Author | Department | Date
Daniel W. Cheng | **Mechanical Engineering** | **5/10/00**

Program - Project - Job: SNS-FE Ion Source/LEBT
Faraday Cup

Title: **SNS-Front End Systems Faraday Cup Diagnostic**

1. Scope

This report describes the design of the 65 mA H- Faraday cup diagnostic that was originally built for the SNS Front End Systems R& D effort. The simulations were performed by Matthaeus Leitner in September 1998, and the design details were completed in October 1998. This report contains the complete drawings set of the Faraday cup.

2. Background

The ion source and Low Energy Beam Transport of the SNS Front End systems is designed to produce and transport a 65 mA H- beam at a 6% duty factor and 65 keV energy into the Radio Frequency Quadrupole (RFQ) for further acceleration. However, prior to the installation of a full Low Energy Beam Transport (LEBT) or an RFQ, the ion beam extracted from the plasma generator must be characterized. An emittance scanner and Faraday cup are key to this characterization process, and this report covers the design of the Faraday cup.

3. Requirements

While the Faraday cup must accurately measure the H- ions that are being extracted from the plasma generator, it must also reject the signal of the electrons that are inherent in a plasma of H- ions. Most electrons are already filtered by the outlet electrode's magnetic field and by the use of cesium in the plasma generator, but the small percentage that remains with the extracted beam must then be dealt with by a magnetic field in the Faraday cup. In order to dump 30 keV electrons, the magnetic field at the entrance of the Faraday cup must be near 360 Gauss (see Figures A2, A3). In order to adequately dump 65 keV electrons, however, the field strength at the entrance must be close to 700 Gauss (see Figure A8). For this reason, the magnets must be interchangeable to accommodate different beam energies (30 keV electrons may *not* be adequately dumped in a 700 Gauss field--see Figure A9). **It is advisable to measure the field strength of the cup using a Hall probe prior to any use, and also at regular intervals**. Lastly, the heat generated by the dumped electrons is detrimental to the magnets that produce the magnetic field, therefore water cooling is necessary to keep temperatures reasonable.

4. Design Overview

The Faraday cup was constructed in a shell of 1006 low-carbon steel for it's magnetic properties. Because of the magnetic field generated by the SmCo filter magnets, the steel serves as a field clamp that reduces fringe fields that could affect the extraction of the ion beam from the plasma generator. The filter magnets are installed transversely at the top and bottom of the front plate, which produce a downward B field. This is designed to deflect the electrons to the side, where they will be absorbed and trapped by graphite plates. Due to the heat generated, the magnets are shielded by a copper sheet that is edge-cooled by brazed copper tubing to minimize any degradation of the magnetic field due to temperature effects.

The target where the H- ions will strike is simply a graphite plate at the rear of the Faraday cup, but is electrically isolated from the body where the electrons are dumped. This provides the filtering needed to ensure a clean reading on the H- signals. Water cooling was not implemented for the 30 keV dumping, but the issue may be revisited for the 65 keV case.

Depending on the Faraday cup's use and application, the hanger bracket (Drawing 21G6912) can be either substituted or modified in order to mount the cup adequately.

5. Design Package

The drawings for all the Faraday cup parts are as follows:

21G690 3	Faraday Cup Assembly & Mount
21G663 1	Faraday Cup Graphite Liner 1
21G664 1	Faraday Cup Graphite Liner 2
21G665 1	Faraday Cup Graphite Liner 3
21G666 1	Faraday Cup Graphite Liner 4
21G667 1	Faraday Cup Graphite Liner 5
21G668 1	Faraday Cup Graphite Liner 6
21G669 1	Faraday Cup Graphite Dump
21G670 1	Faraday Cup Bottom Plate
21G671 1	Faraday Cup Back Clamp Plate
21G672 1	Faraday Cup Cover Plate
21G673 1A	Faraday Cup Top Plate
21G674 1	Faraday Cup Side Plate
21G675 1	Faraday Cup Graphite Dump Insulator
21G676 1	Faraday Cup Insulator Support
21G677 1	Faraday Cup Insulator Washer
21G688 1	Faraday Cup Magnet Heat Shield
21G691 2	Hanger Bracket Faraday Cup Mount

All drawings are included with this document.

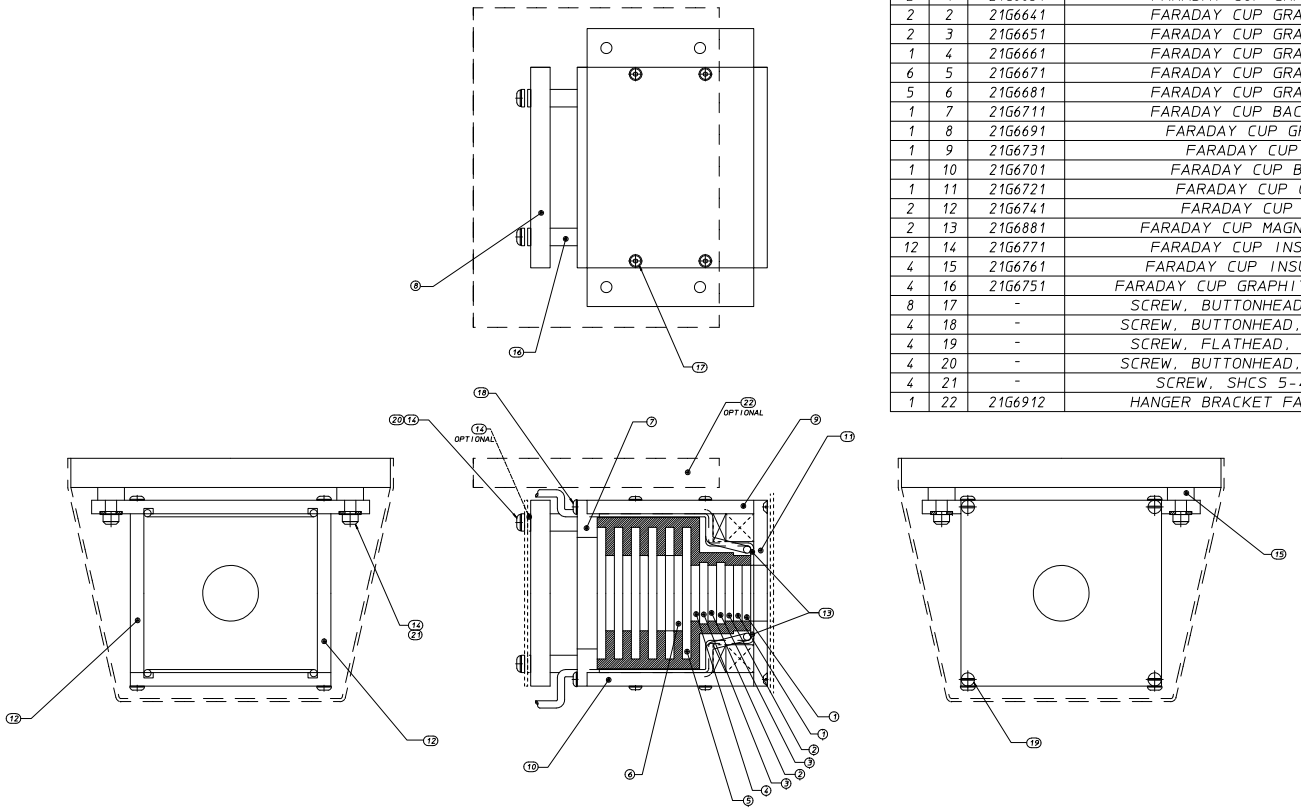
6. Additional Reference Documents

6.1 See Appendix A. for magnetic field simulations.
6.2 See Appendix B. for electron deflection simulations at various beam energies.
6.3 FE-PH-011, Calibration of H-/e- Faraday Cup

7. SNS-FE Design Personnel

Matthaeus Leitner, Primary Physicist
Daniel Cheng, primary Engineer & Designer

REQ	ITEM	PART NUMBER	DESCRIPTION
2	1	21G6631	FARADAY CUP GRAPHITE LINER 1
2	2	21G6641	FARADAY CUP GRAPHITE LINER 2
2	3	21G6651	FARADAY CUP GRAPHITE LINER 3
1	4	21G6661	FARADAY CUP GRAPHITE LINER 4
6	5	21G6671	FARADAY CUP GRAPHITE LINER 5
5	6	21G6681	FARADAY CUP GRAPHITE LINER 6
1	7	21G6711	FARADAY CUP BACK CLAMP PLATE
1	8	21G6691	FARADAY CUP GRAPHITE DUMP
1	9	21G6731	FARADAY CUP TOP PLATE
1	10	21G6701	FARADAY CUP BOTTOM PLATE
1	11	21G6721	FARADAY CUP COVER PLATE
2	12	21G6741	FARADAY CUP SIDE PLATE
2	13	21G6881	FARADAY CUP MAGNET HEAT SHIELD
12	14	21G6771	FARADAY CUP INSULATOR WASHER
4	15	21G6761	FARADAY CUP INSULATOR SUPPORT
4	16	21G6751	FARADAY CUP GRAPHITE DUMP INSULATOR
8	17	-	SCREW, BUTTONHEAD, 2-56 x .4" LG
4	18	-	SCREW, BUTTONHEAD, 2-56 x .375" LG
4	19	-	SCREW, FLATHEAD, 2-56 x .375" LG
4	20	-	SCREW, BUTTONHEAD, 4-40 x .875" LG
4	21	-	SCREW, SHCS 5-40 x .625" LG
1	22	21G6912	HANGER BRACKET FARADAY CUP MOUNT



21G6903

REV	DWG	CHK	ZONE	DATE	CHANGES

UNLESS OTHERWISE SPECIFIED
TOLERANCES: .X ± .1 FRAC. ±1/64; .XX ± .01 ANGLES ±.01°; .XXX ± .001 FINISH 125
THREADS ARE CLASS 2
CHAMFER ENDS OF ALL SCREW THREADS 30°. CUT 1.5 PITCH THRD RELIEF WITH ROUND NOSE TOOL ON MACHINE CUT THREADS.
BREAK EDGES .016 MAX. ON MACHINED WORK
REMOVE BURRS WELD SPLATTER & LOOSE SCALE
REFERENCES: ANSI Y14.5 & B46.1.

