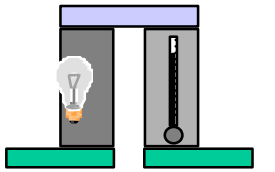
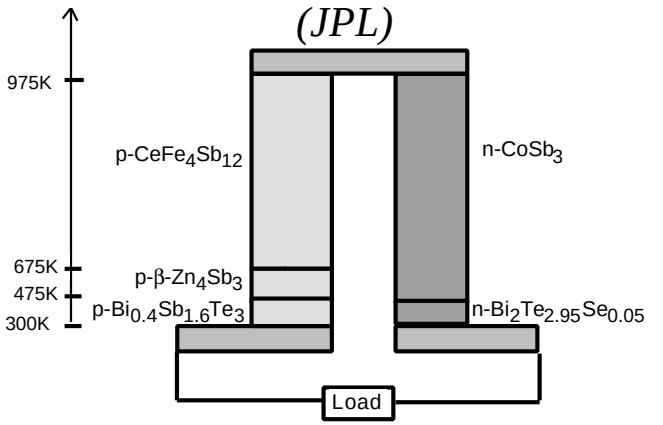
New Device Concepts

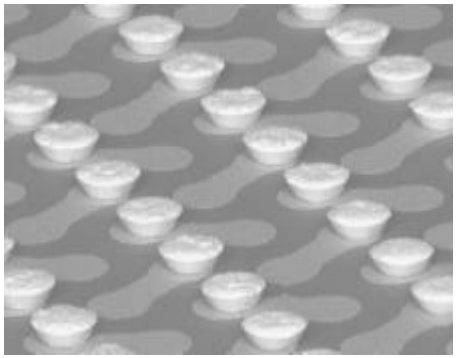


- segmented unicouple
  for large delta T power generation
- ***micro-devices, high power density (cooling and power generation)***
- ***MEMS TE cooler***

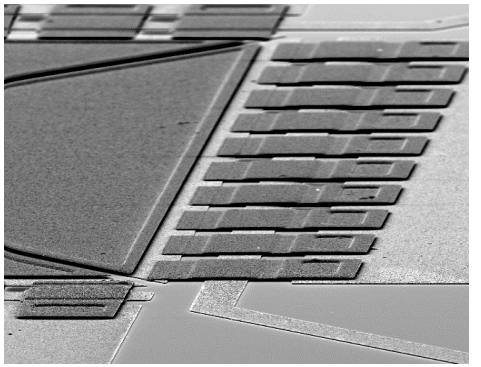
Projected 15% conversion efficiency (JPL)



Several 100 W/cm^2 cooling power (JPL)



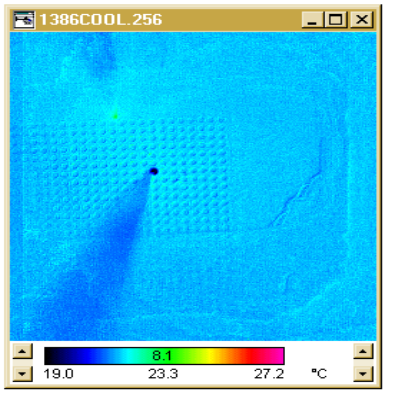
MEMS thermal switches for fast cooling (Teravicta, formerly MCC)



Program Highlights

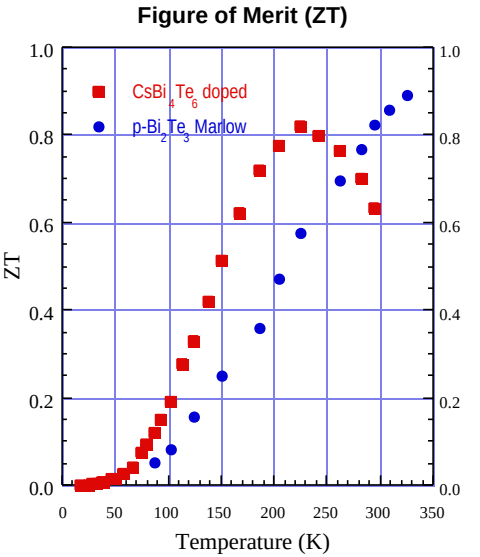
Record high ZT values:

- Bi_2Te_3/Sb_2Te_3 superlattice
  - first demonstration of cooling in a thin film
  - fast response (<10 µs)
  - high power density (> 500 W/cm^2)
  - extrinsic ZT (including losses) = 2.4
  - intrinsic ZT believed to be as high as 4.0!!



