Problems of Photon IDEM with the EE

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The current state

I followed https://gitlab.cern.ch/ATLAS-EGamma/Software/ElectronID/TagAndProbeFrame/tree/photonID_ElectronExtrapolationFall2018 and completed the following steps.

I. git clone ssh://git@gitlab.cern.ch:7999/ATLAS-EGamma/Software/ElectronID/TagAndProbeFrame.git

II. source initialize.sh

```
Detaching debug info of libTagAndProbeFrameLib.so into libTagAndProbeFrameLib.so
.dbg
[ 99%] Built target TagAndProbeFrameLib
[100%] Built WorkDirRootMapMerge
[100%] Built package TagAndProbeFrame
TagAndProbeFrame: Package build succeeded
[100%] Built target WorkDirRootMapMerge
[100%] Built target Package_TagAndProbeFrame
[liukang@bl-0 TagAndProbeFrame]$
```

The current state

But there was a problem when I followed the 'TagAndProbeFrame README_EE' to create a photon ntuple in the first step: https://gitlab.cern.ch/ATLAS-EGamma/Software/ElectronID/TagAndProbeFrame/blob/photonID_ElectronExtrapolationFall2018/TagAndProbeFrame/README_EE.md

The early problems is the files in the README are very old. So I asked Francisco for new MC STDM2 DAODs/MC EGAM1 DAODs files.

```
[liukang@bl-0 TagAndProbeFrame]$ rucio list-files mc16_13TeV.423100.Pythia8EvtGen_A14NNPDF23LO_gammajet_DP17_35.deriv.DAOD_STDM2.e3
791_s3126_r10201_p4191
+-----------------------------------------------------+--------------------------------------+-------------+-----------+----------+
| SCOPE:NAME                                          | GUID                                 | ADLER32     | FILESIZE  | EVENTS   |
|-----------------------------------------------------+--------------------------------------+-------------+-----------+----------|
| mc16_13TeV:DAOD_STDM2.25594786._000001.pool.root.1 | A07D3718-FA46-E14D-987C-9F73B8B3A557 | ad:25947277 | 1.216 GB  | 10000    |
| mc16_13TeV:DAOD_STDM2.25594786._000002.pool.root.1 | 03F6B950-3D66-514C-9C8D-E546B3C746C2 | ad:78d925ea | 1.220 GB  | 10000    |
| mc16_13TeV:DAOD_STDM2.25594786._000003.pool.root.1 | B33F7E03-FC00-2D49-9828-C9573A978EF9 | ad:8b356992 | 1.212 GB  | 10000    |
| mc16_13TeV:DAOD_STDM2.25594786._000004.pool.root.1 | 90C02E07-0B25-DF44-BB35-DC62DEE874C7 | ad:d73343da | 1.219 GB  | 10000    |
| mc16_13TeV:DAOD_STDM2.25594786._000005.pool.root.1 | 737C0AE5-ADBE-584F-B696-E4760C14E0C0 | ad:4733d2c1 | 1.216 GB  | 10000    |
| mc16_13TeV:DAOD_STDM2.25594786._000006.pool.root.1 | 10F3F4CE-7803-514F-BC0C-B352A306A56B | ad:ecdf00ff | 1.217 GB  | 10000    |
| mc16_13TeV:DAOD_STDM2.25594786._000007.pool.root.1 | D418E825-5BFF-5342-A7DA-AB8A99890023 | ad:63f1a598 | 1.216 GB  | 10000    |

Total files : 45
Total size : 263.405 GB
Total events : 2171800
```

The current state

I have downloaded one of MC STDM2 DAODs and updated input.list to create photon ntuple.
Some new errors appeared when I ran ZmassRunEE.py again:

```
PropertyMgr                ERROR   /cvmfs/atlas.cern.ch/repo/sw/software/21.2/AnalysisBase/
21.2.42/InstallArea/x86_64-slc6-gcc62-opt/src/Control/AthToolSupport/AsgTools/AsgTools/
PropertyMgr.icc:33 (StatusCode PropertyMgr::setProperty(const string&, const T&) [with T =
std::map<TString, int>; std::__cxx11::string = std::__cxx11::basic_string<char>]): Property not
found: varDir
PropertyMgr                ERROR   /cvmfs/atlas.cern.ch/repo/sw/software/21.2/AnalysisBase/
21.2.42/InstallArea/x86_64-slc6-gcc62-opt/src/Control/AthToolSupport/AsgTools/AsgTools/
PropertyMgr.icc:33 (StatusCode PropertyMgr::setProperty(const string&, const T&) [with T =
std::map<TString, int>; std::__cxx11::string = std::__cxx11::basic_string<char>]): Property not
found: varDir_el
 xAODHelper.cxx:827:INFO: enablePhotonSelector
ConvPhotonSelector         INFO    operating point : Tight
UnConvPhotonSelector       INFO    operating point : Tight
PathResolver               WARNING Could not locate TagAndProbeFrame/transform_conv_1516.root
TFile::Open                 ERROR   no url specified
TUnixSystem::DispatchS...  ERROR   segmentation violation
==========================================================
```

