

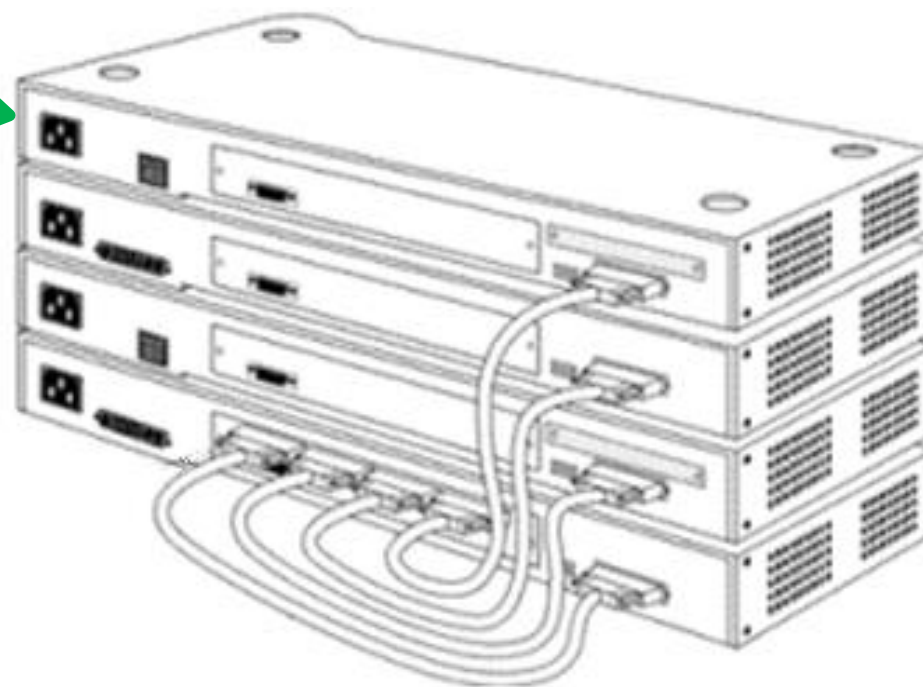
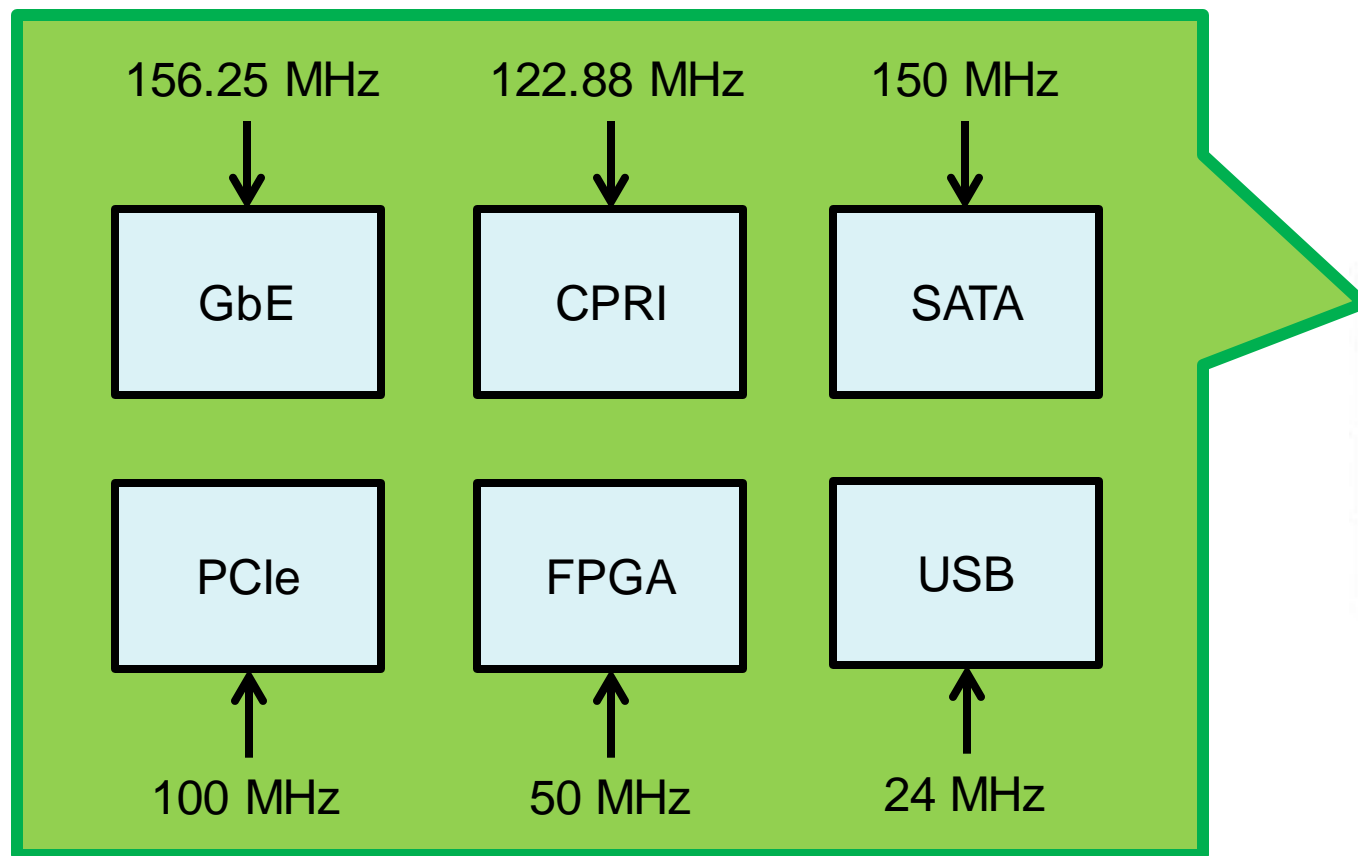
Clock Generator: Key Parameters and Specifications

