Comparison of Fringe Analysis Measurement Statistics

PRECISION-OPTICAL ENGINEERING

IF 002

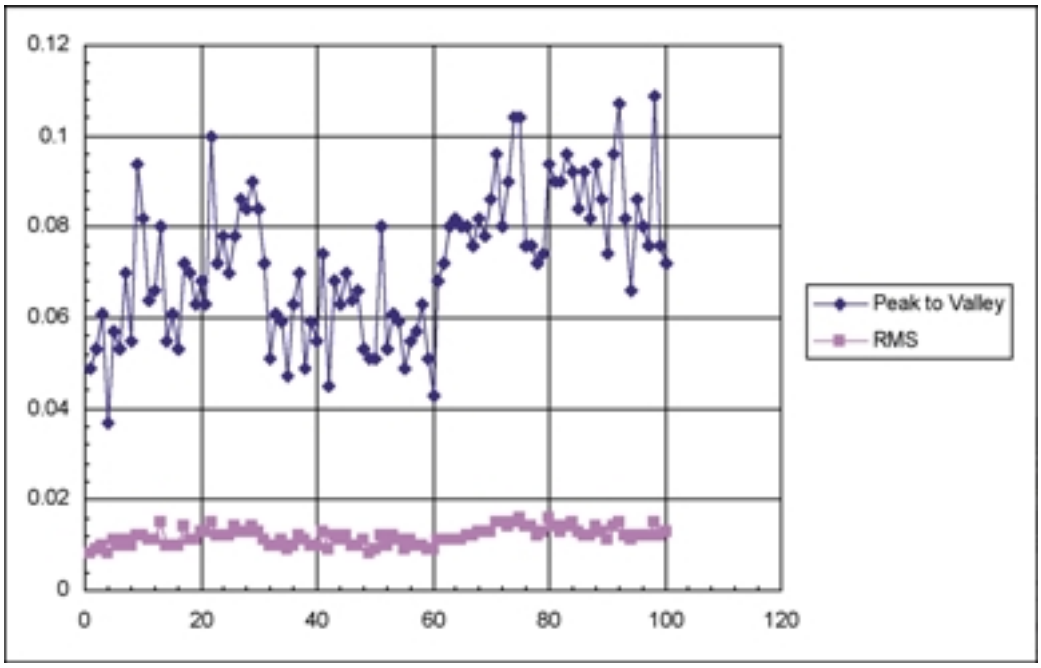
Application Note

Two forms of fringe analysis are used in everyday testing of optical systems,

- Static fringe analysis, in which fringe centres are located by a variety of different methods, e.g. by fringe thinning or by location of turning points. The software used in these measurements is of the fringe thinning type.

- Phase shifting analysis:- whereby the variation of phase is calculated for every pixel within the optical pupil by measuring intensities during a phase scan of 2π.

The latter technique is by far the more accurate as can be seen in the following curves. One hundred consecutive measurements were made using the two different methods. The software packages for each method were provided by the same supplier and the same hardware (computer, interferometer, frame grabber etc) was used for each set of measurements.



Variation over 100 measurements with Static Fringe analysis software

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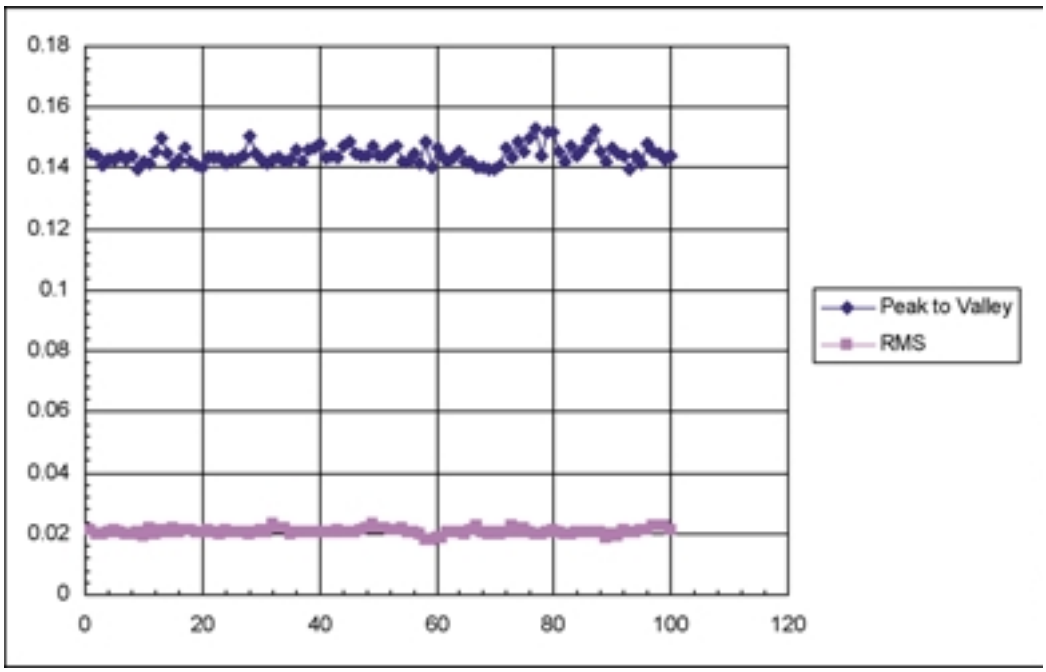

Variation over 100 measurements with Phase Shift software.

The spread of results with the phase shifting system is much smaller than with the static system. Measurements made using the static system vary considerably with time due to changes in the environment. The phase shifting system is not so badly affected mainly because of its ability to make several measurements and display an average. This tends to smooth out time dependant variations such as air turbulence, which may be frozen into a static fringe acquisition. It may be expected that the phase shifting system may suffer more from vibration effects since the measurement process takes longer, unlike the static system which simply grabs one frame and thereby freezes the fringe. However if the fringes are 'fluffed out' phase shift software can cope with small vibrations – if the fringes are not fluffed out then more serious effects can occur as they move about.

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