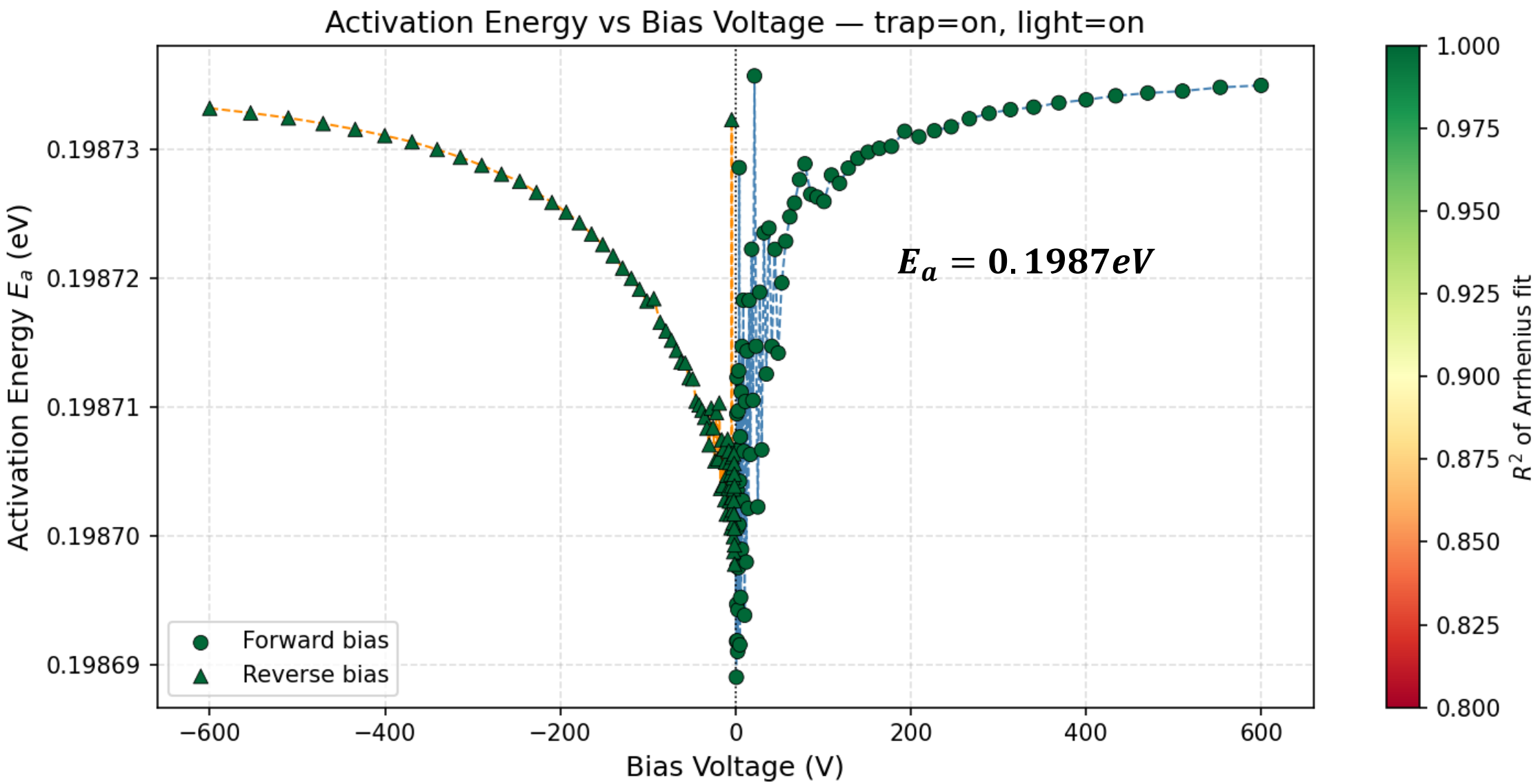
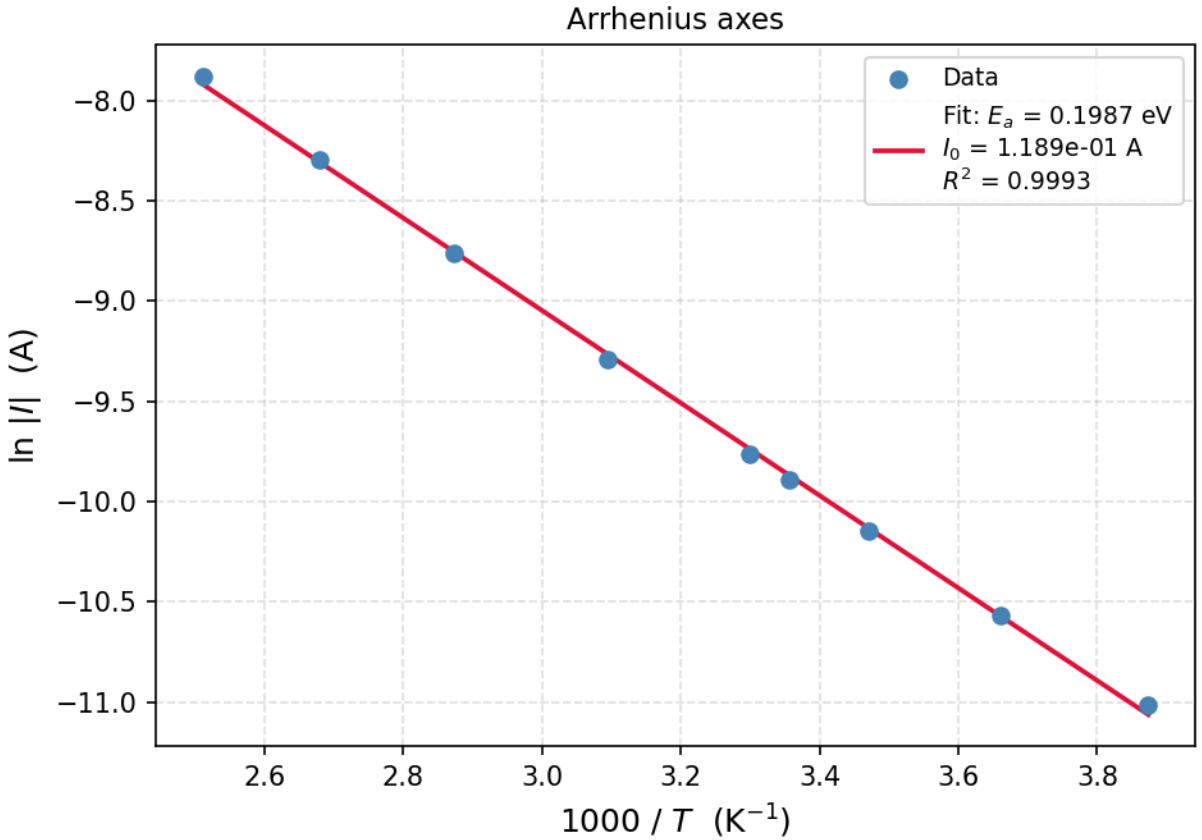
HEP InP Thin Films Update September 15, 2026

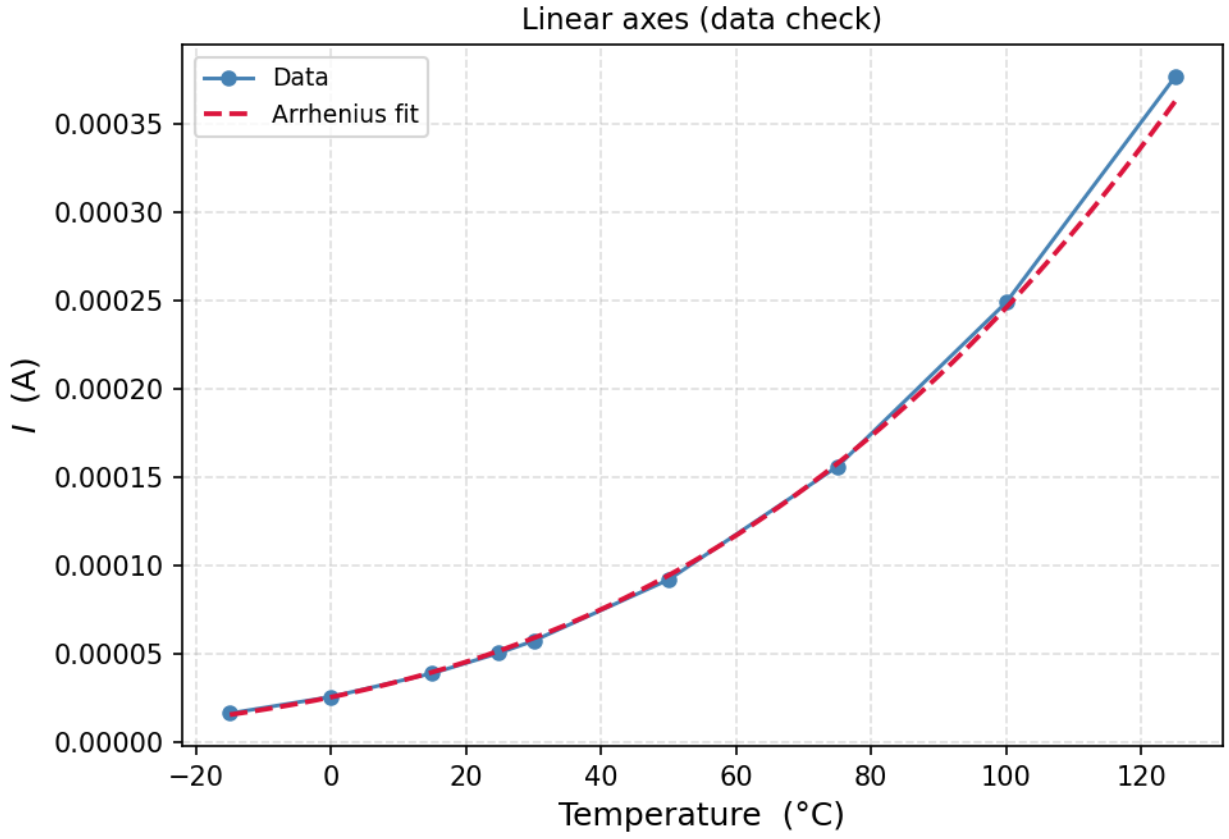
Richville Fagaragan

Arrhenius Plot - CLS

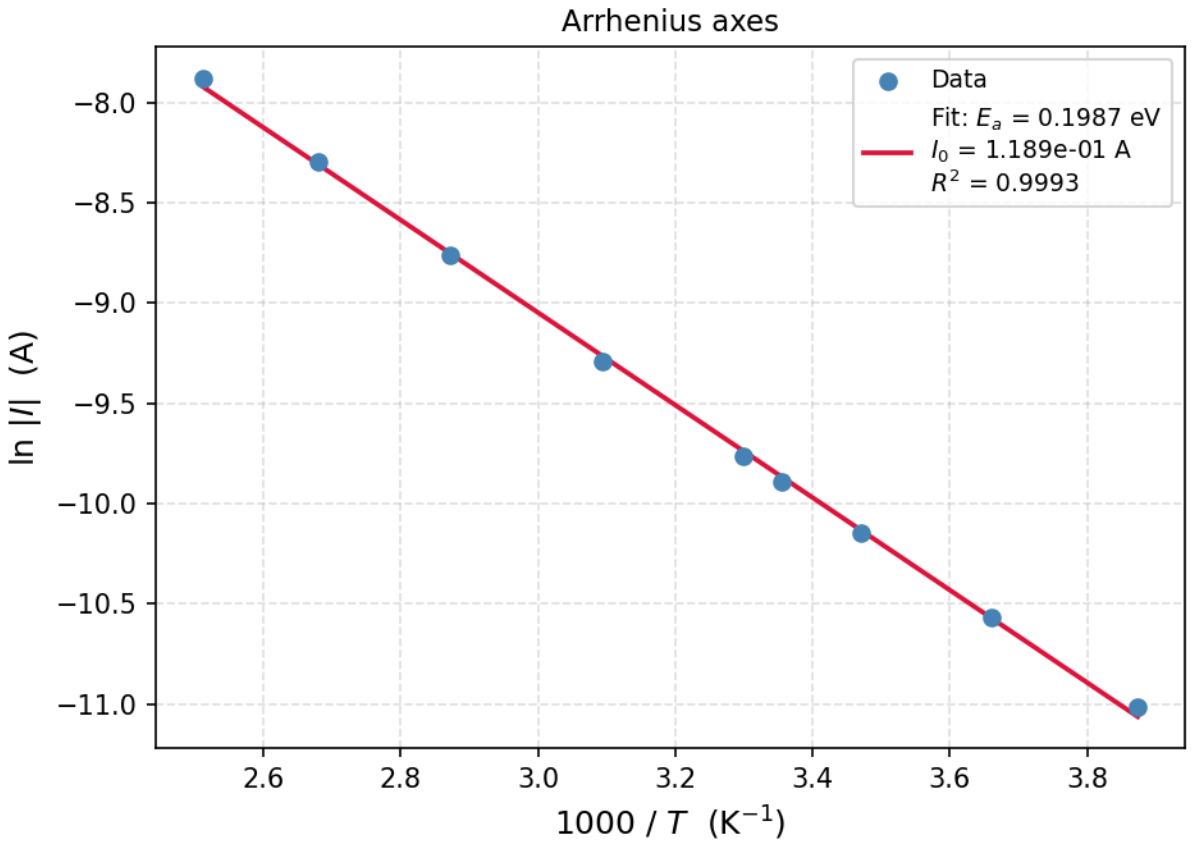

Activation Energy vs Bias Voltage — trap=on, light=on
$E_a = 0.1987eV$
Activation Energy E_a (eV)
0.19873
0.19872
0.19871
0.19870
0.19869
Forward bias
Reverse bias
−600
−400
−200
0
200
400
600
Bias Voltage (V)
1.000
0.975
0.950
0.925
0.900
0.875
0.850
0.825
0.800
R^2 of Arrhenius fit

