A Review of Total Harmonic Distortion in an Oscillator and Modulating Waveforms from Digitally Controlled CCCII+ Oscillator

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Abstract- *This paper presents the Comparison of Total harmonic distortion in an oscillator and other modulating generated waveforms [10]*

Keywords- Total Harmonic Distortion, Amplitude Shift Keying, Frequency Shift Keying, Biasing current [10]

I. INTRODUCTION

II generation CC is a versatile building block which can realize a variety of current mode circuits. A compression of voltage signal swing and a reduction of supply voltage are possible using CCCII+ which is CMOS based, as it provides minimum voltage and low power consumption.

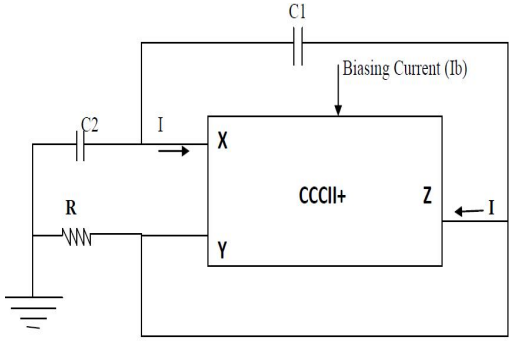

Fig 1: Block diagram of clocked CCCII+ Oscillator[10]

The oscillators assume a vital part in simple circuit plan, since they are generally utilized as a part of correspondence, sign preparing and control frameworks. The negative impedance change properties of current transports make them a characteristic possibility for oscillator circuits. The main transport oscillator was proposed by in 1975 and was adequately restricted to the sound recurrence range, show connected maintainability in the two transport structure furthermore requiring broad segment coordinating in the single transport version. The fig 1, shows the CCCII based oscillator with C1=C2=10pf, R=5kΩ. The biasing current Ib=17uA, for which the frequency of oscillation is given as

$$\omega = \frac{1}{\sqrt{C1C2RxR4}} \quad (1)$$

Where: $R4 = \frac{(C1+C2)RX}{C2}$

According to the analysis, firstly biasing current is applied (un-clocked CCCII+) to get the desired oscillations, fig 2

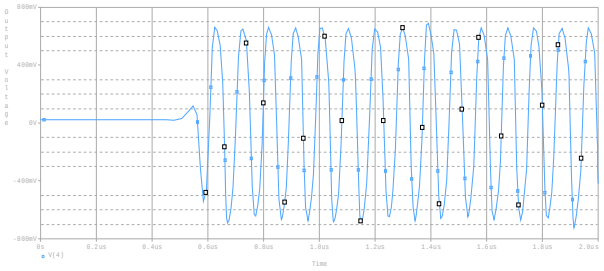

Fig.2: Simple Oscillations (un-clocked CCCII)

The above waveform is set aside as for time for motions up-to 2u seconds. The recurrence is observed to be 11MHZ. It is clear that the most extreme abundancy for above motions is 0.64V which is not exactly the supply voltage i.e ±1.5V, likewise the aggregate consonant contortion (THD) =28%. After generating the oscillations, a clocked biasing current is applied with a time period of 2us and the transitions occur up-to 4u seconds, fig 3

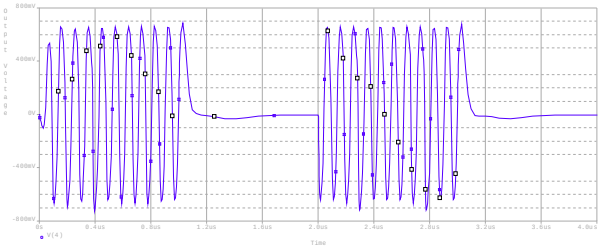

Fig 3: Clocked Oscillations [10]

From the above motions it is anticipated that the greatest yield voltage is observed to be same as when the oscillator was un-timed i.e 0.64V. In this way in the wake of applying a clock biasing current the motions are likewise happening as per the clock with a biasing current of 17uA however now the aggregate symphonious contortion (THD) expanded 73%.

ASK waveforms

ASK is a form of amplitude modulation that represents digital data as variations in the sufficiency of a transporter wave. Any advanced tweak plan utilizes a limited number of particular signs to speak to computerized information. It utilizes a limited number of amplitudes, which are doled out a special example of twofold digits. Presently as per the yield of oscillator ASK sign is created with a move of clock structure 0uA to 17uA, as in fig 3, there was a change of stage when second clock heartbeat was happening. So in order to keep constant phase ASK signal is produced, fig 4

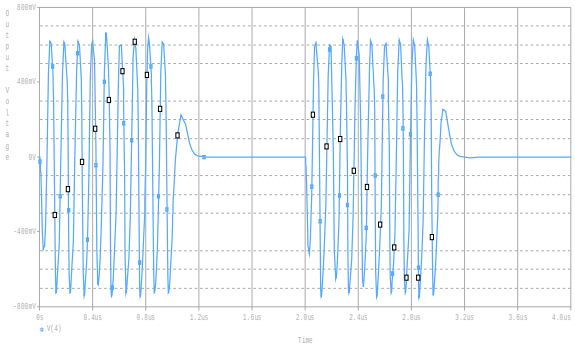

Fig 4: ASK Signal

Again for the above figure the amplitude remains constant i.e. 0.64V with an increased frequency of 20.78MHz which is much more than the un-clocked oscillations. THD=78 [10]

FSK waveform

FSK is a frequency modulation scheme in which digital information is transmitted through discrete frequency changes of a carrier wave. From fig 3-4, it can be said, for generating FSK signal the transition if a clock pulse is taken from 20uA to 60uA

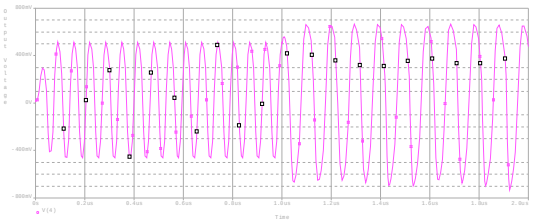

Fig 5: FSK Signal [10]

From fig 5, there are two frequencies for each transition but still the amplitude is not fixed for the two transitions of clock pulses. So in order to keep the amplitude constant, biasing transistors length is varied to 0.7µm, fig 6. For the first clock the frequency is calculated to be 15MHz and for next clock pulse that is after 1µs the frequency is calculated to be 9.74MHz. THD=34%

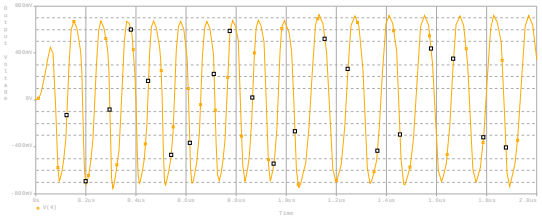

Fig 6: FSK with two different frequencies [10]

II. CONCLUSION

This paper shows the comparison of clocked CCCII oscillations and the waveforms of ASK and FSK. With a biasing current of 17µA, the THD of clocked oscillations is 73%. For ASK the THD is increased to 78% but with a high frequency of 20.4MHz with a biasing current ranging from 20µA-60µA. So, in order to reduced the THD FSK technique is used due to which THD is reduced to 43% as the length of the biasing transistor is increased to 0.7µm..

Table 1: Conclusion [10]

Oscillations	Biasing current	THD(Total Harmonic Distortion)
Clocked Oscillations	0-17µA	73%
ASK	17µA	78%
FSK	20µA-60µA	34%

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