Supporting Information for

Direct C-H Alkoxylation of BODIPY Dyes via Cation Radical Accelerated Oxidative Nucleophilic Hydrogen Substitution: A New Route to Building Blocks for Functionalized BODIPYs

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1. General information

Reagents and solvents were used as received from commercial suppliers (Energy Chemicals, Shanghai, China) unless noted otherwise. All reactions were performed in oven-dried or flame-dried glassware unless stated otherwise and were monitored by TLC using 0.25 mm silica gel plates with UV indicator (60F-254). ^{1}H and ^{13}C NMR spectra were recorded on a 400 or 500 MHz NMR spectrometer at room temperature. Chemical shifts (δ) are given in ppm relative to $CDCl_3$ (7.26 ppm for ^{1}H and 77 ppm for ^{13}C, or to internal TMS). High-resolution mass spectra (HRMS) were obtained using quadrupole-time-of-flight (TOF) mass spectrometers with ESI or APCI ion source in positive mode.

UV-visible absorption and fluorescence emission spectra were recorded on commercial spectrophotometers (Shimadzu UV-2450 and Edinburgh FS5 spectrometers) at 25 ^{o}C. Relative fluorescence quantum efficiencies of BODIPY derivatives were obtained by comparing the areas under the corrected emission spectrum of the test sample in various solvents with fluorescein (Φ = 0.90 in 0.1 M NaOH aqueous solution)[1], as reference at room temperature. Non-degassed, spectroscopic grade solvents and a 10 mm quartz cuvette were used. Dilute solutions ($0.01<A<0.05$) were used to minimize the reabsorption effects. Quantum yields were determined using the following equation[2]:

$$\Phi_x = \Phi_r \times \frac{F_x}{F_r} \times \frac{1 - 10^{-A_r(\lambda_{ex})}}{1 - 10^{-A_x(\lambda_{ex})}} \times \frac{n_x^2}{n_r^2}$$

The subscripts *x* and *r* refer respectively to our sample *x* and reference (standard) fluorophore *r* with known quantum yield Φ_r in a specific solvent, F stands for the spectrally corrected, integrated fluorescence spectra, $A(\lambda_{ex})$ denotes the absorbance at the used excitation wavelength λ_{ex}, and *n* represents the refractive index of the solvent (in principle at the average emission wavelength).

Crystals of compounds **3a**, **3d** and **3ia** suitable for X-ray analysis were obtained via the slow diffusion of petroleum ether into their dichloromethane solutions. The vials containing these solutions were placed, loosely capped, to promote the crystallization. A suitable crystal was chosen and mounted on a glass fiber using grease. Data were collected using a diffractometer equipped with a graphite crystal

monochromator situated in the incident beam for data collection at room temperature. Cell parameters were retrieved using SMART[3] software and refined using SAINT on all observed S2 reflections. The determination of unit cell parameters and data collections were performed with Mo Kα radiation (λ) at 0.71073 Å. Data reduction was performed using the SAINT software[4], which corrects for Lp and decay. The structure was solved by the direct method using the SHELXS-97[3] program and refined by least squares method on F^2 , SHELXL-2018/3[5], incorporated in SHELXTL V5.10[6], CCDC-2043554 (**3a**), CCDC-2043557 (**3d**) and CCDC-2043558 (**3ia**) contain the supplementary crystallographic data for this paper. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre *via* www.ccdc.cam.ac.uk/data_request/cif.

CW X-band EPR spectra for radicals were acquired on Bruker EMX instrument. EPR spectra of various mixtures were recorded after reaction for 1 h at 80 ^{o}C.

2. Computational data

All computations were carried out in the Gaussian 09 program suite[7] at the B3LYP/6-31G+(d,p) level of theory. Natural population analyses (NPA atomic charges and molecular orbital populations) were performed using the NBO formalism and the NPA values were calculated according to a prior procedure from our laboratory.

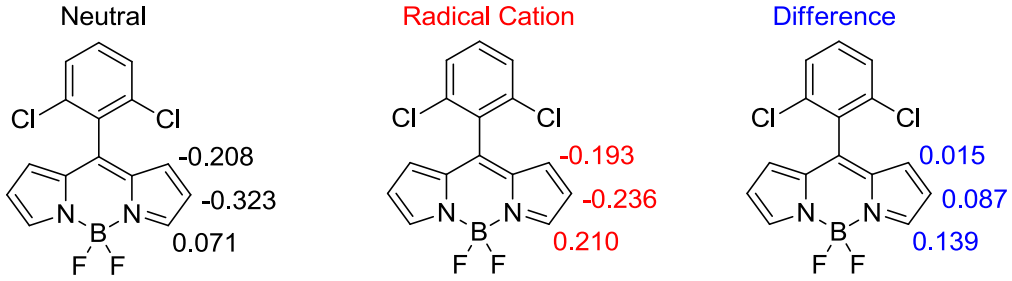


Chart S1. Natural population analysis (NPA) values of BODIPY.

3. Chemical structure of 1a-h and 2a-2k

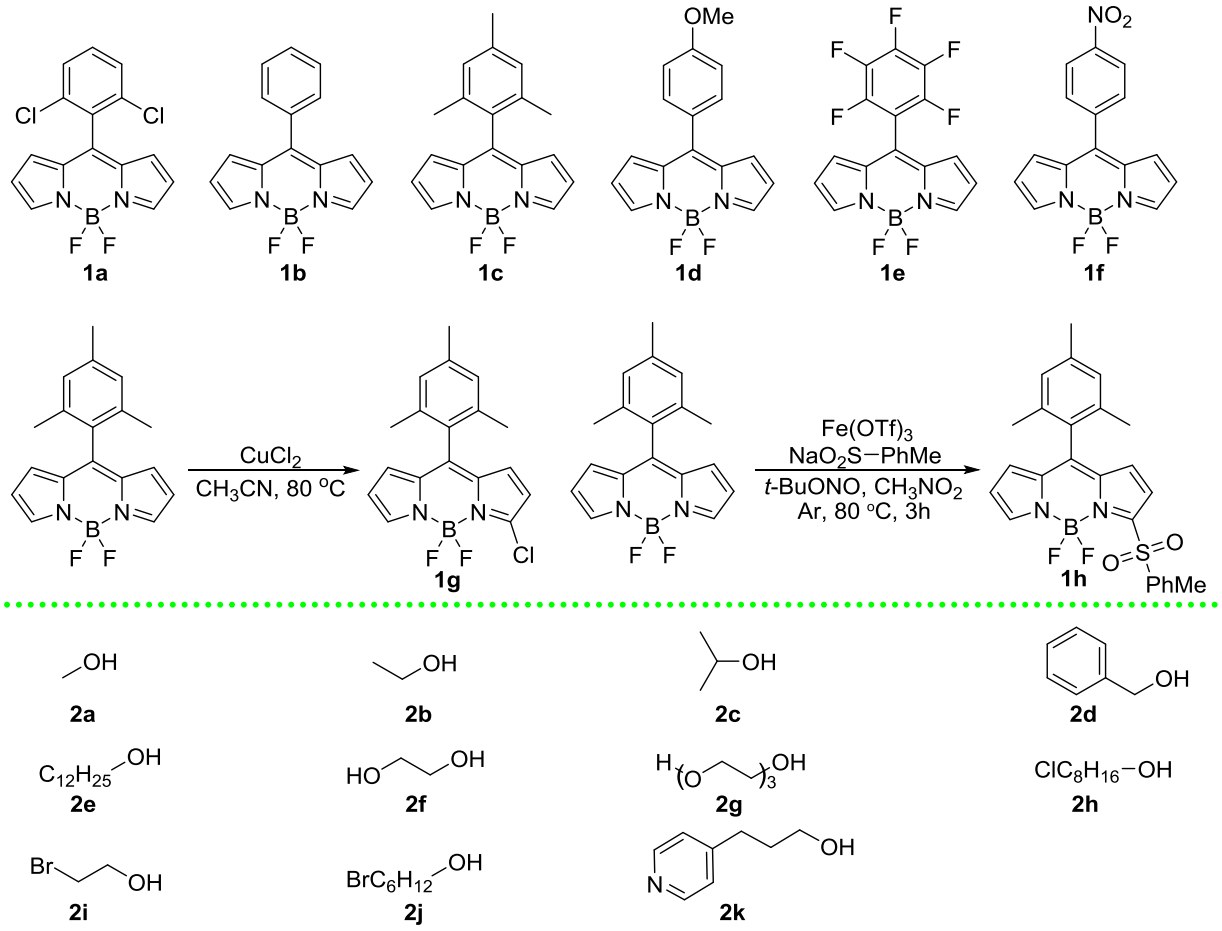
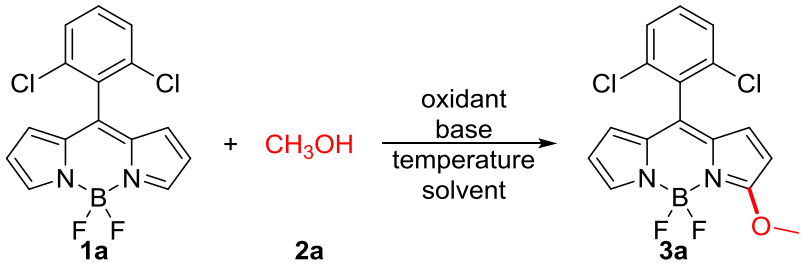


Figure S1. Chemical structure of BODIPYs **1a-h** and various alcohols **2a-k**.

4. Table S1. Optimization of the reaction condition.[a]

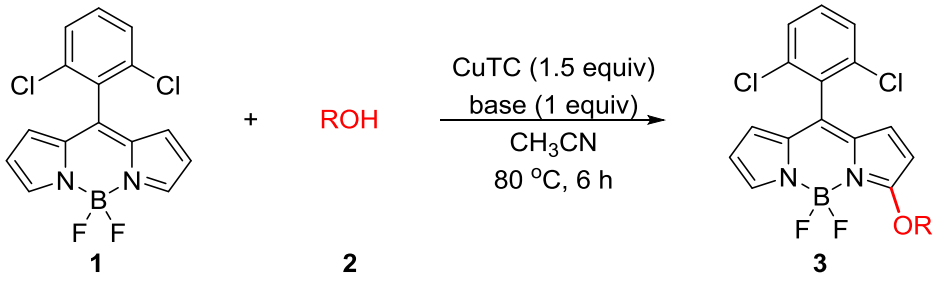


Entry	Oxidant	Solvent	Base	Temp. (°C)	Yields[b] (%)
1	$Cu(OAc)_2$	CH_3CN	Na_2CO_3	80	51
2	CuI	CH_3CN	Na_2CO_3	80	10
3	Cu_2O	CH_3CN	Na_2CO_3	80	< 5
4	CuOTf	CH_3CN	Na_2CO_3	80	15
5	$AgNO_3$	CH_3CN	Na_2CO_3	80	< 5
6	$FeCl_3$	CH_3CN	Na_2CO_3	80	N.R.
7	**CuTC**	**CH_3CN**	**Na_2CO_3**	**80**	**78**
8	CuTC	THF	Na_2CO_3	80	30
9	CuTC	1,2-DCE	Na_2CO_3	80	37
10	CuTC	Toluene	Na_2CO_3	80	40
11	CuTC	PhCl	Na_2CO_3	80	42
12	CuTC	CH_3CN	Na_2CO_3	60	65
13	CuTC	CH_3CN	Na_2CO_3	100	70
14	CuTC	CH_3CN	K_2CO_3	80	76
15	CuTC	CH_3CN	Cs_2CO_3	80	77
16	CuTC	CH_3CN	Na_2CO_3	80	51[c]
17	CuTC	CH_3CN	Na_2CO_3	80	70[d]
18	CuTC	CH_3CN	Na_2CO_3	80	37[e]
19	CuTC	CH_3CN	Na_2CO_3	80	73[f]
20	CuTC	CH_3CN	None	80	68
21	None	CH_3CN	Na_2CO_3	80	N.R.

[a]Reaction conditions: **3a** (0.1 mmol), **2a** (0.4 mmol), oxidant (0.15 mmol), solvent (1 ml), 6 h. [b]Isolated yields based on **3a**. [c]Reaction stopped after 2 h. [d]Reaction stopped after 8 h. [e]0.5 equiv of **2a** was used. [f]2 equiv of **2a** was used.

5. Synthesis and characterization

BODIPYs **1a-h** were synthesized according to literatures[8]. Compounds **2a-k** are commercially available reagents.



General Procedure for the Preparation of 3a-3p and **4:** BODIPY **1** (1 equiv, 0.2 mmol), CuTC (1.5 equiv, 0.3 mmol), alcohols **2** (4 equiv, 0.8 mmol), Na_2CO_3 (1 equiv, 0.2 mmol) were dissolved in acetonitrile (CH_3CN, 2 mL). The reaction mixture was heated at 80 °C for 6 h. Upon completion, the reaction mixture was cooled to room temperature and was poured into dichloromethane (100 mL), washed three times with water (100 mL), dried over Na_2SO_4, filtered, and evaporated to dryness. The crude product was purified by column chromatographically (silica; petroleum ether/ethyl acetate; 10:1-1:1 v/v).

3a was obtained as a red solid in 78% (57 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and methanol **2a** (0.032 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 193.5-195.1 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (s, 1H), 7.45 (d, J = 8.7 Hz, 2H), 7.38 (dd, J = 9.2, 6.7 Hz, 1H), 6.76 (d, J = 4.8 Hz, 1H), 6.40 (d, J = 7.6 Hz, 2H), 6.14 (d, J = 4.8 Hz, 1H), 4.17 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.9, 138.4, 135.6, 135.0, 133.9, 132.2, 131.3, 130.9, 130.5, 128.1, 124.2, 116.2, 105.1, 59.4. HRMS calcd. For $C_{16}H_{11}BCl_2F_2N_2O$, $[M+H]^+$: 367.0388, found: 367.0372

3b was obtained as a red solid in 74% (56 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and ethanol **2b** (0.046 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 170.0-171.4 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (s, 1H), 7.47-7.42 (m, 2H), 7.38 (dd, J = 9.2, 6.8 Hz, 1H), 6.74 (d, J = 4.8 Hz, 1H), 6.37 (d, J = 4.5 Hz, 2H), 6.12 (d, J = 4.8 Hz, 1H), 4.43 (q, J = 7.1 Hz, 2H), 1.56 (t, J = 7.1 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.5, 137.8, 135.7, 134.5, 133.9, 132.0, 131.4, 130.9,

130.5, 128.2, 123.7, 115.9, 105.9, 68.9, 14.9. HRMS calcd. for $C_{17}H_{13}BCl_2F_2N_2O$, $[M-F]^+$: 361.0482, Found: 361.0474.

3c was obtained as a red solid in 76% (59 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and *iso*-propyl alcohol **2c** (0.061 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 212.9-214.2 ^oC. ^1H NMR (400 MHz, d_6-DMSO) δ 7.71-7.67 (m, 2H), 7.61 (dd, J = 9.1, 7.0 Hz, 1H), 7.52 (s, 1H), 7.08 (d, J = 5.0 Hz, 1H), 6.71 (d, J = 5.0 Hz, 1H), 6.35 (dd, J = 3.8, 2.2 Hz, 1H), 6.29 (d, J = 3.4 Hz, 1H), 5.00-5.09 (m, 1H), 1.42 (d, J = 6.1 Hz, 6H). ^{13}C NMR (101 MHz, d_6-DMSO) δ 169.9, 135.5, 135.3, 134.4, 132.1, 131.9, 130.9, 130.4, 130.3, 128.5, 121.5, 115.2, 109.7, 77.8, 21.9. HRMS calcd. For $C_{18}H_{15}BCl_2F_2N_2O$, $[M-F]^+$: 375.0639, found: 375.0640.

3d was obtained as a red solid in 43% (38 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and benzyl alcohol **2d** (0.083 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 142.3-145.1 ^oC. ^1H NMR (400 MHz, $CDCl_3$) δ 7.69 (s, 1H), 7.52-7.32 (m, 8H), 6.70 (d, J = 4.8 Hz, 1H), 6.40 (dd, J = 11.1, 2.8 Hz, 2H), 6.09 (d, J = 4.8 Hz, 1H), 5.44 (s, 2H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.0, 138.5, 135.7, 135.0, 134.6, 133.6, 132.2, 131.3, 130.90, 130.3, 128.9, 128.7, 128.2, 126.9, 124.2, 116.1, 106.0, 73.7. HRMS calcd. For $C_{22}H_{15}BCl_2F_2N_2O$, $[M-F]^+$: 423.0639, found: 463.0625.

3e was obtained as a red solid in 47% (48 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and lauryl alcohol **2e** (0.149 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 10:1 v/v). Mp: 140.7-142.1 ^oC. ^1H NMR (400 MHz, $CDCl_3$) δ 7.64 (s, 1H), 7.47-7.43 (m, 2H), 7.40-7.36 (m, 1H), 6.74 (d, J = 4.8 Hz, 1H), 6.37 (t, J = 3.7 Hz, 2H), 6.11 (d, J = 4.8 Hz, 1H), 4.34 (t, J = 6.7 Hz, 2H), 1.90 (m, 2H), 1.50 (m, 2H), 1.27 (d, J = 8.6 Hz, 16H), 0.87 (d, J = 7.0 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.6, 137.8, 135.7, 134.3, 133.9, 132.0, 131.4, 130.9, 130.5, 128.1, 123.6, 115.8, 105.9, 73.1, 31.9, 29.7, 29.6, 29.5, 29.4, 29.2, 29.1, 25.5, 22.7, 18.4, 14.1. HRMS calcd. For $C_{27}H_{33}BCl_2F_2N_2O$, $[M-F]^+$: 501.2047, found: 501.2039.

3f was obtained as a red solid in 54% (42 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and ethylene glycol **2f** (0.044 mL, 0.8 mmol) using the general procedure

described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 1:1 v/v). Mp: 163.5-166.8 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (s, 1H), 7.46 (d, *J* = 7.3 Hz, 2H), 7.42-7.36 (m, 1H), 6.76 (d, *J* = 4.7 Hz, 1H), 6.41 (d, *J* = 11.1 Hz, 2H), 6.14 (d, *J* = 4.7 Hz, 1H), 4.46 (t, *J* = 4.7 Hz, 2H), 4.07-4.01 (m, 2H), 2.01 (s, 1H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.1, 138.6, 135.7, 135.3, 133.8, 132.3, 131.2, 131.0, 130.2, 128.2, 124.5, 116.3, 105.9, 74.4, 60.8. HRMS calcd. For $C_{17}H_{13}BCl_2F_2N_2O_2$, $[M-F]^+$: 377.0431, found: 377.0414.

3g was obtained as a red solid in 51% (49 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and triglycol **2g** (0.109 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 1:1 v/v). Mp: 132.6-134.5 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (s, 1H), 7.45 (d, *J* = 6.9 Hz, 2H), 7.38 (dd, *J* = 9.2, 6.8 Hz, 1H), 6.74 (d, *J* = 4.8 Hz, 1H), 6.38 (d, *J* = 8.1 Hz, 2H), 6.18 (d, *J* = 4.8 Hz, 1H), 4.54-4.48 (m, 2H), 3.99-3.94 (m, 2H), 3.83-3.78 (m, 2H), 3.74-3.71 (m, 2H), 3.70-3.66 (m, 2H), 3.63-3.58 (m, 2H), 2.77 (s, 1H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.3, 138.1, 135.7, 134.8, 133.7, 132.1, 131.3, 130.9, 130.4, 128.2, 124.0, 116.1, 106.2, 72.5, 72.5, 71.4, 70.4, 69.0, 61.8. HRMS calcd. For $C_{12}H_{21}BCl_2F_2N_2O_4$, $[M-F]^+$: 465.0955, found: 465.0968.

3h was obtained as a red solid in 41% (40 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and 8-chloro-1-octano **2h** (0.136 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 8:1 v/v). Mp: 110.9-113.1 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (s, 1H), 7.47-7.43 (m, 2H), 7.38 (dd, *J* = 9.2, 6.8 Hz, 1H), 6.74 (d, *J* = 4.8 Hz, 1H), 6.37 (t, *J* = 4.2 Hz, 2H), 6.11 (d, *J* = 4.8 Hz, 1H), 4.35 (t, *J* = 6.5 Hz, 2H), 3.54 (t, *J* = 6.7 Hz, 2H), 1.95-1.88 (m, 2H), 1.81-1.75 (m, 2H), 1.47-1.36 (m, 8H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.5, 137.9, 135.7, 134.4, 133.85, 132.1, 131.4, 130.9, 130.5, 128.1, 123.7, 115.9, 105.8, 72.9, 45.2, 32.6, 31.4, 29.0, 28.7, 26.8, 25.4. HRMS calcd. For $C_{23}H_{24}BCl_3F_2N_2O$, $[M-F]^+$: 479.1031, found: 479.1040.

3i was obtained as a red solid in 42% (38 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and 2-bromoethanol **2i** (0.058 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 145.7-148.3 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (s, 1H), 7.48-7.37 (m, 3H), 6.75 (d, J = 4.5 Hz, 1H), 6.44 (s, 1H), 6.40 (s, 1H), 6.10 (d,

J = 4.5 Hz, 1H), 4.61 (t, J = 6.9 Hz, 2H), 3.73 (t, J = 6.8 Hz, 2H). 13C NMR (101 MHz, CDCl3) δ 167.9, 139.3, 135.8, 135.7, 133.5, 132.5, 131.2, 131.0, 130.2, 128.2, 125.0, 116.6, 104.8, 71.4, 26.8. HRMS calcd. For $C_{17}H_{12}BBrCl_2F_2N_2O$, $[M-F]^+$: 438.9587, found: 438.9586.

3j was obtained as a red solid in 40% (41 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and 6-bromo-1-hexanol **2j** (0.105 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 5:1 v/v). Mp: 143.6-145.3 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) *δ* 7.65 (s, 1H), 7.45 (d, *J* = 7.1 Hz, 2H), 7.38 (dd, *J* = 9.1, 6.8 Hz, 1H), 6.75 (d, *J* = 4.8 Hz, 1H), 6.38 (dd, J = 9.6, 3.8 Hz, 2H), 6.11 (d, J = 4.8 Hz, 1H), 4.36 (t, J = 6.3 Hz, 2H), 3.44 (t, J = 6.7 Hz, 2H), 1.97-1.88 (m, 4H), 1.63-1.54 (m, 4H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.4, 138.0, 135.5, 134.6, 133.84, 131.4, 130.9, 130.9, 130.4, 128.1, 123.8, 116.0, 105.7, 72.7, 33.8, 32.5, 28.85, 27.7, 24.8. HRMS calcd. For $C_{21}H_{20}BBrCl_2F_2N_2O$, $[M]^+$: 516.0170, found: 516.0167.

3k was obtained as a red solid in 52% (48 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and 4-pyridinepropanol **2k** (0.102 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 3:1 v/v). Mp: 120.6-121.7 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) *δ* 8.53 (s, 2H), 7.69 (s, 1H), 7.48-7.44 (m, 2H), 7.39 (dd, J = 9.2, 6.8 Hz, 1H), 7.24 (d, *J* = 4.3 Hz, 2H), 6.74 (d, *J* = 4.8 Hz, 1H), 6.43 (d, *J* = 3.7 Hz, 1H), 6.39 (d, *J* = 3.9 Hz, 1H), 6.04 (d, *J* = 4.8 Hz, 1H), 4.31 (t, *J* = 6.0 Hz, 2H), 2.95 (t, *J* = 7.4 Hz, 2H), 2.28-2.21 (m, 2H). ^{13}C NMR (101 MHz, $CDCl_3$) *δ* 168.8, 150.0, 149.6, 138.4, 135.7, 135.1, 133.8, 132.5, 132.3, 131.3, 130.97, 130.3, 128.2, 124.3, 116.3, 105.4, 70.8, 30.7, 29.3. HRMS calcd. For $C_{23}H_{18}BCl_2F_2N_3O$, $[M+H]^+$: 472.0961, found: 472.0972.

