



# Data vs emulator comparison on B904 test stand data

Sven Dildick  
Rice University

*Plots not for publication*

July 1, 2021

# Introduction

- Data vs emulation is done on 10k cosmic events collected with the B904 test-stand
  - Fully functional GE1/1 and ME1/1 chamber with DAQ
- Phase-2 firmware is loaded onto the ME1/1 OTMB FPGA
- Data run taken on June 9th at 14h23
- Raw data file has name  
csc\_00000001\_EmuRUI01\_Local\_000\_210609\_142357\_UTC.raw on  
CSC DAQ pc

# Introduction

- Set up CMSSW\_12\_0\_X\_2021-06-30-2300
  - Rebase Victor Barashko's branch for Run-3 CSC unpacker "cscgem\_tests\_CMSSW\_12" (this will be integrated into CMSSW soon)
  - Rebase this development branch (few minor changes in the configuration)

- Re-emulation procedure:

```
label="csc_00000001_EmuRUI01_Local_000_210609_142357.UTC"  
B904RunNumberLabel="210609_142357"
```

```
## step 2: convert the .raw file to EDM ROOT (keep firstRun to 341761)  
cmsRun IORawData/CSCCommissioning/test/readFile_b904_Run3.py firstRun=341761 inputFiles="$label.raw" maxEvents=10000
```

```
## step 3: unpack, emulate, first step of the DQM. B904 setup. Example command:  
cmsRun L1Trigger/CSCTriggerPrimitives/test/runCSCTriggerPrimitiveProducer_cfg.py unpack=True l1=True dqm=True runCCLUT=True  
runME11ILT=False useB904Data=True maxEvents=-1 inputFiles="file:$label.root"
```

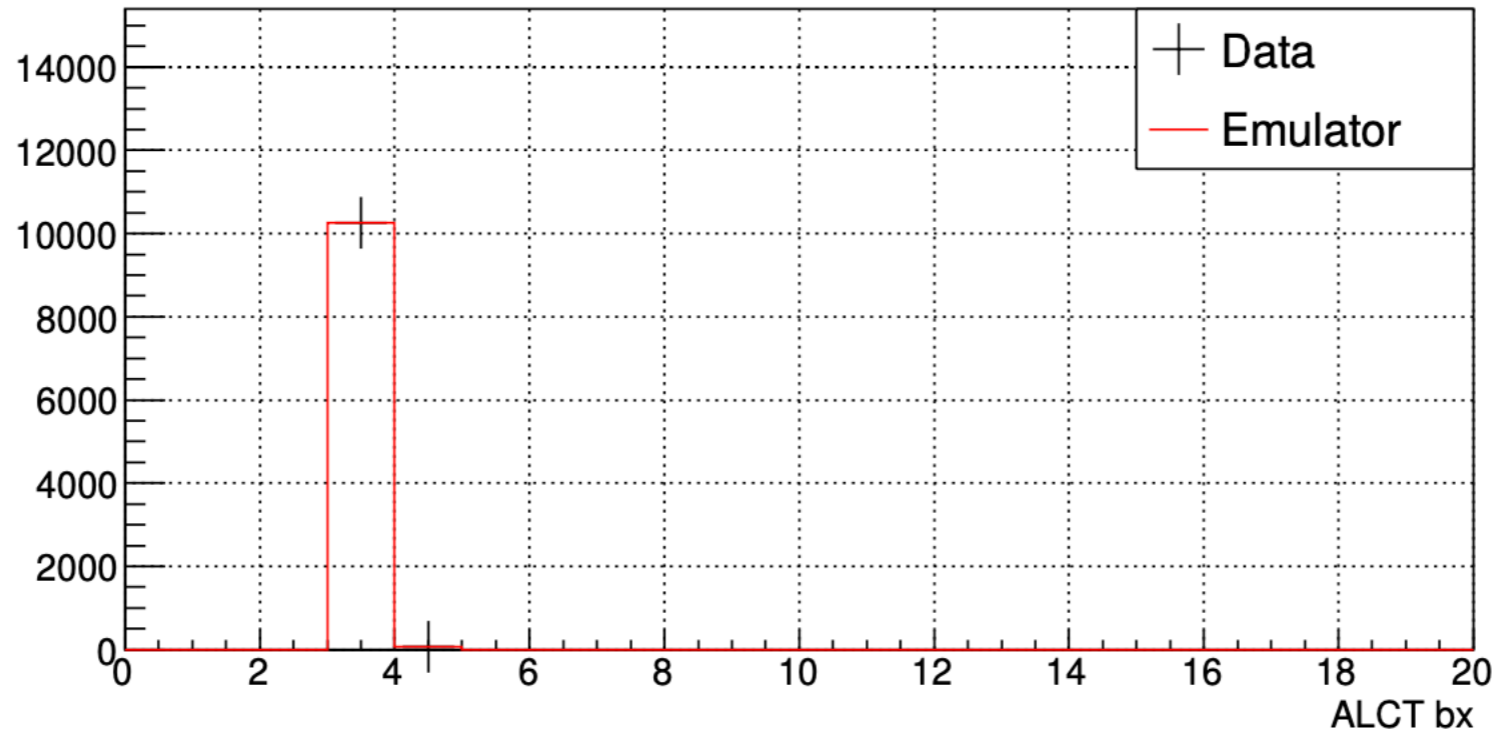
```
## step 4: run the DQM client  
cmsRun L1Trigger/CSCTriggerPrimitives/test/runCSCL1TDQMClient_cfg.py mc=False run3=True useB904Data=True
```

```
## step 5: run the L1 CSC analyzer (run number 341761 is set in step 2) Example command:  
cmsRun L1Trigger/CSCTriggerPrimitives/test/runCSCTriggerPrimitiveAnalyzer_cfg.py dataVsEmulation=True  
dataVsEmulationFile=file:DQM_V0001_R000341761__Global__CMSSW_X_Y_Z__RECO.root runNumber=341761 B904Setup=True  
B904RunNumber=$B904RunNumberLabel
```

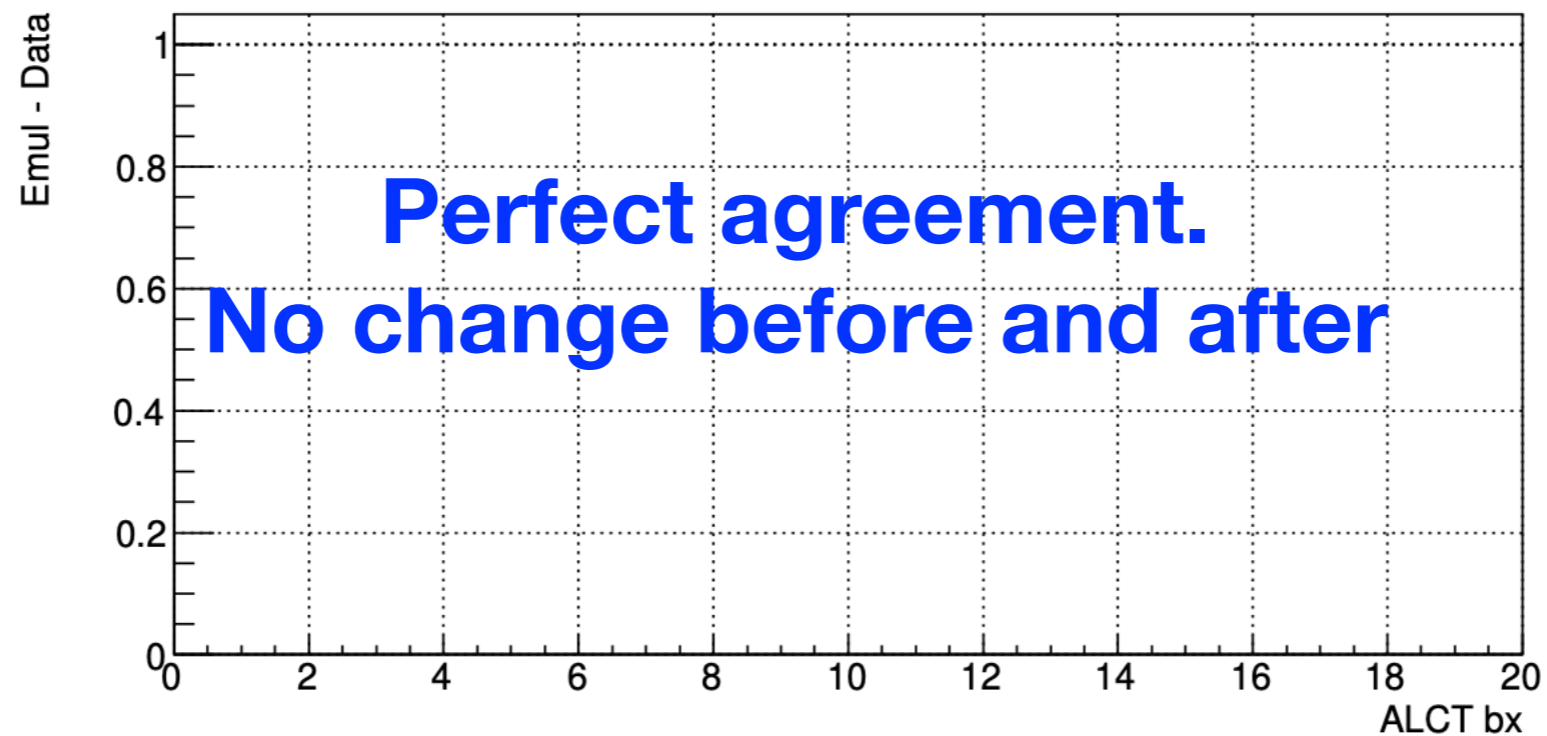
- Plots before (CMSSW\_12\_0\_X\_2021-06-30-2300 + Run-3 unpacker) and after (before + this development branch) on next few slides
  - CLCT and LCT.
  - ALCT not included (since no changes in the algorithm)
  - Left: before. Right: after

# ALCT

ME11 ALCT bx (B904 Cosmic Run 210609\_142357)

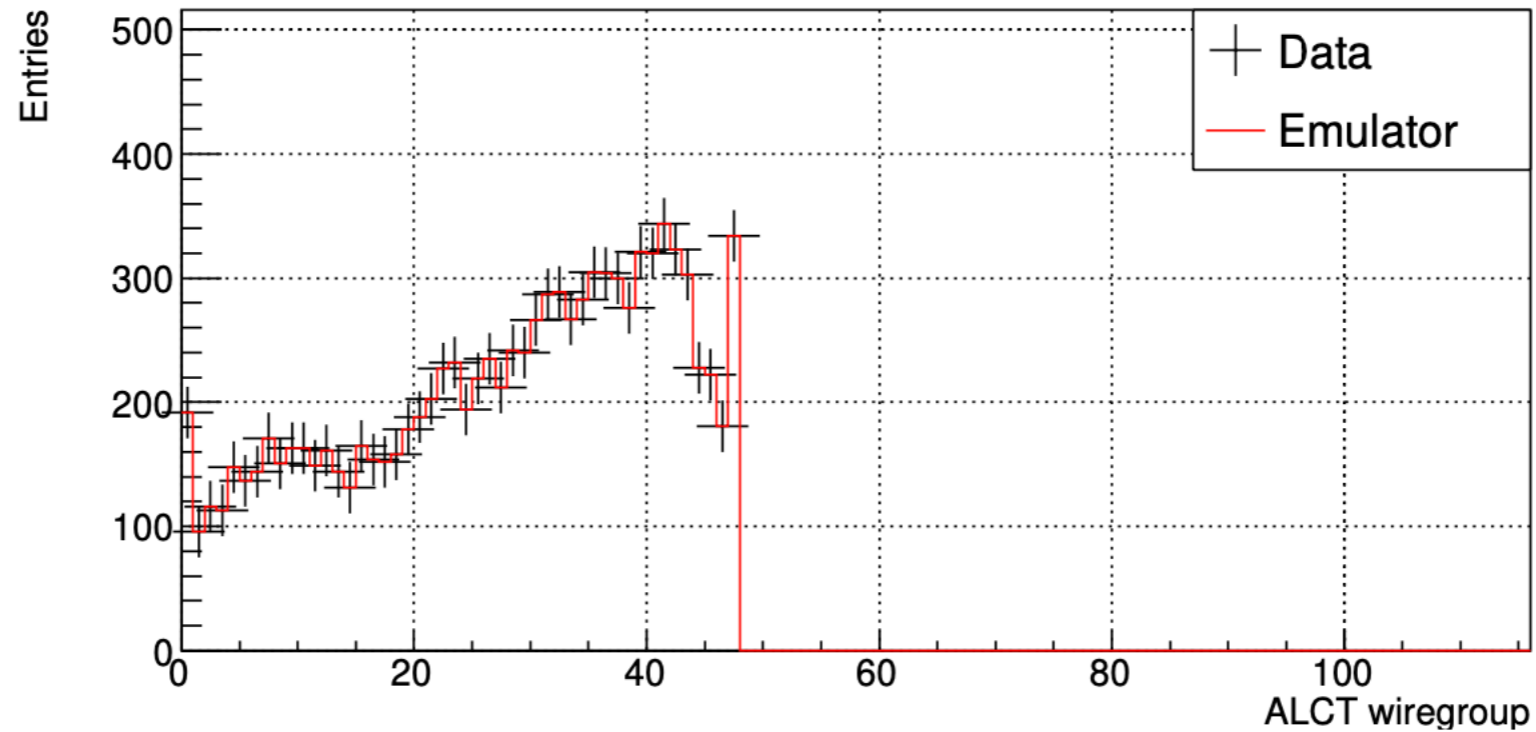


ME11 ALCT bx (B904 Cosmic Run 210609\_142357)

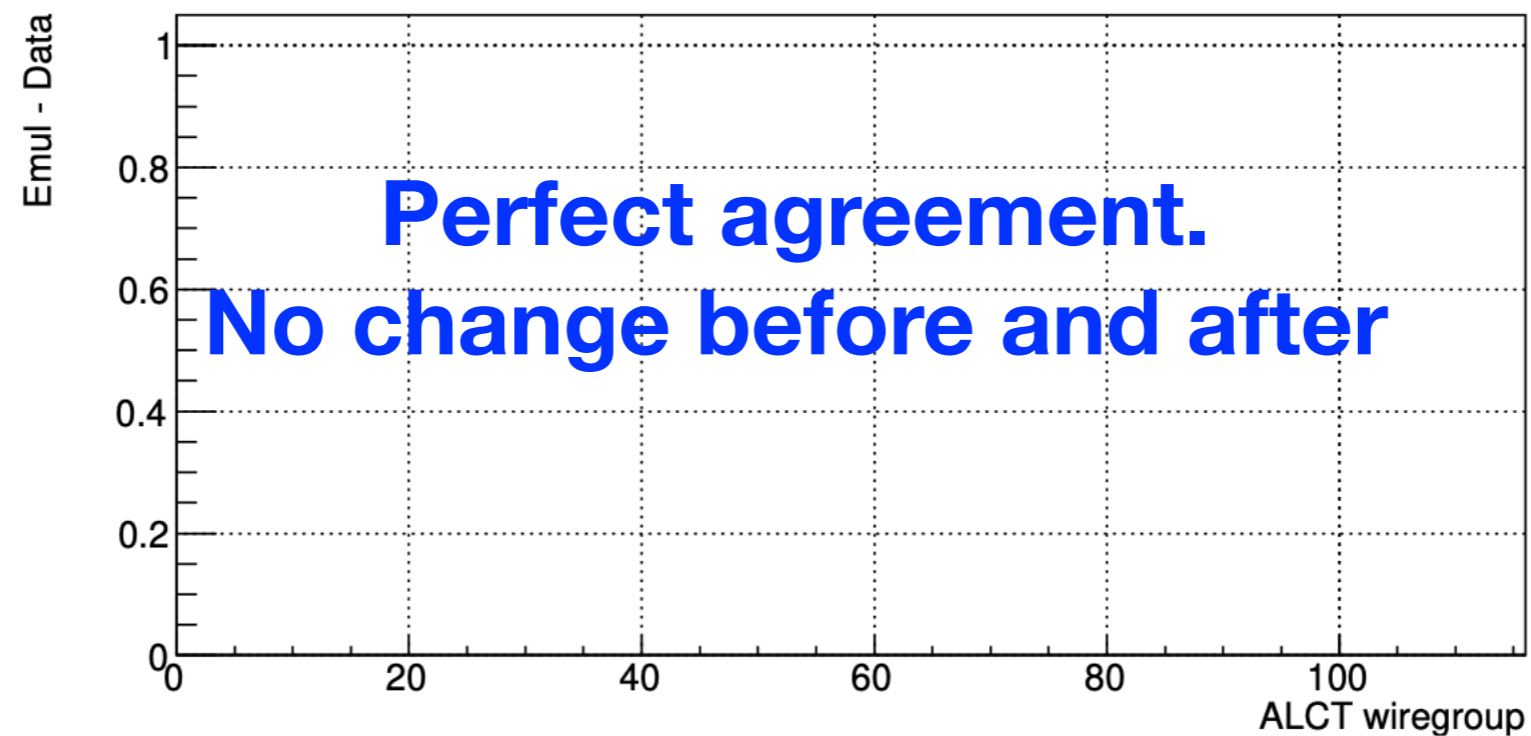


# ALCT

ME11 ALCT wiregroup (B904 Cosmic Run 210609\_142357)

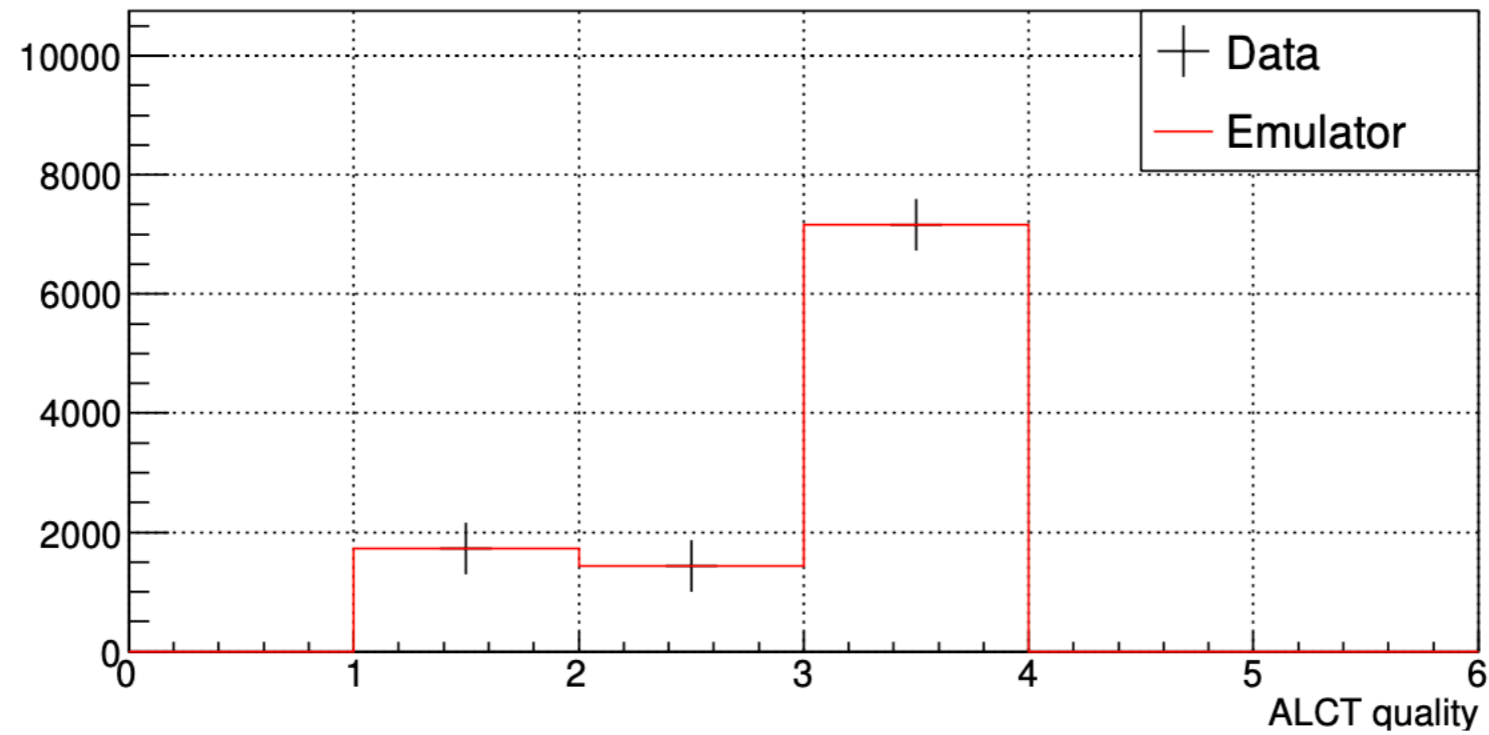


ME11 ALCT wiregroup (B904 Cosmic Run 210609\_142357)

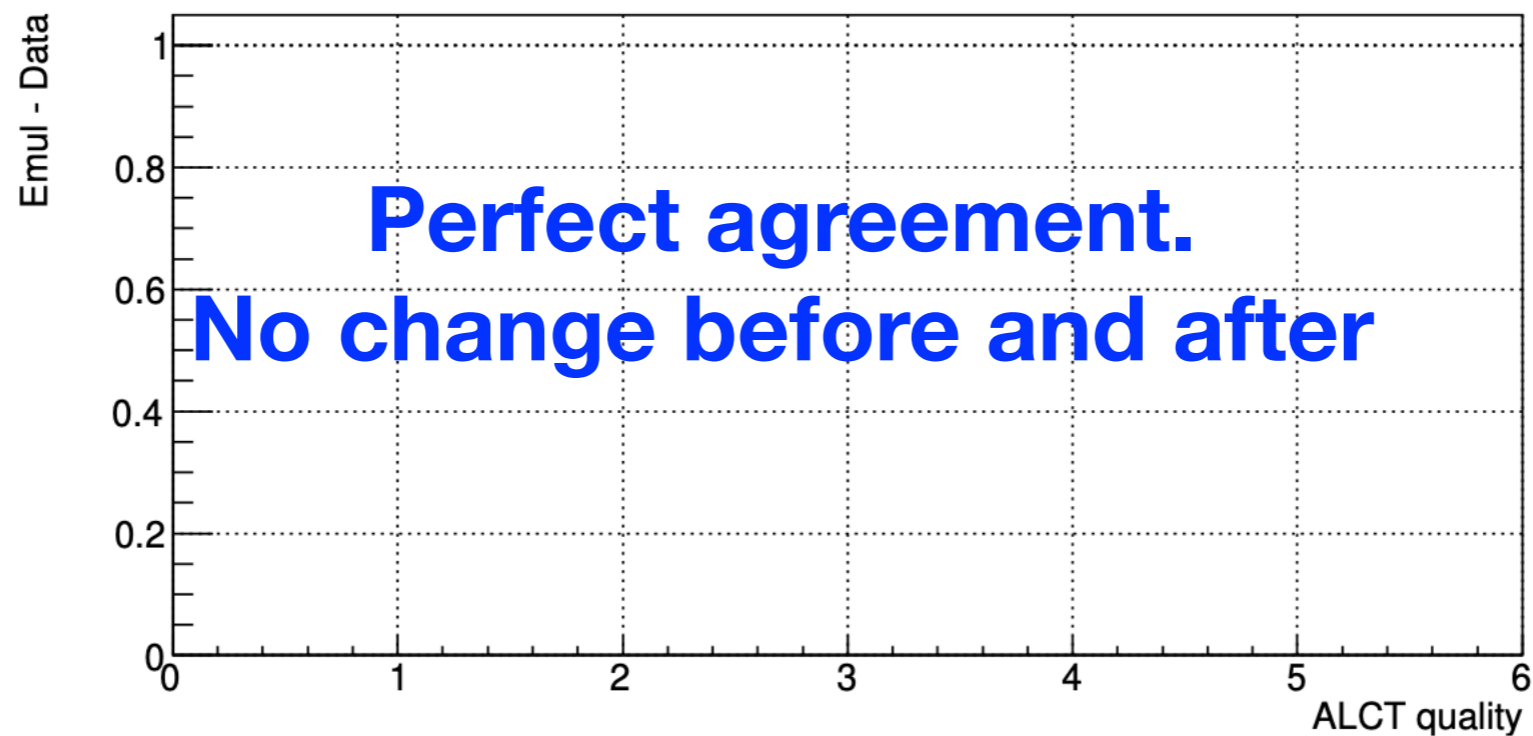


# ALCT

ME11 ALCT quality (B904 Cosmic Run 210609\_142357)

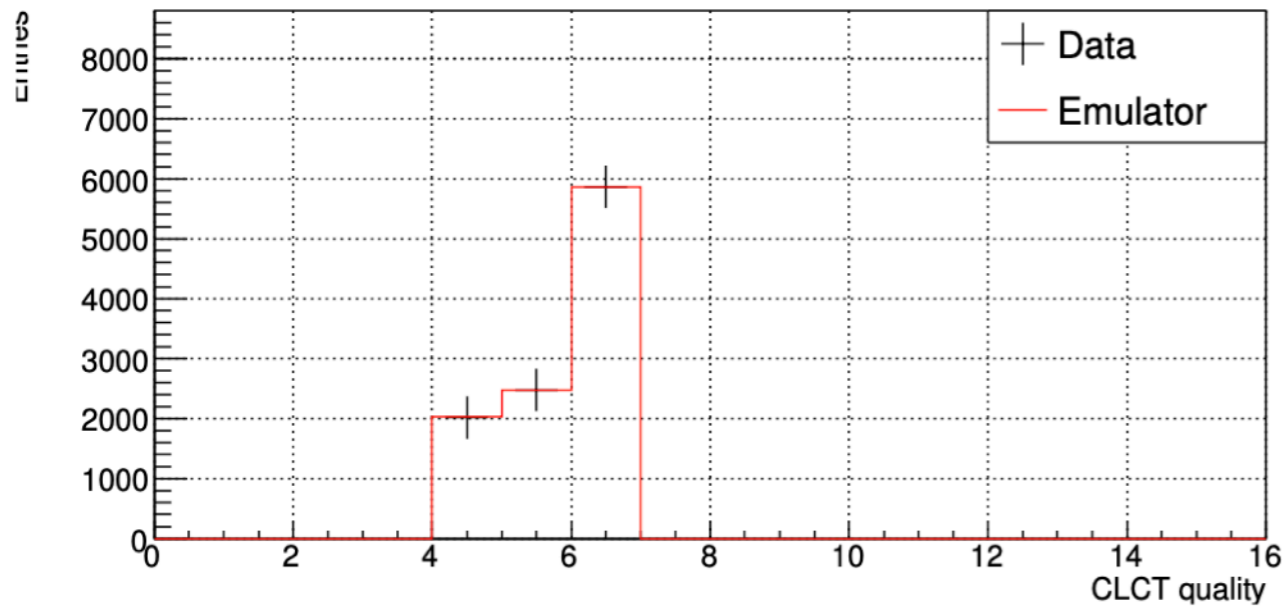


ME11 ALCT quality (B904 Cosmic Run 210609\_142357)

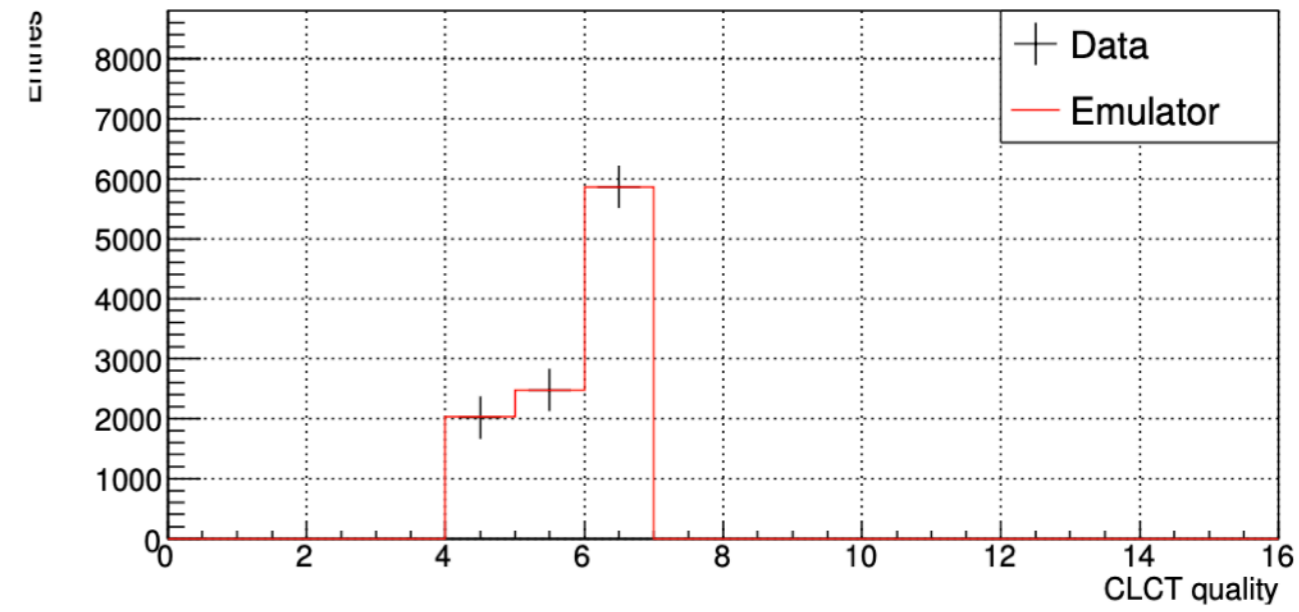


# CLCT

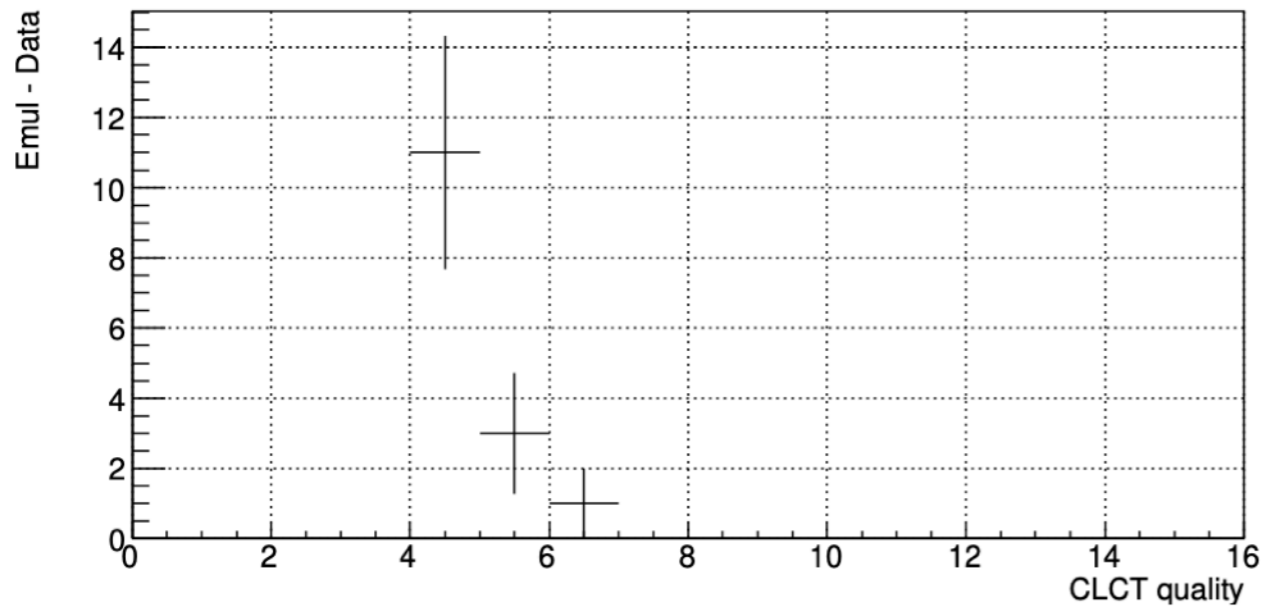
ME11 CLCT quality (B904 Cosmic Run 210609\_142357)



