Towards a true 8-digit digitiser- Workshop

IPQ, Lisbon

15 May 2026

Time	Title	Presenter
10:00 hrs	The True8DIGIT project – objectives, work programme and outputs	Oliver Power, NSAI
10:20 hrs	Precision ADCs – current state-of-the art	Nikolai Beev, CERN and STU
10:40 hrs	A bridge for measuring distortion of components at the 170 dB level	Rado Lapuh, Left Right s.p.
11:20 hrs	Coffee Break	
11:40 hrs	Characterisation of components for use in precision integrating ADCs	Vitor Cabral, IPQ
12:00 hrs	Measurement of charge injection of electronic Switches	Paolo Durandetto, INRIM
12:20 hrs	Design, fabrication and testing of an ultra-clean power supply with continuous output	Jan Kucera, CMI
12:40 hrs	Lunch	
13:30 hrs	Ultra-low jitter timing platform for high-precision composite ADCs	Ricardo Iuzzulino, INTI
13:40	Ultra-low distortion sinewaves for ADC testing	Rado Lapuh, Left Right s.p.
14:00	Recent improvements in multi-tone testing of ADCs	R. A Belcher, Signal Conversion Ltd.
14:20	Discussion Forum	
15:00	Close of Workshop	

Towards a true 8-digit digitiser- Project overview

Oliver Power, NSAI

Project Co-ordinator

METROLOGY PARTNERSHIP | EURAMET

True 8 DIGIT

Quantum Voltmeter

DC – 100 kHz

DC Performance

Noise ≈10^{-8}

Linearity ≈ 10^{-8}

Conventional Voltmeter

- ❑ Best performance
- ❑ Cryogenic
- ❑ High Cost

Is there a need for a single range digitizer with better performance than the DMMs?

- ❑ Affordable cost
- ❑ Room temperature
- ❑ Multifunction

Who needs sub-ppm accuracy?

“Is there a market for a single range digitizer with sub-ppm accuracy at DC and ppm accuracy up to 100 kHz?”

- Voltage measurement at primary level (NMIs)
- Industrial measurements (IC manufacturers)
- Audio (Ultra-low distortion)
- Seismology (Dynamic range)
- High precision control (e.g. CERN magnets)
- Research (Kibble balance)
- Power quality (grid instrumentation)

An “Ideal” Digitizer

- High resolution/High Accuracy
- High speed
- High dynamic range
- Perfect linearity
- Low excess noise
- Low distortion
- Immune to outside influences

Major Performance Limitations of Digitizers

- ADC: Non-linearity, noise
- Voltage Reference: Drift, excess noise
- Signal Conditioner: Loading, distortion, noise
- Timing: Jitter, trigger delay
- Power Supply: Noise, coupling (imperfect isolation)

A two-step approach

Step 1 (Preparatory Research)

EPM Research Potential Project (22RPT02)

*True*8DIGIT "Towards a true 8 digit digitizer" Jun 2023- Jun 2026

Step 2 (Implementation)

