

Sustainable Protocol for the Synthesis of 2',3'-Dideoxynucleoside and 2',3'-Didehydro-2',3'-dideoxynucleoside Derivatives

Virginia Martín-Nieves,¹ Yogesh S. Sanghvi,² Susana Fernández,^{1,*} and Miguel Ferrero^{1,*}

¹*Departamento de Química Orgánica e Inorgánica, Universidad de Oviedo, Avenida Julián de Clavería 8, 33006-Oviedo (Asturias), Spain*

²*Rasayan Inc., 2802 Crystal Ridge Road, Encinitas, CA 92024-6615, USA*

S.F.: fernandezgsusana@uniovi.es; M.F.: mferrero@uniovi.es

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5'-O-Levulinyl- β -D-uridine (**2a**). $^1\text{H-NMR}$ (300.13 MHz, CDCl_3): δ 2.18 (s, 3H, *Me*-Lev), 2.58 (t, 2H, CH_2 -Lev, $J = 6.2$ Hz), 2.78 (t, 2H, CH_2 -Lev, $J = 6.0$ Hz), 4.19 (m, 1H, H_3), 4.27 (m, 2H, $\text{H}_2 + \text{H}_4$), 4.36 (m, 2H, H_5), 5.78 (d, 1H, H_5 , $J = 8.1$ Hz), 5.82 (d, 1H, H_1 , $J = 3.6$ Hz), 7.66 (d, 1H, H_6 , $J = 8.1$ Hz) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, CDCl_3): δ 28.0 (CH_2 -Lev), 29.9 (CH_3 -Lev), 38.0 (CH_2 -Lev), 63.6 (C_5'), 70.3 (C_3'), 75.0 (C_2'), 82.3 (C_4'), 90.6 (C_1'), 102.7 (C_5), 140.5 (C_6), 151.4 (C_2), 164.2 (C_4), 172.8 (CO-Lev), 207.6 (CO-Lev) ppm.

5'-O-Levulinyl- β -D-5-methyluridine (**2b**). $^1\text{H-NMR}$ (300.13 MHz, CDCl_3): δ 1.88 (s, 3H, *Me*), 2.19 (s, 3H, *Me*-Lev), 2.59 (t, 2H, CH_2 -Lev, $J = 6.3$), 2.80 (t, 2H, CH_2 -Lev, $J = 6.3$), 4.19 (m, 1H, H_3), 4.23-4.37 (several m, 3H, $\text{H}_2 + \text{H}_4 + \text{H}_5$), 4.45 (dd, 1H, H_5 , $J = 12.3, 3.7$ Hz), 5.84 (d, 1H, H_1 , $J = 3.7$ Hz), 7.41 (s, 1H, H_6) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, $\text{MeOH-}d_4$): δ 12.5 (CH_3), 28.9 (CH_2 -Lev), 29.6 (CH_3 -Lev), 38.6 (CH_2 -Lev), 64.8 (C_5'), 71.3 (C_3'), 74.9 (C_2'), 83.1 (C_4'), 91.1 (C_1'), 111.8 (C_5), 138.0 (C_6), 152.5 (C_2), 166.3 (C_4), 174.2 (CO-Lev), 209.5 (CO-Lev) ppm.

5'-O-Levulinyl- β -D-cytidine (**2c**). $^1\text{H-NMR}$ (300.13 MHz, $\text{MeOH-}d_4$): δ 2.17 (s, 3H, *Me*-Lev), 2.59 (t, 2H, CH_2 -Lev, $J = 5.9$ Hz), 2.84 (t, 2H, CH_2 -Lev, $J = 6.8$ Hz), 4.08 (dd, 1H, H_3 , $J = 6.3, 5.3$ Hz), 4.16 (m, 2H, $\text{H}_2 + \text{H}_4$), 4.33 (dd, 1H, H_5 , $J = 12.3, 4.1$ Hz), 4.40 (dd, 1H, H_5 , $J = 12.4, 2.9$ Hz), 5.84 (d, 1H, H_5 , $J = 3.2$ Hz), 5.95 (d, 1H, H_1 , $J = 7.5$ Hz), 7.81 (d, 1H, H_6 , $J = 7.5$ Hz) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, $\text{MeOH-}d_4$): δ 28.8 (CH_2 -Lev), 29.6 (CH_3 -Lev), 38.6 (CH_2 -Lev), 64.5 (C_5'), 71.0 (C_3'), 75.9 (C_2'), 82.7 (C_4'), 92.6 (C_1'), 96.2 (C_5), 142.5 (C_6), 158.2 (C_2), 167.6 (C_4), 174.2 (CO-Lev), 209.5 (CO-Lev) ppm.

*N*⁴-Benzoyl-5'-O-levulinyl- β -D-cytidine (**2d**). $^1\text{H-NMR}$ (300.13 MHz, $\text{DMSO-}d_6$): δ 2.12 (s, 3H, *Me*-Lev), 2.54 (t, 2H, CH_2 -Lev, $J = 6.3$ Hz), 2.75 (t, 2H, CH_2 -Lev, $J = 6.3$ Hz), 3.97 (m, 1H, H_4), 4.09 (m, 2H, $\text{H}_2 + \text{H}_3$), 4.25 (dd, 1H, H_5 , $J = 12.2, 5.1$ Hz), 4.35 (dd, 1H, H_5 , $J = 12.1, 2.3$ Hz), 5.82 (d, 1H, H_1 , $J = 2.7$ Hz), 7.38 (d, 1H, H_5 , $J = 7.5$ Hz), 7.51 (m, 2H, H_{arom}), 7.63 (m, 1H, H_{arom}), 8.01 (m, 2H, H_{arom}), 8.16 (d, 1H, H_6 , $J = 7.5$ Hz) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, $\text{DMSO-}d_6$): δ 28.0 (CH_2 -Lev), 30.0 (CH_3 -Lev), 37.9 (CH_2 -Lev), 63.9 (C_5'), 69.7 (C_4'), 74.3 (C_2'), 81.3 (C_3'), 91.4 (C_1'), 96.9 (C_5), 128.9 (4CH_{arom}), 133.2, 133.6 ($\text{CH}_{\text{arom}} + \text{C}_{\text{arom}}$), 145.5 (C_6), 154.9 (C_2), 163.5 (C_4), 168.0 ($\text{C}=\text{O}$), 172.2 (CO-Lev), 207.4 (CO-Lev) ppm.

5'-O-Levulinyl- β -D-adenosine (**2e**). $^1\text{H-NMR}$ (300.13 MHz, $\text{MeOH-}d_4$): δ 2.14 (s, 3H, *Me*-Lev), 2.56 (t, 2H, CH_2 -Lev, $J = 6.4$ Hz), 2.78 (m, 2H, CH_2 -Lev, $J = 6.4$ Hz), 4.25 (q, 1H, H_4 , $J = 4.7$ Hz), 4.37 (m, 3H, $\text{H}_3 + \text{H}_5$), 4.74 (t, 2H, H_2 , $J = 4.9$ Hz), 6.03 (d, 1H, H_1 , $J = 4.5$ Hz), 8.21 (s, 1H, H_2), 8.31 (s, 1H, H_8) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, $\text{MeOH-}d_4$): δ 28.8 (CH_2 -Lev), 29.6 (CH_3 -Lev), 38.6 (CH_2 -Lev), 64.8 (C_5'), 71.8 (C_3'), 75.2 (C_2'), 83.5 (C_4'), 90.2 (C_1'), 120.5 (C_5 , cross peak with H_8 in HMBC), 141.2 (C_8), 150.6 (C_4), 153.9 (C_2), 157.3 (C_6), 174.2 (CO-Lev), 209.5 (CO-Lev) ppm.

5'-O-Levulinyl- β -D-inosine (**2f**). $^1\text{H-NMR}$ (300.13 MHz, $\text{MeOH-}d_4$): δ 2.15 (s, 3H, *Me*-Lev), 2.57 (t, 2H, CH_2 -Lev, $J = 6.4$ Hz), 2.80 (t, 2H, CH_2 -Lev, $J = 6.4$ Hz), 4.25 (q, 1H, H_4 , $J = 4.3$ Hz), 4.37 (m, 3H, $\text{H}_3 + \text{H}_5$), 4.70 (t, 2H, H_2 , $J = 4.8$ Hz), 6.03 (d, 1H, H_1 , $J = 4.6$ Hz), 8.07 (s, 1H, H_2), 8.27 (s, 1H, H_8) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, $\text{MeOH-}d_4$): δ 28.8 (CH_2 -Lev), 29.6 (CH_3 -Lev), 38.6 (CH_2 -Lev), 64.8 (C_5'), 71.7 (C_3'), 75.5 (C_2'), 83.7 (C_4'), 90.4 (C_1'), 125.9 (C_5), 140.7 (C_8), 146.8 (C_2), 149.9 (C_4 , cross peak with H_1 in HMBC), 158.9 (C_6), 174.2 (CO-Lev), 209.5 (CO-Lev) ppm.

5'-O-(*tert*-Butyldimethylsilyl)- β -D-uridine (**5a**). $^1\text{H-NMR}$ (300.13 MHz, CDCl_3): δ 0.10 (s, 6H, Si-*Me*), 0.91 (s, 9H, Si-*t*-Bu), 3.83 (dd, 1H, H_5 , $J = 11.7, 1.5$ Hz), 4.01 (dd, 1H, H_5 , $J = 11.8, 1.8$ Hz), 4.12 (m, 1H, H_4), 4.23 (m, 2H, $\text{H}_2 + \text{H}_3$), 5.64 (d, 1H, H_5 , $J = 8.1$ Hz), 5.90 (d, 1H, H_1 , $J = 2.2$ Hz), 8.05 (d, 1H, H_6 , $J = 8.1$ Hz) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, CDCl_3): δ -5.4 (Si- CH_3), 18.6 (Si- CMe_3), 26.1 (tBu-CH_3), 62.0 (C_5'), 69.5 (C_2'), 75.8 (C_3'), 85.1 (C_4'), 90.3 (C_1'), 102.3 (C_5), 140.6 (C_6), 151.5 (C_2), 164.1 (C_4) ppm.

5'-O-(*tert*-Butyldimethylsilyl)- β -D-5-methyluridine (**5b**). $^1\text{H-NMR}$ (300.13 MHz, $\text{MeOH-}d_4$): δ 0.15 (s, 3H, Si-*Me*), 0.16 (s, 3H, Si-*Me*), 0.97 (s, 9H, Si-*t*-Bu), 1.88 (d, 3H, *Me*, $J = 1.1$ Hz), 3.85 (dd, 1H, H_5 , $J = 11.6, 2.7$ Hz), 3.94 (dd, 1H, H_5 , $J = 11.6, 2.3$ Hz), 4.02 (q, 1H, H_4 , $J = 2.6$ Hz), 4.13 (m, 2H, $\text{H}_2 + \text{H}_3$), 5.95 (d, 1H, H_1 , $J = 5.0$ Hz), 7.58 (d, 1H, H_6 , $J = 1.1$ Hz) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, $\text{MeOH-}d_4$): δ -5.2 (Si- CH_3), 12.6 (CH_3), 19.4 (Si- CMe_3), 26.5 (tBu-CH_3), 64.3 (C_5'), 71.7 (C_2'), 75.7 (C_3'), 86.4 (C_4'), 89.6 (C_1'), 111.6 (C_5), 137.4 (C_6), 152.6 (C_2), 166.2 (C_4) ppm.

5'-O-(*tert*-Butyldimethylsilyl)- β -d-cytidine (**5c**). $^1\text{H-NMR}$ (300.13 MHz, MeOH- d_4): δ 0.15 (s, 6H, Si-Me), 0.96 (s, 9H, Si-*t*Bu), 3.87 (dd, 1H, H_{5'}, J = 12.0, 2.1 Hz), 4.02-4.16 (several m, 4H, H_{2'} + H_{3'} + H_{4'} + H_{5'}), 5.85 (d, 1H, H₅, J = 7.6 Hz), 5.88 (d, 1H, H_{1'}, J = 2.7 Hz), 8.11 (d, 1H, H₆, J = 7.5 Hz) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, MeOH- d_4): δ -5.39 (Si-CH₃), -5.36 (Si-CH₃), 19.3 (SiCMe₃), 26.5 (^tBu-CH₃), 63.0 (C_{5'}), 70.1 (C_{2'}), 76.8 (C_{3'}), 85.3 (C_{4'}), 91.8 (C_{1'}), 95.71 (C₅), 142.4 (C₆), 158.4 (C₂), 167.6 (C₄) ppm.

N⁴-Benzoyl-5'-O-(*tert*-butyldimethylsilyl)- β -d-cytidine (**5d**). $^1\text{H-NMR}$ (300.13 MHz, MeOH- d_4): δ 0.17 (s, 3H, Si-Me), 0.19 (s, 3H, Si-Me), 0.99 (s, 9H, Si-*t*Bu), 3.91 (dd, 1H, H_{5'}, J = 12.2, 2.1 Hz), 4.15 (several m, 4H, H_{2'} + H_{3'} + H_{4'} + H_{5'}), 5.90 (d, 1H, H_{1'}, J = 1.5 Hz), 7.58 (m, 4H, H₅ + H_{arom}), 7.98 (m, 2H, H_{arom}), 8.64 (d, 1H, H₆, J = 7.5 Hz) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, MeOH- d_4): δ -5.3 (Si-CH₃), 19.4 (SiCMe₃), 26.5 (^tBu-CH₃), 62.6 (C_{5'}), 69.5 (C_{2'}), 76.8 (C_{3'}), 85.5 (C_{4'}), 92.9 (C_{1'}), 98.1 (C₅), 129.2 (CH_{arom}), 129.8 (CH_{arom}), 134.1 (CH_{arom}), 134.7 (C_{arom}), 146.3 (C₆), 157.9 (C₂), 164.8 (C₄), 169.2 (C=O) ppm.

5'-O-(*tert*-Butyldimethylsilyl)- β -d-adenosine (**5e**). $^1\text{H-NMR}$ (300.13 MHz, MeOH- d_4): δ 0.11 (s, 6H, Si-Me), 0.92 (s, 9H, Si-*t*Bu), 3.87 (dd, 1H, H_{5'}, J = 11.6, 3.0 Hz), 4.01 (dd, 1H, H_{5'}, J = 11.6, 3.0 Hz), 4.13 (m, 1H, H_{4'}), 4.36 (t, 1H, H_{3'}, J = 5.0 Hz), 4.56 (t, 1H, H_{2'}, J = 4.6 Hz), 6.05 (d, 1H, H_{1'}, J = 4.2 Hz), 8.20 (s, 1H, H₂), 8.38 (s, 1H, H₈) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, MeOH- d_4): δ -5.33 (Si-CH₃), -5.31 (Si-CH₃), 19.3 (SiCMe₃), 26.5 (^tBu-CH₃), 63.8 (C_{5'}), 71.3 (C_{3'}), 76.3 (C_{2'}), 86.3 (C_{4'}), 90.1 (C_{1'}), 120.4 (C₅), 140.7 (C₈), 150.5 (C₄), 153.9 (C₂), 157.3 (C₆) ppm.

5'-O-(*tert*-Butyldimethylsilyl)- β -d-inosine (**5f**). $^1\text{H-NMR}$ (300.13 MHz, MeOH- d_4): δ 0.10 (s, 6H, Si-Me), 0.91 (s, 9H, Si-*t*Bu), 3.86 (dd, 1H, H_{5'}, J = 11.6, 3.1 Hz), 3.99 (dd, 1H, H_{5'}, J = 11.6, 3.0 Hz), 4.14 (m, 1H, H_{4'}), 4.36 (t, 1H, H_{3'}, J = 4.8 Hz), 4.56 (t, 1H, H_{2'}, J = 4.8 Hz), 6.07 (d, 1H, H_{1'}, J = 4.5 Hz), 8.07 (s, 1H, H₂), 8.31 (s, 1H, H₈) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, MeOH- d_4): δ -5.33 (Si-CH₃), -5.29 (Si-CH₃), 19.3 (SiCMe₃), 26.5 (^tBu-CH₃), 63.9 (C_{5'}), 71.5 (C_{3'}), 76.6 (C_{2'}), 86.6 (C_{4'}), 90.0 (C_{1'}), 125.6 (C₅), 140.1 (C₈), 146.8 (C₂), 149.9 (C₄), 158.9 (C₆) ppm.

5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -d-uridine (**6a**). $^1\text{H-NMR}$ (300.13 MHz, CDCl₃): δ 0.15 (s, 3H, Si-Me), 0.17 (s, 3H, Si-Me), 0.95 (s, 9H, Si-*t*Bu), 1.35 (t, 3H, SCH₂-Me, J = 7.4 Hz), 1.37 (t, 3H, SCH₂-Me, J = 7.4 Hz), 3.13 (m, 4H, S-CH₂), 3.92 (dd, 1H, H_{5'}, J = 11.4, 1.7 Hz), 4.03 (dd, 1H, H_{5'}, J = 11.4, 1.5 Hz), 4.44 (m, 1H, H_{4'}), 5.75 (d, 1H, H₅, J = 8.2 Hz), 6.07 (dd, 1H, H_{2'}, J = 7.4, 5.7 Hz), 6.22 (dd, 1H, H_{3'}, J = 5.6, 1.1 Hz), 6.56 (d, 1H, H_{1'}, J = 7.4 Hz), 7.87 (d, 1H, H₆, J = 8.2 Hz), 9.09 (br s, 1H, NH) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, CDCl₃): δ -5.5 (Si-CH₃), -5.2 (Si-CH₃), 13.3 (SCH₂-CH₃), 13.5 (SCH₂-CH₃), 18.5 (SiCMe₃), 26.1 (^tBu-CH₃), 30.8 (S-CH₂), 63.5 (C_{5'}), 78.9 (C_{3'}), 79.6 (C_{2'}), 84.6 (C_{4'}), 85.4 (C_{1'}), 103.6 (C₅), 139.7 (C₆), 150.4 (C₂), 163.0 (C₄), 213.7 (C=S), 214.1 (C=S) ppm.

5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -d-5-methyluridine (**6b**). $^1\text{H-NMR}$ (300.13 MHz, CDCl₃): δ 0.19 (s, 6H, Si-Me), 0.98 (s, 9H, Si-*t*Bu), 1.35 (t, 3H, SCH₂-Me, J = 7.4 Hz), 1.37 (t, 3H, SCH₂-Me, J = 7.4 Hz), 1.94 (d, 3H, Me, J = 1.1 Hz), 3.14 (m, 4H, S-CH₂), 3.93 (dd, 1H, H_{5'}, J = 11.4, 1.7 Hz), 4.07 (dd, 1H, H_{5'}, J = 11.4, 1.7 Hz), 4.42 (m, 1H, H_{4'}), 6.03 (dd, 1H, H_{2'}, J = 7.8, 5.6 Hz), 6.22 (dd, 1H, H_{3'}, J = 5.6, 1.0 Hz), 6.56 (d, 1H, H_{1'}, J = 7.9 Hz), 7.54 (d, 1H, H₆, J = 1.2 Hz), 8.16 (br s, 1H, NH) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, CDCl₃): δ -5.3 (Si-CH₃), -4.9 (Si-CH₃), 12.6 (CH₃), 13.4 (SCH₂-CH₃), 13.5 (SCH₂-CH₃), 18.6 (SiCMe₃), 26.2 (^tBu-CH₃), 30.79 (S-CH₂), 30.83 (S-CH₂), 63.5 (C_{5'}), 78.7 (C_{3'}), 79.1 (C_{2'}), 84.4 (C_{4'}), 84.7 (C_{1'}), 112.2 (C₅), 134.9 (C₆), 150.5 (C₂), 163.5 (C₄), 213.7 (C=S), 214.2 (C=S) ppm.

5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -d-cytidine (**6c**). $^1\text{H-NMR}$ (300.13 MHz, CDCl₃): δ 0.14 (s, 3H, Si-Me), 0.15 (s, 3H, Si-Me), 0.94 (s, 9H, Si-*t*Bu), 1.33 (t, 3H, SCH₂-Me, J = 6.1 Hz), 1.35 (t, 3H, SCH₂-Me, J = 6.1 Hz), 3.13 (m, 4H, S-CH₂), 3.92 (dd, 1H, H_{5'}, J = 11.3, 1.8 Hz), 4.01 (dd, 1H, H_{5'}, J = 11.3, 1.7 Hz), 4.41 (m, 1H, H_{4'}), 5.76 (d, 1H, H₅, J = 7.4 Hz), 6.04 (dd, 1H, H_{2'}, J = 7.0, 5.6 Hz), 6.24 (dd, 1H, H_{3'}, J = 5.5, 2.0 Hz), 6.67 (d, 1H, H_{1'}, J = 7.0 Hz), 7.84 (d, 1H, H₆, J = 7.4 Hz) ppm. $^{13}\text{C-NMR}$ (75.5 MHz, CDCl₃): δ -5.4 (Si-CH₃), -5.2 (Si-CH₃), 13.4 (SCH₂-CH₃), 13.6 (SCH₂-CH₃), 18.5 (SiCMe₃), 26.2 (^tBu-CH₃), 30.66 (S-CH₂), 30.71 (S-CH₂), 63.4 (C_{5'}), 78.8 (C_{3'}), 80.4 (C_{2'}), 83.9 (C_{4'}), 86.1 (C_{1'}), 95.6 (C₅), 141.3 (C₆), 155.8 (C₂), 165.7 (C₄), 213.7 (C=S), 214.1 (C=S) ppm.

N⁴-Benzoyl-5'-O-(*tert*-butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -d-cytidine (**6d**). $^1\text{H-NMR}$ (300.13 MHz, CDCl₃): δ 0.18 (s, 6H, Si-Me), 0.97 (s, 9H, Si-*t*Bu), 1.34 (t, 3H, SCH₂-Me, J = 6.1 Hz), 1.37 (t, 3H,

SCH₂-Me, *J* = 6.1 Hz), 3.14 (m, 4H, S-CH₂), 3.98 (dd, 1H, H_{5'}, *J* = 11.5, 1.8 Hz), 4.05 (dd, 1H, H_{5'}, *J* = 11.5, 1.6 Hz), 4.49 (m, 1H, H_{4'}), 6.15 (dd, 1H, H_{2'}, *J* = 6.8, 5.6 Hz), 6.27 (dd, 1H, H_{3'}, *J* = 5.5, 1.8 Hz), 6.74 (d, 1H, H_{1'}, *J* = 6.9 Hz), 7.50 (m, 3H, H₅ + H_{arom}), 7.61 (m, 1H, H_{arom}), 7.91 (m, 2H, H_{arom}), 8.30 (d, 1H, H₆, *J* = 7.6 Hz), 8.69 (br s, 1H, NH) ppm. ¹³C-NMR (75.5 MHz, CDCl₃): δ -5.4 (Si-CH₃), -5.2 (Si-CH₃), 13.3 (SCH₂-CH₃), 13.5 (SCH₂-CH₃), 18.5 (SiCMe₃), 26.1 (^tBu-CH₃), 30.65 (S-CH₂), 30.74 (S-CH₂), 63.2 (C_{5'}), 78.8 (C_{3'}), 80.7 (C_{2'}), 84.6 (C_{4'}), 86.5 (C_{1'}), 97.8 (C₅), 127.8 (CH_{arom}), 129.1 (CH_{arom}), 133.2 (C_{arom}), 133.3 (CH_{arom}), 144.4 (C₆), 154.6 (C₂), 162.5 (C₄), 167.1 (C=O), 213.6 (C=S), 214.0 (C=S) ppm.

5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]-β-d-adenosine (**6e**). ¹H-NMR (300.13 MHz, CDCl₃): δ 0.16 (s, 6H, Si-Me), 0.95 (s, 9H, Si-^tBu), 1.29 (t, 3H, SCH₂-Me, *J* = 7.4 Hz), 1.37 (t, 3H, SCH₂-Me, *J* = 7.4 Hz), 3.07 (q, 2H, S-CH₂, *J* = 7.4 Hz), 3.17 (q, 2H, S-CH₂, *J* = 7.3 Hz), 3.95 (dd, 1H, H_{5'}, *J* = 11.4, 2.1 Hz), 4.05 (dd, 1H, H_{5'}, *J* = 11.3, 2.1 Hz), 4.52 (m, 1H, H_{4'}), 6.14 (br s, 2H, NH₂), 6.41 (dd, 1H, H_{3'}, *J* = 5.4, 1.9 Hz), 6.48 (dd, 1H, H_{2'}, *J* = 6.8, 5.5 Hz), 6.60 (d, 1H, H_{1'}, *J* = 6.9 Hz), 8.22 (s, 1H, H₈), 8.35 (s, 1H, H₂) ppm. ¹³C-NMR (75.5 MHz, CDCl₃): δ -5.3 (Si-CH₃), -5.1 (Si-CH₃), 13.3 (SCH₂-CH₃), 18.6 (SiCMe₃), 26.2 (^tBu-CH₃), 30.8 (S-CH₂), 63.4 (C_{5'}), 78.8 (C_{3'}), 80.7 (C_{2'}), 84.7 (C_{1'} + C_{4'}), 119.6 (C₅), 138.5 (C₈), 150.3 (C₄), 153.4 (C₂), 155.7 (C₆), 213.6 (C=S), 214.0 (C=S) ppm.

5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]-β-d-inosine (**6f**). ¹H-NMR (300.13 MHz, CDCl₃): δ 0.17 (s, 6H, Si-Me), 0.96 (s, 9H, Si-^tBu), 1.31 (t, 3H, SCH₂-Me, *J* = 7.4 Hz), 1.39 (t, 3H, SCH₂-Me, *J* = 7.4 Hz), 3.09 (q, 2H, S-CH₂, *J* = 7.4 Hz), 3.18 (q, 2H, S-CH₂, *J* = 7.4 Hz), 3.97 (dd, 1H, H_{5'}, *J* = 11.4, 2.0 Hz), 4.06 (dd, 1H, H_{5'}, *J* = 11.4, 2.0 Hz), 4.55 (m, 1H, H_{4'}), 6.40 (dd, 1H, H_{3'}, *J* = 5.3, 2.0 Hz), 6.46 (m, 1H, H_{2'}), 6.53 (d, 1H, H_{1'}, *J* = 6.7 Hz), 8.20 (s, 1H, H₂), 8.24 (s, 1H, H₈), 13.10 (br s, 1H, NH) ppm. ¹³C-NMR (75.5 MHz, CDCl₃): δ -5.3 (Si-CH₃), -5.1 (Si-CH₃), 13.3 (SCH₂-CH₃), 13.4 (SCH₂-CH₃), 18.6 (SiCMe₃), 26.2 (^tBu-CH₃), 30.86 (S-CH₂), 30.93 (S-CH₂), 63.3 (C_{5'}), 78.7 (C_{3'}), 80.9 (C_{2'}), 84.9 (C_{4'}), 85.2 (C_{1'}), 124.9 (C₅), 138.3 (C₈), 145.6 (C₂), 149.3 (C₄), 159.3 (C₆), 213.4 (C=S), 214.0 (C=S) ppm.

5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy-β-d-uridine (**7a**). ¹H-NMR (300.13 MHz, DMSO-*d*₆): δ 0.03 (s, 6H, Si-Me), 0.85 (s, 9H, Si-^tBu), 3.75 (dd, 1H, H_{5'}, *J* = 11.7, 3.7 Hz), 3.81 (dd, 1H, H_{5'}, *J* = 11.7, 3.0 Hz), 4.82 (m, 1H, H_{4'}), 5.52 (d, 1H, H₅, *J* = 8.0 Hz), 5.95 (dt, 1H, H_{2'}, *J* = 6.0, 1.8 Hz), 6.39 (dt, 1H, H_{3'}, *J* = 6.0, 1.6 Hz), 6.80 (m, 1H, H_{1'}), 7.63 (d, 1H, H₆, *J* = 8.0 Hz), 11.35 (br s, 1H, NH) ppm. ¹³C-NMR (75.5 MHz, DMSO-*d*₆): δ -5.43 (Si-CH₃), -5.38 (Si-CH₃), 18.2 (SiCMe₃), 25.8 (^tBu-CH₃), 64.3 (C_{5'}), 86.9 (C_{4'}), 89.1 (C_{1'}), 101.6 (C₅), 126.2 (C_{2'}), 134.5 (C_{3'}), 140.8 (C₆), 150.7 (C₂), 163.1 (C₄) ppm.

5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-3'-deoxy-β-d-5-thymidine (**7b**). ¹H-NMR (300.13 MHz, DMSO-*d*₆): δ 0.03 (s, 6H, Si-Me), 0.85 (s, 9H, Si-^tBu), 1.75 (d, 3H, Me, *J* = 0.9 Hz), 3.72 (dd, 1H, H_{5'}, *J* = 11.5, 4.6 Hz), 3.80 (dd, 1H, H_{5'}, *J* = 11.6, 3.2 Hz), 4.78 (m, 1H, H_{4'}), 5.96 (dt, 1H, H_{2'}, *J* = 6.0, 2.0 Hz), 6.38 (dt, 1H, H_{3'}, *J* = 6.0, 1.6 Hz), 6.78 (m, 1H, H_{1'}), 7.28 (d, 1H, H₆, *J* = 1.2 Hz), 11.36 (br s, 1H, NH) ppm. ¹³C-NMR (75.5 MHz, DMSO-*d*₆): δ -5.3 (Si-CH₃), -5.2 (Si-CH₃), 12.2 (CH₃), 18.3 (SiCMe₃), 25.9 (^tBu-CH₃), 64.7 (C_{5'}), 86.7 (C_{4'}), 89.2 (C_{1'}), 109.4 (C₅), 126.2 (C_{2'}), 134.4 (C_{3'}), 135.9 (C₆), 150.8 (C₂), 163.8 (C₄) ppm.

5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy-β-d-cytidine (**7c**). ¹H-NMR (300.13 MHz, CDCl₃): δ 0.066 (s, 3H, Si-Me), 0.070 (s, 3H, Si-Me), 0.90 (s, 9H, Si-^tBu), 3.83 (dd, 1H, H_{5'}, *J* = 11.6, 2.8 Hz), 3.92 (dd, 1H, H_{5'}, *J* = 11.5, 3.0 Hz), 4.90 (m, 1H, H_{4'}), 5.62 (d, 1H, H₅, *J* = 7.4 Hz), 5.91 (m, 1H, H_{2'}), 6.14 (dt, 1H, H_{3'}, *J* = 6.0, 1.6 Hz), 7.07 (m, 1H, H_{1'}), 7.94 (d, 1H, H₆, *J* = 7.4 Hz) ppm. ¹³C-NMR (75.5 MHz, CDCl₃): δ -5.3 (Si-CH₃), -5.2 (Si-CH₃), 18.6 (SiCMe₃), 26.1 (^tBu-CH₃), 64.5 (C_{5'}), 87.3 (C_{4'}), 91.0 (C_{1'}), 94.0 (C₅), 128.2 (C_{2'}), 132.7 (C_{3'}), 142.8 (C₆), 156.3 (C₂), 165.6 (C₄) ppm.

N⁴-Benzoyl-5'-O-(*tert*-butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy-β-d-cytidine (**7d**). ¹H-NMR (300.13 MHz, CDCl₃): δ 0.08 (s, 3H, Si-Me), 0.10 (s, 3H, Si-Me), 0.90 (s, 9H, Si-^tBu), 3.86 (dd, 1H, H_{5'}, *J* = 11.7, 2.6 Hz), 3.99 (dd, 1H, H_{5'}, *J* = 11.7, 2.7 Hz), 4.99 (m, 1H, H_{4'}), 6.02 (d, 1H, H_{2'}, *J* = 5.7 Hz), 6.18 (dt, 1H, H_{3'}, *J* = 6.0, 1.4 Hz), 7.03 (m, 1H, H_{1'}), 7.49 (m, 3H, H₅ + H_{arom}), 7.60 (m, 1H, H_{arom}), 7.93 (d, 2H, H_{arom}, *J* = 7.3 Hz), 8.40 (d, 1H, H₆, *J* = 7.5 Hz), 8.71 (br s, 1H, NH) ppm. ¹³C-NMR (75.5 MHz, CDCl₃): δ -5.4 (Si-CH₃), -5.2 (Si-CH₃), 18.6

(SiMe₃), 26.0 (tBu-CH₃), 64.2 (C_{5'}), 88.0 (C_{4'}), 91.8 (C_{1'}), 96.9 (C₅), 127.67 (C_{2'}), 127.71 (CH_{arom}), 129.1 (CH_{arom}), 133.0 (C_{3'}), 133.2 (CH_{arom}), 133.4 (C_{arom}), 145.7 (C₆), 155.1 (C₂), 162.3 (C₄), 167.3 (C=O) ppm.

5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy-β-d-adenosine (**7e**). ¹H-NMR (300.13 MHz, CDCl₃): δ 0.03 (s, 3H, Si-Me), 0.04 (s, 3H, Si-Me), 0.87 (s, 9H, Si-*t*Bu), 3.81 (d, 2H, H_{5'}, *J* = 3.8 Hz), 4.97 (m, 1H, H_{4'}), 5.95 (br s, 2H, NH₂), 6.03 (dt, 1H, H_{2'}, *J* = 6.0, 1.9 Hz), 6.38 (dt, 1H, H_{3'}, *J* = 6.0, 1.6 Hz), 7.09 (m, 1H, H_{1'}), 8.09 (s, 1H, H₈), 8.34 (s, 1H, H₂) ppm. ¹³C-NMR (75.5 MHz, CDCl₃): δ -5.3 (Si-CH₃), -5.2 (Si-CH₃), 18.7 (SiMe₃), 26.1 (tBu-CH₃), 64.9 (C_{5'}), 87.9 (C_{4'}), 88.4 (C_{1'}), 119.2 (C₅), 125.7 (C_{2'}), 134.7 (C_{3'}), 139.4 (C₈), 149.7 (C₄), 152.9 (C₂), 155.7 (C₆) ppm.

5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy-β-d-inosine (**7f**). ¹H-NMR (300.13 MHz, CDCl₃): δ 0.03 (s, 3H, Si-Me), 0.04 (s, 3H, Si-Me), 0.87 (s, 9H, Si-*t*Bu), 3.82 (m, 2H, H_{5'}), 4.99 (m, 1H, H_{4'}), 6.05 (dt, 1H, H_{2'}, *J* = 5.9, 1.8 Hz), 6.42 (dt, 1H, H_{3'}, *J* = 5.8, 1.7 Hz), 7.04 (m, 1H, H_{1'}), 8.09 (s, 1H, H₈), 8.23 (s, 1H, H₂), 13.23 (br s, 1H, NH) ppm. ¹³C-NMR (75.5 MHz, CDCl₃): δ -5.3 (Si-CH₃), -5.2 (Si-CH₃), 18.7 (SiMe₃), 26.1 (tBu-CH₃), 64.9 (C_{5'}), 88.1 (C_{4'}), 88.6 (C_{1'}), 124.7 (C₅), 125.3 (C_{2'}), 135.0 (C_{3'}), 139.1 (C₈), 145.3 (C₂), 149.0 (C₄), 159.5 (C₆) ppm.

2',3'-Didehydro-2',3'-dideoxy-β-d-uridine (**8a**). ¹H-NMR (300.13 MHz, MeOH-*d*₄): δ 3.73 (m, 2H, H_{5'}), 4.87 (m, 1H, H_{4'}), 5.65 (d, 1H, H₅, *J* = 8.1 Hz), 5.92 (m, 1H, H_{2'}), 6.41 (dt, 1H, H_{3'}, *J* = 6.0, 1.7 Hz), 6.94 (dt, 1H, H_{1'}, *J* = 3.1, 1.5 Hz), 7.89 (d, 1H, H₆, *J* = 8.1 Hz) ppm. ¹³C-NMR (75.5 MHz, MeOH-*d*₄): δ 63.8 (C_{5'}), 89.1 (C_{4'}), 91.3 (C_{1'}), 102.5 (C₅), 127.0 (C_{2'}), 136.1 (C_{3'}), 143.1 (C₆), 152.7 (C₂), 166.3 (C₄) ppm.

2',3'-Didehydro-3'-deoxy-β-d-5-thymidine (**8b**). ¹H-NMR (300.13 MHz, MeOH-*d*₄): δ 1.84 (d, 3H, Me, *J* = 1.1 Hz), 3.76 (m, 2H, H_{5'}), 4.86 (debajo de H₂O, 1H, H_{4'}), 5.90 (dt, 1H, H_{2'}, *J* = 6.0, 2.0 Hz), 6.40 (dt, 1H, H_{3'}, *J* = 6.0, 1.7 Hz), 6.95 (dt, 1H, H_{1'}, *J* = 3.4, 1.7 Hz), 7.75 (d, 1H, H₆, *J* = 1.2 Hz) ppm. ¹³C-NMR (75.5 MHz, MeOH-*d*₄): δ 12.4 (CH₃), 63.8 (C_{5'}), 89.0 (C_{4'}), 91.0 (C_{1'}), 111.2 (C₅), 127.3 (C_{2'}), 135.9 (C_{3'}), 138.9 (C₆), 152.9 (C₂), 166.6 (C₄) ppm.

N⁴-Benzoyl-2',3'-didehydro-2',3'-dideoxy-β-d-cytidine (**8d**). ¹H-NMR (300.13 MHz, MeOH-*d*₄): δ 3.78 (m, 2H, H_{5'}), 4.99 (m, 1H, H_{4'}), 6.05 (m, 1H, H_{2'}), 6.41 (dt, 1H, H_{3'}, *J* = 6.0, 1.6 Hz), 7.00 (dt, 1H, H_{1'}, *J* = 2.9, 1.4 Hz), 7.54 (m, 3H, H₅ + H_{arom}), 7.64 (m, 1H, H_{arom}), 7.97 (m, 2H, H_{arom}), 8.46 (d, 1H, H₆, *J* = 7.5 Hz) ppm. ¹³C-NMR (75.5 MHz, MeOH-*d*₄): δ 63.7 (C_{5'}), 89.9 (C_{4'}), 93.4 (C_{1'}), 98.5 (C₅), 127.6 (C_{2'}), 129.2 (CH_{arom}), 129.8 (CH_{arom}), 134.1 (CH_{arom}), 134.7 (C_{arom}), 135.5 (C_{3'}), 147.3 (C₆), 158.3 (C₂), 165.0 (C₄), 169.1 (C=O) ppm.

2',3'-Didehydro-2',3'-dideoxy-β-d-adenosine (**8e**). ¹H-NMR (300.13 MHz, MeOH-*d*₄): δ 3.75 (m, 2H, H_{5'}), 5.01 (m, 1H, H_{4'}), 6.13 (m, 1H, H_{2'}), 6.48 (dt, 1H, H_{3'}, *J* = 6.0, 1.7 Hz), 7.04 (dt, 1H, H_{1'}, *J* = 3.2, 1.7 Hz), 8.20 (s, 1H, H₂), 8.28 (s, 1H, H₈) ppm. ¹³C-NMR (75.5 MHz, MeOH-*d*₄): δ 64.2 (C_{5'}), 89.8 (C_{1'}), 90.3 (C_{4'}), 120.2 (C₅), 126.8 (C_{2'}), 135.7 (C_{3'}), 141.3 (C₈), 150.3 (C₄), 153.8 (C₂), 157.4 (C₆) ppm.

2',3'-Didehydro-2',3'-dideoxy-β-d-inosine (**8f**). ¹H-NMR (300.13 MHz, DMSO-*d*₆): δ 3.56 (m, 2H, H_{5'}), 4.89 (m, 1H, H_{4'}), 4.98 (t, OH_{5'}, *J* = 5.4 Hz), 6.13 (m, 1H, H_{2'}), 6.48 (dd, 1H, H_{3'}, *J* = 6.0, 1.5 Hz), 6.90 (m, 1H, H_{1'}), 8.08 (s, 1H, H₂), 8.11 (s, 1H, H₈), 12.39 (br s, 1H, NH) ppm. ¹³C-NMR (75.5 MHz, DMSO-*d*₆): δ 62.7 (C_{5'}), 88.1 (C_{1'}), 88.3 (C_{4'}), 124.1 (C₅), 125.3 (C_{2'}), 134.8 (C_{3'}), 138.6 (C₈), 146.0 (C₂), 148.1 (C₄), 156.7 (C₆) ppm.

2',3'-Dideoxy-β-d-uridine (**9a**). ¹H-NMR (300.13 MHz, MeOH-*d*₄): δ 1.96 (m, 2H, H_{3'}), 2.08 (m, 1H, H_{2'}), 2.40 (m, 1H, H_{2'}), 3.68 (dd, 1H, H_{5'}, *J* = 12.2, 4.0 Hz), 3.86 (dd, 1H, H_{5'}, *J* = 12.2, 3.1 Hz), 4.14 (m, 1H, H_{4'}), 5.66 (d, 1H, H₅, *J* = 8.1 Hz), 6.04 (dd, 1H, H_{1'}, *J* = 6.8, 3.4 Hz), 8.08 (d, 1H, H₆, *J* = 8.1 Hz) ppm. ¹³C-NMR (75.5 MHz, MeOH-*d*₄): δ 25.9 (C_{3'}), 33.5 (C_{2'}), 63.7 (C_{5'}), 83.5 (C_{4'}), 87.7 (C_{1'}), 101.9 (C₅), 142.6 (C₆), 152.2 (C₂), 166.4 (C₄) ppm.

3'-Deoxy-β-d-5-thymidine (**9b**). ¹H-NMR (300.13 MHz, MeOH-*d*₄): δ 1.88 (d, 3H, Me, *J* = 1.1 Hz), 1.98 (m, 2H, H_{3'}), 2.07 (m, 1H, H_{2'}), 2.38 (m, 1H, H_{2'}), 3.68 (dd, 1H, H_{5'}, *J* = 12.2, 3.8 Hz), 3.88 (dd, 1H, H_{5'}, *J* = 12.2, 2.9

Hz), 4.13 (m, 1H, H_{4'}), 6.05 (dd, 1H, H_{1'}, *J* = 6.8, 3.5 Hz), 7.92 (d, 1H, H₆, *J* = 1.1 Hz) ppm. ¹³C-NMR (75.5 MHz, MeOH-*d*₄): δ 12.4 (CH₃), 25.9 (C_{3'}), 33.3 (C_{2'}), 63.7 (C_{5'}), 83.2 (C_{4'}), 87.3 (C_{1'}), 110.8 (C₅), 138.4 (C₆), 152.4 (C₂), 166.6 (C₄) ppm.

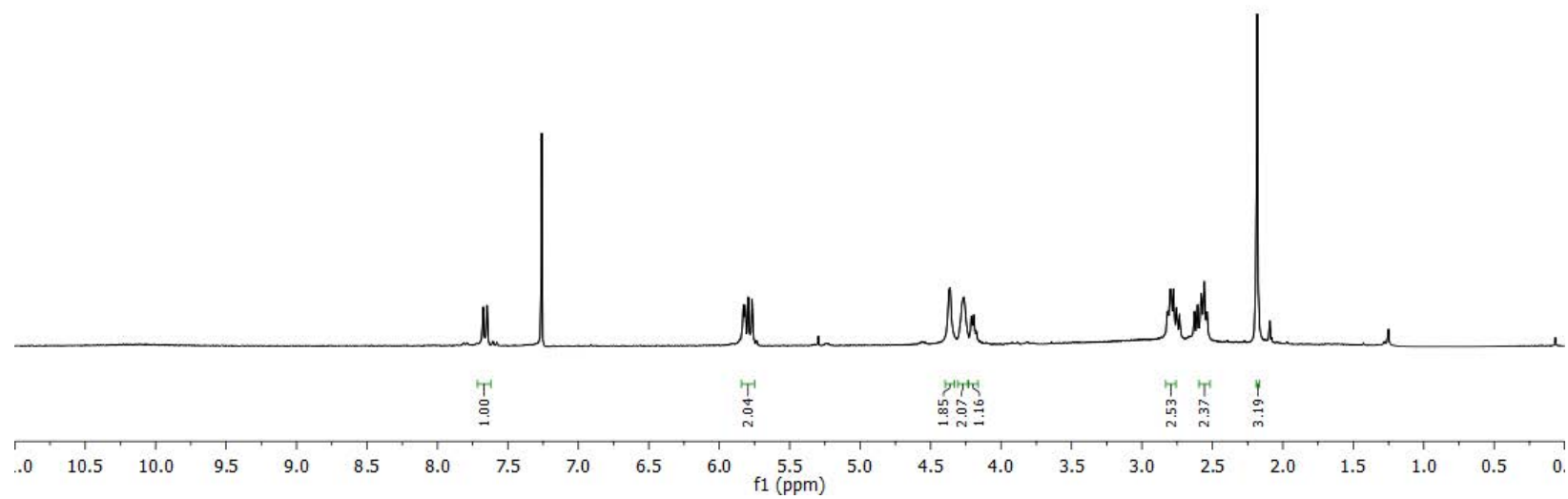
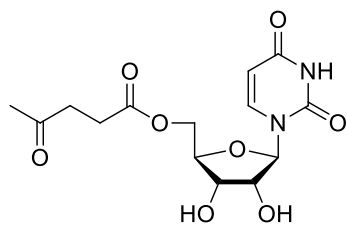
2',3'-Dideoxy-β-d-cytidine (**9c**). ¹H-NMR (300.13 MHz, D₂O): δ 1.78 (m, 1H, H_{3'}), 2.05 (m, 2H, H_{2'} + H_{3'}), 2.45 (m, 1H, H_{2'}), 3.72 (dd, 1H, H_{5'}, *J* = 12.4, 5.4 Hz), 3.87 (dd, 1H, H_{5'}, *J* = 12.4, 3.1 Hz), 4.23 (m, 1H, H_{4'}), 6.00 (d, 1H, H₅, *J* = 7.5 Hz), 6.05 (dd, 1H, H_{1'}, *J* = 7.0, 2.7 Hz), 7.89 (d, 1H, H₆, *J* = 7.5 Hz) ppm. ¹³C-NMR (75.5 MHz, D₂O): δ 24.7 (C_{3'}), 31.9 (C_{2'}), 62.6 (C_{5'}), 82.2 (C_{4'}), 87.0 (C_{1'}), 95.5 (C₅), 141.6 (C₆), 157.3 (C₂), 165.9 (C₄) ppm.

2',3'-Dideoxy-β-d-adenosine (**9e**). ¹H-NMR (300.13 MHz, MeOH-*d*₄): δ 2.15 (m, 2H, H_{3'}), 2.51 (m, 2H, H_{2'}), 3.67 (dd, 1H, H_{5'}, *J* = 12.2, 3.9 Hz), 3.87 (dd, 1H, H_{5'}, *J* = 12.2, 3.0 Hz), 4.27 (m, 1H, H_{4'}), 6.28 (dd, 1H, H_{1'}, *J* = 5.8, 4.8 Hz), 8.18 (s, 1H, H₂), 8.41 (s, 1H, H₈) ppm. ¹³C-NMR (75.5 MHz, MeOH-*d*₄): δ 26.5 (C_{3'}), 33.7 (C_{2'}), 64.5 (C_{5'}), 83.6 (C_{4'}), 87.4 (C_{1'}), 120.5 (C₅), 141.0 (C₂), 149.8 (C₄), 153.5 (C₈), 157.3 (C₆) ppm.

2',3'-Dideoxy-β-d-inosine (**9f**). ¹H-NMR (300.13 MHz, MeOH-*d*₄): δ 2.12 (m, 2H, H_{3'}), 2.52 (m, 2H, H_{2'}), 3.67 (dd, 1H, H_{5'}, *J* = 12.1, 4.2 Hz), 3.84 (dd, 1H, H_{5'}, *J* = 12.1, 3.2 Hz), 4.26 (m, 1H, H_{4'}), 6.31 (dd, 1H, H_{1'}, *J* = 6.5, 3.5 Hz), 8.04 (s, 1H, H₂), 8.39 (s, 1H, H₈) ppm. ¹³C-NMR (75.5 MHz, MeOH-*d*₄): δ 26.4 (C_{3'}), 33.9 (C_{2'}), 64.3 (C_{5'}), 83.9 (C_{4'}), 87.3 (C_{1'}), 125.7 (C₅), 140.4 (C₈), 146.6 (C₂), 149.3 (C₄), 159.0 (C₆) ppm.

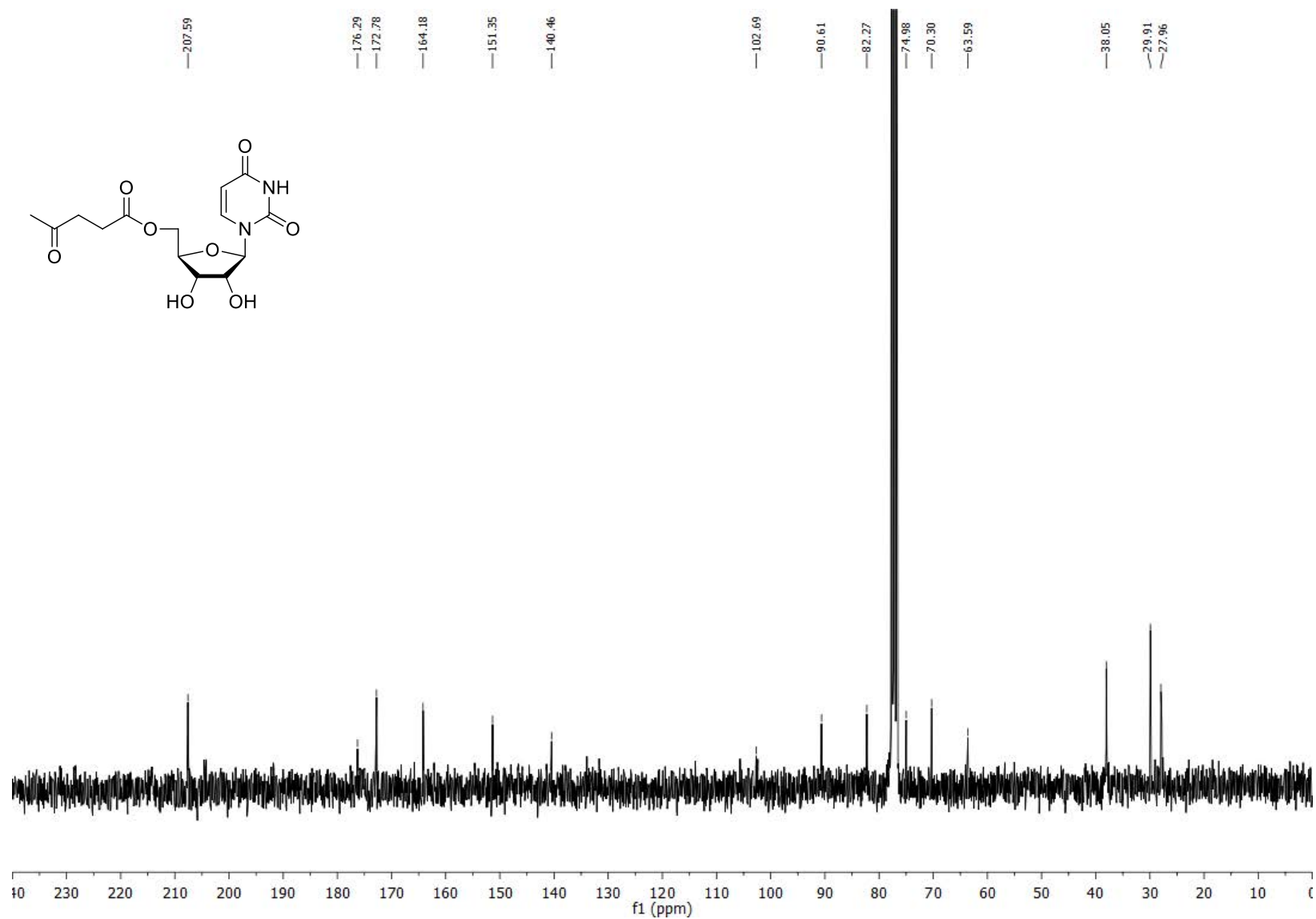
5'-*O*-Levulinyl- β -D-uridine (2a)

$^1\text{H-NMR}$ (300.13 MHz, CDCl_3)



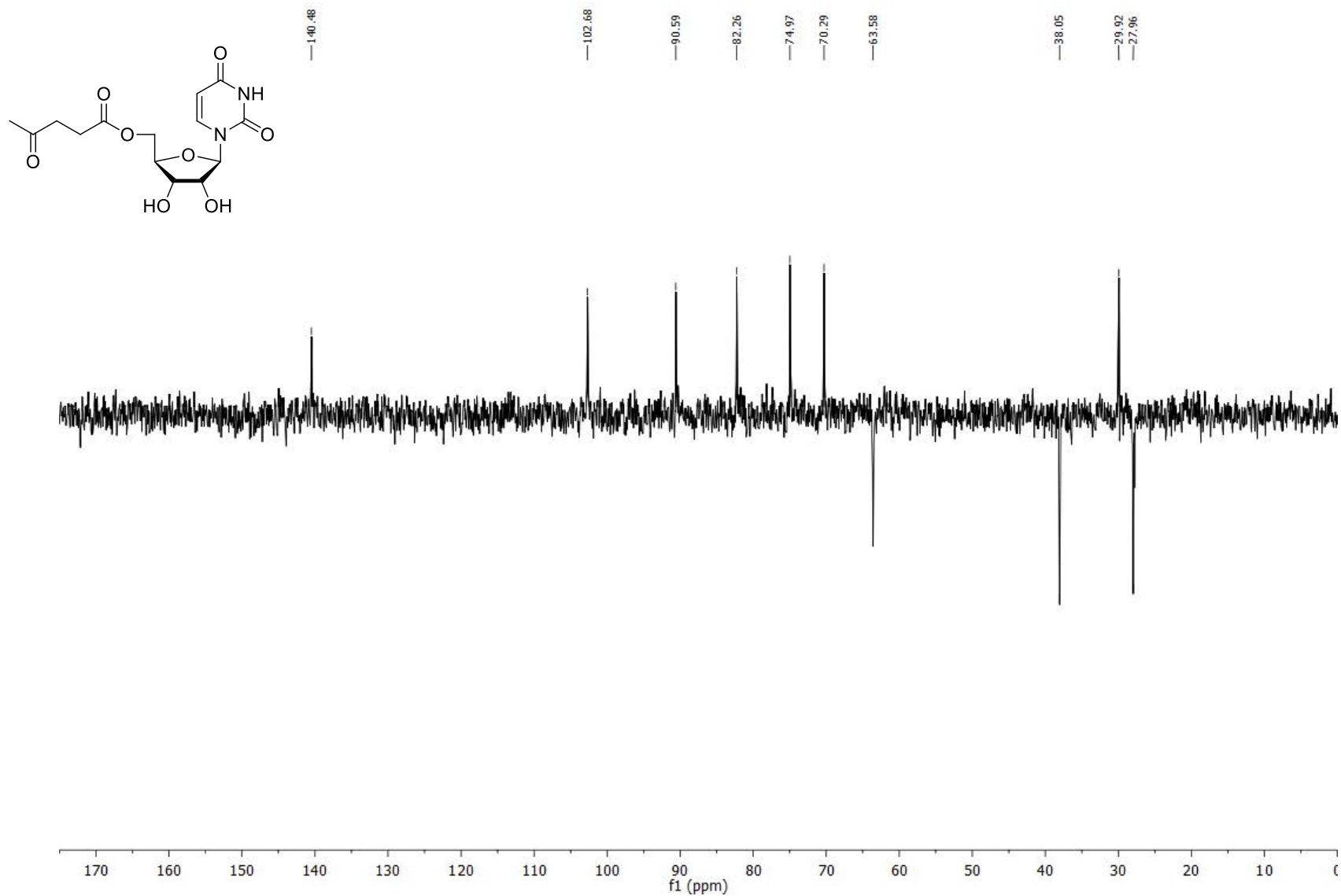
5'-*O*-Levulinyl- β -D-uridine (2a)

^{13}C -NMR (75.5 MHz, CDCl_3)



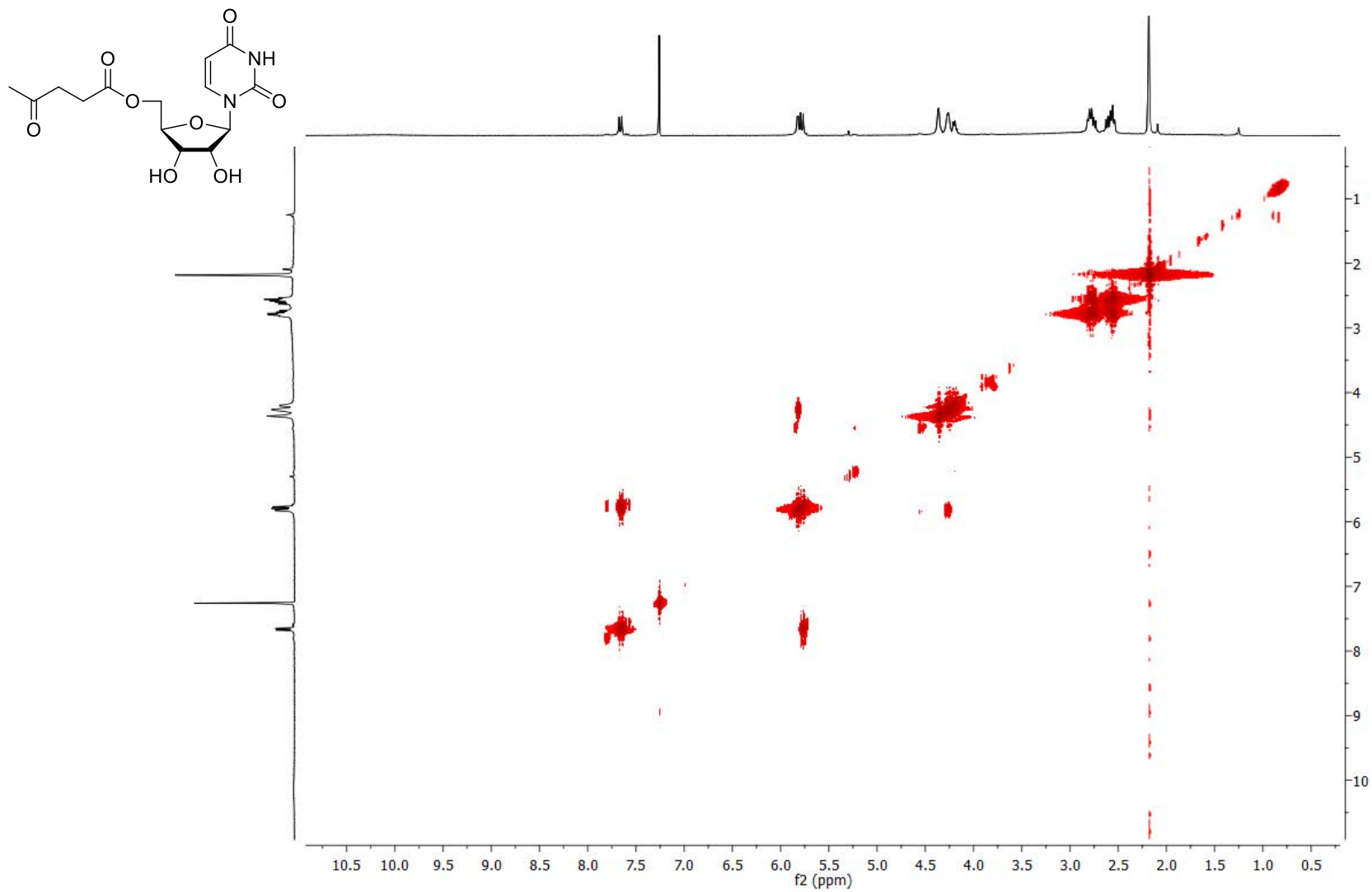
5'-*O*-Levulinyl- β -D-uridine (2a)

DEPT NMR (75.5 MHz, CDCl₃)



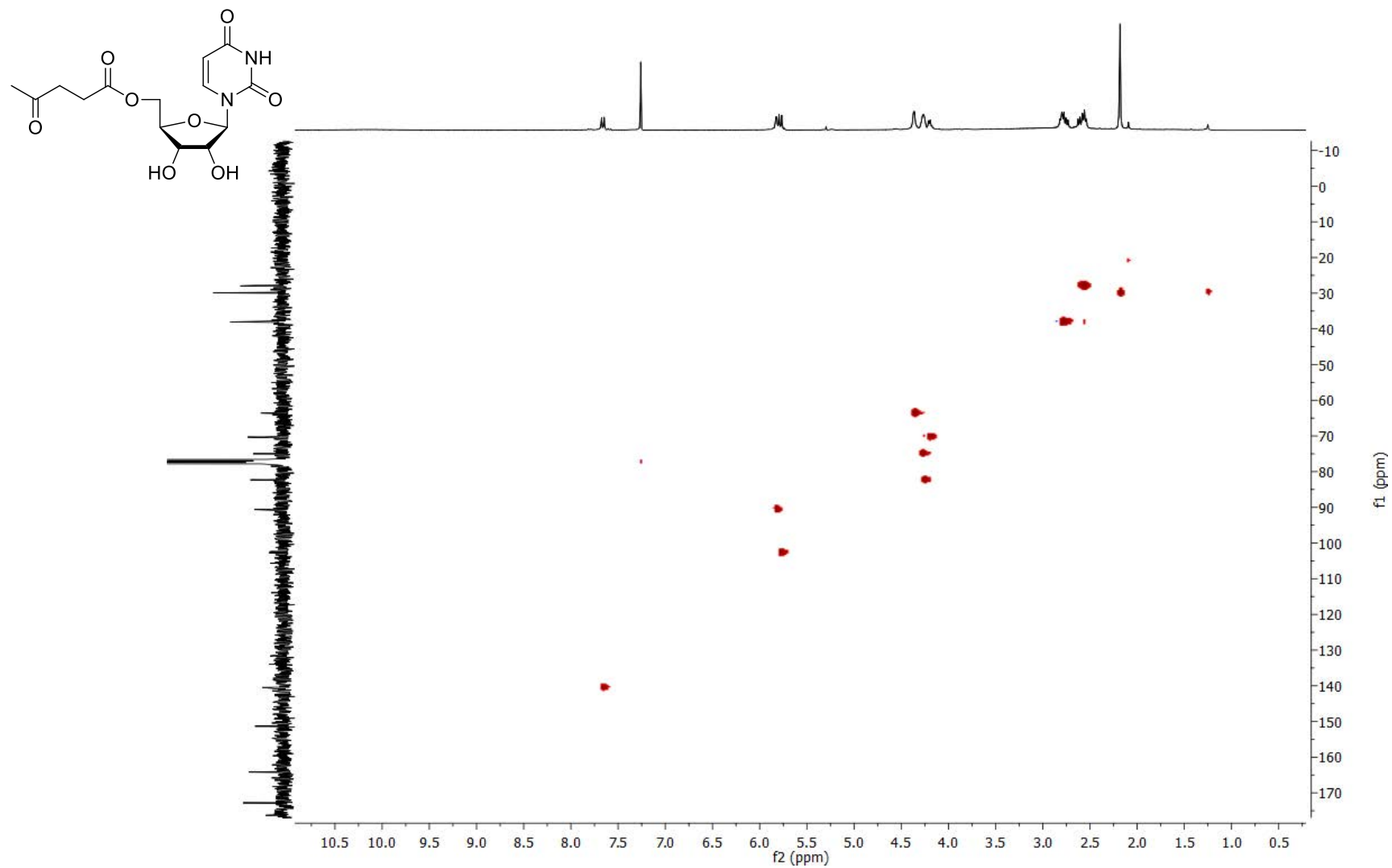
5'-*O*-Levuliny-β-D-uridine (2a)

COSY NMR (CDCl₃)



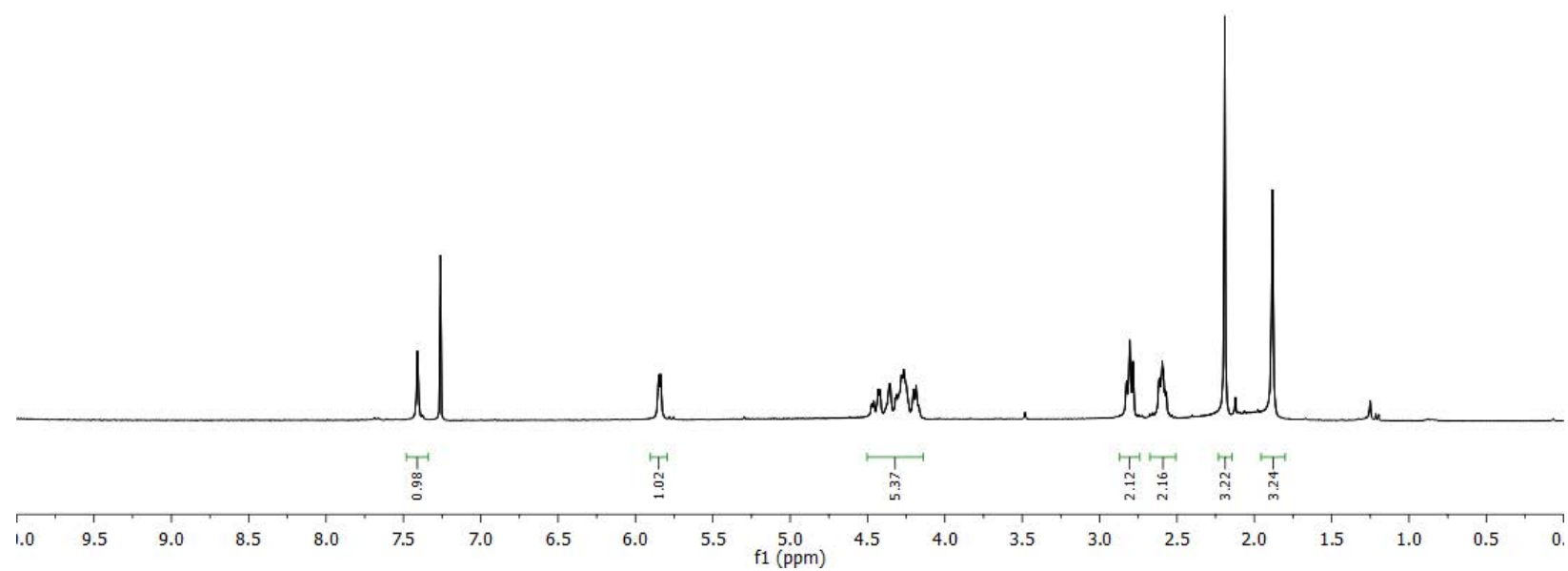
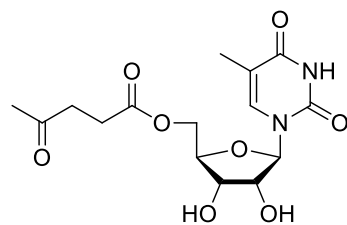
5'-*O*-Levulinyl- β -D-uridine (2a)

HSQC NMR (CDCl₃)



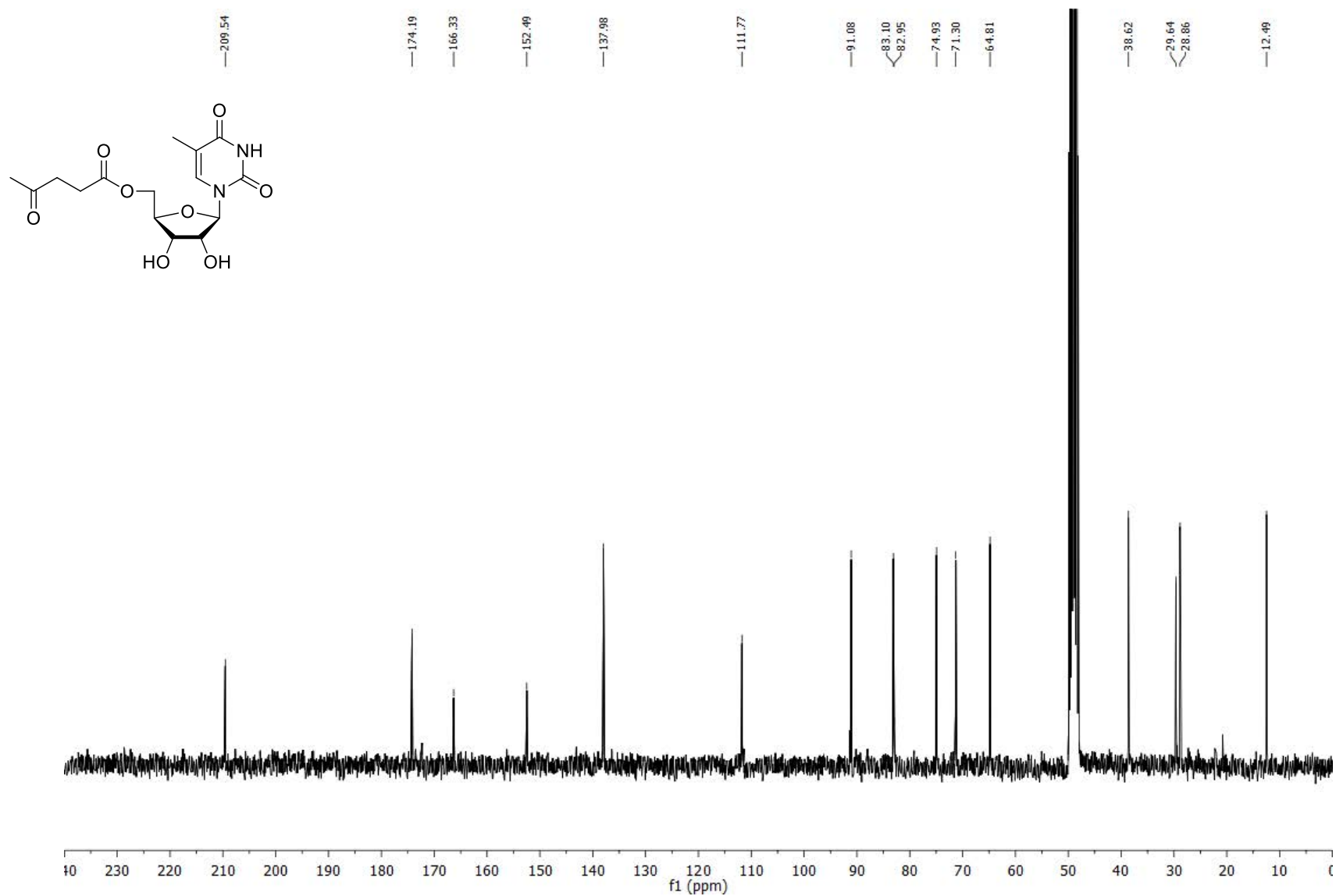
5'-*O*-Levulinyl- β -D-5-methyluridine (2b)

$^1\text{H-NMR}$ (300.13 MHz, CDCl_3)



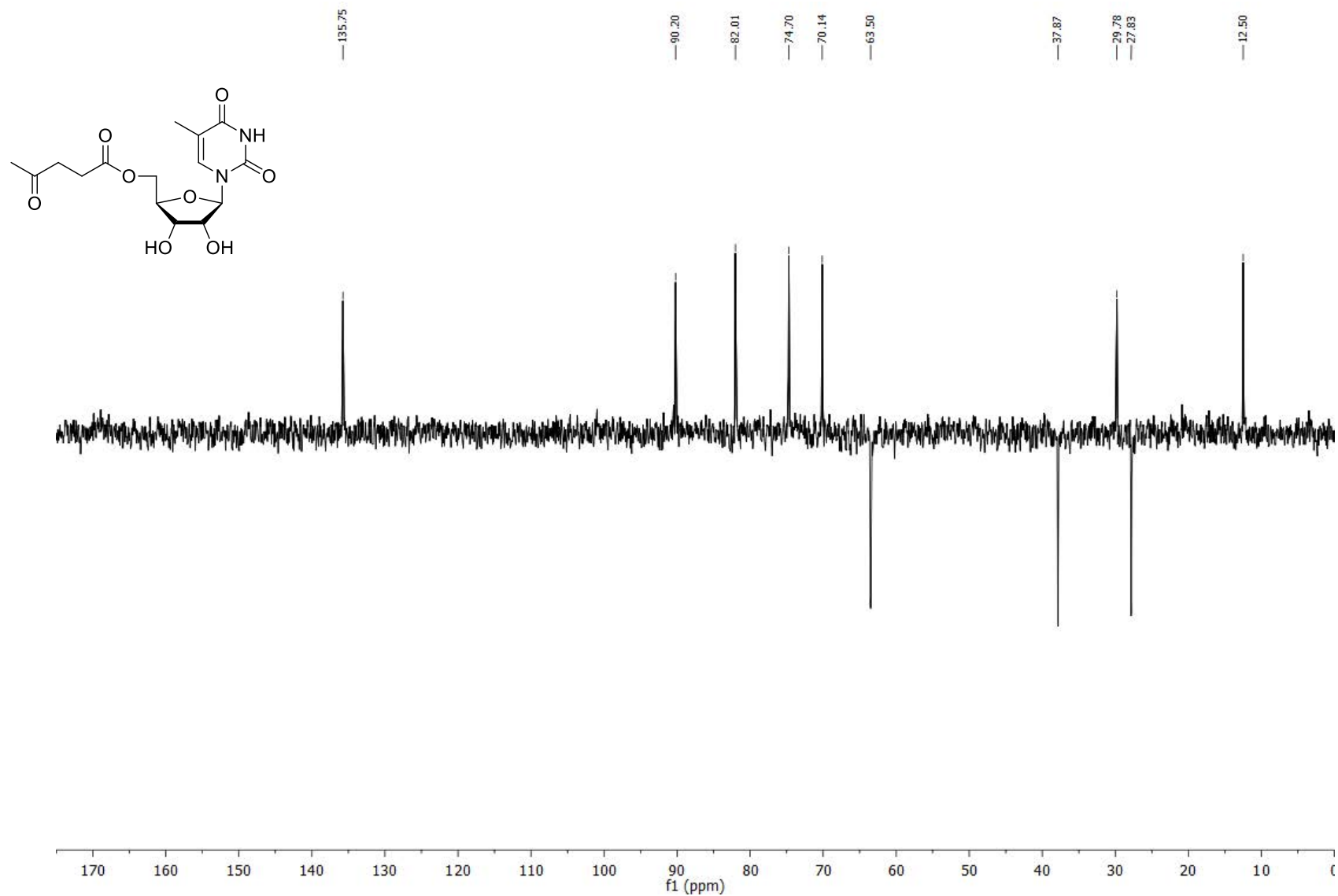
5'-*O*-Levulinyl- β -D-5-methyluridine (2b)

^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



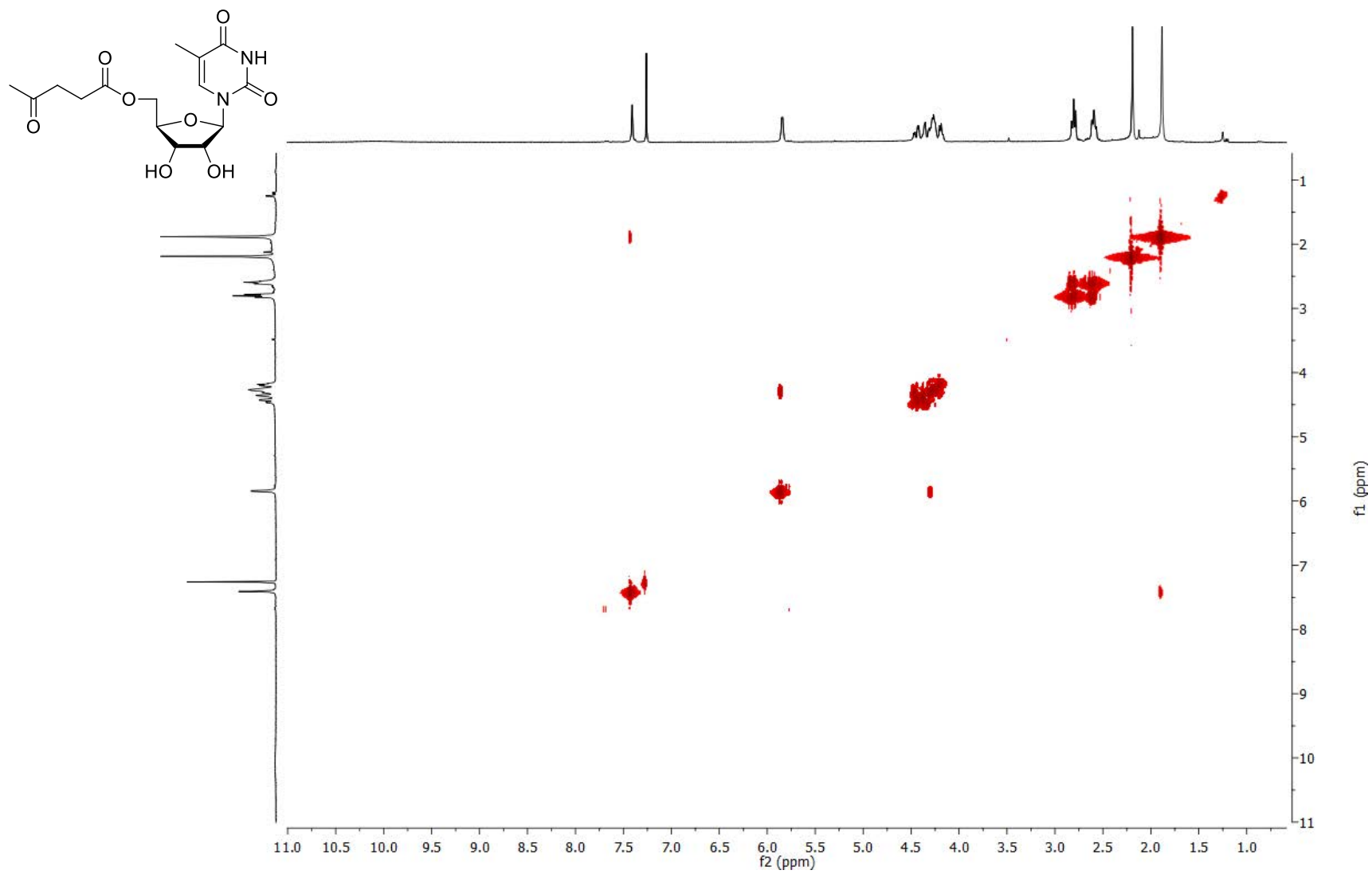
5'-*O*-Levulinyl- β -D-5-methyluridine (2b)

DEPT NMR (75.5 MHz, CDCl₃)



