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The Crossing Geometry of RHIC Insertion

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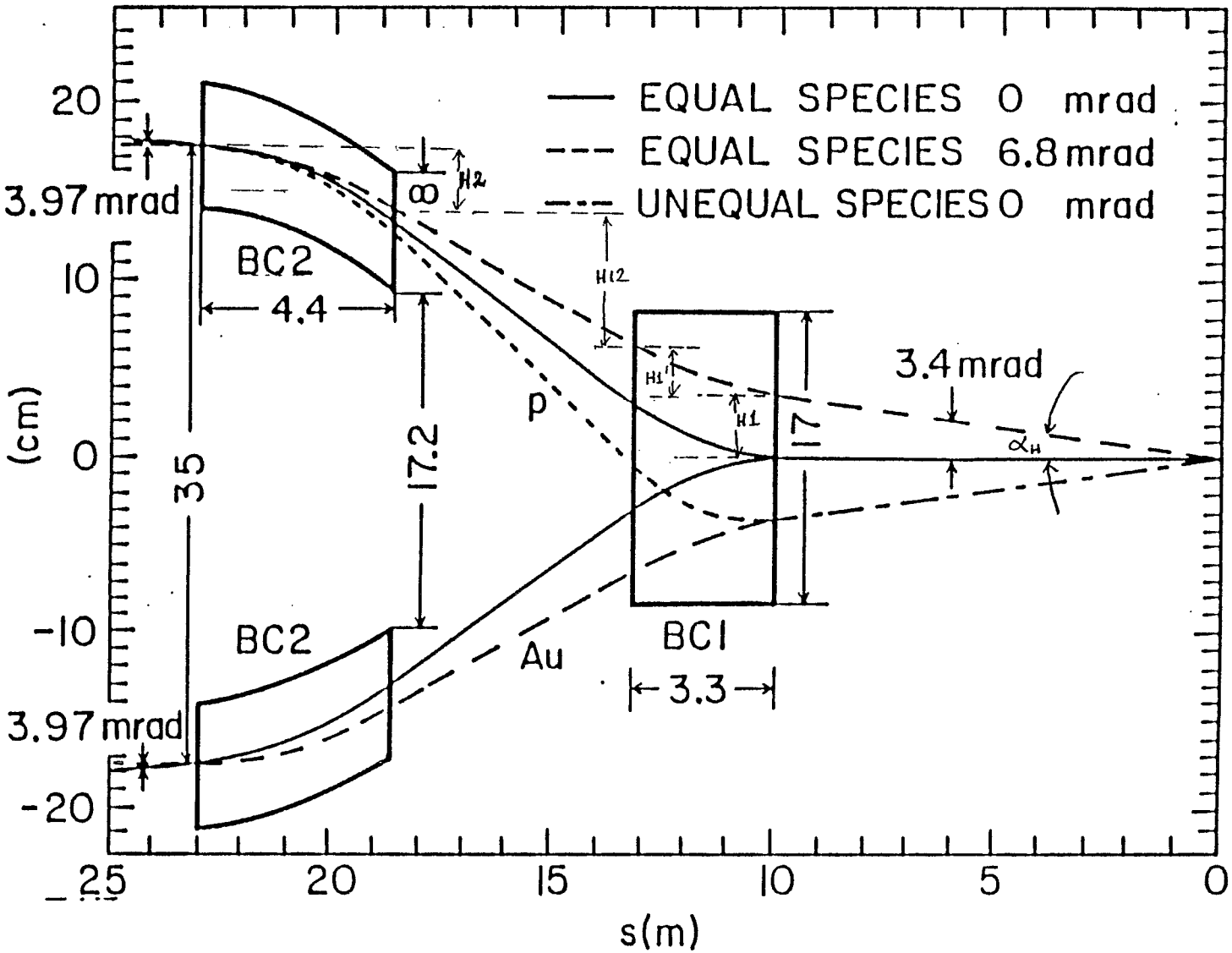
The beam crossing geometry in RHIC insertion is tabulated and graphed here for reference. They may be useful in the particle tracking calculations and/or detector design. The beam is incident/or away from the triplet matching section with angle 3.97 mrad at 23 m from the crossing point. The beam separation is determined to be 35 cm necessary for the dipole BC2 construction. Geometry is shown in Fig. 1. Since BC1 is a common dipole for both beams, unequal species colliding at the same velocity for synchronization would experience different bending kicks. The bending radius for these two species depends on their charge to mass ratio.

