P3 Workshop @ JLab October 2016
Notes
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1. BNL 700MHz SRF gun uses a cathode cooled to 77 K, Erdong did observe QE dropping to about 1%, same as Mamun's observations. He points out that at 2K the QE will be dominated by loss of conductivity. Their 112MHZ gun (WiFEL style) uses a cathode at room temperature b/c it is thermally isolated from the SRF gun, so he is not worried about the QE at 2 K.

2. Jochen said they never measured CsTe QE at 2K as a systematic study, but they did not observe significant drop. He is very very afraid of using again a semiconductor cathode in the HZDR style SRF gun, the last one 'exploded' and contaminated the cavity.

3. We have to research papers on the band gap vs T, below 55 K there is almost no change, but again, this will not ve relevant since QE will be dominated by loss of conductivity, so we need to search papers for 'semiconductor conductivity vs T", there seems to be a lot of literature on this. If there is loss of conductivity at 77 K, we can tell by measuring QE vs laser power, if the current saturates at 77K, but it does not at TR. Erdong measured this and saw no evidence of conductivity loss. This can be checked also with equations from papers.

4. Andreas Schroeder explained the QE vs wavelength spectrum that Chio and Mamun obtained. He says the 'bump' is characteristic of CsK2Sb, and I could see the same spectrum in Theo's and in Mengjia's (BNL) talks. The change in slope is due to contributions from electrons in another band (near 2 eV) to photoemission. It is directly related to the band structure and density of states, we need to search papers for these. We could also (eventually) answer

if we are indeed making CsK2Sb or just Cs3Sb by adding a Cs effusion source. We grow two types of cathodes and compare their QE spectra. Also, let's revisit the data that Mamun took with dry ice and cold water, the fact that the spectrum looks 'erratic' indicates that the band structure has been modified by 'crap' on the surface. Andreas said he'd be happy to look at our draft manuscript.

5. It is clear for me now, that the reason QE decreases with lower temperature is because the lattice shrinks, and the bands have to re-organize, leading to larger energy band gaps.

6. We could use Kevin Jensen's equations to fit our data, since those are based on Fowler's. Erdong's fits his Qe vs lambda data plugging those equation in MontCarlo.