

# Algebro-geometric solutions, solitons and breathers of Davey-Stewartson and Nonlinear Schrödinger equations

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## Abstract:

We present a new derivation of solutions to the Davey-Stewartson system and (vector) Nonlinear Schrödinger equations in terms of multi-dimensional theta functions on compact Riemann surfaces. The starting point of the construction of the solutions is a new variant of Fay's trisecant identity. Regularity and reality conditions on the solutions are discussed. In the limit that the Riemann surface degenerates, these solutions reduce to elementary functions describing solitons and breathers.

## References:

1. C. Kalla, Breathers and solitons of generalized nonlinear Schrödinger equations as degenerations of algebro-geometric solutions, *J. Phys. A* 44 (2011).
2. C. Kalla, New Degeneration of Fay's Identity and its Application to Integrable Systems, *IMRN* doi: 10.1093/imrn/rns175 (2012).
3. C. Kalla and C. Klein, Computation of the topological type of a real Riemann surface (2012) arXiv:1204.4826
4. C. Kalla and C. Klein, On the numerical evaluation of algebro-geometric solutions to integrable equations, *Nonlinearity* Vol. 25 569-596 (2012).