Signal to Noise Comparison between various Spectrometers

AC-300 = WM-360 = DPX-300

DRX-400 = $\sqrt{2}$ **S/N increase** over AC-300, WM-360, or DPX-300

AMX-600 = $\sqrt{2}$ **S/N increase** over DRX-400
(2 times S/N increase over AC-300, WM-360, or DPX-300

Signal-to-Noise (S/N) builds up by $\sqrt{2}$. So if we have a peak height relative to baseline noise ratio of 2:1, then to **double** our Signal-to-Noise ratio to 4:1, we would need to Acquire **4 times** as many scans.

On the AC-300:
Student-A had 10mgs of sample (M.W. = 300) dissolved in 0.5ml of $CDCl_3$ solvent and was able to get a ^1H spectra in 8 scans. Student-B was only able to isolate 5mgs of sample (M.W. = 300) dissolved in 0.5ml of $CDCl_3$ solvent. For Student-B to Acquire a ^1H spectra with the same Signal-to-Noise as Student-A, then Student-B would need to Acquire 32 scans. Student-C was only able to isolate 1mg of sample (M.W. = 300) dissolved in 0.5ml of $CDCl_3$ solvent. Student-C would then need to Acquire 800 scans to get the same S/N compared to Student-A.

Student-D isolated 6.6mgs of sample (M.W. = 200) dissolved in 0.5ml of $CDCl_3$ solvent. Student-D should be able to Aquire 8 scans to get the same S/N as Student-A.

Student-E isolated 10 mgs of sample (M.W. = 300) dissolved in 0.5ml of $CDCl_3$ solvent. Student-E did not optimize the magnet shims and got peak heights of only half of what could have been achieved. Student-E would then have to Aquire 32 scans to get the same S/N as Student-A, but Student-E would also have extra work in interpreting the ^1H spectra collected.

On the DRX-400, Student-G was only able to isolate 5mgs of sample (M.W. = 300) dissolved in 0.5ml of $CDCl_3$ solvent. Student-G would only need to Acquire 16 scans to get the same S/N compared to Student-A. This would be ½ the number of scans as what Student-B needed for the same concentration.

Items that affect the S/N include: Concentration, Field Strength, Probe Design, Peak Line-Widths, T1 & T2 relaxation, Observe Nucleus, Decoupling,