Development of a TSC-Setup for the Characterization of Electron and Hole Traps in Irradiated Silicon Sensors

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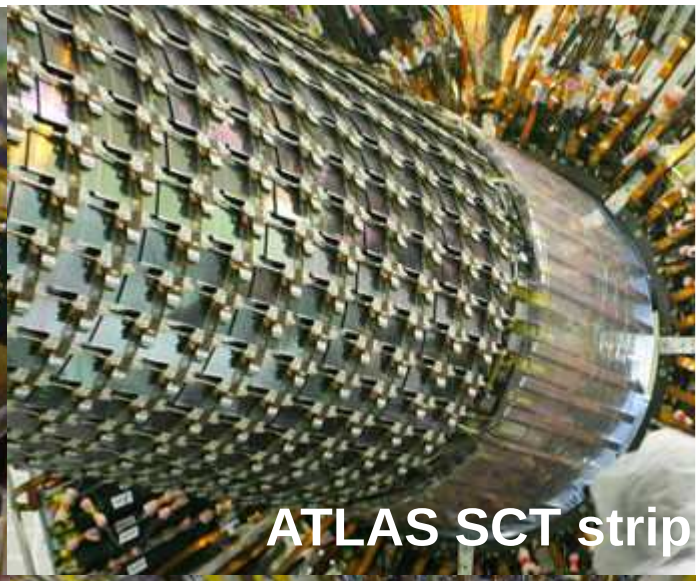
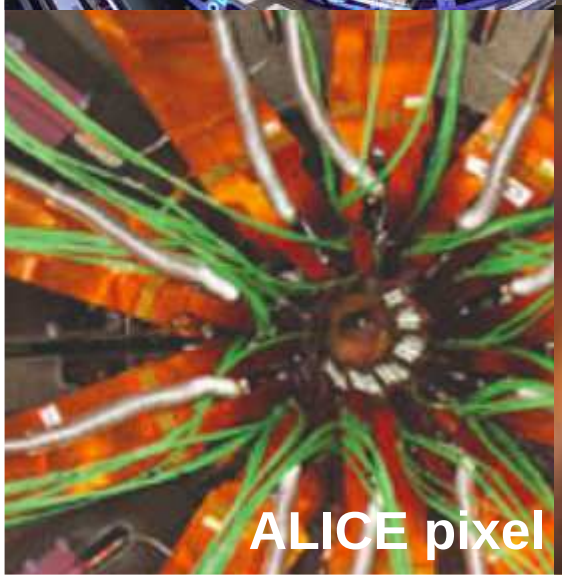
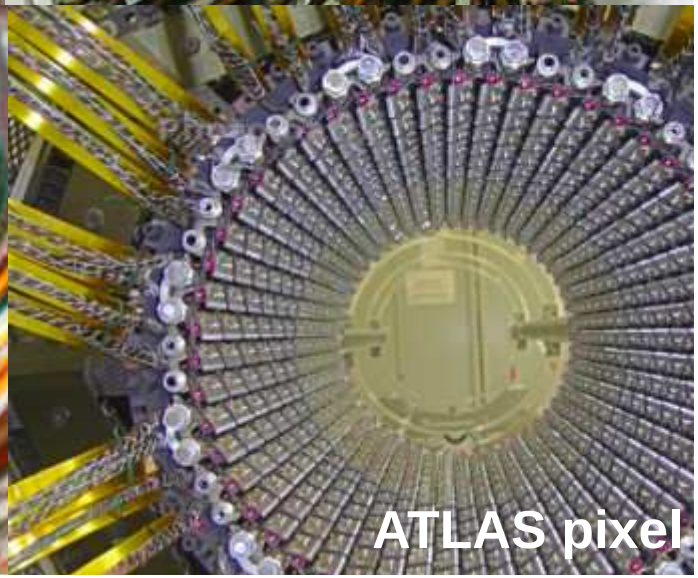
PH-DT-DD

