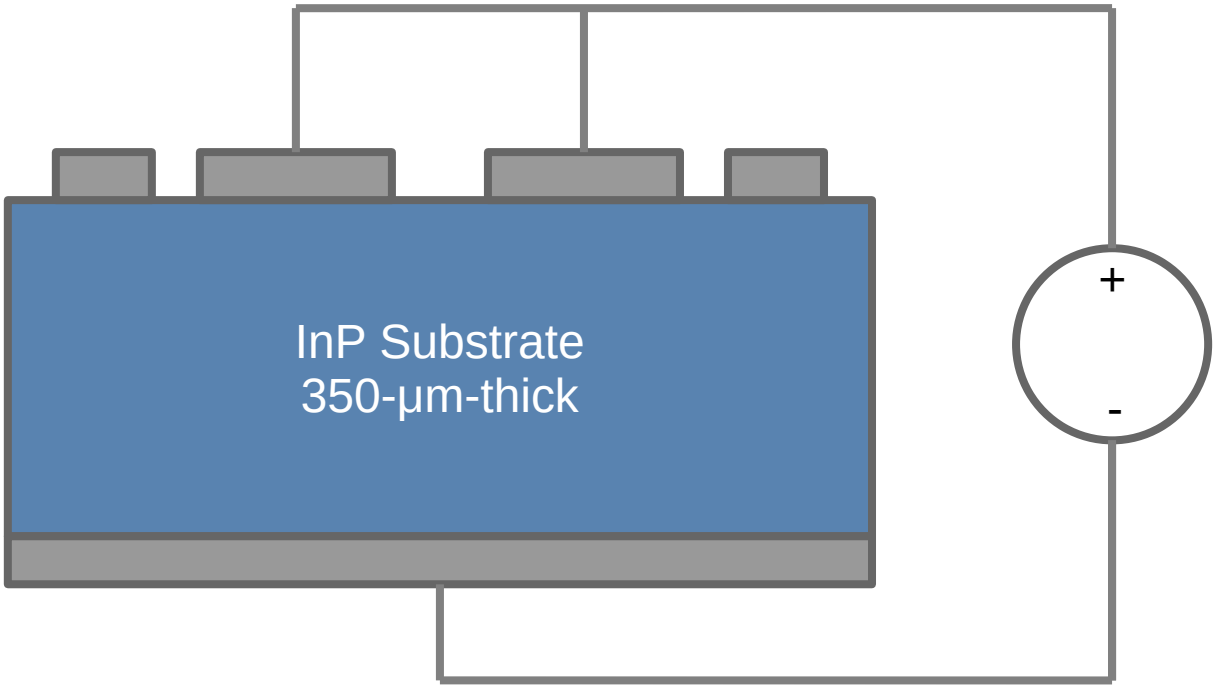
InP
TCAD Material Simulation
Update

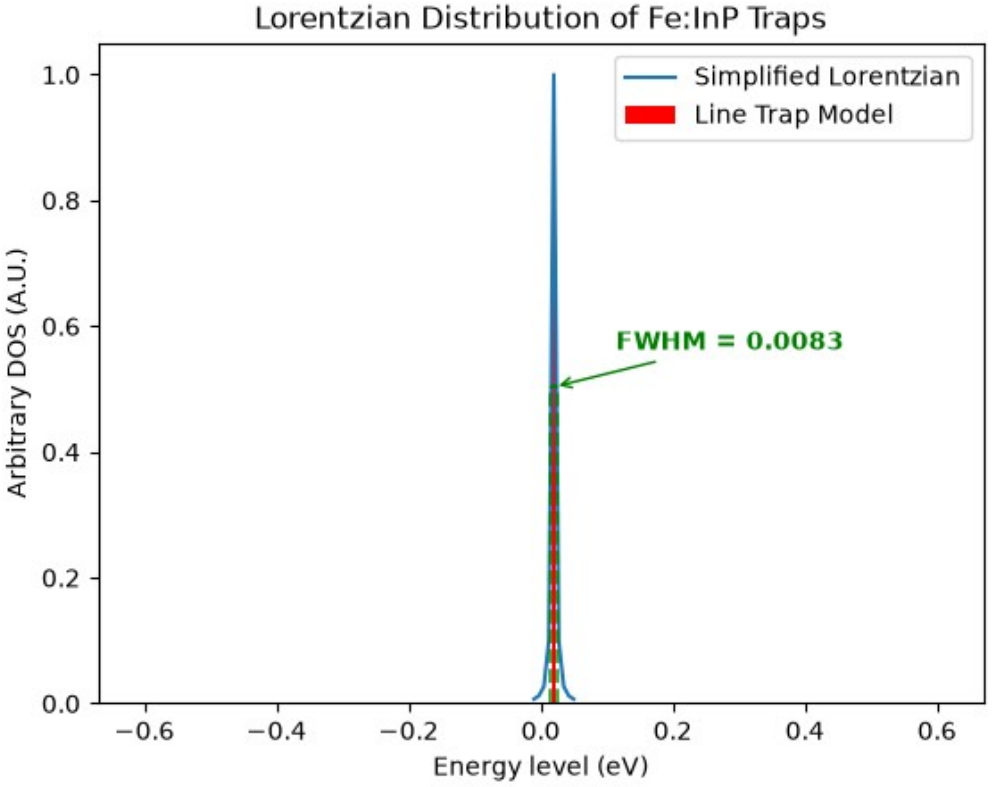
Nov. 6th 2026

Taylor Shin

Simulation Overview



Simulation Efforts So far

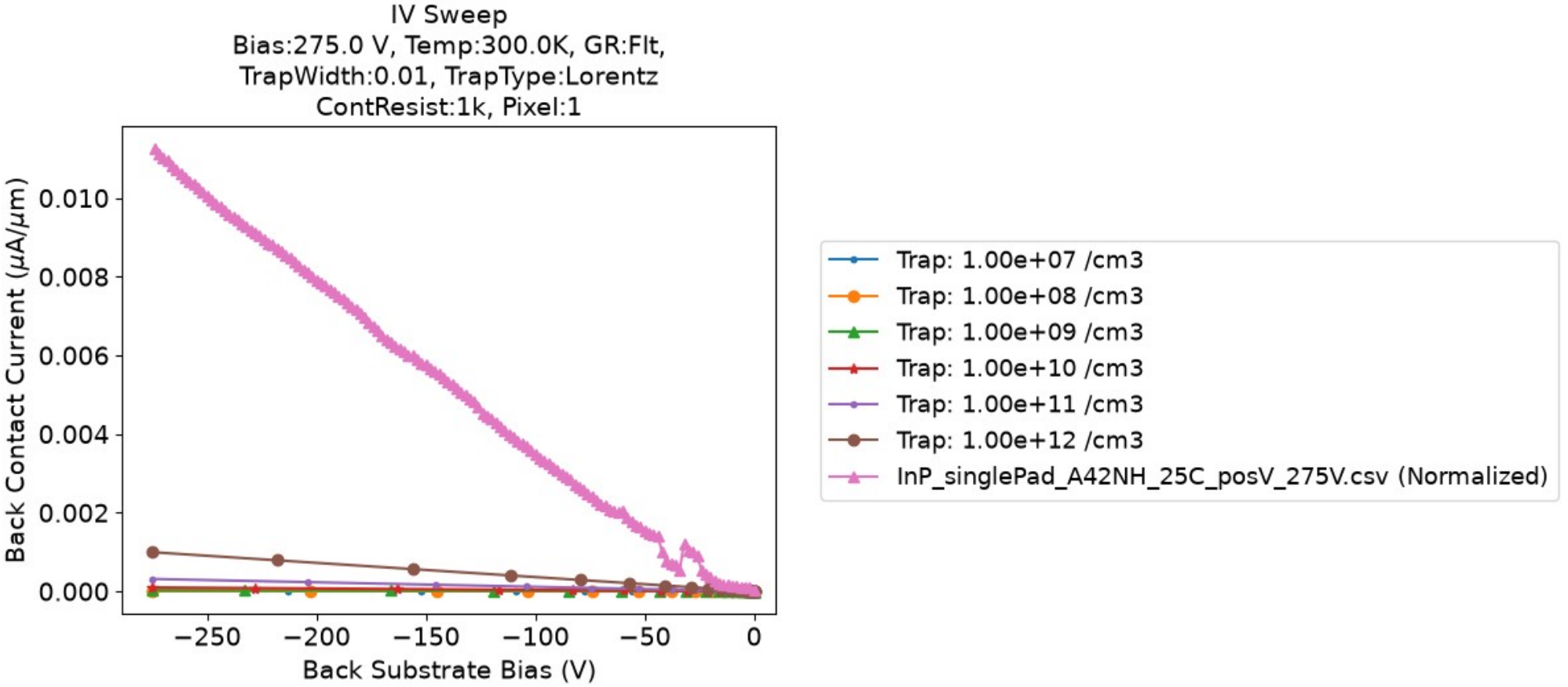


- Base Trap Profile: Lorentzian.