EPM Follow-on Project

Next-generation digitiser for scientific and technological frontiers

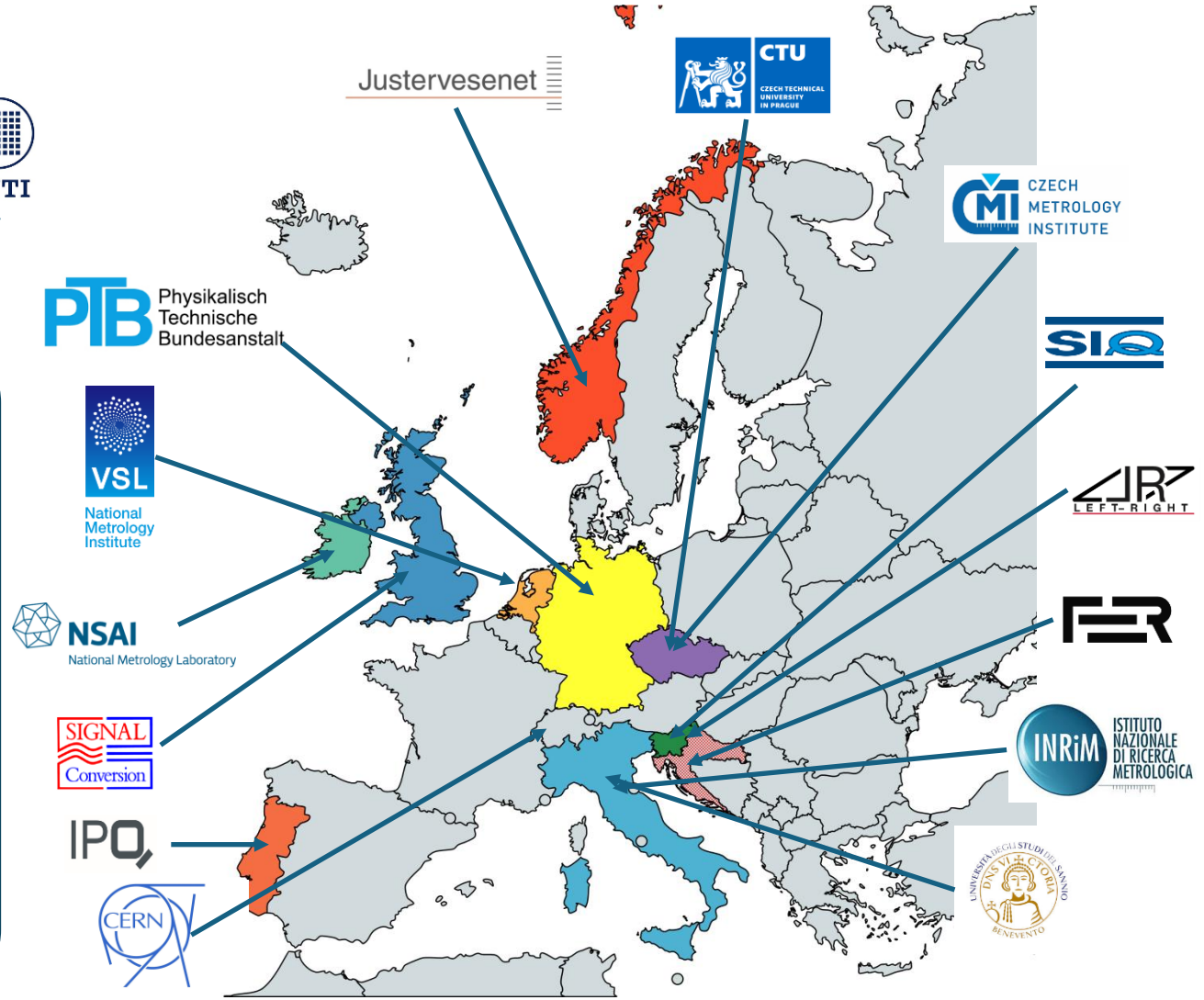
IEM Call 2025 Industry Call 2026

True8DIGIT “Towards a true 8-digit digitizer”

“This project addresses the development of a digitizer based on state-of-the-art analogue-to-digital converters (ADCs), operating from direct current (DC) to 100 kHz, meeting the demands for linearity, noise, and overall accuracy of high-level measurement applications that cannot be met using currently available digitizers.”

True8DIGIT Project Partners and Collaborators

Partners: 15
Budget: 900 k€
Duration: 3 years
Start: June 2023



Our Collaborators

- ✓ V. Janásek (Janascard)
- ✓ J. Sukuba (DMI)
- ✓ J. Pickering (Metron Designs)

