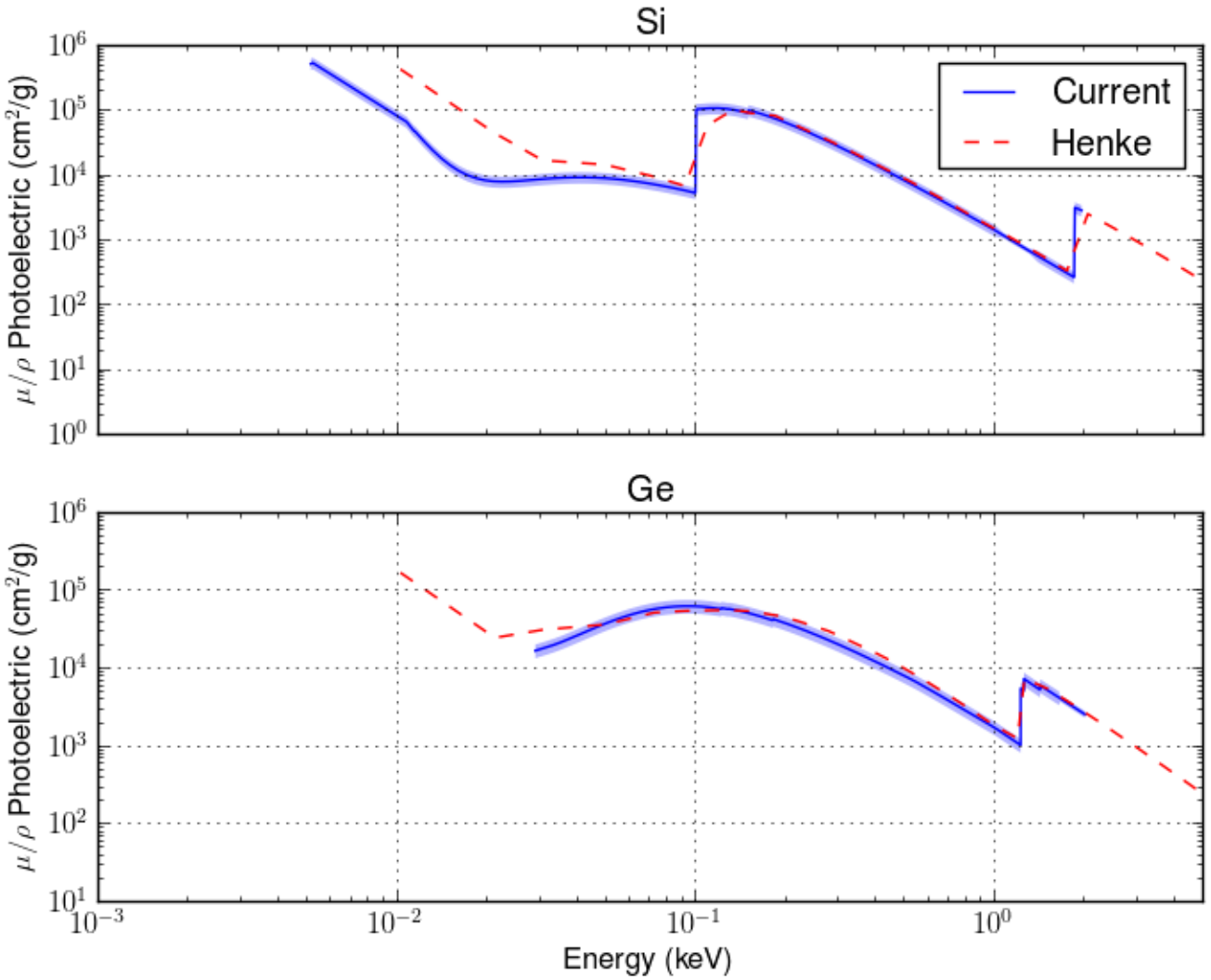
Weekly Meeting

October 18 2017

Dark Photon

I’m still concerned about data below 50eV – both Henke and NIST note ignorance to condensed matter effects



