PARTI Final Report

August 29, 2012

Proton beam profile monitor

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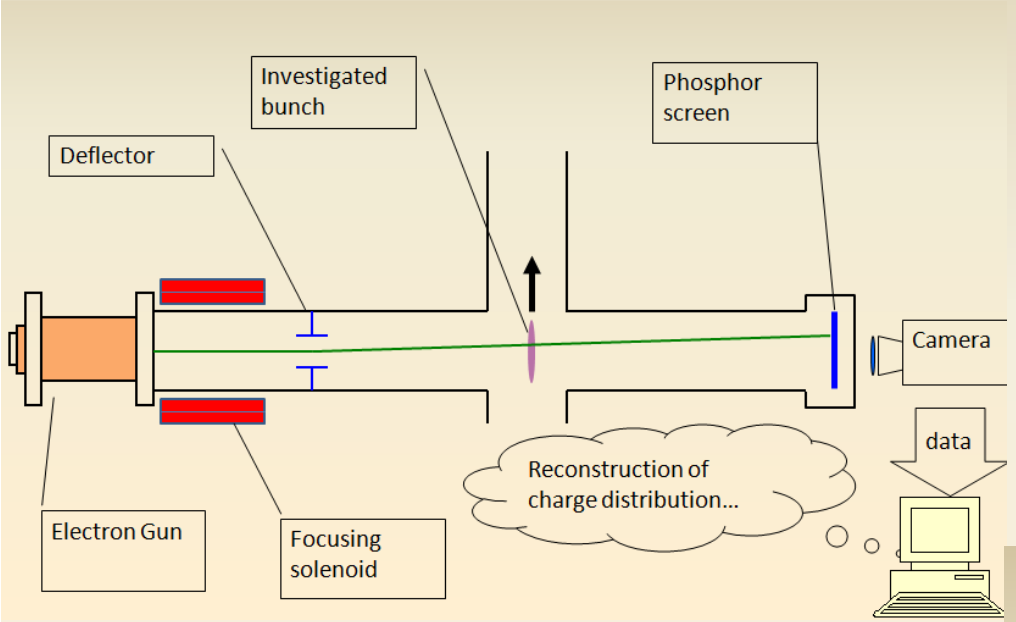
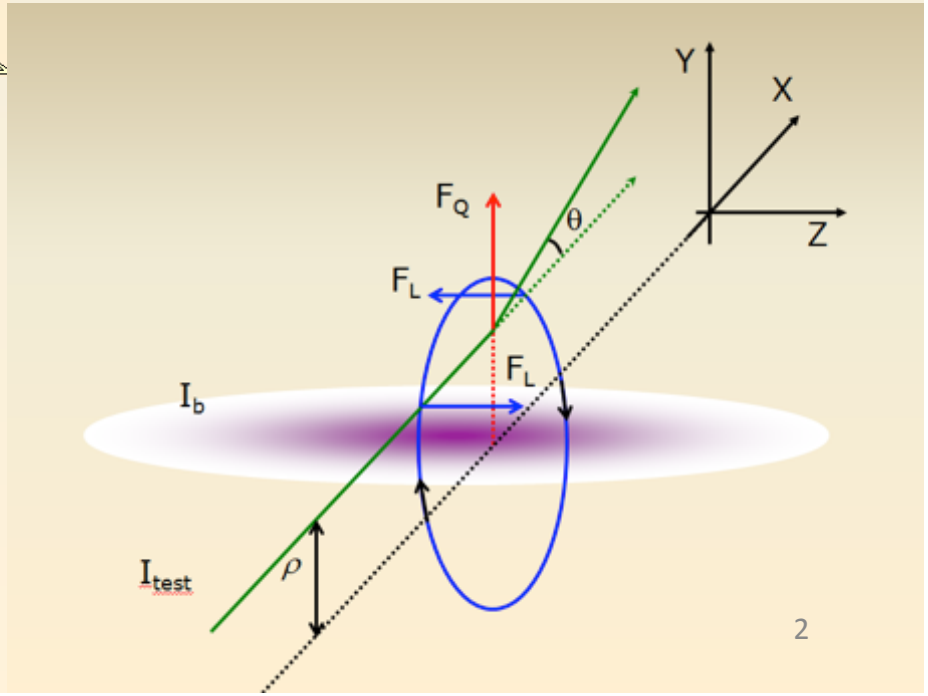
Principle of operation



Nondestructive diagnostics(variants)

- The gas flow moving perpendicularly to the diagnosed beam
- An external electron beam
- A laser beam

