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Demodulation of distorted ASK signals

Eddy Veltman

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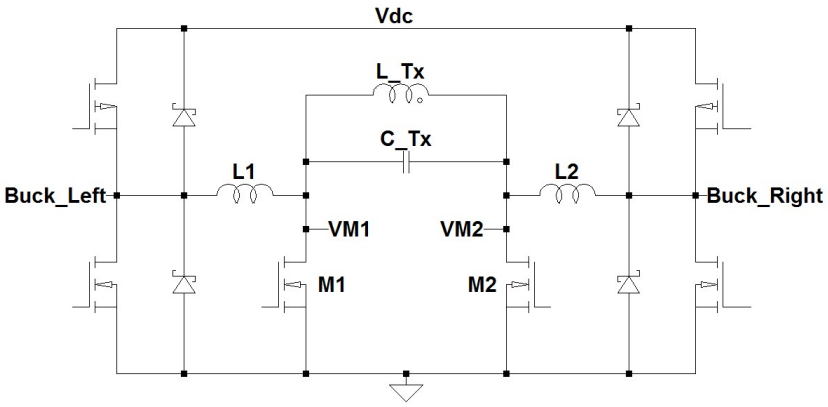
Recap WPC1605 Seattle

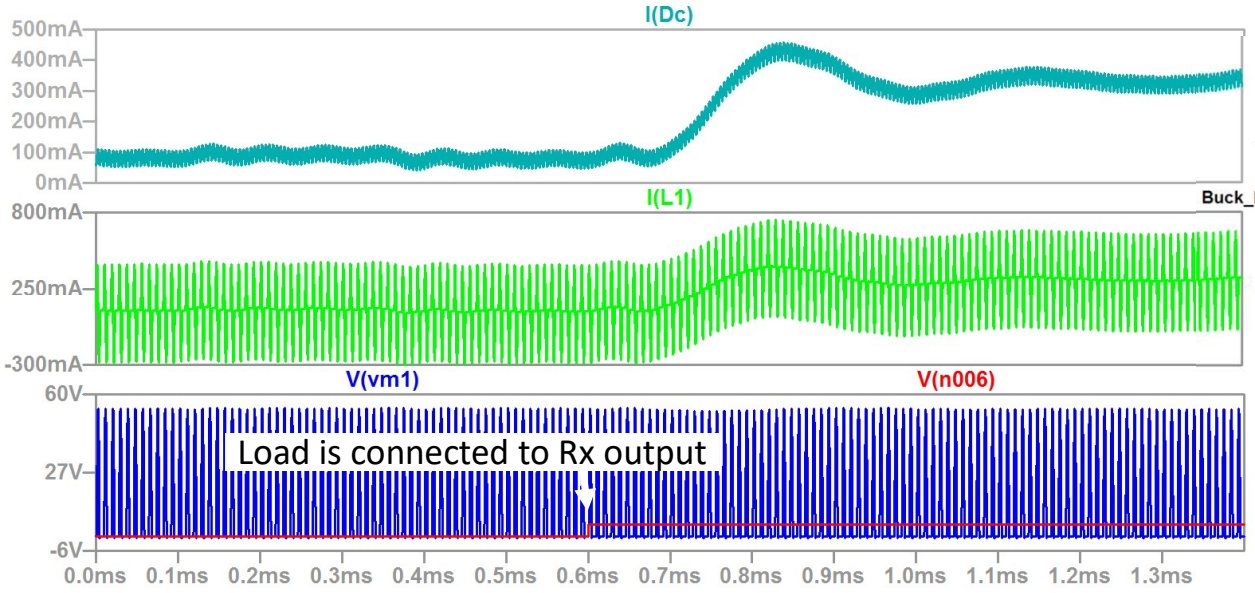
- Philips presented the Buck-Royer converter topology in the Resonance Task Force
- Technology was demonstrated with medium-z demonstrator
- Advantages:
  - improves EMC performance
  - tunable effective resonance frequency
  - inherent stability for load steps even at low coupling

