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Non-Linear Rational Riemann-Hilbert-Problems with Circular Target Curves

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Abstract. This article may be considered as a continuation of [3], where we studied non-linear Riemann-Hilbert problems with circular target curves $|w-c| = r$ and Hölder continuous coefficients c and r. Here we assume that c and r^2 are rational functions and emphasize algorithmic and numerical aspects. It is shown that all solutions of the problem are rational and can be obtained by solving an interpolation problem of (generalized) Nevanlinna-Pick type. This problem is in turn reduced to a linear system, which leads to efficient (and stable) numerical methods. Special emphasis is on the Laurent case, which is of importance in applications. We propose an *a-posteriori* estimate which allows one to verify the accuracy of the approximate solution and report on some test calculations.

Keywords. Riemann-Hilbert problem, generalized modulus problem, Nehari problem, Nevanlinna-Pick interpolation, Nevanlinna parametrization, Wiener-Hopf factorization.

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