Implementation of PMU Calibration and Certification Laboratory at Texas A&M University

Cheng Qian, Tomo Popovic, Ph.D., Mladen Kezunovic, Ph.D.
Texas A&M Engineering Experiment Station, College Station, TX

TEXAS A&M ENGINEERING EXPERIMENT STATION

Dwight Look College of ENGINEERING TEXAS A&M UNIVERSITY

Objectives

- Automation of test procedures
- Implementation of test plans specified in IEEE Test Suite Specification
- Certification of the Calibration Laboratory with future standards

Motivation

- PMU-based technology is new and products need to be tested and certified
- The interoperability of PMU-based devices is hindered by proprietary features and various synchrophasor estimation methods
- PMU Calibration Laboratory should guarantee conformance of PMUs with the standards

Application

- Testing new PMU algorithms developed through R&D (Fig. 4)
- Testing commercial PMU-based products (Fig.5)

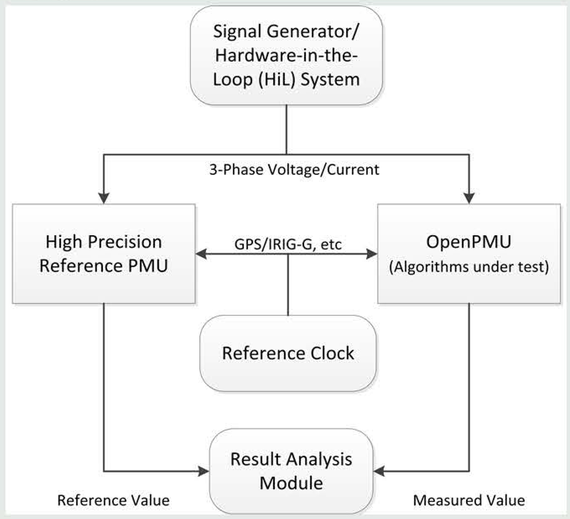

Fig.4 Structure of PMU Calibration System for Algorithm Testing

Test Procedure Automation

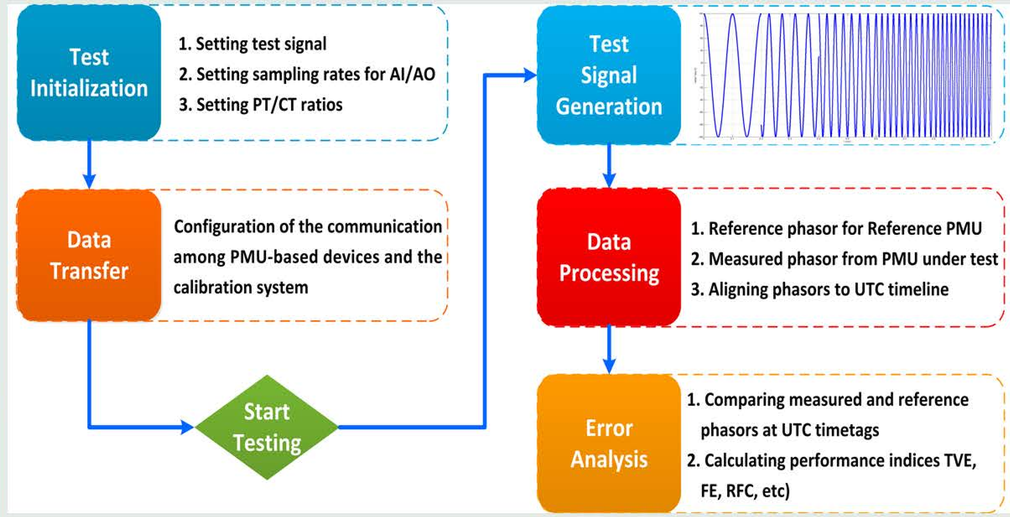

Fig.1 PMU Test Procedure

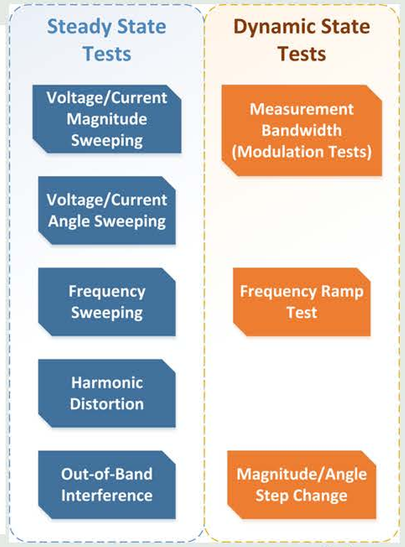

Fig.2 PMU Test Categories [1,2]

