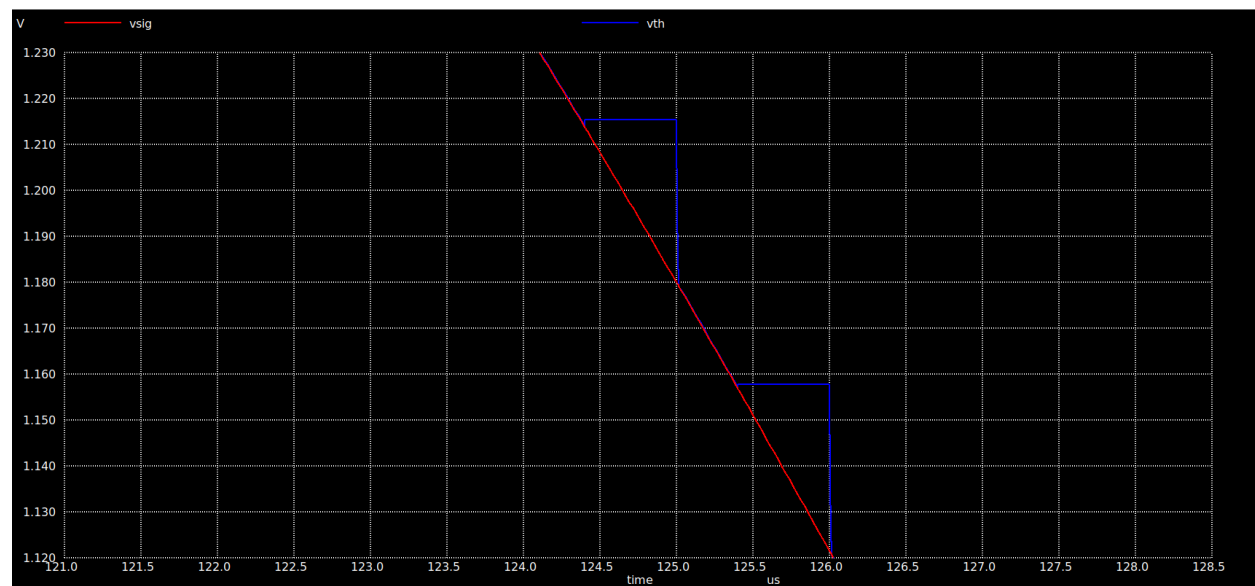
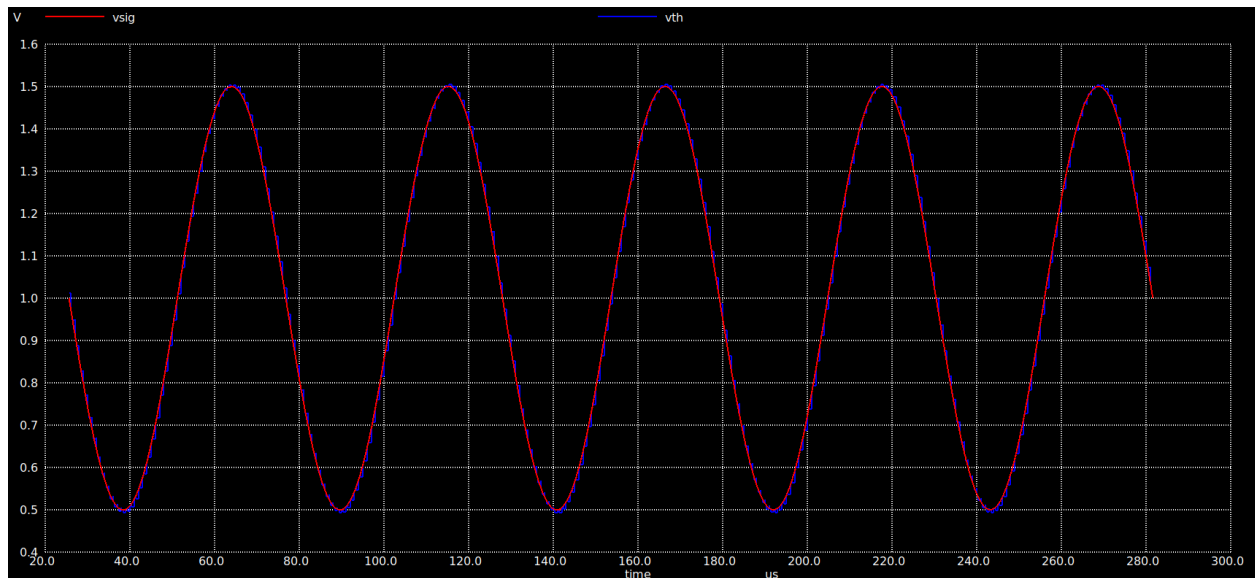


