

Quantum-Based Resistance Metrology – topical aspects of metrology and potential of new standards

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Scope of the talk is to elucidate relevant aspects of modern resistance metrology, being based on quantum electrical effects, and its relation to and quest for novel ‘Dirac cone’ material systems for advanced applications and for new standard devices in resistance metrology based on the quantum Hall effect.

As introduction from a metrologist’s perspective, the development and evolution of the International System of Units (SI) are summarized, with emphasis on the role of the quantum electrical effects, i.e. the quantum Hall and the Josephson effects for primary ohm and volt realizations, respectively.

Main aspects of quantum resistance metrology based on the quantum Hall effect are presented with focus on state-of-the-art standard devices and measurement methodology.

Topical developments in the fields of novel device architectures and material systems for advanced quantum Hall standards and their potential for future metrology applications are discussed, together with remaining challenges.
