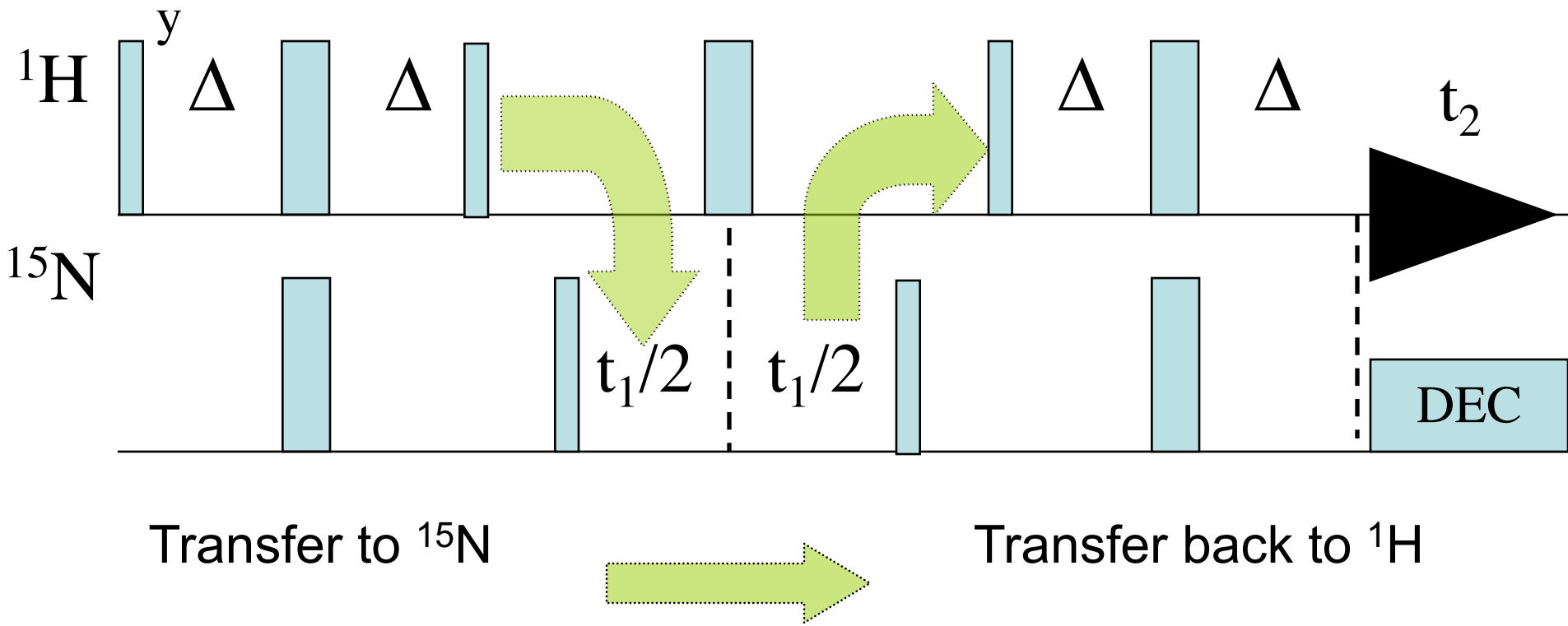
An overview of the HSQC



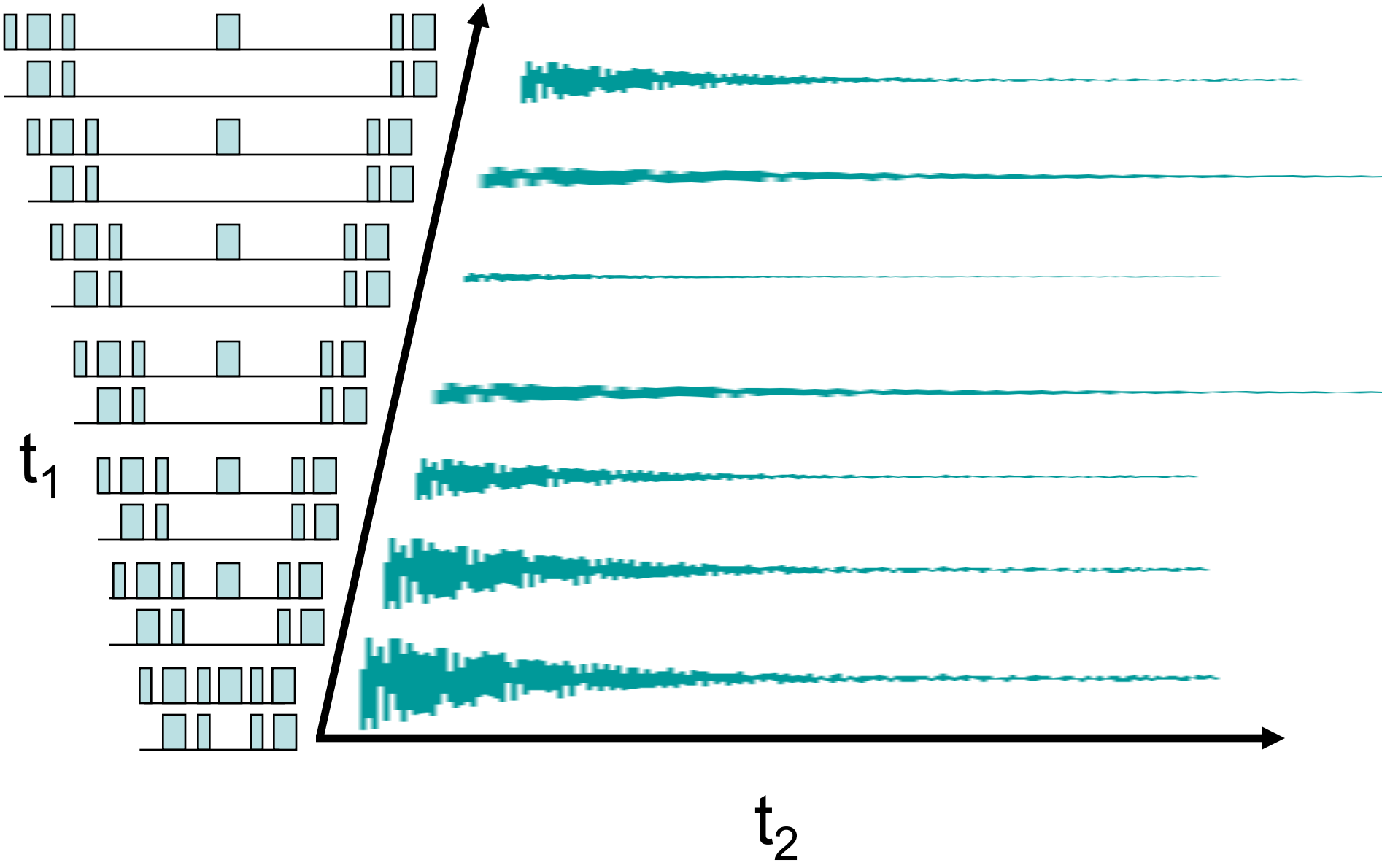