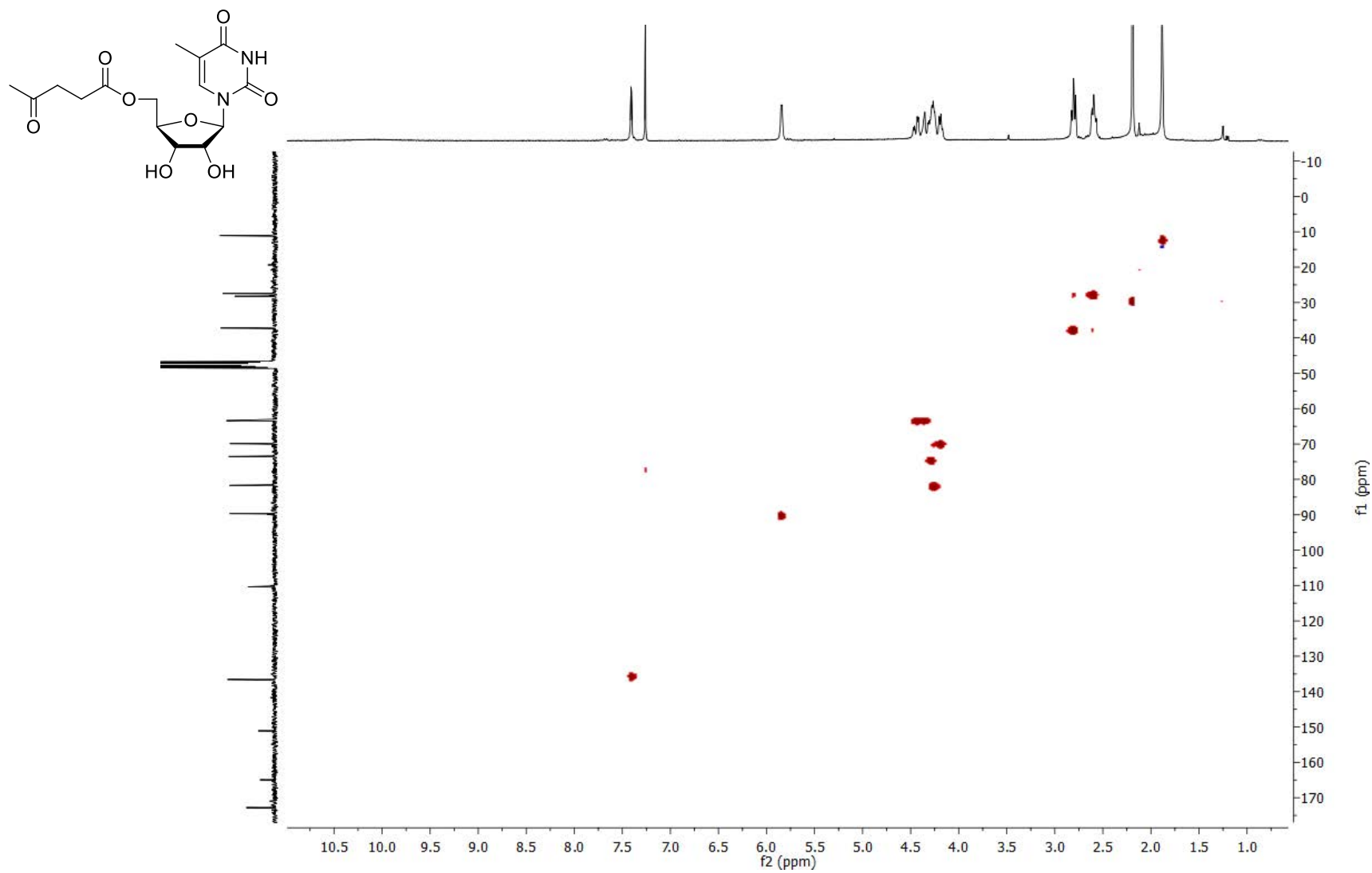
5'-*O*-Levulinyl- β -D-5-methyluridine (2b)

COSY NMR (CDCl₃)



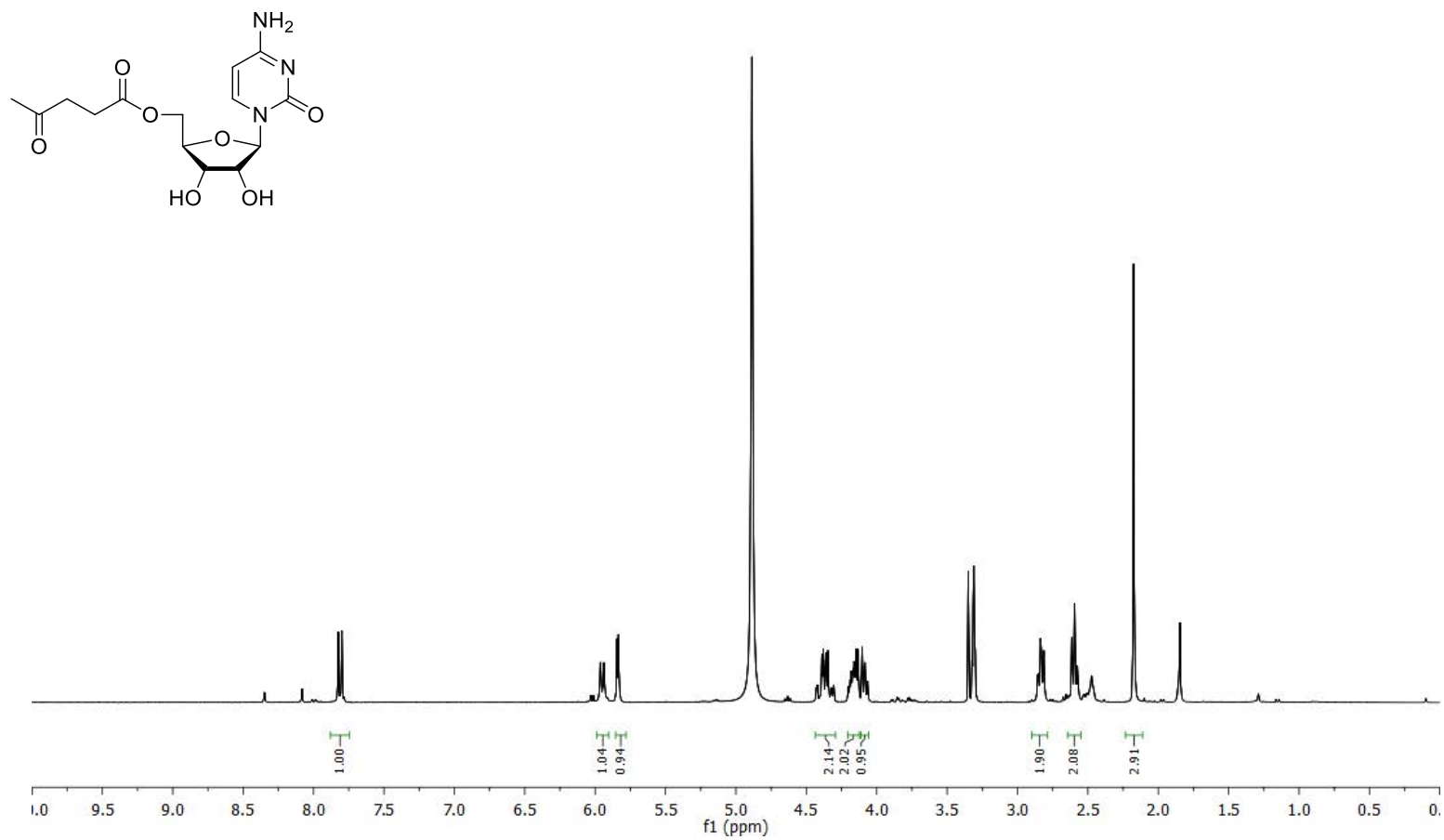
5'-*O*-Levulinyl- β -D-5-methyluridine (2b)

HSQC NMR (CDCl₃)



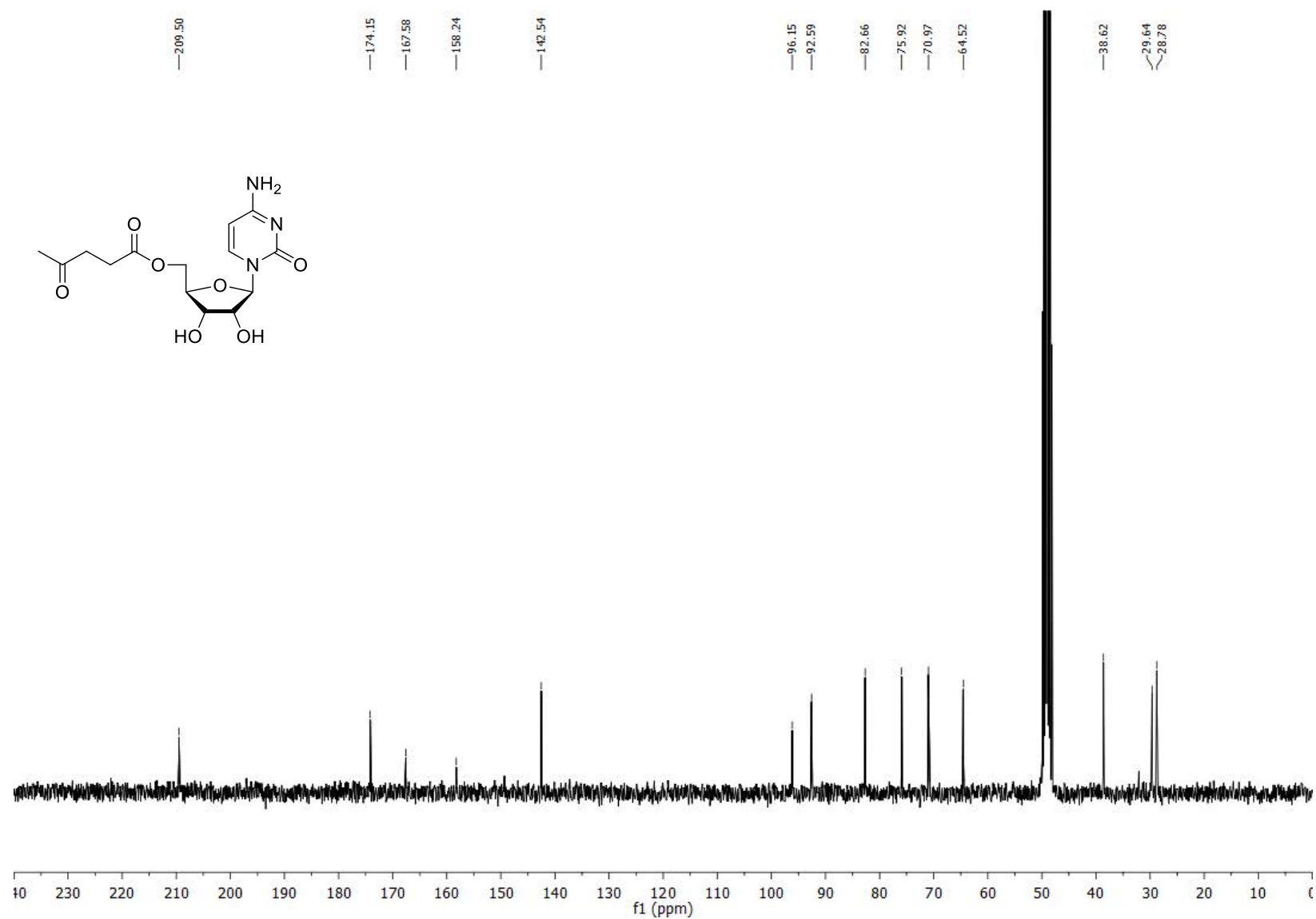
5'-*O*-Levulinyl-β-D-cytidine (2c)

¹H-NMR (300.13 MHz, MeOD-*d*₄)



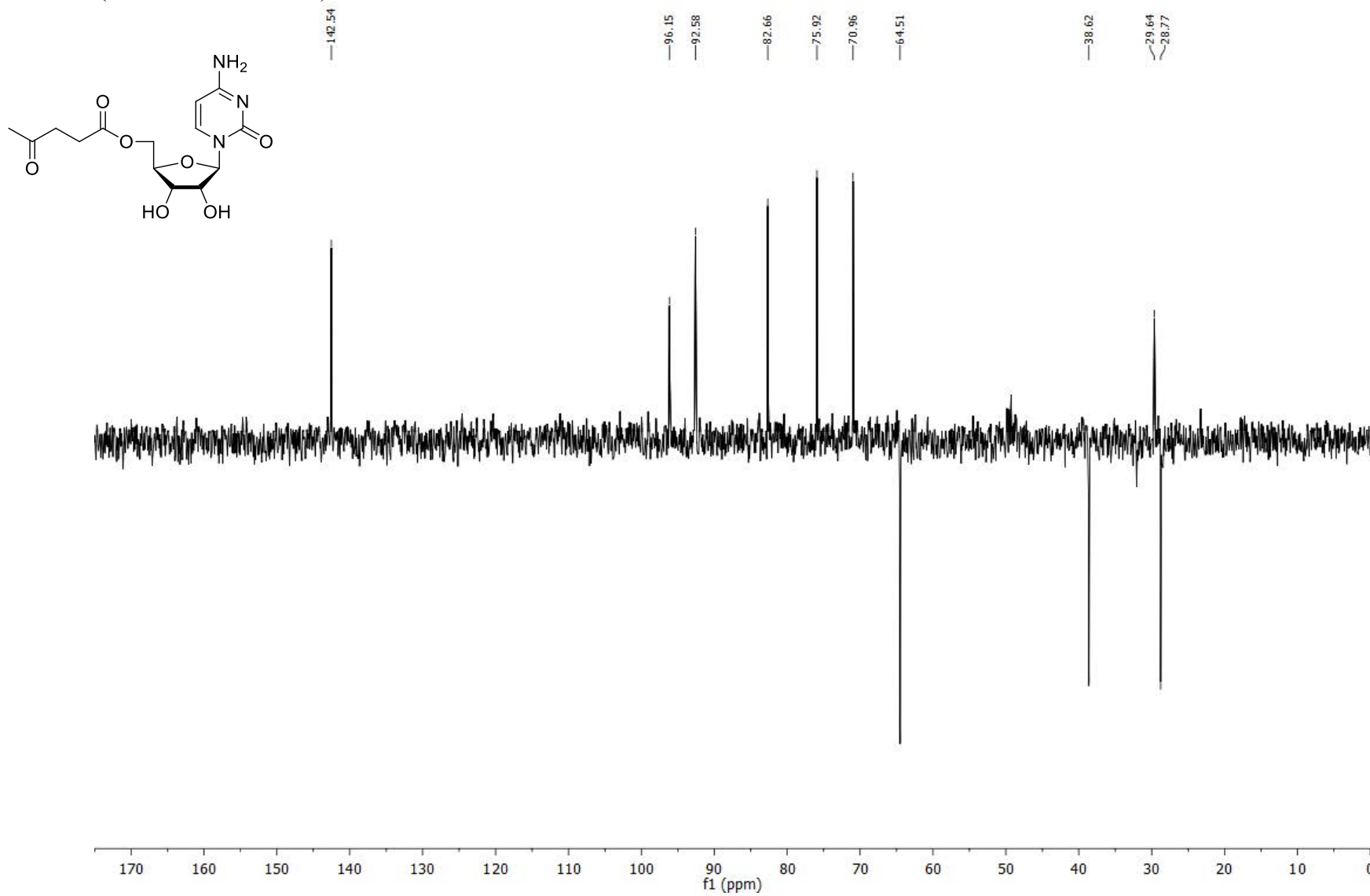
5'-*O*-Levulinyl- β -D-cytidine (2c)

^{13}C -NMR (75.5 MHz, $\text{MeOD-}d_4$)



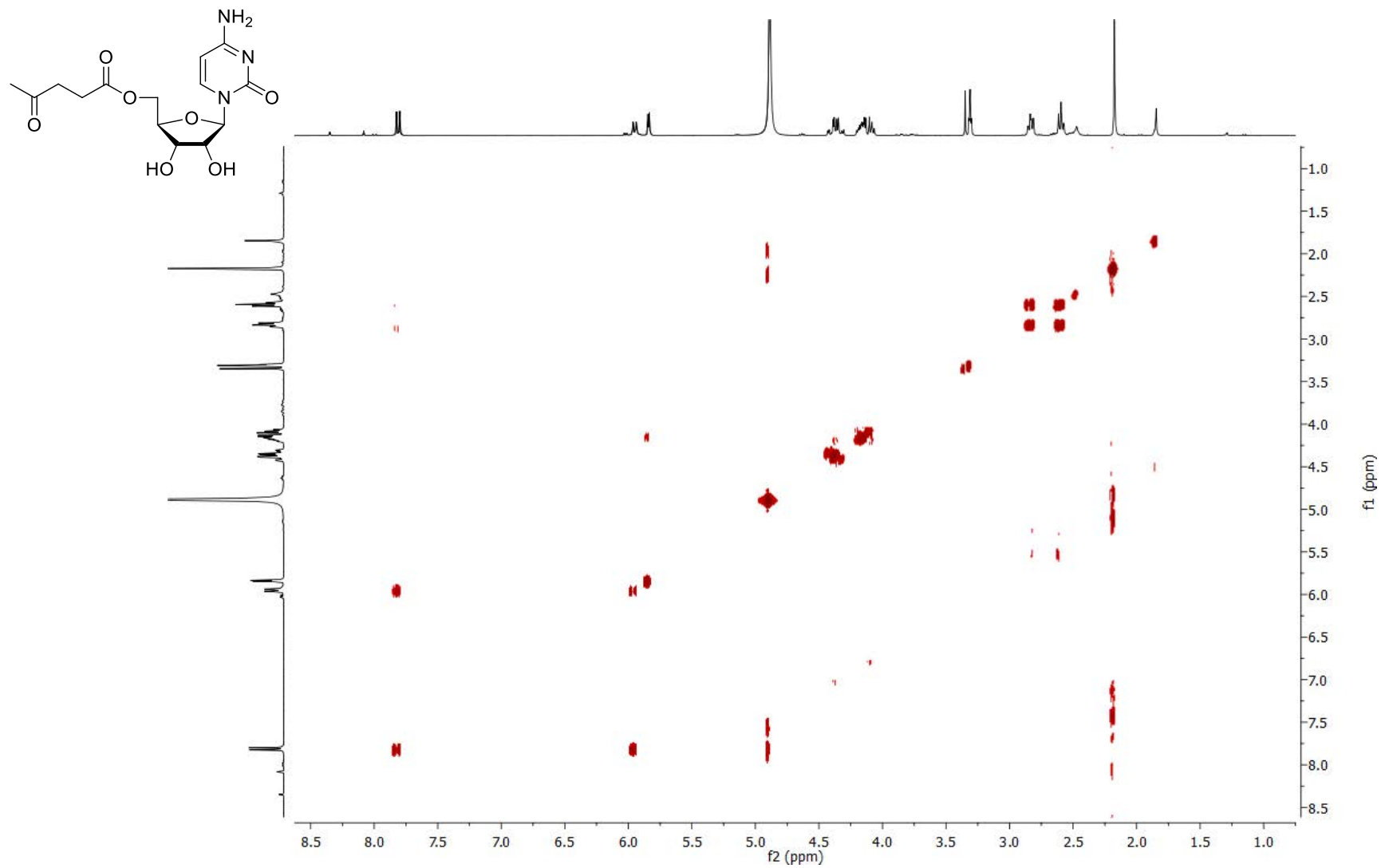
5'-*O*-Levulinyl-β-D-cytidine (2c)

DEPT NMR (75.5 MHz, MeOD-*d*₄)



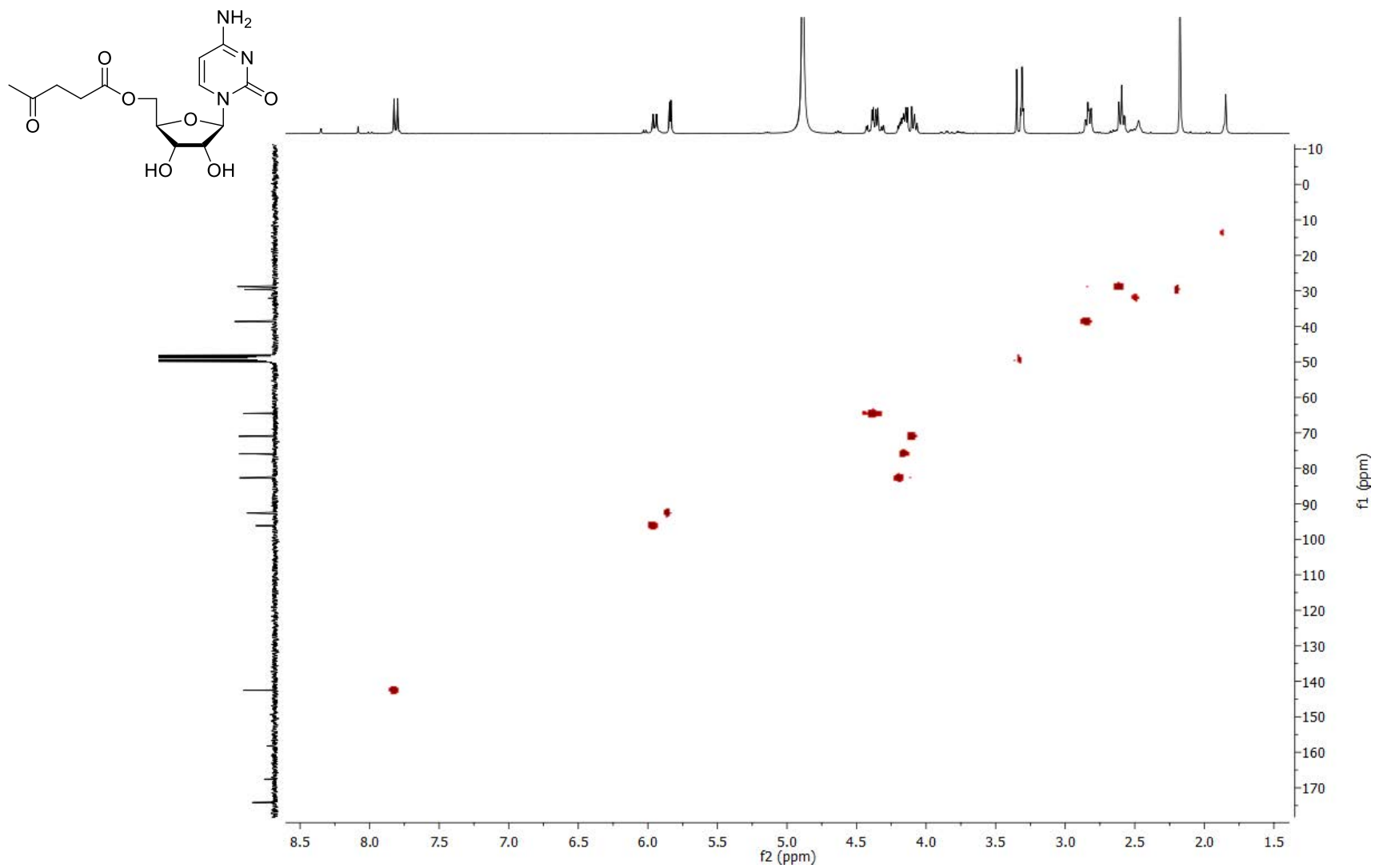
5'-*O*-Levulinyl- β -D-cytidine (2c)

COSY NMR (MeOD- d_4)



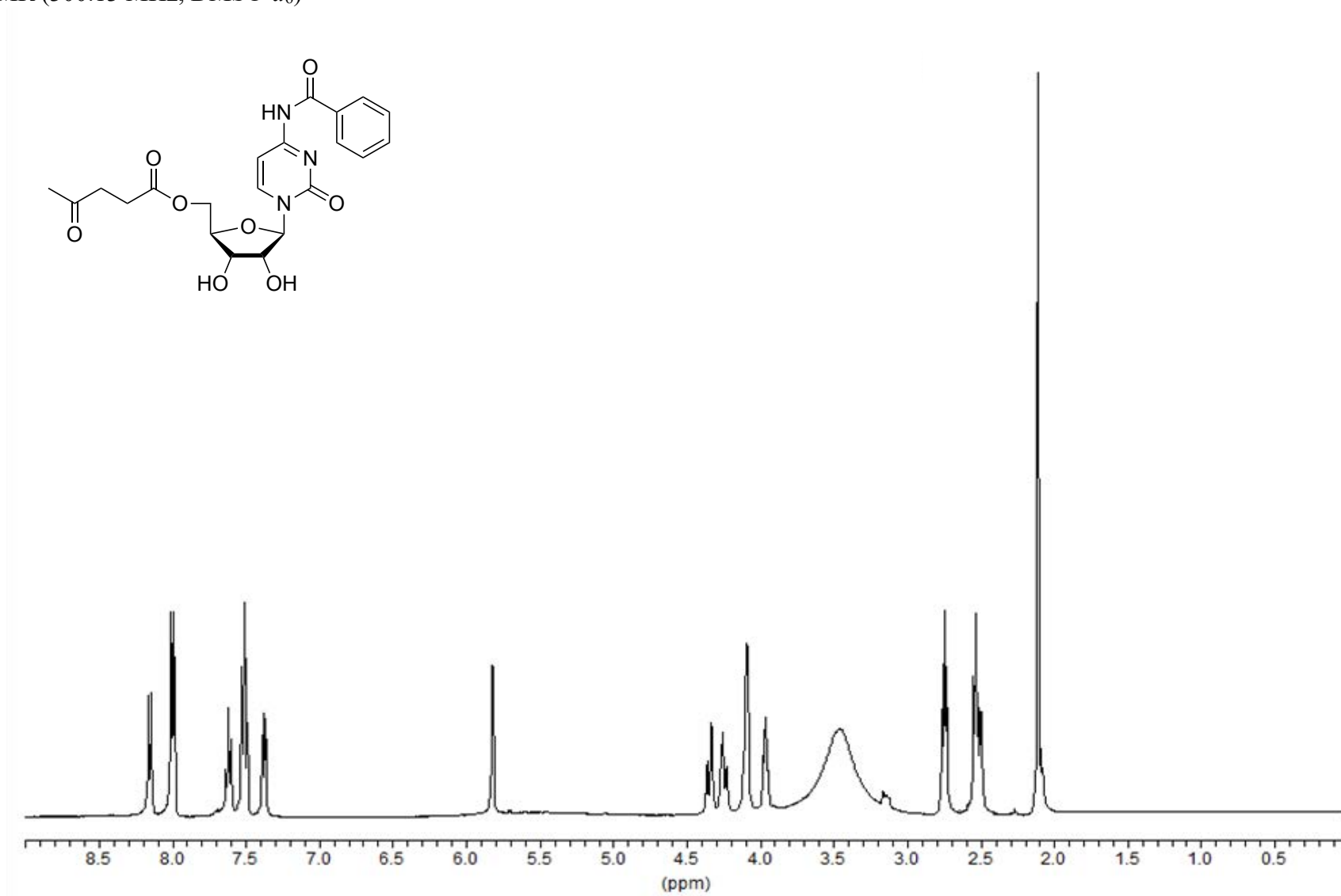
5'-*O*-Levulinyl- β -D-cytidine (2c)

HSQC NMR (MeOD- d_4)



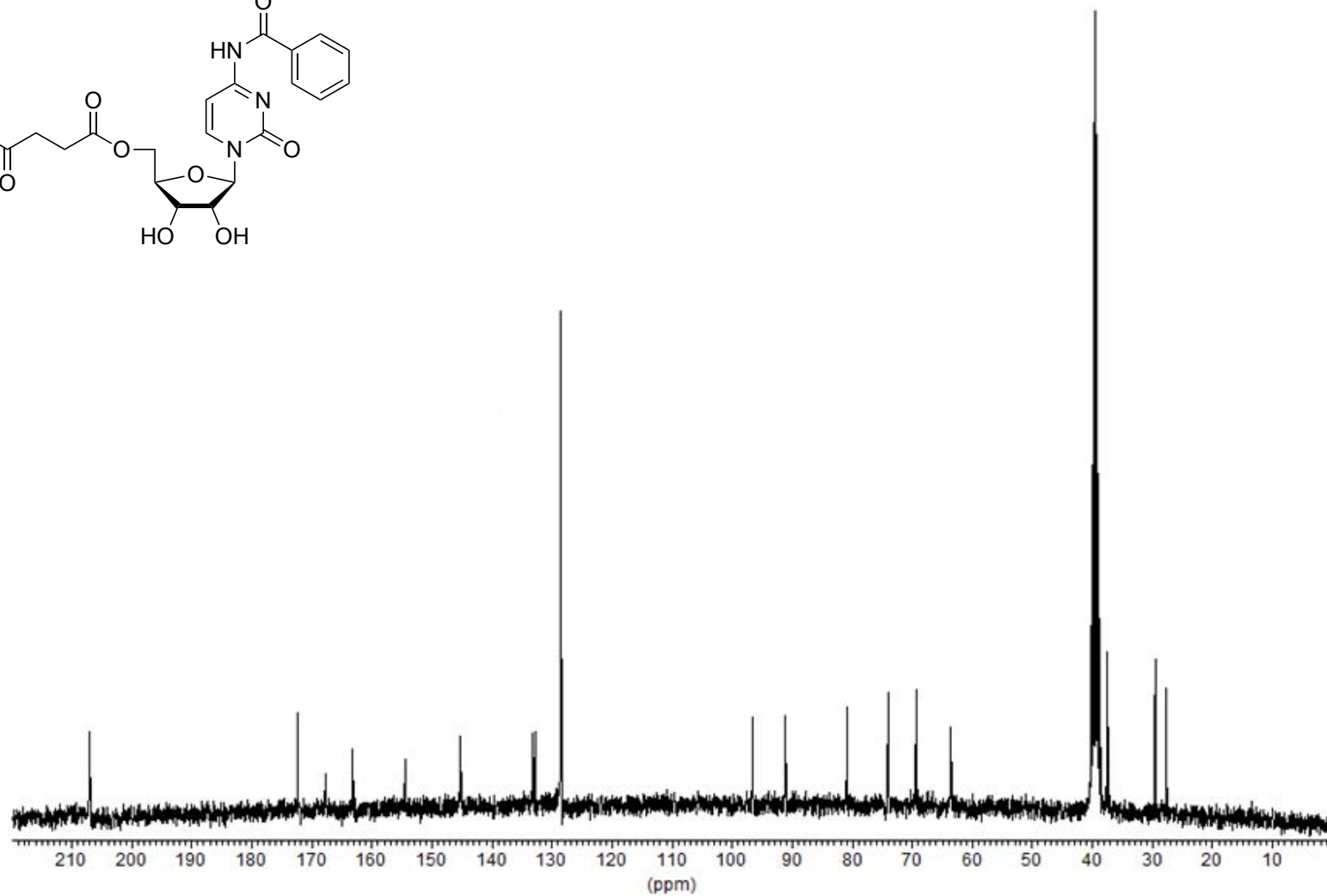
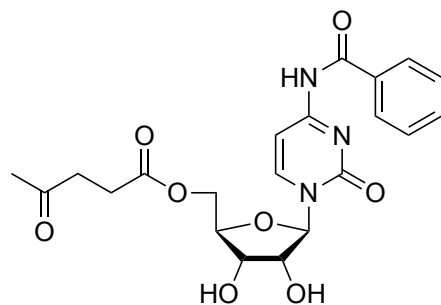
N-Benzoyl-5'-*O*-Levulinyl- β -D-cytidine (2d)

^1H -NMR (300.13 MHz, $\text{DMSO}-d_6$)



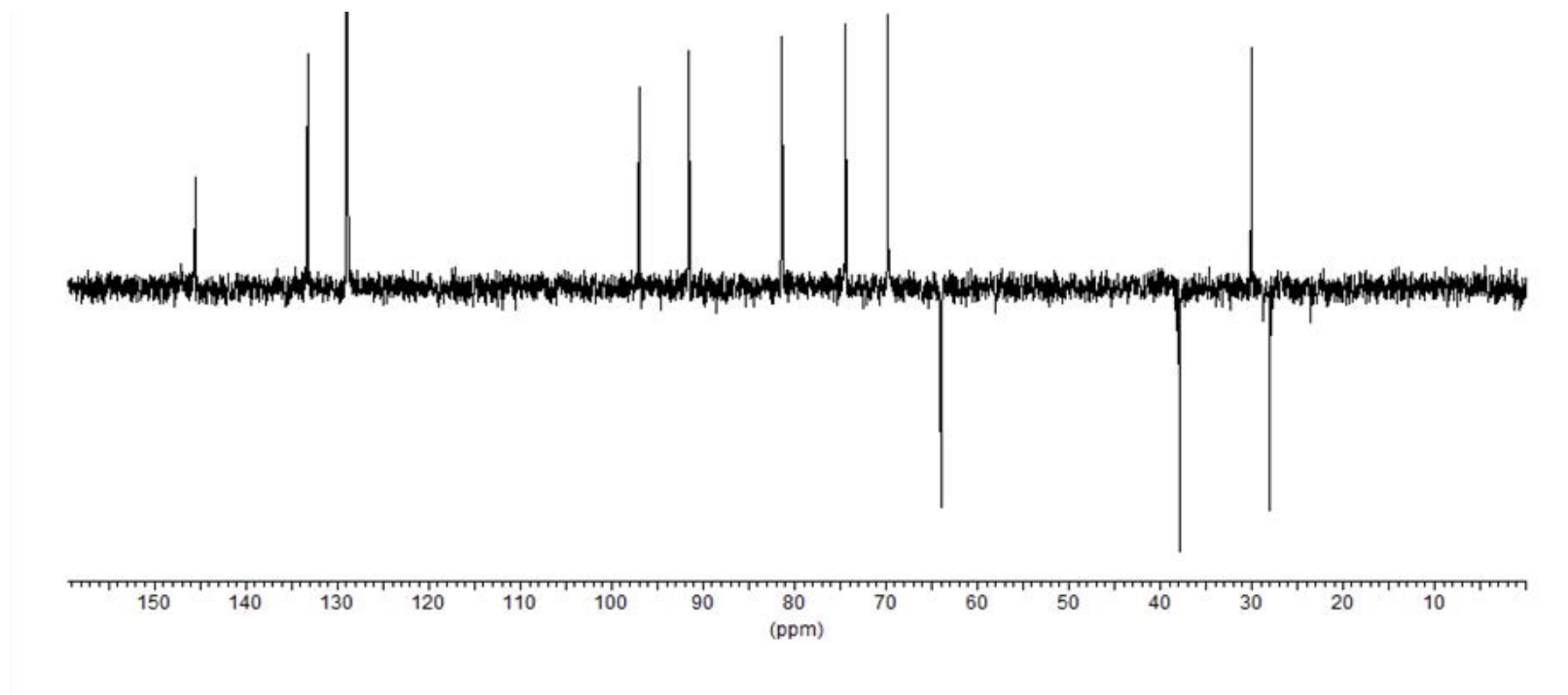
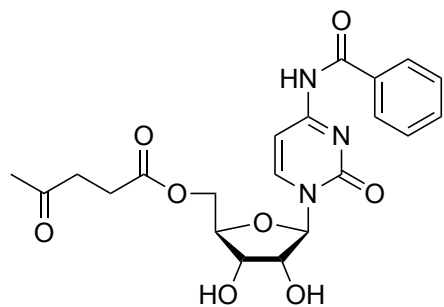
N-Benzoyl-5'-*O*-Levulinyl- β -D-cytidine (2d)

^{13}C -NMR (75.5 MHz, $\text{DMSO-}d_6$)



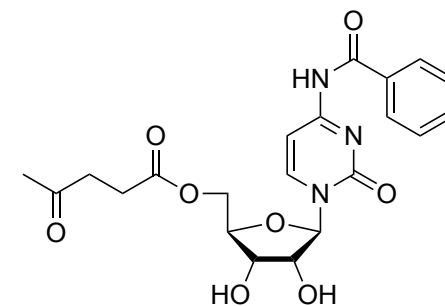
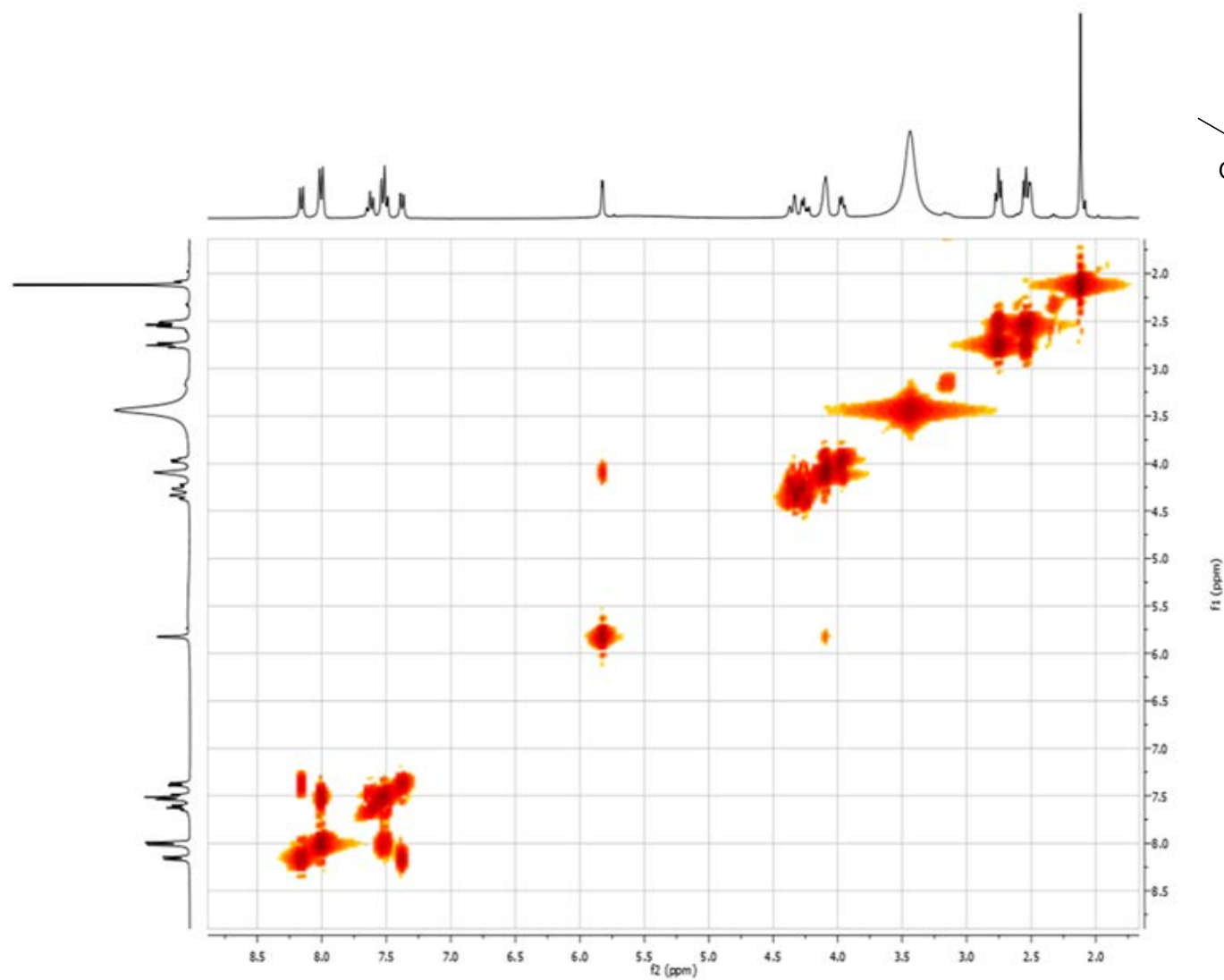
N-Benzoyl-5'-*O*-Levulinyl- β -D-cytidine (2d)

DEPT NMR (75.5 MHz, DMSO-*d*₆)



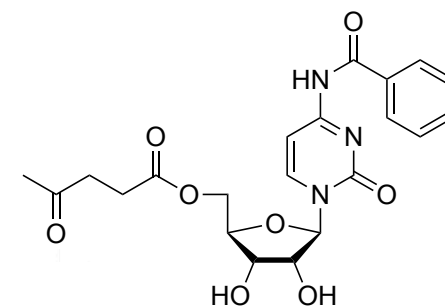
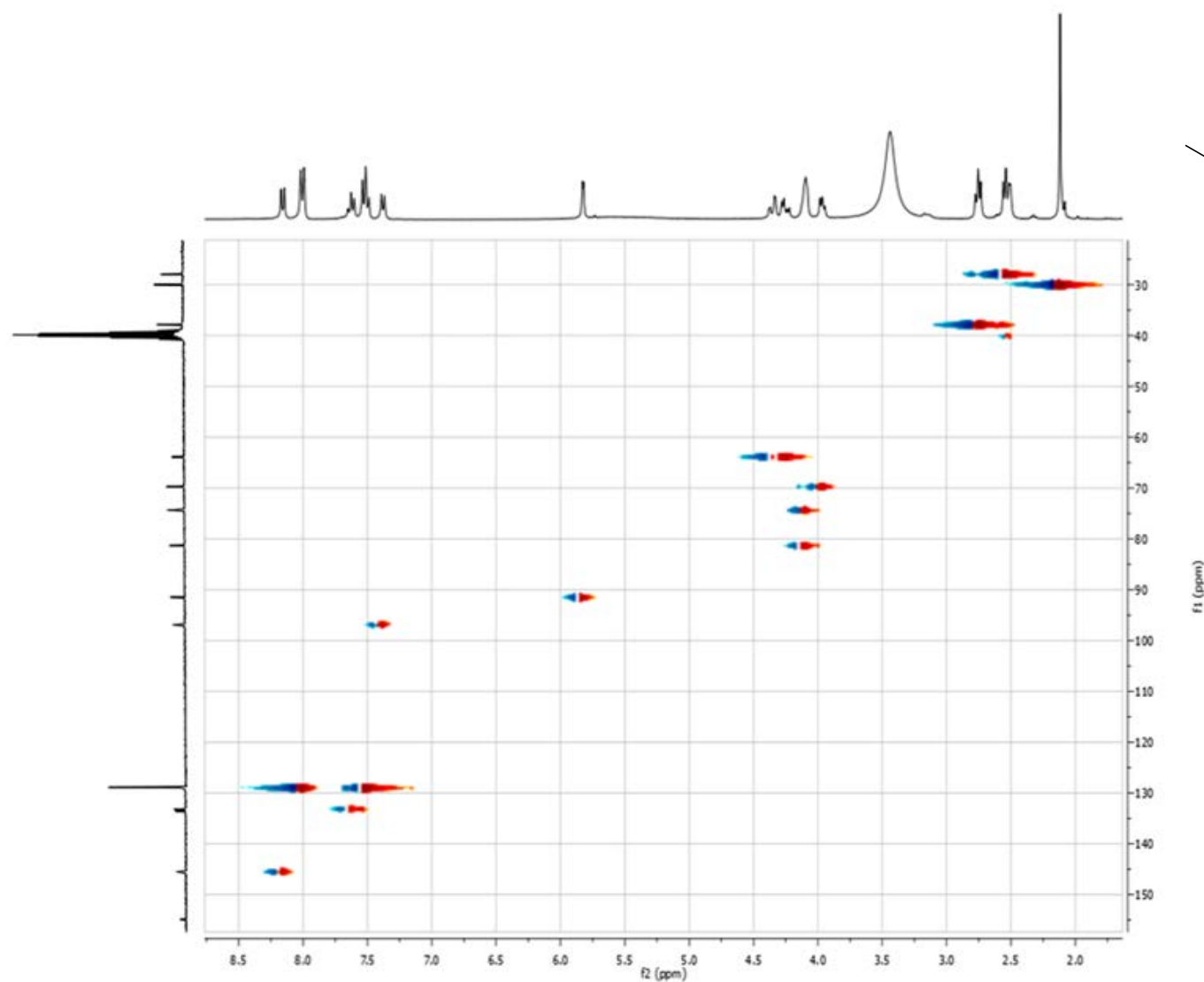
N-Benzoyl-5'-*O*-Levulinyl- β -D-cytidine (2d)

COSY NMR (300.13 MHz, DMSO- d_6)



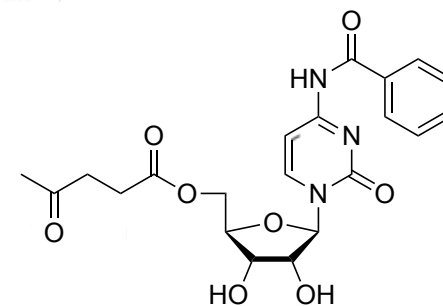
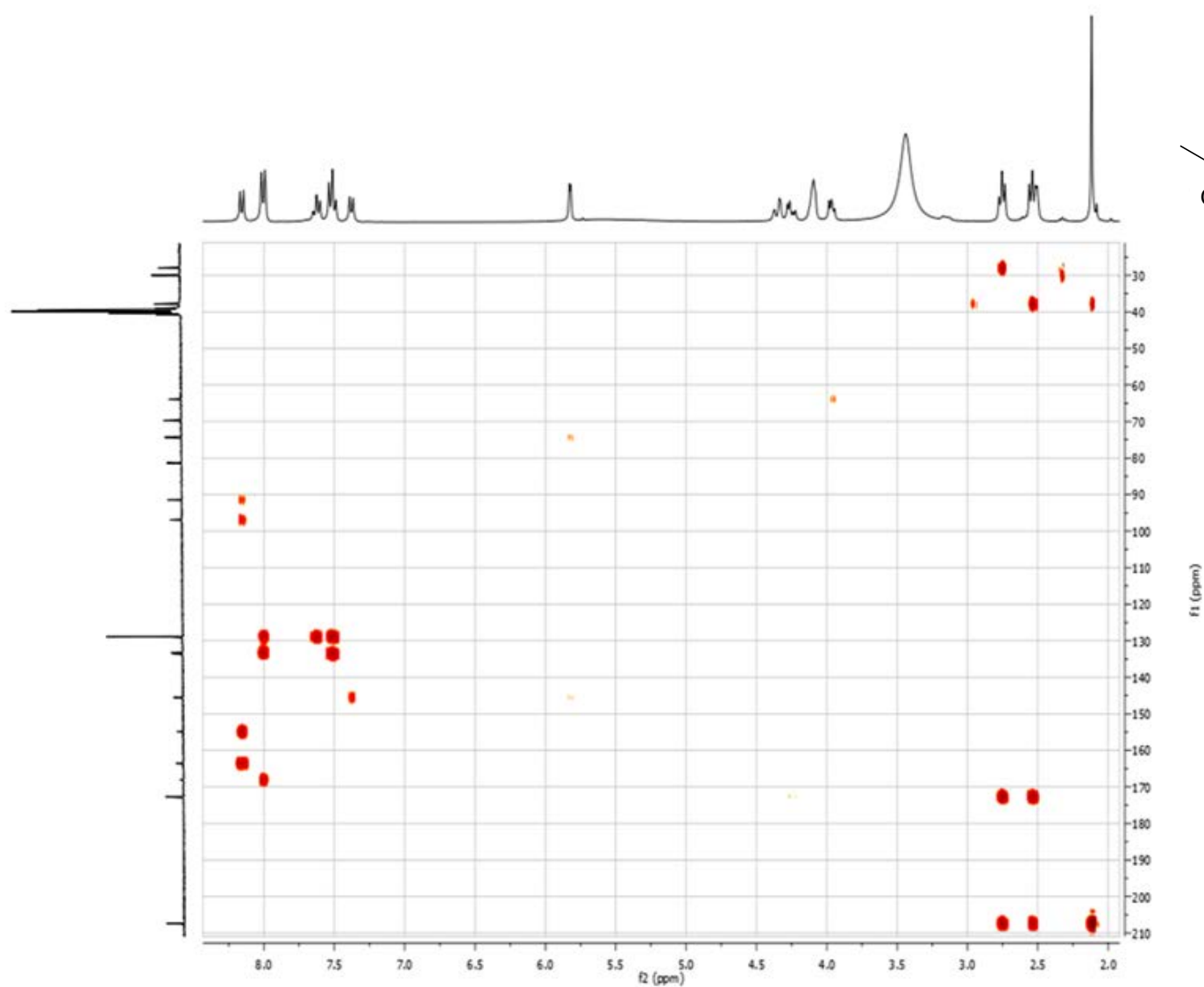
N-Benzoyl-5'-*O*-Levulinyl- β -D-cytidine (2d)

HSQC NMR (300.13 MHz, DMSO- d_6)



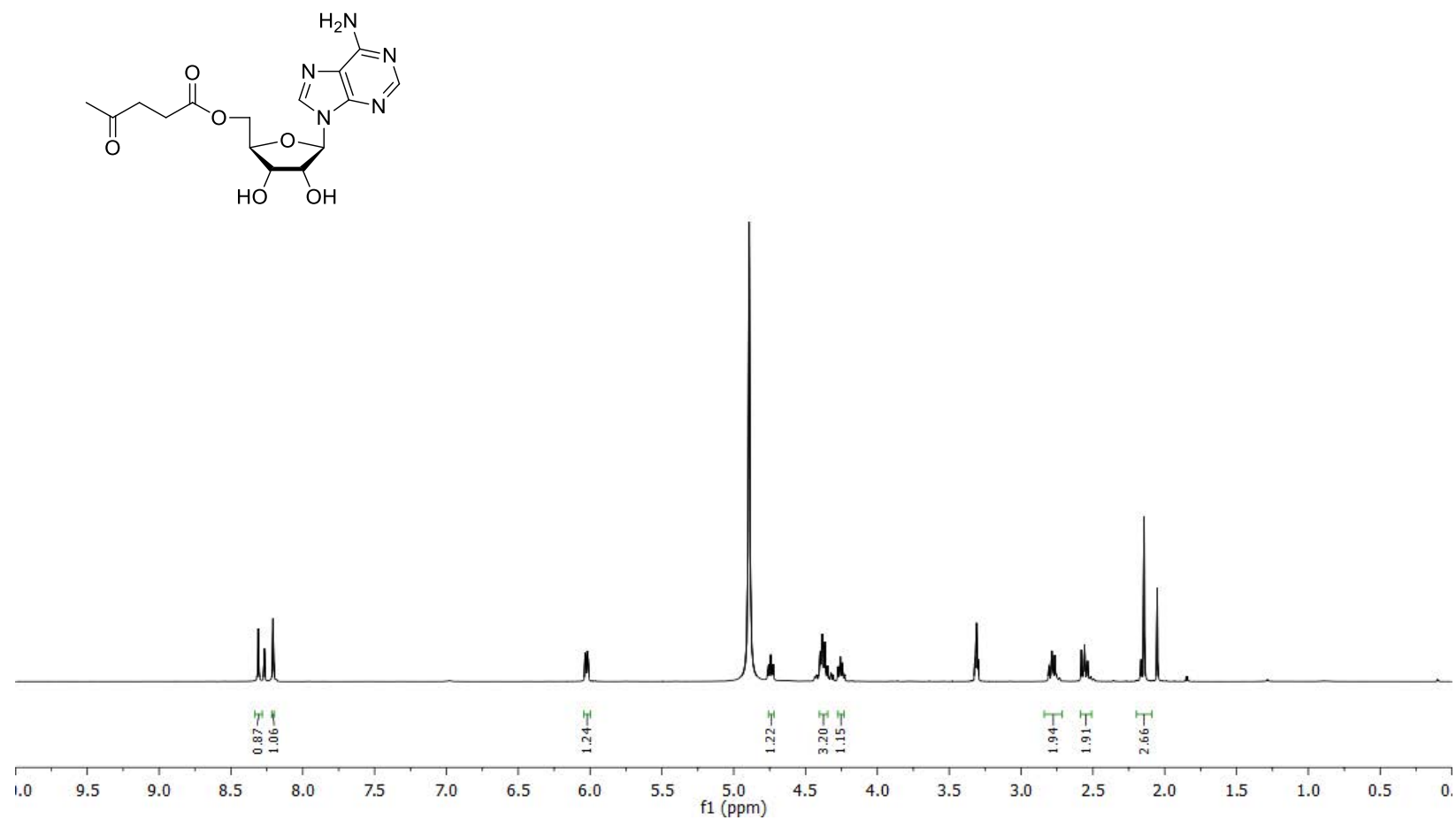
N-Benzoyl-5'-*O*-Levulinyl- β -D-cytidine (2d)

HMBC NMR (300.13 MHz, DMSO- d_6)



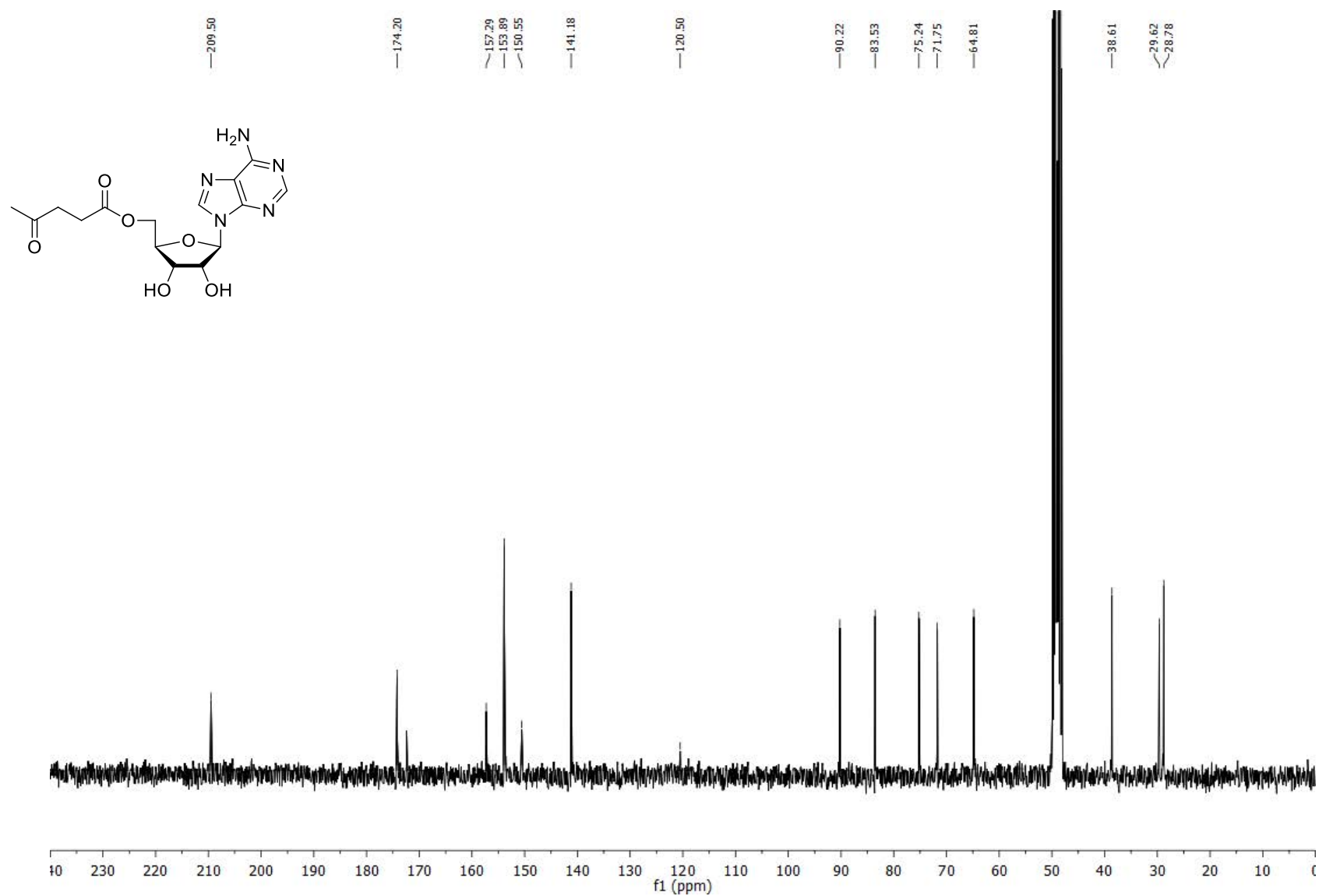
5'-*O*-Levulinyl- β -D-adenosine (2e)

^1H -NMR (300.13 MHz, $\text{MeOD-}d_4$)



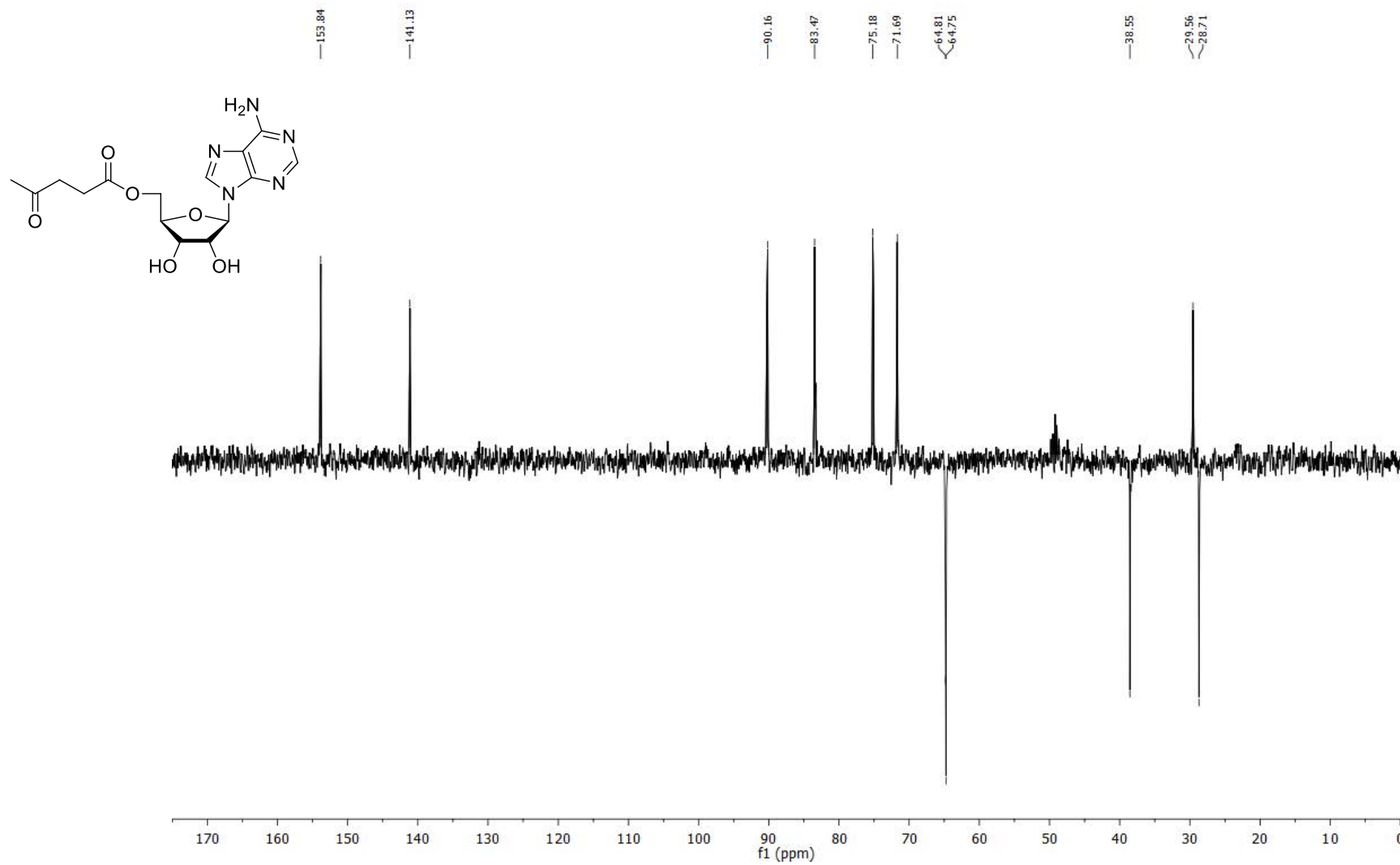
5'-*O*-Levulinyl- β -D-adenosine (2e)

^{13}C -NMR (75.5 MHz, $\text{MeOD-}d_4$)



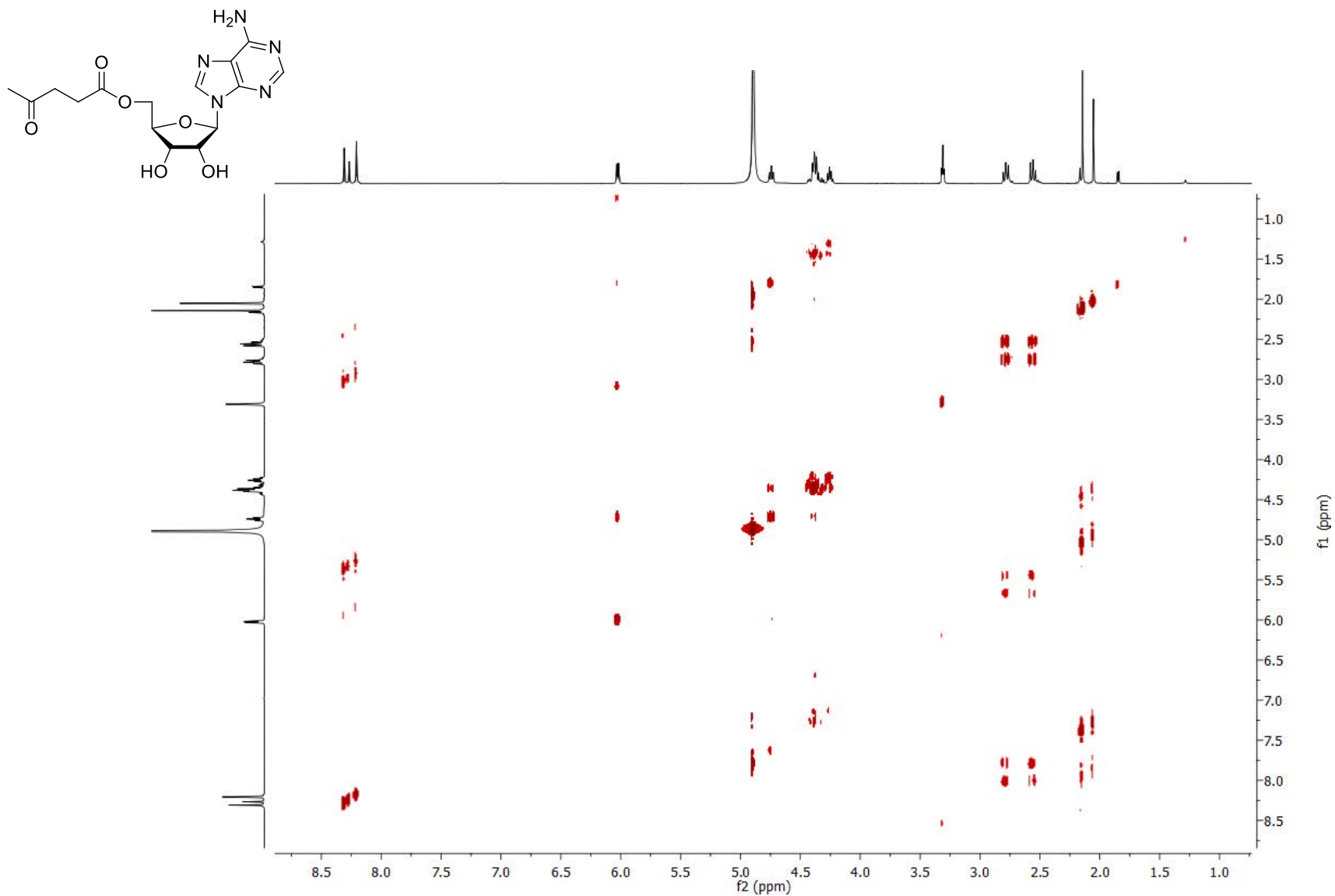
5'-*O*-Levulinyl- β -D-adenosine (2e)

DEPT NMR (75.5 MHz, MeOD- d_4)



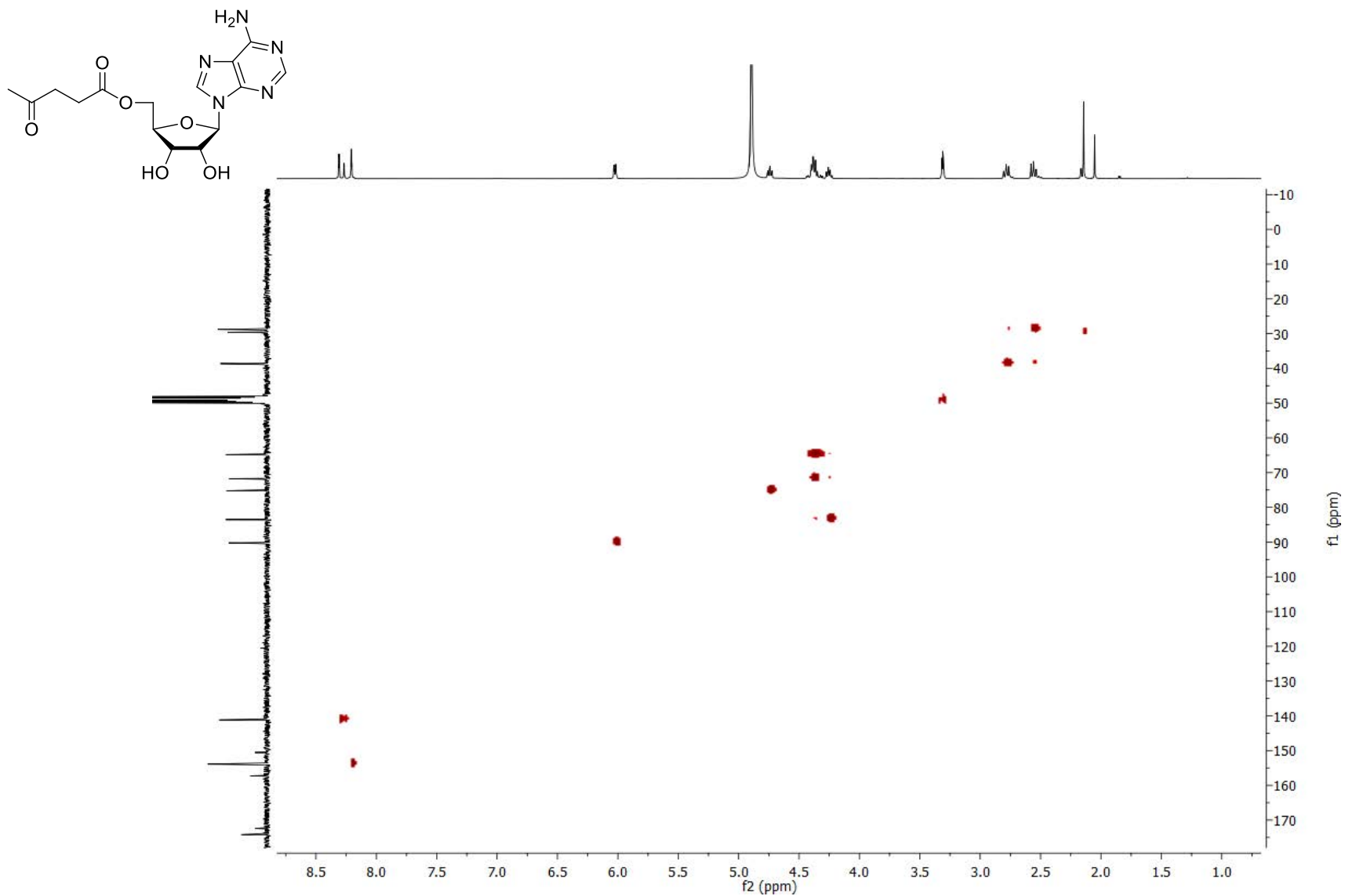
5'-*O*-Levulinyl- β -D-adenosine (2e)

COSY NMR (MeOD- d_4)



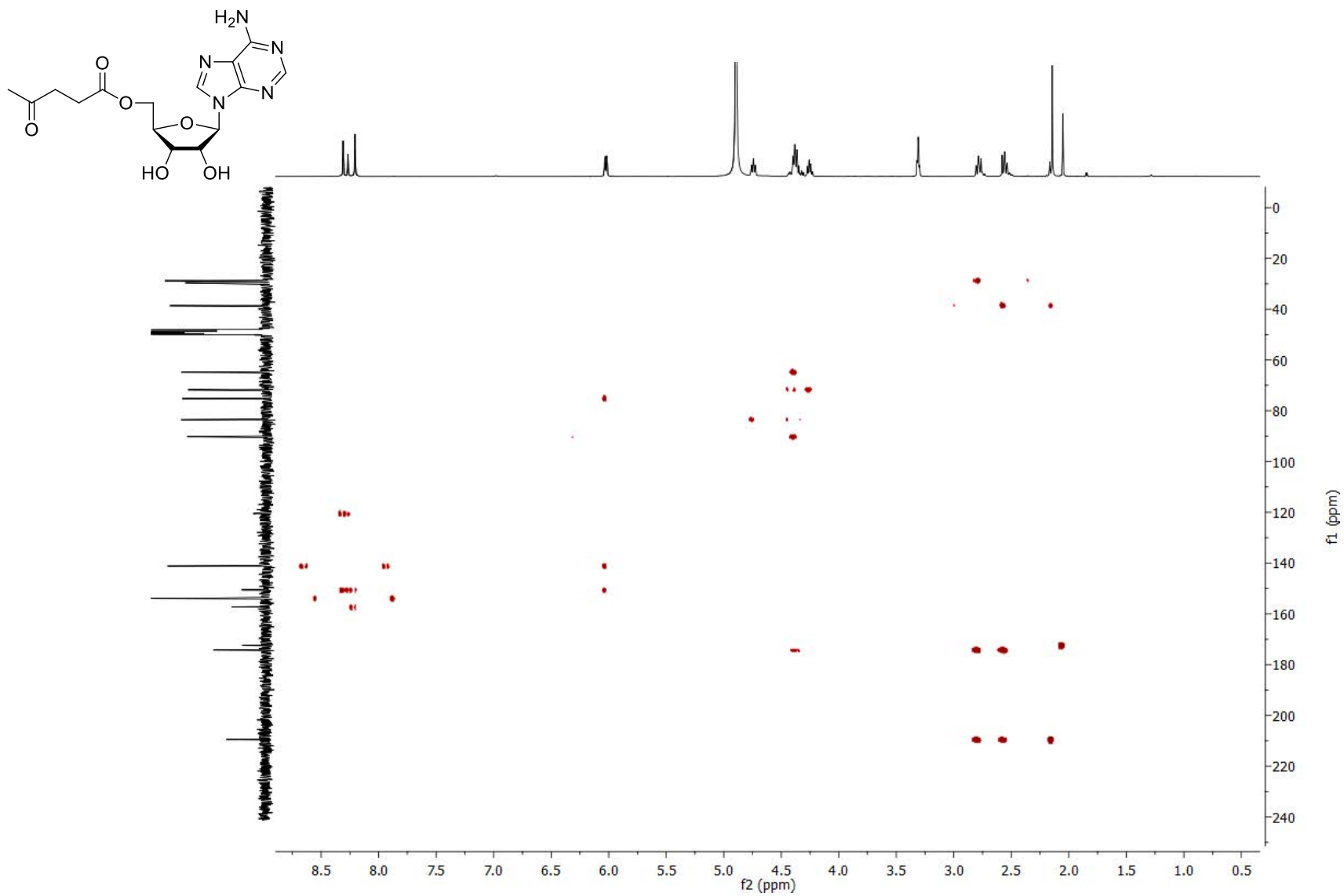
5'-*O*-Levulinyl- β -D-adenosine (2e)

HSQC NMR (MeOD- d_4)



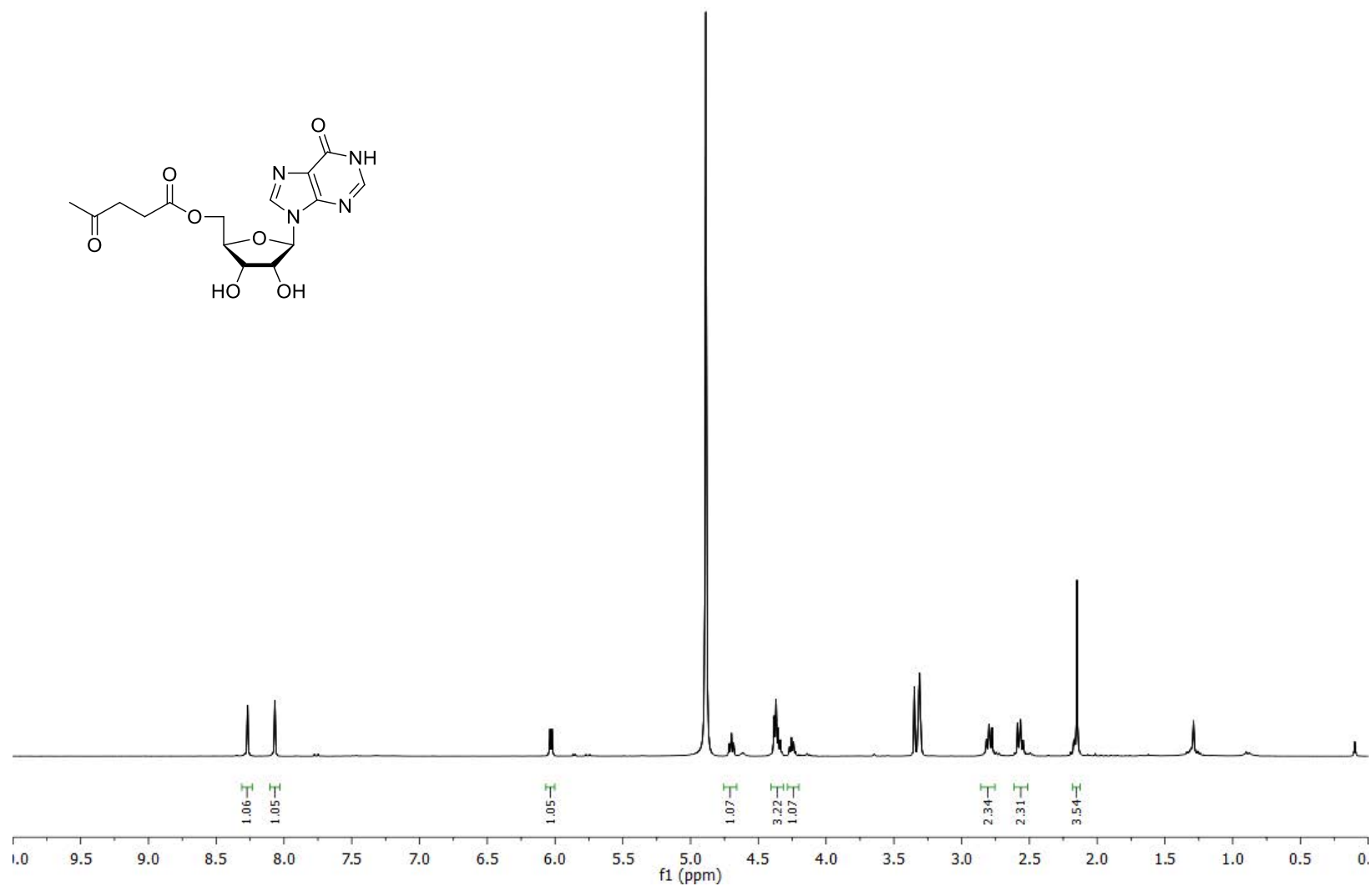
5'-*O*-Levulinyl- β -D-adenosine (2e)

HMBC NMR (MeOD- d_4)



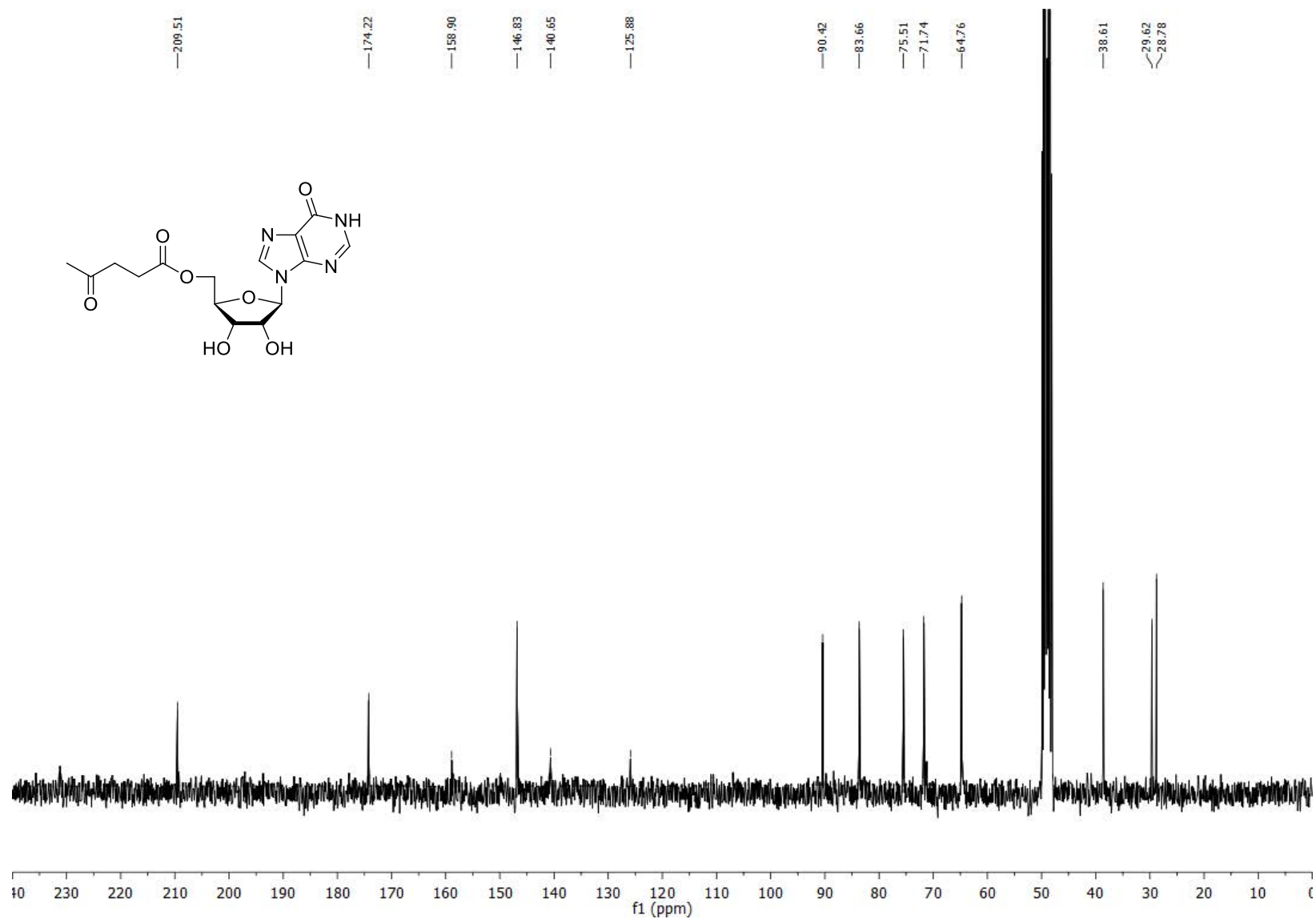
5'-*O*-Levulinyl- β -D-inosine (2f)

^1H -NMR (300.13 MHz, $\text{MeOD-}d_4$)



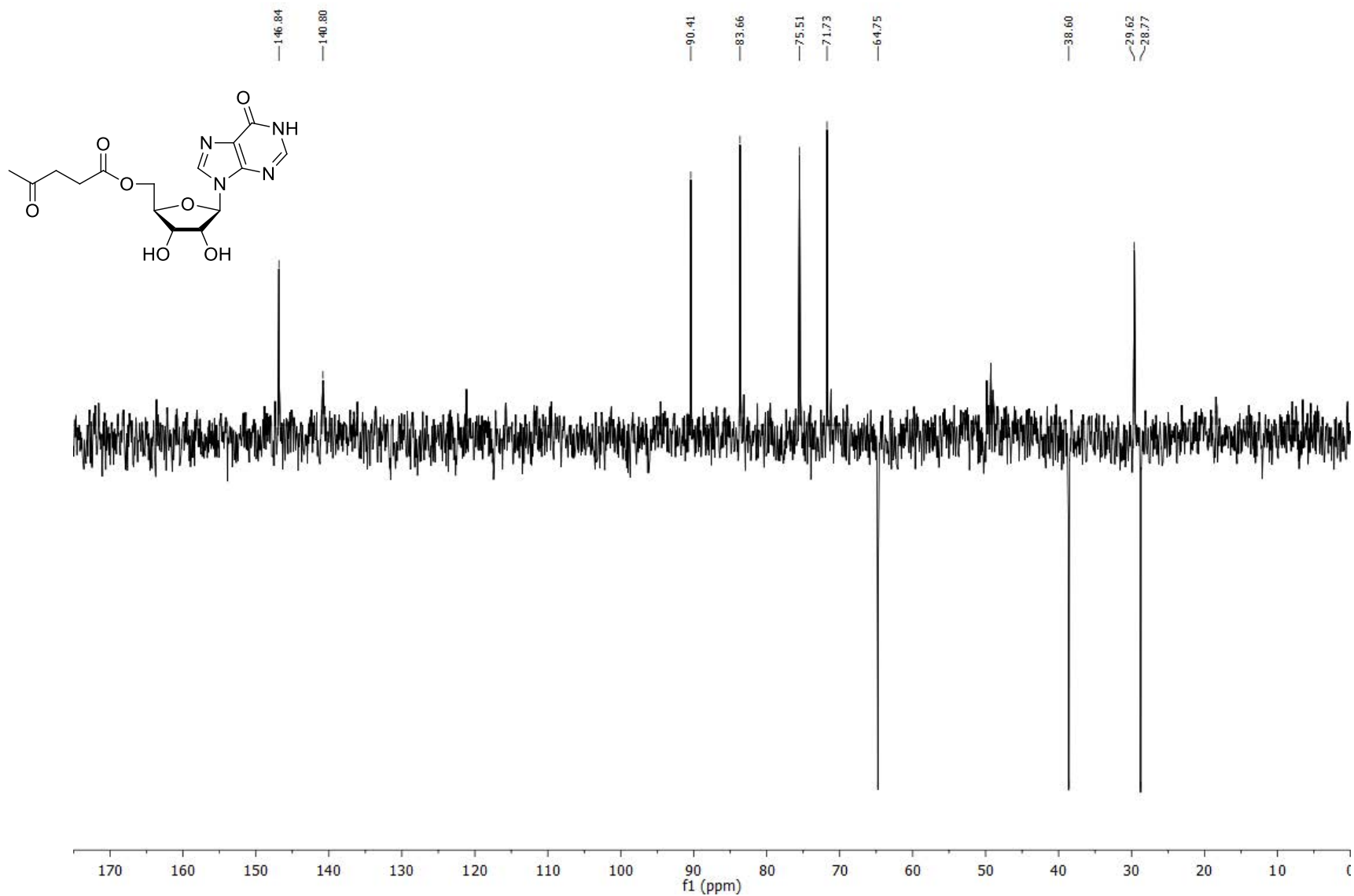
5'-*O*-Levulinyl- β -D-inosine (2f)

