Phase change coolers (like those used in refrigerators) are very efficient but they have noisy compressors and high thermal resistance. No moving parts and durability are advantages of thermoelectric coolers, which are solid state heat pumps with low thermal resistance when inactive.

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**Abstract**

There are no Intel processors that run at 5GHz stock. Breaking the 5GHz barrier is equivalent to joining the 150 MPH club out on the salt flats.

Thermoelectric coolers are used because they are solid state heat pumps that have low thermal resistance when they are inactive.

**Conclusions**

15% efficiency and 5GHz overclock was our goal. We surpassed both goals.

**Results**

Achieved 5.4GHz stable overclock. 5.5GHz was possible but unstable. Coolant freeze at -3C. 40% efficiency achieved.

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**Alternatives**

- Phase change coolers (like those used in refrigerators) are very efficient but they have noisy compressors and high thermal resistance.

**Advantages**

- No moving parts
- Durability
- Less noise
- Low thermal resistance

**Testing**

- Monitored power usage
- Intel 8700k used for overclocking
- CPU & coolant temperatures monitored

**Thermoelectric Cooled (TEC) Central Processing Unit**

- Many TECs are used in parallel at lower voltages to increase efficiency.
- Large radiators are needed to dissipate all the excess heat.
- "Deliding" the processor is achieved by removing the Integrated Heat Spreader (IHS) and replacing the thermal interface material (TIM).

- Power to the TECs is controlled in part by solid state relays.
- The controller is based on the AMC6821 chip manufactured by TI.