3l was obtained as a red solid in 69% (47 mg) yield from BODIPY **1c** (60 mg, 0.2 mmol) and methanol **2a** (0.032 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 170.9-173.0 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) *δ* 7.65 (s, 1H), 6.93 (s, 2H), 6.73 (d, *J* = 4.7 Hz, 1H), 6.40 (d, *J* = 3.7 Hz, 1H), 6.34 (d, *J* = 5.8 Hz, 1H), 6.07 (d, *J* = 4.7 Hz, 1H), 4.14 (s, 3H), 2.35 (s, 3H), 2.09 (s, 6H). ^{13}C NMR (101 MHz, $CDCl_3$) *δ* 169.2, 141.6, 138.5, 137.9, 136.8, 133.9, 133.1, 130.6, 129.5, 128.1, 124.8, 115.9, 103.9, 59.1, 21.1, 19.9. HRMS calcd. For $C_{19}H_{19}BF_2N_2O$, $[M+H]^+$: 341.1637,

found: 341.1619.

3m was obtained as a red solid in 82% (63 mg) yield from BODIPY **1e** (71 mg, 0.2 mmol) and methanol **2a** (0.032 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 164.5-167.2 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (s, 1H), 6.87 (d, J = 4.8 Hz, 1H), 6.52 (d, J = 3.7 Hz, 1H), 6.43 (d, J = 2.1 Hz, 1H), 6.22 (d, J = 4.9 Hz, 1H), 4.20 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.7, 146.0, 143.4, 139.3, 138.9, 134.1, 132.1, 131.0, 124.7 123.6, 116.8, 108.0, 106.1, 59.7. HRMS calcd. For $C_{16}H_8BF_7N_2O$, $[M\text{-}F]^+$: 369.0634, found: 369.0612.

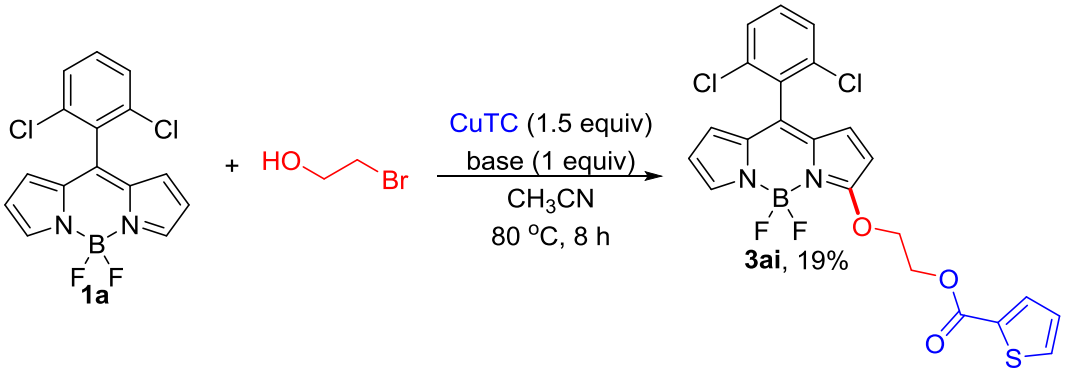
3n was obtained as a red solid in 72% (43 mg) yield from BODIPY **1b** (54 mg, 0.2 mmol) and methanol **2a** (0.032 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 225.0-226.3 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (s, 1H), 7.56-7.47 (m, 5H), 6.98 (d, J = 4.7 Hz, 1H), 6.67 (d, J = 3.8 Hz, 1H), 6.43 (d, J = 3.8 Hz, 1H), 6.13 (d, J = 4.8 Hz, 1H), 4.15 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.3, 141.9, 137.9, 135.4, 133.7, 133.07, 130.3, 130.3, 130.0, 128.3, 126.1, 115.9, 103.9, 59.2 (s). HRMS calcd. For $C_{16}H_{13}BF_2N_2O$, $[M\text{-}F]^+$: 279.1105, found: 279.1107.

3o was obtained as a red solid in 64% (42 mg) yield from BODIPY **1d** (59 mg, 0.2 mmol) and methanol **2a** (0.032 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 205.8-206.4 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (s, 1H), 7.47 (d, J = 11.5 Hz, 2H), 7.01 (d, J = 8.6 Hz, 3H), 6.71 (d, J = 3.8 Hz, 1H), 6.43 (d, J = 6.0 Hz, 1H), 6.12 (d, J = 4.7 Hz, 1H), 4.14 (s, 3H), 3.90 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.0, 161.3, 142.0, 137.6, 135.2, 133.1, 132.0, 130.1, 126.2, 126.0, 115.8, 113.9, 103.5, 59.1, 55.5. HRMS calcd. For $C_{17}H_{15}BF_2N_2O_2$, $[M\text{-}F]^+$: 309.1274, found: 309.1260.

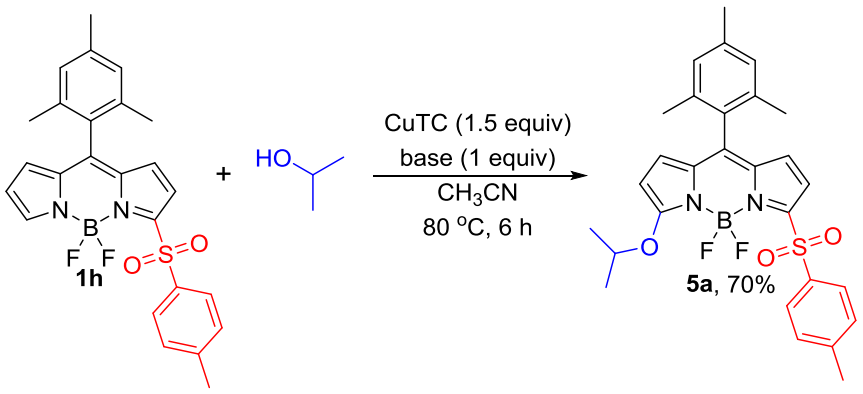
3p was obtained as a red solid in 80% (54 mg) yield from BODIPY **1f** (63 mg, 0.2 mmol) and methanol **2a** (0.032 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 254.1-256.3 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.37 (d, J = 8.7 Hz, 2H), 7.76-7.68 (m, 3H), 6.90 (d, J = 4.8 Hz, 1H), 6.57 (d, J = 3.8 Hz, 1H), 6.45 (d, J = 3.9 Hz, 1H), 6.20 (d, J = 4.8 Hz, 1H), 4.19 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.1,

148.8, 140.0, 138.9, 138.3, 134.9, 132.4, 131.3, 130.1, 125.7, 123.6, 116.6, 105.1, 59.5. HRMS calcd. For $C_{16}H_{12}BF_2N_3O_3$, $[M-F]^+$: 324.0956, found: 324.0962.

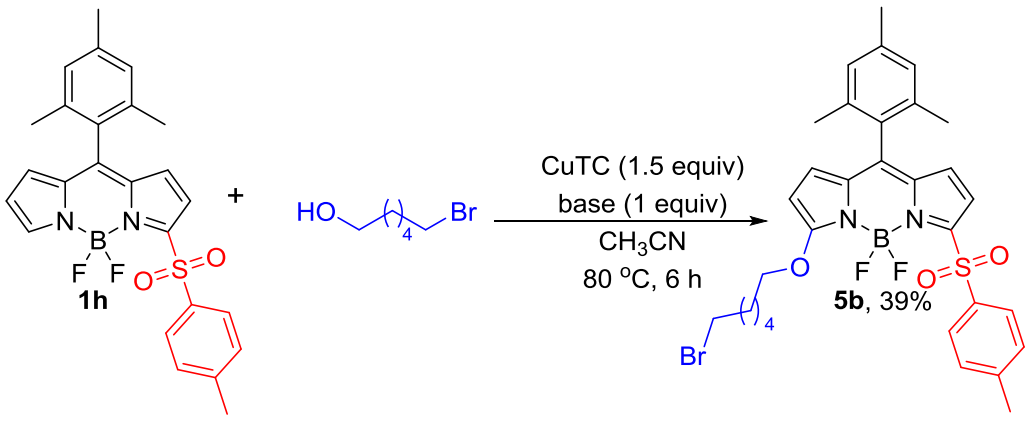
4 was obtained as a red solid in 75% (56 mg) yield from BODIPY **1g** (69 mg, 0.2 mmol) and methanol **2a** (0.032 mL, 0.8 mmol) using the general procedure described above and was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 151.9-153.4 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.93 (s, 2H), 6.71 (d, J = 4.5 Hz, 1H), 6.32 (d, J = 3.8 Hz, 1H), 6.21 (d, J = 4.0 Hz, 1H), 6.09 (d, J = 4.7 Hz, 1H), 4.14 (s, 3H), 2.34 (s, 3H), 2.08 (s, 6H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 171.2, 169.4, 139.9, 138.7, 137.0, 133.8, 132.2, 130.5, 128.8, 128.1, 124.9, 115.5, 104.6, 59.2, 21.1, 19.9. HRMS calcd. For $C_{19}H_{18}BClF_2N_2O$, $[M-F]^+$: 355.1185, found: 355.1169.



3ia was obtained as a red solid in 19% (19 mg) yield from BODIPY **1a** (67 mg, 0.2 mmol) and 2-bromoethanol **2e** (0.07 mL, 0.8 mmol) were dissolved in acetonitrile (2 mL) using the general procedure described above and extend this reaction time to 8 hours. The crude product was purified by chromatography (silica gel, petroleum ether/ethyl acetate: 2:1 v/v). Mp: 185.3-186.7 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (s, 1H), 7.57 (d, J = 5.0 Hz, 1H), 7.49-7.43 (m, 2H), 7.39 (dd, J = 9.1, 6.8 Hz, 1H), 7.09 (dd, J = 7.8, 3.8 Hz, 1H), 6.74 (d, J = 4.8 Hz, 1H), 6.43 (d, J = 3.6 Hz, 1H), 6.39 (d, J = 5.5 Hz, 1H), 6.16 (d, J = 4.8 Hz, 1H), 4.77-4.71 (m, 2H), 4.71-4.63 (m, 2H).^{13}C NMR (101 MHz, $CDCl_3$) δ 168.7, 161.9, 138.9, 135.7, 134.3, 133.67, 133.2, 132.8, 132.3, 131.3, 131.1, 130.9, 130.3, 128.2, 127.9, 124.6, 116.4, 105.4, 70.1, 62.5. HRMS calcd. For $C_{22}H_{15}BCl_2F_2N_2O_3S$, $[M+Na]^+$: 529.0134, found: 529.0132.

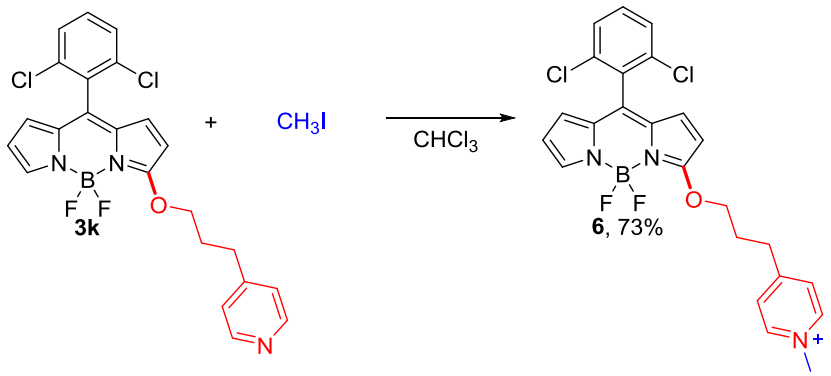


BODIPY **1h** (38 mg, 0.1 mmol), isopropanol (0.030 mL, 0.4 mmol), CuTC (28 mg, 0.15 mmol), Na_2CO_3 (10 mg, 0.1 mmol) were dissolved in acetonitrile (2 mL). The reaction mixture was stirred at 80 °C for 6 h. Upon completion, the reaction mixture was poured into dichloromethane (50 mL), washed three times with water (50 mL), dried over Na_2SO_4, filtered, and evaporated to dryness. The crude product was purified by column chromatographically (silica; petroleum ether/ethyl acetate; 2:1 v/v) to provide **5a** as a red solid in 60 % yield (31 mg). Mp: 138.5-141.2 °C. ^{1}H NMR (400 MHz, d_6-DMSO) δ 7.80 (d, J = 8.0 Hz, 2H), 7.40 (d, J = 7.9 Hz, 2H), 7.05 (d, J = 5.2 Hz, 1H), 7.03 (s, 2H), 6.97 (d, J = 3.8 Hz, 1H), 6.94 (d, J = 5.1 Hz, 1H), 6.06 (d, J = 3.6 Hz, 1H), 5.17-5.11 (m, 1H), 2.37 (s, 3H), 2.32 (s, 3H), 1.97 (s, 6H), 1.44 (d, J = 5.8 Hz, 6H). ^{13}C NMR (101 MHz, d_6-DMSO) δ 173.1, 144.2, 141.0, 139.5, 138.9, 137.9, 136.6, 136.5, 134.0, 130.0, 128.8, 128.8, 128.7, 128.1, 121.6, 118.3 , 115.1, 79.9, 22.6, 21.5, 21.2, 19.9. HRMS calcd. For $C_{28}H_{30}BF_2N_2O_3S$, $[M+H]^+$: 523.2038, found: 523.2028.



BODIPY **1h** (38 mg, 0.1 mmol), 6-bromo-1-hexanol (0.053 mL, 0.4 mmol), CuTC (28 mg, 0.15 mmol), Na_2CO_3 (10 mg, 0.10 mmol) were dissolved in acetonitrile (2 mL). The reaction mixture was stirred at 80 °C for 6 h. Upon completion, the reaction

mixture was poured into dichloromethane (50 mL), washed three times with water (50 mL), dried over Na_2SO_4, filtered, and evaporated to dryness. The crude product was purified by column chromatographically (silica; petroleum ether/ethyl acetate; 4:1 v/v) to provide **5b** as a red solid in 39 % yield (23 mg). Mp: 112.7-113.5 ^{o}C. ^{1}H NMR (400 MHz, d_6-DMSO) δ 7.81 (d, J = 8.0 Hz, 2H), 7.38 (d, J = 7.9 Hz, 2H), 7.07 (d, J = 5.0 Hz, 1H), 7.03 (s, 2H), 6.97 (d, J = 3.7 Hz, 1H), 6.91 (d, J = 5.2 Hz, 1H), 6.07 (d, J = 3.7 Hz, 1H), 4.61-4.58 (m, 2H), 3.55 (s, 2H), 2.37 (s, 3H), 2.31 (s, 3H), 1.97 (s, 6H), 1.86-1.80 (m, 4H), 1.47 (s, 4H). ^{13}C NMR (101 MHz, d_6-DMSO) δ 173.7, 144.2, 141.4, 139.5, 138.9, 137.9, 136.6, 136.5, 134.1, 129.9, 128.9, 128.7, 128.3, 121.4, 118.4, 114.9, 74.8, 35.5, 32.6, 28.8, 27.4, 24.4, 21.5, 21.2, 19.9. HRMS calcd. For $C_{31}H_{34}BBrFN_2O_2S$, $[M\text{-}F]^+$: 623.1550, found: 623.1549.



6 was obtained as a red solid in 73% (35 mg) yield from compound **3k** (47 mg, 0.1 mmol) and CH_3I (0.128 mL, 2 mmol) added to a chloroform solution (2 mL) and this mixture was stirred 24 h in dark. The precipitate was collected, and washed three times with petroleum ether. Mp: 118.5-120.7 ^{o}C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.90 (d, J = 6.3 Hz, 2H), 8.04 (t, J = 5.5 Hz, 2H), 7.58 (d, J = 5.7 Hz, 1H), 7.44-7.38 (m, 3H), 6.74 (t, J = 4.1 Hz, 1H), 6.38 (d, J = 9.9 Hz, 2H), 6.31 (t, J = 5.8 Hz, 1H), 4.55-4.45 (m, 5H), 3.31-3.18 (m, 2H), 2.39-2.34 (m, 2H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 169.1, 161.6, 144.8, 137.7, 135.5, 134.8, 134.4, 132.1, 131.2, 131.0, 130.5, 128.5, 128.3, 124.0, 116.2, 106.9, 71.7, 48.8, 32.0, 28.7. HRMS calcd. For $C_{24}H_{21}BCl_2F_2N_3O^+$, $[M]^+$: 486.1117, found: 486.1116.

6. Crystal data

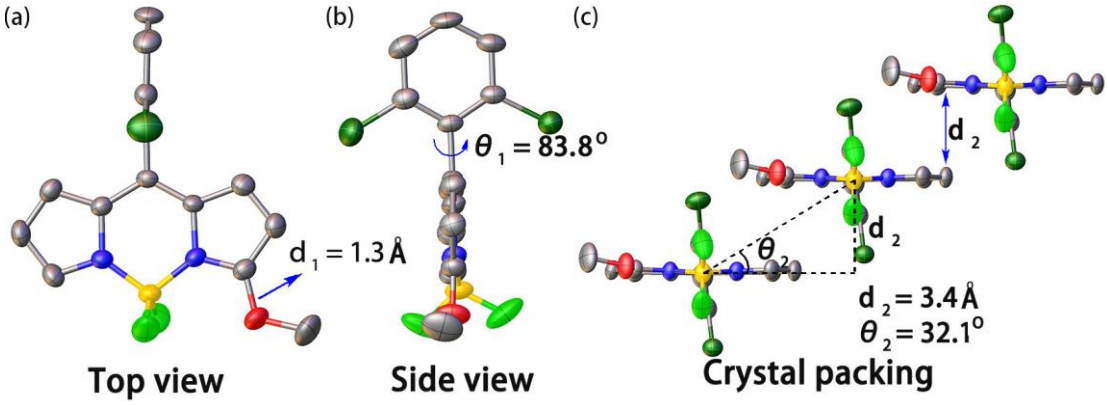


Figure S2. Single-crystal structure of **3a**, with thermal ellipsoids shown at 50% probability: (a) Top view, (b) side view and (c) crystal packing of X-Ray structures of BODIPY **3a**. C, gray; N, blue; B, yellow; F, bright green; Cl, dark green; O, red. Hydrogen atoms have been removed for clarity.

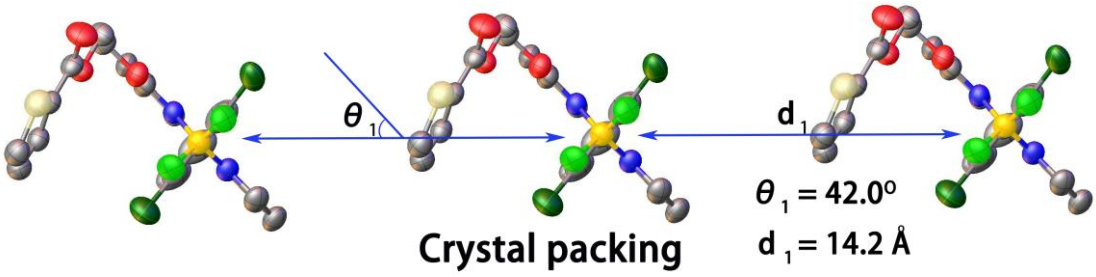
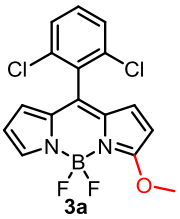
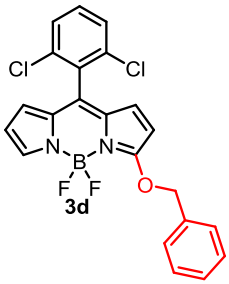
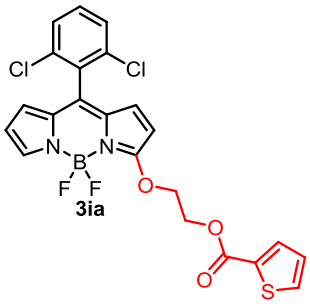


Figure S3. Single-crystal structure of **3ia**, with thermal ellipsoids shown at 50% probability: crystal packing of X-Ray structures of BODIPY **3ia**. C, gray; N, blue; B, yellow; F, bright green; Cl, dark green; O, red; S, light yellow. Hydrogen atoms have been removed for clarity.

Table S2. Selected Geometrical Parameters of **3a**, **3d** and **3ia** obtained from crystallography.





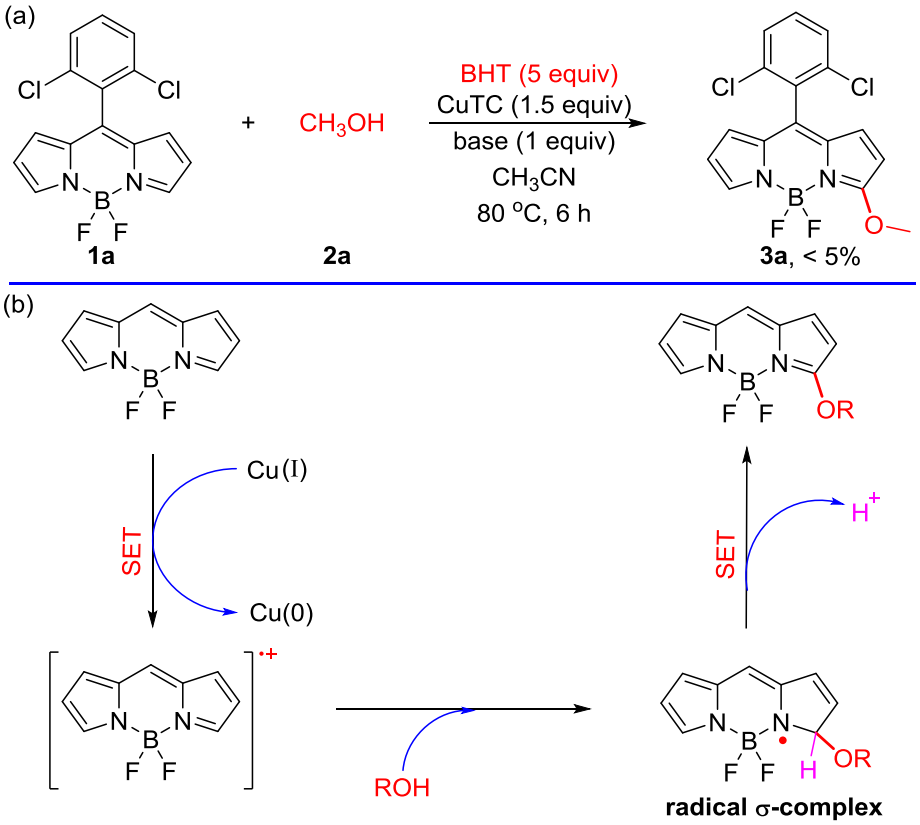


	3a	**3d**	**3ia**
B-N bond length (Å)	1.550 (7) 1.539 (7)	1.563 (3) 1.542 (3)	1.567 (4) 1.546 (6)
dihedral angles between *meso*-mesityl group and dipyyrin core (deg)	83.851 (12)	88.727 (50)	82.883 (82)
dihedral angles of two pyrrole rings in dipyyrin core (deg)	2.947 (15)	5.575 (80)	0.490 (11)
Newly formed C-O single bond **d**$_1$ length (Å)	1.321 (8)	1.327 (3)	1.324 (4)

Table S3. Crystal experimental details.

