

# Front End Geometry Summary

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*RAL*

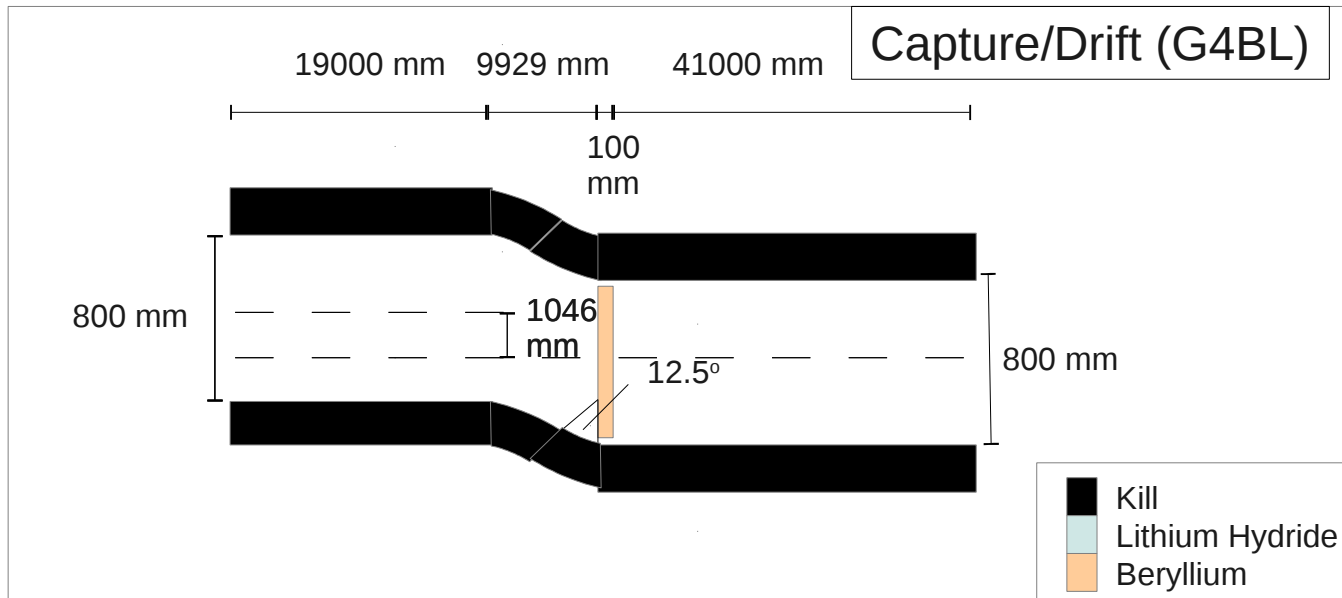
(Apr 15, 2013)

## Notes

Volumes listed as “kill” kill all particles that step into them.

Beam pipes are circular; diameter dimensions are shown across the beampipe.

# Capture/Drift



From 0 to 19000 mm fields defined by coil set

The chicane consists of a bend and reverse bend through  $12.5^\circ$  with radius of curvature 22917 mm to the centre of the beam pipe. In ICOOL this is simulated using an idealised  $B_s \sim 1/r$ ; in G4BL this is simulated using coils arranged periodically on the toroid.

Note due to the “cartoon” nature of the schematic the transverse displacement in the chicane looks deceptively small – it is in fact a little more than 1 beam pipe diameter.

G4BL chicane coils have:

