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Matrix method analysis of quantum Hall effect device connections

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The modelling of electrical connections of single, or several, multiterminal quantum Hall effect (QHE) devices is relevant for electrical metrology: it is known, in fact, that certain particular connections allow i) the realization of multiples or fractions of the quantised resistance, or ii) the rejection of stray impedances, so that the configuration maintains the status of quantum standard. Ricketts-Kemeny and Delahaye equivalent circuits are known to be accurate models of the QHE: however, the numerical or analytical solution of electrical networks including these equivalent circuits can be difficult. In this paper, we introduce a method of analysis based on the representation of a QHE device by means of the \emph{indefinite admittance matrix}: external connections are then represented with another matrix, easily written by inspection. Some examples, including the solution of double- and triple-series connections, are shown.

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