Some ideas for the "Test on energy scale" chapter

General considerations

The idea is to test the performance of some example calibration chains on samples different from those used to obtain the last calibration step. Infact since the calibration steps must be obtained and applied with the same order the consistency check done for the last step will include all the previous steps.
If one of the calibration step is obtained from Data this means that we will have two sets of correction one for data and one for MC obtained from Data and MC respectively. This allows to fix the discrepancies we could observe. Hopefully as we gain experience and understand MC/data discrepancies most of the calibration will be obtained from MC and the residual differences between data and MC will estimate the systematic uncertainty.
One of the step that can only be obtained from data is the correction for pile-up. For the moment I am not addressing this point. TO BE DONE

OPEN POINT: the order of calibration is to be undersood. I think it is better to correct for non compensation and dead material losses, even if only on average, and than to apply the dijet balance.

Among the many possible calibration chains we propose to concentrate on the following ones:

1. **Calibrating from EM Scale:**

   EM + NI + Dijet BalanceData - Pavel done
   - **Comments**: this calibration requires the EM spectra to be well described by the MC and also it requires that at least in the central region the particle-jet scale is reached using NI. The eta uniformity is than reastored using dijet balance from data. The final scale is at particle level. Data and MC will have a different DijetBalance correction using data and mc respectively.
   - Plots to produce: see table at the end.

     Evaluation of the systematic error can be done looking at the difference between Data and MC for W->jj and gamma/jet and also moving the cuts used to obtain the dijet balance correction.

   EM + dijet-eta balance + gamma/jet balance - Georgios, Vincent&Michele

   - **Comments**: this calibration chain, where all the corrections are obtained for data, is considered as a back-up solution. In case with the NI step, even in the central

region, we do not manage to restore the particle-jet scale, we will use gamma/jet balance from data.
The statistic collectable for gamma/jet events in the region that has to be used to obtain the absolute calibration has to be understood as a function of the region dimension.
Plots to be produced see table at the end.

2. **We understand our EM scale:**

   H1/LC + dijet-eta balance + gamma/jet balance - implemented by ?
   H1/LC + NI + dijet-eta balance - Pavel Done ?
   H1/LC + NI - D.Lopez, Belen

   - **Comments:** If the EM scale and shower description is reproduced from the MC at the level of few percent one of the MC based calibration to correct for compensation and dead material can be used. This will allow to better exploit the calorimeter and to obtain better performances. Among the many possibilities (layer weighting, layer fraction, H1, LC) we will consider H1 and LC as examples. In order to have H1 correctly recovering the particle-jet scale we must also have a good description of the hadronic shower shapes and fragmentation. The lack of understanding of this can be corrected again using the next two steps based either on data or MC. The gamma/jet and dijet balance will give a much smaller correction with respect to the previous case. Again the final scale is at the particle-jet in the first scale and at parton level in the second one.
     For plots to be produced and for systematic evaluation same comments as above.

3. **Plots to be prepared**

		EM+NI + Dijet	**EM+Dijet +GammaJet**
QCD	Lin+Ris	Pavel	Pavel
	DijetBal vs pt in 4 eta regions	Pavel	-
	DijetBal vs eta in pt bin	Pavel	-
GammaJet	Lin+Ris	Vincent/Georgius	Vincent/Georgius
	gamma jet balance vs	Vincent/Georgius	-

	pt in 4 eta regions		
	GammajetBal vs eta in pt bin	Vincent/Georgius	-
tt	Light jet linearity and resolution	?	?
	W->jj	?	?
MinBias	Lin+Res pt>20Gev	?	?

		H1+NI	**H1+NI +DiJetBal**	**H1+Dijet+GammaJet**
QCD	Lin+Ris	Pavel	Pavel	Pavel
	DijetBal vs pt in 4 eta regions	Pavel	-	-
	DijetBal vs eta in pt bin	Pavel	-	-
GammaJet	Lin+Ris	Vincent/ Georgius	Vincent Georgius	Vincent Georgius
	gamma jet balance vs pt in 4 eta regions	Vincent Georgius	-	-
	GammajetBal vs eta in pt bin	Vincent/ Georgius	-	-
tt	Light jet linearity and resolution	Belen	?	?
	W->jj	Belen	?	?
MinBias	Lin+Res pt>20Gev	?	?	?

		LC+NI	**LC+NI +DiJetBal**	**LC+Dijet+GammaJet**
QCD	Lin+Ris	Pavel	Pavel	Pavel
	DijetBal vs pt in 4 eta regions	Pavel	-	-
	DijetBal vs eta in pt bin	Pavel	-	-

GammaJet	Lin+Ris	Vincent/ Georgius	Vincent Georgius	Vincent Georgius
	gamma jet balance vs pt in 4 eta regions	Vincent Georgius	-	-
	GammajetBal vs eta in pt bin	Vincent/ Georgius	-	-
tt	Light jet linearity and resolution	?	?	?
	W->jj	?	?	?
MinBias	Lin+Res pt>20Gev	?	?	?

Plots to be done in 4 Eta, and 4 pTtruth bins:

* pT bins:
  - 30-40 GeV
  - 60-70 GeV
  - 150-170 GeV
  - 300-320 GeV
* Eta bins:
  - 0<|Eta|<0.3 (jets fully contained in TileCal Barrel)
  - 0.3<|Eta|<0.8 (jets fully contained in Barrel)
  - 2.1<|Eta|<2.8 (jets fully contained in Endcap)
  - 3.6<|Eta|<4.5 (jets fully contained in Forward calorimeter)