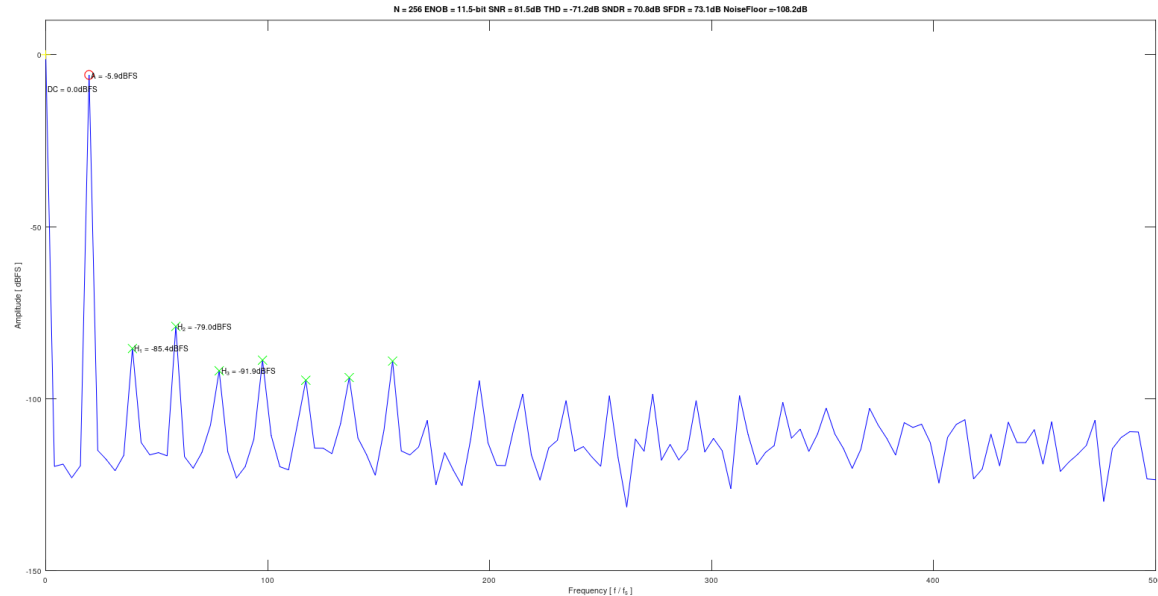
Lab 03

PART 1: S&H Artifacts

- 1 RUN TRANSIENT ANALYSIS. PLOT VSIG AND VTH OVERLAID. ZOOM INTO OBSERVE THE S&H ARTIFACTS.



