Résumés/ Abstracts

F. Breuer "Galois representations and Drinfeld modular polynomials"

Abstract : I will report on joint work with Hans-Georg Rueck. We study the Galois action on torsion modules of the "generic" Drinfeld $F_q[T]$- module of rank r, and show that the resulting Galois representation is surjective in most cases. We achieve this by studying the Galois action on Drinfeld modular polynomials of rank r, which can then be studied analytically. If I have time, I will also briefly show Kronecker-type congruences for these modular polynomials.

S. David "Points de petite hauteur de Néron-Tate"

Résumé : Une conjecture de Lang (sur les courbes elliptiques), généralisée par Silverman (sur les variétés abéliennes) affirme que la hauteur de Néron-Tate d'un point d'ordre infini d'une variété abélienne est au moins égale, à une constante multiplicative près à la hauteur différentielle de la variété abélienne sous-jacente. Après avoir évoqué le cas des corps de nombres, nous nous concentrerons sur les variétés abéliennes définies sur un corps de fonctions (travail en cours avec A. Pacheco).

E. U. Gekeler "Goss polynomials vs. Eulerian polynomials : Zero distribution and consequences for modular forms"

Abstract : Goss polynomials provide a function field analogue of classical Eulerian polynomials (not to be confused with "Euler polynomials"). Their respective arithmetics govern the "q-expansions" of Eisenstein series for the full modular group $GL(2, F_q[T])$ resp. $SL(2, \mathbb{Z})$ and for their principal congruence subgroups. We discuss some common features : distribution of the zeroes of these polynomials, and implications for modular forms. This is another beautiful instance of "far from obvious" analogies between function and number field arithmetic.

D. Logachev "Abelian varieties with multiplication by imaginary quadratic fields : results coming from the analogy with Anderson T-motives"

Abstract : It is known that an Anderson T-motive M of rank r and dimension n having the nilpotent operator N equal to 0 is the functional field case analog of an abelian variety A over C with multiplication by an imaginary quadratic field K (abbreviation : MIQF), of dimension r and of signature $(n, r-n)$. This analogy permits us to get two results for A : 1. If M is uniformizable then analytically $M = C_\infty^n/L$ where L is a $F_q[\theta]$-lattice of dimension r. In the number field case clearly there is no r-dimensional lattices in C^n, but we can show that the set of maps $O_K^r \to C^n$ (where C^n is the "positive" part of C^r) — its image is an analog of the lattice — is, roughly speaking, in 1 – 1 correspondence with the set of abelian varieties with MIQF. 2. There are tensor operations of Anderson T-motives. If these T-motives have the nilpotent operator N equal to 0 then usually the result of a tensor operation has $N \neq 0$. The only exception : the Anderson T-motive is

a Drinfeld module (i.e. $n = 1$, r arbitrary) or its dual, and the tensor operation is an exterior power. By analogy, we can expect that abelian varieties with MIQF of signature $(1, r-1)$ have a well-defined exterior power. We really construct it. There is a problem : Find a number field case analog of Anderson T-motives having the nilpotent operator N not equal to 0. We discuss an approach to its solution. Namely, the application of the above construction of an exterior power to an abelian variety with MIQF of signature $(n, r-n)$ $(n > 1)$ gives us a polarized Hodge structure. If it is the Betti realization of an object (a Grothendieck motive ?), then this object is the number field case analog of an exterior power of an Anderson T-motive of rank r and dimension $n > 1$, i.e. of an Anderson T-motive having $N \neq 0$.

I. Longhi "On the Iwasawa main conjecture for abelian varieties over global function fields"

Abstract : Let F be a global function field and A/F an abelian variety. Also, let L/F a $\mathbb{Z}_p^d$-extension (where p is the characteristic of F) with restricted ramification. To this triple one can associate some form of an Iwasawa Main Conjecture. I will discuss a little what is known in general and in more detail how to prove the relevant Main Conjecture in case A is constant.

M. Hindry "Analogs of Brauer-Siegel for abelian varieties over function fields in positive characteristic"

Abstract : The classical Brauer-Siegel theorem states that for a family of number fields of given degree, the product of the unit regulator by the class number behaves asymptotically like the square root of the discriminant. For a sequence of abelian varieties of a given dimension, defined over a fixed global field, one expects that the product of the Néron- Tate regulator by the cardinality of the Tate-Shafarevic group should behave asymptotically like the height of the abelian variety. The statement over number fields remains essentially conjectural ; the analog over function fields, though not entirely settled, is far more advanced. In particular there are specific families for which we can unconditionally prove the Brauer-Siegel statement. A large part of the talk is joint work with Amilcar Pacheco ; this research is also linked with work of Micha Tsfasman, Boris Kunyavski et Alexey Zykin.

F. Pellarin "Tau-recurrent sequences and modular forms"

Abstract : In this talk, we will see how the theory of t-motives justifies the existence of recursive relations involving certain Drinfeld modular forms. This will be compared with the classical theory of Gauss hypergeometric functions, where contiguity relations generate remarkable families of modular forms.

A. Petrov "More Non-Standard Fourier Expansions of Drinfeld Modular Forms"

Abstract : In a recent paper Lopez has shown the existence of non-standard Fourier expansions (Fourier expansions indexed by the monic polynomials) for the *discriminant function $\triangle$ as well as for its $(q-1)$st root h (the Poincare series introduced by Gekeler). We will present more examples of Drinfeld modular forms that possess non-standard Fourier expansions. These forms turn out to be eigenforms for the Hecke action and have particularly simple eigenvalues.*

L. Taelman "The Carlitz module and a function field Herbrand-Ribet theorem"

Abstract : It has long been known that the Carlitz module is in manyways an "A-module" analogue of the multiplicative group scheme. In this talk I will discuss a recent result which gives the A-module analogue of the Herbrand-Ribet theorem on cyclotomic number fields.

Reference : `http://arxiv.org/abs/1104.5363`.

K.-S. Tan "The leading term of the characteristic series of the dual Selmer group of a $\mathbb{Z}_p^d$-extension"

Abstract : Let A/K be an abelian variety over a global field and let L/K be a $\mathbb{Z}_p^d$-extension un-ramified outside a finite set of good ordinary places. Then the dual Selmer group X over L is finitely generated over the Iwasawa algebra $\mathbb{Z}_p[[Gal(L/K)]]$ which can be viewed as the ring of formal power series over $\mathbb{Z}_p$ in d variables. Let x be a generator of the characteristic ideal of X over L. We conjecture that the leading term of x is proportional to a p-adic regulator associated to certain p-adic pairing on the Selmer groups. Some evidence will be shown.

D. Ulmer "Explicit points on the Legendre curve"

Abstract : I will explain an elementary and explicit construction of elliptic curves over function fields with Mordell-Weil group of arbitrarily large rank. More advanced methods then lead to precise information on Tate-Shafarevich groups and to a number of open questions.

D. Vauclair "Unramified Iwasawa theory for abelian varieties"

Abstract : The first goal of the talk is to state the Iwasawa Main Conjecture for an abelian variety over a p-adic Lie extension of function fields which is everywhere unramified. If time allows, I will then indicate how this conjecture can be proven under some assumptions. The main ingredient is adapted from Kato-Trihan work on BSD, and relies on a comparison theorem between flat and (the slope 1 part of) crystalline cohomology. This is a joint work with F. Trihan.

F. Voloch "Brauer-Manin and finite descent obstruction for curves over function fields"

Abstract : We will discuss these two obstructions to the existence of rational and integral points on curves over function fields, what is known about them and some open problems.