APPLICATION NOTE: SILICON SOLAR CELL TESTING

This application note describes the use of an **ARCspectro FT interferometer** for measuring the spectral response of **silicon solar cells** in the near-infrared region between **600nm and 1300nm**.

A customized interferometer was built for a customer active in the solar cell industry. This interferometer has both a fiber connections for an input light source (here we have used a commercial halogen light source) and another fiber connection for the modulated light output. A connector on the interferometer module allows wiring an external detector (in this case a silicon cell) to the internal amplifier. The complete system is shown on Figure 1.

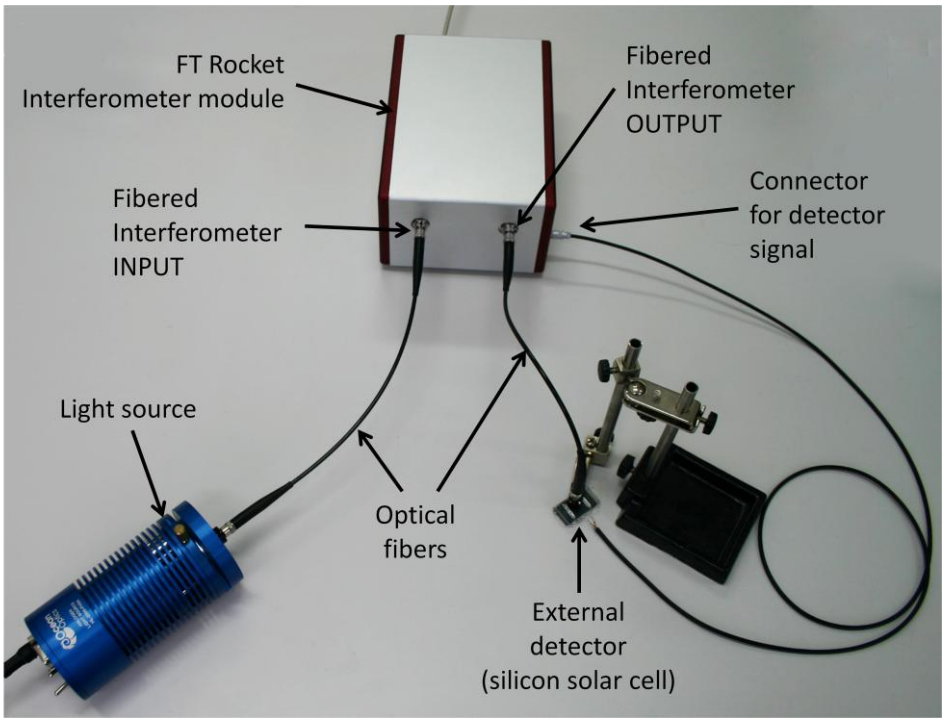


FIGURE 1 - INTERFEROETER MODULE FOR MEASURING SILICON CELL RESPONSE

By illuminating the silicon cell via an optical fiber with the modulated light beam, an interferogram is recorded from which the spectrum is retrieved via Fourier transformation. The resulting spectrum intensity, shown on Figure 2, depends on the responsitivity of the silicon cell, but also on the intrinsic light

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transmission and modulation efficiency of the interferometer optics, and on the spectral intensity of the light source.

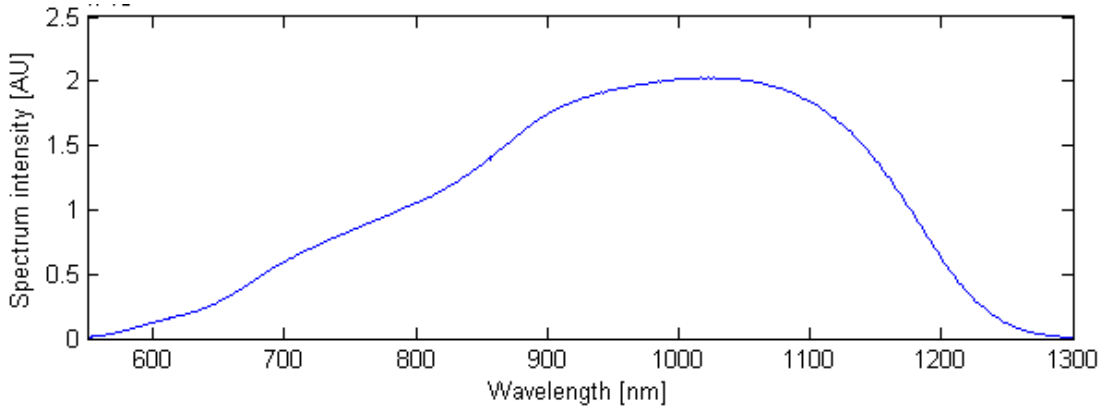


FIGURE 2 - RAW SPECTRUM INTENSITY MEASURED FORM THE DETECTOR

The lower cut-off wavelength (about 550nm) results from the interferometer optics, while the higher cut-off wavelength (close to 1300nm) is due to the bandgap of the silicon cell under test.

By comparing the response of the silicon cell under test to a calibrated (reference) cell, it is possible to calculate and eliminate the spectral contribution of the measurement system. Hence, the quantum efficiency of the cell under test can be calculated. Relative comparisons between different cells are possible, even without a reference cell.

In this example, signal and noise levels allow comfortably measuring the silicon cell response between 600 and 1250nm, as illustrated in Figure 3 showing the system's baseline repeatability.

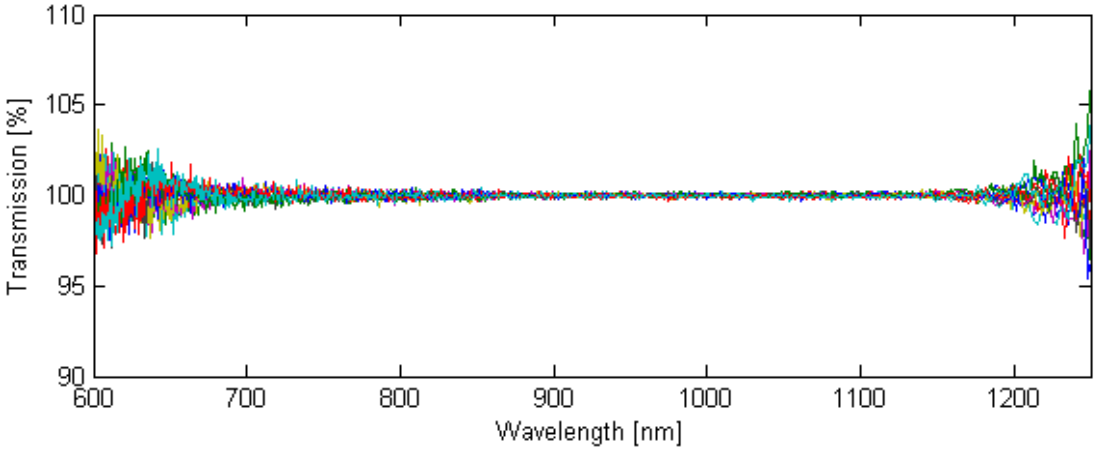


FIGURE 3 - BASELINE REPETABILITY WITH SILICON CELL

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