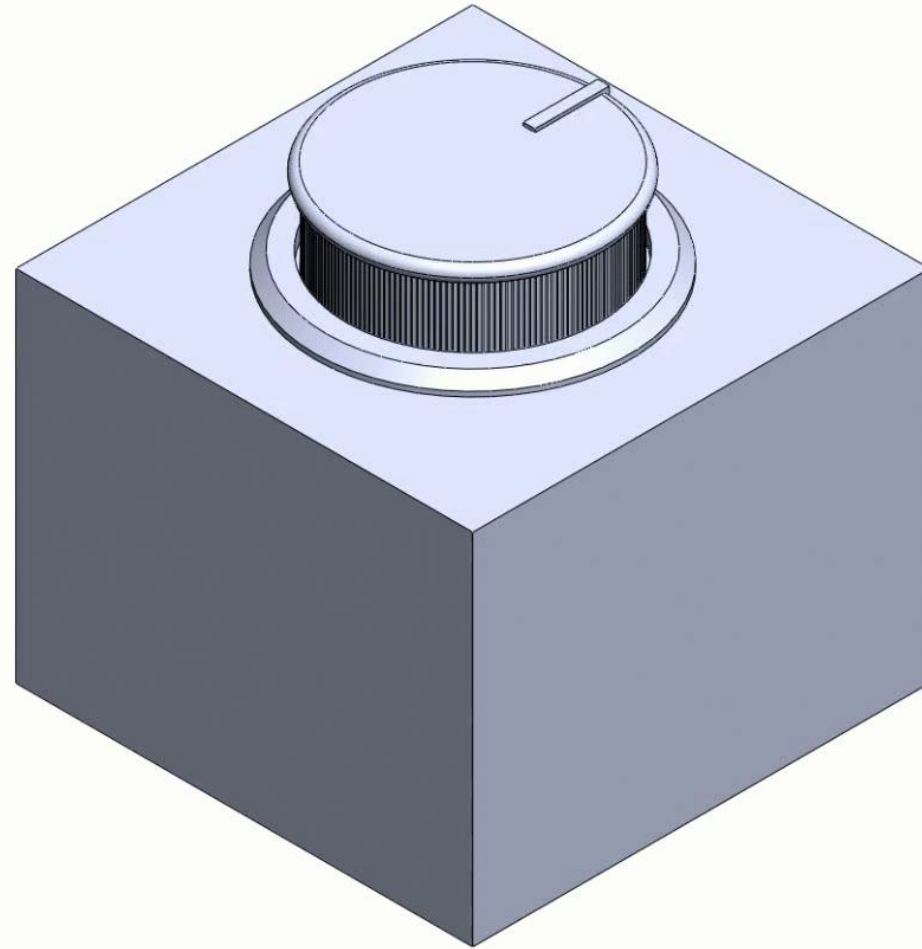


# Simulating rotation motion

TI Precision Labs – TI Magnetic Sense Simulator (TIMSS)

Presented and prepared by Isaac Lara

# Rotational motion



# TIMSS simulation configuration

Function **Rotation** Save ...

Magnet Sensor Sim Settings

> Magnet Specifications ⓘ

> Magnet Geometry ⓘ

▼ Magnet Motion ⓘ

Origin Position

Position

X Axis	Y Axis	Z Axis
<input type="text" value="0"/> mm	<input type="text" value="0"/> mm	<input type="text" value="0"/> mm

Angle

X Axis	Y Axis	Z Axis
<input type="text" value="0"/> Deg	<input type="text" value="0"/> Deg	<input type="text" value="0"/> Deg

