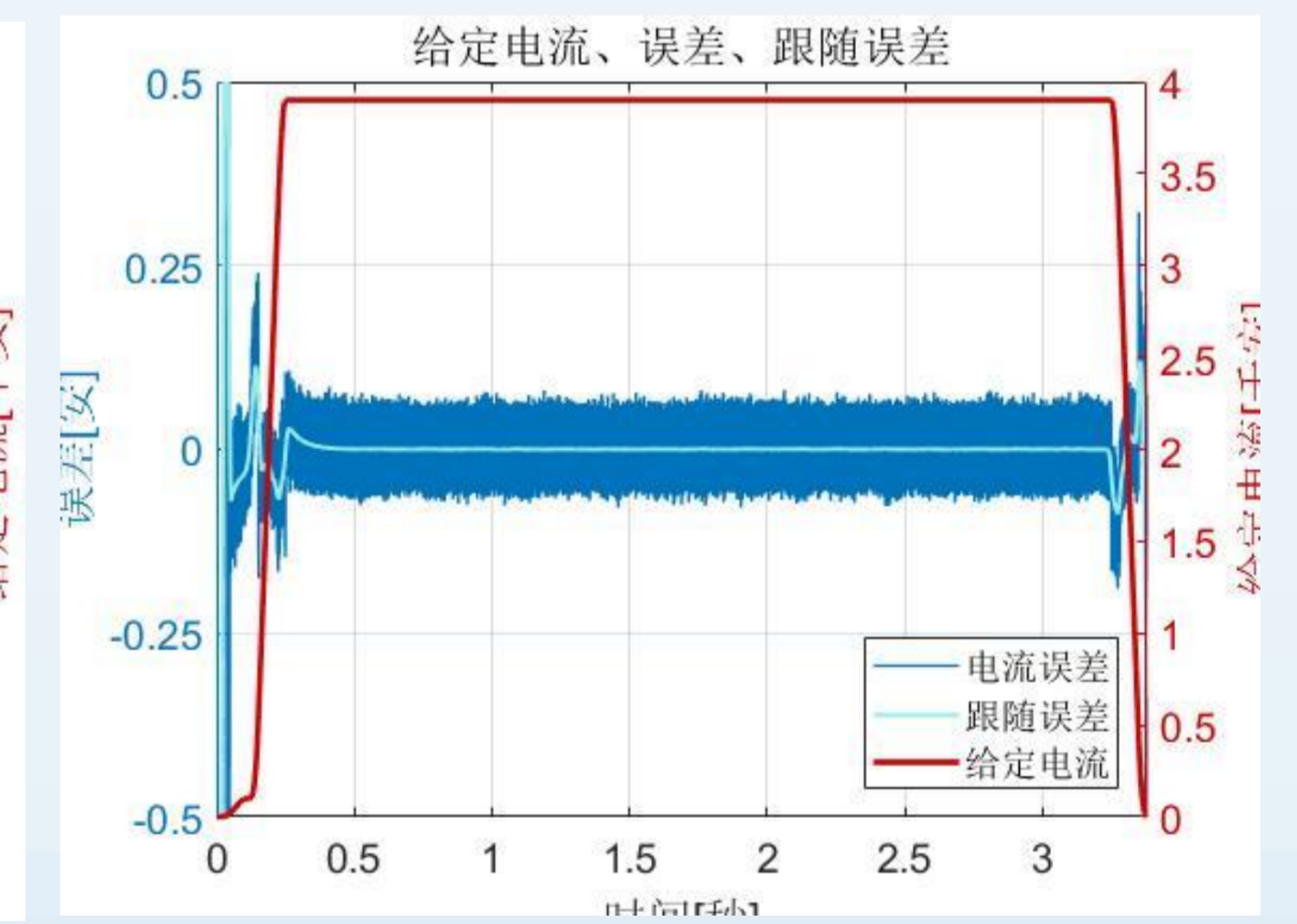


The HIAF dipole power supply 