Hardware required for cold tests of bare DQW CC at Jefferson lab

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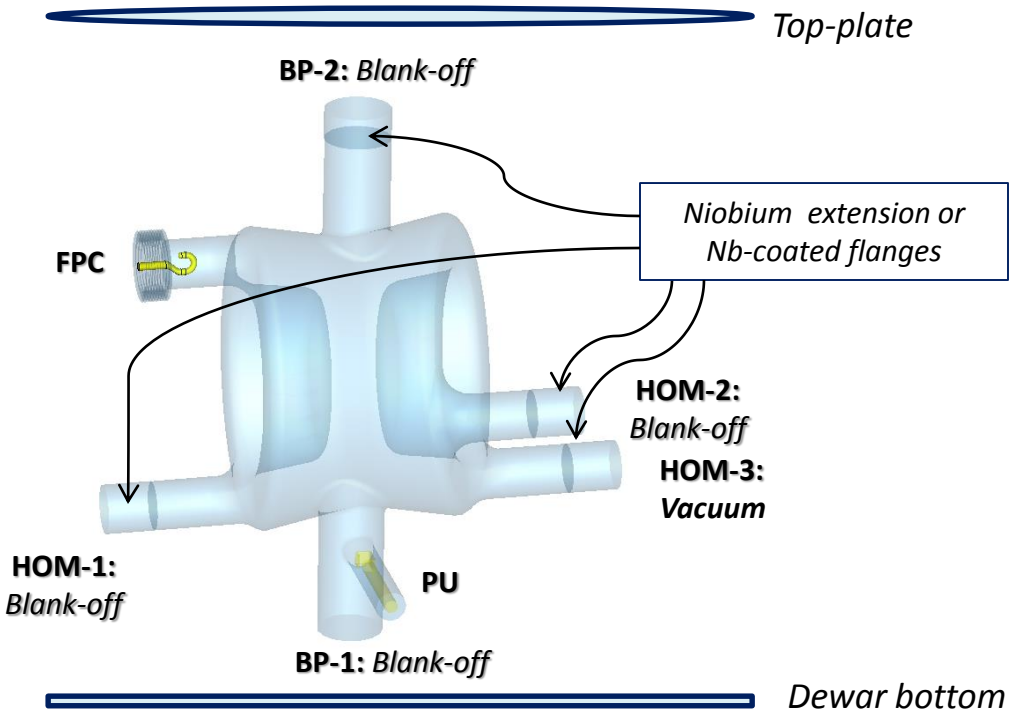
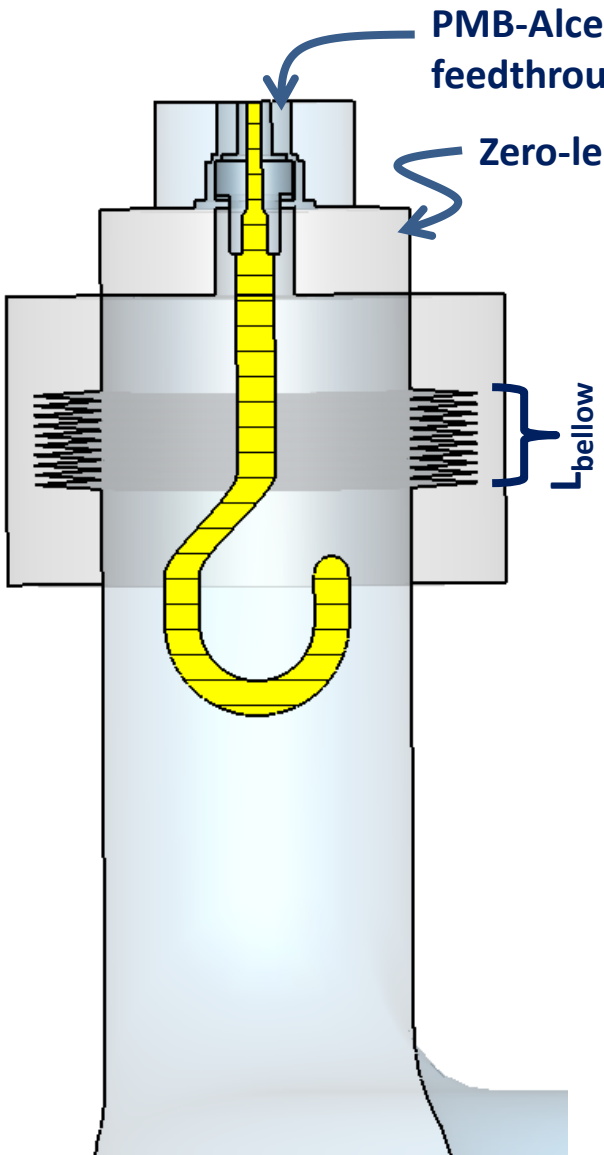
SPS DQWCC – Bare cavity cold tests: ***port assignation***



