

# AN ADAMS-RIEMANN-ROCH THEOREM IN ARAKELOV GEOMETRY

DAMIAN ROESSLER

## CONTENTS

1. Introduction.....	61
2. The $\lambda$ -structure of arithmetic $K_0$ -theory.....	64
3. The statement.....	65
4. The $\gamma$ -filtration of arithmetic $K_0$ -theory.....	68
5. Analytical preliminaries.....	72
5.1. The higher analytic torsion.....	72
5.2. The singular Bott-Chern current.....	76
5.3. Bismut's theorem.....	79
6. An Adams-Riemann-Roch formula for closed immersions.....	81
6.1. Geometric preliminaries.....	81
6.1.1. The deformation to the normal cone.....	81
6.1.2. Deformation of resolutions.....	82
6.2. Proof of the Adams-Riemann-Roch theorem for closed immersions.....	83
6.2.1. The case $k = 1$ .....	83
6.2.2. A model for closed embeddings.....	86
6.2.3. The deformation theorem.....	90
6.2.4. The general case.....	100
7. The arithmetic Adams-Riemann-Roch theorem for local complete intersection p.f.s.r. morphisms.....	101
8. The arithmetic Grothendieck-Riemann-Roch theorem for local complete intersection p.f.s.r. morphisms.....	121

**1. Introduction.** In this paper, we investigate relative Riemann-Roch formulas for the  $\lambda$ -operations acting on Grothendieck groups “compactified” in the sense of Arakelov geometry. Let  $Y$  be a quasi-projective scheme over  $\mathbf{Z}$  that is smooth over  $\mathbf{Q}$ . We call such a scheme an arithmetic variety. Following [20, II], one can associate to  $Y$  an arithmetic Grothendieck group  $\tilde{K}_0(Y)$ , whose generators are differential forms and vector bundles on  $Y$  equipped with hermitian metrics on the manifold  $Y(\mathbf{C})$  of complex points of  $Y$ . The group  $\tilde{K}_0(Y)$  is related to the Grothendieck group  $K_0(Y)$  of vector bundles of  $Y$  via the

Received 30 May 1996. Revision received 26 June 1997.

1991 *Mathematics Subject Classification*. 14G40, 14C40, 19E08.