Some Exercises with Rules of Thumb/Scaling on Si w. Gain

S. White, May 14, 2017

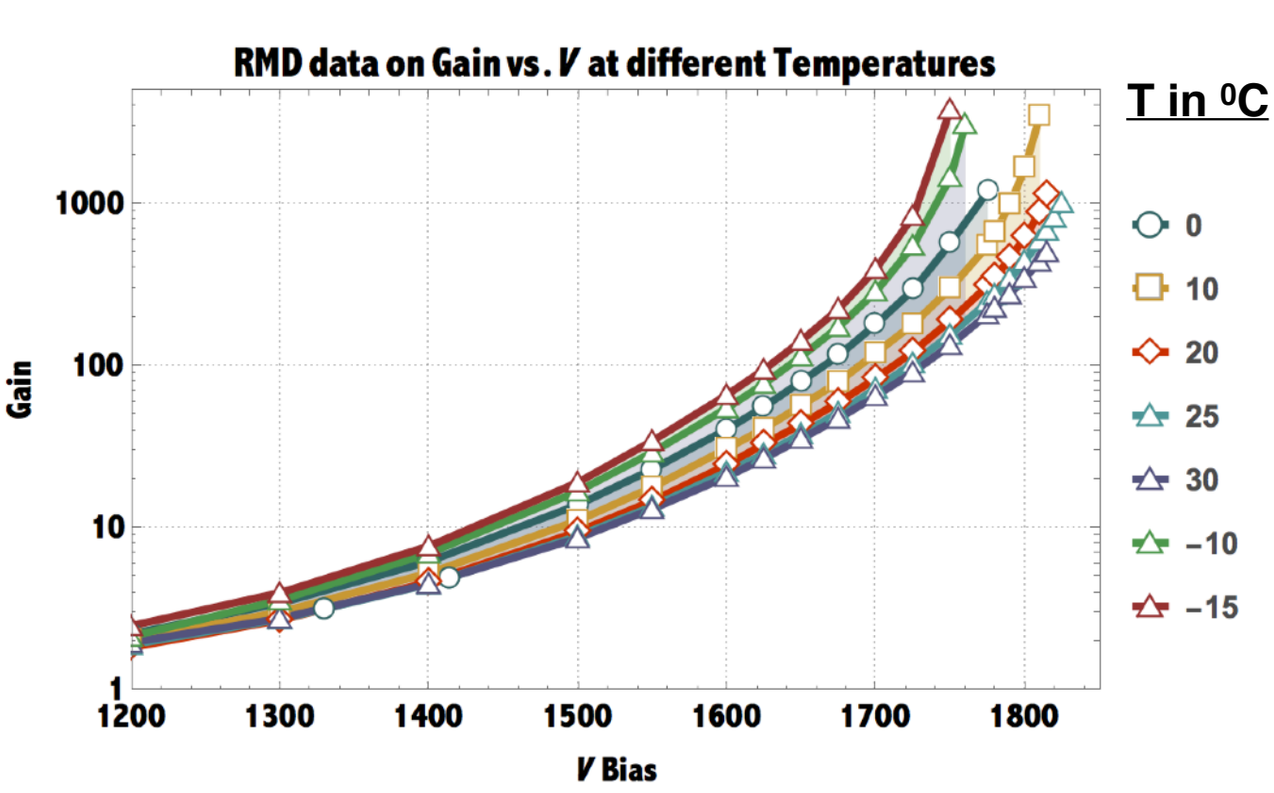
In the following I do some exercises, using data from Mickel, to display some of the lore that is familiar in the Si community and a little less so in discussions about the RMD devices.

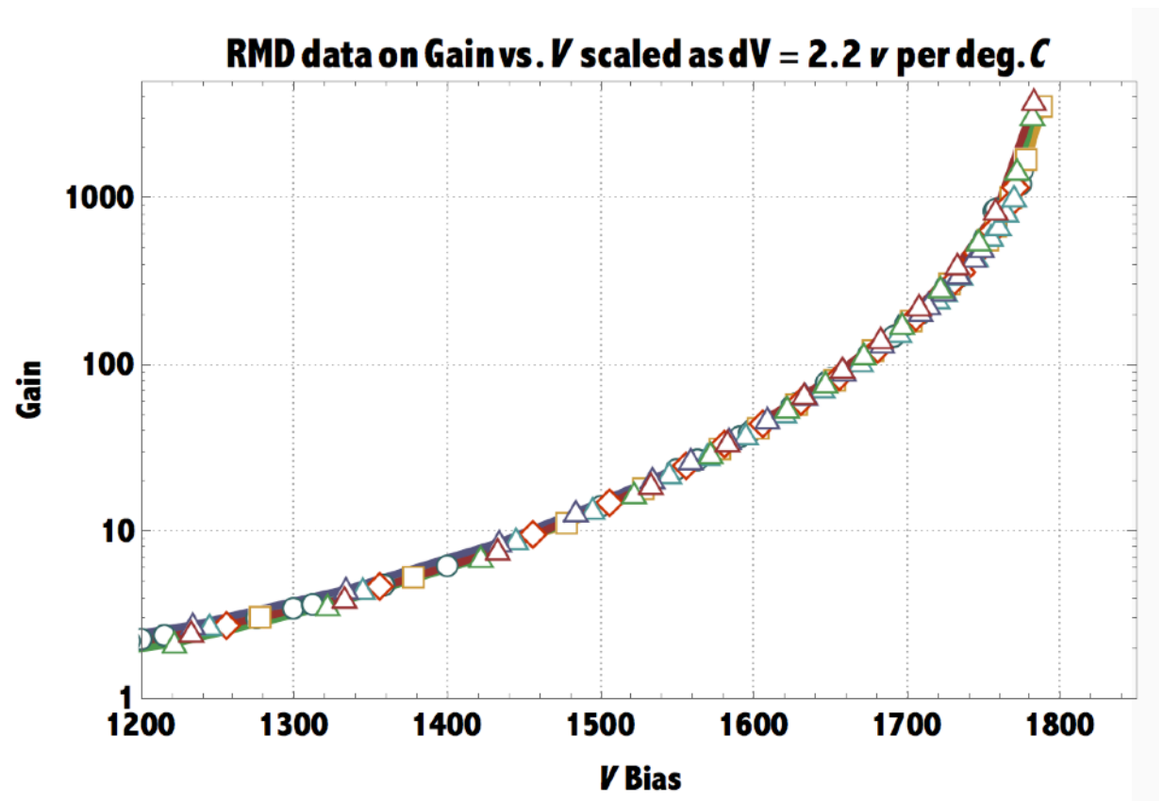
I find that the dependence of Voltage for fixed gain vs. temperature (which is useful for stabilizing APDs and can be fitted to performance to cryo temperatures) fits remarkably well for all values of gain.

