

Applications of MRF

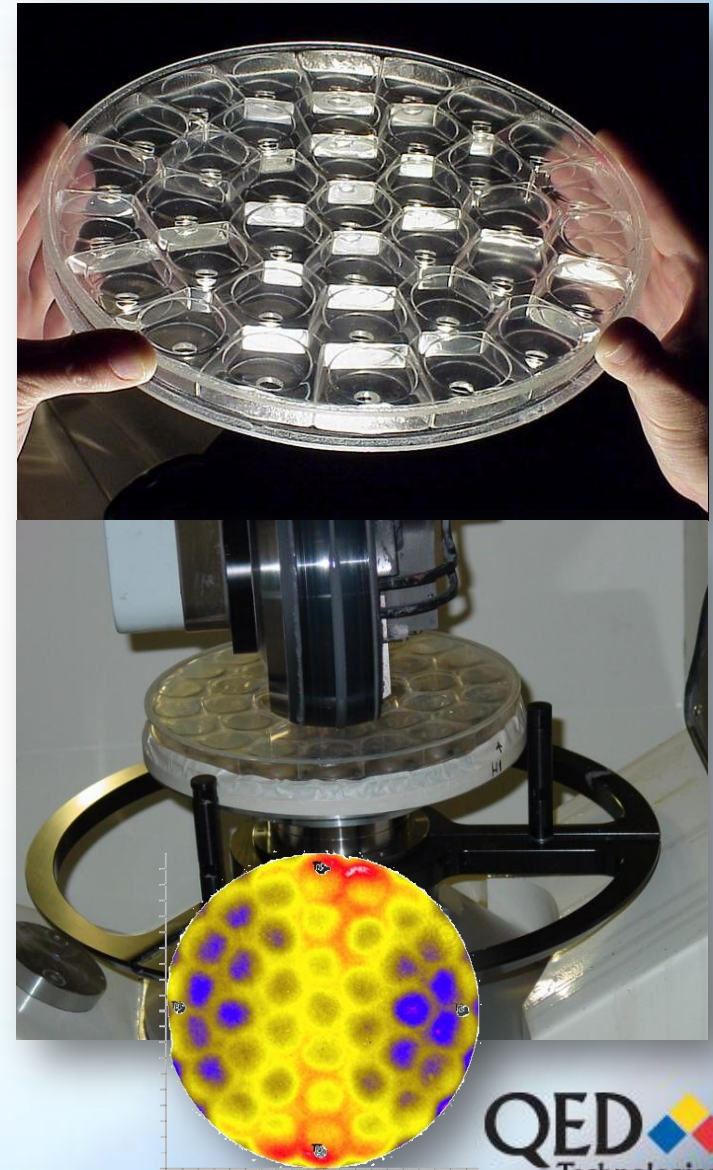
Case Study - Efficient correction of print-through on a light weighted Silicon Carbide mirror

Presented By:

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Introduction

- ❖ Many space and large mirror optical applications require a light-weighted support design
- ❖ Light-weighted optics that have been polished using conventional techniques, often show print-through, or quilting errors
 - Conventional polishing techniques apply normal forces that can deform non-supported surface areas causing variation in polishing rate
- ❖ Material removal from MRF is a result of shearing forces and very little normal force is applied to the surface of an optic; therefore, MRF does not cause any print-through or quilting
- ❖ Due to its deterministic nature, MRF can also correct pre-existing print-through errors



Print Through Correction – Silicon Carbide Mirror

◆ Light-weighted mirror

- Size: 100 mm Φ
- Material: Silicon Carbide
- Surface form: Plano

◆ The Goal

- Correct figure error that is a result of print through from conventional polishing

◆ The Configuration

- Q-flex 100
 - ◆ Raster Polishing
- 150 mm wheel
 - ◆ Large spot to minimize cycle time
- D10 fluid
 - ◆ Achieves best roughness on Silicon Carbide

