# Laboratory verification of the measurement of pupil plane wavefront phase with the plenoptic camera. (May 2011).

1.- Test Procedure

     A phase plate has been used as the example wavefront to be measured. It was manufactured by Lexitec (USA) using the well known technology of sandwiching materials of very similar refraction indexes. This phase plate was ordered to have a Kolmogorov spectral density with 1,5 mm of r_0, and has by chance a shape fairly easy to be recognized. The phase is drawn along an annulus (circular corona) of the plate, leaving the center with no phase as an excellent reference.

     The phase peak was identified with the help of a Zygo interferometer by sticking a small post-it tape signaling to it, as it can be seen in the following figure:
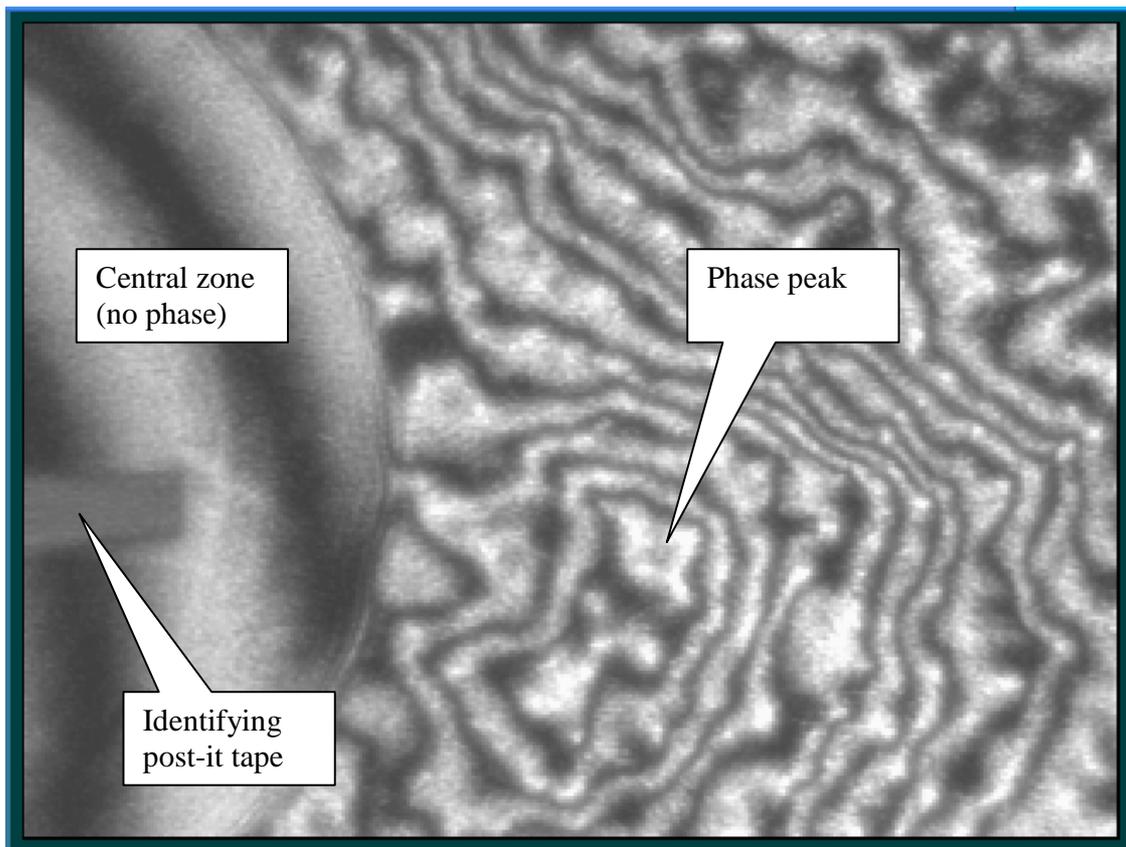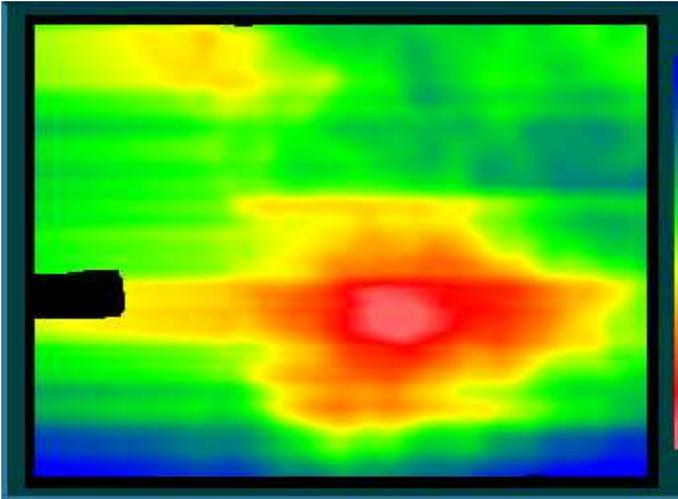
Wavefront reconstruction as provided by the Zygo interferometer

