

Electron Lens Test Bench Preparation

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2 November 2011, BNL

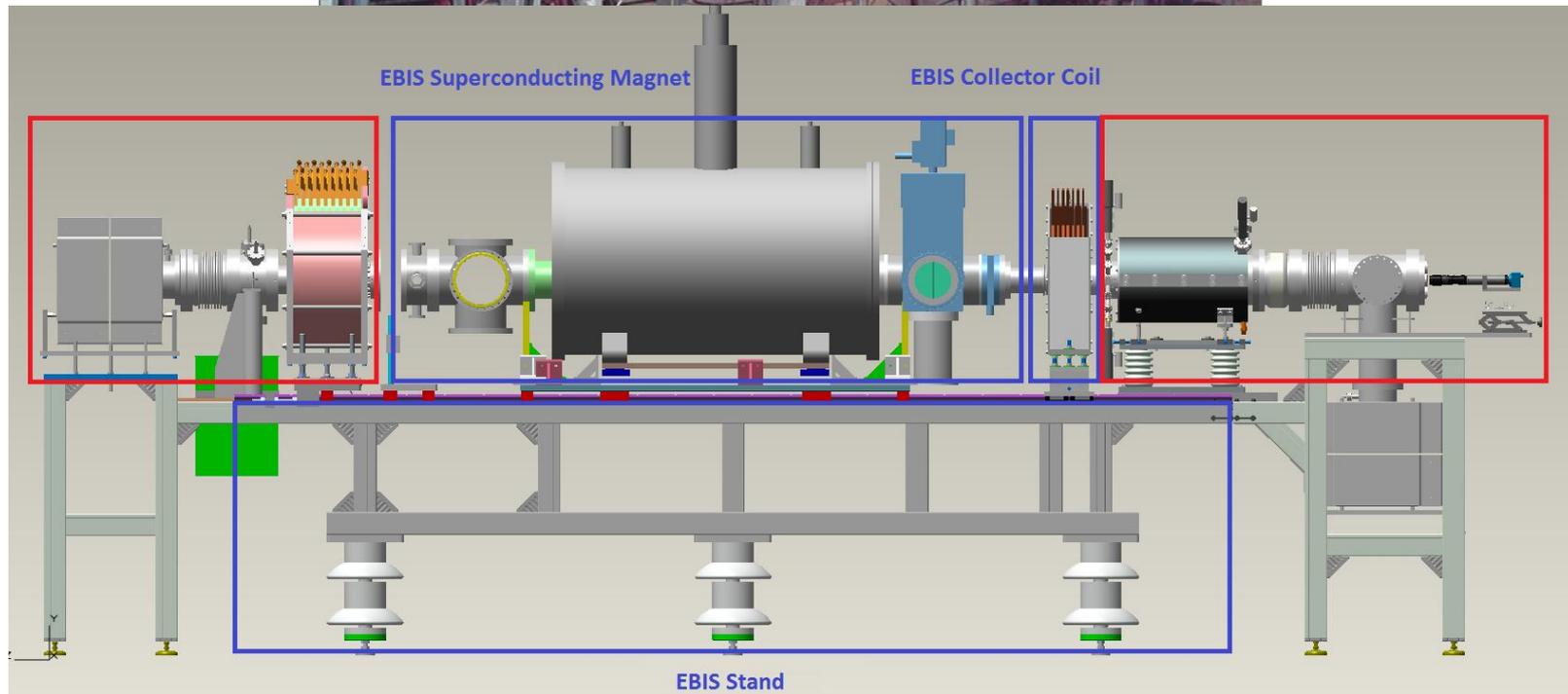
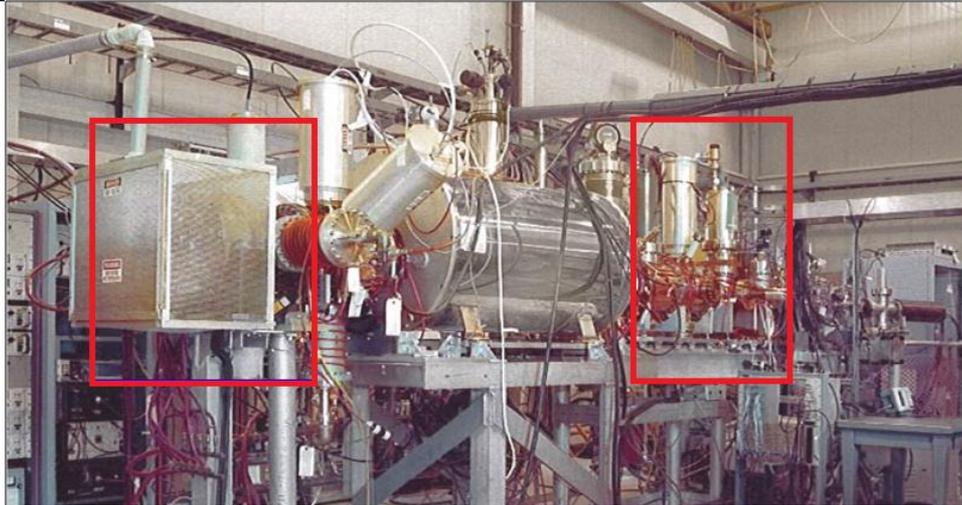
1. E-lens & Test Bench & Test EBIS

2. Test Bench Preparation

- E-gun
- Coil & Power Supply
- Instrumentation
- Collector

3. Plan & Summary

Test Bench & Test EBIS



E-lens & Test Bench & Test EBIS

	Item	Status	Test EBIS	Test Bench	E-lens	Comments
Hardware	Gun	Working		Yes	Yes	modulator & crack
	Gun Coil	Ready		Yes	Yes	
	Collector	Working		Yes	Yes	
	Collector Coil	Ready	Yes			
	Main Solenoid	Ready	Yes			
	Deflector	Ready	Yes			One new Y deflector
	Drift Tube	Ready	Yes			One new gun tube
Power	Gun Power	Ready	Yes			
	Gun Coil Power	Ready		Yes	Yes	
	Collector Power	Working	Yes			Capacitor, Nov.
	Collector Coil Power	Ready	Yes			
	Main Solenoid Power	Ready	Yes			
	Deflector Power	Ready	Yes			
	Drift Tube Power	Ready	Yes			
Instrumentation	Pin hole	Assembling		Yes	Yes	
	YAG Screen	Ready		Yes	Yes	
	Current Sensor	Ready		Yes	Yes	
	CCD Camera	Ready		Yes	Yes	
	Ion Collector	Ready		Yes	Yes	
Control	Hardware Control	Ready	Yes	Yes		
	Machine Protection	Working	Yes	Yes		90% is finished
	Imaging Processing	Working		Yes	Yes	network testing
	Profile Scan	Working		Yes	Yes	
	Vacuum	Ready		Yes	Yes	