Supervisor: Christian Gallrapp

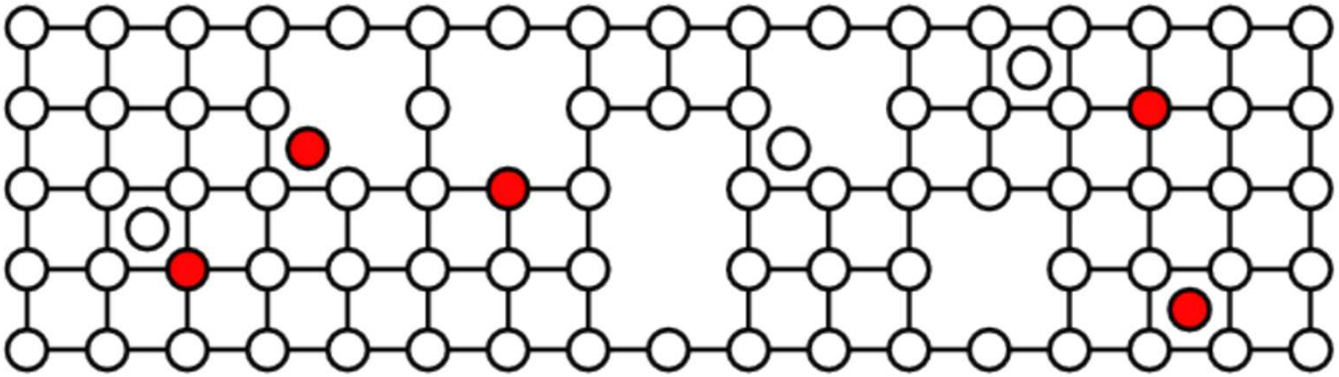
LHC Silicon Detectors

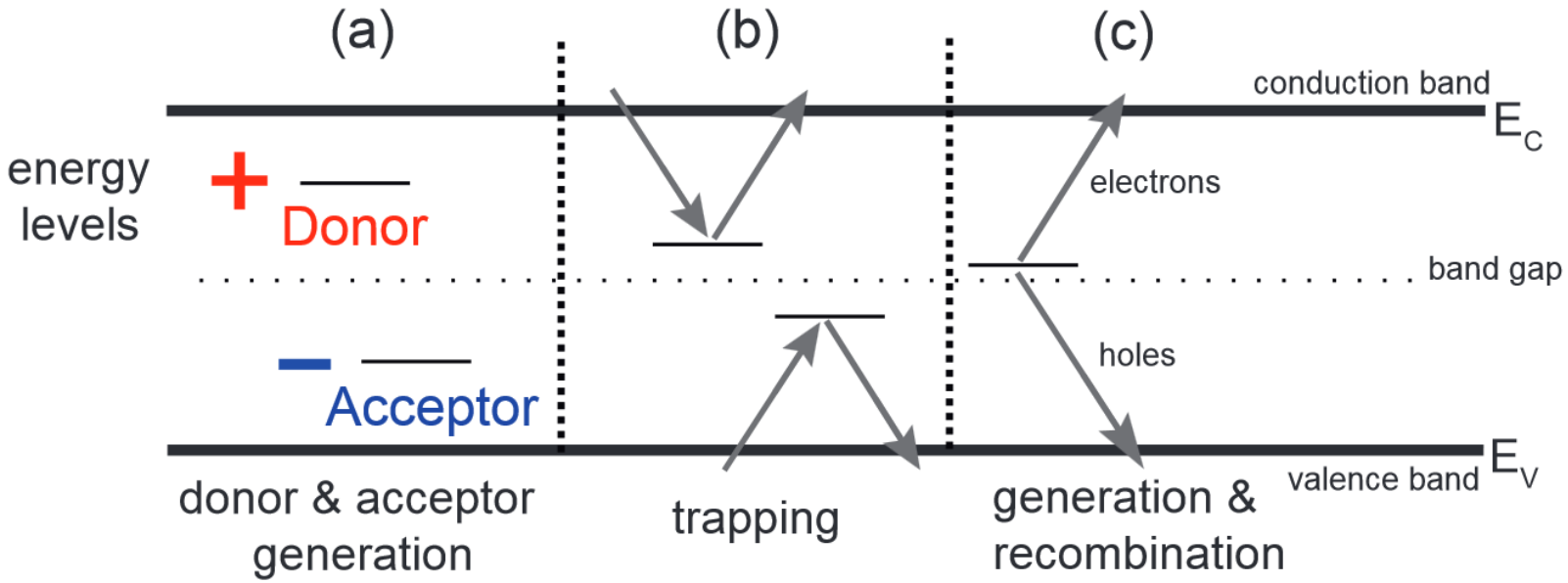






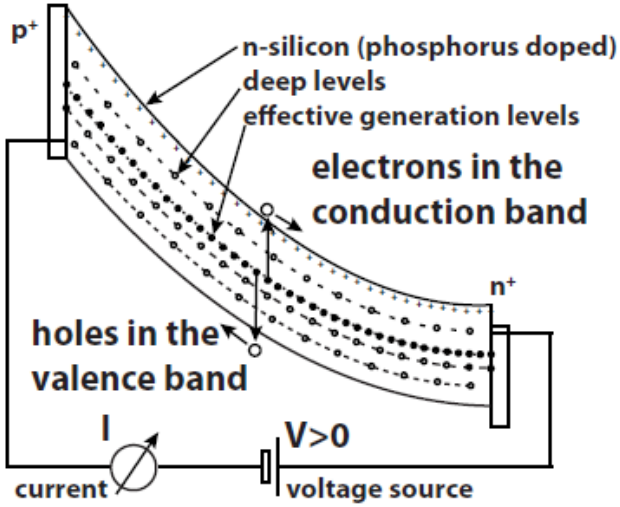
Defects




(a)
(b)
(c)
conduction band
E_C
energy levels
Donor
electrons
band gap
Acceptor
holes
E_V
valence band
donor & acceptor generation
trapping
generation & recombination

TSC – Measurements

1.



