ValidationsTools

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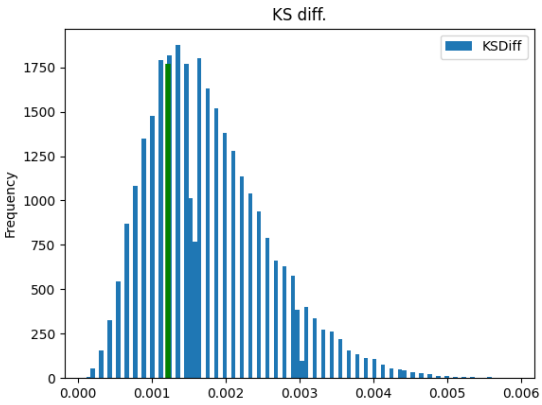
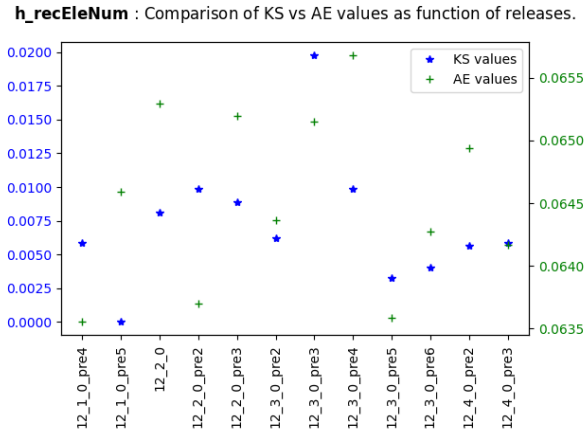
General explanation :

This repository get all the validations tools such as Kolmogorov-Smirnov (KS Tools) or AutoEncoders Tools (AE).

KS : talk about first dev (1 release vs 1 reference) to (1 reference vs lot of releases). pValues.
From the values of an histogram, we can construct an integrated cumulative curve. From this curve we can take the maximum of the difference between 2 consecutives values. Repeating this operation with a lot of ROOT files (200, 500 or 1000) we can construct a KS curve such here onto the right.
From this curve we can extract a pValue and try to obtain an idea of the validity of the histo and then the release.



AE : analyze on a reference and comparison with a lot of releases. The precedent explanation was made for one release vs 1 reference. Keeping the reference we can compare with a lot of releases (here about 12).
From the ROOT files presented above we can train an autoencoder and try to predict the result of a given entry for one release. Doing this for a tenth of releases we can obtain a comparison, function of the releases, for the pValues or the differences at the end of the AE.
This is shown onto the left here, and extract an idea about the validity of one (or more) release(s).



One goal of those operations is from a reference release, to create a lot of ROOT files from this reference release. The set of the reference ROOT files are named as RRF or generated reference ROOT Files (GRRF).

Once you have created all those files (see 6), you will need to think about comparison.
In KS you have a reference release, and one or more release(s) to compare with. Into the first version of the KS tool, we have one « official » reference release (and a lot of created ROOT files from the same reference release). From those files we can compare a new release (in general called rel by comparison with the ref file) with the reference release and extract a lot of pictures for each histogram.

KS curves

First we generate an average curve bin to bin from the mean of all the histograms from RRF.
For each histogram we generate a graph with 3 curves representing the classical comparison of the histograms (ref vs rel) with the average curve added.
The new histo curve is in red, the reference one is in blue and the average curve in green.

We have 3 graphs more. The first one represents the cumulative curves of the 3 curves described above. A second graph representing the difference curve between the 2 (new/rel and reference/ref) cumulative curves. The last picture represents the difference curve between the new curve and the average curve.

With those 4 preceding pictures, we add 3 new pictures names as KS pictures and representing the Kolmogorov curves (see first picture above). For the first graph, we use all the references histograms and compare each accumulated curve with all the others.
For the second graph, we choose a random histogram as reference and compare its accumulated curve with each accumulated curve of all the others.
For the third graph, we took the histogram to be validated and compare its accumulated curve with each other accumulated curve of all the others histograms.
The last three curves are created with KS_Tools while the fourth others are created with a simple validation routine.

AE curves

For AE, we have a lot of difficulties. instead of KS, we have to search for a correct AE (number of layers, number of points for those layers, …) and generate some pictures for a lot of releases (those placed into the DATA folder).
We can generate some comparisons with KS results (such as into the second picture above) as a function of a release, generate a prediction for each histo, and for each release. This can give some advice for the validity of the histogram and then for a release.

All thoses files are located into a folder named ValidationsTools which contains at least 5 folders :
- Doc : containing this documentation,
- ZEE_Flow : folder used for the creation of the ROOT files,
- KS_Tools : folder used for the KS pictures and files,
- AutoEncoder : containing the autoencoder tools and results,
- DATA : empty at the installation. Contain the « official » ROOT files, i.e. the releases ROOT files used for the comparison mentioned above.

⚠later create a link to an explanation of the common files used for the ROOT files creation (CommonFiles/path...).
- CommonFiles : with the files which are used by all the tools, KS as AE.

Here is a summary of all the files/folders used for this tool.

CommonFiles : files used by all scripts

default.py
pathsLLR.py
pathsLocal.py
pathsPBS.py
rootValues.py
sources.py
defaultStd.py
defaultDiff.py

Doc : containing the documentation

DATA : empty at the installation. Contain the « official » ROOT files.

RESULTFOLDER : empty at the installation. Contain the «created» ROOT files (CRF).