- Contact Resistances kept under 1k at most.
- The Lorentzian width(Γ) was spanned from 0.01 to 1.0 to find reasonable matching point.

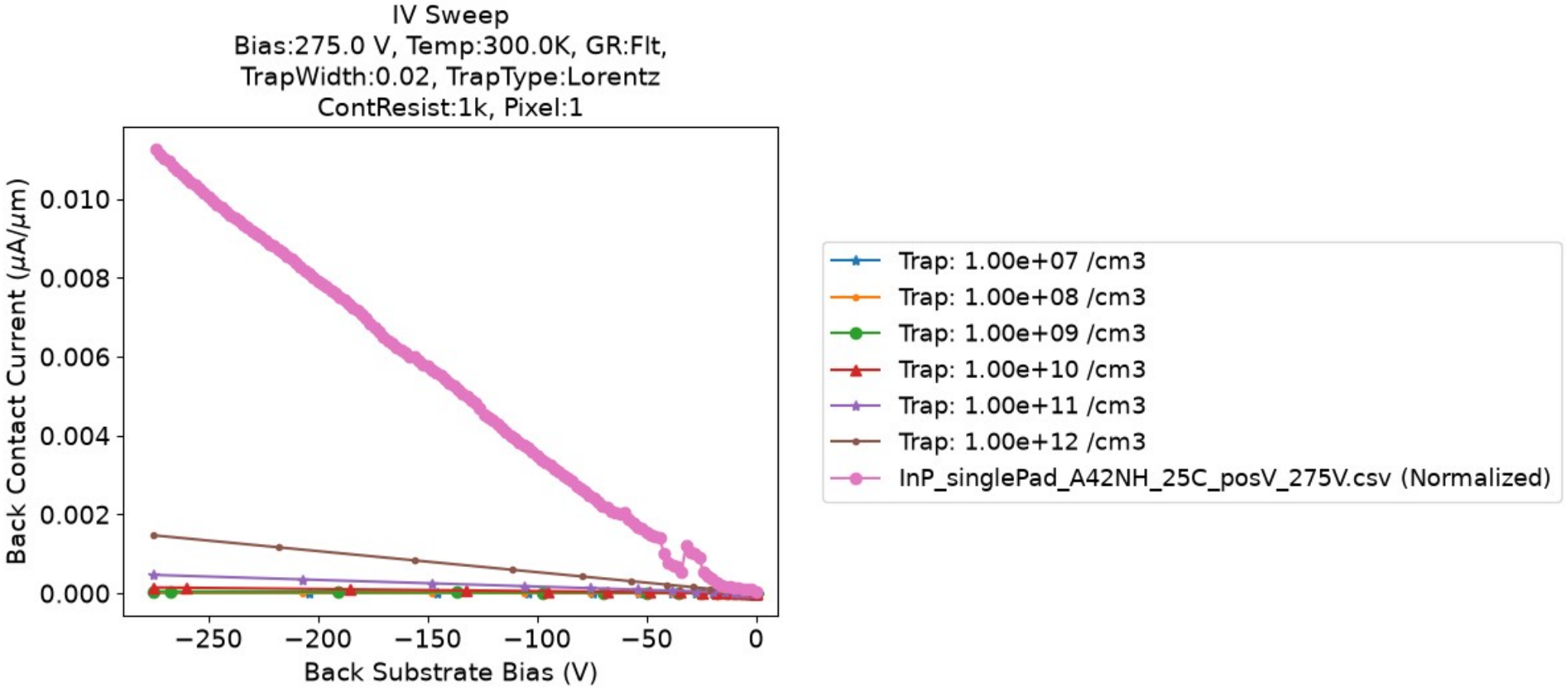
$$L(x) = \frac{1}{\pi} \frac{\frac{1}{2}\Gamma}{(x - x_0)^2 + \left(\frac{1}{2}\Gamma\right)^2},$$