1. E-lens & Test Bench & Test EBIS

2. Hardware Preparation

- E-gun

- Coil & Power Supply

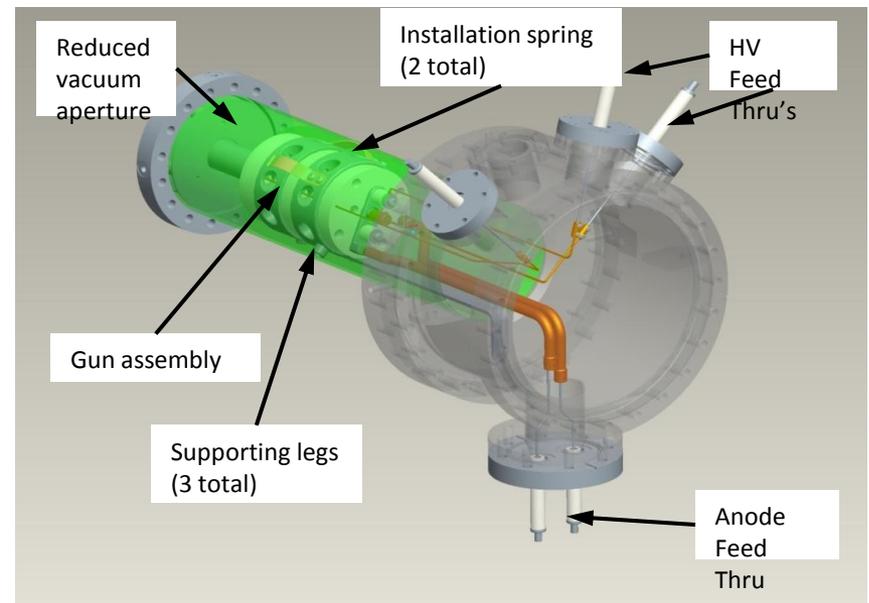
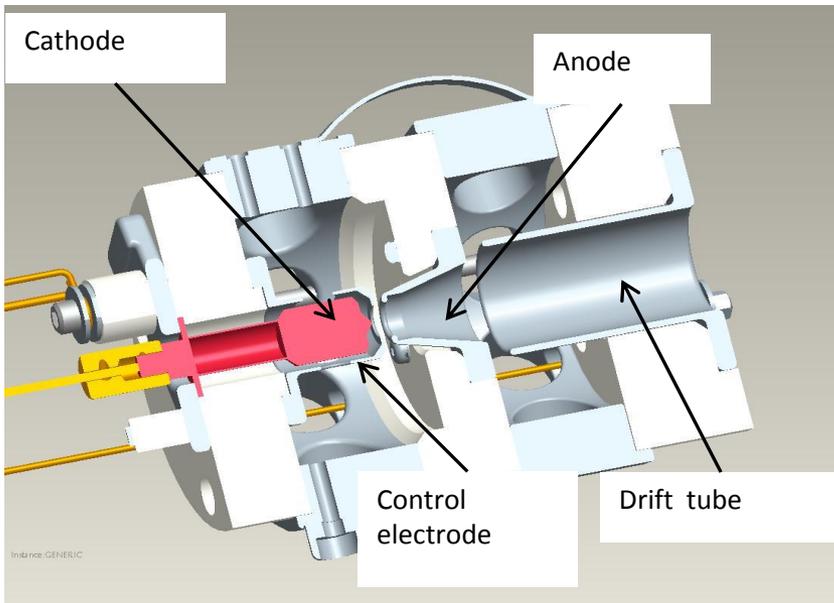
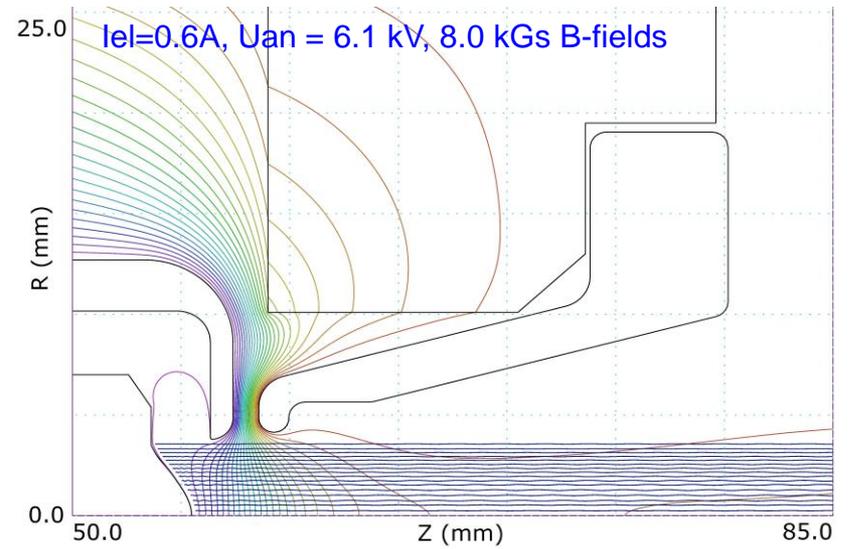
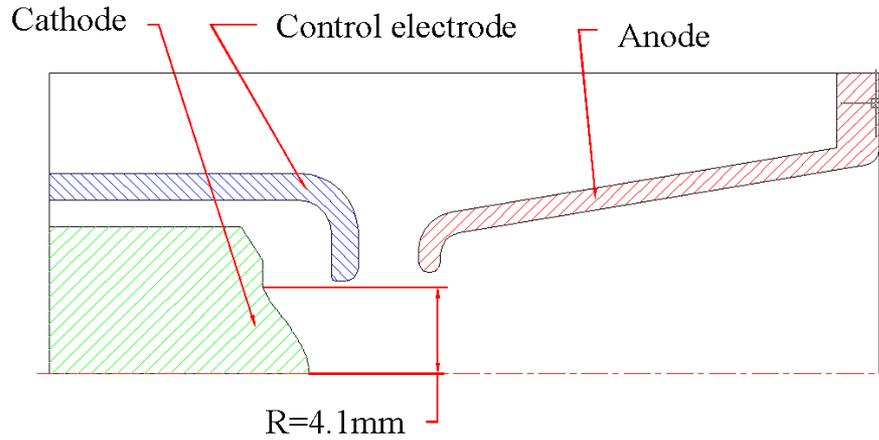
- Instrumentation