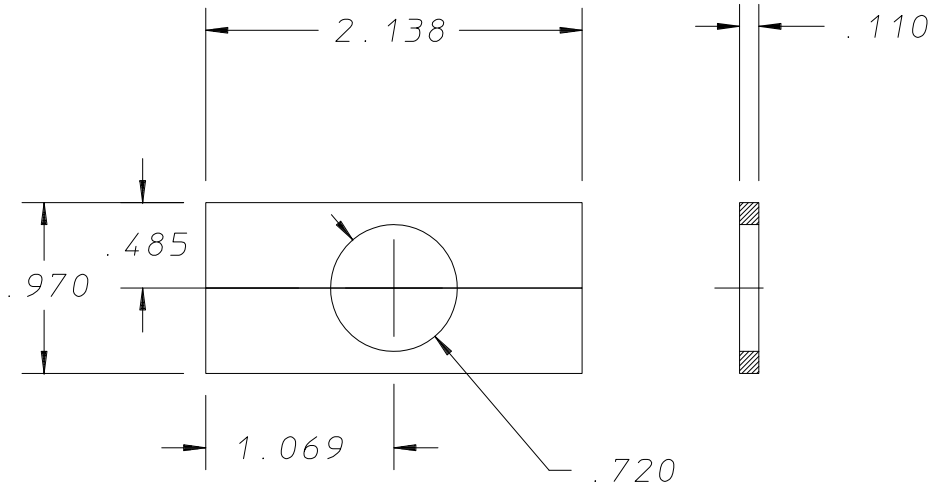
SHOP ORDERS
ACCT. NO. | SERIAL NO.
DATE ISSD. | DATE REQD. | NO. REQD.
DELIVER TO
SURFACE TREATMENT: DEGREASE
IDENT. METH.: TAG
DWG BY: D. CHENG | DATE: 10-5-98
CHK. BY | DATE

LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA-BERKELEY

SNS-FE ION SOURCE R&D
ION SOURCE DEVELOPMENT
FARADAY CUP ASSEMBLY & MOUNT

PATENT CLEAR	DWG. TYPE	SHOWN ON	SCALE	DO NOT SCALE PRINTS
	ASSEMBLY		FULL	
MICROFILMED	DESIGN ACCT. NO.	CATEGORY CODE	DWG. NO.	SIZE / REV.
	8210-11	FE1100	21G6903	

Dwg. No. 21G6631 Size Rev

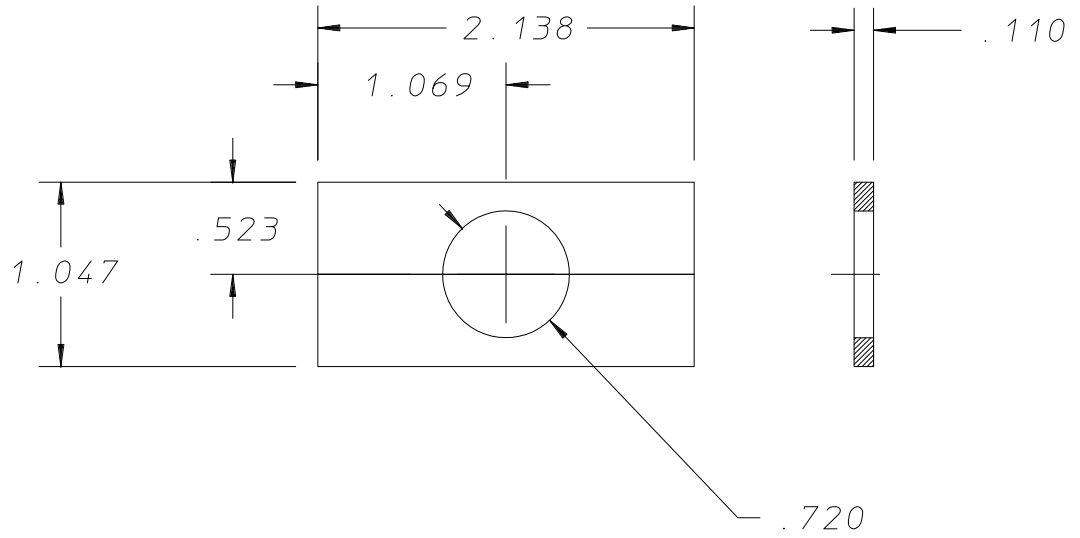


Material – GRAPHITE		- - - -	
Unless Otherwise Noted		Rev Dwn Date Changes	
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°		LAWRENCE BERKELEY LABORATORY	
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1		University of California – Berkeley	
		SNS-FE ION SOURCE R&D	
Account Number –	Finish √ 125	ION SOURCE DEVELOPMENT	
Date Issued –	Date Reqd –	FARADAY CUP GRAPHITE LINER 1	
Number Required –	Deliver To –	Shown on Dwg No. 21G6903	
Surface Treatment Degrease	Identific Method Tag	Patent Clear	Category Code FE-1100
Drawn By DAN CHENG	Date 10-1-98	Micro-Filmed	Drawing Scale Full
Check By	Date	Design Account 8210-11	Drawing Type Detail

Do not Scale Prints

Dwg. No. 21G6631 Size Rev

Dwg. No.	Size	Rev
21G6641		

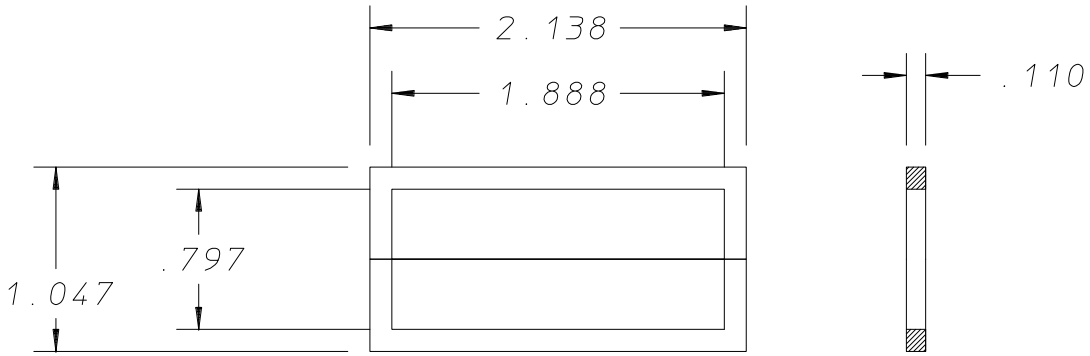


Material – GRAPHITE		- - - -	
Unless Otherwise Noted		Rev Dwn Date Changes	
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°		LAWRENCE BERKELEY LABORATORY	
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1		University of California – Berkeley	
		SNS-FE ION SOURCE R&D	
Account Number –	Finish √ 125	ION SOURCE DEVELOPMENT	
Date Issued –	Date Reqd –	FARADAY CUP GRAPHITE LINER 2	
Number Required –	Deliver To –	Shown on Dwg No. 21G6903	
Surface Treatment Degrease	Identific Method Tag	Patent Clear	Category Code FE-1100
Drawn By DAN CHENG	Date 10-1-98	Micro-Filmed	Drawing Scale Full
Check By	Date	Design Account 8210-11	Drawing Type Detail

Do not Scale Prints

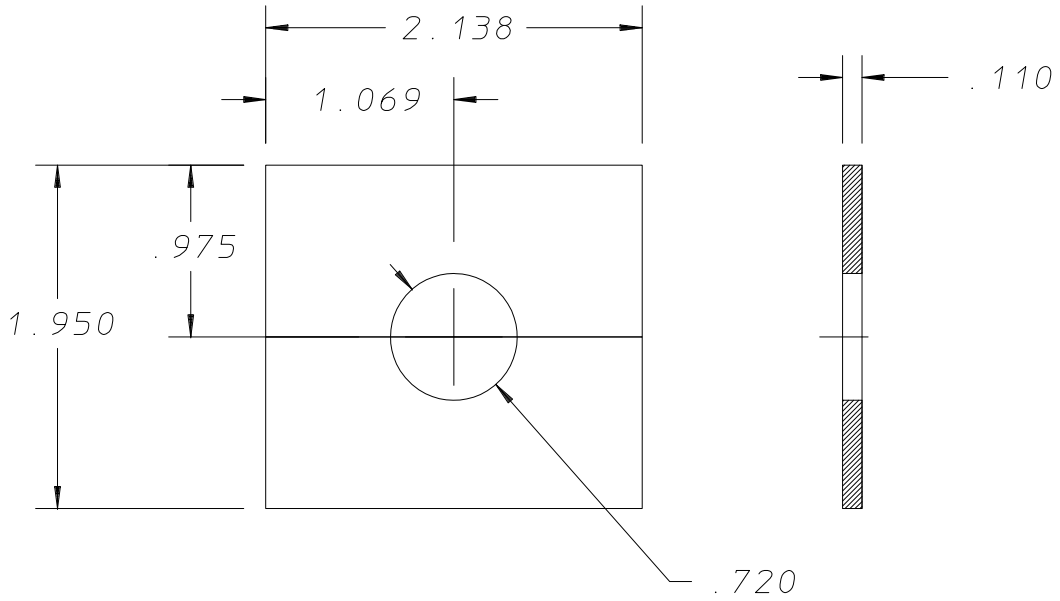
Dwg. No.	Size	Rev
21G6641		

Dwg. No. 21G6651 Size Rev



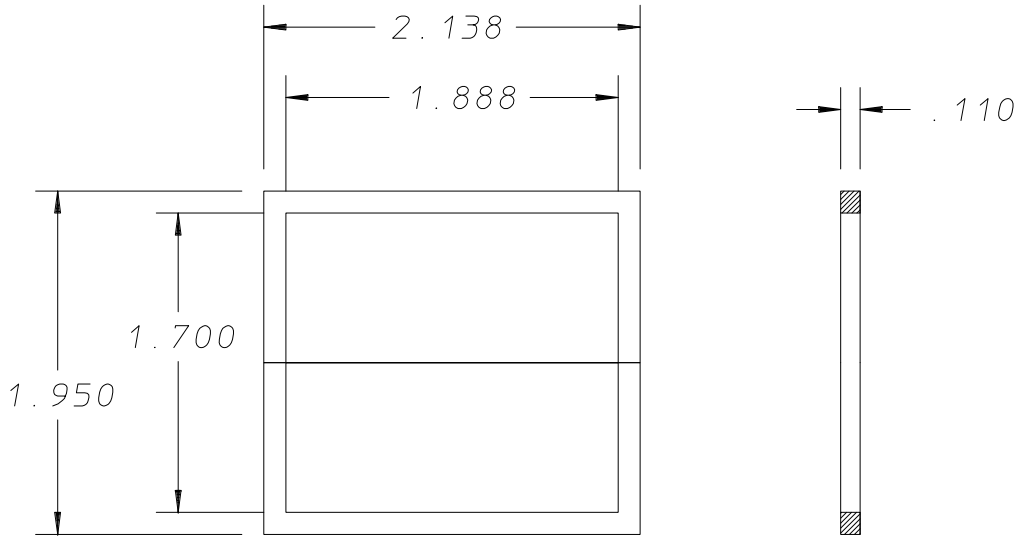
Material – GRAPHITE		-	-	-	-
Unless Otherwise Noted		Rev	Dwn	Date	Changes
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°		LAWRENCE BERKELEY LABORATORY			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1		University of California – Berkeley			
		SNS-FE ION SOURCE R&D			
Account Number –	Finish √ 125	ION SOURCE DEVELOPMENT			
Date Issued –	Date Reqd –	FARADAY CUP GRAPHITE LINER 3			
Number Required –	Deliver To –	Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag	Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98	Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6651	Size Rev
Check By	Date	Design Account 8210-11	Drawing Type Detail		