Dark Photon

- Hit the jackpot in terms of experimental data
- Found a preliminary publication of the 1993 Henke data
- “The photoabsorption data used include those described in the Lockheed and DOE listings of research abstracts for the past then years and those which have been recently added to the comprehensive NBS Measured Data Base”

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- From NBS the compares experimental data to Henke data and theoretical calculations:

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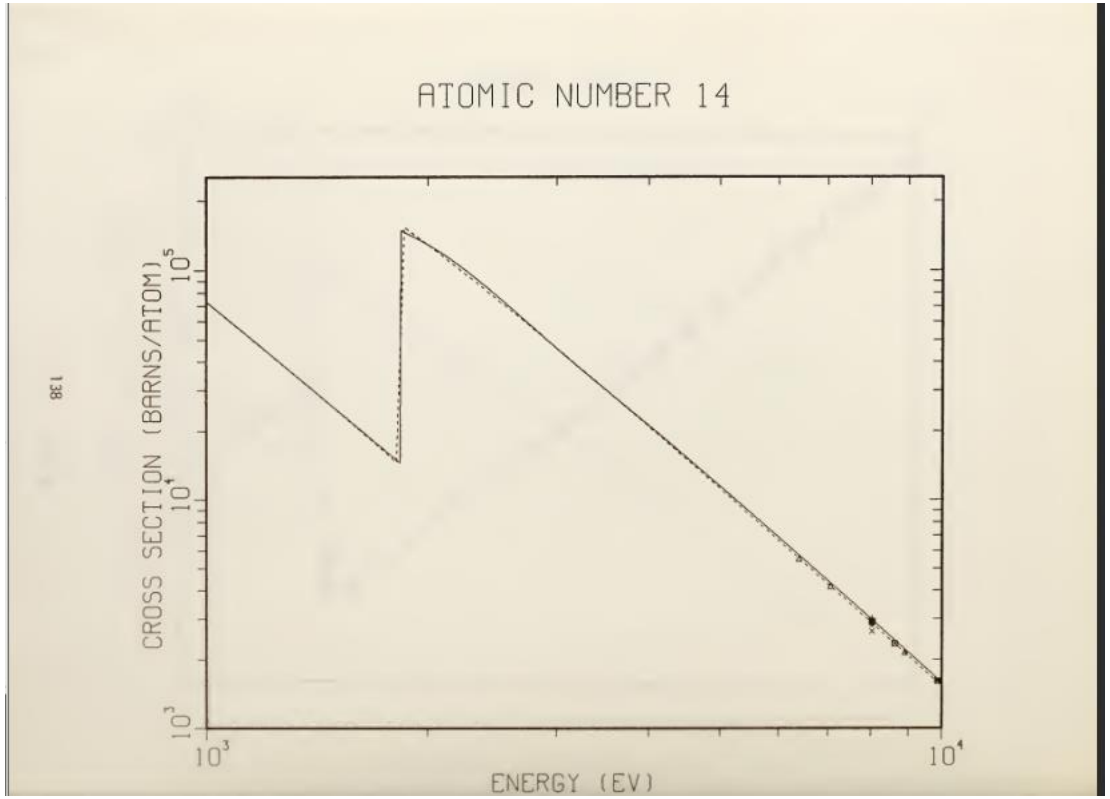
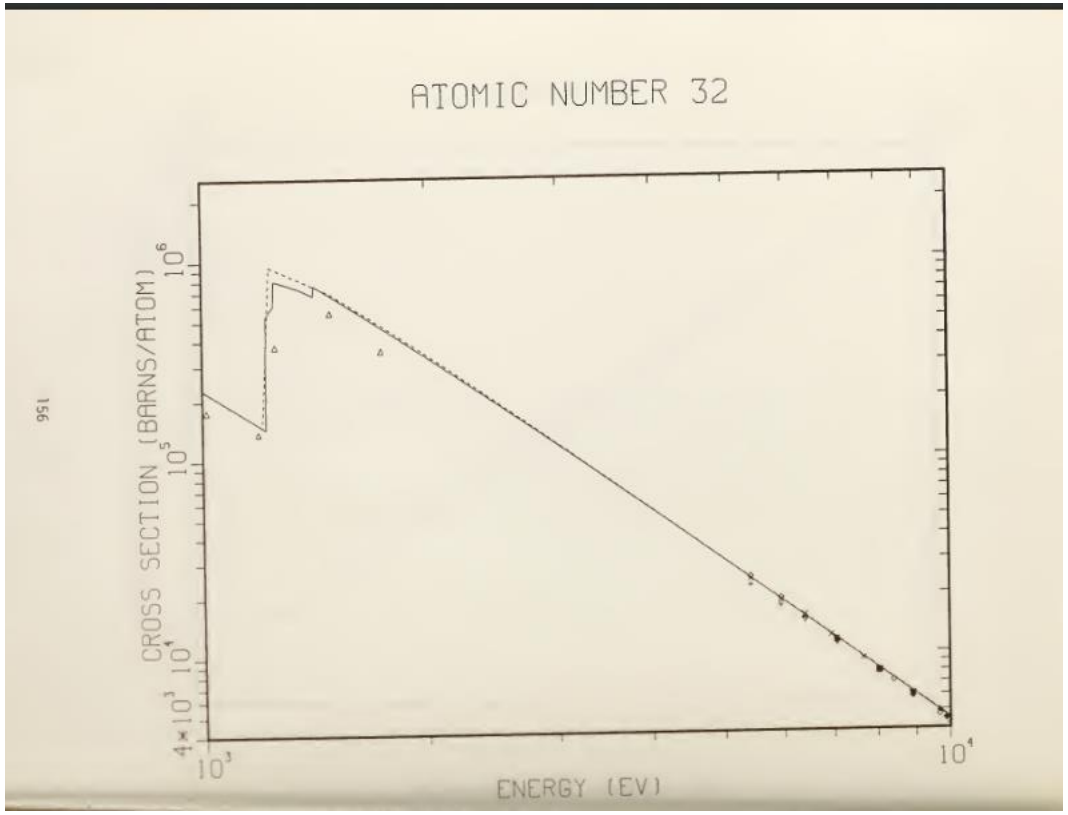

