**Final Transfer Function of the Lares Retroreflector Array**

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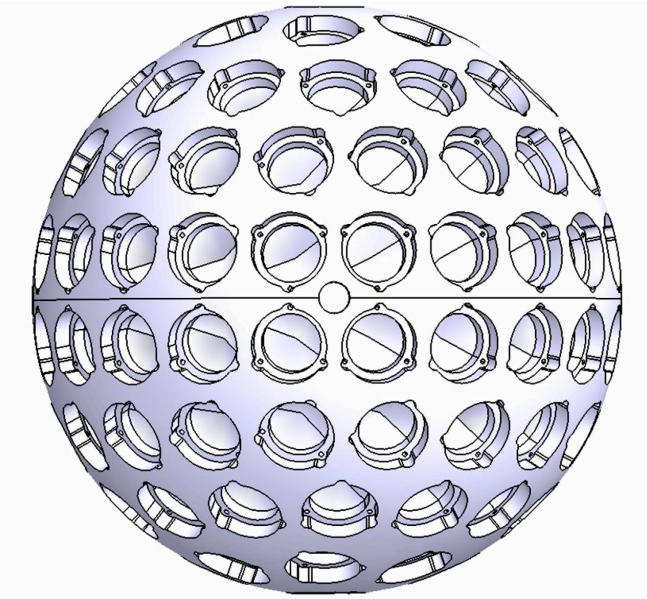

This poster contains excerpts from the paper "Final Transfer Function of the LARES Retroreflector Array" which will be available after final review on the ILRS website at http://ilrs.gsfc.nasa.gov/about/reports/other_publications.html. The table of contents for that report patterned after the 1979 Lageos report is given below.

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**Pulse Histogram**

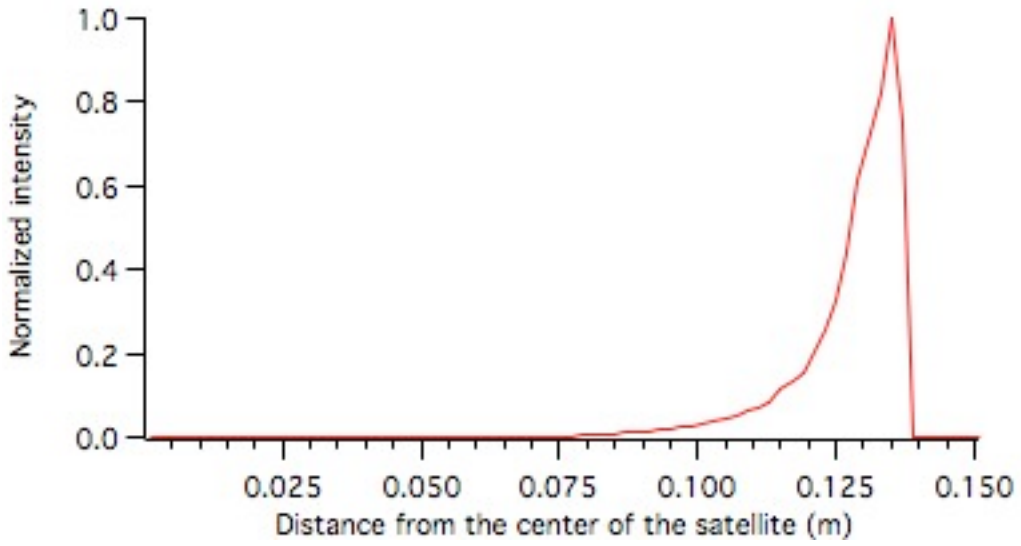



Figure 8.1. Histogram of the return pulse from Lares (2 mm bins).