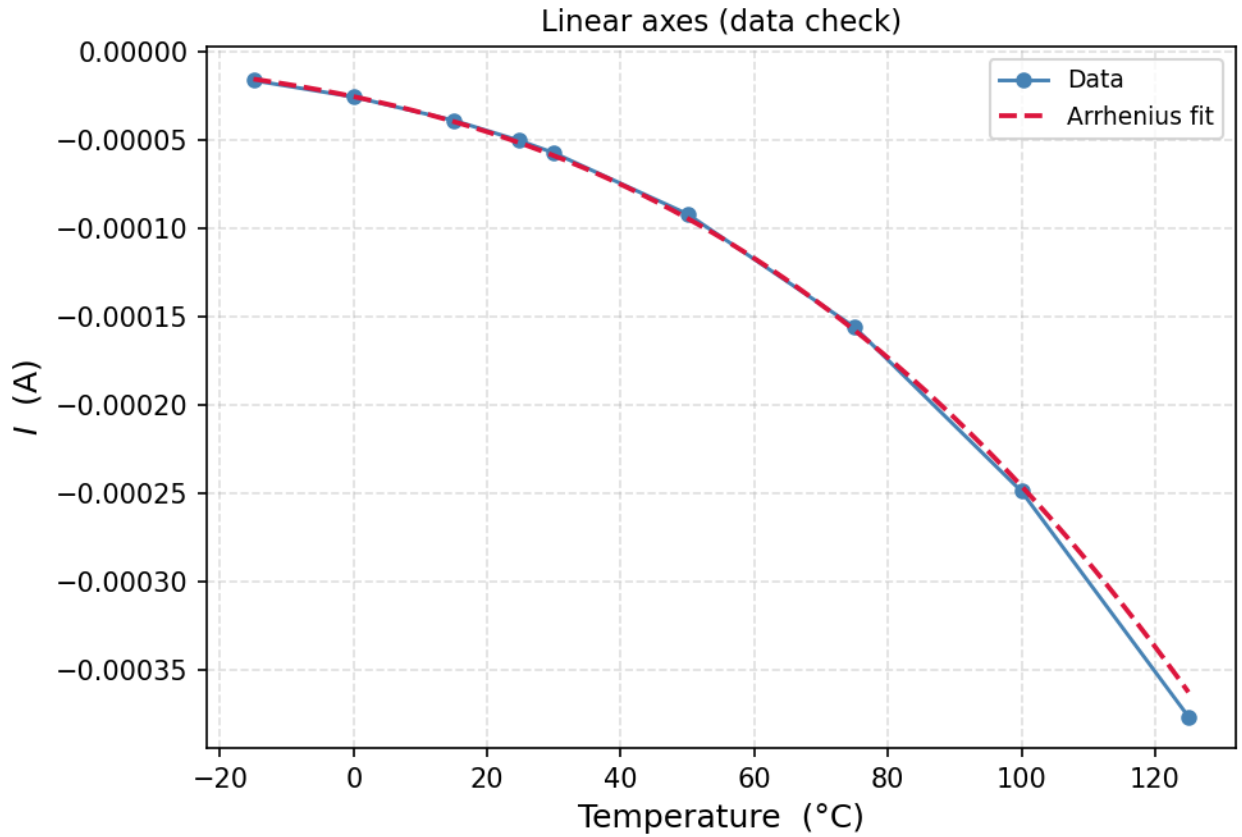
trap=on, light=on (bias = +600.0 V)



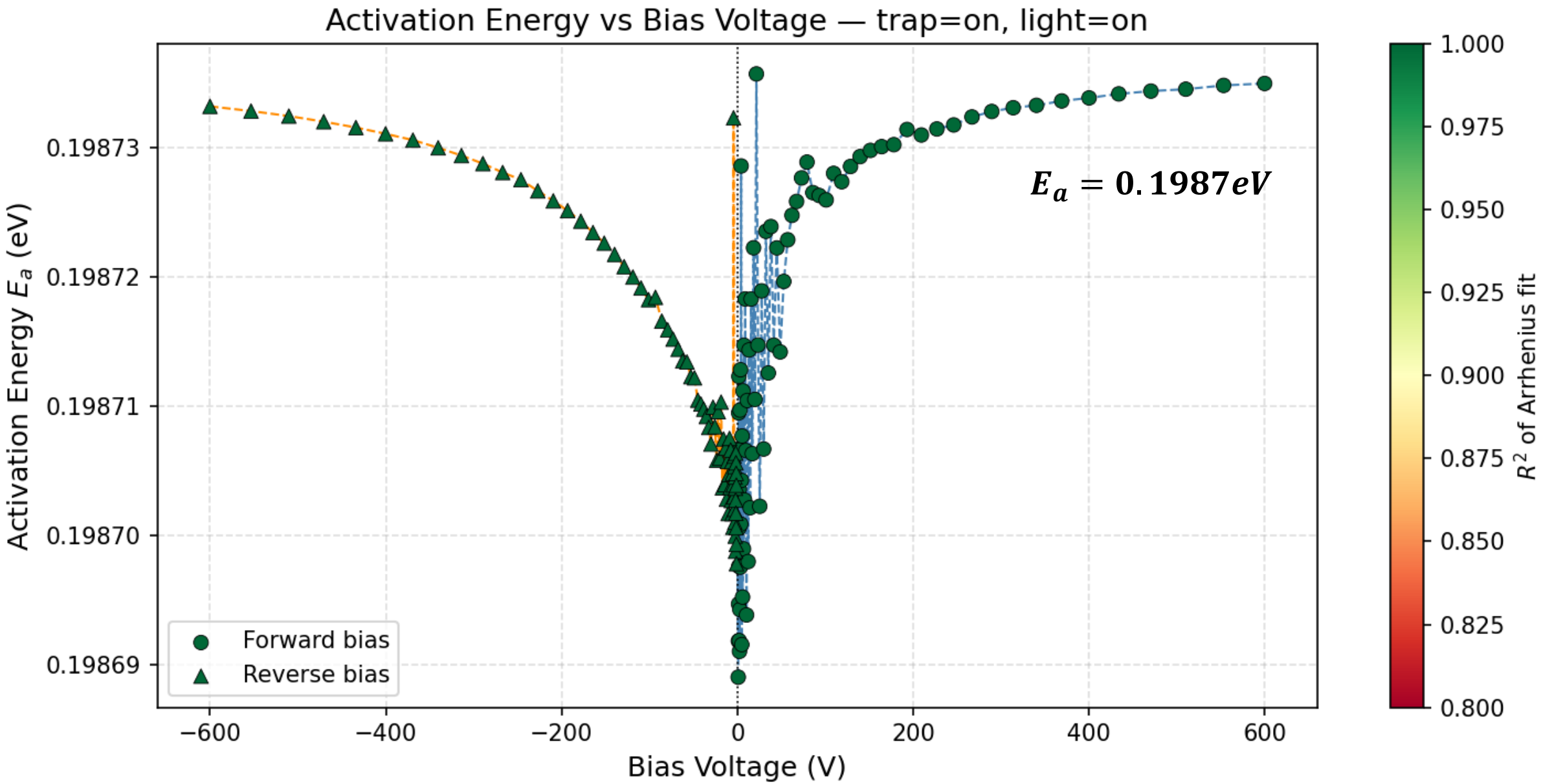


trap=on, light=on (bias = -600.0 V)