Final Position

Position

Arc Length

<input type="text" value="360"/> Deg
--------------------------------------

Magnet Sensor **Sim Settings**

▼ Simulation Settings ⓘ

Angular Step Size  Deg

Initial location of the magnet center



Orientation of the magnet



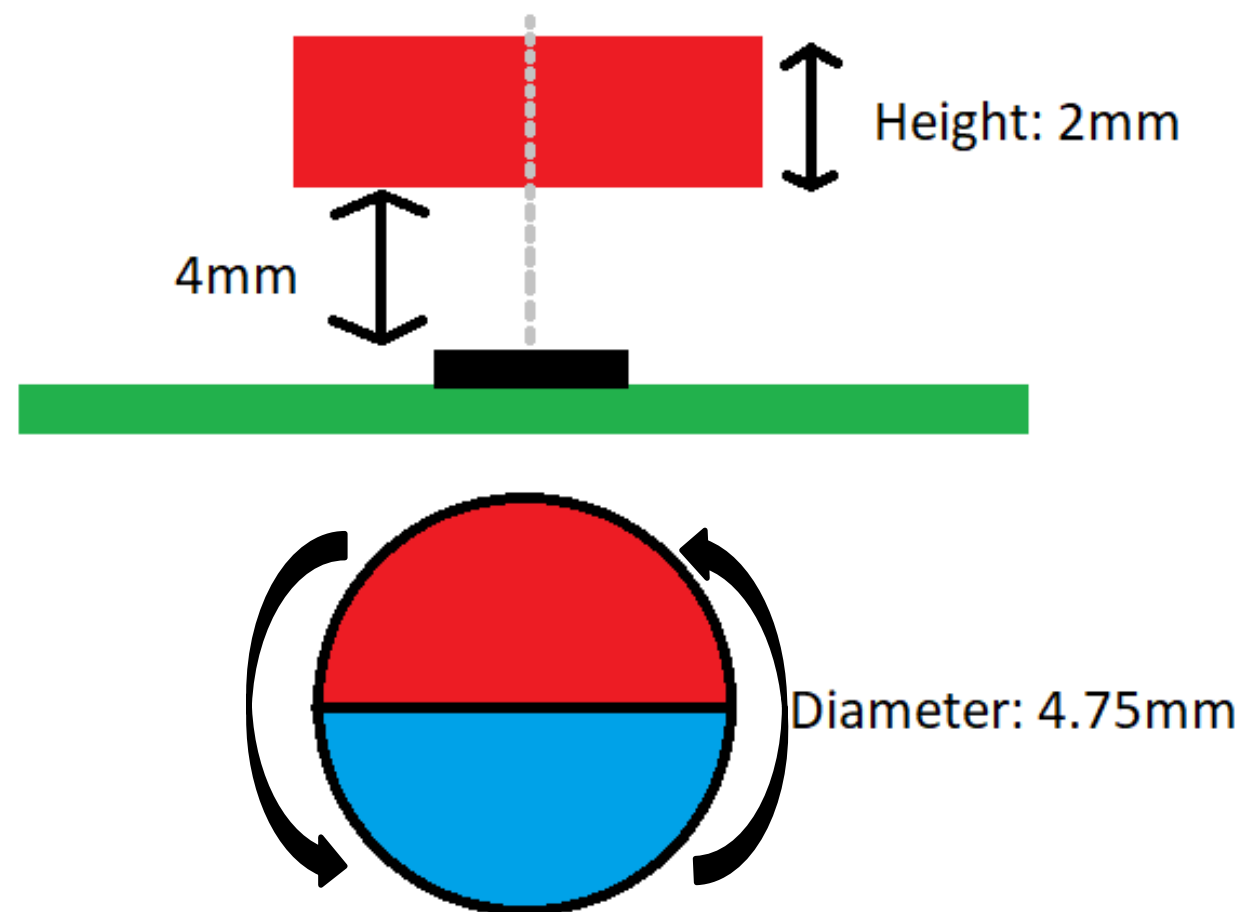
Degrees the magnet rotates about the Z-axis