	3a	**3d**	**3ia**
Crystal data			
Chemical formula	$C_{16}H_{11}BCl_2F_2N_2O$	$C_{22}H_{15}BCl_2F_2N_2O_2$	$C_{22}H_{15}BCl_2F_2N_2O_3S$
M_r	366.98	443.07	507.13
Crystal system, space group	Triclinic, P-1	Triclinic, P-1	Monoclinic $P2_1/c$
Temperature (K)	298(2)	273(2)	273(2)
a, *b*, *c* (Å)	6.5368(3) 10.9882(6), 12.5935(7)	7.0336(2), 11.3399(4), 14.7341(5)	14.0000(6), 12.6326(5), 14.1556(5)
α, *β*, *γ* (°)	114.913(2), 91.931(3), 96.868(3)	70.1820(10) 78.6320(10) 82.1520(10)	90, 112.884(2), 90
V (Å^3)	810.95(7)	1080.80(6)	2306.47(16)
Z	2	2	4
ρ_{calc}(g·cm^{-3})	1.503	1.361	1.460
Radiation type	Mo *Kα*	Mo *Kα*	Mo *Kα*
μ (mm^{-1})	0.426	0.333	0.416
Crystal size (mm)	0.22 × 0.21 × 0.20	0.22 × 0.21 × 0.20	0.22 × 0.21 × 0.20
2Θ range for date collection/^{o}	6.306 to 55.07	5.956 to 55.052	5.802 to 55.086
Reflections collected	22138	19948	78020
Independent reflections	3362 [R_{int}=0.0523, Rsigma = 0.0439]	4950 [R_{int} = 0.0287, Rsigma = 0.0270]	5325 [R_{int} = 0.0793, Rsigma = 0.0335]
Date/restraints/parameters	3362/0/218	4950/1/271	5325/0/298
Goodness-of-fit on F^2	1.260	1.036	1.019
Final R indexes [I> =2σ (I)]	R_1 = 0.1057, wR_2 =0.1693	R_1 = 0.056, wR_2 =0.1308	R_1 = 0.0638, wR_2 =0.1368
Final R indexes [all date]	R_1 = 0.1326, wR_2 =0.1792	R_1 = 0.0764, wR_2 =0.1489	R_1 = 0.1184, wR_2 =0.1671
Largest diff. Peak/hole/ e Å^{-3}	0.59/-0.33	0.55/-0.34	0.35/-0.45

7. Reaction mechanism



Scheme S1. (a) The influence of BHT to this etherification reaction, (b) proposed reaction mechanism.

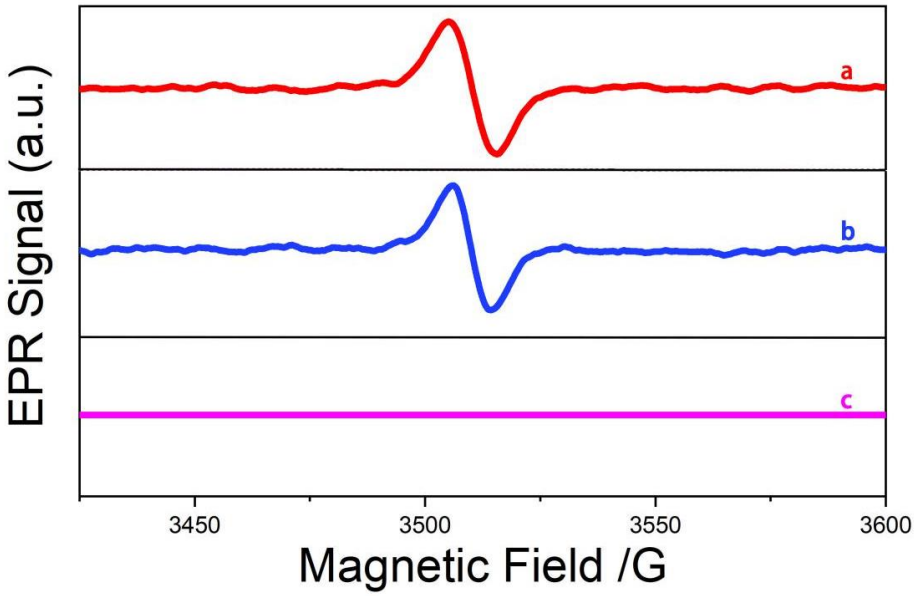


Figure S4. EPR titration spectrum in acetonitrile at room temperature. (a) A mixture of **1a** (0.1 mmol) and CuTC (0.15 mmol) after stirring at 80 °C for 1 h. (b) A mixture of **1a** (0.1 mmol), **2a** (0.4 mmol) and CuTC (0.15 mmol) after stirring at 80 °C for 1 h. (c) A mixture of **1a** (0.1 mmol) and **2a** (0.4 mmol) after stirring at 80 °C for 1 h without addition of CuTc.

8. Photophysical properties

8.1. Table S4. Photophysical properties of these newly synthesized BODIPYs in different solvents at room temperature.

dyes	Solvent	λ_{abs}^{max} (nm)	$\log\varepsilon_{max}$ [a]	λ_{em}^{max} (nm)	Φ[b]	Stokes shift (cm^{-1})
	Hexane	509	4.89	525	0.84	599
	Toluene	511	4.89	529	0.82	666
3a	DCM	506	4.79	525	0.90	715
	THF	505	4.82	524	0.80	718
	Acetonitrile	499	4.68	519	0.91	772
	Hexane	509	4.86	525	0.89	599
	Toluene	511	4.81	529	0.91	666
3b	DCM	506	4.76	525	0.91	715
	THF	504	4.75	524	0.87	757
	Acetonitrile	498	4.69	521	0.87	886
	Hexane	509	4.86	524	0.87	562
	Toluene	510	4.84	529	0.91	704
3c	DCM	504	4.70	526	0.92	830
	THF	504	4.72	524	0.86	757
	Acetonitrile	498	4.61	519	0.88	812
	Hexane	511	4.87	527	0.88	594
	Toluene	513	4.87	531	0.87	661
3d	DCM	508	4.76	527	0.95	710
	THF	507	4.75	526	0.88	712
	Acetonitrile	502	4.68	521	0.86	726
	Hexane	510	4.86	525	0.93	560
	Toluene	512	4.85	530	0.98	663
3e	DCM	506	4.73	526	0.94	751
	THF	506	4.76	526	0.90	751
	Acetonitrile	498	4.63	522	0.84	923
	Hexane	510	4.82	524	0.83	524
	Toluene	511	4.79	531	0.90	737
3f	DCM	507	4.69	526	0.93	712
	THF	505	4.67	526	0.87	791
	Acetonitrile	499	4.61	520	0.85	809
	Hexane	508	4.79	525	0.89	637
	Toluene	512	4.78	530	0.91	663
3g	DCM	506	4.65	526	0.92	751
	THF	504	4.66	524	0.88	757
	Acetonitrile	500	4.61	520	0.82	769
	Hexane	510	4.85	525	0.84	560
3h	Toluene	512	4.83	528	0.91	592
	DCM	506	4.71	526	0.95	751

	THF	506	4.74	524	0.90	679
	Acetonitrile	500	4.61	520	0.83	769
3i	Hexane	510	5.02	526	0.86	596
	Toluene	513	4.98	530	0.89	625
	DCM	509	4.91	528	0.88	707
	THF	507	4.89	525	0.85	676
	Acetonitrile	501	4.81	521	0.84	766
3ia	Hexane	510	4.31	523	0.90	487
	Toluene	512	4.30	529	0.89	628
	DCM	508	4.18	526	0.98	674
	THF	506	4.11	523	0.94	642
	Acetonitrile	501	4.08	520	0.96	729
3j	Hexane	509	4.37	526	0.94	635
	Toluene	512	4.33	530	0.91	663
	DCM	506	4.26	526	0.90	751
	THF	506	4.34	522	0.89	606
	Acetonitrile	499	4.08	518	0.90	735
3k	Hexane	510	4.88	526	0.87	596
	Toluene	512	4.84	529	0.98	628
	DCM	508	4.75	526	0.89	674
	THF	506	4.75	526	0.90	751
	Acetonitrile	500	4.67	523	0.87	880
3l	Hexane	499	4.88	510	0.87	432
	Toluene	502	4.91	517	0.87	578
	DCM	498	4.82	514	0.88	625
	THF	497	4.81	512	0.86	589
	Acetonitrile	493	4.71	510	0.83	676
3m	Hexane	511	4.84	532	0.60	772
	Toluene	514	4.81	539	0.73	902
	DCM	509	4.75	535	0.79	955
	THF	506	4.70	531	0.72	930
	Acetonitrile	499	4.60	527	0.76	1065
3n	Hexane	499	4.80	517	0.01	698
	Toluene	502	4.79	521	0.03	726
	DCM	498	4.75	520	0.03	850
	THF	497	4.77	520	0.03	890
	Acetonitrile	492	4.66	518	0.02	1020
3o	Hexane	498	4.84	515	0.01	663
	Toluene	501	4.83	522	0.03	803
	DCM	497	4.75	516	0.03	741
	THF	497	4.74	513	0.03	628
	Acetonitrile	492	4.69	510	0.02	717
3p	Hexane	504	4.75	530	0.002	973
	Toluene	508	4.73	549	0.012	1470

	DCM	504	4.68	537	0.013	1219
	THF	502	4.68	534	0.015	1194
	Acetonitrile	497	4.61	524	0.013	1037
4	Hexane	507	4.93	517	0.88	382
	Toluene	508	4.89	522	0.88	528
	DCM	504	4.80	519	0.91	573
	THF	502	4.79	518	0.87	615
	Acetonitrile	496	4.69	515	0.83	744
5a	DCM	478	4.51	512	0.74	1390
5b	DCM	482	4.35	513	0.75	1250
6	DCM	509	4.55	529	0.71	743
	Acetonitrile	501	4.47	526	0.88	840

[a]Molar extinction coefficients are in the maximum of the highest absorption peak. [b]Fluorescence quantum yields of **3a**-**3p**, **4**, **5a**, **5b** and **6** was calculated using fluorescein (Φ = 0.90 in 0.1 N NaOH aqueous solution) as reference at room temperature.

8.2. UV-Vis absorption and fluorescence emission spectra in different solvents at room temperature.

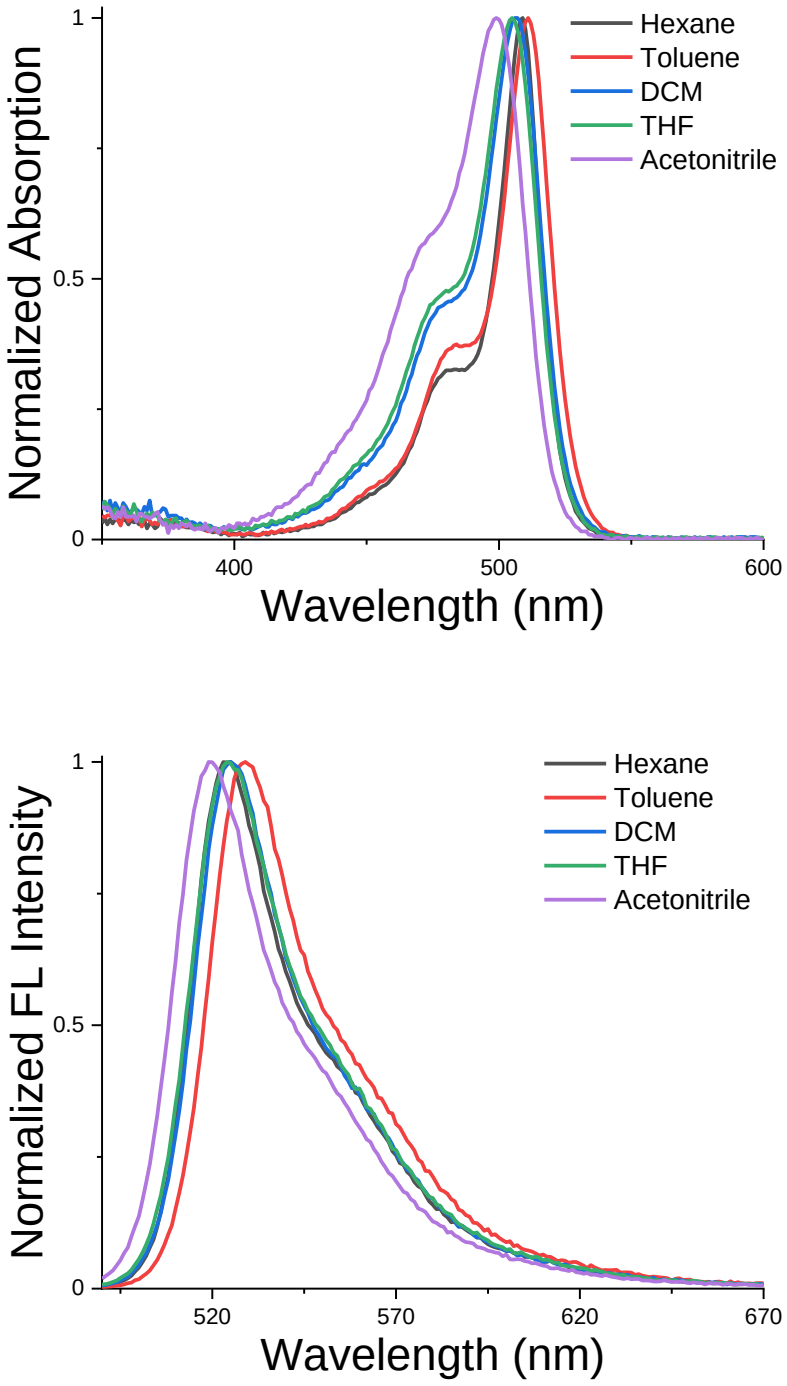


Figure S5. Absorption (top) and emission (bottom) spectra of compound **3a** recorded in different solvents (Excited at 480 nm).

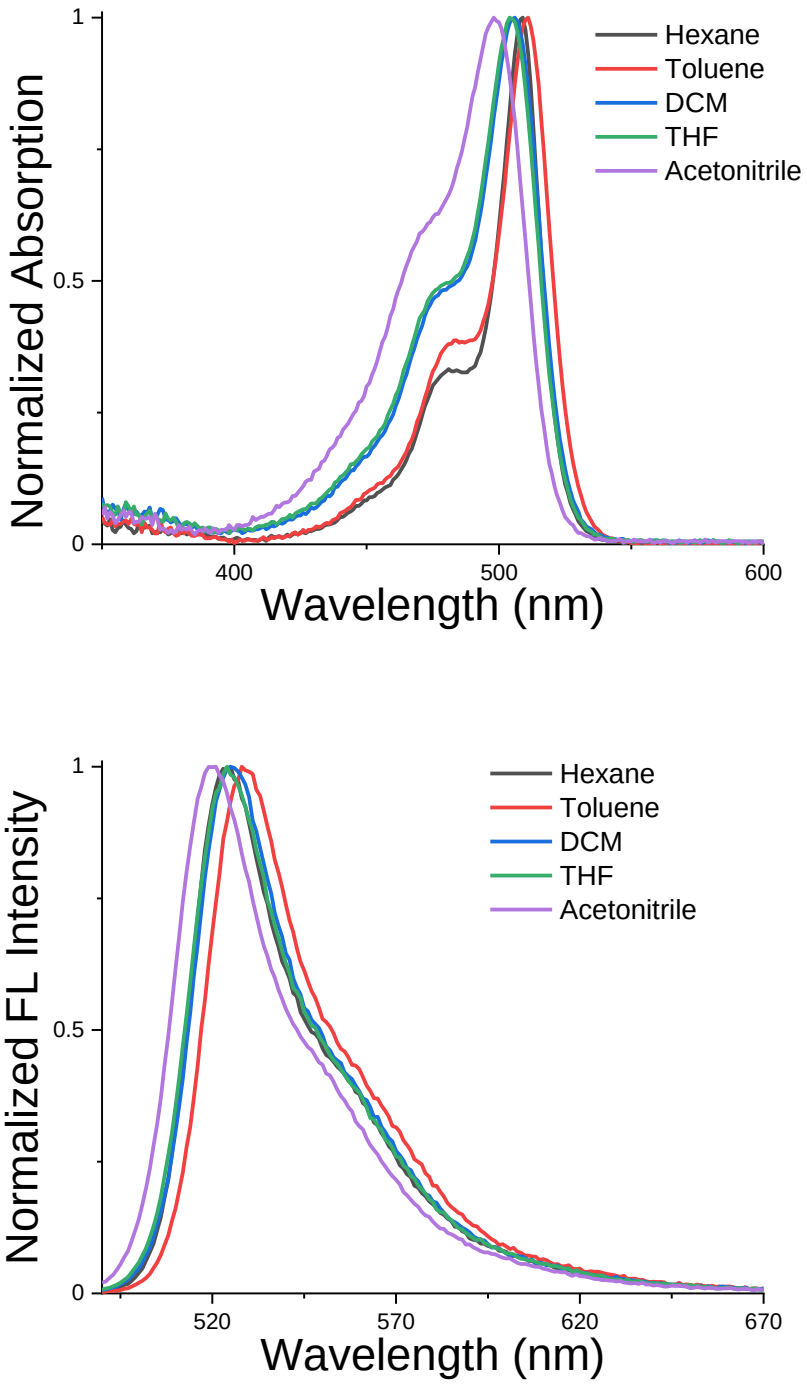


Figure S6. Absorption (top) and emission (bottom) spectra of compound **3b** recorded in different solvents (Excited at 480 nm).

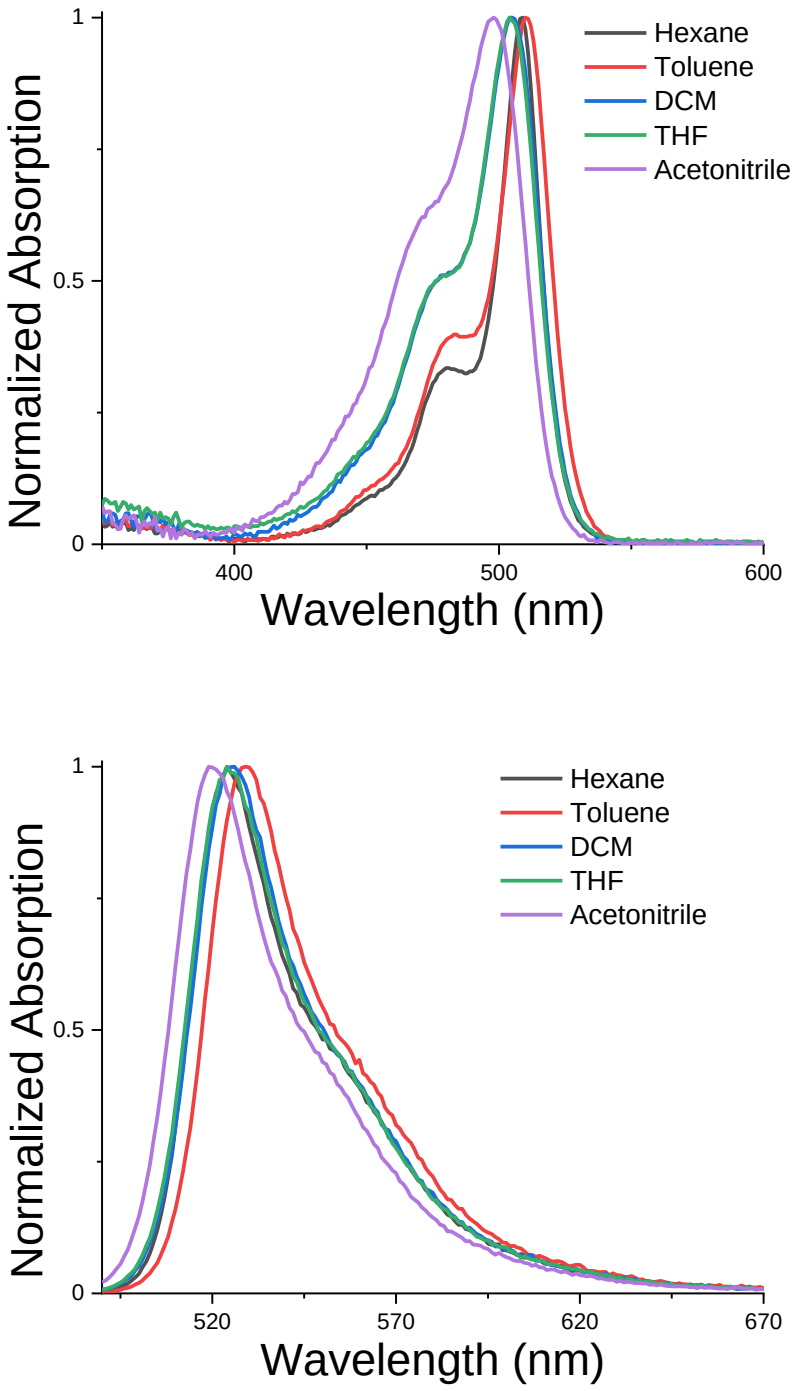


Figure S7. Absorption (top) and emission (bottom) spectra of compound **3c** recorded in different solvents (Excited at 480 nm).

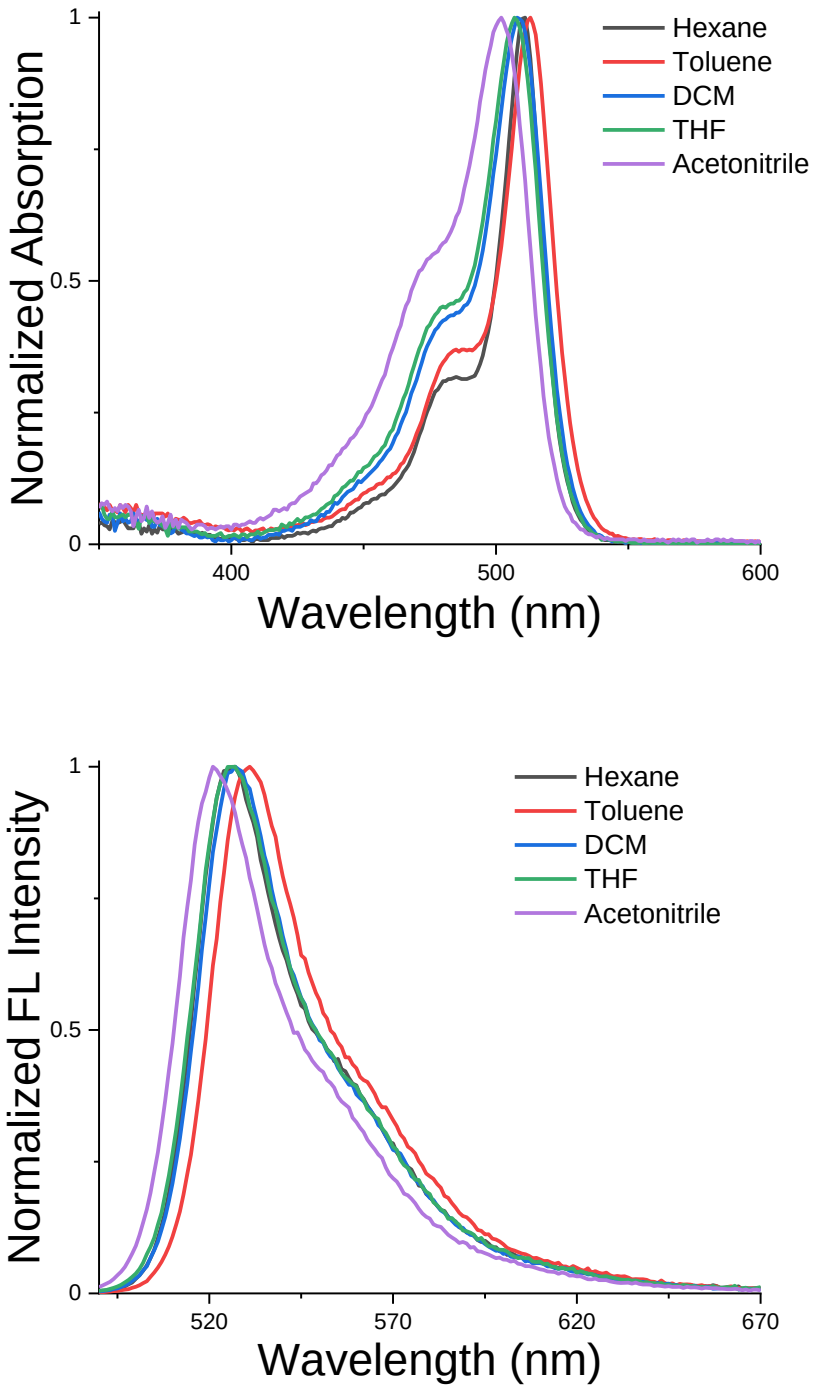


Figure S8. Absorption (top) and emission (bottom) spectra of compound **3d** recorded in different solvents (Excited at 480 nm).

