Rough MOCADI simulation to see spot sizes and influence of focusing/collimationa vs. angular sacttering at S4

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Estimated distances for MOCADI input for S293

name	rho*x	rho	L	L-sum
	[mg/cm^2]	[mg/cm^3]	[cm]	
vacuum			78.45	78.45
air	12.86	1.286	10	88.45
MW-41			10	98.45
air	19.29	1.286	15	113.45
Sc41	0.3	1	0.3	113.75
air	19.29	1.286	15	128.75
MUSIC			46	174.75
air	19.29	1.286	15	189.75
target	100	71.5	15	204.75
air	360.08	1.286	280	484.75
TWIN-MUSIC				
air	797.32	1.286	620	1104.75
ToF-Wall				

results of MOCADI simulation for spot size of primary beam

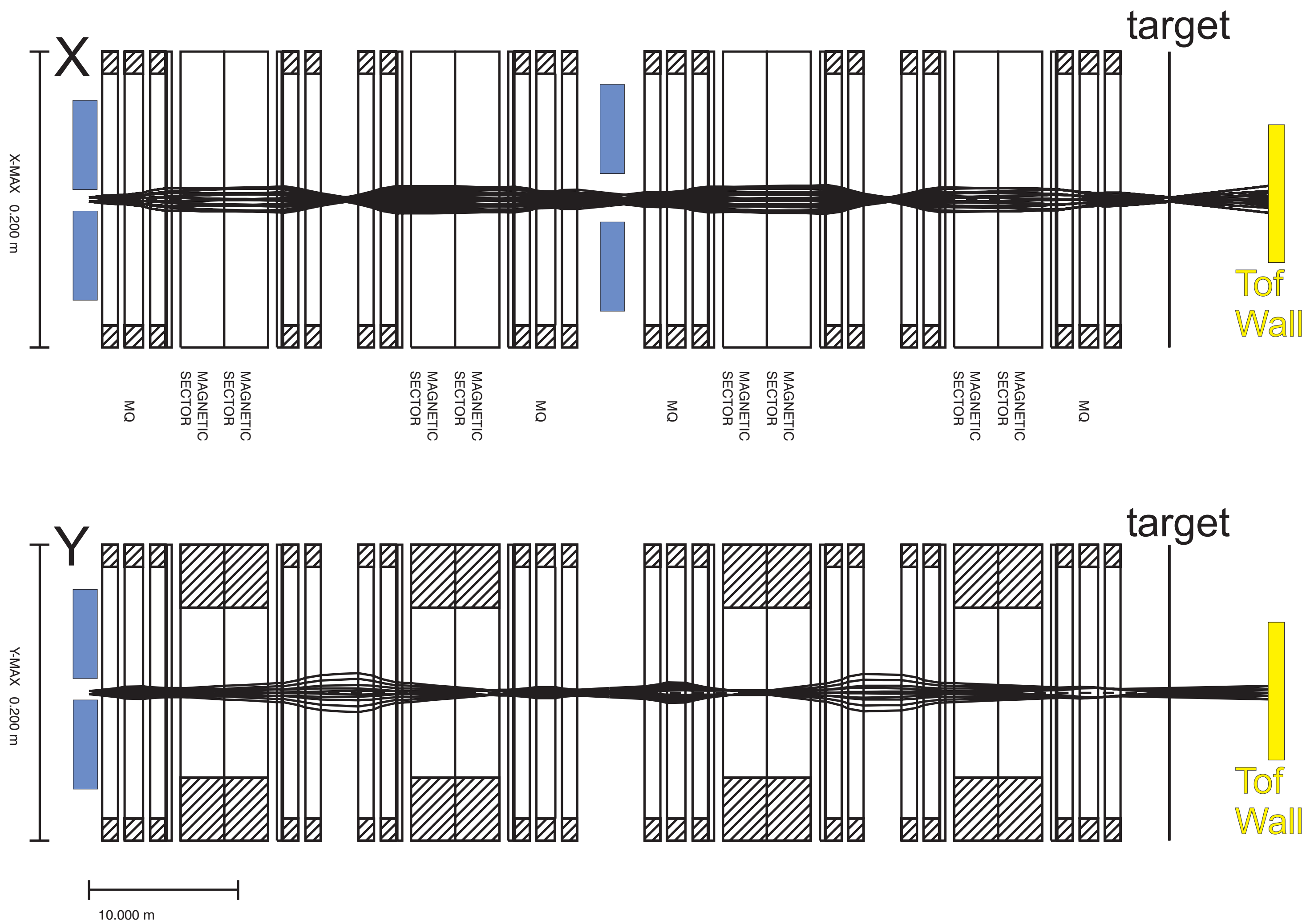
	zw_x	zw_y	sigx-min	sigy-min	sigx-TW	sigy-TW
					after 10.26m	
	[m]	[m]	[cm]	[cm]	[cm]	[cm]
no-cut	0.9	-0.2	0.2696	0.1729	2.846	2.129
<1mrad at S0	-0.3	-0.5	0.1344	0.08622	1.97	2.081
no matter	2.5	1.8	0.046	0.1148	2.133	0.9387
no matter, <1mrad at S0	2.4	0.8	0.0526	0.0568	0.499	0.8195
no matter after					1.98	1.404
no matter after, <1mrad at S0					1.273	1.376
TA-slit 1m after target=+/-1mm	-0.1	-0.7	0.1841	0.1122	2.015	1.985
	waist position		@H-target		@TOF wall	

Result: focusing and even more collimation helps but not so much as straggling in the matter at S4 is already a large contribution at 300 MeV/u.
For example slow down from 370 MeV/u -> 300 MeV/u at S4 in front of the target.

