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Semistable sheaves in positive characteristic. (English) Zbl 1080.14014
Ann. Math. (2) 159, No. 1, 251-276 (2004).

In this paper semistable vector bundles over projective schemes are investigated. The fact that these bundles form bounded families was known so far only in characteristic zero. The aim of the paper is twofold: giving restriction theorems for vector bundles (or pure sheaves) in arbitrary characteristic, and proving the boundedness of the family of slope semistable sheaves on projective varieties over Noetherian rings.

The main results are the restriction theorems 3.1 and 5.2, and the boundedness results 4.2 and 4.4. Theorem 3.1 gives a weak restriction theorem bounding the Harder-Narasimhan polygon of the restriction $E|_D$ of a vector bundle E to a general divisor in a very ample linear system in terms of the Harder-Narasimhan polygon of E . Using this result the boundedness of μ -semistable sheaves on a projective scheme over an Noetherian base scheme is derived. Furthermore, the author affirmatively answers a question of Maruyama about boundedness in mixed characteristic. In section 5 new effective restriction theorems in arbitrary characteristic are given. In the last section semistable sheaves in positive characteristic are investigated. In particular it is proved that tensor products of strongly semistable sheaves are strongly semistable too (Theorem 6.1). The results 6.2–6.4 concern the slope of subsheaves of the cotangent bundle and its Frobenius pull backs.

Reviewer: [Georg Hein \(Berlin\)](#)

MSC:

- [14D20](#) Algebraic moduli problems, moduli of vector bundles
- [14D22](#) Fine and coarse moduli spaces
- [14F05](#) Sheaves, derived categories of sheaves, etc. (MSC2010)

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semistable vector bundles; boundedness; moduli space

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