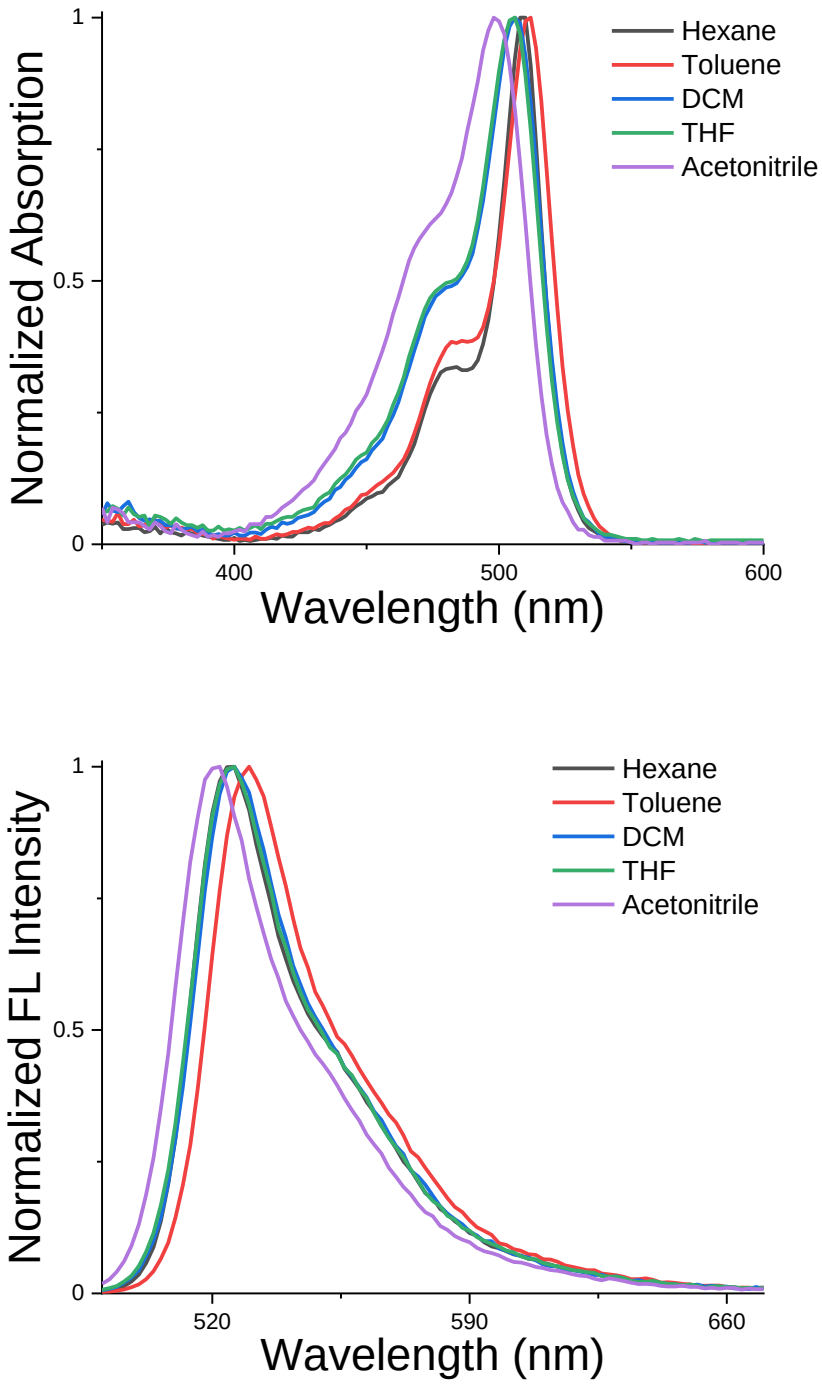


Figure S9. Absorption (top) and emission (bottom) spectra of compound **3e** recorded in different solvents (Excited at 480 nm).

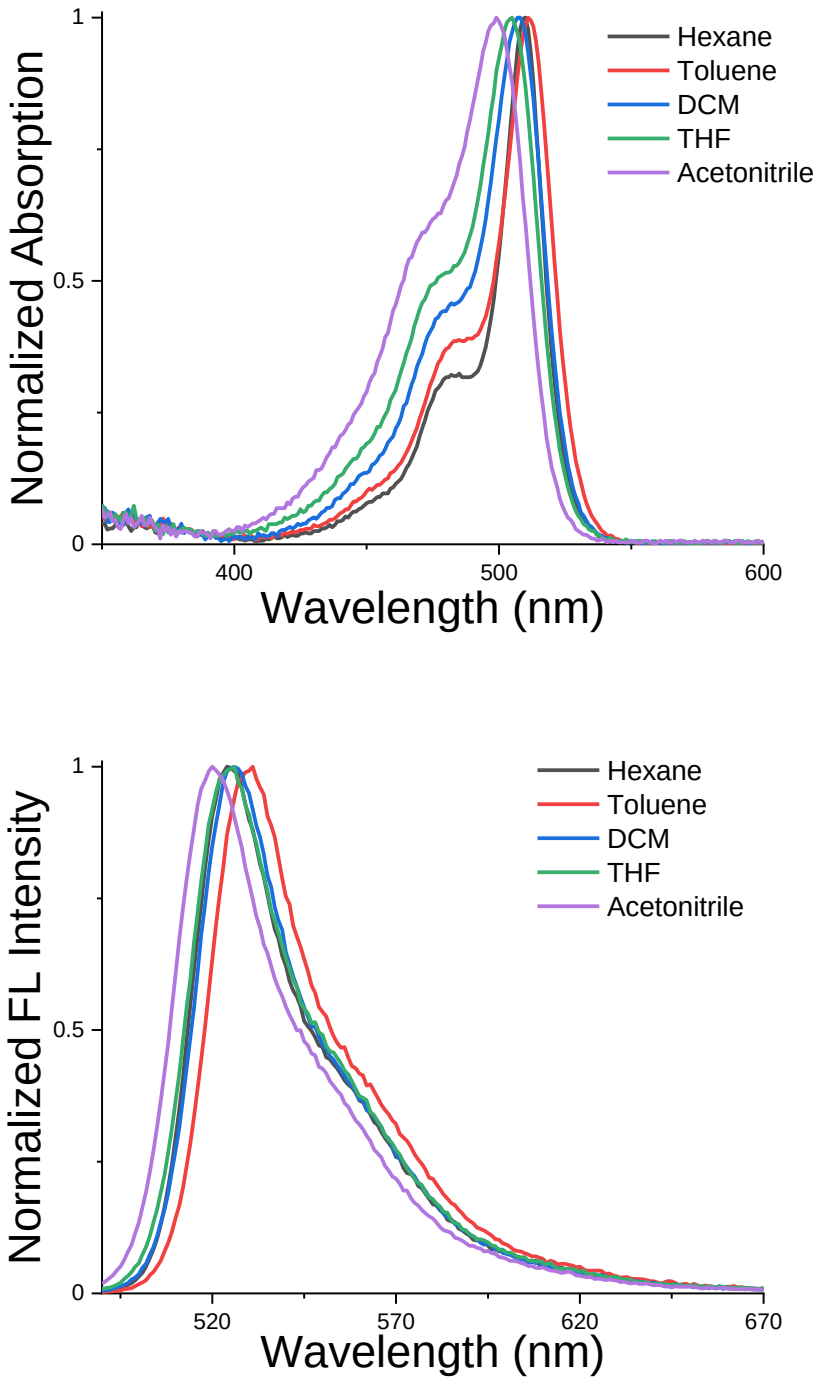


Figure S10. Absorption (top) and emission (bottom) spectra of compound **3f** recorded in different solvents (Excited at 480 nm).

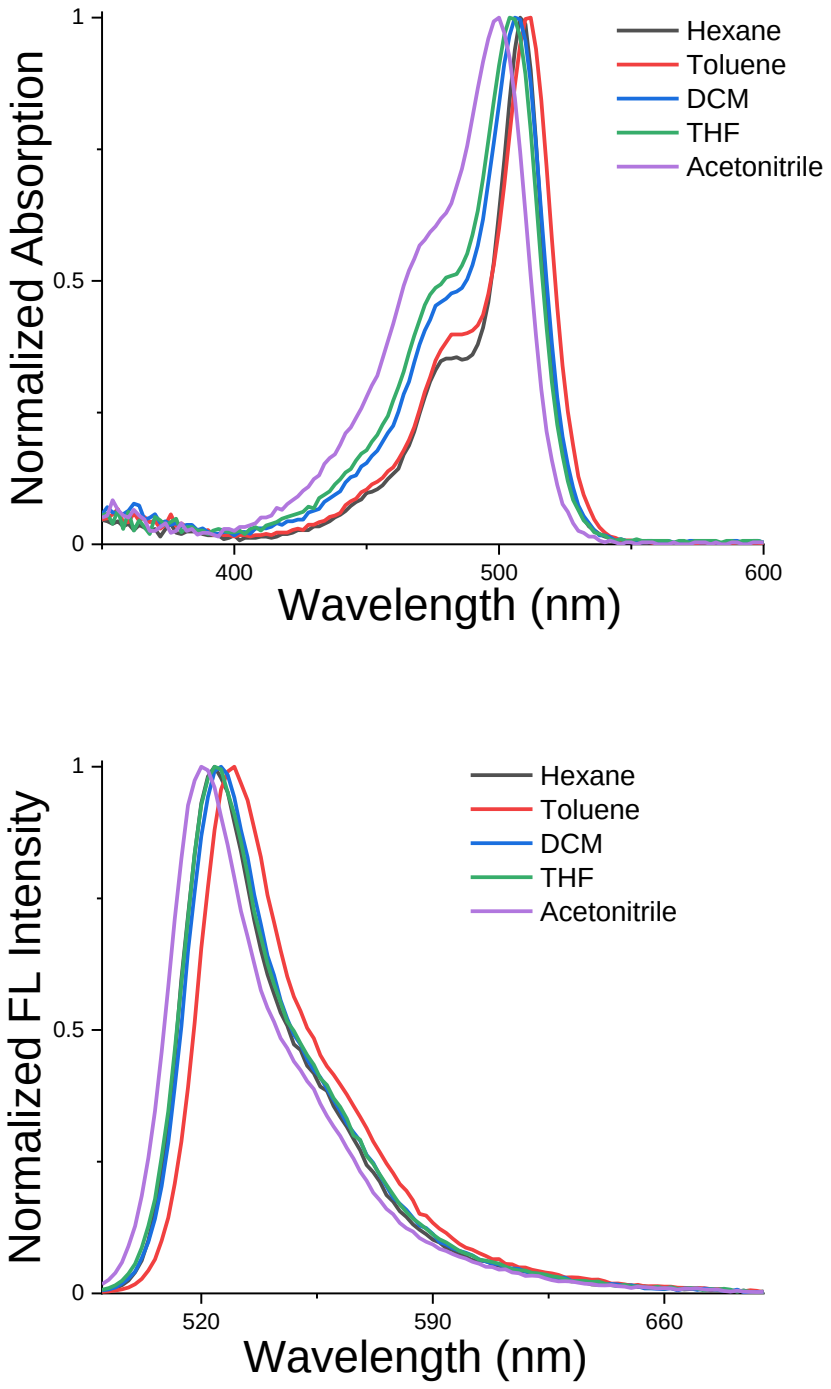


Figure S11. Absorption (top) and emission (bottom) spectra of compound **3g** recorded in different solvents (Excited at 480 nm).

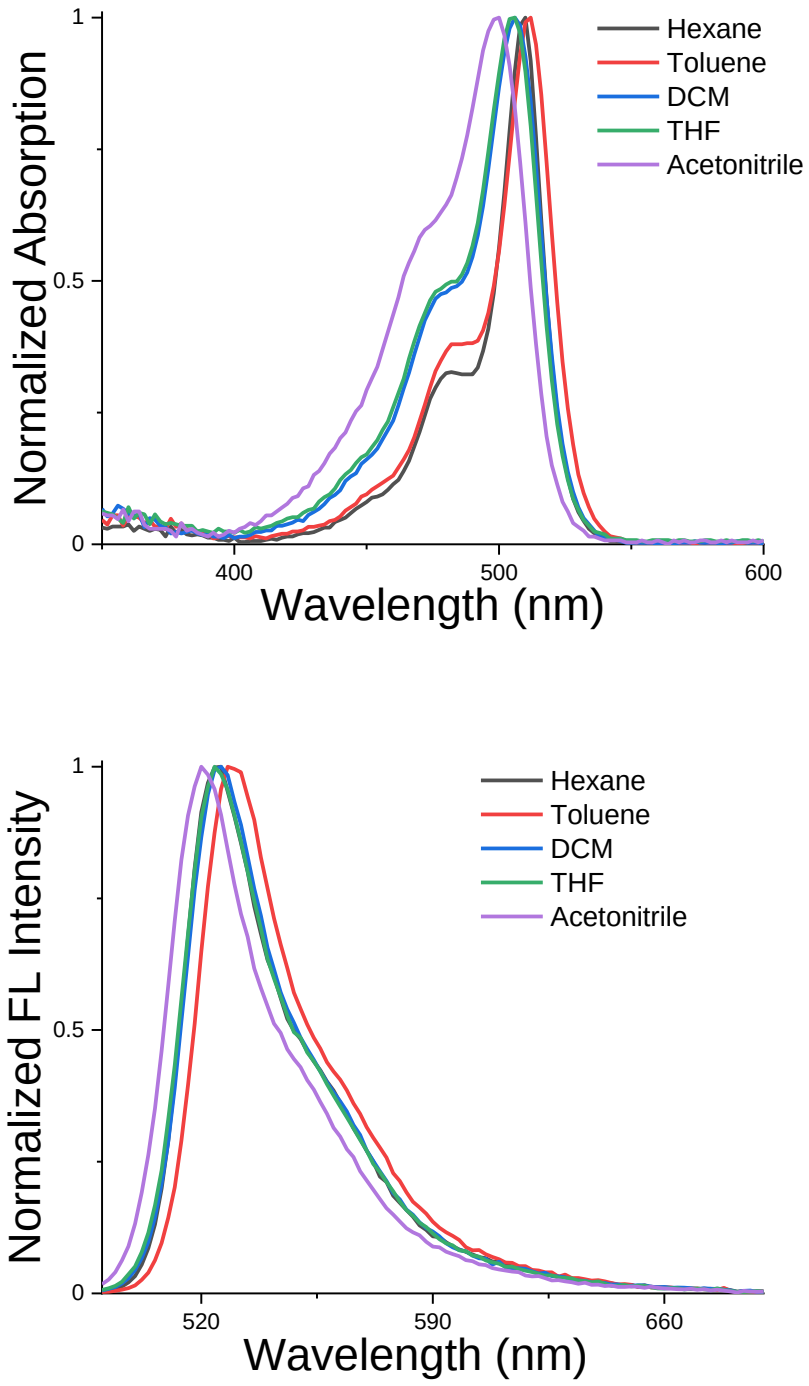


Figure S12. Absorption (top) and emission (bottom) spectra of compound **3h** recorded in different solvents (Excited at 480 nm).

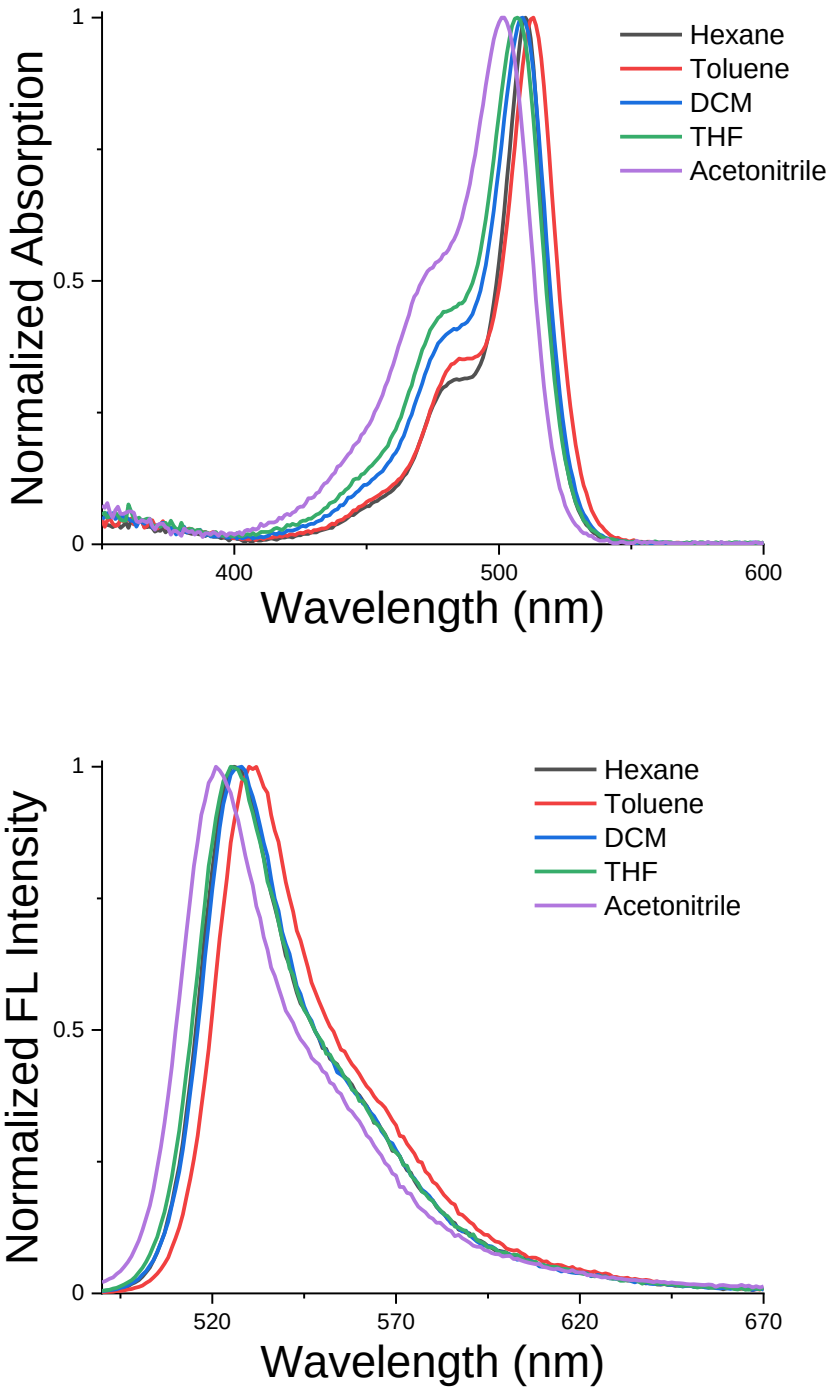


Figure S13. Absorption (top) and emission (bottom) spectra of compound **3i** recorded in different solvents (Excited at 480 nm).

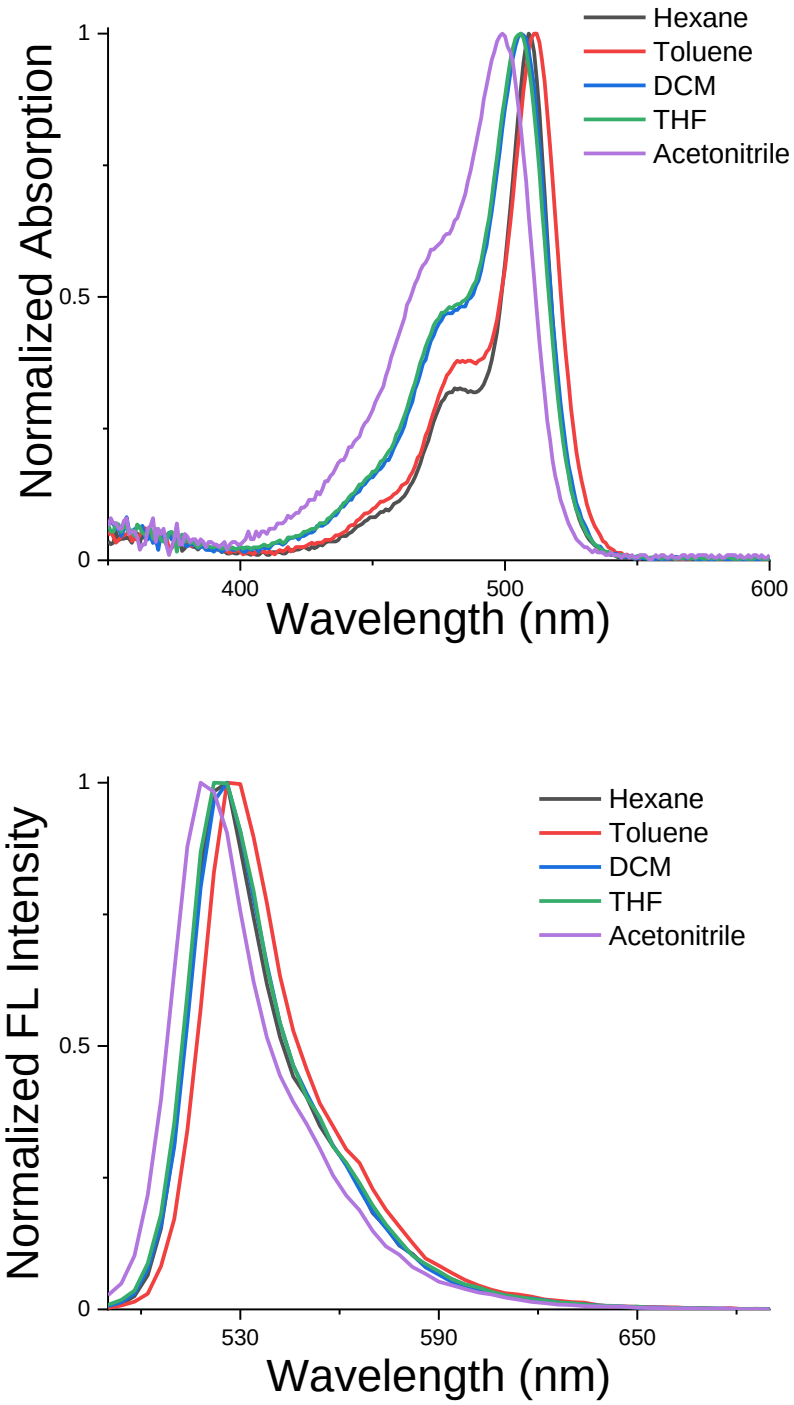


Figure S14. Absorption (top) and emission (bottom) spectra of compound **3j** recorded in different solvents (Excited at 480 nm).