3900A/3Hz output with all high PUs only

Fast extraction waveform

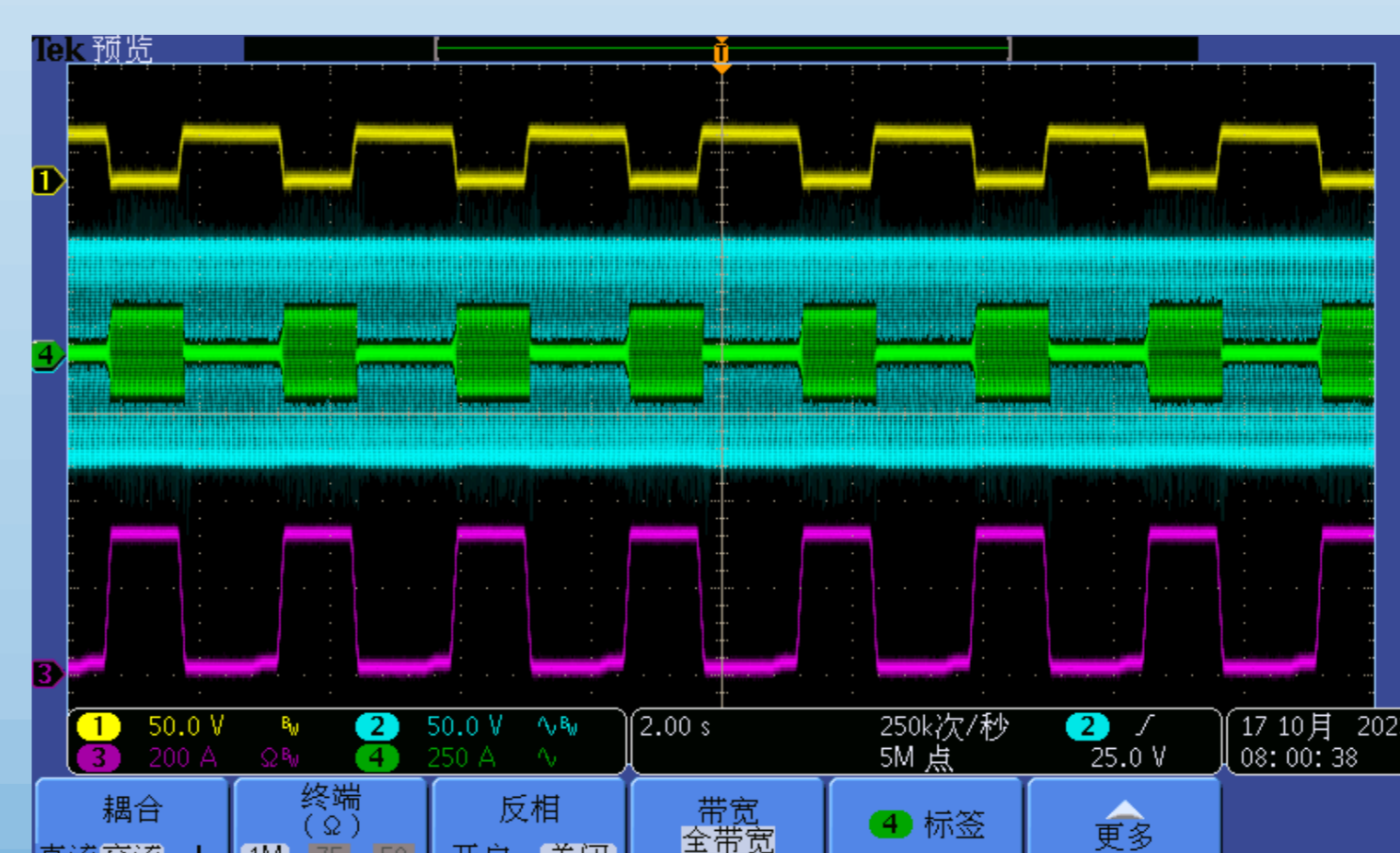
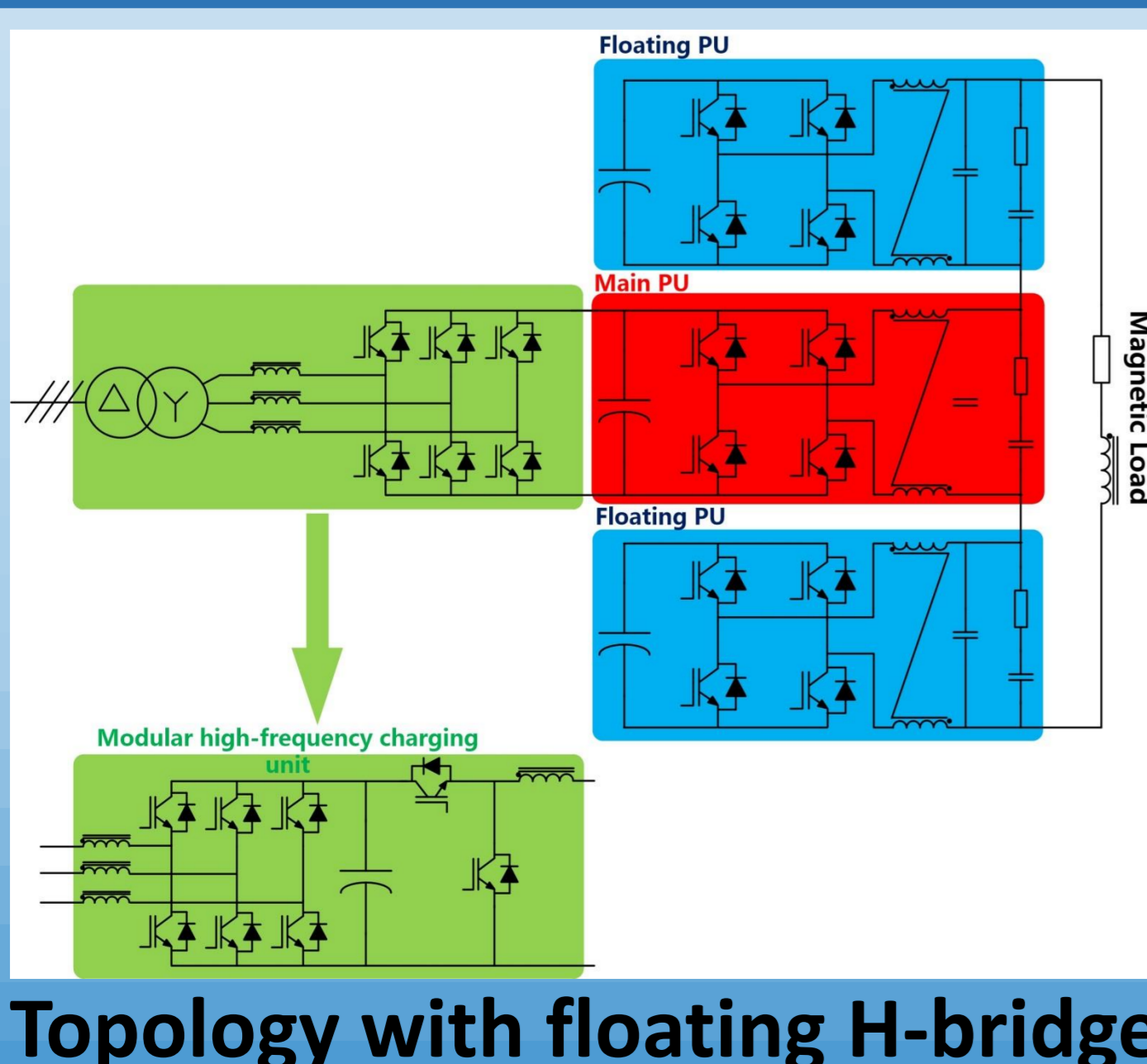