^{13}C -NMR (75.5 MHz, $\text{MeOD-}d_4$)



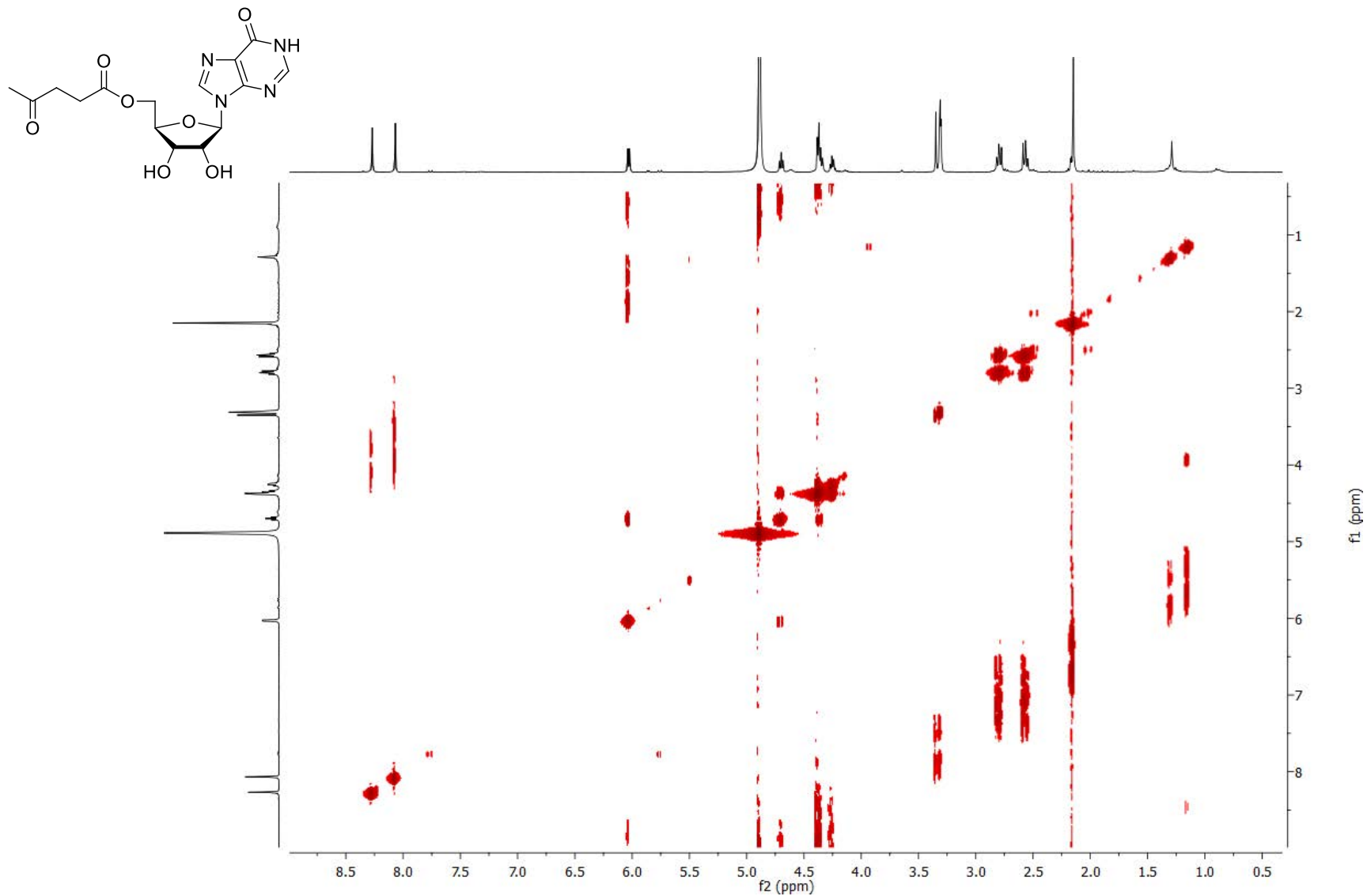
5'-*O*-Levulinyl- β -D-inosine (2f)

DEPT NMR (75.5 MHz, MeOD- d_4)



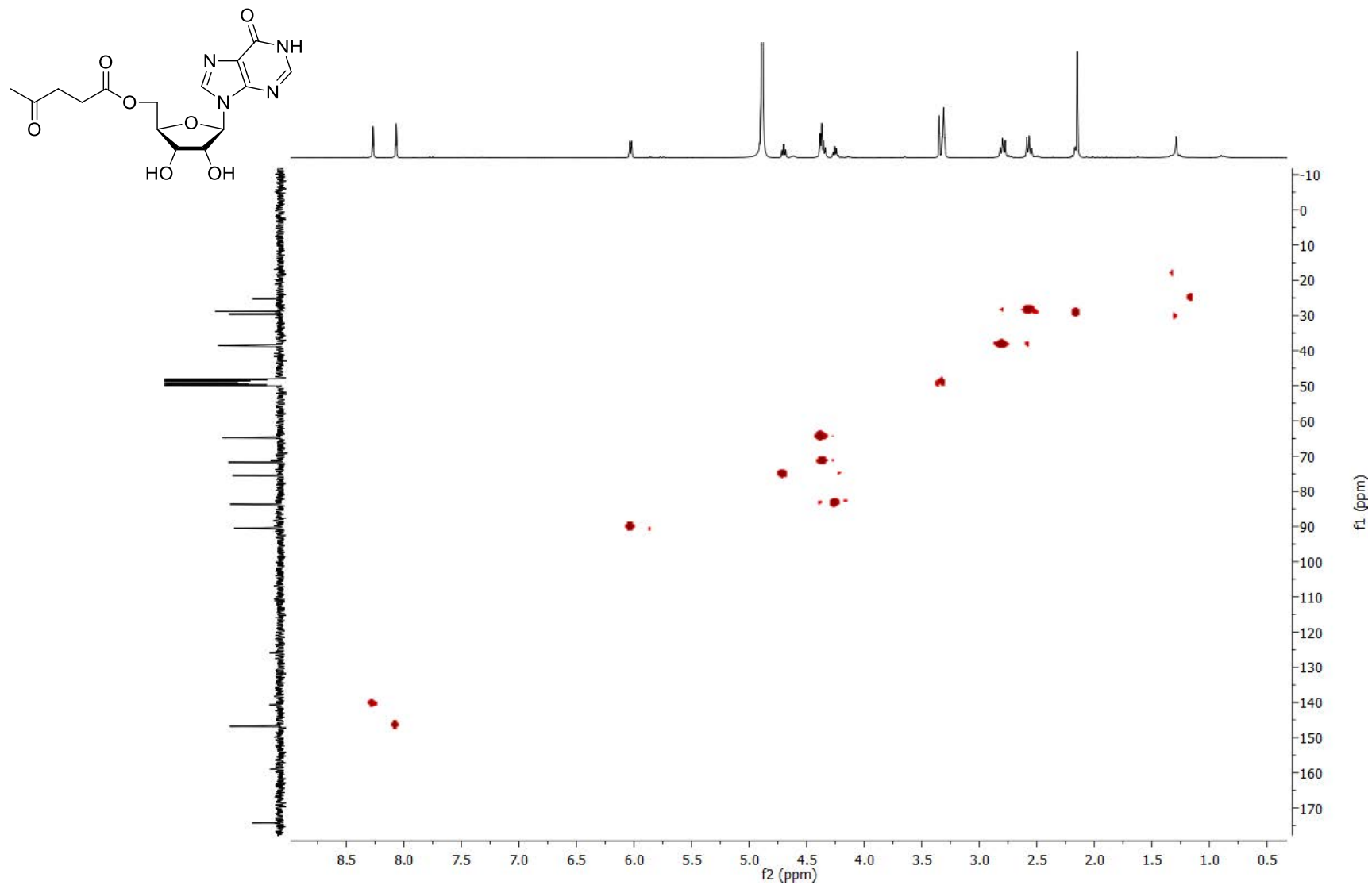
5'-*O*-Levulinyl- β -D-inosine (2f)

COSY NMR (MeOD- d_4)



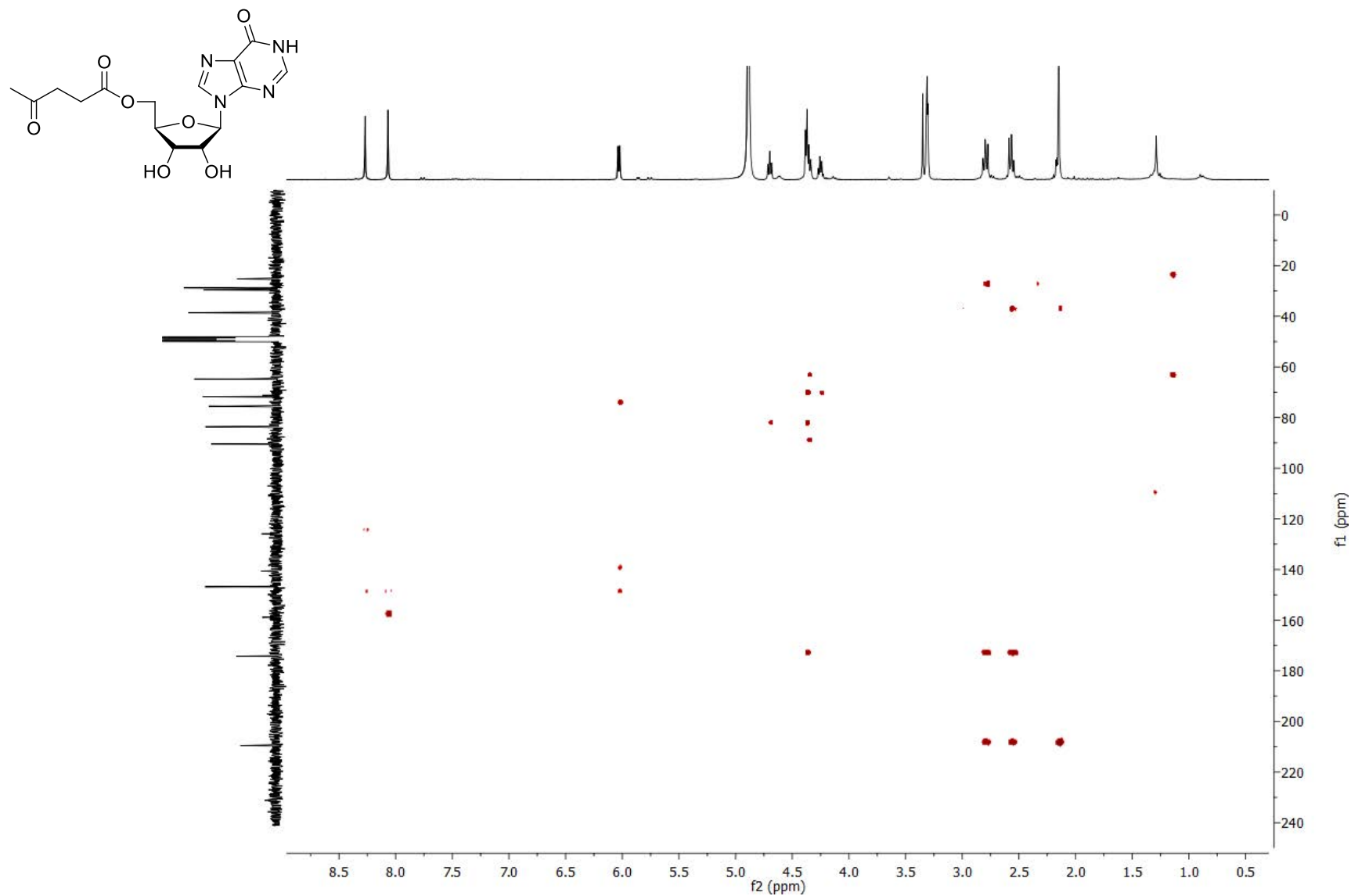
5'-*O*-Levulinyl- β -D-inosine (2f)

HSQC NMR (MeOD- d_4)



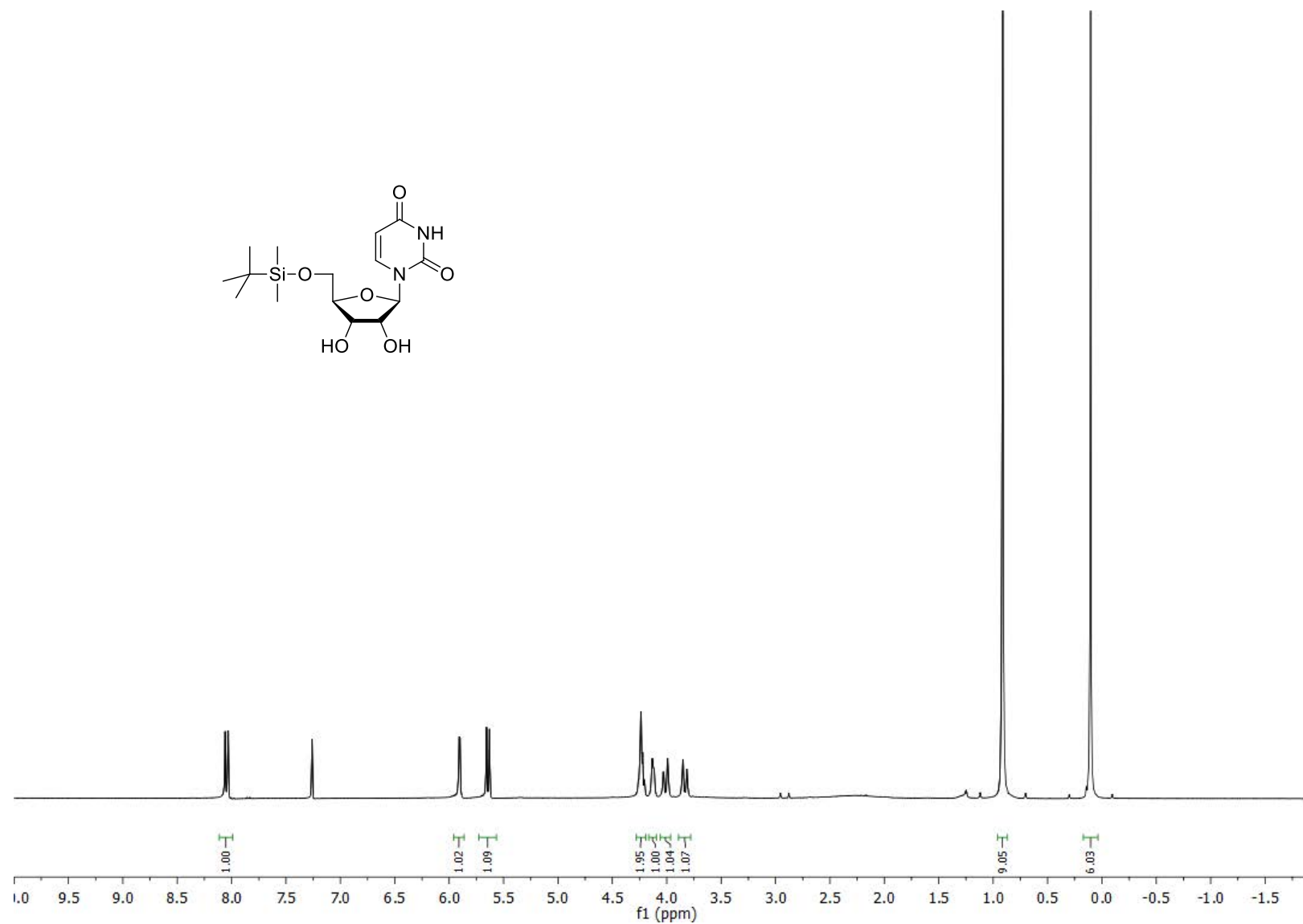
5'-*O*-Levulinyl- β -D-inosine (2f)

HMBC NMR (MeOD- d_4)



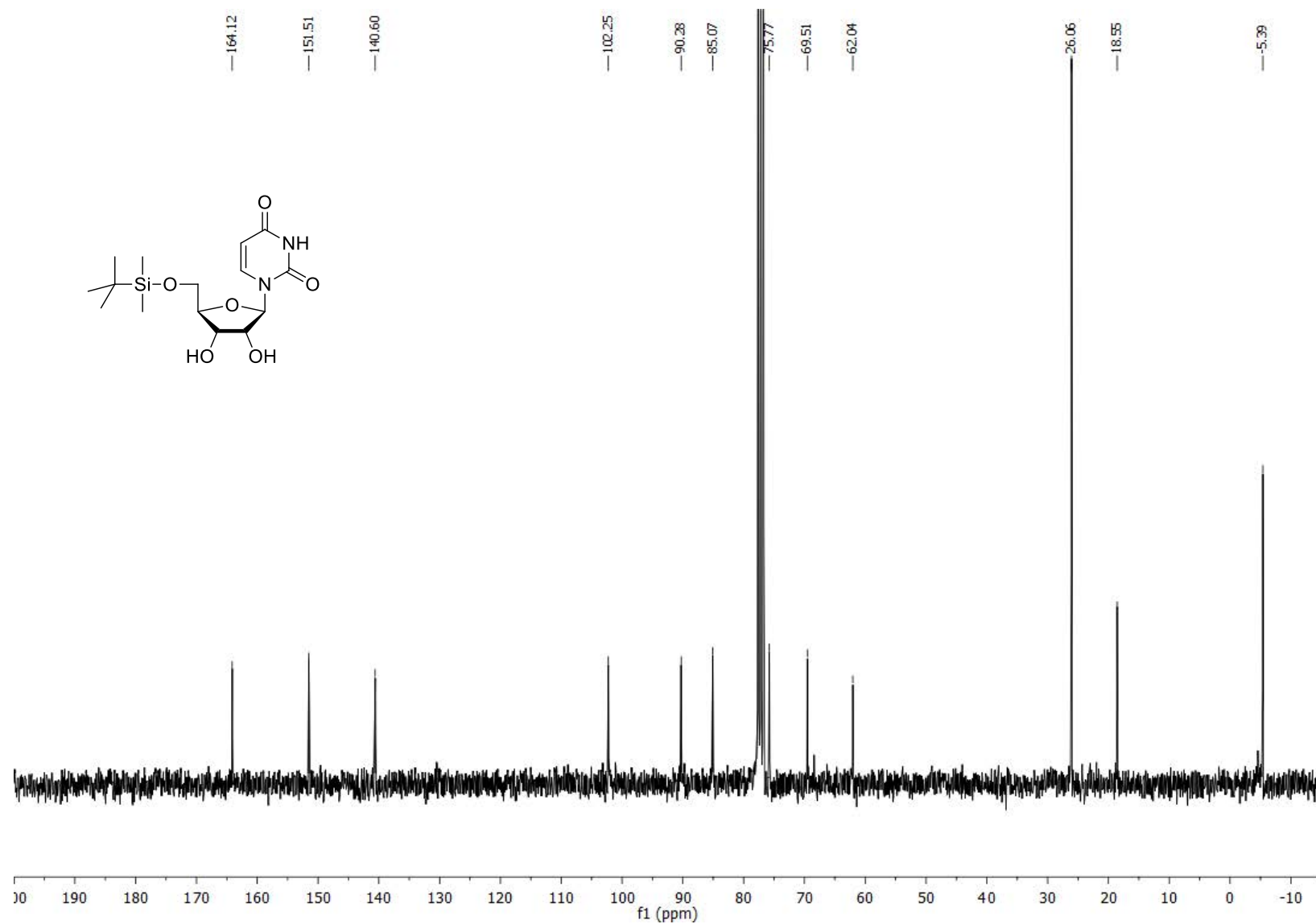
5'-O-(*tert*-Butyldimethylsilyl)- β -D-uridine (5a)

^1H -NMR (300.13 MHz, CDCl_3)



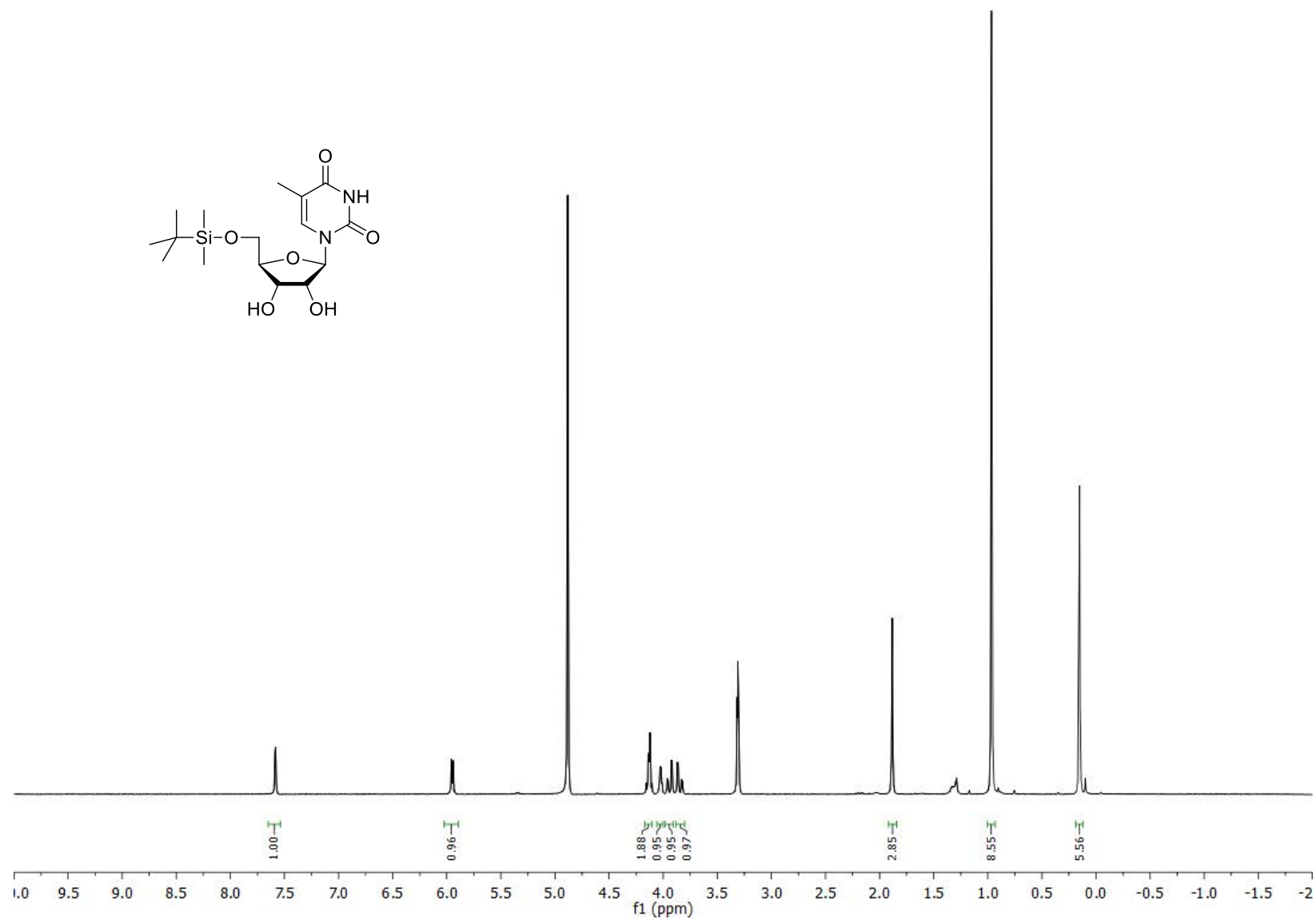
5'-O-(*tert*-Butyldimethylsilyl)- β -D-uridine (5a)

^{13}C -NMR (300.13 MHz, CDCl_3)



5'-O-(*tert*-Butyldimethylsilyl)- β -D-5-methyluridine (5b)

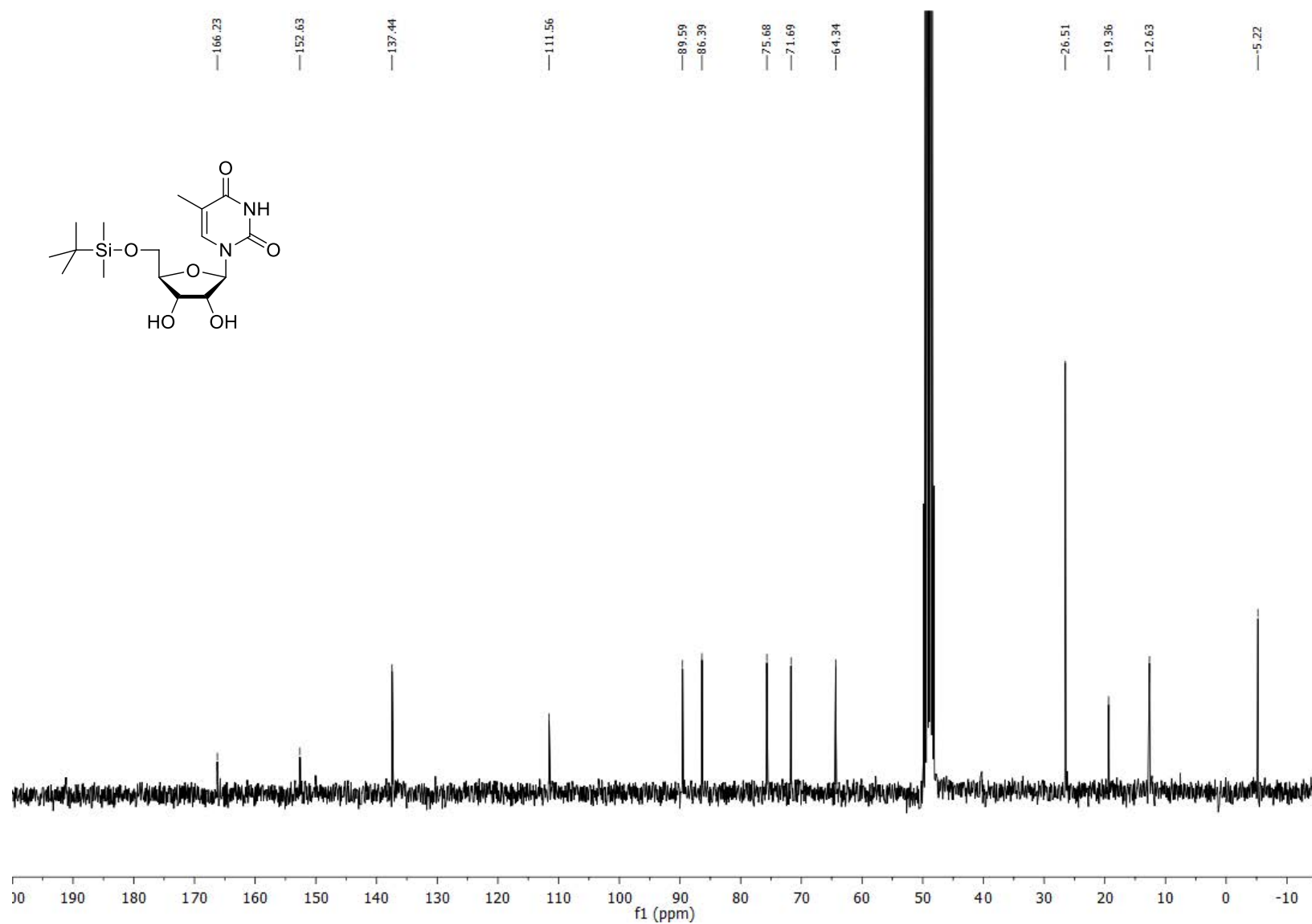
$^1\text{H-NMR}$ (300.13 MHz, CDCl_3)



S43

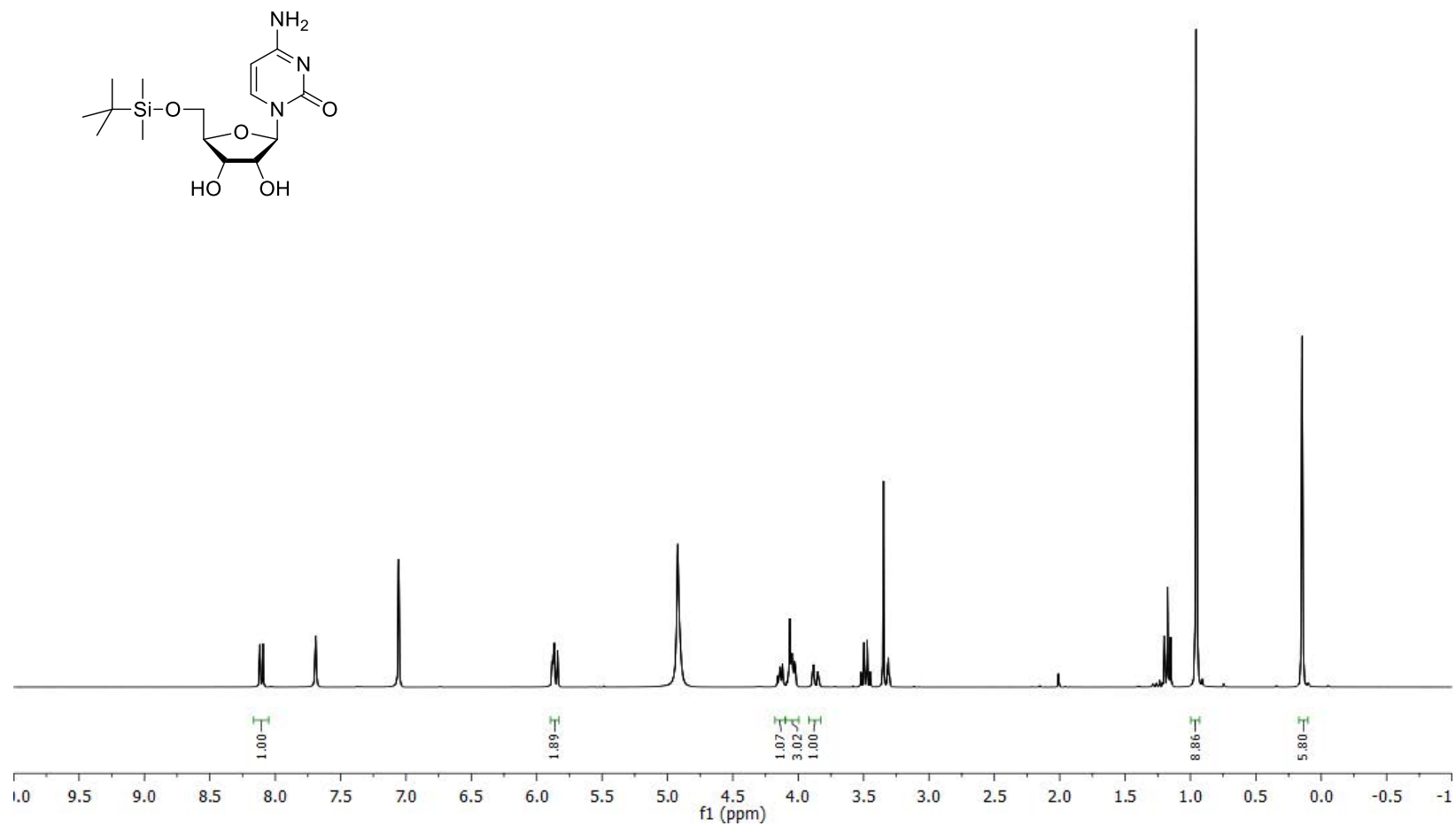
5'-O-(*tert*-Butyldimethylsilyl)- β -D-5-methyluridine (5b)

^{13}C -NMR (75.5 MHz, CDCl_3)



5'-O-(*tert*-Butyldimethylsilyl)- β -D-cytidine (5c)

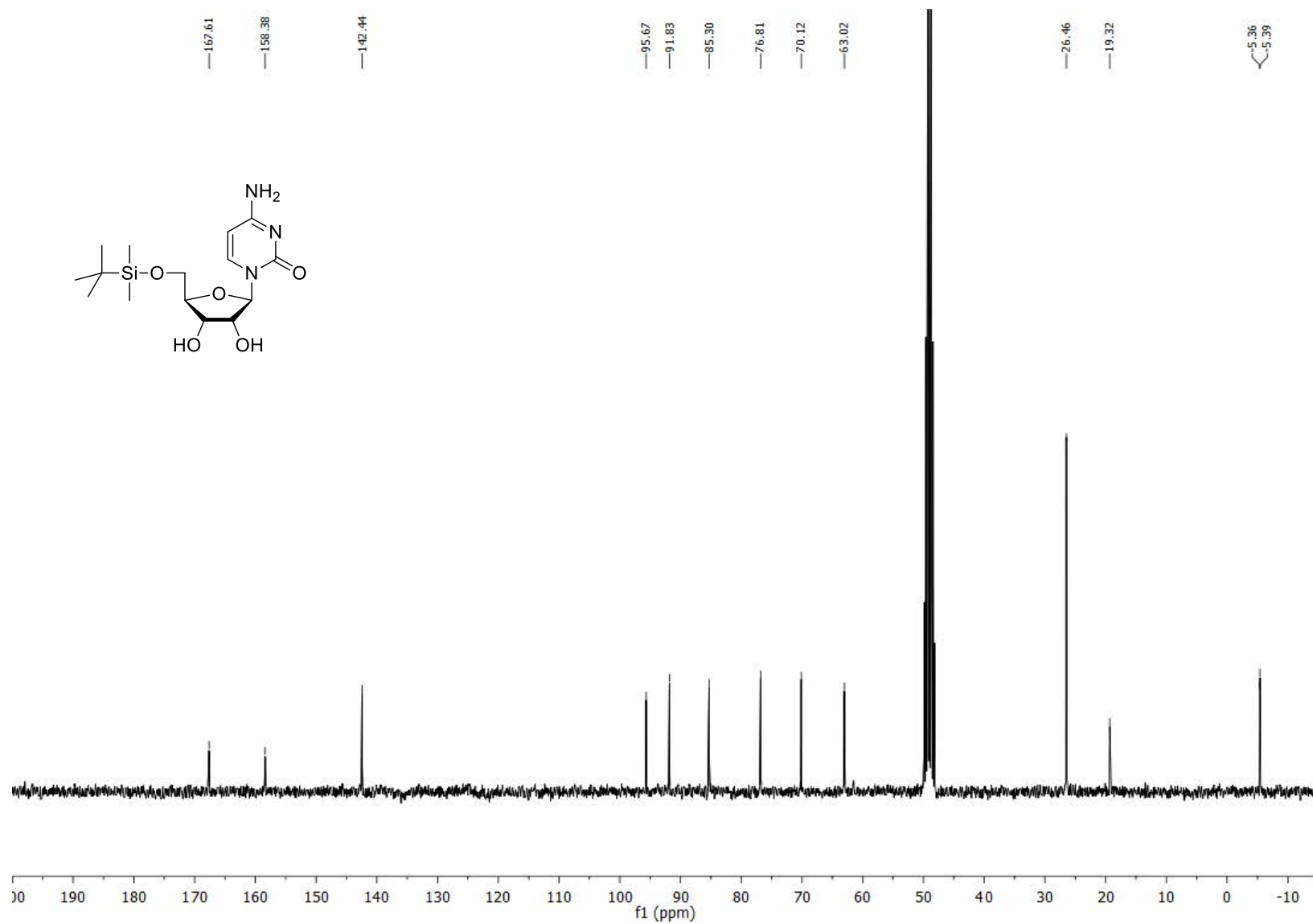
$^1\text{H-NMR}$ (300.13 MHz, $\text{MeOH-}d_4$)



S45

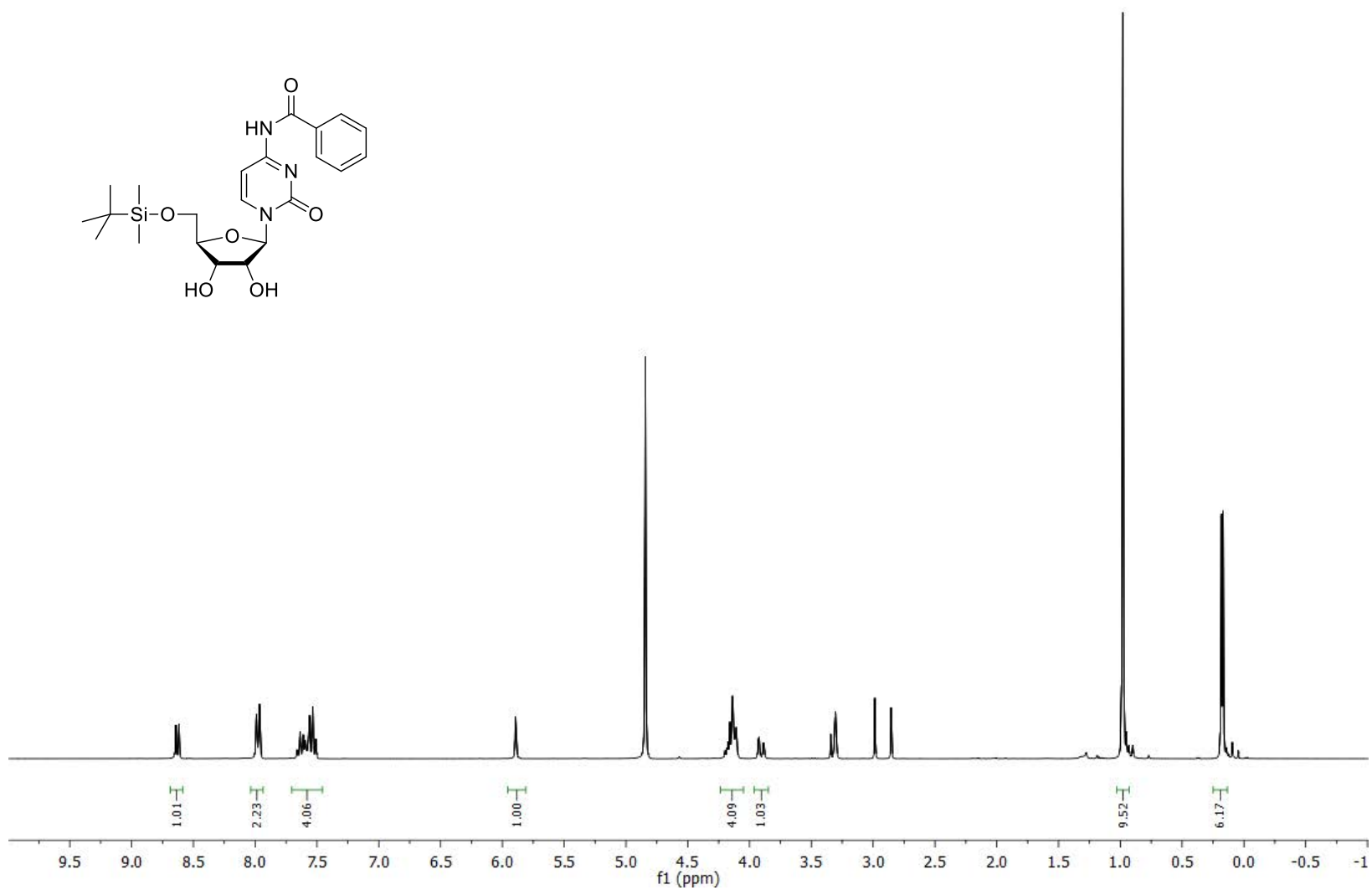
5'-O-(*tert*-Butyldimethylsilyl)- β -D-cytidine (5c)

^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



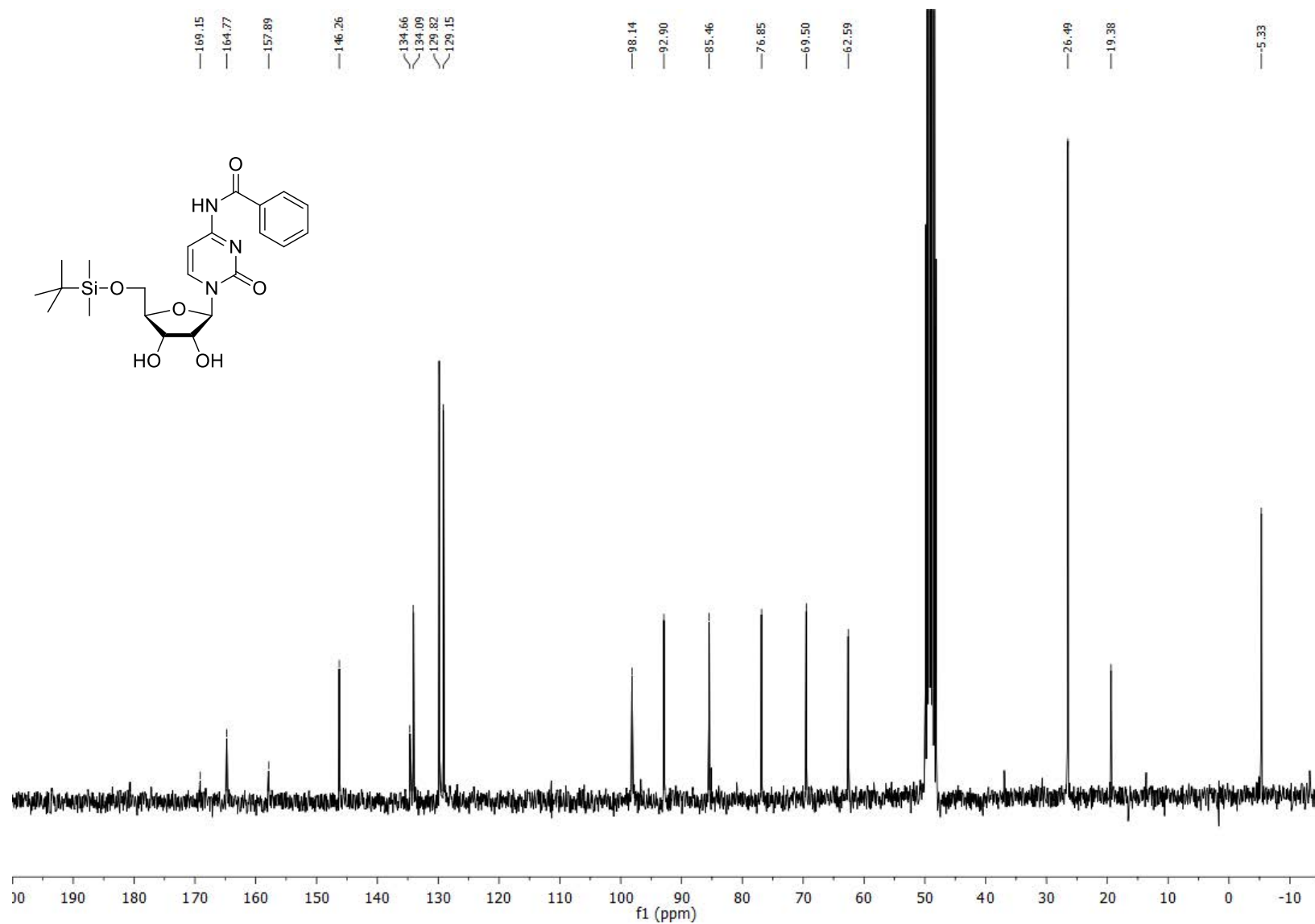
***N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)- β -D-cytidine (5d)**

¹H-NMR (300.13 MHz, MeOH-*d*₄)



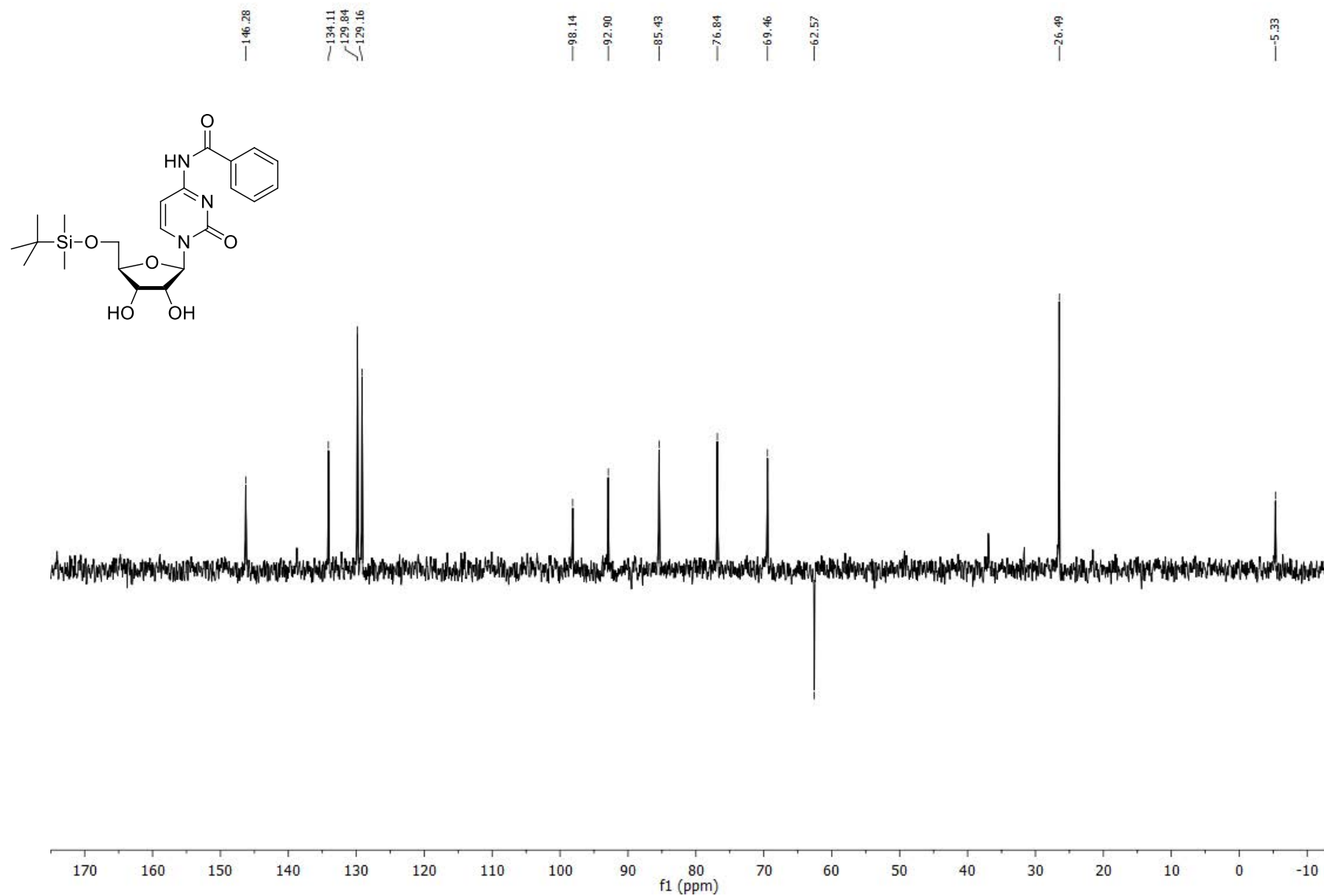
***N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)- β -D-cytidine (5d)**

¹³C-NMR (75.5 MHz, MeOH-*d*₄)



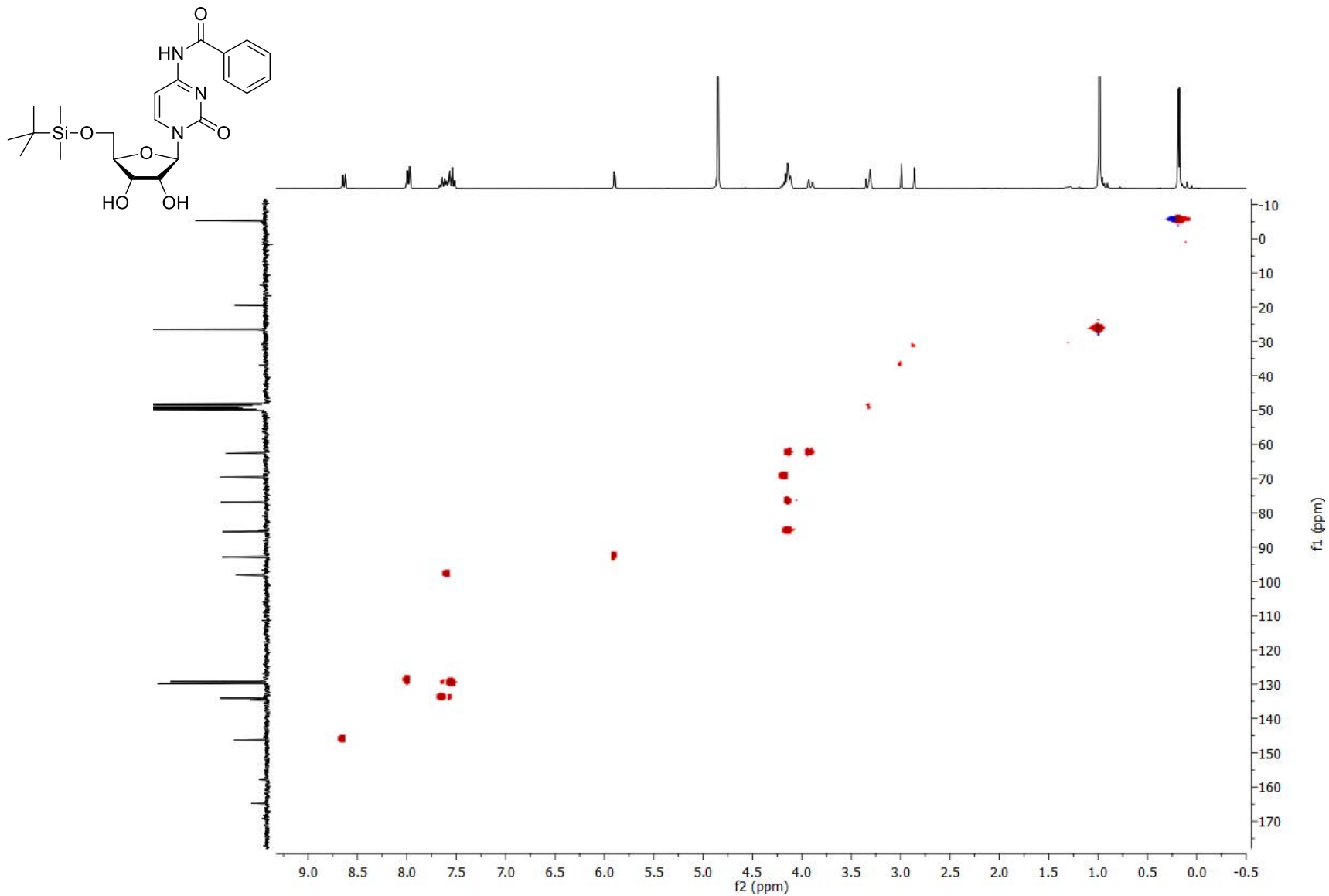
*N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-β-D-cytidine (5d)

DEPT NMR (75.5 MHz, MeOH-*d*₄)



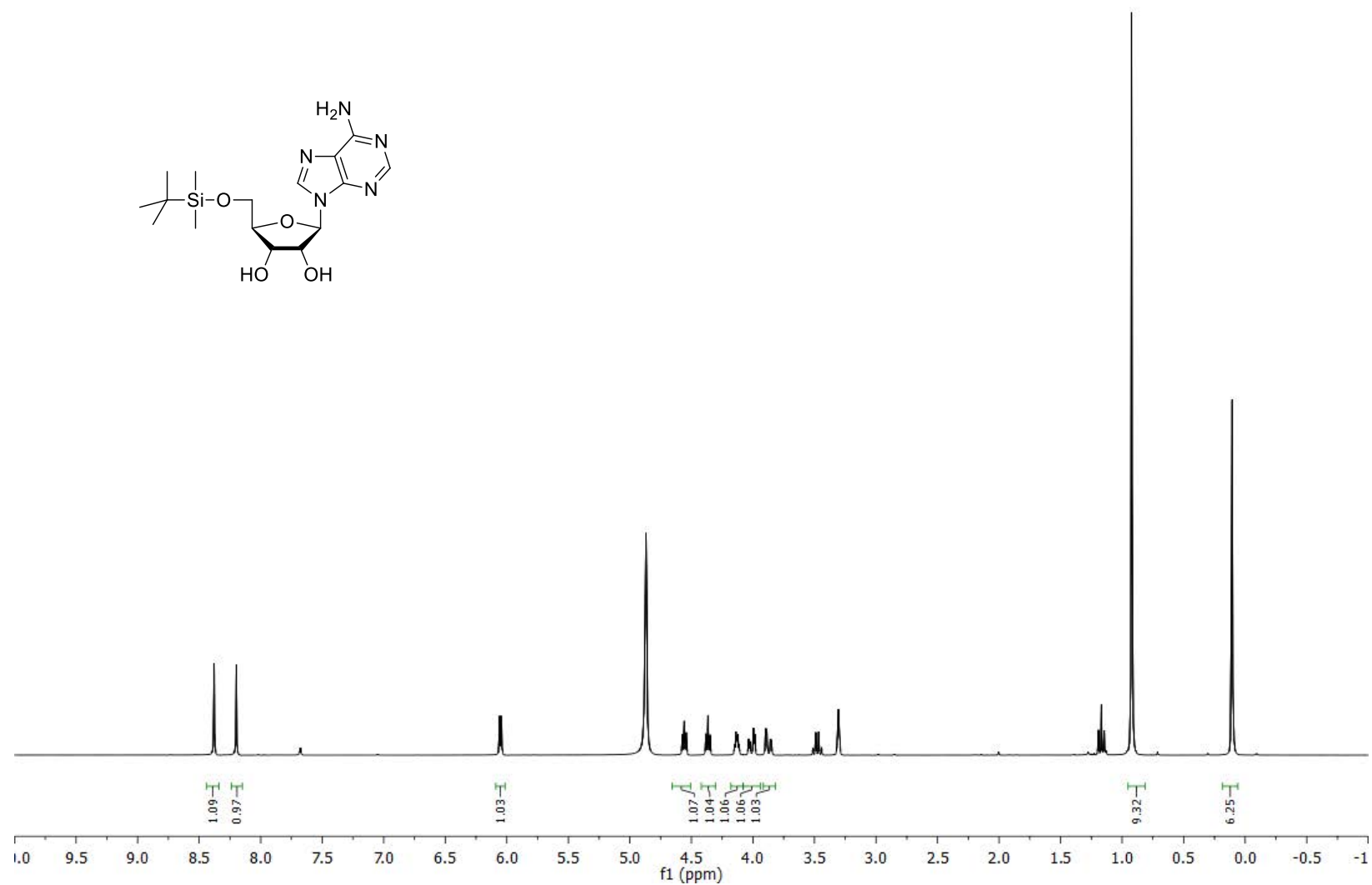
*N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-β-D-cytidine (5d)

HSQC NMR (MeOH-*d*₄)



5'-*O*-(*tert*-Butyldimethylsilyl)- β -D-adenosine (5e)

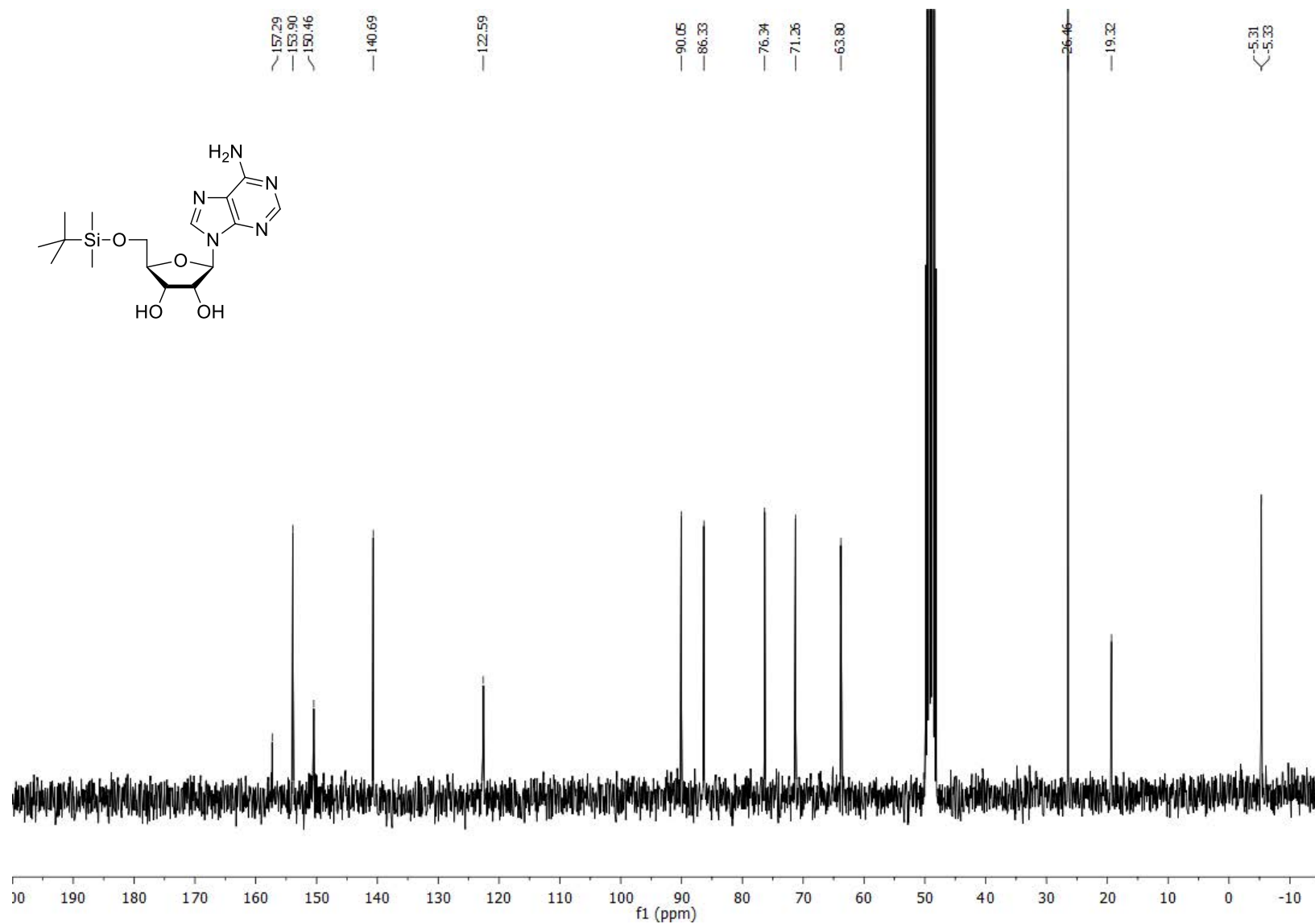
$^1\text{H-NMR}$ (300.13 MHz, $\text{MeOH-}d_4$)



S51

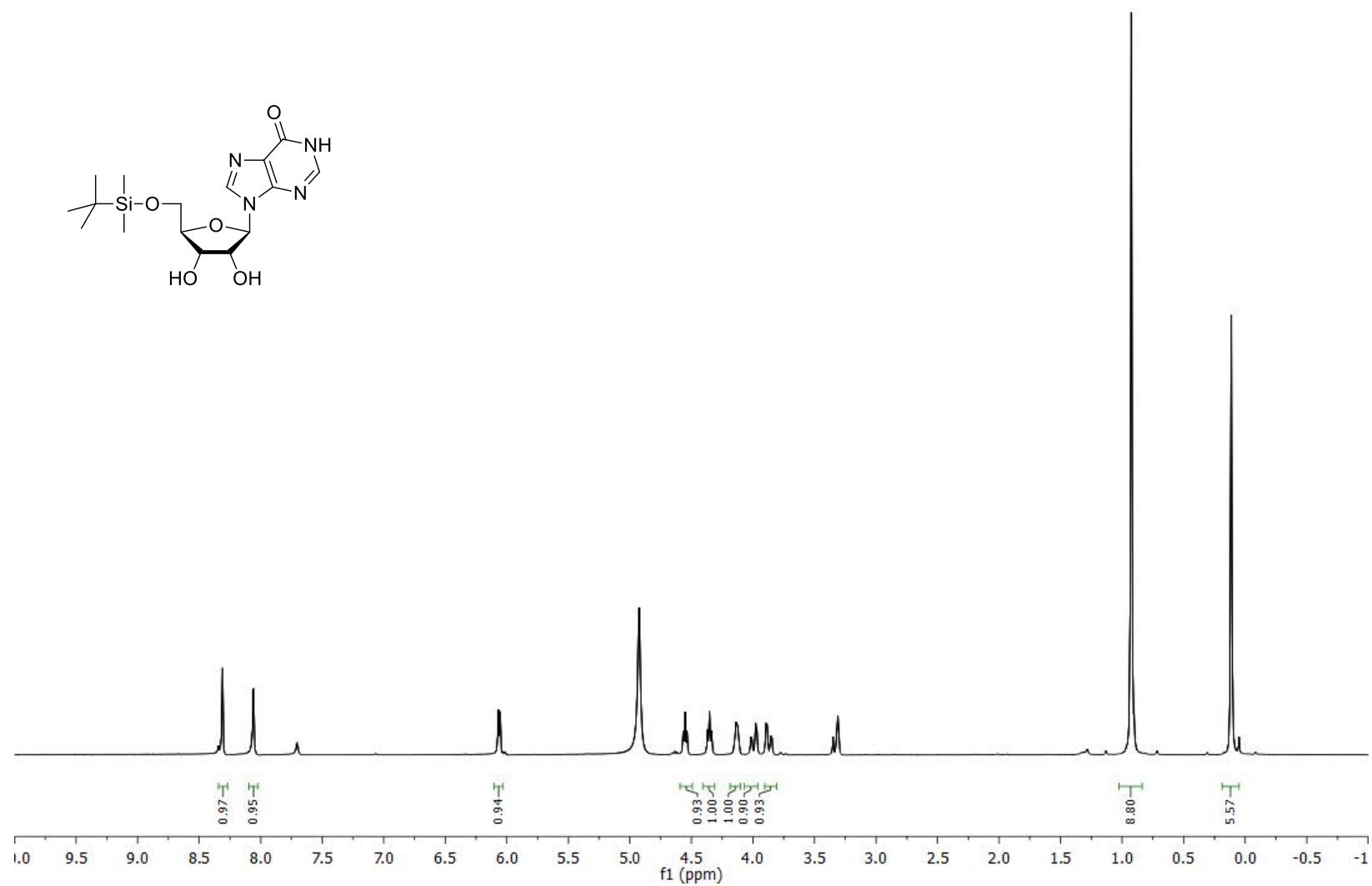
5'-O-(*tert*-Butyldimethylsilyl)- β -D-adenosine (5e)

^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



5'-O-(*tert*-Butyldimethylsilyl)- β -D-inosine (5f)

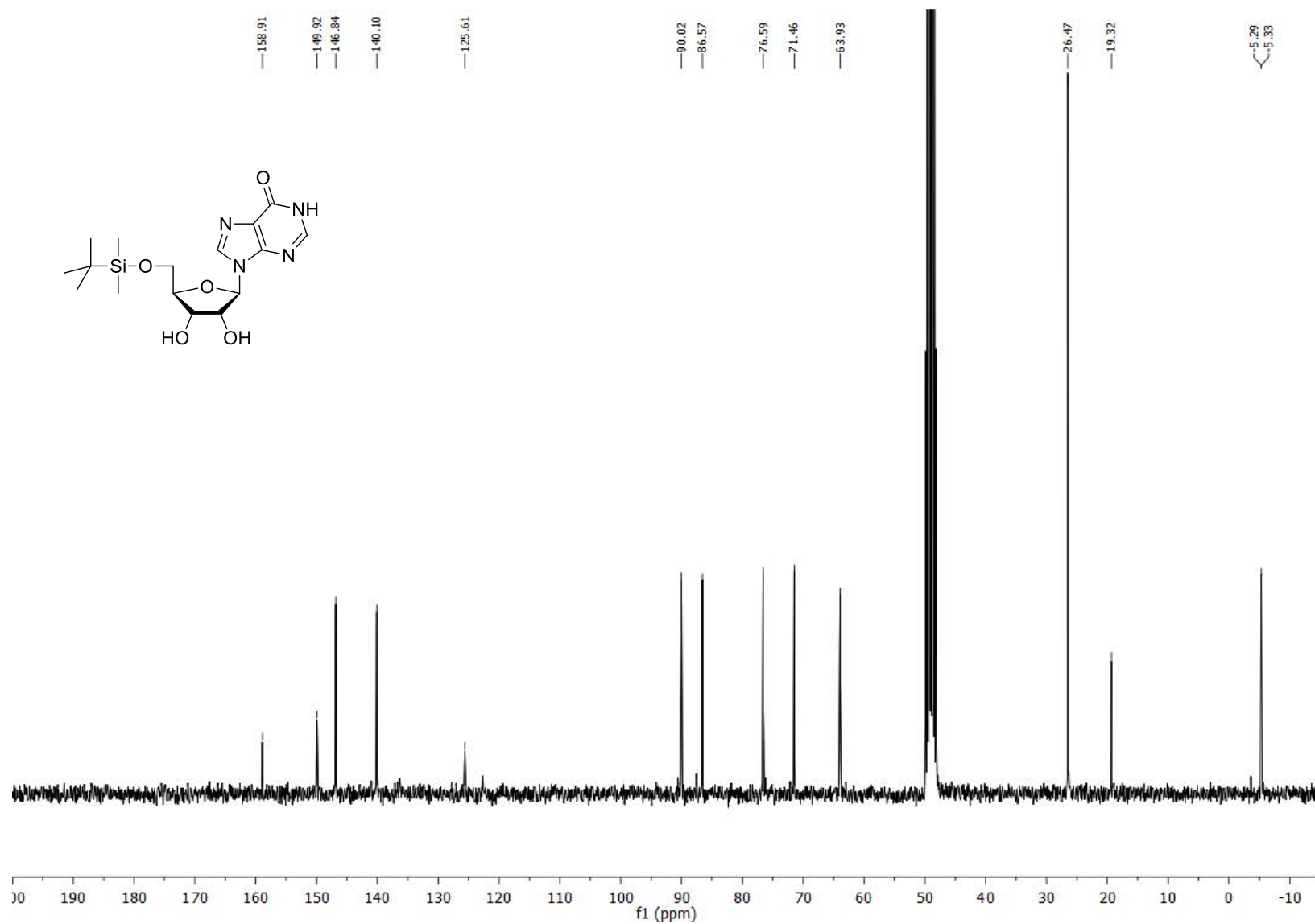
^1H -NMR (300.13 MHz, $\text{MeOH-}d_4$)



S53

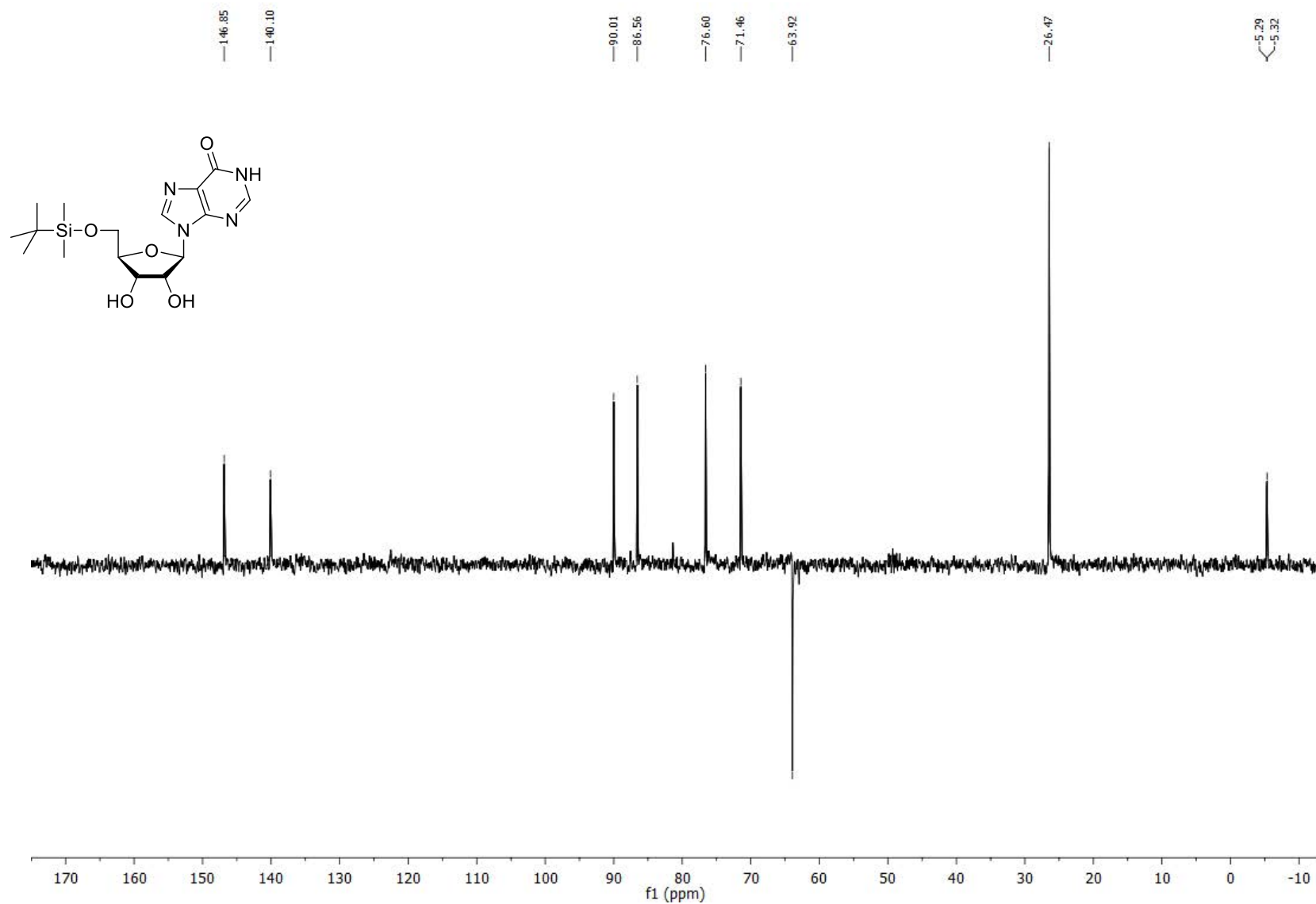
5'-O-(*tert*-Butyldimethylsilyl)- β -D-inosine (5f)

^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



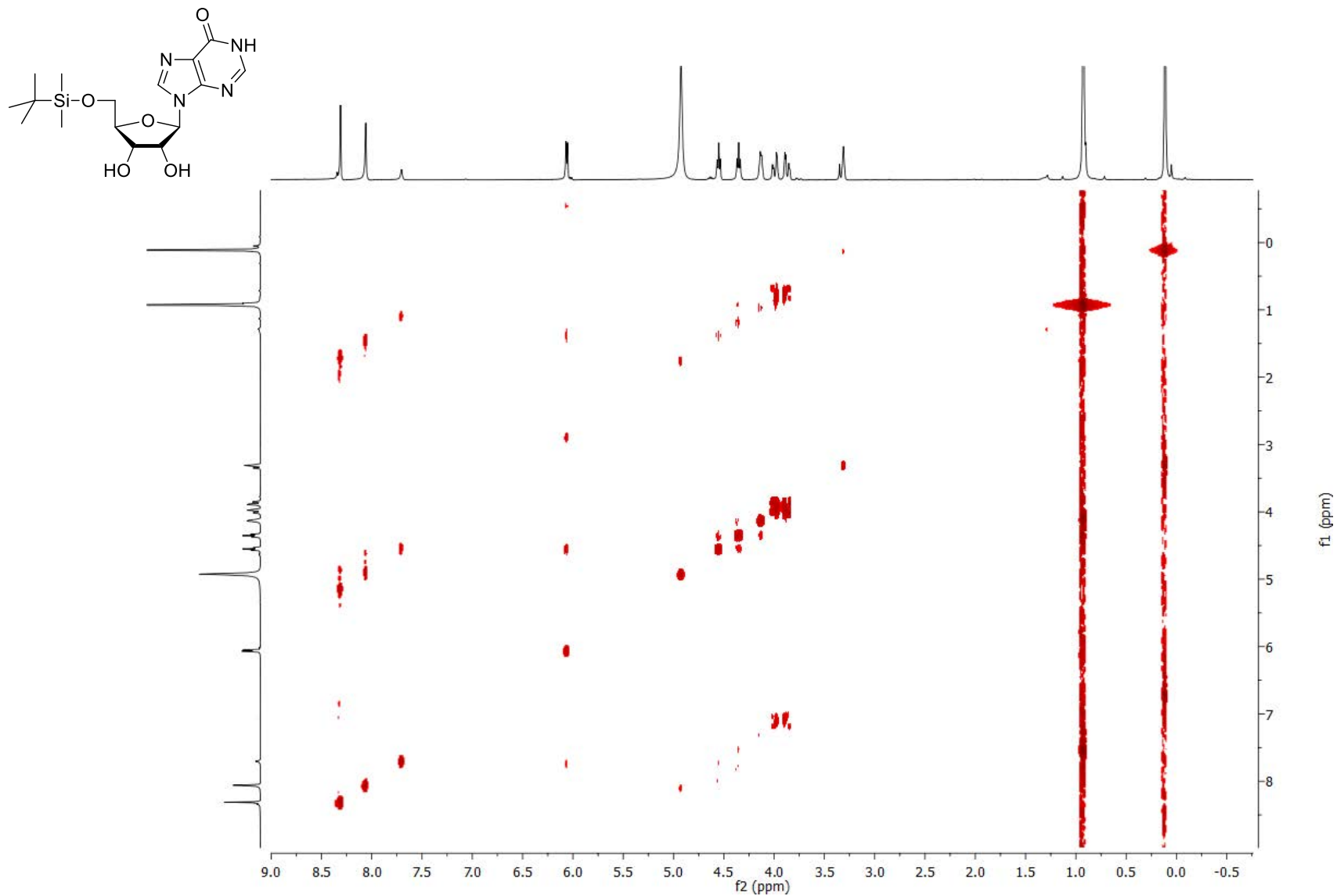
5'-*O*-(*tert*-Butyldimethylsilyl)- β -D-inosine (5f)

DEPT NMR (75.5 MHz, MeOH-*d*₄)



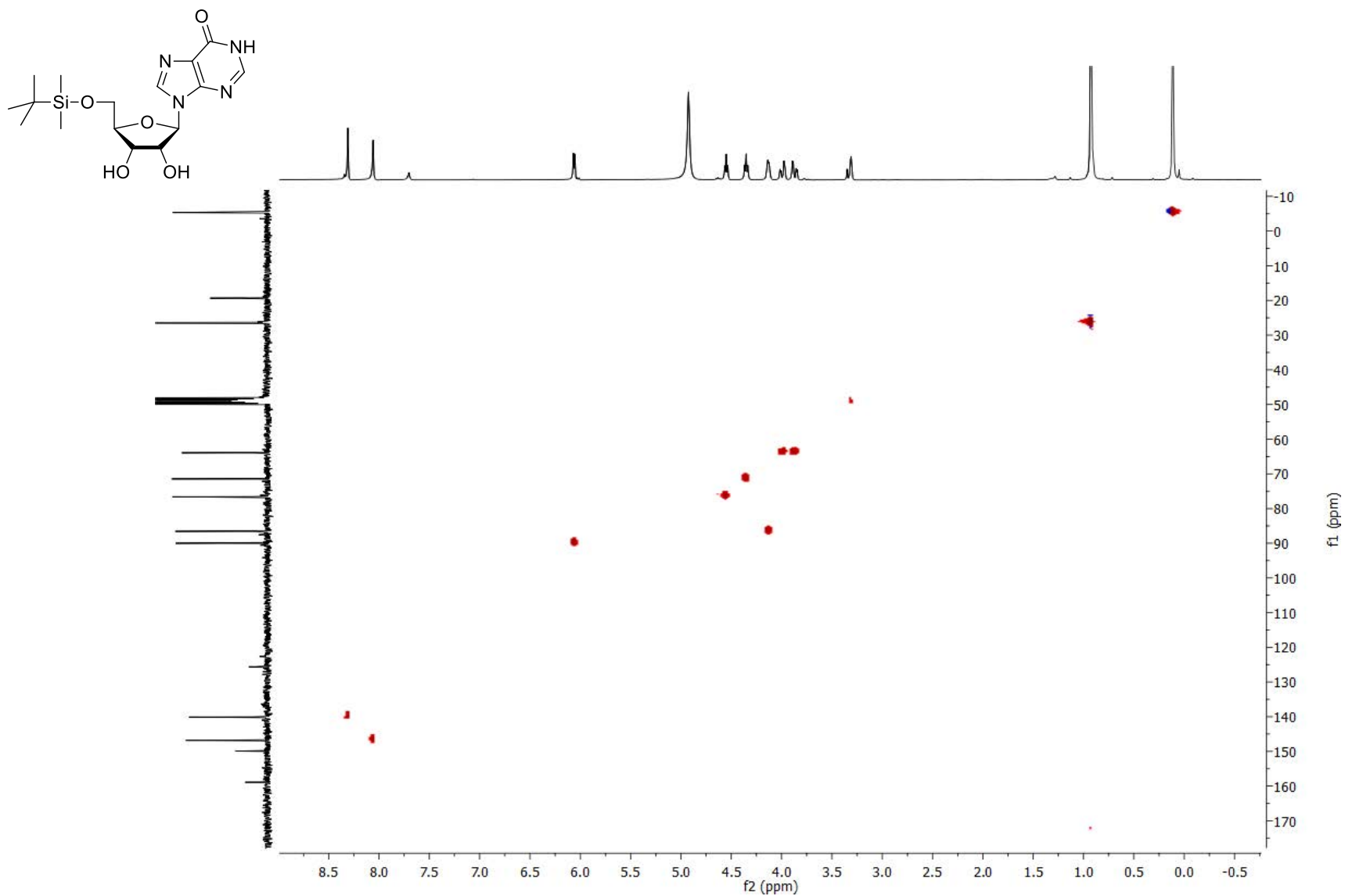
5'-*O*-(*tert*-Butyldimethylsilyl)- β -D-inosine (5f)

COSY NMR (MeOH- d_4)



