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Environmental Conditions Effect on Optical Components Performance and Cleaning Techniques

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Laboratory working conditions and unproperly set experimental designs highly impact the instruments' performance and shortens their life. Several studies have been conducted on the performance of optical components in ultrafast high-power lasers and metrology equipment. The work presented is a study of different types of damages observed on stretcher and compressor diffraction gratings used in an ultrafast high-power laser system. It was found that short term exposure and operation of the systems at relative humidity and temperatures outside the operating range can damage the systems' components irremediably. The effects of different cleaning techniques are presented along with measurements of the diffraction efficiency of the gratings using a monochromator. Among the cleaning techniques, the 5 min, 75-100% power oxygen plasma cleaning has been found to be the least invasive technique.

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