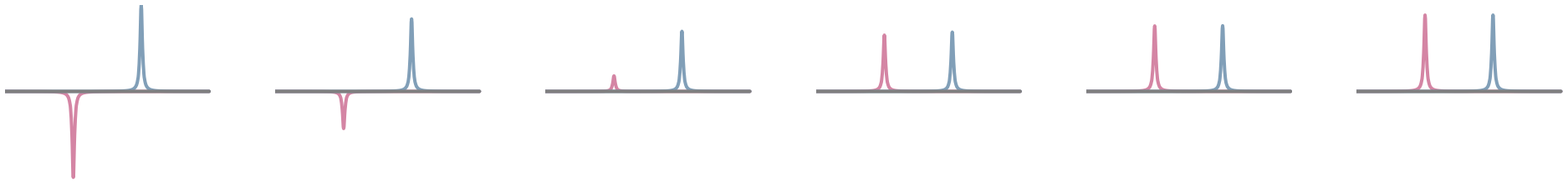
Magnetisation Transfer



Yuan Gao

Tips and Tricks, SNUG 2024

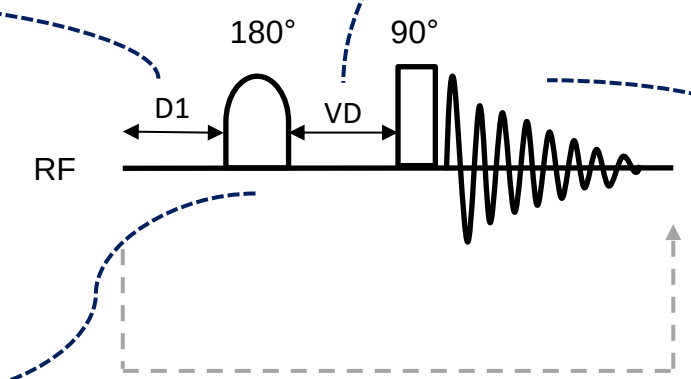
What is magnetisation transfer?

Magnetisation transfer

Selective inversion recovery / Hoffman-Forsén

Variable delay
Both relaxation and exchange (magnetisation transfer) occur

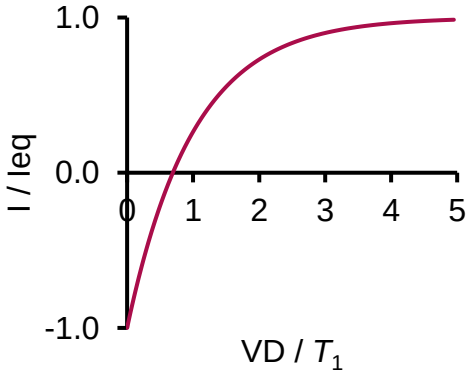
Relaxation delay (D1)
To ensure all relevant nuclei have *fully* relaxed



Acquisition
Measure the outcome

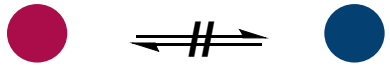
Soft 180° pulse
Selective inversion of chosen signal (frequency range)

Repeat whole sequence

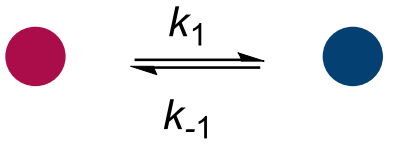


Forsén, S., Hoffman, R. A, *J. Chem. Phys*., 1963, 39, 2892–2901
Orrell, K. G.; Šik, V.; Stephenson, D., *Prog. Nucl. Magn. Reson. Spectrosc.,* 1990, 22, 141–208