Contact Resistance: 1k Ohm

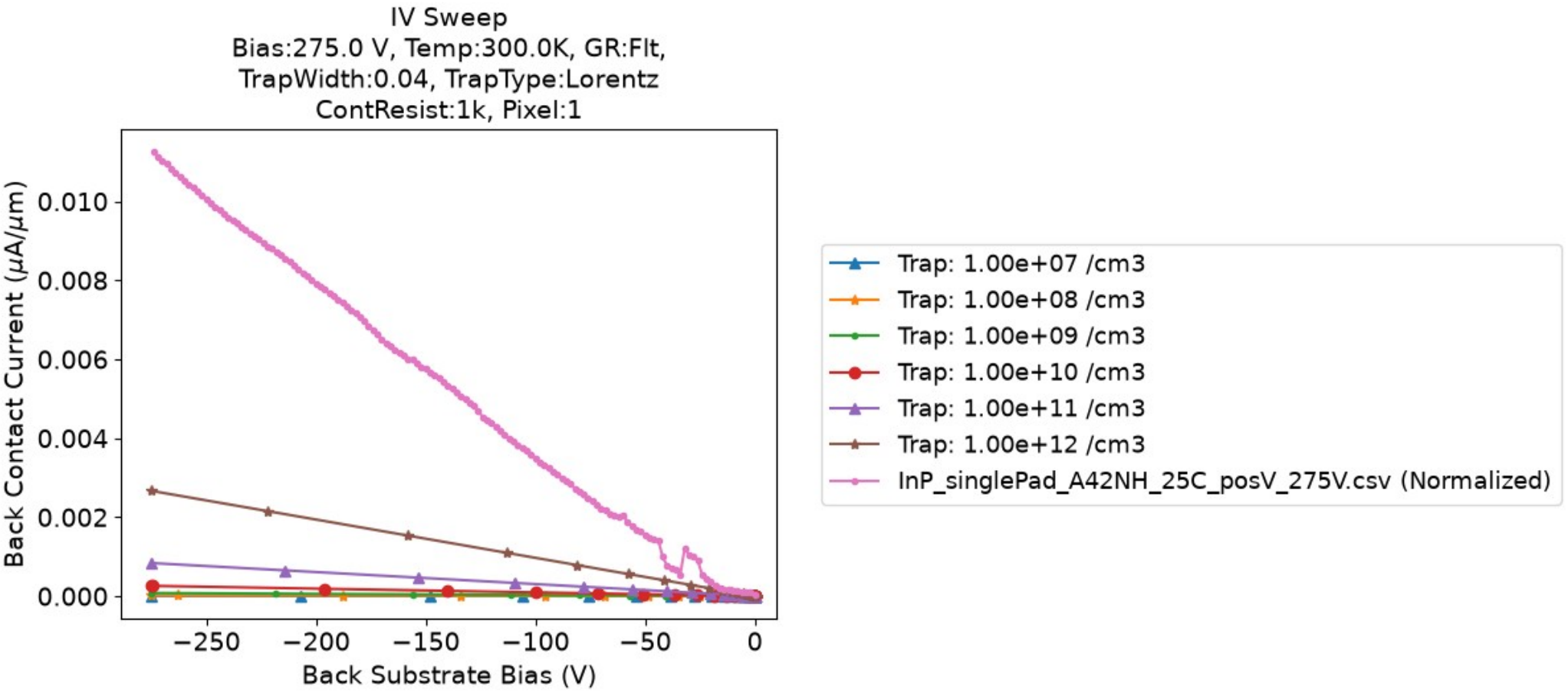
Cont R: 1k – Width 0.01 eV



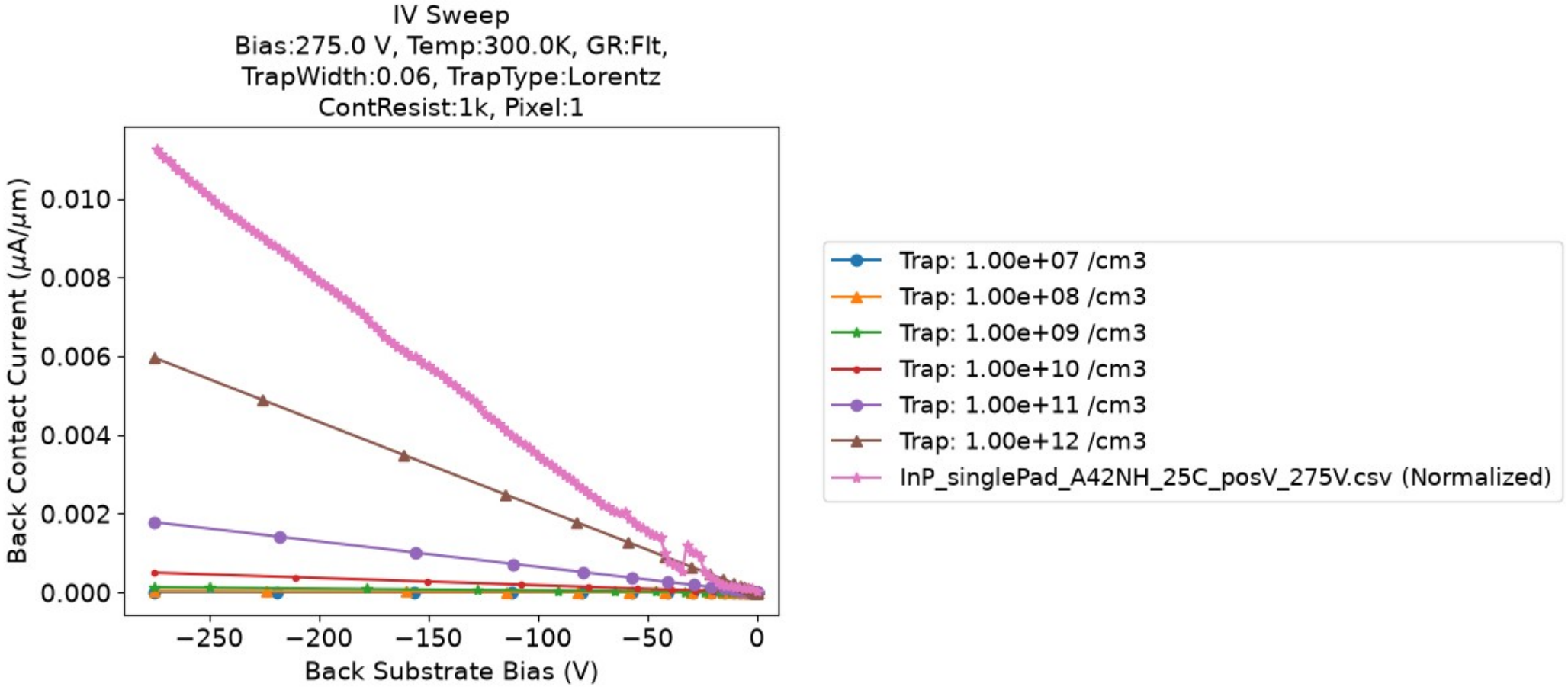
Cont R: 1k – Width 0.02 eV



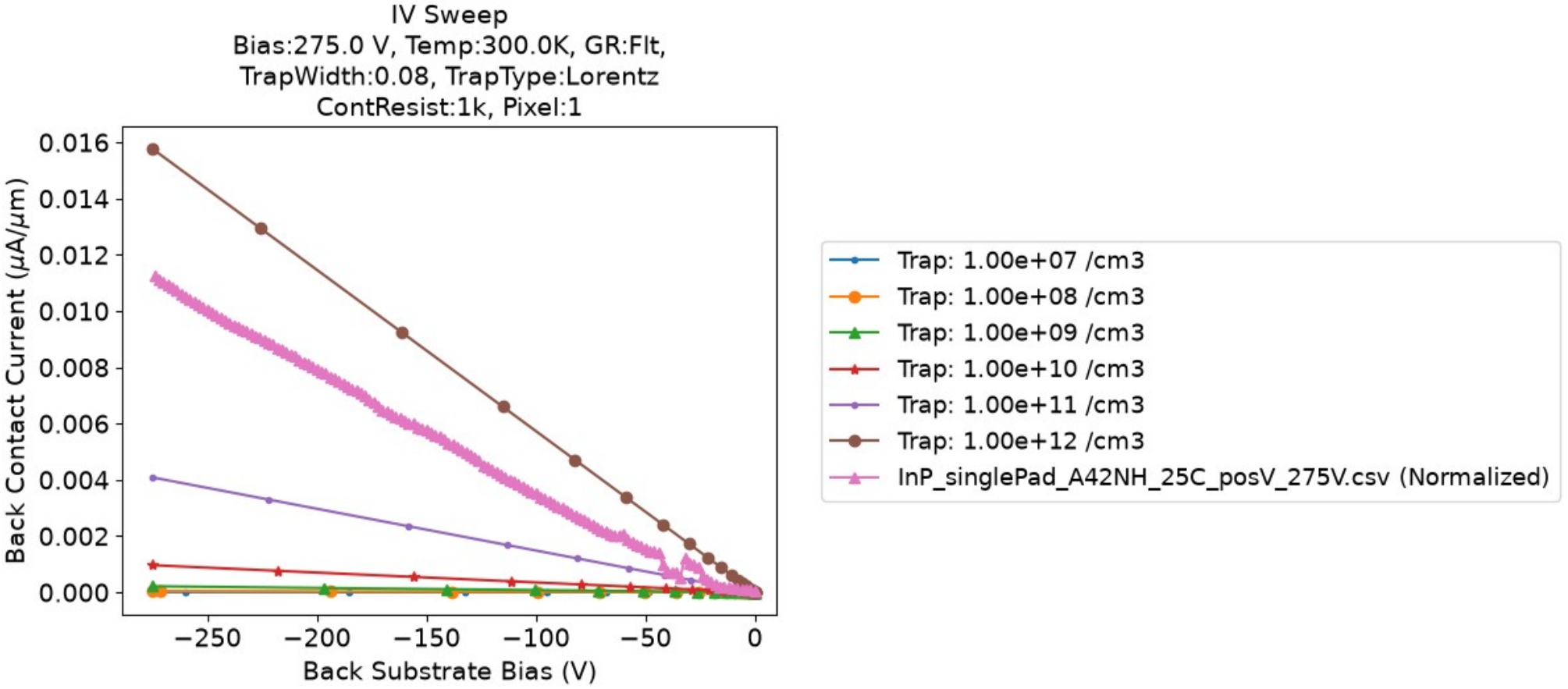
Cont R: 1k – Width 0.04 eV



