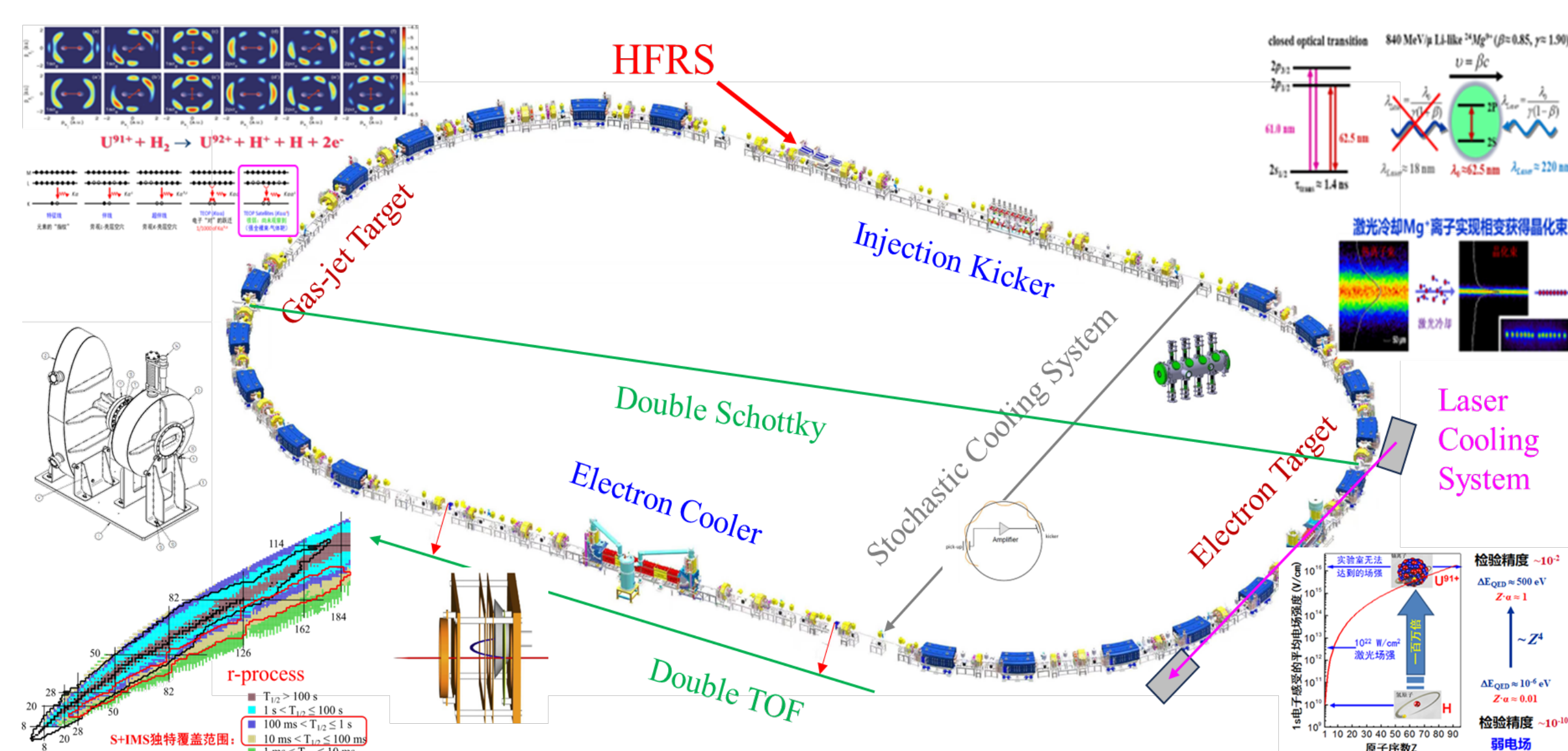


High intensity heavy-ion beam stacking in the Spectrometer Ring of HIAF

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Abstract: The Spectrometer Ring (SRing) is an essential part of the High Intensity heavy-ion Accelerator Facility (HIAF). Multiple single-turn injections are employed to achieve higher beam intensity with the operation mode of beam stacking. The pulse beam extracted from the Booster Ring will be compressed to within 120 ns, with momentum dispersion of 5 per thousand. The rise/fall time of the power supply for Kicker magnets is about 200 ns. Based on the revolution period of SRing, up to 4 times beam stacking will be performed. The stored beam will be first debunched and then rebunched into a single bunch, with the length compressed to less than 100ns, providing short-pulse high-intensity beams for high-energy-density physics experiments.

