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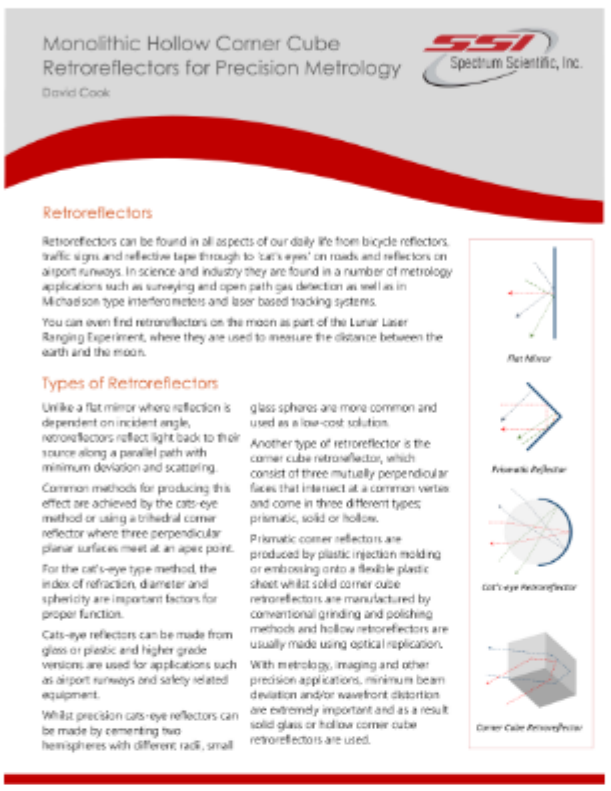
Monolithic Hollow Corner Cube Retroreflectors for Precision Metrology

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Retroreflectors

Retroreflectors can be found in all aspects of our daily life from bicycle reflectors, traffic signs and reflective tape through to 'cat's eyes' on roads and reflectors on airport runways. In science and industry they are found in a number of metrology applications such as surveying and open path gas detection as well as in Michaelson type interferometers and laser based tracking systems.

You can even find retroreflectors on the moon as part of the Lunar Laser Ranging Experiment, where they are used to measure the distance between the earth and the moon.

Types of Retroreflectors

Unlike a flat mirror where reflection is dependent on incident angle, retroreflectors reflect light back to their source along a parallel path with minimum deviation and scattering.

Common methods for producing this effect are achieved by the cats-eye method or using a trihedral corner reflector where three perpendicular planar surfaces meet at an apex point.

For the cat's-eye type method, the index of refraction, diameter and sphericity are important factors for proper function.

Cats-eye reflectors can be made from glass or plastic and higher grade versions are used for applications such as airport runways and safety related equipment.

Whilst precision cats-eye reflectors can be made by cementing two hemispheres with different radii, small glass spheres are more common and used as a low-cost solution.

Another type of retroreflector is the corner cube retroreflector, which consist of three mutually perpendicular faces that intersect at a common vertex and come in three different types: prismatic, solid or hollow.

Prismatic corner reflectors are produced by plastic injection molding or embossing onto a flexible plastic sheet whilst solid corner cube retroreflectors are manufactured by conventional grinding and polishing methods and hollow retroreflectors are usually made using optical replication.

With metrology, imaging and other precision applications, minimum beam deviation and/or wavefront distortion are extremely important and as a result solid glass or hollow corner cube retroreflectors are used.

Flat Mirror

Prismatic Reflector

Cat's-eye Retroreflector

Corner Cube Retroreflector

Monolithic Hollow Corner Cube Retroreflectors for Precision Metrology

This white paper compares the advantages and disadvantages of different types of retroreflectors. It highlights the advantages of monolithic, hollow retroreflectors which do not suffer from chromatic aberration making them ideal for use with broadband or multiple frequency light sources. Manufactured from a solid block of aluminum they also offer high accuracy and repeatability and are thermally stable, insensitive to vibration, position and movement.

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