

## Calibration results

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### Normalized Residuals

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Reprojection error (cam0): mean 0.182005538766, median 0.160849047852, std: 0.111473888172

Gyroscope error (imu0): mean 0.0649933458209, median 0.058145561027, std: 0.0383692648252

Accelerometer error (imu0): mean 0.163167930075, median 0.134795292601, std: 0.11790953495

### Residuals

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Reprojection error (cam0) [px]: mean 0.182005538766, median 0.160849047852, std: 0.111473888172

Gyroscope error (imu0) [rad/s]: mean 0.0045957235562, median 0.00411151204981, std: 0.00271311673471

Accelerometer error (imu0) [m/s<sup>2</sup>]: mean 0.0230754299656, median 0.0190629330941, std: 0.0166749263459

### Transformation (cam0):

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T\_ci: (imu0 to cam0):

[[ -0.99977624 -0.01193635 0.01746424 0.05445671]

[ -0.01735368 -0.00930377 -0.99980613 -0.02371471]

[ 0.01209652 -0.99988548 0.00909455 -0.03267106]

[ 0. 0. 0. 1. ]]

T\_ic: (cam0 to imu0):

[[ -0.99977624 -0.01735368 0.01209652 0.05442819]

[ -0.01193635 -0.00930377 -0.99988548 -0.03223794]

[ 0.01746424 -0.99980613 0.00909455 -0.02436403]

[ 0. 0. 0. 1. ]]

timeshift cam0 to imu0: [s] (t\_imu = t\_cam + shift)

0.00434952115664

Gravity vector in target coords: [m/s<sup>2</sup>]

[-0.00695021 -9.79491016 -0.47760809]

### Calibration configuration

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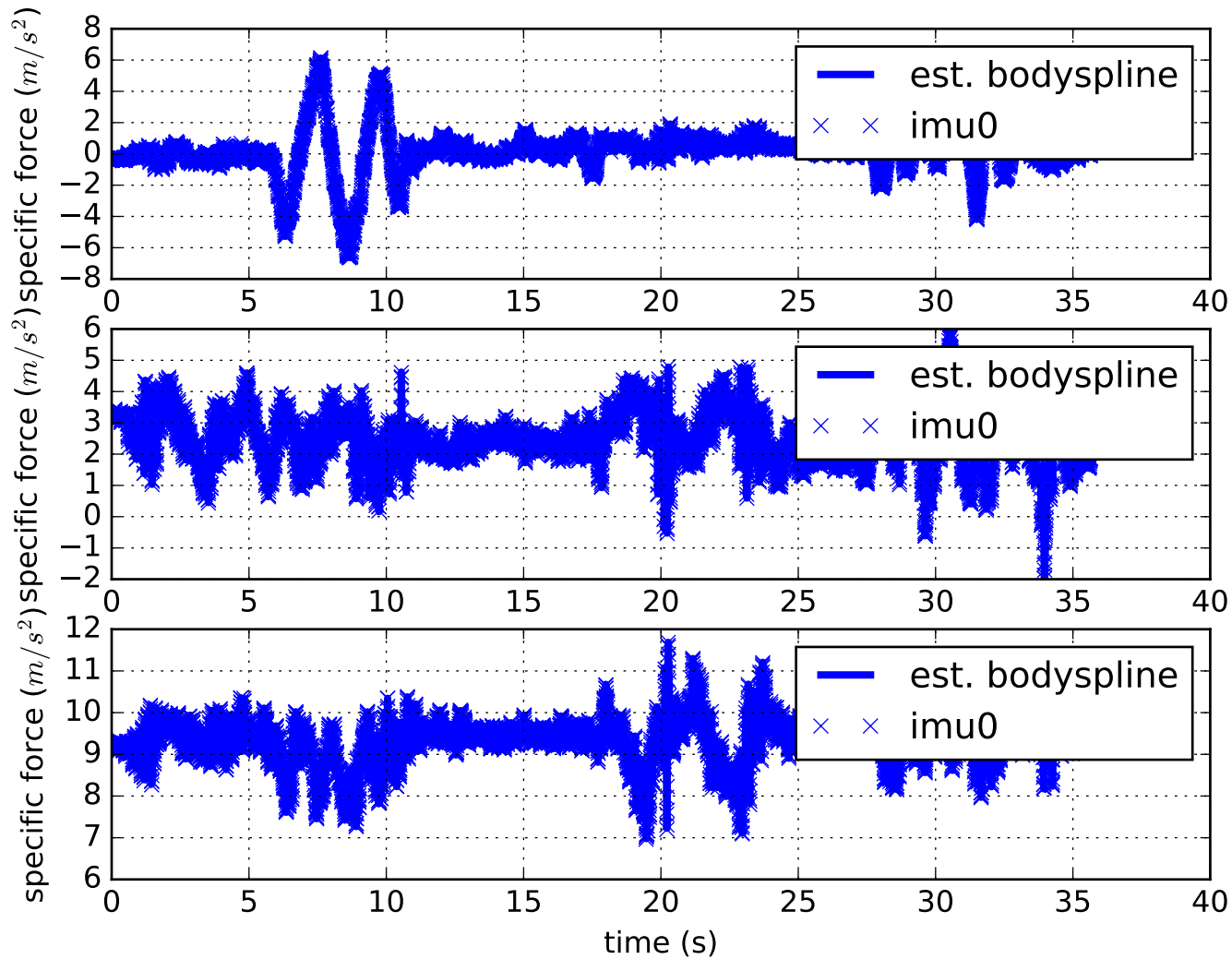
cam0

