

preliminary design for converter stick and polarimeter brackets



Converter Stick assembly

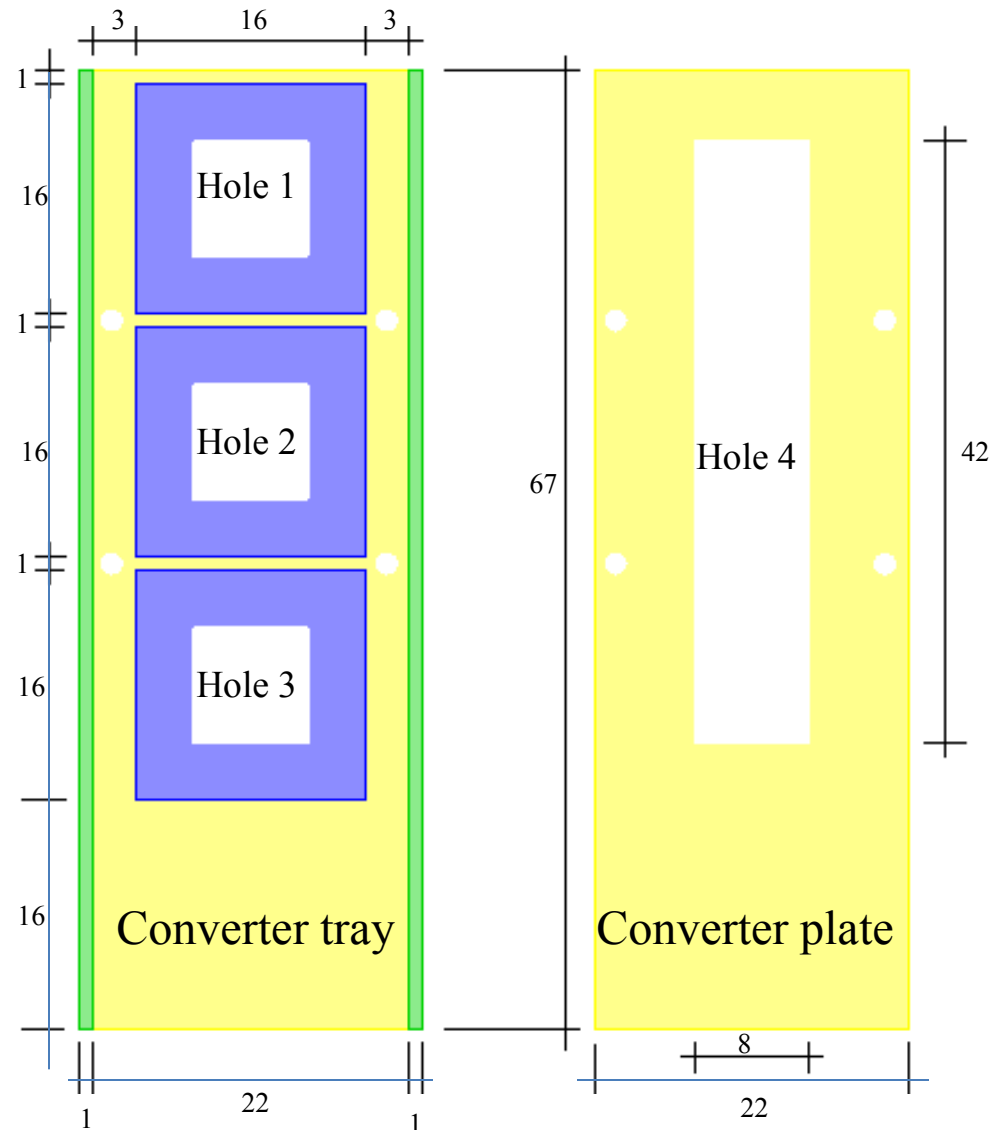
Color code:

Yellow → 1.5 mm thick

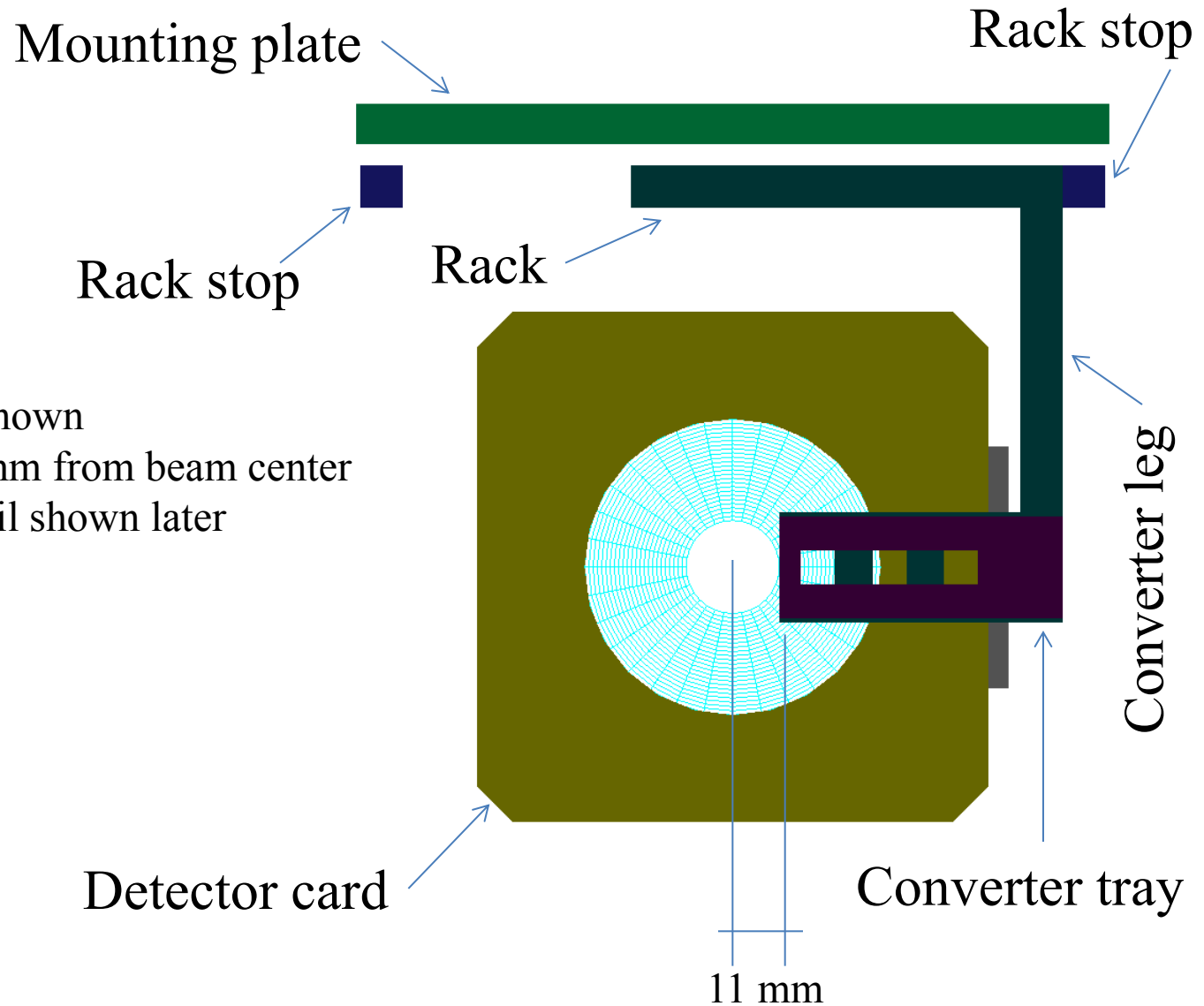
Green → 3.0 mm thick

Blue → 1.4 mm thick

- Material: Aluminum
- All units in mm
- Hole 1-3: 8x8
- Hole 4: 8x42
- Screw holes on converter tray are threaded
- Weight ~ 0.41 oz