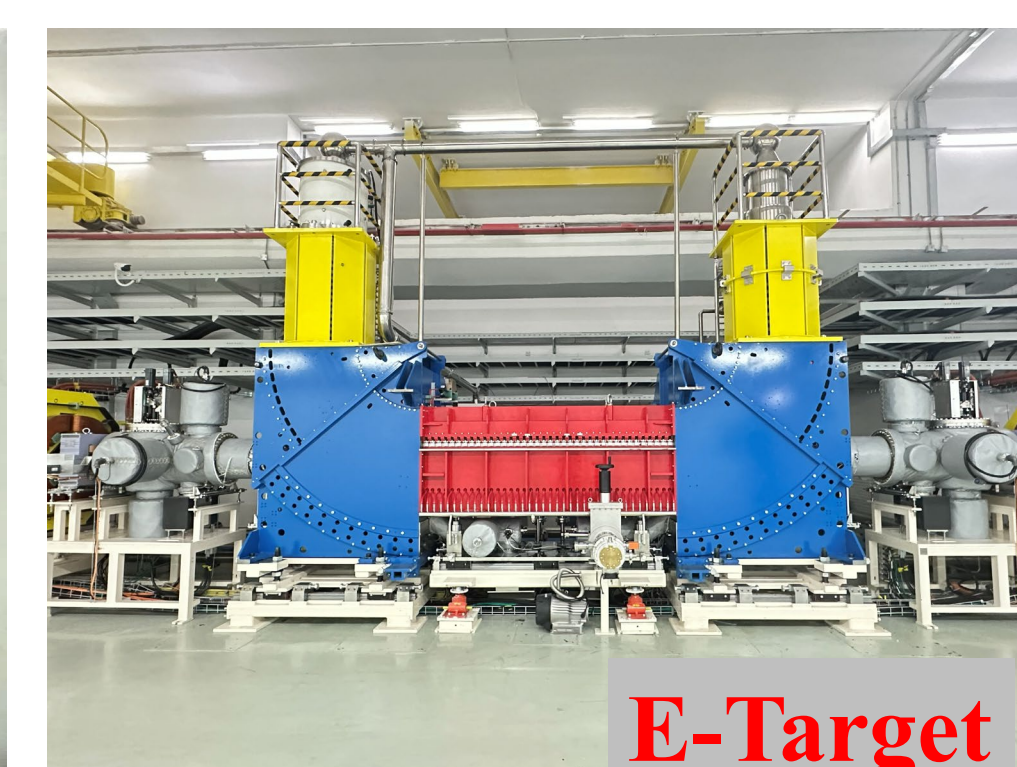
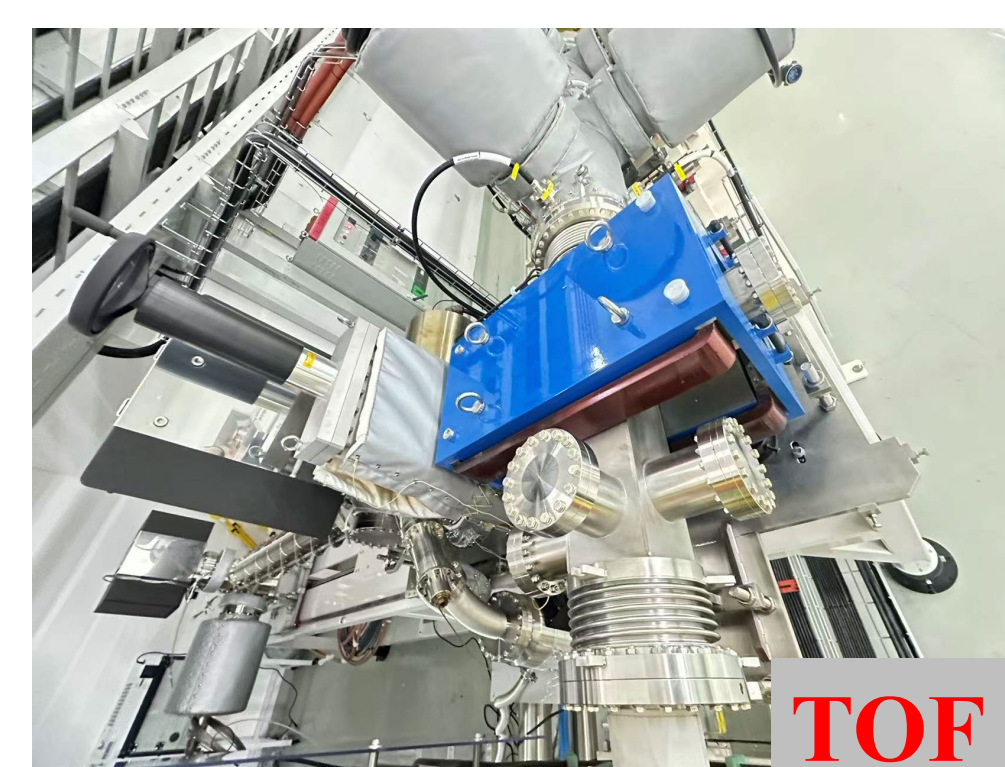
1. Introduction of SRing



