Trihaloisocyanuric Acids in Ethanol: An Eco-Friendly System for the Regioselective Halogenation of Imidazo-heteroarenes

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I. Materials and Methods

Proton nuclear magnetic resonance spectra (^{1}H NMR) were obtained at 200 MHz on a Bruker AC-200 NMR spectrometer or at 400 MHz on a Bruker AC-400 NMR spectrometer. Spectra were recorded in $CDCl_3$ solutions. Chemical shifts are reported in ppm, referenced to the solvent peak of $CDCl_3$ or tetramethylsilane (TMS) as the external reference. Data are reported as follows: chemical shift (δ), multiplicity, coupling constant (J) in Hertz and integrated intensity. Carbon-13 nuclear magnetic resonance spectra (^{13}C NMR) were obtained either at 50 MHz on a Bruker AC-200 NMR spectrometer or at 100 MHz on a Bruker AC-200 NMR spectrometer. Spectra were recorded in $CDCl_3$. Chemical shifts are reported in ppm, referenced to the solvent peak of $CDCl_3$. Abbreviations to denote the multiplicity of a particular signal are: s (singlet), d (doublet), t (triplet), q (quartet), quint (quintet), sext (sextet) and m (multiplet). High resolution mass spectra were recorded on a Bruker microTOF-Q II APPI/APCI mass spectrometer equipped with an automatic syringe pump for sample injection. The melting points were determined in a Microquimica MQRPF-301 digital model equipment with heating plate. Column chromatography was performed using Silica Gel (230-400 mesh). Thin layer chromatography (TLC) was performed using Merck Silica Gel GF_{254}, 0.25 mm thickness. For visualization, TLC plates were either placed under ultraviolet light, or stained with iodine vapor and acidic vanillin. Most reactions were monitored by TLC for disappearance of starting material.

Unless otherwise stated, all reagents and solvents were obtained from commercial sources and used without any further purification. The starting materials, imidazo[1,2-*a*]pyridines, imidazo[1,2-*a*]pyrimidines and imidazo [2,1-*b*]thiazole, were prepared according to the literature reports.[1]

The yields are based on isolated compounds after purification.

II. General procedure for preparation of tribromoisocyauric acid (TBCA):

TBCA was prepared according procedure of literature.[2a]

Cyanuric acid (6.25 mmol), NaOH (18.75 mmol), Na_2CO_3 (18.75 mmol) and KBr (18.75 mmol) was added to a solution of cyanuric acid (6.25 mmol), NaOH (37.5 mmol), Na_2CO_3 (18.75) and H_2O (90 mL) and was stirred until forms a homogeneous mixture. The mixture was cooled in an ice bath and a solution of Oxone® (18.75 mmol) in H_2O (75.0 mL) was added dropwise. During the addition the mixture forms a white precipitate, resulting in a dense solution. After 24h of stirring the product is isolate by vacuum filtration, washed with cold H_2O and dried in vacuum.

III. General procedure for preparation of triiodooisocyauric acid (TICA):

TBCA was prepared according procedure of literature.[2b]

Trichloroisocyanuric acid (14.0 mmol, 2.75 g) and Iodine (46.2 mmol, 11.72 g) were added to a 50 mL sealed tube and heated in a sand bath at 180°C for 24h. After this time, the resulted ICl was distilled off under reduced pressure. The resulted mixture in the sealed tube was heated for 230 ºC for 48h. The procedure to remove the ICl was repeated. The obtained product as a brown solid. Reaction yield: 90%

IV. General procedure to halogenated compounds synthesis:

To a Schlenk tube under air atmosphere, equipped with magnetic stirring, was added a solution of the appropriate imidazo-heteroarenes (0.5 mmol) in anhydrous ethanol (3.0 mL). Afterwards, appropriate trihaloisocyanuric acid (TXCA = 0.35 equiv = 0.175 mmol) was added and the reaction mixture was stirred at room temperature until the consumption of the starting material (monitored by TLC). After that, saturated aqueous NH_4Cl (3.0 mL) was added and the product was extracted

with ethyl acetate (2 X 5.0 mL), dried over $MgSO_4$, filtered, and concentrated under vacuum. The residue was then purified by silica-gel chromatography with hexane/ethyl acetate as the eluent.)

NOTE: In some cases when TICA was used, the reaction turns dark brown. For this, 10% aqueous solution of $Na_2S_2O_3$ (3mL) was used for work up, in order to get a cleaner solution.

Characterization data of the synthesized compounds

3-chloro-2-phenylimidazo[1,2-*a*]pyridine 2a:[3a] It was obtained as a white solid (97.2 mg, 85% yield, mp 119.5−121.4 °C, lit = 115 ºC) after silica gel flash chromatography (100% hexane - 70% hexane: ethyl acetate gradient); · ^{1}H NMR (200 MHz, $CDCl_3$): δ 8.19 – 8.02 (m, 3H), 7.65 (d, *J* = 9.1 Hz, 1H), 7.56 – 7.33 (m, 3H), 7.25 (ddd, *J* = 8.7, 6.1, 1.3 Hz, 1H), 6.93 (t, *J* = 6.8 Hz, 1H). ^{13}C NMR (50 MHz, $CDCl_3$): δ 143.7, 139.8, 132.5, 128.5, 128.2, 127.5, 124.8, 122.7, 117.7, 112.9,105,6. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 696, 754, 1351, 2429, 3030, 3437; HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for $C_{13}H_{10}ClN_2$, 229.0527; found, 229.0532.

3-chloro-6-methyl-2-phenylimidazo[1,2-*a*]pyridine 2b:[3b] It was obtained as a yellow solid (90.8 mg, 75% yield, mp 138.6 – 141.3 °C, lit = 140.6 - 142.3 °C.) after silica gel flash chromatography (100% hexane - 80% hexane: ethyl acetate gradient); ^{1}H NMR (200 MHz, $CDCl_3$): δ 8.12 (d, *J* = 6.8 Hz, 1H), 7.96 (d, *J* = 7.4 Hz, 1H), 7.55 – 7.32 (m, 4H), 6.73 (dd, *J* = 6.9, 1.7 Hz, 1H), 2.41 (s, 3H). ^{13}C NMR (50 MHz, $CDCl_3$): δ 144.1, 139.4, 135.8, 132.7, 128.5, 128.0, 127.4, 121.8, 116.0, 115.5, 21.3. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 693, 768, 1558, 1636, 2913, 3032, 3439; HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for $C_{14}H_{12}ClN_2$, 243.0684; found, 243.0687.

3-chloro-7-methyl-2-phenylimidazo[1,2-*a*]pyridine 2c: It was obtained as a white solid (93.0 mg, 77% yield, mp 116.2 – 119.5°) after silica gel flash chromatography (100% hexane - 80% hexane : ethyl acetate gradient); ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.12 (*d, J* = 8.1 Hz, 2H), 7.98 (*d,*

J = 7.0 Hz, 1H), 7.48 (*t*, *J* = 7.6 Hz, 2H), 7.41 – 7.34 (*m*, 2H), 6.76 (*d*, *J* = 7.0 Hz, 1H), 2.43 (*s*, 3H);. ^{13}C NMR (100 MHz, $CDCl_3$): δ 144.1, 139.4, 135.9, 132.7, 128.5128.1, 127.4, 121.9, 116.0, 115.5, 104.5 21.3 IR (KBr), $\bar{v}_{max}$ (cm^{-1}): 698, 761, 802, 1466, 2919, 2960, 3439; HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for $C_{14}H_{12}ClN_2$, 243.0684; found, 243.0687.

3-chloro-8-methyl-2-phenylimidazo[1,2-*a*]pyridine 2d:[3c] It was obtained as a white solid (84.6 mg, 70% yield, mp 201.7 – 204.9 °C, lit = 202-203 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^{1}H NMR (200 MHz, $CDCl_3$): δ 8.14 (d, *J* = 6.7 Hz, 1H), 7.96 (d, *J* = 7.0 Hz, 1H), 7.55 – 7.29 (m, 3H), 7.01 (d, *J* = 6.9 Hz, 1H), 6.82 (t, *J* = 6.9 Hz, 1H), 2.65 (s, 3H).^{13}C NMR (50 MHz, $CDCl_3$): δ 144.0, 139.3, 132.8, 130.0, 128.5, 128.0, 127.6, 123.5, 120.5 (2C), 112.9, 16.48. IR (KBr), $\bar{v}_{max}$ (cm^{-1}): 698, 768, 784, 1355, 1475, 2890, 2953, 3440; HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for $C_{14}H_{12}ClN_2$, 243.0684; found, 243.0686.

3,6-dichloro-2-phenylimidazo[1,2-*a*]pyridine 2e:[3c] It was obtained as a orange solid (122.2 mg, 93% yield, mp 157.6–159.2 °C , lit. = 158.5 - 161.3 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^{1}H NMR (200 MHz, $CDCl_3$): δ 8.13 (s, 3H), 8.21 – 7.33 (m, 4H), 7.31 – 7.11 (m, 1H). ^{13}C NMR (50 MHz, $CDCl_3$): δ 142.0, 140.8, 132.0, 128.6, 128.5, 127.4, 126.3, 121.4, 120.6 (2C), 118.0. IR (KBr), $\bar{v}_{max}$ (cm^{-1}): 687, 804, 1082, 1322, 1428, 2924, 3032, 3439; HRMS (ESI$^+$)m/z: $[M+H]^+$ calcd for $C_{13}H_9Cl_2N_2$, 263.0137; found, 263.0142.

2-(4-bromophenyl)-3-chloroimidazo[1,2-*a*]pyridine 2f: It was obtained as a white solid (112.2 mg, 73% yield, mp 125.6-128.1 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^{1}H NMR (300 MHz, $CDCl_3$): δ 8.14 – 8.07 (m, 3H), 8.06 – 7.97 (m, 5H), 7.66 – 7.56 (m, 3H), 7.30 – 7.22 (m, 4H), 6.94 (t, *J* = 6.8 Hz, 1H). ^{13}C NMR (75 MHz,

$CDCl_3$): δ 143.7, 138.7, 131.7, 131.5, 128.9, 125.1, 122.7, 122.4, 117.7, 113.1, 105.8. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 499, 727, 748, 827, 1353, 1468, 1633, 1634, 3039, 3444; HRMS (ESI^+) m/z: $[M+H]^+$ calcd for $C_{13}H_9BrClN_2$, 306.9632; found, 306.9635.

3-chloro-2-(4-methoxyphenyl)imidazo[1,2-*a*]pyridine 2g:[3c] It was obtained as a white solid (64.4 mg, 50% yield, mp 119.9-121.8 °C, lit = 126.2 - 127.5 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (300 MHz, $CDCl_3$): δ 8.14 – 8.02 (m, 3H), 7.61 (dd, *J* = 9.1, 1.1 Hz, 1H), 7.31 – 7.17 (m, 1H), 7.01 (d, *J* = 8.9 Hz, 2H), 6.95 – 6.85 (m, 1H). ^{13}C NMR (75 MHz, $CDCl_3$): δ 159.6, 143.6, 139.7, 128.7, 125.1, 124.6, 122.5, 117.3, 113.9, 112.7, 104.8, 55.2. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 524, 757, 1041, 1240, 1480, 1609, 2840, 3012, 3444; HRMS (ESI^+) m/z: $[M+H]^+$ calcd for $C_{14}H_{12}ClN_2O$, 259.0633; found, 259.0634.

3-chloro-2-(3,4-dimethoxyphenyl)imidazo[1,2-*a*]pyridine 2h: It was obtained as a yellow solid (83.5 mg, 58% yield, mp 106.1−110.0 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (300 MHz, $CDCl_3$): δ 8.09 (d, *J* = 8.0 Hz, 1H), 7.72 (dt, *J* = 3.9, 1.9 Hz, 2H), 7.63 (d, *J* = 9.2 Hz, 1H), 7.28 – 7.20 (m, 1H), 7.02 – 6.88 (m, 2H), 4.01 (s, 3H), 3.94 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$): δ 149.1, 149.0, 143.5, 139.6, 125.3, 124.7, 122.5, 120.0, 117.3, 112.8, 111.0, 110.6, 104.9, 55.9, 55.8. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 583, 748, 1021, 1258, 1436, 2829, 2922, 2946, 3421; HRMS (ESI^+) m/z: $[M+H]^+$ calcd for $C_{15}H_{14}ClN_2O_2$, 289.0738; found, 289.0739.

3-chloro-2-(4-(methylsulfonyl)phenyl)imidazo[1,2-*a*]pyridine 2i: It was obtained as a yellow solid (70.4 mg, 46% yield, mp 78.7-82.7 °C) after silica gel flash chromatography (100% hexane - 50% hexane : ethyl acetate gradient); ^1H NMR (300 MHz,) δ 8.38 (d, *J* = 8.4 Hz, 2H), 8.16 (d, *J* = 6.8 Hz, 1H), 8.05 (d, *J* = 8.4 Hz, 2H), 7.67 (d, *J* = 9.1 Hz, 1H), 7.36 – 7.29 (m, 1H), 7.01 (t, *J*

= 6.8 Hz, 1H), 3.11 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 144.0, 139.5, 138.0, 137.7, 128.0, 127.6, 125.7, 122.9, 118.0, 113.5, 107.1, 44.6. IR (KBr), $\bar{v}_{max}$ (cm^{-1}): 535, 549, 754, 1148, 1308, 1604, 2926, 3439. HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for $C_{14}H_{12}ClN_2O_2S$, 307.0303; found, 307.0303.

3-Chloro-6-methyl-2-(*p*-tolyl)imidazo[1,2-*a*]pyridine 2j:[3c] It was obtained as a white solid (92.2 mg, 72% yield, mp 135.5-139.2 °C, lit = 144.5 - 146.9 °C) after silica gel flash chromatography (100% hexane - 65% hexane : ethyl acetate gradient). ^{1}H NMR (200 MHz, $CDCl_3$) δ 8.02 (d, *J* = 8.1 Hz, 2H), 7.86 (s, 1H), 7.51 (d, *J* = 9.2 Hz, 1H), 7.28 (d, *J* = 7.9 Hz, 2H), 7.06 (dd, *J* = 9.2, 0.7 Hz, 1H), 2.40 (s, 3H), 2.36 (s, 3H). ^{13}C NMR (50 MHz, $CDCl_3$) δ 142.9, 139.8, 138.0, 130.0, 129.3, 128.0, 127.4, 122.7, 120.4, 117.0, 105.0, 21.4, 18.5. IR (KBr), $\bar{v}_{max}$ (cm^{-1}): 508, 579, 720, 799, 822, 993, 1112, 1155, 1177, 1346, 1420, 1483, 1546, 1618, 1640, 2921, 3005, 3033; HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for $C_{15}H_{14}ClN_2$, 257.0840; found, 256.0841.

3-chloro-2-(4-methoxyphenyl)-7-methylimidazo[1,2-*a*]pyridine 2k: It was obtained as a yellow solid (120.0 mg, 88% yield, mp 109.4–112.6 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^{1}H NMR (300 MHz, $CDCl_3$): δ 8.06 (d, *J* = 8.9 Hz, 2H), 7.94 (d, *J* = 6.9 Hz, 1H), 7.35 (s, 2H), 7.00 (d, *J* = 8.9 Hz, 2H), 6.72 (d, *J* = 6.9 Hz, 1H), 3.85 (s,12H), 2.41 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$): δ 159.5, 144.0, 139.3, 135.7, 128.6, 125.3, 121.7, 115.7, 115.3, 113.9, 104.0. IR (KBr), $\bar{v}_{max}$ (cm^{-1}): 519, 851, 1179, 1242 1492, 1604, 2833, 2998, 3450; HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for Chemical Formula: $C_{15}H_{14}ClN_2O$, 273.00481; found, 273.0788.

3-chloro-2-(5-chlorothiophen-3-yl)imidazo[1,2-*a*]pyridine 2l : It was obtained as a yellow solid (123.8 mg, 92% yield, mp 129.9-132.5 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^{1}H NMR (300 MHz, $CDCl_3$): δ 8.02 (dt, *J* = 6.8, 1.7 Hz, 1H), 7.59 (d, *J* = 1.2 Hz, 1H), 7.51 (d, *J* = 3.9 Hz, 1H), 7.32 – 7.17 (m, 1H), 7.02 – 6.88 (m, 2H). ^{13}C

NMR (75 MHz, $CDCl_3$): δ 143.6, 134.8, 134.2, 130.7, 126.8, 125.3, 124.5, 122.5, 117.3, 113.1, 104.5. IR (KBr), $\bar{v}_{max}$ (cm^{-1}): 490, 727, 786, 1003, 1236, 1351, 1435, 1493, 1622, 3039, 3446; HRMS (ESI^+) m/z: $[M+H]^+$ calcd for $C_{11}H_7Cl_2N_2S$, 268.9702; found, 268.9706.

3-bromo-2-phenylimidazo[1,2-*a*]pyridine 3a:[3a] It was obtained as a brown solid (94.2 mg, 69% yield, mp 83.5-84.6 °C, lit = 85 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (300 MHz, $CDCl_3$) δ 8.23 – 8.10 (m, 3H), 7.64 (dd, *J* = 9.1, 1.1 Hz, 1H), 7.54 – 7.45 (m, 2H), 7.43 – 7.38 (m, 1H), 7.31 – 7.20 (m, 1H), 6.97 – 6.89 (m, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 145.4, 142.6, 132.8, 128.4, 128.2, 127.8, 125.0, 123.9, 117.5, 113.0, 91.6. IR (KBr), $\bar{v}_{max}$ (cm^{-1}): 499, 693, 754, 1346, 1468, 1624, 3028, 3435; HRMS (ESI^+) m/z: [M]+ calcd for $C_{13}H_{10}BrN_2$, 273.0022; found, 273.0022.

3-bromo-7-methyl-2-phenylimidazo[1,2-*a*]pyridine 3b:[4a] It was obtained as a white solid (100.5 mg, 70% yield, mp 98.1-100.8°C, lit = 113-115 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (300 MHz, $CDCl_3$) δ 400 MHz, $CDCl_3$) *δ* (ppm): 8.15 – 8.09 (*m*, 2H), 7.99 (*d*, *J* = 7.0 Hz, 1H), 7.49 – 7.44 (*m*, 2H), 7.40 – 7.34 (*m*, 2H), 6.70 (*dd*, *J* = 7.0, 1.4 Hz, 1H), 2.39 (*s*, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 145.9, 142.4, 136.2, 133.1, 128.5, 128.2, 127.9, 123.1, 115.9, 115.7, 90.8, 21.4. IR (KBr), $\bar{v}_{max}$ (cm^{-1}):678, 681, 690, 772, 1140, 1349, 1472, 2914, 3022, 3443. HRMS (ESI^+) m/z: $[M+H]^+$ calcd for $C_{14}H_{12}IN_2$, 286.0178; found, 286.0181.

3-bromo-6-chloro-2-phenylimidazo[1,2-*a*]pyridine 3c:[4b] It was obtained as a white solid (98.4 mg, 64% yield, mp 128.3-130.4 °C, lit = 127.0−129.0 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (400 MHz, $CDCl_3$) δ 8.17 (d, *J* = 1.6 Hz, 1H), 8.09 (d, *J* = 7.3 Hz, 2H), 7.54 (d, *J* = 9.5 Hz, 1H), 7.46 (t, *J* = 7.5 Hz, 2H), 7.39 (d, *J* = 7.2 Hz, 1H), 7.18 (dd, *J* = 9.5, 1.8 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.6, 143.5, 132.3,

128.4, 128.4, 127.7, 126.4, 121.8, 121.4, 117.8, 92.0. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 684, 699, 770, 830, 1062, 1468,1520,3011, 3054. HRMS (ESI^+) m/z: [M+H]+ calcd for $C_{13}H_9BrClN_2$, 306.9632; found, 306.9637.

3-bromo-2-(4-chlorophenyl)imidazo[1,2-*a*]pyridine 3d:[4c] It was obtained as a white solid (119.7 mg, 79% yield, mp 141.2-144.3°C, lit. = 146−148 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (300 MHz, $CDCl_3$) δ 8.18 (d, *J* = 7.0 Hz, 1H), 8.08 (d, *J* = 8.6 Hz, 2H), 7.64 (d, *J* = 9.1 Hz, 1H), 7.45 (d, *J* = 8.6 Hz, 2H), 7.33 – 7.24 (m, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 145.4, 141.3, 134.3, 131.4, 129.1, 128.7, 125.4, 124.0, 117.6, 113.2, 91.7.IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 500, 728, 828, 981, 1014, 1091, 1150, 1232, 1350, 1469, 1632, 2852, 2923, 3041, 3064, 3445; HRMS (ESI^+) m/z: 306.9632 $[M+H]^+$, calcd for $C_{13}H_9BrClN_2$: found, 306.9633.

3-bromo-2-(4-methoxyphenyl)imidazo[1,2-*a*]pyridine 3e:[4c] It was obtained as a white solid (119.7 mg, 79% yield, mp 93.5-97.4°C, lit. = 92−94 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (200 MHz, $CDCl_3$) δ 8.17 – 8.03 (m, 3H), 7.61 (d, *J* = 9.0 Hz, 1H), 7.25 (d, *J* = 7.7 Hz, 1H), 7.01 (d, *J* = 8.7 Hz, 2H), 6.89 (t, *J* = 6.8 Hz, 1H), 3.86 (s, 3H). ^{13}C NMR (50 MHz, $CDCl_3$) δ 159.6, 145.3, 142.5, 129.1, 125.4, 124.8, 123.7, 117.3, 113.8, 112.7, 90.8, 55.2. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 512, 733, 1035, 1240, 1480, 1609, 2928, 3455; HRMS (ESI^+) m/z: $[M+H]^+$ calcd for $C_{14}H_{12}BrN_2$, 303.0128; found, 303.0127.

3-bromo-6-chloro-2-(4-chlorophenyl)-imidazo[1,2-*a*]pyridine 3f:[3a] It was obtained as a white solid (138.5 mg, 81% yield, mp 171.2-175.8 °C, lit = 160 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (400 MHz, $CDCl_3$) δ 8.20 (s, 1H), 8.05 (d, *J* = 8.5 Hz, 2H), 7.56 (d, *J* = 9.5 Hz, 1H), 7.44 (d, *J* = 8.5 Hz, 2H), 7.23 (dd, *J* = 9.5, 1.9

Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.8, 142.5, 134.5, 130.9, 128.9, 128.7, 126.7, 121.9, 121.7, 117.9, 92.1. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 727, 802, 1080, 1331, 1462, 1622, 3068, 3455; HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for $C_{13}H_8BrCl_2N_2$, 340.9242; found, 340.9240.

3-iodo-2-phenylimidazo[1,2-*a*]pyridine 4a:[3a] It was obtained as a white solid (152.0, 95% yield, mp 158.2-160.1°C, lit = 165 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.21 – 8.11 (m, 3H), 7.64 (dd, *J* = 9.0, 1.1 Hz 1H), 7.53 – 7.45 (m, 2H), 7.44 – 7.38 (m, 1H), 7.30 – 7.22 (m, 1H), 6.97 – 6.89 (m, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 145.4, 142.6, 132.8, 128.4, 128.2, 127.8, 125.0, 123.9, 117.5, 113.0, 91.6. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 696, 971, 1229, 1342, 1462, 1627, 3037, 3455; HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for $C_{13}H_{10}IN_2$, 320.9883; found, 320.9884.

3-iodo-7-methyl-2-phenylimidazo[1,2-*a*]pyridine 4b:[4b] It was obtained as a yelow solid (133.6 mg, 80% yield, mp 167.3-171.7 °C, lit = 176.0−177.0 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^{1}H NMR (300 MHz, $CDCl_3$): δ 8.11 – 8.00 (m, 3H), 7.54 – 7.43 (m, 2H), 7.42 – 7.33 (m, 2H), 6.75 – 6.64 (m, 1H), 2.40 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 148.2, 147.6, 136.4, 133.6, 128.3, 128.2, 128.0, 125.4, 115.8, 115.5, 58.1, 21.1. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 696, 766, 978, 1139, 1346, 1464, 1642, 3057, 3448; HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for $C_{14}H_{12}IN_2$, 335.0040; found, 335.0037.

6-chloro-3-iodo-2-phenylimidazo[1,2-*a*]pyridine 4c:[5a] It was obtained as a white solid (79.9 mg, 40% yield, mp 139.0-142.3°C, lit = mp 135- 136 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient);^{1}H NMR (400 MHz, $CDCl_3$) δ 8.17 (s, 1H), 8.09 (d, *J* = 7.3 Hz, 2H), 7.54 (d, *J* = 9.5 Hz, 1H), 7.46 (t, *J* = 7.5 Hz, 2H), 7.39 (d, *J* = 7.2 Hz, 1H), 7.18 (dd, *J* = 9.5, 1.8 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.6, 143.5, 132.3, 128.4, 128.4, 127.7,

126.4, 121.8, 121.4, 117.8, 92.0. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 696, 768, 1077, 1466, 1670, 2922, 3423; HRMS (ESI^+) m/z: $[M+H]^+$ calcd for $C_{13}H_9ClIN_2$, 354.9494; found, 354.9494.

3-iodo-2-(4-chlorophenyl)imidazo[1,2-*a*]pyridine 4d:[4b] It was obtained as a white solid (157.8 mg, 89% yield, mp 159.0-162.3°, lit = 157.0−158.0 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (300 MHz, $CDCl_3$) δ 8.21 (dd, *J* = 6.9, 1.3 Hz, 1H), 8.02 (dd, *J* = 8.8, 1.1 Hz, 2H), 7.65 – 7.55 (m, 1H), 7.45 (dd, *J* = 8.5, 1.5 Hz, 2H), 7.31 – 7.22 (m, 1H), 6.94 (td, *J* = 6.8, 1.5 Hz, 1H). ^{13}C NMR (50 MHz, $CDCl_3$) δ ^{13}C NMR (50 MHz, $CDCl_3$) δ 148.1, 146.8, 134.2, 132.0, 129.7, 128.5, 126.5, 125.8, 117.5, 113.3, 59.5. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 504, 724, 742, 818, 836, 973, 1012, 1091, 1142, 1230, 1342, 1463, 1493, 1628, 2854, 2925, 3072, 3435; HRMS (ESI^+): 354.9494 $[M+H]^+$, calculated for $[C_{13}H_9ClIN_2]^+$: 354.9498 .

3-iodo-2-(4-methoxyphenyl)imidazo[1,2-*a*]pyridine 4e: [5b] It was obtained as a yelow solid (169.8 mg, 97% yield, mp 126.6-130.7 °C, lit = 116−118 °C.) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (300 MHz, $CDCl_3$) δ 8.23 – 8.13 (m, 1H), 8.02 (d, *J* = 8.0 Hz, 2H), 7.58 (d, *J* = 8.4 Hz, 1H), 7.32 – 7.12 (m, 1H), 7.01 (d, *J* = 7.6 Hz, 2H), 6.96 – 6.75 (m, 1H), 3.86 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 159.6, 147.9, 147.8, 129.7, 126.3, 126.0, 125.3, 117.2, 113.7, 112.9, 58.6 55.2. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 725, 833, 1247, 1340, 1468, 1532, 1611, 2951, 3453; HRMS (ESI^+) m/z: $[M+H]^+$ calcd for $C_{14}H_{12}IN_2O$, 350.9989; found, 350.9991.

6-chloro-2-(4-chlorophenyl)-3-iodoimidazo[1,2-*a*]pyridine 4f:[3a] It was obtained as a white solid (188.6 mg, 97% yield, mp 205.1-209.9 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^1H NMR (400 MHz,) δ 8.28 (s, 1H), 8.00 (d, *J* = 8.4 Hz,

2H), 7.56 (d, *J* = 9.4 Hz, 1H), 7.46 (d, *J* = 8.4 Hz, 2H), 7.27 – 7.22 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 147.8, 146.5, 134.6, 131.6, 129.6, 128.6, 127.2, 124.5, 121.8, 117.9, 60.0. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 522, 800, 829, 1080, 1455, 1642, 3080, 3448; HRMS (ESI$^+$) m/z: [M+ H]$^+$ calcd for $C_{13}H_7Cl_2IN_2$, 388.9104; found, 388.3103.

3-chloro-2-phenylimidazo[1,2-*a*]pyrimidine 5a: It was obtained as a white solid (60.8 mg, 53% yield, mp 130.5-133.5 °C) after silica gel flash chromatography (100% hexane - 55% hexane : ethyl acetate gradient); ^{1}H NMR (300 MHz, $CDCl_3$): δ 8.56 (dd, *J* = 4.1, 1.9 Hz, 1H), 8.38 (dt, *J* = 6.8, 1.6 Hz, 1H), 8.22 (dq, *J* = 6.2, 1.3 Hz, 2H), 7.49 (ddd, *J* = 8.7, 5.0, 1.3 Hz, 2H), 7.44 – 7.35 (m, 1H), 7.05 – 6.94 (m, 1H). ^{13}C NMR (75 MHz, $CDCl_3$): δ 149.89, 146.25, 141.24, 131.78, 130.16, 128.73, 128.50, 127.66, 109.08, 104.25. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 696, 795, 1001, 1217, 1340, 1489, 1605, 3004, 3053, 3449; HRMS (ESI$^+$) m/z: [M+H]$^+$ calcd for $C_{12}H_9ClN_3$, 230.0480; found, 230.0481.

3-iodo-2-phenylimidazo[1,2-*a*]pyrimidine 5b: It was obtained as a yellow solid (149.3 mg, 93% yield, mp 127.1-132.4 °C) after silica gel flash chromatography (100% hexane - 70% hexane : ethyl acetate gradient); ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.62 – 8.45 (m, 2H), 8.17 (d, *J* = 7.5 Hz, 2H), 7.60 – 7.33 (m, 3H), 6.98 (dd, *J* = 6.6, 4.3 Hz, 1H).^{13}C NMR (75 MHz, $CDCl_3$) δ 151.0, 150.5, 149.4, 133.8, 132.8, 128.8, 128.5, 128.3, 109.5, 58.29. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 698, 759, 1211, 1493, 1606, 3041, 3448; (ESI$^+$) m/z: [M+H]$^+$ calcd for $C_{12}H_9IN_3$, 321.9836; found, 321.9840.

3-Chloro-7-methyl-2-phenylimidazo[1,2-*a*]pyrimidine 5c: It was obtained as a white solid (60 mg, 52% yield; mp 125.1-128.4) after silica gel flash chromatography (50:50 to 40:60, hexane:ethyl acetate gradient); ^{1}H NMR (200 MHz, $CDCl_3$) δ (ppm): 8.22 (d, *J* = 7.1 Hz, 3H),

7.52 – 7.37 (m, 3H), 6.83 (d, *J* = 7.0 Hz, 1H), 2.64 (s, 3H); ^{13}C NMR (50 MHz, $CDCl_3$) δ (ppm): 160.5, 146.4, 140.5, 132.3, 129.6 (2C, overlapped signals), 128.6, 127.7, 110.1, 103.7, 25.1; IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 161.11, 151.10, 148.75, 133.26, 133.19, 128.72, 128.48, 128.44, 110.60, 56.85, 24.83; HRMS (ESI$^+$): $[M+H]^+$, calculated for $C_{13}H_{11}ClN_3$ 244.0636; found, 244.0640.

3-Bromo-7-methyl-2-phenylimidazo[1,2-*a*]pyrimidine 5d. It was obtained as a white solid (74.6 mg, 52% yield; mp 96.5-99.3 °C) after silica gel flash chromatography (50:50 to 40:60, hexane:ethyl acetate gradient); ^{1}H NMR (400 MHz, $CDCl_3$) δ (ppm): 8.27 (d, *J* = 7.0 Hz, 1H), 8.25 – 8.20 (m, 2H), 7.48 (t, *J* = 7.6 Hz, 2H), 7.39 (t, *J* = 7.3 Hz, 1H), 6.83 (d, *J* = 7.0 Hz, 1H), 2.65 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ (ppm): 160.68, 148.22, 143.36, 132.59, 130.82, 128.68, 128.54, 127.97, 110.36, 89.44, 24.99; ; IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 679, 691, 763, 828, 983, 1030, 1146, 1212, 1228, 1342, 1422, 1471, 1503, 1618, 3060; HRMS (ESI$^+$) m/z: $[M+H]^+$ calcd for $C_{13}H_{11}BrN_3$, 288.0131; found, 288.0135.

3-Iodo-7-methyl-2-phenylimidazo[1,2-*a*]pyrimidine 5e: It was obtained as a light yellow solid (127.3 mg, 76% yield; mp 207,1-211,9 °C) after silica gel flash chromatography (50:50 to 40:60, hexane:ethyl acetate gradient); ^{1}H NMR (200 MHz, $CDCl_3$) δ (ppm): 8.31 (d, *J* = 7.0 Hz, 1H), 8.18 (d, *J* = 6.8 Hz, 2H), 7.52 – 7.35 (m, 3H), 6.82 (d, *J* = 7.0 Hz, 1H), 2.67 (s, 3H); ^{13}C NMR (50 MHz, $CDCl_3$) δ (ppm): 161.11, 151.10, 148.75, 133.26, 133.19, 128.72, 128.48, 128.44, 110.60, 56.85, 24.83. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 696, 763, 781, 979, 1026, 1142, 1210, 1336, 1432, 1466, 1507, 1620; HRMS (ESI$^+$): $[M+H]^+$, calculated for $C_{13}H_{11}IN_3$: 335.9992; found, 335.9999.

3-bromo-1*H*-indazole 5f:[5c] It was obtained as a white solid (191.1 mg, 97% yield) after silica gel flash chromatography (100% hexanes - 70% hexanes ethyl acetate gradient);^{1}H NMR (400 MHz, $CDCl_3$) δ12.55 (s, 1H), 7.67 (dd, *J* = 20.7, 8.4 Hz, 1H), 7.46 (t, *J* = 8.0 Hz, 1H), 7.28 – 7.09 (m,

1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 141.2, 128.1, 122.8, 122.2, 121.8, 120.0, 110.8. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 732, 1041, 1344, 1482, 1624, 2924, 3184, 3389;

3-iodo-1*H*-indazole 5g:[5d] It was obtained as a yellow solid (10 9.8 mg, 45% yield,) after silica gel flash chromatography (100% hexanes - 70% hexanes ethyl acetate gradient); ^{1}H NMR (300 MHz, $CDCl_3$) δ 12.08 (s, 1H), 7.67 (d, *J* = 8.4 Hz, 1H), 7.53 (d, *J* = 8.2 Hz, 1H), 7.47 (t, *J* = 7.7 Hz, 1H), 7.25 (d, *J* = 6.9 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 140.6, 128.0, 127.4, 121.8, 121.2, 110.5, 93.5. HRMS (Q-TOF) m/z: HRMS (ESI$^+$) m/z: [M-H]+ calcd for $C_7H_4IN_2$, 242.9414; found, 242.9417.

5-bromo-3-methyl-6-phenylimidazo[2,1-*b*]thiazole 5h: It was obtained as a white solid (388.0 mg, 81% yield, 131.2-133.8 °C mp) after silica gel flash chromatography (100% hexanes - 70% hexanes ethyl acetate gradient); ^{1}H NMR (200 MHz, DMSO-d_6) δ 7.91 (d, *J* = 7.1 Hz, 2H), 7.59 – 7.24 (m, 3H), 6.98 (s, 1H), 2.65 (s, 3H). ^{13}C NMR (50 MHz, DMSO) δ 149.8, 143.1, 133.0, 129.7, 128.3, 127.5, 126.8, 109.1, 90.4, 14.6. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 680, 763, 1290, 1480, 1602, 2924, 3432; HRMS (ESI$^+$) m/z: [M]+ calcd for $C_{12}H_{10}BrN_2S$, 292.9743; found 292.9745.

5-iodo-3-methyl-6-phenylimidazo[2,1-*b*]thiazole 5i: It was obtained as a white solid (316.0 mg, 93% yield, mp 171.2-175.8 °C) after silica gel flash chromatography (100% hexanes - 70% hexanes ethyl acetate gradient); ^{1}H NMR (200 MHz, DMSO-d_6) δ 7.98 – 7.72 (m, 1H), 7.54 – 7.28 (m, 2H), 6.96 (s, 1H), 2.71 (d, *J* = 1.4 Hz, 1H). ^{13}C NMR (50 MHz, DMSO-d_6) δ 152.10, 149.14, 134.10, 130.35, 128.14, 127.86, 127.52, 109.19, 57.25, 16.11. IR (KBr), $\bar{\nu}_{max}$ (cm^{-1}): 685, 763, 1473,0 1744, 2924, 3441; HRMS (ESI$^+$) m/z: [M]+ calcd for $C_{12}H_{10}IN_2S$, 340.9604; found 340.9611.

3-((4-methoxyphenyl)ethynyl)-2-phenylimidazo[1,2-*a*]pyridine 6: It was obtained as a white solid (54.32 mg, 67% yield, mp 155.3-157.0 °C) after silica gel flash chromatography (100% hexanes - 70% hexanes ethyl acetate gradient); ^{1}H NMR (200 MHz, $CDCl_3$) δ 8.36 (t, *J* = 6.5 Hz, 3H), 7.66 (d, *J* = 9.0 Hz, 1H), 7.59 – 7.19 (m, 6H), 6.93 (d, *J* = 8.8 Hz, 3H), 3.85 (s, 3H). ^{13}C NMR (50 MHz, $CDCl_3$) δ 160.0, 147.5, 145.1, 133.6, 132.8, 128.5, 128.4, 127.2, 126.0, 125.1, 117.4, 114.7, 114.2, 112.8, 105.0, 101.1, 55.3. HRMS (ESI^+) m/z: $[M+H]^+$ calcd for $C_{22}H_{17}Br_2N_2O$, 325.1335; found 325.1335.

2,3-diphenylimidazo[1,2-*a*]pyridine 7:[3a] It was obtained as a white solid (64.8 mg, 96% yield, mp 146.3-149.1 °C lit = 148 ^{o}C) after silica gel flash chromatography (100% hexanes - 70% hexanes ethyl acetate gradient);^{1}H NMR (200 MHz, $CDCl_3$) δ 7.94 (d, *J* = 6.9 Hz, 1H), 7.68 (d, *J* = 8.1 Hz, 2H), 7.57 – 7.35 (m, 3H), 7.28-7.14 (m, 4H), 6.70 (t, *J* = 6.7 Hz, 1H). ^{13}C NMR (50 MHz, $CDCl_3$) δ 144.7, 142.3, 134.1, 130.6, 1298, 129.4, 128.8, 128.2, 128.0, 127.4, 124.6, 123.18, 121.0, 117.4, 112.2.

V. References

1 (a) Seferoğlu, Z.; Ihmels, H.; Şahinc, E. Synthesis and photophysical properties of fluorescent arylstyrylimidazo[1,2-a]pyridine-based donor-acceptor chromophores. *Dyes Pigm*. **2015**, *113*, 465-473. (b) Mukherjee, C.; Watanabe, K. T.; Biehl, E. R. Microwave assisted synthesis of novel imidazo [2,1-*b*]thiazole derivative attached to quinoxalinones. *Tetrahedron Lett.* **2012**, *53*, 6008-6014.

2 (a) De Almeida, L. S.; Esteves, P. M.; de Mattos, M. C. S. Tribromoisocyanuric acid: A new reagent for regioselective cobromination of alkenes. *Synlett* **2006**, 1515-1518. (b) W. Gottardi, Über die trijodisocyanursäure. *Monatsh. Chem.* **1970**, *101*, 655-661.

3 (a) Semwal, R.; Chitrakar, R; Kumar, R.; Meena, R.; Adimurthy, S. *J. Org. Chem.* **2019**, *84*, 792. (b) Li, J.;Tang, J.; Wu, Y.; He, Q.; Yu. Y. Transition-metal-free regioselective C–

H halogenation of imidazo[1,2-a]pyridines: sodium chlorite/bromite as the halogen source. *RSC Adv.* **2018**, *8*, 5058-5062. (c) Xiao, X,; Xie, Y.; Bai, S.; Deng, Y.; Jiang, H.; Zeng W. Transition-metal-free tandem chlorocyclization of amines with carboxylic acids: access to chloroimidazo[1,2-*α*]pyridines. *Org. Lett.* **2015**, *17*, 3998-4001.

4 (a) Liu, Y.; Lu, L.; Zhou, H.; Xu, F.; Ma, C.; Huang, Z.; Xu, J.; Xu, S. Chemodivergent synthesis of *N*-(pyridin-2-yl)amides and 3-bromoimidazo[1,2-*a*]pyridines from *α*-bromoketones and 2-aminopyridines. *RSC Adv.* **2019**, *9*, 34671-34676. (b) Katrun, P.; Kuhakarn. C. $K_2S_2O_8$-Mediated halogenation of 2-arylimidazo[1,2-*a*]pyridines using sodium halides as the halogen sources. *Tetrahedron. Lett.* **2019**, *60*, 989-993.(c) Zhou, X.; Yan, H.; Ma, C.; He, Y.; Li, Y.; Cao, J.; Yan, R.; Huang, G. Copper-mediated aerobic oxidative synthesis of 3-bromo-imidazo[1,2-*a*]pyridines with pyridines and enamides. *J. Org. Chem.* **2016**, *81*, 25-31.

5 (a) Mondal, S.; Samanta, S.; Singsardar, M.; Mishra. S.; Mitra, S.; Hajra, A. Zwitterionic-type molten salt catalyzed iodination in water: Synthesis of iodoimidazoheterocycles. *Synthesis* **2016**, *48*, 4009-4015 (b) Zhou, B.; Yuan, Y.; Jin, H.; Liu, Y. I_2O_5-mediated iodocyclization cascade of *N*-(1-arylallyl)pyridine-2-amines with concomitant C═C bond cleavage: A synthesis of 3-iodoimidazo[1,2-*a*]pyridines. *J. Org. Chem.* **2019**, *84*, 5773-5782. (c) Tang, R. J.; Milcent, T.; Crousse, B. Regioselective halogenation of arenes and heterocycles in hexafluoroisopropanol. *J. Org. Chem.* **2018**, *83*, 930-938. (d) Jiang, P.-P.; Yang, X. J. A quick, mild and efficient bromination using a CFBSA/KBr system *RSC Adv.* **2016**, *6*, 90031-900344.

VI. NMR Spectra

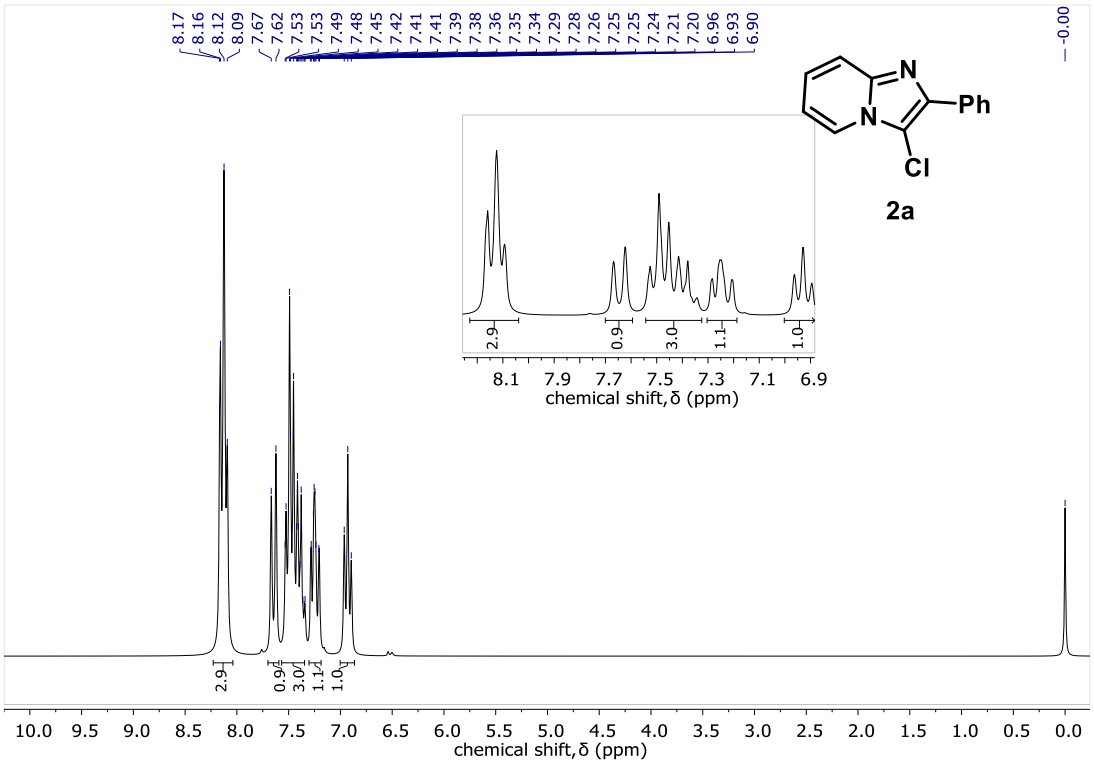


Figure S-01. ^{1}H NMR (200 MHz, $CDCl_3$) of compound **2a**.

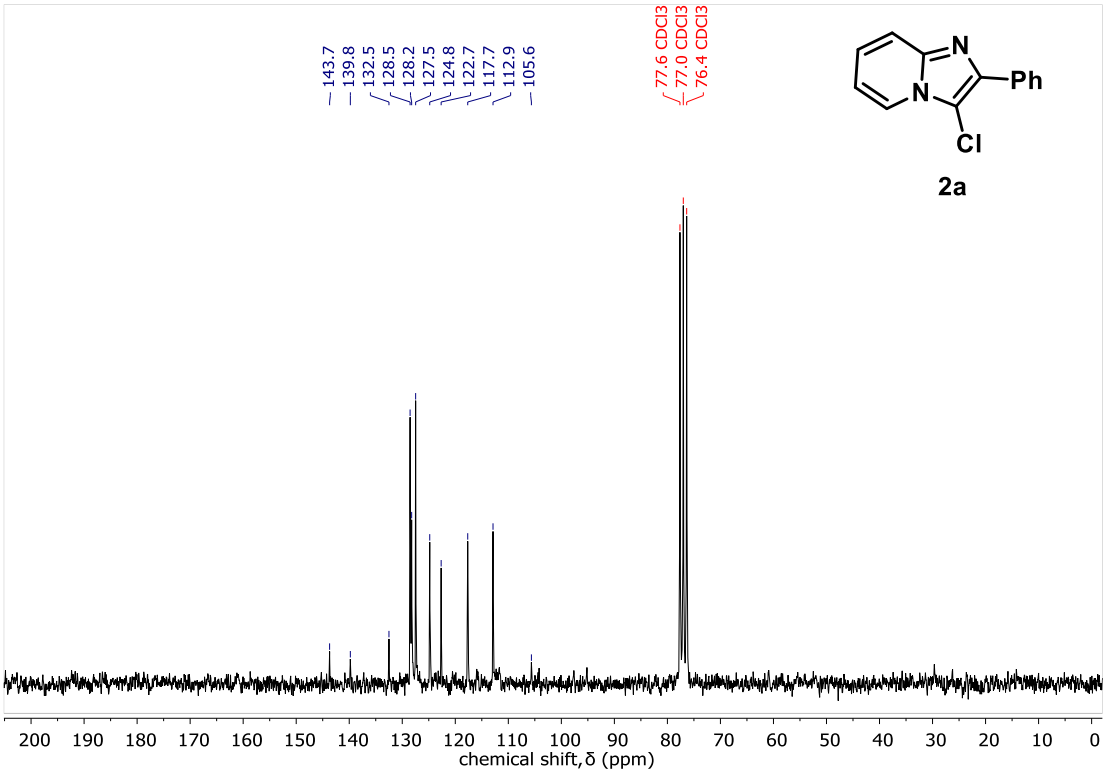


Figure S-02. ^{13}C NMR (50 MHz, $CDCl_3$) of compound **2a**.

