Structure Testing, Coupler Design, Structure Calculations.

G.Romanov, FNAL

ICG8, June 24-27, SLAC

Structure testing

RF quality control after manufacturing

•Single cell QC

•RF measurements of disk stacks

RF measurements after brazing of parts

•Stack after brazing

•Couplers after brazing

RF tuning of complete structure

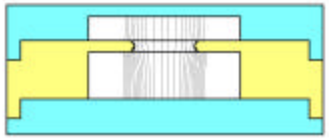
•Plunger measurements and tuning of couplers

•Cell tuning

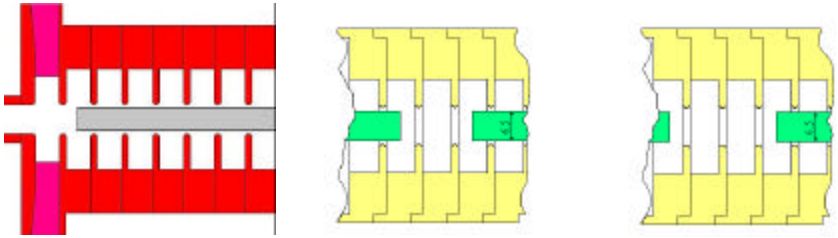
•Final tuning of couplers

Timergali Khabibouline, automation of RF measurements and tuning procedures
Ivan Gonin, electrodynamics simulations.

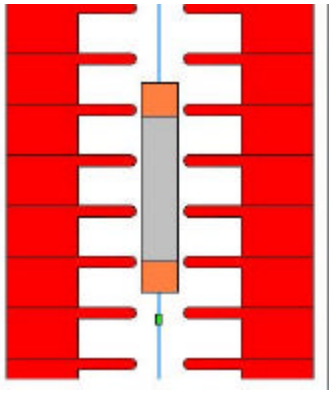
Structure testing



Input disk sets QC. Short stacks.
Fundamental modes, HOM, Q



Stacks, brazed stacks
Fundamental modes, HOM,
Nodal measurements



Couplers, brazed structures.
Complete tuning and matching.

Structure testing

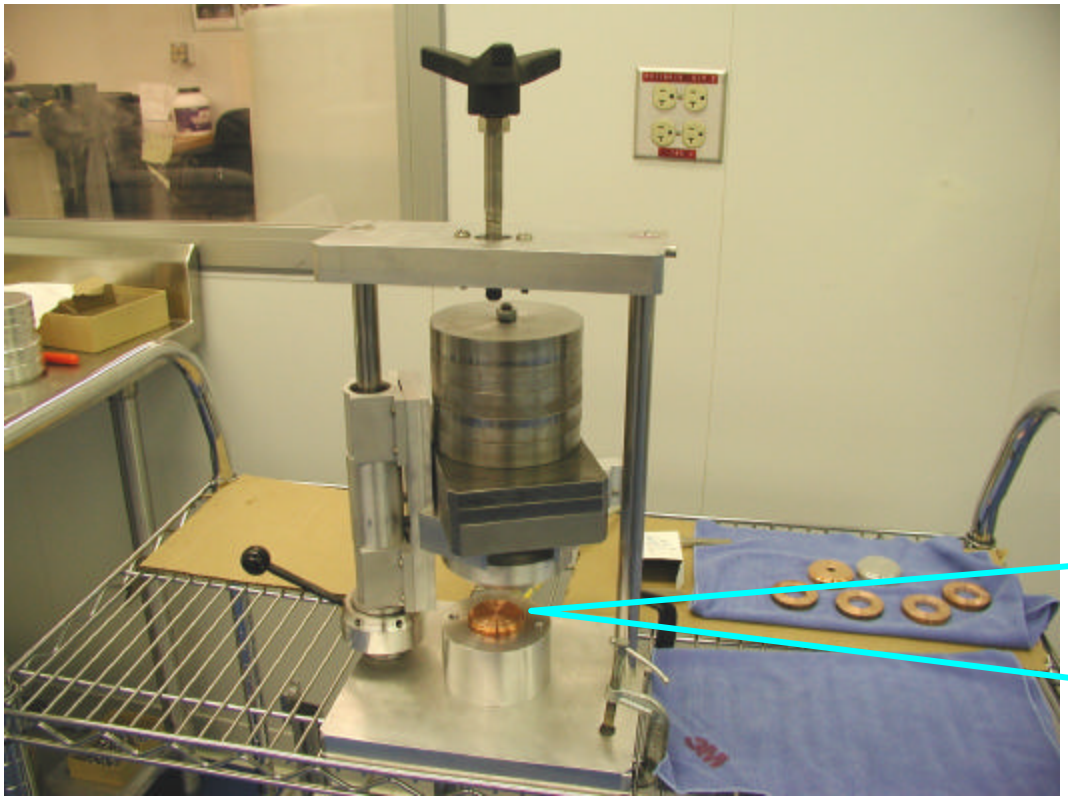
Single cell QC.

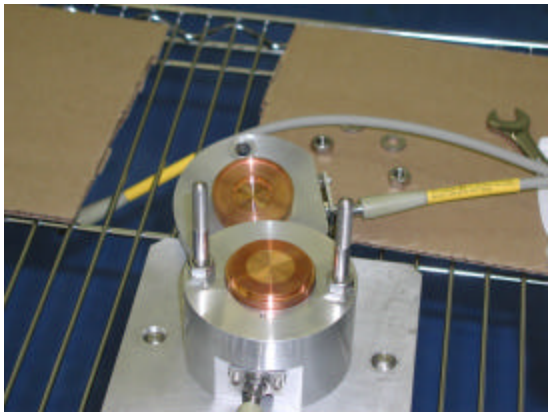
-Structure is tapered. Absolute measurements is not an appropriate way.

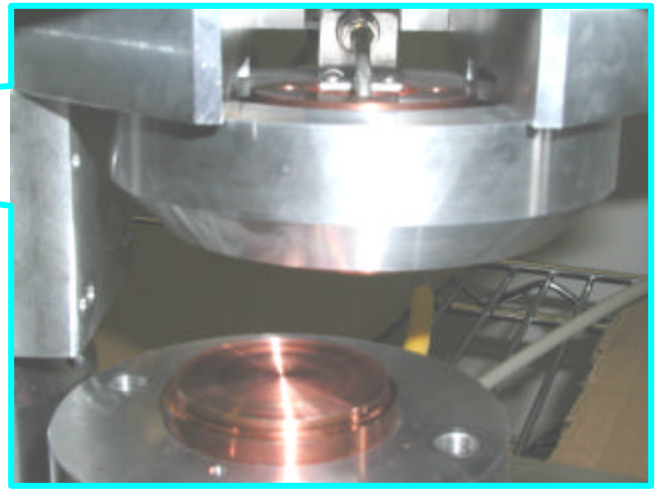
- So, relative measurements – compare calculations and measurements, compare master disks, single disks and stacks of disks.

