Calibration results
==========
Normalized Residuals

Reprojection error (cam0):   mean 0.296378867808, median 0.300400183818, std: 0.125825116375
Gyroscope error (imu0):   mean 0.000150226941885, median 5.737866266e-09, std: 0.00107508126984
Accelerometer error (imu0):   mean 0.000290798184902, median 0.000290977738416, std: 1.37367337355e-06

Residuals

Reprojection error (cam0) [px]:   mean 0.296378867808, median 0.300400183818, std: 0.125825116375
Gyroscope error (imu0) [rad/s]:   mean 3.07965230864e-06, median 1.17626258453e-10, std: 2.20391660318e-05
Accelerometer error (imu0) [m/s^2]: mean 9.30554191687e-07, median 9.31128762933e-07, std: 4.39575479536e-09

Transformation (cam0):

T_ci: (imu0 to cam0):
[[-0.01767743 -0.99954898 0.0242765 -0.00004166]
 [-0.03723893 -0.02360525 -0.99902755 -0.0001557]
 [0.99915002 -0.01856427 -0.03680485 -0.00011613]
 [0.   0.   0.   1.   ]]

T_ic: (cam0 to imu0):
[[-0.01767743 -0.03723893 0.99915002 0.0001095]
 [-0.99954898 -0.02360525 -0.01856427 -0.00004748]
 [0.0242765 -0.99902755 -0.03680485 -0.00015881]
 [0.   0.   0.   1.   ]]

timeshift cam0 to imu0: [s] (t_imu = t_cam + shift)
0.0

Gravity vector in target coords: [m/s^2]
[-0.06678613 -9.80632116 -0.00526861]

