

Supporting Information - Spectra

**Spirocyclization of Keto-Ynesulfonamides Promoted by
Quaternary Ammonium Salts**

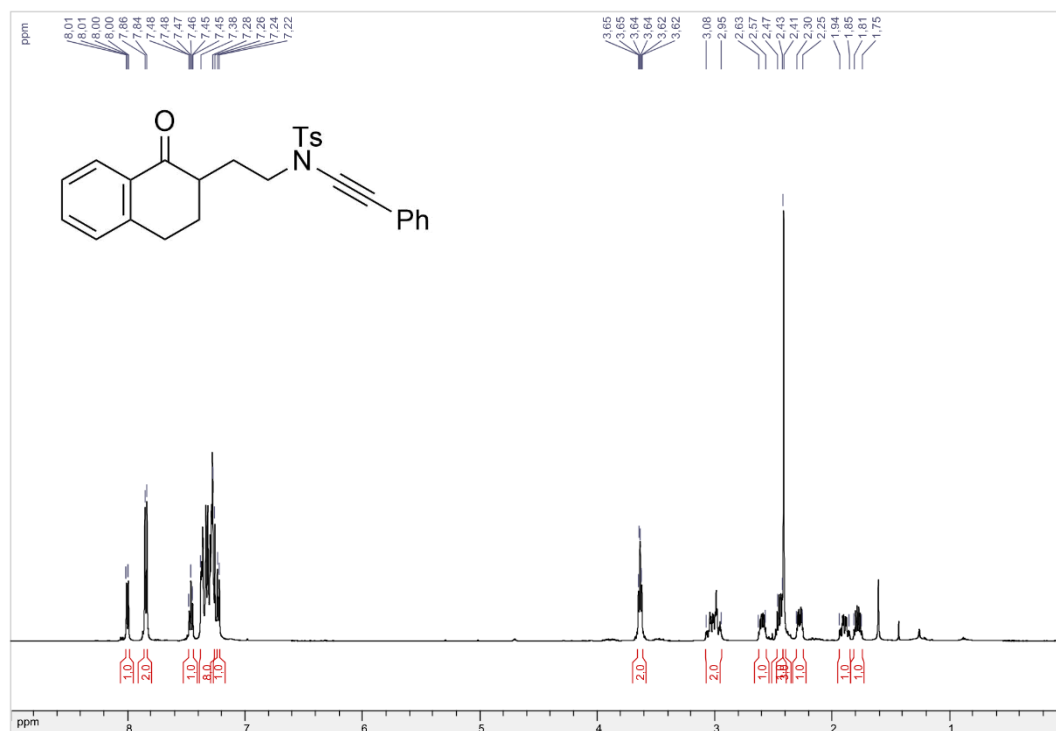
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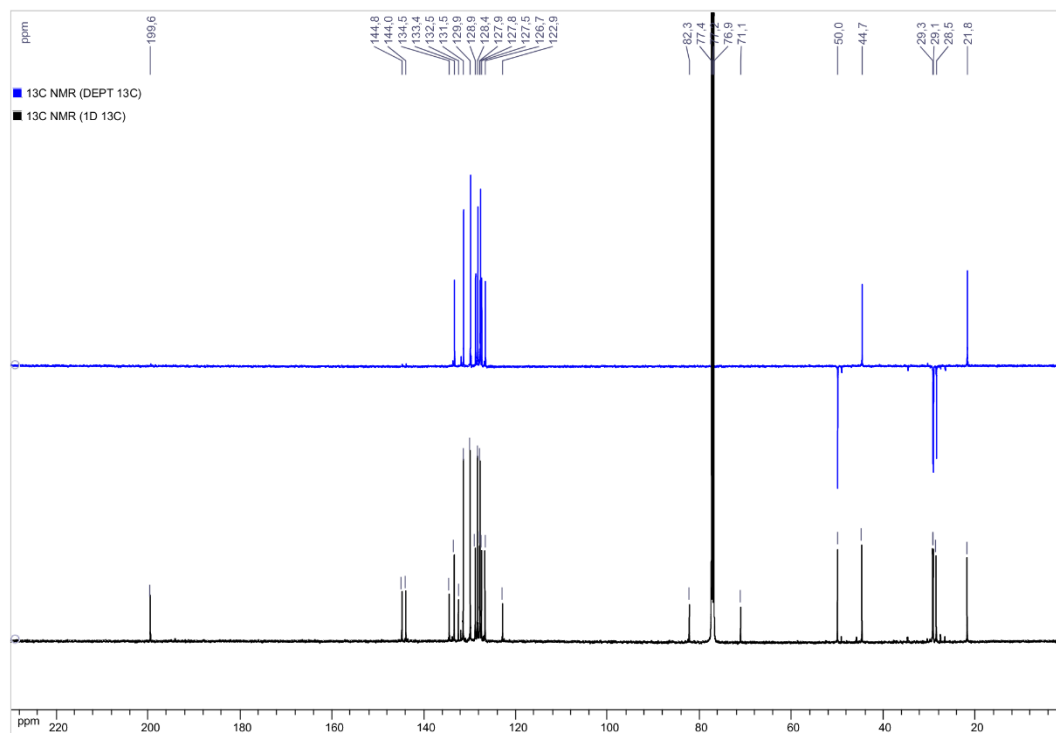
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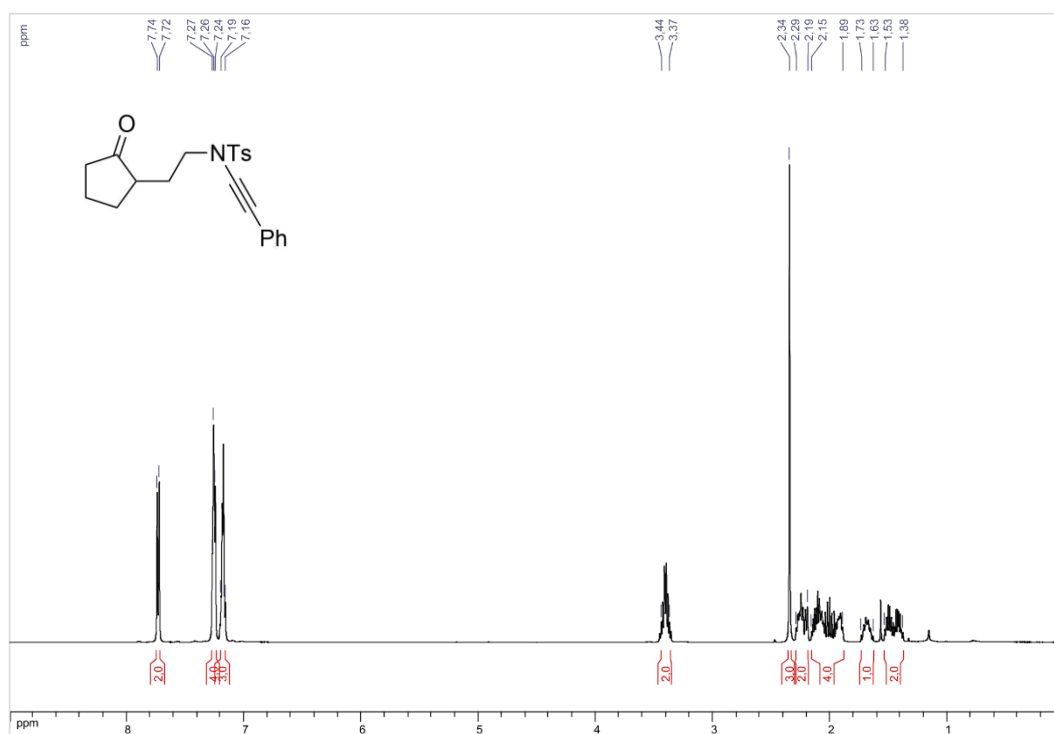
¹H and ¹³C spectra for keto-yne sulfonamides (1a-y)



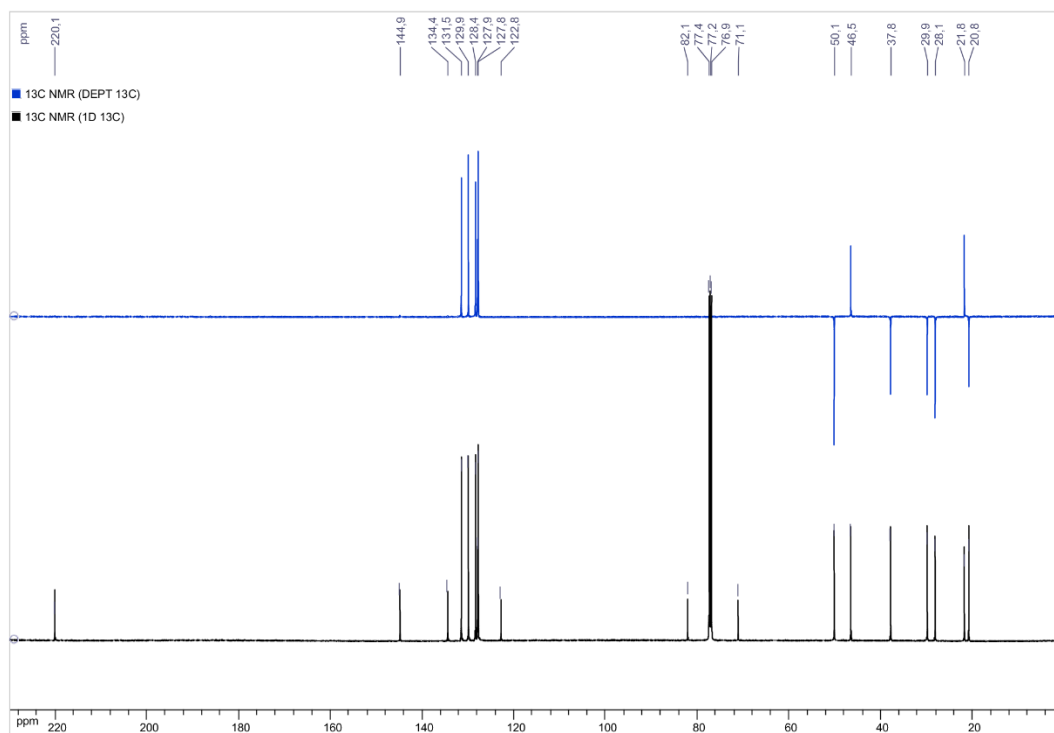
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1a**



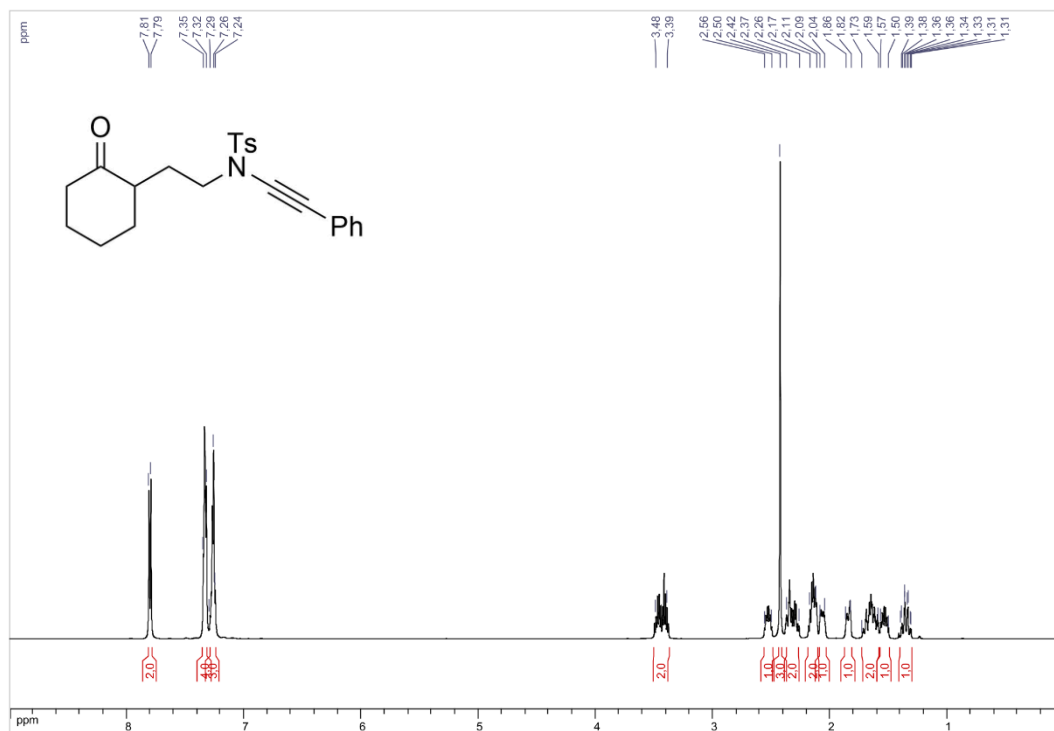
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1a**



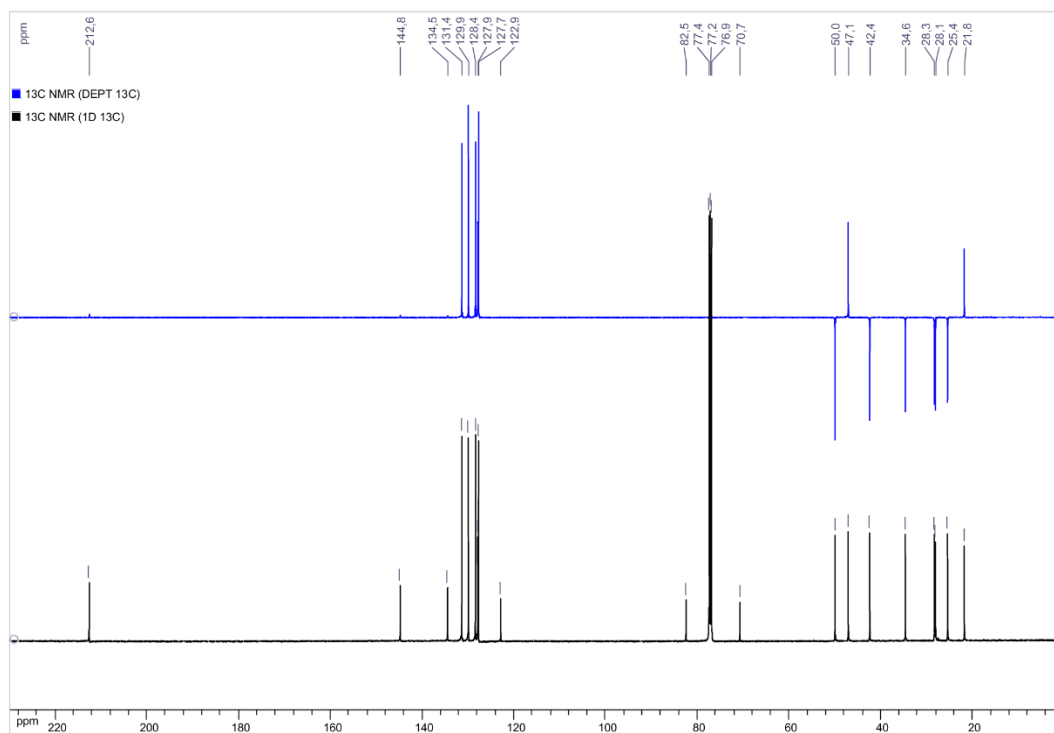
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1b**



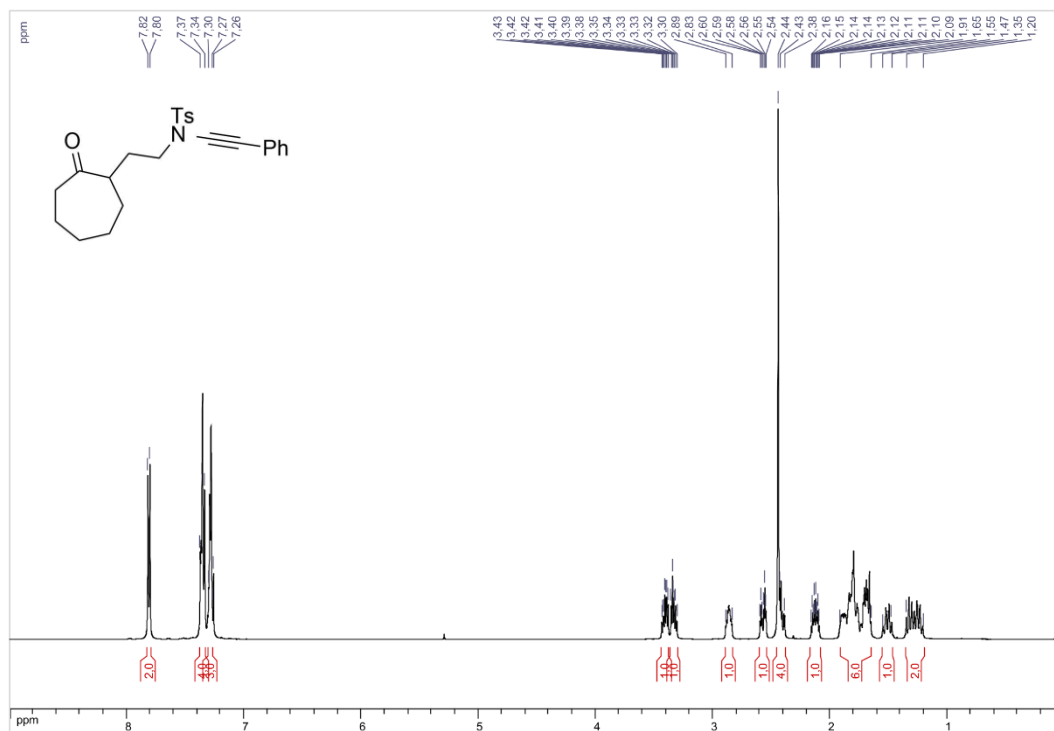
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1b**



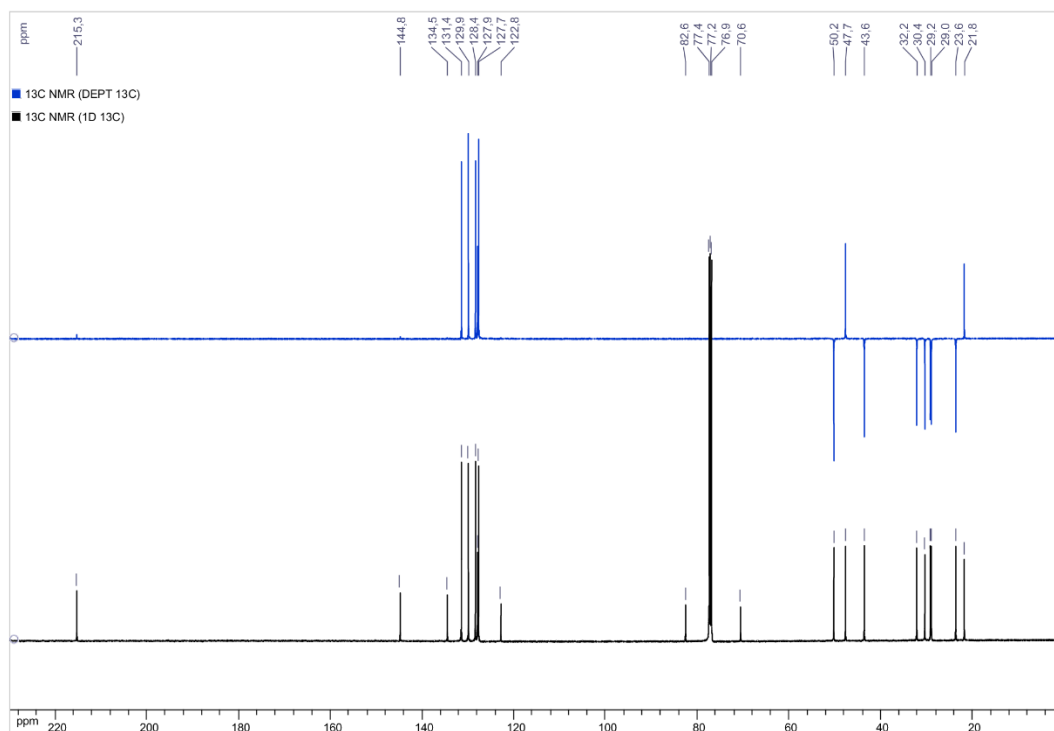
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1c**



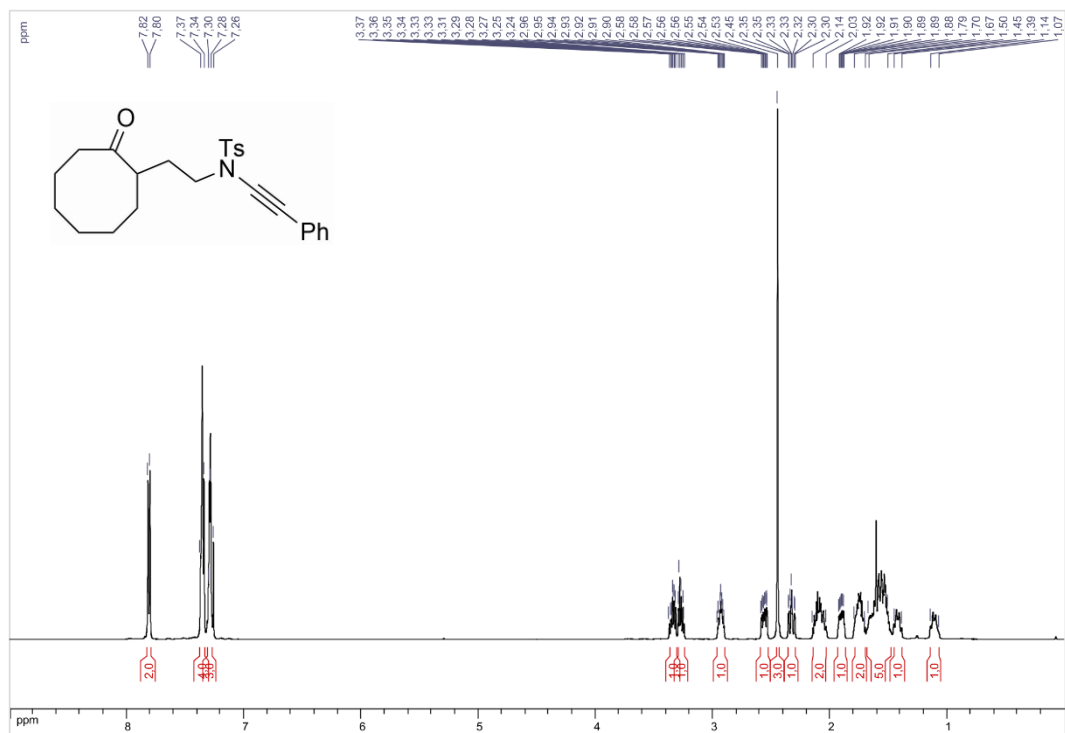
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1c**



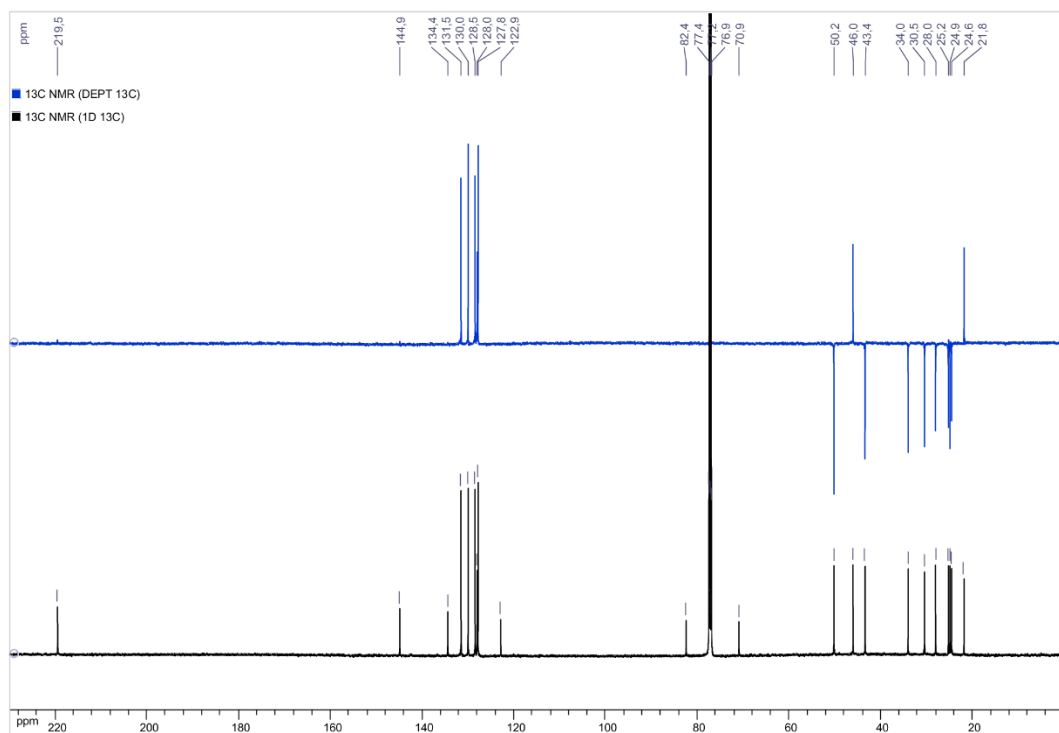
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1d**



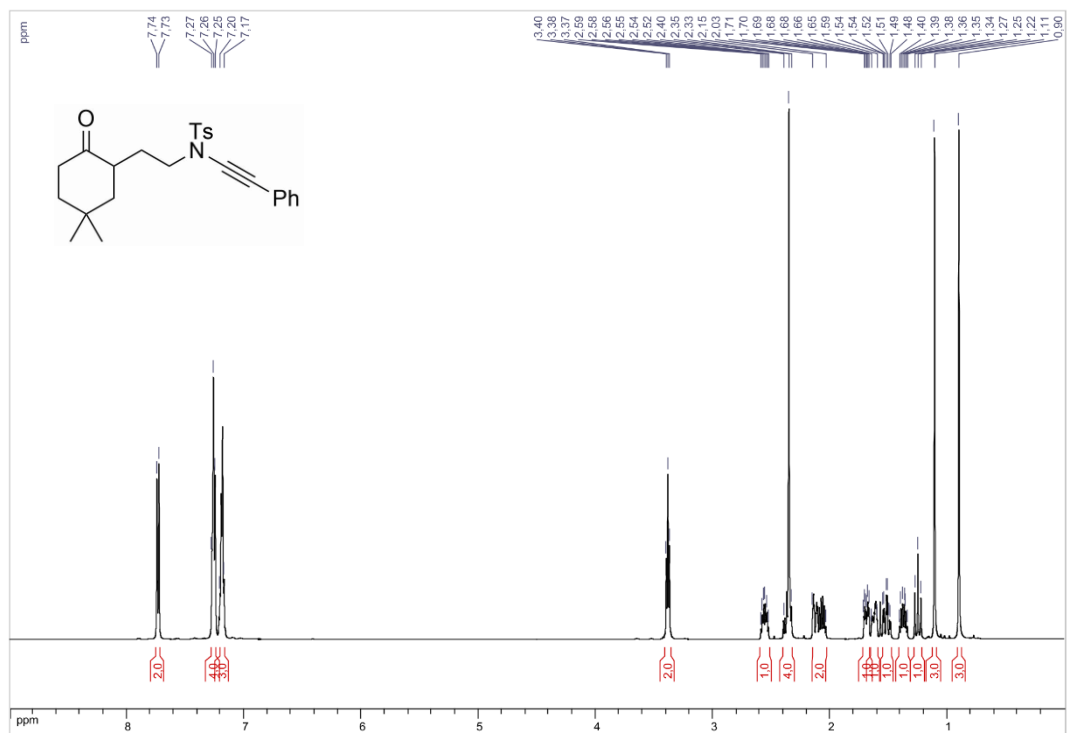
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1d**



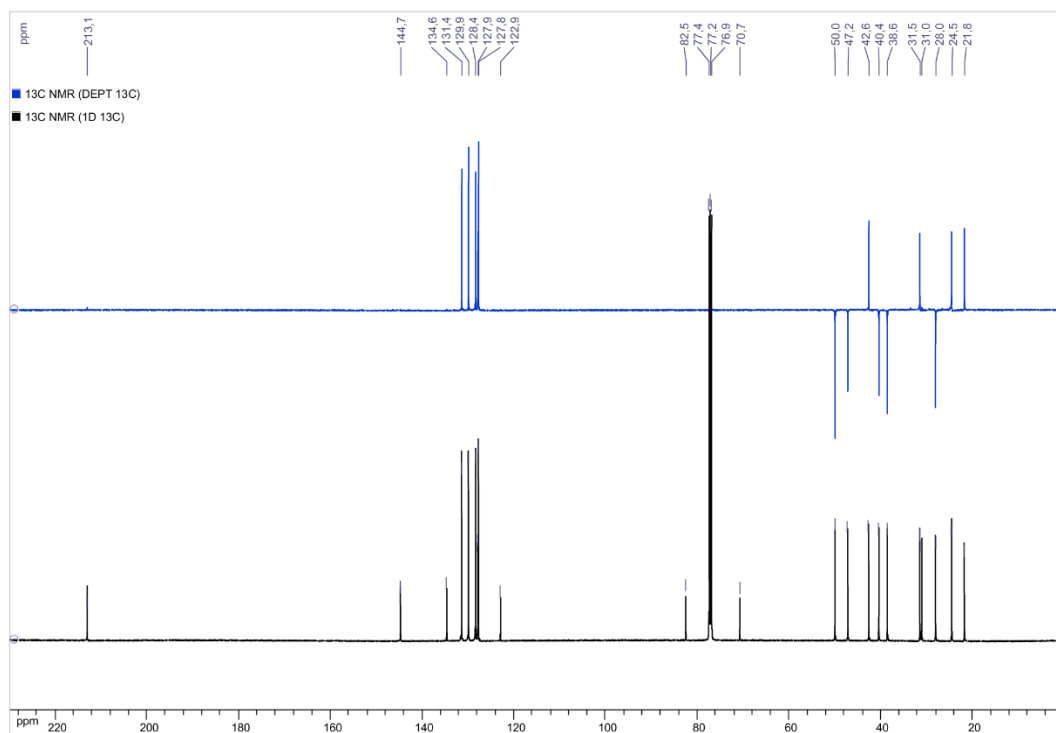
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1e**



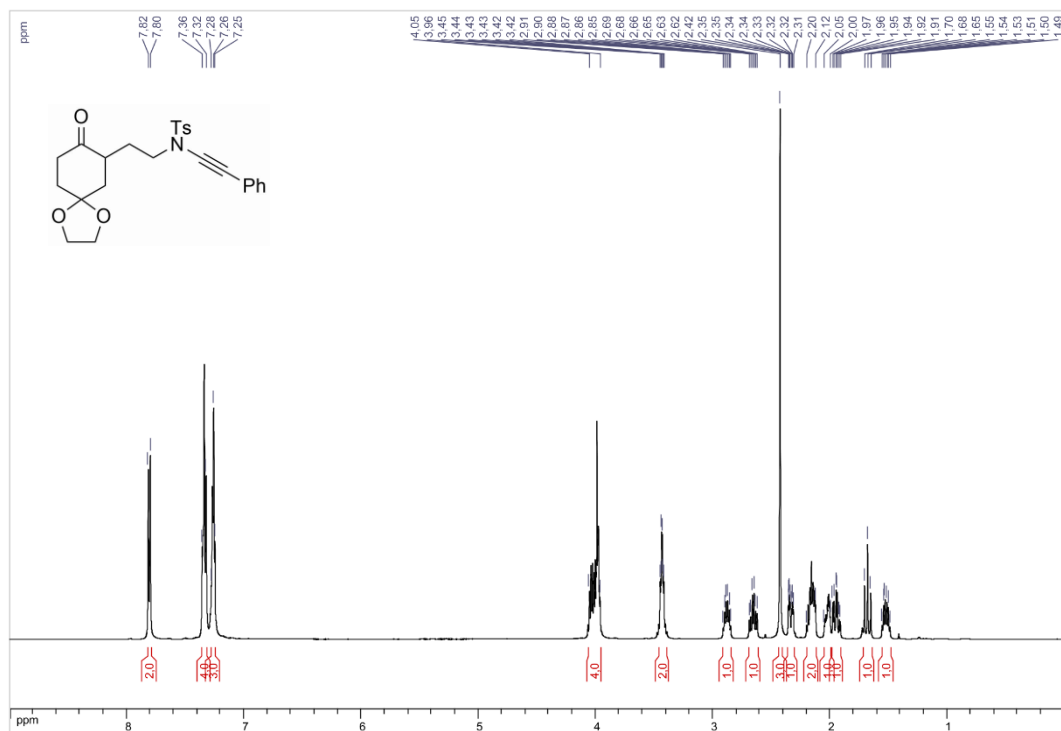
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1e**



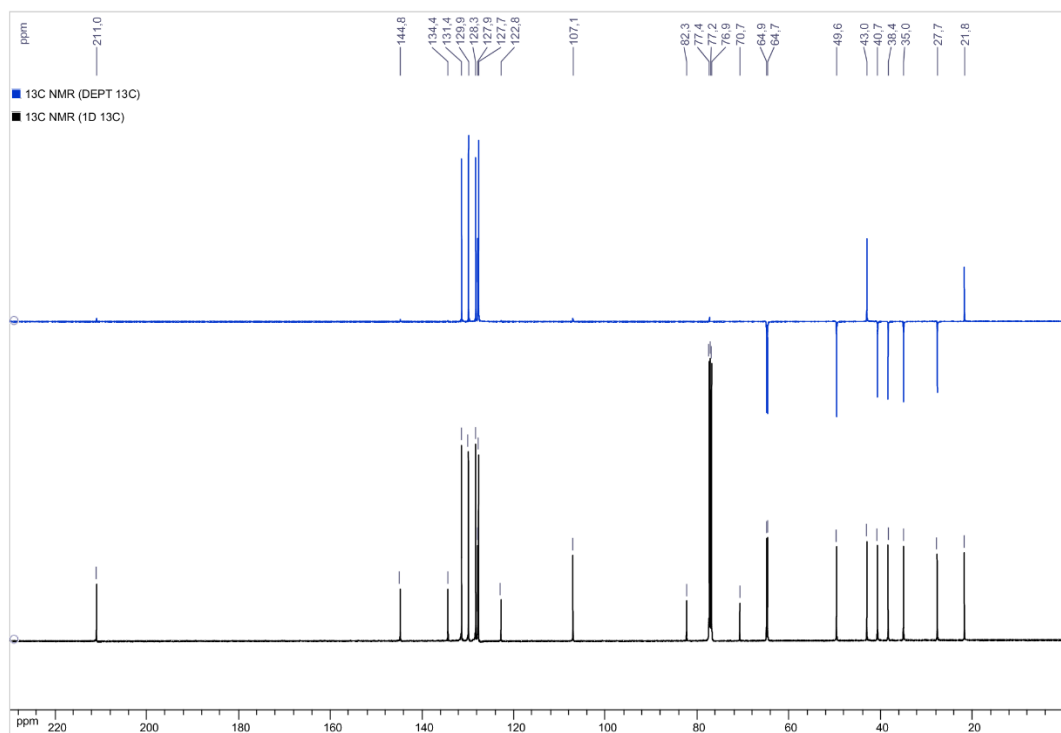
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1f**



