

COUNTING POINTS ON HILBERT SCHEMES OVER FUNCTION FIELDS

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ABSTRACT: We consider the Hilbert scheme $\text{Hilb}^2\mathbb{P}^2$ defined over a global field K of characteristic greater than 2. This variety is precisely the desingularisation of the symmetric product $\mathbb{P}^2 \times \mathbb{P}^2 / \mathfrak{S}_2$, where \mathfrak{S}_2 is the symmetric group of 2 elements and acts on $\mathbb{P}^2 \times \mathbb{P}^2$ by permuting the factors. We give an asymptotic formula for the number of K -points of bounded height on $\text{Hilb}^2\mathbb{P}^2$ and show that by eliminating an exceptional thin set, the refined version of Manin's conjecture holds. Moreover, we extend the analogy between integers and 0-cycles on a variety V over a finite field to 0-cycles on a variety V over K and give a quick application of our result in the case when $V = \mathbb{P}^2$.