2 USE THE SAME PROCEDURE AND THE CODE IN LAB02 TO PLOT THE SPECTRUM OF VSH, COMPARE THE RESULTS

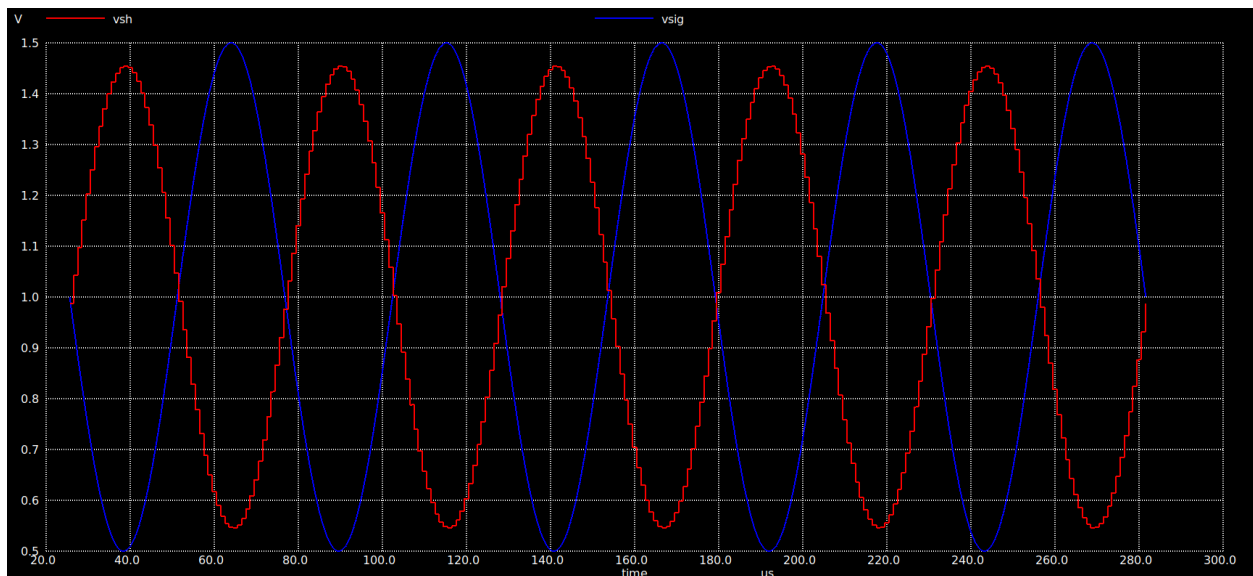
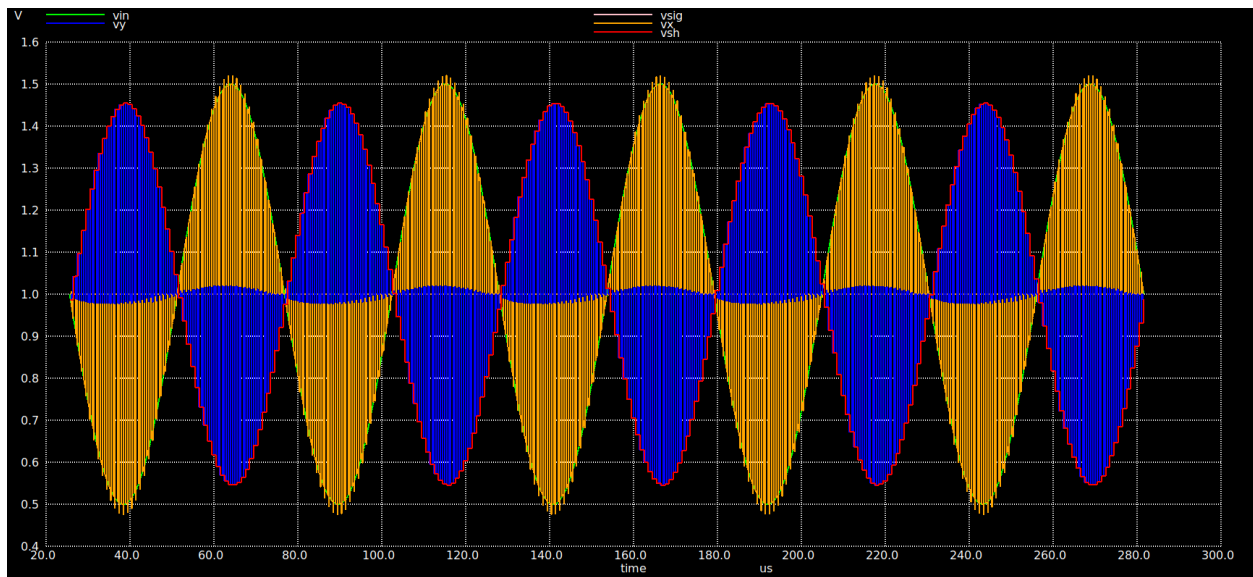