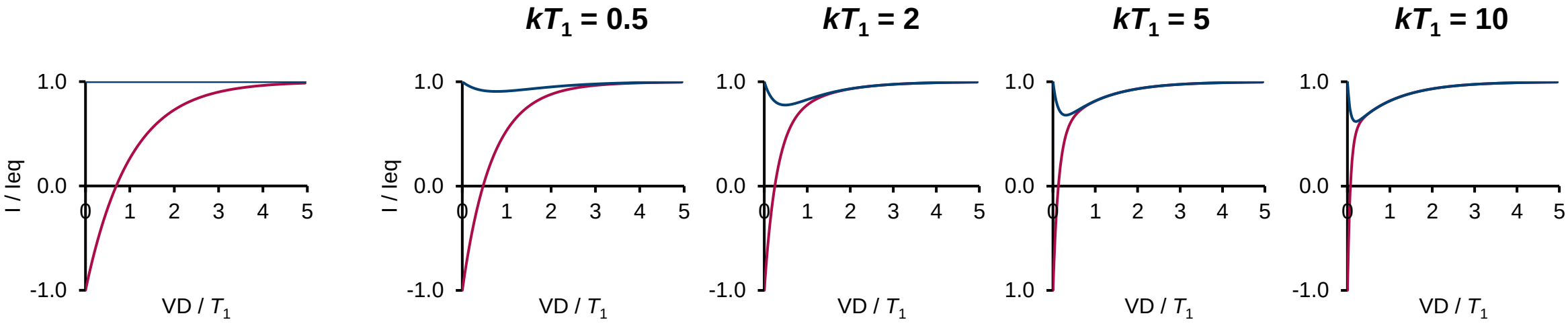
Probing the chemical exchange



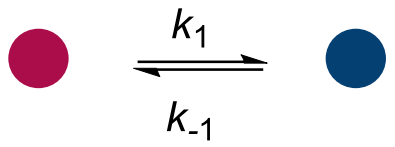
Spin A Spin B



Same T_1

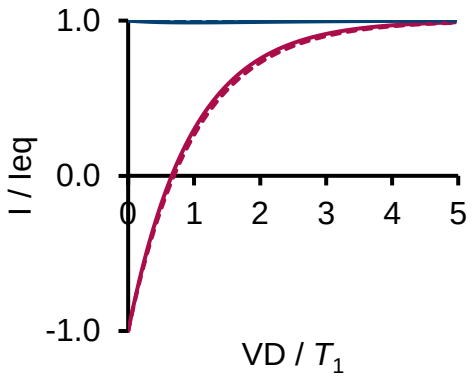


Probing the chemical exchange

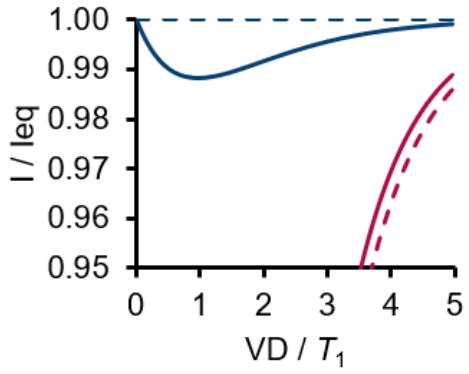


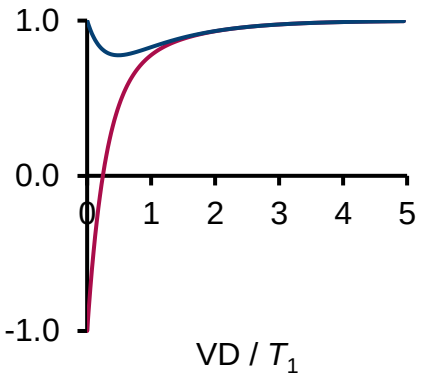
Same T_1

kT_1 = 0.05 ⟵ **kT_1 = 0.5** **kT_1 = 2** **kT_1 = 10** ⟶ **kT_1 = 30**

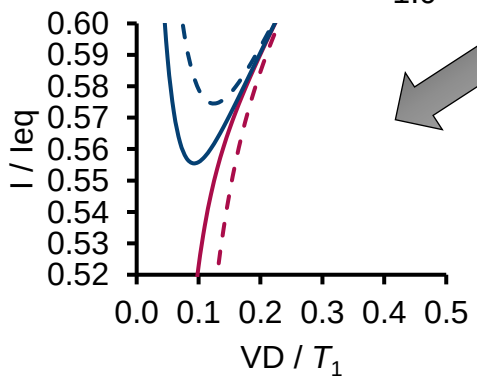


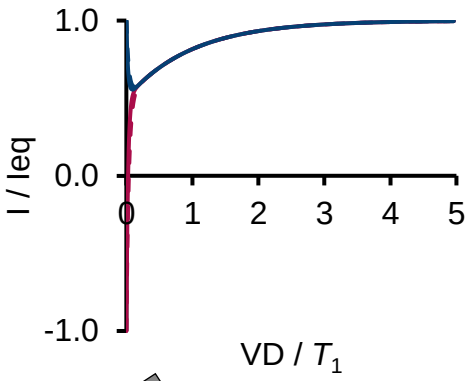
Dash:
kT_1 = 0



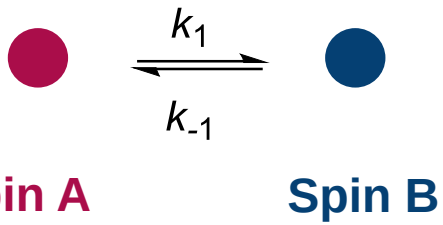


Dash:
kT_1 = 20



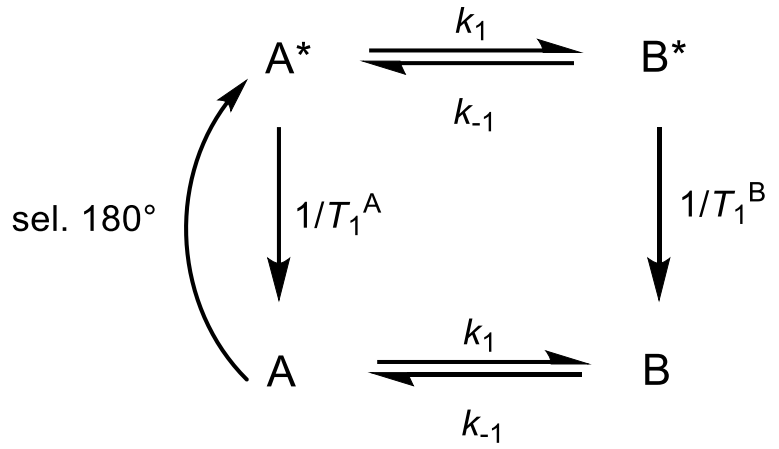


