Rapid Kinetic and Spectroscopy instruments

SFM300&400 – Submillisecond dead time measurements. (Updated, August 14, 2009)

This series of test was designed to demonstrate the fastest dead time that can be achieved with the SFM-300 or SFM-400 instrument

The test below uses aSFM-300/400 with a hard stop valve.

INSTRUMENTS USED:

Stopped-flow : SFM-300 equipped with FC-08 cuvette. All syringes were the standard 10 mL syringes
Spectrometer : MOS-250 in absorbance mode.

- Illumination wavelength : 525 nm
- Bandpass 20 nm
- 150 W Xe lamp

TEST REACTION
Reduction of DCIP by ascorbic acid at acid pH

DESCRIPTION OF THE EXPERIMENTAL PROCEDURE
Syringe contents :

- Syringe N°1 = water
- Syringe N°2 = 50 mM Ascorbic acid
- Syringe N°3 = 500 µM DCIP

Flow rate was adjusted to 10 mL/s per active syringe
Absorbance was measured at 525 nm.
In a first series of shot DCIP was mixed with water and the absorbance of DCIP diluted by ½ was recorded.
In a second series DCIP was mixed with ascorbic acid and reduction of DCIP was observed.

Results are shown in the figure below :

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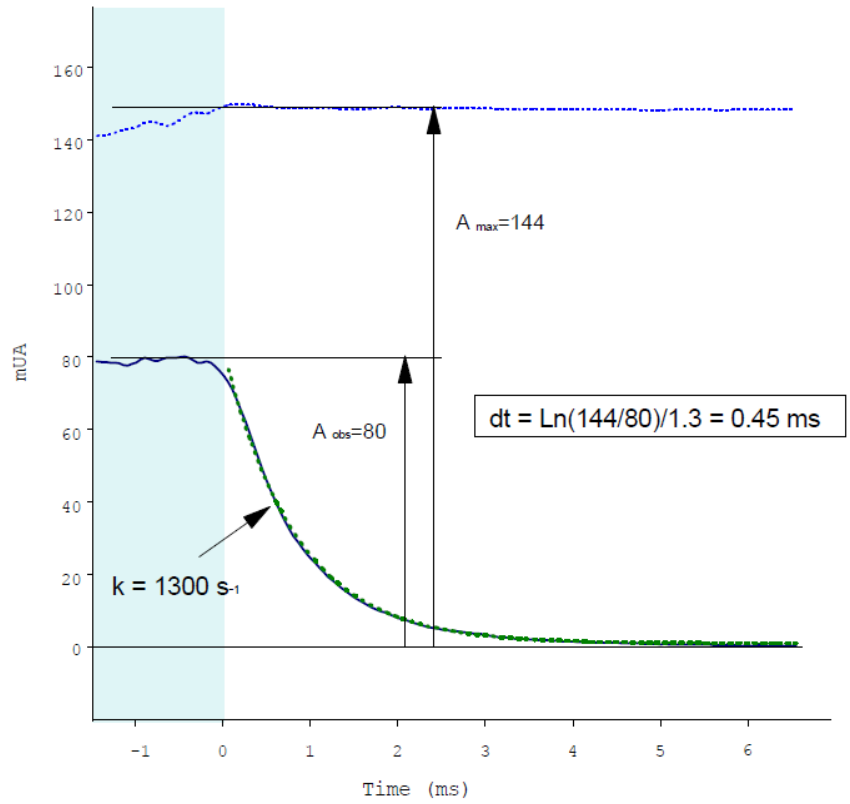

The time axis is set to zero at the time of hard stop closure.
The trace in blue above is the DCIP dilution while the trace below is obtained when DCIP is mixed with ascorbic acid. The trace is fitted with an exponential corresponding to a rate constant of 1300 s^{-1}. From this value of the rate constant and from the observed absorbance amplitudes a dead time of **0.45 ms** can be calculated.
It is interesting to note that the hard stop provides a clean stop with a perturbation shorter that 100 µs.