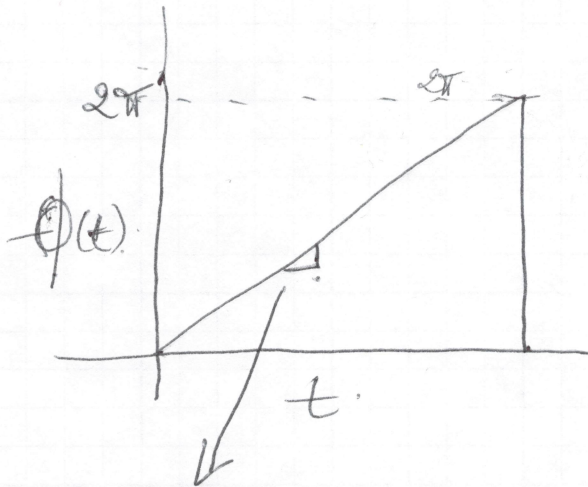


$$f_{out} = \sin(2\pi f_s t + \phi \cdot t)$$

$$= \sin[2\pi (f_s + f_d) t] \quad f_{PS} = f_s = 312.5 \text{ MHz} = 312.5 \times 10^6$$



$$f_{VCO} = 1.2 \text{ GHz} = 1.2 \times 10^9$$

$$\Delta t_{\text{update-MAX}} = 13 \times \left[\frac{1}{f_s} \right]$$

$$\Delta t_{\text{MAX}} = \frac{13}{f_s} = \frac{13}{312.5 \times 10^6}$$

$$\frac{\Delta \phi}{\Delta t_{\text{MAX}}} = \frac{\frac{1}{(56 \times 1.2 \times 10^9)}}{13}$$

$$\Delta \phi = \frac{1}{56} \left[\frac{1}{f_{VCO}} \right] = \frac{1}{56 \times 1.2 \times 10^9}$$

$$= \frac{f_{PS}}{13 \times 56 \times f_{VCO}} \rightarrow \text{constant for MMCM}$$

↓
constant

$$= \frac{312.5 \times 10^6}{13 \times 56 \times 1.2 \times 10^9} = \text{large value (curr.)}$$

$$= 0.3577 \times 10^{-3}$$

$$= 357.7 \times 10^{-6} \text{ } \left. \begin{array}{l} \text{Max} \\ \text{VCO} \text{ freq.} \\ \text{chase} \end{array} \right\}$$

(skew) (Phase Shift)

$$\therefore \text{for } f_s = f_{PS} = 312.5 \text{ MHz}, \quad f_{VCO} = 1.2 \text{ GHz}$$

$$f_{out} = f_{VCO} \pm \boxed{\text{PPM}_{PS-MAX}} = f_{VCO} \pm 357.7 \text{ PPM}(f_{VCO})$$

(MAX) 1.2 GHz

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15 1.2 GHz - 357.7
715.6 - 21.5
3.5 3.15 - 40
156.25