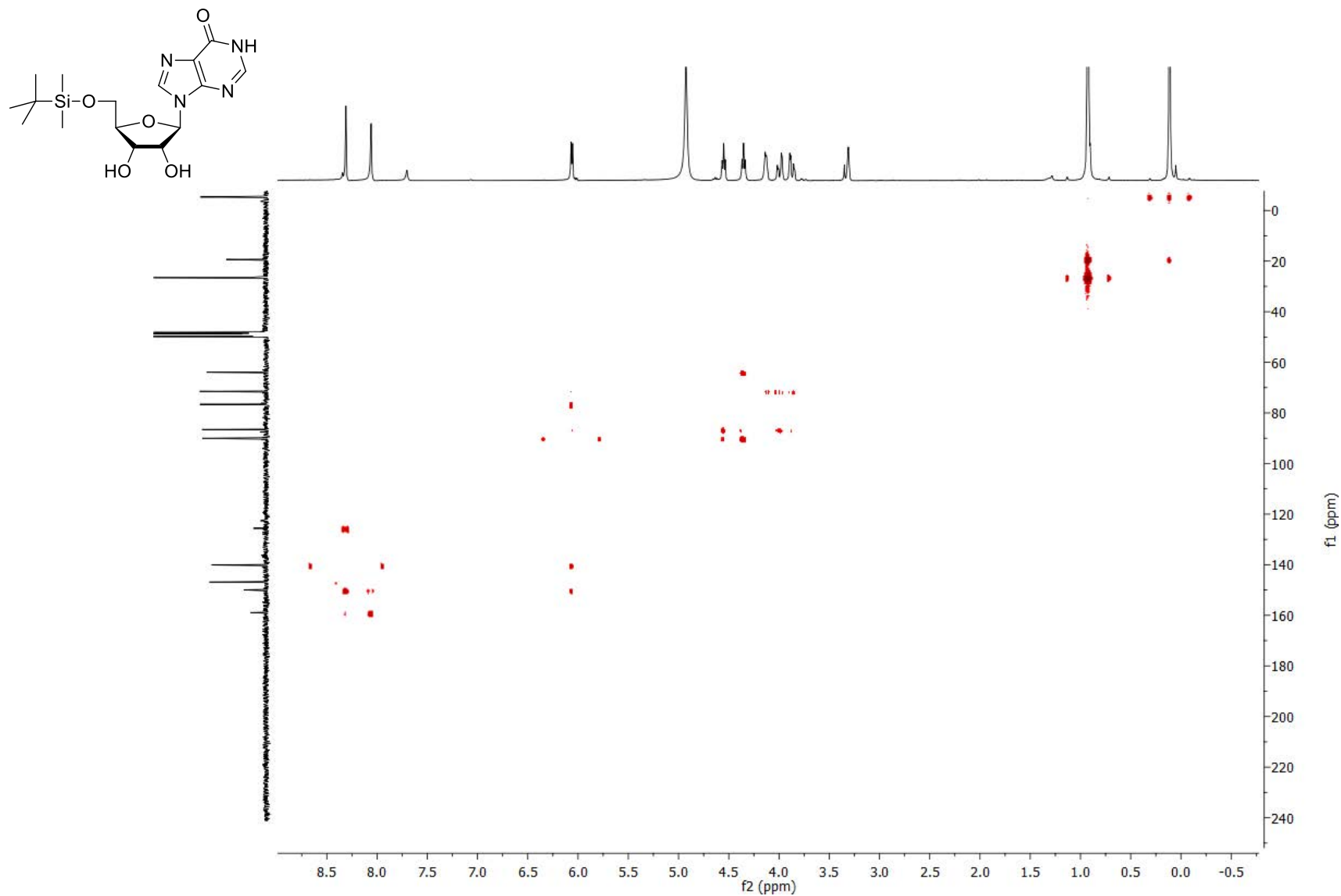
5'-*O*-(*tert*-Butyldimethylsilyl)- β -D-inosine (5f)

HSQC NMR (MeOH- d_4)



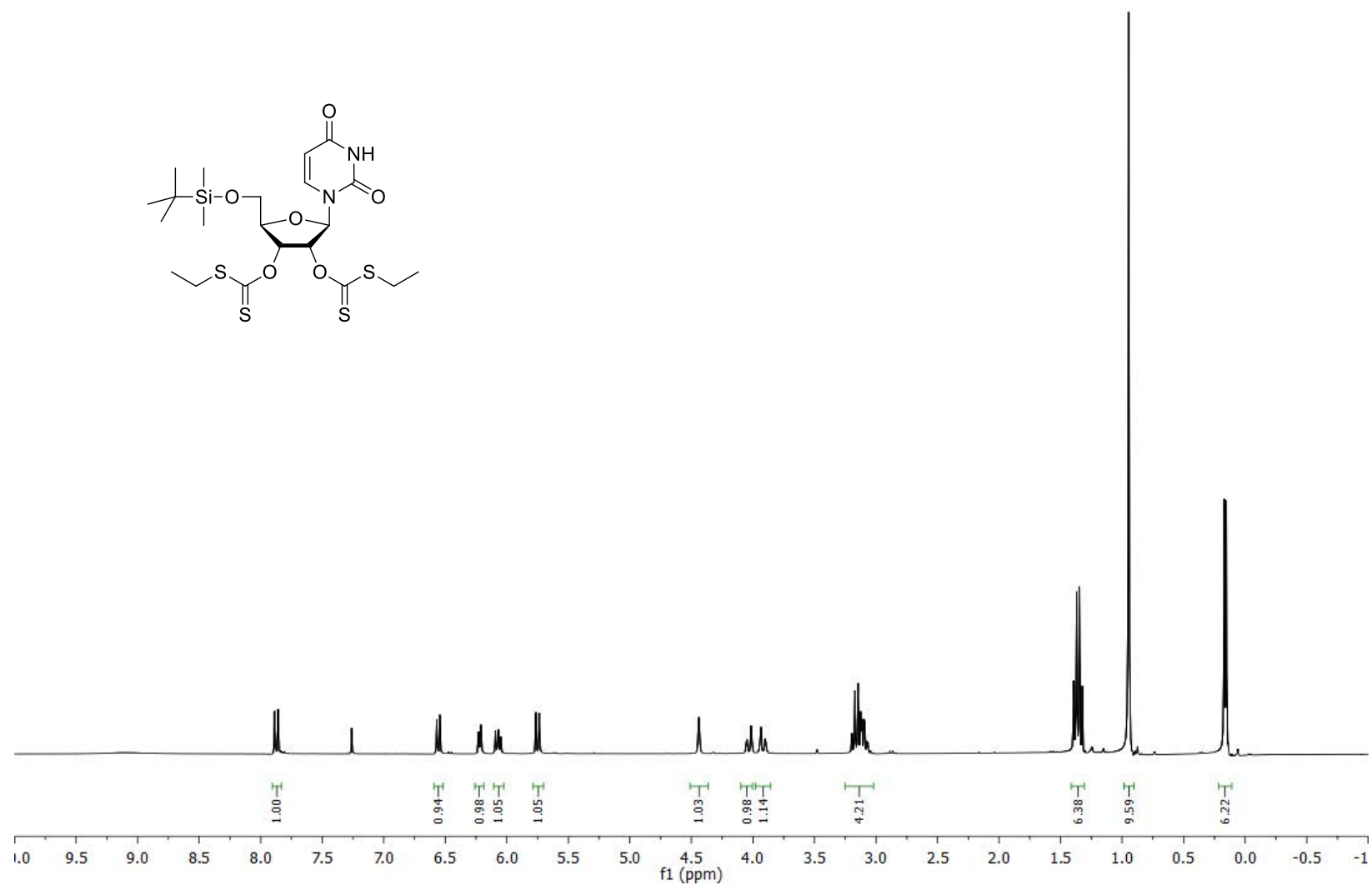
5'-*O*-(*tert*-Butyldimethylsilyl)- β -D-inosine (5f)

HMBC NMR (MeOH- d_4)



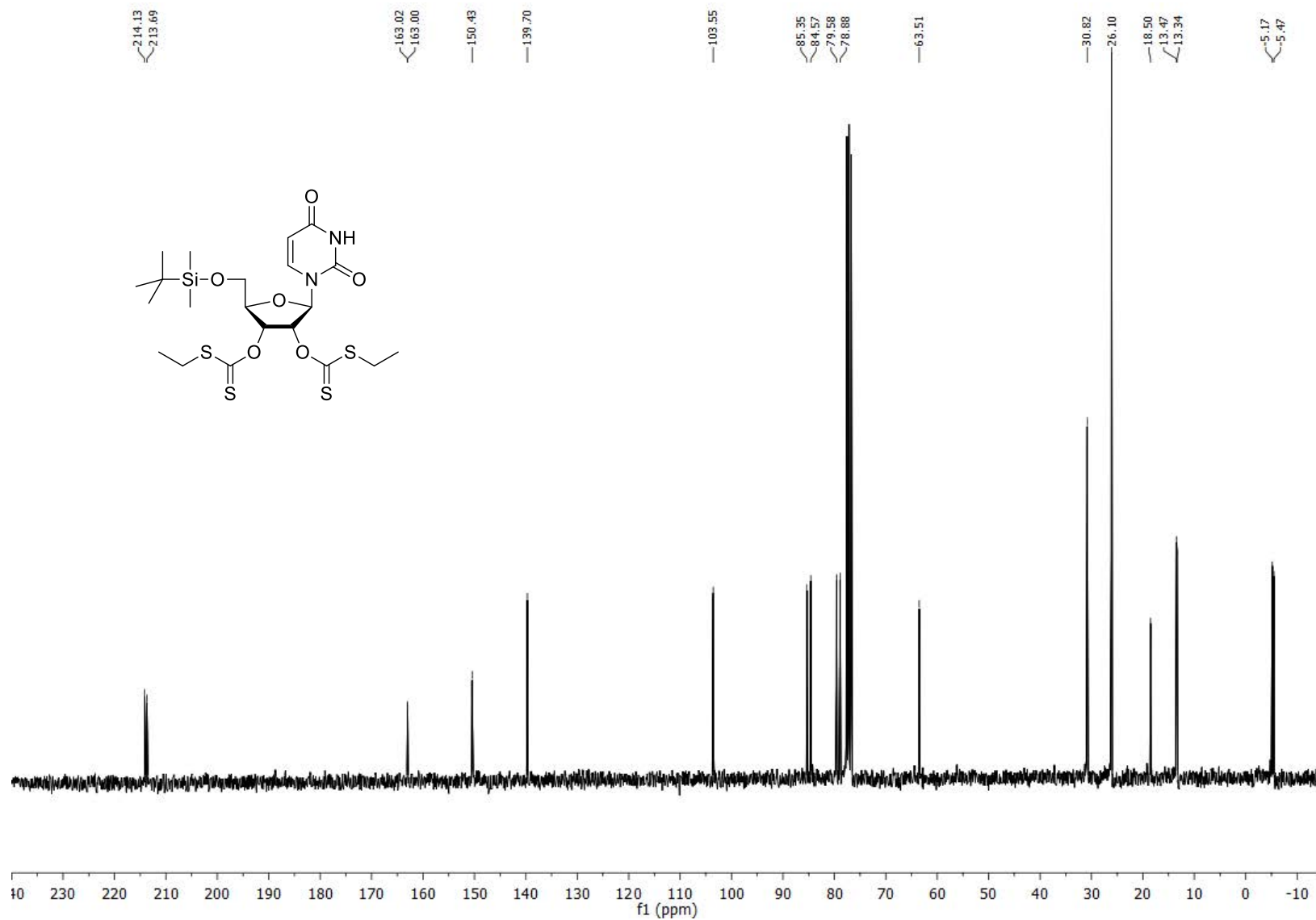
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-uridine (6a)

^1H -NMR (300.13 MHz, CDCl_3)



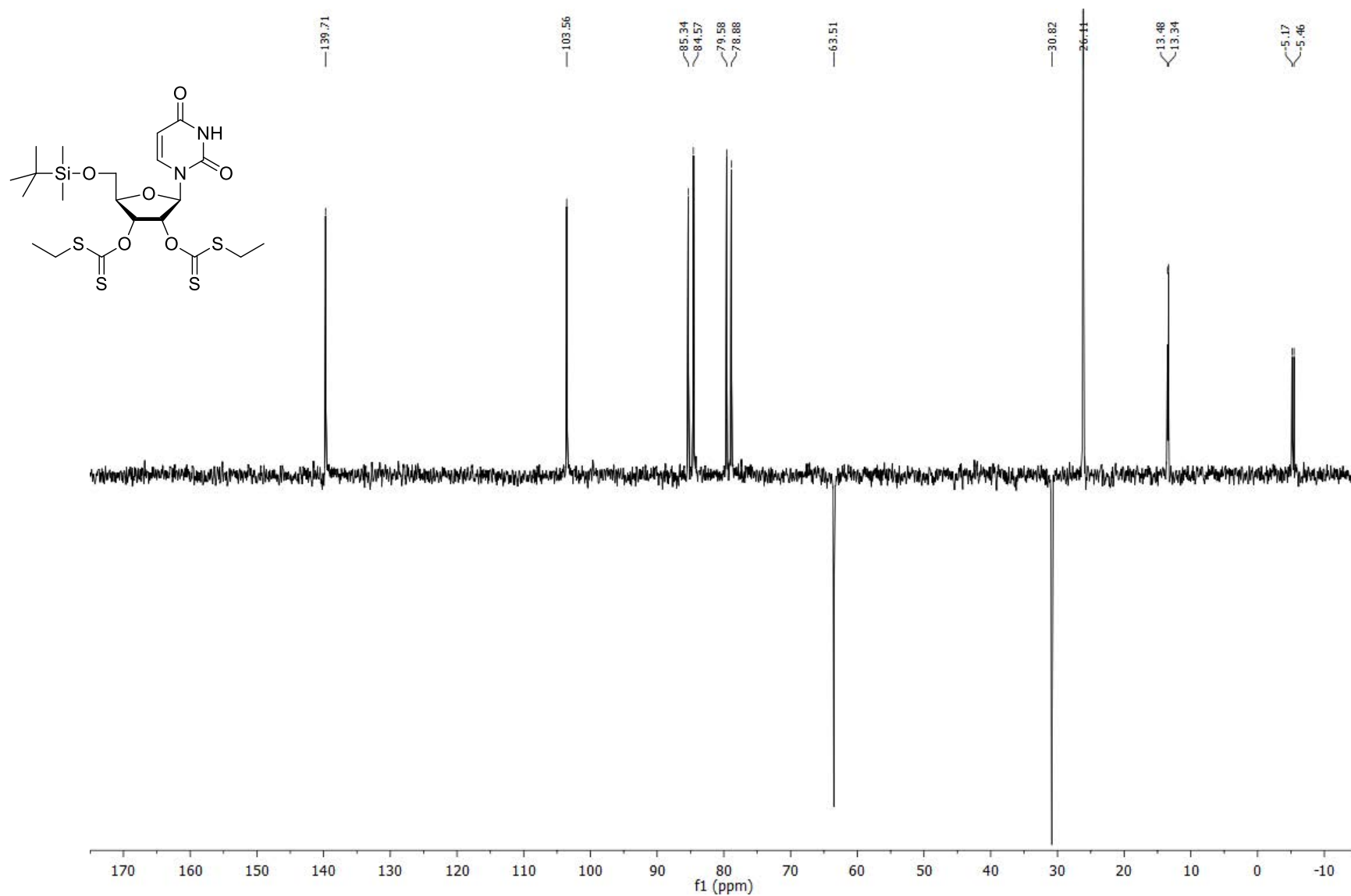
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -D-uridine (6a)

^{13}C -NMR (75.5 MHz, CDCl_3)



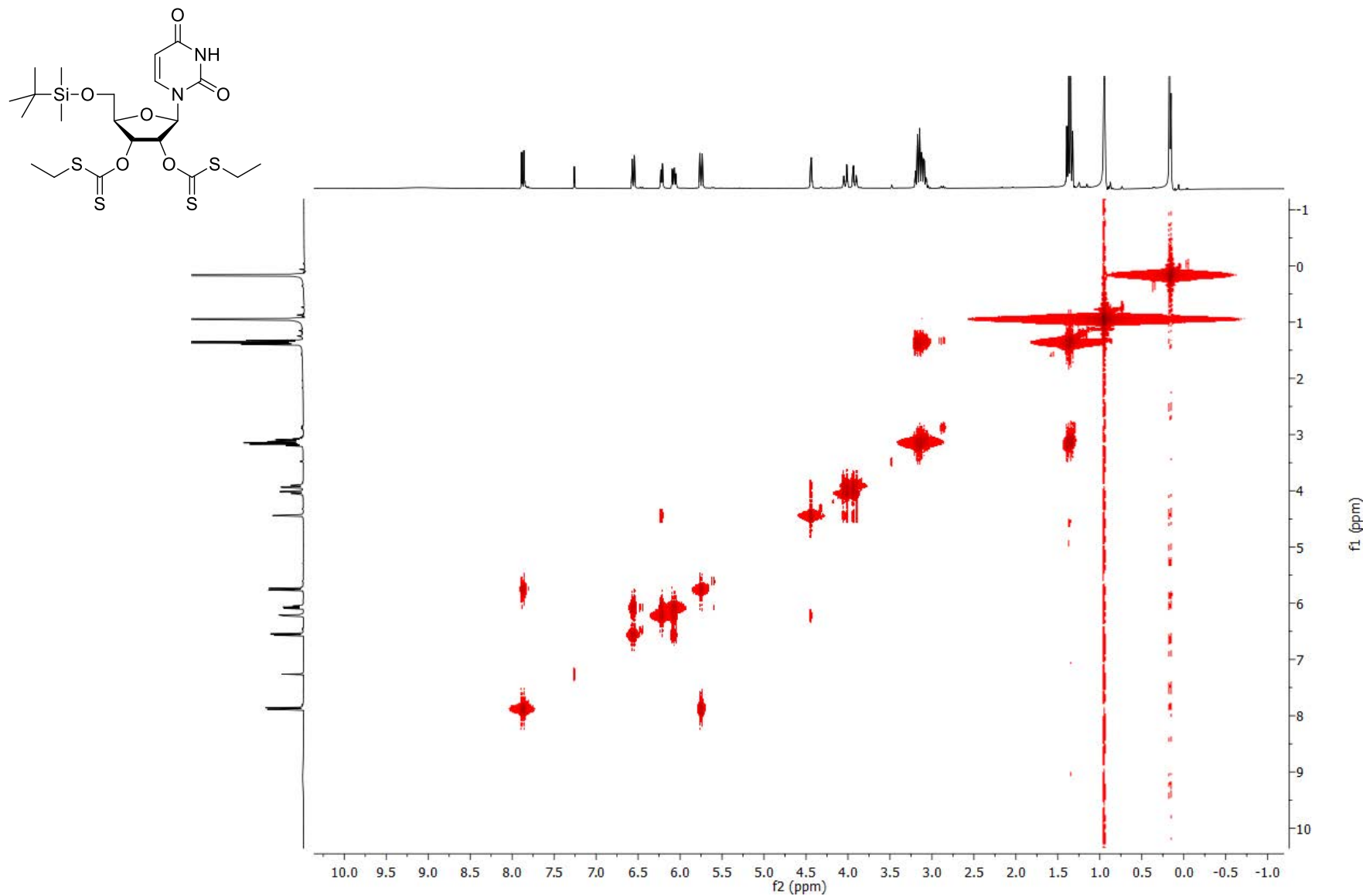
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -D-uridine (6a)

^{13}C -NMR (75.5 MHz, CDCl_3)



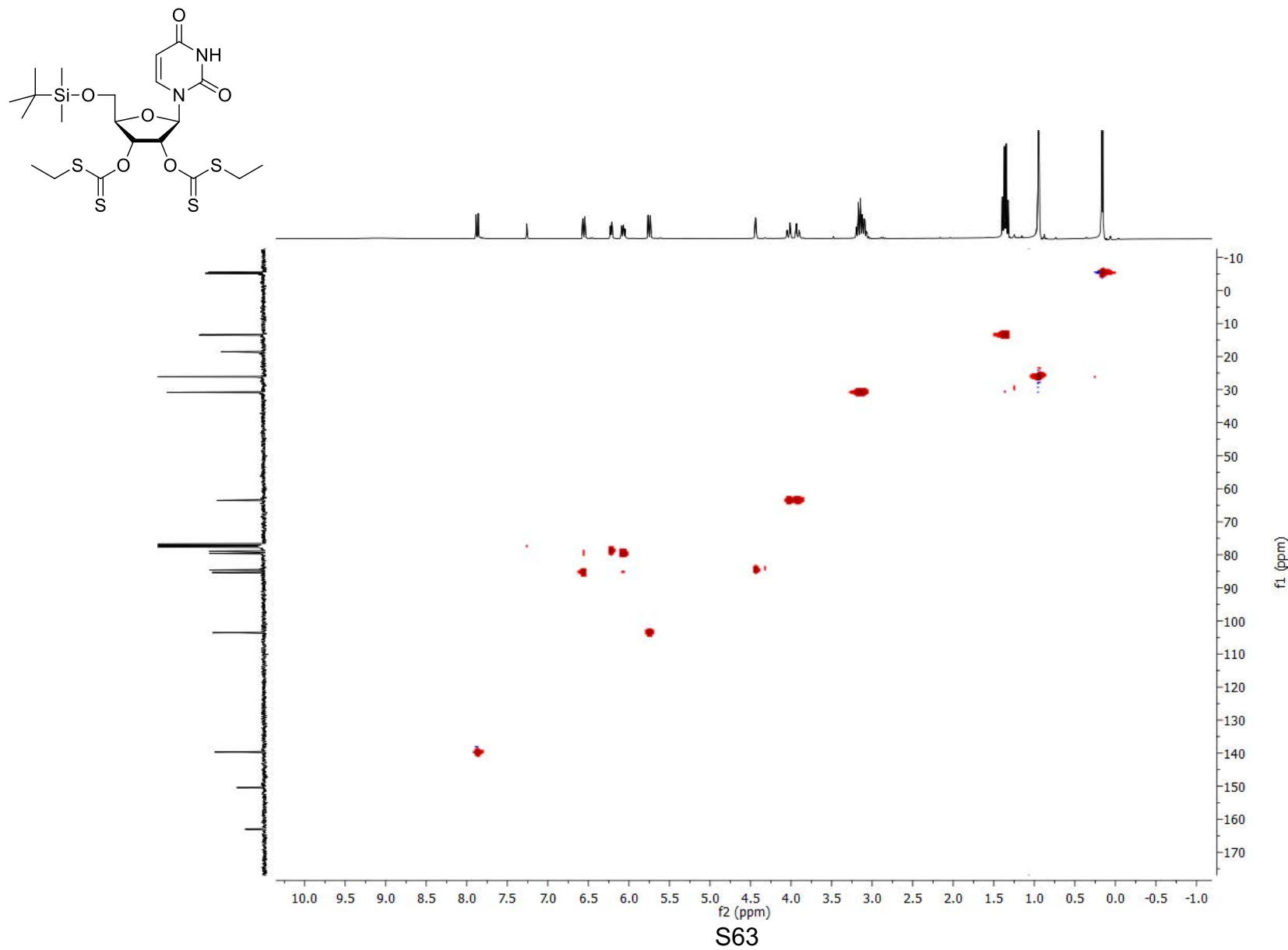
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-uridine (6a)

COSY NMR (CDCl₃)



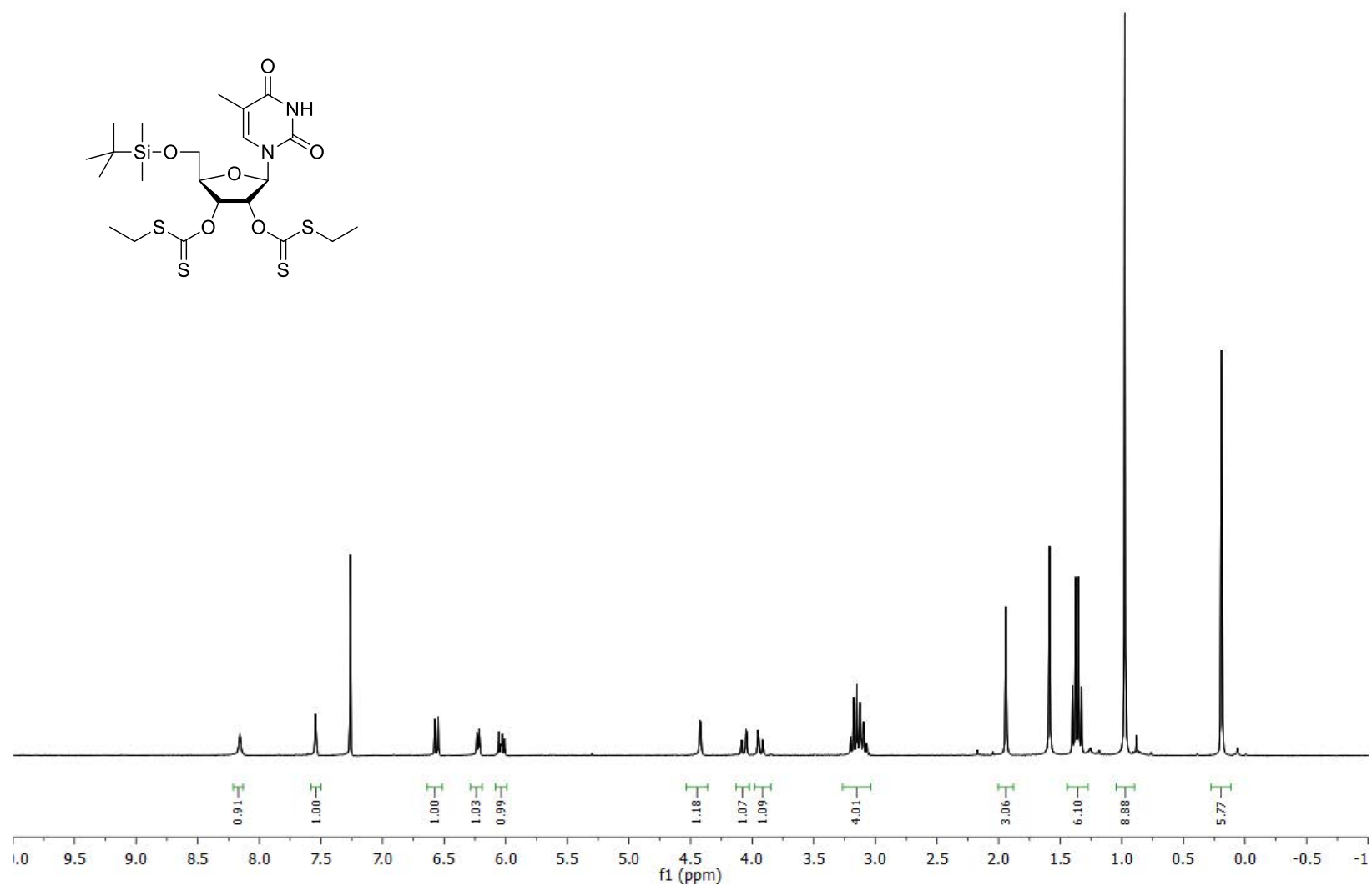
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -D-uridine (6a)

HSQC NMR (CDCl₃)



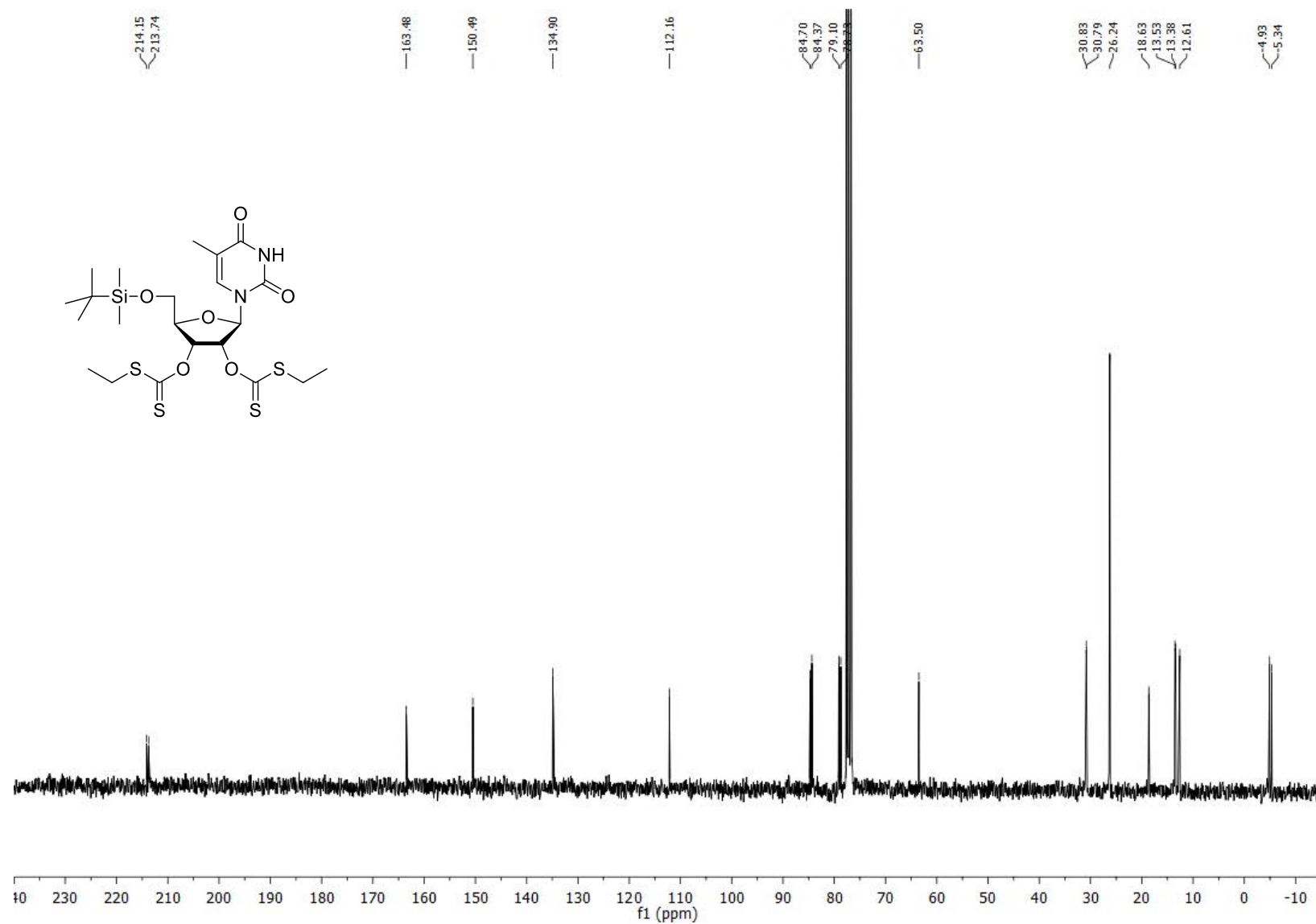
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-5-methyluridine (6b)

$^1\text{H-NMR}$ (300.13 MHz, CDCl_3)



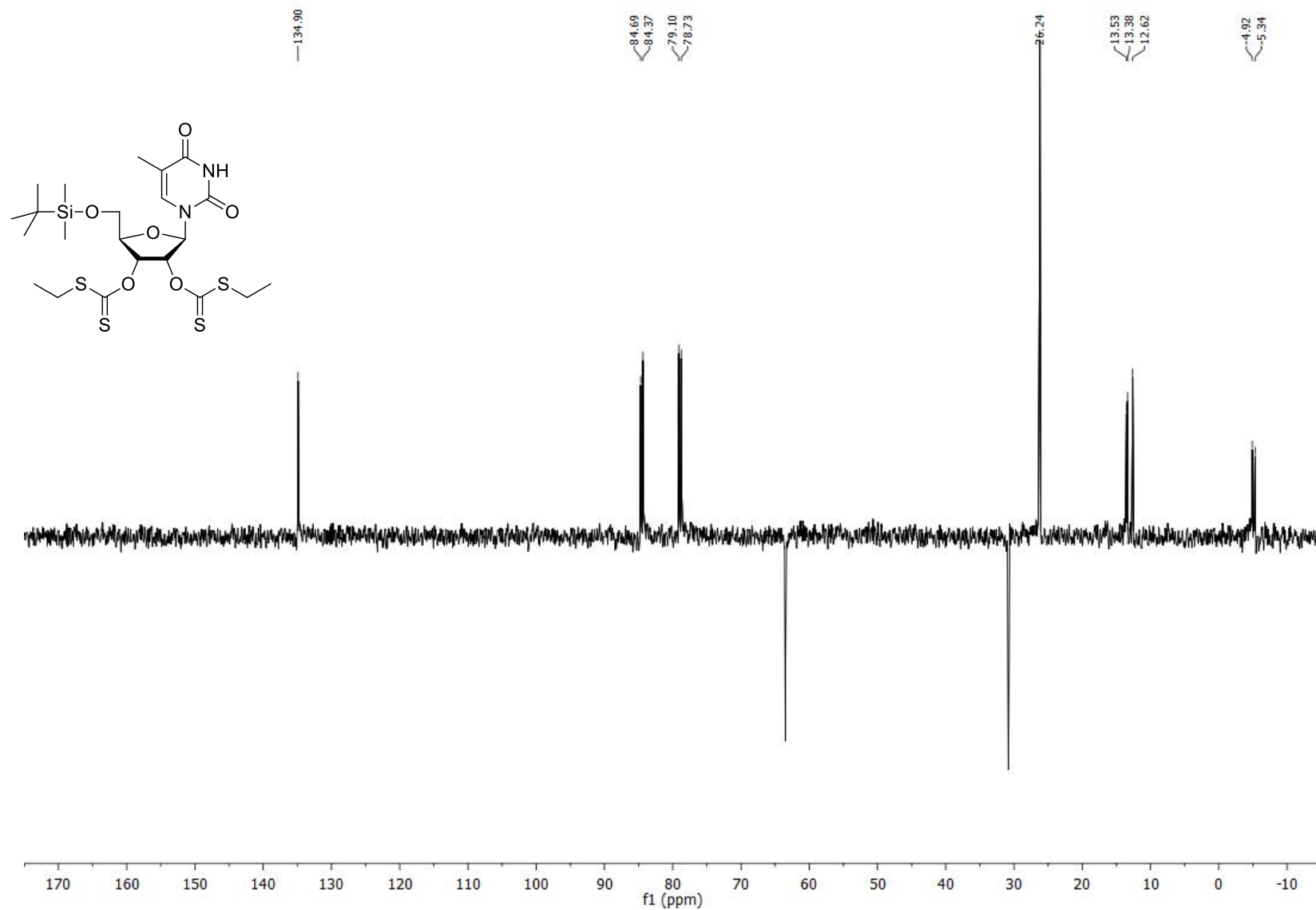
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]-β-D-5-methyluridine (6b)

¹³C-NMR (75.5 MHz, CDCl₃)



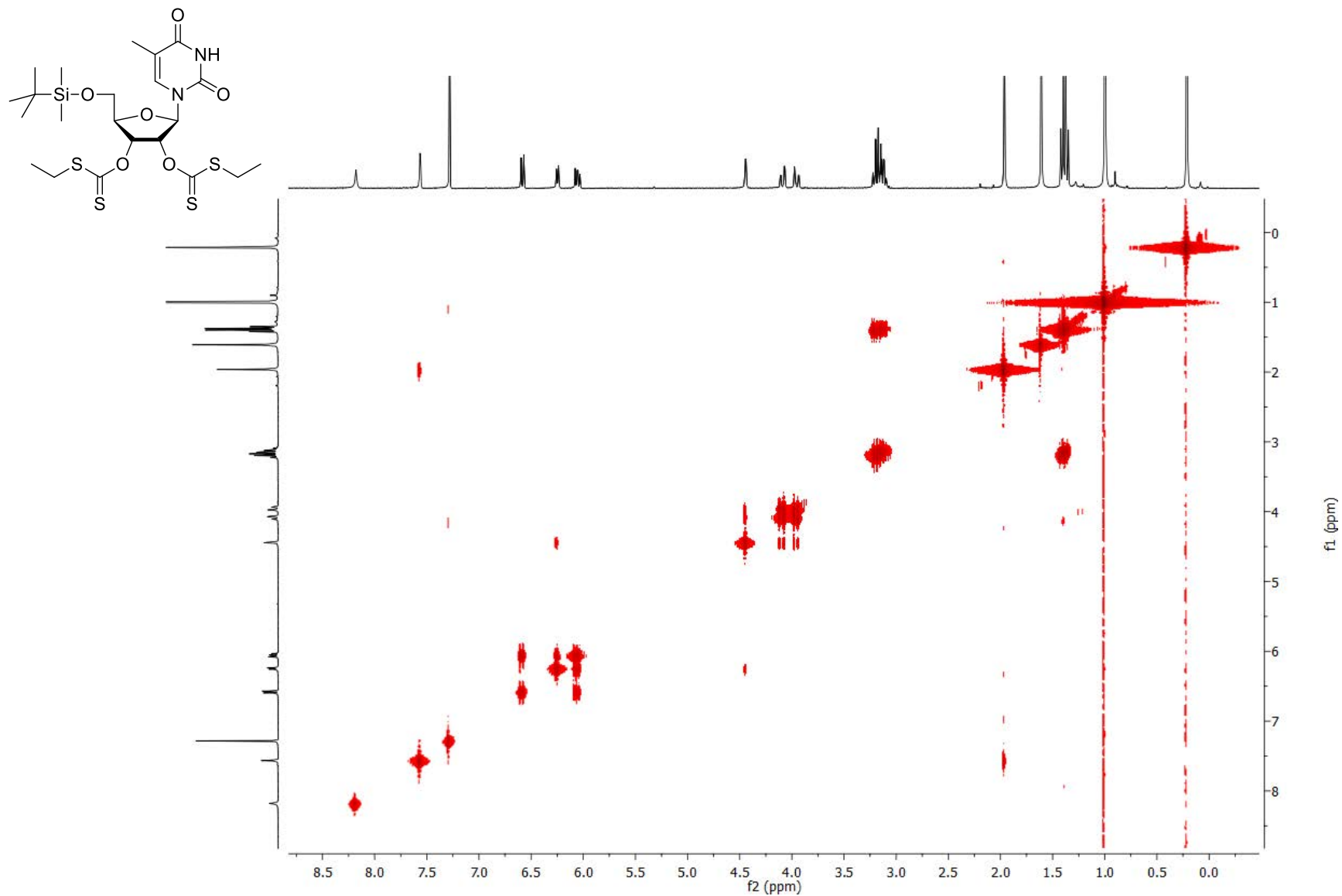
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -D-5-methyluridine (6b)

DEPT NMR (75.5 MHz, CDCl₃)



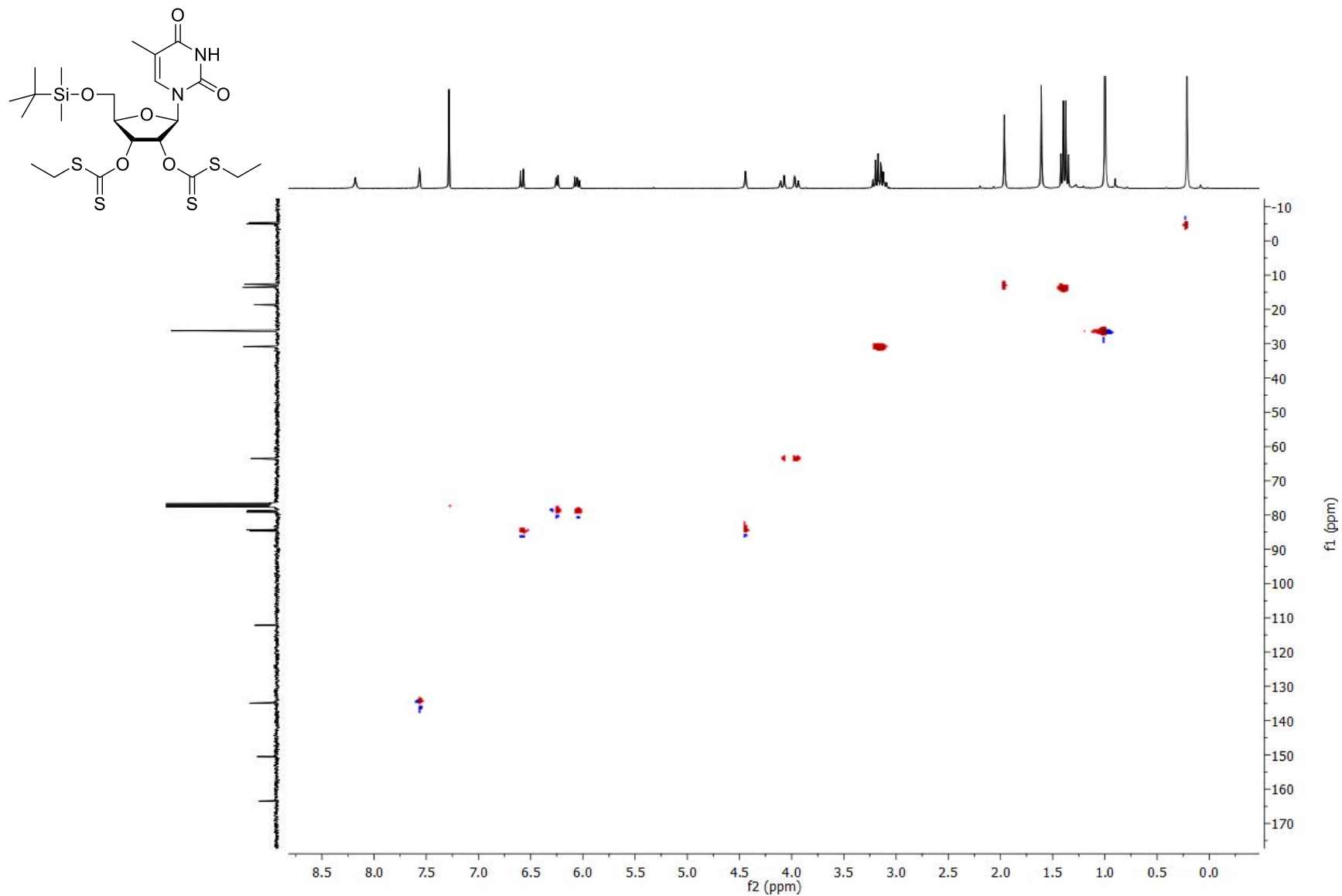
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -D-5-methyluridine (6b)

COSY NMR (CDCl₃)



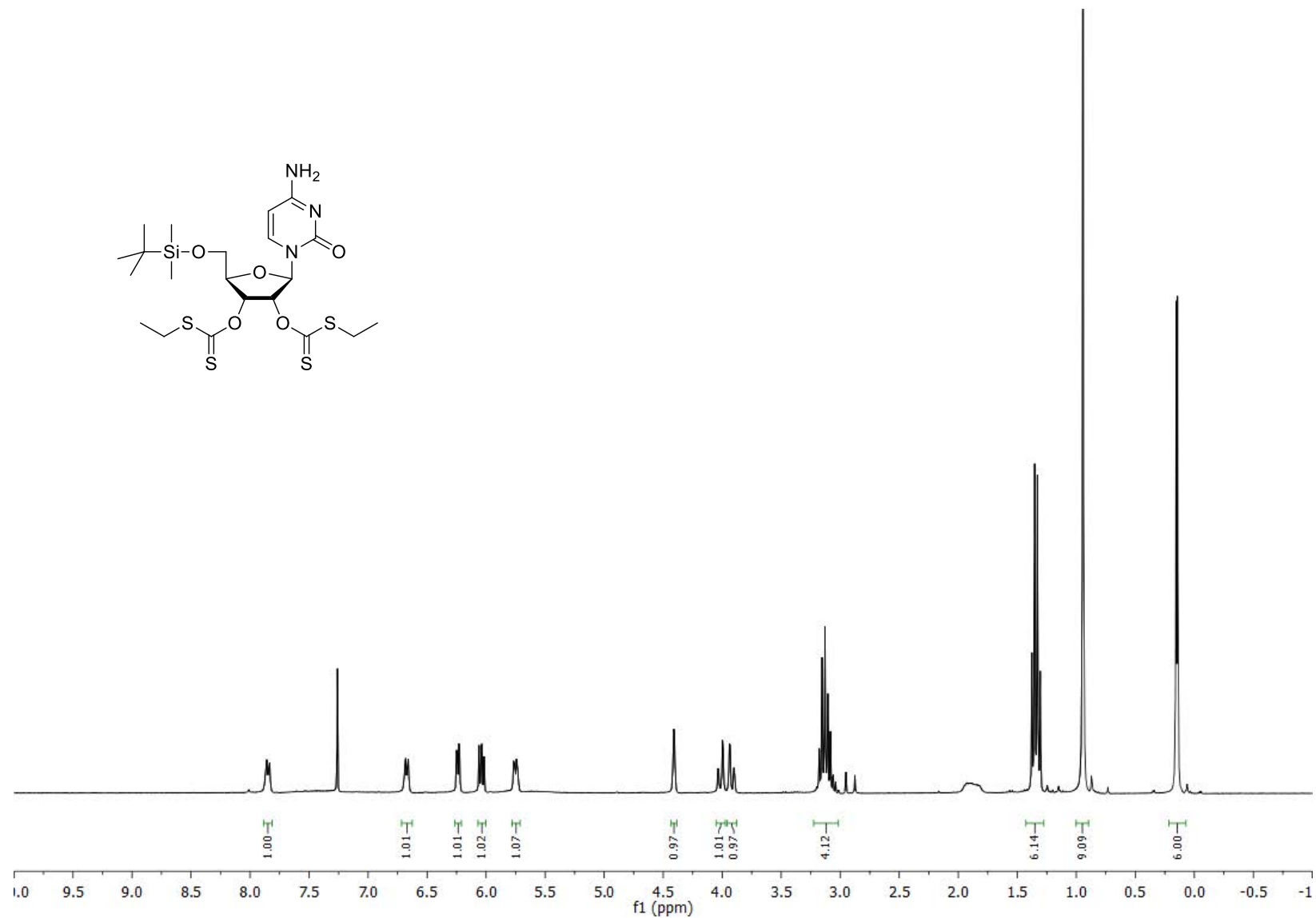
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -D-5-methyluridine (6b)

HSQC NMR (CDCl₃)



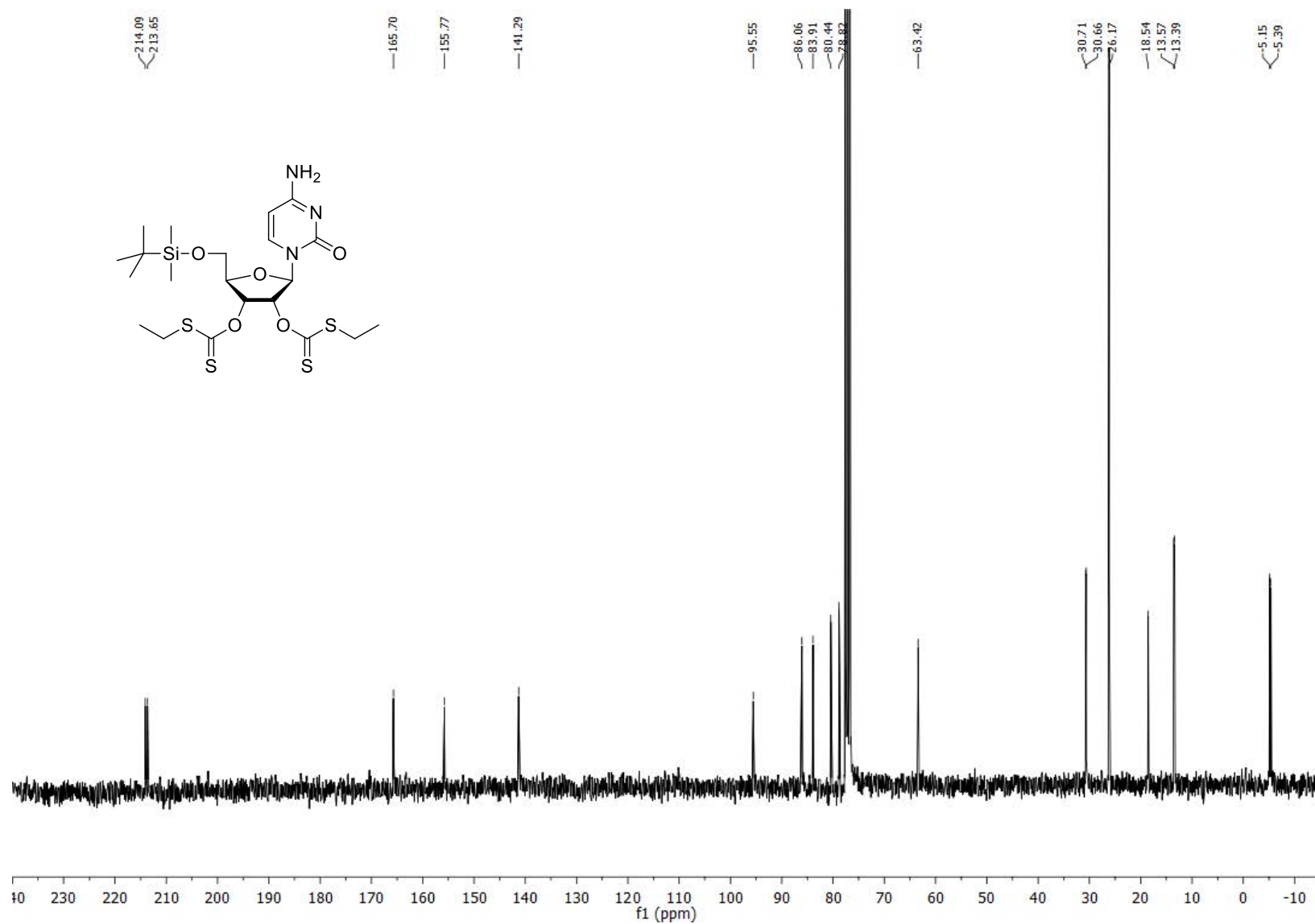
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-cytidine (6c)

$^1\text{H-NMR}$ (300.13 MHz, CDCl_3)



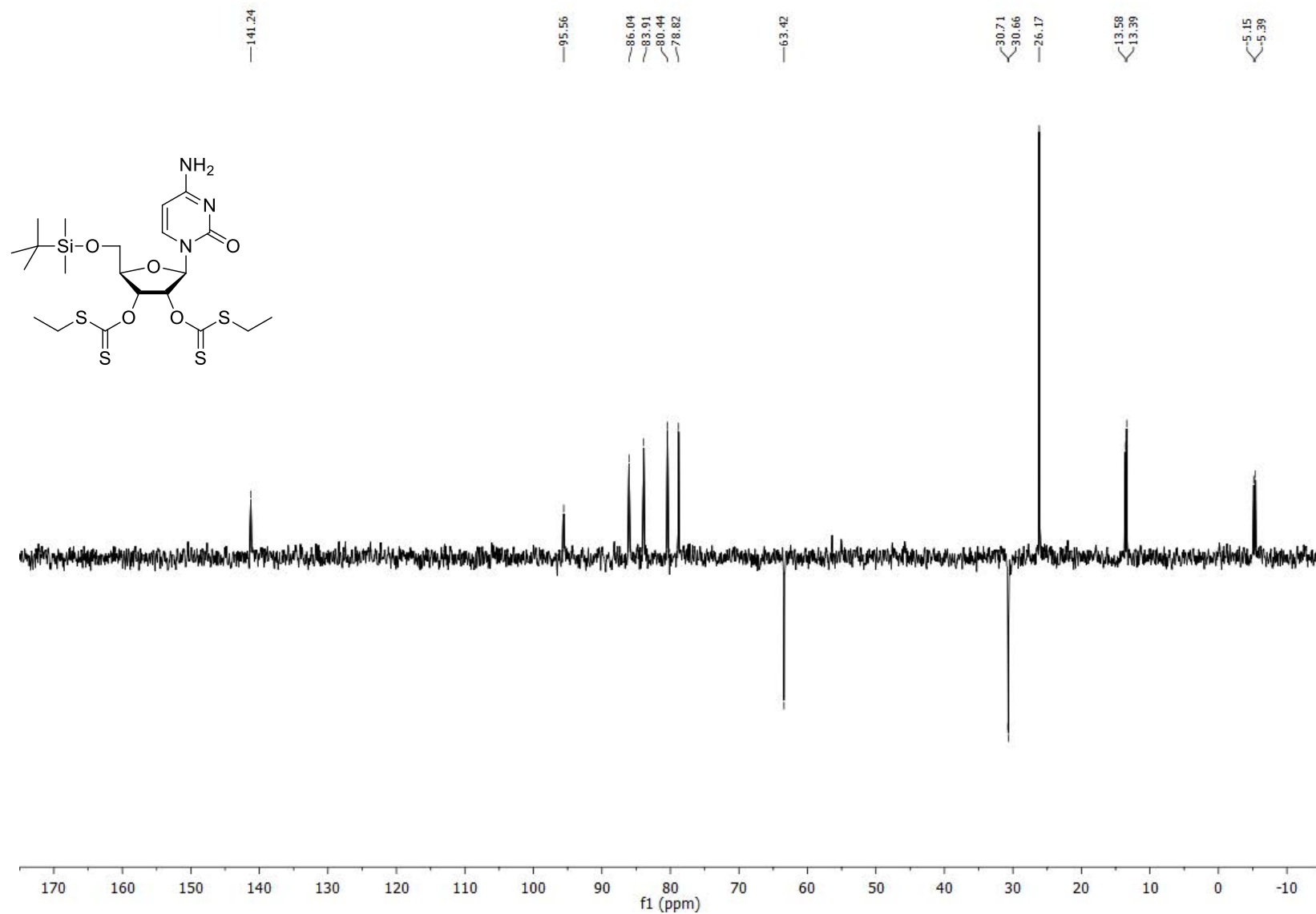
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -D-cytidine (6c)

^{13}C -NMR (75.5 MHz, CDCl_3)



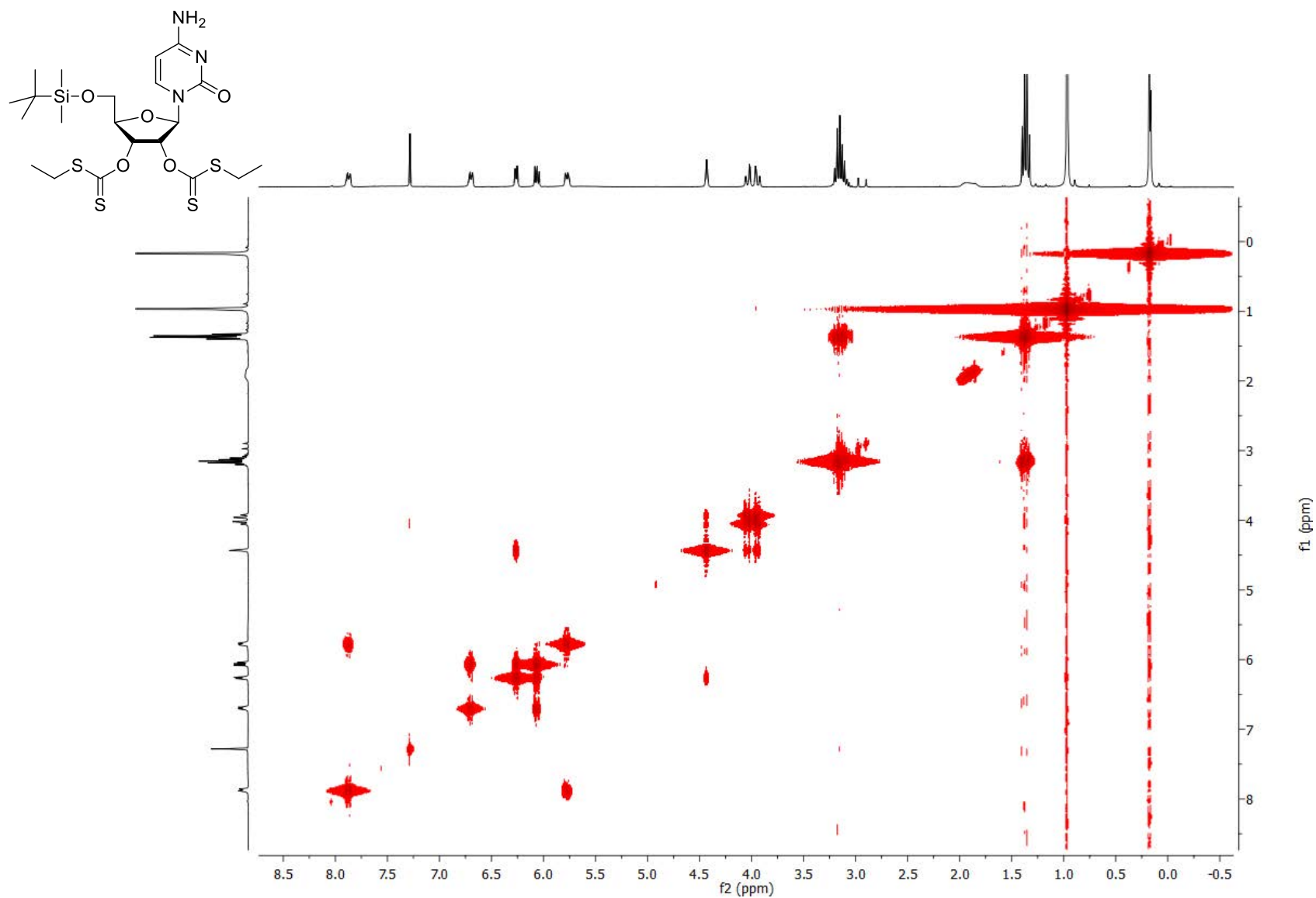
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -D-cytidine (6c)

DEPT NMR (75.5 MHz, CDCl₃)



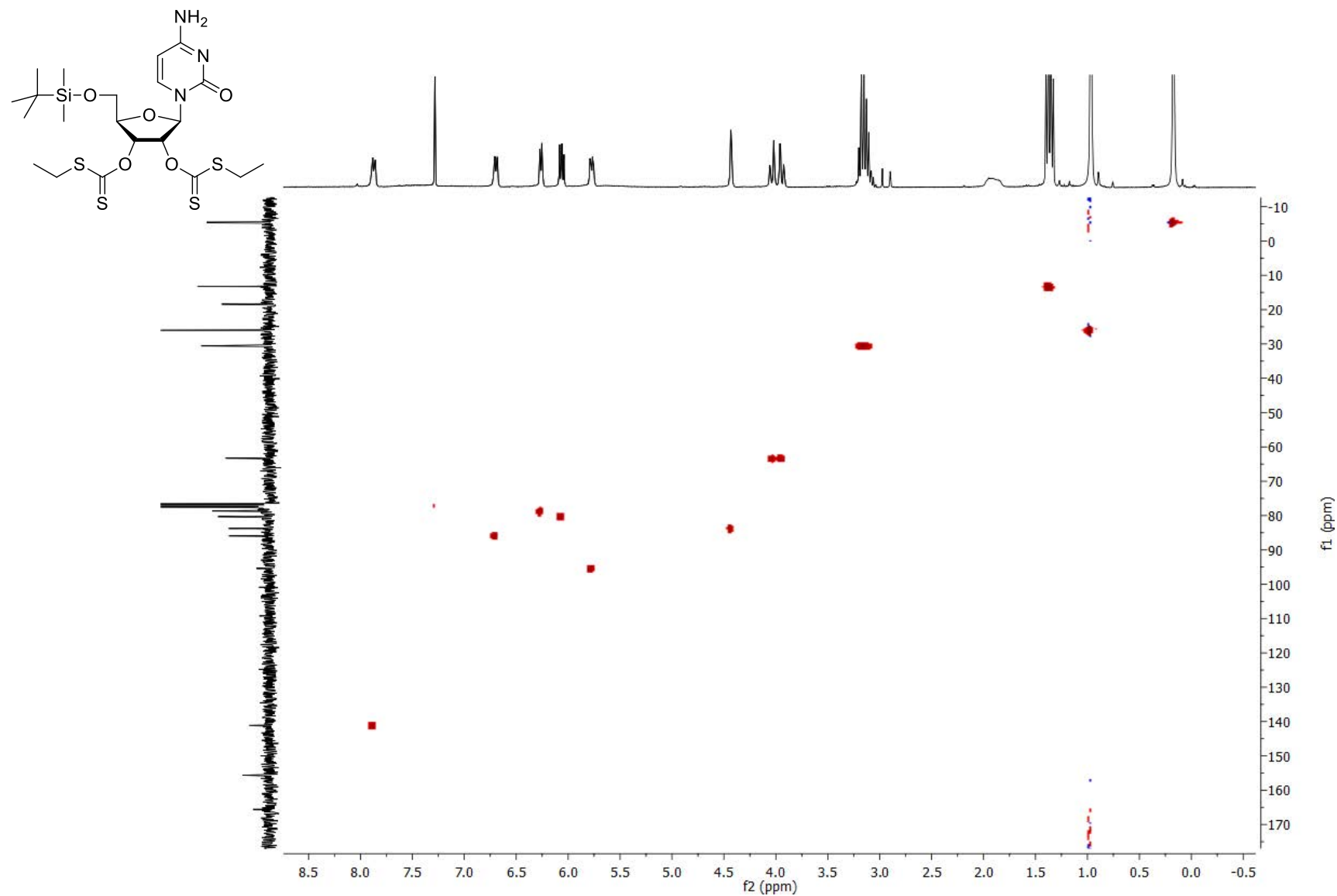
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-cytidine (6c)

COSY NMR (CDCl₃)



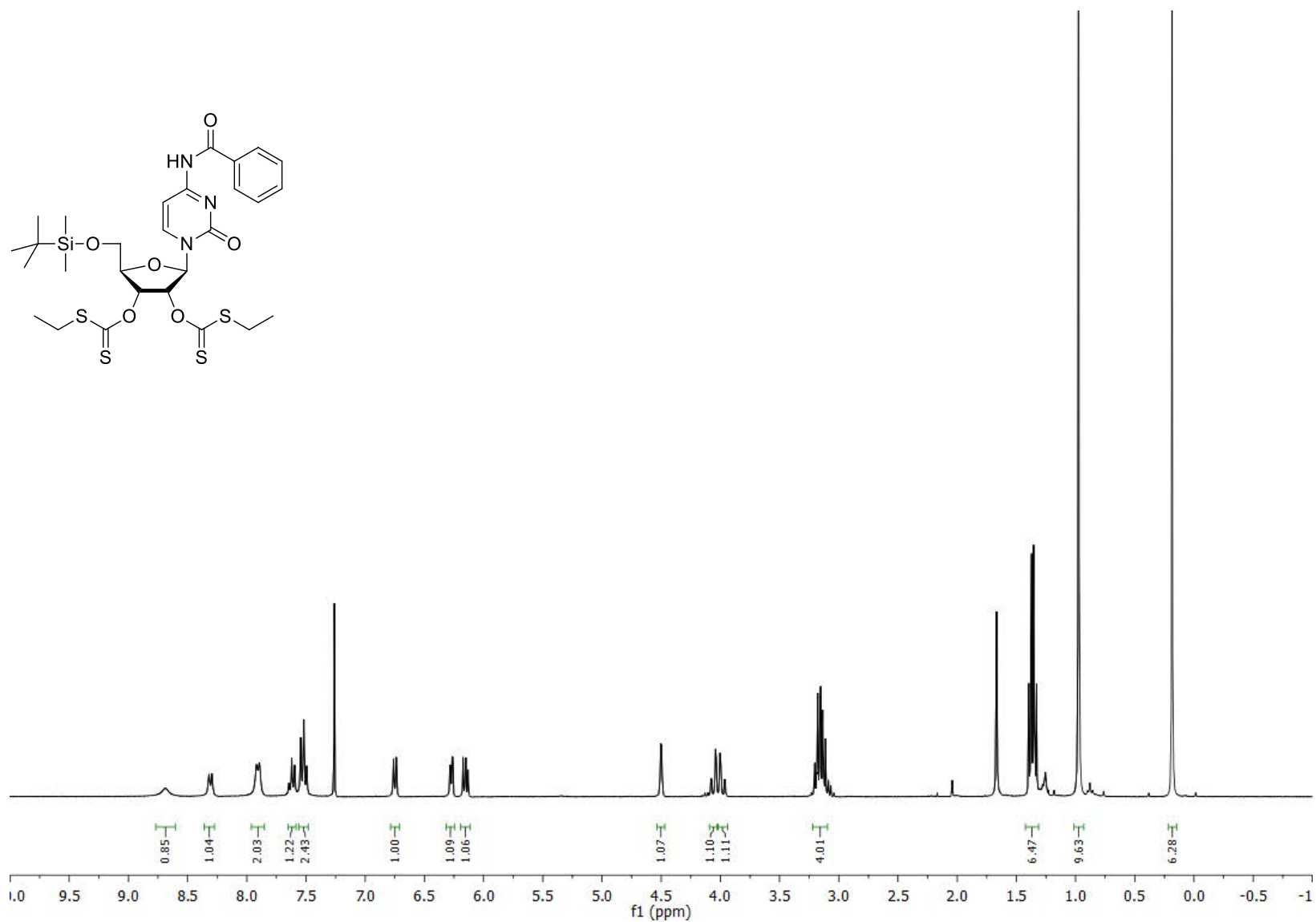
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-cytidine (6c)

HSQC NMR (CDCl₃)



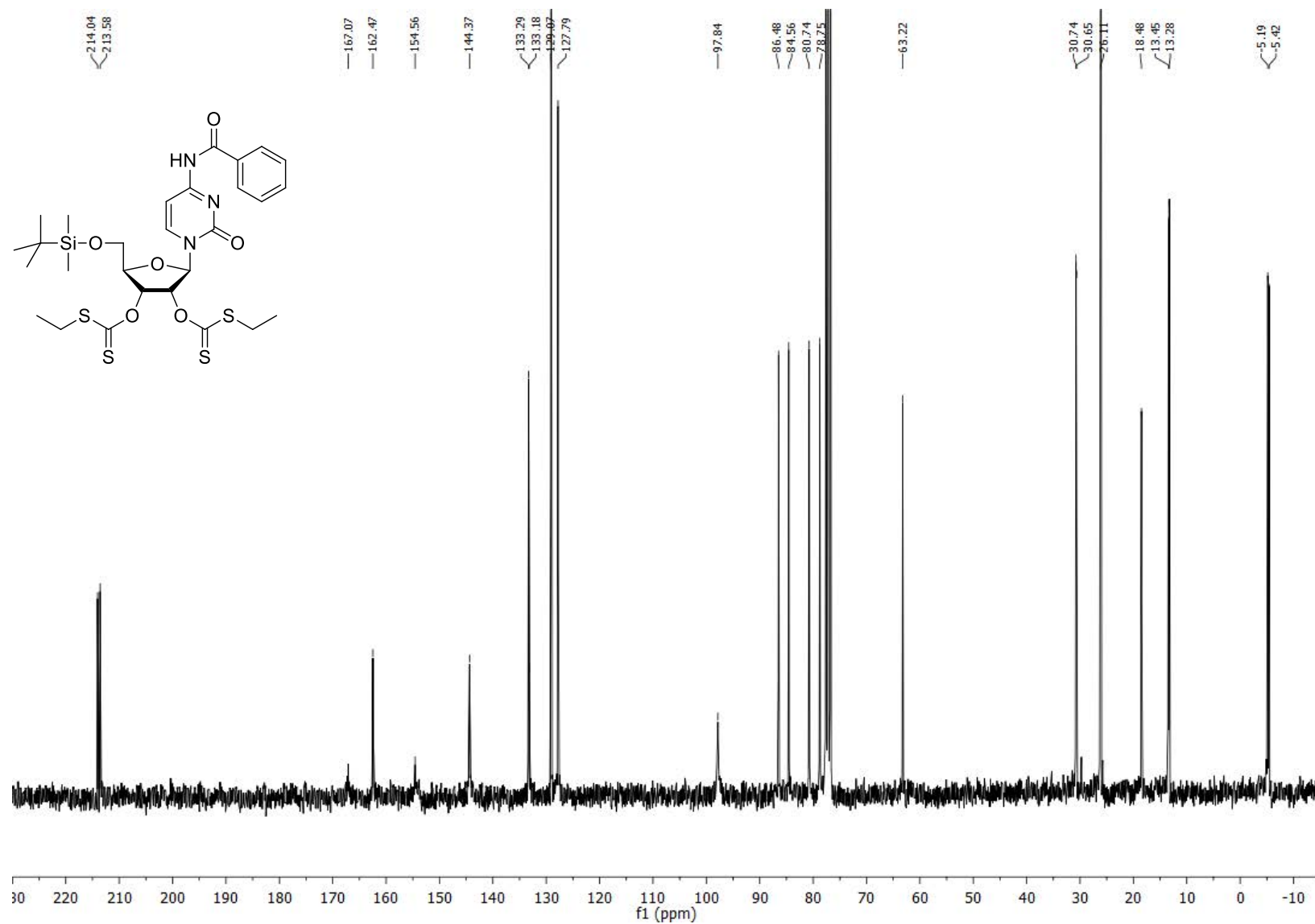
***N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]-β-D-cytidine (6d)**

¹H-NMR (300.13 MHz, CDCl₃)



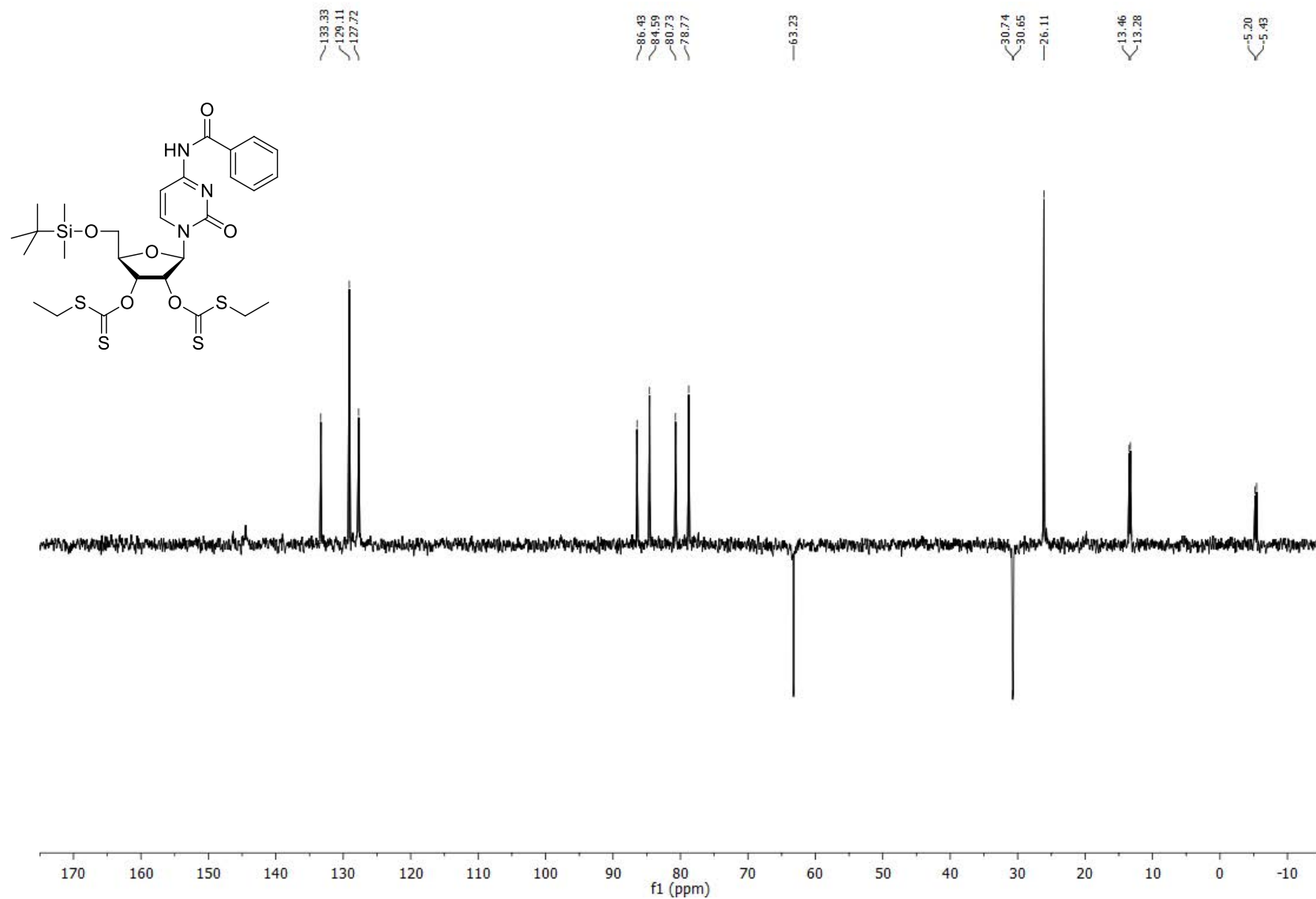
***N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-cytidine (6d)**

¹³C-NMR (75.5 MHz, CDCl₃)



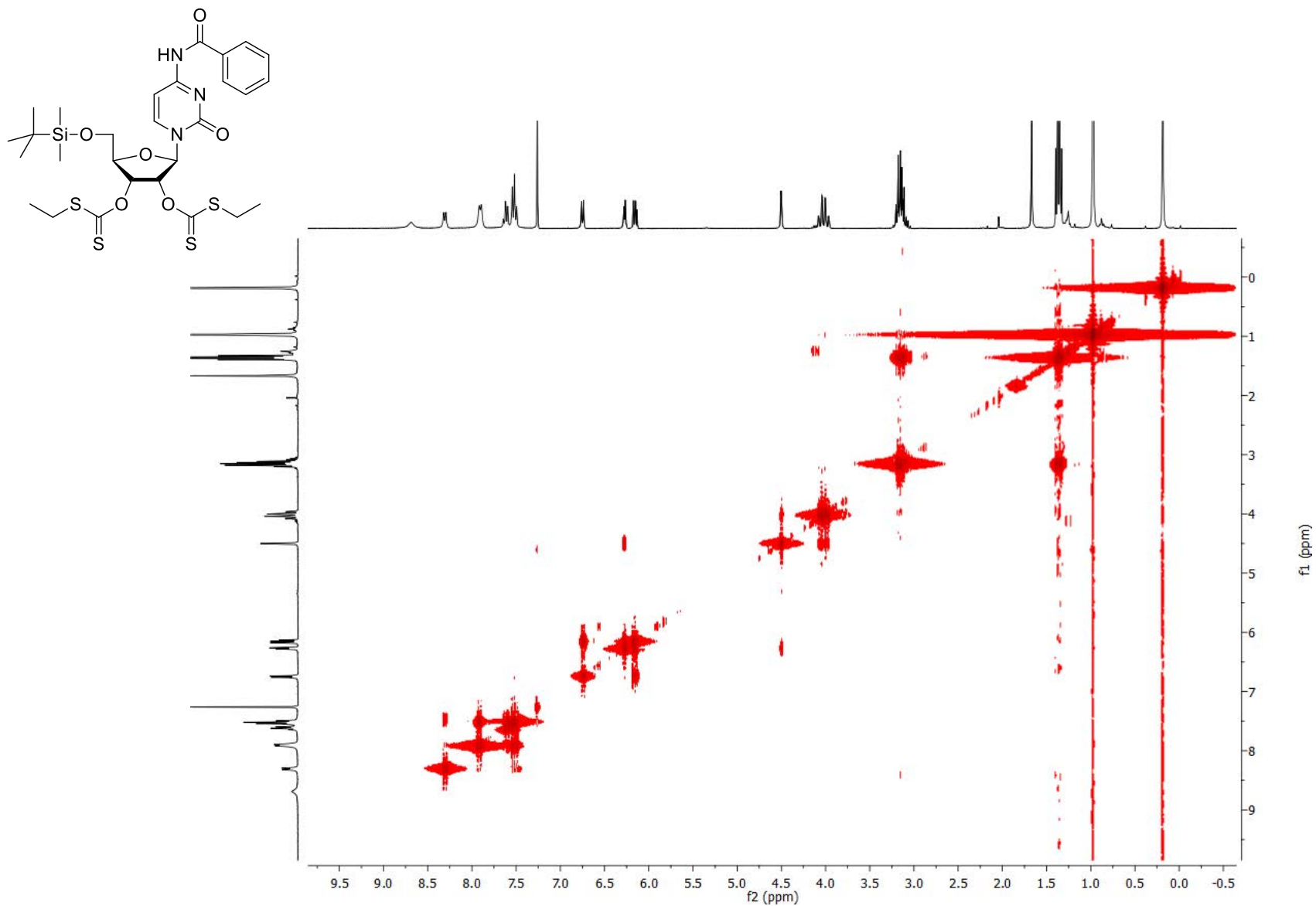
***N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]-β-D-cytidine (6d)**

DEPT NMR (75.5 MHz, CDCl₃)



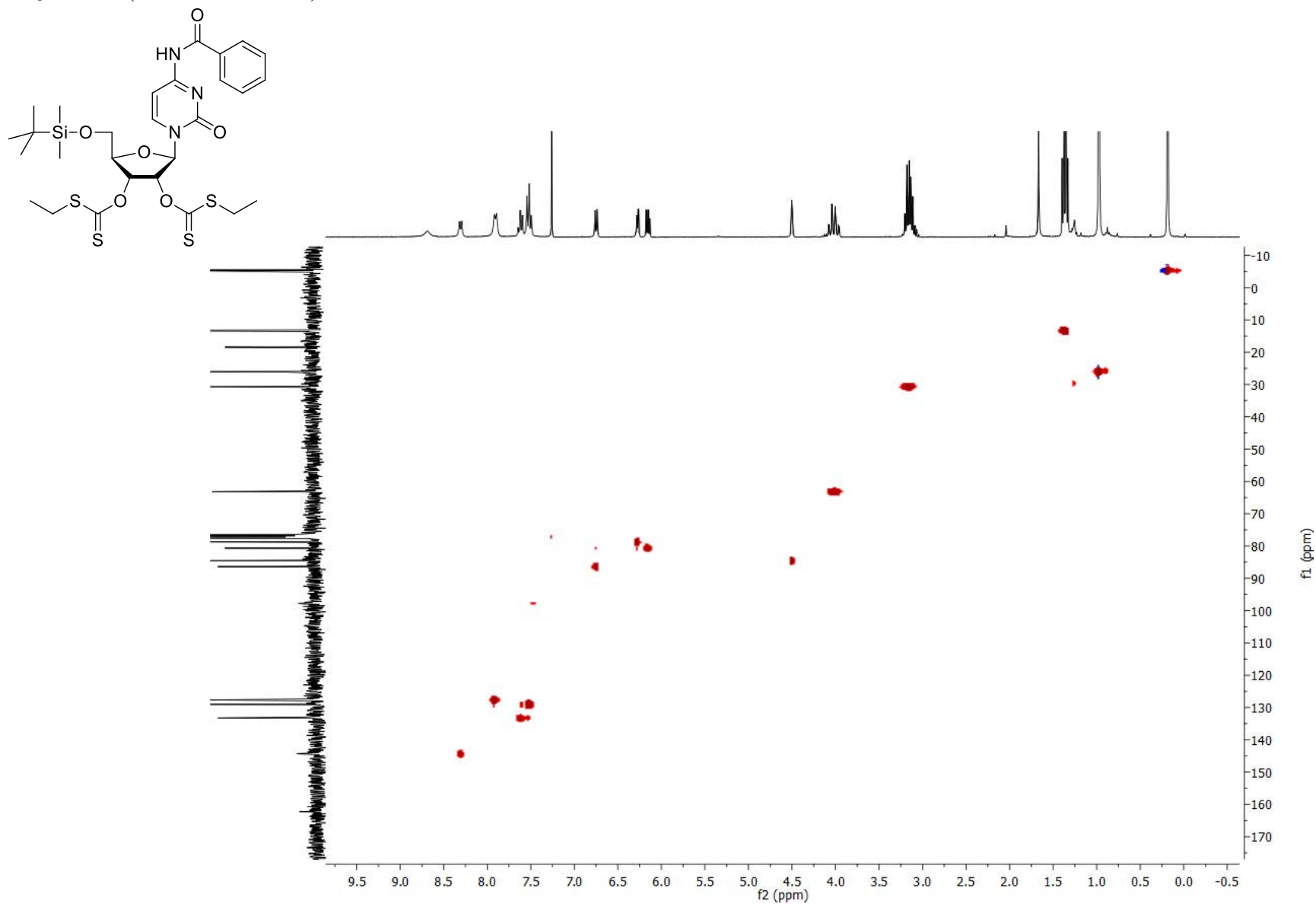
***N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]-β-D-cytidine (6d)**

COSY NMR (75.5 MHz, CDCl₃)



