Towards the propagation of AC Quantum Voltage Standards

EMPIR project 14 RPT ACQ-PRO

Project timeline: 2015 – 2018
Partners: CEM,BEV,CMI,FER,GUM,INRIM,IPQ,JV,NPL,PTB,SIQ,TUBITAK
Collaborators: BIPM, SUPRACON
Coordinator: **Javier Díaz de Aguilar,** jdiaz@cem.minetur.es
Website: **http://acqpro.cmi.cz/**

Status of ACJVS in Metrology

A substantial research activity on ACJVS happened in last decade. However current systems are still complicated to construct and operate. Thus huge gap between different NMIs exist. While some of them are among the most advanced in the world, others lack not only AC but also DC quantum voltage standards. Only a few NMIs in Europe have the capability to operate and conduct research in this area. Traceability is maintained by small number of NMI. ACJVS need to be improved and their applications extended so that also industrial calibration laboratories can operate it.

Objectives

The goal of the project is to provide transeuropean access to AC quantum voltage standards, to increase research capacity and to establish the basis for future collaboration between metrological institutes working on AC quantum voltage standards. Objectives are:

- *Transfer of experience and expertise.*
- *Design a new practical ACJVS.*
- *Good practice guide on the use of ACJVS.*
- *Establish collaboration between NMIs.*
- *Individual strategy for NMI development in ACJVS metrology.*

Transfer of experience and expertise

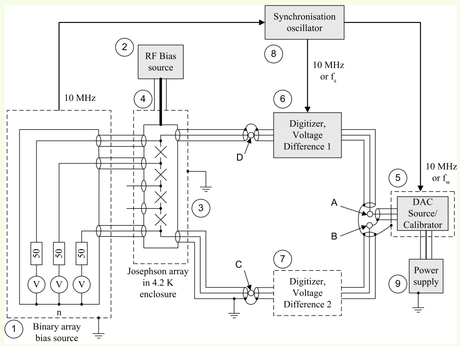
12 research activities have been conducted so the experience with ACJVS was transfered to a number of NMIs. Research have been focused on ADC and DAC, power and impedance measurements, thermal converters calibration, AC voltage source calibration and AC voltmeter calibration.

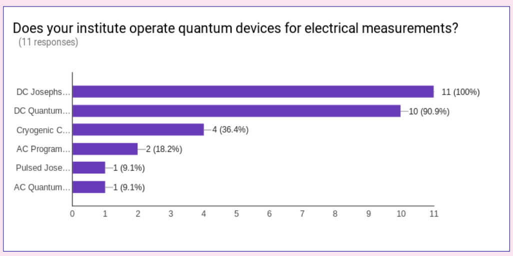
Working groups

A working group on ACJVs cryogenics is being established. It will aim at the development of an European research network on JVS cryogenics, and application of cryocoolers to JVS. It will enable sharing of experiences, tricks and know-how.

Design of a new practical ACJVS

A new ACJVS design have been proposed to fullfill multiple roles. It is based on ultrastable DAC directly corrected by a PJVS to form a quantum traceable waveform generator. The DAC has been built by VTT MIKES Metrology. Furthermore, the new design will be validated by means of a inter-comparison between BIPM, NPL, and PTB. This will serve as a basis for future worldwide bilateral and pilot comparisons of ACQ standards.



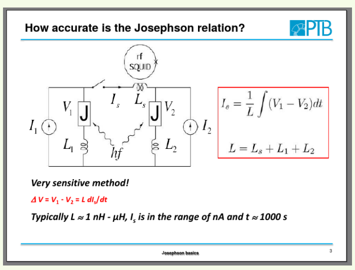


Startup Survey

A questionnaire to collect informations on participants plans and aims have been conducted. One of outcomes is participants interest on practical know-how improvements (input for Best Practice Guide) but not only aimed at calibrations. Participants are willing to tightly cooperate, possibly sharing systems.

Good Practice Guide

A collection of training materials have been compiled and released publicly (webpage). It contains 250 pages focused on ACJVS.
A Good Practice Guide on the use of AC quantum voltage standards is in development and will focus on instruments, configuration, cryogenics and how to use.



Everyone is welcome to collaborate: suggestions for the best practice guide, participate on the creation of working group, comment the comparison, ...