TODO List, Sr Lab manual

DONE

**IN PROCESS**

Title page and cover page differ on including SF campus. How to resolve?

What should the title of the manual be? Old title made more sense when we stopped with Heisenberg.

-- take suggestions?

~~Is there a new apparatus for the cathode ray tube experiment?~~ [not yet]

**On Ballmer series: “k is the order number of that image”: k is in fact constant in our practicum**

Remove Lewis, Mulliken, Davisson to three separate PDFs. Davisson – missing

**Polarization:**

~~-- quote Dirac sec. 2 at greater length? (just for text…)~~ [brief refc on sine vs cosine]

-- circle diagrams. writeups for these: linear, circular, ellptical

-- cite Huygens Treatise on Light, Chap. 5

-- discuss Malus, Faraday, Maxwell

-- propose a mini-demo on Iceland spar? [check what we have] (YES)

**-- Include beam splitter in polarization setup? [ask around about interferometer confusion]**

**Optics Lab: Introduction**

223 – DC crystal: difft for one than other: First mention simplified, but announces difficulty and difference with the Bell setup.

224 – beam splitter ([dis]analogy with sound?) Is this going to be covered in polarization practicum?

225 – coincidence detector – 8 ns or 2 ns? 4-ish ns!

225 – “You are invited to consider” --- try to get a good answer: *why* are we counting B and B’ only when there is a detection at A, also? What are the results without this restriction? What is the interpretation of the results *with* the addition of this restriction? Currently: semi-justified as extra stringency.

226 – more on SD, mean, error. Check calculation of g with error range?

throughout – replace “taken as evidence for” with “consistent with” QM

**interferometer:**

-- rename “Single photon interference and ‘superposition’”

-- 229 why not include B’: make it explicit that including it would be a SECOND STEP, i.e., make sure demonstrating interference comes first.

-- piezo description: uni-directional, through several peaks and troughs

-- maybe one more sentence of description of why peaks and troughs, compare to diffraction

-- 229: “repeatedly displaced…” 🡪 “uniformly advanced by a set distance”

-- 229 “optional second detector” should be “subsequently a second detector” or the like

-- double arrow on piezo should be made single in all diagrams

Talk more about the DC crystal, saying more, but acknowledging that this does not explain it. “How are the photons altered?”

-- in ch. 16 (lab intro), and 18 (Bell)?

~~-- demystify by showing the alignment/setup process? [too involved]~~

-- ~~demonstrate the “unpolarized” state of the individual beams? (save for Bell?)~~

-- how to deal with the claim that the pairs are polarization-entangled? ~~omit?~~ explain?

-- link to EPR? single QM process that produces a pair of entities at the same time

Beam splitters?

-- what is desired here? Not stuff about phase?

**Bell chapter**

-- dot product

-- n7: describe the Stern-Gerlach apparatus/phenomenon more fully (Addendum and n7)

-- “singlet state”: relate to EPR, Bohr’s response to EPR

-- describe: unit vectors, dot product

-- relate the above two to detection of polarization angle explicitly [in CHSH sec.]

-- n9 should be more readable with an improved n7

-- inequality: figure out?

-- what results look like when the detectors are at different angles? [lower chance of violation]

-- sample data (linked to above?) [necessary? why?]

-- more info about how equipment works: DC crystal and the whole setup, basically

~~-- 240: page break? rename “REMARKS” to “Remarks on Bell”~~

~~-- redescribe the CHSH calculation [e.g., a-perp = not-a]~~

-- why is “PRACTICUM” a new level and the previous not? [review all]

Old stuff

10 **Faraday current 🡪 0.5A? two paragraphs and a diagram suggest wrong current + rheostat**

18 - two eqns on same line at mid page

18n7 “with velocity *v*”should be lower case

19n11 abcou 🡪 abC [2x]

23 “abcou” needs a space before and to be “abC”

37 spread columns in (9)

44 more abcou: search everywhere

54 pu = SA dot v should be centered

54 missing equation after note 19!

54 p^2 = SA \* (SA -b)

54n19, 57n26 fix reference to n14 🡪 n13

69e12 shd end with d-nu

80l-4 “where E [=Ne] fix spacing

94n5 expand spacing around “or”

98 Indicate that the lines we measure are all first order (k=1).

166 lambda approx lambda over sin epsilon 🡪 LHS shd be delta x