SPS DQWCC – Bare cavity cold tests: ***hardware***

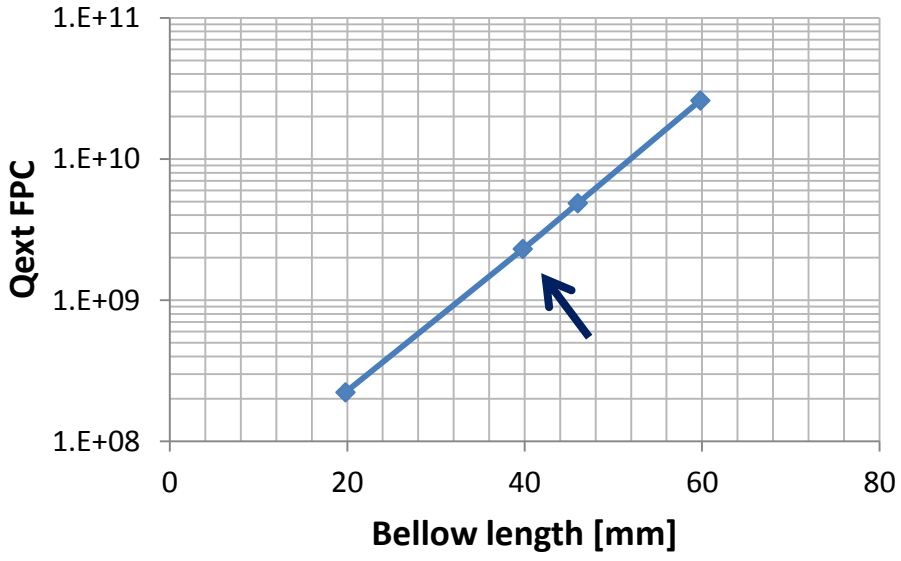
Part	**Material**	**Size**	**Number needed**	**Status**
RF-seal gasket	copper	DN63CF		In stock at BNL
RF-seal gasket	copper	DN100CF		In stock at BNL
Conventional gasket	copper	DN40	1	Check
Blank-off flange	Nb-coated SS	DN63CF	2	Request to CERN + spares
Blank-off flange	Nb-coated SS	DN100CF	2	Request to CERN + spares
Zero length flange	Nb-coated SS	DN63CF	1	Request to CERN + spares
Feedthrough	--	mini	1	In stock at BNL
Feedthrough	--	DN40	1	Check
Input probe	TBD	--	1	TBD
Pickup probe	TBD	--	1	TBD