The current state

The first two properties that were not found are in TagAndProbeFrame/Root/xAODHelper.cxx

```
7367  void xAODHelper::SetFudgeConfig(TString var){
7368    m_MCShifterTool->setProperty("varDir", CreateFudgeConfig(var));
7369  }
7370  void xAODHelper::SetFudgeConfigElectron(TString var){
7371    m_MCShifterTool->setProperty("varDir_el", CreateFudgeConfig(var));
7372  }
```

These two variables are called in TagAndProbeFrame/Root/ SkimToNtupleForEE.cxx and SkimToNtuplePhoton.cxx. which seems to be to extract the shape factor.
But I haven't figured out why these properties can't be found

The current state

Another problem is ’PathResolver WARNING Could not locate TagAndProbeFrame/transform_conv_1516.root’ I found it in TagAndProbeFrame/Root/xAODHelper.cxx， the two errors that followed seem to be related to this

```
  //----- transfer file ------
  {
    transformfile_conv["nom"] = TFile::Open( PathResolverFindCalibFile(Form("TagAndProbeFrame/transform_conv_%s.root", m_dataTakin
gYear.Data())).c_str() );
  //FIXME: is this still needed? cant see the file

    if(m_doElectronExtrapolationSyst){
      for (auto variation : eeVariations){
        transformfile_conv[variation] = TFile::Open( PathResolverFindCalibFile(Form("TagAndProbeFrame/transform_conv_%s_%s.root",
variation.Data(), m_dataTakingYear.Data())).c_str());
      }
    }
```

Here is a note //FIXME: is this still needed? cant see the file.
But when I comment out these lines of code, the initialize will report some errors.

The current state

The error is concentrated on lines 951 ~ 968 of the TagAndProbeFrame/Root/xAODHelper.cxx file.
I am getting familiar with these codes and looking for solutions.

```
949   std::vector<double> V_etabins{0, 0.6, 0.8, 1.15, 1.37, 1.52, 1.81, 2.01, 2.37};
950   double *abins = &V_etabins[0];
951   htransform_etabin=new TH1F("htransform_etabin","htransform_etabin", V_etabins.size()-1 ,abins);
952
953   std::vector<double> V_ptbins{25,30,35,40,45,50,60,80,100,125,150,175,250};
954   double *ptabins = &V_ptbins[0];
955   htransform_ptbin=new TH1F("htransform_ptbin","htransform_ptbin", V_ptbins.size()-1,ptabins);
956
957   ShowerShapeTypeName.clear();
958   ShowerShapeTypeName.insert(std::make_pair(xAOD::EgammaParameters::Reta,"reta"));
959   ShowerShapeTypeName.insert(std::make_pair(xAOD::EgammaParameters::Rphi,"rphi"));
960   ShowerShapeTypeName.insert(std::make_pair(xAOD::EgammaParameters::Eratio,"eratio"));
961   ShowerShapeTypeName.insert(std::make_pair(xAOD::EgammaParameters::Rhad,"rhad0"));
962   ShowerShapeTypeName.insert(std::make_pair(xAOD::EgammaParameters::Rhad1,"rhad1"));
963   ShowerShapeTypeName.insert(std::make_pair(xAOD::EgammaParameters::DeltaE,"DeltaE"));
964   ShowerShapeTypeName.insert(std::make_pair(xAOD::EgammaParameters::weta1,"weta1"));
965   ShowerShapeTypeName.insert(std::make_pair(xAOD::EgammaParameters::weta2,"weta2"));
966   ShowerShapeTypeName.insert(std::make_pair(xAOD::EgammaParameters::fracs1,"fracs1"));
967   ShowerShapeTypeName.insert(std::make_pair(xAOD::EgammaParameters::wtots1,"wstot"));
968 }
```

The current state

I am stuck here at the moment, and the above-mentioned problems have not been solved yet.

Now I am familiar with these codes TagAndProbeFrame/util/ZmassRunEE.py, TagAndProbeFrame/Root/xAODHelper.cxx, TagAndProbeFrame/Root/ SkimToNtupleForEE.cxx and SkimToNtuplePhoton.cxx.

I have contacted Evgeny and he suggested that I contact Asma Hadef and Stefan Richter and Tianjue Min.

Thanks !