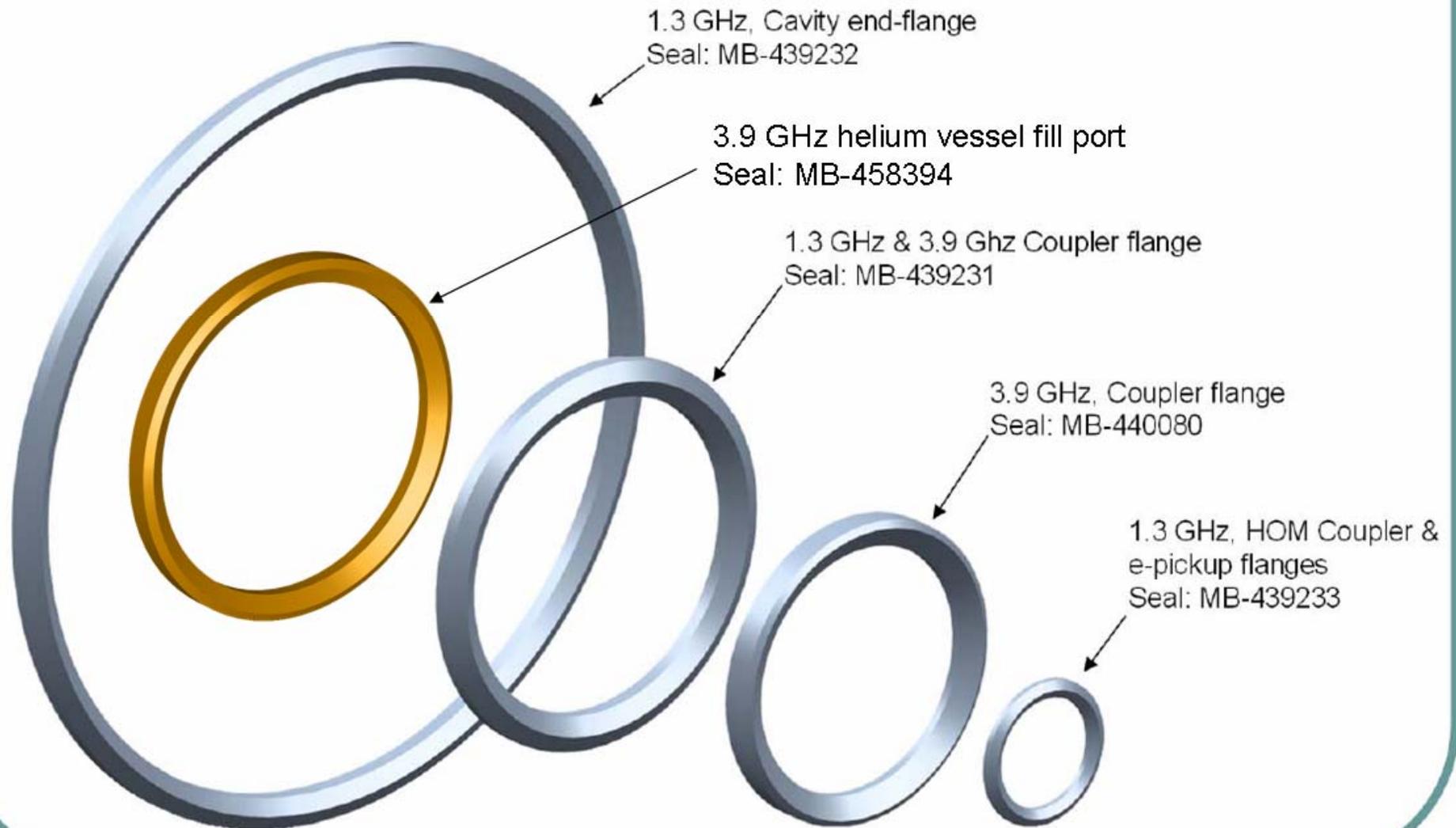


1.3 GHz & 3.9 GHz Aluminum Hex Seals



Materials for SRF Cavity Hardware Collection of Current Specifications, Opinions

Dan Olis

6Feb06

Aluminum Diamond Seals

At Fermi, according to Allan Rowe, specification developed by Mark Champion and Danny Snee is 5052 aluminum plate. Temper is not specified and temper of material used to make seals for both Allan Rowe (3.9 cavity ends) and Dan Olis (3.9 coupler) is uncertain but Danny Snee guesses it is H32. Allan says plate (v. round stock) is required since in limited testing it seems to achieve more reliable sealing.

Kurt Escherich at DESY says Fermi should buy gaskets from their vendor according to DESY's specification. He has no confidence that we could get good seals otherwise. DESY spec. does not require aluminum to be machined from plate (and this requirement doesn't make sense to them per conversation Tug had while at DESY). DESY's vendor: WEPEC

Marlowring 4

22525 Hamburg

Germany

Phone +49 40 85 37 40 61

Fax +49 40 85 15 72 75

Specification on DESY seal drawings and from Kurt Escherich is:

Material:	Al Mg Si 0.5 F22
DIN:	(3.3206.71)
EN AW-6060 / ISO:	Al Mg Si 0.5
Composition:	Al 0.5Mg 0.5Si Fe
Brinnell hardness:	HB 2.5 / 62.5 : 70

AA6060

6000 series is heat treatable. This is an extrusion grade alloy.

Composition: 0.35-0.6Mg 0.3-0.6Si 0.1-0.30 Fe

Temper T6 has Brinnell 67

AA6063

This is also an extrusion grade alloy.

