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**Short title:** One kind of inverse eigenvalue problems and its applications in quaternionic quantum mechanics.

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**Review text:**

In a fairly vaguely specified global context of physics a motivation is found for two problems in the manipulation with matrices over quaternions. The first one is an inversion of the usual problem of determination of eigenvalues (now, eigenvectors and eigenvalues are given), the second one is its certain least square extension. The necessary and sufficient conditions of the existence of the solutions are found, and the explicit formulae and a numerical illustration are provided.