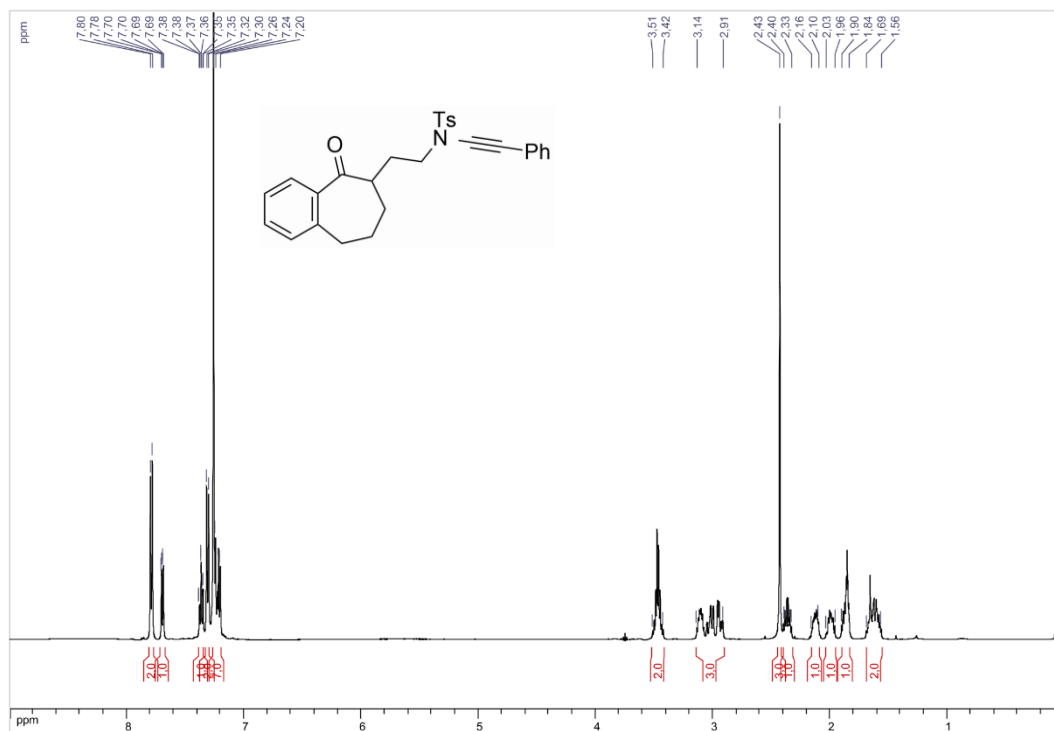
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1f**



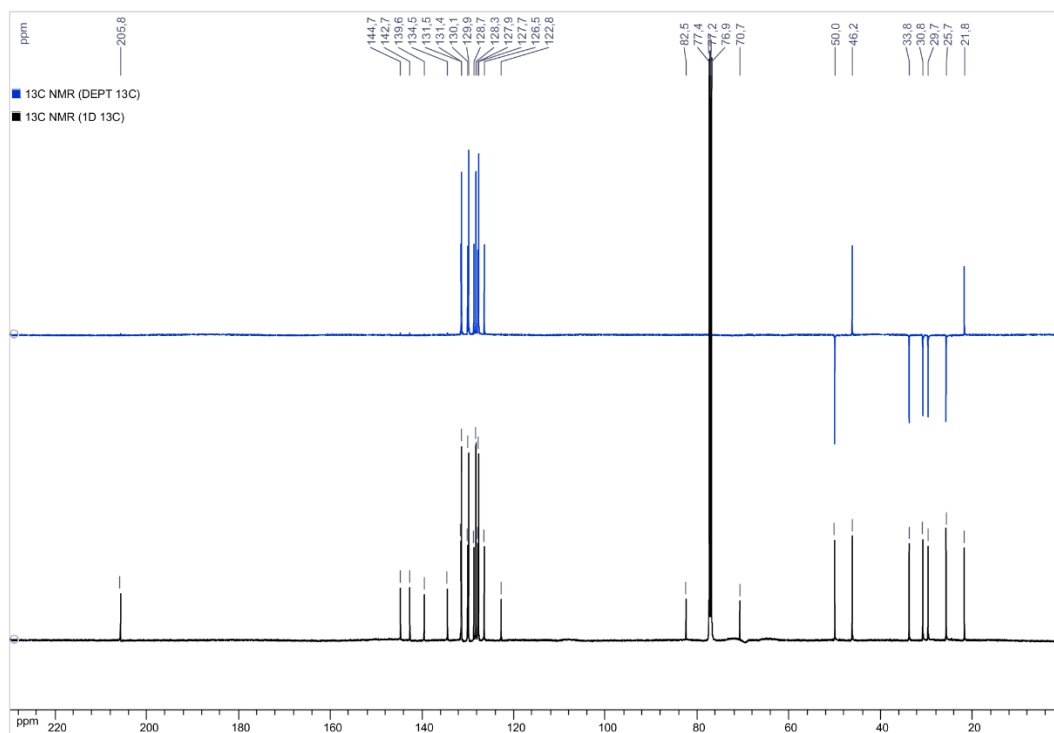
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1g**



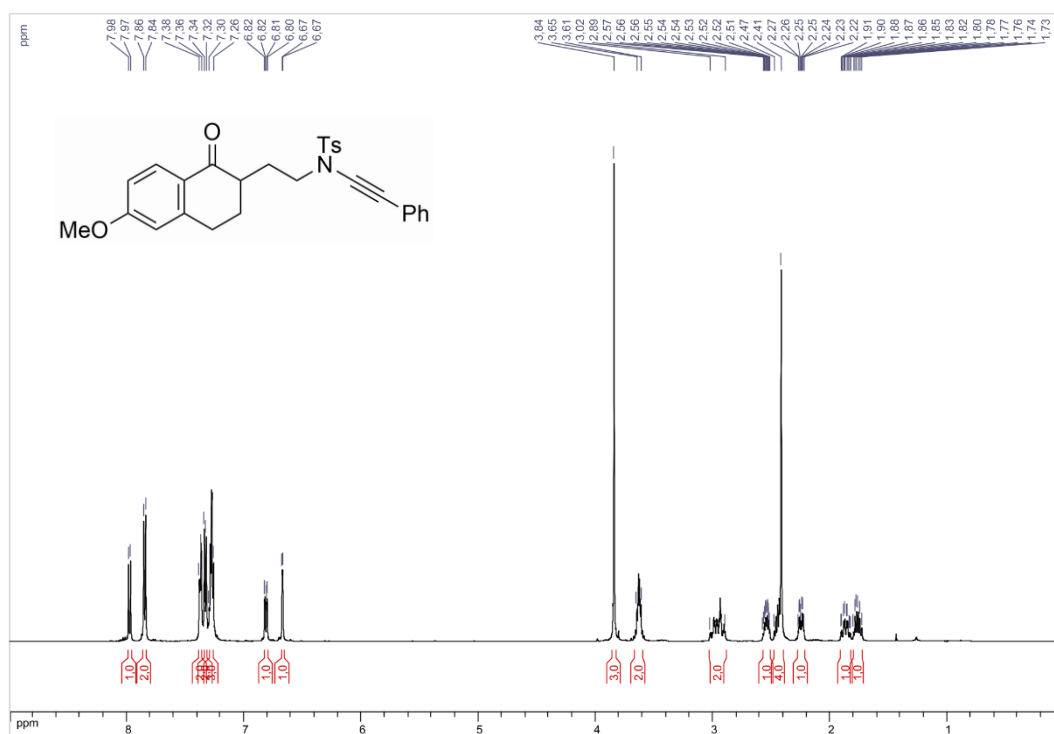
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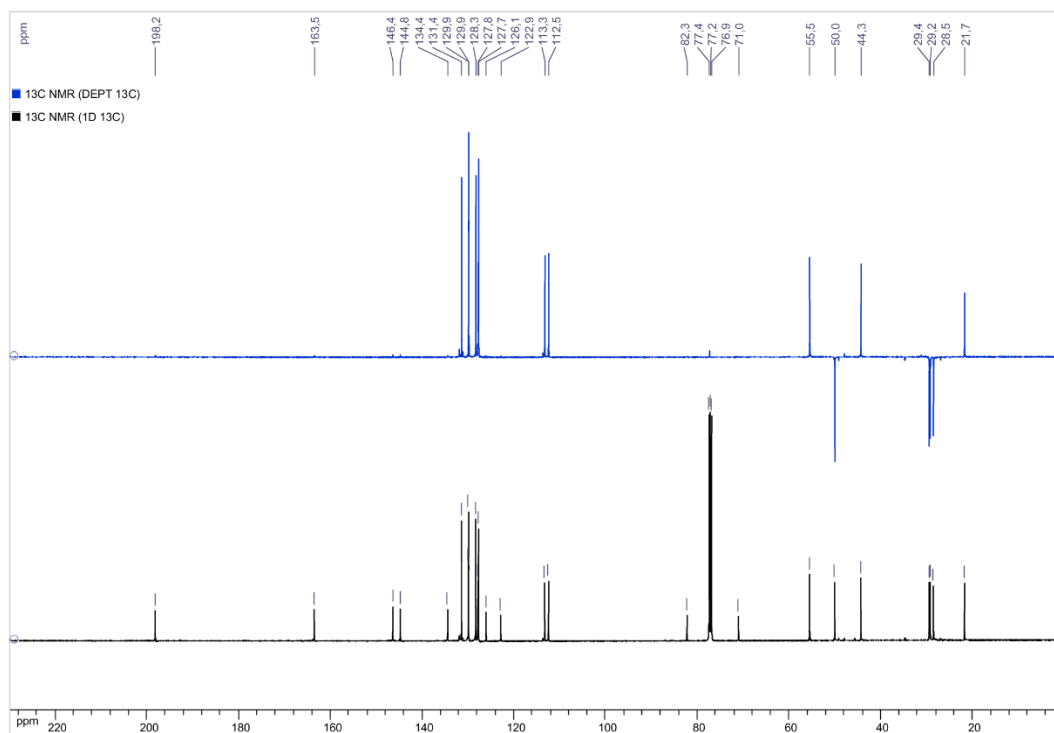
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1h**



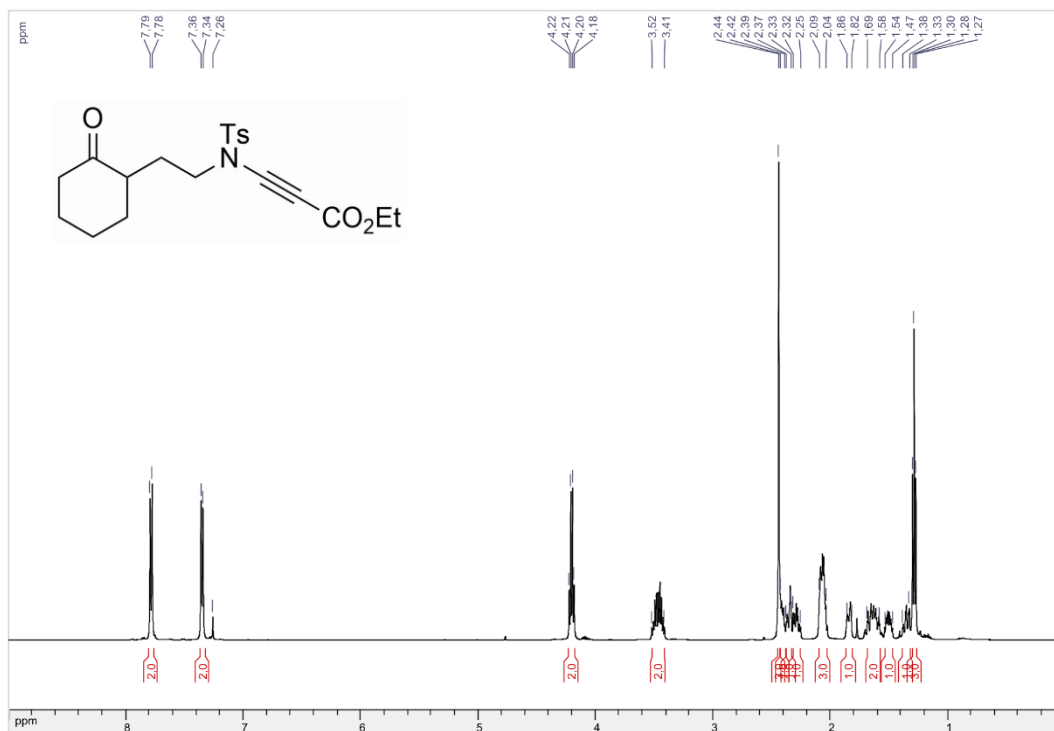
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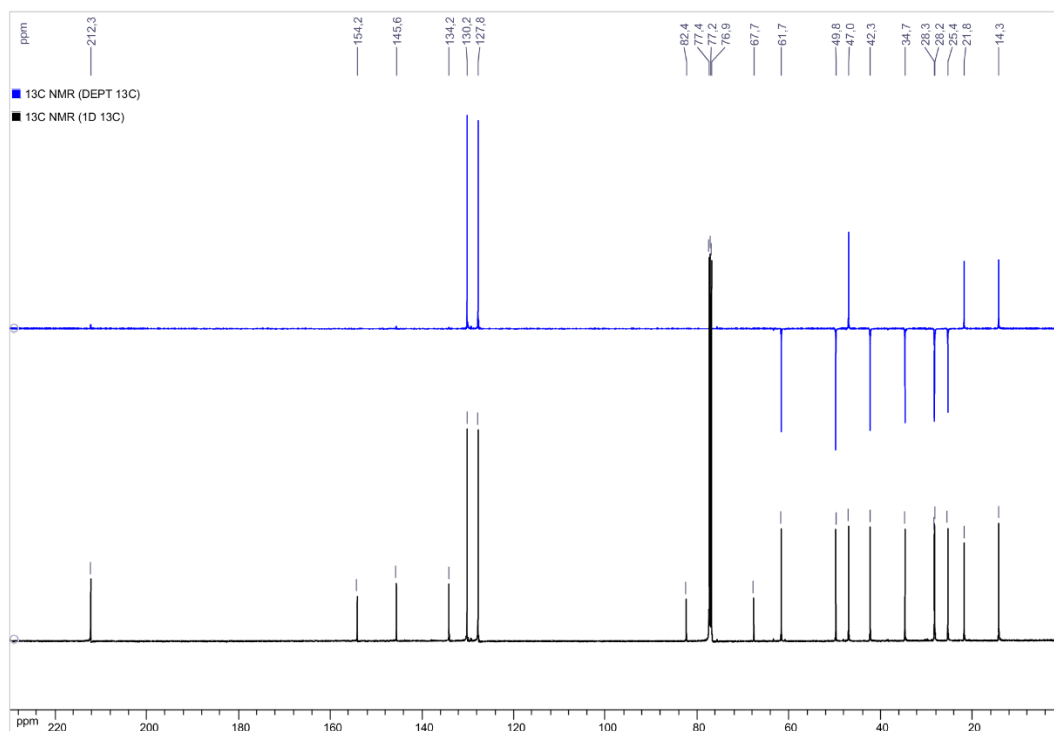
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1i**



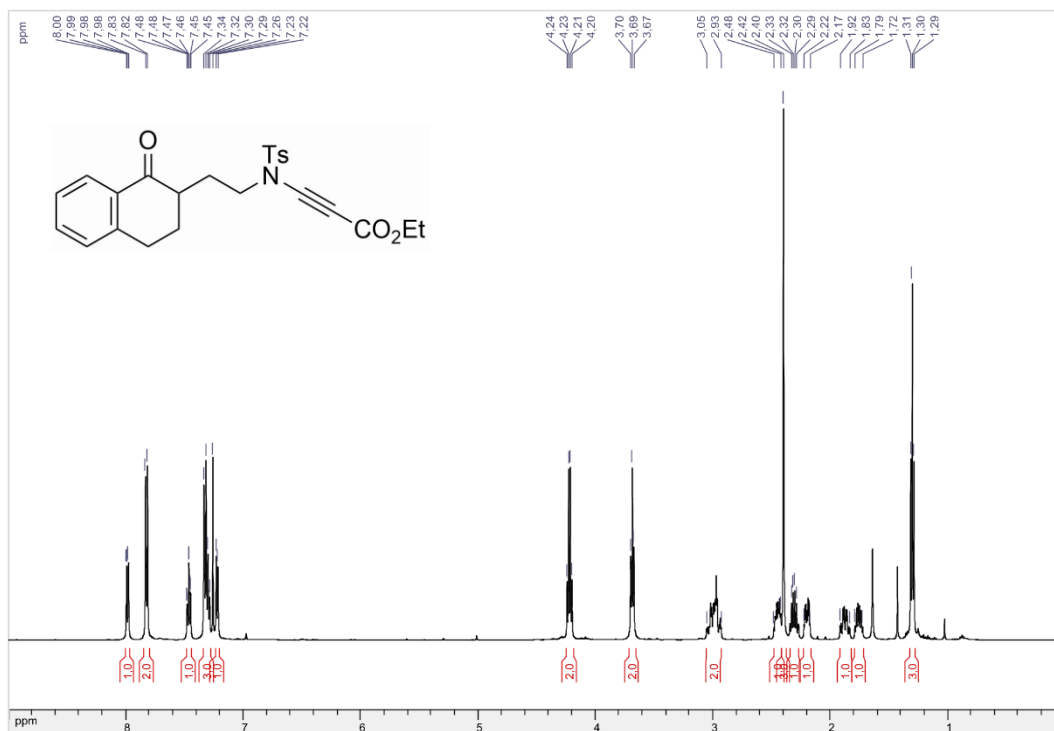
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1i**



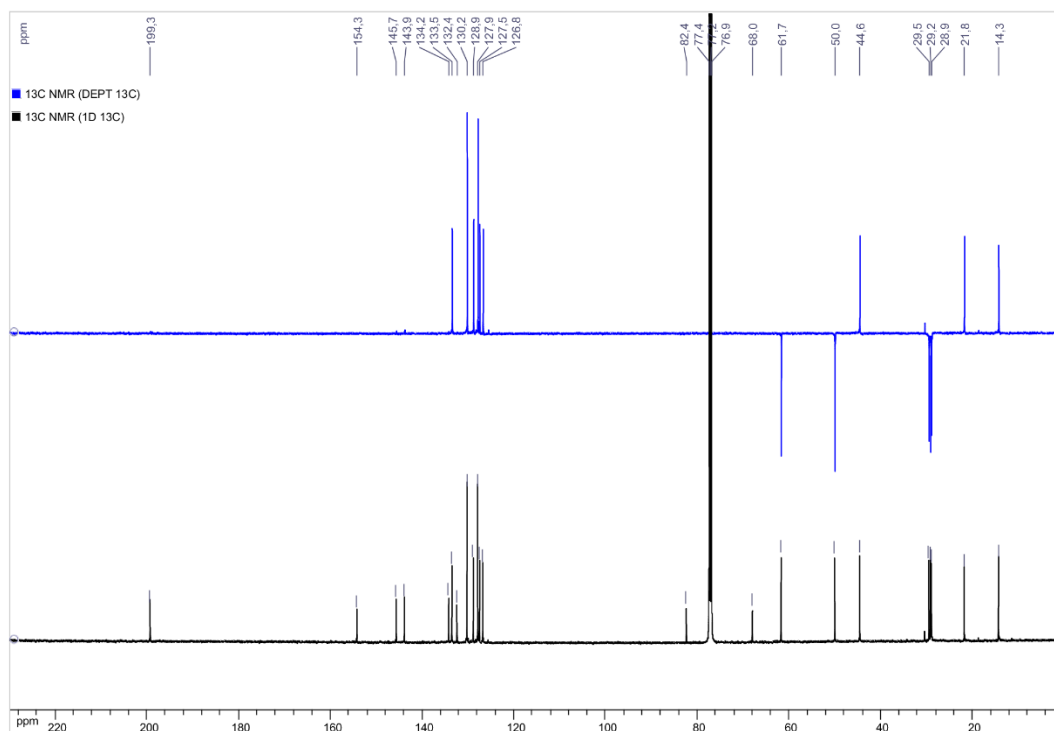
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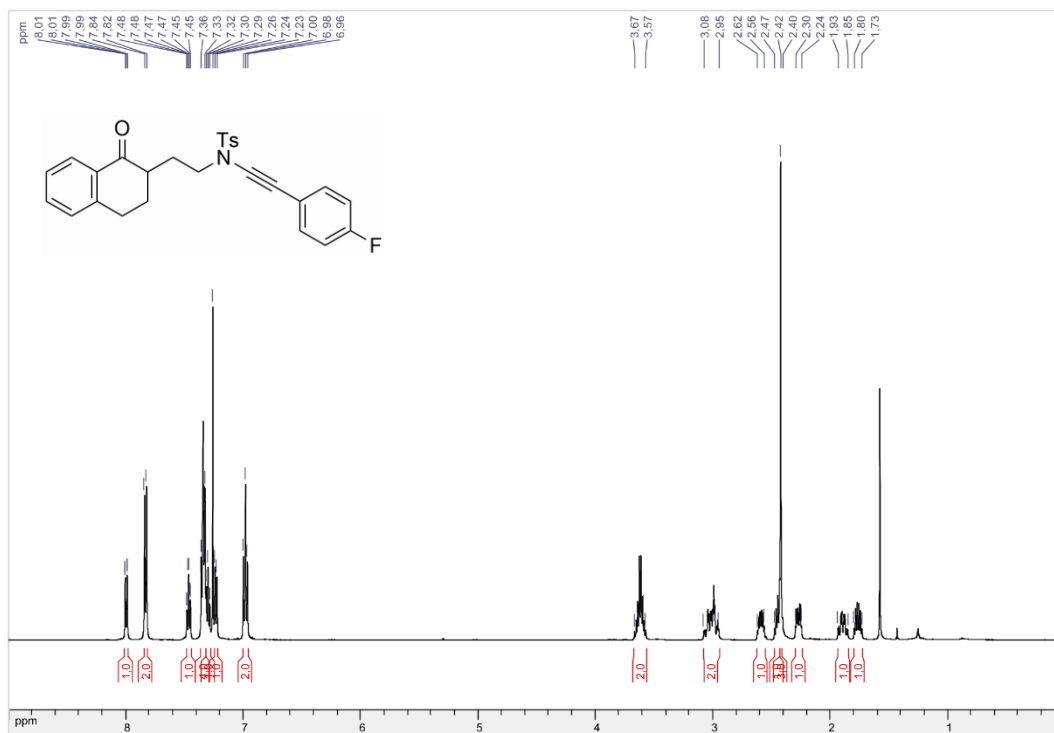
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1j**



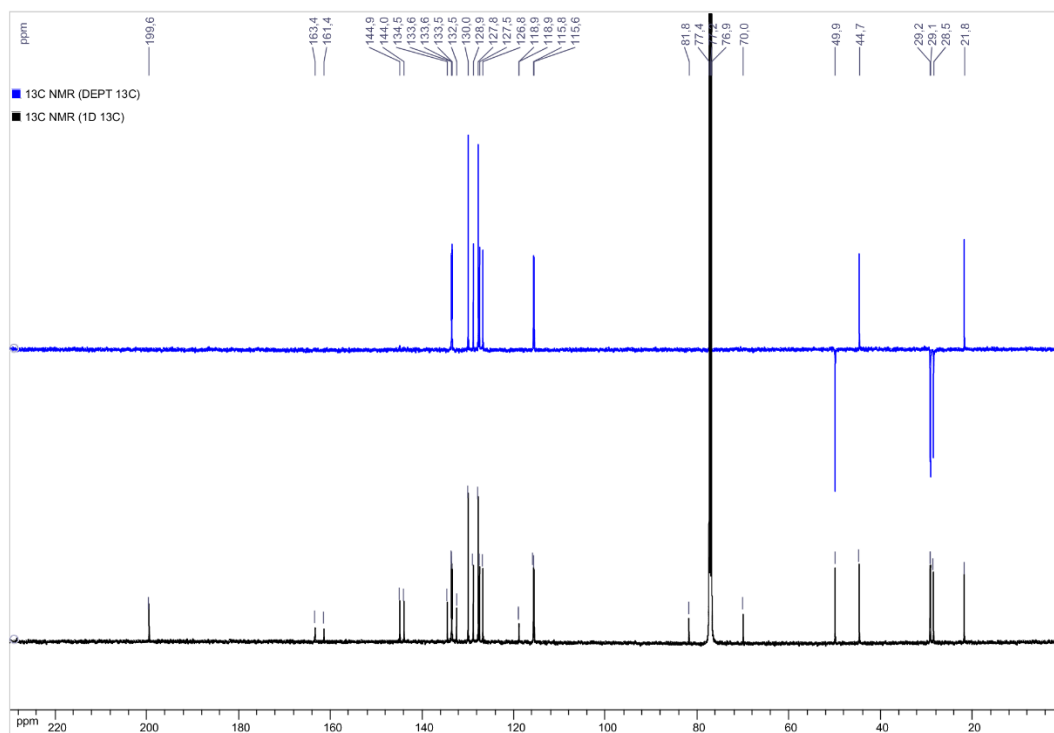
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1k**



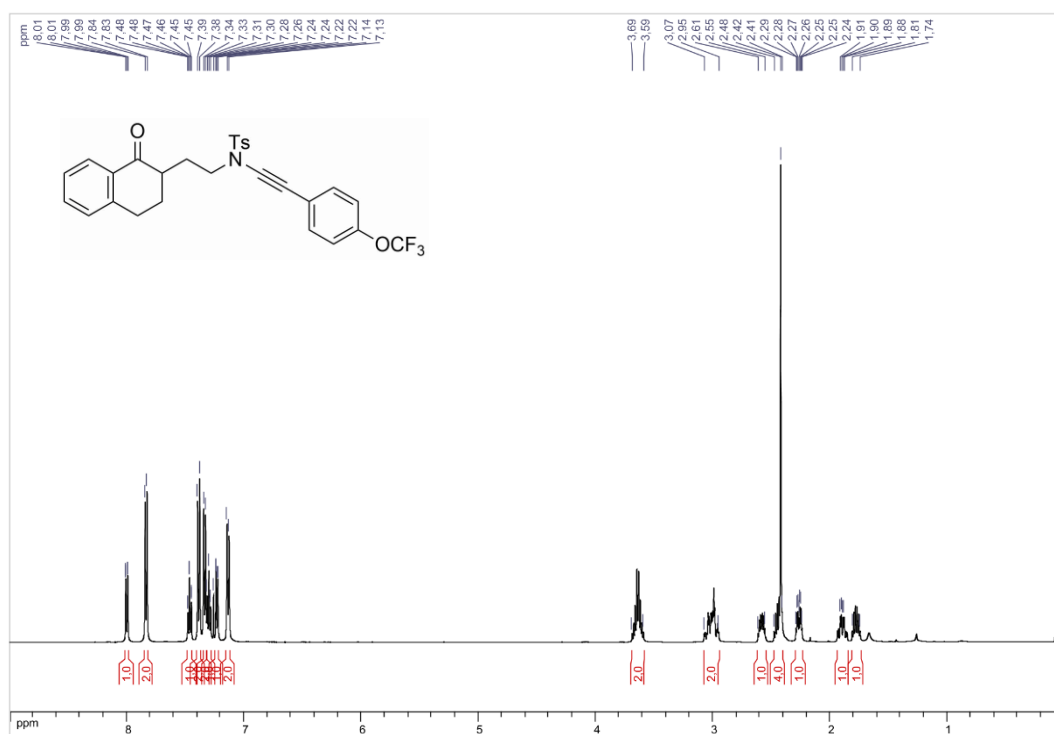
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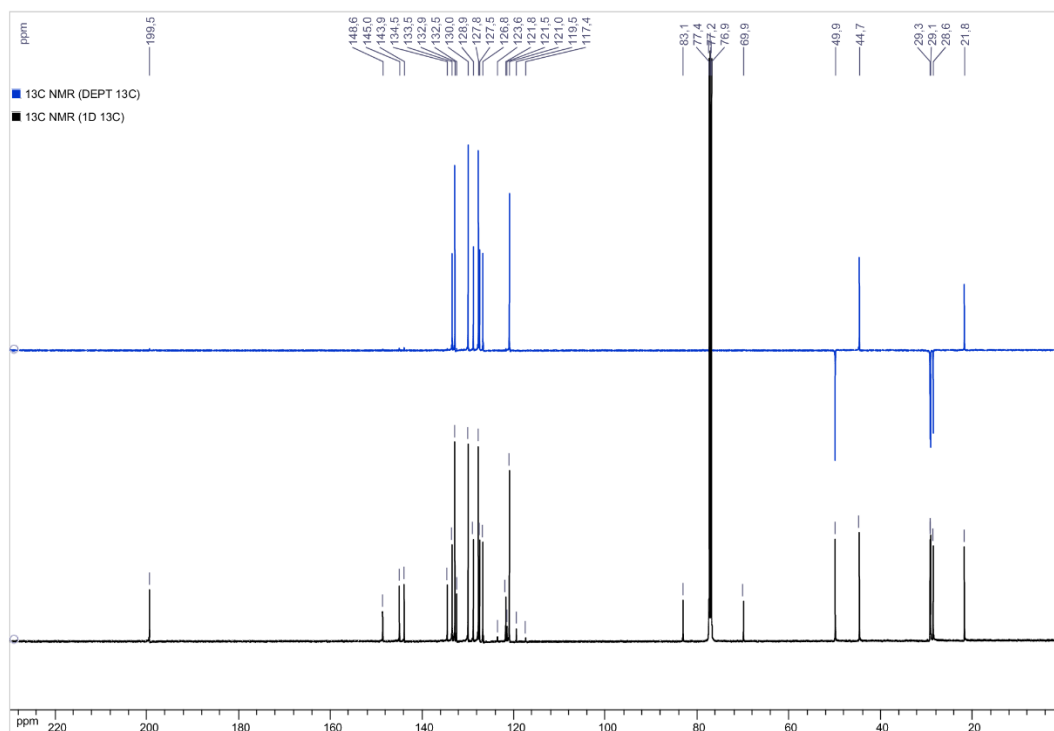
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **11**



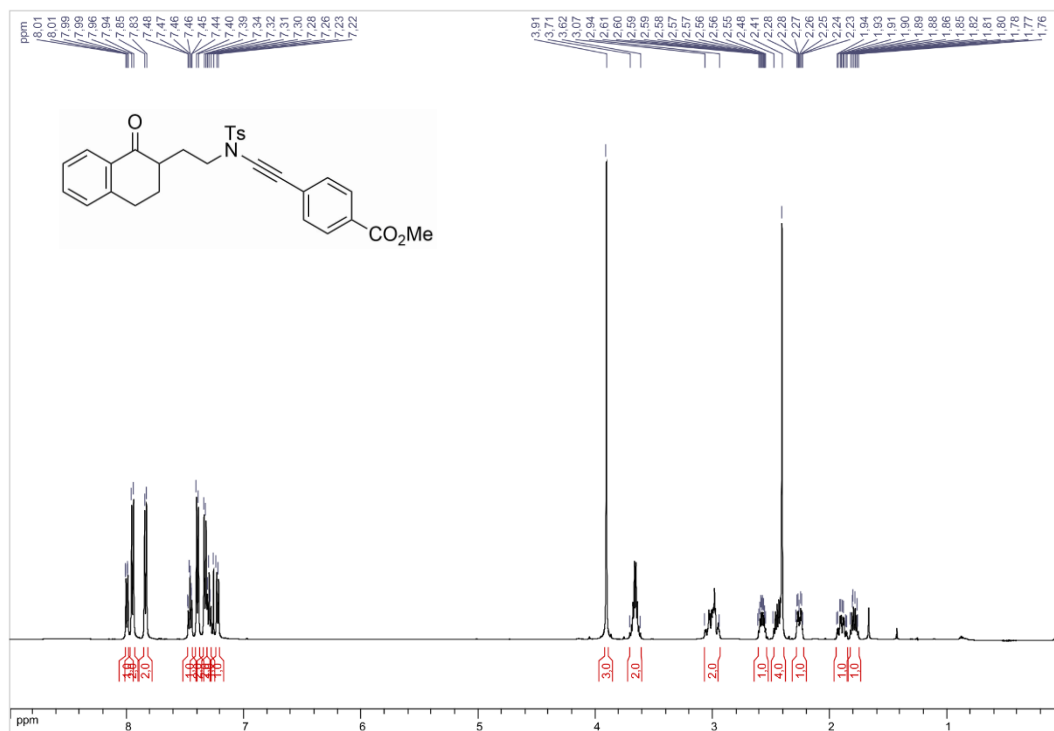
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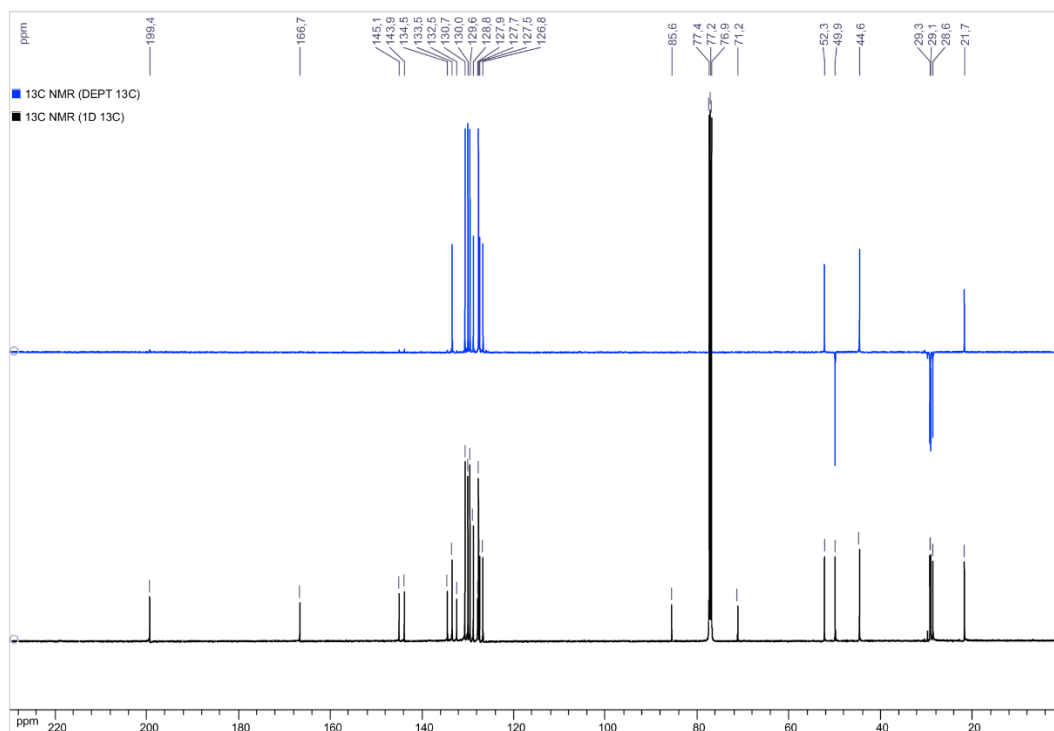
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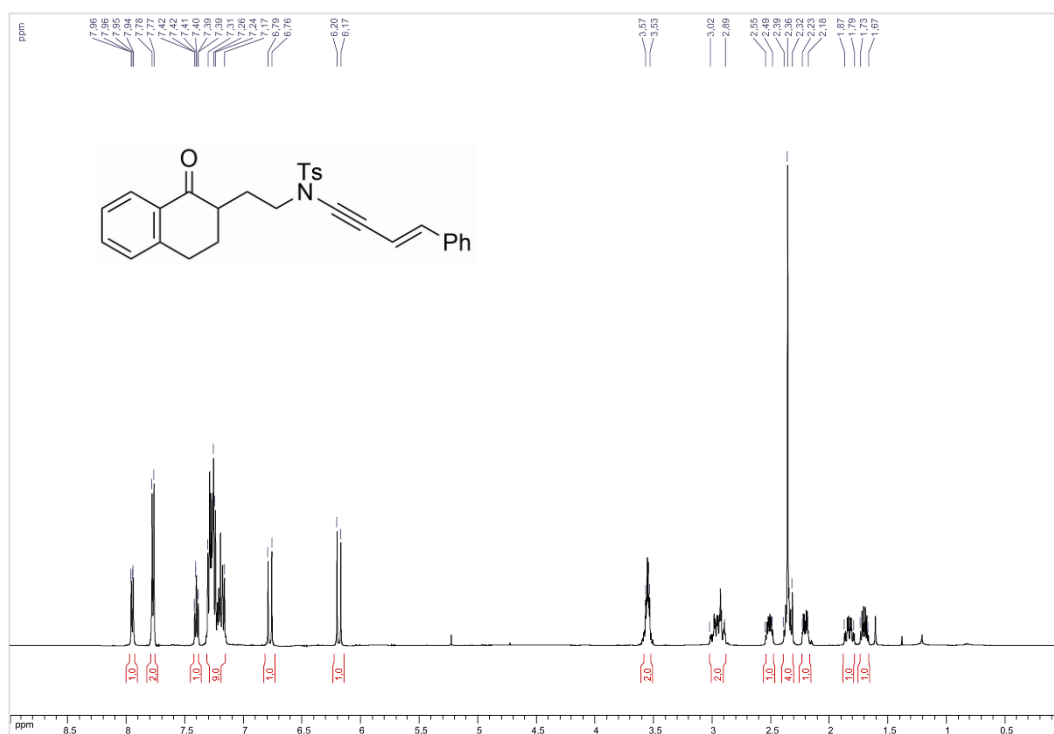
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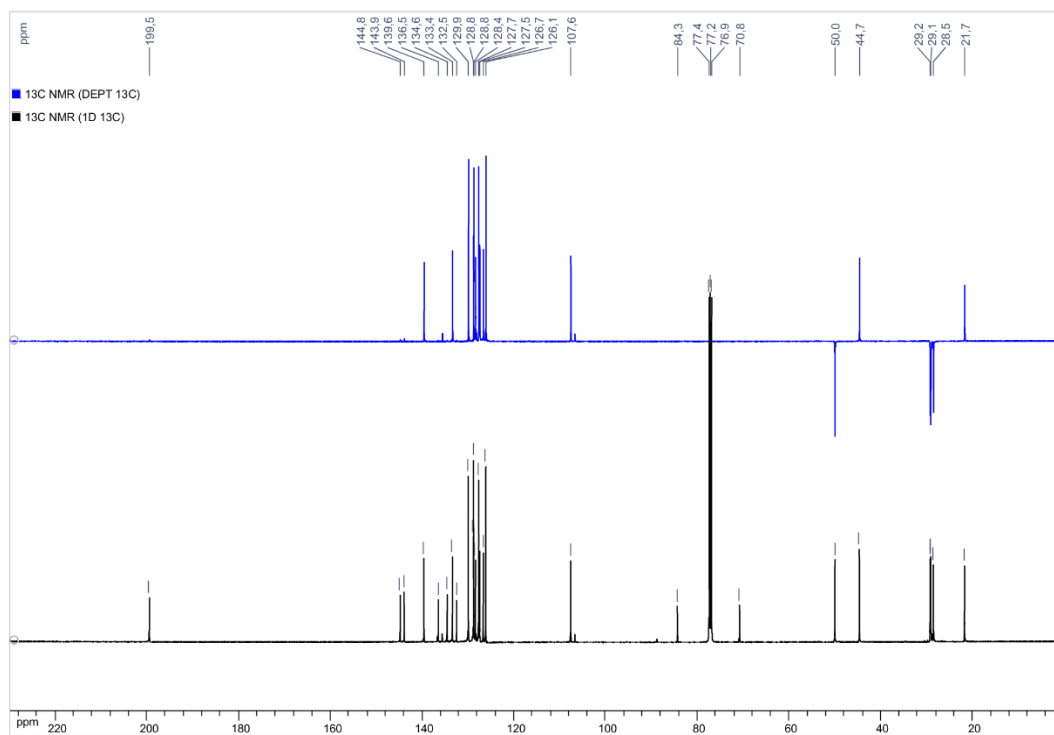
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1o**