Composition: 0.45-0.9Mg 0.2-0.6Si 0.35 Fe MAX

According to the Aluminum Design Manual this grade is *similar* DIN AlMgSi0.5.

Temper T6 has Brinnell 73

Temper T831 has Brinnell 70

AA5052 (ref. Matweb.com)

5000 series is strain hardened, not heat treatable.

Composition: 2.2-2.8Mg 0.15 -0.35 Cr 0.25 Si MAX 0.4 Fe MAX
H32 has Brinnell hardness 60
H34 has Brinnell hardness 68

A table from aluminum.matter.org.uk compares national alloy designations and it also shows:

AA6060 equivalent to DIN AlMgSi0.5
AA6063 equivalent to DIN AlMgSi0.5 (identical)

D. Olis has ordered (50) 3.9GHz main coupler diamond seals from EVAC, specifying their proprietary material. An email from Hans Luedi, Midwest Vacuum sales representative for EVAC, follows regarding the material (Feb.24, 2006). It seems the material is soft.

“I asked them, to send you an e-mail, but maybe they thought I would. Well, here it goes. The material is a cryogenic vacuum material, developed together with either CERN or DESY a long time ago. It is a proprietary alloy of Aluminum, almost pure aluminum. It is the best material they know of.”

Studs

Specification from Kurt Escherich at DESY is:

ASTM Material:	316L or 316LN
DIN Material:	1.4429
Permeability:	< 1.06
Or	
ASTM Material:	316L
DIN Material:	1.4404
Permeability:	< 1.06

Threads are to be rolled, not cut. Fasteners are to be electro-polished.

Email from Tug Arkan, 2/21/06

Subject: NW78 flanges (end flanges on 1.3GHz cavities)

“I talked a little bit with Axel Matheisen about the diamond seals and flanges. We need to torque the silicon bronze nuts at both ends...with 30N/m. “

Tug Arkan's observation while at DESY is that the flanges are not tightened with a torque wrench and the technicians doing the assembly do not seem to be using much force.

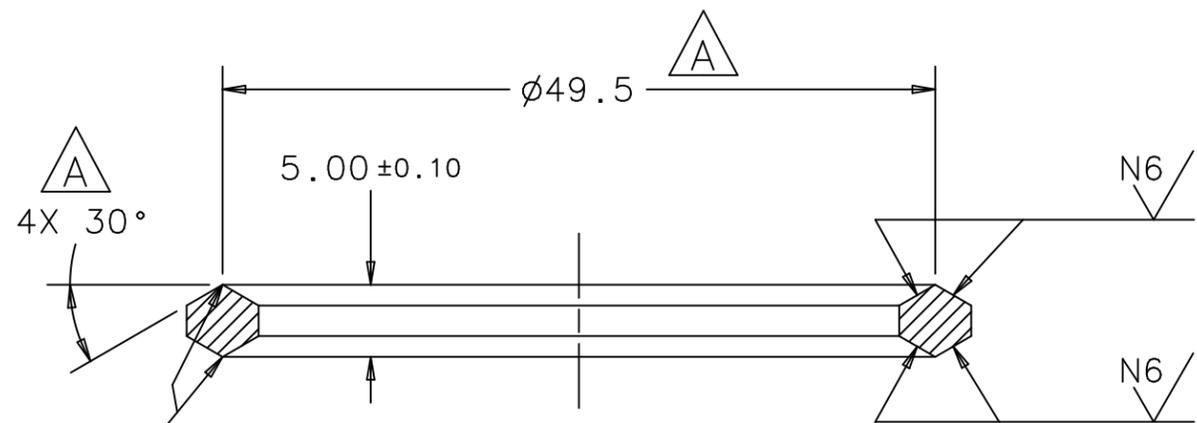
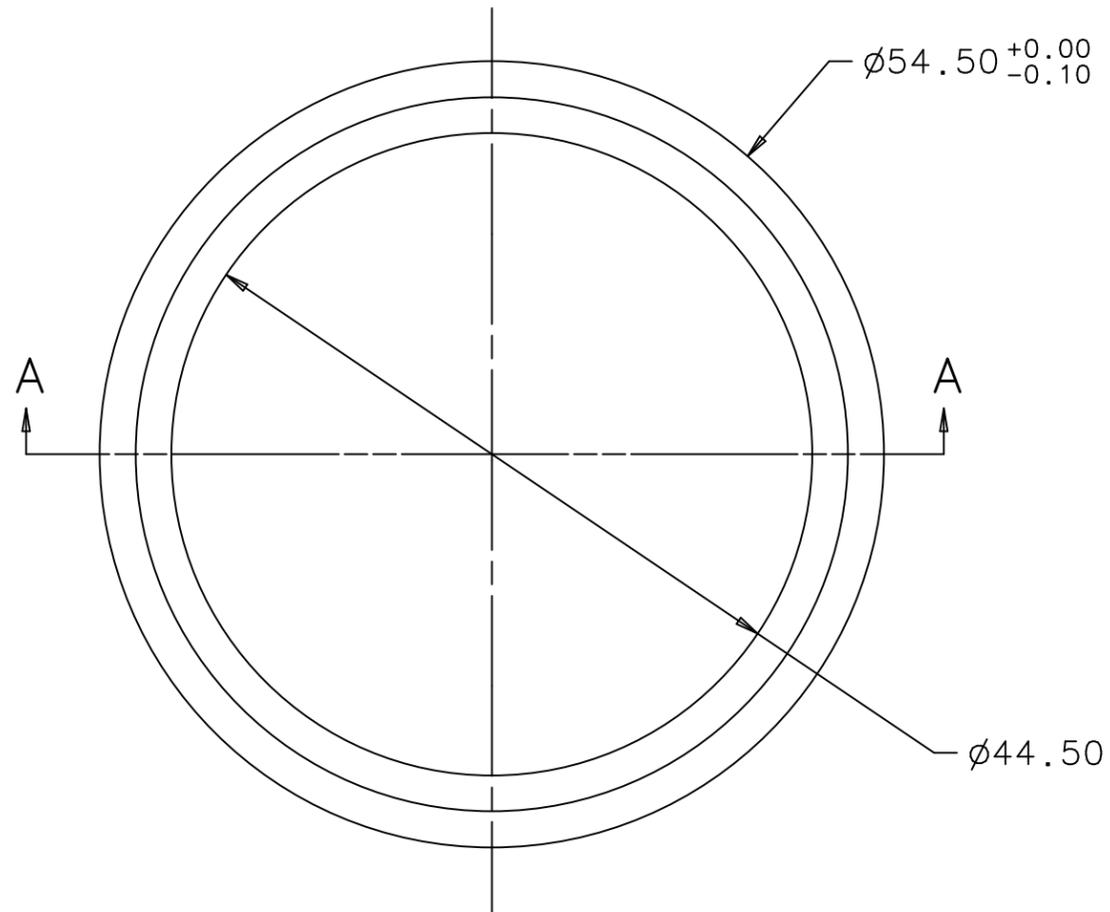
Tim Rothgeb at JLAB recommends A286 fasteners, developed by NASA for aircraft/space industry. Material has magnetic permeability < 316LN and higher strength. Tim's experience is that high torque values are required to ensure good sealing.

