

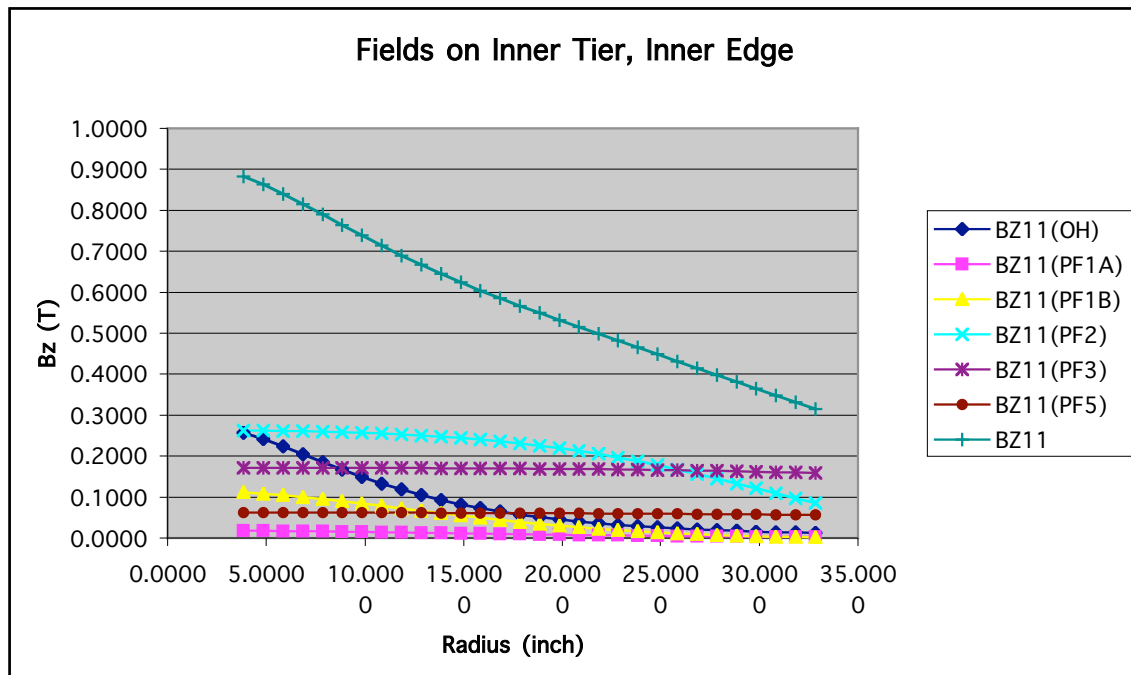
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SUBJECT: OUT OF PLANE LOADS ON TF FLAG

SOLFI was used to calculate the vertical field seen by the TF flags due to OH=24kA, PF1A=15kA, PF1B=20kA, PF2=20kA, PF3=20kA, PF5=20kA, and the corresponding force with ITF=71.2kA.