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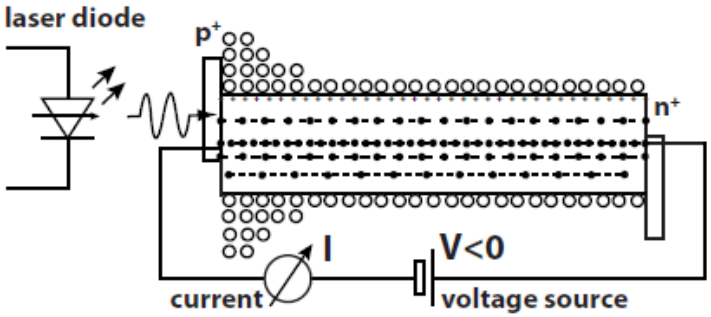

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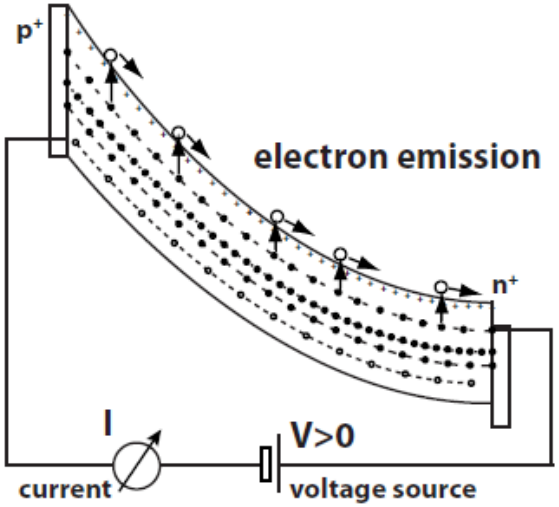