XFEL Technical Particular Clauses (CCTP) for Power Couplers (TTF3-like)
Written at LAL, shared with me by Serge Prat
Screws: AISI 316 (no DIN provided)

Nuts

Specification from Kurt Escherich at DESY is:

Material:	Cu Ni 1 Si
DIN:	EN 12163
ASTM:	C191010
Material Number:	CW 109 C



EDGES ARE TO BE SHARP
DON'T BREAK EDGES

SECTION A-A

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
	ER# 8021		
A	ECO# 8280; $\phi 49.5$ WAS $\phi 49.50$, ADDED NOTE 2, 4X 30° WAS 30° TYP, UPDATED TOLERANCE BLOCK, 0.13 WAS .012, MATERIAL WAS ALMGS1 0.5 F22.	D.ARNOLD	10-FEB-2006
		D.OLIS	13-FEB-2006

NOTES:

- 1.) PART IS TO BE CLEANED AND DEGREASED.
- 2.) PLATE STOCK REQUIRED TO ACHIEVE SEALING. ROUND STOCK IS NOT ALLOWED.

UNLESS OTHERWISE SPECIFIED			ORIGINATOR	DESY	
0.X	0.XX	ANGLES	DRAWN	E.PIRTLE	28-APR-2005
± 0.3	± 0.13	$\pm 1^\circ$	CHECKED	D.MITCHELL	25-MAY-2005
1. BREAK ALL SHARP EDGES 0.40 MAX. 2. DO NOT SCALE DRAWING. 3. DIMENSIONS BASED UPON ASME Y14.5M-1994 4. MAX. ALL MACH. SURFACES N7 5. DRAWING UNITS: MM			APPROVED	T.ARKAN	25-MAY-2005
			USED ON		
			MATERIAL		
			ANNEALED 5052 ALUMINUM PLATE (SEE NOTE 2)		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

