MAGIC + LST simulations

A short update.

F. Di Pierro, on behalf of several people...

2019/04/29

Introduction

1. **Goals of the production**
   i. To estimate the performance of combined MAGIC and LST1 observations
      - Check the simulation and analysis pipelines comparing these results and MAGIC known performance
   ii. To test cross-calibration strategies (MAGIC – LST1)
2. **Redmine issue**, to follow the task:
   i. https://forge.in2p3.fr/issues/35807
3. Production (corsika, simtel) and Analysis (chimp/mars, ctapipe) using **Dirac** on CTA VO resources

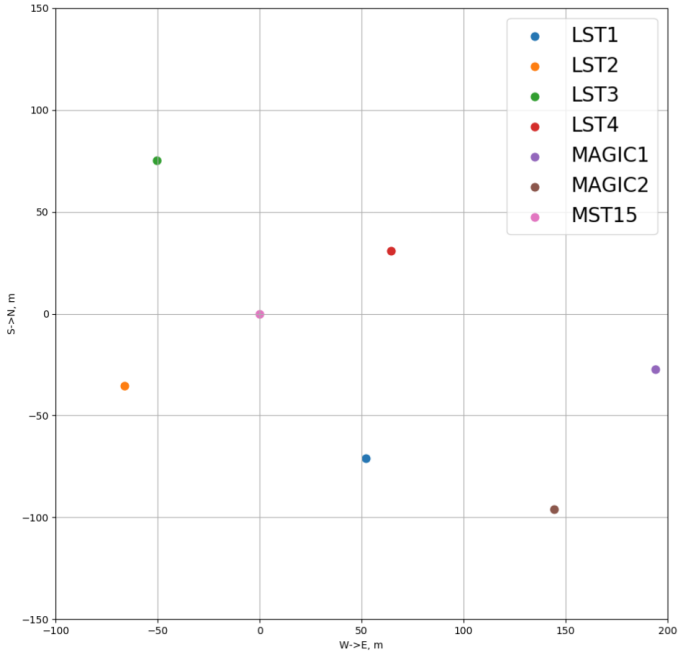
Status

1. corsika
2. sim_telarray
3. Analysis
   i. Chimp/mars
      - Chimp (calibration, image cleaning, conversion to root for MARS analysis)
      - MARS (DirLut, Energy RF, gamma/hadron, performance estimation)
   ii. ctapipe
4. Re-do a larger production?
5. Nice plots and ICRC contribution

corsika

1. Layout (4 LSTs, 2 MAGIC, central MST)
2. Zenith angle, THETAP = 20º
3. Azimuth, PHIP = 0º (array pointing South)

Primary	Gamma	Proton
Emin [GeV]	3	4
Emax [GeV]	330E3	600E3
Eslope	-2	-2
CSCAT [m]	700	1000
NSCAT	5	10
Viewcone [deg]	0	6
N. showers/job	5E4	1E5
Jobs	~2200	~12000



- Files can be found here: **/vo.cta.in2p3.fr/MC/PROD4/LaPalma/**
- Produced with Dirac Transformation: 1897 (gammas), 1904 (protons)

simtel

1. **Version**: /vo.cta.in2p3.fr/software/corsika_simhessarray/2018-11-07/
2. **Configurations:**
   /vo.cta.in2p3.fr/user/f/fdipierro/mycfg_simtel_magic_lst_test.tar.gz
   i. LST: CTA-ULTRA6-LST-40ns.cfg (same as prod3 CTA-ULTRA6-LST.cfg, but with fadc_sum_bins = 40 instead of 30 [ns])
   ii. MAGIC1 and MAGIC2 (CTA-PROD4-MAGIC1.cfg and CTA-PROD4-MAGIC2.cfg, produced by Sasa, Yoshiki, Yusuke, Ievgen, Julian, et al.).