SPS DQWCC – Cold tests: *bellow characteristics (new)*



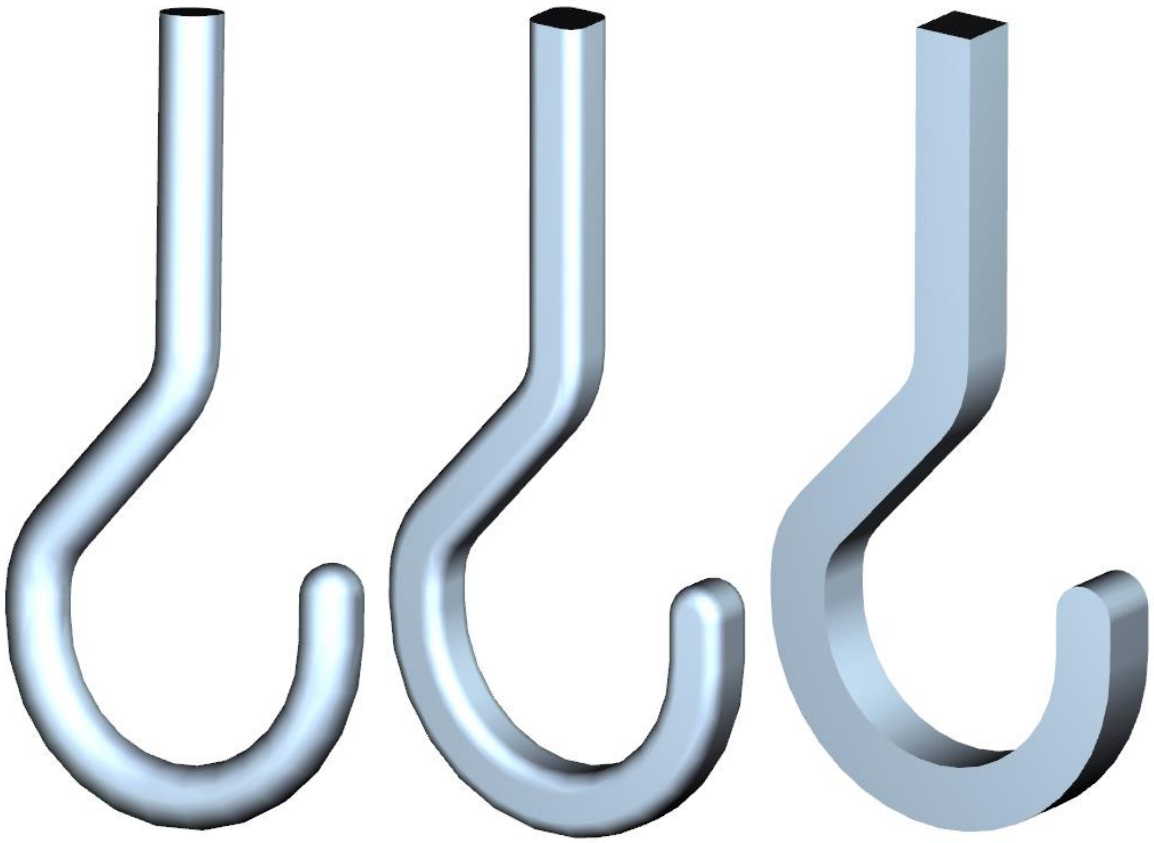
L_{bellow} [mm]	Qext FPC	Pdiss FPC [W]	Bpk hook [mT]	Pdiss insertion feedthru [mW]
Max. coupling	19.8	2.23e8	1.9	1.6	50
Nom. coupling	39.8	2.30e9	0.16	0.6	4
Nom. coupling	46.0	4.87e9	0.08		
Min. coupling	59.8	2.6e10			

** Values calculated for nominal deflecting voltage of 3.34 MV.*



SPS DQWCC – Cold tests: ***FPC hook - fabrication***

Hooks with different blending radii – **machining options using EDM**
(Electric Discharge Machining)



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SPS DQWCC – Cold tests: ***FPC hook***