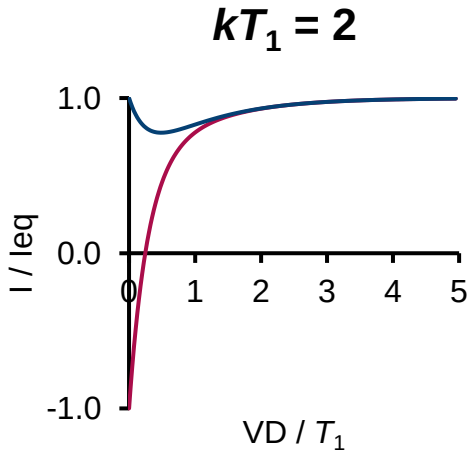
Things to consider

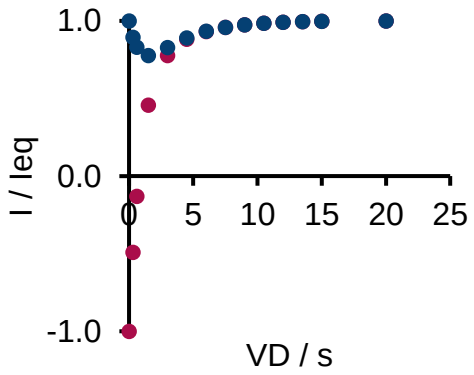


Determine the T_1

Decide a suitable range of variable delay



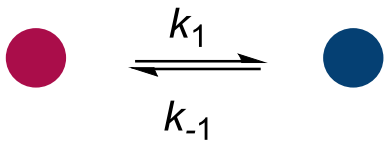




T_1 can be different for A and B
… and it changes!

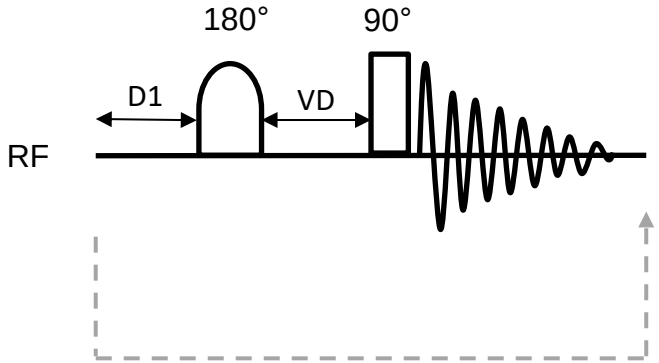
So does chemical shifts
--- is selective pulse selective?

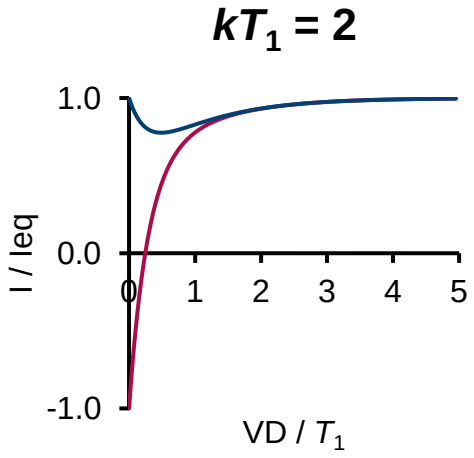
Things to consider



Nuclei with longer T_1

--- expand the window with the cost of time





Phase cycling important

--- 8 scans recommended

1 scan possible but need to be careful.