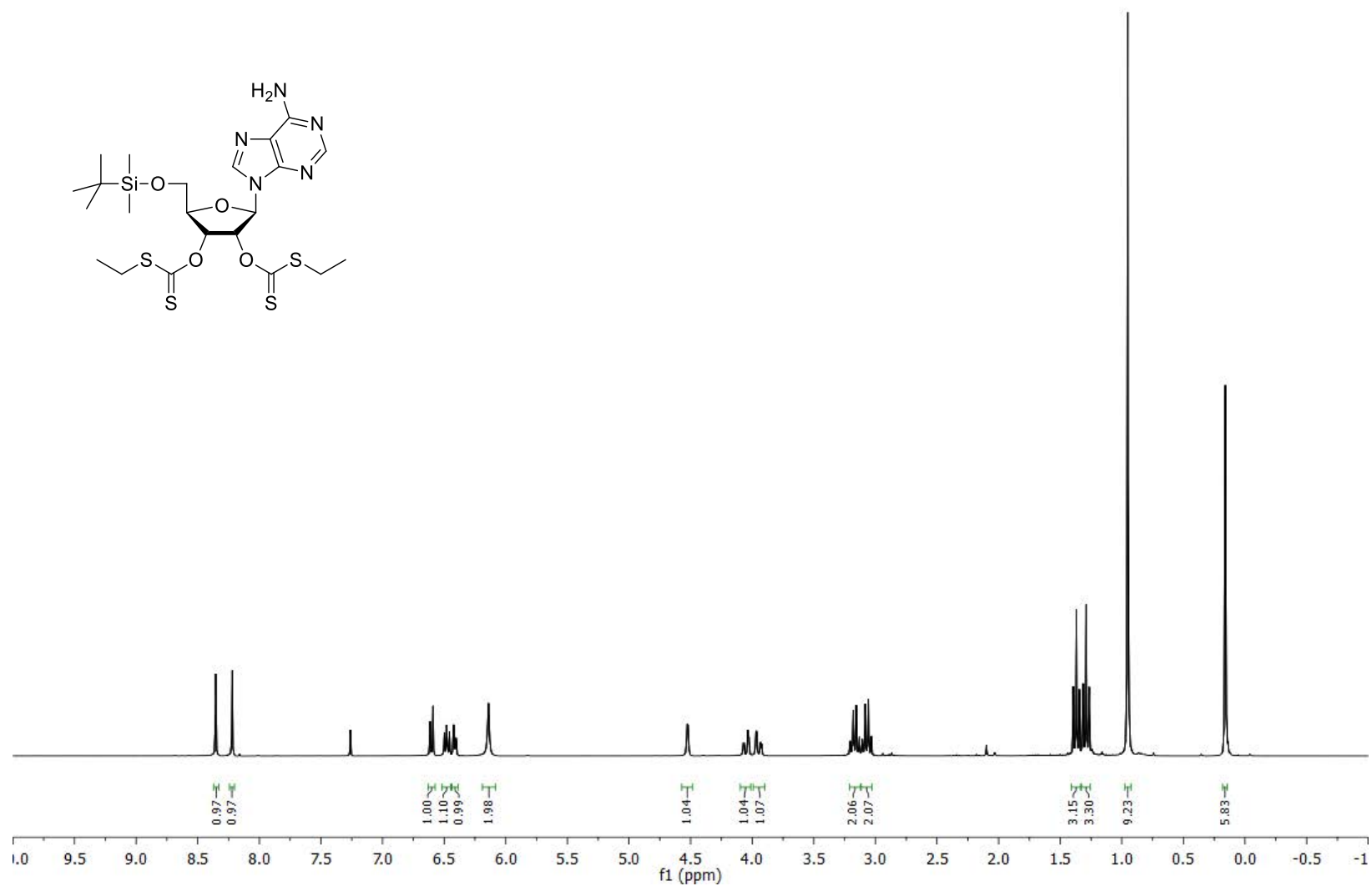
***N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]-β-D-cytidine (6d)**

HSQC NMR (75.5 MHz, CDCl₃)



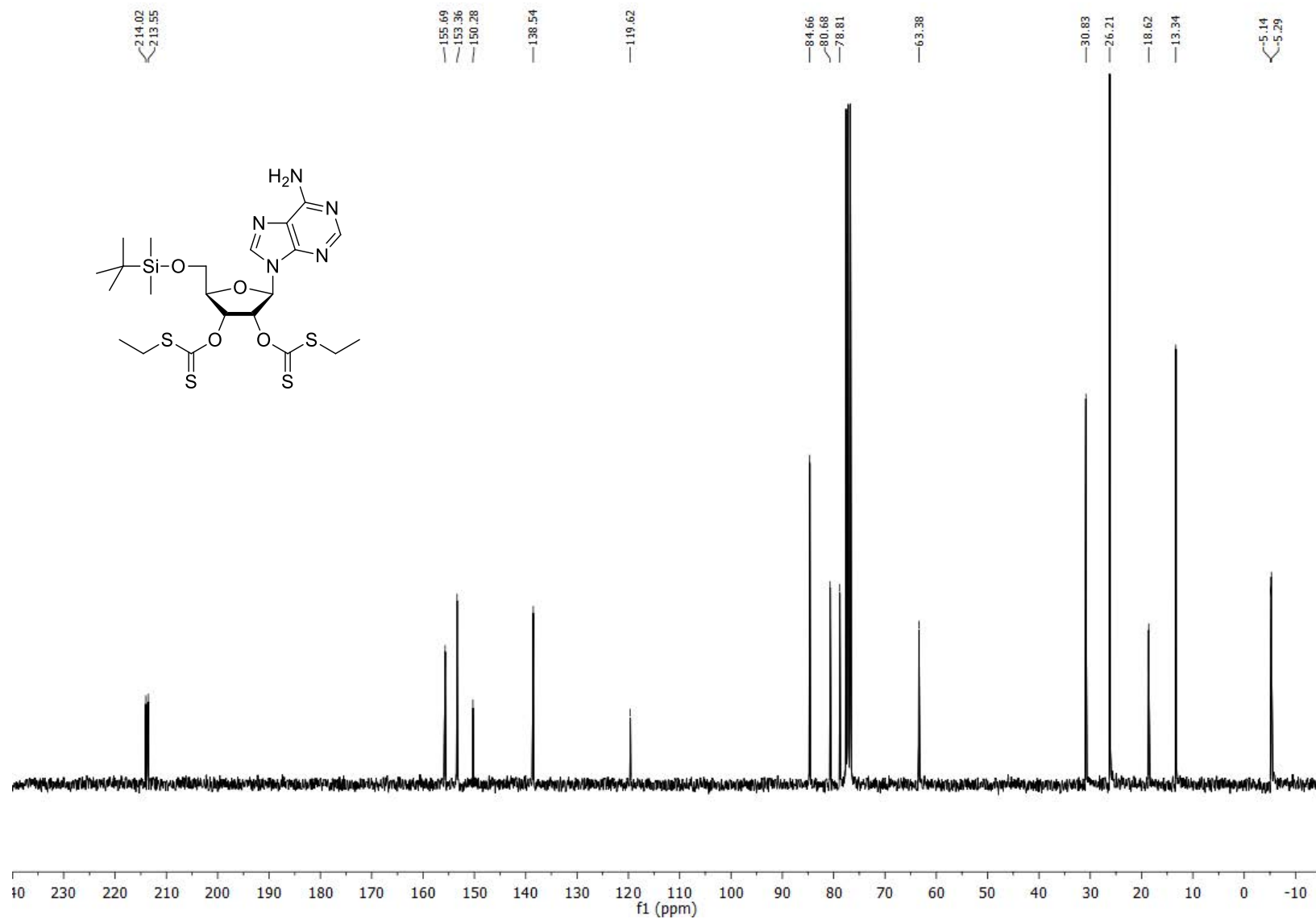
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-adenosine (6e)

^1H -NMR (300.13 MHz, CDCl_3)



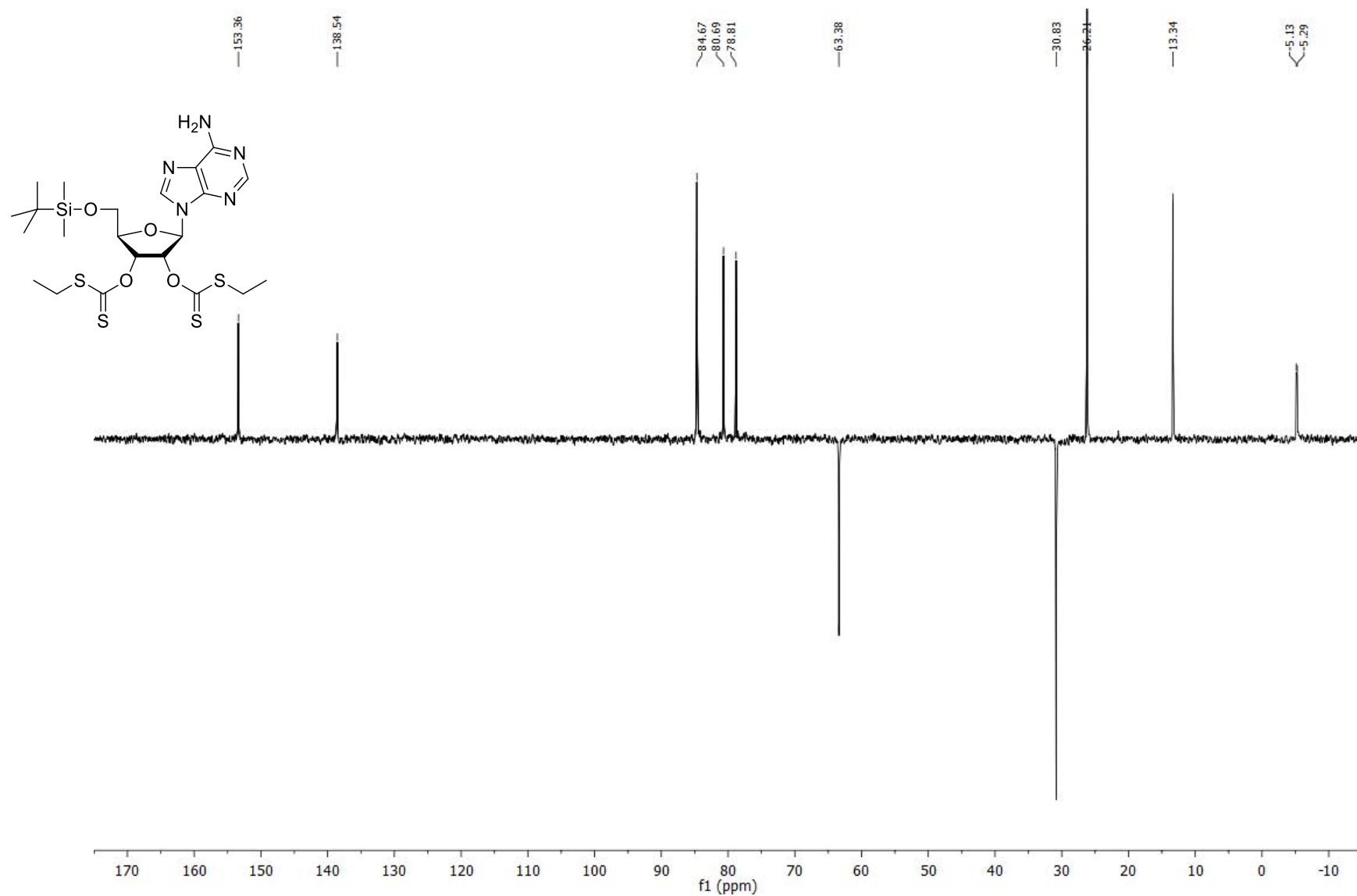
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-bis-O-[(ethylthio)thiocarbonyl]- β -D-adenosine (6e)

^{13}C -NMR (75.5 MHz, CDCl_3)



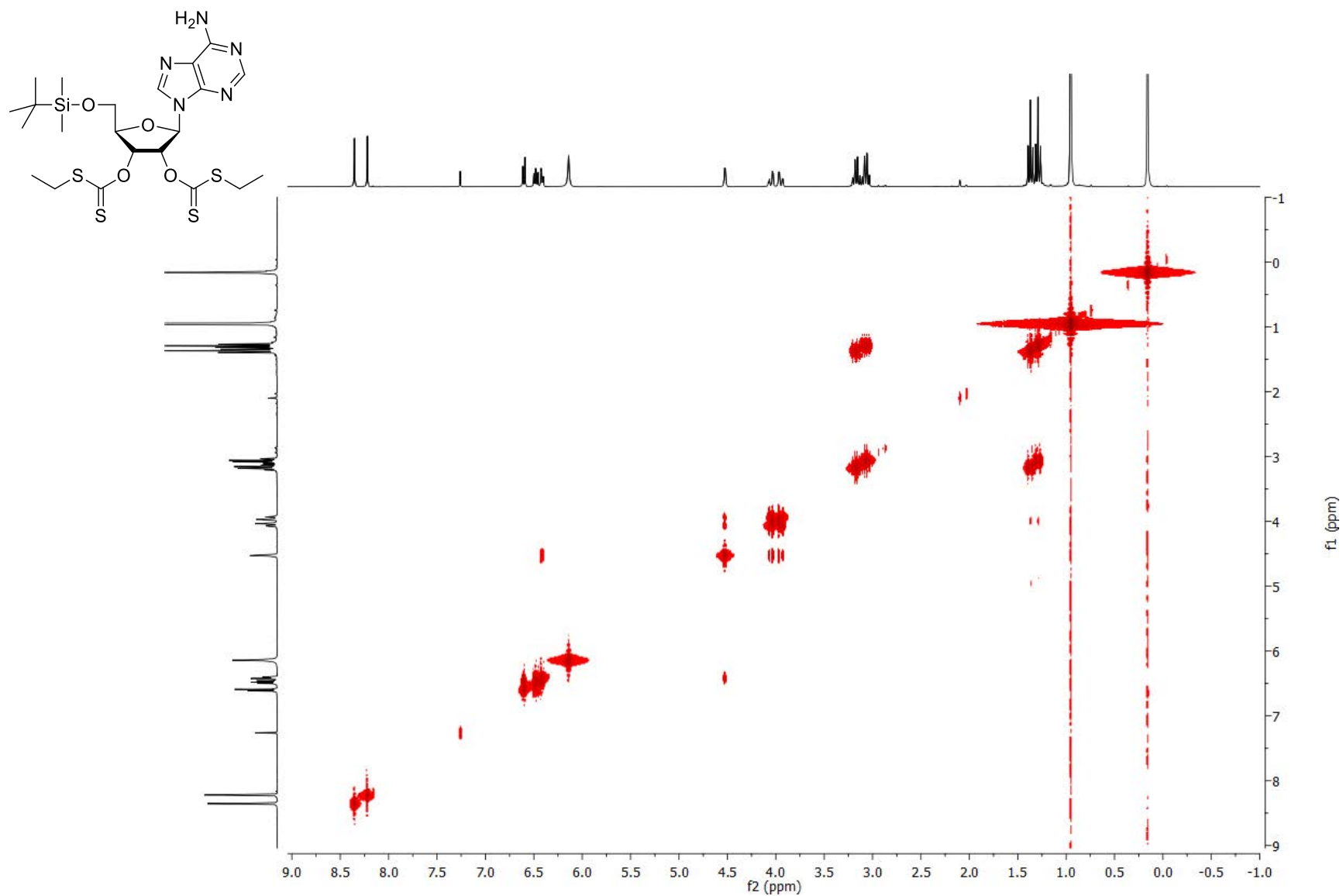
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-adenosine (6e)

DEPT NMR (75.5 MHz, CDCl₃)



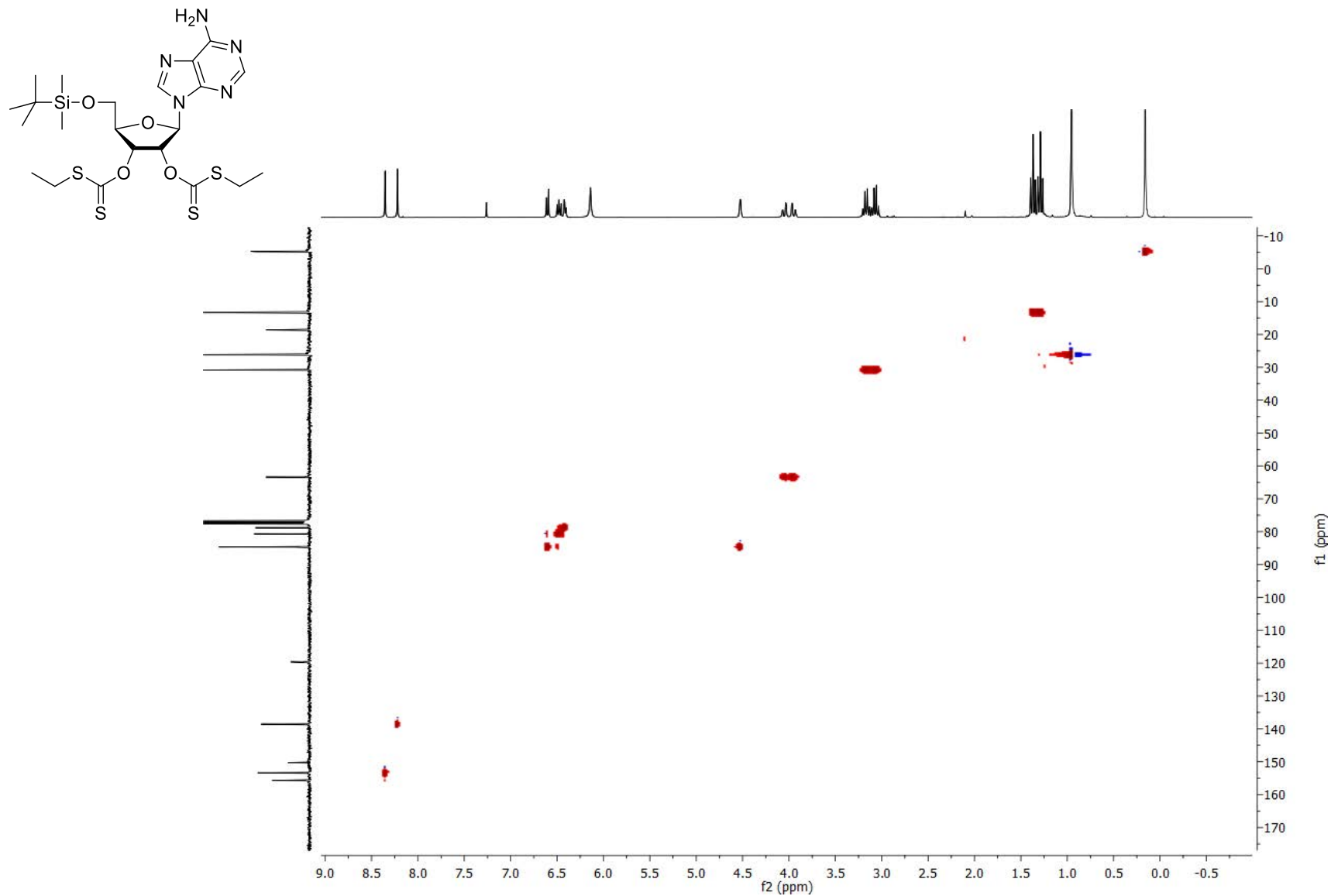
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-adenosine (6e)

COSY NMR (CDCl_3)



5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-adenosine (6e)

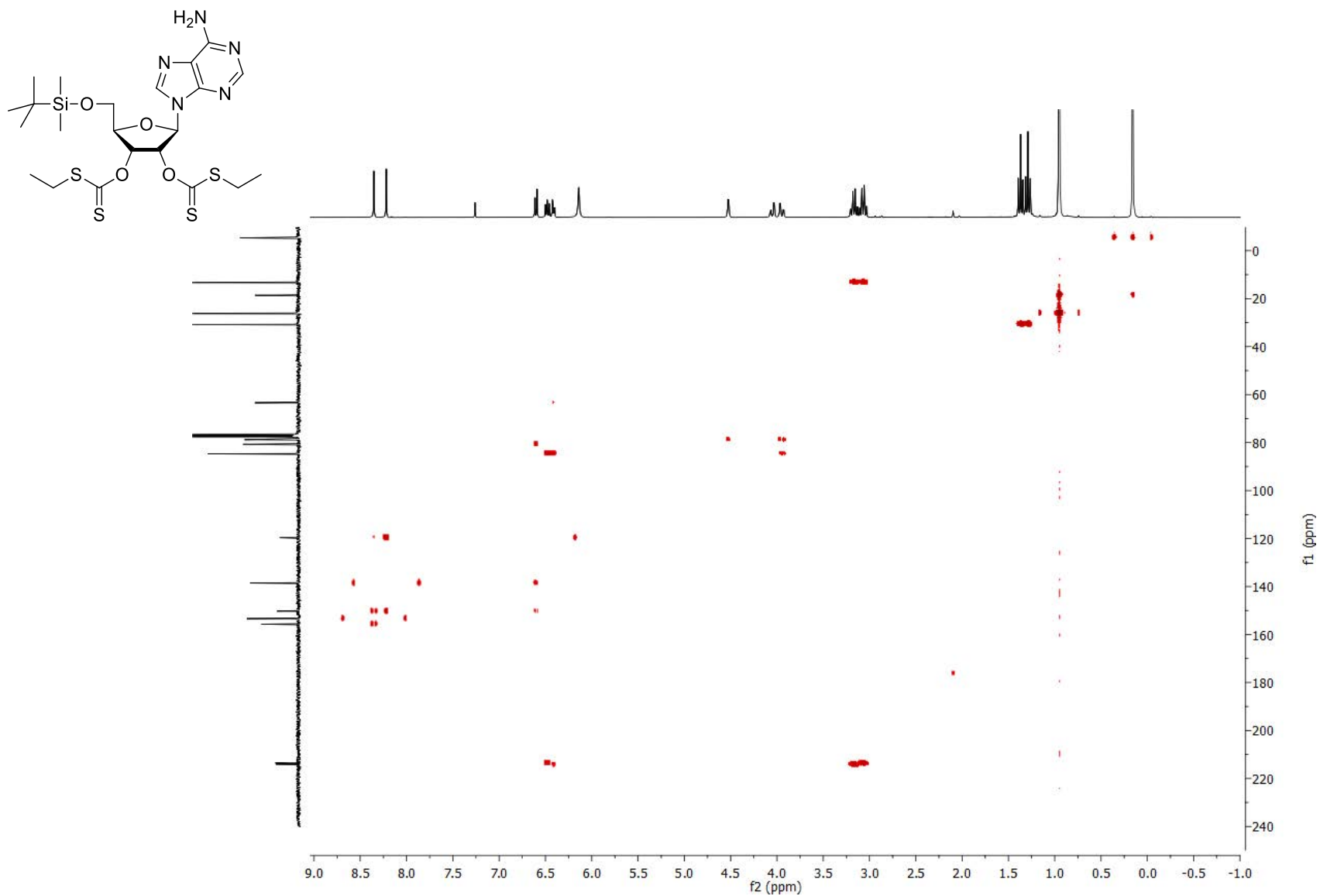
HSQC NMR (CDCl₃)



S83

5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-adenosine (6e)

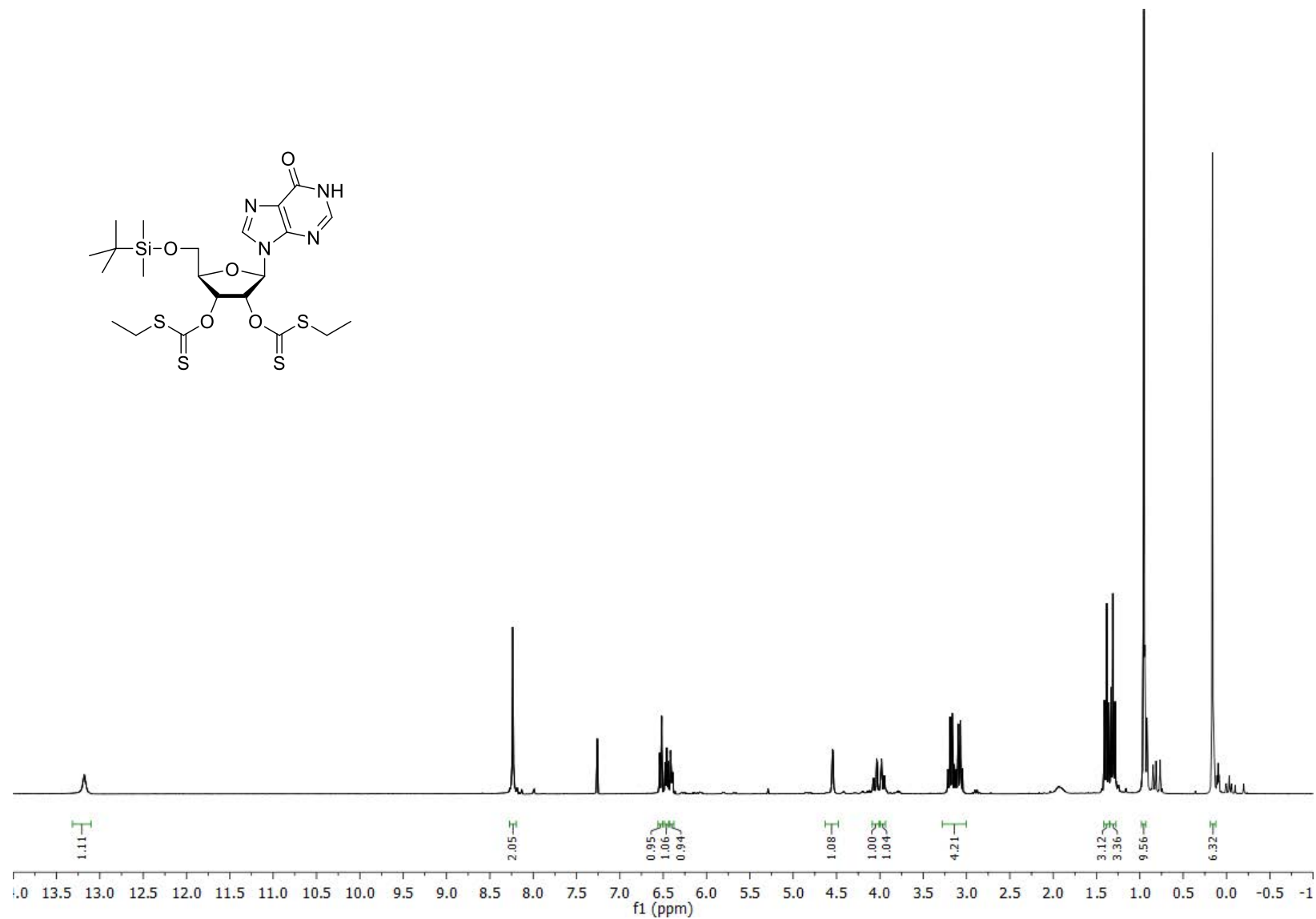
HMBC NMR (CDCl₃)



S84

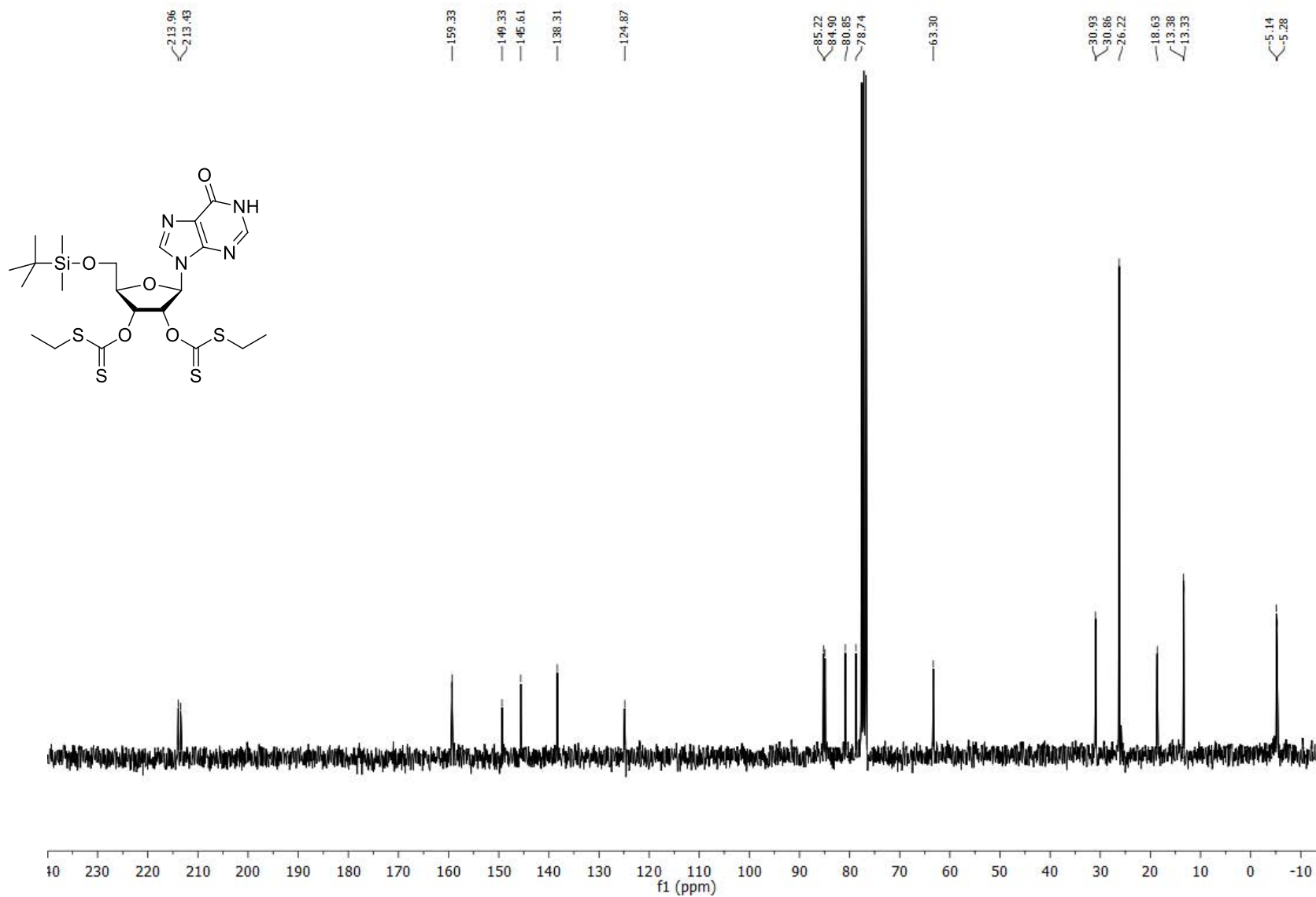
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-inosine (6f)

^1H -NMR (300.13 MHz, CDCl_3)



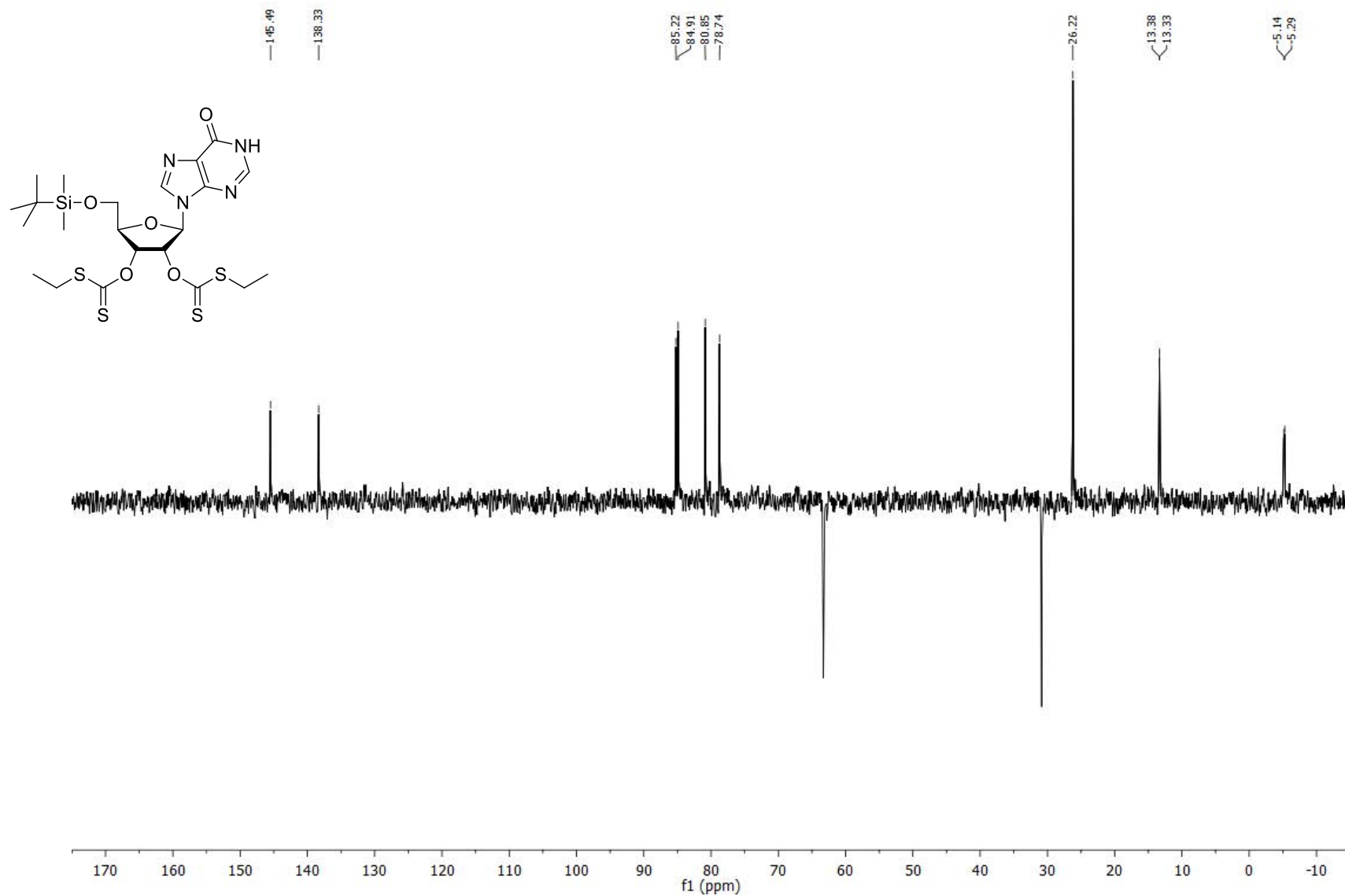
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-inosine (6f)

^{13}C -NMR (75.5 MHz, CDCl_3)



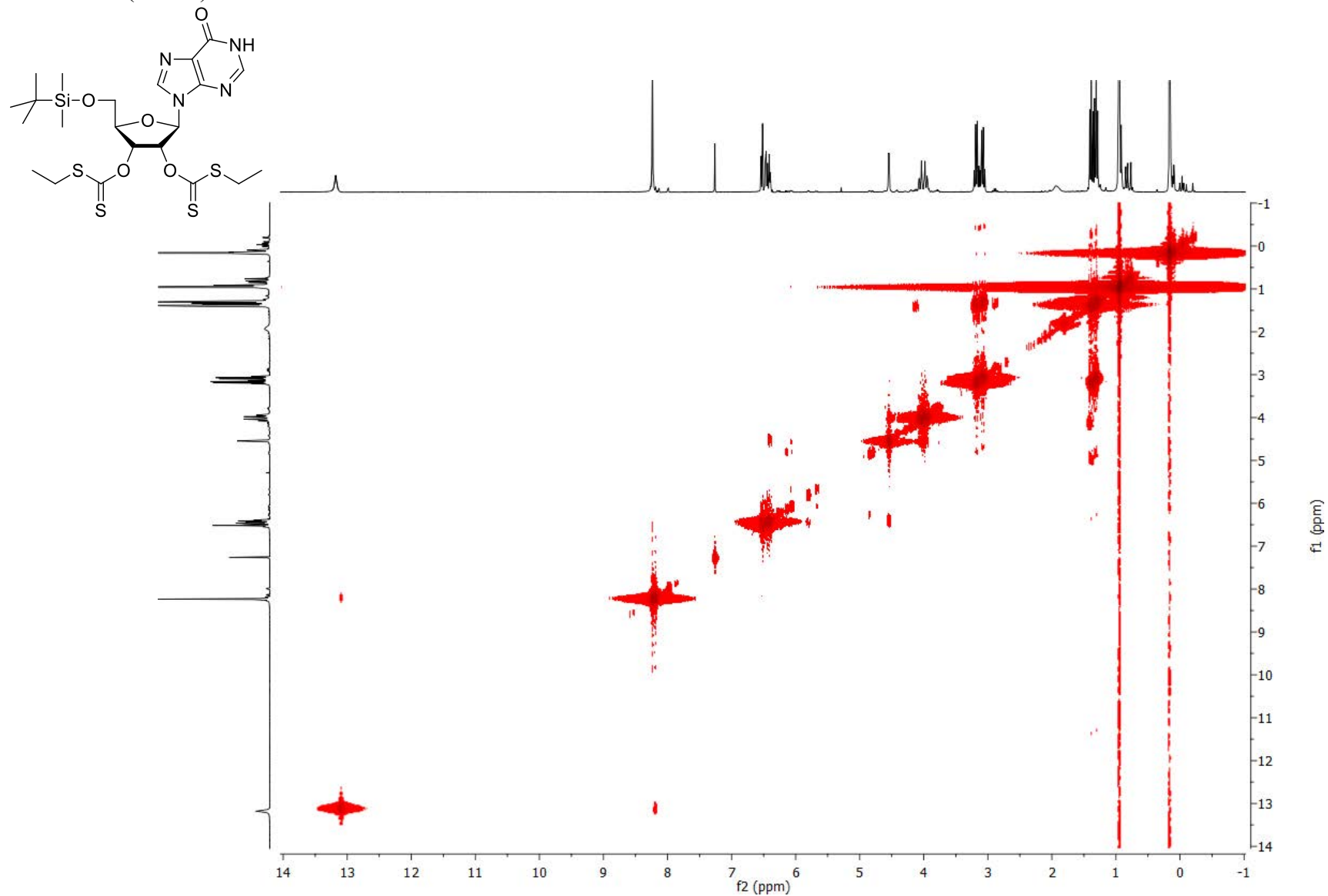
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-inosine (6f)

DEPT NMR (75.5 MHz, CDCl₃)



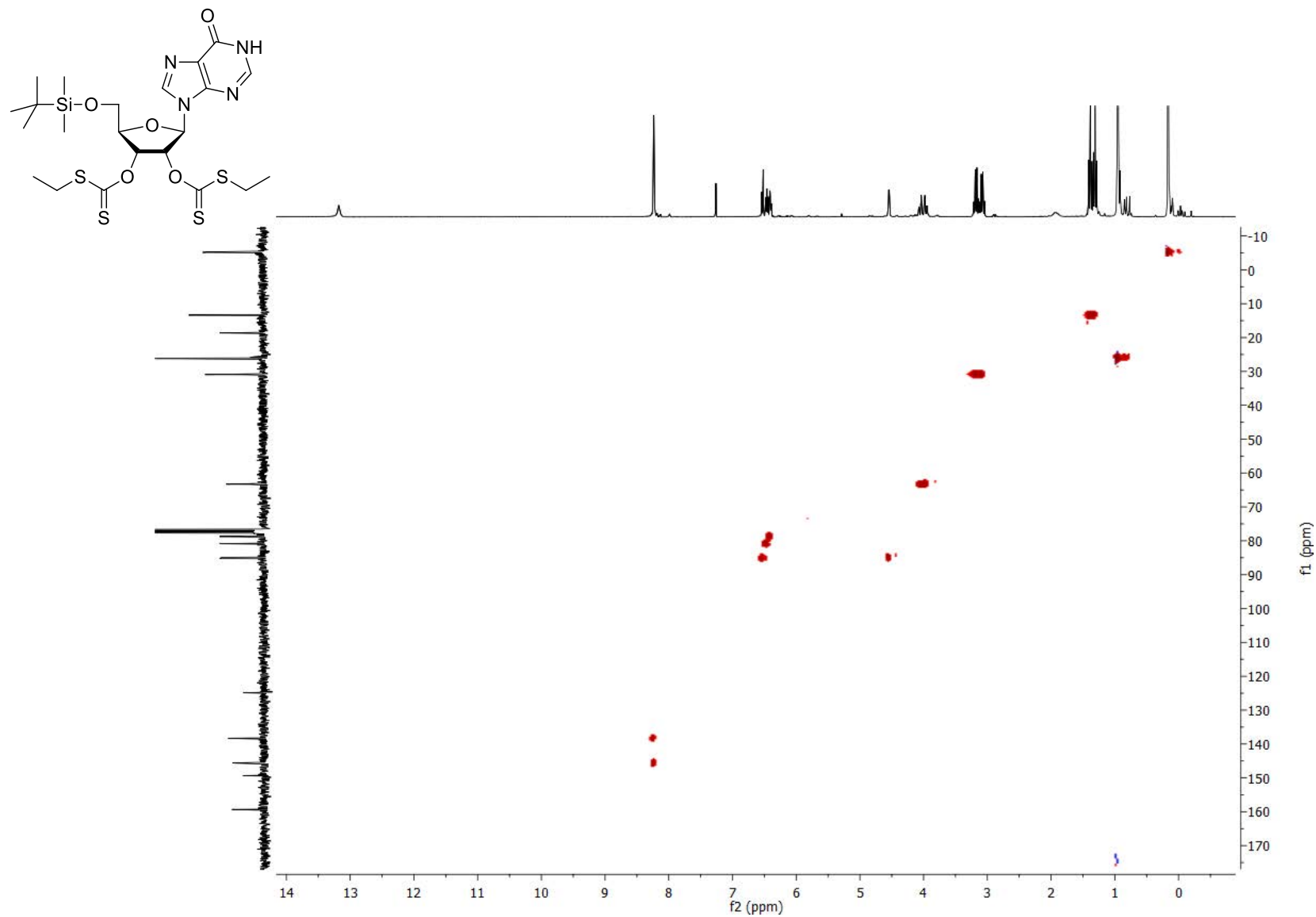
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-inosine (6f)

COSY NMR (CDCl₃)



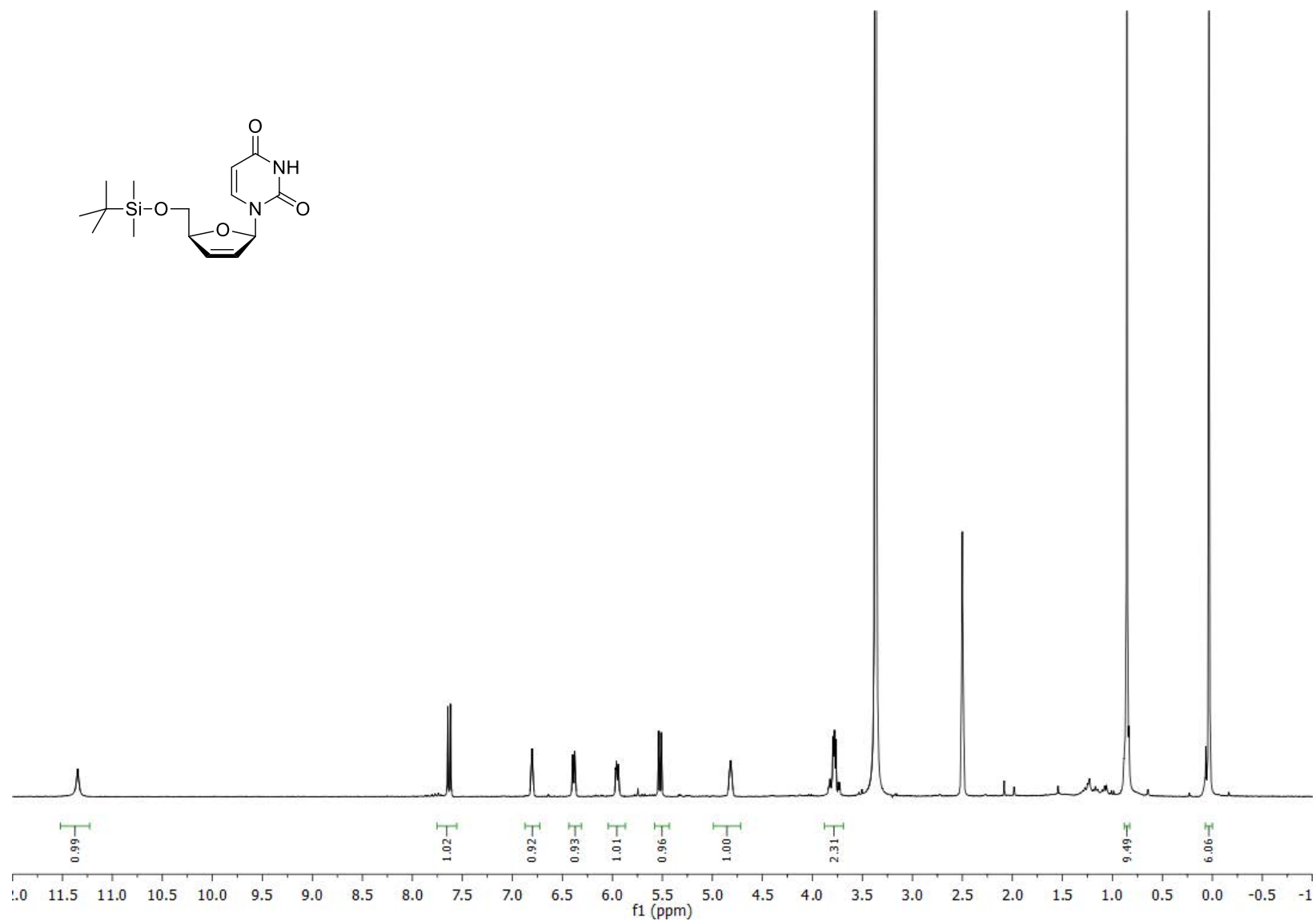
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-bis-*O*-[(ethylthio)thiocarbonyl]- β -D-inosine (6f)

HSQC NMR (CDCl₃)



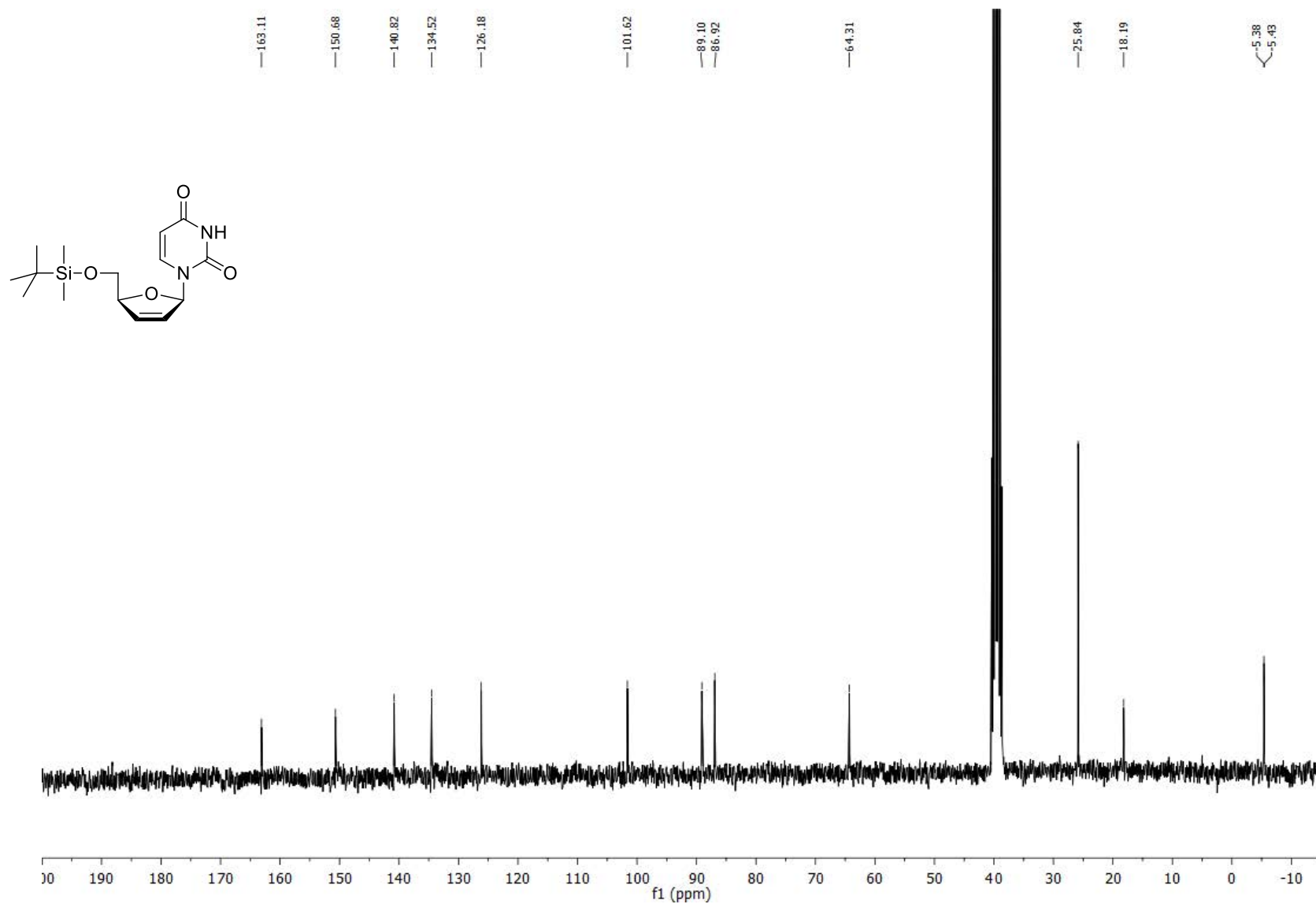
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-uridine (7a)

$^1\text{H-NMR}$ (300.13 MHz, $\text{DMSO-}d_6$)



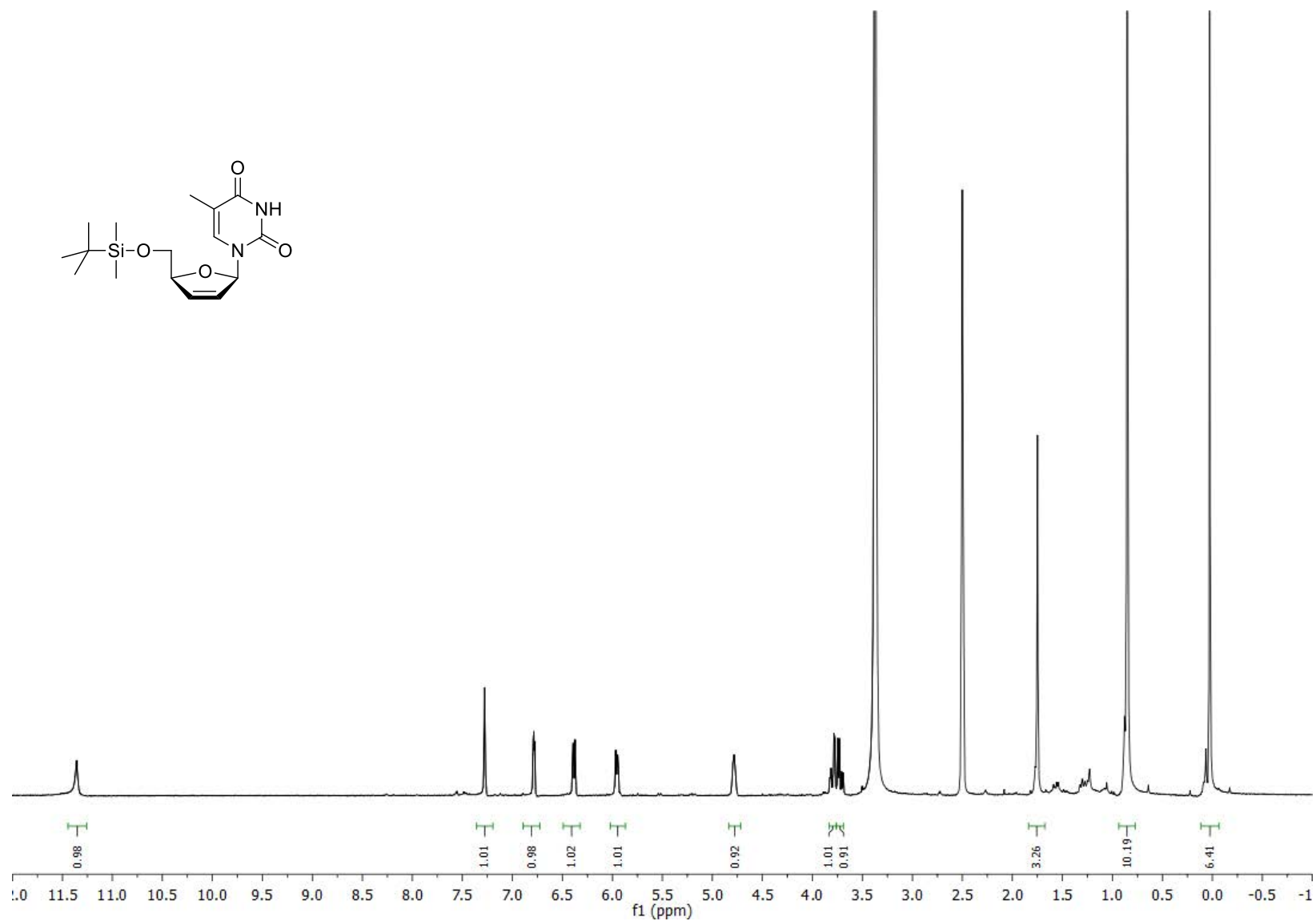
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-uridine (7a)

^{13}C -NMR (75.5 MHz, $\text{DMSO-}d_6$)



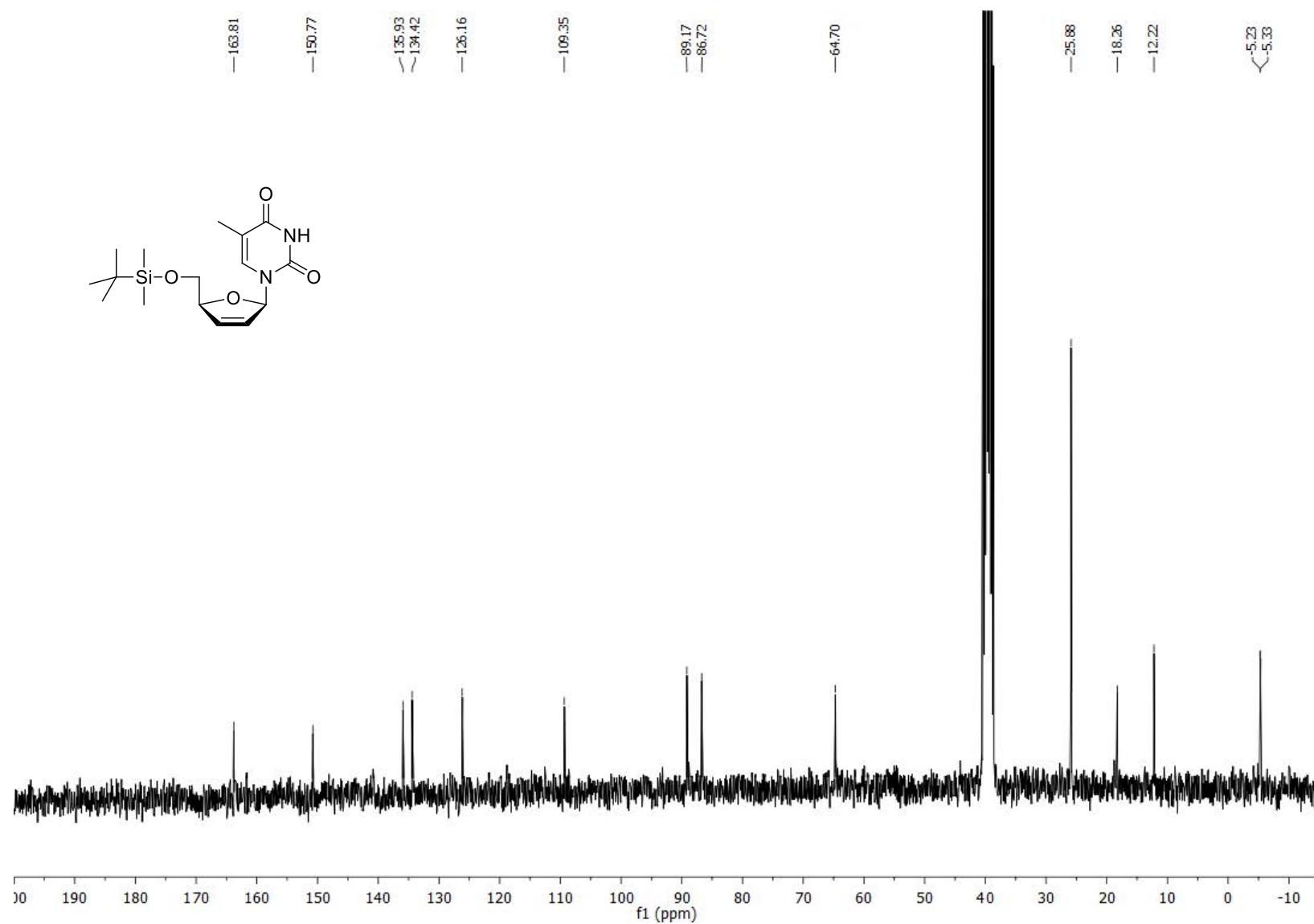
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-3'-deoxy- β -D-5-thymidine (7b)

$^1\text{H-NMR}$ (300.13 MHz, $\text{DMSO-}d_6$)



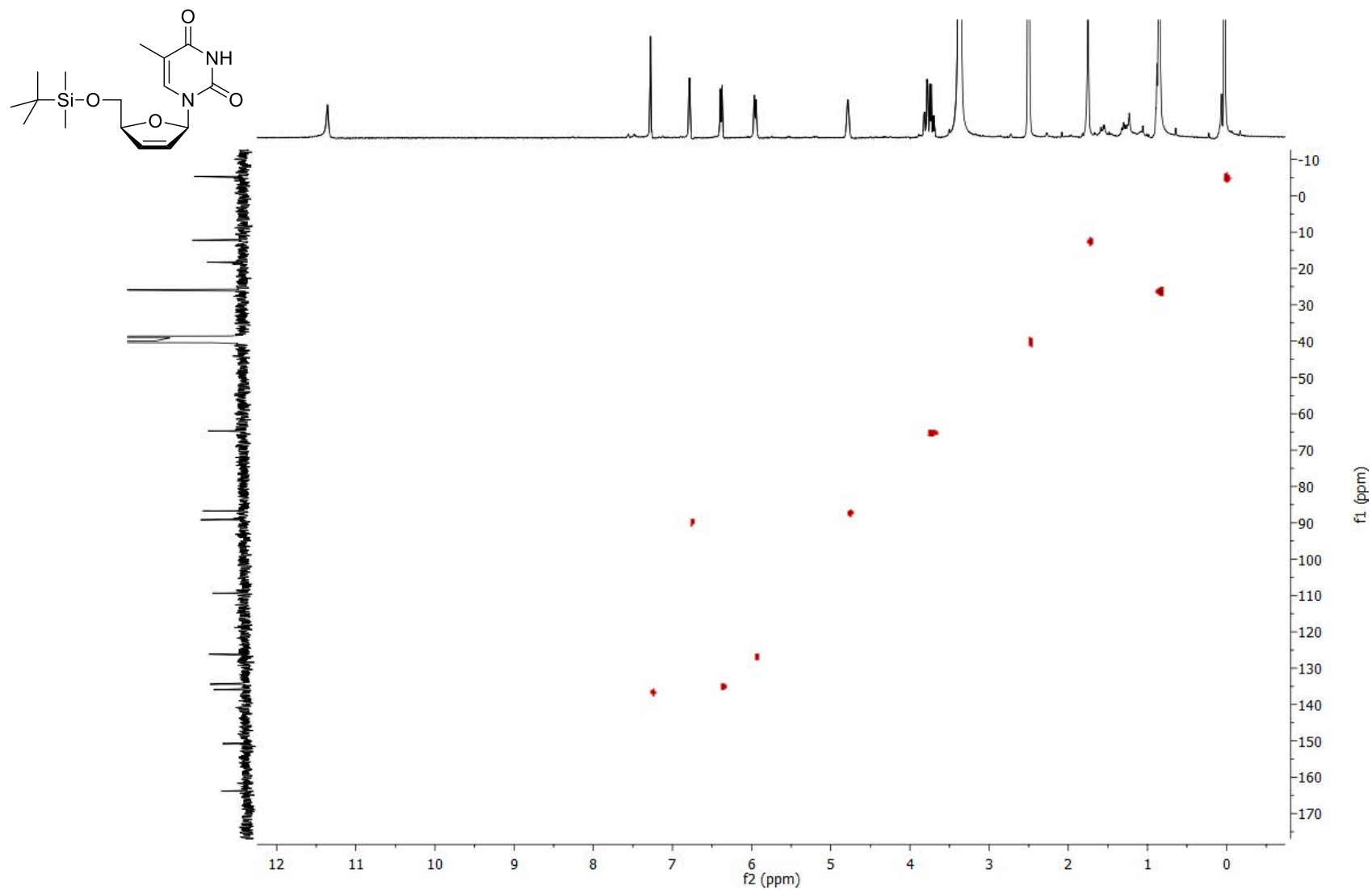
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-3'-deoxy- β -D-5-thymidine (7b)

^{13}C -NMR (75.5 MHz, $\text{DMSO-}d_6$)



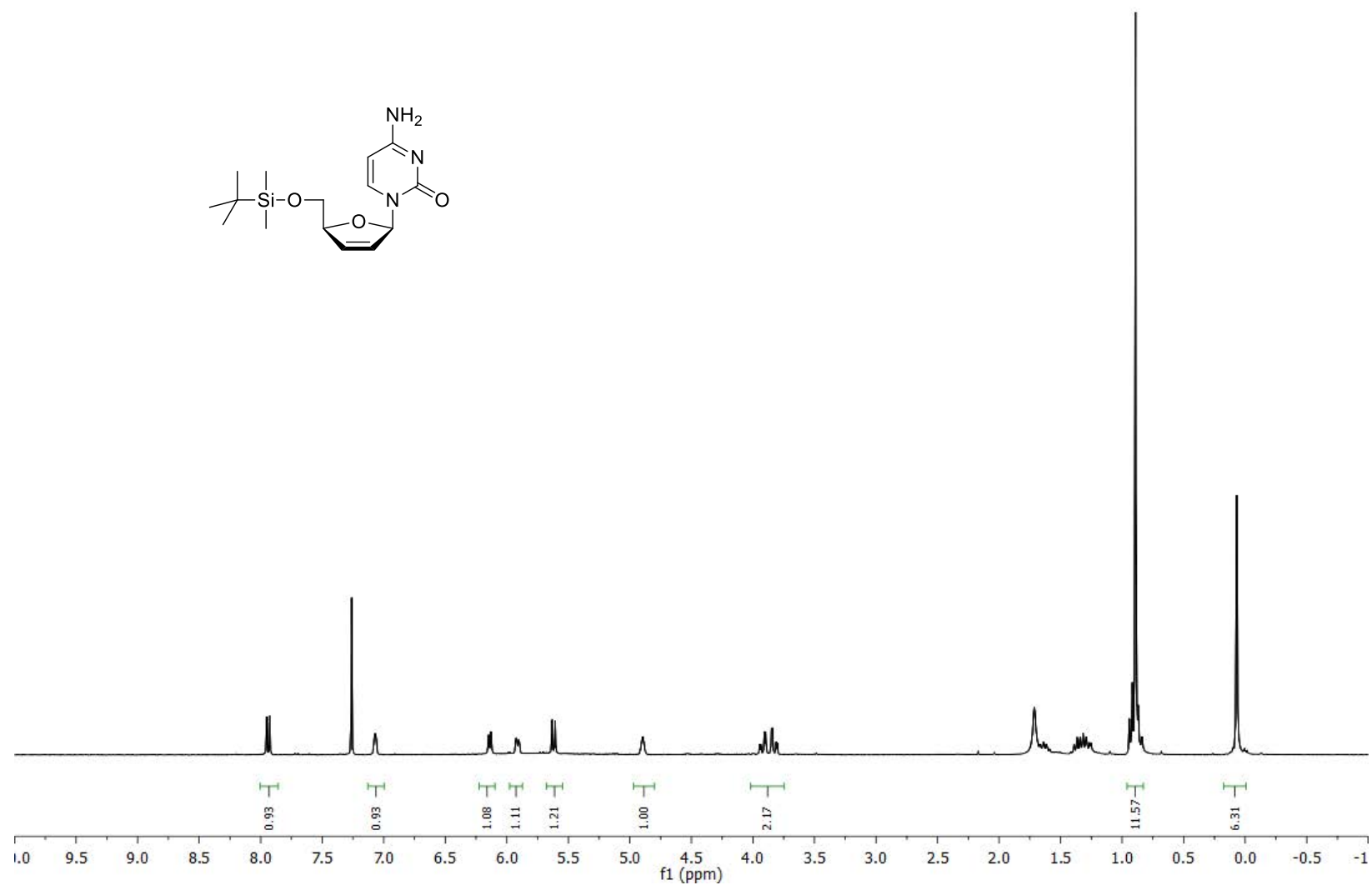
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-3'-deoxy- β -D-5-thymidine (7b)

HSQC NMR (DMSO- d_6)



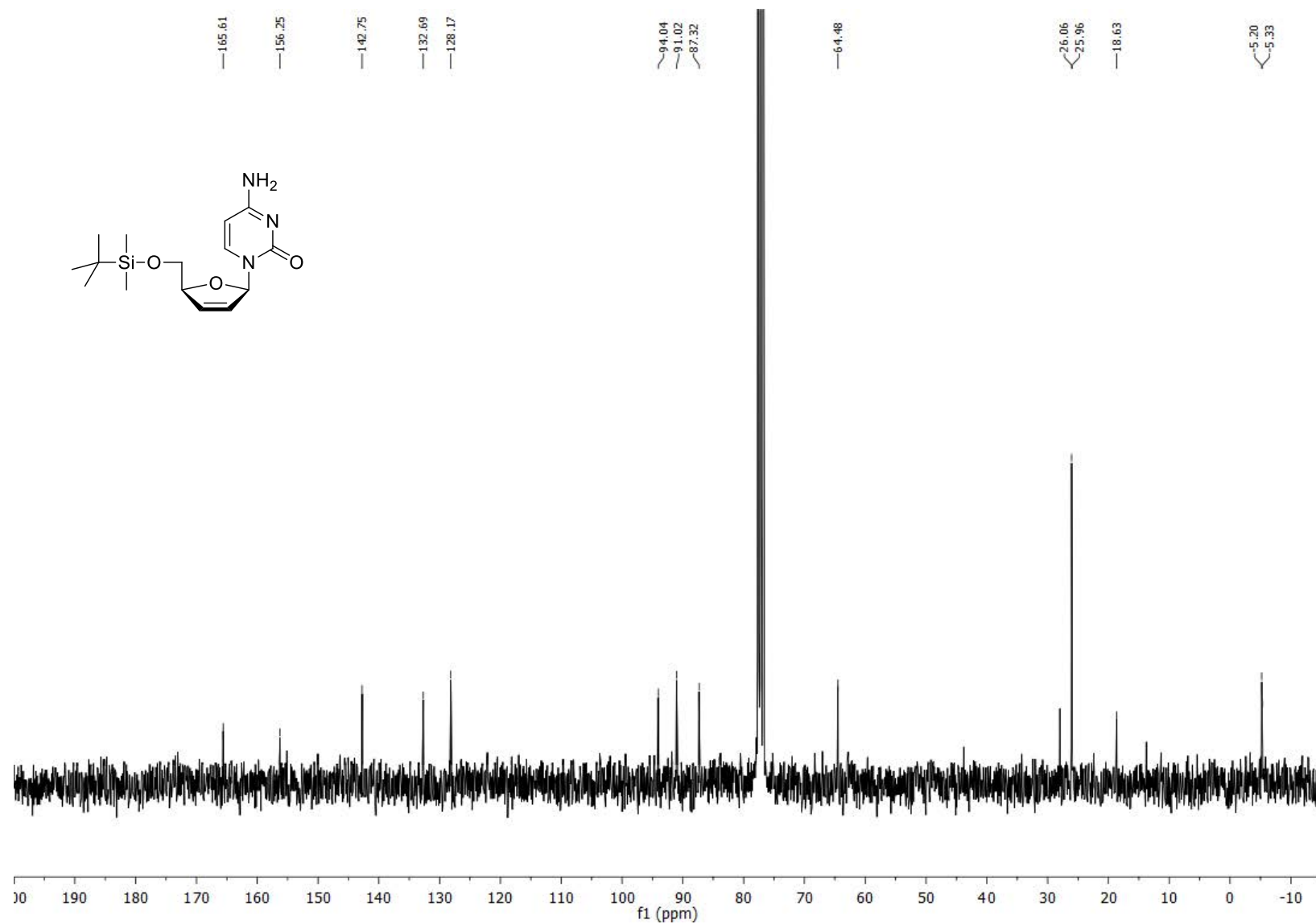
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-cytidine (7c)

$^1\text{H-NMR}$ (300.13 MHz, CDCl_3)



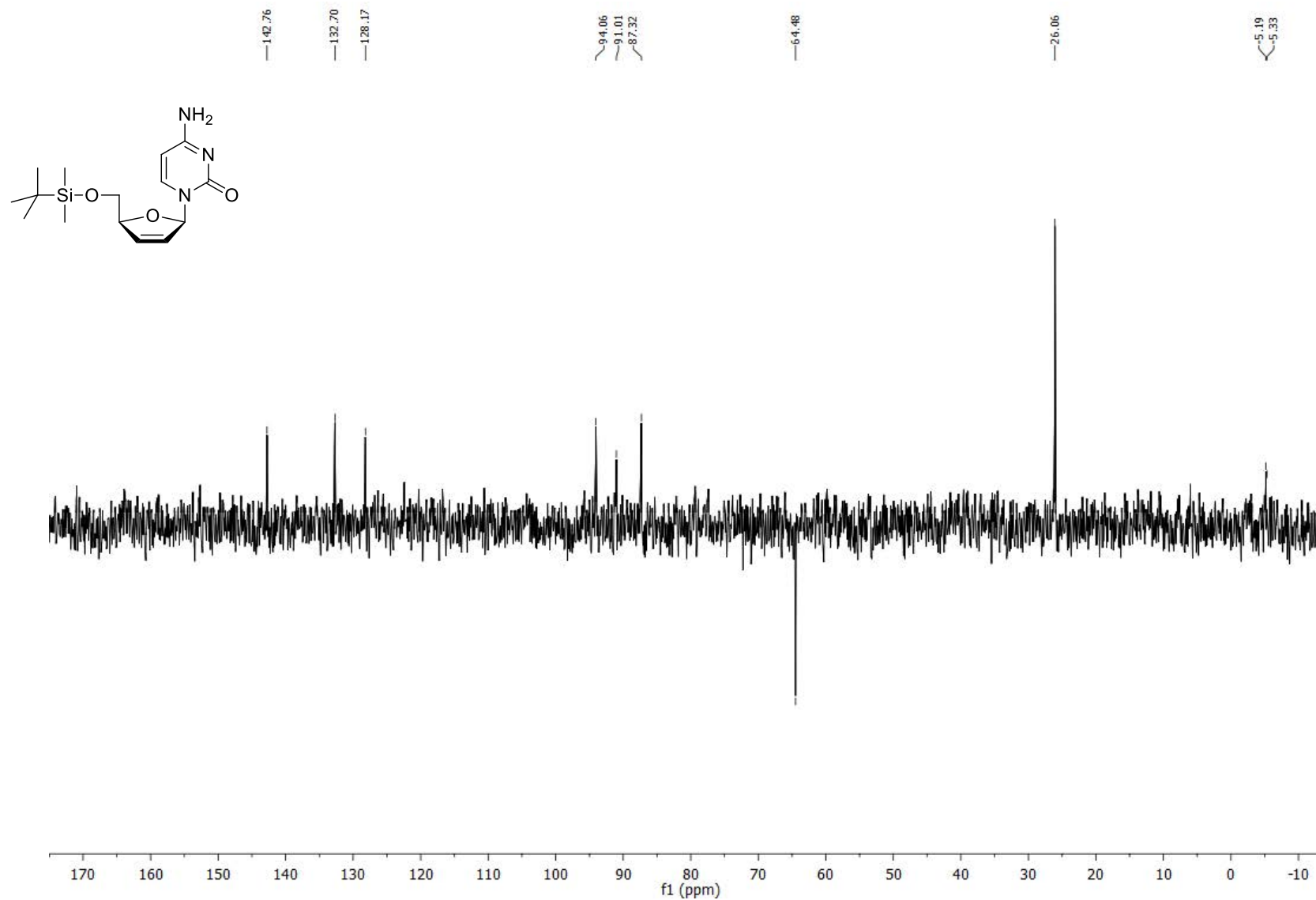
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-cytidine (7c)

^{13}C -NMR (75.5 MHz, CDCl_3)



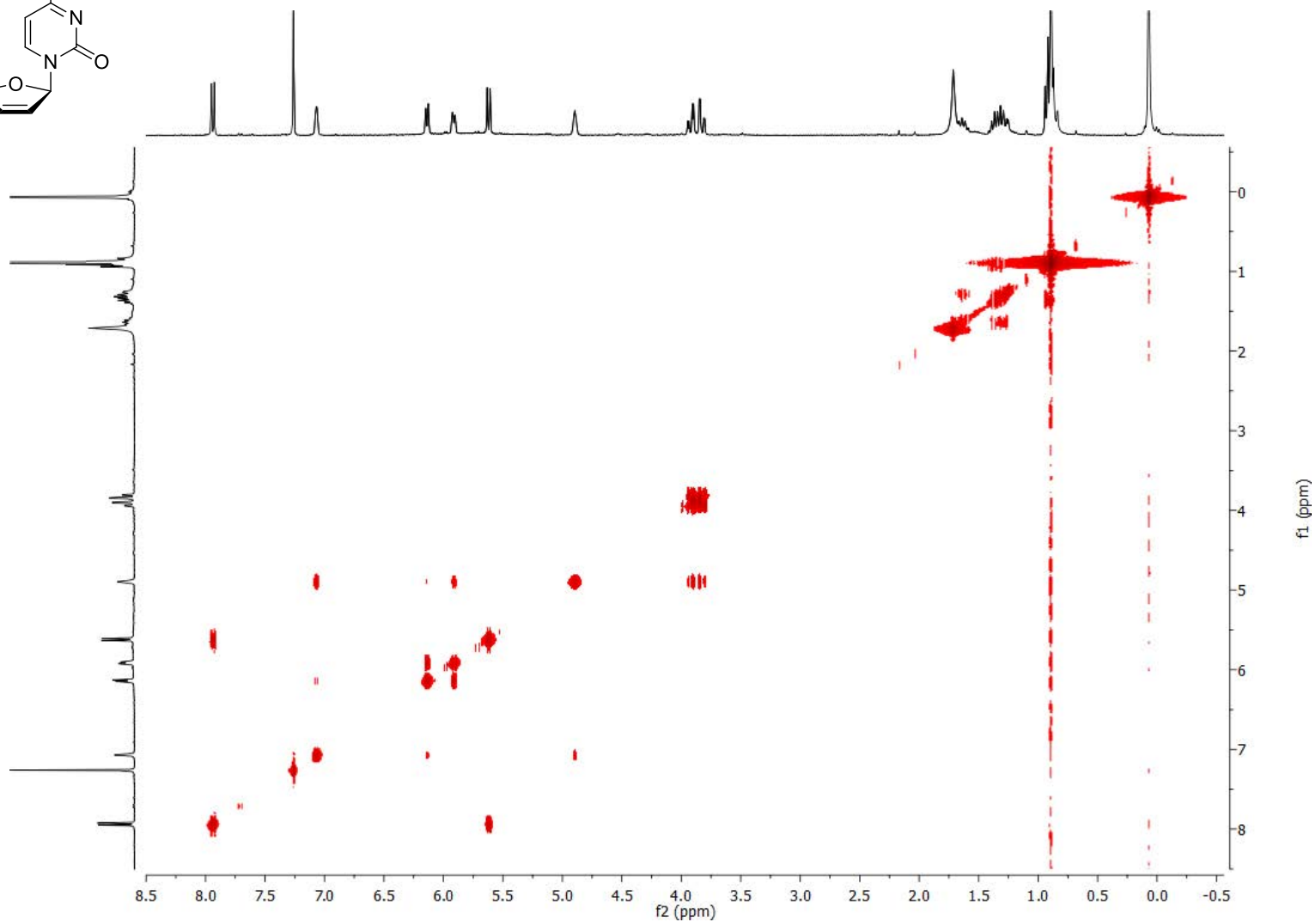
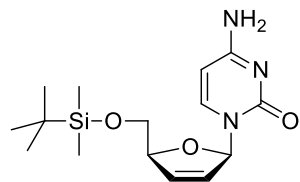
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-cytidine (7c)

DEPT NMR (75.5 MHz, CDCl₃)



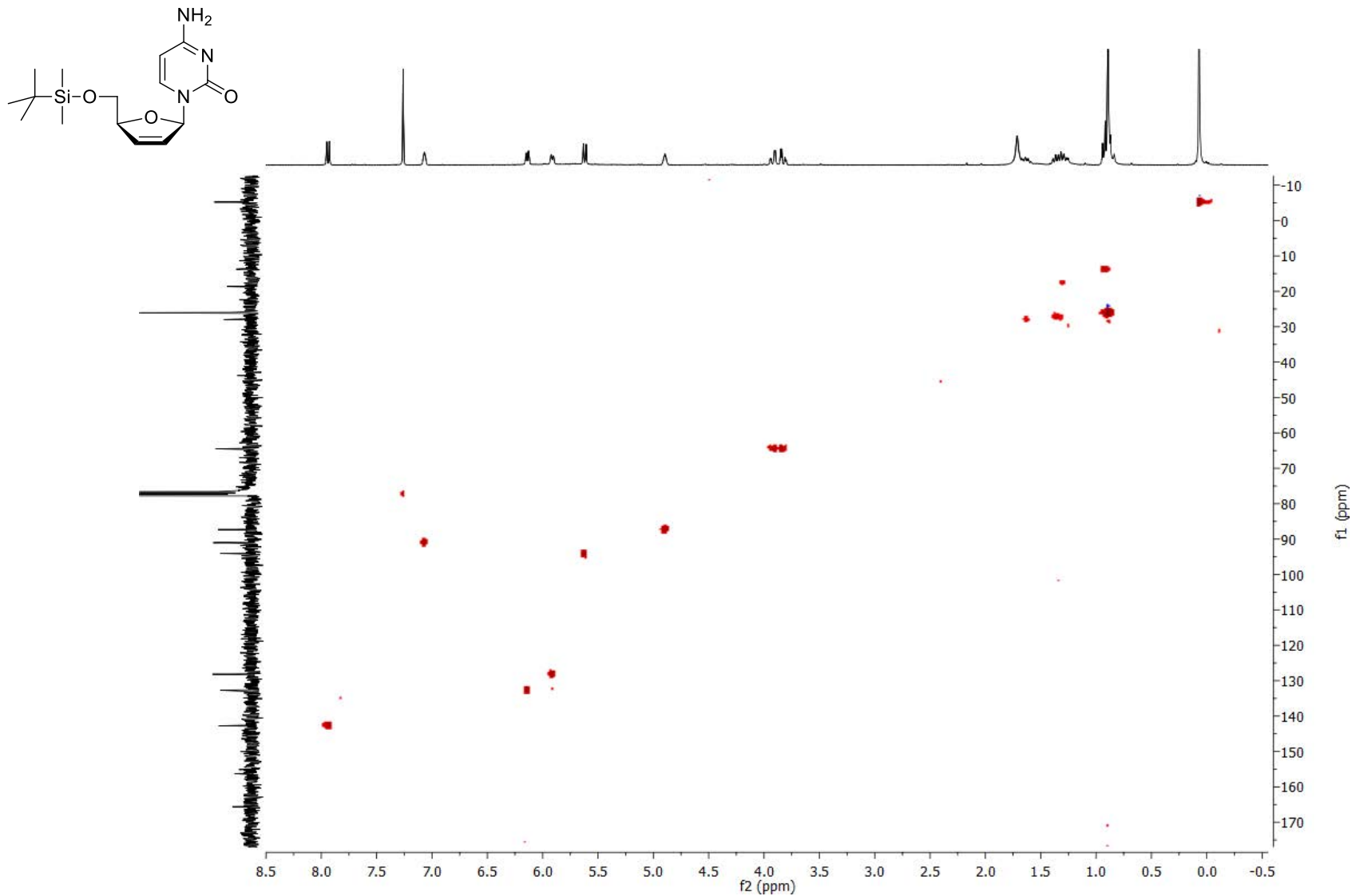
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-cytidine (7c)