TI Precision Labs – Clocks and Timing

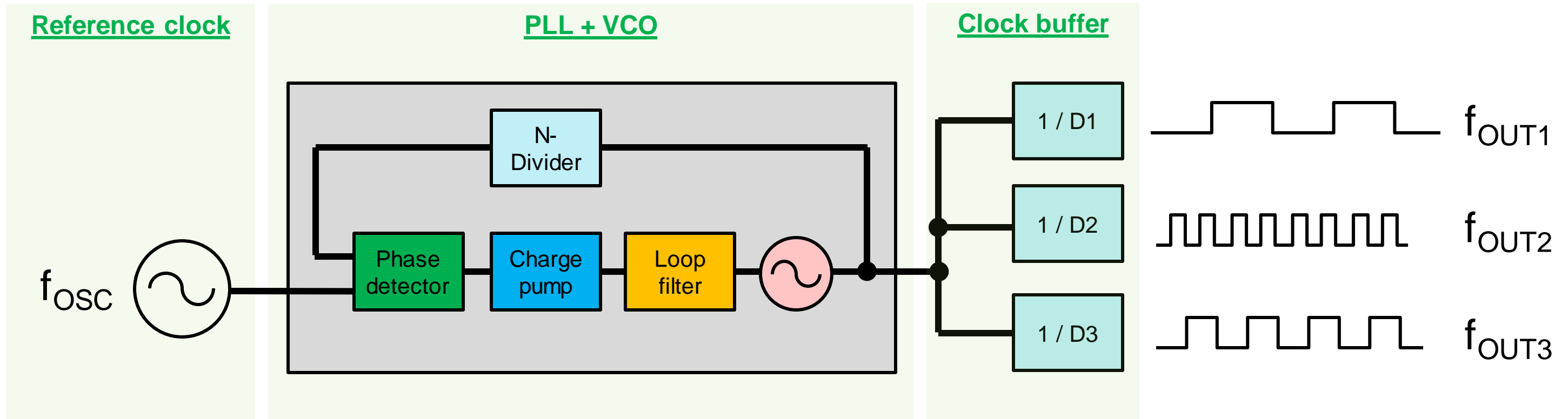
Presented by Liam Keese

Prepared by Noel Fung

System level clocking