Dwg. No.	Size	Rev
21G6661		



Material – GRAPHITE			-	-	-	-
Unless Otherwise Noted			Rev	Dwn	Date	Changes
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°			**LAWRENCE BERKELEY LABORATORY**			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1			**University of California – Berkeley**			
			SNS-FE ION SOURCE R&D			
Account Number –	Finish √ 125		ION SOURCE DEVELOPMENT			
Date Issued –	Date Reqd –		FARADAY CUP GRAPHITE LINER 4			
Number Required –	Deliver To –		Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag		Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98		Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6661	Size / Rev
Check By	Date		Design Account 8210-11	Drawing Type Detail		

Dwg. No. 21G6671 Size Rev



Material – GRAPHITE					
Unless Otherwise Noted					
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°					
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1					
Account Number –	Finish √ 125				
Date Issued –	Date Reqd –				
Number Required –	Deliver To –				
Surface Treatment Degrease	Identific Method Tag				
Drawn By DAN CHENG	Date 10-1-98				
Check By	Date				

Rev	Dwn	Date	Changes
-	-	-	-

LAWRENCE BERKELEY LABORATORY

University of California – Berkeley

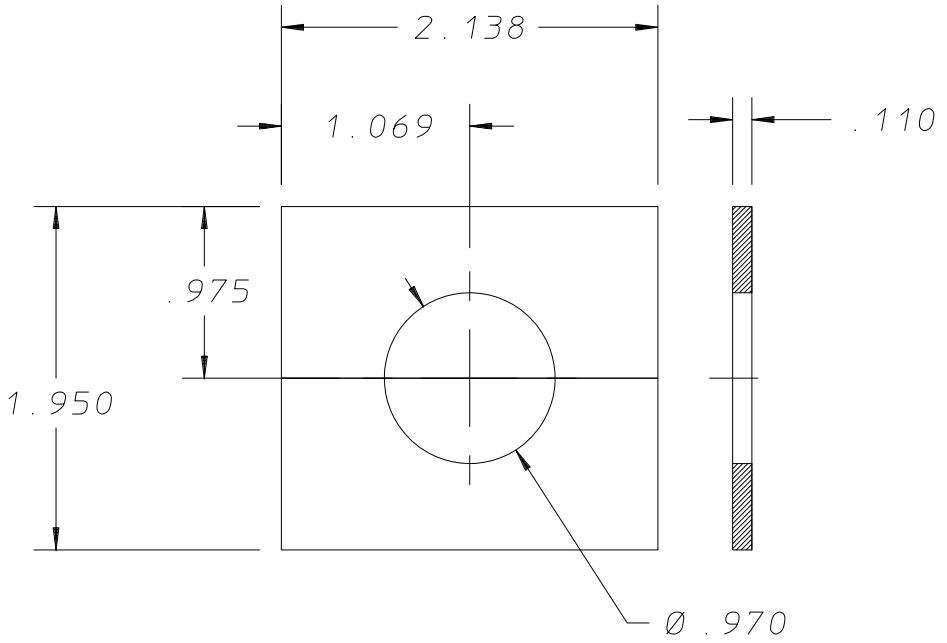
SNS-FE ION SOURCE R&D

ION SOURCE DEVELOPMENT

FARADAY CUP GRAPHITE LINER 5

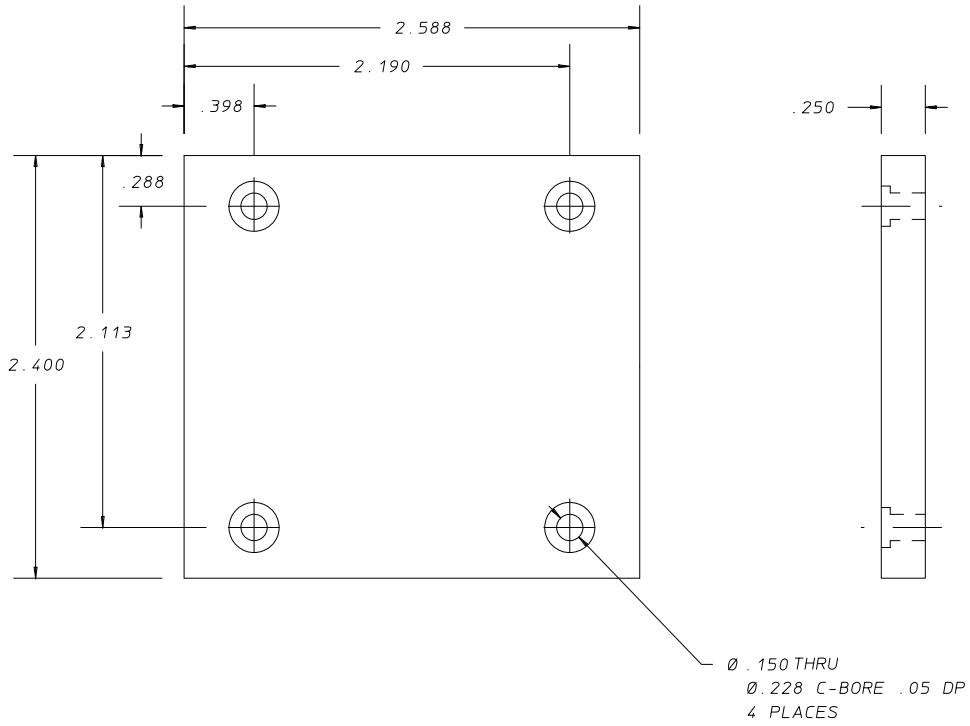
Shown on Dwg No. 21G6903			
Patent Clear	Category Code FE-1100	Do not Scale Prints	
Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6671	Size / Rev
Design Account 8210-11	Drawing Type Detail		

Dwg. No. 21G6681 Size Rev



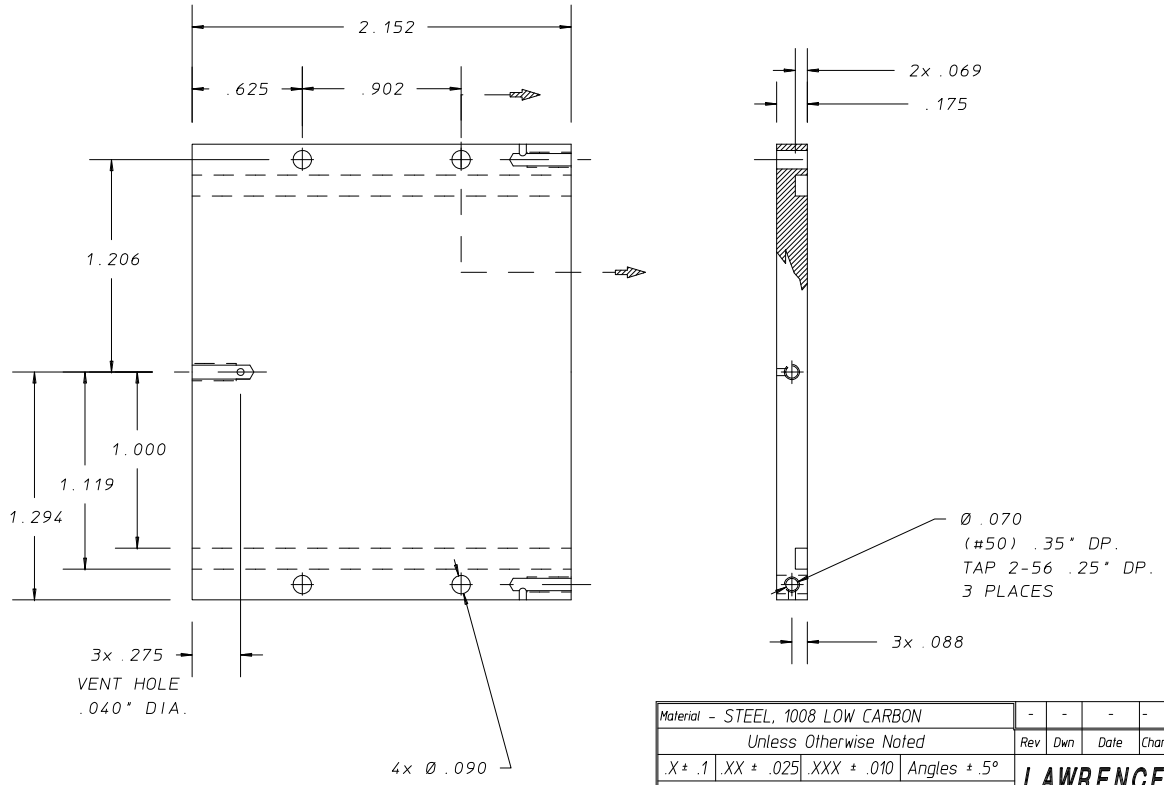
Material – GRAPHITE		-	-	-	-
Unless Otherwise Noted		Rev	Dwn	Date	Changes
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°		LAWRENCE BERKELEY LABORATORY			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1		University of California – Berkeley			
		SNS-FE ION SOURCE R&D			
Account Number –	Finish √ 125	ION SOURCE DEVELOPMENT			
Date Issued –	Date Reqd –	FARADAY CUP GRAPHITE LINER 6			
Number Required –	Deliver To –	Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag	Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98	Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6681	Size Rev
Check By	Date	Design Account 8210-11	Drawing Type Detail		