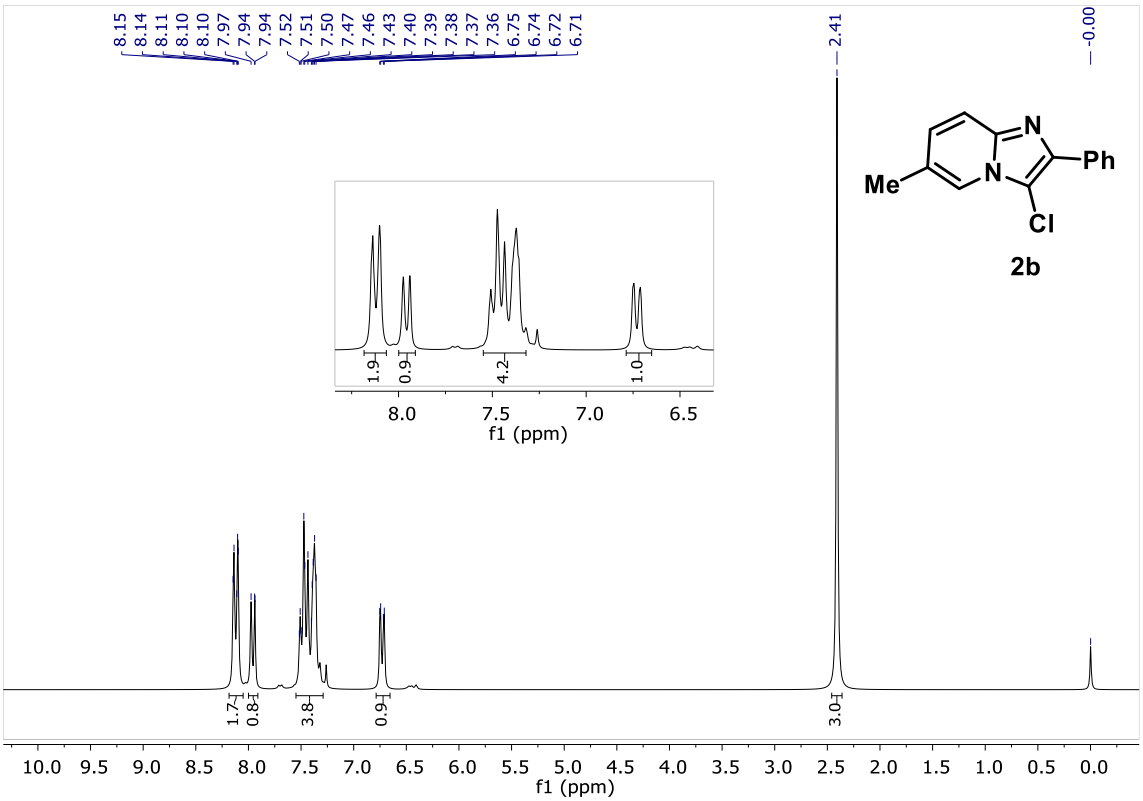


Figure S-03. ^{1}H NMR (200 MHz, $CDCl_3$) of compound **2b**.

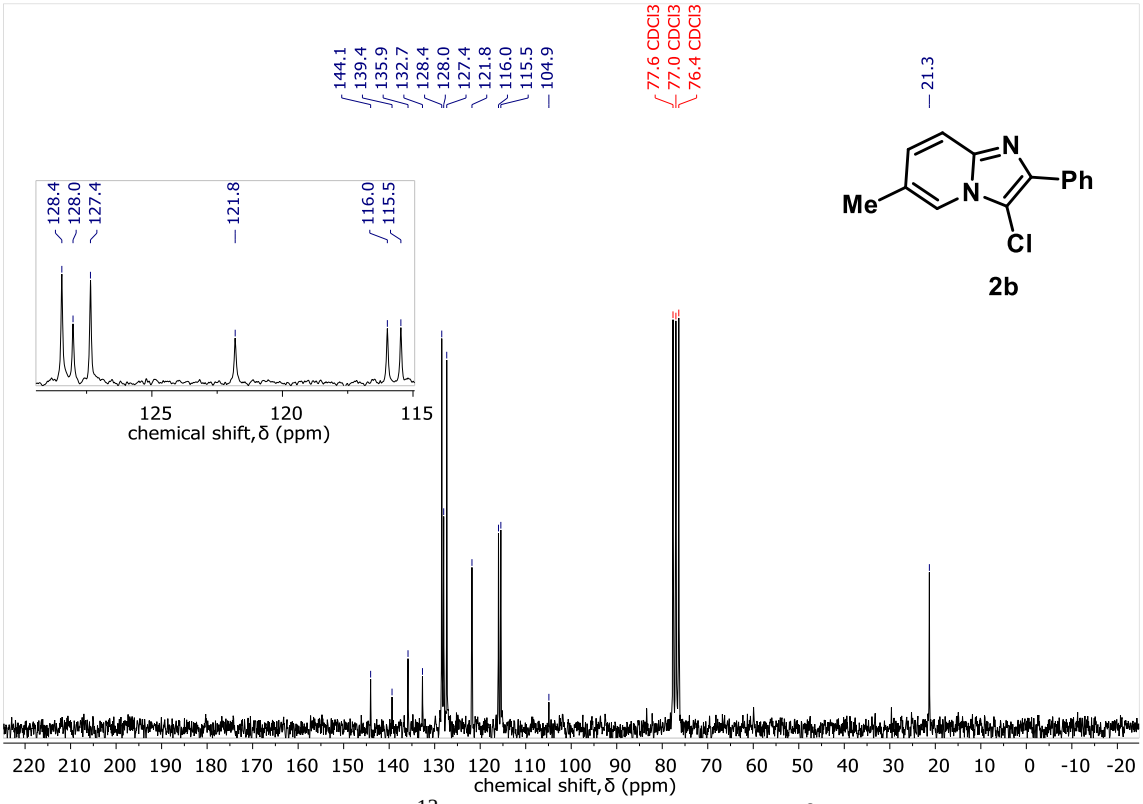


Figure S-04. ^{13}C NMR (50 MHz, $CDCl_3$) of compound **2b**.

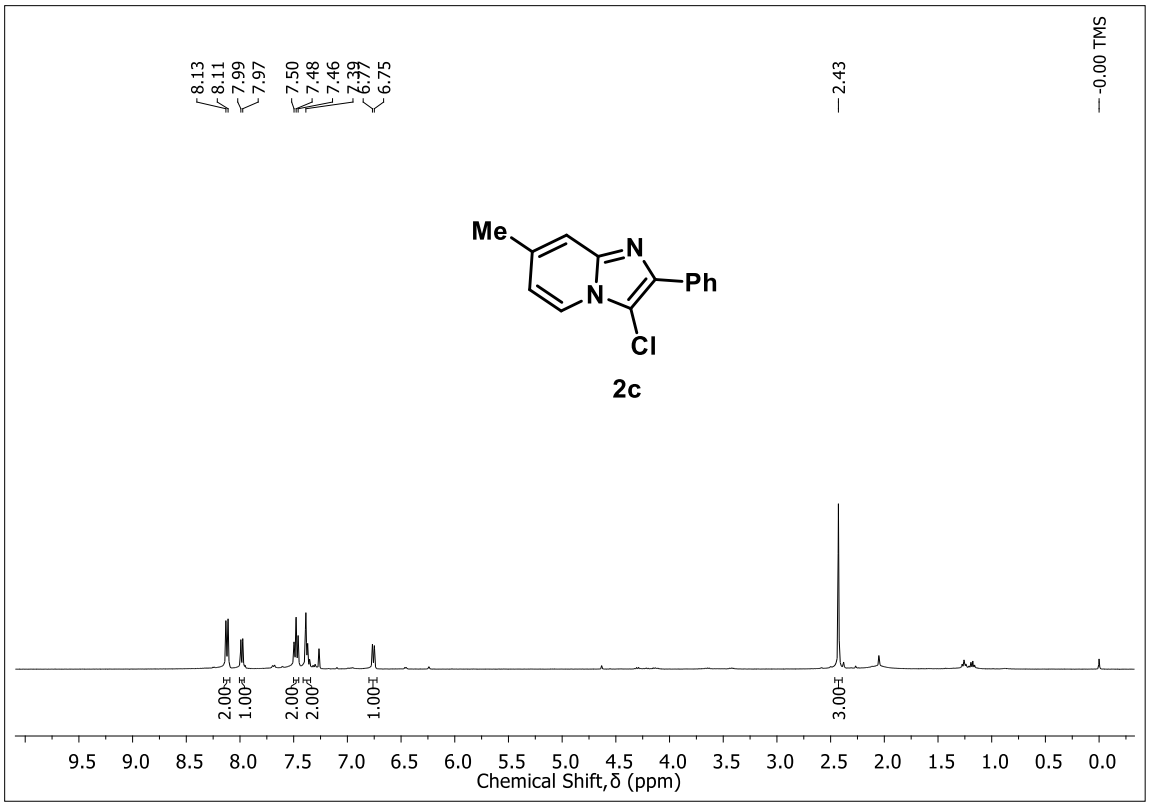


Figure S-05. ^{1}H NMR (400 MHz, $CDCl_3$) of compound **2c**.

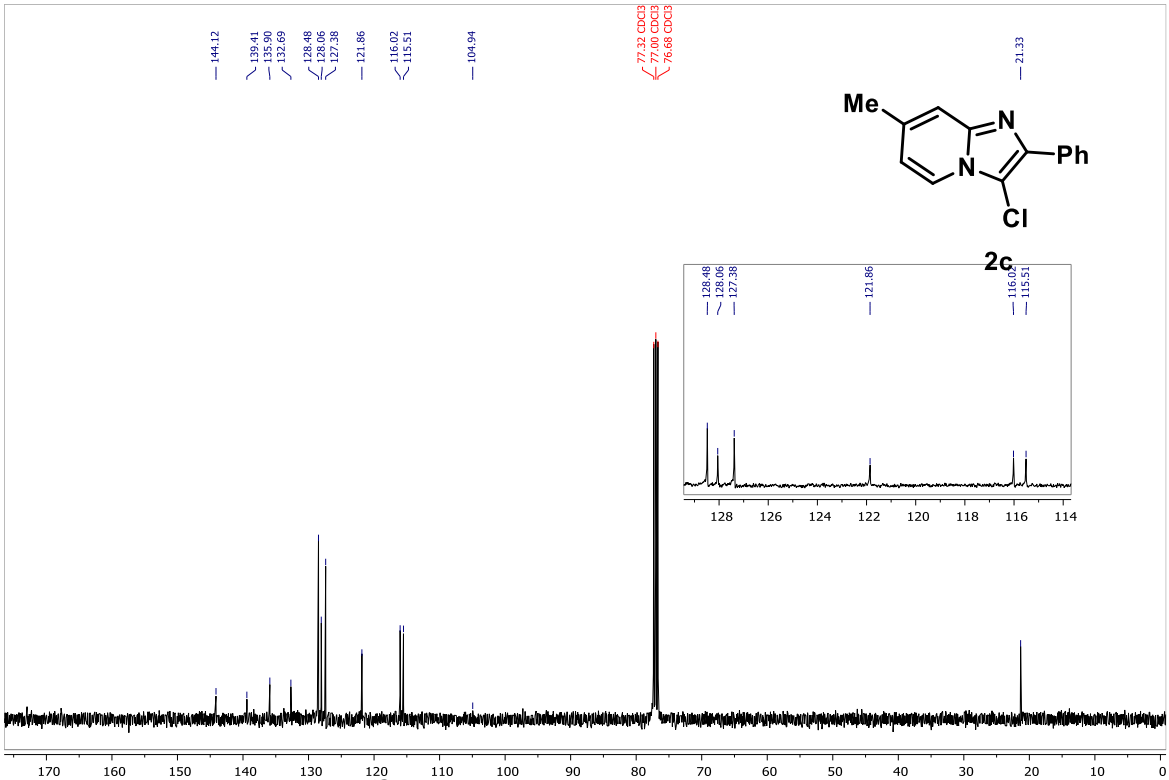


Figure S-06. ^{13}C NMR (100 MHz, $CDCl_3$) of compound **2c**.

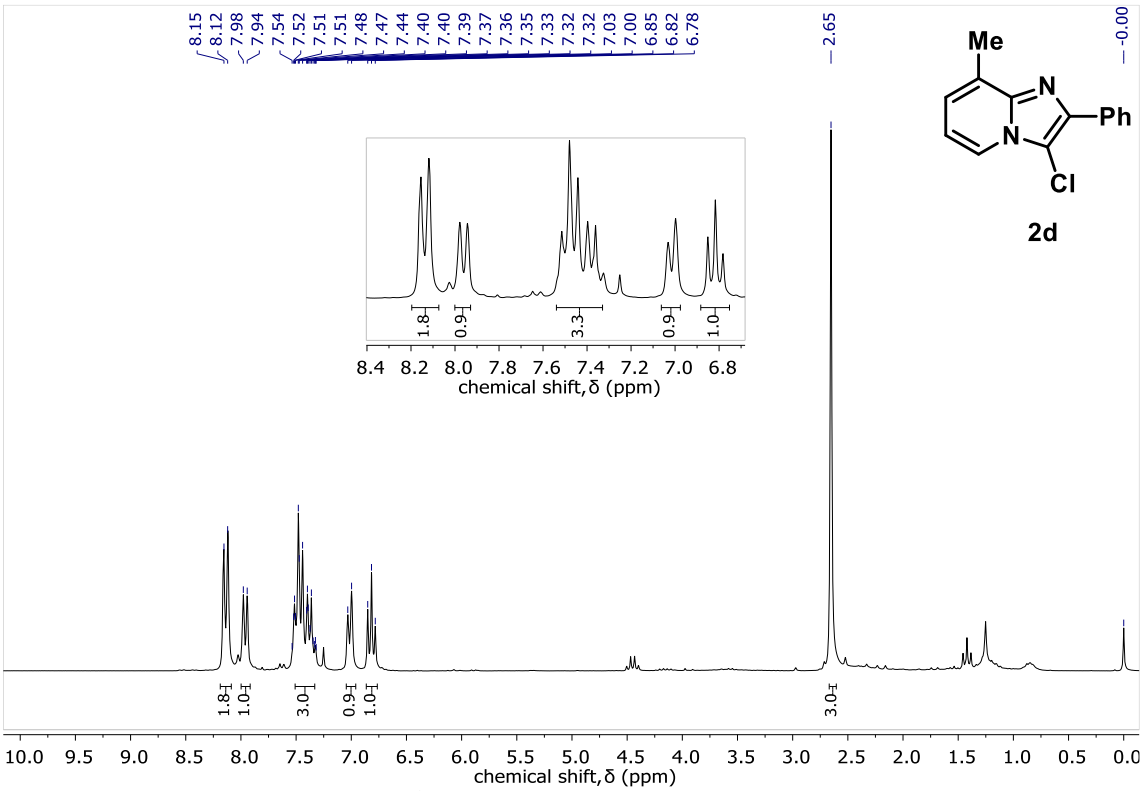


Figure S-07. ^{1}H NMR (200 MHz, $CDCl_3$) of compound **2d**.

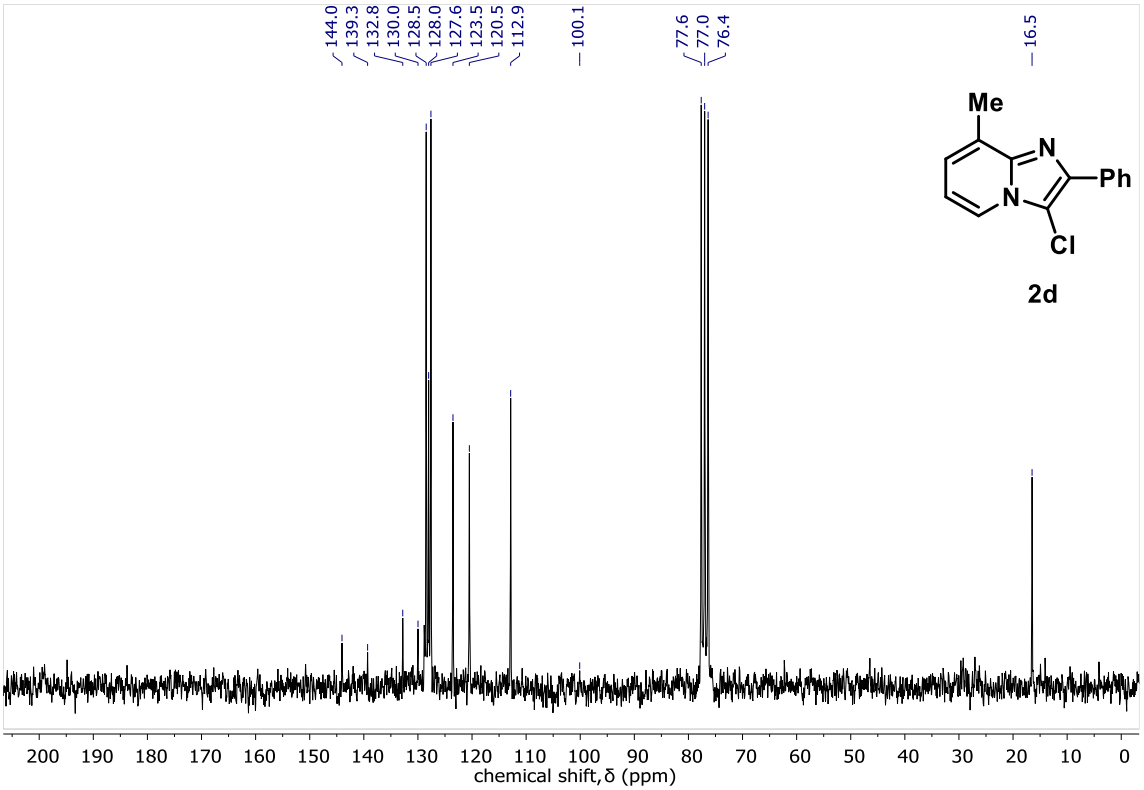


Figure S-08. ^{13}C NMR (50 MHz, $CDCl_3$) of compound **2d**.

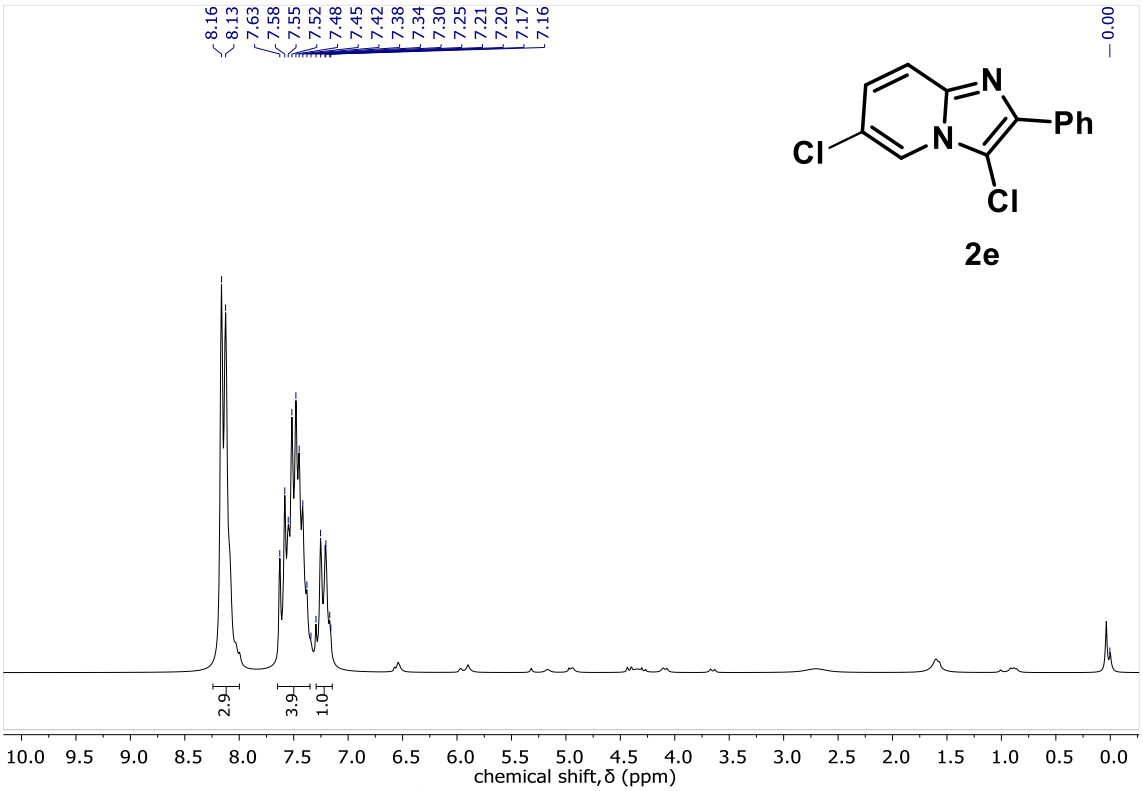


Figure S-09. ^{1}H NMR (200 MHz, $CDCl_3$) of compound **2e**.

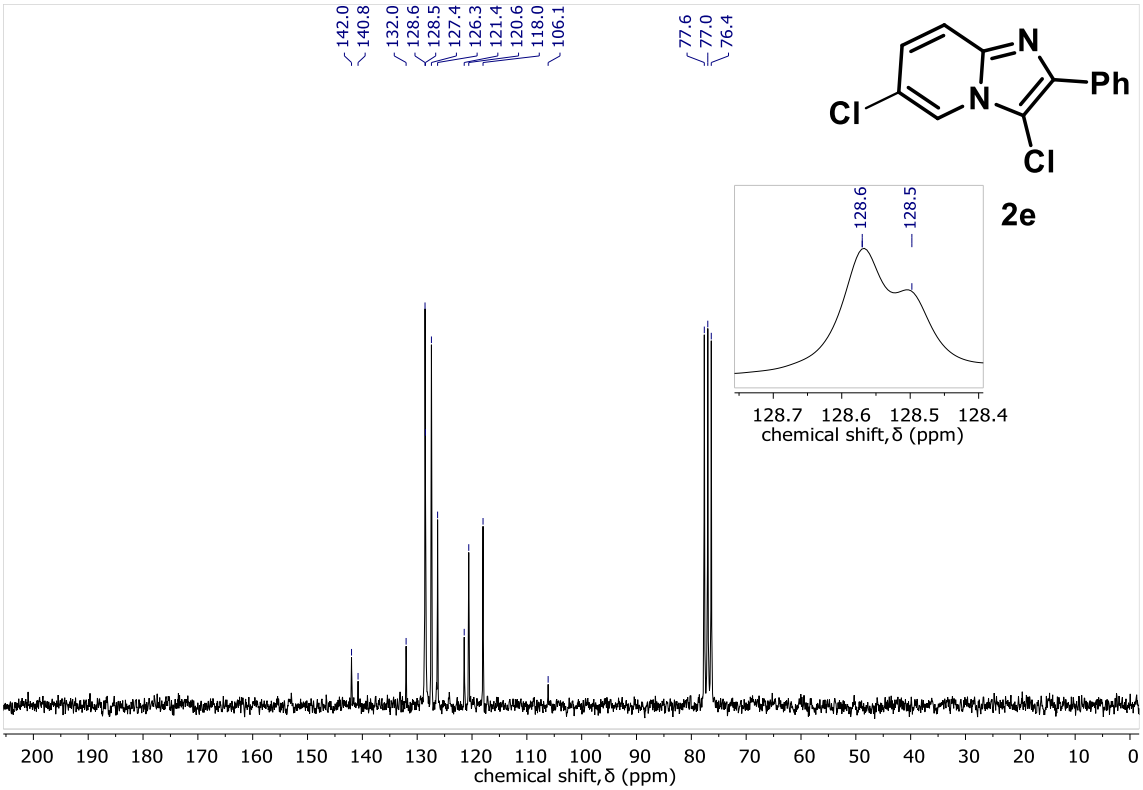


Figure S-10. ^{13}C NMR (50 MHz, $CDCl_3$) of compound **2e**.

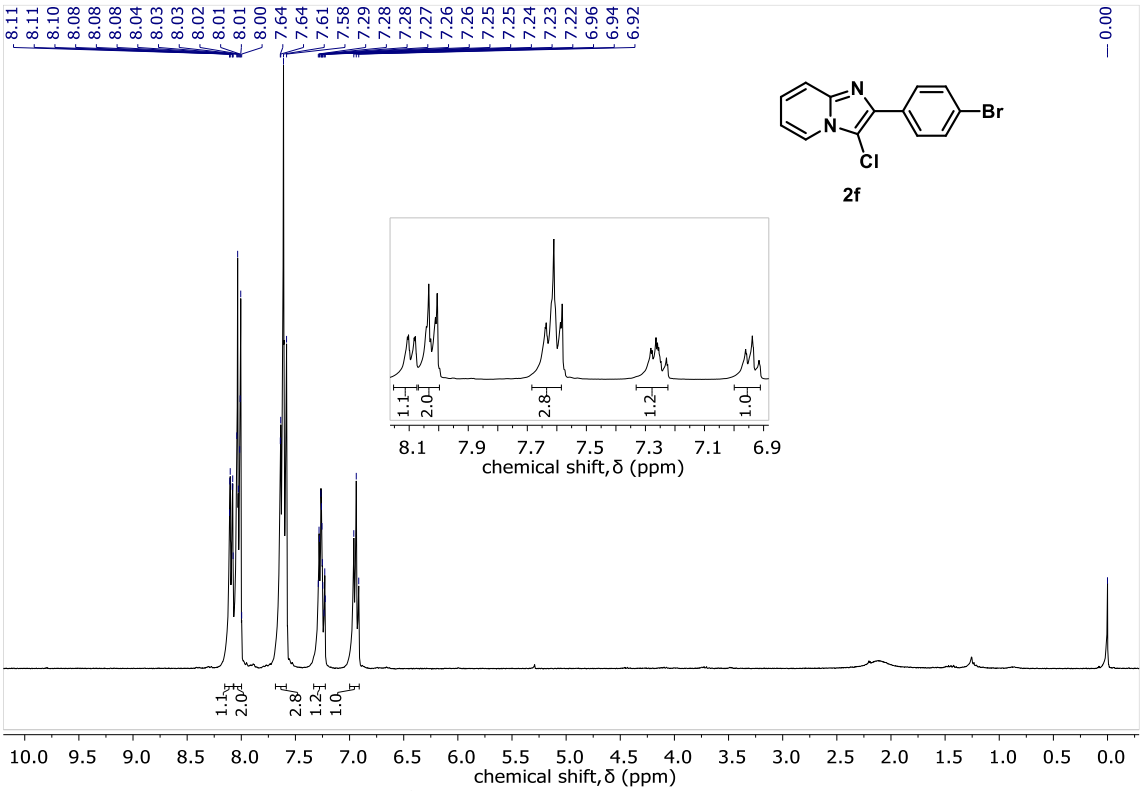


Figure S-11. ^{1}H NMR (d300 MHz, $CDCl_3$) of compound **2f** .

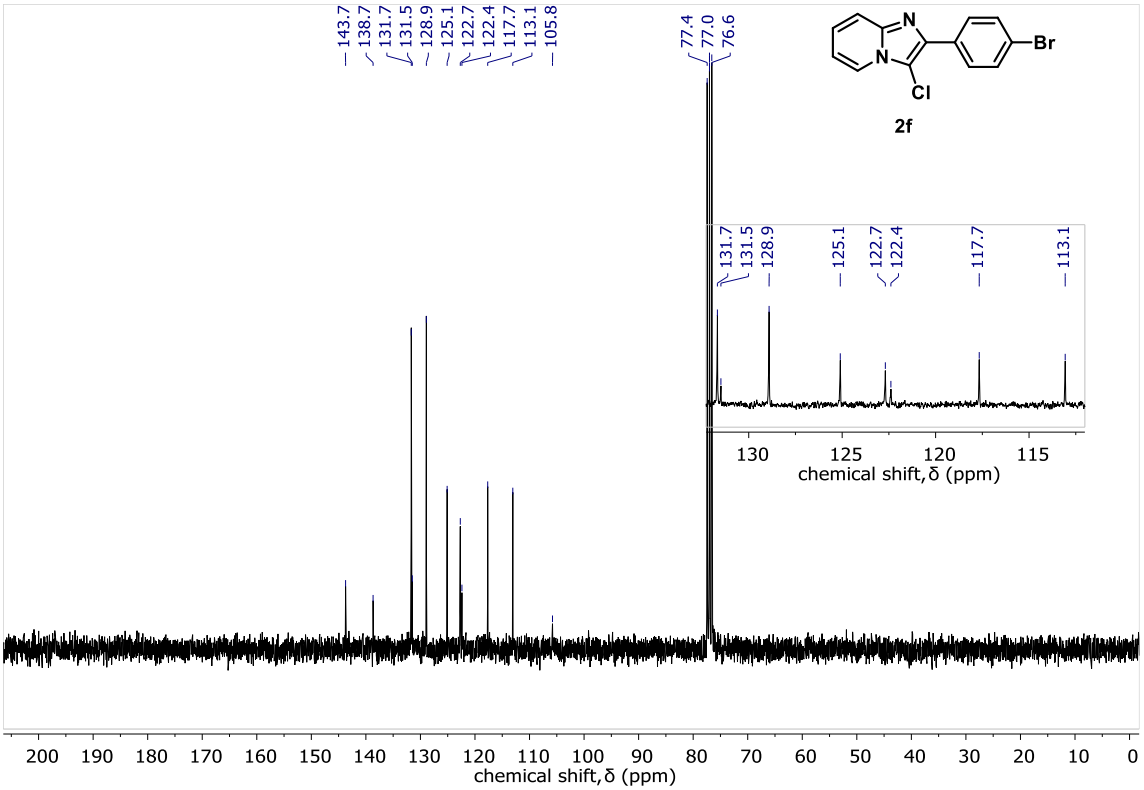


Figure S-12. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **2f** .

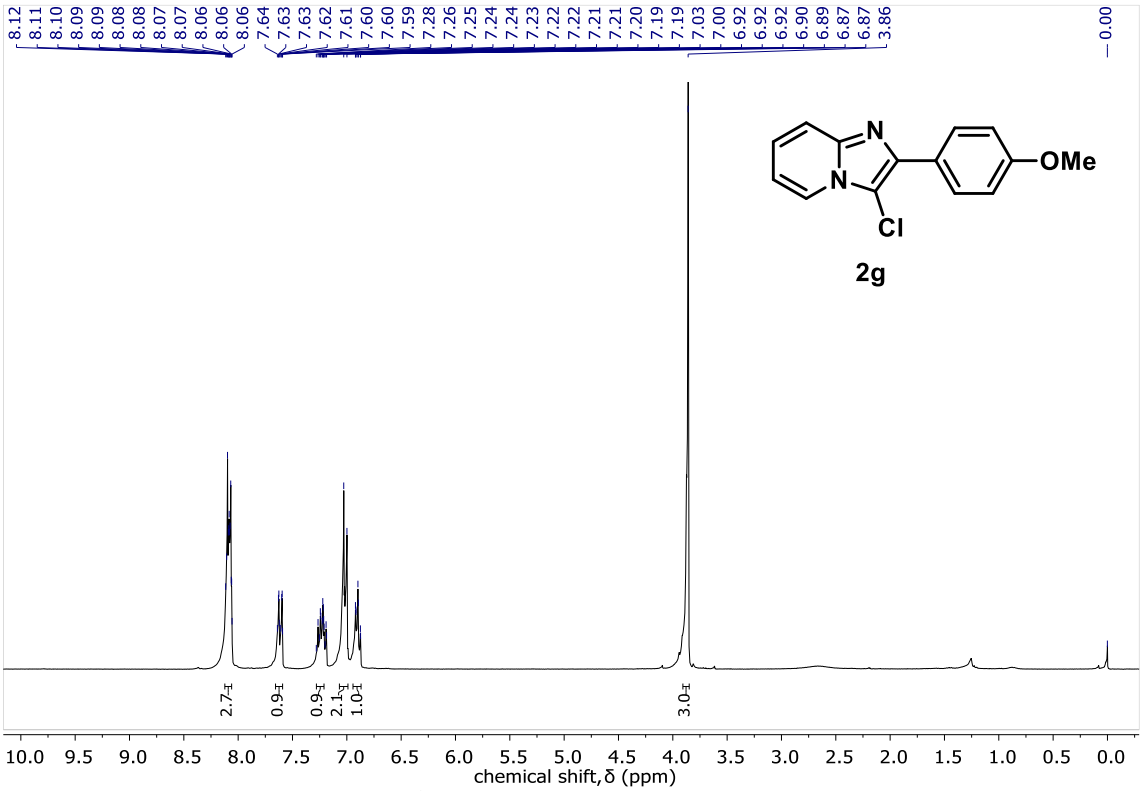


Figure S-13. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **2g**.

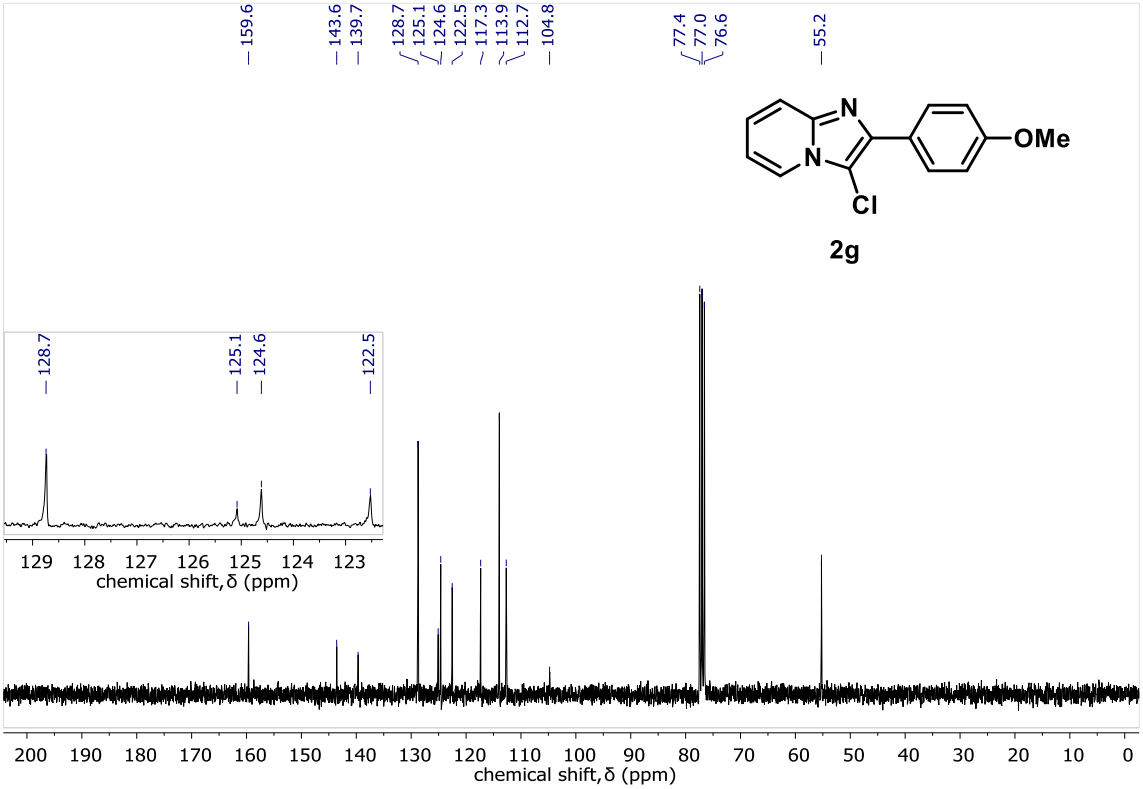


Figure S-14. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **2g**.

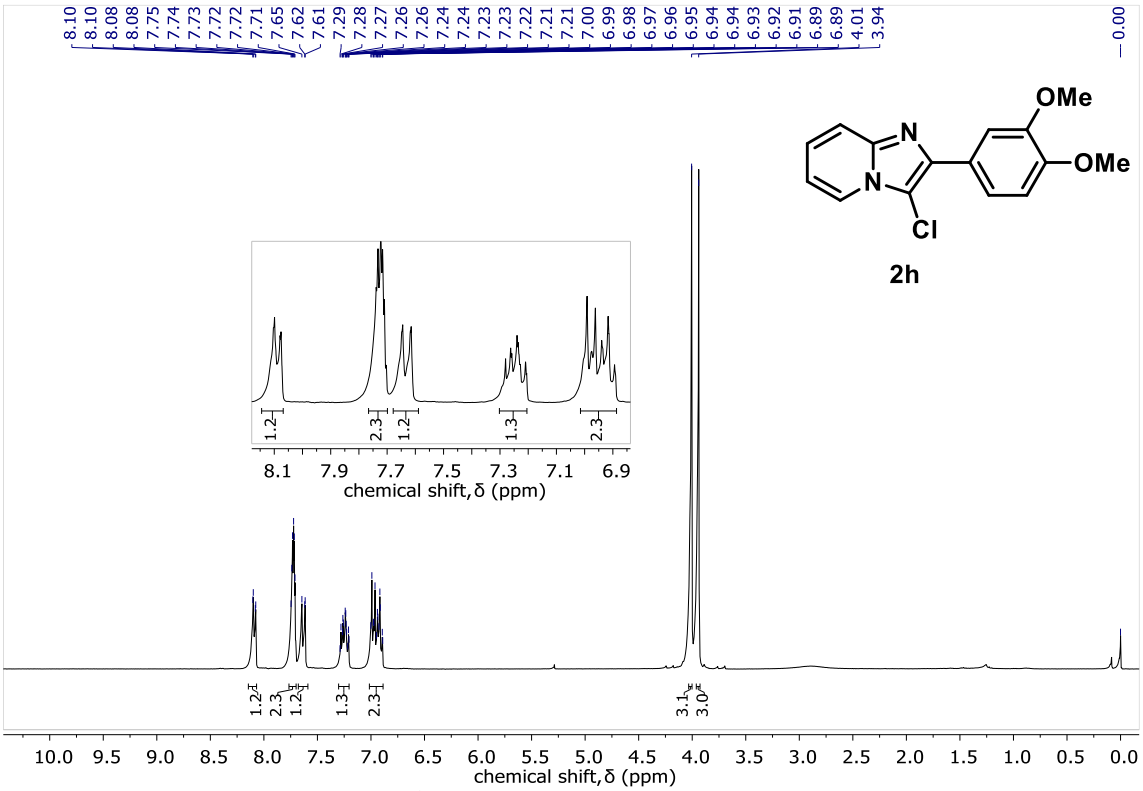


Figure S-15. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **2h**.

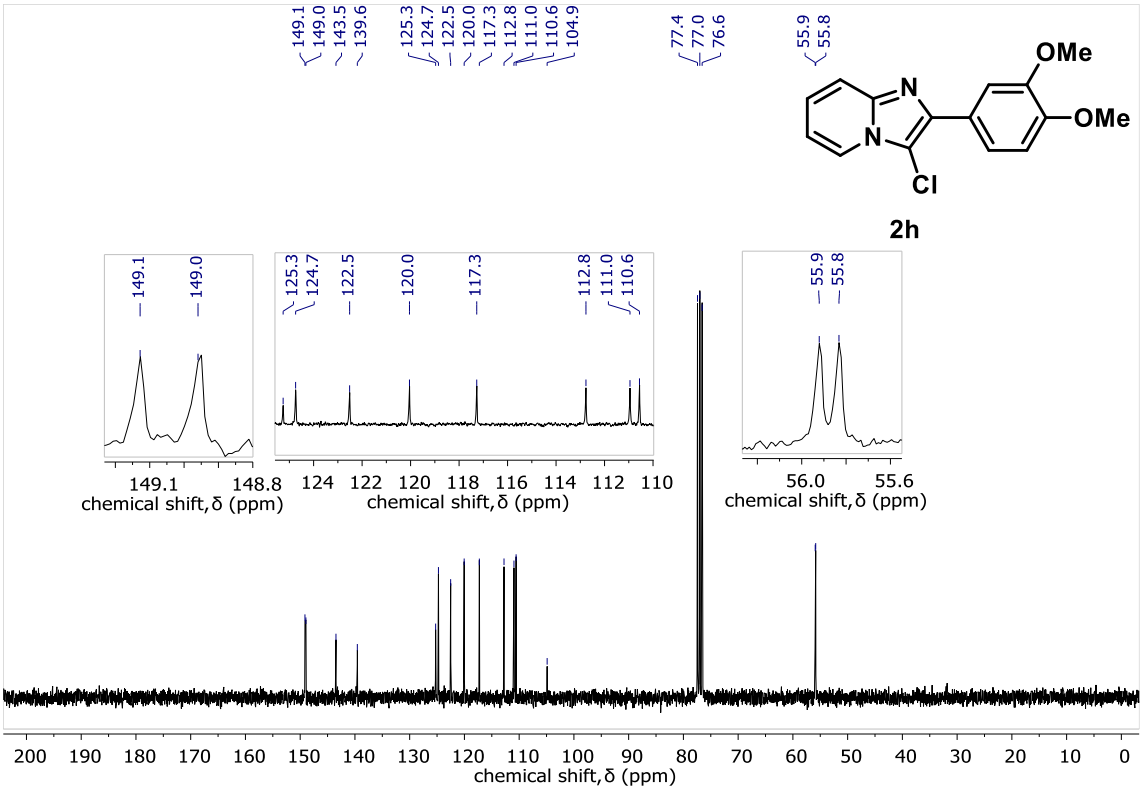


Figure S-16. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **2h**.

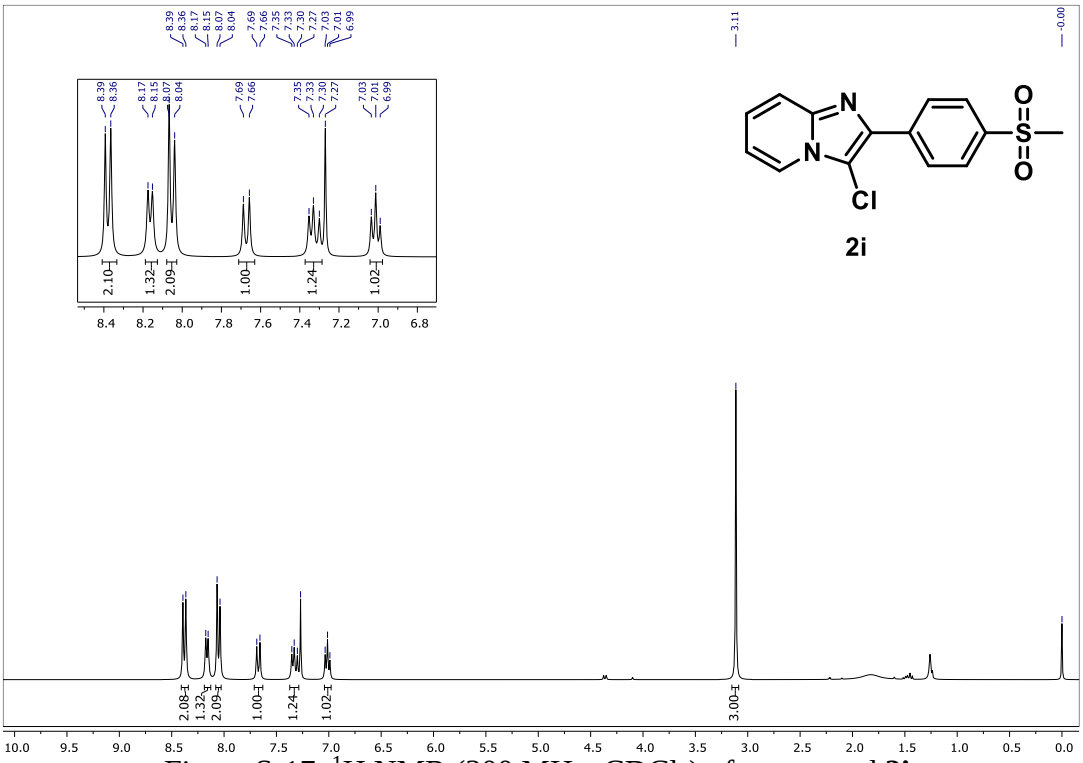


Figure S-17. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **2i**.

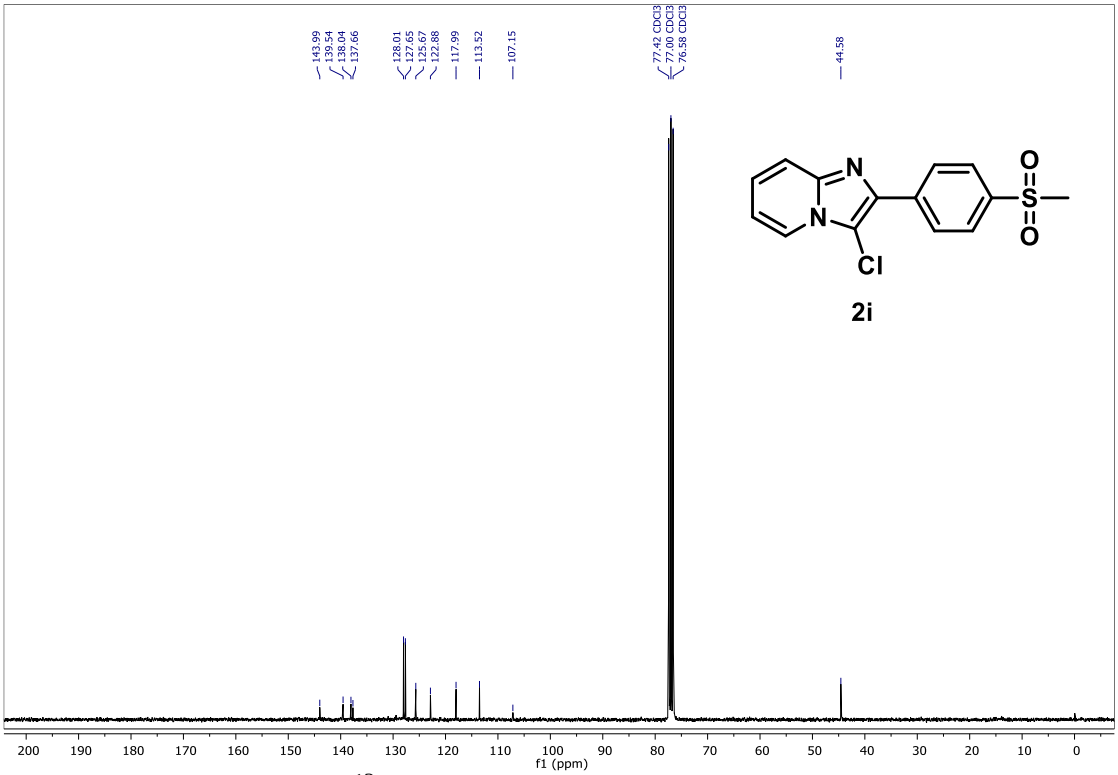


Figure S-18. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **2i**.

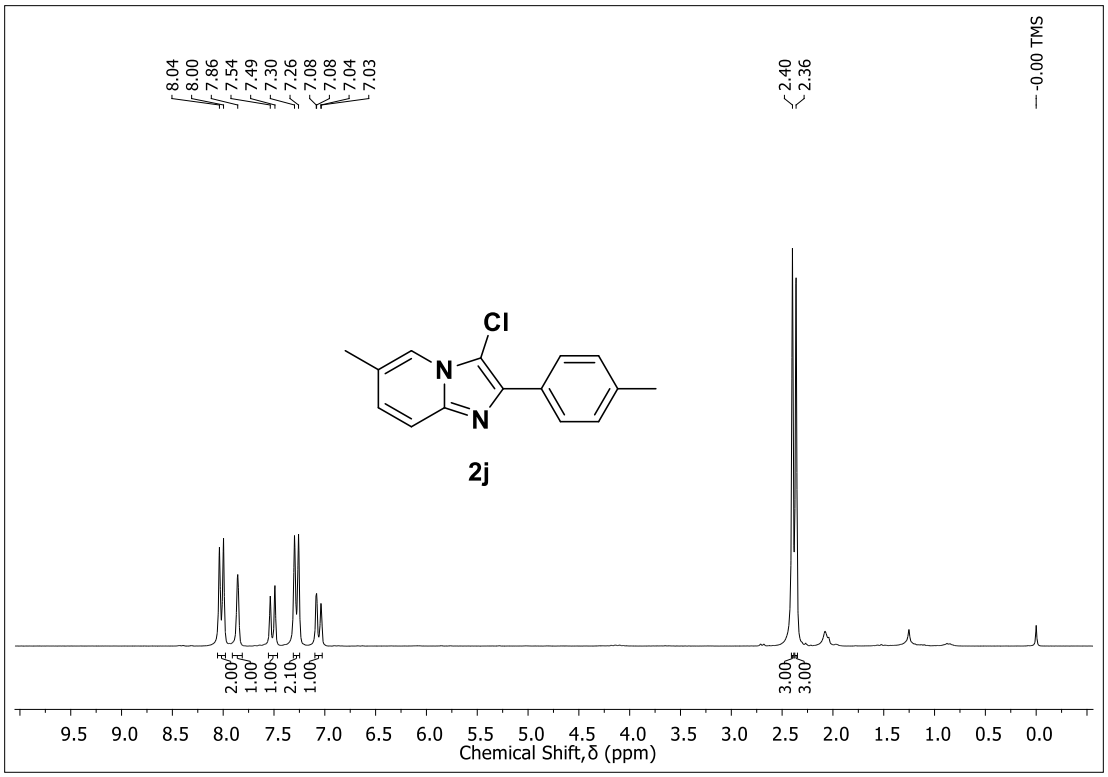


Figure S-19. ^{1}H NMR (200 MHz, $CDCl_3$) of compound **2j**.

