The Hamiltonian structure

$\underset{\text{open}}{\Omega} \subset \mathbb{R}^N \times \mathbb{R}^N$, $H : \Omega \to \mathbb{R}$ C^∞

$$\dot{\xi} = J \nabla H(\xi), \quad J = \begin{pmatrix} 0 & I_N \\ -I_N & 0 \end{pmatrix}$$

H is a first integral

$$\xi = (q, p), \quad q, p \in \mathbb{R}^N$$

$$\dot{q} = \frac{\partial H}{\partial p}(q,p), \quad \dot{p} = -\frac{\partial H}{\partial q}(q,p)$$

$$N = 3, \quad q = (z, E), \quad p = (w, t), \quad w = 4z'$$

$$H = \frac{1}{8}|w|^2 - E|z|^2 - 1 - \mathcal{P}(t, z, \bar{z})$$

$$\boxed{\dot{\xi} = J \nabla H(\xi), \quad H = 0}$$

Symmetries of H

$$H = \frac{1}{8}|w|^2 - E|z|^2 - 1 - \mathcal{P}(t, z, \bar{z})$$

$$H(-z, -w, E, t) = H(z, w, E, t) \qquad S(z, w, E, t) = (-z, -w, E, t)$$

$$\xi(t) \text{ solution} \iff S\xi(t) \text{ solution}$$

LC is a double covering $\quad x = z^2$

$$H(z, w, E, t+T) = H(z, w, E, t) \qquad t$$

angular variable

$$q = (z, E) \in \mathbb{C} \times \mathbb{R}, \quad p = (w, \bar{t}) \in \mathbb{C} \times \mathbb{R}/T\mathbb{Z}$$

$M = (\mathbb{C} \times \mathbb{R}) \times (\mathbb{C} \times \mathbb{R}/T\mathbb{Z})$ symplectic manifold

$$\omega = \sum_{j=1}^{2} dz_j \wedge dw_j + dE \wedge d\bar{t}$$