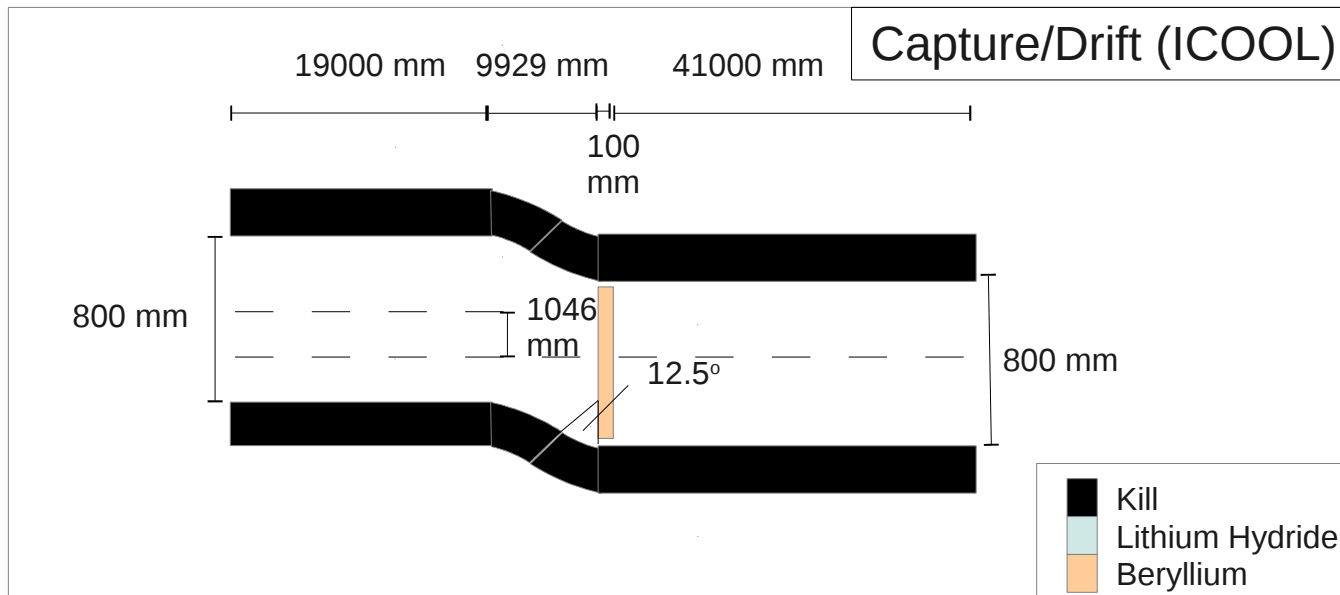
**Inner radius:** 430 mm

**Outer radius:** 530 mm

**Length:** 180 mm

**Current Density:** 16.57 A/mm<sup>2</sup>

Placed at  $1.25^\circ$  intervals (250 mm in s)



From the end of the chicane onwards both lattices use constant 1.5 T field

Coil number	Z Start [m]	Length [m]	Radius [m]	Current Density [A/m]
1	-0.48	0.103	8.350001E-02	764999.8
2	-0.48	0.103	0.1005	764999.8
3	-0.48	0.103	0.1175	764999.8
4	-0.48	0.475	0.1305	439200
5	-0.48	0.475	0.1395	439200
6	-0.48	0.475	0.1485	439200
7	-0.48	0.616	0.1636667	776533.4
8	-0.48	0.616	0.185	776533.4
9	-0.48	0.616	0.2063333	776533.4
10	-0.48	0.755	0.2308333	650166.6
11	-0.48	0.755	0.2585	650166.6
12	-0.48	0.755	0.2861667	650166.6
13	-0.755	0.882	0.4533333	4970667
14	-0.755	0.882	0.56	4970667
15	-0.755	0.882	0.6666667	4970667
16	0.177	0.517	0.4386667	3688801
17	0.177	0.517	0.516	3688801
18	0.177	0.517	0.5933334	3688801
19	0.7440001	0.485	0.5536667	3065332
20	0.7440001	0.485	0.617	3065332
21	0.7440001	0.485	0.6803333	3065332
22	1.279	0.7099999	0.7158333	2388100
23	1.279	0.7099999	0.7635	2388100
24	1.279	0.7099999	0.8111666	2388100
25	2.039	0.9590001	0.936	1774800

G4BL fields are represented by coil of 1 mm radial thickness and appropriate current density in A/mm<sup>2</sup>

Coil number	Z Start [m]	Length [m]	Radius [m]	Current Density [A/m]
26	2.039	0.9590001	0.97	1774800
27	2.039	0.9590001	1.004	1774800
28	3.048	1.465	1.274167	1515834
29	3.048	1.465	1.3025	1515834
30	3.048	1.465	1.330833	1515834
31	4.563001	3.153	1.507833	925898.5
32	4.563001	3.153	1.5235	925898.5
33	4.563001	3.153	1.539167	925898.5
34	7.766	4.707001	1.503833	565033.4
35	7.766	4.707001	1.5115	565033.4
36	7.766	4.707001	1.519167	565033.4
37	12.523	6.700001	1.502167	397873
38	12.523	6.700001	1.5065	397873
39	12.523	6.700001	1.510833	397873