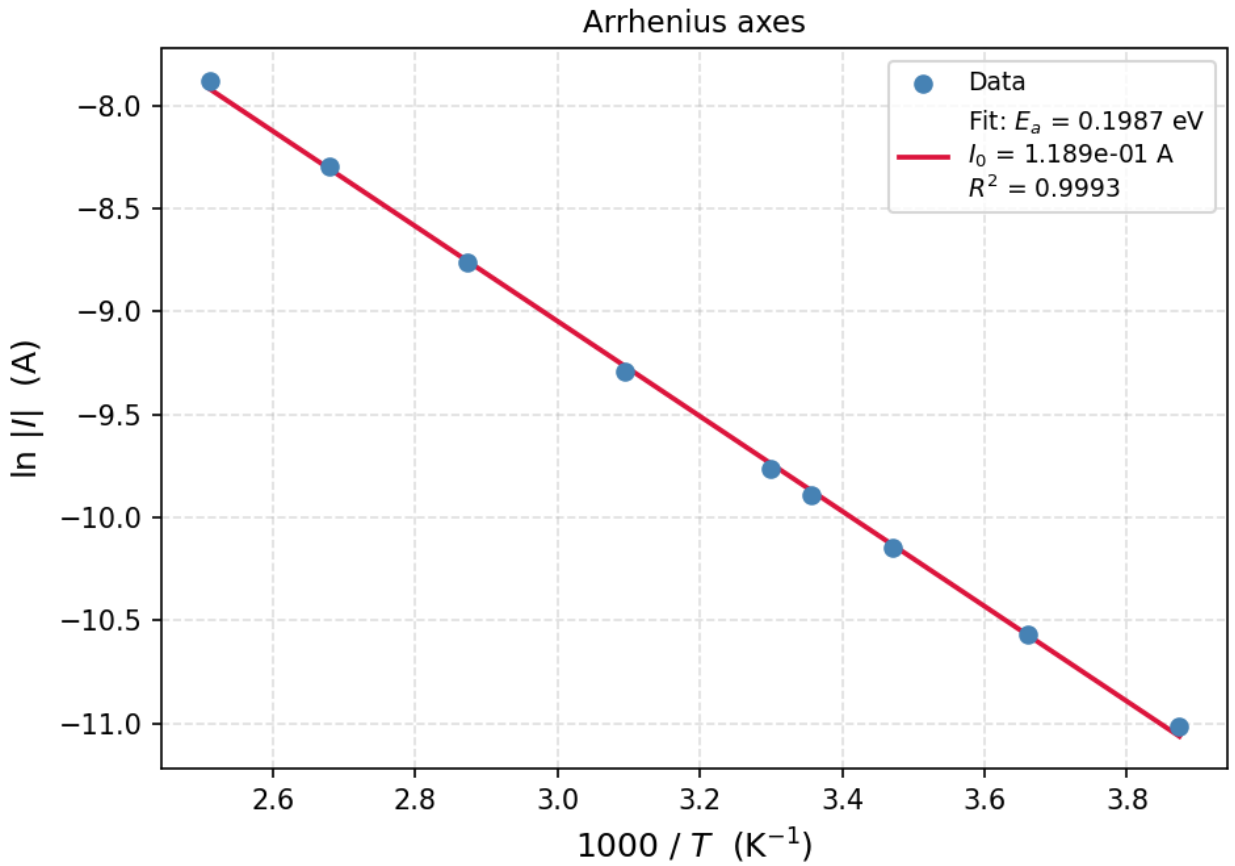


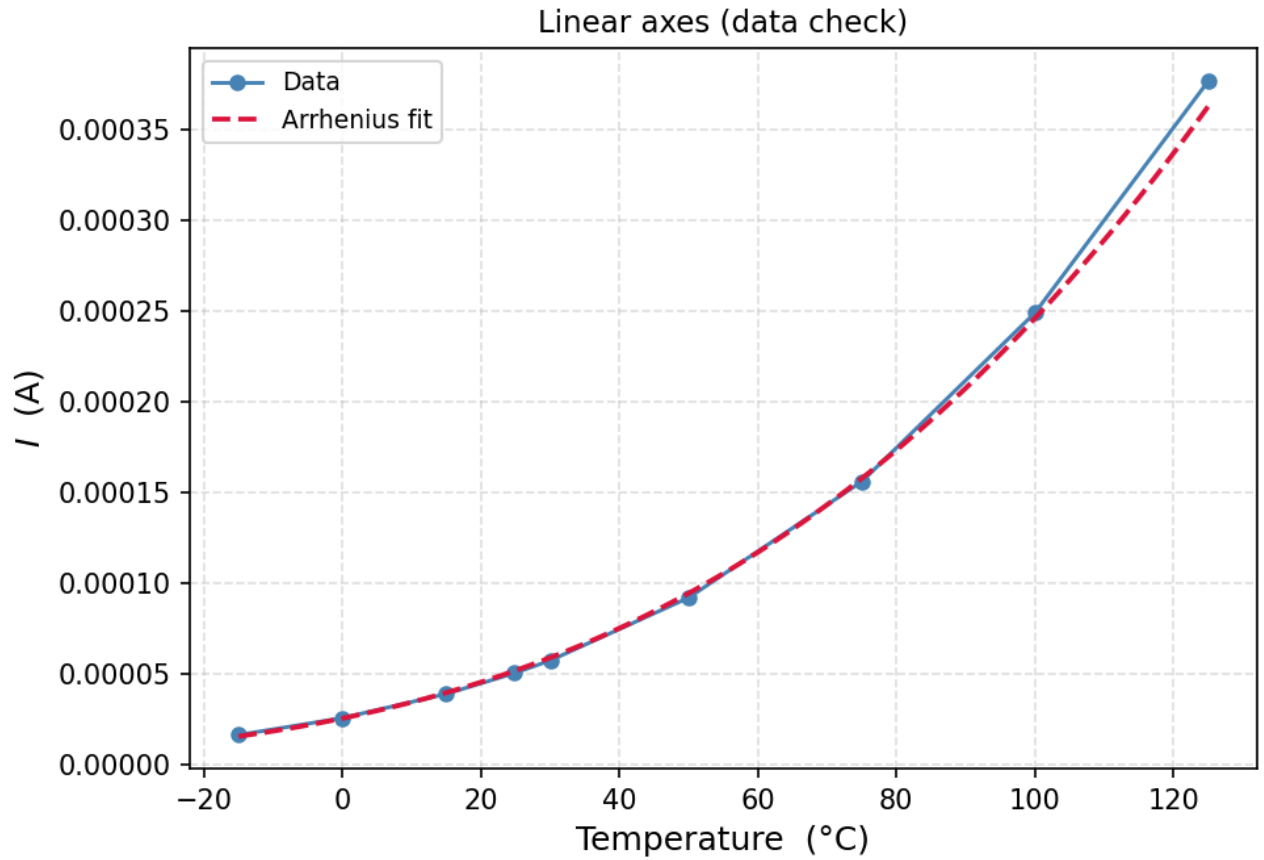


Arrhenius Plot - DLS

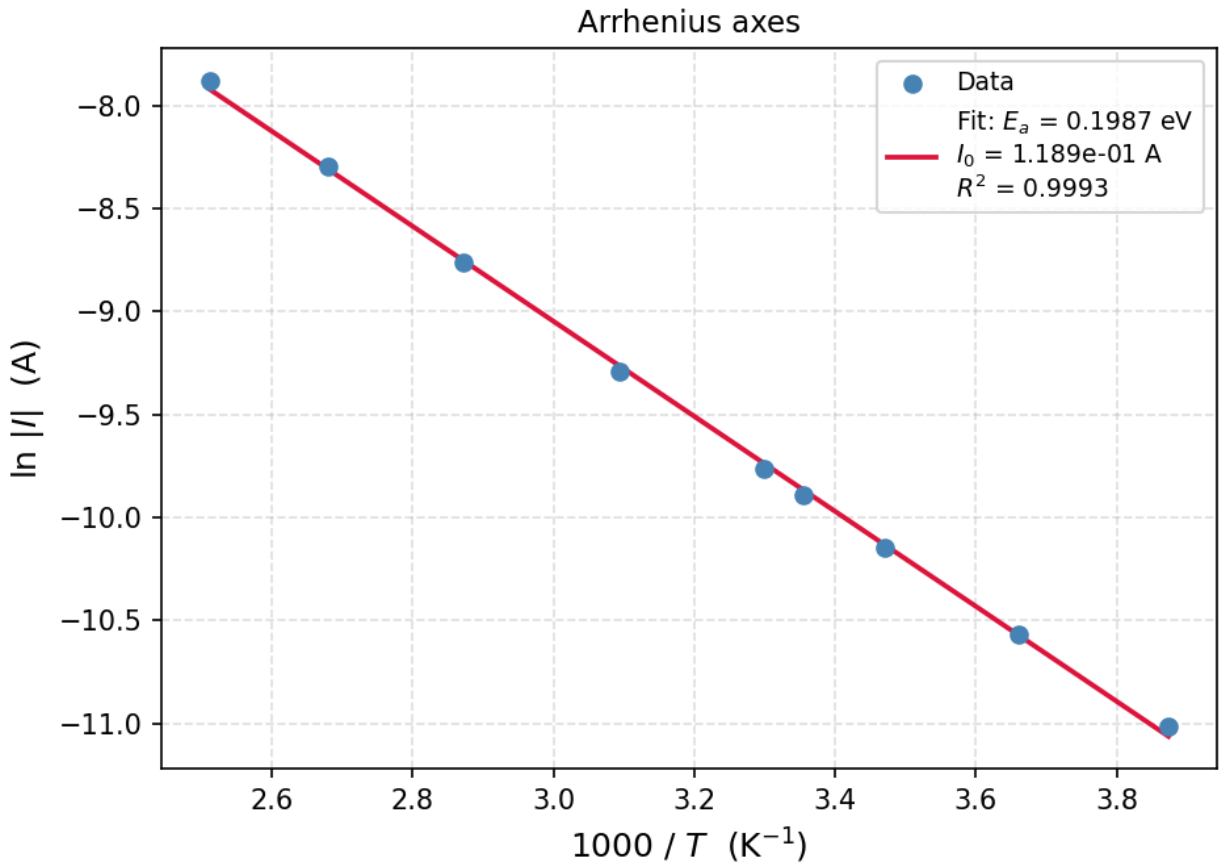

Activation Energy vs Bias Voltage — trap=on, light=on
$E_a = 0.1987eV$
Activation Energy E_a (eV)
0.19873
0.19872
0.19871
0.19870
0.19869
Forward bias
Reverse bias
−600
−400
−200
0
200
400
600
Bias Voltage (V)
1.000
0.975
0.950
0.925
0.900
0.875
0.850
0.825
0.800
R^2 of Arrhenius fit

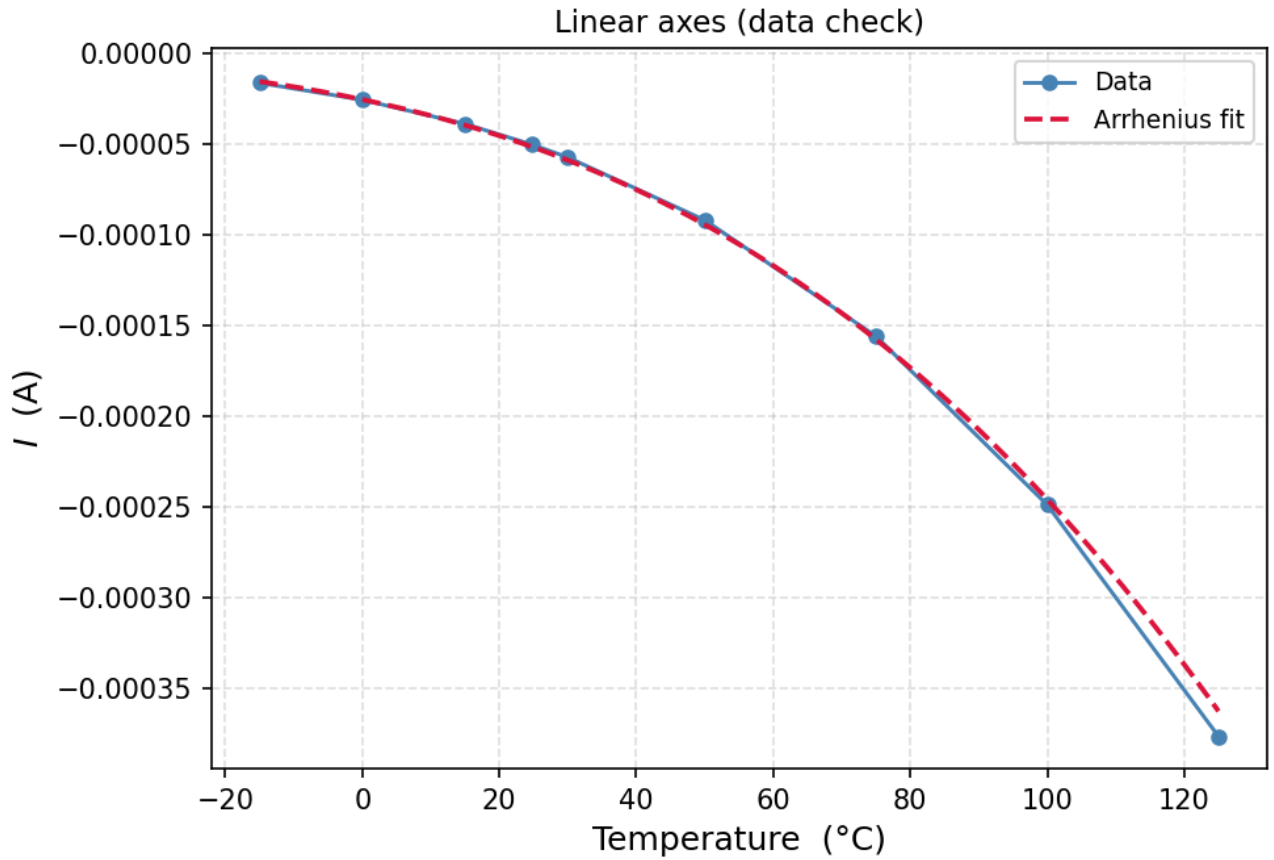
trap=on, light=on (bias = +600.0 V)



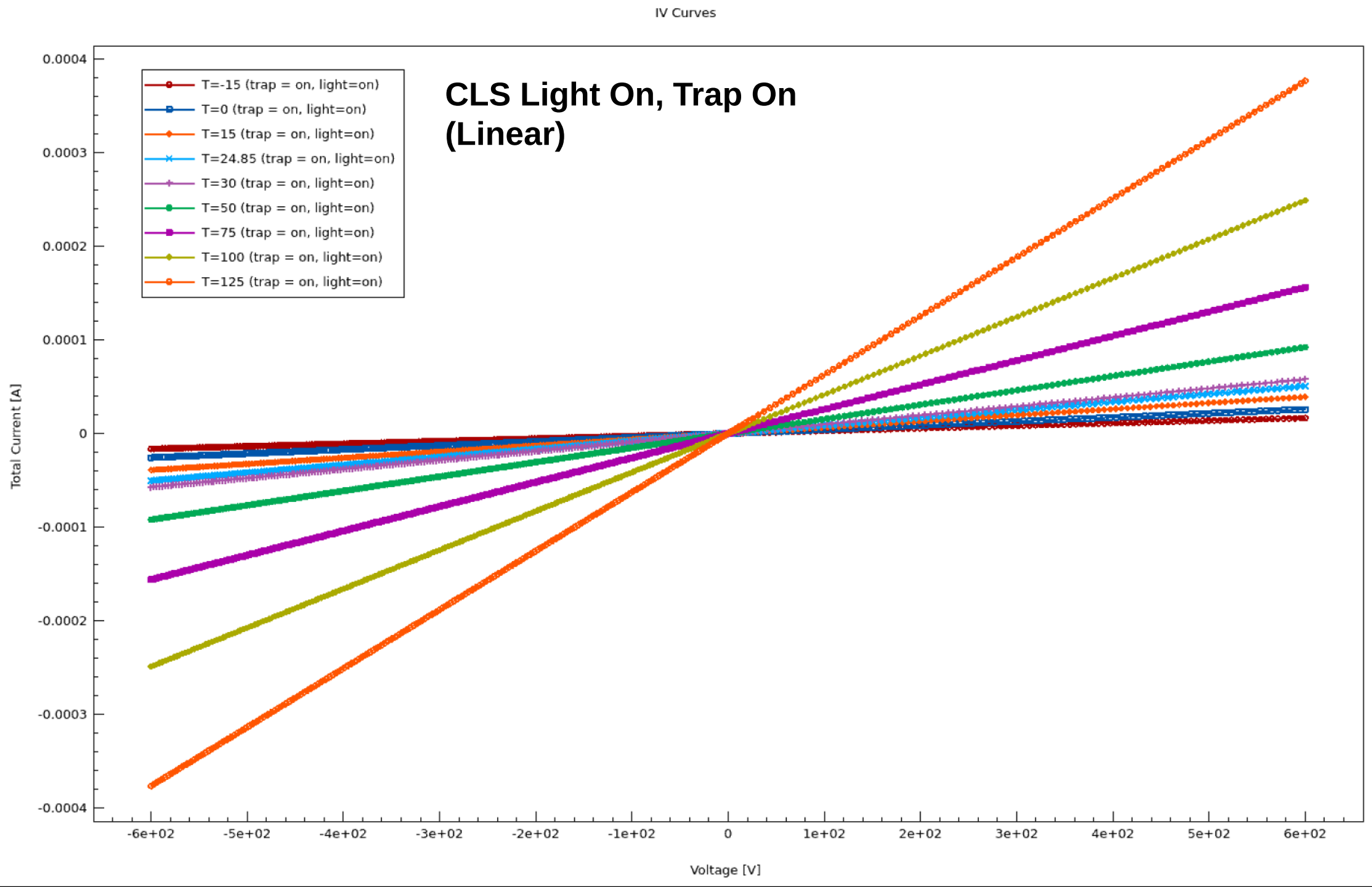


trap=on, light=on (bias = -600.0 V)



