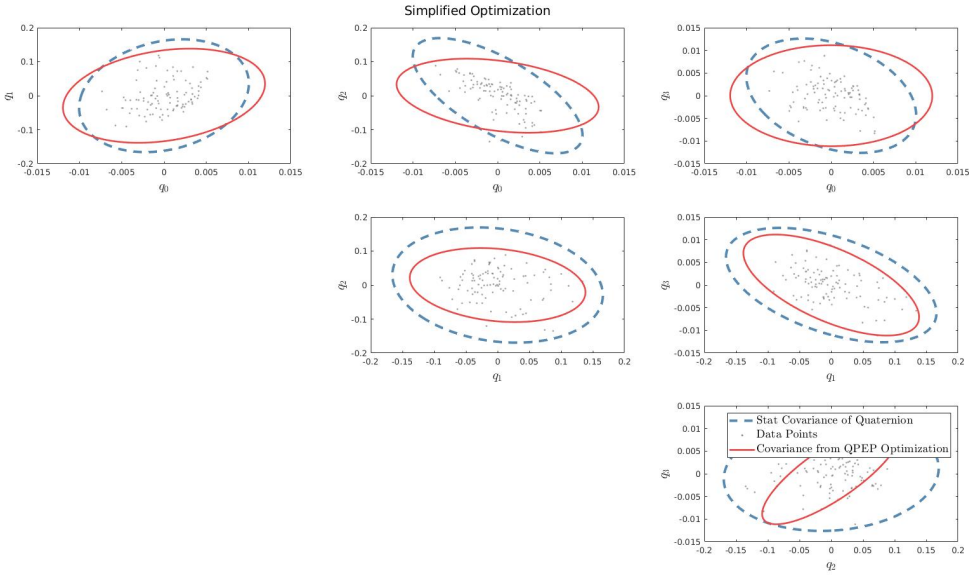
# Experiment Results ------ 20220318

## Pipeline of QPEP-LCEcalib

1. Extract **pattern points from images** and **board, edge points from LiDARs**
2. Compute the board transformation w.r.t. the camera frame using QPEP-PnP
3. Compute the board planar coefficient: [n;d]
4. Compute the initial transformation from the camera to LiDAR by performing a point-to-plane registration using QPEP-PToP: T_ini
5. With multiple iterations: for i = 1:max_iterations (i.e., 5)
6. |---------- With T_ini, we find corresponding edge for each LiDAR edge point
7. |---------- Compute T_ref by performing a point-to-plane registration using QPEP-PToP

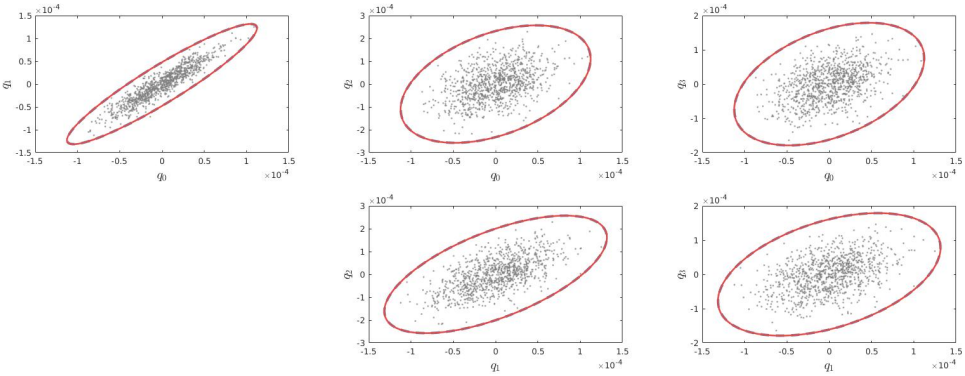
## Covariance of quaternion from QPEP-PnP

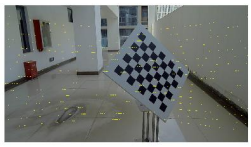
1. The computed covariance does not fit well with Monte Carlo sampling