Dwg. No. 21G6691 Size Rev



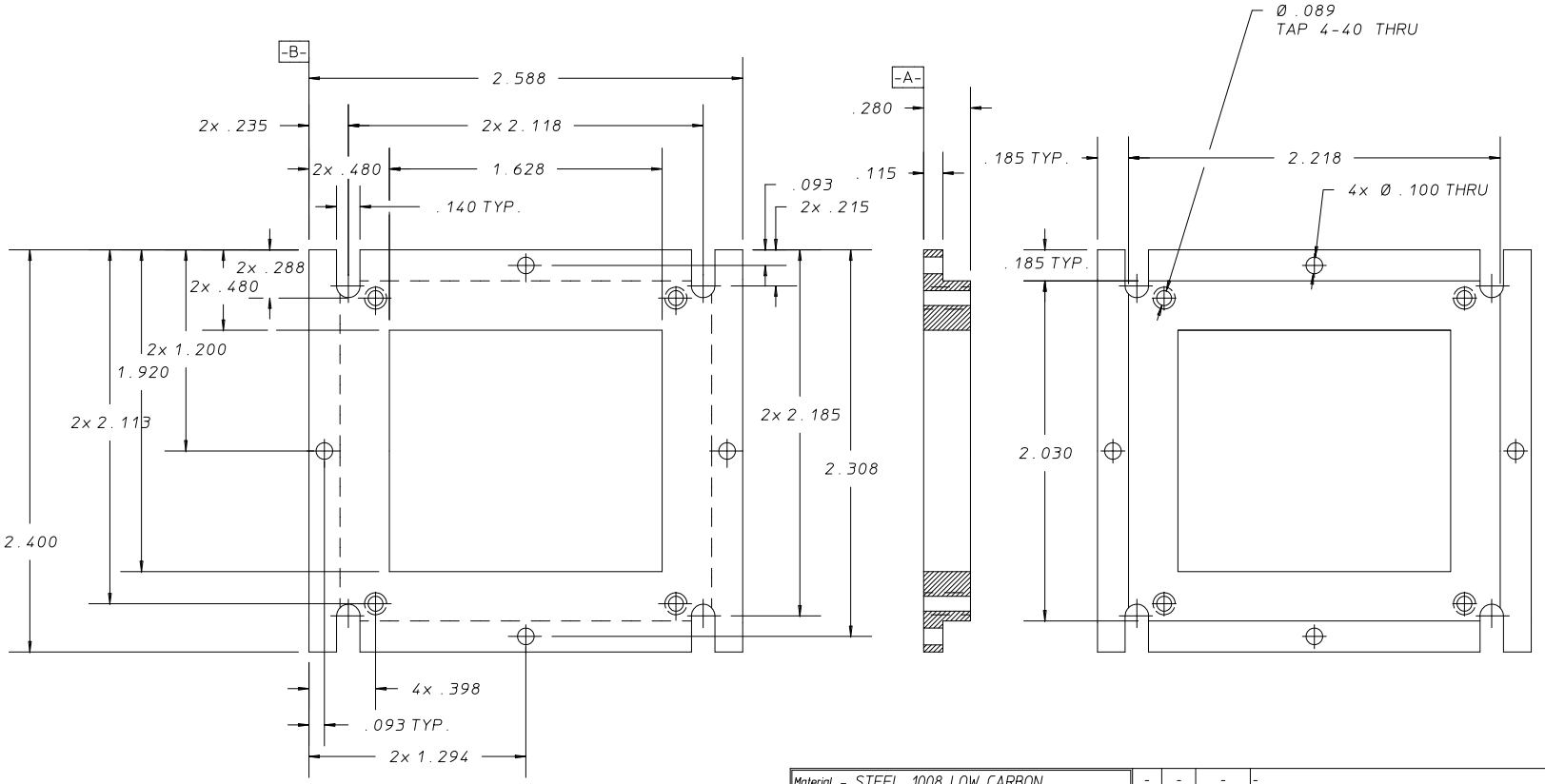
Material – GRAPHITE				-	-	-	-
Unless Otherwise Noted				Rev	Dwn	Date	Changes
.X ± .1	.XX ± .025	.XXX ± .010	Angles ± .5°	LAWRENCE BERKELEY LABORATORY			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1				University of California – Berkeley			
				SNS-FE ION SOURCE R&D			
Account Number –	Finish √ 125			ION SOURCE DEVELOPMENT			
Date Issued –	Date Reqd –			FARADAY CUP GRAPHITE DUMP			
Number Required –	Deliver To –			Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag			Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98			Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6691	Size Rev
Check By	Date			Design Account 8210-11	Drawing Type Detail		

Dwg. No. 21G6701 Size Rev



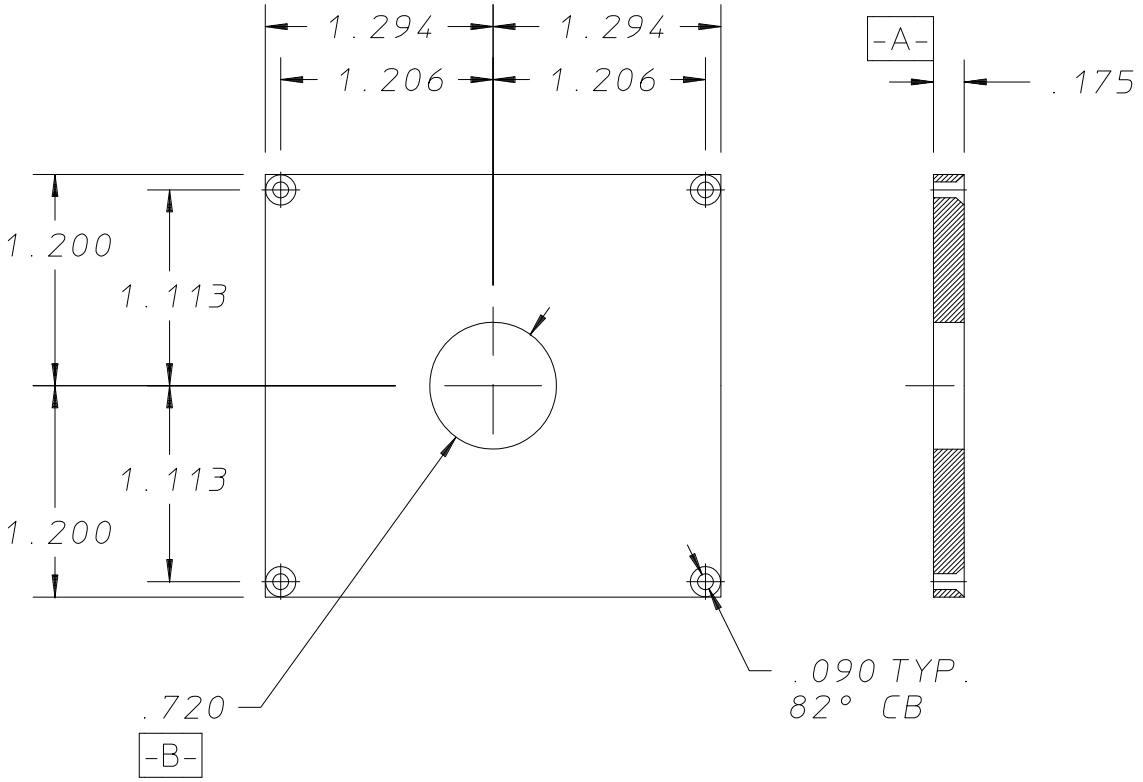
Material – STEEL, 1008 LOW CARBON		-	-	-	-
Unless Otherwise Noted		Rev	Dwn	Date	Changes
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°		LAWRENCE BERKELEY LABORATORY			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1		University of California – Berkeley			
		SNS-FE ION SOURCE R&D			
Account Number –	Finish √ 125	ION SOURCE DEVELOPMENT			
Date Issued –	Date Reqd –	FARADAY CUP BOTTOM PLATE			
Number Required –	Deliver To –	Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag	Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98	Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6701	Size Rev
Check By	Date	Design Account 8210-11	Drawing Type Detail		

Dwg. No. 21G6711 Size Rev



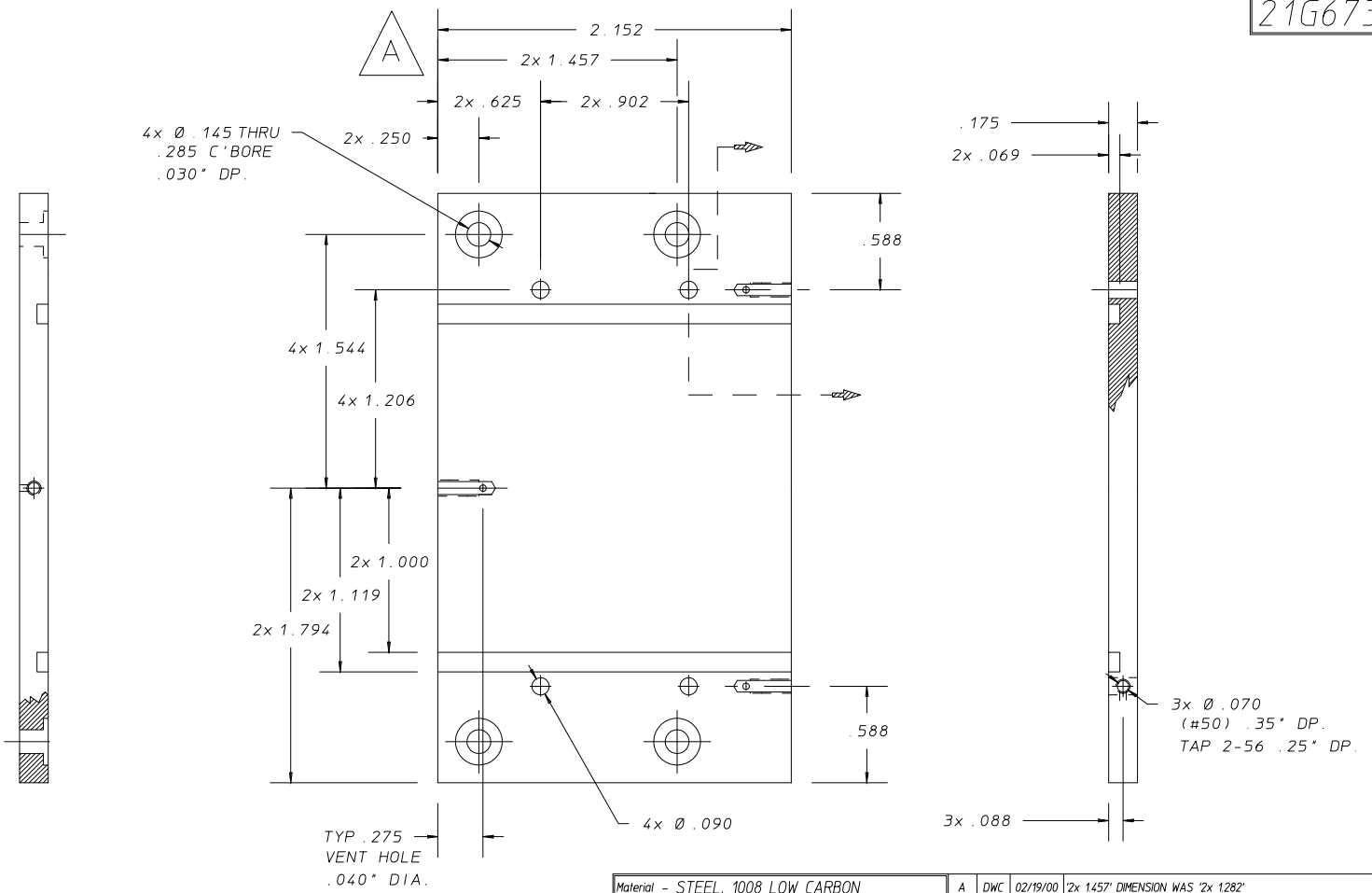
Material - STEEL, 1008 LOW CARBON		-	-	-	-
Unless Otherwise Noted		Rev	Dwn	Date	Changes
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°		LAWRENCE BERKELEY LABORATORY			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1		University of California - Berkeley			
		SNS-FE ION SOURCE R&D			
Account Number -	Finish √ 125	ION SOURCE DEVELOPMENT			
Date Issued -	Date Reqd -	FARADAY CUP BACK CLAMP PLATE			
Number Required -	Deliver To -	Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag	Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98	Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6711	Size Rev
Check By	Date	Design Account 8210-11	Drawing Type Detail		