DESY 1.3GHZ TESLA
CAVITY DRESSED
SEAL FOR NW40 FLANGE

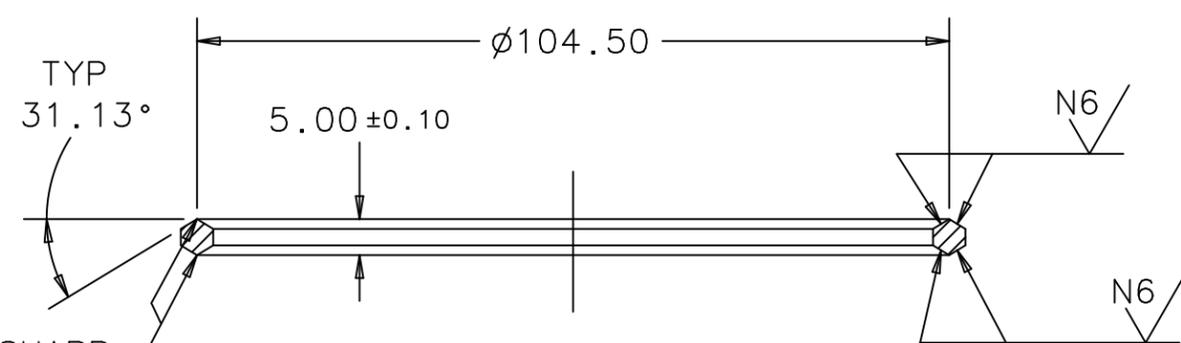
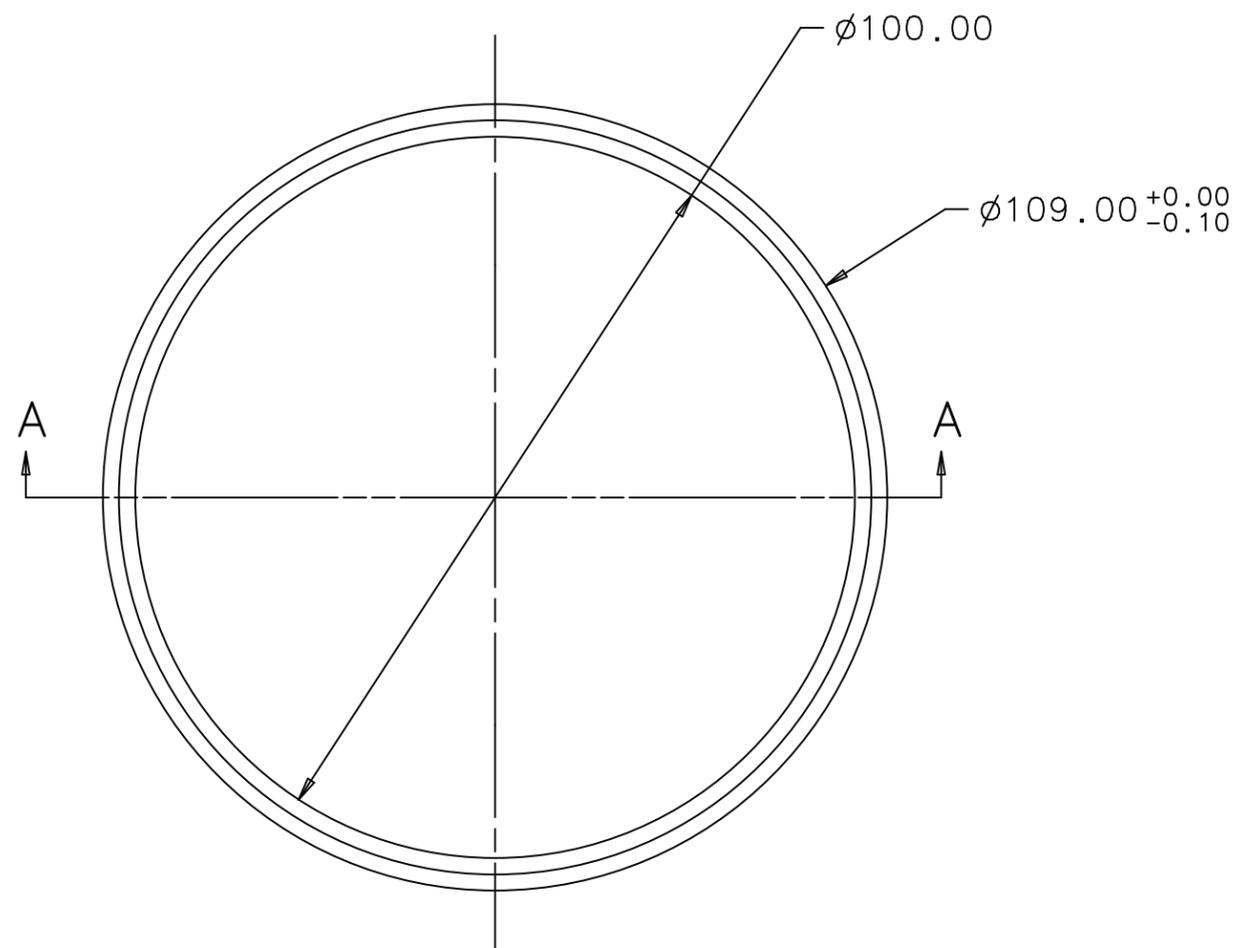
SCALE	DRAWING NUMBER	SHEET	REV
2:1	4904.010-MB-439231	1 OF 1	A

CREATED WITH : Ideas11NXSeries GROUP: TD/DDCIS-DESIGN-COMPUTING

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF DESY
ACCORDING TO DIN 34 / ISO 16016. THIS DRAWING HAS
BEEN REDRAWN WITH DESY'S PERMISSION FOR FABRICATION
PURPOSES WITHIN THE USA AND IS TO BE USED
EXCLUSIVELY WITHIN FERMILAB. USAGE OUTSIDE OF
FERMILAB MUST BE APPROVED BY DESY.

FOR REFERENCE ONLY
NOT FOR FABRICATION
MAY NOT BE CURRENT

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
ER# 8021			



EDGES ARE TO BE SHARP
DON'T BREAK EDGES

SECTION A-A

NOTES:

- 1) PART IS TO BE CLEANED AND DEGREASED

UNLESS OTHERWISE SPECIFIED			ORIGINATOR	DESY	
.XX mm	.XXX in	ANGLE	DRAWN	E. PIRTLE	28-APR-2005
± 0.30	$\pm .012$	$\pm 1^\circ$	CHECKED	D. MITCHELL	25-MAY-2005
1. BREAK ALL SHARP EDGES 0.4mm/.015in MAX. 2. DO NOT SCALE DRAWING. 3. DIMENSIONS BASED UPON ASME Y14.5-M-1994 4. MAX. ALL MACH. SURFACES N7 5. DRAWING UNITS: METRIC			APPROVED	T. ARKAN	25-MAY-2005
			USED ON		
			MATERIAL		
			ALMGS1 0.5 F22		