- In this study: Ebeam – tool for investigation of high intensity proton bunch

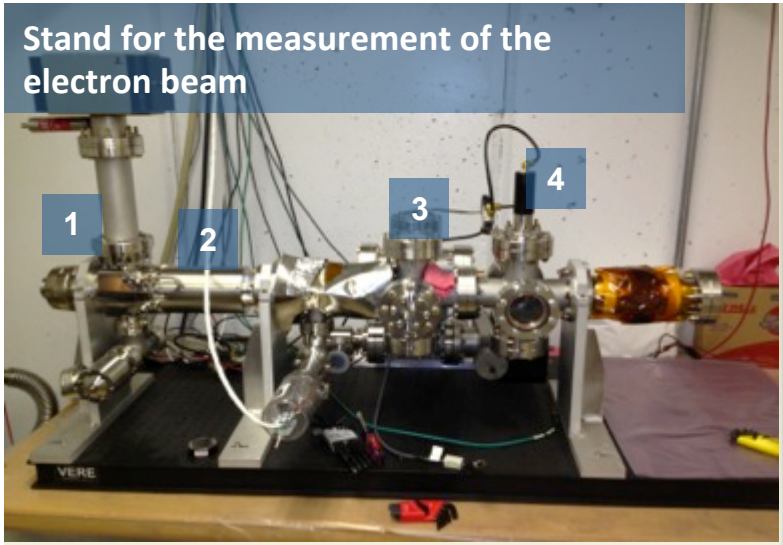


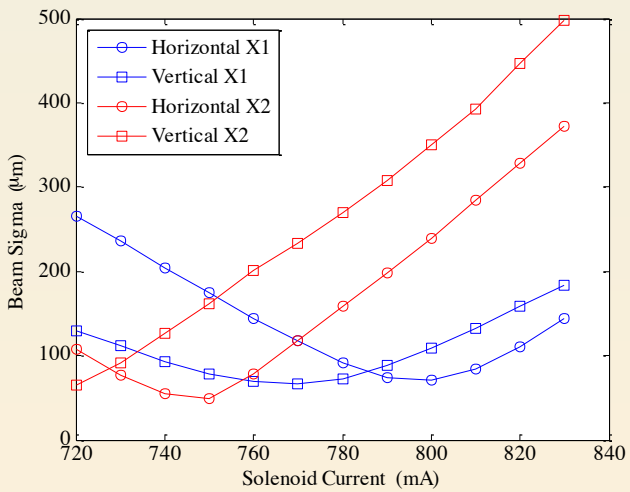
Technical Specifications

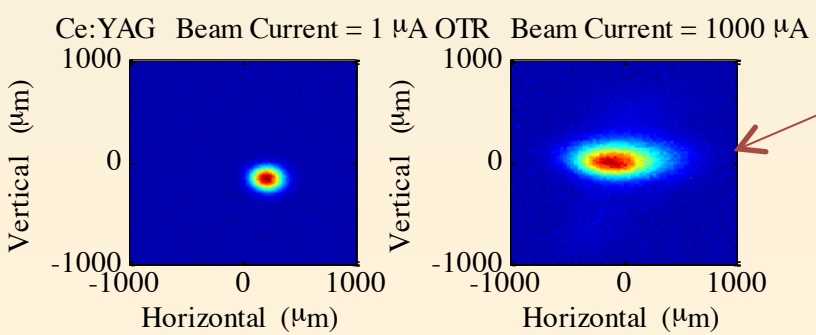
NOvA Era Main Injector Parameters	
Energy	8 – 120 GeV
Beam Intensity	$4 \cdot 10^{11-12}$
RMS Bunch Length	1 – 3 ns
Revolution Time	~11 μs