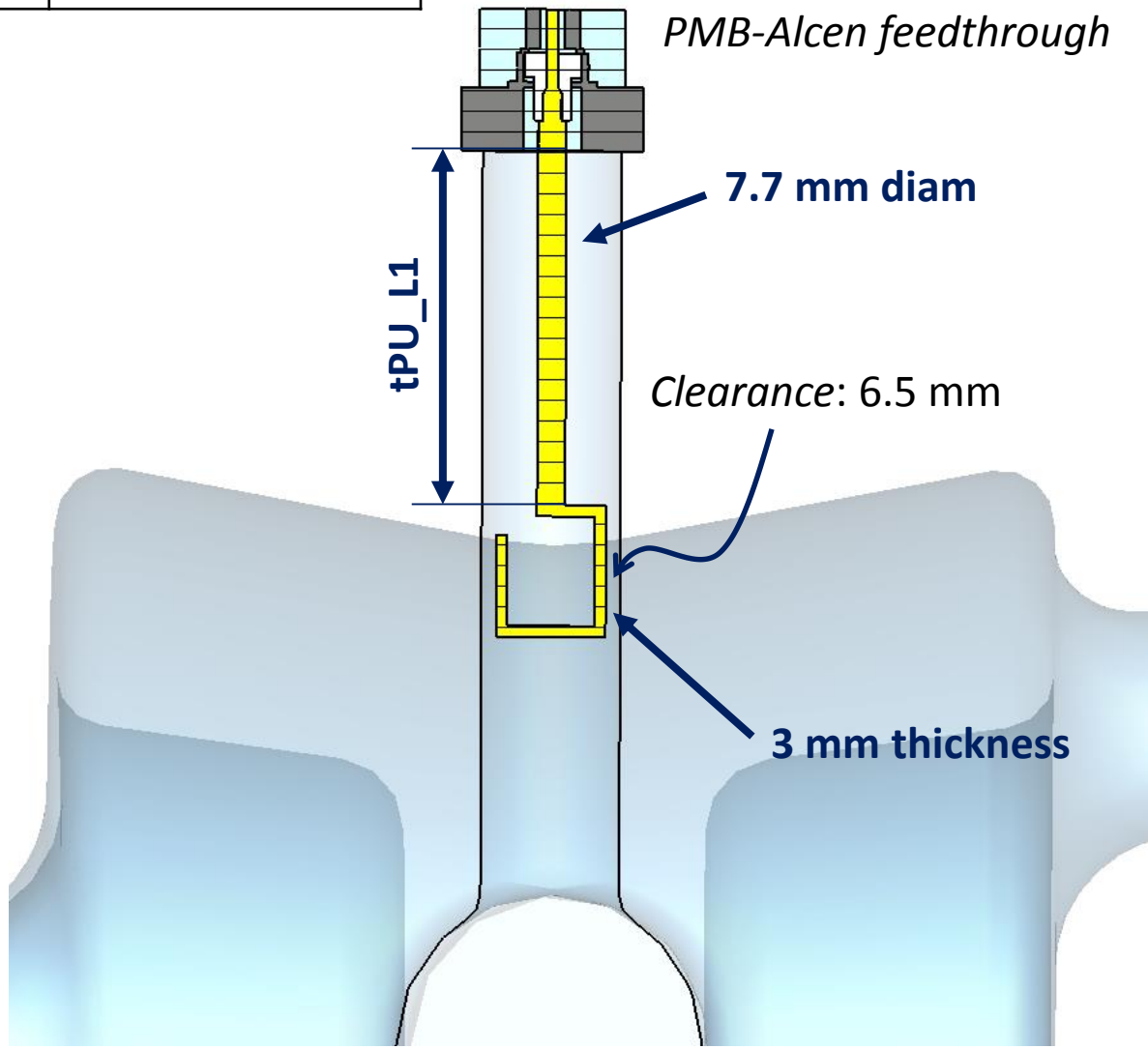
Review:
- Penetration if no movable system is available
- Losses in hook → material choice

SPS DQWCC – Cold tests: ***PU antenna***

File: > F:\CST\DQWCC for SPS\Cold test - calculations\V16k-CST_withFilter_nFPC-26-2_tFPC-19 - PU-16.cst

sim	tPU_L1 (mm)	Q_{ext}^{PU}	P_{ext}^{PU} (W) [3.34 MV]
PU16	132	3.3e10	0.47

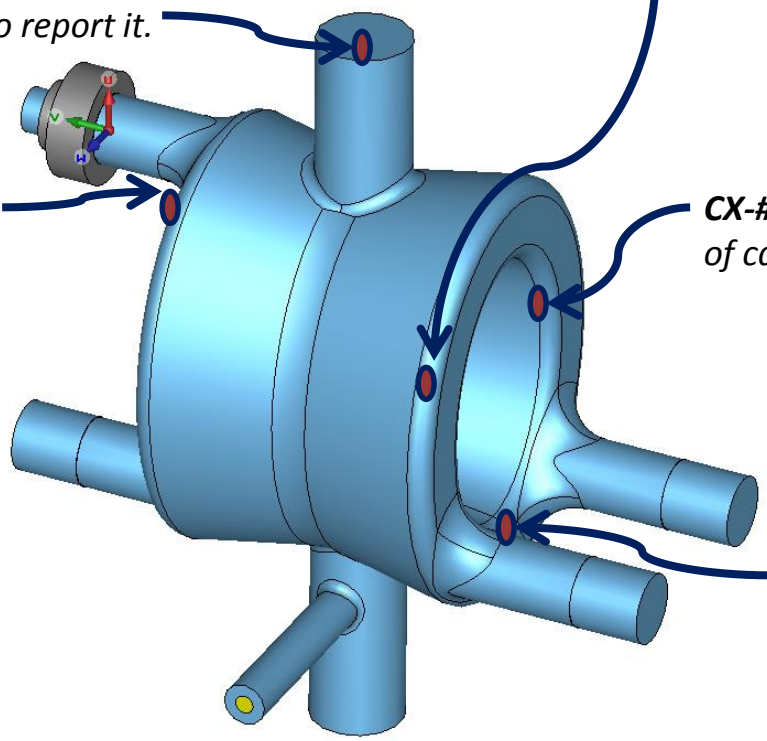
- Hook in copper
- Heat loss = 3 mW
- Mass = 80 grams
- This model has increased clearance of 6.5 mm from hook to tube wall.



