Talks

Lennart Berg (JLU Giessen)

Title: **H_3-graded groups**

Abstract: Let Φ be a finite root system. A Φ-grading of a group G is a family of subgroups $(U_\alpha)_{\alpha\in\Phi}$ satisfying some purely combinatorial axioms. The main examples of Φ-graded groups are the Chevalley groups of type Φ, which by construction are defined over commutative rings. It was recently shown by Wiedemann that if Φ is crystallographic and of rank at least 3, then every Φ-graded group is defined over some algebraic structure in a similar way as the Chevalley groups. For the root system H_3, one obtains examples of root gradings via so-called foldings (a generalisation of Tits indices) of root gradings of type D_6. We prove that, in fact, all H_3-graded groups can be constructed in this way. Another way of saying this is that they are defined over $\mathcal{R}\times\mathcal{R}$ where $\mathcal{R}$ is a commutative ring. As a corollary, this provides a new proof of the known fact that there exist no thick buildings of type H_3.

This is joint work with Torben Wiedemann.

Claudio Bravo (École Polytechnique)

Title: **Conjugacy classes of maximal unipotent subgroups of Chevalley group over certain Dedekind domains**

Abstract: Let G be a split simply connected semisimple Z-group. It is well known that there exists a unique G(F)-conjugacy class of maximal unipotent subgroup of G(F), when F is a field characteristic 0 or a field of positive characteristic p>0 such that $[F : F^p] \leq p$. Let C be a smooth, projective, geometrically integral curve C defined over a perfect field L, and let S be a finite set of closed points of C. Let k=L(C) be the function field of C, and let G_0 be an S-arithmetic subgroup of G(k), i.e. a subgroup of G(k) which is commensurable with $G(O_S)$. In this talk, we investigate on the conjugacy classes of maximal unipotents subgroups of S-arithmetic subgroups. More specifically, we describe the G_0-conjugacy classes of maximal unipotents subgroups of G_0. These are parameterized thanks to the Picard group of O_S and the rank of G. Furthermore, these maximal unipotent subgroups can be realized as the unipotent part of natural stabilizer, that are the stabilizers of sectors of the associated Bruhat-Tits building. We decompose these natural stabilizers in terms of their diagonalisable part and unipotent part, and we precise the group structure of the diagonalisable part.

Pierre-Emmanuel Caprace (UCLouvain)

Title: **Hyperbolic groups of Type I**

Abstract: The classical theory of unitary representations of locally compact groups reveals a fundamental dichotomy between the so-called Type I groups, whose representation theory is well-behaved, and all the others. A theorem of Thoma ensures that a discrete group is Type I if and only if it is virtually abelian. In the non-discrete case, no such characterization of the Type I groups is known. The goal of this talk is to discuss the Type I condition for locally compact groups acting on buildings, and to present some results in the hyperbolic case. Based on a joint work with Mehrdad Kalantar and Nicolas Monod.

Corina Ciobotaru (Aarhus University)

Title: **Symmetry breaking for PGL_2 over a local field**

Abstract: TBA

Matthias Grüninger (JLU Giessen)

Title: **Special Moufang sets with abelian root groups of finite dimension**

Abstract: A *Moufang set* consists of a set X with $|X| \geq 3$ an a family of subgroups $(U_x)_{x \in X}$ of $\mathrm{Sym}(X)$ (called *root groups*) such that

(i) For all $x \in X$ the group Z_x fixes x and acts regularly on $X \setminus \{x\}$.

(ii) For all $x, y \in X$ and all $g \in U_x$ we have $U_{xg} = U_x^g$.

If J is a quadratic Jordan division algebra, then J gives rise to a Moufang set $\mathbb{M}(J)$ with root groups isomorphic to $(J, +)$, These Moufang sets satisfy a condition called *special*. It is a major open problem in theory of Moufang sets whether every special Moufang set with abelian root groups is isomorphic to $\mathbb{M}(J)$ for some quadratic Jordan division algebra J. It is known that the root groups are $\mathbb{k}$-vector spaces for some field $\mathbb{k}$ such the 2-point stabilisers act $\mathbb{k}$-linearly on the root groups. We show that if the dimension over $\mathbb{k}$ is finite and if some additional conditions are satified (which is automatically the case if $\mathrm{char}\mathbb{k} = 0$), then the Moufang set arises in fact from a quadratic Jordan division algebra. As a corollary, every KT-nearfield of characteristic different from 2 that is finite-dimensional over its kernel is a Dickson nearfield.

Amy Herron (University of Buffalo)

Title: **Triangle Presentations in $\tilde{A}_2$ Buildings**

Abstract: TBA

Paulien Jansen (Ghent University)

Title: **TBA**

Abstract:

Norbert Knarr (Universität Stuttgart)

Title: **Subalgebras of octonion algebras and generalized hexagons**

Abstract: We present a construction of the split Cayley hexagon using 5- and 6-dimensional subalgebras of a split octonion algebra. This is joint work with Markus Stroppel.