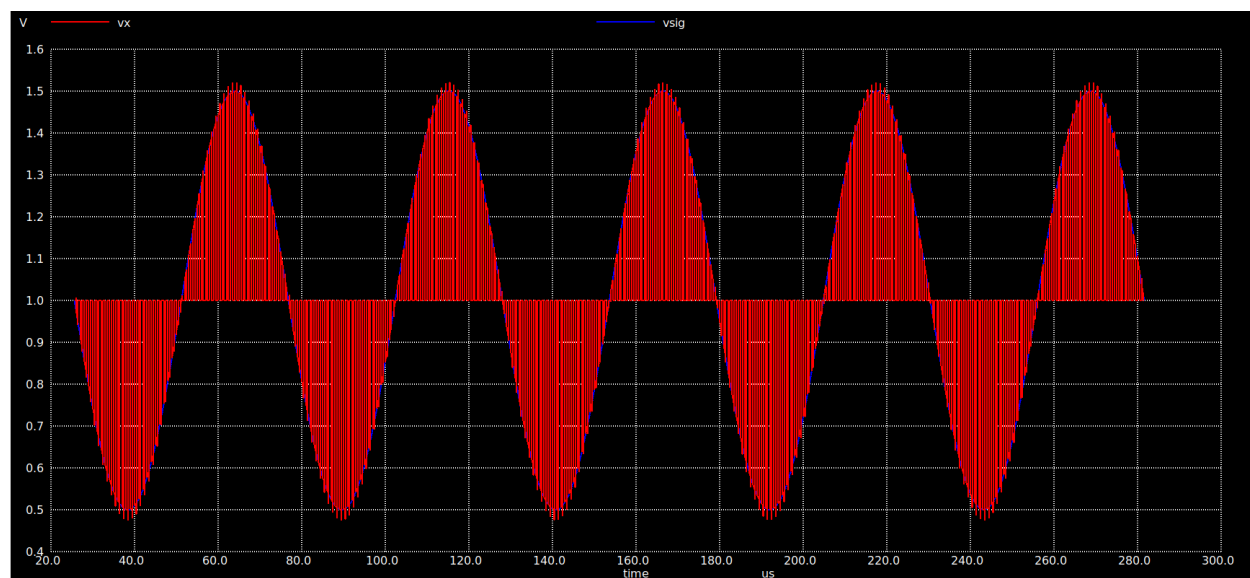
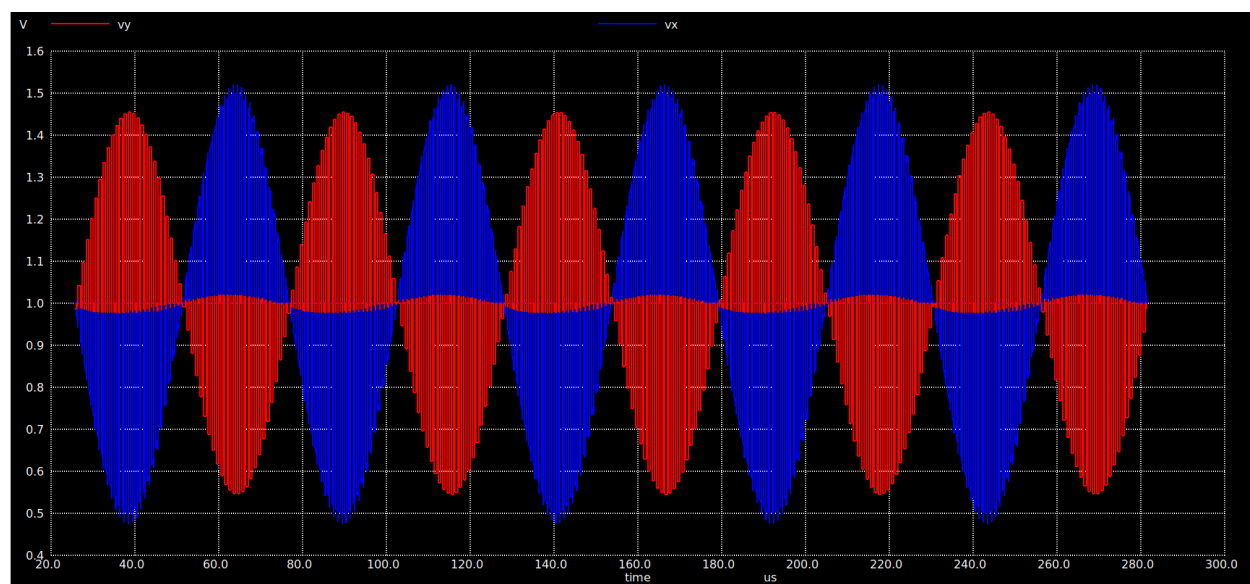
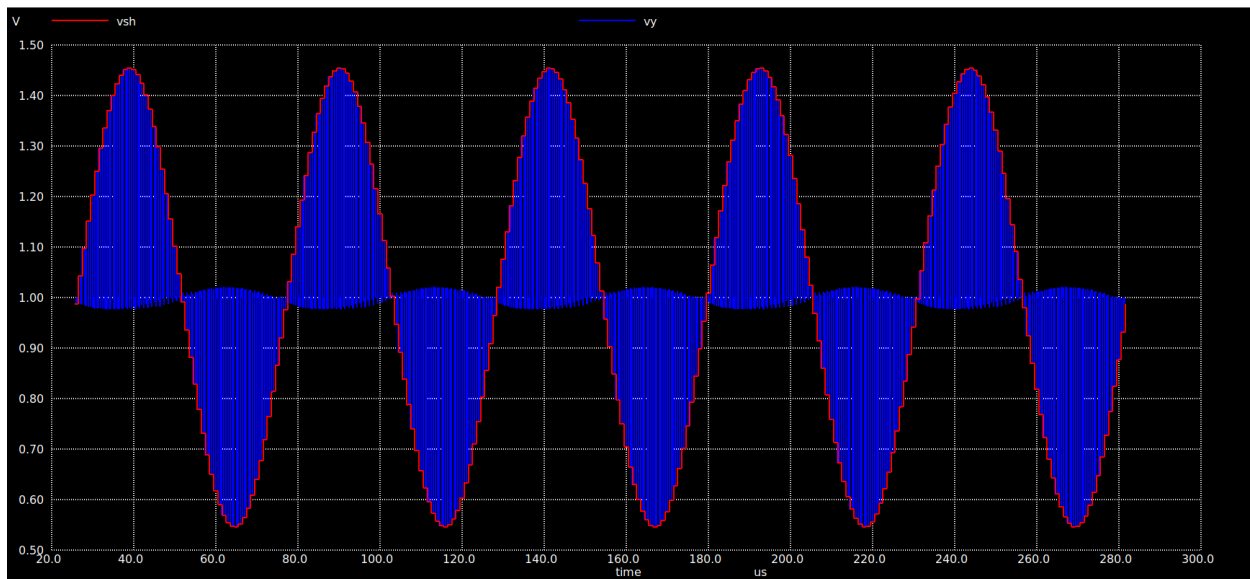
	Lab02	Lab03
ENOB	22.3-bits	11.5-bits
SINAD	136.1db	70.8db
SNR	136.1db	81.5db
SFDR	151.1db	73.1db
THD (indB)	-171.6db	-71.2db
Signal power	-9dbfs=0.1258	-8.9dbfs=0.128
DC power	0dbfs=1	0dbfs=1

