Formation of uniform rings in FFDP of flat CCRs-array for MEO satellites

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It is necessary to provide an annular intensity distribution in the far field of the reflected light with the angular radius of $\approx 5{,}3''$ for uniaxially oriented GLONASS navigation satellites (the orbital altitude is 19 500 km), regardless of the orientation of the plane of polarization of laser radiation.

The uniform distribution of the reflected radiation within the peripheral ring (Cross-section change is no more than 20%) is one of the factors which influences detectability of SLR stations especially when working in the daylight and must be maintained during changes of the plane of polarization of laser radiation.

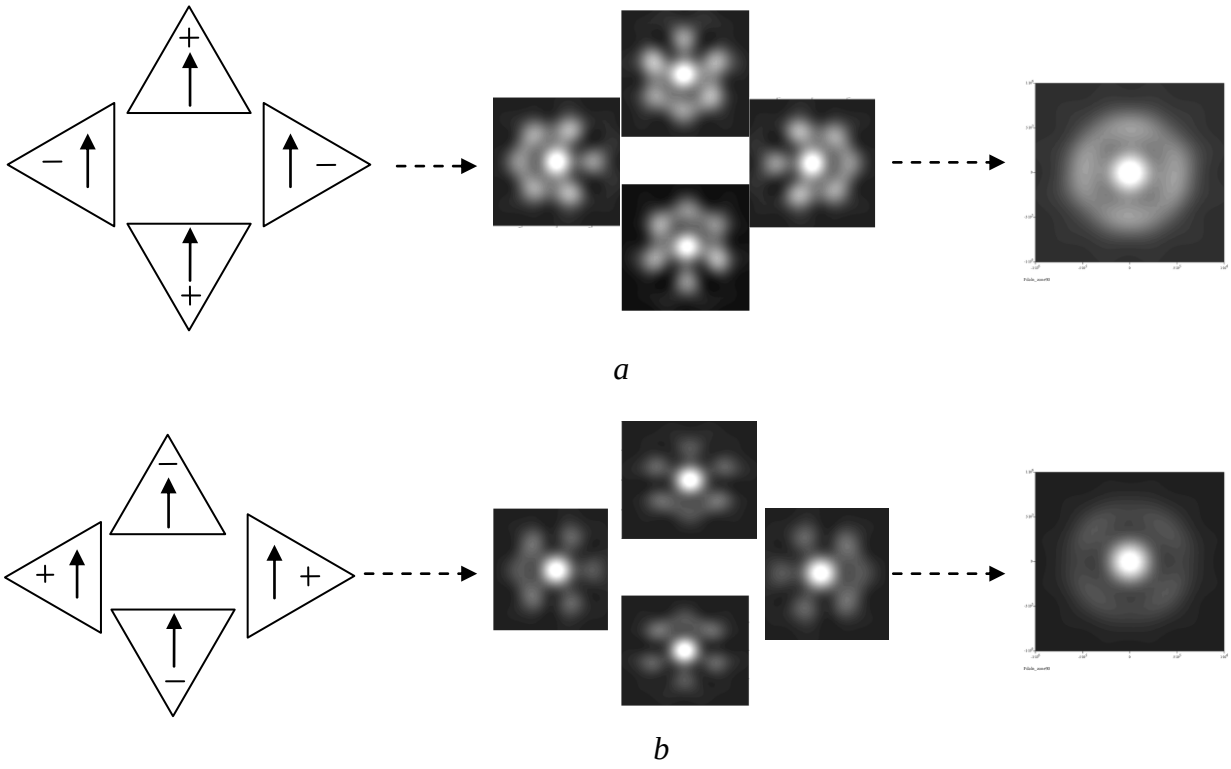
To form the peripheral ring when assembling the array it is necessary to expand CCR relative to each other at a certain angle. This task is complicated in practice because of inevitable, though minor errors in CCRs manufacturing.

One of these errors is deviation of one of the dihedral angles from 90^0. In this case, the distribution of energy is determined by two factors: the orientation of vector **E** with the reference to CCR faces and the sign of errors, which means increasing or decreasing of the dihedral angle. Depending on the combination of these factors either the central spot may increase, which is not desirable, or peripheral spots. First of all one should carry out diagnostics of all manufactured corner cube reflectors and classify then according to types of errors.

In this work it is shown the way the peripheral ring with the equal intensity by none-ideal CCR with a minor split of one dihedral angle is formed. For this it is necessary to use a CCR with the difference sign of the dihedral angle variation. In case of four CCR we can see a uniform pattern only for one array's orientation relative to **E.** Another pattern with the faint peripheral ring – in case of orthogonal. To receive a pattern with the uniform ring of intensity, independent of **E** vector orientation, it is necessary to use 8 corner cube reflectors.

In practice there are CCR with a different value and a sign of manufacture error. To provide uniformity of intensity in the peripheral ring diffraction pattern and its independence from the state of polarization of the falling light it is necessary that there should be in the array a number of CCRs with a certain error value which will be multiple 4, meanwhile a number of CCR with different sign errors should be the same. In every quaternary CCRs turn on 30^0 relative to each other.

It should be noted that in general the uniform pattern can be formed by the combination of N-number of CCRs, for example, if $N = 8$, then the turn of CCR relative to each other will be equal to $120/N = 15^o$.



a

b

Fig. 1. *a*: FFDP formation of 4 CCR's array with uniform peripheral ring. A plus sign (+) or minus sign (-) denotes a sign of the CCR DAO; *b* – FFDP formation of 4 CCR's array at the turn on 90^{o} with respect to **E**

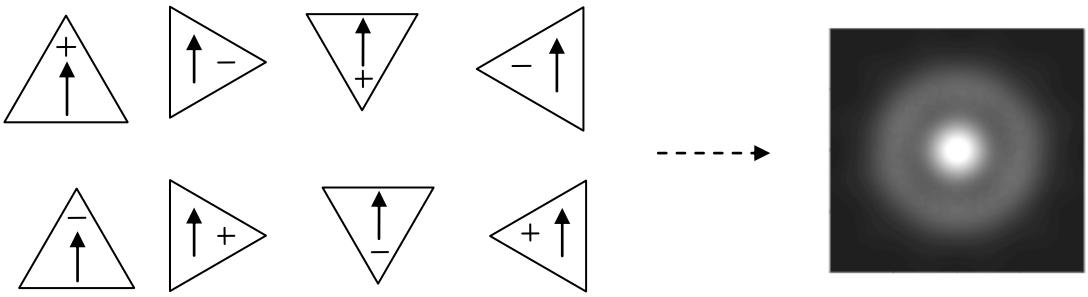


Fig. 2. Summing of two FFDP from Fig.1