

Problems in QUANTUM FIELD THEORY

Python and C Source Code

For most problems in this book, the required calculations can be done fairly easily by hand. However, a small number of problems involve calculations that are more tedious or error prone, for which the aid of a computer algebra system is quite beneficial, at least for checking the results. This folder contains PYTHON notebooks (and in instance, C source code) that may be used to perform these lengthy calculations.

All the PYTHON notebooks require SYMPY and can be run by loading them inside a JUPYTER console. The C source code of problem 29 requires the gcc compiler and the FFTW3 library.

Brief description of the provided code:

- **02** : the script of this folder performs some of the algebra involving the Lorentz generators, represented as 4×4 matrices.
- **09** : the provided script calculates the action of an arbitrary little group element on the reference polarization vectors.
- **29** : we provide the C source code used to produce the data points of Figure 2.9. The corresponding folder contains a PDF description of the numerical method employed to perform this computation.
- **33** : the python script in this folder performs the matrix manipulations involved in the solution of Problem 33.
- **51** : the script "problem-51.py" performs the straightforward but tedious recursion involved in the solution of Problem 51. The script deals with the case of Yang-Mills theory, but it is trivial to adapt it to quantum field theories with other interactions.
- **61** : the python script "problem-61.py" checks the final equality in Problem 61, namely that two seemingly distinct functions of s, t, u are in fact equivalent thanks to the constraint $s+t+u=0$.
- **64** : the python scripts "problem-64.py" and "problem-64-ordered.txt" perform the recursion and expansion involved in the solution of Problem 64. The scripts deal with the case of Yang-Mills theory.
- **68** : the python script "problem-68.py" can be used to check some calculations in the questions 68.c and 68.d.