



ThermoPhotoVoltaics - TPV at JX Crystals Inc

Dr. Lewis Fraas

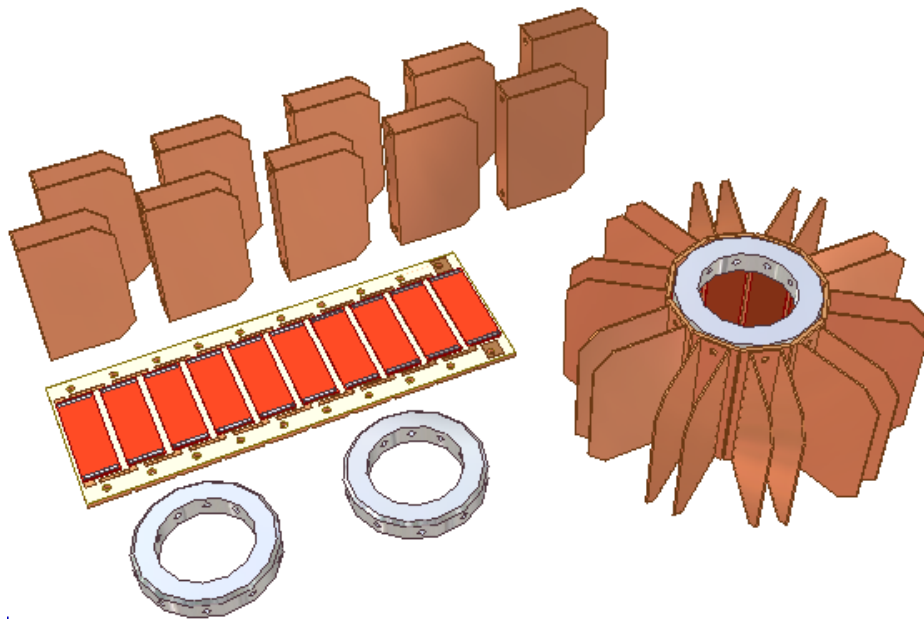
October 2011



Primary Achievements

- IR sensitive III-V cells
- Pilot production of GaSb IR cells
- Spectral Control
- Midnight Sun™ TPV Stove