ZEE_Flow : folder used for the creation of the ROOT files

step1.py
step2.py
step3.py
step4.py
generateAE.sh
KScompare.sh
createFiles.sh
checkRootFiles.sh
createRootFiles.sh
reduceROOTFiles.sh
ReduceROOTSize.sh
extractValues.sh
reduceSize1File.py : reduce the size of the created ROOT files

KS_Tools : folder used for the KS pictures and files

extractValues.py : create a file per histo with all values from the CRF
createFiles_v2.py : create a pValues file and a diffmax file for AE
extractNewFilesValues.py
KScompare.py : comparison between releases for KS
statpValues.py : pictures for pValues comparison between releases

AutoEncoder : containing the autoencoder tools and results

AEGeneration.py : generate some AE kernels, pictures and comparisons with KS results.

Check : folder used for the check of the ROOT files

checkRootFiles.py : create a check of the ROOT files (histos with pbms)
checkMapDiff.py : create maps for max ttl diff. Of the ROOT files

0 – Launching the installation :

- git clone https://github.com/archiron/ValidationsTools ValidationsTools
- cd ValidationsTools
- chmod 755 *.sh

then launch : . installValidationsTools.sh newRelease

This install the library (ChiLib), the release file env (cmsrel $Release $Release) and copy the ZEE_Flow/CCA or ZEE_Flow/LLR files (depending of the site you are working on – the CC or the

LLR site) onto the $Release/src/Kolmogorov folder.
$Release is the release you want working with. If you don't put any value this take a default release (CMSSW_12_1_0_pre5).

1 – Launching the ROOT files creation :

From the top of the Tools (i.e. ValidationsTools), then launch :
. createROOTFiles_init.sh
This script launch the creation of the ROOT files, using the step[1-4].py scripts.
You can use own but they have to be similar to the existing ones (see 13).

!! talk about the minimum size needed for nb_evts (~ 1000). 10 is too small and could be used only for development tests.

2 – Reducing size :

When ALL ROOT files are created, launch (always from the top folder) :
. reduceROOTSize_init.sh
this will reduce the size of the ROOT files (typically from 150/200 Mo to 1.5/2 Mo), keeping the name of the file. We only kept the used branches i.e. DQMData/Run 1/Info and DQMData/Run 1/EgammaV.

3 – Extracting values :

When all the ROOT files are created and reduced, we need to creates 1 file per histo with all the histo values for each ROOT file.
It is the first job of the extractValues[_init].sh scripts.

It can be launched with : . extractValues_init.sh
This script launch 2 others python scripts :
extractValues.py
extractNewFilesValues.py

The first script create into the RESULTFOLDER (see 14) a lot of text files. All ROOT files are read, and then for each histo, the values of the histo curve is stored into an array, ROOT file after ROOT file.

Once we have all the ROOT files read, the array is stored into a text file dedicated to this histo.
The name is : RESULTFOLDER + 'histo_' + str(leaf) + '_' + '{:03d}'.format(nbFiles) + '.txt' where leaf is the name of the histo, nbFiles the number of the ROOT files (**WARNING** : it is **NOT** the same as NB_EVTS in rootValues.py – see 14).

Example :

histo_h_ele_zEff_200.txt
histo_h_ele_seedDphi2_200.txt

After the extraction of the values, if you want to work with AE, you will need to generate another file : branchesHistos_NewFiles.txt which contains the values of all histos for all the added ROOT files. The creation of this file is made with the same script as above which launch 2 python files : one for the extraction and another for this file creation.

The second script create a new file called : branchesHistos_NewFiles.txt

This file contains all the histos values for all the add ROOT files.

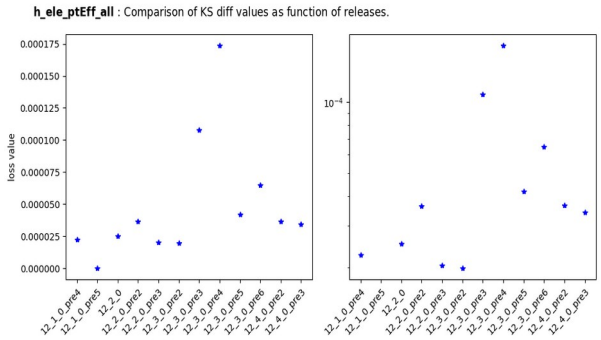
4 – Reference, comparison files :

Talk about the files to add into the DATA folder. empty at the installation. Contain the « official » ROOT files, i.e. the releases ROOT files used for the comparison mentioned above.
The main goal of the KS tests is to validate a new release by comparing it to a reference. In order to simplify the process we first put those 2 files into the DATA folder. The reference file (named input_ref_file for the computation) is called with the sources.py file.

But, if we can make a comparison between a reference ROOT file and a new one, what's happen when we put a lot of files (say 10) of various releases. We always a reference but we can have a lot of new files and we can have an evolution of values with the releases.

Release
12_1_0_pre4
12_1_0_pre5
12_2_0
12_2_0_pre2
12_2_0_pre3
12_3_0_pre2
12_3_0_pre3
12_3_0_pre4
12_3_0_pre5
12_3_0_pre6
12_4_0_pre2
12_4_0_pre3

In the array on the left we have 12 releases. 12_1_0_pre5 is the reference so we can compare the 11 others with it.
An example is given with this picture where we have the maximum of the differences of the cumulative curve of a release with the reference release for the h_ele_ptEff_all histo.
For the reference release the difference is 0 and we can see some possible problems with 2 others releases (12_3_0_pre3 & 12_3_0_pre4).