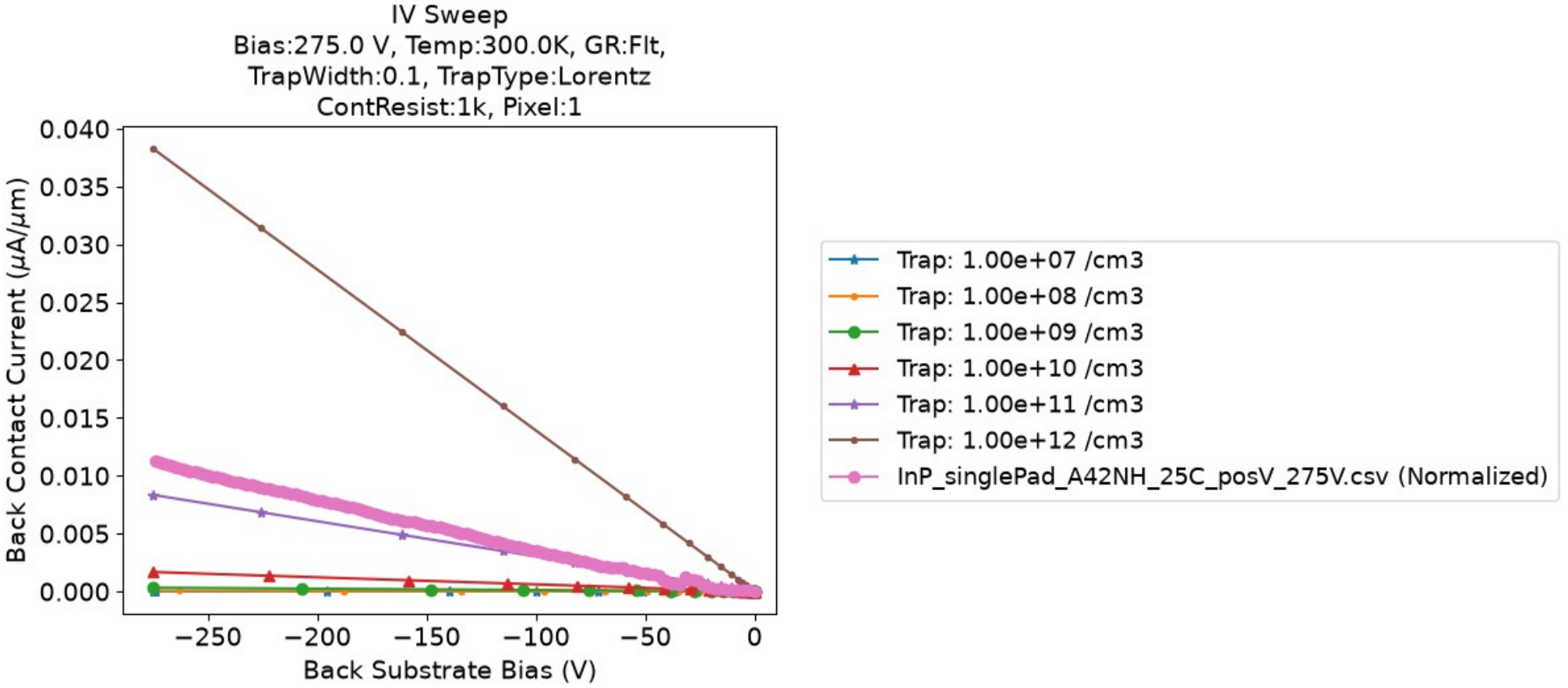
Cont R: 1k – Width 0.06 eV



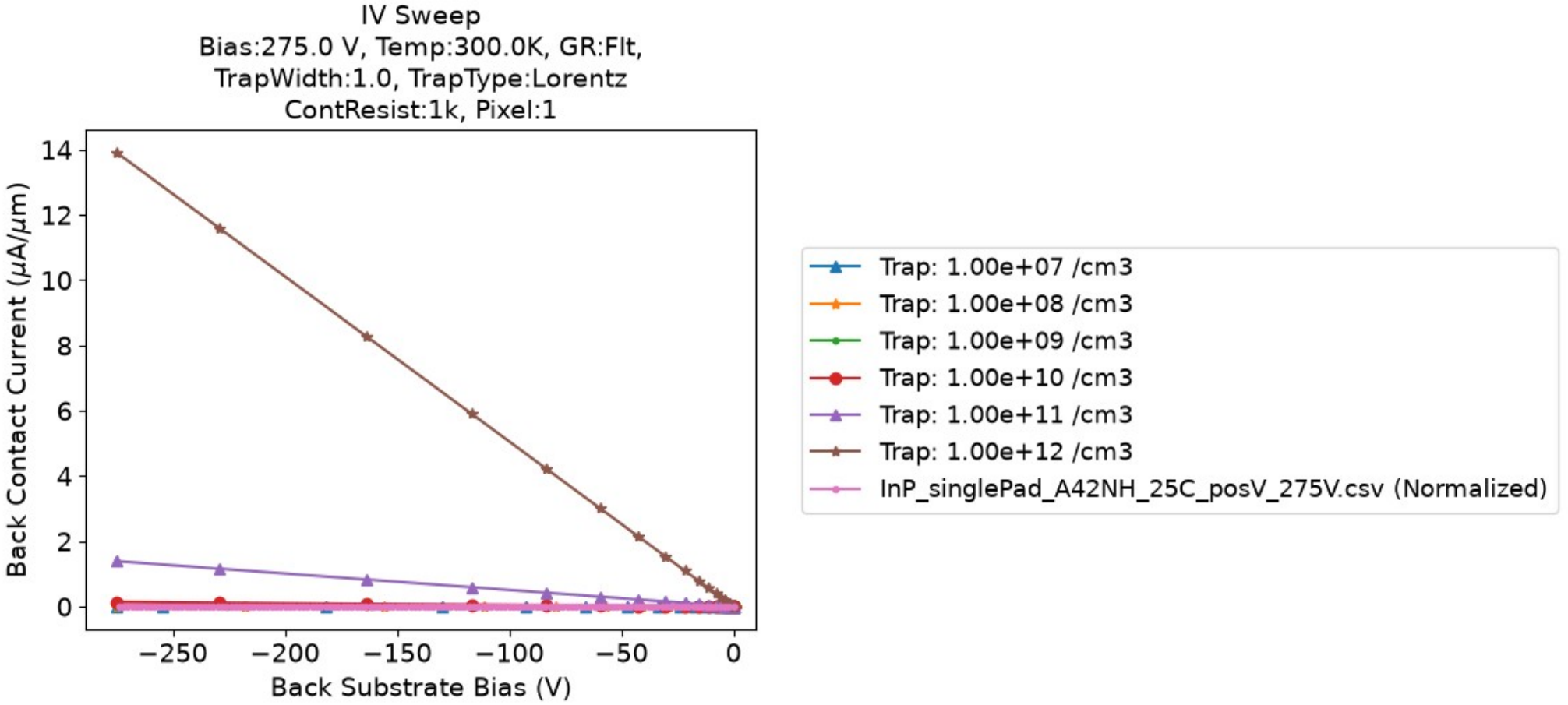
Cont R: 1k – Width 0.08 eV



Cont R: 1k – Width 0.1 eV

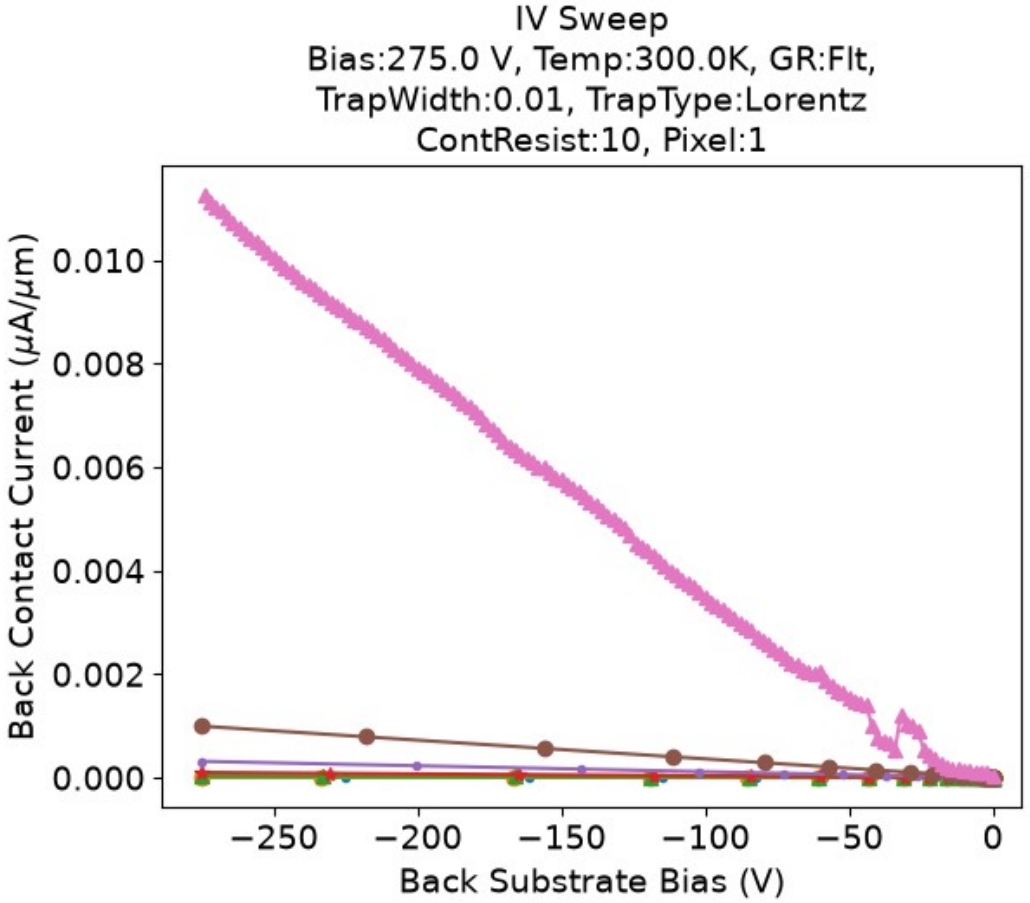


Cont R: 1k – Width 1.0 eV

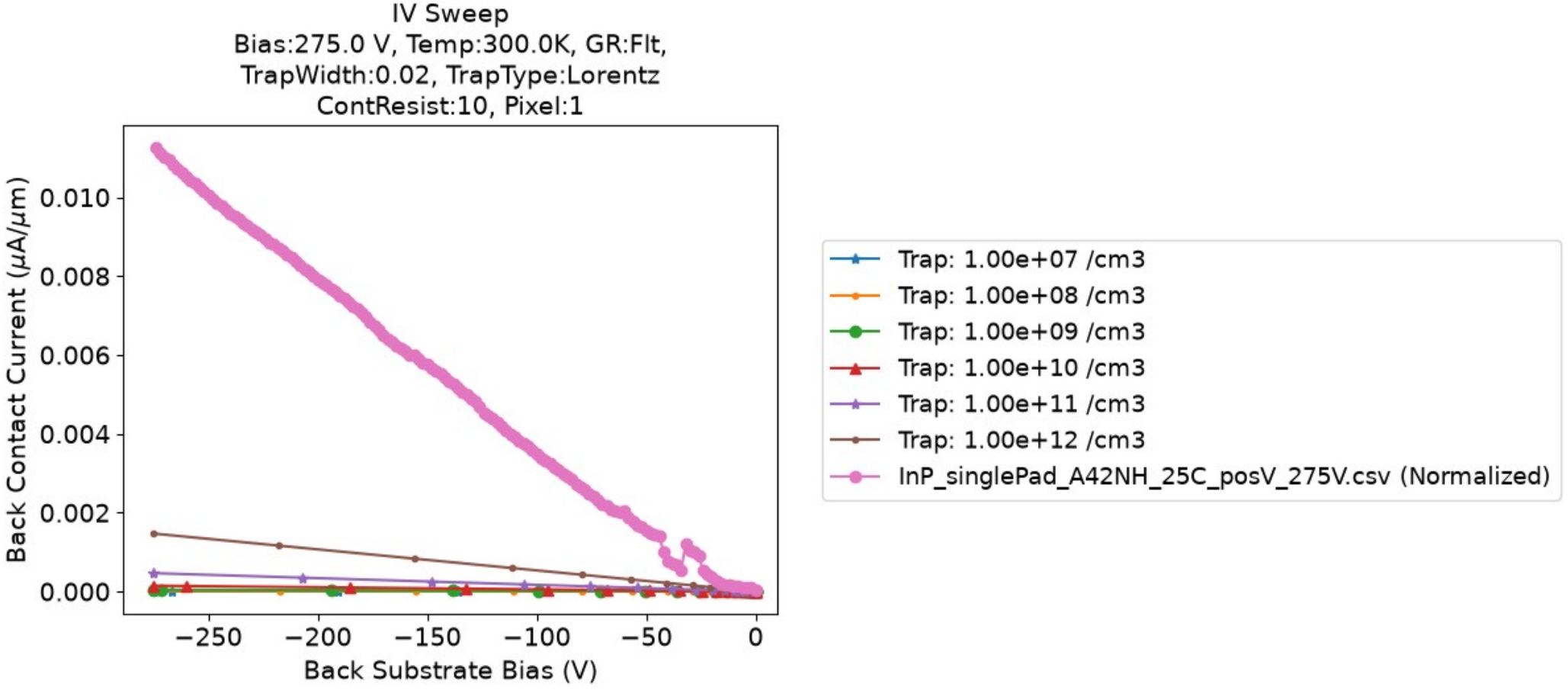