Transfer to ^{15}N

Transfer back to ^{1}H

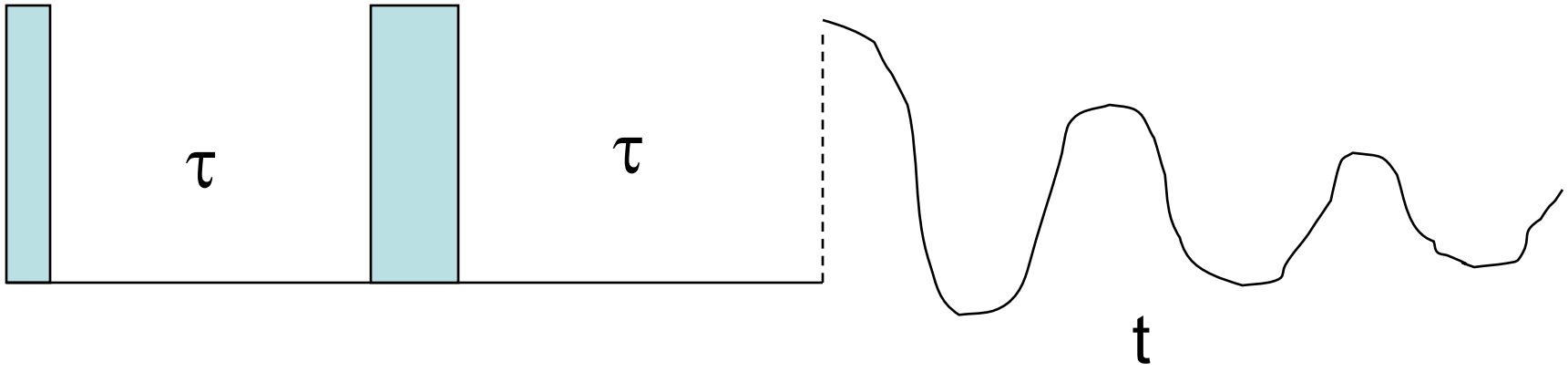
Encode ^{15}N chemical shift for time t_1