The phase plate was located as close as possible to the pupil of the plenoptic camera, having a 400 mm focal length and a 400 micron pitched microlens array, staring an extended 2-dimensional high-contrast object. A computer controlled trolley was used to move horizontally the phase plate from right to left, starting at the center (no phase) and slowly moving over the phase peak and beyond.


Start position

Final position
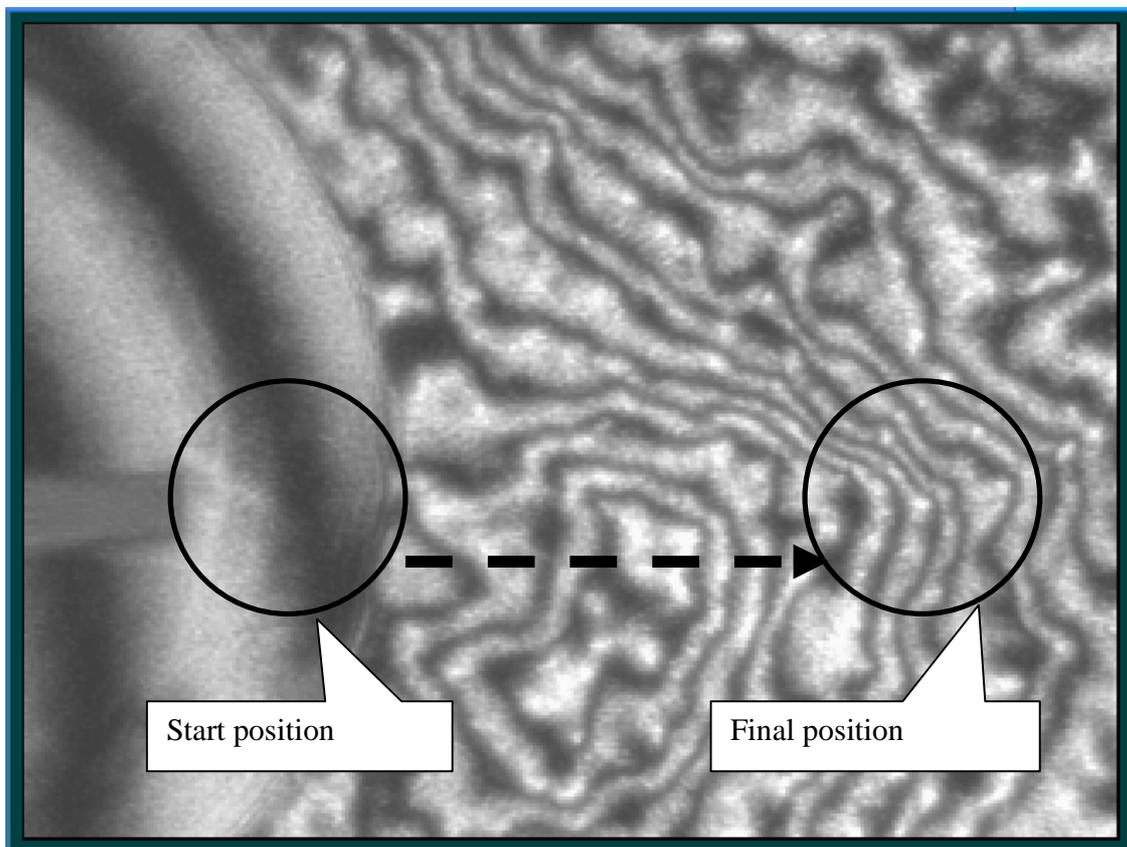
2.- Results

The computed slopes have been put together in the movie available at
www.cafadis.ull.es/demo. Watching the movie it can be identified the beginning with
very small slopes, the arrival of the phases at the right, the peak at its position
