“...[processed H] lines at large n are both narrower and stronger than expected from theory...” and suggested, “This behavior is...inconsistent with Griem’s theory...”
Bell et al. (2000); hereafter BASV

“...[result] remains a mystery...”
Griem (2005)

“Thus this mystery is not resolved by the present calculations.”
Watson (2006)

“...[result is a] dramatic discrepancy...”
Gravrilenko & Oks (2007)

“The Bell et al. (2000) results are so different from what had been expected...”
Gordon & Sorochenko (2009)
Conventional Hardware FS (Frequency Switching)

Used in radio astronomy to reduce instrumental backgrounds in detected spectra. When the resultant bandpass is formed by differencing them, spectra appear twice, once in emission and once in absorption. These pairs are combined to obtain a $\sqrt{2}$ improvement in S/N (Signal-to-Noise) Robinson 1964.
FS removes many gain variations and does not require subjective estimates of the zero level of a spectrum, but there is a price to pay, S/N decreases as

\[ S/N \approx 0.9 i^{-\frac{1}{4}} \]
Using conventional broadening theory and Monte Carlo simulation, we determine a transition zone \( n = 224, \ldots, 241 \) (\( \Delta n = 11, \ldots, 14 \)), where measurement errors grow quickly with \( n \) and become comparable with the measurement values themselves. Our simulation predicts “processed” line narrowing in the transition zone similar to that reported by Bell et al. 2000.
Insensitivity to changing line widths

Correction Curve

- Lockman & Brown (1975)
- Bell et al. (2011) Fig. 12
- \( N = 4e3 \text{cm}^{-3}, T = 1e4 \text{K} \)
- Bell et al. (2000) Fig. 4, Voigt profiles
- no correction
Conclusions

- We find good agreement between our simulation results and their findings, both in line temperatures and widths. We conclude, therefore, that Bell et al.’s findings do not indicate a need to revise Stark broadening theory.

- At the end of the day, we have proven nothing, because we need to repeat those measurements!

- Multiple FS will be shown in a forthcoming publication to be a powerful technique for the detection and measurement of weak, wide/narrow spectral lines.

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