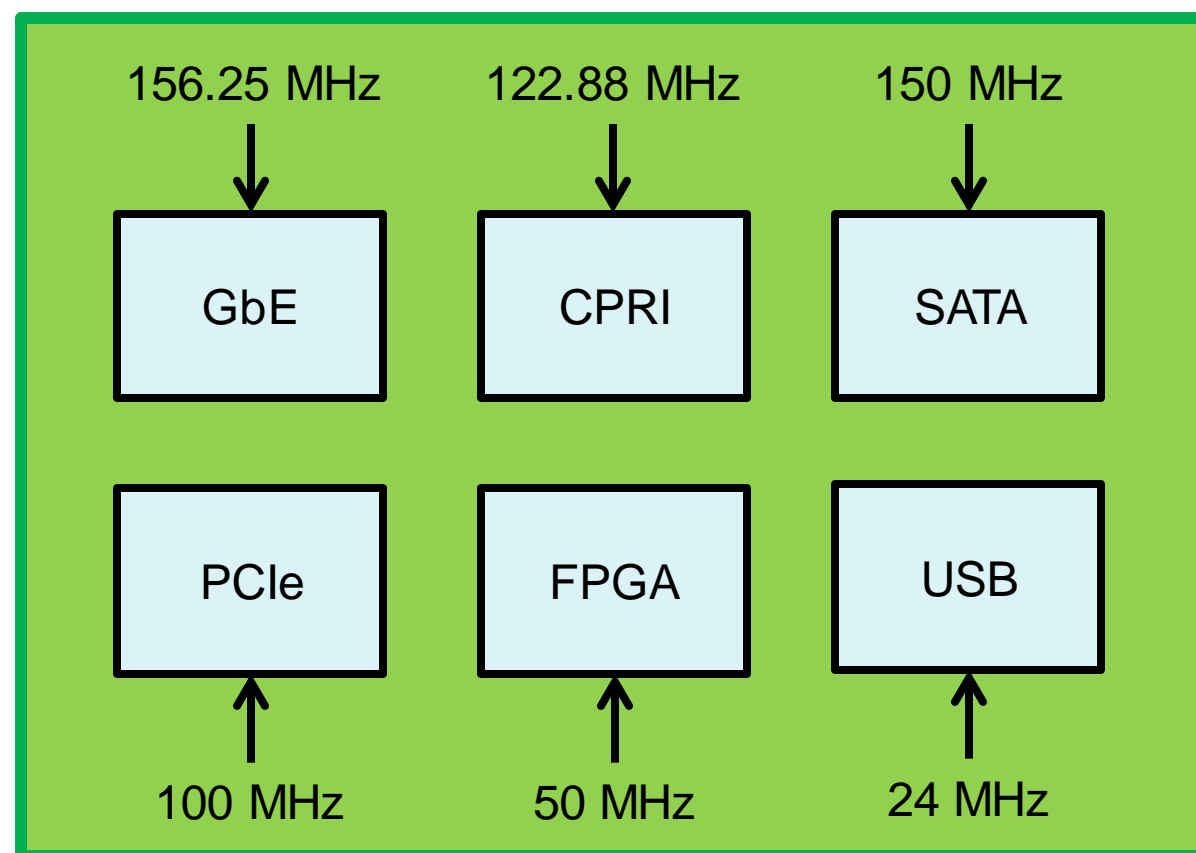
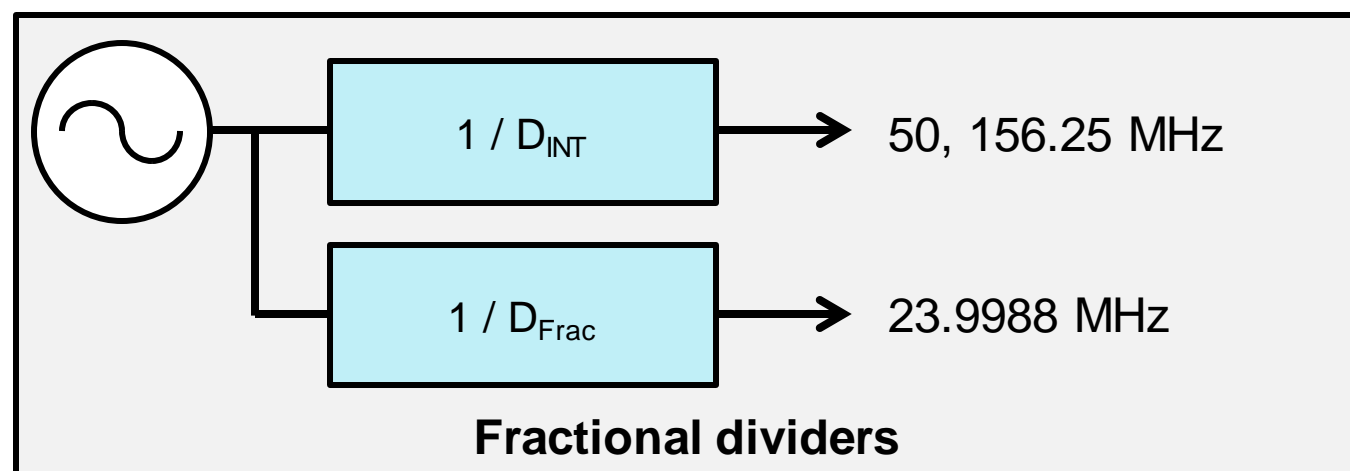
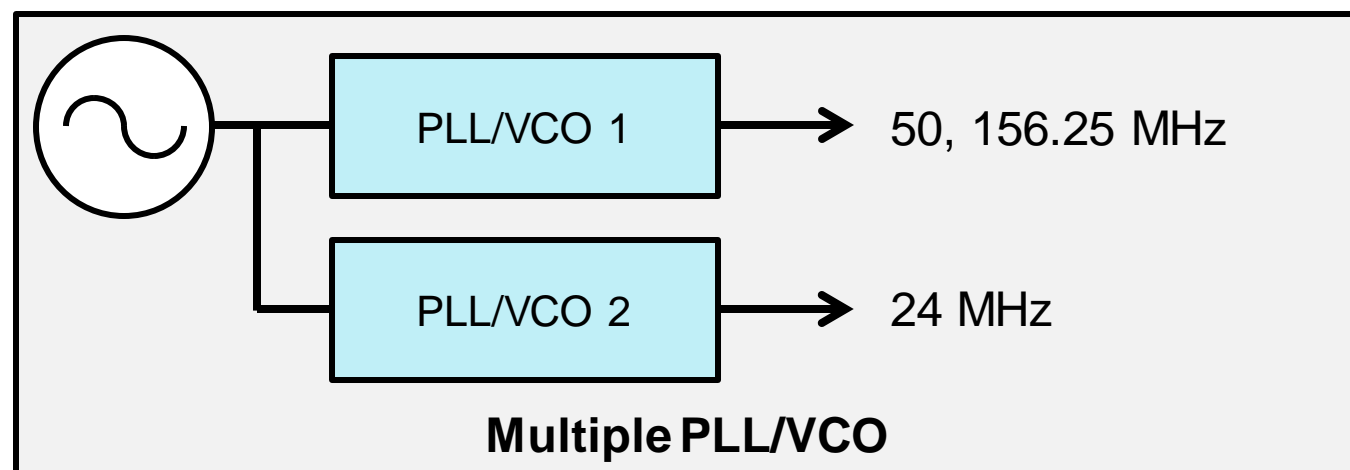
Clock generator structure