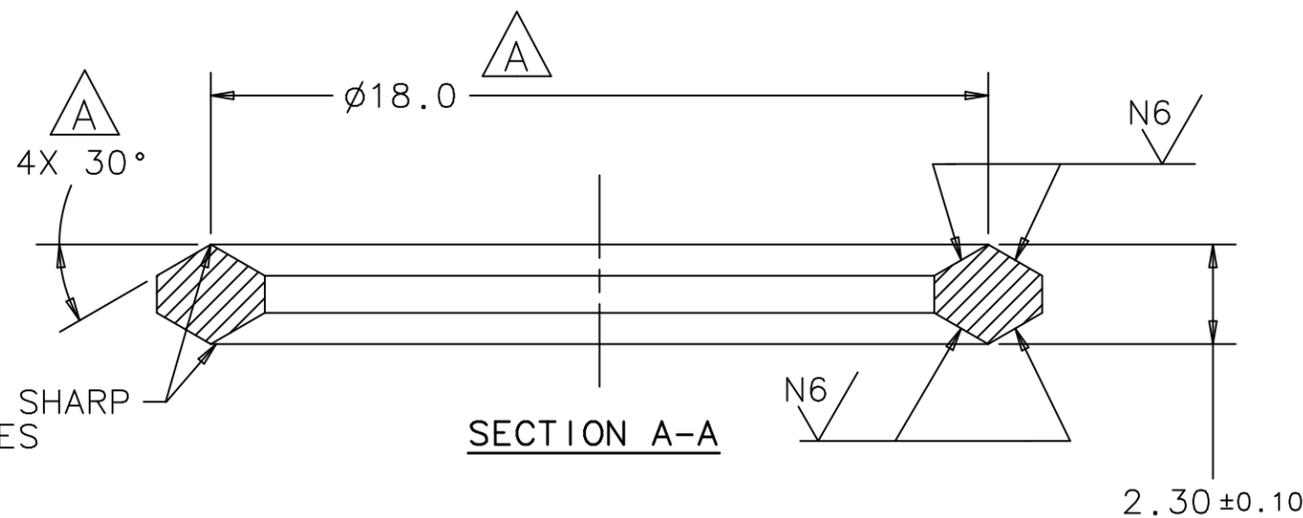
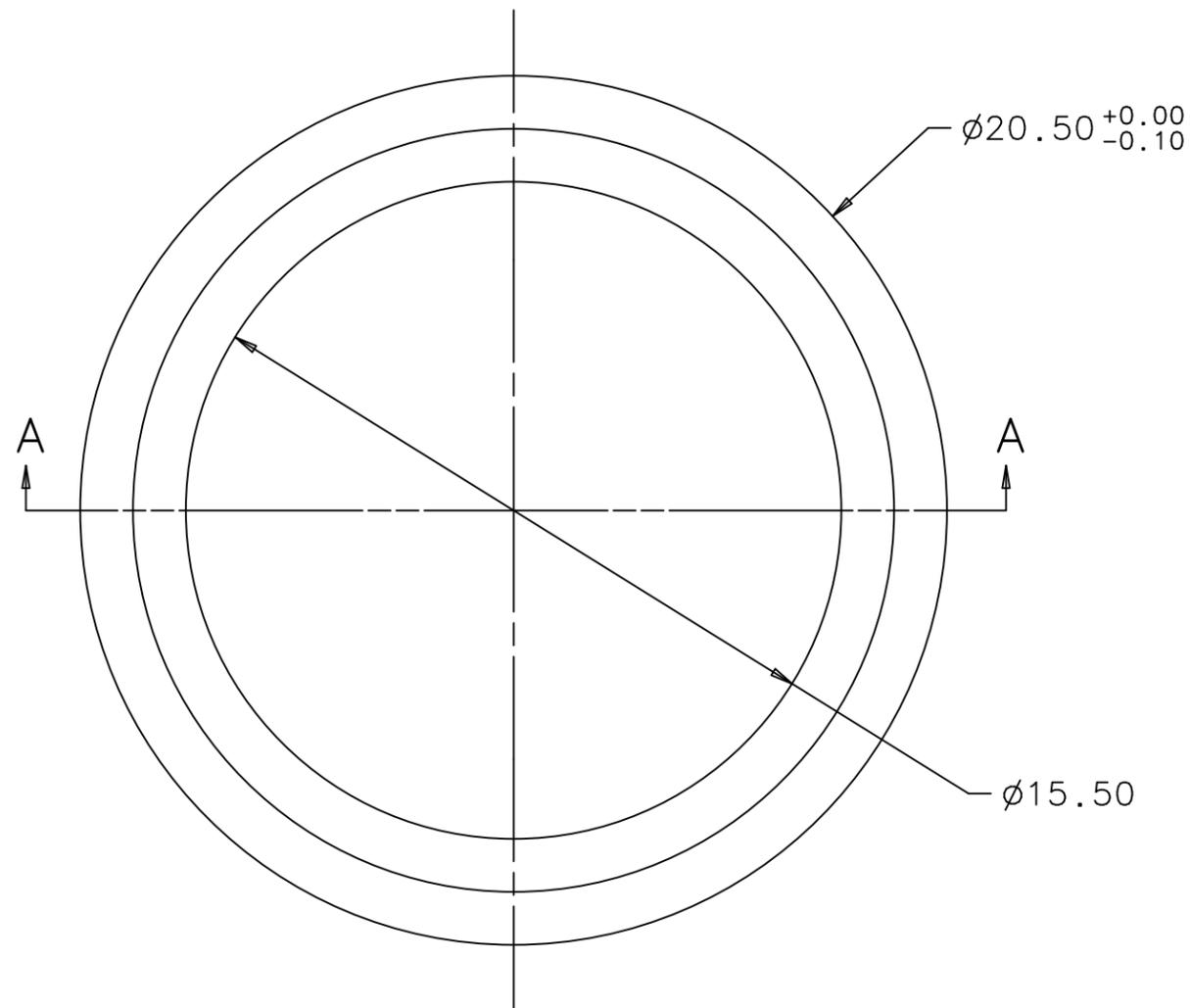
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UNITED STATES DEPARTMENT OF ENERGY

DESY 1.3GHZ TESLA
CAVITY DRESSED
SEAL FOR NW78 FLANGE

SCALE	DRAWING NUMBER	SHEET	REV
1:1	4904.010-MB-439232	1 OF 1	
CREATED WITH : Ideas11NXSeries		GROUP: ACCELERATOR MECH. SUPPT.	