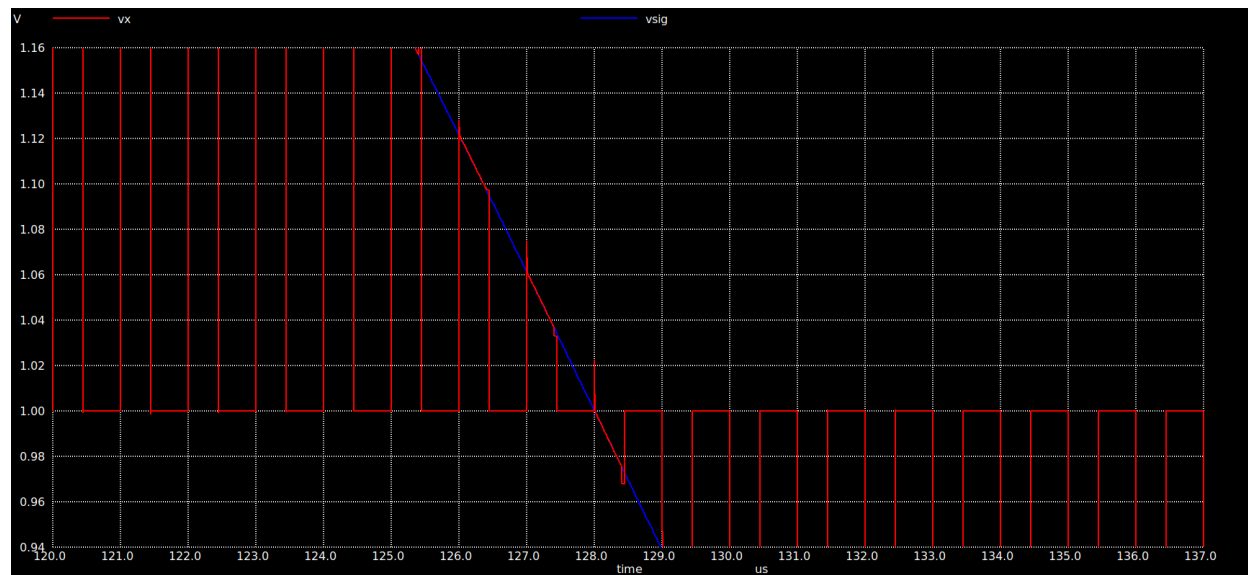
As expected, in ideal case (lab2) the snr and Enob are much higher than using Tg and real components (lab3).

PART 2: Bottom Plate Sampling

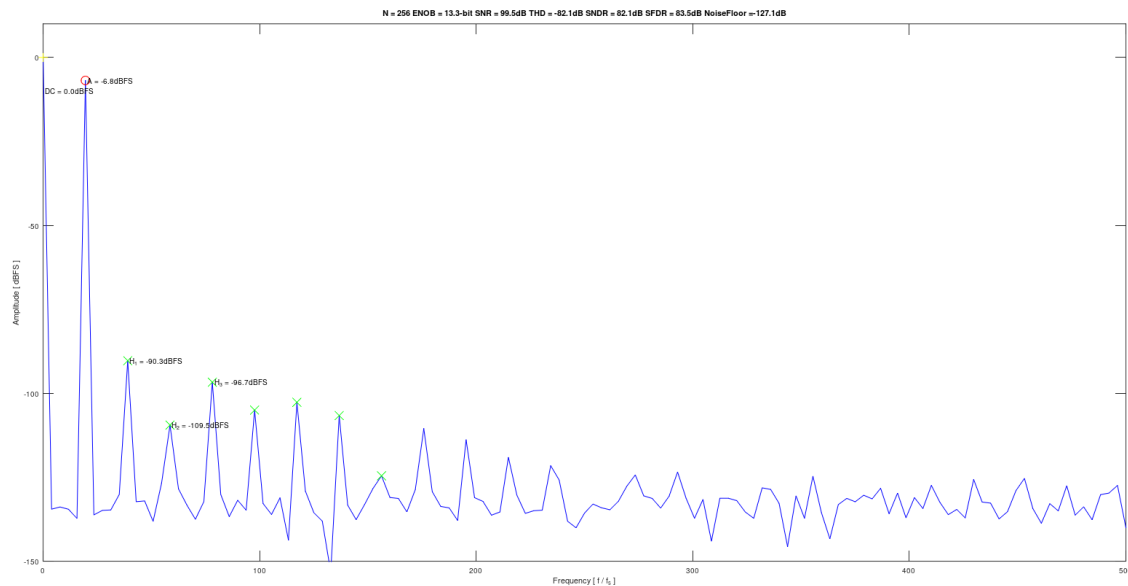
- 1 RUN TRANSIENT ANALYSIS. OBSERVE THE TIMING RELATIONS BETWEEN DIFFERENT SIGNALS. NOTE THAT CHARGE INJECTION STILL EXISTS, BUT IT SHOULD BE LESS INDEPENDENT ON INPUT SIGNAL (I.E., LESS NON-LINEAR) DUE TO BOTTOM-PLATE SAMPLING.







