How sensitive is the determination of an S-factor from experimental data to the nuclear theory used?

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An R-matrix analysis of experimental total and differential nuclear cross-section data on the reactions $^{10}\text{B}(p,\alpha_0)^7\text{Be}$ and $p^{10}\text{B}$ elastic scattering is presented. This is the most comprehensive R-matrix analysis of these reactions to date. 1845 data points from 10 experimental references for laboratory proton energies from 0.02-3 MeV are entered. The reactions fit with a reasonable $\chi^2/(\text{point})$ of 2.2 using approximately 25 R-matrix parameters. The evaluated $^{10}\text{B}(p,\alpha_0)^7\text{Be}$ cross-section is presented from which the S-factor is determined. The value is 6 times smaller than the value previously extracted by Angulo et al. By relaxing first the multichannel nature of the fit, and secondly, the multiresonance nature of the fit, we show that the S-factor is very sensitive to the details of the nuclear theory used.