SPS DQWCC – Cold tests: ***instrumentation***

***CX-#5**: on top of BP-A to monitor temperature but also if He level goes down and He level probe fails to report it.*

***CX-#2**: external radius of cavity ring*



***CX-#3**: internal radius at interface between cavity and FPC tube*

***CX-#1**: internal radius of cavity ring*

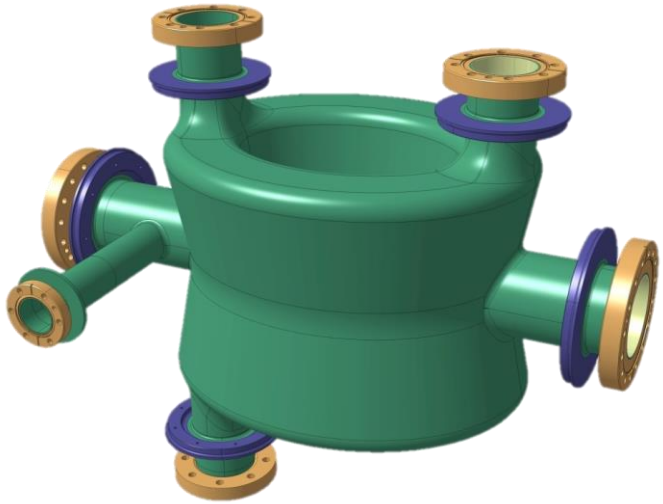
***CX-#4**: between lower HOM ports, on internal radius of cavity ring*

More?

SPS DQWCC – Cold tests: ***power losses on ports***

		Nb-coated SS	Order(Q)	Stainless Steel	Order(Q)
Beam port with PU tube	Flange	4 nW	18	12 mW	12
		Conventional		RF-seal	
	Cu gasket	1.4 mW	13	68 uW	14
Beam port without PU tube		Nb-coated SS		Stainless Steel	
	Flange	0.11 uW	17	330 mW	11
		Conventional		RF-seal	
	Cu gasket	32 mW	12	1.5 mW	13
Three HOMs		Nb-coated SS		Stainless Steel	
	Flange	1.8 mW	13	5.4 W	9
		Conventional		RF-seal	
	Cu gasket	700 mW	10	36 mW	12
PU		Nb-coated SS		Stainless Steel	
	Flange	<<		4.4 uW	16
		Conventional		RF-seal	
	Cu gasket	35 uW	15	17 nW	18

Alternative: use niobium extension tubes

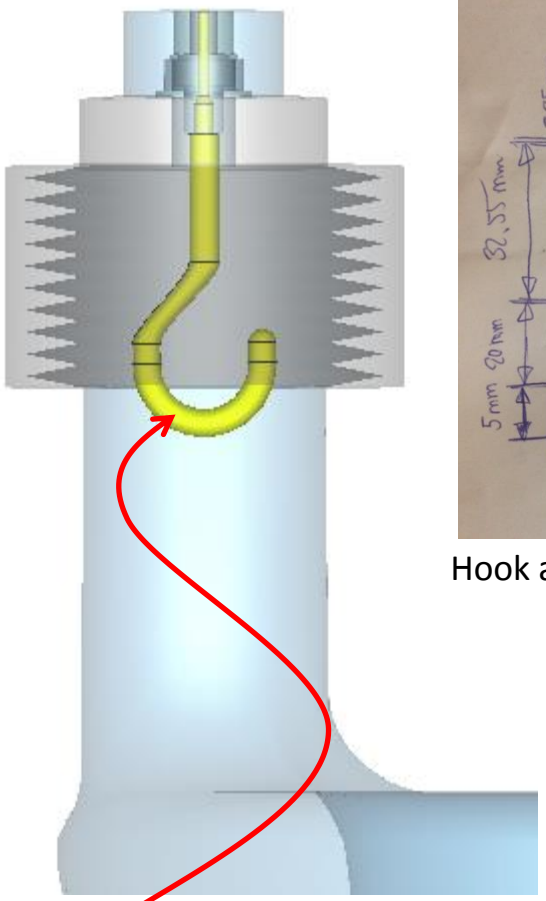


Material	**Rs**	
Nb, 2K	10	nOhm
Cu, 2K (anomalous skin + roughness)	8	mOhm
SS, 2K (Bellavia's data for SS304 at 4K)	30	mOhm