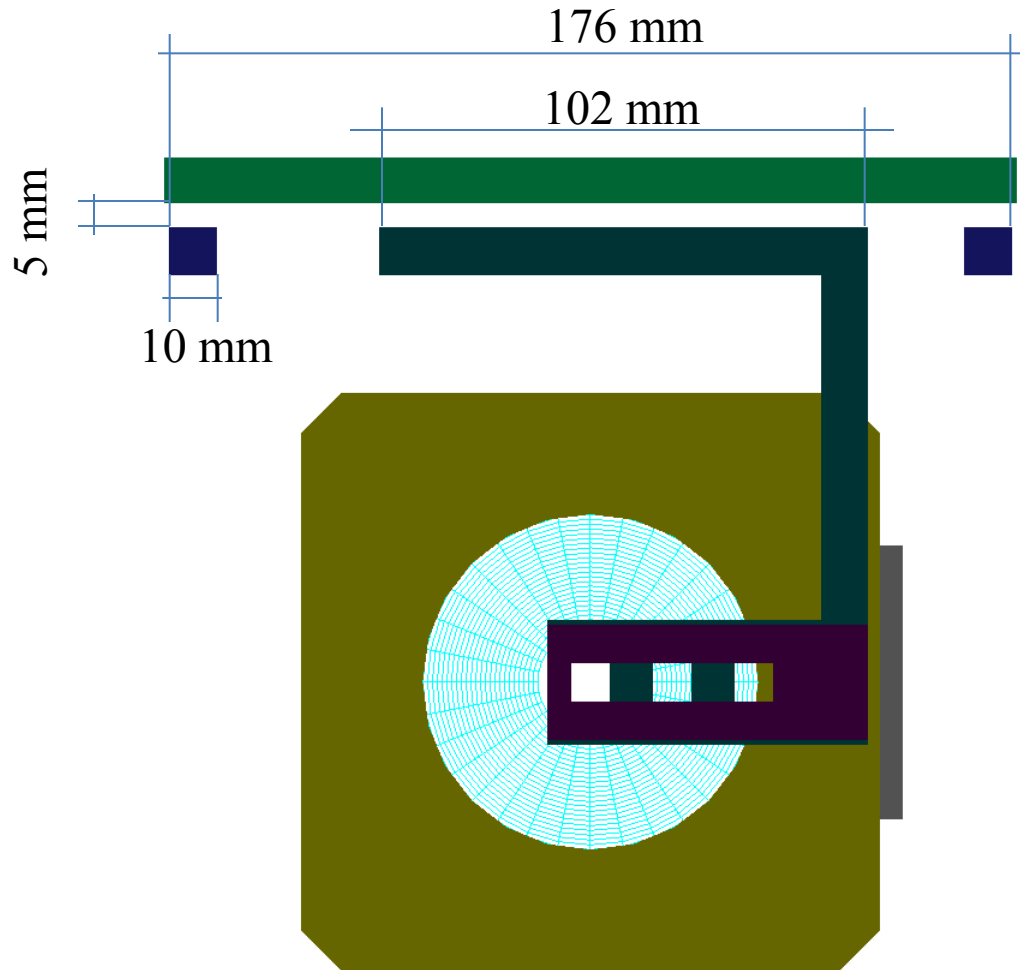


Converter retracted

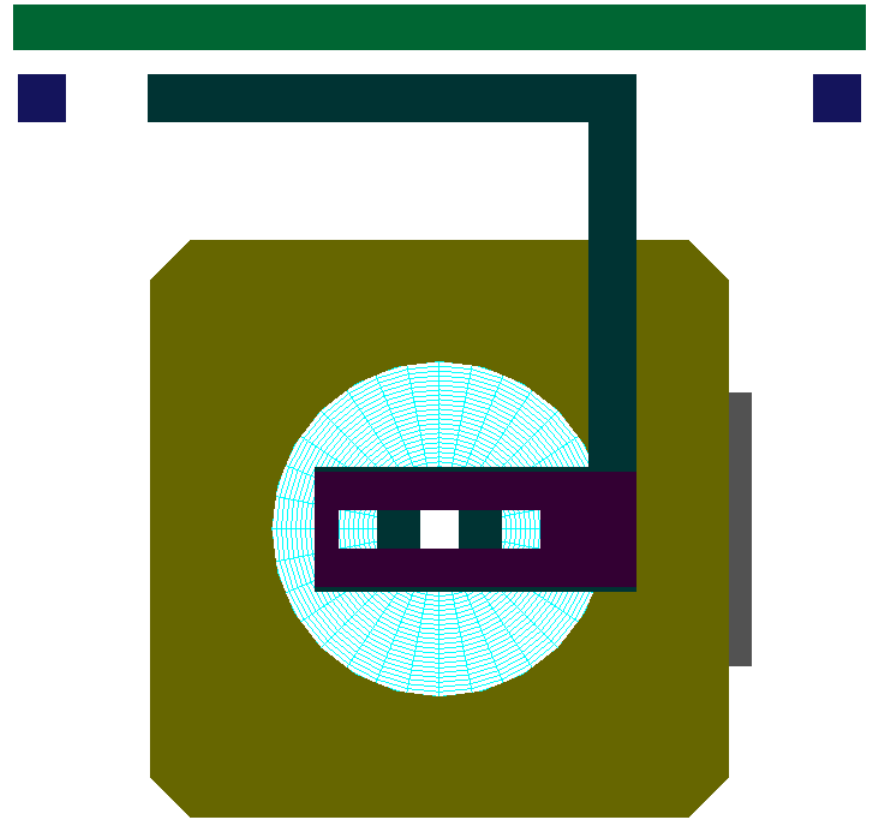


- Teeth on rack not shown
- Converter tray 11 mm from beam center
- Converter tray detail shown later

