KAZAN FEDERAL UNIVERSITY

Kazan Federal University
Russian Gravitational Society

18-я РОССИЙСКАЯ ГРАВИТАЦИОННАЯ КОНФЕРЕНЦИЯ

Международная конференция по гравитации, астрофизике и космологии

Посвящается памяти Алексея Старобинского

Тезисы докладов

18th RUSSIAN GRAVITATIONAL CONFERENCE

International Conference on Gravitation, Astrophysics and Cosmology

Dedicated to the memory of Alexei Starobinsky

Abstracts

25-29 ноября 2024, Казань, Россия

УДК 530.12+521

18-й Российская гравитационная конференция – Международная конференция по гравитации, космологии и астрофизике «RusGrav-18». Тезисы докладов. — Казань: Изд-во КФУ, 2024. – 122 с.

Сборник содержит тезисы докладов участников 18-й Российской гравитационной конференции – Международной конференции по гравитации, космологии и астрофизике «RusGrav-18». В материалах представлены работы ведущих специалистов и начинающих исследователей из научных центров России, ближнего и дальнего зарубежья, посвящённые исследованиям в ОТО и модифицированных теориях гравитации, теоретической и наблюдательной космологии, релятивистской астрофизике. Международная конференция проходила в Казанском федеральном университете с 25 по 29 ноября 2024 года.

Сборник адресован научным работникам, аспирантам и молодым ученым, специализирующихся в области теории гравитации, космологии и астрофизики, а также для студентов старших курсов естественнонаучных направлений.

УДК 530.12+521

4. M. Tsang and C. Caves, “Evading Quantum Mechanics: Engineering a Classical Subsystem within a Quantum Environment,” *Physical Review X*, vol. 2, p. 031016, 2012.

5. S.P. Vyatchanin, A.I. Nazmiev, and A.B. Matsko, “Broadband coherent multidimensional variational measurement,” *Physical Review A*, vol. 106, p. 053711, 2022.

BLACK HOLE UNIQUENESS THEOREMS IN GAUGED SUPERGRAVITIES

S.G. Ovchinnikov[1]

1 Институт теоретической и математической физики при МГУ им. М.В. Ломоносова, Москва, Россия

The classification of anti de Sitter black holes is an open problem of central importance in holography. In this talk, I will present new advances in classification of supersymmetric solutions to five-dimensional gauged supergravity coupled to arbitrary number of Abelian vector multiplets. In particular, we prove a black hole uniqueness theorem within a subclass of solutions with biaxial symmetry and a certain twistor structure. This subclass includes all known solutions of this theory, both analytic and numerical.

The logic of the proof is based on the near-horizon data only and is agnostic of the asymptotic region. We, therefore, deduce that a classification of CFT states in the UV of the holographic correspondence is possible to derive by deep IR arguments.

BLACK HOLES IN SEMICLASSICAL F(R) GRAVITY WITH EXTRA DIMENSIONS

A.A. Popov[1], S.G. Rubin[2]

1 *apopov@kpfu.ru*; Kazan Federal University, 18 Kremlyovskaya street, Kazan 420008, Russia
2 *sergeirubin@list.ru*; National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe shosse, Moscow 115409, Russia

In this work we obtained the solution of the equations of the semiclassical $f(R)$ theory of gravitation ($c = \hbar = 1$)

$$-\frac{1}{2} f(R)\delta_A^B + \left(R_A^B + \nabla_A \nabla^B - \delta_A^B \Box\right) \frac{d\, f(R)}{dR} = \frac{8\pi}{m_{\rm D}^2} \langle T_A^B \rangle\,, \tag{1}$$

describing a black hole in $(4+n)$-dimensional spacetime

$$ds^2 = \left(1 - \frac{2M}{r}\right) dt^2 - \frac{dr^2}{\left(1 - \frac{2M}{r}\right)} - r^2\left(d\theta^2 + \sin^2\theta\, d\varphi^2\right) - {L_0}^2 d\Omega_n^2, \tag{2}$$

where M is the integration constant, $A, B, C, \ldots = 1, 2, \ldots, 4+n$, $f(R)$ is an arbitrary function of scalar curvature R, $m_{\rm D}$ – $(4+n)$ - dimensional Planck mass, ∇_A – denotation of the covariant derivative, R_A^B - Ricci tensor, $\Box = g^{AB}\nabla_A\nabla_B$. The additional space is assumed to be an n - dimensional sphere of radius L_0, much smaller than the characteristic scale of curvature l ($L_0 \ll l$) of the four-dimensional part of space

The right part of equations (1) describes the expectation value of the stress-energy tensor operator of the quantized matter fields. In the limit $l_{\rm Pl} \ll L_0$ the structure of this tensor has the form (see Popov A., Phys. Rev. D (2001), V. 64, 104005)

$$\langle T_A^B \rangle = \frac{l_{\rm Pl}^2}{{L_0}^4} K_A^B \Big(1 + O\big({L_0}^2/l(r)^2\big)\Big), \tag{3}$$

where in the coordinates (2)

$$K_A^B = \mathrm{diag}\Big(K_t^t, K_t^t, K_t^t, K_t^t, K_5^5, \dots, K_5^5\Big), \tag{4}$$

and K_t^t and K_5^5 are constant values. The solution (2) is obtained in the case of neglecting the small terms of the expansion (3) and is possible with the following relations between parameters $R(r) = R_0, L_0$, $f(R_0)$ and $\left.\frac{df}{dR}\right|_{R=R_0}$ $\left.\frac{df}{dR}\right|_{R=R_0}$

$$f(R_0) = -\frac{16\pi}{m_{\rm D}^2} \frac{{R_0}^2 K_t^t}{n^2(n-1)^2}, \tag{5}$$

$$\left.\frac{df}{dR}\right|_{R=R_0} = \frac{8\pi}{m_{\rm D}^2} \frac{R_0\Big(K_5^5 - K_t^t\Big)}{n(n-1)^2}, \tag{6}$$

$${L_0}^2 = \frac{n(n-1)}{R_0}. \tag{7}$$

In the case of quadratic gravity $f(R) = aR^2 + R + c$ these expressions will take the form

$${L_0}^2 = \frac{n(n-1)}{R_0} = \frac{8\pi}{m_{\rm D}^2} \frac{(K_5^5 - K_t^t)}{(n-1)} - 4a, \tag{8}$$

$$c = \frac{(n-1)^2\Big(an^2(n-1)^2 + \frac{8\pi}{m_{\rm D}^2}\left(K_t^t(n-2) - nK_5^5\right)\Big)}{4\Big(an(n-1)^2 + \frac{4\pi}{m_{\rm D}^2}\left(K_t^t - K_5^5\right)\Big)^2}. \tag{9}$$

Note that taking into account the following terms of the expansion (3) leads to the dependence of the radius of the extra space L_0, as well as the four-dimensional Planck mass and the four-dimensional cosmological constant (under the adopted assumptions, the theory can be reduced to Einstein's four-dimensional theory of gravitation) on the radial coordinate.

SPONTANEOUS BRANES FORMATION

A.A. Popov[1], S.G. Rubin[2]

1 *apopov@kpfu.ru*; N.I. Lobachevsky Institute of Mathematics and Mechanics, Kazan Federal University, Kremlyovskaya ulitsa 18, Kazan 420008, Russia

2 *sergeirubin@list.ru*; N.I. Lobachevsky Institute of Mathematics and Mechanics, Kazan Federal University, Kremlyovskaya ulitsa 18, Kazan 420008, Russia; National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Kashirskoe shosse 31, Moscow 115409, Russia