WORKSHOP ON VECTOR BUNDLES IN POSITIVE CHARACTERISTIC
LABORATOIRE J. A. DIEUDONNÉ, NICE
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Holger Brenner: Hilbert-Kunz theory over projective curves and surfaces.

Abstract: The Hilbert-Kunz multiplicity defined for a ring of positive characteristic leads to natural problems about vector bundles on projective varieties. With this geometric approach, exploiting bundle theory on smooth projective curves, it is possible to prove for two-dimensional graded domains the rationality of the Hilbert-Kunz multiplicity, periodicity for the constant term, and the existence of the limit Hilbert-Kunz multiplicity in characteristic zero. In higher dimension, a recently found example shows that the Hilbert-Kunz multiplicity might be an irrational number.

Michael Gröchenig: Moduli of local systems and Geometric Langlands in positive characteristic.

Abstract: We will study the relation between moduli stacks of local systems and Higgs bundles on curves defined over a field of positive characteristic. Extending a result of Bezrukavnikov-Braverman we obtain a derived equivalence, which can be viewed as an instance of the Geometric Langlands Correspondence for D-modules in positive characteristic.

Kirti Joshi: The Dormant Operatic Locus.

Abstract: An Oper, which is an object introduced by Beilinson-Drinfeld, is a vector bundle with connection and a filtration which satisfies an extremal version of Griffiths Transversality (with respect to the connection). Dormant opers are certain characteristic $p > 0$ opers, and for rank two these were studied by Mochizuki. We will explain the object of the title and explain a conjectural formula for its degree. For the rank two case, a proof of our conjectural formula has recently been announced by Yasuhiro Wakabayashi (RIMS) and we hope to report on this development as well.

João Pedro Dos Santos: On the number of vector bundles trivilized by the Frobenius.

Abstract: A conjecture of M. Nori made in his thesis (1982) states that the fundamental group scheme "base-changes" well. Since the work of Mehta and Subramanian (2002), this conjecture assumed a more appealing form: are there many (stable) vector bundles trivialized by the Frobenius morphism? It then followed that the conjecture is plainly false for singular ambient spaces. On the other hand, for smooth ambients, the first counterexample relied on a delicate analysis of the moduli space of vector bundles (Pauly 2007). We present some other

counterexamples which ensue from an explicit calculation of the Lie algebra of the fundamental group scheme.

Xiaotao Sun: Etale fundamental groups and D-modules in characteristic $p > 0$.

Abstract: I will show how a theorem of Hrushovski can be used together with moduli spaces to prove Gieseker's conjecture completely, which relates etale fundamental groups with D-modules. This is a joint work with H. Esnault.