Next steps

Offsets and Coordinates

Meaning:

- *(GEM_X, GEM_Y):* The coordinates of GEM1 **origin** in GEM2 Frame.
- *(HYCAL_GEM_X, HYCAL_GEM_Y):* The coordinates of HyCal **origin** in GEM2 Frame.
- *(BEAM_X, BEAM_Y):* The coordinates of **beam position** in GEM2 Frame.

For check with HyCal results

Transform to beam line Coordinate:

$$X_{GEM\,1} = X_{GEM\,1} + GEM\_X - BEAM\_X$$
$$Y_{GEM\,1} = Y_{GEM\,1} + GEM\_Y - BEAM\_Y$$

$$X_{GEM\,2} = X_{GEM\,2} - BEAM\_X$$
$$Y_{GEM\,2} = Y_{GEM\,2} - BEAM\_Y$$

$$X_{HyCal} = X_{HyCal} + HyCal\_GEM\_X - BEAM\_X$$
$$Y_{HyCal} = Y_{HyCal} + HyCal\_GEM\_Y - BEAM\_Y$$

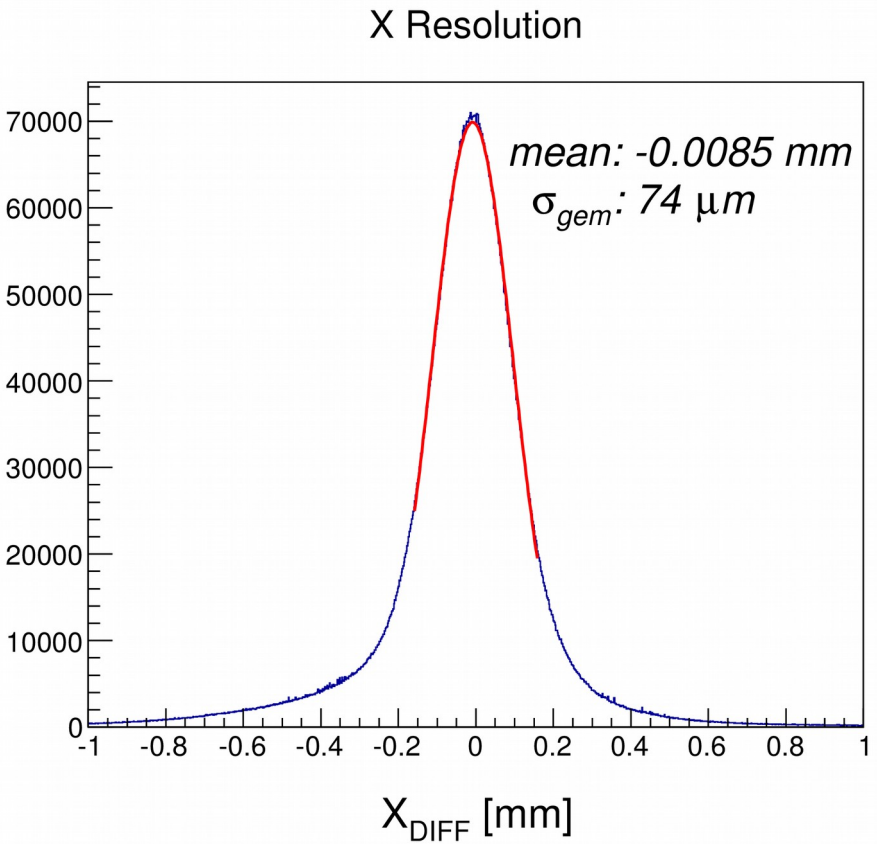
RUN_NUMBER	**GEM_X**	**GEM_Y**	**HYCAL_GEM_X**	**HYCAL_GEM_Y**	**BEAM_X**	**BEAM_Y**
1240	0.3372	0.1884	2.1270	0.9307	1.4630	-0.4750
1287	0.3358	0.1889	2.1790	0.9501	1.5000	-0.4397
1302	0.3366	0.1884	2.1550	0.9437	1.4940	-0.4448
1304	0.3365	0.1884	2.1370	0.9300	1.4820	-0.4356
1307	0.3373	0.1889	2.1160	0.9236	1.4900	-0.4245
1341	0.3382	0.1890	2.1520	0.9360	1.4960	-0.4439
1345	0.3331	0.1864	2.1930	0.9146	1.0230	-0.4599
1371	0.3362	0.1868	2.3930	0.9633	1.5530	-0.4530
1372	0.3354	0.1864	2.3930	0.9585	1.5510	-0.4506
1373	0.3365	0.1868	2.3900	0.9594	1.5530	-0.4546
1374	0.3367	0.1874	2.3880	0.9636	1.5520	-0.4528
1394	0.3360	0.1867	2.3860	0.9560	1.5540	-0.4564
1401	0.3353	0.1860	2.4020	0.9569	1.5490	-0.4660