Structure testing

Single disk QC Set-Up

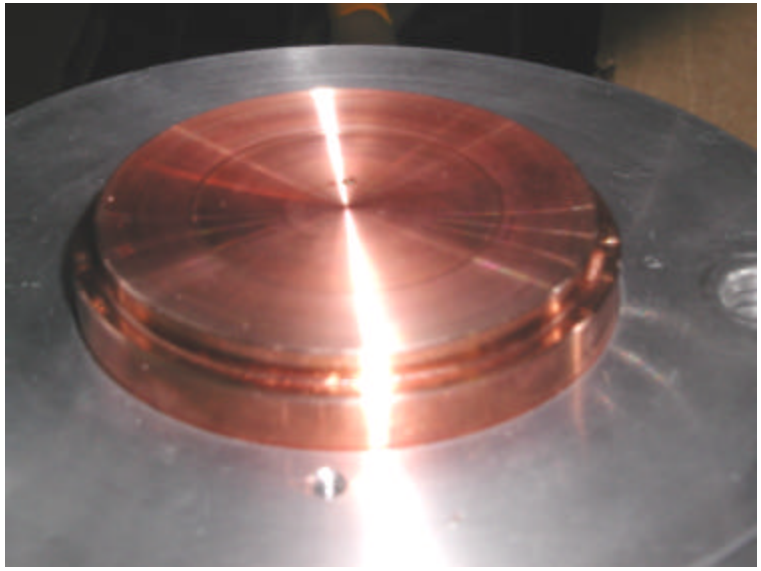




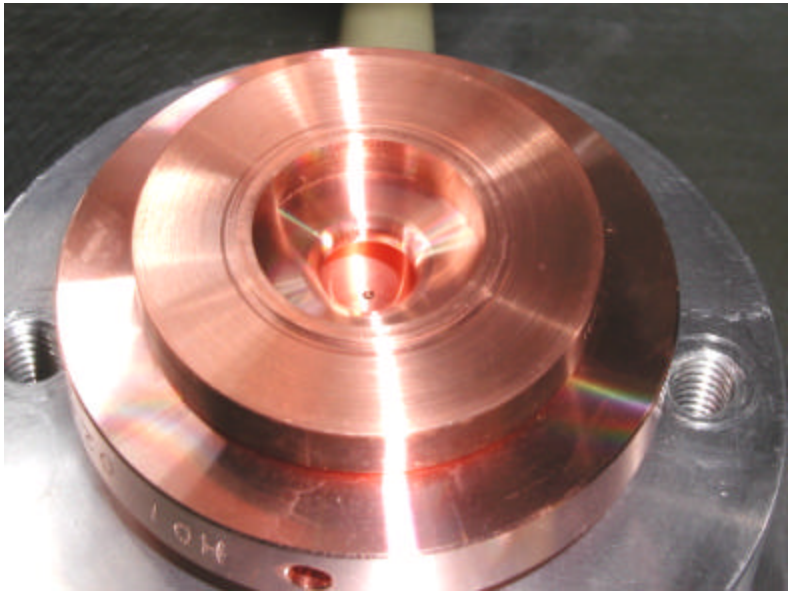


Structure testing

Single disk QC Set-Up



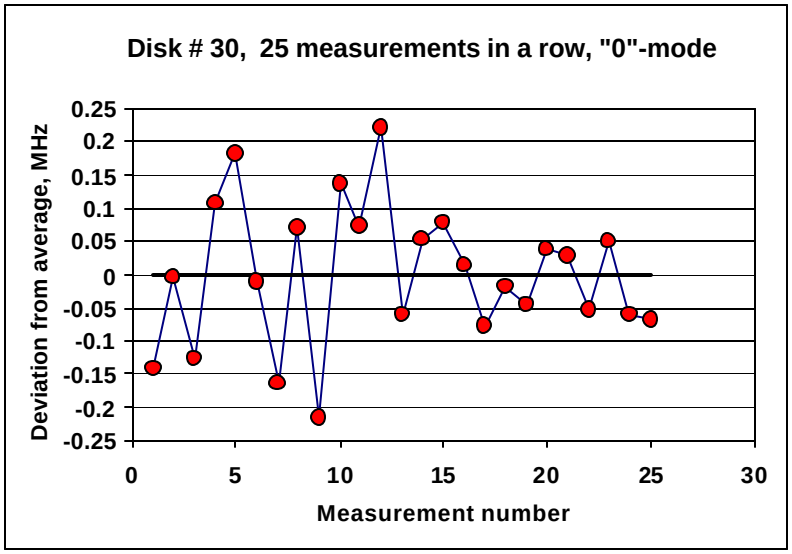
Ground-block

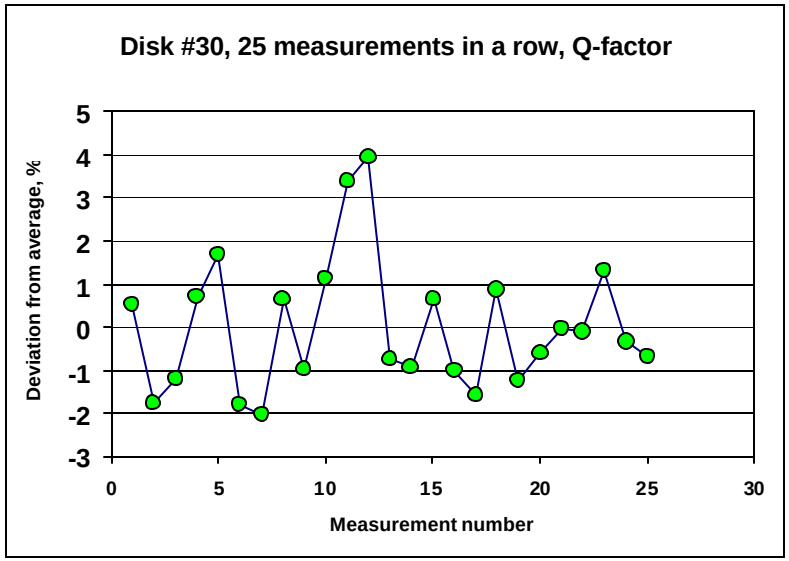


FXB-001 disk and half-cell

Structure testing

Single disk QC. Accuracy.



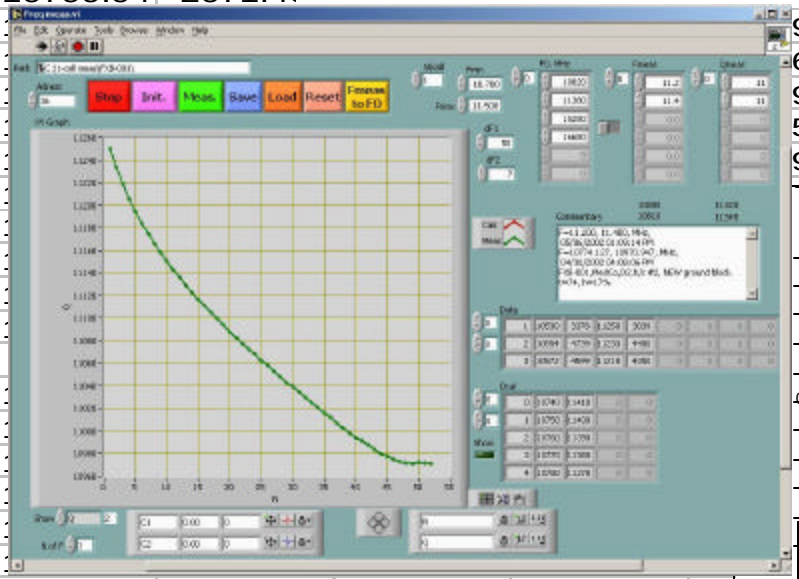


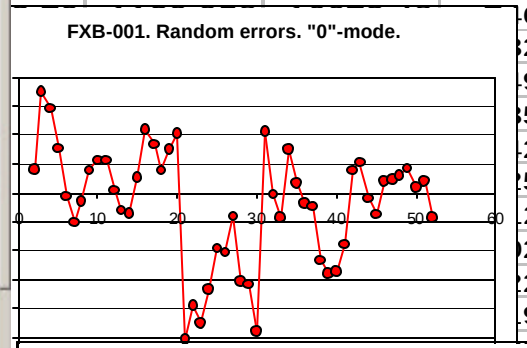
Progress

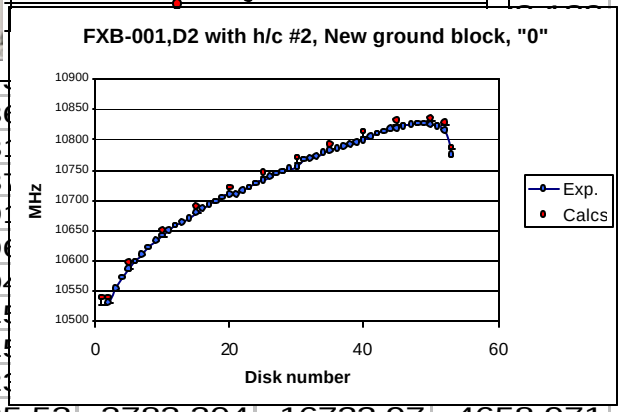
± 0.5 MHz → ± 0.2 MHz

Structure testing

Single disk QC. Automation.







1	10830.68	4761.31				6.513	16721.56	4770.846
2	10795.58	4698.21				2.262	16675.09	4955.865
3	10799.94	2671.40				7.203	16681.53	2238.855
4					9.98	1922.47	16676.99	1614.671
5					6.19	1657.339	16680.49	1505.054
6					9.14	1343.356	16678.24	1287.944
7					5.26	2063.223	16688.49	2529.18
8					9.95	1516.353	16686.55	1271.711
9								6.659
10								2.851
11								9.417
12								5.589
13								2.921
14								5.343
15								254.1
16								2.476
17								28.65
18								9.895
19								
20								
21	10826.68	2053.331	11332.09	1354.798				
			6.13	1376.345	1538			
			6.36	790.105	1538			
24	10827.99	1221.158	11324.32	640.284	1538			
		1663.798	11321.69	893.568	1539			
		1636.642	11320.67	1367.396	1539			
		1567.718	11316.18	961.363	1540			
28	10838.18	1559.081	11314.85	1585.231	1541			
			4	746.64	1541			
			3	3929.052	1542			
			7	3985.157	15425.53	3783.204	16733.97	4658.971
32	10830.38	4065.423	11332.12	2483.74	15376.22	3487.199	16721.48	4325.541

