

Power supply unit for field gradient with high stability and high power

A new 30A power unit for field gradients provides 3 times the power and the equal stability of a standard power unit in ECA/ECX series. This unit can supply field gradient pulses up to 90G/cm when used with a standard tunable probe (TH5AT/FG probe) and is suitable for measurements of diffusion coefficients and DOSY of polymers.



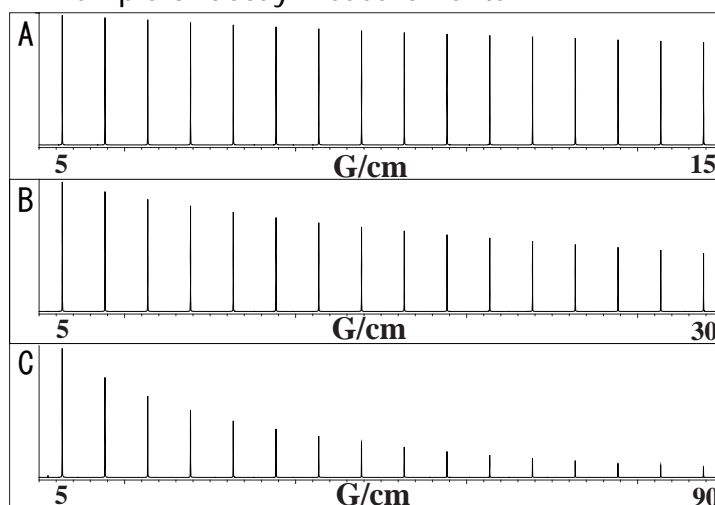
In NMR spectroscopy, a diffusion coefficient is determined by fitting or calculation for the following decay curve of signal intensity $I(G)$:

$$\frac{I(G)}{I(0)} = \exp\left[-(\gamma G \delta)^2 D \left(\Delta - \frac{\delta}{3}\right)\right]$$

γ : Gyromagnetic ratio / G : Field gradient strength /
 δ : Field gradient pulse width / Δ : Diffusion time /
 D : Self diffusion coefficient

A maximum value of Δ is limited by the relaxation time of a sample, while δ is usually the order of ms regardless of NMR systems. Consequently, strong field gradients are required to obtain a sufficient decay in the case of small diffusion coefficients (see below). If a decay is not sufficient because of weak field gradients, the resultant diffusion coefficient becomes less accurate and the separation in DOSY spectra becomes ambiguous.

< Example of decay measurements >



Sample: polyethylene glycol
 (Molecular weight: 35,000)
 Solvent: D₂O
 Temperature: 30°C

Experimental conditions:

- A. Diffusion time $\Delta = 0.4$ s
 Field gradient pulse width $\delta = 8$ ms
 Field gradient strength $G = 5-15$ G/cm
- B. Diffusion time $\Delta = 0.4$ s
 Field gradient pulse width $\delta = 8$ ms
 Field gradient strength $G = 5-30$ G/cm
- C. Diffusion time $\Delta = 0.4$ s
 Field gradient pulse width $\delta = 5$ ms
 Field gradient strength $G = 5-90$ G/cm