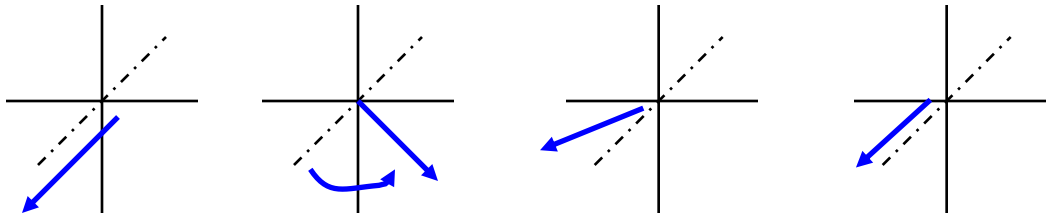
Bodenhausen & Ruben

2D Time-Domain Data



The Spin Echo "averages" chemical shift evolution



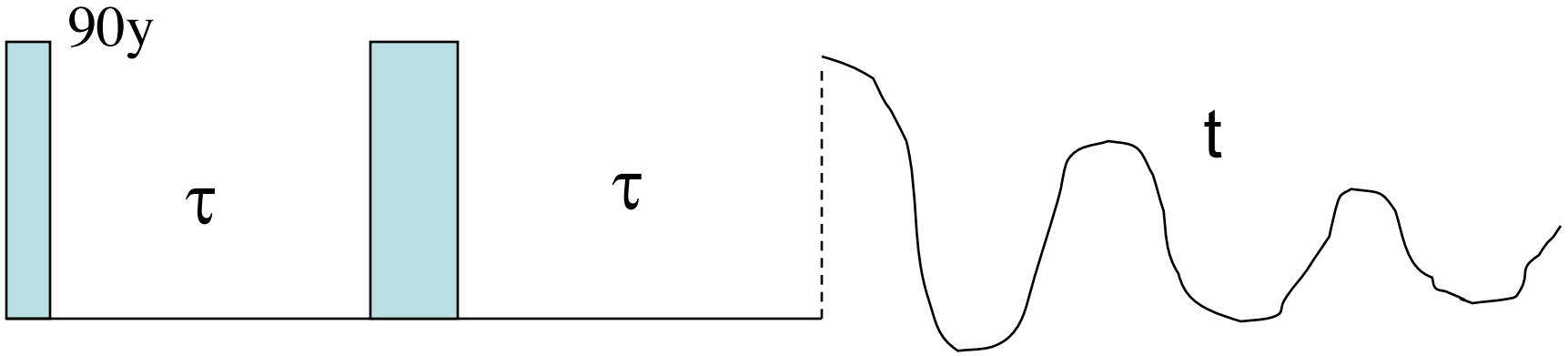


Echo Forms After 2τ

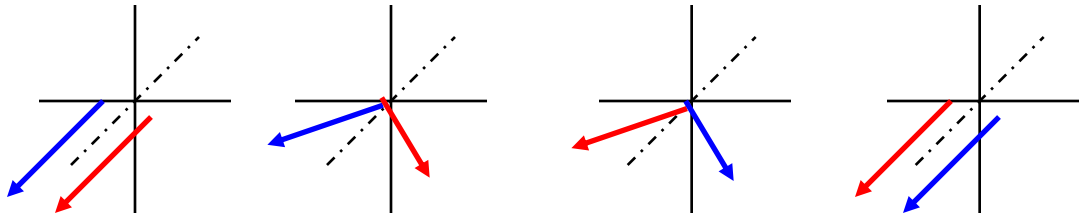
ϕ $-\phi$

$\phi = 2\pi\tau\delta$

Spin-Echo Refocuses J and CS Evolution