Defining the symbols α_H, H1, H1', H12, H2 shown in Fig. 1. The following table lists all relevant quantities with respect to α_H. Some of these quantities are shown in Figs. 2 and 3.


EQUAL SPECIES 0 mrad
EQUAL SPECIES 6.8 mrad
UNEQUAL SPECIES 0 mrad
3.97 mrad
3.97 mrad
BC2
4.4
BC2
BC1
3.3
p
Au
3.4 mrad
35
17.2
17
8
H2
H12
H1
H1
20
10
0
-10
-20
(cm)
25
20
15
10
5
0
s(m)

α_H	ρ_1	ρ_2				
HALPHA(mr)	RHO1(m)	RHO2(m)	H1(mm)	H1'(mm)	H12(mm)	H2(mm)
0.000	181.6359	309.9406	0.000	29.980	96.307	48.713
1.000	207.6065	340.4649	10.000	29.530	89.559	45.912
1.100	210.6180	343.8514	11.000	29.485	88.884	45.632
1.500	223.5917	358.0992	15.000	29.304	86.184	44.511
2.000	242.2441	377.6605	20.000	29.079	82.810	43.111
2.500	264.2920	399.4829	25.000	28.854	79.436	41.710
3.000	290.7556	423.9826	30.000	28.629	76.061	40.310
3.125	298.2209	430.5844	31.250	28.572	75.218	39.960
3.250	306.0797	437.3952	32.500	28.516	74.374	39.610
3.375	314.3639	444.4249	33.750	28.460	73.531	39.260
3.400	316.0749	445.8581	34.000	28.448	73.362	39.190
3.450	319.5532	448.7523	34.500	28.426	73.025	39.049
3.500	323.1090	451.6843	35.000	28.403	72.687	38.909
-1.000	161.4409	284.4405	-10.000	30.430	103.056	51.513
-1.100	159.6657	282.1195	-11.000	30.475	103.731	51.793
-1.500	152.9390	273.2023	-15.000	30.656	106.431	52.914
-2.000	145.2878	262.8186	-20.000	30.881	109.805	54.314
-2.500	138.3658	253.1956	-25.000	31.106	113.180	55.714
-3.000	132.0735	244.2526	-30.000	31.331	116.554	57.115
-3.125	130.5889	242.1147	-31.250	31.387	117.398	57.465
-3.250	129.1372	240.0140	-32.500	31.443	118.242	57.815
-3.375	127.7175	237.9494	-33.750	31.500	119.085	58.165
-3.400	127.4373	237.5407	-34.000	31.511	119.254	58.235
-3.450	126.8806	236.7276	-34.500	31.533	119.592	58.375
-3.500	126.3287	235.9201	-35.000	31.556	119.929	58.515

Beam sizes at various locations (mm)

HEAVY ION						
Emittance	34			34		
GAMMA	30.			100		
BETA*(M)	BC12	BC21	BC22	BC12	BC21	BC22
2	24.800	34.494	42.570	13.583	18.893	23.317
3	20.527	28.365	34.921	11.243	15.536	19.127
4	18.108	24.806	30.438	9.918	13.587	16.672
5	16.570	22.461	27.449	9.076	12.303	15.034
6	15.533	20.806	25.305	8.508	11.396	13.860
PROTON						
Emittance	16			17		
GAMMA	30			100		
BETA*(M)	BC12	BC21	BC22	BC12	BC21	BC22
2	17.012	23.663	29.203	9.605	13.360	16.487
3	14.081	19.458	23.956	7.950	10.986	13.525
4	12.422	17.017	20.881	7.013	9.607	11.789
5	11.367	15.408	18.830	6.418	8.699	10.631
6	10.656	14.273	17.359	6.016	8.058	9.801

BC12 : End of Bc1

BC21 : BEGINING of BC2

BC22 : END of BC2