Calibration configuration
==========

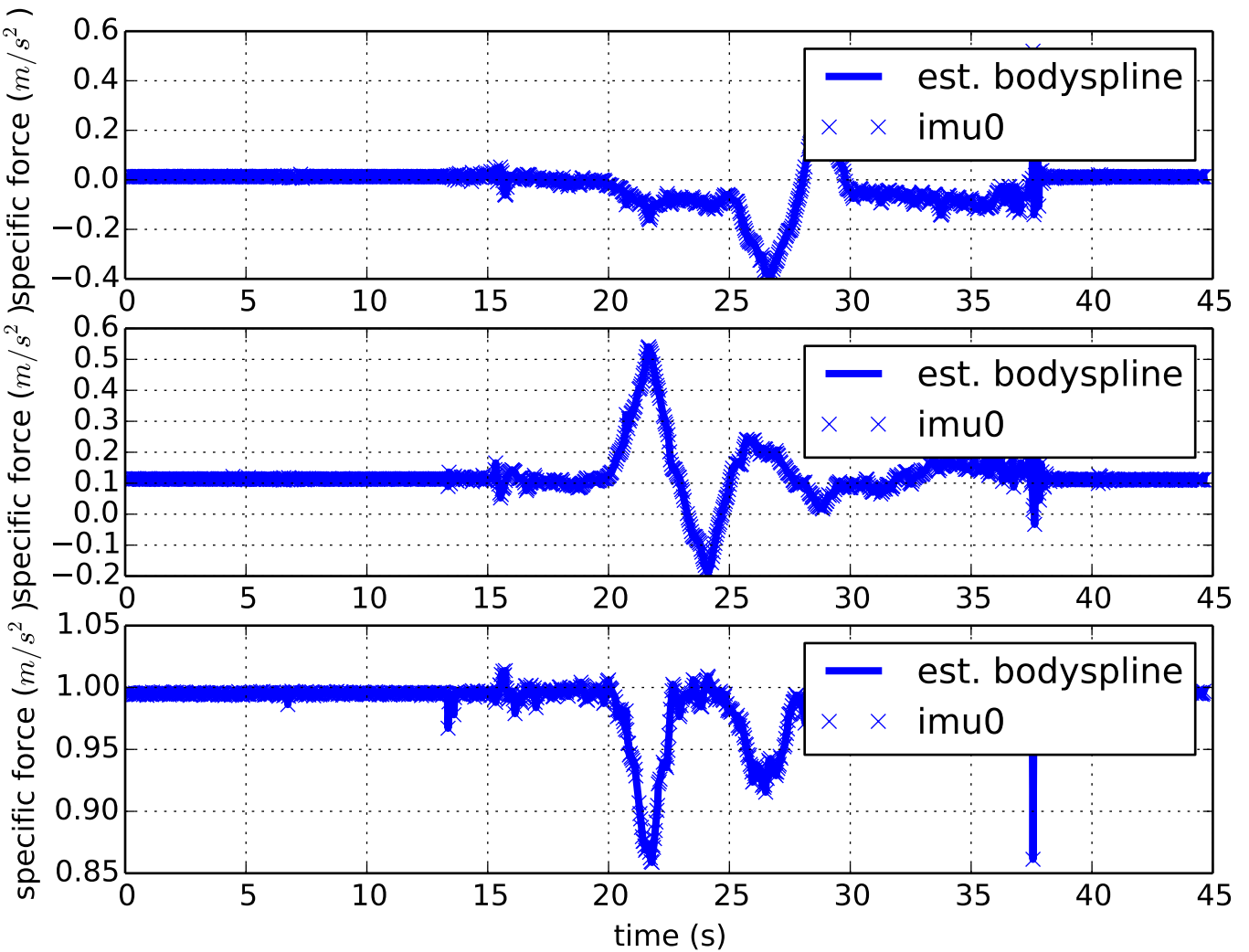
cam0

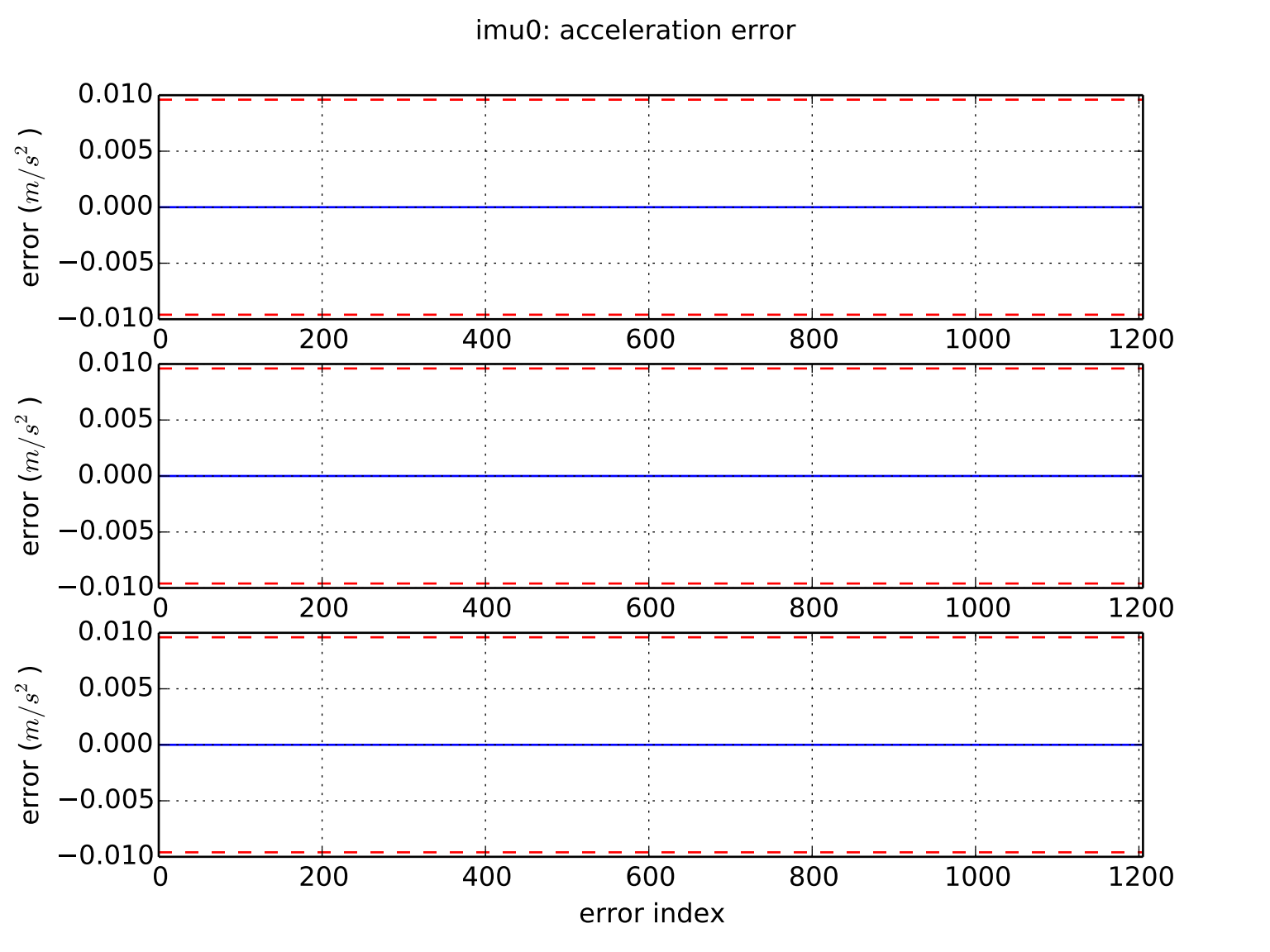
  Camera model: omni
  Focal length: [411.4184, 412.0773]
  Principal point: [161.415, 101.9626]
  Omni xi: 3.282446
  Distortion model: radtan
  Distortion coefficients: [0.8560437616, 17.43165613, 0.0, 0.0]
  Type: aprilgrid
  Tags:
    Rows: 6
    Cols: 6
    Size: 0.03 [m]
    Spacing 0.00999 [m]