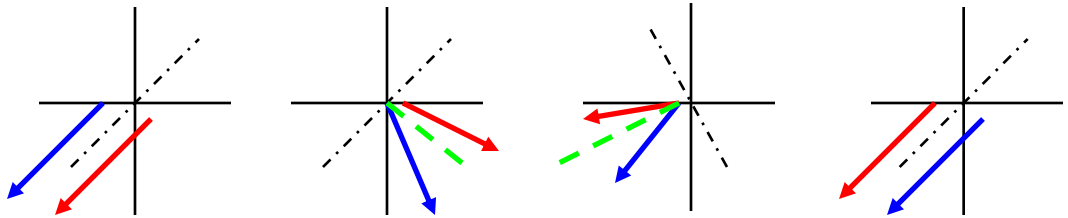


J_{XH} only



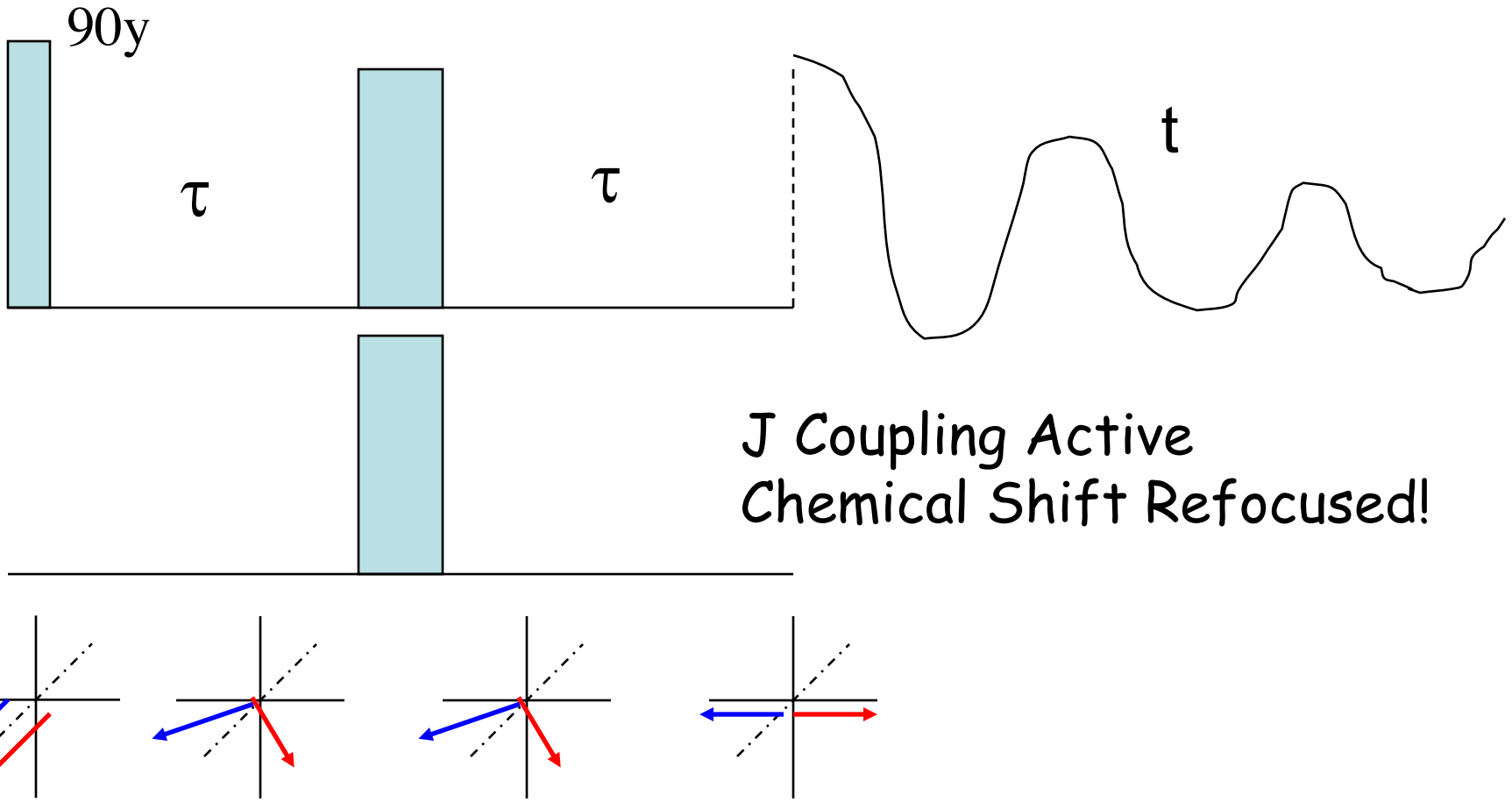
J Coupling Refocused

J & CS



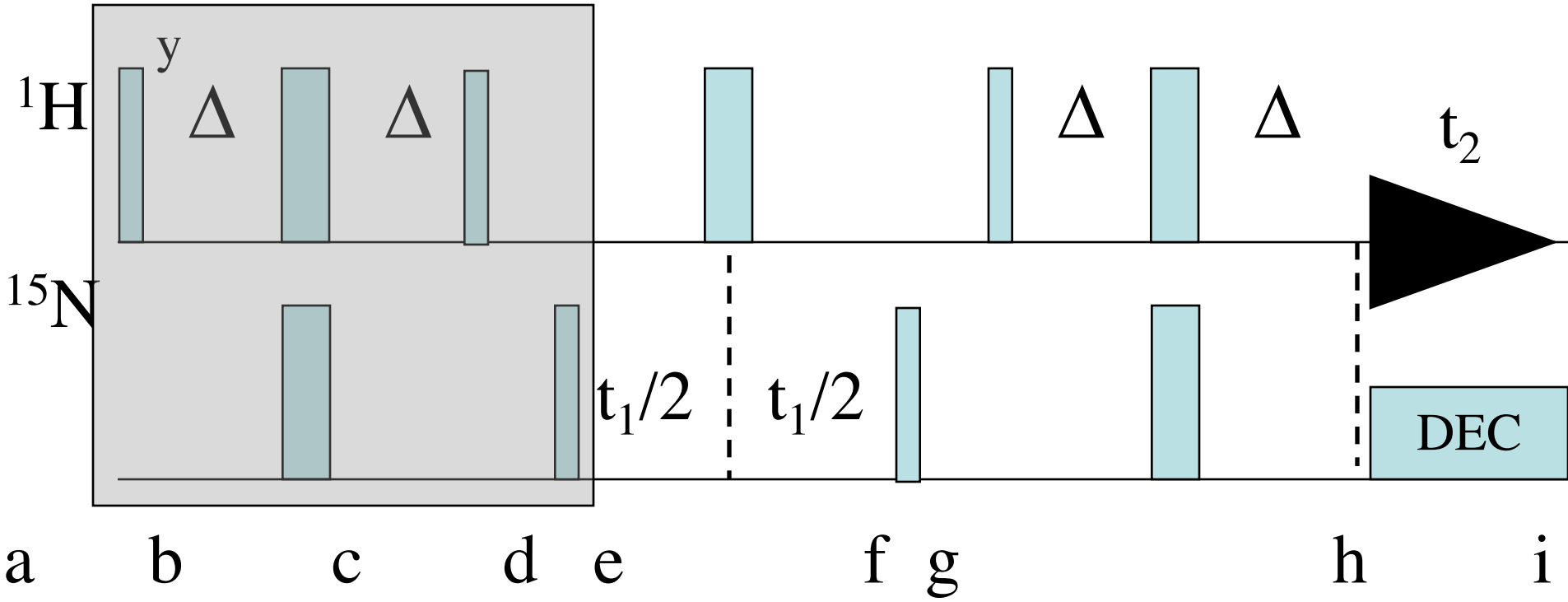
J Coupling & Chemical Shift Refocused

Double Spin Echo



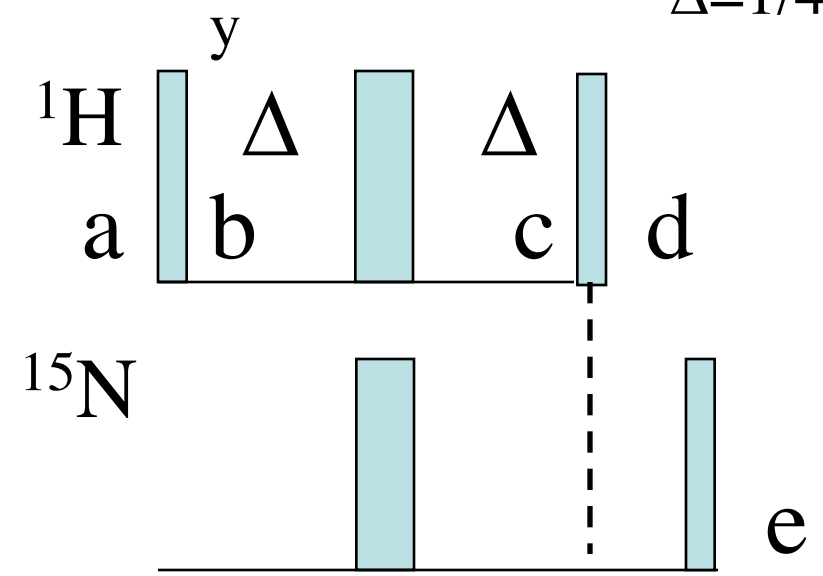
J Coupling Active
Chemical Shift Refocused!

