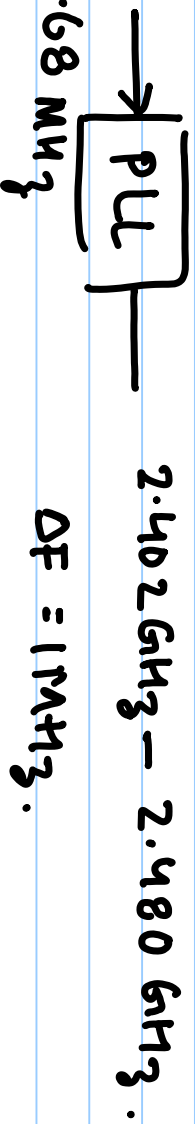
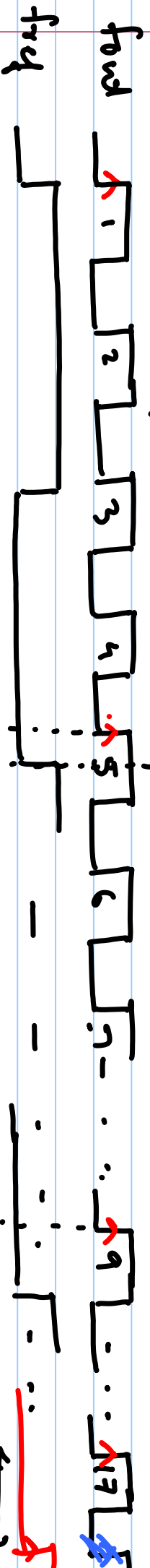