G4BL fields are represented by coil of 1 mm radial thickness and appropriate current density in A/mm<sup>2</sup>

Coil centre [mm]	Current [A/m <sup>2</sup> ]
15000	6960820
15250	1841751
15500	3038931
15750	5646814
16000	7537398
16250	7484287
16500	10615760
16750	11525331
17000	12481662
17250	13614542
17500	14578132
17750	13699930
18000	16707465
18250	13198077
18500	17561416
18750	14939200

Matching coils from solenoid taper to chicane

**Inner radius:** 430 mm

**Outer radius:** 530 mm

**Length:** 180 mm

**G4BL only**

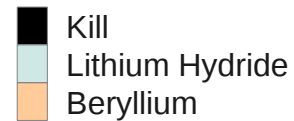
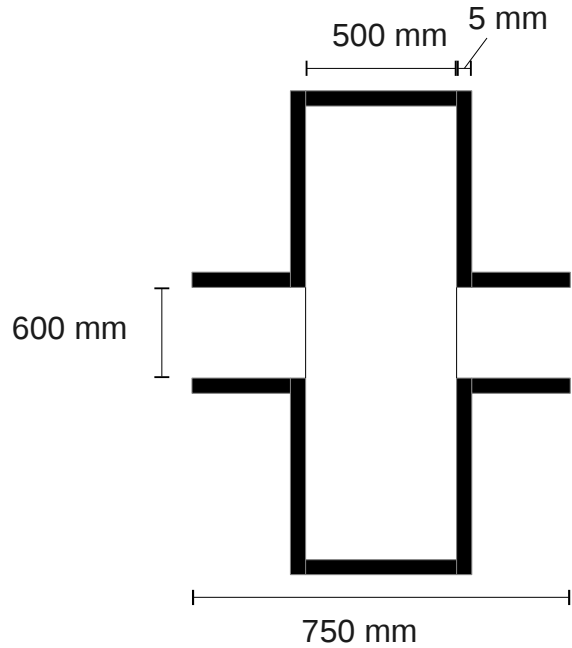
Coil number	Z Start [m]	Length [m]	Radius [m]	Current Density [A/mm <sup>2</sup> ]
40	19.273	6.700001	1.502167	397873
41	19.273	6.700001	1.5065	397873
42	19.273	6.700001	1.510833	397873

Matching coils from solenoid taper to chicane  
– provides fringe field (z > 19000 mm use  
1.5 T constant field)

**ICOOL only**

# RF Capture

## Buncher Cell (G4BL)



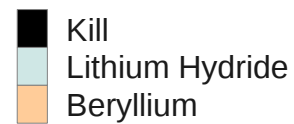
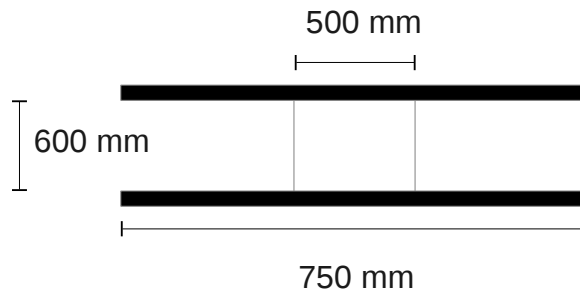
Field is constant 1.5 T (no coils simulated)

