

Beam tuning to Reaction chamber

SNU

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Last status

Yesterday's one

- ~400eV KE
- Coil 8 : 20A
- L1(-2kV), L2(-10kV), L3(-18kV)
- Buncher 4kV, Lower coil(8A), upper coil(-5A)
- MCP : 1400V, 3000V

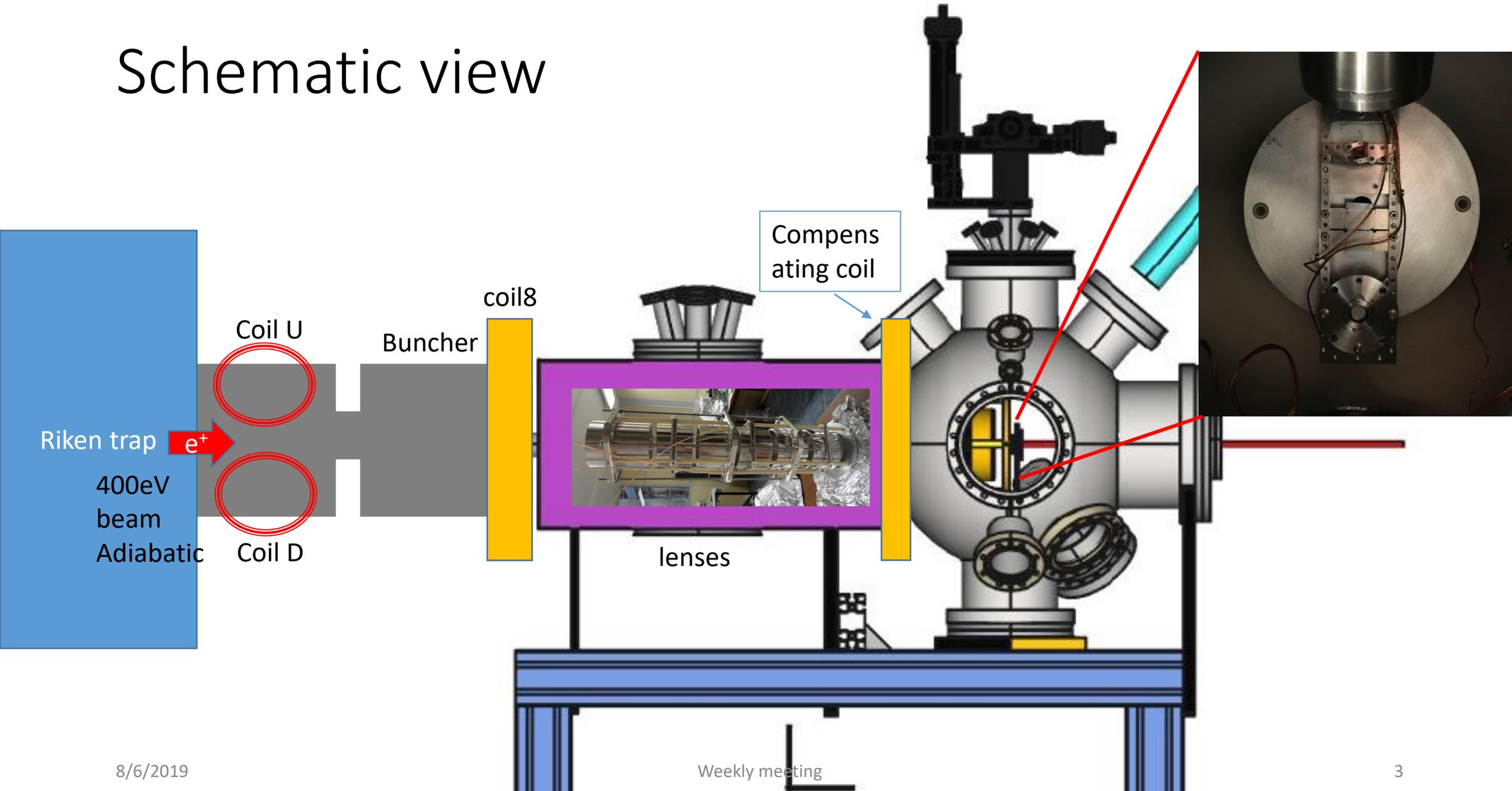
8/6/2019



- No compensating coil power (at the reaction chamber)
- Positron beam from Riken trap is quite stable and short time width.
- Beam was moved to **left down** side when focusing voltage is increased.
- Most of beam can reach the reaction chamber but without enough focusing.

Weekly meeting

Schematic view



Current status

- PWO intensity is decreased from -77nWb to -19.6nWb . ($1/4$) with same setup.....
- With Judith, we tried to check the tendency of beam intensity for correction coil (U,D) to compare with before.



Tuning of coil U, D, 8

The current at Coil 8 was changed from 30A to 10A and 20A shows the higher intensity

- Condition
L1 = 0, L2 = 12kV, L3 = 13kV
Coil8 = 20A
PWO HV = -1500V
Buncher = 4kV

- Condition
L1 = 0, L2 = 12kV, L3 = 13kV
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ch1 (A) coil U	ch2 (A) coil D	PWO intensity (nWb)
3	8	-18.6
4	8	-19.9
5	8	-19.6
6	8	-20.5
7	8	-17.9
8	8	-16.0
5	9	-20.7
5	10	-21.3