$$\rightarrow f_{osc} \leq f_{OUT} \leq f_{osc}$$

VCO frequency

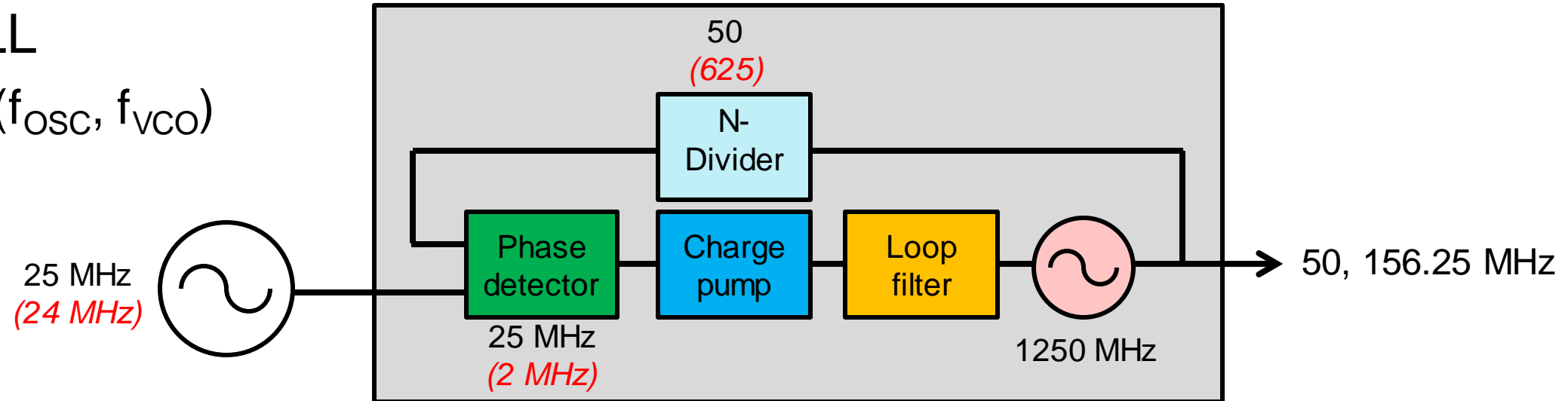
- Minimum VCO frequency = $\text{LCM}(f_{\text{OUT1}}, f_{\text{OUT2}}, \dots)$
- $\text{LCM}(156.25 \text{ MHz}, 24 \text{ MHz}) = 15 \text{ GHz!}$