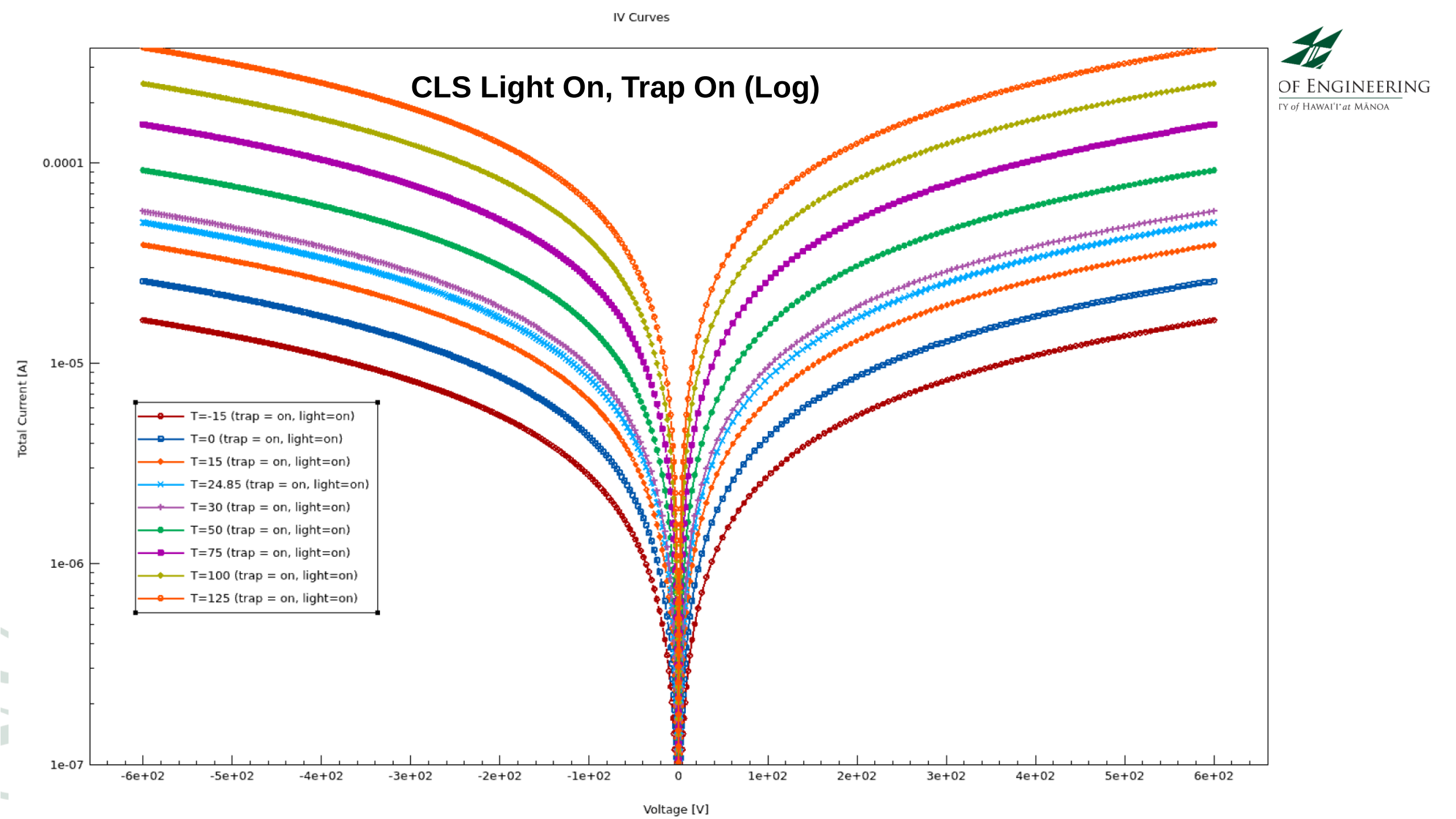


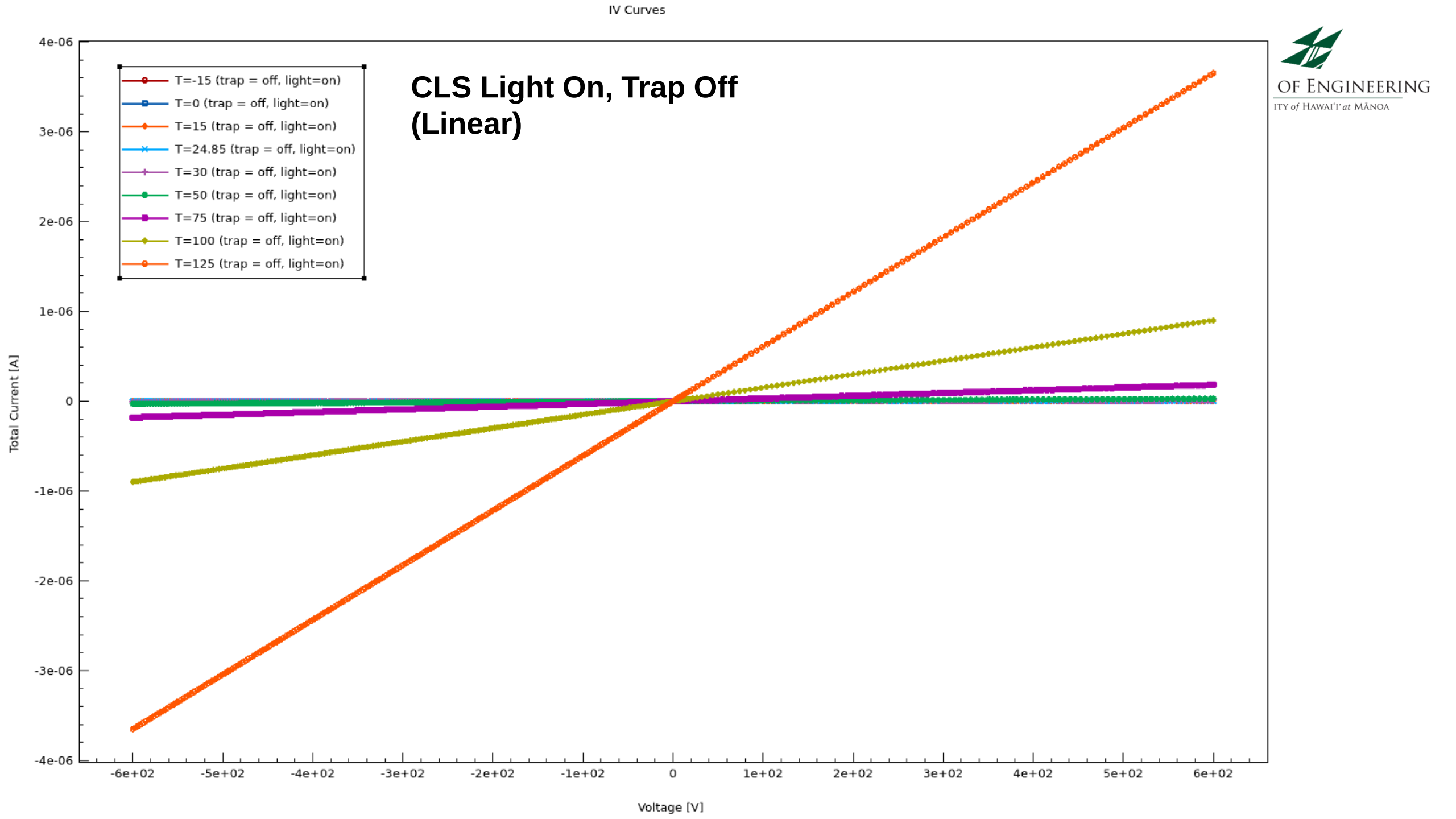
Backup



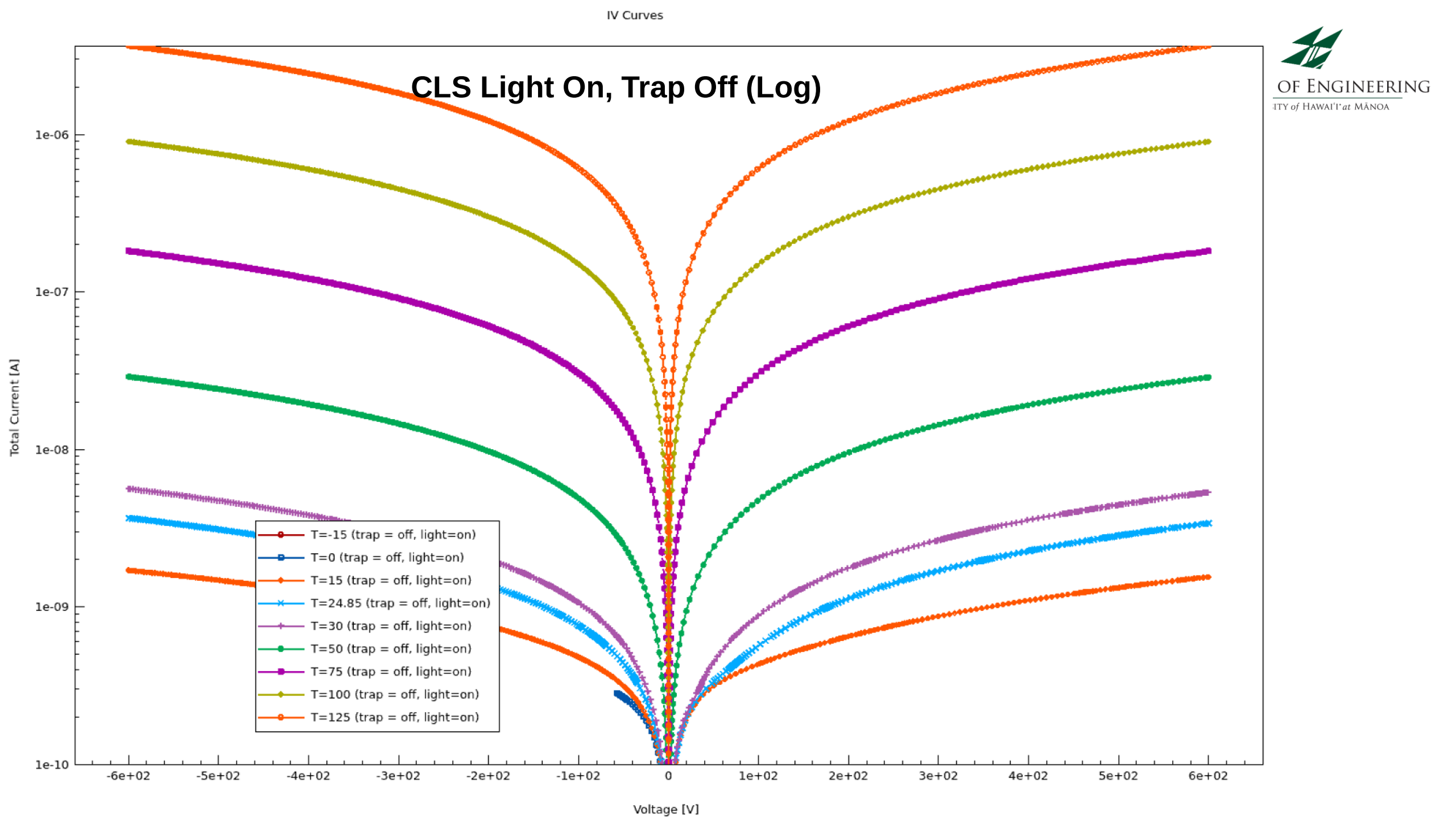
OF ENGINEERING

SITY of HAWAI'I at MĀNOA





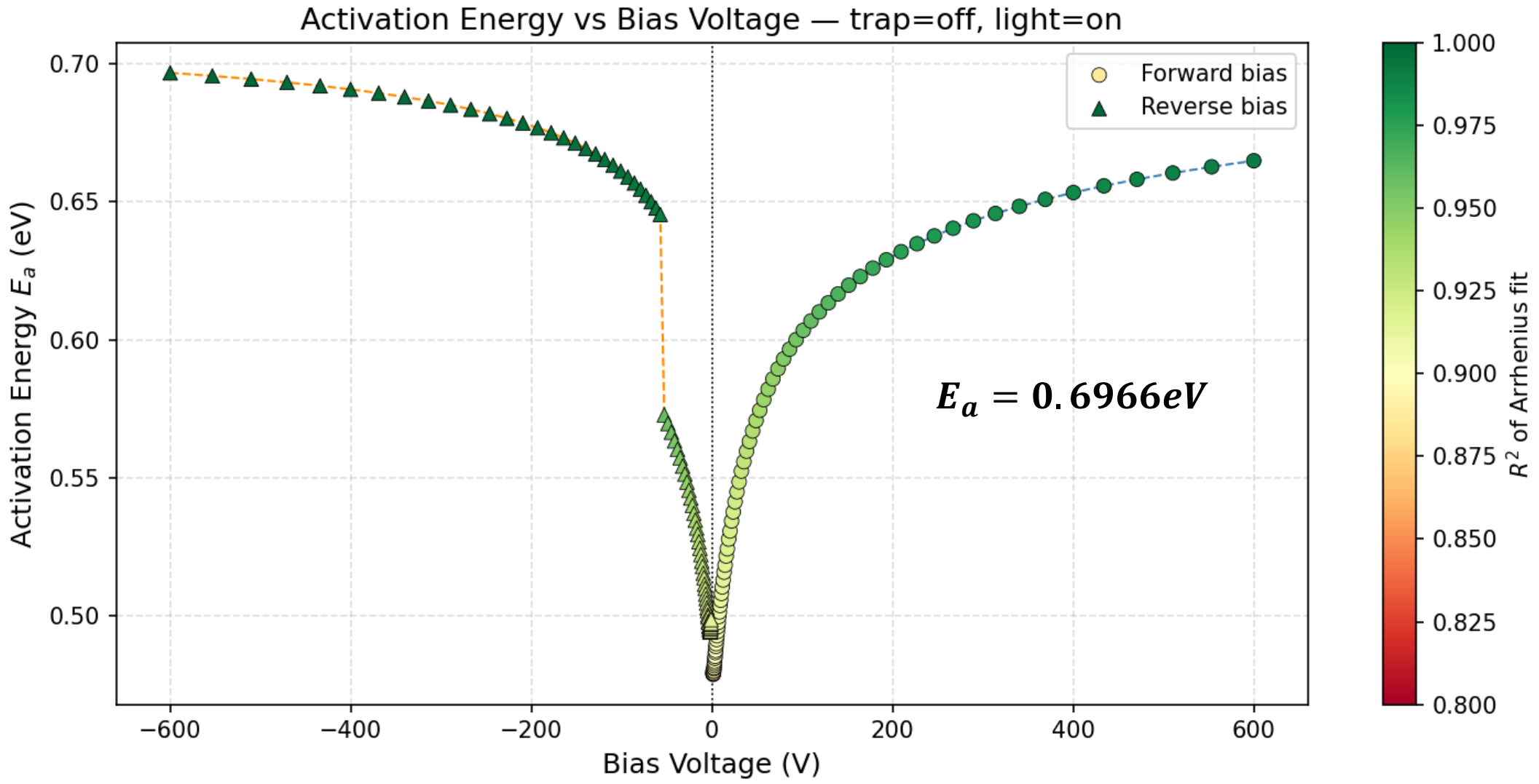
OF ENGINEERING
ITY of HAWAI'I at MĀNOA



OF ENGINEERING

ITY of HAWAI'I at MĀNOA

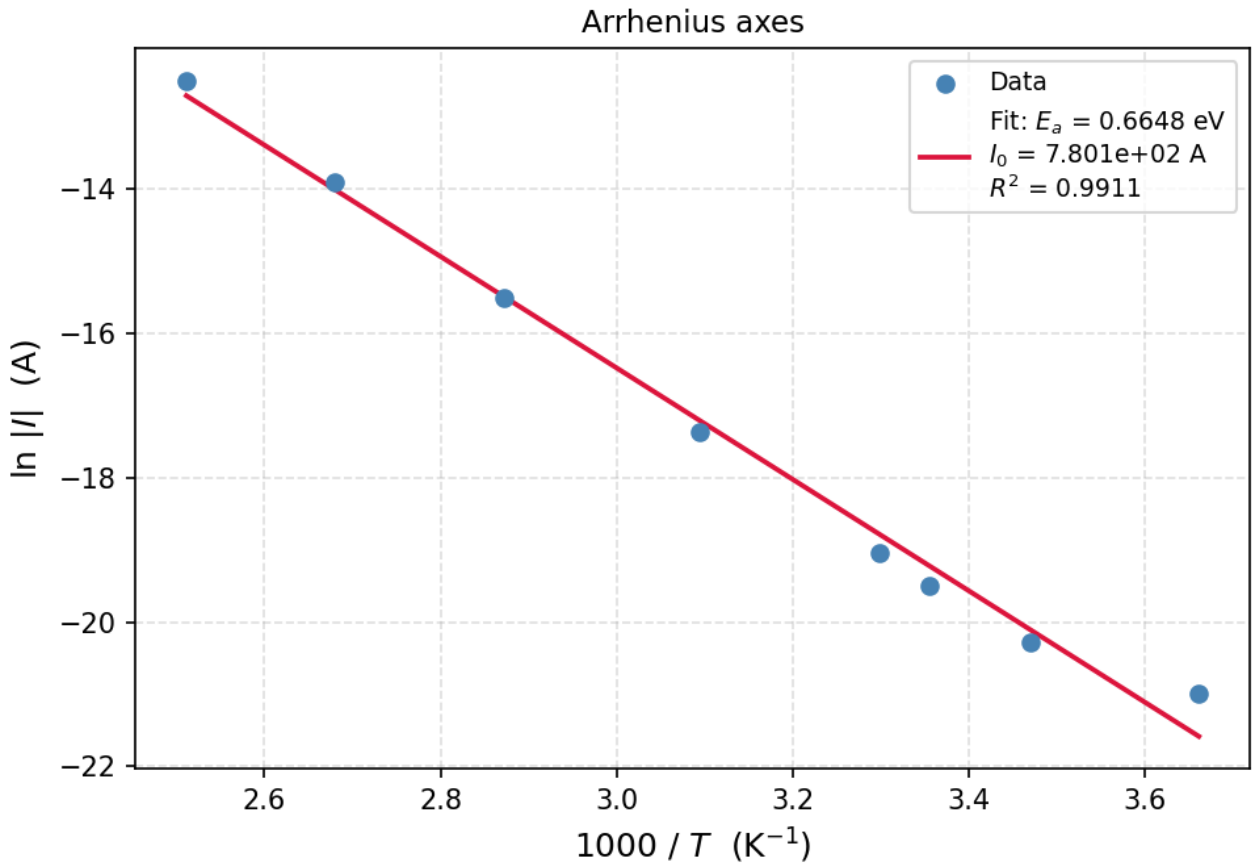
CLS

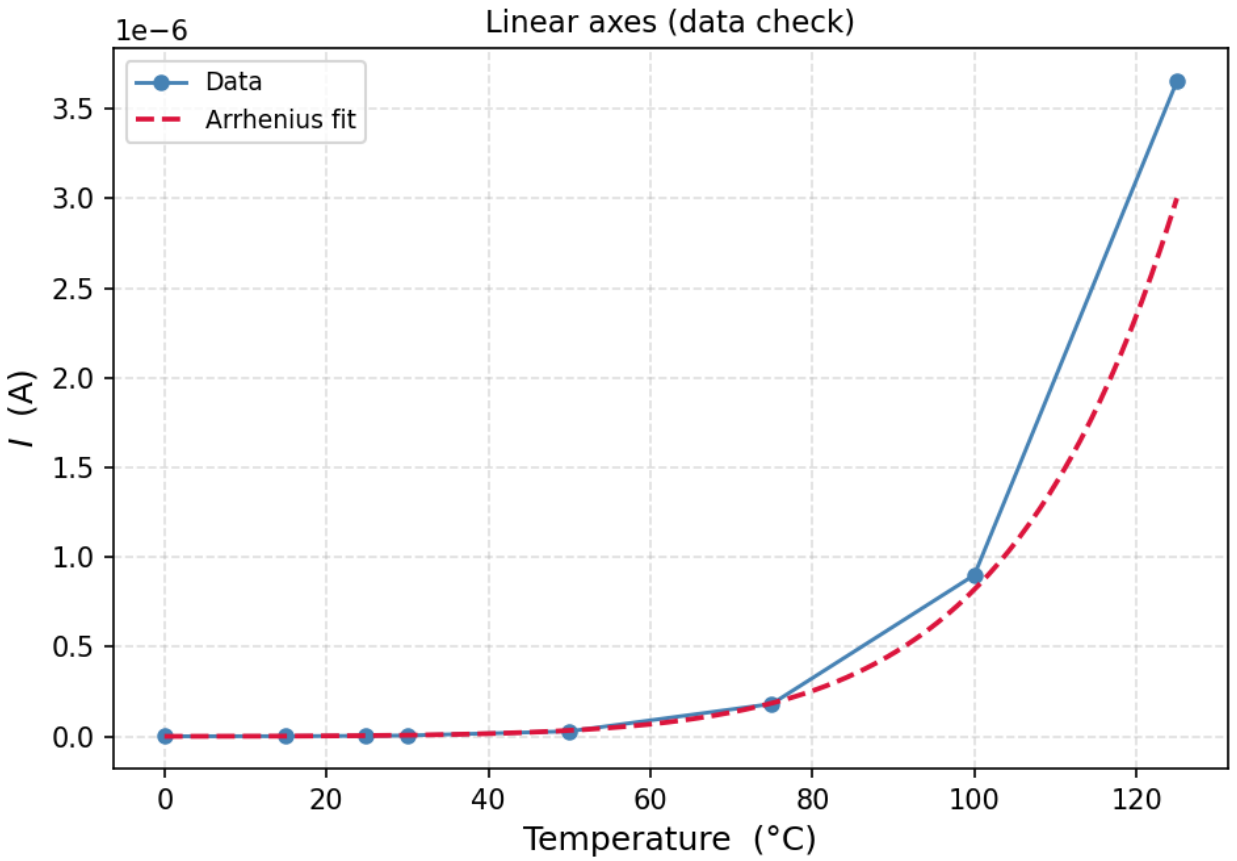

Activation Energy vs Bias Voltage — trap=off, light=on
Forward bias
Reverse bias
$E_a = 0.6966eV$
Activation Energy E_a (eV)
0.70
0.65
0.60
0.55
0.50
−600
−400
−200
0
200
400
600
Bias Voltage (V)
1.000
0.975
0.950
0.925
0.900
0.875
0.850
0.825
0.800
R^2 of Arrhenius fit

CLS

COLLEGE OF ENGINEERING
UNIVERSITY of HAWAI'I at MĀNOA

trap=off, light=on (bias = +600.0 V)