At room temperature, the leakage current can be fit with a simple form linear for the Surface leakage and proportional to gain for bulk.

In any case leakage currents at fixed Gain scale according to the rule 7deg. C-> factor of 2 in leakage.

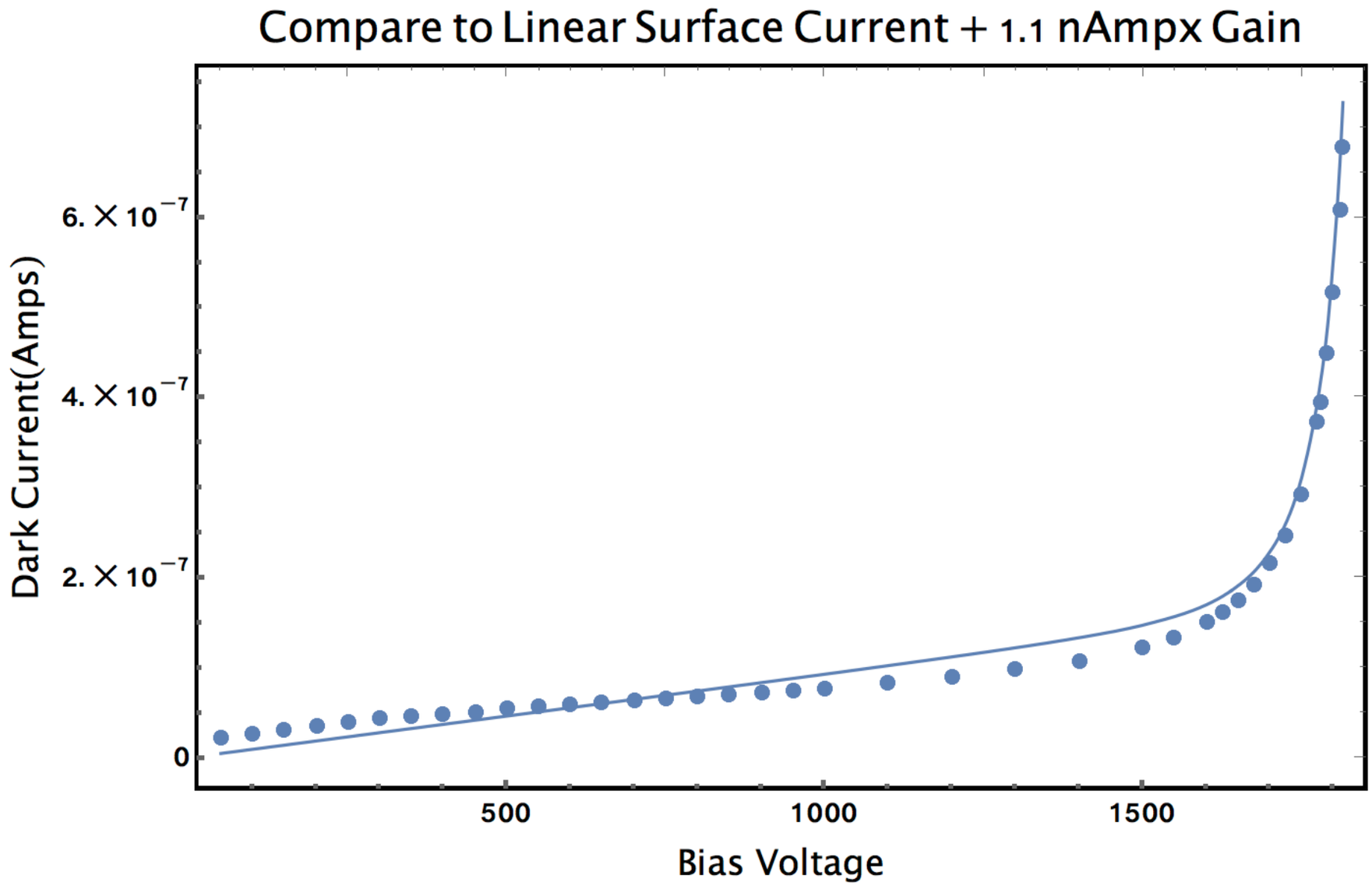
Rescaling V for fixed Gain





what is the theory behind this?

Simple Ids,Idb model



30 deg. C data, Ids-> 165nA at 1800 v

Leakage vs. Temp