   See Sasa's slides for the details:
   https://forge.in2p3.fr/attachments/download/62474/LST_Analysis_Bootcamp_2018_Micanovic.pdf

   iii. Central MST: CTA-ULTRA6-MST-NectarCam.cfg
3. **Trigger**: all mono triggers (possible cross-checks with cta-lstchain)
4. Files are:
   i. /vo.cta.in2p3.fr/user/f/fdipierro/simtel/gamma/magic_lst/test/
   ii. /vo.cta.in2p3.fr/user/f/fdipierro/simtel/proton/magic_lst/test/

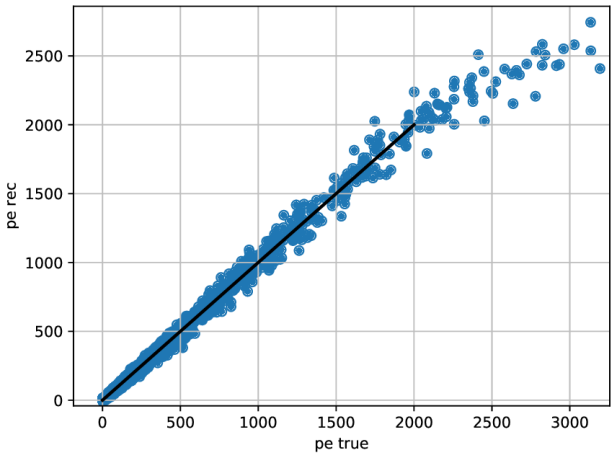
Chimp/MARS

1. **Versions**: /cvmfs/cta.in2p3.fr/software/sl6-gcc44/simulations/mars/2019-04-19/
   i. ROOT: 5.34.38
   ii. MARS: V2-19-3
   iii. Chimp: current CVS version + small modification (see next slide)
2. **Chimp has run** (calibration, image cleaning, conversion to root)
3. **Files** are:
   i. /vo.cta.in2p3.fr/user/f/fdipierro/chimp/
4. **Next steps**: to run the MARS analysis
   i. Several sublayouts (e.g.: M1 + M2, 2-3-4 LSTs, **2 MAGIC + LST1**, M1 + LST1, M2 + LST1, M1+M2+LST1+LST2, All,...)

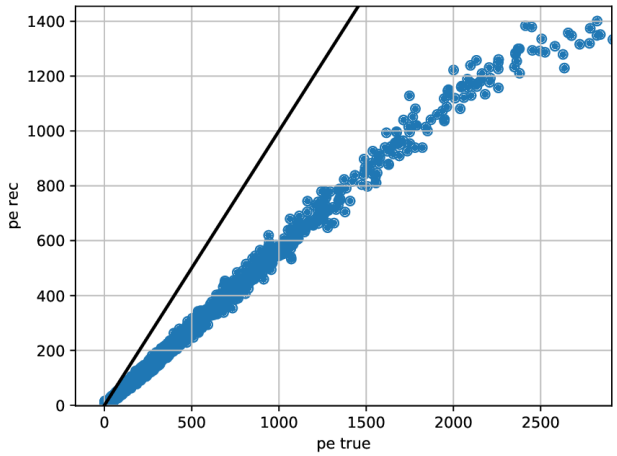
Example of Chimp updating: correction of MAGIC calibration

- There was an inconsistency between Size distributions obtained by ctapipe and chimp, so we investigated the calibration steps and introduced a correction factor for MAGIC in chimp

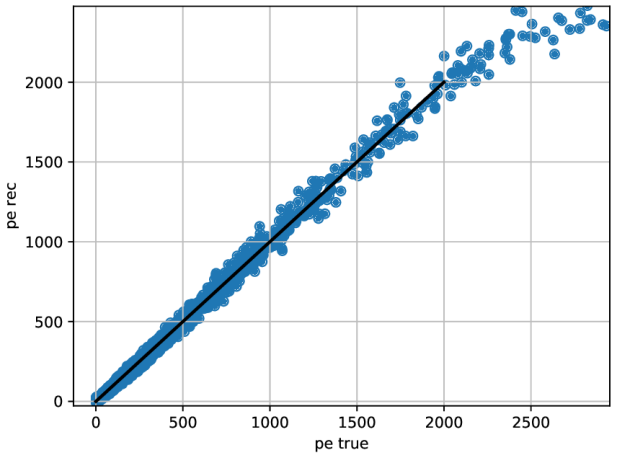
ctapipe



Chimp original (historical generic "adc" to pe conversion value)



Chimp w. correction factor



The black line is just y=x

Correction factor in chimp for MAGIC = 1.77

Conclusions

1. MARS analysis has started
2. ctapipe analysis should start ASAP
3. Results must be compared with prod3b results (for LSTs, as sanity check)