Input frequency

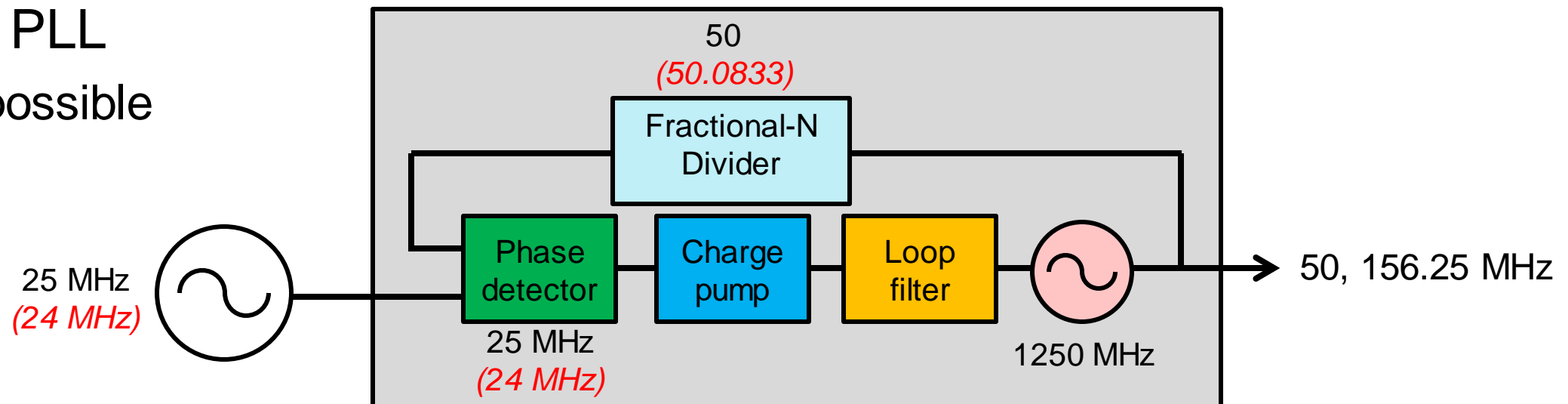
- Integer-N PLL

- $f_{PD} = \text{GCD}(f_{OSC}, f_{VCO})$

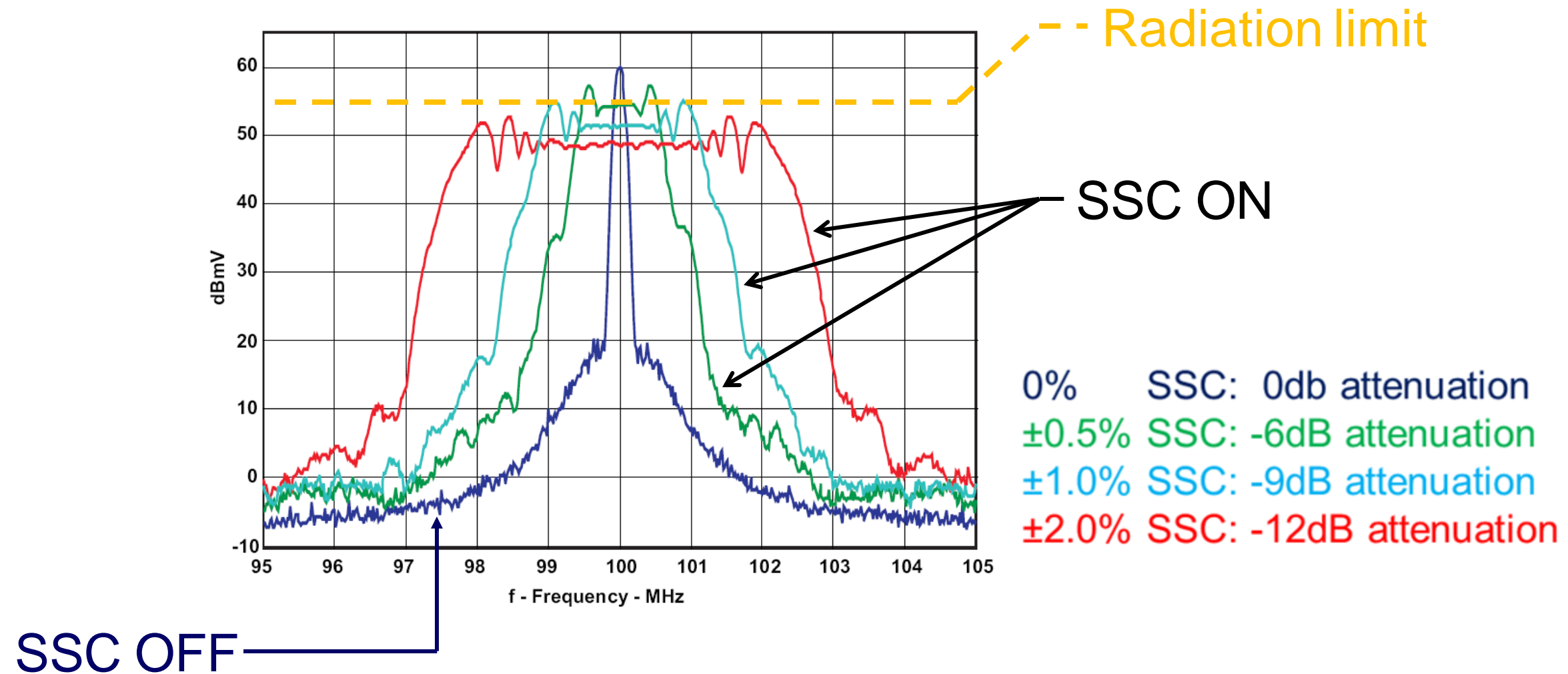


- Fractional-N PLL

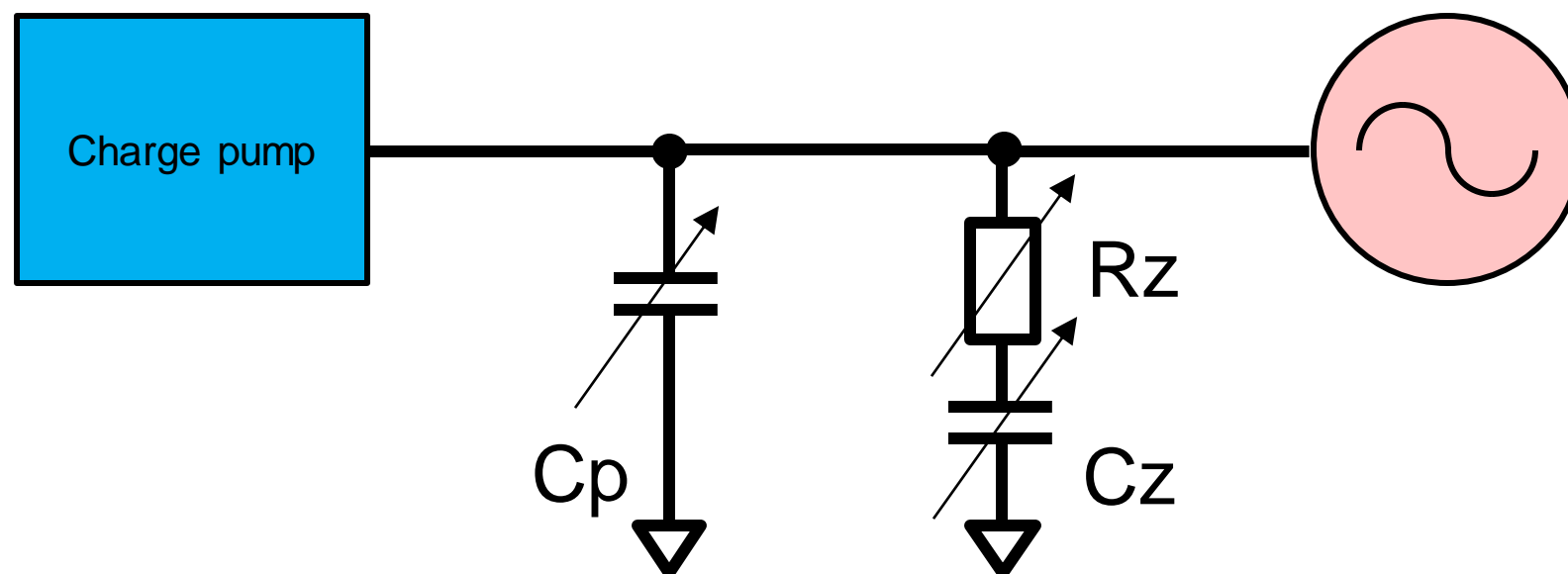