JX Crystals TPV Demonstrator

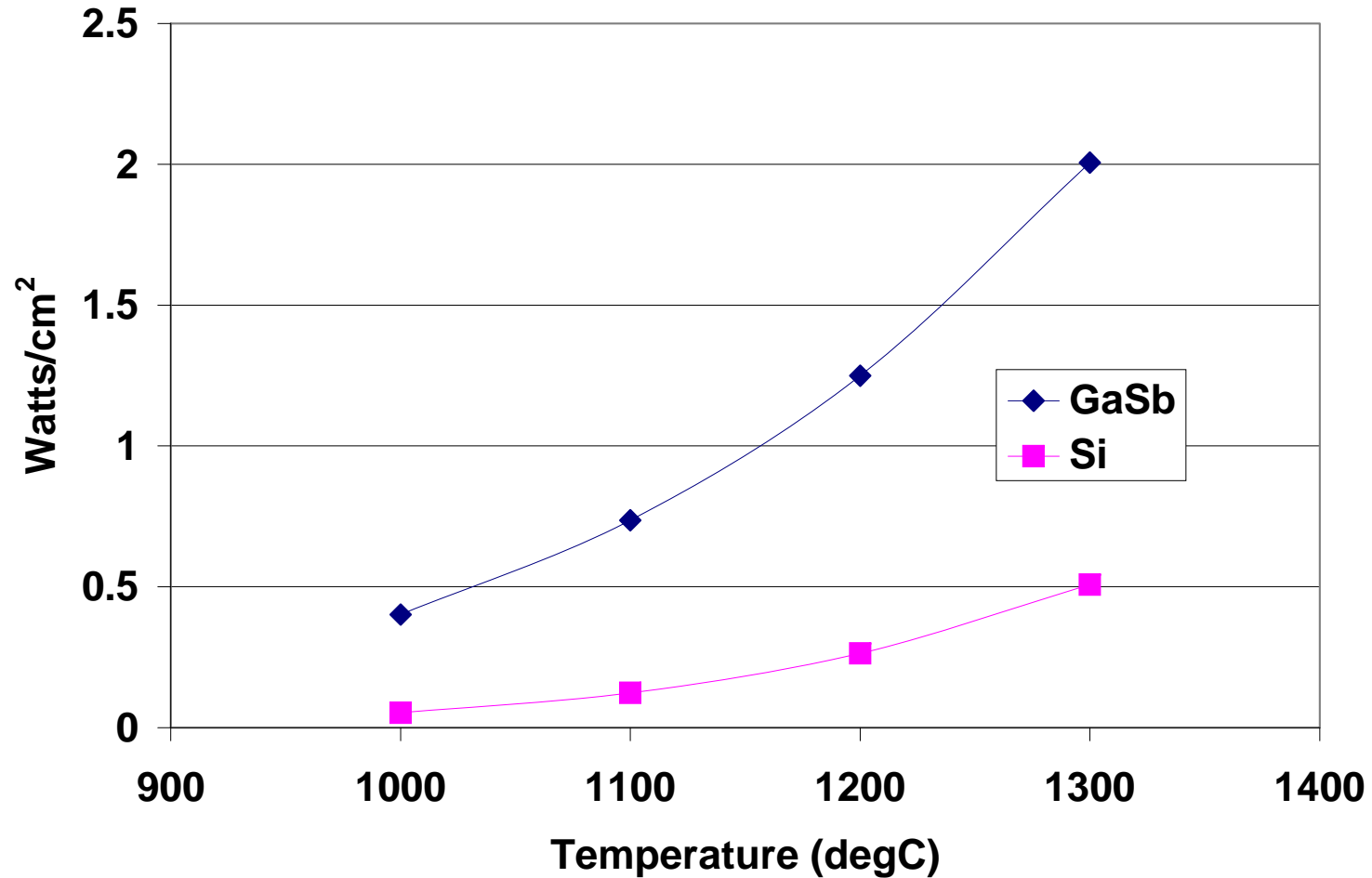


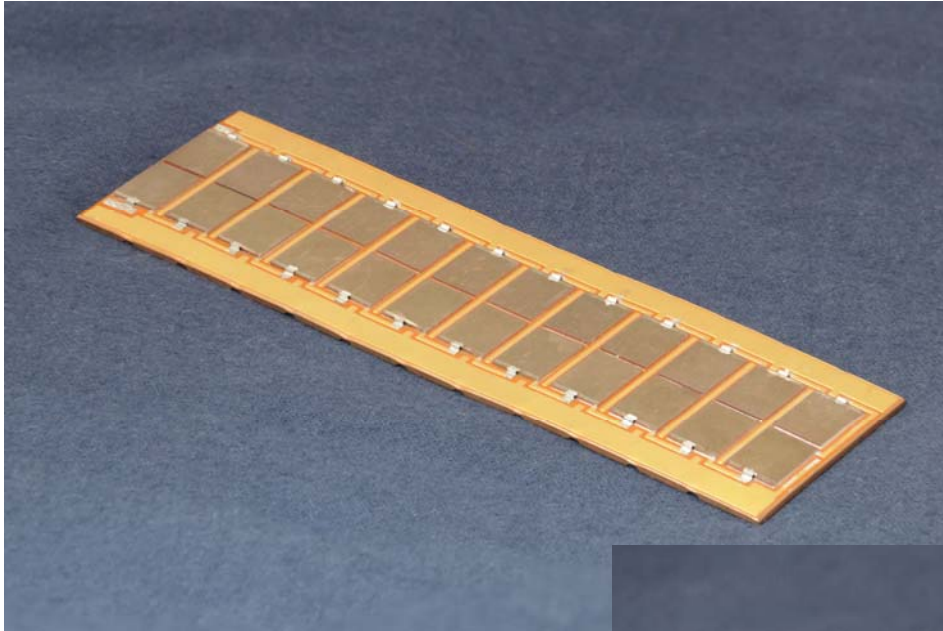
**TPV Circuit rolls up into cylinder
with fins added for cooling**