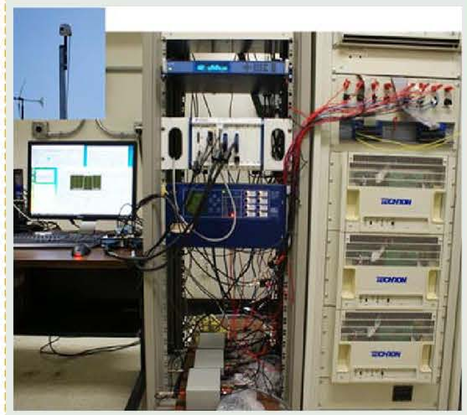

Fig.3 Automated PMU Test System

Calibration Laboratory Setup

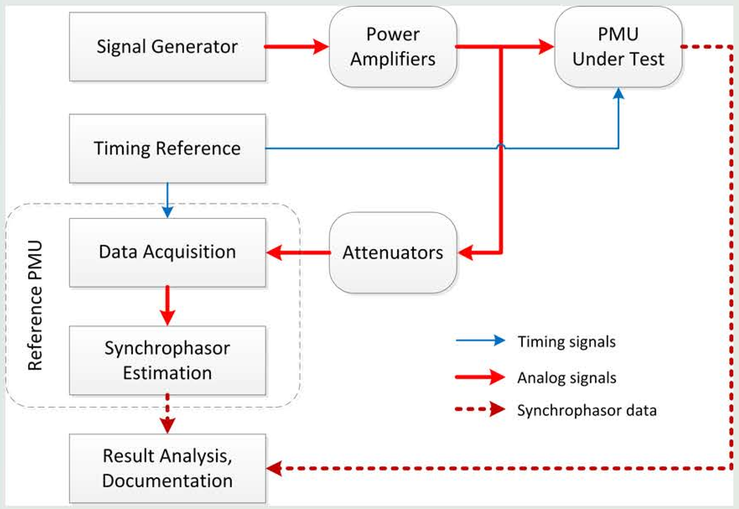

Fig.5 Structure of PMU Calibration System for PMU Testing

- Time Reference: provides UTC time reference
- Signal source and conditioning: generates test signals and performs voltage/current scaling
- Data acquisition: performs A/D conversion, generating sampled signals
- Synchrophasor data interface: provides connection and data transfer within the test system
- GUI interface: provides a console for controlling, monitoring the testing process and collecting test results

Expected Results

An example of test results is shown in Fig. 6. The plots illustrate the type of output that is expected during Frequency Sweeping Test.

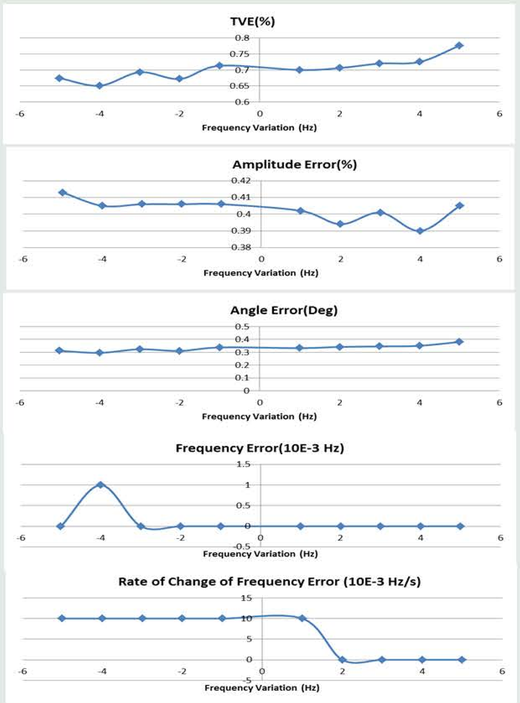

Fig.6 Frequency Test Result

References

[1] IEEE Synchrophasor Measurement Test Suite Specification, Chapter 8: Test Plans
[2] IEEE Standard C37.118.1a-2014. IEEE Standard for Synchrophasor Measurement for Power Systems
[3] ISO/IEC 17025:2005. General Requirements for the Competence of Testing and Calibration Laboratories
[4] ISO/IEC 17065:2012. Requirements for Bodies Certifying Products, Processes and Services