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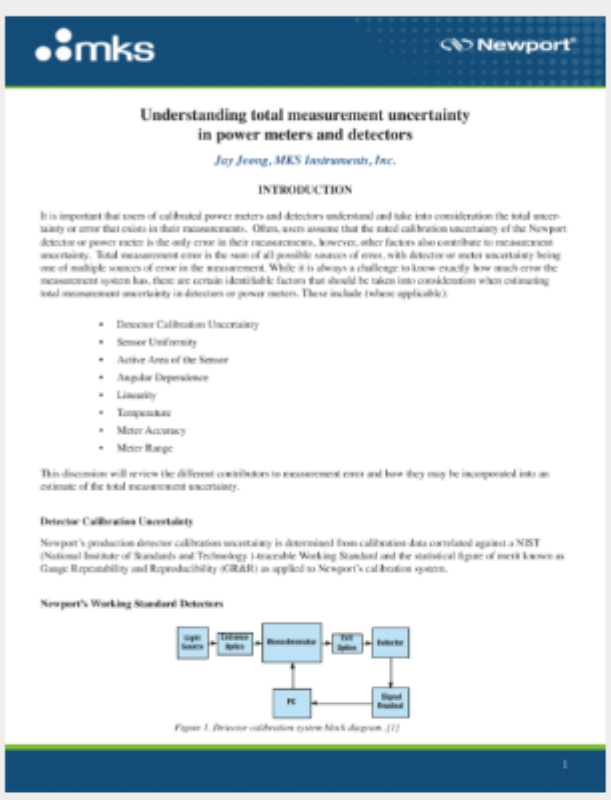
mks Newport

Understanding total measurement uncertainty in power meters and detectors

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INTRODUCTION

It is important that users of calibrated power meters and detectors understand and take into consideration the total uncertainty or error that exists in their measurements. Often, users assume that the rated calibration uncertainty of the Newport detector or power meter is the only error in their measurements, however, other factors also contribute to measurement uncertainty. Total measurement error is the sum of all possible sources of error, with detector or meter uncertainty being one of multiple sources of error in the measurement. While it is always a challenge to know exactly how much error the measurement system has, there are certain identifiable factors that should be taken into consideration when estimating total measurement uncertainty in detectors or power meters. These include (where applicable):

- Detector Calibration Uncertainty
- Sensor Uniformity
- Active Area of the Sensor
- Angular Dependence
- Linearity
- Temperature
- Meter Accuracy
- Meter Range

This discussion will review the different contributors to measurement error and how they may be incorporated into an estimate of the total measurement uncertainty.

Detector Calibration Uncertainty

Newport's production detector calibration uncertainty is determined from calibration data correlated against a NIST (National Institute of Standards and Technology) traceable Working Standard and the statistical figure of merit known as Gauge Repeatability and Reproducibility (GR&R) as applied to Newport's calibration system.

Newport's Working Standard Detectors

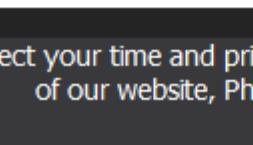

Figure 1. Detector calibration system block diagram. [1]

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