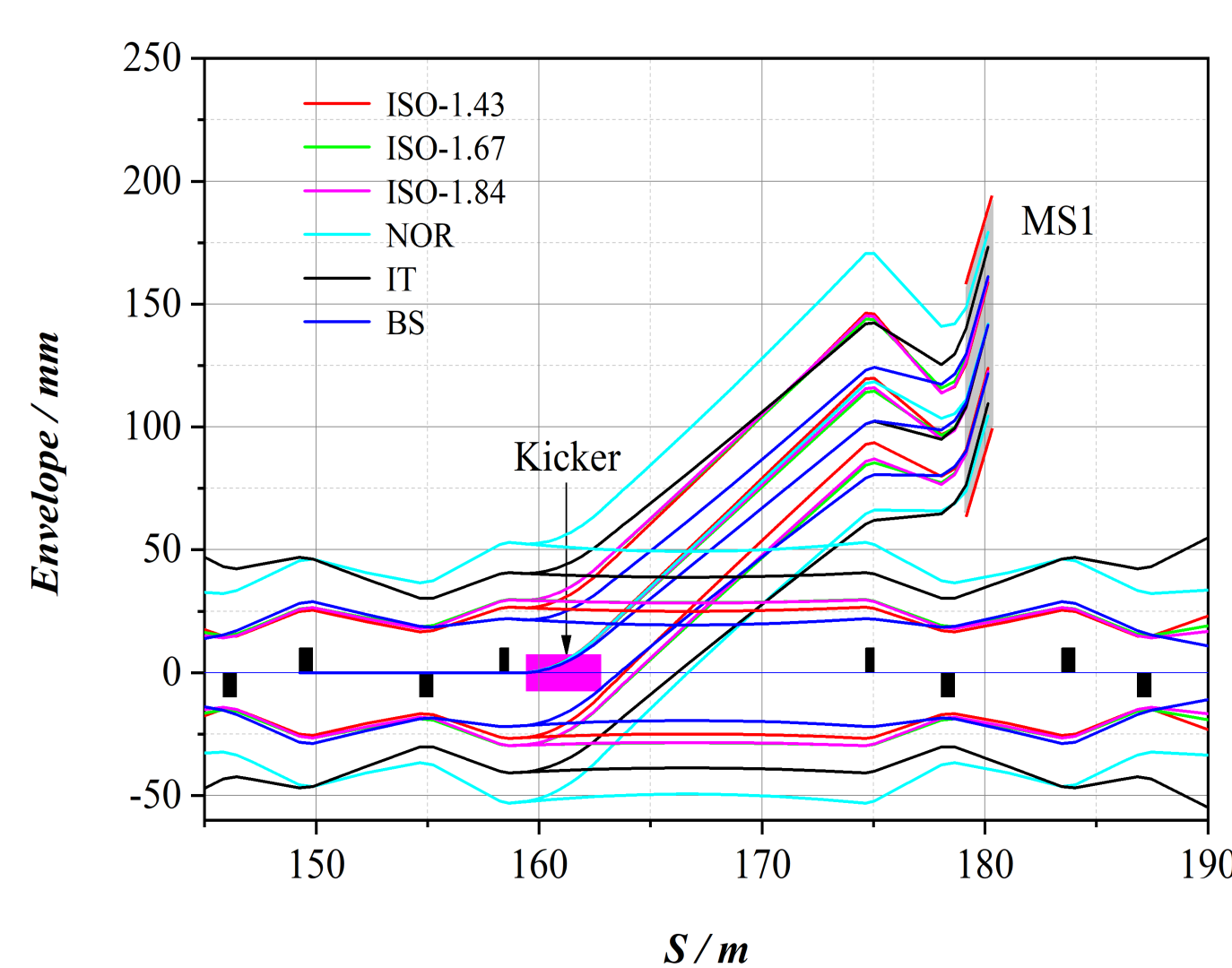
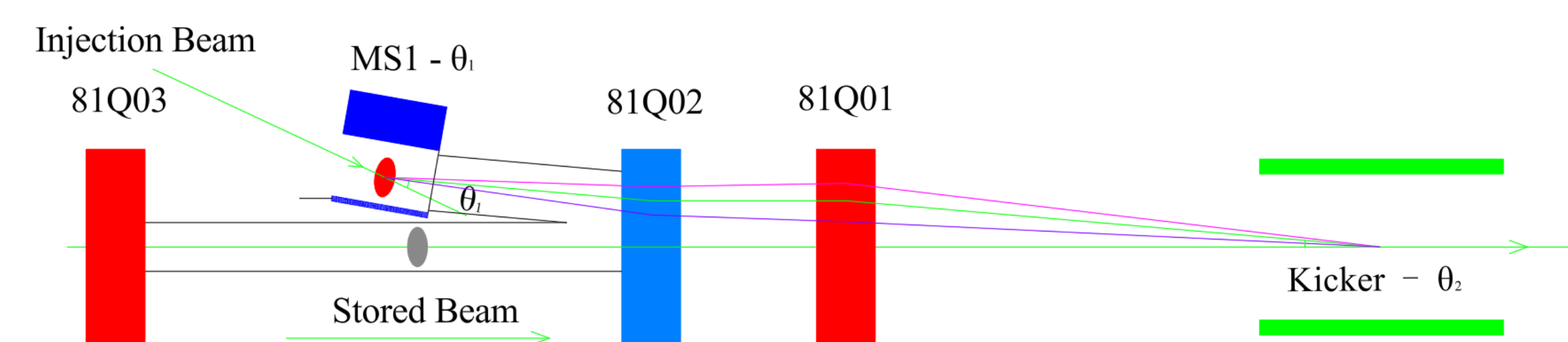
The layout of SRing