HSQC: guided tour

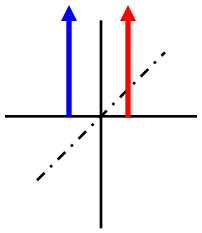


First transfer

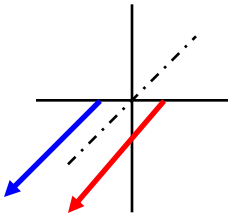
$\Delta = 1/4J_{NH}$



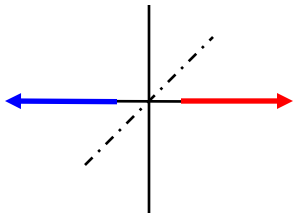
a)



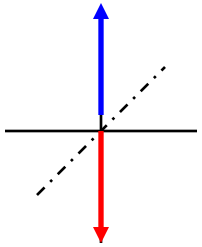
b)



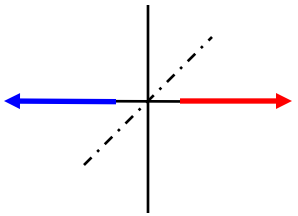
c)



d)



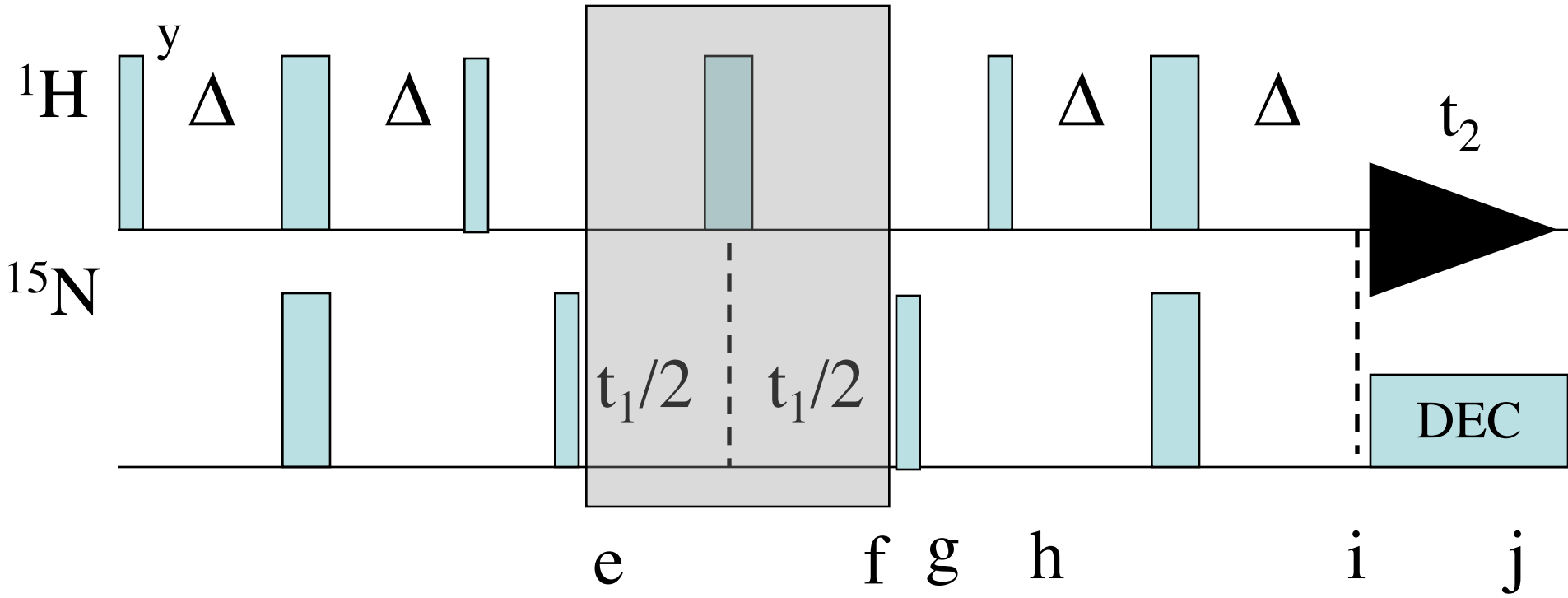
e)



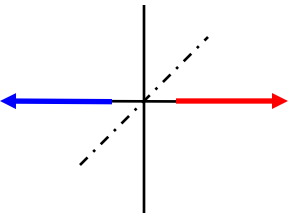
^{15}N transverse "antiphase" magnetization subject to ^{15}N chemical shift

Morris & Freeman, INEPT

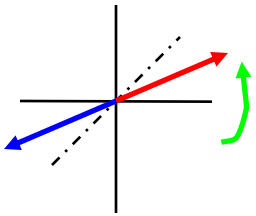
^{15}N Chemical Shift Evolution



e)

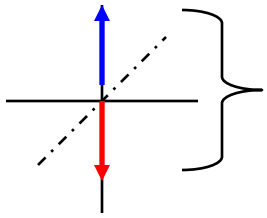


f)

