

International
Online Conference



**Algebraic
and Geometric
Methods of Analysis**

dedicate to the memory
of Yuriy Trokhymchuk
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LIST OF TOPICS

- Topological methods in analysis
- Geometric problems of complex and mathematical analysis
- Algebraic methods in geometry
- Differential geometry in the whole
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Geometric and topological methods in natural sciences

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Conharmonic Transformations of Locally Conformal Kähler Manifolds

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A Hermitian manifold (M^{2m}, J, g) is called a *locally conformal Kähler manifold (LCK - manifold)* if there is an open cover $\mathfrak{U} = \{U_\alpha\}_{\alpha \in A}$ of M^{2m} and a family $\{\sigma_\alpha\}_{\alpha \in A}$ of C^∞ functions $\sigma_\alpha : U_\alpha \rightarrow \mathbb{R}$ so that each local metric

$$\hat{g}_\alpha = e^{-2\sigma_\alpha} g|_{U_\alpha}$$

is Kählerian. An LCK - manifold is endowed with some form ω , so called *Lee form* which can be calculated as [1]

$$\omega = \frac{1}{m-1} \delta\Omega \circ J.$$

The form should be closed:

$$d\omega = 0.$$

Here and below, we denote by comma covariant differentiation with respect to the Levi-Civita connection of (M^{2m}, J, g) .

If a contravariant analytic vector field ξ generates conformal infinitesimal transformation of an LCK-manifold, then the field satisfy the system [2]

$$\begin{aligned} 1) \quad & \xi_{i,j} = \xi_{j,i}; \\ 2) \quad & \xi_{i,j} + \xi_{j,i} = (\omega_\alpha \xi^\alpha + C) g_{ij}; \\ 3) \quad & \xi_{i,jk} = \xi_\alpha R_{kji}^\alpha + \frac{1}{2} ((\omega_\alpha \xi^\alpha)_{,k} g_{ij} + (\omega_\alpha \xi^\alpha)_{,j} g_{ik} - (\omega_\alpha \xi^\alpha)_{,i} g_{jk}); \\ 4) \quad & J_{j,k}^i \xi^k - J_j^\alpha \xi_{,\alpha}^i + J_\alpha^i \xi_{,j}^\alpha = 0. \end{aligned} \tag{1}$$

If a conformal transformation (101) also preserves a product Rg_{ij} , i. e. the equation

$$\mathfrak{L}_\xi(Rg_{ij}) = 0 \tag{2}$$

holds, then the transformation is called *conharmonic*. We obtain the theorem.

Theorem 1. *If an LCK-manifold (M^{2m}, J, g) of non-zero scalar curvature admits nontrivial conharmonic transformations, then the general solution of the PDE system (101)-(2) depends on no more than $m^2 + 2m$ essential parameters.*

Also we have proved that the tensor

$$P_{ij} \stackrel{\text{def}}{=} \frac{1}{n-2} R_{ij} - \frac{1}{2} \omega_{i,j} - \frac{1}{4} \omega_i \omega_j + \frac{1}{8} \omega^\alpha \omega_\alpha g_{ij}$$

is preserved by conharmonic transformations.

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