

PULSED BEAM GENERATION FOR THE THREE-DIMENSIONAL SPIRAL INJECTION SCHEME TEST

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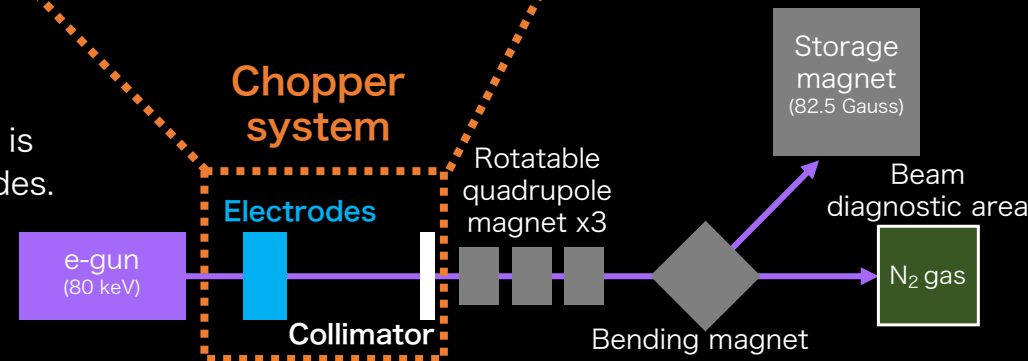
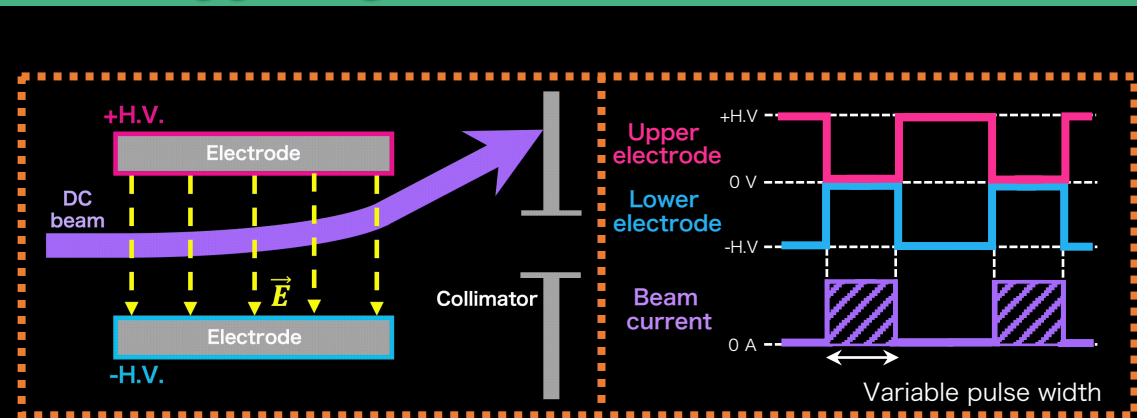
1. Introduction

- The pulsed beam is needed for the demonstration experiment of the three dimensional spiral injection scheme for J-PARC muon g-2/EDM experiment.
- However, we had only electron gun which can generate the DC beam.
- We developed **the chopper system** to **generate the pulsed beam from the DC beam**.

- Pulsed voltage is applied to the electrode pair to generate a pulsed E-field.
- To generate the pulsed beam, the DC beam is chopped by the E-field between the electrodes.
- Specifications

Apply voltage	+ 350 V - 350 V
Pulse width(FWHM)	<60 ns to DC
$f_{\text{Rep.}}$	Single shot to >20 kHz