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Camera model: pinhole  
Focal length: [708.7250276090394, 707.5720928291857]  
Principal point: [377.1496498296681, 231.4704438084926]  
Distortion model: equidistant  
Distortion coefficients: [0.480014413538239, 0.3641160926609374, -4.890797341610791, 9.512675222287179]  
Type: aprilgrid  
Tags:  
  Rows: 6  
  Cols: 6  
  Size: 0.083 [m]  
  Spacing 0.0249 [m]

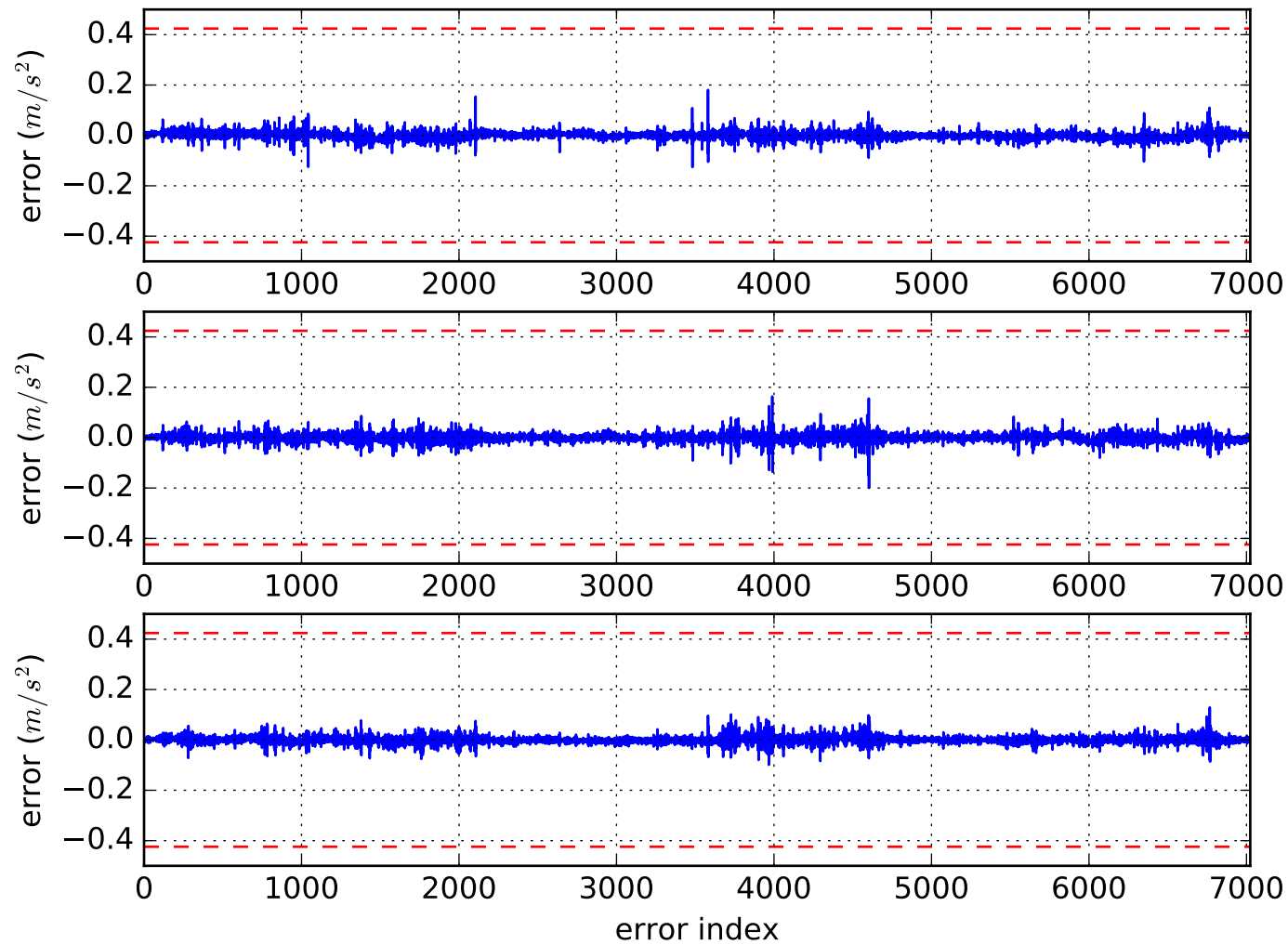
IMU configuration  
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IMU0:  
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Model: calibrated  
Update rate: 200.0  
Accelerometer:  
  Noise density: 0.01  
  Noise density (discrete): 0.141421356237  
  Random walk: 0.0002  
Gyroscope:  
  Noise density: 0.005  
  Noise density (discrete): 0.0707106781187  
  Random walk: 4e-06  
T\_i\_b  
  [[ 1. 0. 0. 0.]  
  [ 0. 1. 0. 0.]  
  [ 0. 0. 1. 0.]  
  [ 0. 0. 0. 1.]]  
time offset with respect to IMU0: 0.0 [s]