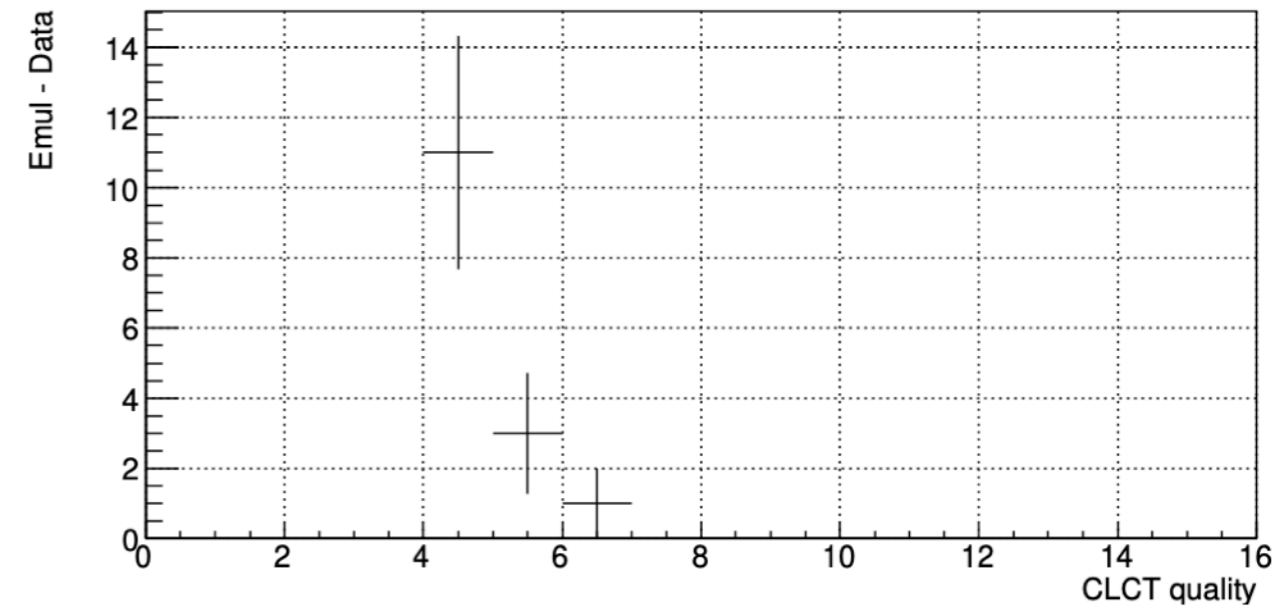
ME11 CLCT quality (B904 Cosmic Run 210609\_142357)



ME11 CLCT quality (B904 Cosmic Run 210609\_142357)



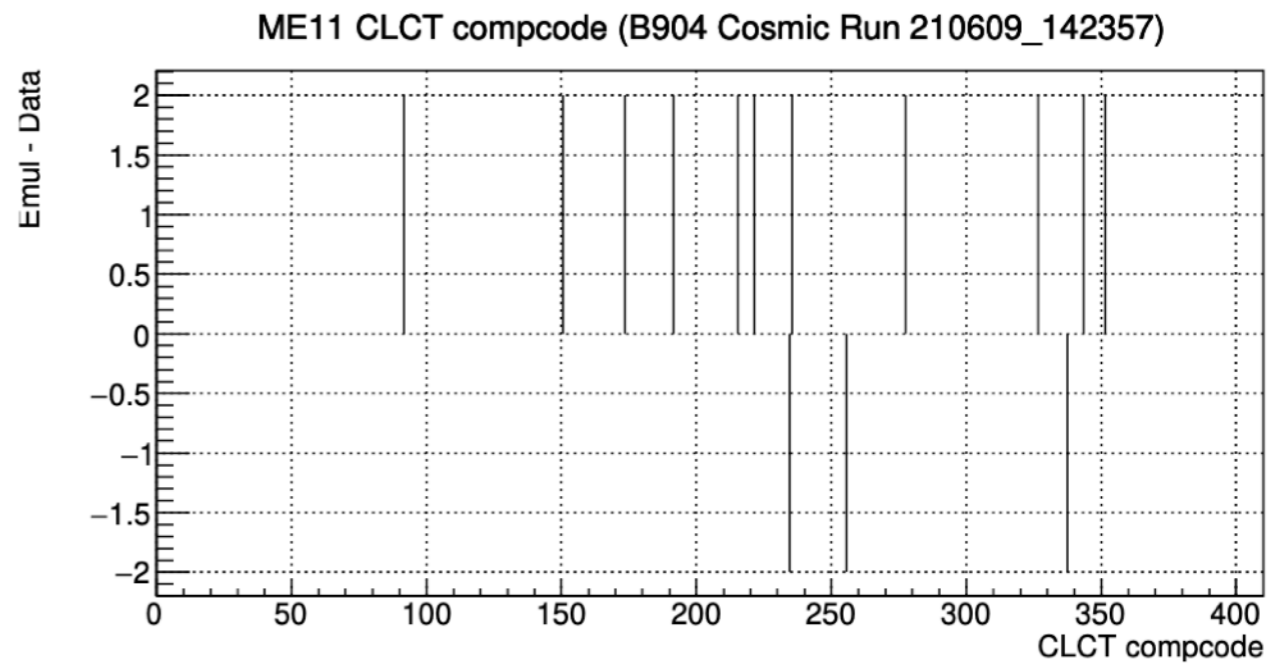
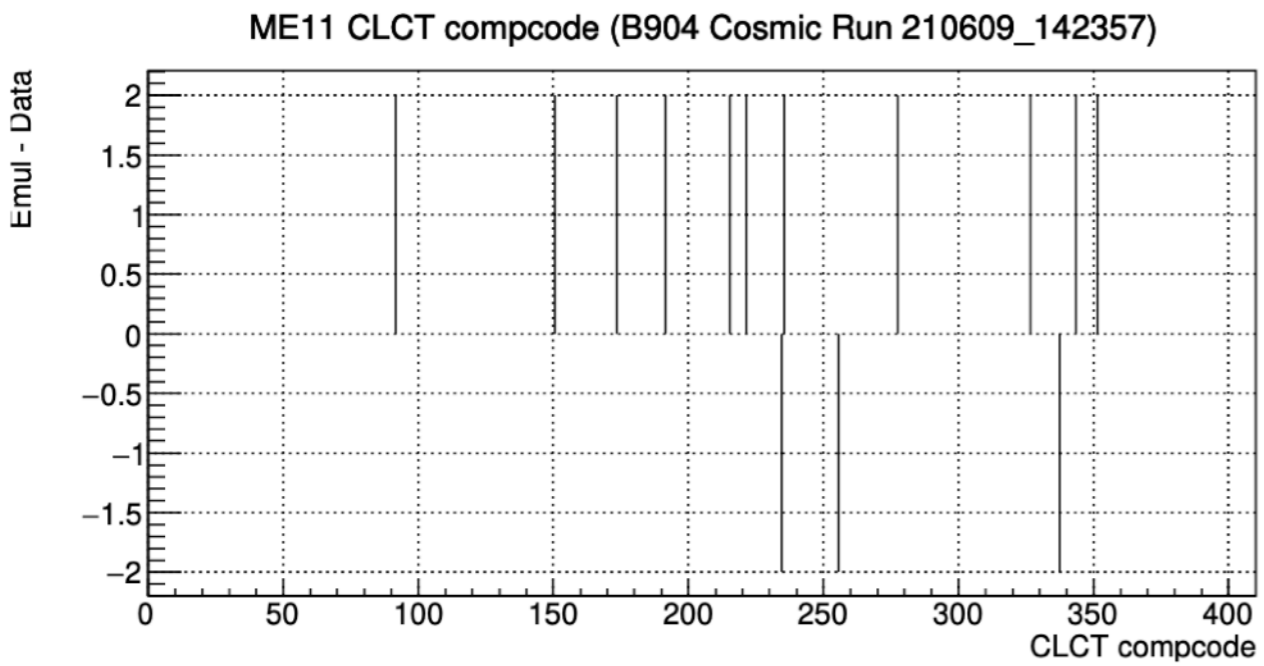
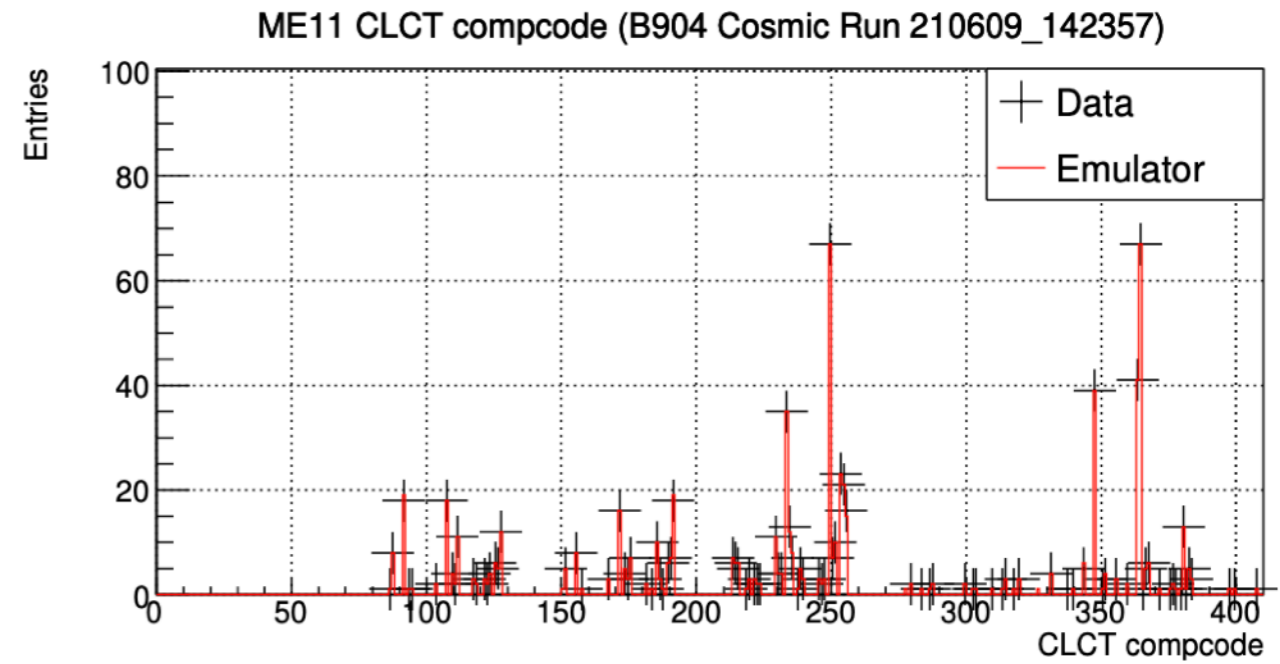
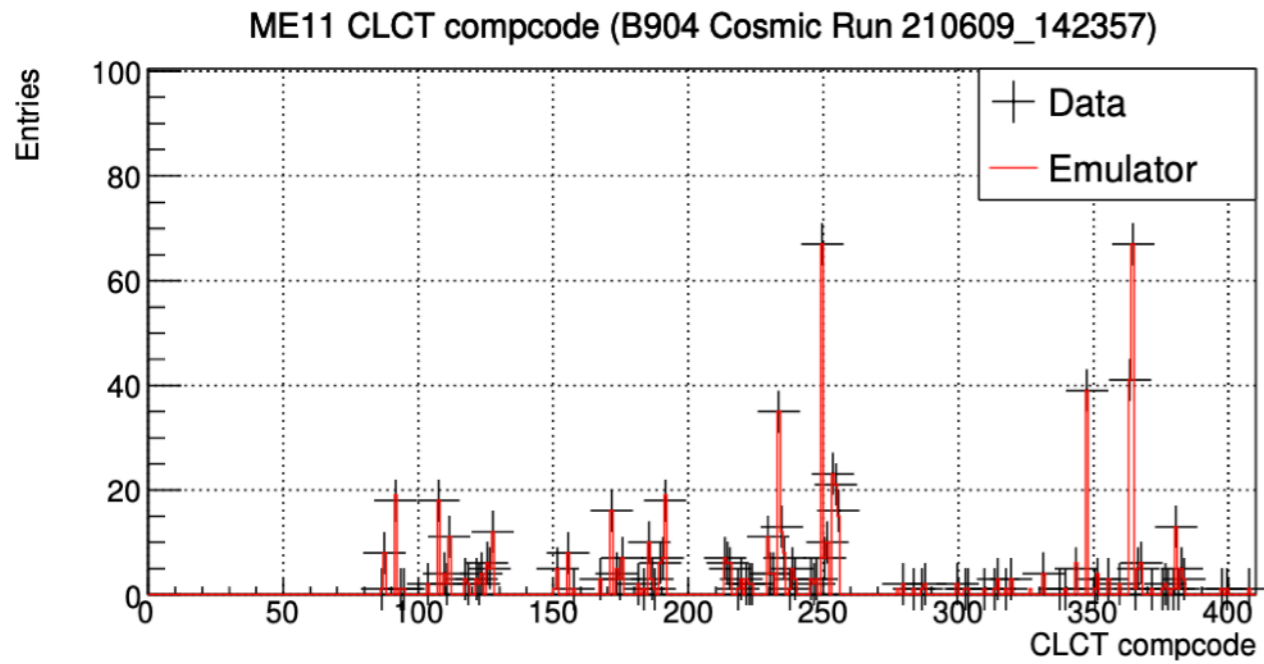
ME11 CLCT quality (B904 Cosmic Run 210609\_142357)



**Before**

**After**

# CLCT



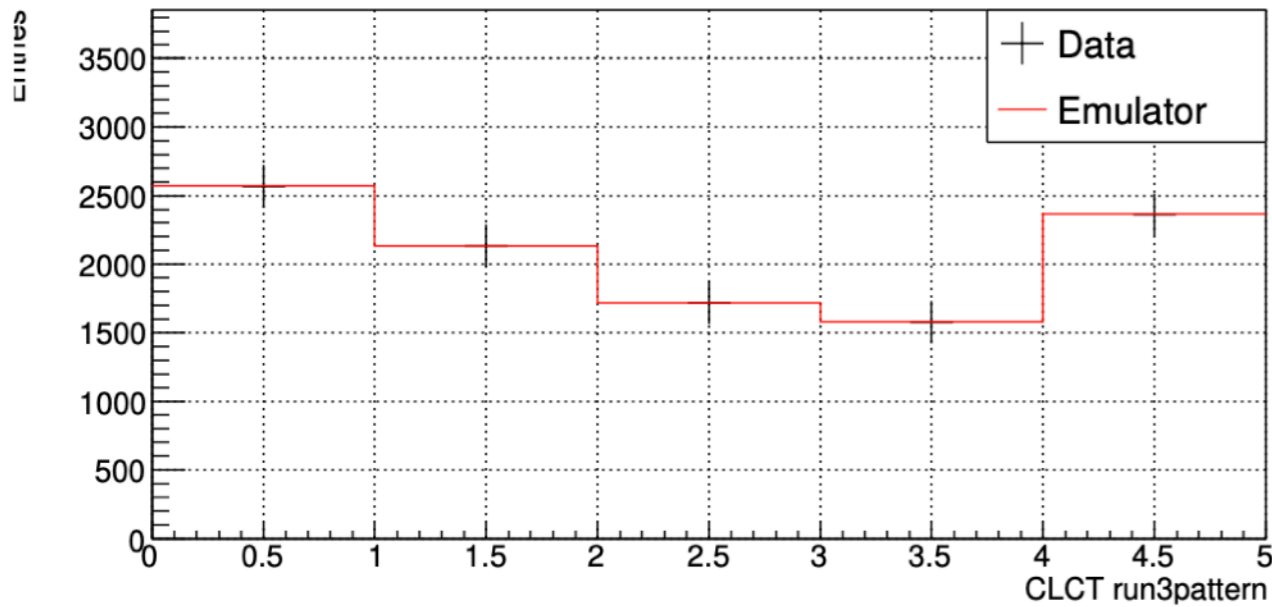
**Before**

**After**

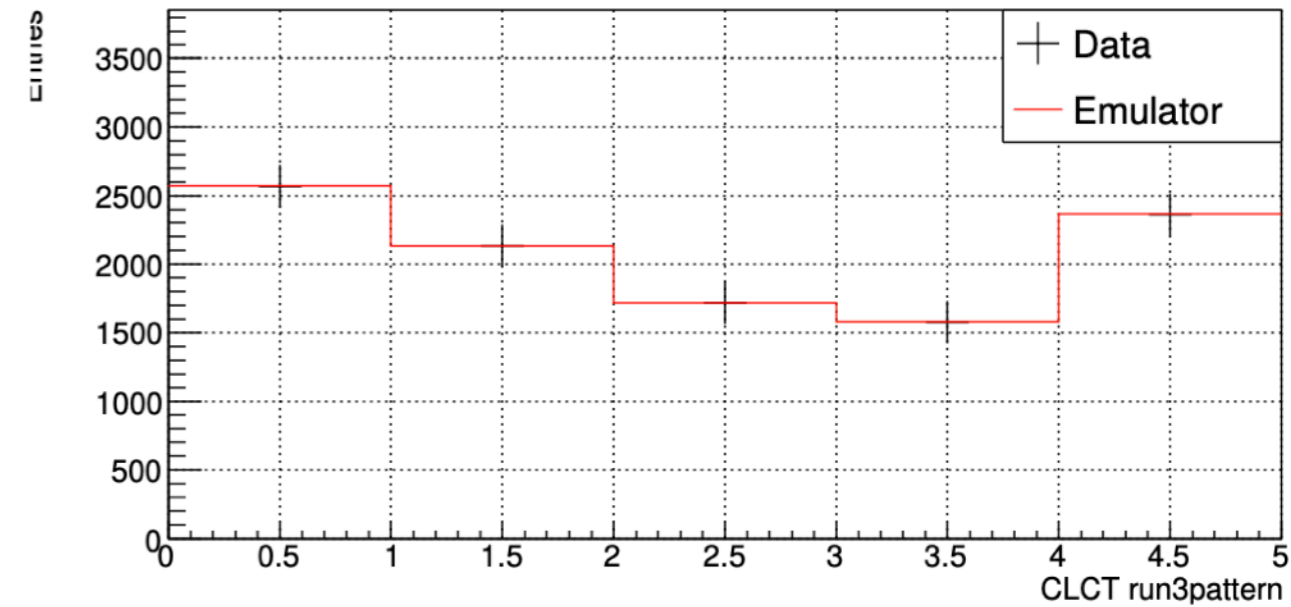


# CLCT

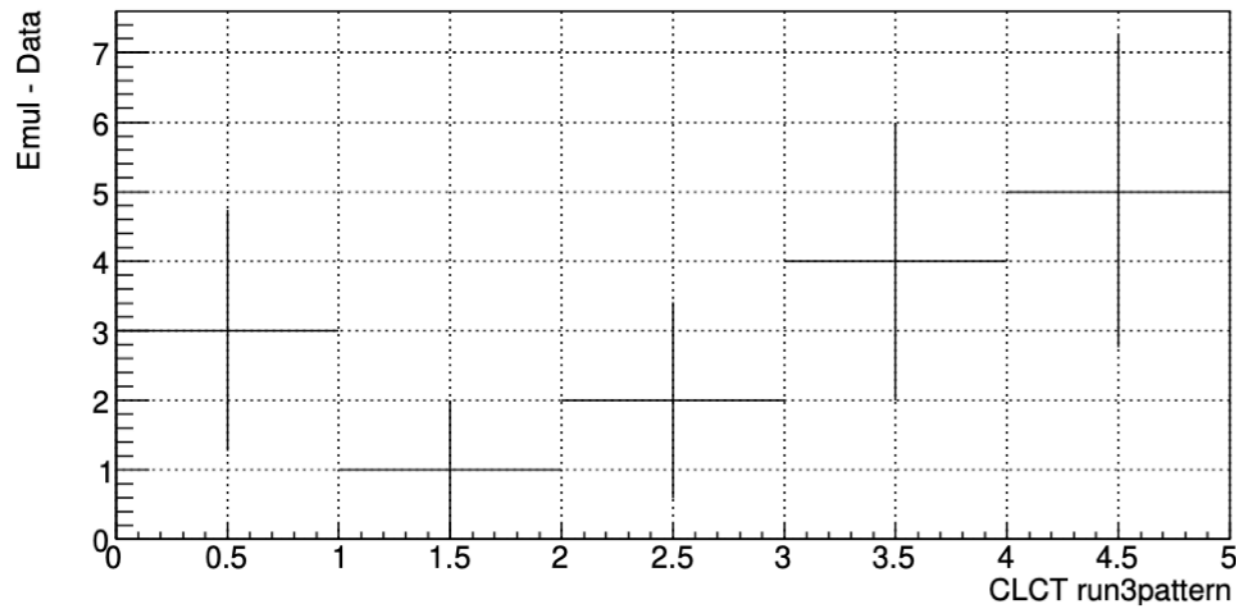
ME11 CLCT run3pattern (B904 Cosmic Run 210609\_142357)



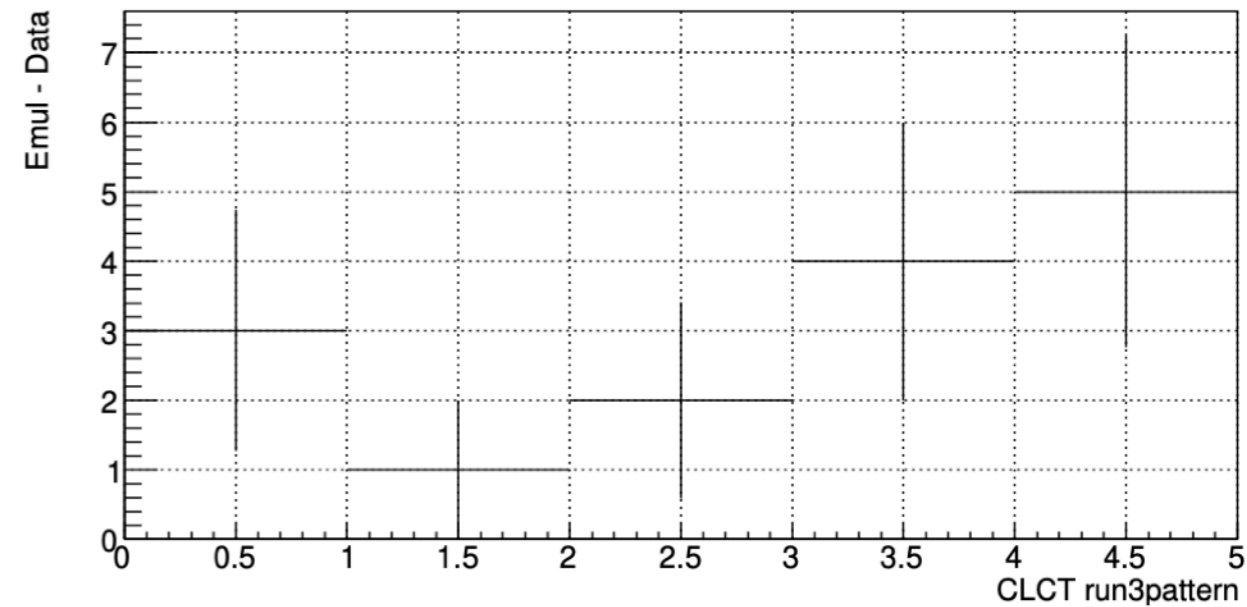
ME11 CLCT run3pattern (B904 Cosmic Run 210609\_142357)



ME11 CLCT run3pattern (B904 Cosmic Run 210609\_142357)



ME11 CLCT run3pattern (B904 Cosmic Run 210609\_142357)

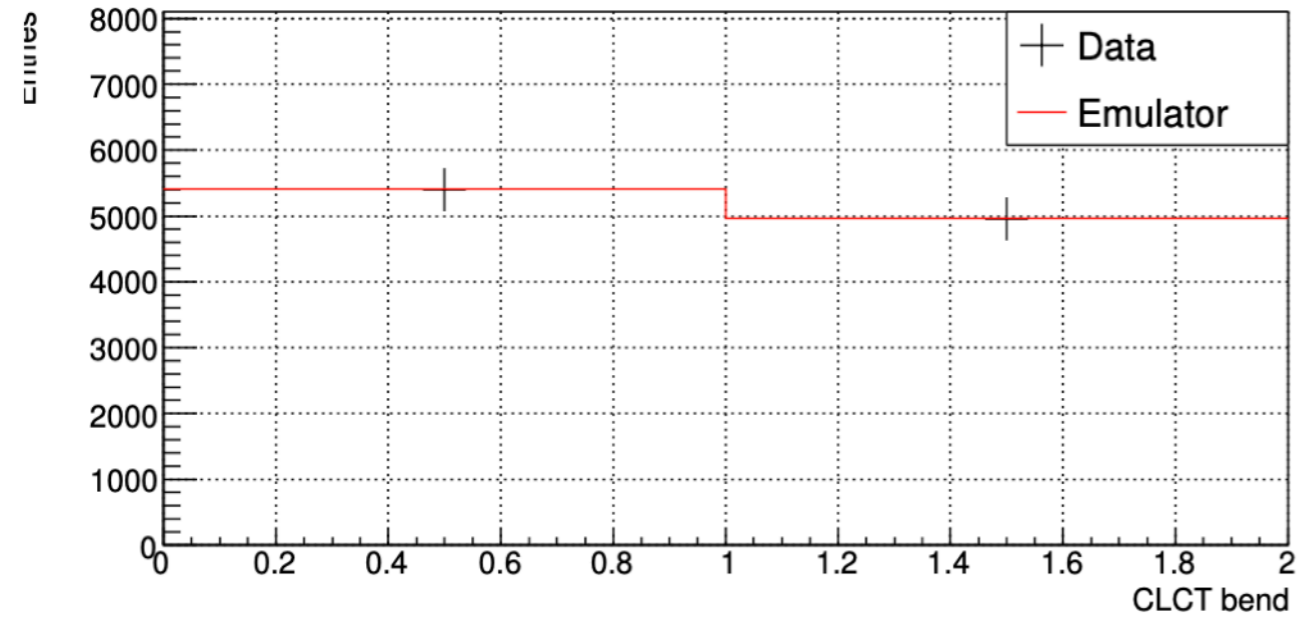


**Before**

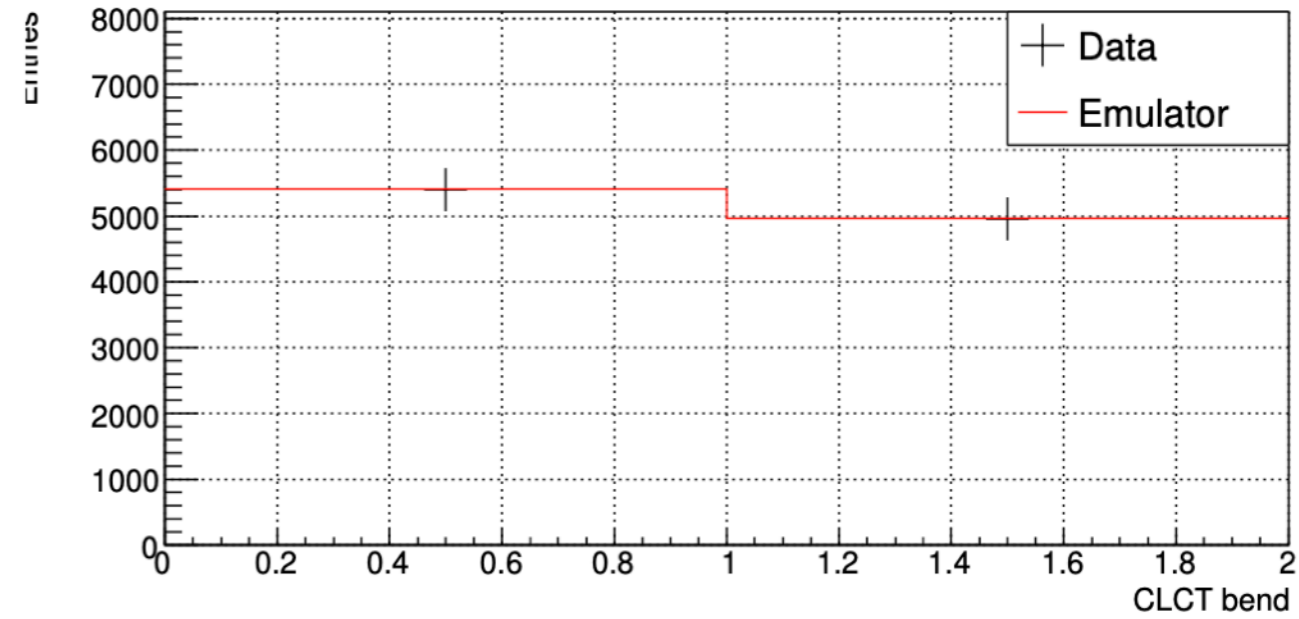
**After**

# CLCT

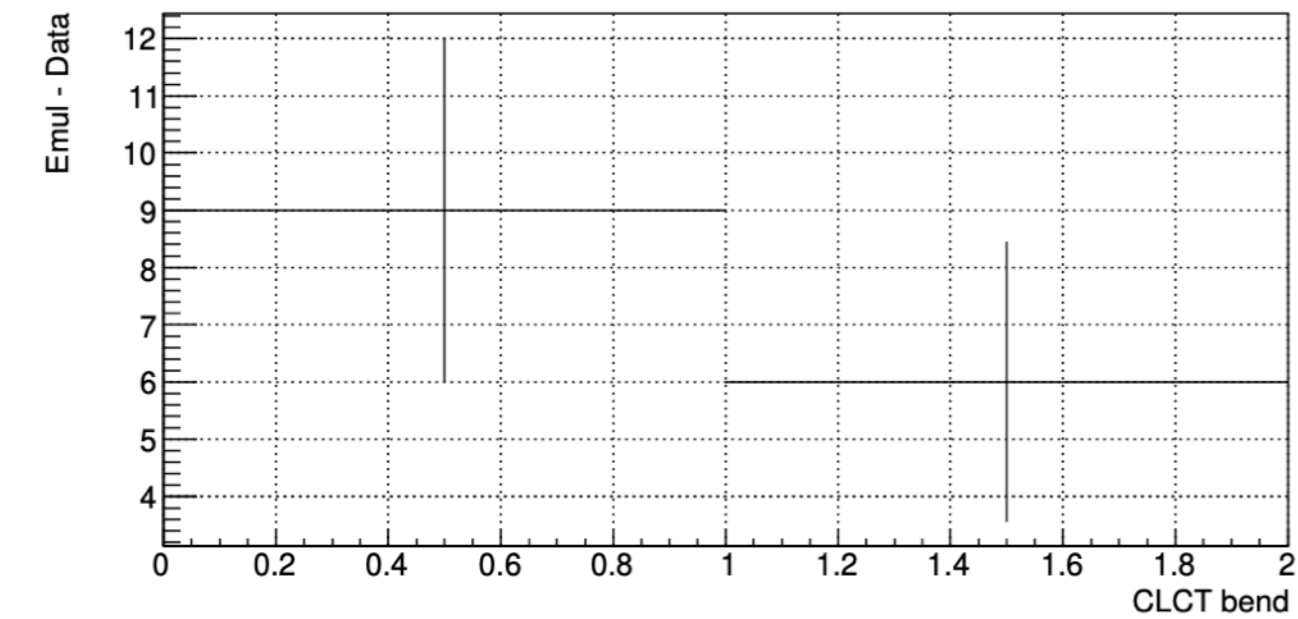
ME11 CLCT bend (B904 Cosmic Run 210609\_142357)



