Things I have tried

- I added some code in the GBL fitter to include the vertex, but when the millepede data is produced something goes awry (NaN values?).

```
 PEREAD: record    35153 in file      1 contains      3 NaNs !!!
STOP PEREAD: stopping due to bad records
```

- I will revisit the code I added to see if I can identify the cause.

- Added χ2 cut to iterations in Millepede to reject very large χ2 in beginning iterations.
  - Millepede by default rejects ”Huge χ2”. (50 * χ2 corresponding to 3σ).

FTT Alignment

- No misalignment, but allow the 4 pentagons in +x,+y quadrant vary in Δu, Δv, and Δγ in alignment calculation.
  - Alignment performs well. Worst results for plane farthest in z:

Farthest Pentagon in Z

Parameter	Input	Output	Error	Global Corr.
Δu (μm)	0.0	-1.5	1.5	0.987
Δv (μm)	0.0	-8.1	3.0	0.996
Δγ (mrad)	0.0	0.022	0.009	0.997

- No misalignment, allow all 6 parameters to vary.
  - Clearly this is not performing well. Specifically, the added rotations and shifts which involve the changing the z(w)-location of the sensors.
  - I will try to add some pre-sigma to millepede program, which can help to stabilize poorly defined parameters.

Farthest Pentagon in Z

Parameter	Input	Output	Error	Global Corr.
Δu (μm)	0.0	-9.3	2.2	0.996
Δv (μm)	0.0	1.2	2.4	0.997
Δγ (mrad)	0.0	-0.041	0.007	0.997
Δw (μm)	0.0	2589.5	74.7	1.000
Δα(mrad)	0.0	590.7	0.6	1.000
Δβ (mrad)	0.0	-1.15	0.15	0.999

FTT Alignment

- I tried various misalignments in the one of the FTT planes and allowed Δu, Δv, and Δγ to vary in alignment.
  - In this I saw that the misalignment was sort of “shared” for different planes.
  - Say I shifted in Δu of the second plane. I would see large shifts in the second and third plane, but still smaller than the misalignment in one plane.