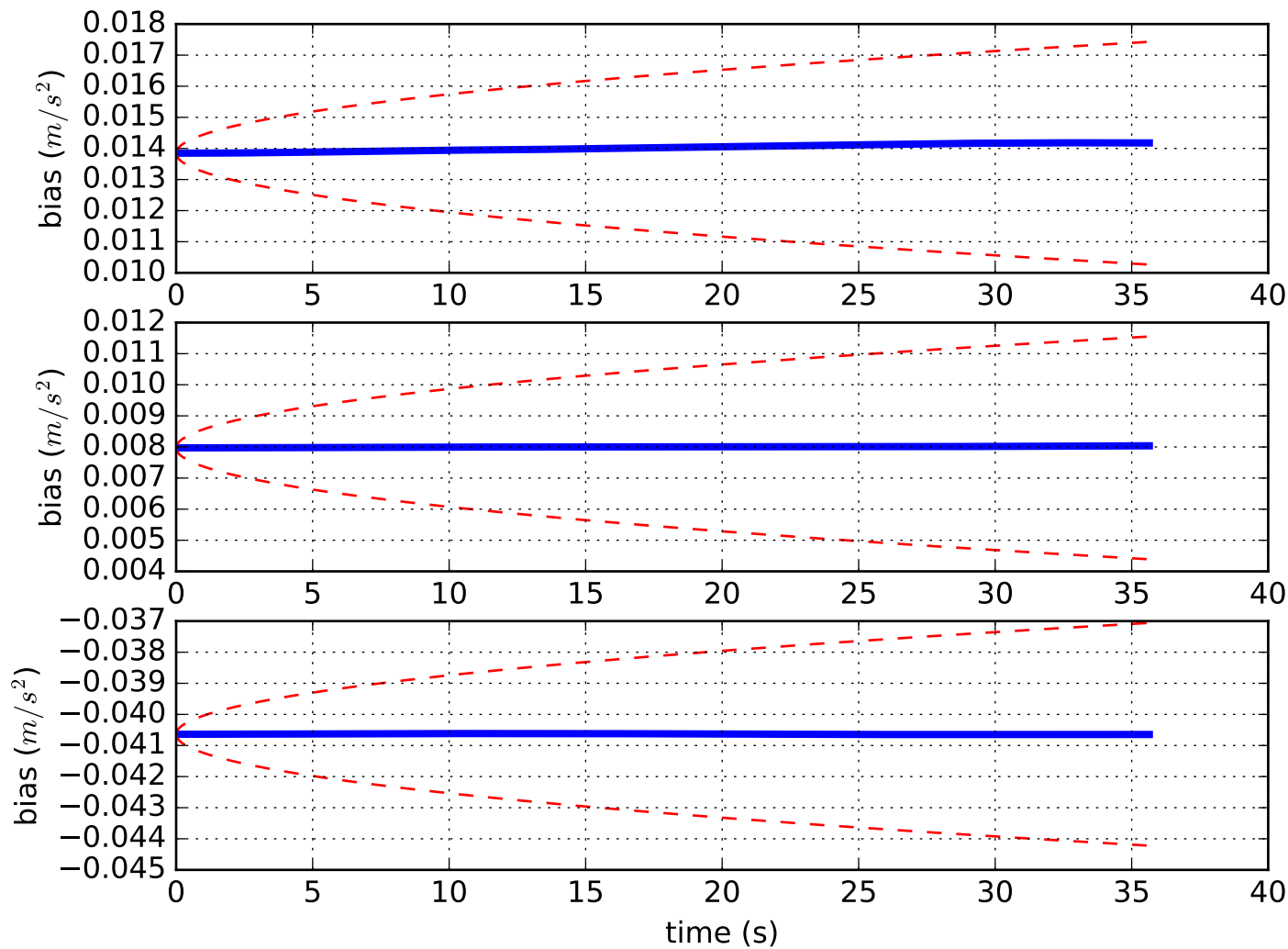
Comparison of predicted and measured specific force (imu0 frame)



