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## A Talk at the 2nd ISNMP Conference

Bad Ems, 28 June to 4 July 2026

### Regular Session:

**Speaker:** Jose Francisco Gomes (IFT-Unesp, Brazil)

**Title:** *New solitonic solutions for higher grading integrable hierarchies*

**Abstract:** A generalized framework to accommodate higher graded integrable hierarchies is proposed, primarily extending the conventional algebraic formalism. This approach utilizes a Generalized Riemann-Hilbert-Birkhoff decomposition to systematically generate and classify multi-component nonlinear integrable models. Explicit examples of the positive and negative flows of the mKdV and Chen-Lee-Liu (CLL) hierarchies and its various reductions, including Burgers hierarchy are considered. For the CLL hierarchy two classes of vacua, namely zero and non-zero constant vacuum solutions are shown to be admissible. The tau functions for soliton solutions are obtained by a dressing method and vertex operators are constructed for both types of vacua. We are able to select and classify the soliton solutions in terms of the type of vertices involved. A particular set of solitons solutions constructed by a judicious choice of vertices are shown to yield in a closed form, the multi soliton solutions for the Burgers hierarchy.