VSL
National Metrology Institute

IT4PQ
Instrument Transformers for Power Quality

IT4PQ WP2
Approach for an industrial wideband PQ comparator based on synchronized sampling units

Stakeholder workshop
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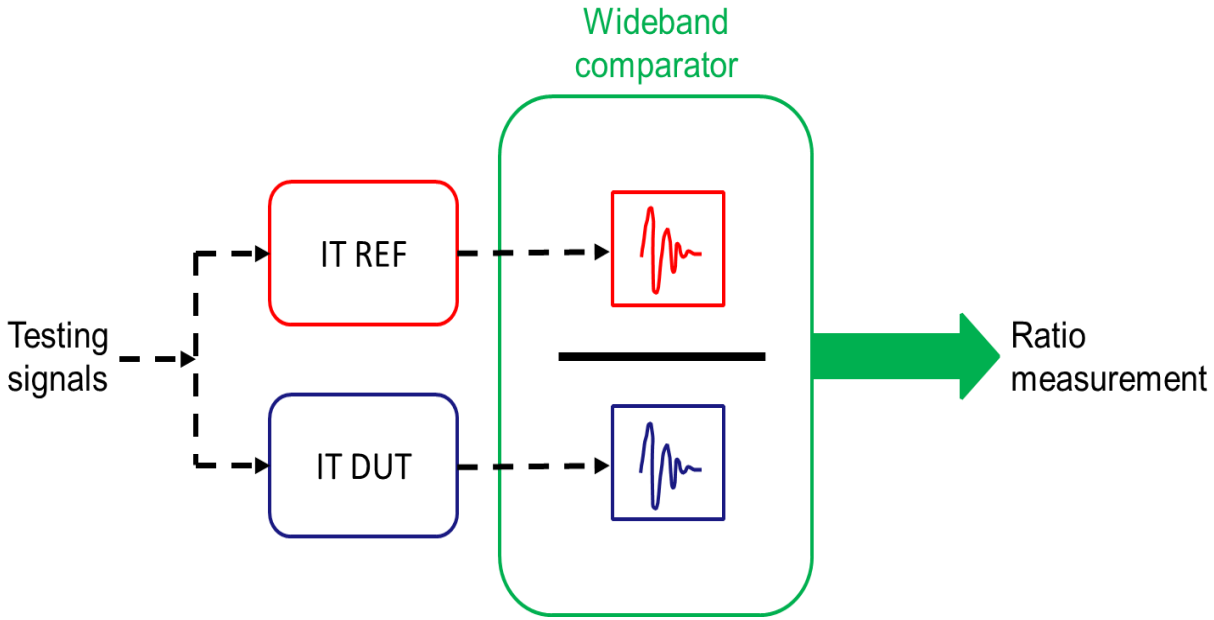
Broadband comparator for IT4PQ

