Calibration of RF Power Meters based on an Isothermal Method

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Calibration of high frequency power meter with high power input is very important and essential in the development of measurement techniques. Popular methods of measuring power transfer the signal power into other forms of energy such as direct current, potential difference, resistance and heat temperature, and employ a signal bridge to extract the corresponding power level. Among these, heat temperature that indicates a heat power is considered most accurate and reliable parameter to indicate the power level. A calibration procedure and system based on this method is thus employed to provide accurate calibration of RF power meters at high frequency and high power levels. In particular, an isothermal method, which tends to provide accurate measurement of heat power and was firstly employed to measure the efficiency at lower power level, is employed in the system. In the application of this isothermal method to power measurement is found to be very accurate at lower power level, and cause some uncertain factors. In order to improve the accuracy and stability of this method at high power, a RF network analyzer is first employed to study the effects of the calorimeter caused by the mismatch of transmission lines. Correction factors are then obtained based on the measured reflection coefficients, which are then employed in the calibration procedure to provide accurate measurement of actual power levels. Note that an automatic control system is also implemented to further assure the stability. System structure of the calibration procedure as well as its performance evaluations will be presented and validated.