approximately at the middle of the movie, and even the slopes at the end corresponding
closely to the normal of the lines of the interferogram.

Three frames have been extracted from the movie. The starting frame is used as a
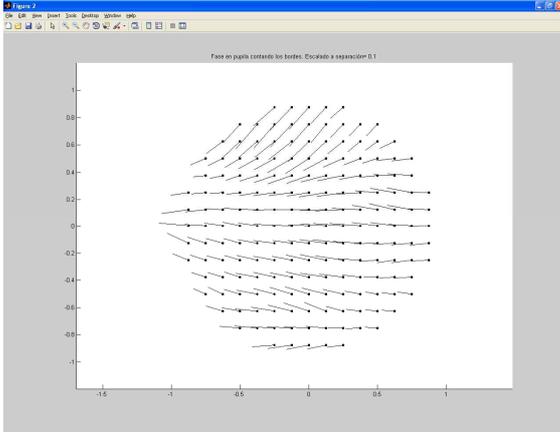reference for the others:
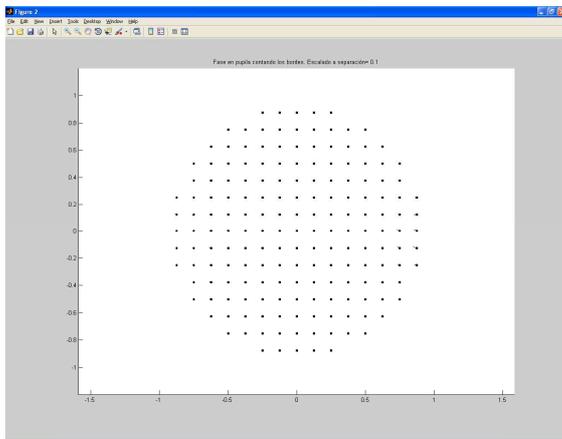
Frame #3
(null phases at the center of the annulus)
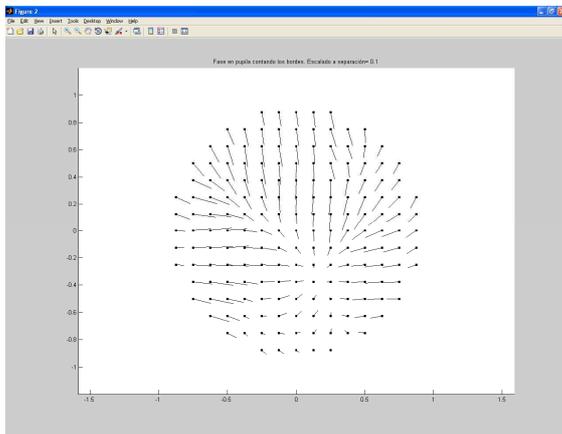
frame #200
(note the position of the peak, the higher slopes measured at the top half of the pupil and
the shape running at 45 degrees to the left and top, clearly corresponding with the
interferogram).

Frame #351 (last)

(Note the leftward orientation of the slopes at the center, to the left-down at the top, and slightly to upwards-left at the bottom.