Arbitrary number of modes

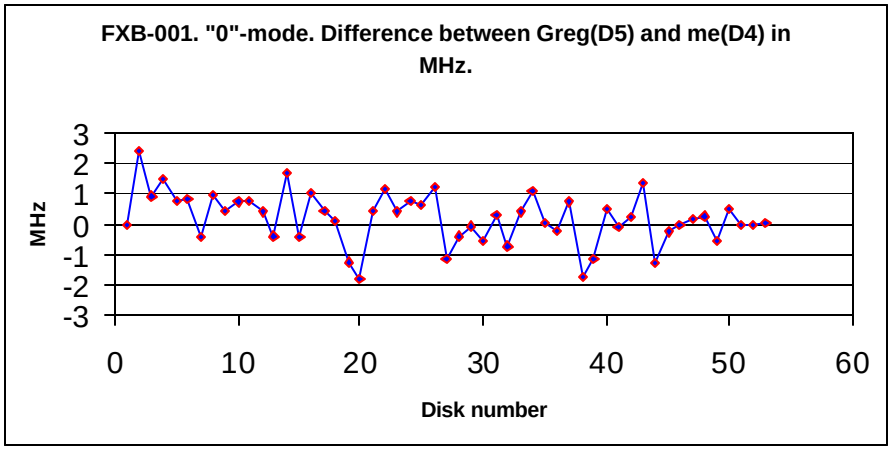
On-line control

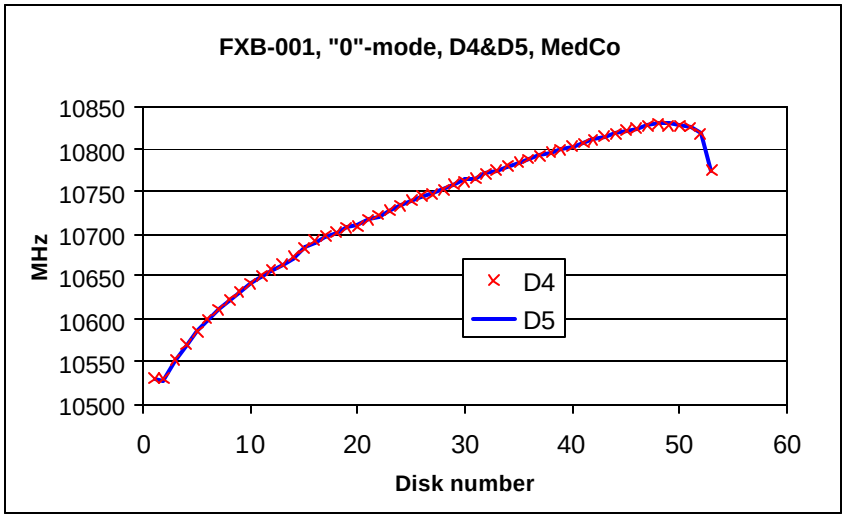
Record is 35 seconds per disk

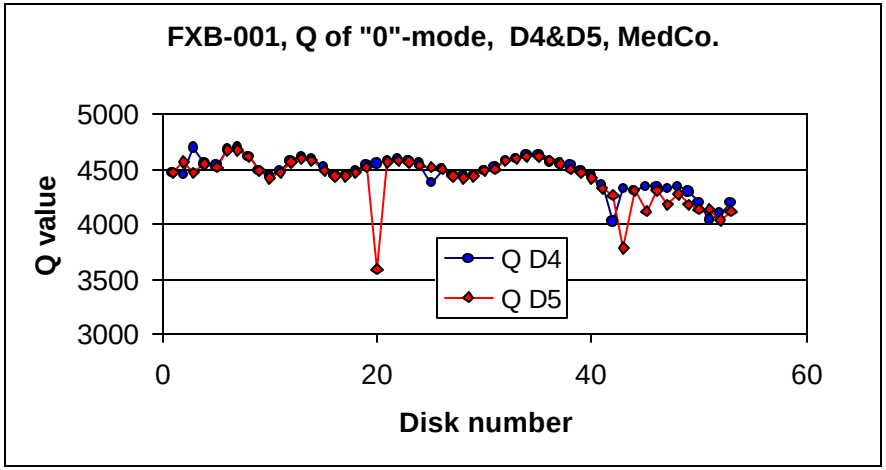
Structure testing

Single disk QC. Student vs. engineer.

The student, Greg Linder, started out watching and assisting me by operating the computer while I operated the test equipment. After testing one set of disks in this manner, the student spent 45 minutes getting the feel of the testing machine by repeatedly testing the same sample disk. This is the only practice he had before spending three hours testing the D5 disk set alone.

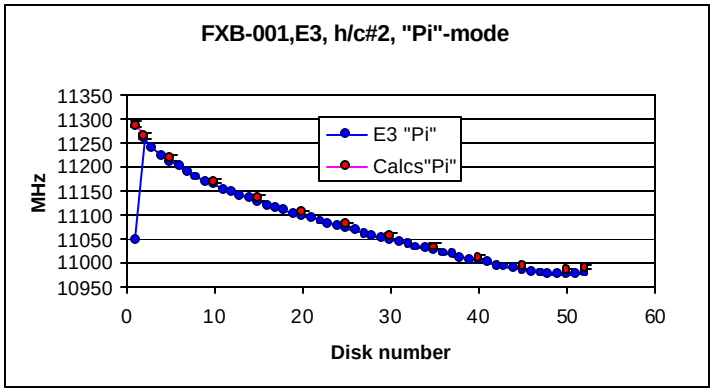


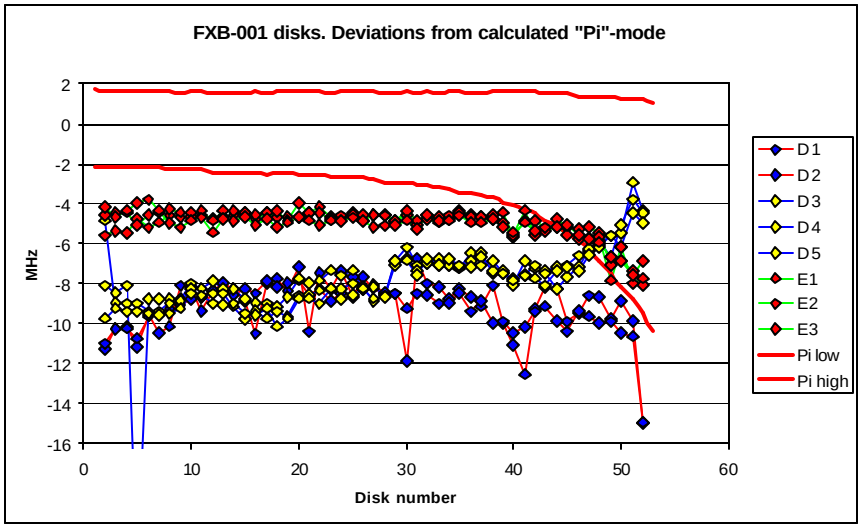


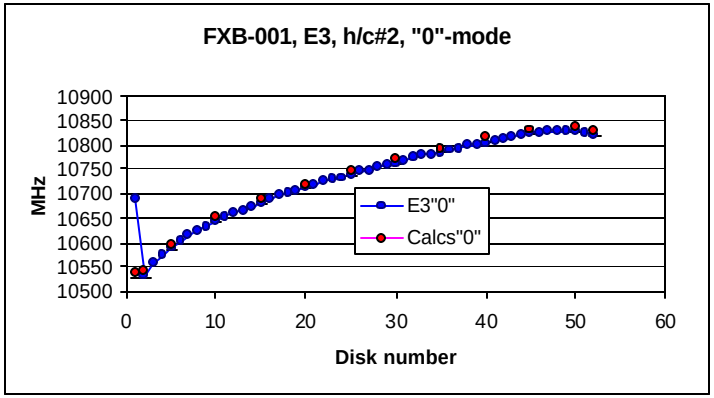


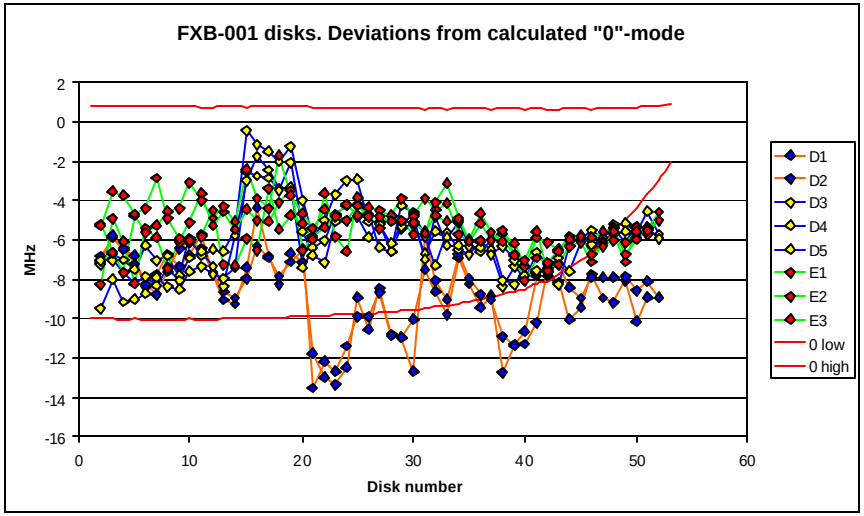
Structure testing

Single disk QC. Summary. FXB.