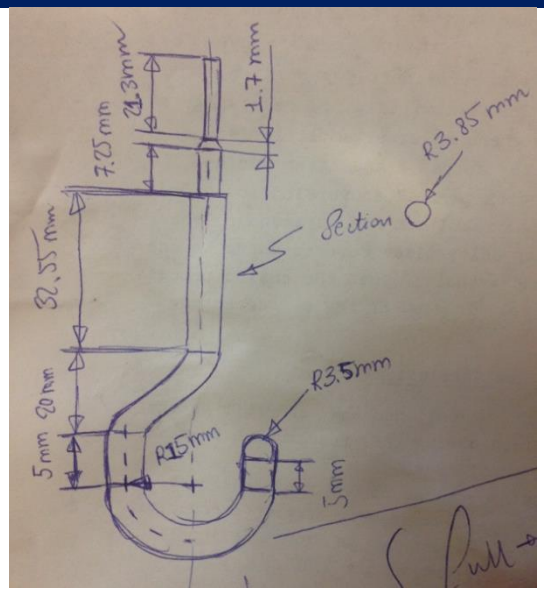
Note:
Qloss ~ 10^10 impacts on measured cavity Q;
Qloss ~ 10^11 starts to be acceptable...

Rule of thumb:
30 dB power attenuation each diameter-long tube section

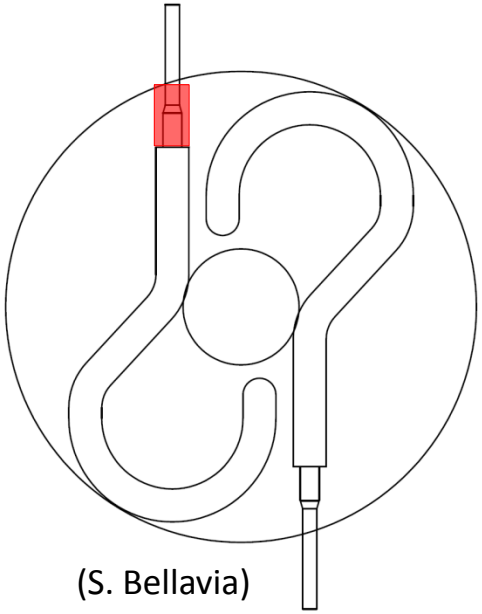
SPS DQWCC – Cold tests: *FPC hook - material*



About 0.6 mT max Bpk on hook for 3.34 MV; 0.16 W dissipated in hook is made of copper



Hook about 7 mm-diam; 145 mm-long



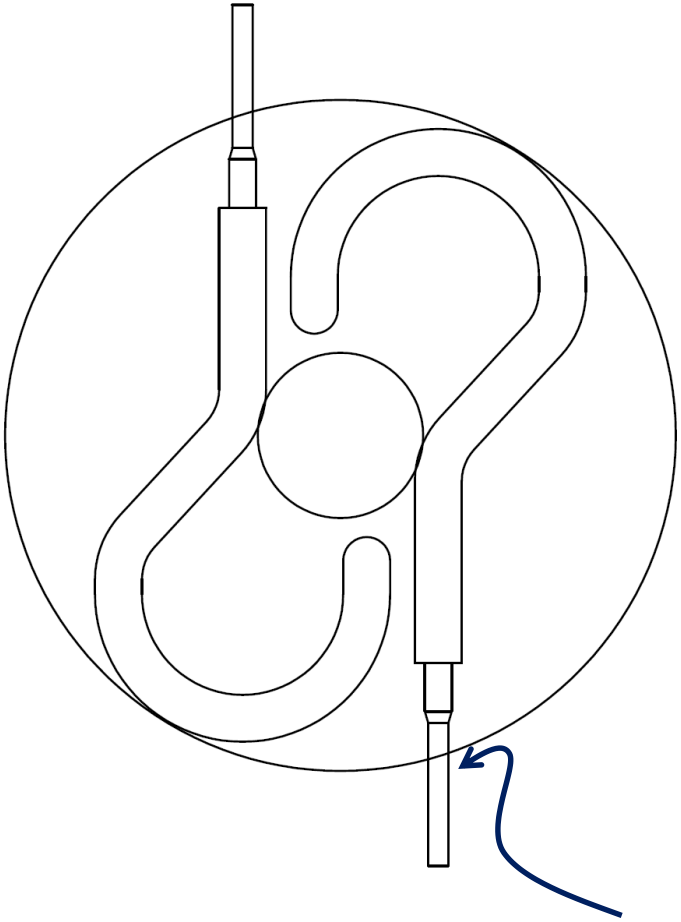
(S. Bellavia)