COSY NMR (CDCl₃)



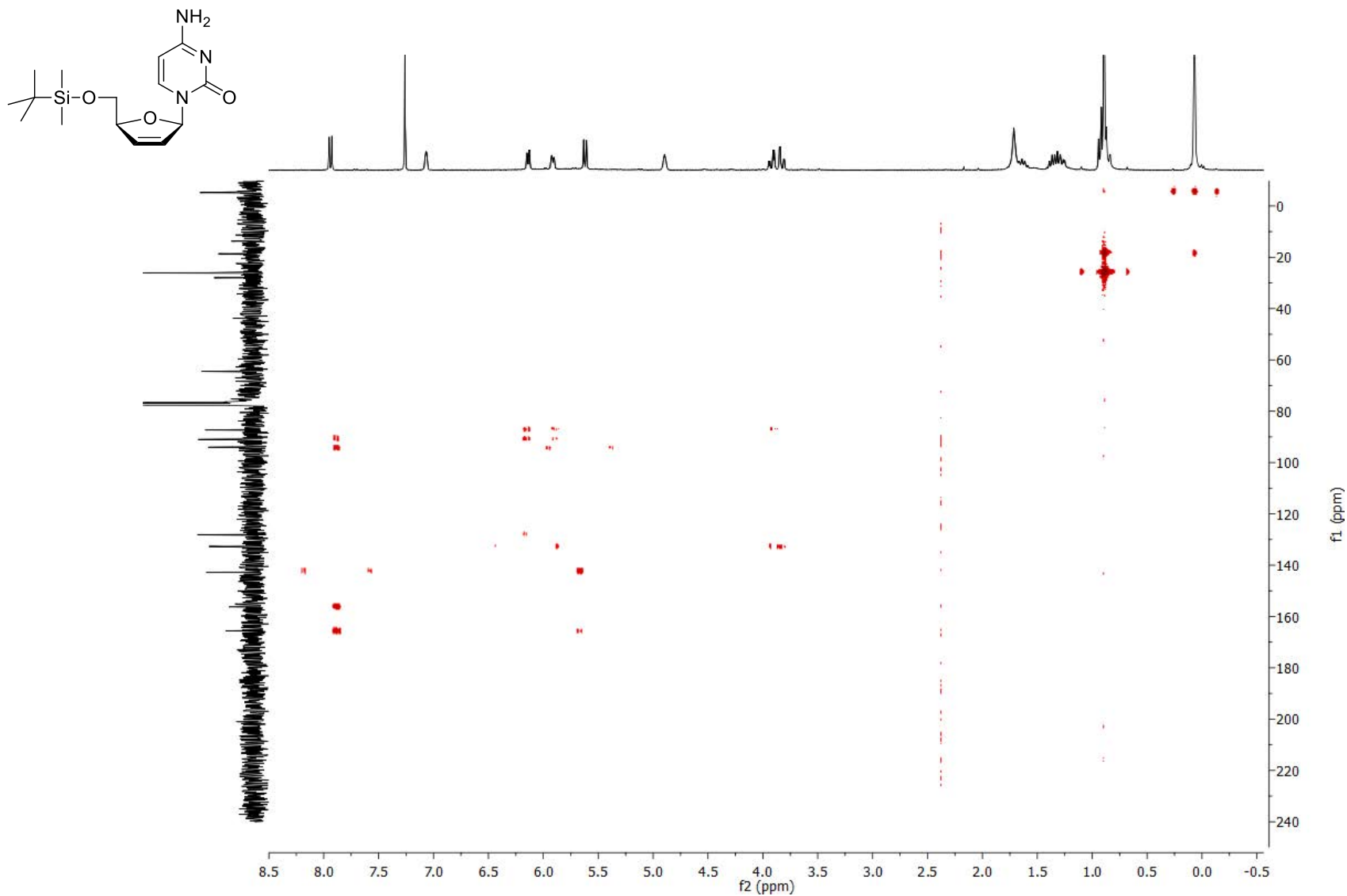
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-cytidine (7c)

HSQC NMR (CDCl₃)



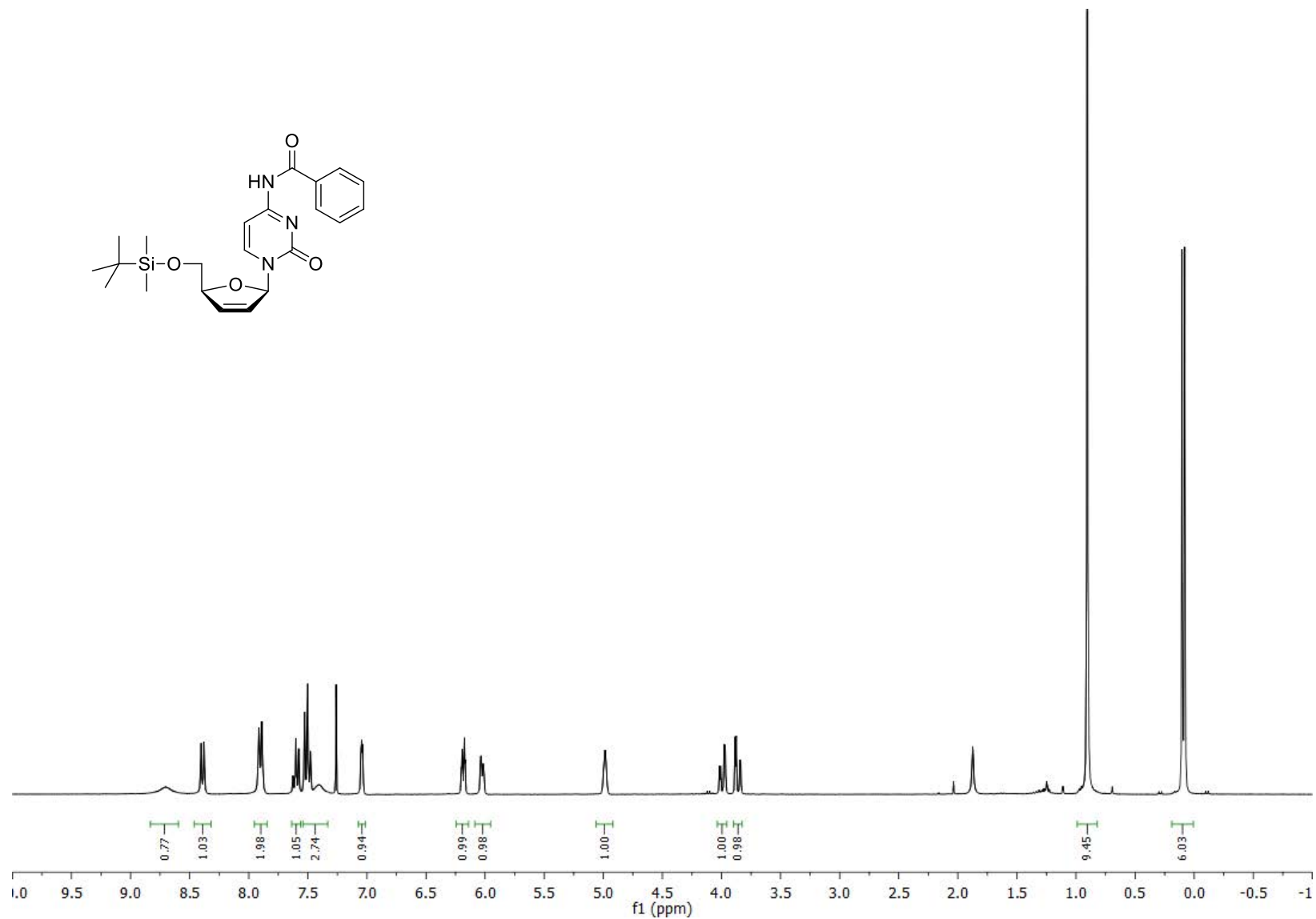
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-cytidine (7c)

HMBC NMR (CDCl₃)



***N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-cytidine (7d)**

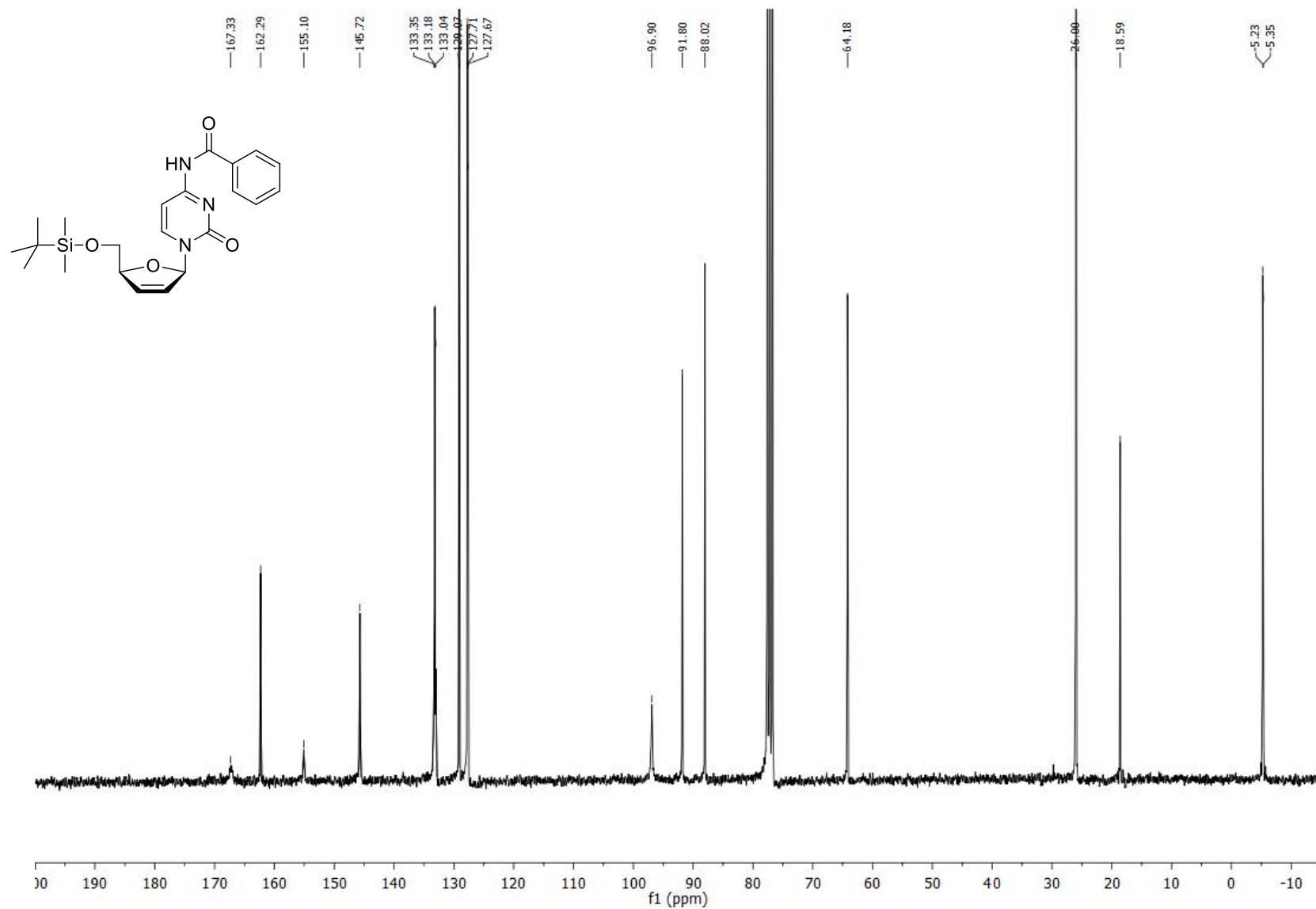
¹H-NMR (300.13 MHz, CDCl₃)



S101

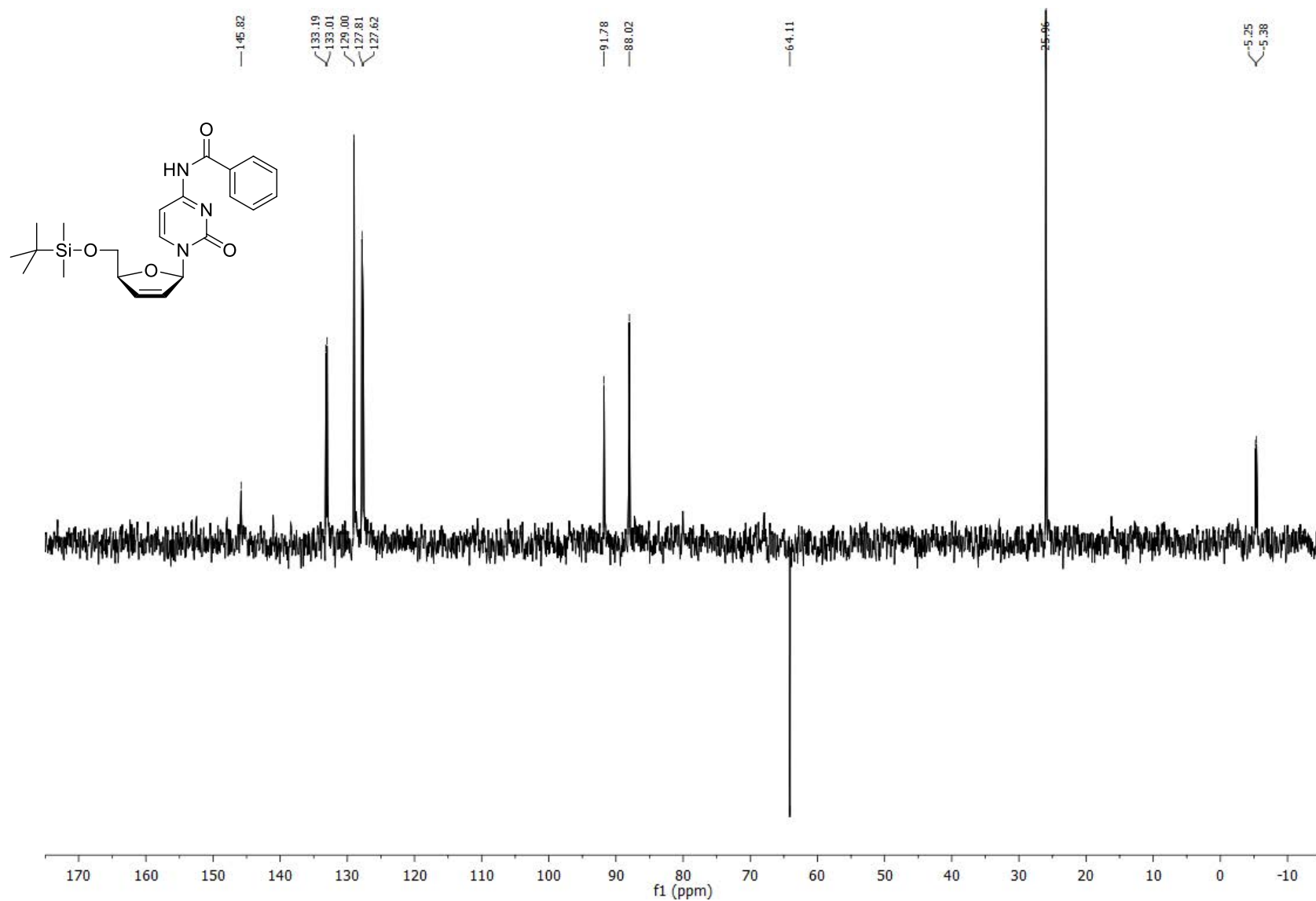
***N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-cytidine (7d)**

¹³C-NMR (75.5 MHz, CDCl₃)



***N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy-β-D-cytidine (7d)**

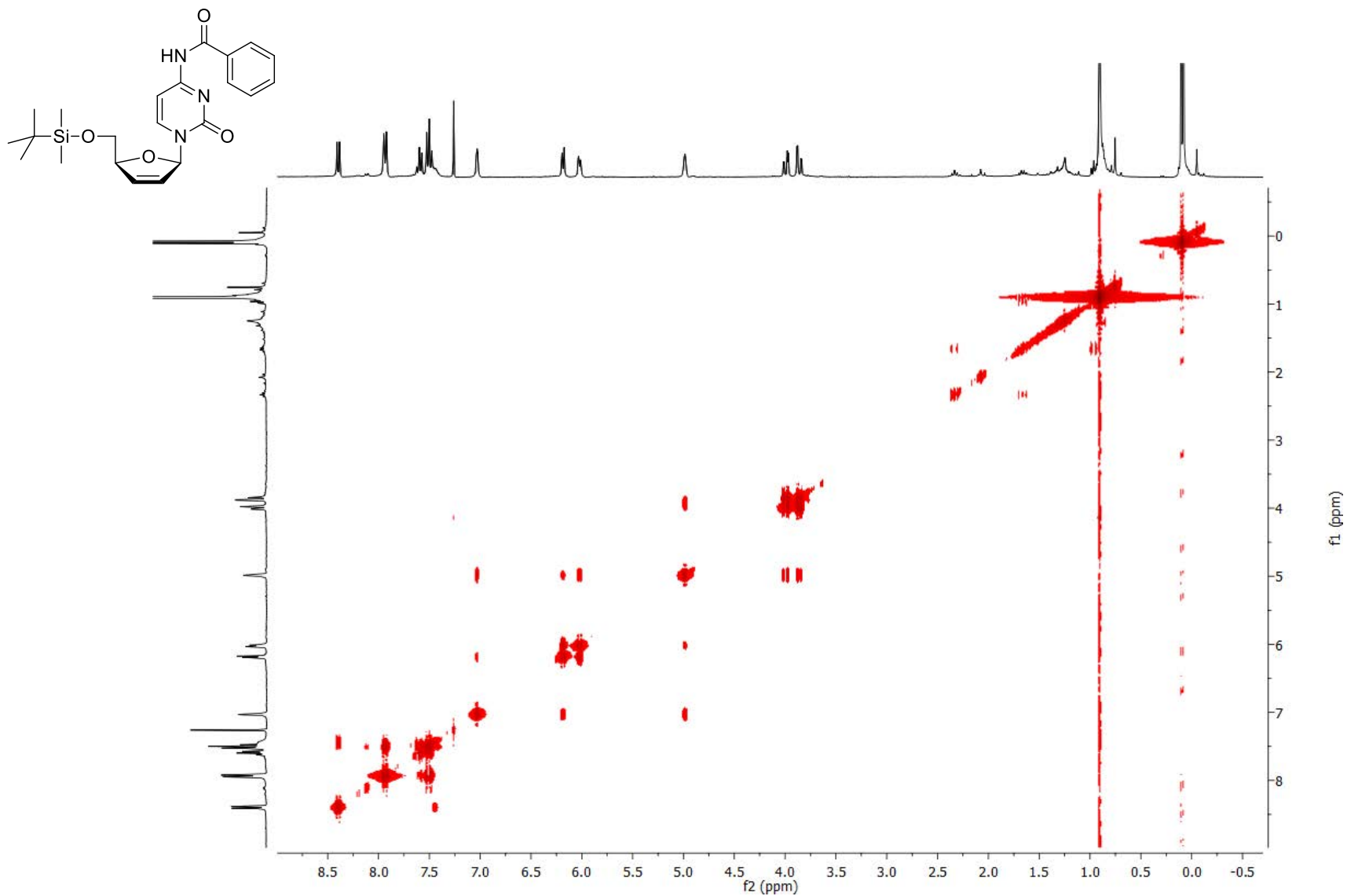
DEPT NMR (75.5 MHz, CDCl₃)



S103

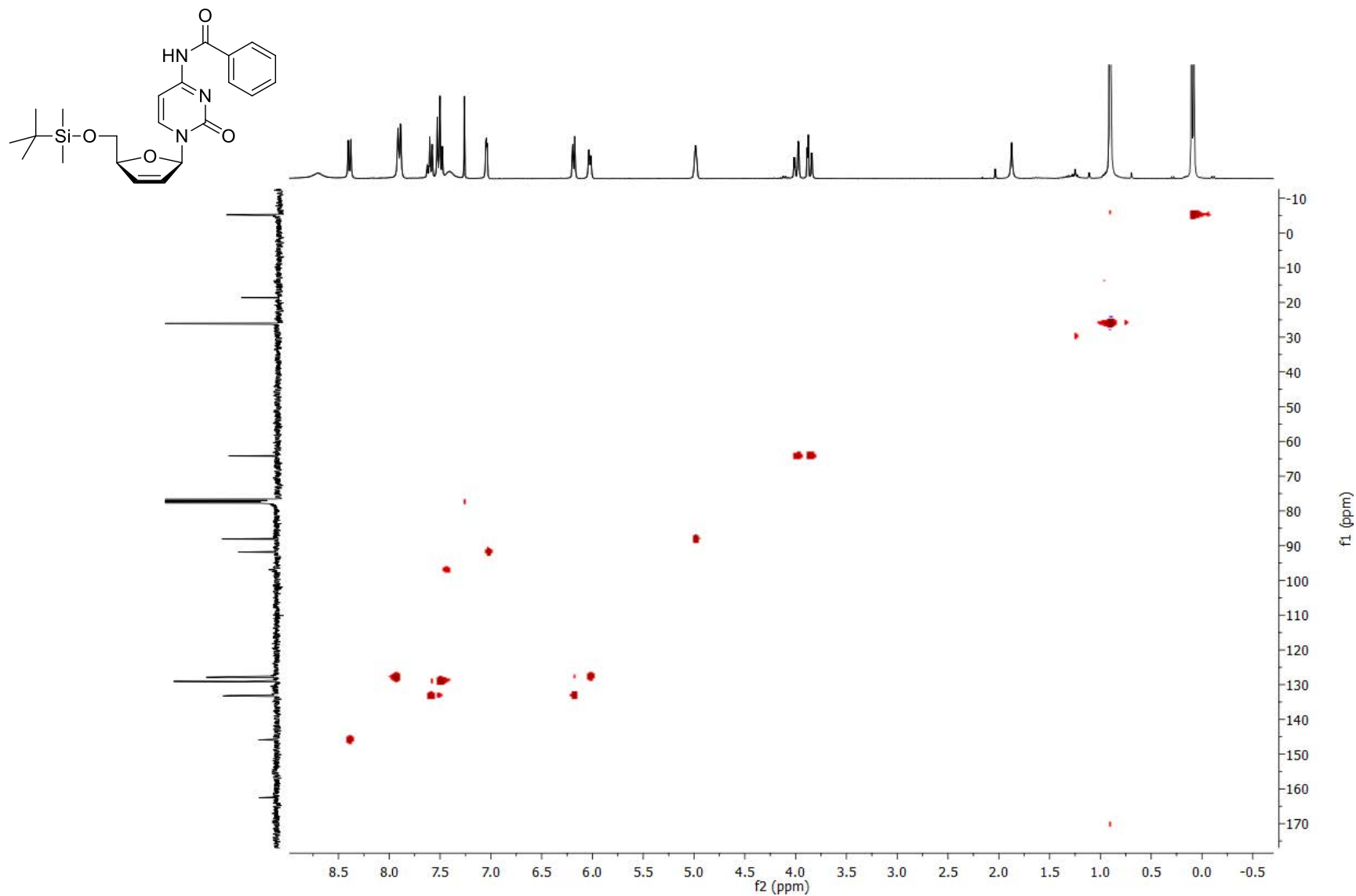
*N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy-β-D-cytidine (7d)

COSY NMR (CDCl₃)



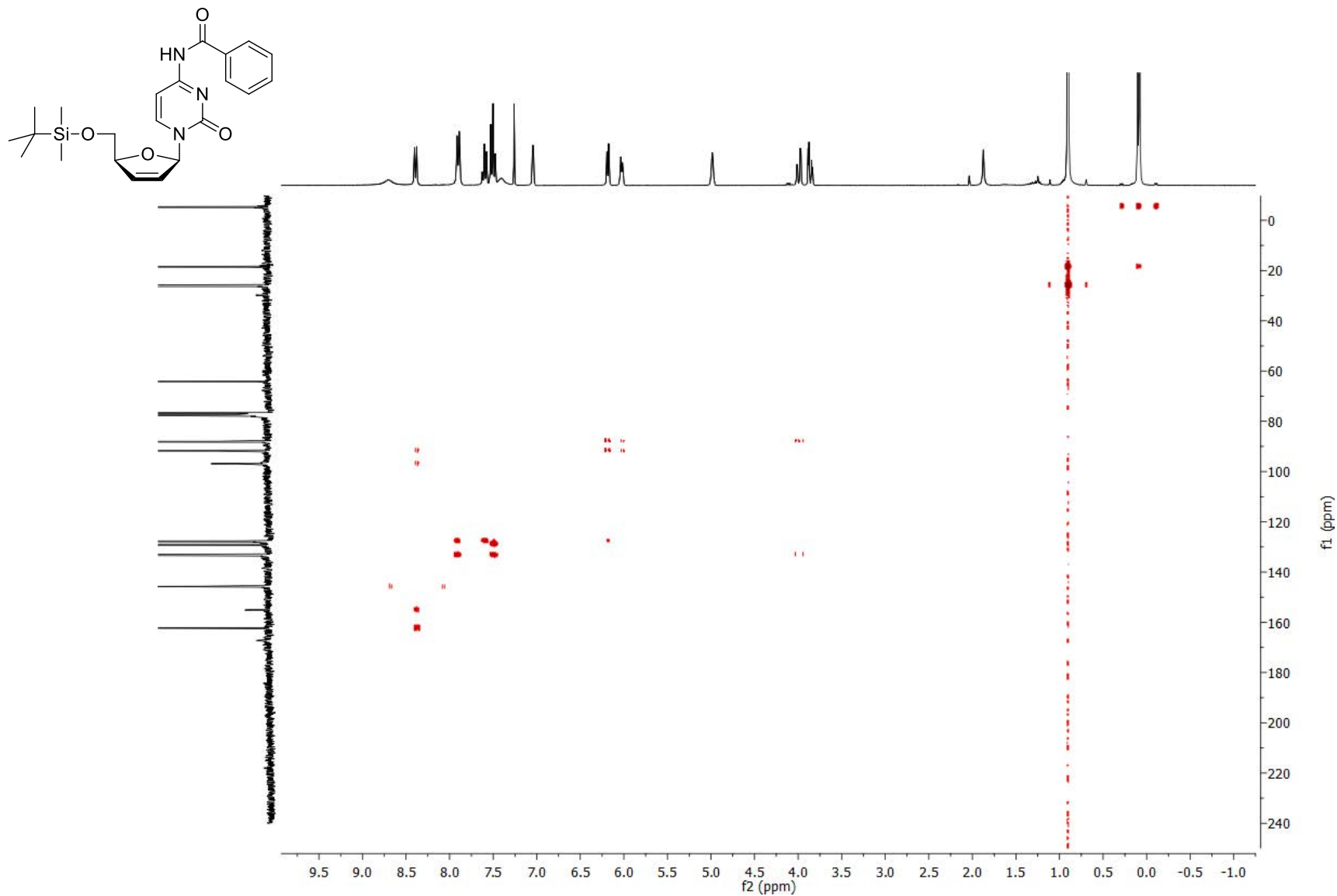
*N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy-β-D-cytidine (7d)

HSQC NMR (CDCl₃)



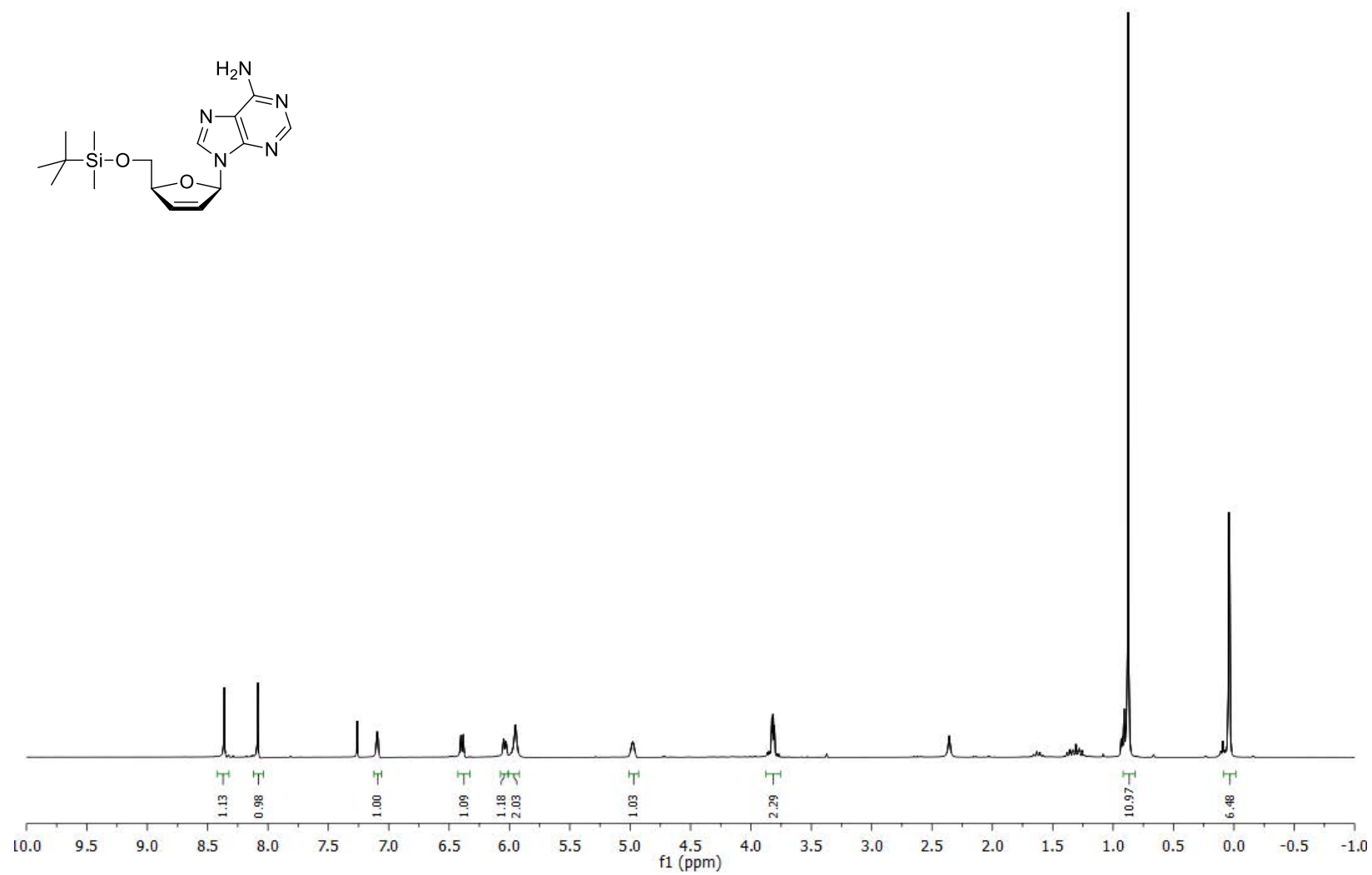
*N*⁴-Benzoyl-5'-*O*-(*tert*-butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy-β-D-cytidine (7d)

HMBC NMR (CDCl₃)



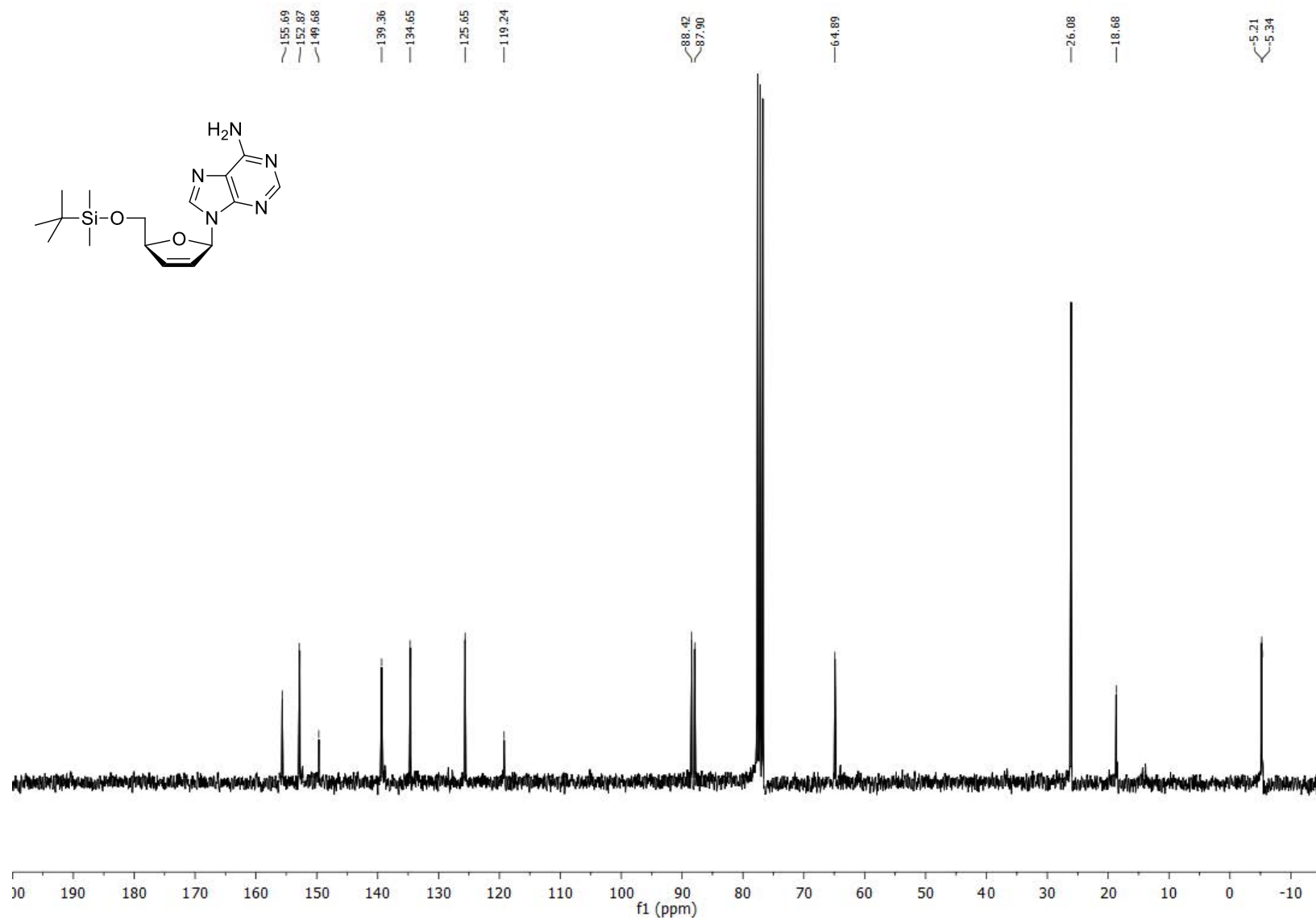
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-adenosine (7e)

^1H -NMR (300.13 MHz, CDCl_3)



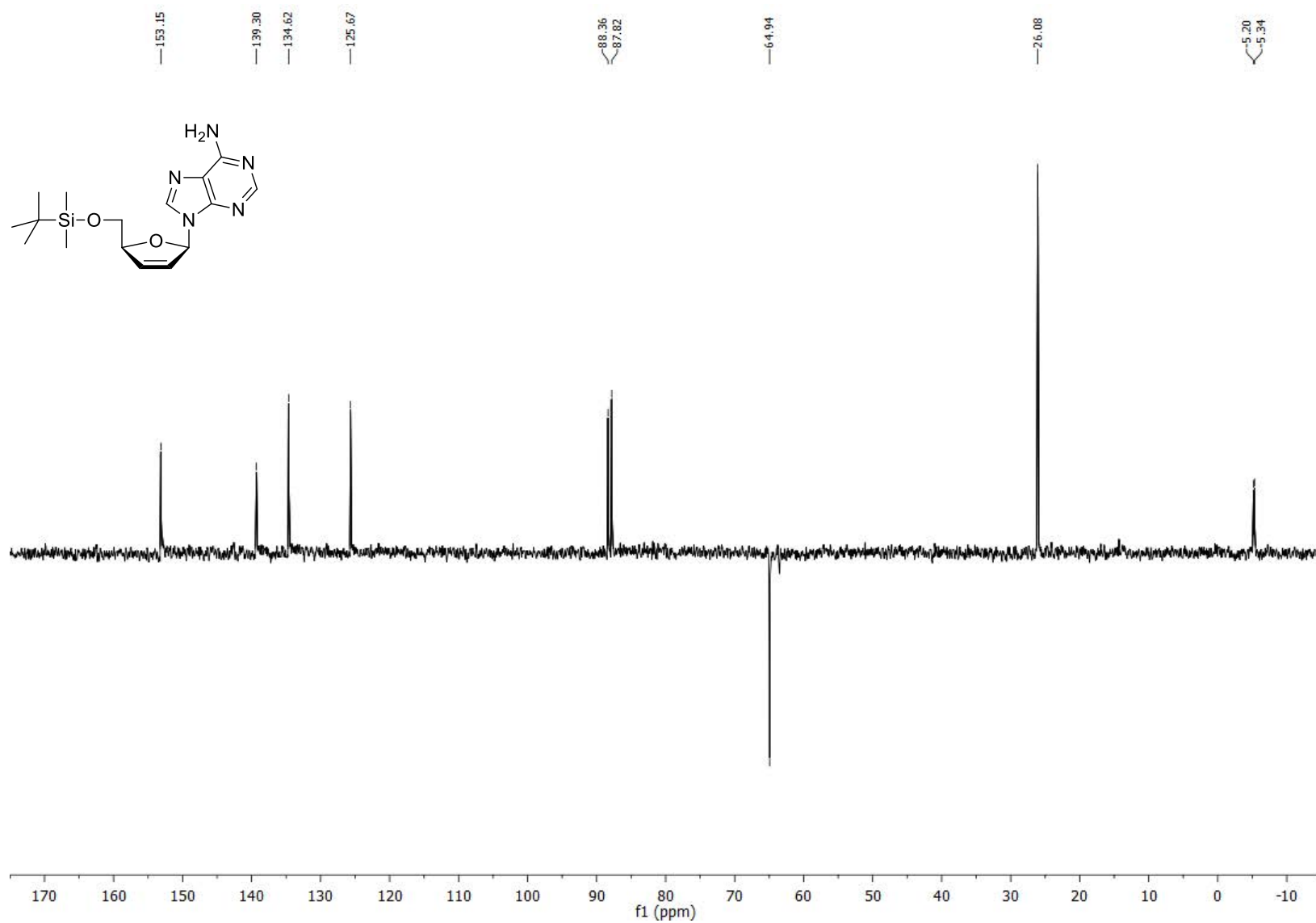
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-dideoxy-2',3'-dideoxy-β-D-adenosine (7e)

^{13}C -NMR (75.5 MHz, CDCl_3)



5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-adenosine (7e)

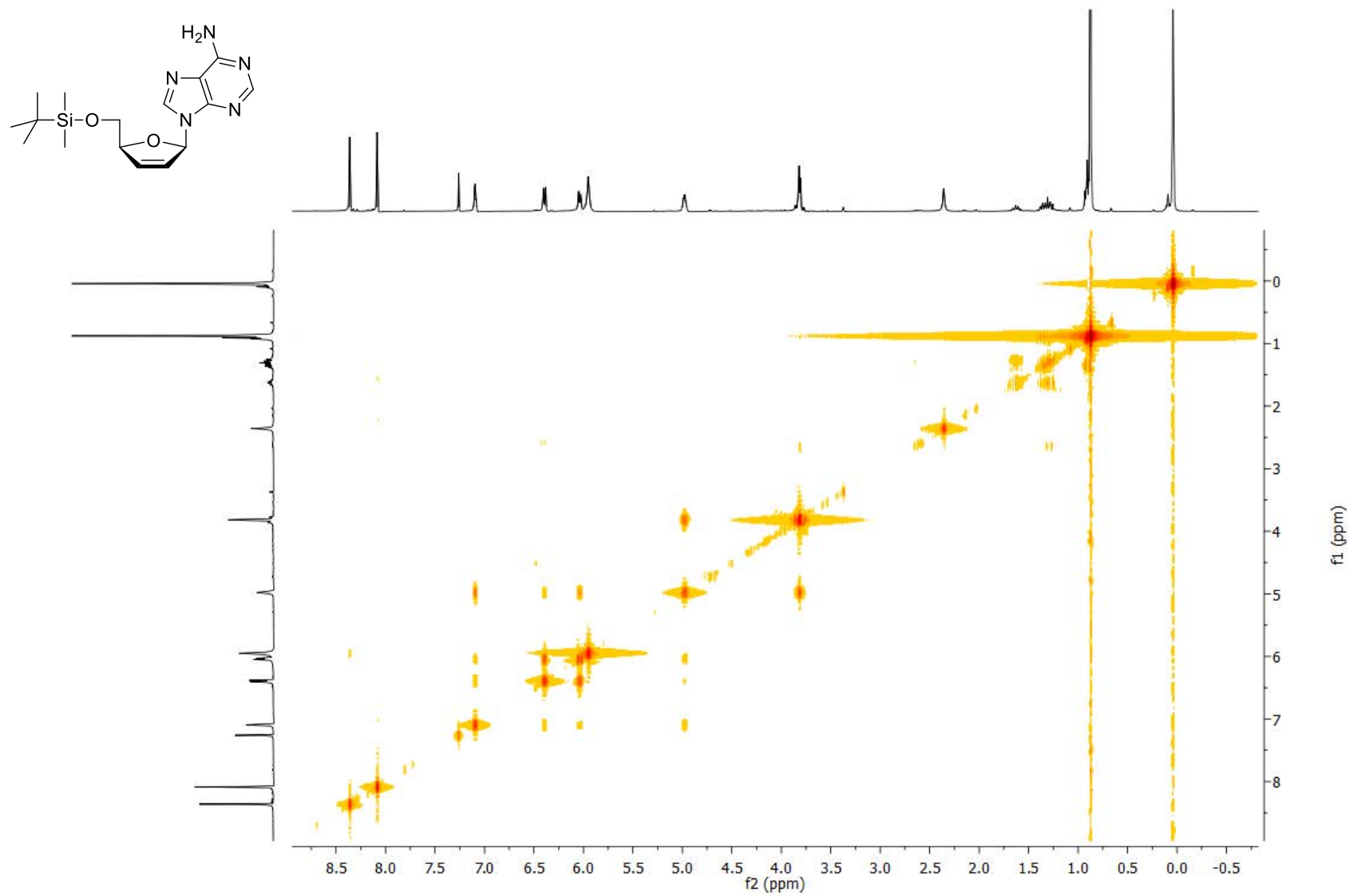
DEPT NMR (75.5 MHz, CDCl₃)



S109

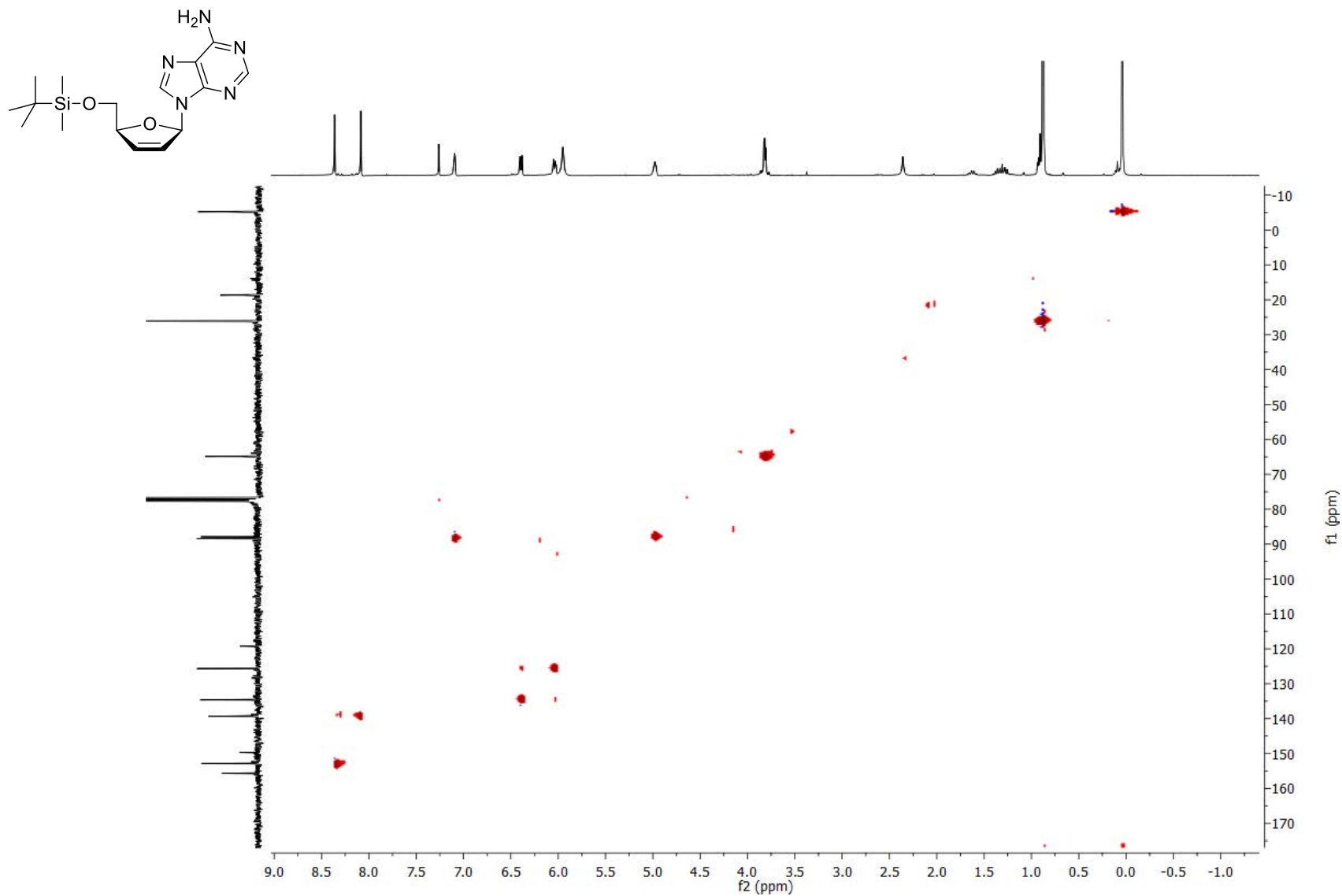
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-adenosine (7e)

COSY NMR (CDCl₃)



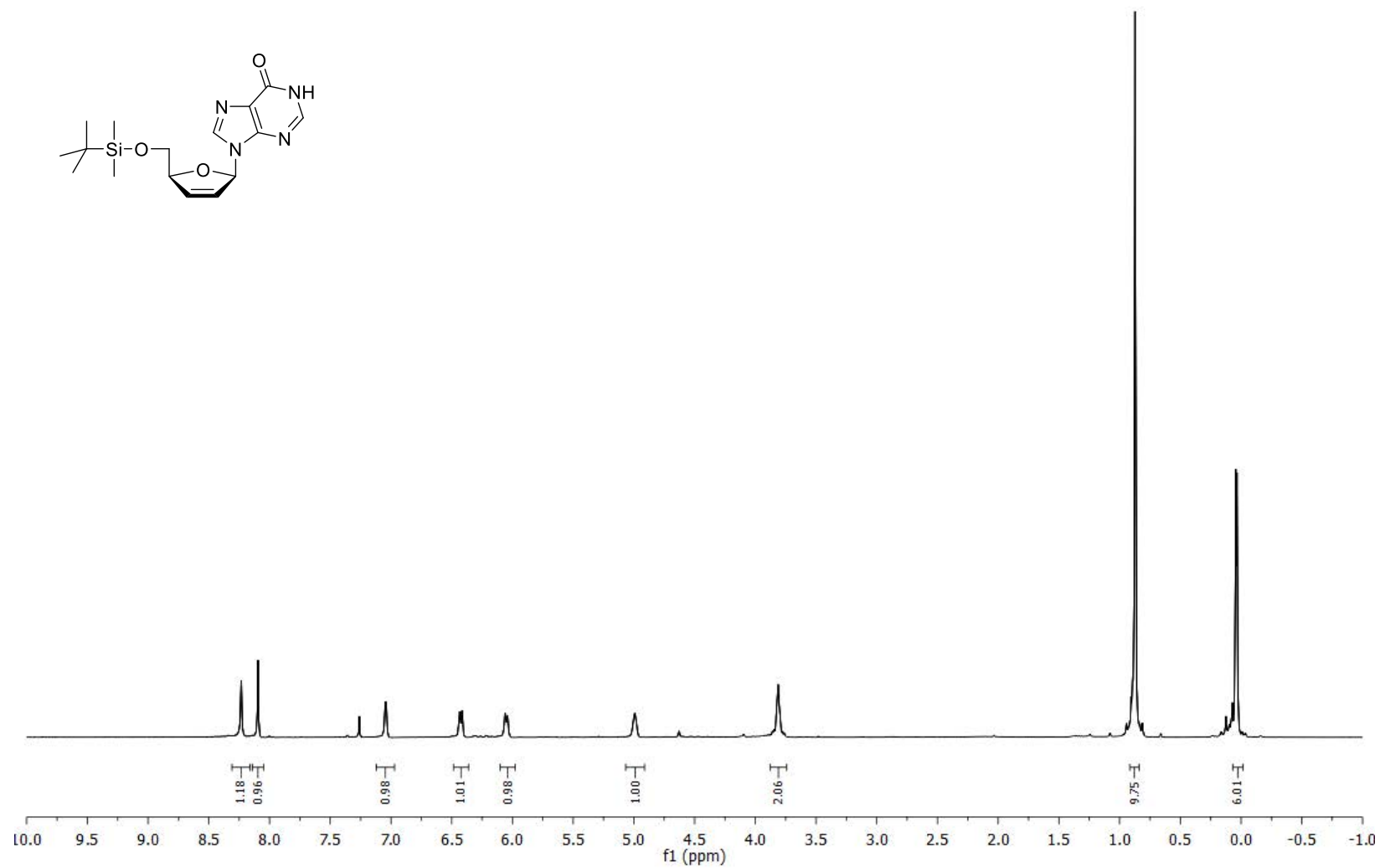
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-dideohydro-2',3'-dideoxy- β -D-adenosine (7e)

HSQC NMR (CDCl_3)



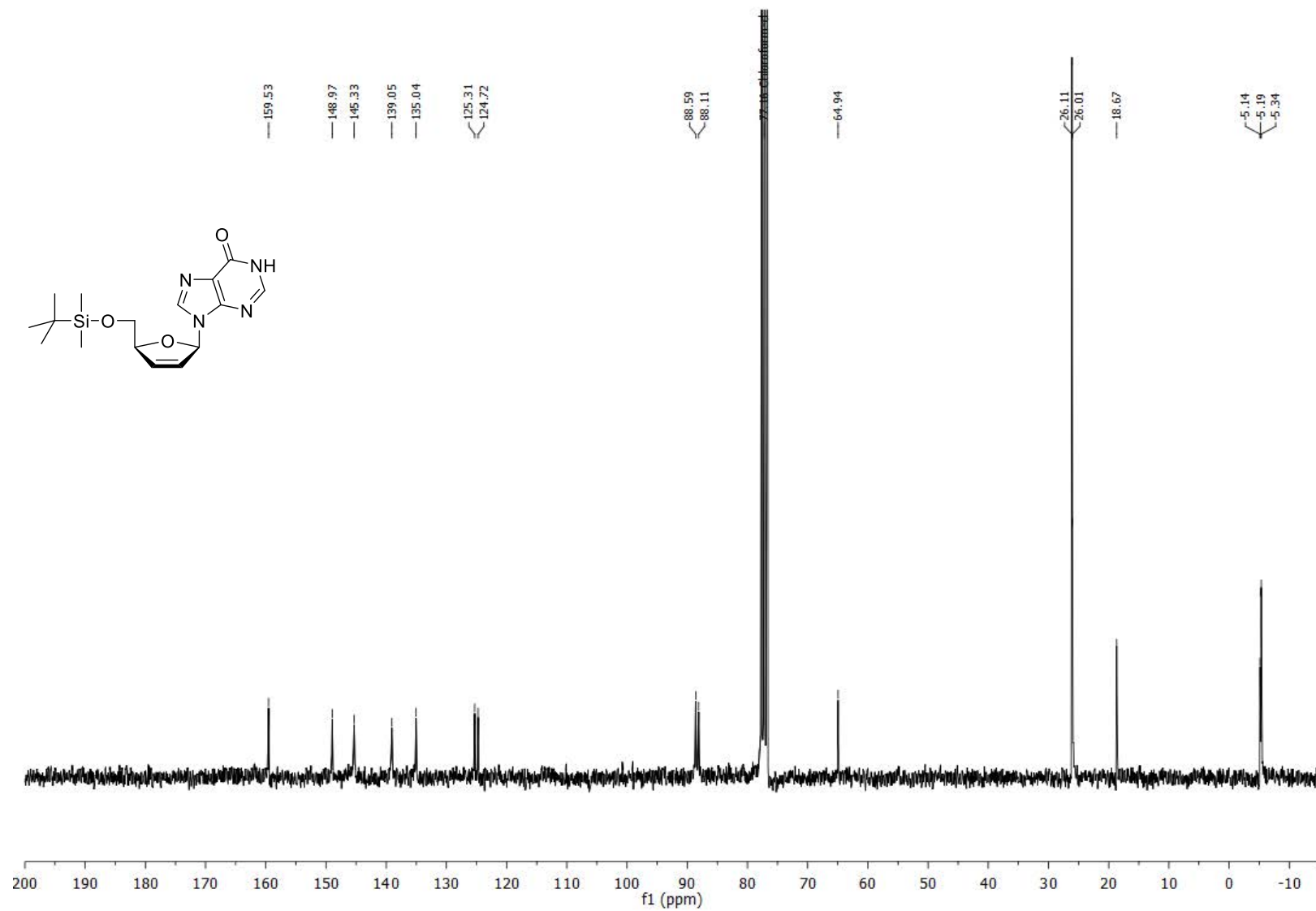
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-inosine (7f)

^1H -NMR (300.13 MHz, CDCl_3)



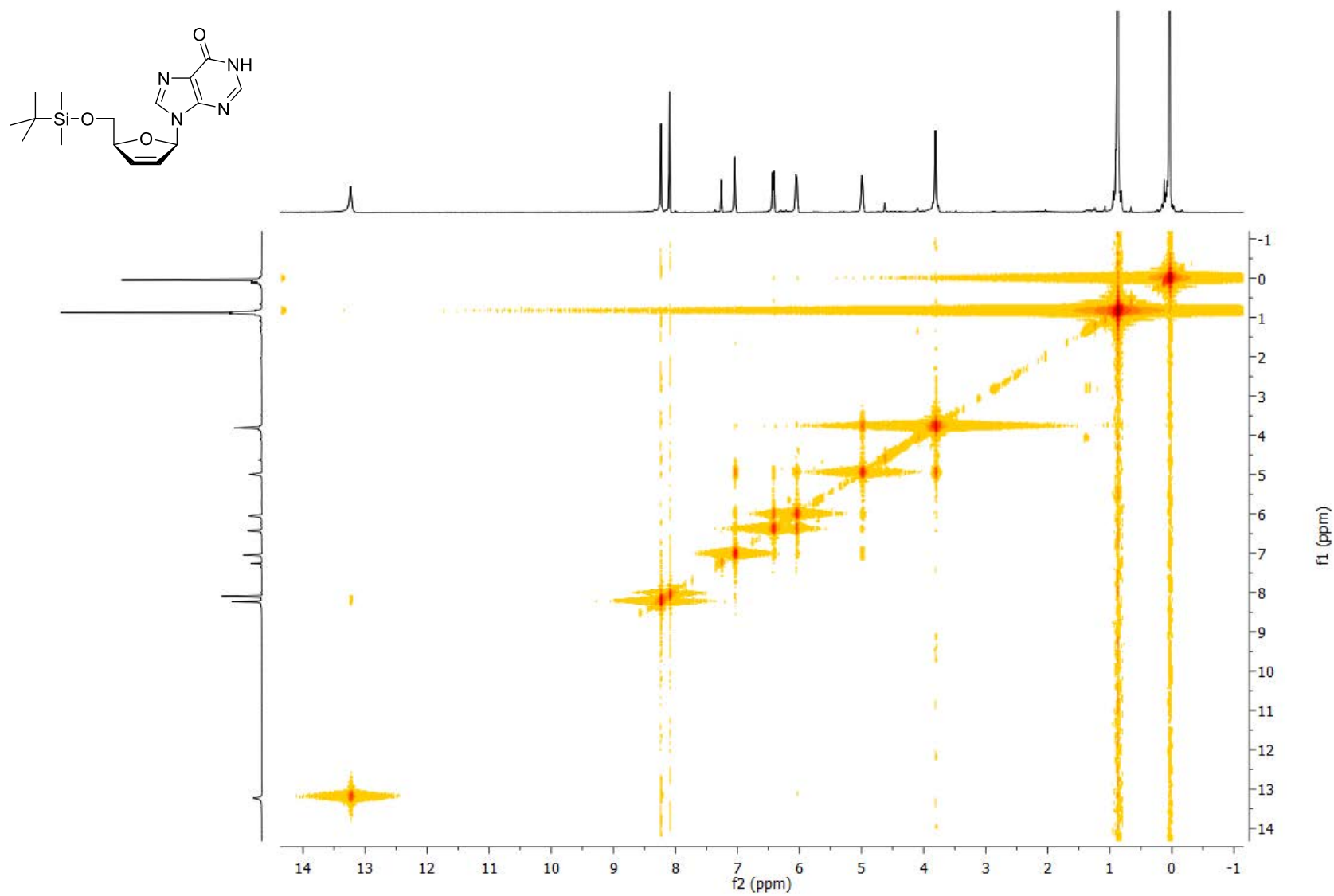
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-inosine (7f)

^{13}C -NMR (75.5 MHz, CDCl_3)



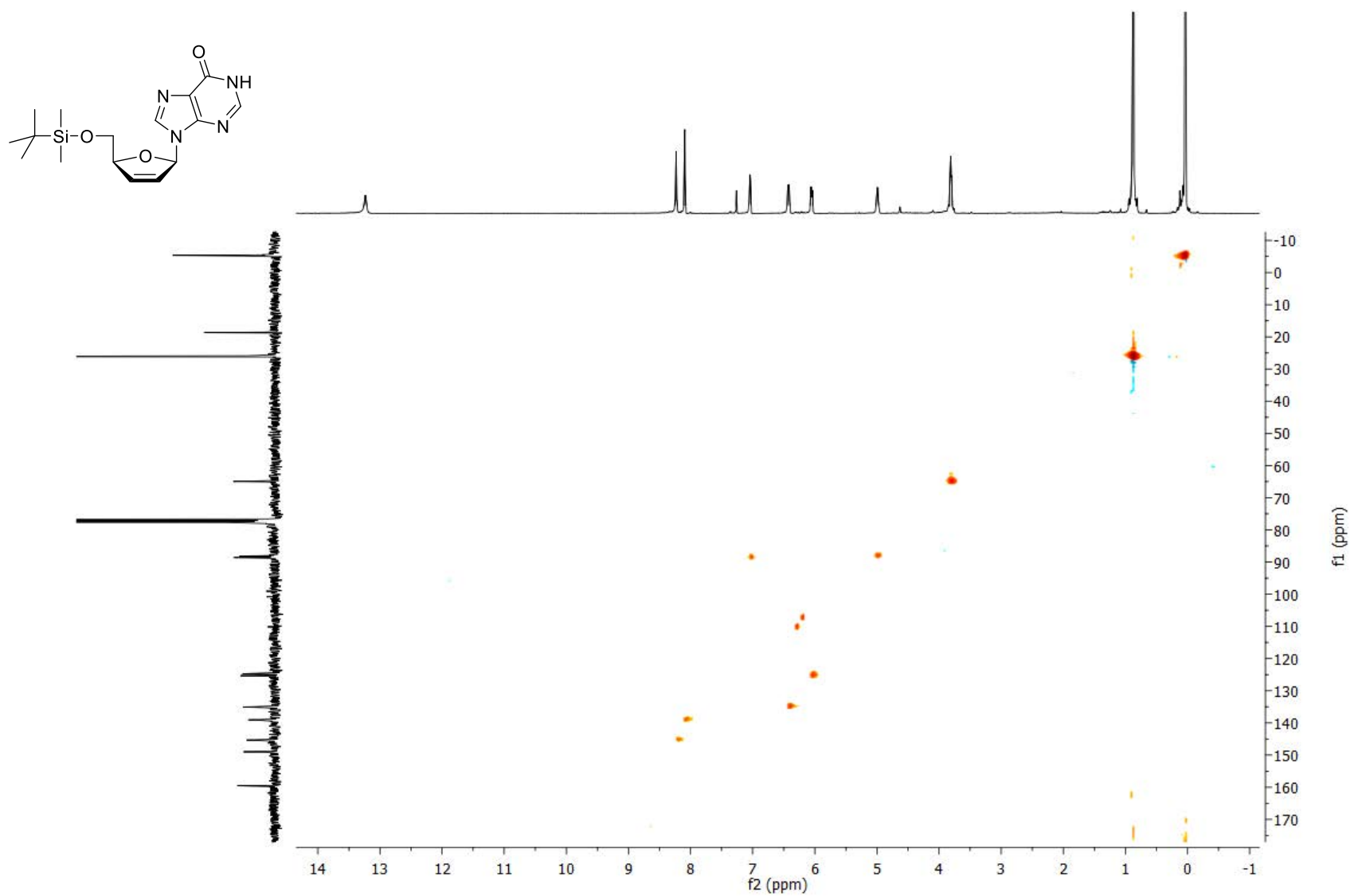
5'-*O*-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-inosine (7f)

COSY NMR (CDCl₃)



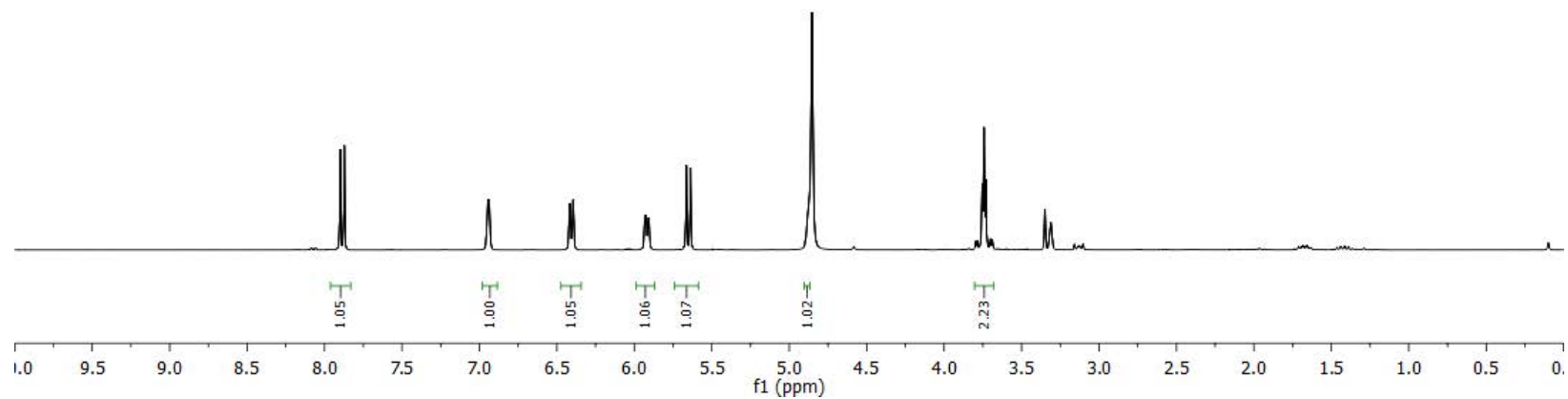
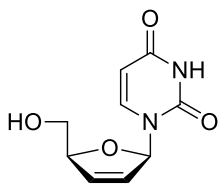
5'-O-(*tert*-Butyldimethylsilyl)-2',3'-didehydro-2',3'-dideoxy- β -D-inosine (7f)

HSQC NMR (CDCl₃)



2',3'-Didehydro-2',3'-dideoxy- β -D-uridine (8a)

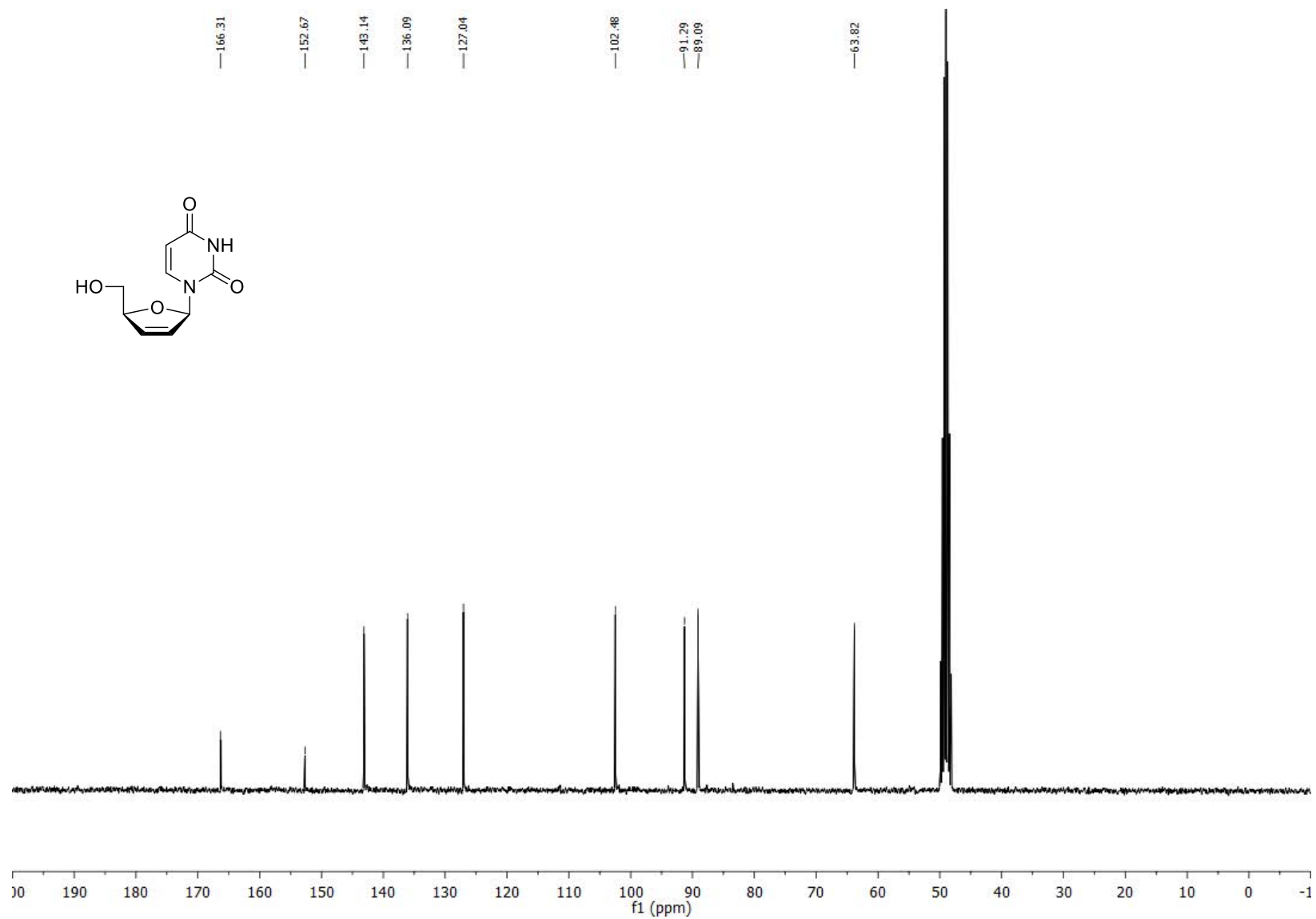
$^1\text{H-NMR}$ (300.13 MHz, $\text{MeOH-}d_4$)



S116

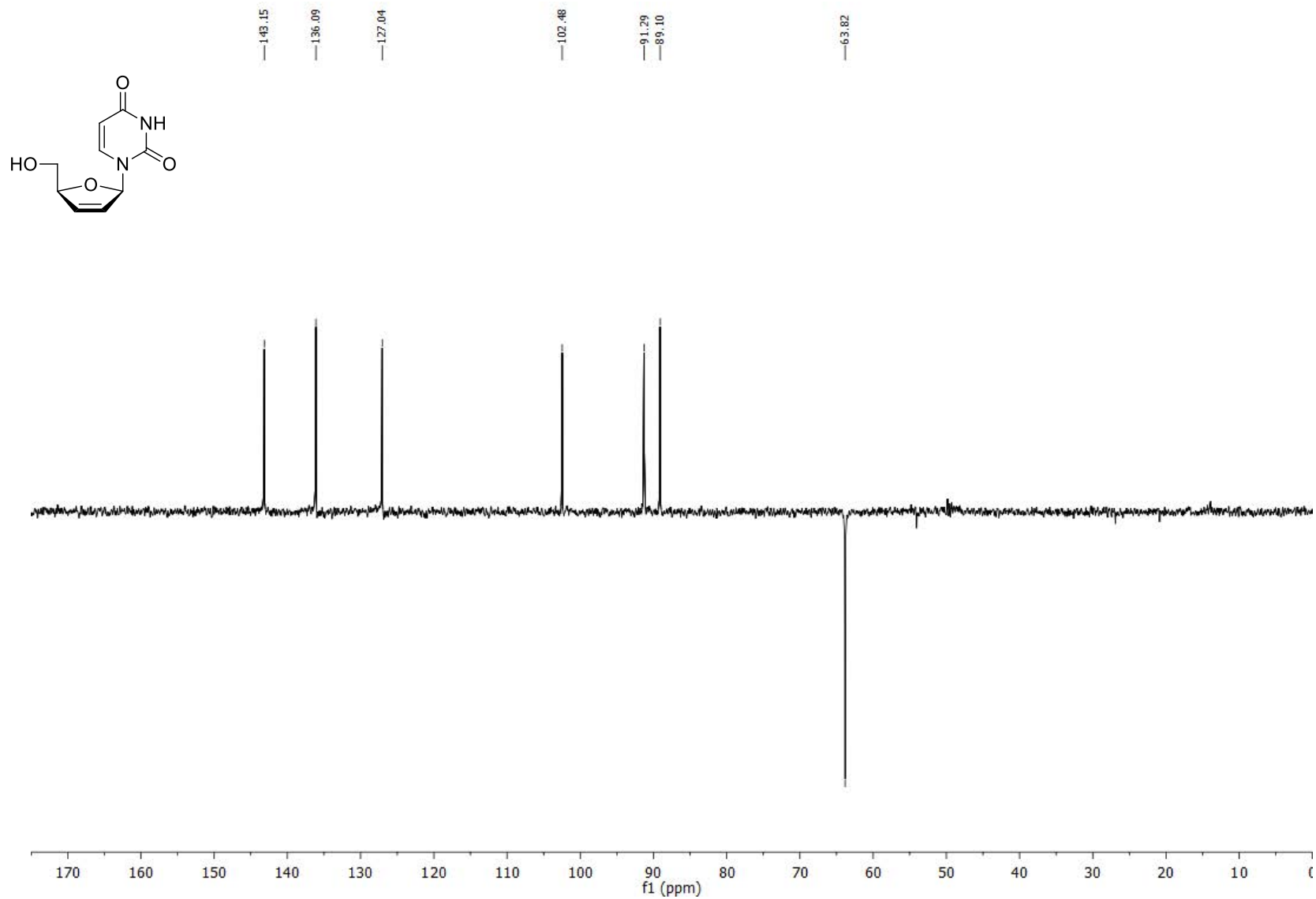
2',3'-Didehydro-2',3'-dideoxy- β -D-uridine (8a)

^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



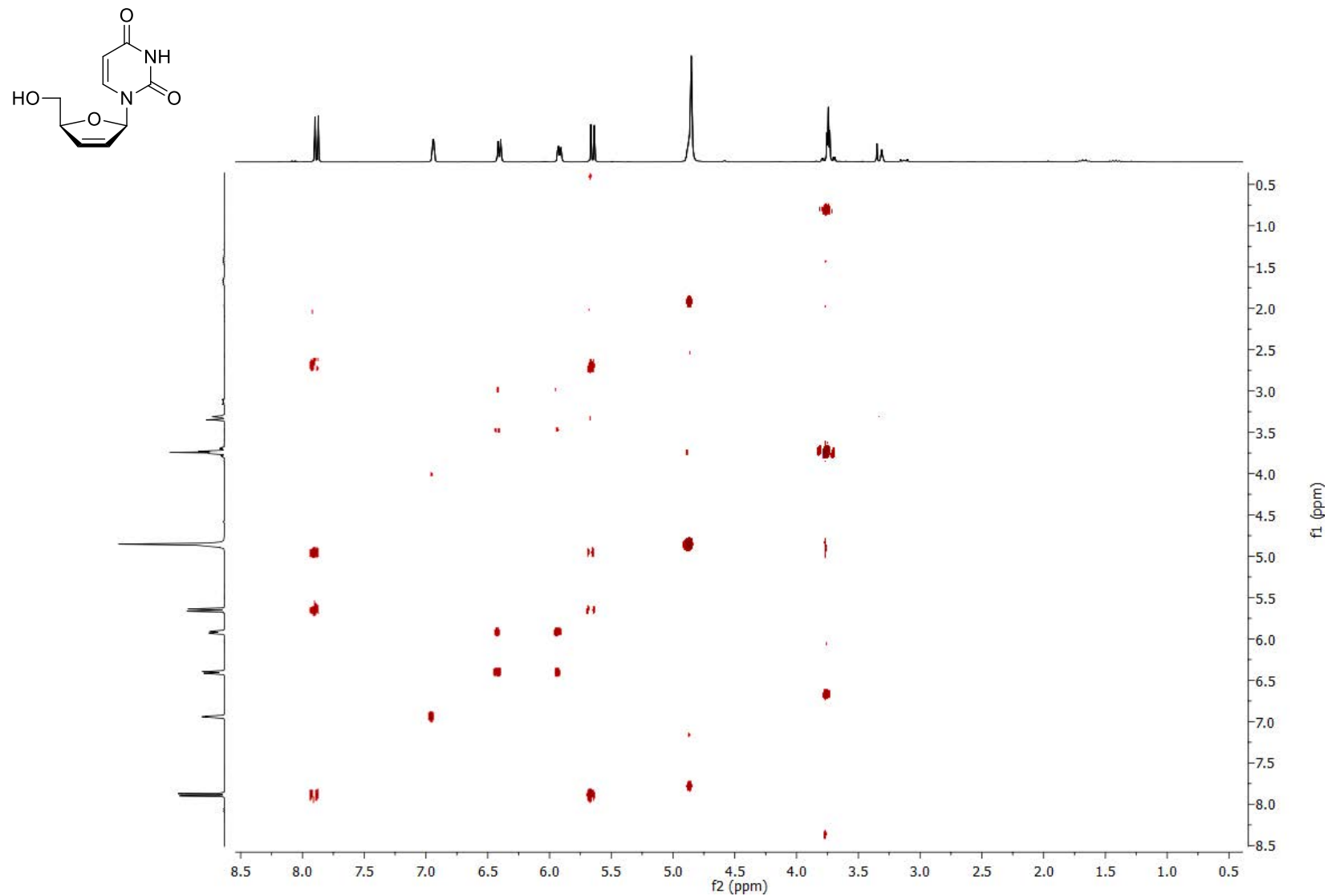
2',3'-Didehydro-2',3'-dideoxy- β -D-uridine (8a)

DEPT NMR (75.5 MHz, MeOH- d_4)



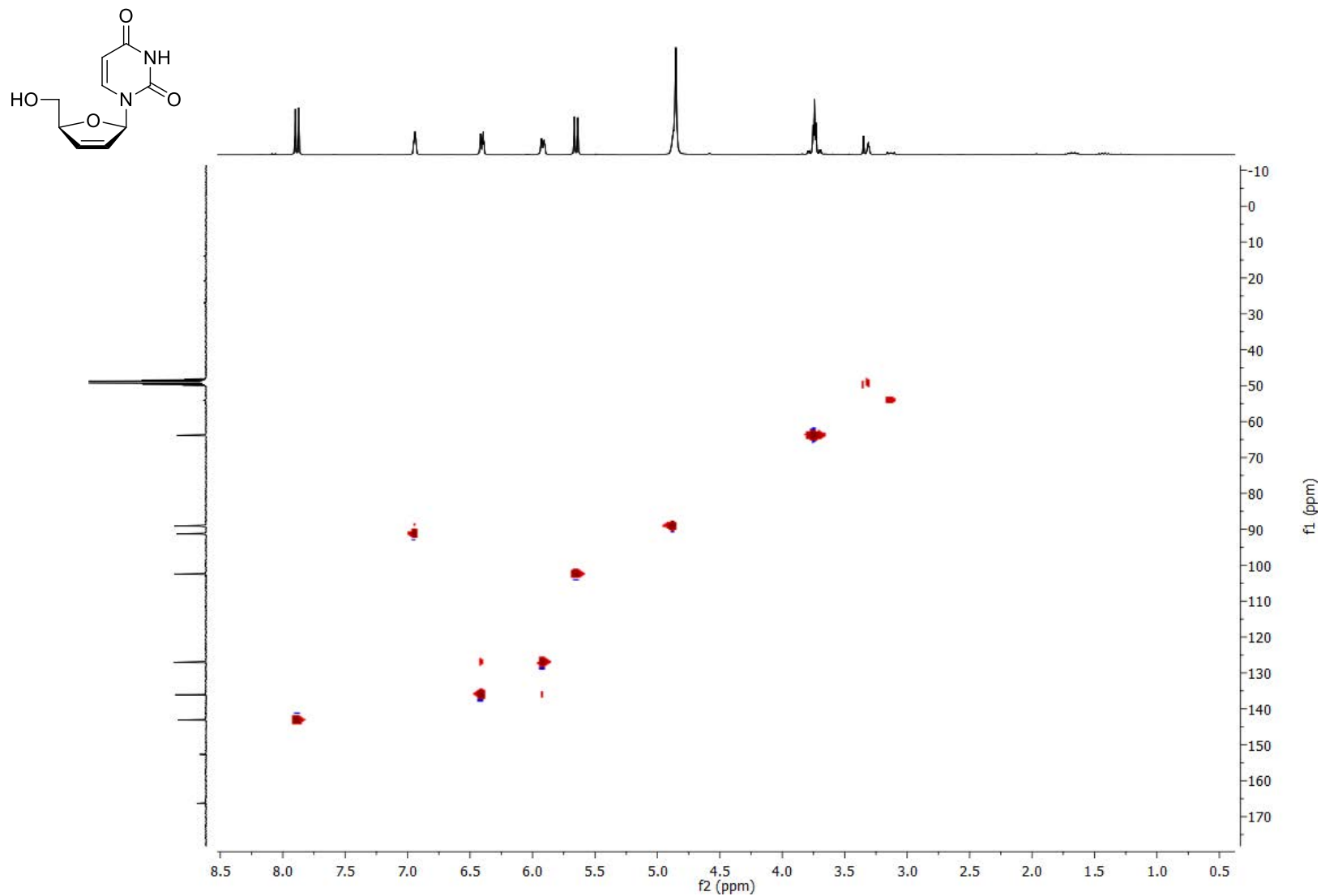
2',3'-Didehydro-2',3'-dideoxy- β -D-uridine (8a)

COSY NMR (MeOH- d_4)



