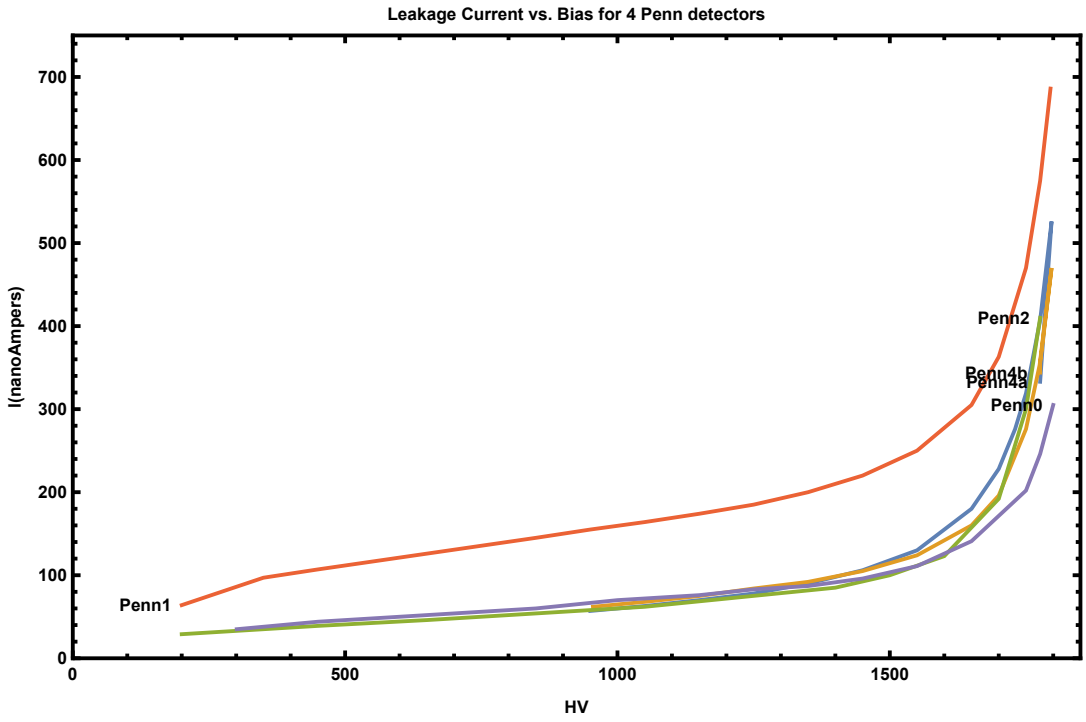
Some Tests on Penn4

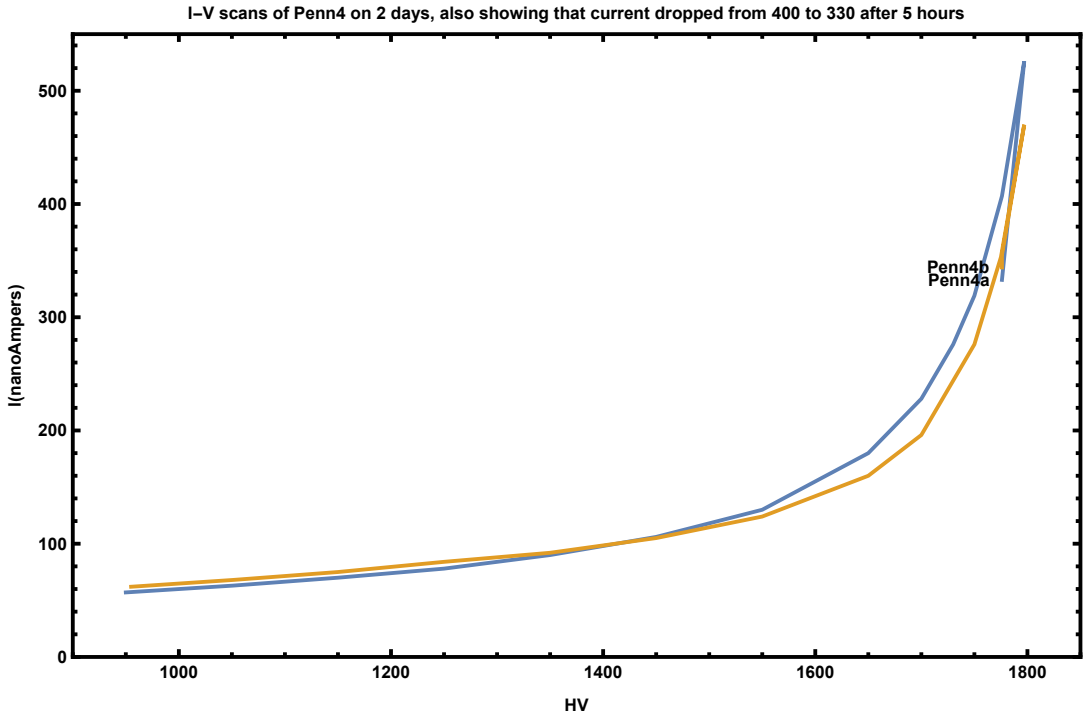
Sebastian White, Dec. 15, 2017

Following some tests of the new package with Mitch and Manny at Penn on Dec. 1 it was obvious that this detector was requiring some “burn in”. We took the bias up to ~1500V and convinced ourselves that we saw signals from a source.
However as we raised the bias we saw signs of large noise pulses that seemed to settle down with time.
I’d like to study this more systematically but, in the meantime I thought it would be good to look at Penn4 in comparison with similarly packaged models by Bert to see if Penn4 was special. Since he tried coating the edges in epoxy it could be more stable and have less surface leakage.
The measurements were done over 2 days in the SSD lab- probably about 55 deg. F. In fact, Penn4 seems pretty typical. The I-V curves on 2 different days were reproducible and on one day I left the bias at 1776V and over 5 hrs the leakage current dropped from 407 to 330 nanoAmps. So there is some evidence for relaxation of the leakage current. Matteo has noticed the same effect by logging the current of the iSeg.
One thing you can see from the exercise below is that if you take two very different devices and subtract a linear (surface leakage) term from them the residual I-V looks pretty similar.
Because of amplifier instabilities I wasn’t able to do systematic measurements on Penn4 with sources/laser but maybe this would be best done with Mitch and Manny in the next weeks.