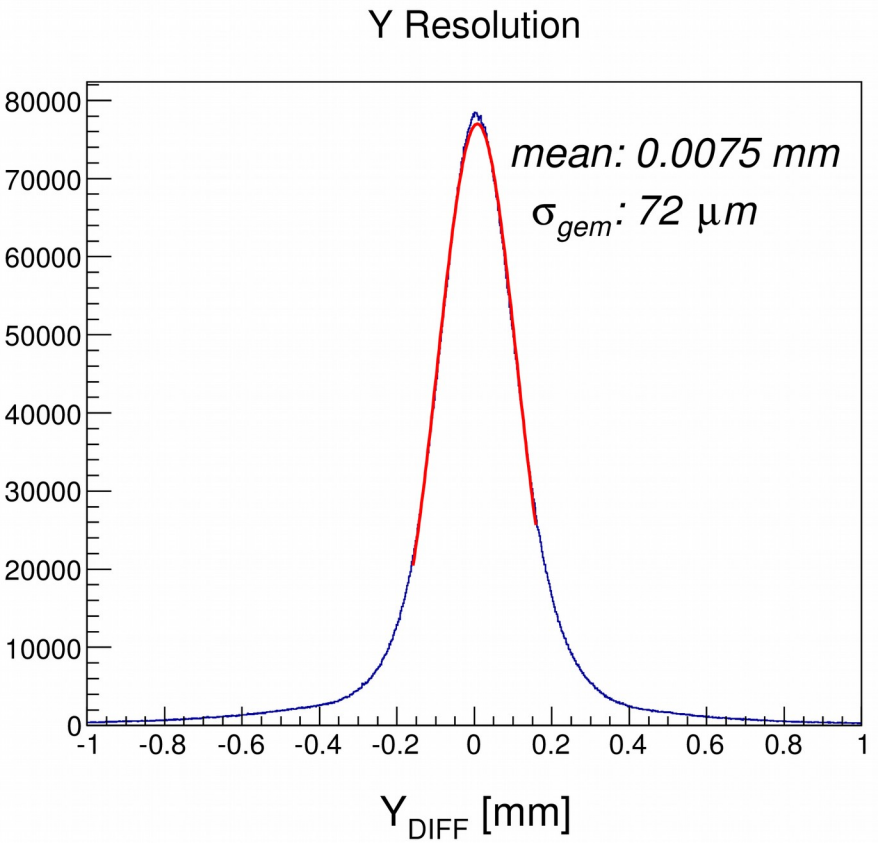
Mostly done, a few RUNs program always break, examining program.