- Collector

3. Plan & Summary

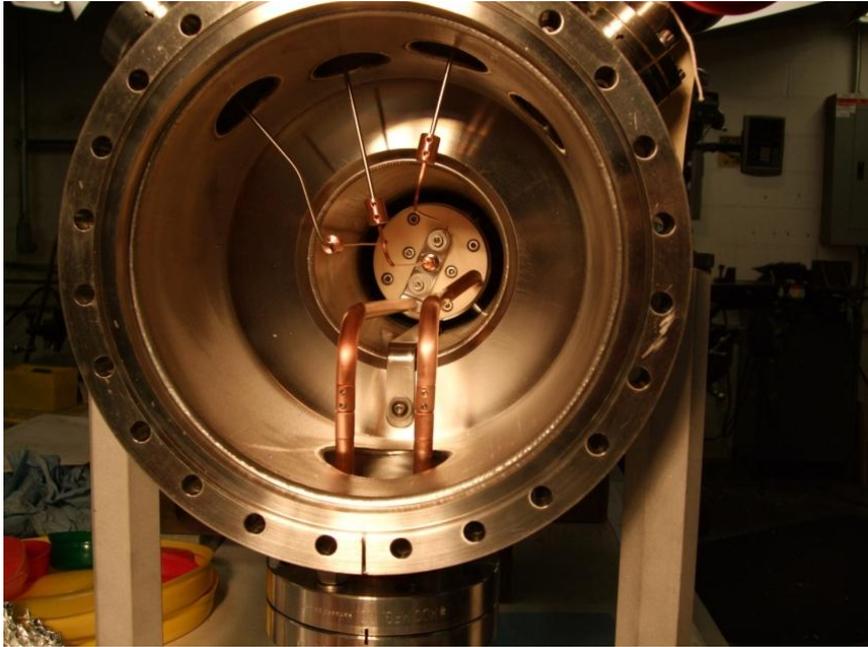
E-gun: Model & Mechanical Design

Electrostatic model:

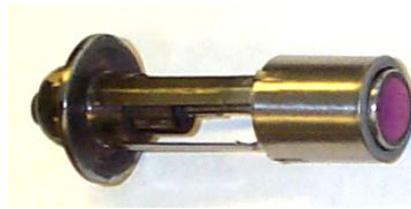


Courtesy of A.I. Pikin 6

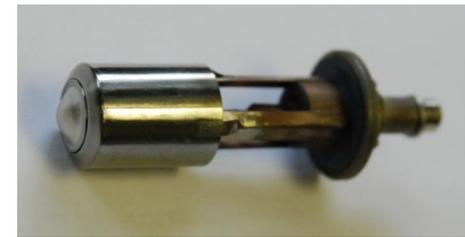
E-gun: Manufactured Parts



Anode modulator (prototype):

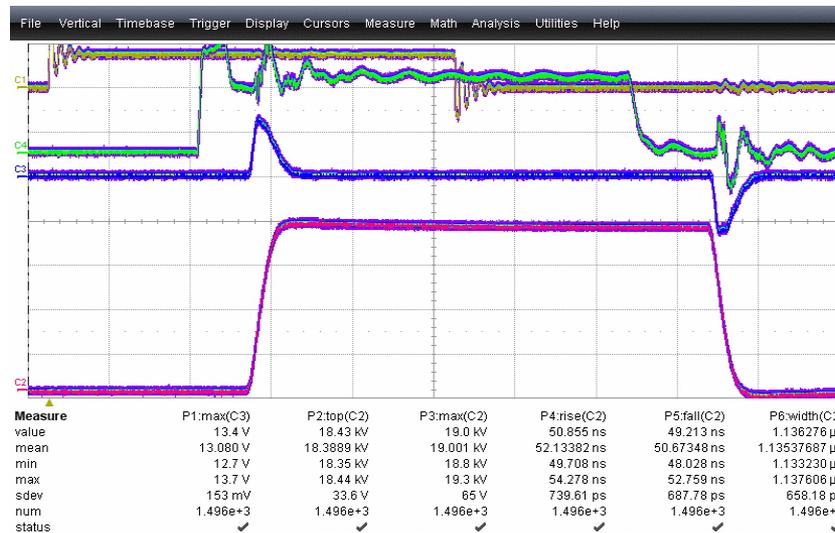


IrCe cathode prototype (G. Kuznetsov, Budker Institute, Novosibirsk)



