Open Joint-stock Company «Research-and-Production Corporation
«Precision Systems and Instruments»
(OJC «RPC «PSI»)

New types of corner cube reflectors with various coatings on faces

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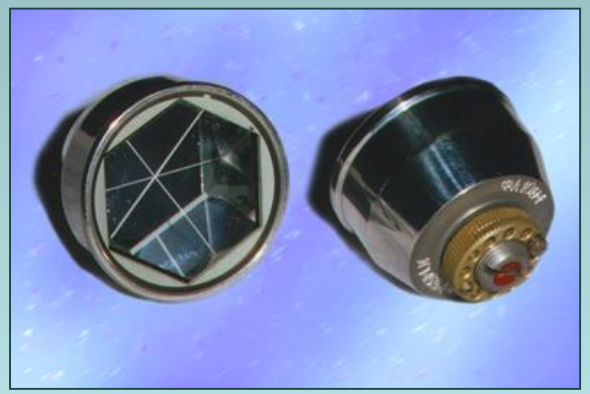
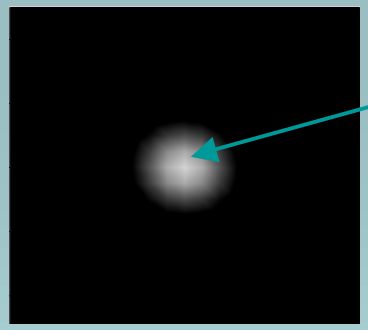


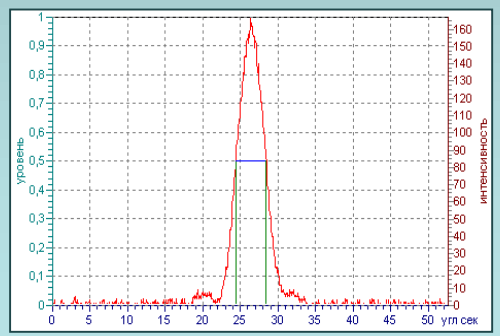
Far-field diffraction patterns (FFDP) of standard corner cube reflectors (CCR)

One of the most effective ways to modify and optimize the FFDP is to control the phase shifting of vector E orthogonal components by covering the CCR faces with different gradient coatings.