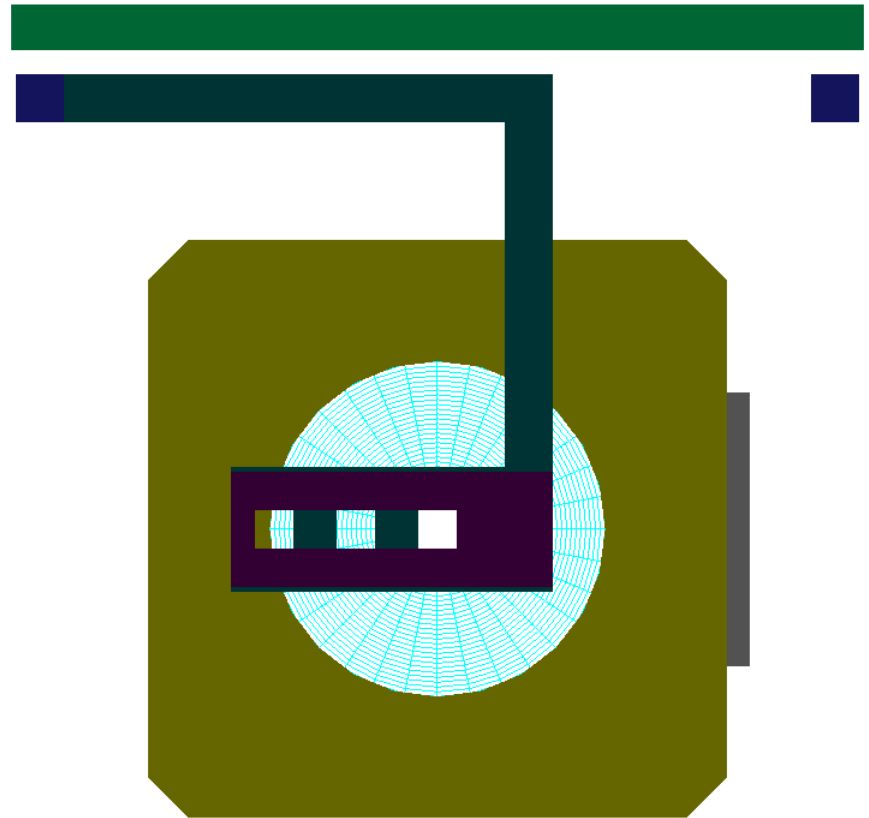
Converter position 1



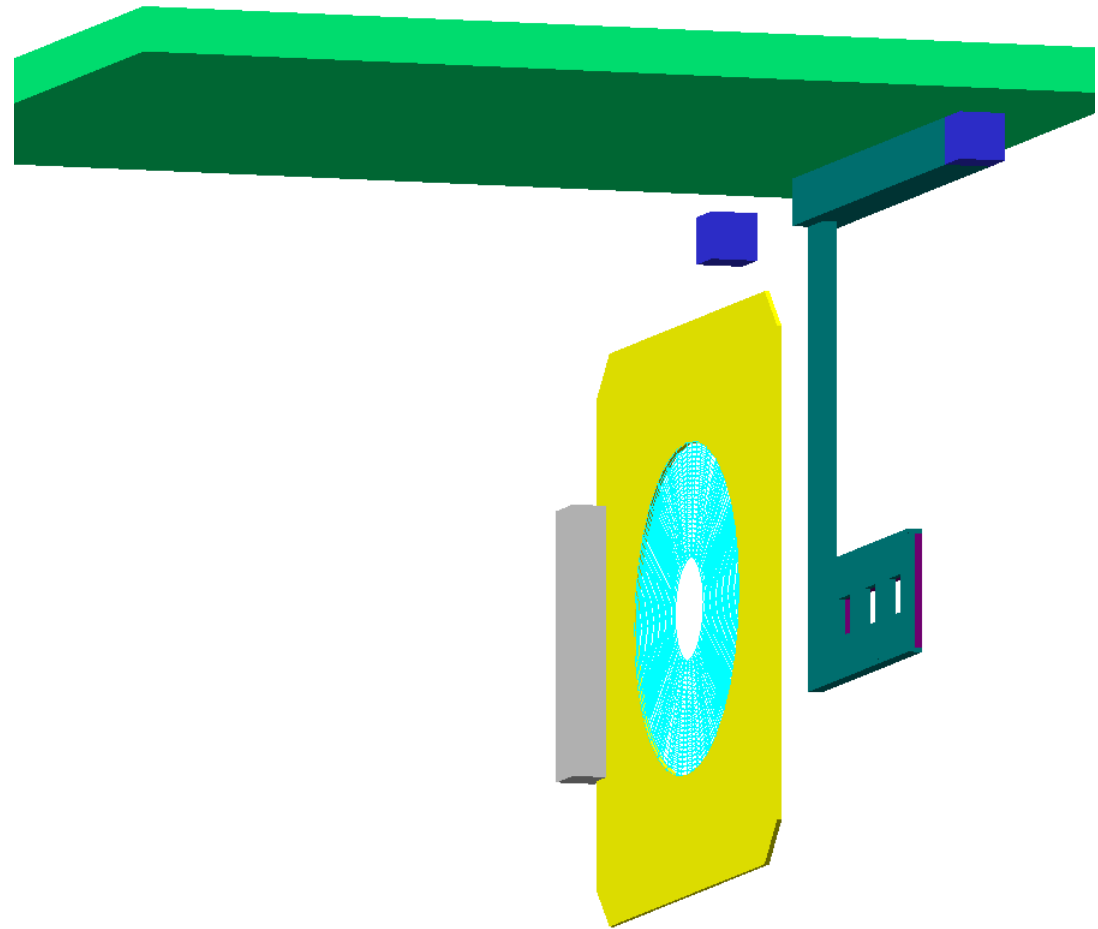
Converter position 2



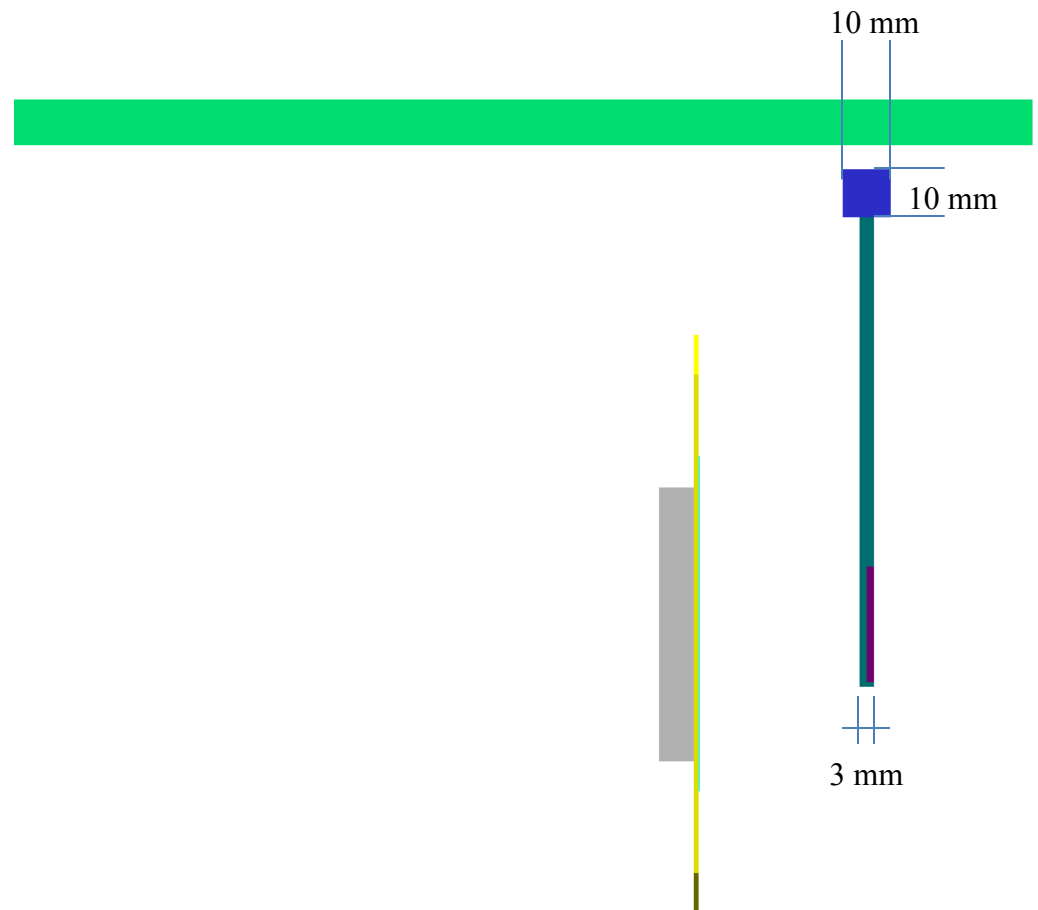
Converter position 3