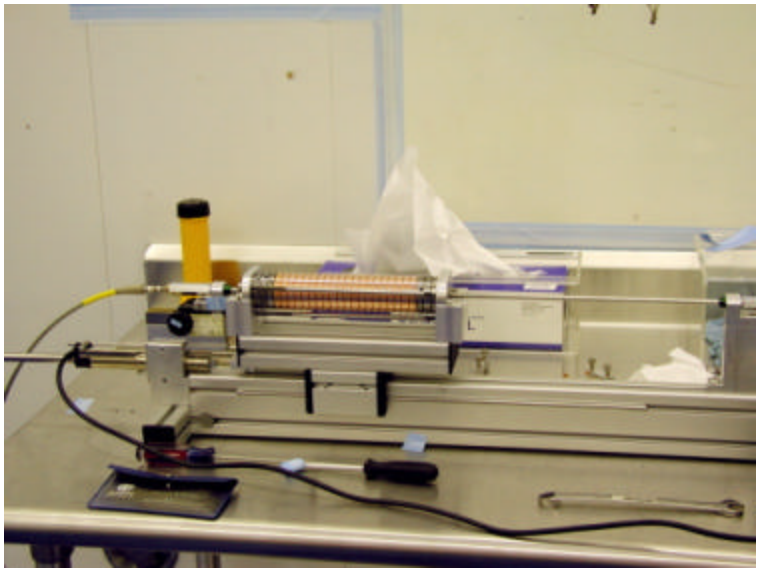


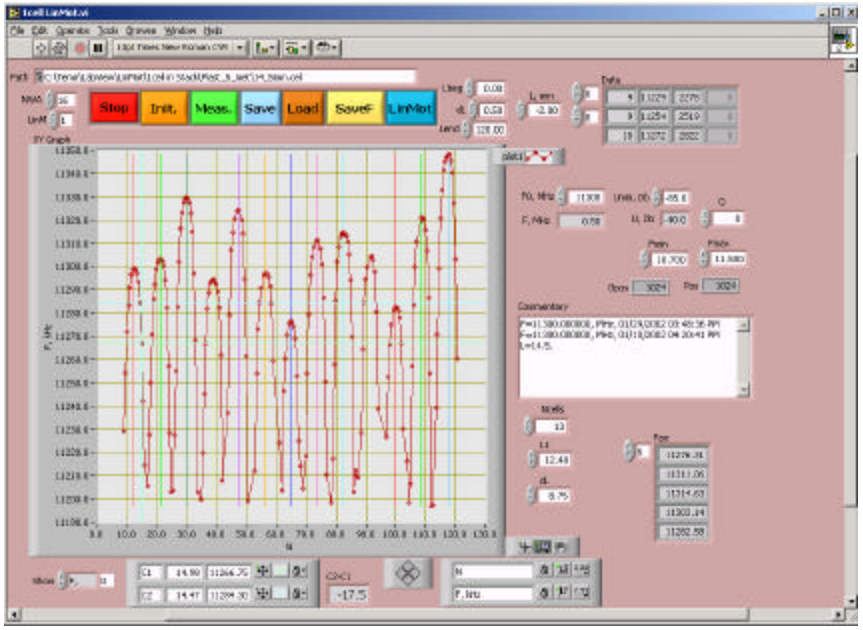




Structure testing

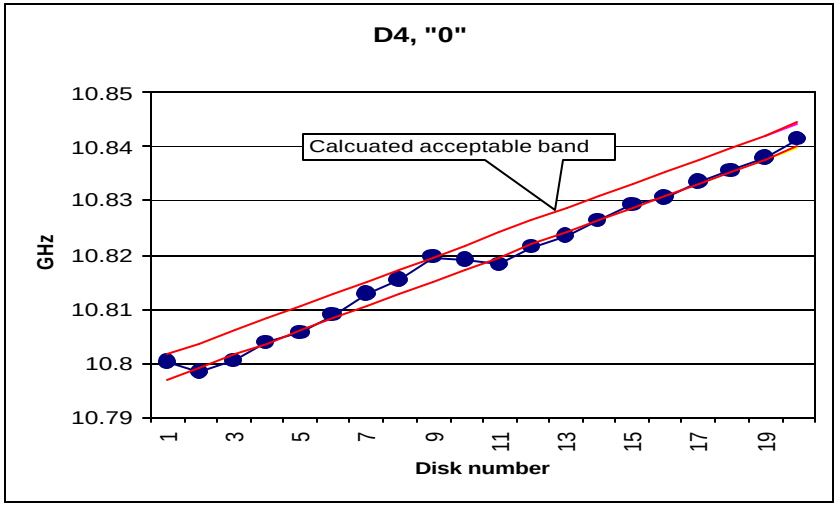
Plunger measurements of disk stacks

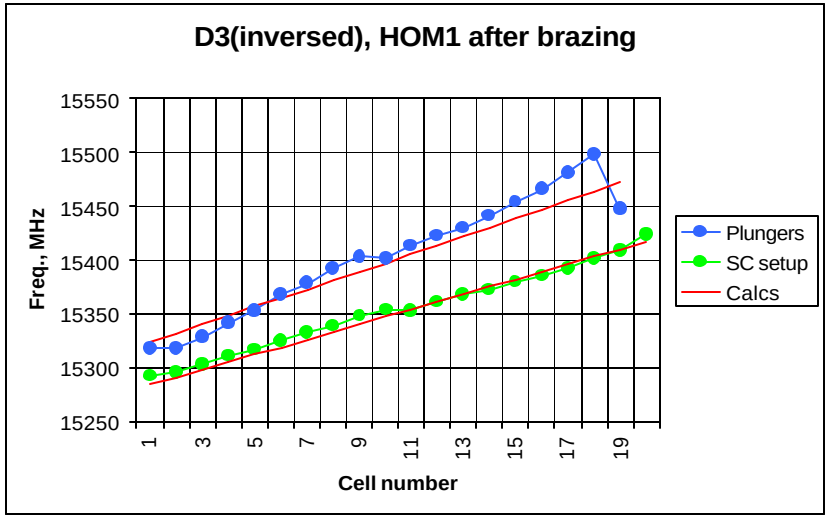


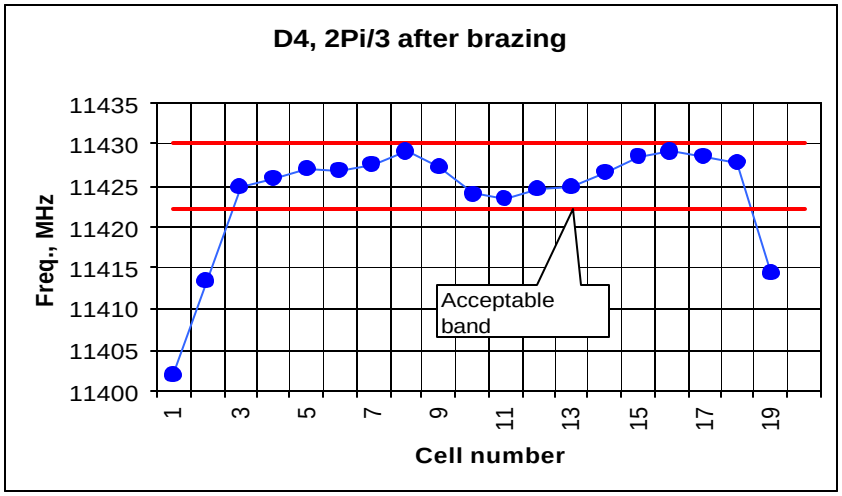


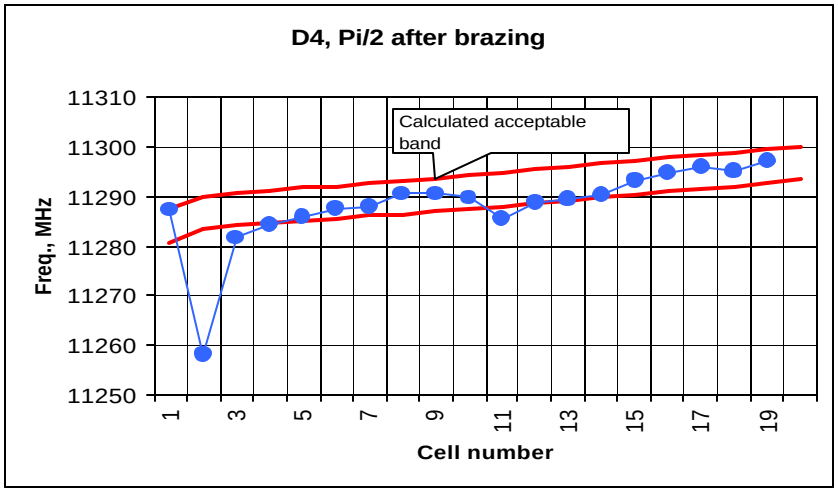
Structure testing

Plunger measurements of disk stacks.



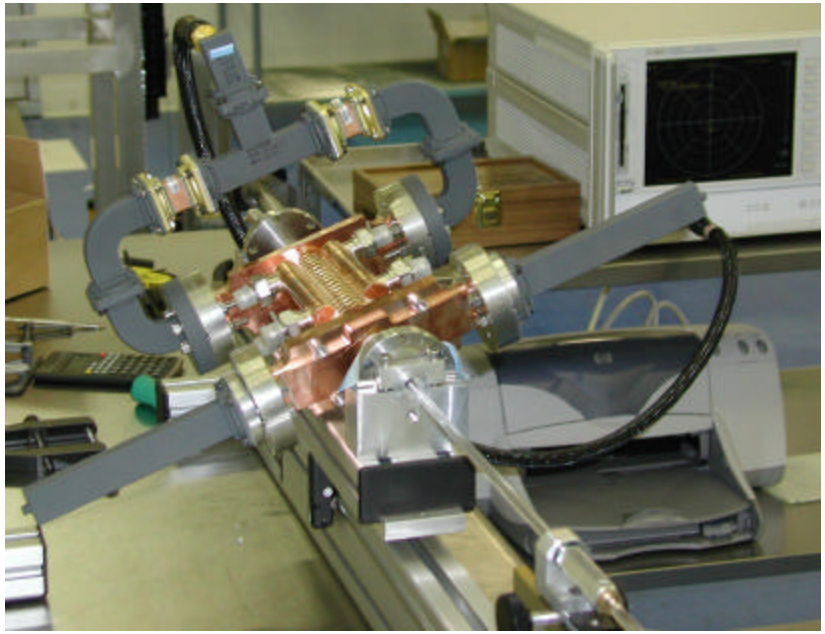


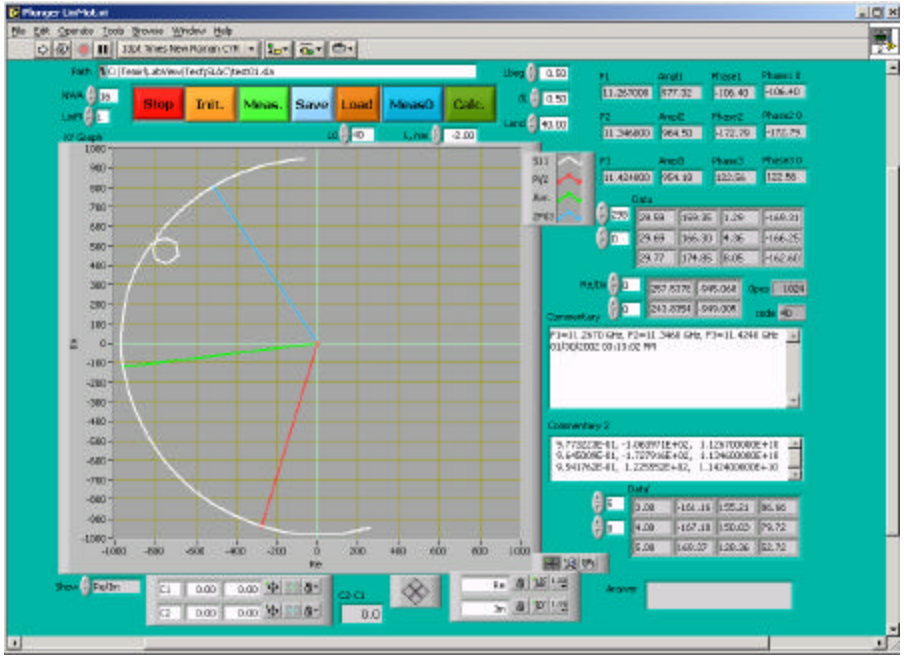




Structure testing

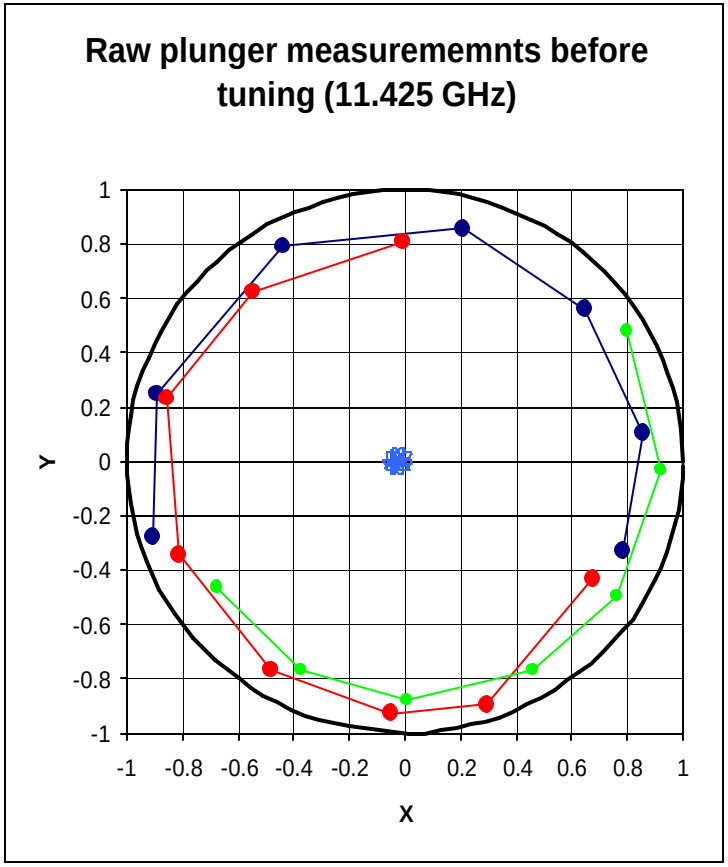
Nodal measurements of complete structure .

