How to find commissioning Gap

1. Measure all field integrals with the long coil at required gaps. Use “Phase\_matching\_data” gap file and the following settings: average of 3, x\_steps = 0, y\_steps = 0, “Measure all integrals”.
2. Measure fields with the Hall probe for different gaps. Use the gap file with the same name as in step 1 and the following settings: averaging = 1, x\_pos = 1, y\_pos =1.
3. Start Matlab. Set the working directory in the “Long\_coil\_anal\_param.m” file to the current directory with the long coil data; run “Long\_coil\_anal.m” to process the data.
4. In “pid\_anal\_param.m” file set the correction coil directory name to the current directory name from step 3. In “pid\_anal\_op.m” file change the root directory to the current directory with “z\_scan’s” data; run “pid\_anal\_op.m” to process Hall probe data.
5. Change root directory in “pid\_fit\_k.m” to the current directory with “z\_scan’s” data; run it. The result for the commissioning gap will be in the data file.

LCLS-II Undulator Analysis Programs

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1. Hall probe scan

* “pid\_anal.m” for single scans
* “pid\_anal\_op.m” for many scans

If desired, long coils measurements can be made first, in order to correct the Hall probe scans. The long coil results file is given in the parameter file “pid\_anal\_param.m”.

1. Long coil measurements

* “long\_coil\_anal.m” for on-axis measurements
* “long\_coil\_anal\_off\_axis.m” for off-axis measurements

1. Fit K vs gap

* “pid\_fit\_k.m” takes the pid\_anal results and summarizes them for spline fits. It also calculates the gap that gives the commissioning K value of 4.05 and writes it to the data file.
* “pid\_fit\_k\_hyst.m” takes pid\_anal results and summarizes them for spline fits as the gap is opening and as the gap is closing. It makes plots comparing the two.
* “pid\_fit\_k\_off\_axis.m” summarizes the K value for off-axis measurements
* “pid\_fit\_calc\_k\_gap\_gui.m” takes the pid\_fit\_k results and does the spline fits in a GUI. If a K value is entered, the gap corresponding to K is displayed. If a gap is entered, the K value is displayed.

1. Fit phase matching data

* “pid\_fit\_phase\_match.m” takes pid\_anal results and summarizes the phase matching error as a function of gap for spline fits.

1. Fit Hall probe field integral data

* “pid\_fit\_i12xy.m” takes pid\_anal results and summarizes the Hall probe field integrals for spline fits.
* “pid\_fit\_i12xy\_off\_axis.m” summarizes the Hall probe field integrals for off-axis measurements

1. Midplane height vs gap

“cmm\_yctr\_vs\_gap.m” fits the midplane height vs gap measurements for a spline fit

1. Pitch vs gap

“cmm\_pitch\_vs\_gap.m” fits the midplane pitch vs gap measurements for a spline fit