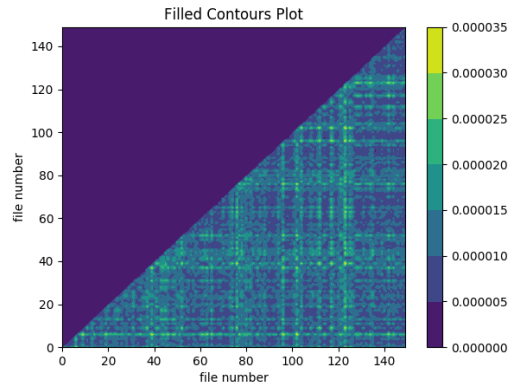
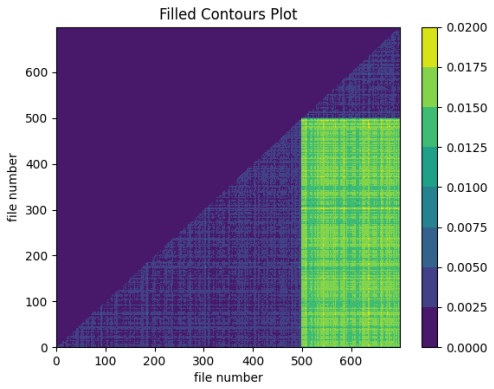
5 – Checking ROOT files :

When ALL ROOT files are reduced, launch (always from the top folder) :
. checkRootFiles_init.sh

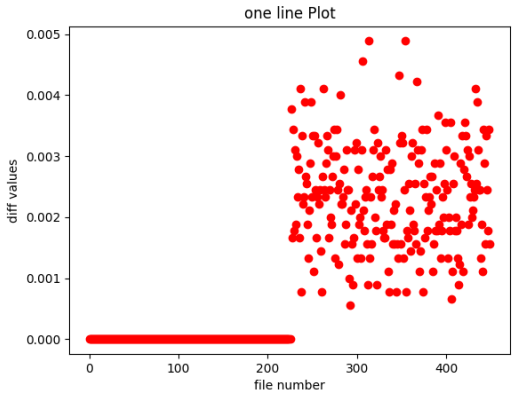
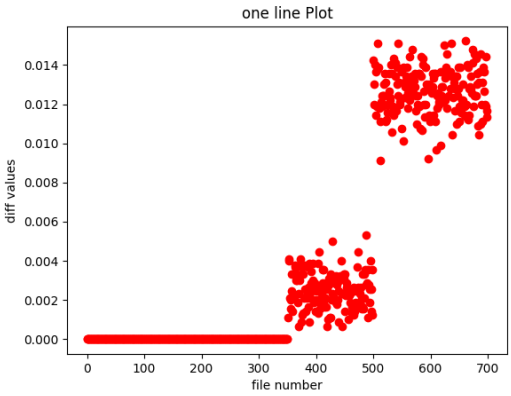
Here, 3 scripts are launched :
checkRootFiles.py – checkMapDiff.py - checkCreatedVsOfficial.py

The first and the second are used to make a test of the ROOT files (those which are generated but also those which are added), and have an idea of some problem which can occur.

The problems are generally a problem of a number of histograms.

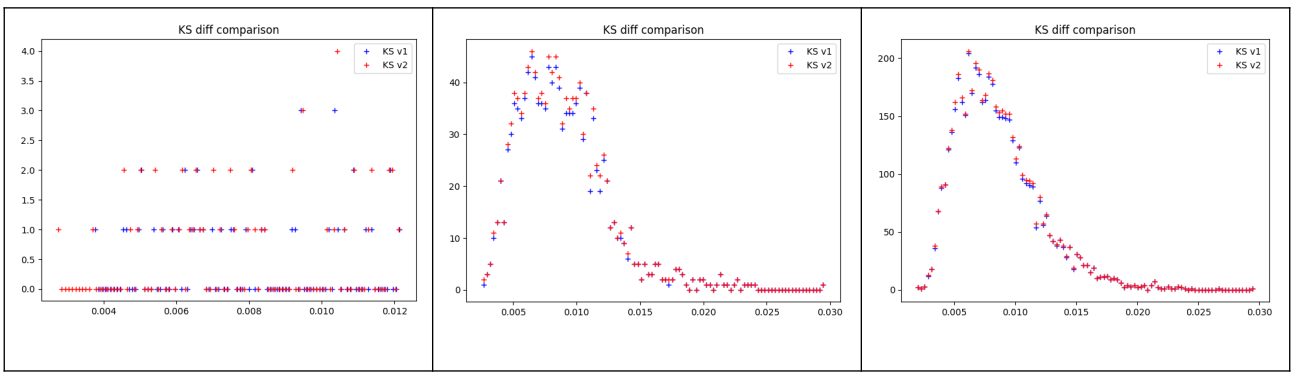
A correct set of ROOT files	A set of ROOT files with pbm
	

We can see on the maps above that on the left all the ROOT files are consistent (we plot for each histo the maximum difference between each ROOT file cumulative curve with each other curve) because there is no excess value. On the left there is a pbm with some histos as we can see with the colored map.

A correct set of ROOT files	A set of ROOT files with pbm
	

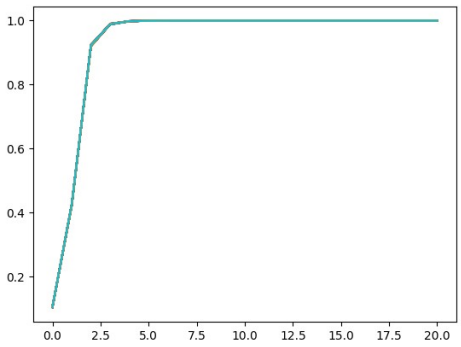
Here on the right we can see on a cut of the precedent right map that there is a clear step into the values while on the left there is no step.
There is also some more tips displayed into a log file.

The third script create some pictures by comparing the KS accumulated curves (see next chapter) and comparing them at different steps. This can be seen below.