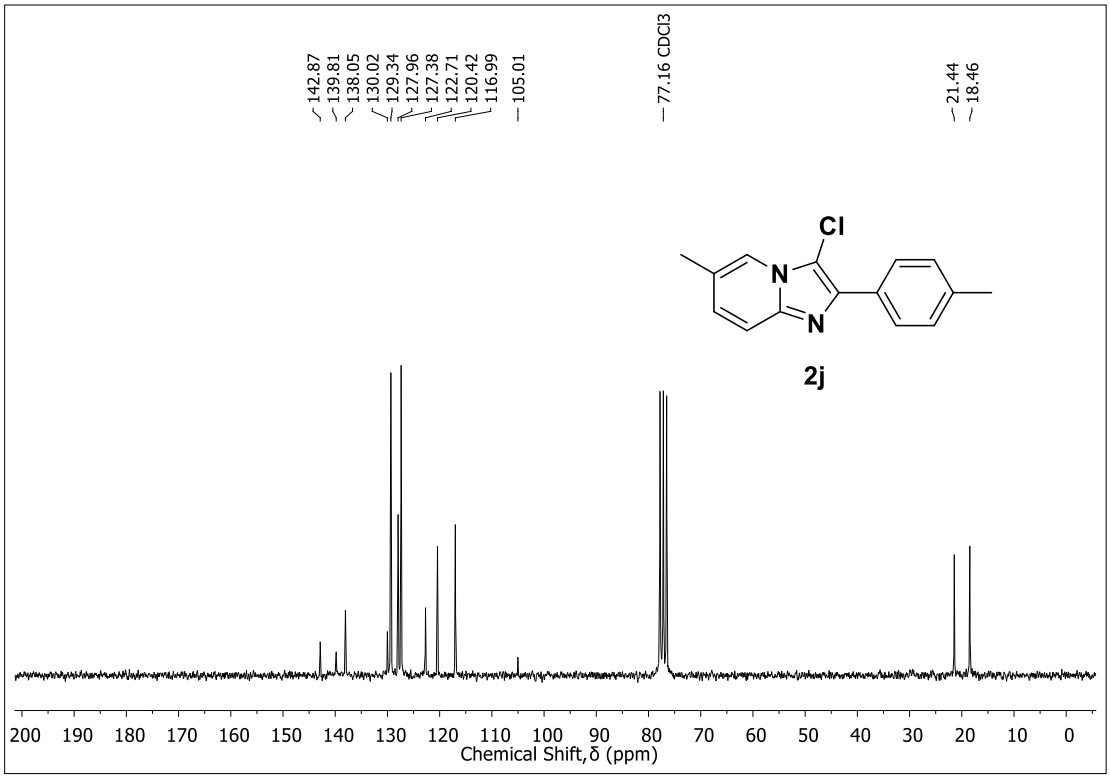


Figure S-20. ^{13}C NMR (50 MHz, $CDCl_3$) of compound **2j**.

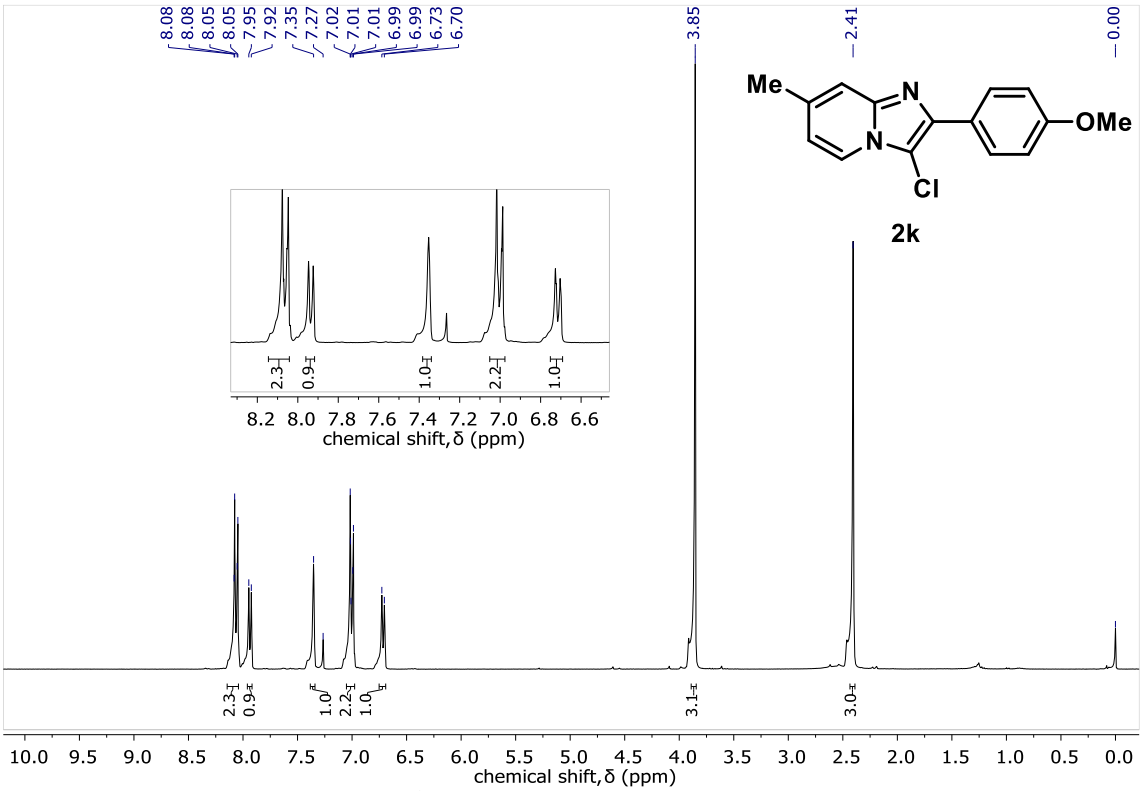


Figure S-21. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **2k**.

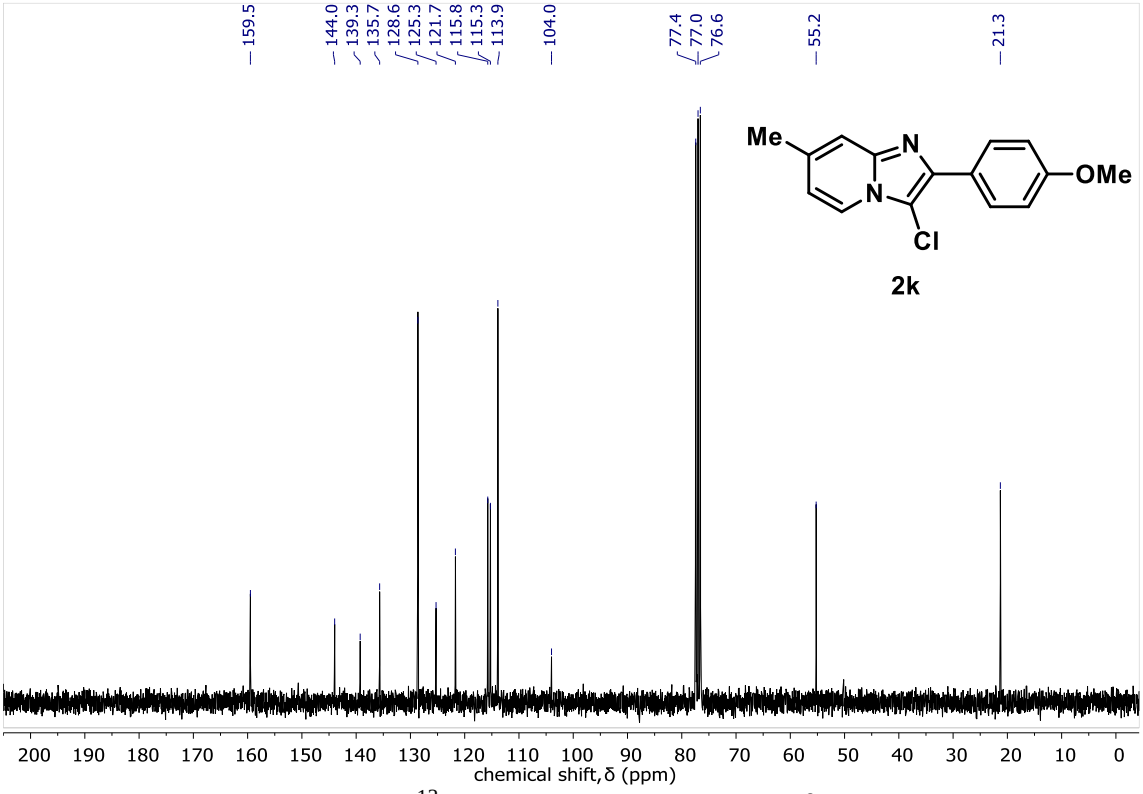


Figure S-22. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **2k**.

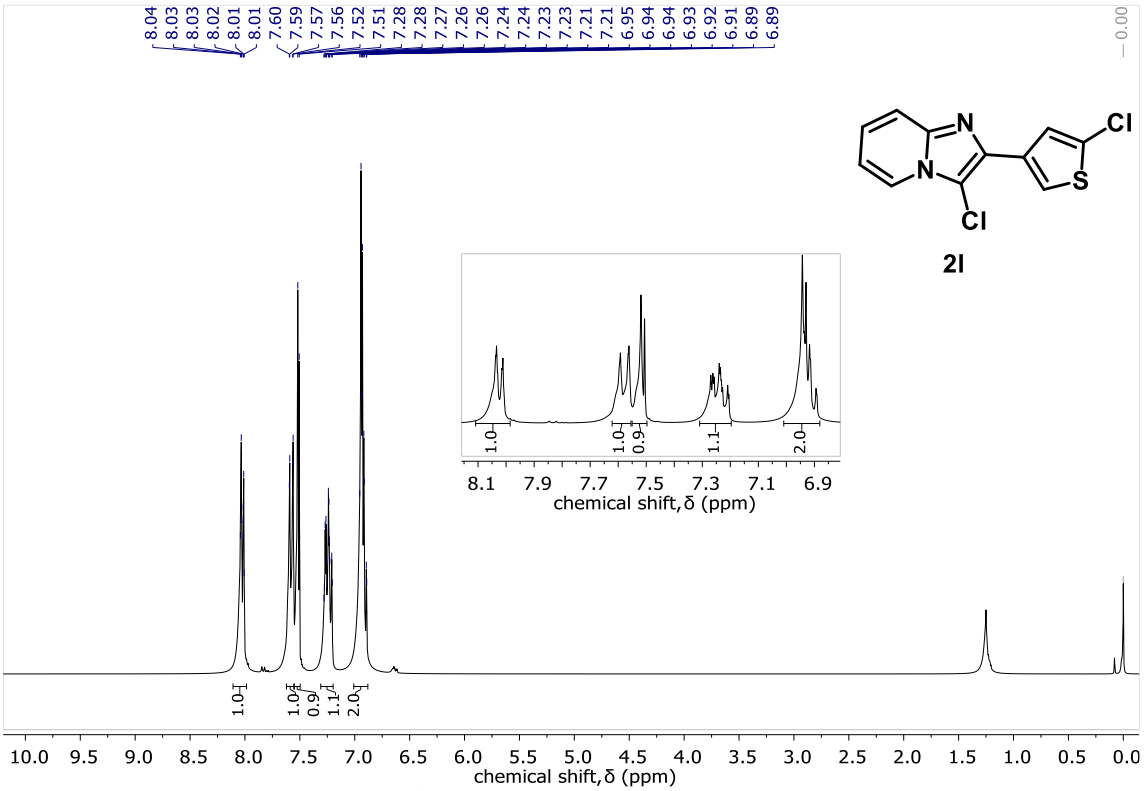


Figure S-23. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **2l**.

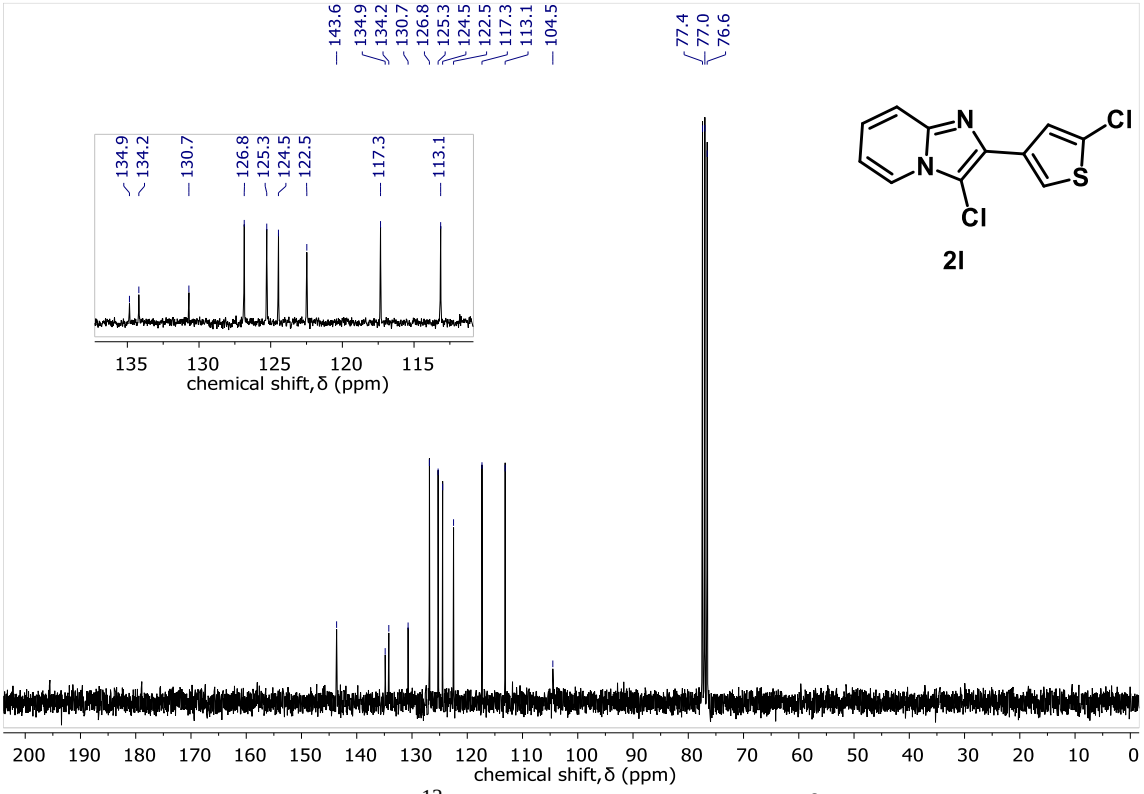


Figure S-24. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **2l**.

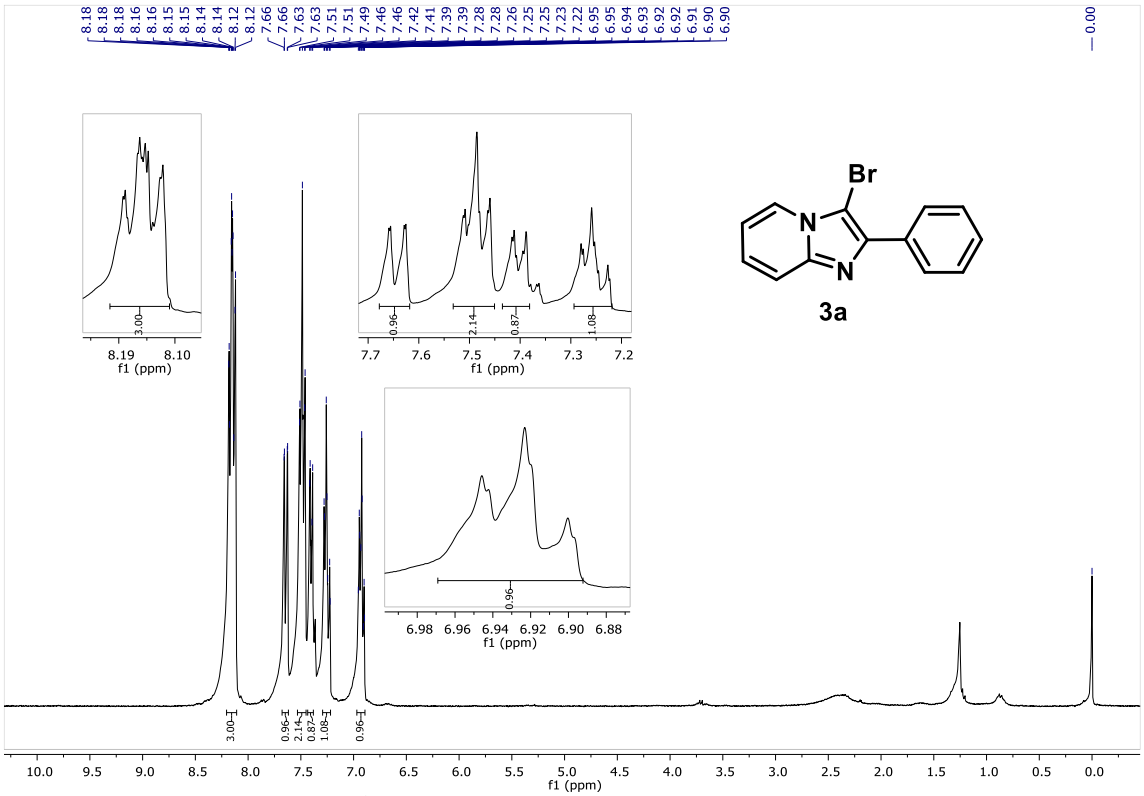


Figure S-25. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **3a**.

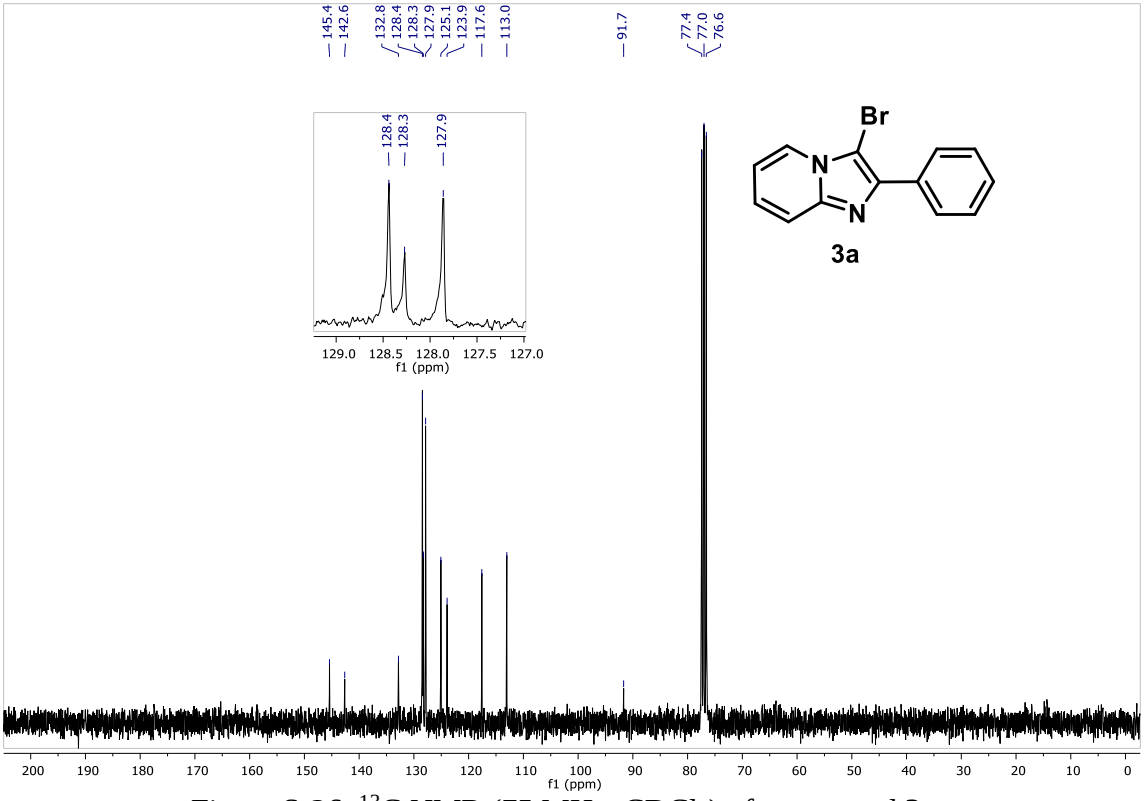


Figure S-26. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **3a**.

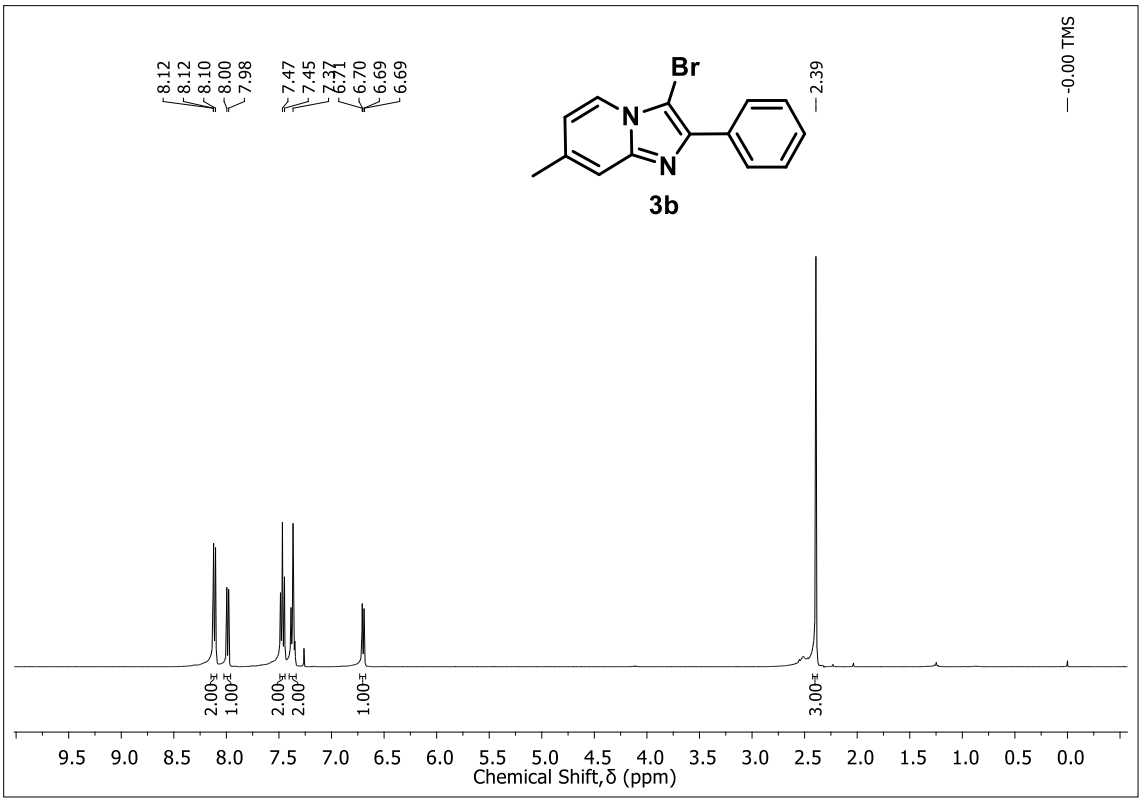


Figure S-27. ^{1}H NMR (400 MHz, $CDCl_3$) of compound **3b**.

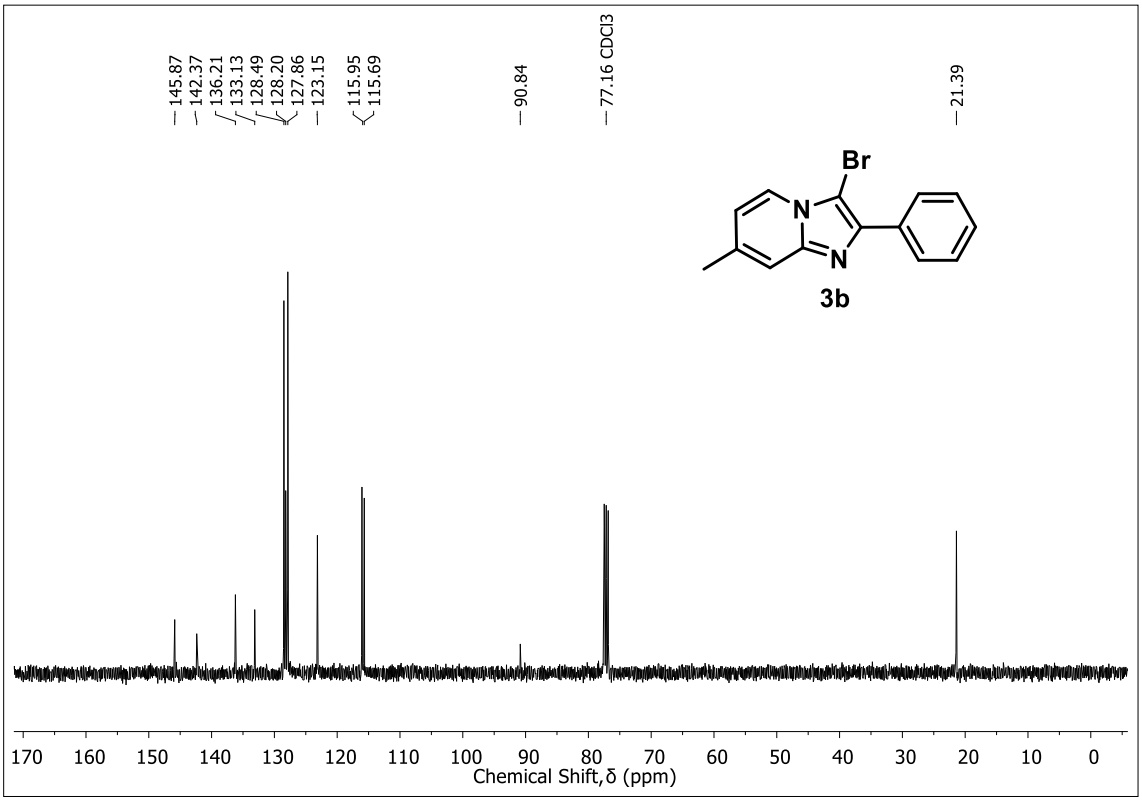


Figure S-28. ^{13}C NMR (100 MHz, $CDCl_3$) of compound **3b**.

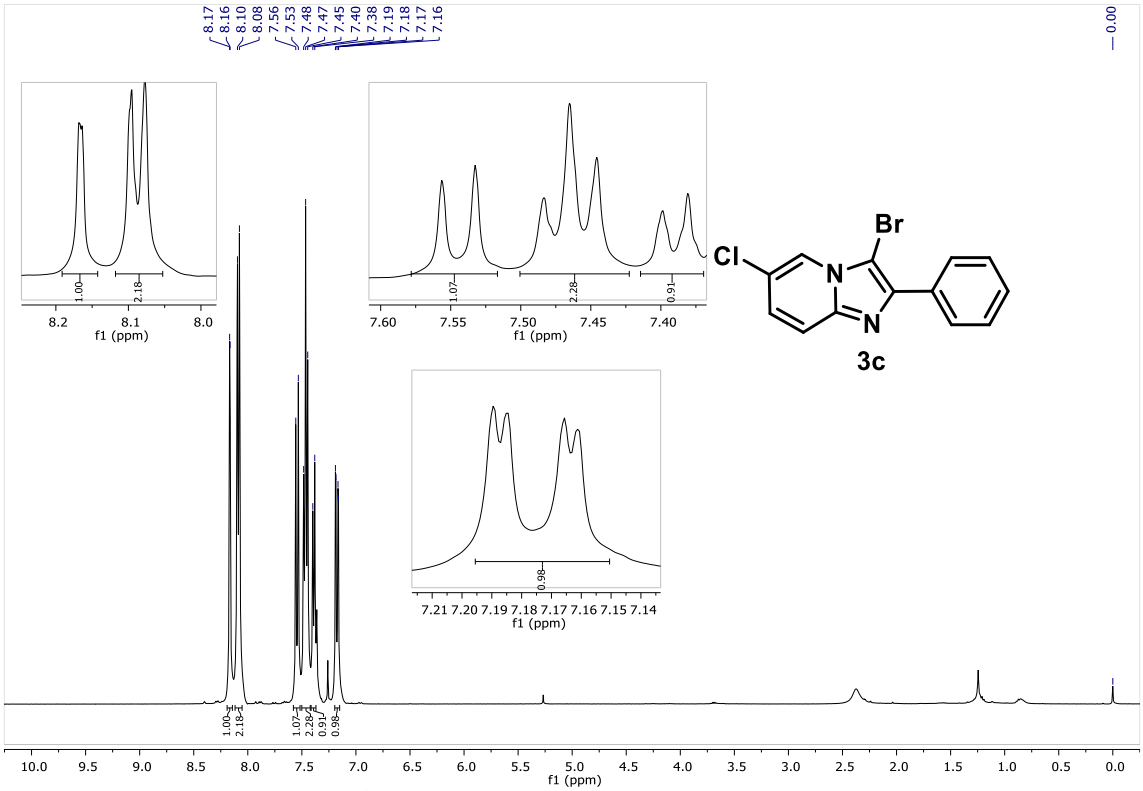


Figure S-29. ^{1}H NMR (400 MHz, $CDCl_3$) of compound **3c**.

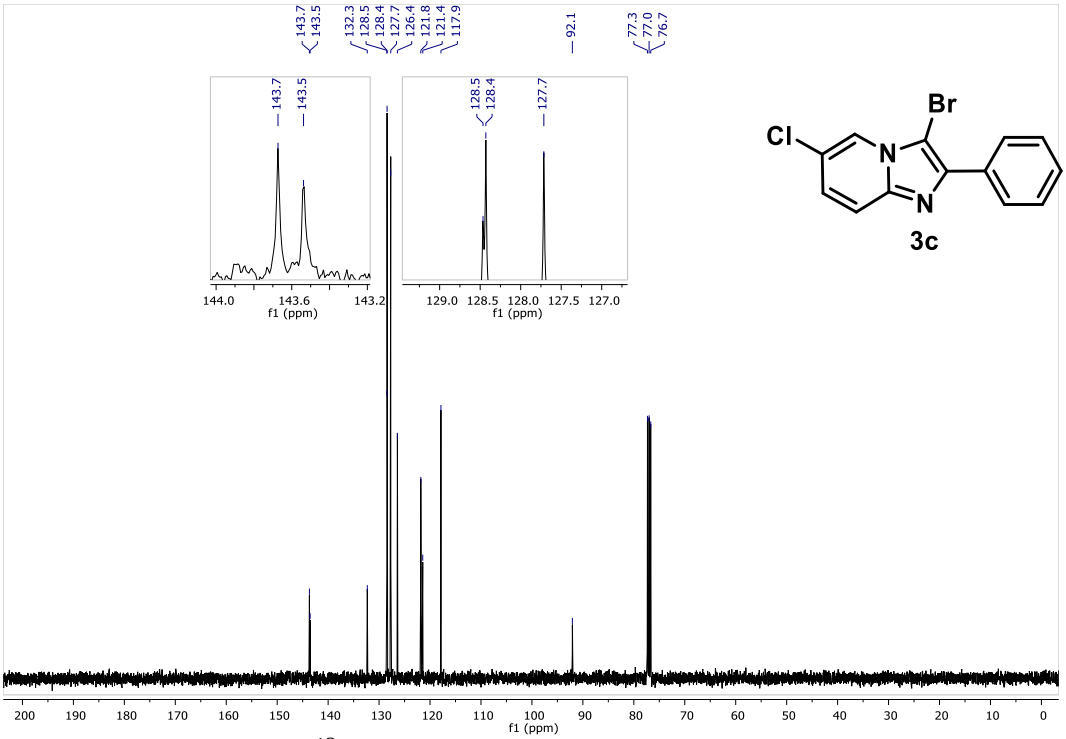


Figure S-30. ^{13}C NMR (100 MHz, $CDCl_3$) of compound **3c**.

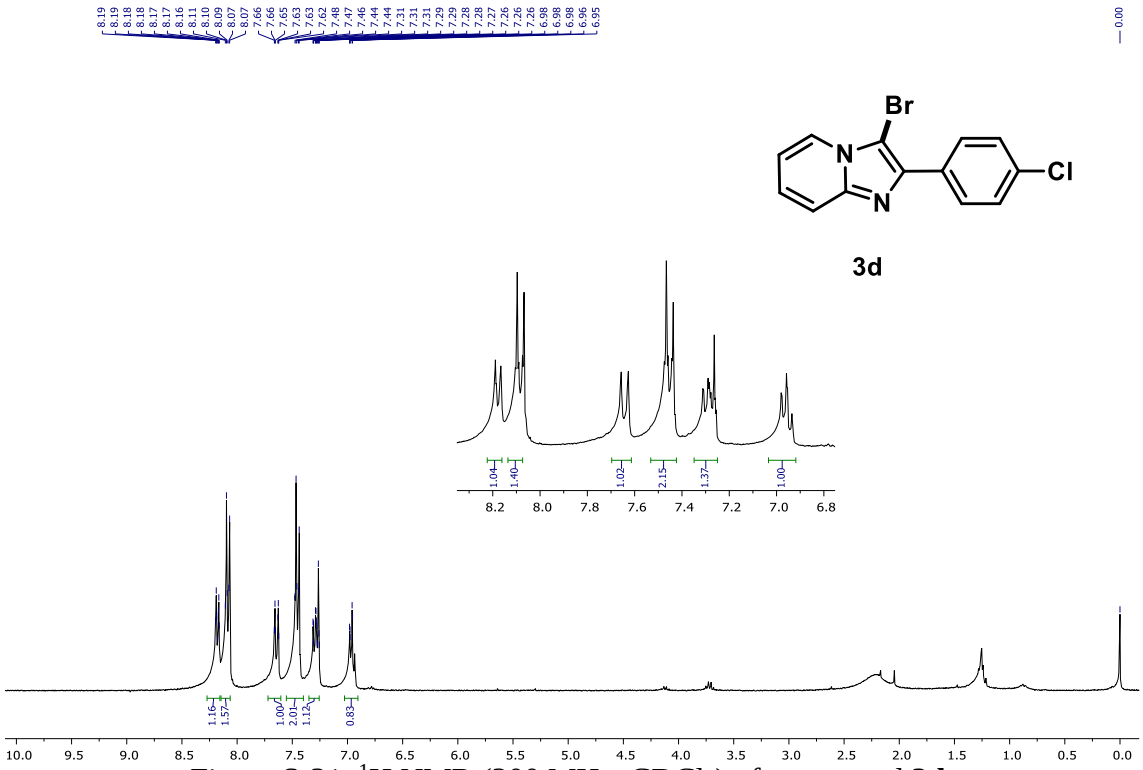


Figure S-31. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **3d**.

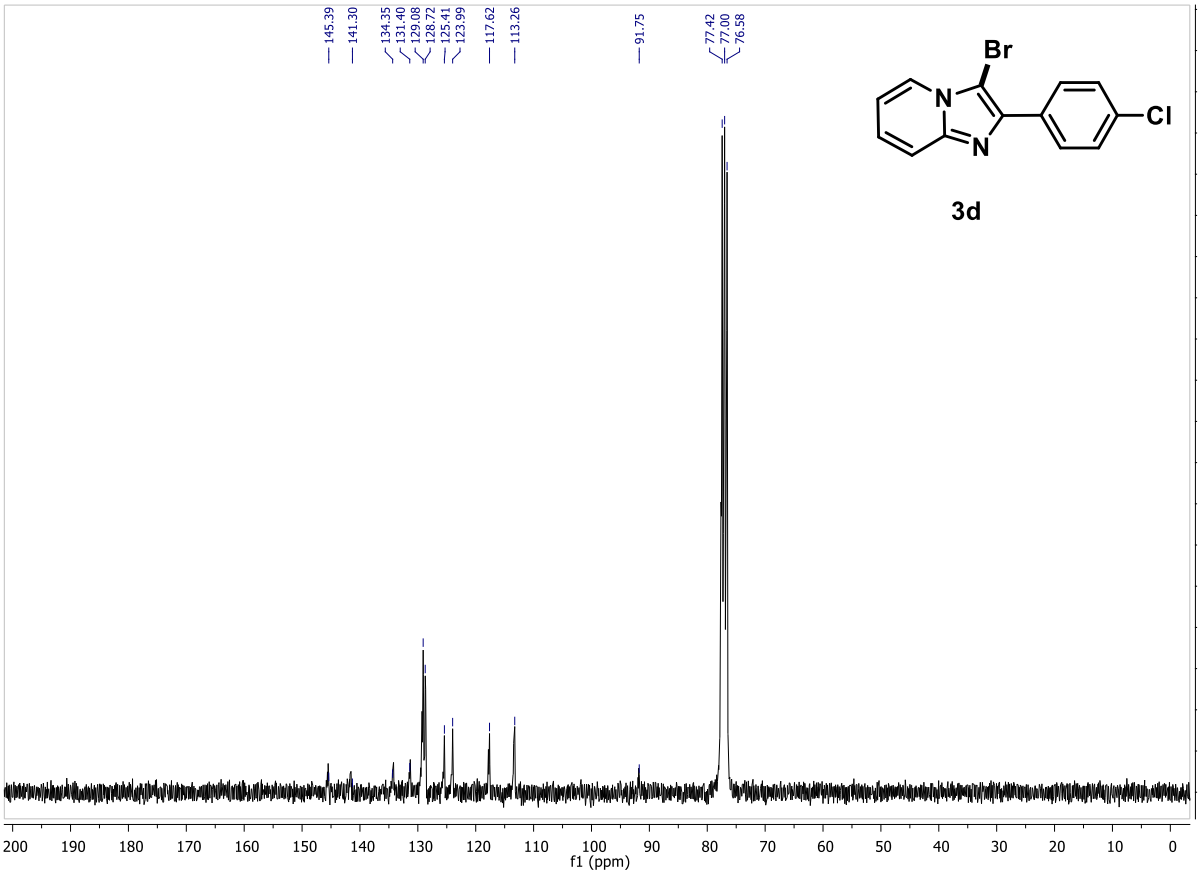


Figure S-32. ^{13}C NMR (100 MHz, $CDCl_3$) of compound **3d**.

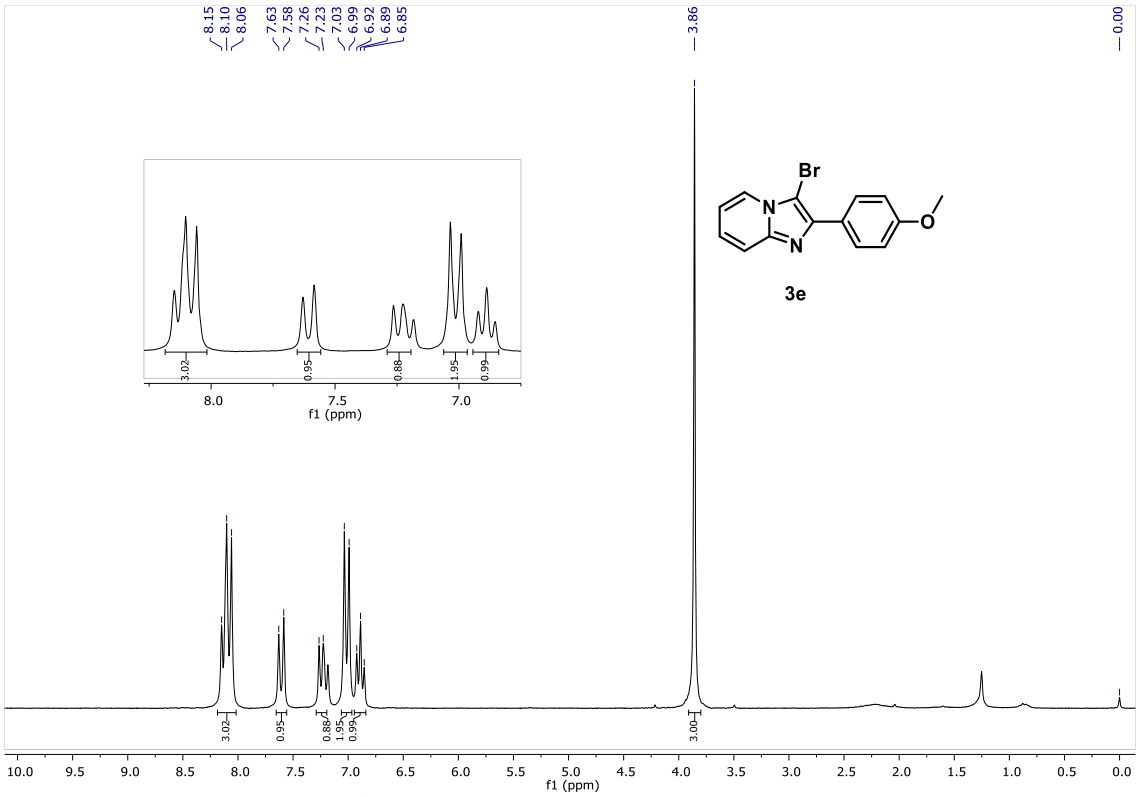


Figure S-32. ^{1}H NMR (200 MHz, $CDCl_3$) of compound **3e**.

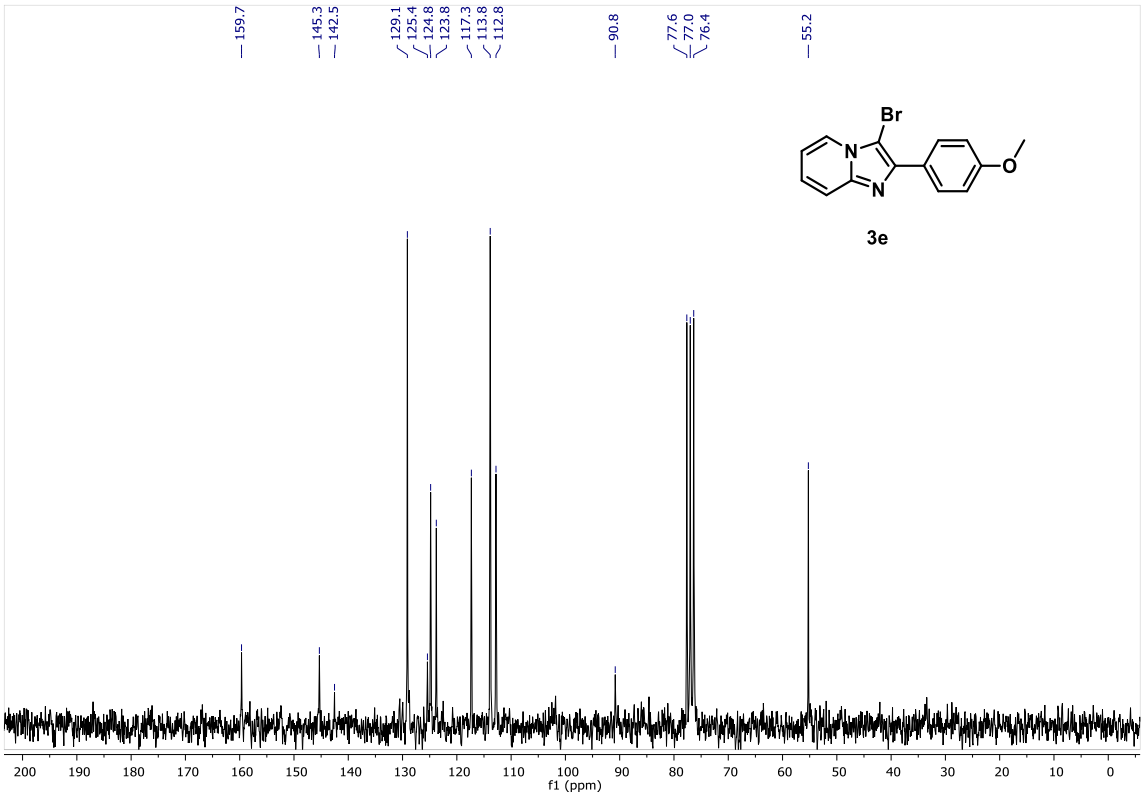


Figure S-33. ^{13}C NMR (50 MHz, $CDCl_3$) of compound **3e**.

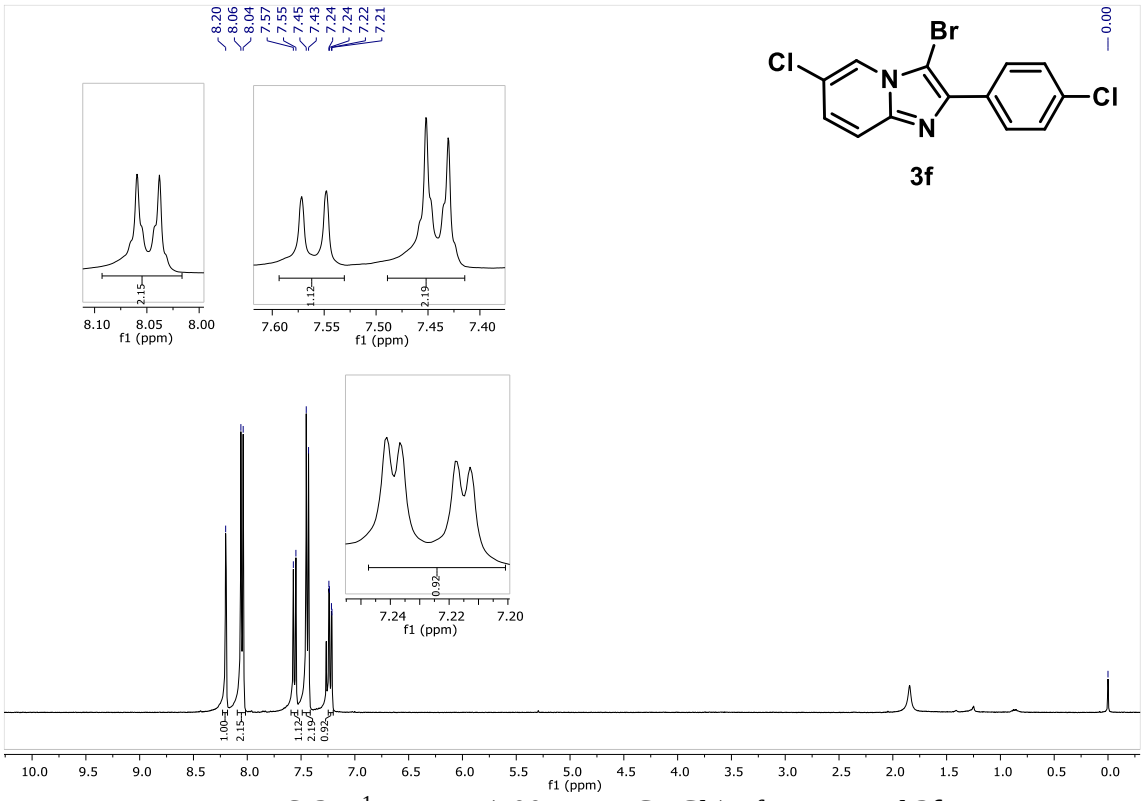


Figure S-34. ^{1}H NMR (400 MHz, $CDCl_3$) of compound **3f**.