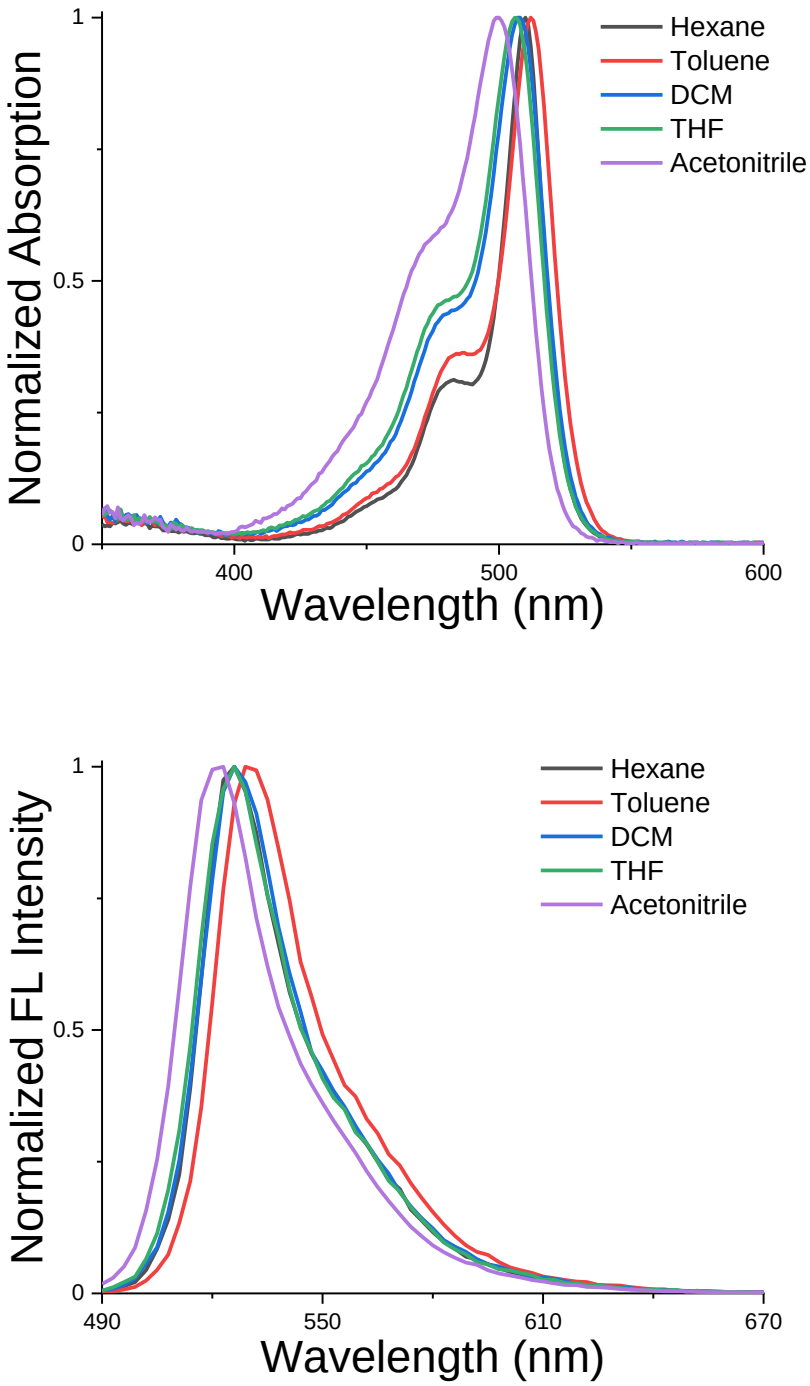


Figure S15. Absorption (top) and emission (bottom) spectra of compound **3k** recorded in different solvents (Excited at 480 nm).

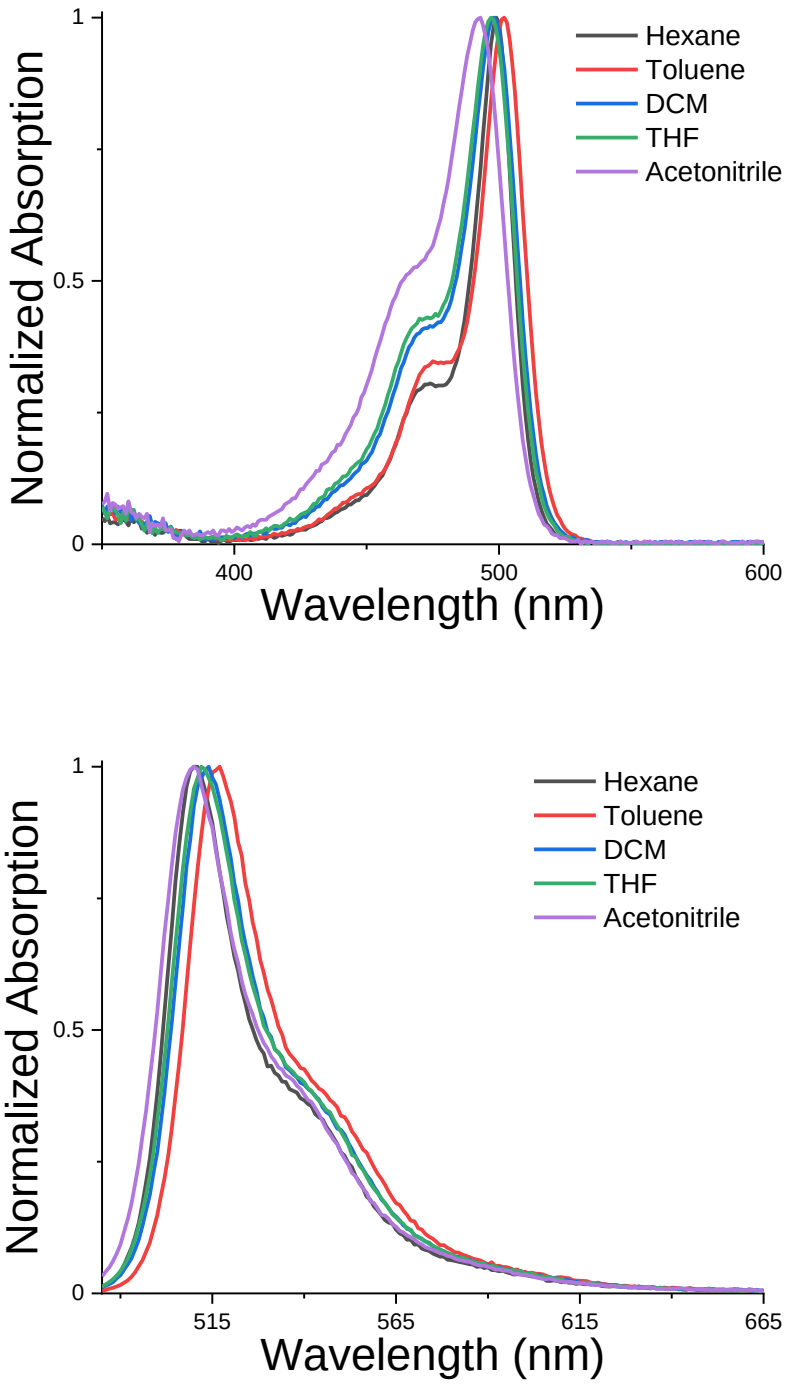


Figure S16. Absorption (top) and emission (bottom) spectra of compound **3l** recorded in different solvents (Excited at 480 nm).

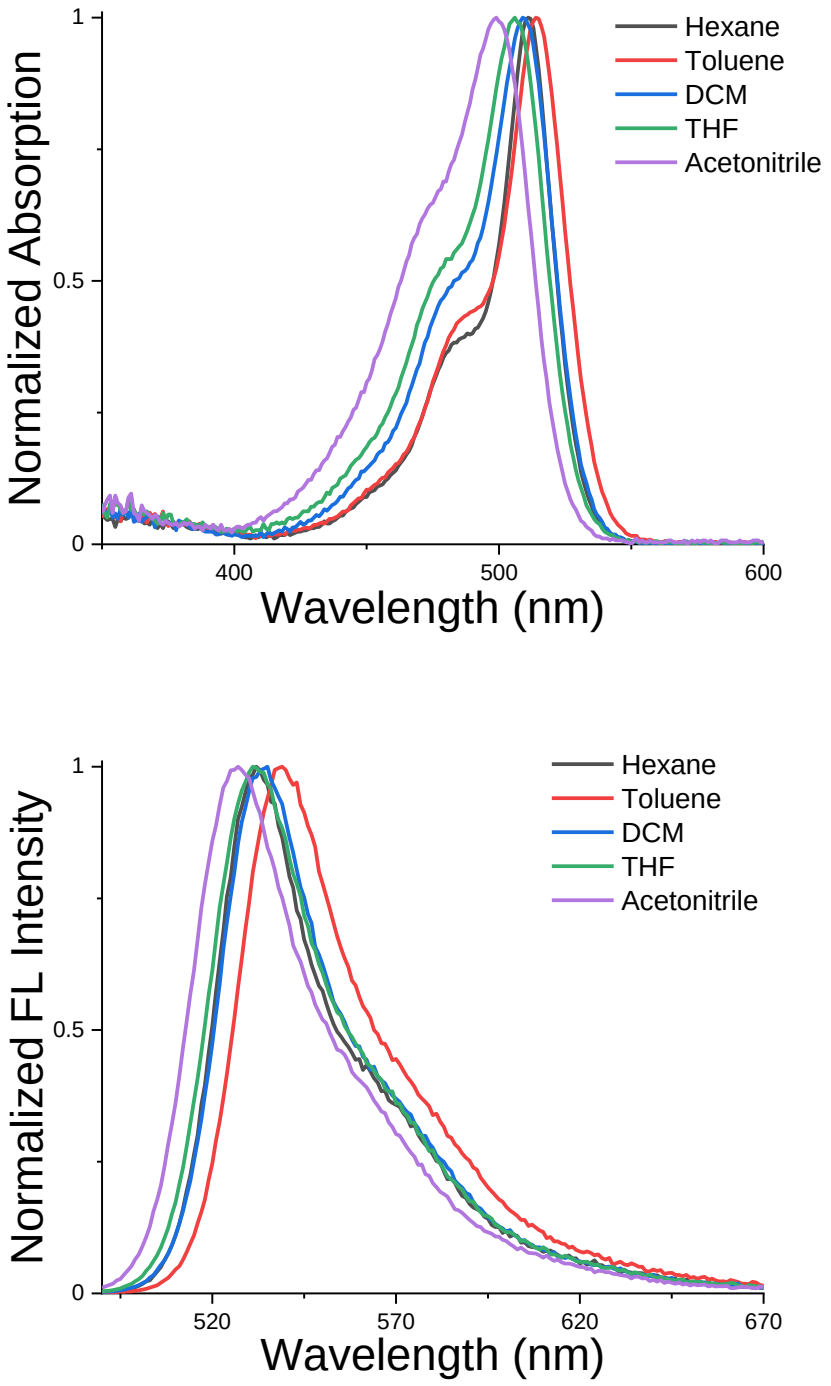


Figure S17. Absorption (top) and emission (bottom) spectra of compound **3m** recorded in different solvents (Excited at 480 nm).

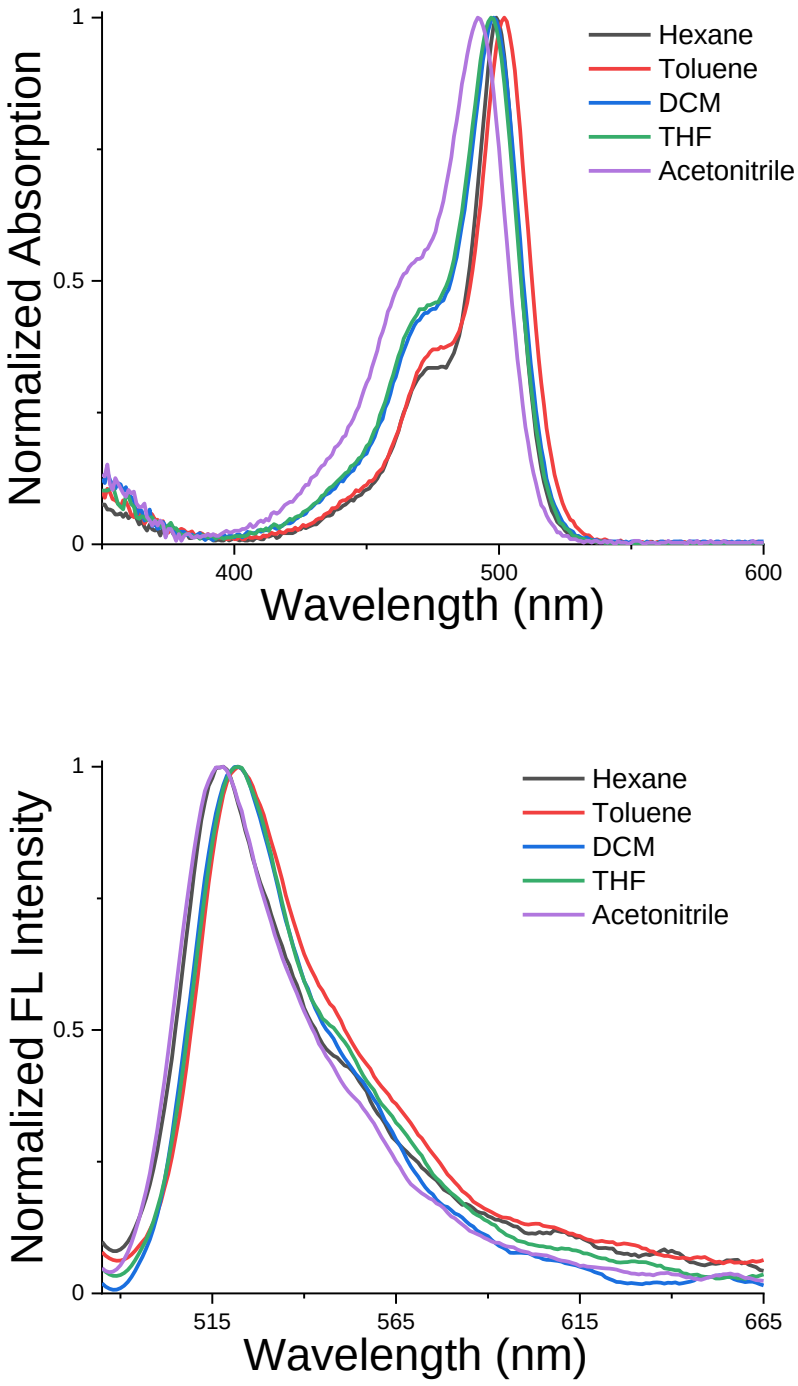


Figure S18. Absorption (top) and emission (bottom) spectra of compound **3n** recorded in different solvents (Excited at 480 nm).

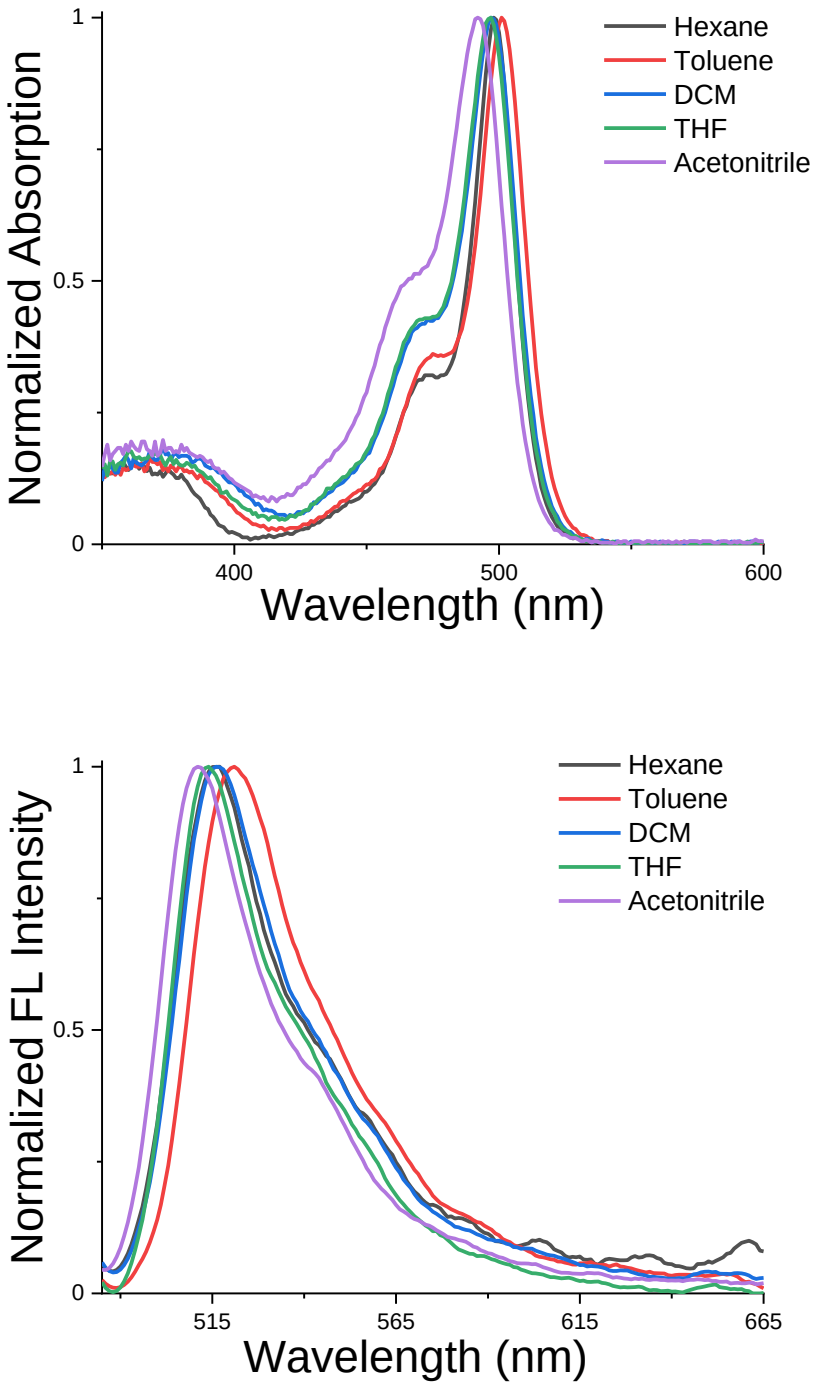


Figure S19. Absorption (top) and emission (bottom) spectra of compound **3o** recorded in different solvents (Excited at 480 nm).

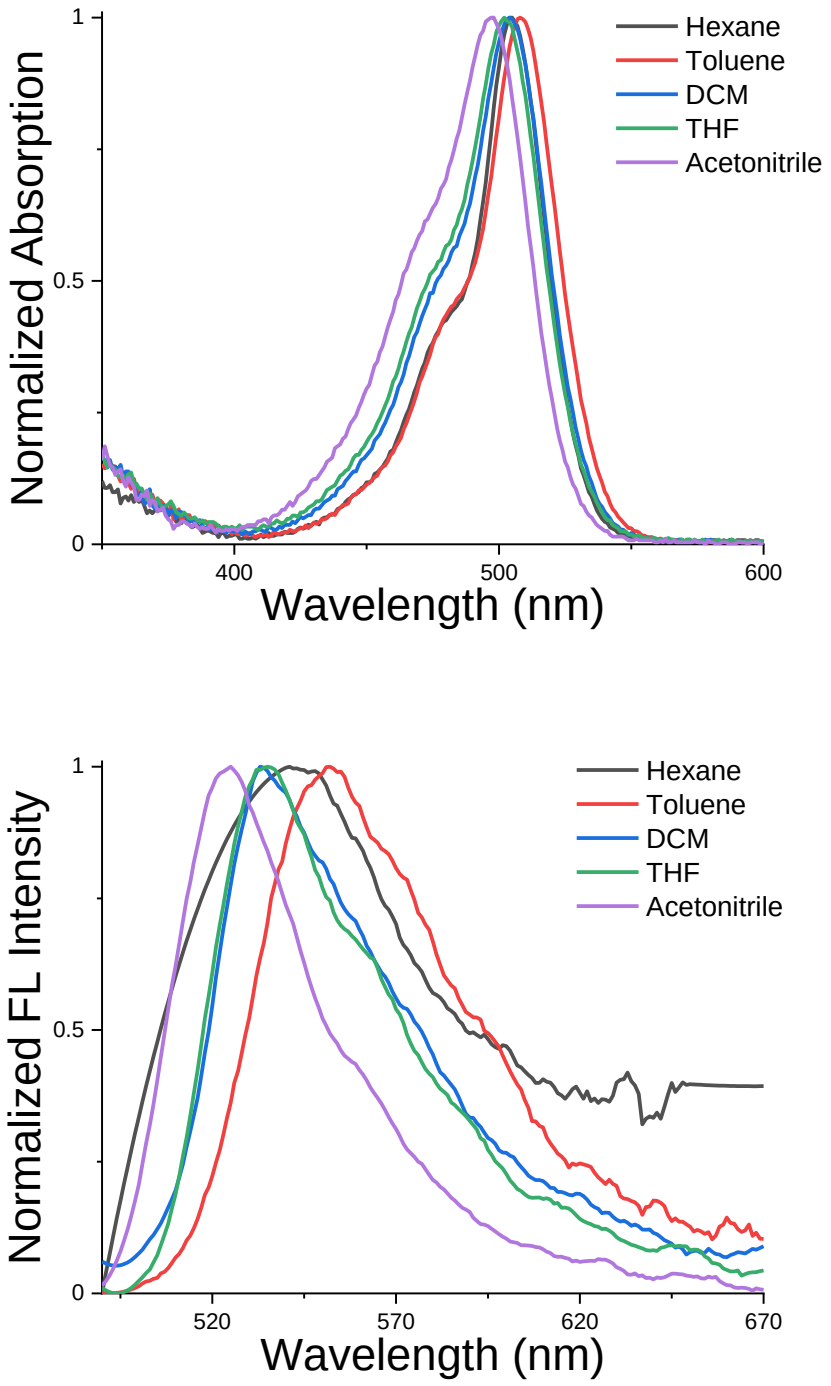


Figure S20. Absorption (top) and emission (bottom) spectra of compound **3p** recorded in different solvents (Excited at 480 nm).

