

# Rhodium-Catalyzed Asymmetric Arylation of *N*-*tert*-Butanesulfinyl Imines with Sodium Tetraarylborates

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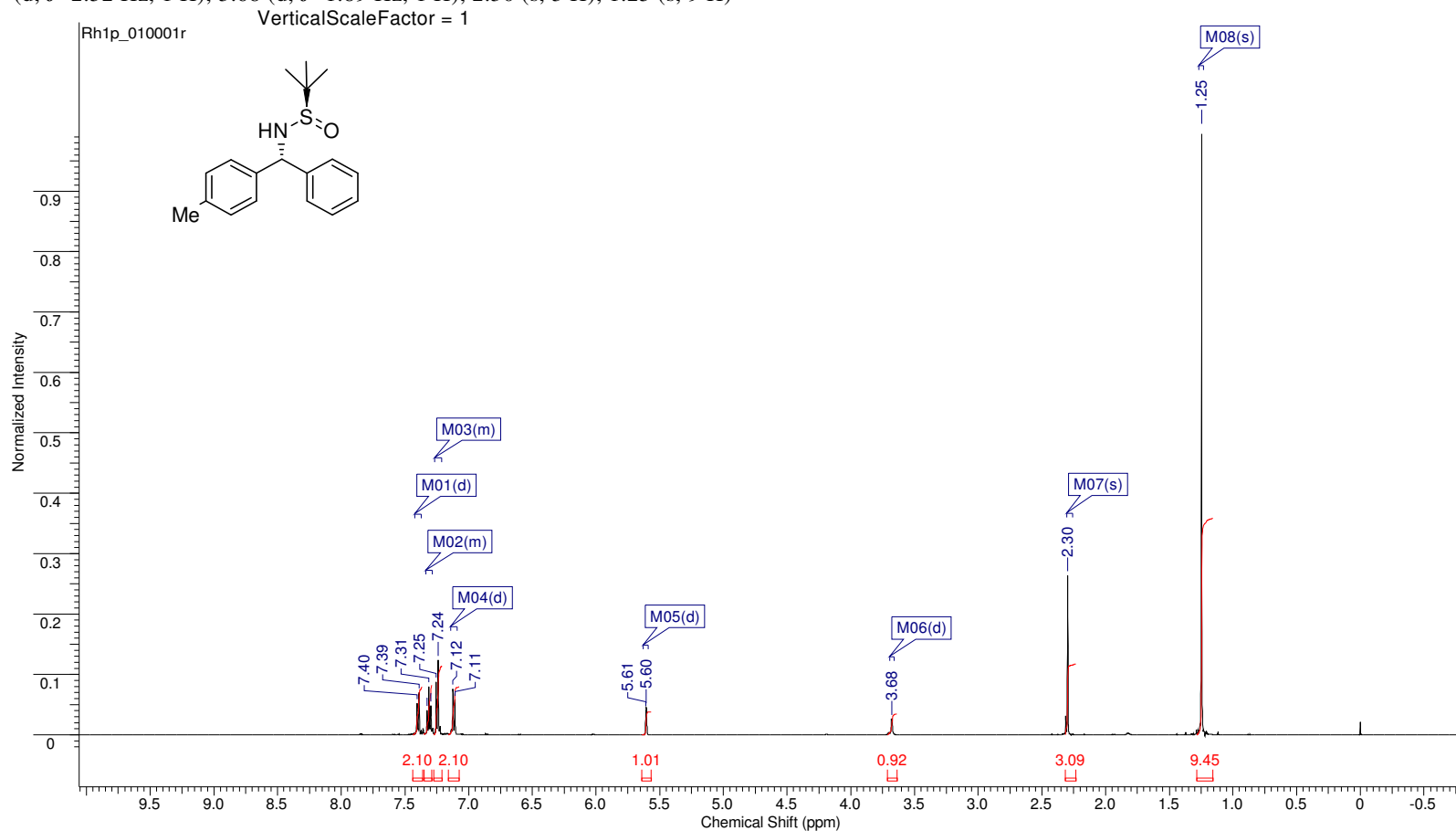
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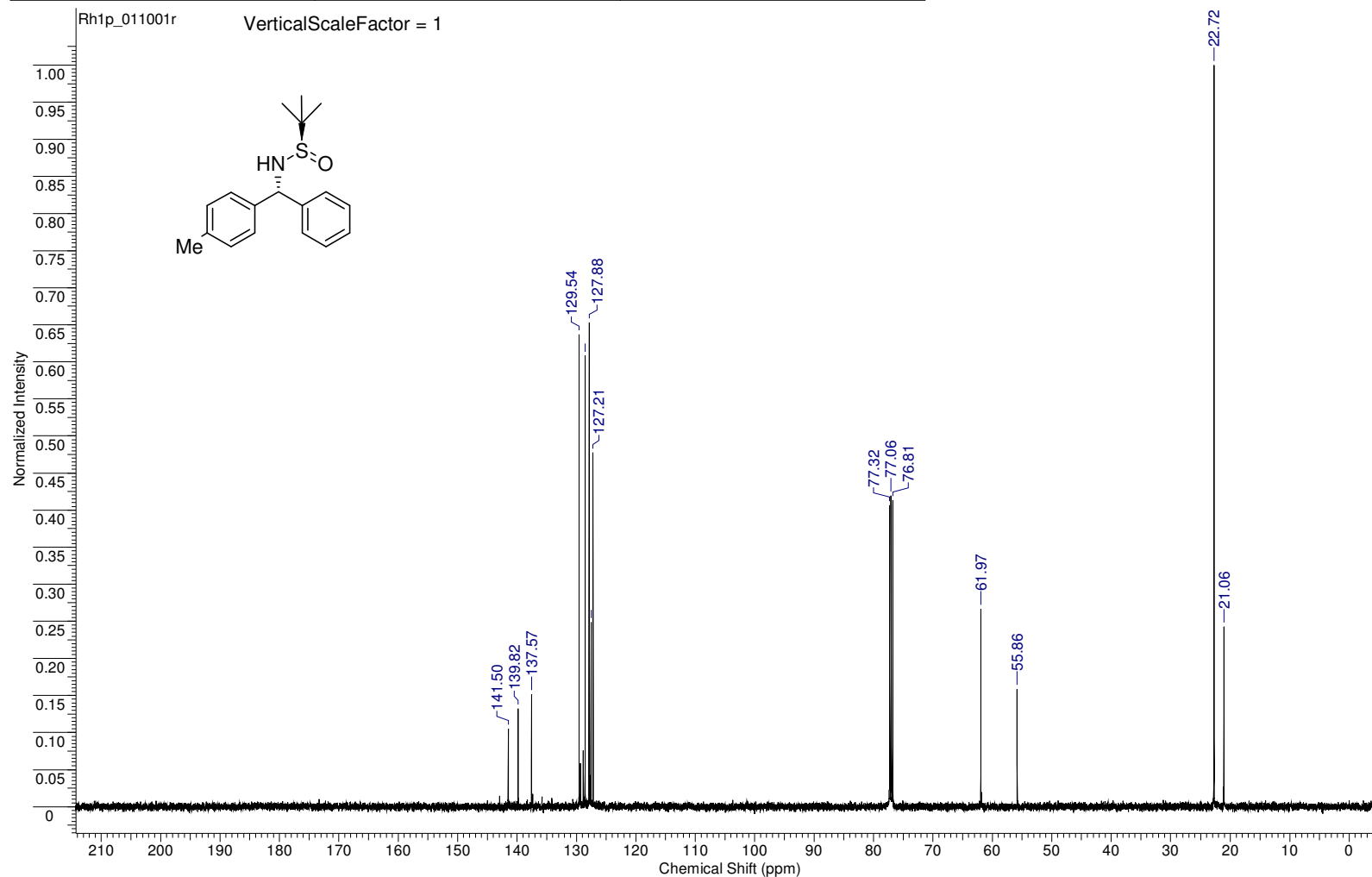
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|                               |                      |                          |                                                                     |                               |                      |
|-------------------------------|----------------------|--------------------------|---------------------------------------------------------------------|-------------------------------|----------------------|
| <b>Acquisition Time (sec)</b> | 3.1719               | <b>Comment</b>           | rh1p PROTON16 CDCl3 u leletra1 38                                   | <b>Date</b>                   | 29 Jan 2011 23:13:04 |
| <b>Date Stamp</b>             | 29 Jan 2011 23:13:04 | <b>File Name</b>         | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh1p_010001r |                               |                      |
| <b>Frequency (MHz)</b>        | 500.63               | <b>Nucleus</b>           | <sup>1</sup> H                                                      | <b>Number of Transients</b>   | 16                   |
| <b>Original Points Count</b>  | 32768                | <b>Owner</b>             | nrmrsu                                                              | <b>Points Count</b>           | 32768                |
| <b>Receiver Gain</b>          | 71.80                | <b>SW(cyclical) (Hz)</b> | 10330.58                                                            | <b>Solvent</b>                | CHLOROFORM-d         |
| <b>Spectrum Offset (Hz)</b>   | 3070.7305            | <b>Sweep Width (Hz)</b>  | 10330.26                                                            | <b>Temperature (degree C)</b> | 27.000               |

<sup>1</sup>H NMR (501 MHz, CHLOROFORM-d)  $\delta$  ppm 7.40 (d,  $J=7.25$  Hz, 2 H), 7.29 - 7.34 (m, 2 H), 7.21 - 7.27 (m, 3 H), 7.12 (d,  $J=8.20$  Hz, 2 H), 5.61 (d,  $J=2.52$  Hz, 1 H), 3.68 (d,  $J=1.89$  Hz, 1 H), 2.30 (s, 3 H), 1.25 (s, 9 H)

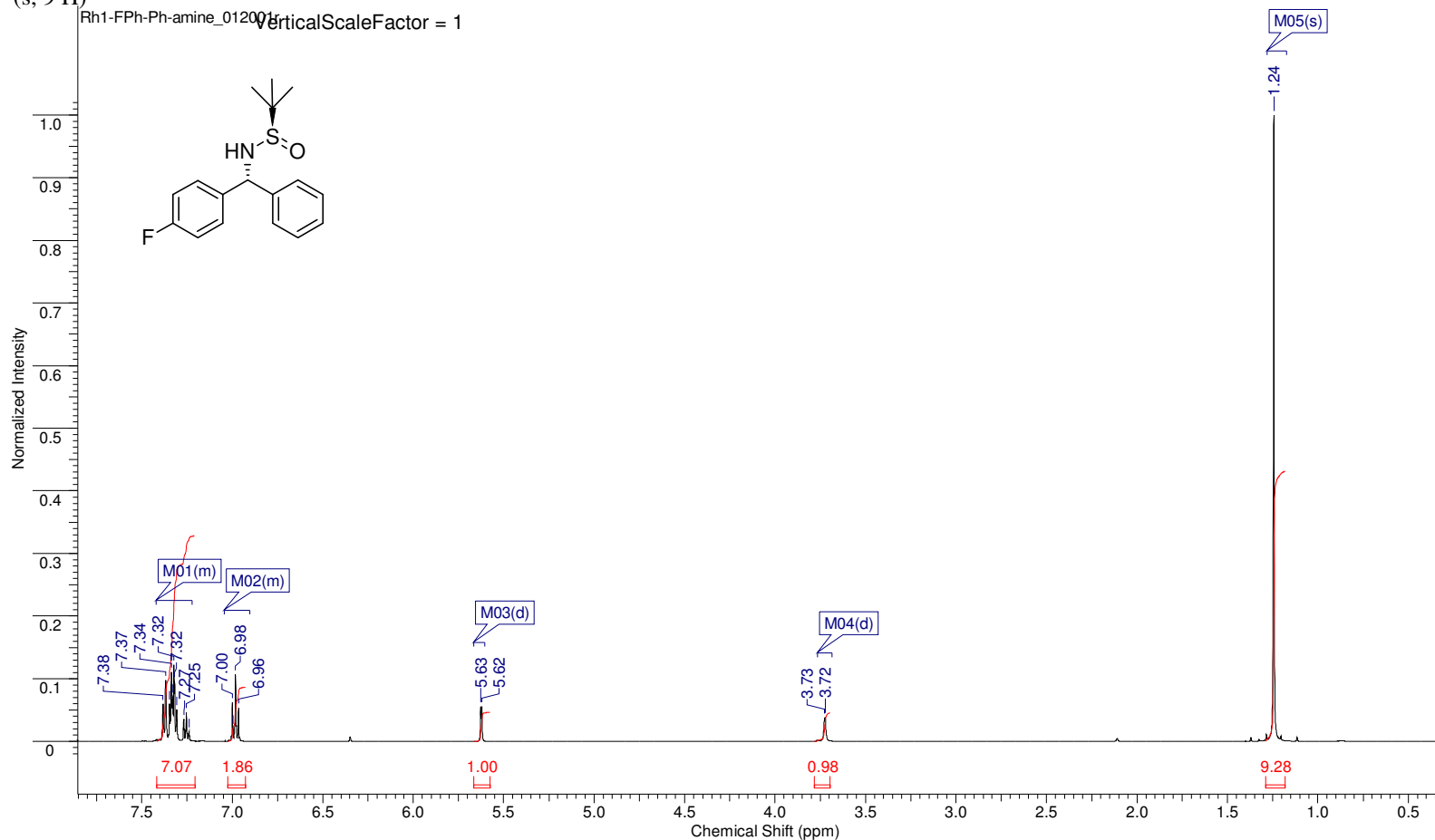


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| <b>Date Stamp</b>             | 29 Jan 2011 23:21:36 | <b>File Name</b>         | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh1p_011001r |                               |                      |
| <b>Frequency (MHz)</b>        | 125.88               | <b>Nucleus</b>           | 13C                                                                 | <b>Number of Transients</b>   | 256                  |
| <b>Original Points Count</b>  | 32768                | <b>Owner</b>             | nmsu                                                                | <b>Points Count</b>           | 32768                |
| <b>Receiver Gain</b>          | 8192.00              | <b>SW(cyclical) (Hz)</b> | 30030.03                                                            | <b>Solvent</b>                | CHLOROFORM-d         |
| <b>Spectrum Offset (Hz)</b>   | 12587.9785           | <b>Sweep Width (Hz)</b>  | 30029.11                                                            | <b>Temperature (degree C)</b> | 27.000               |



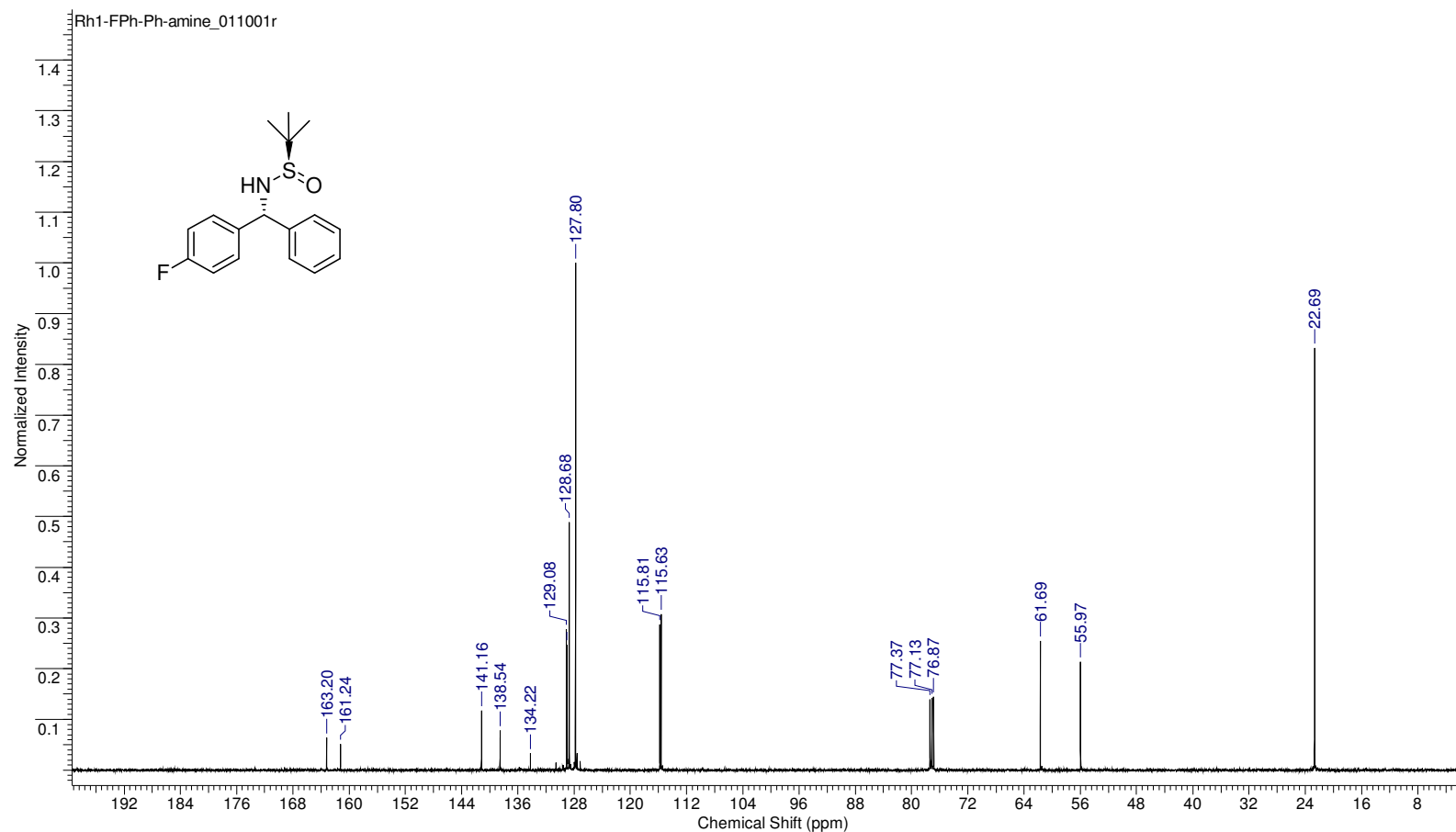
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| <b>Date Stamp</b>             | 05 Feb 2011 01:18:56                                                            |                             |                                                |                         |                      |
| <b>File Name</b>              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh1-FPh-Ph-amine_012001r | <b>Frequency (MHz)</b>      | 500.63                                         |                         |                      |
| <b>Nucleus</b>                | <sup>1</sup> H                                                                  | <b>Number of Transients</b> | 1024                                           | <b>Origin</b>           | spect                |
| <b>Owner</b>                  | nmrsu                                                                           | <b>Points Count</b>         | 32768                                          | <b>Pulse Sequence</b>   | zg30                 |
| <b>SW(cyclical) (Hz)</b>      | 10330.58                                                                        | <b>Solvent</b>              | CHLOROFORM-d                                   | <b>Receiver Gain</b>    | 40.30                |
| <b>Temperature (degree C)</b> | 27.000                                                                          | <b>Spectrum Offset (Hz)</b> | 3074.6401                                      | <b>Sweep Width (Hz)</b> | 10330.26             |

<sup>1</sup>H NMR (501 MHz, CHLOROFORM-d)  $\delta$  ppm 7.22 - 7.42 (m, 7 H), 6.90 - 7.04 (m, 2 H), 5.62 (d,  $J=2.84$  Hz, 1 H), 3.72 (d,  $J=2.84$  Hz, 1 H), 1.24 (s, 9 H)



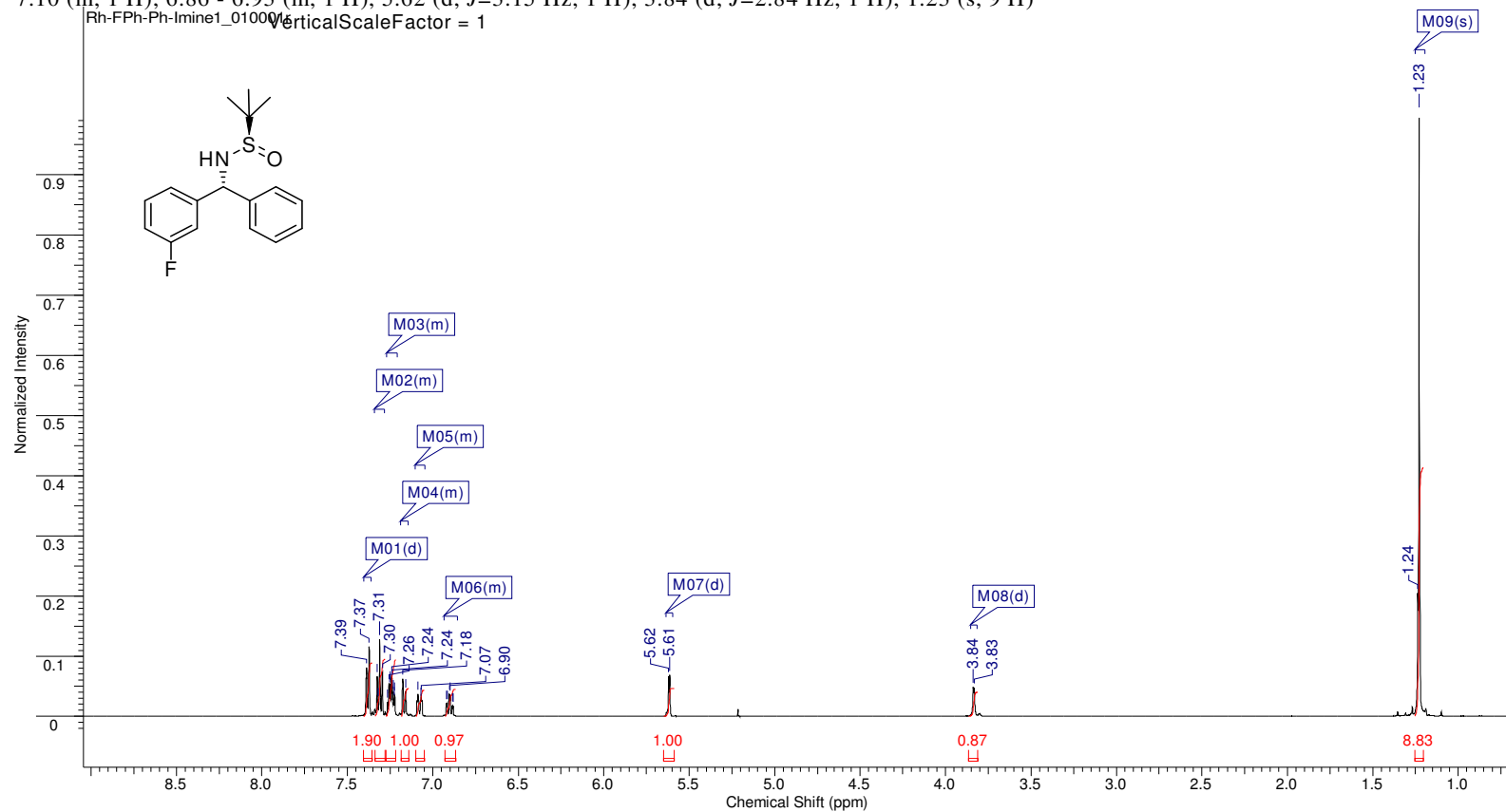
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| Date Stamp             | 04 Feb 2011 16:57:36                                                            |                      |                                               |                      |            |                       |                      |
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| Nucleus                | 13C                                                                             | Number of Transients | 256                                           | Origin               | spect      | Original Points Count | 32768                |
| Owner                  | nmrsu                                                                           | Points Count         | 32768                                         | Pulse Sequence       | zgpg30     | Receiver Gain         | 6502.00              |
| SW(cyclical) (Hz)      | 30030.03                                                                        | Solvent              | CHLOROFORM-d                                  | Spectrum Offset (Hz) | 12587.9785 | Sweep Width (Hz)      | 30029.11             |
| Temperature (degree C) | 27.000                                                                          |                      |                                               |                      |            |                       |                      |