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FERMILAB MUST BE APPROVED BY DESY.

FOR REFERENCE ONLY
NOT FOR FABRICATION
MAY NOT BE CURRENT



REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
	ER# 8021		
A	ECO# 8280; $\phi 18.0$ WAS $\phi 18.00$, ADDED NOTE 2, 4X 30° WAS 30° TYP, UPDATED TOLERANCE BLOCK, 0.13 WAS .012, MATERIAL WAS ALMGS1 0.5 F22.	D.ARNOLD	10-FEB-2006
		D.OLIS	13-FEB-2006

NOTES:

- 1.) PART IS TO BE CLEANED AND DEGREASED.
- $\triangle A$ 2.) PLATE STOCK REQUIRED TO ACHIEVE SEALING. ROUND STOCK IS NOT ALLOWED.

UNLESS OTHERWISE SPECIFIED			ORIGINATOR	DESY	
0.X	0.XX	ANGLES	DRAWN	E.PIRTLE	28-APR-2005
± 0.3	± 0.13	$\pm 1^\circ$	CHECKED	D.MITCHELL	25-MAY-2005
1. BREAK ALL SHARP EDGES 0.40 MAX. 2. DO NOT SCALE DRAWING. 3. DIMENSIONS BASED UPON ASME Y14.5M-1994 4. MAX. ALL MACH. SURFACES N7 5. DRAWING UNITS: MM			APPROVED	T.ARKAN	25-MAY-2005
			USED ON		
			MATERIAL		
			ANNEALED 5052 ALUMINUM PLATE $\triangle A$ (SEE NOTE 2)		

EDGES ARE TO BE SHARP
DON'T BREAK EDGES

SECTION A-A

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF DESY ACCORDING TO DIN 34 / ISO 16016. THIS DRAWING HAS BEEN REDRAWN WITH DESY'S PERMISSION FOR FABRICATION PURPOSES WITHIN THE USA AND IS TO BE USED EXCLUSIVELY WITHIN FERMILAB. USAGE OUTSIDE OF FERMILAB MUST BE APPROVED BY DESY.

FOR REFERENCE ONLY
NOT FOR FABRICATION
MAY NOT BE CURRENT

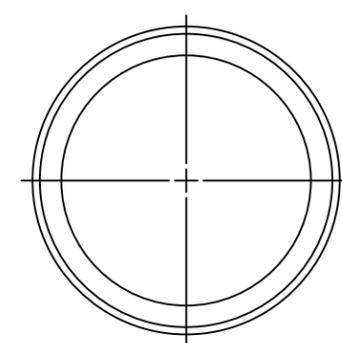
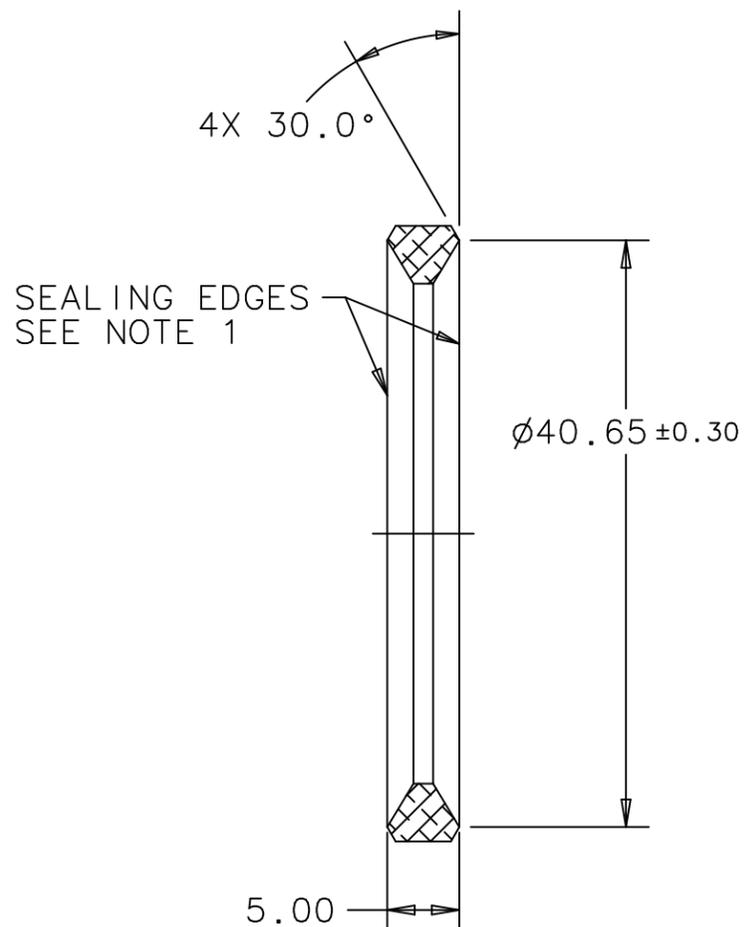
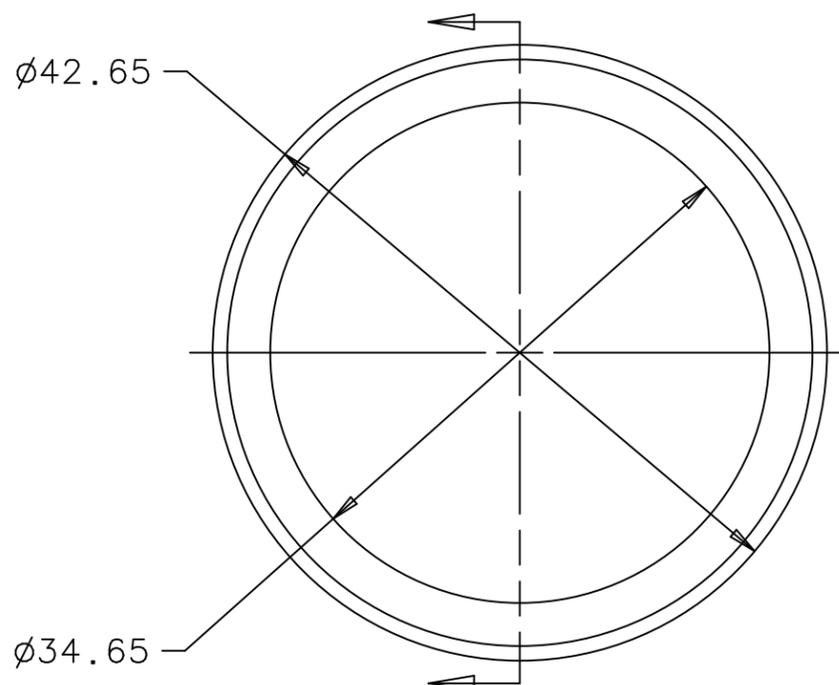
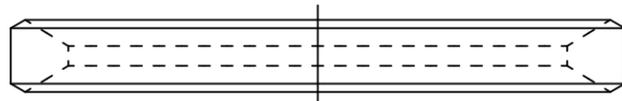


FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

DESY 1.3GHZ TESLA
CAVITY DRESSED
SEAL FOR NW8 FLANGE

SCALE	DRAWING NUMBER	SHEET	REV
6:1	4904.010-MB-439233	1 OF 1	A
CREATED WITH : Ideas11NXSeries		GROUP: TD/DDCIS-DESIGN-COMPUTING	

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
	ER # 8186		



ACTUAL SIZE

SECTION VIEW

NOTES:

- 1.) BREAK SHARP CORNERS ON I.D. AND O.D. BUT NOT ON SEALING EDGES.
- 2.) KEEP CLEAN AND GREASE FREE.

FOR REFERENCE ONLY
NOT FOR FABRICATION
 MAY NOT BE CURRENT

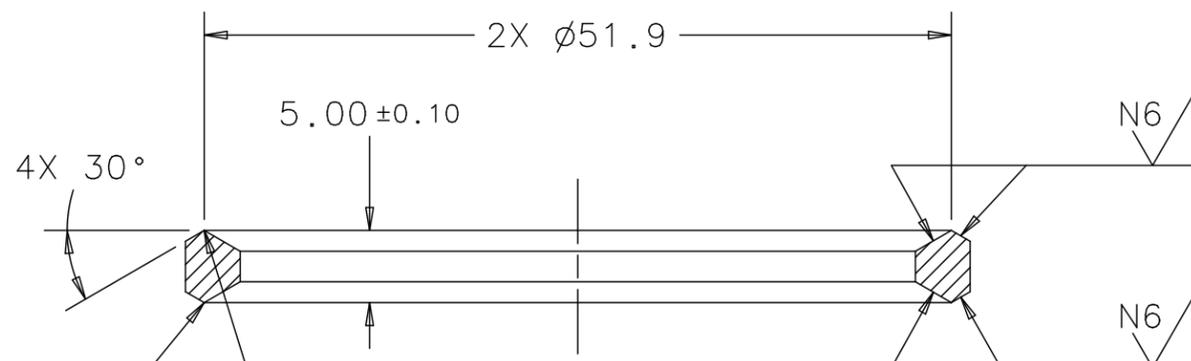
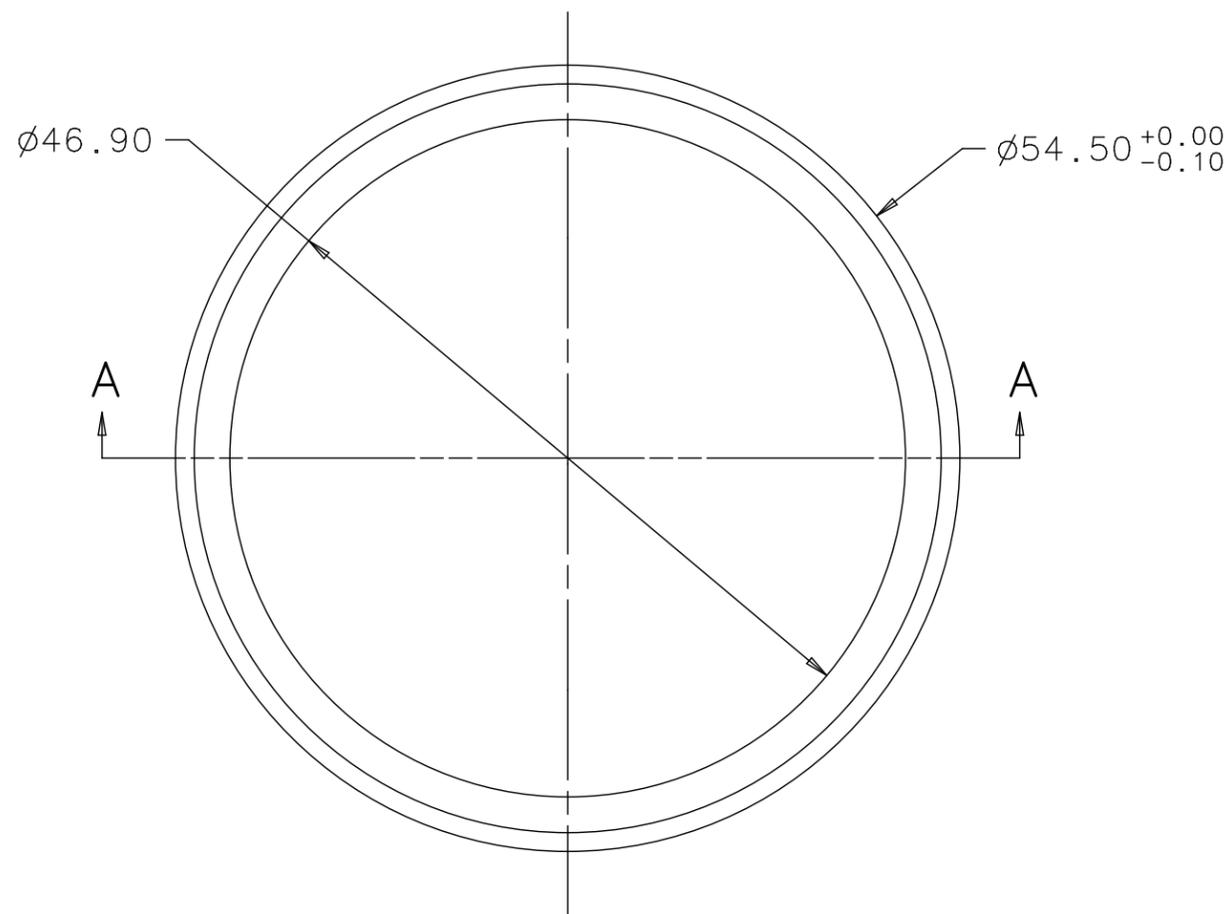
UNLESS OTHERWISE SPECIFIED			ORIGINATOR	D.OLIS	04-NOV-2005
0.X	0.XX	ANGLES	DRAWN	D.ARNOLD	Ck
\pm ---	\pm 0.10	\pm 1.0°	CHECKED	D.OLIS	28-NOV-2005
1. BREAK ALL SHARP EDGES 0.25 MAX. 2. DO NOT SCALE DRAWING. 3. DIMENSIONS BASED UPON ASME Y14.5M-1994 4. MAX. ALL MACH. SURFACES 0.8 5. DRAWING UNITS: MM			APPROVED	D.OLIS	28-NOV-2005
			USED ON		
			MATERIAL		

 **FERMI NATIONAL ACCELERATOR LABORATORY**
 UNITED STATES DEPARTMENT OF ENERGY

SCRF - 3RD HARMONIC ACCEL
 MAIN COUPLER
 CELL TO FLANGE HEX SEAL

