Data Acquisition System in Silicon Carbide

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Background/Relevance

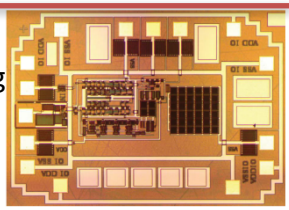
- Silicon carbide is a substance that has been found to be useful for manufacturing products that are needed to perform at high temperatures.
- A phase – locked loop (PLL) is a control system where the phase of an output signal is related to the phase of an input signal.

Innovation

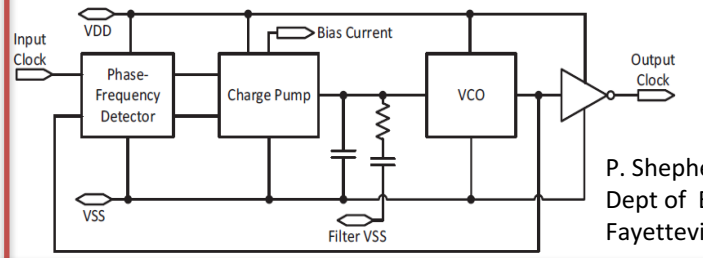
- Determine the characteristics of the noise of the PLL and the VCO in order to determine how the noise is effected when heat is applied, so that devices with a PLL can function at high temperatures.

Approach

- Measure VCO by disabling IBIAS and sweeping control from 0V – 15V.
- Measure the PLL as a whole by comparing a square wave input to the PLL output.



Above: PLL bare die

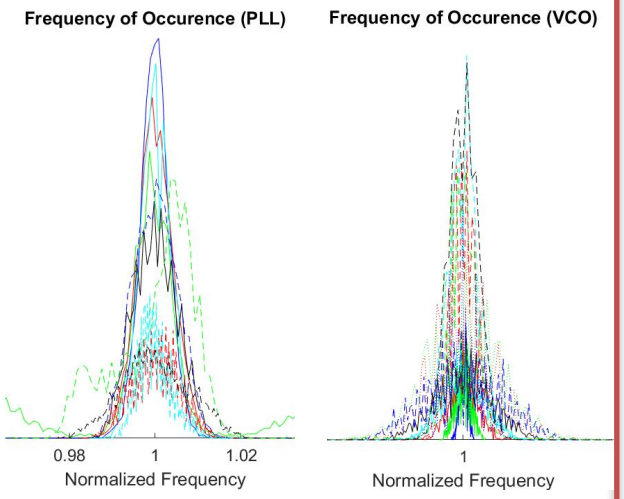


Left: a schematic of the PLL

P. Shepherd, Ph. D. dissertation, Dept of Elect. Eng., UofA, Fayetteville, AR, 2014.

Key Results

- These results show that some noise comes from the VCO, but not all.
- Some noise was caused by the phase frequency detector, charge pump, resistors and capacitors.



Conclusions

- The VCO seems to work correctly although it does put off some noise.
- It is still unknown if it is the main cause of noise in the system due to lack of time to get sufficient data.
- The PLL is made up of many components: the phase frequency detector, the charge pump, the VCO, capacitors and resistors, so there are many different places that the noise could come from.

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