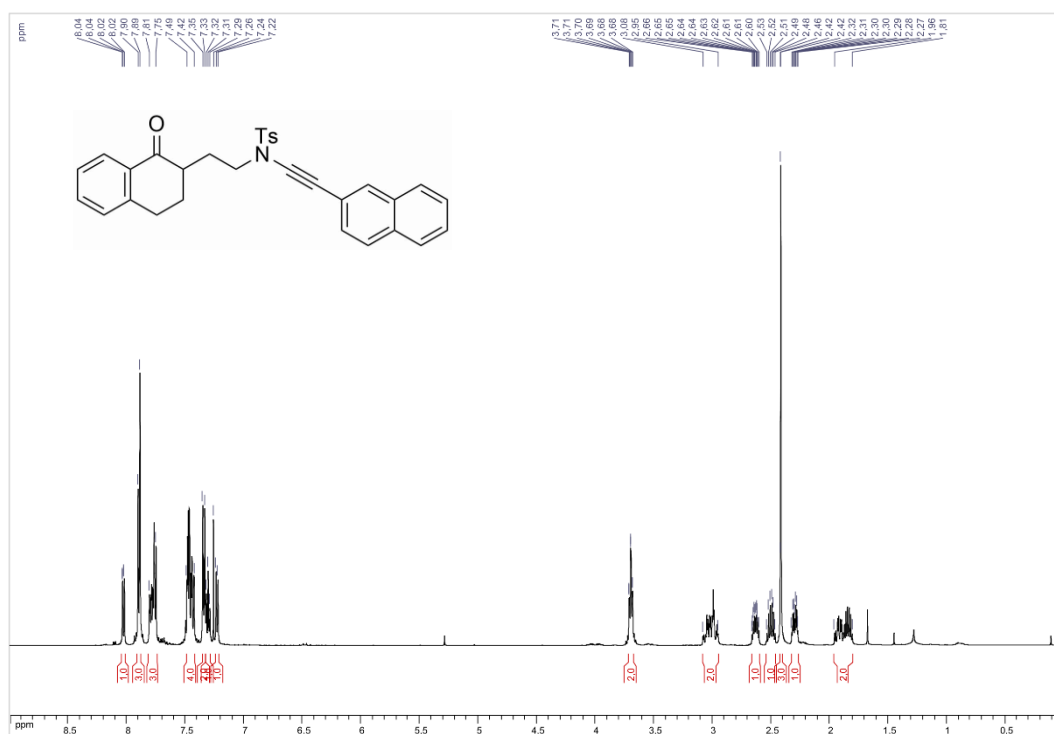
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1o**



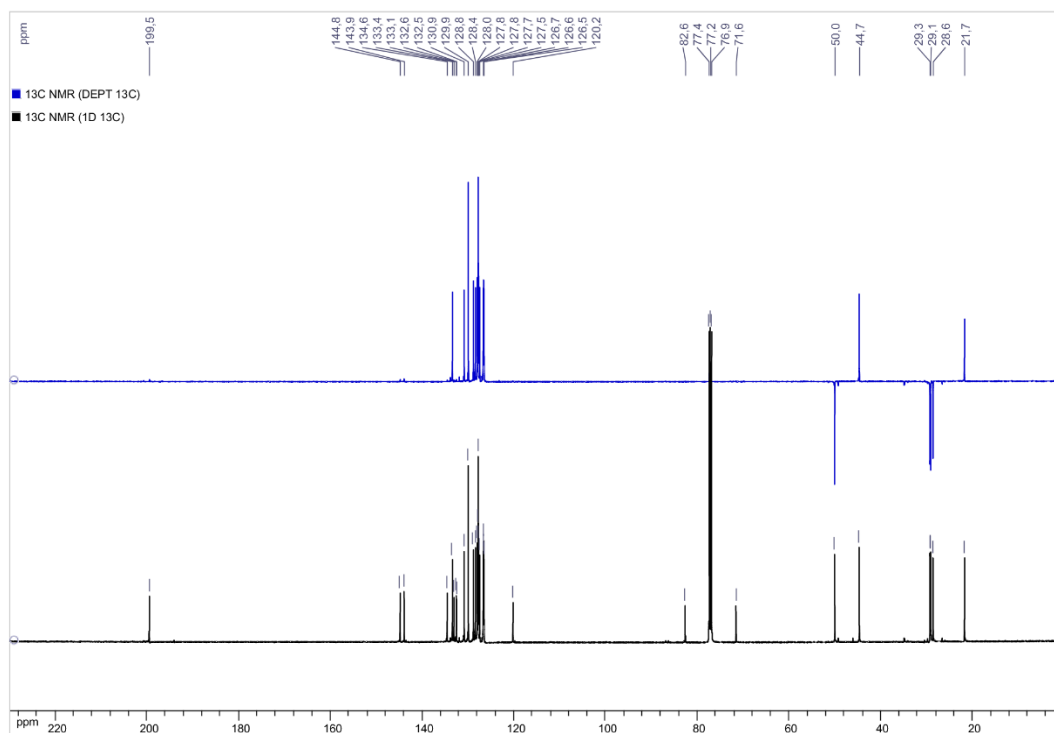
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1p**



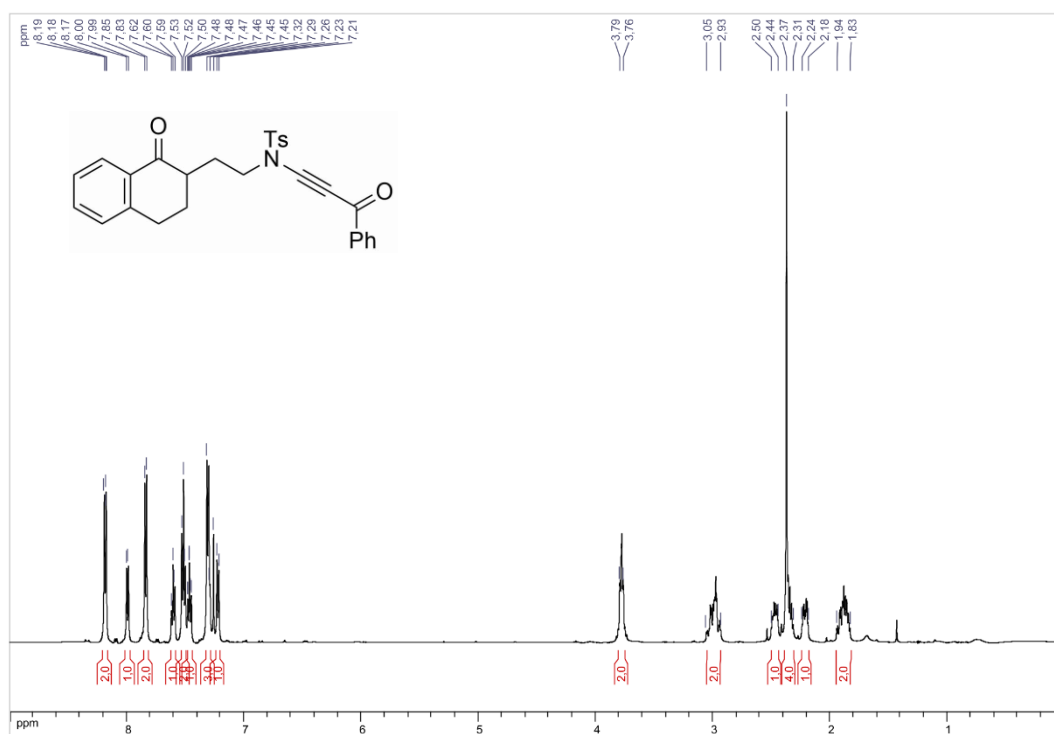
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1p**



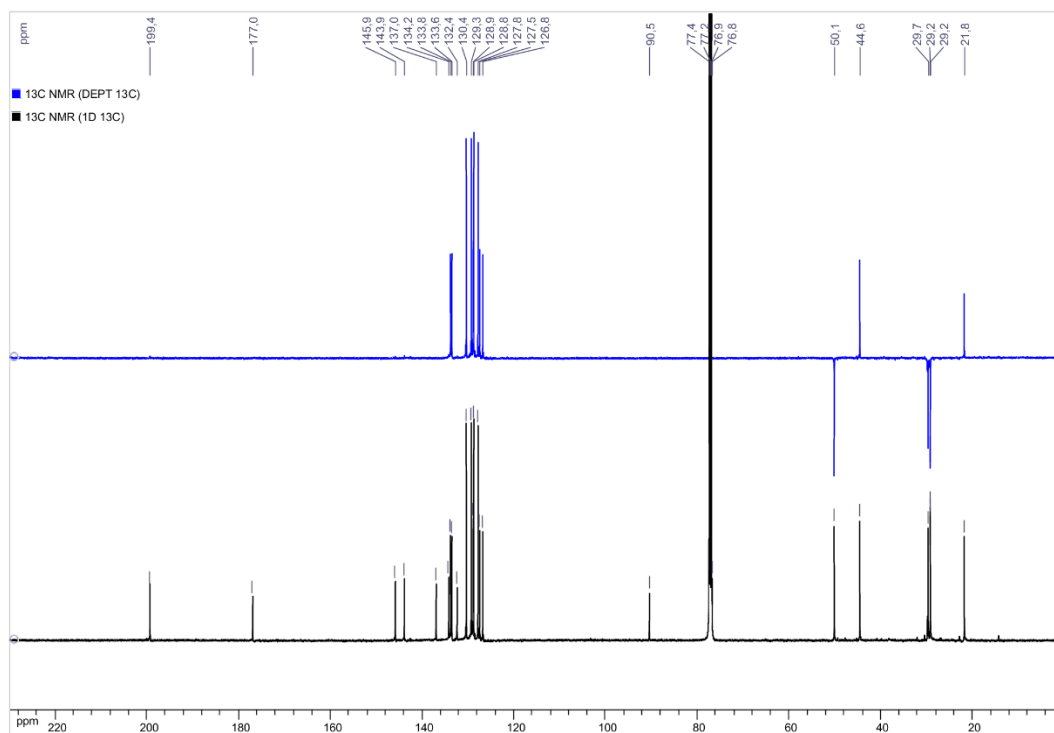
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1q**



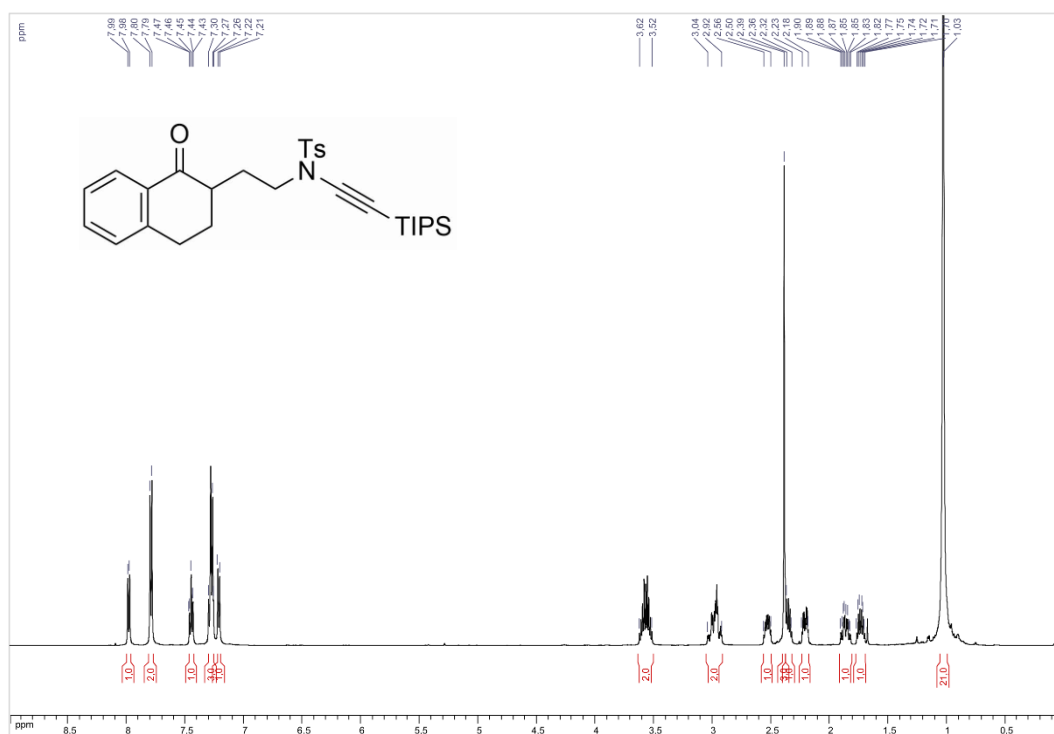
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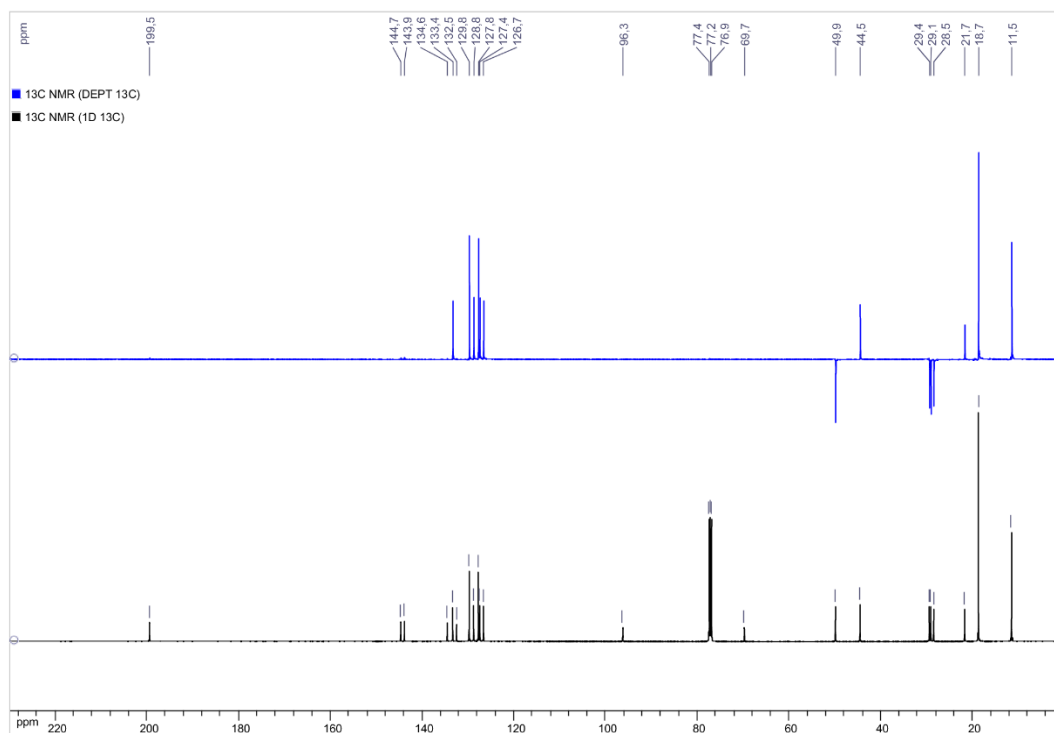
¹H NMR (CDCl₃, 500 MHz) spectrum of compound 1r



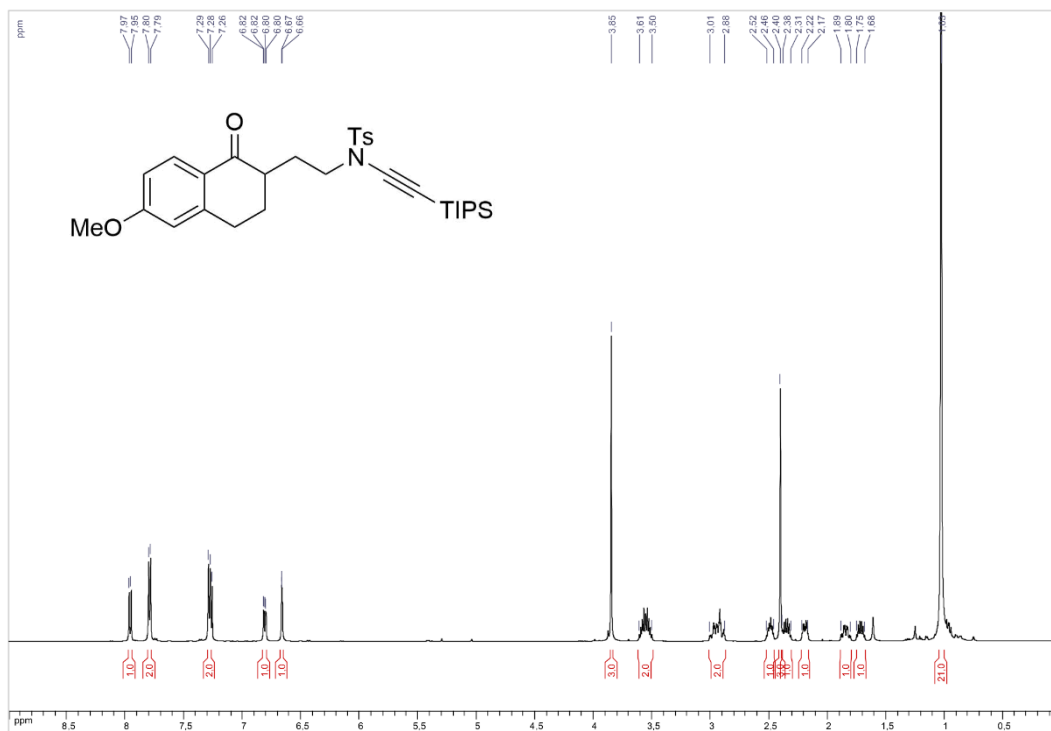
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound 1r



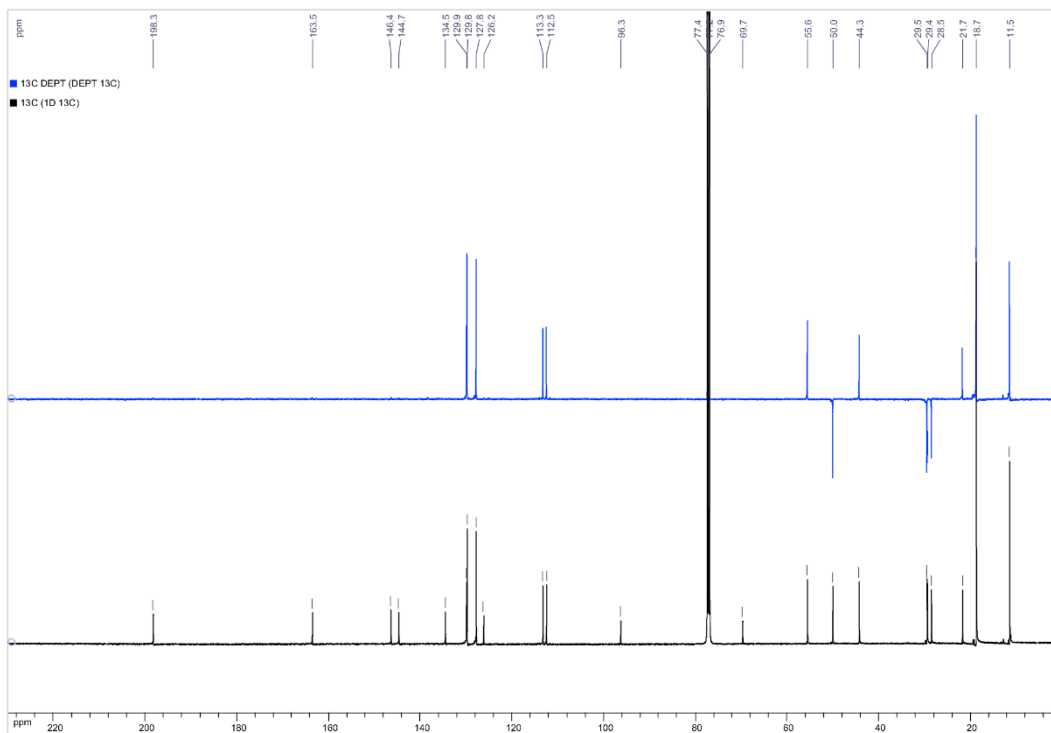
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1u**



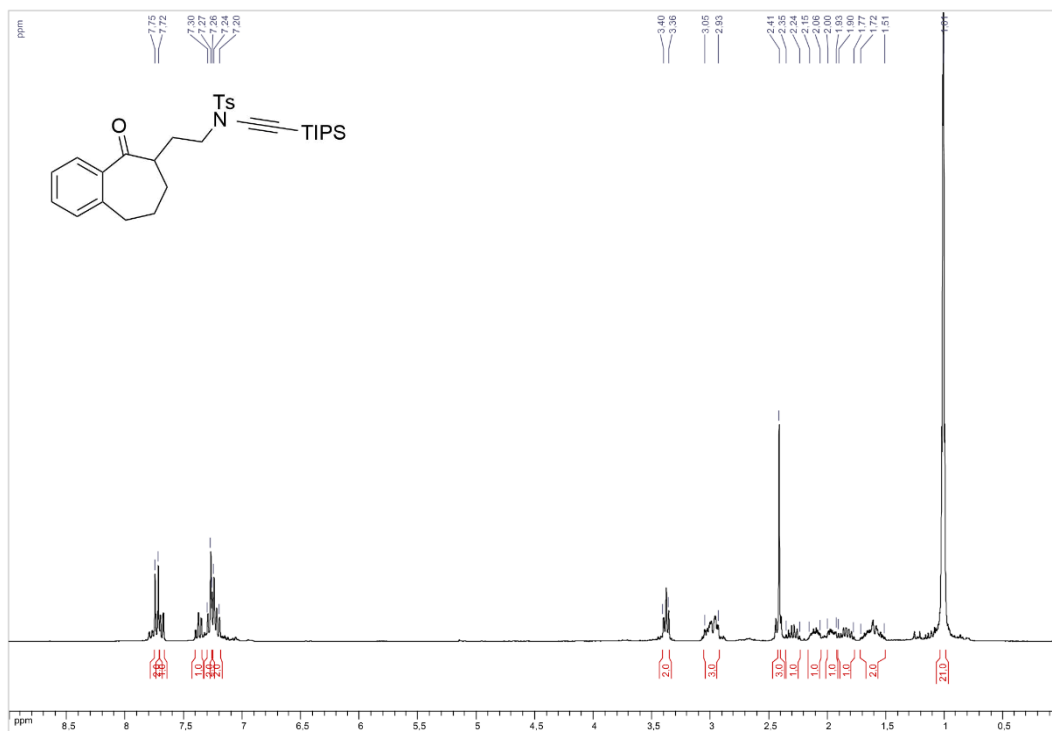
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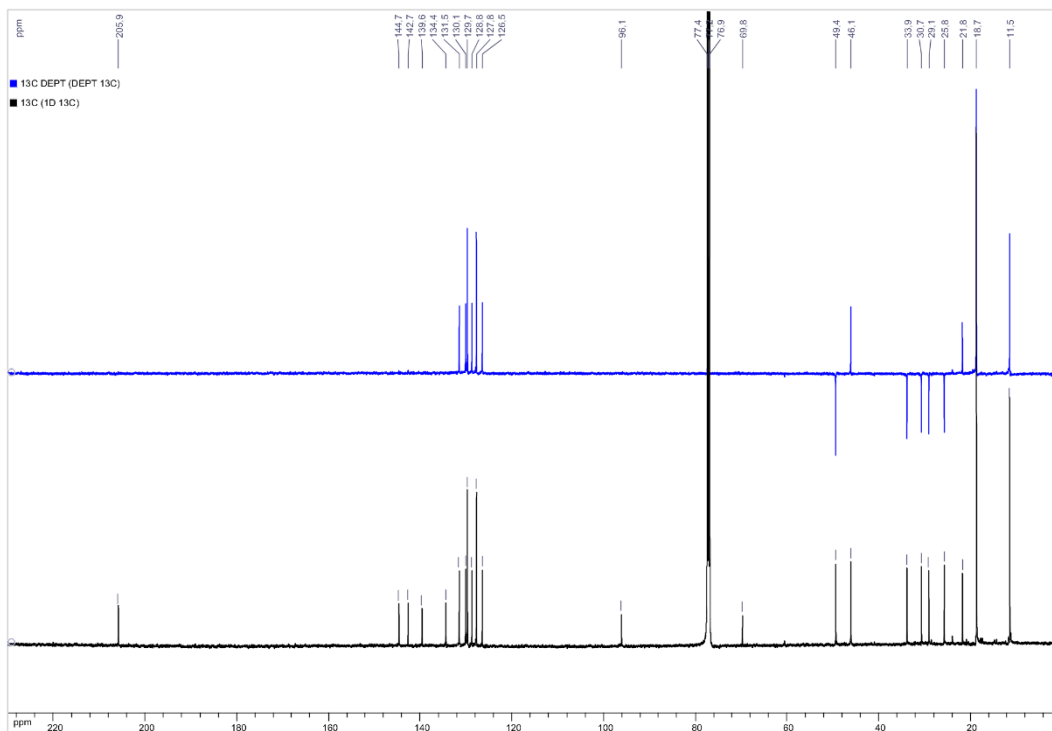
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **1v**



¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1v**

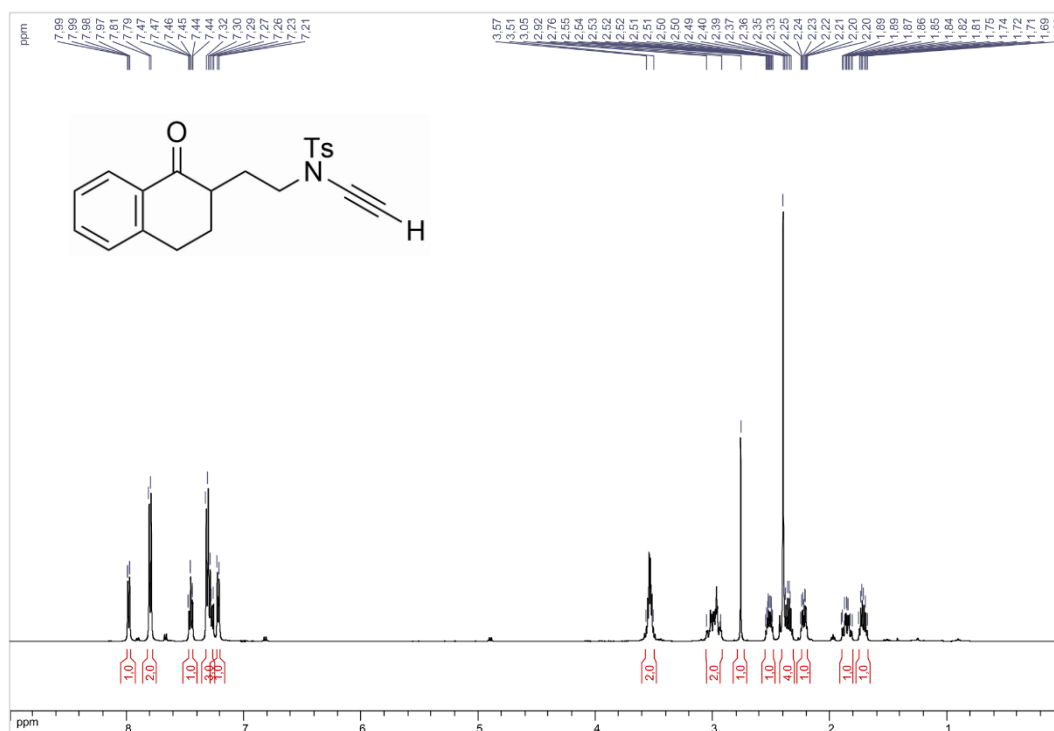


¹H NMR (CDCl₃, 300 MHz) spectrum of compound **1y**

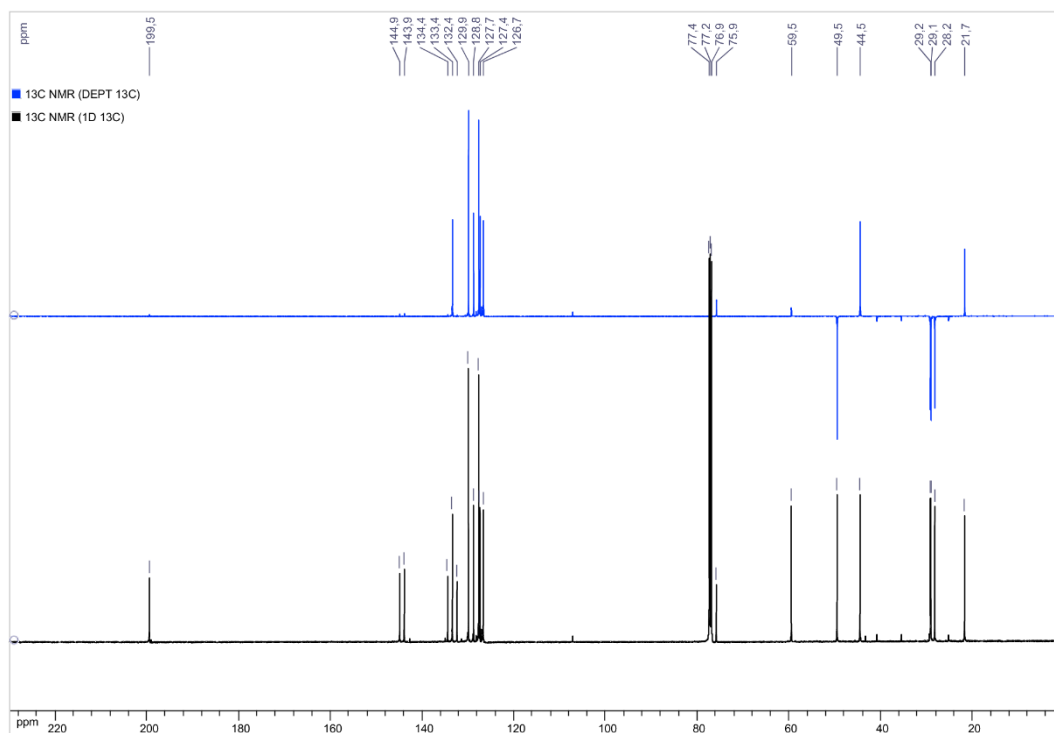


¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **1y**

¹H and ¹³C spectra for keto-ynesulfonamide (5u)

