Steps to Generate ADC Gain Coefficients using Cosmic:

First, open a terminal and login to any Hall A CH machine. Then navigate to: /adaqfs/home/a-onl/sbs/BBCal_replay

Step 1: Replay the cosmic run:

```
[a-onl@aonl2 BBCal_replay]$ source ./setup.sh
 setting DATA_DIR etc
[a-onl@aonl2 BBCal_replay]$ cd replay/
[a-onl@aonl2 replay]$ analyzer -l
analyzer [0] .x replay_BBCal.C+(<nrun>,<nevents>)
```

Step 2: Get Amplitude to Integral Ratio:

Again, start from /adaqfs/home/a-onl/sbs/BBCal_replay

For Shower:

```
[a-onl@aonl2 BBCal_replay]$ cd macros
[a-onl@aonl2 macros]$ root -l
root [0] .x Shower_macros/bbsh_ampToint.C
 Run number?
<nrun>
 No. of events replayed? [-1 => All]
<nevents>
```

For PreShower:

```
[a-onl@aonl2 BBCal_replay]$ cd macros
[a-onl@aonl2 macros]$ root -l
root [0] .x PreShower_macros/bbps_cos_cal.C
 Run number?
<nrun>
 No. of events replayed? [-1 => All]
<nevents>
```

Step 3: Generate ADC Gain Coefficients:

Once again, start from /adaqfs/home/a-onl/sbs/BBCal_replay

```
[a-onl@aonl2 BBCal_replay]$ cd macros/
[a-onl@aonl2 macros]$ root -l
root [0] .x Combined_macros/calculate_adcGain_cos.C
 Run number?
<nrun>
 Shower(SH) or PreShower(PS)? [SH=1, PS=0]
```

```
1 [or 0]
 Trigger amplitude? (mV) [Default: 25mV]
<trigAmp>
 Correction factor for gain calibration? [Default: 1.21]
<cF>
```

The entries with **red bold** font indicate user input. Here are what they represent:

<nrun> : The run number of the cosmic run one wants to look at.
<nevents> : The number of events to be (or has been) replayed.
<trigAmp> : The amplitude of the signals (gain matched) at trigger.
<cF> : Correction factor for the cosmic energy deposition estimate in a single module.

Additional Useful Information:

- **Dependencies:**
  - These macros read from replayed root files. There is no other dependency.

- **Outputs:**
  - `Output/fit_results/run_<nrun>_sh(ps)_ampToint.txt:` Contains signal amplitude to integral ratios produced by the bbsh(ps)_ampToint.C scripts. We need these ratios for Step 3.

  - `plots/SH_ampToint_<nrun>.pdf:` All the fitted signal amplitude to integral ratio distributions gets saved here.

  - `Output/adcGain_<nrun>_SH(PS)_<trigAmp>mV_cF<cF>.txt:` Contains generated ADC gain coefficients (GeV/pC).

  - `plots/adcGain_<nrun>_SH(PS)_<trigAmp>mV_cF<cF>.pdf:` Saves the 2D histogram that shows ADC gain coefficients in detector view.