Courtesy of A.I. Pikin

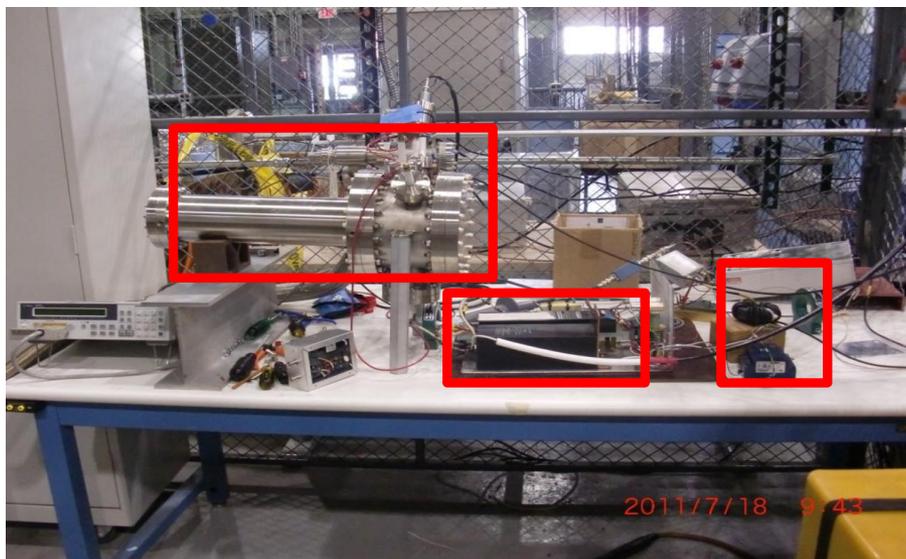
E-gun: Conditioning Results



Trigger

Modulator Current

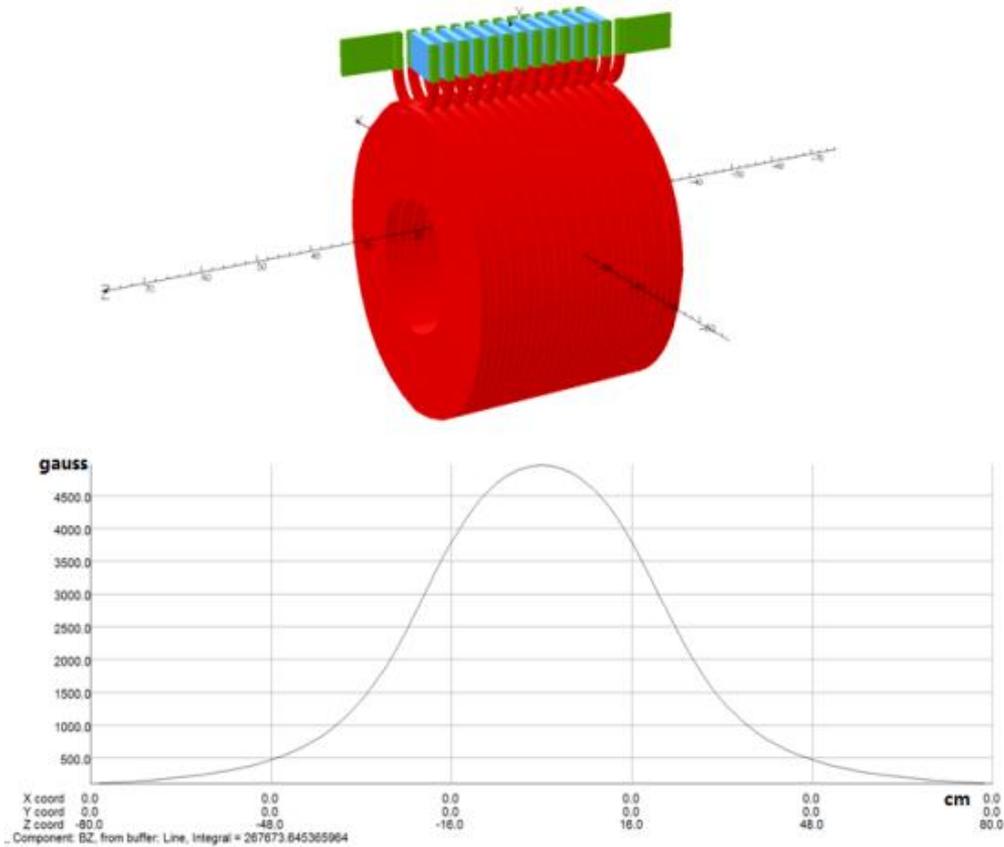
Anode Voltage



Components	Voltage	Comments
Drift Tube	20 KV	P=2.5E-7 TORR
Anode	15 KV	(hold for 48 hours)
Control Electrode	10 KV	P=2.5E-7 TORR
Cathode	10 KV	P=2.5E-7 TORR

E-gun is ready for test bench.

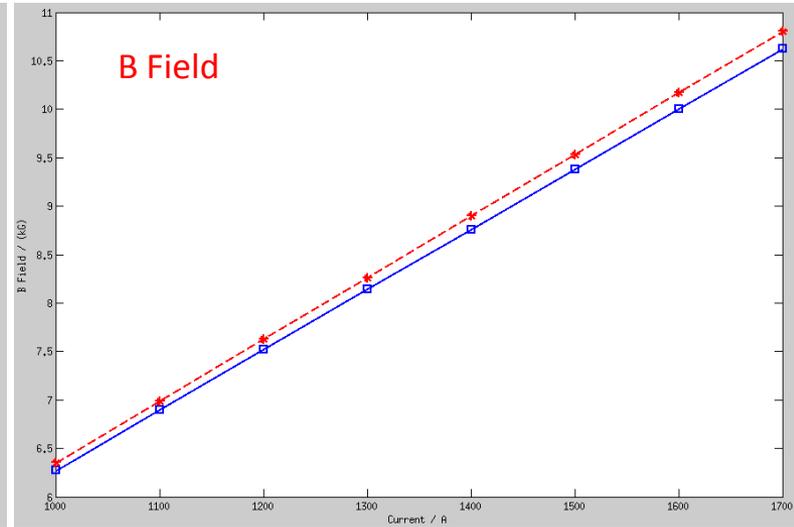
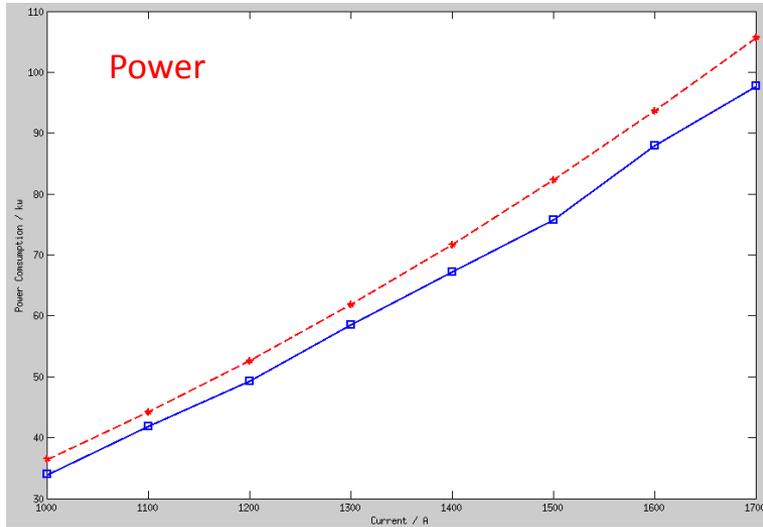
Coil: Design Model & Testing