- $f_{PD} = f_{OSC}$ possible



Other considerations – Spread Spectrum Clocking



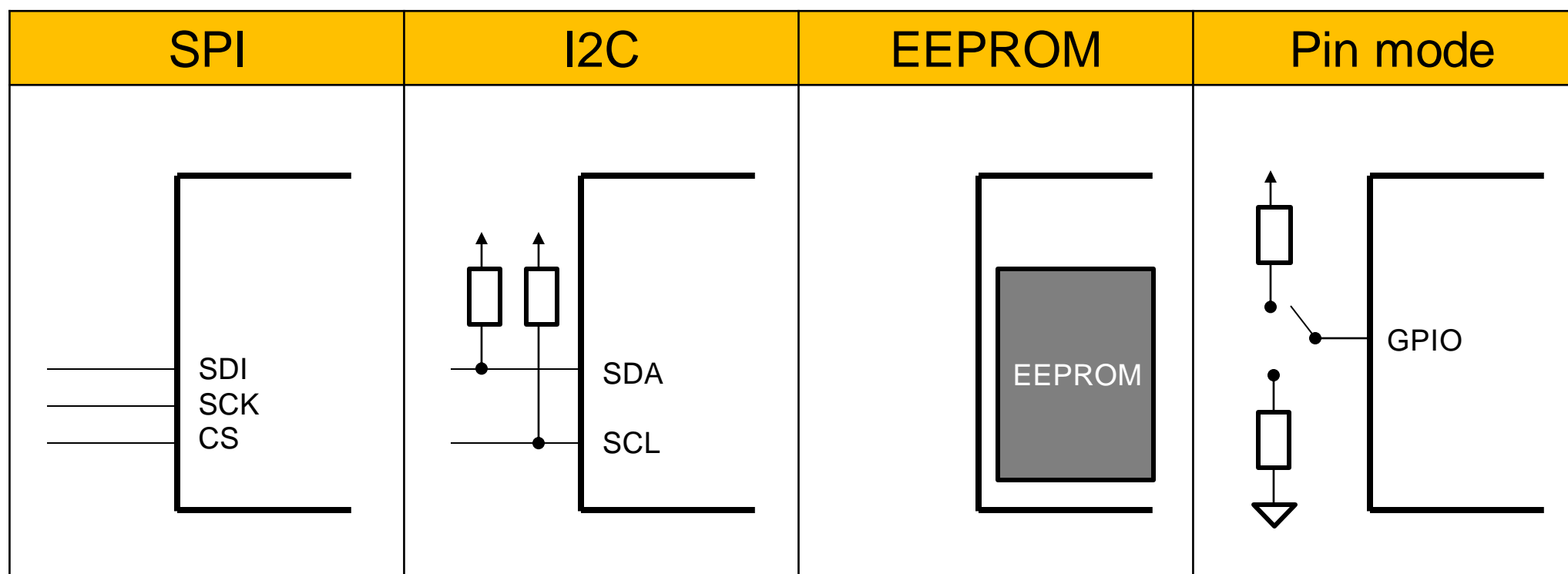
Other considerations - loop filter



Example configurable loop filter characteristic:

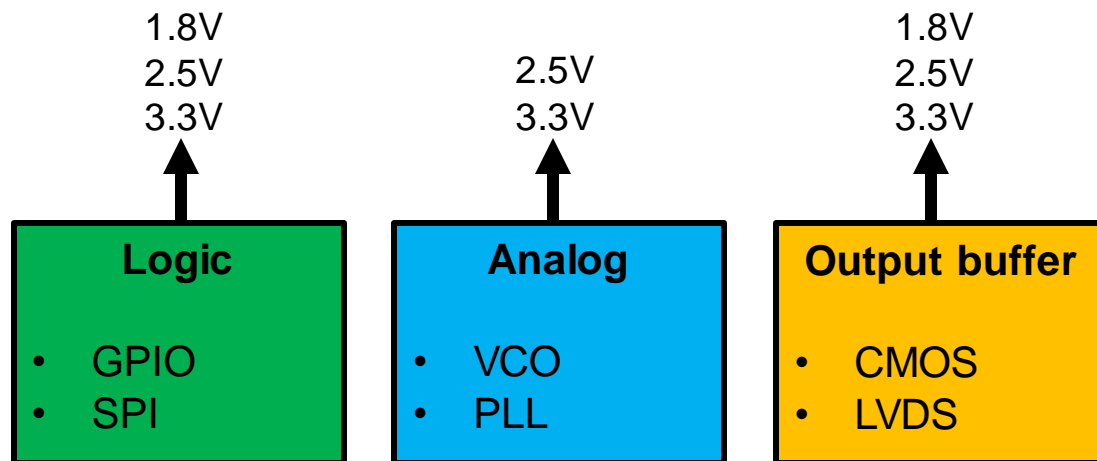
f_{VCO} (MHz)	f_{PD} (MHz)	Loop bandwidth (kHz)	Phase margin (deg)	Charge pump current (μA)	C_p (pF)	R_z (k Ω)	C_z (pF)
2400	25	459	70	600	16.1	2.5	580
2400	50	938	70	600	8.2	2.5	276
2400	100	1600	70	800	8.2	2.5	303