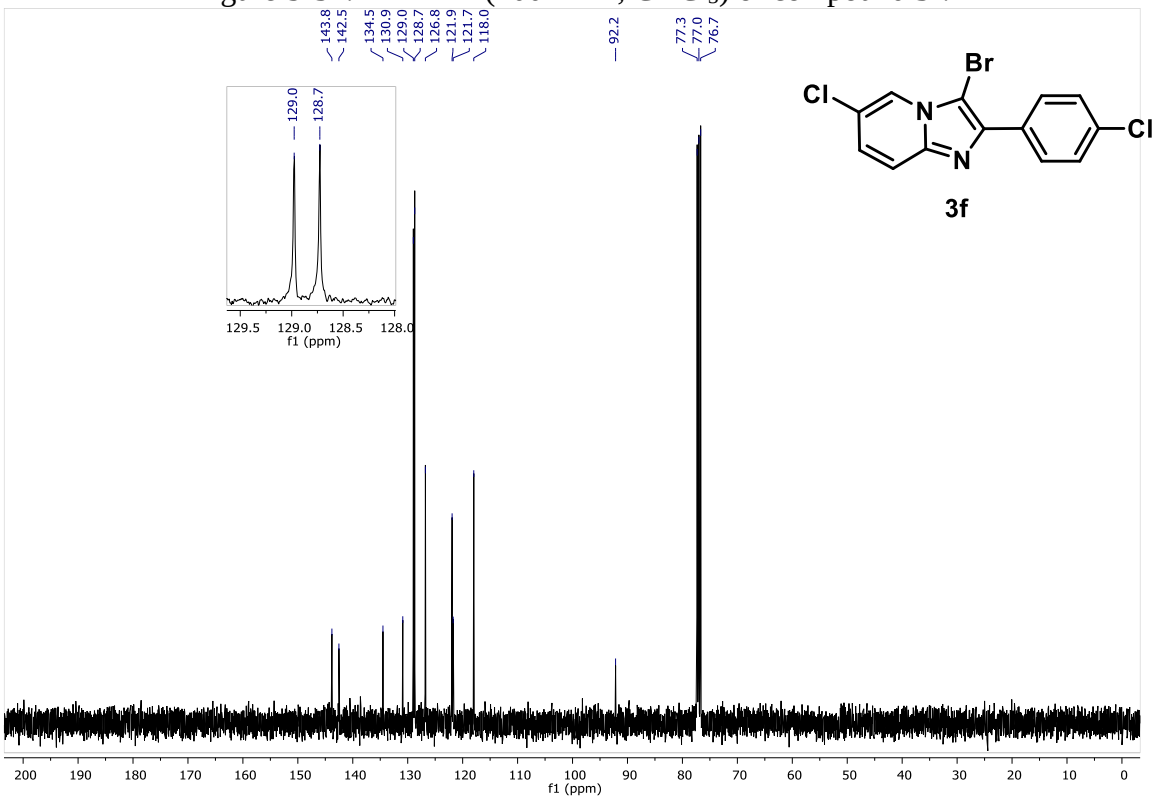


Figure S-35. ^{13}C NMR (100 MHz, $CDCl_3$) of compound **3f**.

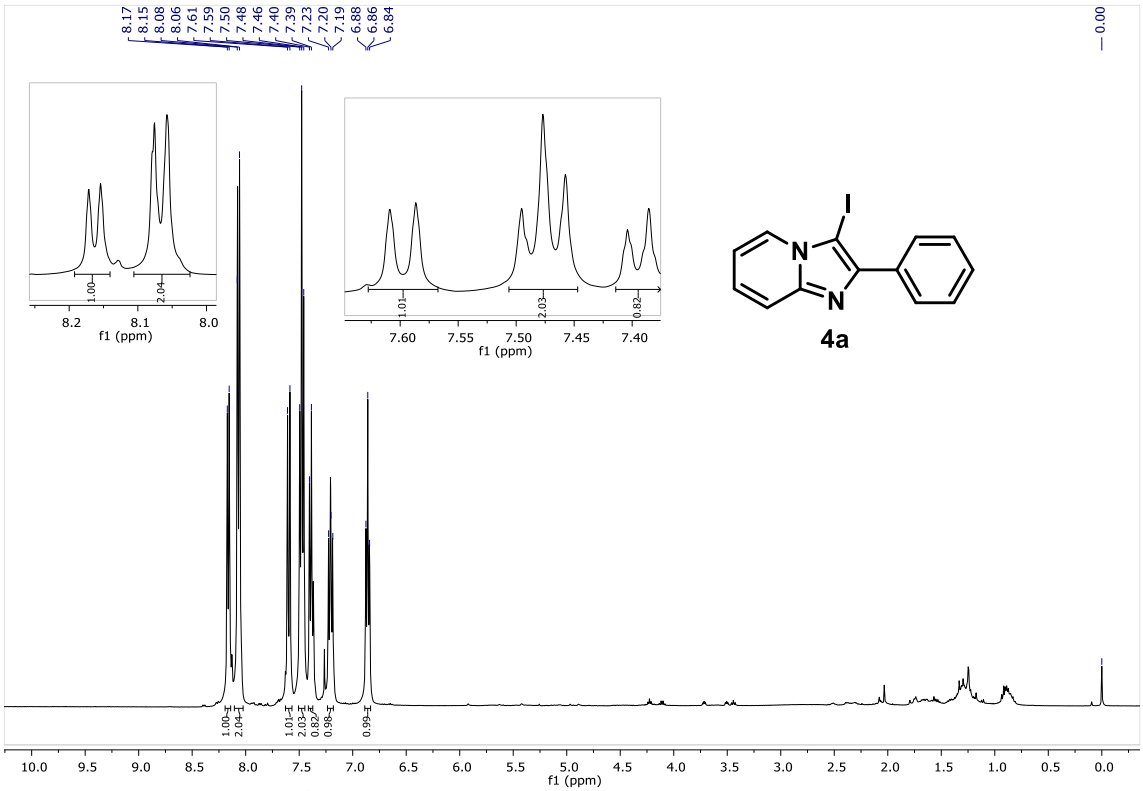


Figure S-36. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **4a**.

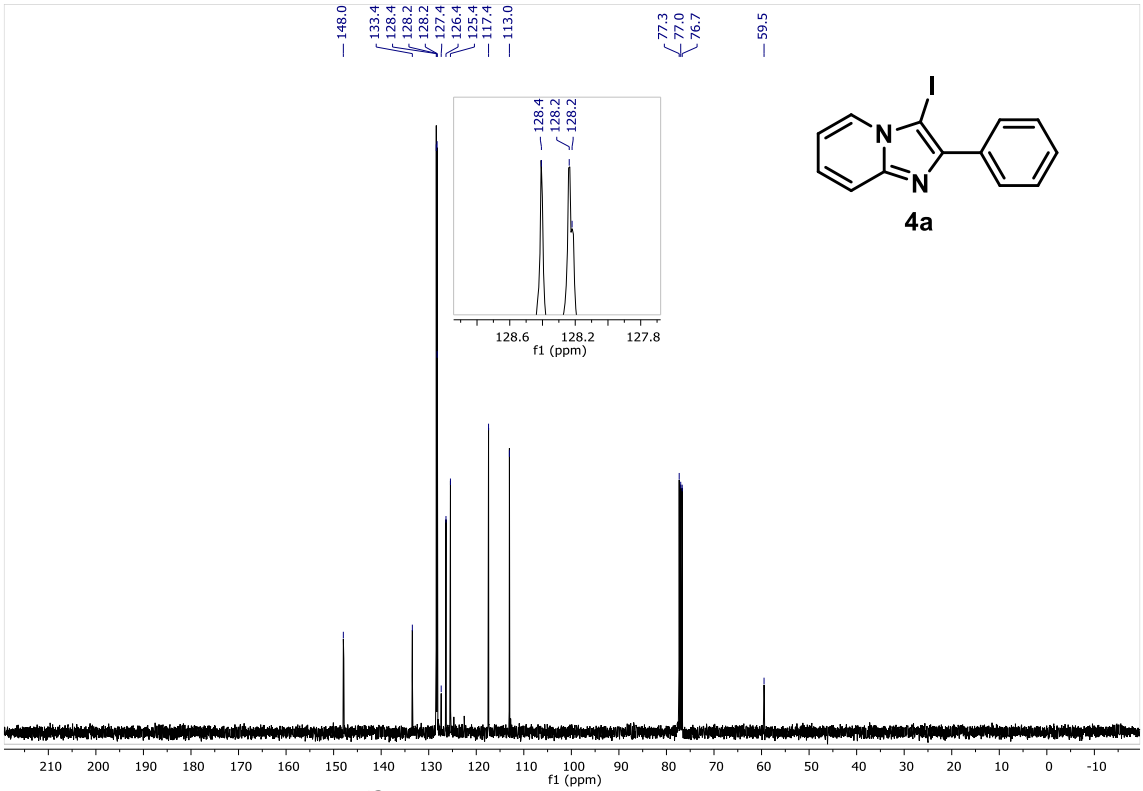


Figure S-37. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **4a**.

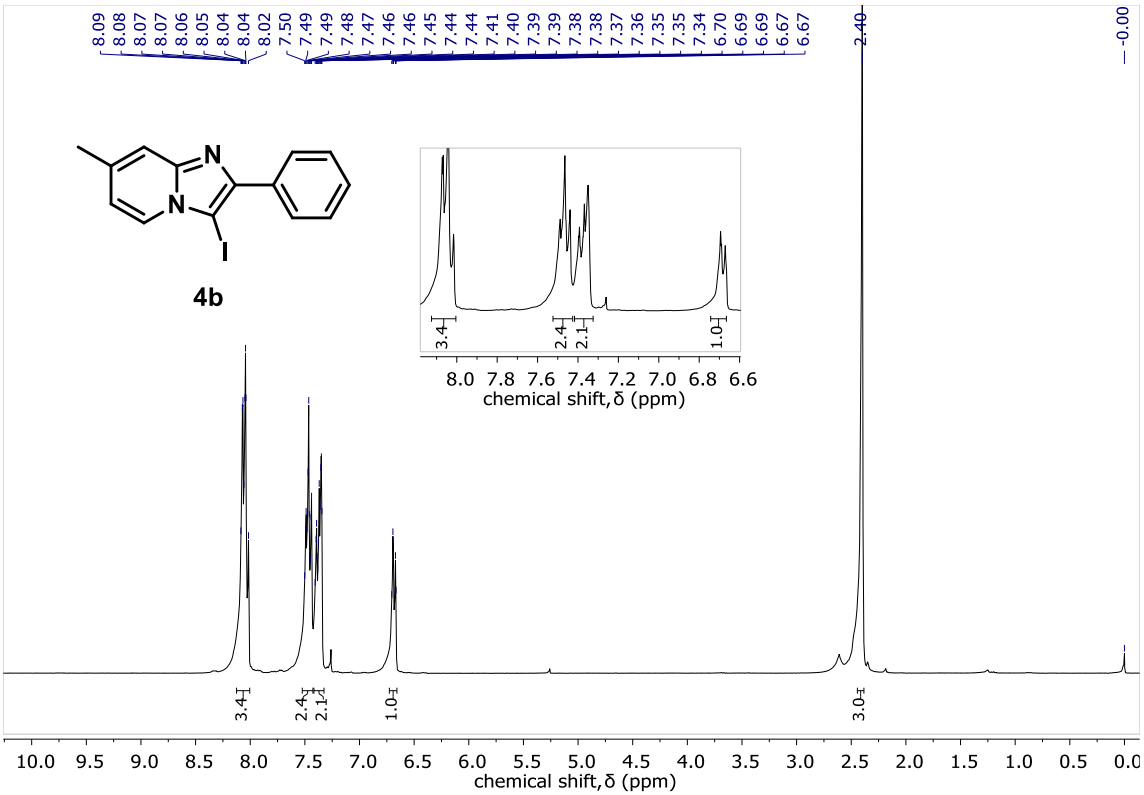


Figure S-38. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **4b**.

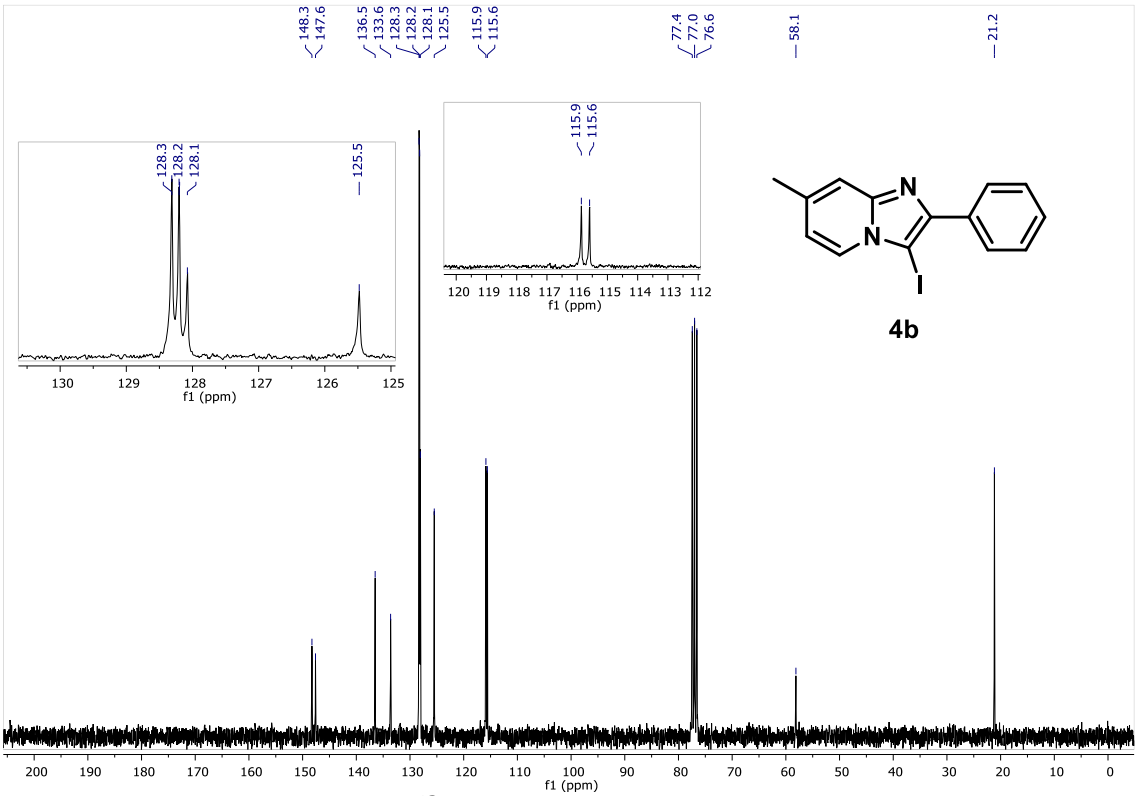


Figure S-39. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **4b**.

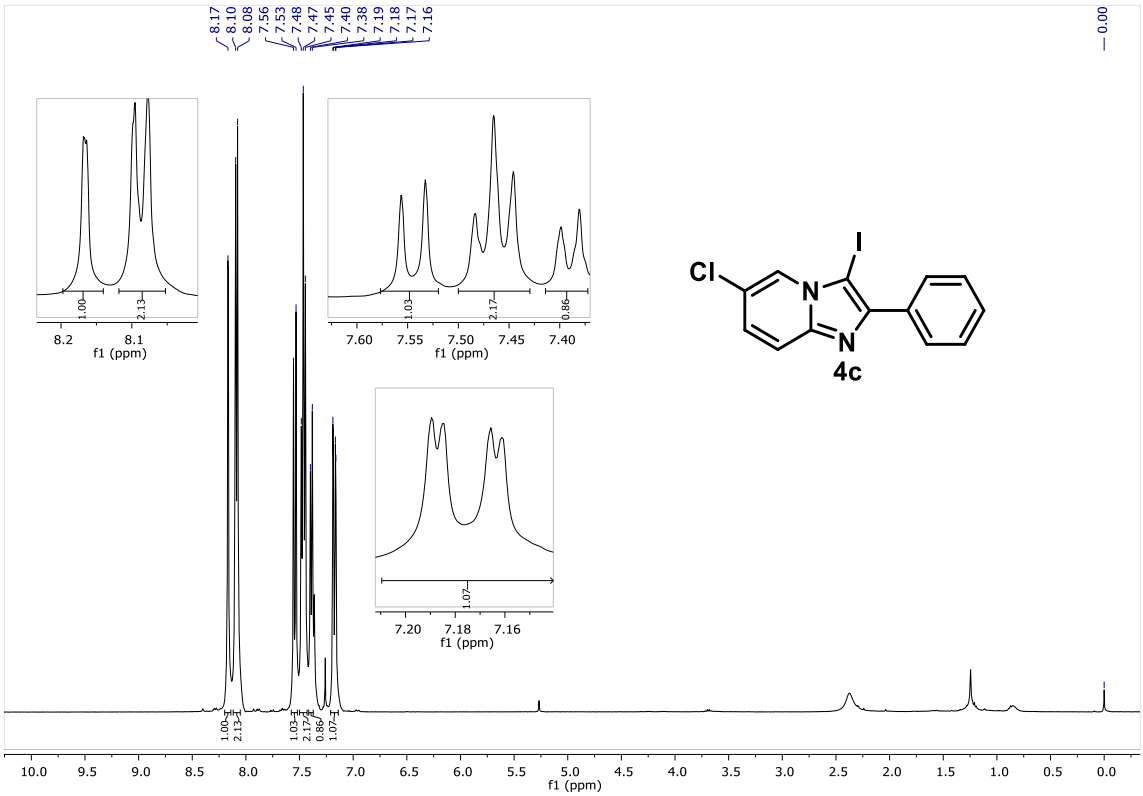


Figure S-40. ^{1}H NMR (400 MHz, $CDCl_3$) of compound **4c**.

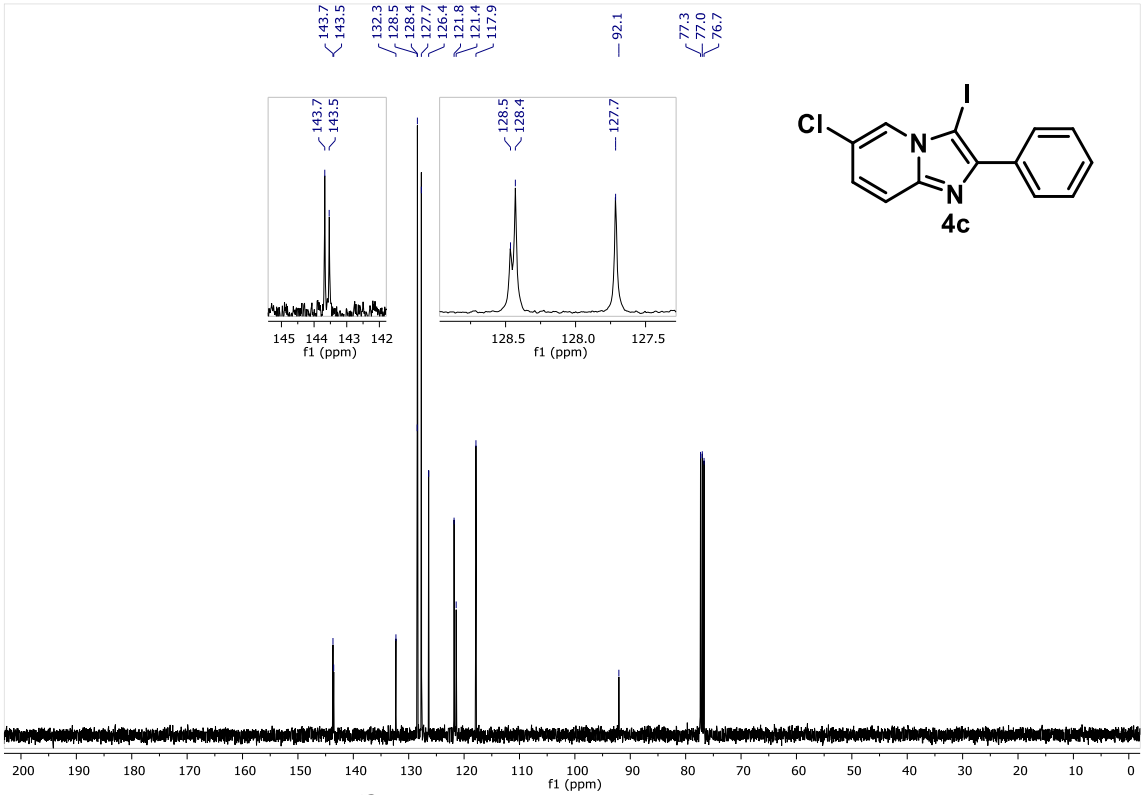


Figure S-41. ^{13}C NMR (100 MHz, $CDCl_3$) of compound **4c**.

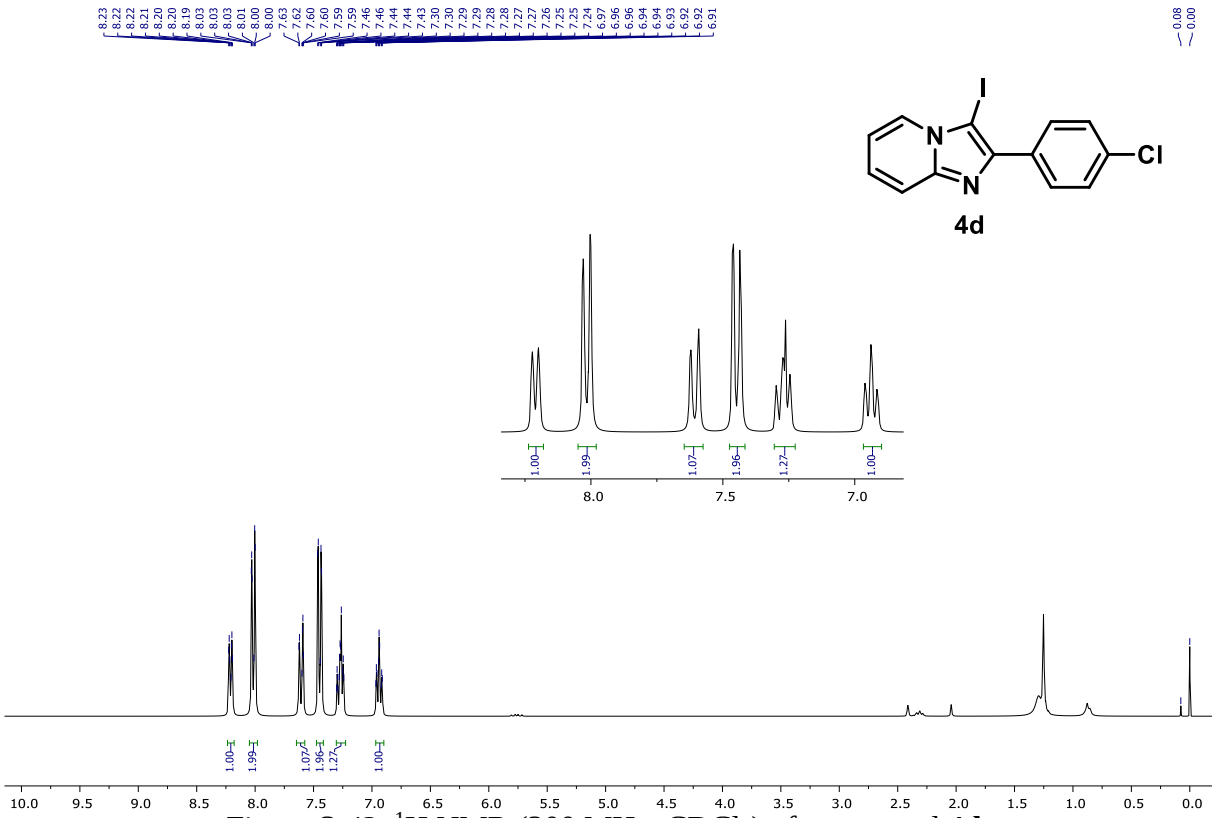


Figure S-42. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **4d**.

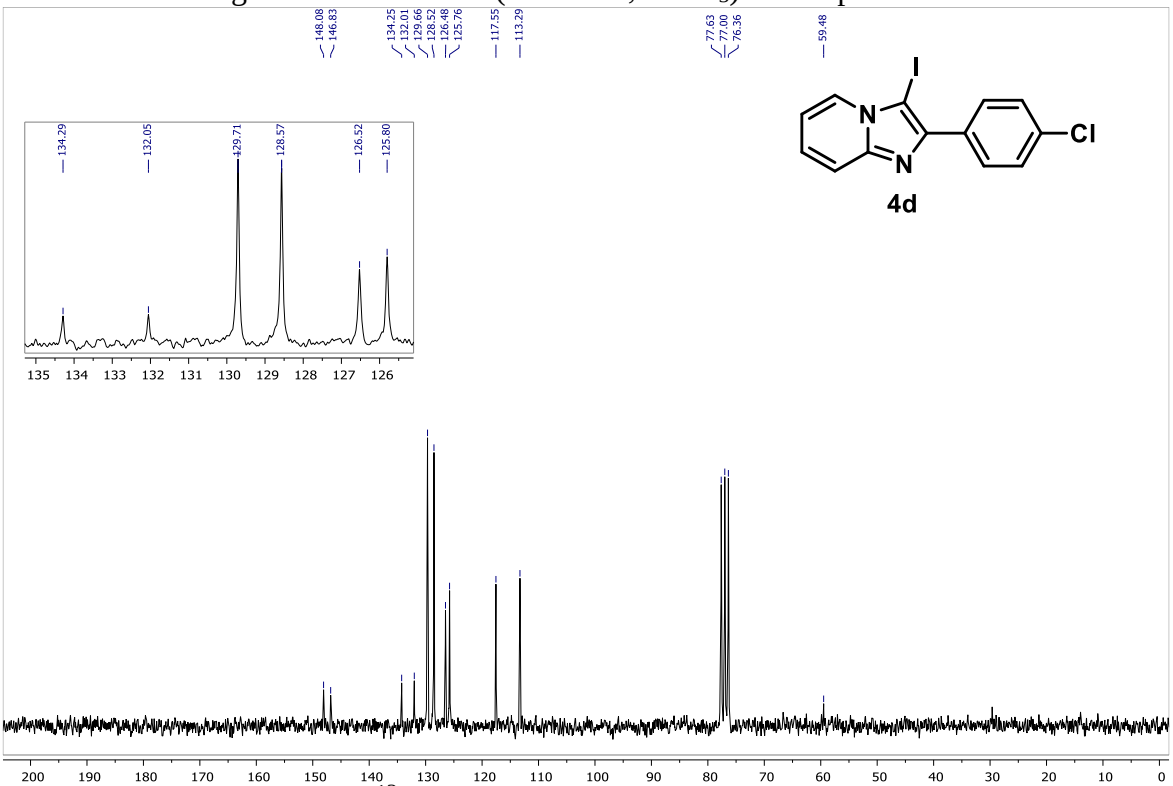


Figure S-43. ^{13}C NMR (50 MHz, $CDCl_3$) of compound **4d**.

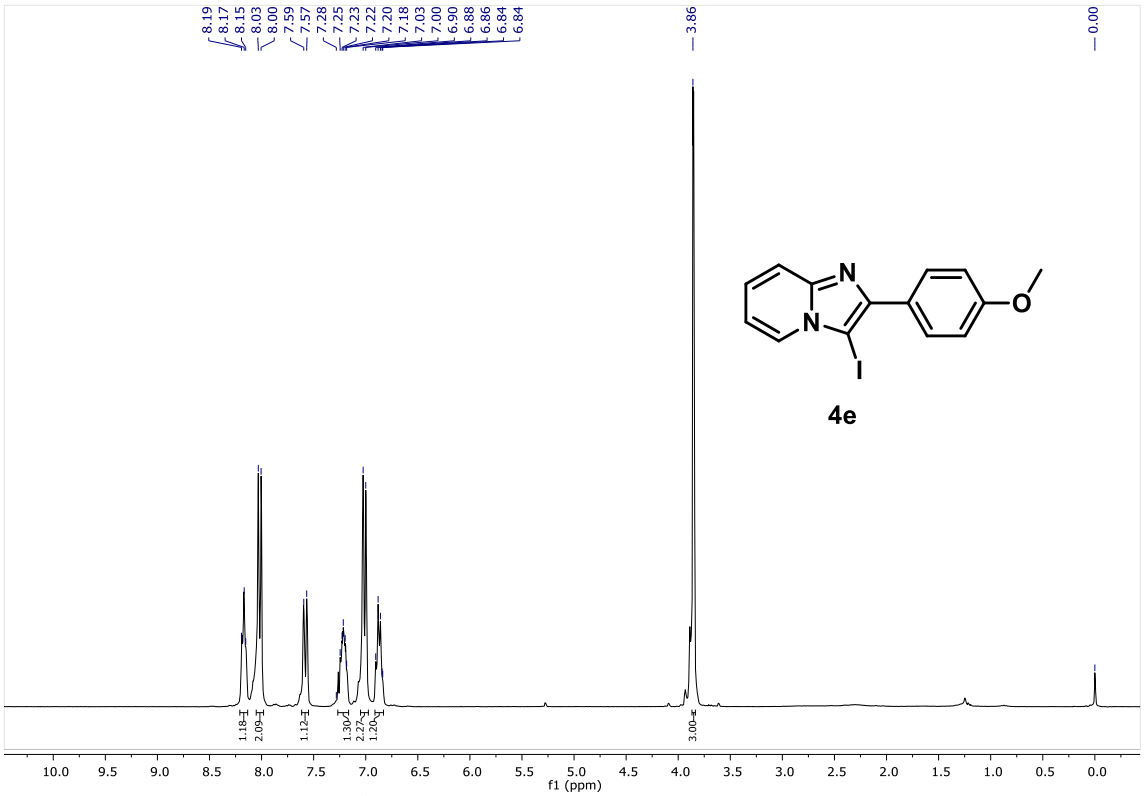


Figure S-44. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **4e**.

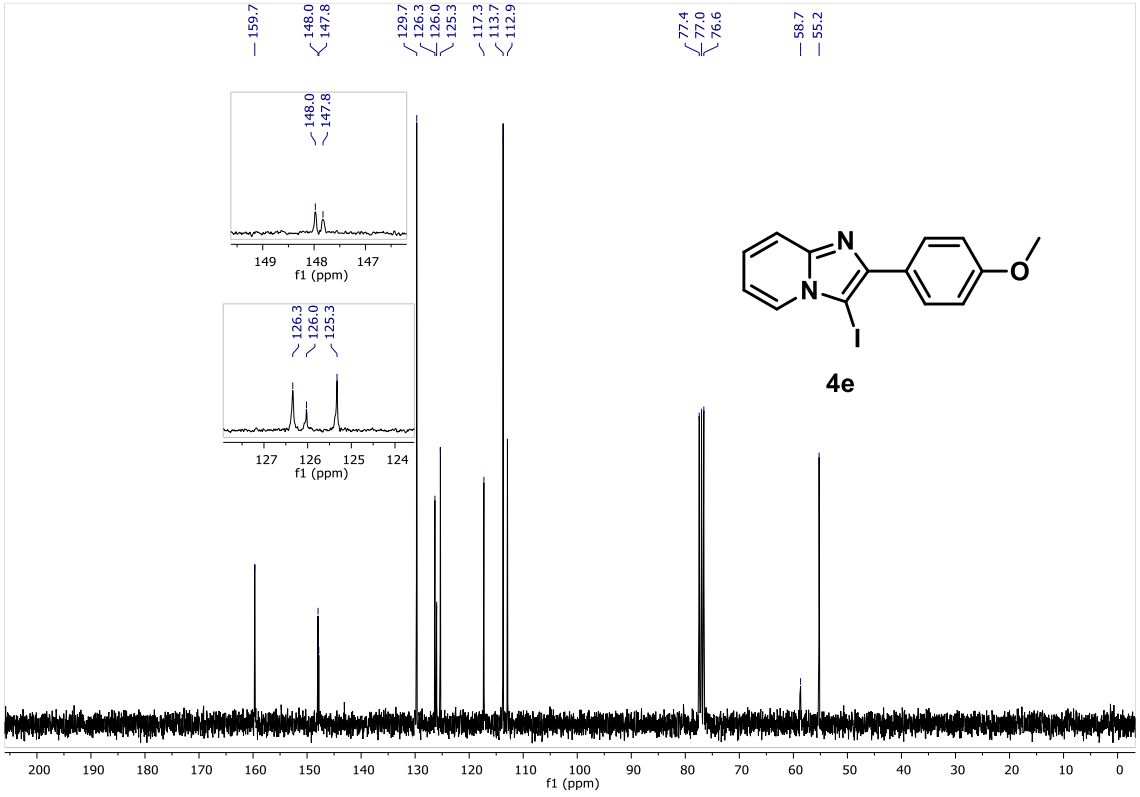


Figure S-45. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **4e**.

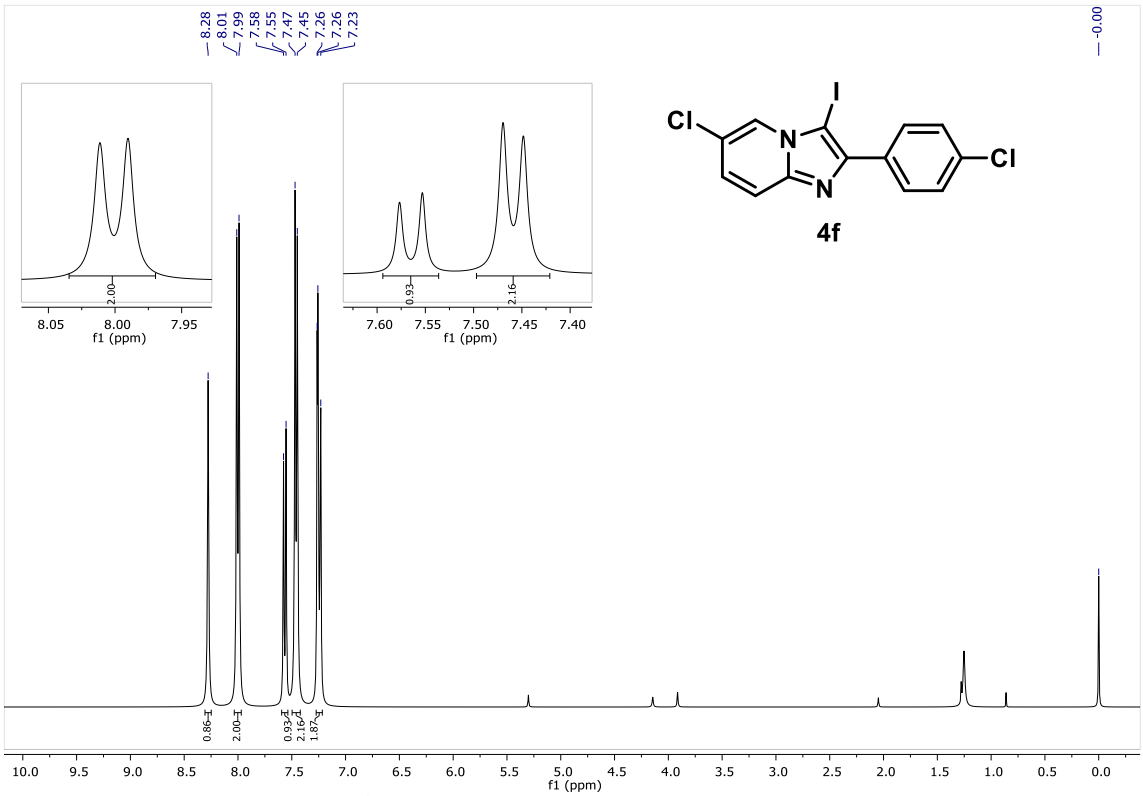


Figure S-46. ^{1}H NMR (400 MHz, $CDCl_3$) of compound **4f**.

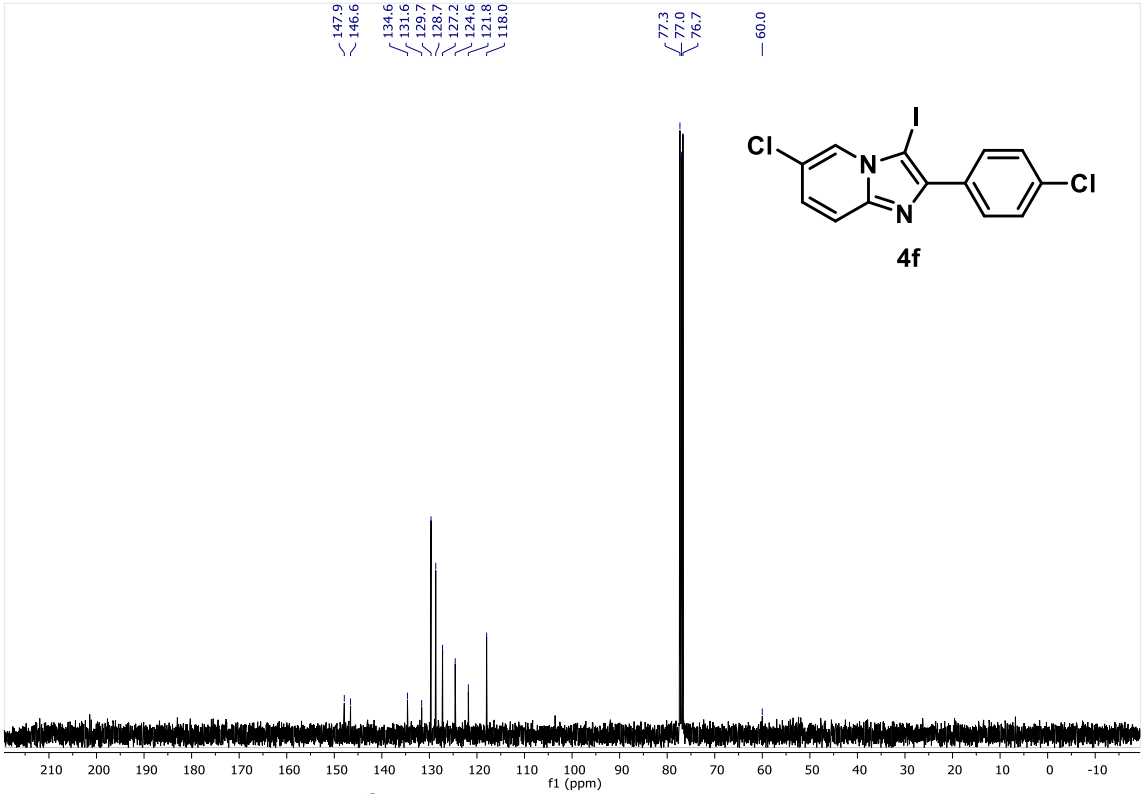


Figure S-47. ^{13}C NMR (100 MHz, $CDCl_3$) of compound **4f**.

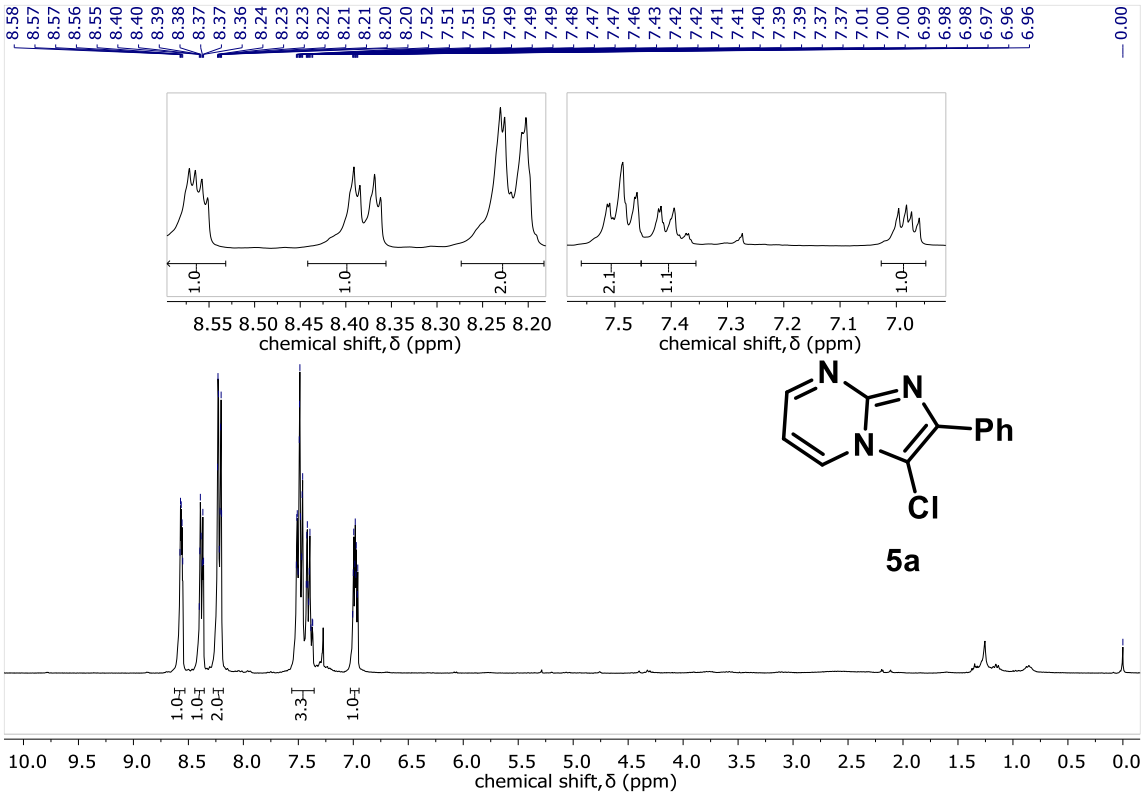


Figure S-48. ^{1}H NMR (300 MHz, $CDCl_3$) of compoud **5a**.

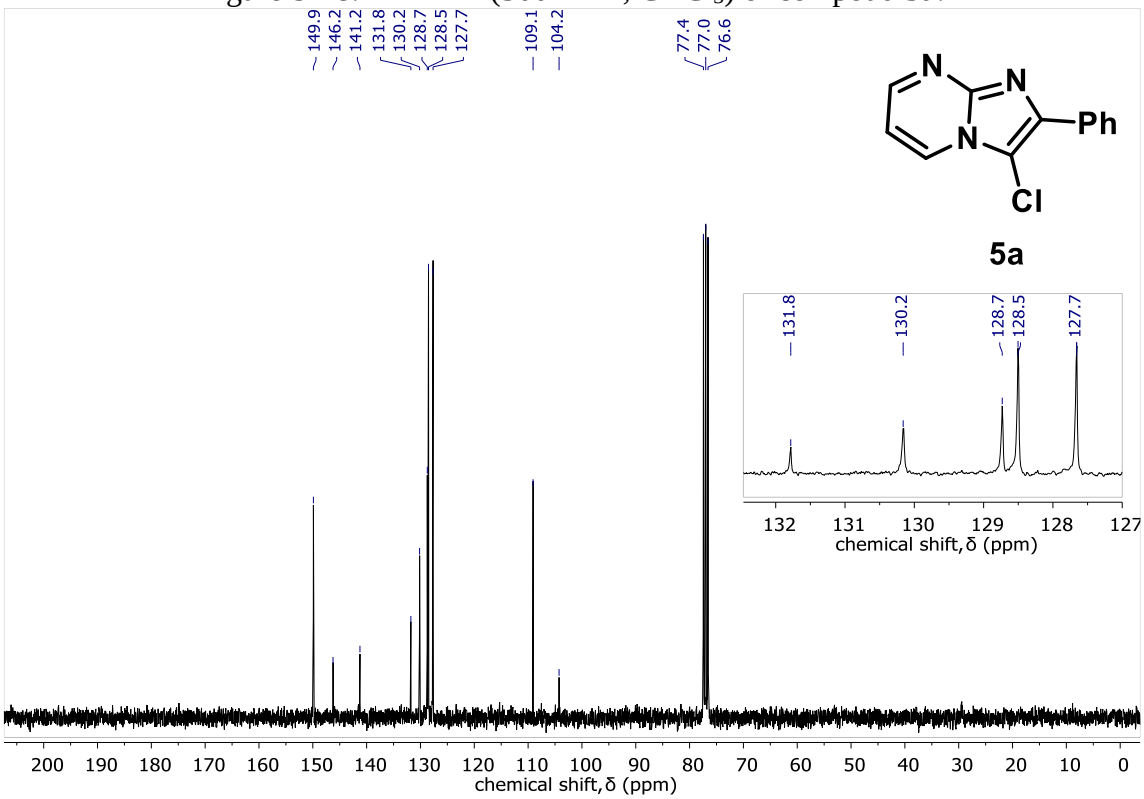


Figure S-49. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **5a**.

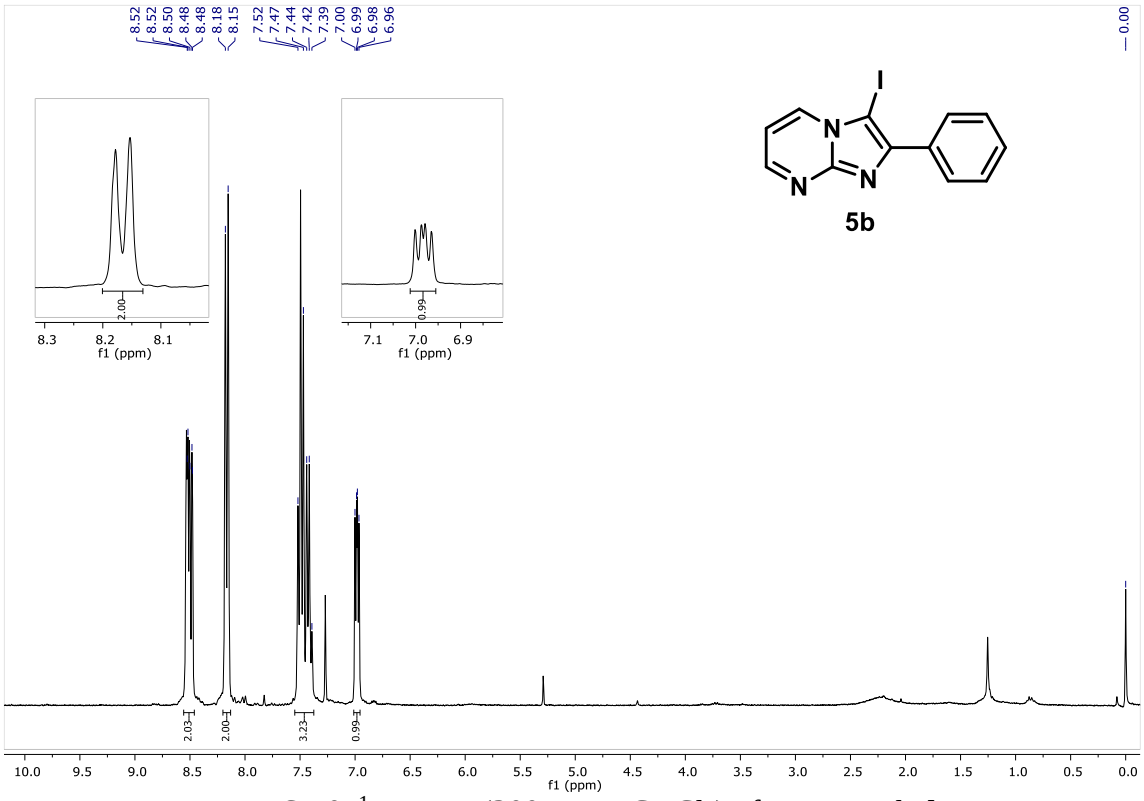


Figure S-50. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **5b**.