**Oil Lamp with TPV
cylinder operates radio**

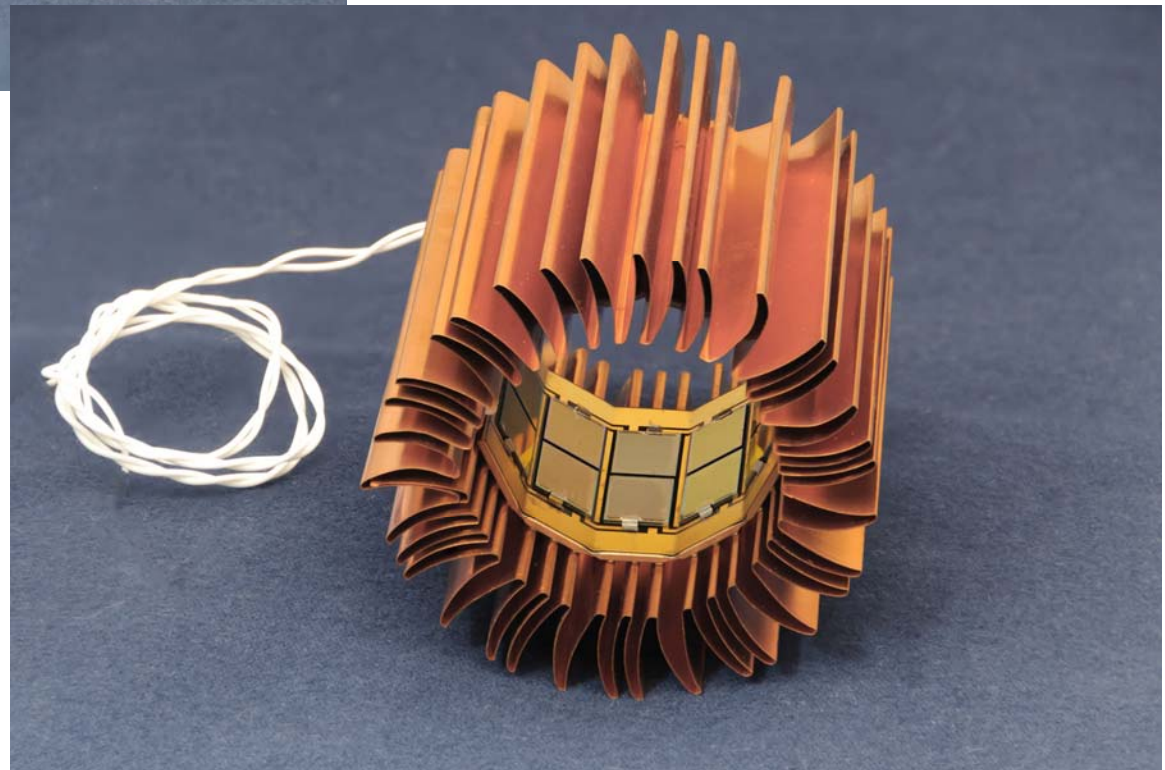
New GaSb IR Cell Developed by JX Crystals Enabling for Low Cost High Power TPV



