

# SD FRAC-N PLL SIMULATION WITH SYSTEMC-AMS

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COMPANY INTERNAL/PROPRIETARY



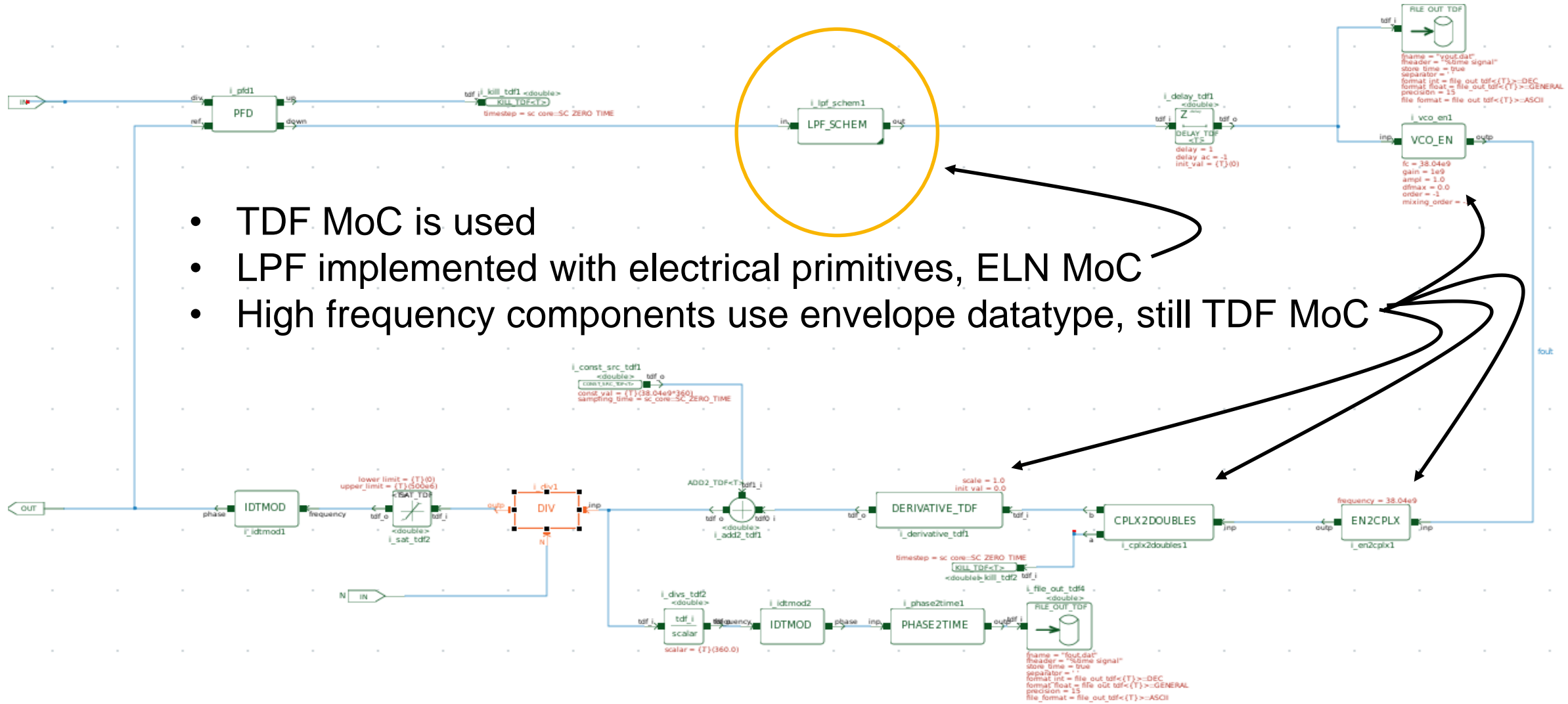