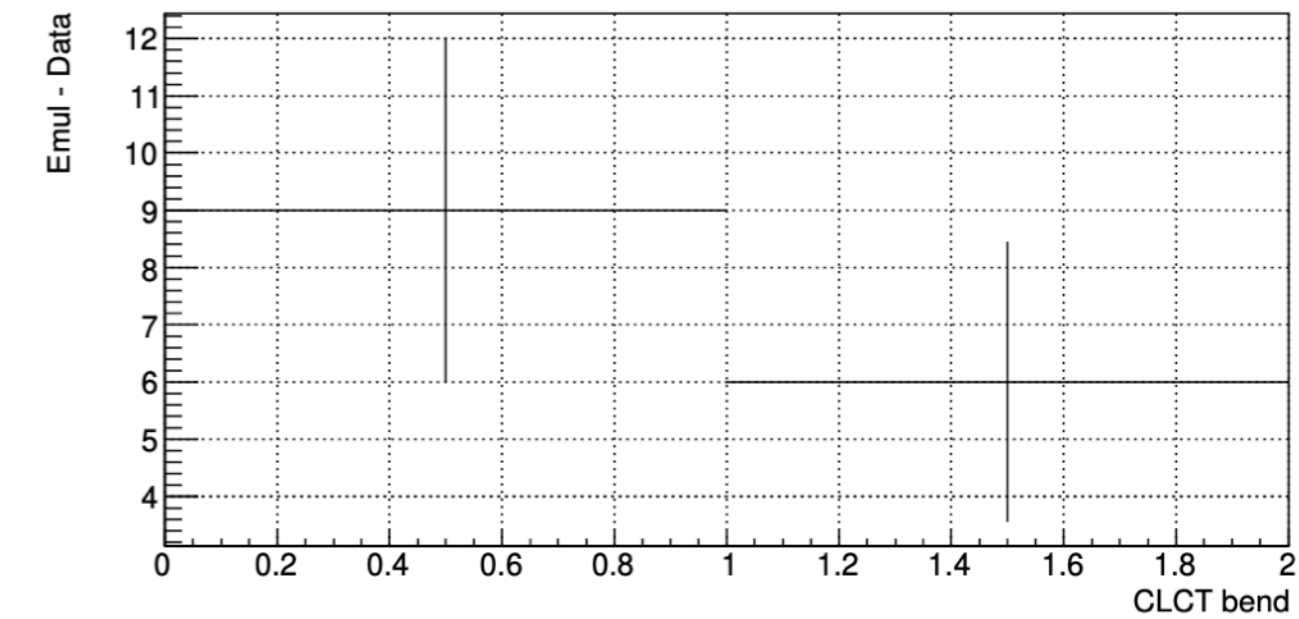
ME11 CLCT bend (B904 Cosmic Run 210609\_142357)



ME11 CLCT bend (B904 Cosmic Run 210609\_142357)



ME11 CLCT bend (B904 Cosmic Run 210609\_142357)

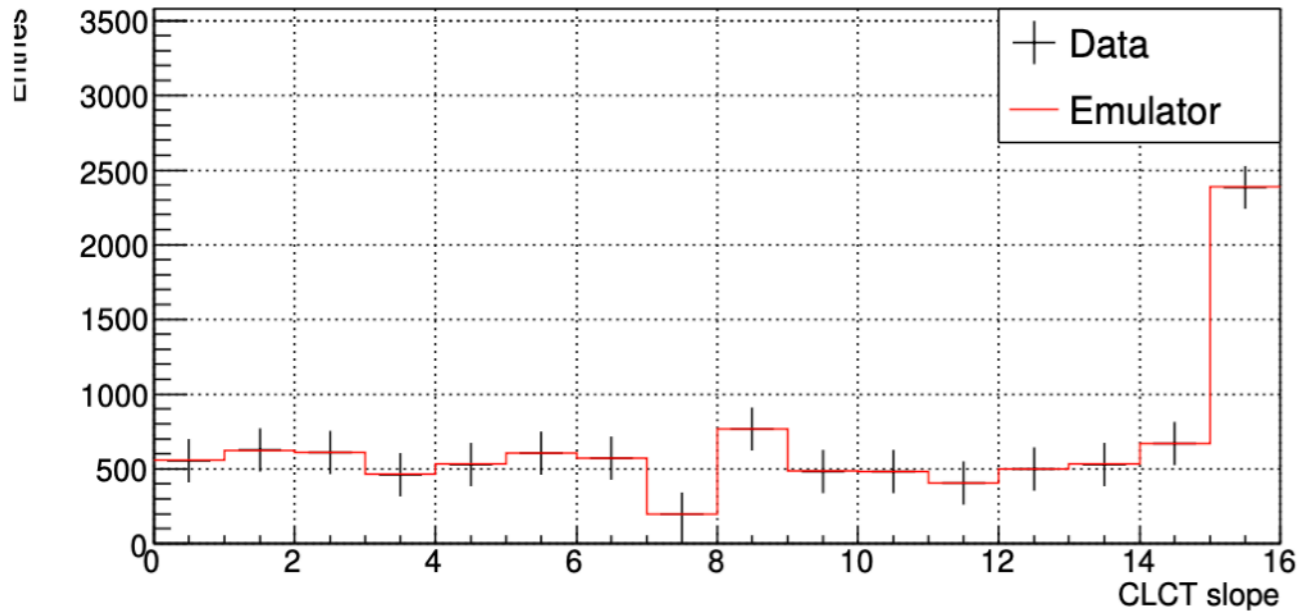


**Before**

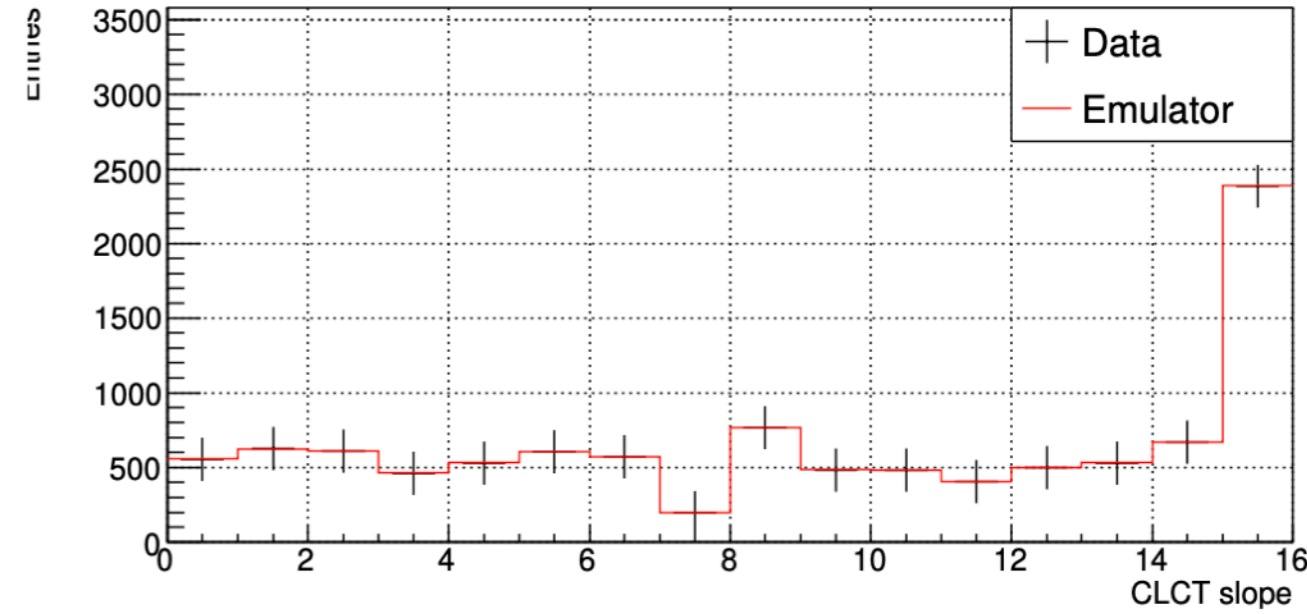
**After**

# CLCT

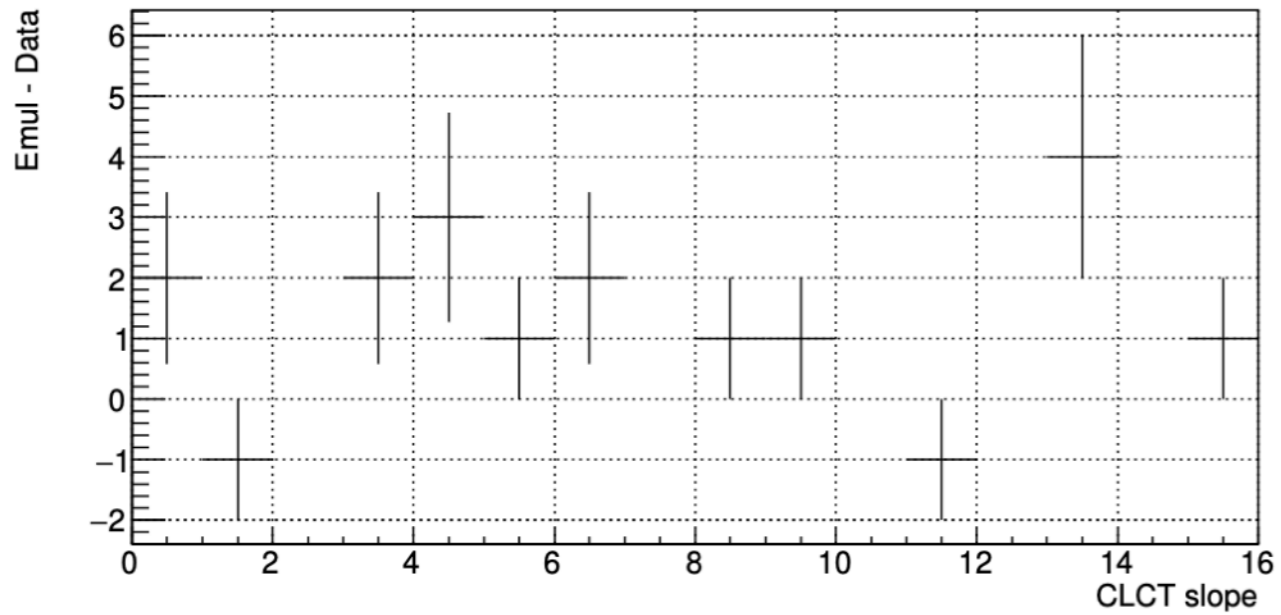
ME11 CLCT slope (B904 Cosmic Run 210609\_142357)



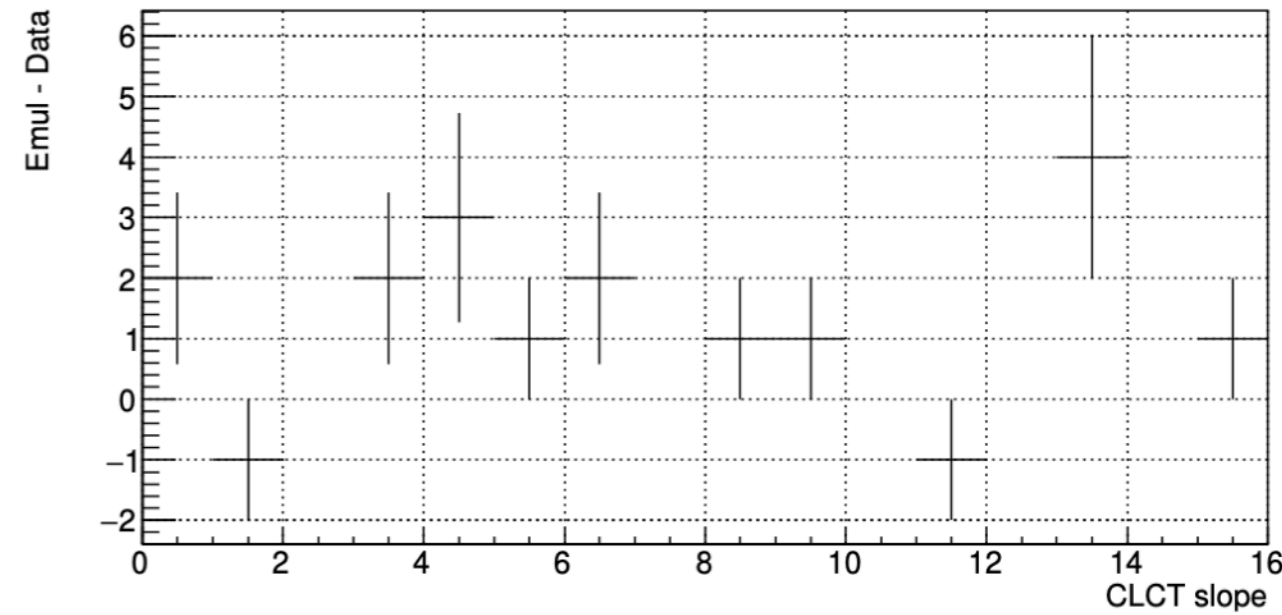
ME11 CLCT slope (B904 Cosmic Run 210609\_142357)



ME11 CLCT slope (B904 Cosmic Run 210609\_142357)



ME11 CLCT slope (B904 Cosmic Run 210609\_142357)

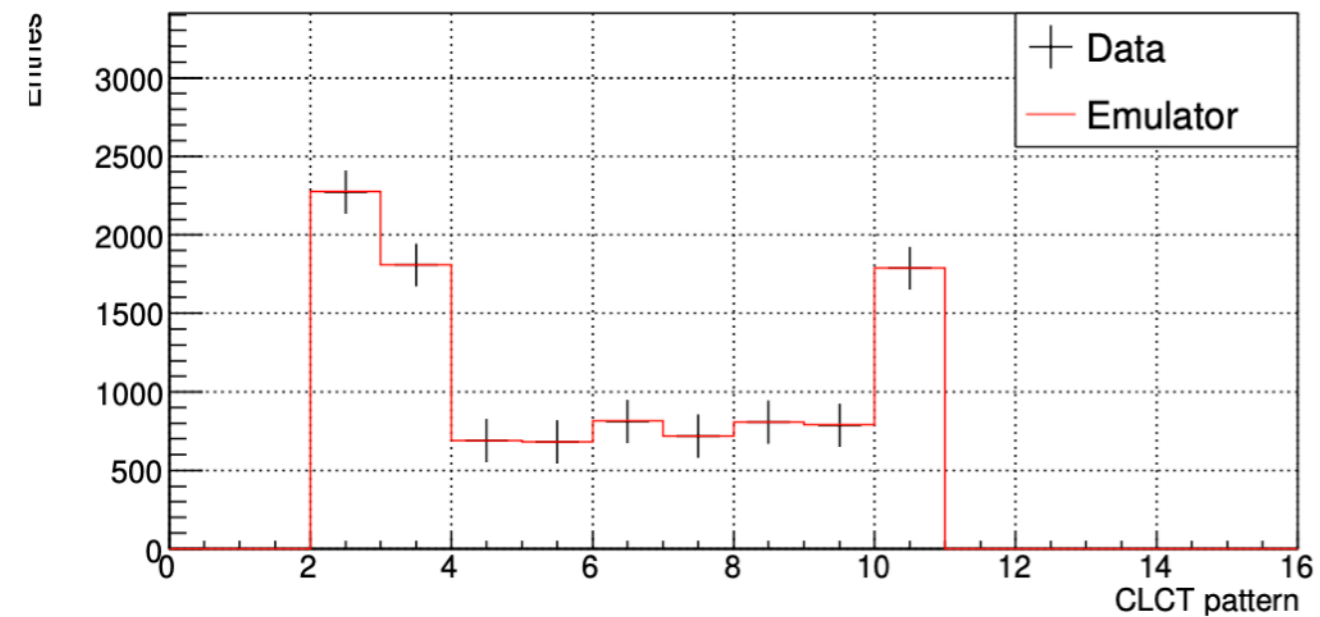


**Before**

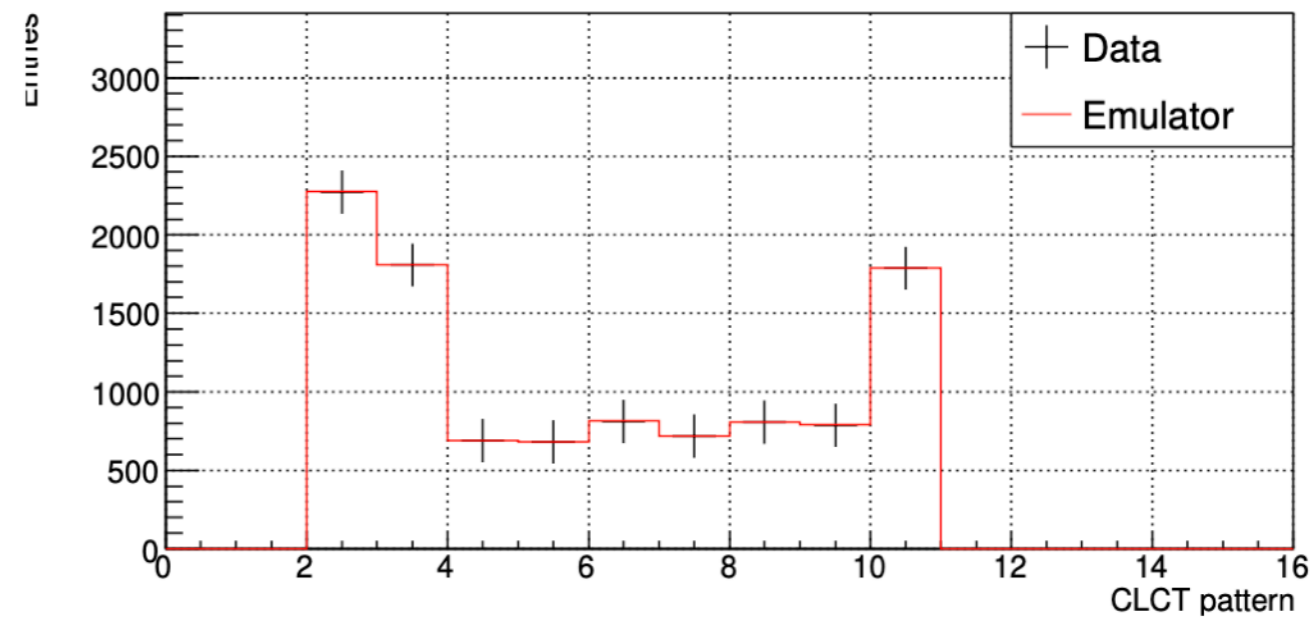
**After**

# CLCT

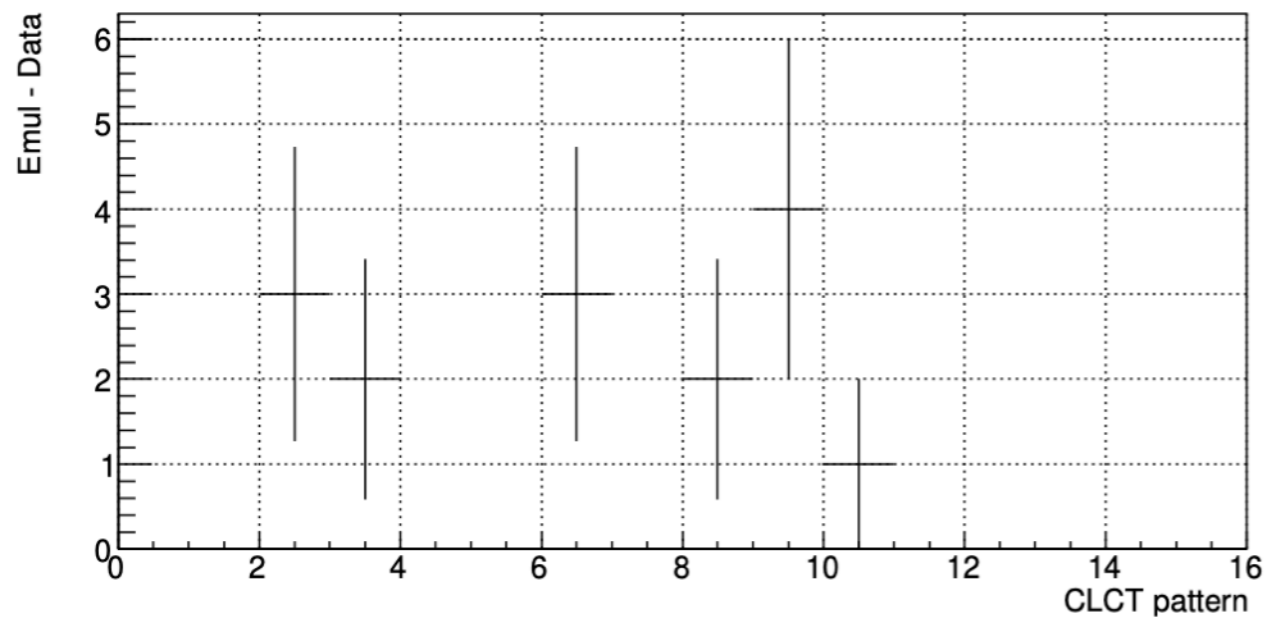
ME11 CLCT pattern (B904 Cosmic Run 210609\_142357)



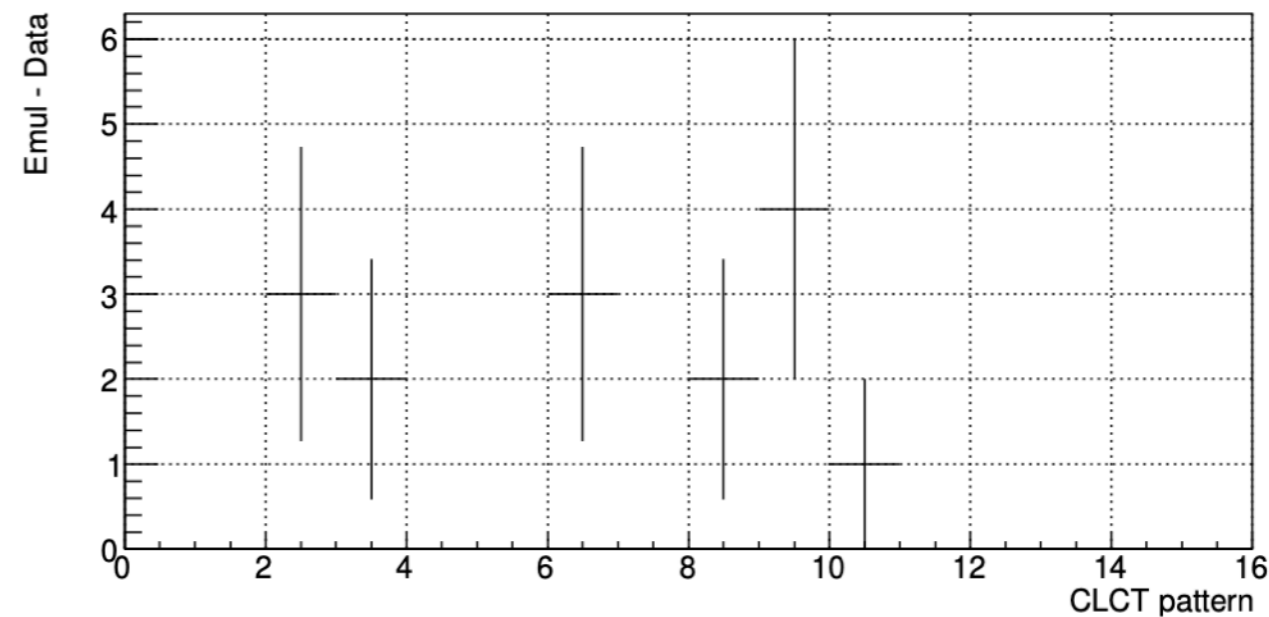
ME11 CLCT pattern (B904 Cosmic Run 210609\_142357)



ME11 CLCT pattern (B904 Cosmic Run 210609\_142357)



ME11 CLCT pattern (B904 Cosmic Run 210609\_142357)

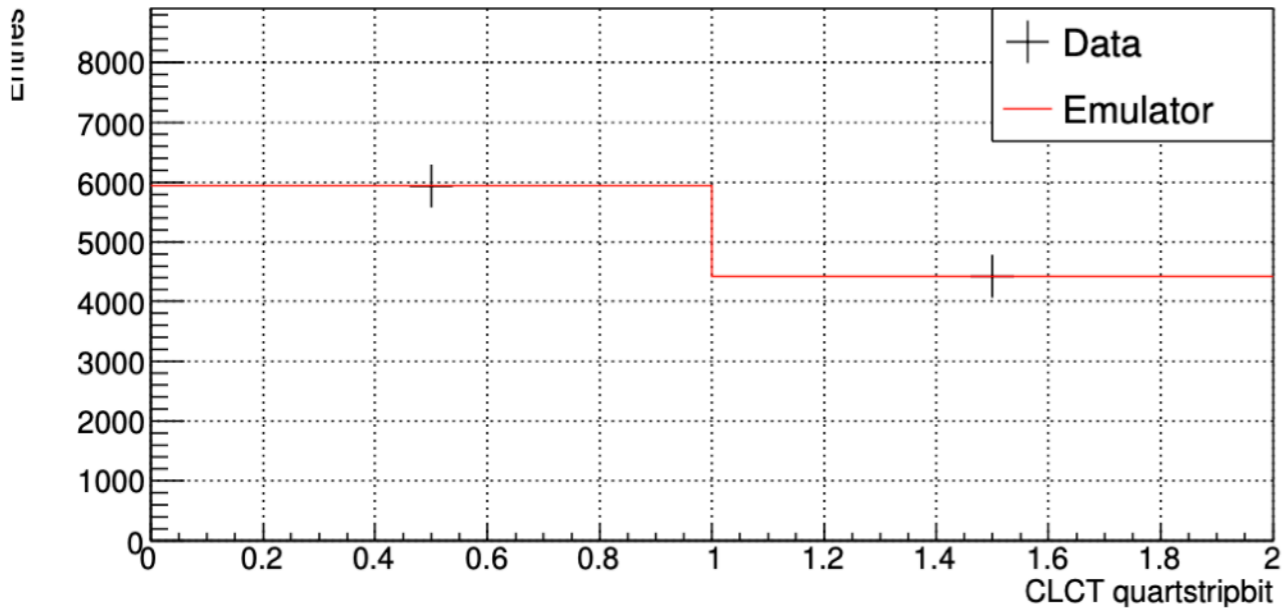


**Before**

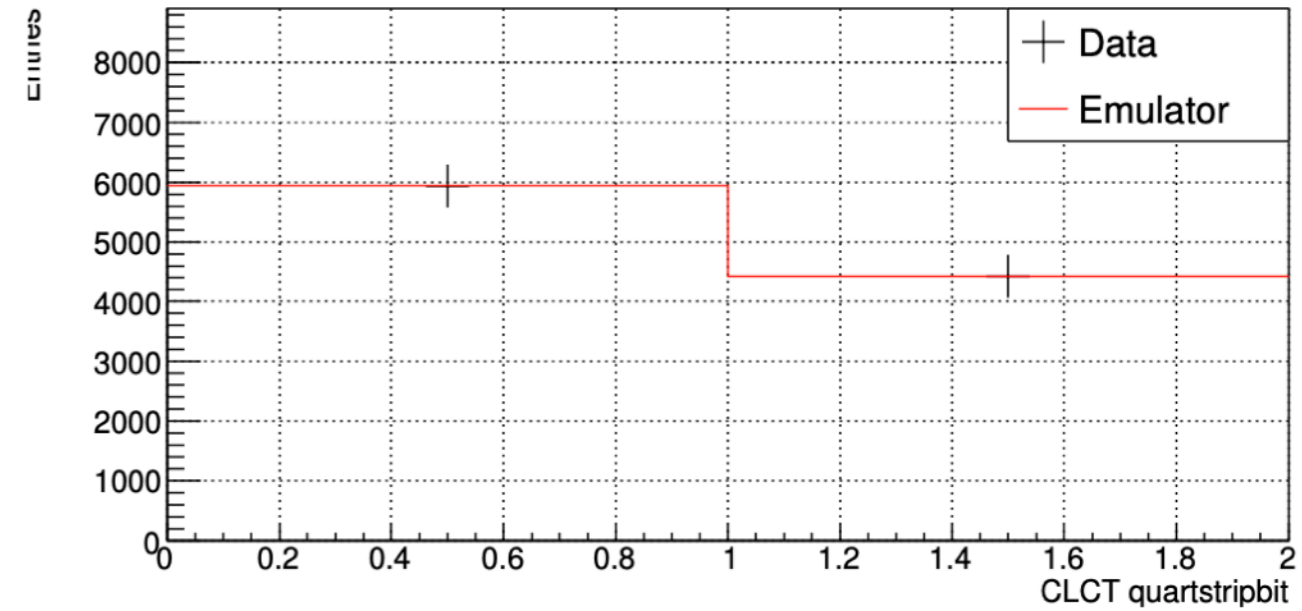
**After**

# CLCT

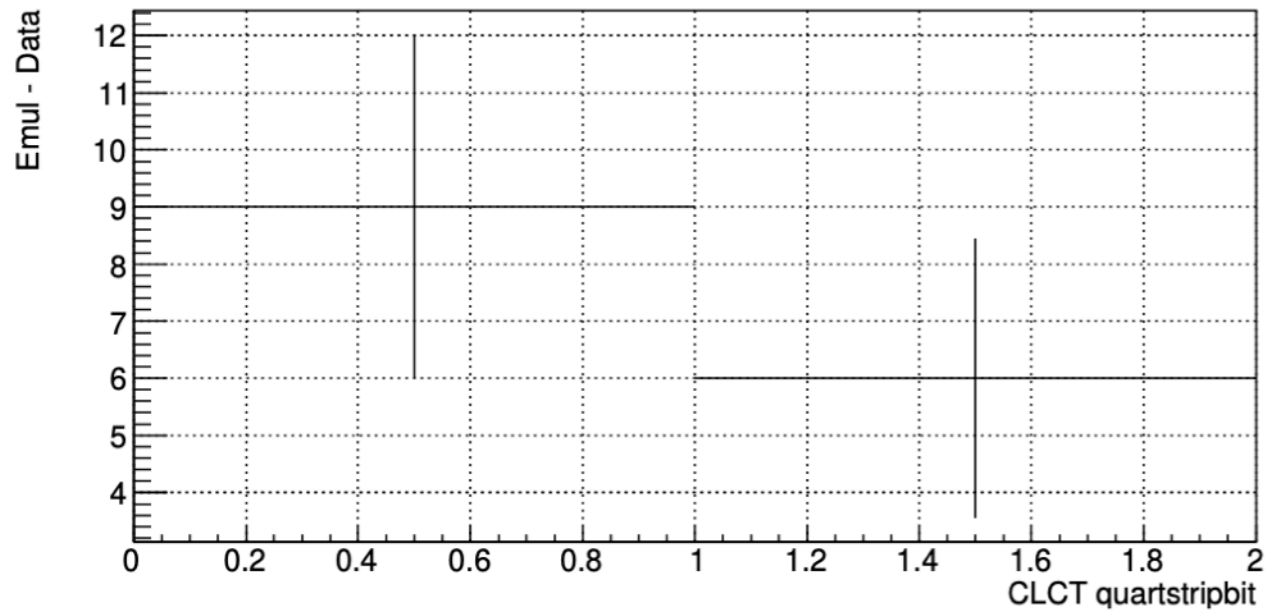
ME11 CLCT quartstripbit (B904 Cosmic Run 210609\_142357)