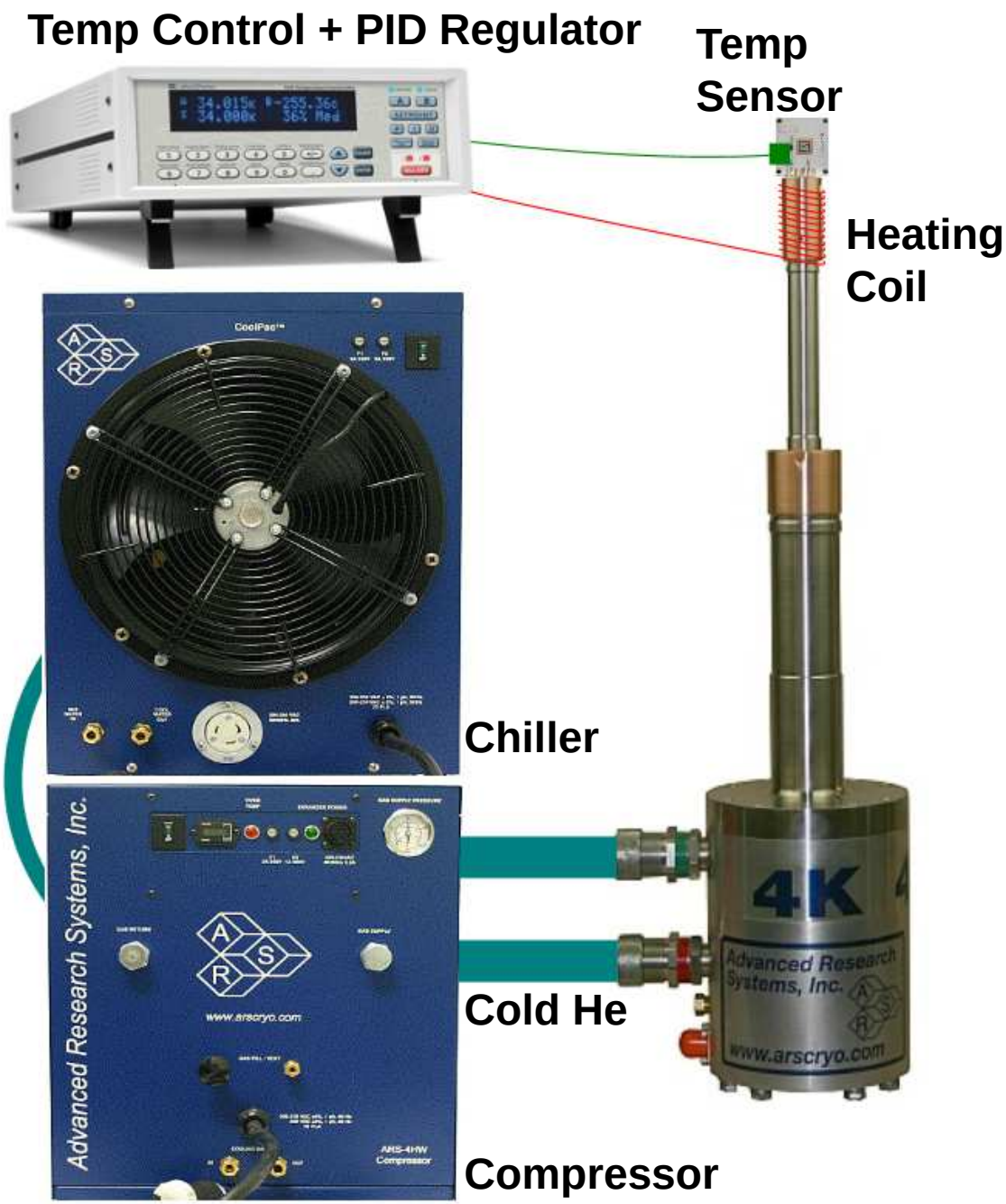
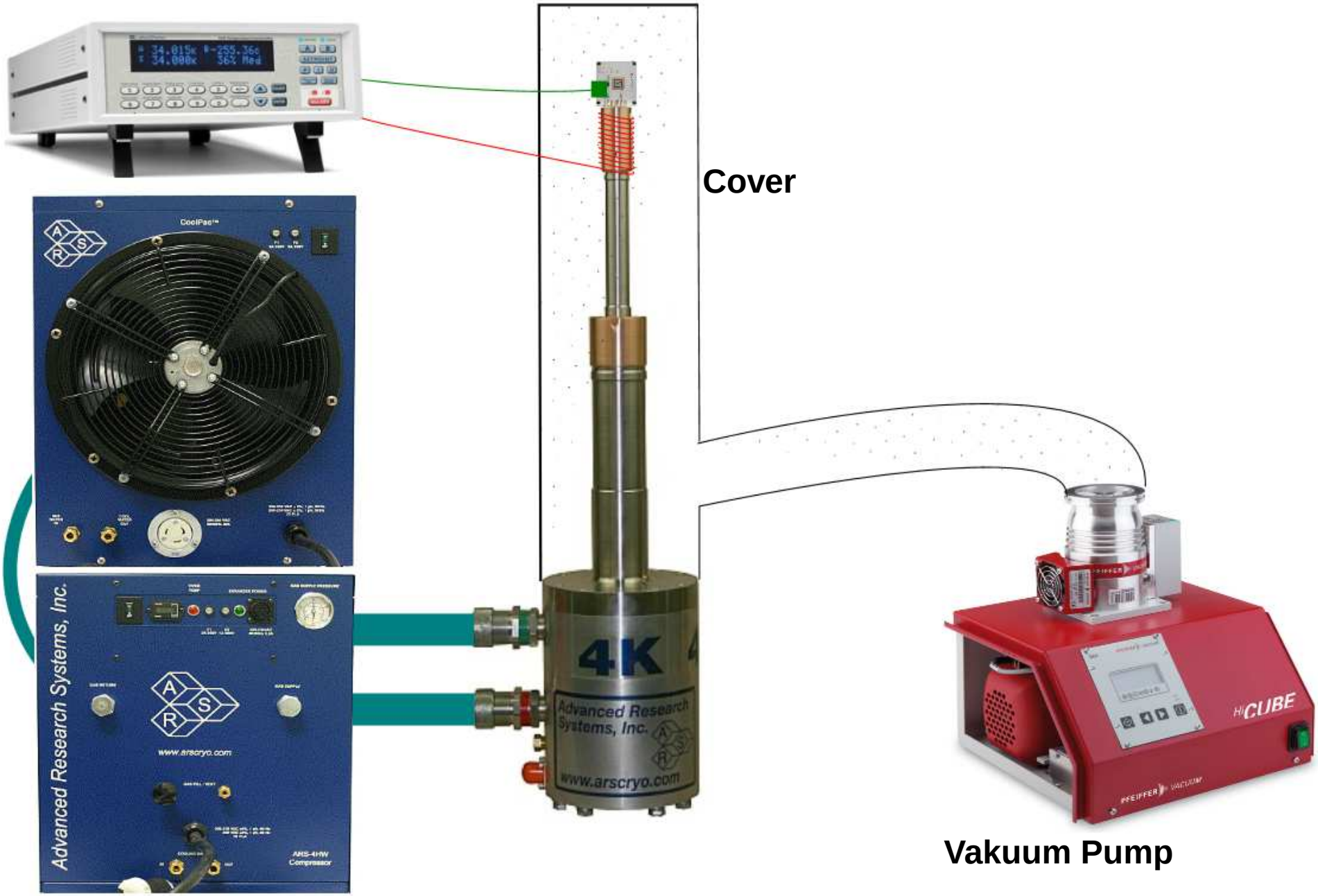
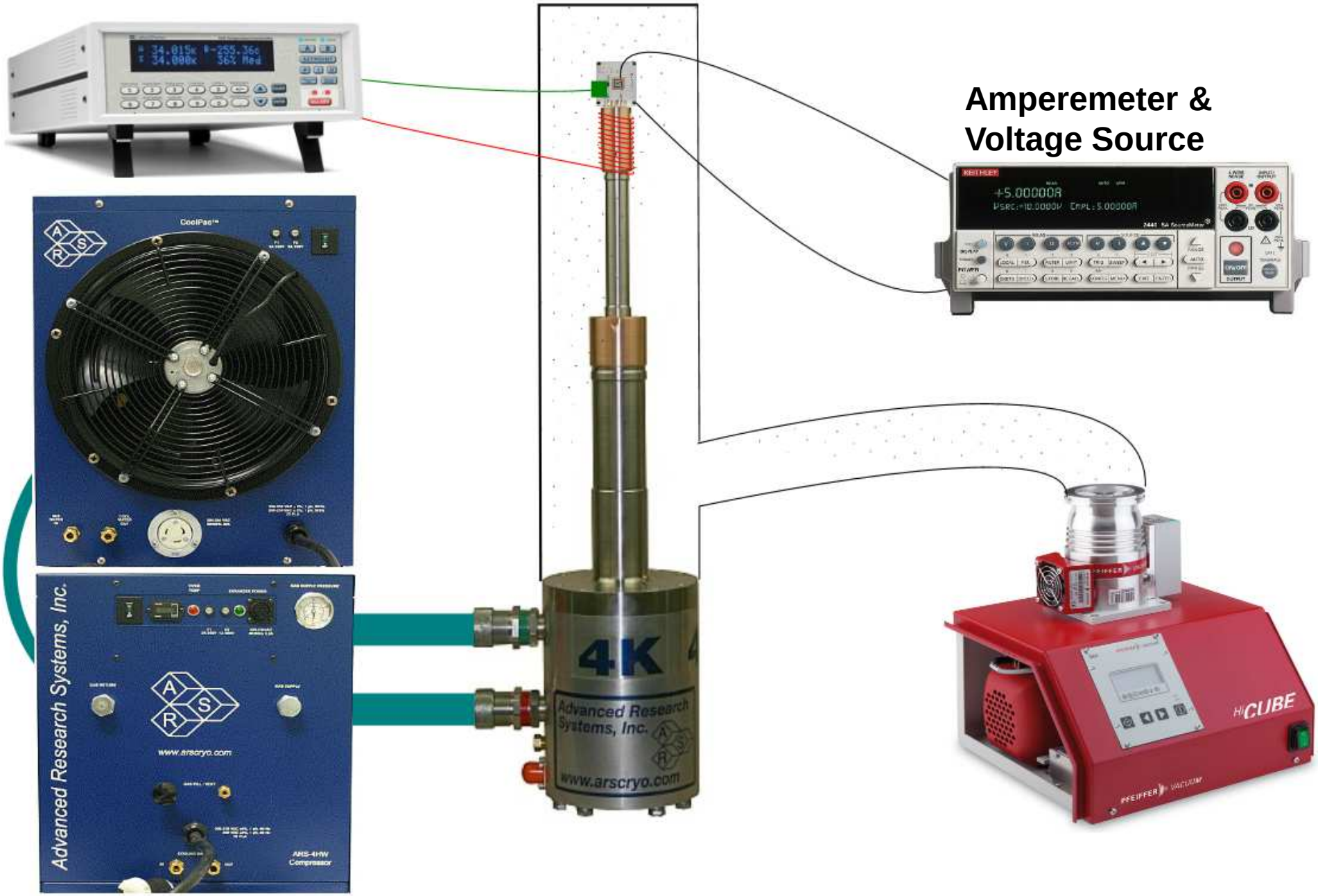