Dwg. No. 21G6721 Size Rev



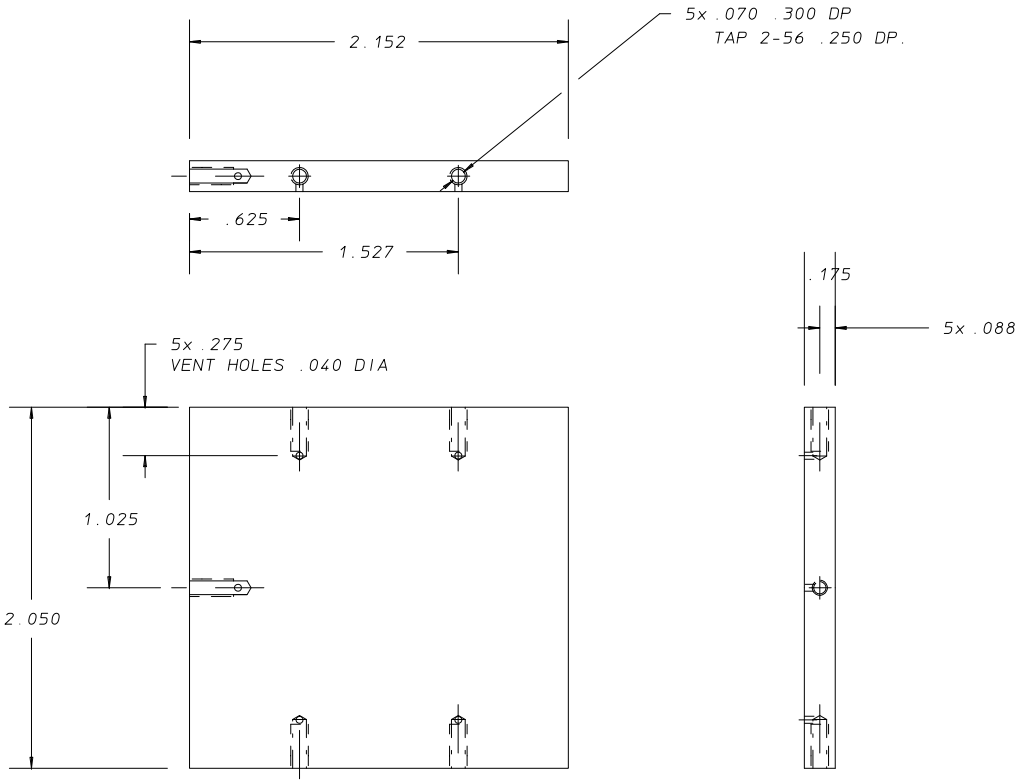
Material - STEEL, 1008 LOW CARBON		-	-	-	-
Unless Otherwise Noted		Rev	Dwn	Date	Changes
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°		LAWRENCE BERKELEY LABORATORY			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1		University of California - Berkeley			
		SNS-FE ION SOURCE R&D			
Account Number -	Finish √ 125	ION SOURCE DEVELOPMENT			
Date Issued -	Date Reqd -	FARADAY CUP COVER PLATE			
Number Required -	Deliver To -	Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag	Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98	Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6721	Size Rev
Check By	Date	Design Account 8210-11	Drawing Type Detail		

Dwg. No. 21G6731A Size Rev



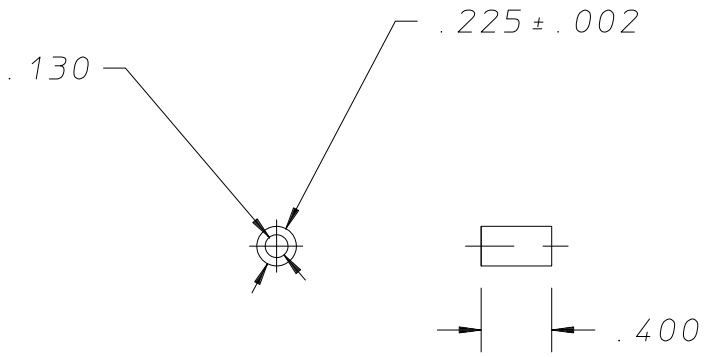
Material – STEEL, 1008 LOW CARBON		A	DWC	02/19/00	'2x 1.457' DIMENSION WAS '2x 1.282'		
Unless Otherwise Noted		Rev	Dwn	Date	Changes		
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°		LAWRENCE BERKELEY LABORATORY					
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1		University of California – Berkeley					
		SNS-FE ION SOURCE R&D					
Account Number –	Finish √ 125	ION SOURCE DEVELOPMENT					
Date Issued –	Date Reqd –	FARADAY CUP TOP PLATE					
Number Required –	Deliver To –	Shown on Dwg No. 21G6903					
Surface Treatment Degrease	Identific Method Tag	Patent Clear		Category Code FE-1100	Do not Scale Prints		
Drawn By DAN CHENG	Date 10-1-98	Micro-Filmed		Drawing Scale Full	Dwg. No. 21G6731	Size A	Rev
Check By	Date	Design Account 8210-11		Drawing Type Detail			

Dwg. No. 21G6741 Size Rev



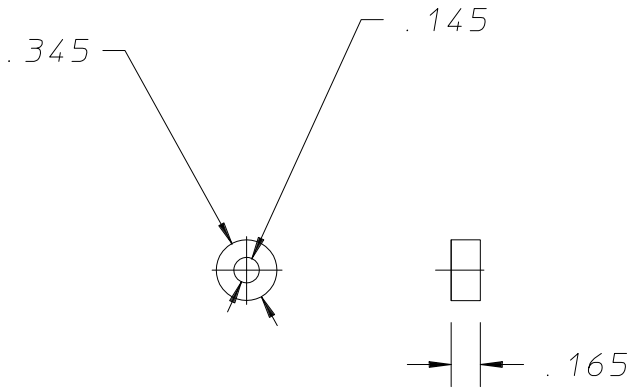
Material – STEEL, 1008 LOW CARBON		-	-	-	-
Unless Otherwise Noted		Rev	Dwn	Date	Changes
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°		LAWRENCE BERKELEY LABORATORY			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1		University of California – Berkeley			
		SNS-FE ION SOURCE R&D			
Account Number –	Finish √ 125	ION SOURCE DEVELOPMENT			
Date Issued –	Date Reqd –	FARADAY CUP SIDE PLATE			
Number Required –	Deliver To –	Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag	Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98	Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6741	Size Rev
Check By	Date	Design Account 8210-11	Drawing Type Detail		

Dwg. No. 21G6751 Size Rev



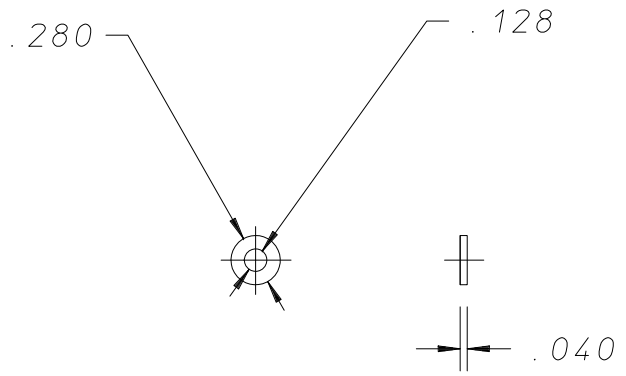
Material – ALUMINA, ROD STOCK				-	-	-	-
Unless Otherwise Noted				Rev	Dwn	Date	Changes
.X ± .1	.XX ± .025	.XXX ± .010	Angles ± .5°	LAWRENCE BERKELEY LABORATORY			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1				University of California – Berkeley			
				SNS-FE ION SOURCE R&D			
Account Number –	Finish √ 125			ION SOURCE DEVELOPMENT			
Date Issued –	Date Reqd –			FARADAY CUP GRAPHITE DUMP INSULATOR			
Number Required –	Deliver To –			Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag			Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98			Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6751	Size Rev
Check By	Date			Design Account 8210-11	Drawing Type Detail		