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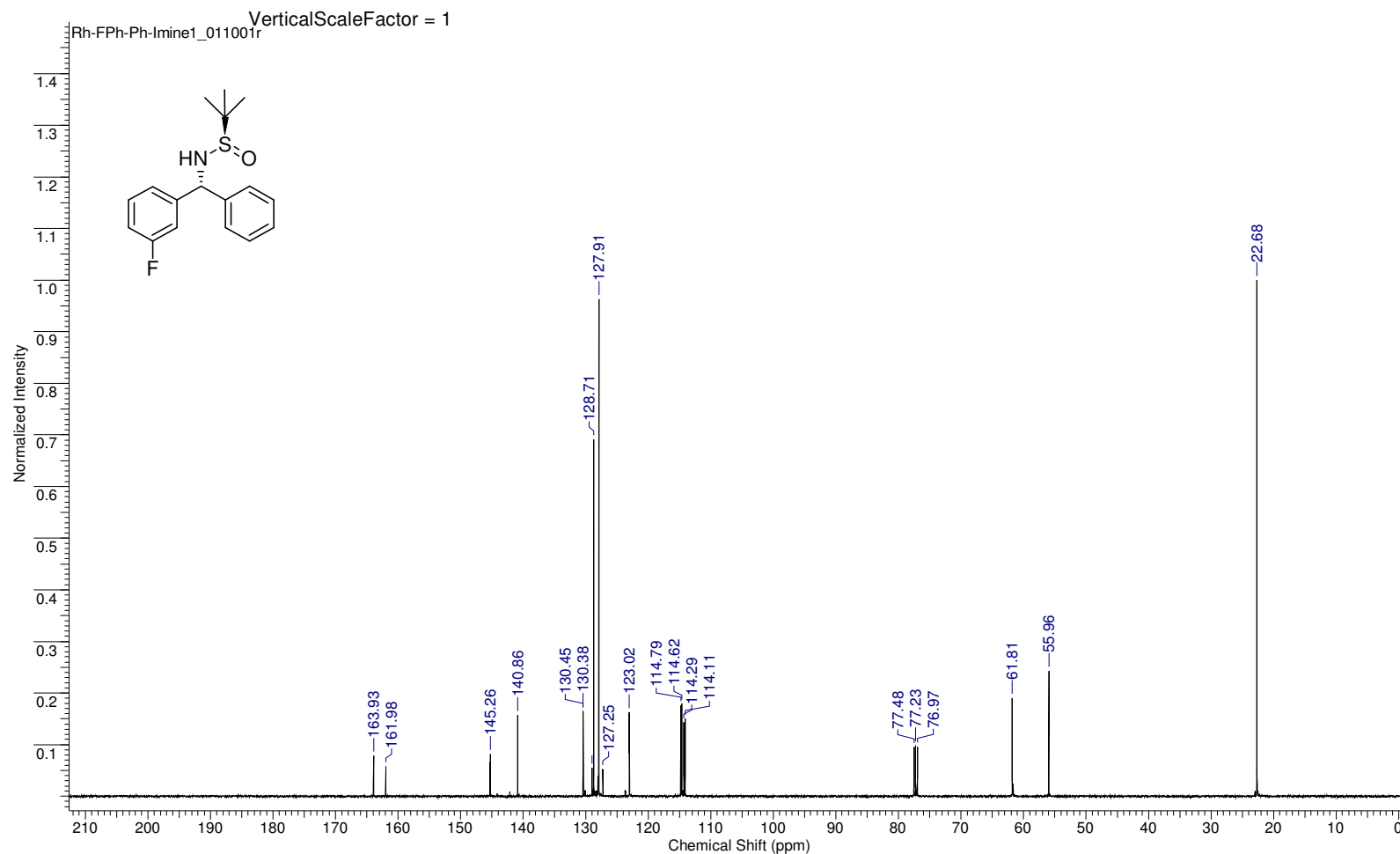


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| Acquisition Time (sec) | 3.1719                                                                          | Comment                | Rh-FPh-Ph-imine1 PROTON16 CDCl3 u leletra1 46 |                |       | Date                  | 08 Feb 2011 19:41:52 |
| Date Stamp             | 08 Feb 2011 19:41:52                                                            |                        |                                               |                |       |                       |                      |
| File Name              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-FPh-Ph-imine1_010001r |                        |                                               |                |       | Frequency (MHz)       | 500.63               |
| Nucleus                | 1H                                                                              | Number of Transients   | 16                                            | Origin         | spect | Original Points Count | 32768                |
| Owner                  | nmsu                                                                            | Points Count           | 32768                                         | Pulse Sequence | zg30  | Receiver Gain         | 25.40                |
| SW(cyclical) (Hz)      | 10330.58                                                                        | Solvent                | CHLOROFORM-d                                  |                |       | Spectrum Offset (Hz)  | 3078.2695            |
| Sweep Width (Hz)       | 10330.26                                                                        | Temperature (degree C) | 27.000                                        |                |       |                       |                      |

<sup>1</sup>H NMR (501 MHz, *CHLOROFORM-d*)  $\delta$  ppm 7.38 (d,  $J=7.25$  Hz, 2 H), 7.28 - 7.34 (m, 2 H), 7.21 - 7.27 (m, 2 H), 7.14 - 7.19 (m, 1 H), 7.05 - 7.10 (m, 1 H), 6.86 - 6.93 (m, 1 H), 5.62 (d,  $J=3.15$  Hz, 1 H), 3.84 (d,  $J=2.84$  Hz, 1 H), 1.23 (s, 9 H)

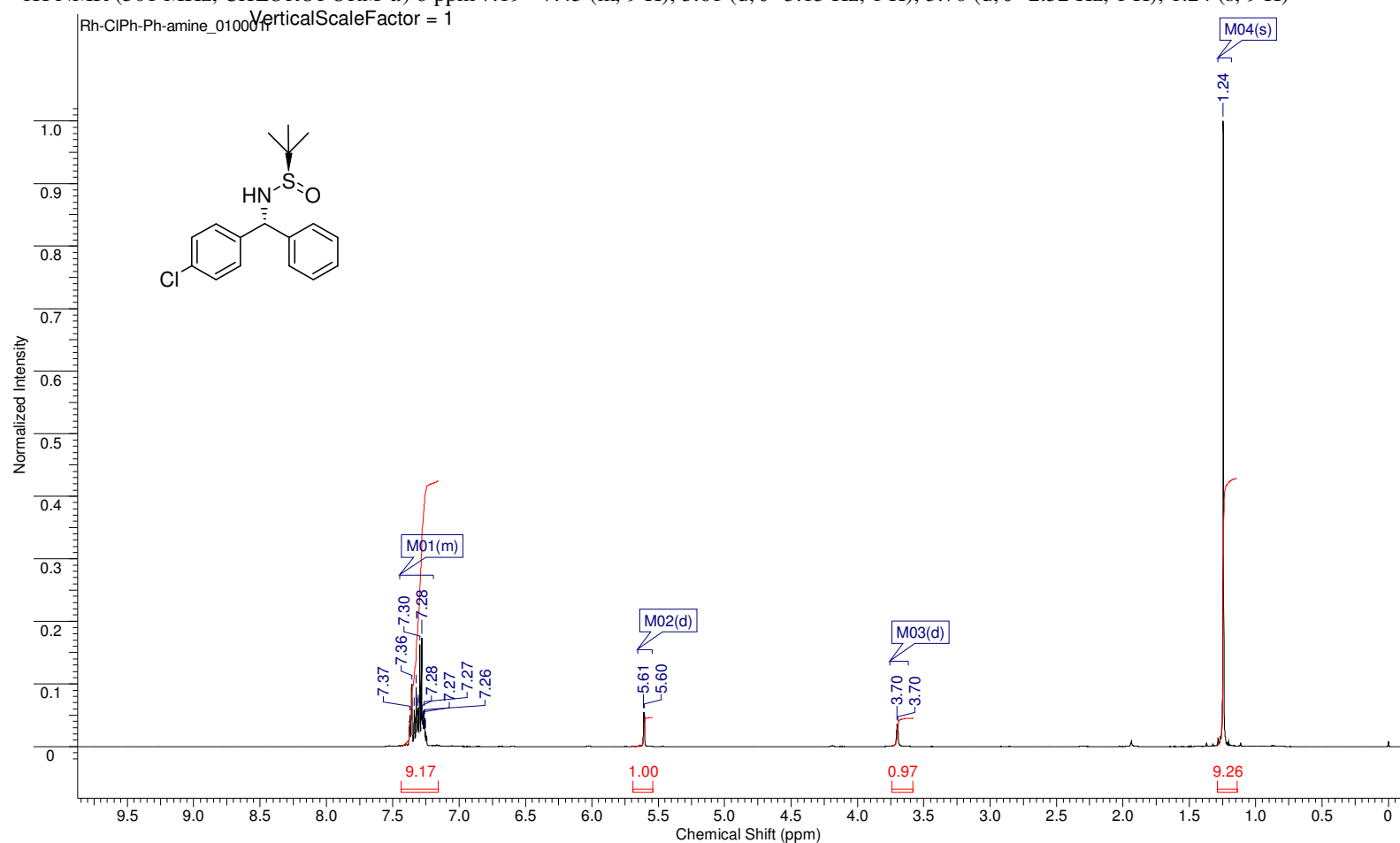


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| Date Stamp             | 08 Feb 2011 19:52:32                                                            |                      |                                                |                      |            |                       |                      |
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| Nucleus                | 13C                                                                             | Number of Transients | 256                                            | Origin               | spect      | Original Points Count | 32768                |
| Owner                  | nrmrsu                                                                          | Points Count         | 32768                                          | Pulse Sequence       | zgpg30     | Receiver Gain         | 8192.00              |
| SW(cyclical) (Hz)      | 30030.03                                                                        | Solvent              | CHLOROFORM-d                                   | Spectrum Offset (Hz) | 12587.9785 | Sweep Width (Hz)      | 30029.11             |
| Temperature (degree C) | 27.000                                                                          |                      |                                                |                      |            |                       |                      |

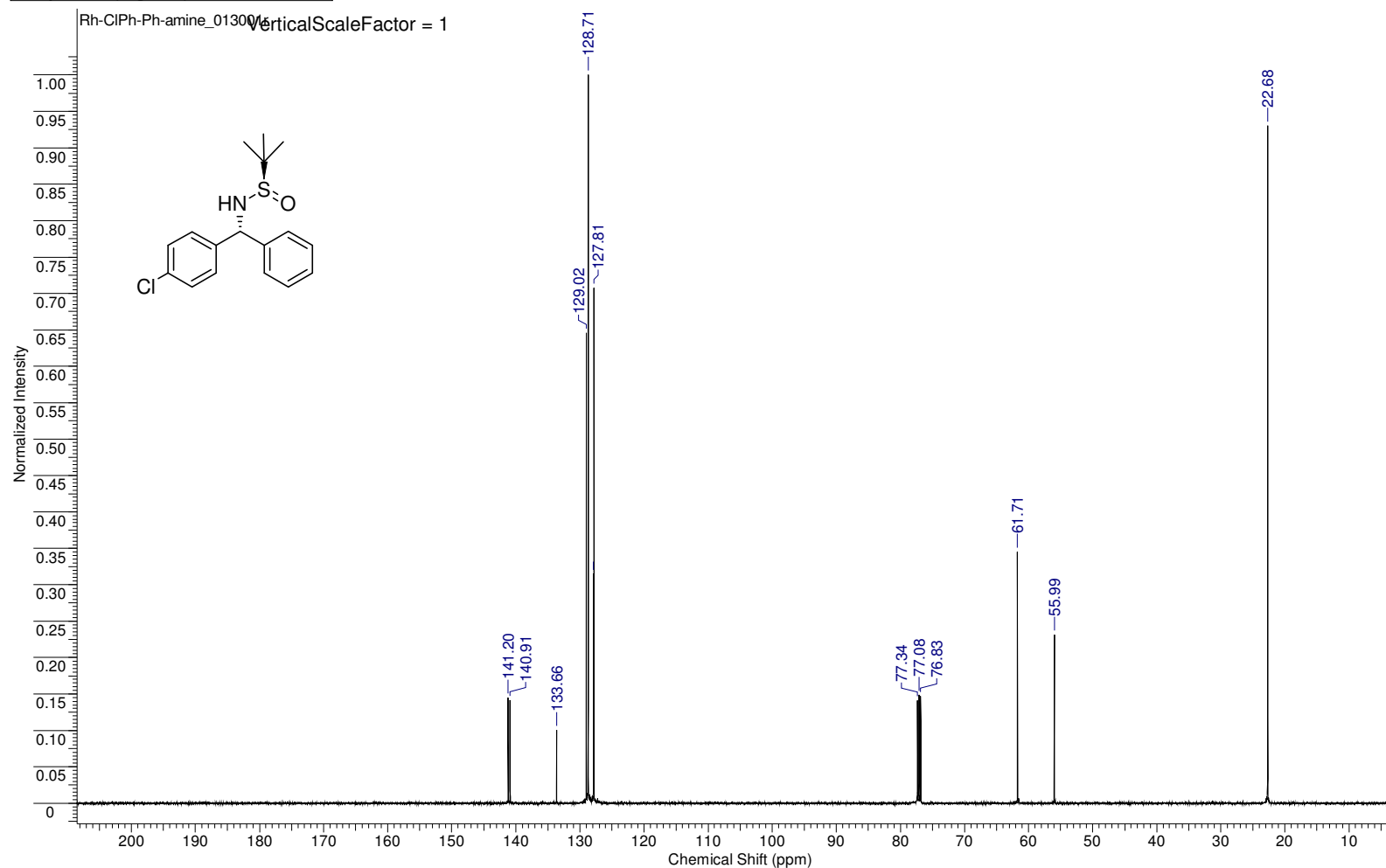


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| <b>Date Stamp</b>             | 18 Feb 2011 19:22:40                                                            |                               |                                              |                             |                      |
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| <b>Nucleus</b>                | <sup>1</sup> H                                                                  | <b>Number of Transients</b>   | 16                                           | <b>Origin</b>               | spect                |
| <b>Owner</b>                  | nmrsu                                                                           | <b>Points Count</b>           | 32768                                        | <b>Pulse Sequence</b>       | zg30                 |
| <b>SW(cyclical) (Hz)</b>      | 10330.58                                                                        | <b>Solvent</b>                | CHLOROFORM-d                                 | <b>Receiver Gain</b>        | 50.80                |
| <b>Sweep Width (Hz)</b>       | 10330.26                                                                        | <b>Temperature (degree C)</b> | 27.000                                       | <b>Spectrum Offset (Hz)</b> | 3075.8518            |

<sup>1</sup>H NMR (501 MHz, *CHLOROFORM-d*)  $\delta$  ppm 7.19 - 7.45 (m, 9 H), 5.61 (d,  $J=3.15$  Hz, 1 H), 3.70 (d,  $J=2.52$  Hz, 1 H), 1.24 (s, 9 H)

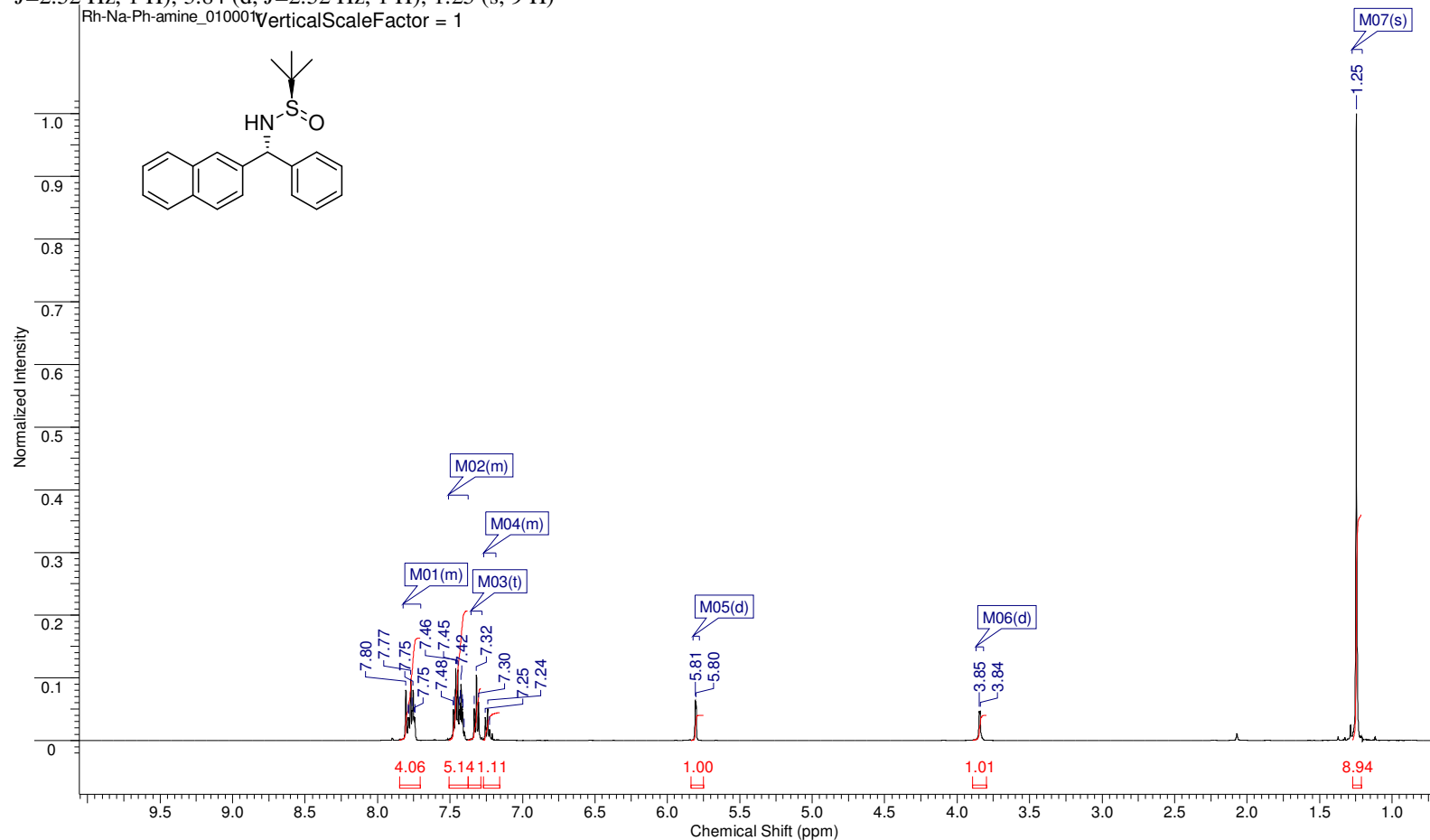


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| <b>Date Stamp</b>             | 19 Feb 2011 03:26:56                                                            |                             |                                                |                             |            |                              |                      |
| <b>File Name</b>              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-CIPh-Ph-amine_013001r |                             |                                                |                             |            | <b>Frequency (MHz)</b>       | 125.88               |
| <b>Nucleus</b>                | 13C                                                                             | <b>Number of Transients</b> | 2048                                           | <b>Origin</b>               | spect      | <b>Original Points Count</b> | 32768                |
| <b>Owner</b>                  | nmsu                                                                            | <b>Points Count</b>         | 32768                                          | <b>Pulse Sequence</b>       | zgpg30     | <b>Receiver Gain</b>         | 13004.00             |
| <b>SW(cyclical) (Hz)</b>      | 30030.03                                                                        | <b>Solvent</b>              | CHLOROFORM-d                                   | <b>Spectrum Offset (Hz)</b> | 14476.6104 | <b>Sweep Width (Hz)</b>      | 30029.11             |
| <b>Temperature (degree C)</b> | 27.000                                                                          |                             |                                                |                             |            |                              |                      |

