Université de Lille   Laboratoire Paul Painlevé   CEMPI CENTRE EUROPÉEN POUR LES MATHÉMATIQUES, LA PHYSIQUE ET LEURS INTERACTIONS

56th Seminar Aachen-Bonn-Köln-Lille-Siegen on Automorphic Forms

Organizers:
K. Bringmann, J. Bruinier, V. Gritsenko, A. Krieg,
P. Moree, G. Nebe, N.-P. Skoruppa, S. Zwegers

This is the 56th meeting of the joint French-German seminar on automorphic forms.

When: Wednesday, February 27, 2019
Where: University of Lille, Cité Scientifique, Villeneuve d'Ascq, Bat. M2, la salle de réunion

14.00 – 15.00 **Haowu Wang** (LabEx CEMPI, Lille)
The Weyl-invariant weak Jacobi forms for the root system E_8

15.15 – 16.15 **Amir-Kian Kashani-Poor** (Laboratoire de physique théorique de l'ENS, Paris)
Curve counting and (extended) Weyl invariant Jacobi forms

16:15—17:15 Coffee Break

17.15 – 18.15 **Shoyu Nagaoka** (Kindai University)
Theta Operator for Modular Forms

18:30 Buffet (in the building M2)

For further informations concerning this meeting please send an email to *Valery.Gritsenko@univ-lille.fr*. For the previous meetings see
http://www.matha.rwth-aachen.de/en/forschung/abkls/

Haowu Wang *(LabEx CEMPI, Lille)*
The Weyl-invariant weak Jacobi forms for the root system E_8

The Chevalley type theorem for affine root systems is equivalent to the fact that the bigraded ring of the Weyl-invariant weak Jacobi forms for a classical root system R is a pure polynomial algebra.The corresponding generators play an important role in the theory of Frobenius varieties. This subject was developed by E. Looijenga, K. Saito, J. Bernstein, O. Schwarzman, K. Wirthmüller, B. Dubrovin, M. Bertola and others. In 1992, Wirthmüller proved that the bigraded ring of W(R)-invariant weak Jacobi forms is a polynomial algebra over the ring of SL(2, Z) modular forms except the root system E8. The Weyl invariant E8 Jacobi forms have many applications in mathematics and physics, but very little has been known about its structure. In this talk, I will present a description of W(E8)-invariant Jacobi forms of small indices. As a corollary we give the negative answer on this old problem: the ring of W(E8)-invariant weak Jacobi forms is NOT a polynomial algebra. Thus a Chevalley type theorem is NOT true for the root system E8. Then I give a proper extension of the Chevalley type theorem to the case of the affine root system E8.

Amir-Kian Kashani-Poor *(Laboratoire de physique théorique de l'ENS, Paris)*
Curve counting and (extended) Weyl invariant Jacobi forms

Packaging enumerative invariants into generating functions has proven to be a powerful strategy to compute them. Symmetries underlying the geometry act on such functions, and in propitious cases, substantially simplify their computation. In this talk, I will address curve counting in elliptically fibered Calabi-Yau manifolds from this vantage point. After a short excursion into how the problem fits into physics, I will discuss the structure of the topological string partition function Z_top, a physically motivated generating function for curve counting invariants, on a class of such geometries. Weyl invariant Jacobi forms — Lie algebras make an appearance due to the Kodaira classification of singularities of elliptic fibers — will play an important role in the construction of Z_top. To fully exploit the symmetries of the problem, I will introduce a subring of such forms, invariant also under diagram symmetries of the associated affine Dynkin diagrams.

Shoyu Nagaoka *(Kindai University)*
Theta Operator for Modular Forms

Theta operator *Theta* is a kind of differential operator operating on modular foms. It is a generalization of the classical Ramanujan's theta-operator. For a prime p, the mod p kernel of the theta operator is defined as the set of modular form F such that *Theta* (F) = 0 mod p. Namely, the element in the set can be interpreted as a mod p analogue of the singular modular form. In this talk, I will give examples of modular forms in the mod p kernel of the theta operator.