Slow extraction waveform

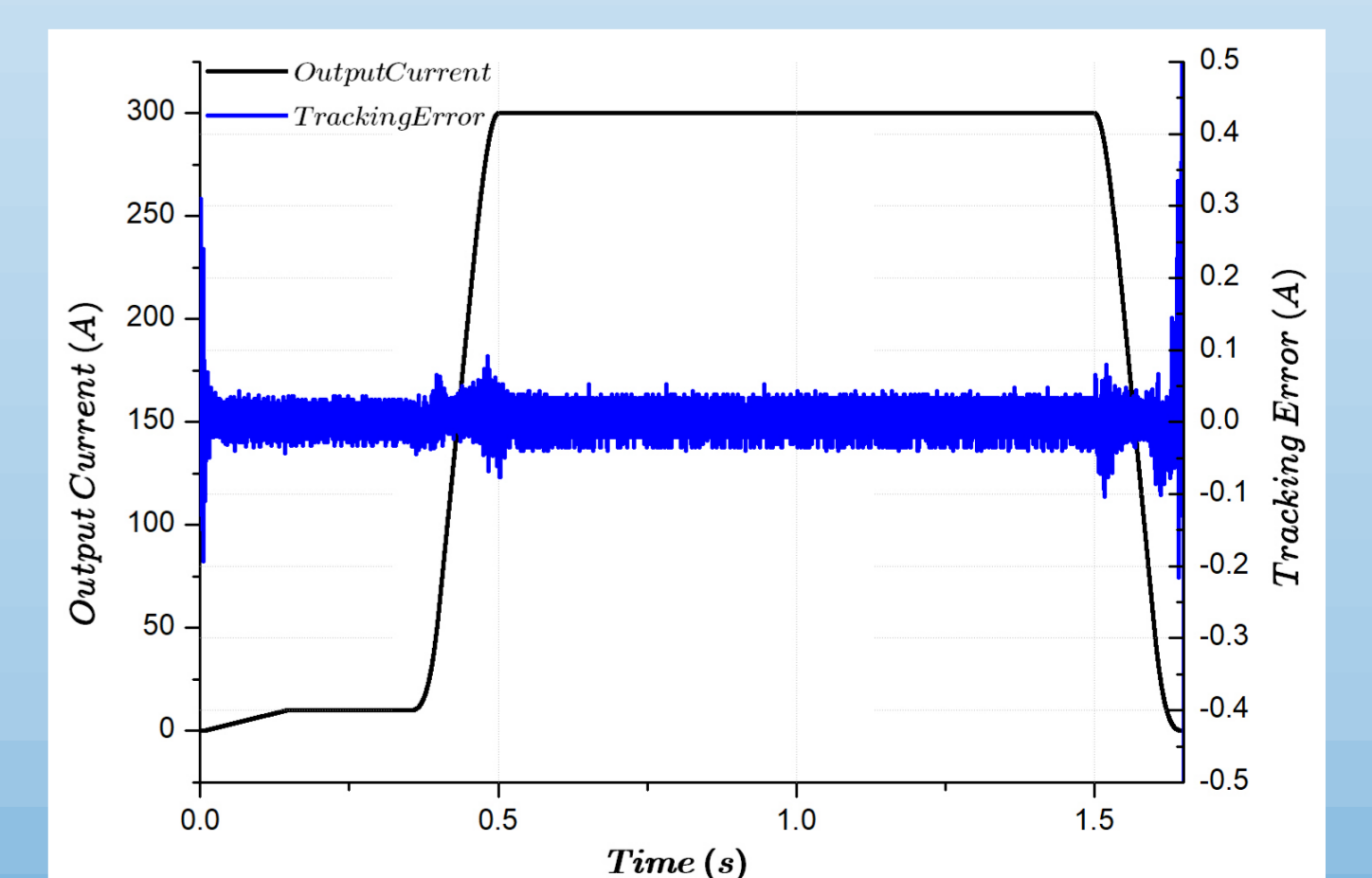


Parameters	Fast extraction	Slow extraction
Tracking error	108mA	145mA
Current ripple bandwidth	192mA	198mA

What's next



300A with ramping time 150ms



Tracking error is within ±100mA

200Hz fast-cycling pulse power supply is on the way!