**Average cross section matrix for circular and linear polarization**

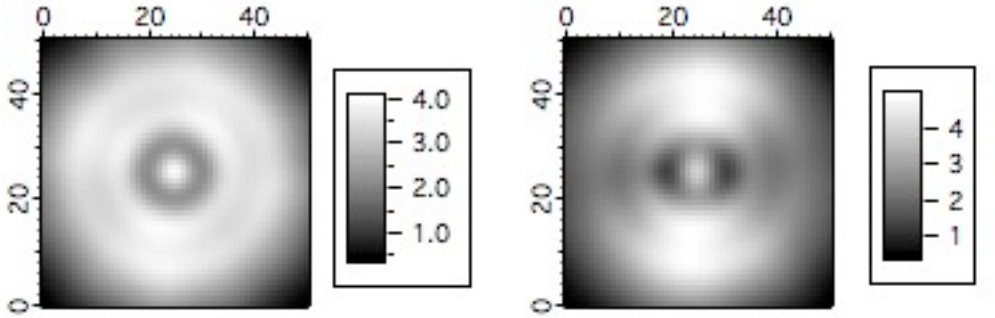
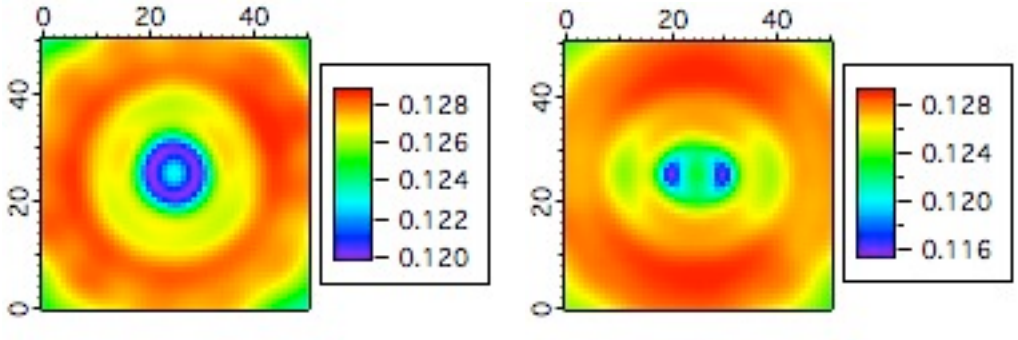



Figure 9.1. Average cross section matrix (million sq m) over 1080 incidence angles for circular polarization (a) and linear vertical polarization (b). The dihedral angle offset is 1.5 arcsec. The cross section matrix has circular symmetry for circular polarization. However, it is asymmetric for linear vertical polarization. The matrix is 51 x 51 elements going from -50 to +50 microradians.

***The average cross section between 30 and 45 microradians is 3.3 million sq meters.***

**Average centroid correction for circular and linear polarization**




(a) (b)

Figure 10.3. Average centroid range correction (m) over 1080 incidence angles for circular polarization (a) and linear vertical polarization (b). The dihedral angle offset is 1.5 arcsec. For circular polarization the pattern has nearly circular symmetry. For linear vertical polarization the pattern is asymmetric. There is a systematic variation of the range correction around a circle in the far field pattern with linear polarization.