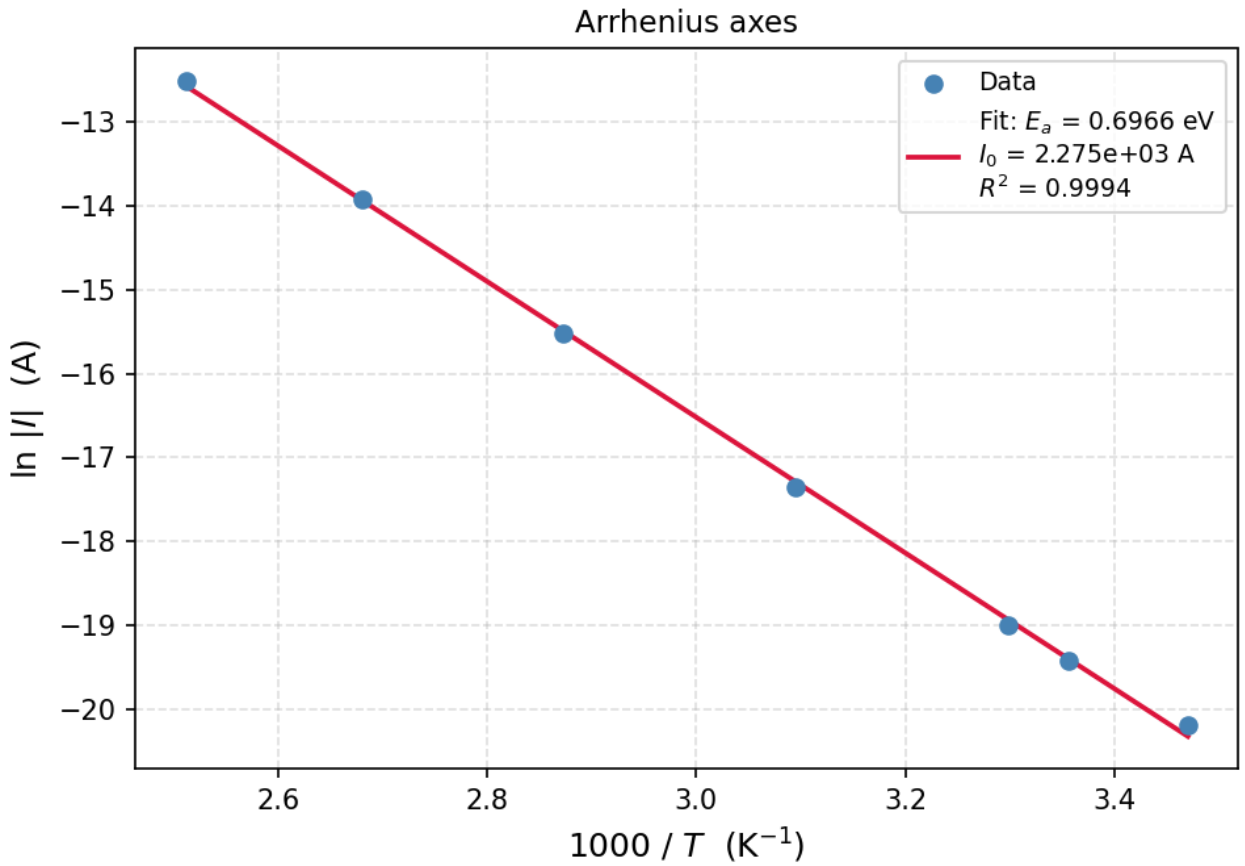


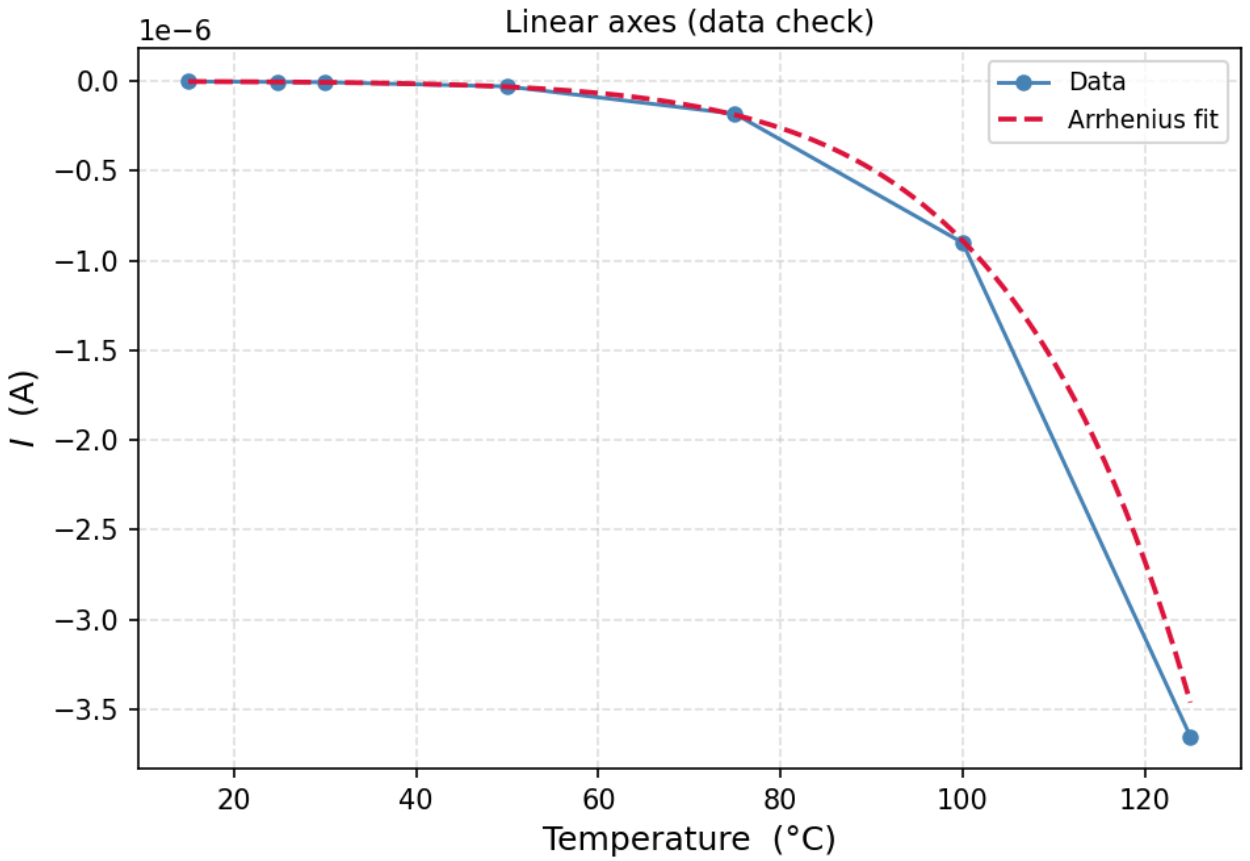


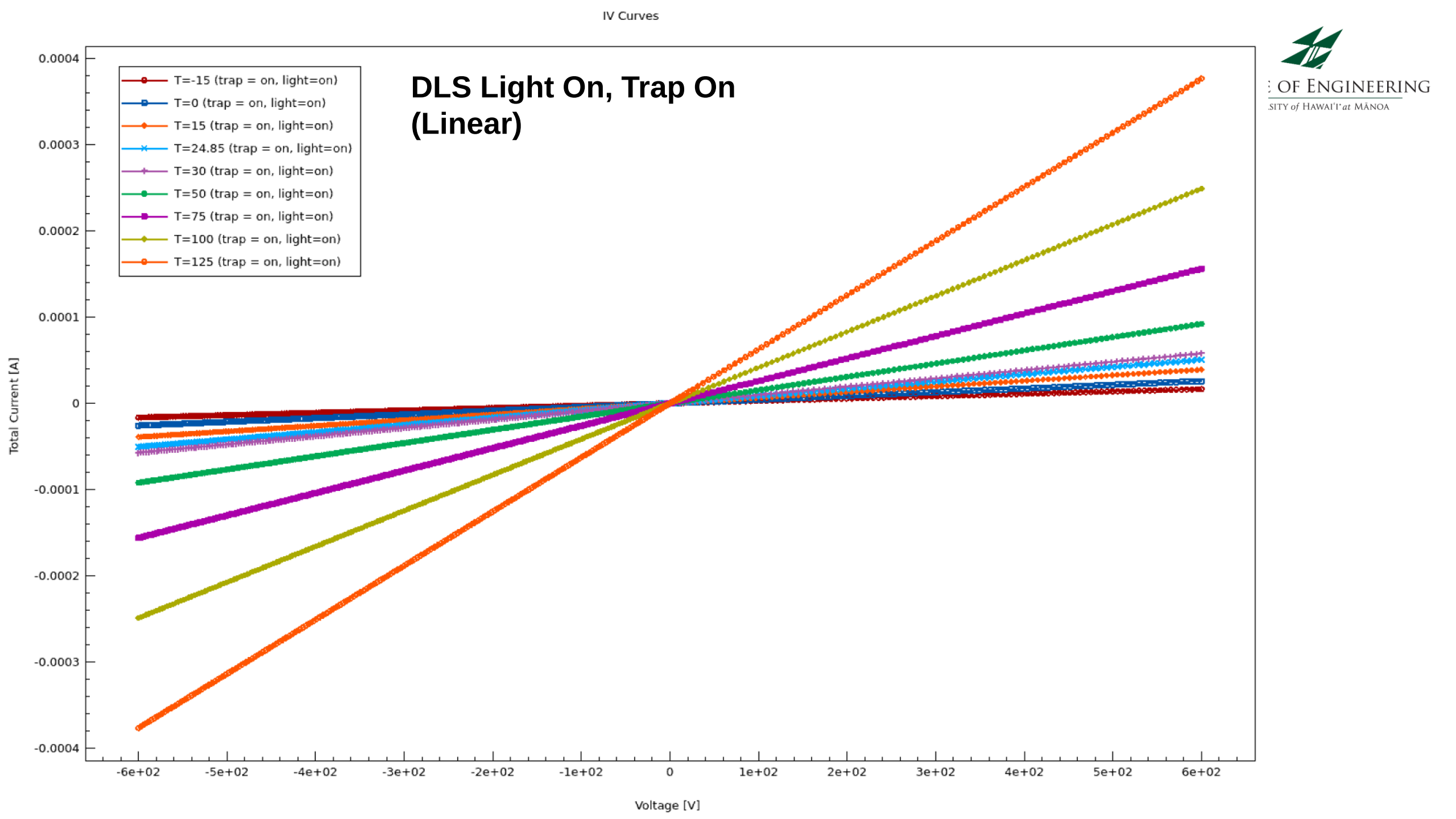
CLS

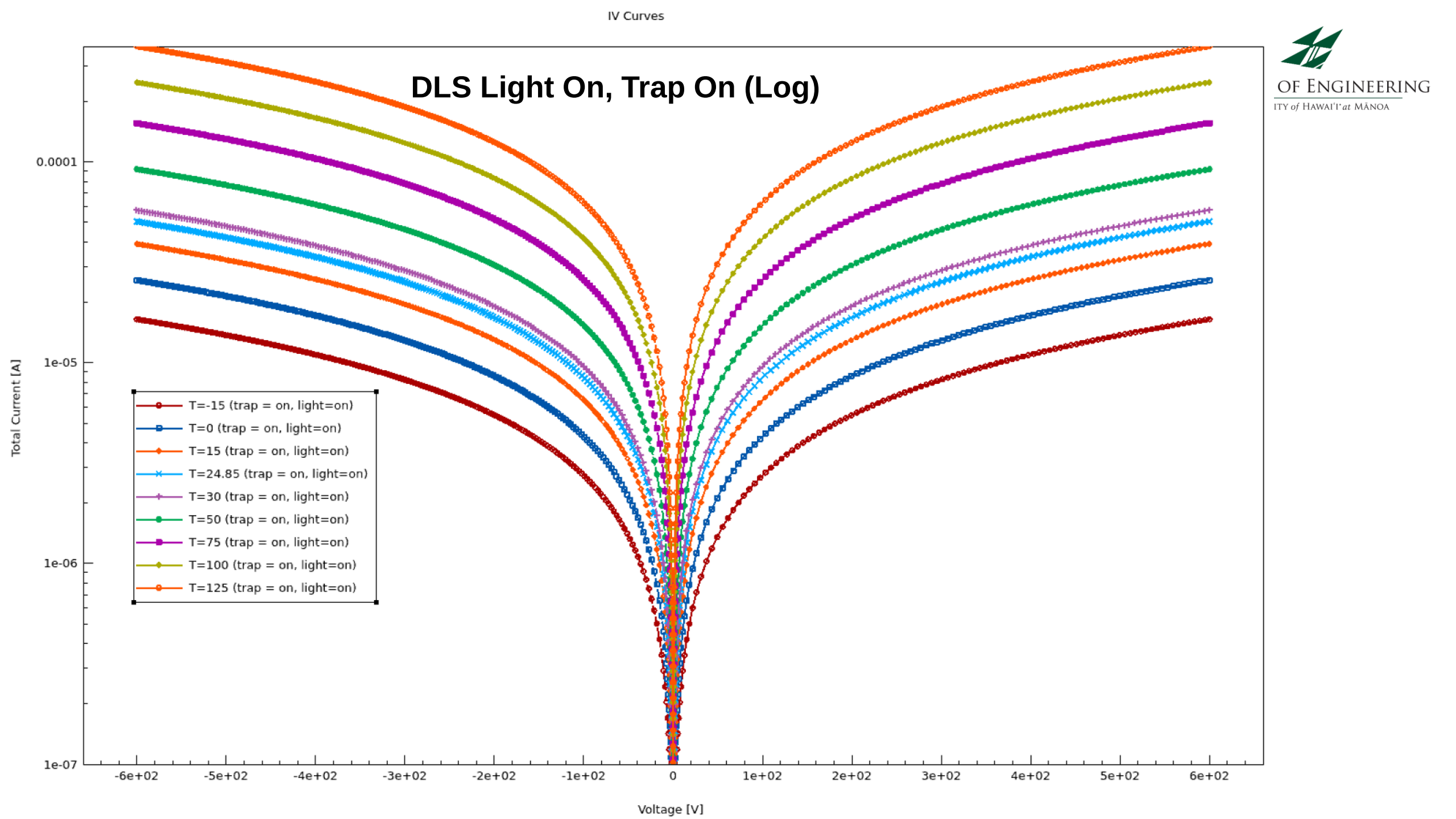
COLLEGE OF ENGINEERING
UNIVERSITY of HAWAI'I at MĀNOA

trap=off, light=on (bias = -600.0 V)

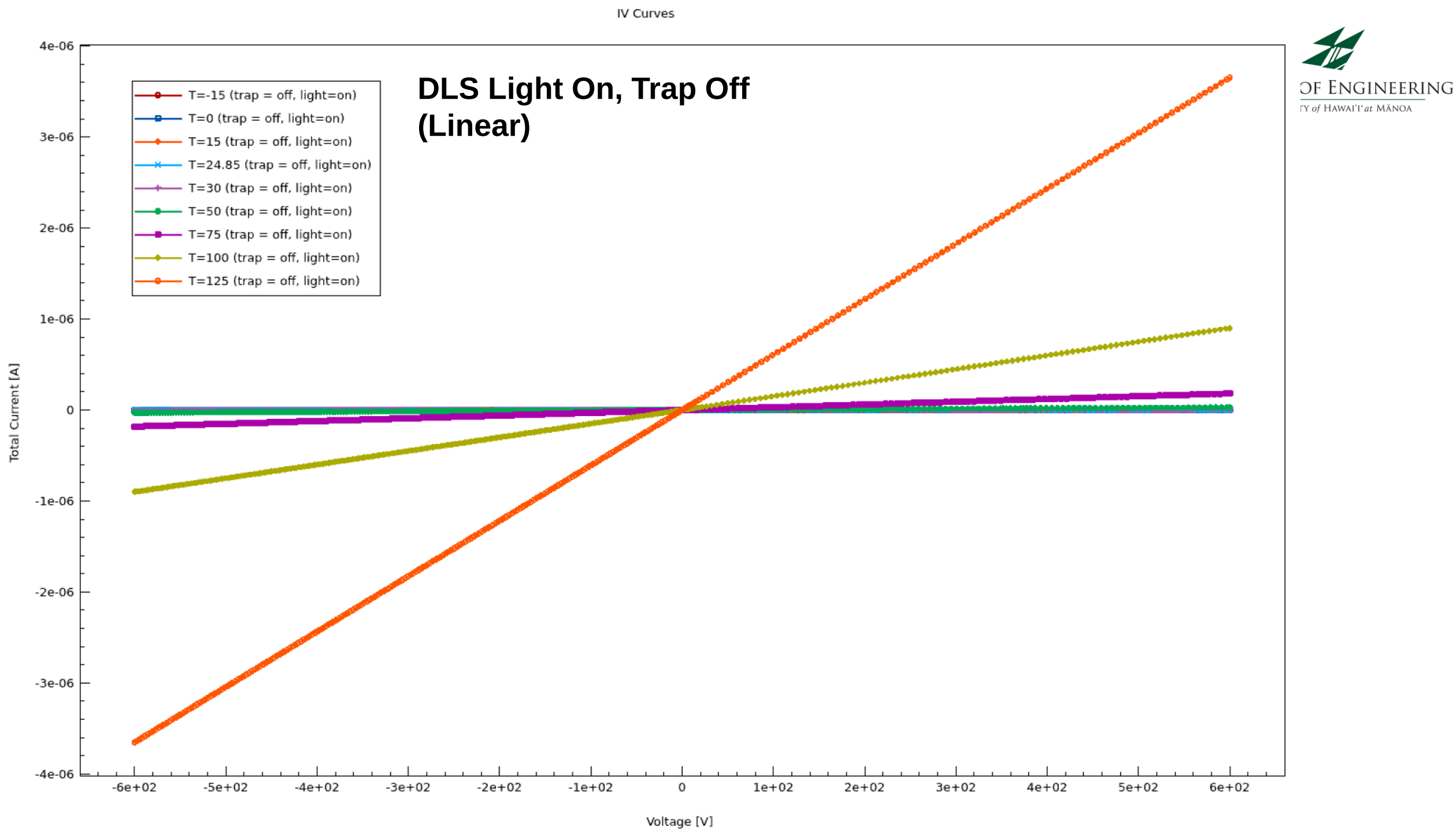




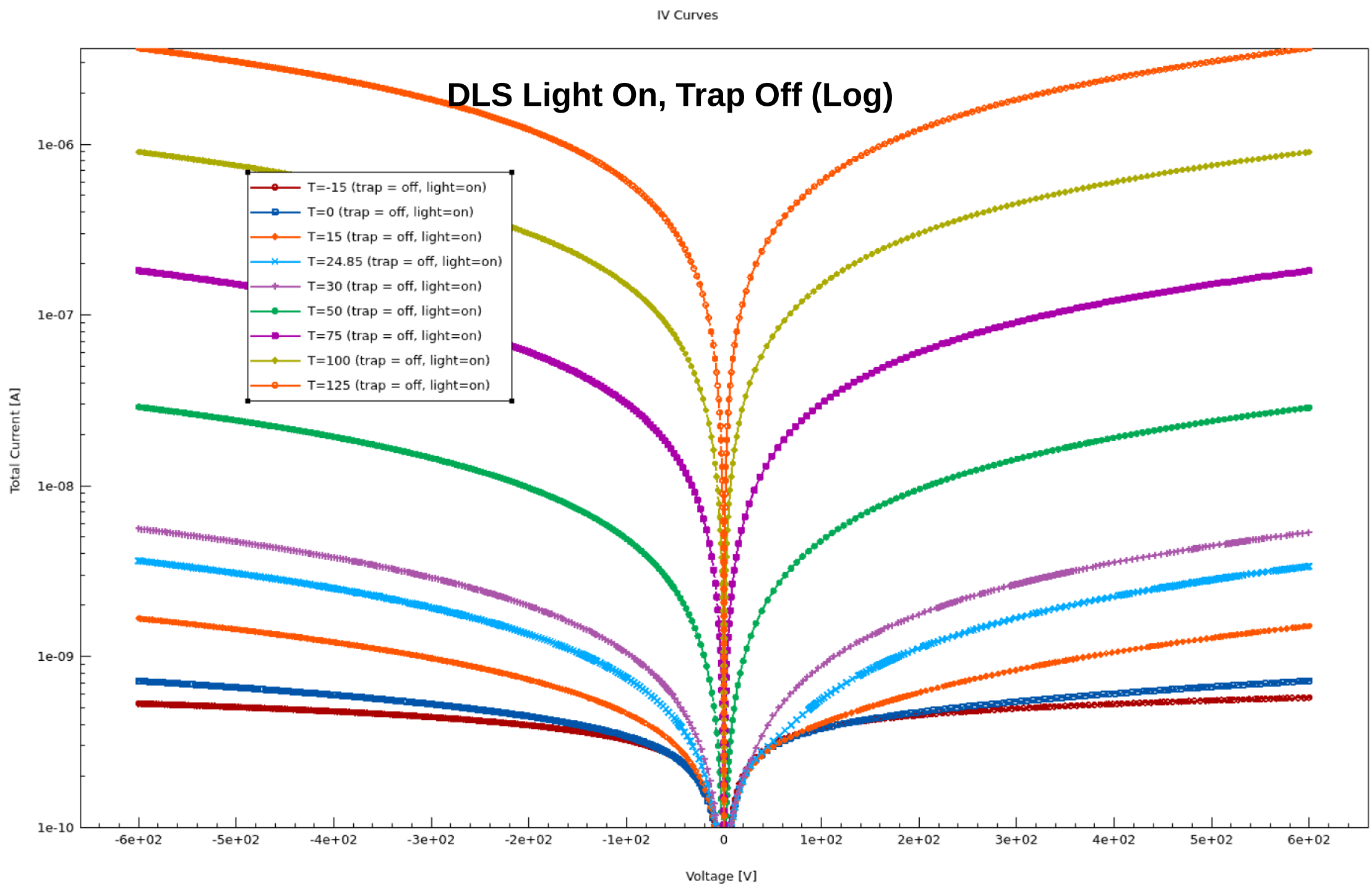

IV Curves
DLS Light On, Trap On (Linear)
T=-15 (trap = on, light=on)
T=0 (trap = on, light=on)
T=15 (trap = on, light=on)
T=24.85 (trap = on, light=on)
T=30 (trap = on, light=on)
T=50 (trap = on, light=on)
T=75 (trap = on, light=on)
T=100 (trap = on, light=on)
T=125 (trap = on, light=on)
Total Current [A]
0.0004
0.0003
0.0002
0.0001
0
-0.0001
-0.0002
-0.0003
-0.0004
-6e+02
-5e+02
-4e+02
-3e+02
-2e+02
-1e+02
0
1e+02
2e+02
3e+02
4e+02
5e+02
6e+02
Voltage [V]



