Real lines on random cubic surfaces

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It is a classical result in algebraic geometry that there are exactly 27 complex lines on a smooth cubic surface in three-dimensional projective space. If the cubic surface is defined by a real equation there could be generically 3, 7, 15 or 27 lines. In this context it is natural to ask for the expected number of real lines, by letting the defining equation be a random polynomial.
There is a one dimensional family of probability distributions on the space of polynomials which are invariant under orthogonal change of variables: we give an explicit formula for the expectation with respect to any distribution of this type.