Instructions about Lorentz-CPT violation code, talks, tech note and paper draft

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Contents

1. CODE

There are two versions, one for the one energy bin analysis, the other is for five energy bins analysis. The difference is that they divide the data into different number of energy bins. Both of them are used in the note/paper. And they have similar structures.

Please follow the following steps:

1.1. One energy bin

- **Get the P14A data set** (do not try to do this unless you are having new data (like P14B) or you want to check this step. you will need several days to run this on the farm).
  From this you will get the fulltime, livetime, single event, muon event in each hour.
  two versions for sidereal and solar time analysis.
  Go to /Code/OneEBin/Input/Ostw/EH1/Ostw/aileron
  run ./GenScript.py, you will get the file InfoInEachBin.txt in the ../src directory, then, move/copy it to /Code/OneEBin/SiderealTime/InfoInEachBin_EH1.txt
  and delete the last empty line of this file.
  same procedure for EH2/EH3 and for Solar analysis (in Ostw_Solar directory)
  To check whether any run is missed, run root -l /Code/OneEBin/SiderealTime/FindBad.C
  Finally, run root -l /Code/OneEBin/SiderealTime/InfoReader.C to generate the .root files of the fulltime, livetime, single event, muon event in each hour.
- **Get the hourly IBD, and neutron like event** (do not try to do this, this will also take time!!)
  Go to /Code/OneEBin/Input/P14AIBD/EH1
  make new_DataSelection_EH1
  root -l gen_list.cc
  chmod 744 *.csh
  ./cmd_list.csh

Go to result/IBD
hadd IBD_EH1_AD1.root *EH1_AD1.root
hadd IBD_EH1_AD2.root *EH1_AD2.root
Go to result/nLikeUp
hadd nLikeUp_EH1_AD1.root *EH1_AD1.root
hadd nLikeUp_EH1_AD2.root *EH1_AD2.root
Go to result/nLikeDown
hadd nLikeDown_EH1_AD1.root *EH1_AD1.root
hadd nLikeDown_EH1_AD2.root *EH1_AD2.root

Similar for EH2/EH3.

Then, run root -l /Code/OneEBin/SiderealTime/IBD.C and nLike.C to generate the .root files of the IBD and neutron like events in each hour. Similar for Solar time analysis (they share the same P14AIBD files).

- **Get the hourly flux**(do not try to do this, since this will need someone else's help)
  Go to /Code/OneEBin/SiderealTime/SiderealTime/daily_data
  Send the Neil.C to Weili Zhong and let her run this file and send the output files to you, and put them in this directory.
  root -l Flux_Interp.C (this needs several minutes = =)
  root -l AlphaBeta_Interp.C (this needs several minutes = =)

- **SME fitting**
  Go to /Code/OneEBin/SiderealTime/FullTime
  root -l FullTime.C
  Go to /Code/OneEBin/SiderealTime/LiveTime
  root -l LiveTime.C
  Go to /Code/OneEBin/SiderealTime/MuEff
  root -l MuEff.C
  Go to /Code/OneEBin/SiderealTime/MultiEff
  root -l MultiEff.C
  Go to /Code/OneEBin/SiderealTime/AccBkg
  source run.csh
  Go to /Code/OneEBin/SiderealTime/Muon
  source run.csh
  Go to /Code/OneEBin/SiderealTime/FastN
  root -l FastN.C
  Go to /Code/OneEBin/SiderealTime/Li9
  root -l Li9.C
  Go to /Code/OneEBin/SiderealTime/AmC
  root -l AmC.C
  Go to /Code/OneEBin/SiderealTime/IBD
  root -l IBD.C
  root -l IBD_Candidate.C
  Go to /Code/OneEBin/SiderealTime/Fit
  source run.csh

1.2. Five energy bins

- **Get the P14A data set**
  same data (.txt files) as the one energy bin.

- **Get the hourly IBD, and neutron like event**
  Go to /Code/5EBin/Input/P14AIBD/
  similar step as the one energy bin

- **Get the hourly flux**
  same files as the one energy bin

- **Backgrounds spectrum**
  in /Code/5EBin/Input/Li9He8Spectrum and AccSpectrum (from Xiangpan)

- **SME fitting**
  Go to /Code/5EBin/SiderealTime/FullTime
  root -l FullTime.C
  Go to /Code/5EBin/SiderealTime/LiveTime
  root -l LiveTime.C
  Go to /Code/5EBin/SiderealTime/MuEff
  root -l MuEff.C
  Go to /Code/5EBin/SiderealTime/MultiEff
  root -l MultiEff.C
  Go to /Code/5EBin/SiderealTime/AccBkg
  source run.csh
  Go to /Code/5EBin/SiderealTime/Muon
  source run.csh
  Go to /Code/5EBin/SiderealTime/FastN
  root -l FastN.C
  Go to /Code/5EBin/SiderealTime/Li9
  root -l Li9.C
  Go to /Code/5EBin/SiderealTime/AmC
  root -l AmC.C
  Go to /Code/5EBin/SiderealTime/IBD
  root -l IBD.C
  Go to /Code/5EBin/Sidervi ealTime/Fit
  source run.csh

1.3. Fast Fourier Transform

- **Prerequisite**: install FFTW in root.
  see:
  https://root.cern.ch/drupal/content/build-prerequisites
  https://root.cern.ch/drupal/content/installing-root-source
  To test whether you install this properly, go to /Code/OneEBin/FFT, and try root -l FFTTest.C, if you get some plot, congratulations please go ahead!

- Steps:
  Go to /Code/OneEBin/FFT_paper
  source runMacro.sh

2. TALKS

Go to directory /Talks

You can find all my previous THU group meeting talks, Daya Bay Collaboration talks, etc.. With .pptx, .pdf, .tex file formats. Most of the file name have the date as the suffix.

