



复旦大学数学科学学院 数学综合报告会

报告题目: **Negative Weight Derivation and Rational Homotopy Theory**

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摘要: In the spring of 1976, Halperin proposed his famous conjecture in the rational homotopy seminar in Lille. If F is an elliptic space with positive Euler characteristic and $F \hat{\rightarrow} E \hat{\rightarrow} B$ is a Serre fibration of simply connected spaces, then the Serre spectral sequence for this fibration collapses at E_2 term. This conjecture remains open. Meier proved that collapsing of the Serre spectral sequence is closely related to vanishing of derivations of the cohomology algebra of F . In this paper, we formulate two conjectures. The first conjecture generalizes Halperin Conjecture in that the fiber F is no longer required to be an elliptic space with positive Euler characteristic. Conjecture I: Suppose the cohomology algebra of X is a finite dimensional commutative positively graded algebra of the form $R = \mathbb{C}[x_1, \dots, x_n]/(f_1, \dots, f_m)$. If the weight of each x_i is a positive even integer and weight degree of each f_i is bounded below by a suitable constant C (The constant C depends only on weights of x_1, \dots, x_n), then the Serre spectral sequence of any fibration with fiber X collapses. Conjecture I is a consequence of the following Conjecture II. Conjecture II: Let $R = \mathbb{C}[x_1, \dots, x_n]/(f_1, \dots, f_m)$ be a finite dimensional commutative positively graded algebra. If weight degree of each f_i is bounded below by a suitable constant C (The constant C depends only on weights of x_1, \dots, x_n), then all derivations of negative degree of R vanish. We prove recently that Conjectures I and II are true. This is the joint work with HAO CHEN, AND HUAI QING ZUO.

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