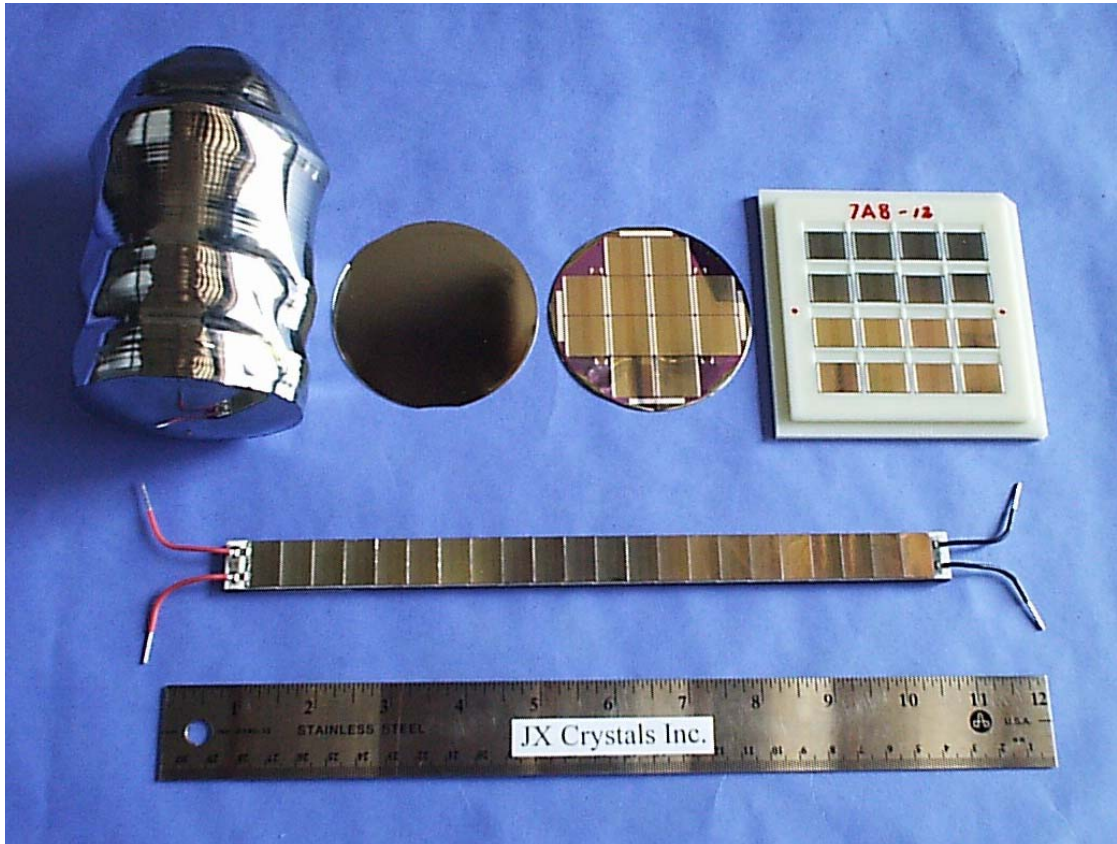


20 W GaSb TPV Circuit & Cylinder

Cells and Circuits fabricated at
JX Crystals Inc

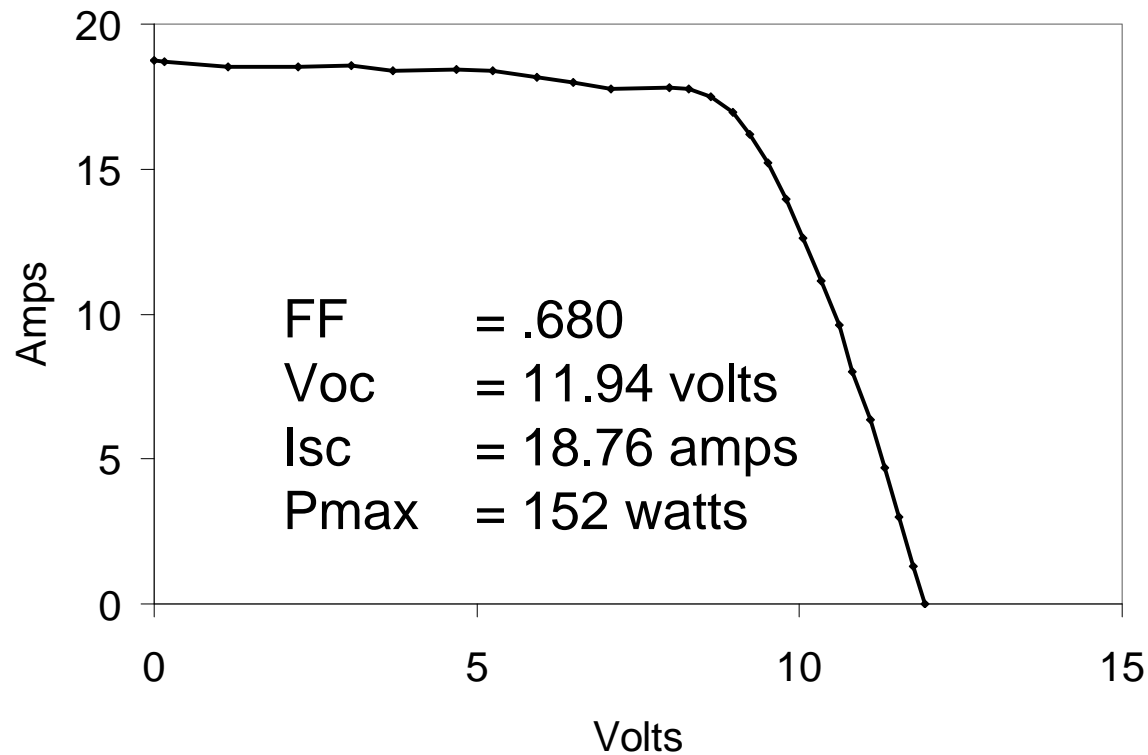


Integrated IR Cell & Circuit Production at JXC



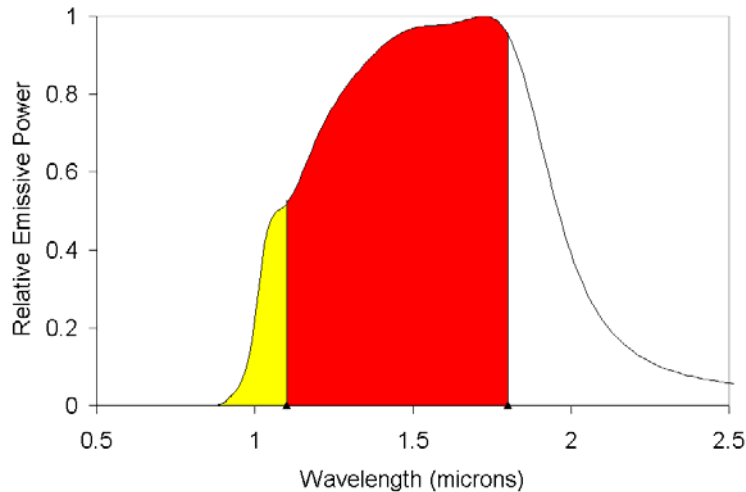