GS2 Coil Design Model



Coil: Testing Results



Current (A)	Power (kW)		Field (kG)		Temp_Delta (degree)	
	Measured	Calculation	Measured	Calculation	Measured	Calculation
1000	34	36.575	6.274	6.357	14	15.4
1100	41.8	44.255	6.897	6.992	17	18.6
1200	49.2	52.668	7.519	7.628	21	22.2
1300	58.5	61.811	8.139	8.264	23	23.4
1400	67.2	71.687	8.759	8.899	22	23.6
1500	75.75	82.293	9.382	9.535	23	24
1600	88	93.632	10.003	10.171	23	23.6
1700	97.75	105.701	10.624	10.806	22	22.2

Gun Coil is ready for test bench.

Power Supplies: Manufacture



Courtesy of Robert Lambiase 11

Power Supplies: Testing



GS2 power supply is ready for test bench.

Instrumentation: Overview

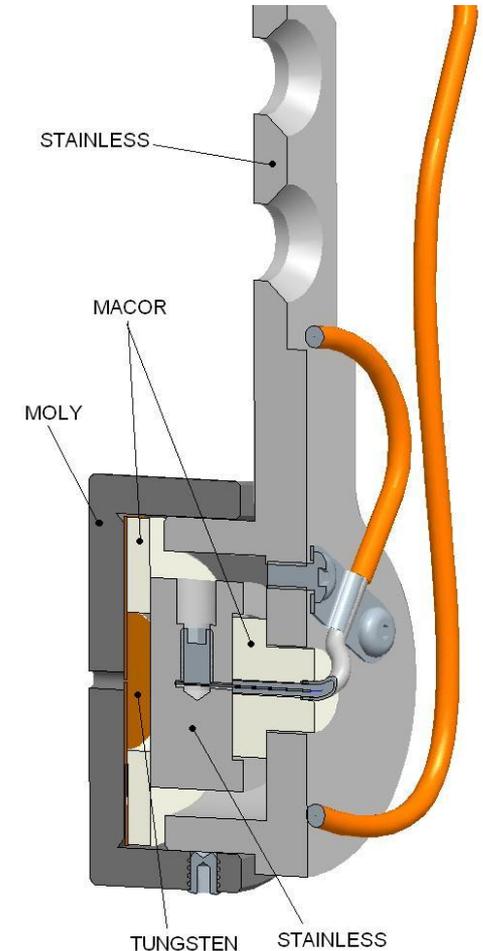
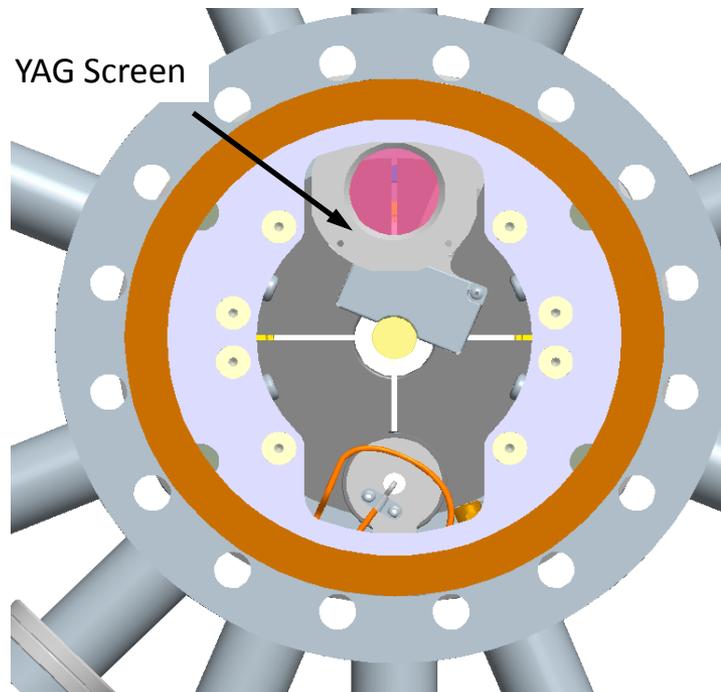
E-Beam Diagnostics Quantities

E-beam Current : Pulsed BCT (1) , DCCT (1)

E-beam Profile : YAG Screen (1), Pin-hole detector (1)

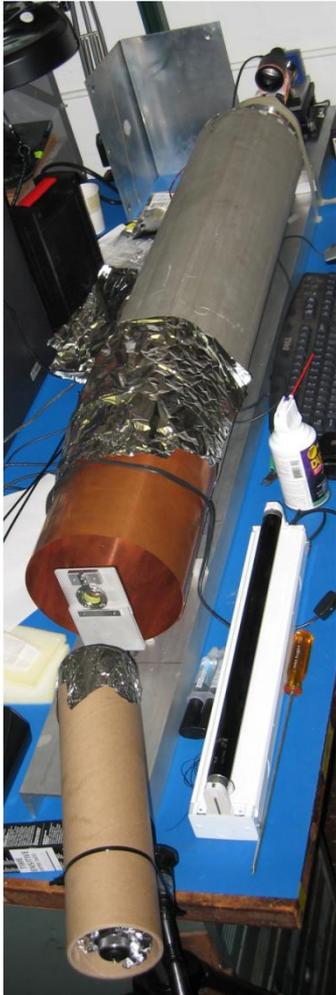
Ion Current : Ion collector (1)