Different view



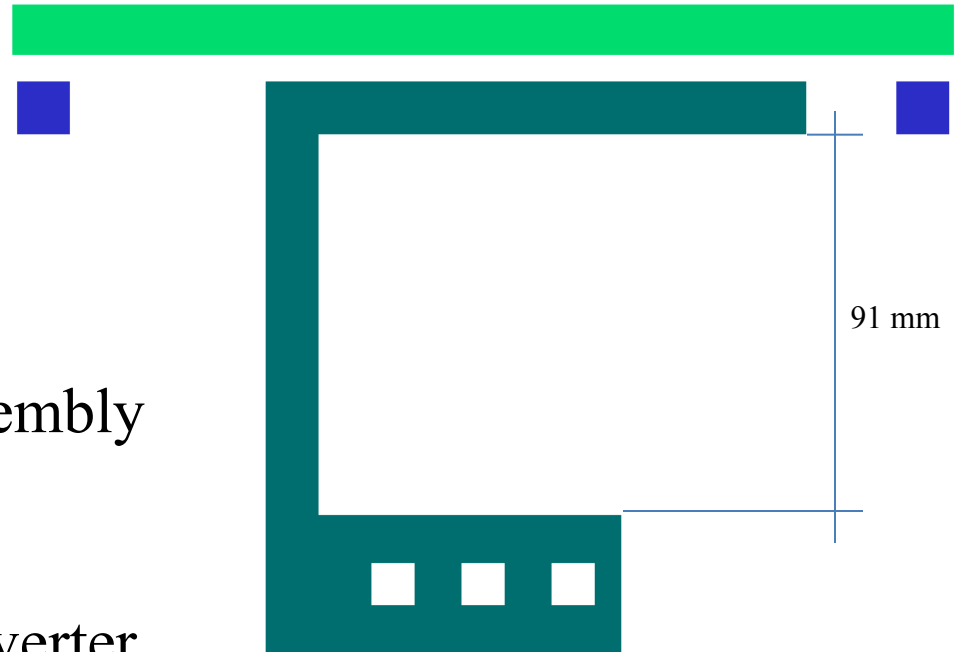
Front view



View from downstream, detector removed

Weight of rack ~ 0.97 oz
Weight of arm ~ 0.26 oz
Weight of converter tray assembly
 ~ 0.41 oz