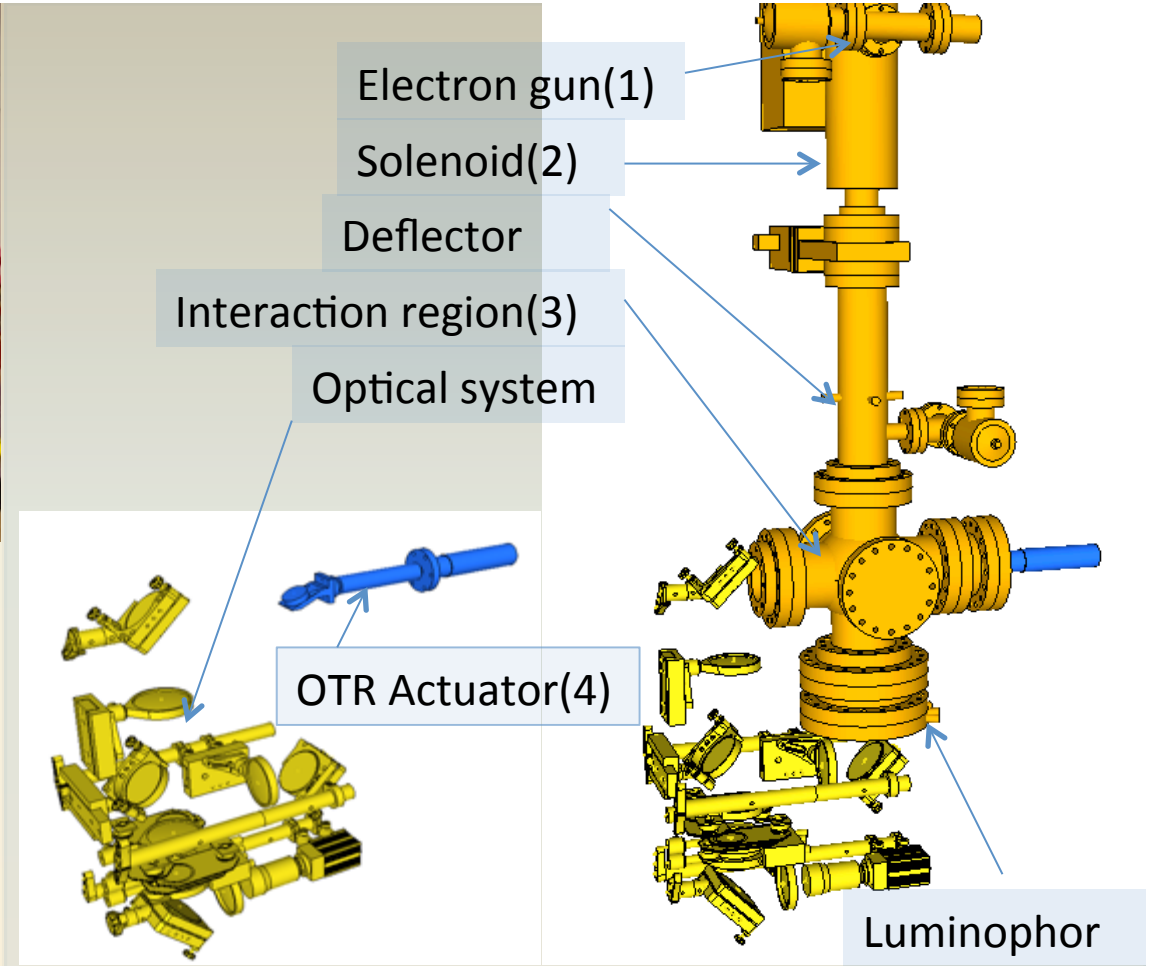
Electron beam probe Parameters	
Energy	15 Kev
Current	1 ma
Bunch Length	~2μs

Stand for the measurement of the electron beam

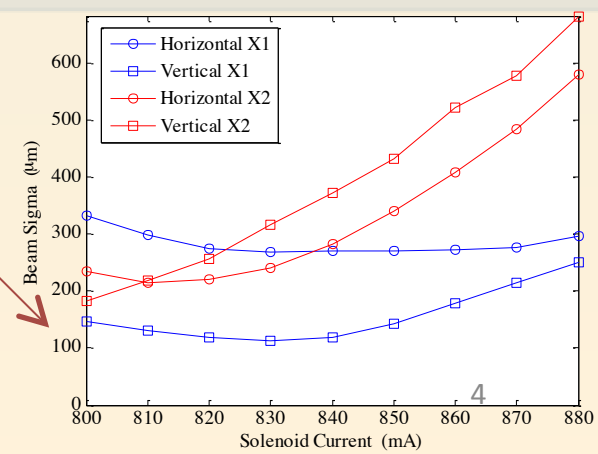




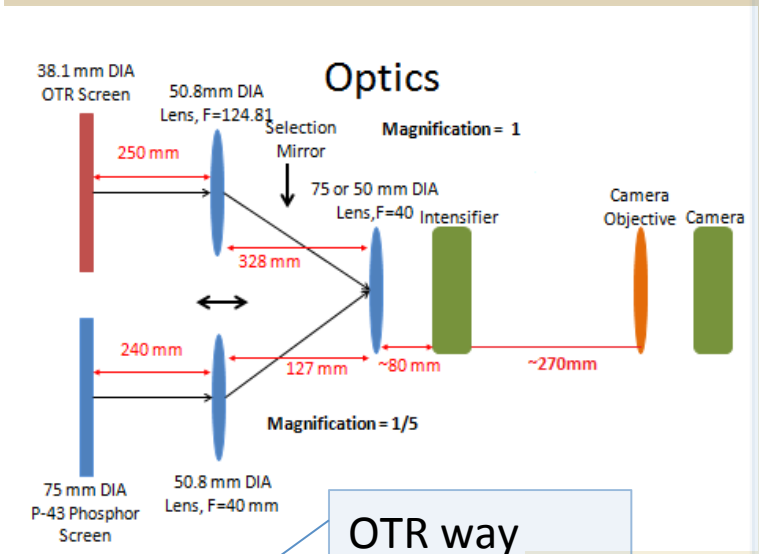




The horizontal beam size for the high beam current case is larger than the vertical