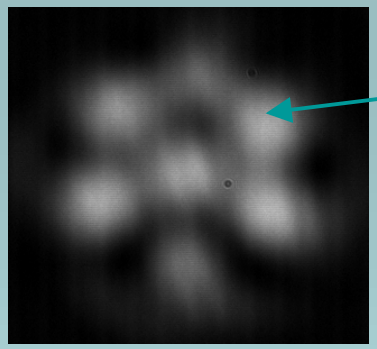
Metallic coating



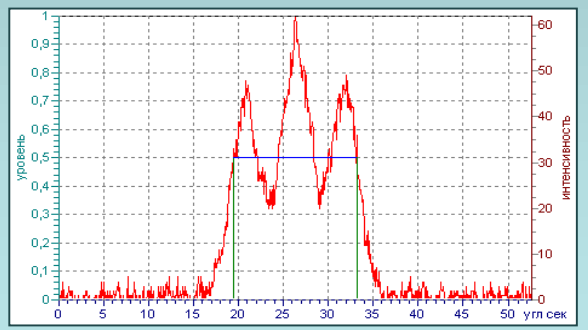
CS = 9,2·10⁶ m²



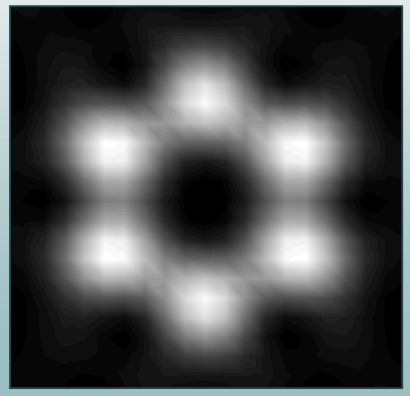
Total internal reflection



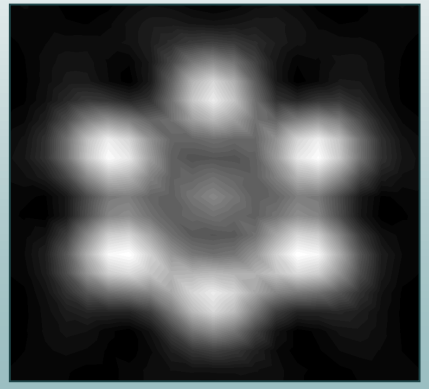
CS = 1,9·10⁶ m²



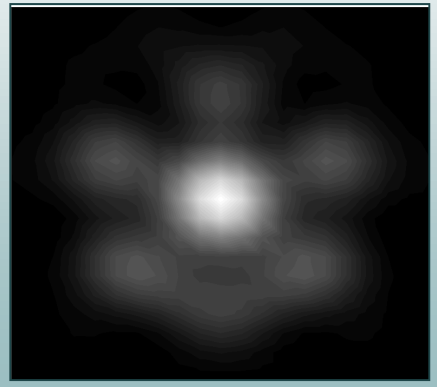
FFDP of a corner cube as a function of reflection phase shifts