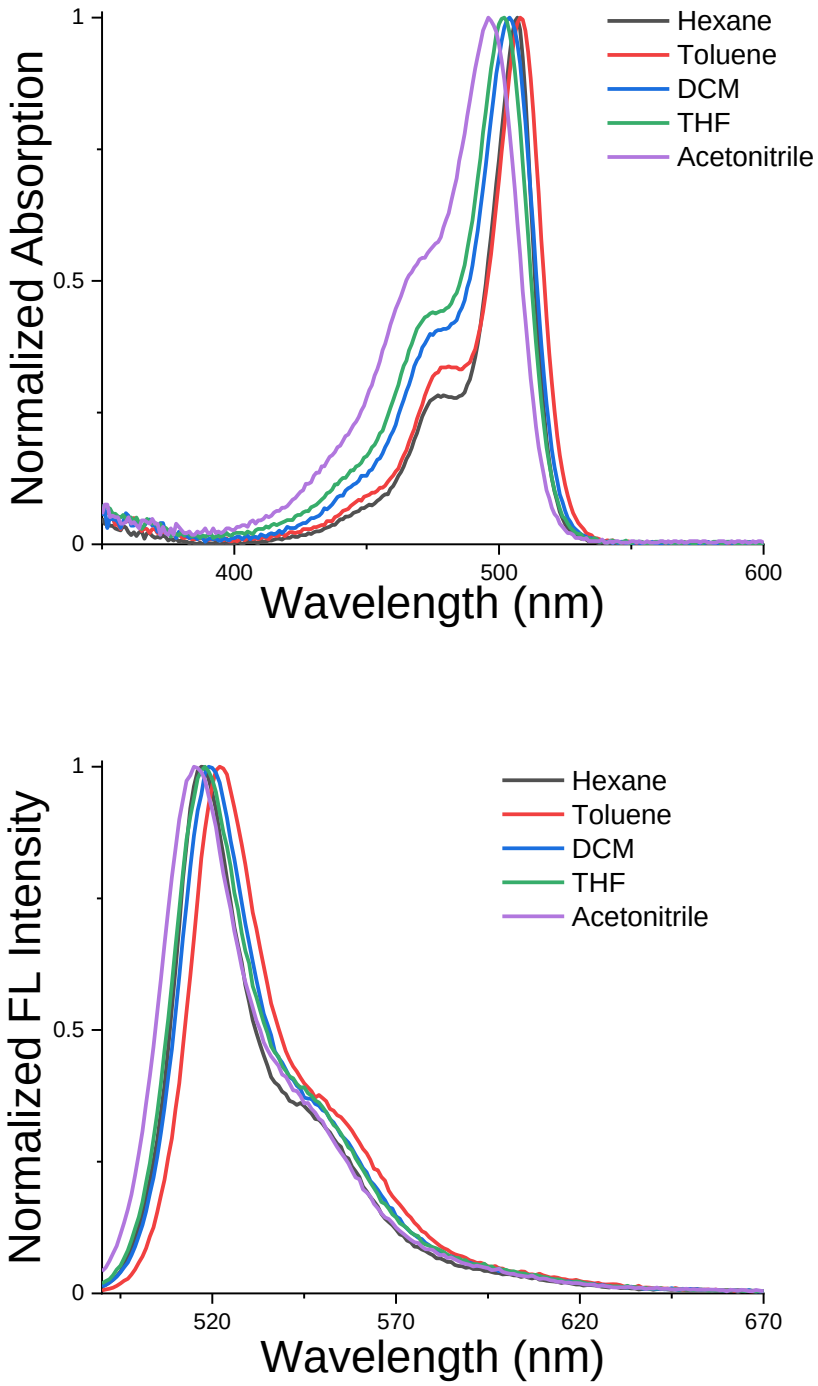


Figure S21. Absorption (top) and emission (bottom) spectra of compound **4** recorded in different solvents (Excited at 480 nm).

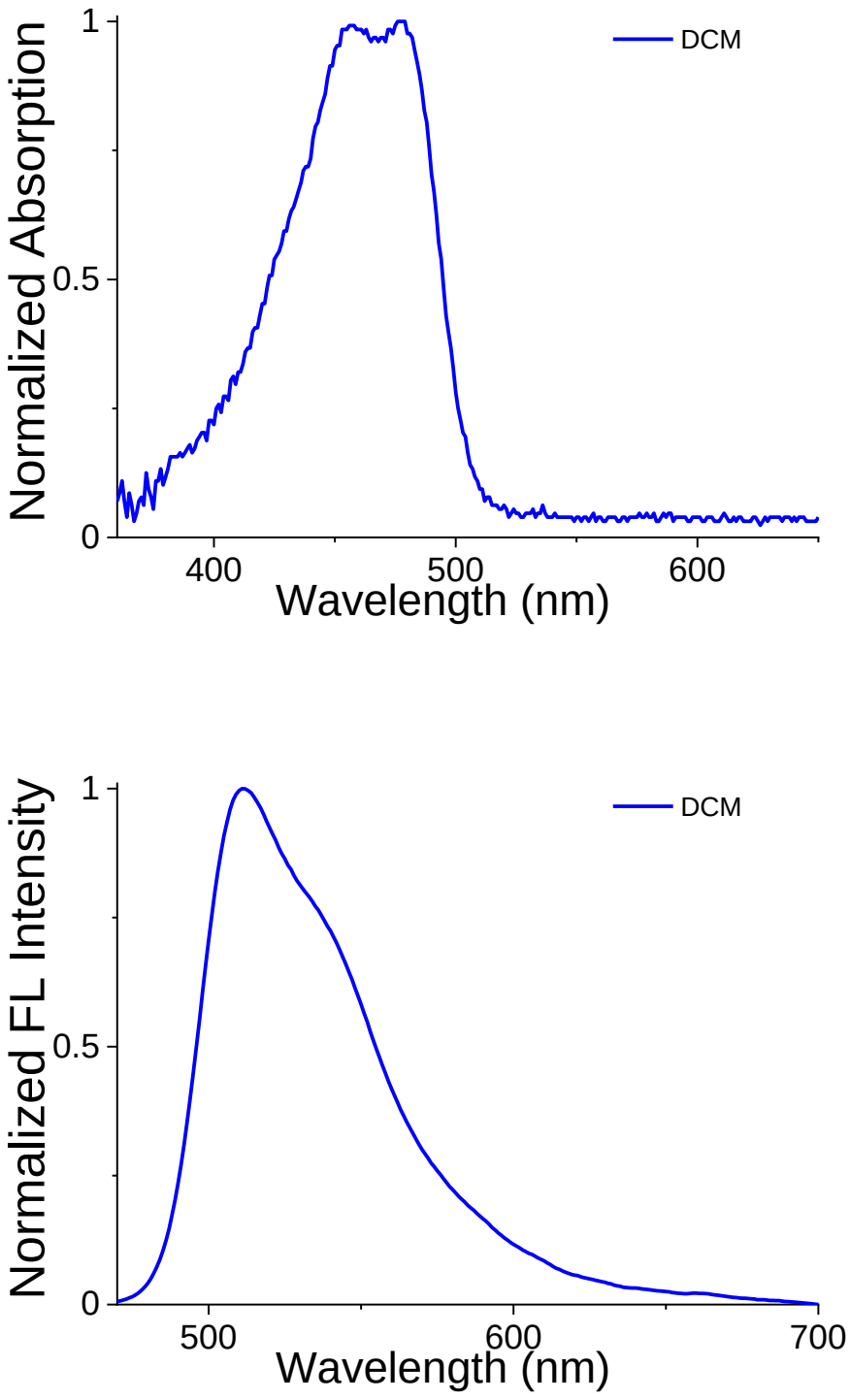


Figure S22. Absorption (top) and emission (bottom) spectra of compound **5a** recorded in DCM (Excited at 470 nm).

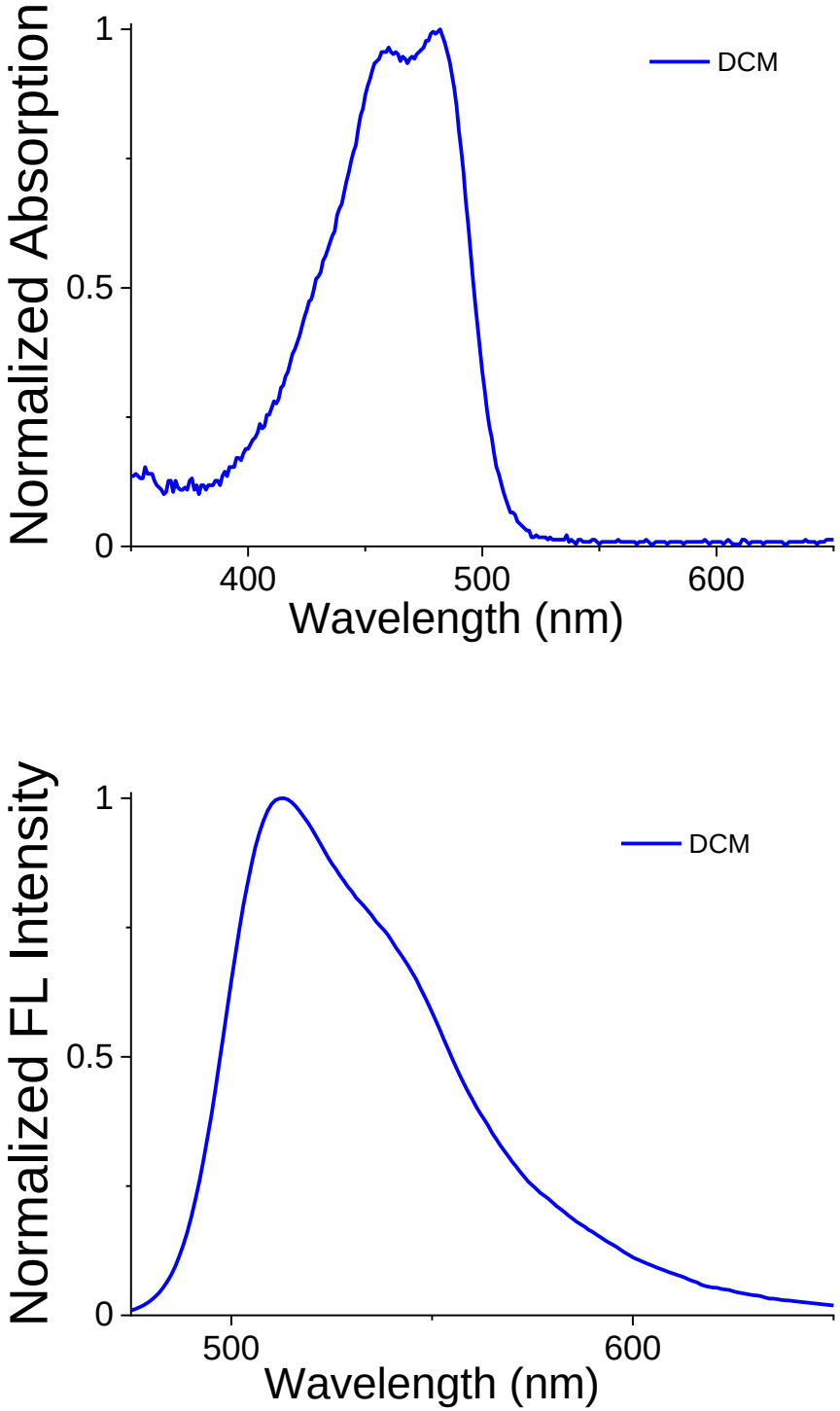


Figure S23. Absorption (top) and emission (bottom) spectra of compound **5b** recorded in DCM (Excited at 470 nm).

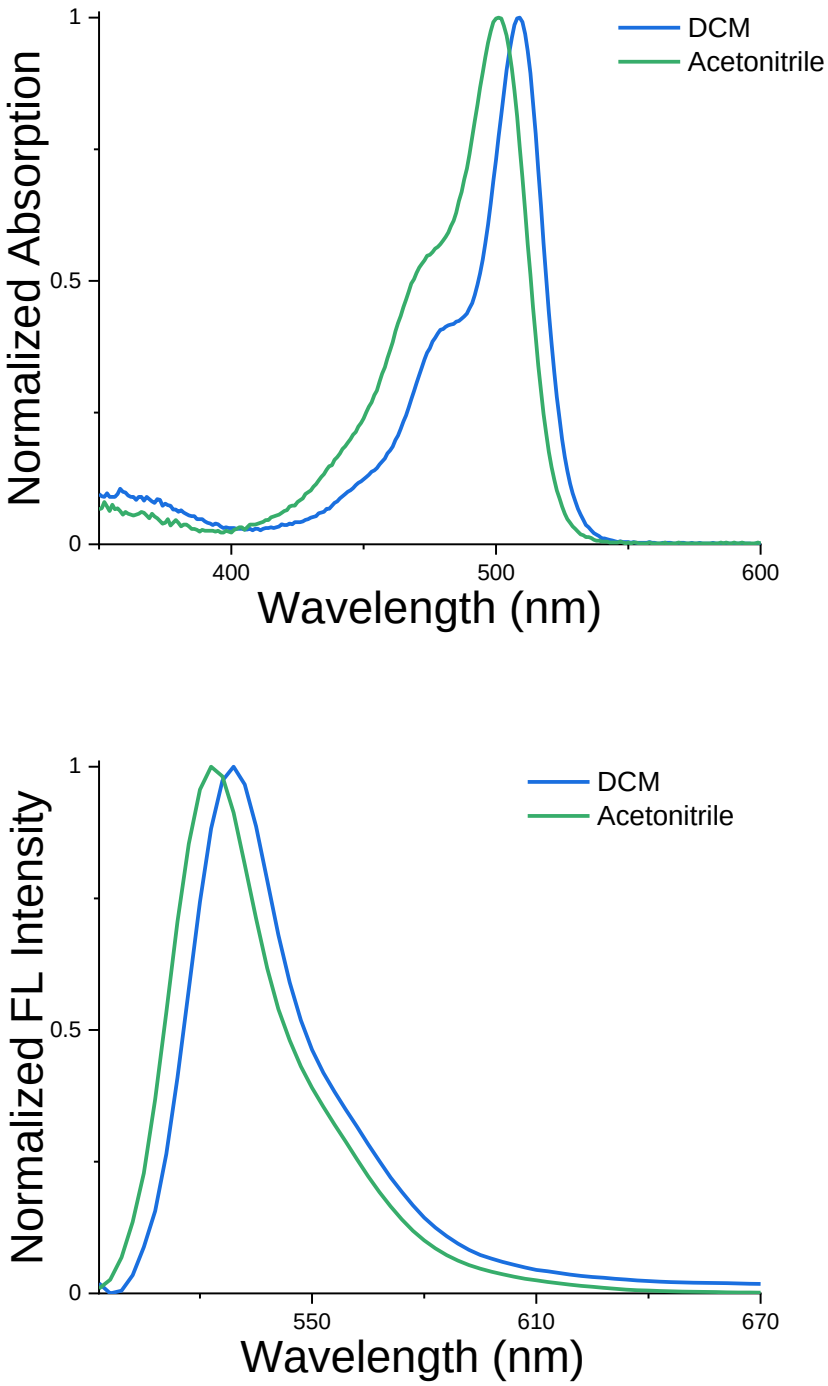


Figure S24. Absorption (top) and emission (bottom) spectra of compound **6** recorded in different solvents (Excited at 480 nm).

9. Cellular studies

9.1. Cell culture

Hela cells (human cervical cancer cells) were cultured in culture media (RPMI-1640, supplemented with 10% FBS and 1% penicillin/streptomycin solution) at 37 ^{o}C in an atmosphere of 5% CO_2 and 95% humidified atmosphere for 24 h.

9.2. Cell incubation and colocalization imaging

A total of 30000 HeLa cells were seeded into a glass bottom dish and were cultured in culture media (RPMI-1640, supplemented with 10% FBS) at 37 °C in an atmosphere of 5% CO_2 and 95% humidified atmosphere for 24 h. HeLa cells were first stained with **6** (1 μM, 1% DMSO and 99% 1640 complete medium) at 37 ^{o}C in an atmosphere of 5% CO_2 for 1 h. After washing the plates two times with PBS, the cells were fixed by 4% formaldehyde for 20 min. The organelle tracer 4',6-diamidino-2-phenylindole (DAPI, 0.08 μg/mL) and MitoTracker® Deep Red FM (MTDR, 0.5 uM) were added subsequently and were incubated for 30 min to stain the nucleus and mitochondria, respectively. Finally, the plates were washed again with PBS and the morphologies of the HeLa cells were observed using a confocal fluorescence microscope (Leica Microsystems SP8 MP, excitation at 405, 488 and 638 nm for DAPI, **6**, and MTDR, respectively).

9.3. Cytotoxicity determined by the CCK-8 method

The cytotoxicity of the **6** was evaluated on Hela cells. These cells were seeded into 96-well plates with a density of 5000 cells per well and cultured overnight. Then, solutions of **6** with a serious of different concentrations were added and incubated with cells for 24 h. Every experiment was performed for at least three times. The working solutions were then removed, and the cells were washed with PBS buffer for two times. A total of 10 μL of CCK-8 (Cell Counting Kit-8, BIOMIKY) was added into each well, and the cells were further incubated at 37 ºC for 2 h. Then the plate was shaken for 5 min (protect from light), and the absorbance at 450 nm was measured with a microplate reader (Multiskan Sky).

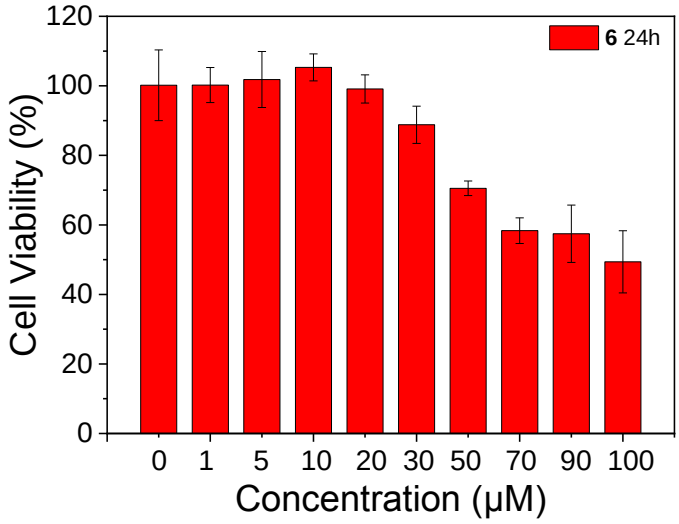


Figure S25. Cytotoxicity of HeLa cells treated with different concentrations of **6** for 24 h as demonstrated by CCK-8 assay.

9.4 Cellular uptake

A total of 30000 HeLa cells were seeded into a glass bottom dish and were cultivated in RPMI-1640 with 10% FBS at 37°C, 5% CO_2 and 95% humidity for 24 h. BODIPY **6** (0.3 μM, 1% DMSO and 99% 1640 complete medium) were cultivated with HeLa cells for 0.5, 1, 2, and 4 h, respectively. The above cells were washed twice with PBS. Then these cells were used to measure the fluorescence intensity using a confocal fluorescence microscope.

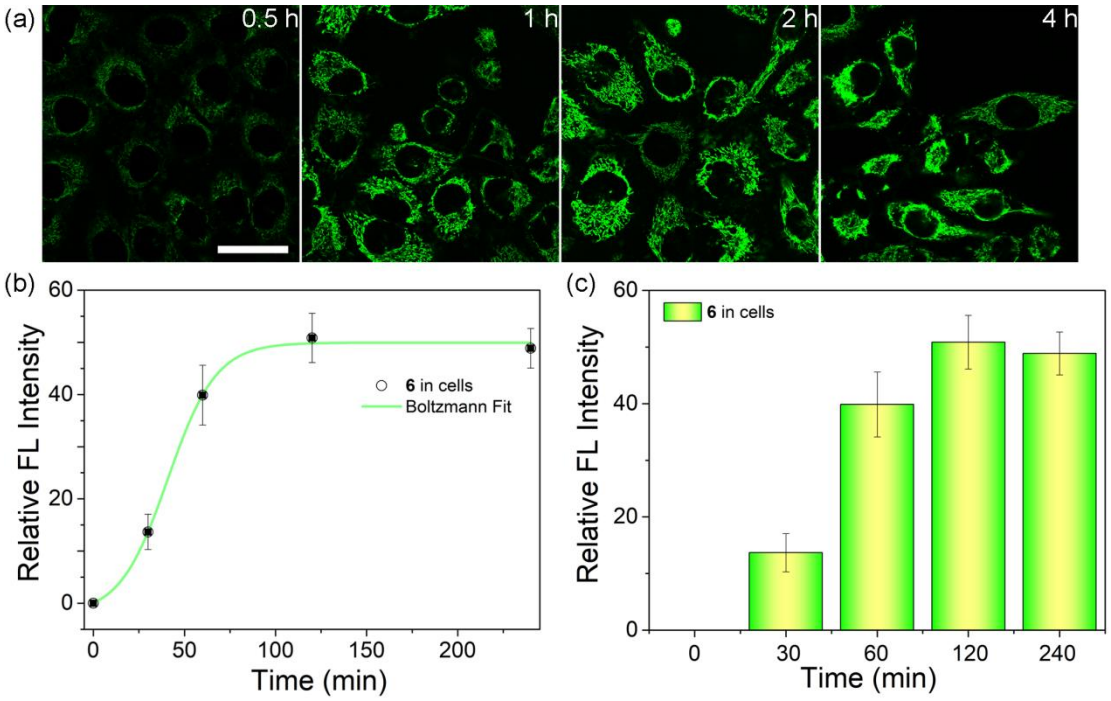


Figure 26. (a) Fluorescence microscopy images of time-dependent uptake of **6** at 0.3 μM by Hela cells (human cervical cells); (b), (c) Normalized fluorescence intensity quantitation was analyzed by the images; Scale bars = 50 μm.

9.5. Photostability

A total of 30000 HeLa cells were seeded into a glass bottom dish and were cultured in culture media (RPMI-1640, supplemented with 10% FBS) at 37 °C in an atmosphere of 5% CO_2 and 95% humidified atmosphere for 24 h. The cells with **6,** RDM 123 or MTDR were incubated at 37 °C for 30 min in different dishes. For photostability test, cells were continuously irradiated with confocal lasers (488 nm for **6** and RDM 123, 638 nm for MTDR) under the same laser power. The image was captured about every 5 min.