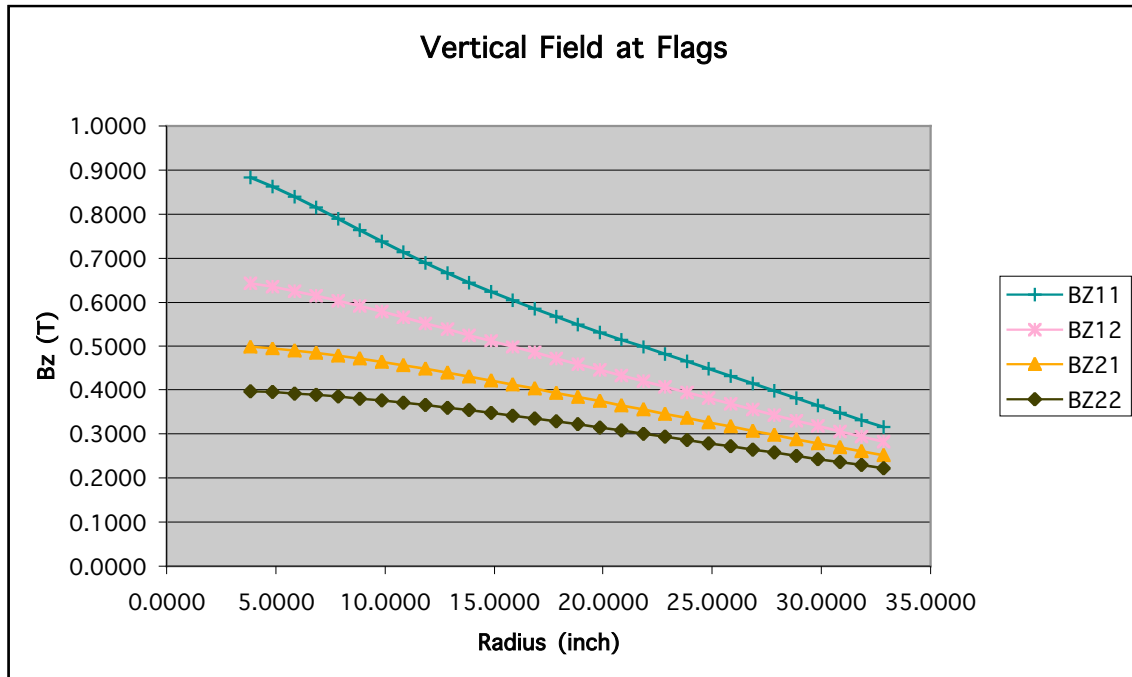
As a simplifying assumption, the field due to the PF coils in the opposite half plane was not included. Due to $1/r$ effects, this should be reasonable.

The fields and forces were calculated at four elevations, namely the inner edge of the inner tier flags, the outer edge of the inner tier flags, the inner edge of the outer tier flags, and the outer edge of the outer tier flags. These are referred to with suffixes 11, 12, 21, and 22, respectively.

The following curve shows the field contribution of the various coils, and the total, at the inner edge of the inner tier flags (worst case).



The following curve shows the total vertical field at the four locations.



The following table gives the forces at $B_t=6kG$.

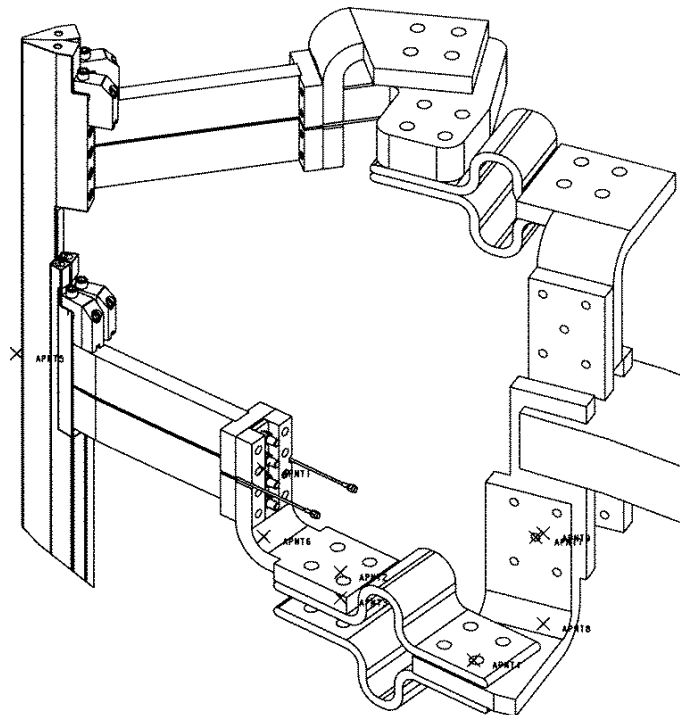
R	R'	Component	F Φ 1	Σ F Φ 1	F Φ 2	Σ F Φ 2
(inch)	(inch)		(lbf/in)	(lbf)	(lbf/in)	(lbf)
3.8480	0.0000	Flag	334.5	0.0	192.3	0.0
4.8480	1.0000	Flag	327.5	331.0	190.8	191.6
5.8480	2.0000	Flag	319.6	654.6	189.0	381.5
6.8480	3.0000	Flag	311.0	969.9	187.0	569.5
7.8480	4.0000	Flag	302.1	1276.4	184.7	755.4
8.8480	5.0000	Flag	292.9	1573.9	182.2	938.8
9.8480	6.0000	Flag	283.8	1862.3	179.4	1119.6
10.8480	7.0000	Flag	274.9	2141.7	176.5	1297.6
11.8480	8.0000	Flag	266.3	2412.3	173.5	1472.6
12.8480	9.0000	Flag	257.9	2674.4	170.3	1644.6
13.8480	10.0000	Flag	249.9	2928.2	167.1	1813.3
14.8480	11.0000	Flag	242.1	3174.2	163.7	1978.6
15.8480	12.0000	Link	234.7	3412.7	160.3	2140.6
16.8480	13.0000	Link	227.6	3643.8	156.8	2299.2
17.8480	14.0000	Link	220.6	3867.9	153.2	2454.2
18.8480	15.0000	Link	213.9	4085.2	149.7	2605.6
19.8480	16.0000	Link	207.3	4295.8	146.0	2753.5
20.8480	17.0000	Link	200.8	4499.8	142.4	2897.7
21.8480	18.0000	Link	194.4	4697.5	138.7	3038.3
22.8480	19.0000	Link	188.0	4888.7	135.1	3175.2