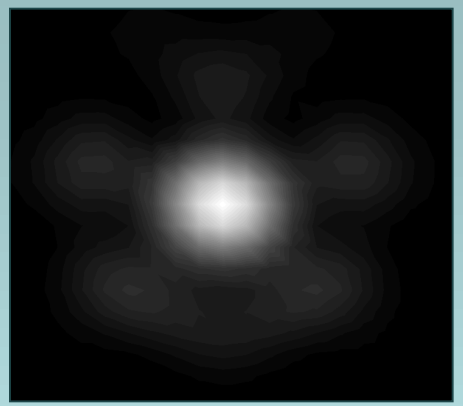
$\delta = 0$



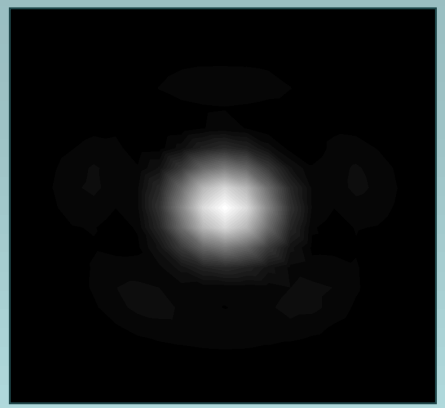
$\delta = 20$



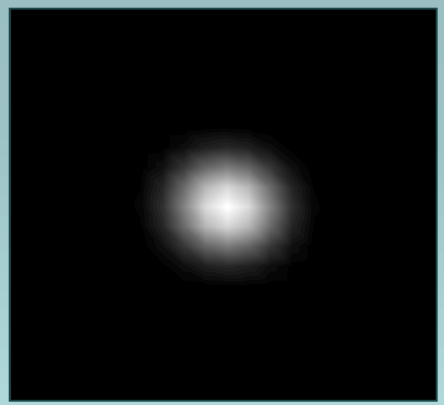
$\delta = 45$



$\delta = 60$



$\delta = 90$

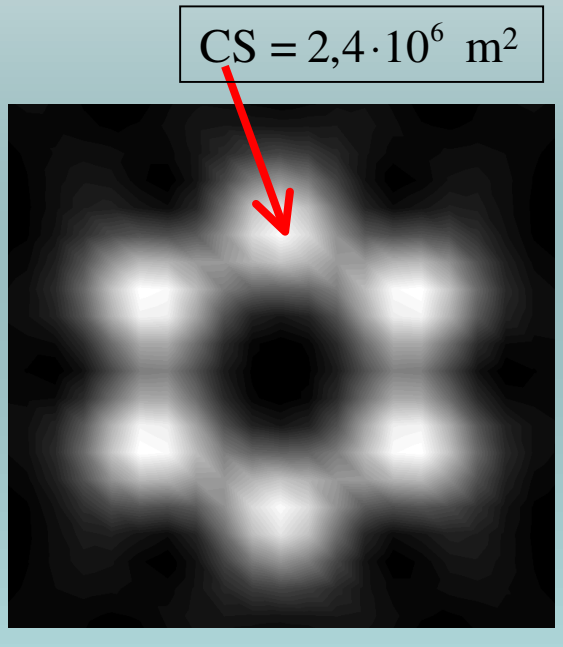


$\delta = 120$

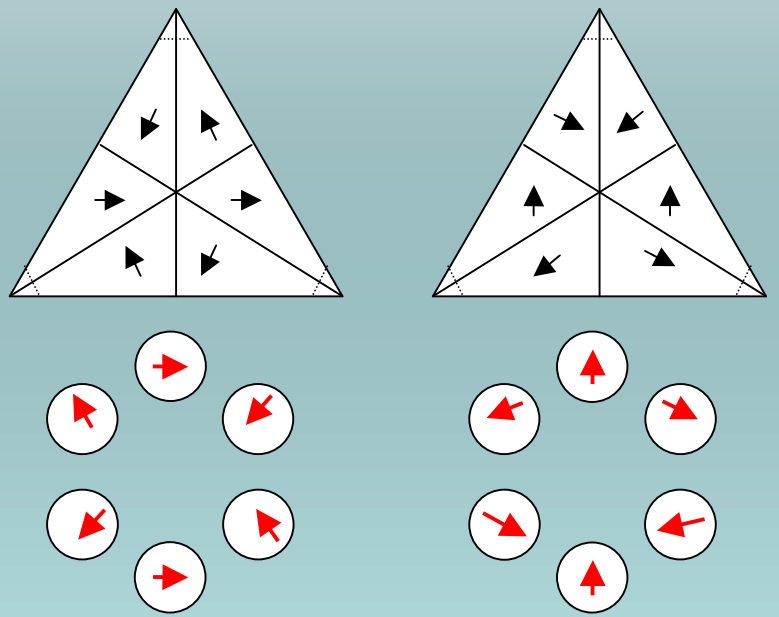
Three-films interference coatings may to vary the phase shift upon reflection and control the angular width of the pattern and its form.

FFDP of corner cube reflectors with dielectric coating on faces (the phase shift is zero)

The velocity aberration for GLONASS systems is 5"



Polarization structures in near-field and far-field

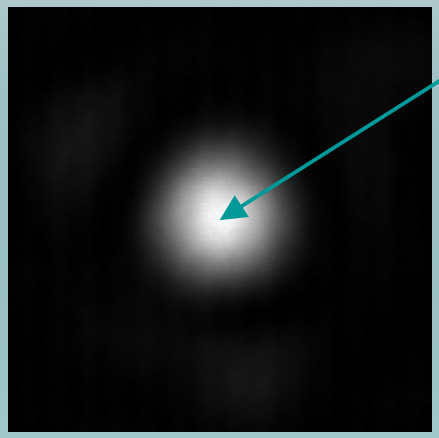


The best pattern occurs in case of phase shift close to zero: there is a peripheral ring of the intensity maxima consisting of six spots at the required angular distance without a central spot.

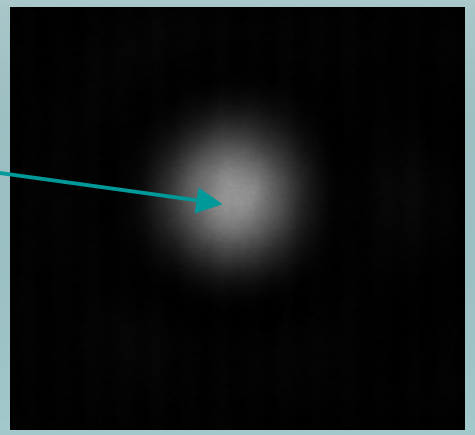
Corner cube reflectors for a Lunar station

The velocity aberration for a Lunar station is 1 arc second

CS = $14 \cdot 10^6$ m^2



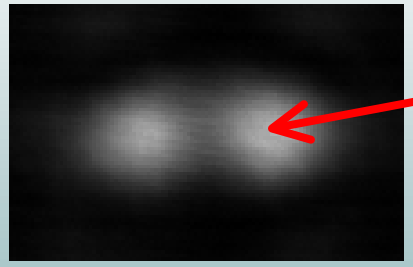
CS = $9{,}2 \cdot 10^6$ m^2



Dielectrically interference coating on faces (the phase shift is 180)