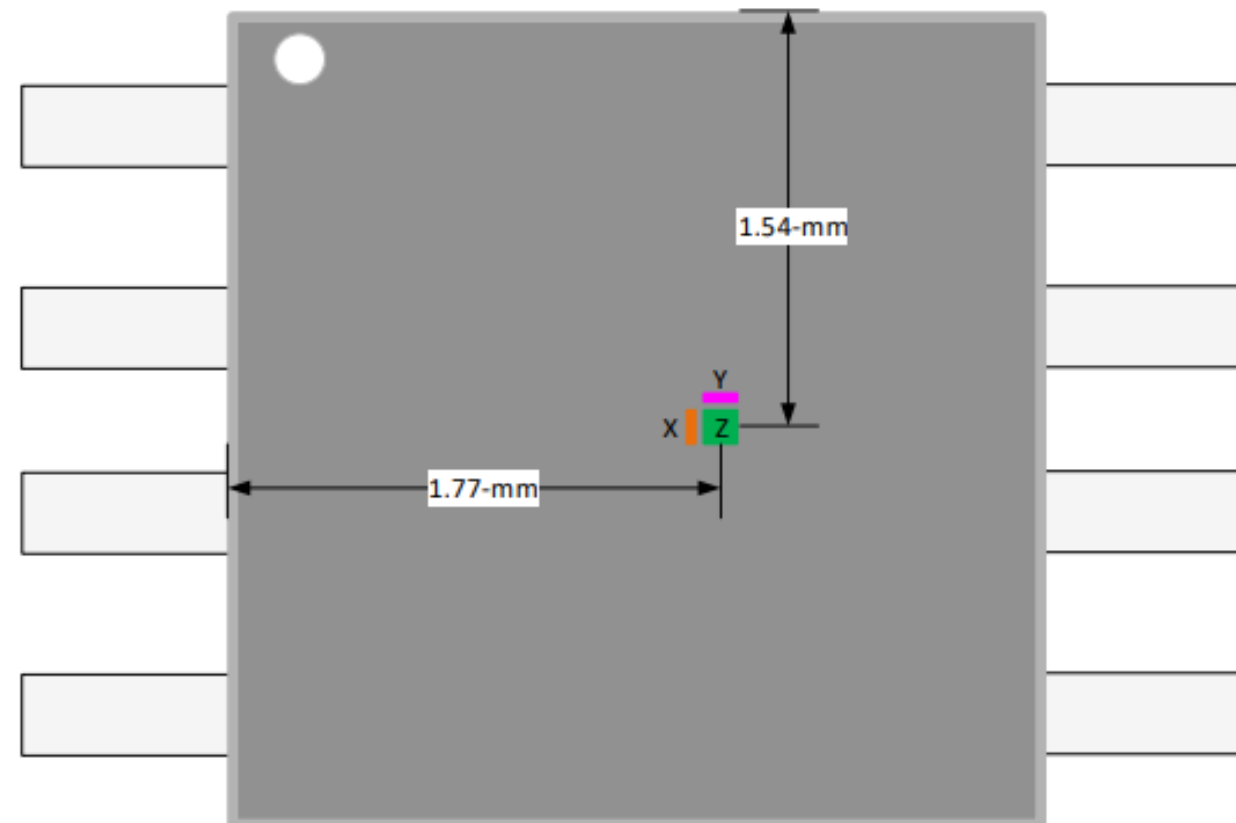
Simulation step size



# Simulation configuration example



Other magnet details:  
Magnet Shape- Diametric cylinder  
Material- Neodymium  
Magnet grade-N35  
Degrees of rotation- 360°



Sensor position accounting for Hall element:

- Airgap- 4mm
- X- -0.27
- Y- 0.04

# Simulation configuration walkthrough

TI Magnetic Sense Simulator (TIMSS) Isaac

1 Function & Magnet      2 Select Sensor      3 Preview Window

### 1. Select Function

- Hinge
- Linear
- Joystick
- Rotation
- Static Position

### 2. Select Magnet Shape

- Bar**  
Pole Count:  $\geq 2$   
Commonly used in:  
Laptop lid closure  
Limit detection
- Diametric Cylinder**  
Pole Count: Only 2  
Commonly used in:  
Angle Measurements  
End of Shaft Motor speed
- Axial Cylinder**  
Pole Count: Only 2  
Commonly used in:  
Trigger detection  
Joystick
- Ring**  
Pole Count:  $\geq 2$   
Commonly used in:  
Angle Measurements  
On Shaft motor speed
- Axial Ring**  
Pole Count:  $\geq 2$   
Commonly used in:  
Angular Incremental Encoding
- Sphere**  
Pole Count: Only 2  
Spherical magnets field contour is closest to an ideal magnetic dipole

