Winter seminar of the Darmstadt algebra group

March 12 – March 17, 2017

SCHEDULE

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
08.00 – 08.45	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast
09.00 – 13.00	Working/Skiing	Working/Skiing	Working/Skiing	Working/Skiing	Working/Skiing	Working/Skiing
13.00 – 14.45	Lunch break	Lunch break	Lunch break	Lunch break	Lunch break	Lunch break
14.45 –	Working	**Scheithauer Möller**	**Wedhorn Henkel**	Working	**Li Pippich**	**Bruinier**
	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
– 17:15	Working	**Salvati Manni**	**Hesse**	Working	**Völz Schwagenscheidt**	**Funke**
17.15 – 18.45	Informal discussions	Informal discussions	Informal discussions	Informal discussions	Informal discussions	Informal discussions
19.00 – 20.00	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner
20.00 – 21.00	**Buck Rennig**	Evening session	Evening session	**Rössler Ehlen**	Evening session	Evening session

- 8 Lectures (45 min): Jan Bruinier, Jens Funke, Timo Henkel, Jens Hesse, Sven Möller, Riccardo Salvati Manni, Nils Scheithauer, Torsten Wedhorn

- 8 Talks (30 min): Johannes Buck, Stephan Ehlen, Yingkun Li, Anna von Pippich, Maximilian Rössler, Markus Schwagenscheidt, Fabian Völz, Markus Rennig

TITLES AND ABSTRACTS

Jan Bruinier	**Heegner divisors in generalized Jacobians and traces of singular moduli**
	In this talks we report on recent joint work with Yingkun Li.

Johannes Buck	**Vector valued modular forms and Eisenstein series**
	In the first part of my talk I will briefly explain the concept of vector valued modular forms transforming with the Weil representation. Then in particular we will focus vector valued Eisenstein series and see some results of my master's thesis.

Stephan Ehlen	**Invariants of Weil representations**
	In joint work with Nils-Peter Skoruppa, we develop a simple algorithm for computing bases and dimensions of spaces of invariants of Weil representations associated with finite quadratic modules. We prove that these spaces are in fact defined over $\mathbb{Z}$, and that their dimension remains stable if we reduce the coefficients modulo ℓ for a suitable prime number ℓ.

Jens Funke	**Higher weight Zwegers**
	In this talk we report about a generalization of the work of Zwegers.

Timo Henkel	**Classification of p-divisible groups over rings of mixed characteristic**
	This talk will explain a result of Scholze and Weinstein which classifies p-divisible groups over certain rings of mixed characteristic in terms of $\mathbb{Z}_p$-modules and certain vector spaces. The talk provides first examples of this correspondence and a sketch of the proof.

Jens Hesse	**Shimura varieties mod p**
	A suitable modular interpretation – where it is available – gives rise to various stratifications and foliations (Newton stratification, Oort's central leaves) on the mod p reduction of a Shimura variety. In this talk, the focus will be on the Siegel modular variety with hyperspecial level structure at p with a view towards extending results to the case of parahoric level structure, where less is known.

Yingkun Li	**Petersson norm of a real-dihedral cusp form**
	In 1926, Hecke constructed a weight one cusp form from a theta integral associated to a real quadratic field F. It is a rather special case of the Siegel-Weil formula from $O(1,1)$ to SL_2. Its Petersson norm is closely related to the logarithm of the fundamental unit of F. In this talk, we will evaluate this norm using the Fourier-Jacobi expansion of an $O(2,2)$ theta integral.

Sven Möller	**Generalized Moonshine**
	We describe Scott Carnahan's proof of Norton's generalized moonshine conjecture (for the twisted modules of the moonshine module), which makes use of a recent result by van Ekeren, M., and Scheithauer.

Anna von Pippich	**A Rohrlich-type formula for the hyperbolic 3-space**
	Jensens's formula is a well-known theorem of complex analysis which characterizes, for a given meromorphic function f, the value of the integral of $\log|f(z)|$ along the unit circle in terms of the zeros and poles of f inside this circle. An important theorem of Rohrlich generalizes Jensen's formula for modular functions f with respect to the full modular group, and expresses the integral of $\log|f(z)|$ over a fundamental domain in terms of special values of Dedekind's Delta function. In this talk, we report on a Rohrlich-type formula for the hyperbolic 3-space.

Riccardo Salvati Manni	**Gradients of odd theta functions**
	Using the evaluation at 0 of gradients of odd theta functions, I will define basic vector valued modular forms in two different ways. The two different constructions will lead to a geometric criterion for determining reducible period matrices in the Siegel space $\mathbb{H}_g$. I will also treat the possibility of generalizing to $\mathbb{H}_g/\Gamma_g$ a result of Caporaso and Sernesi that characterizes curves by the odd theta characteristics.

Markus Rennig	**The covering radius**
	We study algebraic curves with a complex disc as universal orbifold covering. Serge Lang first asked the question whether the radius of the disc is algebraic or transcendent, if we normalize the tangent map in its center to an algebraic number. We answer this question for certain quotients $\mathbb{H}/\Gamma$.

Maximilian Rössler	**Dimension formulas for modular forms on orthogonal groups**
	To determine dimension formulas for modular forms, one usually uses Selberg trace formulas or Riemann–Roch theorems. In this talk we present an approach based on Mumford's construction of toroidal compactifications and the Hirzebruch–Riemann–Roch theorem. We concentrate on the case of the orthogonal groups $O(2, n)$ and outline the necessary intermediate steps as well as the problems arising along the way.

Nils Scheithauer	**Monstrous moonshine**
	We describe Borcherds' proof of Conway and Norton's moonshine conjecture.

Markus Schwagenscheidt	**Borcherds lifts of harmonic Maass forms**
	We extend Borcherds' regularized theta lift in signature (2,1) to harmonic Maass forms whose non-holomorphic part is allowed to grow exponentially at the cusp. We encounter new singularities along geodesics in the upper half-plane. By computing the derivative of the Borcherds lift of a suitable harmonic Maass form, we recover the weight 2 modular integral of Duke, Imamoglu and Toth, which is given by a certain generating series of traces of geodesic cycle integrals of j.

Fabian Völz	**Non-holomorphic Eisenstein series as theta lifts**
	Generalising the concept of classical non-holomorphic Eisenstein series associated to cusps, one can define elliptic Eisenstein series associated to points in the upper-half plane, and hyperbolic Eisenstein series associated to geodesics. In my talk I will present realizations of these elliptic and hyperbolic Eisenstein series as theta lifts of non-holomorphic Poincaré series. In particular, this generalizes a classical result on lifts of holomorphic Poincaré series.

Torsten Wedhorn	**P-divisible Groups**
	As an introduction to Timo's and Jens' talk I will explain what p-divisible groups are, why they should be considered and explain how they can be classified.