Collector Temperature: RTD (4)

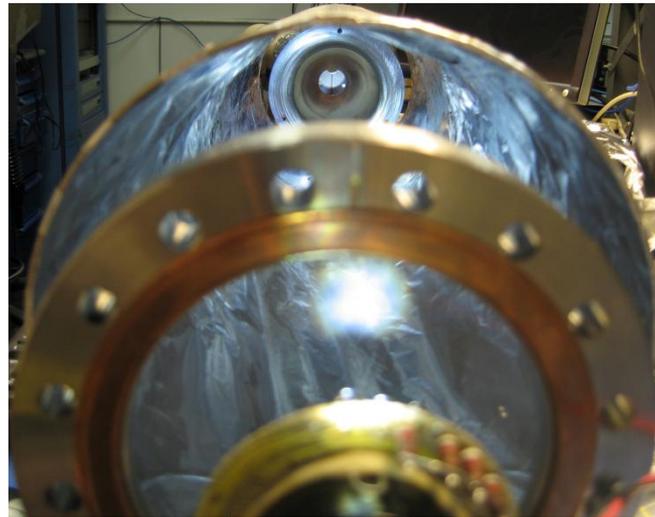


Courtesy of D.M. Gassner 13

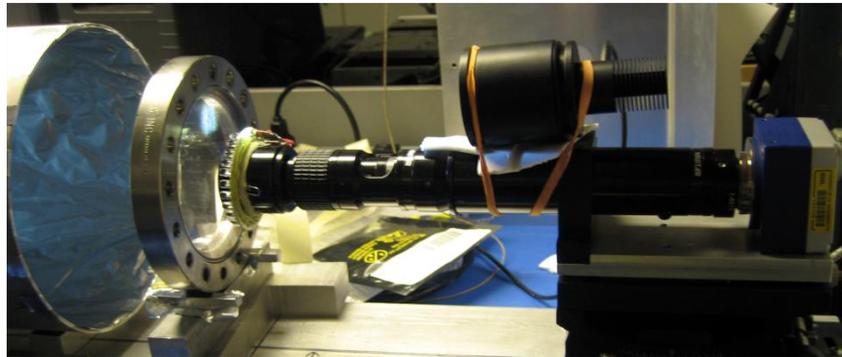
Instrumentation: Testing YAG screen and Camera