SCALE 2:1 & NOTED	DRAWING NUMBER 5520.000-MB-440080	SHEET 1 OF 1	REV
CREATED WITH : Ideas11NXSeries		GROUP: TD/DCCIS-DESIGN-COMPUTING	

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
	INITIAL RELEASE - ER# 8968		



EDGES ARE TO BE SHARP
DO NOT BREAK EDGES

SECTION A-A

NOTES:

- 1.) PART IS TO BE CLEANED AND DEGREASED.
- 2.) PLATE STOCK REQUIRED TO ACHIEVE SEALING. ROUND STOCK IS NOT ALLOWED.

FOR REFERENCE ONLY
NOT FOR FABRICATION
MAY NOT BE CURRENT

UNLESS OTHERWISE SPECIFIED			ORIGINATOR	FNAL	28-APR-2005
0.X	0.XX	ANGLES	DRAWN	D.MITCHELL	25-JAN-2008
± 0.3	± 0.13	$\pm 1^\circ$	CHECKED	D.OLIS	28-JAN-2008
1. BREAK ALL SHARP EDGES 0.40 MAX. 2. DO NOT SCALE DRAWING. 3. DIMENSIONS BASED UPON ASME Y14.5M-1994 4. MAX. ALL MACH. SURFACES N7 5. DRAWING UNITS: mm			APPROVED	T.ARKAN	28-JAN-2008
			USED ON		
			MATERIAL ANNEALED 5052 ALUMINUM PLATE (SEE NOTE 2)		



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UNITED STATES DEPARTMENT OF ENERGY

SCRF-3RD HARMONIC-ACCEL
HORIZONTAL TESTING
SEAL, HELIUM FILL PORT

SCALE	DRAWING NUMBER	SHEET	REV
2:1	5520.000-MB-458394	1 OF 1	
CREATED WITH : Ideas12NXSeries		GROUP: TD/SRF-DEVELOPMENT	