

## Characterization of Capacitance Standards at High Frequency at National Physical Laboratory, India

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**Received:** 03 January 2017 / **Accepted:** 30 October 2017 / **Published online:** 22 November 2017

**Abstract:** Four-terminal-pair air dielectric capacitance standards with nominal values of 1000 and 100 pF have been characterized up-to 10 MHz at NPLI. The procedure employed involves the determination of all capacitive and inductive parameters of the simple electrical-equivalent-circuit-model of these capacitance standards. The effective capacitance of each standard has also been computed as a function of frequency from 1 kHz to 10 MHz. The capacitive parameters have been measured at 1 kHz while inductive parameters have been estimated up to 10 MHz using linear regression analysis by employing least-squares-approximation method. The paper highlights the computation procedure of impedance terms which further requires the determination of various capacitive and inductive terms involved in the calculation of effective capacitance. The method employed for the estimation of inductive parameters as a function of frequency is also discussed in detail. The present work will help in the establishment of metrological traceability of capacitance standards at highfrequency at NPLI which will be further used to establish calibration facility for LCR meters and RF impedance analyzers for capacitance parameter up-to 10 MHz.

**Keywords:** Capacitance standards; High frequency; Impedance-matrix; Electrical equivalent circuit model; Inductive; Capacitive