

# PHY2407S Assignment

January 2017

There will be one assignment, due at the end of the lectures. I will assess, give feedback and assign a grade for this. It will be assessed on completeness, accuracy of physics content and readability. A portion of the grade will be for a 1-page letter-of-intent and for a classroom presentation. Each student will have a choice of one of the following projects:

Project #1:

The Large Hadron Collider (LHC) is now taking data over a several year period at 13 or 14 TeV. It is expected to acquire  $150 \text{ fb}^{-1}$  of data by 2018. Write a short proposal for a physics measurement using the expected dataset, outlining the motivation, the required luminosity, trigger requirements and analysis strategy. Estimate the expected uncertainty of the measurement, including key systematic sources. This proposal should be written assuming it will be peer reviewed, so ensure that it is readable, properly referenced and understandable to the typical particle physicist involved in collider physics.

Project #2:

The LHC will be upgraded to  $10^{35} \text{ cm}^{-2}\text{s}^{-1}$  in the timeframe of 2026, after the initial scientific goals are achieved running for several years at  $<10^{34} \text{ cm}^{-2}\text{s}^{-1}$ . You are proposing a measurement that requires  $> 1 \text{ ab}^{-1}$ , requiring running at this intensity for between one and two years. Identify a physics process that requires a dataset of this sensitivity, outline a strategy for triggering and for analysis (assuming appropriate upgrades have been done to maintain excellent charged particle tracking and lepton identification) and estimate the key systematic uncertainties. Present your results in the form of a relatively short proposal outlining i) physics motivation, ii) measurement strategy, iii) triggering requirements, iv) systematic uncertainties and v) expected precision or sensitivity. This proposal will be subject to the appropriate peer review, so ensure that it is readable, properly referenced and understandable to the typical particle physicist involved in collider physics.

The proposals are to be five pages in length, single-spaced, and in 12 point font (the length does not include figures, tables or references). **It constitutes 80% of the grade.**

You will have to prepare a short “letter-of-intent” of less than one page that summarizes what you plan to do by Friday, 3 February 2017. You should consult with me ahead of time so that you don’t take on a project that is too large or too broad. **This will constitute 10% of your grade.**

Every student will give a 10-minute summary of their project, followed by a 5-minute question period. These are intended to have the flavor of an APS or CAP parallel session talk. **This will constitute 10% of the overall assessment.**