```
In [49]: %matplotlib inline
```

```
In [41]: import timing.tune_dll_trim as tuneTrim
         import surf
         dev=surf.Surf()
```

```
In [42]: #Tune the DLL feed back trim on channels 1, and 2 (signal plugged into lower SYNC input)
         channels=[1,2]
         #using 235 MHz sine wave
         freq=235.e6
         #sine wave amplitude is 300 ADC counts
         amp=300
         #run the scans:
         scan_dict = tuneTrim.do(channels, freq, amp)
```

```
--------------
tuning LAB 1
--------------
difference: input freq - fitted freq = (kHz) 3574.50560894 trim 1160
difference: input freq - fitted freq = (kHz) 3270.63440554 trim 1170
difference: input freq - fitted freq = (kHz) 2934.17415815 trim 1180
difference: input freq - fitted freq = (kHz) 2624.66449163 trim 1190
difference: input freq - fitted freq = (kHz) 2353.97052626 trim 1200
difference: input freq - fitted freq = (kHz) 2060.55531639 trim 1210
difference: input freq - fitted freq = (kHz) 1826.74284741 trim 1220
difference: input freq - fitted freq = (kHz) 1574.80306888 trim 1230
difference: input freq - fitted freq = (kHz) 1316.71343222 trim 1240
difference: input freq - fitted freq = (kHz) 1099.39301319 trim 1250
difference: input freq - fitted freq = (kHz) 879.81695646 trim 1260
difference: input freq - fitted freq = (kHz) 669.871229278 trim 1270
difference: input freq - fitted freq = (kHz) 404.662354176 trim 1280
difference: input freq - fitted freq = (kHz) 232.963115856 trim 1290
difference: input freq - fitted freq = (kHz) 1.12193670201 trim 1300
difference: input freq - fitted freq = (kHz) -162.570496907 trim 1310
difference: input freq - fitted freq = (kHz) -323.182074147 trim 1320
difference: input freq - fitted freq = (kHz) -498.608411765 trim 1330
difference: input freq - fitted freq = (kHz) -654.690190063 trim 1340
difference: input freq - fitted freq = (kHz) -777.773189665 trim 1350
difference: input freq - fitted freq = (kHz) -954.694544789 trim 1360
difference: input freq - fitted freq = (kHz) -1118.59966445 trim 1370
difference: input freq - fitted freq = (kHz) -1235.22552152 trim 1380
difference: input freq - fitted freq = (kHz) -1343.4466097 trim 1390
difference: input freq - fitted freq = (kHz) -1455.68463342 trim 1400
difference: input freq - fitted freq = (kHz) -1559.15622442 trim 1410
lab: 1 , VtrimFB dac for 3.2 GSPS from fit: 1301.51593077  derivative, counts/kHz 0.0528342822115
setting VtrimFB to.. 1301
--------------
tuning LAB 2
--------------
difference: input freq - fitted freq = (kHz) 2873.75695344 trim 1160
difference: input freq - fitted freq = (kHz) 2514.17619835 trim 1170
difference: input freq - fitted freq = (kHz) 2181.84865133 trim 1180
difference: input freq - fitted freq = (kHz) 1824.30866525 trim 1190
difference: input freq - fitted freq = (kHz) 1537.98147527 trim 1200
difference: input freq - fitted freq = (kHz) 1252.32457857 trim 1210
difference: input freq - fitted freq = (kHz) 970.634682401 trim 1220
difference: input freq - fitted freq = (kHz) 673.859552052 trim 1230
difference: input freq - fitted freq = (kHz) 444.124474736 trim 1240
difference: input freq - fitted freq = (kHz) 186.596880604 trim 1250
difference: input freq - fitted freq = (kHz) -61.4818576448 trim 1260
difference: input freq - fitted freq = (kHz) -281.663108929 trim 1270
difference: input freq - fitted freq = (kHz) -444.039411026 trim 1280
difference: input freq - fitted freq = (kHz) -605.958254856 trim 1290
difference: input freq - fitted freq = (kHz) -789.066577433 trim 1300
difference: input freq - fitted freq = (kHz) -959.104970967 trim 1310
difference: input freq - fitted freq = (kHz) -1130.3092458 trim 1320
difference: input freq - fitted freq = (kHz) -1298.97390495 trim 1330
difference: input freq - fitted freq = (kHz) -1437.86201966 trim 1340
difference: input freq - fitted freq = (kHz) -1576.86205504 trim 1350
difference: input freq - fitted freq = (kHz) -1706.17000518 trim 1360
difference: input freq - fitted freq = (kHz) -1804.15107841 trim 1370
difference: input freq - fitted freq = (kHz) -1956.32480676 trim 1380
difference: input freq - fitted freq = (kHz) -2091.14232609 trim 1390
difference: input freq - fitted freq = (kHz) -2194.0652695 trim 1400
difference: input freq - fitted freq = (kHz) -2316.76948501 trim 1410
lab: 2 , VtrimFB dac for 3.2 GSPS from fit: 1258.37333123  derivative, counts/kHz 0.0460514695459
setting VtrimFB to.. 1258
```

```
In [43]:  #show the fitted register values
          scan_dict

Out[43]:  {'1': 1301, '2': 1258}
```

```
In [44]:  #save to cal file
          tuneTrim.save(scan_dict, dev.dna())

          1 1301
          1
          2 1258
          2
          reading back cal file:
          vtrimfb {u'1': 1301, u'0': 1325, u'3': 1268, u'2': 1258, u'5': 1391, u'4': 1236}
```
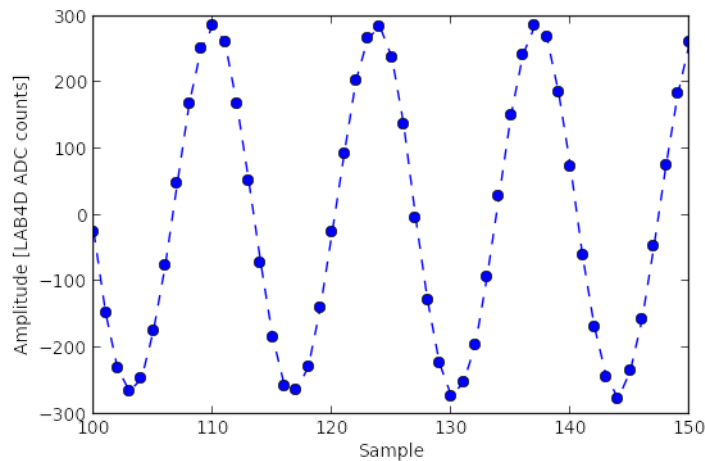
```
In [45]:  #to load the feedback trim values for the board use this function:
          #it assigns the default value defined in utils/surf_constants.py if not defined in the cal file
          tuneTrim.load(dev.dna())

Out[45]:  [1325, 1301, 1258, 1268, 1236, 1391, 1350, 1350, 1350, 1350, 1350, 1350]
```

```
In [58]:  #examine at the DLL wraparound seam sample 127->128
          import surf_data
          import matplotlib
          import matplotlib.pyplot as plt
          devData=surf_data.SurfData()
          plt.plot(devData.log(1, save=False)[0][0], 'o--')
          plt.xlim([100,150])
          plt.xlabel('Sample')
          plt.ylabel('Amplitude [LAB4D ADC counts]')

Out[58]:  <matplotlib.text.Text at 0xab6574c>
```



```
In [ ]:
```