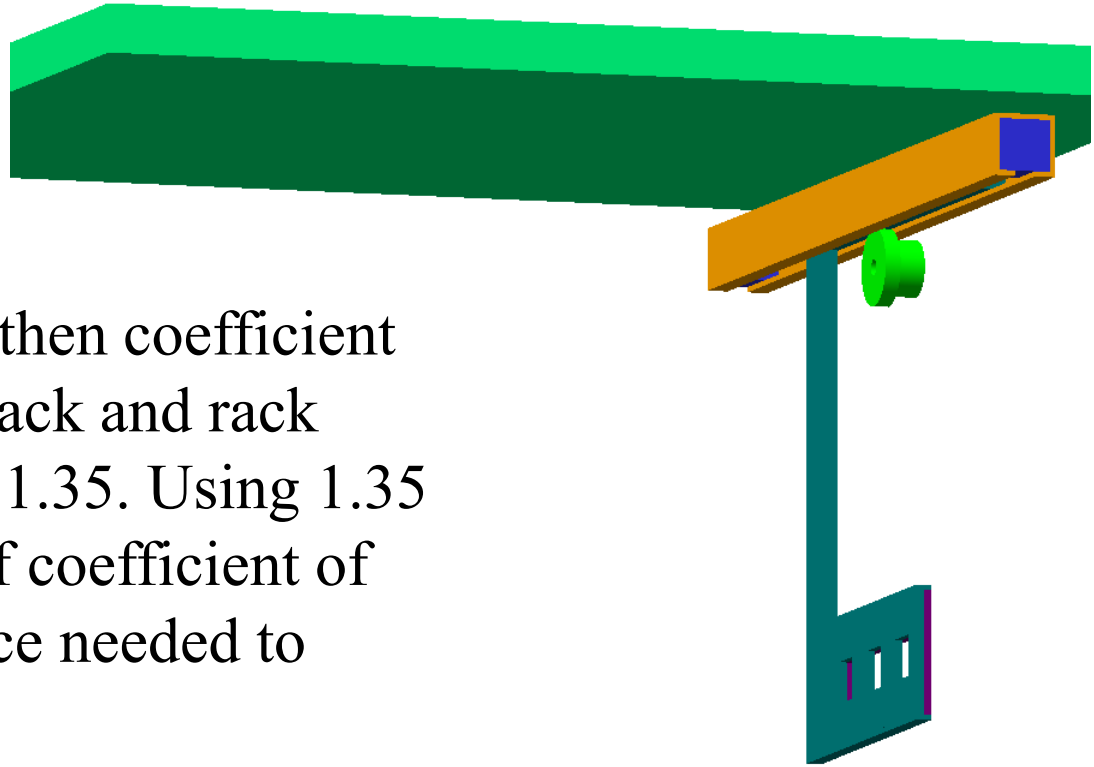
→ Weight of rack+arm+converter
tray assembly = 1.64 oz



Gear added

- Gear has outer diameter of 15 mm (can be a bit smaller) with a minimum of 18 teeth
- Teeth on gear not shown
- Precision in linear motion per step (200 steps per revolution is standard for stepper motors): $\sim 1/4$ mm

Rack guide added



If rack guide is aluminum then coefficient of static friction between rack and rack guide is between 1.05 and 1.35. Using 1.35 as conservative estimate of coefficient of static friction, then the force needed to break static equilibrium is $1.35 * 1.64 \text{ oz} \sim 2.2 \text{ oz}$

Motor added

Since gear has radius of 7.5 mm (~ 0.3 inch) and force needed to break static friction is 2.2 oz, then minimum torque required of motor is ~ 0.7 oz-inch

Motor that I'm interested in has holding torque of 7.5 oz-inch

Motor details shown later.



Motor mount added

Motor mount attached
to plate with screws
(not shown)