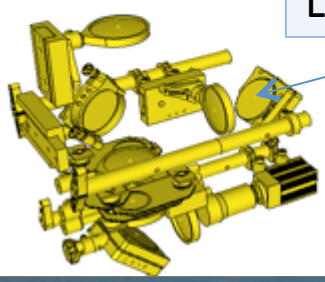


Optic measurements



OTR way

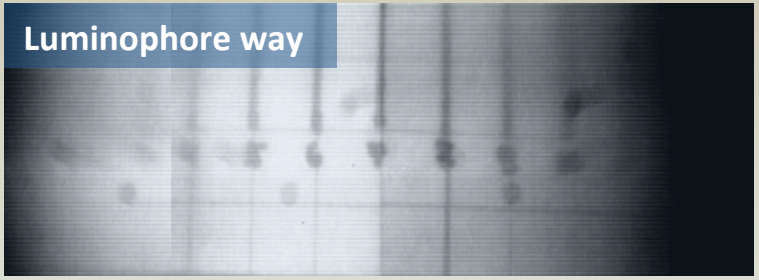
Luminophore way



Acceptable size of the beam for Luminophor way – 55- 60mm

Acceptable size of the beam for OTR – (10 – 15) mm (longitudinal) and around 5-10 mm for transverse size

Luminophore way

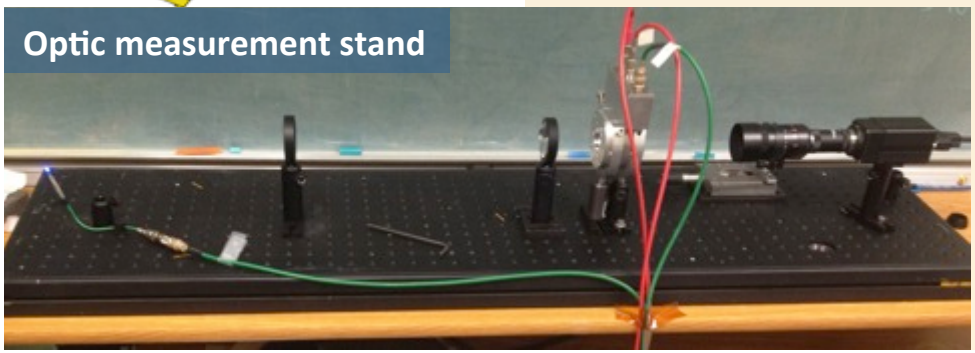


OTR way

Luminophore way

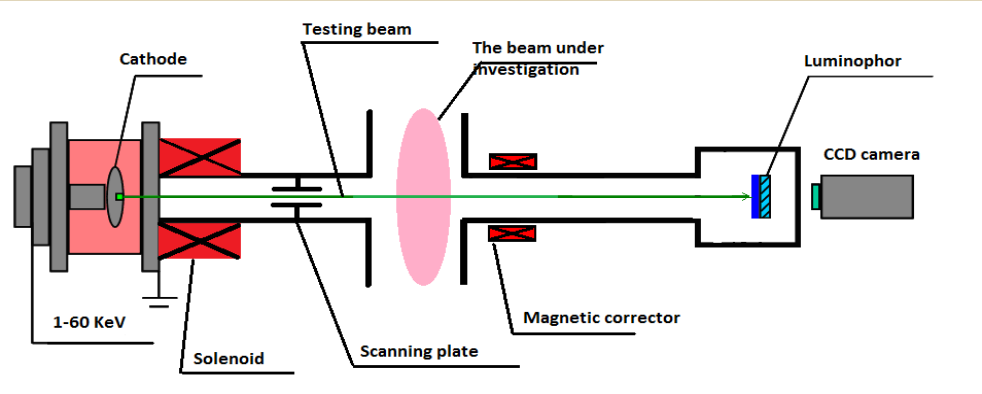
OTR way

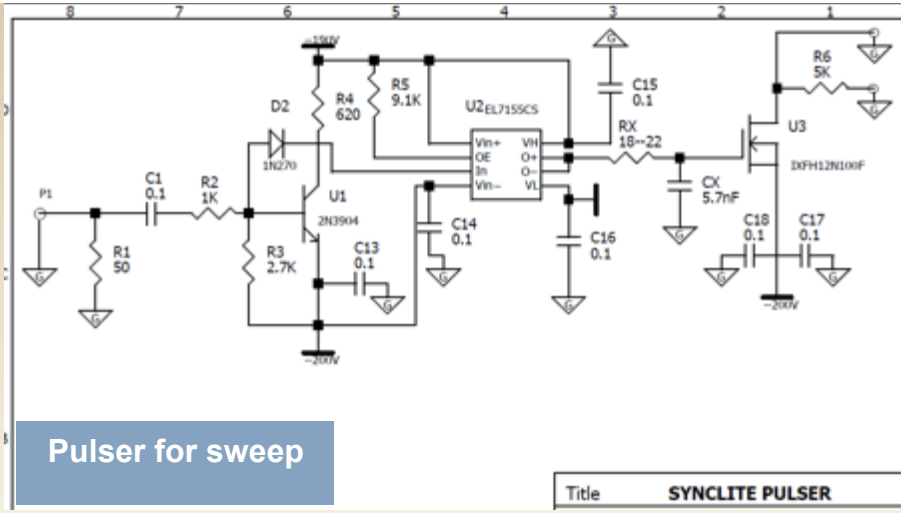
Optic measurement stand

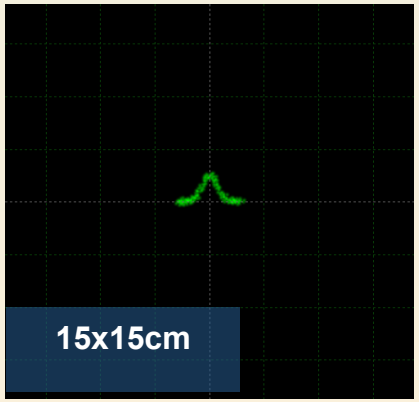


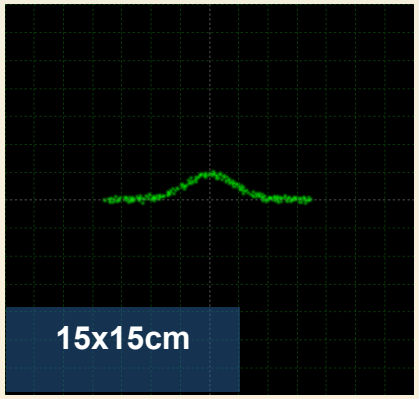