6 – Create some files and pictures :

When ALL ROOT files are created and values extracted, launch (always from the top folder) :
. createFiles_init.sh



Here also 3 scripts generate some textfiles or pictures :
createFiles_v3.py – KShistos.py - KSvalidation.py

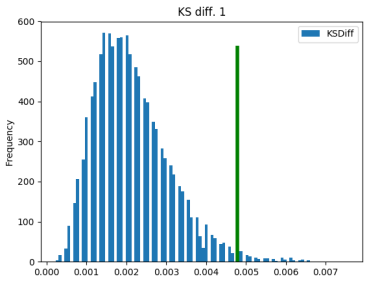
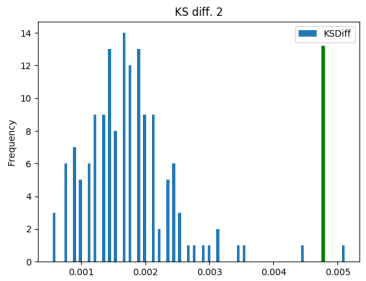
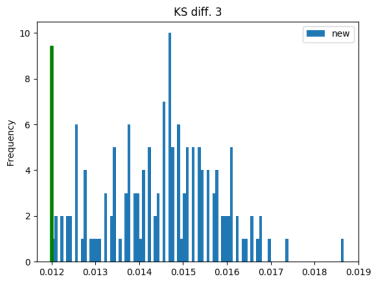
the first generate some pictures :
Cumulative : for each histogram we extract from each ROOT file the values (see 6) and then create accumulated curves when it is possible. Those curves à normalized to the range [0, 1] and we display all the curves; it's a sort of new test because in case of problem, we will see some differences onto the curves.

KS_ttlDiff : For the first graph (KS_ttlDiff_1), we use all the references histograms and compare each accumulated curve with all the others and took the maximum of the difference.

For the second graph (KS_ttlDiff_2), we choose a random histogram as reference and compare its accumulated curve with each accumulated curve of all the others.

For the third graph (KS_ttlDiff_3), we took the histogram to be validated and compare its accumulated curve with each other accumulated curve of all the others histograms.

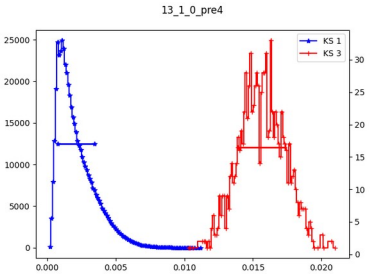
For each comparison, we take the maximum value of the difference.
For the 3 graphs, we took the max difference written above in the central box, and display it with the following color code :
if the value is included into the x-axis limits, the max. difference corresponding to the p-Value is displayed as a **green** line,
and if the value is lesser or greater than the x-axis limits, then the corresponding line is in **red**.

KS ttl diff 1	KS ttl diff 2	KS ttl diff 3
		

There is also the creation of numerous files with pValues for different release/histogram in order to use it later with the Comparison nor the AE generation.

The second script (Kshistos.py) use some previously generated text file and create some comparison of the KS curve for the first case (KS1) with the third one (KS3).

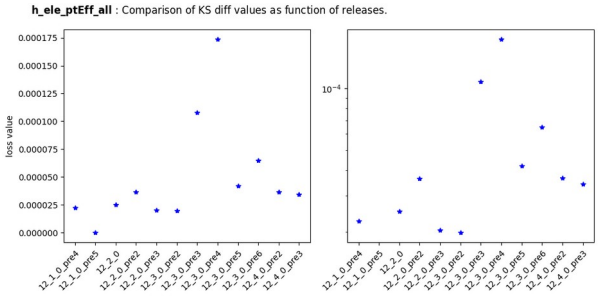
The idea behind this was to see if we can extract some information with the gap between the 2 curves. Actually, nothing was found.



7 – Comparing pValues for all added ROOT files :

When ALL ROOT files are created and values extracted, launch (always from the top folder) :
. KScompare_init.sh

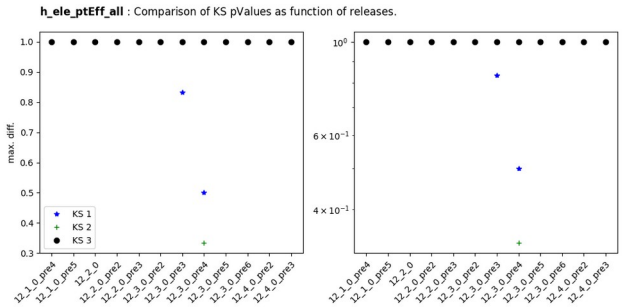
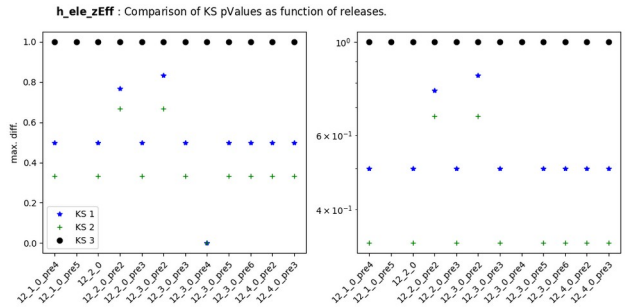
As usual, 3 scripts are used :
KScompare.py
statpValues.py
statConfiance.py



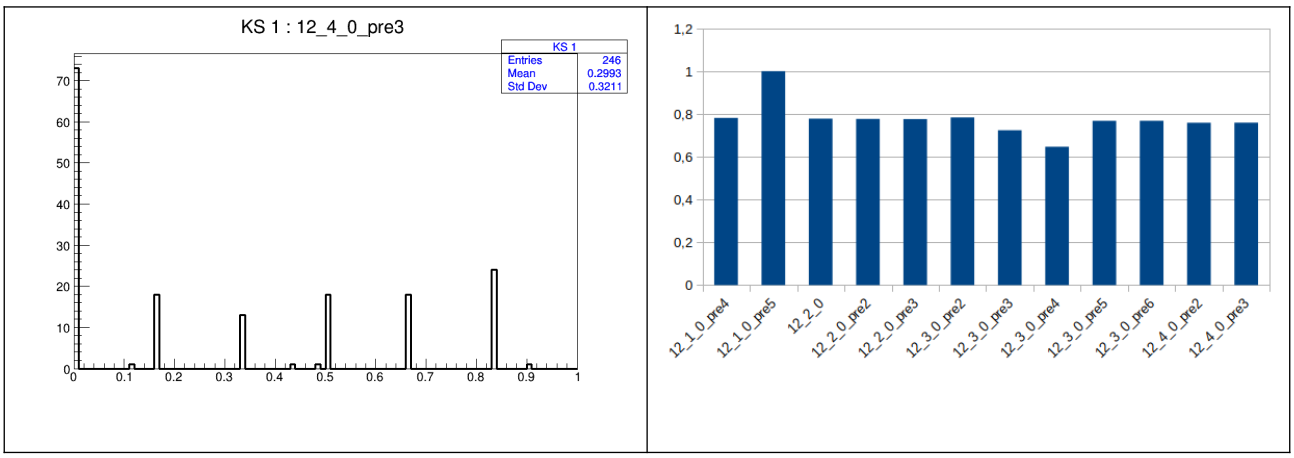
The first script is used to generate some comparison pictures.