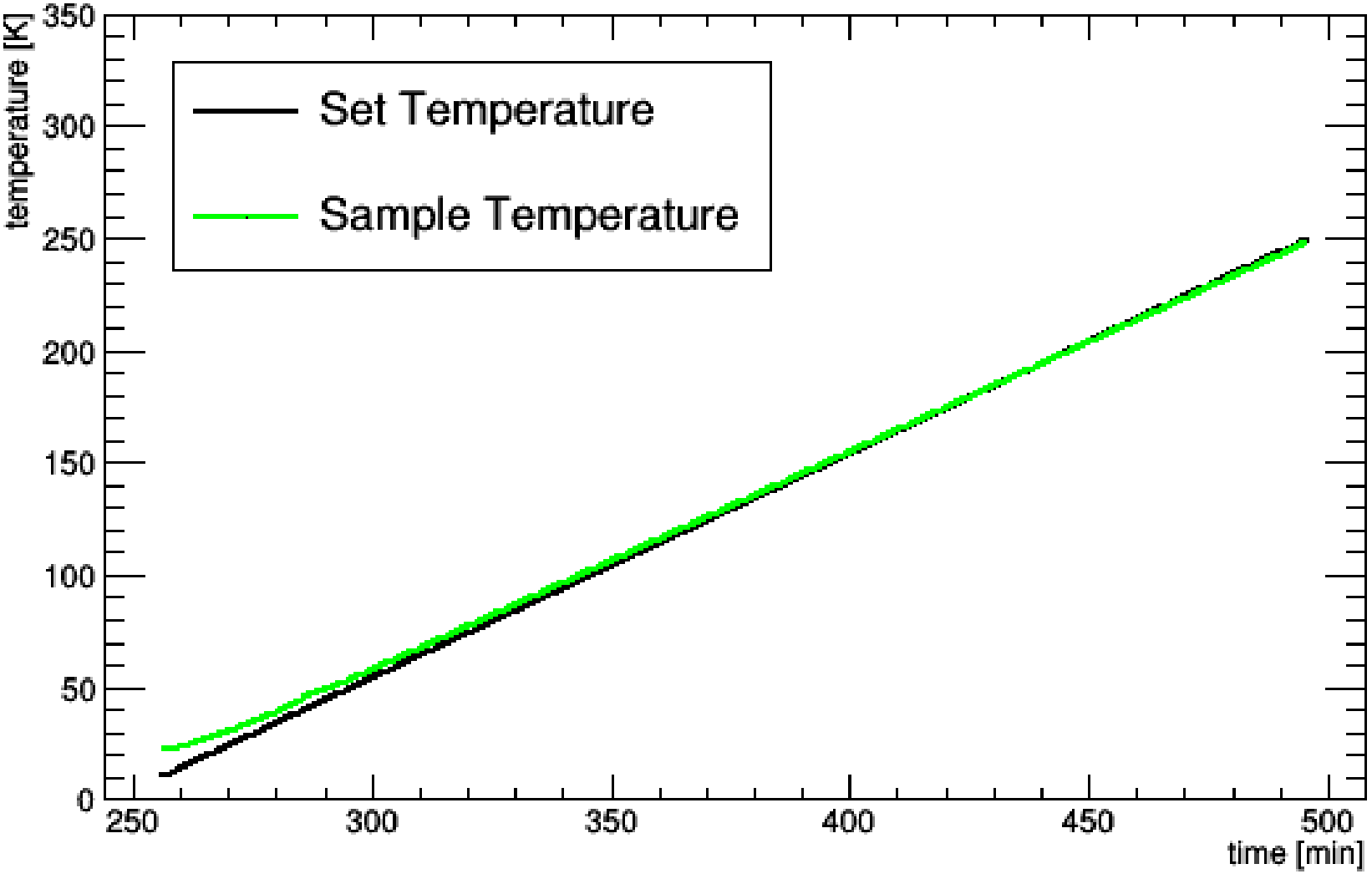

Sample
Cryo Cooler
4K
Advanced Research Systems, Inc.
www.arscryo.com


Temp Control + PID Regulator
Temp Sensor
Heating Coil
Chiller
Cold He
Compressor
Advanced Research Systems, Inc.
www.arscryo.com
4K