ATOMIC NUMBER 14
CROSS SECTION (BARNS/ATOM)
10^5
10^4
10^3
10^3
10^4
ENERGY (EV)


ATOMIC NUMBER 32
CROSS SECTION (BARNS/ATOM)
10^6
10^5
10^4
4×10^3
10^3
10^4
ENERGY (EV)

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- From there, found an online bibliography data based, which lists all references to experimental data for each element
- Looking into these references…some are in German

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- A very simply experiment to measure the photoelectric absorption cross section:

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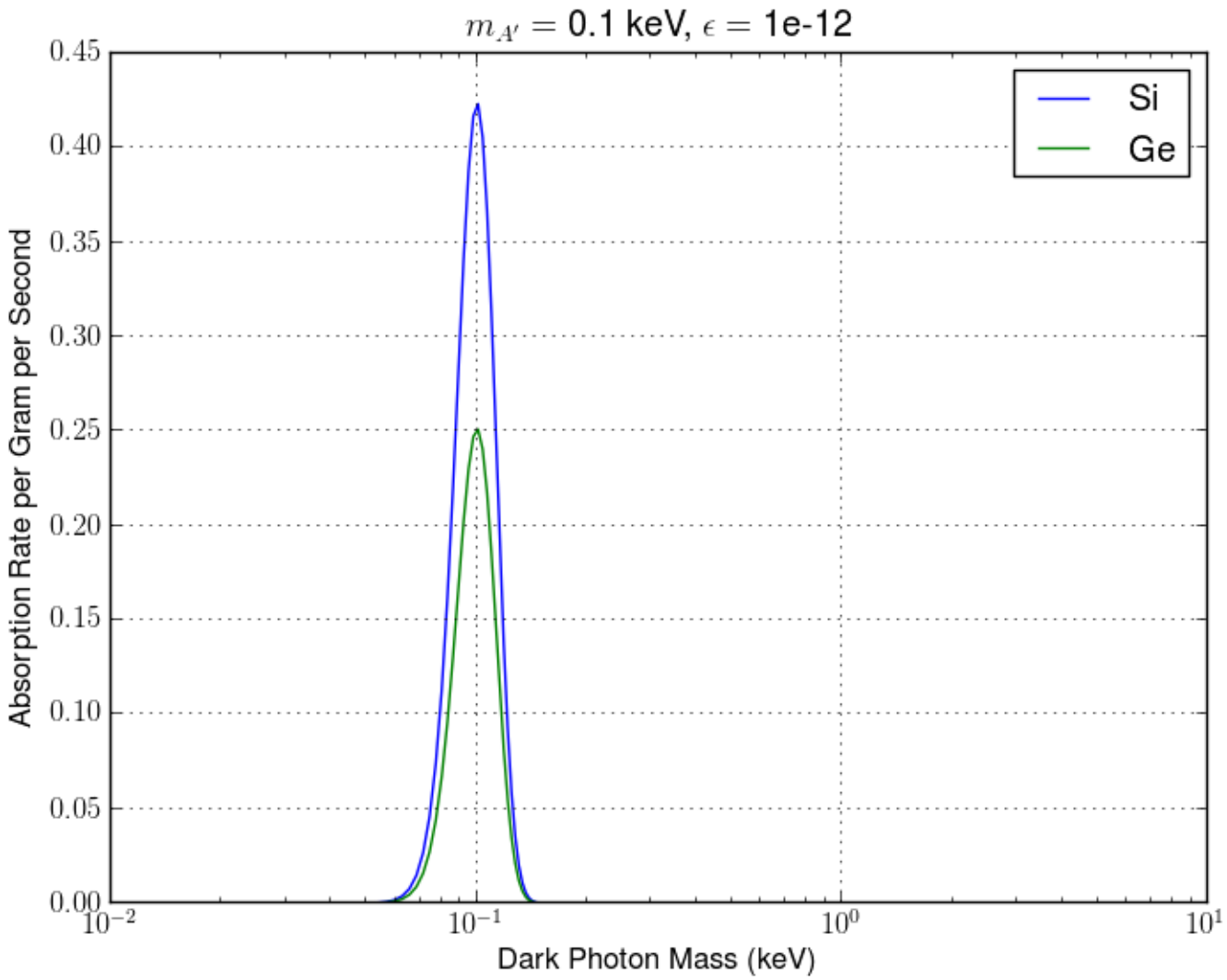
- Would need very thin samples to notice measurable effects
- For $\mu \sim 10^5$, a 10% reduction in intensity would require $d \sim 10^{-7}$cm or nanometers in scale.

Dark Photon


$m_{A'} = 0.1$ keV, $\epsilon = 1e\text{-}12$
Si
Ge
Absorption Rate per Gram per Second
Dark Photon Mass (keV)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
10^{-2}
10^{-1}
10^{0}
10^{1}

Dark Photon

- Order of magnitude seems correct.
- I’m confused about the statistics. There can be a measurement of both the Rate and the energy. Distribution in energy is caused by finite energy resolution.
  - Normalization of the Gaussian function increases the Rate by a factor of ~32, does this make sense? Should the peak not correspond to what the expected *measured* rate be?

Other Work

- IO LIB – no updates
- DQM – starting working on scripts