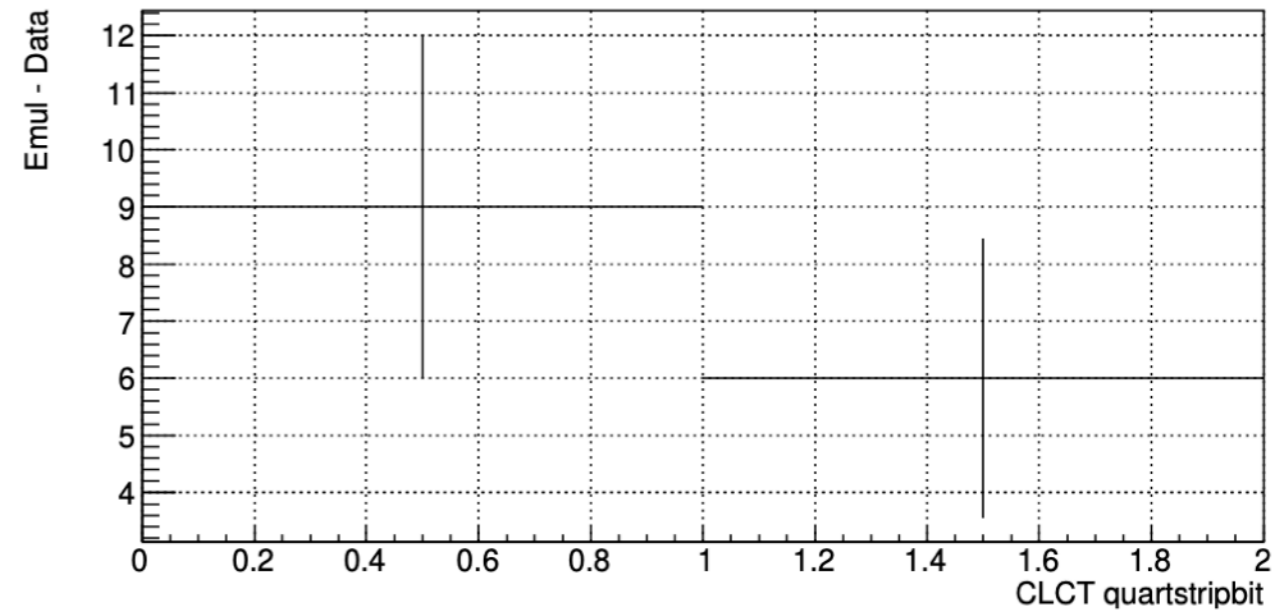
ME11 CLCT quartstripbit (B904 Cosmic Run 210609\_142357)



ME11 CLCT quartstripbit (B904 Cosmic Run 210609\_142357)



ME11 CLCT quartstripbit (B904 Cosmic Run 210609\_142357)

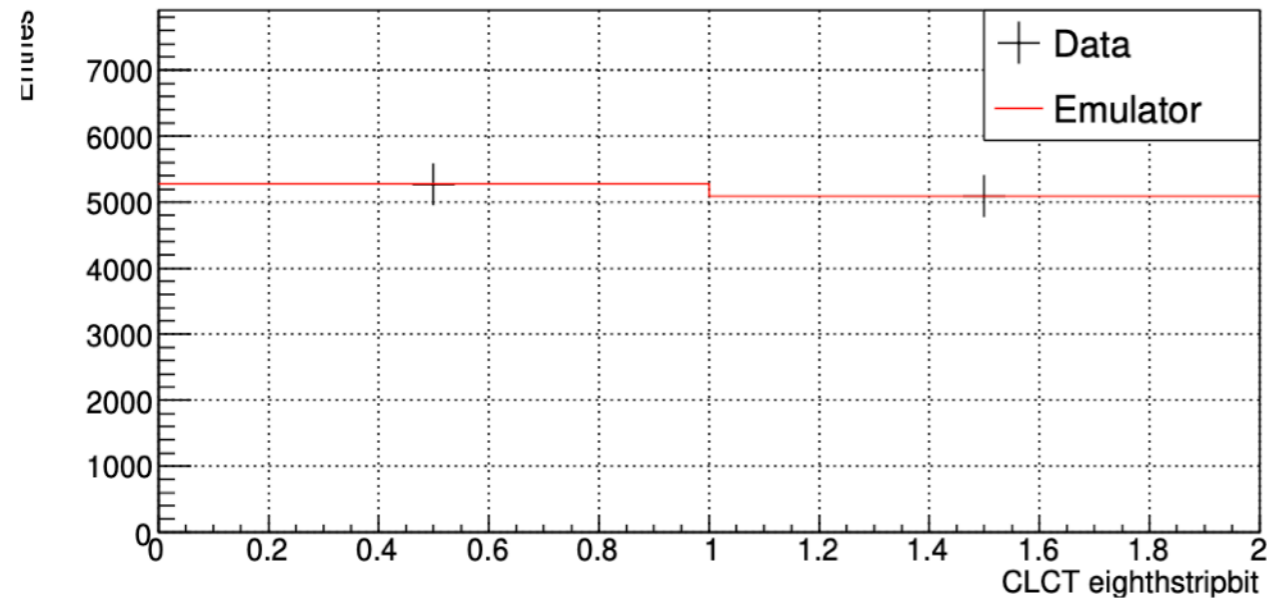


**Before**

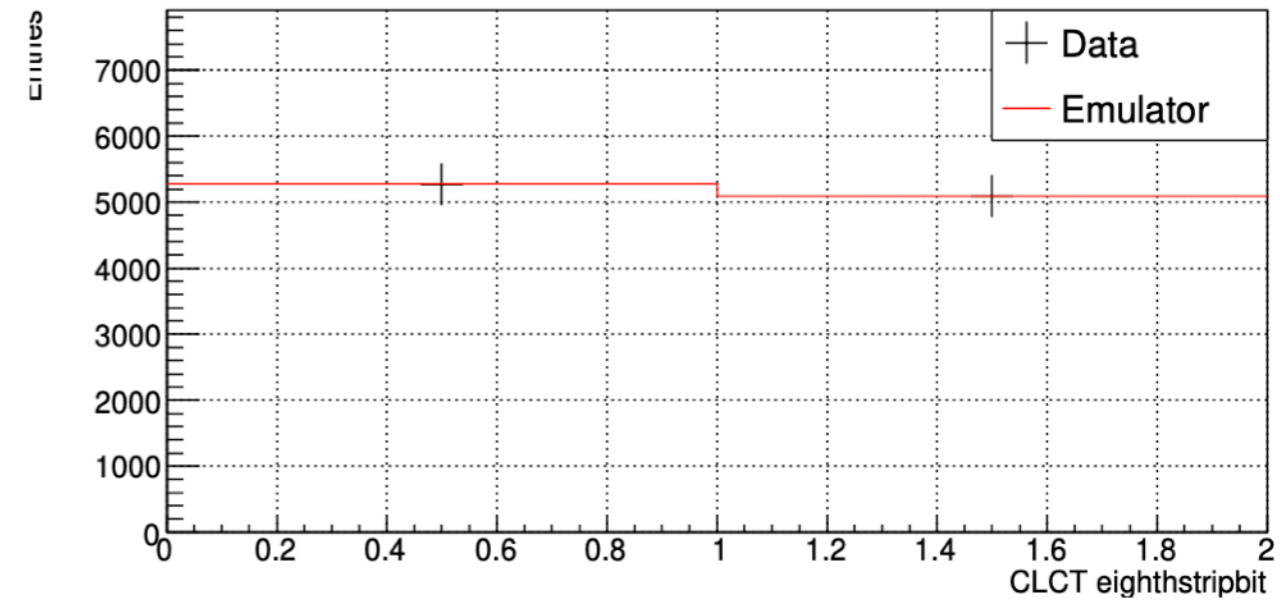
**After**

# CLCT

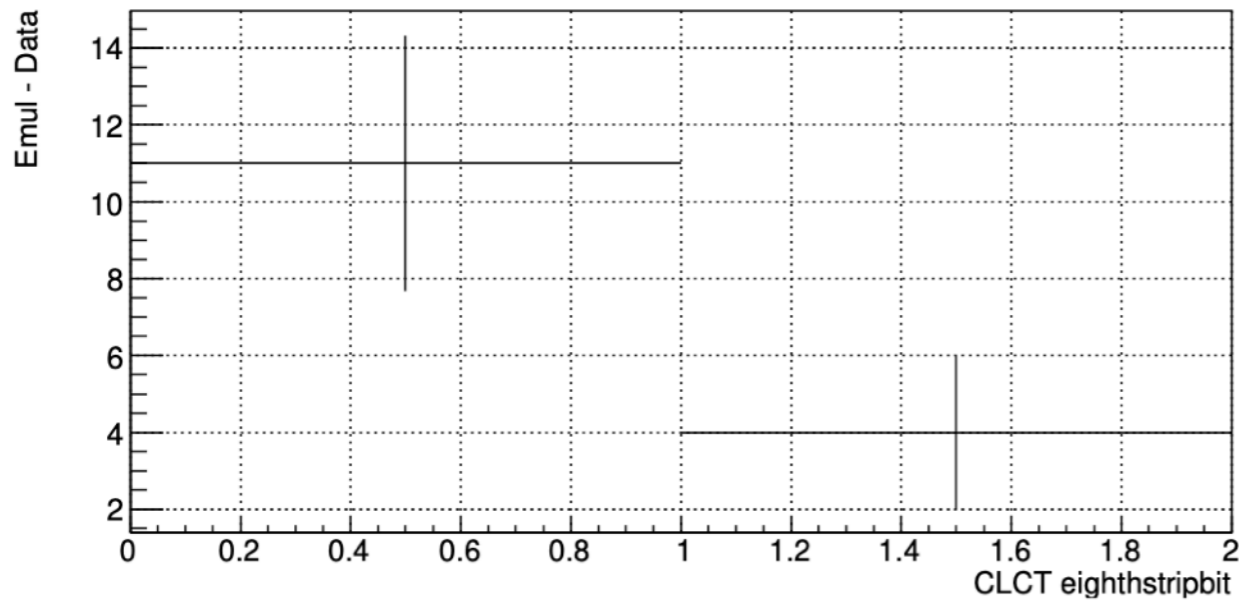
ME11 CLCT eighthstripbit (B904 Cosmic Run 210609\_142357)



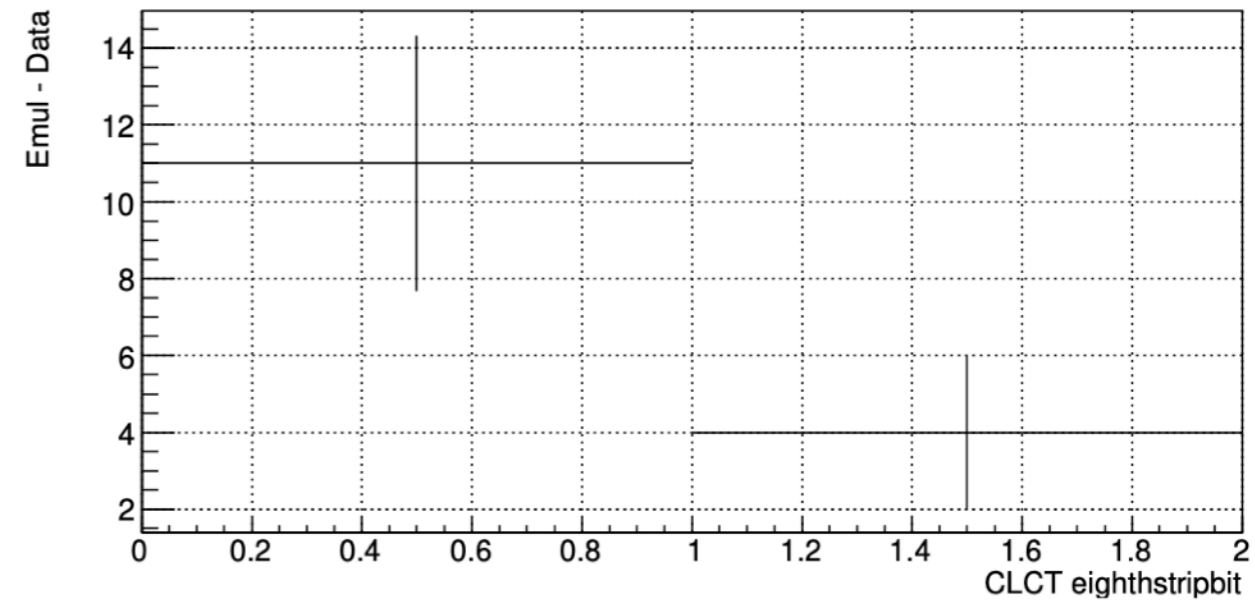
ME11 CLCT eighthstripbit (B904 Cosmic Run 210609\_142357)



ME11 CLCT eighthstripbit (B904 Cosmic Run 210609\_142357)



ME11 CLCT eighthstripbit (B904 Cosmic Run 210609\_142357)

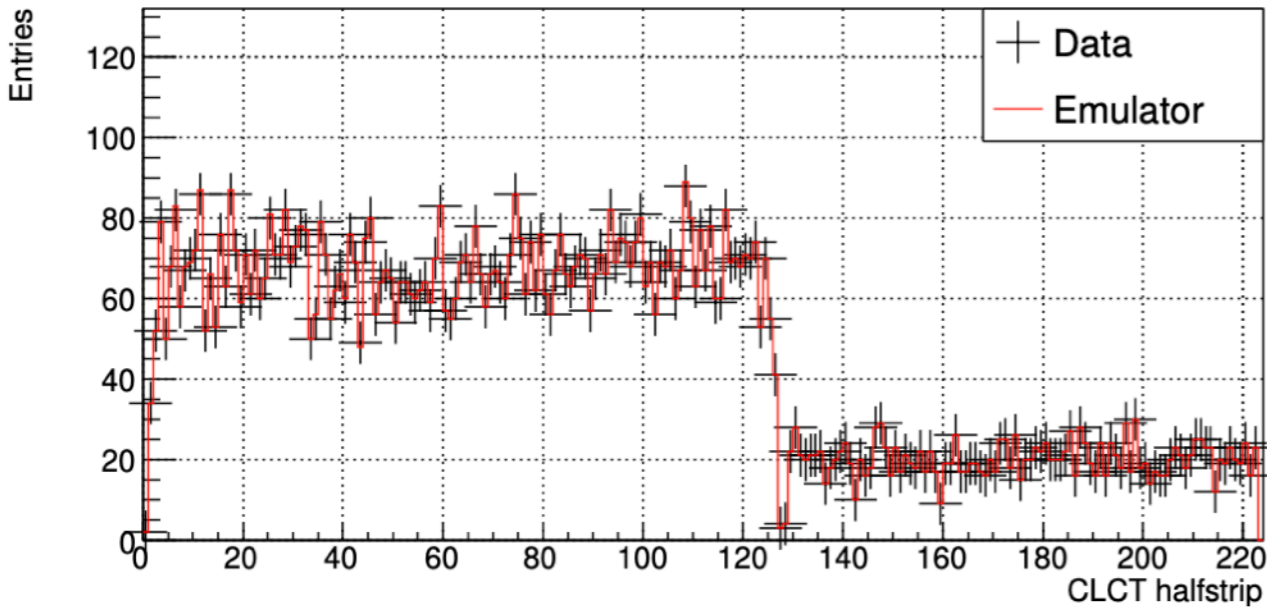


**Before**

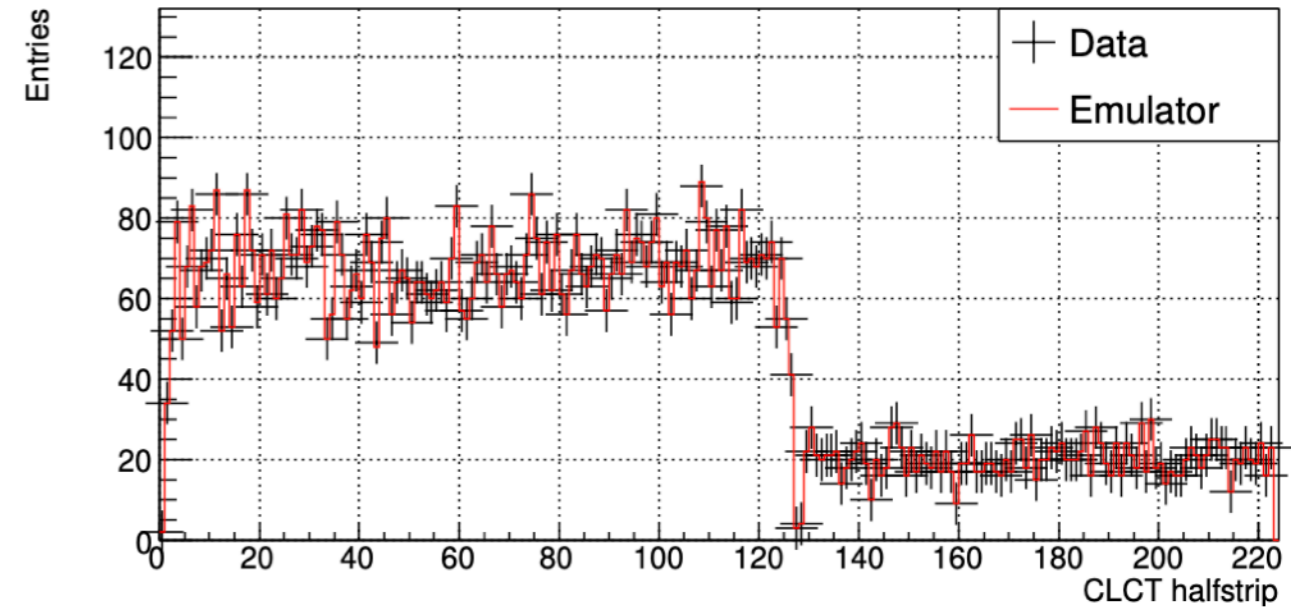
**After**

# CLCT

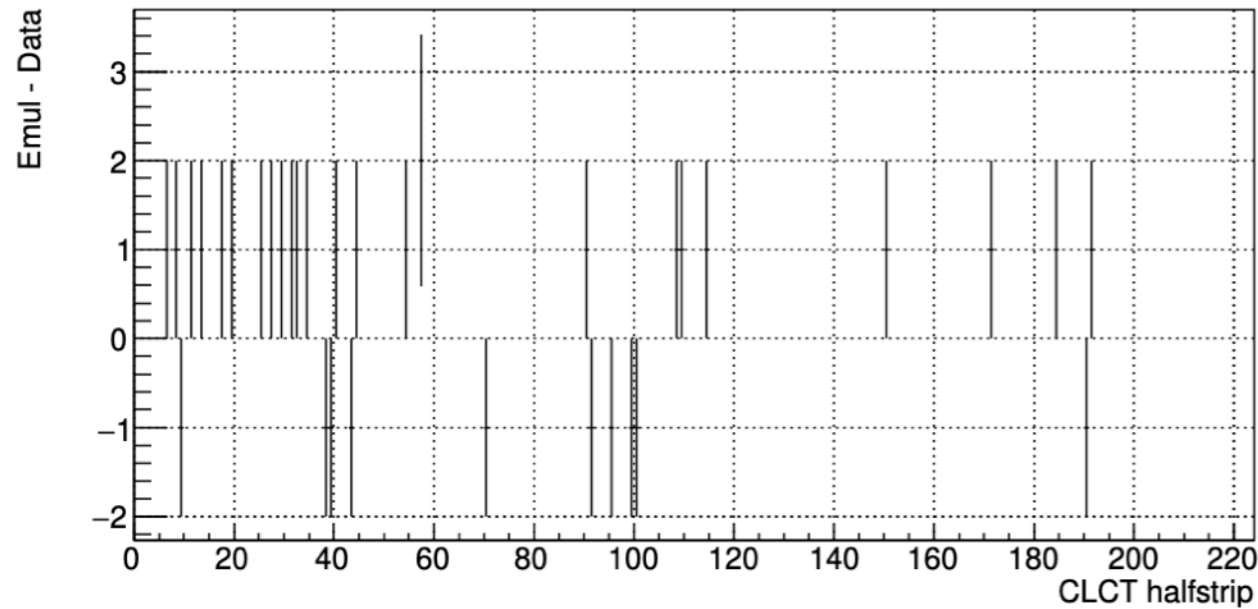
ME11 CLCT halfstrip (B904 Cosmic Run 210609\_142357)



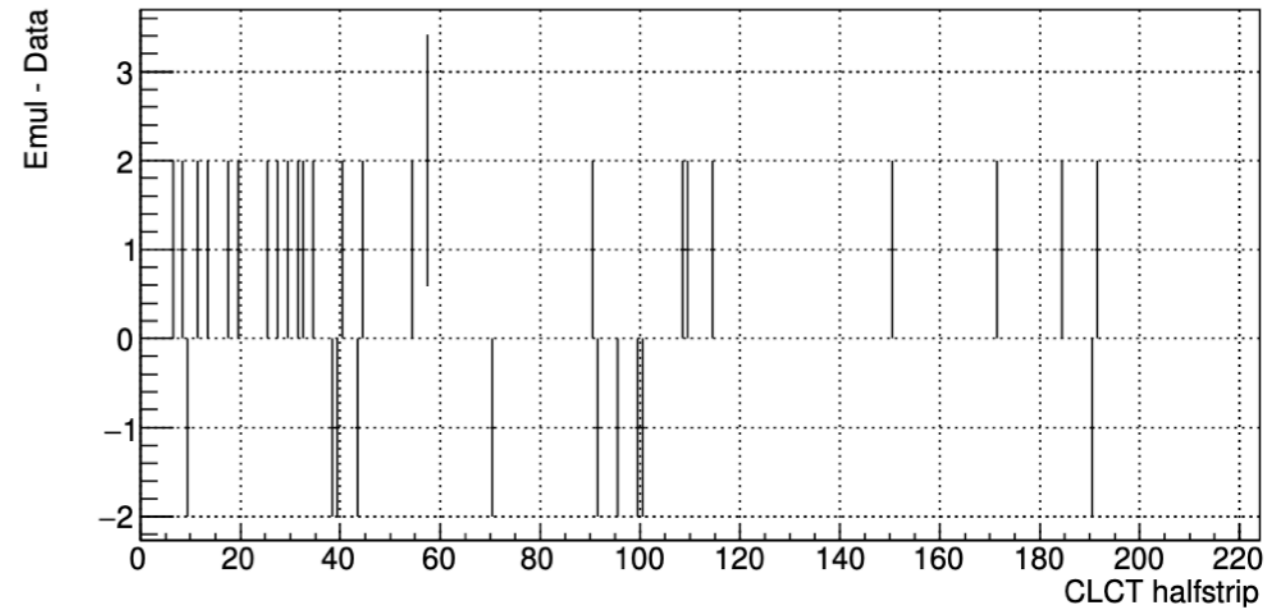
ME11 CLCT halfstrip (B904 Cosmic Run 210609\_142357)



ME11 CLCT halfstrip (B904 Cosmic Run 210609\_142357)



ME11 CLCT halfstrip (B904 Cosmic Run 210609\_142357)

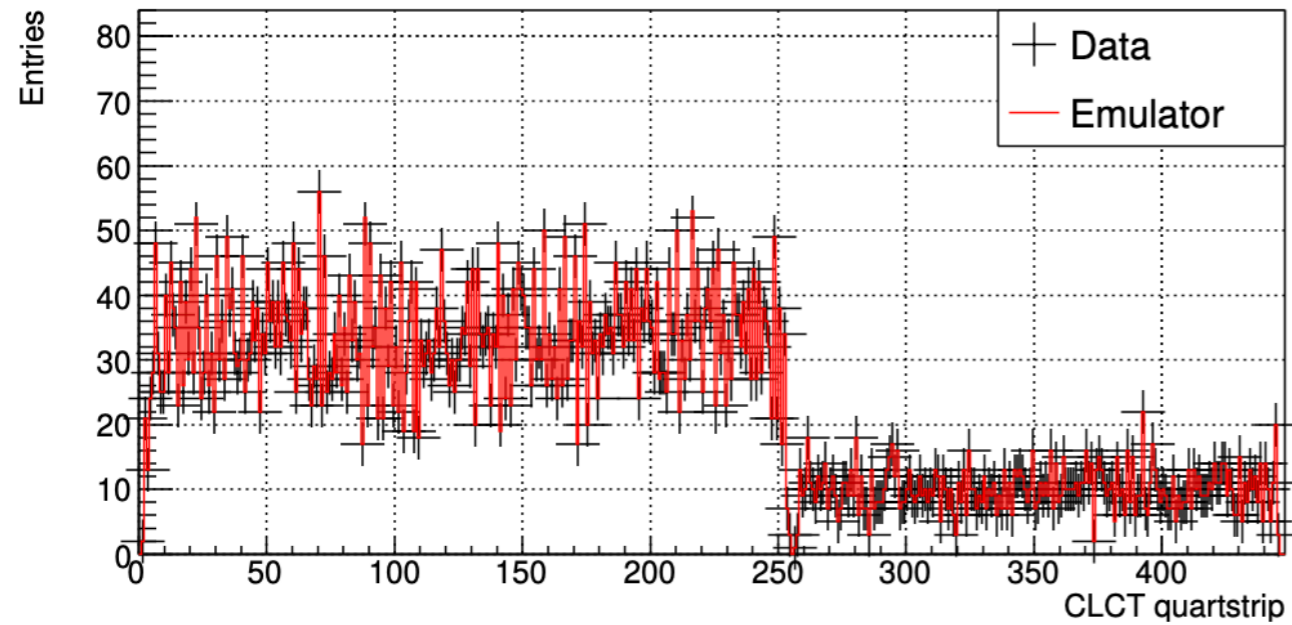


**Before**

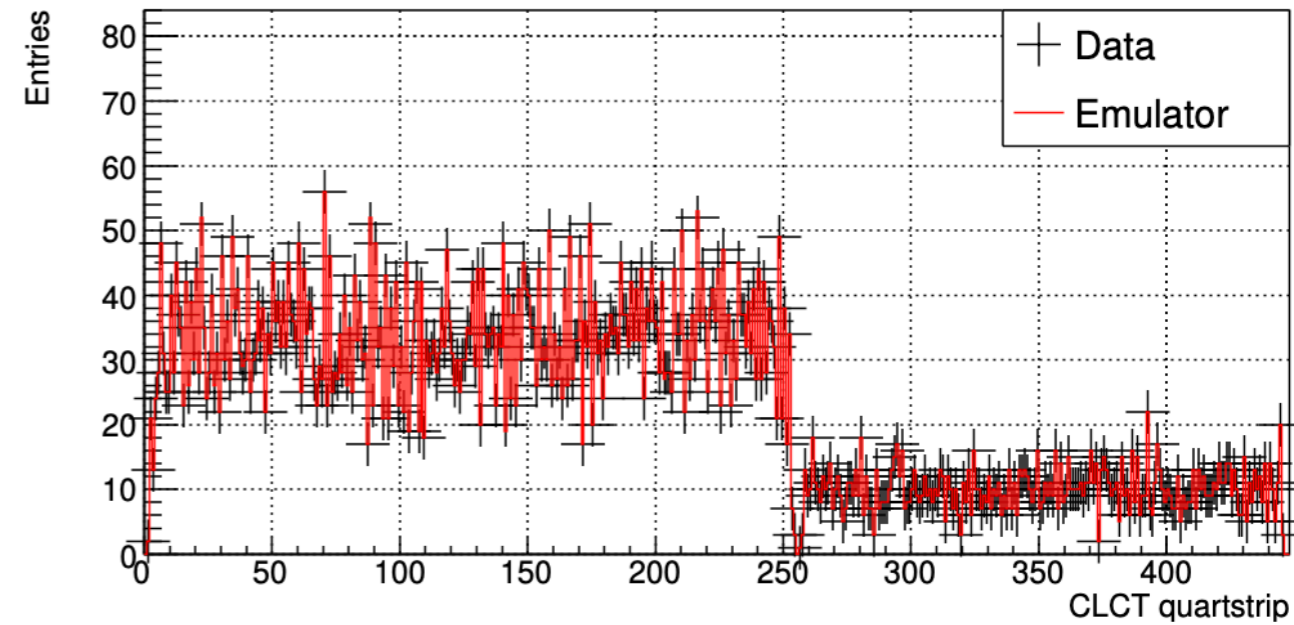
**After**

# CLCT

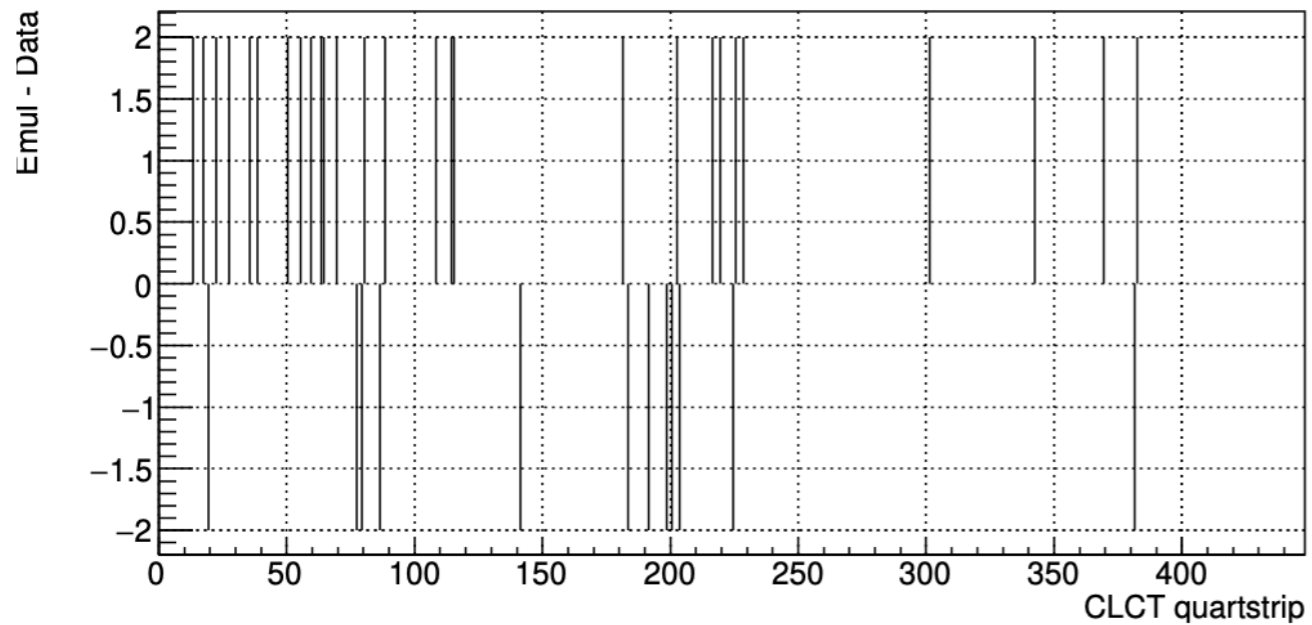
ME11 CLCT quartstrip (B904 Cosmic Run 210609\_142357)



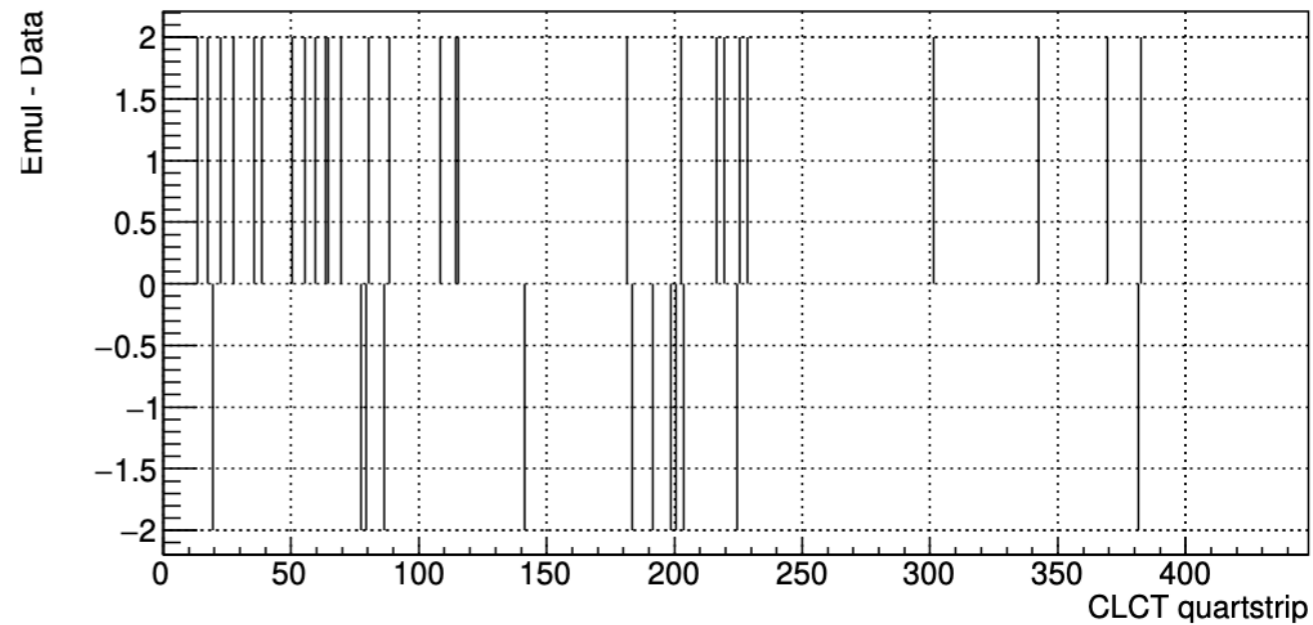
ME11 CLCT quartstrip (B904 Cosmic Run 210609\_142357)



