THE UNIVERSITY          OF HONG KONG

*Institute of Mathematical Research*
*Department of Mathematics*

# CONFERENCE ON NUMBER THEORY

## November 29, 2012
## Room 210, Run Run Shaw Building, HKU

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| 09:55 – 10:00 | Welcoming speech by Prof. Ngaiming Mok (Director of IMR, HKU) |

10:00 – 10:55    **Y.K. Lau**, University of Hong Kong, Hong Kong

*The Shifted convolution sum problem*

Abstract: Shifted convolution sums arise naturally in the study of subconvexity bounds of L-functions. In this talk, we give an exposition on the background and developed methods, and explore the direction for future investigations.

*Coffee Break*

11:30 – 12:25    **X. Ren,** Shandong University, China

*Asymptotic expansions of Voronoi's summation formulas for $SL_3(\mathbb{Z})$ and their applications*

Abstract: Let $f$ be a Maass form for $SL_3(\mathbb{Z})$ and let $A_f(m, n)$ be its Fourier coefficients. We will talk about asymptotic expansions of Voronoi's summation formula for $A_f(m, n)$. For applications of these asymptotic formulas, we will consider smoothly weighted sums of $A_f(m, n)$ against exponential functions $e(\alpha n^\beta)$ for $\alpha \in \mathbb{R}$, $\beta \in (0, 1]$ and $X \leq n \leq 2X$. From these applications one can see the duality of Voronoi's summation formula for $SL_3(\mathbb{Z})$.

*Lunch Break*

15:00 – 15:55    **M.A. Korolev**, Steklov Mathematical Institute, Moscow

*On the moments of certain trigonometric polynomials*

Abstract: Suppose that $\kappa > 0$ and let

$$I_\kappa(T) = \int_0^T \left| \sum_{p \leq x} \frac{a_p}{\sqrt{p}} \sin(t \log p) \right|^{2\kappa} dt, \quad J_\kappa(T) = \int_0^T \left| \sum_{p \leq x} \frac{a_p}{\sqrt{p}} \cos(t \log p) \right|^{2\kappa} dt,$$

where $2 \leq x \leq T^{1/\kappa}$, $p$ runs through prime numbers and $a_p$ is the sequence of real numbers. These integrals are called as the moments of degree $2\kappa$ of polynomials

$$\sum_{p \leq x} \frac{a_p}{\sqrt{p}} \sin(t \log p) \qquad \sum_{p \leq x} \frac{a_p}{\sqrt{p}} \cos(t \log p).$$

It is known that in some cases there is an asymptotic formula for these moments of the following type:

$$I_\kappa(T),\ J_\kappa(T) \sim c(\kappa)T \left( \sum_{p \leq x} \frac{a_p^2}{p} \right)^\kappa.$$

Using some recent results of K. Soundararajan and M. Radziwill we will prove some new asymptotic expansions for the integrals $I_\kappa(T)$ and $J_\kappa(T)$ and demonstrate some applications of these formulas to the theory of the function $S(t) = \pi^{-1} \arg \zeta(\frac{1}{2} + it)$.

*Coffee Break*

16:30 – 17:25    **I.S. Rezvyakova**, Steklov Mathematical Institute, Moscow

*Zeros of linear combinations of Hecke L-functions on the critical line*

Abstract: Let us consider a linear combination of Hecke $L$-functions associated with the characters of the ideal class group of the imaginary quadratic field $\mathbb{Q}(\sqrt{-D})$. In general, such linear combinations have many non-trivial zeros outside the critical line. Nevertheless, under certain natural conditions we shall show that the critical line is an exceptional set, which contains a large proportion of their non-trivial zeros.

*Organizers: Yuk-Kam Lau, Kai-Man Tsang*

*All are welcome*