Other considerations – programming



Other considerations – operating conditions

- Supply voltage

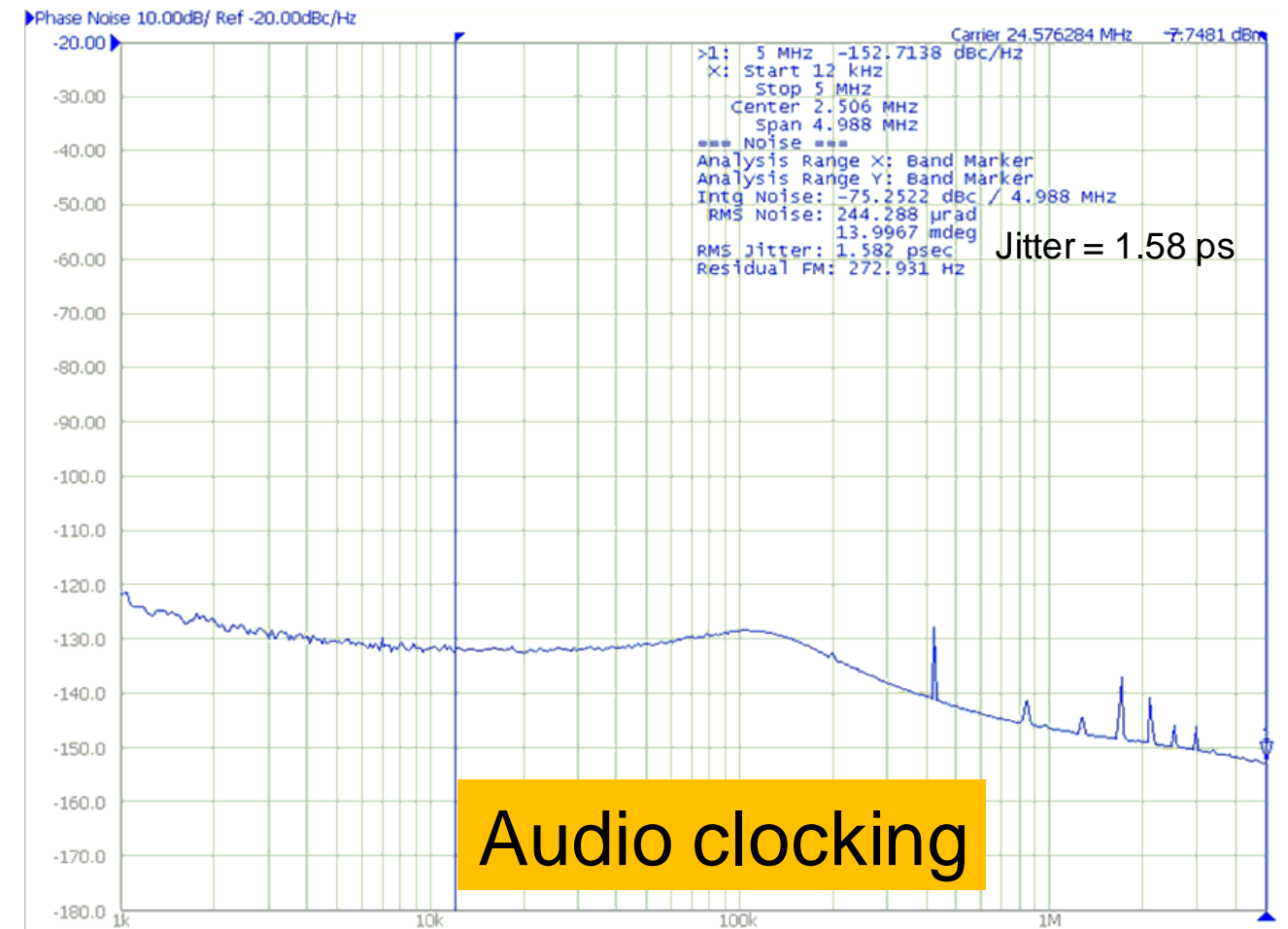
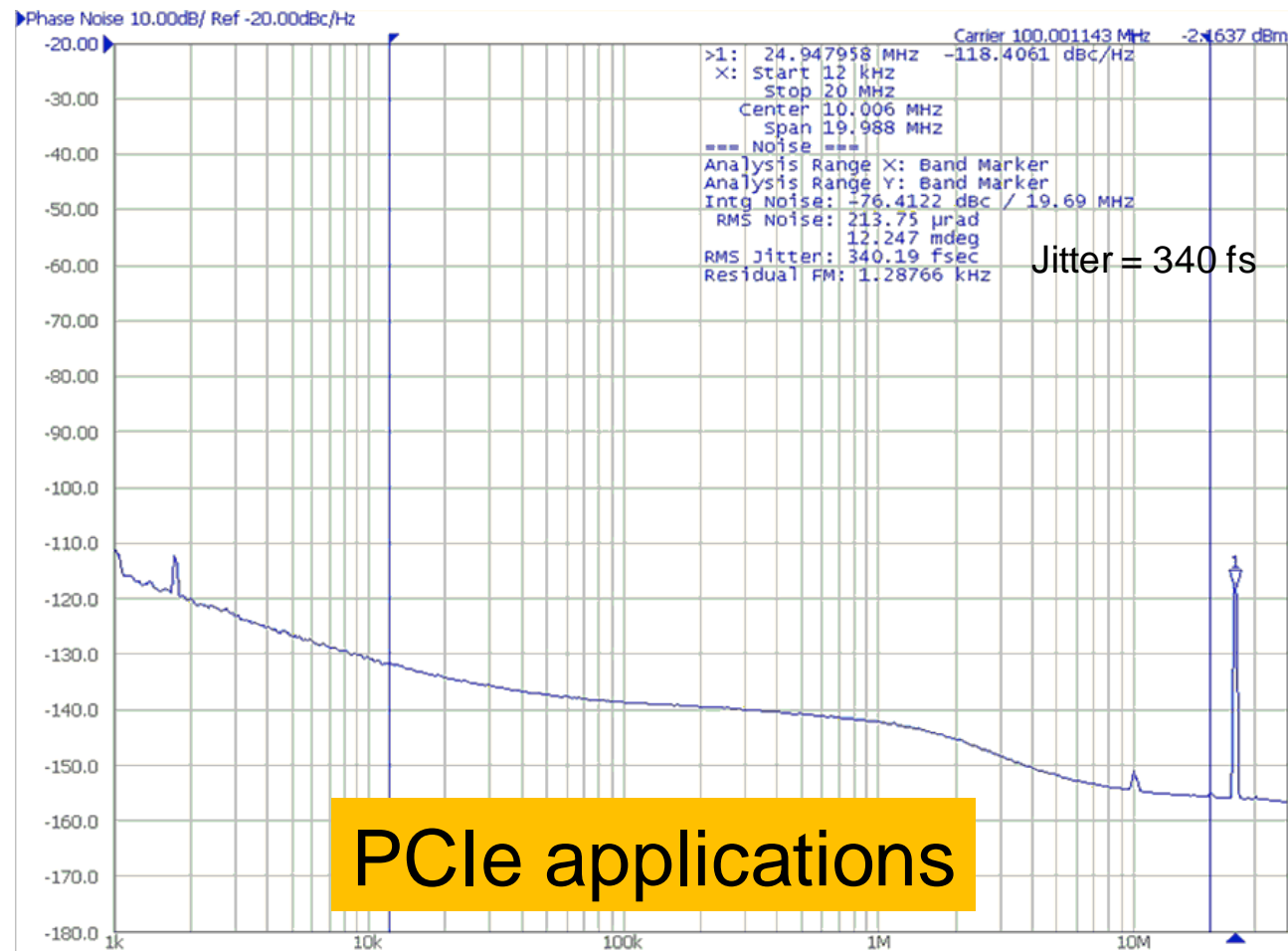


- Operating temperature range

Grade		Temperature range
Commercial		0 °C to 70 °C
Industrial		-40 °C to 85 °C
Automotive	Q1	-40 °C to 125 °C
	Q2	-40 °C to 105 °C

Other considerations – jitter performance

- General purpose: > 300 fs rms
- High performance: < 300 fs rms



To find more technical resources and search products, visit ti.com/clocks