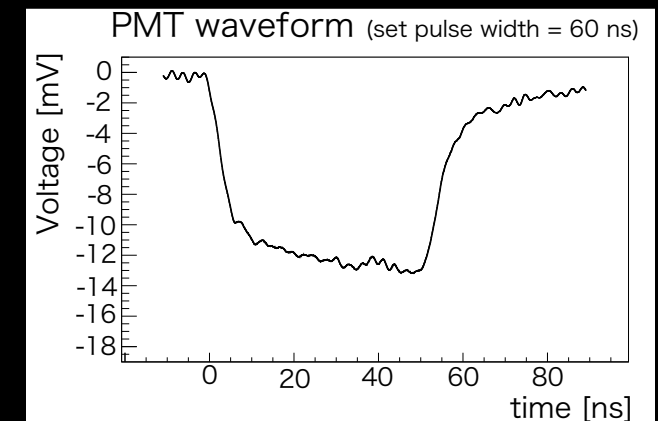
2. Chopper system



Outline of the beamline

3. Summary

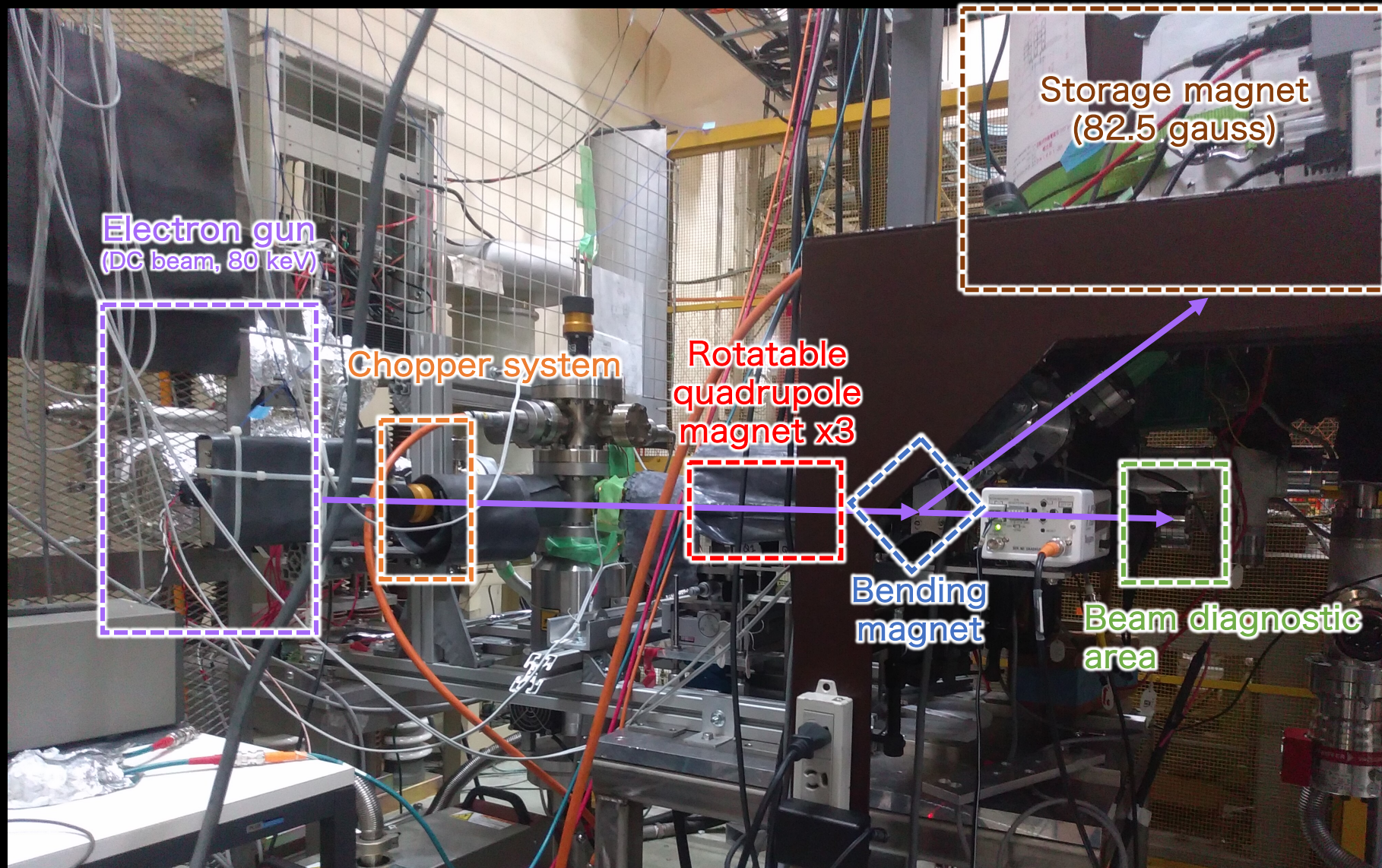
- Constructed the chopper system and generated the pulsed beam from the DC beam.
- It was confirmed that the generated pulsed beam had the expected pulse width.
- The time structure of the pulsed beam is checked by detecting the de-excitation light of N₂ gas by the beam with a PMT and was as expected.
- Example of waveform (averaging waveform of 10⁴ shots)



Backup

A solid green horizontal bar at the top of the page, which is slightly thicker on the right side, creating a subtle upward curve.