2 PLOT FFT. COMPARE THE RESULTS BELOW WITH PART 1 RESULTS IN A TABLE. COMMENT ON THE DIFFERENCES.

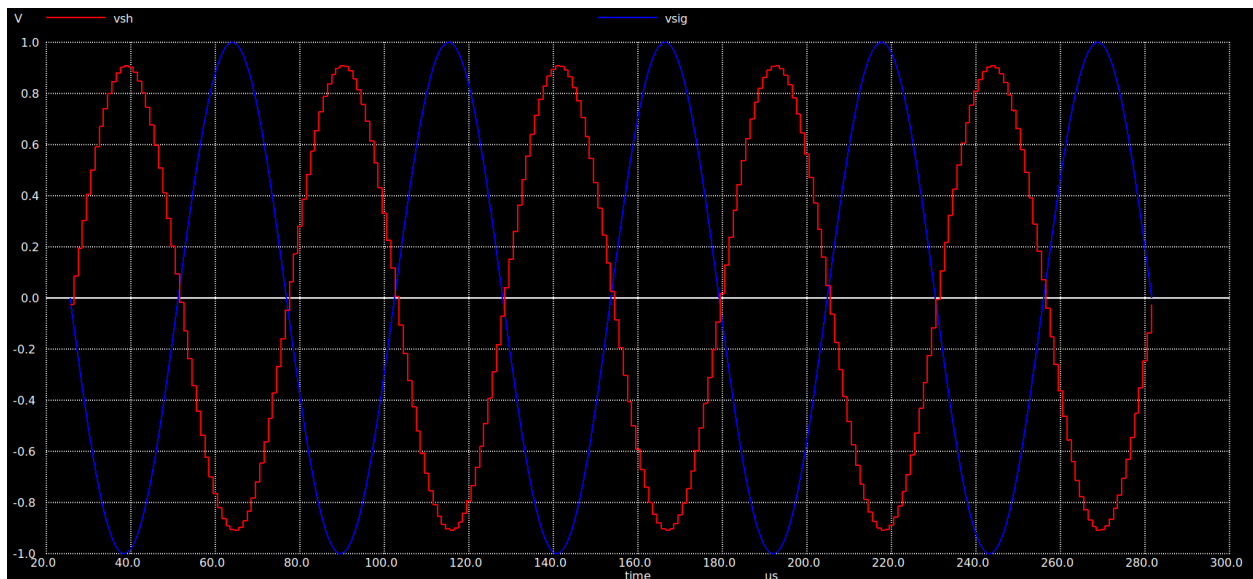
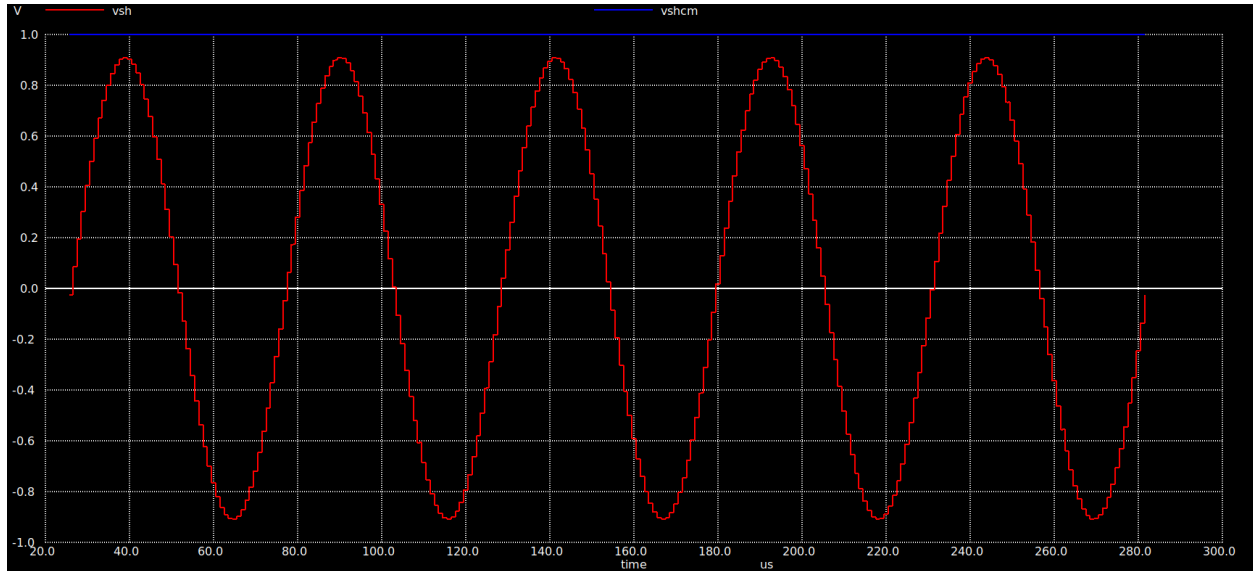


