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Solar Cells Stability at Vibrations and Temperature Gradients[1]
DANIEL QUISPE, CRISTIAN BAHRIM, Lamar University — Our analysis of solar cells' response to its orientation, mechanical stability, and temperature variations will be reported. Most of our indoor experiments are done with a thermal light source located at one-foot distance from a commercial silicon-based PASCO solar cell, model SE-8847 of 1W. Our studies reveal that the solar cell receives irradiance from this light source which follows an inverse square law dependence. This allows us to extrapolate our results for any distance from 8 inches to 6 feet. First, we report the stability cone of the solar cell, which is about 15 degrees from the normal to the cell's surface. Next, we measure the impact of thermal change on the cell's surface due to the incident radiation from the thermal source and notice a drop of 11% in the photo-voltage production for an increase by 27% in cell's surface temperature (from 22 to 28 Celsius). Such drop can be recovered with air blowers orientated at grazing incidence. From the characteristic curve, we measure the resistance of the solar cell and observe that is temperature independent. In fact, the photo-voltage and photo-current of the solar cell vary in sinc with the change in temperature. We also report studies of photo-voltage production with the mechanical stability due to air blowers oriented toward the surface within the stability cone, as well as using a PASCO Mechanical Wave Driver controlled by Sine Wave Generator. We notice that within 15 Hz about the resonant frequency of the solar cell-supporting platform system, the photo-voltage has a parabolic variation with a minimum at a value 15% below the nominal photo-voltage value in the absence of vibrations.

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