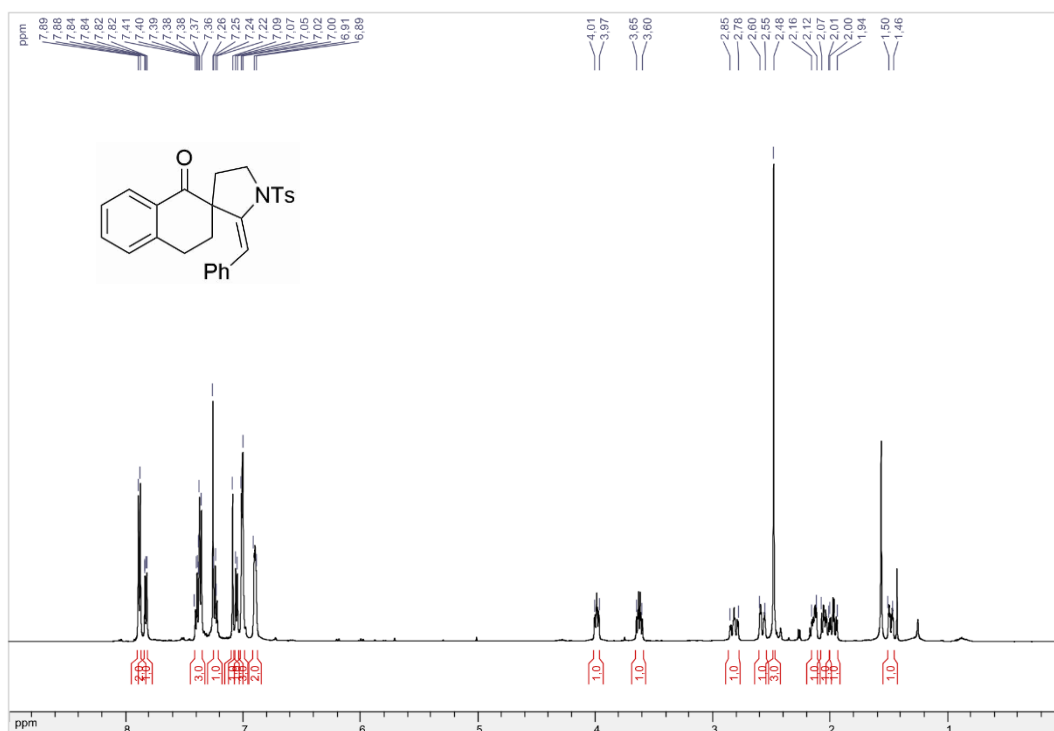


¹H NMR (CDCl₃, 500 MHz) spectrum of compound **5u**

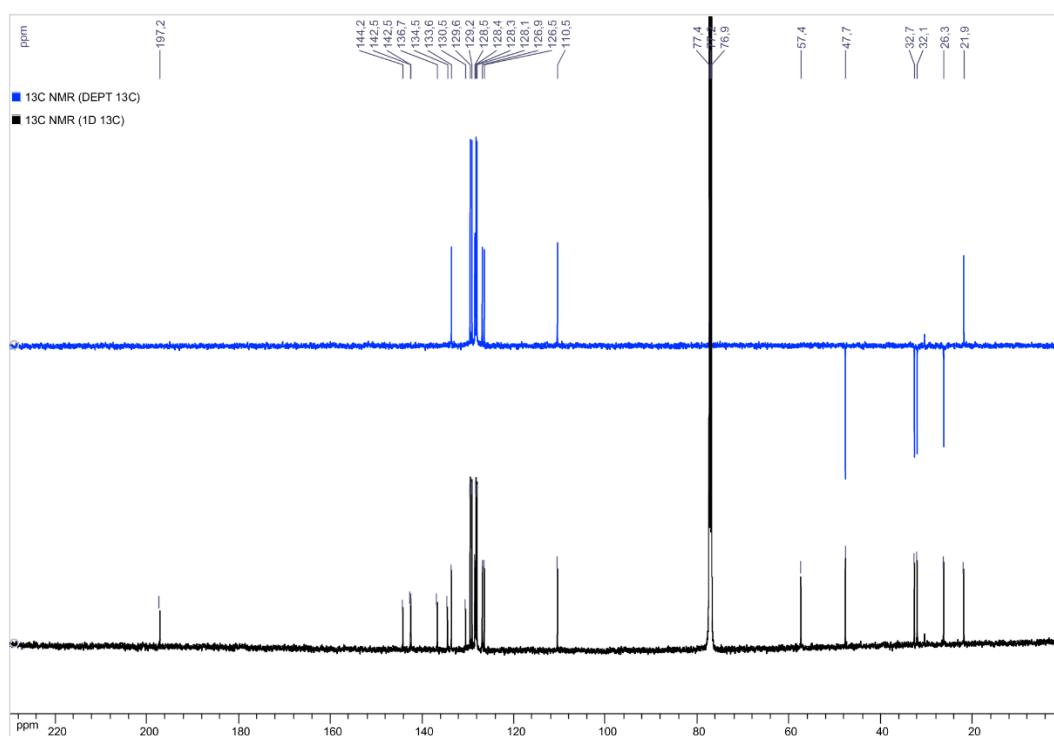


¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **5u**

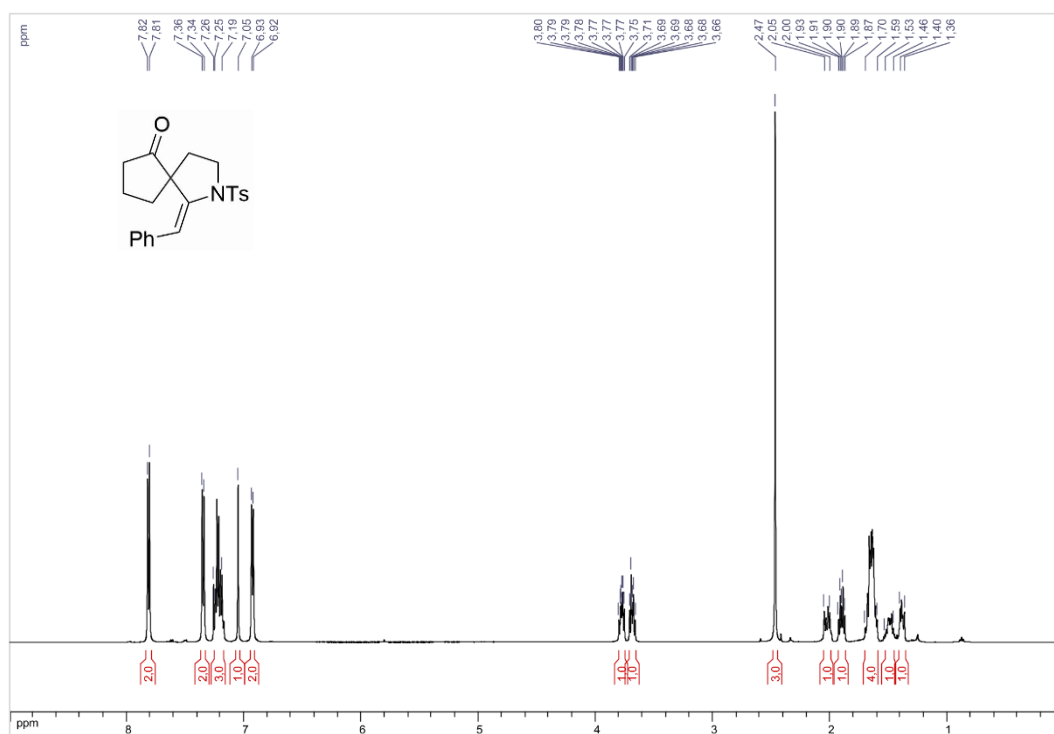
^1H and ^{13}C spectra for spiro-enesulfonamides (2a-z, 4o, 6t-z)



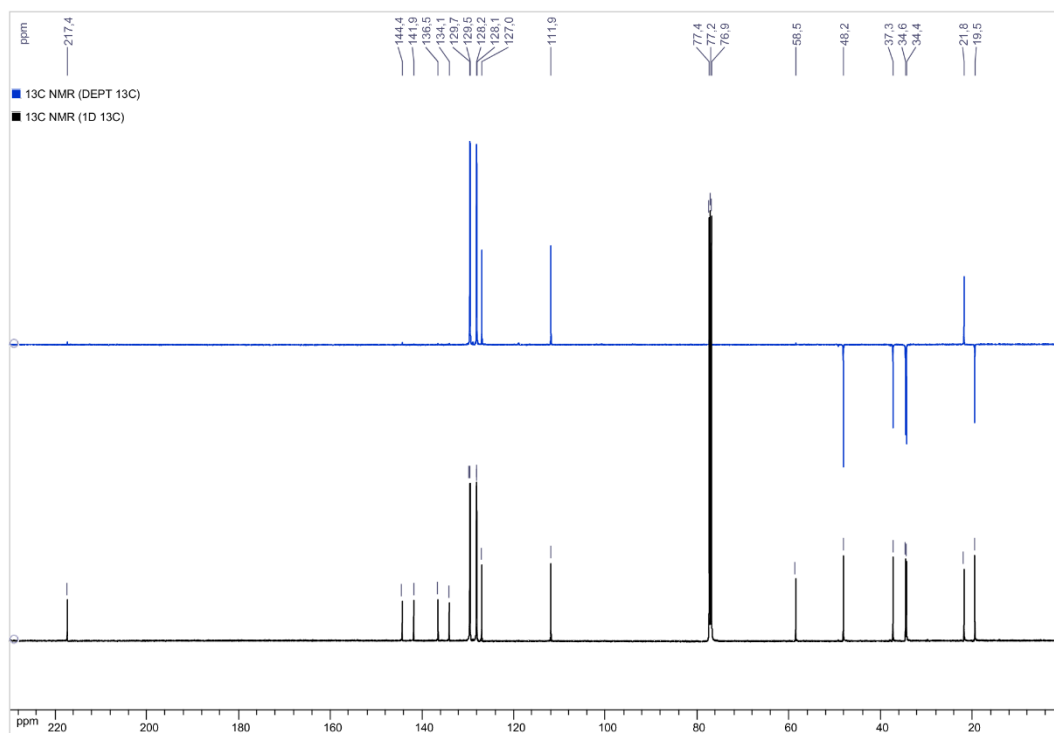
^1H NMR (CDCl_3 , 500 MHz) spectrum of compound **2a**



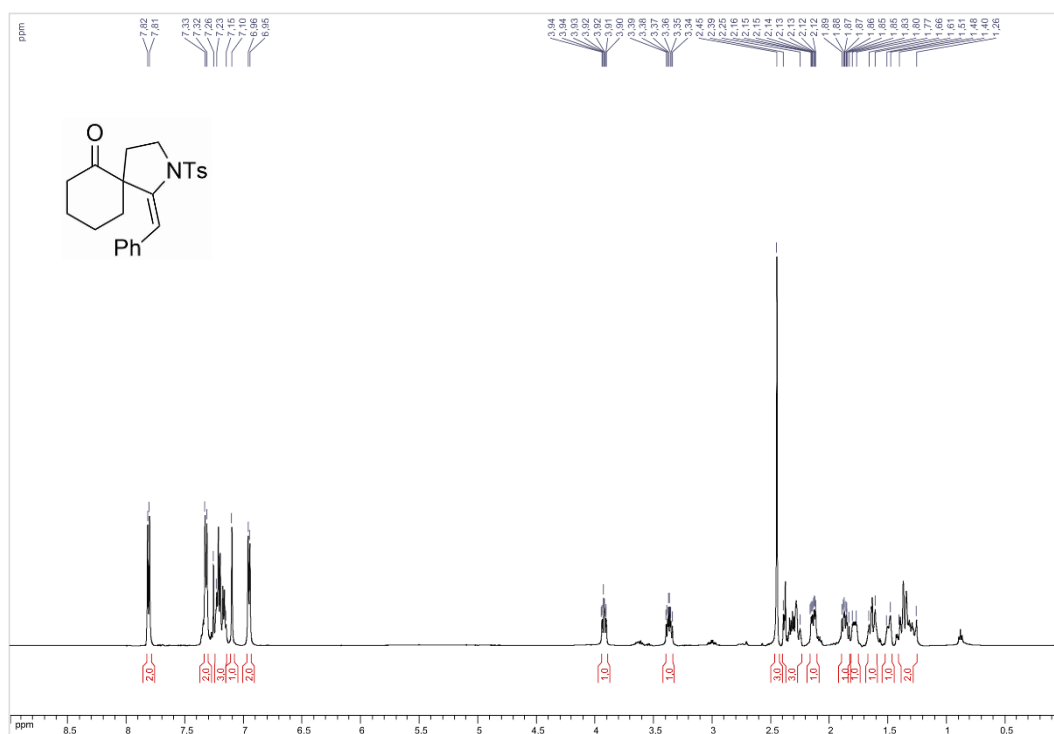
^{13}C NMR (CDCl_3 , 125 MHz) spectrum of compound **2a**



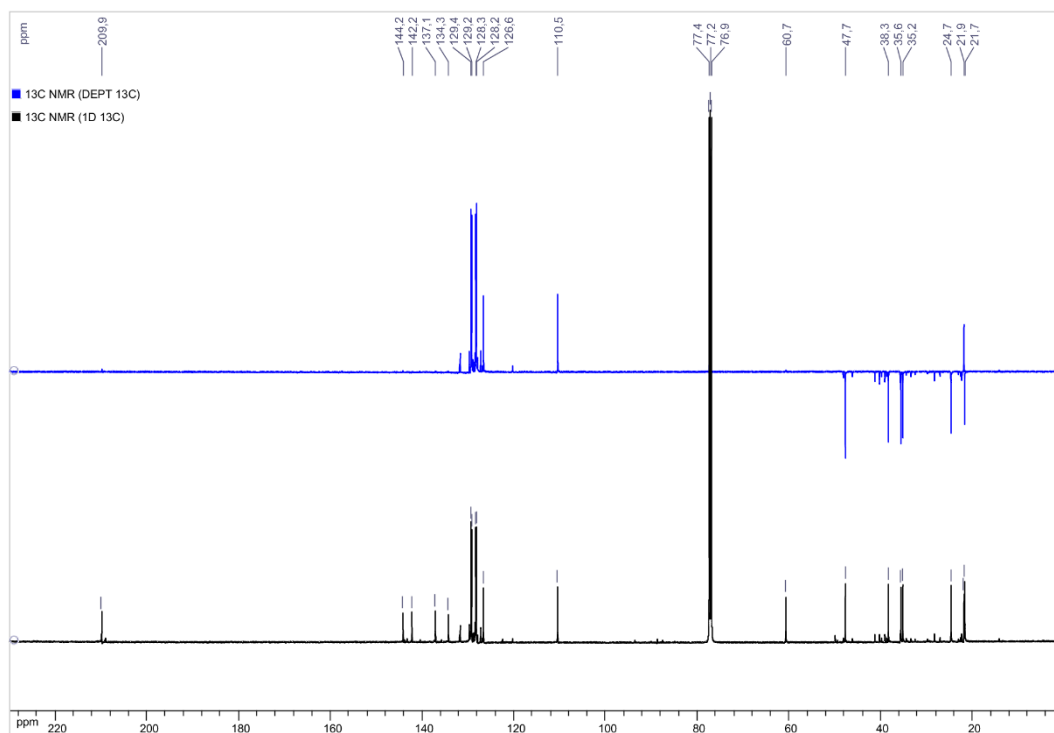
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2b**



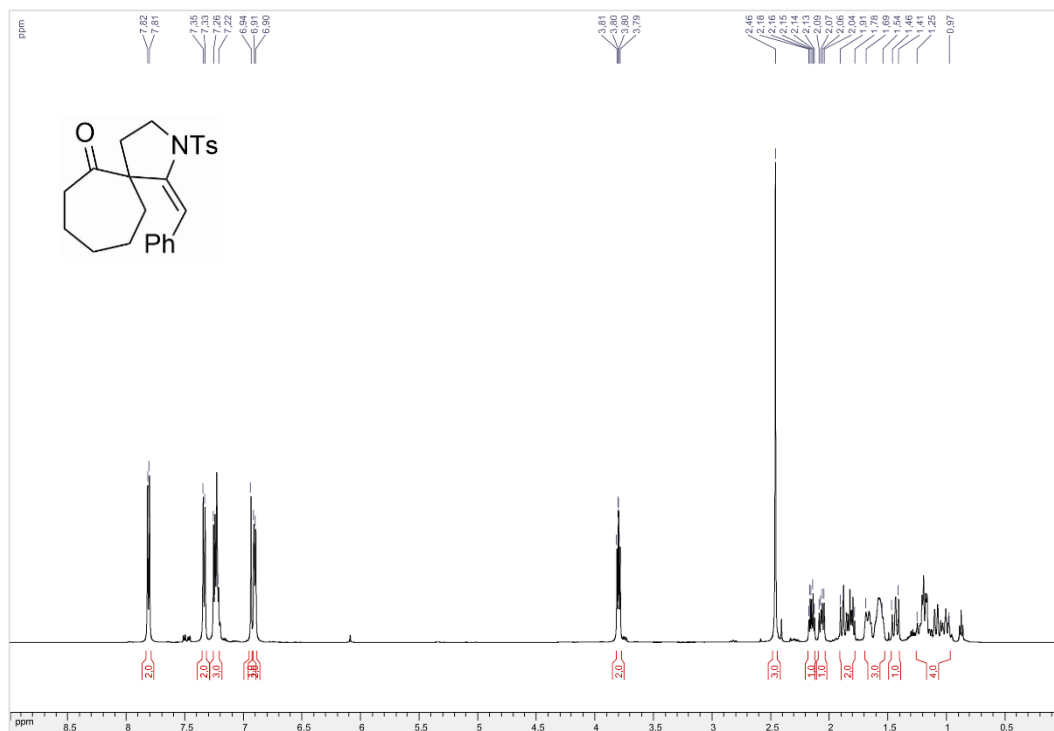
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2b**



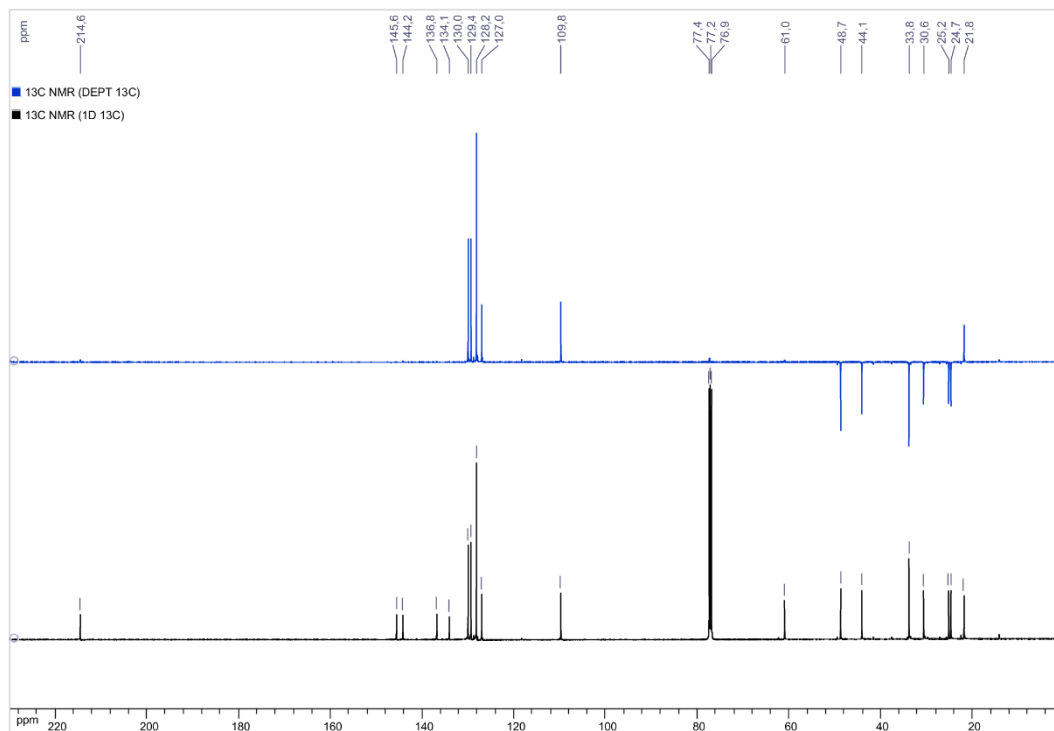
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2c**



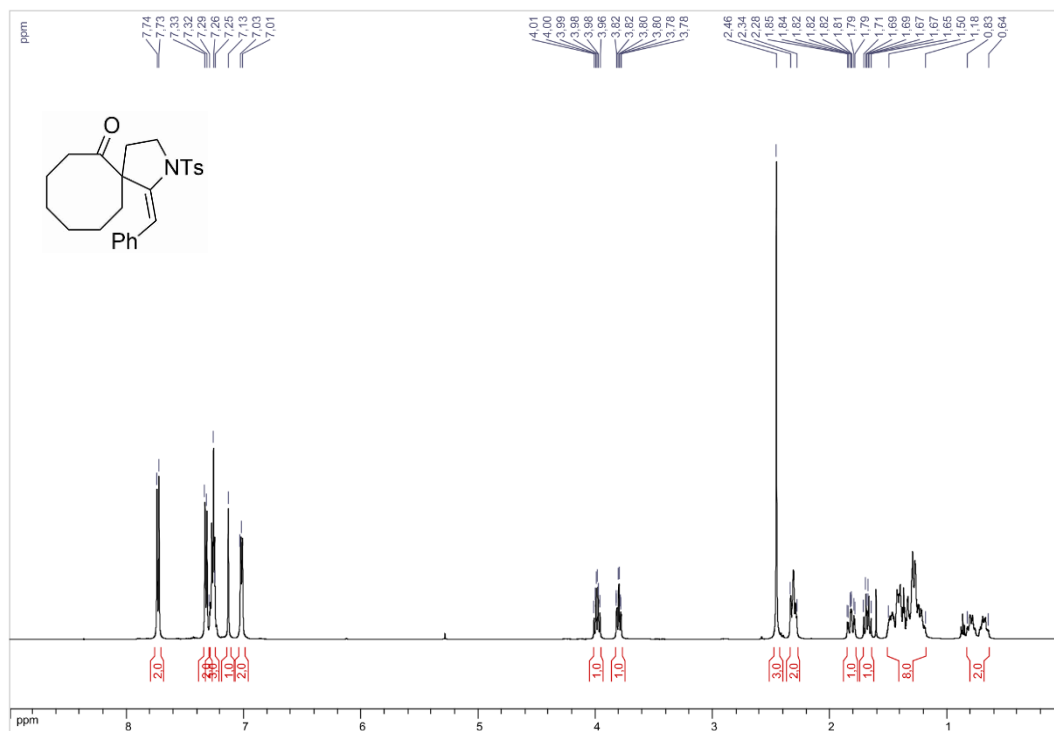
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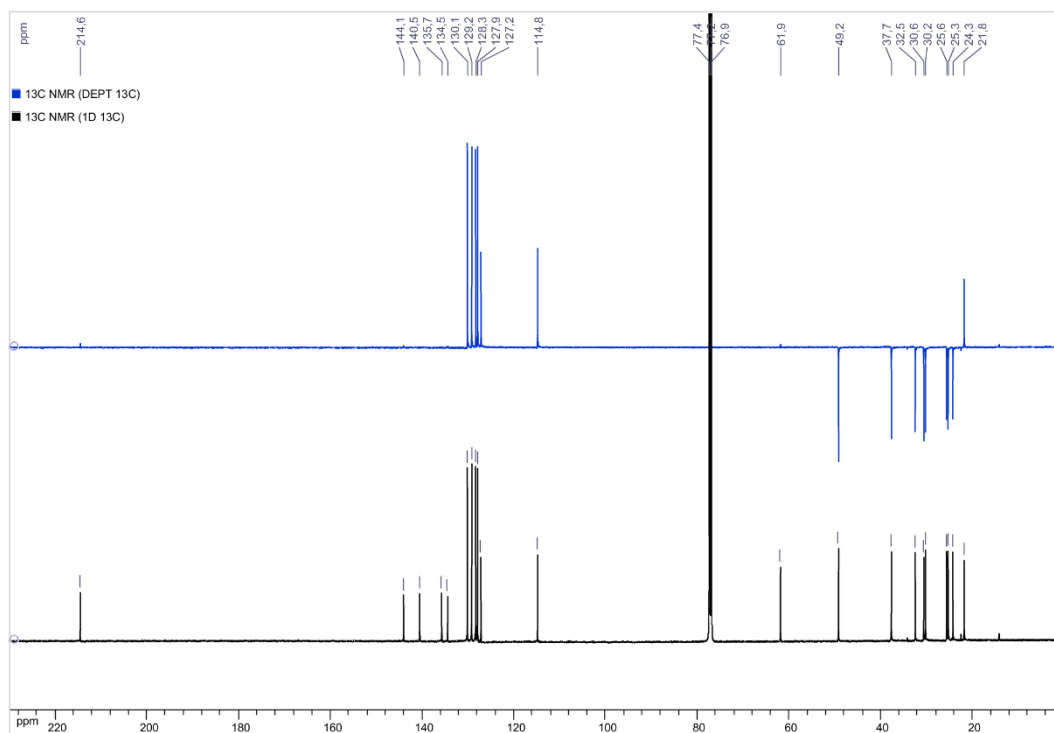
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2d**



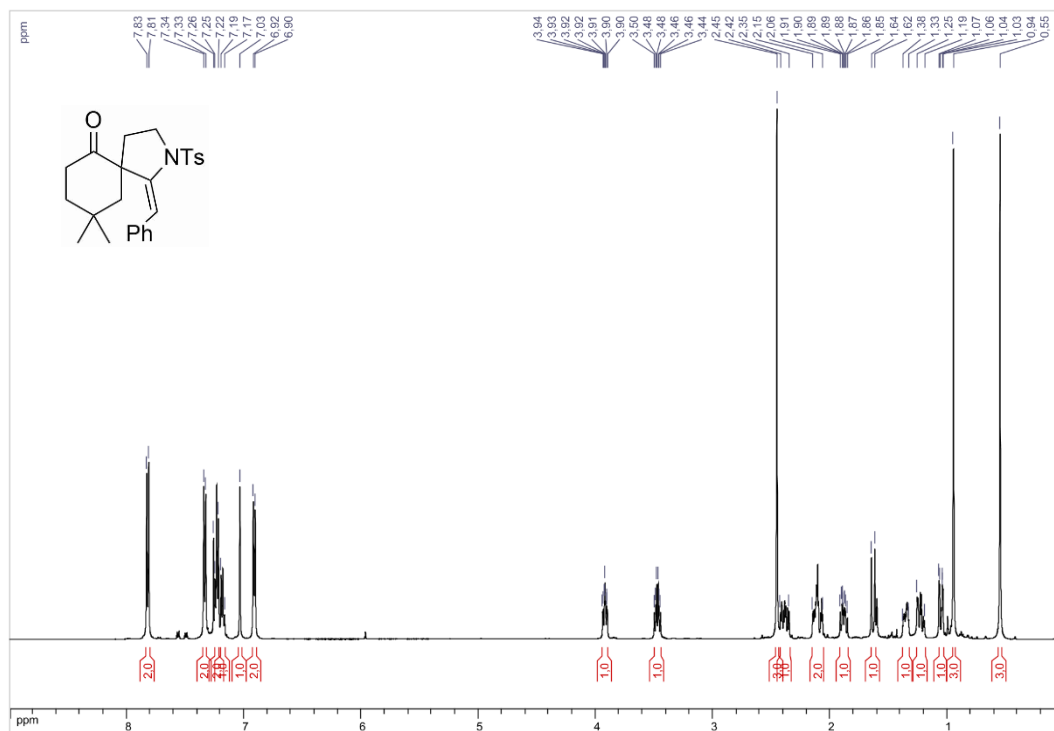
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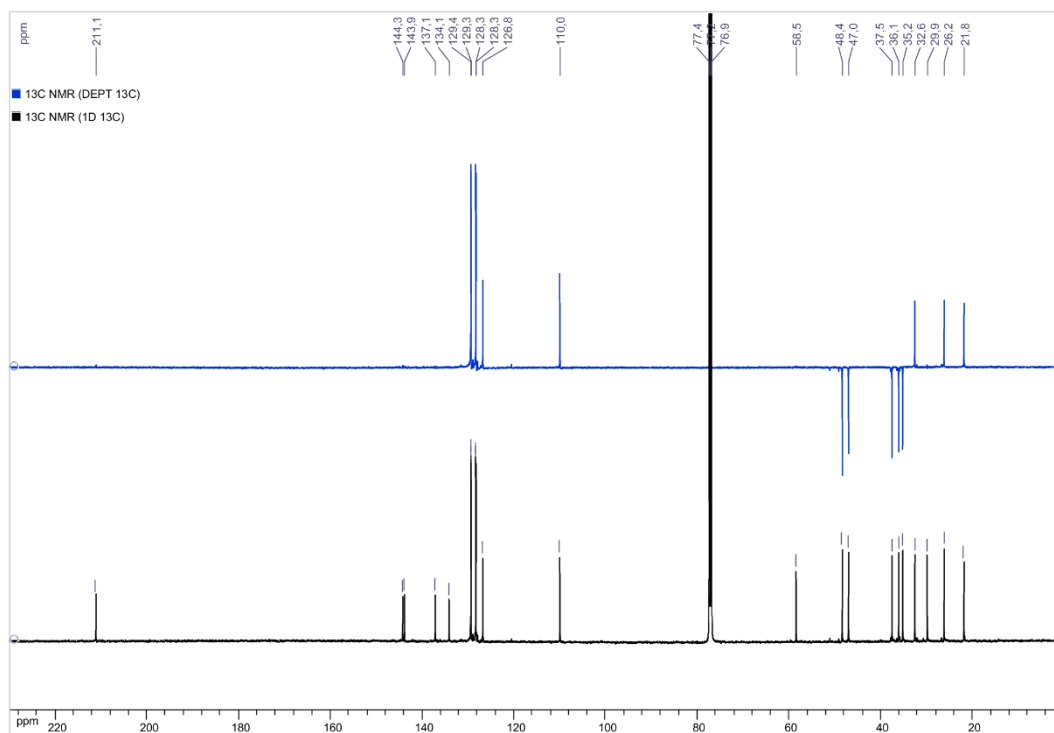
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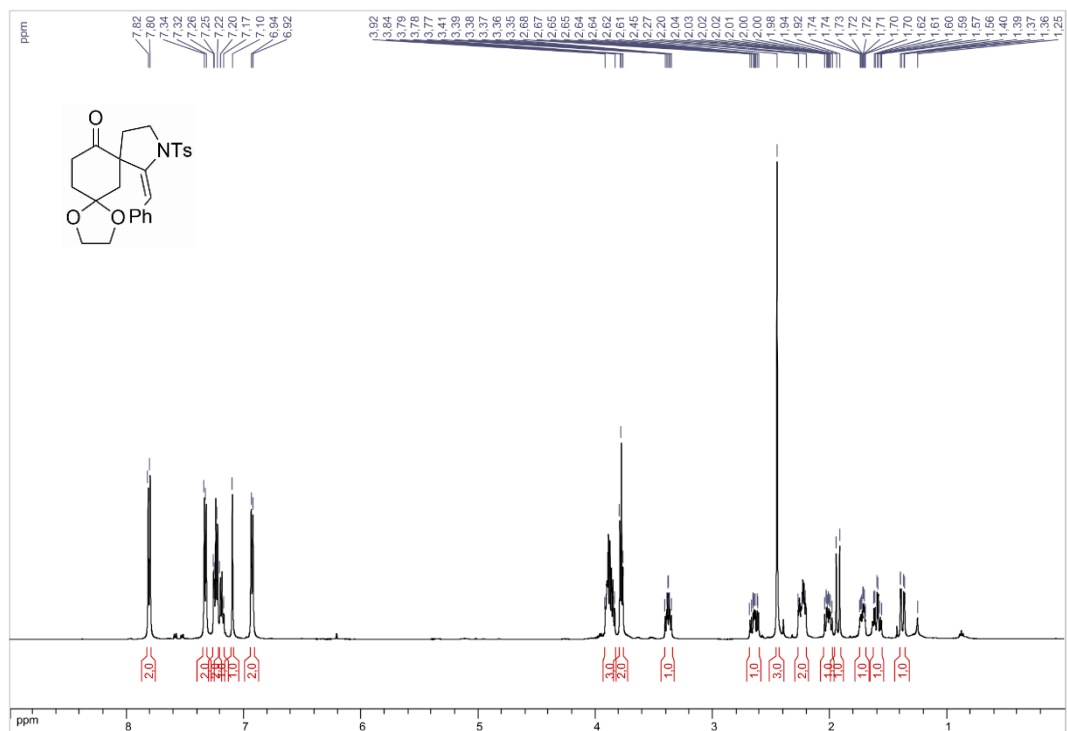
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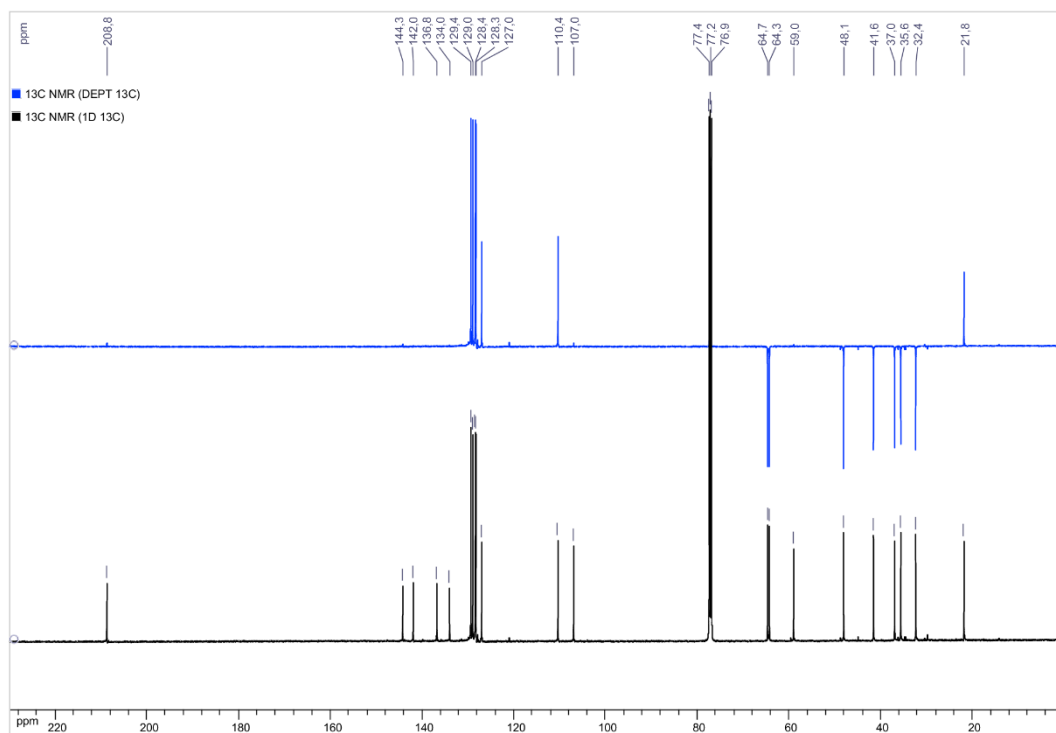
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2f**



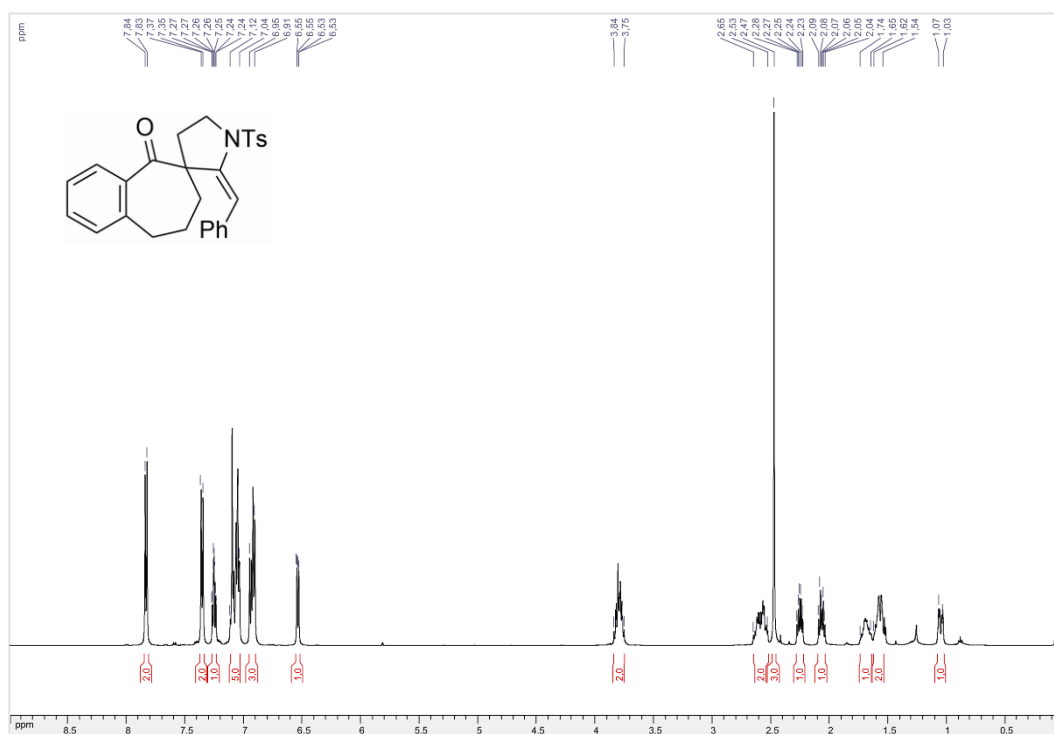
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2f**