No windows

“Buncher” refers to variable voltage section

“Phase rotation” refers to fixed voltage section

## Buncher Cell (ICOOOL)



# RF Capture Cell Parameters (1)

Cell	F [GHz]	V [MV/m]		Cell	F [GHz]	V [MV/m]
1	0.36728	0.13364		17	0.30234	3.4064
2	0.36242	0.33818		18	0.29904	3.6109
3	0.35768	0.54273		19	0.29581	3.8155
4	0.35307	0.74727		20	0.29264	4.02
5	0.34857	0.95182		21	0.28955	4.2245
6	0.34418	1.1564		22	0.28651	4.4291
7	0.33991	1.3609		23	0.28354	4.6336
8	0.33574	1.5655		24	0.28064	4.8382
9	0.33167	1.77		25	0.27779	5.0427
10	0.32769	1.9745		26	0.275	5.2473
11	0.32381	2.1791		27	0.27226	5.4518
12	0.32003	2.3836		28	0.26958	5.6564
13	0.31633	2.5882		29	0.26695	5.8609
14	0.31271	2.7927		30	0.26437	6.0655
15	0.30918	2.9973		31	0.26184	6.27
16	0.30572	3.2018		32	0.25935	6.4745

# RF Capture Cell Parameters (2)

Cell	F [GHz]	V [MV/m]		Cell	F [GHz]	V [MV/m]
33	0.25692	6.6791		49	0.22513	13
34	0.25453	6.8836		50	0.22365	13
35	0.25218	7.0882		51	0.22226	13
36	0.24988	7.2927		52	0.22094	13
37	0.24762	7.4973		53	0.2197	13
38	0.2454	7.7018		54	0.21852	13
39	0.24322	7.9064		55	0.21741	13
40	0.24107	8.1109		56	0.21635	13
41	0.23897	8.3155		57	0.21536	13
42	0.2369	8.52		58	0.21441	13
43	0.23486	8.7245		59	0.21352	13
44	0.23287	8.9291		60	0.21267	13
45	0.23195	13		61	0.21188	13
46	0.23009	13		62	0.21112	13
47	0.22834	13		63	0.21041	13
48	0.22669	13		64	0.20973	13



# RF Capture Cell Parameters (3)

Cell	F [GHz]	V [MV/m]		Cell	F [GHz]	V [MV/m]
65	0.2091	13		81	0.20296	13
66	0.2085	13		82	0.20278	13
67	0.20793	13		83	0.20261	13
68	0.2074	13		84	0.20247	13
69	0.2069	13		85	0.20234	13
70	0.20643	13		86	0.20223	13
71	0.20599	13		87	0.20214	13
72	0.20558	13		88	0.20206	13
73	0.20519	13		89	0.202	13
74	0.20483	13		90	0.20196	13
75	0.20449	13		91	0.20193	13
76	0.20418	13		92	0.20191	13
77	0.20389	13				
78	0.20363	13				
79	0.20339	13				
80	0.20316	13				