OF ENGINEERING
ITY of HAWAI'I at MĀNOA



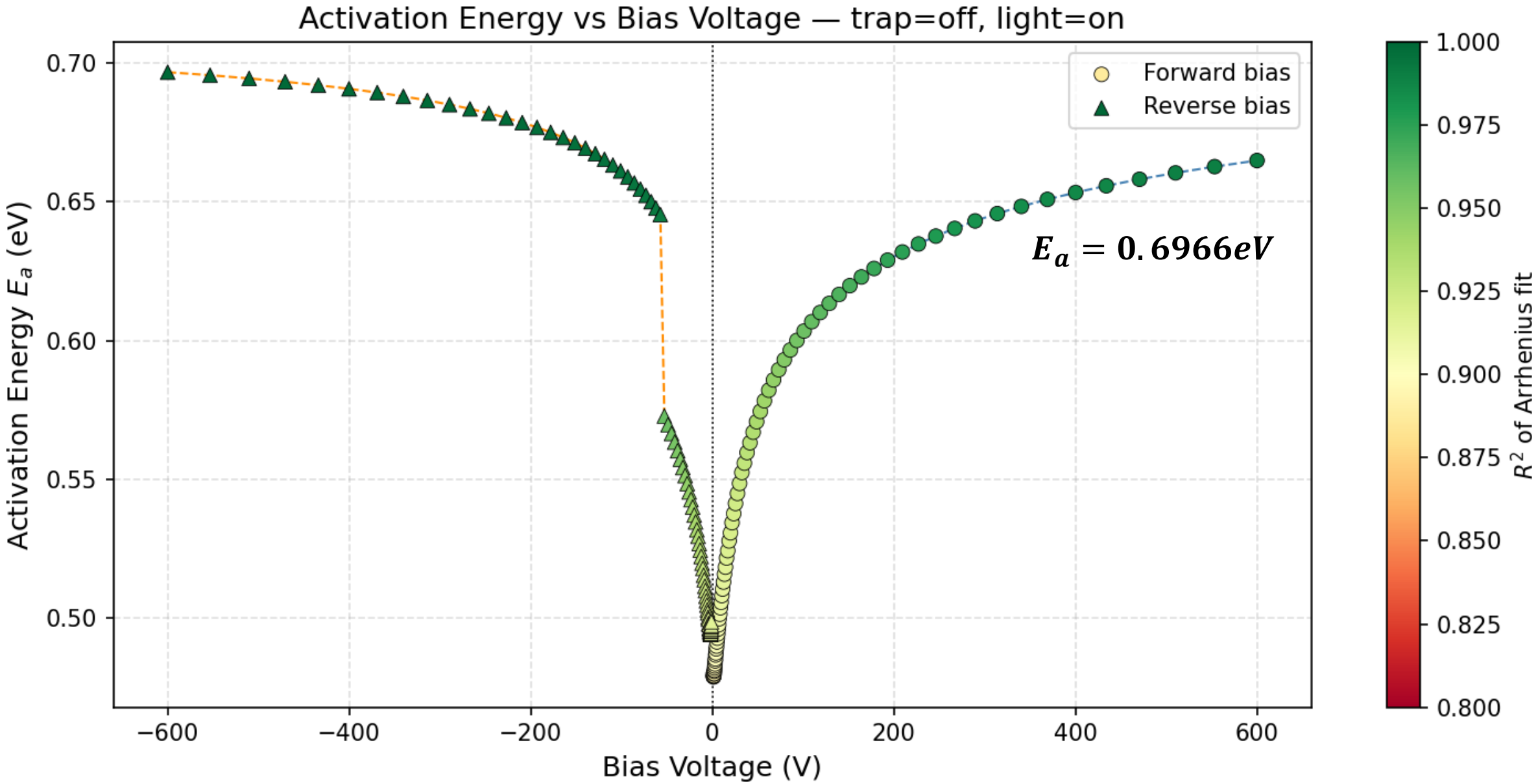
OF ENGINEERING
TY of HAWAI'I at MĀNOA



OF ENGINEERING
SITY of HAWAI'I at MĀNOA

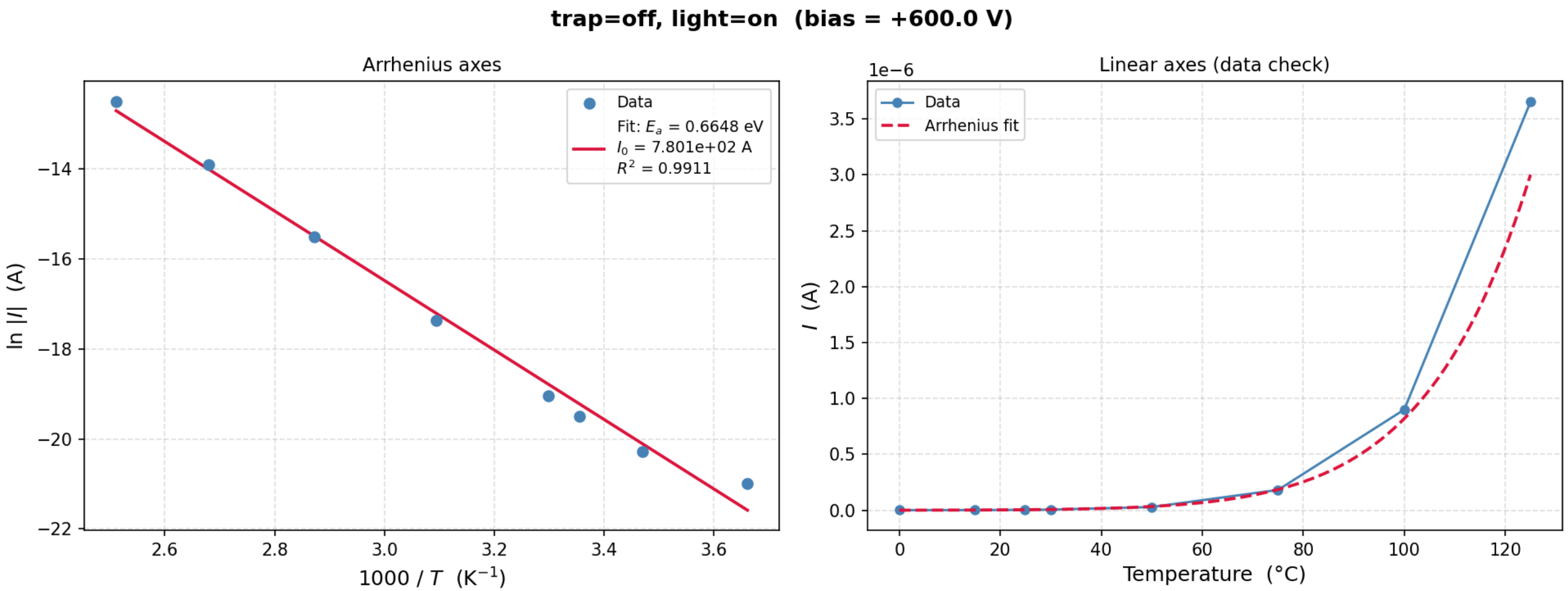
DLS

COLLEGE OF ENGINEERING



DLS

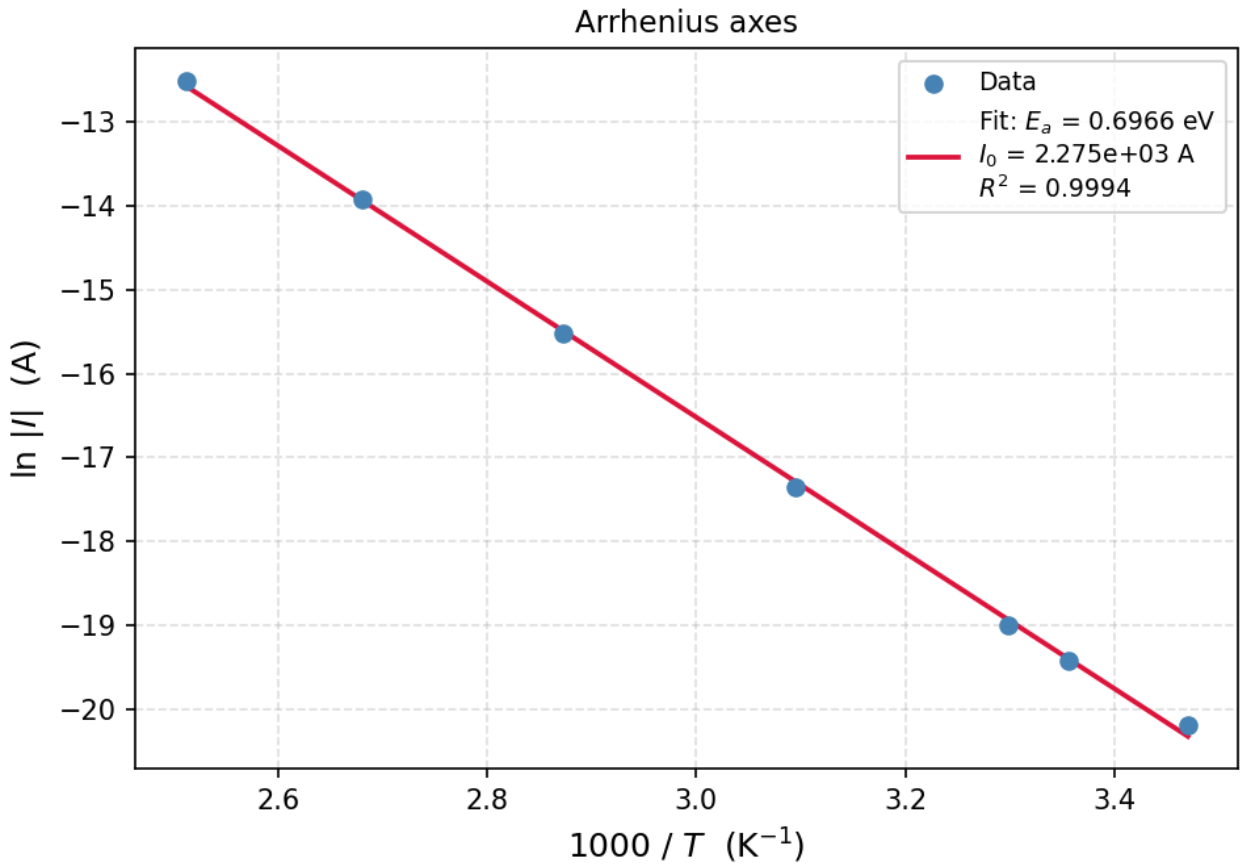
COLLEGE OF ENGINEERING
UNIVERSITY of HAWAI'I at MĀNOA

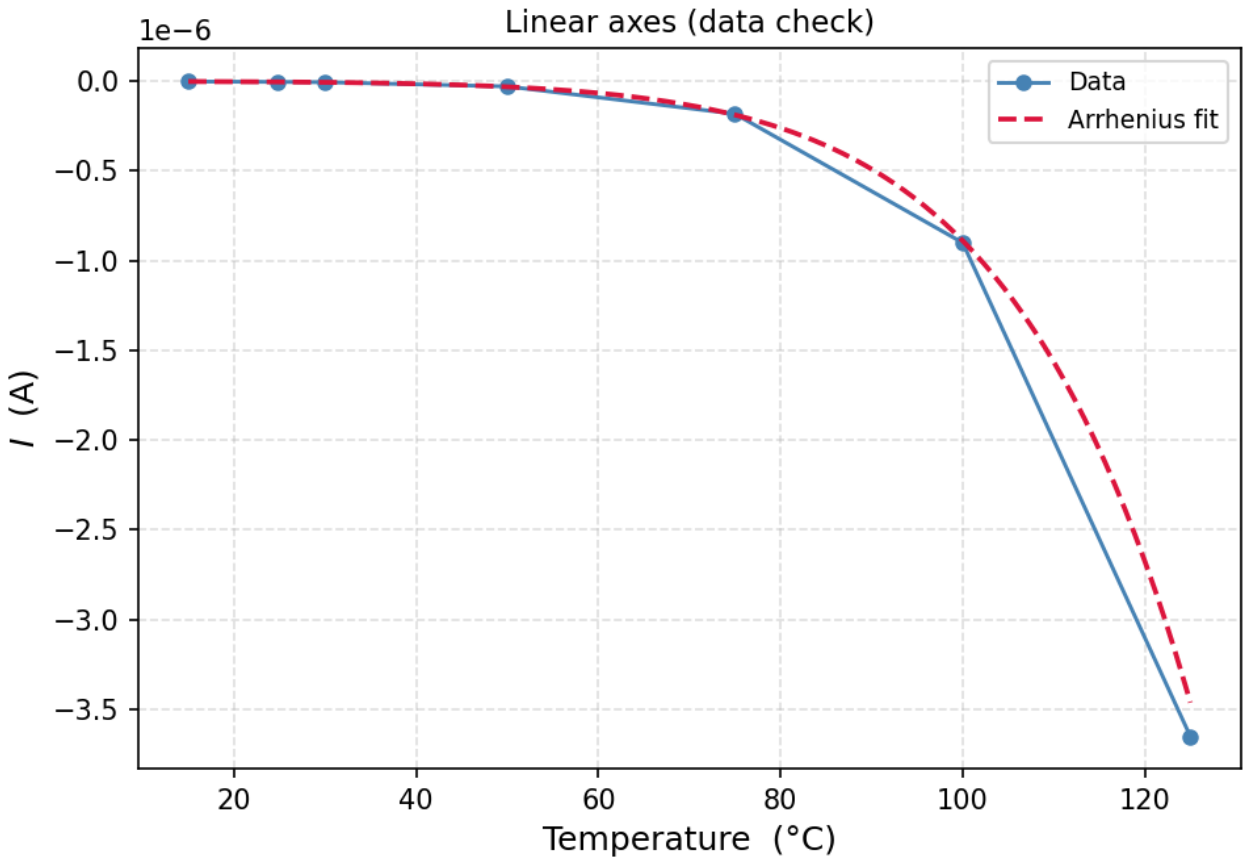


DLS

COLLEGE OF ENGINEERING
UNIVERSITY of HAWAI'I at MĀNOA

trap=off, light=on (bias = -600.0 V)