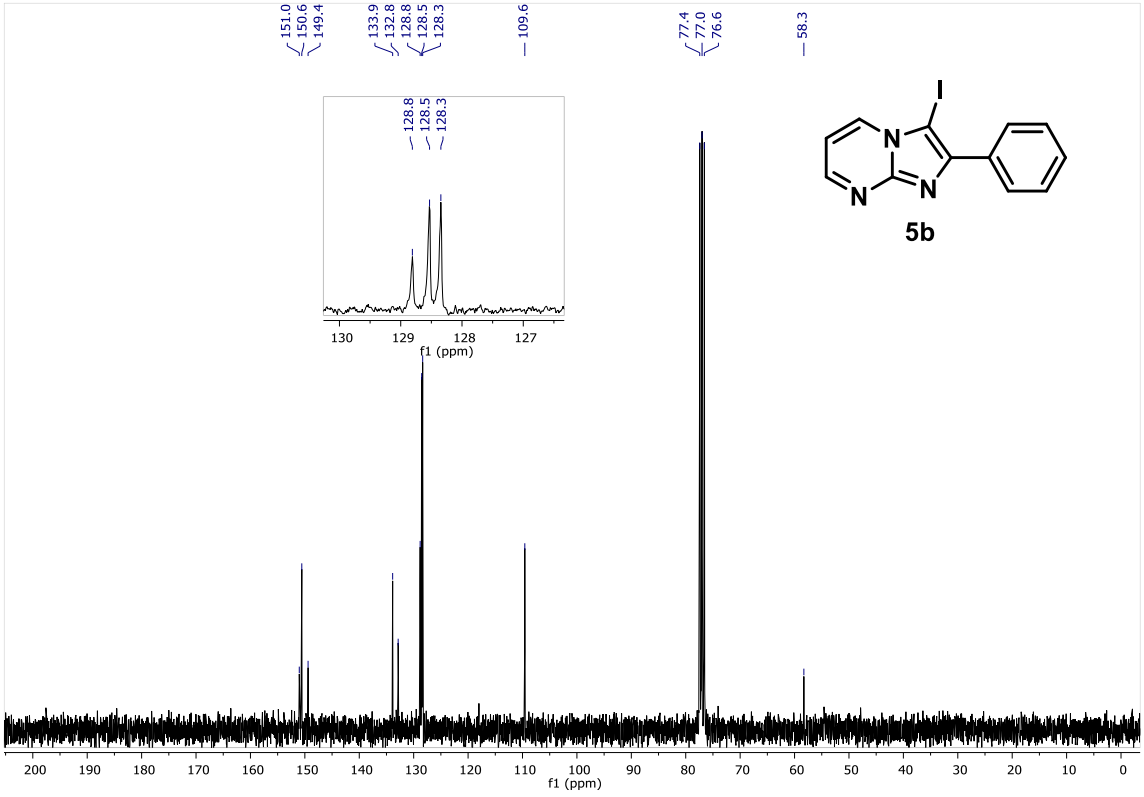


Figure S-51. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **5b**.

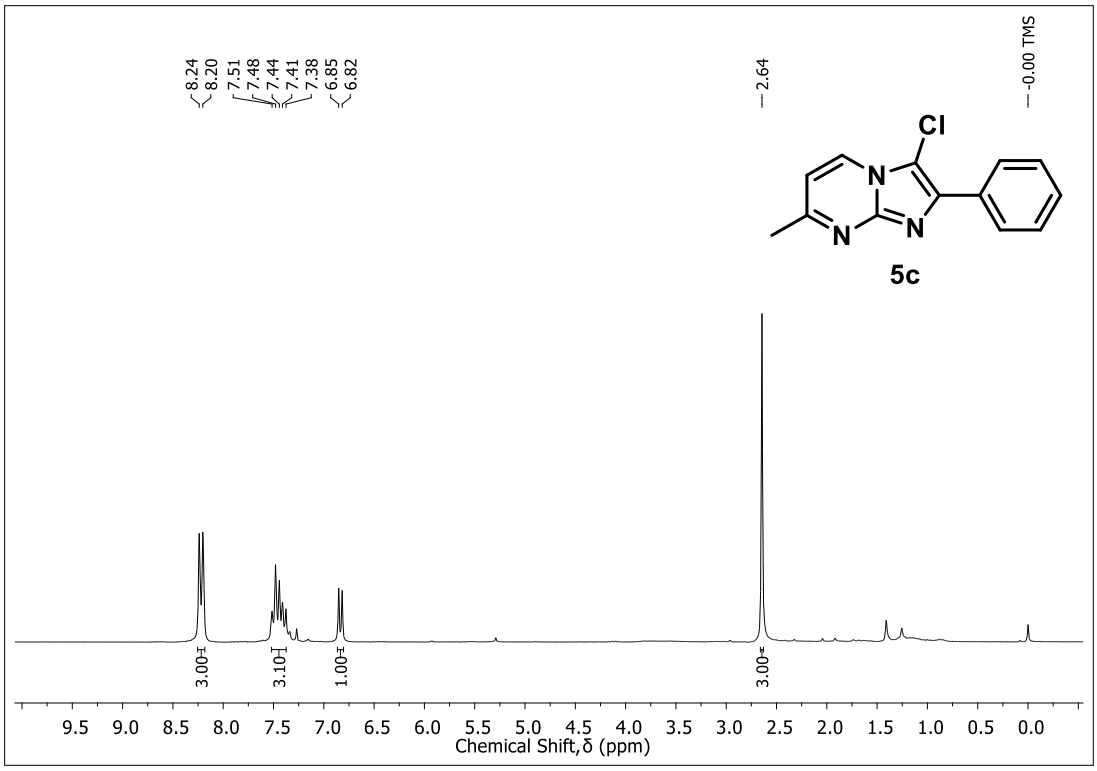


Figure S-52. ^{1}H NMR (200 MHz, $CDCl_3$) of compound **5c**.

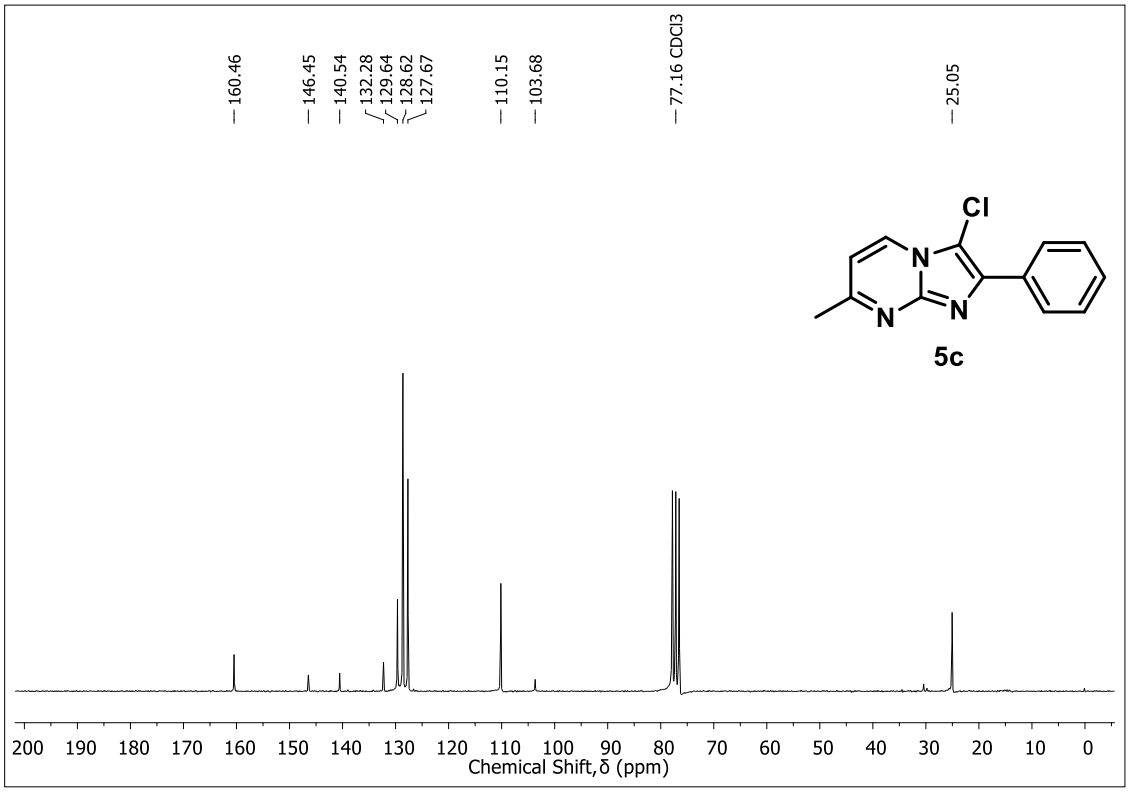


Figure S-53. ^{13}C NMR (50 MHz, $CDCl_3$) of compound **5d**.

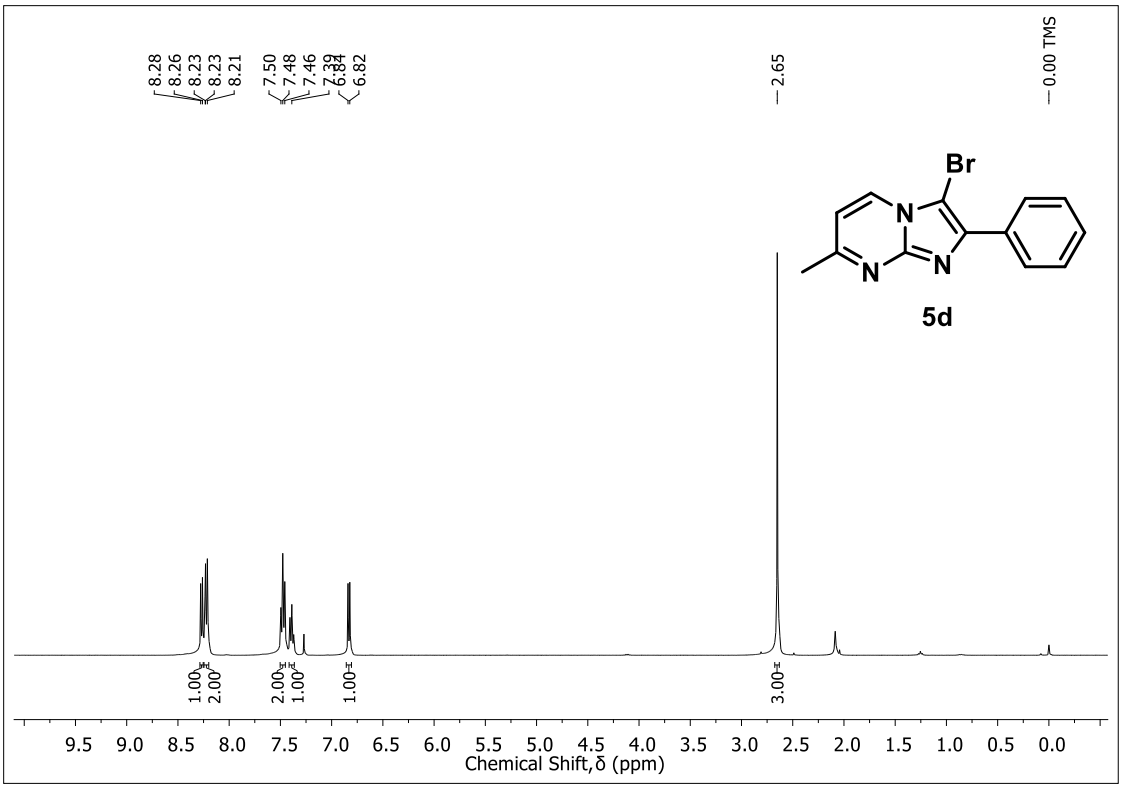


Figure S-54. ^{1}H NMR (400 MHz, $CDCl_3$) of compound **5d**.

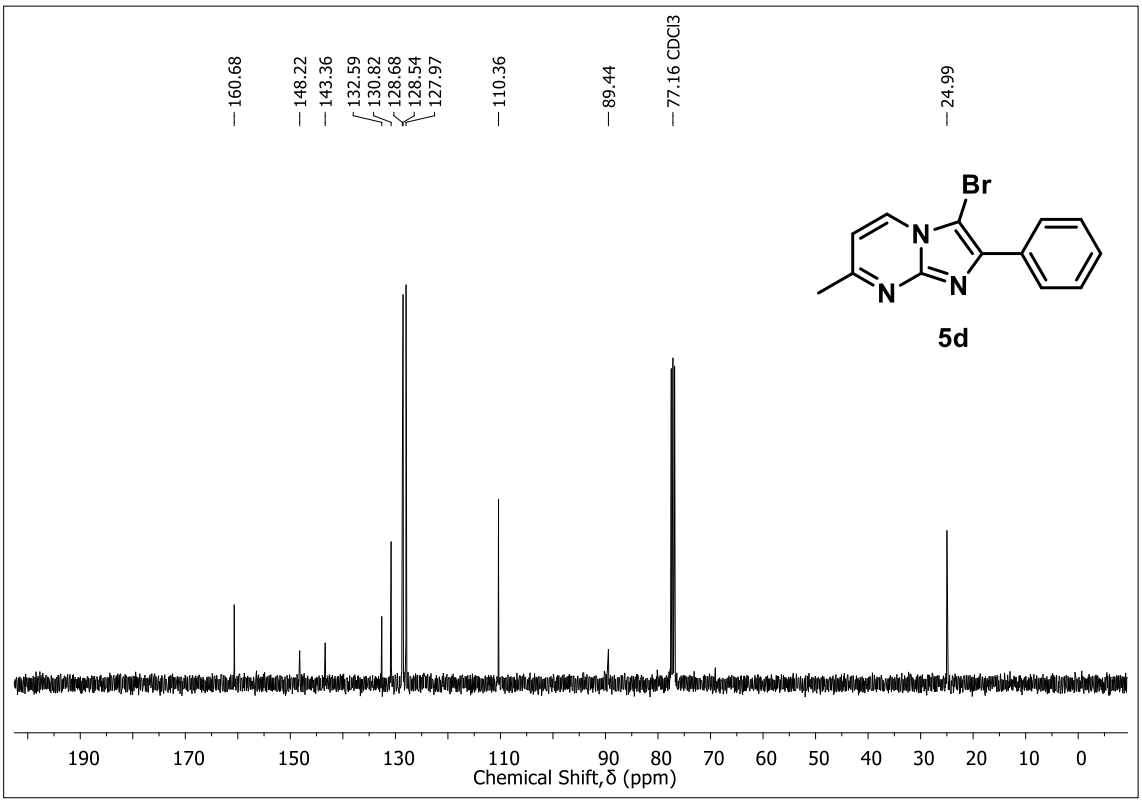


Figure S-55. ^{13}C NMR (100 MHz, $CDCl_3$) of compound **5d**.

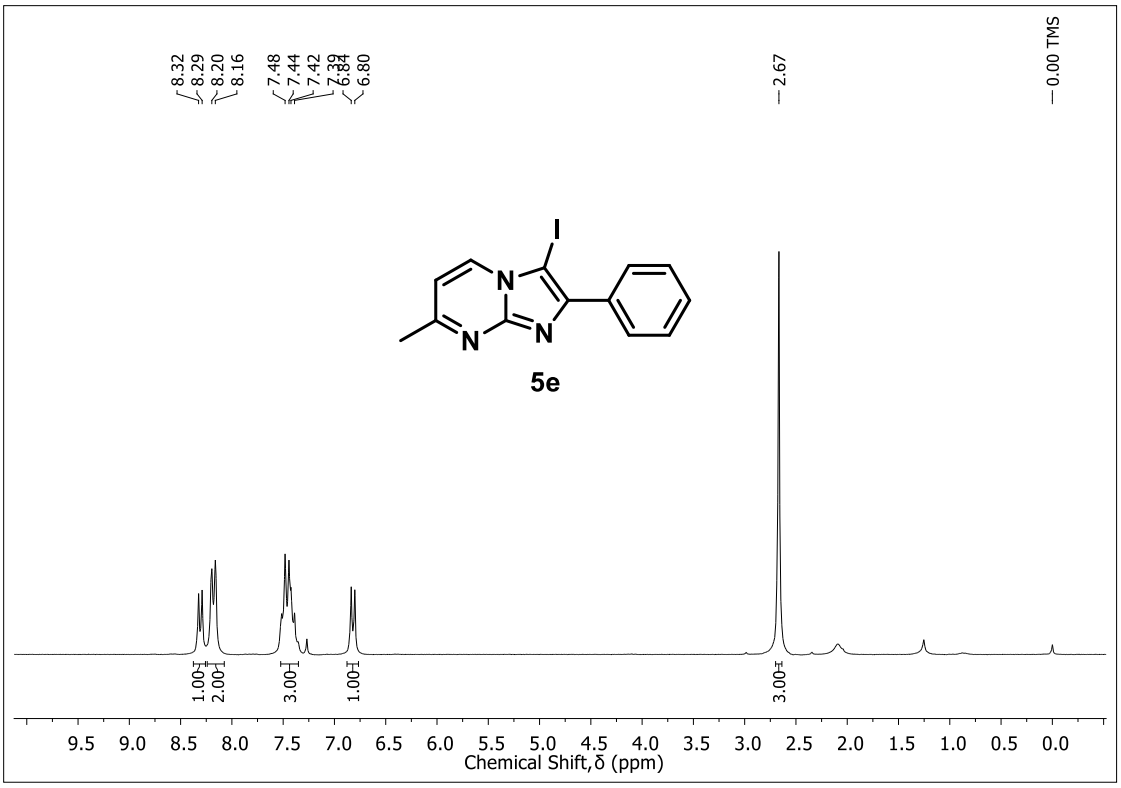


Figure S-56. ^{1}H NMR (200 MHz, $CDCl_3$) of compound **5e**.

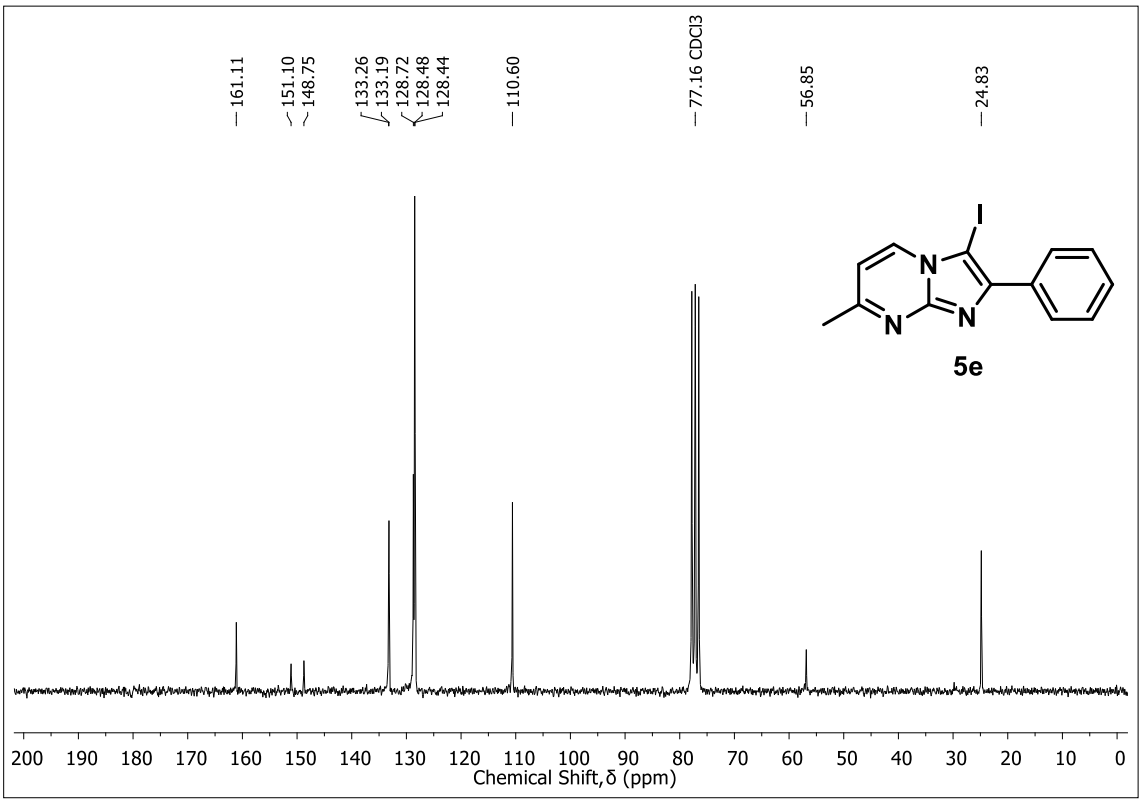


Figure S-57. ^{13}C NMR (50 MHz, $CDCl_3$) of compound **5e**.

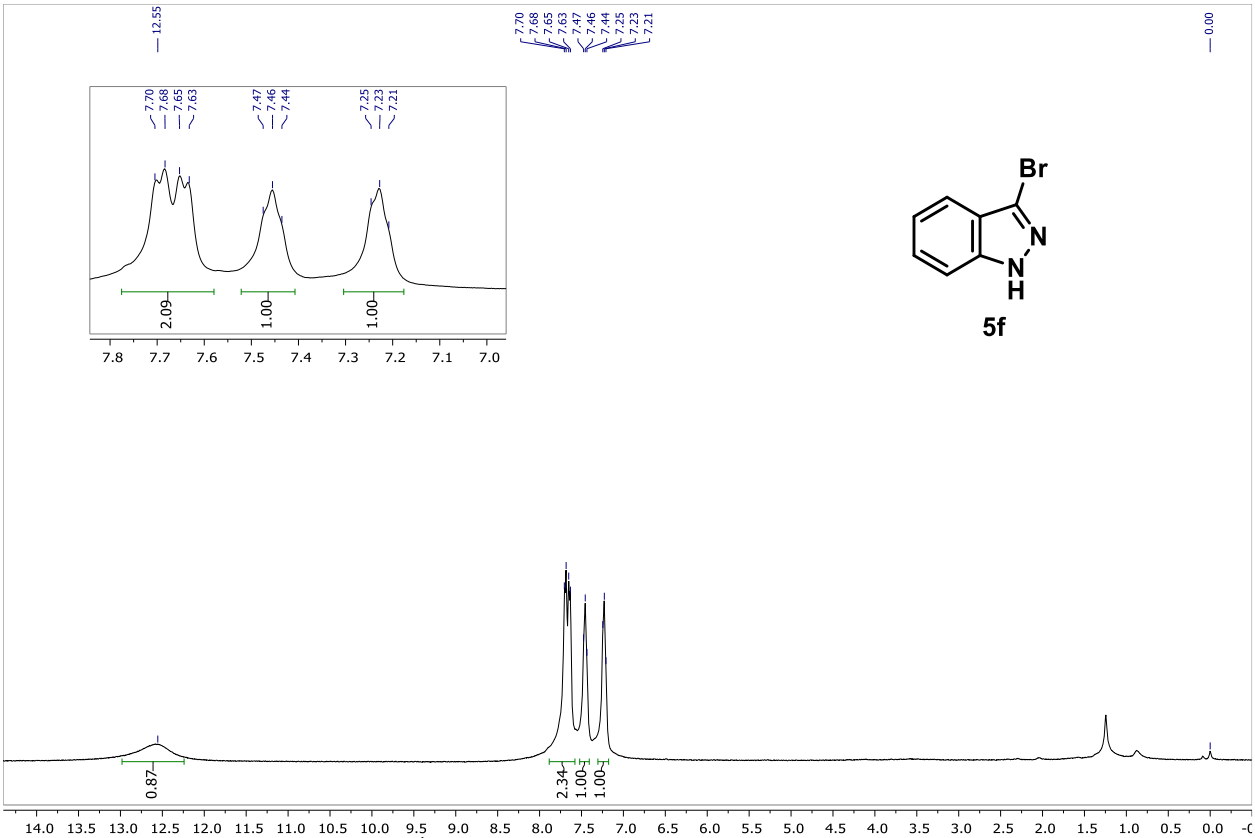


Figure S-58. ^{1}H NMR (400 MHz, $CDCl_3$) of compound **5f**.

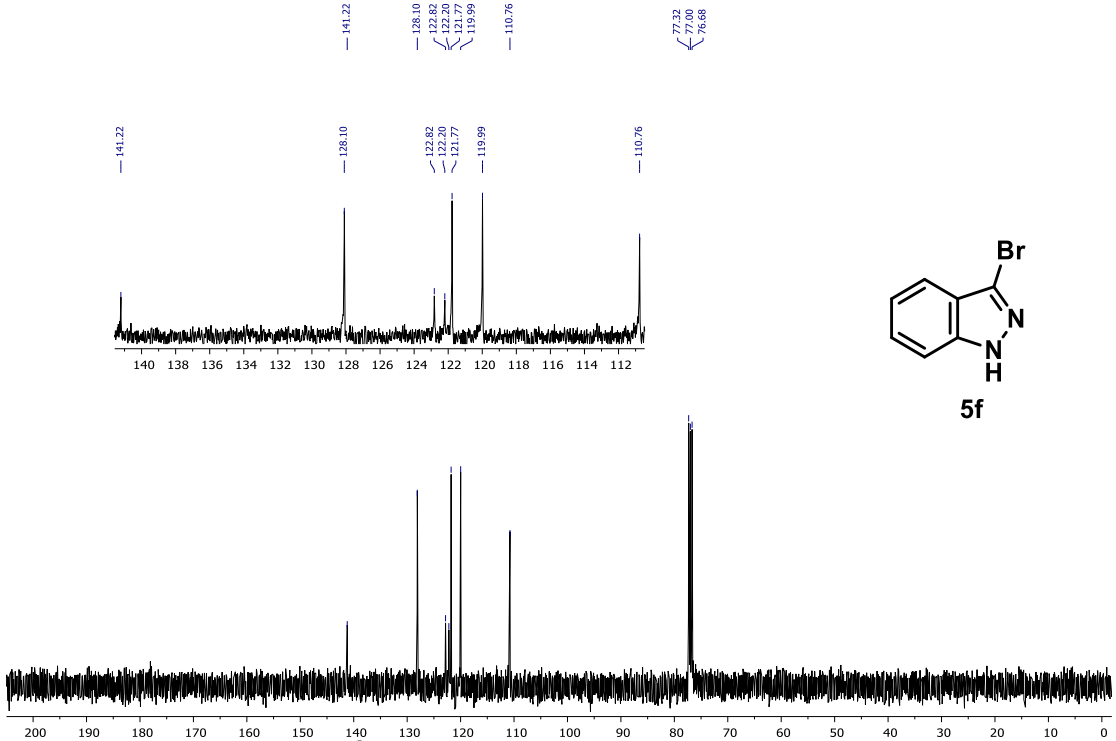


Figure S-59. ^{13}C NMR (100 MHz, $CDCl_3$) of compound **5f**.

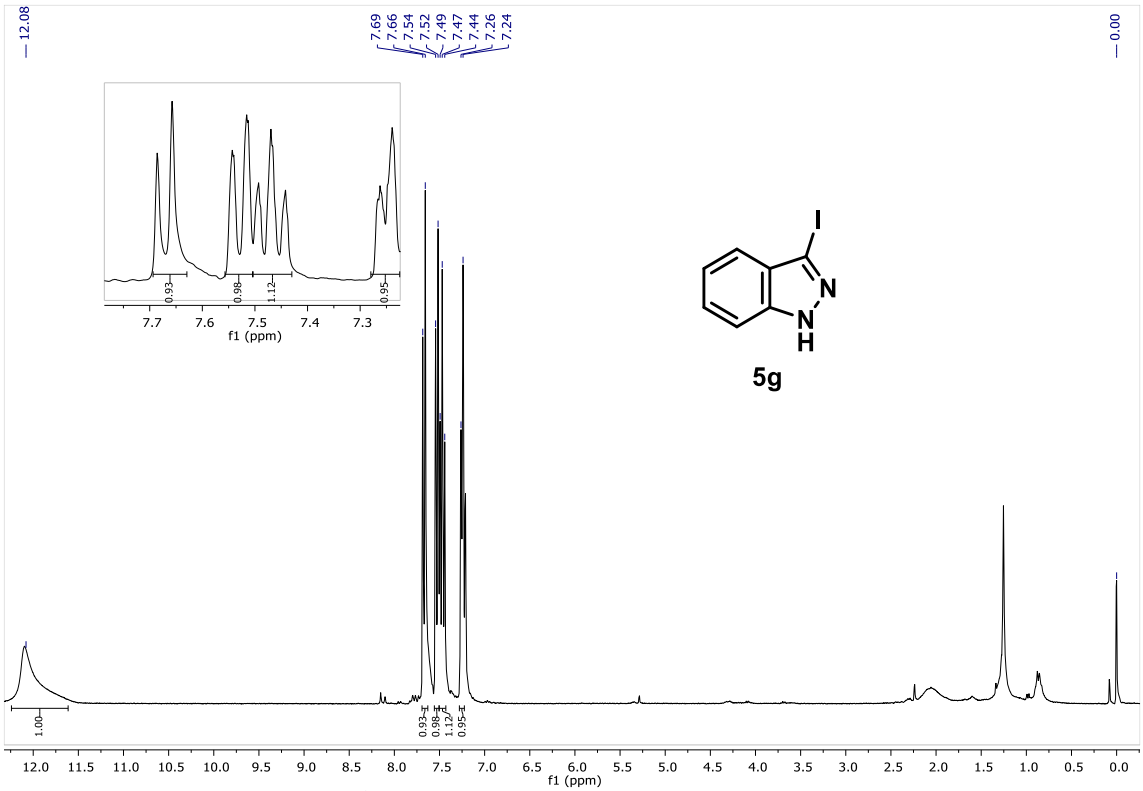


Figure S-60. ^{1}H NMR (300 MHz, $CDCl_3$) of compound **5g**.

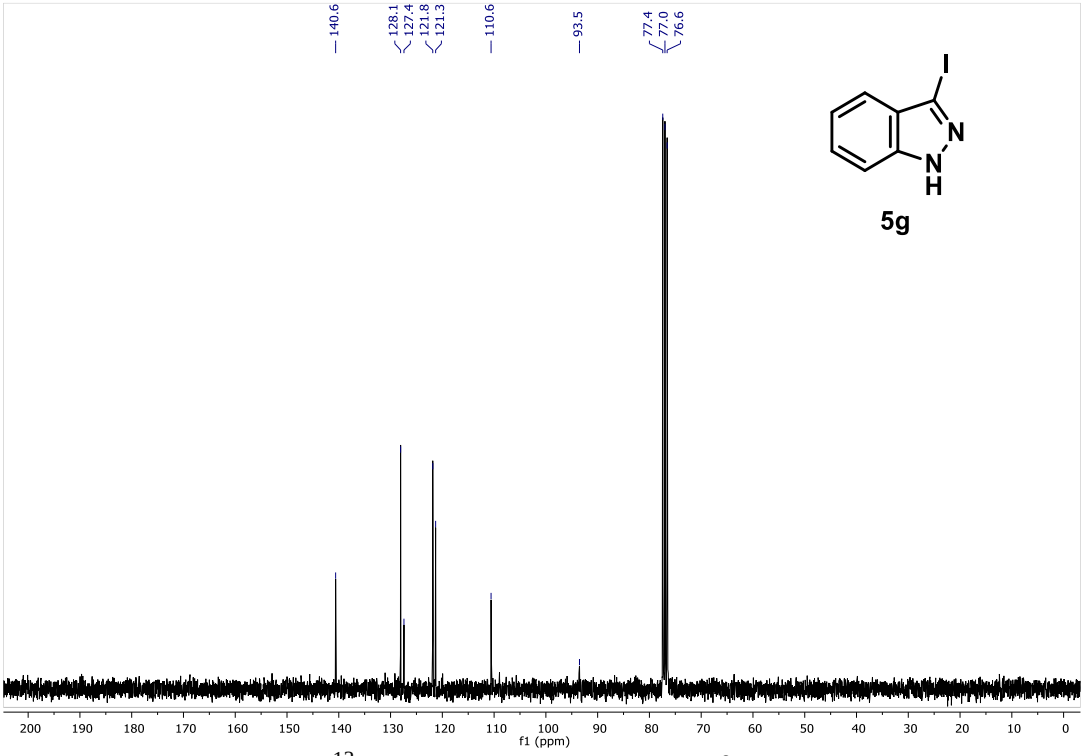


Figure S-61. ^{13}C NMR (75 MHz, $CDCl_3$) of compound **5g**.

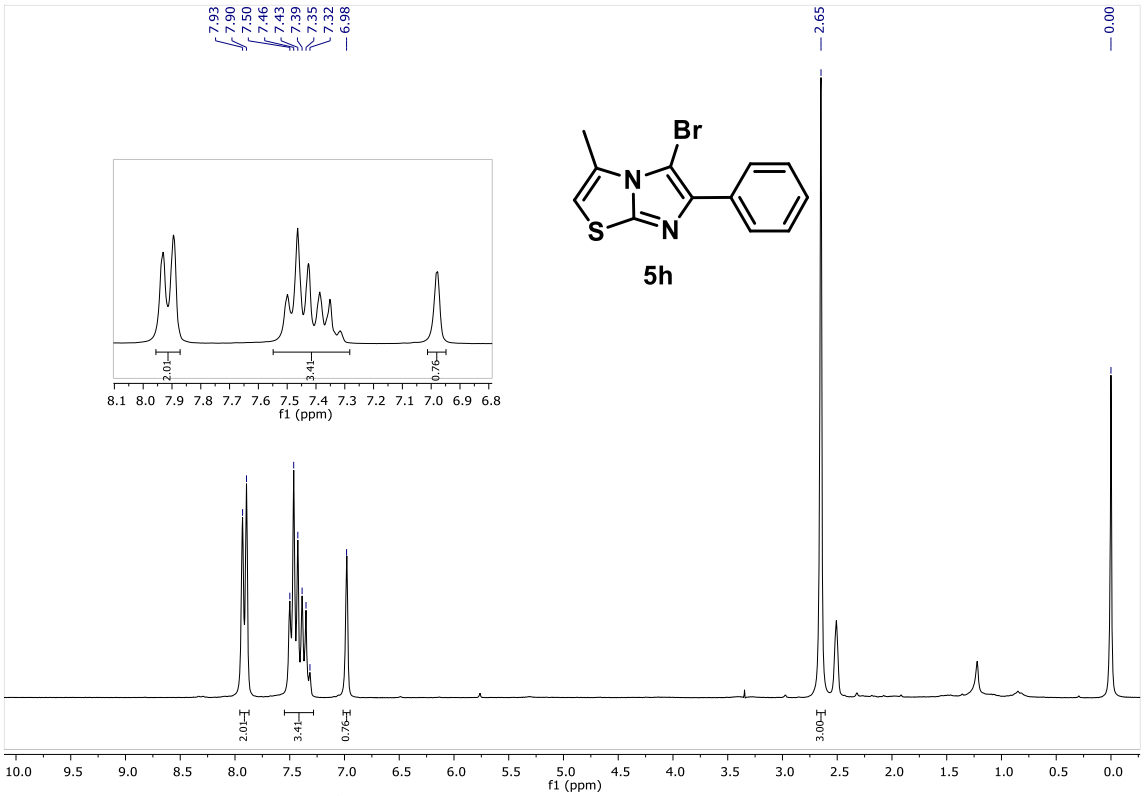


Figure S-63. ^{1}H NMR (200 MHz, DMSO- d_6) of compound **5h**.

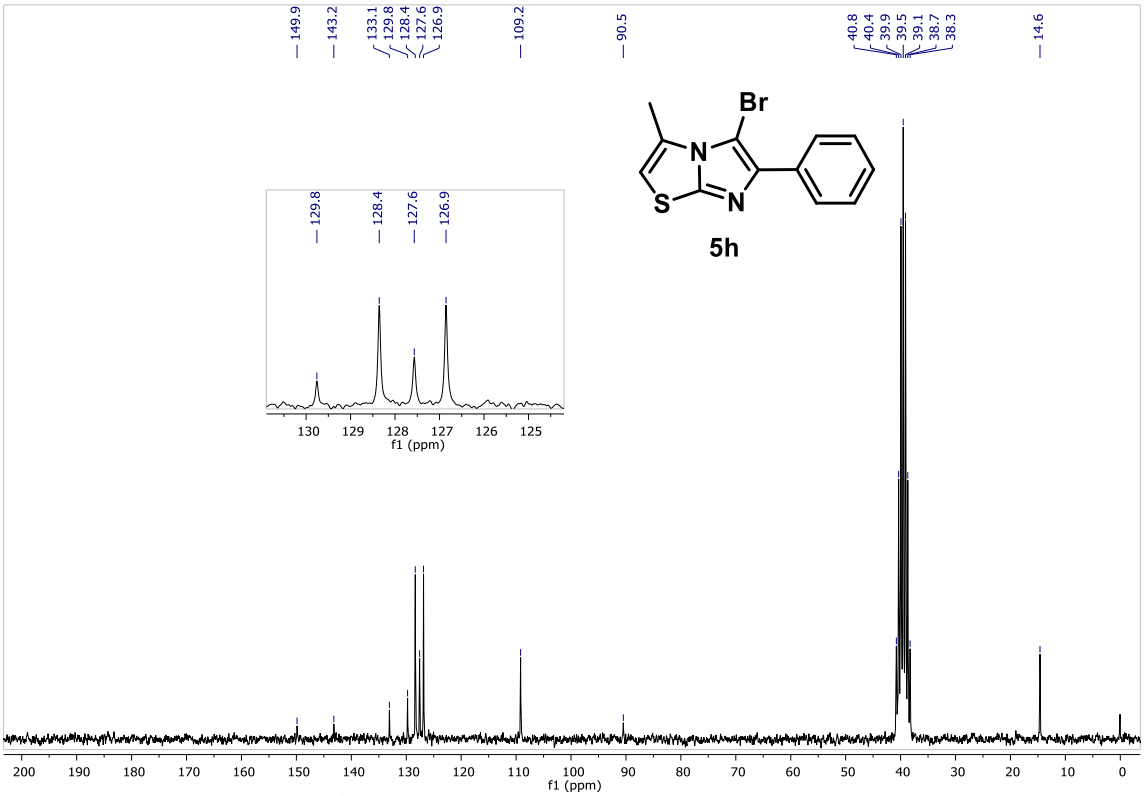


Figure S-64. ^{1}H NMR (50 MHz, DMSO- d_6) of compound **5h**.

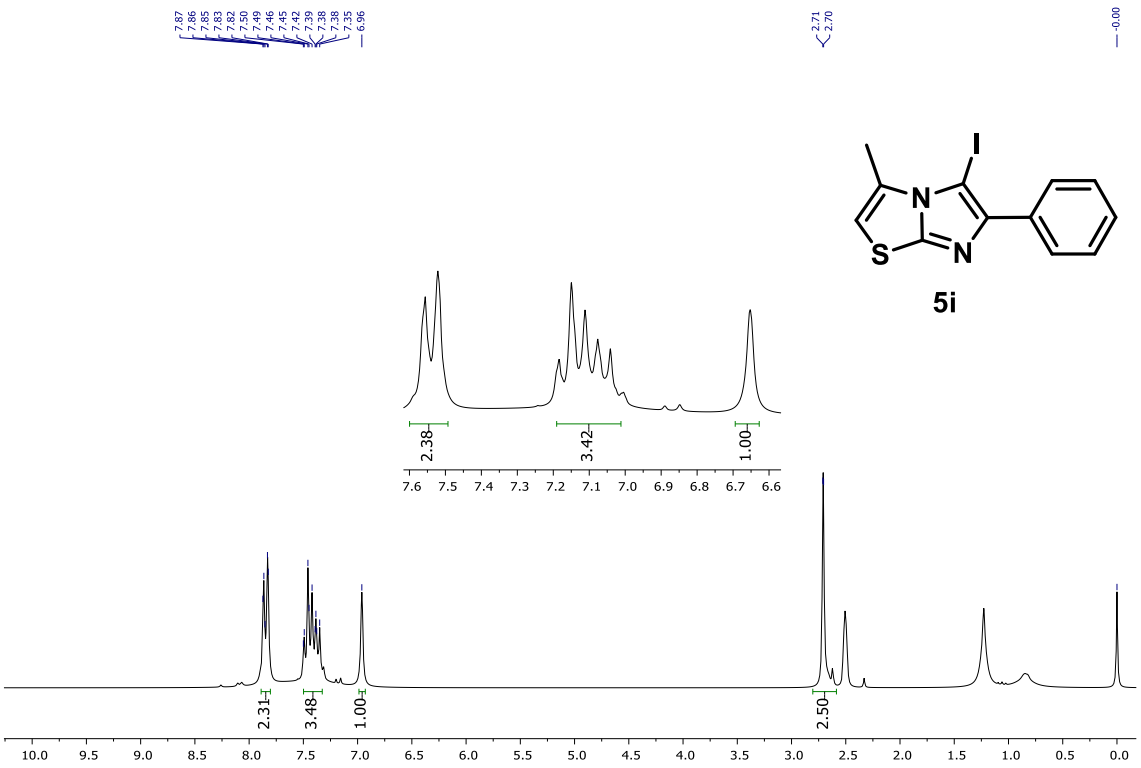


Figure S-65. ^{1}H NMR (200 MHz, DMSO- d_6) of compound **5i**.

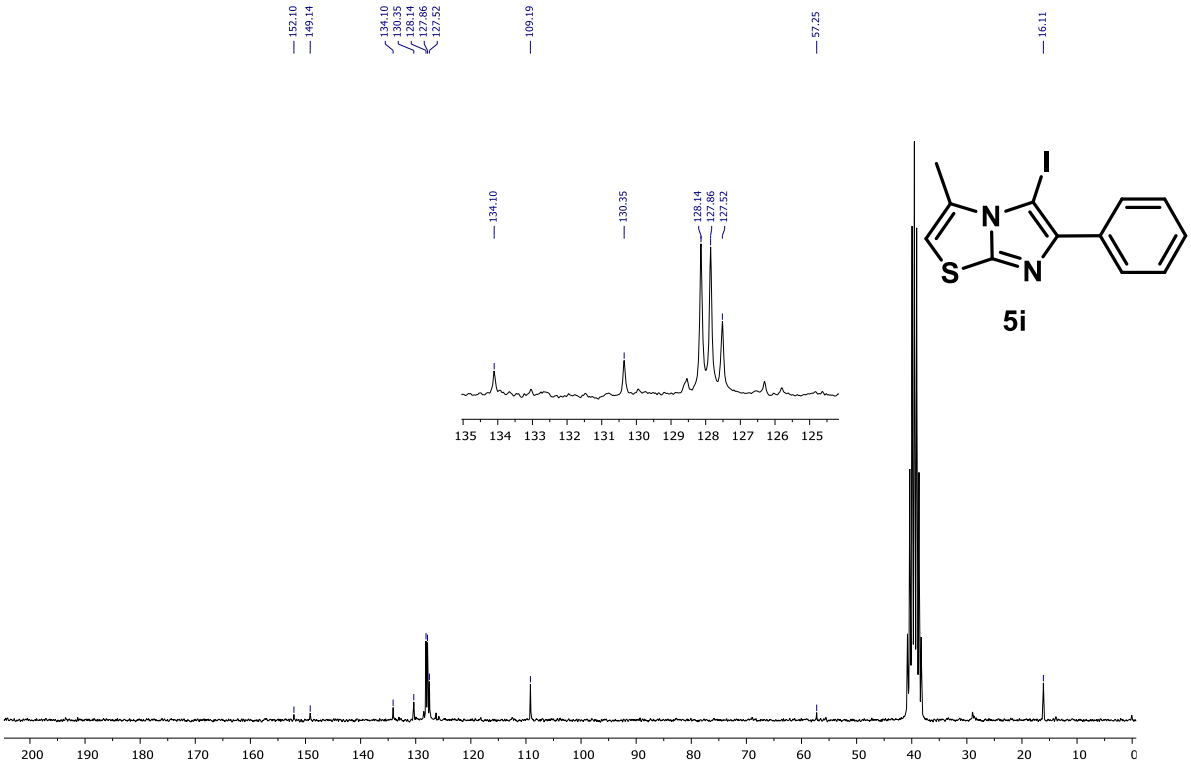


Figure S-66. ^{1}H NMR (50 MHz, DMSO- d_6) of compound **5i**.

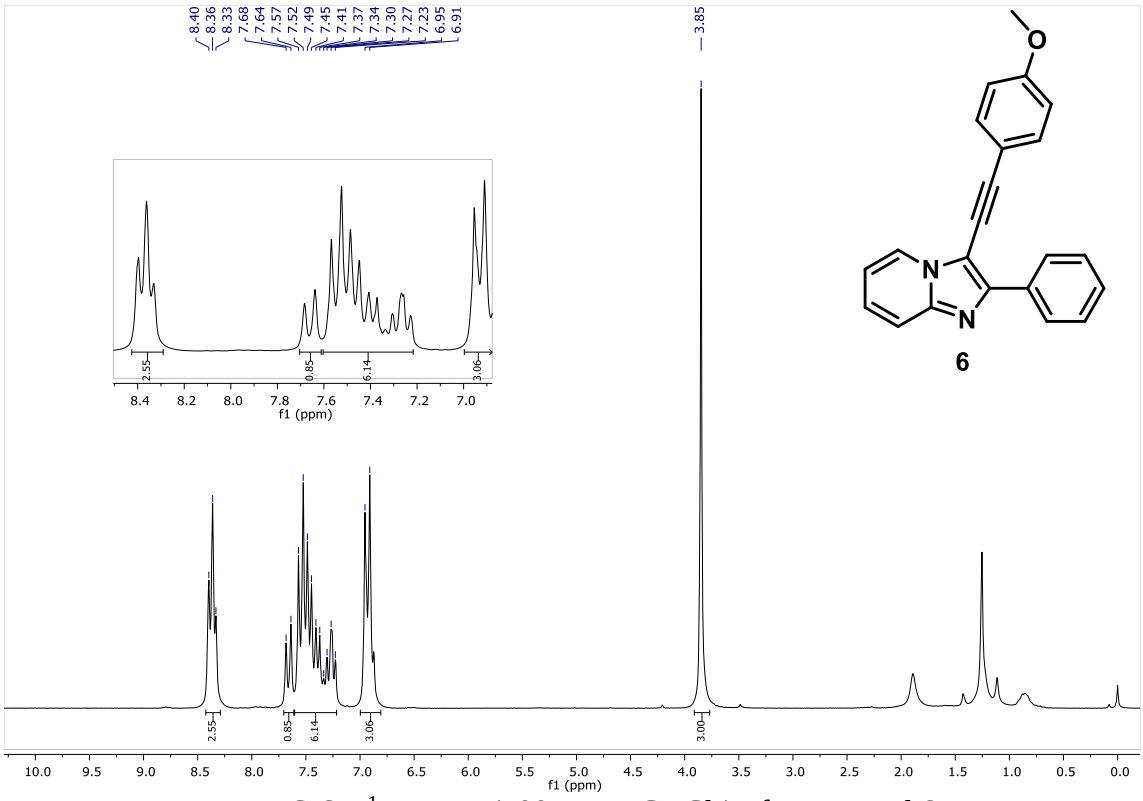


Figure S-67. ^{1}H NMR (200 MHz, $CDCl_3$) of compound **6**.

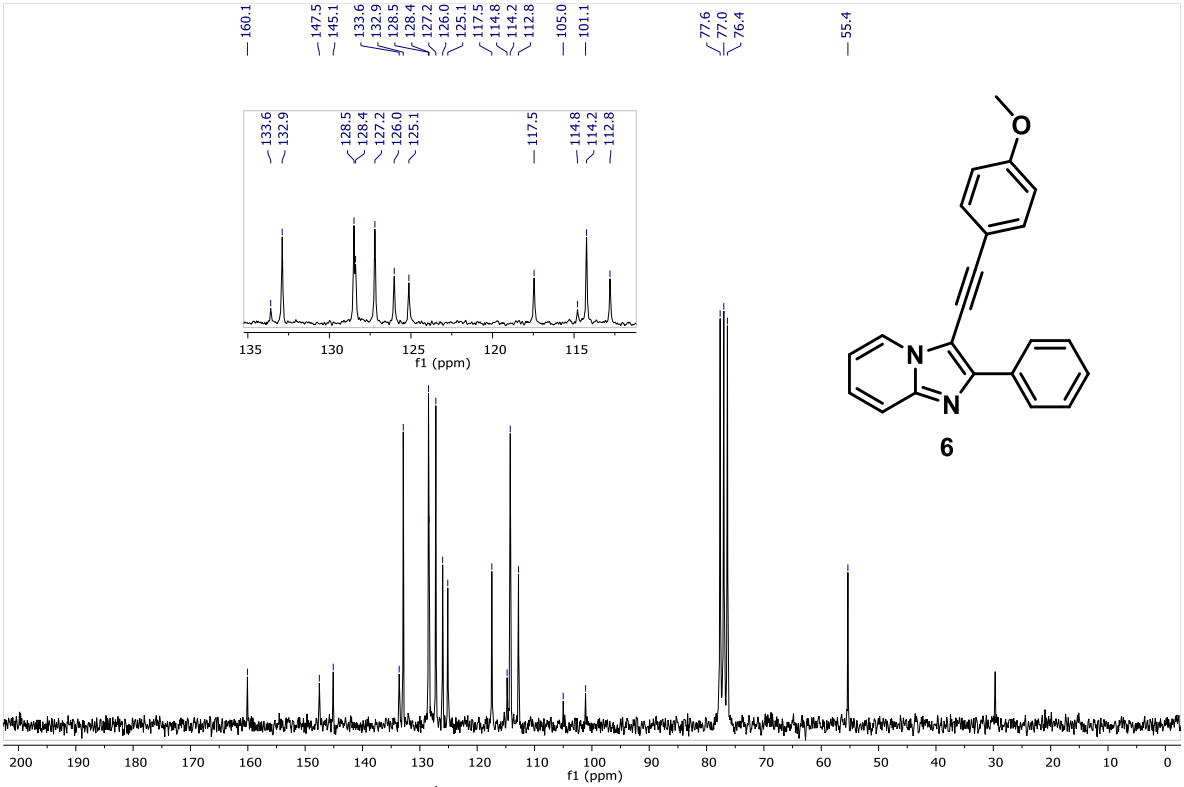


Figure S-68. ^{1}H NMR (50 MHz, $CDCl_3$) of compound **6**.