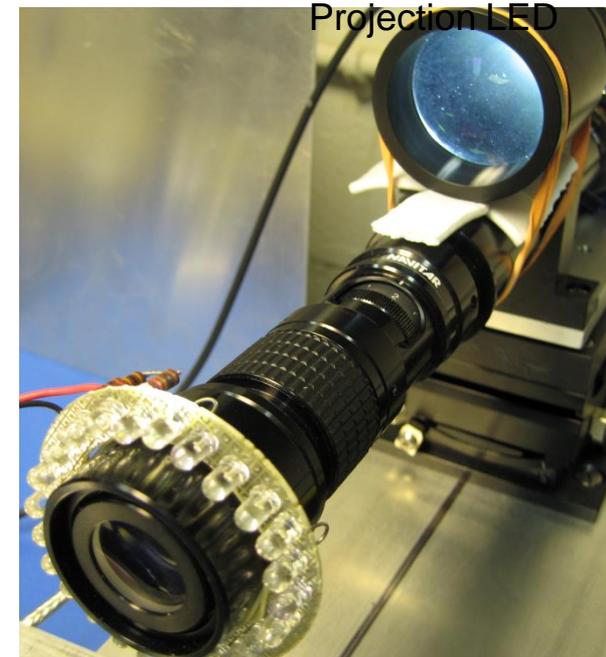
Collector Mock-Up



Ion deflector cone
limits aperture

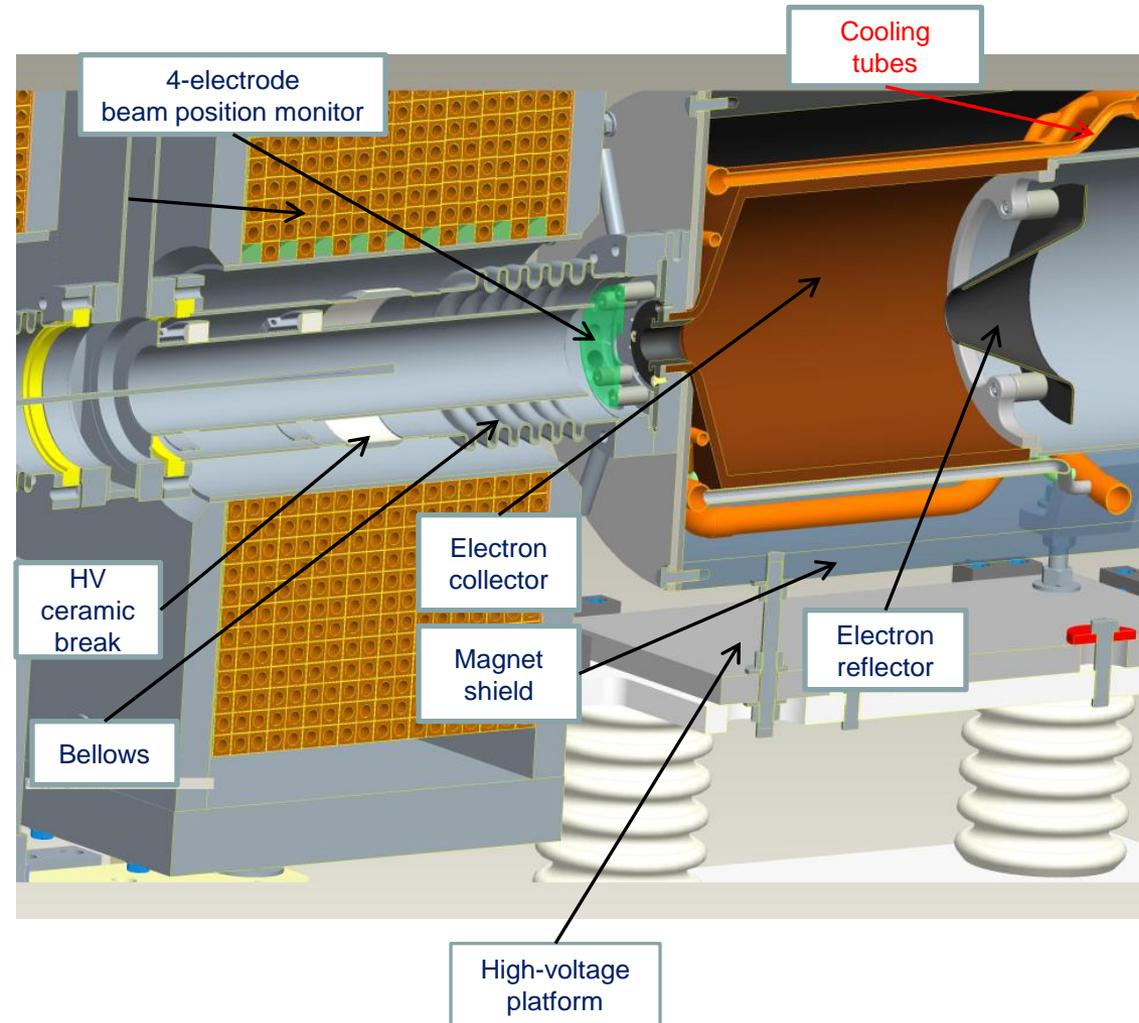


Camera, Lens & Illumination



YAG screen and camera are ready for test bench.

Courtesy of Toby Miller



Manufactured EC parts



1. E-lens & Test Bench & Test EBIS

2. Preparation

- E-gun

- Coil & Power Supply

- Instrumentation

- Collector

3. Plan & Summary

Test Bench Experiment Plan

❑ Cold Commissioning (Without electron beam):

Items	Test Parameters	Items	Test Parameters
Vacuum	10^{-7} T	Water system	Water flow
Power Supplies (Goal 5)	Power output	Electron Collector	Water flow
Cold Magnet	Current	Electron Gun	Heater current
	Cryogenic		Voltages
Warm Magnet	Current	Instrumentation (Goal 5)	Reflector voltage
	Power		YAG & Camera
	Water Flow		Profile Scanner
	Temperature		Ion collector

❑ Warm Commissioning (With low current pulsed beam):

Items	Test Parameters	Items	Test Parameters
Vacuum	10^{-7} T		
Instrumentation (Goal 3 & 4)	YAG & Camera	Electron Collector	RTD (Temperature)
	Profile Scanner		Reflector voltage
	BCT (Current & Ion)	Electron Gun	Voltages
Deflector Coil (Goal 3 & 4)	Current		Heater current
Control system (Goal 4 & 6)	everything	Modulator	Voltage, pulse

For the goals, please refer to the second slide of Alexander Pikin's presentation.

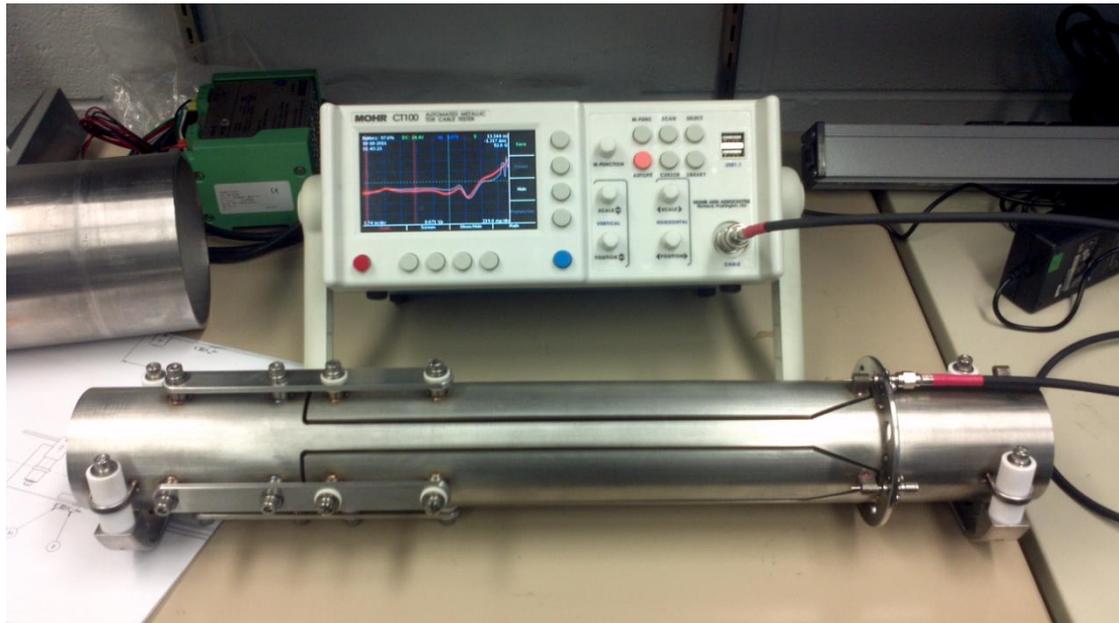
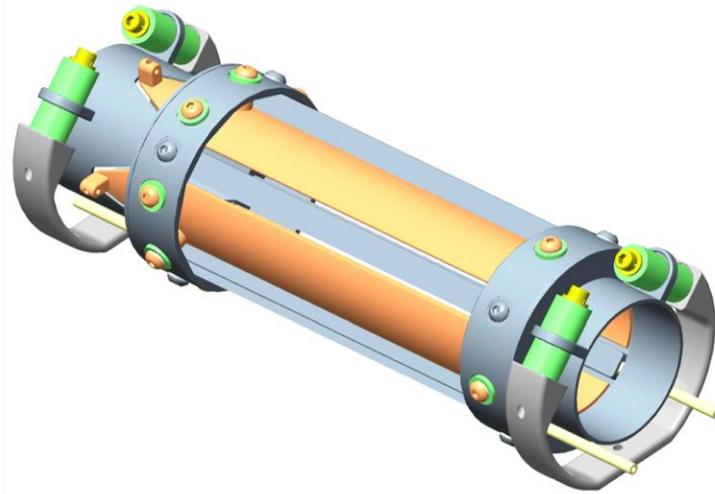
Test Bench Experiment Plan