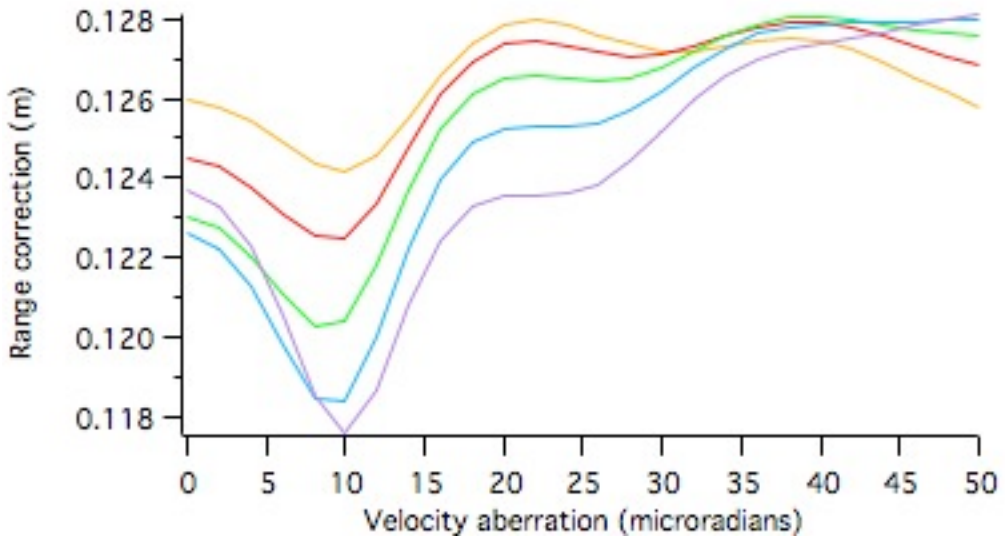



Figure 10.7. Range correction (m) vs velocity aberration (microradians) for 5 different dihedral angle offsets.

| Color | Arcsec | Range correction (m)<br>30 – 45 microradians |
|---|---|---|
| Yellow | 1.00 | .1273 |
| Red | 1.25 | .1277 |
| Green | 1.50 | .1278 |
| Blue | 1.75 | .1276 |
| Purple | 2.00 | .1270 |

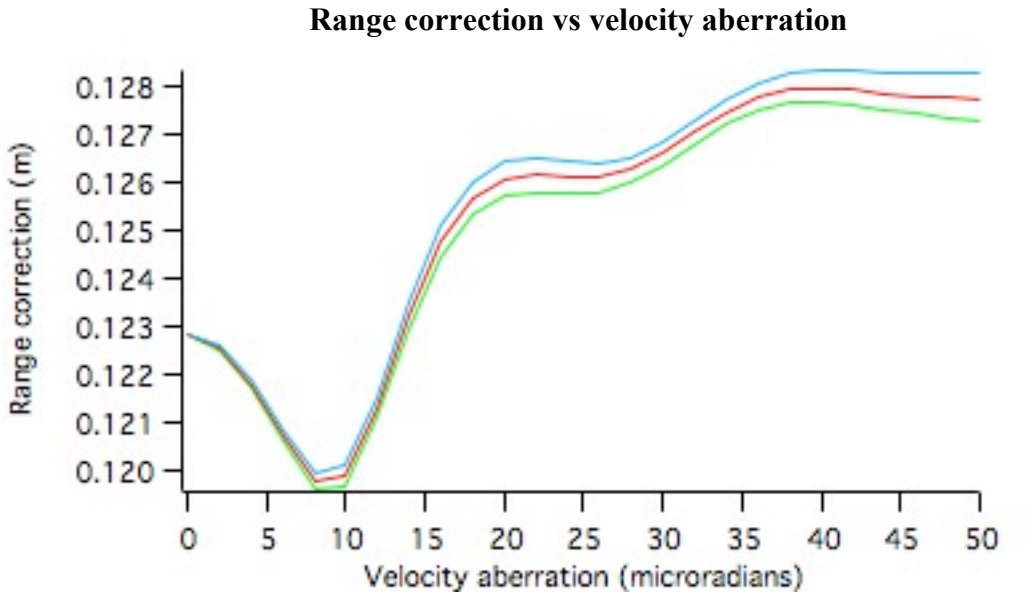



Figure 10.9. Range correction vs velocity aberration averaged over 1080 orientations using the actual dihedral angle offsets for Lares with circular polarization.

Green = minimum around the circle
Red = average around the circle
Blue = maximum around the circle