Two SPS-DQWCCs → two FPC hooks

Round **piece can accommodate two hooks**:

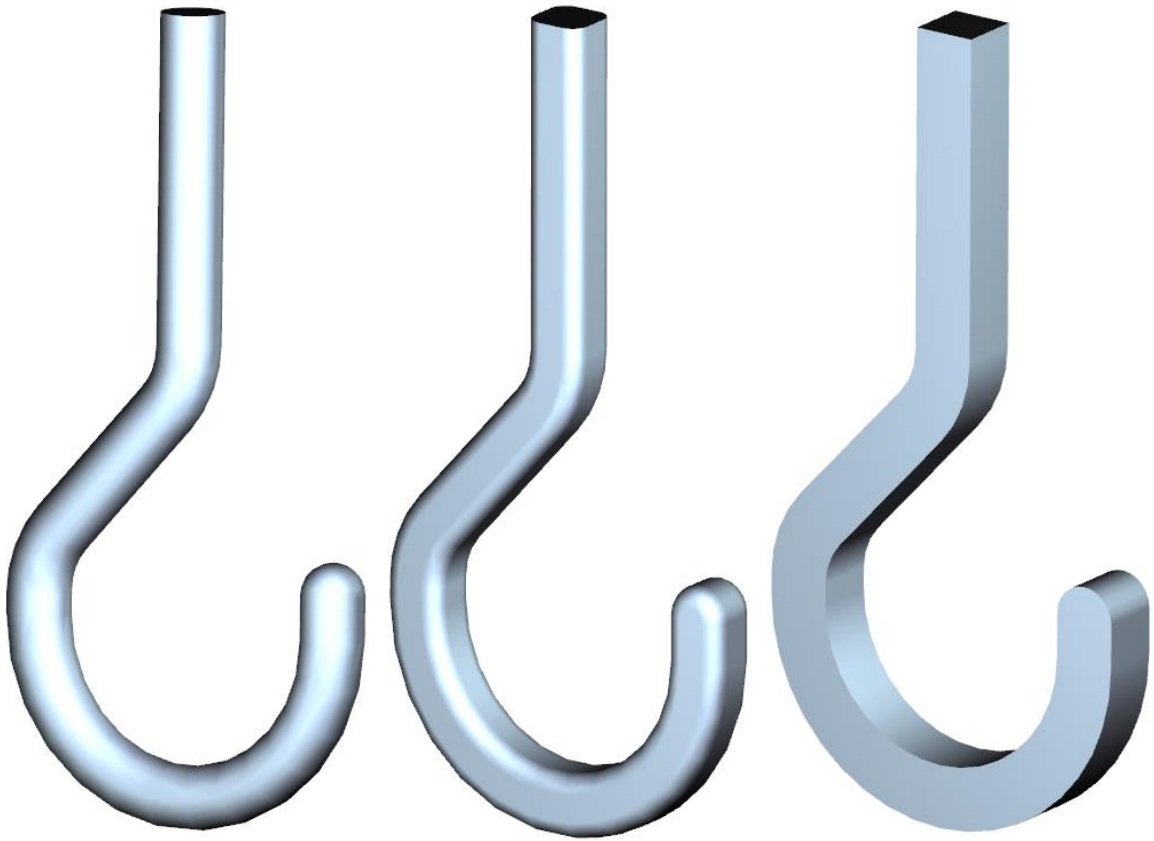
- get hooks in one piece
- avoid bending piece to preserve mech. prop.

SPS DQWCC – Cold tests: *FPC hook - fabrication*



Made of NbTi (harder than Nb, better if we need to thread this piece). It can then be TiG weld to Nb.

Hooks with different blending radii – **machining options using EDM** (Electric Discharge Machining)



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