Speed of Light

Apparatus

microwave oven, tray or plate of marshmallows, ruler

Note – this also works with a layer of cheese on toast.

Action

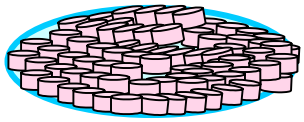
The rotating plate should be removed from the microwave or the rollers beneath the plate, so that the tray can sit still in the microwave. The marshmallows should be placed in a single complete layer on the tray, and placed in the microwave. The microwave is then turned on. The students (**and tutor**) should watch carefully while the microwave runs, and when sections of marshmallow begin to melt. The microwave should be turned off immediately and the marshmallows allowed to cool for a minute. The students them measure from melted patch or line to the next melted patch or line and calculate the wavelength of the standing waves in the microwave from this.

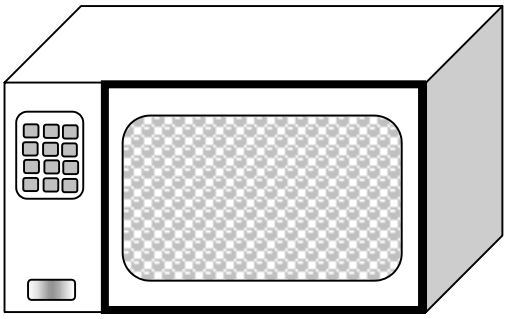
The Physics

The melted patches occur at antinodes in the standing wave pattern inside the microwave. The distance between two antinodes is ½ λ,. The speed of light can then be found using $c = \lambda f$, where the frequency, f, is read off the compliance plate on the back of the microwave. The resulting speed should be within ~ 30% of the accepted value. Not that this is not a particularly accurate method, but does supply post-tute snacks.

Note: some caution needs to be exercised as the melted marshmallows are very hot. This activity is best done with small groups. (Molten marshmallow makes an excellent filling between two plain biscuits.)

single complete layer
of marshmallows





Accompanying sheet

Speed of Light

Arrange the marshmallows carefully on the tray in a single layer.
Put the tray in the microwave.

While watching carefully, turn the microwave on.
Stop the microwave as soon as patches of marshmallow begin to melt or bubble.

Measure the distance between melted patches, and calculate the speed of light.