Linde Lambrecht (Ghent University)

Title: **Automorphisms and opposition in metasymlectic spaces**

Abstract: TBA

Yannick Neyt (Ghent University)

Title: **Kangaroos in (para)polar spaces**

Abstract: Kangaroos are collineations of (para)polar spaces where some of the possible distances between points and their images are skipped. For example, a 1-kangaroo of $D_n, 1$, either fixes a point, or sends it to an opposite point. These collineations often have interesting properties, like their fixed points space, which is in many examples enough to characterize them.

Carsten Peterson (Aalto University/Paderborn University)

Title: **Quantum ergodicity on the Bruhat-Tits building for** $\mathrm{PGL}(3, F)$ **in the Benjamini-Schramm limit**

Abstract: Originally, quantum ergodicity concerned equidistribution properties of Laplacian eigenfunctions with large eigenvalue on manifolds for which the geodesic flow is ergodic. More recently, several authors have investigated quantum ergodicity for sequences of spaces which "converge" to their common universal cover and when one restricts to eigenfunctions with eigenvalues in a fixed range. Previous authors have considered this type of quantum ergodicity in the settings of regular graphs, rank one symmetric spaces, and some higher rank symmetric spaces. We prove analogous results in the case when the underlying common universal cover is the Bruhat-Tits building associated to $PGL(3, F)$ where F is a non-archimedean local field. This may be seen as both a higher rank analogue of the regular graphs setting as well as a non-archimedean analogue of the symmetric space setting. The proof uses tools from p-adic representation theory, polytopal geometry, and the geometry of affine buildings.

Colin Reid (WWU Münster)

Title: **Boundary-2-transitive actions on trees**

Abstract: Let T be a locally finite tree. A natural class of 'large' closed subgroups G of Aut(T) are those with unbounded orbits that act transitively on the boundary (space of ends) of the tree. In fact, all such groups act 2-transitively on the boundary.

I will talk about some reasons to be interested in this class of groups, and some restrictions I obtained on their structure in terms of local actions, in other words, the finite permutation groups induced by a subgroup fixing a vertex on the neighbours of that vertex. If one of the local actions of G has insoluble point stabilizers, then G has no prosoluble open subgroup and is micro-supported (with an exception that only occurs for the (31,21)-semiregular tree). If G is vertex-transitive, the local action of an end stabilizer is a point stabilizer of the local action of G; this is usually true also if G is not vertex-transitive, but there are some combinations of local actions where a local action of an end stabilizer can be smaller.

Yuri Santos Rego (Otto-von-Guericke-Universität Magdeburg)

Title: **Traveling through the Coxeter galaxy**

Abstract: In the vast universe of finitely presented groups, the galaxy of Coxeter of groups is a particularly prominent celestial gathering. We will discuss some space travel techniques and to what extent the Coxeter galaxy has been charted, (re)phrasing some old and new problems along the way.

Based on joint work with Petra Schwer.

Thomas Titz Mite (JLU Giessen)

Title: **Torsion-free building lattices**

Abstract: We develop an algorithm that searches efficiently for torsion-free lattices in 2-dimensional buildings. Using this algorithm we obtain a non-residually finite lattice in a locally-finite $\tilde{C}_2$-building.

Hendrik Van Malgeghem (Ghent University)

Title: **Kangaroos, unicorns and magic squares. Ceci n'est pas un conte de fées.**

Abstract: In the past decade I have been trying to characterize the Magic Square by the notion of "Domestic automorphism" of a spherical building. And indeed, the classes of such automorphisms that fix no chamber are almost in one-to-one correspondence with the diagrams in the Magic Square. Only, there are a few domestic automorphisms not appearing in the Magic Square, and there are a few diagrams in de MS that do not correspond to domestic automorphisms. The latter can be repaired using the notion of kangaroo (collineation), but the former seemed more problematic. However, the new notion of "uniclass collineation", briefly, a "unicorn", characterizes exactly the diagrams in

the Magic square. We explain how it is a kind of synthesis of domesticity and kangaroos. This is joint work with James Parkinson and Yannick Neyt.

Olga Varghese (HHU Düsseldorf)

Title: **Profinite flexibility and rigidity of Coxeter groups**

Abstract: For a group G we denote by F(G) the set of isomorphism classes of finite quotients of G. We address the following question: Let W be a Coxeter group. Given a finitely generated residually finite group G with F(G)=F(W), what can be said about G?

Christopher Voll (Bielefeld University)

Title: **Ehrhart theory, Hecke series, and vertex enumeration in affine buildings**

Abstract: The number of integral points of the integral inflations of a lattice polytope in Z^n is given by the polytope's Ehrhart polynomial, a well-studied invariant in polyhedral geometry. How is this invariant distributed over all superlattices of Z^n? Viewed locally, this question leads us to consider families of counting functions on the vertices of affine buildings associated with classical p-adic groups.

I will explain how these counting functions are connected with classical multivariate generating functions arising in number theory, viz. Hecke series, and eigenfunctions for Hecke operators. I will assume no previous knowledge on Ehrhart or Hecke theory.

This is joint work with Claudia Alfes-Neumann and Joshua Maglione.