Circumference	277.29 m
Magnetic rigidity	2~15.77 Tm
Vacuum	$1 \times 10^{-11} \sim 5 \times 10^{-12}$ mbar

SRing is one of the core facilities of the HIAF accelerator system. It is a key device for producing high-quality radioactive secondary beams and high-intensity, highly charged stable heavy-ion beams, and for applying them to high-precision mass measurements, atomic physics, and nuclear physics experiments. It is an advanced spectrometer in the world for short-lived nuclear mass measurements. SRing employs multiple operating modes and optical designs, including the isochronous mode, normal mode, internal target mode, and beam stacking mode.

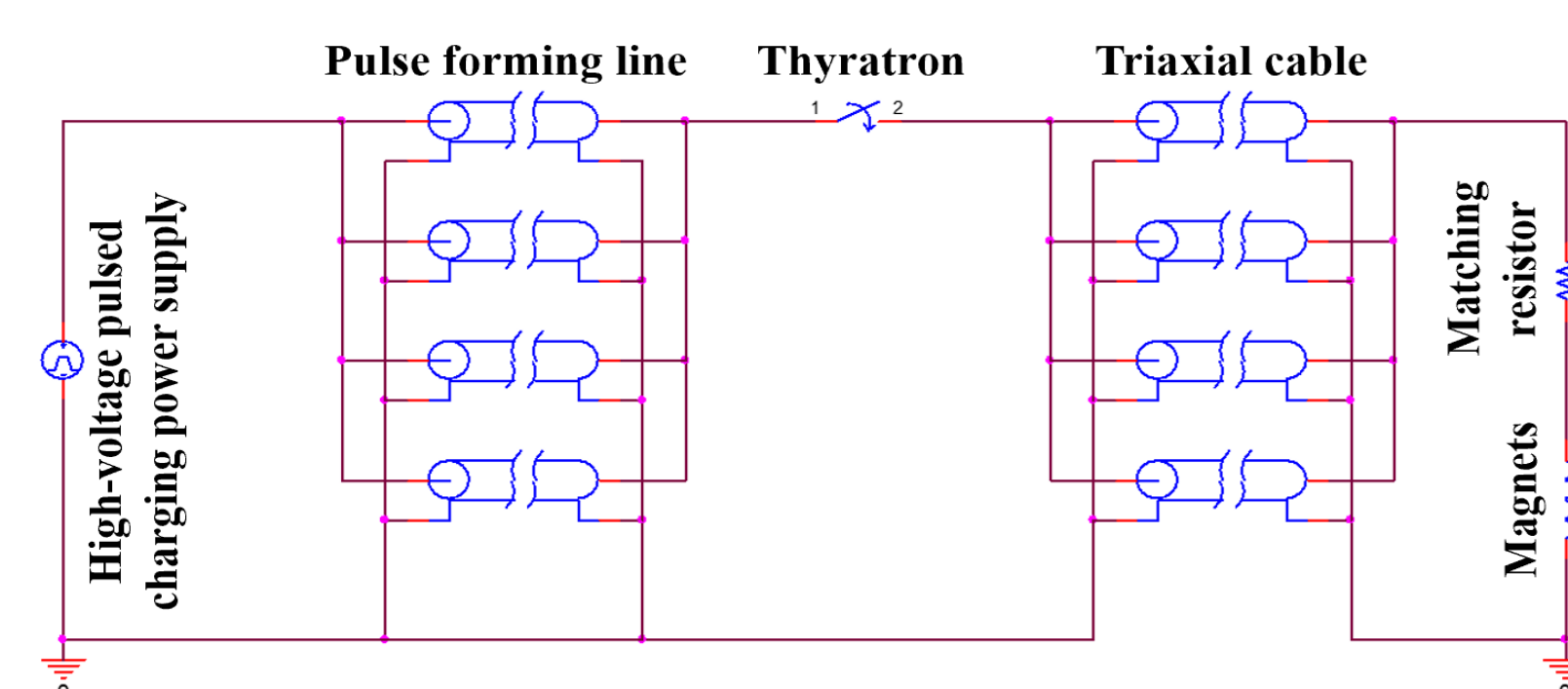


2. Injection System

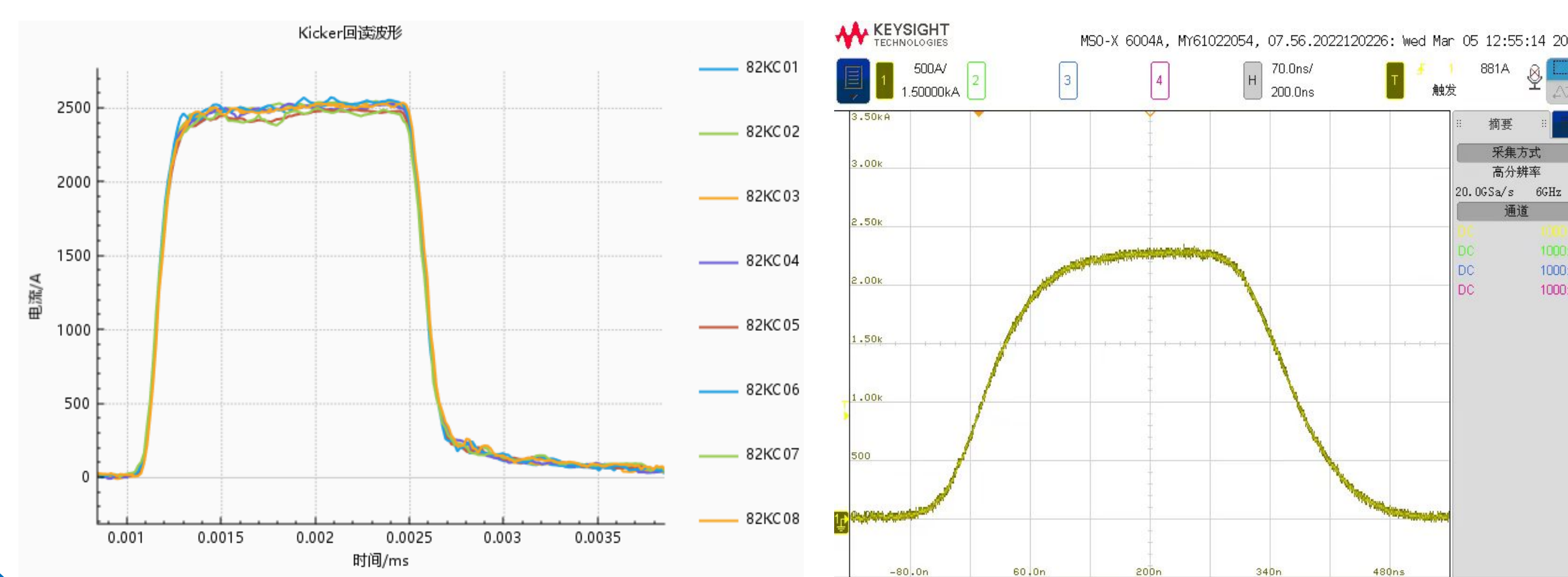


The different operating modes of SRing share a single injection system, including 8 kicker magnets and 3 septum magnets. The kick angle of the injection kicker and the deflection angle of the last septum are adjusted to satisfy the injection matching requirements of different optics.

