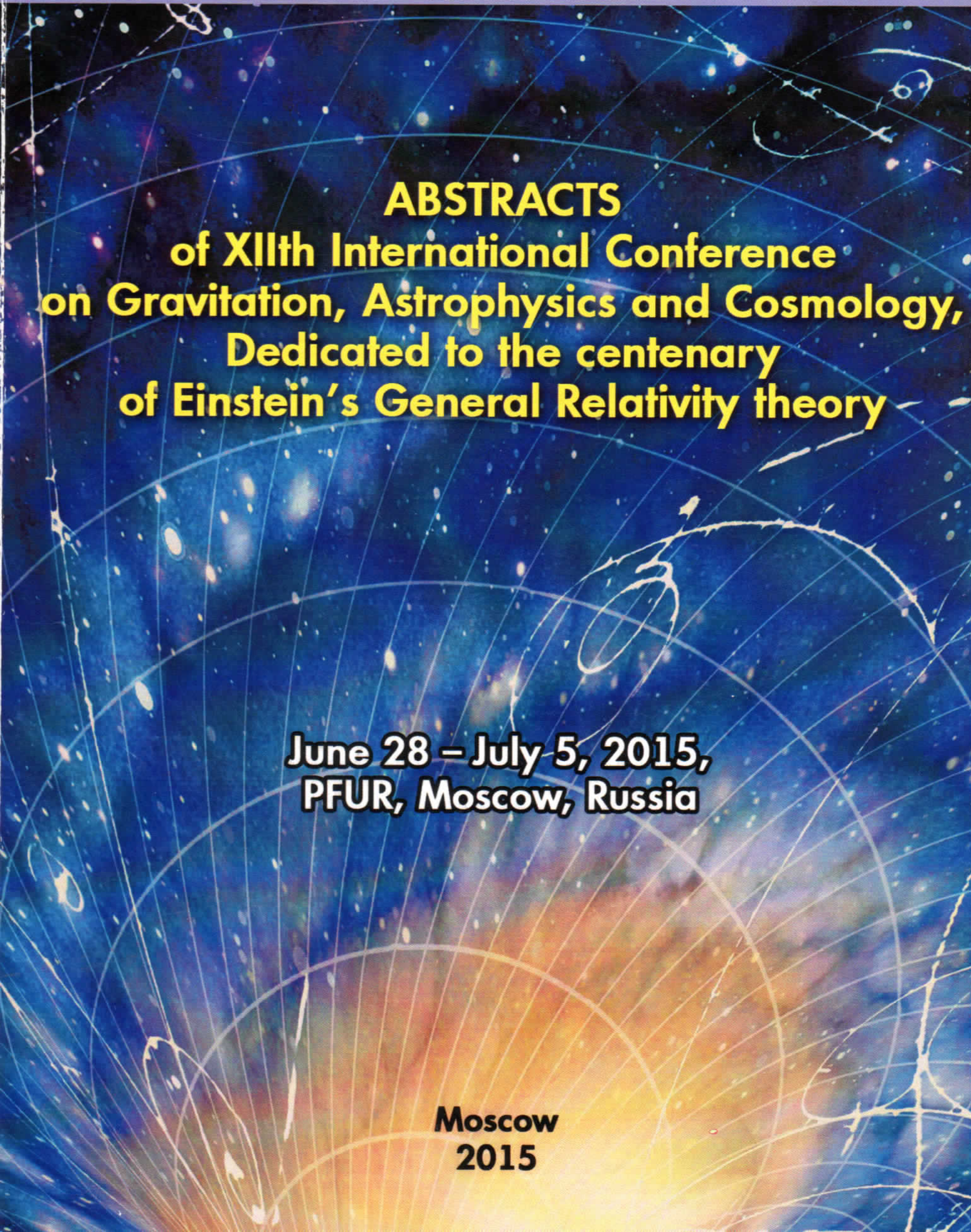
ICGAC-12



ABSTRACTS

of XIIth International Conference
on Gravitation, Astrophysics and Cosmology,
Dedicated to the centenary
of Einstein's General Relativity theory

June 28 – July 5, 2015,
PFUR, Moscow, Russia

Moscow
2015

Scaling of body masses and orbital periods in the Solar system as a consequence of gravity interaction elasticity

Hartmut Müller[1]

Advanced Natural Research Institute in memoriam Leonhard Euler, Munich, Germany

[1] e-mail: admin@anr-institute.com

Scaling of body masses and orbital periods in the Solar system can be understood as the consequence of Hooke's law for gravity interaction elasticity in fractal models of chain systems of many harmonic oscillators.

The connection between the body mass distribution and the distribution of orbital periods of planets and planetoids in the Solar system can be described by the scaling law $T = \mu \cdot M^D$, where M is a celestial body mass, T is a celestial body orbital period and μ and D are constants.

For sorted by value couples of a body mass M and an orbital period T, the exponent D is quite constant and closed to the model value $^2/_3$. Furthermore, for M in units of the proton rest mass $m_p \approx 1.67 \times 10^{-27}$ kg and T in units of the proton oscillation period $\tau_p = \hbar/m_p c^2 \approx 7.02 \times 10^{25}$ s, the constant $\mu = 1$.

Mass-orbit scaling is also valid in the moon systems of Saturn, Jupiter and Uranus. Already in the eighties the scaling exponent $^2/_3$ was found by V. Kolombet in the distribution of particle masses. Possibly, the approximation of the model values $D = {}^2/_3$ and $\mu = 1$ for proton units is a macroscopic quantum physical property, which is based on the baryon nature of normal matter, because $\mu = 1$ means that $M^D/T = {m_p}^D/_{\tau_p}$, where the ratio M/m_p is the number of model protons and the ratio T/τ_p is the number of model proton oscillation cycles.

The scaling exponent $^2/_3$ arises as a consequence of natural oscillations in chain systems of harmonic oscillators. Within our fractal model of matter as a chain system of oscillating protons and under the consideration of quantum oscillations as model mechanism of mass generation, we interpret the exponent $D = \ln(T/\tau_p)/\ln(M/m_p)$ as a Hausdorff fractal dimension of similarity.

If we interpret mass-orbit scaling as a consequence of the fractality of the mass distribution in the system, then we can represent it in the form $M^\Delta/T^2 = 1$, where $\Delta = 2D$ is the fractal dimension of the mass distribution, the constant of proportionality is 1 for proton units m_p and τ_p. The model value of $\Delta = {}^4/_3$.

Within our fractal model, mass-orbit scaling arises in chain systems of many harmonic oscillators and can be understood as fractal equivalent of the Hooke's law. The mass-orbit scaling law is valid for sorted by value couples of system properties. The Saturn system shows, that mass-orbit scaling can be valid for one and the same body. The Jupiter and Uranus systems show, that mass-orbit scaling can be valid also for couples of different bodies. This may mean, that in general, the orbital period of each body does not depend only on its own mass, but depends on the body mass distribution in the system.

[1] H. Müller, Scaling of Moon Masses and Orbital Periods in the systems of Saturn, Jupiter and Uranus, Progress in Physics, 2015, issue 2, 165-166.