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On surfaces with $p_g = q = 1$ and non-ruled bicanonical involution

CARLOS RITO

Abstract. This paper classifies surfaces S of general type with $p_g = q = 1$ having an involution i such that S/i has non-negative Kodaira dimension and that the bicanonical map of S factors through the double cover induced by i.

It is shown that S/i is regular and either: a) the Albanese fibration of S is of genus 2 or b) S has no genus 2 fibration and S/i is birational to a $K3$ surface. For case a) a list of possibilities and examples are given. An example for case b) with $K^2 = 6$ is also constructed.

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