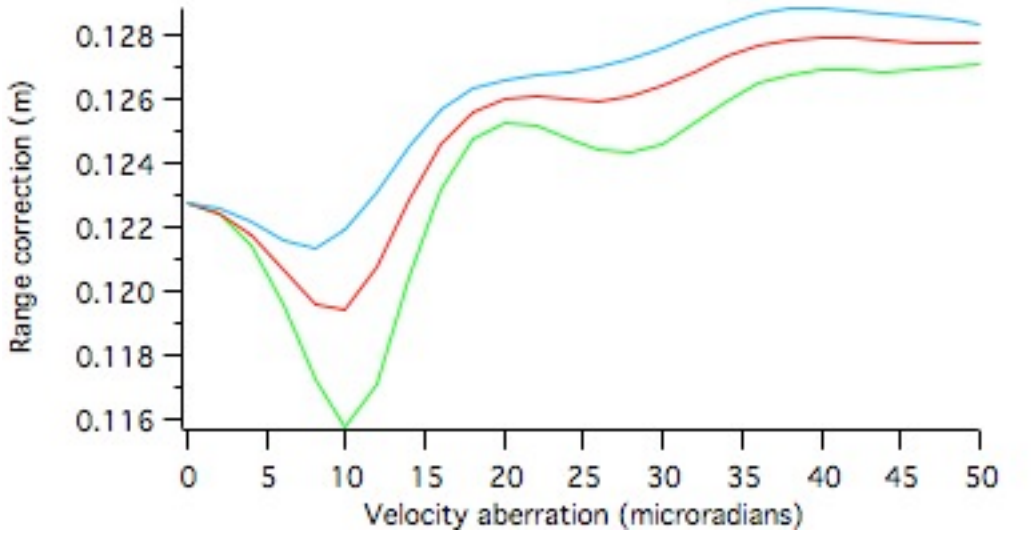



Figure 10.12. Centroid vs velocity aberration averaged over 1080 orientations with actual dihedral angles and linear vertical polarization.

Green = minimum around the circle
Red = average around the circle
Blue = maximum around the circle

**Range correction vs velocity aberration**

| Microrad | Circular(m) | Linear(m) |
|---|---|---|
| 30.0 | 0.1265930 | 0.1263715 |
| 32.0 | 0.1270283 | 0.1268242 |
| 34.0 | 0.1274531 | 0.1272825 |
| 36.0 | 0.1277645 | 0.1276309 |
| 38.0 | 0.1279288 | 0.1278265 |
| 40.0 | 0.1279638 | 0.1278839 |
| 42.0 | 0.1279181 | 0.1278532 |
| 44.0 | 0.1278470 | 0.1277948 |
| 46.0 | 0.1277905 | 0.1277519 |

Table 10.5. Range correction vs velocity aberration for circular and linear polarization with the actual dihedral angle offsets.

***The average range correction for linear polarization in Table 10.5 over the range from 30 to 45 microradians is 127.4 mm.*** This should be the best estimate for actual ranging data.