GaSb IR Crystals, wafers, cells and circuits made at JXC

JXC 72 Cell Circuit and Current vs. Voltage Analysis



72 GaSb cells
shingle-mounted
on a circuit
measuring
5 cm * 26 cm

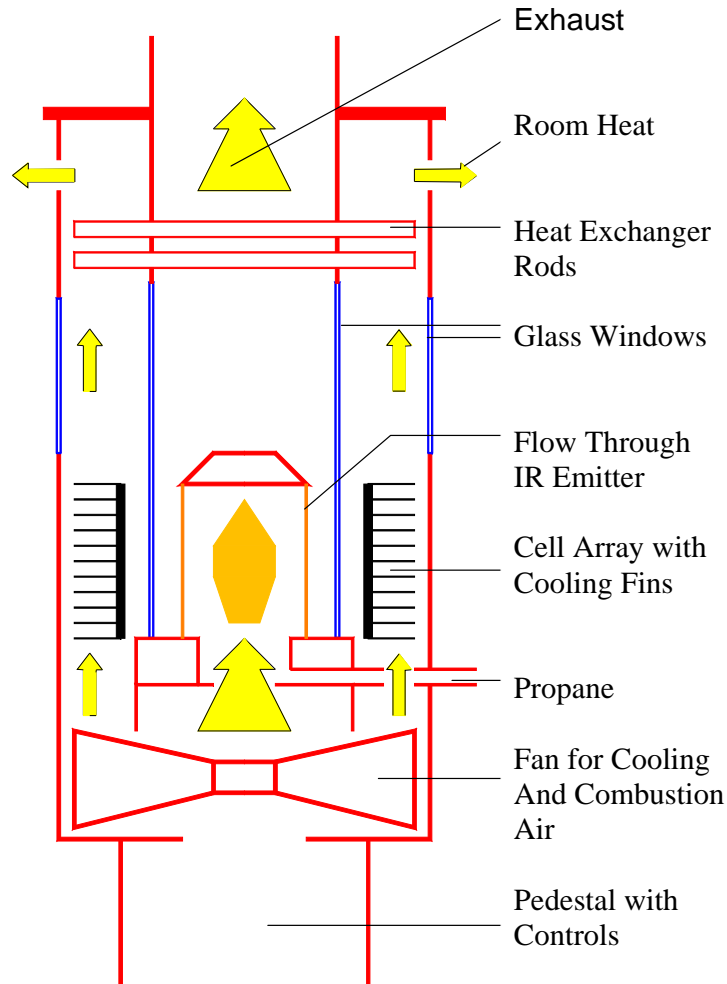
New Infrared Cell Is Enabling for TPV Combined Heat and Electric Power for the Home



