

Bilag 2

Kortfattet dansksproget projektbeskrivelse egnet til publikation på dansk EMPIR hjemmeside

2017 Research Potential 17RPT04	A versatile electrical impedance calibration laboratory based on digital impedance bridges VersiCaL	
Projektets formål Det overordnede mål med VersiCaL projekt er at forbedre den europæiske infrastruktur indenfor måling af elektrisk impedans i audio området (100Hz – 10 kHz). Dette opnås ved at udvikle alsidige, overkommelige måleopsætninger (digitale impedans målebros) til realisering af induktansskalaen i området fra 1 mH til 10 H samt kapacitansskalaen i området fra 1 nF til 10 µF. Arbejdet vil udnytte resultaterne af tidligere EMRP-finansieret forskning inden for dette område. Målet med projektet er at imødekomme behovene for mere nøjagtig måling af kapacitans- og induktans standarder hos mindre NMIs samt større kalibreringscentre. Ønsker du mere information kan du besøge projektets hjemmeside: https://sites.google.com/inrim.it/versical Projektet er delt op i 5 arbejdsopgaver: WP 1 Impedance measurement infrastructure WP 2 Development of bridges and their validation WP 3 Development of uncertainty tool and good practice guide WP 4 Creating impact WP 5 Management and coordination		
Antal deltagere 11	Projektets budget ¹ 444 999.50 EUR	Person-måneder 81.8
Dansk deltager Trescal A/S	Trescal Budget ¹ 93 996 EUR	Person-måneder 11
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Trescals bidrag: Trescal deltager i alle 5 arbejdsopgaver. Trescals primære opgave er at udvikle og opbygge en sampling baseret 4-terminal-par impedans målebros som kan realisere kapacitans- og induktansskalaerne ud fra et sæt modstande med kendt AC værdier. Trescal vil også arbejde med usikkerhedsberegninger ved brug af Monte Carlo simuleringer. Målet er at Trescal ved projektets afslutning skal være i stand til at indsende nye nationale CMC'er på impedansområdet.		

¹ Angives som EU finansiering (direct costs + 5 %)

Trescal er arbejdspakkeleder for WP 4 – Creating Impact

Konkret er Trescals milepæle:

- A1.1.1: Trescal will perform a survey of their institutes and determine a list of calibration services for customers, in the field of impedance metrology, that at the present time they a) do not cover with any CMC claims or b) they cover with CMC claims that require calibration of standards by another NMI or by BIPM.
- A1.1.2: Trescal will review the Calibration and Measurement Capabilities, published in the KCDB by European NMIs in the CCEM Classification Branch 4. Impedance: up to the MHz range, to determine and specify a basic but competitive set of target CMC declarations for electrical inductances (in the range 1 mH - 10 H) and capacitance (1 nF - 10 μ F), with uncertainty claims (in the 10^{-5} - 10^{-6} range) suitable to be developed within a calibration laboratory using digital impedance bridges and appropriate for primary dissemination towards industry and calibration centres.
- A1.1.3: Trescal will determine proper calibration traceability chains to national standards (e.g., DC resistance) or quantum standards (e.g. quantum Hall effect) which are already available in their laboratories, that will allow the declaration of the basic CMC set for Branch 4 as determined in A1.1.2. The maximum uncertainties allowed corresponding to each step in the traceability chain will be also determined. INRIM will collate the information and write a report on the traceability chains.
- A1.3.1: Taking account of stakeholder needs (identified in A1.1.1) and available equipment Trescal will produce outline schemes for the realisation of impedance scales in the range 1 nF to 10 μ F and 1 mH to 10 H based on digital bridge techniques. These schemes will contain bridge operating principles, basic specifications, and references to published material.
- A1.3.2: Trescal will provide to INRIM the specifications of the algorithms and programs which are required to run, with a proper level of automation, the bridges described in A1.3.1. The collected specifications will constitute one of the inputs to activity A2.1.2 to develop a general automated software application for the reference and other bridges.
- A1.3.3: Taking into consideration the equipment available to them Trescal will identify suitable sets of artefact standards, and their specifications, required to maintain the quantities and scales corresponding to the traceability chains identified in A1.1.3. The environmental specifications, thermostating requirements, and calibration periodicity will also be considered.
- A2.1.4: Using inputs from Task 1.1 (A1.1.1-A1.1.3), and Task 1.3 (A1.3.1-A1.3.6) on the determination of partner's needs and selection of suitable techniques and bridges and knowledge obtained during realisation of the reference model bridge in A2.1.2, Trescal, with support from Metroserit and CMI, will modify existing impedance bridges for L and C scales. Trescal will attempt to save purchase costs by using parts already available to them and will aim to extend the frequency range achieved in A2.1.2 below 120 Hz and above at least 2 kHz. Detailed goal specifications will depend on inputs from Task 1.1.
- A2.3.1: With support from CMI, Trescal will identify possible ways of validating their newly modified bridge from Task 2.1, considering internally maintained reference standards with internal or external traceability identified in A1.3.3 and A1.3.4, or bilateral interlaboratory comparisons.
- A3.1.1: INRIM, with support from Trescal, among others, will produce guidance documentation on modelling of the measurement uncertainty for the realisation of the inductance scale in the range 1 mH - 10 H, with uncertainties at the level of 10^{-5} at frequencies in the range 120 Hz - 1592 Hz and the capacitance scale in the range 1 nF - 10 μ F, with uncertainties at the level of 10^{-6} at frequencies in the range 120 Hz - 1592 Hz.
- A4.1.2: Trescal will code a public website.

- A4.2.5: Trescal will receive training and upskilling via secondment to INRiM and CMI. Trescal will host a secondment of other partners.
- A4.3.2: Trescal will develop a national strategy for the long-term operation of the capacity developed, including regulatory support, research collaborations, quality schemes and accreditation. They should also develop a strategy for offering calibration services. The individual strategies will be discussed within the consortium and with other EURAMET NMIs/DIs, to ensure that a coordinated and optimised approach to the development of traceability in this field is developed for Europe as a whole.
- A4.3.3: Using their new digital bridges validated in A2.3.2 and the software tool developed in A3.1.2, Trescal will develop improved draft Calibration and Measurement Capabilities (CMCs) for electrical inductances (in the range 1 mH - 10 H) and capacitance (1 nF - 10 μ F), with uncertainty claims (in the 10^{-5} - 10^{-6} range).