Intensifier parameters: Voltage between MCP and Luminophore – 5.7 kV, between photo cathode and MCP – 150 V, voltage for MCP – 780 V.

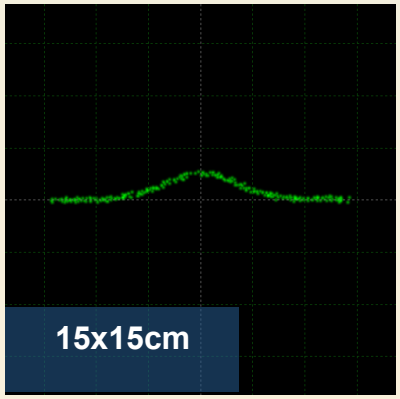
Scan plate

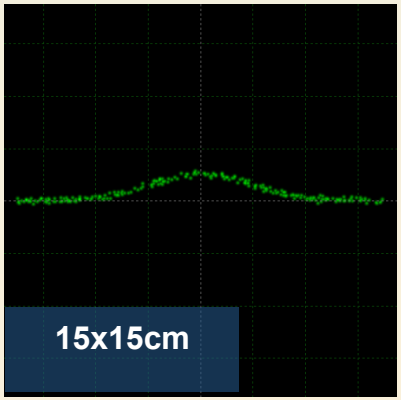




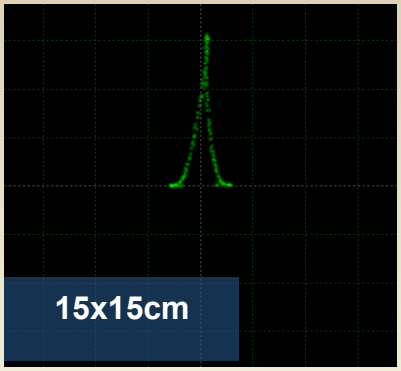








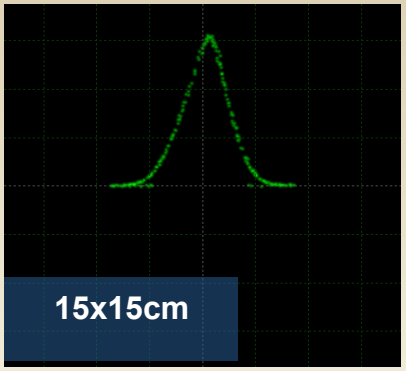
Ee^{-}=15KeV Ep=8GeV	Ee^{-}=15KeV Ep=8GeV	Ee^{-}=15KeV Ep=8GeV	Ee^{-}=15KeV Ep=8GeV
Sweep Voltage = 100V	Sweep Voltage = 300V	Sweep Voltage = 500V	Sweep Voltage = 700V
Duration - 30nS	Duration - 30nS	Duration - 30nS	Duration - 30nS
Intensity - $4*10^{11}$	Intensity - $4*10^{11}$	Intensity - $4*10^{11}$	Intensity - $4*10^{11}$