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- Ideal PLL in the time domain (transient envelope)
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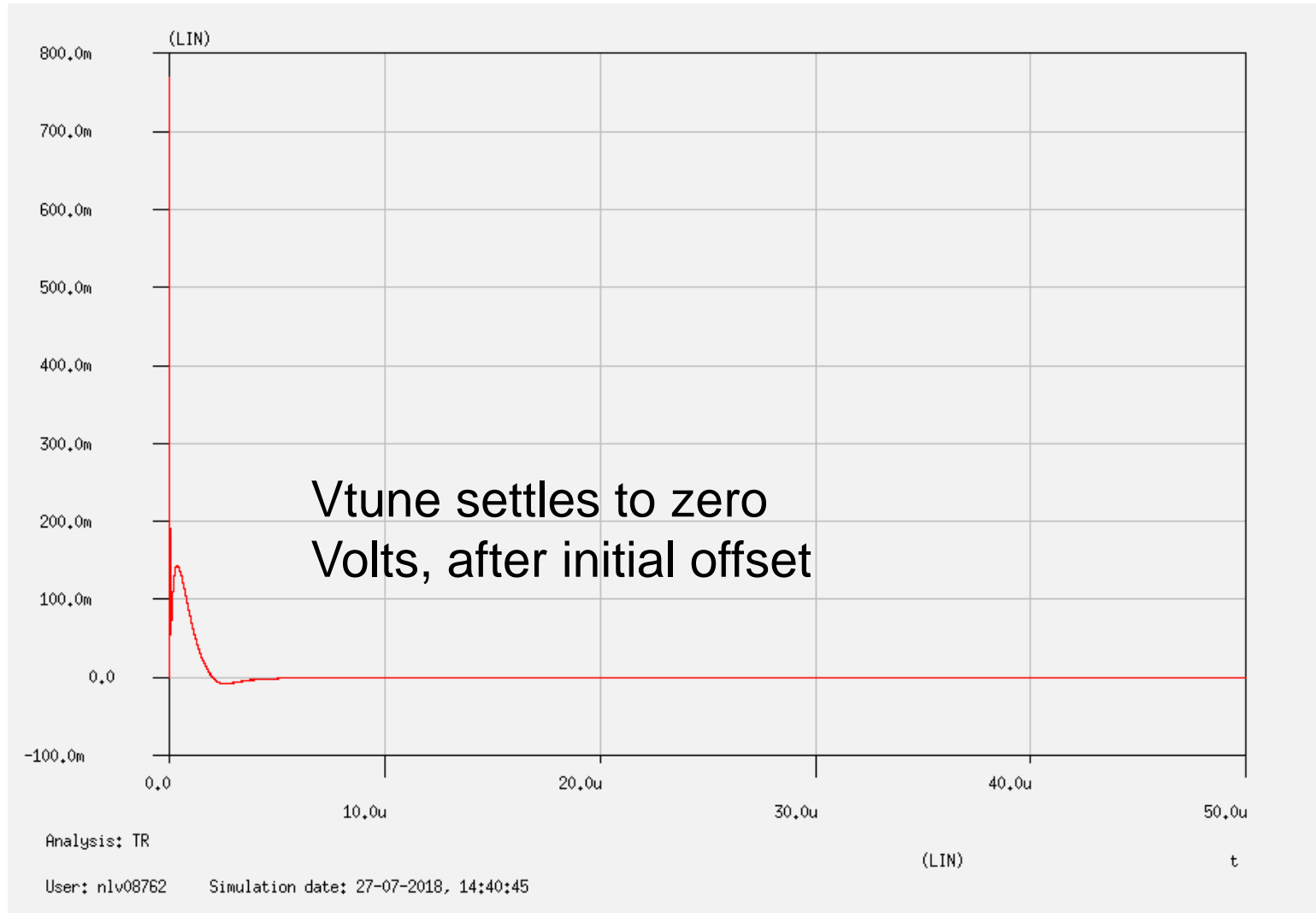
# Ideal PLL in the time domain

