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Borel chromatic number of quadratic graphs.

For a field F and a quadratic form Q defined on an n-dimensional vector space V over F, let G_Q, called the quadratic graph associated to Q, be the graph with the vertex set V where vertices u, w in V form an edge if and only if $Q(v-w) = 1$. Quadratic graphs can be viewed as natural generalizations of the unit-distance graph featuring in the famous Hadwiger-Nelson problem. In the present talk, we will prove that for a local field F of characteristic zero, the Borel chromatic number of G_Q is infinite if and only if Q represents zero non-trivially over F. The proof employs a recent spectral bound for the Borel chromatic number of Cayley graphs, combined with an analysis of certain oscillatory integrals over local fields. As an application, we will also answer a variant of question 525 proposed in the 22nd British Combinatorics Conference 2009. This is a joint work with Keivan Mallahi Karai.