Ee$^-$=15KeV Ep=8GeV

Sweep Voltage = 100V

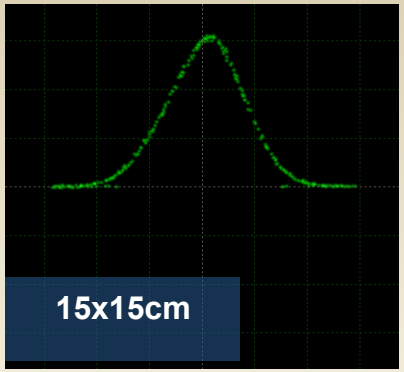
Intensity - $4*10^{12}$



Ee$^-$=15KeV Ep=8GeV

Sweep Voltage = 300V

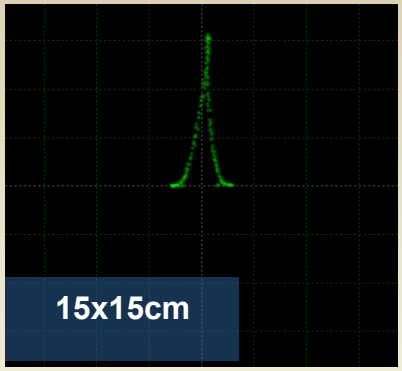
Intensity - $4*10^{12}$



Ee$^-$=15KeV Ep=8GeV

Sweep Voltage = 500V

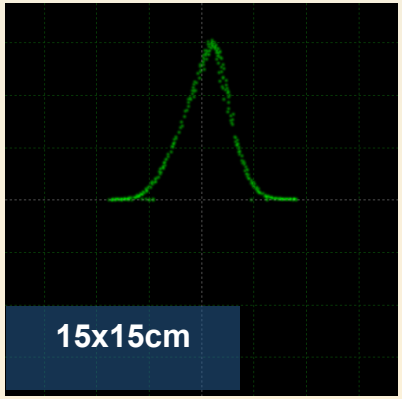
Intensity - $4*10^{12}$



Ee$^-$=30KeV Ep=8GeV

Sweep Voltage = 300V

Intensity - $4*10^{13}$



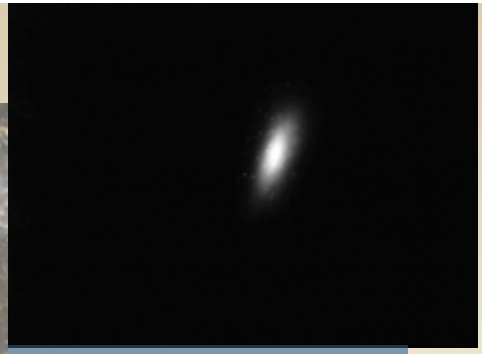
Ee$^-$=30KeV Ep=8GeV

Sweep Voltage = 600V

Intensity - $4*10^{13}$

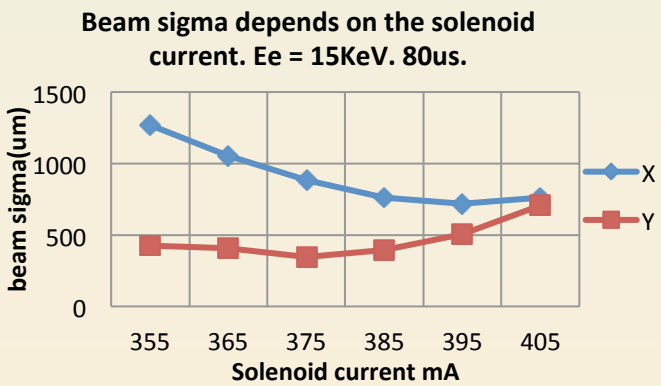
Scan plate voltage		Duration
Intensity	Voltage	
$4*10^{11}$ (15KeV)	250V	30nS
$4*10^{12}$ (15KeV)	300V	30nS
$4*10^{13}$ (30KeV)	550V	30nS

