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Automorphisms of algebraic K3 susfaces which act trivially on Picard groups

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§ 0. Introduction.

In this paper we give a correction and a proof of the result announced in [2]. Let X be an algebraic K3 surface defined over $\boldsymbol{C}$. The second cohomology group $H^2(X, \boldsymbol{Z})$ has a canonical structure of a lattice of rank 22 induced from the cup product. Let S_X be the Picard group of X. Then S_X admits a structure of sublattice of $H^2(X, \boldsymbol{Z})$. Let T_X be the orthogonal complement of S_X in $H^2(X, \boldsymbol{Z})$ which is called a *transcendental lattice* of X. Put $H_X = \mathrm{Ker}\{\mathrm{Aut}(X) \to O(S_X)\}$, where $O(S_X)$ is the group of isometries of the lattice S_X. Nikulin [3] proved that H_X is a finite cyclic group of order m and $\varphi(m)$ is a divisor of the rank of T_X, where φ is the Euler function. We now give a correction of the result in [2] as follows:

THEOREM. *Let X be an algebraic K3 surface and m_X the order of H_X. Assume that the lattice T_X is unimodular (i.e. $det(T_X) = \pm 1$). Then*

(i) *m_X is a divisor of* 66, 44, 42, 36, 28 *or* 12.

(ii) *Suppose that $\varphi(m_X) = rank(T_X)$. Then m_X is equal to either* 66, 44, 42, 36, 28 *or* 12. *Moreover for m=66, 44, 42, 36, 28 or 12, there exists a unique (up to isomorphisms) K3 surface with $m_X = m$.*

In [2], on page 358, line 9, the statement "the order of the restriction …" is false, and the Vorontsov's result [12] is correct. In [12], Vorontsov proved the result (i) of the above Theorem. In case T_X is non unimodular, he also proved a similar result as the above theorem (see Corollary 6.2). His method is based on the theory of a cyclotomic field $\boldsymbol{Q}(m)$. Here we use mainly the theory of elliptic surfaces due to Kodaira [1] and Nikulin's results on finite automorphisms of K3 surfaces [3], [4]. Also we give examples of such K3 surfaces. Some of them are independently constructed by I. Dolgachev, K. Saito [6], T. Shioda, and the author.

In Section 1, we recall the result of Nikulin [3] on automorphisms of K3 surfaces. Section 2 is devoted to some remarks on elliptic pencils on K3 sur-