(RPI)

- $CsBi_4Te_6$
  - a new, low temperature TE material
  - ZT ~ 0.8 at 225K (40% improvement over state-of-the-art)
  - potential for use with HTS circuitry at 80 K
  - both n and p-doped
  - projected ZT values as high as 1.5 with further optimization



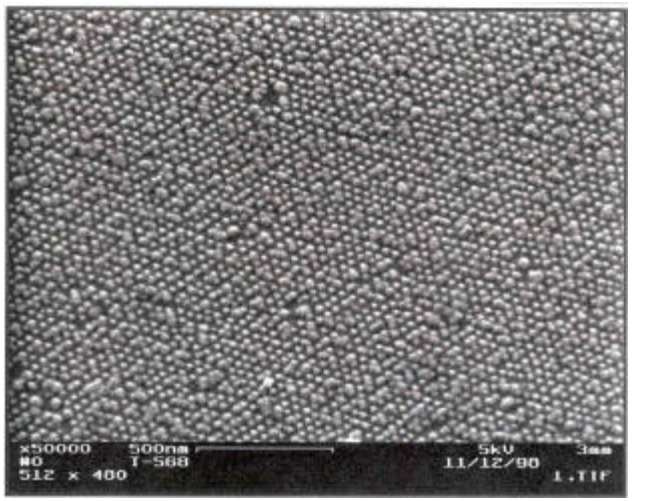
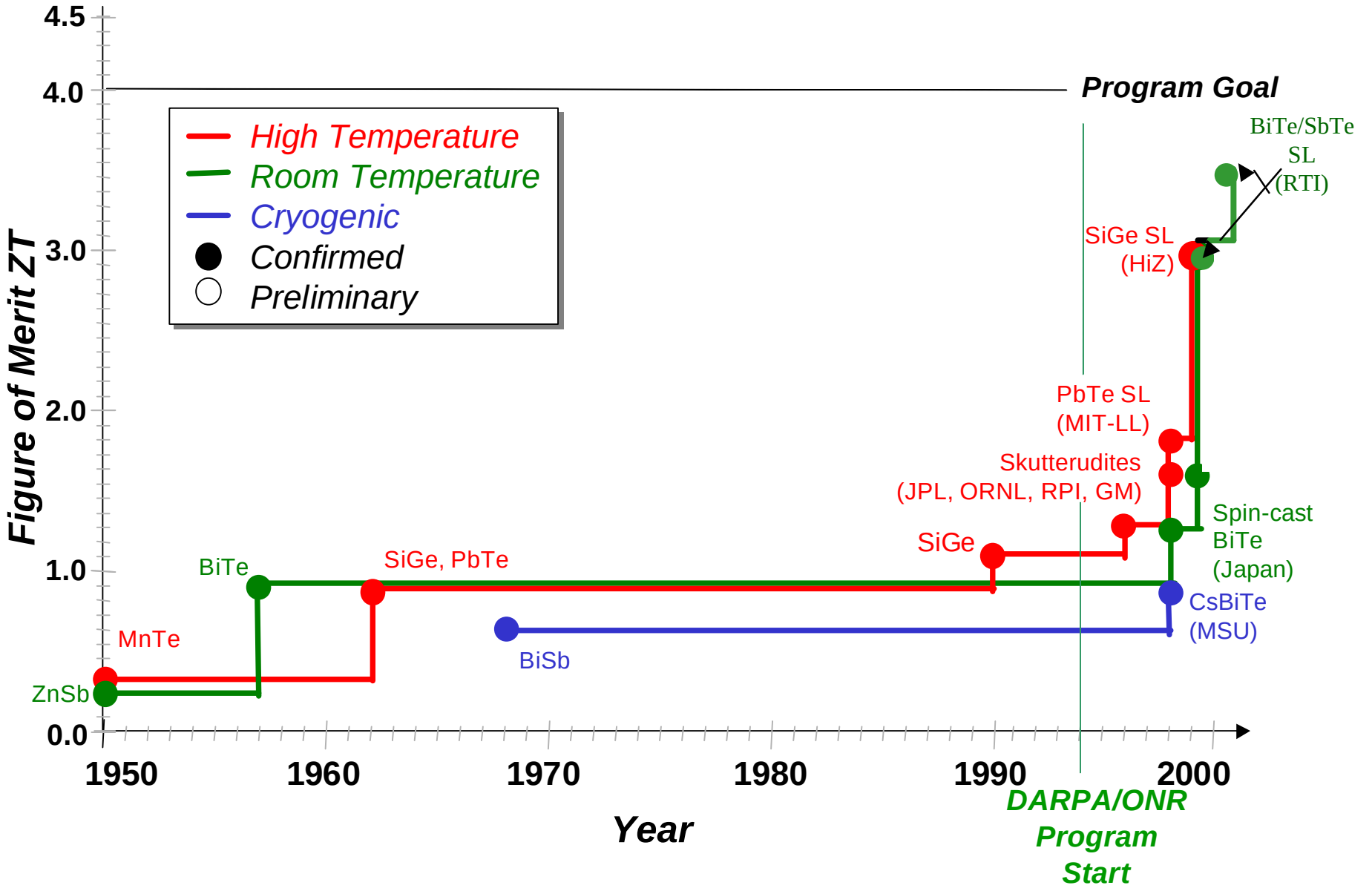
(Michigan State)

Program Highlights (cont'd)

Record high ZT values (cont'd):

PbTe/PbSeTe quantum dot superlattice

- first demonstration of cooling using quantum dots
- ZT = 2 at 550 K
- 43 K cooling demonstrated at room temperature



History of the Thermoelectric Figure of Merit ZT