

Reciprocal Photo Test for Measuring Solar Cooker Performance

The *Reciprocal Photo Test* is a unique new way of measuring the performance of panel and parabolic solar cookers. Until now, there has not been an effective way of measuring the performance of a solar cooker over the full range of sun elevation angles and for a range of rotation angles between the sun and the axis of the cooker. The data needed to plot graphs of cooker performance vs. sun elevation angle and cooker performance vs. the rotation angle between the sun and the cooker axis is obtained from the test. An experimental 25 ft (7.6m) test range was set up and, while the procedure was being perfected, preliminary tests on a [CookKit](#) and a [Sunny Cooker](#) were conducted. The experimental test range was replaced with an improved 50 ft (15.2m) test range and tests were performed on a [Lightoven](#) cooker. Before the conference, tests on the CookKit, Sunny Cooker, Lightoven III and other cookers will be completed using the improved test range.

The *Reciprocal Photo Test* is based upon reciprocity¹. In the normal operation of a panel or parabolic solar cooker, parallel rays from the sun enter the mouth of the cooker and some of them are focused onto the cooking pot. In this new test, the process is reversed. The pot becomes the source of light. Some of the rays from the pot are reflected toward the spot where the sun would be if the cooker was operating normally. A photograph of the cooker is taken with a digital camera that is in front of the cooker where the sun would normally be. To minimize parallax, the camera should be a long distance (preferably 50 ft (15.2m) or more) from the cooker. The room lights are turned off when the photo is taken and the illuminated area in the photograph corresponds to the effective area of the cooker.

More information about the test and preliminary test results are available on the earthboundtech.com website.

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¹ In radio antenna design, a somewhat similar principle is called the reciprocity theorem. The reciprocity theorem states that the performance of an antenna is identical whether the antenna is used for transmitting or receiving.