From : Olympus

Engineer: Tom Truong

Objective: Reporting on AM-PM effect at the output of the ADC3444 EVM module

Date: 4/13/2018

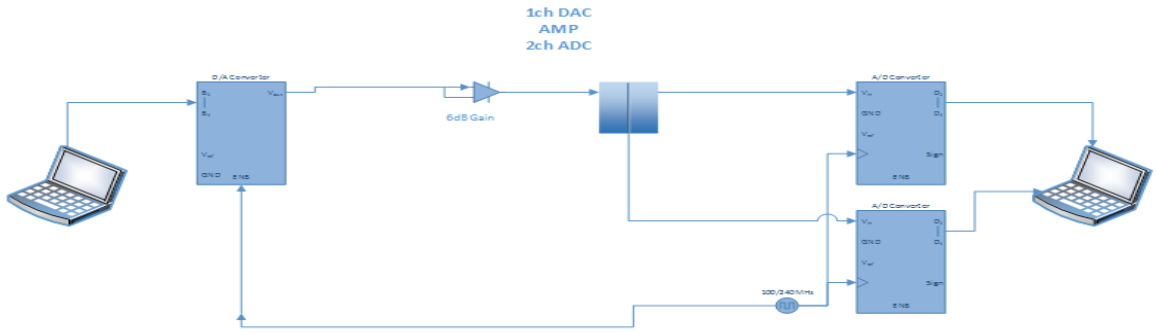

Figure 6 *single input – dual output test*

Test setup:

TX: DAC3162EVM, Sampling Rate = 100MHz

RX: ADC3444EVM, Sampling Rate = 100MHz

SMA splitter

Single channel op-amp 6dB gain amplifier

Connecting the output of the TX DAC directly to RX ADC, without any analog filter, and using a single input-output amplifier and a splitter to derive a two separated receiving paths (figure 6). The theoretical result of the different of output assumed to be zero in phase, based on a two well-match PCB trace of the ADC Evaluation Module (EVM).

For DAC synthesis sinusoidal input with Matlab (figure 7)

*S_ref = tx_power*sin((2*pi*frequency*(1:tx_sampling_rate*sim_time)/tx_sampling_rate));*
(%frequency = 10MHz)

Figure 7 Measured DAC output using high sampling signal analyzer

For ADC output capture (figure 8)

xbaseband_pd(1,:) = data(1,:).*exp(-1j*2*pi*frequency*(1:length(data(1,:)))/rx_sampling_rate);
xbaseband_pd(2,:) = data(4,:).*exp(-1j*2*pi*frequency*(1:length(data(4,:)))/rx_sampling_rate);

phase_diff = angle(mean(xbaseband_pd(2,:)))-angle(mean(xbaseband_pd(1,:)));

where data(n,:) are captured output from ADC channel 1 and 4 (n=1, 2), respectively.

Calculated Phase_diff		tx_power in % fullscale (500mv to 1Vp-p)										
degree	radians	p10	p20	p30	p40	p50	p60	p70	p80	p90	FS	Delta
0.6	0.0500	0.0038	0.0037	0.0043	0.0044	0.0061	0.0064	0.0075	0.0083	0.0092	0.0102	0.0064
1.2	0.1000	0.0130	0.0137	0.0137	0.0144	0.0153	0.0163	0.0174	0.0180	0.0193	0.0200	0.0070

Table 1 Captured ADC output of the phase difference

The differential phase value of 0.6 and 1.2 degree (0.05 and 0.10 radians) is hardcoded in the DAC pattern and each one is loaded onto the DAC via TSW1400, during each test case. The capture values (table 1) are then compared with the captured output at each input power level. The closest achievable measurement is shown in between p40 and p50. These measured value varies within a range of 0.0064 for 0.6 deg. case, and 0.0070 for 1.2 deg. case.

Issue:

Phase is computed independently of the input amplitude. This single-source input is fed onto both ch1 and ch4, the captured digitized sine waves at the output of the ADC contains an AM-PM effect which cannot be explained.

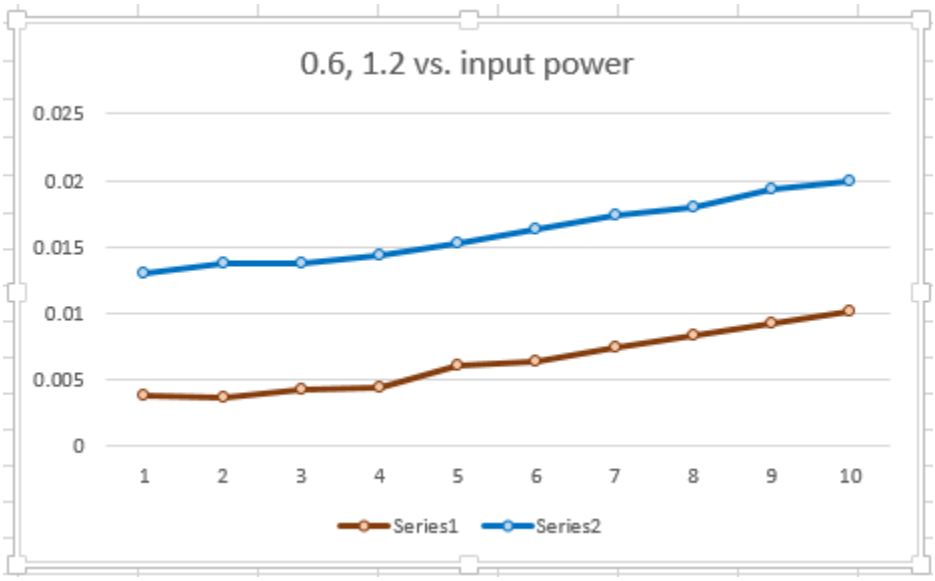

Figure 8 phase increases as input power incremented by 10%