Time-Encoding Sub-Nyquist ADC

DeepTech

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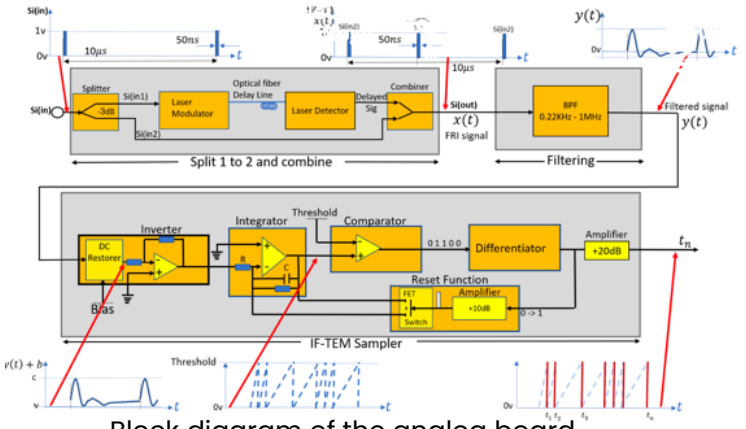
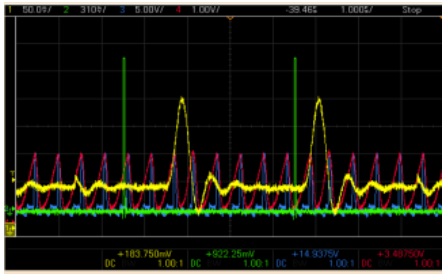
Modern ADCs must reduce cost and power consumption without compromising signal quality, particularly in power-sensitive systems such as wearables, IoT, and security devices. This technology introduces the first sub-Nyquist ADC based on an integrate-and-fire time encoding machine (IF-TEM). By combining low power, reduced complexity, and scalable performance, it enables high-resolution signal acquisition at significantly lower sampling rates without requiring a clock, making it an ideal solution for next-generation energy-efficient computing systems.



Block diagram of the analog board



FRI input x(t) (yellow), BPF output y(t) (green), and IF-TEM output with 19 samples (blue)

APPLICATIONS

- Wearable and IoT devices
- Remote and industrial sensors
- Homeland security systems
- Neuromorphic computing systems

DEVELOPMENT STAGE

A hardware prototype was developed, demonstrating the applicability of efficiently emulating an integrate-and-fire (IF) neuron. The proposed hardware and the reconstruction method operated at a sampling rate 10-12 times lower than Nyquist with a signal-to-noise (SNR) ratio of up to -25 dB.

DIFFERENTIATION

- Scalable and Cost-Effective
- Lower engineering costs
- High resolution
- Very low power consumption

REFERENCES

- Naaman, H. et al. 2024
- Naaman, H. et al. 2022