S293 Beam to S4

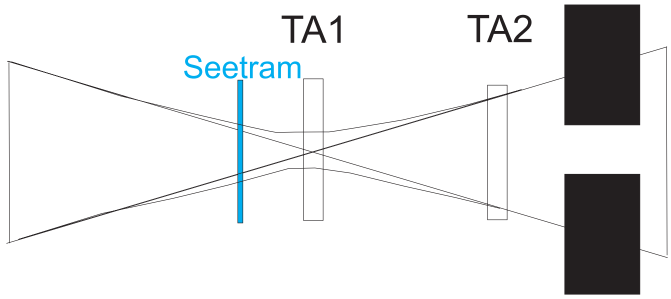
Focus on target station no.1 and use slits behind target no.2 to cut the angular disitribution. This can introduce background of lower energy and a few fragments on slits. Select only one energy with S2 slits. Remaining fragments wll be much less than those produced in scintillator at S4.
It is useful to reduce intensity to some part by closing the chopper window for SIS injection.
This also reduces the emittance of the SIS beam.

Use FRS standard mode, only last triplet changed due to changed beam parameters and therefore shifted beam waist position (focus).



How to collimate and strip Ta beam

FRS prod. target area (S0) (1)

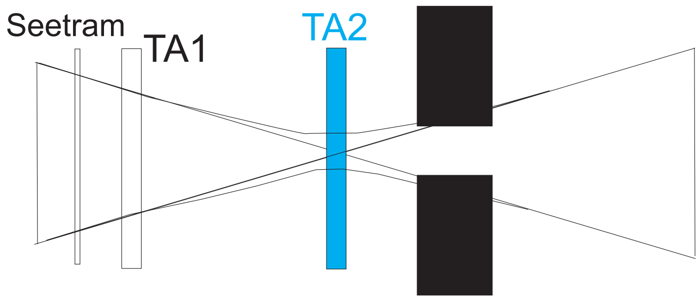


Seetram is sufficient as stripper CSD after Ta (GLOBAL)

0el.	1el.	2.el	3.el	
11%	43%	45%	1%	(370 MeV/u)
1%	37%	52%	3%	(1000 MeV/u)

To avoid background take He-like ions (higher Brho)

FRS prod. target area (S0) (2)



The alternative to stripping with the seetram is to use a stripper target, Cu-82 mg/cm2 or Be-118 mg/cm^2. Bot are sufficient strippers, Be gives less angular spread but a bit more energy spread. However from the matter at S4 there will be even more energy spread.

But the collimation does not work so nicely when focusing on the second target as the distance to the slits is very short.

Be-118 mg/cm2 (sigma_A = 0.27 mrad)

0el.	1el.	2.el	3.el	
19%	49%	31%	0.5%	(at 370 MeV/u)

Cu-82 mg/cm^2 (sigma_A = 0.51 mrad)

0el.	1el.	2.el	3.el	
76%	22%	1.8%	0.01%	(at 370 MeV/u)

FRS optics data sets

1.)
In general mode run81-ta1b.dat only S4 changed
and assume a phase space cut at the target by slits.
Use Seetram as stripper and focus on target#1 (SIS-TA).

X = 2.0E-3 ;
A = 1E-3 ;
Y = 2.0E-3 ;
B = 1E-3 ;
DRIFT to 1st quadrupole = 0.9 m starting at slits.
waist fitted at 1.9m behind last quadrupole.
quads = 3.278582759E-01 3.990555157E-01 3.110513755E-01 T
for Brho = 11.6307 Tm

1.b)
The same with waist in x aimed at dz=-40cm.
quads = 3.441893226E-01 4.056376105E-01 3.103175241E-01 T

2.)
In general mode run81-ta2b.dat only s4 changed
and assume a phase space cut at the target by slits.
Use Cu-82 or Be-118 mg/cm^2 as stripper and focus on target#2 (SIS-TA).

X = 1.0E-3 ;
A = 2E-3 ;
Y = 1.0E-3 ;
B = 2E-3 ;
DRIFT to 1st quadrupole = 1.561 m.
quads = 3.010372196E-01 4.213033341E-01 3.256174212E-01 T
for Brho = 11.6307 Tm

2.b)
The same with waist in x aimed at dz=-40cm.
quads = 3.169731002E-01 4.275561194E-01 3.251157989E-01 T

For setting the the last triplet load standard setting and modify last triplet
by hand. The normal values in both modes run81-ta1b and run81-ta2b are
HFSQT11 = 0.291211 T
HFSQT12 = 0.515188 T
HFSQT13 = 0.361969 T
for Brho = 11.6307 Tm.
At different Brho at least the ratio must be the same.