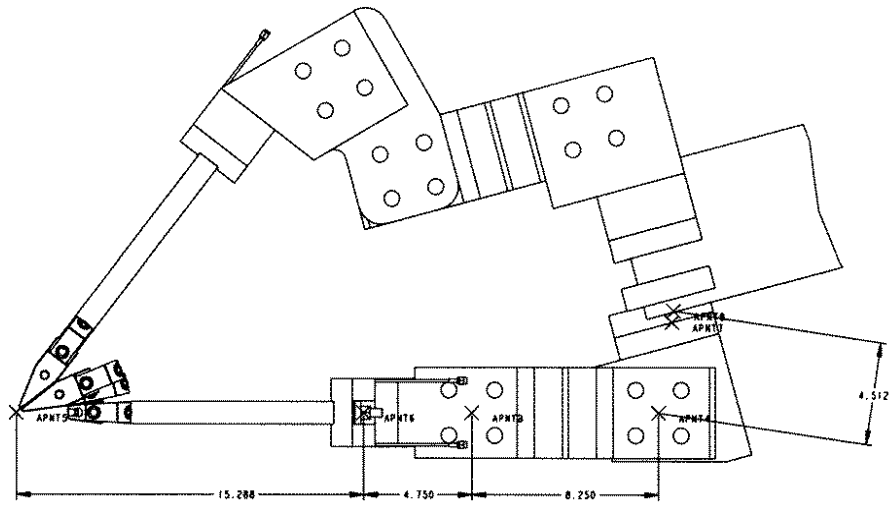
23.8480	20.0000	Link	181.7	5073.5	131.4	3308.4
24.8480	21.0000	Link	175.3	5252.0	127.7	3438.0
25.8480	22.0000	Link	168.9	5424.1	124.1	3563.9
26.8480	23.0000	Link	162.5	5589.8	120.4	3686.2
27.8480	24.0000	Link	156.1	5749.1	116.8	3804.8
28.8480	25.0000	Outer Leg	149.6	5901.9	113.2	3919.8
29.8480	26.0000	Outer Leg	143.3	6048.4	109.6	4031.2
30.8480	27.0000	Outer Leg	137.0	6188.5	106.1	4139.1
31.8480	28.0000	Outer Leg	130.8	6322.4	102.6	4243.5

The calculated fields are in general agreement with the results from HM Fan's original ANSYS model, but it is difficult to check because only the color plots are available from the ANSYS runs. HM is not able to re-run his code from the earlier ANSYS version. It is noted that HM only included the effects from OH and PF1A; the outer PF's were omitted.

A cross check was performed using another field solver for one of the field calculations (PF2) and good agreement was found.

Connection scheme from end of flag to outer leg is complex. There is one style of connector associated with the inner layer and two styles associated with the outer layer. Bottom and top of machine are identical. The following figures depict typical connection paths.





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