## Covariance of quaternion from QPEP-PTop

1. The computed covariance fits well with Monte Carlo sampling



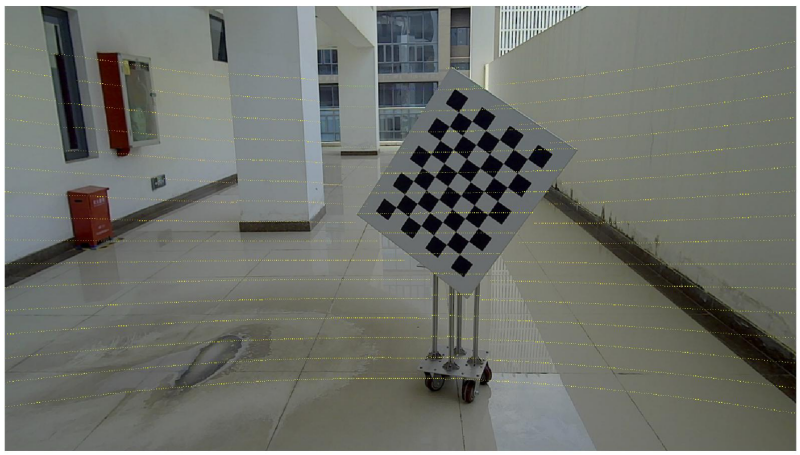


## Extrinsic Calibration Results

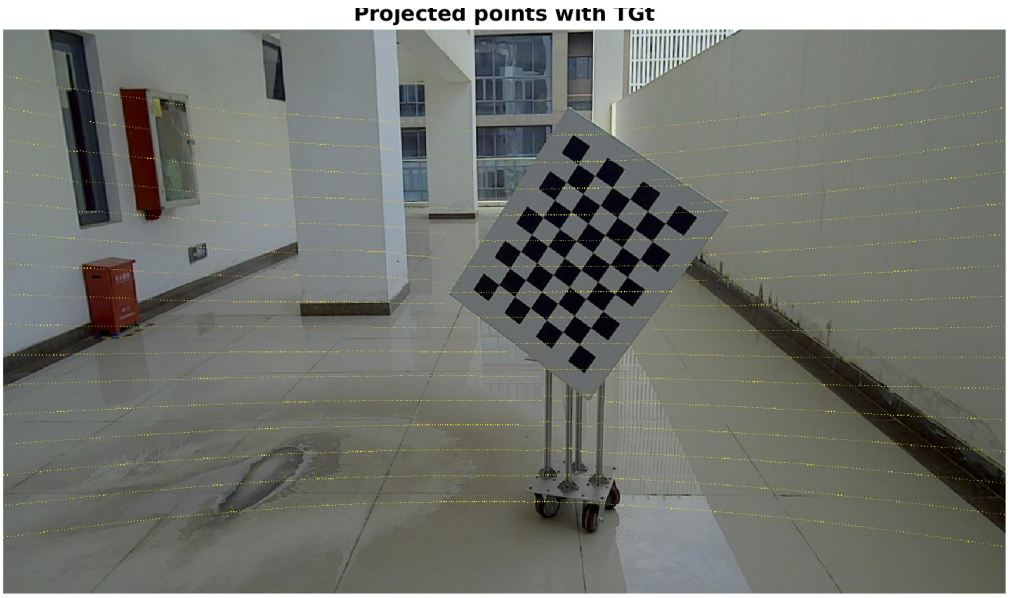
1. Estimated extrinsics against GT
    - Rotation error: 0.6078 *deg*
    - Translation error: 0.0189 *m*

```
T_est
0.772965 -0.634295  0.013967  0.008904
0.010479 -0.009247 -0.999902 -0.064026
0.634362  0.773036 -0.000500 -0.090145
0.000000  0.000000  0.000000  1.000000
TGt
0.777640 -0.628670  0.006663 -0.008374
0.006309 -0.002794 -0.999980 -0.069025
0.628670  0.777670  0.001794 -0.084349
0.000000  0.000000  0.000000  1.000000
```

2. Projected point cloud: LiDAR points are not perfectly aligned onto the image



**estimated extrinsics**




**GT extrinsics**

3. Visualization of planar LiDAR point cloud on the checkerboard in camera frame