Outline of beamline



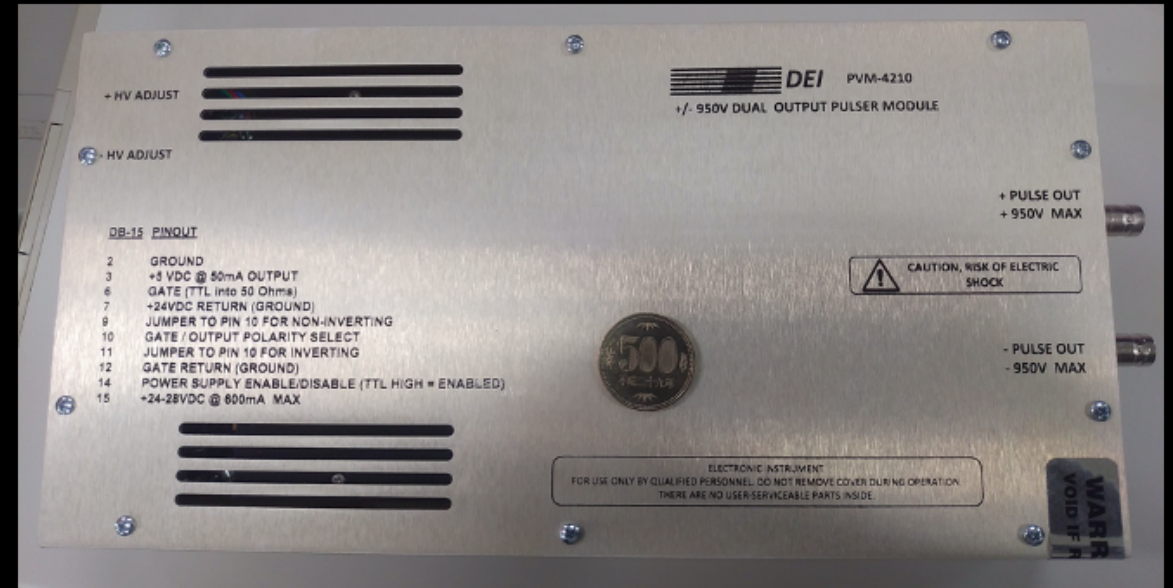
- The storage magnet is filled with N_2 gas for beam orbit visualization.
- The time structure of the beam was checked with nitrogen gas that leaked from the storage magnet to the beam diagnostic area.

Pulsed power supply

- The pulse width (FWHM) and repetition frequency can be changed within the specifications of the pulse power supply.
- Pulse power supply : DEI PVM-4210 (<https://directedenergy.com/product/pvm-4210/>)

