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FSK GFSK signal generation with I&Q engine on VSG6G1





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The concept of FSK and GFSK generation 1

MSK and GMSK is special type of FSK and GFSK, when modulation index $m=0.5$, $FSK=MSK$ and $GFSK=GMSK$.

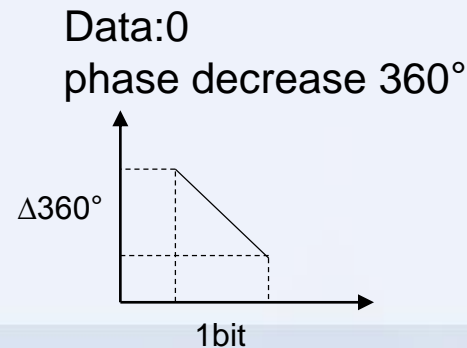
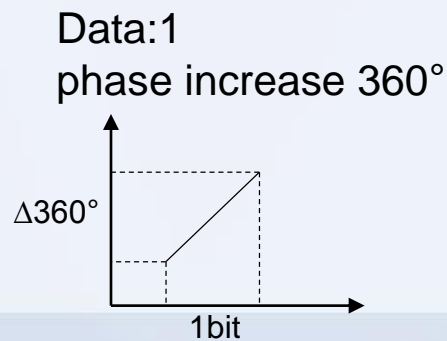
If modulation index m will be increased by 1, 1.5, 2, ...

It means one bit carrier phase will be changed by $180^\circ, 270^\circ, 360^\circ, \dots$

MSK and GMSK will be FSK and GFSK.

For example, $m=2$, the phase will be changed 360° .

If data rate is 2.4Kb, frequency deviation will be $\pm 2.4\text{KHz}$. (total 4.8KHz)





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The concept of FSK and GFSK generation 2

How to increase the modulation index m ?

The simple way is replaced 1 by 1111 and 0 by 0000 in the MSK or GMSK,

The m will be increase 4 times, it will be $0.5 \times 4 = 2$. So that FSK and GFSK can be generated by repeat data several times to change modulation index.

FSK and GFSK $m=1$, repeat data of MSK and GMSK 2 times

FSK and GFSK $m=1.5$, repeat data of MSK and GMSK 3 times

FSK and GFSK $m=2$, repeat data of MSK and GMSK 4 times

FSK and GFSK $m=2.5$, repeat data of MSK and GMSK 5 times

FSK and GFSK $m=3$, repeat data of MSK and GMSK 6 times

FSK and GFSK $m=3.5$, repeat data of MSK and GMSK 7 times

FSK and GFSK $m=4$, repeat data of MSK and GMSK 8 times



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I&Q engine Data stream file 1

I&Q engine Data stream file have 4 section:

1. Binary Data input with FSK mode
2. S/P mode setting
3. Code converter setting
4. I&Q pattern data

For MSK and GMSK setting, FSK mode must be 1, then input any data stream. It limit by 4K/pattern length.

For FSK and GFSK, FSK mode will be from 2~8,

Modulation index $m=0.5 \times \text{FSK mode value}$

If FSK mode value=4, $m=2$

Item 2~4 must be setup to MSK or GMSK mode.



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I&Q engine Data stream file 2

Following is example of I&Q data stream file for GFSK $m=1.5$

Binary_IN,3,0001101111010100111111110000000010100101000101011101010

S/P_mode,4,5

Code_converter,3

PatternI_00000,683,838,977,1088,1159

PatternQ_00000,1183,1158,1087,977,837

PatternI_00001,183,208,279,390,529

PatternQ_00001,684,838,977,1088,1159

PatternI_00010,682,527,388,278,207

PatternQ_00010,183,208,279,390,529

PatternI_00011,1183,1158,1087,976,836

PatternQ_00011,681,527,388,278,207

PatternI_00100,683,830,951,1036,1096

PatternQ_00100,1183,1161,1105,1037,964

PatternI_00101,183,205,260,328,401

.....

PatternI_11111,183,208,279,390,529

PatternQ_11111,681,527,388,278,207



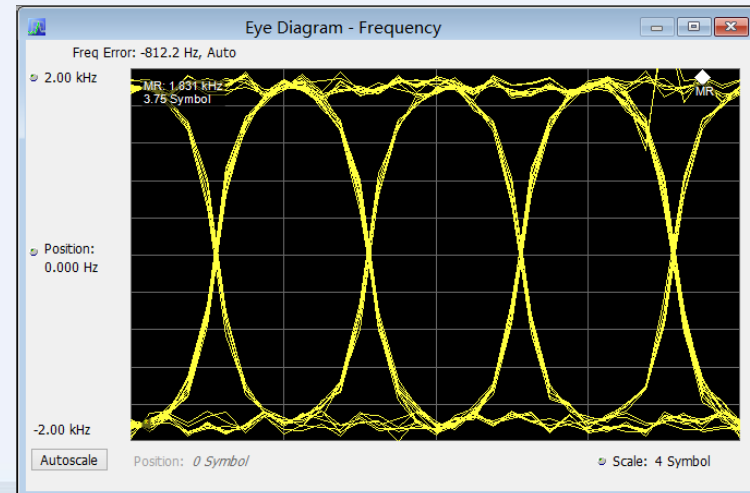
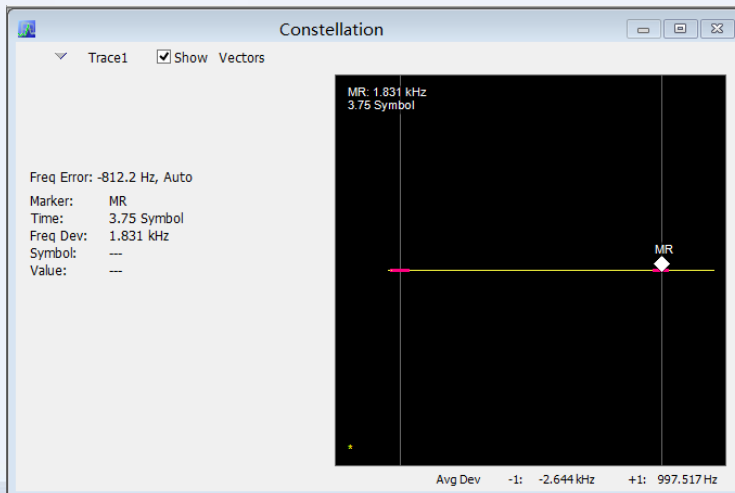
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GFSK testing example

Load GFSK-10S-m1.5.txt file at Digital Mod function, setup I&Q step count to 2000, GFSK data rate will be 2.4Kb, and deviation will be +/-1.8KHz.

Start Freq	1GHz	Stop Freq	1GHz	Step Freq	-
Amplitude	0dBm	Repeat Time	10ms	Duration Time	-
Mode	Single Freq w/o Pulse Mod			Symbol Rate	2.40KHz





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GFSK setting on the VSG6G1

The FSK and GFSK modulation must select FSK mode value large than 1

Select FSK mode value to decide with modulation index value.

$m=0.5*\text{FSK mode value.}$

FSK setup will based on MSK setting, only changing FSK mode value.

GFSK setup will based on GMSK setting, only changing FSK mode value.

Another important parameter is data rate, you can change I&Q step count value to choice right data rate.

If you want to get 2.4Kb data rate, I&Q step count will be 2000, and assume I&Q pattern length is 10