Dwg. No. 21G6761 Size Rev



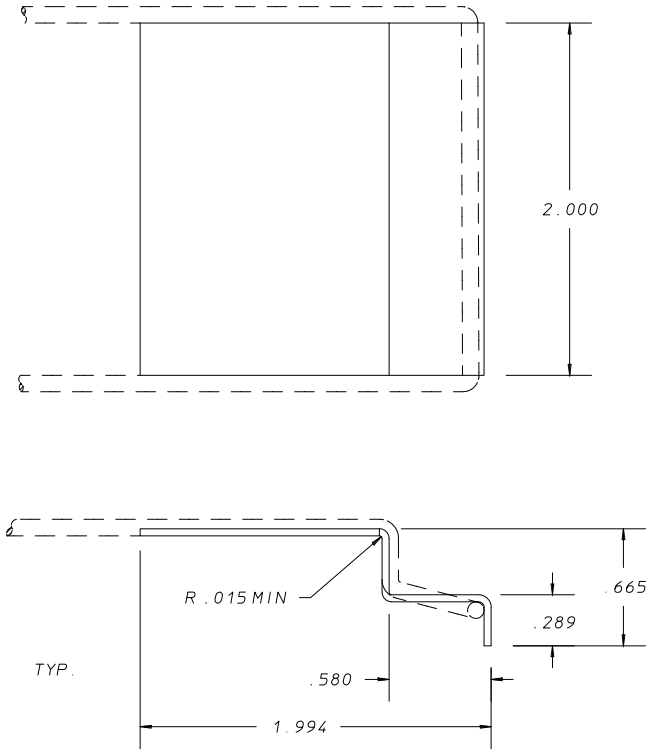
Material – ALUMINA, ROD STOCK				-	-	-	-
Unless Otherwise Noted				Rev	Dwn	Date	Changes
.X ± .1	.XX ± .025	.XXX ± .010	Angles ± .5°	LAWRENCE BERKELEY LABORATORY			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1				University of California – Berkeley			
				SNS-FE ION SOURCE R&D			
Account Number –	Finish √ 125			ION SOURCE DEVELOPMENT			
Date Issued –	Date Reqd –			FARADAY CUP INSULATOR SUPPORT			
Number Required –	Deliver To –			Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag			Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98			Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6761	Size Rev
Check By	Date			Design Account 8210-11	Drawing Type Detail		

Dwg. No.	Size	Rev
21G6771		



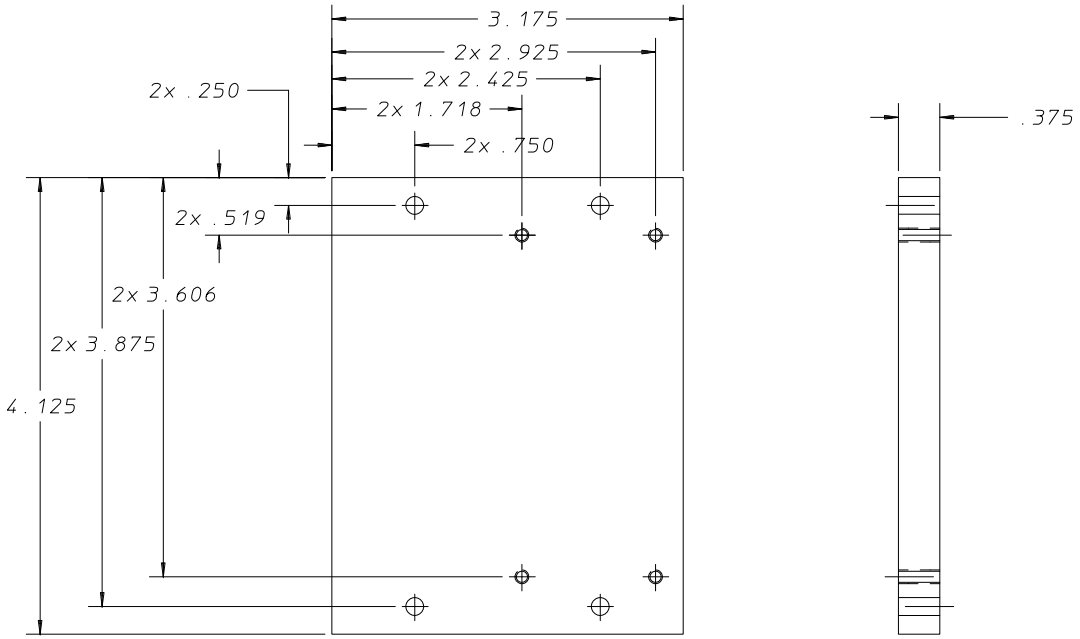
Material – ALUMINA, ROD STOCK			-	-	-	-	
Unless Otherwise Noted			Rev	Dwn	Date	Changes	
.X ± .1 | .XX ± .025 | .XXX ± .010 | Angles ± .5°			**LAWRENCE BERKELEY LABORATORY**				
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1			**University of California – Berkeley**				
			SNS-FE ION SOURCE R&D				
Account Number –	Finish √ 125		ION SOURCE DEVELOPMENT				
Date Issued –	Date Reqd –		FARADAY CUP INSULATOR WASHER				
Number Required –	Deliver To –		Shown on Dwg No. 21G6903				
Surface Treatment Degrease	Identific Method Tag		Patent Clear		Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98		Micro-Filmed		Drawing Scale Full	Dwg. No. 21G6771	Size / Rev
Check By	Date		Design Account 8210-11		Drawing Type Detail		

Dwg. No.	Size	Rev
21G6881		



Material – STEEL, 1008 LOW CARBON				-	-	-	-
Unless Otherwise Noted				Rev	Dwn	Date	Changes
.X ± .1	.XX ± .025	.XXX ± .010	Angles ± .5°	**LAWRENCE BERKELEY LABORATORY**			
Break Edges .016 Max on Machined Work Remove Burrs Weld Splatter and Loose Scale References: ANSI Y 14.5 & B46.1				**University of California – Berkeley**			
				SNS-FE ION SOURCE R&D			
Account Number –	Finish √ 125			ION SOURCE DEVELOPMENT			
Date Issued –	Date Reqd –			FARADAY CUP MAGNET HEAT SHIELD			
Number Required –	Deliver To –			Shown on Dwg No. 21G6903			
Surface Treatment Degrease	Identific Method Tag			Patent Clear	Category Code FE-1100	Do not Scale Prints	
Drawn By DAN CHENG	Date 10-1-98			Micro-Filmed	Drawing Scale Full	Dwg. No. 21G6881	Size / Rev
Check By	Date			Design Account 8210-11	Drawing Type Detail		

21G6912	REQD	ITEM	PART NUMBER	DESCRIPTION



REV	DWN	CHK	DATE	DESCRIPTION

UNLESS OTHERWISE SPECIFIED

TOLERANCE .X ± .1 .XX ± .01 .XXX ± .001

SURFACE FINISH 125 √

1. SAWED, FLAMECUT, SHEARED OR CUT STOCK FINISH.
2. THREADS CLASS 2.
3. CHAMFER ENDS OF ALL SCREW THRDS 30°.
4. 1 1/2 PITCH RELIEF WITH ROUND NOSE TOOL ON ALL MACHINE CUT THRDS.
5. BREAK EDGES 1/64 MAX. ON MACHINE WORK.
6. REMOVE BURRS, LOOSE SCALE AND WELD SPLATTER.
7. REF.-USASI OR ASA STDS SECT Y-14 & B46-1.

SHOP ORDERS

ACCT NO | SER NO

DATE ISSD | DATE REQD | NO REQD

DELIVER TO

SURFACE TREATMENT DEGREASE

IDENTIFIC METHOD TAG

DWG BY D.CHENG | DATE 10-5-98

CHK BY | DATE

LAWRENCE BERKELEY LABORATORY

UNIVERSITY OF CALIFORNIA-BERKELEY

SNS-FE ION SOURCE R&D

ION SOURCE DEVELOPMENT

HANGER BRACKET FARADAY CUP MOUNT

PAT CLEAR	DWG TYPE	SHOWN ON	SCALE: FULL
	DETAIL	00X0000	DO NOT SCALE PRINTS
MICROFILMED	DESIGN ACCT NO	CATEGORY CODE	DWG NO / REV
	8210-11	FE1100	21G6912

Appendix A. Faraday cup simulations.

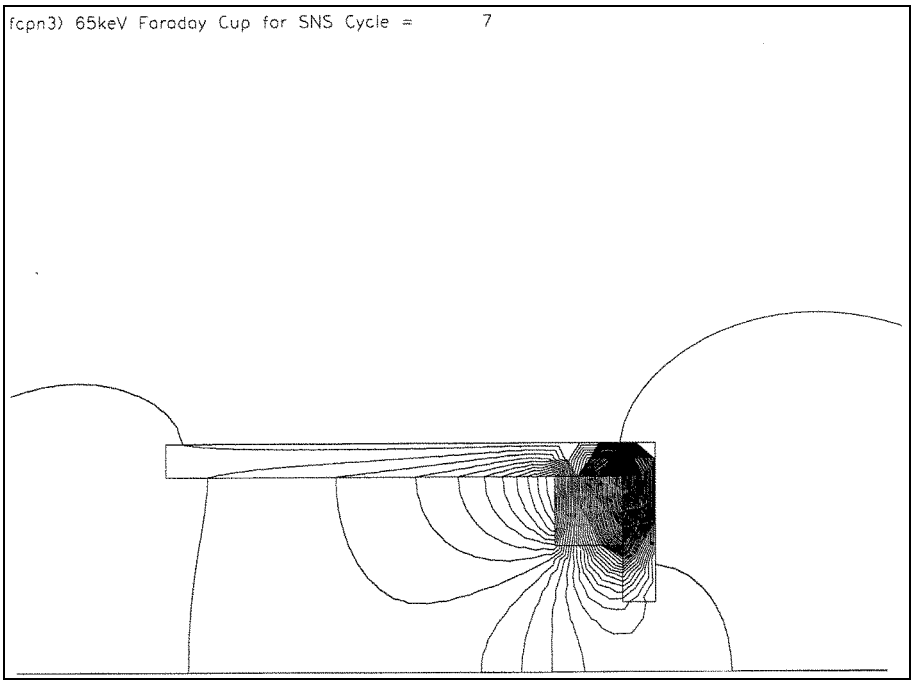


Figure A1. A 2-D magnetic field plot of Faraday cup shell & magnet.