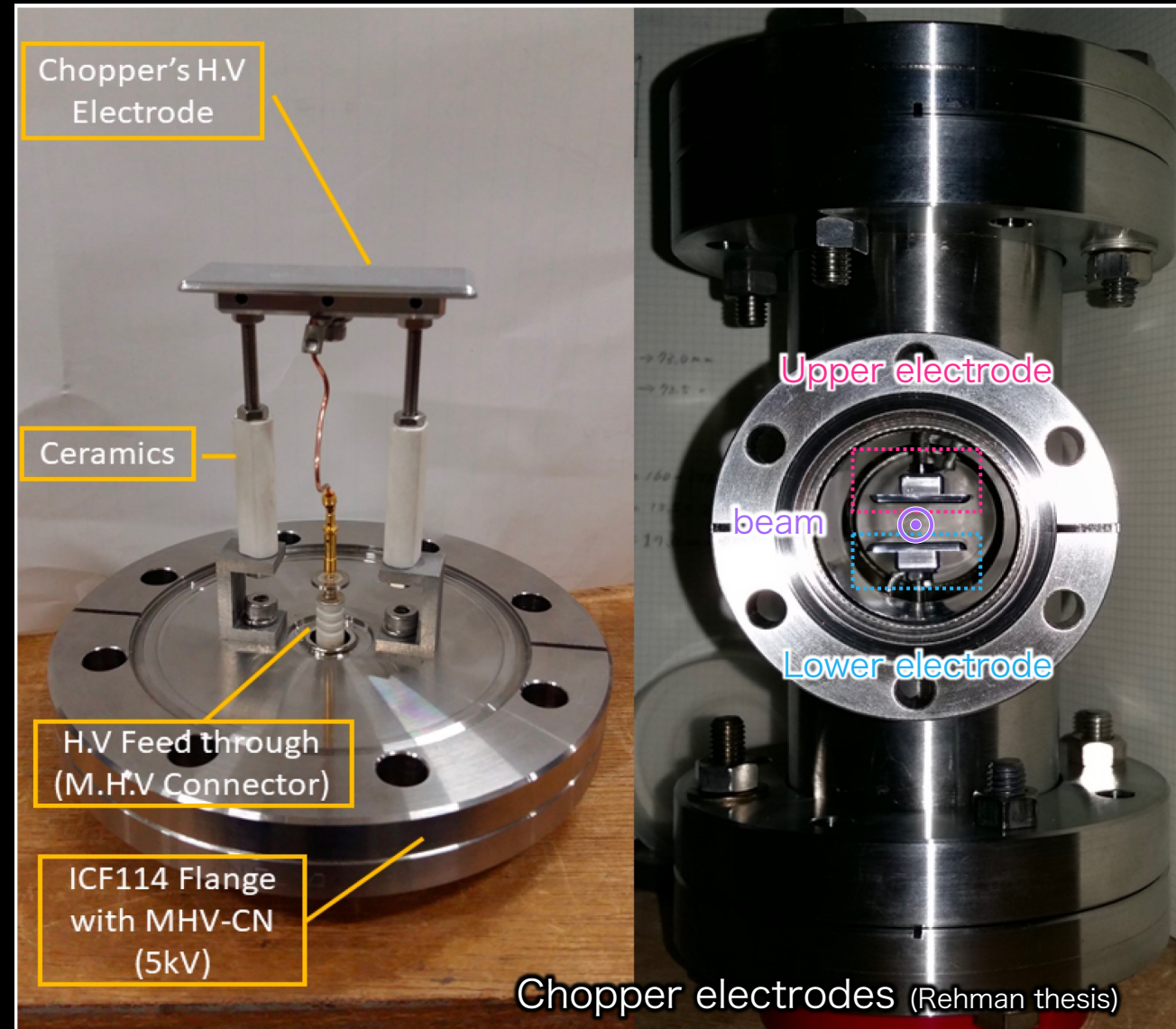
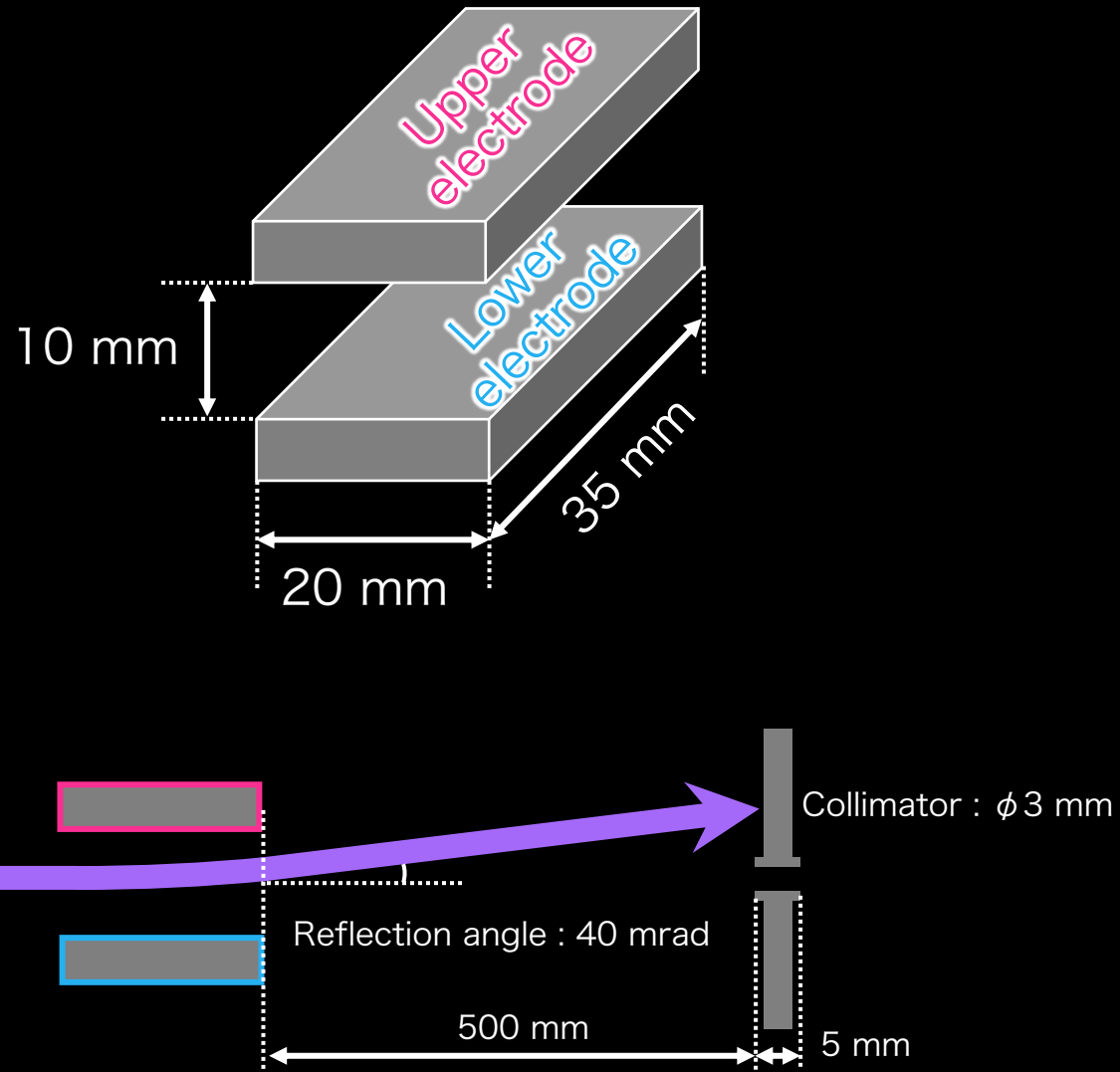
Pulse Power Supply Specifications

