NO RELAXATION DELAY (NORD) SPECTROSCOPY: RAPID SEQUENTIAL ACQUISITION OF NMR EXPERIMENTS

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Since NMR is an inherently low-sensitivity method, it is a matter of constant attention to find ways for improving sensitivity and/or reducing measurement time. A few years ago, the idea of sequentially exploiting two different pools of magnetization in a concatenated experiment was proposed for saving spectrometer time since the two pools can relax simultaneously in a single delay.[1] More recently, we have demonstrated that it was possible to omit the relaxation delay using the NORD (NO Relaxation Delay) strategy.[2] NORD experiments are laid out not only to operate with two orthogonal pools of magnetization but also to have one of the pools relaxing, while the other is being used and vice versa, or to save magnetization in individual modules for succeeding scans in accordance with the Ernst angle concept. A typical set of experiments in small-molecule NMR (^{1}H–^{13}C HSQC or H2OBC/2BOB, ^{1}H–^{13}C HMBC and ^{1}H–^{1}H TOCSY) is combined in novel NORD sequences.[3] The result is a significant sensitivity gain to the least sensitive of the three, HMBC, and thus a highly welcome saving in instrument time. It will be presented in the lecture that the NORD strategy in combination with the concatenation of two or three experiments delivers complete hetero- and homonuclear correlation maps within minutes for small and medium-sized molecules (e.g. carbohydrates, steroids) in moderate concentration. Although the proposed NORD experiments can serve most of the needs across a wide range of NMR applications, but if needed, it is also possible to replace any modules by another one relying on the same pool of magnetization.

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REFERENCES

[1] Ē. Kupče and T. D. W. Claridge, *Angew. Chem. Int. Ed.*, **2017**, 56, 11779-11783.

[2] T. M. Nagy, K. E. Kövér and O. W. Sørensen, *Angew. Chem. Int. Ed.*, **2021**, 60, 13587–13590.

[3] I. Timári, T. M. Nagy, K. E. Kövér and O. W. Sørensen, *Chem. Commun.* **2022**, 58, 2516-2519.