5	7	-21.1
ch1 (A)	ch2 (A)	PWO intensity (nWb)
5	7	-14.5
5	8	-15.5
5	9	-15.1
5	10	-16.2
6	10	-17.3
7	10	-17.2
8	10	-16.5

Tuning of Lenses

L1 [kV]	L2 [kV]	L3 [kV]	PWO int [nWb]	PS amp [mV]	detail
0	12	13	-113.1	504	
0	0	0	-70.0	444	
5	0	0	-98.2	454	
0	2	0	-76.7	434	
0	4	0	-93.7	534	
0	7	0	-104.9	540	Defocused
0	10	0	-108.5	508	Defocused
0	13	0	-109.9	483	Defocused
0	10	5	-112.0	456	Defocused
0	10	8	-109.9	492	
0	10	10	-104.2	410	
0	5	5	-101.7	496	no image
0	5	8	-101.7	404	
0	5	11	-100.8	374	
0	5	14	-109.6	454	
0	5	17	-104.4	428	
0	5	20	-107.9	408	cut at top&bottom
0	8	20	-112.3	474	no cut
0	13	20	-112.1	478	no cut

Tuning compensating coil

compansate coil[A]	Gun current	pwo int[nwb]	PS Amp [mV]
0	923	-38.0	546
3	925.2	-46.2	454
5	918	-53.4	562
8	929	-73.6	502
10	921.6	-84.6	604

→ ~1.6E+5 positron / pulse (10 stack) if all positron s hit the target. (about 10 times small than expected?) ← Probably most annihilations are happened in the middle of beam line..

Contaminated beam image by 400eV beam

Delay time [ns]	PS Amp [mV]	PWO int [nWb]
90	416	-18.9
100	392	-30.1
101	440	-36.16
102	482	-37.5
103	512	-37.7
103	408	-33.95
104	482	-37.3
105	402	-32.45
107	472	-34.7
110	404	-24.3
115	398	-19.5
120	512	-17.8
125	398	-19.5