Lecture #47

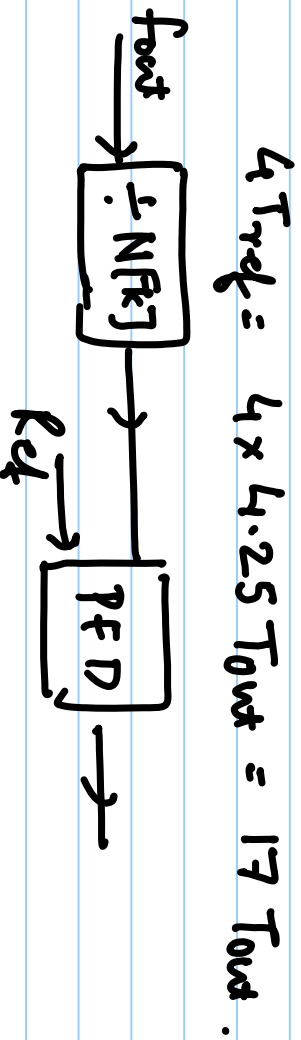
Fractional-N PLL

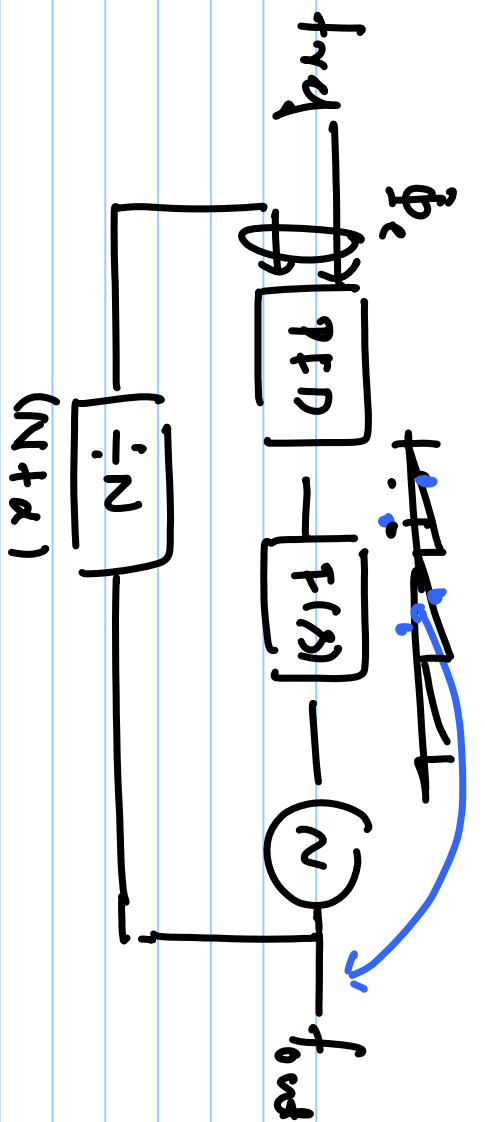


$f_{out} = 2.403 \text{ GHz}$ $N = 122.10366 = 122 + \frac{51}{492}$ ✓
 $f_{out} = 4.25 \text{ freq.} \Rightarrow T_{req} = 4.25 T_{out}$



T_{req}	Δt
1	$0.25 T_{out}$
2	0.5
3	0.75
4	





$N-1, N, N+1$

$$f_{out} = 4.25 f_{ref} \Rightarrow f_{mod} = \frac{f_{ref}}{4}$$

$$= 4.01 f_{ref}$$

$$f_{PFD} = \frac{f_{ref}}{160} \leq \frac{f_{ref}}{10}$$

$$T_{ref} = 4.01 T_{out}$$

$$100 T_{ref} : 401 T_{out}$$

$$f_{out} = \left(122 + \frac{51}{492} \right) f_{req.}$$

$$= \left(122 \left(\frac{441+51}{492} \right) + \frac{51}{492} \right) f_{req.}$$

$$= \left(\frac{51}{492} \times (1222+1) + \frac{441}{492} \times 122 \right) T_{out}$$

$$T_{req} \times 492 = \underbrace{51 \times 123}_{\div 123} \times T_{out} + \underbrace{441 \times 122}_{\div 122} \times T_{out}$$

$\div 123$

$N = 123$ for 51 times

$\div 122$

$N = 122$ for 441 times

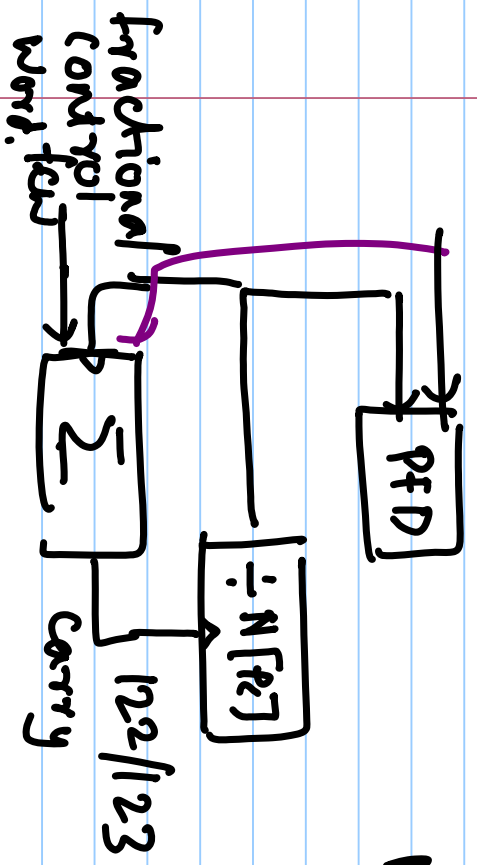
$$f_{out} = 4.25 f_{req}$$

$$T_{req} = \left(4 + \frac{1}{4} \right) T_{out}$$

$$= \left(4 \left(\frac{3+1}{4} \right) + \frac{1}{4} \right) T_{out}$$

$$= \left(\frac{1}{4} \times 5 + \frac{3}{4} \times 4 \right) T$$

$$4 \times T_{req} = 1 \times 5 T_{out} + 3 \times 4 T_{out}$$



$$f_{out} = 4 \text{ (25) } f_{in}$$

$$\Delta t = 0 \quad 0.25 \quad 0.5 \quad 0.75 \quad 1 \rightarrow 0$$