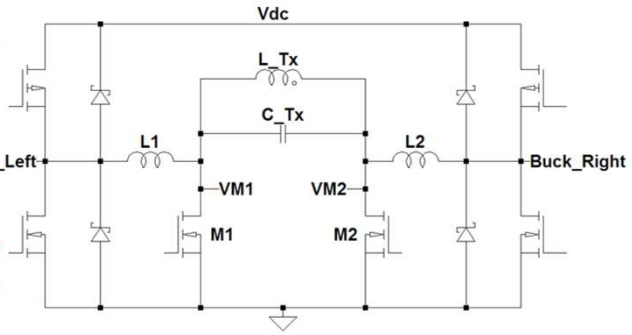


Nexus 5 charging on Royer demonstrator
15 mm coil to coil distance

Distorted ASK is side effect of inherent stability for load steps

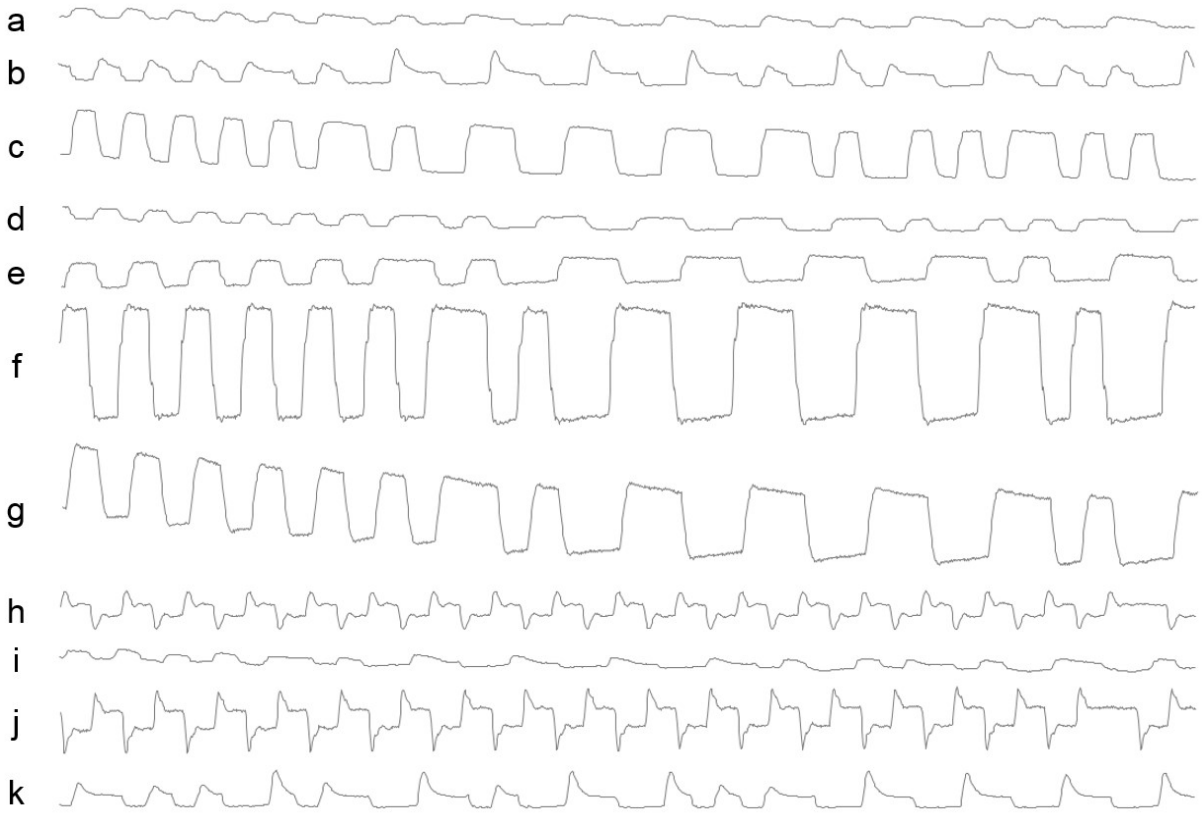
- Coil voltage is automatically kept constant during load steps