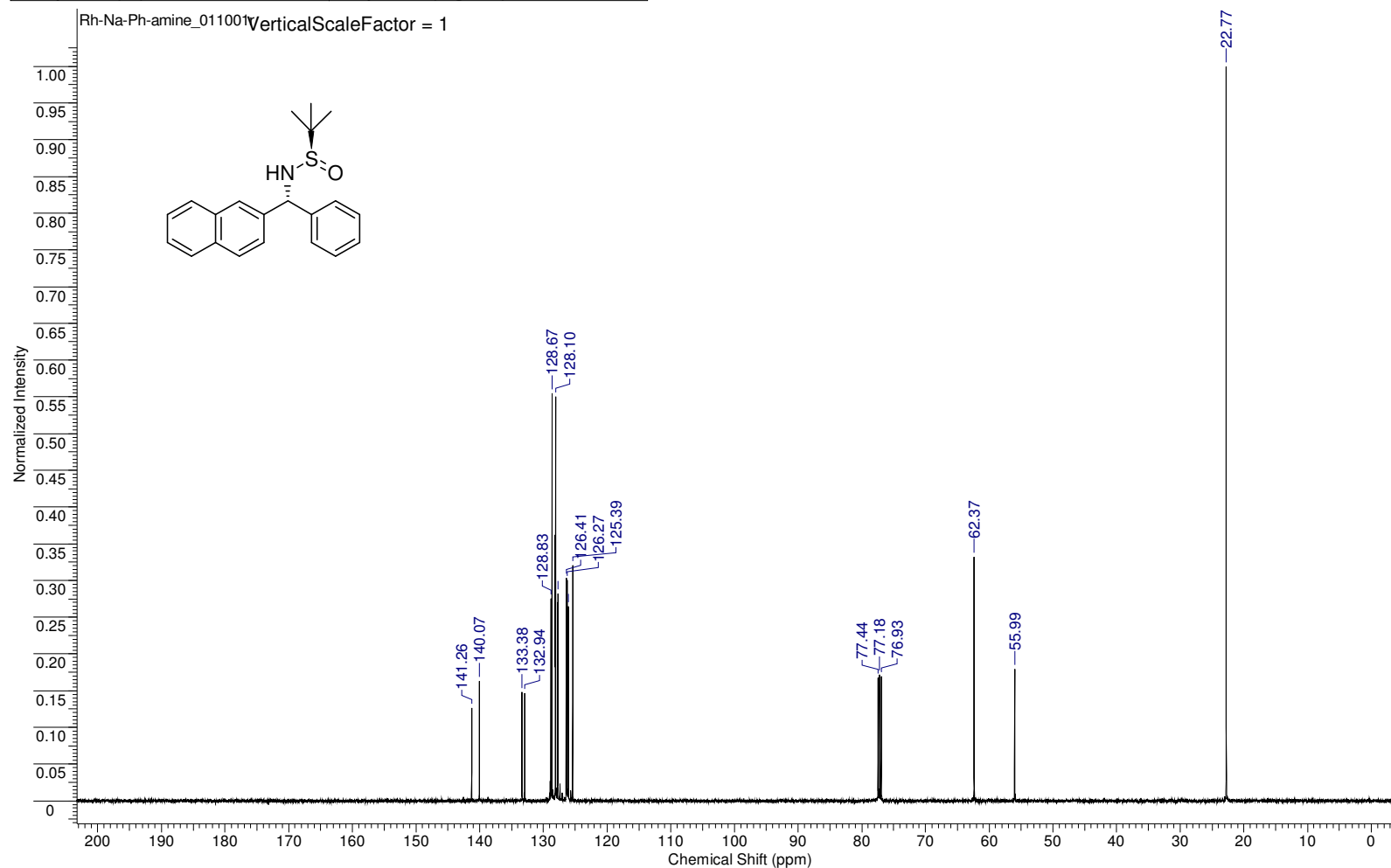


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| Acquisition Time (sec) | 3.1719               | Comment           | Rh-na-ph-amine PROTON16 CDCl3 u leletra1 2 |                                                                               |              | Date           | 01 Mar 2011 19:18:24 |
| Date Stamp             | 01 Mar 2011 19:18:24 |                   | File Name                                  | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-Na-Ph-amine_010001r |              |                |                      |
| Frequency (MHz)        | 500.63               | Nucleus           | 1H                                         | Number of Transients                                                          | 16           | Origin         | spect                |
| Original Points Count  | 32768                | Owner             | nmrsu                                      | Points Count                                                                  | 32768        | Pulse Sequence | zg30                 |
| Receiver Gain          | 35.90                | SW(cyclical) (Hz) | 10330.58                                   | Solvent                                                                       | CHLOROFORM-d |                |                      |
| Spectrum Offset (Hz)   | 3053.3489            | Sweep Width (Hz)  | 10330.26                                   | Temperature (degree C)                                                        | 27.000       |                |                      |

<sup>1</sup>H NMR (501 MHz, *CHLOROFORM-d*)  $\delta$  ppm 7.70 - 7.83 (m, 4 H), 7.37 - 7.51 (m, 5 H), 7.32 (t,  $J=7.57$  Hz, 2 H), 7.18 - 7.27 (m, 1 H), 5.80 (d,  $J=2.52$  Hz, 1 H), 3.84 (d,  $J=2.52$  Hz, 1 H), 1.25 (s, 9 H)

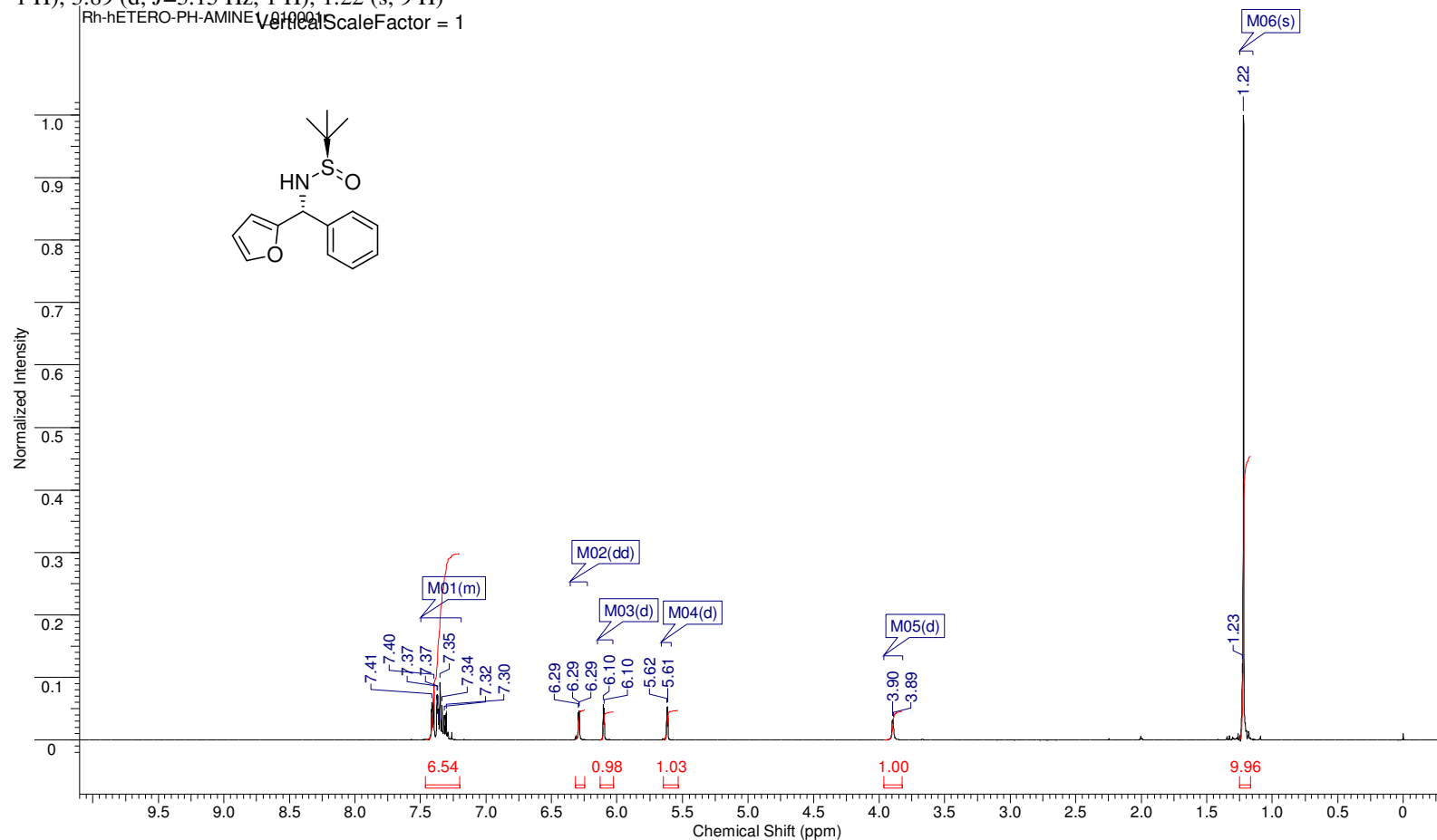


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| Nucleus                | 13C                                                                           | Number of Transients   | 256          | Origin         | spect                                       | Original Points Count | 32768      |                      |  |
| Owner                  | nmrsu                                                                         | Points Count           | 32768        | Pulse Sequence | zgpg30                                      | Receiver Gain         | 8192.00    |                      |  |
| SW(cyclical) (Hz)      | 30030.03                                                                      | Solvent                | CHLOROFORM-d |                |                                             | Spectrum Offset (Hz)  | 12587.9785 |                      |  |
| Sweep Width (Hz)       | 30029.11                                                                      | Temperature (degree C) | 27.000       |                |                                             |                       |            |                      |  |

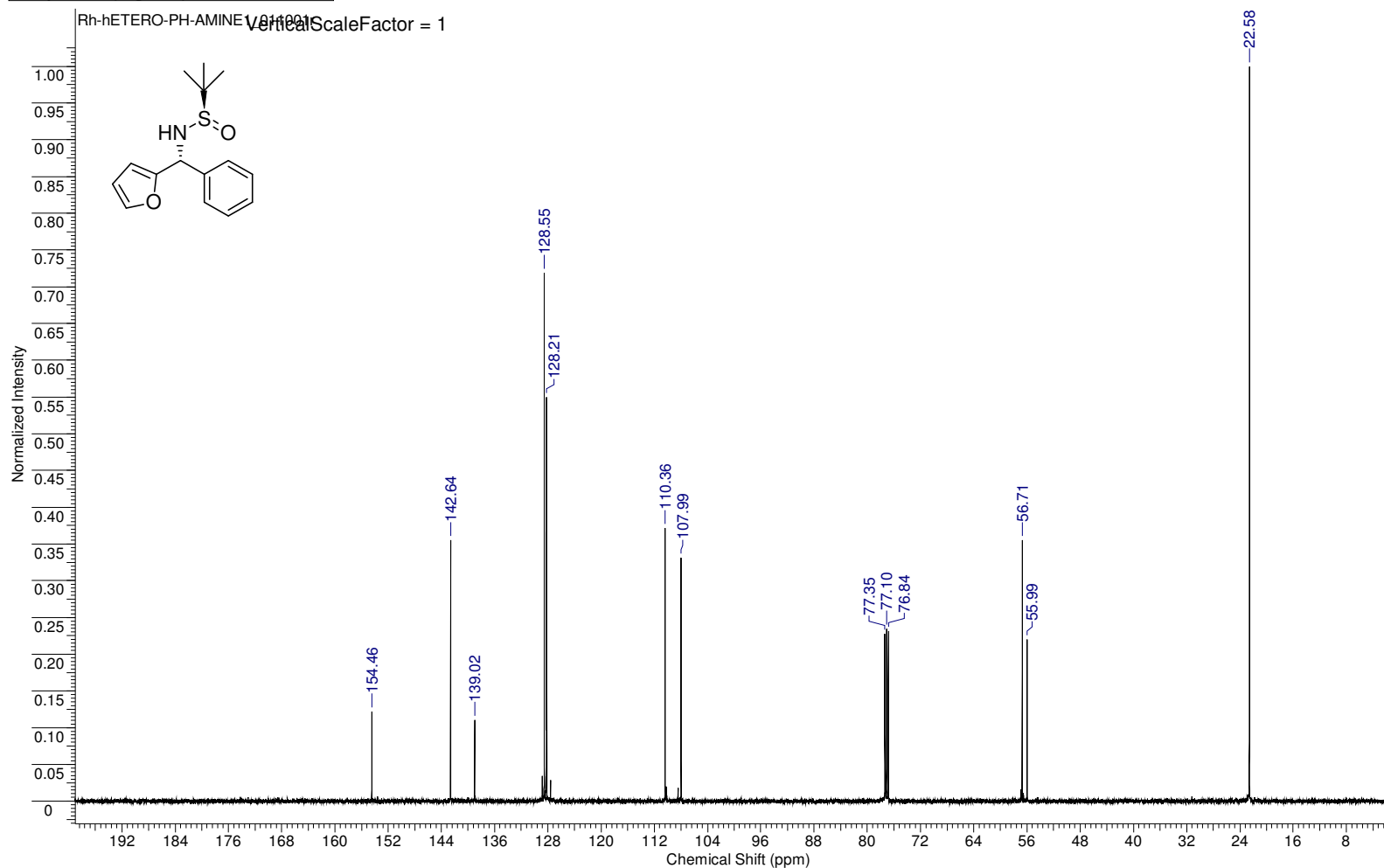


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| <b>Acquisition Time (sec)</b> | 3.1719                                                                             | <b>Comment</b>              | Rh-hetero-ph-imine1 PROTON16 CDCl3 u leletra1 1 | <b>Date</b>                 | 14 Feb 2011 14:11:12 |
| <b>Date Stamp</b>             | 14 Feb 2011 14:11:12                                                               |                             |                                                 |                             |                      |
| <b>File Name</b>              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-hETERO-PH-AMINE1_010001r |                             |                                                 | <b>Frequency (MHz)</b>      | 500.63               |
| <b>Nucleus</b>                | <sup>1</sup> H                                                                     | <b>Number of Transients</b> | 16                                              | <b>Origin</b>               | spect                |
| <b>Owner</b>                  | nmrslu                                                                             | <b>Points Count</b>         | 32768                                           | <b>Pulse Sequence</b>       | zg30                 |
| <b>SW(cyclical) (Hz)</b>      | 10330.58                                                                           | <b>Solvent</b>              | CHLOROFORM-d                                    | <b>Spectrum Offset (Hz)</b> | 3078.7251            |
| <b>Temperature (degree C)</b> | 27.000                                                                             |                             |                                                 | <b>Sweep Width (Hz)</b>     | 10330.26             |

<sup>1</sup>H NMR (501 MHz, *CHLOROFORM-d*)  $\delta$  ppm 7.19 - 7.50 (m, 6 H), 6.29 (dd,  $J=3.15$ , 1.89 Hz, 1 H), 6.10 (d,  $J=3.15$  Hz, 1 H), 5.62 (d,  $J=3.78$  Hz, 1 H), 3.89 (d,  $J=3.15$  Hz, 1 H), 1.22 (s, 9 H)

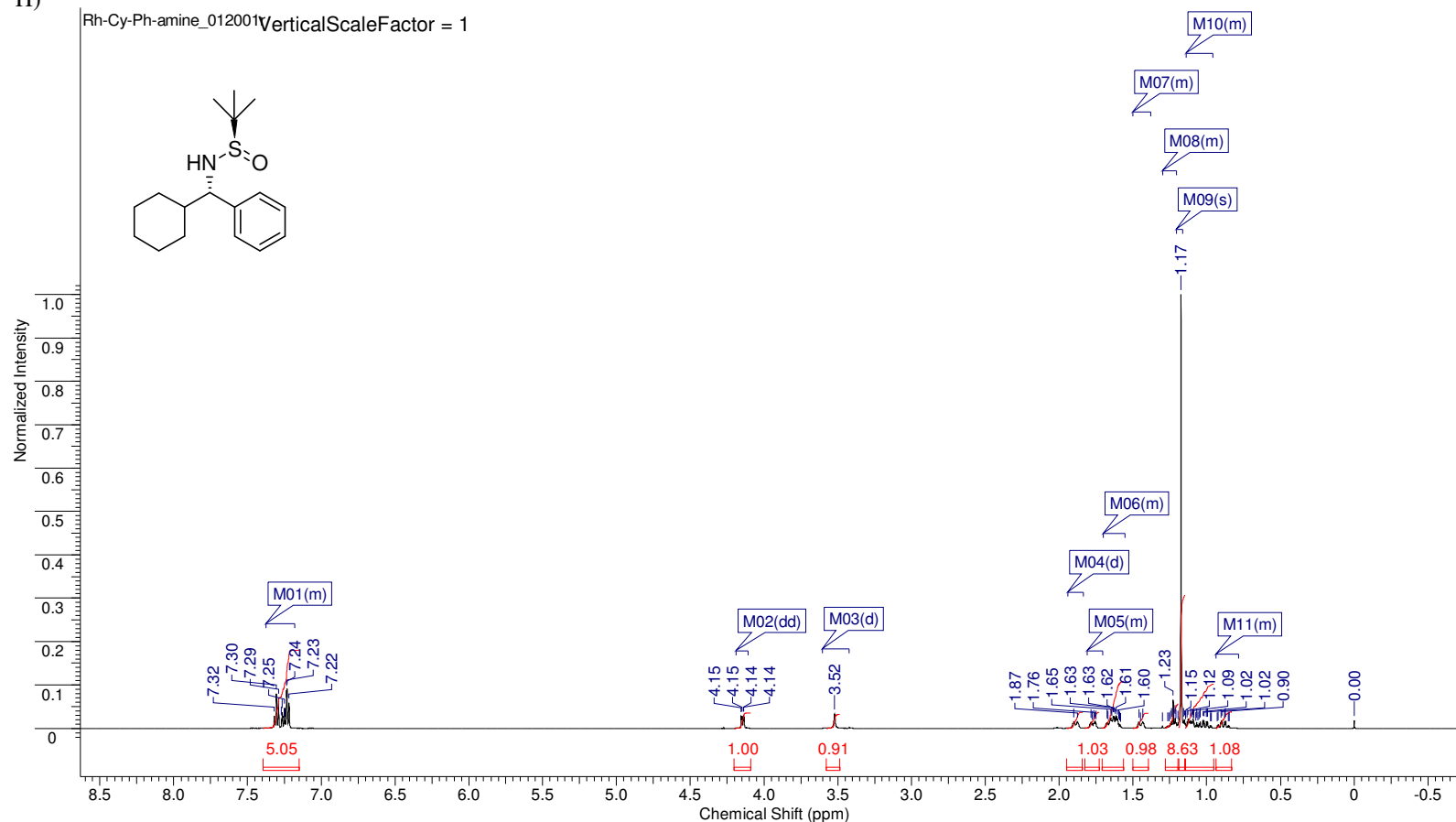


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| Acquisition Time (sec) | 1.0912                                                                             | Comment              | Rh-hetero-ph-imine1 C13CPD256 CDCI3 u leletra1 1 |                      |            | Date                  | 14 Feb 2011 14:41:04 |
| Date Stamp             | 14 Feb 2011 14:41:04                                                               |                      |                                                  |                      |            |                       |                      |
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| Nucleus                | 13C                                                                                | Number of Transients | 256                                              | Origin               | spect      | Original Points Count | 32768                |
| Owner                  | nmrslu                                                                             | Points Count         | 32768                                            | Pulse Sequence       | zgpg30     | Receiver Gain         | 14596.50             |
| SW(cyclical) (Hz)      | 30030.03                                                                           | Solvent              | CHLOROFORM-d                                     | Spectrum Offset (Hz) | 12587.9785 | Sweep Width (Hz)      | 30029.11             |
| Temperature (degree C) | 27.000                                                                             |                      |                                                  |                      |            |                       |                      |



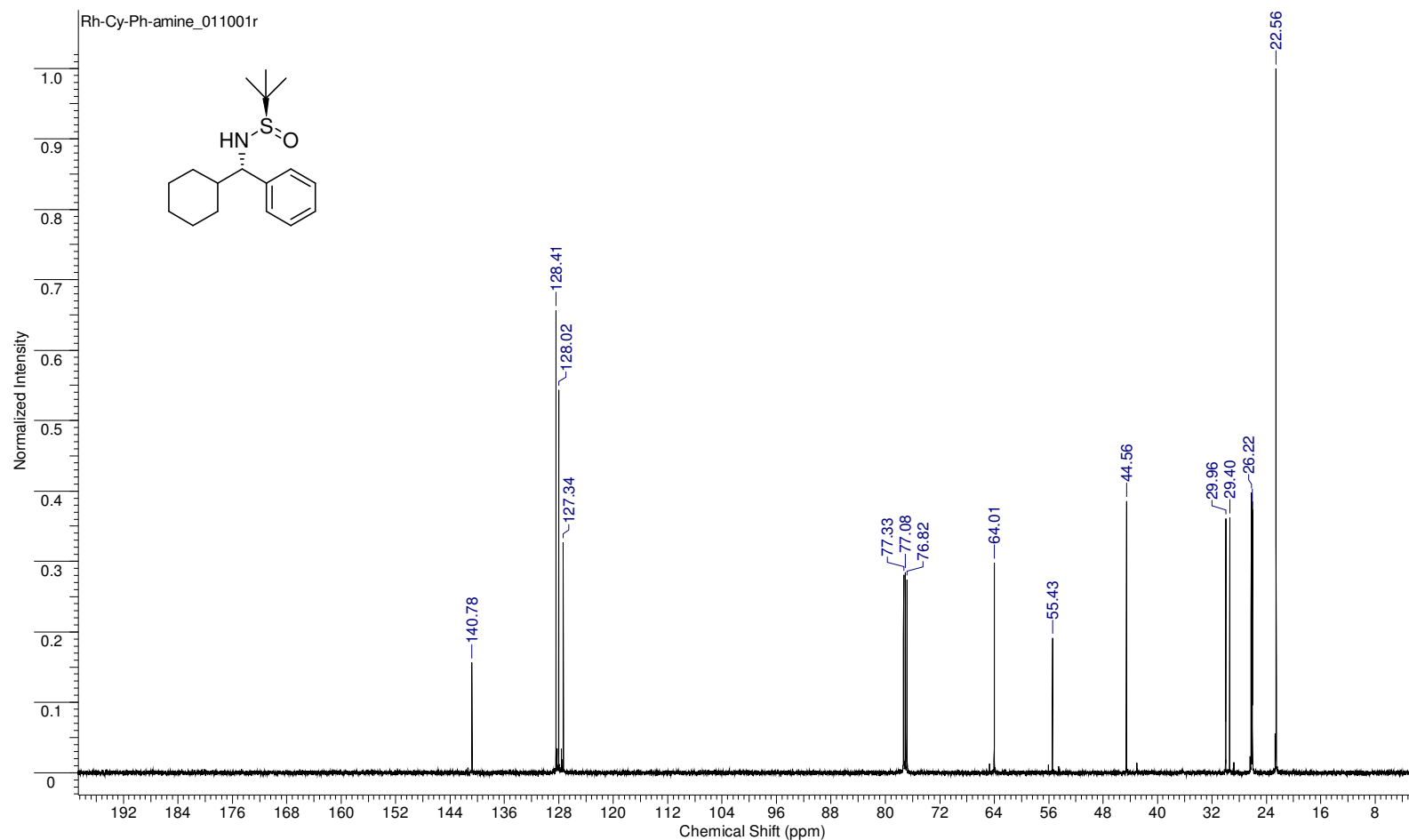
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| <b>Acquisition Time (sec)</b> | 3.1719                                                                        | <b>Comment</b>                | Rh-cy-Ph-amine PROTON1024 CDCl3 u leletra1 28 | <b>Date</b>                 | 10 Feb 2011 01:23:12 |
| <b>Date Stamp</b>             | 10 Feb 2011 01:23:12                                                          |                               |                                               |                             |                      |
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| <b>Nucleus</b>                | <sup>1</sup> H                                                                | <b>Number of Transients</b>   | 1024                                          | <b>Origin</b>               | spect                |
| <b>Owner</b>                  | nrmrsu                                                                        | <b>Points Count</b>           | 32768                                         | <b>Pulse Sequence</b>       | zg30                 |
| <b>SW(cyclical) (Hz)</b>      | 10330.58                                                                      | <b>Solvent</b>                | CHLOROFORM-d                                  | <b>Receiver Gain</b>        | 45.30                |
| <b>Sweep Width (Hz)</b>       | 10330.26                                                                      | <b>Temperature (degree C)</b> | 27.000                                        | <b>Spectrum Offset (Hz)</b> | 3083.8718            |