[Back](#) [Next](#)



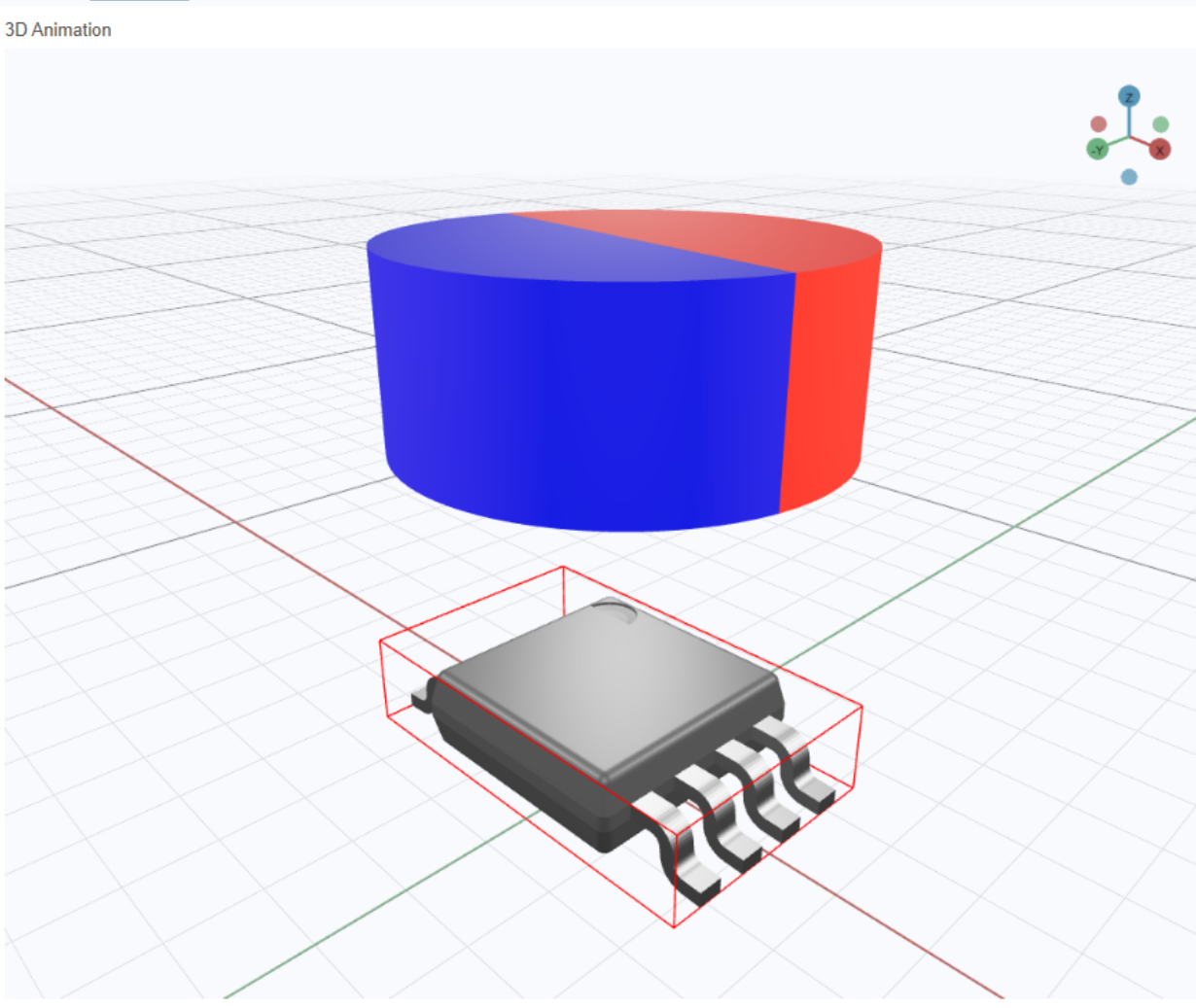
# Rotation field behavior

TI Magnetic Sense Simulator (TIMSS) Isaac

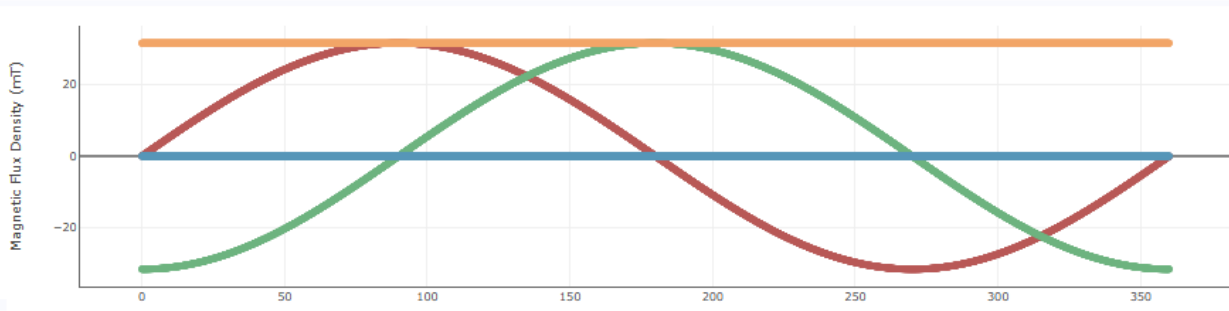