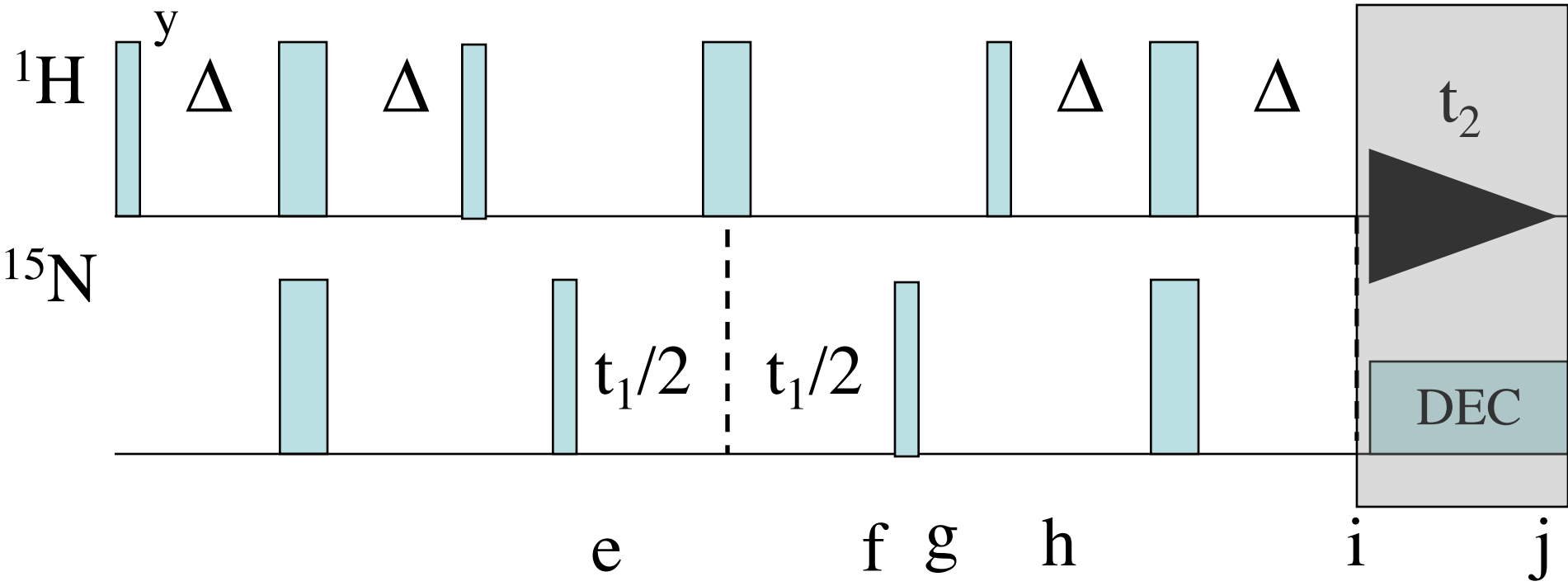


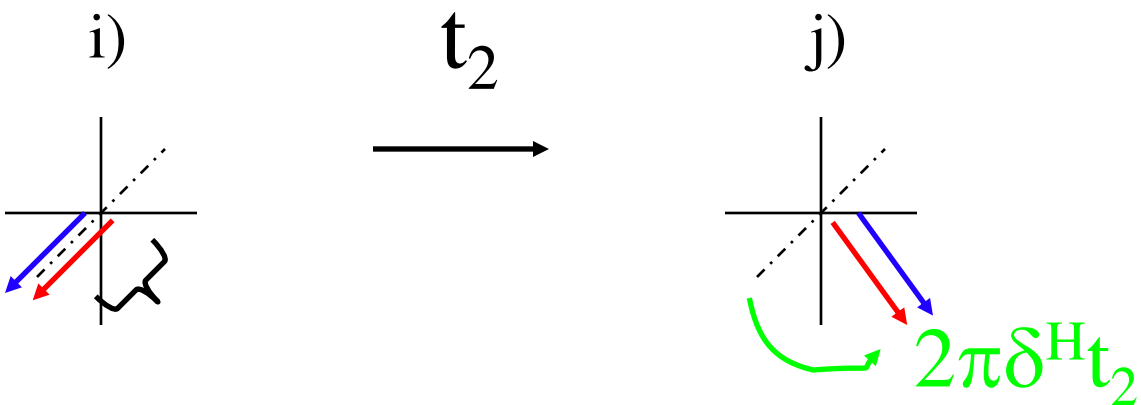
$2\pi\delta^N t_1$

g)