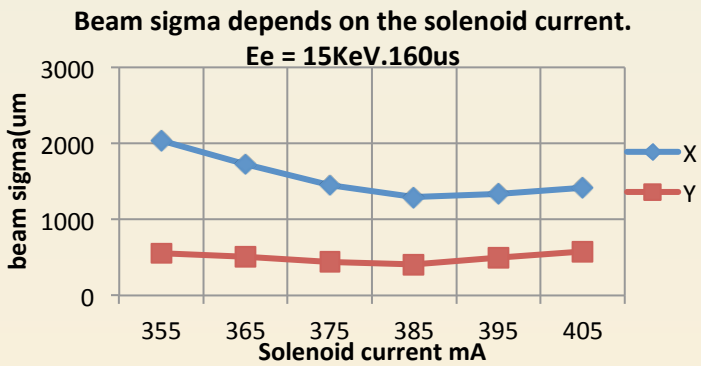
Beam Measurement

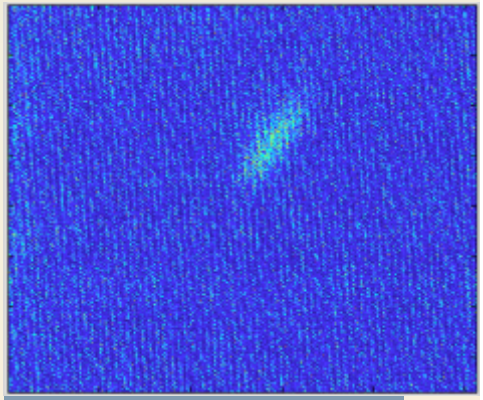


Ee⁻=10KeV , Solenoid current 300mA

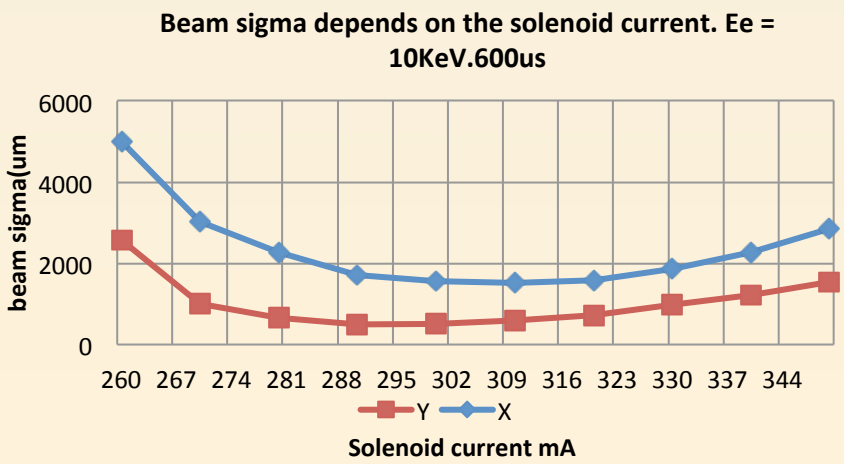
Ee⁻=10KeV , Solenoid current 320mA

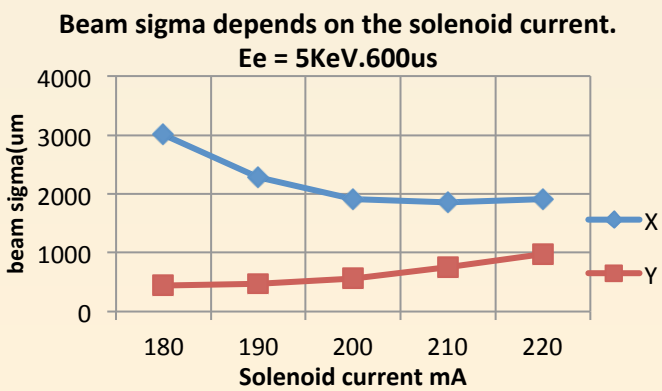






Ee⁻=5KeV , Solenoid current 160mA



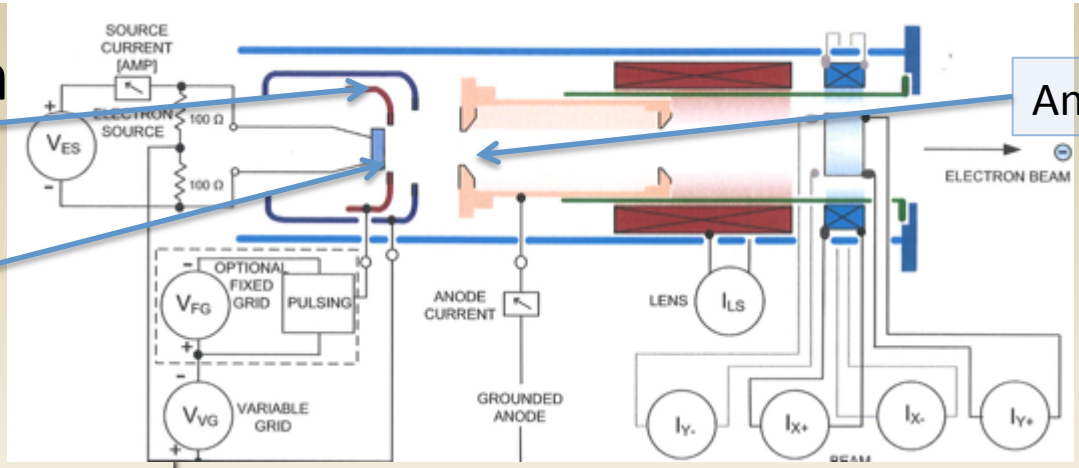


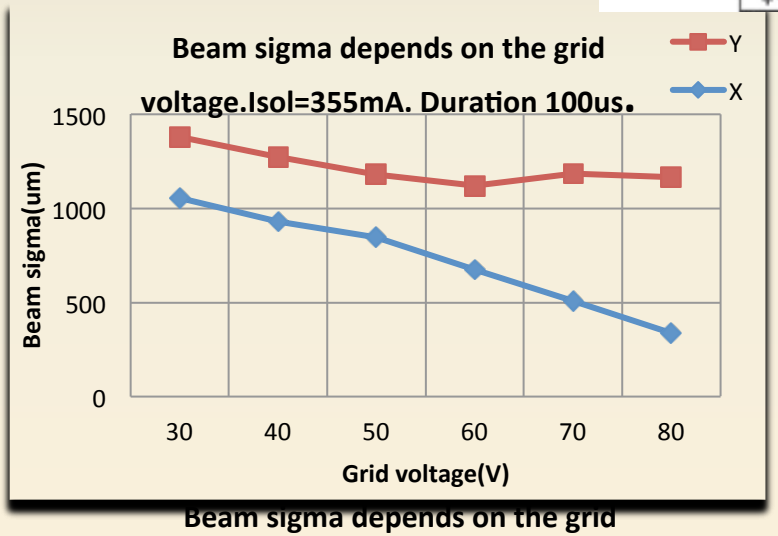
Grid Measuremen