Untitled \* Function Rotation Save

Design Sensor Select Sensor 1 : TMAG5170

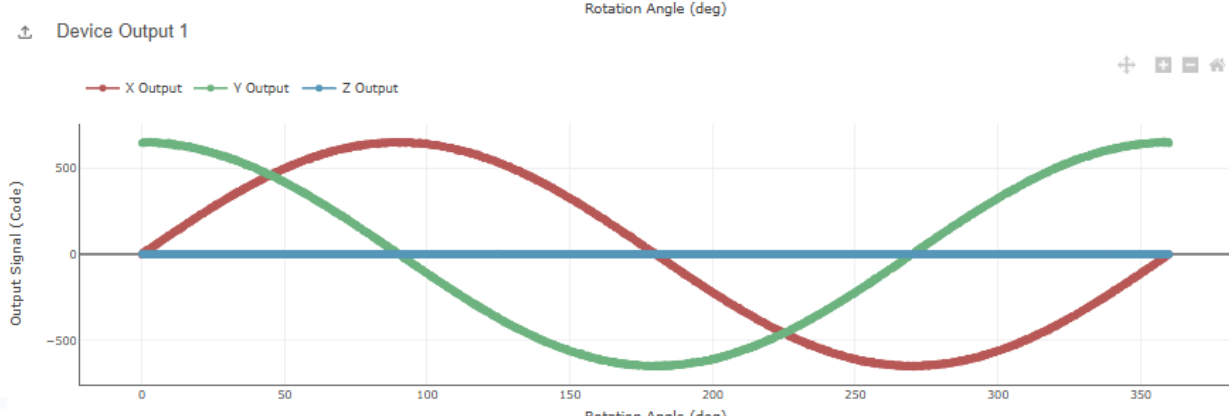
3D Animation



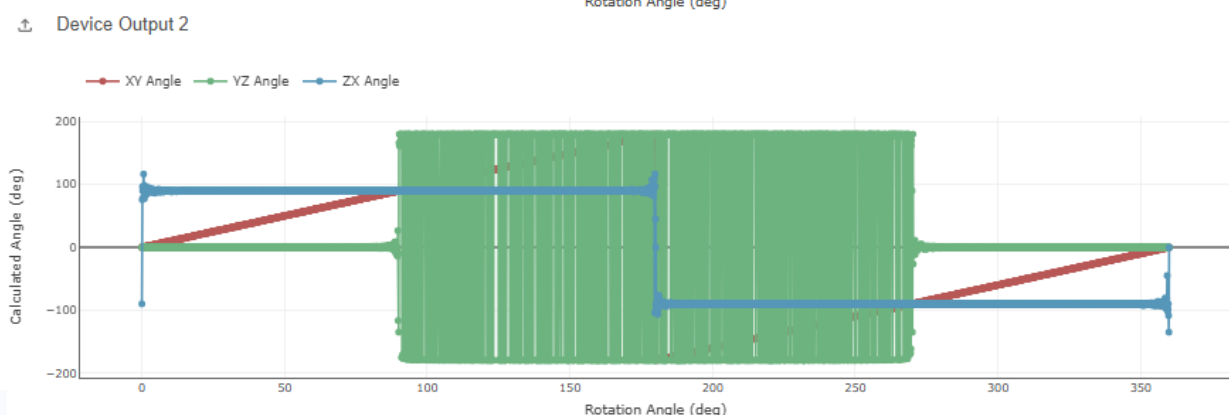
Magnetic Flux Density (mT)