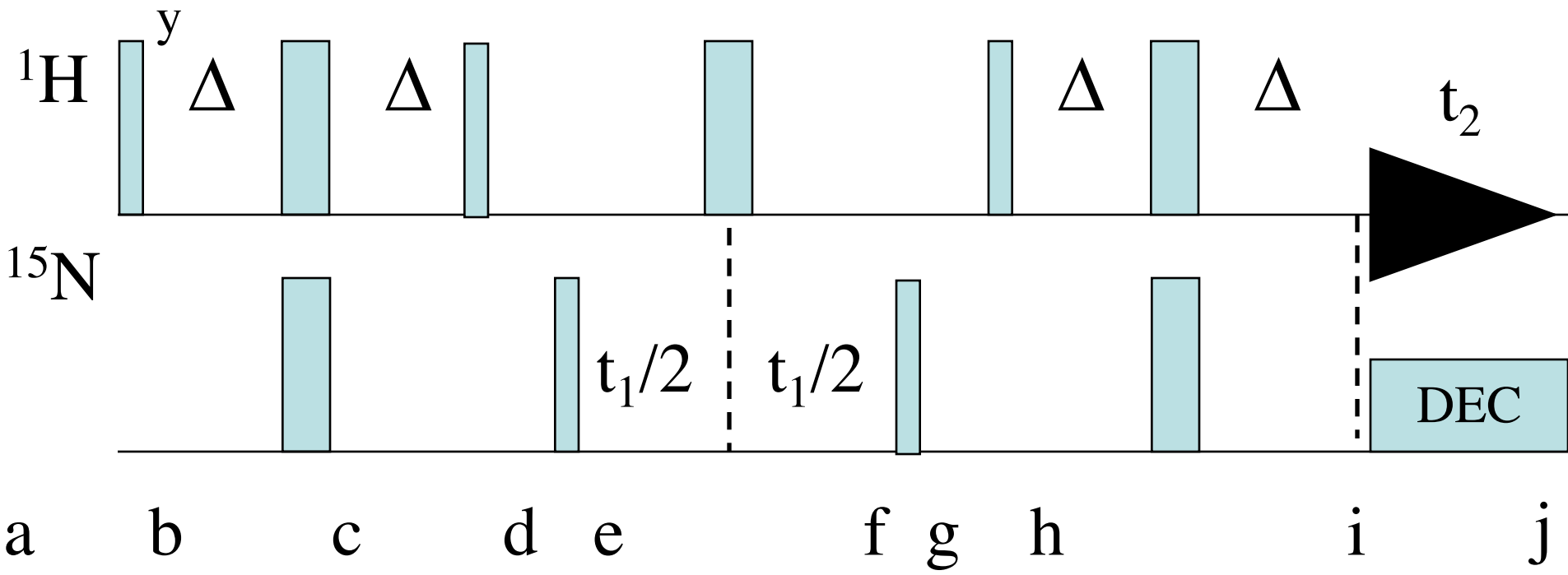


Detection

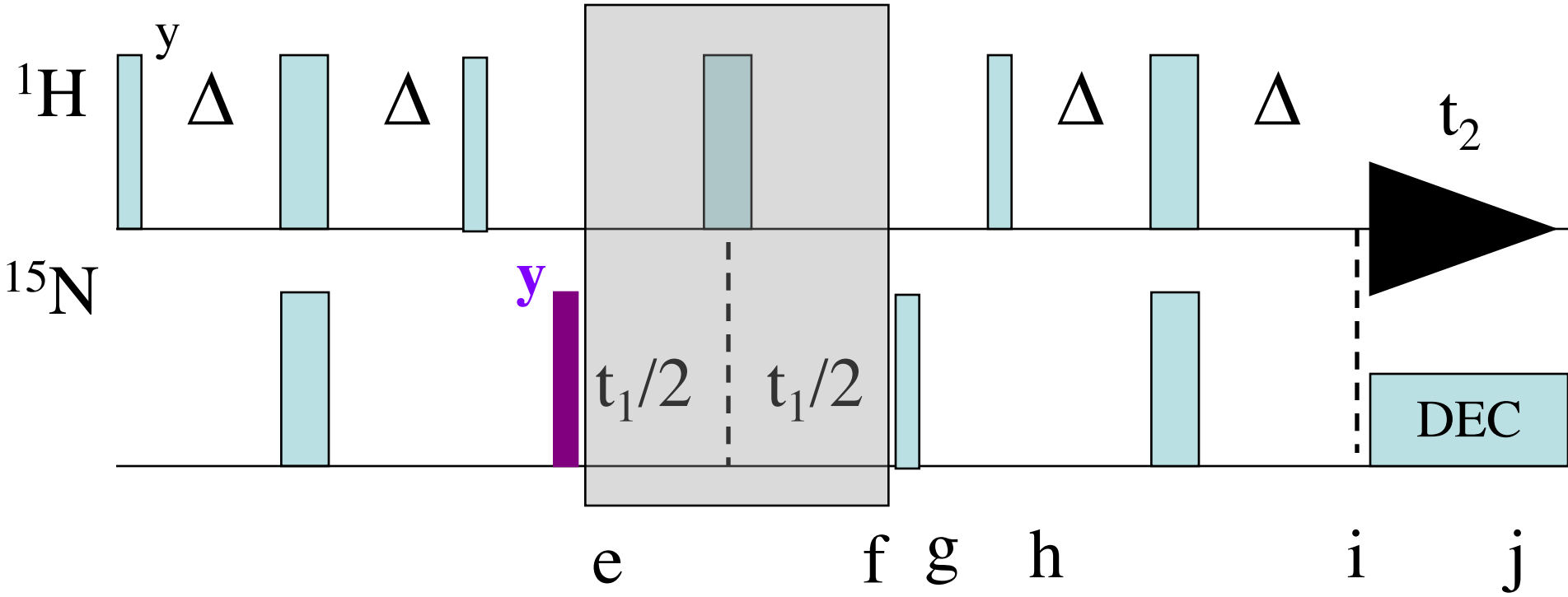




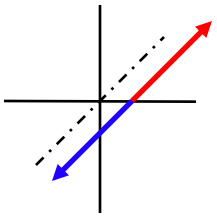
HSQC Signal



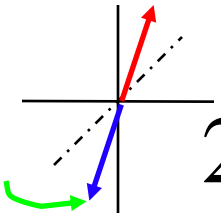
Obtaining the Sine Component



e)

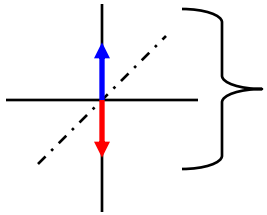


f)



