Rogue waves of the Hirota and the Maxwell-Bloch equations

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Abstract:

In this poster, we derive a Darboux transformation of the Hirota and the Maxwell-Bloch(H-MB) system which is governed by femtosecond pulse propagation through an erbium doped fibre and further generalize it to the matrix form of the n-fold Darboux transformation of this system. This n-fold Darboux transformation implies the determinant representation of n-th new solutions of $(E^{[n]}, p^{[n]}, \eta^{[n]})$ generated from known solution of (E, p, η). The determinant representation of $(E^{[n]}, p^{[n]}, \eta^{[n]})$ provides soliton solutions, positon solutions, and breather solutions (both bright and dark breathers) of the H-MB system. From the breather solutions, we also construct bright and dark rogue wave solutions for the H-MB system, which is currently one of the hottest topics in mathematics and physics. Surprisingly, the rogue wave solution for p and η has two peaks because of the order of the numerator and denominator of them. Meanwhile, after fixing time and spatial parameters and changing other two unknown parameters α and β, we generate a rogue wave shape for the first time.

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