With spectra from man-made heat source, new IR cell responds in red region whereas standard silicon solar cell responds only in yellow region.



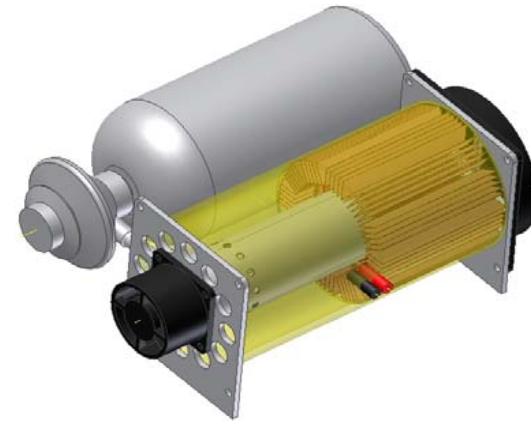
JX Crystals Midnight Sun™ TPV Stove



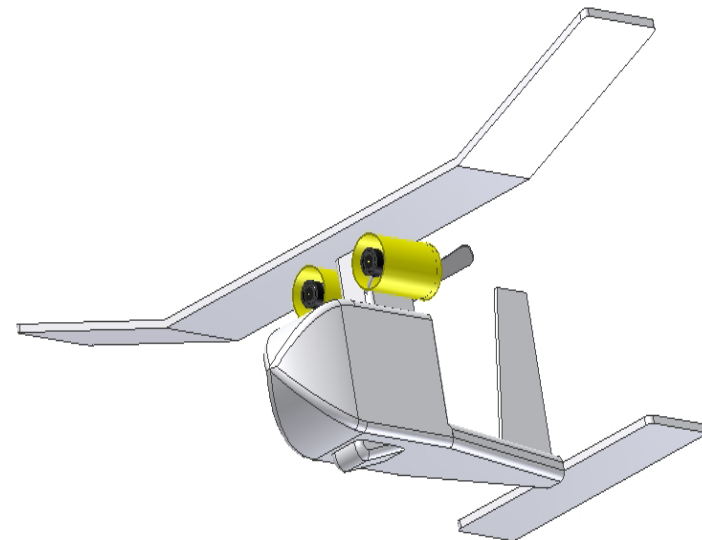
TPV Military Applications



- **Small portable lightweight 20 W TPV battery replacement with adjacent fuel cylinder.**



- **Raven UAV with two 50 W lightweight quiet TPV power cylinders for electric power for extended flight duration.**



Overall Conclusions



JXC fabricates GaSb IR Cells that are enabling for TPV.

TPV technology converts hydrocarbon fuels into electricity.

TPV has advantages over conventional generators in being quieter and lower weight.

TPV could dramatically reduce reliance on primary batteries, providing a quiet and efficient option for recharging portable electronic devices in the field.

TPV can be used in home and industrial furnaces for combined heat and electric power.