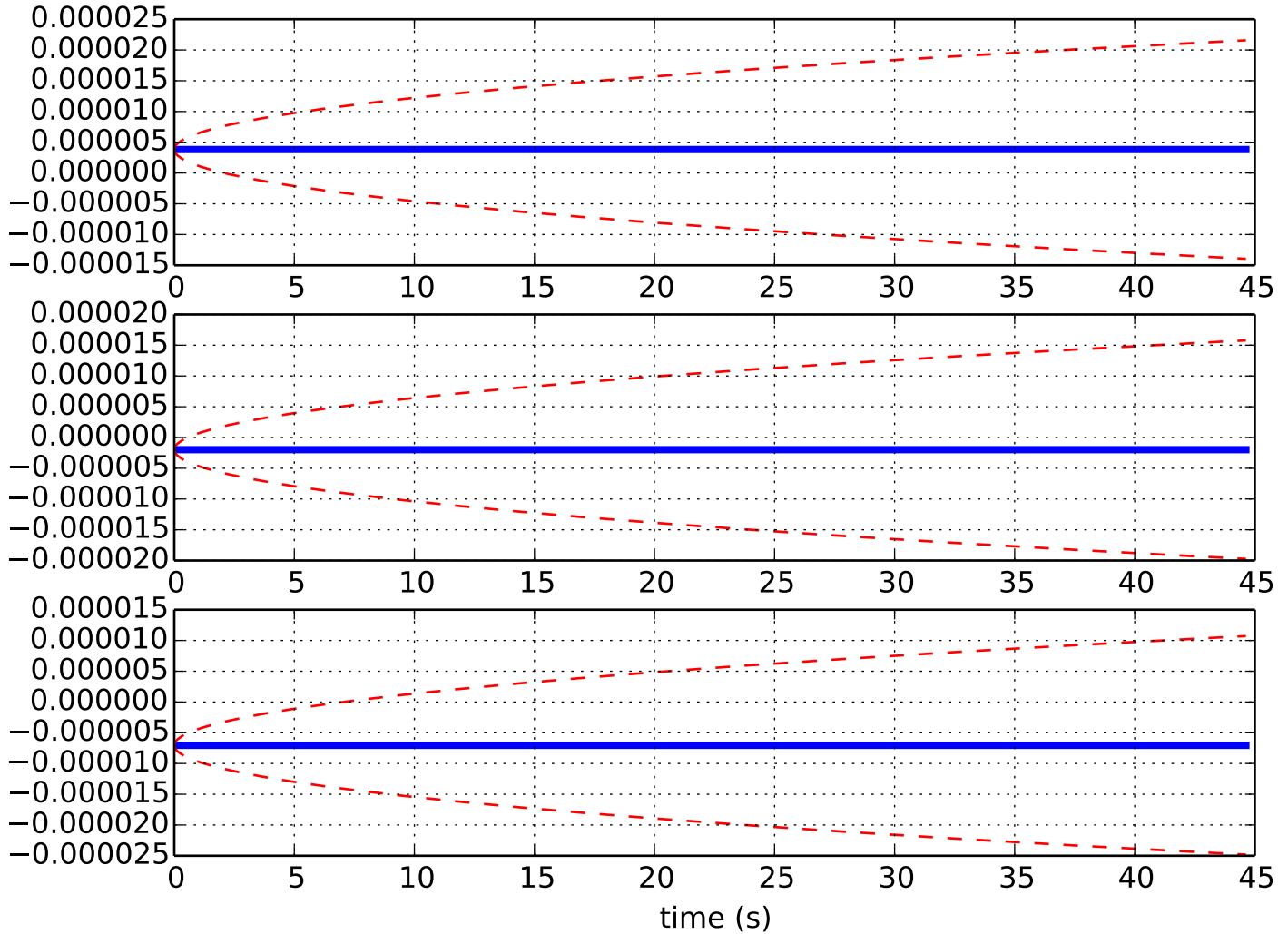
IMU configuration