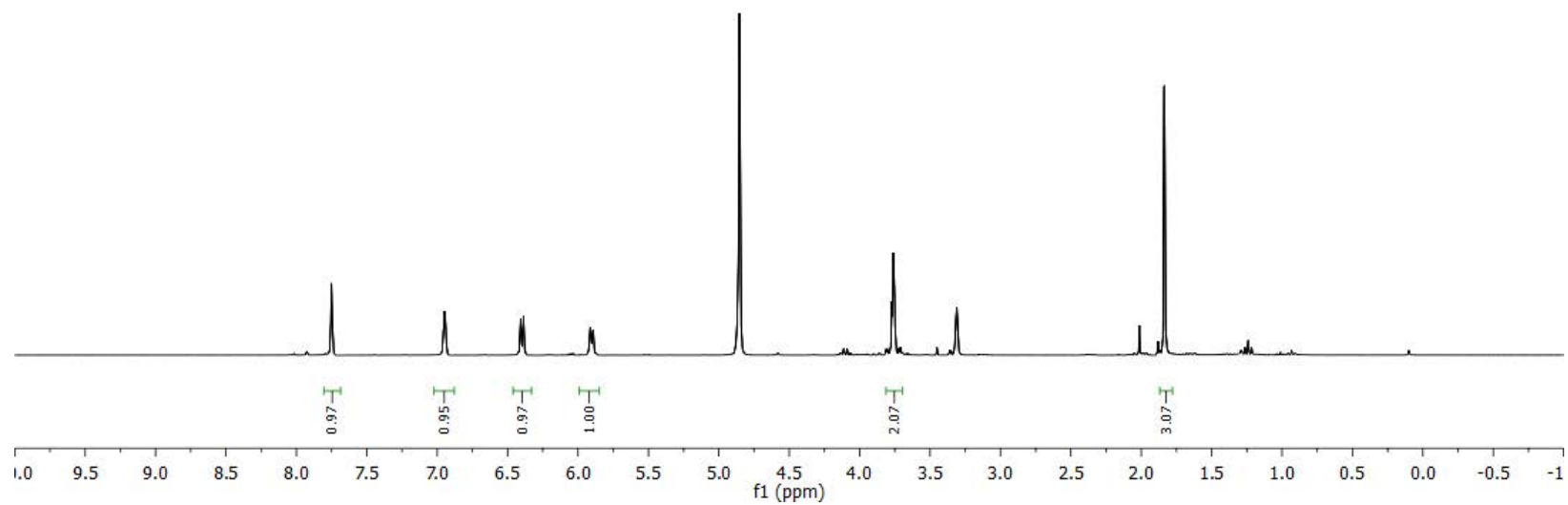
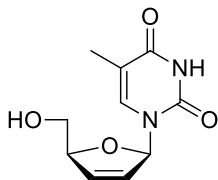
2',3'-Didehydro-2',3'-dideoxy- β -D-uridine (8a)

HSQC NMR (MeOH- d_4)



2',3'-Didehydro-3'-deoxy- β -D-5-thymidine (8b)

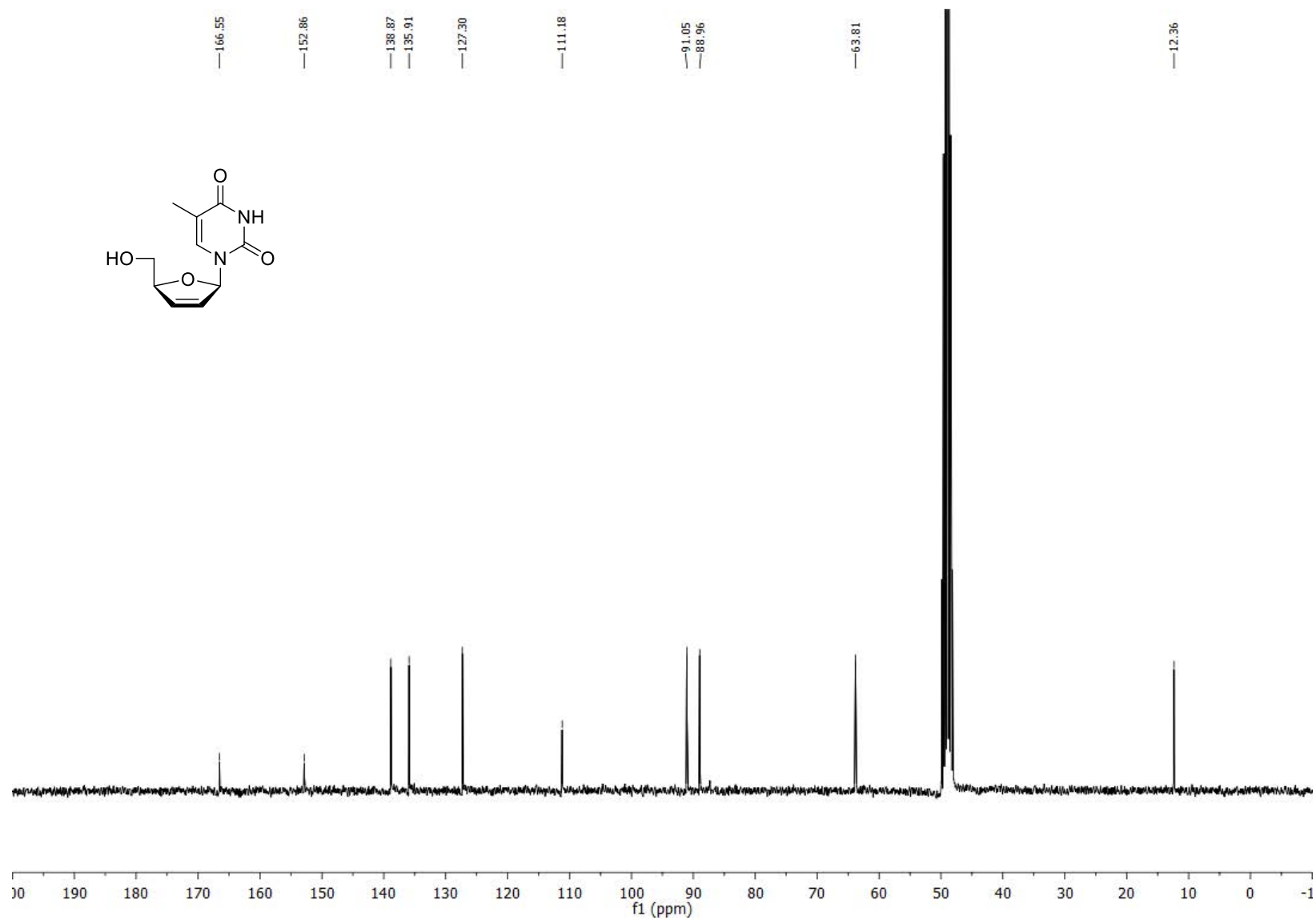
^1H -NMR (300.13 MHz, $\text{MeOH-}d_4$)



S121

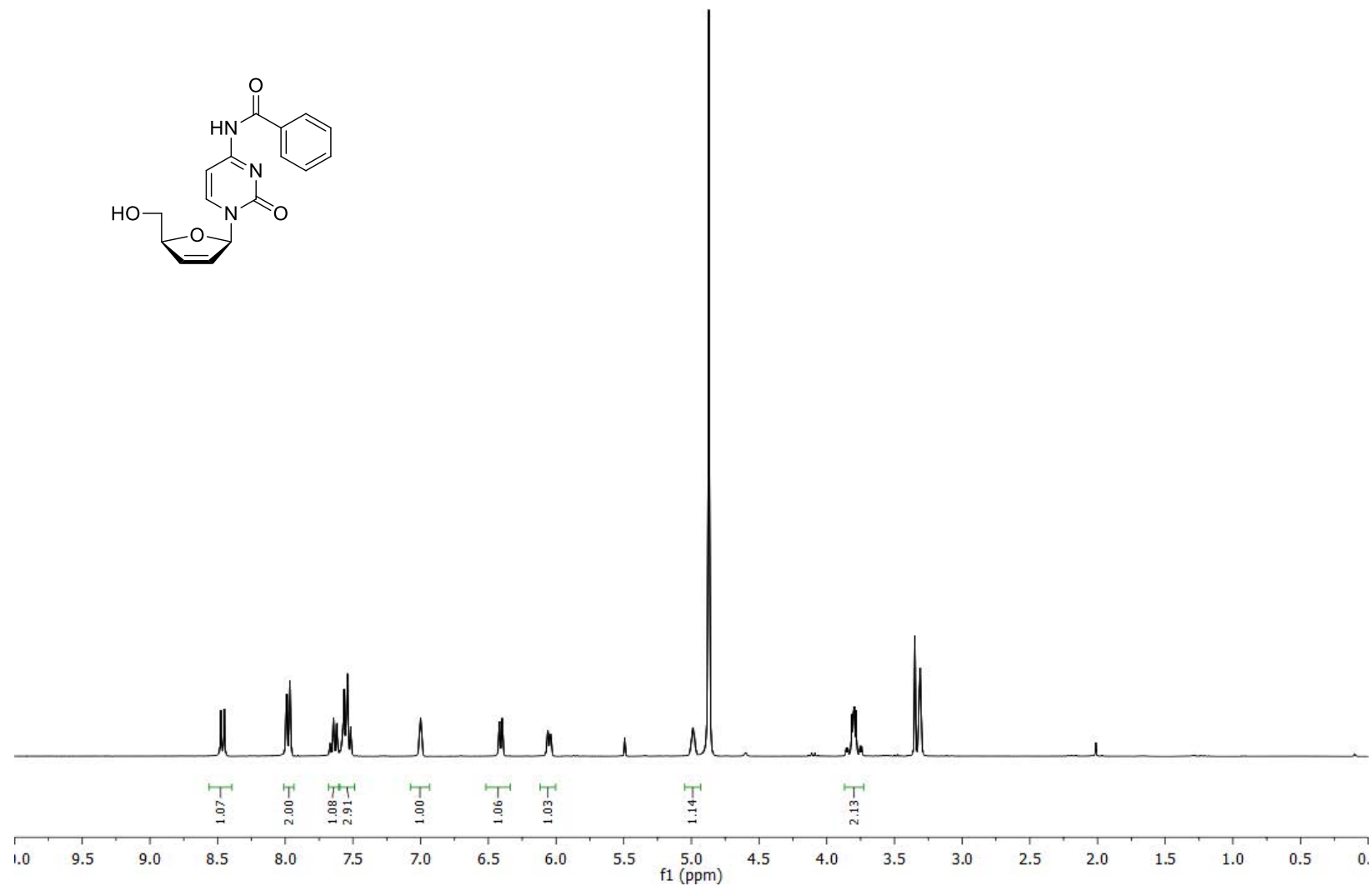
2',3'-Didehydro-3'-deoxy- β -D-5-thymidine (8b)

^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



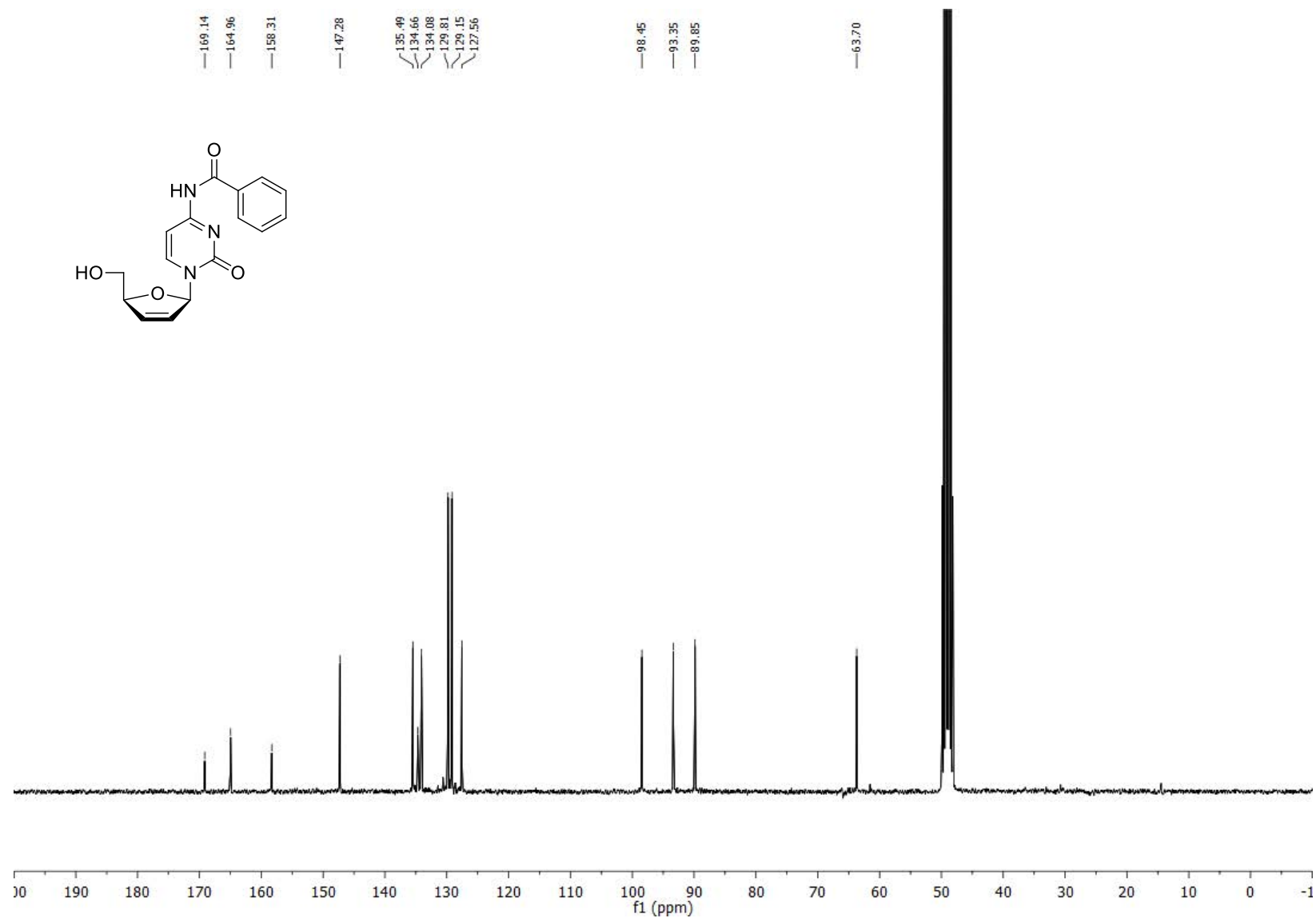
***N*⁴-Benzoyl-2',3'-didehydro-2',3'-dideoxy- β -D-cytidine (8d)**

¹H-NMR (300.13 MHz, MeOH-*d*₄)



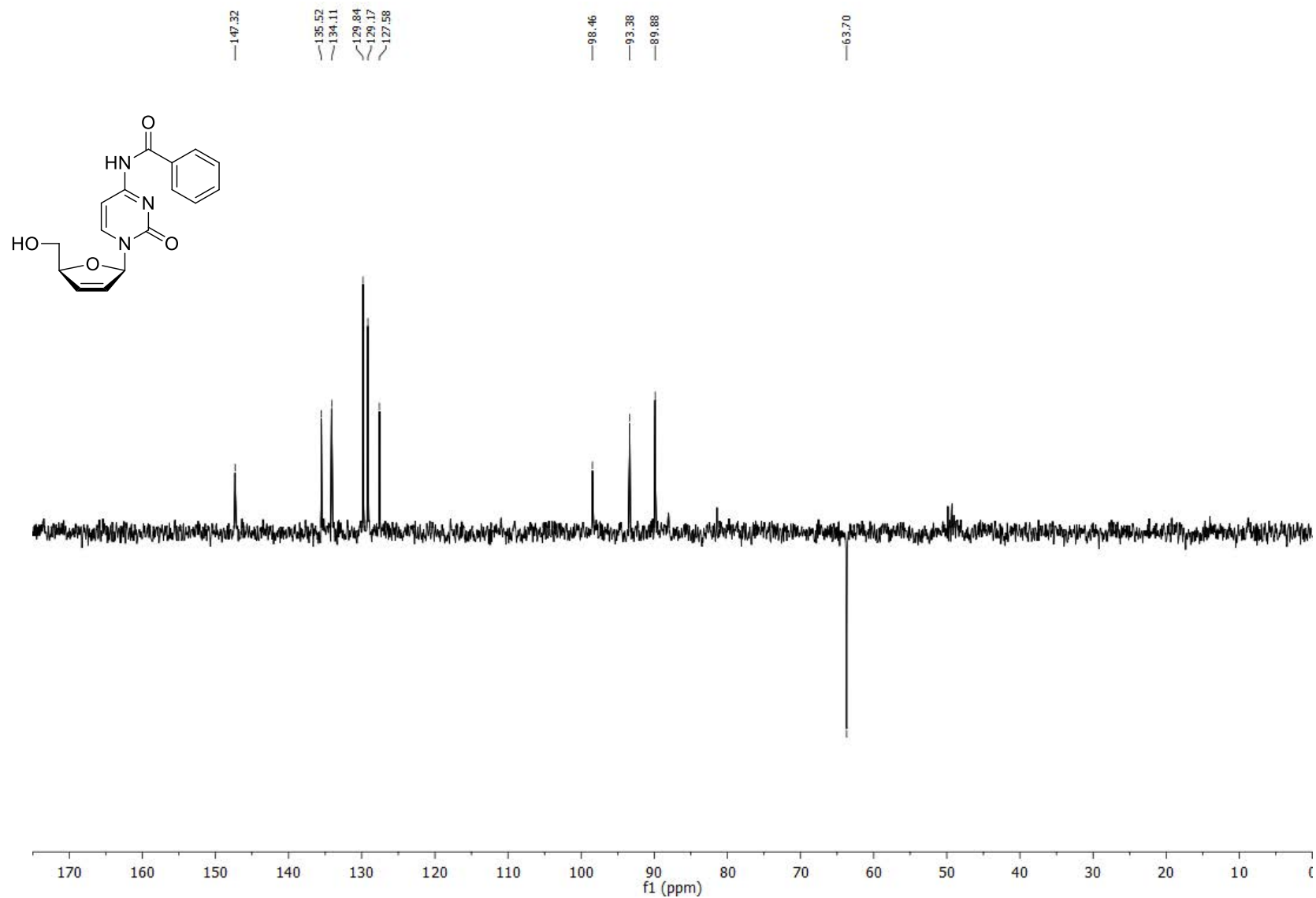
***N*⁴-Benzoyl-2',3'-didehydro-2',3'-dideoxy-β-D-cytidine (8d)**

¹³C-NMR (75.5 MHz, MeOH-*d*₄)



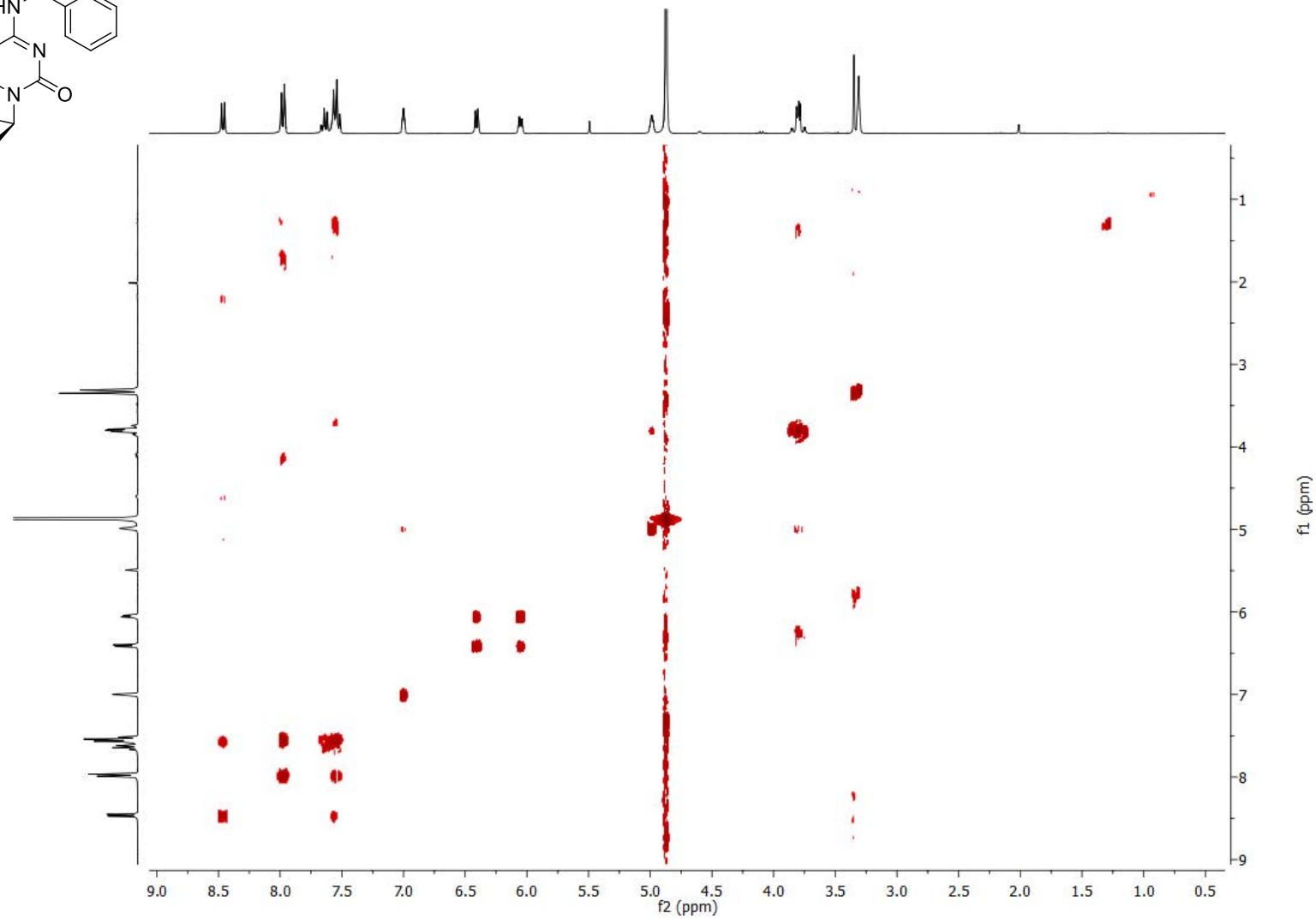
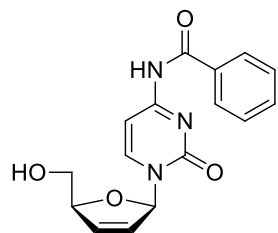
***N*⁴-Benzoyl-2',3'-didehydro-2',3'-dideoxy-β-D-cytidine (8d)**

DEPT NMR (75.5 MHz, MeOH-*d*₄)



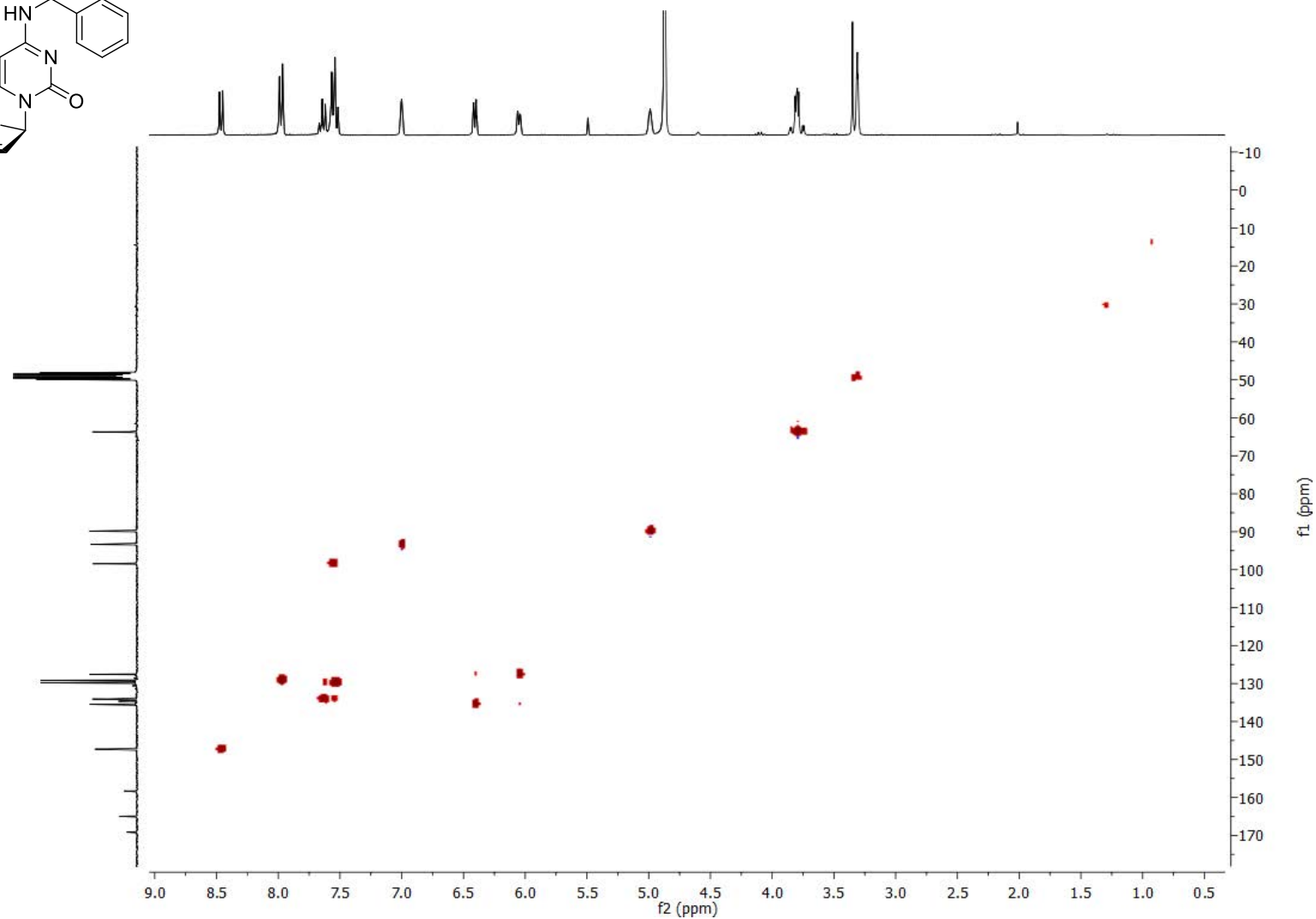
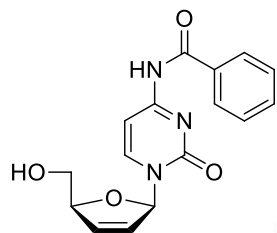
*N*⁴-Benzoyl-2',3'-didehydro-2',3'-dideoxy-β-D-cytidine (8d)

COSY NMR (MeOH-*d*₄)



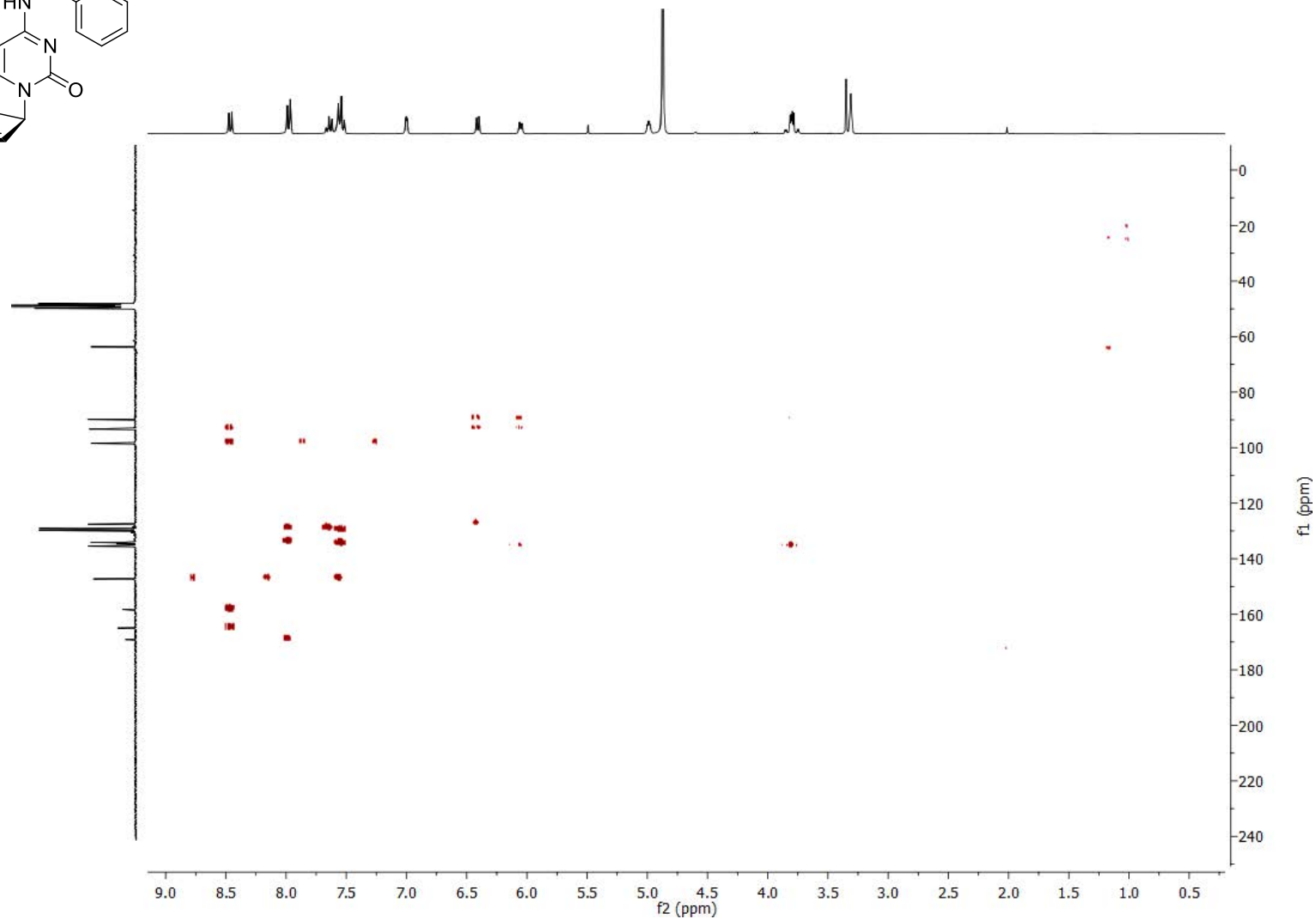
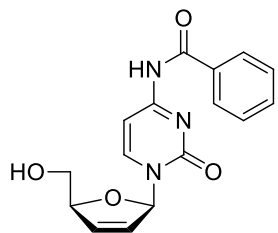
***N*⁴-Benzoyl-2',3'-didehydro-2',3'-dideoxy- β -D-cytidine (8d)**

HSQC NMR (MeOH-*d*₄)



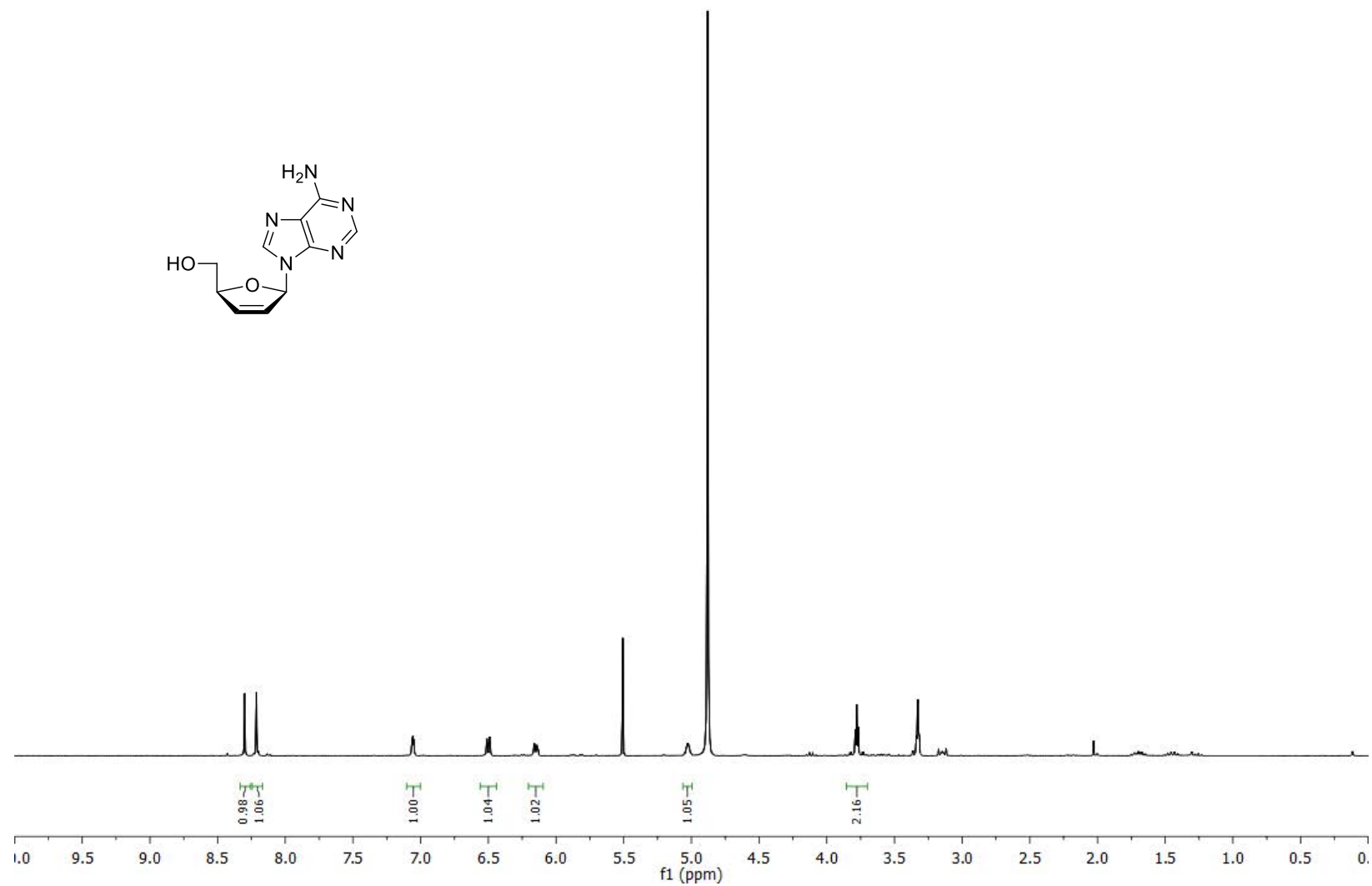
***N*⁴-Benzoyl-2',3'-didehydro-2',3'-dideoxy-β-D-cytidine (8d)**

HMBC NMR (MeOH-*d*₄)



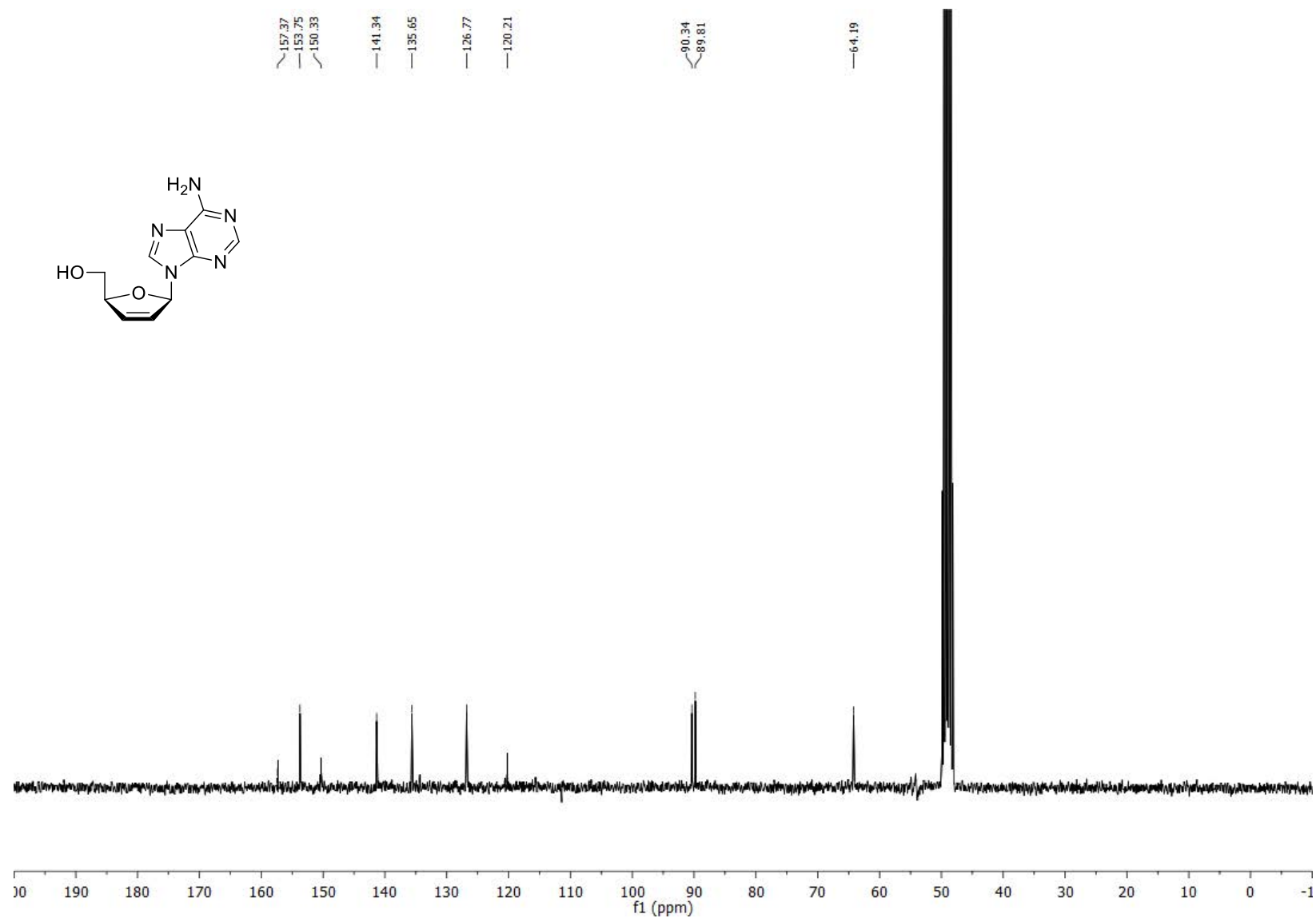
2',3'-Didehydro-2',3'-dideoxy- β -D-adenosine (8e)

$^1\text{H-NMR}$ (300.13 MHz, $\text{MeOH-}d_4$)



2',3'-Didehydro-2',3'-dideoxy- β -D-adenosine (8e)

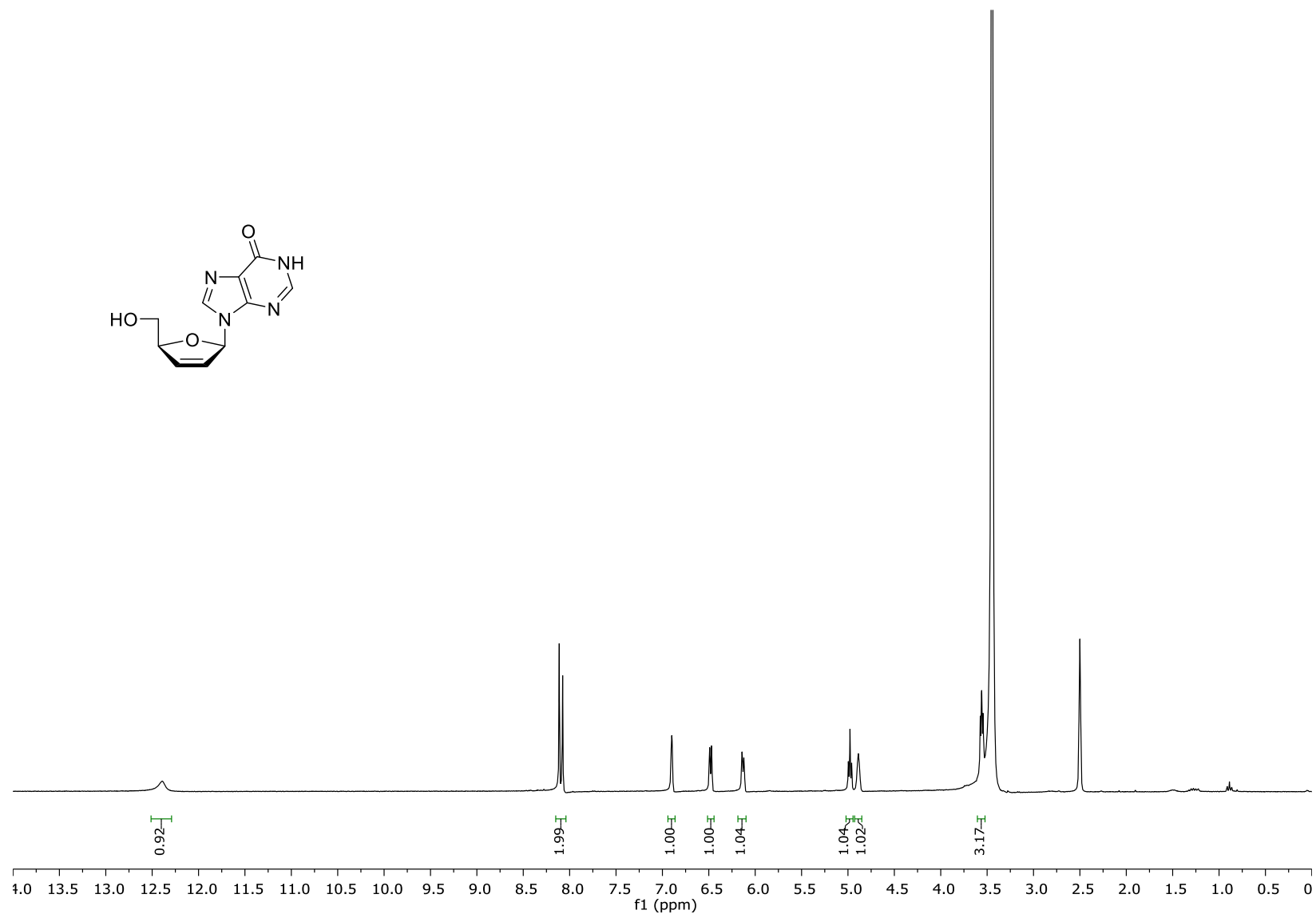
^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



S130

2',3'-Didehydro-2',3'-dideoxy- β -D-inosine (8f)

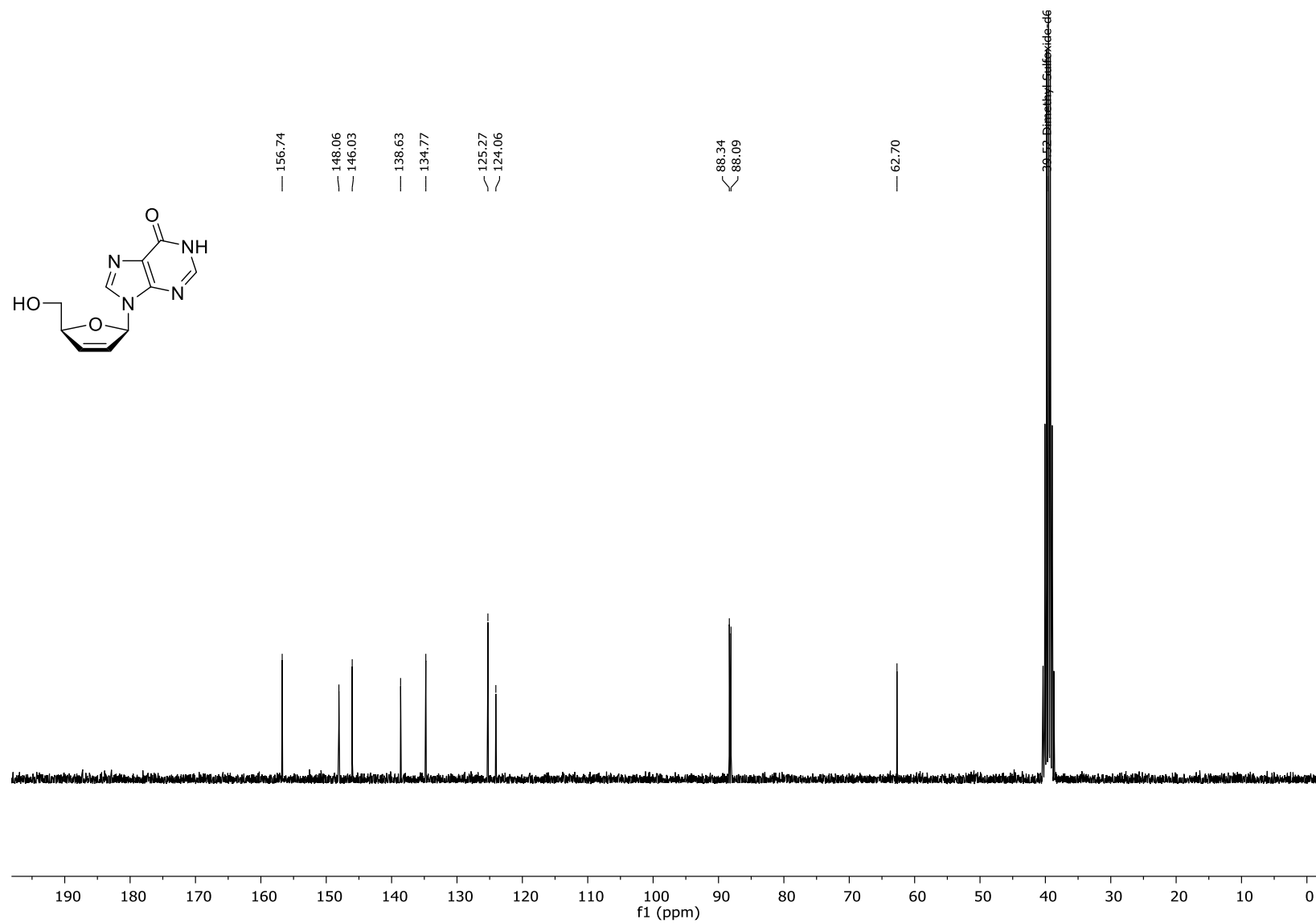
$^1\text{H-NMR}$ (300.13 MHz, $\text{DMSO-}d_6$)



S131

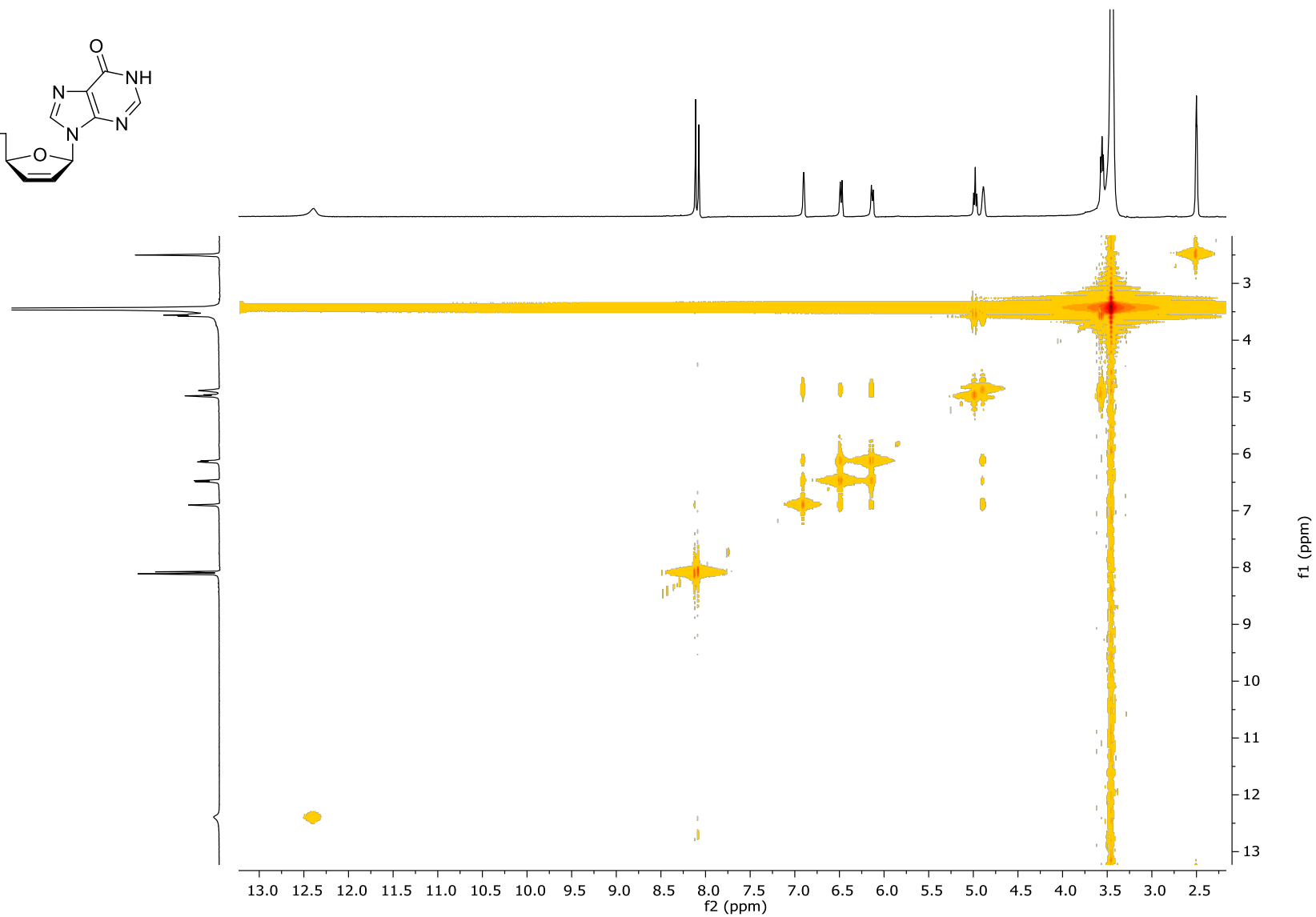
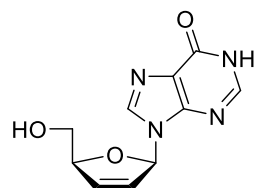
2',3'-Didehydro-2',3'-dideoxy- β -D-inosine (8f)

^{13}C -NMR (75.5 MHz, $\text{DMSO}-d_6$)



2',3'-Didehydro-2',3'-dideoxy- β -D-inosine (8f)

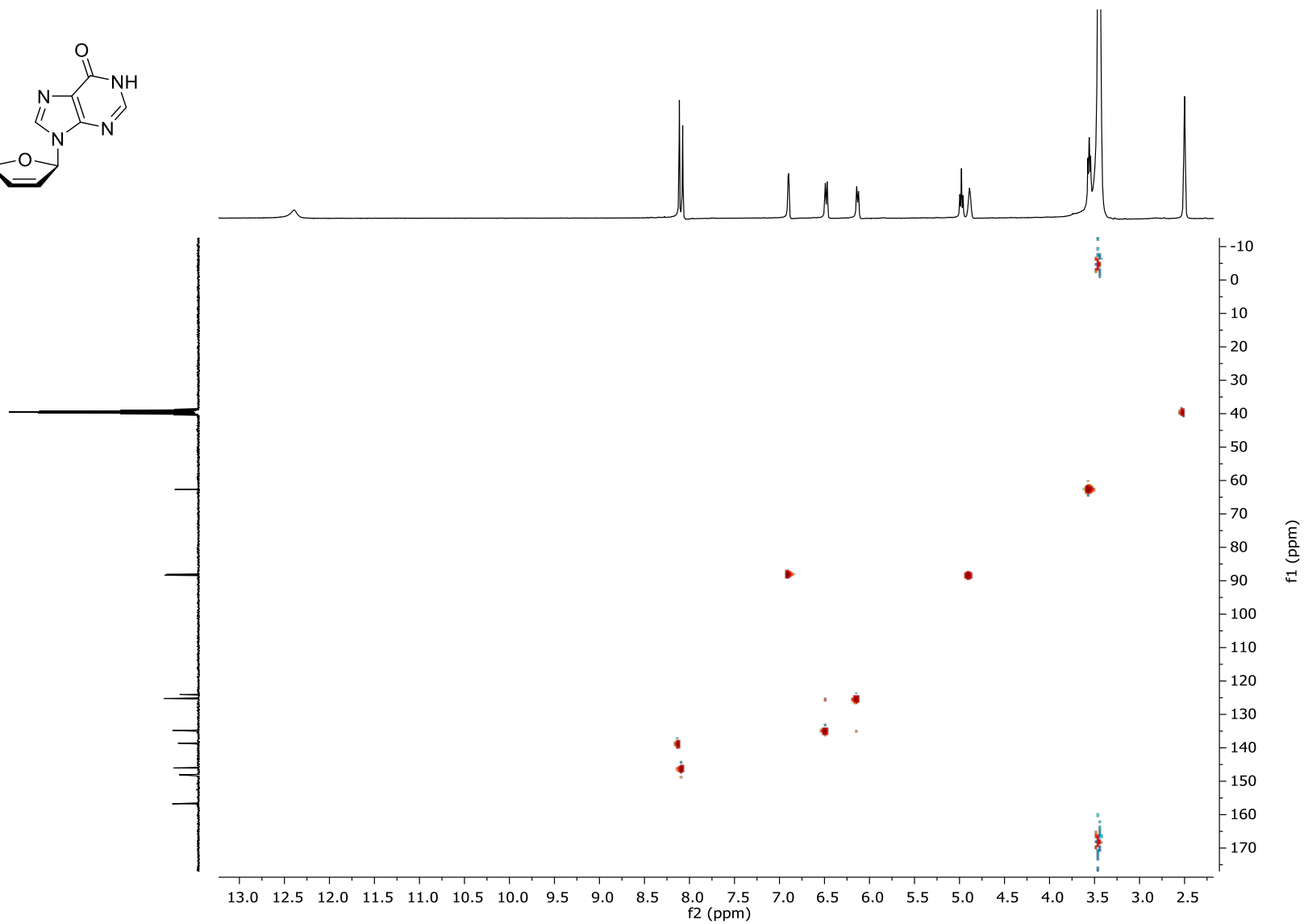
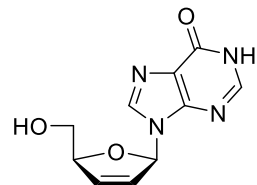
COSY NMR (DMSO- d_6)



S133

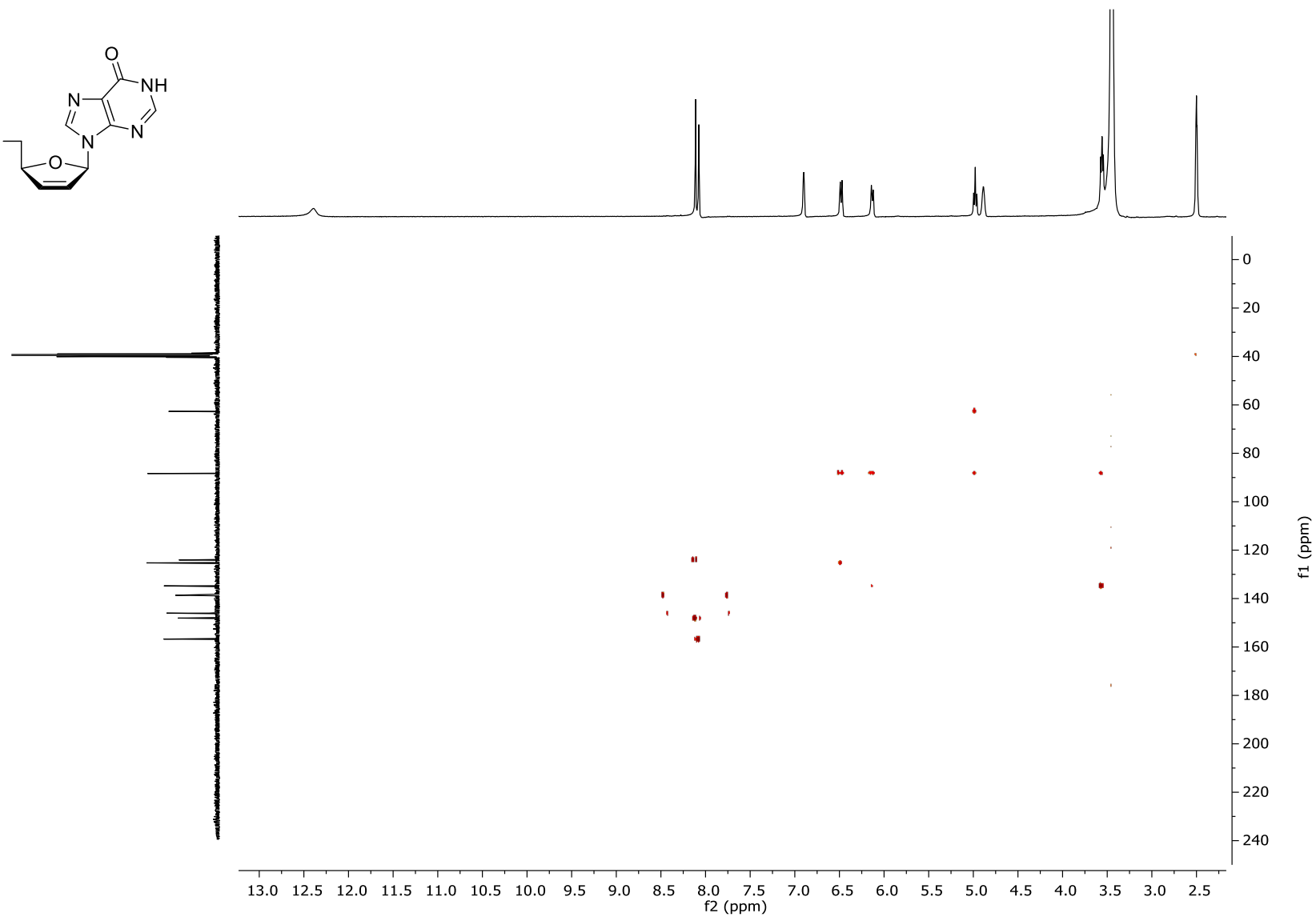
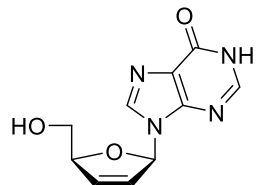
2',3'-Didehydro-2',3'-dideoxy- β -D-inosine (8f)

HSQC NMR (DMSO- d_6)



S134

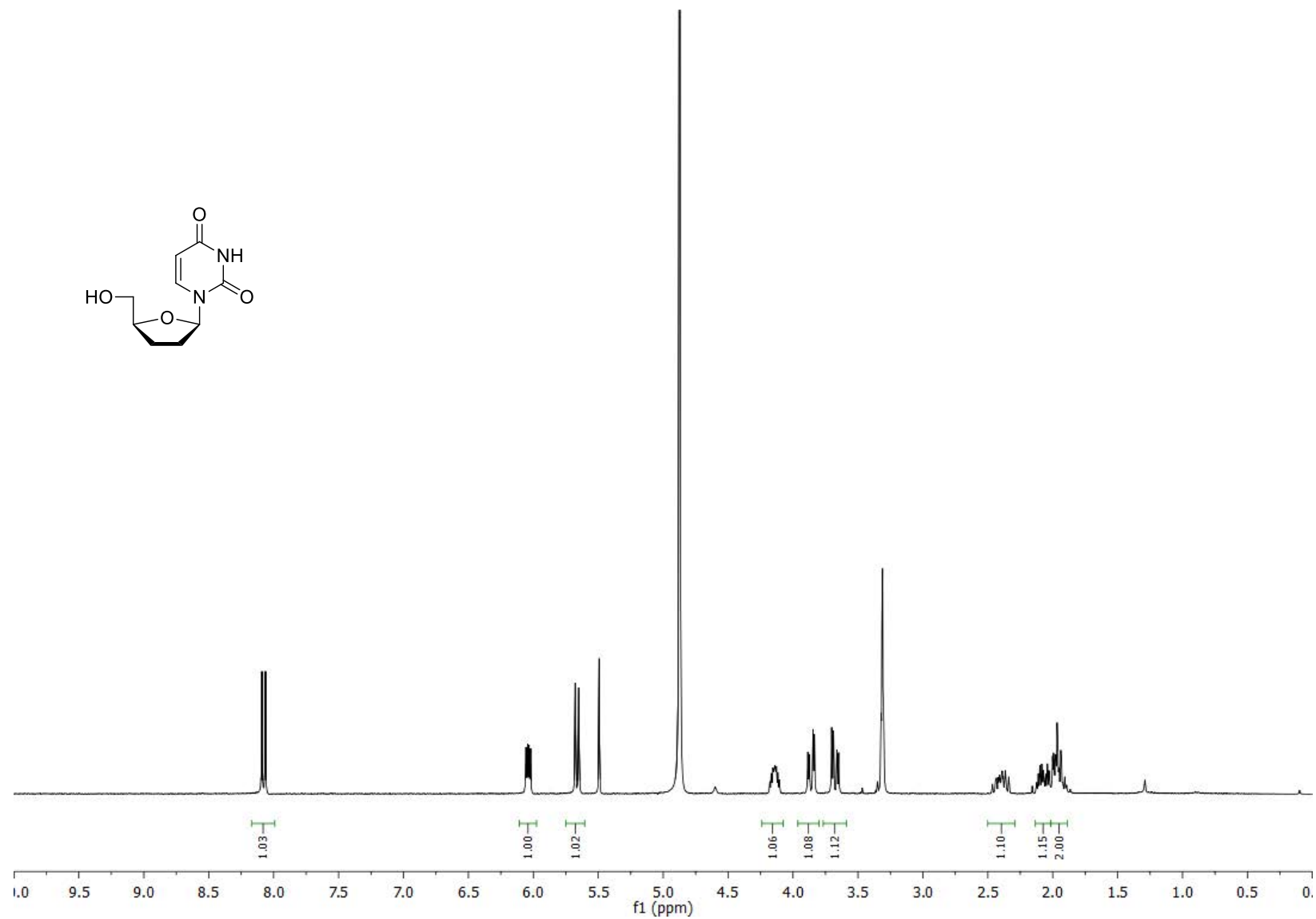
2',3'-Didehydro-2',3'-dideoxy- β -D-inosine (8f)

HMBC NMR (DMSO-*d*₆)

S135

2',3'-Dideoxy- β -D-uridine (9a)

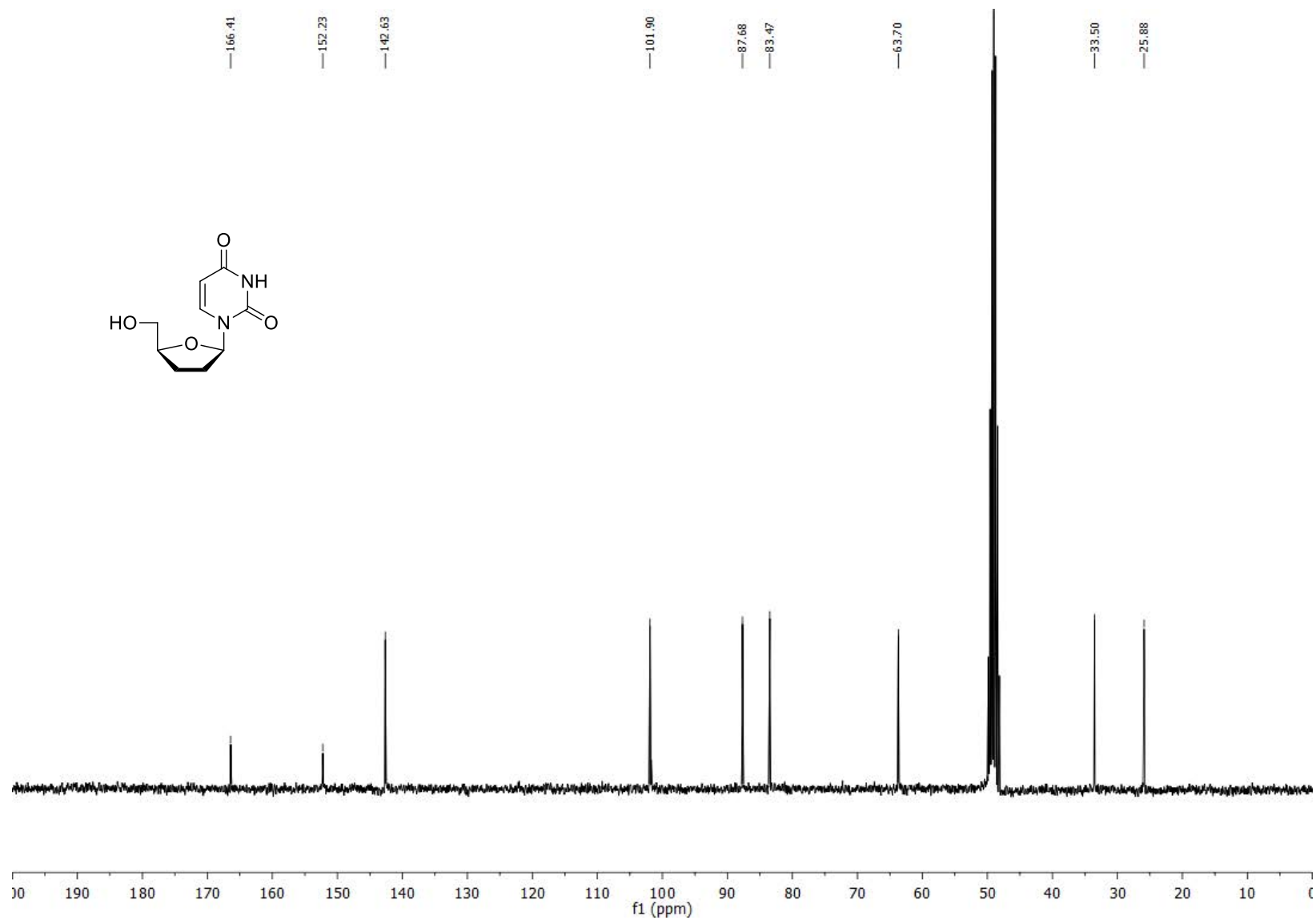
^1H -NMR (300.13 MHz, $\text{MeOH-}d_4$)



S136

2',3'-Dideoxy- β -D-uridine (9a)

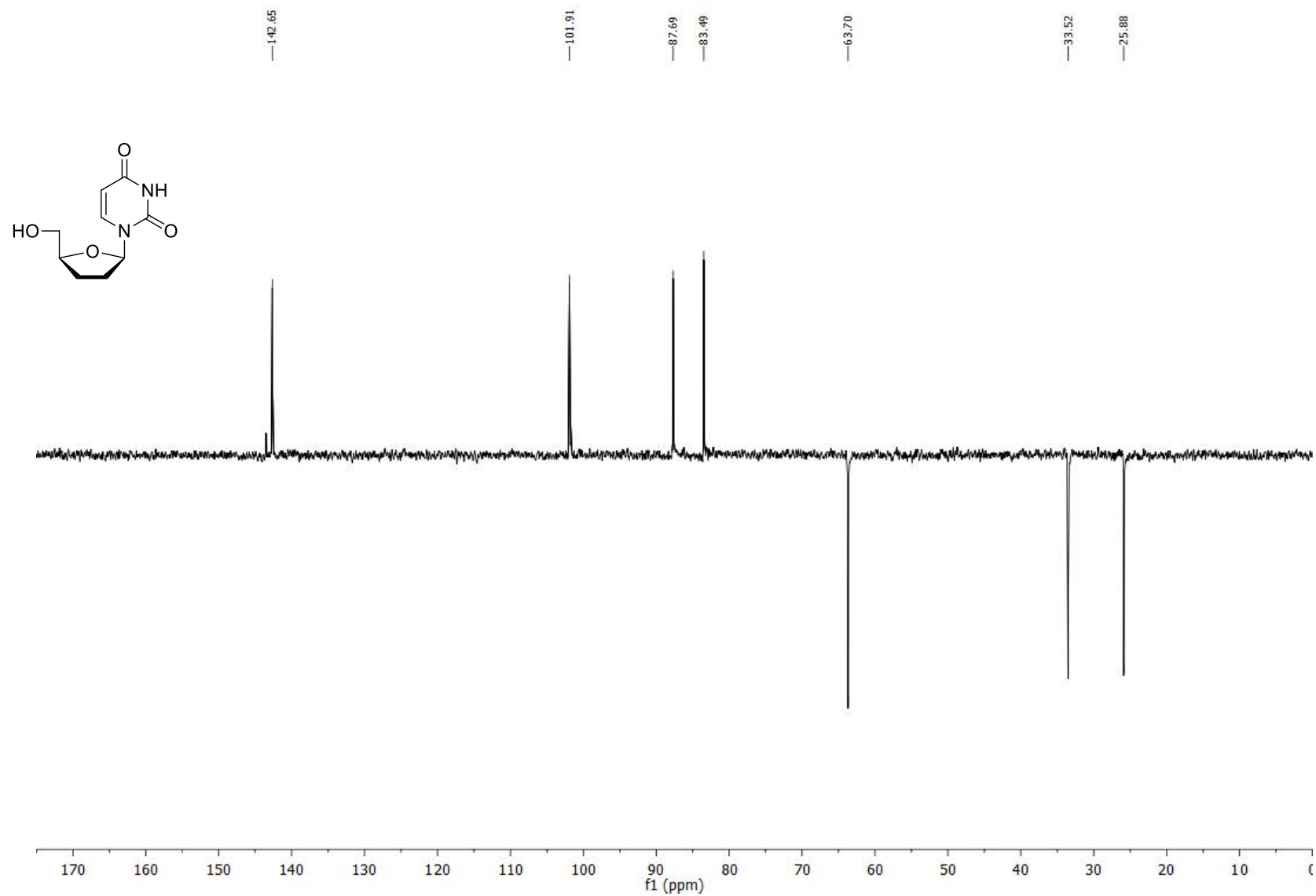
^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



S137

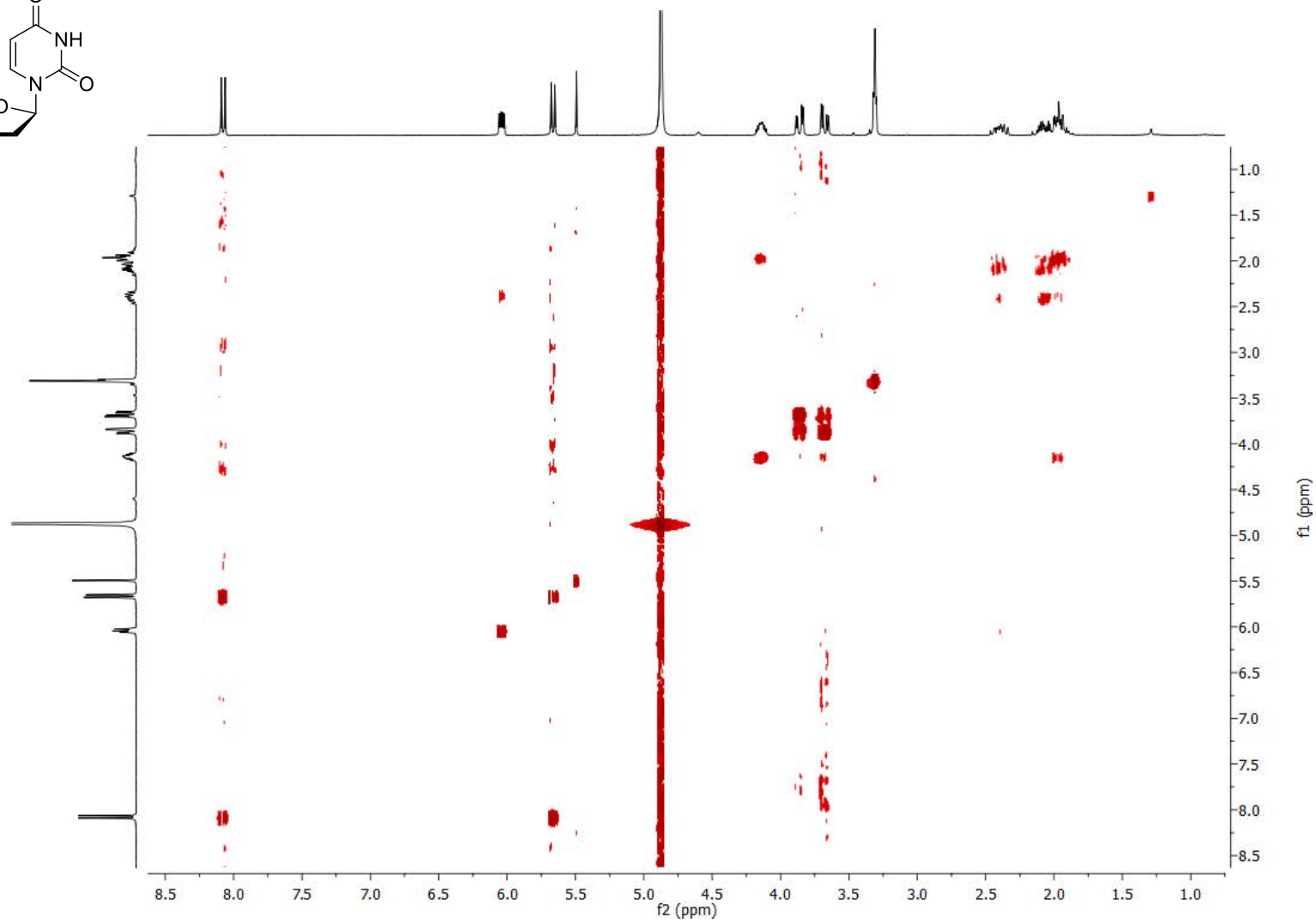
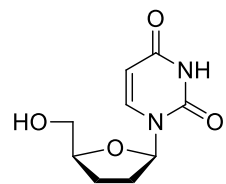
2',3'-Dideoxy- β -D-uridine (9a)

DEPT NMR (75.5 MHz, MeOH- d_4)



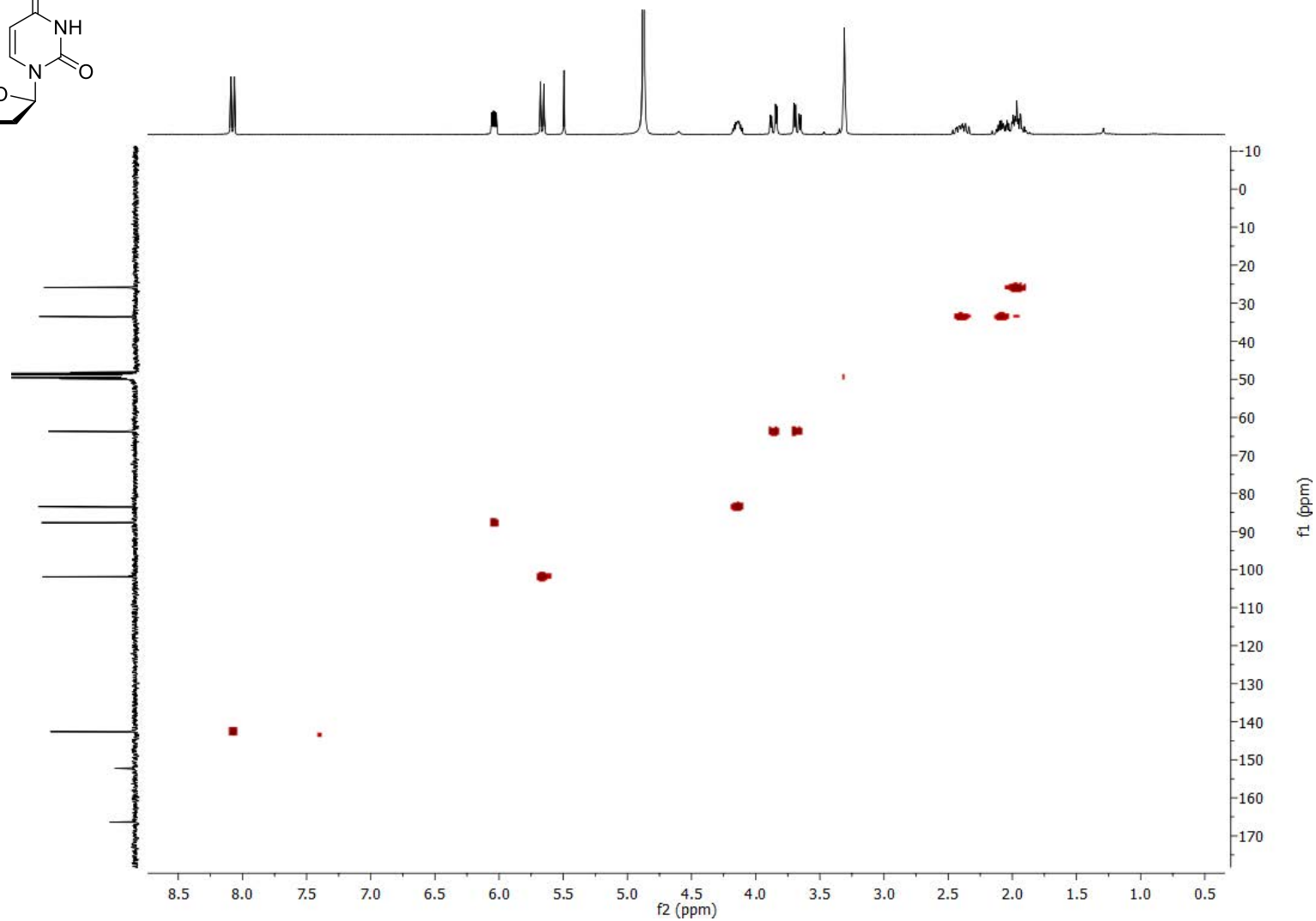
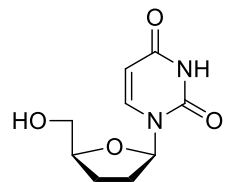
2',3'-Dideoxy- β -D-uridine (9a)

COSY NMR (MeOH- d_4)



2',3'-Dideoxy- β -D-uridine (9a)

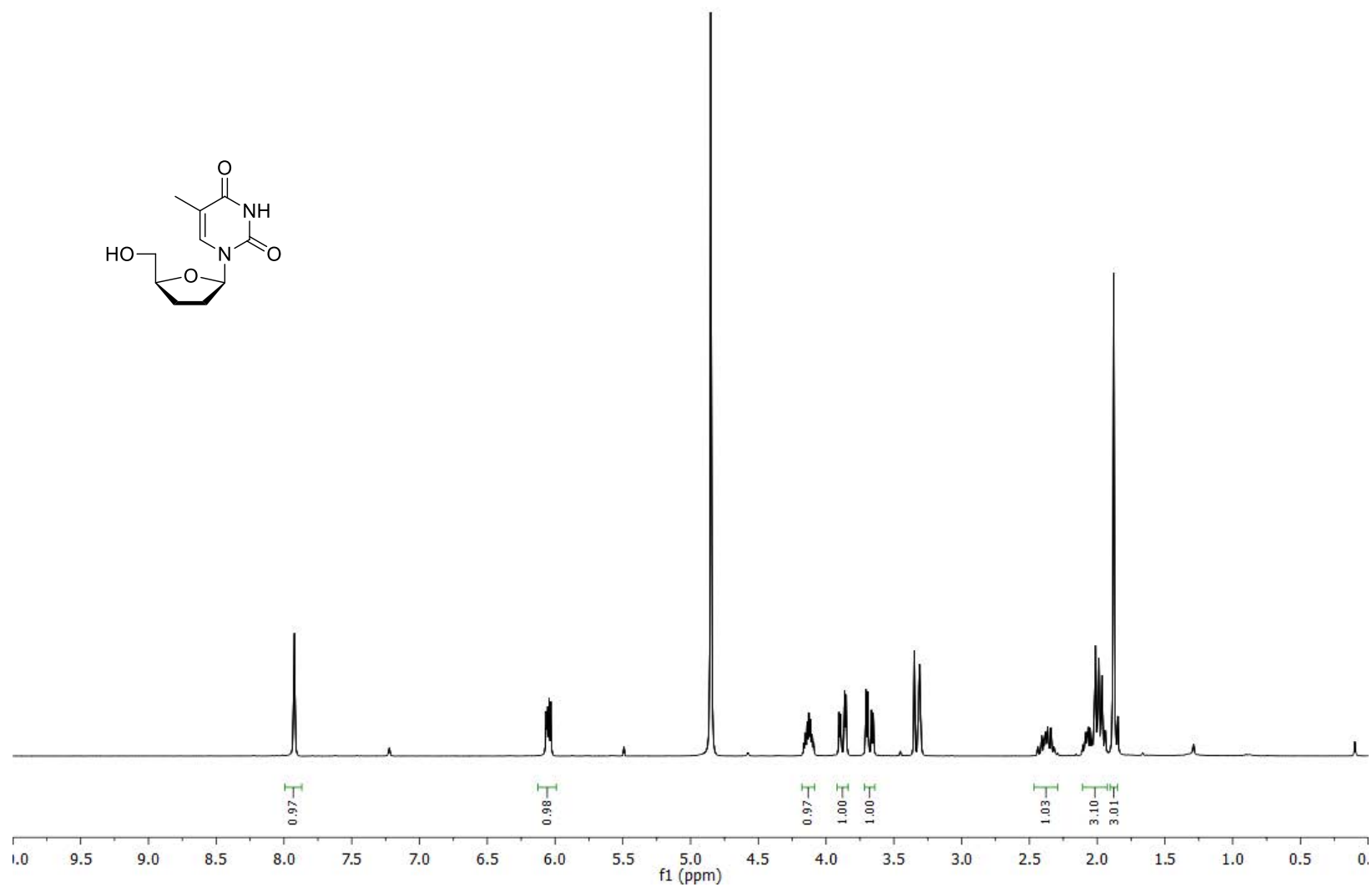
HSQC NMR (MeOH- d_4)



