During a regular inspection of the optics within the Petawatt Compressor Chamber in June 2004 a significant change was observed on the first grating of the compressor. A thin arc of approximately thirty centimetres length and, at maximum, 1 cm thick was discovered passing through the 'parsons nose', an artifact of the manufacturing process (see figure 1a). There was a further damage mark on the left of the grating which was considerably shorter than the central mark at about 5 cm long (see figure 1b).

On further investigation it was noted that the damage had removed the gold top layer and had made significant damage to the photoresist layer.

An investigation into the cause of the damage noted that the gold on the bezel at the right of the grating was suffering from burn damage. It was suggested that the beam had a near-field mismatch into the grating such that it hit the bezel and burnt through the gold. The beam then traveled through the substrate reflecting off the back onto the central mark, a fraction was reflected off to do another bounce and form the second damage mark on the left of the grating.

By applying a similar technique it became apparent that the damage on the second grating was also caused by passage through the side of the grating due to the grating being overfilled. Another edge shield was installed on the second grating.

**Conclusion**

Significant damage has been seen on the first grating in the Petawatt compressor. The cause of this damage has been found and shields installed to prevent it re-occurring.

**References**

1. CN Danson et al., ‘Vulcan Petawatt – Design, Operation and Interactions at 5.10^20 Wcm^-2’ Laser and Particle beams (2005), 23, 87-93