Design and development of a simplified wideband comparator

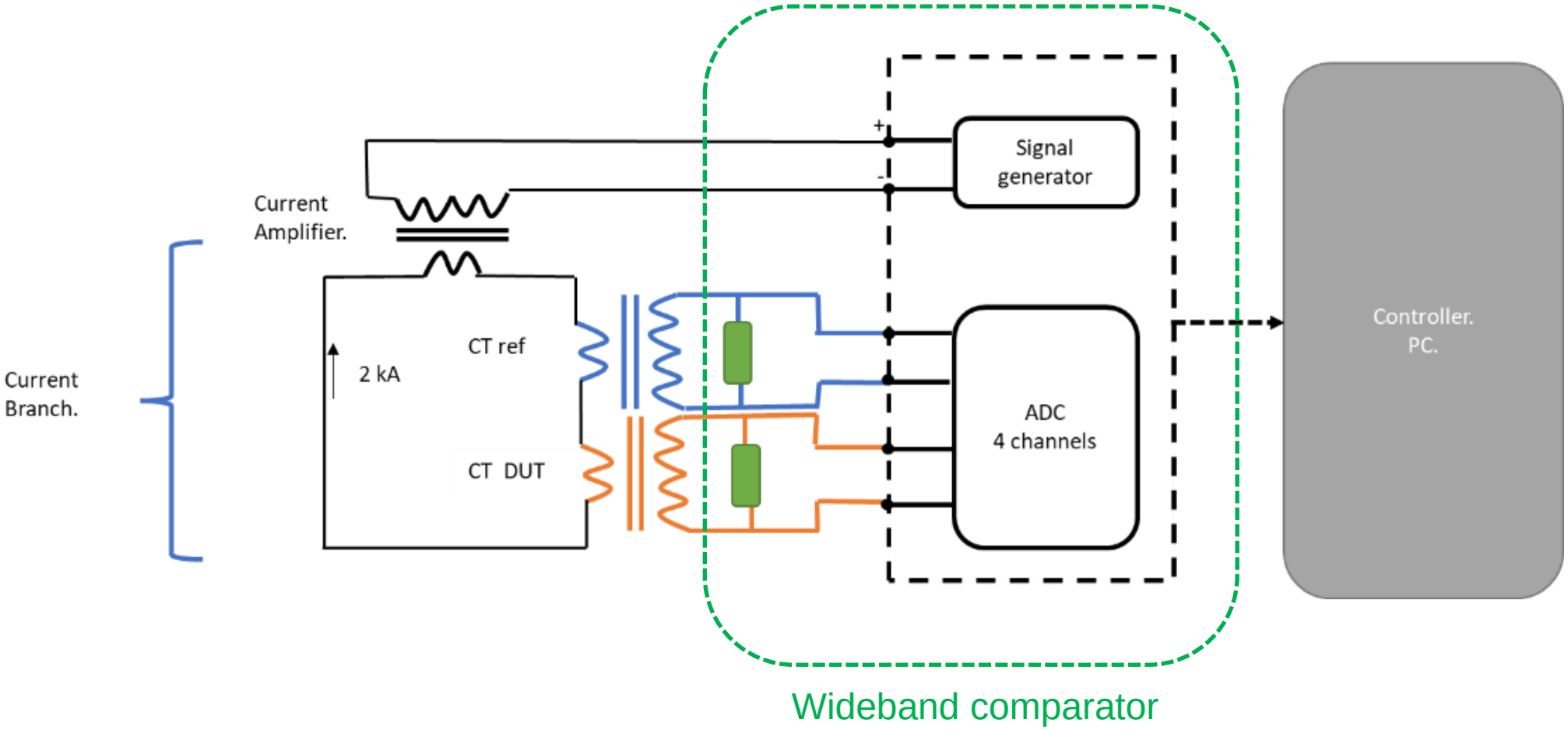


- Based on synchronized units
- For industrial calibrations
- used to compare the outputs of ITs
- For signals in time and freq domain up to 9 kHz