# Matcher

Matcher	
RF length	500 mm
RF volt	16 MV/m
RF phase	35 deg
N cells	8

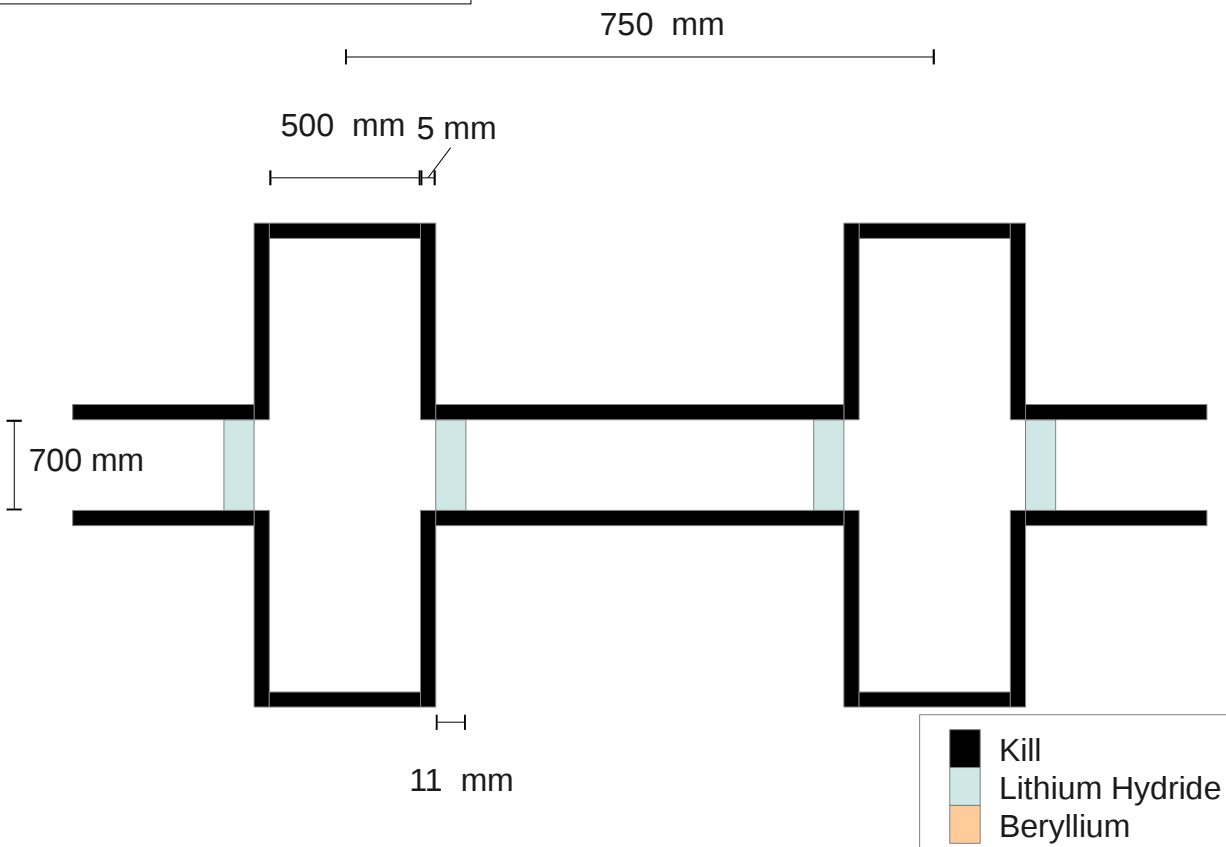
Additional 1 mm LiH block at start of matching

No reasonable coil definition

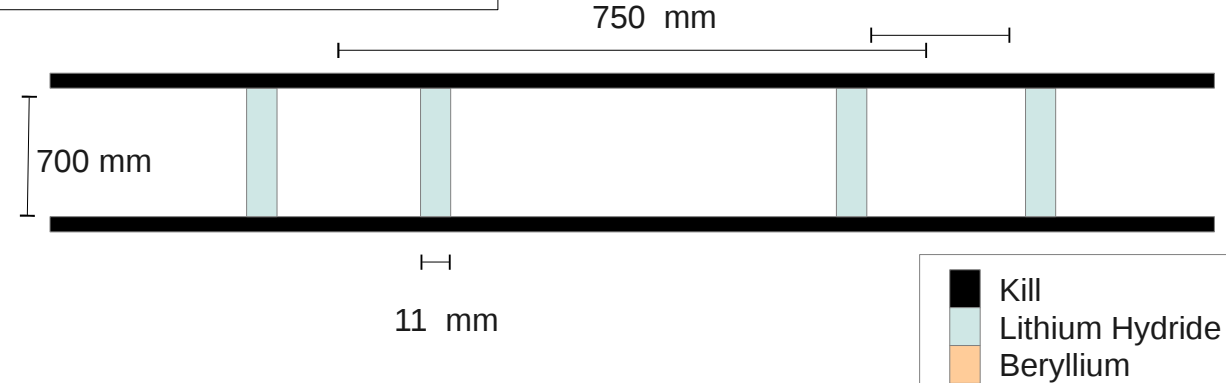
Lithium Hydride (ICOOL) uses default material composition

Lithium Hydride (G4BL) uses  
**Lithium:** 0.873203  
**Hydrogen:** 0.126797  
**Density:** 0.78  
matching MICE parameters