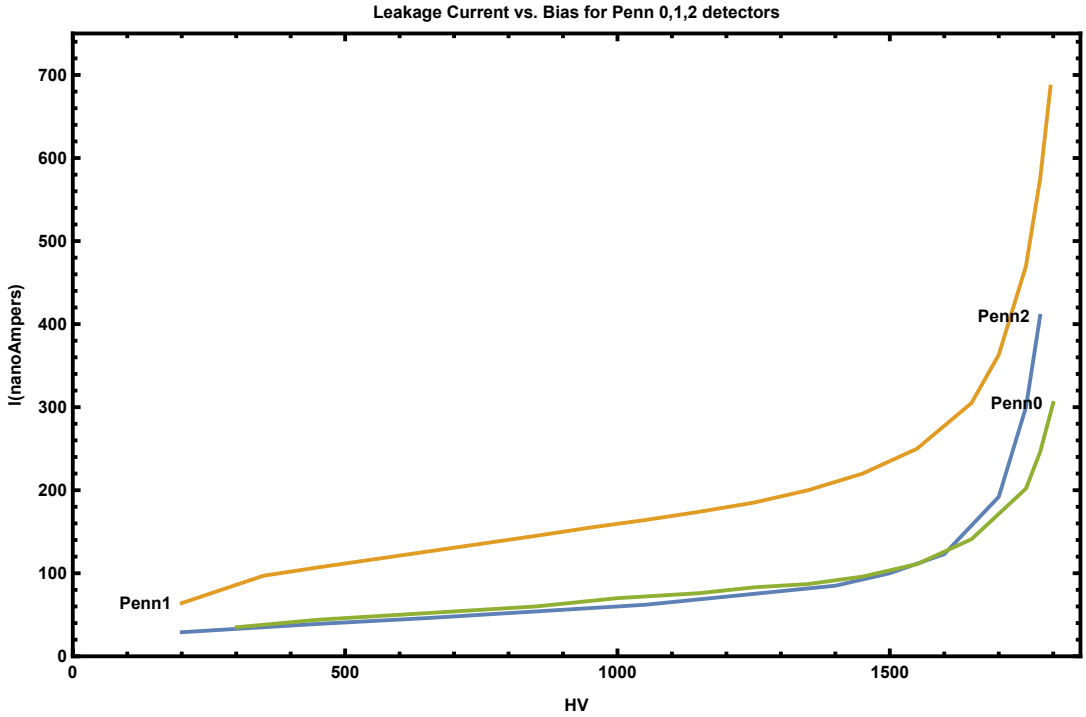
Out[79]=



Out[132]=



Out[95]=



In[126]:=
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penn1Icorr = Table[(penn1I[[i]] - 0.095 * penn1HV[[i]] - 60), {i, 17}];
penn2Icorr = Table[(penn2I[[i]] - 0.035 * penn2HV[[i]] - 20), {i, 11}];
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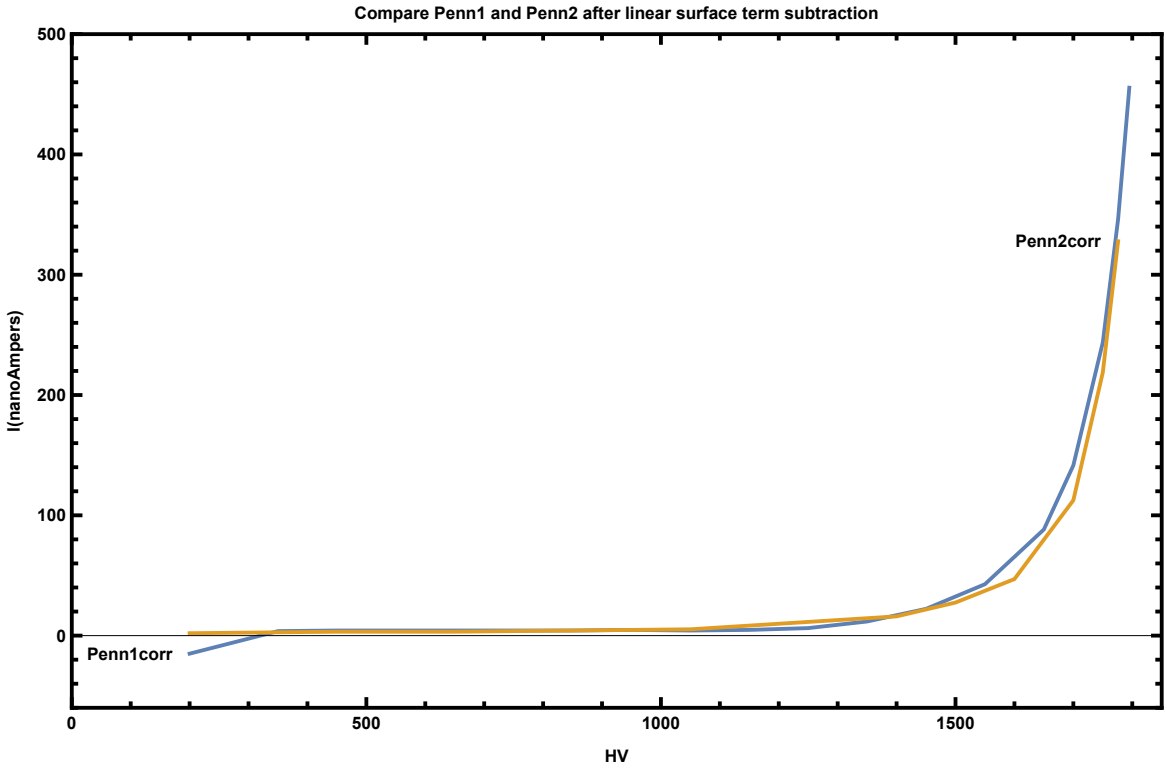
Out[130]=


Compare Penn1 and Penn2 after linear surface term subtraction
I(nanoAmpers)
HV
Penn2corr
Penn1corr
500
400
300
200
100
0
0
500
1000
1500