# SystemD Sensor Analysis

5/13/20205

1. **Accelerometer**
   * Raw counts: [-12096, -10949, 632]
   * Converted: [-0.738 g, –0.668 g, 0.039 g]
   * **Interpretation**: X and Y axes are each seeing about 0.7 g, Z is almost zero.
     + A perfect 45° tilt would give 0.707 g on X & Y;
     + ~0.74/0.67 g means it’s right in that ballpark (±4–5% error is totally fine for a handheld tilt).
     + The tiny Z‐axis reading (~0.04 g) confirms the Z‐axis is essentially horizontal.
   * **Vector magnitude**:

0.7382+0.6682+0.0392≈1.00 g \sqrt{0.738^2 + 0.668^2 + 0.039^2} \approx 1.00\,g

The accelerometer scale factor (0.000061 g/LSB) is spot on.

1. **Gyroscope**
   * Raw counts: [140, –434, 87]
   * Converted: [8.5, –26.5, 5.3] °/s
   * **Interpretation**: This should be stationary, so any non-zero reading is bias.
     + There is a substantial –26.5 °/s bias on Y, and smaller biases on X/Z.
     + We’ll need to capture several seconds of data and subtract these offsets before feeding into Mahony.
2. **Magnetometer**
   * Raw counts: [–202, –581, 125]
   * Converted: [–20.2, –58.1, 12.5] µT
   * **Interpretation**: The vector magnitude is

20.22+58.12+12.52≈62.6 µT \sqrt{20.2^2 + 58.1^2 + 12.5^2} \approx 62.6\,µT

which is right in the Earth-field range (≈ 50 µT ± local variation).

* + The sign/axis orientation (both X and Y negative) matches the magnetometers orientation.

**Conclusions**

* **Axes & scaling** look correct — the accel readings match ~45° tilt, Z ≈ 0 g, total ≈ 1 g.
* **Gyro biases** are large and must be calibrated out.
* **Magnetometer** shows a plausible Earth field magnitude; sign conventions align with its physical orientation.