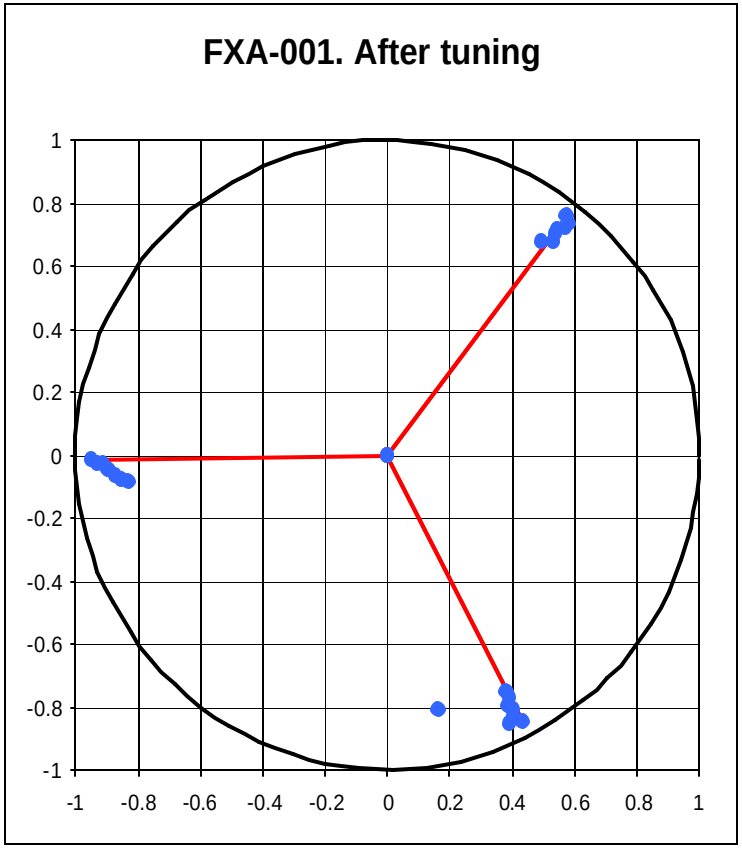




Structure testing

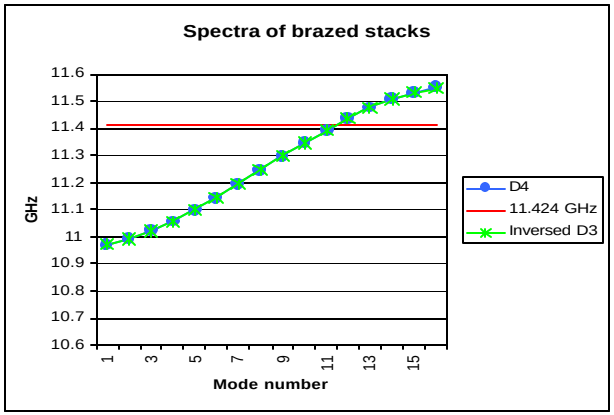
Nodal measurements of complete structure .

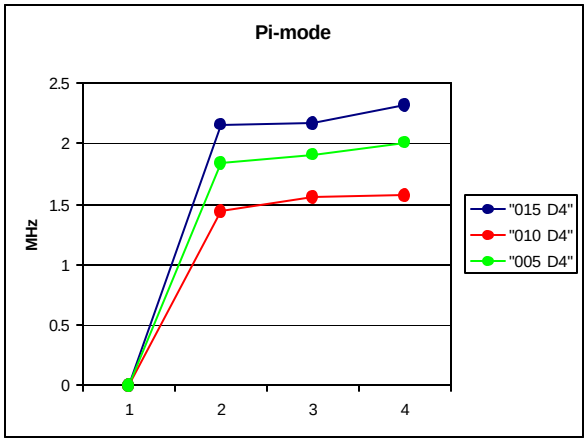


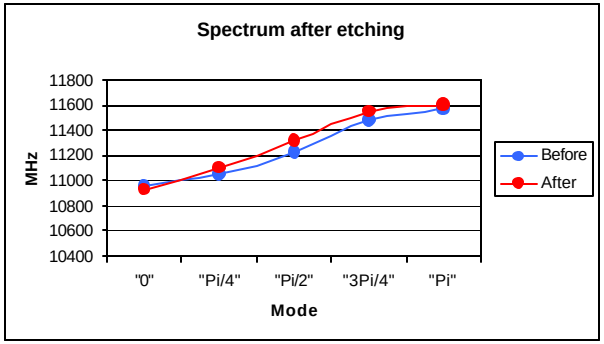


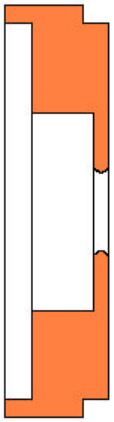
Structure testing

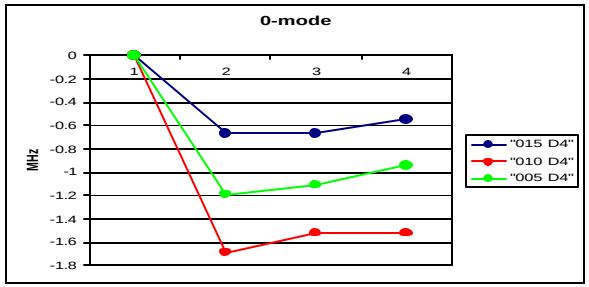
Structure after etching. Etching is not automated.





