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Advanced Multipactor Diagnostics and Tools

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There are a number of advanced techniques which can be used in addition to the standard suite of multipactor diagnostics to discern important information about a multipactor breakdown event. In this work some of these techniques are presented. First, a photomultiplier tube is used to measure photon emission from breakdown. The magnitude of the measured PMT events are correlated with other multipactor diagnostics to assess sensitivity and applicability relative to the standard suite of multipactor diagnostics. Next, signal phase shift and amplitude dropout is measured in several device geometries using a fast oscilloscope. The measured phase shift and amplitude change is compared to the phase null signal excursion. This technique helps translate a common measurement performed during hardware screening to real potential signal impact. Finally, the effect of multipactor breakdown on surface charge on dielectrics is examined. A small amount of surface charge is not necessarily damaging but can temporarily suppress breakdown, giving an indication that an event is short-lived or non-repeatable when in fact the temporary space charge condition is merely suppressing the breakdown for a period of time. These techniques together give greater insight into the physics and severity of multipactor breakdown.

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