Want two cm
clearance between
upstream chamber
wall and motor



→
Upstream

Different view



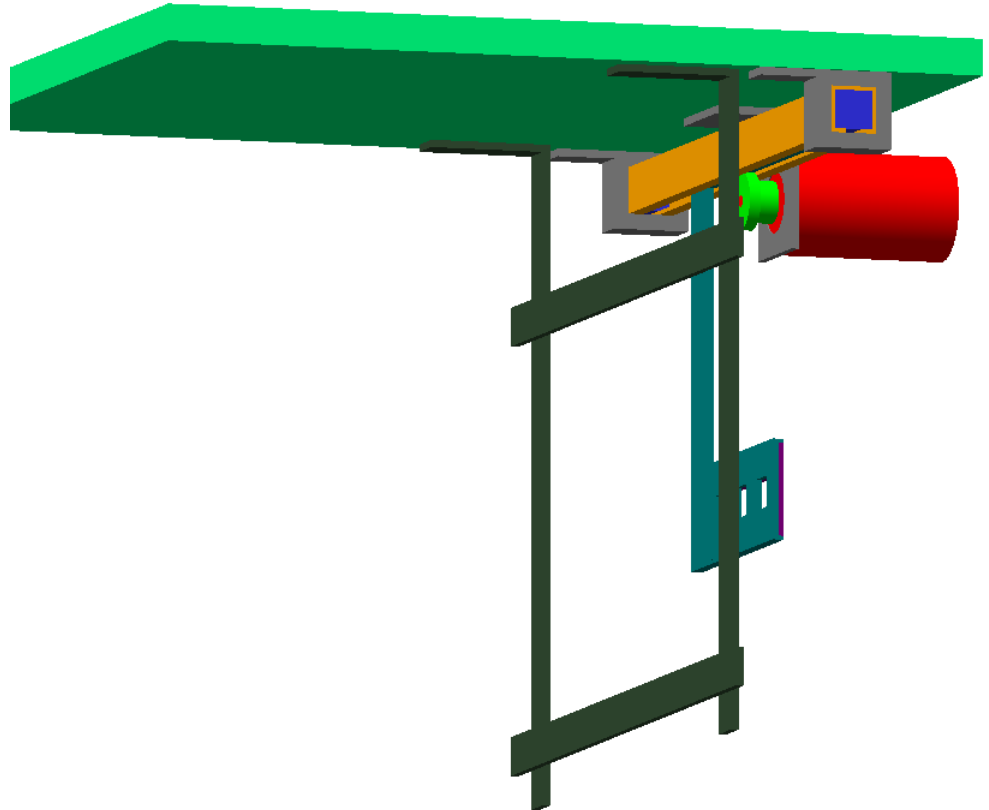
Rack guide supports added

Rack guide supports
attached to plate with
screws (not shown)

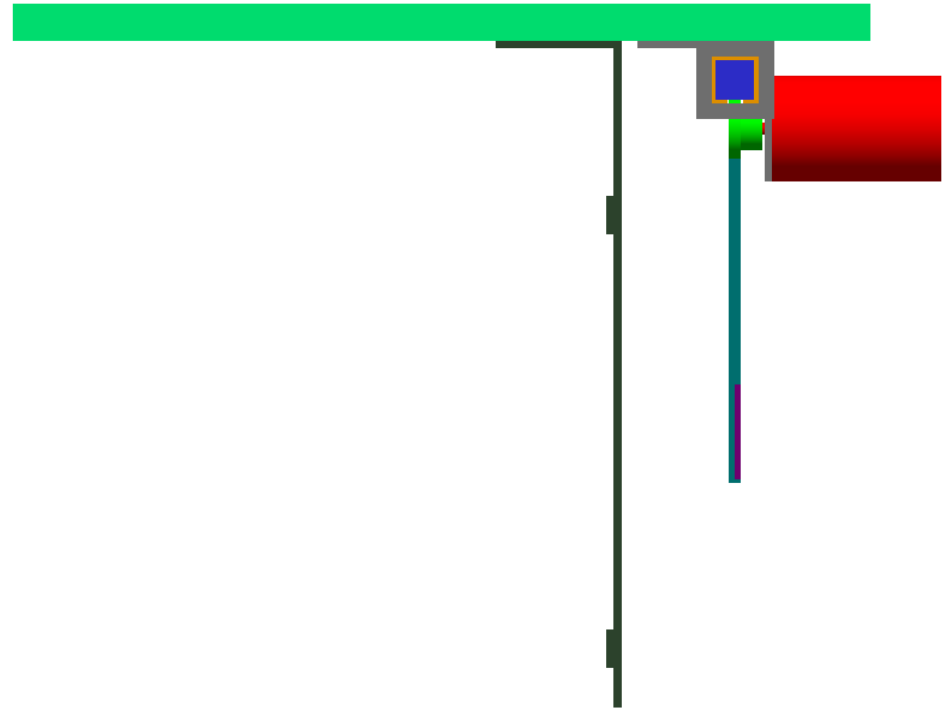


Detector supports added

Detector supports
attached to plate with
screws (not shown)