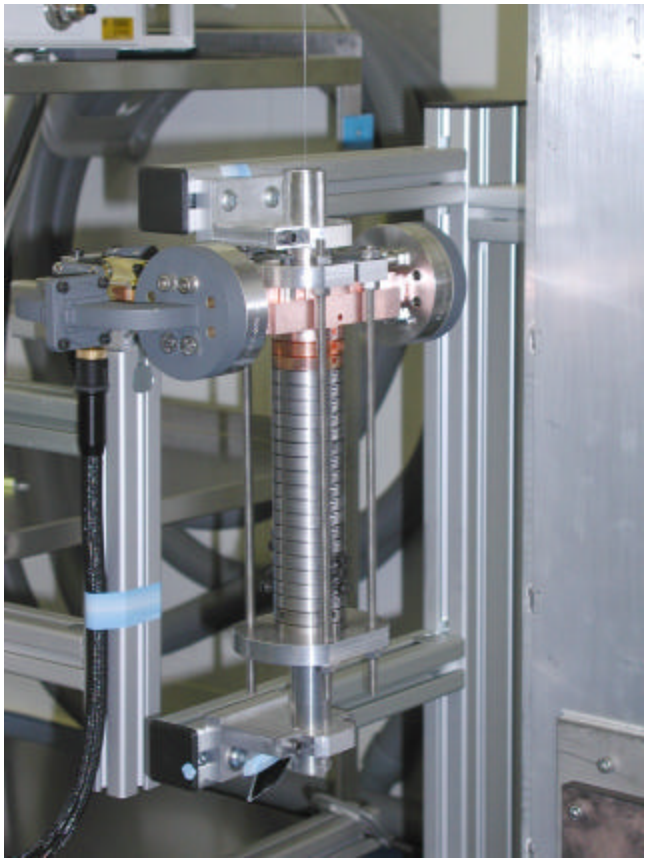


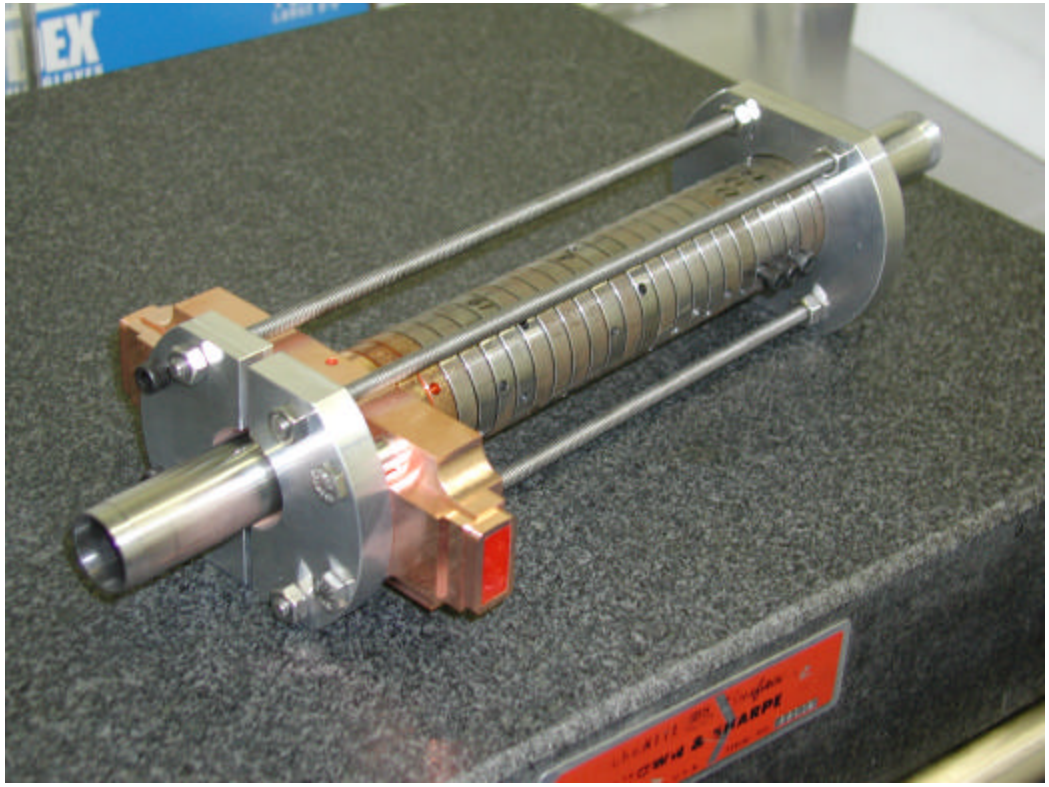




Structure testing

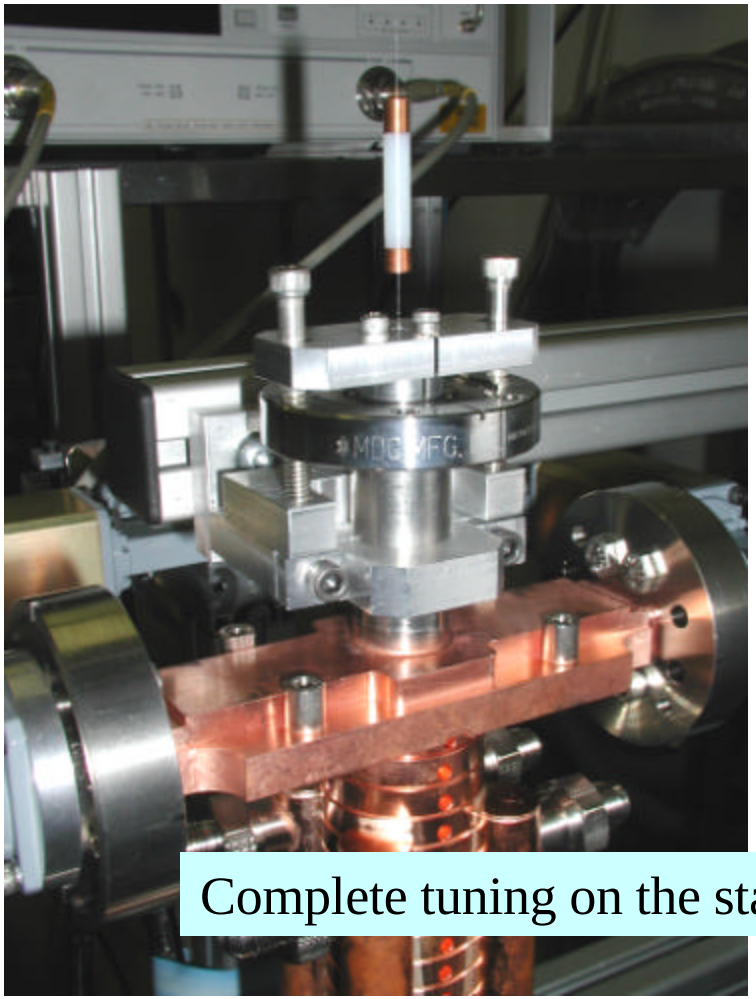
Measurements of couplers before brazing



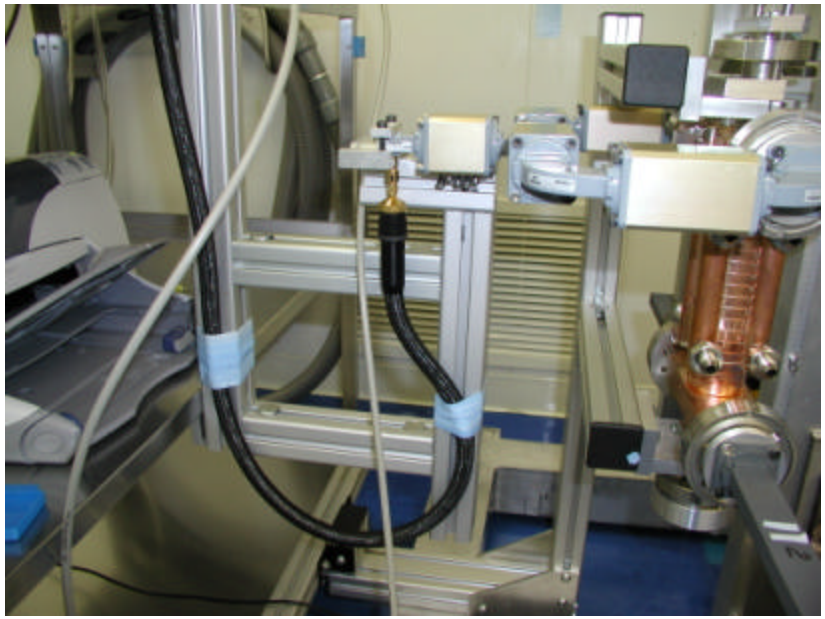


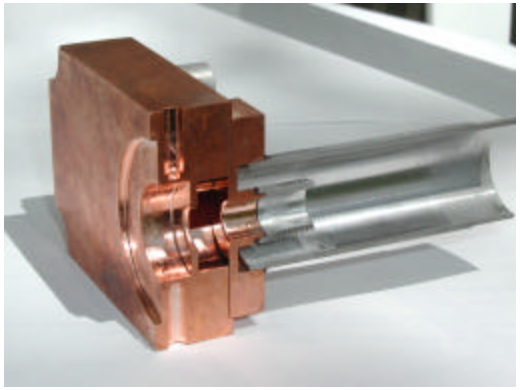
Structure testing

Bead-pull measurements



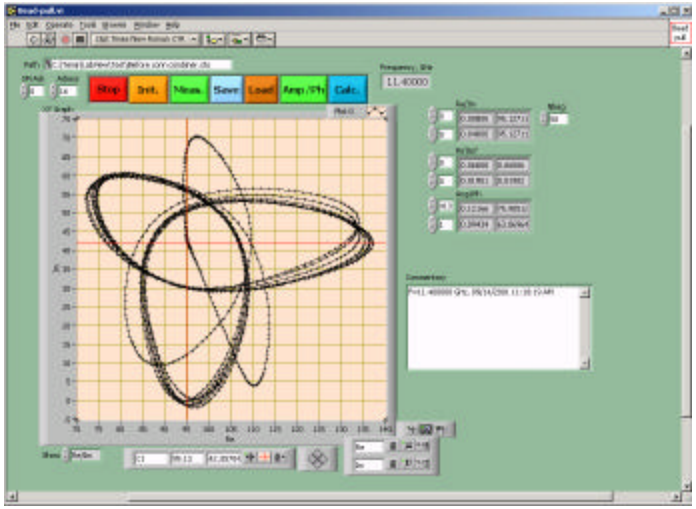
Complete tuning on the stand