ME11 CLCT quartstrip (B904 Cosmic Run 210609\_142357)



ME11 CLCT quartstrip (B904 Cosmic Run 210609\_142357)



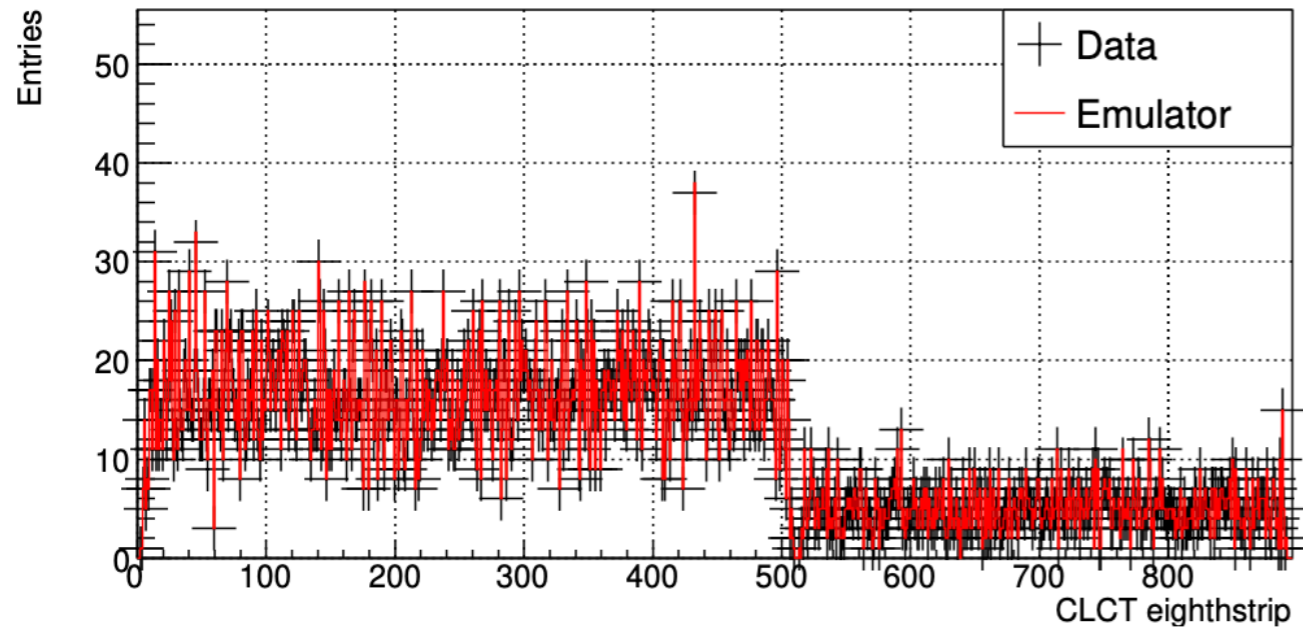
**Before**

**After**

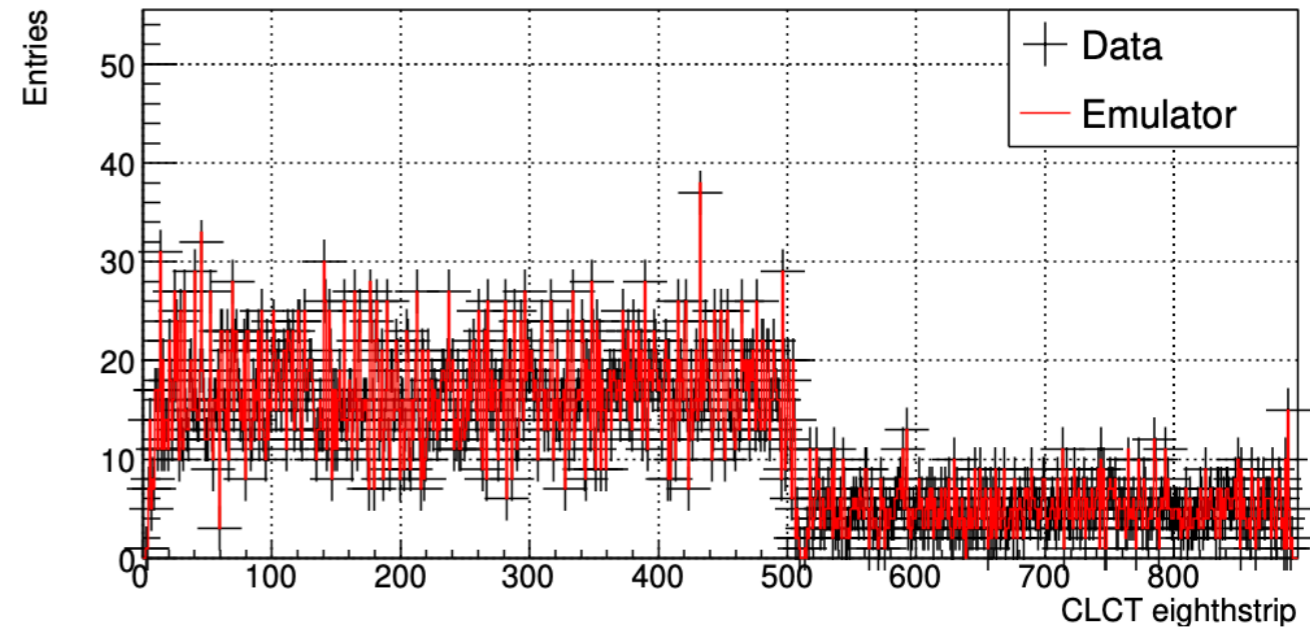


# CLCT

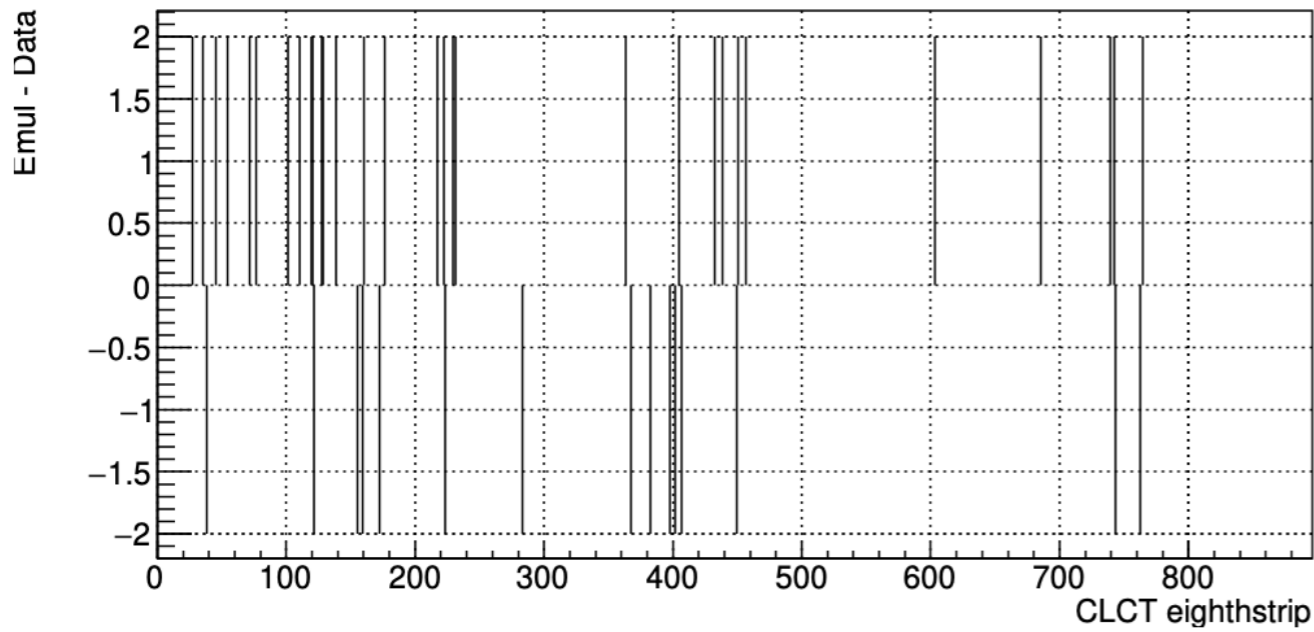
ME11 CLCT eighthstrip (B904 Cosmic Run 210609\_142357)



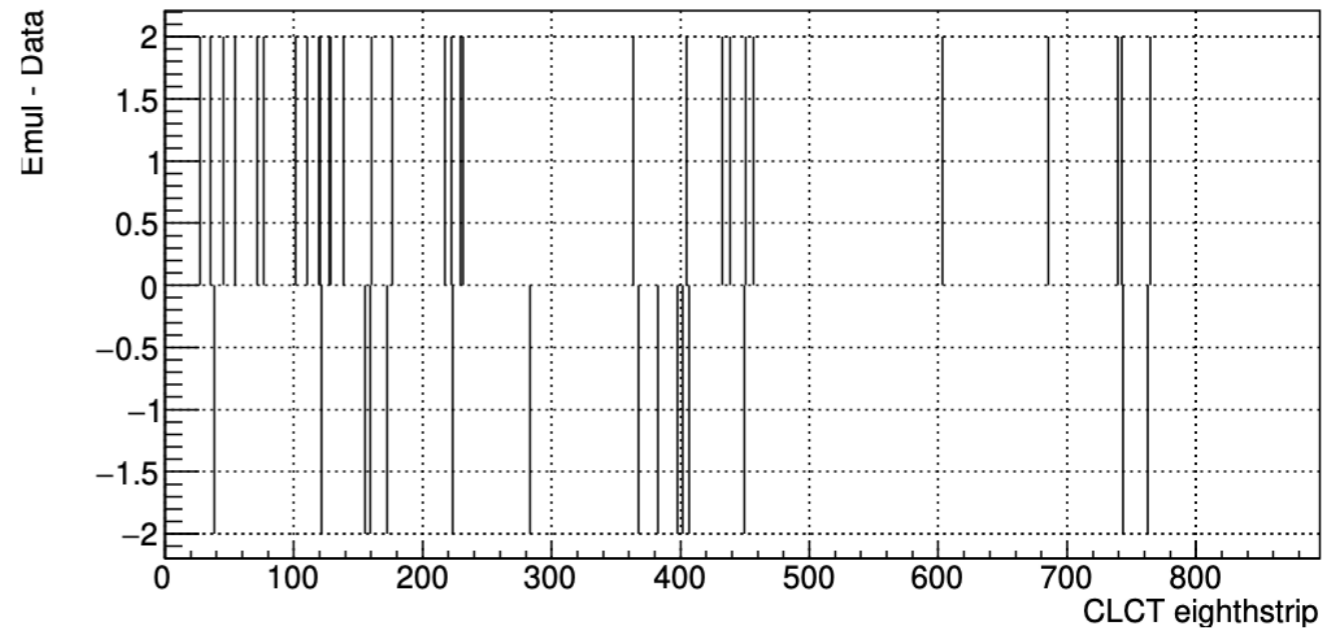
ME11 CLCT eighthstrip (B904 Cosmic Run 210609\_142357)



ME11 CLCT eighthstrip (B904 Cosmic Run 210609\_142357)



ME11 CLCT eighthstrip (B904 Cosmic Run 210609\_142357)

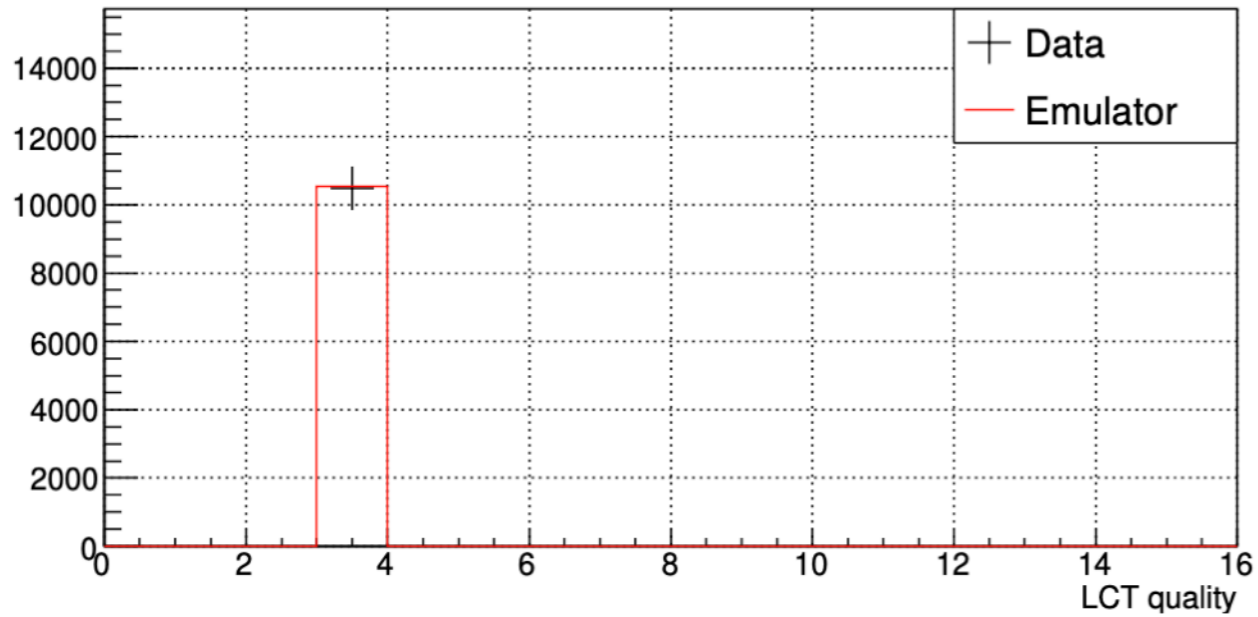


**Before**

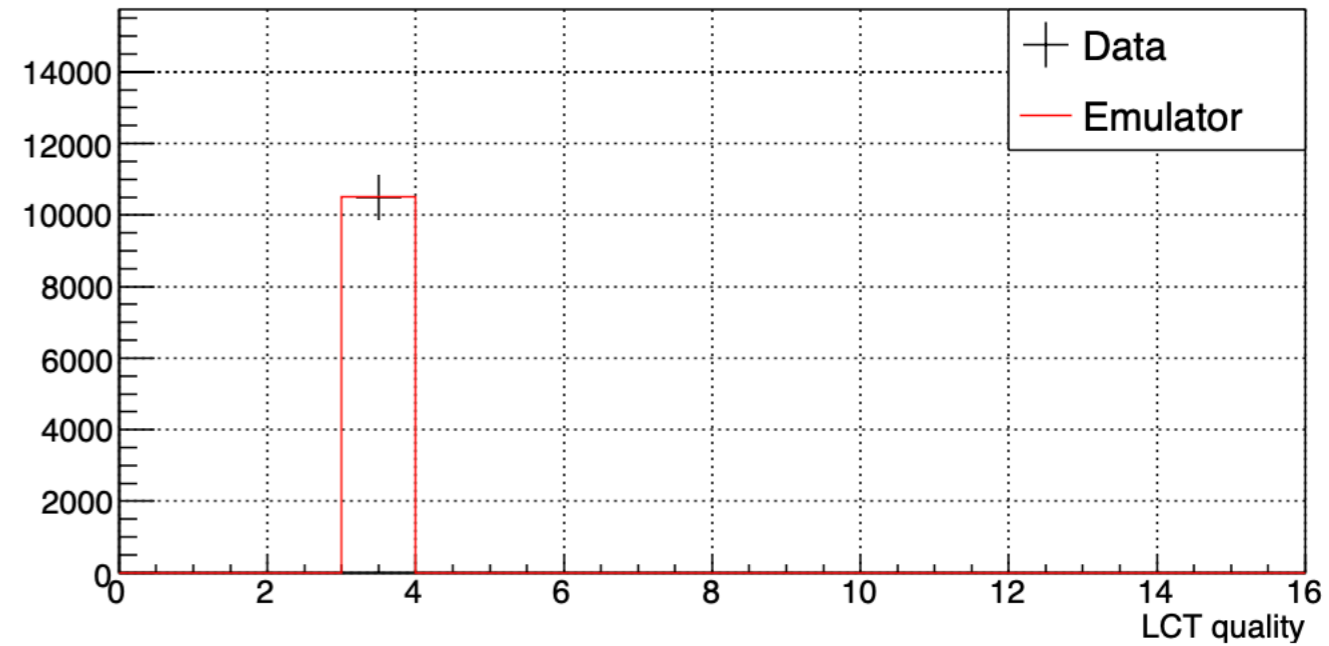
**After**

# LCT

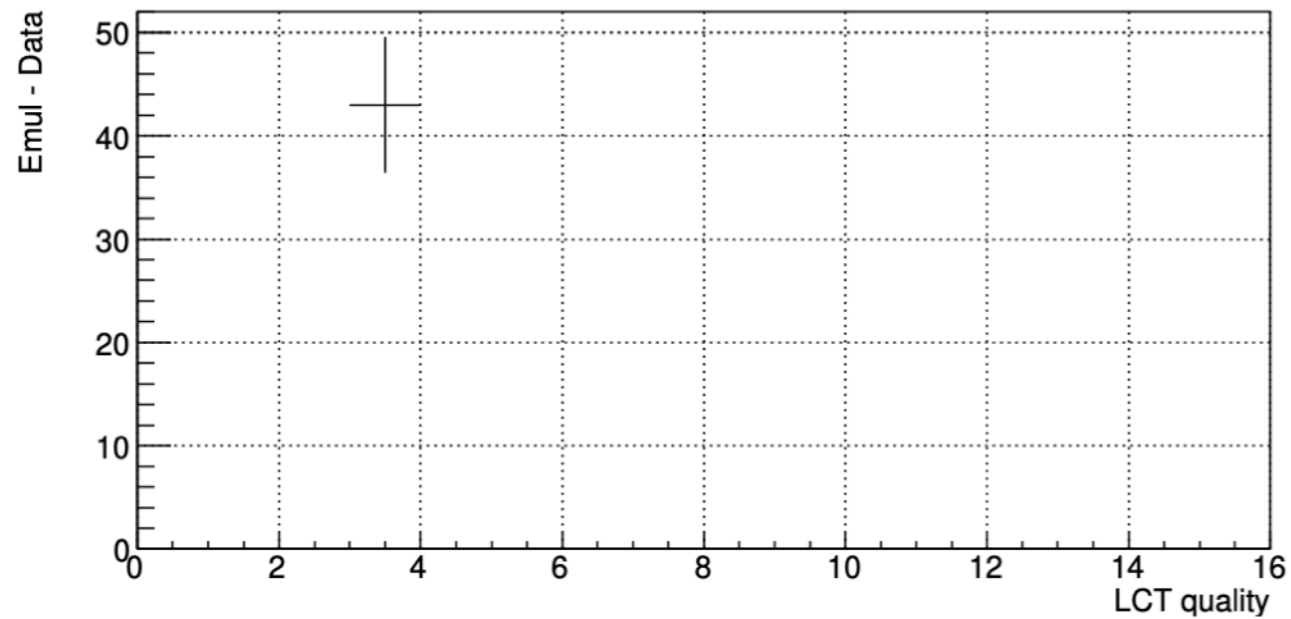
ME11 LCT quality (B904 Cosmic Run 210609\_142357)



ME11 LCT quality (B904 Cosmic Run 210609\_142357)

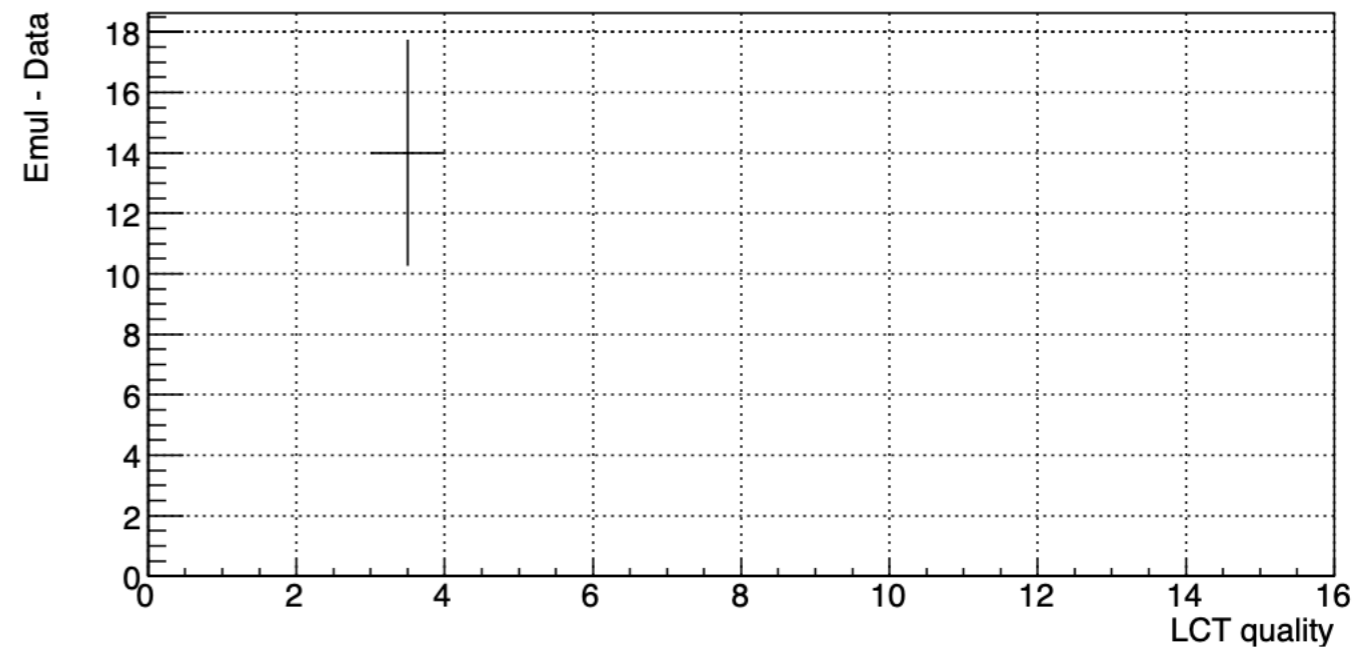


ME11 LCT quality (B904 Cosmic Run 210609\_142357)



**Before**

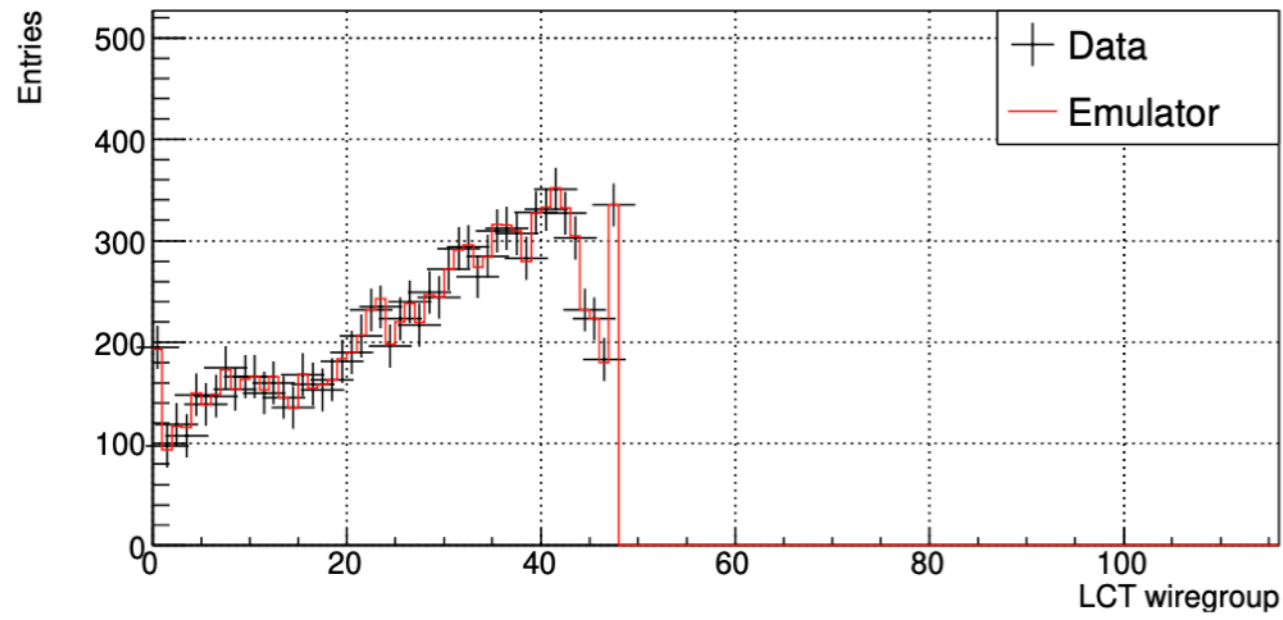
ME11 LCT quality (B904 Cosmic Run 210609\_142357)



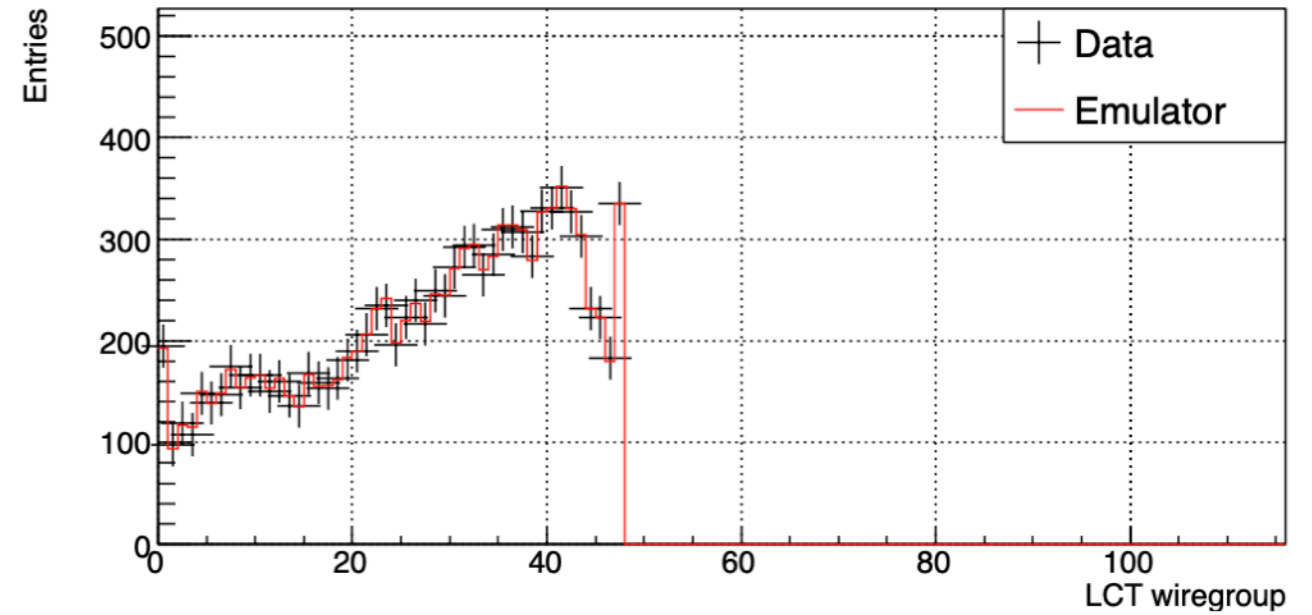
**After**

# LCT

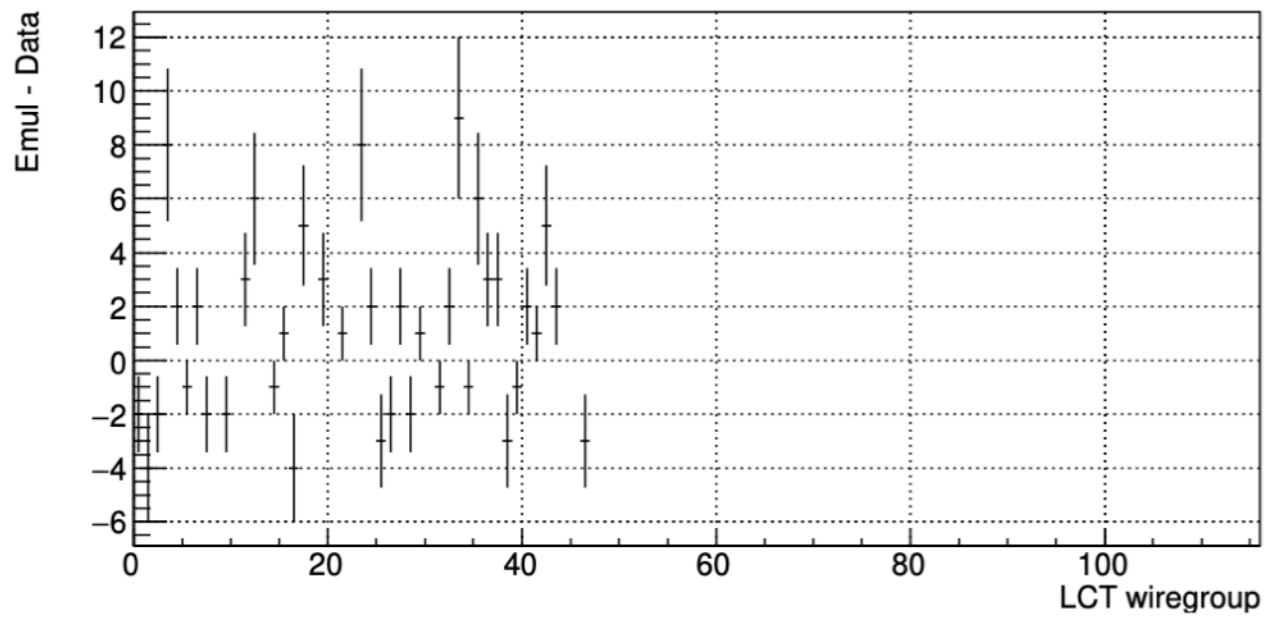
ME11 LCT wiregroup (B904 Cosmic Run 210609\_142357)