Resolution

Will be improved when:

- Offsets get improved, minor adjustment from z direction.
- Better HyCal GEM Matching.
- … …





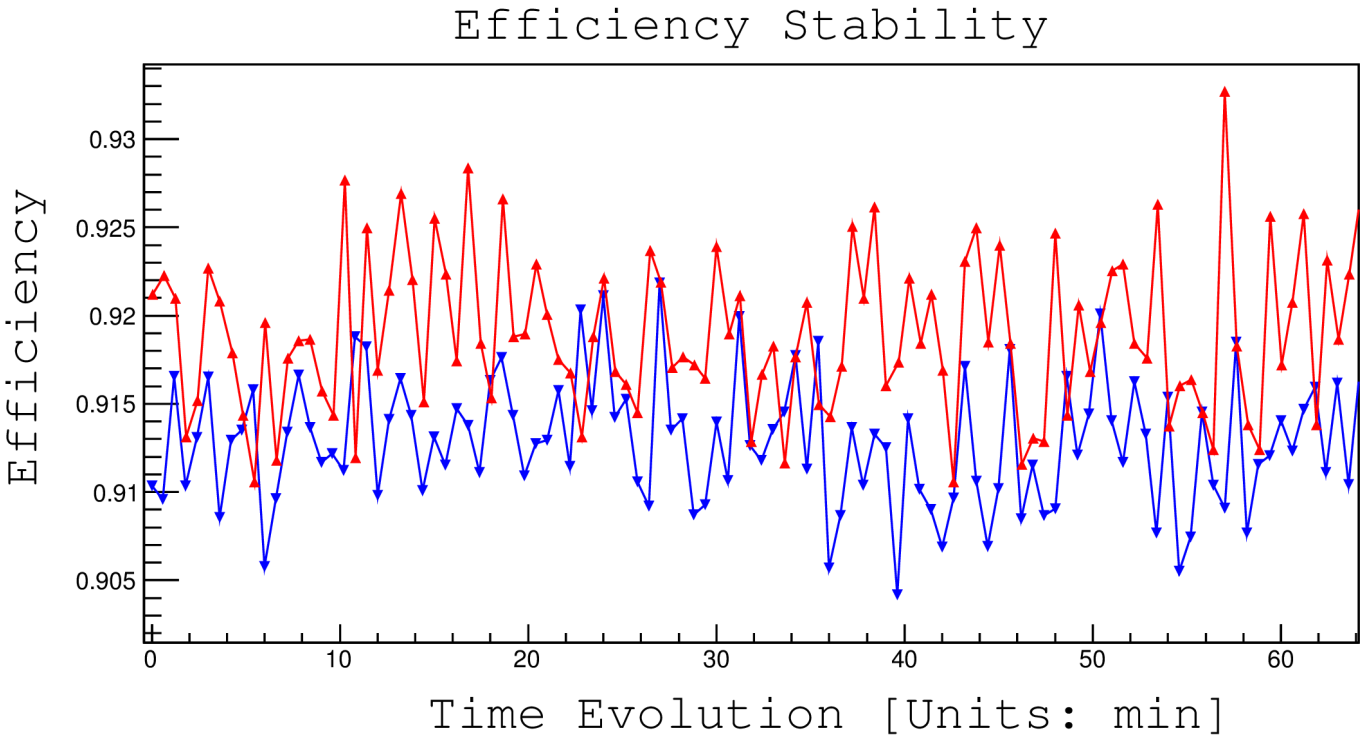
Detection Efficiency

Dead Area:

- Spacer area / Total area: 1.4%.
  However, considering the sagging of spacers, effective ratio maybe higher.
- Dead area / Total area: 3.2%. (Accident).
- A few non-consecutive broken strips (<10).
  Will affect space resolution, but should have no effect to efficiency.

Cut dead area:

- Project spacer to HyCal: 0.32mm ~ 0.52mm, << hycal position resolution.
- Select spots far away from spacer? 9mm away from spacer?
- ……



- *Finalize beam positions for each run, complete the offset table, use this table to transfer coordinates to beam coordinates.*
- *Get Real GEM Efficiency, with dead area removed. (Require even better hycal GEM matching.)*

  1), Better offsets correction.

  2), Better z direction adjustment.

  3), Weaken cross-talk effect on GEMs, clean up GEM cluster … …
- *Check with survey group, make sure survey data are translated correctly.*