Dear Srayan,

> *Srayan said:*
> I would like to clarify a few things.

Let me try to answer your questions as best I can. I hope my comments will be helpful to you.

> *Srayan said:*
> 1. Aren't the PPV data plot and ISF plot the same thing? Or are they different but convey the same message (sensitivity of transient waveforms to charge injection)?

The two are slightly different in that an ISF plot (referred to as $\Gamma(t)_{ISF}$) is computed as follows:

$$\Gamma(t)_{ISF} = \Delta(t) \cdot \frac{2\pi}{T_0} \frac{q_{max}}{\Delta q},$$

where To is the period of the steady-state solution, Δq is the injected charge in a series of time-domain simulations, qmax is the maximum charge displacement between the nodes you are measuring the phase perturbation. As such, it is a unitless quantity.

A ppv plot of the same oscillator (referred to as $\Gamma(t)_{PPV}$) can be obtained by a similar set of simulations, but the phase change measured at each simulation is normalized to the injected charge. Therefore, it is not a unitless quantity. Hence, as you state, the two convey similar information, but are not identical.

> *Srayan said:*
> 2. So plotting the PPV data for the node connected to the bias current will give me NMF of the VCO? This can be multiplied with the ISF of the oscillating node to get the effective ISF of the VCO?

I do not believe plotting the PPV data for the node connected to the bias current will give you the NMF of the VCO. I believe the plot is the effective $\Gamma(t)_{PPV}$. Why do I suggest this? The noise modulation function is a unitless entity since it is a transfer function. However, if you plot the PPV data for your source node, it is not unitless.

Therefore, to estimate the noise modulation function you need to compute it from the effective $\Gamma(t)_{PPV}$ measured at the source node and the $\Gamma(t)_{PPV}$ measured at the output of the VCO. Dos this make sense Srayan?

> *Srayan said:*
> 3. Can you please elaborate on this:" I was thinking you might also be interested in the current itself - not just the source node."

It was not clear to me what specifically you were looking to obtain and hence I suggested examining the PPV plot of the current itself and not the node corresponding to the source of the differential pair. Hence, I suggested saving the current.

Shawn