

A TRANSITION MATRIX FOR TWO BASES
OF THE INTEGRAL COHOMOLOGY OF THE HILBERT
SCHEME
OF POINTS IN THE PROJECTIVE PLANE

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ABSTRACT

This work is devoted to comparing two integral bases for the integral cohomology of the Hilbert scheme of points in the projective plane. Let X be a smooth complex projective surface. One of the more interesting moduli spaces parameterizing objects associated with X is the Hilbert scheme of points, denoted $X^{[n]}$, which parameterizes all 0-dimensional closed subschemes of length n in X . W. Wang, Z. Qin and W.P. Li used Heisenberg algebra operators to construct an integral basis of the integral cohomology of $X^{[n]}$ whenever X is a smooth projective surface with vanishing odd Betti numbers. On the other hand, a work by G. Ellingsrud and S.A. Strømme gives a cellular decomposition of the Hilbert scheme of points on the projective plane. From this work, we have a second integral basis for the integral cohomology of $X^{[n]}$ when $X = \mathbb{P}^2$. We compare the elements of these two bases and ultimately give the upper triangular transition matrix from one basis to the other.