- TDF MoC is used
- LPF implemented with electrical primitives, ELN MoC
- High frequency components use envelope datatype, still TDF MoC

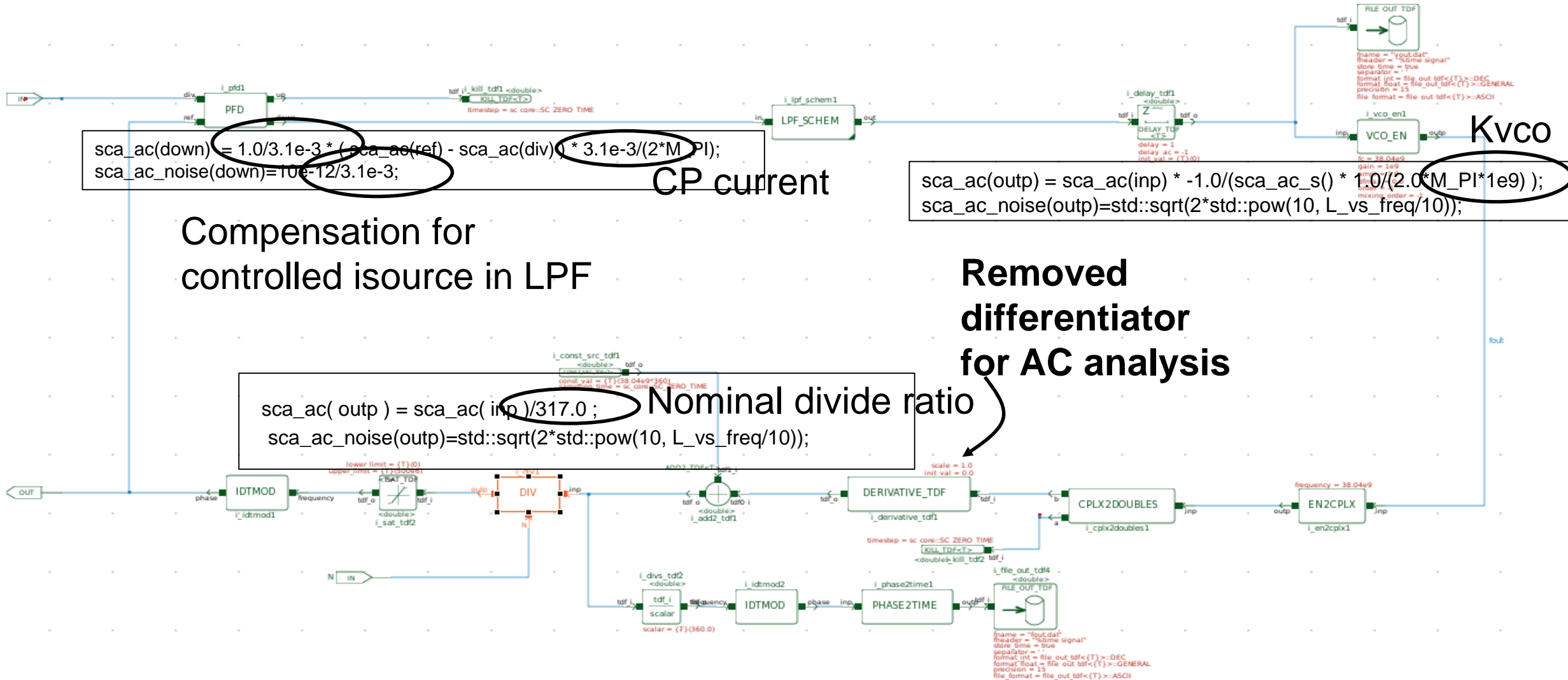




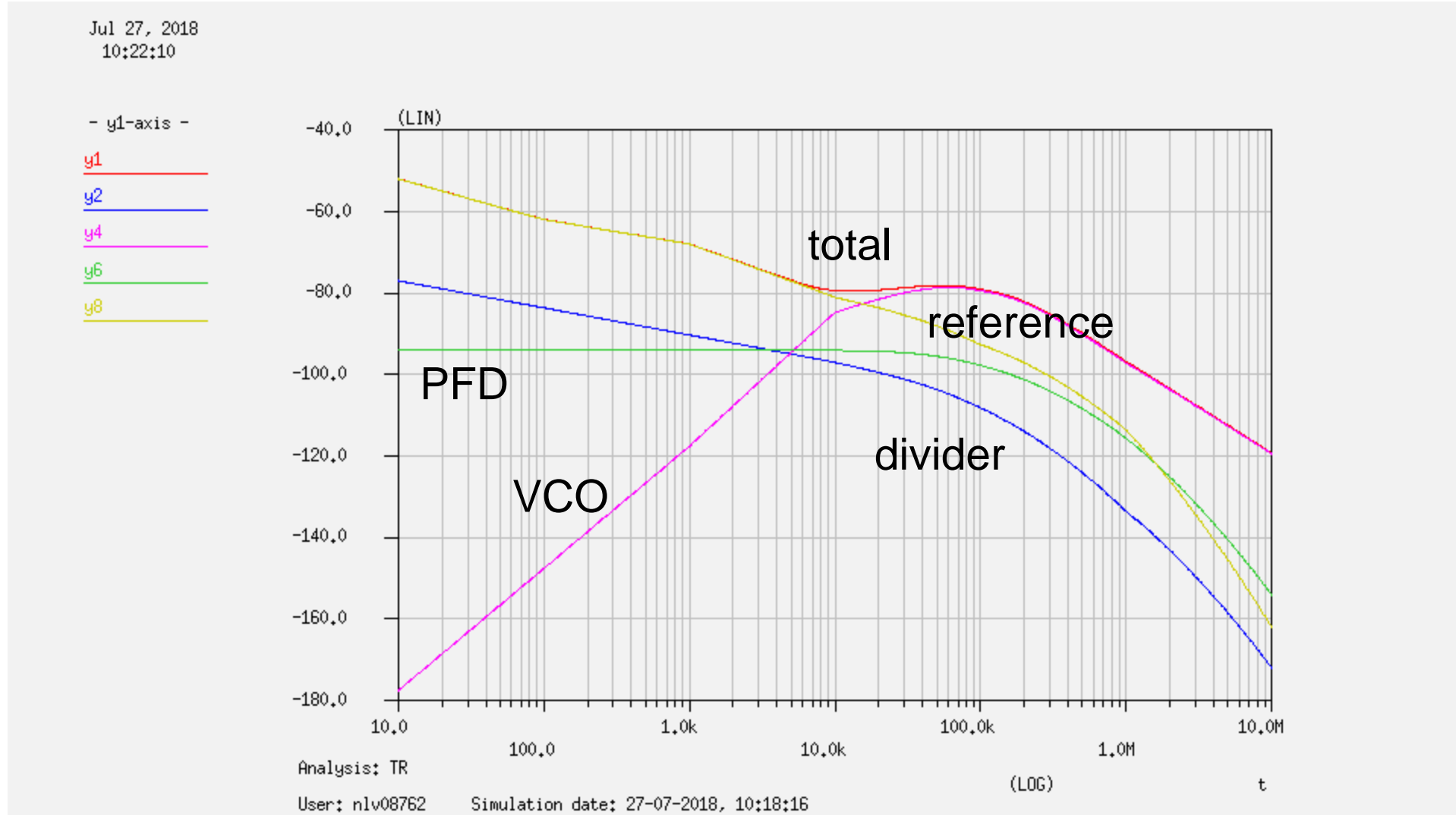
# Ideal PLL in the time domain



# Phase noise in the