So

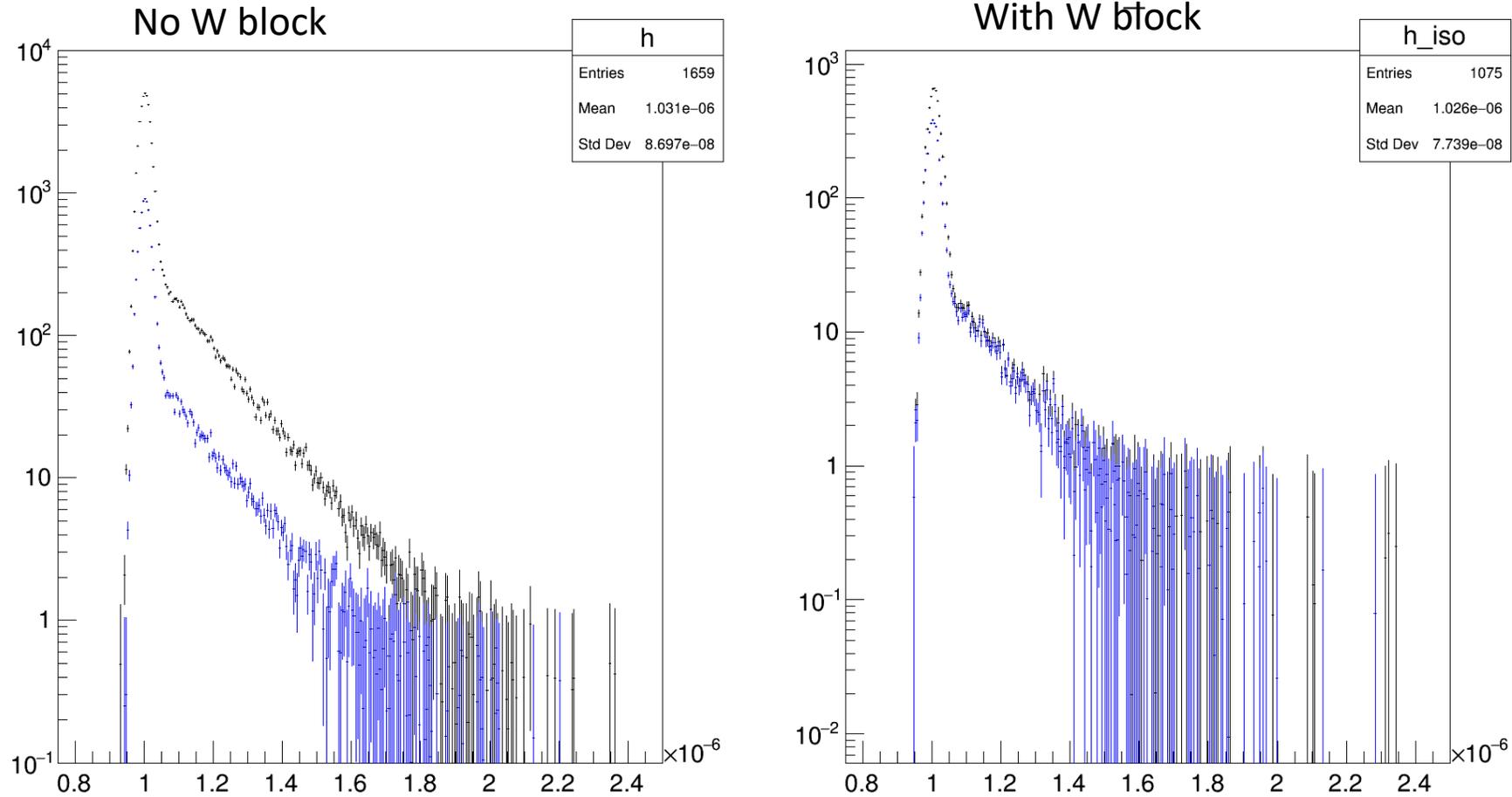
- Tune the lenses to get the beam in the center of MCP at reaction chamber roughly done (then PWO detector test can be started).
- Yesterday, I found that the MCP position is higher than center...
- Need to check the beam position

Then how to measure Compton BG

- Beam is not good (not that focused and loss maybe happened during guiding) and it's hard to check precise Compton BG.
- But positronium Compton background would be clean because it's well focused.
- With/without W block in front of PWO detector, we can get the Compton BG fraction with assumption that the W block effect is correct in the Geant4