comparison_KS_values : As we made numerous files into the preceding step, we can compare each accumulated curve with the reference one (12_1_0_pre5 here). For all those curves, we extract the maximum of the difference as reported on the picture on the right (see the difference =0 when comparing the reference with itself).
We have 2 parts into the picture, the right one is the same as the left one but with a log vertical axis.

comparison_pValues : In a same way we can extract the pValues from the pictures like KS_ttl_Diff_X (1≤X≤3) and compare each other with the others releases. Compared to the precedent case we have now 3 curves of the pValues vs releases corresponding to one of the three cases.
Two examples are displayed on the table below for 2 histograms :

h_ele_ptEff_all	h_ele_zEff
	

Talk about stat pValues (asked by Florian) with : KS_1_, KS_2_, KS_3_ Florian
The second script generate some pictures showing the number of bin for a corresponding pValue between 0 and 1.



The last script is only an indicator for the and use some simple coefficients which try to extract some information about the validity of the release. From those coefficients (need to develop !) one can extract a graph as those displayed above on the right.

8 – Generating AE pictures :

We now are looking for AE. After a choice of the number of layers and number of points per layer, we launch :
. generateAE_init.sh
talk about comparison with pictures.

9 – Creating AE comparison pictures :

This script is used to generate some pictures with AE comparisons for each release to compare, for differences or pValues.
we launch :
. resumeAE_init.sh
This generate some important pictures (also in size) for comparison.
This can be seen here.

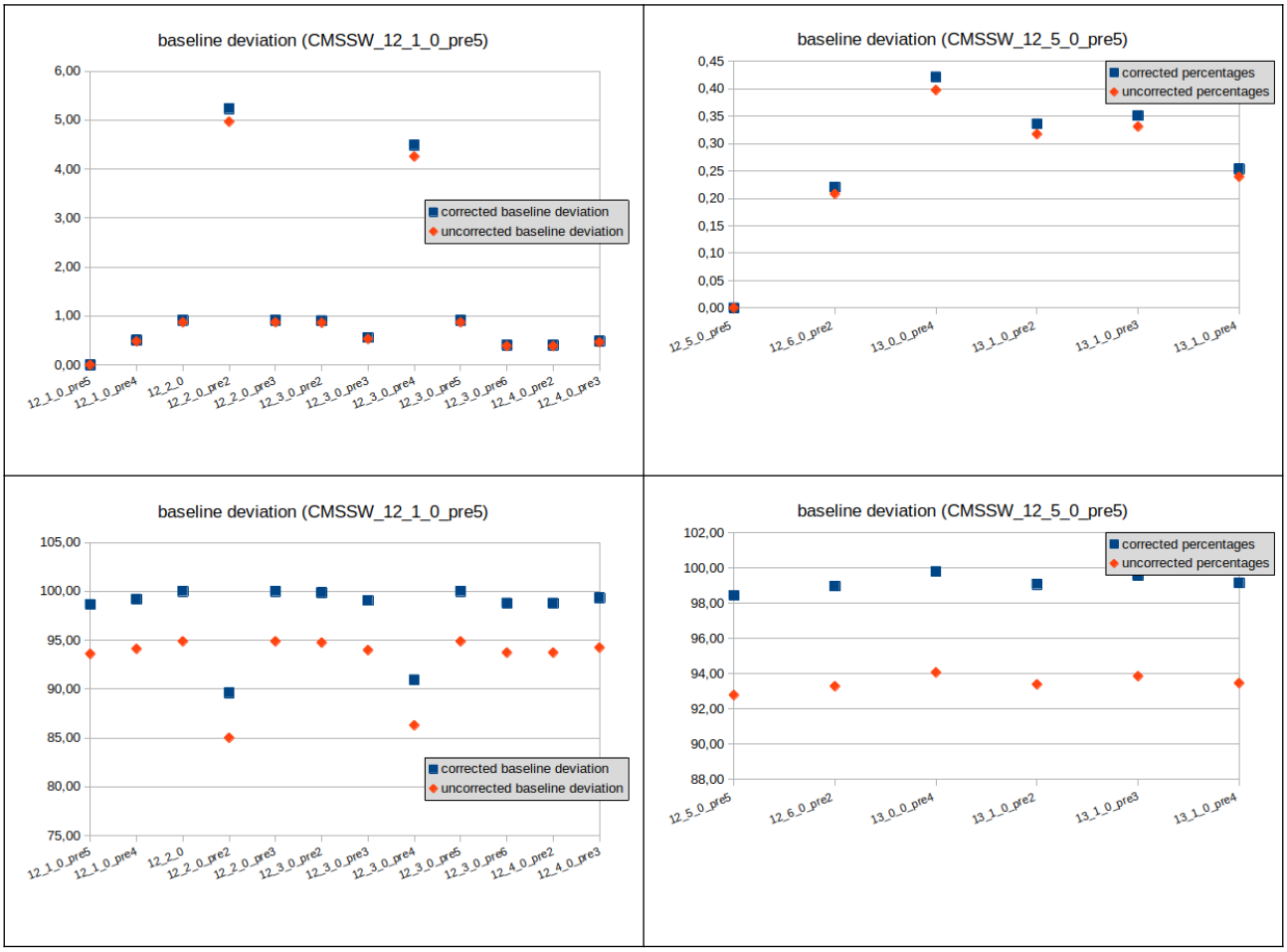
10 – Creating AE losses comparison pictures :

Here also we have some external tests with the number of green/red KS results for all AE cases. So, we launch :
. compAELosses_init.sh
This can give pictures such as below where we can have a deviation (see below) curve as a function of the releases (first line for 2 cases) or the same curve as a percentage of the green vs ttl as a function of the releases (second line).