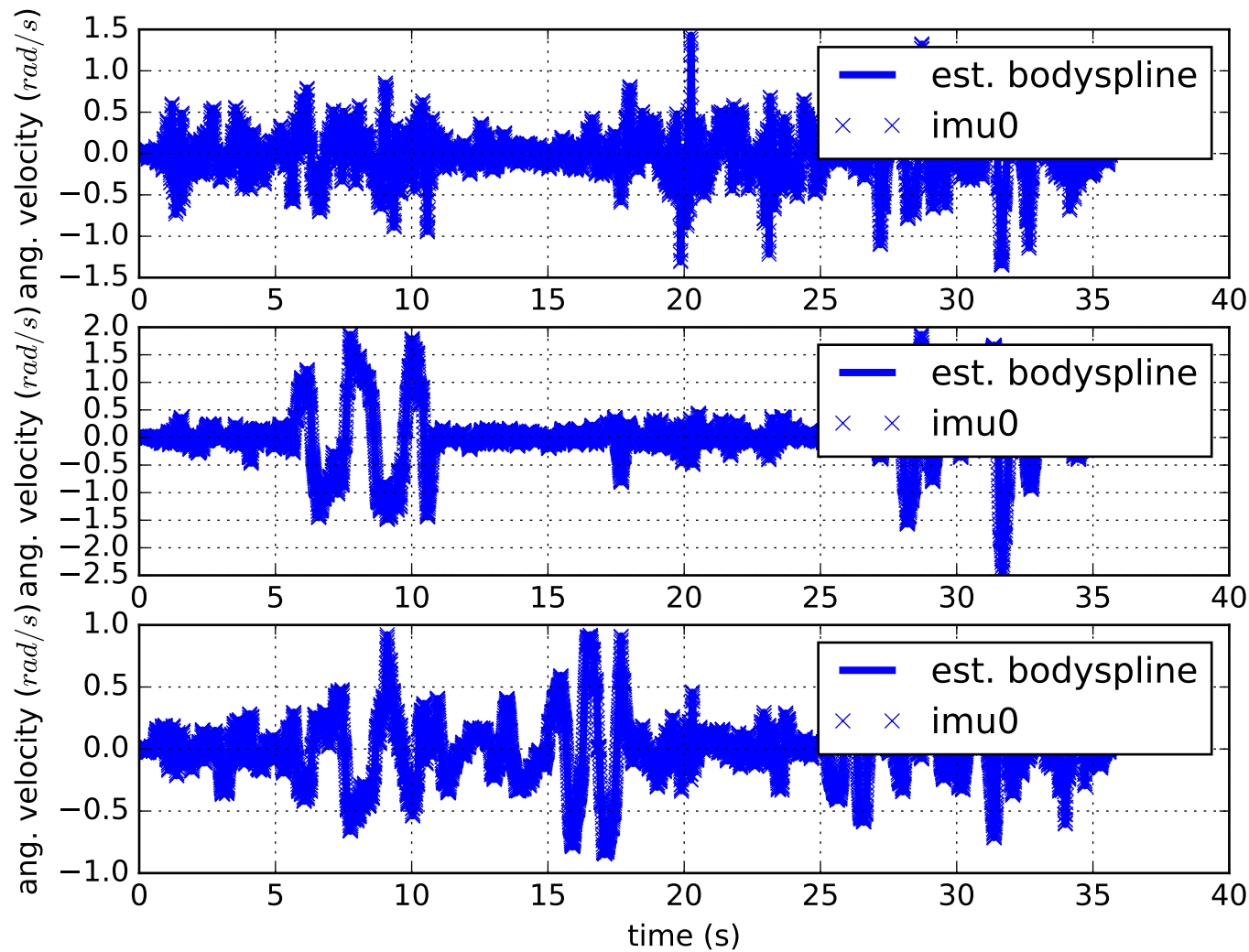
imu0: acceleration error