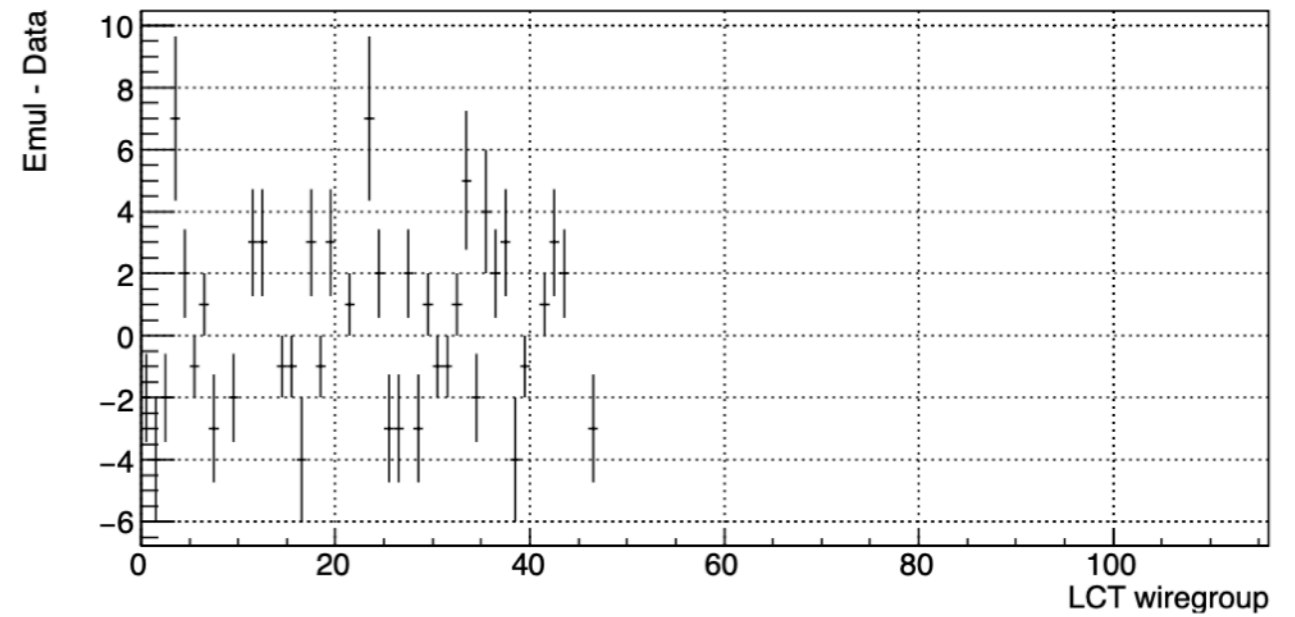
ME11 LCT wiregroup (B904 Cosmic Run 210609\_142357)



ME11 LCT wiregroup (B904 Cosmic Run 210609\_142357)



ME11 LCT wiregroup (B904 Cosmic Run 210609\_142357)

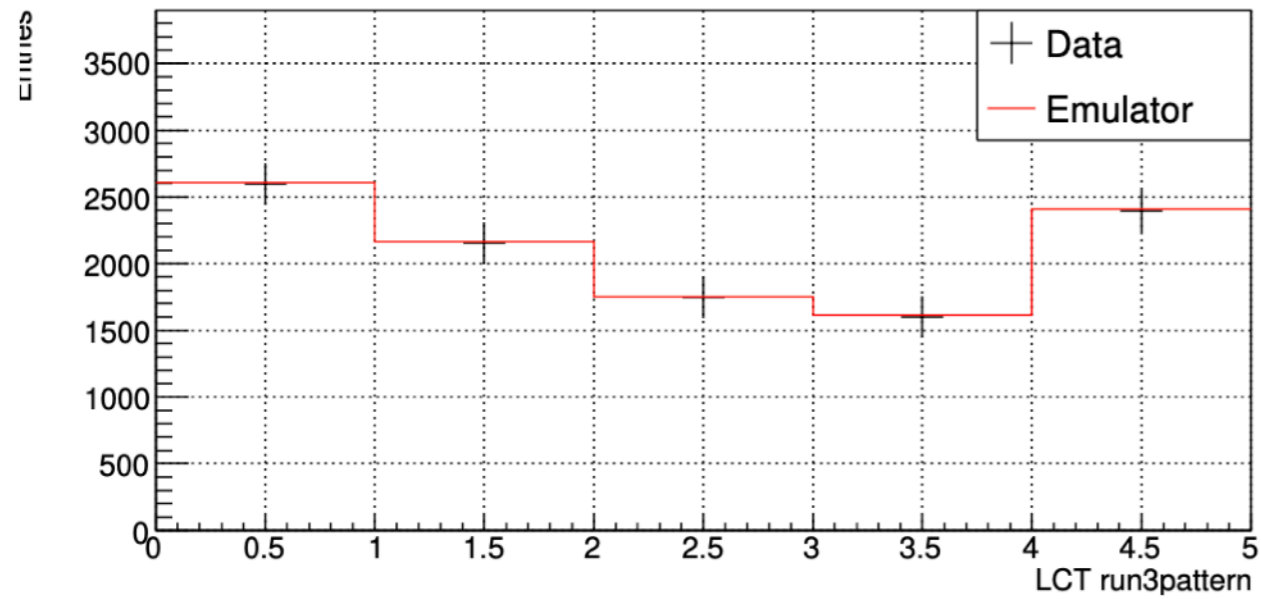


**Before**

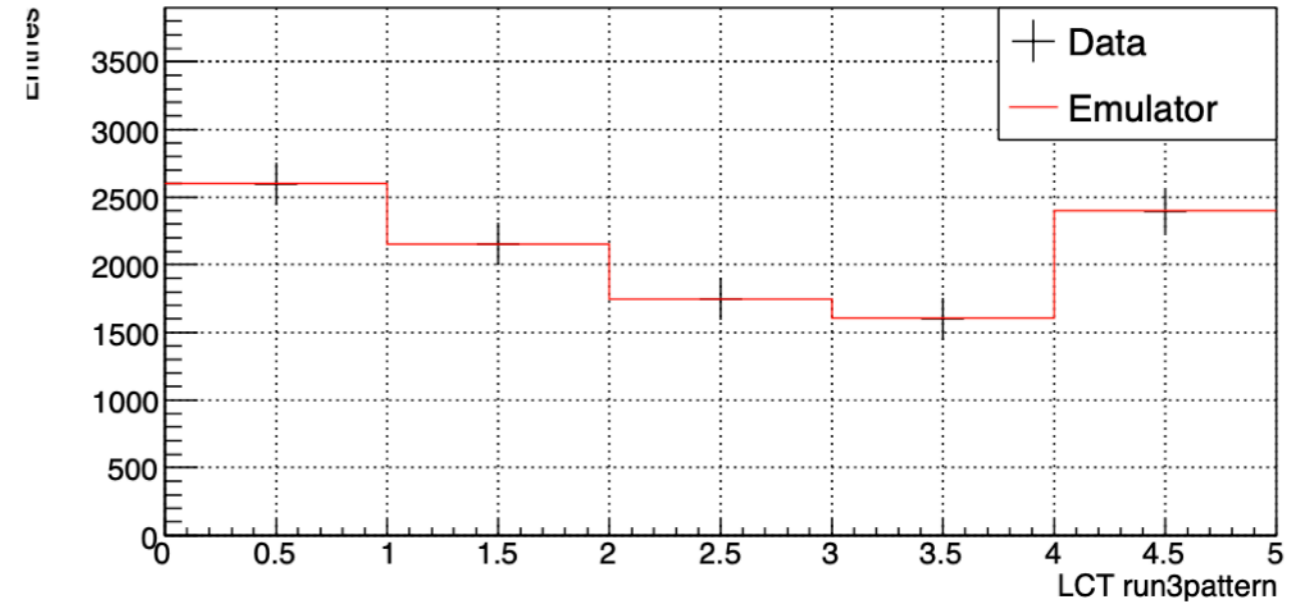
**After**

# LCT

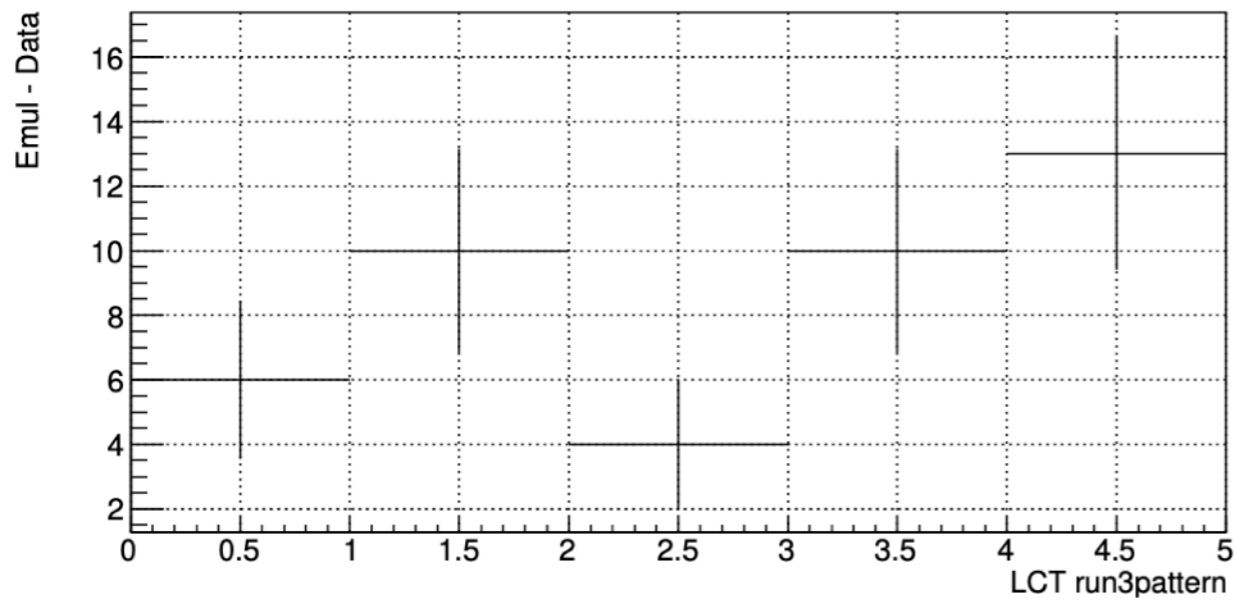
ME11 LCT run3pattern (B904 Cosmic Run 210609\_142357)



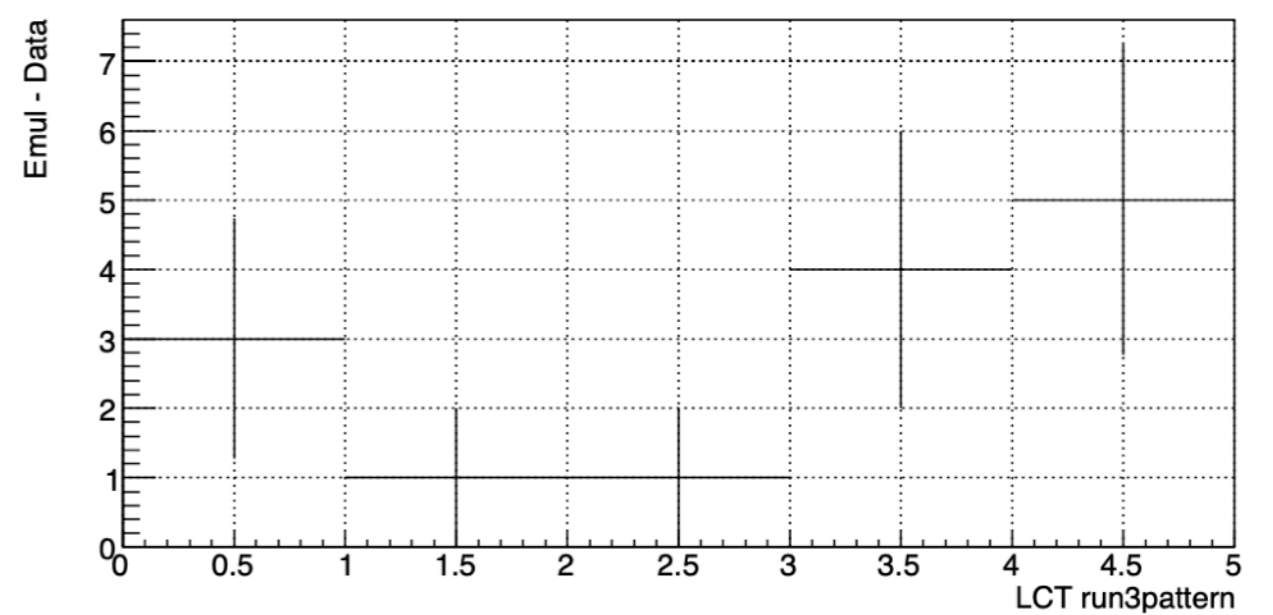
ME11 LCT run3pattern (B904 Cosmic Run 210609\_142357)



ME11 LCT run3pattern (B904 Cosmic Run 210609\_142357)



ME11 LCT run3pattern (B904 Cosmic Run 210609\_142357)

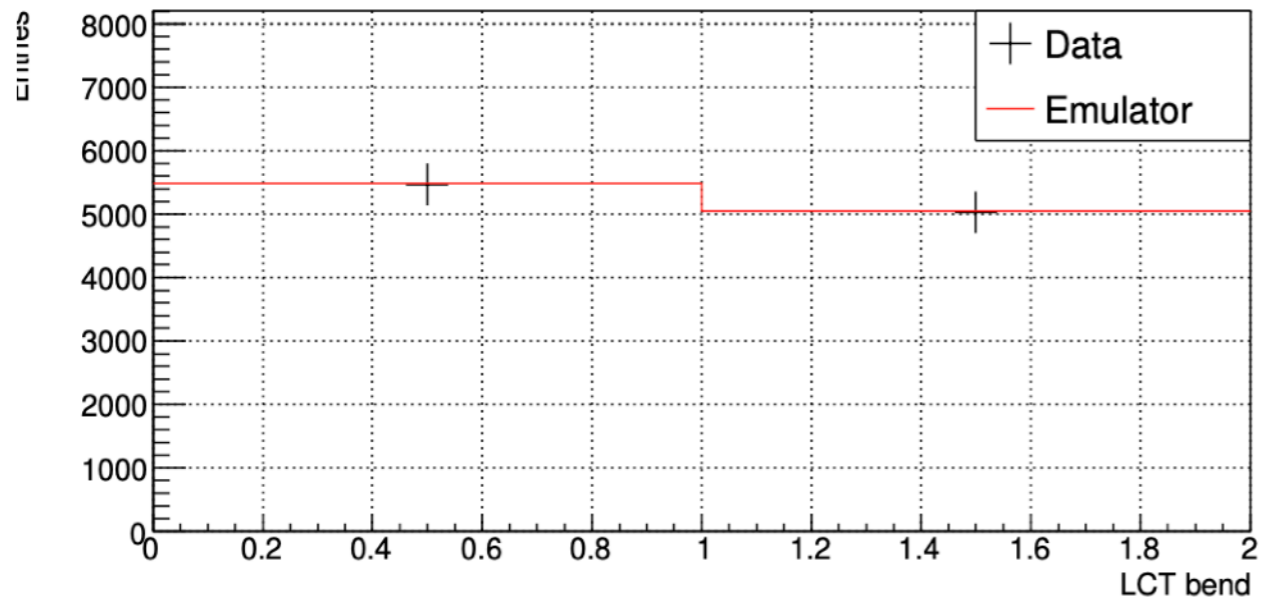


**Before**

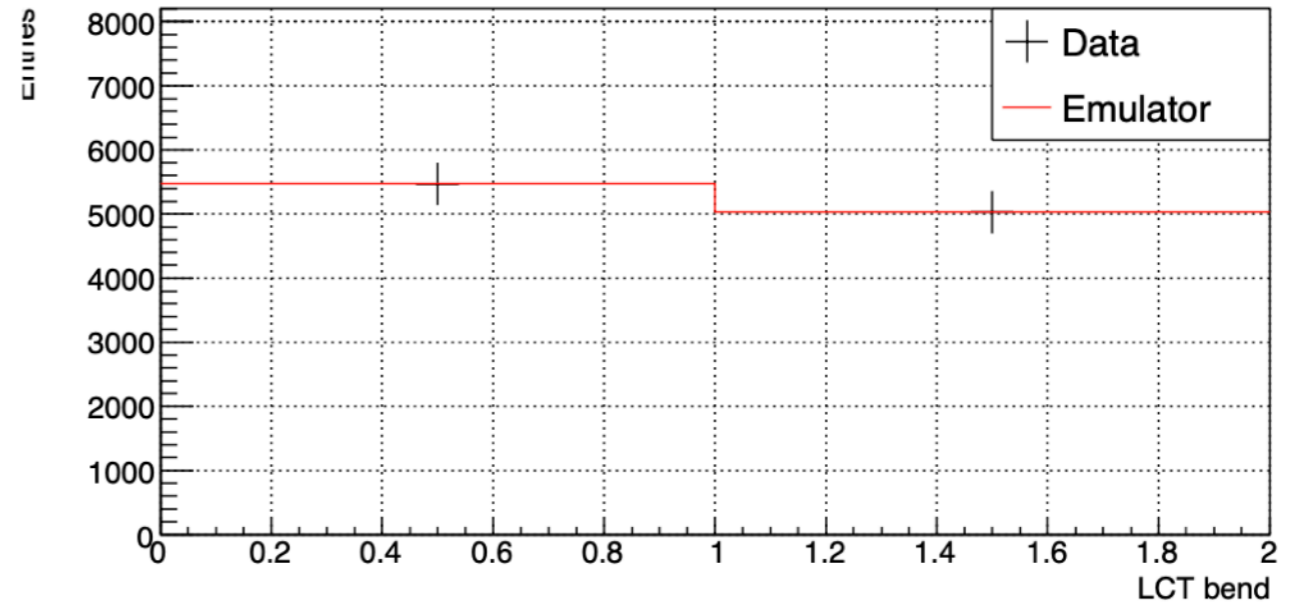
**After**

# LCT

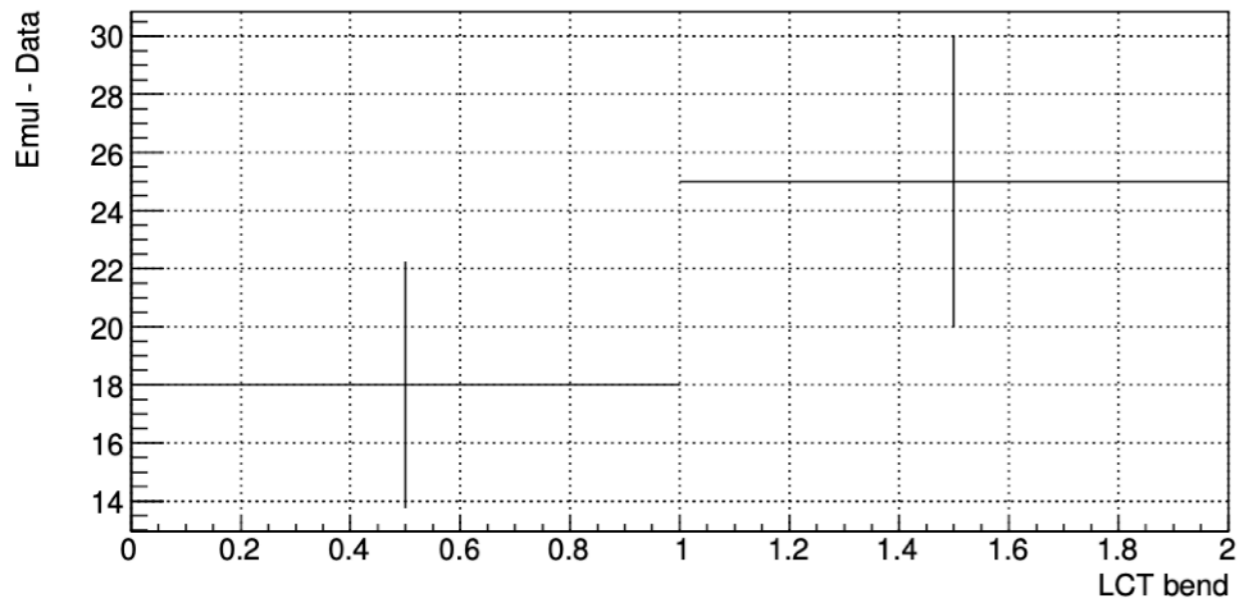
ME11 LCT bend (B904 Cosmic Run 210609\_142357)



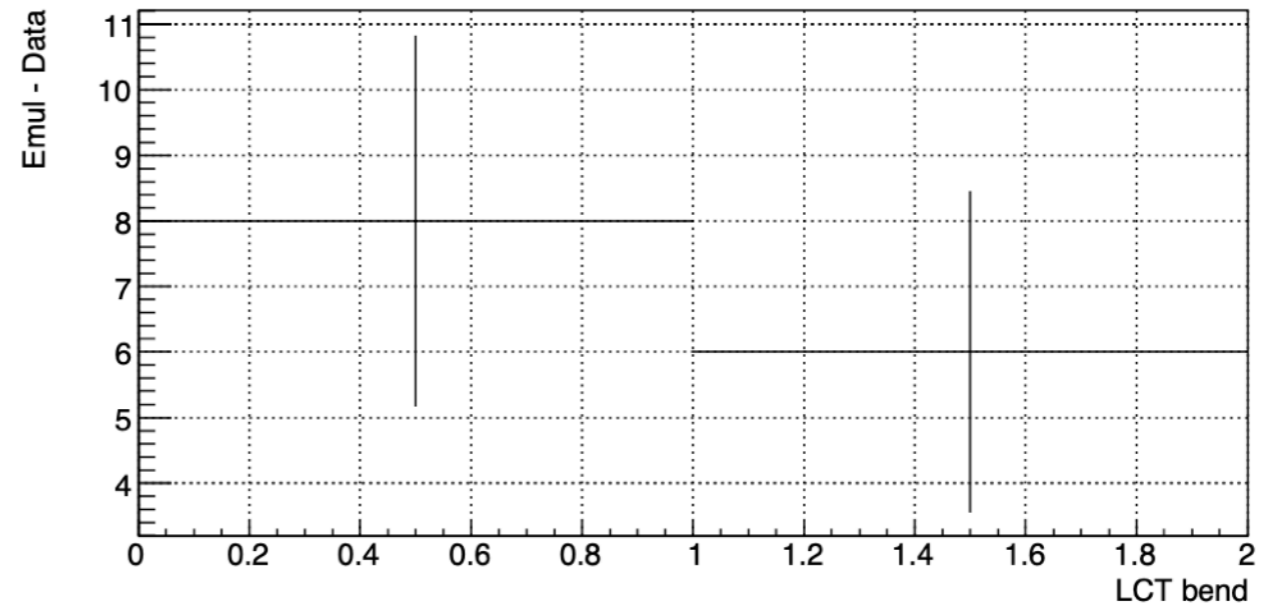
ME11 LCT bend (B904 Cosmic Run 210609\_142357)



ME11 LCT bend (B904 Cosmic Run 210609\_142357)



ME11 LCT bend (B904 Cosmic Run 210609\_142357)

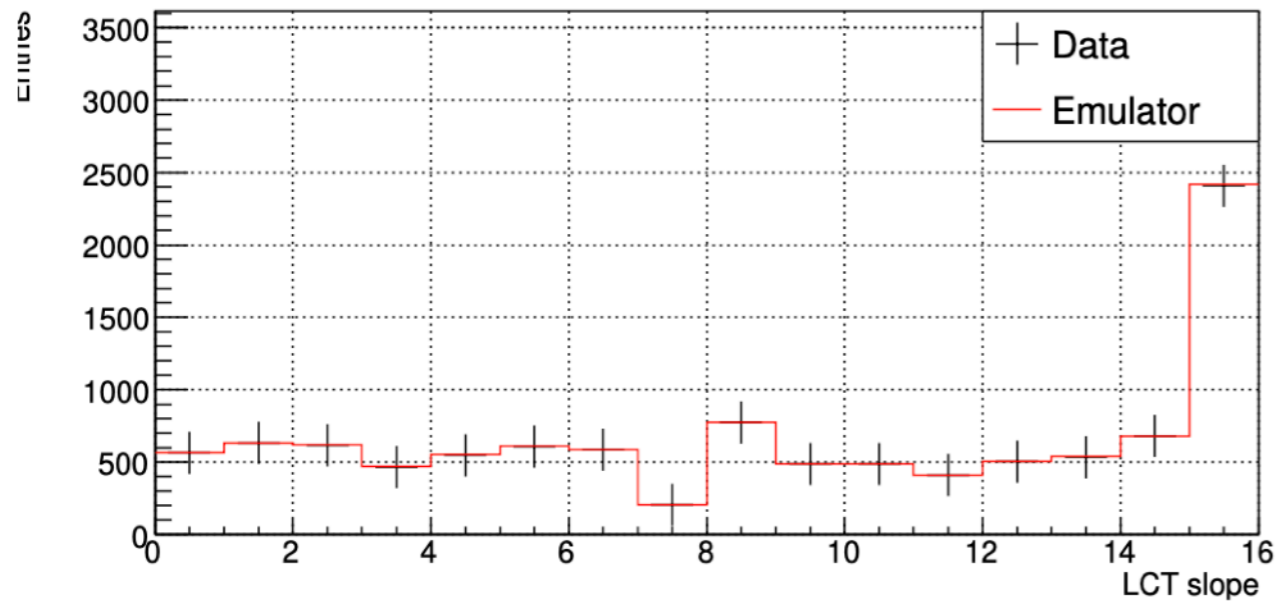


**Before**

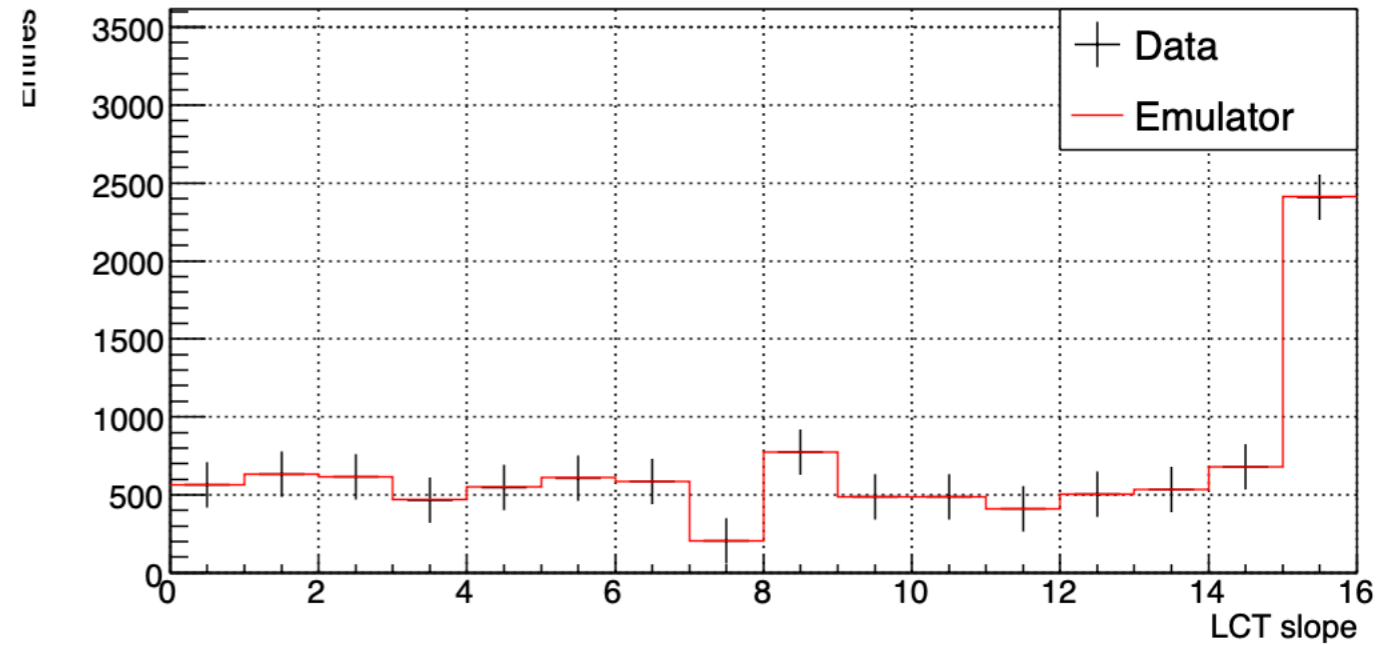
**After**

# LCT

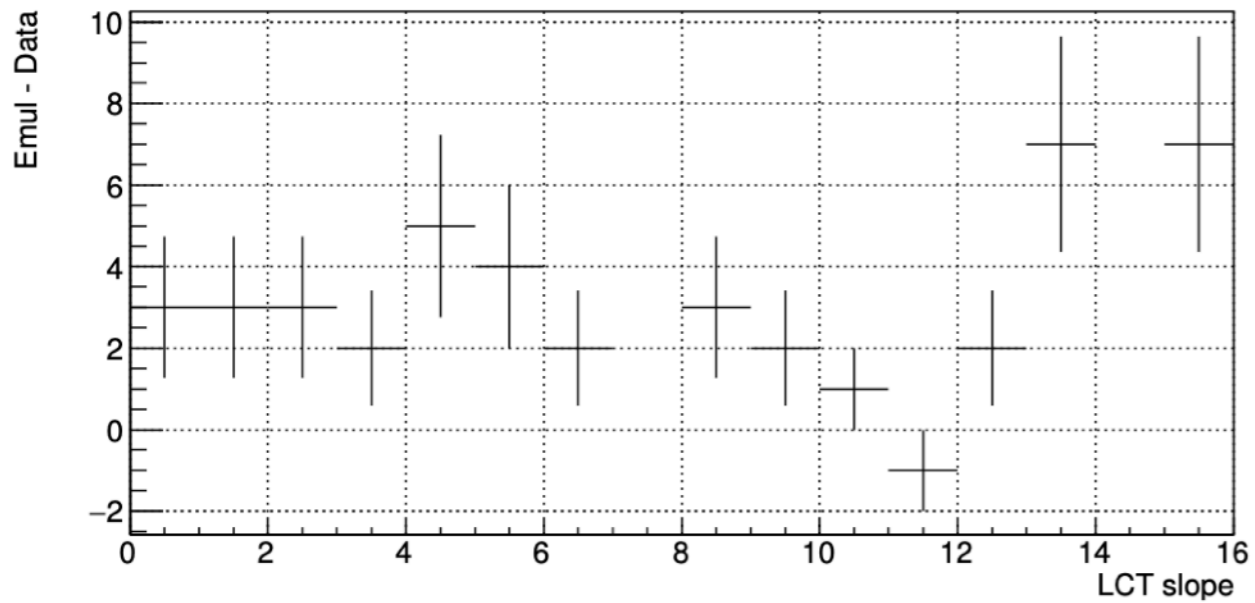
ME11 LCT slope (B904 Cosmic Run 210609\_142357)