## Matcher Cell (G4BL)



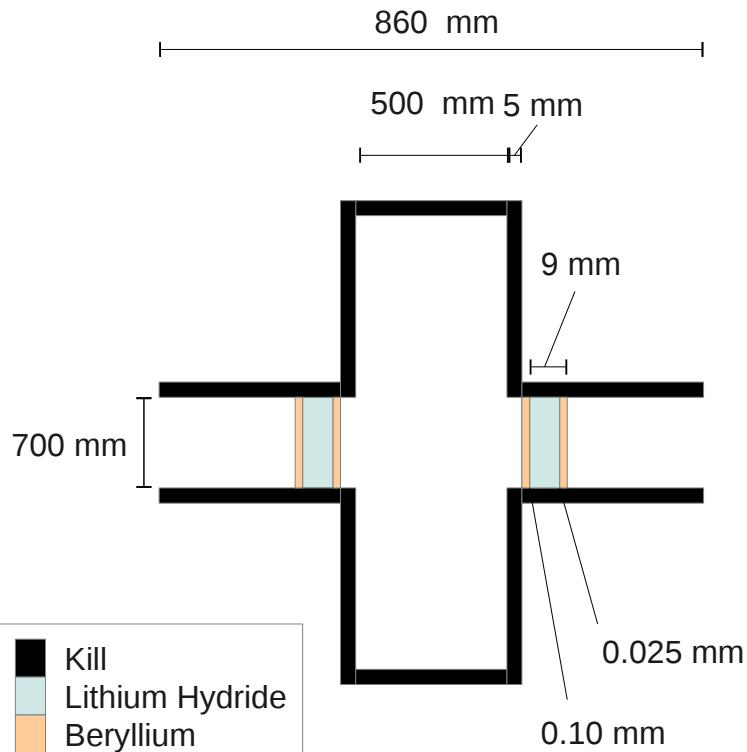
## Matcher Cell (ICOOL)



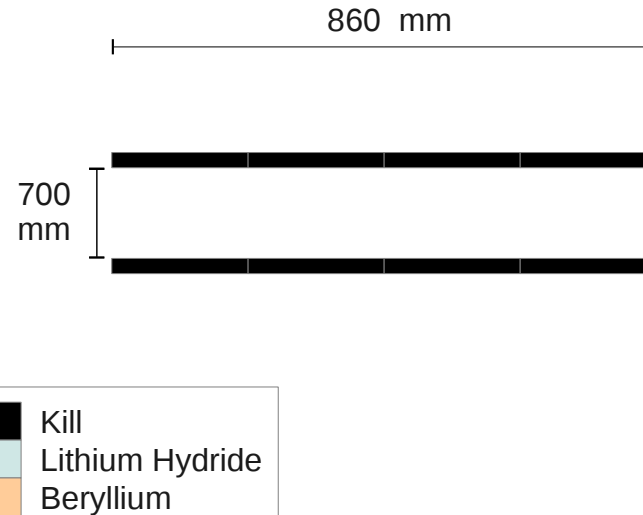
# Cooler

Cooler	
RF length	500 mm
RF volt	16 MV/m
RF phase	35 deg
N RF subcells	5
N Gap subcells	1
N supercells	44

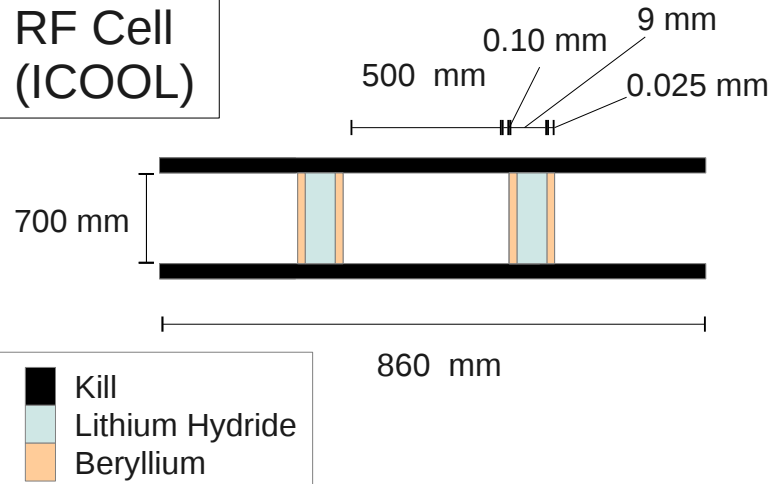
RF Cell (G4BL)



Gap Cell (G4BL)



RF Cell (ICOOL)



Gap Cell (ICOOL)

