# Modulo-Based High Dynamic Range ADC

DeepTech

Reference Number: **2371** \ Principal Investigator: **Prof. Yonina Eldar** \ Patent Status: **PCT/IB2024/061994, Filed**

A novel analog-to-digital conversion pre-processor uses a modulo-based signal folding method to overcome the limited dynamic range of conventional ADCs. The folded signal is reconstructed using a dedicated unfolding algorithm, enabling precise signal recovery across a wide amplitude spectrum. This novel architecture enables accurate reconstruction of the original signal, ensuring accurate signal conversion across a wide amplitude range. This technology extends the effective dynamic range of ADCs, improving performance in demanding applications such as radar, ultrasound imaging, and hearing aids.
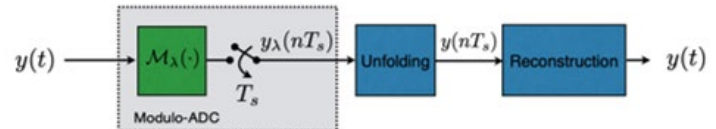
A schematic of modulo-sampling and reconstruction
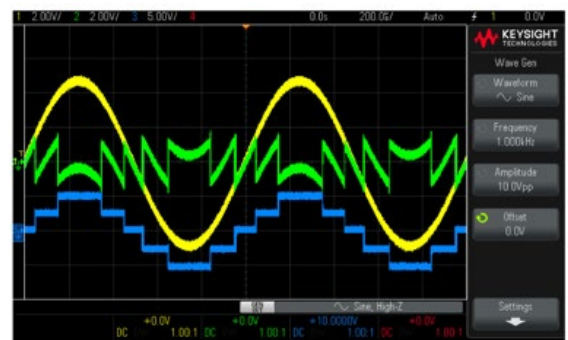
Oscilloscope screenshot showing 1 kHz sinusoid (yellow), modulo-folded output (green), and DVG signal (blue) with peak amplitude of 4λ

APPLICATIONS

- Ultrasound imaging
- Radar systems
- Sonar technology
- High-dynamic range camera
- Hearing aids

DIFFERENTIATION

Extends dynamic range beyond ADC limits

Accurate signal recovery

Reduced power consumption

DEVELOPMENT STAGE

A hardware prototype and unfolding algorithm were developed, enabling sampling at 1/6 the Nyquist rate and supporting signals with 8× greater dynamic range.

REFERENCES

- **Mulleti, S. et al., 2023**
- **Azar, E., Mulleti, S., & Eldar, Y. C., 2025**