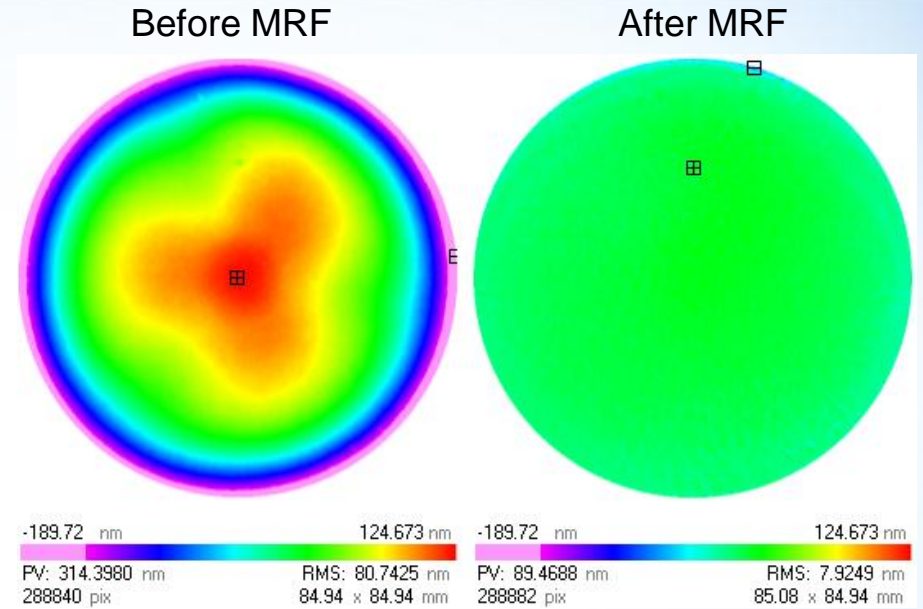
Light-weighted structure
on back of mirror



Silicon Carbide Light-weighted Mirror Figure Correction

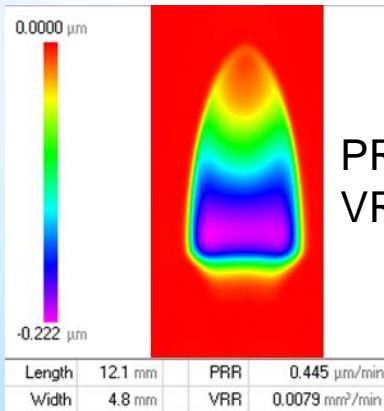
10x RMS improvement

- Quilting/print through corrected efficiently.
- MRF does not induce print through due to minimal normal force during polishing.

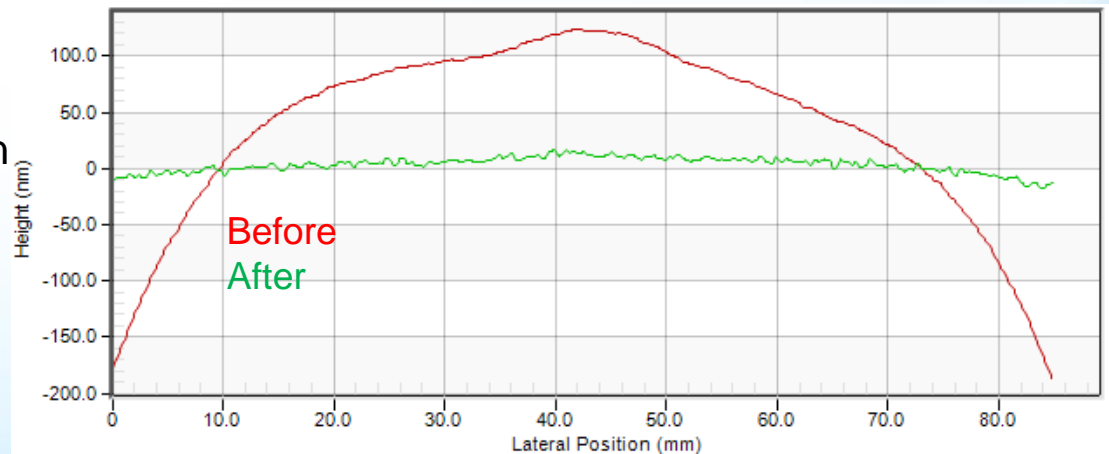


RMS improved from 80.7nm to 7.9nm

Nominal spot



X-slices



Conclusions

- ◆ MRF successfully improved the figure error to $<8\text{nm RMS}$
 - 10x RMS improvement
- ◆ Low normal forces and relative insensitivity to small gap variations means MRF does not induce quilting/print through artifacts.
- ◆ High lateral resolution of MRF process is efficient at correcting quilting/print through artifacts