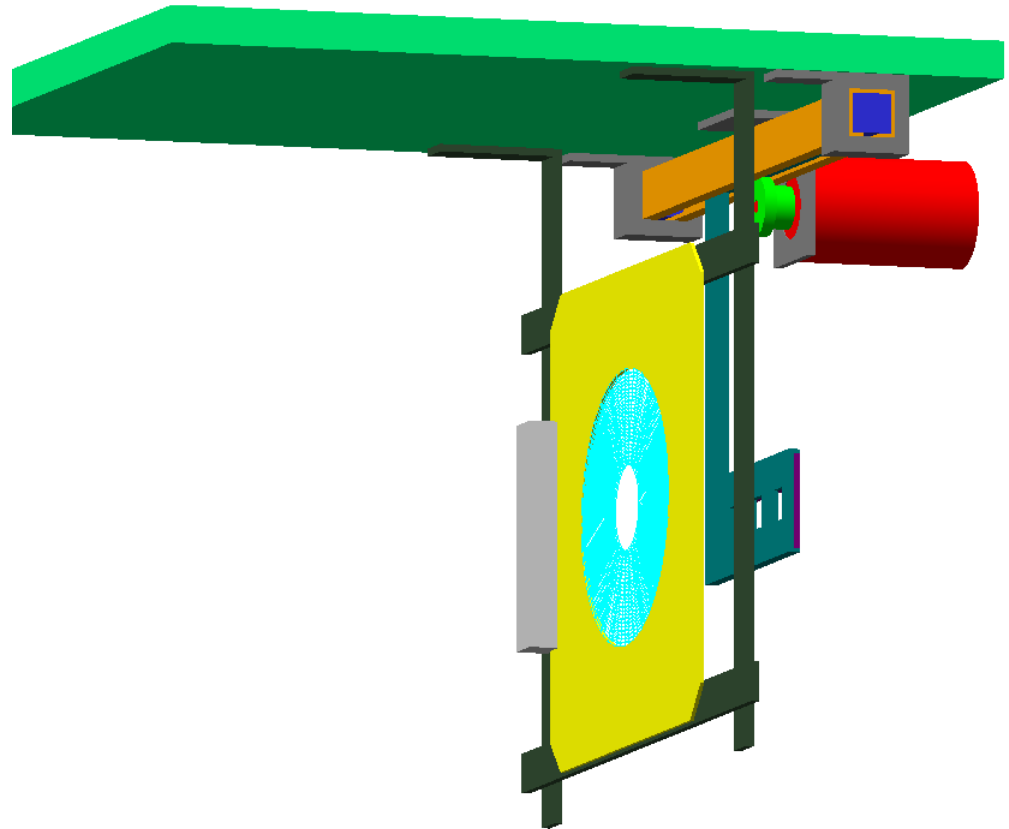


Different view

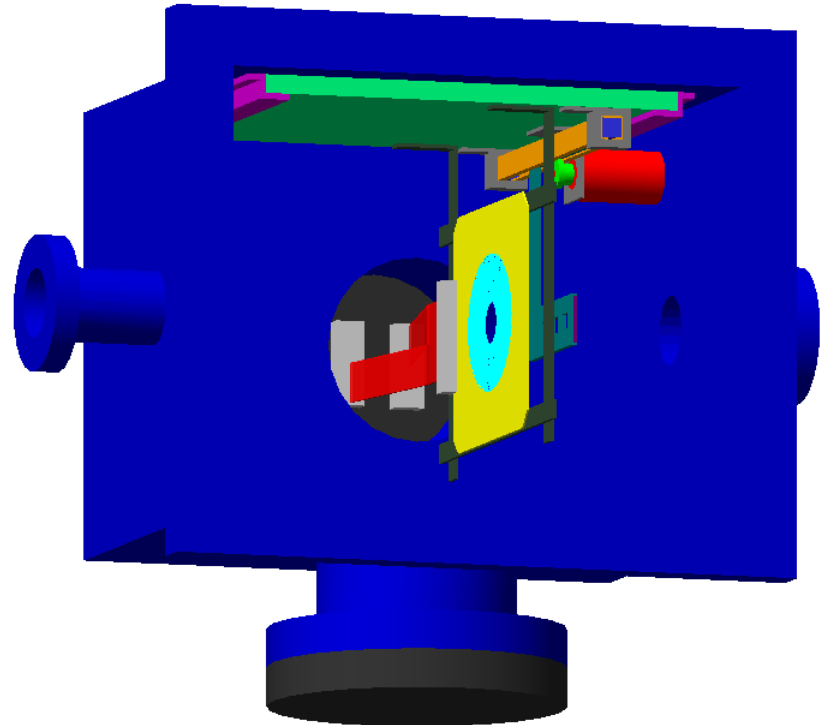


Detector added

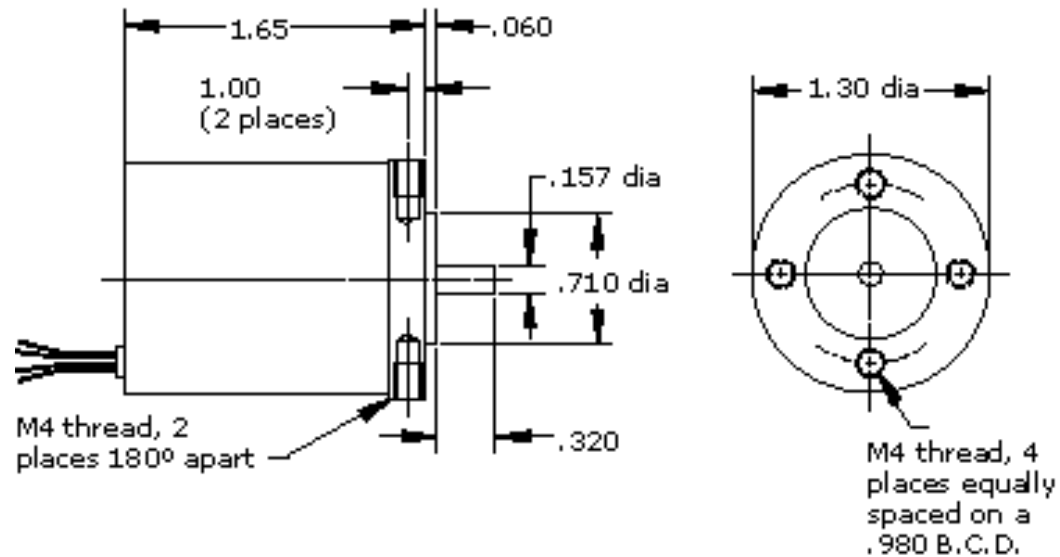
Important: distance in
beam direction
between converter and
detector is 35 mm



In chamber



Motor details



- Kapton insulated
- Holding torque = 7.5 oz-inch
- 200 steps per revolution (1.8 degree per step)
- Vacuum rated (5×10^{-8} Torr)

Polarimeter brackets