Contact Resistance: 10 Ohm

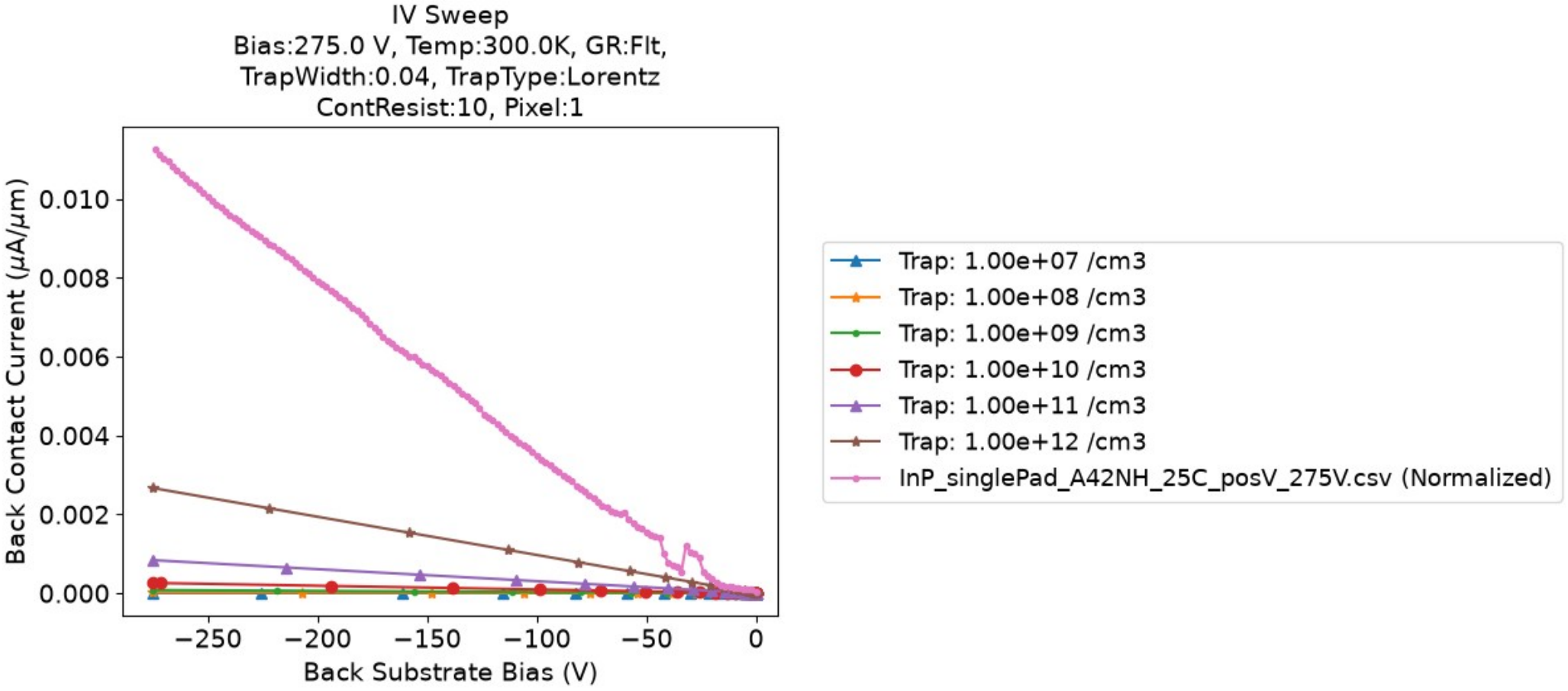
Cont R: 10 – Width 0.01 eV



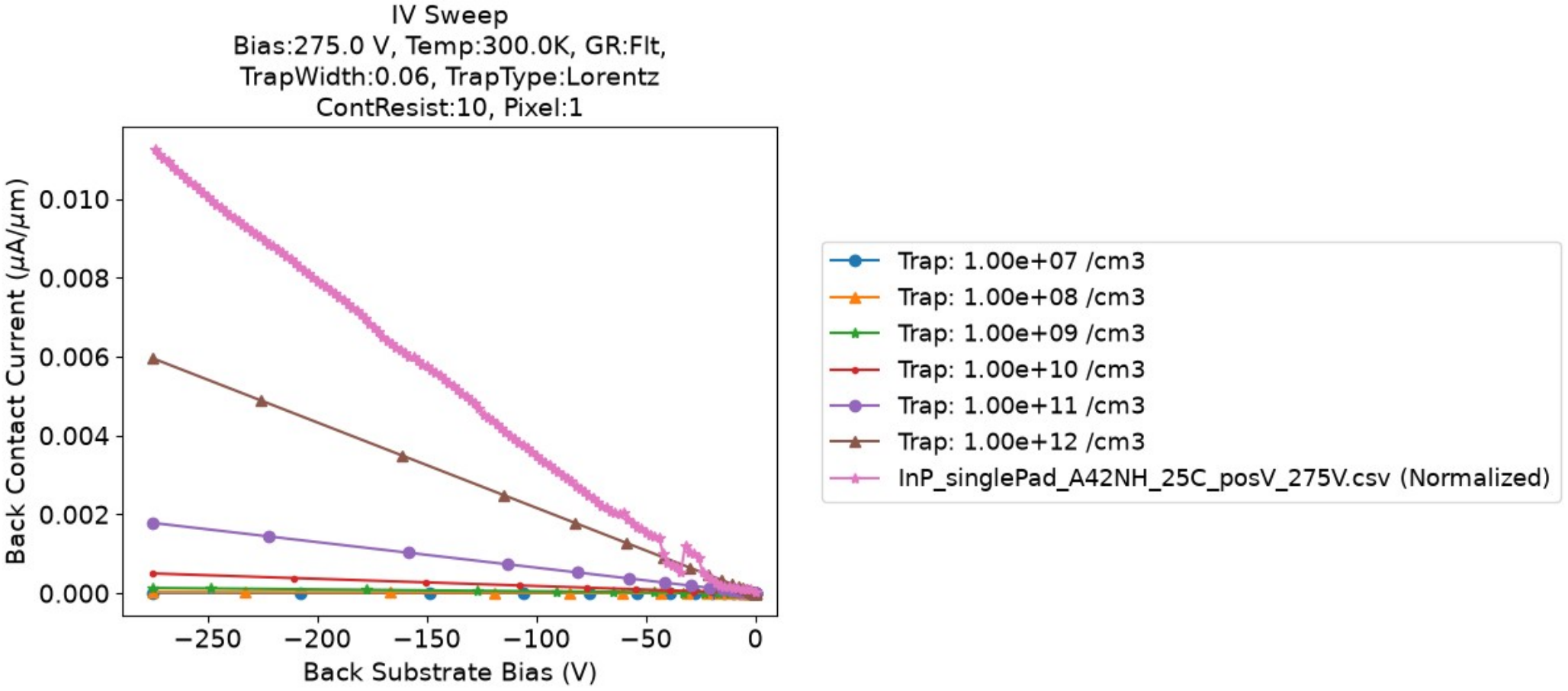
Cont R: 10 – Width 0.02 eV



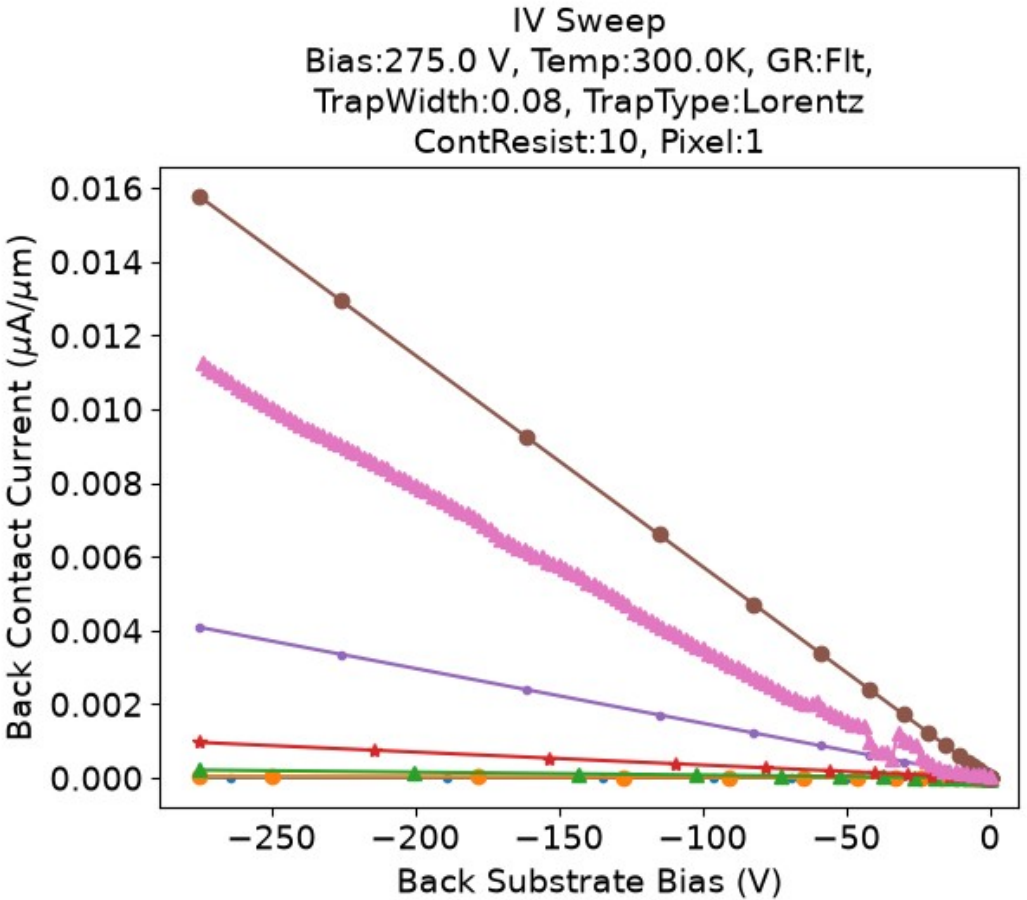
Cont R: 10 – Width 0.04 eV