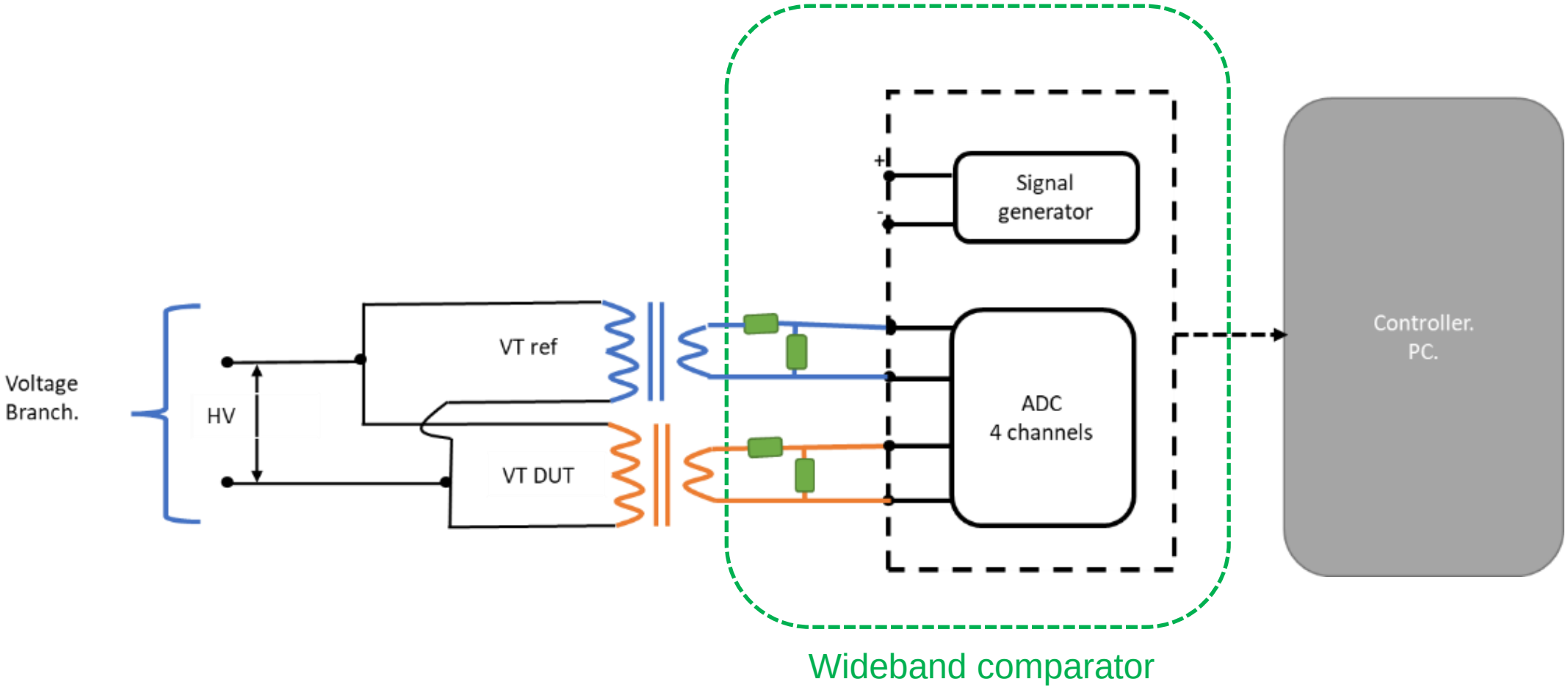
Wideband comparator design criteria

1. Hardware specs and requirements
   - 4 single-ended inputs or 2 differential inputs. (**Synchronized**)
   - Industrial application/onsite measurements.
   - Ideally, current and voltage transducers included.
   - Current range 10 A rms (5 A * 200 %), peak value 20 A.
   - Voltage range 240 V rms (120 V * 200 %), peak value 400 V.
   - Frequency range 0.1 Hz to 9 kHz, preferably DC coupled.
   - Signal generator built-in, but with the possibility of using external signal generators.
   - Operating environmental conditions (0 – 40) ˚C and (10 – 90) % Rh.
   - Compatible with 61326-1:2013 (EMC) and 61010-1:2010 (safety).
2. Uncertainty targets of voltage/current ratio.
   - 10 ppm of nominal amplitude at fundamental frequency .
   - 100 ppm of rated amplitude for 1 kHz single tone harmonics, 500 ppm up to 9 kHz.

Wideband comparator schematic for CTs.

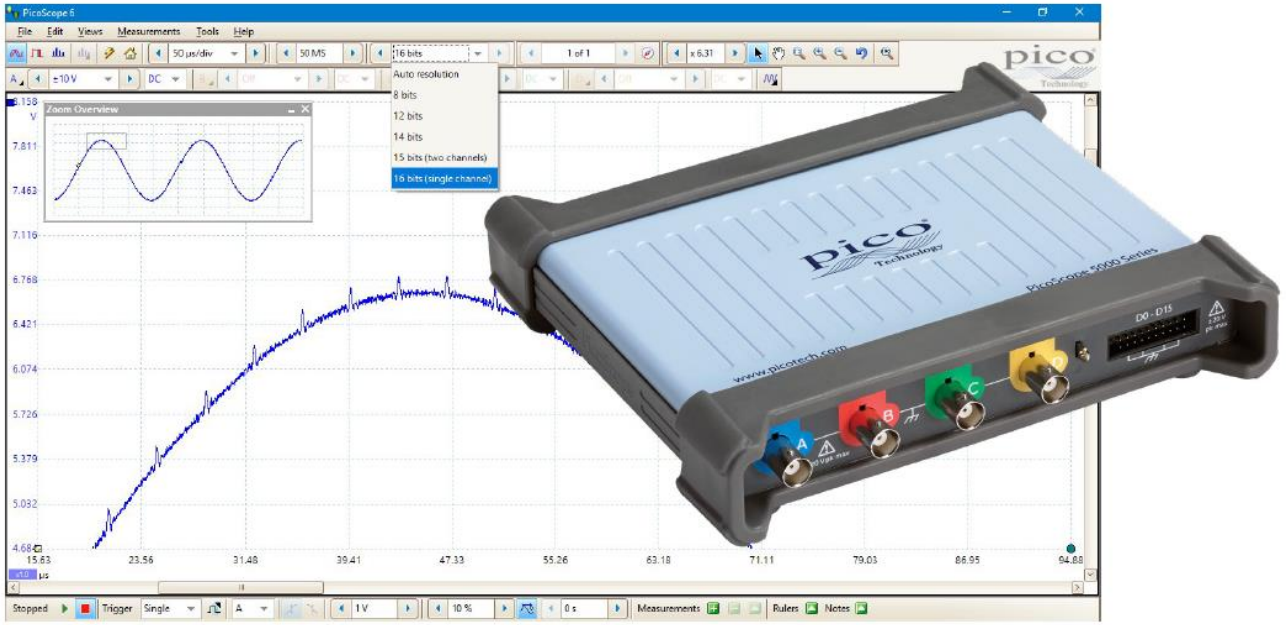


Wideband comparator schematic for VTs.



Selection of the Digitizer: Picoscope 5000

1. 4 inputs or 2 differential, 14-bit, 125 MS/s. 200 MHz bandwidth. VSL has experience with this digitizer.
2. A basic waveform generator included.
   However, the analysis is based on non-synchronized generation and acquisition.
3. Memory 512 MS.



Selection of the Digitizer: Picoscope 5000

1. *Advantages:*
   - High sampling rate.
   - 4 Channels are in the same unit.
   - Compact device.
   - Less expensive choice.
2. *Disadvantages:*
   - Low resolution, 14 bit. Ratio measurement, therefore, resolution less important. Also, this low resolution can be compensated by oversampling.
   - Signal generator buffer size of 32 kS. External signal generator necessary for long signals.
   - Limited input range(only voltage up to 20 V). Extra transducers needed.

Conclusions - Future work

1. We have selected a suitable digitizer.
2. The system will be validated both at VSL and LNE (summer 2022).
3. Onsite demonstration is being planned.
4. Currently, PQ algorithms for processing are being implemented.

Thank you for your attention.