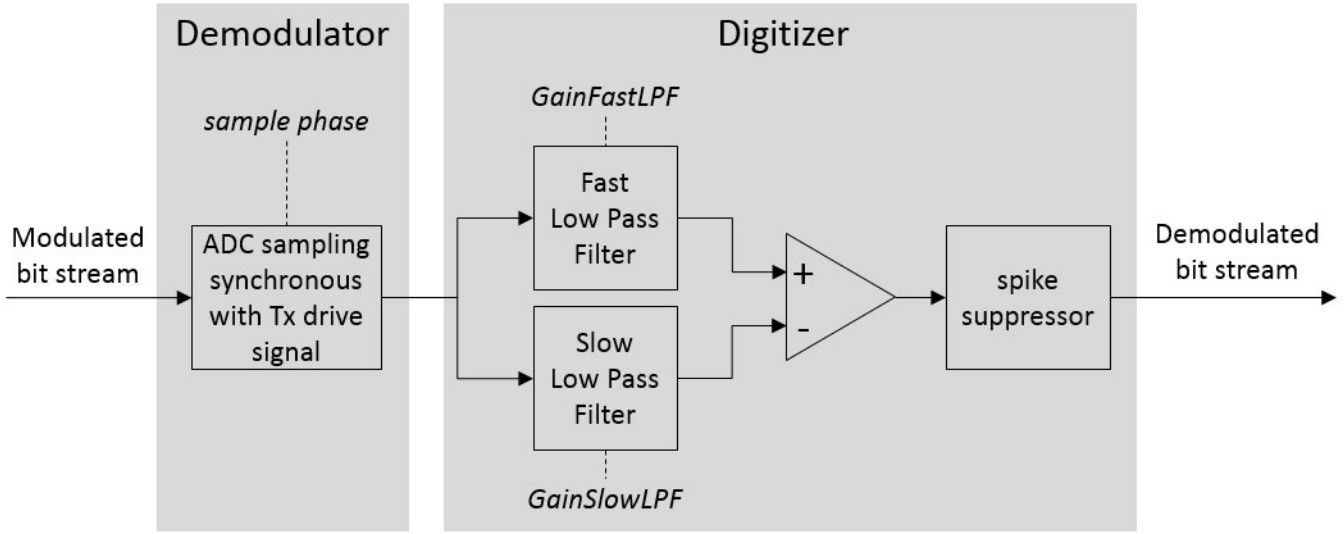
Effect of a load step at Rx (1 kOhm => 5 Ohm)

Examples of distorted ASK bits as seen by the transmitter MCU



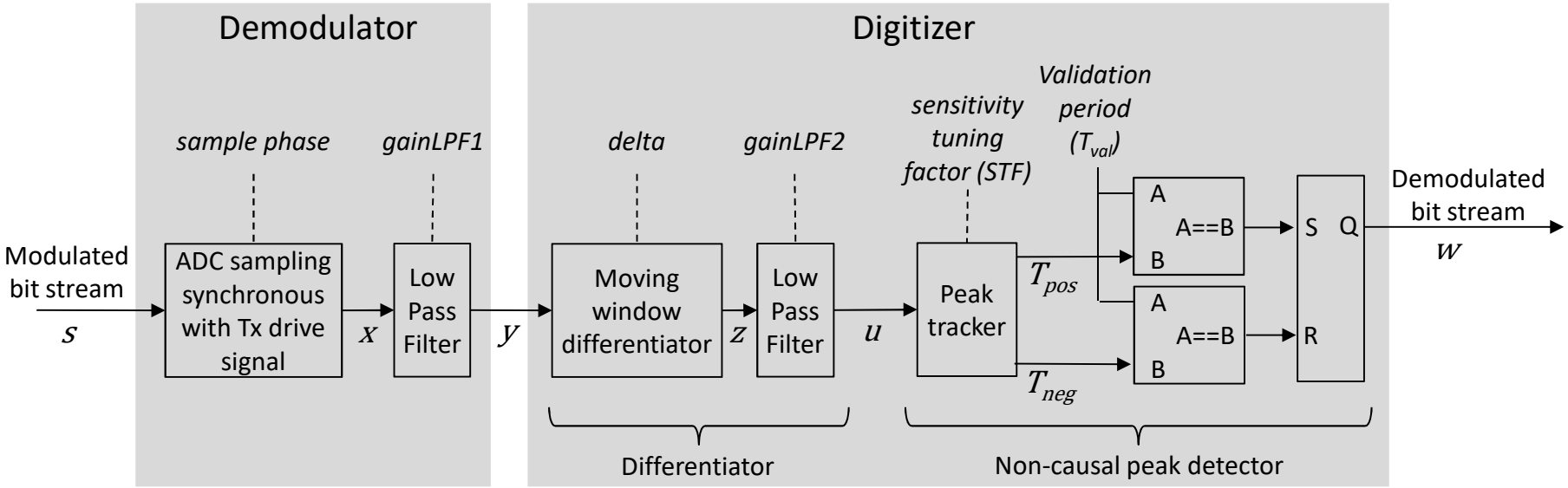
- Signal samples are directly from the MCU ADC.
- Each bit stream example is made with different z distance, receiver or load.
- The scale of the graph is equal for all signals