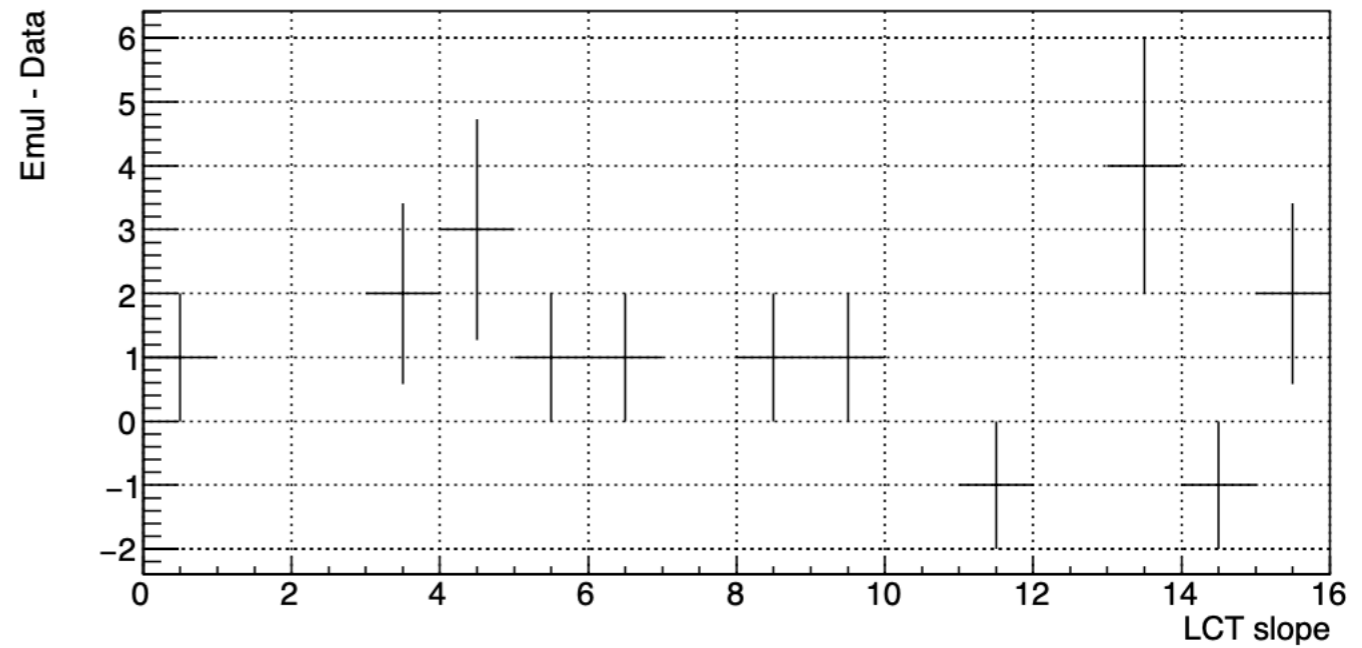
ME11 LCT slope (B904 Cosmic Run 210609\_142357)



ME11 LCT slope (B904 Cosmic Run 210609\_142357)



ME11 LCT slope (B904 Cosmic Run 210609\_142357)

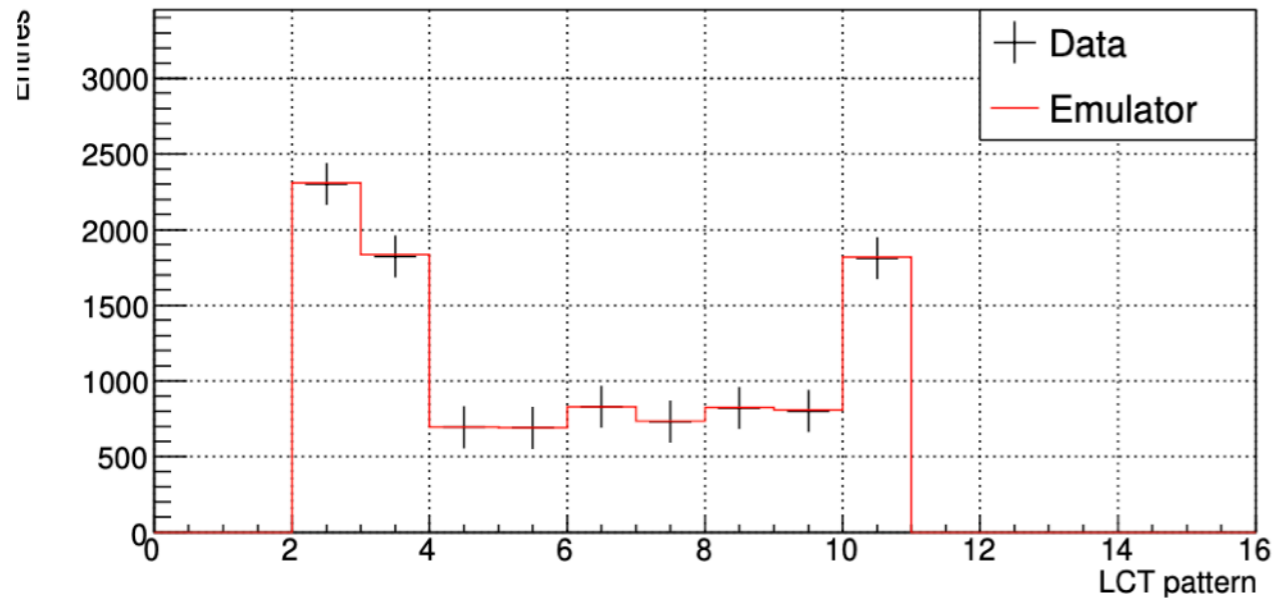


**Before**

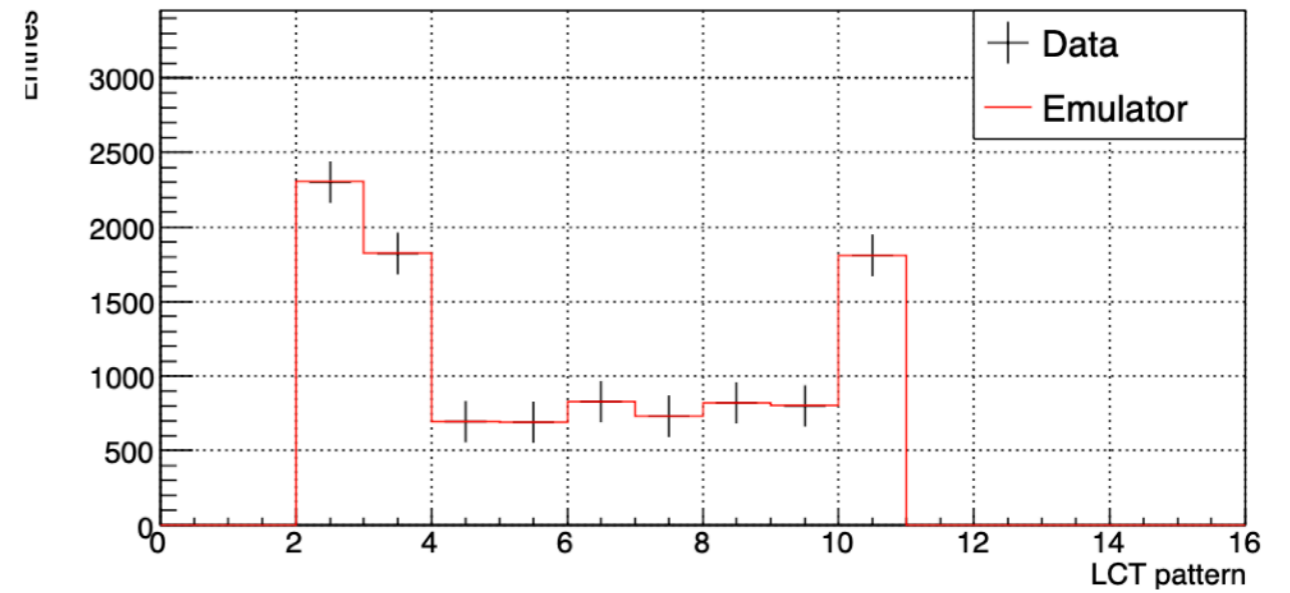
**After**

# LCT

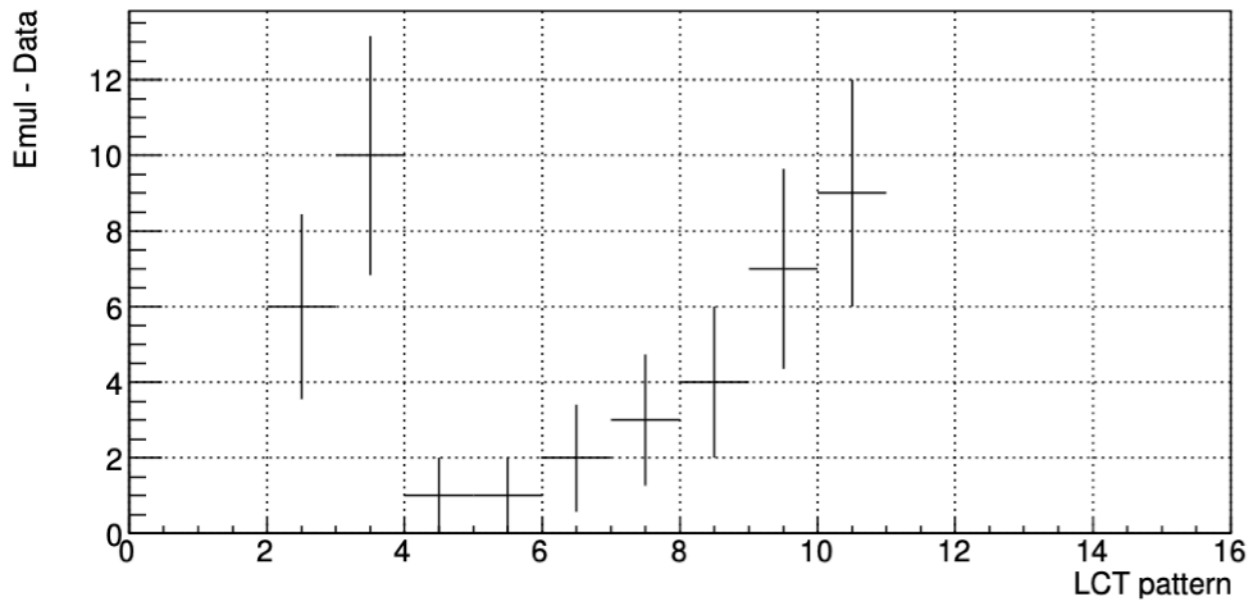
ME11 LCT pattern (B904 Cosmic Run 210609\_142357)



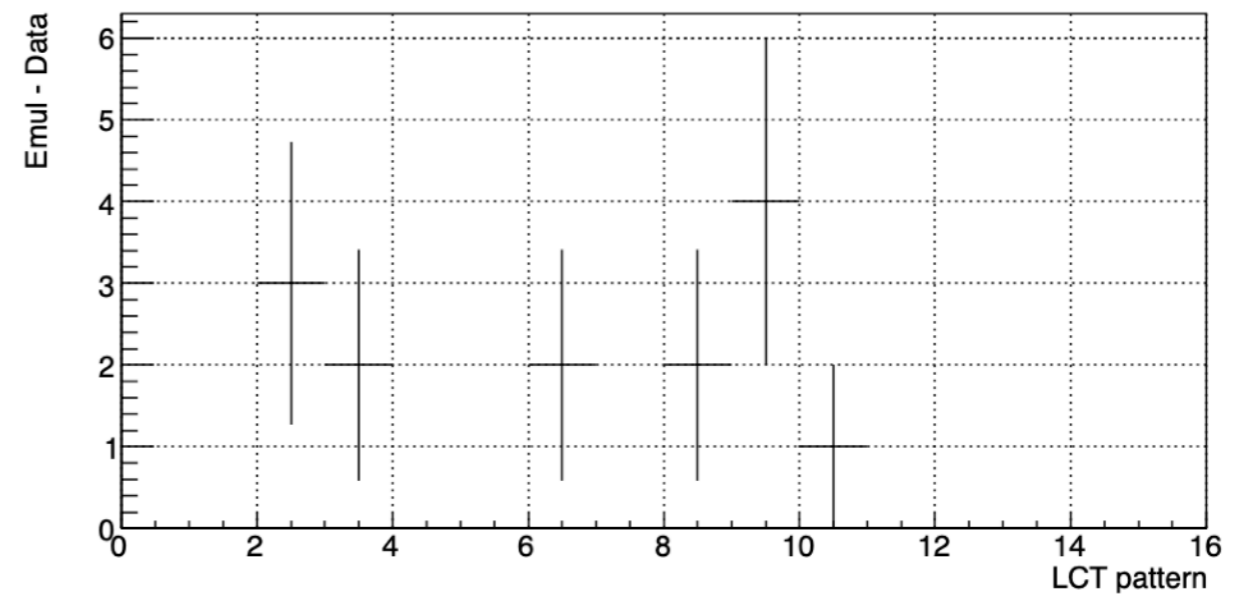
ME11 LCT pattern (B904 Cosmic Run 210609\_142357)



ME11 LCT pattern (B904 Cosmic Run 210609\_142357)



ME11 LCT pattern (B904 Cosmic Run 210609\_142357)

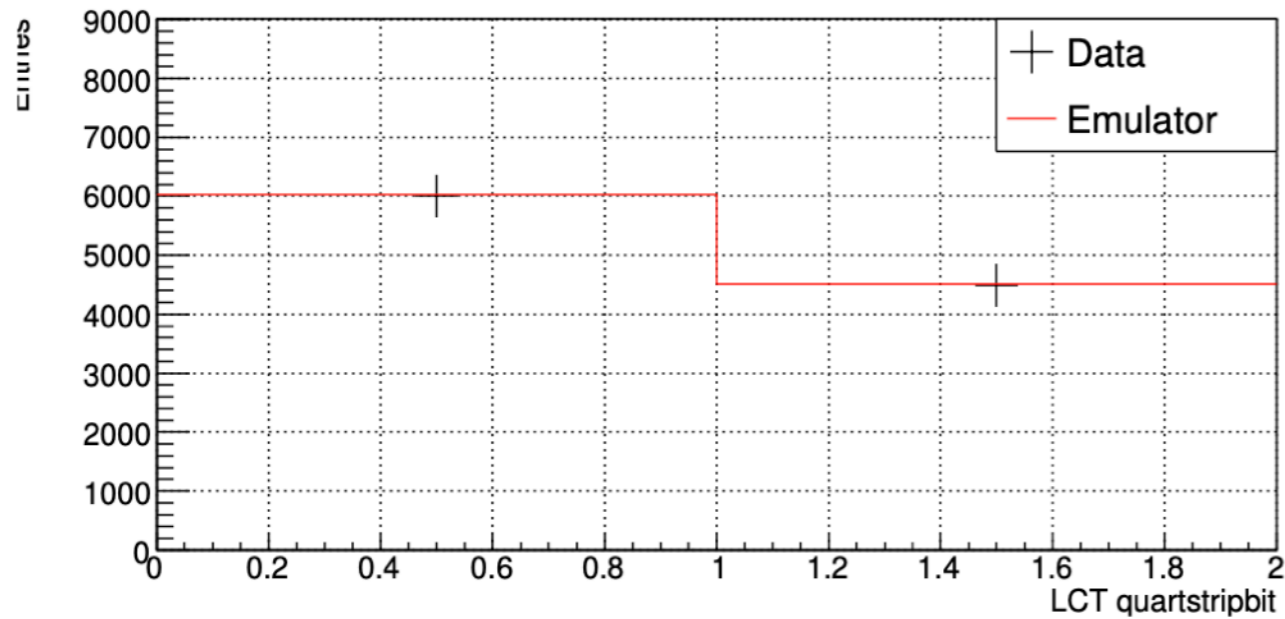


**Before**

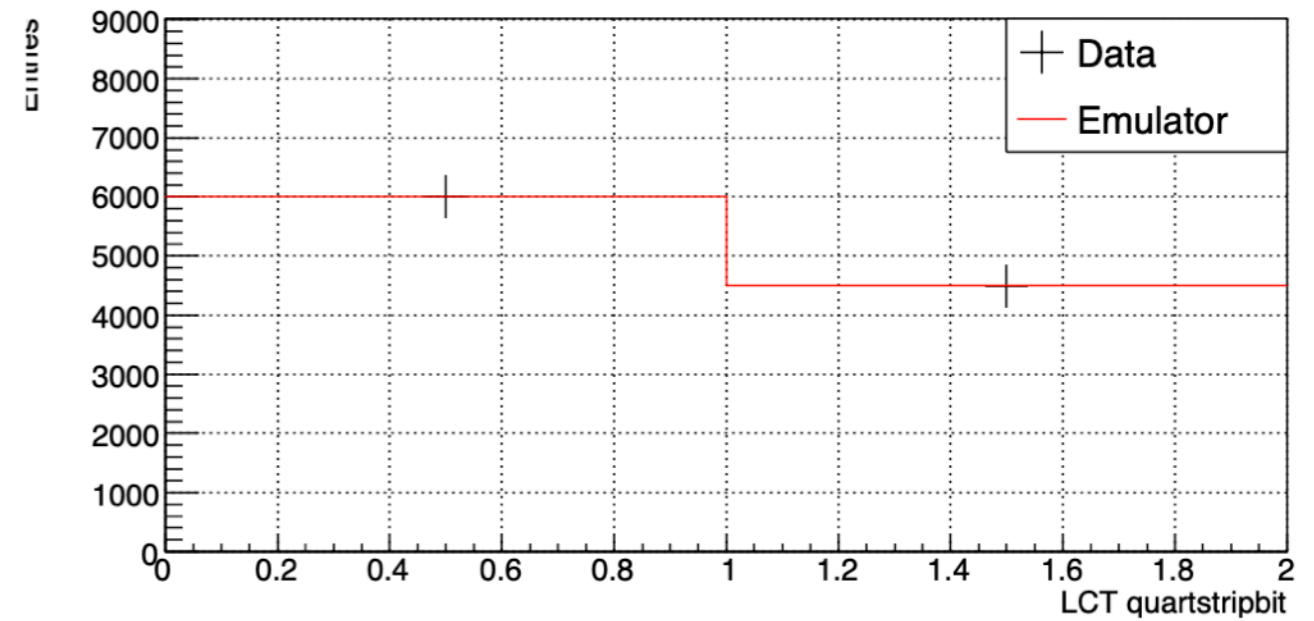
**After**

# LCT

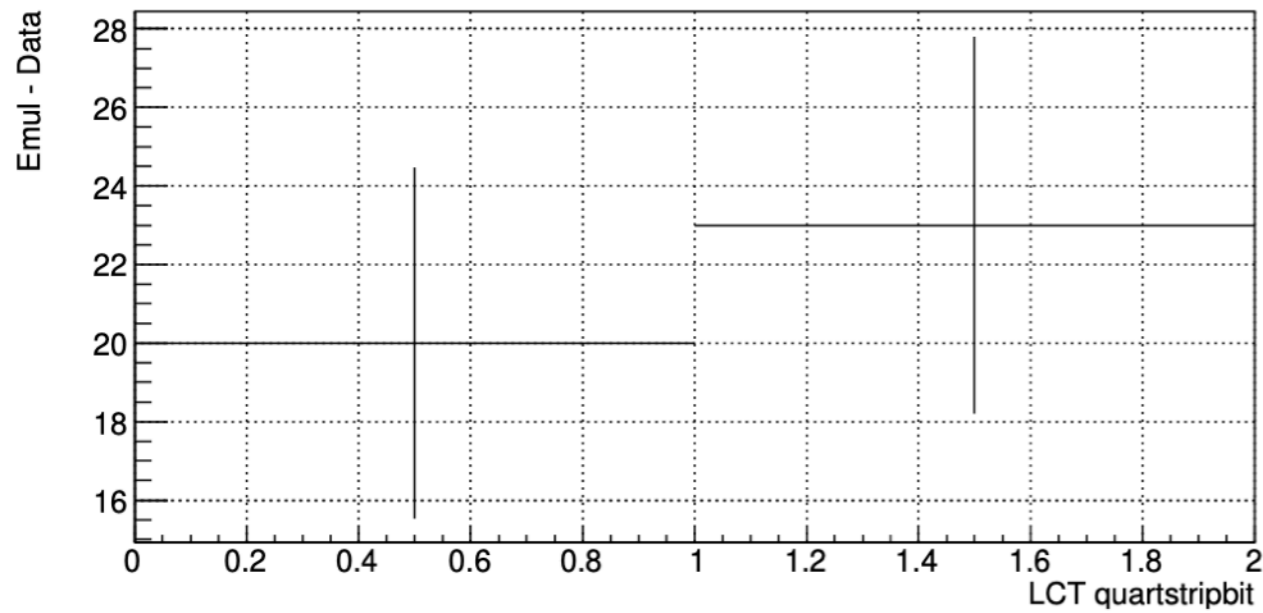
ME11 LCT quartstripbit (B904 Cosmic Run 210609\_142357)



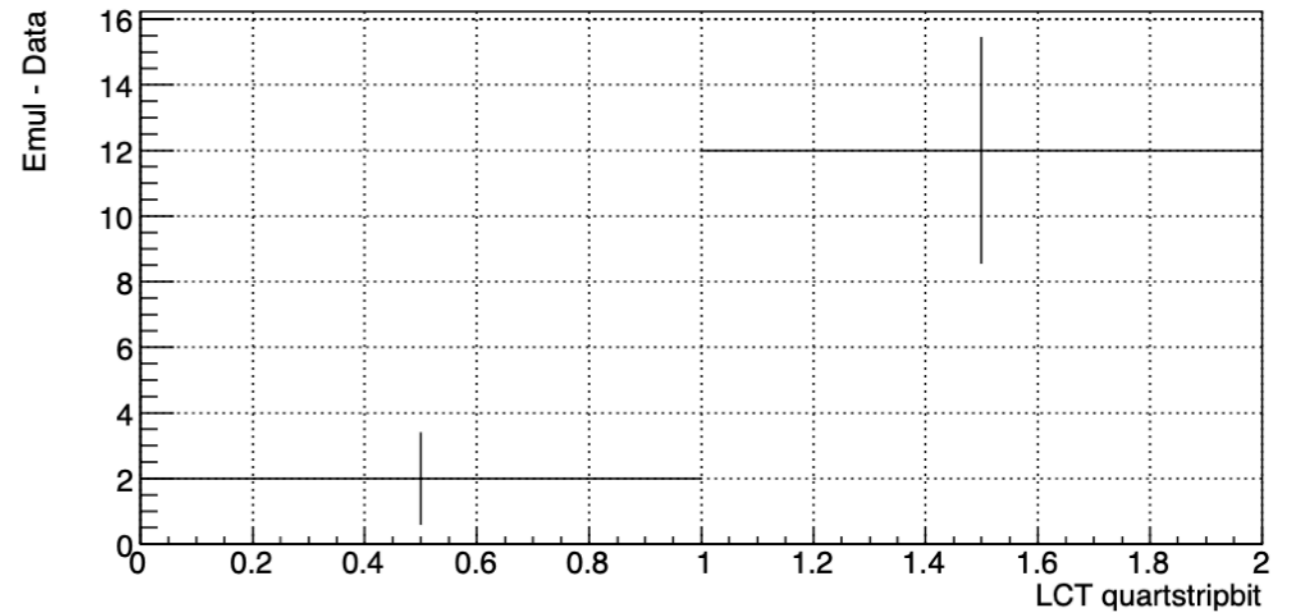
ME11 LCT quartstripbit (B904 Cosmic Run 210609\_142357)



ME11 LCT quartstripbit (B904 Cosmic Run 210609\_142357)



ME11 LCT quartstripbit (B904 Cosmic Run 210609\_142357)



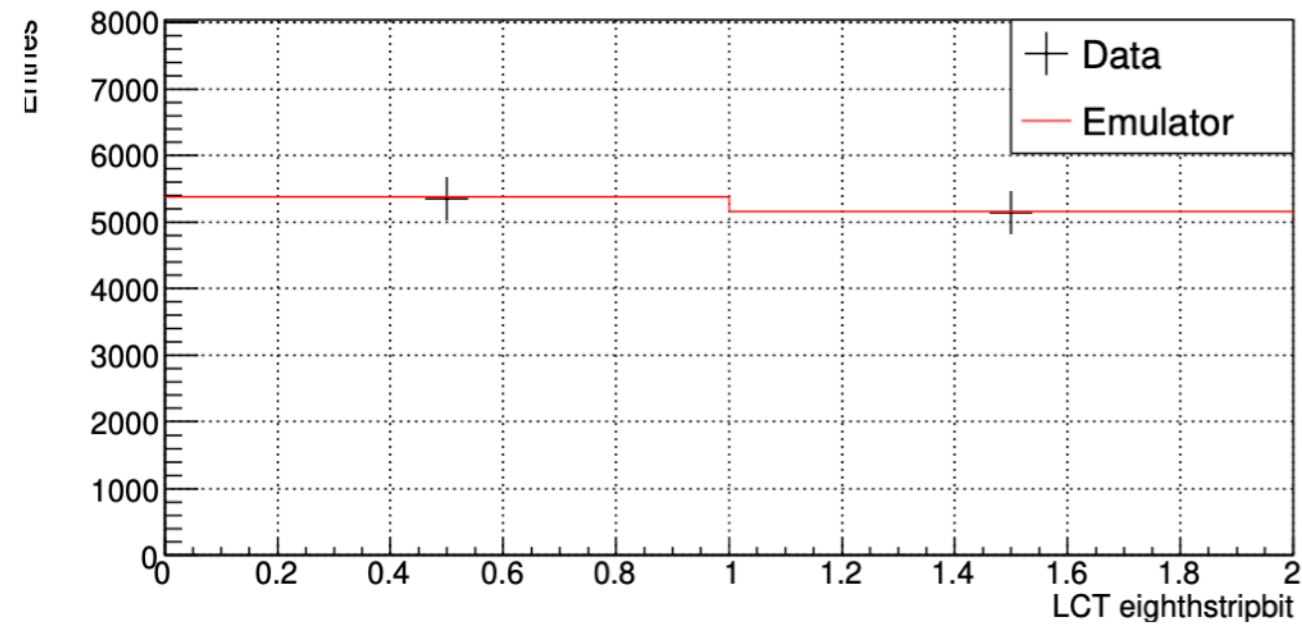
**Before**

**After**

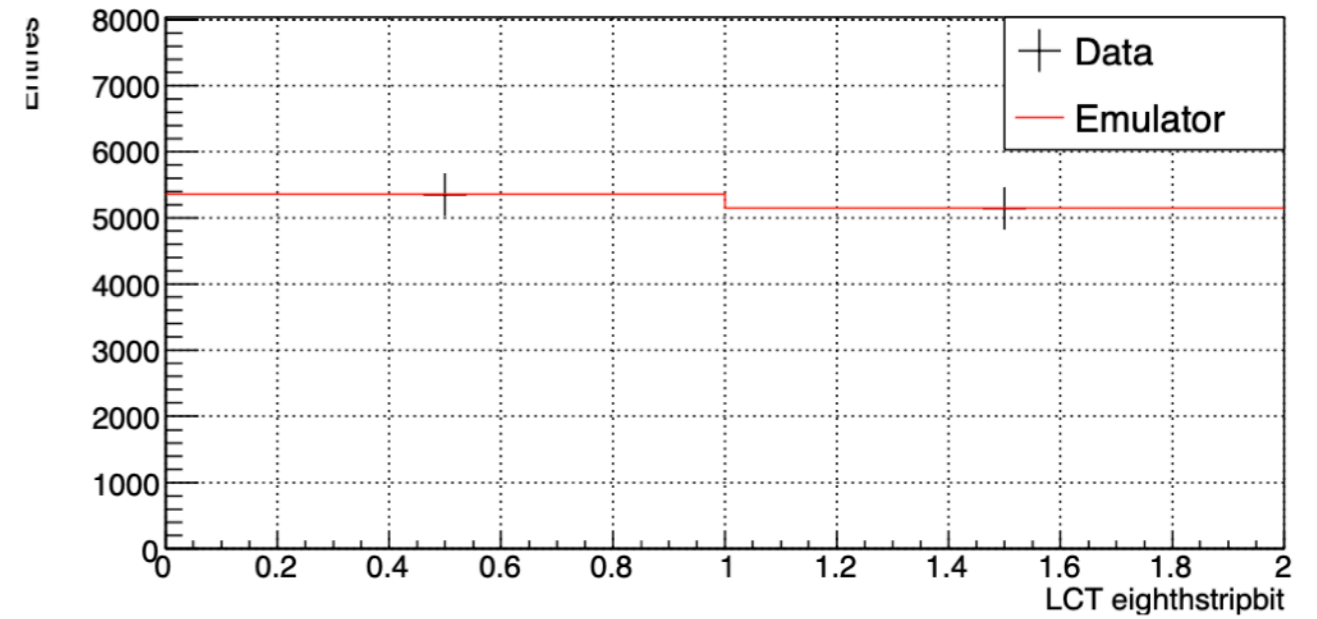


# LCT

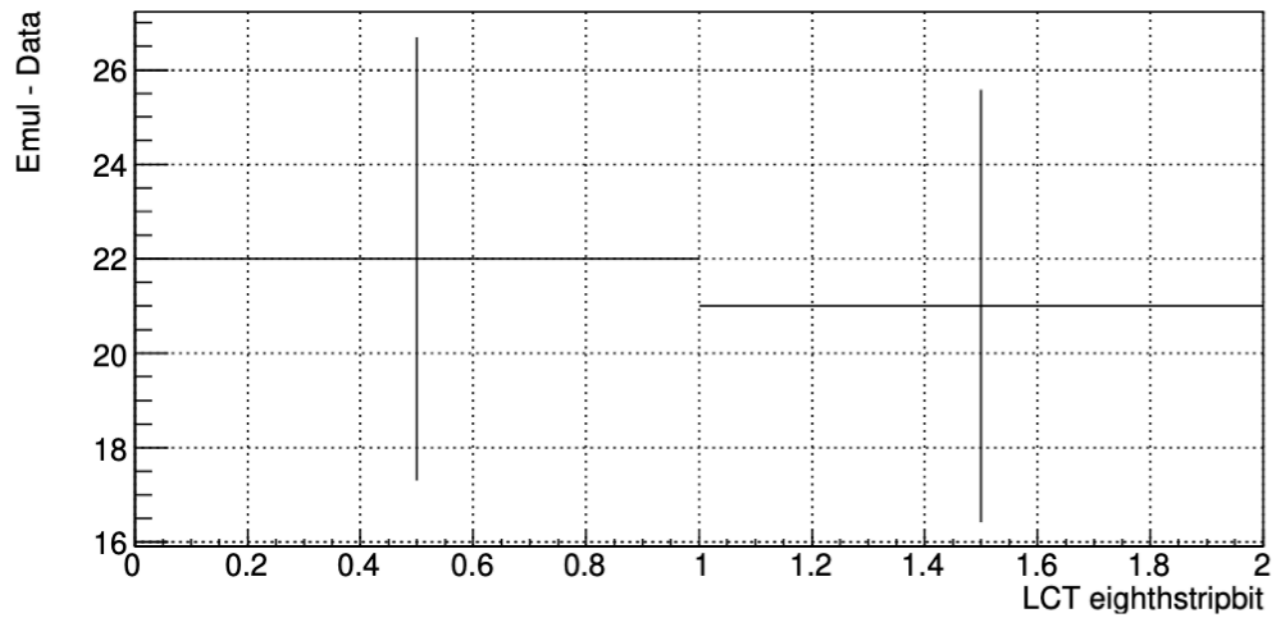
ME11 LCT eighthstripbit (B904 Cosmic Run 210609\_142357)



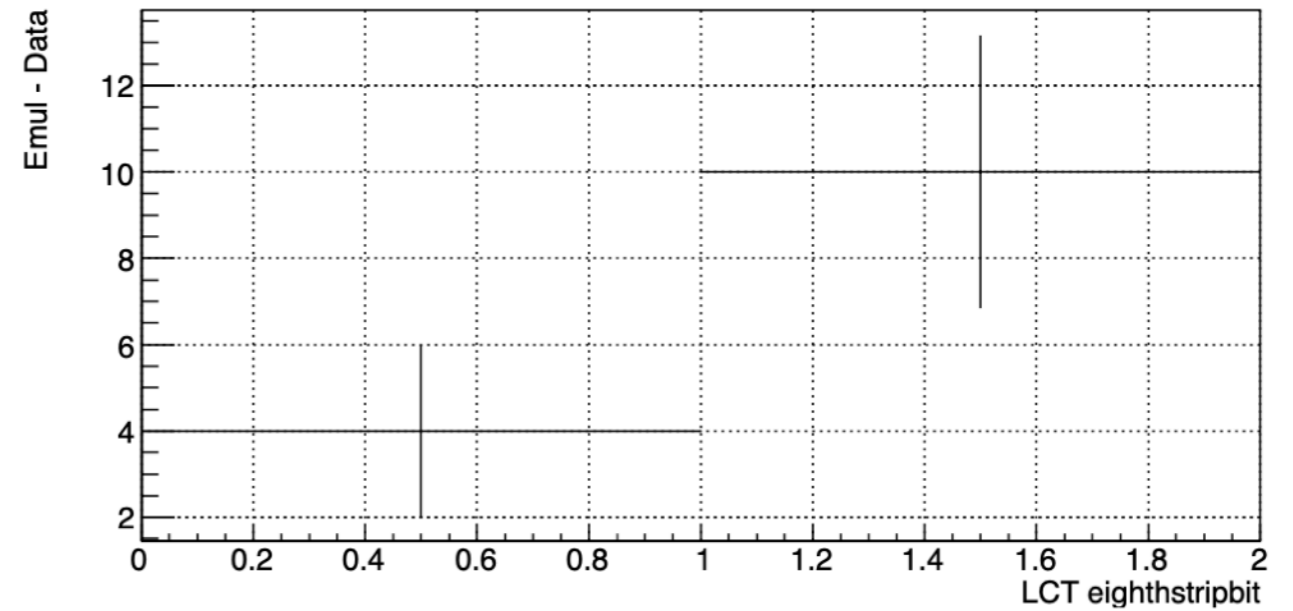
ME11 LCT eighthstripbit (B904 Cosmic Run 210609\_142357)