<sup>1</sup>H NMR (501 MHz, *CHLOROFORM-d*)  $\delta$  ppm 7.18 - 7.37 (m, 5 H), 4.14 (dd,  $J=7.25, 2.52$  Hz, 1 H), 3.52 (d,  $J=1.58$  Hz, 1 H), 1.89 (d,  $J=12.61$  Hz, 1 H), 1.71 - 1.81 (m, 1 H), 1.55 - 1.70 (m, 3 H), 1.38 - 1.50 (m, 1 H), 1.20 - 1.30 (m, 1 H), 1.18 (s, 9 H), 0.96 - 1.14 (m, 2 H), 0.78 - 0.93 (m, 1 H)



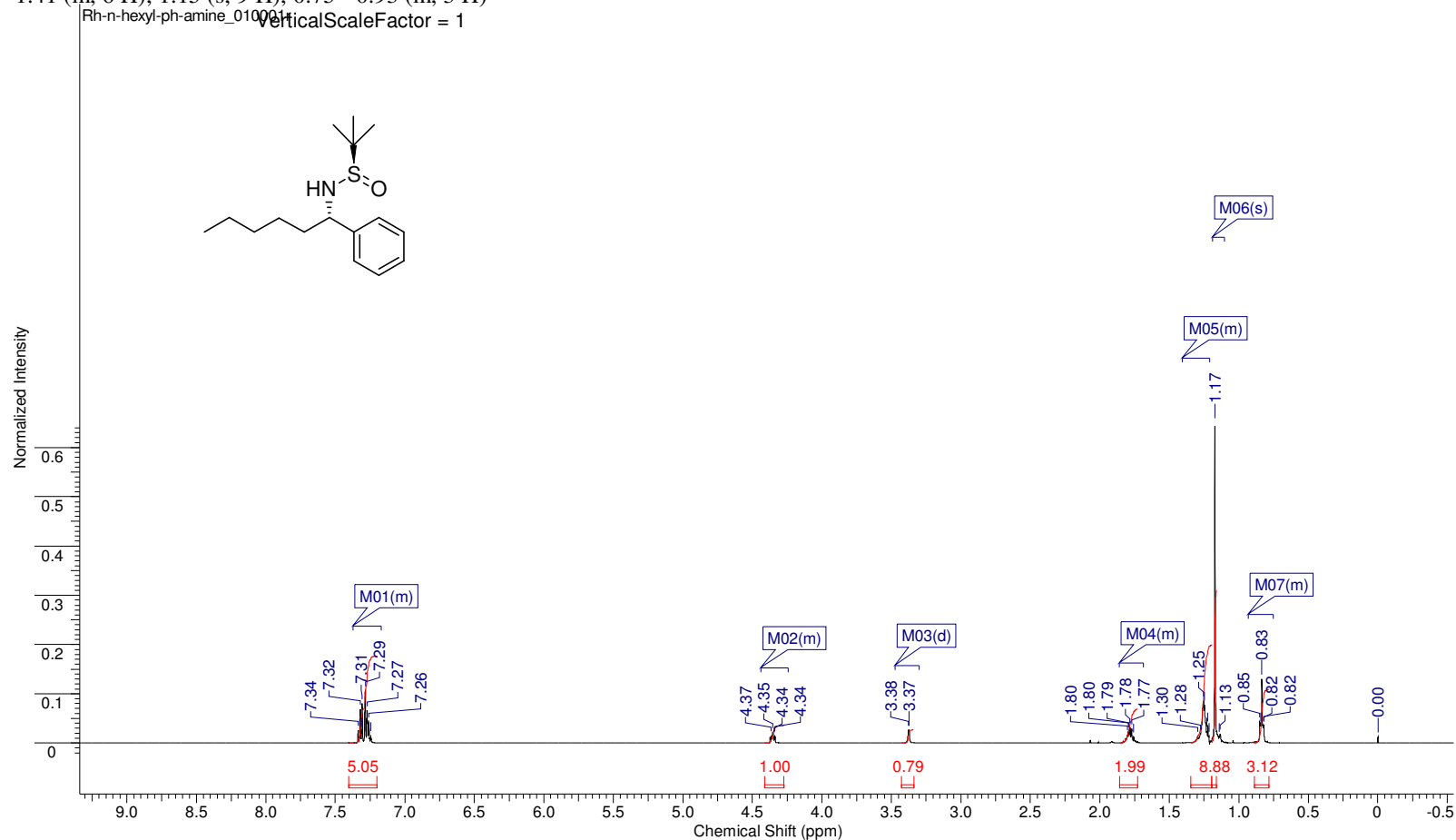
|                        |                                                                               |                      |                                              |                      |            |                       |                      |
|------------------------|-------------------------------------------------------------------------------|----------------------|----------------------------------------------|----------------------|------------|-----------------------|----------------------|
| Acquisition Time (sec) | 1.0912                                                                        | Comment              | Rh-cy-Ph-amine C13CPD256 CDCl3 u leletra1 28 |                      |            | Date                  | 10 Feb 2011 00:10:40 |
| Date Stamp             | 10 Feb 2011 00:10:40                                                          |                      |                                              |                      |            |                       |                      |
| File Name              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-Cy-Ph-amine_011001r |                      |                                              |                      |            | Frequency (MHz)       | 125.88               |
| Nucleus                | 13C                                                                           | Number of Transients | 256                                          | Origin               | spect      | Original Points Count | 32768                |
| Owner                  | nrmrsu                                                                        | Points Count         | 32768                                        | Pulse Sequence       | zgpg30     | Receiver Gain         | 8192.00              |
| SW(cyclical) (Hz)      | 30030.03                                                                      | Solvent              | CHLOROFORM-d                                 | Spectrum Offset (Hz) | 12587.9785 | Sweep Width (Hz)      | 30029.11             |
| Temperature (degree C) | 27.000                                                                        |                      |                                              |                      |            |                       |                      |

VerticalScaleFactor = 1

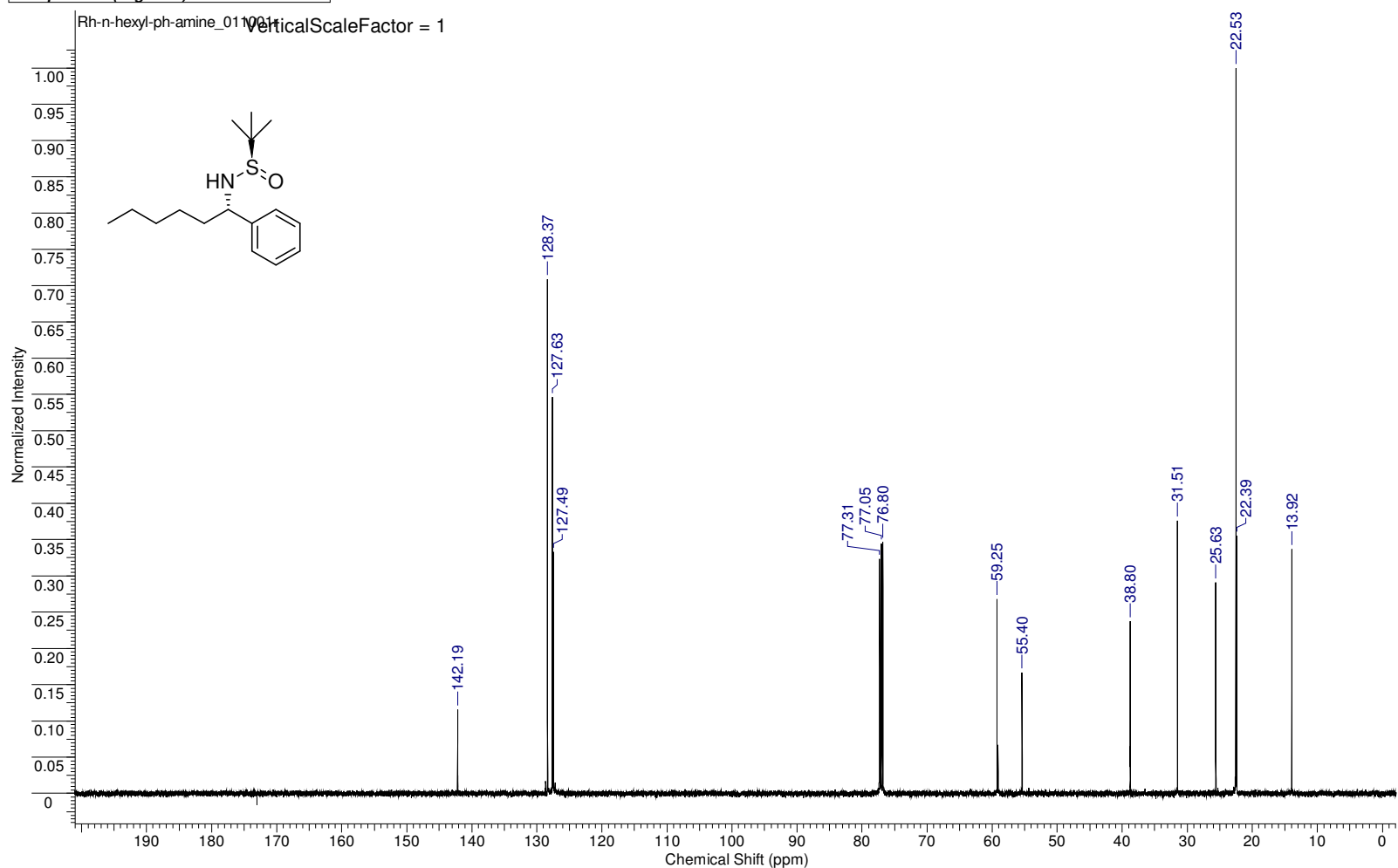


|                               |                                                                                    |                               |                                                 |                             |                      |
|-------------------------------|------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------|-----------------------------|----------------------|
| <b>Acquisition Time (sec)</b> | 3.1719                                                                             | <b>Comment</b>                | Rh-n-hexyl-ph-amine PROTON16 CDCl3 u leletra1 3 | <b>Date</b>                 | 14 Feb 2011 14:49:36 |
| <b>Date Stamp</b>             | 14 Feb 2011 14:49:36                                                               |                               |                                                 |                             |                      |
| <b>File Name</b>              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-n-hexyl-ph-amine_010001r | <b>Frequency (MHz)</b>        | 500.63                                          |                             |                      |
| <b>Nucleus</b>                | <sup>1</sup> H                                                                     | <b>Number of Transients</b>   | 16                                              | <b>Origin</b>               | spect                |
| <b>Owner</b>                  | nmrslu                                                                             | <b>Points Count</b>           | 32768                                           | <b>Pulse Sequence</b>       | zg30                 |
| <b>SW(cyclical) (Hz)</b>      | 10330.58                                                                           | <b>Solvent</b>                | CHLOROFORM-d                                    | <b>Receiver Gain</b>        | 50.80                |
| <b>Sweep Width (Hz)</b>       | 10330.26                                                                           | <b>Temperature (degree C)</b> | 27.000                                          | <b>Spectrum Offset (Hz)</b> | 3082.0442            |

<sup>1</sup>H NMR (501 MHz, *CHLOROFORM-d*)  $\delta$  ppm 7.17 - 7.37 (m, 5 H), 4.24 - 4.44 (m, 1 H), 3.38 (d,  $J=1.89$  Hz, 1 H), 1.69 - 1.86 (m, 2 H), 1.21 - 1.41 (m, 6 H), 1.15 (s, 9 H), 0.75 - 0.93 (m, 3 H)

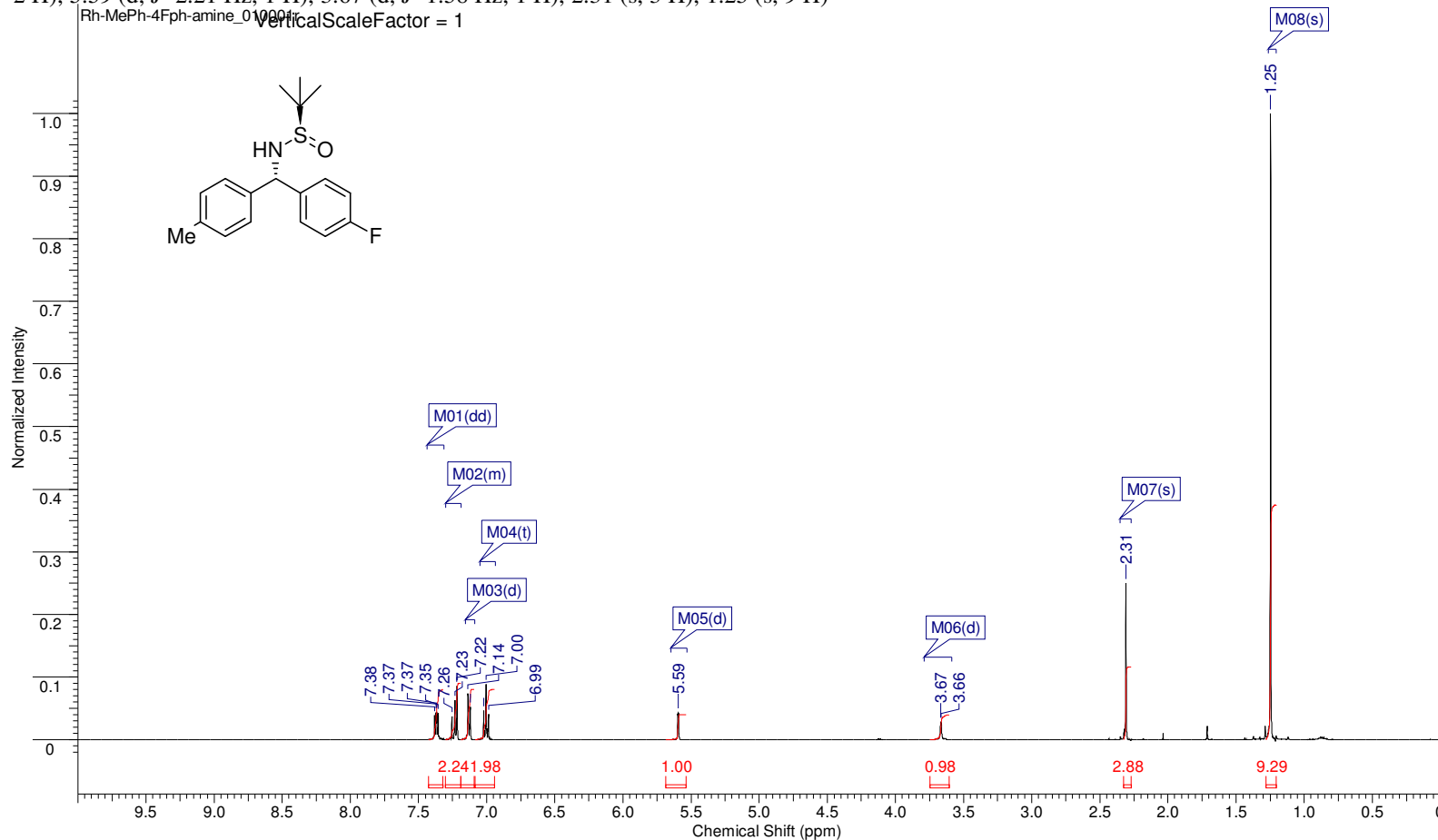


|                        |                                                                                    |                      |                                                  |                      |            |                       |                      |
|------------------------|------------------------------------------------------------------------------------|----------------------|--------------------------------------------------|----------------------|------------|-----------------------|----------------------|
| Acquisition Time (sec) | 1.0912                                                                             | Comment              | Rh-n-hexyl-ph-amine C13CPD256 CDCl3 u leletra1 3 |                      |            | Date                  | 14 Feb 2011 14:58:08 |
| Date Stamp             | 14 Feb 2011 14:58:08                                                               |                      |                                                  |                      |            |                       |                      |
| File Name              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-n-hexyl-ph-amine_011001r |                      |                                                  |                      |            | Frequency (MHz)       | 125.88               |
| Nucleus                | 13C                                                                                | Number of Transients | 256                                              | Origin               | spect      | Original Points Count | 32768                |
| Owner                  | nmsu                                                                               | Points Count         | 32768                                            | Pulse Sequence       | zgpg30     | Receiver Gain         | 8192.00              |
| SW(cyclical) (Hz)      | 30030.03                                                                           | Solvent              | CHLOROFORM-d                                     | Spectrum Offset (Hz) | 12587.9785 | Sweep Width (Hz)      | 30029.11             |
| Temperature (degree C) | 27.000                                                                             |                      |                                                  |                      |            |                       |                      |

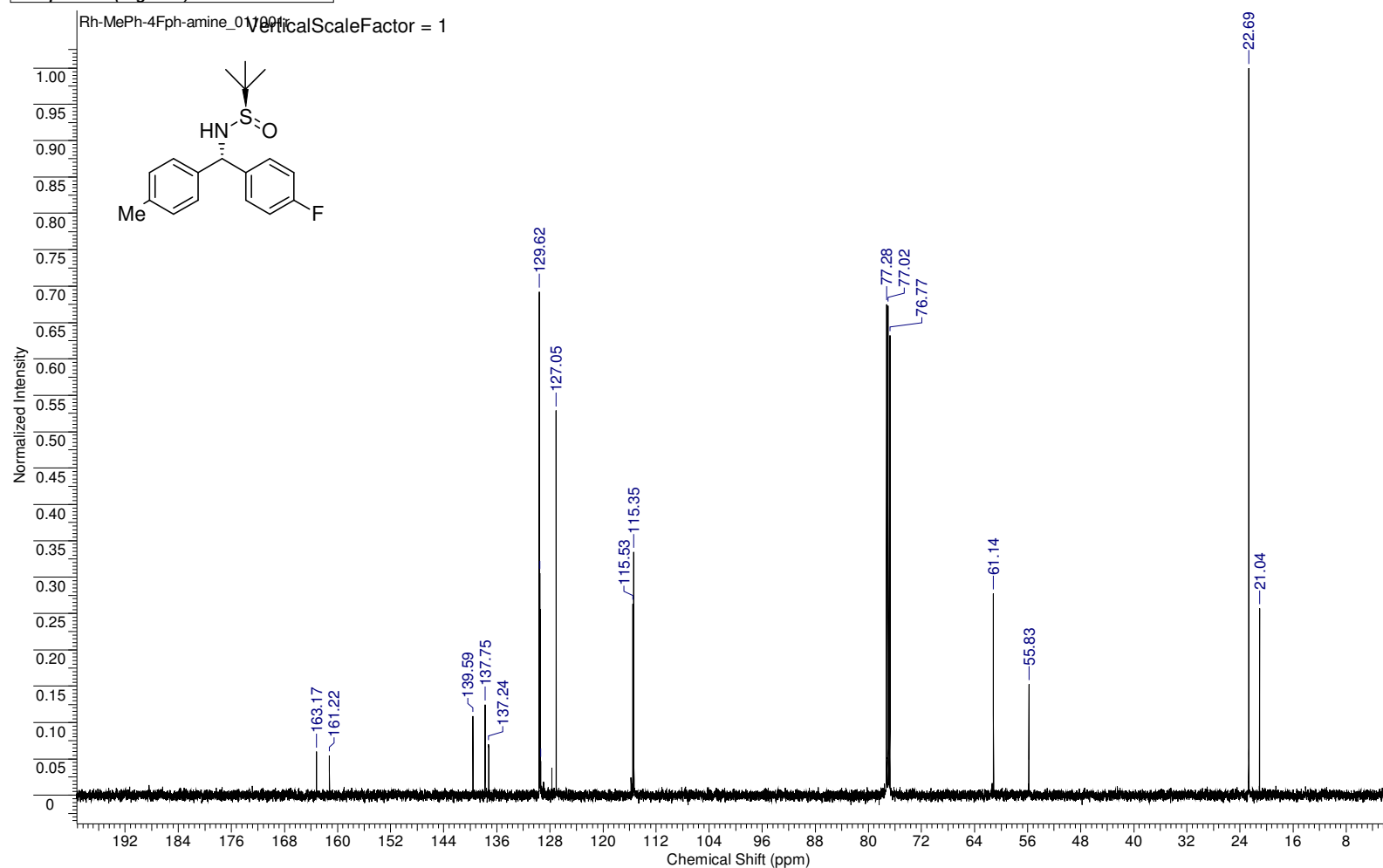


|                        |                                                                                   |                      |                                                 |                      |           |                       |                      |
|------------------------|-----------------------------------------------------------------------------------|----------------------|-------------------------------------------------|----------------------|-----------|-----------------------|----------------------|
| Acquisition Time (sec) | 3.1719                                                                            | Comment              | Rh-MePh-4FPh-amine PROTON16 CDCl3 u leletra1 28 |                      |           | Date                  | 06 Feb 2011 21:26:24 |
| Date Stamp             | 06 Feb 2011 21:26:24                                                              |                      |                                                 |                      |           |                       |                      |
| File Name              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-MePh-4Fph-amine_010001r |                      |                                                 |                      |           | Frequency (MHz)       | 500.63               |
| Nucleus                | 1H                                                                                | Number of Transients | 16                                              | Origin               | spect     | Original Points Count | 32768                |
| Owner                  | nmrsu                                                                             | Points Count         | 32768                                           | Pulse Sequence       | zg30      | Receiver Gain         | 143.70               |
| SW(cyclical) (Hz)      | 10330.58                                                                          | Solvent              | CHLOROFORM-d                                    | Spectrum Offset (Hz) | 3076.3169 | Sweep Width (Hz)      | 10330.26             |
| Temperature (degree C) | 27.000                                                                            |                      |                                                 |                      |           |                       |                      |