S140

3'-Deoxy- β -D-5-thymidine (9b)

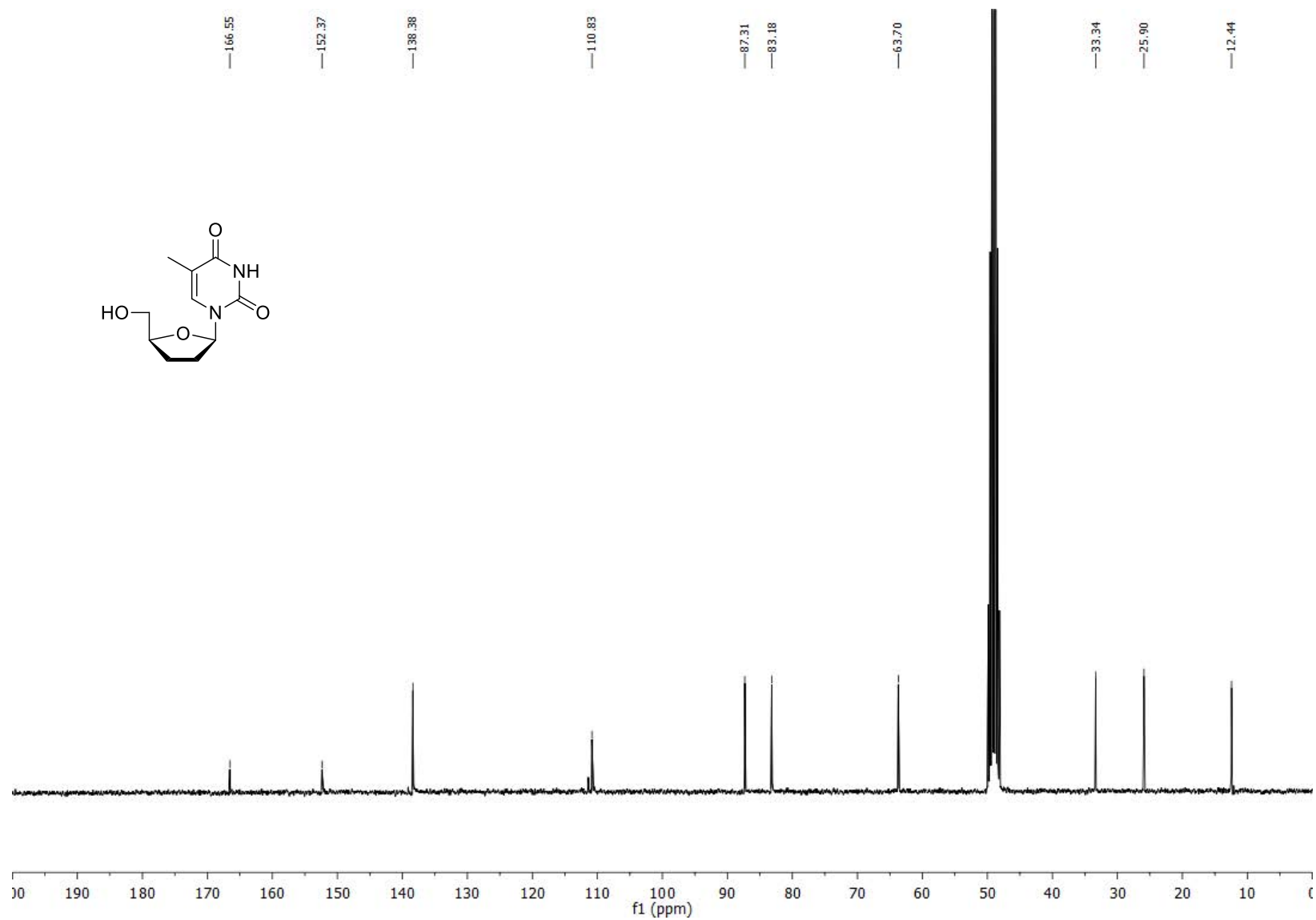
^1H -NMR (300.13 MHz, $\text{MeOH-}d_4$)



S141

3'-Deoxy-β-D-5-thymidine (9b)

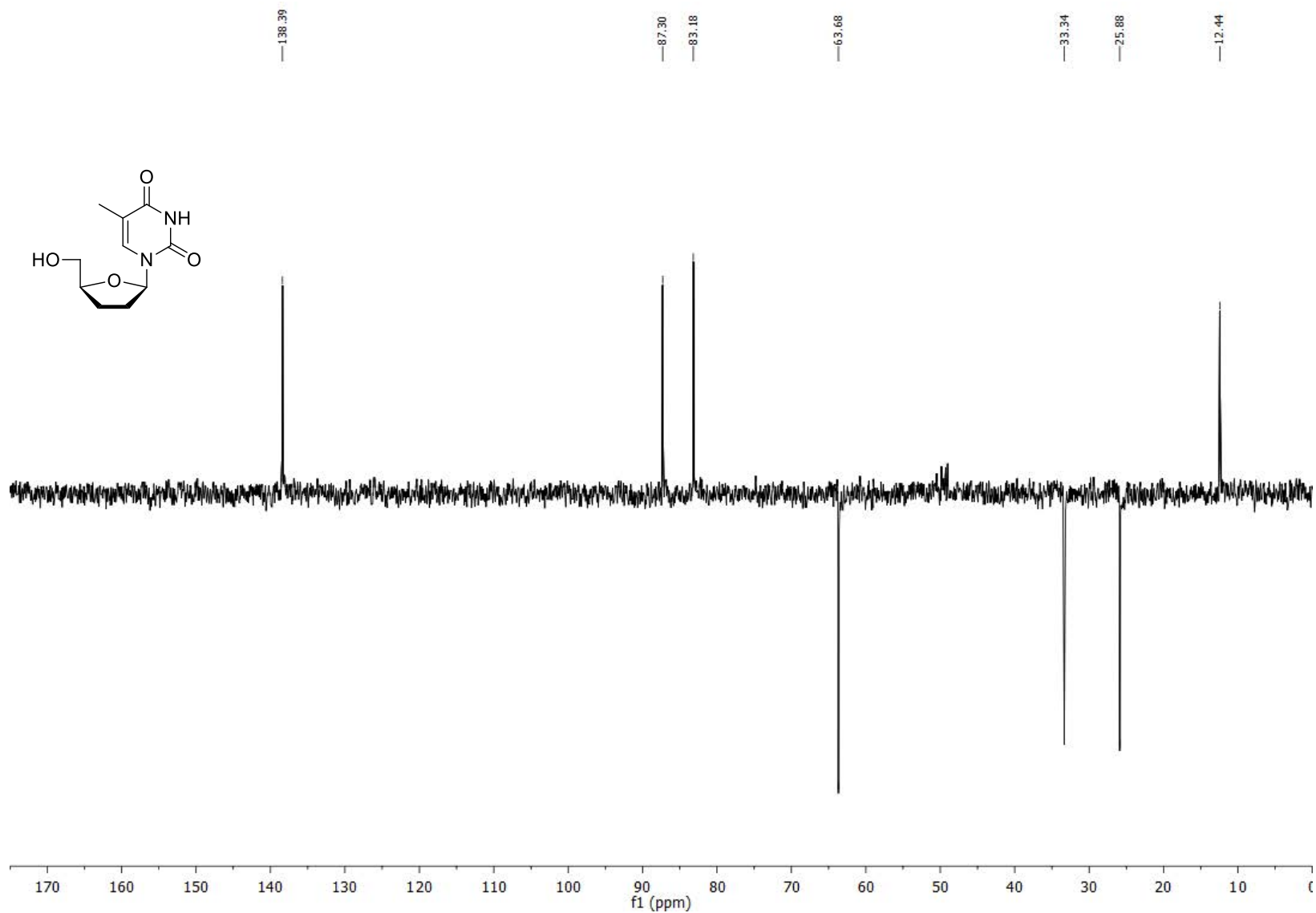
^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



S142

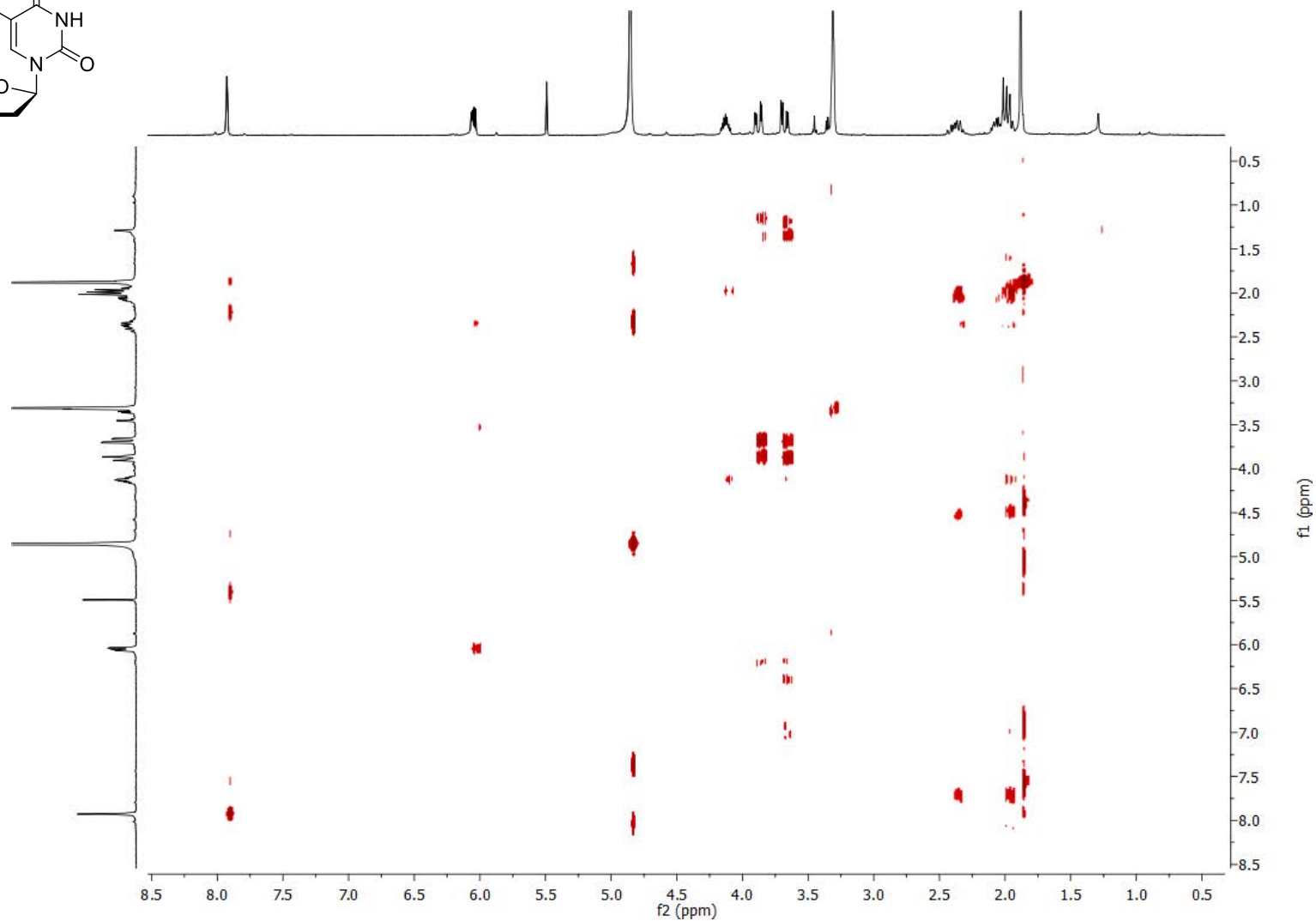
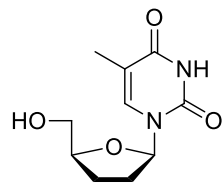
3'-Deoxy- β -D-5-thymidine (9b)

DEPT NMR (75.5 MHz, MeOH- d_4)



3'-Deoxy- β -D-5-thymidine (9b)

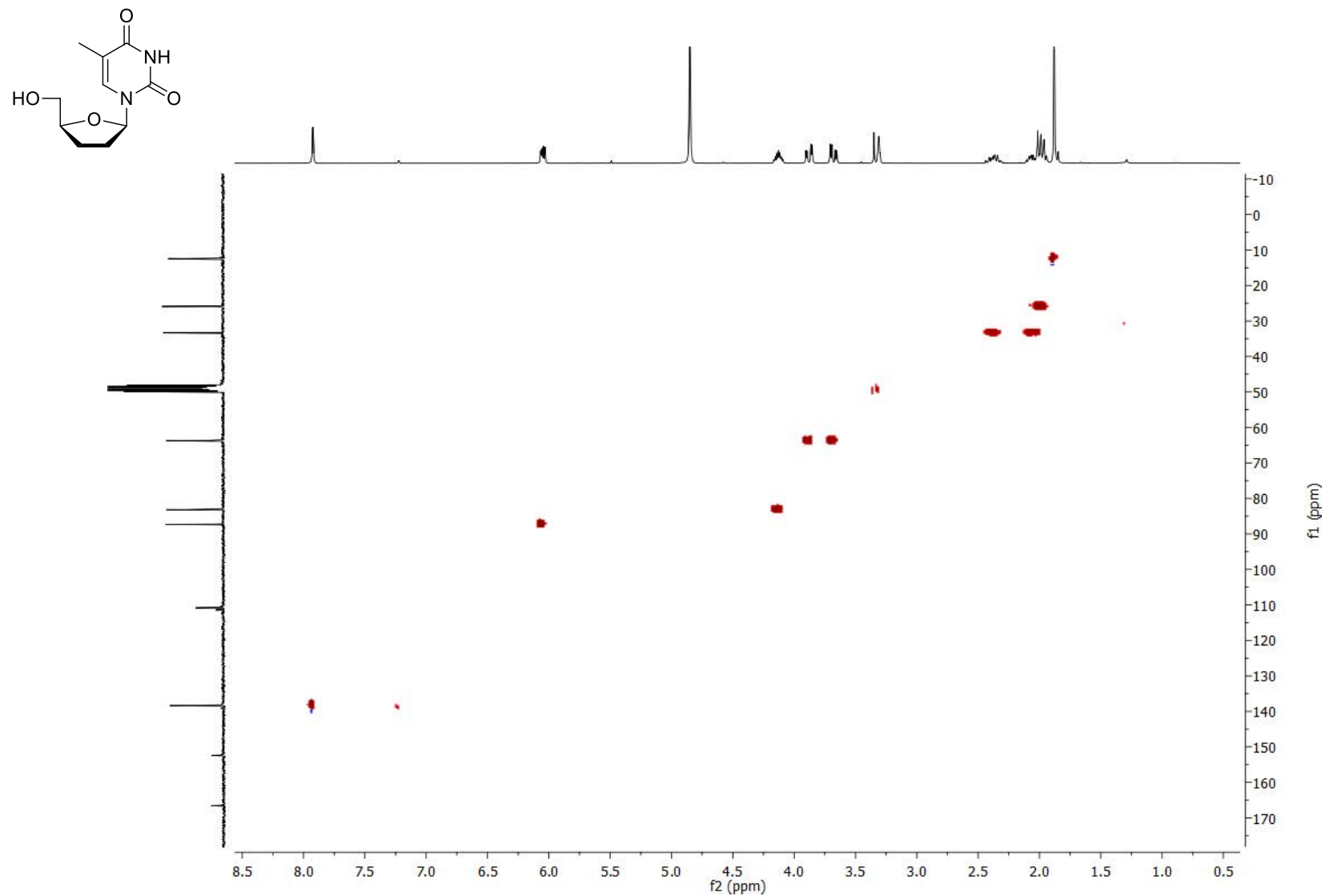
COSY NMR (MeOH- d_4)



S144

3'-Deoxy- β -D-5-thymidine (9b)

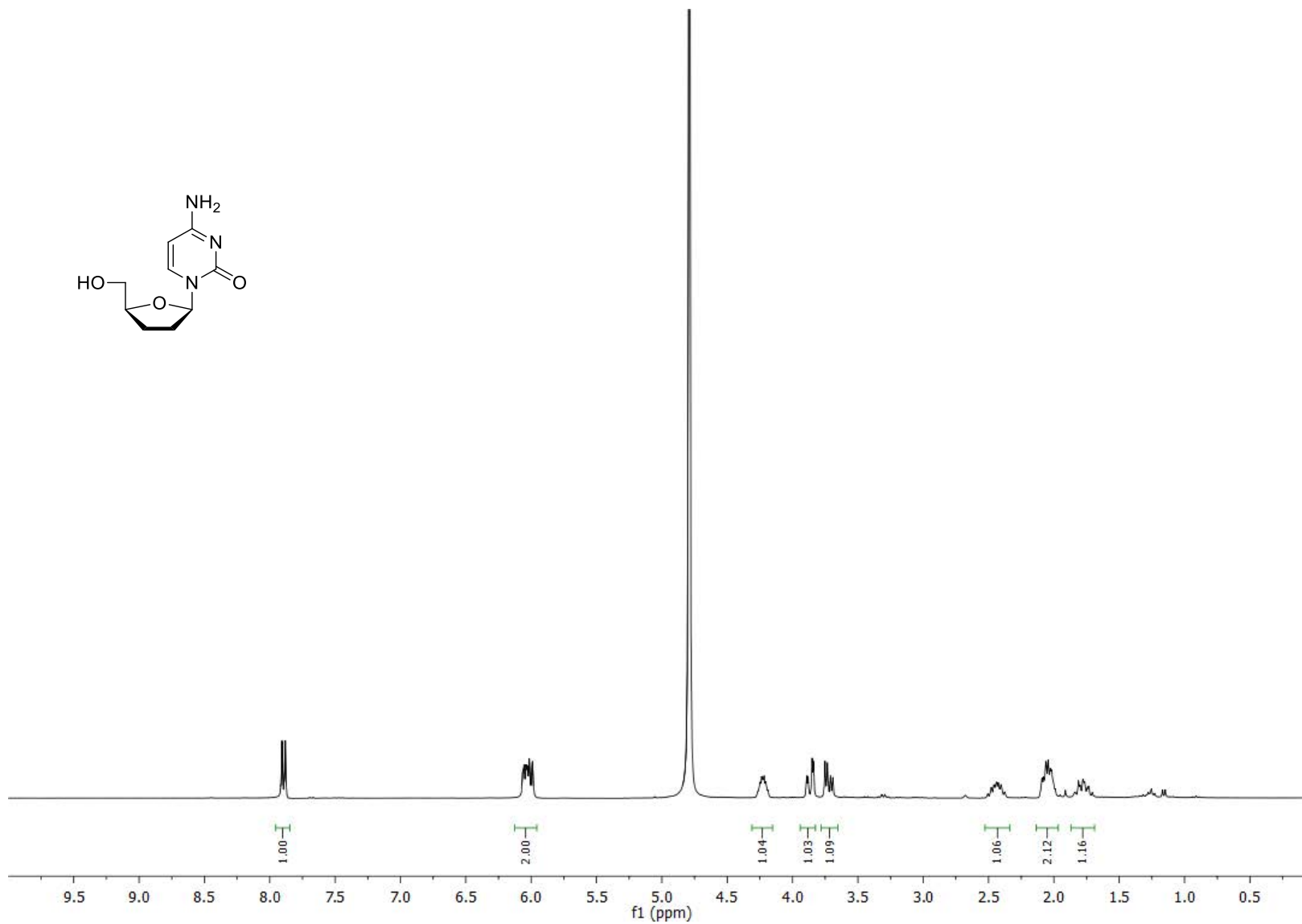
HSQC NMR (MeOH- d_4)



S145

2',3'-Dideoxy- β -D-cytidine (9c)

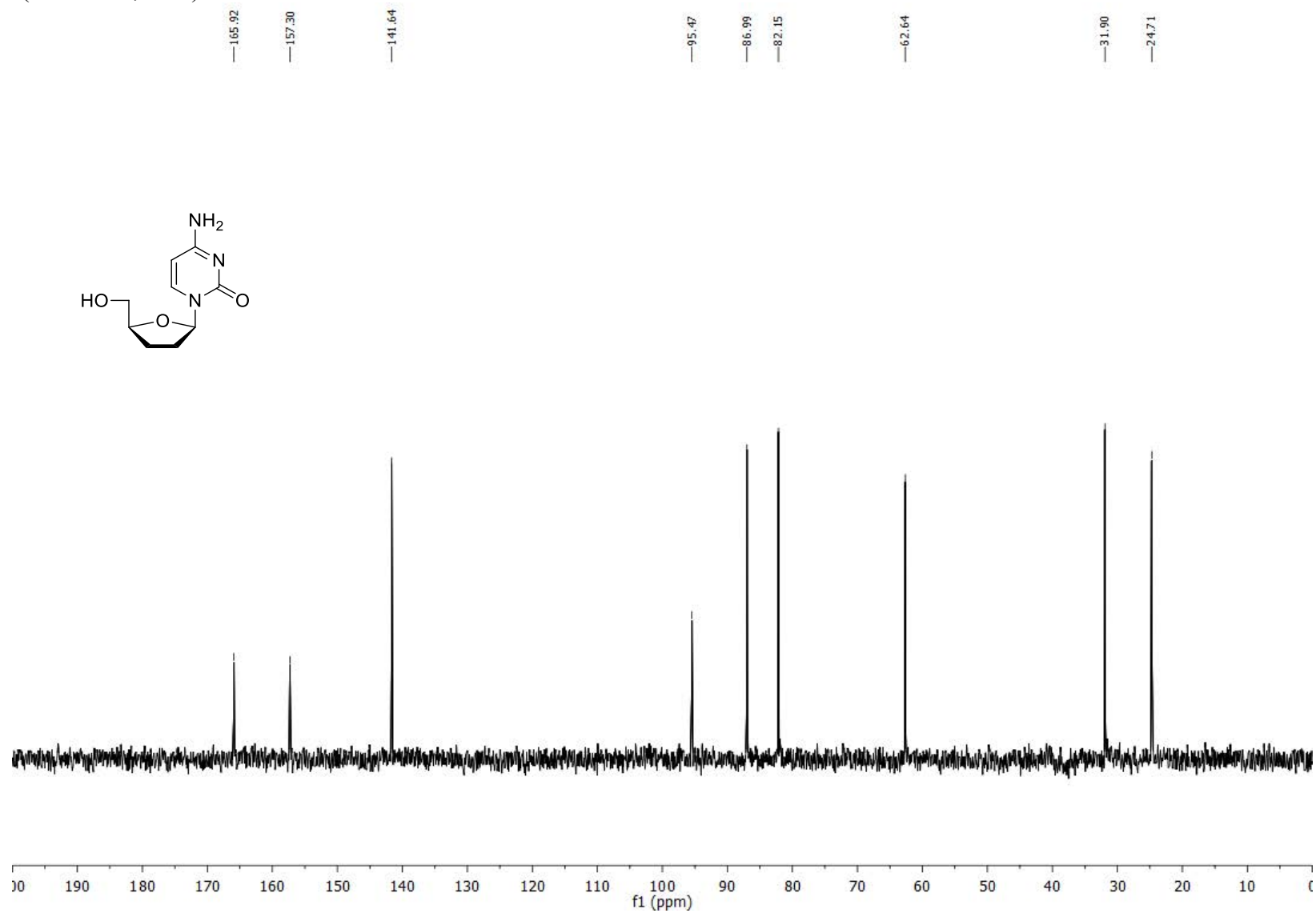
^1H -NMR (300.13 MHz, D_2O)



S146

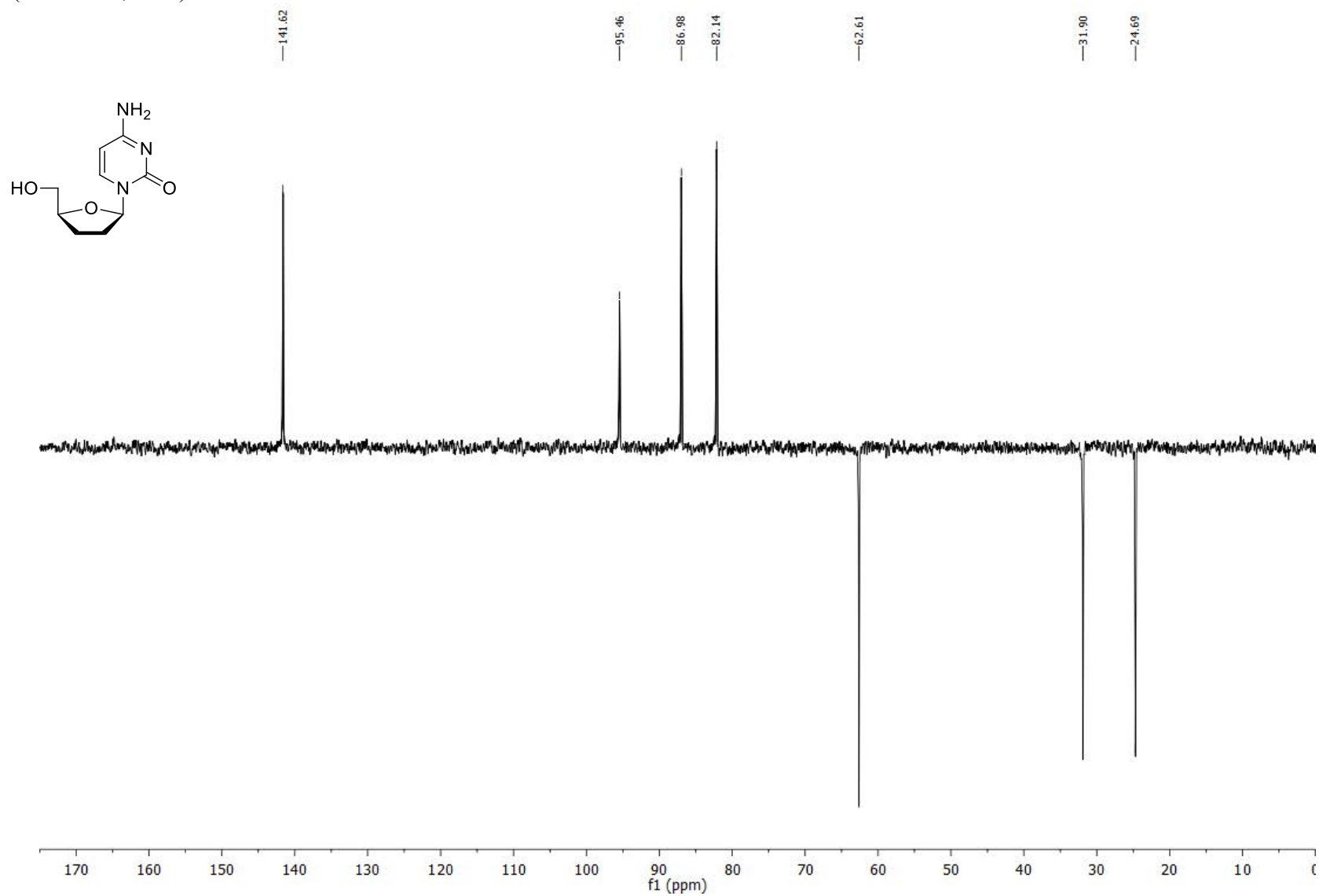
2',3'-Dideoxy-β-D-cytidine (9c)

^{13}C -NMR (75.5 MHz, D_2O)

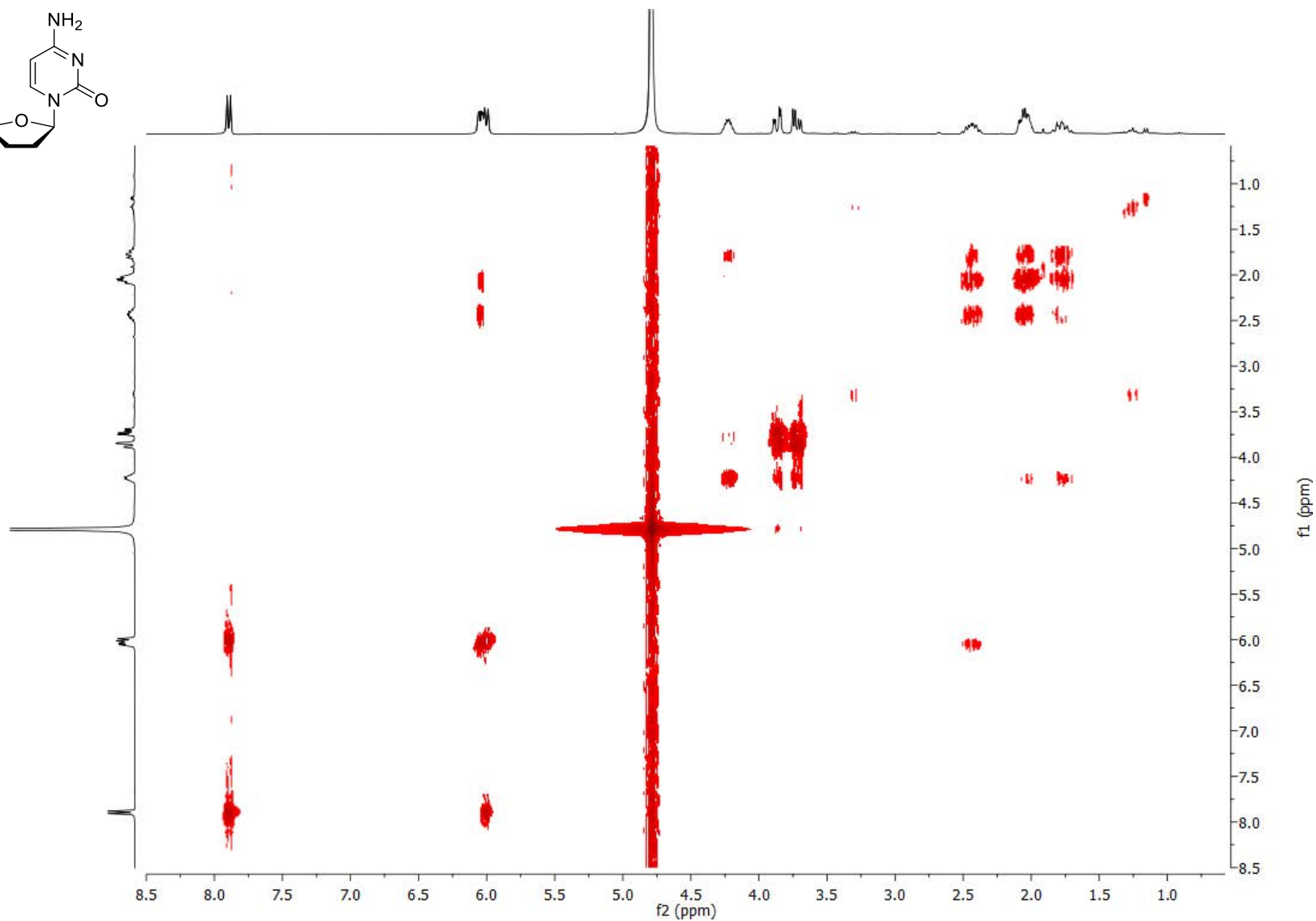
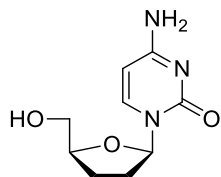


2',3'-Dideoxy- β -D-cytidine (9c)

DEPT (75.5 MHz, D₂O)



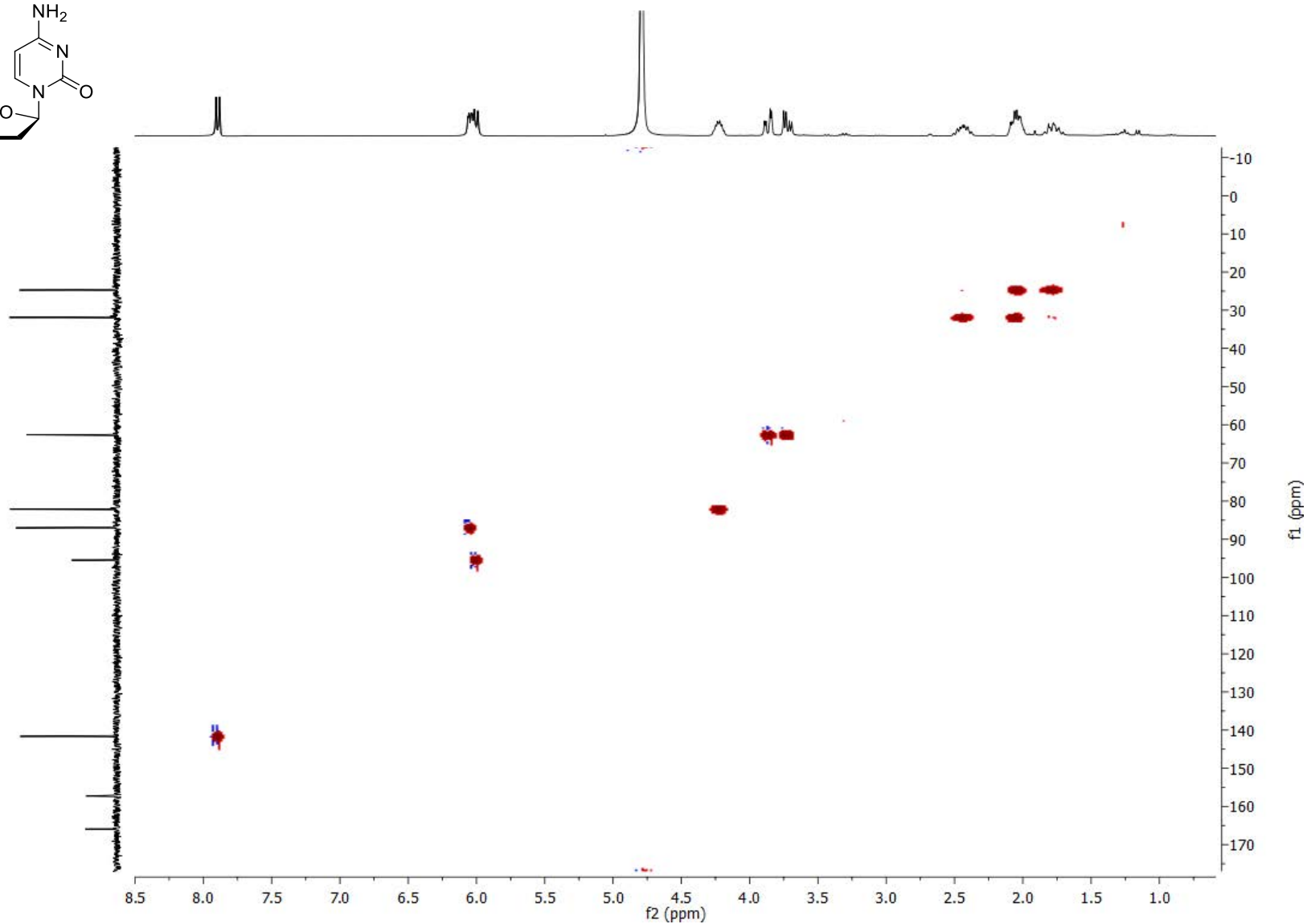
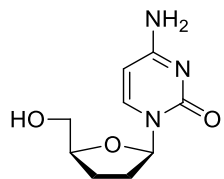
2',3'-Dideoxy-β-D-cytidine (9c)

COSY NMR (D₂O)

S149

2',3'-Dideoxy- β -D-cytidine (9c)

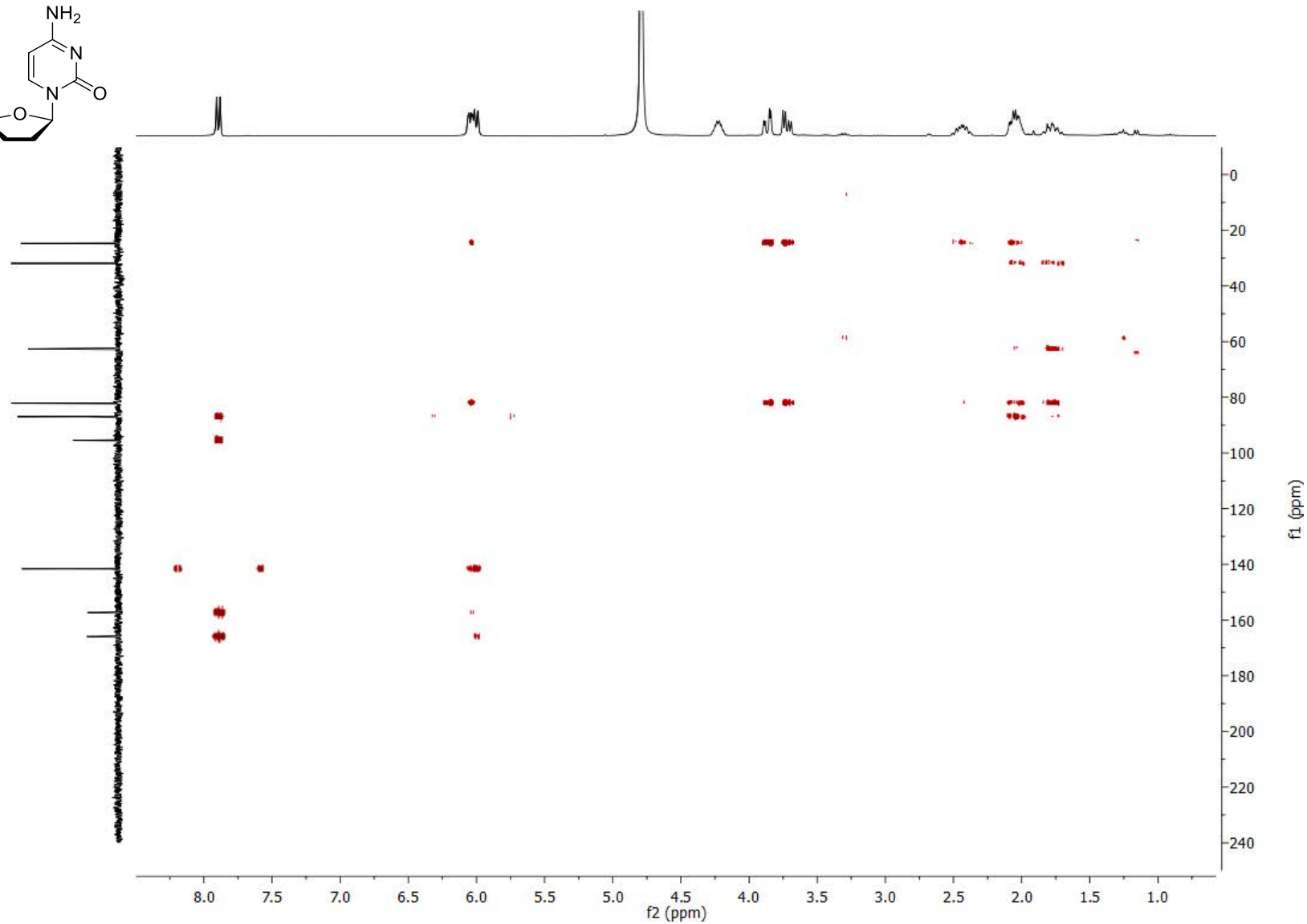
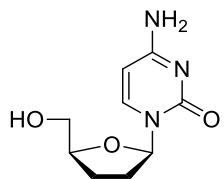
HSQC NMR (D_2O)



S150

2',3'-Dideoxy- β -D-cytidine (9c)

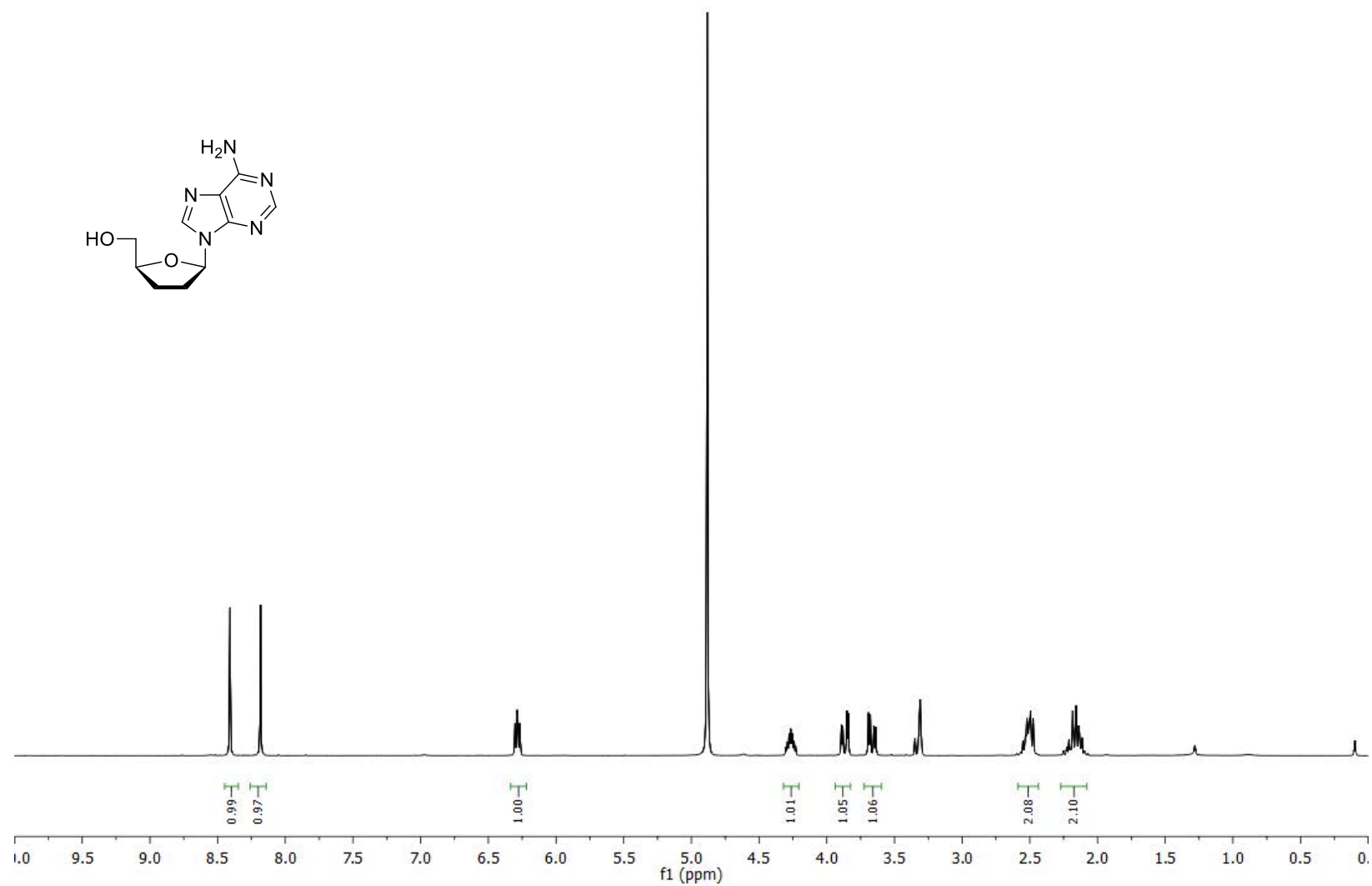
HMBC NMR (D₂O)



S151

2',3'-Dideoxy- β -D-adenosine (9e)

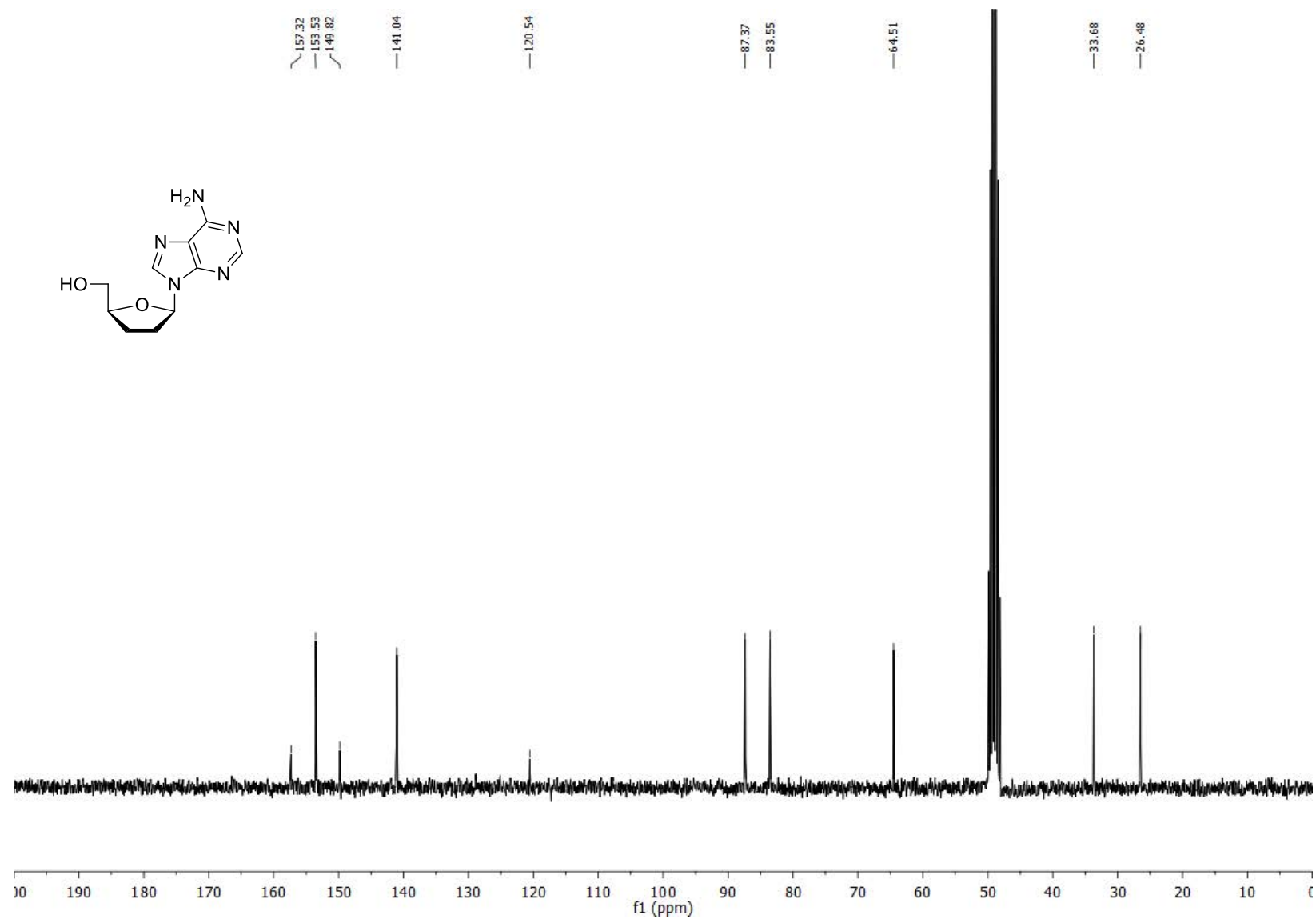
^1H -NMR (300.13 MHz, $\text{MeOH-}d_4$)



S152

2',3'-Dideoxy- β -D-adenosine (9e)

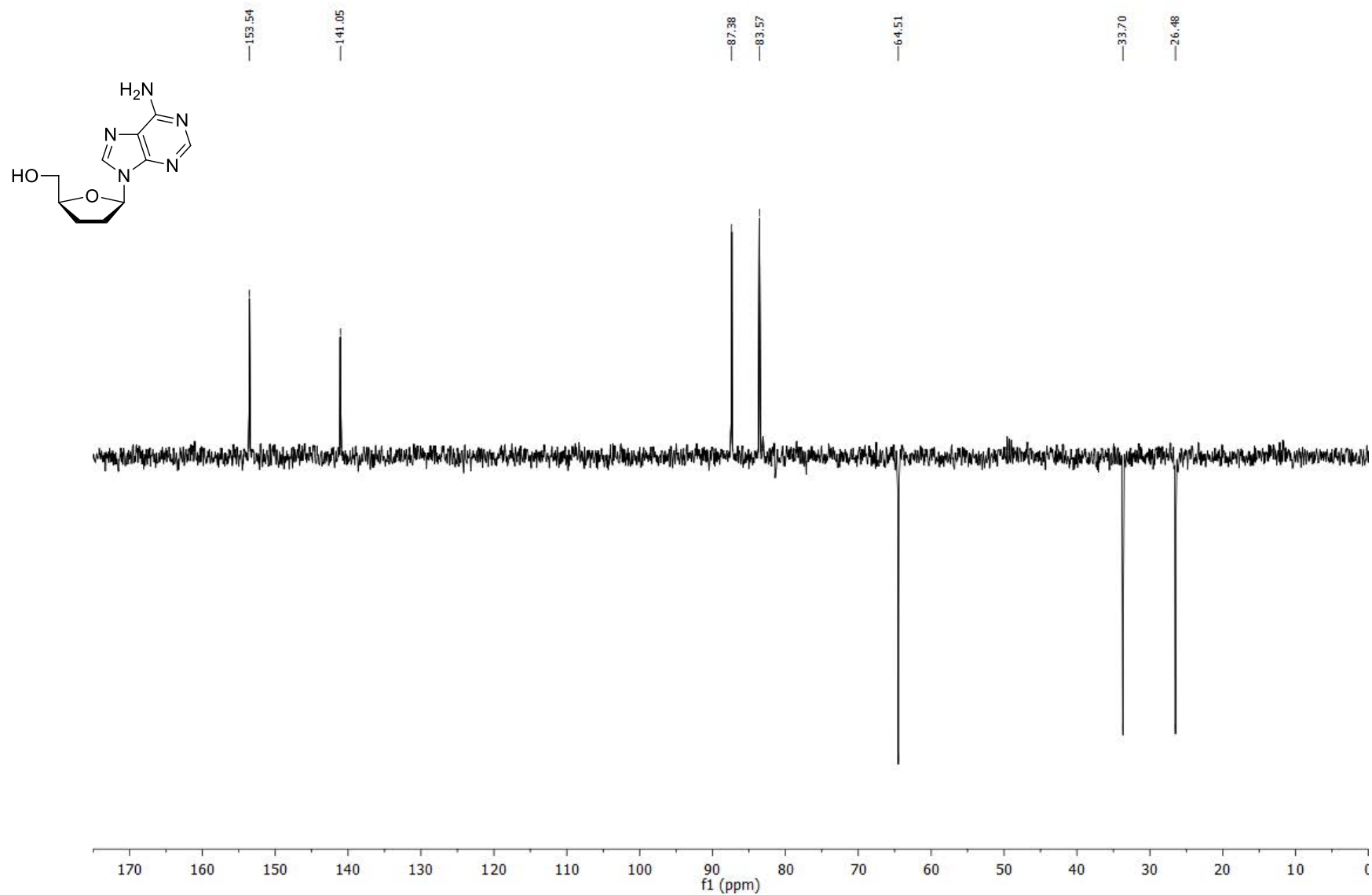
^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



S153

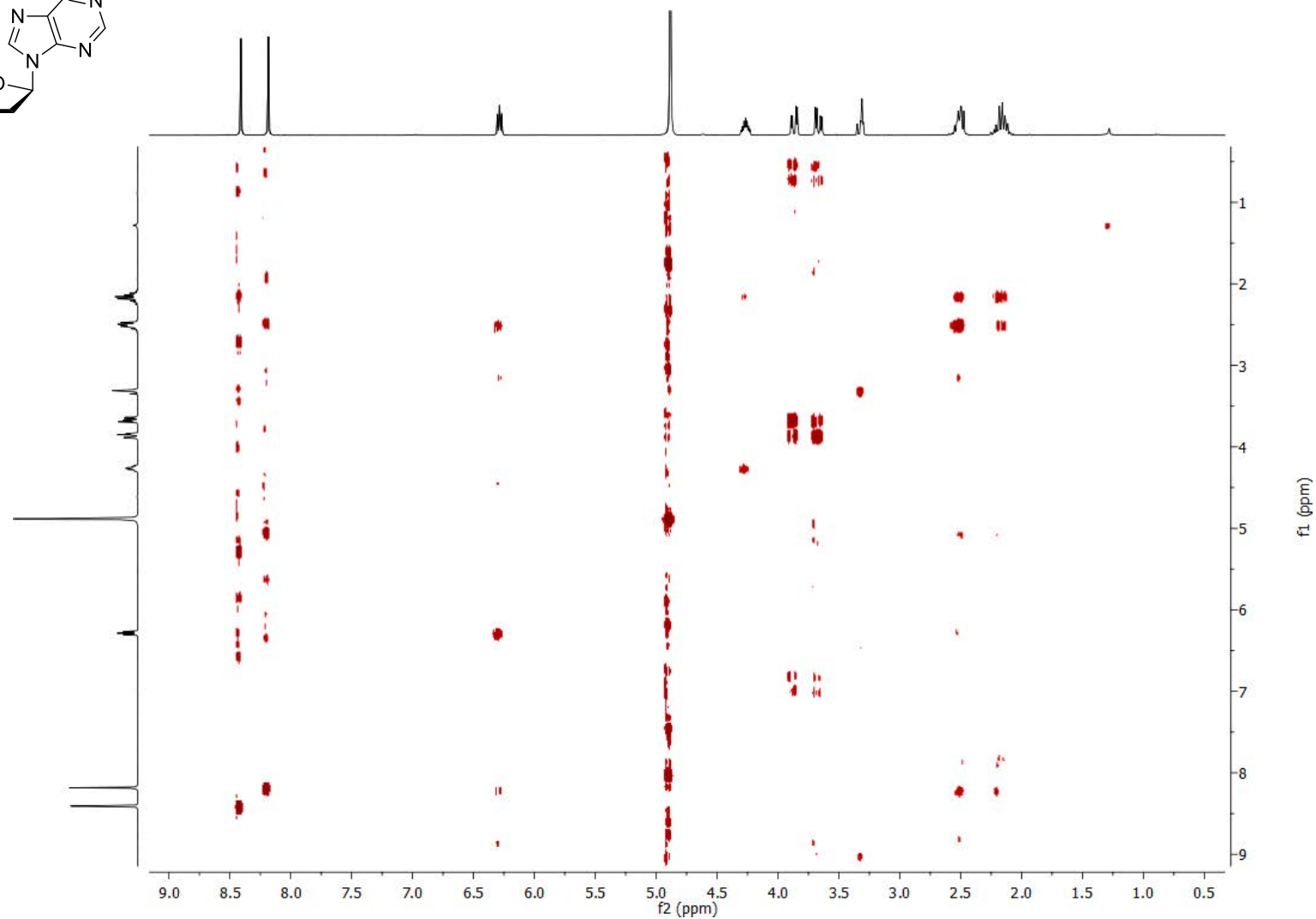
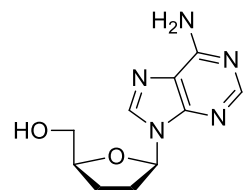
2',3'-Dideoxy- β -D-adenosine (9e)

DEPT NMR (75.5 MHz, MeOH- d_4)



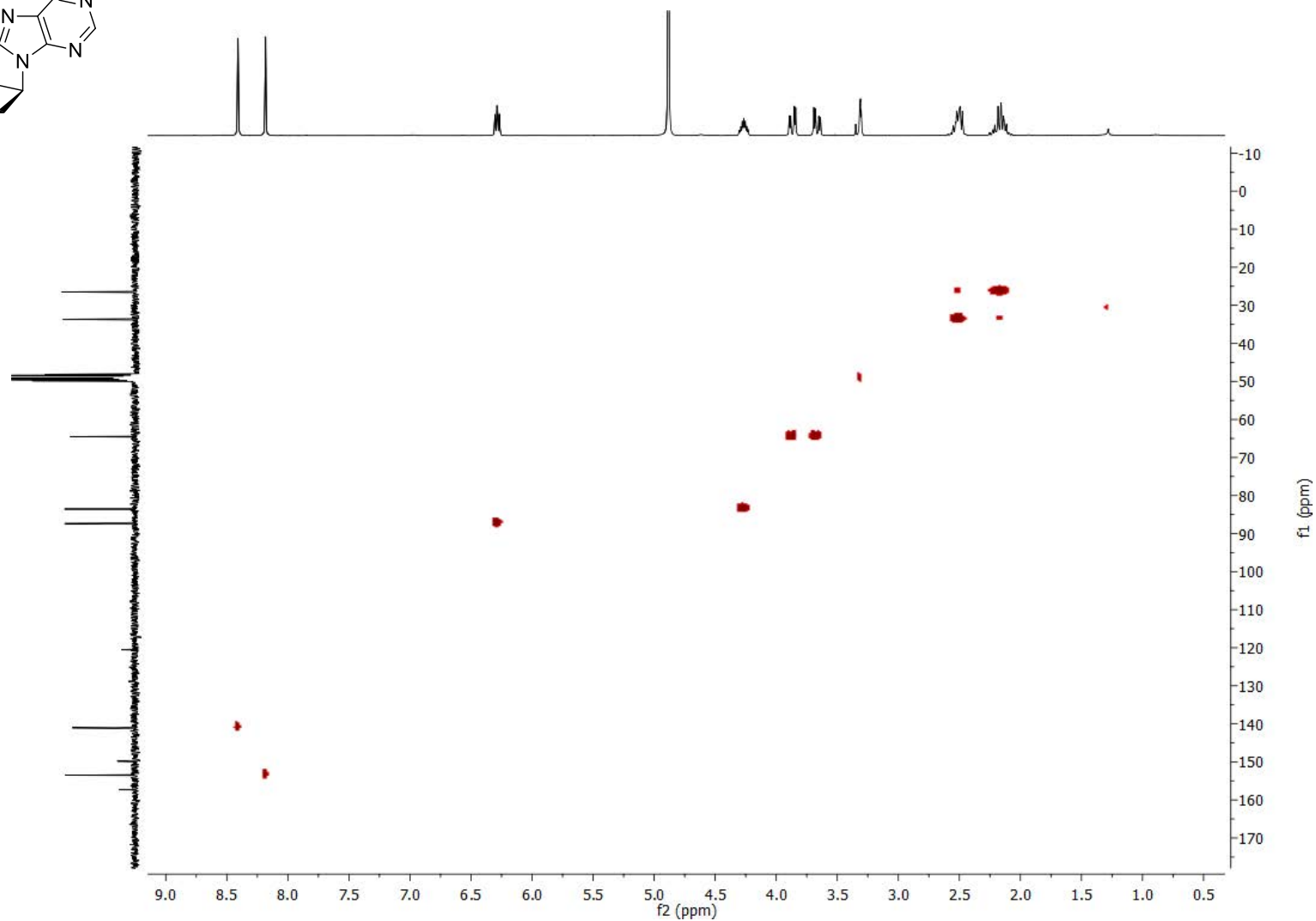
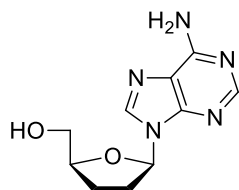
2',3'-Dideoxy- β -D-adenosine (9e)

COSY NMR (MeOH- d_4)



2',3'-Dideoxy- β -D-adenosine (9e)

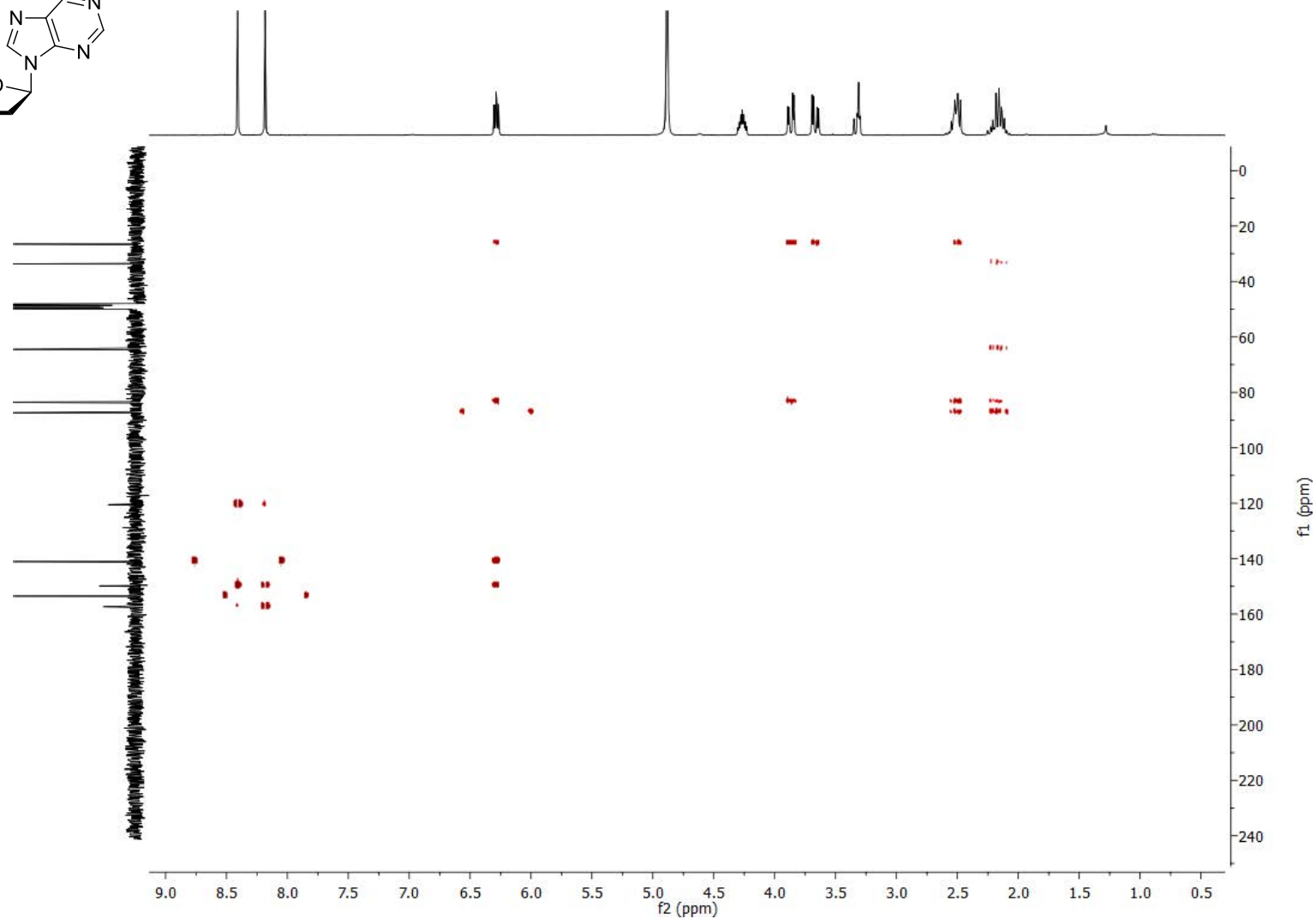
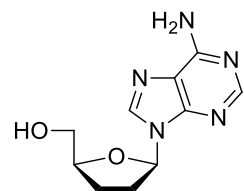
HSQC NMR (MeOH- d_4)



S156

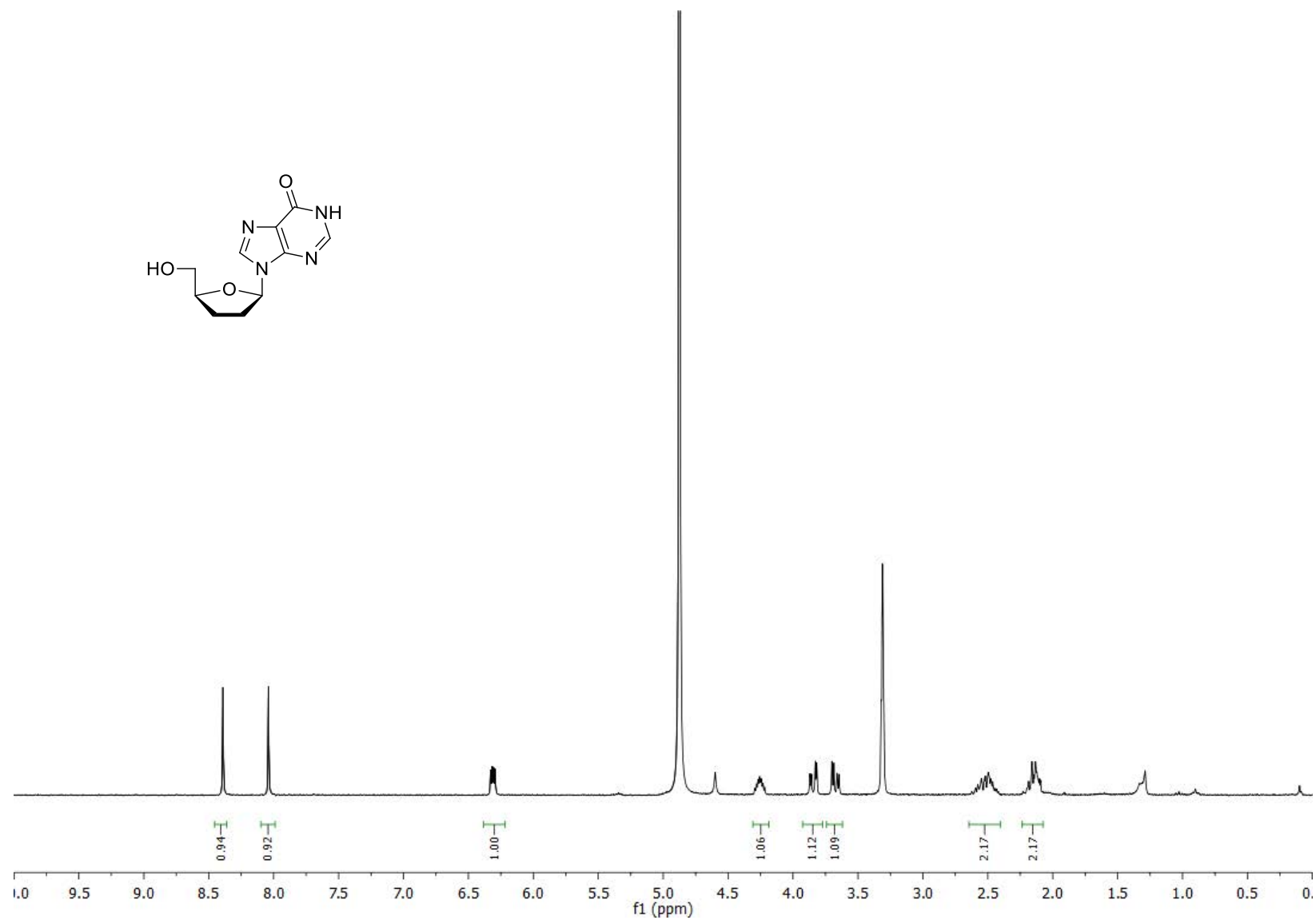
2',3'-Dideoxy- β -D-adenosine (9e)

HMBC NMR (MeOH- d_4)



2',3'-Dideoxy- β -D-inosine (9f)

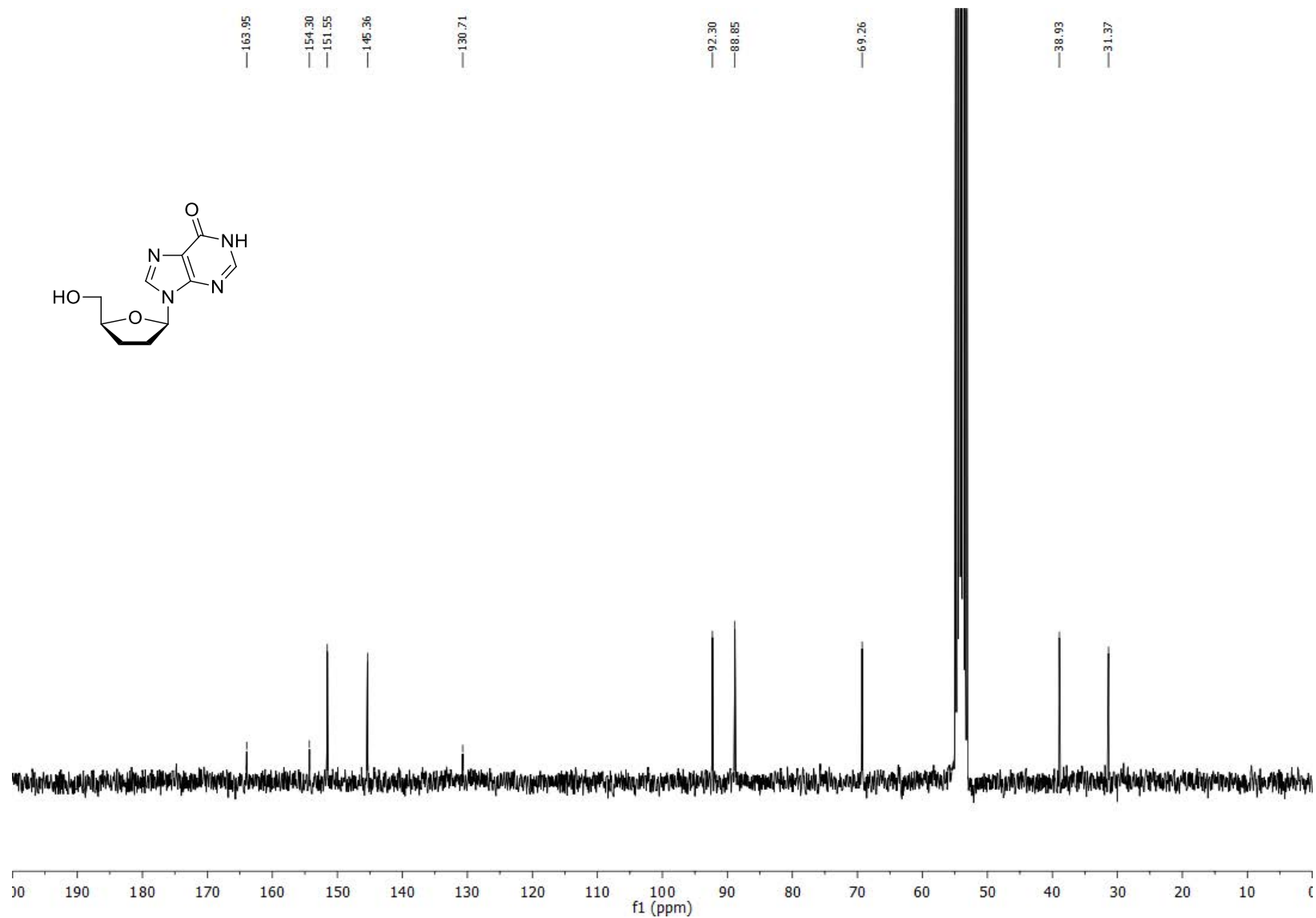
$^1\text{H-NMR}$ (300.13 MHz, $\text{MeOH-}d_4$)



S158

2',3'-Dideoxy- β -D-inosine (9f)

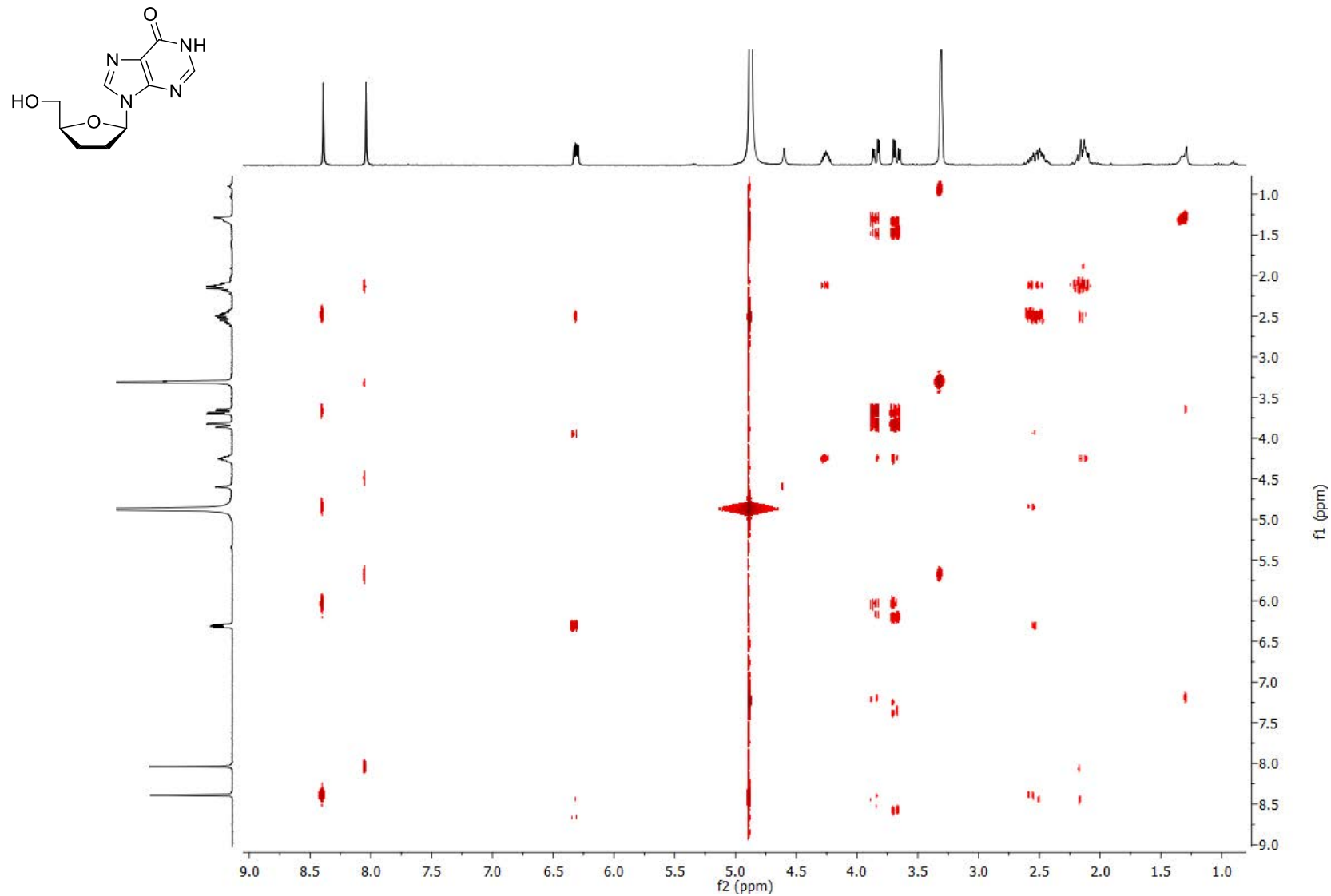
^{13}C -NMR (75.5 MHz, $\text{MeOH-}d_4$)



S159

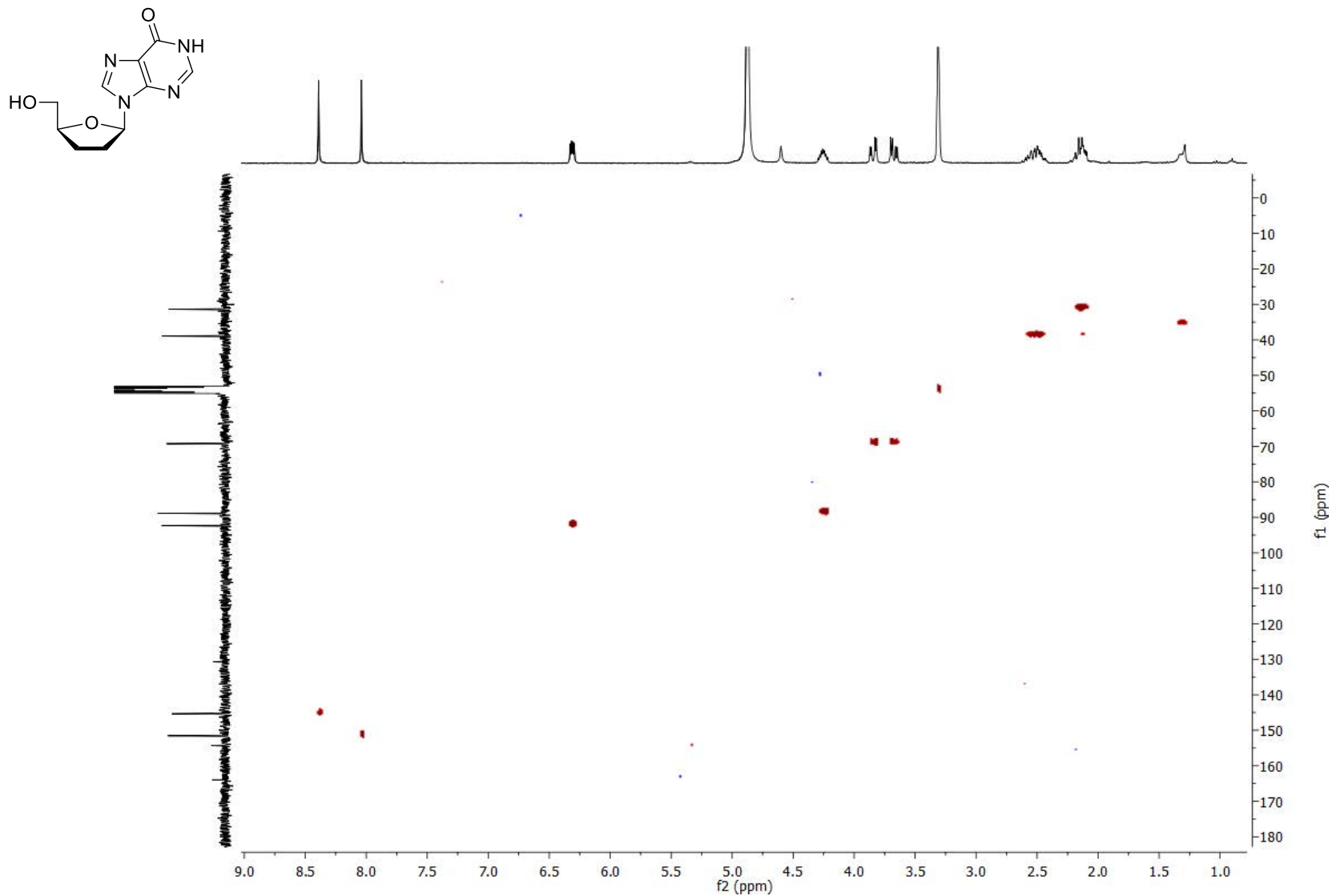
2',3'-Dideoxy- β -D-inosine (9f)

COSY NMR (MeOH- d_4)



2',3'-Dideoxy- β -D-inosine (9f)

HSQC NMR (MeOH- d_4)



S161

2',3'-Dideoxy- β -D-inosine (9f)

HMBC NMR (MeOH- d_4)