Device Output 1



Device Output 2



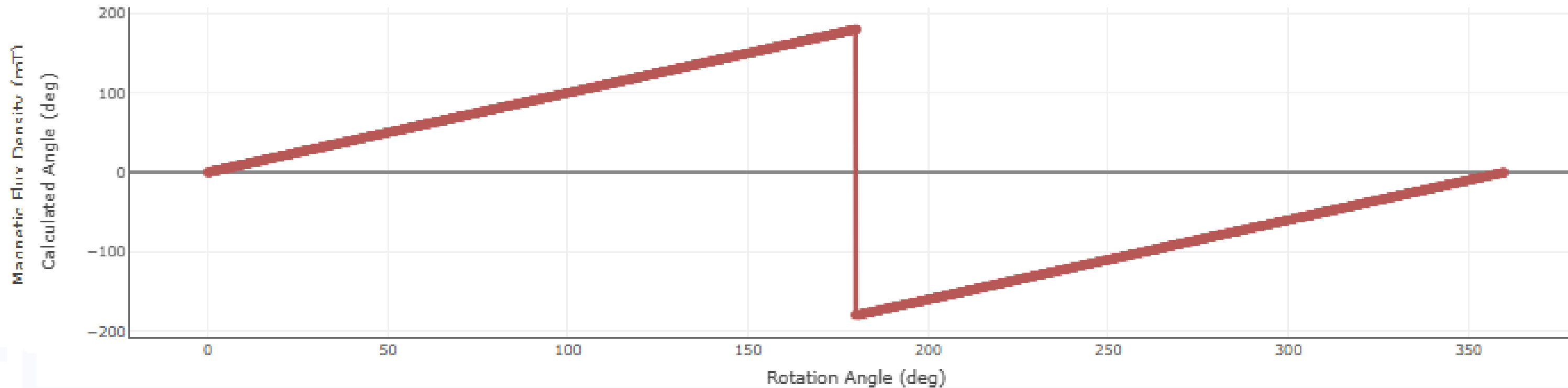
Play Frame #

\*This tool was designed using the MagPyLib API in Python. More information regarding this open source library and its methods can be found at the following publication source: <https://authors.elsevier.com/td/article/S2352711020309170>