Standard steady state based demodulation method



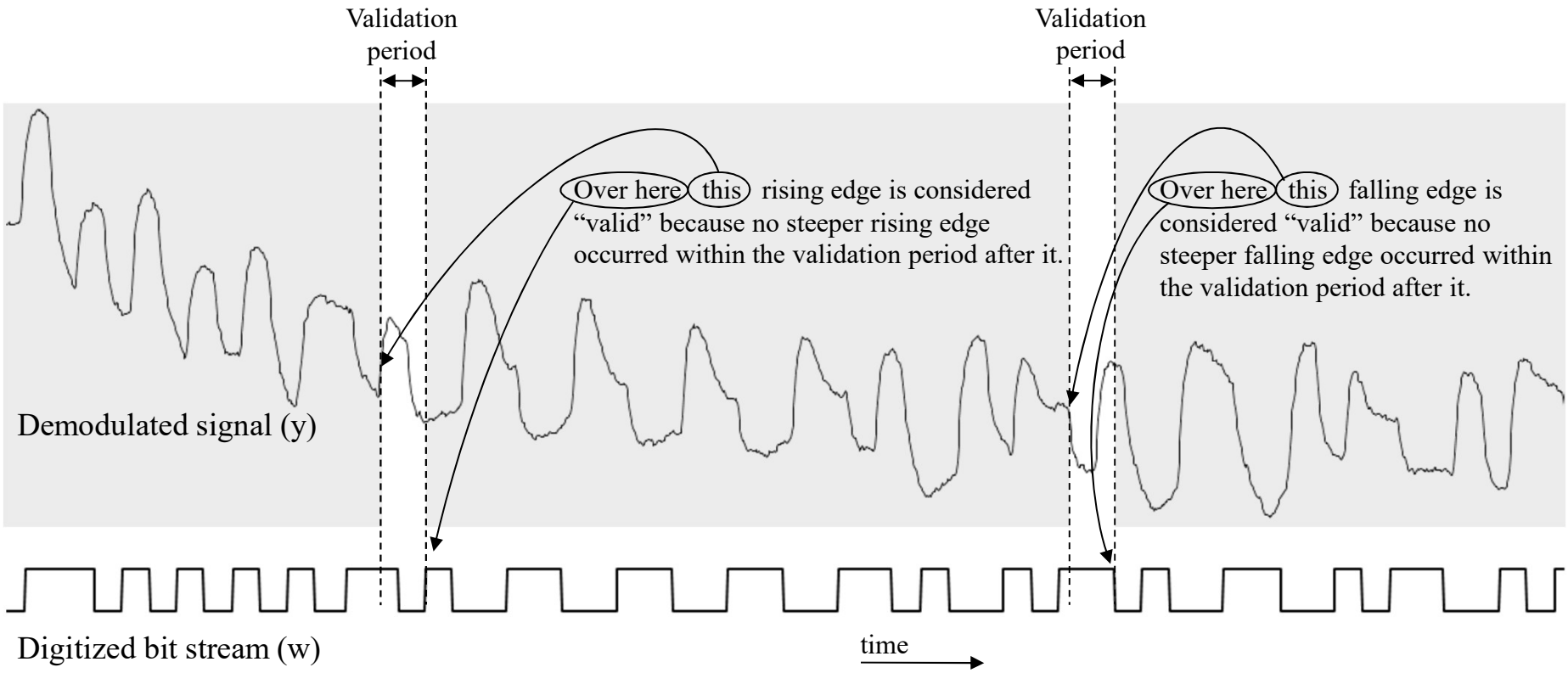
- Uses steady state signal levels in bits for digitizing
- Very simple. Requires minimum resources from MCU
- Sensitive for bit shape deformation and low frequency variation on top of ASK modulation
- Not suitable for Royer topology

Improved transient response based demodulation method



- This digitizer only triggers on the steepest edges in the demodulated bi-phase signal.
- An edge is only considered "valid" when no steeper edge occurs within the validation period after it.
- This method is non-causal. It uses information from the near future to determine whether or not an edge is the steepest. To enable this non-causality the output signal is delayed w.r.t. the original signal.
- Signal delay only requires two counters. No buffer memory is needed.

Example of non-causal transient response digitizing



Conclusions

- A method for good demodulation of distorted ASK signals has been explained
- It is very robust due to its transient based and non-causal approach
- It requires a minimum increase in MCU resource use w.r.t. the standard method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