ME11 LCT eighthstripbit (B904 Cosmic Run 210609\_142357)



ME11 LCT eighthstripbit (B904 Cosmic Run 210609\_142357)

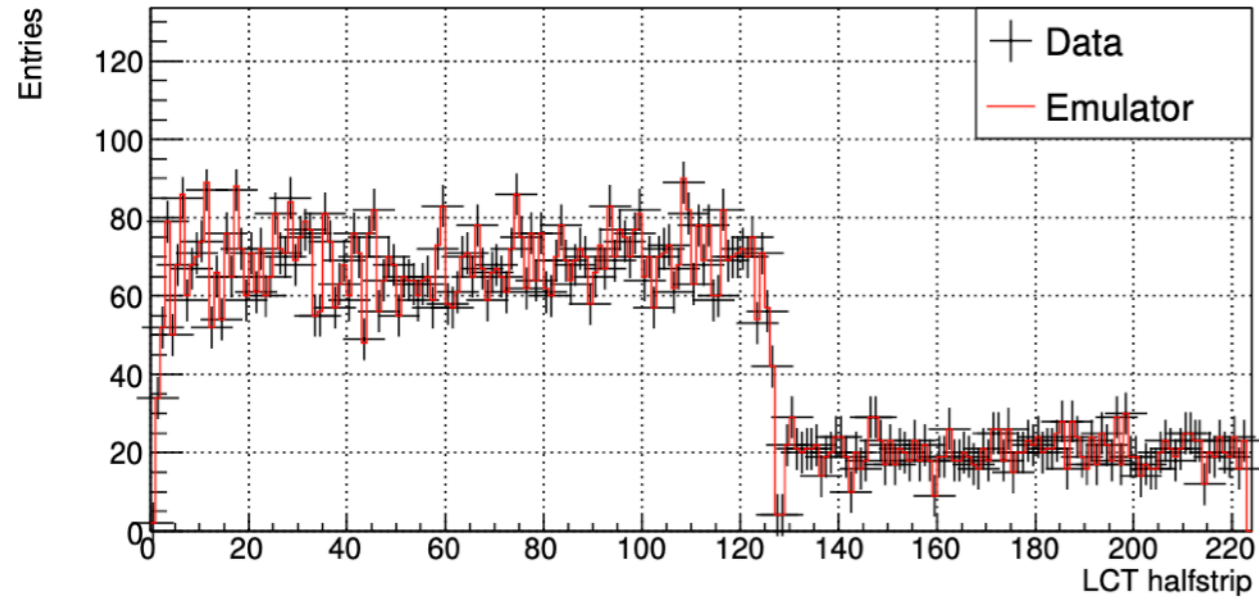


**Before**

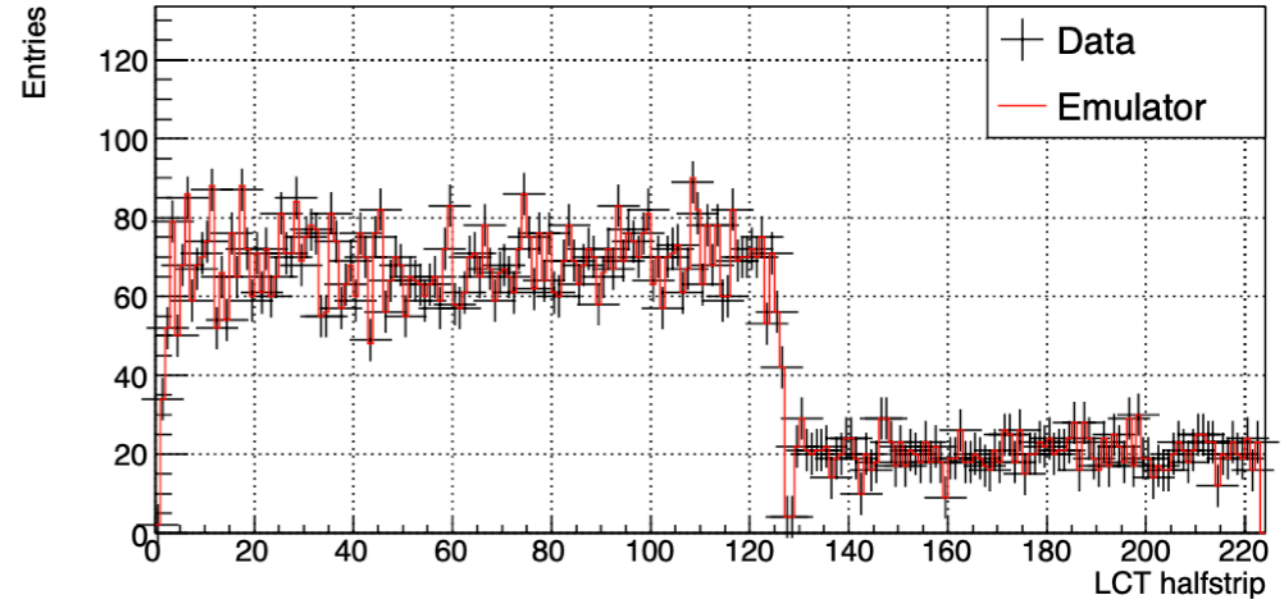
**After**

# LCT

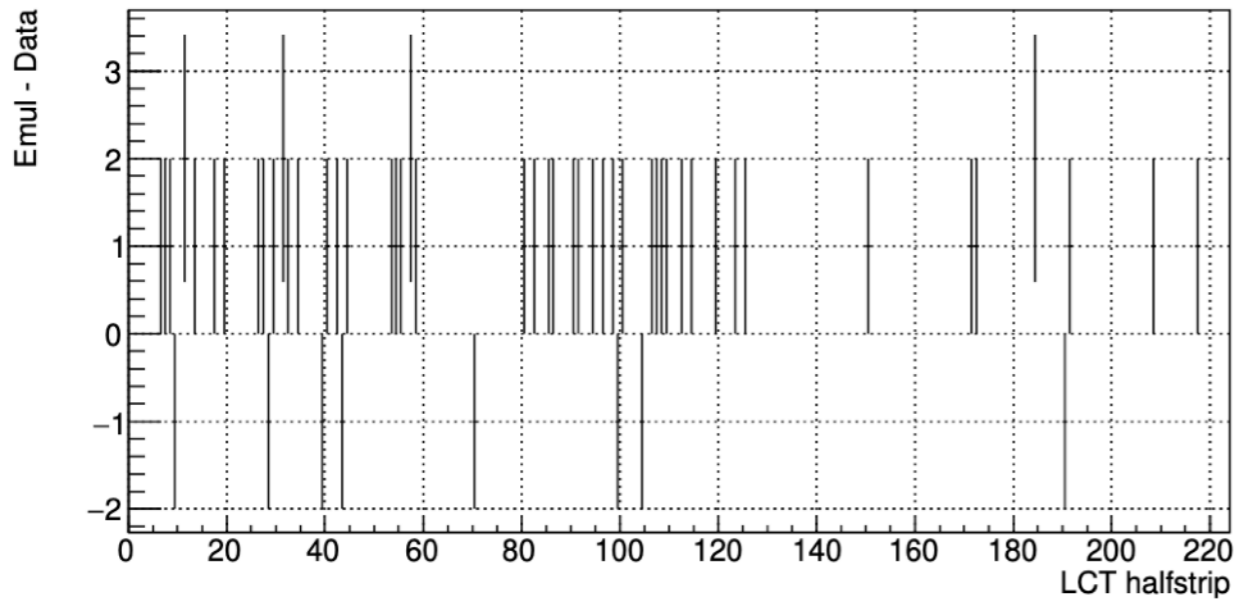
ME11 LCT halfstrip (B904 Cosmic Run 210609\_142357)



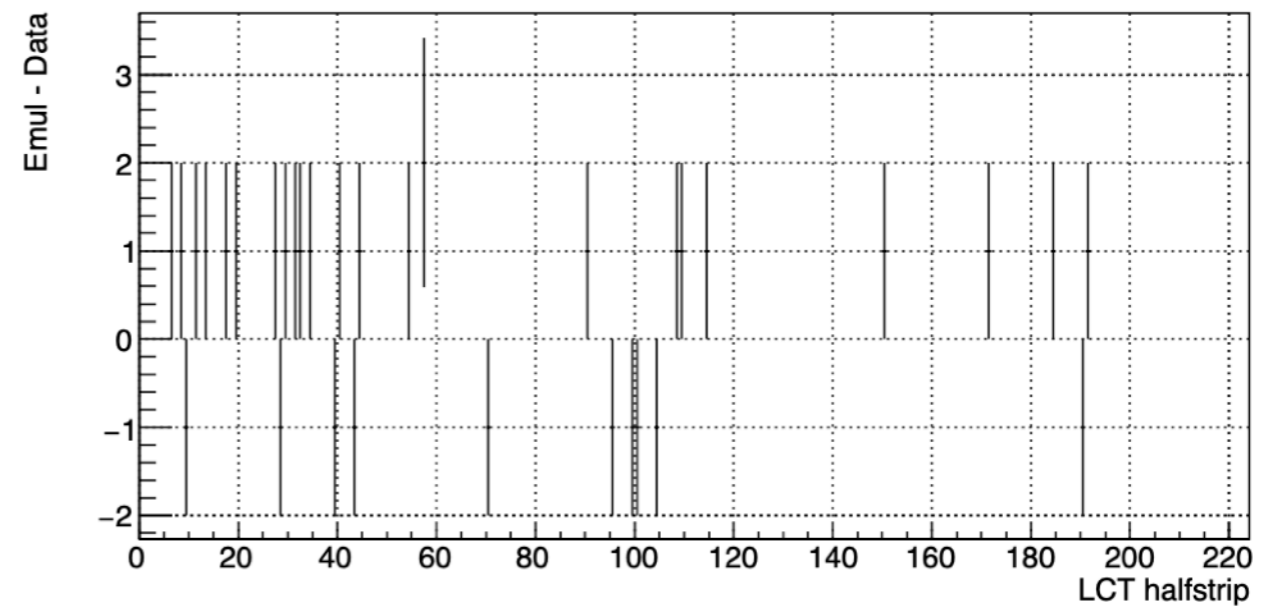
ME11 LCT halfstrip (B904 Cosmic Run 210609\_142357)



ME11 LCT halfstrip (B904 Cosmic Run 210609\_142357)



ME11 LCT halfstrip (B904 Cosmic Run 210609\_142357)

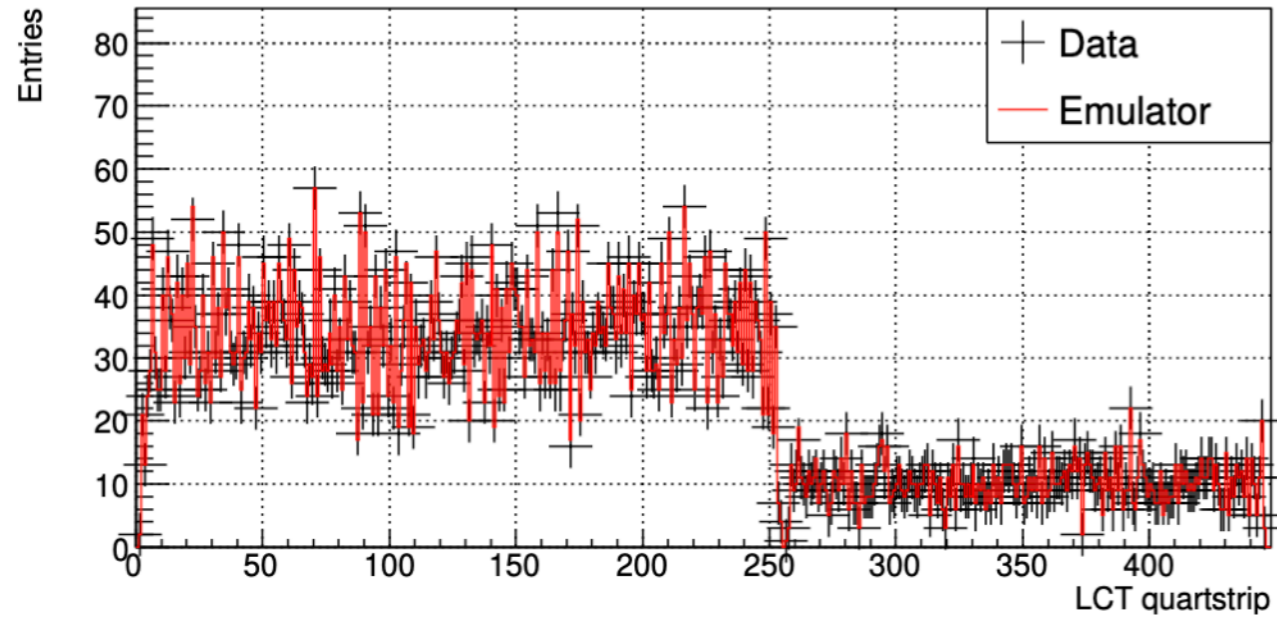


**Before**

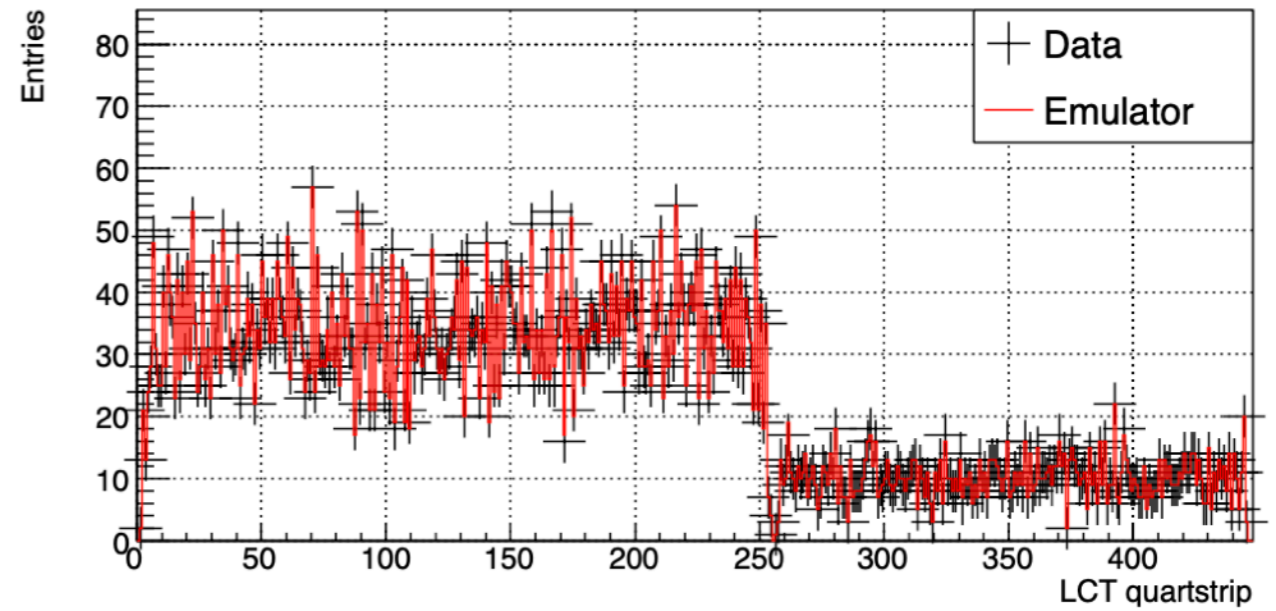
**After**

# LCT

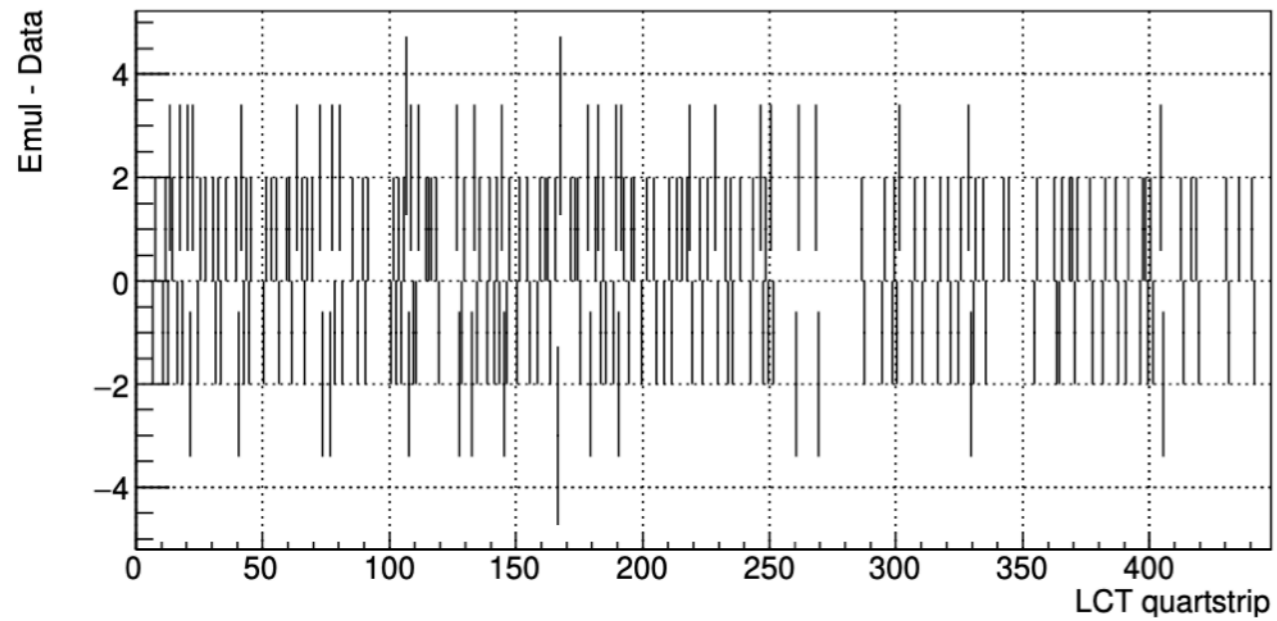
ME11 LCT quartstrip (B904 Cosmic Run 210609\_142357)



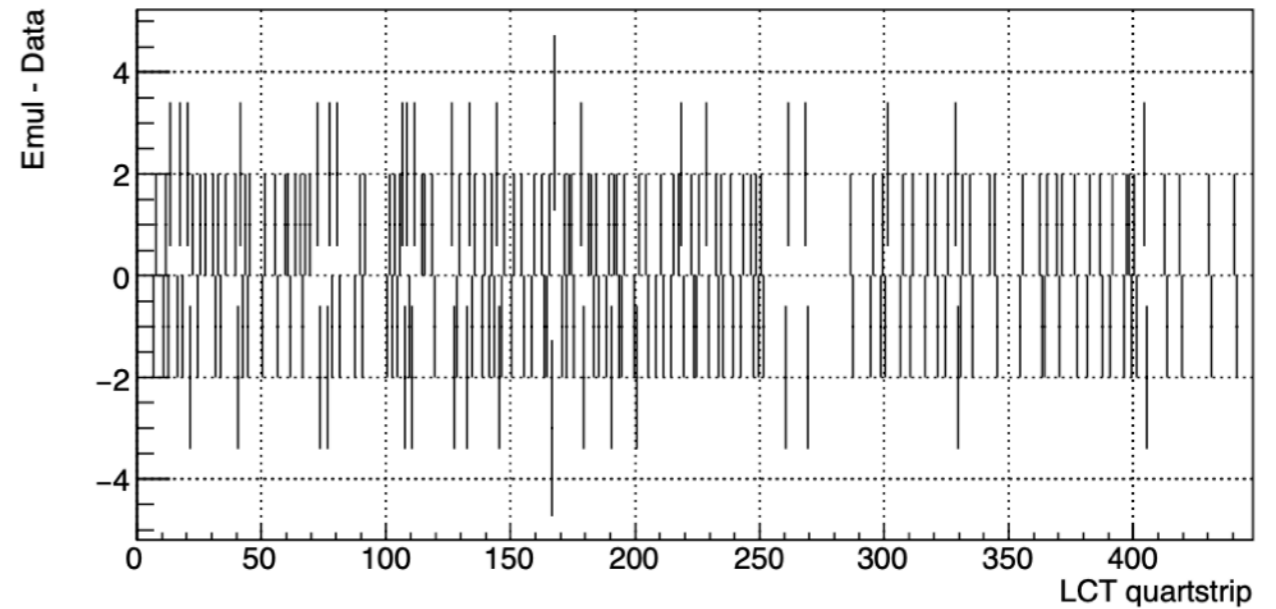
ME11 LCT quartstrip (B904 Cosmic Run 210609\_142357)



ME11 LCT quartstrip (B904 Cosmic Run 210609\_142357)



ME11 LCT quartstrip (B904 Cosmic Run 210609\_142357)

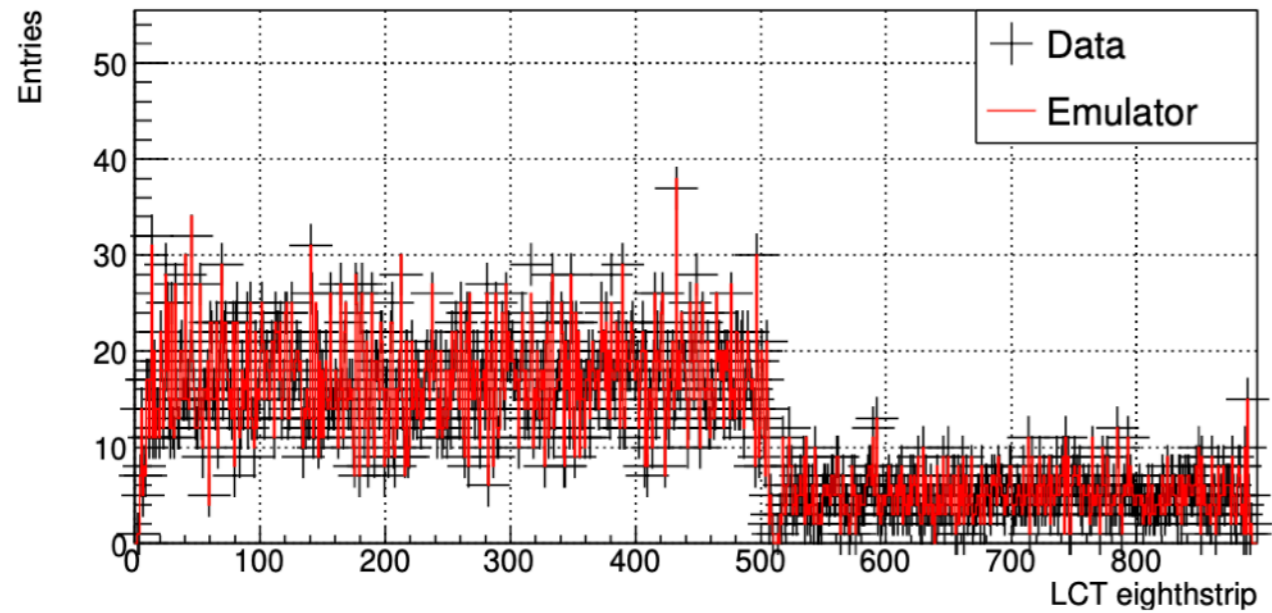


**Before**

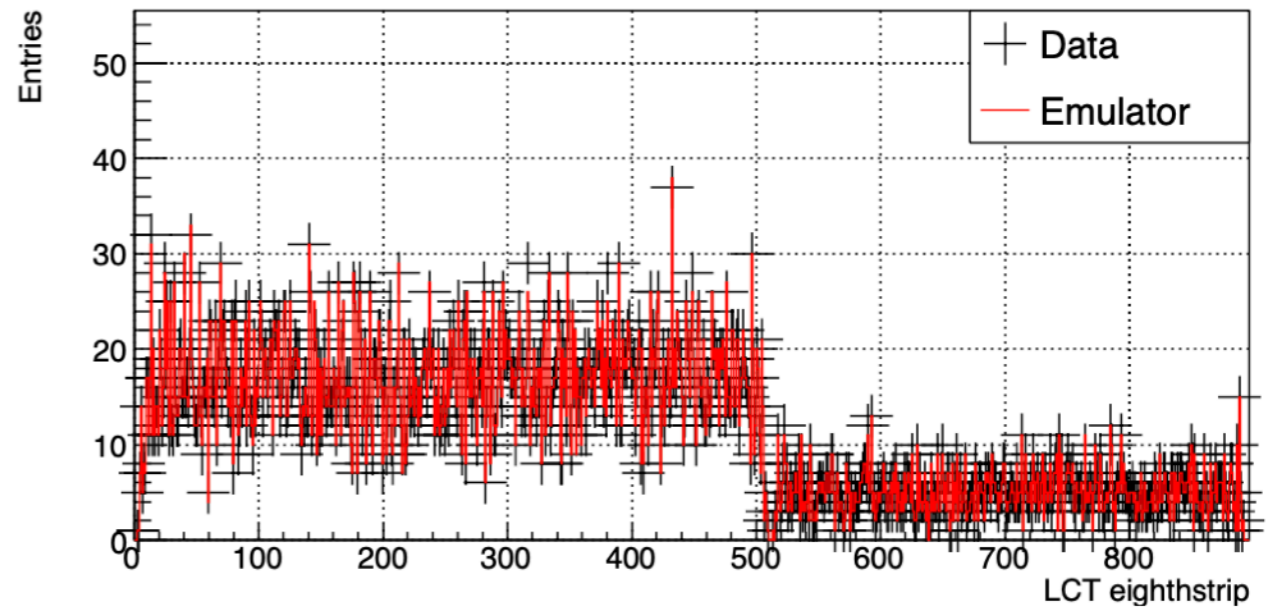
**After**

# LCT

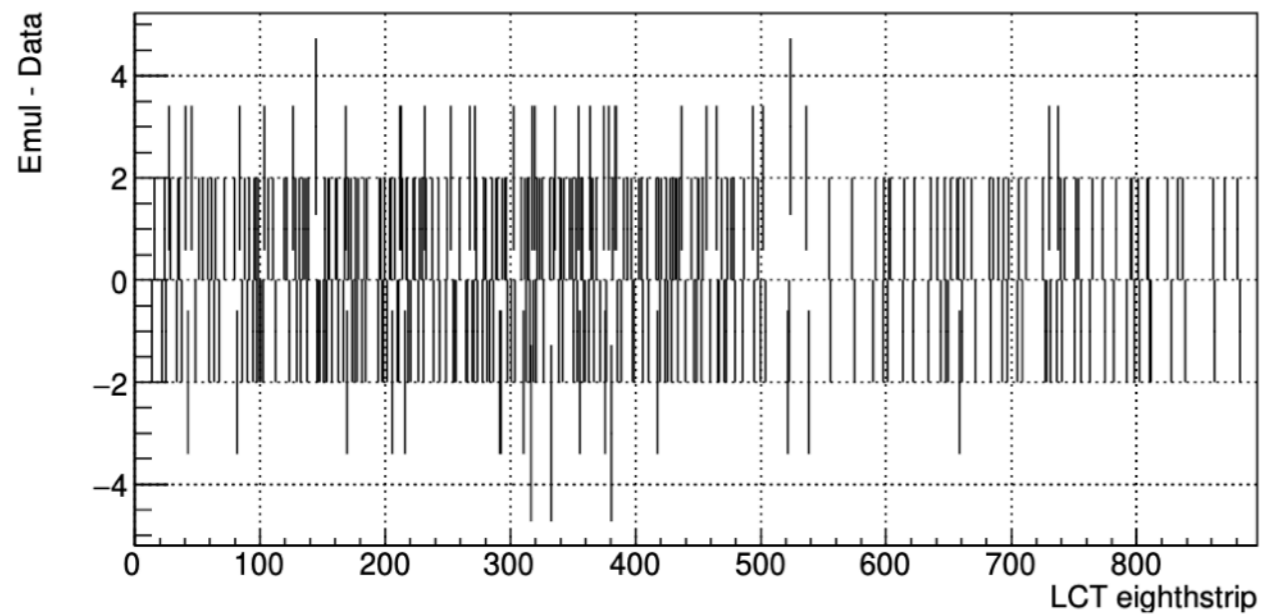
ME11 LCT eighthstrip (B904 Cosmic Run 210609\_142357)



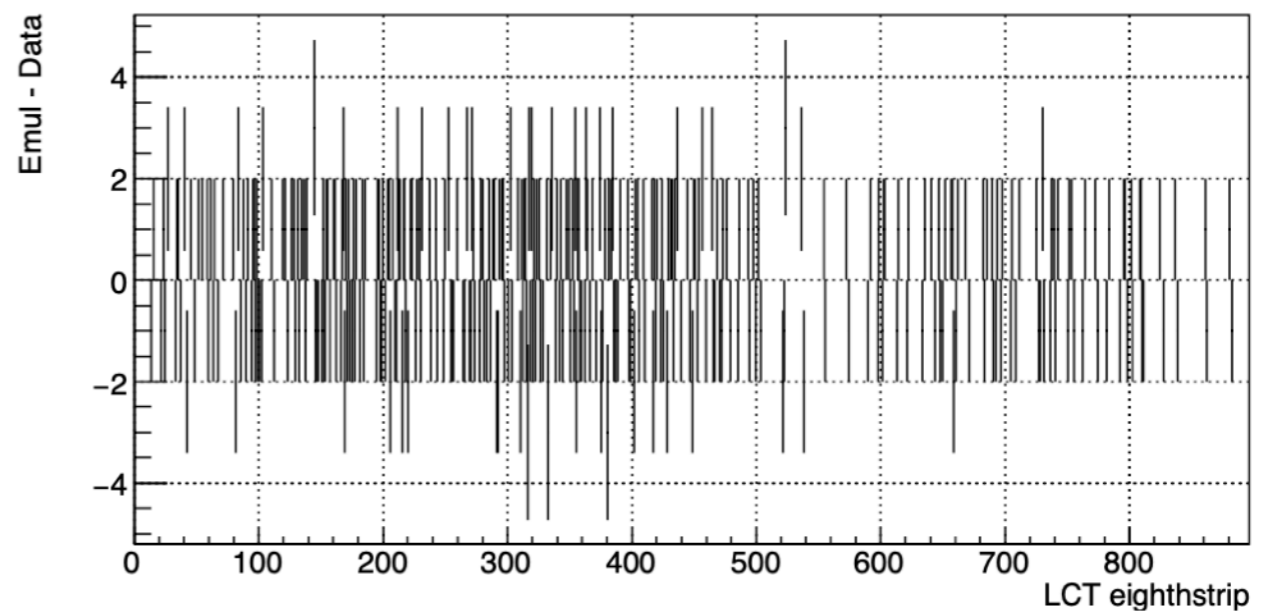
ME11 LCT eighthstrip (B904 Cosmic Run 210609\_142357)



ME11 LCT eighthstrip (B904 Cosmic Run 210609\_142357)



ME11 LCT eighthstrip (B904 Cosmic Run 210609\_142357)



**Before**

**After**