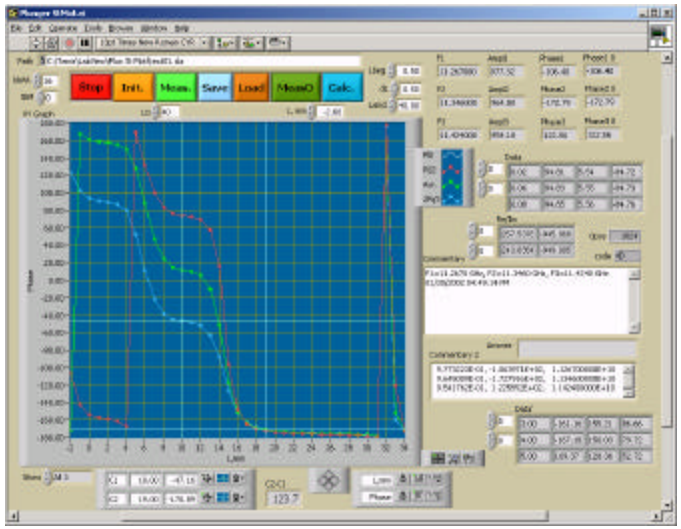


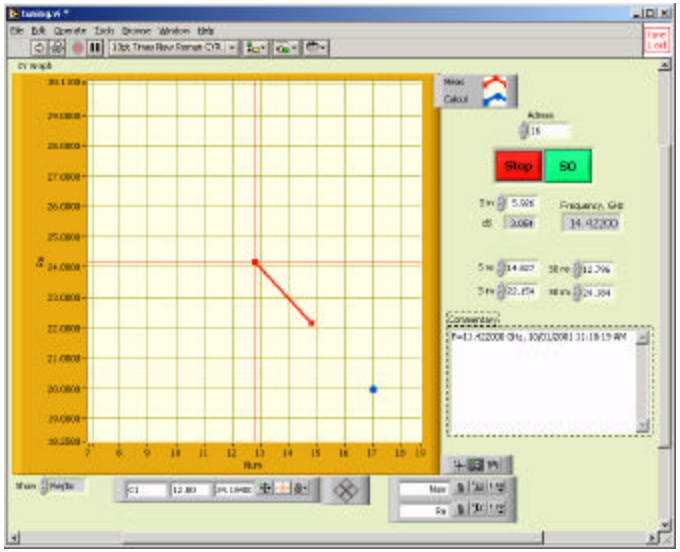


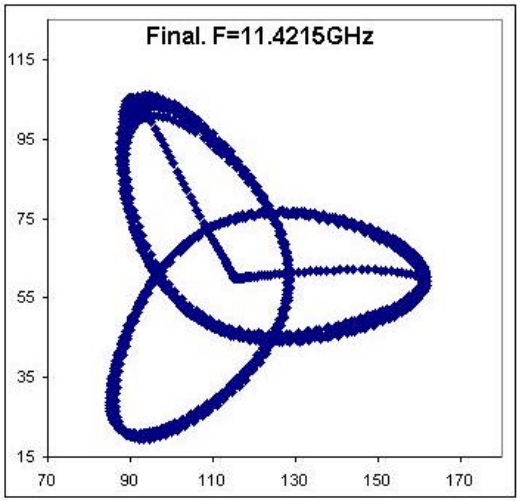
Structure testing

Bead-pull measurements

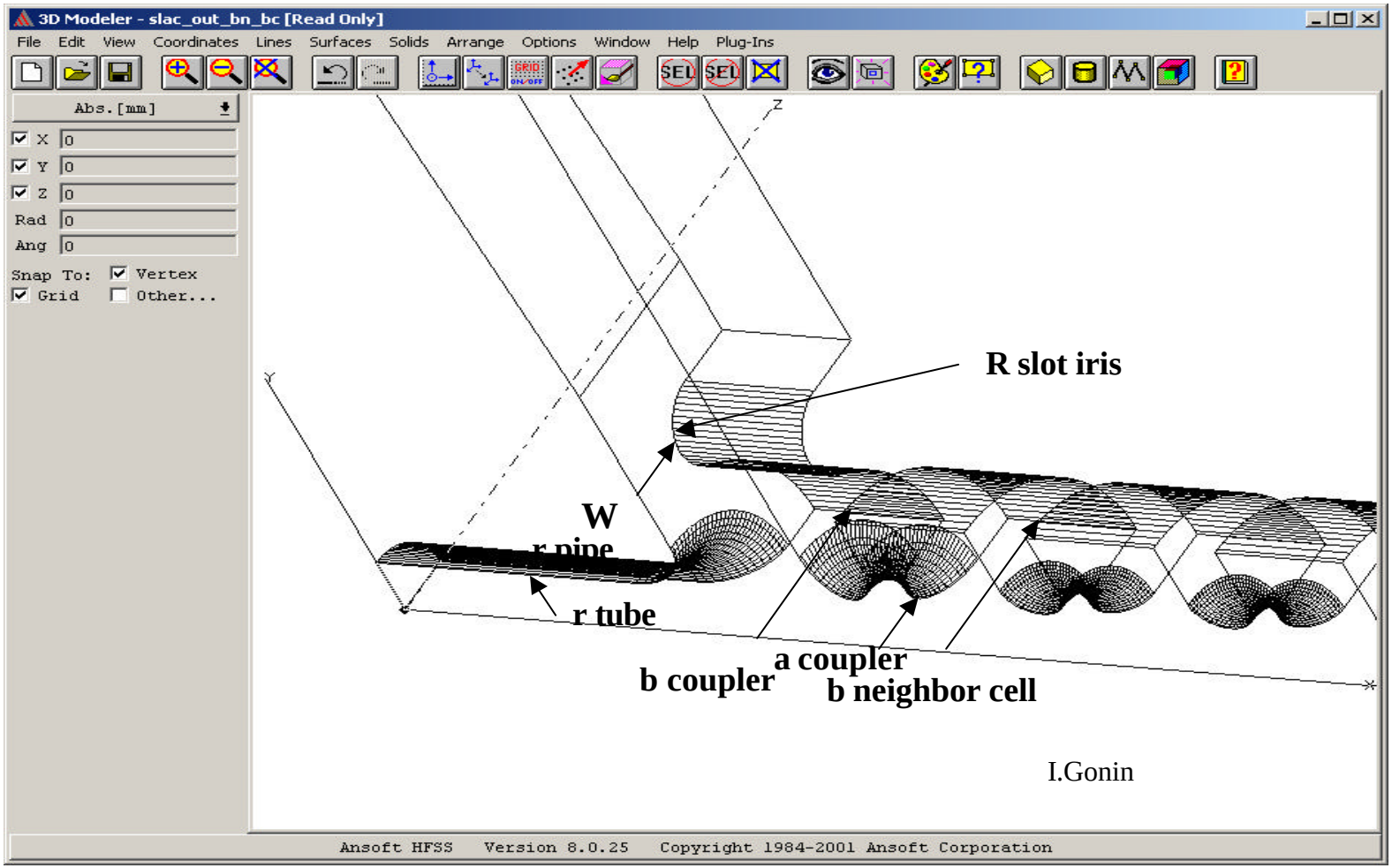






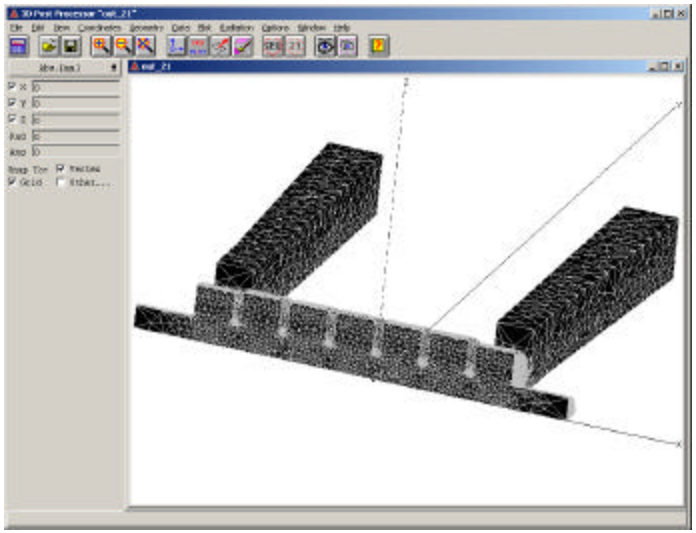


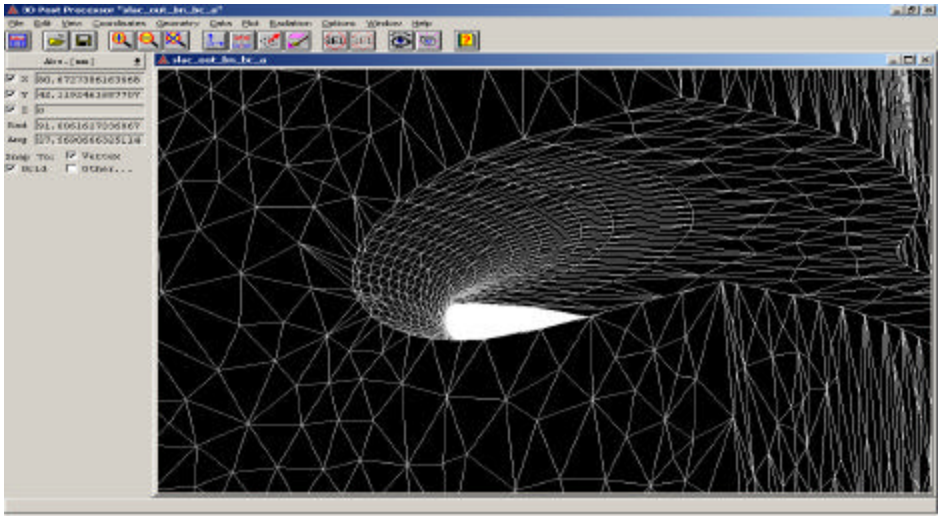
Coupler design for FXB



Coupler design for FXB

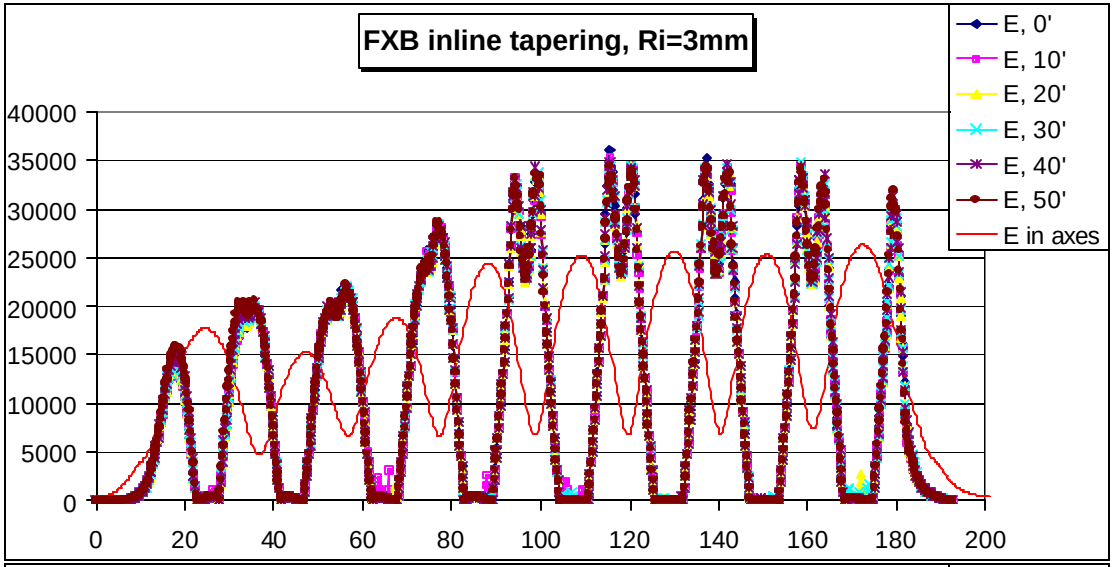
COMPUTATIONAL MODEL of Couplers.