==================

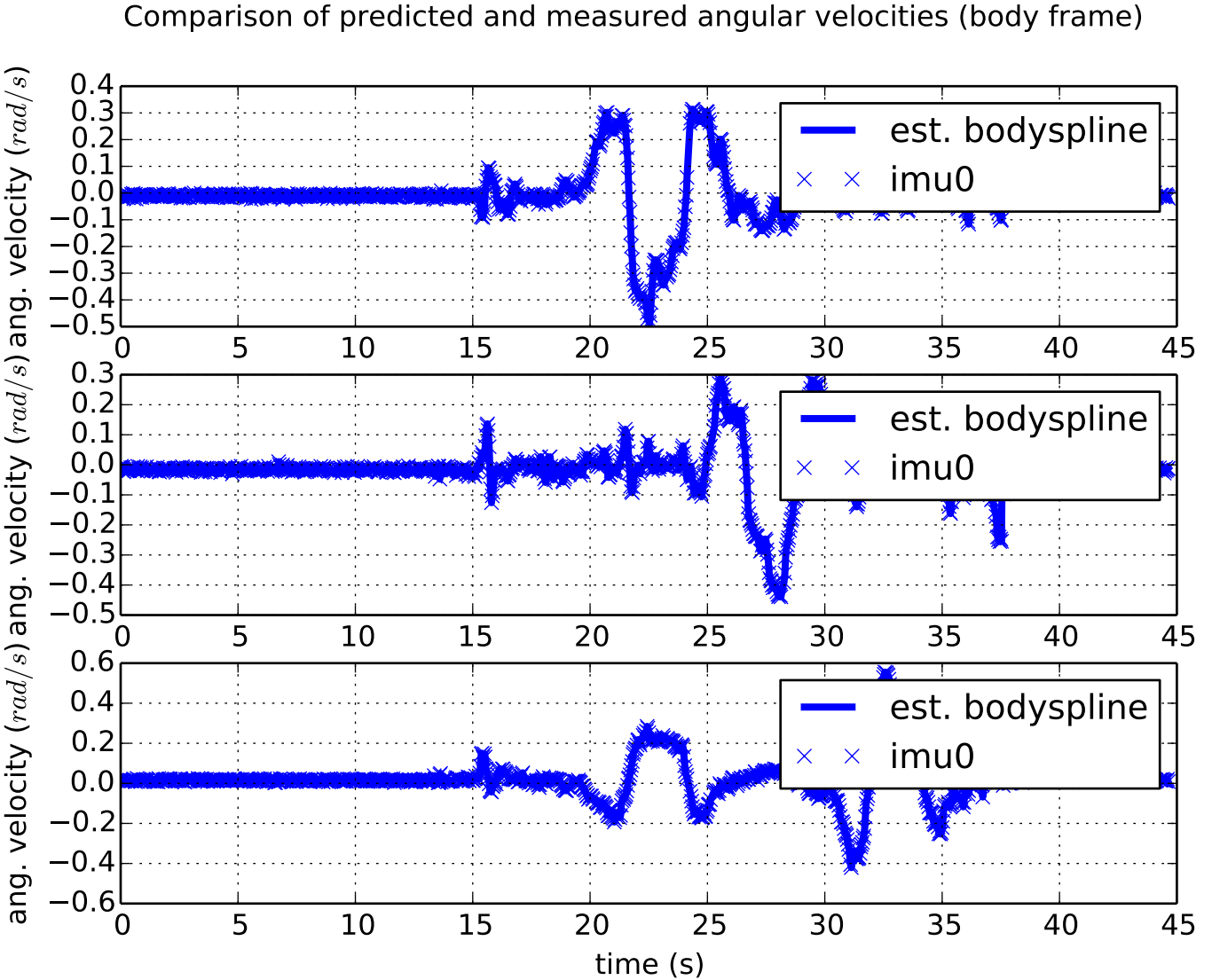
IMU0:

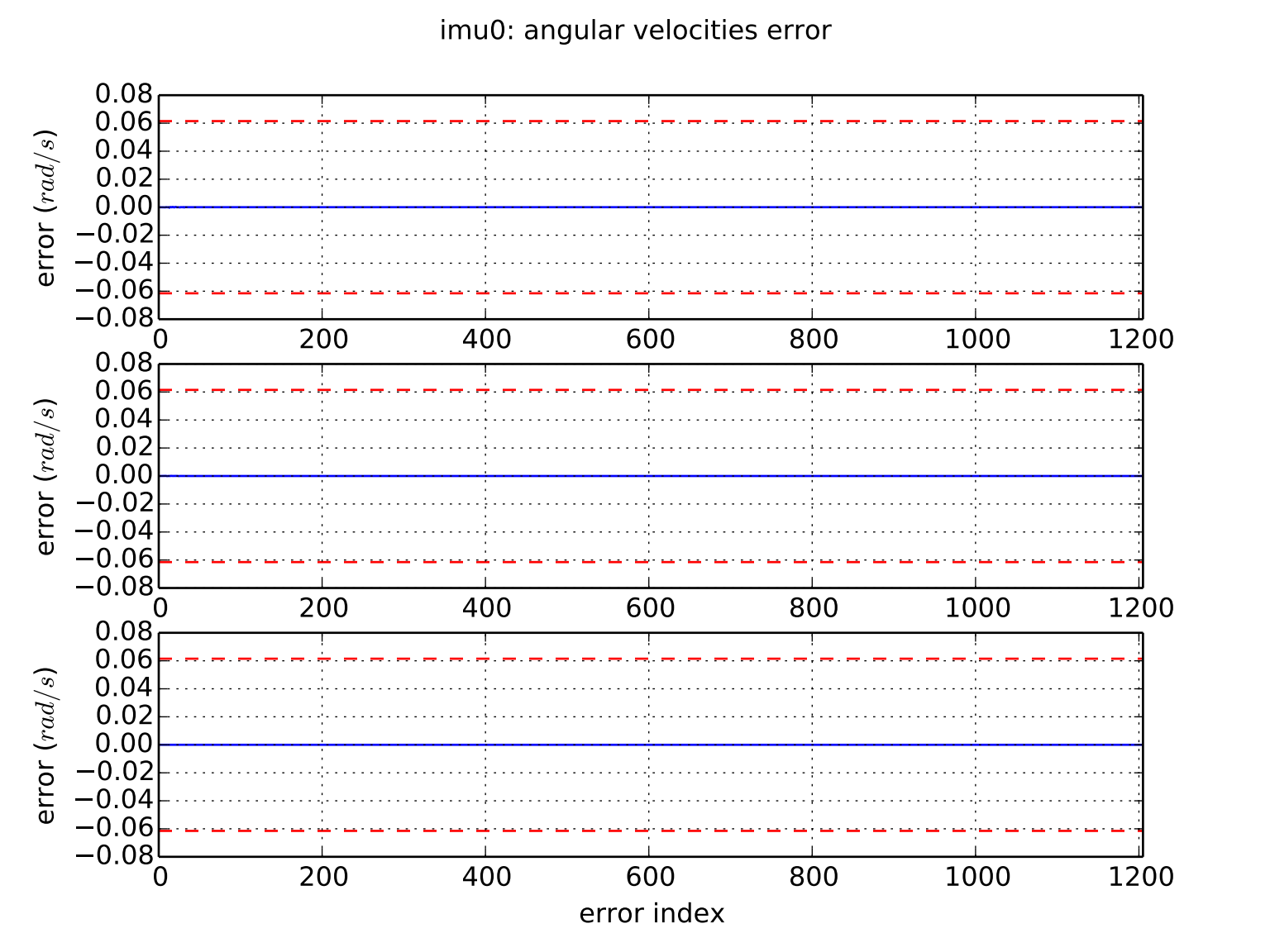
  Model: calibrated
  Update rate: 25
  Accelerometer:
    Noise density: 0.00064
    Noise density (discrete): 0.0032
    Random walk: 8.86e-07
  Gyroscope:
    Noise density: 0.0041
    Noise density (discrete): 0.0205
    Random walk: 5.7e-07
  T_i_b
    [[1. 0. 0. 0.]
     [0. 1. 0. 0.]
     [0. 0. 1. 0.]
     [0. 0. 0. 1.]]
  time offset with respect to IMU0: 0.0 [s]

