High Energy Physics - Theory

Toroidal p-branes, anharmonic oscillators and (hyper)elliptic solutions

Aleksandr Zheltukhin

(Submitted on 23 Jun 2011 (v1), last revised 8 Jan 2012 (this version, v3))

Exact solvability of brane equations is studied, and a new $U(1)\times U(1) \times... \times U(1)$ invariant anzats for the solution of p-brane equations in $D=(2p+1)$-dimensional Minkowski space is proposed. The reduction of the p-brane Hamiltonian to the Hamiltonian of p-dimensional relativistic anharmonic oscillator with the monomial potential of the degree equal to $2p$ is revealed. For the case of degenerate p-torus with equal radii it is shown that the p-brane equations are integrable and their solutions are expressed in terms of elliptic ($p=2$) or hyperelliptic ($p>2$) functions. The solution describes contracting p-brane with the contraction time depending on p and the brane energy density. The toroidal brane elasticity is found to break down linear Hooke law as it takes place for the anharmonic elasticity of smectic liquid crystals.

Comments:	18 pages, extended version accepted in Nucl. Phys. B; discussions on integrability and geometric approach added; correspondence between anharmonic elasticity in toroidal branes and smectic liquid crystals revealed; references and acknowledgements updated; typos corrected
Subjects:	**High Energy Physics - Theory (hep-th)**; General Relativity and Quantum Cosmology (gr-qc); Mathematical Physics (math-ph)
Journal reference:	Nucl. Phys. B858 (2012) 142-154
Report number:	NORDITA-2011-50
Cite as:	**arXiv:1106.4842 [hep-th]** (or **arXiv:1106.4842v3 [hep-th]** for this version)

Submission history

From: Aleksandr Zheltukhin [view email]
[v1] Thu, 23 Jun 2011 22:00:53 GMT (10kb)
[v2] Tue, 9 Aug 2011 12:01:42 GMT (11kb)
[v3] Sun, 8 Jan 2012 17:28:17 GMT (15kb)

Which authors of this paper are endorsers?