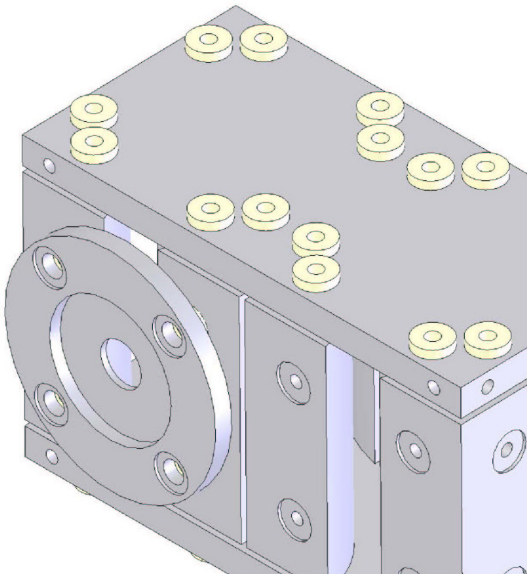
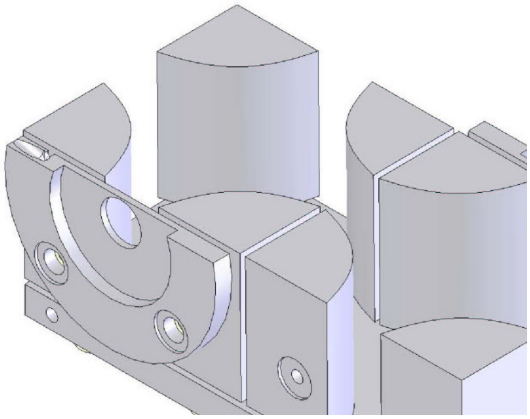
# Periscopic Deflector





## Applications:

- Sampling from Electrospray and APCI ion sources
- Sampling ions from flow tubes, drift tubes, and ion mobility spectrometers.
- High transmission replacement for a Bessel Box.
- Sampling molecular beams (coupled with a molecular beam ionizer).

## Features:

- Provides co-linear ion sampling, with a 1.64 inch centerline offset, for when the ion source **must** be co-linear with the mass analyzer.
- An energy filter that allows for the extraction of ion beams from molecular beams, deflecting them ninety degrees, then ninety degrees again.
- Energy filtering capability allows for improved abundance sensitivity when coupled with a quadrupole mass filter
- Ideal for sampling molecular beams containing condensibles and particulates, preventing these species from contaminating the mass analyzer.
- Static DC voltage operation with resistive voltage divider requires as few as only two lens supplies for eight deflector poles plus entrance and exit lens.
- Improves effective pumping speed in molecular beam systems
- Can couple multiple ion sources to multiple mass analyzers.

## I. THEORY

The Periscopic Deflector was designed to improve differential pumping in systems where an ion beam is to be extracted from a molecular beam, especially for those cases where there is a geometric requirement that the molecular beam must be co-linear with the mass analyzer. If right-angle sampling is possible, then a simpler single quadrupole deflector is recommended.

The Periscopic Deflector combines two simple energy filters to allow sampling of ions from a molecular beam, while preventing the gas load and condensibles of the molecular beam from reaching the mass analyzer, thus improving pumping speed, while minimizing contamination of the mass analyzer.

Ions enter the first deflector, and are deflected ninety degrees into the second deflector, which deflects them ninety degrees back. The centerline of the exit aperture is co-linear with the centerline of the entrance aperture, resulting in an ion beam that is parallel with the source molecular beam, but offset by 1.64 inches.

Transmission efficiency can be quite high, as virtually all of the ions that are transmitted by the first deflector will be transmitted by the second deflector. The primary losses occur as the first deflector narrows the energy and angular acceptance of the device.

As with a single quadrupole deflector, the centerpoint energy of transmitted ion beam is determined by the mean of the two applied voltages.

Energy bandpass of the transmitted ion beam is determined by the delta between the two applied voltages, as well as the cross sectional area of the entrance and exit apertures.

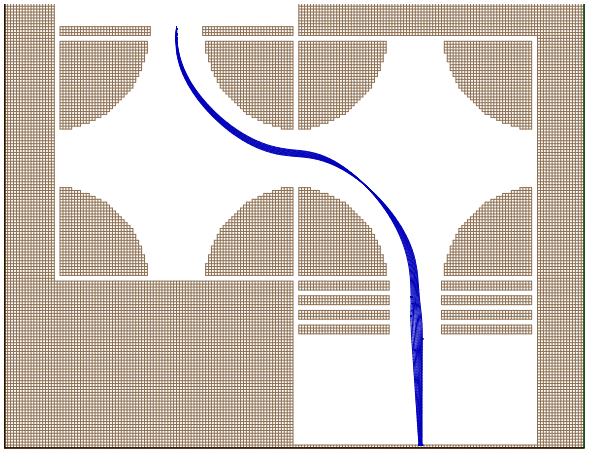


Figure 1: Angular Acceptance of Periscopic Deflector.

## II. SPECIFICATIONS

- Two DC lens power supplies minimum, Three DC lens powers supplies recommended.
- Entrance lens and top/bottom plate potentials derived as centerpoint of pole potentials by an integral voltage divider.
- Typical voltage setpoints:
  - Inner Pole Supply: –200 V
  - Outer Pole Supply: +40 V
  - Exit Lens: -200 V
  - Entrance Lens: (-80 V)
- Voltage rated to +/-1,000V per pole, 2,000V total.
- 10 Megaohm voltage divider resistors draw up to 100 microamps from lens supplies.

## III. DIMENSIONS