Integrability of natural Hamiltonian systems in curved spaces

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We focus our attention on Hamiltonian system with two degrees of freedom which are given by a natural Hamiltonian of the form

$$H = \frac{1}{2}\left(a(r)p_r^2 + b(r)p_\varphi^2\right) + c(r)\cos\varphi + d(r)\sin\varphi,$$

where $a(r)$, $b(r)$, $c(r)$ and $d(r)$ are meromorphic functions of variable r. Using a particular solution we derive necessary conditions for the integrability of this system investigating differential Galois group of variational equations.

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