**Half maximum range correction**

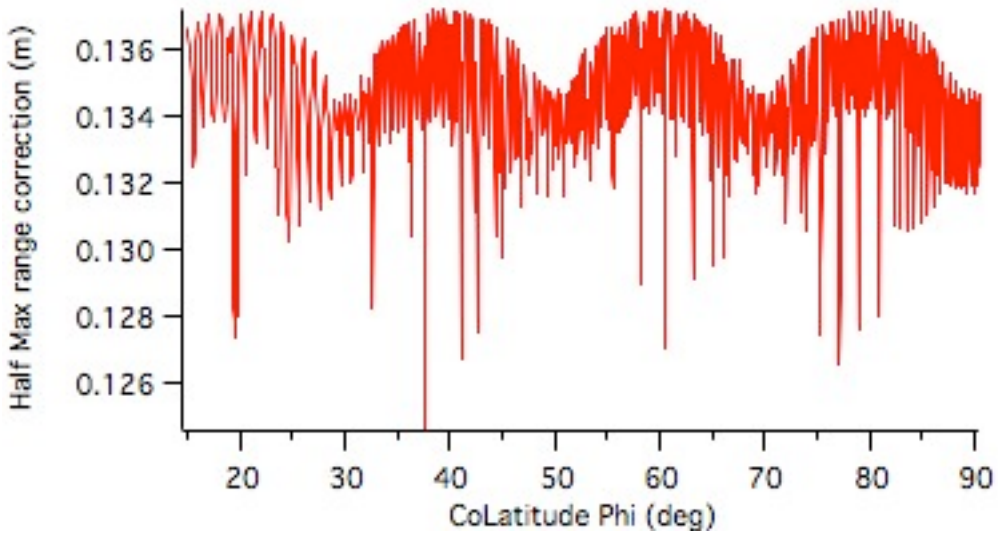



Figure 10.16. Half maximum range correction vs colatitude at velocity aberration (36,0). The half maximum range depends on the transmitted pulse width that is 30 picoseconds. The minimum is .1246 m, the maximum is .1372 m, max – min = .0126 m, the average is .1346 m, and the r.m.s. variation is .0018 m (1.8 mm). There is clearly a systematic variation with colatitude. The peaks correspond to incidence angles where the incidence beam is normal to one of the rows of cube corners. The occasional low values are due to irregular pulse shapes where the first peak is less than half the highest peak

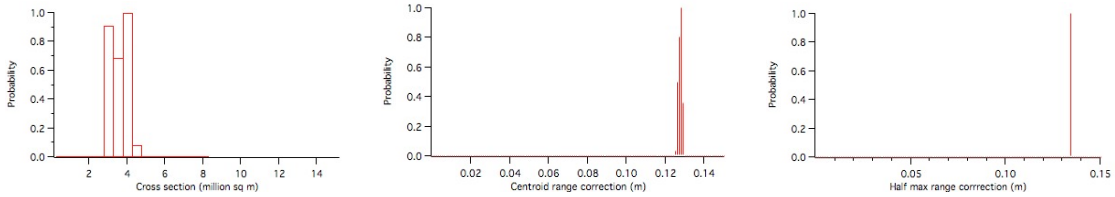
The half maximum correction should be representative of leading edge detection systems.

**Effect of optical coherence.**

Axes: Vertical Probability
Horizontal: (a) cross section (million sq m)
(b) centroid range correction (m)
(c) half max range correction (m)

Pulse length 10 ps.

Cross section Centroid Half max

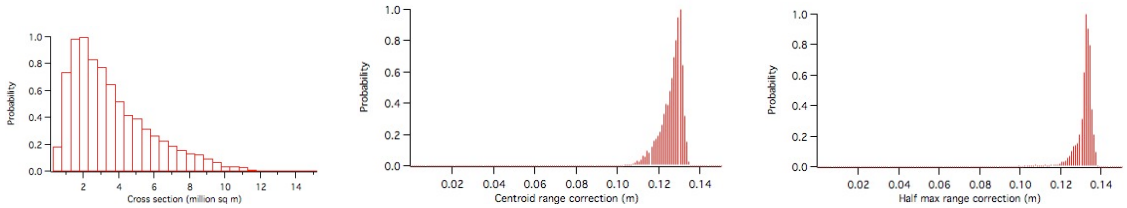



(a) (b) (c)

Figure 11.2 Histograms of the cross section (a), centroid (b), and half max range correction (c) for transmitted pulse length 10 ps.

Pulse length 100 ps.

Cross section Centroid Half max




(a) (b) (c)

Figure 11.3 Histograms of the cross section (a), centroid (b), and half max range correction (c) for transmitted pulse length 100 ps.

Pulse length 10,000 ps.

Cross section Centroid Half max

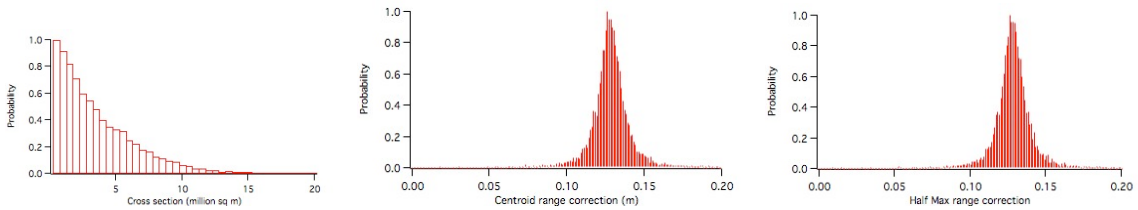



Figure 11.4 Histograms of the cross section (a), centroid (b), and half max range correction (c) for transmitted pulse length 10,000 ps.

The probability distribution of the cross section is exponential for long pulse lengths.