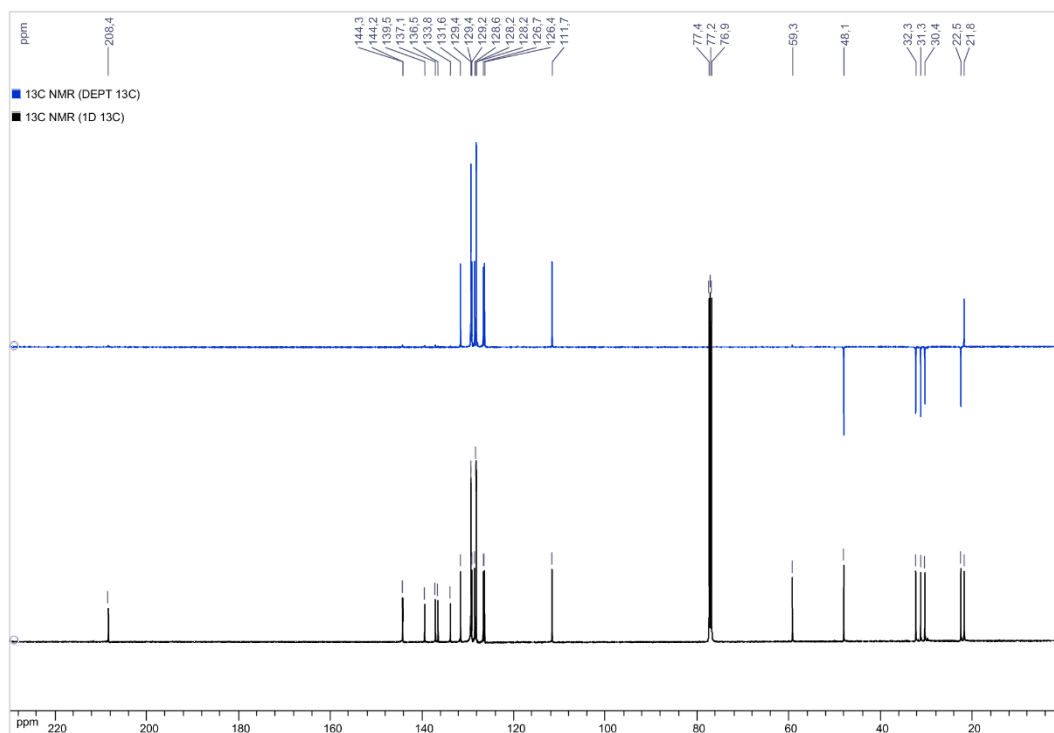
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2g**



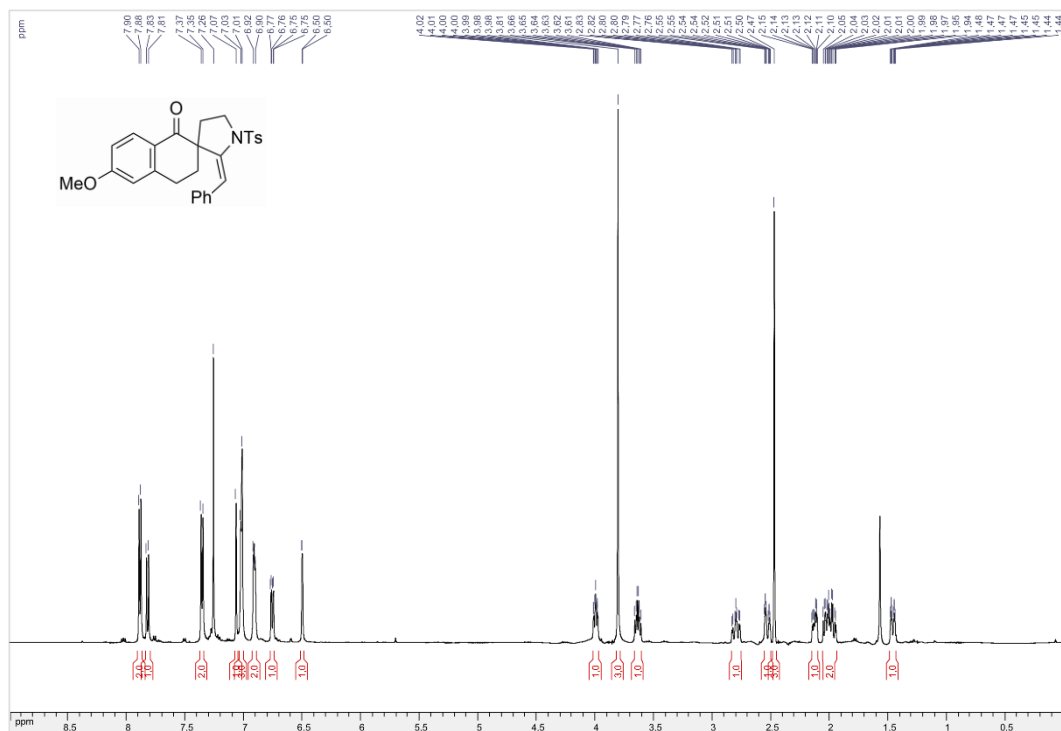
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2g**



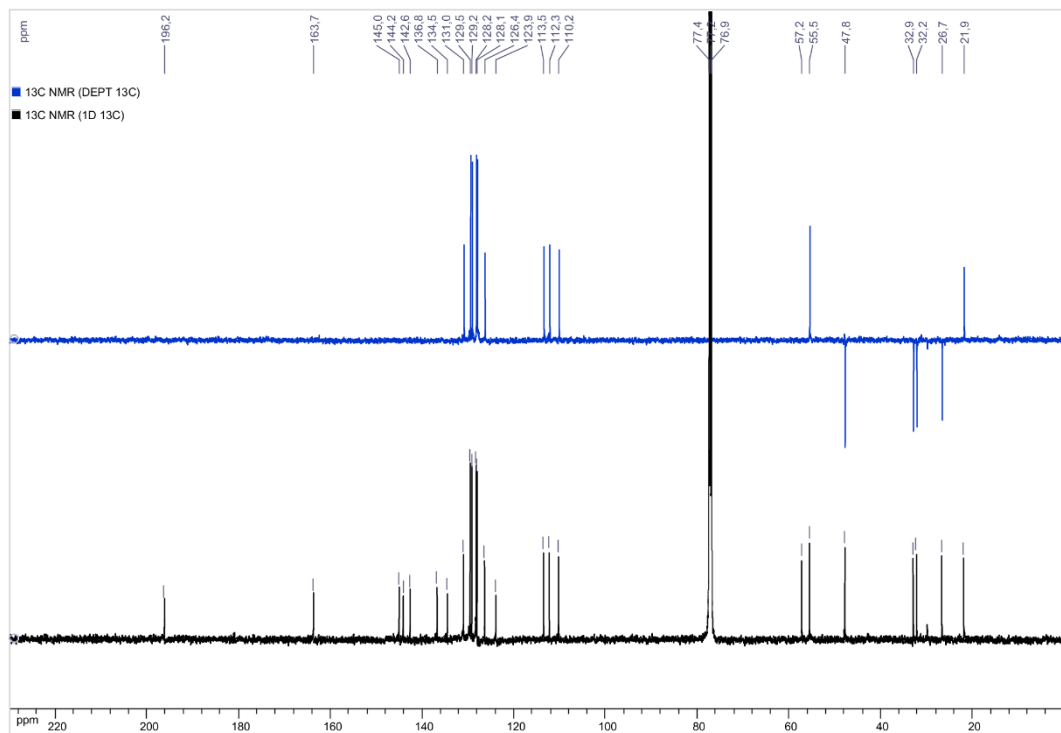
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2h**



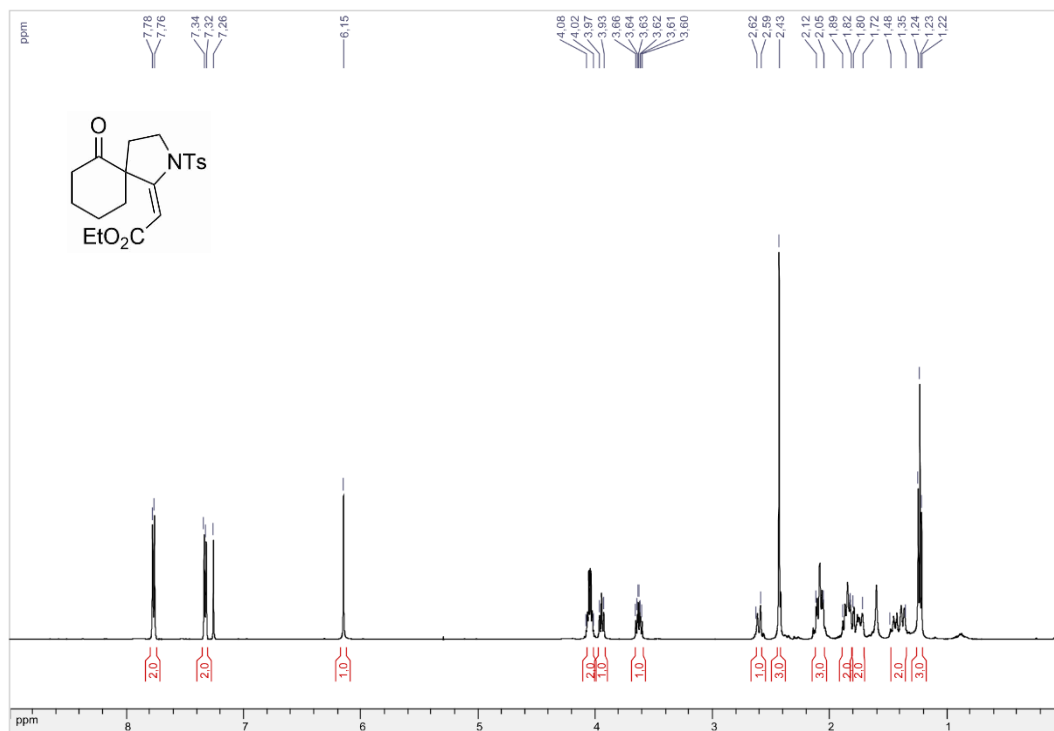
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2h**



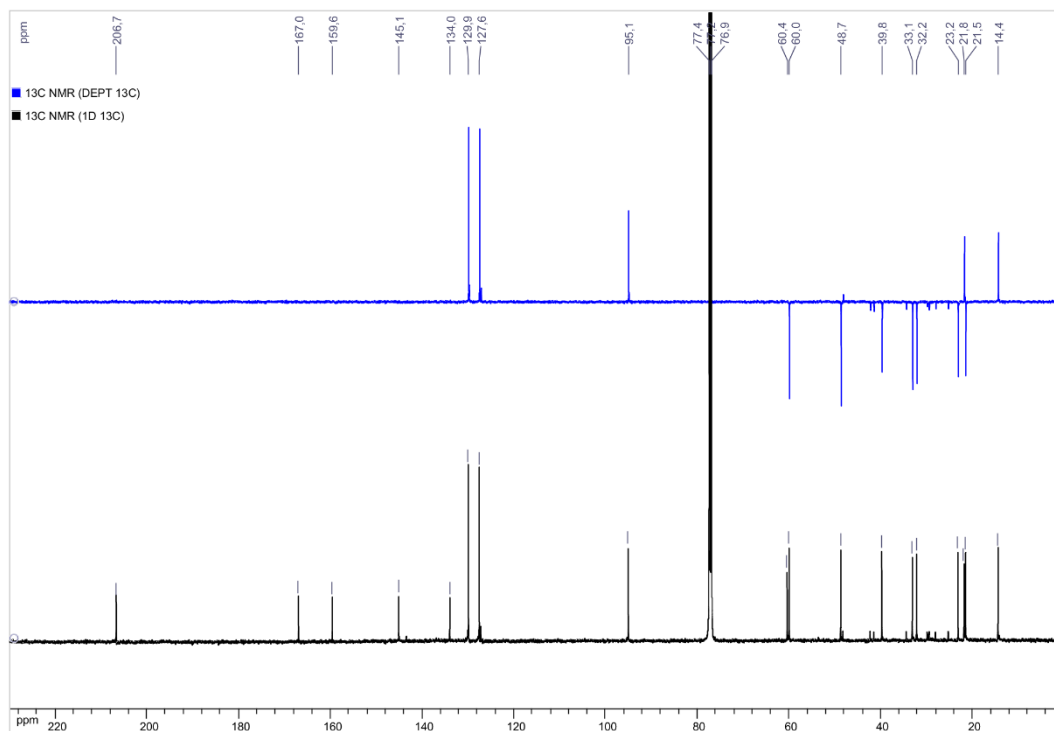
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2i**



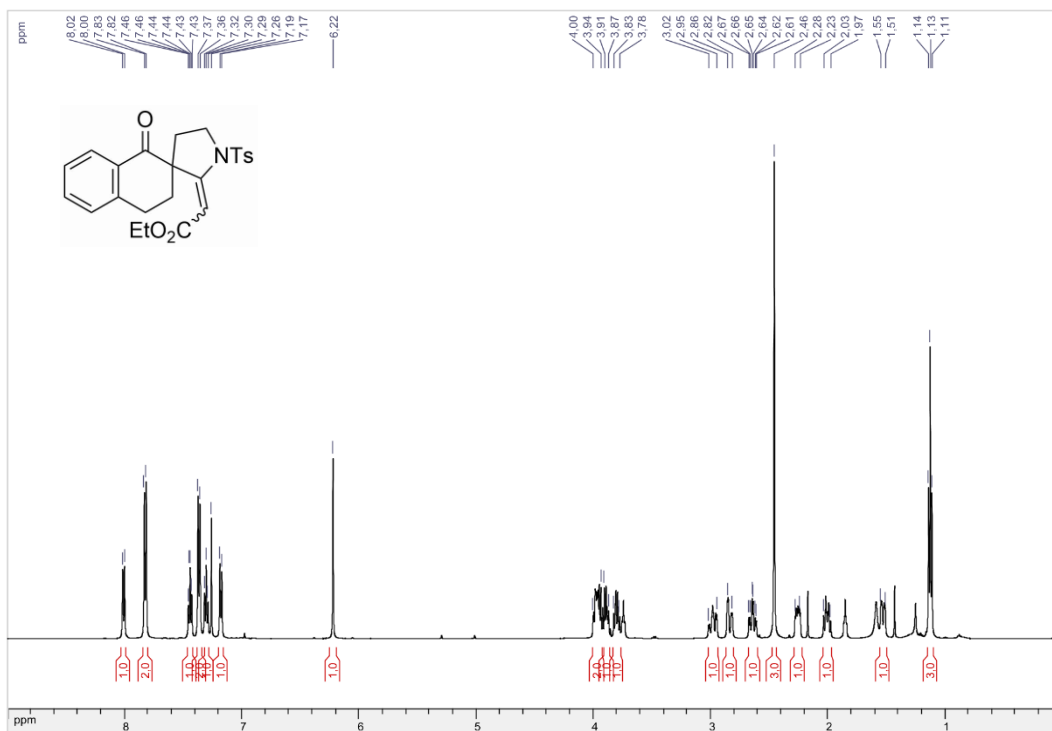
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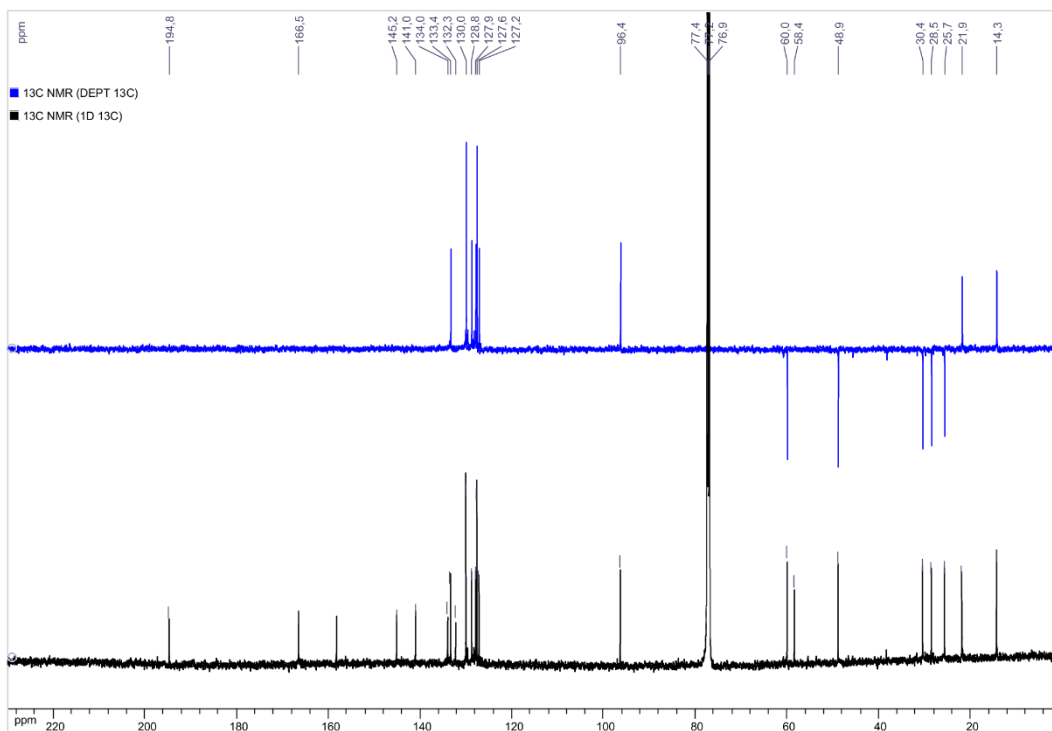
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2j**



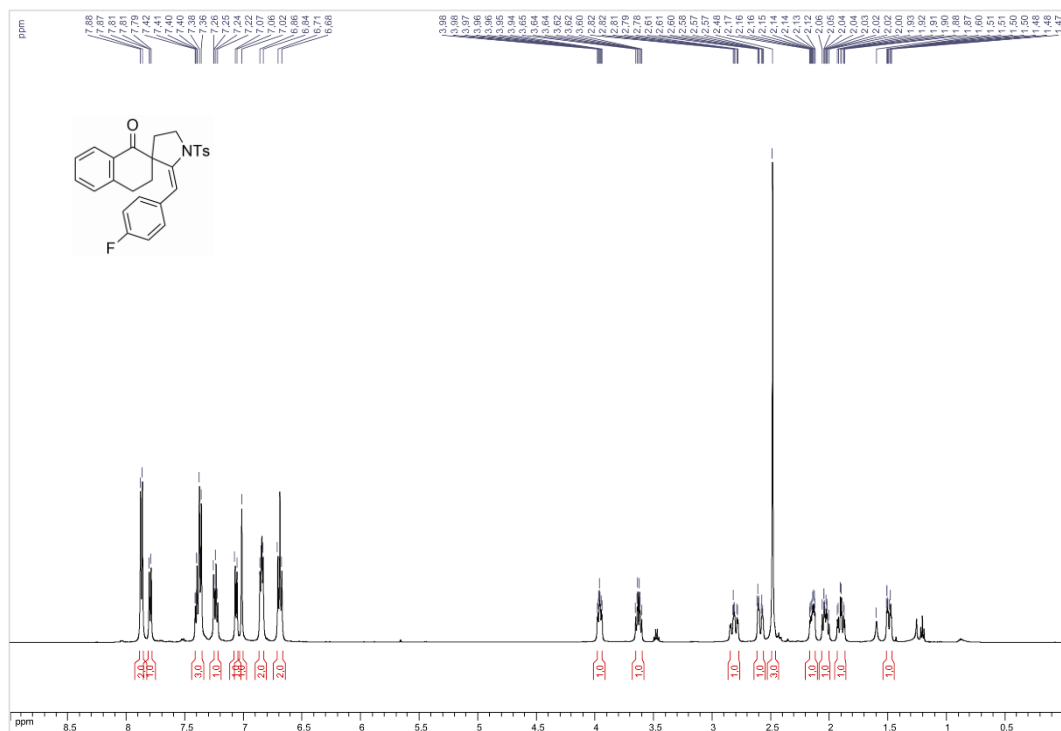
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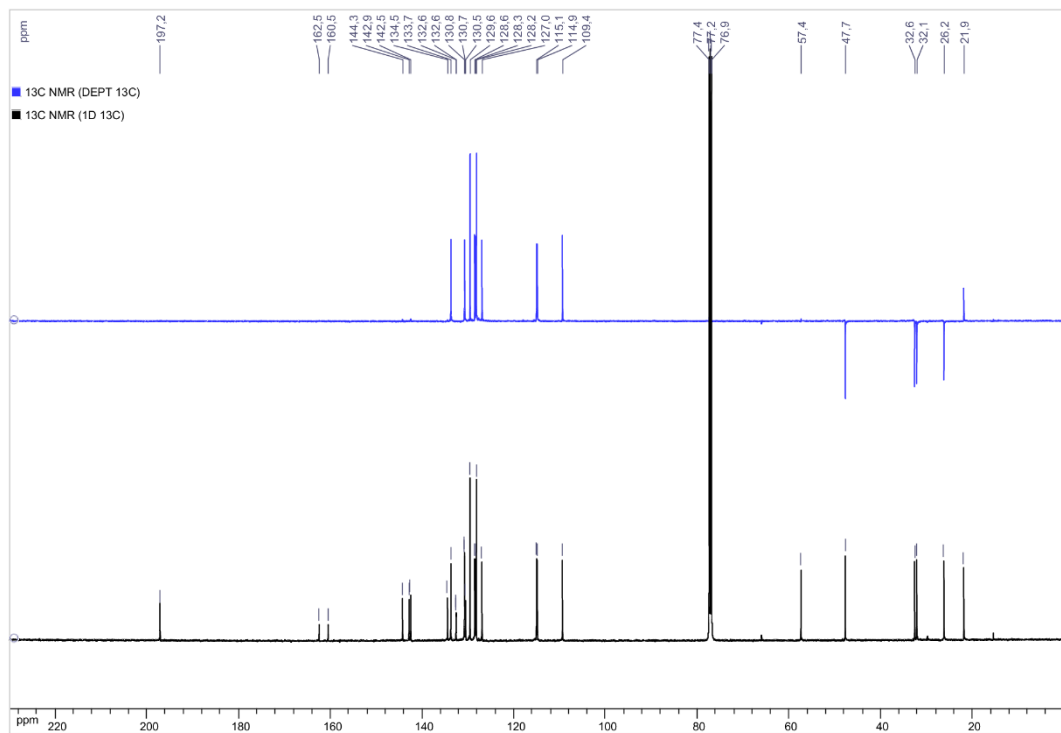
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2k**



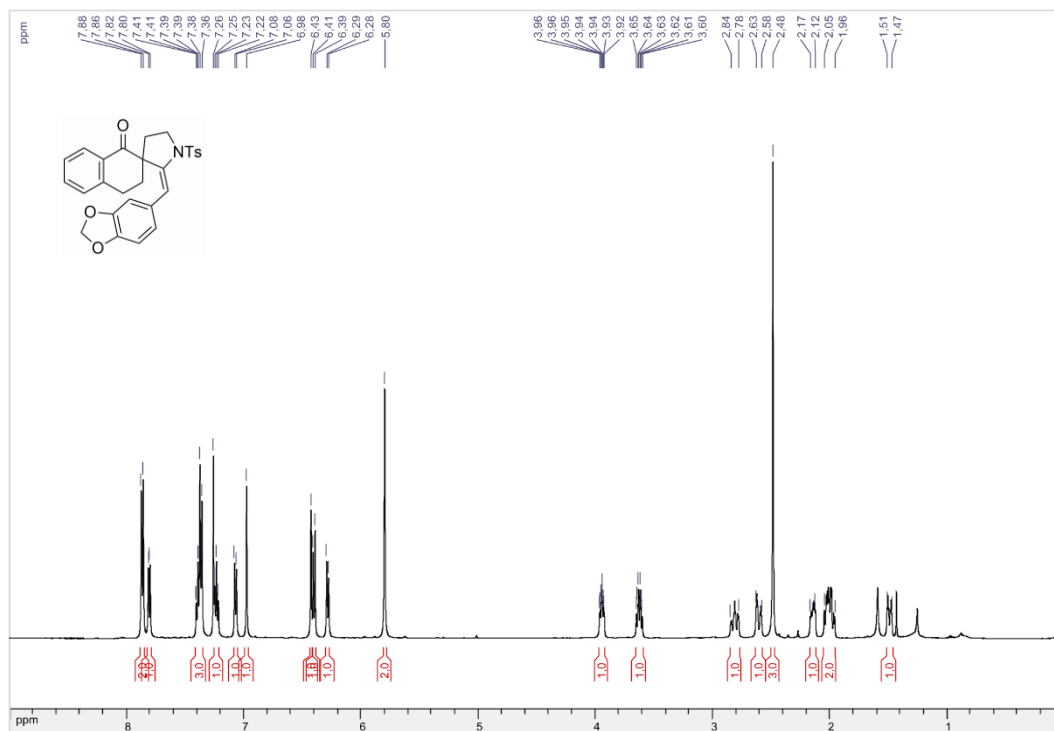
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2k**



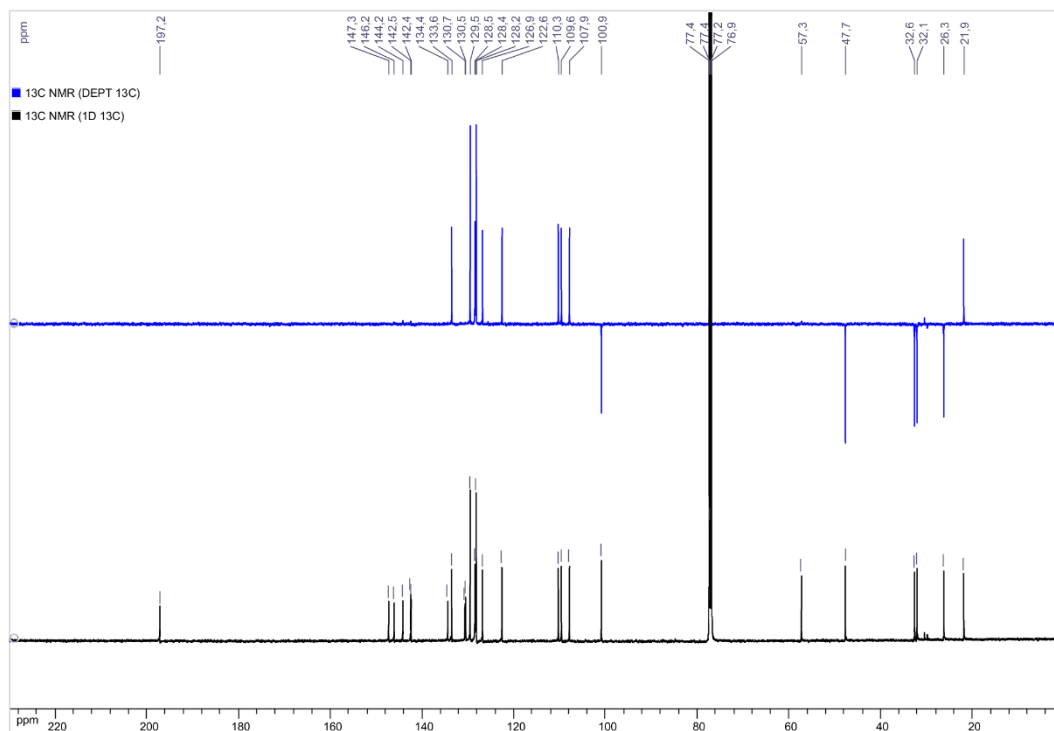
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2I**



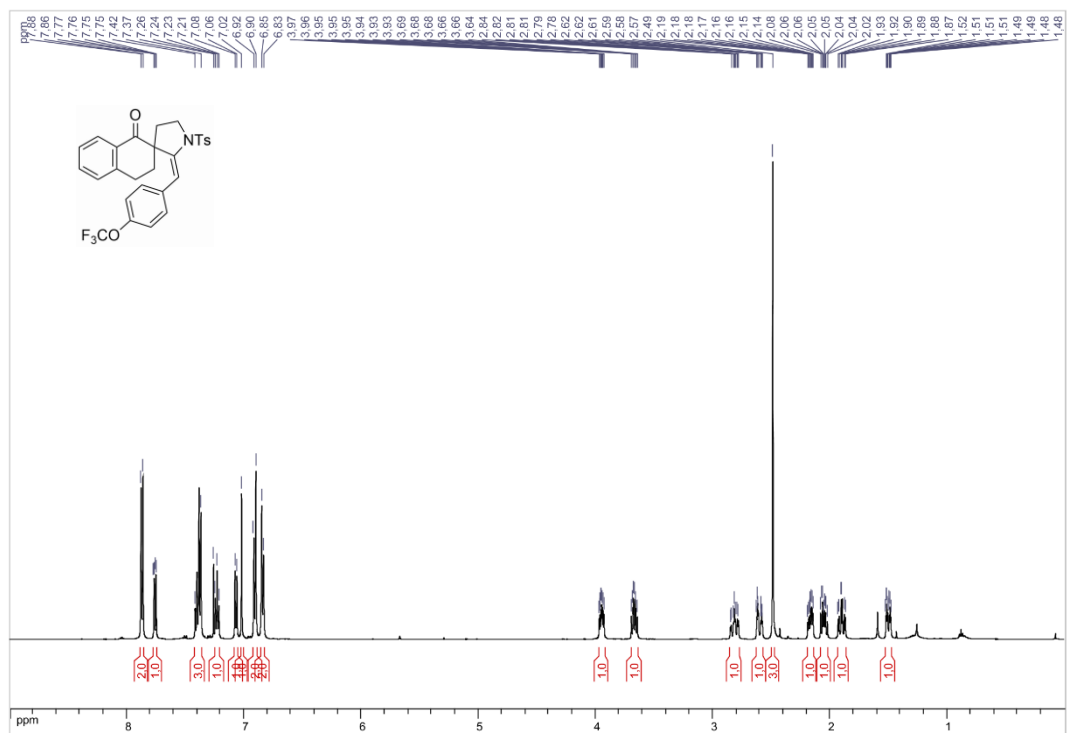
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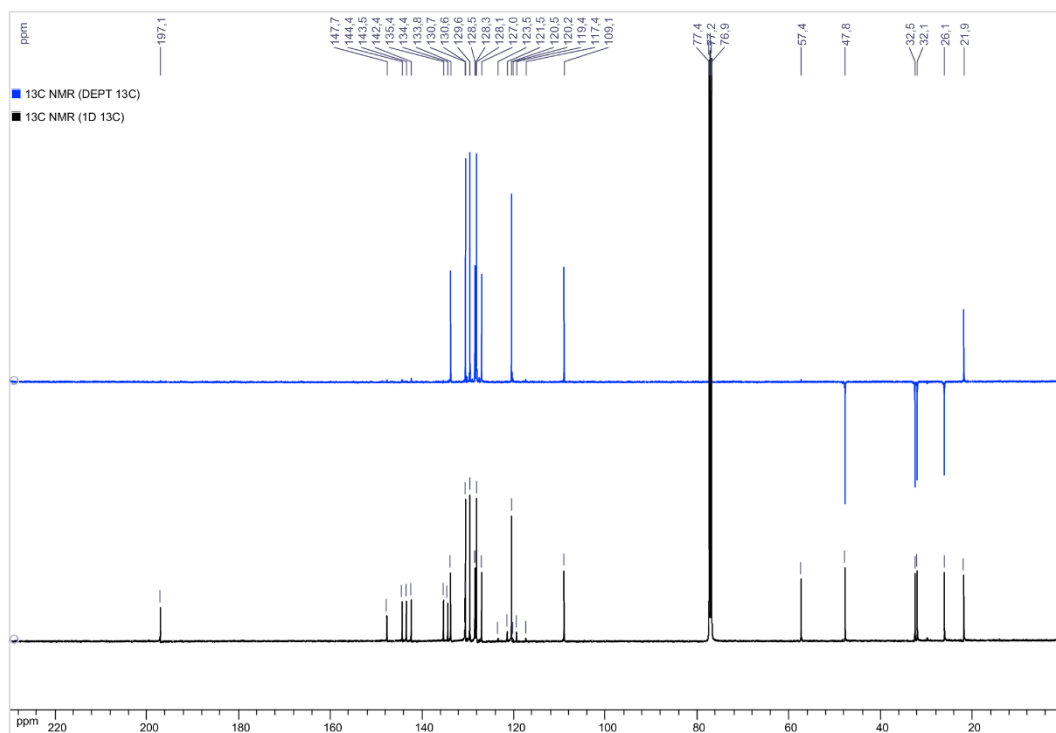
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2m**



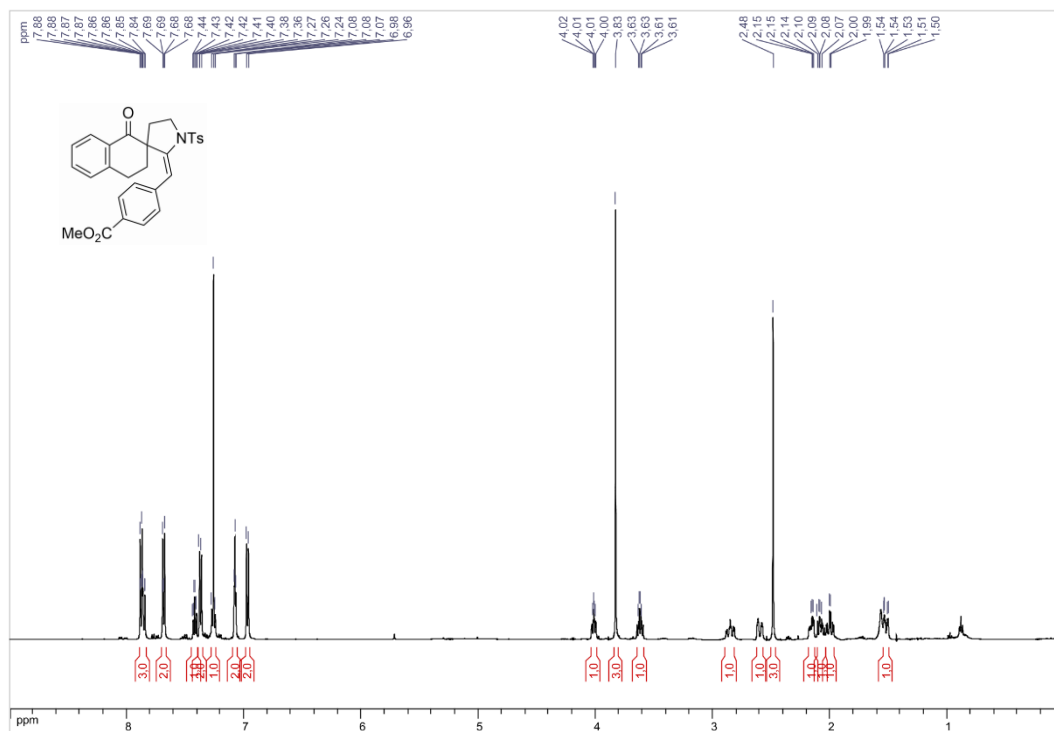
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2m**



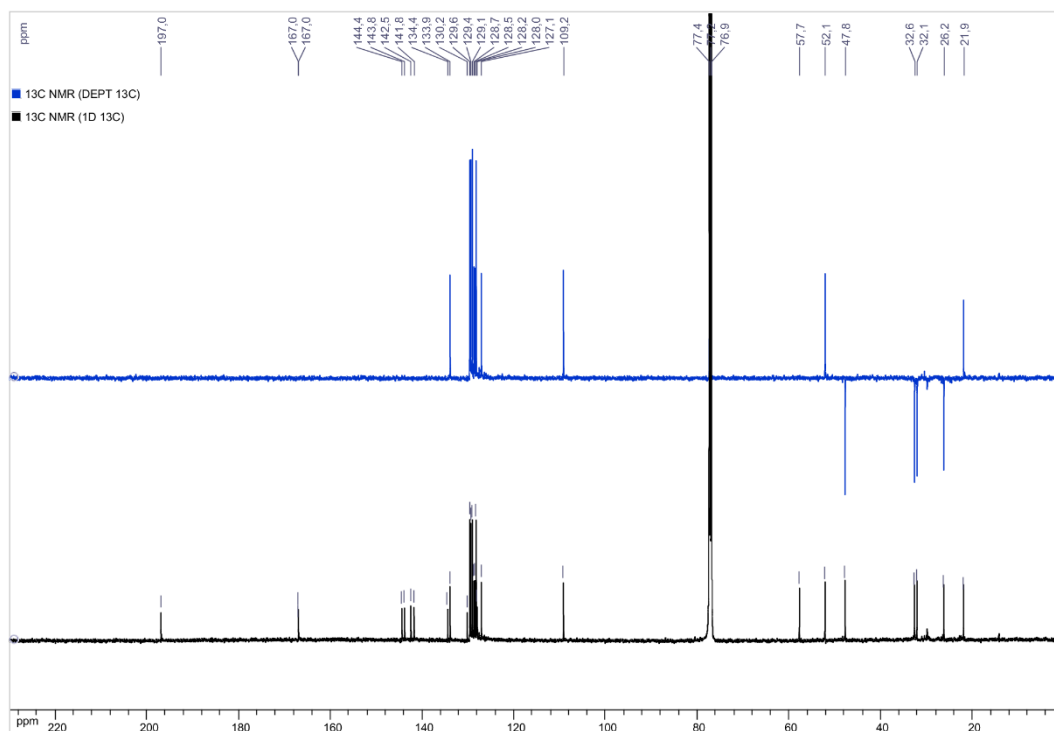
$^1\text{H NMR}$ (CDCl₃, 500 MHz) spectrum of compound **2n**