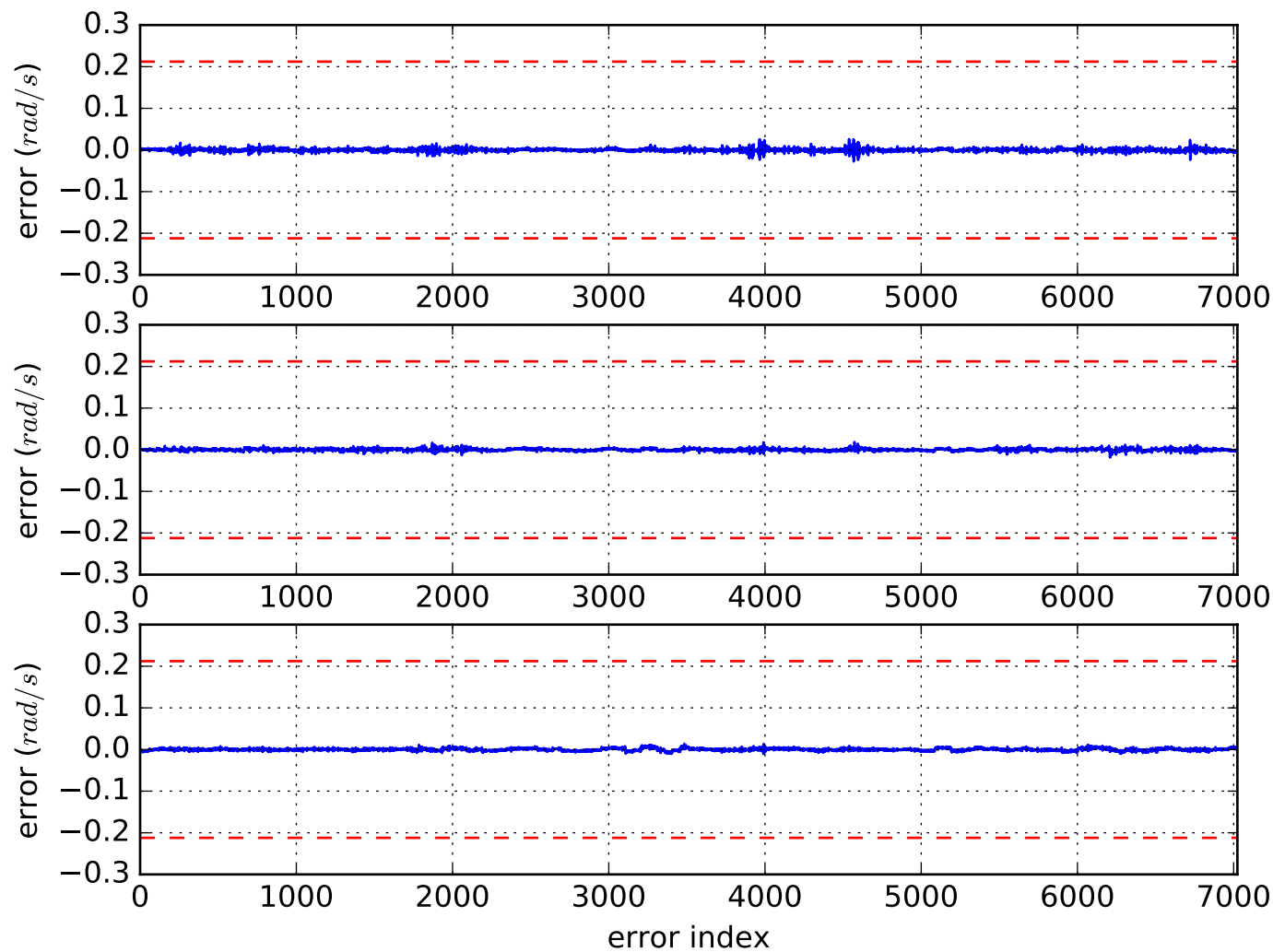
imu0: estimated accelerometer bias (imu frame)



