Summary of Lecture 15

- Lie group of dimension n

$$G(a_1, a_2, \ldots a_n) = \exp\left(-\mathrm{i}\sum_{j=1}^{n} a_j X_j\right)$$

- Lie algebra of generators $\quad [X_j, X_k] = \mathrm{i}\sum_{l=1}^{n} f_{jkl} X_l$

- Generators $\Rightarrow$ constants of motion

- Irreducible representations $\Rightarrow$ degenerate multiplets

This Lecture (16)

- Relativistic QM

Summary of Lecture 16

- Relativistic wave equations

  Taylor expansion $$i\hbar\partial_t\Psi = \sqrt{m^2c^4 - \hbar^2c^2\nabla^2}\,\Psi$$

  Klein Gordon $$\left(\partial_\mu\partial^\mu + m^2c^2/\hbar^2\right)\Psi = 0$$

  Dirac $$\left(i\gamma^\mu\partial_\mu - m\right)\Psi = 0 \qquad [\hbar = c = 1]$$

  4x4 gamma-matrices

- Magnetic moment & Spin-orbit coupling

- Lorentz covariance $$x'^\nu = \Lambda^\nu{}_\mu x^\mu$$

  $$\Psi'(x'^\nu) = D[\Lambda]\Psi(x^\mu)$$

  bi-spinor representation of the Lorentz group

Concluding Remarks

- TP2 Examples Class: 14:00-16:00 on Tuesday 18 March

- TP2 Test: 10:30-12:30 on Wednesday 30 April
  (RDC Seminar Room East and Seminar Room West)
  Make sure to register on TIS

- Examinable vs. non-examinable materials are highlighted in the syllabus and notes.

- Notes, summaries, past papers (+ some solutions):

  http://www.tcm.phy.cam.ac.uk/~nrc25/tp2-new/index.html