Summary of Project Objectives

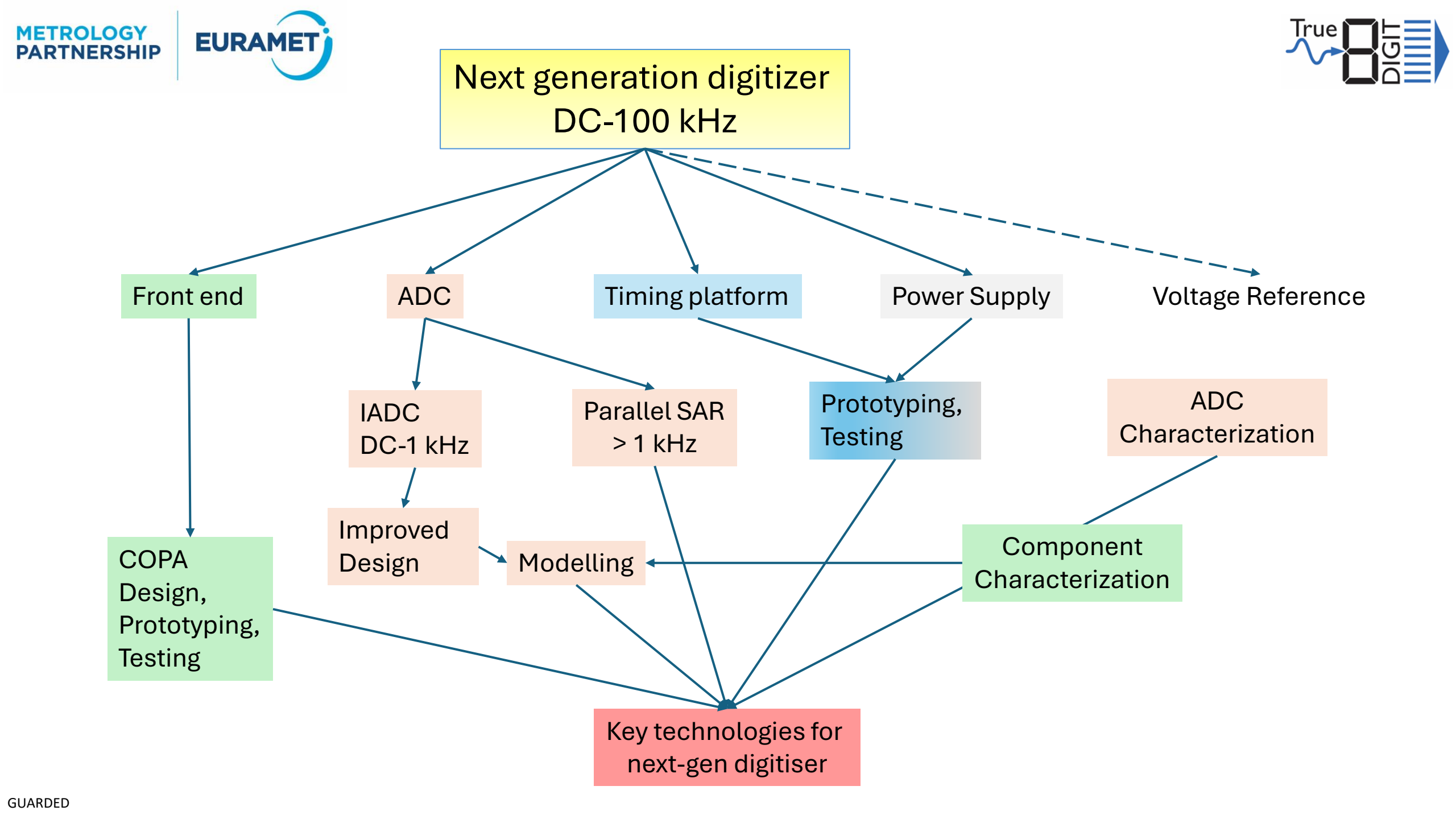
1. To identify and model at least 2 novel metrology grade ADC architectures for the DC to 100 kHz frequency band

2. To assess at least 2 designs for novel amplifiers (composite operational amplifiers for use in IADC and front-end digitizer circuitry

