# ILC-IDT WG2 Steering Meeting #2 (Feb 14, 2022) – J. Grames (JLab)

#### **Defer to PreLab**

- Design and build narrow-band gain-switch fiber laser
- Collaborate with industry to develop and characterize GaAs/GaAsP SL

### **Consider for PrePreLab**

- During GDE, JLab built two XHV inverted 200 KV guns
- Now, consider an inverted 350 KV for higher peak current

Child's Law:  $j_0 = (2.33 \times 10^{-6}) V_0^{3/2} / d^2$ 

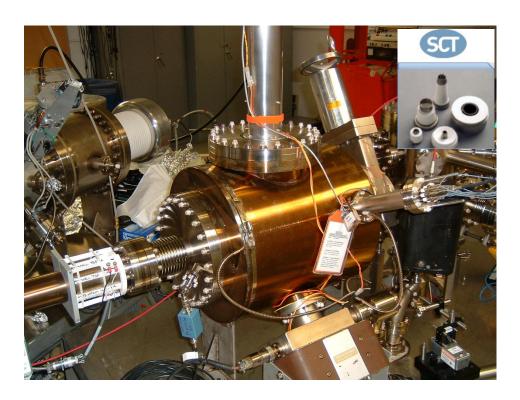
Assume d=3 cm cathode/anode gap
Peak current : GDE (4.8 A), TDR (11 A)

V (kV)	$j_0$ (A/cm <sup>2</sup> )
100	7
140	14
200	23
350	53

14 A/cm<sup>2</sup> (10 mm dia. laser)

**←** GDE ~ 16 A/cm<sup>2</sup>

Current density  $j = 56 \text{ A/cm}^2$  (5 mm dia. laser)



Jefferson Lab has built two 200 kV DC-HV photo-guns

- Large grain Nb tested 225 kV (>18 MV/m)
- Stainless steel now at CEBAF 200 kV (no FE) Both demonstrated <2e-12 Torr (N2 equivalent)

PrePreLab (Years 1 and 2) to model, simulate, produce engineering documents for ILC 350 kV gun; requires 2 FTE Sci + 0.5 FTE Eng

PreLab (Year 3) to fabricate, assemble gun; developing cost estimate, est. \$250k (no overhead) + 0.5 Sci

### **Design (Scientist)**

- Beam dynamics
- Electrostatic
- Vacuum

## Engineering (Scientist + ½ Eng)

- Vacuum chamber/NEGs
- HV insulator
- Cathode/triple point
- Anode/support

**Fabrication** 

**Assembly & Testing** 

			Year L				few 2					Year 3			
Maintank	Sab-bask	Detailed task	01	02	Q5	Q4	01.	02	03	- 04	01.	02	03		
m dynamics simulations															
	Define laser long+transy profile	Determine leser 3D profile for short, high peak current bunches: + large IY to limit lon damage (GPT ion module)													
rectatic design															
	Electrade														
		Define electrode size to accommodate laser transverse size (CST)													
		Maximize gradient at the pharacathode < 10 MN/ms befine flat or focusing generatry (CIT+GPT)													
	Anode-cathode gap														
		Design blassed anode and drift tube to limit ion-bornbandment. (CST=GPT)													
		Design a node to compressate beam deflection. (CST+GFT)													
	HV Feedthrough	Series and compression on the series (series)													
	TH FERRITORS	Decimal Hill Forest Street and communitation with 1800 Mill communitation by													
		Design HV Feedthrough compatible with 350 kV commercial cable. Define HV chamber size based on HV feedbraugh and electrode size, and an anode-cathode gap.													
		Design triple point junction shield to linearize potential along HV feedthrough keeping 2×18 MIC/m at 350 MV													
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au noting	MIN markets														
	NIII readules														
		Define pumping scheme to actione <16-12 Torr													
	Anade support				_										
		Optimals anode drift tube to limit photocathode (on damage (MOUFLOW=GPT+CST)													
dreitatic i vacuum design read	<u> </u>													-	
insering design															
	Vacsum chamber + MEG modules														
		Design and produce engineering drawings													
	HV Feedthrough														
		Work with vendor to develop engineering design and chawings													
	Electrade + triple paint junction shiel														
		Design electrade + shield + front and back ends													
	Electrode support structure														
		Design electracle support to Hi' feedthrough with internal shape to accept photocrafte pucks													
		Design pach for dum my SS substitute puck													
	Anade + support frame														
	Prison - Inggot i til ris	Decign a sode + drift tube + support frame													
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brication													_	_	
ONCHRON	Vacuum chamber + Mill modules														
	VALUE DUTING THE PROPERTY	Procure, sendor makes MEG medal-ps											_		
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	Millordonosh	Photos, whose contracts values over the											_		
	HV Feedthrough														
		Procure HV feedfreugh												Н	
		Vendor Sabricates W feedthrough											_	۰	
	Electrade + triple paint junction shiel												_		
		Fabricate electrode											_		
		Fabicate triple point junction shield													
	Anade + support frame														
		Fabricate anode and drift tube													
		Fabelcate anode support frame and blading/mounting hardware													
	Electrode support structure														
		Fabricate electrode attachment to HV feelthrough with internal diage to accept photocrafte pucks.													
		Fabricate Ma puck for durreny 55 substrate puck													
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ormály														т	
	Vacuum chamber + Mild modules														
		Vacaum bake at 400 C for desgassing													
		Install Milli modules, sorere, extractor gauge													
	Electrode + triple point junction shiel														
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		Palish												Н	
		One												Н	
	HV Feedthrough	MIT .													
	A Carrent redu	White-flavor - lost short													
		Weld to flange + leak shock													
		Clean electrode attachemnet support and dammy puck with 55 substrate													
		Mount electrode + triple point junction shield + dumy puck and fiducial													
		Install on chamber and align per fiducal													
	Anode essembly														
		Vacuum degass to 900 C													
		Palish													
		Cean													
		Assemble and install on chamber and fiducial													
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