frequency domain



# Phase noise in the frequency domain



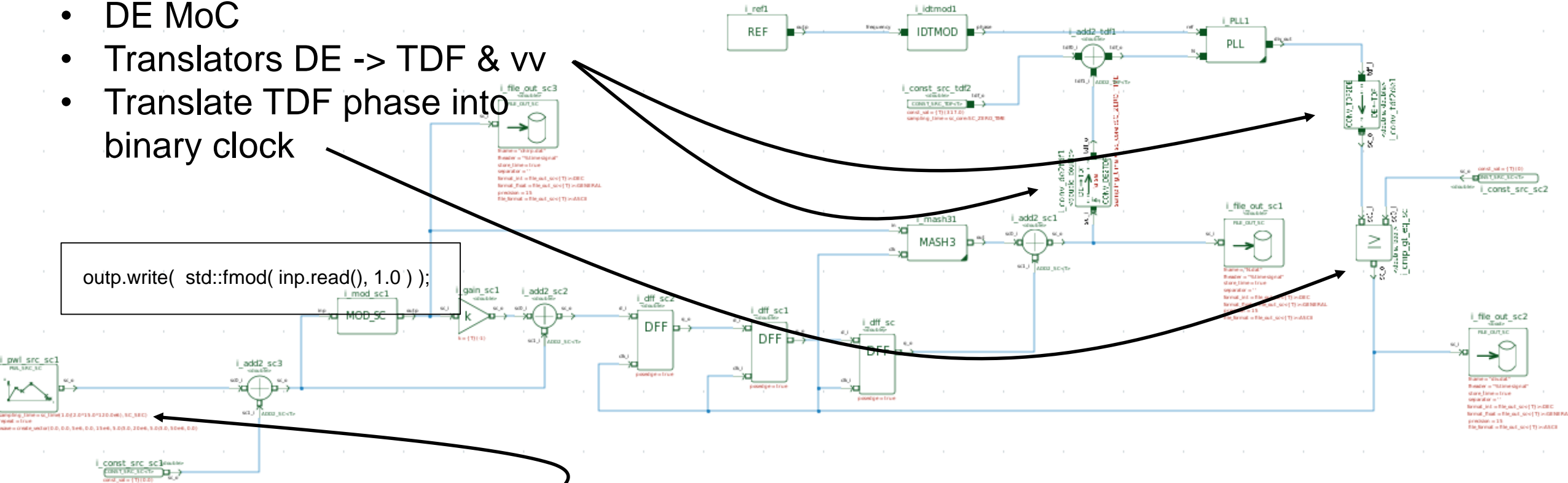
# Frac-N PLL with sigma delta modulator

- DE MoC
- Translators DE -> TDF & vv
- Translate TDF phase into binary clock

```

outp.write( std::fmod( inp.read(), 1.0 ) );
    
```