The process is as follow :
we have for each AE case (some different layer configurations) a lot of releases to compare.
For each release we have the numbers green/red of the corresponding KS cases.
First we can create some percentage of green and display them as a function of the releases.
In second we can sum all AE cases those percentages as in :

$$\frac{\sqrt{\sum_{i=0}^{i=N}(p_i - p_{ref})^2}}{N}$$

where N is the number of the AE cases, p_i the percentage for the release I and p_{ref} the percentage for the reference release. This leads to the first line below.



It seems from previous tests that the deviation is limited to 1 when the release seems correct and have peaks other 1 (such as 5) when there is a problem.

ANNEXE

In that follow, we have the following notation :

al numeric values (int/float) are in **blue**.

Annexe : ROOT scripts to modify

Here we are talking about the step[1-4].py scripts. You can download the needed scripts onto the dmytro site [1] and use the reqmgr into the left bottom of the page [2].

In all stepX.py files, we need to replace the 2 lines :

```
from Configuration.Eras.Era_Run3_cff import Run3

process = cms.Process('SIM',Run3)
```

with :

```
from Configuration.Eras.Era_Run3_cff import Run3

if len(sys.argv) > 1:
print(sys.argv)
print("step 1 - arg. 0 :", sys.argv[0])
print("step 1 - arg. 1 :", sys.argv[1])
print("step 1 - arg. 2 :", sys.argv[2])
print("step 1 - arg. 3 :", sys.argv[3])
print("step 1 - arg. 4 :", sys.argv[4])
ind = int(sys.argv[2])
max_number = int(sys.argv[4])
else:
print("step 1 - rien")
ind = 0
path = ''
max_number = 10 # number of events

max_skipped = ind * max_number

process = cms.Process('SIM',Run3)
```

And also replace :

```
fileName = cms.untracked.string('file:step1.root'),
```

with :

```
fileName = cms.untracked.string('file:step1_' + '%0004d'%max_number + '_' + '%003d'%ind + '.root'),
```

1 Such as https://dmytro.web.cern.ch/dmytro/cmsprodmon/workflows.php?prep_id=CMSSW_11_0_0_pre13__UPSG_Std_2026D41noPU-1575298095-ZEE_14

2 https://cmsweb.cern.ch/reqmgr2/fetch?rid=ssawant_RVCMSSW_11_0_0_pre13ZEE_14__2026D41noPU_191202_155322_5298

And for all file name such as step2.root or other.

In the last script (usually step4.py) which generate the DQM file, we have to insert 2 lines between the dqmsave_step line such as :

```
part3 = '/RECO_' + '%0004d'%max_number + '_' + '%003d'%ind
process.dqmSaver.workflow = '/Global/' + 'CMSSW_X_Y_Z' + part3
process.dqmsave_step = cms.Path(process.DQMSaver)
```

Annexe : paths definitions

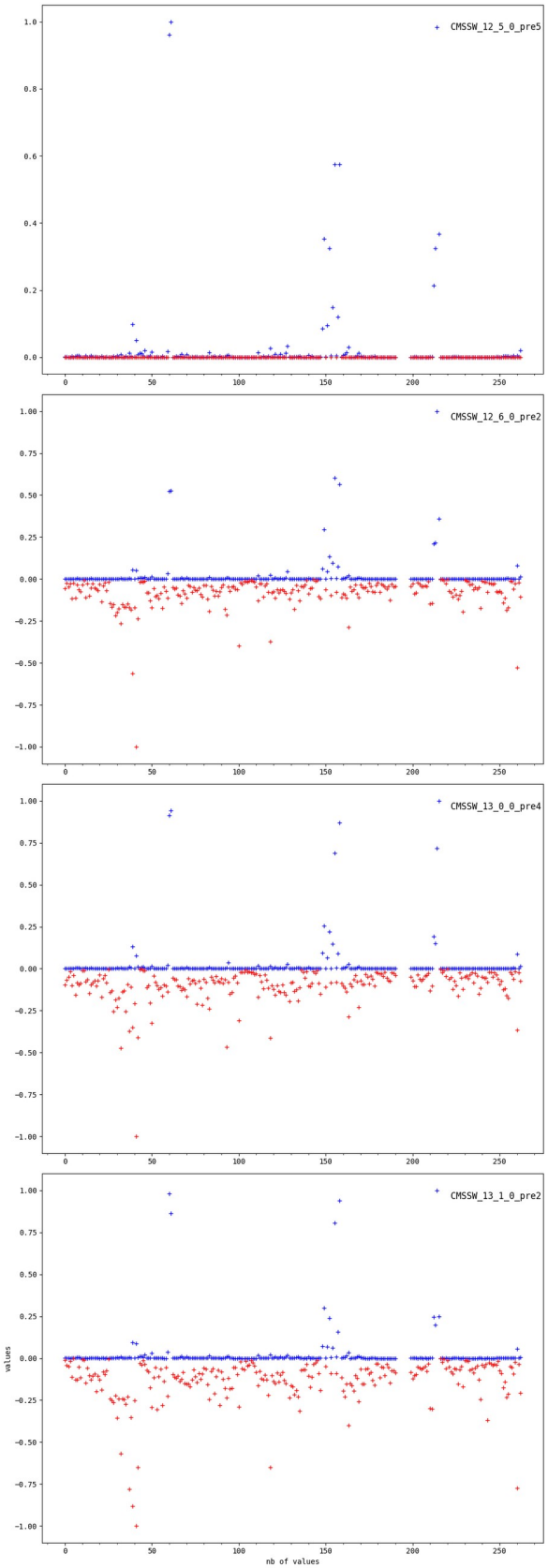
All those path (except RESULTFOLDER) must have to be joined to the local path where ValidationTools is i.e. pwd() = …../ValidationsTools. This is also named as **top folder**.
LOG_SOURCE="ZEE_Flow/CMSSW_12_1_0_pre5/src/Kolmogorov"
LOG_SOURCE : path used to create the ROOT files. Need to keep a cmsRun env.
LOG_OUTPUT="/sps/cms/chiron/TEMP/"
RESULTFOLDER="/sps/cms/chiron/Validations"
RESULTFOLDER : path where you want the created ROOT files are located. It also contain the text files for each histo.
LOG_KS_SOURCE="KS_Tools/"
LIB_SOURCE="ChiLib/"
COMMON_SOURCE="CommonFiles/"
DATA_SOURCE="DATA/"
CHECK_SOURCE="Check/"
LOG_AE_SOURCE="AE_Tools/"