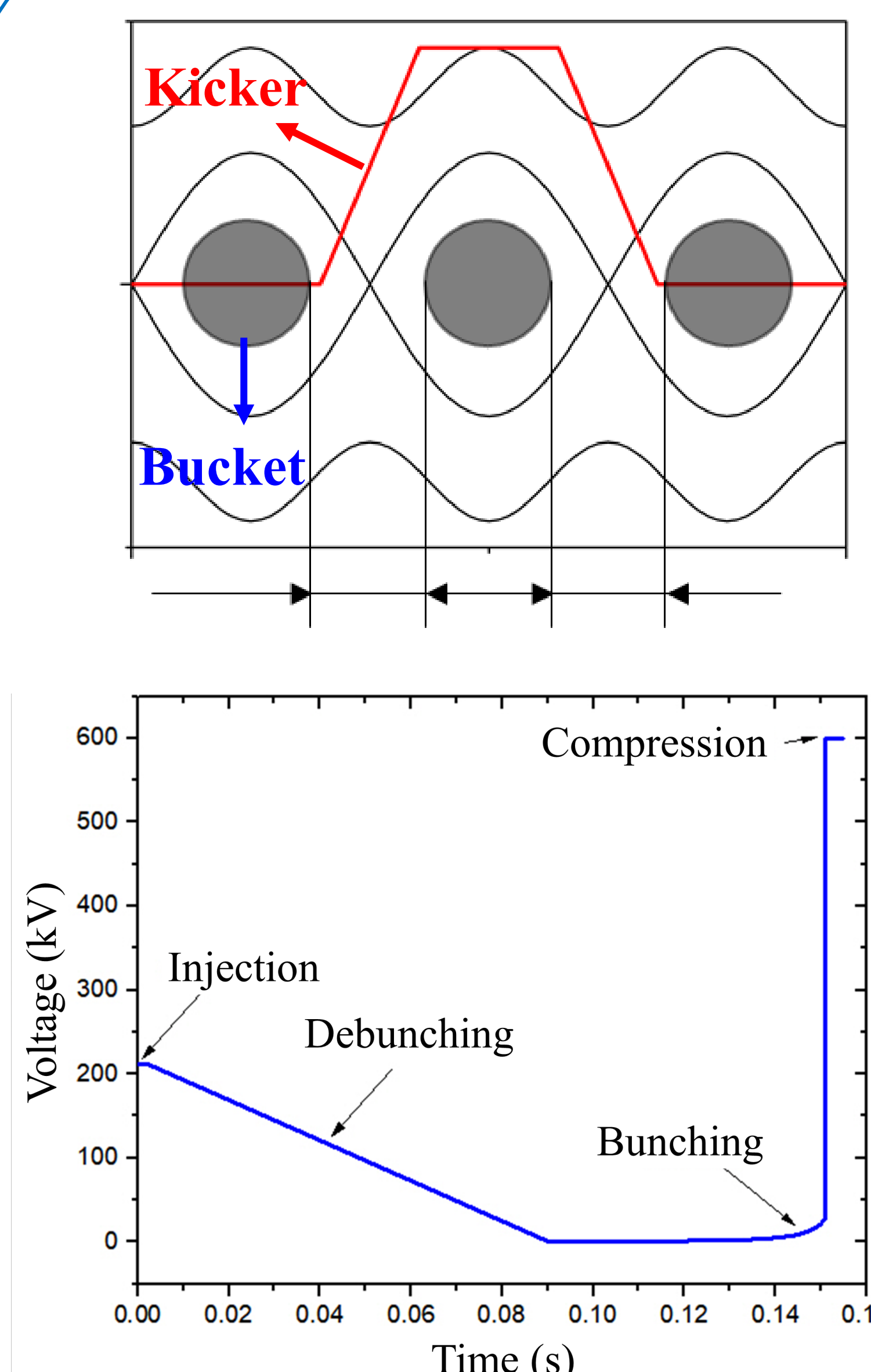
3. Power supplies of kicker magnets



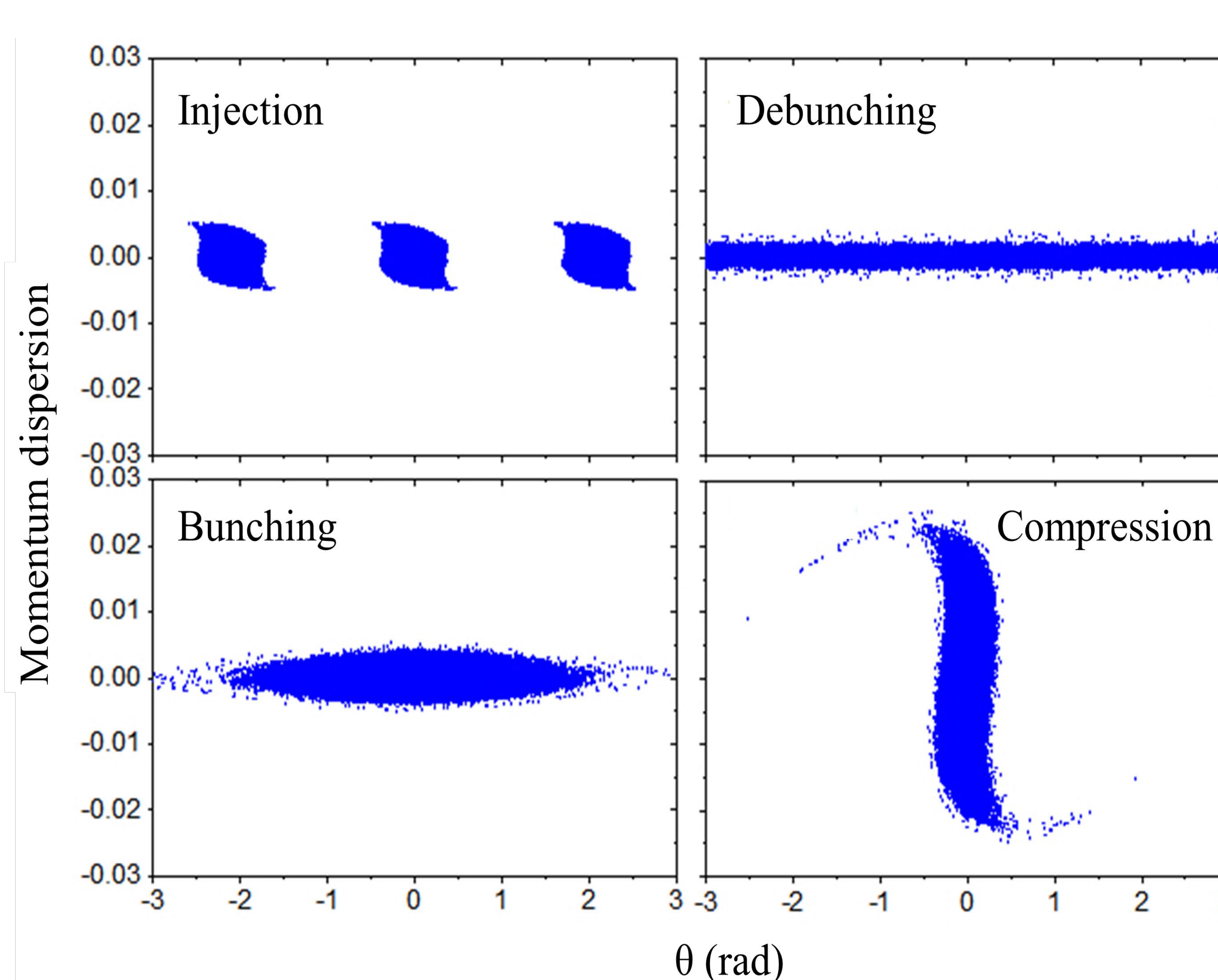
To meet the requirements of both short and long pulse widths for high intensity beam stacking and other physics experiments, different output pulse widths can be obtained by adjusting the length of the PFL.



