But, we do not record NMR data in the analog format. Why not?

Instead, we convert the time domain signal into a digital signal.

How do we "digitize" the signal - well?

Two big Q's.

1) How often?
2) How long?
How often?

$\Delta t$ between samples = "dwell time"

But $\Delta t$ is a big deal...

spectral width = range of detected freqs

$$sw = \frac{1}{\Delta t}$$

Hmm...

If we know what $sw$ we need, then

$$\Delta t = \frac{1}{sw}$$

But this implies of something like a zero (central) frequency...??!

Anyway...

How long $= \Delta t \cdot \# \text{ samples}$

$\frac{nD}{2}$ (number of complex points)
Consider $T_2 = 4s$

$\quad -\frac{t}{T_2} = e^{-\frac{t}{T_2}}$

$\quad e^{-\frac{t}{T_2}} = e^{-\frac{1}{4}} \Rightarrow \phi$

How about $\frac{e^{-\frac{1}{4}}}{e^0} \Rightarrow 0.05 \ (5\% \ of \ initial)$

$\quad e^{-\frac{1}{4}} = 0.05$

$\quad \ln \left( e^{-\frac{1}{4}} \right) = \ln \left( 0.05 \right)$

$\quad -\frac{t}{4} = -3.0$

$\quad t = 12 \ seconds$

"Let's name it's... acquisition time" (at)
Okay, we target 12 seconds...

Let's assume $sw = 5000 \text{ Hz } (5000 \text{ s}^{-1})$

$$\Delta t = \frac{1}{5000 \text{ s}^{-1}} = 0.0002 \text{ s}$$

$$= 0.2 \text{ ms}$$

$$= 200 \mu\text{s}$$

$$at = 12 \text{ s}$$

$$\frac{\text{time}}{\text{sample}} \Rightarrow \Delta t = \# \text{ samples} = 60,000$$

Technical note... For very silly reasons, various instruments number samples incorrectly.

$$\# \text{ samples} = \frac{np}{z}$$

$$np = 2 \times \# \text{ samples}$$

$$= 120,000$$

But, what if we break the law?