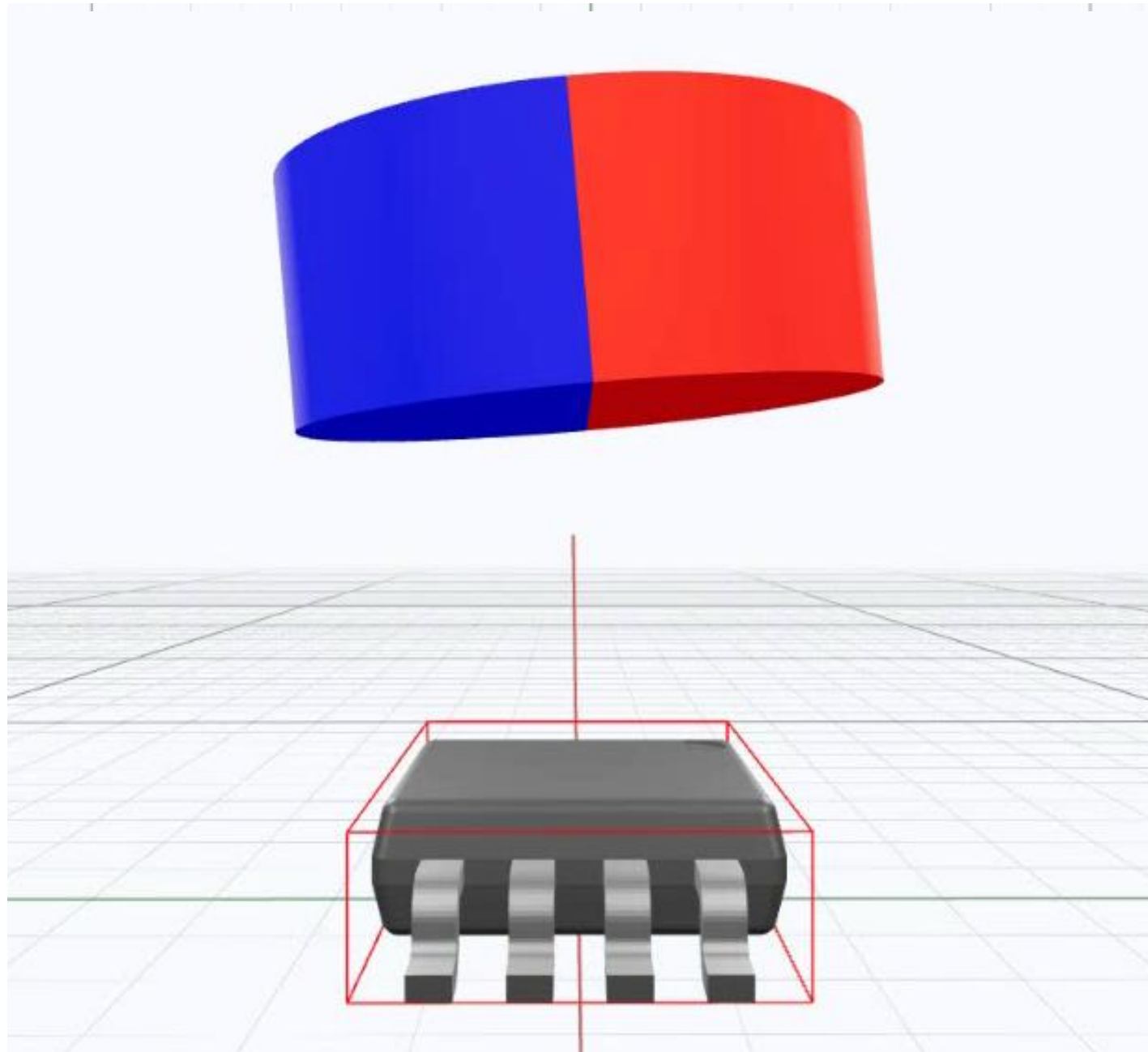
# Magnetic fields and angle

Device Output 2

XY Angle YZ Angle ZX Angle



# Simulating rotational errors



## Origin Position

### Position

X Axis

3 mm

Y Axis

0 mm

Z Axis

5 mm

### Angle

X Axis

0 Deg

Y Axis

0 Deg

Z Axis

0 Deg



# Learn more

- TI Magnetic Sense Simulator Product Folder  
<https://www.ti.com/TIMSS>
- TI Magnetic Sense Simulator User's Guide  
<https://www.ti.com/lit/ug/slyu067/slyu067.pdf>
- TI Magnetic Sense Simulator App Brief  
<https://www.ti.com/lit/ab/slya083/slya083.pdf>
- Angle Measurement With Multi-Axis Linear Hall-Effect Sensors  
<https://www.ti.com/lit/an/sbaa463a/sbaa463a.pdf>
- Position Sensing Demo Video Series  
<https://www.ti.com/video/series/position-sensing-demos.html>
- TI Precision Labs: Magnetic Sensor Training Videos  
<https://www.ti.com/video/series/precision-labs/ti-precision-labs-magnetic-sensors.html>
- Sensors E2E Forum  
<https://e2e.ti.com/support/sensors-group/sensors/f/sensors-forum>
- TI Magnetic Sensor Portfolio  
<https://www.ti.com/magneticsensors>

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