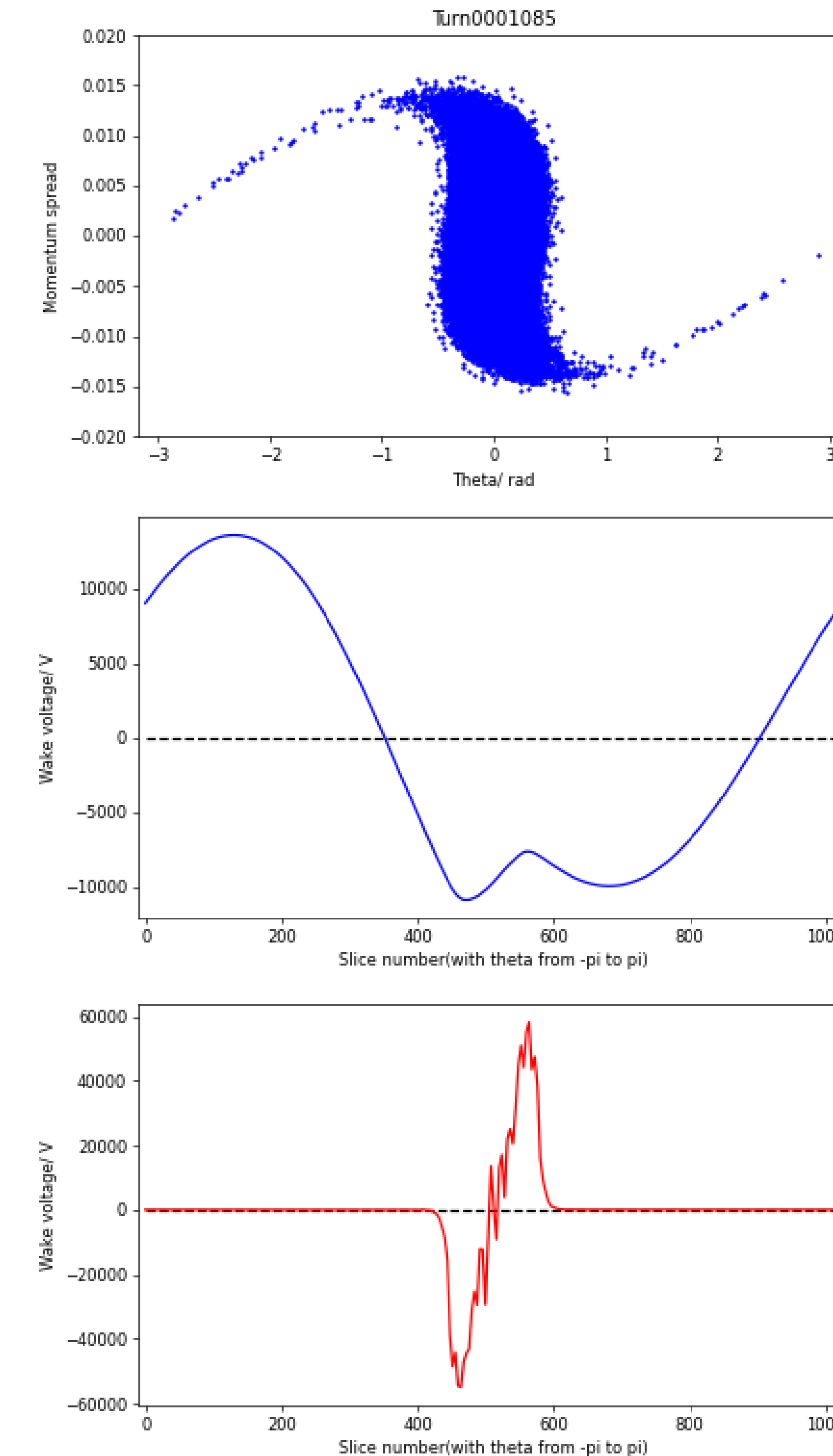
4. Beam stacking and compression



Voltage of RF



The longitudinal phase-space distributions of the beam at different stages



Wake voltage of RF and Beam