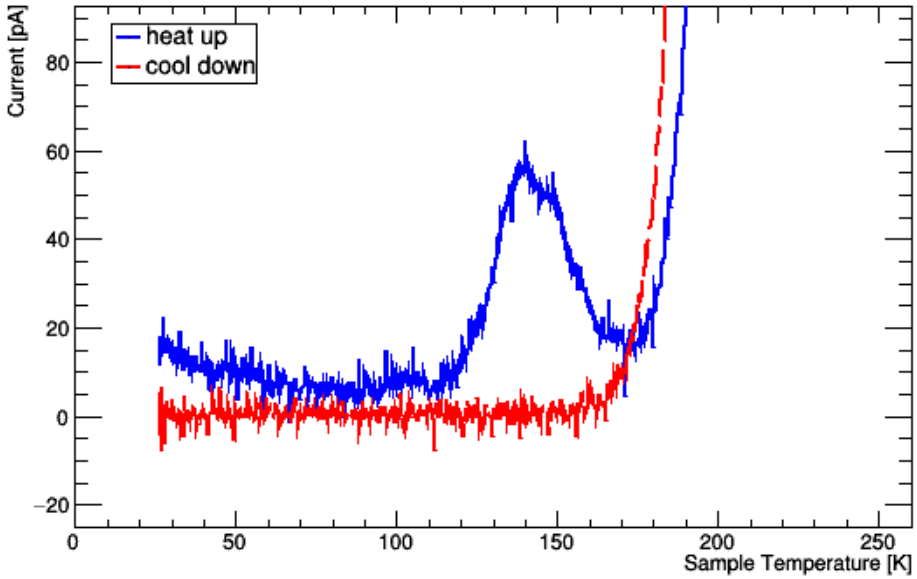

Cover
Vakuum Pump
Advanced Research Systems, Inc.
www.arscryo.com
4K
HiCUBE

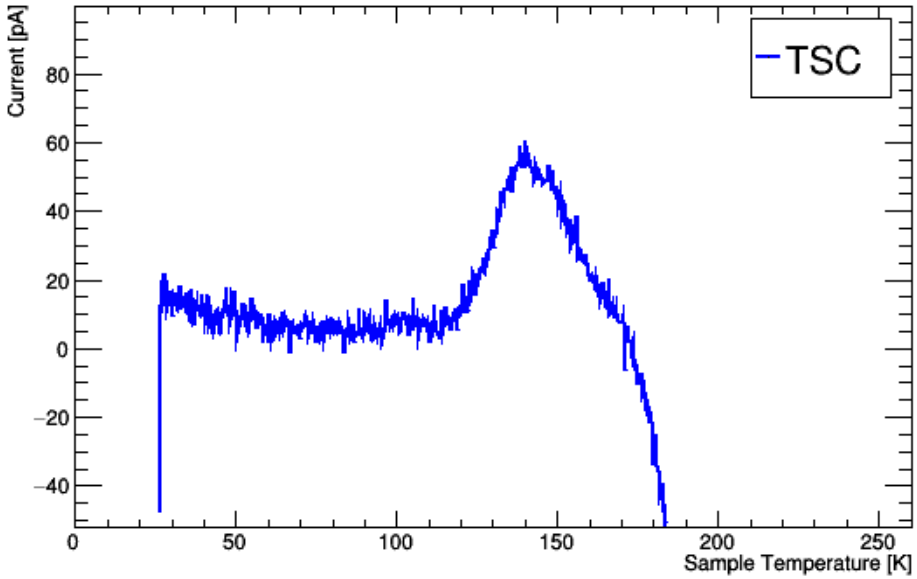

Amperemeter &
Voltage Source
4K
Advanced Research Systems, Inc.
www.arscryo.com
HiCUBE