Annexe : values for ROOT creation

For the creation of the ROOT files we need python files with physics and for those files we need some values.
In general we need a lot files and not only one. So, those file went from **Nbegin = 0** to **Nend=200** or **1000**.
For a lot of tests it can be nice to have smaller values such as :
Nbegin = 20
Nend = 23

Inside the python files we nned to know about the number of events to be used. Most of the « official » runs use **NB_EVTS = 9000**. For some rapid tests we can use :
NB_EVTS = 10
but for tests with values expected, we need NB_EVTS = 1000.

Annexe : resume picture



Loss vs Difference value prediction by histo for various releases.

Losses are in blue, Differences are in red

000 - recEleNum
003 - recOfflineVertices
006 - vertexPt
009 - vertexP
012 - vertexZ
015 - nc_Eta_Extended_matched
018 - vertexPtVsEta_pfx
021 - ecalEnergyError_endcaps
024 - combinedP4Error_endcaps
027 - PoPtrue_barrel
030 - PoPtrue_golden_endcaps
033 - PtoPtTrue
036 - EoEtrue_barrel_new
039 - EoEtrue_ebeegap_new
042 - EoEtrue_endcaps_new_Extended
045 - EoEtrueVsrecOfflineVertices_endcaps_pfx
048 - bcl_EtotoEtrue_barrel
051 - EtaMeEtaTrue
054 - PhiMePhiTrue
057 - PoPtrueVsEta_Extended_pfx
060 - EtaMeEtaTrueVsEta_pfx
063 - EoP_barrel
066 - EoPout_barrel
069 - EeleOPout_barrel
072 - EseedOP_barrel
075 - dEtaCl_propOut_barrel
078 - dEtaEleCl_propOut_barrel
081 - dEtaSc_propVtx_barrel
084 - dPhiCl_propOut
087 - dPhiEleCl_propOut
090 - dPhiSc_propVtx
093 - dPhiSc_propVtx_Extended
096 - EeleOPoutVsEta_pfx
099 - HoE_endcaps
102 - HoE_bc_barrel
105 - hcalDepth1OverEcalBc_barrel
108 - hcalDepth2OverEcalBc_barrel
111 - sigmaEtaEtaVsPt_pfx
114 - sigietaieta_endcaps
117 - full5x5_sigietaieta_endcaps
120 - E1x5_barrel
123 - E2x5max_barrel
126 - E5x5_barrel
129 - ESFrac_endcaps
132 - chi2_endcaps
135 - foundHits_endcaps
138 - lostHits_endcaps
141 - foundHitsVsEta_Extended_pfx
144 - seedMask
147 - seedDphi2
150 - seedDphi2Pos
153 - seedDrz2
156 - seedDrz2Pos
159 - PinMnPout_mode
162 - fbrem_endcaps
165 - superclusterfbrem_barrel
168 - eta_goldenFrac
171 - fbremvsEtamean
174 - tkSumPt_dr03_barrel
177 - ecalRechitSumEt_dr03_barrel
180 - hcalTowerSumEt_dr03_depth1_barrel
183 - hcalTowerSumEt_dr03_depth2_barrel
186 - hcalTowerSumEtBc_dr03_depth1_barrel
189 - hcalTowerSumEtBc_dr03_depth2_barrel
192 - combEOP_all
195 - TIP_all
198 - dPhiSc_propVtx_all
201 - HoE_bc_all
204 - absEtaDbisid
207 - JQbisid
210 - provenance_barrel
213 - nva
216 - nva_isolated
219 - chargedHadronIso
222 - neutralHadronIso
225 - photonIso
228 - chargedHadronRelativeIso
231 - chargedHadronRelativeIso_Extended
234 - neutralHadronRelativeIso_endcaps
237 - photonRelativeIso_barrel
240 - convFlags
243 - convDist_all
246 - convRadius
249 - etaEff_Extended
252 - dEff