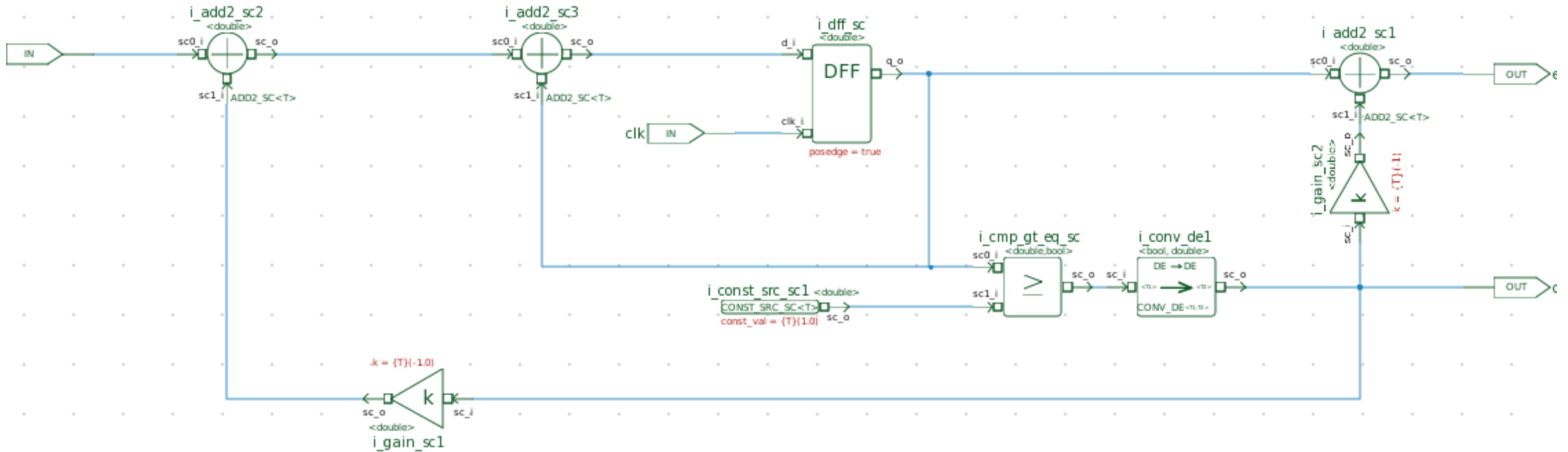
- Timestep set by source





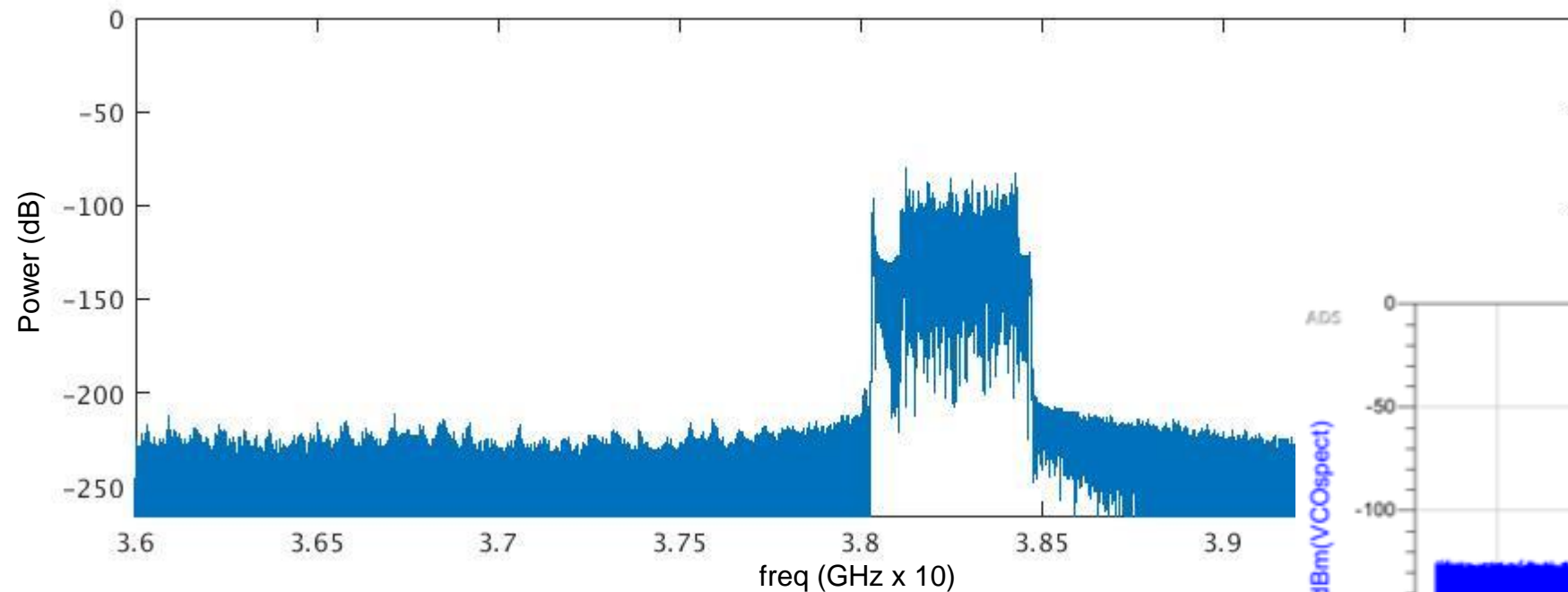
# Frac-N PLL with sigma delta modulator

## SD modulator

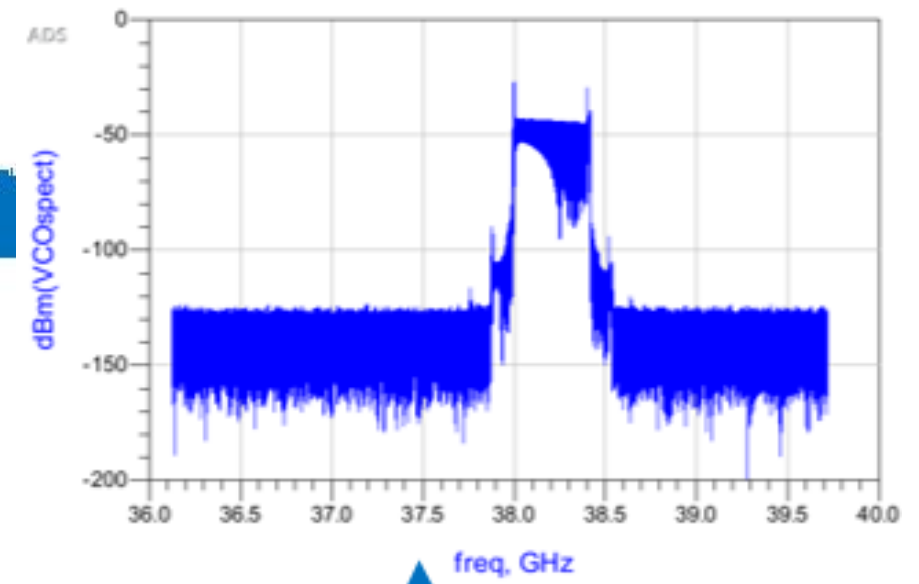


# Frac-N PLL with sigma delta modulator

Processed data after 110us noiseless transient simulation:



Reference from ADS:



Consumed CPU time (SC-AMS): 165.02 sec.

# Conclusions

- SystemC-AMS provided the fastest simulation environment seen so far for this type of application
- However, modelling effort was more significant than with other tools
- The open source models hugely increase acceptance and confidence of the stakeholders
- The Coside tool could not be missed for the development of this model. The development time of the models was greatly reduced by using this tool
- There are still some wishes related to SystemC(-AMS) for modelling and simulation of mixed signal or RF systems



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