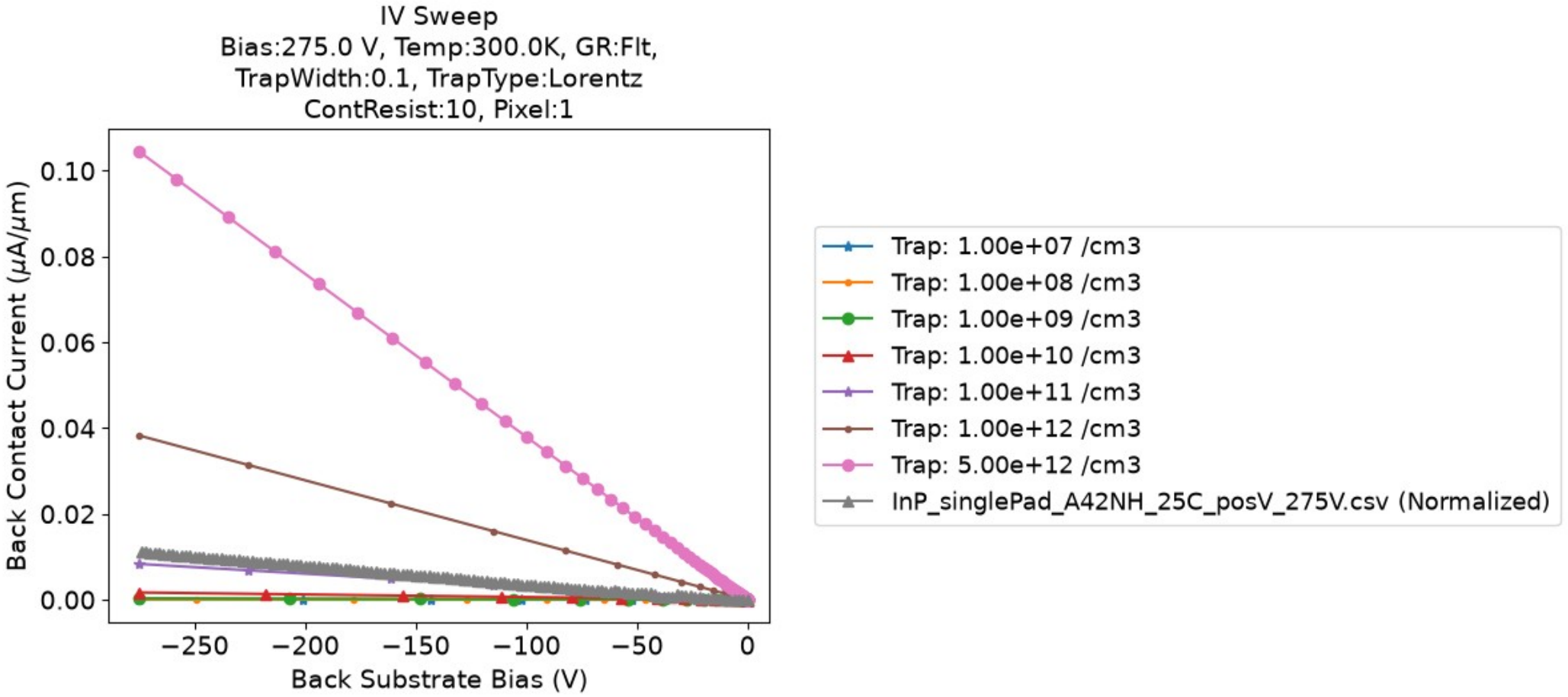
Cont R: 10 – Width 0.06 eV



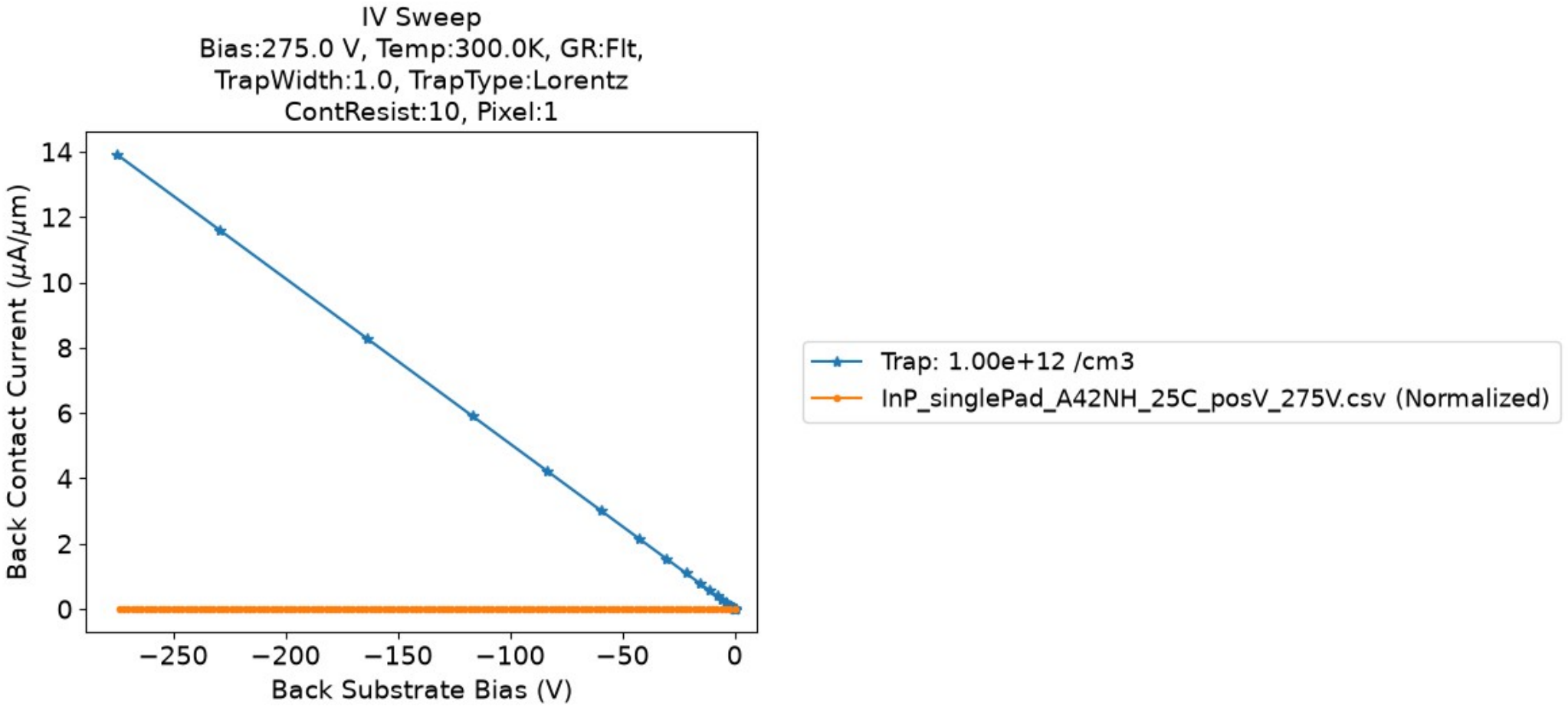
Cont R: 10 – Width 0.08 eV



Cont R: 10 – Width 0.1 eV



Cont R: 10 – Width 1.0 eV



Conclusions

- 10 or 1000 Ohm contact resistance does not really cause any difference in terms of dark current.
- The Lorentzian model with Γ of 0.06 or 0.08 eV seems to be reasonable start point.
  - Assuming the peak trap density will be sitting at $1\mathrm{e}11 \sim 1\mathrm{e}12$ $/\mathrm{cm}^3$ range.
- Still, even though low contact resistance, temperature dependence was not observed. This is quite strange → Temperature equation may not be working at all.
- TCAD simulation can still be used on electric field, transient investigation, etc.