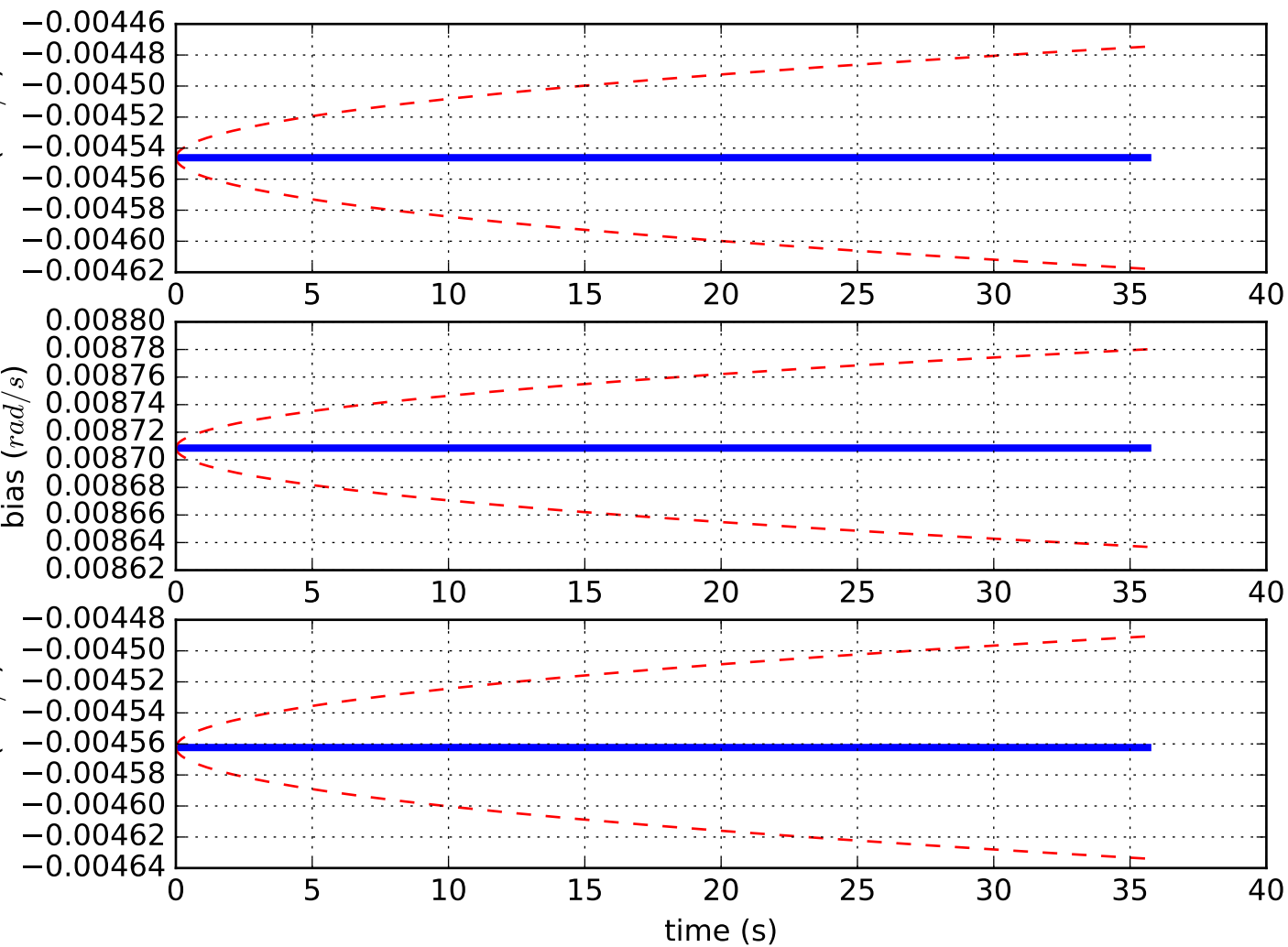
Comparison of predicted and measured angular velocities (body frame)



imu0: angular velocities error



imu0: estimated gyro bias (imu frame)





cam0: reprojection errors