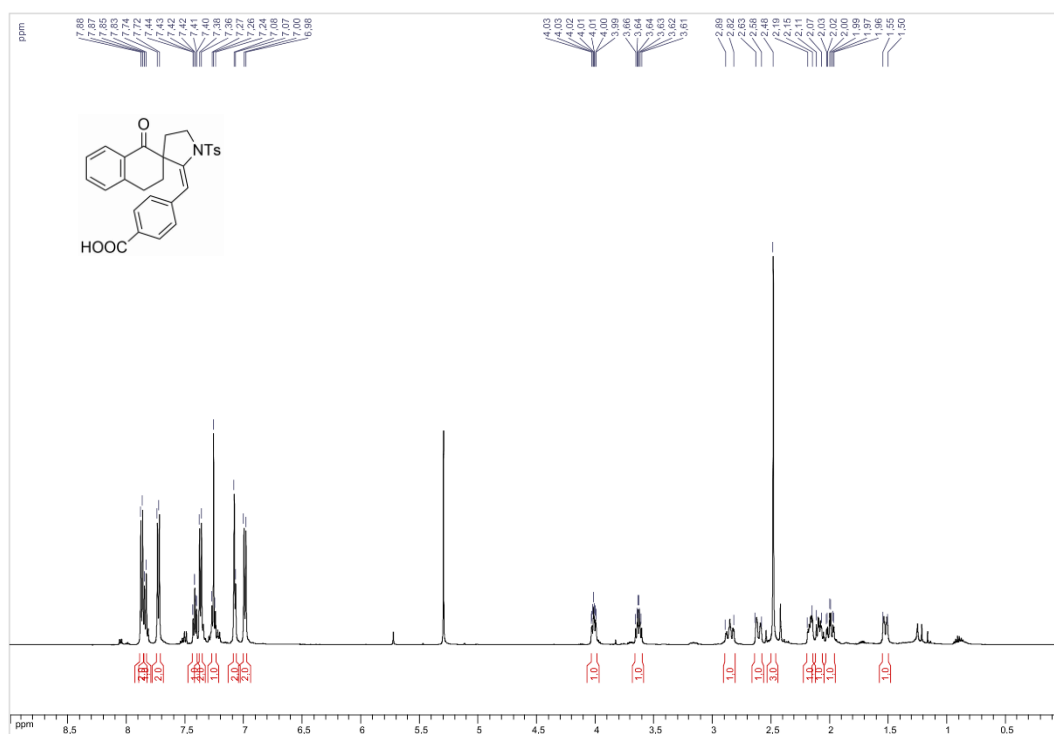
$^{13}\text{C NMR}$ (CDCl₃, 125 MHz) spectrum of compound **2n**



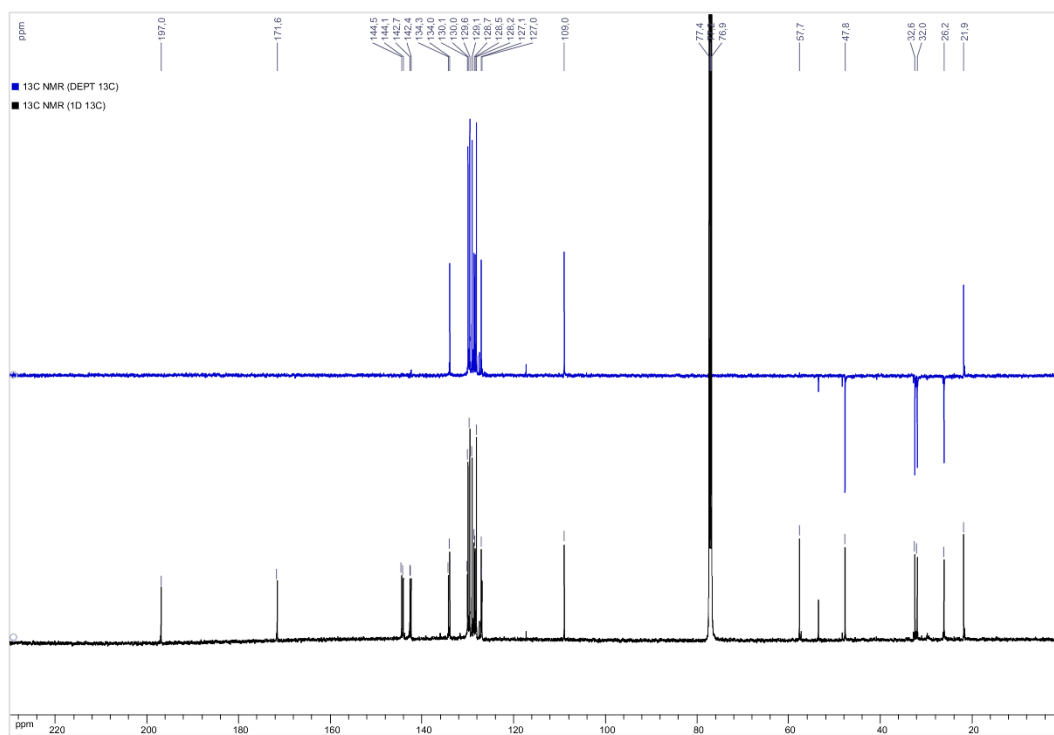
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2o**



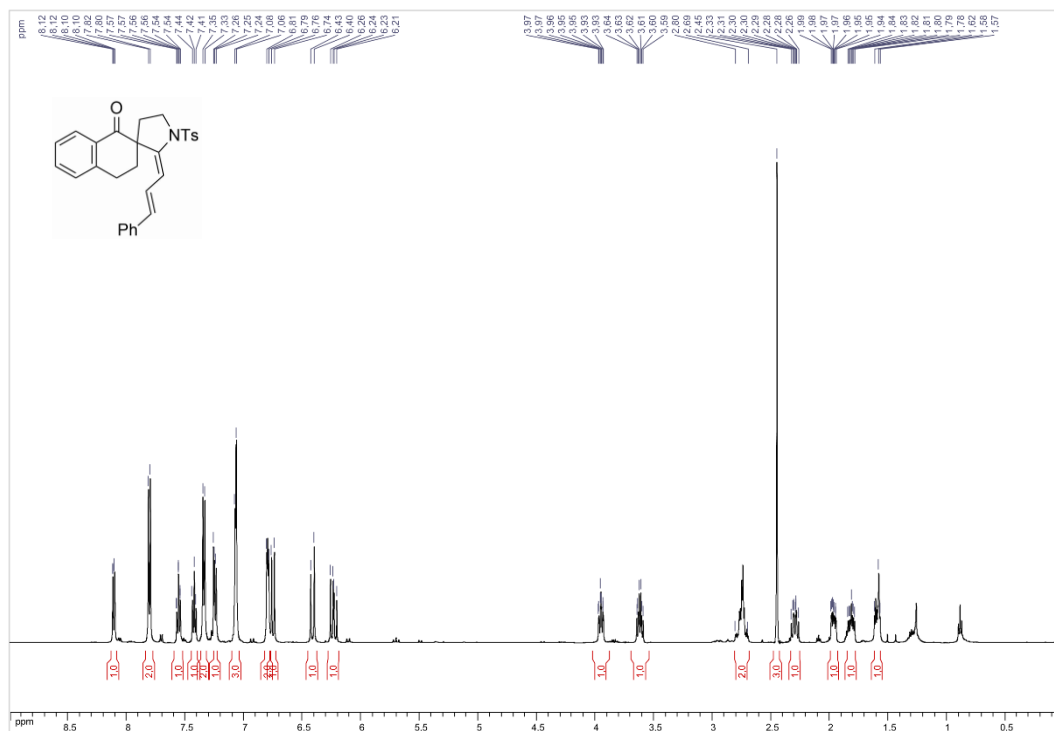
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2o**



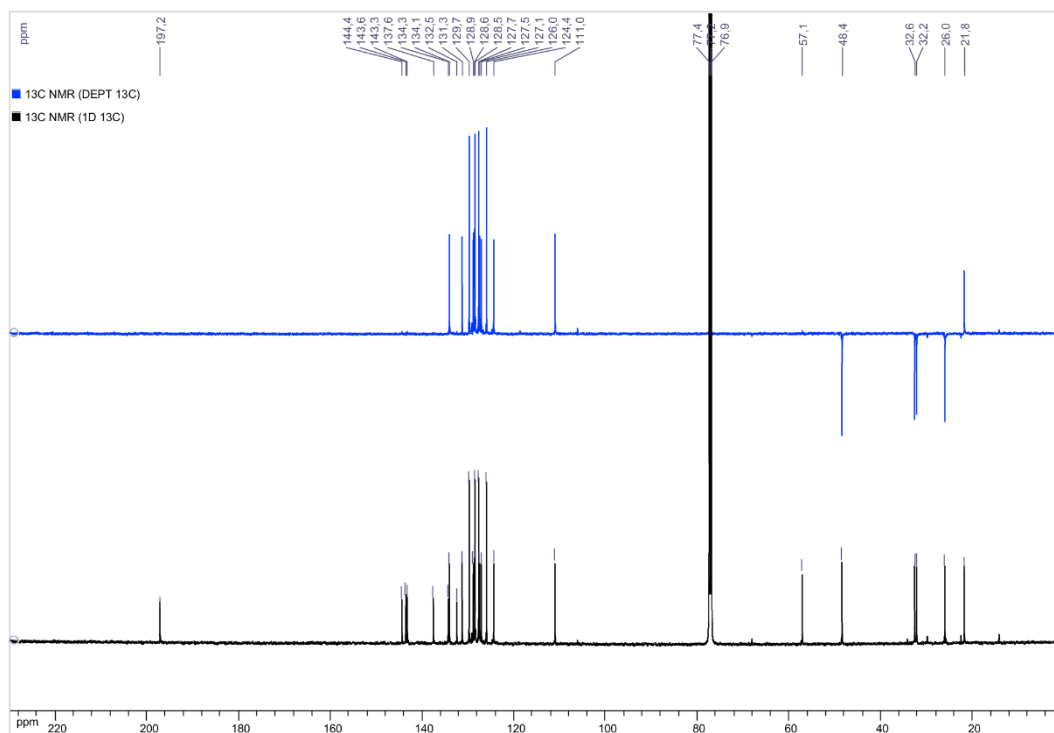
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **4o**



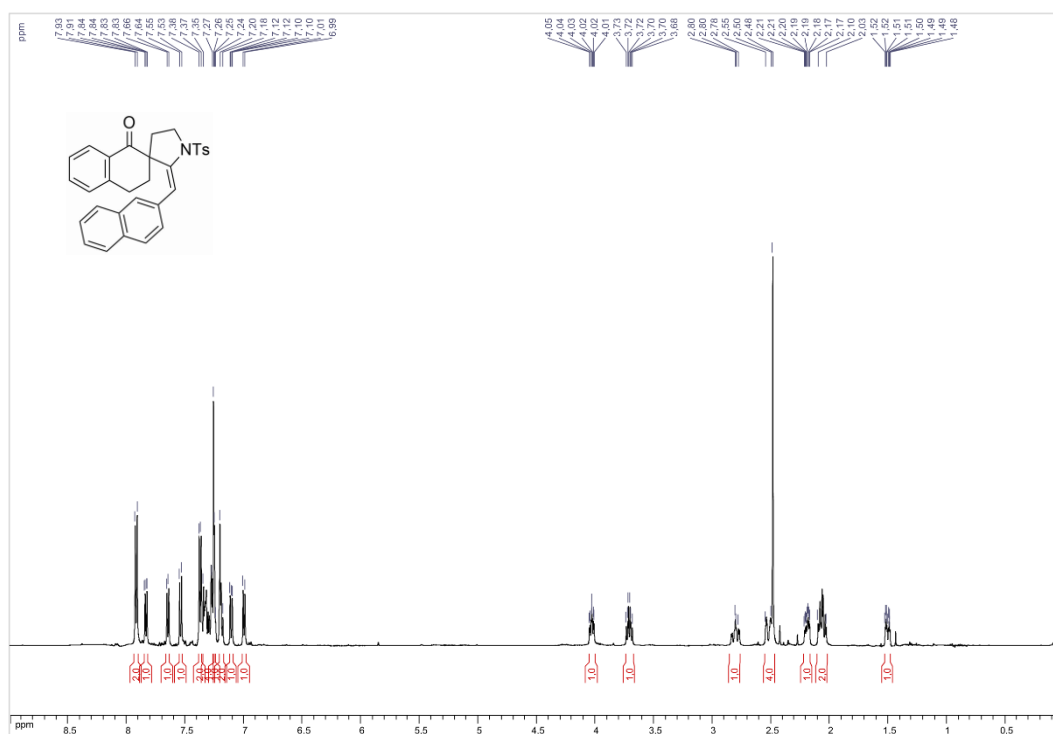
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **4o**



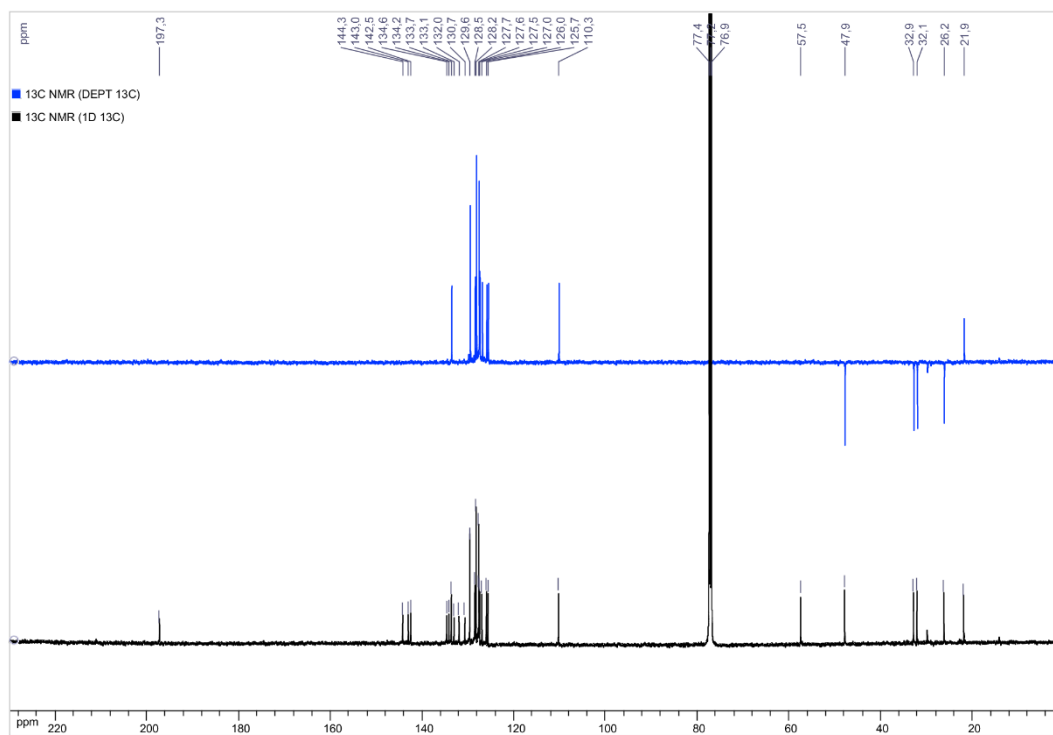
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2p**



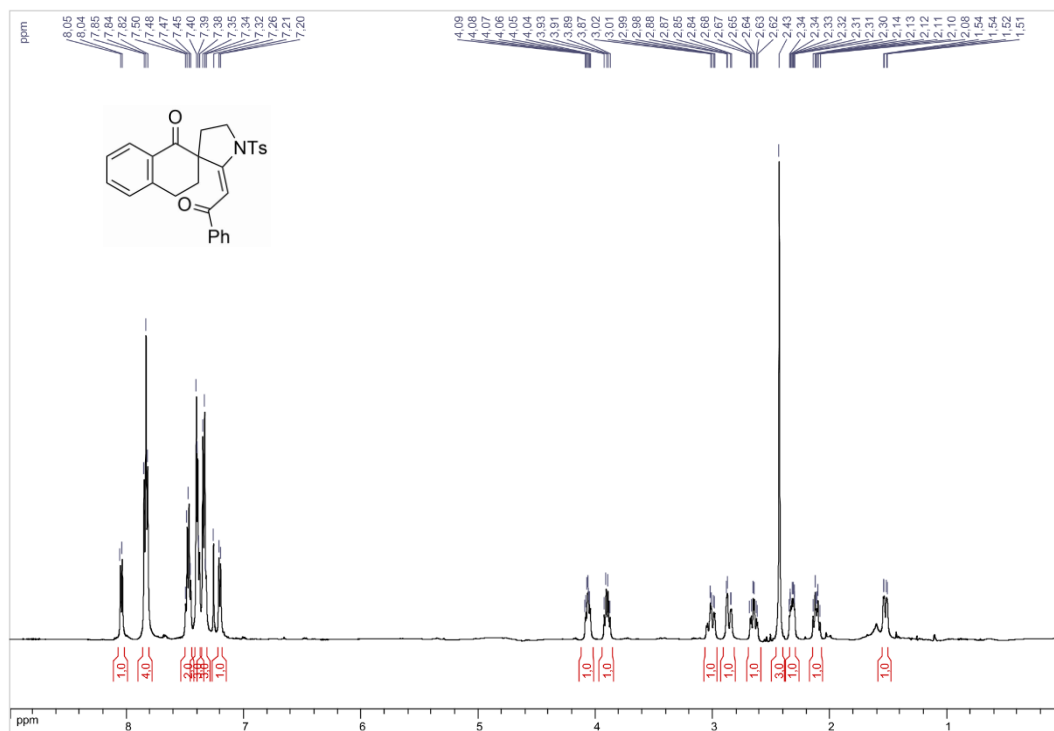
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2p**



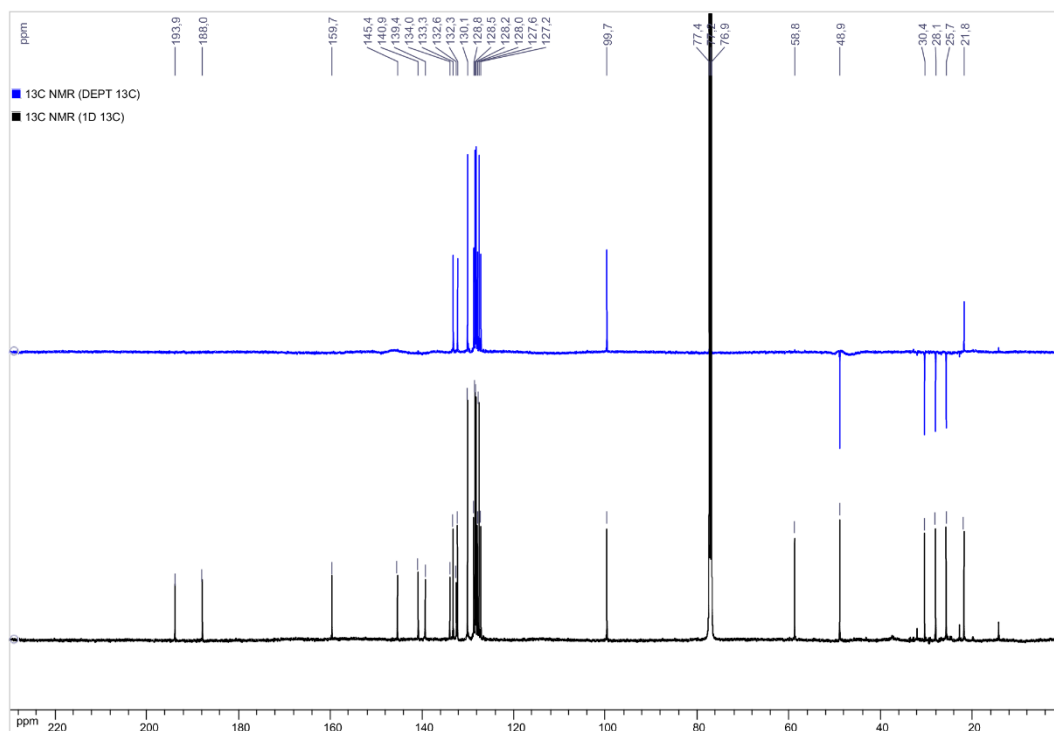
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2q**



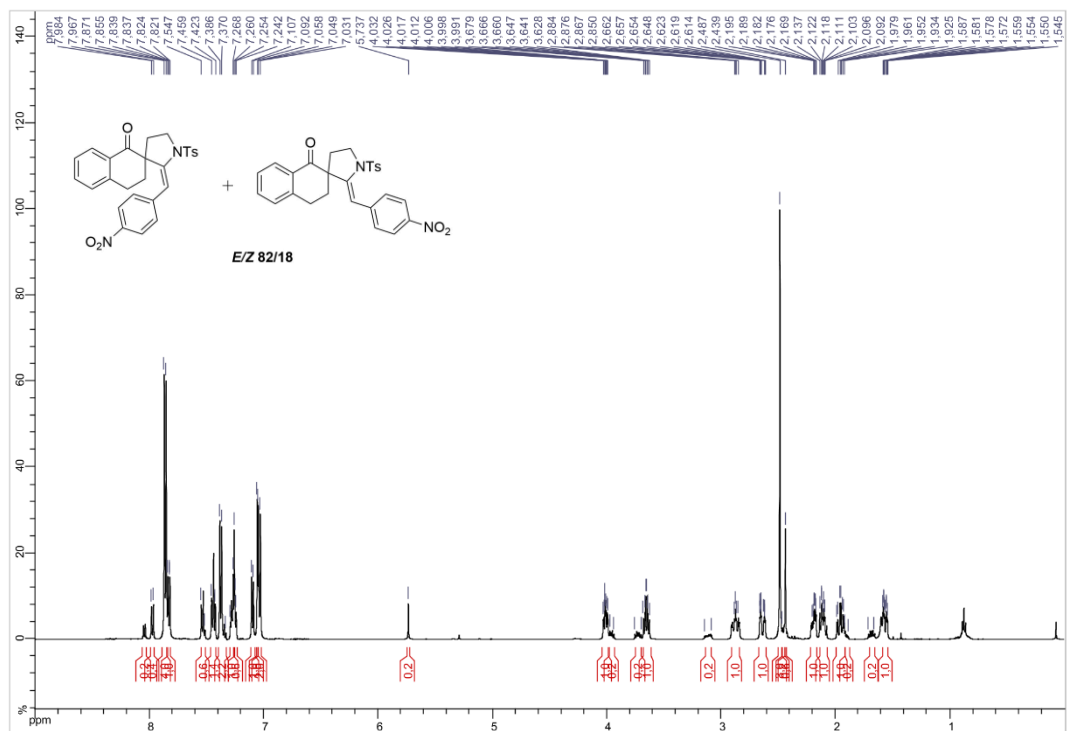
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2q**



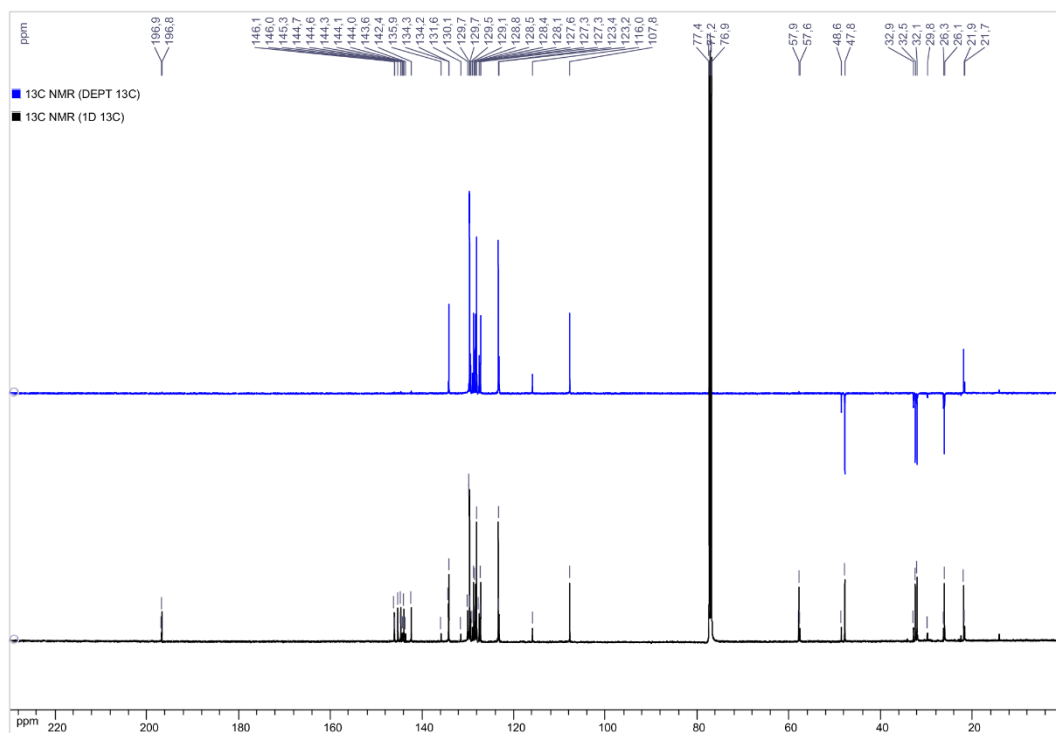
¹H NMR (CDCl₃, 500 MHz) spectrum of compound 2r



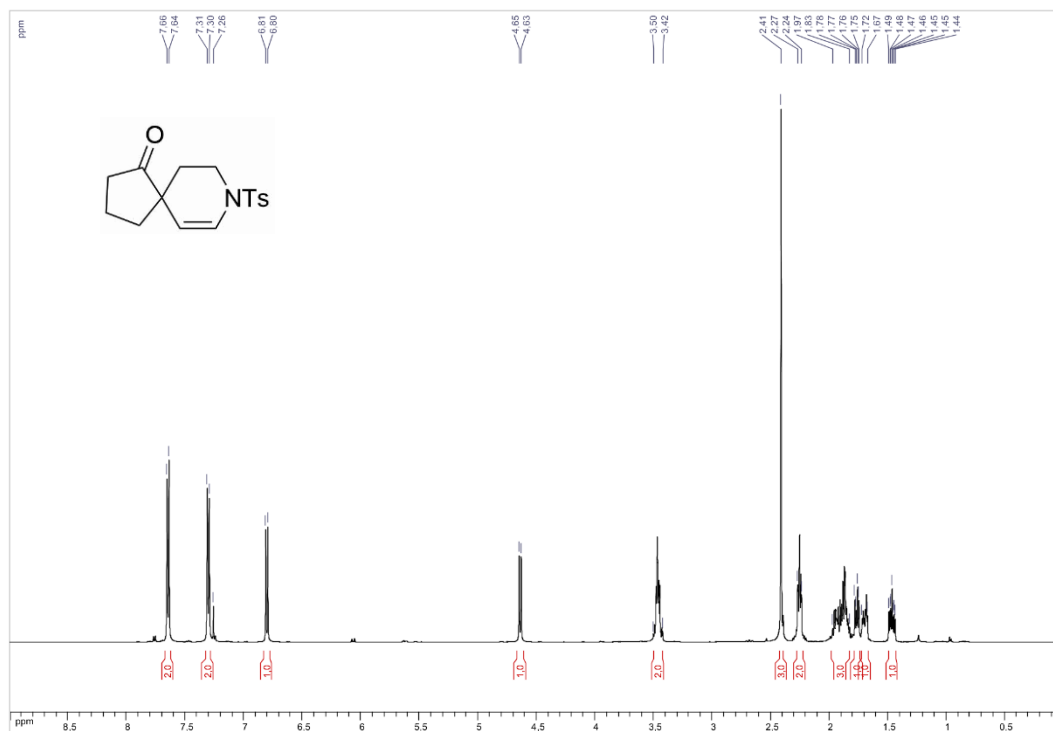
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound 2r



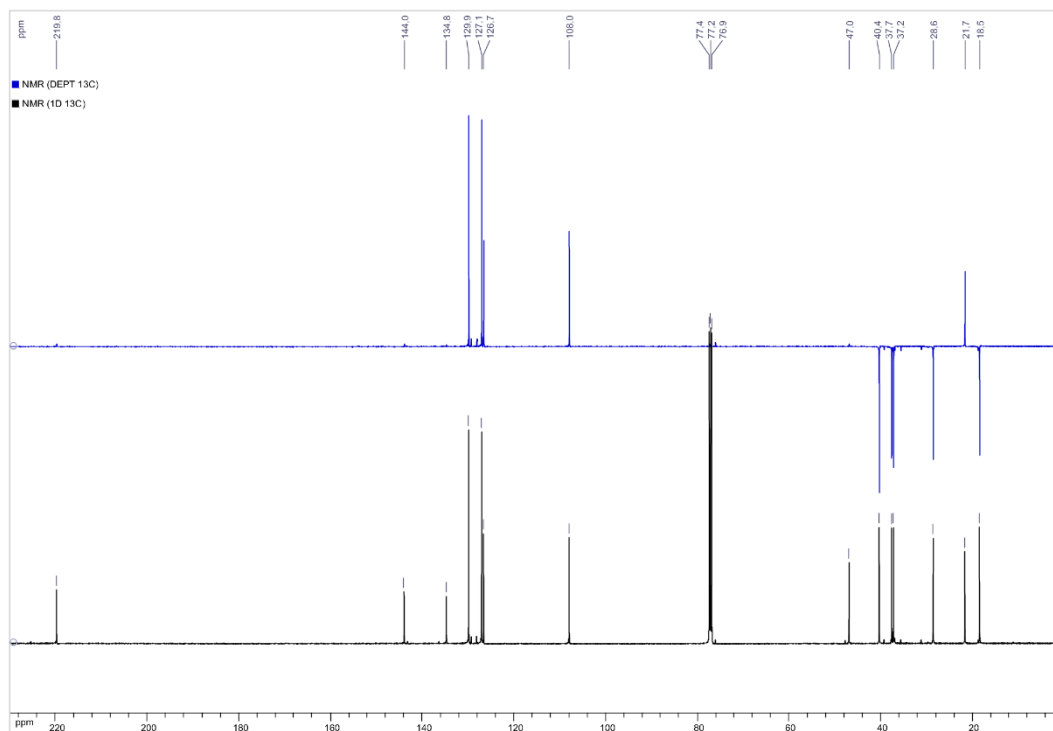
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2s**



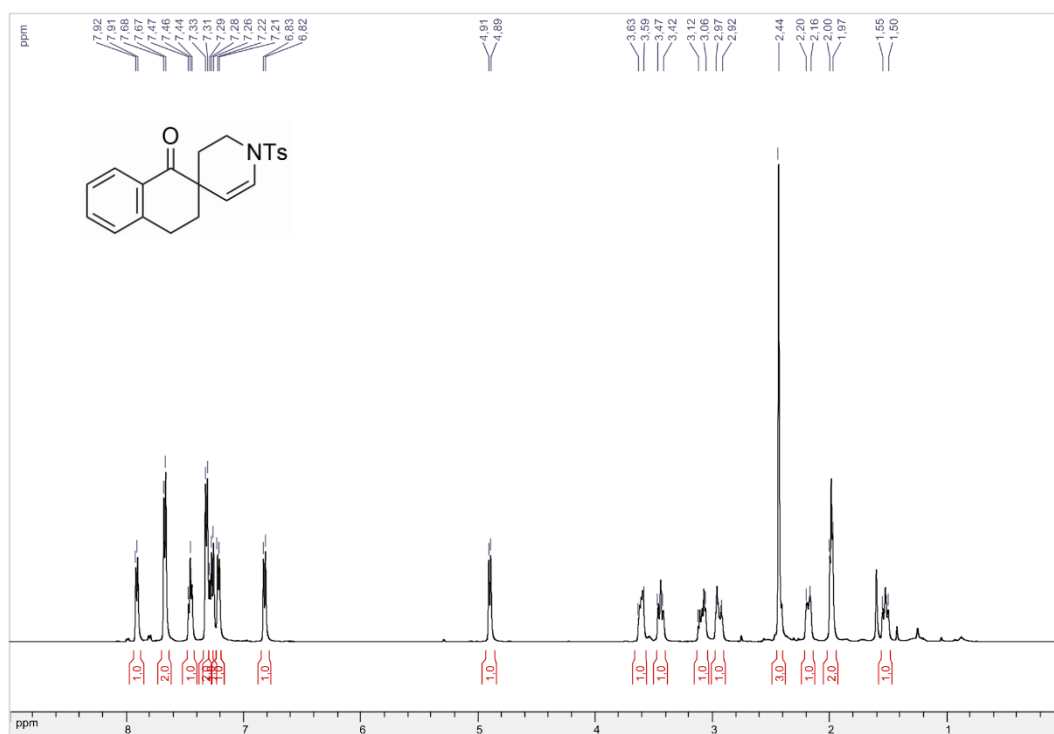
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2s**



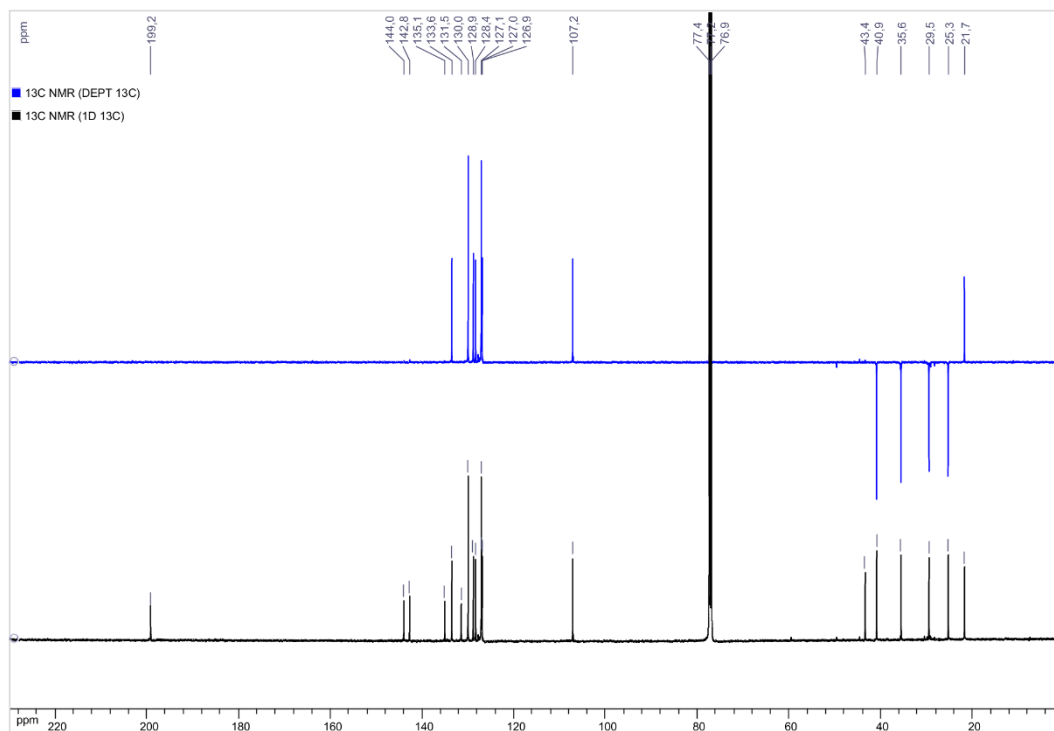
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **6t**