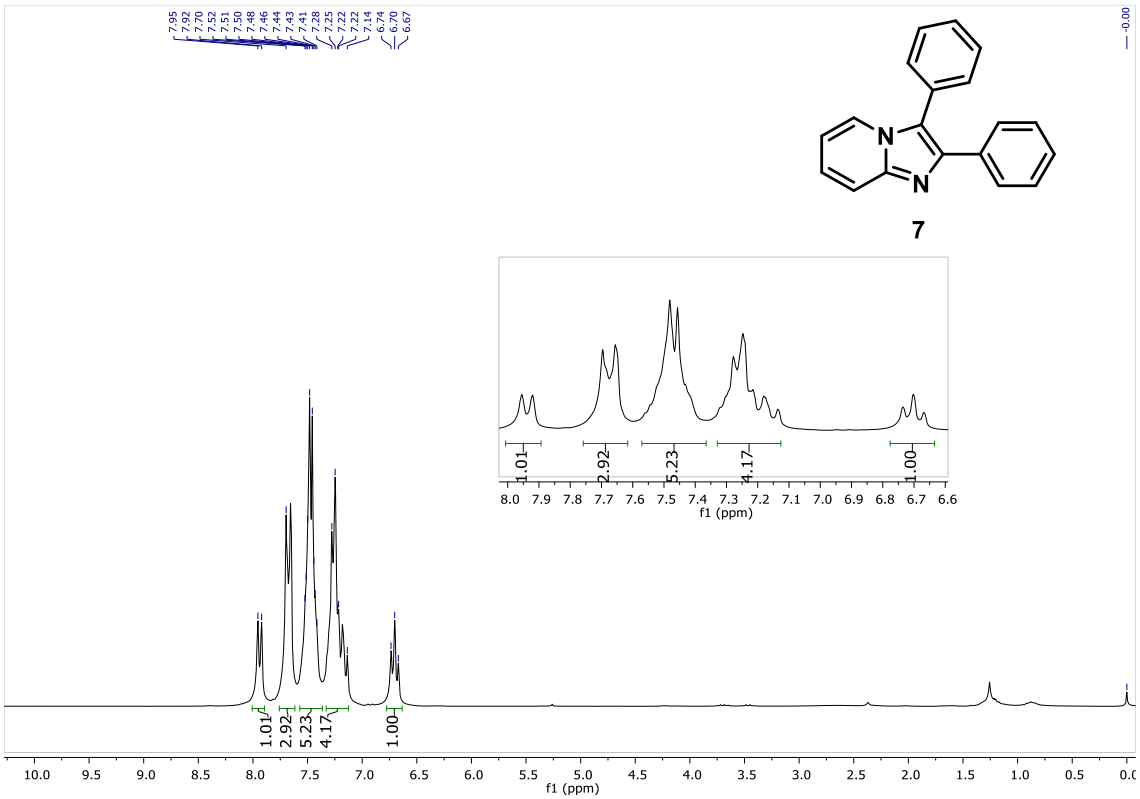


Figure S-69. ^{1}H NMR (200 MHz, $CDCl_3$) of compound **7**.

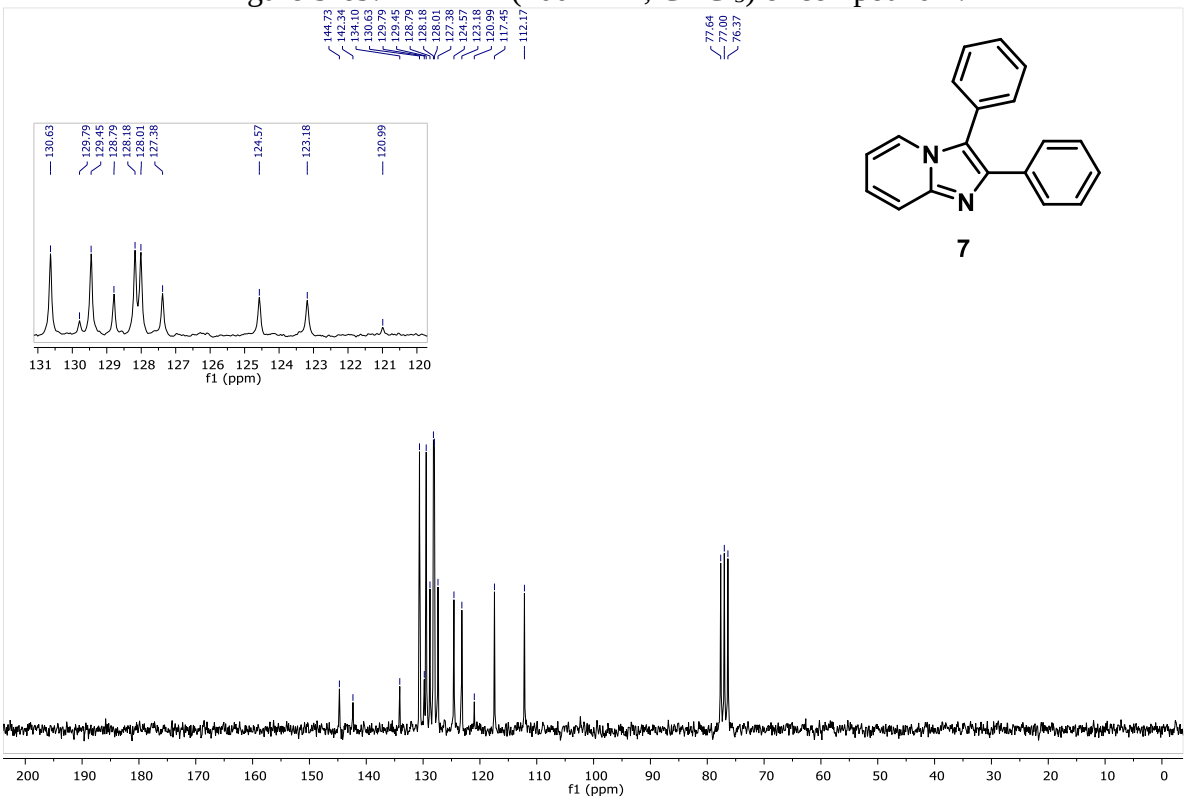
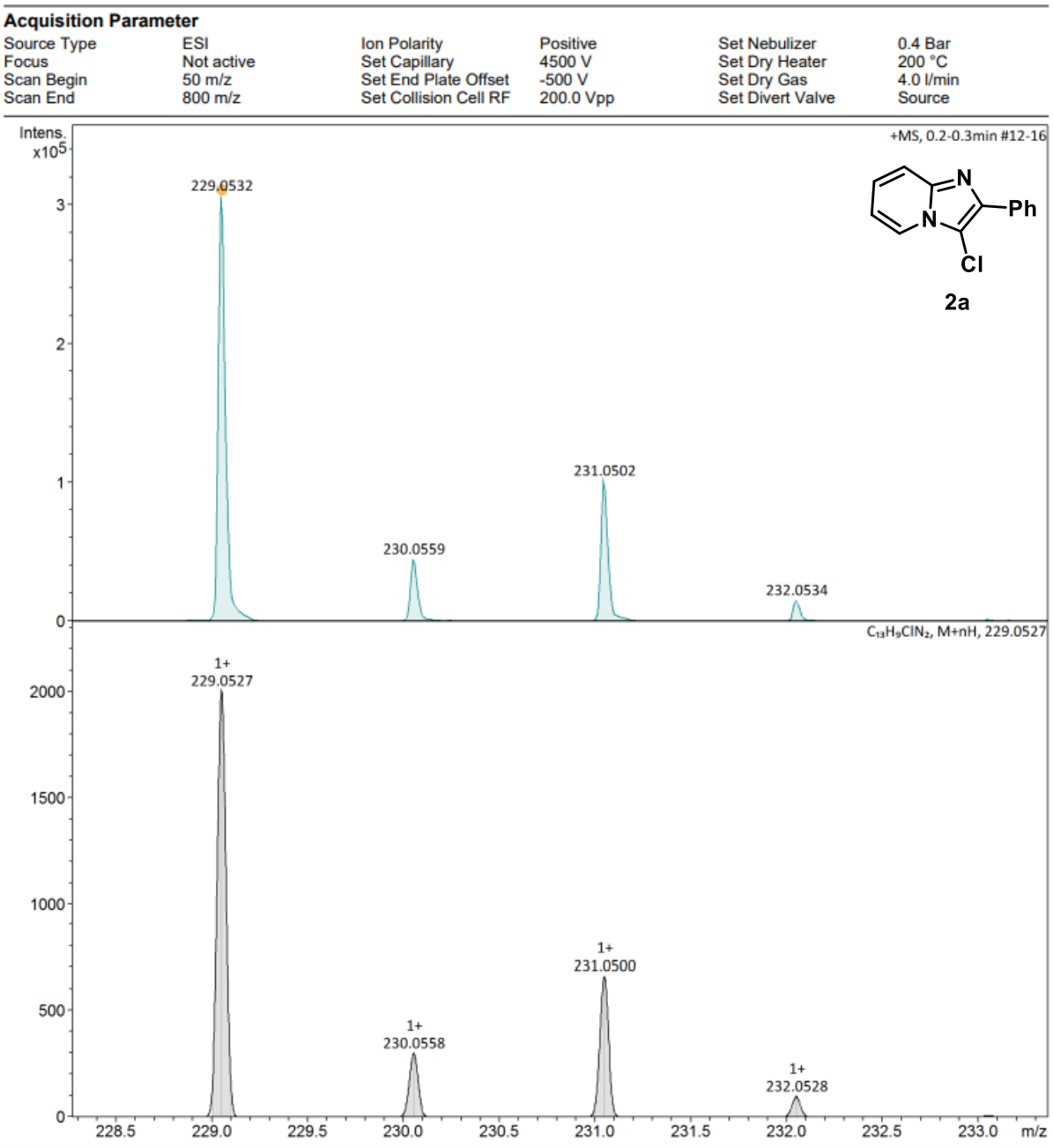


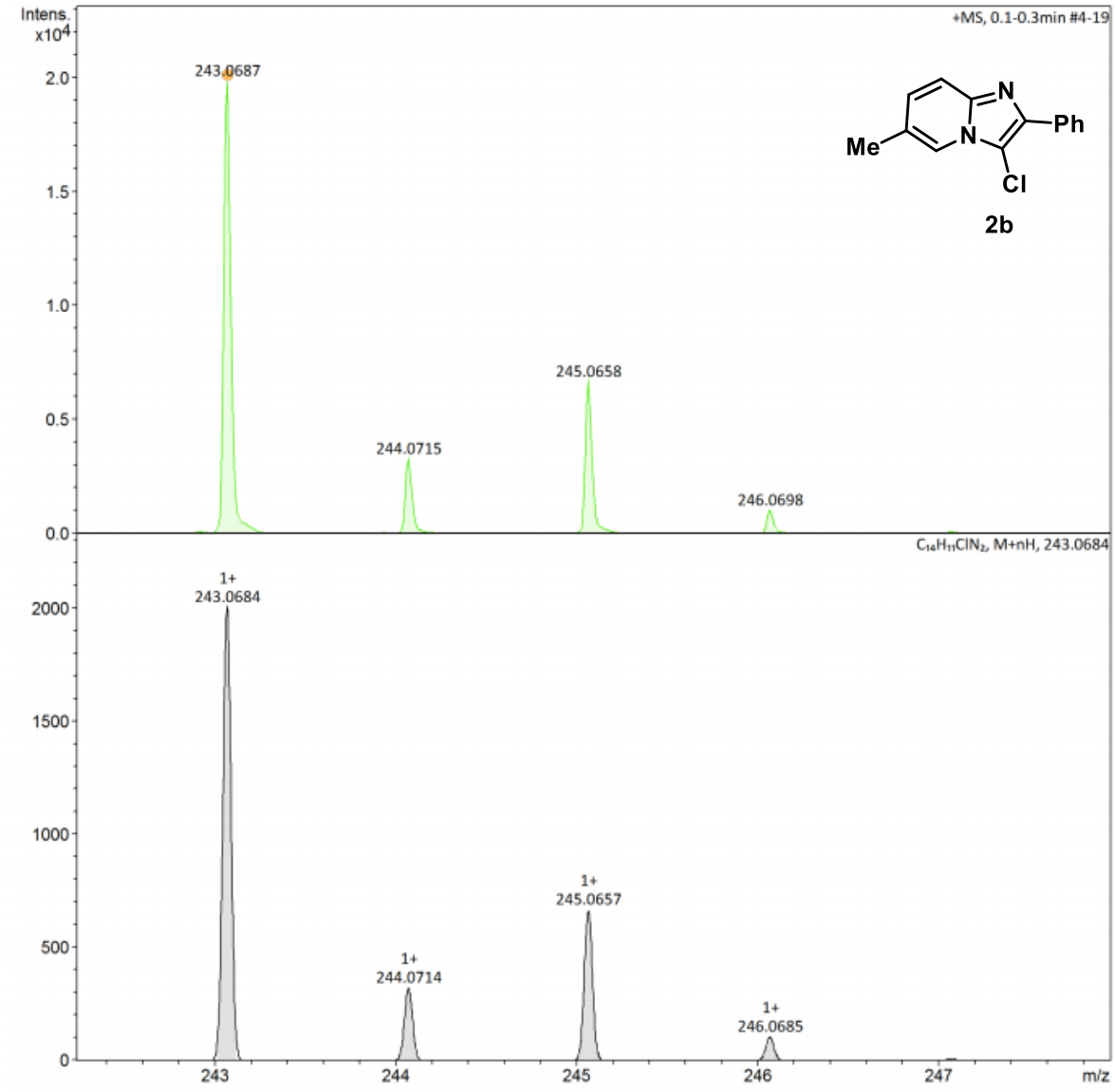
Figure S-70. ^{1}H NMR (50 MHz, $CDCl_3$) of compound **7**.

VII. HRMS


Acquisition Parameter
Source Type ESI
Focus Not active
Scan Begin 50 m/z
Scan End 800 m/z
Ion Polarity Positive
Set Capillary 4500 V
Set End Plate Offset -500 V
Set Collision Cell RF 200.0 Vpp
Set Nebulizer 0.4 Bar
Set Dry Heater 200 °C
Set Dry Gas 4.0 l/min
Set Divert Valve Source
Intens.
x10^5
+MS, 0.2-0.3min #12-16
229.0532
230.0559
231.0502
232.0534
N
N
Ph
Cl
2a
C13H9ClN2, M+nH, 229.0527
1+
229.0527
1+
230.0558
1+
231.0500
1+
232.0528
228.5
229.0
229.5
230.0
230.5
231.0
231.5
232.0
232.5
233.0
m/z

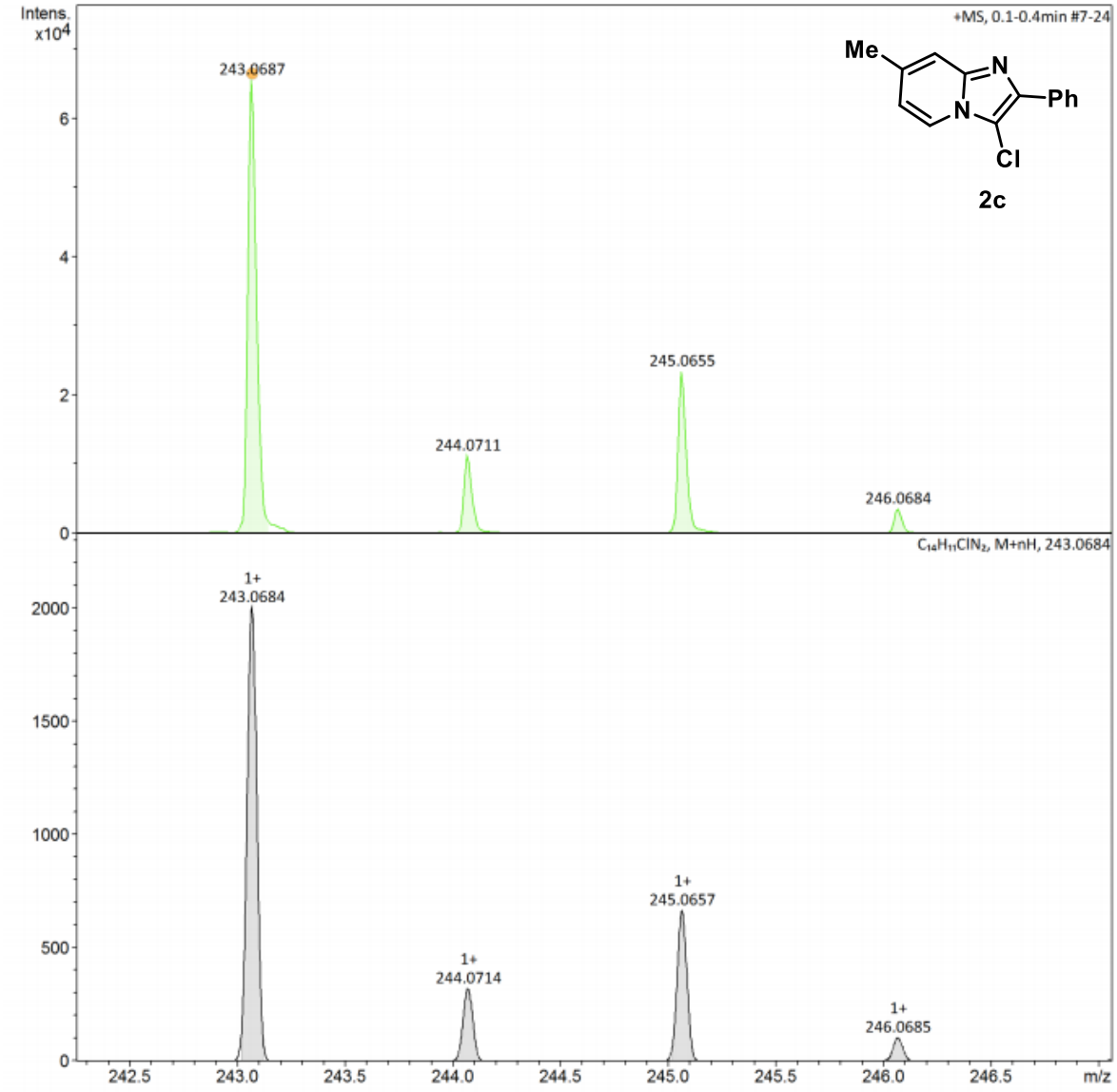
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



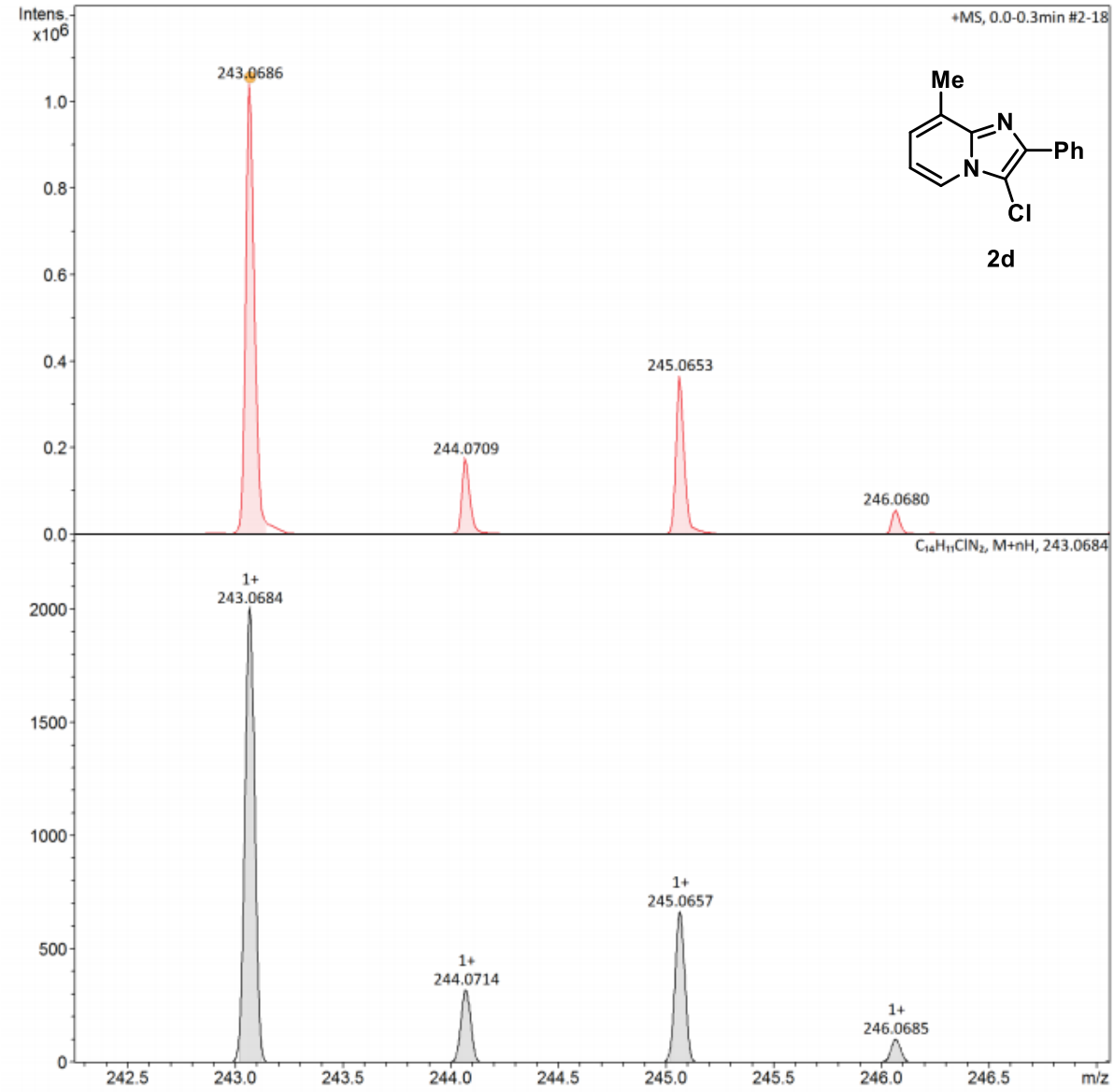
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



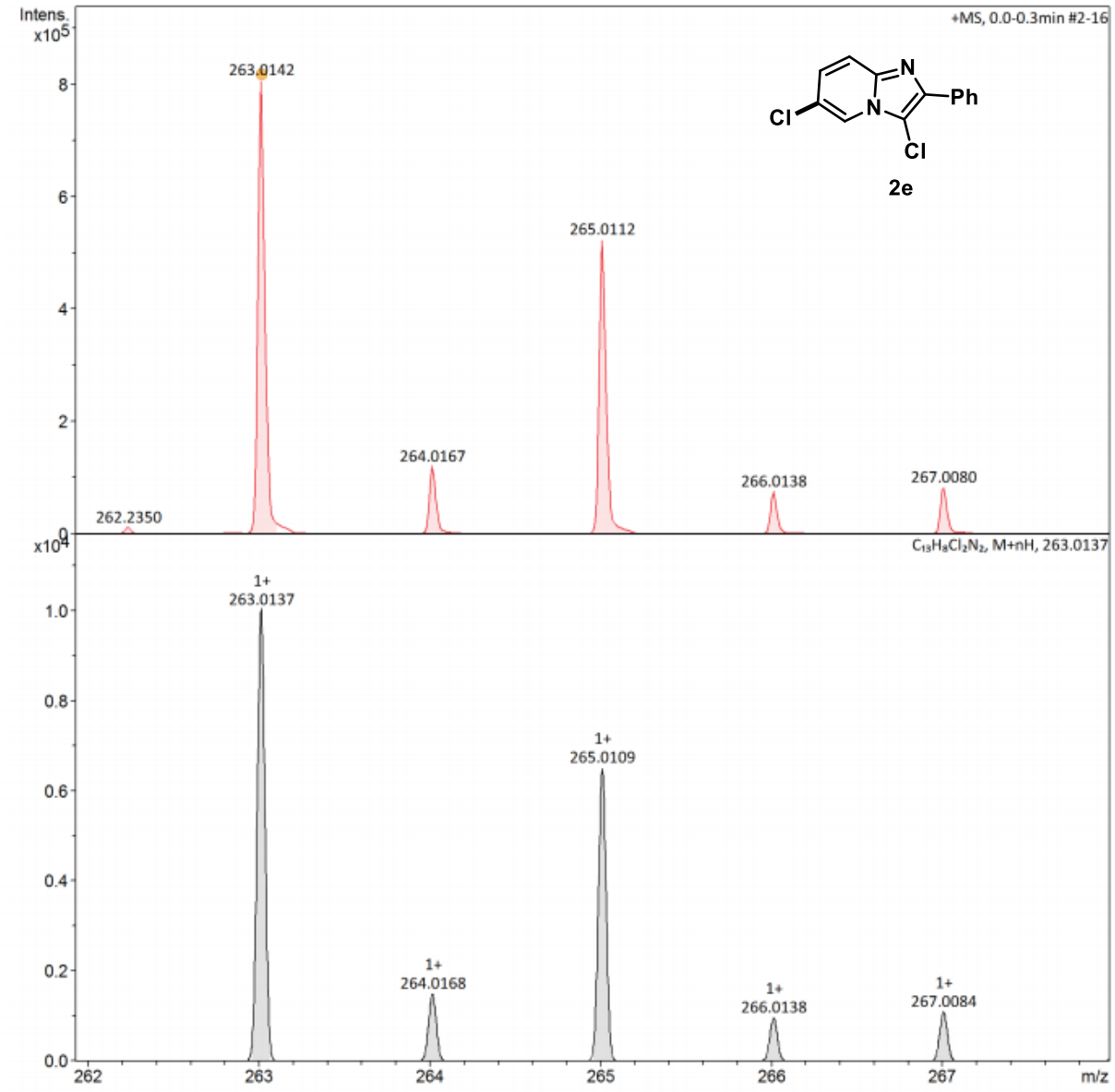
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



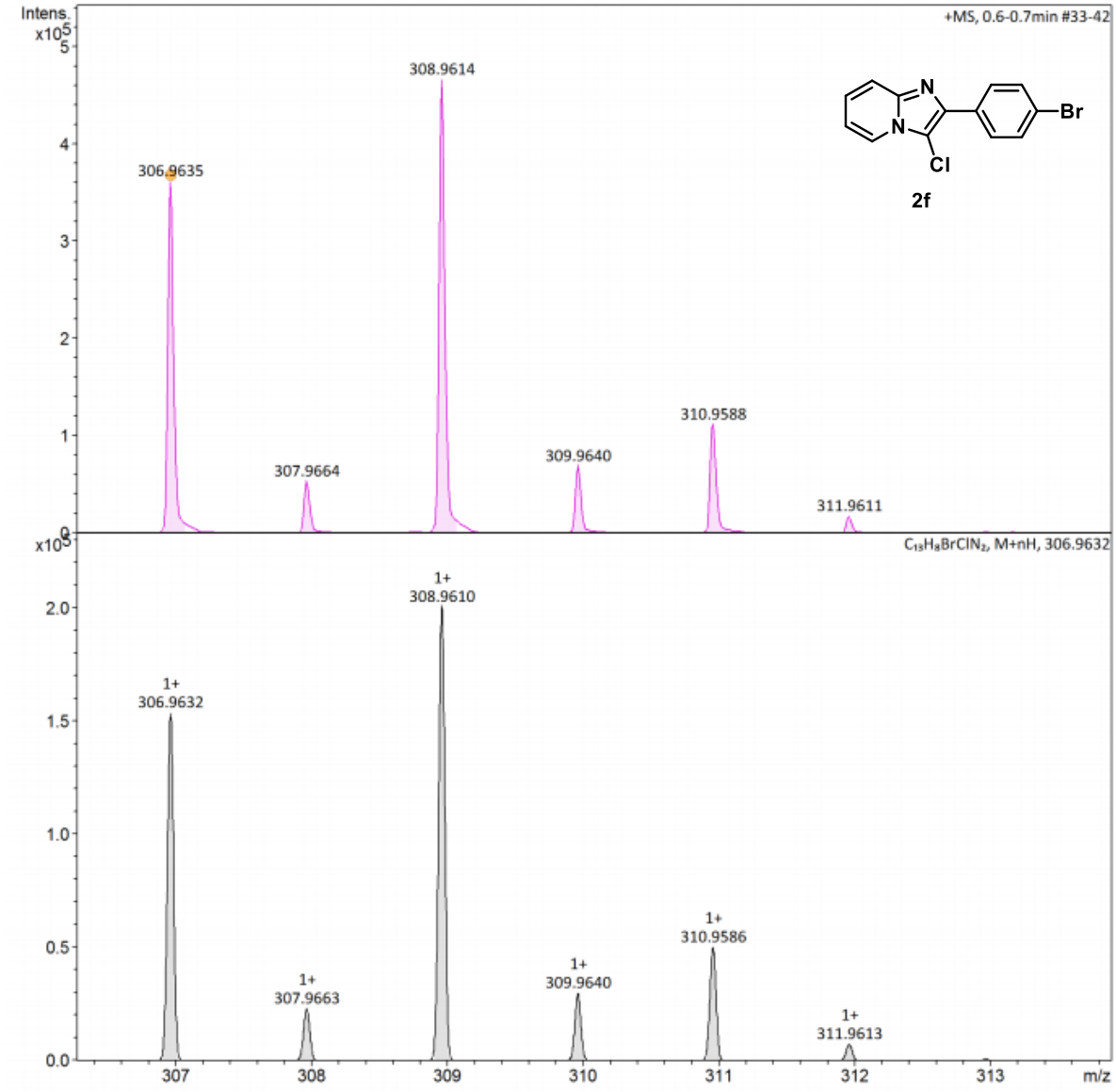
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



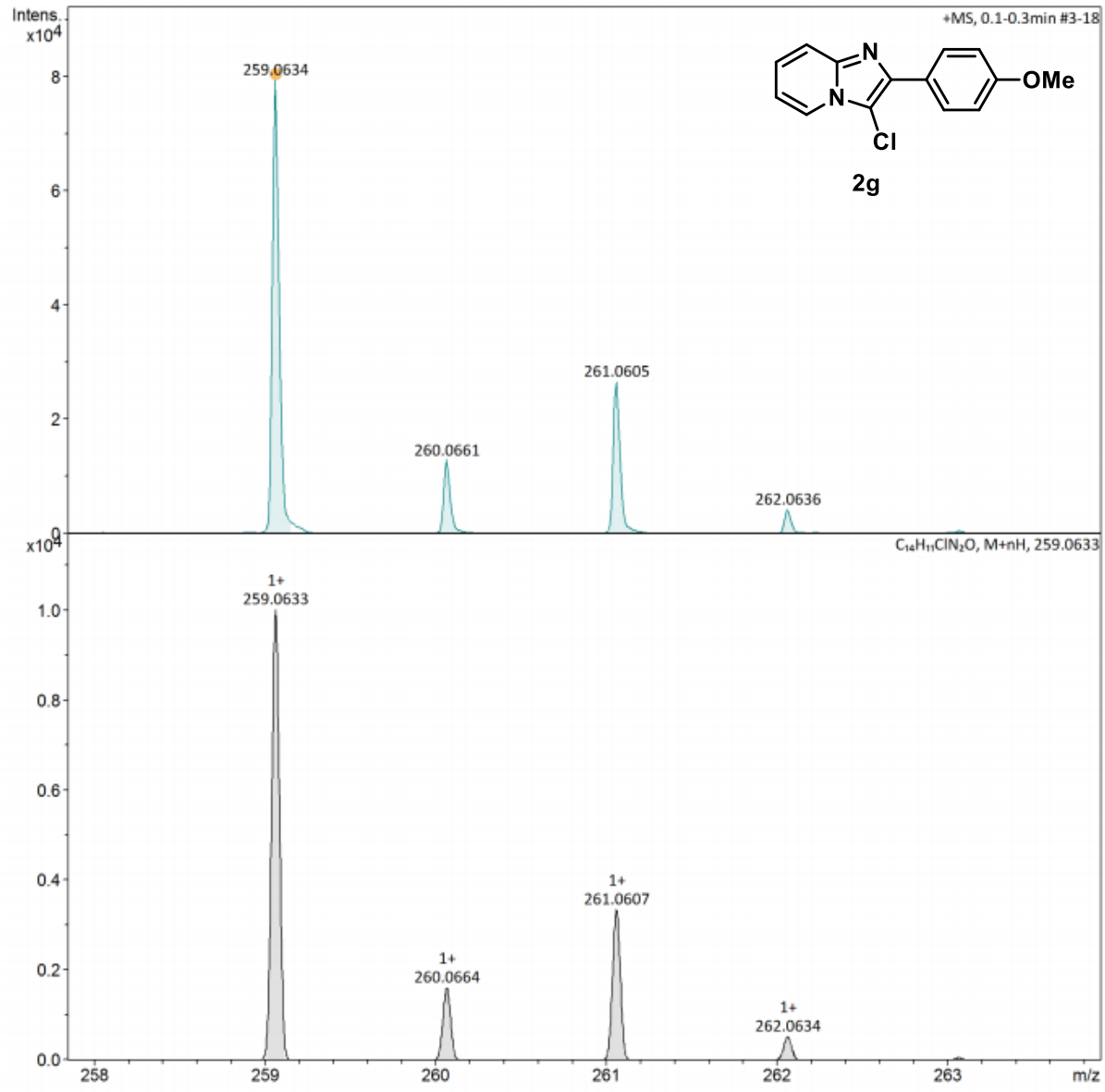
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



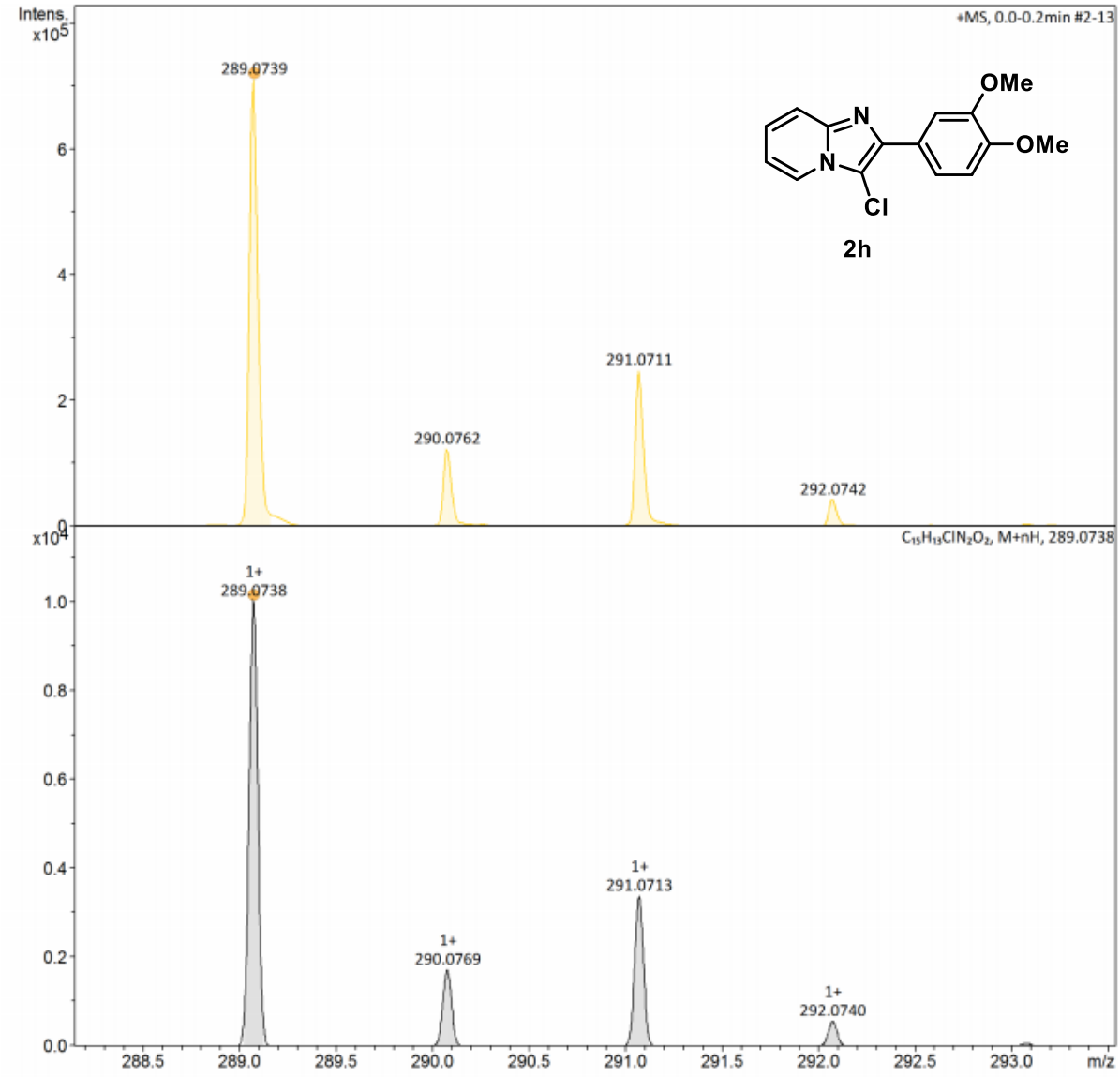
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



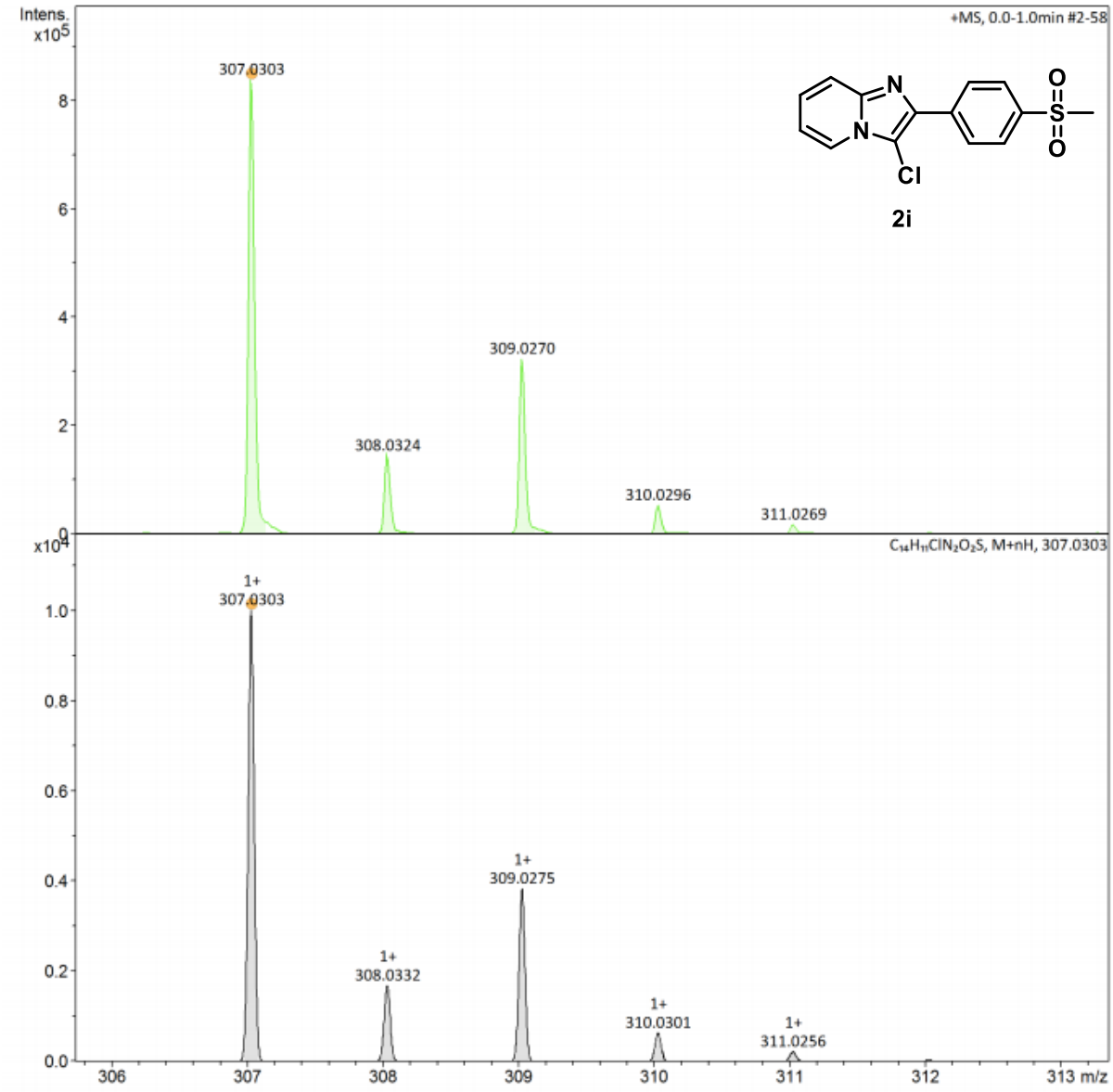
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



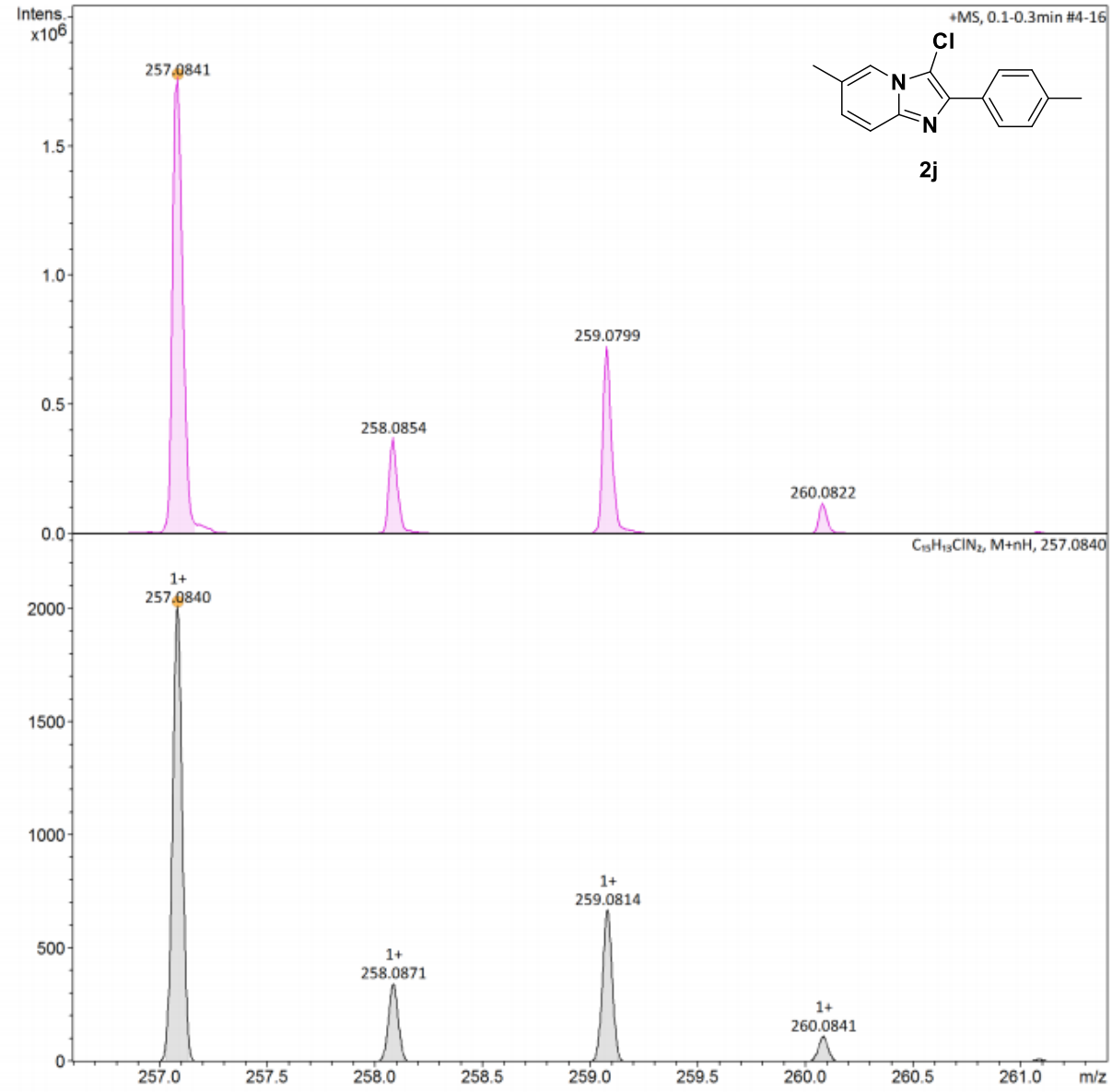
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



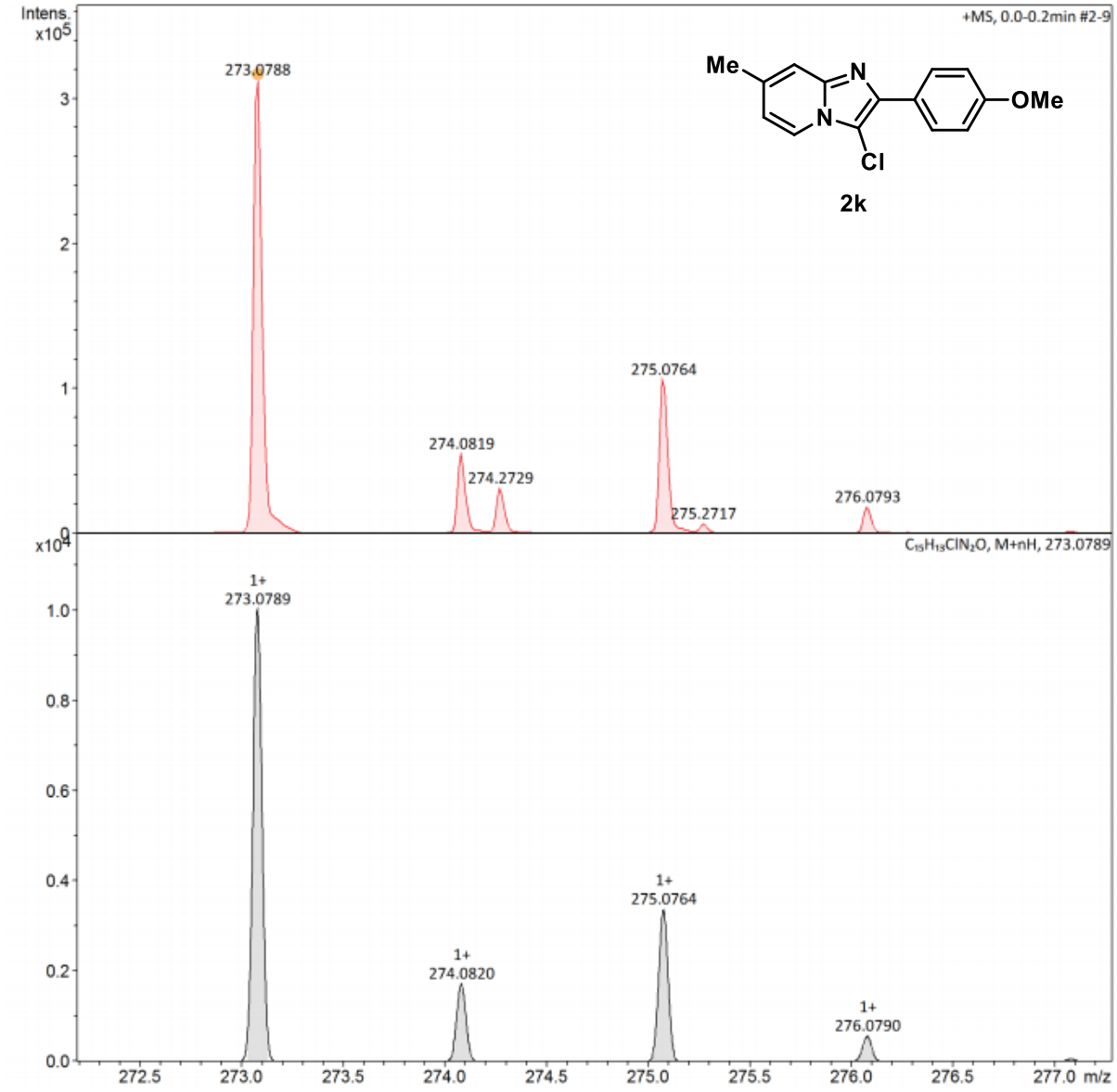
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