<sup>1</sup>H NMR (501 MHz, *CHLOROFORM-d*)  $\delta$  ppm 7.37 (dd,  $J=8.51, 5.36$  Hz, 2 H), 7.19 - 7.30 (m, 2 H), 7.13 (d,  $J=7.88$  Hz, 2 H), 7.00 (t,  $J=8.67$  Hz, 2 H), 5.59 (d,  $J=2.21$  Hz, 1 H), 3.67 (d,  $J=1.58$  Hz, 1 H), 2.31 (s, 3 H), 1.25 (s, 9 H)

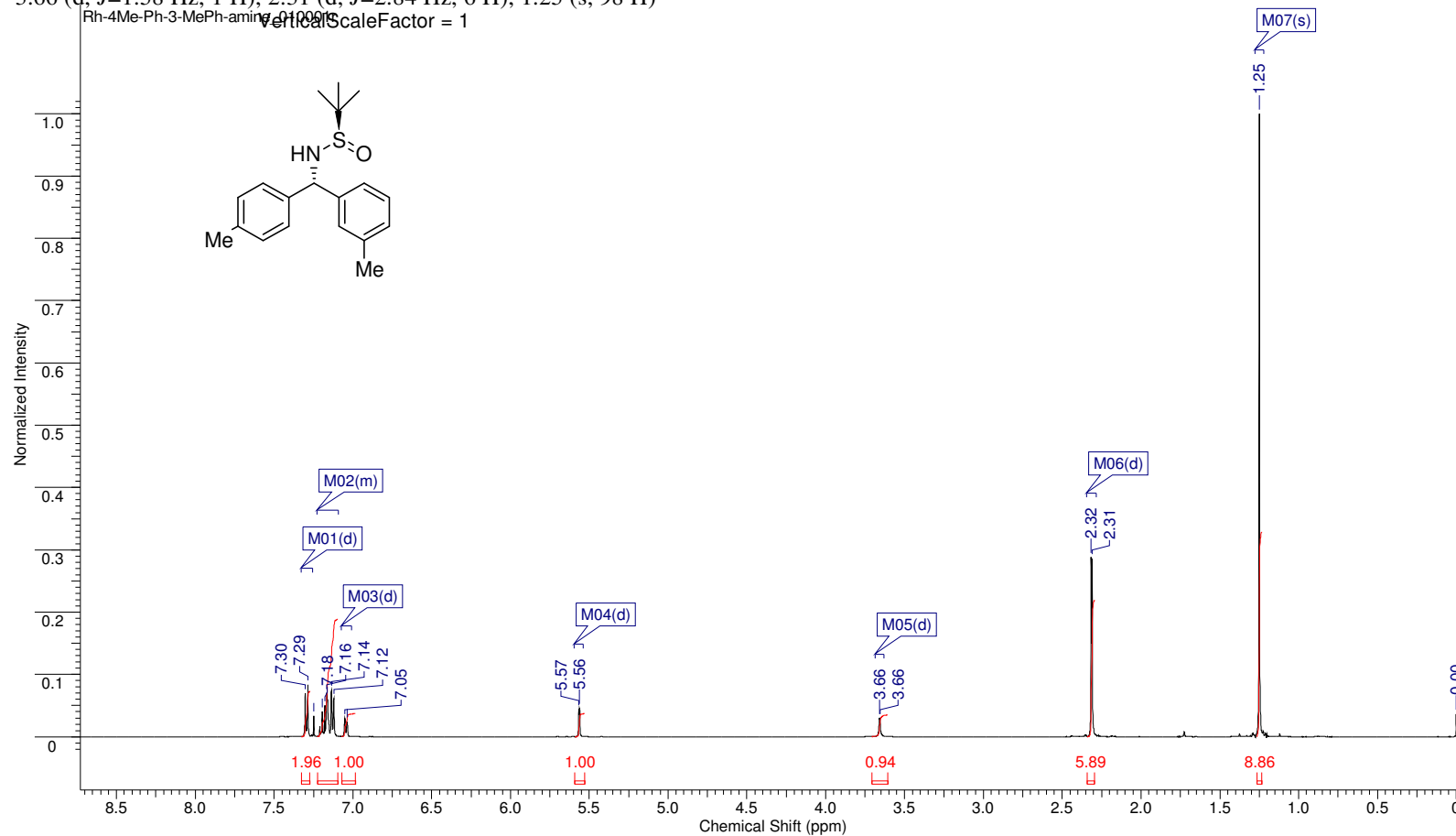


|                        |                                                                                   |                      |                                                  |                      |            |                       |                 |                      |
|------------------------|-----------------------------------------------------------------------------------|----------------------|--------------------------------------------------|----------------------|------------|-----------------------|-----------------|----------------------|
| Acquisition Time (sec) | 1.0912                                                                            | Comment              | Rh-MePh-4Fph-amine C13CPD256 CDCl3 u leletra1 28 |                      |            |                       | Date            | 06 Feb 2011 21:34:56 |
| Date Stamp             | 06 Feb 2011 21:34:56                                                              |                      |                                                  |                      |            |                       |                 |                      |
| File Name              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-MePh-4Fph-amine_011001r |                      |                                                  |                      |            |                       | Frequency (MHz) | 125.88               |
| Nucleus                | 13C                                                                               | Number of Transients | 256                                              | Origin               | spect      | Original Points Count | 32768           |                      |
| Owner                  | nmsu                                                                              | Points Count         | 32768                                            | Pulse Sequence       | zgpg30     | Receiver Gain         | 8192.00         |                      |
| SW(cyclical) (Hz)      | 30030.03                                                                          | Solvent              | CHLOROFORM-d                                     | Spectrum Offset (Hz) | 12587.9785 | Sweep Width (Hz)      | 30029.11        |                      |
| Temperature (degree C) | 27.000                                                                            |                      |                                                  |                      |            |                       |                 |                      |

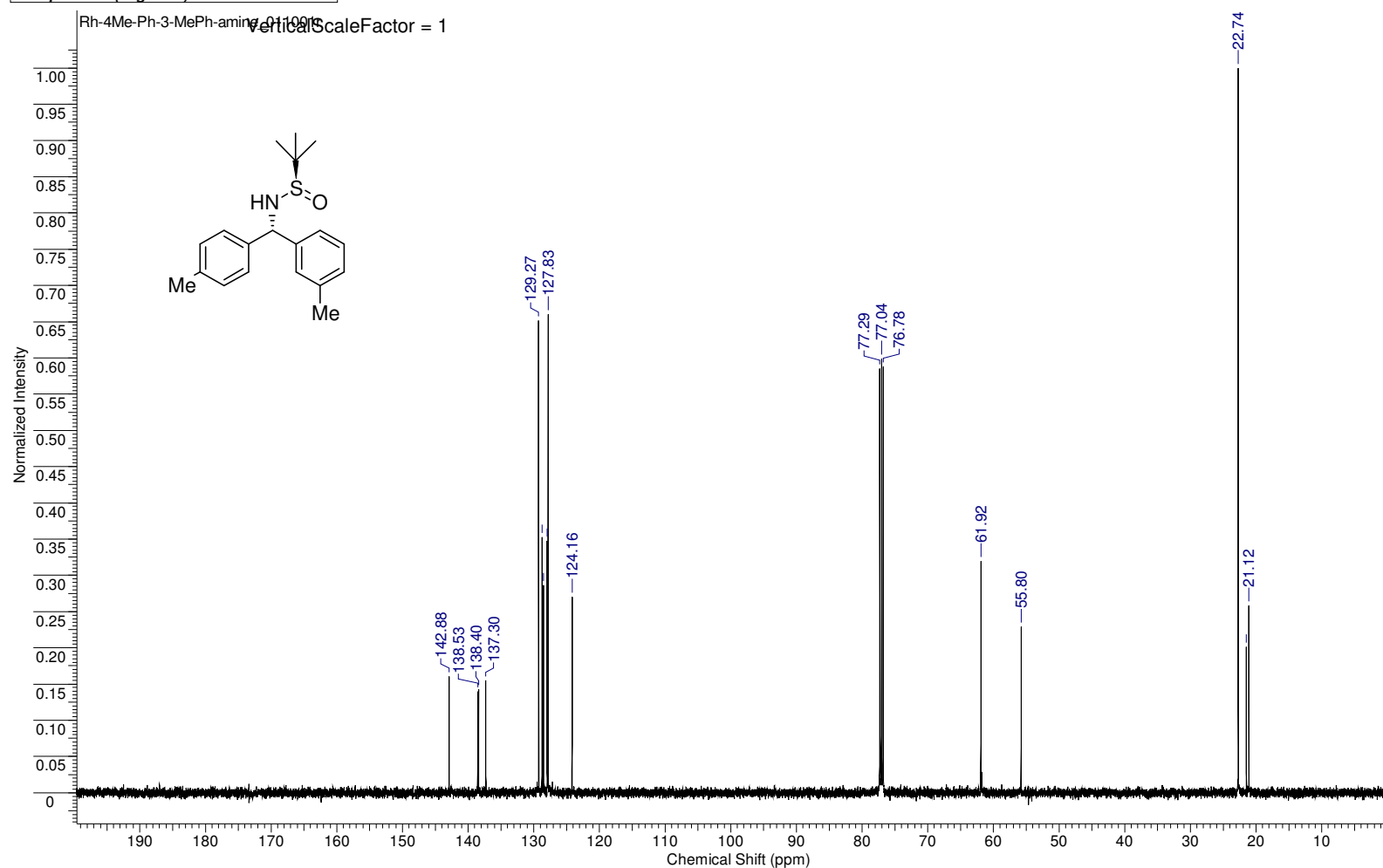


|                               |                                                                                       |                             |                                                    |                         |                      |
|-------------------------------|---------------------------------------------------------------------------------------|-----------------------------|----------------------------------------------------|-------------------------|----------------------|
| <b>Acquisition Time (sec)</b> | 3.1719                                                                                | <b>Comment</b>              | rh-4Me-Ph-3MePh-amine PROTON16 CDCl3 u leletra1 20 | <b>Date</b>             | 09 Feb 2011 21:22:08 |
| <b>Date Stamp</b>             | 09 Feb 2011 21:22:08                                                                  |                             |                                                    |                         |                      |
| <b>File Name</b>              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-4Me-Ph-3-MePh-amine_010001r | <b>Frequency (MHz)</b>      | 500.63                                             |                         |                      |
| <b>Nucleus</b>                | <sup>1</sup> H                                                                        | <b>Number of Transients</b> | 16                                                 | <b>Origin</b>           | spect                |
| <b>Owner</b>                  | nmrsu                                                                                 | <b>Points Count</b>         | 32768                                              | <b>Pulse Sequence</b>   | zg30                 |
| <b>SW(cyclical) (Hz)</b>      | 10330.58                                                                              | <b>Solvent</b>              | CHLOROFORM-d                                       | <b>Receiver Gain</b>    | 128.00               |
| <b>Temperature (degree C)</b> | 27.000                                                                                | <b>Spectrum Offset (Hz)</b> | 3072.7429                                          | <b>Sweep Width (Hz)</b> | 10330.26             |

<sup>1</sup>H NMR (501 MHz, CHLOROFORM-d)  $\delta$  ppm 7.29 (d,  $J=8.20$  Hz, 2 H), 7.09 - 7.23 (m, 5 H), 7.04 (d,  $J=6.94$  Hz, 1 H), 5.56 (d,  $J=2.21$  Hz, 1 H), 3.66 (d,  $J=1.58$  Hz, 1 H), 2.31 (d,  $J=2.84$  Hz, 6 H), 1.25 (s, 98 H)



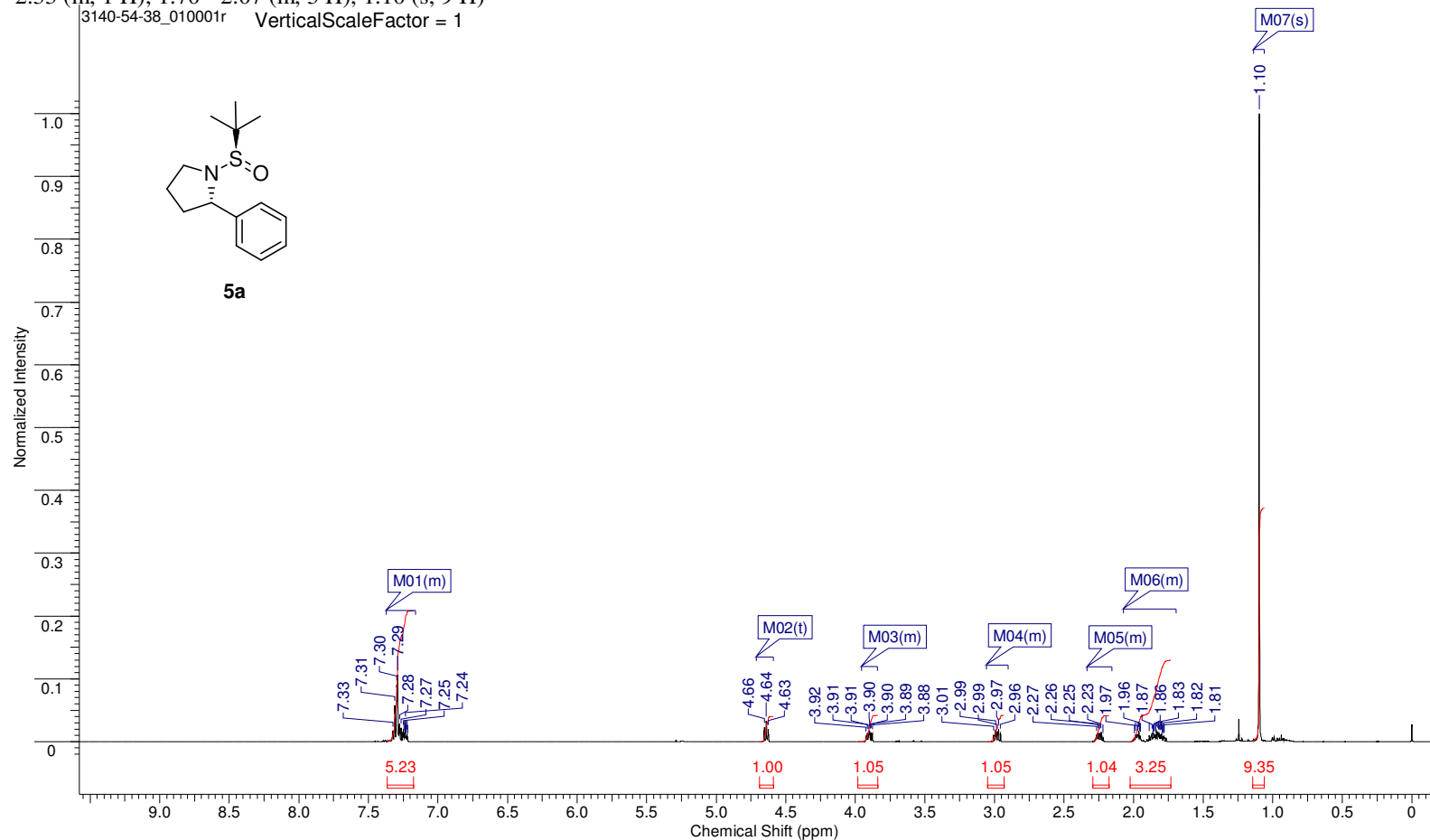
|                        |                                                                                       |                      |                                                     |                      |                 |                       |          |
|------------------------|---------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------|----------------------|-----------------|-----------------------|----------|
| Acquisition Time (sec) | 1.0912                                                                                | Comment              | rh-4Me-Ph-3MePh-amine C13CPD256 CDCl3 u leletra1 20 |                      | Date            | 09 Feb 2011 21:30:40  |          |
| Date Stamp             | 09 Feb 2011 21:30:40                                                                  |                      |                                                     |                      |                 |                       |          |
| File Name              | C:\Documents and Settings\leletra1\Desktop\paper10\NMR\Rh-4Me-Ph-3-MePh-amine_011001r |                      |                                                     |                      | Frequency (MHz) | 125.88                |          |
| Nucleus                | 13C                                                                                   | Number of Transients | 256                                                 | Origin               | spect           | Original Points Count | 32768    |
| Owner                  | nmrsu                                                                                 | Points Count         | 32768                                               | Pulse Sequence       | zgpg30          | Receiver Gain         | 13004.00 |
| SW(cyclical) (Hz)      | 30030.03                                                                              | Solvent              | CHLOROFORM-d                                        | Spectrum Offset (Hz) | 12587.9785      | Sweep Width (Hz)      | 30029.11 |
| Temperature (degree C) | 27.000                                                                                |                      |                                                     |                      |                 |                       |          |



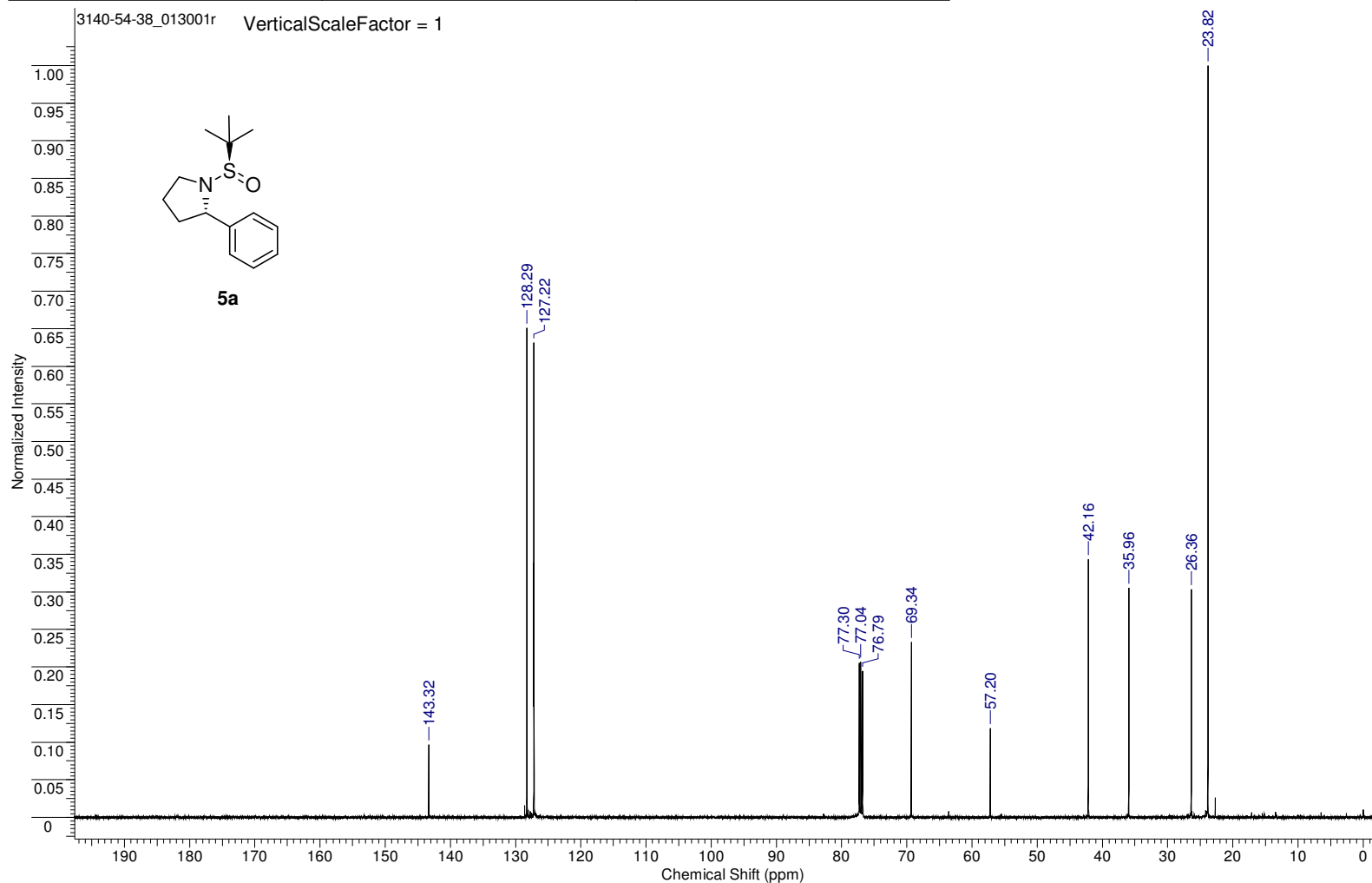
8/26/2011 2:29:34 PM  
3140-54-38 PROTON128 CDCl3 u leletra1 3

|                               |           |                          |                  |                                                                                |              |
|-------------------------------|-----------|--------------------------|------------------|--------------------------------------------------------------------------------|--------------|
| <b>Acquisition Time (sec)</b> | 3.1719    | <b>Comment</b>           |                  | <b>Date</b>                                                                    |              |
| <b>Date Stamp</b>             |           |                          | <b>File Name</b> | C:\Documents and Settings\leletra1\Desktop\paper10\leletra1\3140-54-38_010001r |              |
| <b>Frequency (MHz)</b>        | 500.63    | <b>Nucleus</b>           | 1H               | <b>Number of Transients</b>                                                    | 128          |
| <b>Original Points Count</b>  | 32768     | <b>Owner</b>             | nmr su           | <b>Points Count</b>                                                            | 32768        |
| <b>Receiver Gain</b>          | 80.60     | <b>SW(cyclical) (Hz)</b> | 10330.58         | <b>Solvent</b>                                                                 | CHLOROFORM-d |
| <b>Spectrum Offset (Hz)</b>   | 3081.3586 | <b>Sweep Width (Hz)</b>  | 10330.26         | <b>Temperature (degree C)</b>                                                  | 27.000       |