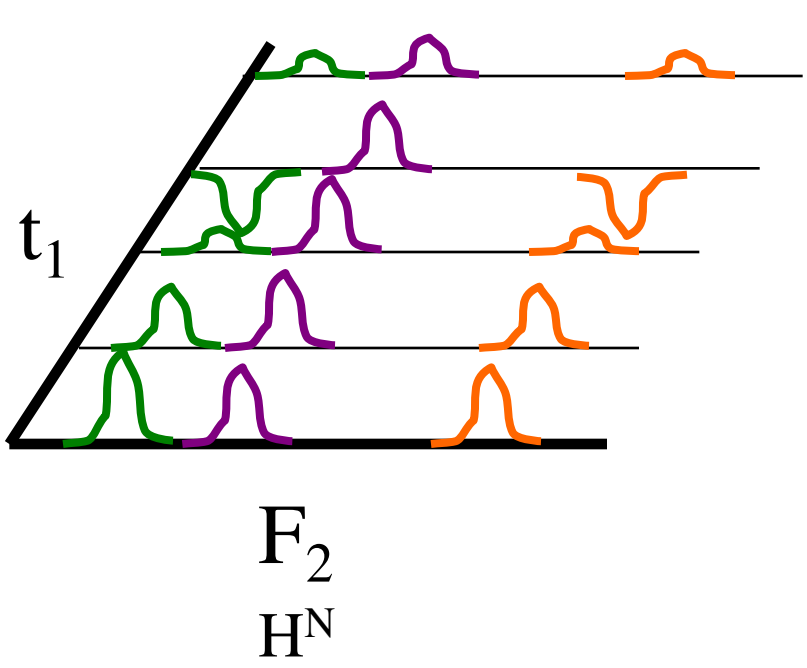
$2\pi\delta^N t_1$

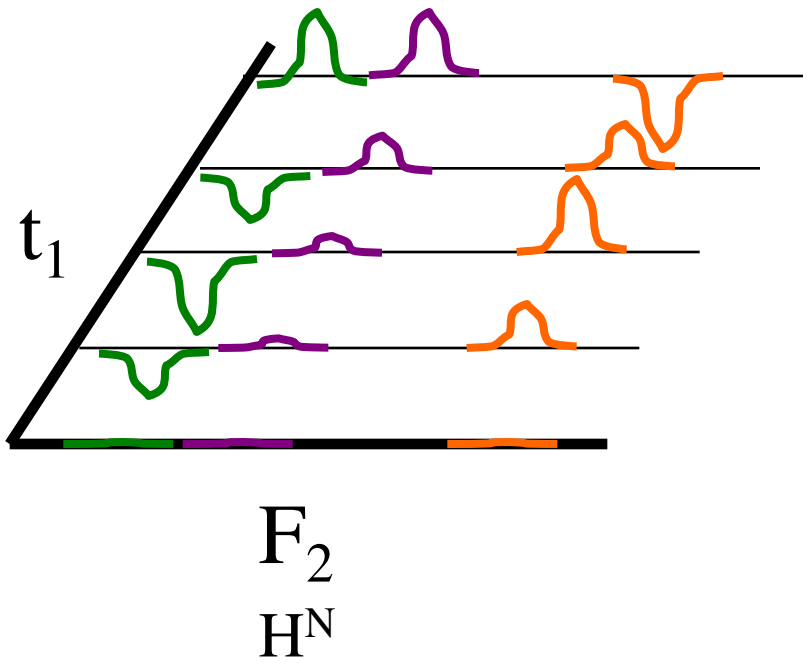
g)



States, Ruben, Haberkorn

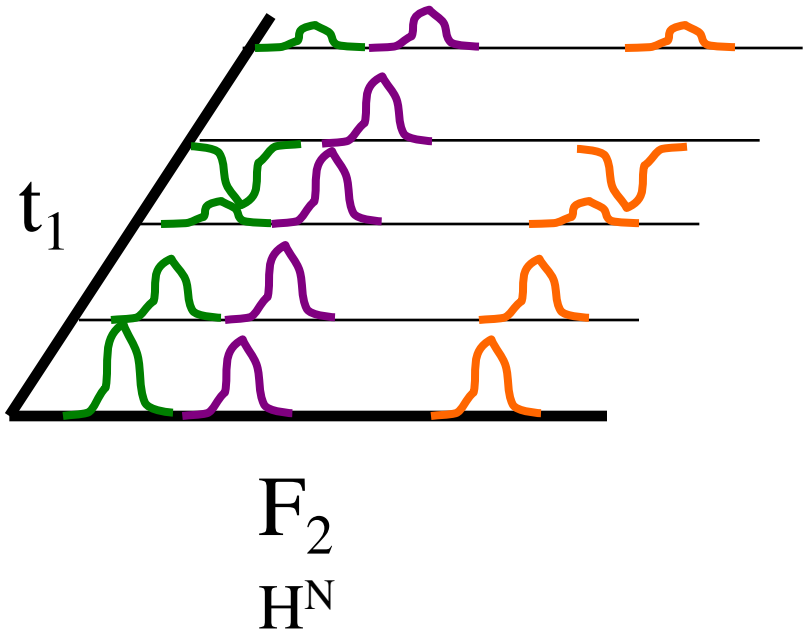
After Obtaining Im Part of Indirect Dimension . . .





2D Fourier Transform: FT Direct Dimension

FT Direct Dimension



Re $S(t_1,\nu_2)$ is absorptive.
But unable to discriminate sign of δ^N

Some data shuffling then 2D FT =the HSQC Spectrum