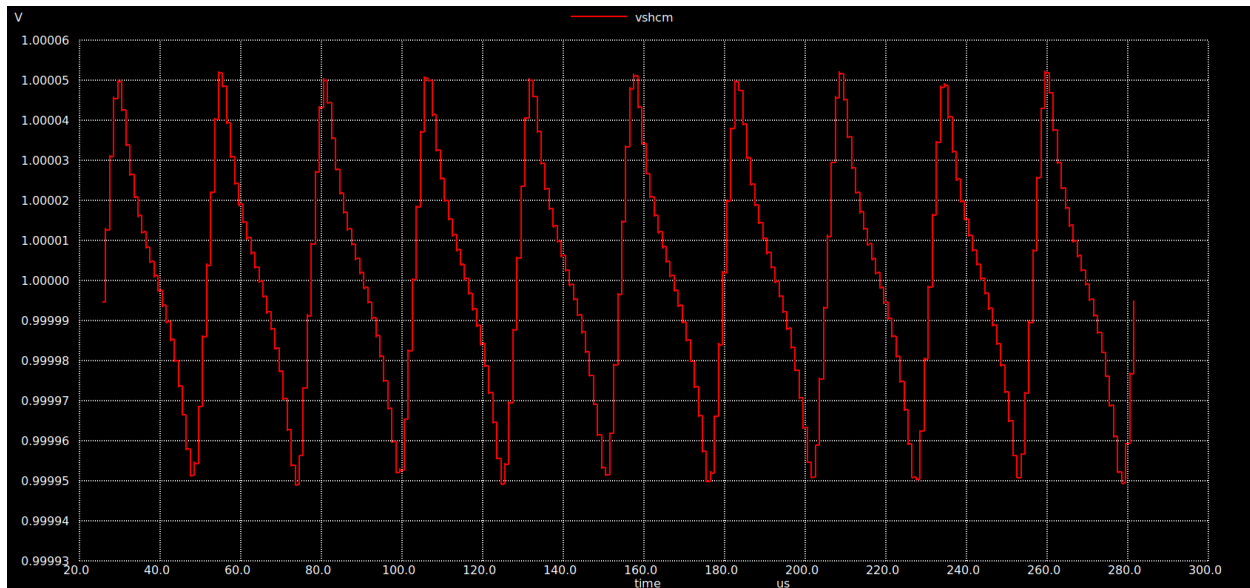
	Part2	Part1
ENOB	13.3-bits	11.5-bits
SINAD	82.1db	70.8db
SNR	99.5db	81.5db
SFDR	83.5db	73.1db
THD (indB)	-82.1db	-71.2db
Signal power	-9.8dbfs=0.104	-8.9dbfs=0.128
DC power	0dbfs=1	0dbfs=1

As we used Bottom-Plate Sampling, there is no non-linear error so there is no distortion so sfdr increased so enob increased.

PART 3: Fully Differential Operation

- 1 PLOT THE DIFFERENTIAL OUTPUT AND THE COMMON MODE OUTPUT VS TIME. COMMENT ON THE PEAK-TO-PEAK DIFFERENTIAL OUTPUT. COMMENT ON THE COMMON OUTPUT WAVEFORM.