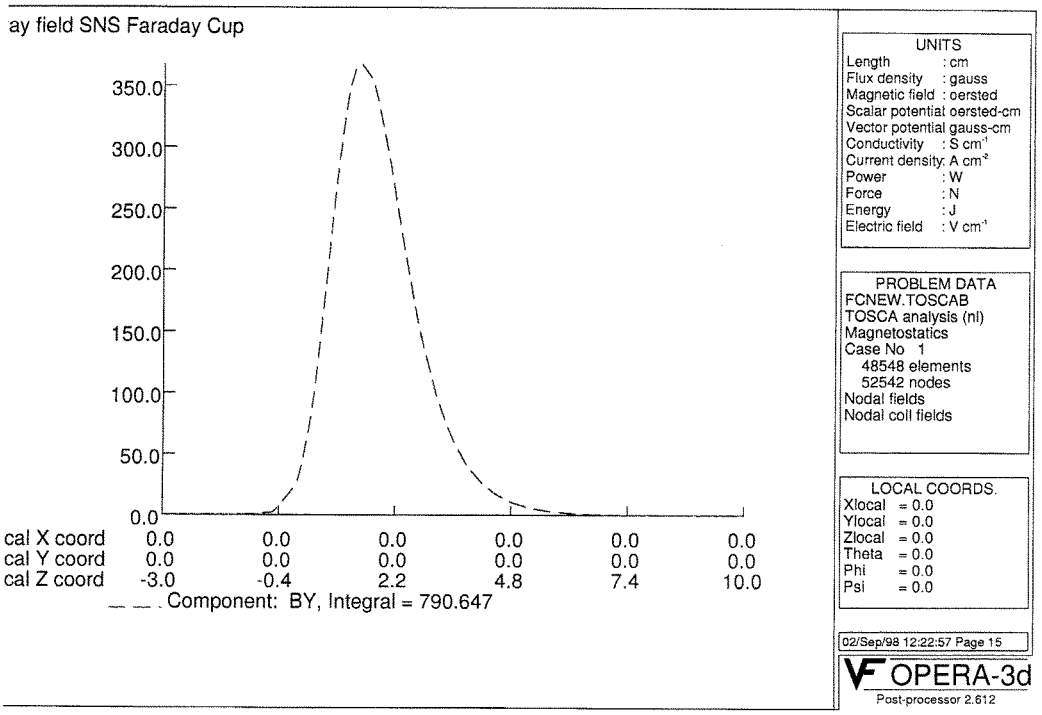


Figure A2. Magnetic field strength for the 30 keV dumping scenario, as a function of position.

Appendix A. (cont.)

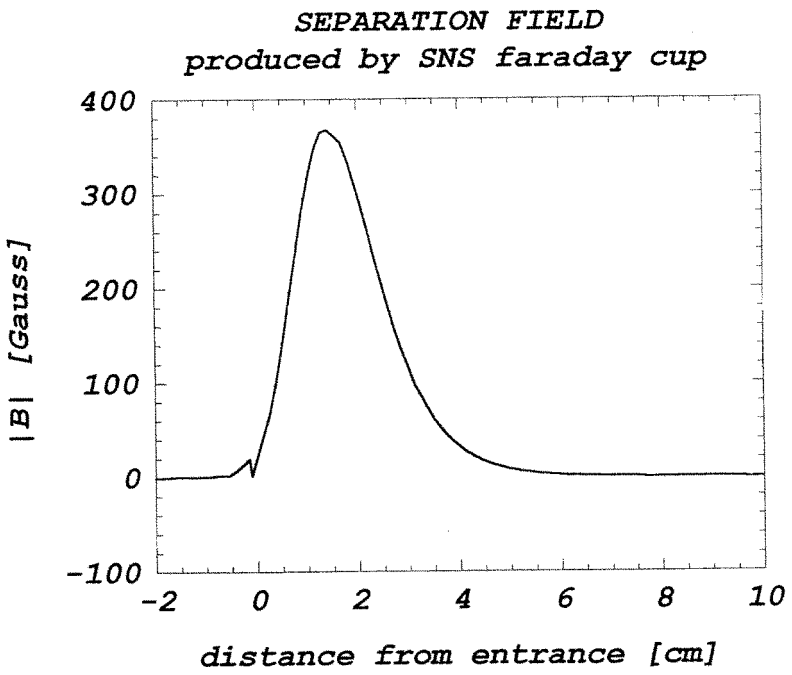


Figure A3. Magnetic separation field requirement for the 30 keV Dumping scenario, as a function of position.

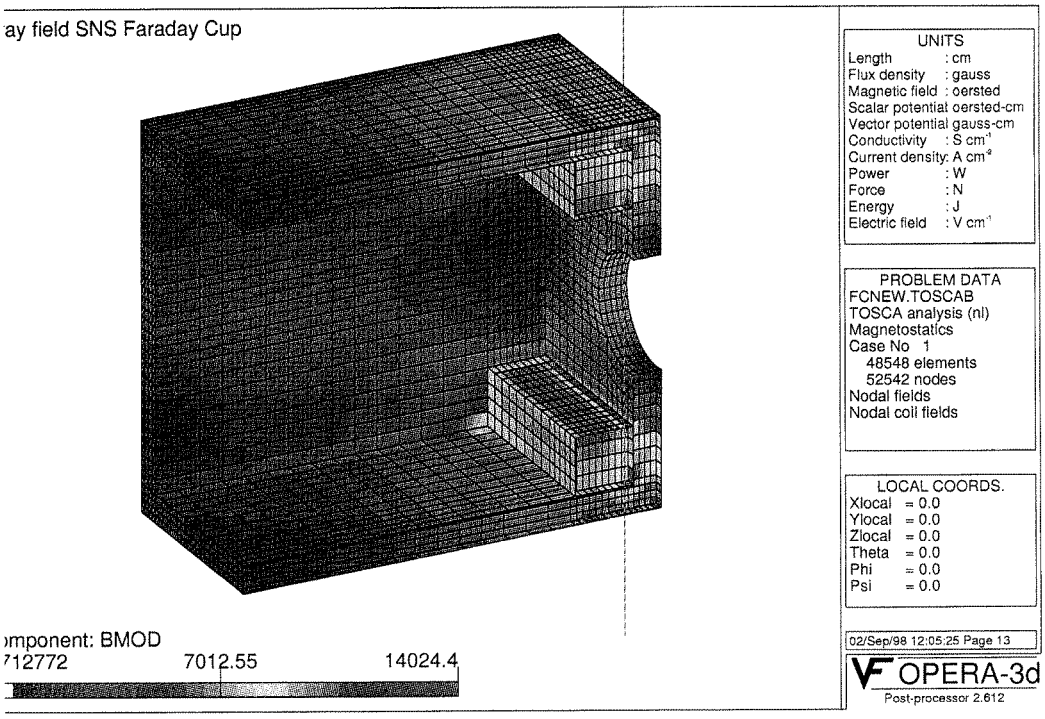


Figure A4. Fringe field plot of Faraday cup (colors not shown).

Appendix A. (cont.)

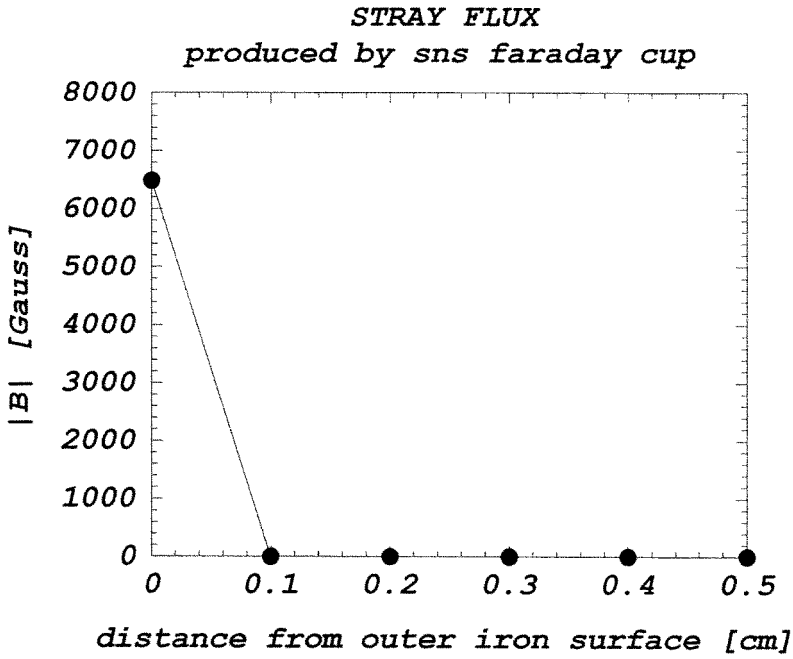


Figure A5. Stray magnetic flux, as a function of distance from iron surface.

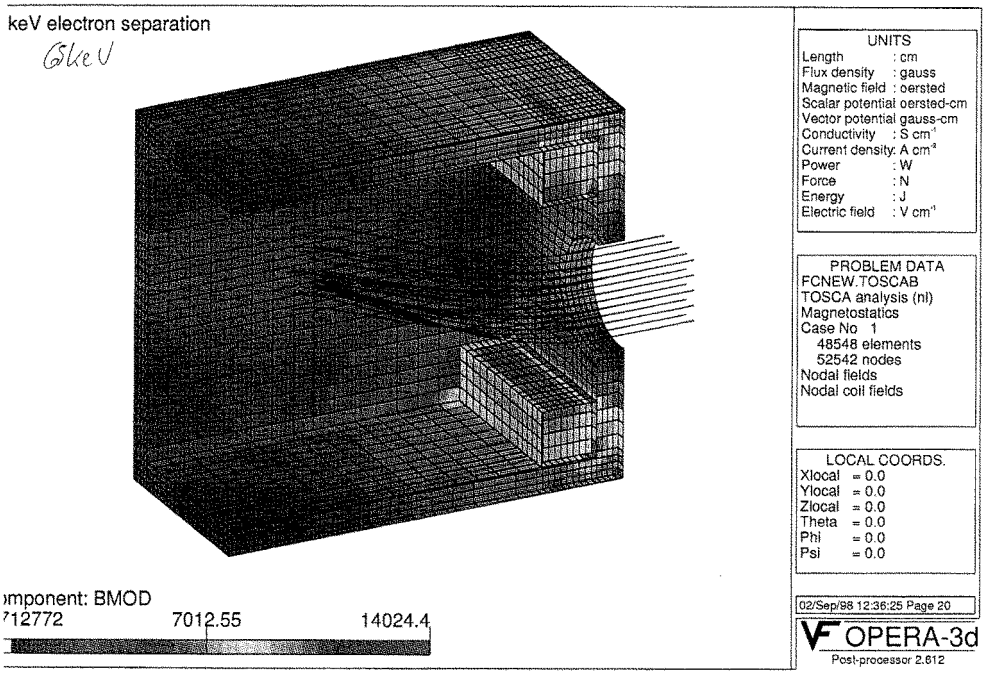


Figure A6. 3-D Plot of 65 keV electrons' deflection due to 360 Gauss magnetic field.

