

**Existing technology** requires the geothermal well to be cooled. Cooling a geothermal well is every expensive and significantly ages the well's steel casing bond to the formation by temperature cycling. In short, geothermal well owners rarely image inside their wells. Existing technology uses a fish-eye lens to image the well wall; we use a 45 degree cone mirror for higher resolution.

## Project Objectives

- No well cooling required
  - Greatly reduces cost
  - Inspection of active production wells
- Uses conventional 600F cable
  - Greatly reduces deployment cost
- Cable up to 12,000 ft long
  - Existing technology limited to ~4Kft
- Imaging either the well wall or straight downhole

## Technical Challenges

- No camera sensor rated over 125C
- Conventional cooling systems only reduce temperatures 25-50C
- Imaging rock fractures requires HD images
- Most logging tools fail to work on 12K<ft of 600F logging cable

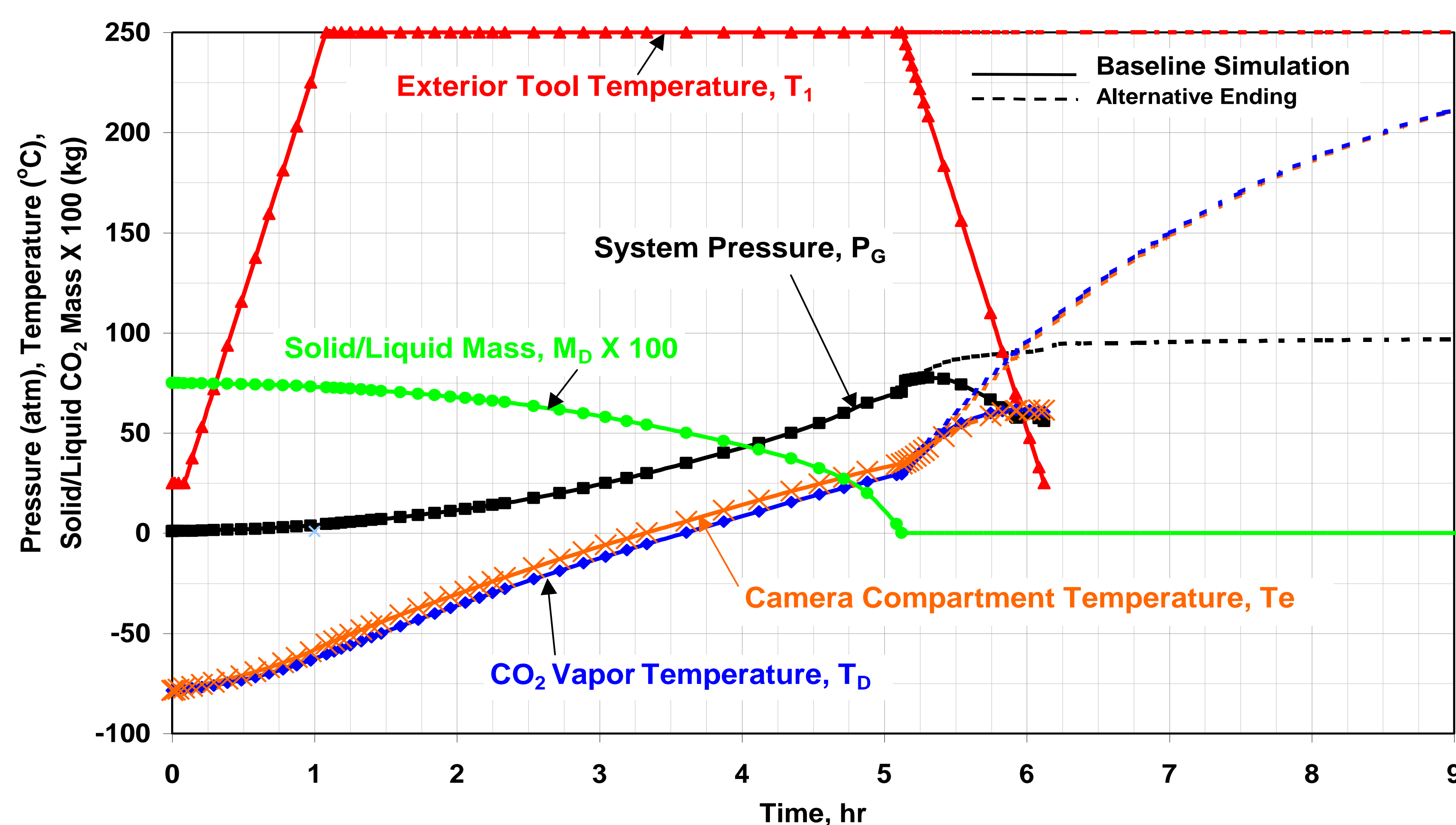
**Solution** – Camera sensors and flash memory are very small, so cool them with CO<sub>2</sub>. Use flash memory to store HD images and transmit lower resolution. Operate the remaining tool at geothermal temperatures using HT SOI electronics.