<sup>1</sup>H NMR (501 MHz, CHLOROFORM-d) δ ppm 7.16 - 7.37 (m, 5 H), 4.64 (t, *J*=7.25 Hz, 1 H), 3.84 - 3.95 (m, 1 H), 2.90 - 3.06 (m, 1 H), 2.16 - 2.33 (m, 1 H), 1.70 - 2.07 (m, 3 H), 1.10 (s, 9 H)

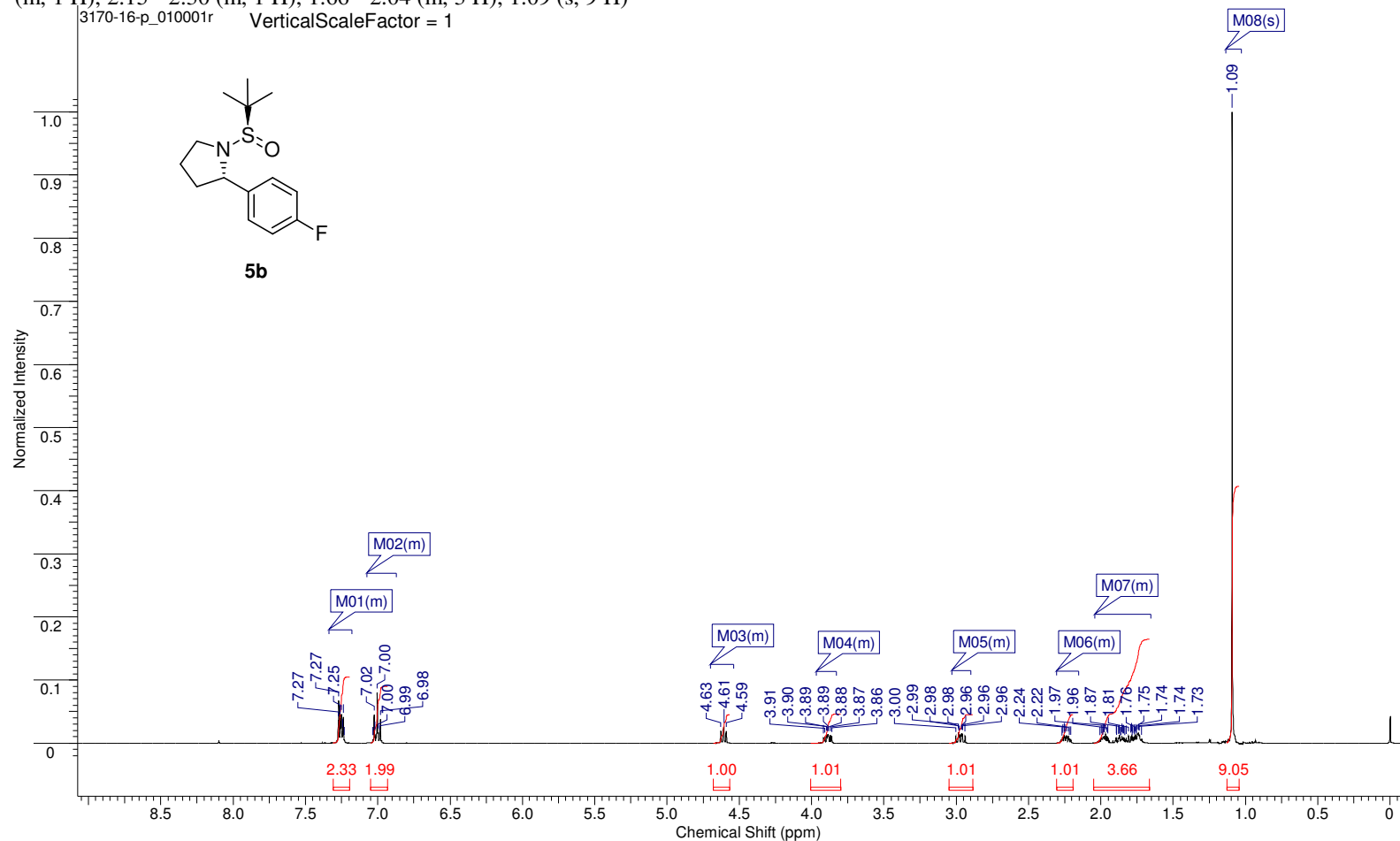


|                        |            |                   |                 |                        |              |
|------------------------|------------|-------------------|-----------------|------------------------|--------------|
| Acquisition Time (sec) | 1.0912     | Comment           |                 | Date                   |              |
| Date Stamp             |            |                   | File Name       |                        |              |
| Frequency (MHz)        | 125.88     | Nucleus           | <sup>13</sup> C | Number of Transients   | 2048         |
| Original Points Count  | 32768      | Owner             | nmrsu           | Points Count           | 32768        |
| Receiver Gain          | 14596.50   | SW(cyclical) (Hz) | 30030.03        | Solvent                | CHLOROFORM-d |
| Spectrum Offset (Hz)   | 14477.9814 | Sweep Width (Hz)  | 30029.11        | Temperature (degree C) | 27.000       |

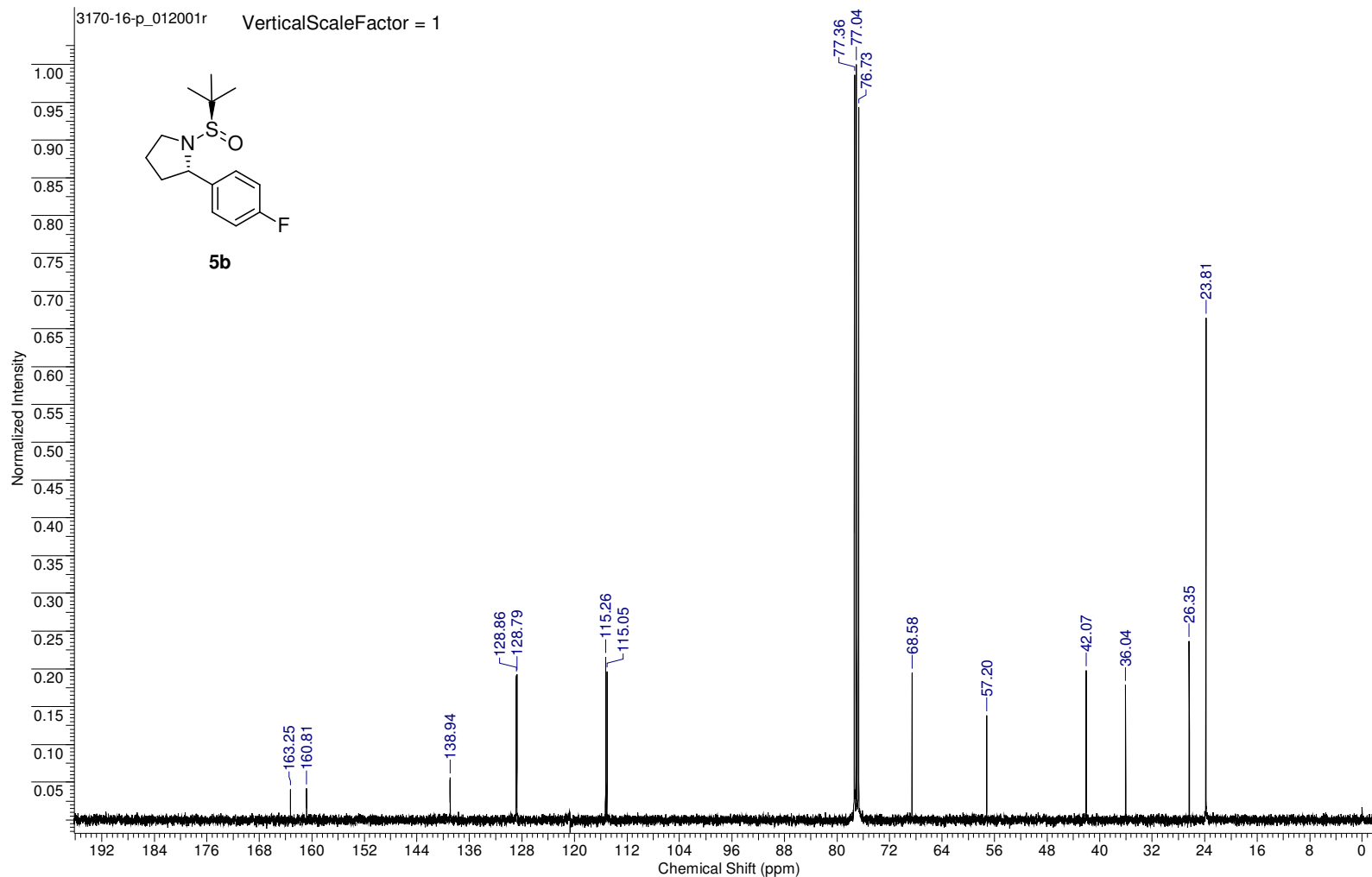


|                        |           |                   |                |                        |              |
|------------------------|-----------|-------------------|----------------|------------------------|--------------|
| Acquisition Time (sec) | 3.9584    | Comment           |                | Date                   |              |
| Date Stamp             |           |                   |                | File Name              |              |
| Frequency (MHz)        | 400.19    | Nucleus           | <sup>1</sup> H | Number of Transients   | 16           |
| Original Points Count  | 32768     | Owner             | nmrsu          | Points Count           | 32768        |
| Receiver Gain          | 322.50    | SW(cyclical) (Hz) | 8278.15        | Solvent                | CHLOROFORM-d |
| Spectrum Offset (Hz)   | 2460.7930 | Sweep Width (Hz)  | 8277.89        | Temperature (degree C) | 27.000       |
|                        |           |                   |                | Origin                 | spect        |
|                        |           |                   |                | Pulse Sequence         | zg30         |

<sup>1</sup>H NMR (400 MHz, CHLOROFORM-d)  $\delta$  ppm 7.18 - 7.34 (m, 2 H), 6.87 - 7.07 (m, 2 H), 4.54 - 4.70 (m, 1 H), 3.83 - 3.97 (m, 1 H), 2.90 - 3.03 (m, 1 H), 2.15 - 2.30 (m, 1 H), 1.66 - 2.04 (m, 3 H), 1.09 (s, 9 H)

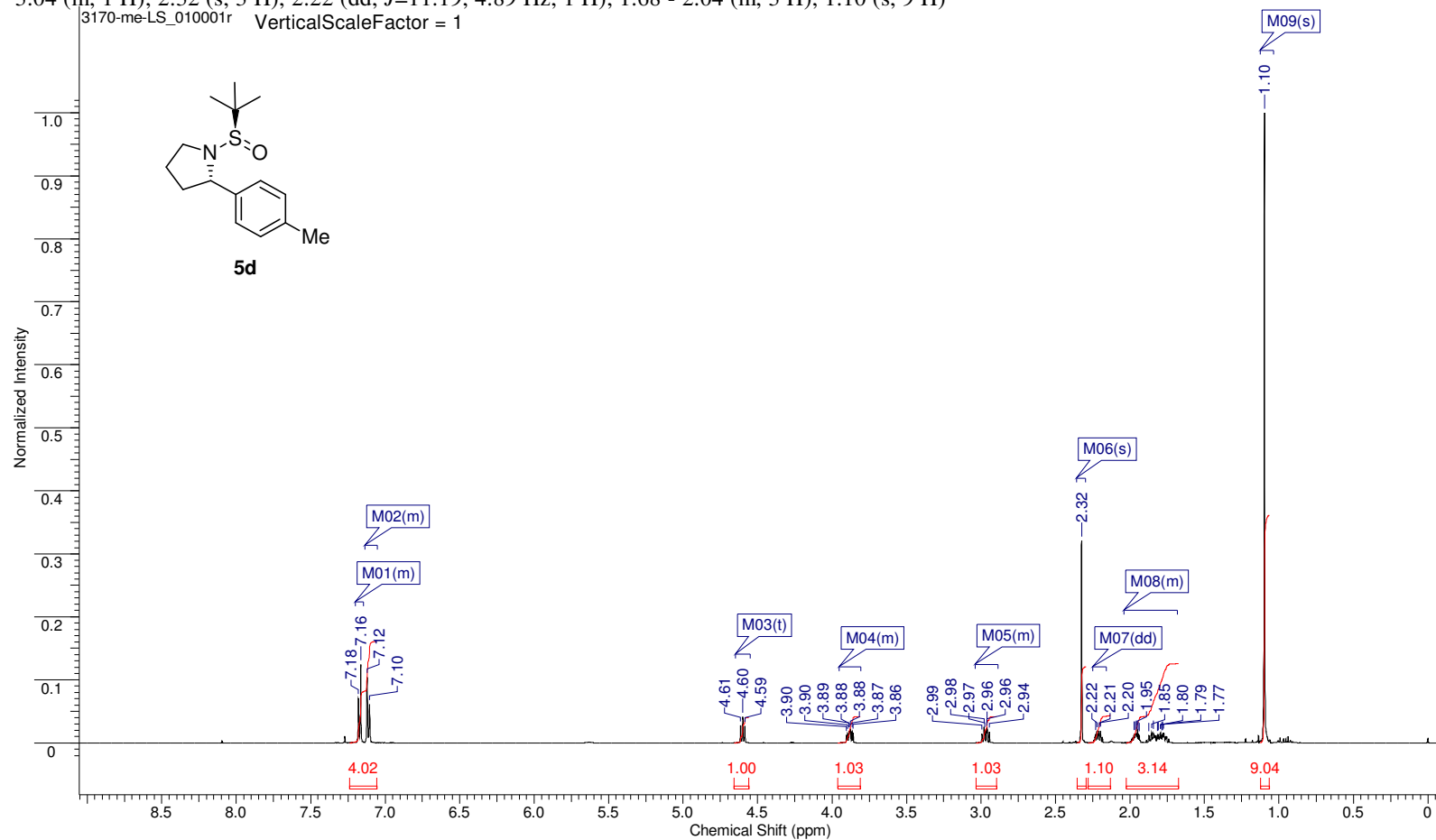


|                        |            |                   |          |                        |              |                |        |
|------------------------|------------|-------------------|----------|------------------------|--------------|----------------|--------|
| Acquisition Time (sec) | 1.3664     | Comment           |          | Date                   |              |                |        |
| Date Stamp             |            |                   |          | File Name              |              |                |        |
| Frequency (MHz)        | 100.63     | Nucleus           | 13C      | Number of Transients   | 2048         | Origin         | spect  |
| Original Points Count  | 32768      | Owner             | nmrsu    | Points Count           | 32768        | Pulse Sequence | zgpg30 |
| Receiver Gain          | 16384.00   | SW(cyclical) (Hz) | 23980.81 | Solvent                | CHLOROFORM-d |                |        |
| Spectrum Offset (Hz)   | 10062.3271 | Sweep Width (Hz)  | 23980.08 | Temperature (degree C) | 27.000       |                |        |

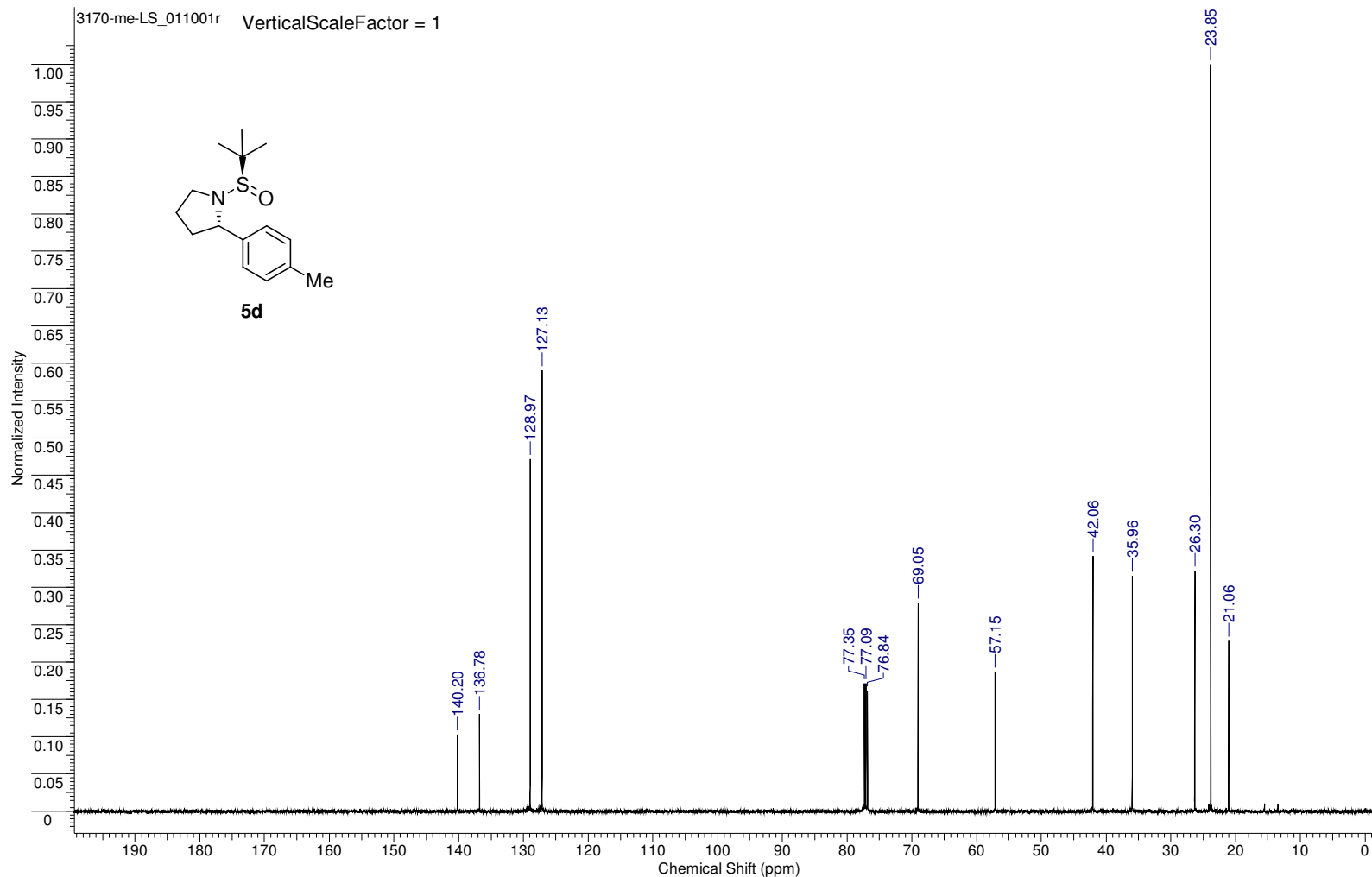


|                        |           |                   |                |                        |              |
|------------------------|-----------|-------------------|----------------|------------------------|--------------|
| Acquisition Time (sec) | 3.1719    | Comment           |                | Date                   |              |
| Date Stamp             |           | File Name         |                |                        |              |
| Frequency (MHz)        | 500.63    | Nucleus           | <sup>1</sup> H | Number of Transients   | 16           |
| Original Points Count  | 32768     | Owner             | nmrsu          | Points Count           | 32768        |
| Receiver Gain          | 35.90     | SW(cyclical) (Hz) | 10330.58       | Solvent                | CHLOROFORM-d |
| Spectrum Offset (Hz)   | 3084.1067 | Sweep Width (Hz)  | 10330.26       | Temperature (degree C) | 27.000       |

<sup>1</sup>H NMR (501 MHz, CHLOROFORM-d)  $\delta$  ppm 7.14 - 7.20 (m, 2 H), 7.05 - 7.14 (m, 2 H), 4.60 (t,  $J=7.41$  Hz, 1 H), 3.81 - 3.95 (m, 1 H), 2.89 - 3.04 (m, 1 H), 2.32 (s, 3 H), 2.22 (dd,  $J=11.19, 4.89$  Hz, 1 H), 1.68 - 2.04 (m, 3 H), 1.10 (s, 9 H)