□ Experiment Plan (DC and pulsed beam):

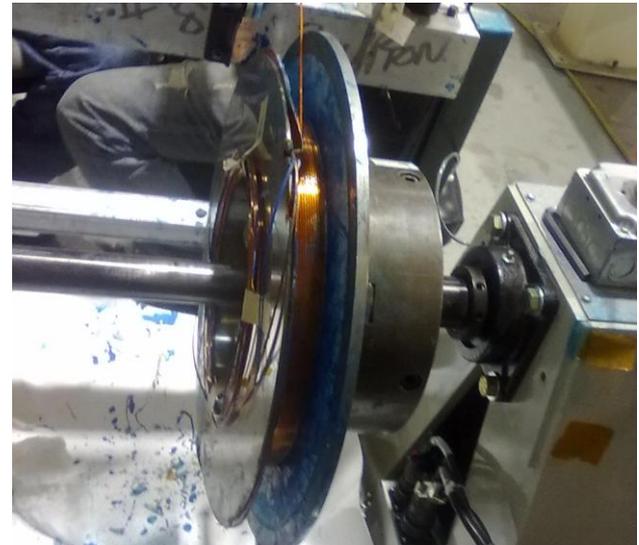
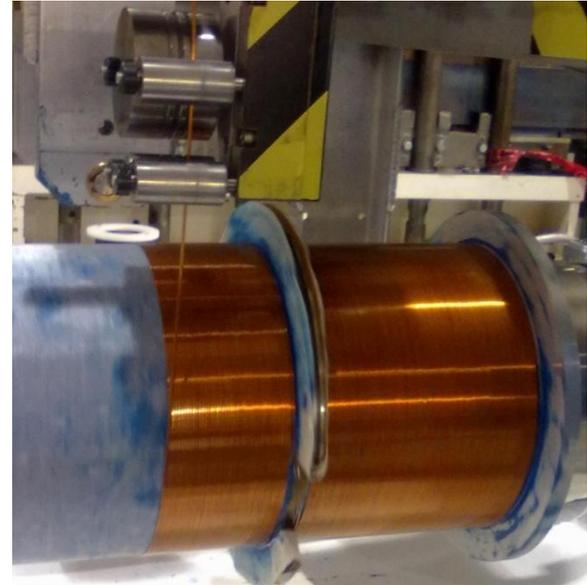
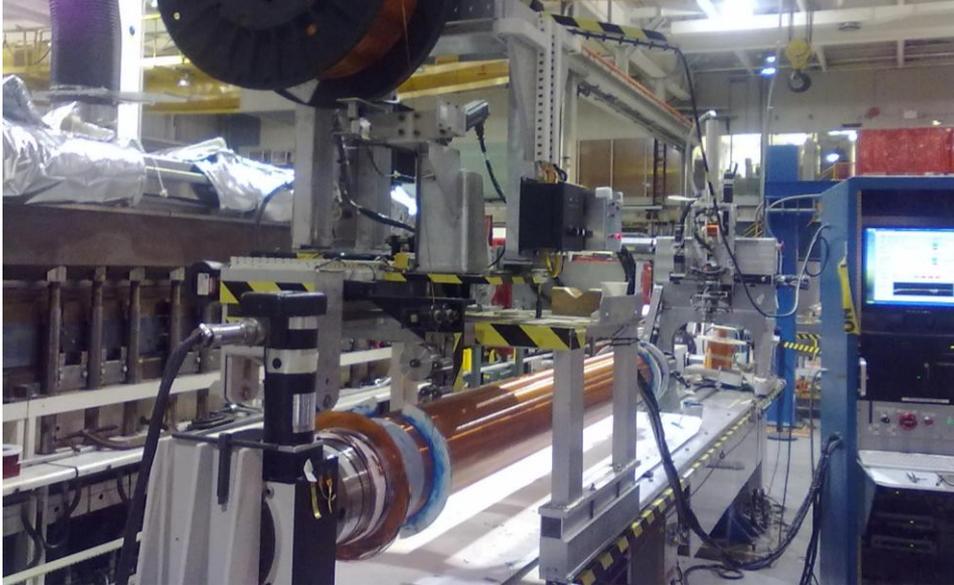
Item	Heater Power	Anode V Voltage	Control Electrode Voltage	Parameters
1 (DC, Goal 1)	-----	Scan	-----	Current/Temp
2 (DC, Goal 1)	Scan	-----	-----	Current/Temp
3 (DC, Goal 1)	-----	-----	Scan	Current/Temp
4 (Pulsed, Goal 1)	-----	Scan	-----	Current/Temp
Item	Deflector X	Deflector Y	Control Electrode Voltage	Parameters
5 (Pulsed, Goal 2)	Tuning	Tuning	-----	Profile (YAG)
6 (Pulsed, Goal 2)	-----	-----	Scan	Profile (YAG)
7 (Pulsed, Goal 2)	Scan	Scan	-----	Profile (Pin-hole)
Item	Gun Coil	EBIS Coil	Collector Coil	Parameters
8 (Pulsed, Goal 2)	Tuning	-----	-----	Profile (YAG)
9 (Pulsed, Goal 2)	-----	-----	Tuning	Profile (YAG)

Summary:

- 1 All power supplies and instrumentations is expected to be ready at the end of Nov.
- 2 All coils (magnets) are ready for test bench now.
- 3 E-gun (modulator and racks) are preparing now, and will be ready at the end of Dec.
- 4 Collector is expected to be ready at the end of Dec.
- 5 Test bench is expected to be ready for operation at the beginning of 2012



Instrumentation: Main Solenoid



Courtesy of SMD 21