Acquisition Parameter

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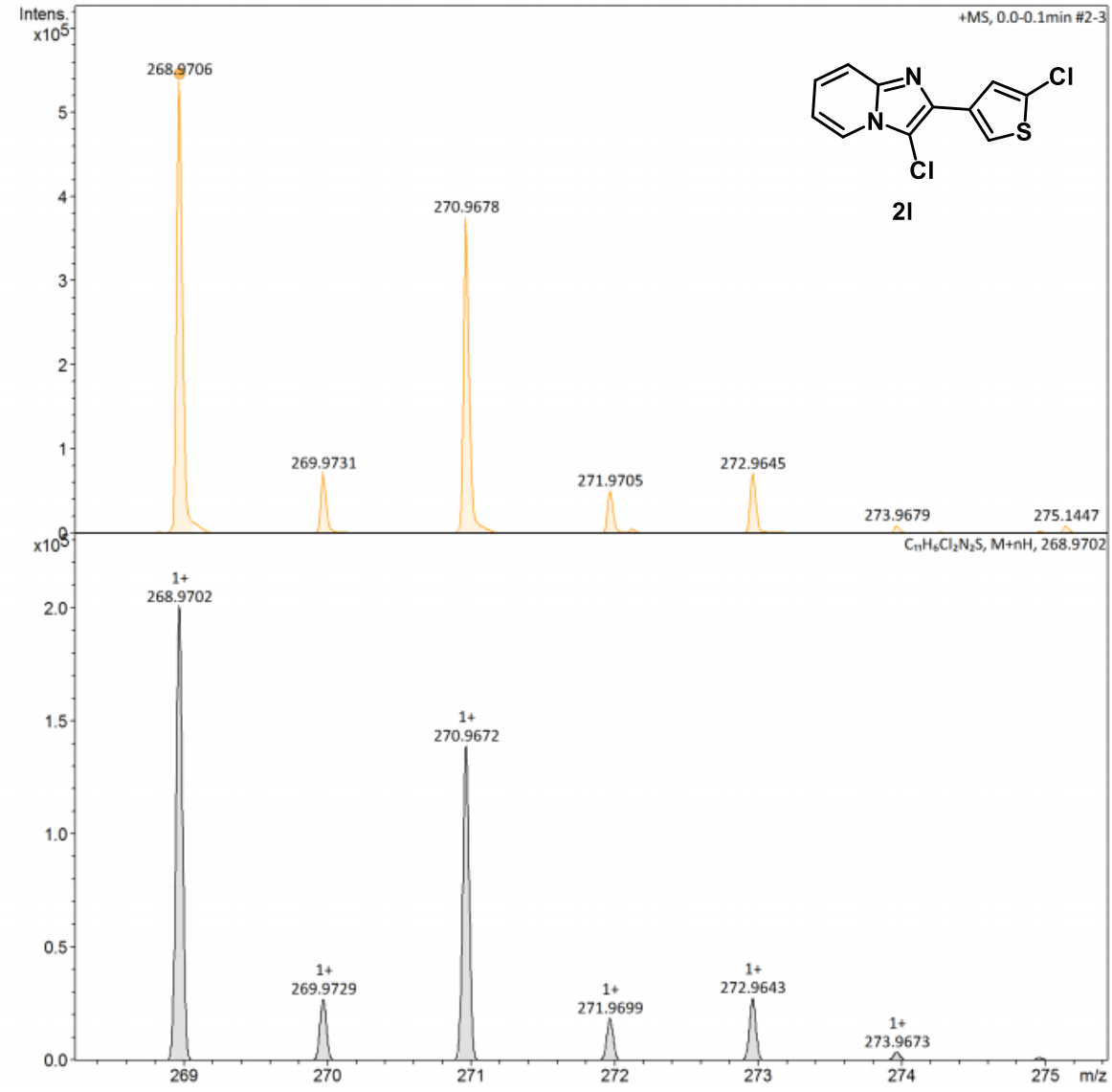
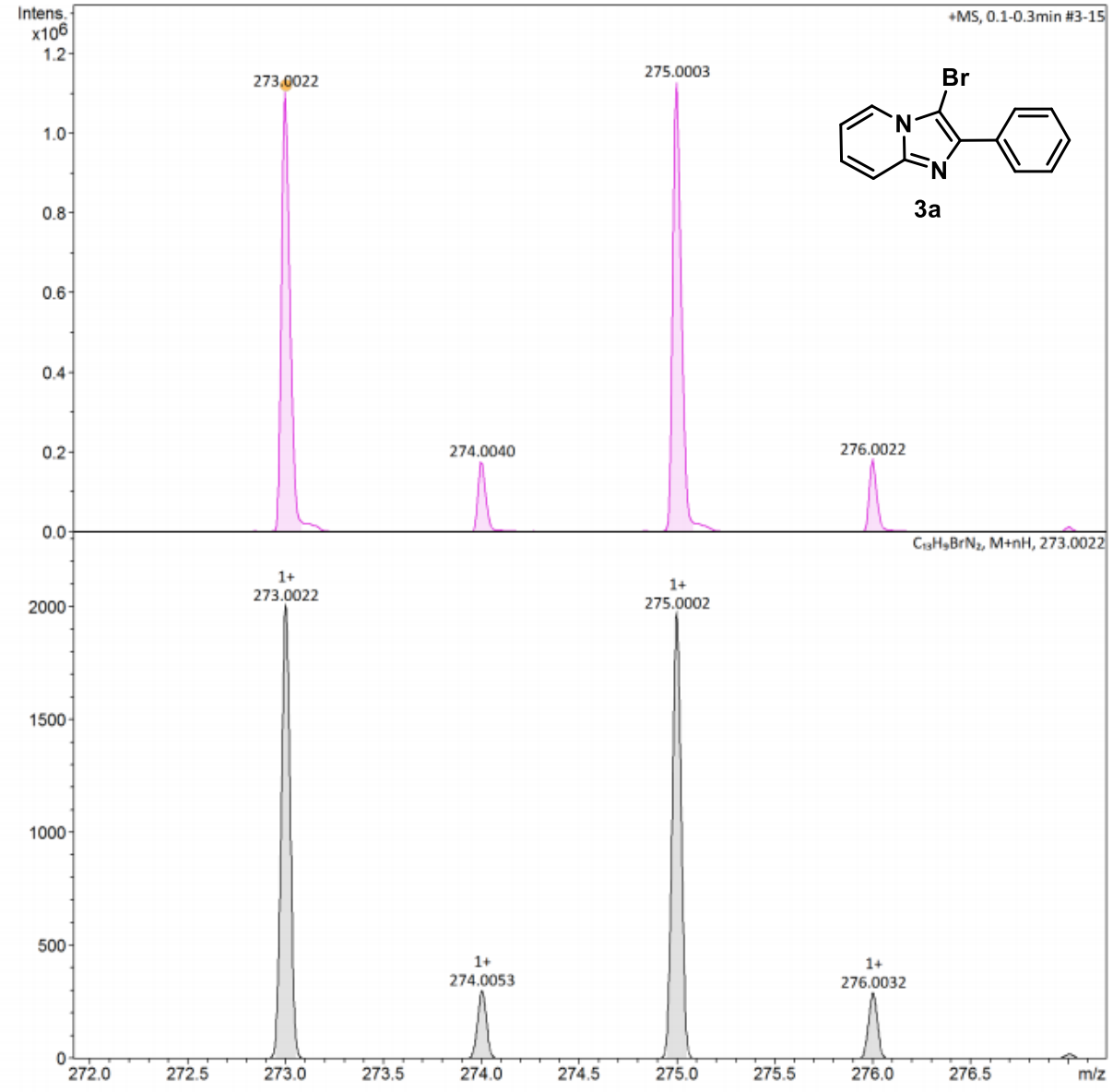
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.6 Bar
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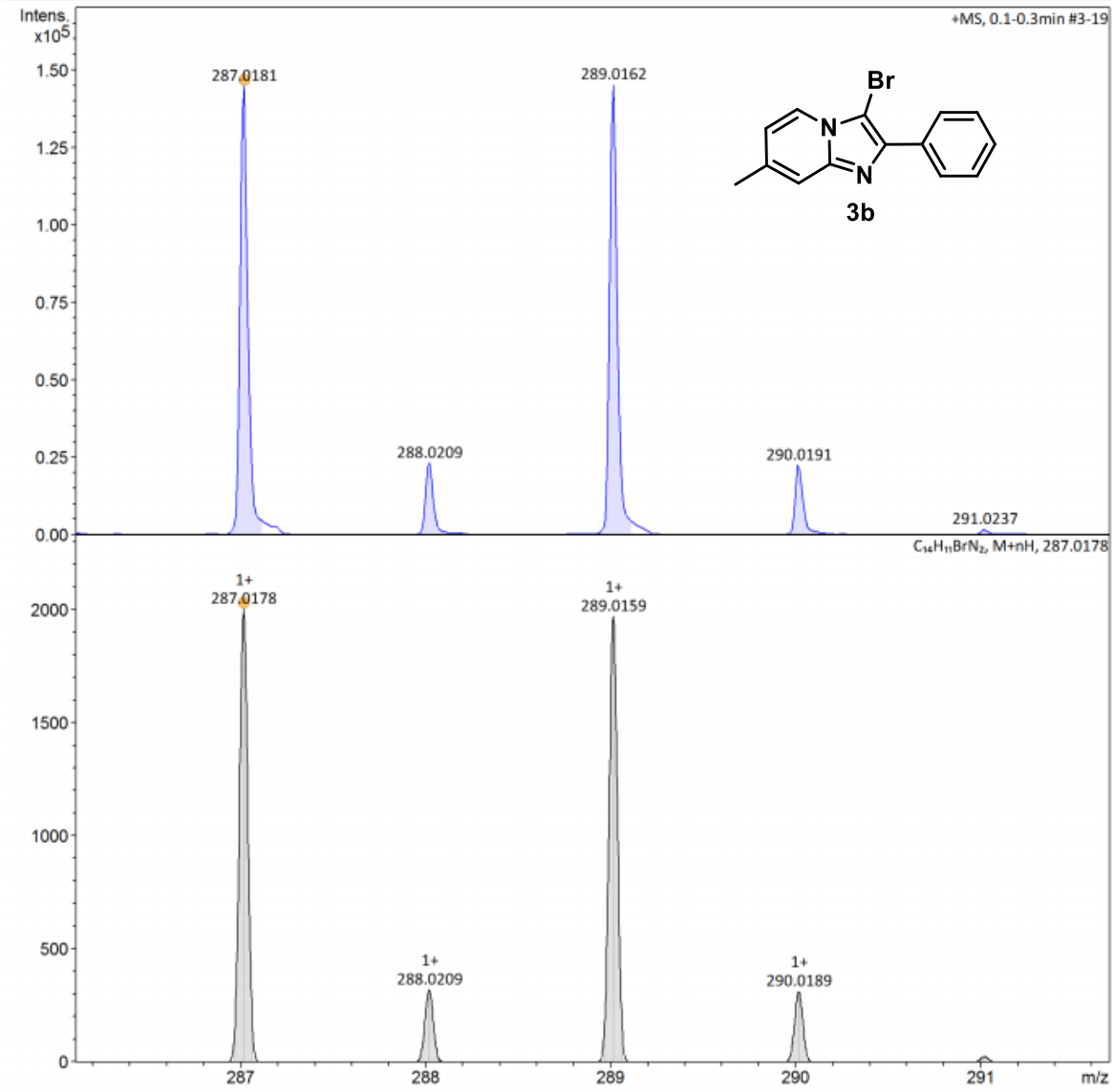
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
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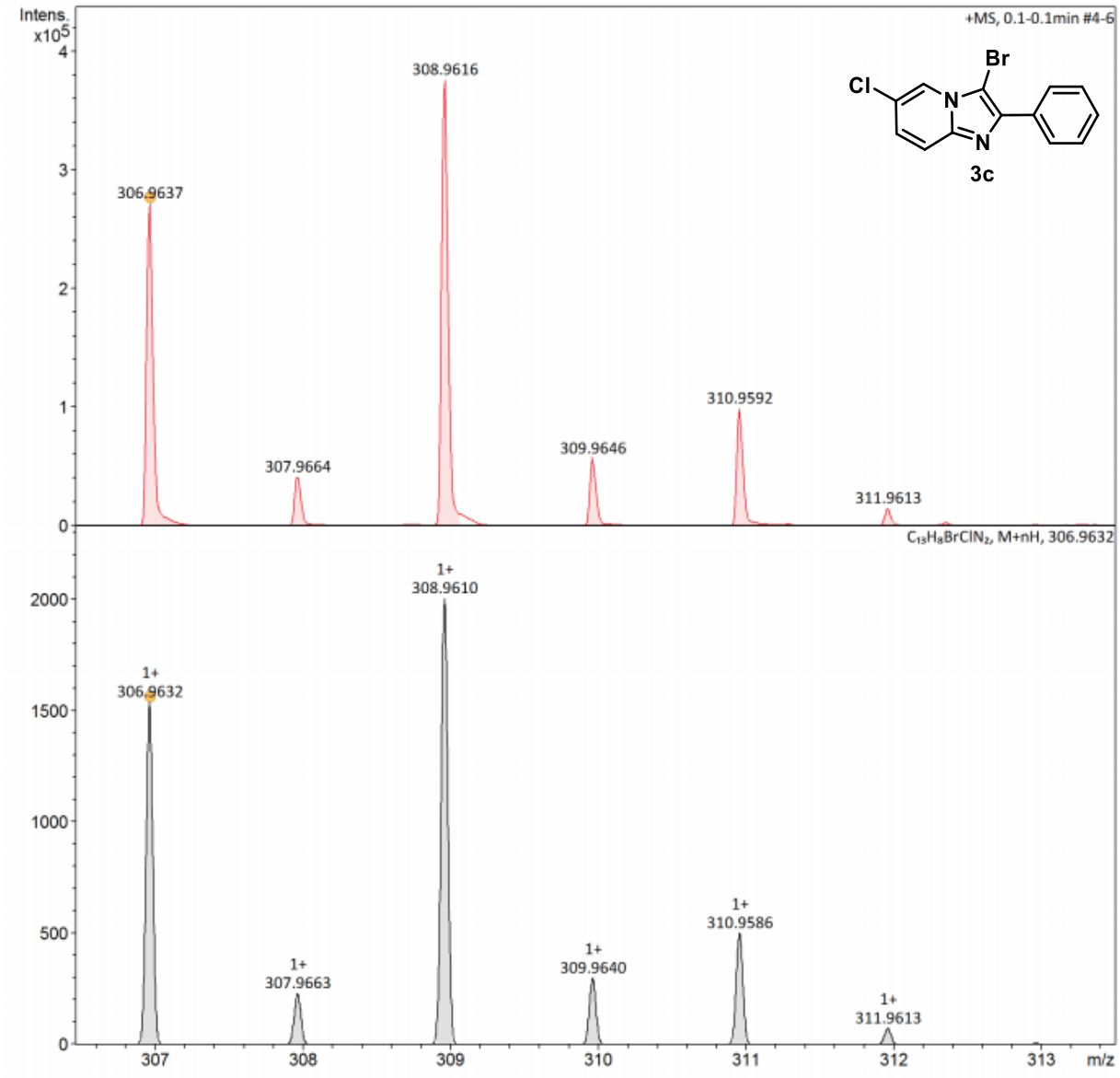

Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
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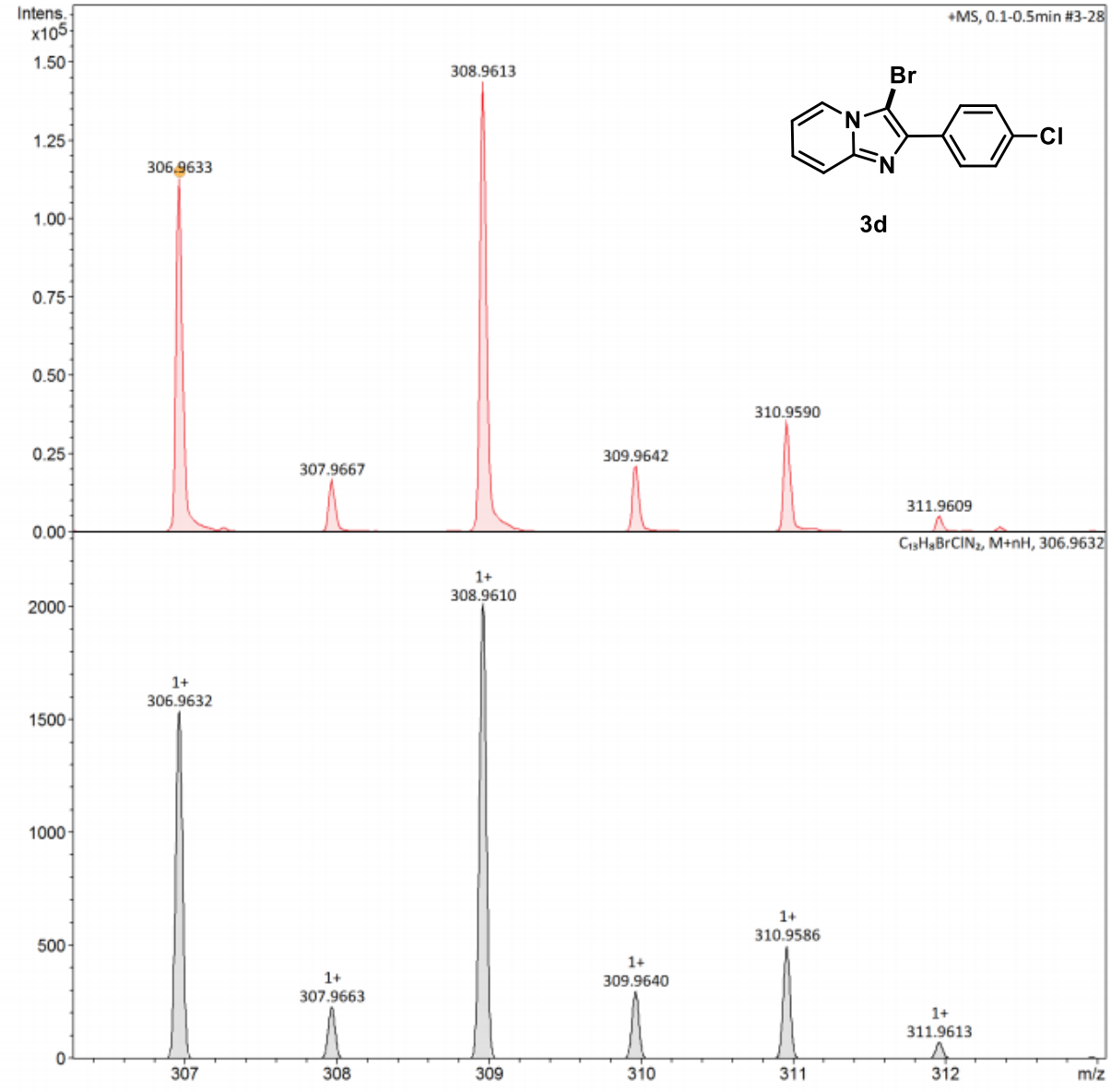
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
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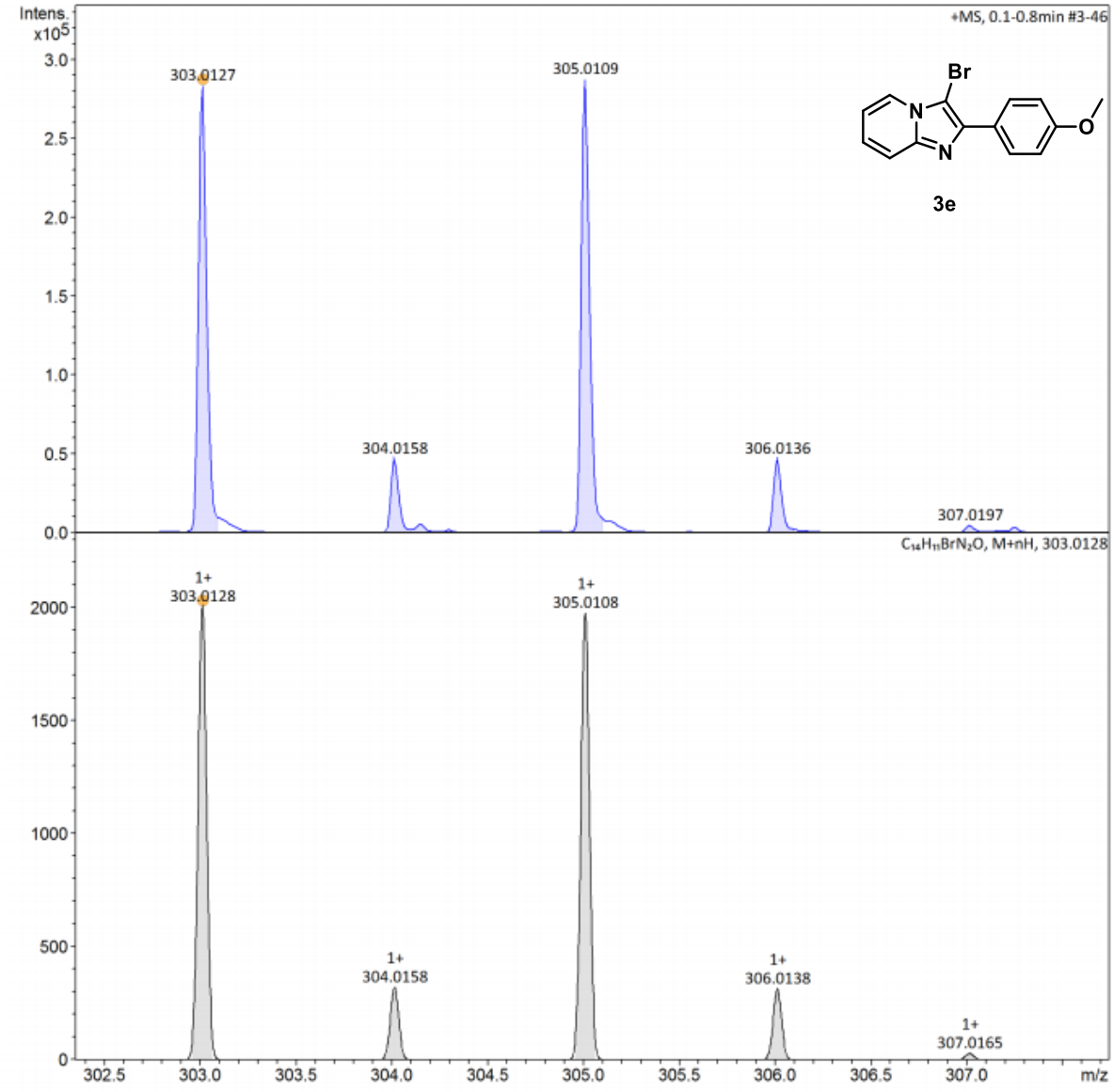

Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.2 Bar
Focus	Not active	Set Capillary	3500 V	Set Dry Heater	200 °C
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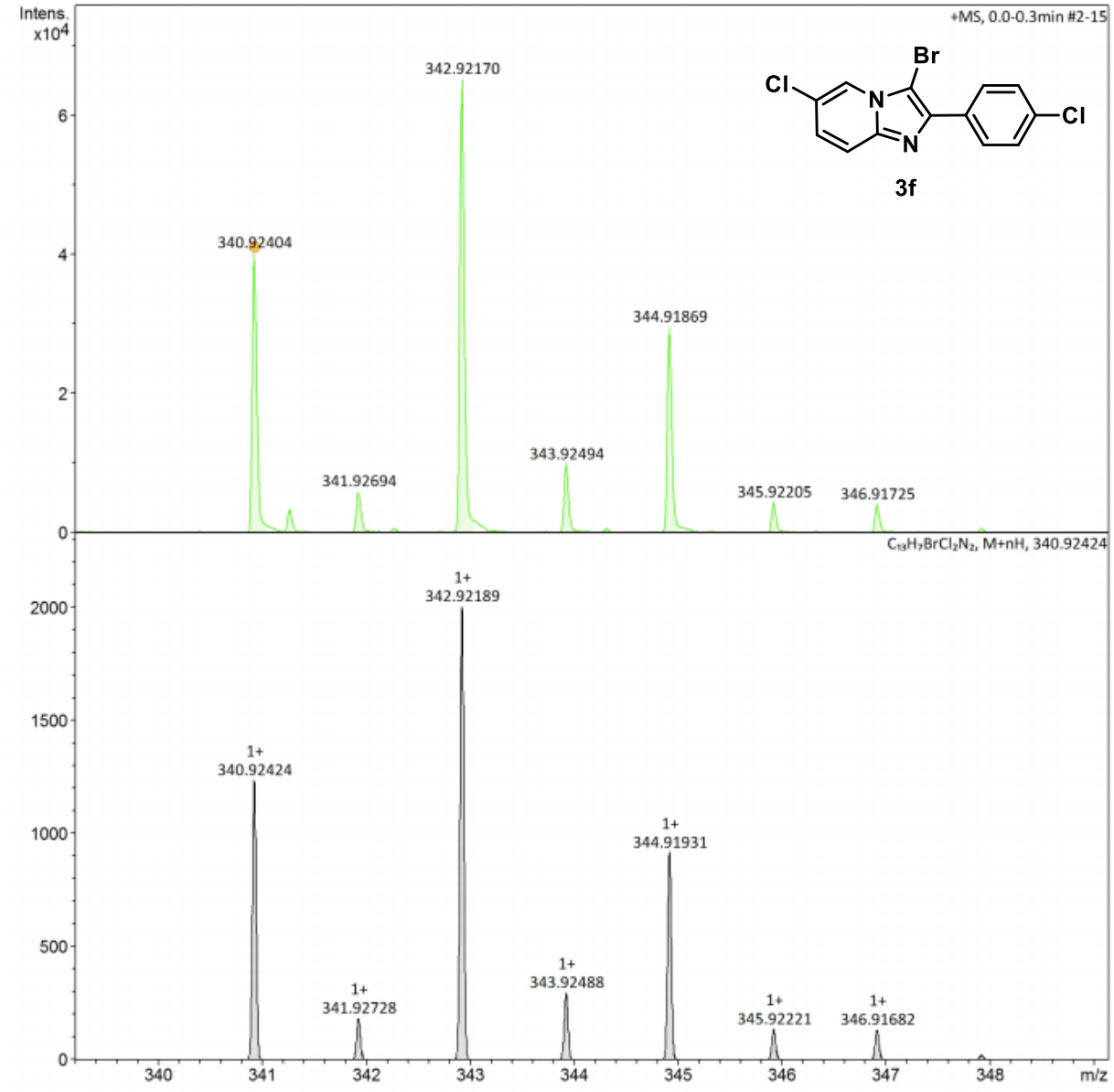
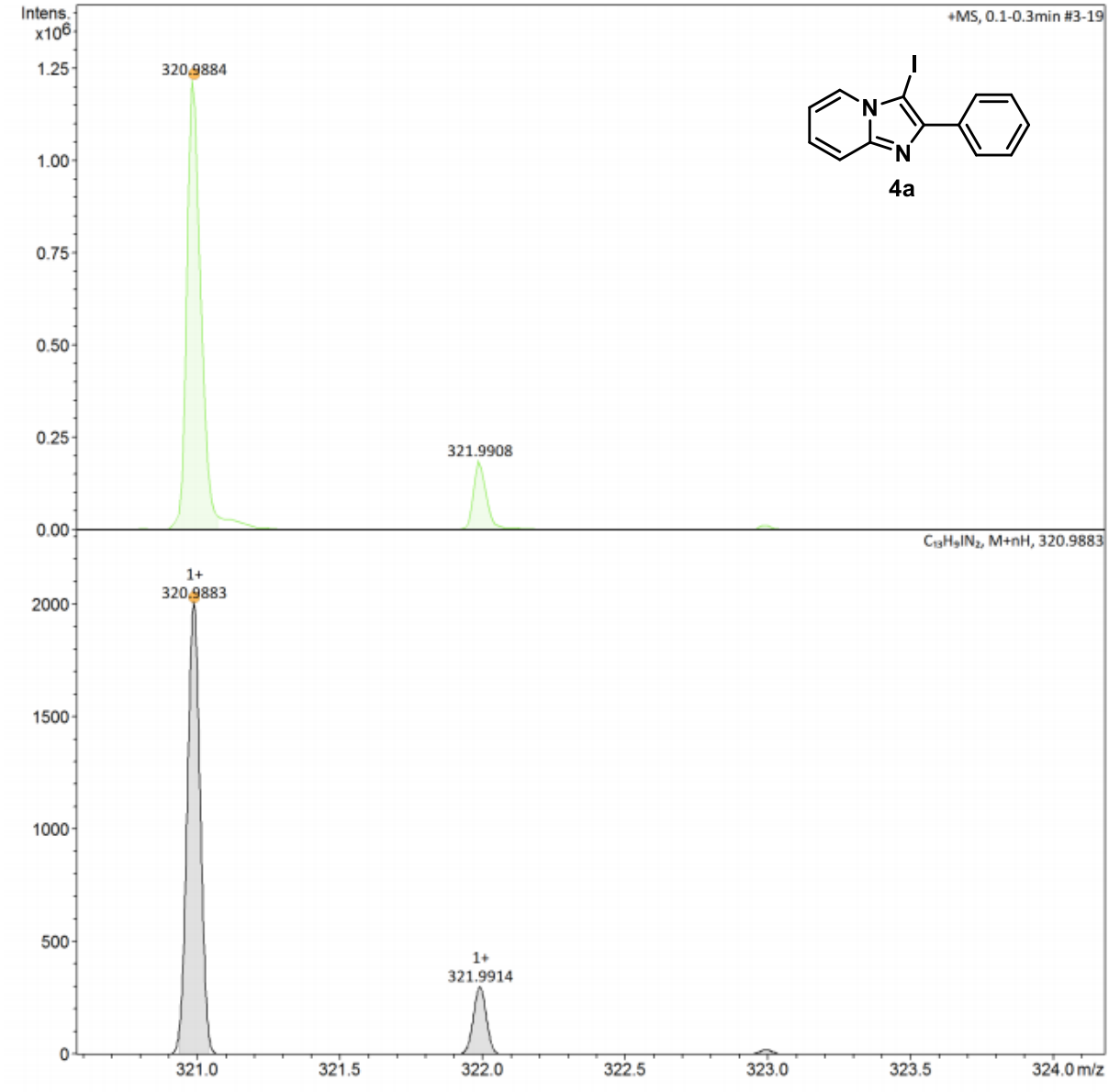


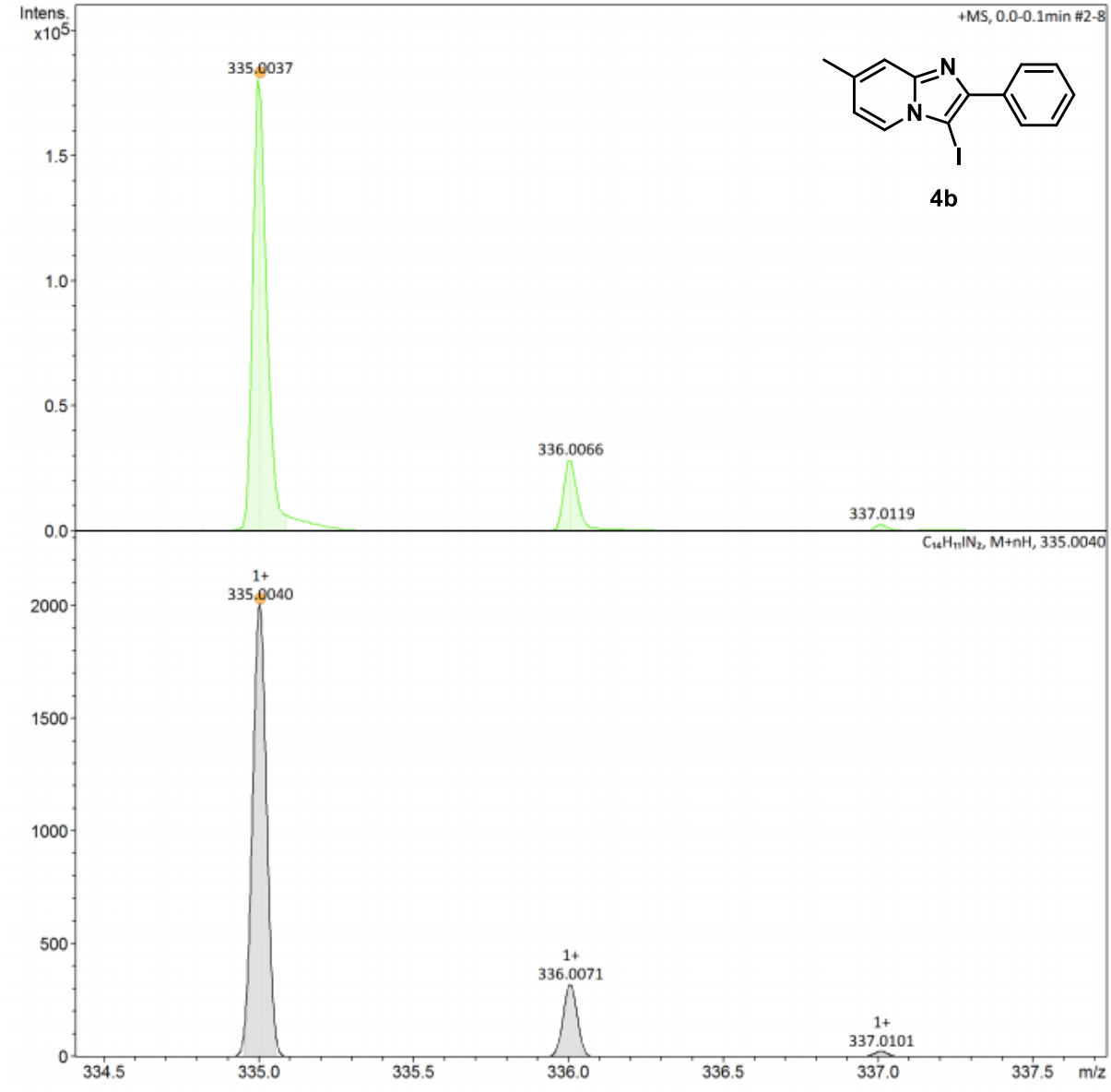
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



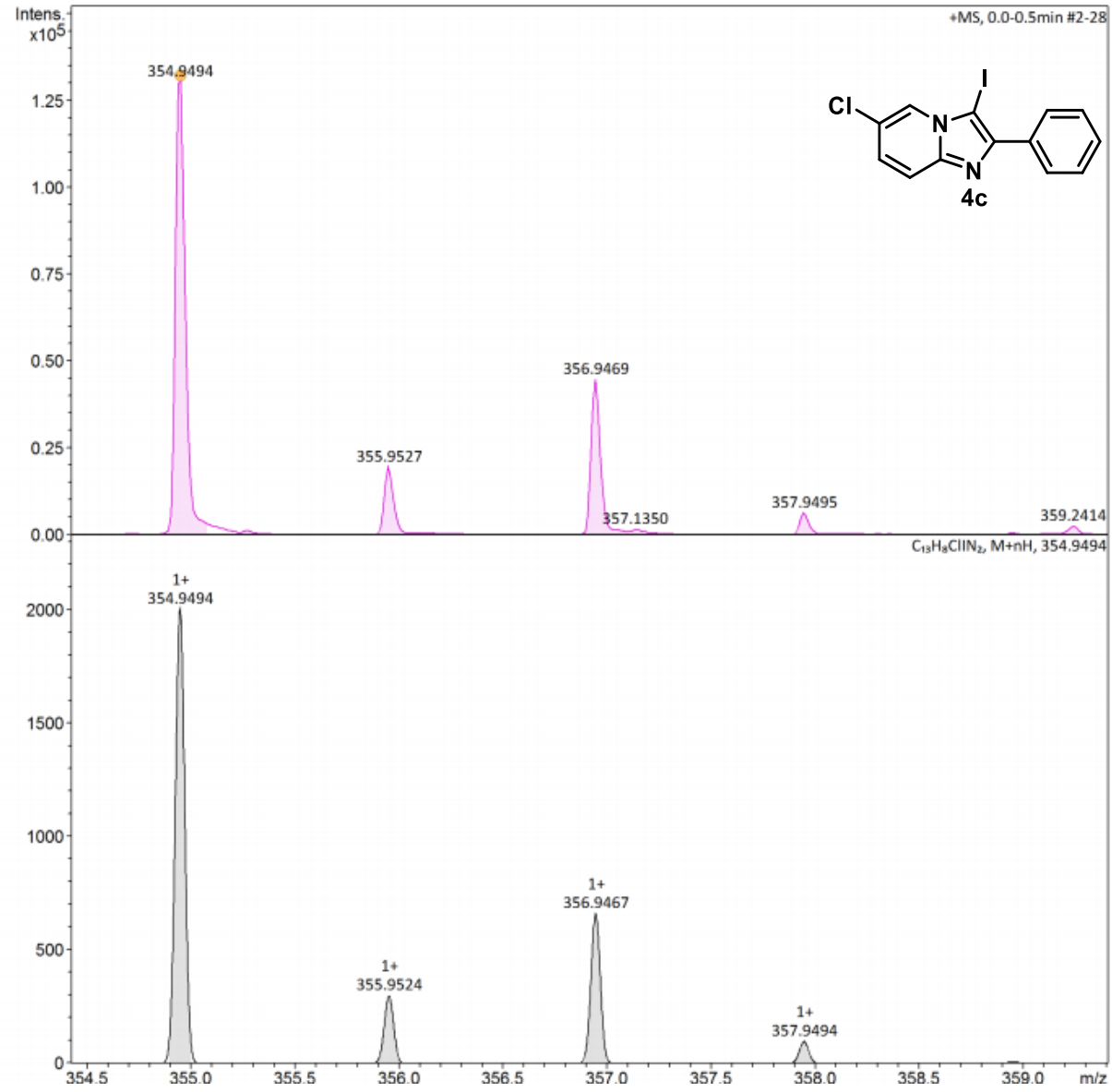
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



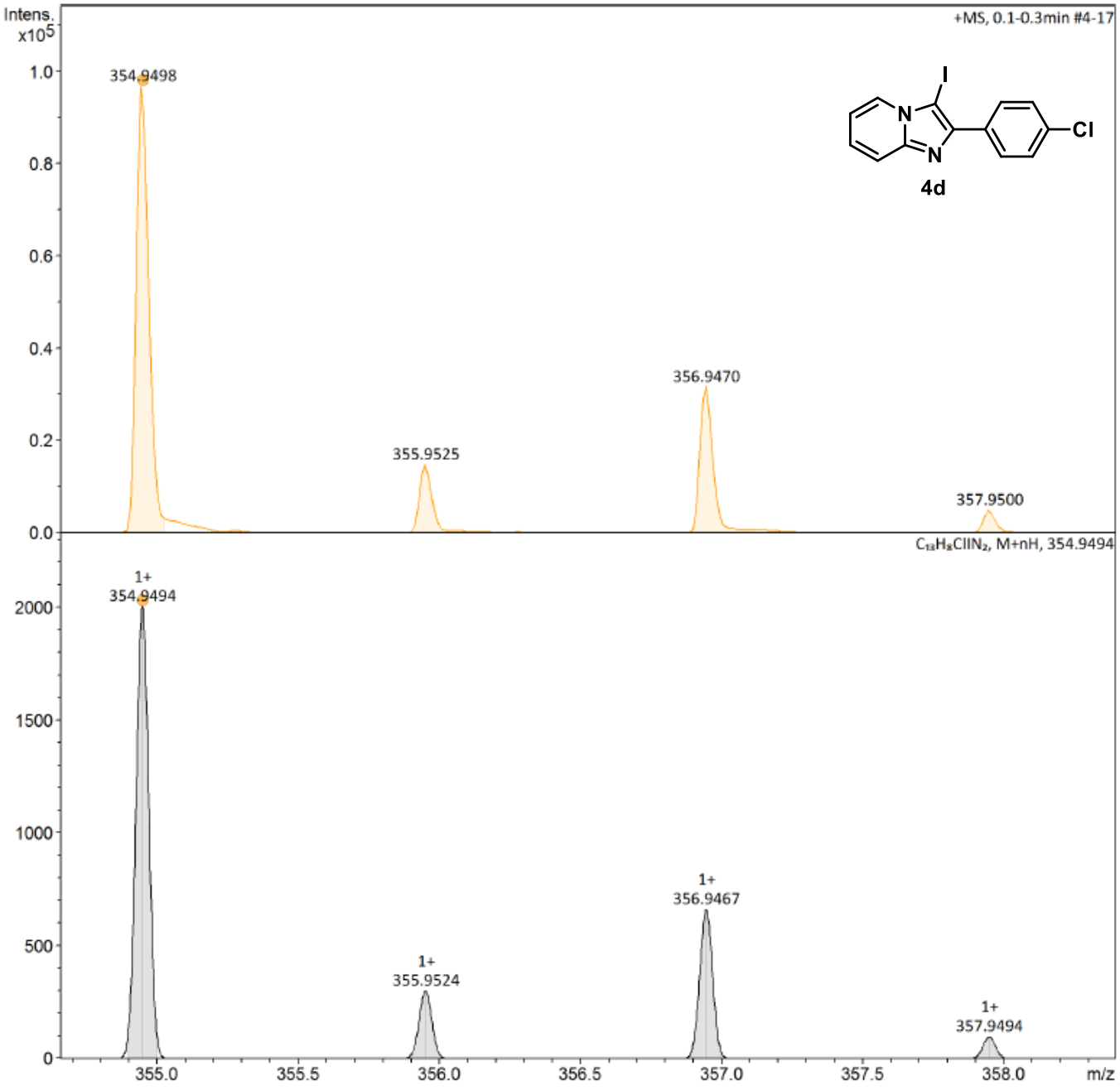
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
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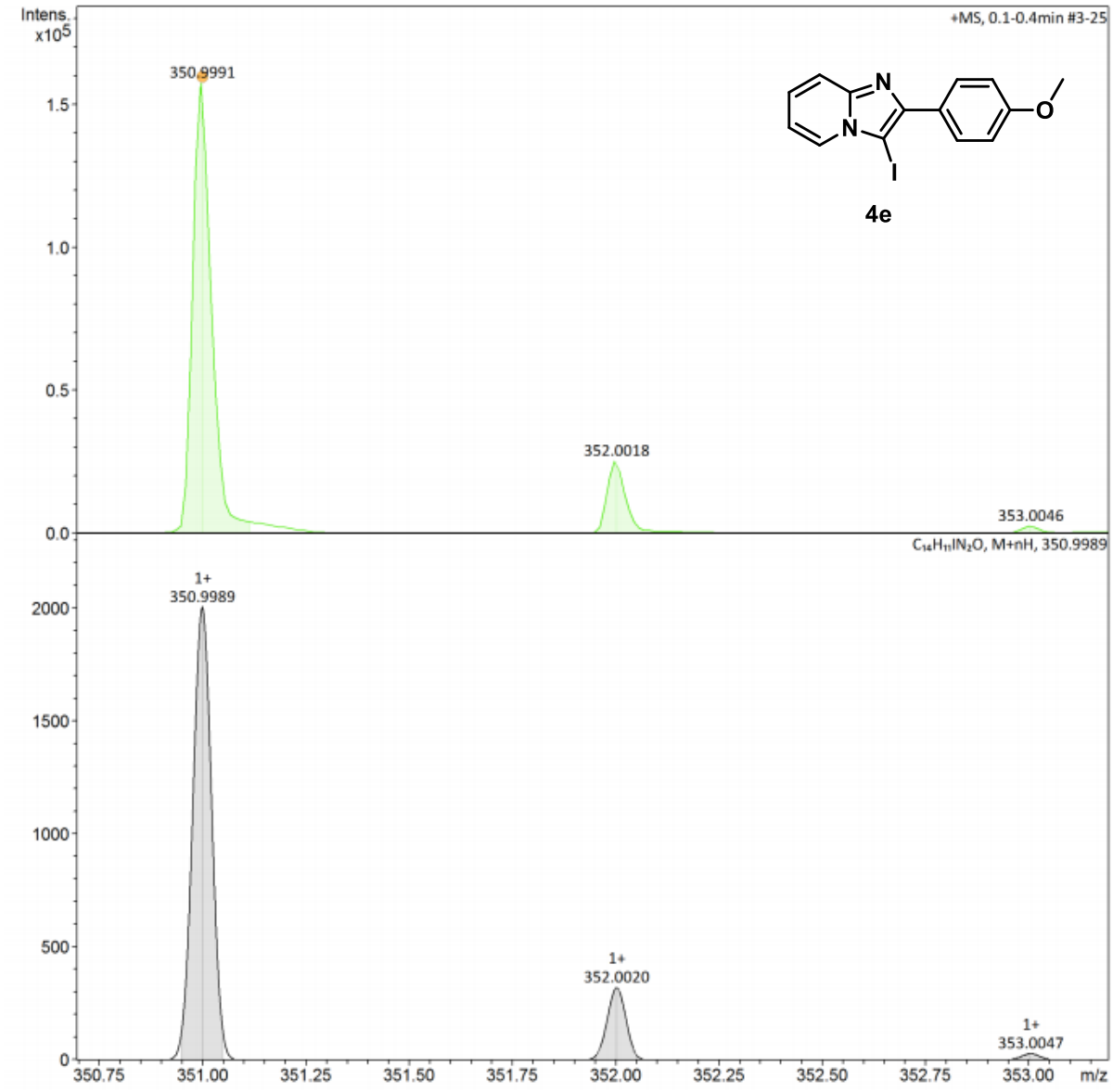
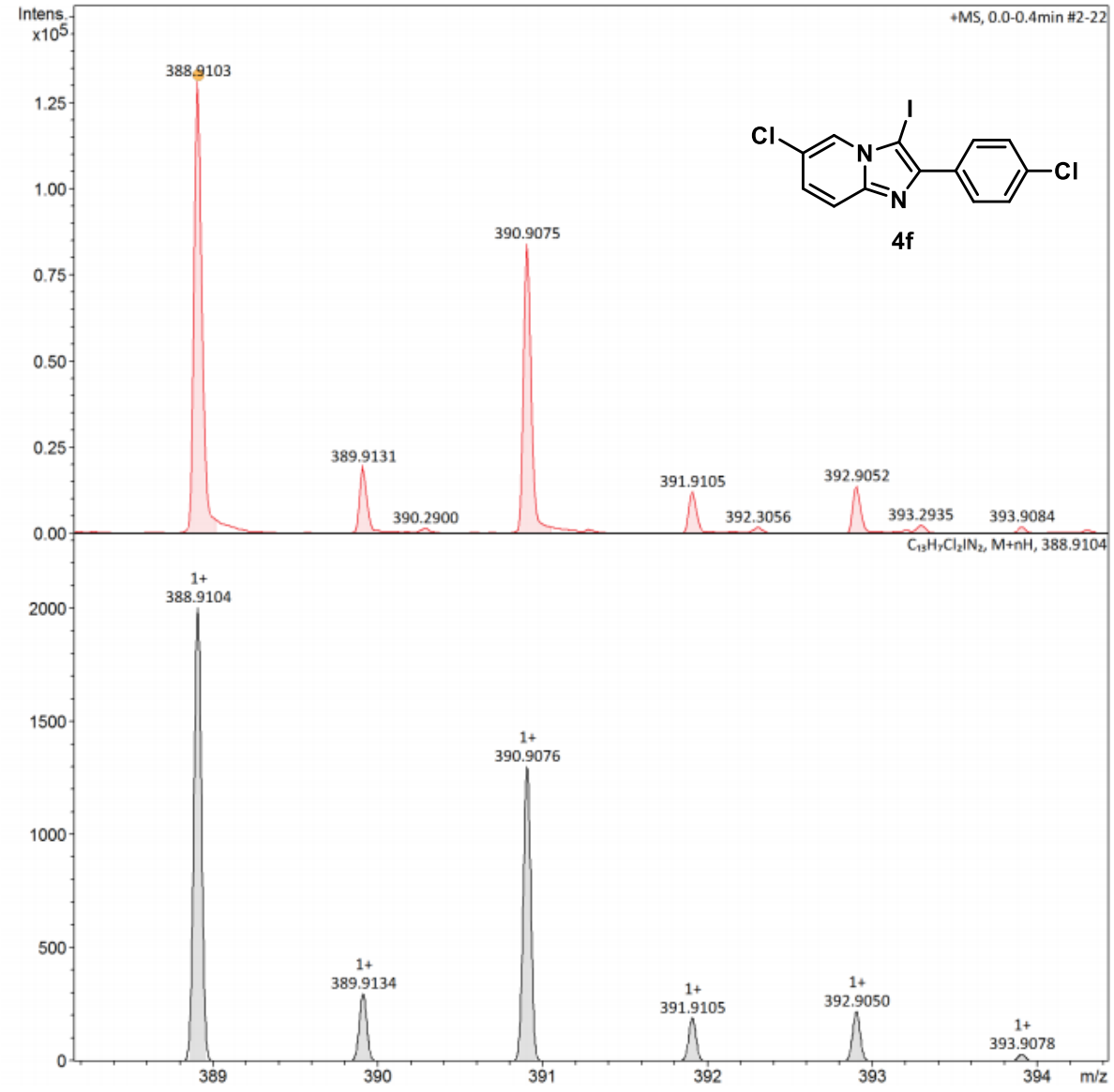


