

様式 2 帰国報告書 (ITP Research Report)

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Research Report of JSPS-ITP

(The international sending-elevating project for young mathematicians based on singularity, topology and mathematical analysis: Hokudai model)

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Period of ITP-Stay: From September 1, 2009 to August 31, 2010

Research Report: I visited the University of Michigan for a year, from September 2009 to August 2010. This report consists of three parts; on the activity I did there, on my study, and on the result I got there. Here, I would express my thanks to researchers, secretaries involved in ITP(International Training Program) to give me a chance of going to the University and to assist me before and during my visit.

I joined some regular seminars every week; Algebraic Geometry Seminar, for researchers, for students, and for young researchers, and Commutative Algebra Seminar. After seminars, I talked to various members of the seminar. In particular, I discussed my interest with those who study near my research area. In May, 2010, there was an international conference on Frobenius splitting at the university, so I was able to discuss with many specialists. Most Japanese mathematicians in my research area also attended the conference. I had an un-official seminar about my improvements with them.

Let me note my research problem. My research area is an intersection between singularity theory in characteristic zero and commutative ring theory in positive characteristic. The main interest is an invariant of a ring of positive characteristic and its ideal. It is defined via the Frobenius map of the ring and called the F-pure threshold. On the other hand, F-pure threshold seems a positive characteristic analogue of the log canonical threshold, which is an invariant in characteristic zero. Indeed, these two invariants have similar properties, and they coincide each other via reduction to some good prime numbers. However other properties do not satisfy for F-pure thresholds, although they do for log canonical thresholds. That is my motivation. I have tried refining the definition of it not to encounter this difference.

Let R be a ring of positive characteristic, I its ideal, and t be a positive rational number. The F-purity is a class of singularities for the combined information (R, I, t) defined via the Frobenius map of the ring. The F-pure threshold of a pair (R, I) is the upper bound of positive rational numbers t satisfying a combined information (R, I, t) is F-pure. Therefore I

need to refine the definition of the F-purity of the combined information. When the F-pure threshold of a pair (R, I) do not satisfy the property, which I note above, its denominator is always divided by the characteristic p of R . Hence I focused the p -adic valuation of a rational number t . I added one step in the algorithm measuring F-purity for a combined information (R, I, t) . This step is given by considering the p -adic valuation of t . This new definition is like the original definition of F-purity in most cases. In particular, it coincides with the original one when the denominator of t is not divided by p . Moreover, for known examples, I observed that my problem does not appear, if I replaced the original definition of F-purity with the new one. After I came back to Japan, I gave further refinement of the definition of F-purity, and proved that the new definition was able to avoid my problem when we consider the polynomial rings and its monomial ideals. Some researcher in Michigan was interested in my study, and we have been contacting each other since then. Finally, this research might be a joint work with him.