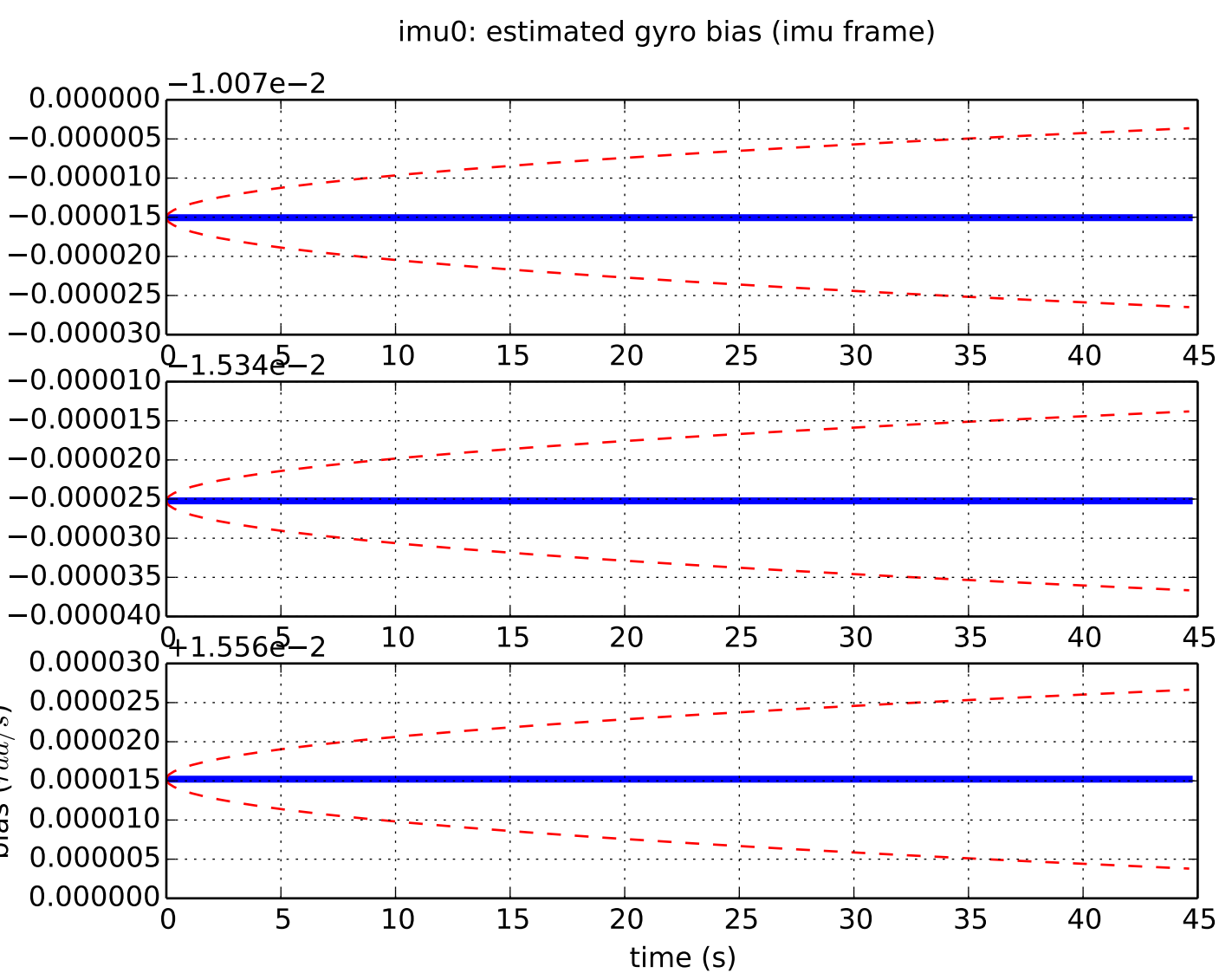

Comparison of predicted and measured specific force (imu0 frame)
specific force (m/s^2)
est. bodyspline
imu0
time (s)