Aluminum coatings on faces (for comparison)

FFDP of a corner cube reflector with one coated face



$CS = 6{,}5 \cdot 10^{6}\ m^{2}$

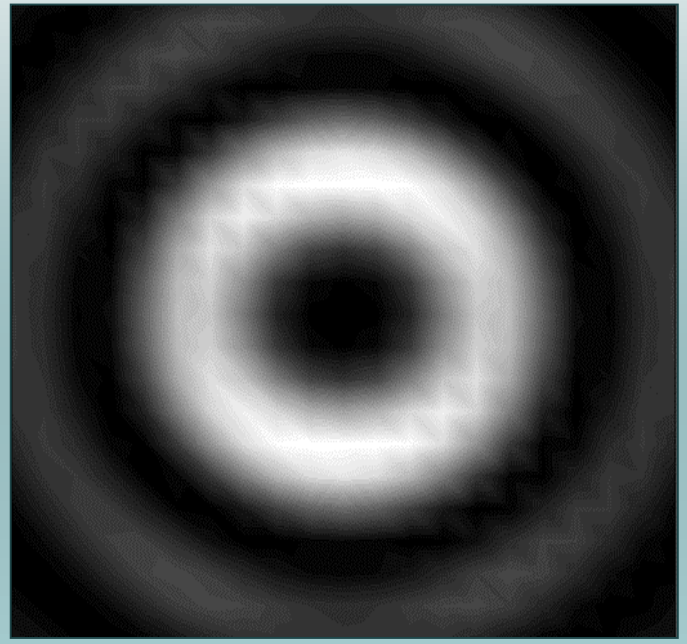
Laser beam polarization is vertical.
A cube corner is rotated.

The transmission axis of the polarizer is horizontal

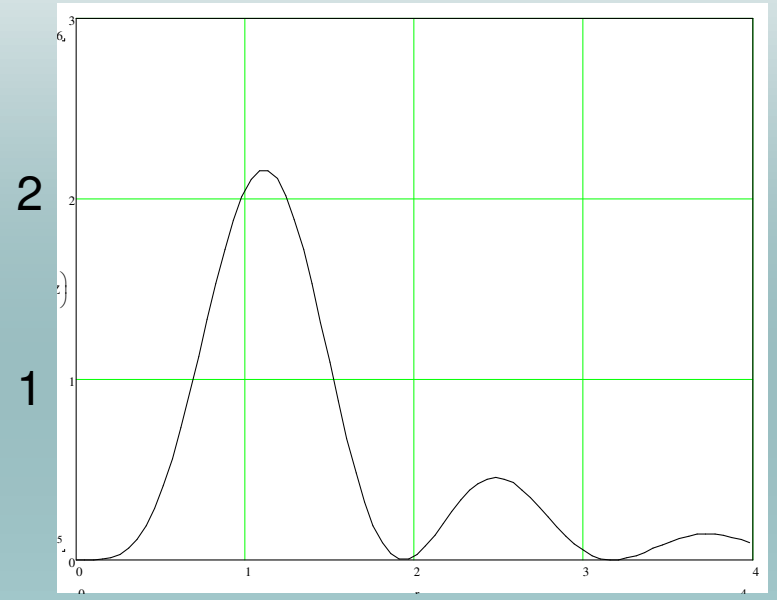
The transmission axis of the polarizer is vertical

No polarizer

FFDP of a corner cube reflector with gradient dielectric coating in the front face



CS



1 (4“) 2 (8“) $r D / \lambda z = \gamma / \gamma_m$

Another way to optimize the pattern is to make a gradient surface on the CCR front face. Instead of the Airy diffraction pattern, several rings are observed; the brightest ring is at an almost optimal angular distance for the GLONASS system.

Conclusions:

1. There is a possibility to produce CCR with different DDFP by coating of some faces of CCR.
2. Velocity aberration can be compensated and cross-section - increased
3. Loss can be decreased
4. Thermal optic effects can be reduced

Thank you for attention!