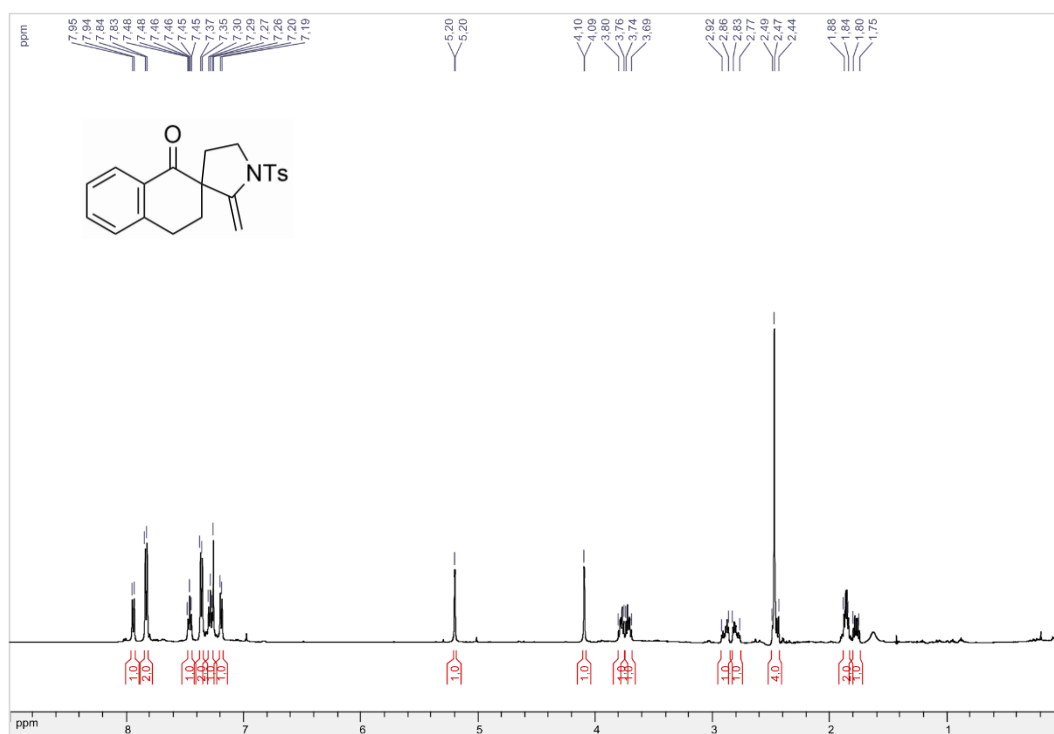
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **6t**



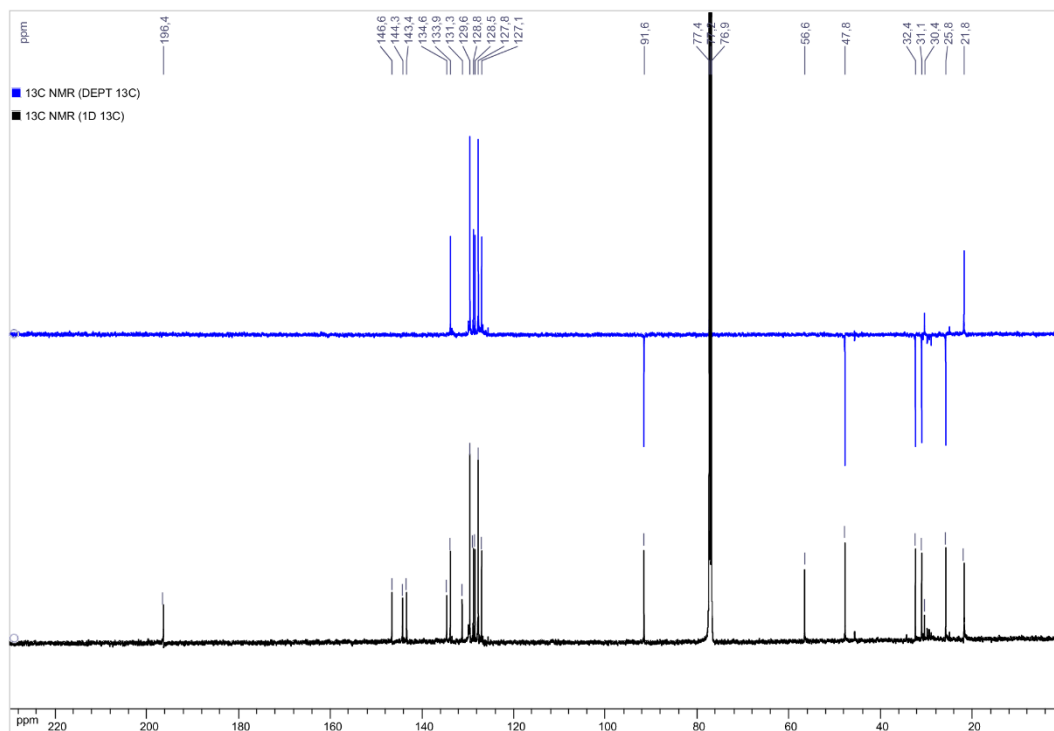
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **6u**



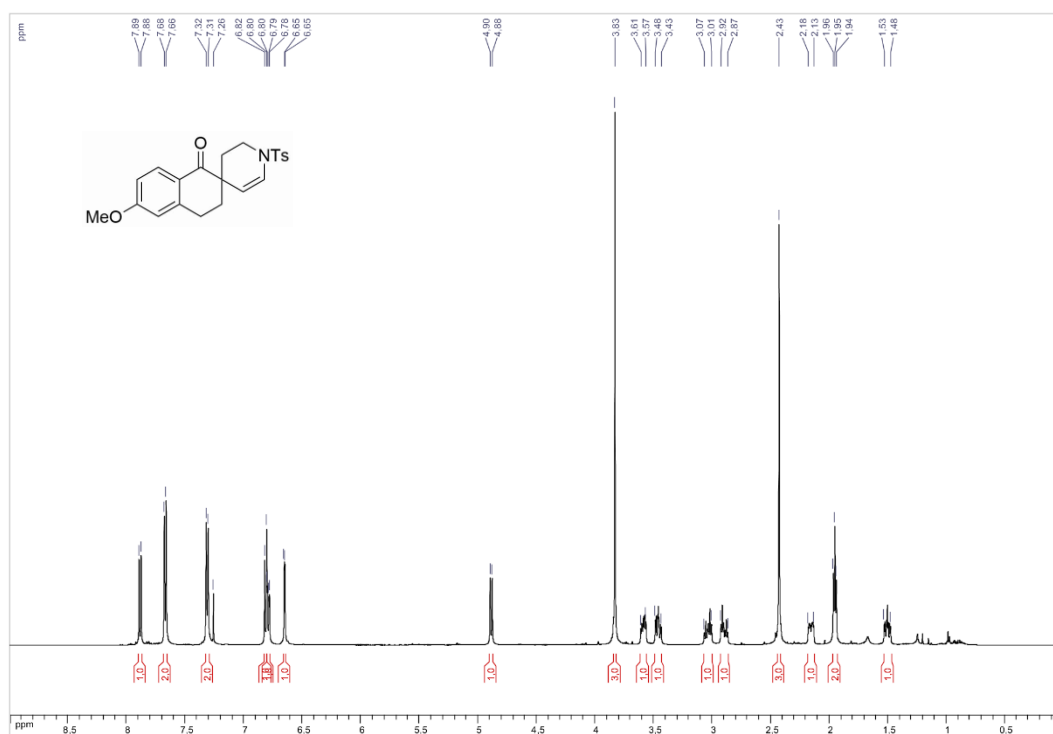
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **6u**



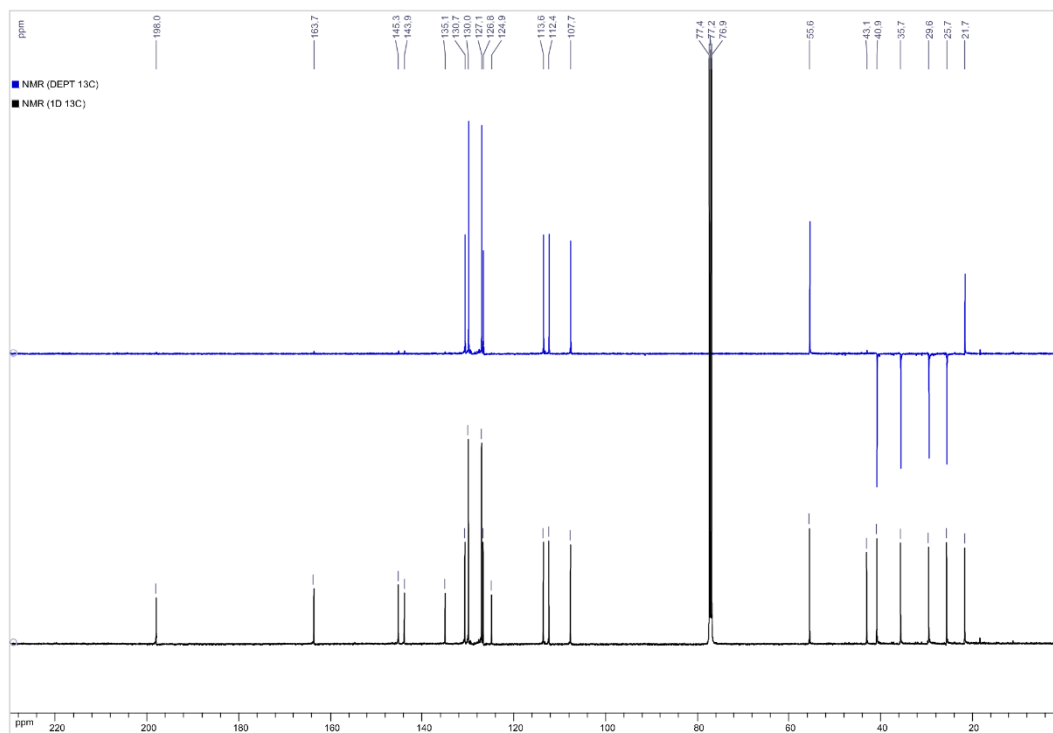
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2u**



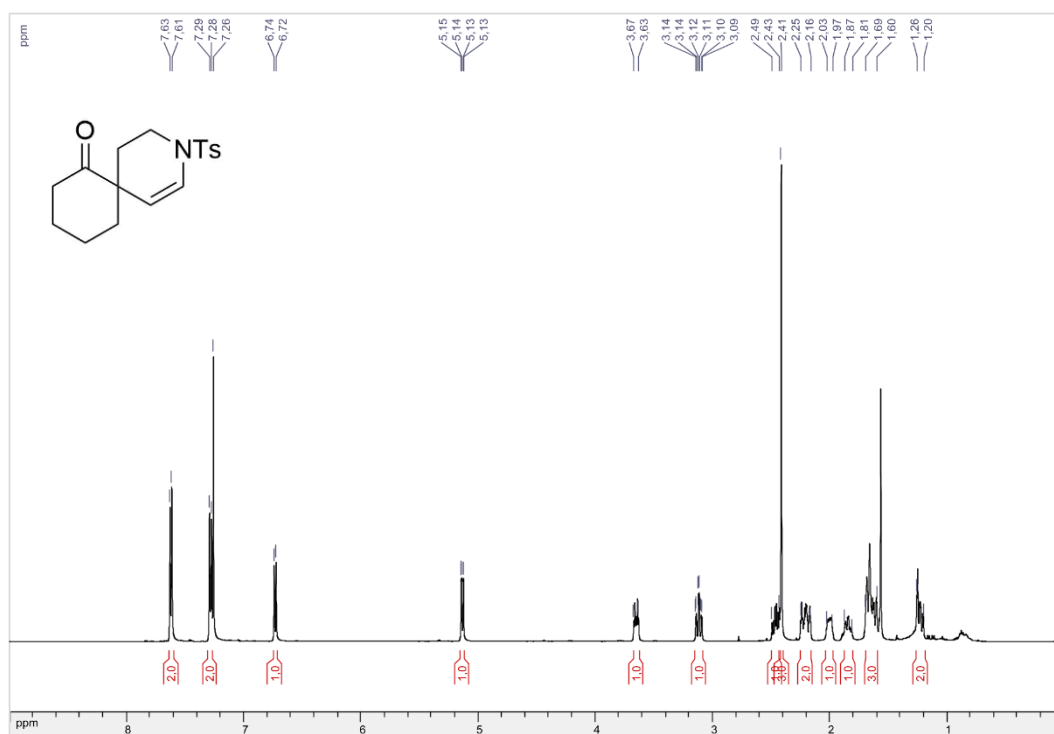
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2u**



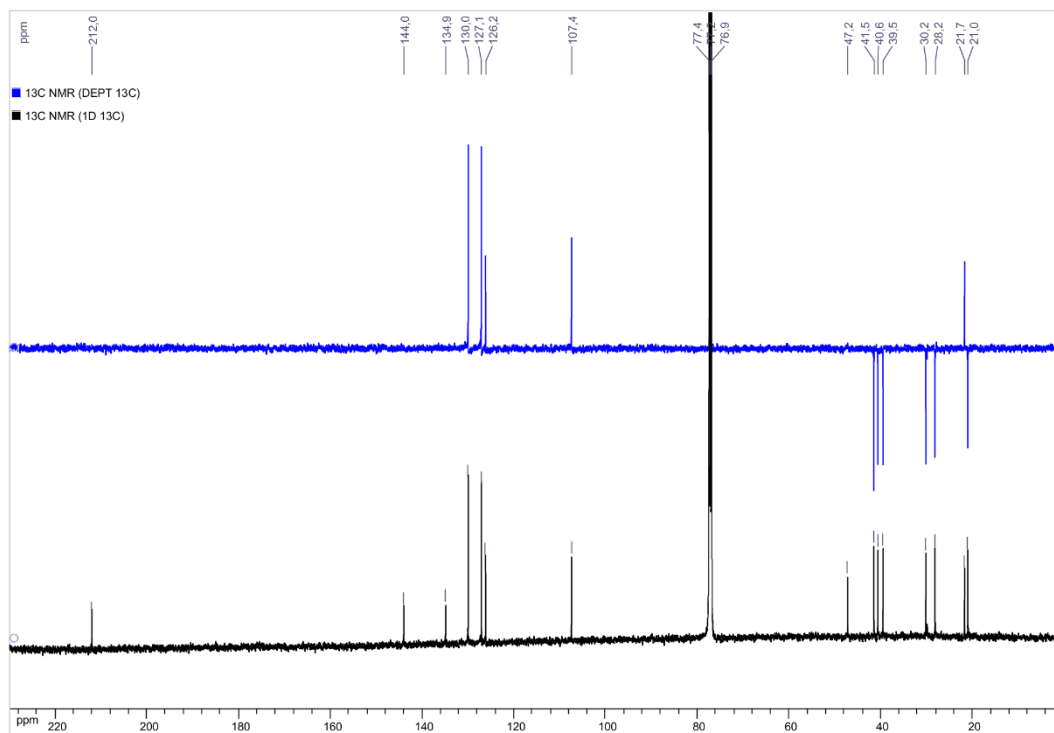
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **6v**



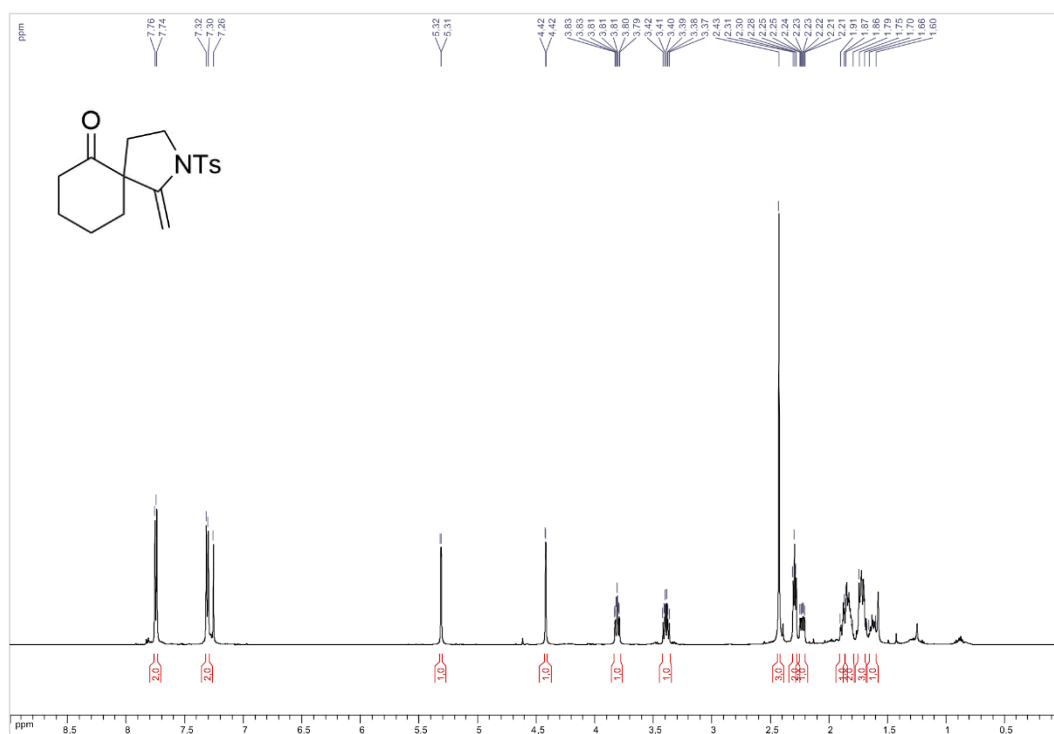
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **6v**



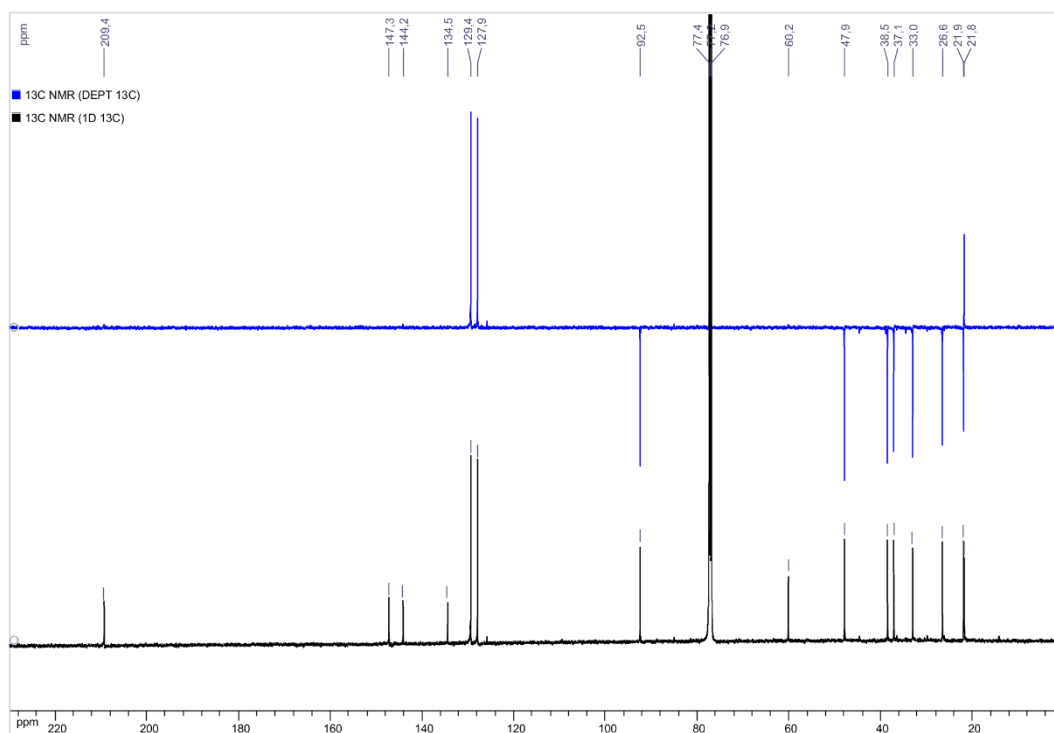
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **6w**



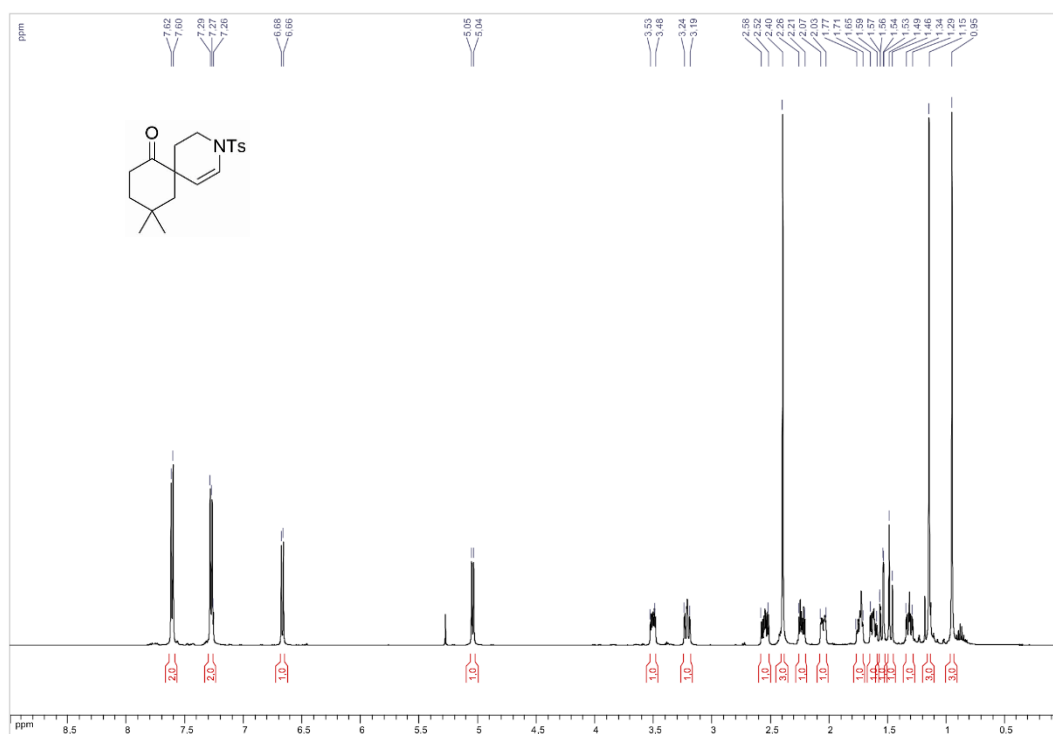
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **6w**



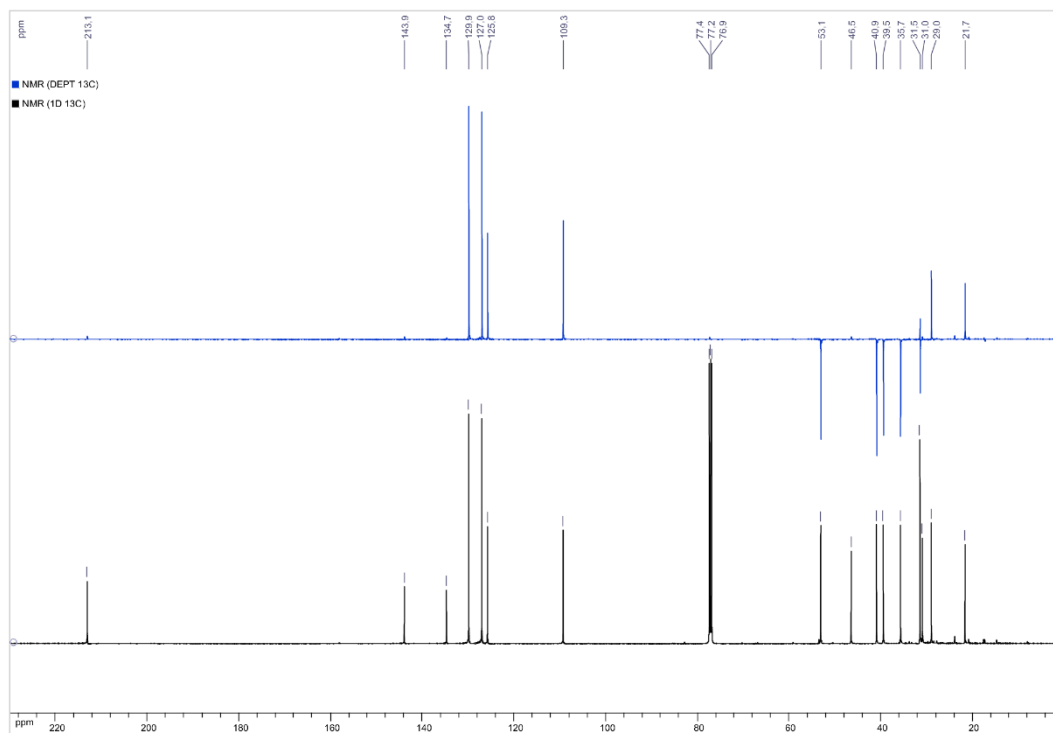
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **2w**



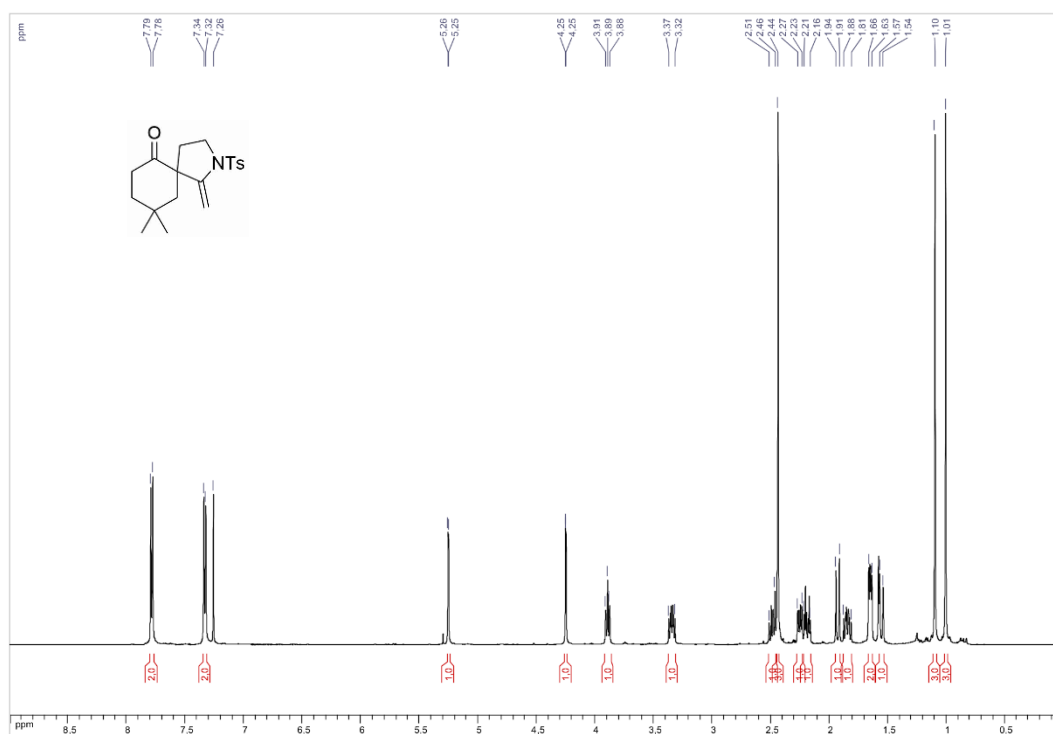
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2w**



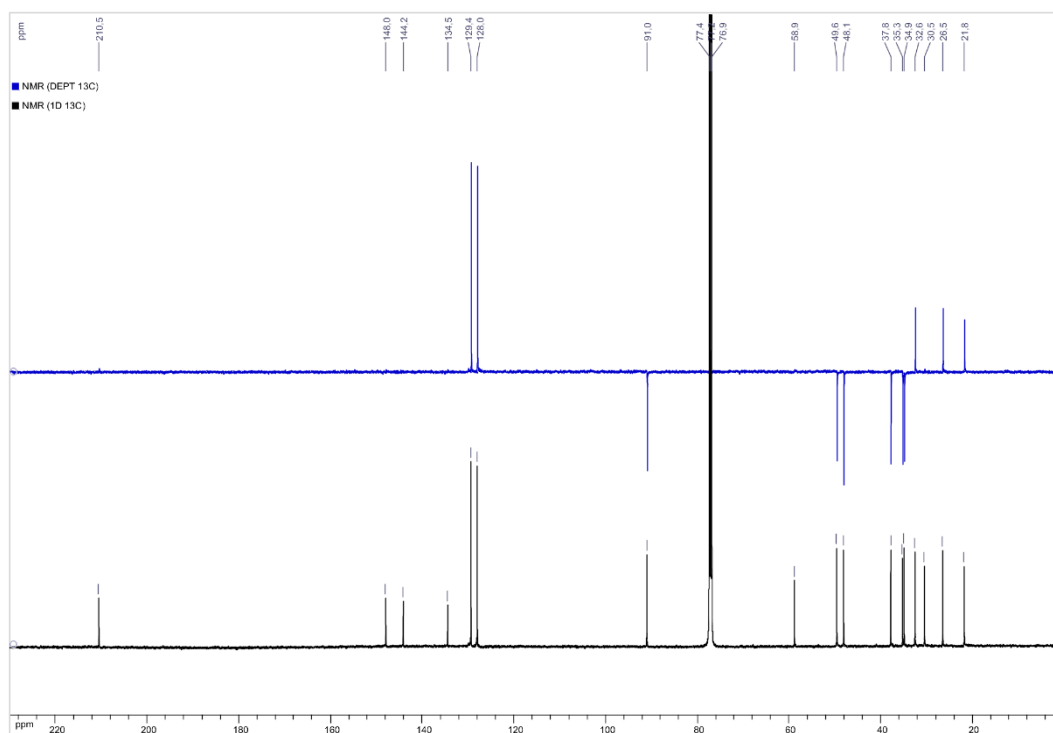
^1H NMR (CDCl₃, 500 MHz) spectrum of compound **6x**



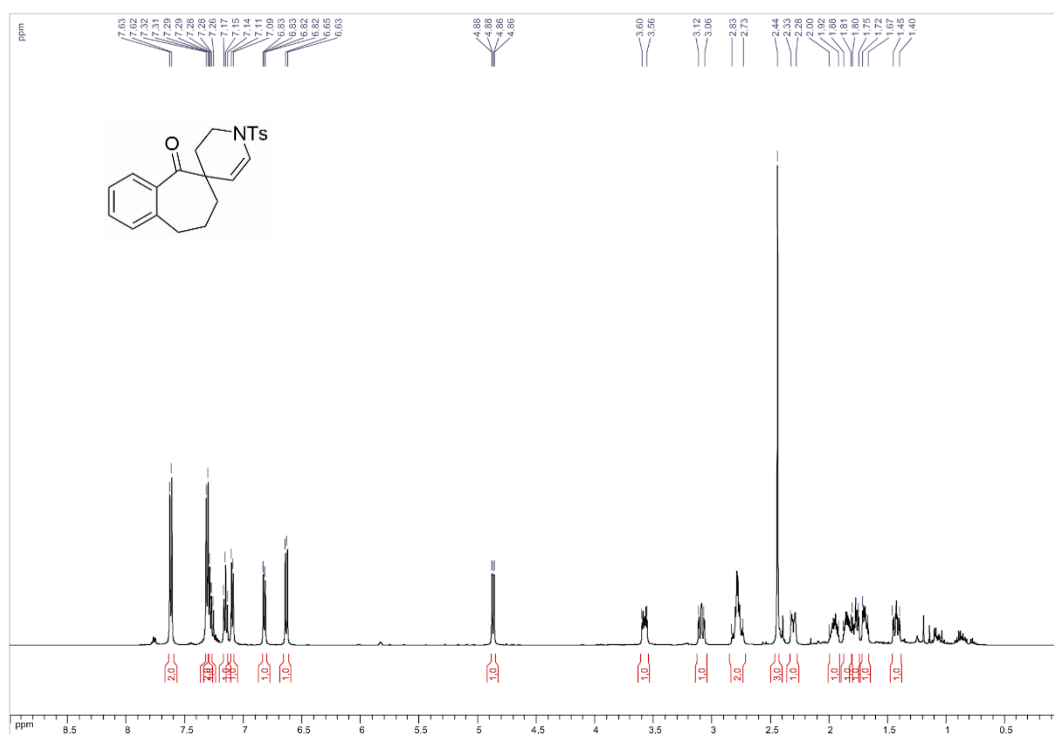
^{13}C NMR (CDCl₃, 125 MHz) spectrum of compound **6x**



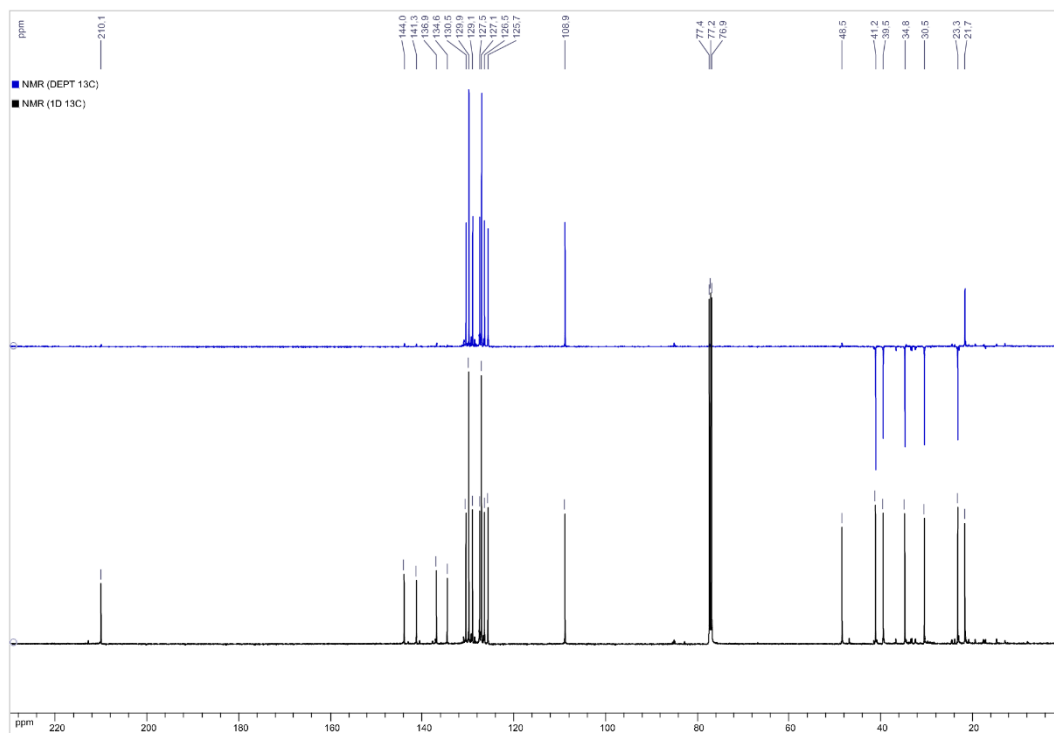
^1H NMR (CDCl₃, 500 MHz) spectrum of compound **2x**