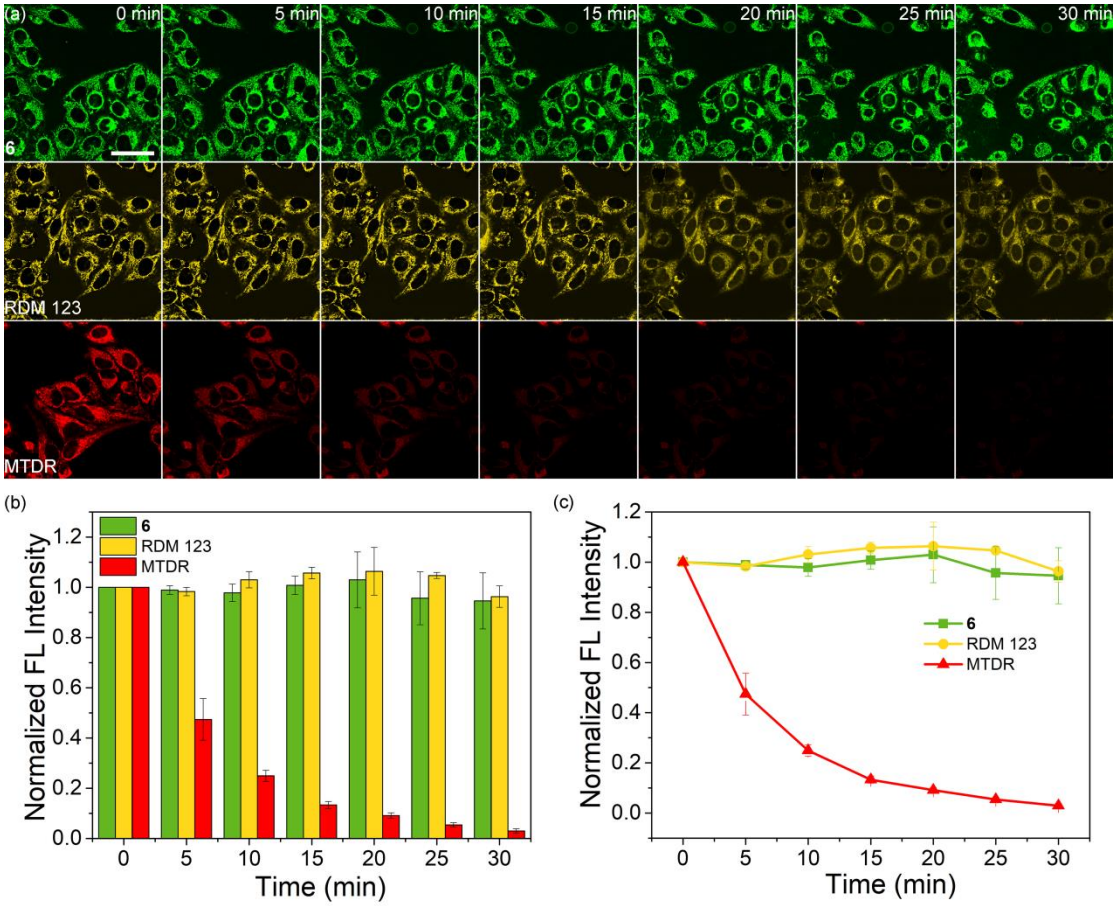
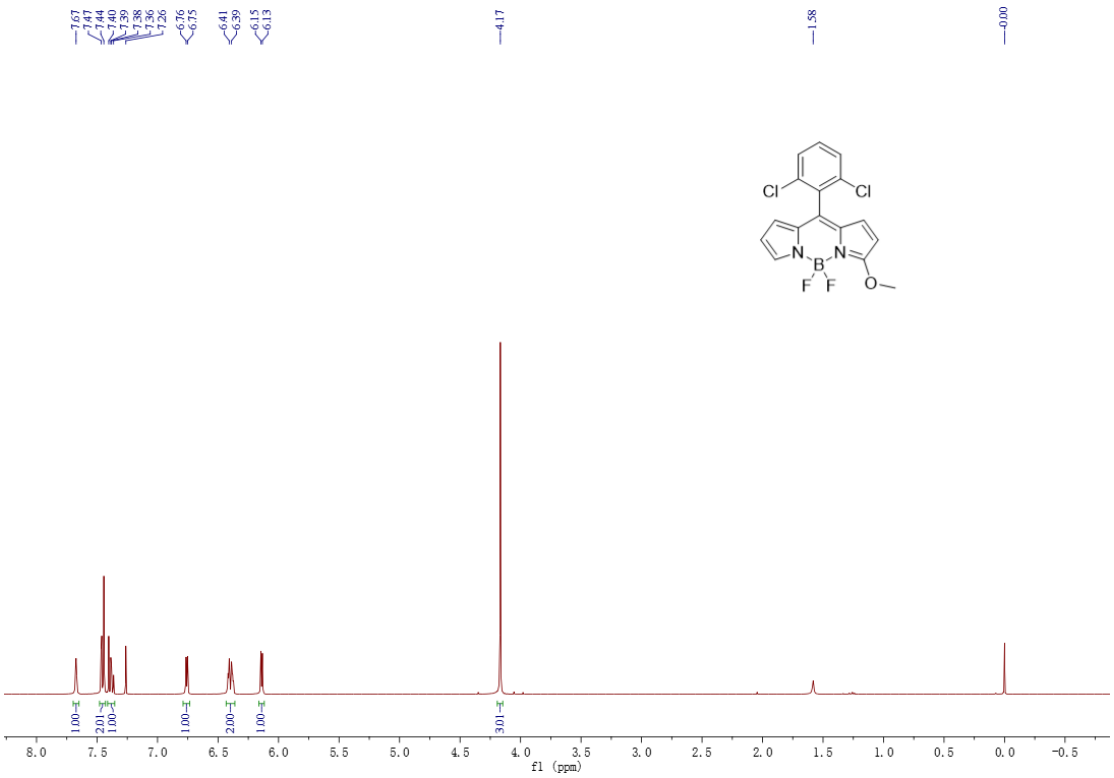
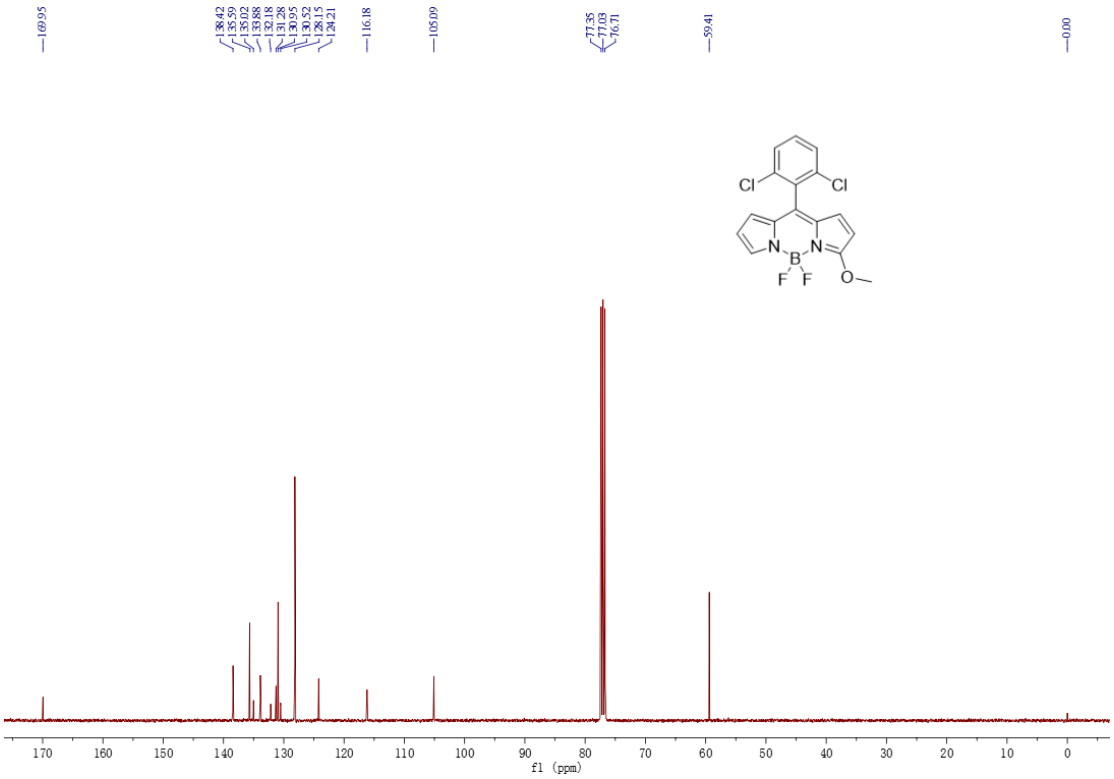


Figure S27. (a) Fluorescent images and (b), (c) fluorescence intensity of **6** (λ_{ex} = 488 nm), RDM 123 (Rhodamine 123, λ_{ex} = 488 nm) or MTDR (MitoTracker® Deep Red FM, λ_{ex} = 638 nm) by continuous irradiation laser at different time. The image was scanned about every 5 min. Scale bar: 50 μm.

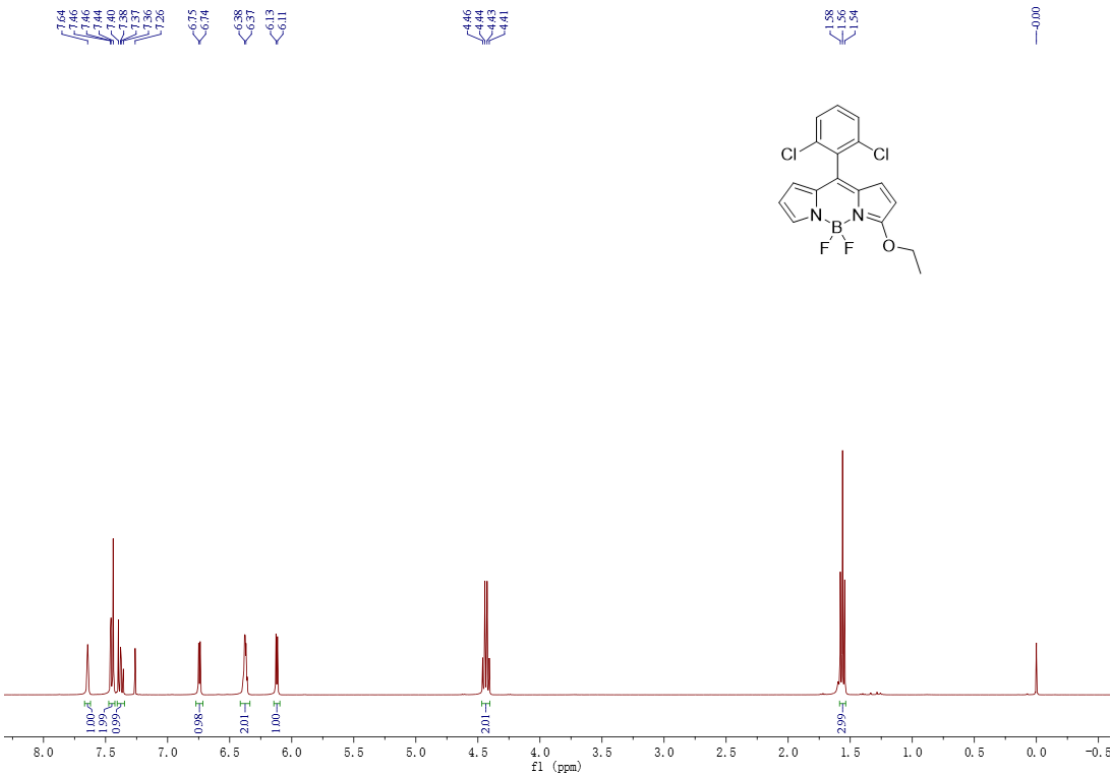
10. ^{1}H, ^{13}C NMR and HRMS spectra for all new compounds



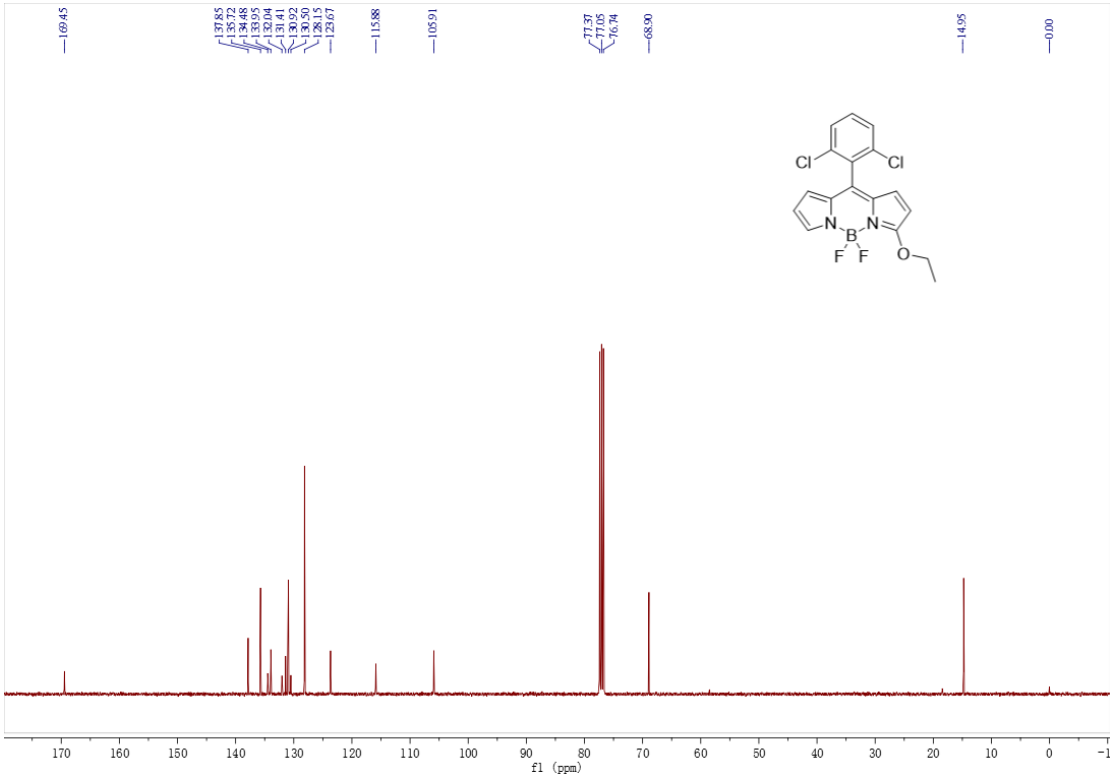
^{1}H NMR spectrum of **3a** in $CDCl_3$ (400 MHz)



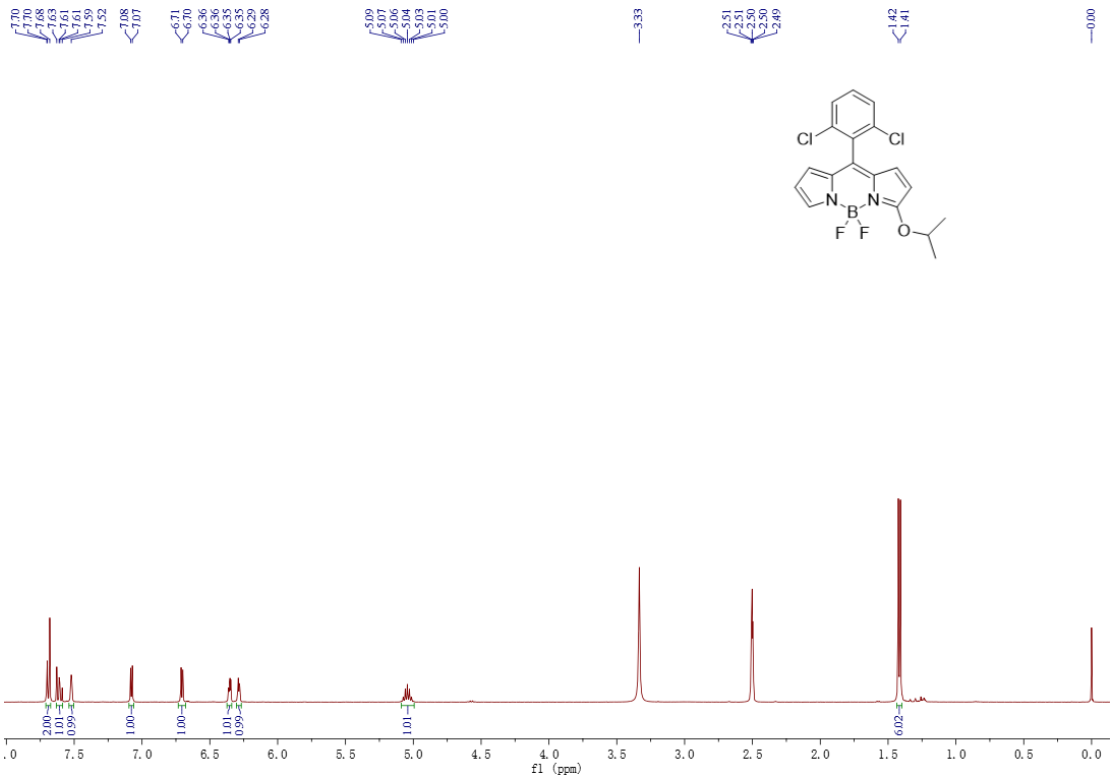
^{13}C NMR spectrum of **3a** in $CDCl_3$ (101 MHz)



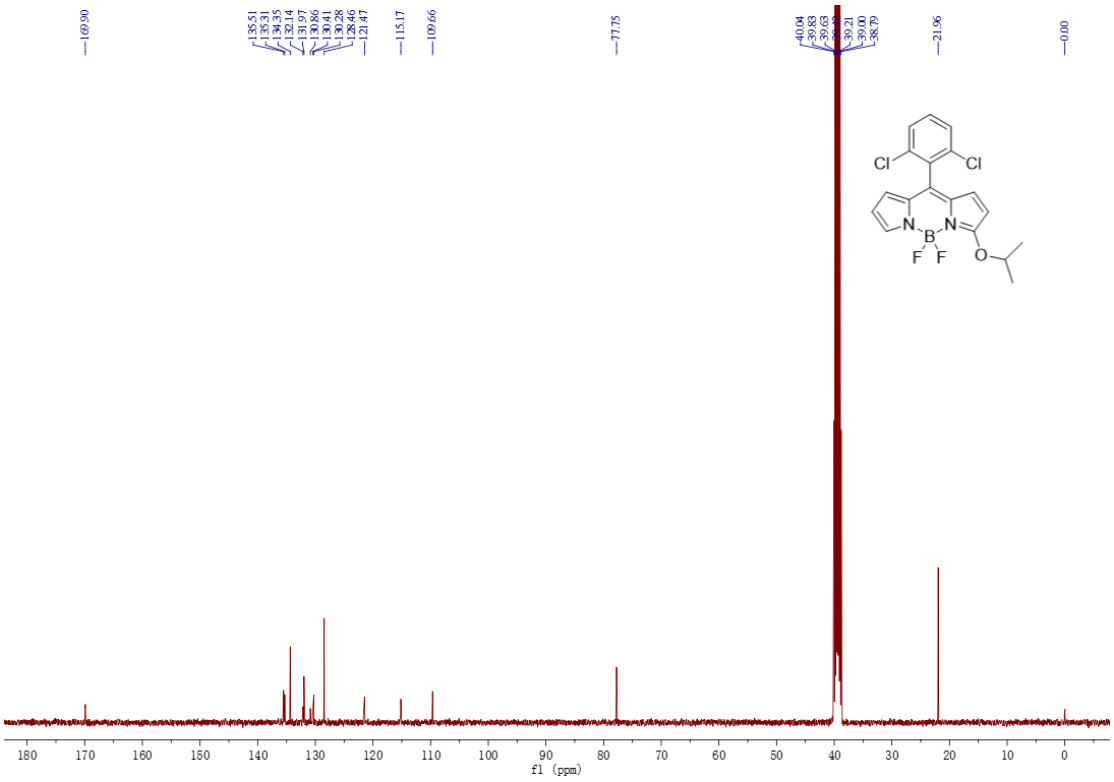
^{1}H NMR spectrum of **3b** in $CDCl_3$ (400 MHz)



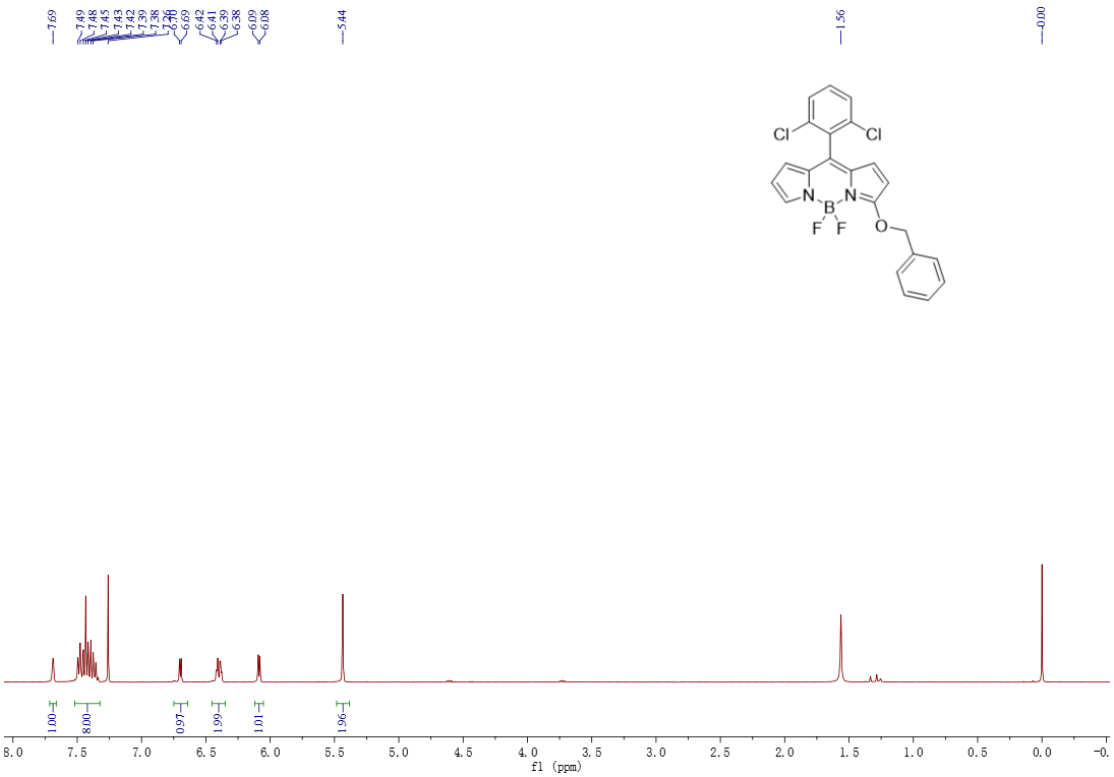
^{13}C NMR spectrum of **3b** in $CDCl_3$ (101 MHz)



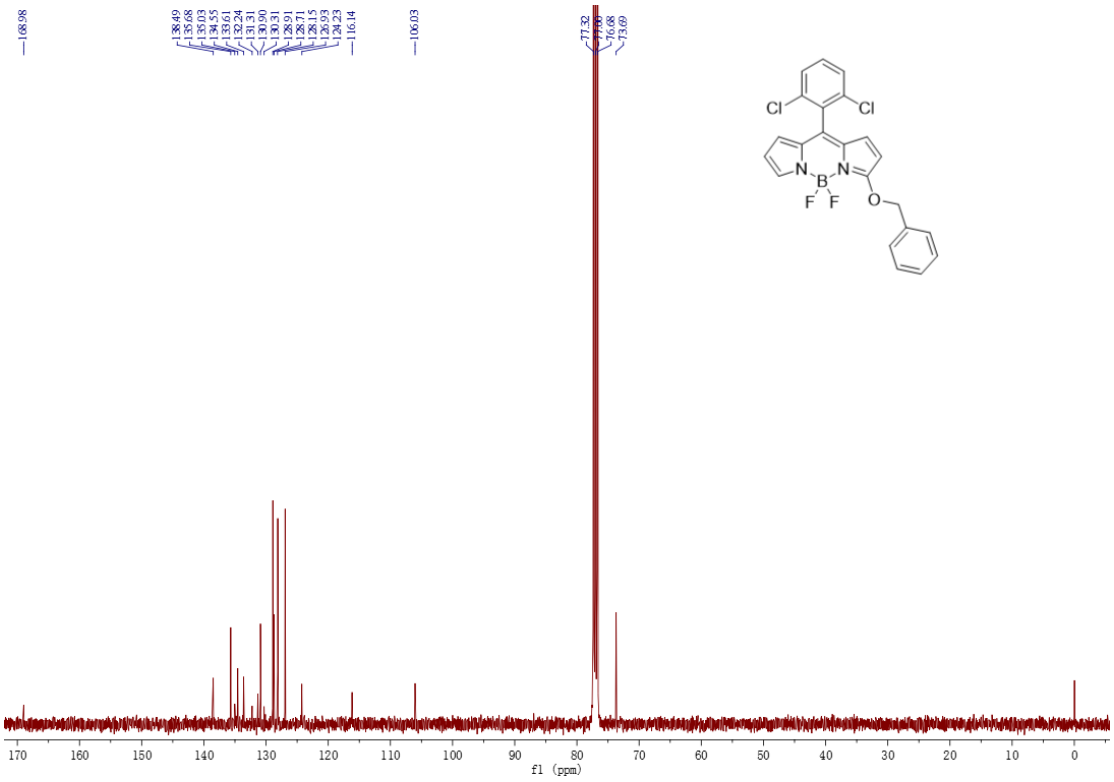
^{1}H NMR spectrum of **3c** in d_6-DMSO (400 MHz)