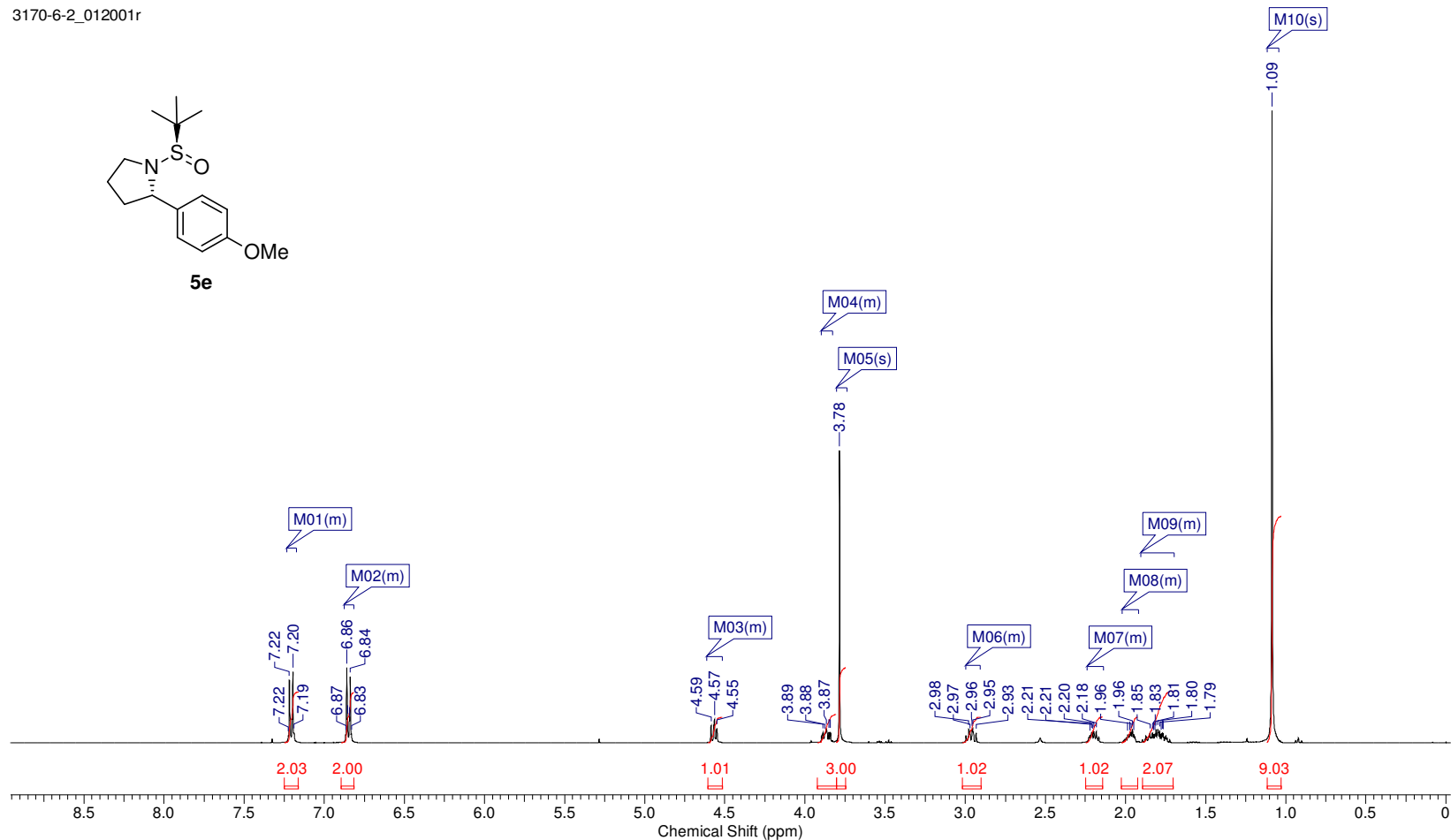


|                               |                      |                          |                                                                              |                               |                      |
|-------------------------------|----------------------|--------------------------|------------------------------------------------------------------------------|-------------------------------|----------------------|
| <b>Acquisition Time (sec)</b> | 1.0912               | <b>Comment</b>           | 3170-Me-LS C13CPD256 CDCl3 u leletra1 58                                     | <b>Date</b>                   | 15 Jun 2009 13:07:12 |
| <b>Date Stamp</b>             | 15 Jun 2009 13:07:12 | <b>File Name</b>         | C:\Documents and Settings\leletra1\Desktop\paper10\Leleti\3170-me-LS_011001r |                               |                      |
| <b>Frequency (MHz)</b>        | 125.88               | <b>Nucleus</b>           | 13C                                                                          | <b>Number of Transients</b>   | 256                  |
| <b>Original Points Count</b>  | 32768                | <b>Owner</b>             | nmr su                                                                       | <b>Points Count</b>           | 32768                |
| <b>Receiver Gain</b>          | 8192.00              | <b>SW(cyclical) (Hz)</b> | 30030.03                                                                     | <b>Solvent</b>                | CHLOROFORM-d         |
| <b>Spectrum Offset (Hz)</b>   | 12587.9785           | <b>Sweep Width (Hz)</b>  | 30029.11                                                                     | <b>Temperature (degree C)</b> | 27.000               |



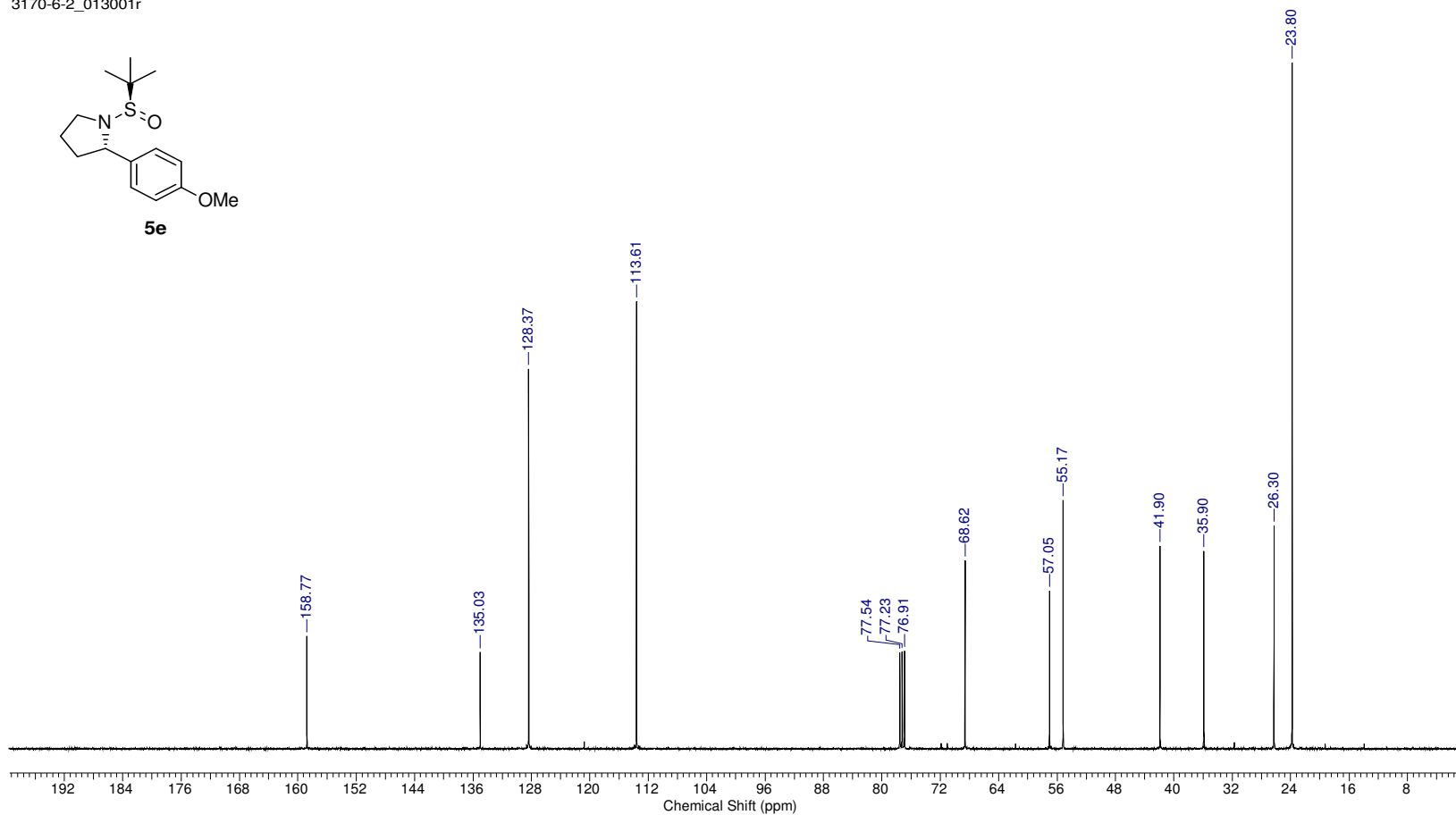
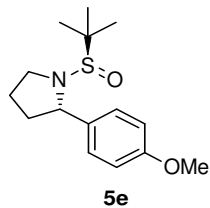
|                        |           |                   |           |                        |              |
|------------------------|-----------|-------------------|-----------|------------------------|--------------|
| Acquisition Time (sec) | 3.9584    | Comment           | Date      |                        |              |
| Date Stamp             |           |                   | File Name |                        |              |
| Frequency (MHz)        | 400.19    | Nucleus           | 1H        | Number of Transients   | 1024         |
| Original Points Count  | 32768     | Owner             | nmrsu     | Points Count           | 32768        |
| Receiver Gain          | 50.80     | SW(cyclical) (Hz) | 8278.15   | Solvent                | CHLOROFORM-d |
| Spectrum Offset (Hz)   | 2483.6433 | Sweep Width (Hz)  | 8277.89   | Temperature (degree C) | 27.000       |
|                        |           |                   |           | Origin                 | spect        |
|                        |           |                   |           | Pulse Sequence         | zg30         |

3170-6-2\_012001r



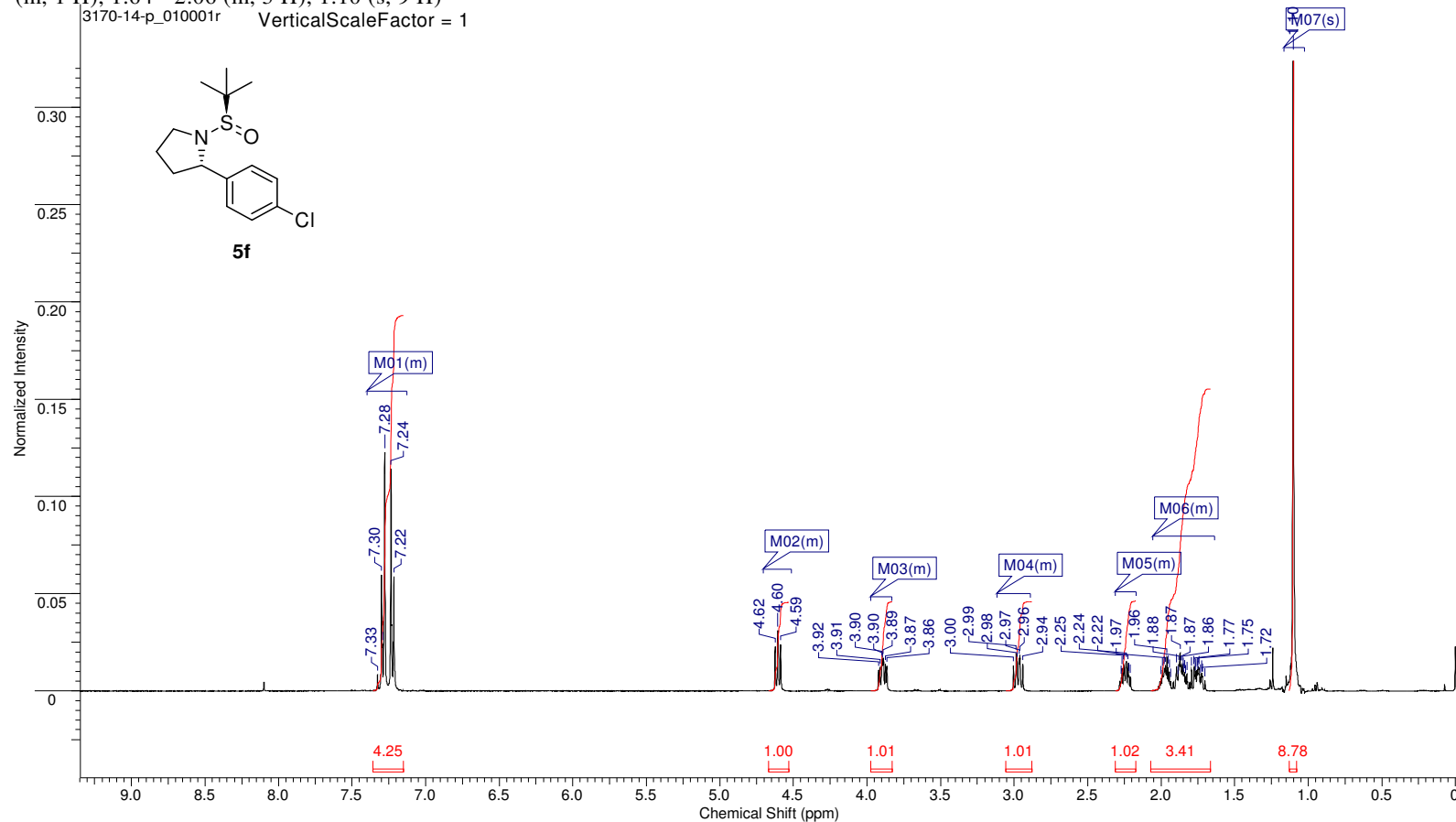
|                               |            |                          |                 |                               |              |
|-------------------------------|------------|--------------------------|-----------------|-------------------------------|--------------|
| <b>Acquisition Time (sec)</b> | 1.3664     | <b>Comment</b>           |                 | <b>Date</b>                   |              |
| <b>Date Stamp</b>             |            |                          |                 | <b>File Name</b>              |              |
| <b>Frequency (MHz)</b>        | 100.63     | <b>Nucleus</b>           | <sup>13</sup> C | <b>Number of Transients</b>   | 2048         |
| <b>Original Points Count</b>  | 32768      | <b>Owner</b>             | nmrslu          | <b>Points Count</b>           | 32768        |
| <b>Receiver Gain</b>          | 8192.00    | <b>SW(cyclical) (Hz)</b> | 23980.81        | <b>Origin</b>                 | spect        |
| <b>Spectrum Offset (Hz)</b>   | 10062.3271 | <b>Sweep Width (Hz)</b>  | 23980.08        | <b>Pulse Sequence</b>         | zgpg30       |
|                               |            |                          |                 | <b>Solvent</b>                | CHLOROFORM-d |
|                               |            |                          |                 | <b>Temperature (degree C)</b> | 27.000       |

3170-6-2\_013001r

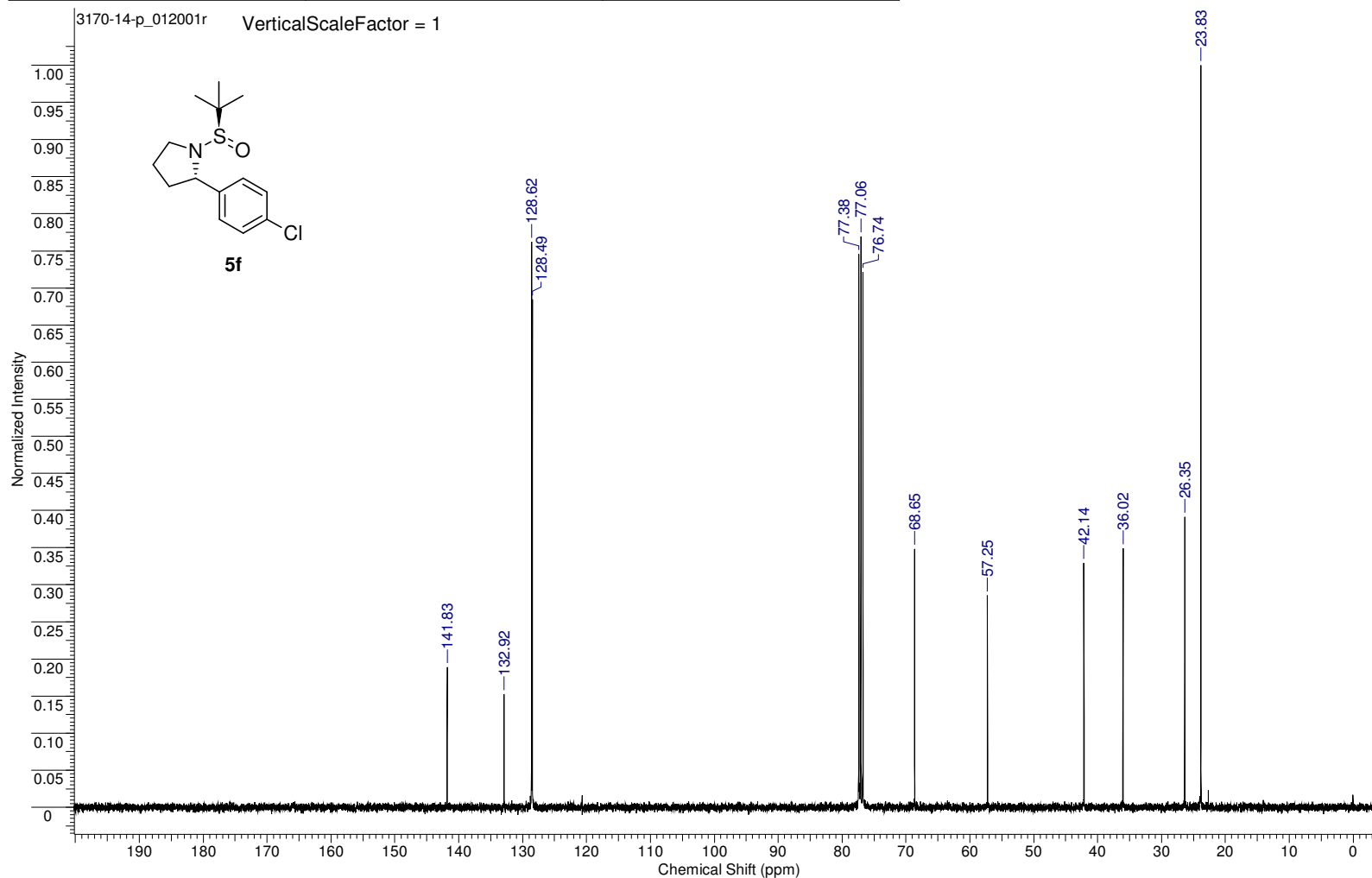


|                        |           |                        |              |
|------------------------|-----------|------------------------|--------------|
| Acquisition Time (sec) | 3.9584    | Comment                | Date         |
| Date Stamp             |           |                        | File Name    |
| Frequency (MHz)        | 400.19    | Nucleus                | 1H           |
| Original Points Count  | 32768     | Owner                  | nmsu         |
| Receiver Gain          | 203.20    | SW(cyclical) (Hz)      | 8278.15      |
| Spectrum Offset (Hz)   | 2463.3936 | Sweep Width (Hz)       | 8277.89      |
|                        |           | Solvent                | CHLOROFORM-d |
|                        |           | Temperature (degree C) | 27.000       |
|                        |           | Number of Transients   | 16           |
|                        |           | Origin                 | spect        |
|                        |           | Points Count           | 32768        |
|                        |           | Pulse Sequence         | zg30         |

<sup>1</sup>H NMR (400 MHz, CHLOROFORM-d)  $\delta$  ppm 7.13 - 7.40 (m, 4 H), 4.51 - 4.71 (m, 1 H), 3.83 - 3.97 (m, 1 H), 2.89 - 3.11 (m, 1 H), 2.17 - 2.31 (m, 1 H), 1.64 - 2.06 (m, 3 H), 1.10 (s, 9 H)

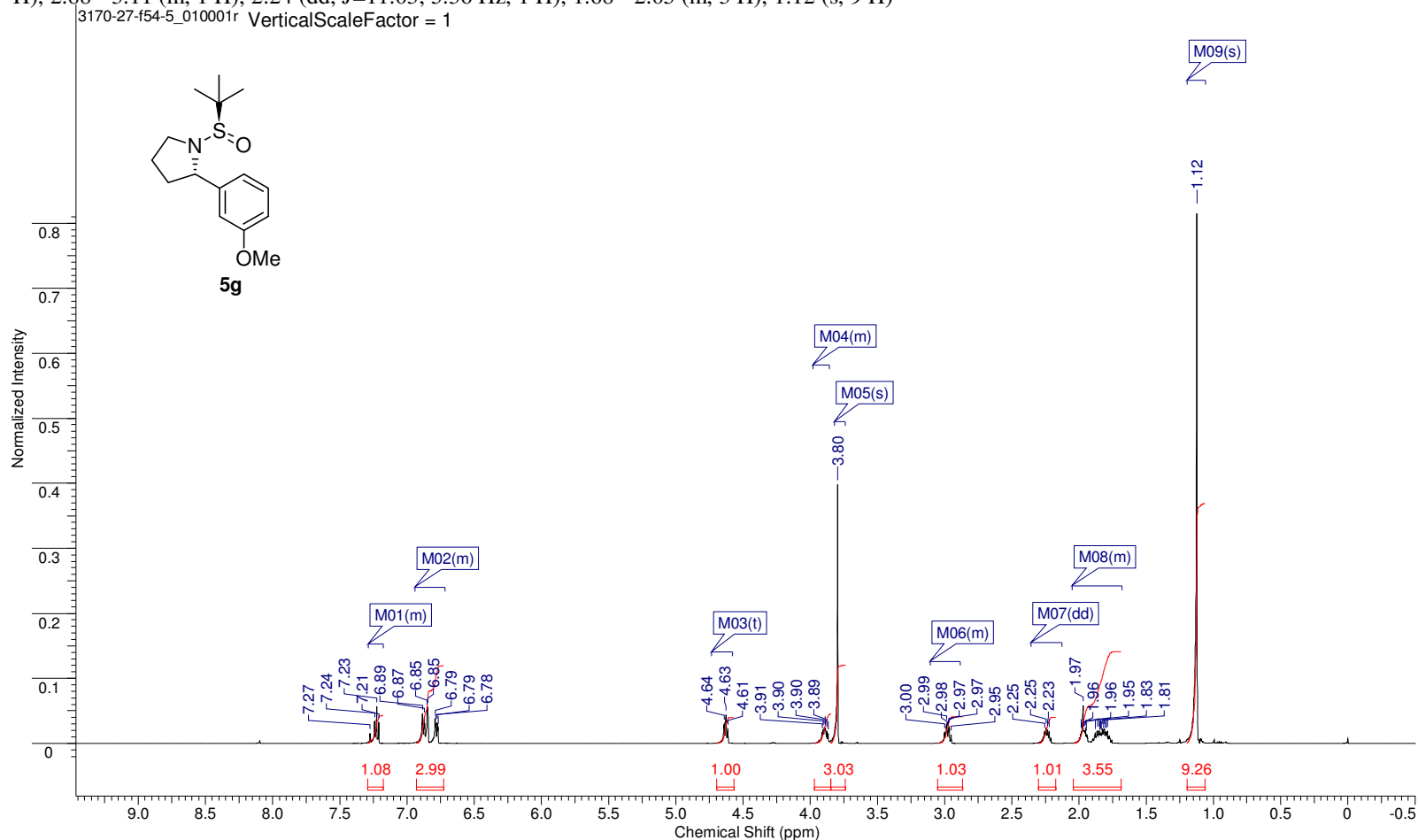


|                        |                      |                   |                 |                        |                                                                             |
|------------------------|----------------------|-------------------|-----------------|------------------------|-----------------------------------------------------------------------------|
| Acquisition Time (sec) | 1.3664               | Comment           | 3170-14-p       | Date                   | 20 Jun 2009 04:16:00                                                        |
| Date Stamp             | 20 Jun 2009 04:16:00 |                   |                 | File Name              | C:\Documents and Settings\leletra1\Desktop\paper10\Leleti\3170-14-p_012001r |
| Frequency (MHz)        | 100.63               | Nucleus           | <sup>13</sup> C | Number of Transients   | 2048                                                                        |
| Original Points Count  | 32768                | Owner             | nmrsu           | Points Count           | 32768                                                                       |
| Receiver Gain          | 14596.50             | SW(cyclical) (Hz) | 23980.81        | Solvent                | CHLOROFORM-d                                                                |
| Spectrum Offset (Hz)   | 10062.3271           | Sweep Width (Hz)  | 23980.08        | Temperature (degree C) | 27.000                                                                      |