## Developed a revolutionary **Cooling** system for Geothermal Tools



The Beagle Bone Geo, a 32bit, 1GHz Geothermal Data Collection System developed for this project.

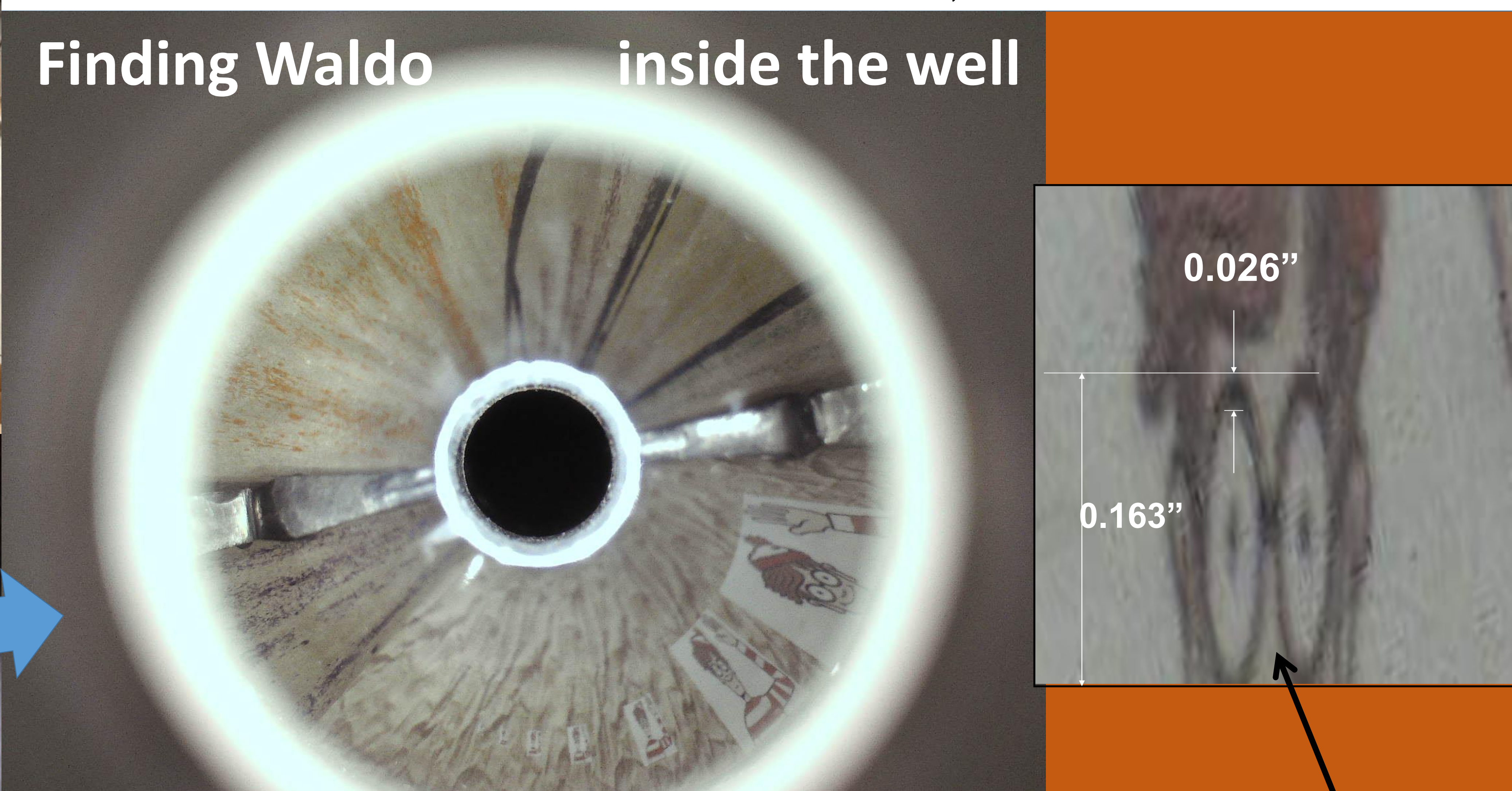
Thermal modeling predicts we can keep the camera cool!



Forward-Imaging Mode



Finding Waldo inside the well



Side Wall Imaging Mode

