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**MATHEMATICS COLLOQUIUM SERIES**  
**UNIVERSITY OF CENTRAL FLORIDA**

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**Professor Alexander Ramm**  
**Department of Mathematics**  
**Kansas State University**

will speak on

**Many-body wave scattering and creating materials  
with a desired refraction coefficient**

**ABSTRACT:**

Many-body scattering problem is solved asymptotically when the size of the particles tends to zero and the number of the particles tends to infinity.

A method is given for calculation of the number of small particles and their boundary impedances such that embedding of these particles in a bounded domain, filled with known material, results in creating a new material with a desired refraction coefficient.

The new material may be created so that it has negative refraction, that is, the group velocity in this material is directed opposite to the phase velocity.

Another possible application consists of creating the new material with some desired wave-focusing properties. For example, one can create a new material which scatters plane wave mostly in a fixed given solid angle. In this application it is assumed that the incident plane wave has a fixed frequency and a fixed incident direction.

An inverse scattering problem with scattering data given at a fixed wave number and at a fixed incident direction is formulated and solved.

**REFERENCES:**

- 1) A.G.Ramm, Wave scattering by small bodies of arbitrary shapes, World Sci. Publishers, Singapore, 2005.
- 2) A.G.Ramm, Inverse problems, Springer, New York, 2005.
- 3) A.G.Ramm, Distribution of particles which produces a "smart" material, J. Stat. Phys., 127, N5, (2007), 915-934.
- 4) A.G.Ramm, Many-body wave scattering by small bodies and applications, J. Math. Phys., 48, N10, 103511, (2007).
- 5) A.G.Ramm, Scattering by many small bodies and applications to condensed matter physics, Europ. Phys. Lett., 80, (2007), 44001.

**DATE: Thursday, September 25, 2008**

**TIME: 11:30 – 12:30pm**

**PLACE: MAP 318**

Refreshments will be served