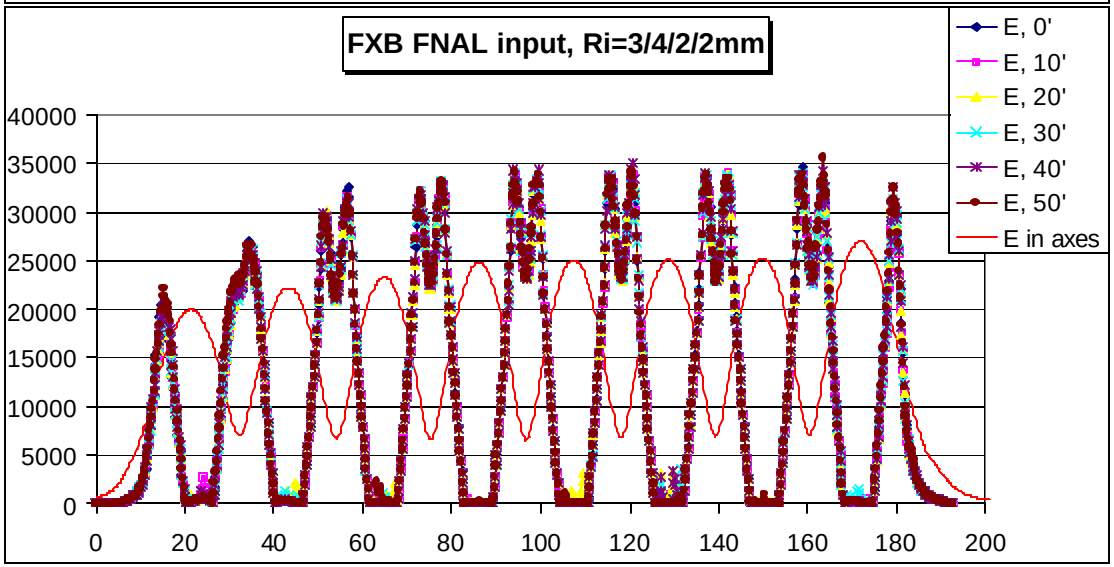




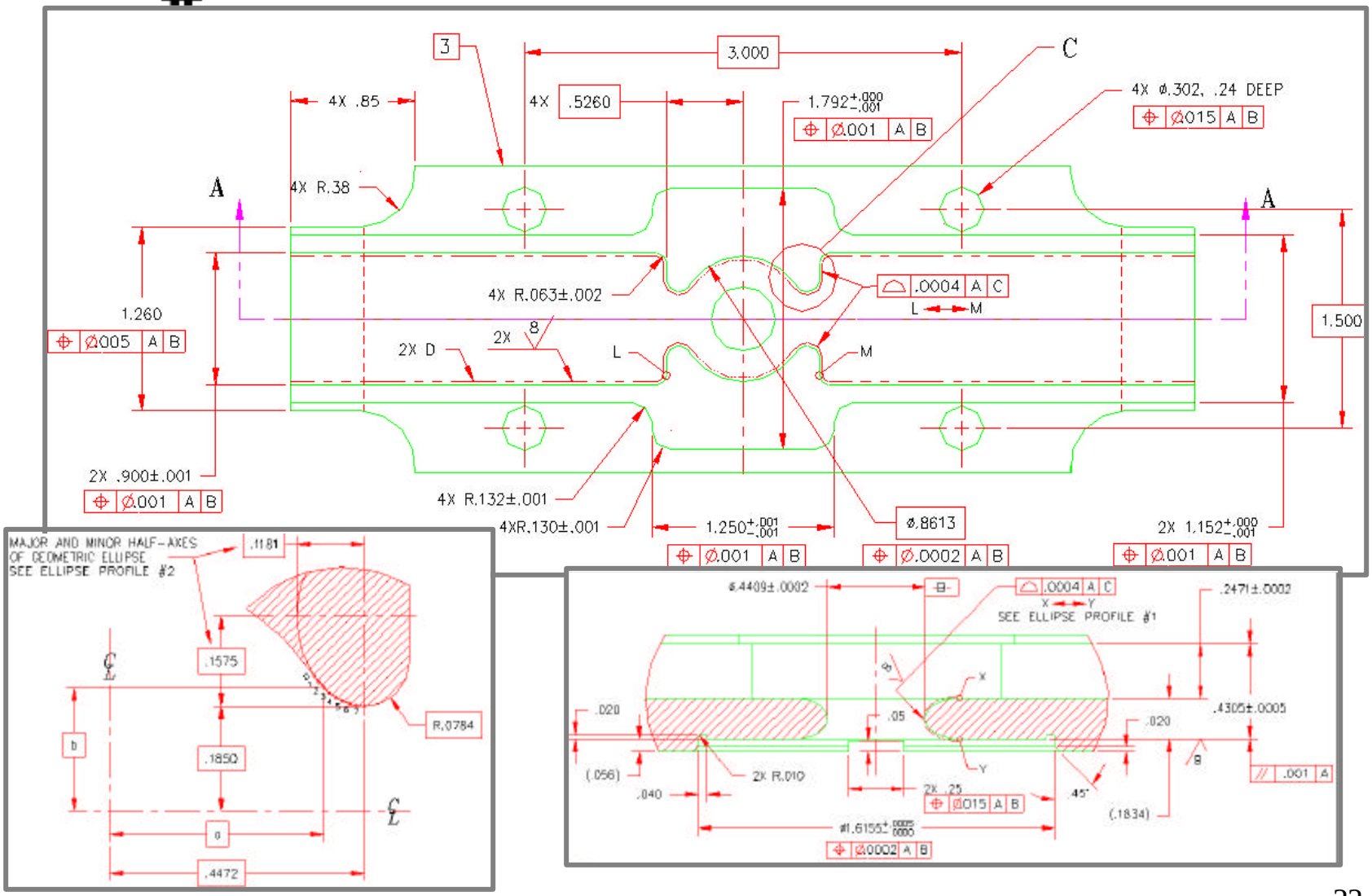
	S11	R	Phase advance, degrees	Max E, MV/m coupler/structure	Max I, MAmp/m	T, degrees C
FXB-001 Input	0.08	0.05	149	100/145	0.33	30
FXB-001 Output	0.05	0.04	151	115/130	0.31	27
P input = 70MW, P output = 24 MW						
						I.Gonin, T.Khabiboulline

Coupler design for FXB



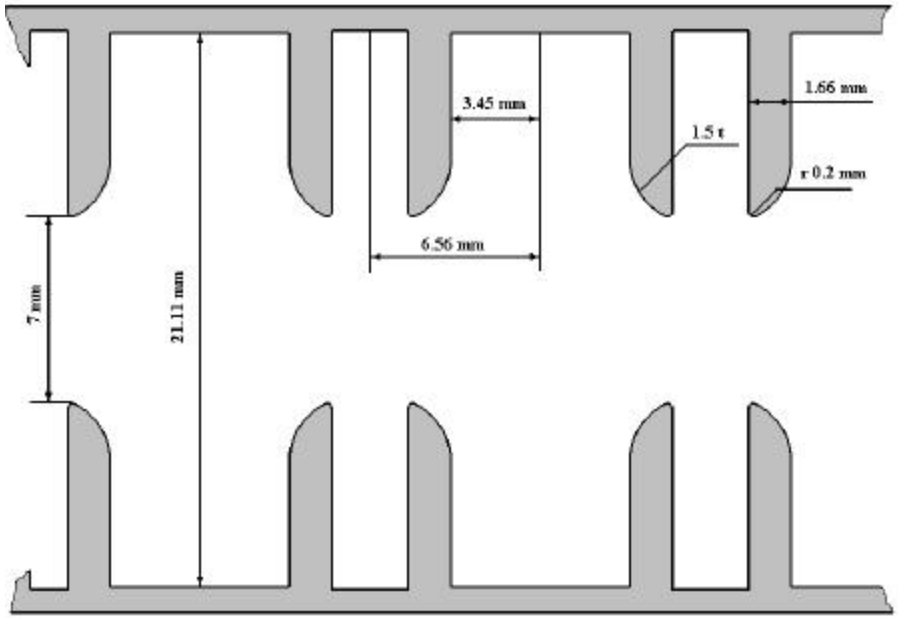


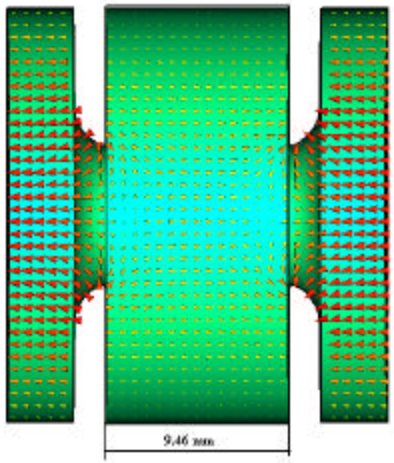
Coupler design for FXB



I.Gonin, T.Khabiboulline, E.Borissov

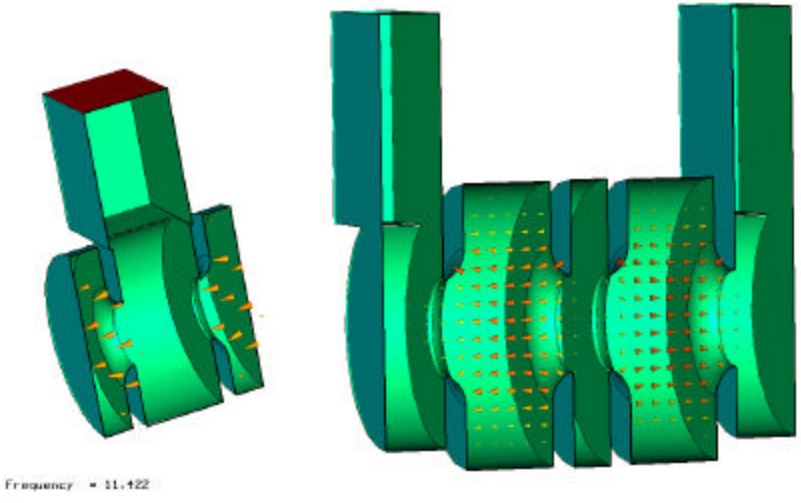
SW structure design





Es/Ea » 1.5

This is some set up for high power tests.



Two nearest goals

- Pretune one of FXB structures before etching and brazing

- Develop RF quality control coupler parts before brazing