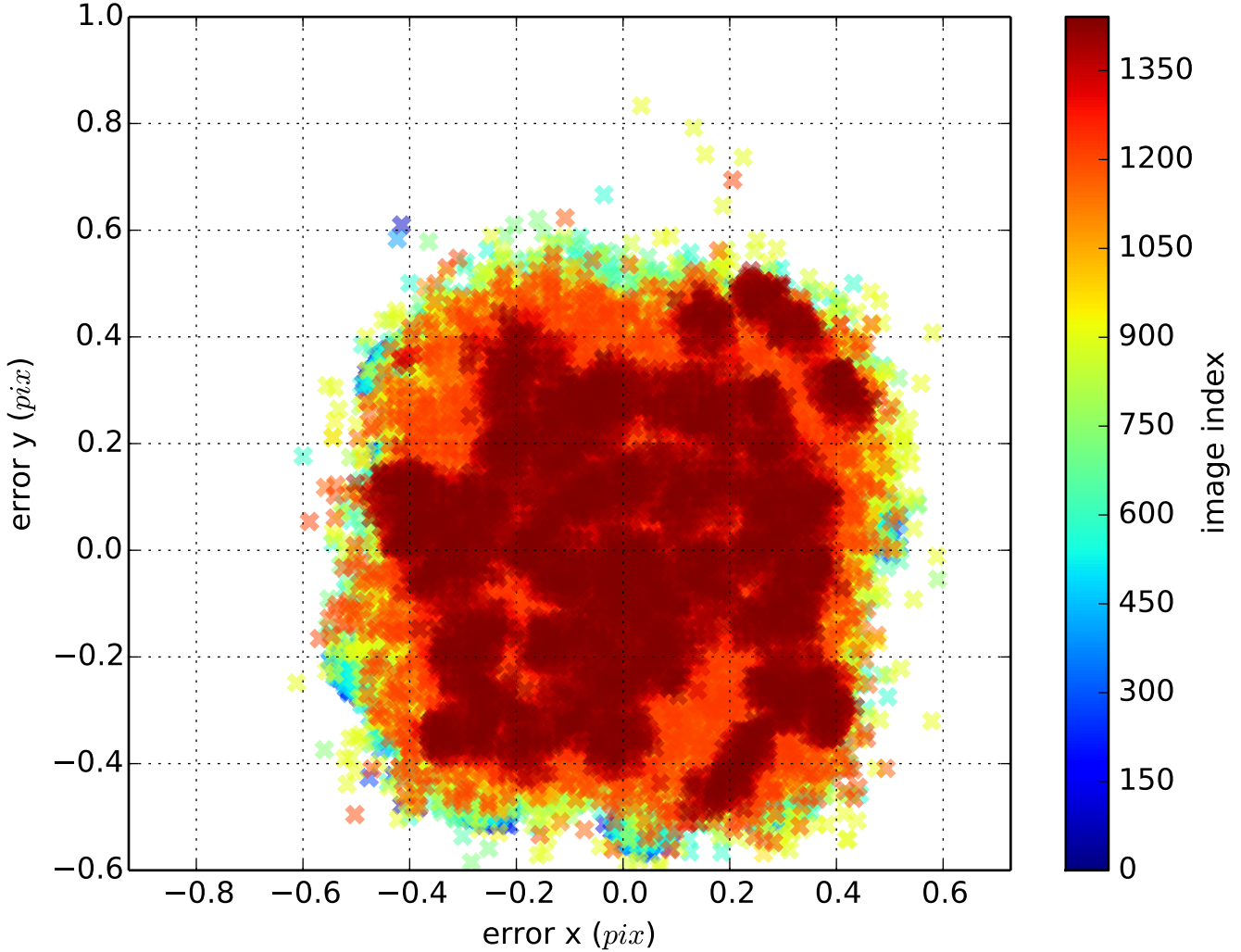

imu0: acceleration error
error (m/s^2)
0.010
0.005
0.000
−0.005
−0.010
0
200
400
600
800
1000
1200
error index


imu0: estimated accelerometer bias (imu frame)
0.000025
0.000020
0.000015
0.000010
0.000005
0.000000
−0.000005
−0.000010
−0.000015
0.000020
0.000015
0.000010
0.000005
0.000000
−0.000005
−0.000010
−0.000015
−0.000020
0.000015
0.000010
0.000005
0.000000
−0.000005
−0.000010
−0.000015
−0.000020
−0.000025
0
5
10
15
20
25
30
35
40
45
time (s)


Comparison of predicted and measured angular velocities (body frame)
ang. velocity (rad/s)
ang. velocity (rad/s)
ang. velocity (rad/s)
time (s)
est. bodyspline
imu0
est. bodyspline
imu0
est. bodyspline
imu0


imu0: angular velocities error
error (rad/s)
0.08
0.06
0.04
0.02
0.00
−0.02
−0.04
−0.06
−0.08
0
200
400
600
800
1000
1200
error index


imu0: estimated gyro bias (imu frame)
−1.007e−2
0.000000
−0.000005
−0.000010
−0.000015
−0.000020
−0.000025
−0.000030
0
5
10
15
20
25
30
35
40
45
−1.534e−2
−0.000010
−0.000015
−0.000020
−0.000025
−0.000030
−0.000035
−0.000040
+1.556e−2
0.000030
0.000025
0.000020
0.000015
0.000010
0.000005
0.000000
time (s)


cam0: reprojection errors
error x (pix)
error y (pix)
image index
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6
1350
1200
1050
900
750
600
450
300
150
0