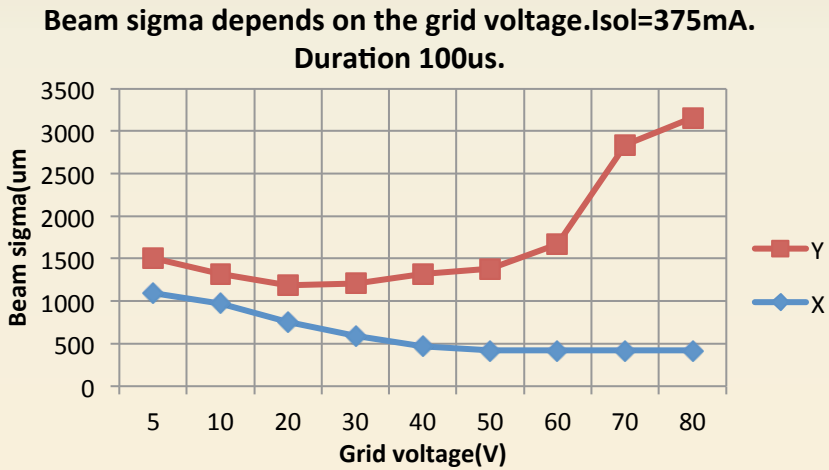
Grid

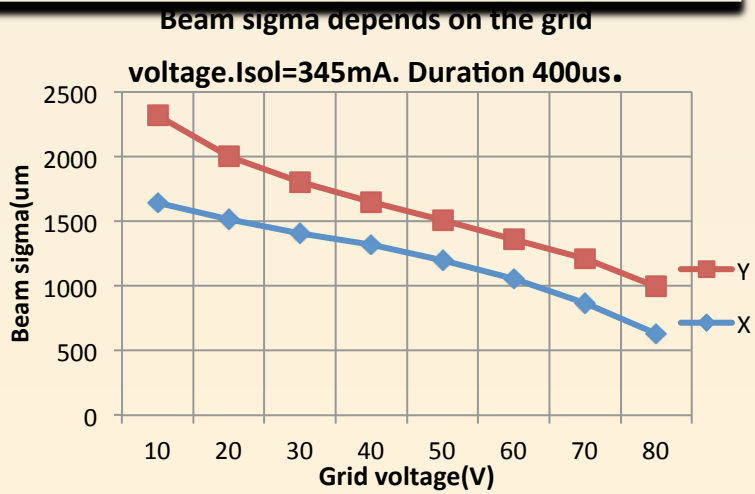
Cathode

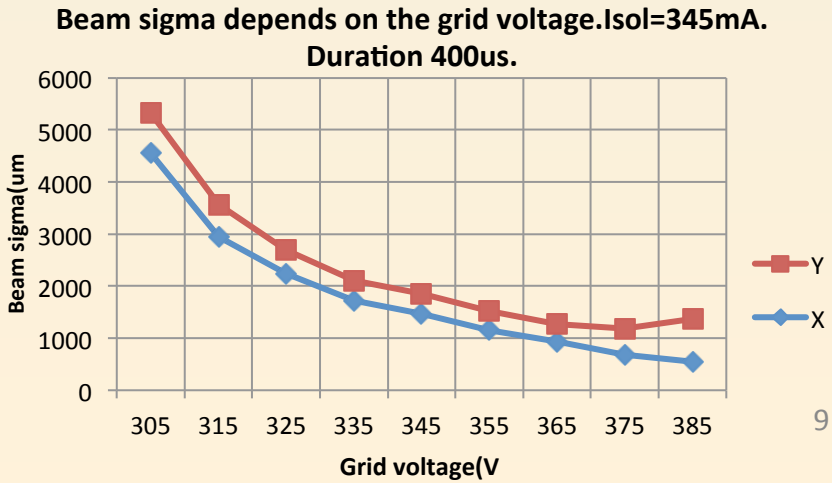
Anode







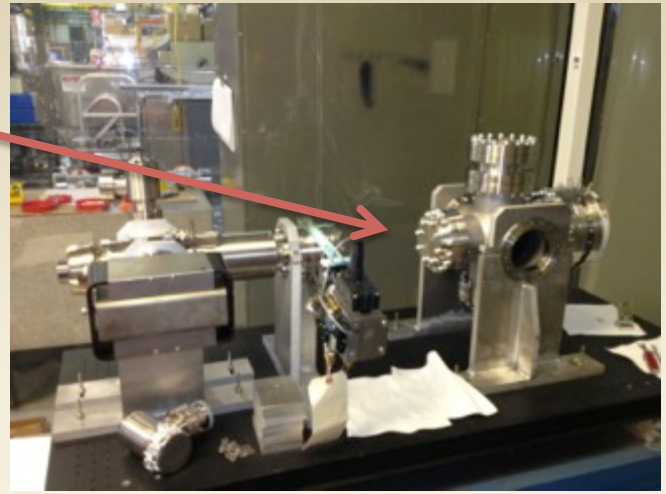




Plans(until September 12)

- Complete the assemble of scan plate
- Investigate the longitudinal structure of electron beam
- Assembly of the optical system and testing with scan plate

Gap for scan plate



Luminophore