Output voltage (2 output)	0 to +950 V \pm 5 V 0 to -950 V \pm 5 V
Rise time (10% to 90%)	<20 ns
Pulse width(FWHM)	<50 ns to DC
Repetition frequency	Single shot to >20 kHz



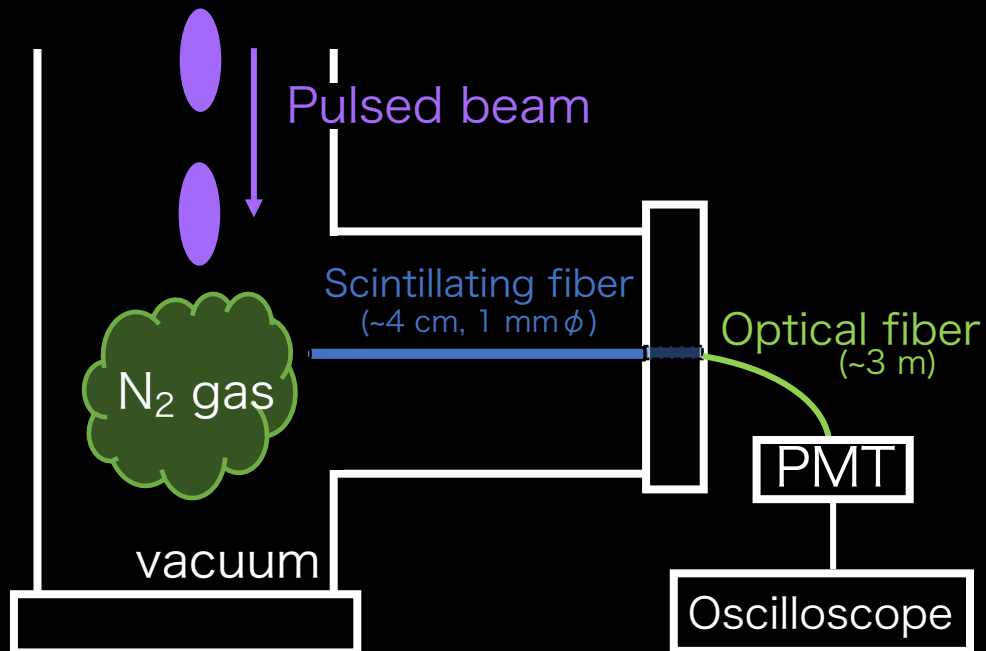
Chopper electrode

- The geometry of chopper electrodes.



Pulse width check

- The pulse width of the beam was measured by applying the pulsed beam to nitrogen gas and detecting the de-excitation light.
- The light is transported to the PMT using optical fiber.
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PMT waveform (averaging waveform of 10^4 shots)