091 - recCoreNum
094 - recSeedNum
097 - vertexEta
010 - vertexX
013 - vertexTIP
016 - outerP_mode
019 - ecalEnergyError
022 - combinedPtError
025 - ChargeMnChargeTrue
028 - PoPtrue_endcaps
031 - PoPtrue_showering_barrel
034 - PtoPtTrue_barrel
037 - EoEtrue_barrel_new_etagap
040 - EoEtrue_endcaps_new
043 - EoEtrueVsrecOfflineVertices_pfx
046 - EoEtrueVsrecOfflineVertices_Extended_pfx
049 - bcl_EtotoEtrue_endcaps
052 - EtaMeEtaTrue_barrel
055 - PhiMePhiTrue_barrel
058 - PoPtrueVsPhi_pfx
061 - PhiMePhiTrueVsEta_pfx
064 - EoP_endcaps
067 - EoPout_endcaps
070 - EeleOPout_endcaps
073 - EseedOP_endcaps
076 - dEtaCl_propOut_endcaps
079 - dEtaEleCl_propOut_endcaps
082 - dEtaSc_propVtx_endcaps
085 - dPhiCl_propOut_barrel
088 - dPhiEleCl_propOut_barrel
091 - dPhiSc_propVtx_barrel
094 - EoPoutVsEta_Extended_pfx
097 - HoE
100 - HoE_Extended
103 - HoE_bc_endcaps
106 - hcalDepth1OverEcalBc_endcaps
109 - hcalDepth2OverEcalBc_endcaps
112 - sigietaieta
115 - full5x5_sigietaieta
118 - full5x5_sigietaieta_Extended
121 - E1x5_endcaps
124 - E2x5Max_endcaps
127 - E5x5_endcaps
130 - chi2
133 - foundHits
136 - lostHits
139 - ambiguousTracks
142 - ambiguousTracksVsEta_pfx
145 - seedMask_Ppix
148 - seedDphi2_VsEta_pfx
151 - seedDphi2Pos_VsEta_pfx
154 - seedDrz2_VsEta_pfx
157 - seedDrz2Pos_VsEta_pfx
160 - fbrem
163 - fbrem_Extended
166 - superclusterfbrem_endcaps
169 - eta_bbremFrac
172 - fbremvsEtamode
175 - tkSumPt_dr03_endcaps
178 - ecalRechitSumEt_dr03_endcaps
181 - hcalTowerSumEt_dr03_depth1_endcaps
184 - hcalTowerSumEt_dr03_depth2_endcaps
187 - hcalTowerSumEtBc_dr03_depth1_endcaps
190 - hcalTowerSumEtBc_dr03_depth2_endcaps
193 - EoPout_all
196 - dEtaSc_propVtx_all
199 - dPhiCl_propOut_all
202 - mee_all
205 - etaDbisid
208 - chargeInfo
211 - provenance_endcaps
214 - nva_barrel
217 - nva_isolated_barrel
220 - chargedHadronIso_barrel
223 - neutralHadronIso_barrel
226 - photonIso_barrel
229 - chargedHadronRelativeIso_barrel
232 - neutralHadronRelativeIso
235 - neutralHadronRelativeIso_Extended
238 - photonRelativeIso_endcaps
241 - convFlags_all
244 - convDcot
247 - convRadius_all
250 - ptEff
253 - etaEff_all

002 - recTrackNum
005 - charge
008 - vertexPhi
011 - vertexY
014 - Et
017 - outerPt_mode
020 - ecalEnergyError_barrel
023 - combinedP4Error_barrel
026 - PoPtrue
029 - PoPtrue_golden_barrel
032 - PoPtrue_showering_endcaps
035 - PtoPtTrue_endcaps
038 - EoEtrue_barrel_new_phigap
041 - EoEtrue_endcaps_new_deepgap
044 - EoEtrueVsrecOfflineVertices_barrel
047 - bcl_EtotoEtrue
050 - bcl_EtotoEtrue_Extended
053 - EtaMeEtaTrue_endcaps
056 - PhiMePhiTrue_endcaps
059 - EoEtruePfVsEg_pfy
062 - EoP
065 - EoPout
068 - EeleOPout
071 - EseedOP
074 - dEtaCl_propOut
077 - dEtaEleCl_propOut
080 - dEtaSc_propVtx
083 - dEtaSc_propVtx_Extended
086 - dPhiCl_propOut_endcaps
089 - dPhiEleCl_propOut_endcaps
092 - dPhiSc_propVtx_endcaps
095 - EoPoutVsEta_pfx
098 - HoE_barrel
101 - HoE_bc
104 - hcalDepth1OverEcalBc
107 - hcalDepth2OverEcalBc
110 - HoE_fiducial
113 - sigietaieta_barrel
116 - full5x5_sigietaieta_barrel
119 - E1x5
122 - E2x5max
125 - E5x5
128 - HoEVsEta_pfx
131 - chi2_barrel
134 - foundHits_barrel
137 - lostHits_barrel
140 - chi2VsEta_pfx
143 - seedSubdet2
146 - seedMask_Pxix
149 - seedDphi2_VsPt_pfx
152 - seedDphi2Pos_VsPt_pfx
155 - seedDrz2_VsPt_pfx
158 - seedDrz2Pos_VsPt_pfx
161 - fbrem_barrel
164 - superclusterfbrem
167 - classes
170 - eta_showerFrac
173 - tkSumPt_dr03
176 - ecalRechitSumEt_dr03
179 - hcalTowerSumEt_dr03_depth1
182 - hcalTowerSumEt_dr03_depth2
185 - hcalTowerSumEtBc_dr03_depth1
188 - hcalTowerSumEtBc_dr03_depth2
191 - EoverP_all
194 - EeleOPout_all
197 - dEtaCl_propOut_all
200 - HoE_all
203 - mee_os
206 - ptDbisid
209 - provenance
212 - provenance_Extended
215 - nva_endcaps
218 - nva_isolated_endcaps
221 - chargedHadronIso_endcaps
224 - neutralHadronIso_endcaps
227 - photonIso_endcaps
230 - chargedHadronRelativeIso_endcaps
233 - neutralHadronRelativeIso_barrel
236 - photonRelativeIso
239 - photonRelativeIso_Extended
242 - convDist
245 - convDcot_all
248 - absetaEff_Extended
251 - phiEff
254 - ptEff_all