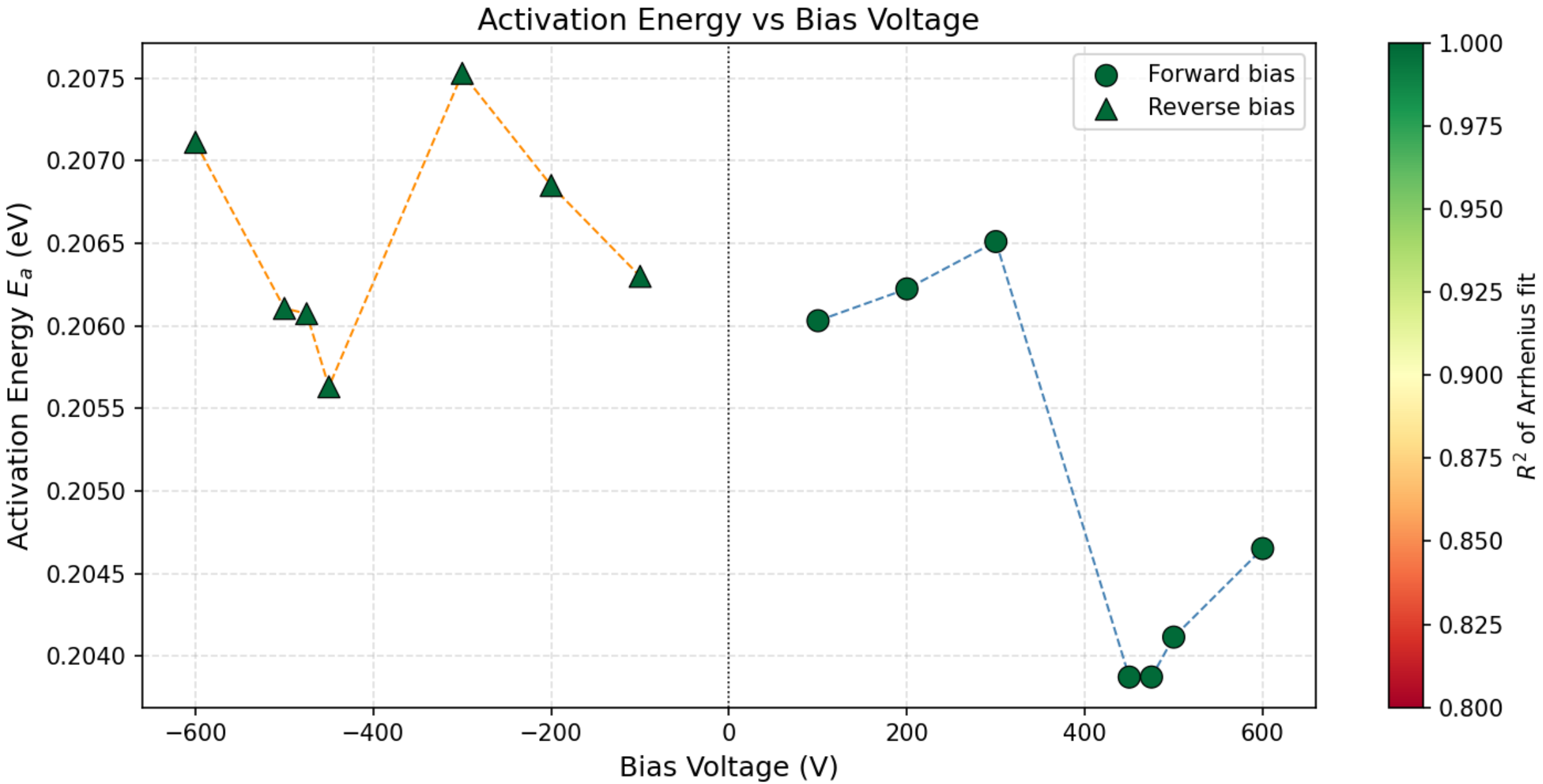


Original Arrhenius Plot

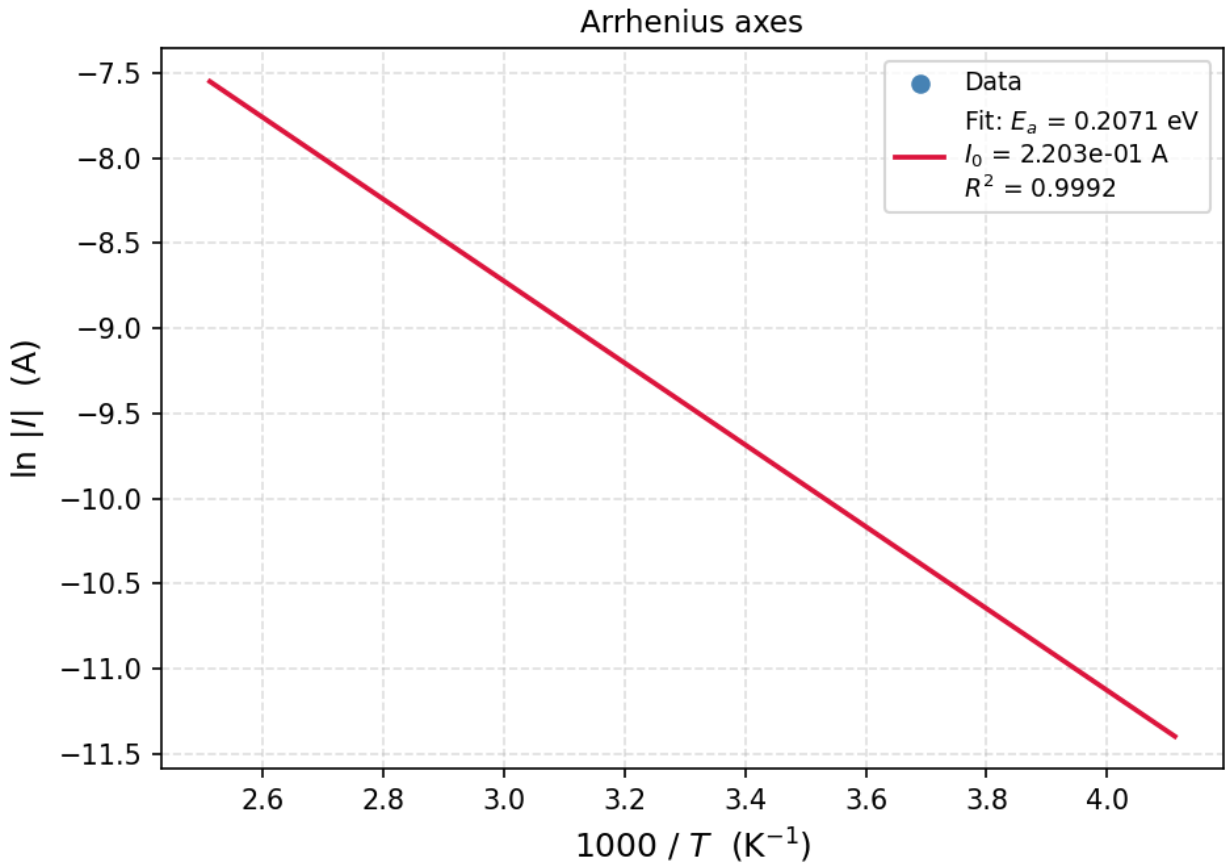
Python Script

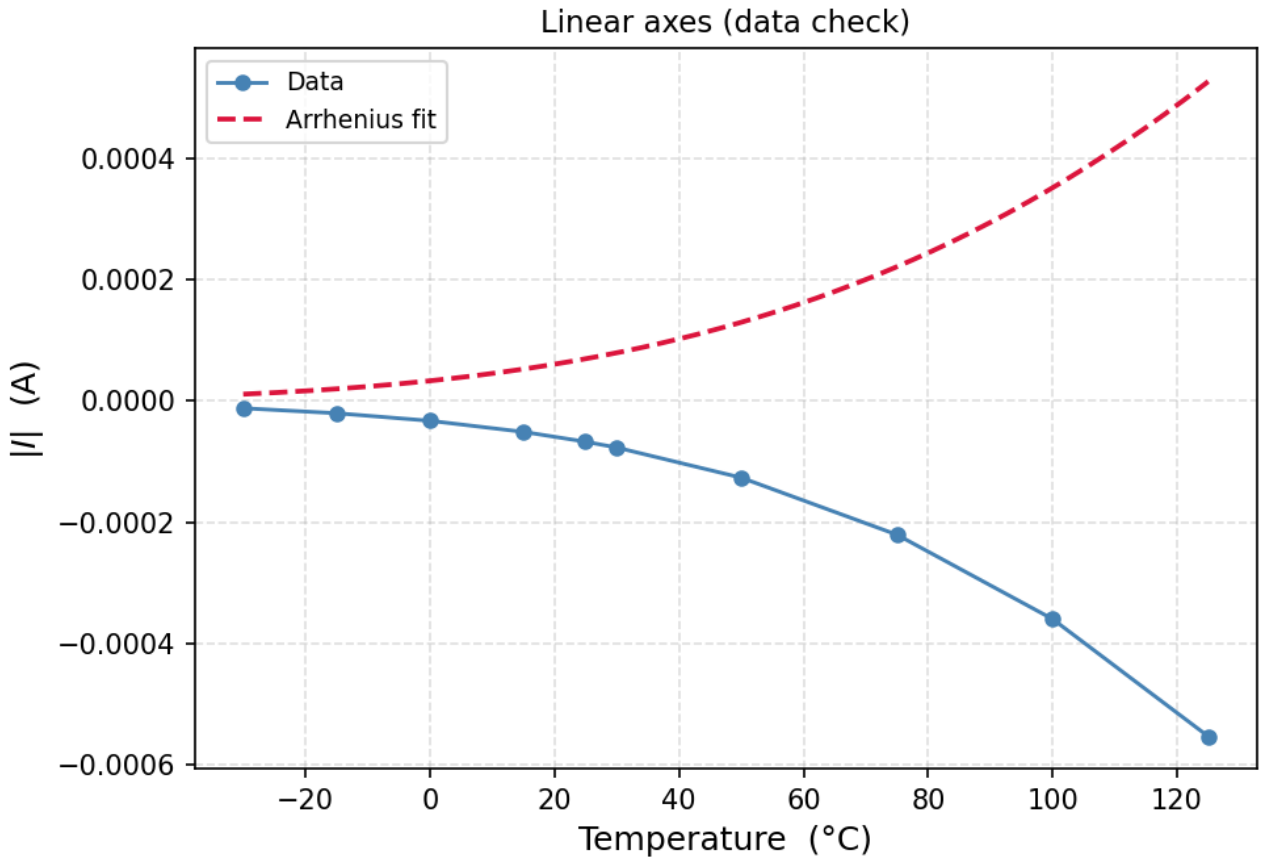
- **Based on ‘IvsT_<node>_T<temp>_VHV<value>.csv’**
  - Temp such as -15.0000 or 15.0000
  - VHV such as 100 or 600
- **Parses the filename**
- **Compute the Arrhenius fit**

```
temps_K   = np.array(temps_C) + 273.15
currents  = np.array(currents_A)

# Keep only finite, non-zero currents (use |I| so reverse-bias negatives are included)
mask = np.isfinite(currents) & (currents != 0) & np.isfinite(temps_K)
if mask.sum() < 2:
    return None, None, None, None, None

inv_T = 1.0 / temps_K[mask]
ln_I  = np.log(np.abs(currents[mask]))

slope, intercept, r, _, _ = linregress(inv_T, ln_I)
Ea_eV     = -slope * kB_eV          # slope = -Ea/kB  =>  Ea = -slope*kB
I0        = np.exp(intercept)
r_squared = r ** 2

return Ea_eV, I0, r_squared, inv_T, ln_I
```


Activation Energy vs Bias Voltage
Forward bias
Reverse bias
Activation Energy E_a (eV)
0.2075
0.2070
0.2065
0.2060
0.2055
0.2050
0.2045
0.2040
−600
−400
−200
0
200
400
600
Bias Voltage (V)
1.000
0.975
0.950
0.925
0.900
0.875
0.850
0.825
0.800
R^2 of Arrhenius fit

600V_Temp_Reverse (bias = -600.0 V)





600V_Temp (bias = +600.0 V)