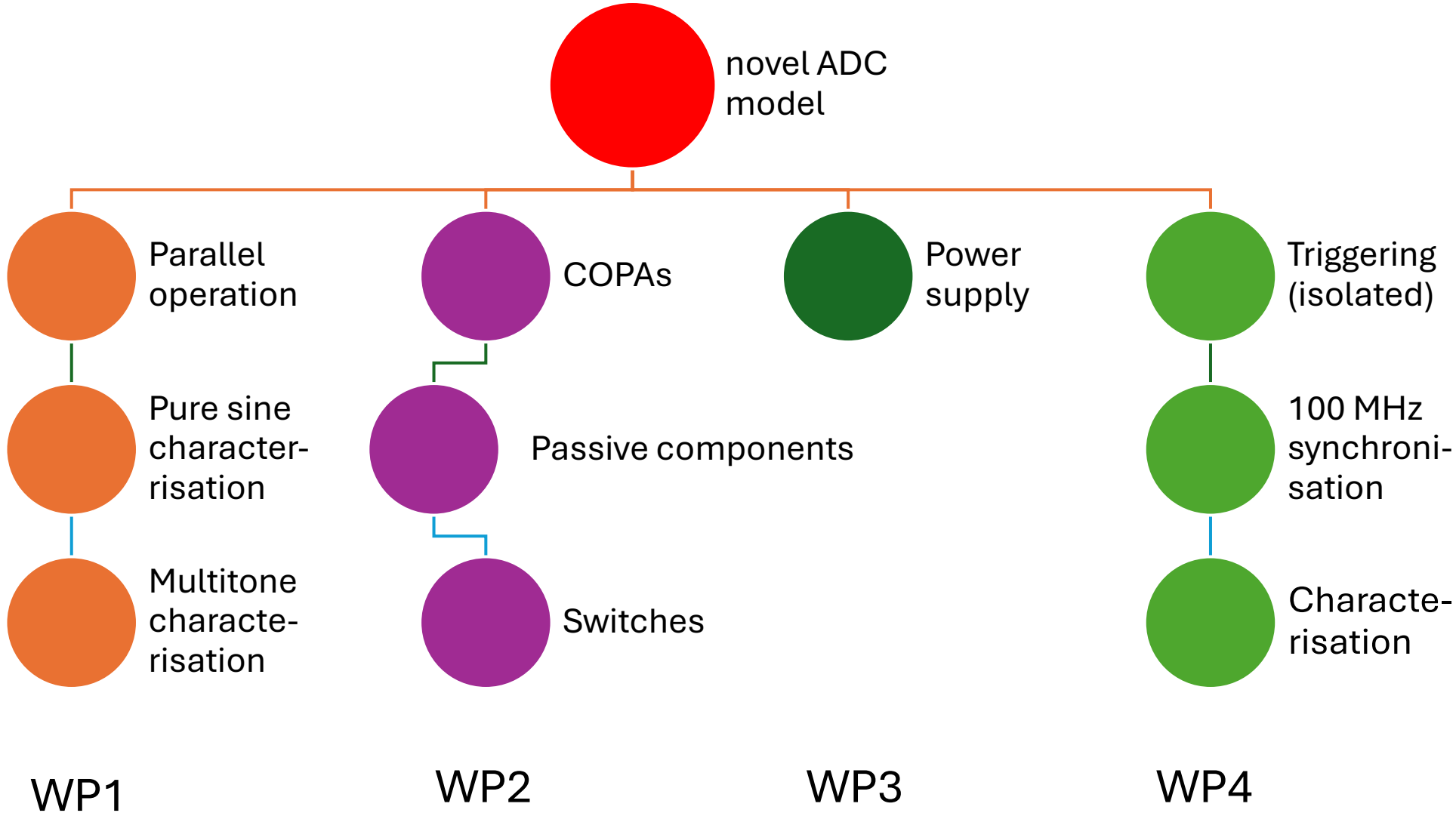
3. To develop metrological methods for characterization of resistors and capacitors for the amplifier's stability, tracking and nonlinear behaviour

