

QuantumBoost™ Video Demonstration Script

The following videos are a demonstration of the properties of Ultrasolar Technology's QuantumBoost™ Pyroelectric engine. The demonstration is using a prototype glass manufactured 3 years ago. Directly above it is today's glass manufactured to quality control and performance criteria for mass production. The purpose of this video is to show the property of the Pyroelectric material and how its unique properties drive the function of the QB1500S to deliver 20% more power from any solar module. In the glass with the holes in it, the Pyroelectric material appears as a white substrate under coating.

The heart of the QB1500S is the Pyroelectric material housed inside the unit. The material is a crystalline structure sputtered onto a glass substrate. A Pyroelectric material has a unique property as a non-Centro symmetrical crystal such that in the presence of a temperate change, it will generate a charge.

The change in temperature modifies positions of the atoms slightly within the lattice, such that the polarization of the material changes. This charge however is not constant and will fade as the temperature normalizes across the crystal. It is necessary to create a continuously changing temperature to create a continuous potential. The proprietary materials use a standard sputtering technique to apply a thin film of Pyroelectric material in a way that allows it to capture IR (black body radiation that exist everywhere) and generate a standing wave as depicted in the diagram below. The changing amplitude of the wave is interpreted by the Pyroelectric material as continuously changing temperature anywhere on the surface of the material.

The importance of this observation is twofold. When the coating is biased by the solar panel string, the pulse voltage increases to 200V+ and creates a potential "pull" for the "Hot Electrons" present in the solar cell. With a stronger field than the force of the moving "Hot Electron" such that electrons are drawn to QuantumBoost™ and thus extracted from the solar cell before they dissipate as heat; and two, the frequency of the pulses the Pyroelectric material generates is on the order of 2+ terahertz. The amplitude is high enough to propagate through every module on a string with little reduction. That is fast enough to harvest an electron every femto second. The secondary benefit of the very high frequency is it does not represent a continuous bias of the solar cell (or module) and thus does not harm the physical properties of the module.

The first video shows the phenomenon of continuous temperature change. This video is demonstrating the temperature reading of the Pyroelectric material with the temperature probe on one spot but as you can see the temperature is continuously changing. In the case of the temperature probe, the scan rate of the device is only good up to seconds, so the temperature appears to change every second when it fact, it is changing 10,000 times a second.

The second video shows the continuous potential reading across the material on glass. The reading is actually seeing the standing wave, however the sensitivity is only fine enough to see the voltage as a DC reading. The video shown demonstrates this the material generates a continuous potential (voltage) of .7 - .9 Volts which is higher than the voltage created by a single solar cell.

What is demonstrated in these two videos is how 20% additional electrons are being extracted from the solar module. Up to 7 in a string in the case of QB1500S.

- ▶ Pyroelectric effect is used to create electric pulses
- ▶ Electric pulses applied to the solar cell to capture hot electrons
- ▶ This improves the PV output by 20%