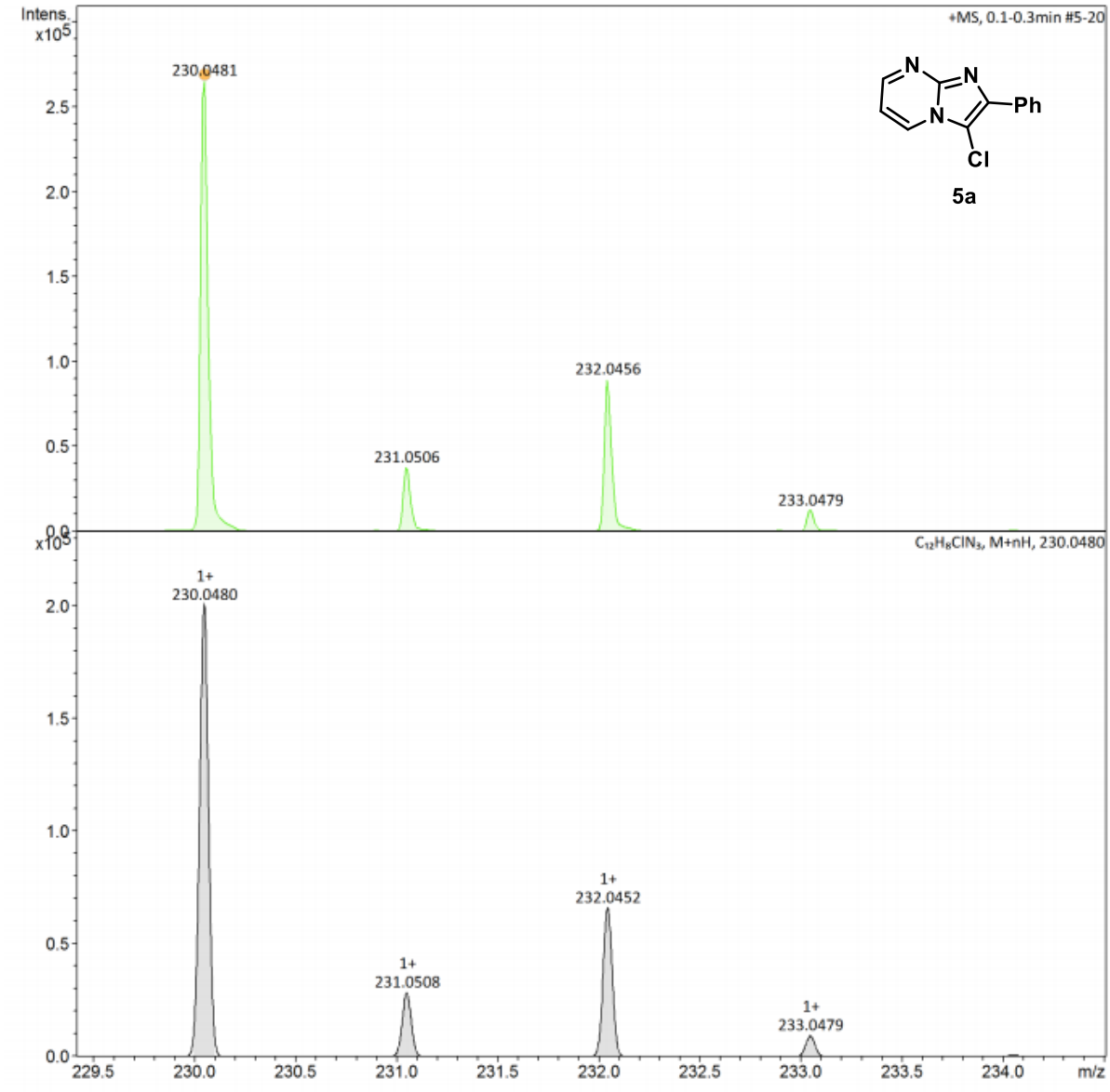
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



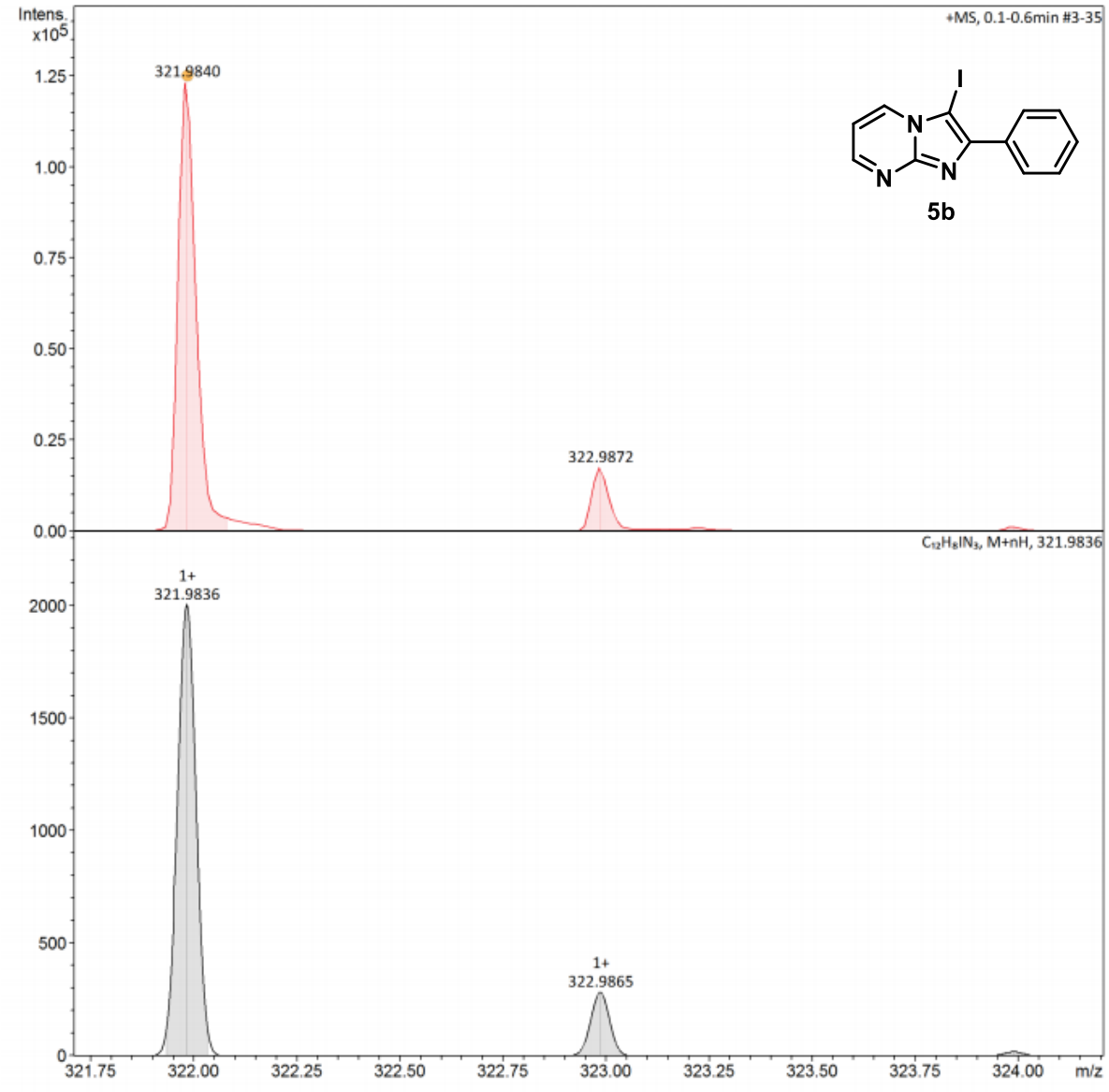
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



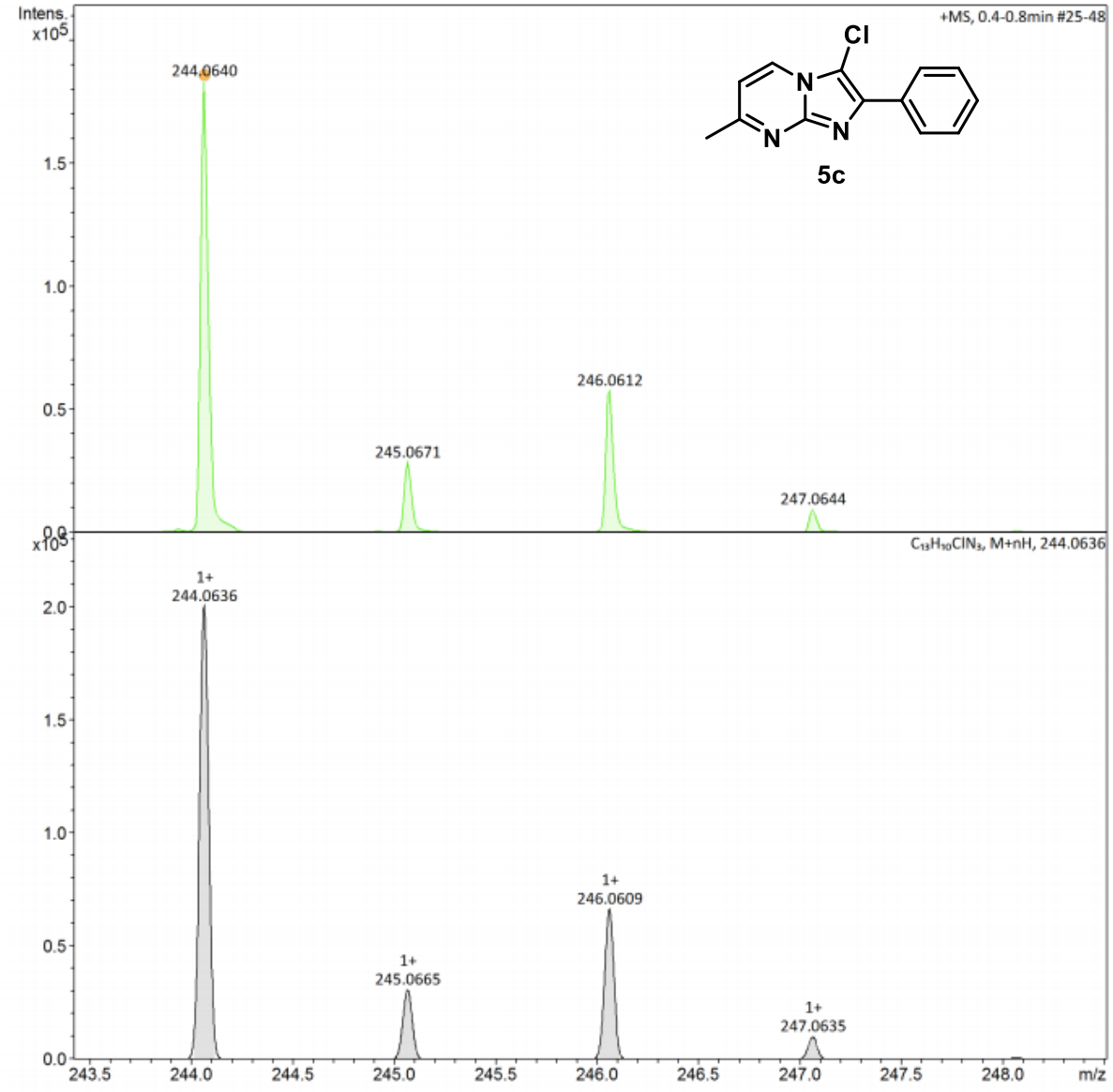
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



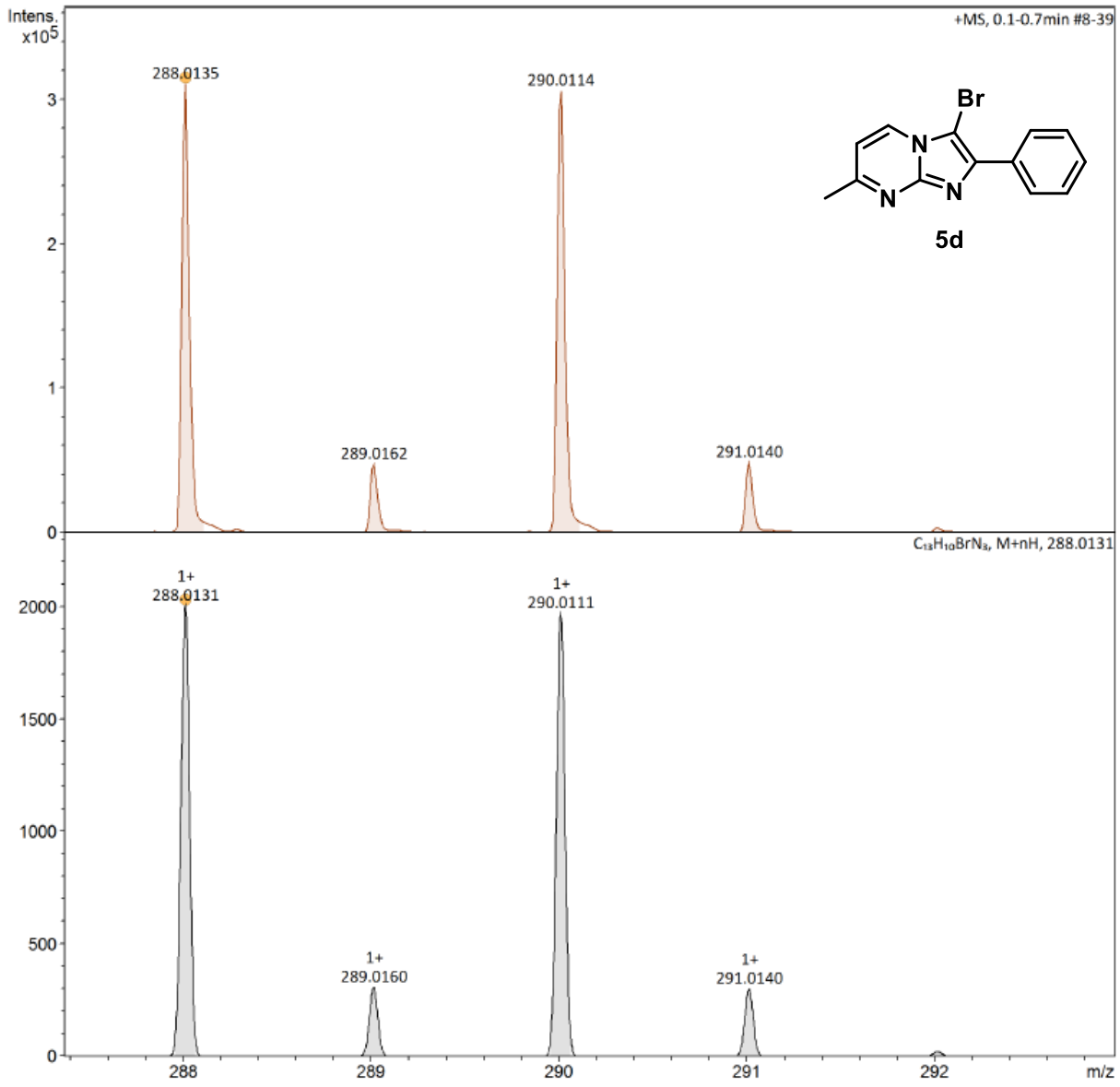
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	800 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



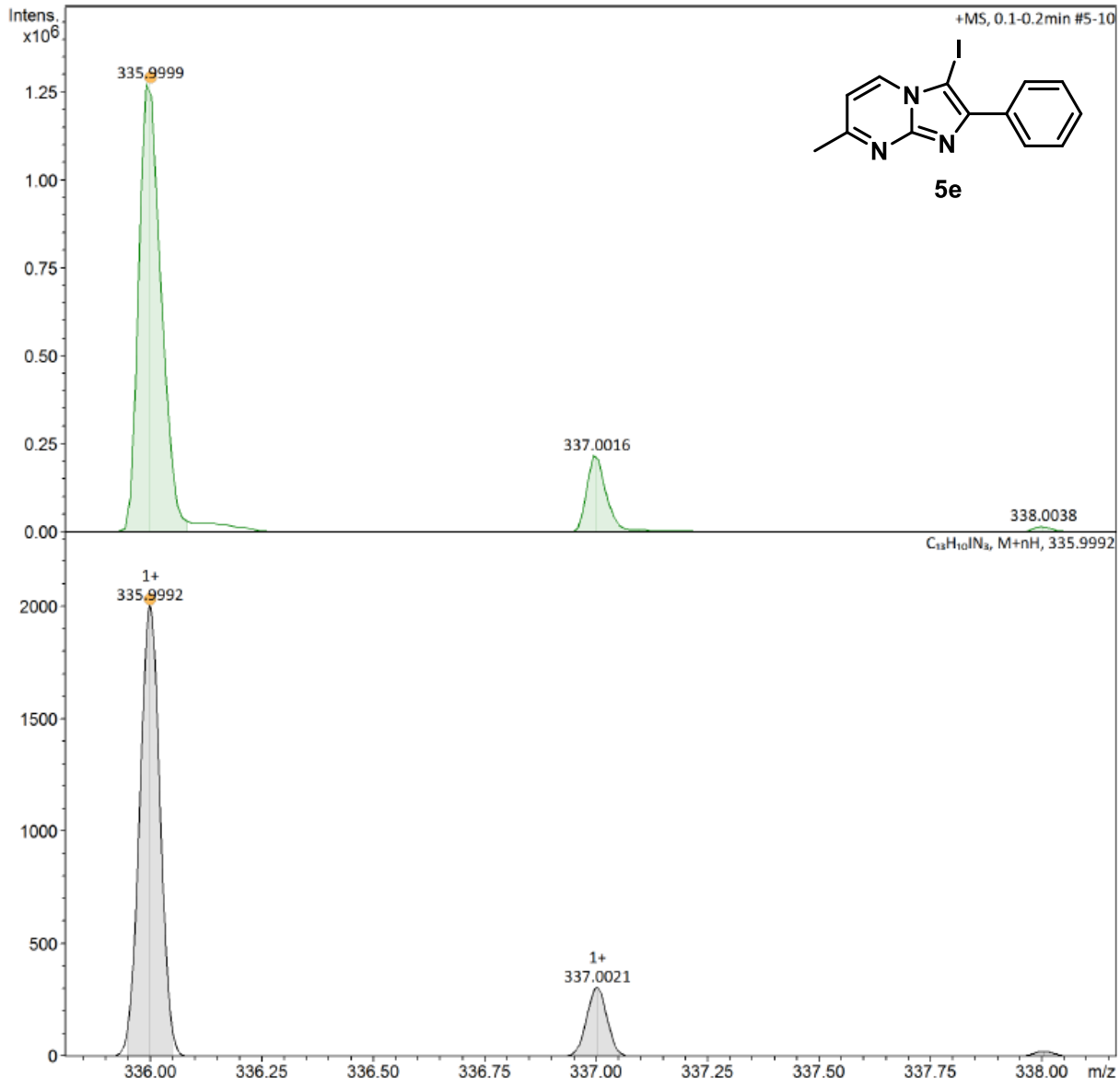
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



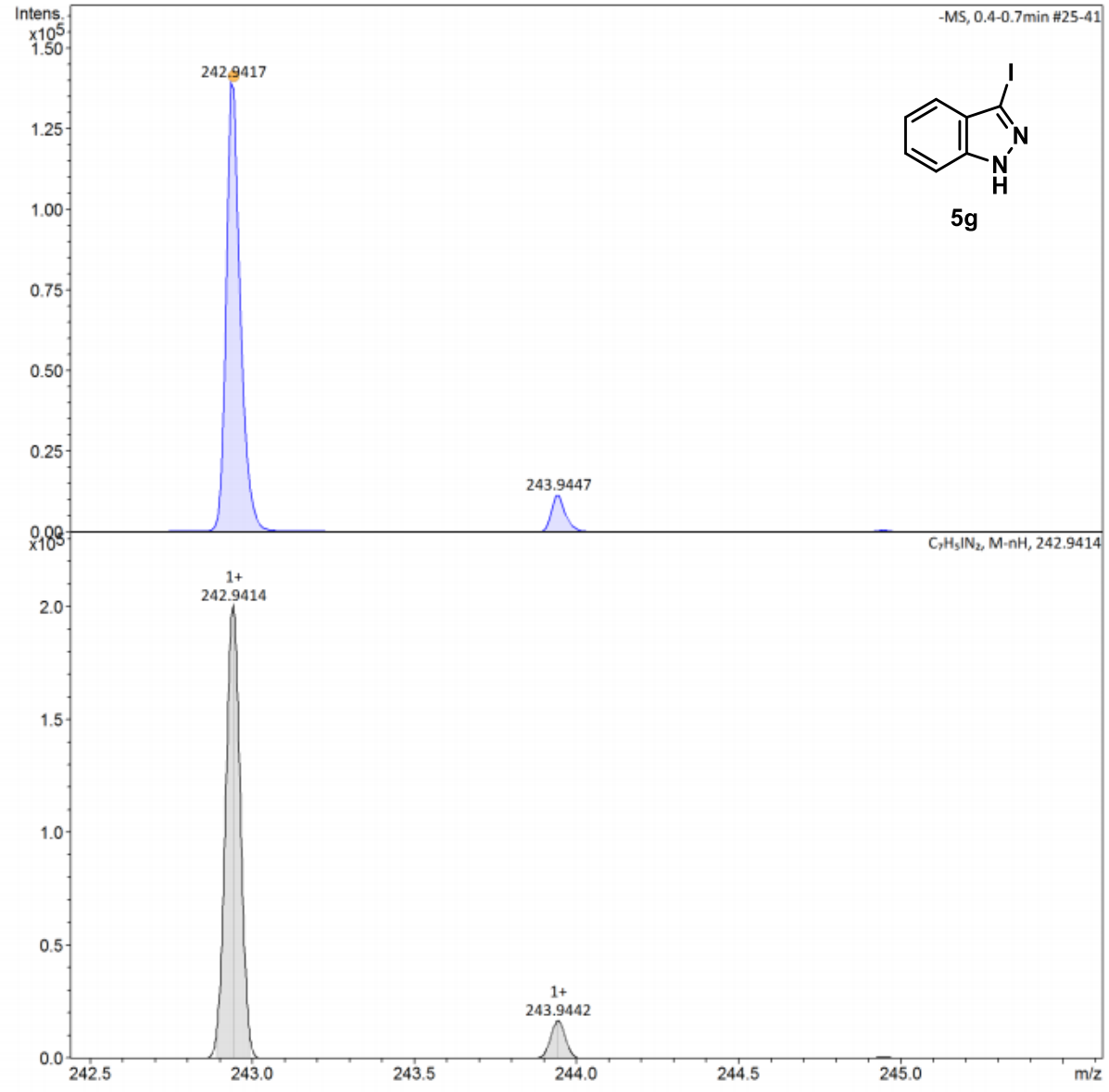
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



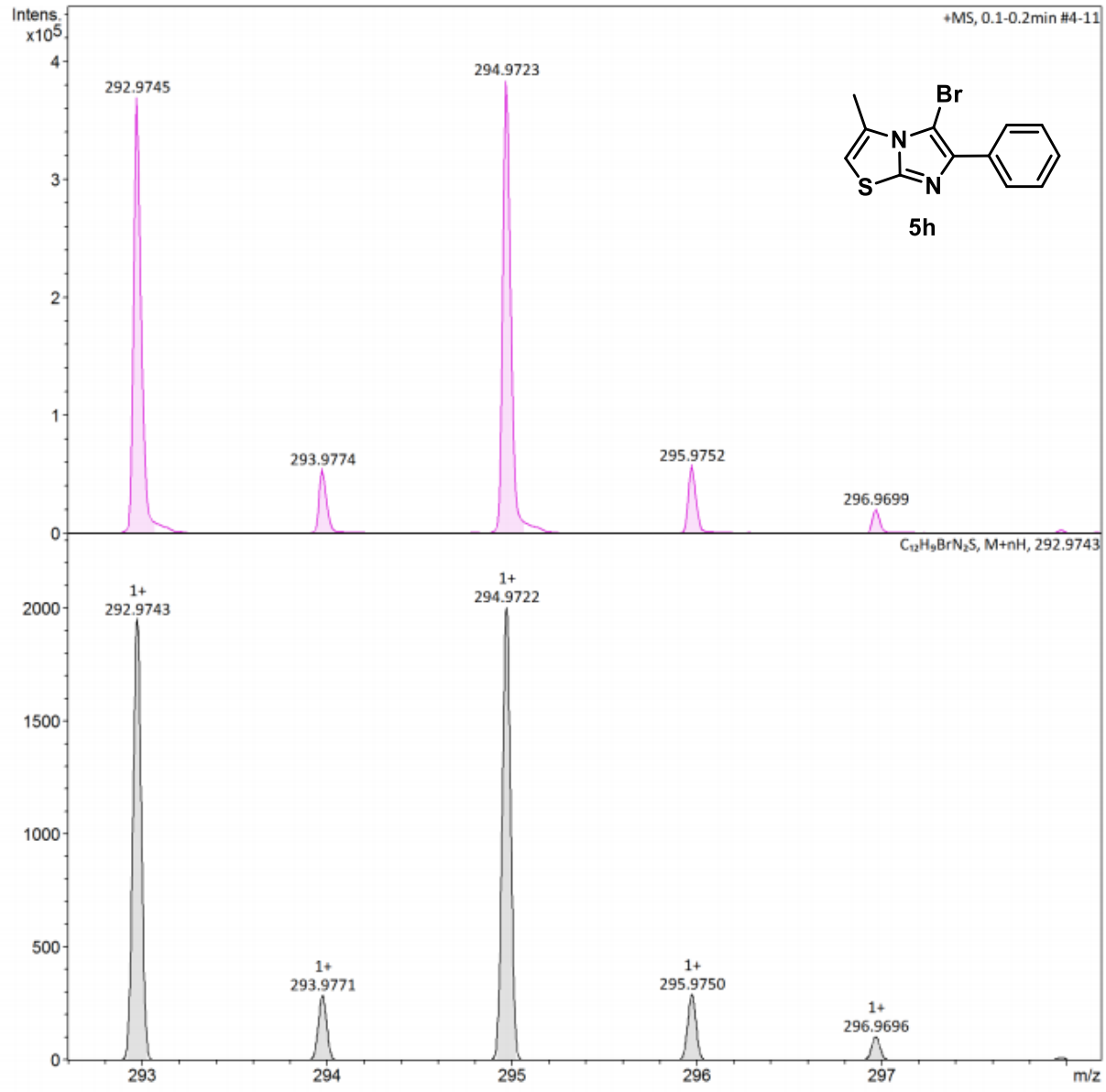
Acquisition Parameter

Source Type	ESI	Ion Polarity	Negative	Set Nebulizer	0.5 Bar
Focus	Not active	Set Capillary	3500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	6.0 l/min
Scan End	1100 m/z	Set Collision Cell RF	200.0 Vpp	Set Divert Valve	Source



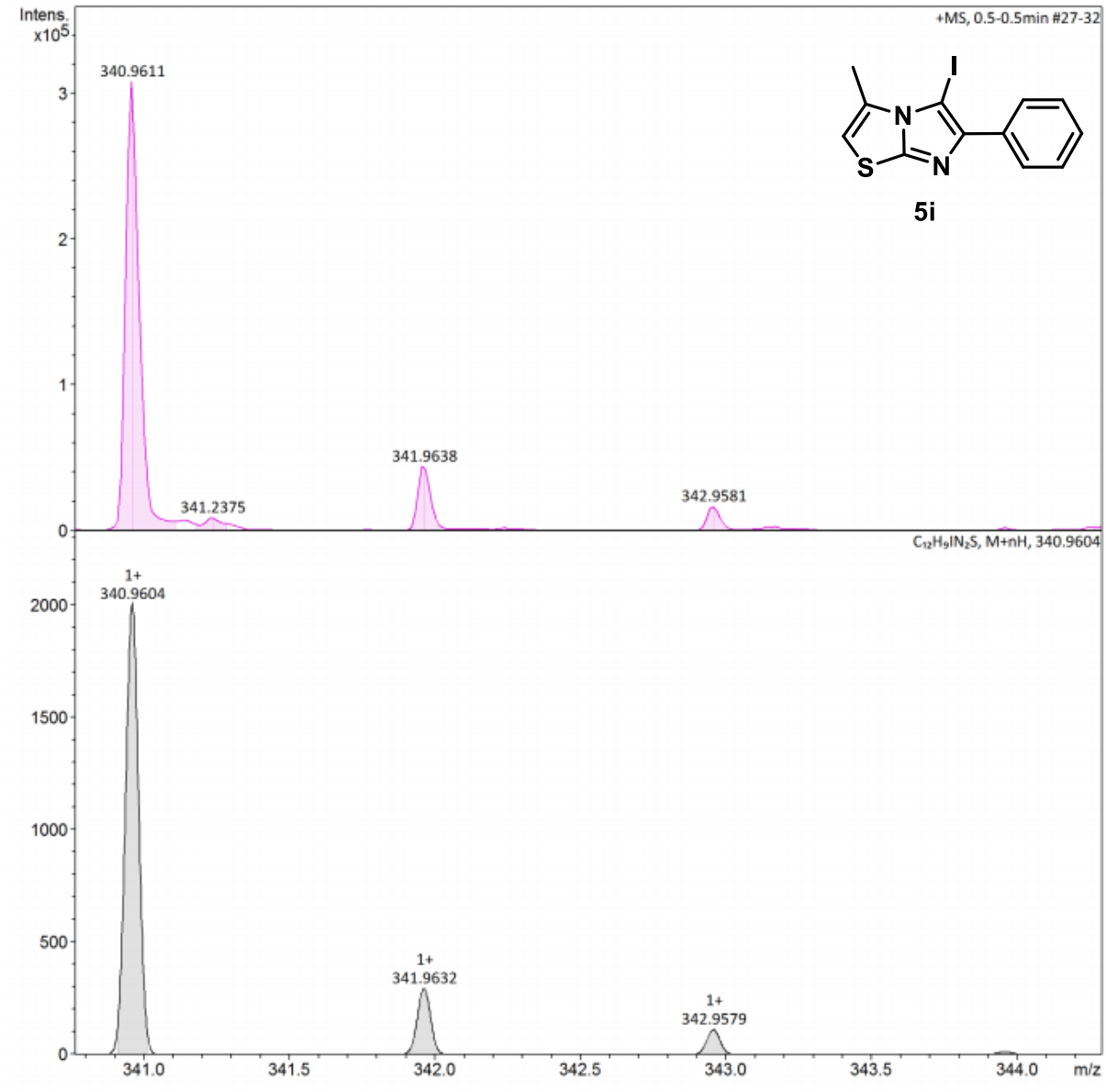
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



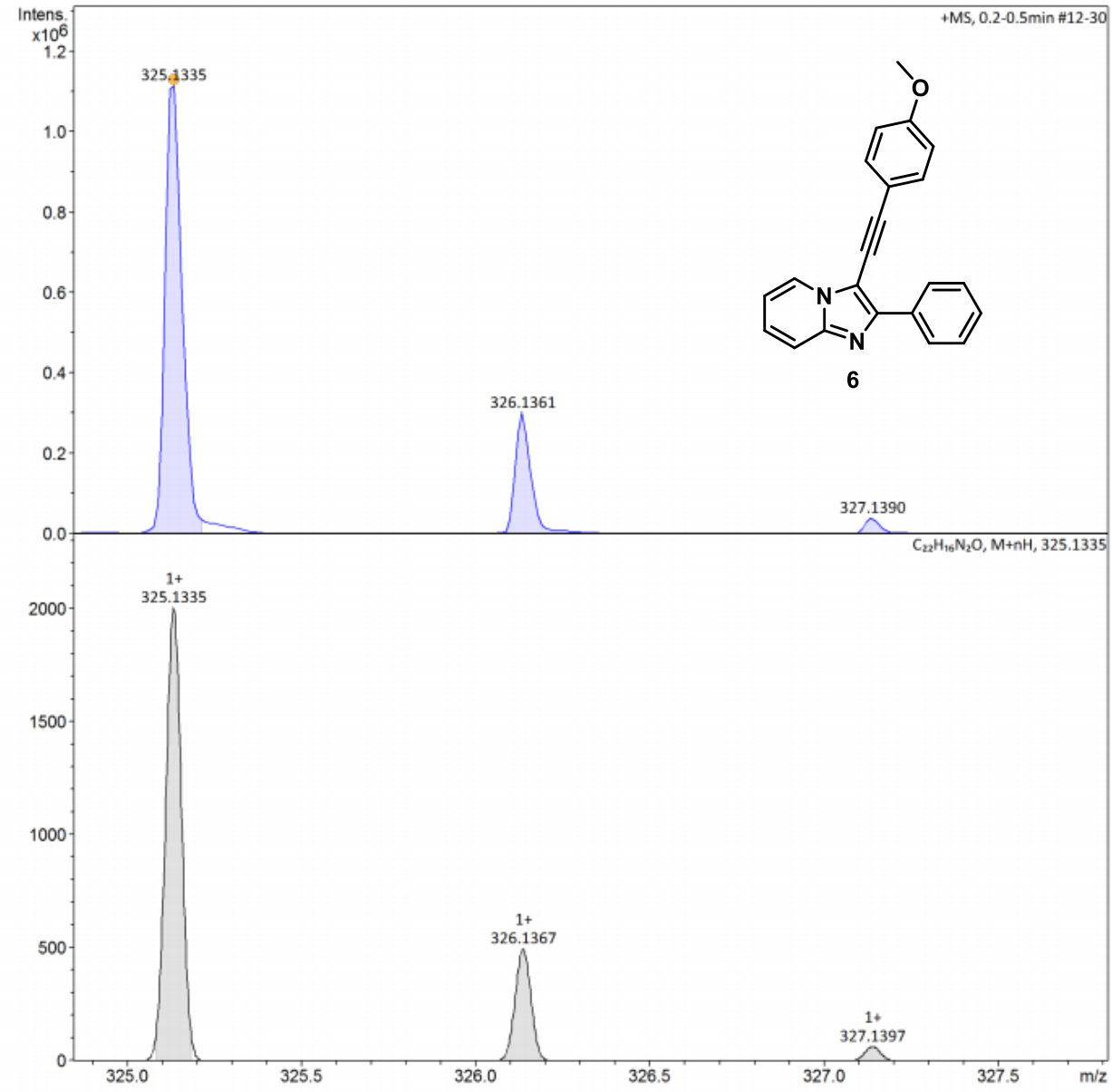
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.4 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	200 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	500.0 Vpp	Set Divert Valve	Source



6

IX. Procedure to recover cyanuric acid from the reaction mixture:

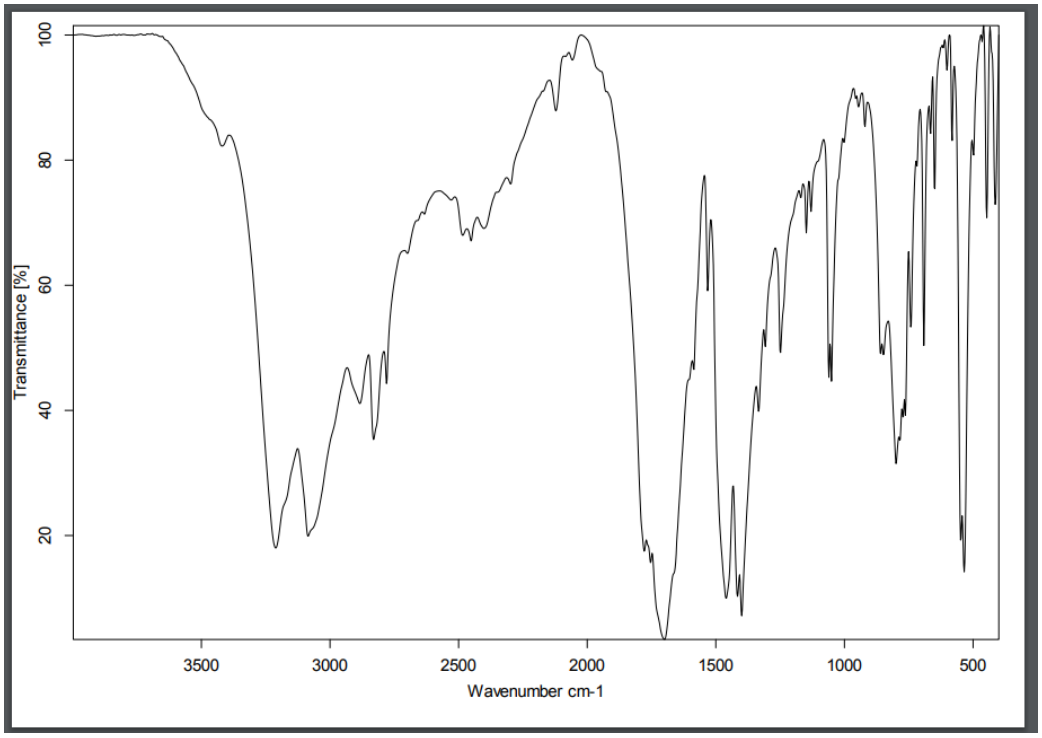
After completion of the reaction (see entry IV. Pg. S3), the resulting mixture was stored under refrigeration (-20 ºC) for 30 minutes, leading to the formation of a precipitate. The reaction mixture was then filtered, providing an yellowish solid, which was washed with EtOAc (3 x 3.0 mL) and dried under vacuum, resulting in 20.2 mg (90%) of a white solid that was characterized as cyanuric acid (for IR analysis, see page S86).

The EtOAc layer was concentrated under reduced pressure, providing 106 mg of crude product **2a** in 79% of purity (for LC/MS analysis, see page S87). After microfiltration by flash chromatography, compound **2a** was obtained in 61% yield (70 mg).

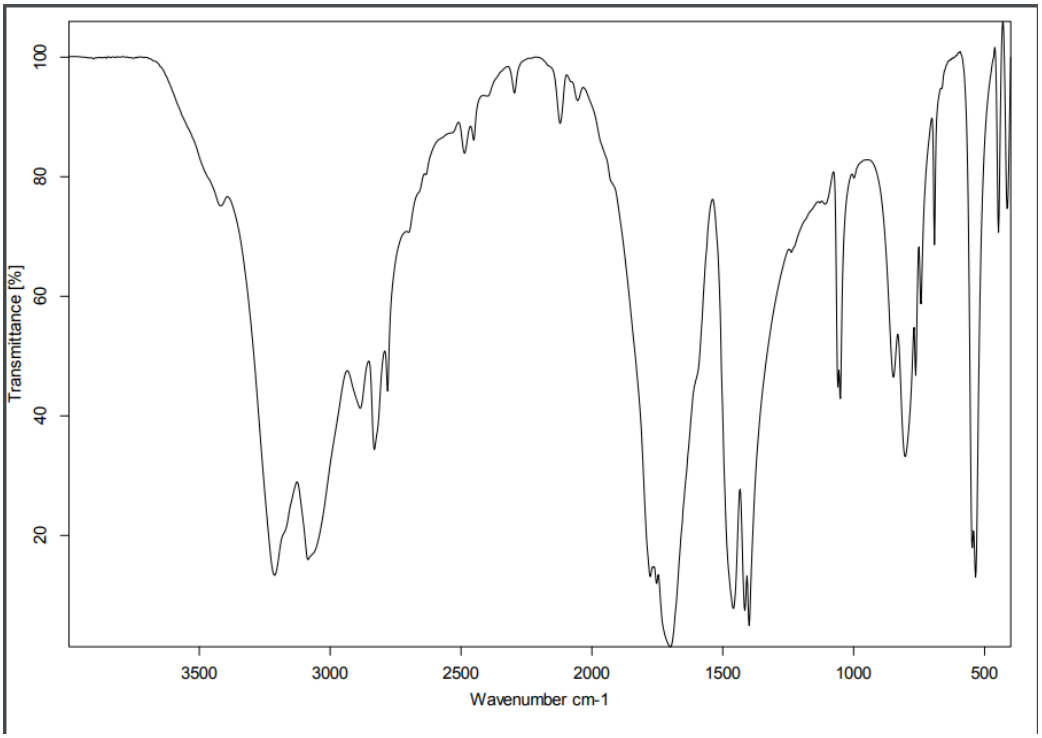
X. Alternative procedure avoiding aqueous work-up:

After completion of the reaction (see entry IV. Pg. S3), 1.0 g of silica gel was added to the reaction mixture and the solvent was removed under the reduced pressure. This mixture was then submitted to flash chromatography (100% hexane- 70% hexane:30% EtOAc gradient) furnishing product **2a** in 79% yield (90mg).

XI. IR analysis of recovered cyanuric acid



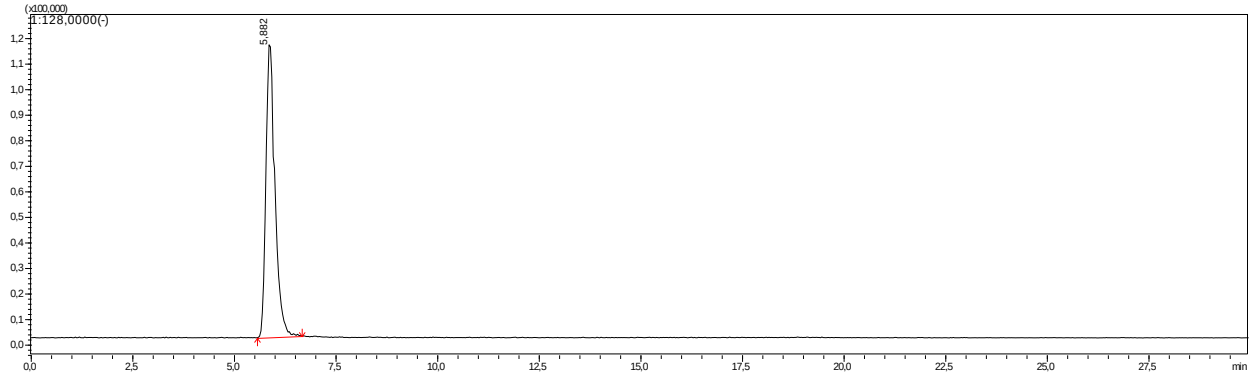
Recovered cyanuric acid IR Analysis



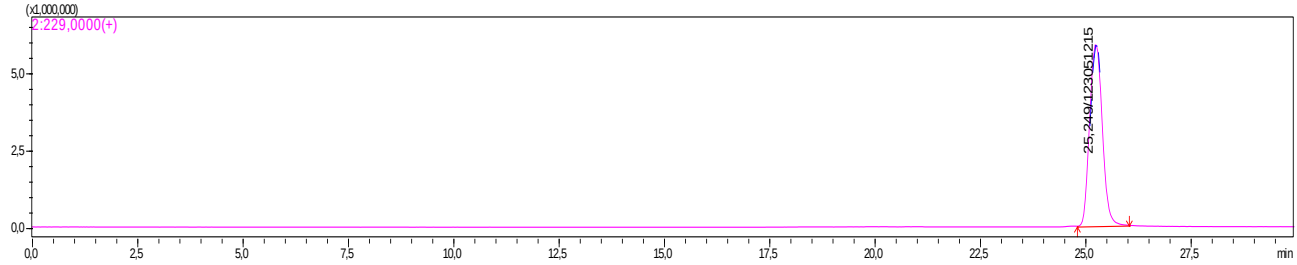
Commercial cyanuric acid (standard) IR analysis

XII. LC-MS analysis of crude product

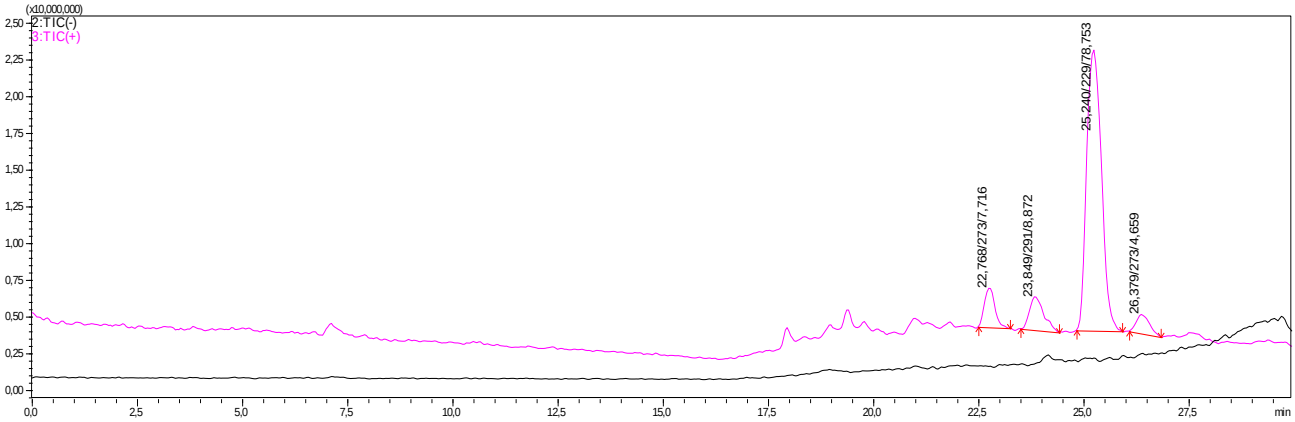
Experimental conditions:
LC-MS : Shimadzu; LC-20A; MS 2020
Detector : ESI, SCAN 100-400 m/z (both positive and negative mode) or SIM in +229/-128.
Oven Temperature: 40°C
Column : Phenomenex Luna C18 (2)
Eluent : a) H_2O/HCO_2H 0.1% b) CH_3CN
Flow rate: 0.3 mL/min



Commercial Cyanuric Acid (standard) LC/MS analysis



Pure Product **2a** LC/MS analysis



Crude product **2a** LC/MS Analysis (78,75% purity)