This is a good place to find the .pptx/.tex formats of all the formulas if you are going to give a talk about this~

3. NOTE

Go to directory /Note

pdflatex TechNote_LorentzViolation_Tsinghua_July2015.tex

3.1. Sources of plots

FIG.1, see the link in the note
FIG.2, see the references in the note
FIG.3, Go to directory /Others, open data.xlsx, go to sheet "Position", you'll find it and edit it
FIG.4, see the references in the note
FIG.5,6,7, Go to /Code/OneEBin/SiderealTime/MC, then
root -l MC_Bin.C (this takes hours to generate the sample, if you don't want to wait, just skip this and use the sample I generated: MC_EH1.root, MC_EH2.root, MC_EH3.root)
root -l MC_Draw.C
then you can find Simple_Shuffle_EH1/2/3.pdf in this directory.
FIG.8, /Code/OneEBin/SolarTime/FullTime
FIG.9, /Code/OneEBin/SiderealTime/FullTime
FIG.10, from Aaron
FIG.11, /Code/OneEBin/SiderealTime/MuEff
FIG.12, /Code/OneEBin/SiderealTime/MultiEff
FIG.13, /Code/OneEBin/SiderealTime/AccBkg
FIG.14, /Code/OneEBin/SolarTime/AccBkg
FIG.15, /Code/OneEBin/SiderealTime/Sg
FIG.16, /Code/OneEBin/SolarTime/AmC
FIG.17, /Code/OneEBin/SiderealTime/AmC
FIG.18, /Code/OneEBin/SolarTime/Muon
FIG.19, /Code/OneEBin/SiderealTime/Li9
FIG.20, /Code/OneEBin/SiderealTime/IBD
FIG.21, from Aaron
FIG.22, /Code/OneEBin/SiderealTime/Fit
FIG.23, /Code/OneEBin/SiderealTime/Fit
FIG.24, /Code/OneEBin/FFT/FFT_paper
FIG.25, /Code/OneEBin/FFT/FFT_paper
FIG.26, /Code/OneEBin/FFT/FFT_paper
FIG.27, /Code/OneEBin/SiderealTime/Fit
FIG.28,29,30, /Code/5EBin/SiderealTime/Fit/ThreeSites
FIG.31, from PPT
FIG.32,33,34, /Code/OneEBin/SiderealTime/MC/Shuffle, code in /Code/OneEBin/SiderealTime/MC/ThreeSites.C
FIG.35,36, /Code/OneEBin/SiderealTime/MC/Shuffle/Chi2One,
code in /Code/OneEBin/SiderealTime/MC/ThreeSites_Chi2.C
FIG.37, /Code/OneEBin/SiderealTime/Fit
FIG.38, /Code/OneEBin/SiderealTime/Fit/OscP.C
FIG.39,40, from Logan

3.2. Sources of tables

TABLE I, from Logan and /Code/5EBin/SiderealTime/Fit/ConstTerm.C
TABLE II, from Logan
TABLE III, /Others/data.xlsx
TABLE IV, /Code/OneEBin/SiderealTime/MultiEff/MultiEff.C
TABLE V, /Code/OneEBin/SolarTime/AccBkg/Acc.C
TABLE VI, /Code/OneEBin/SolarTime/AmC/AmC.C

TABLE VII, /Code/OneEBin/SolarTime/Li9/Li9.C
TABLE VIII, /Code/OneEBin/FFT/FFT_paper/FFT_result.C
TABLE IX,X, /Code/OneEBin/SiderealTime/Fit/CalculateRatio.C
TABLE XI,XII,XII,XIV,XV,XVI, /Code/OneEBin/SiderealTime/Fit/Fit_OneE_OneFlavor_ThreeSites.C and /Code/5EBin/SiderealTime/Fit/FitRatio_Paper.C
TABLE XVII, from FIG.32,33,34 and /Code/OneEBin/SiderealTime/Fit/Ratio_EH1/2/3_OneDay_sidereal_Simple.pdf
TABLE XVIII, from /Code/OneEBin/FFT/FFT_paper/FFT_result.C and /Code/OneEBin/SiderealTime/Fit/Ratio_EH1/2/3_OneDay_sidereal_Simple.pdf
TABLE XIX, from the numbers in the plots and tables above
TABLE XX, /Code/OneEBin/SiderealTime/Fit/DrawResult.C
TABLE XXI, XXII, /Code/OneEBin/SiderealTime/Fit/ConstTerm.C

4. PAPER

Go to directory /Paper
pdflatex LV_CPTV.tex

4.1. Sources of plots

FIG.1, go to /Others/Map.pptx; edit it as you wish, then save as .pdf; then open the .pdf file, and save as .eps
FIG.2, /Code/OneEBin/SolarTime/Sum/SumEff.C
FIG.3, /Code/OneEBin/SolarTime/AccBkg/AccRealTime.C
FIG.4, /Code/OneEBin/SolarTime/AmC/AmCRealTime.C
FIG.5, /Code/OneEBin/SolarTime/Muon/HMuG5RealTime.C
FIG.6, /Code/OneEBin/SolarTime/Sum/SumPlot.C
FIG.7, /Code/OneEBin/FFT/FFT_paper
FIG.8, /Code/OneEBin/SiderealTime/Fit/ThreeSites_Paper

4.2. Sources of tables

TABLE I, data are from TABLE VI to XI in the paper
TABLE II, see table XVII and XVIII in the note
TABLE III, see table XXI in the note
TABLE IV, see table XXII in the note
TABLE V, /Code/OneEBin/FFT/FFT_paper/FFT_result.C
TABLE VI to XI, see table TABLE XI,XII,XII,XIV,XV,XVI in the note

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