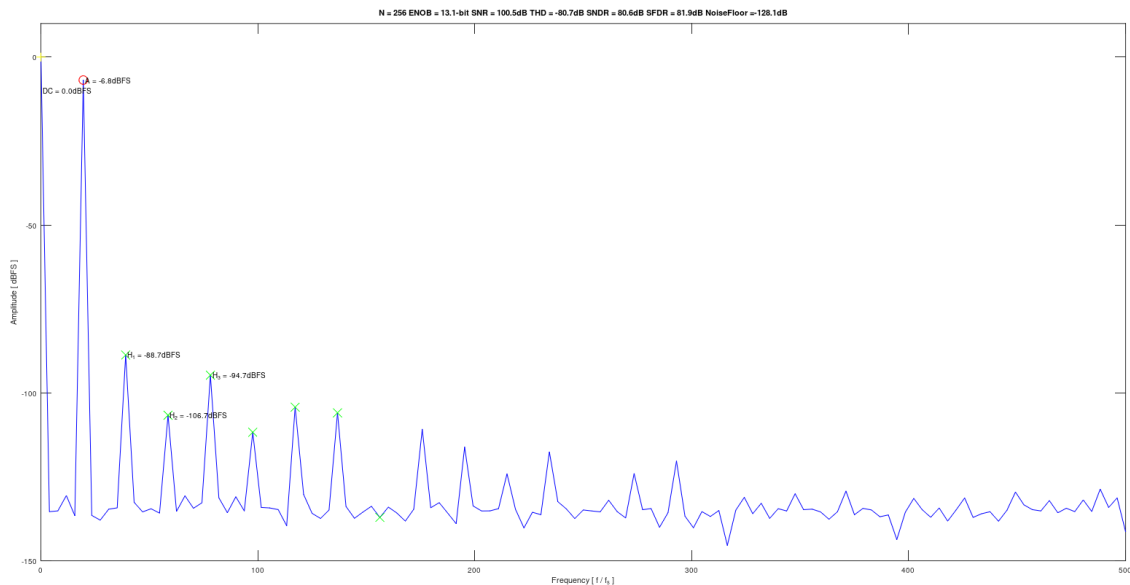




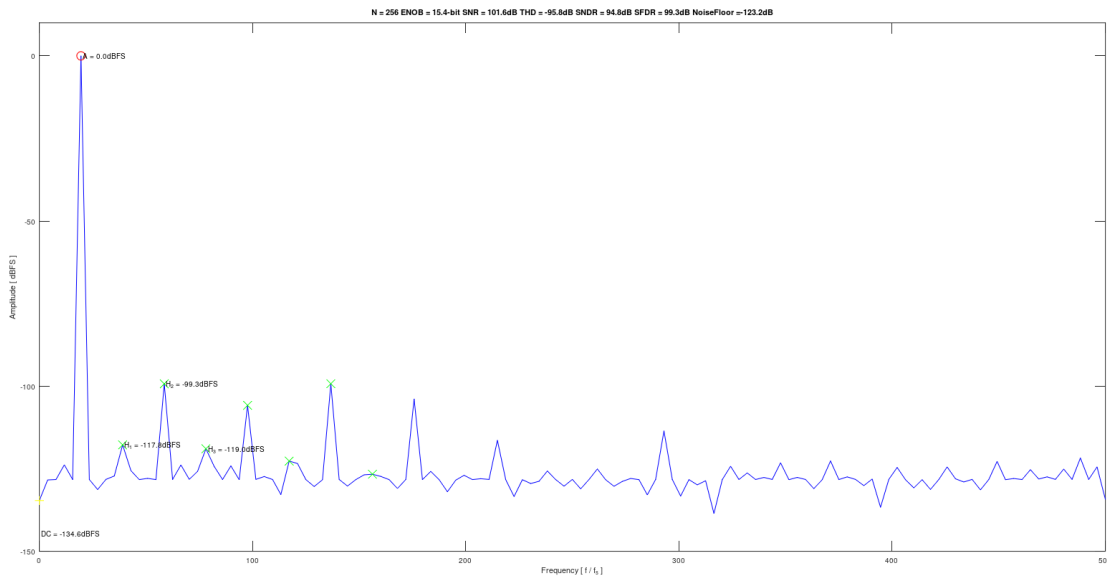
the peak-to-peak differential output is less than the input signal due to parasitic capacitances, the common output waveform is almost constant but slightly changes with the input signal due to non linearities.

2 PLOT FFT OF THE POSITIVE HALF OUTPUT VSHP AND THE DIFFERENTIAL OUTPUT VSH.

2.1 VSHP



2.2 VSH



2.3 COMPARE THE 2ND HARMONIC POWER IN VSHP AND VSH SPECTRUM

vshp	vsh
-88.7dbfs	-117.8dbfs

In differential there is significantly less distortion in 2nd harmonic compared to the Single sided output in vshp because of the even-order distortion rejection in differential.

2.4 COMPARE THE RESULTS BELOW FOR VSHP AND VSH IN A TABLE,
COMMENT ON THE DIFFERENCES.

	VSHP	VSH
ENOB	13.1bit	15.4bit
SINAD	80.6db	94.8db
SNR	100.5db	101.6db
SFDR	81.9db	99.3db
THD (indB)	-80.7db	-95.8db
Signal power	-9.8 dbfs =0.104w	-3 dbfs =0.4545w
DC power	0 dbfs	-137.6dbfs

In vsh there is significantly less distortion, and cm errors and dc rejection.