4. To design and develop an ultra-quiet and stable low noise mains-powered power supply

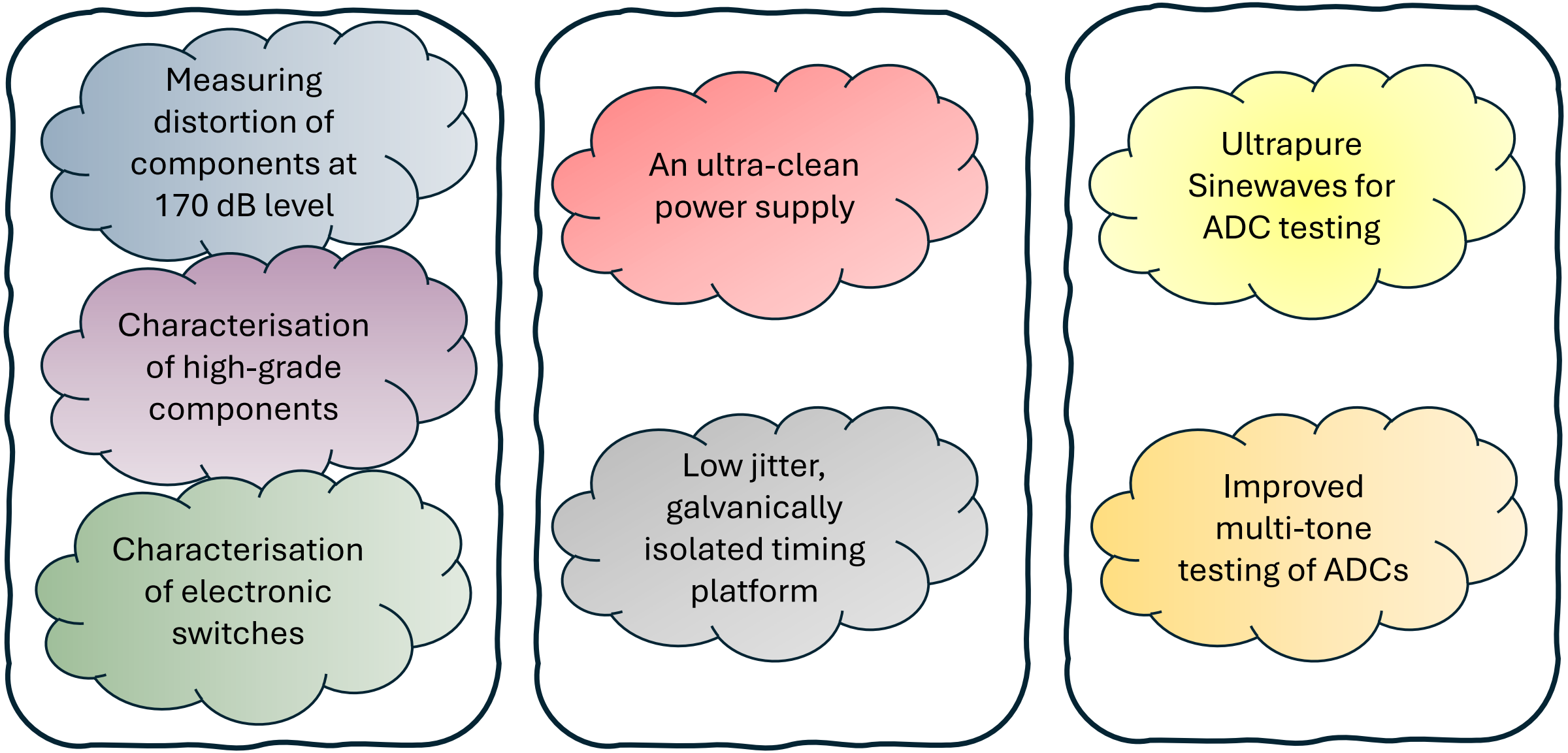
5. To develop a precision (< 50 ps jitter) timing solution for the ADC architectures identified in objective 1,


Next generation digitizer
DC-100 kHz
Front end
ADC
Timing platform
Power Supply
Voltage Reference
IADC
DC-1 kHz
Parallel SAR
> 1 kHz
Prototyping,
Testing
ADC
Characterization
Improved
Design
Modelling
Component
Characterization
COPA
Design,
Prototyping,
Testing
Key technologies for
next-gen digitiser

Project Structure



Project Outcomes - highlights



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Project website

https://true8digit.eu/

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