Simulation of compton



From geometry

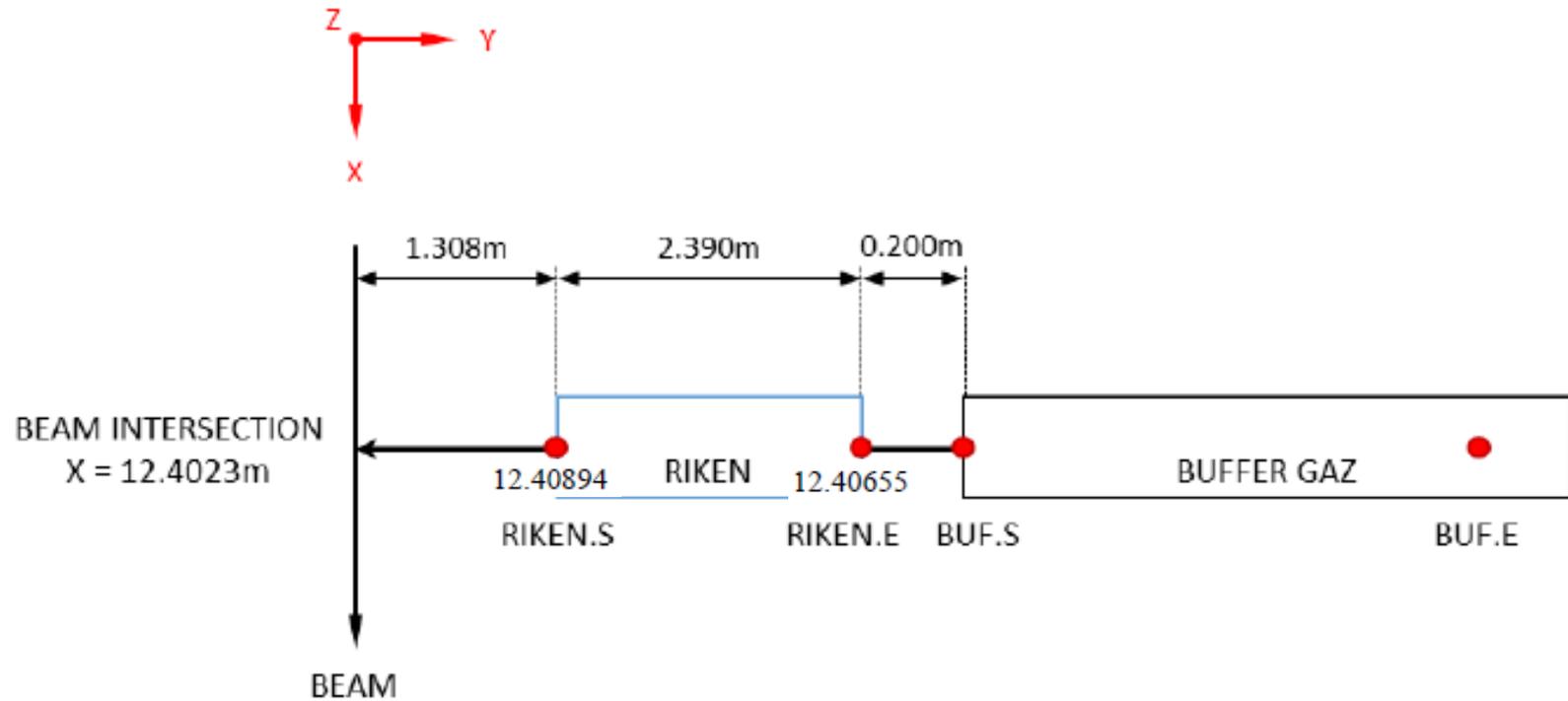


Figure 8 : Sketch of measured elements