Appendix A. (cont.)

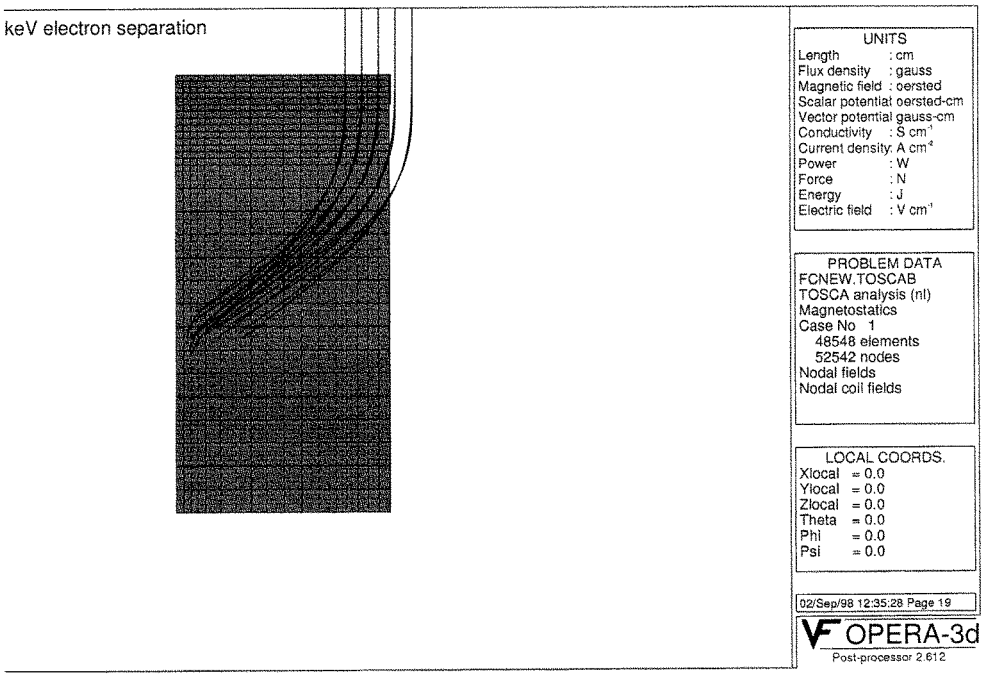


Figure A7. Top view of 65 keV electrons' deflection due to 360 Gauss field.

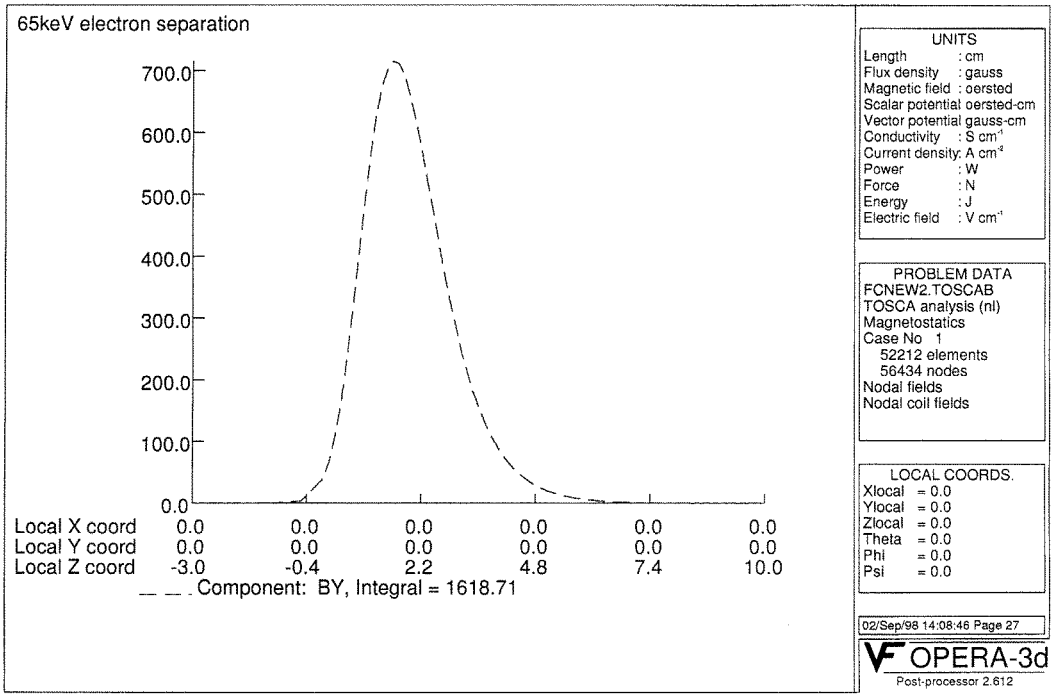


Figure A8. Electron separation field requirement for the 65 keV scenario, as a function of position.

Appendix A. (cont.)

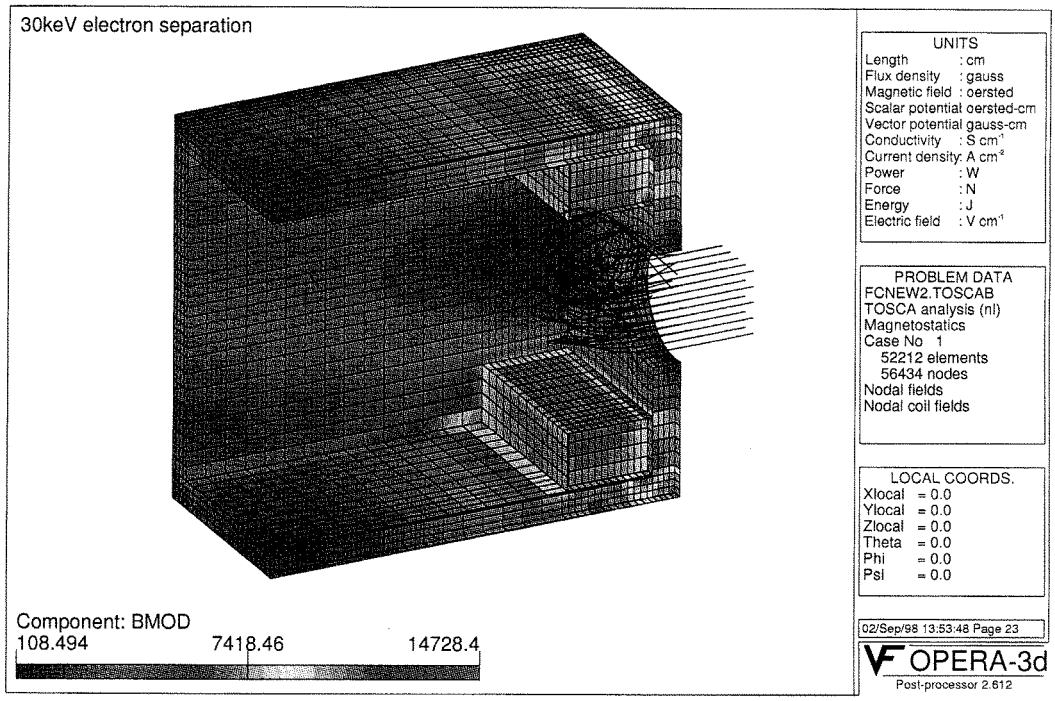


Figure A9. Plot of 30 keV electron separation in a 700 Gauss magnetic field. Note the spiraling path of the electrons.

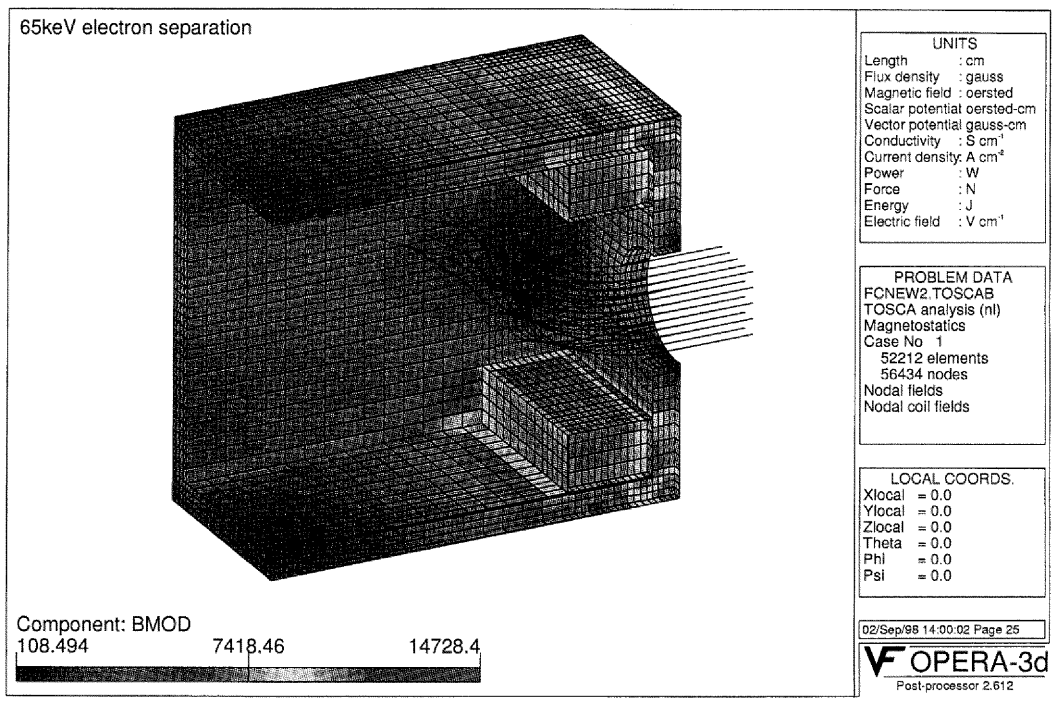


Figure A10. Plot of 65 keV electron separation in a 700 Gauss magnetic field.