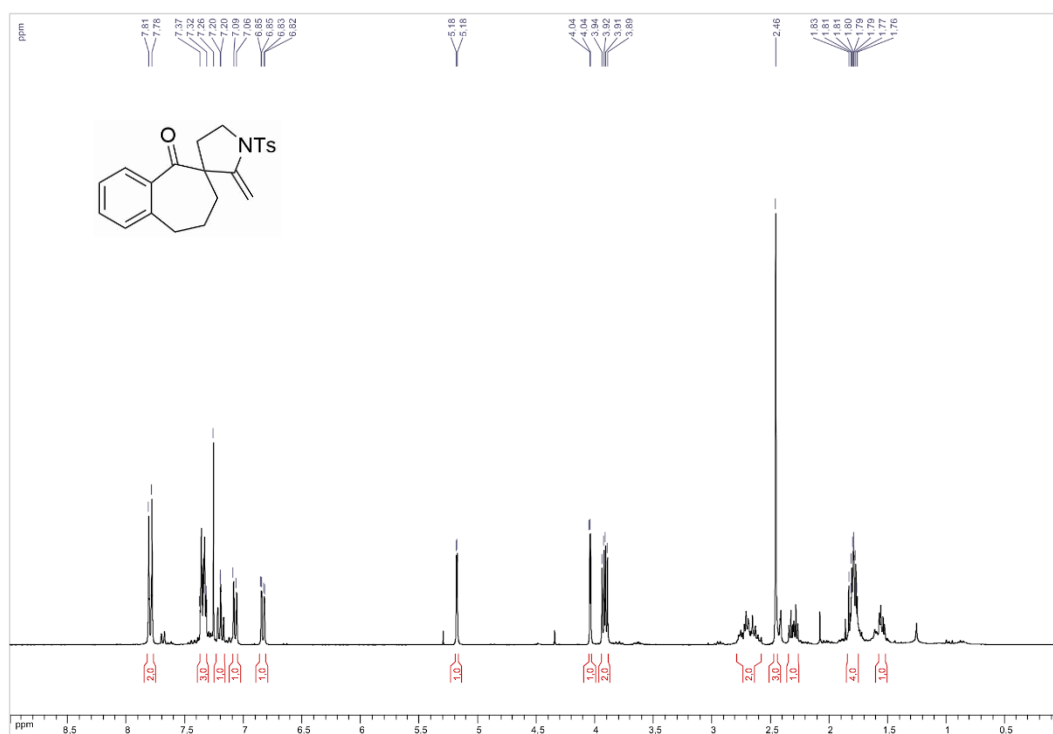
^{13}C NMR (CDCl₃, 125 MHz) spectrum of compound **2x**



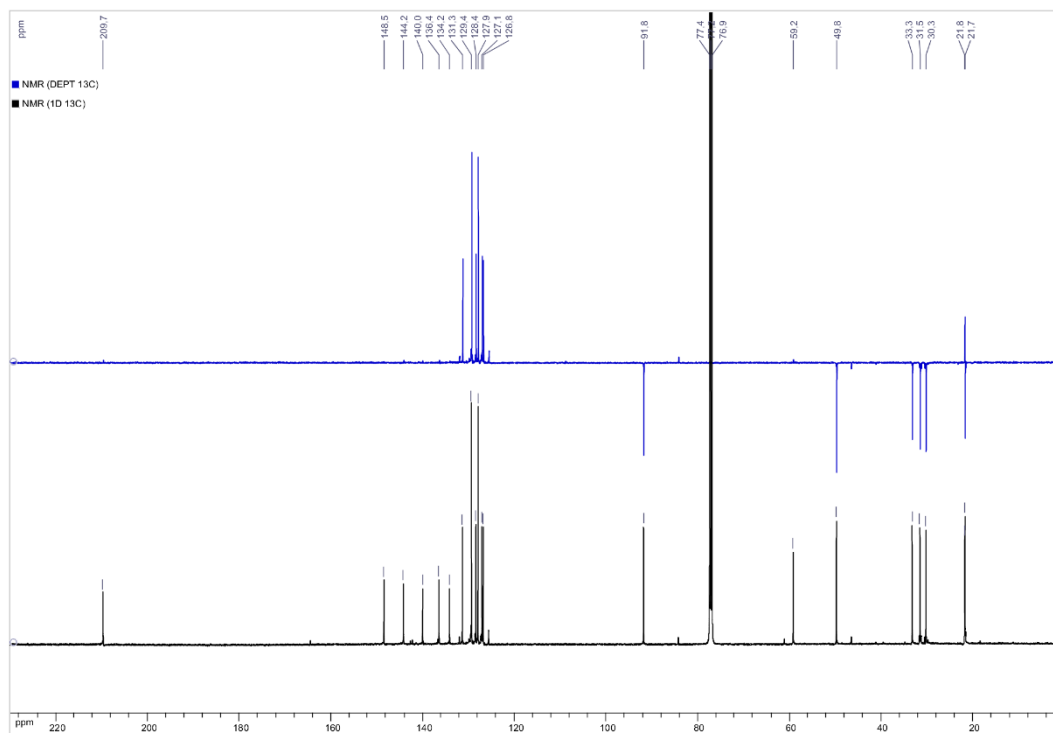
¹H NMR (CDCl₃, 500 MHz) spectrum of compound **6y**



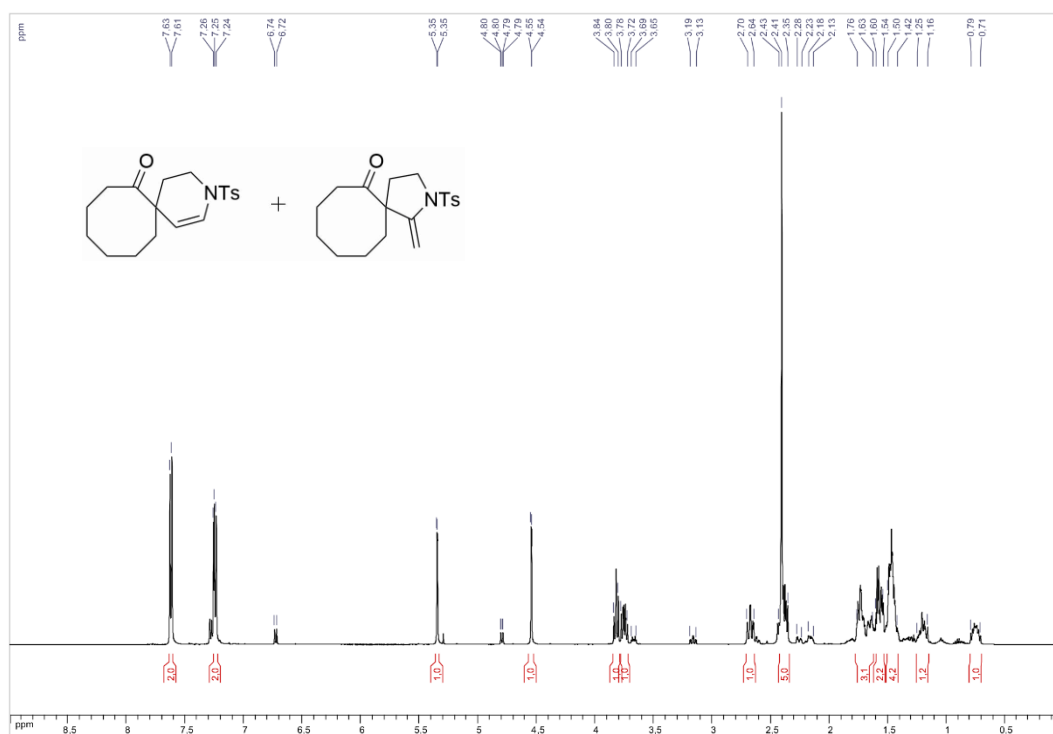
¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **6y**



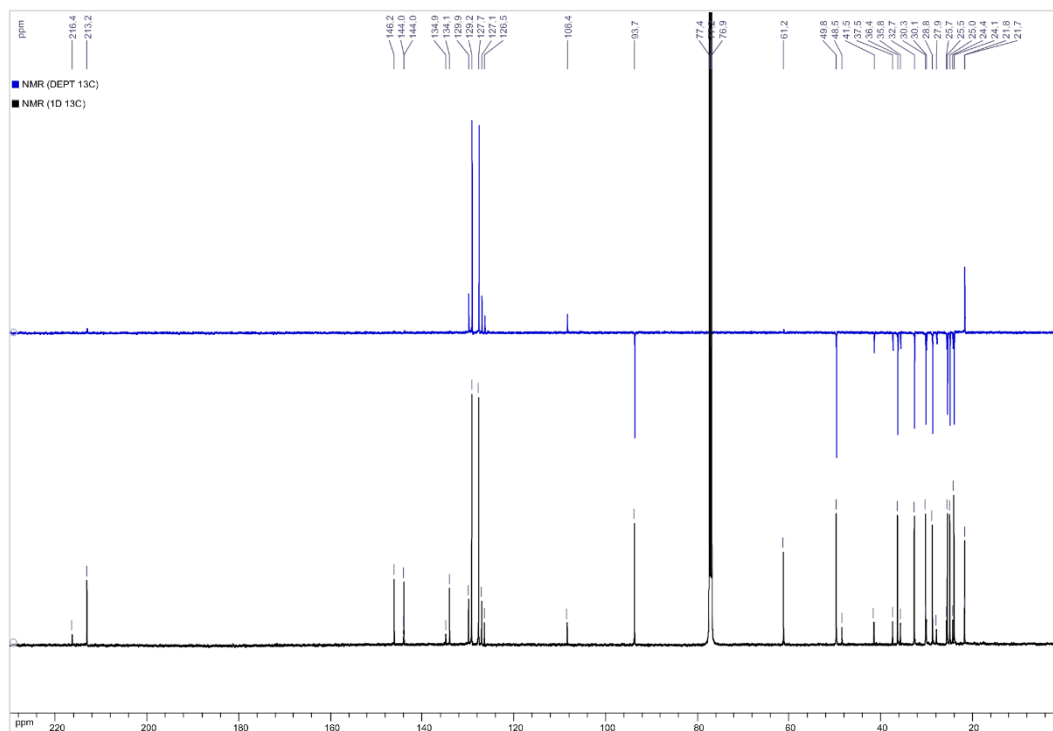
¹H NMR (CDCl₃, 300 MHz) spectrum of compound **2y**



¹³C NMR (CDCl₃, 125 MHz) spectrum of compound **2y**

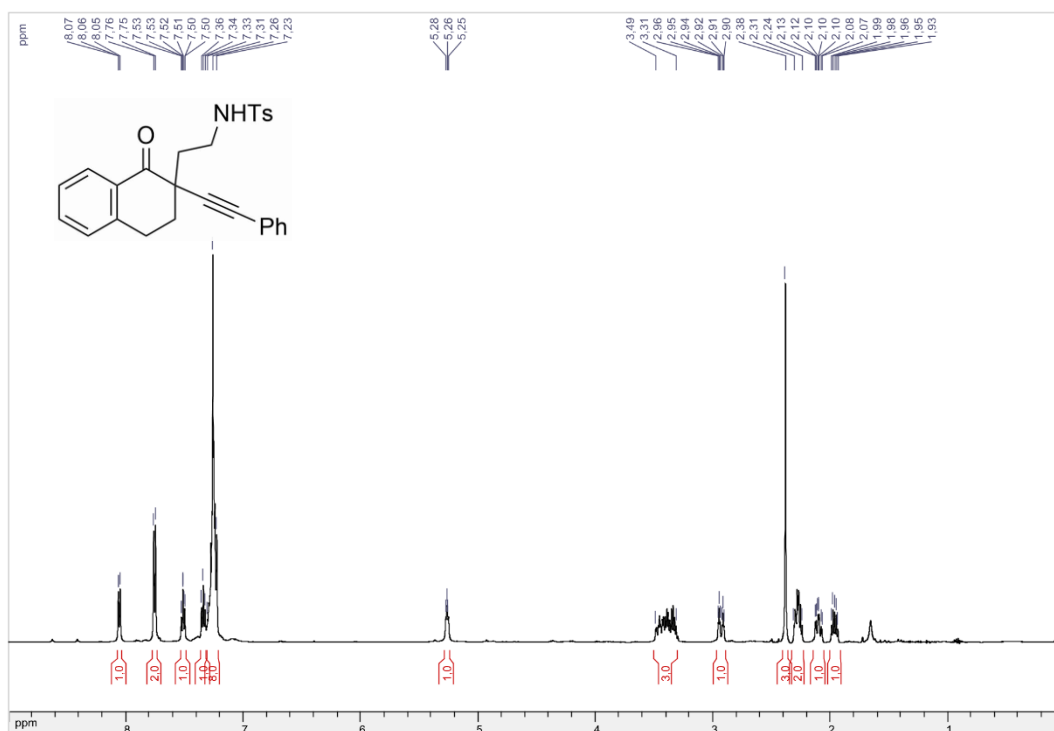


¹H NMR (CDCl₃, 500 MHz) spectrum of compounds **6z/2z**

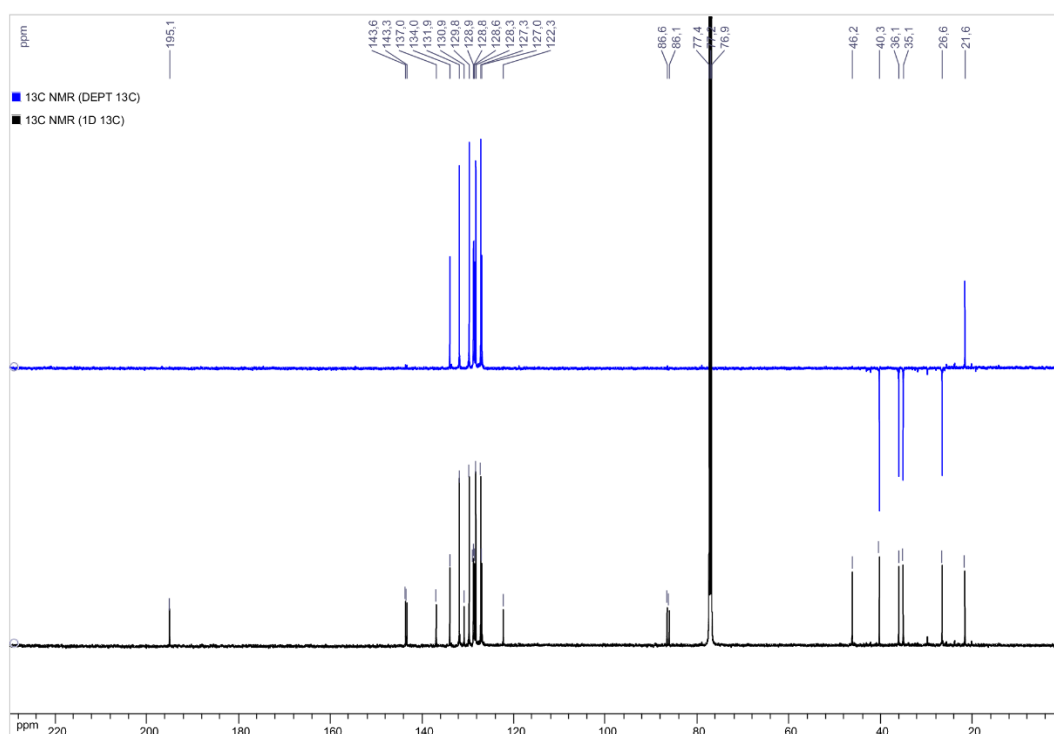


¹³C NMR (CDCl₃, 125 MHz) spectrum of compounds **6z/2z**

^1H and ^{13}C spectra for keto-alkynyl-sulfonamide (3a)

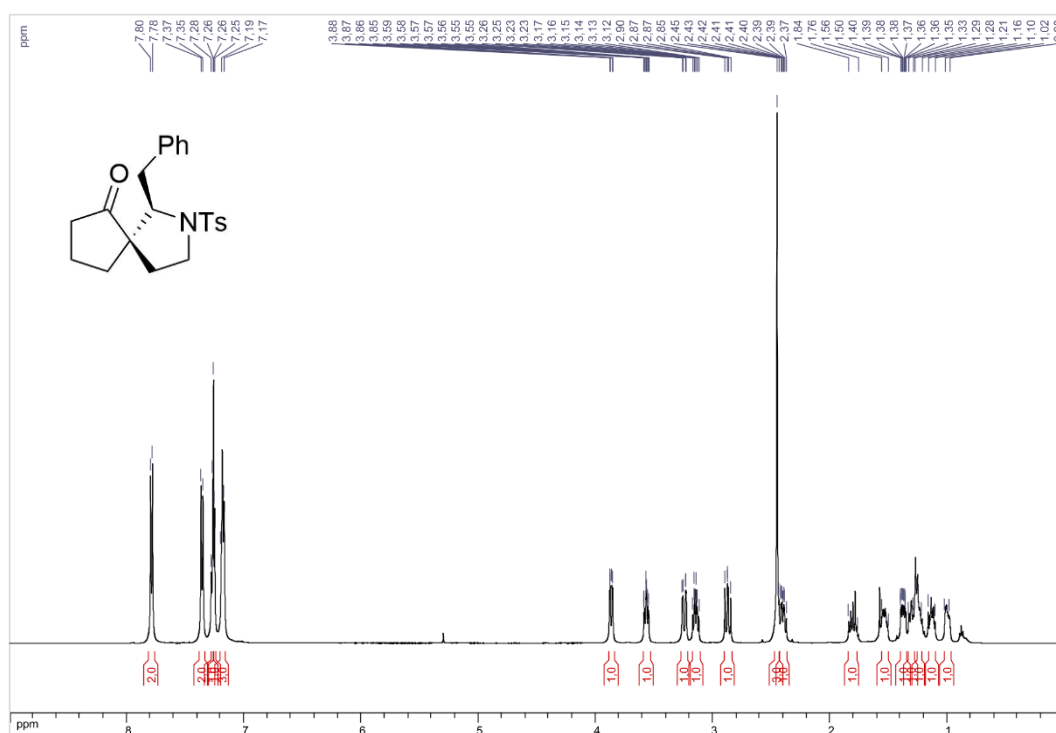


^1H NMR (CDCl₃, 500 MHz) spectrum of compound 3a

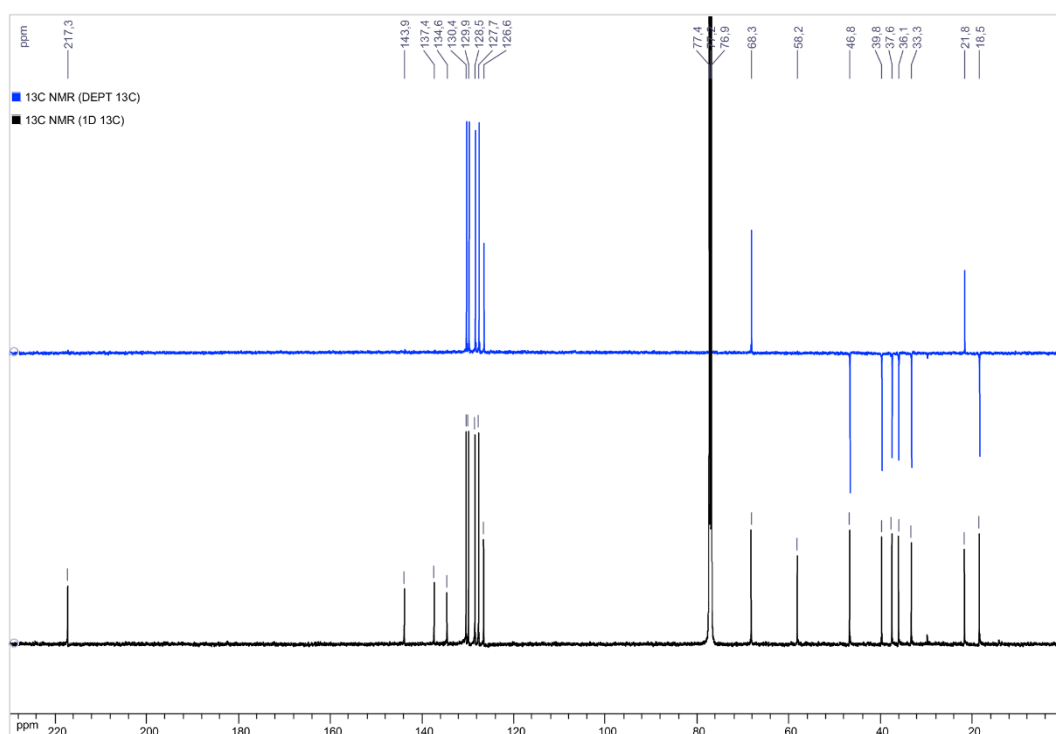


^{13}C NMR (CDCl₃, 125 MHz) spectrum of compound 3a

^1H and ^{13}C spectra for spiro-sulfonamide (13)

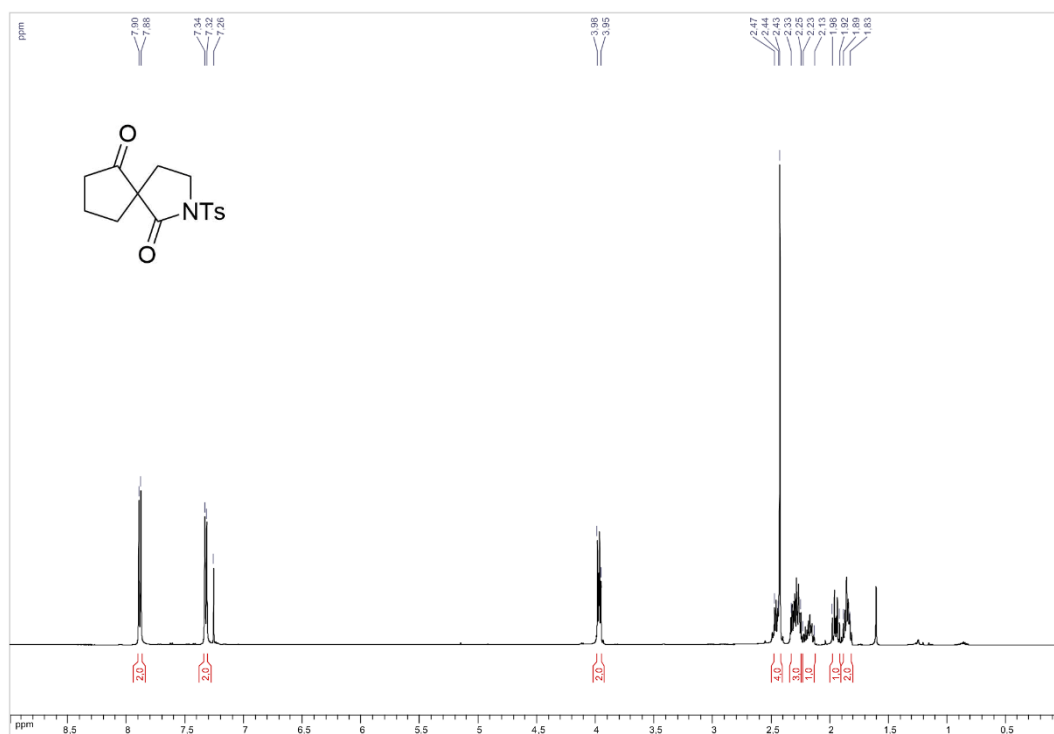


^1H NMR (CDCl₃, 500 MHz) spectrum of compound 13

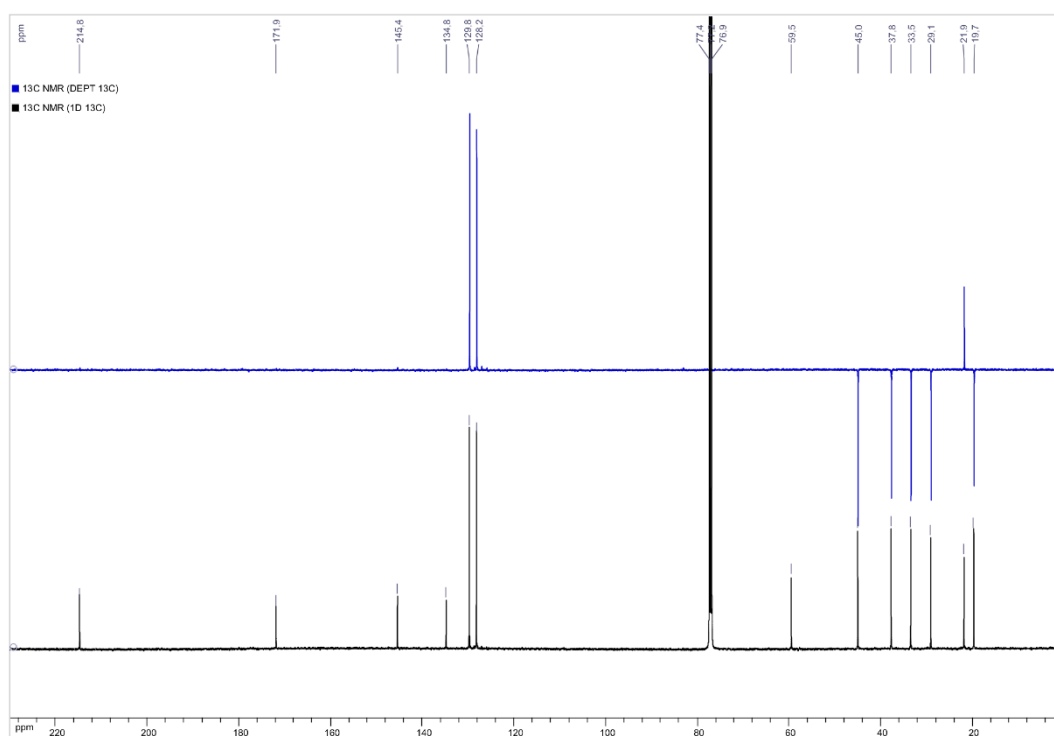


^{13}C NMR (CDCl₃, 125 MHz) spectrum of compound 13

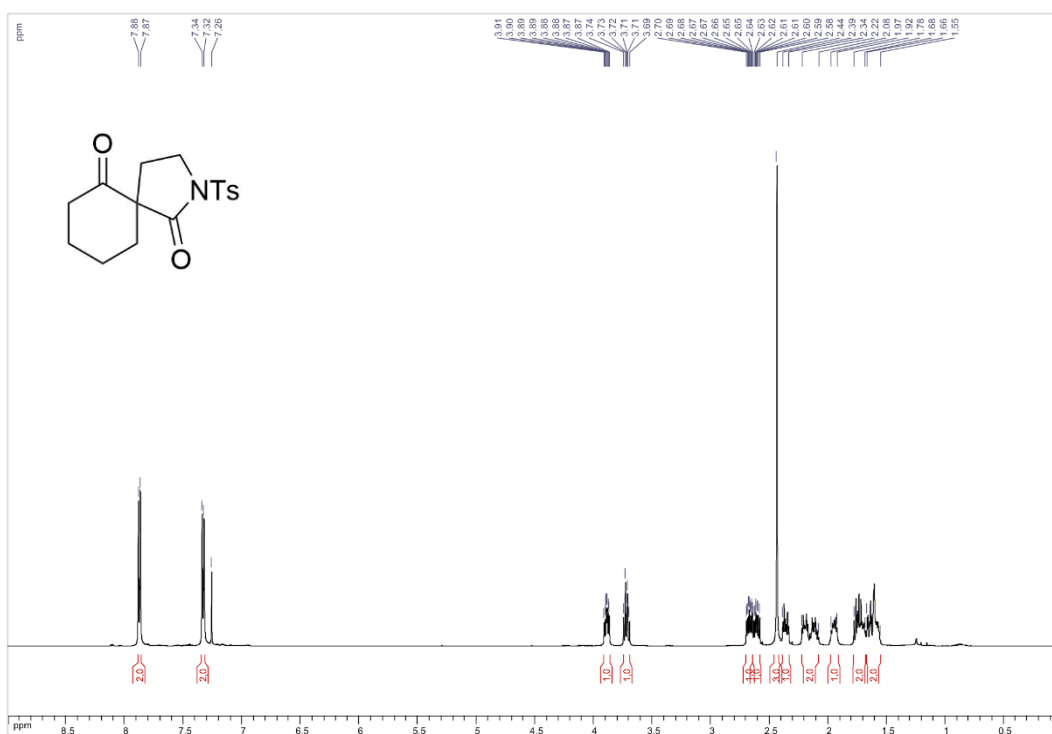
^1H and ^{13}C spectra for β -spiro-lactams (14b-d)



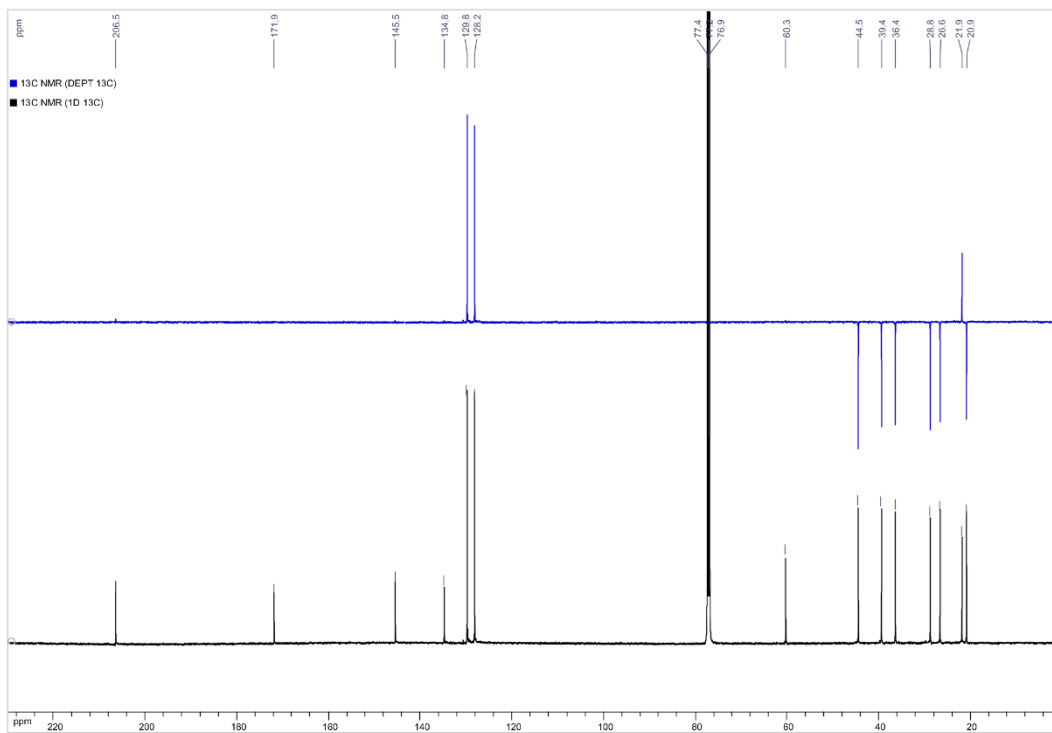
^1H NMR (CDCl_3 , 500 MHz) spectrum of compound **14b**



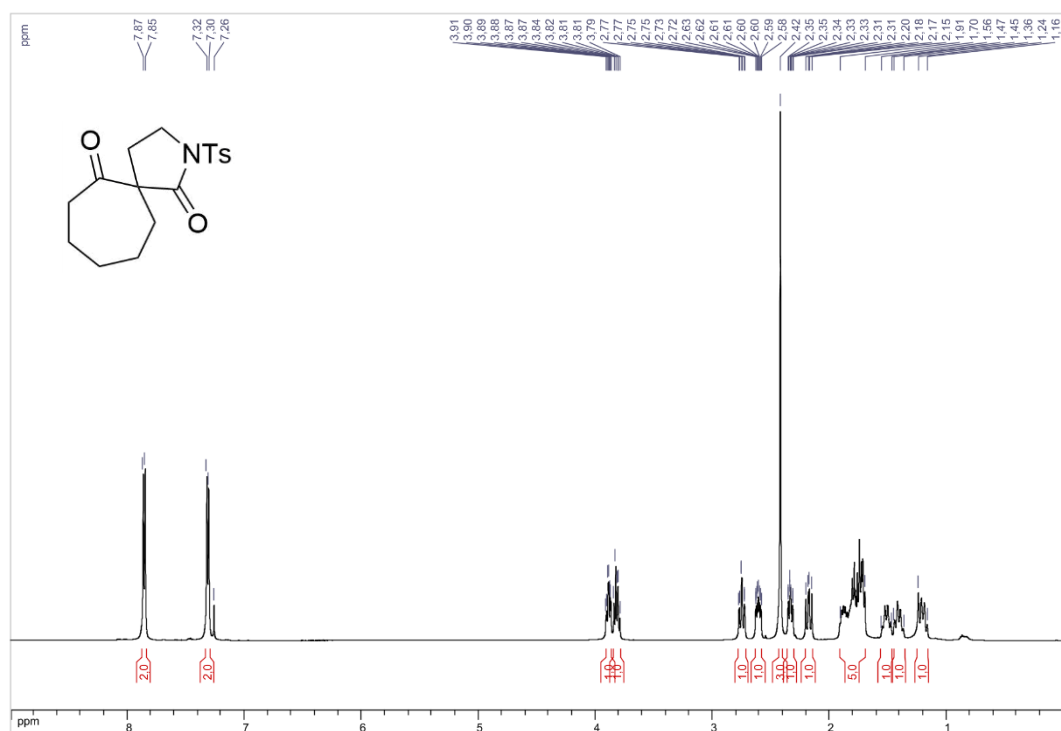
^{13}C NMR (CDCl_3 , 125 MHz) spectrum of compound **14b**



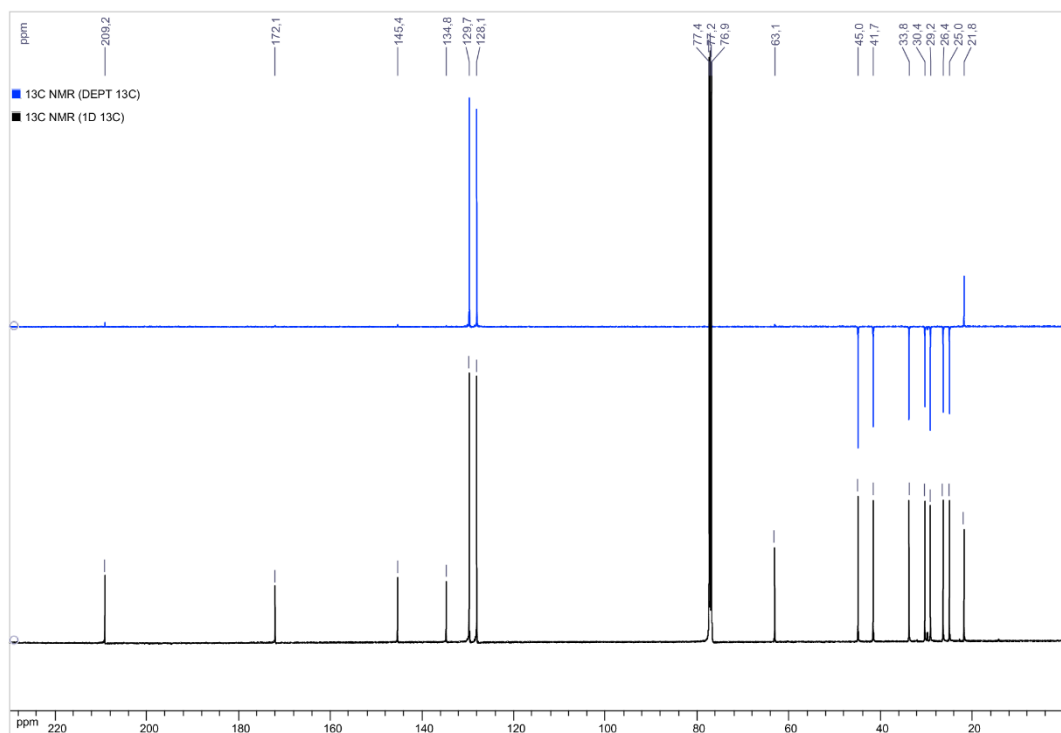
¹H NMR (CDCl₃, 500 MHz) spectrum of compound 14c



¹³C NMR (CDCl₃, 125 MHz) spectrum of compound 14c



^1H NMR (CDCl₃, 500 MHz) spectrum of compound **14d**



^{13}C NMR (CDCl₃, 125 MHz) spectrum of compound **14d**