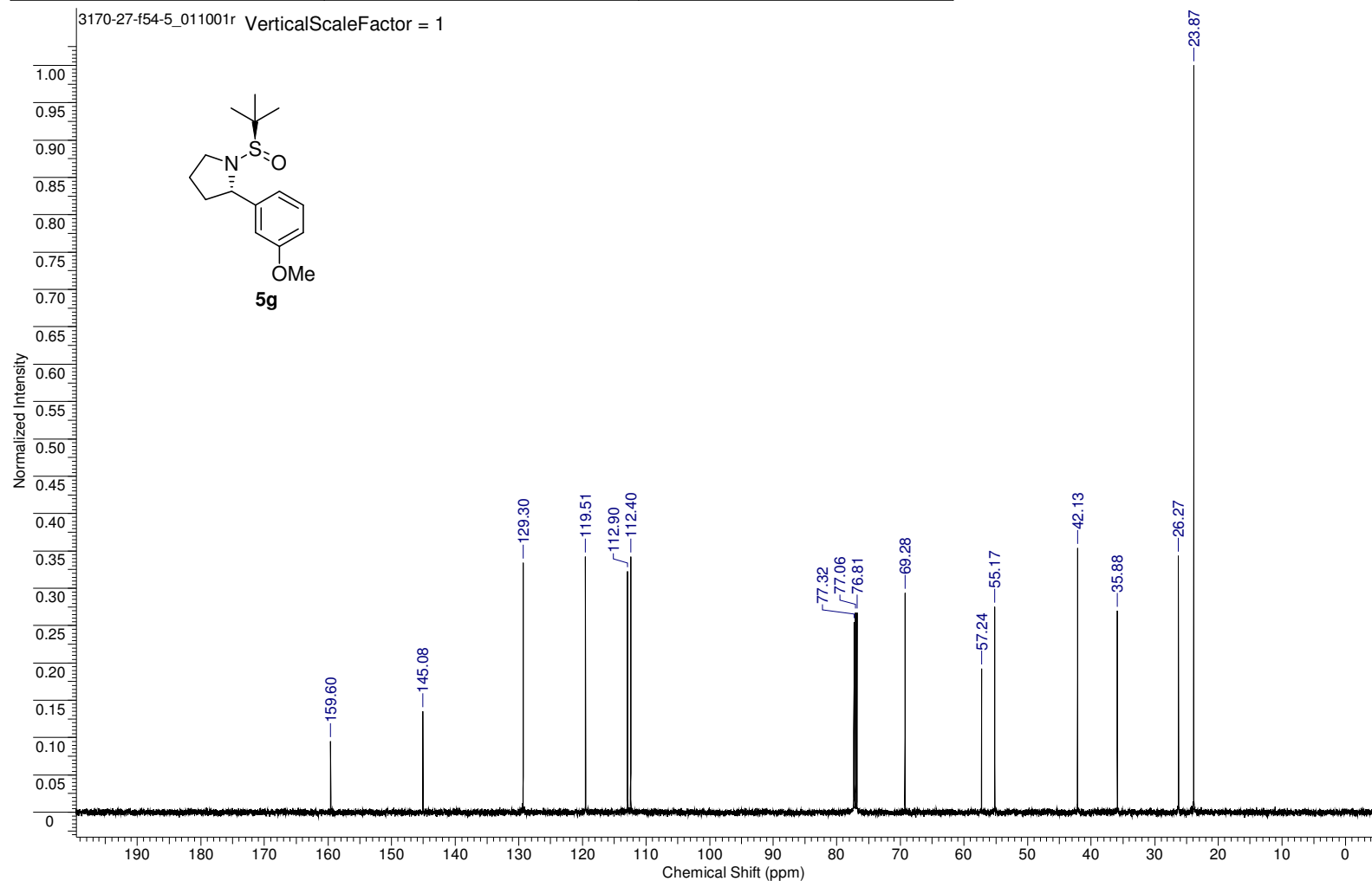


|                        |           |                   |          |                        |              |
|------------------------|-----------|-------------------|----------|------------------------|--------------|
| Acquisition Time (sec) | 3.1719    | Comment           |          | Date                   |              |
| Date Stamp             |           | File Name         |          |                        |              |
| Frequency (MHz)        | 500.63    | Nucleus           | 1H       | Number of Transients   | 16           |
| Original Points Count  | 32768     | Owner             | nmrsu    | Points Count           | 32768        |
| Receiver Gain          | 57.00     | SW(cyclical) (Hz) | 10330.58 | Solvent                | CHLOROFORM-d |
| Spectrum Offset (Hz)   | 3086.4653 | Sweep Width (Hz)  | 10330.26 | Temperature (degree C) | 27.000       |

<sup>1</sup>H NMR (501 MHz, CHLOROFORM-d)  $\delta$  ppm 7.18 - 7.29 (m, 1 H), 6.72 - 6.94 (m, 3 H), 4.63 (t,  $J=7.09$  Hz, 1 H), 3.86 - 3.98 (m, 1 H), 3.80 (s, 3 H), 2.88 - 3.11 (m, 1 H), 2.24 (dd,  $J=11.03, 5.36$  Hz, 1 H), 1.68 - 2.05 (m, 3 H), 1.12 (s, 9 H)

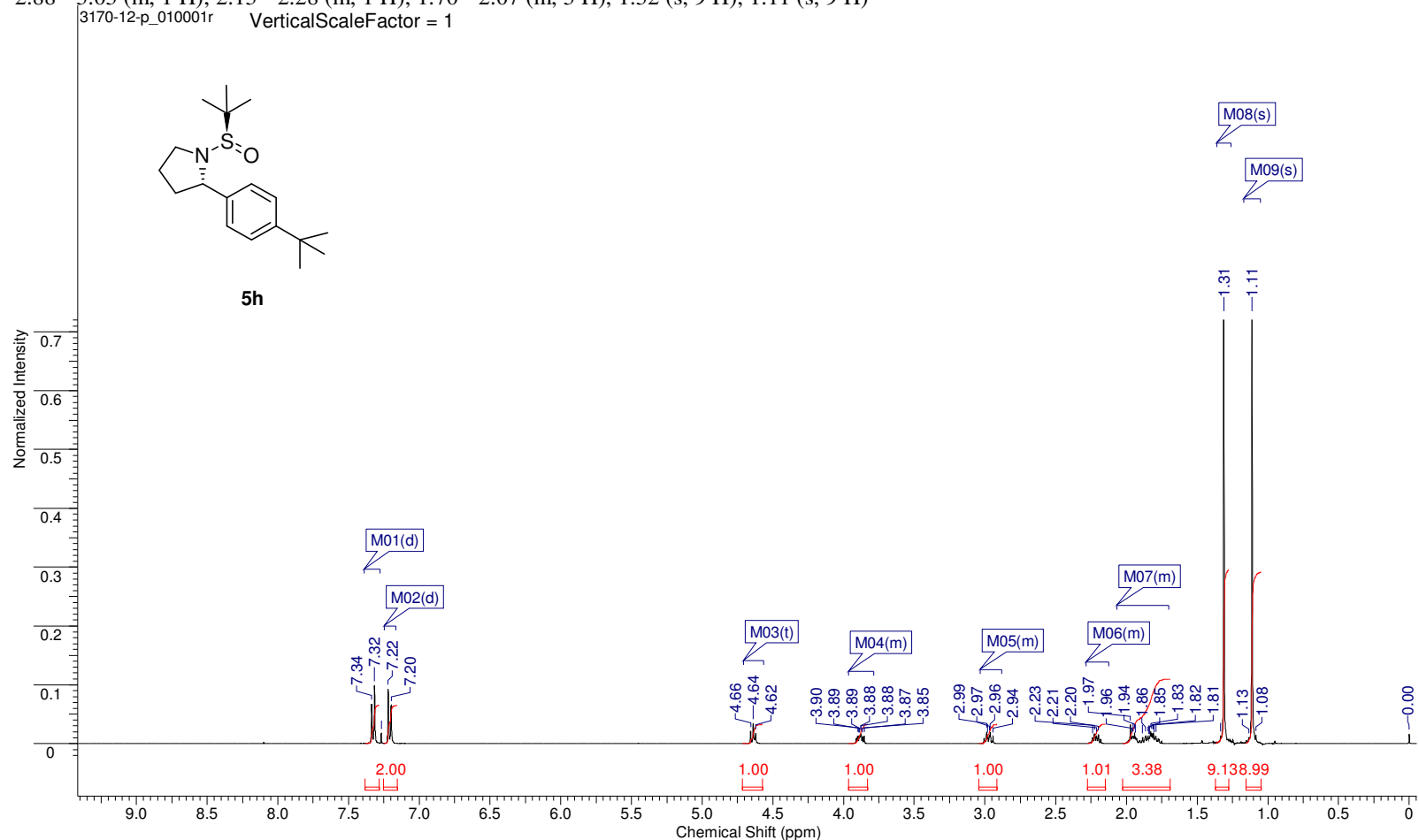


|                        |            |                   |                 |                        |              |
|------------------------|------------|-------------------|-----------------|------------------------|--------------|
| Acquisition Time (sec) | 1.0912     | Comment           |                 | Date                   |              |
| Date Stamp             |            | File Name         |                 |                        |              |
| Frequency (MHz)        | 125.88     | Nucleus           | <sup>13</sup> C | Number of Transients   | 256          |
| Original Points Count  | 32768      | Owner             | nmr su          | Points Count           | 32768        |
| Receiver Gain          | 13004.00   | SW(cyclical) (Hz) | 30030.03        | Solvent                | CHLOROFORM-d |
| Spectrum Offset (Hz)   | 12587.9785 | Sweep Width (Hz)  | 30029.11        | Temperature (degree C) | 27.000       |

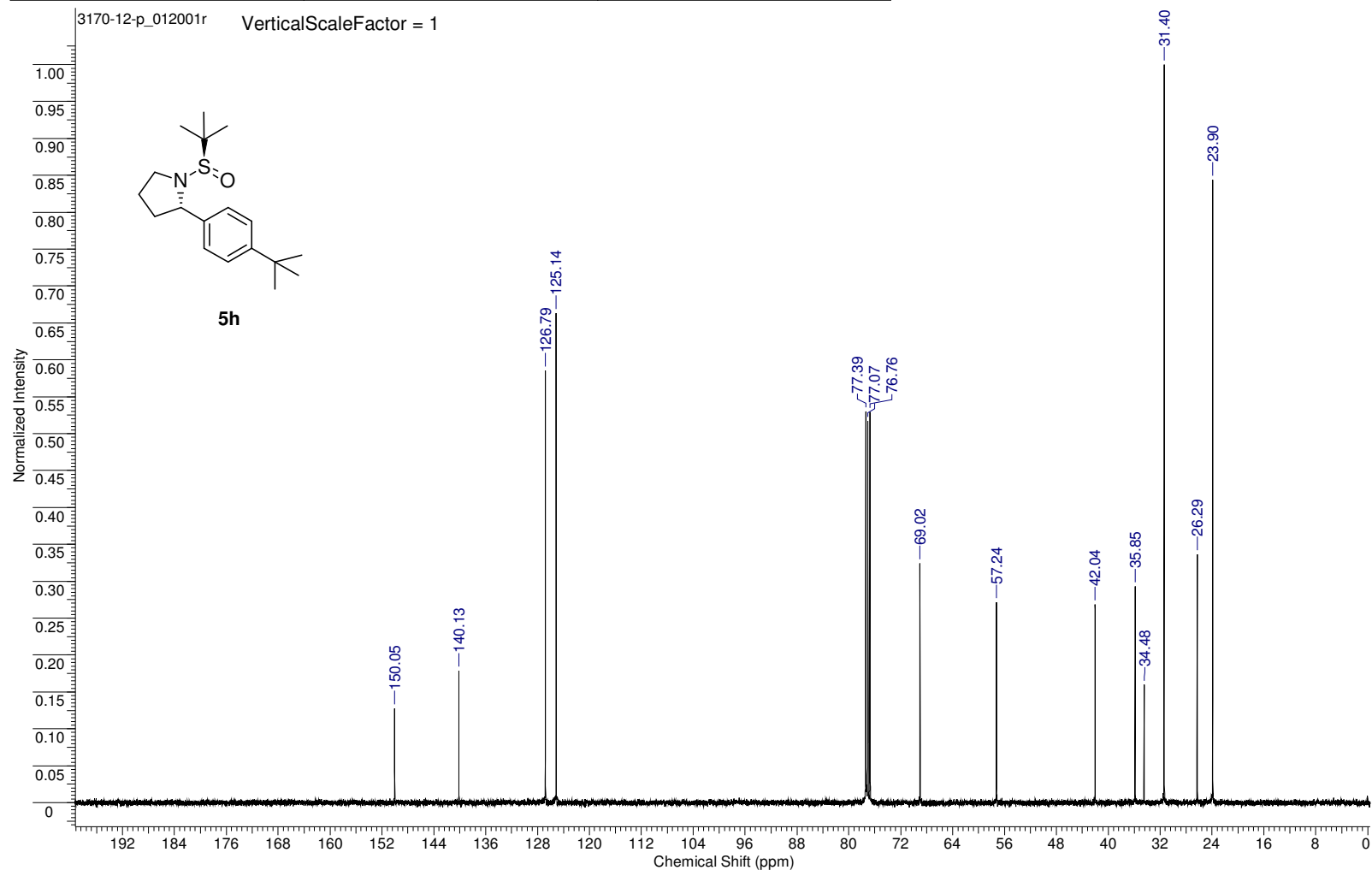


|                               |           |                          |                |                               |              |
|-------------------------------|-----------|--------------------------|----------------|-------------------------------|--------------|
| <b>Acquisition Time (sec)</b> | 3.9584    | <b>Comment</b>           |                | <b>Date</b>                   |              |
| <b>Date Stamp</b>             |           |                          |                | <b>File Name</b>              |              |
| <b>Frequency (MHz)</b>        | 400.19    | <b>Nucleus</b>           | <sup>1</sup> H | <b>Number of Transients</b>   | 16           |
| <b>Original Points Count</b>  | 32768     | <b>Owner</b>             | nmrsu          | <b>Points Count</b>           | 32768        |
| <b>Receiver Gain</b>          | 80.60     | <b>SW(cyclical) (Hz)</b> | 8278.15        | <b>Solvent</b>                | CHLOROFORM-d |
| <b>Spectrum Offset (Hz)</b>   | 2460.8809 | <b>Sweep Width (Hz)</b>  | 8277.89        | <b>Temperature (degree C)</b> | 27.000       |
|                               |           |                          |                | <b>Origin</b>                 | spect        |
|                               |           |                          |                | <b>Pulse Sequence</b>         | zg30         |

<sup>1</sup>H NMR (400 MHz, CHLOROFORM-d)  $\delta$  ppm 7.33 (d,  $J=8.34$  Hz, 2 H), 7.21 (d,  $J=8.34$  Hz, 2 H), 4.64 (t,  $J=6.95$  Hz, 1 H), 3.79 - 3.96 (m, 1 H), 2.88 - 3.03 (m, 1 H), 2.13 - 2.28 (m, 1 H), 1.70 - 2.07 (m, 3 H), 1.32 (s, 9 H), 1.11 (s, 9 H)

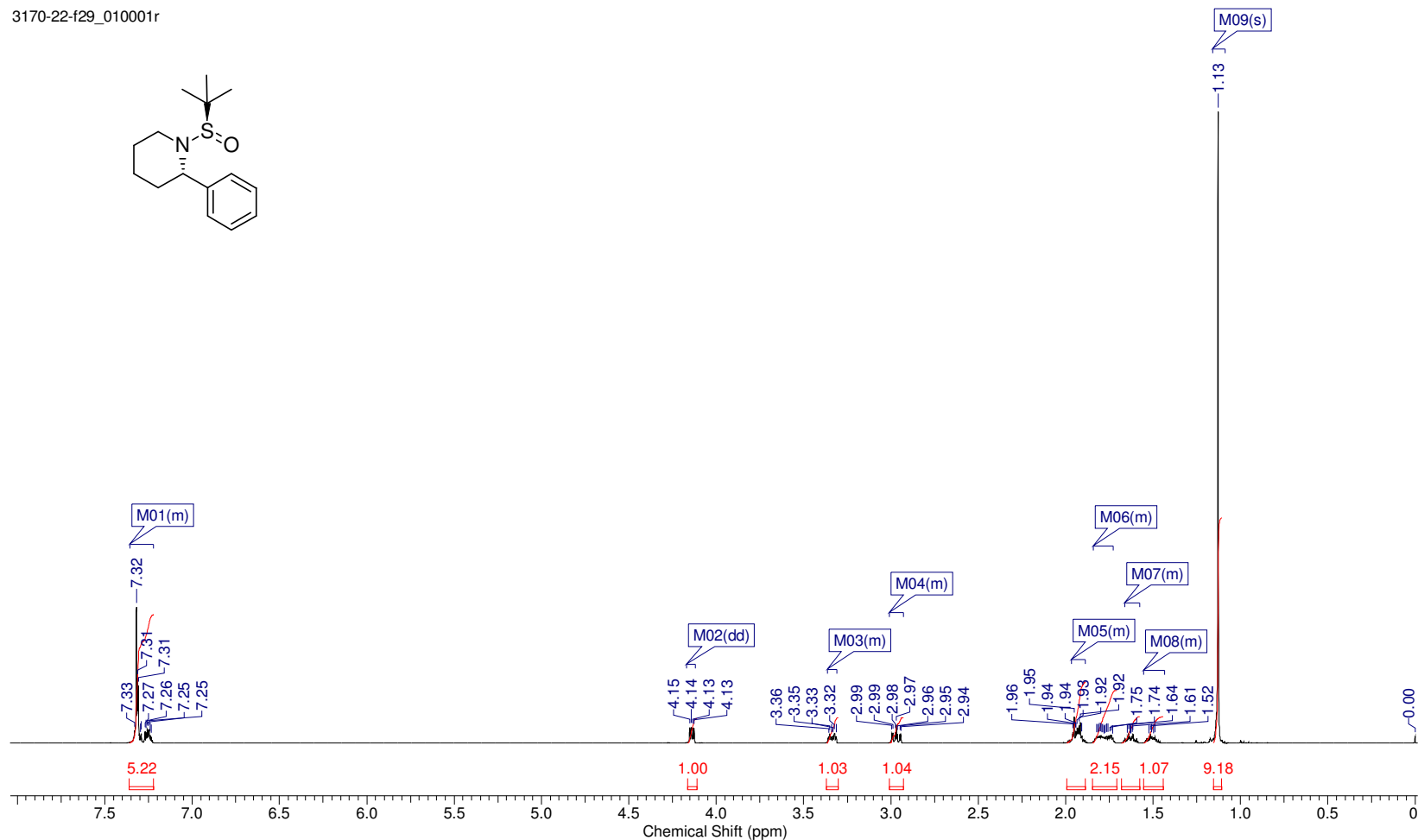


|                        |            |                        |              |
|------------------------|------------|------------------------|--------------|
| Acquisition Time (sec) | 1.3664     | Comment                | Date         |
| Date Stamp             |            |                        | File Name    |
| Frequency (MHz)        | 100.63     | Nucleus                | 13C          |
| Original Points Count  | 32768      | Owner                  | nmrsu        |
| Receiver Gain          | 8192.00    | SW(cyclical) (Hz)      | 23980.81     |
| Spectrum Offset (Hz)   | 10062.3271 | Sweep Width (Hz)       | 23980.08     |
|                        |            | Solvent                | CHLOROFORM-d |
|                        |            | Temperature (degree C) | 27.000       |



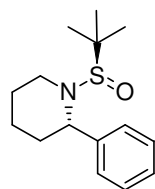
|                               |           |                          |          |                               |              |
|-------------------------------|-----------|--------------------------|----------|-------------------------------|--------------|
| <b>Acquisition Time (sec)</b> | 3.1719    | <b>Comment</b>           |          | <b>Date</b>                   |              |
| <b>Date Stamp</b>             |           | <b>File Name</b>         |          |                               |              |
| <b>Frequency (MHz)</b>        | 500.63    | <b>Nucleus</b>           | 1H       | <b>Number of Transients</b>   | 16           |
| <b>Original Points Count</b>  | 32768     | <b>Owner</b>             | nrmrsu   | <b>Points Count</b>           | 32768        |
| <b>Receiver Gain</b>          | 57.00     | <b>SW(cyclical) (Hz)</b> | 10330.58 | <b>Solvent</b>                | CHLOROFORM-d |
| <b>Spectrum Offset (Hz)</b>   | 3083.7163 | <b>Sweep Width (Hz)</b>  | 10330.26 | <b>Temperature (degree C)</b> | 27.000       |

3170-22-f29\_010001r



|                        |            |                   |                 |                        |              |
|------------------------|------------|-------------------|-----------------|------------------------|--------------|
| Acquisition Time (sec) | 1.0912     | Comment           |                 | Date                   |              |
| Date Stamp             |            | File Name         |                 |                        |              |
| Frequency (MHz)        | 125.88     | Nucleus           | <sup>13</sup> C | Number of Transients   | 256          |
| Original Points Count  | 32768      | Owner             | nmsu            | Points Count           | 32768        |
| Receiver Gain          | 8192.00    | SW(cyclical) (Hz) | 30030.03        | Solvent                | CHLOROFORM-d |
| Spectrum Offset (Hz)   | 12587.9785 | Sweep Width (Hz)  | 30029.11        | Temperature (degree C) | 27.000       |

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6a