Linear Temperature Rise



Very first Results

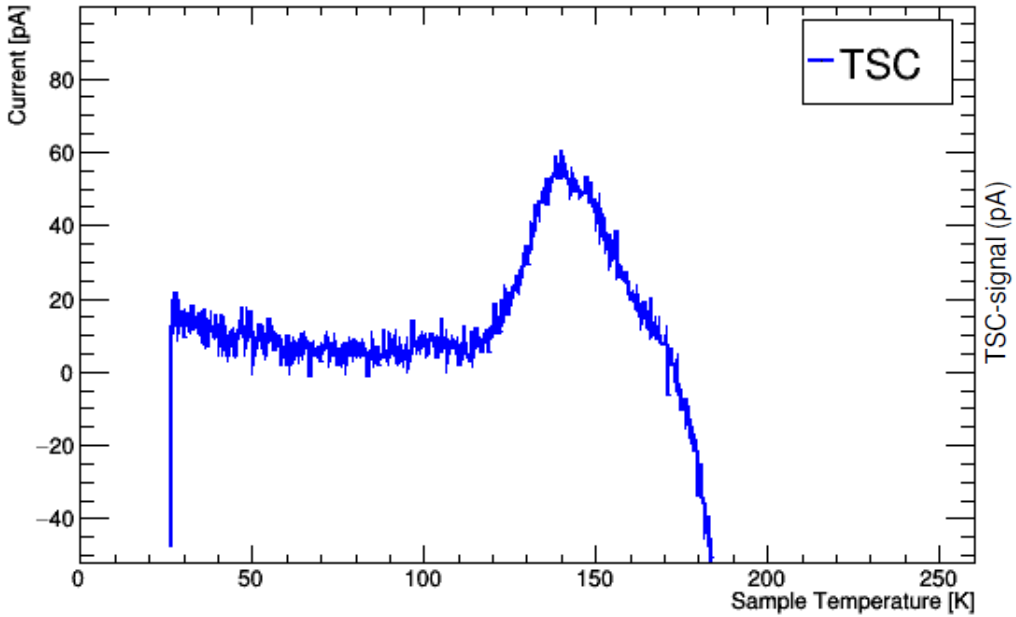




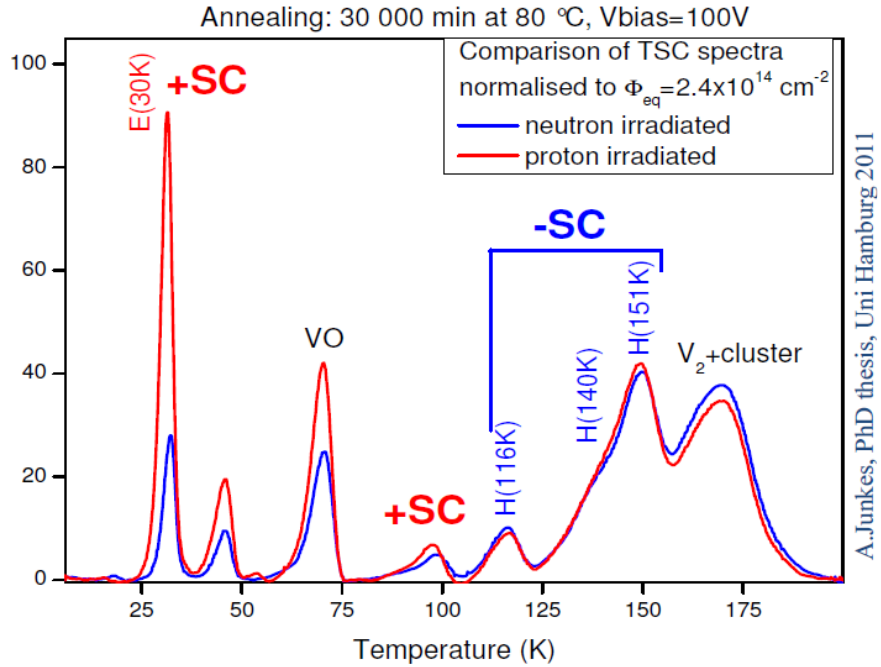
Sample: W331-P10; p-irrad; fluence 1E14 p/cm²;
Cryo Cooler off, heating rate: 5K/min, -100V, filled with 0.3mA for 300s

Outlook

Where we are



Where we want to go

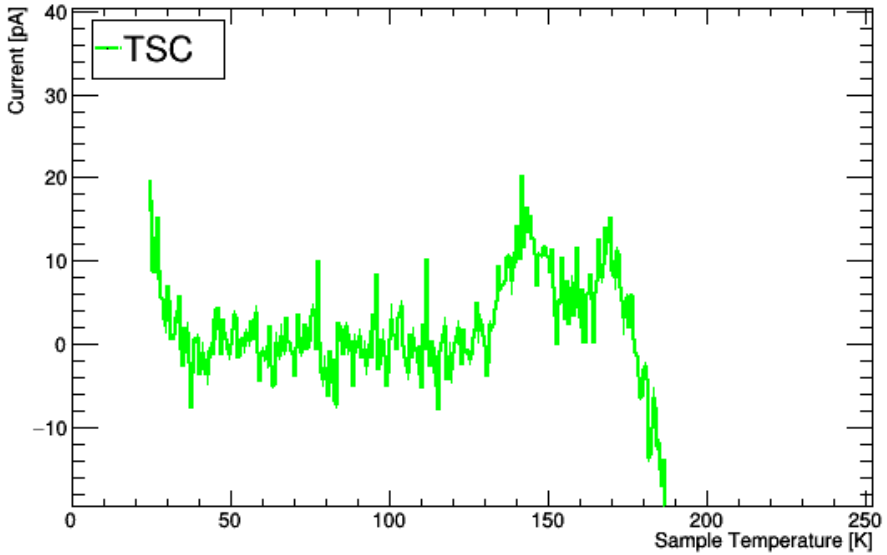


Outlook

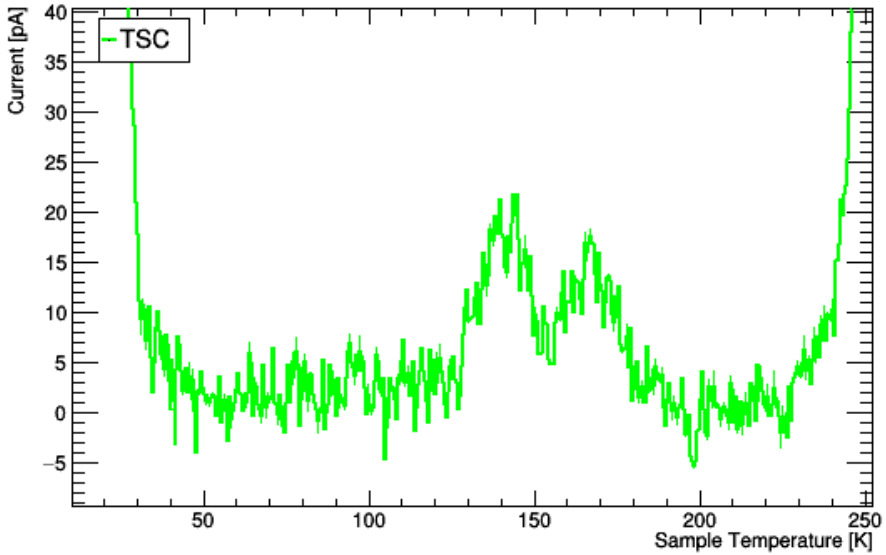
- Near Future:
  - New Sample Holder
  - Better Cables
  - Smoothing Algorithm
- Later:
  - Introducing Laser for optical Filling
- Far away Future:
  - TCT-Meassurements at low Temperatures

Vibrations of Cryo Cooler?

Cryo Cooler on



Cryo Cooler off



Sample: W331-P7; p-irrad; fluence: 1E13 p/cm²:
heating rate: 10K/min, -100V, filled with 2.5mA for 60s