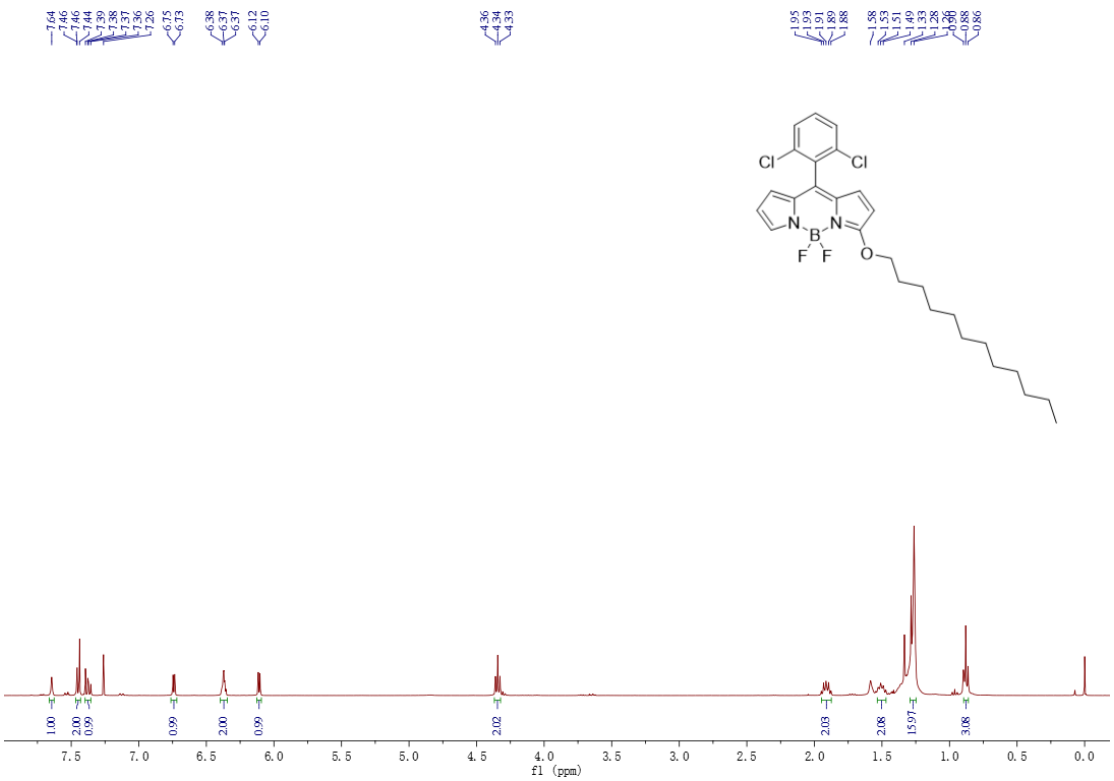
^{13}C NMR spectrum of **3c** in d_6-DMSO (101 MHz)



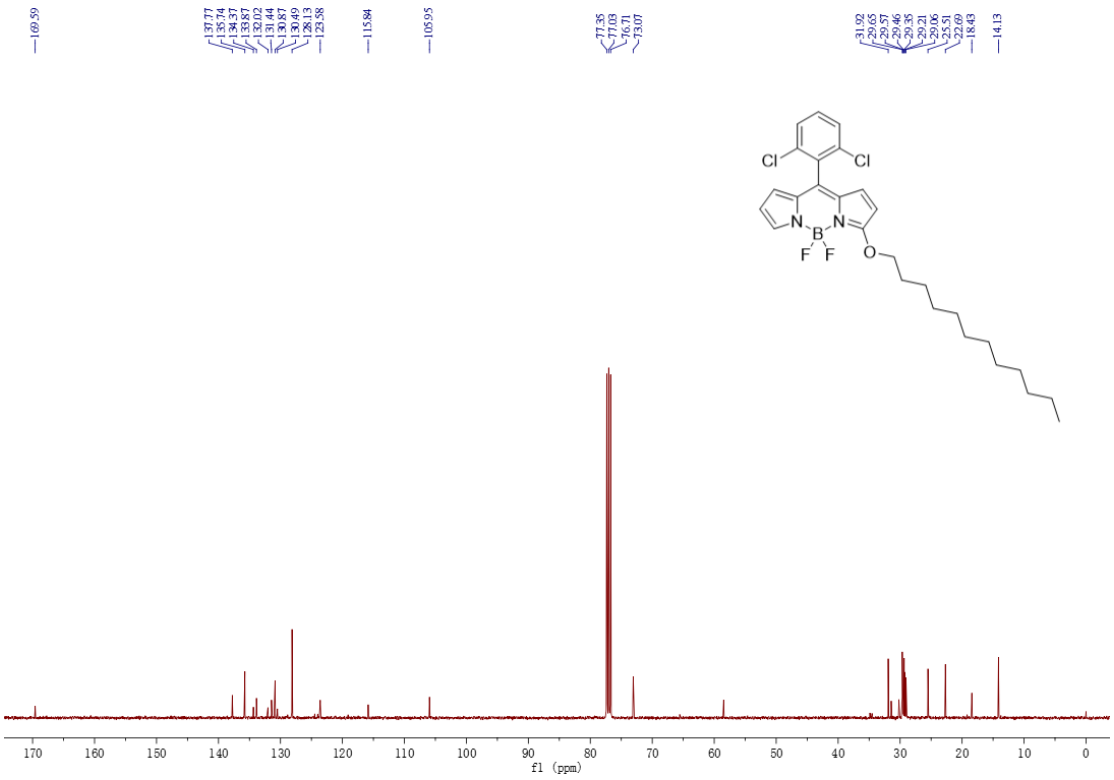
^{1}H NMR spectrum of **3d** in $CDCl_3$ (400 MHz)



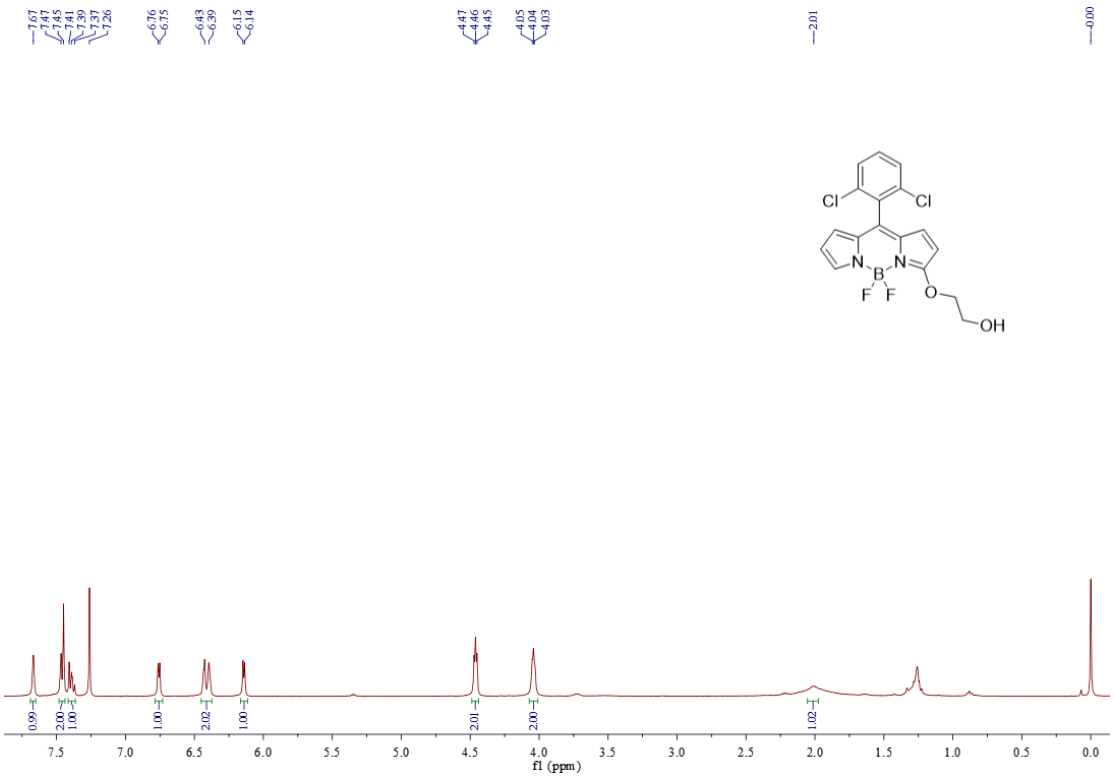
^{13}C NMR spectrum of **3d** in $CDCl_3$ (101 MHz)



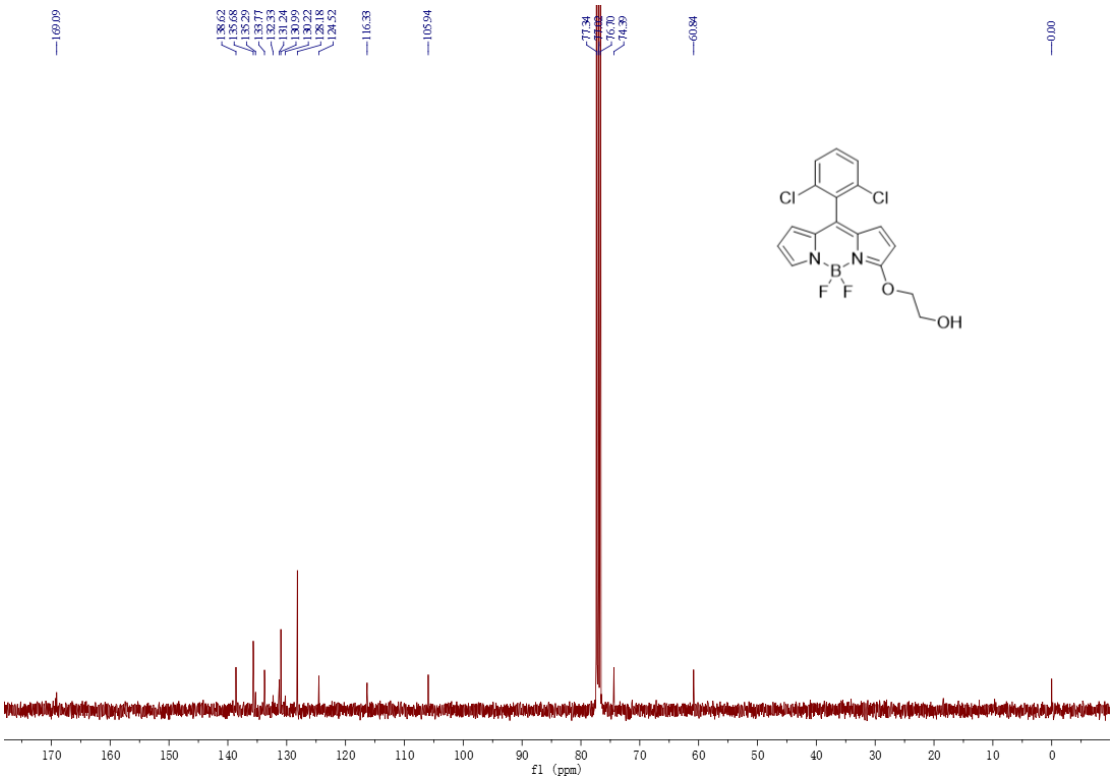
^{1}H NMR spectrum of **3e** in $CDCl_3$ (400 MHz)



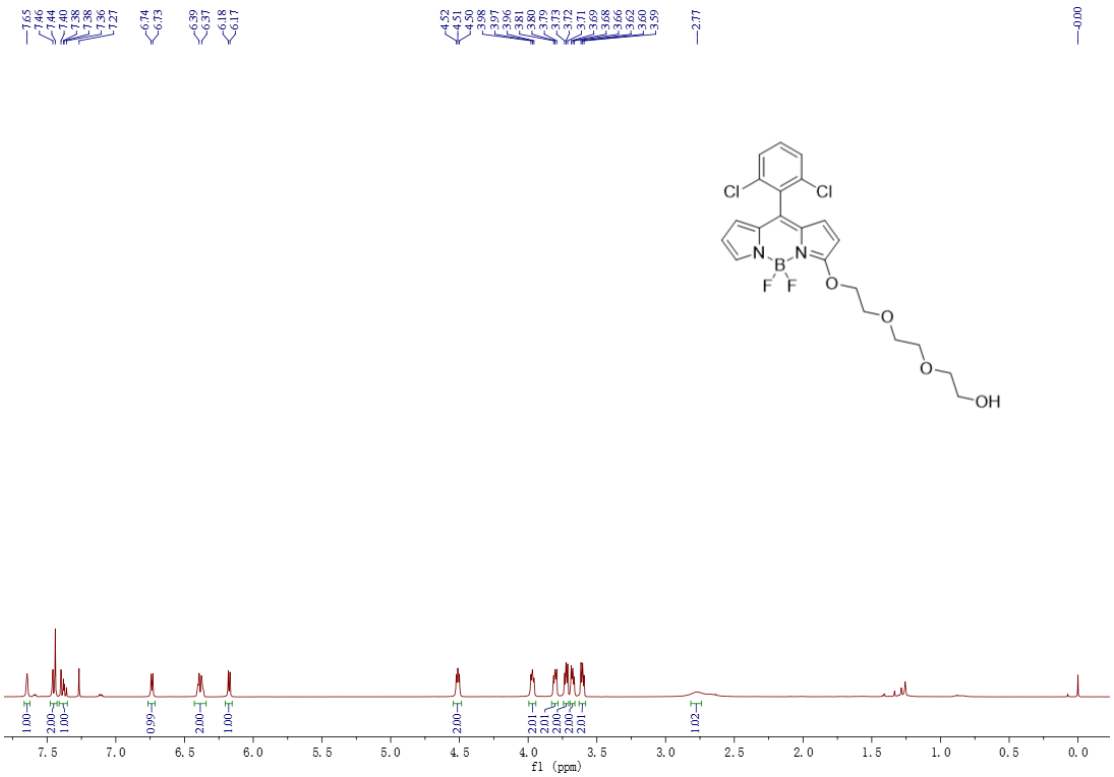
^{13}C NMR spectrum of **3e** in $CDCl_3$ (101 MHz)



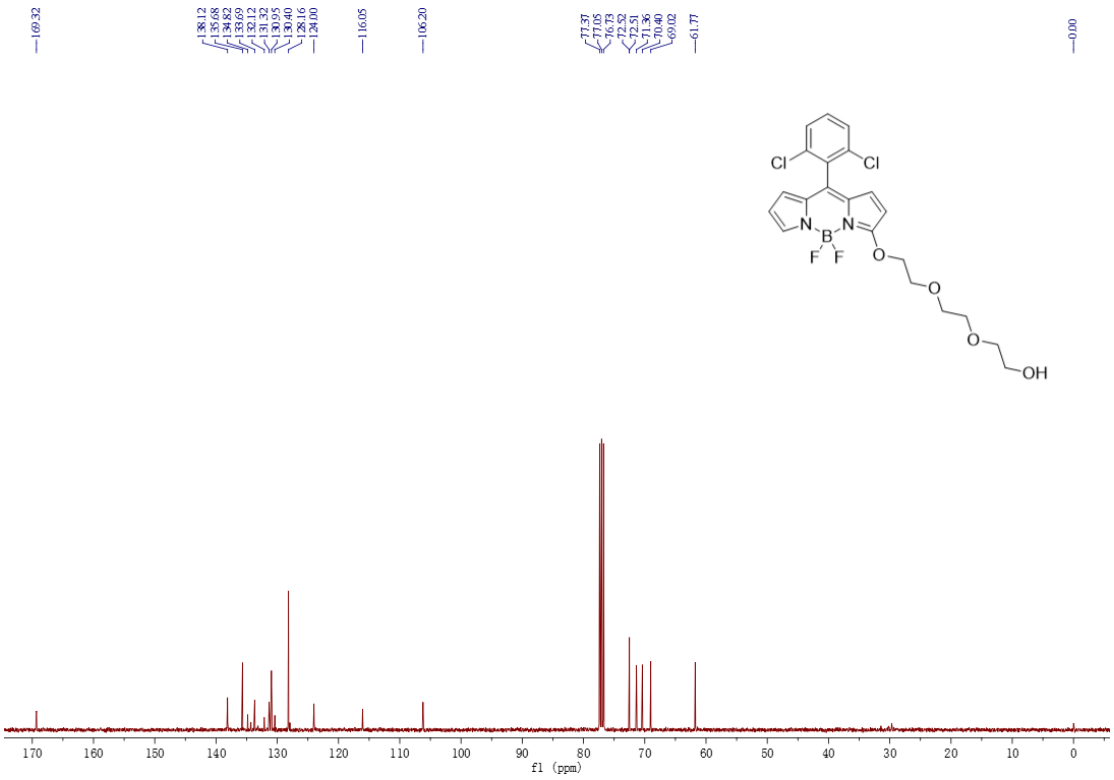
^{1}H NMR spectrum of **3f** in $CDCl_3$ (400 MHz)



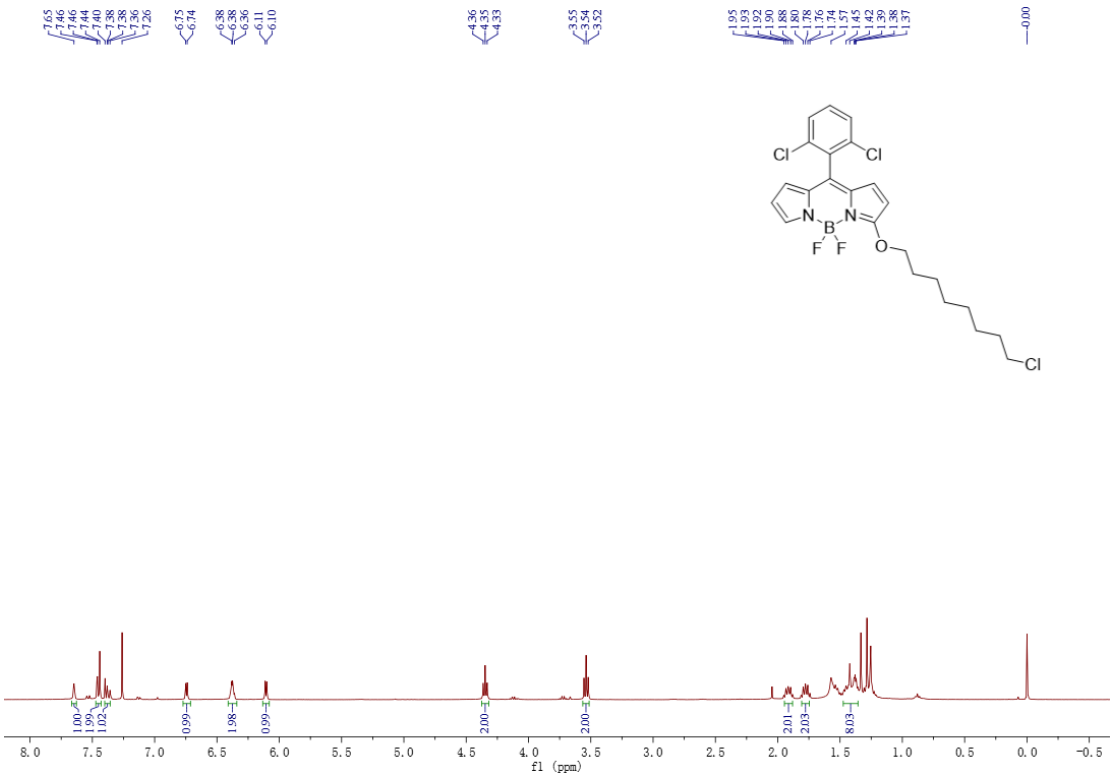
^{13}C NMR spectrum of **3f** in $CDCl_3$ (101 MHz)



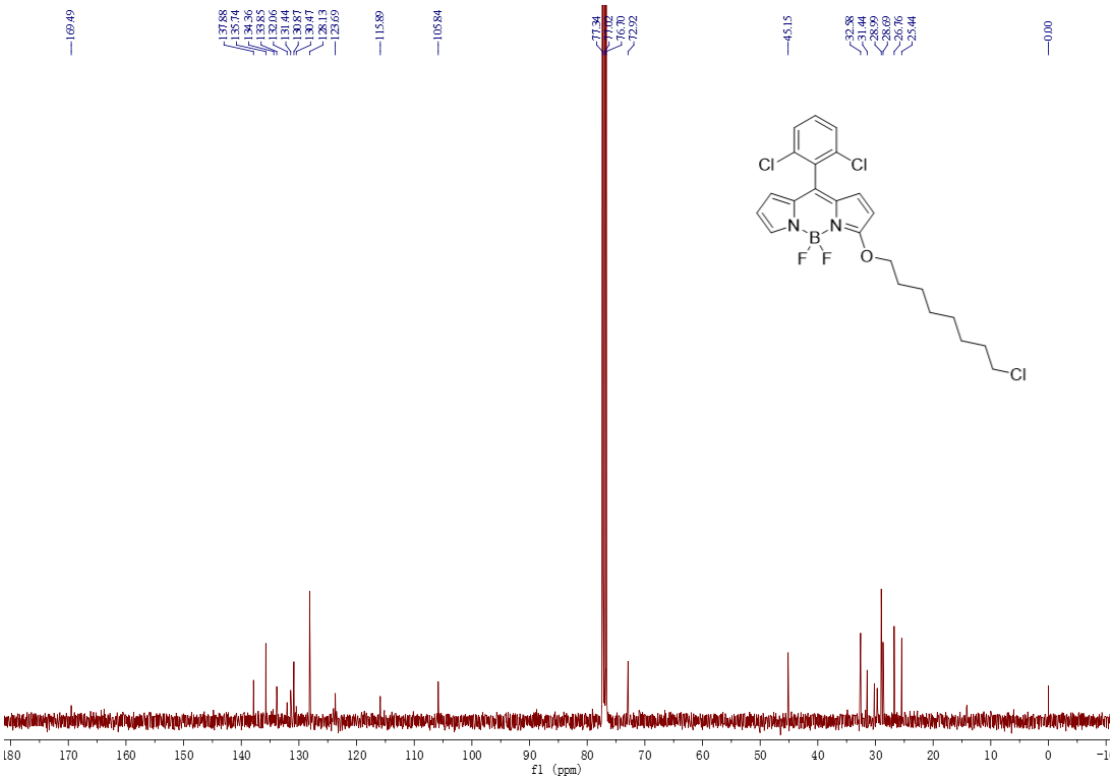
^{1}H NMR spectrum of **3g** in $CDCl_3$ (400 MHz)



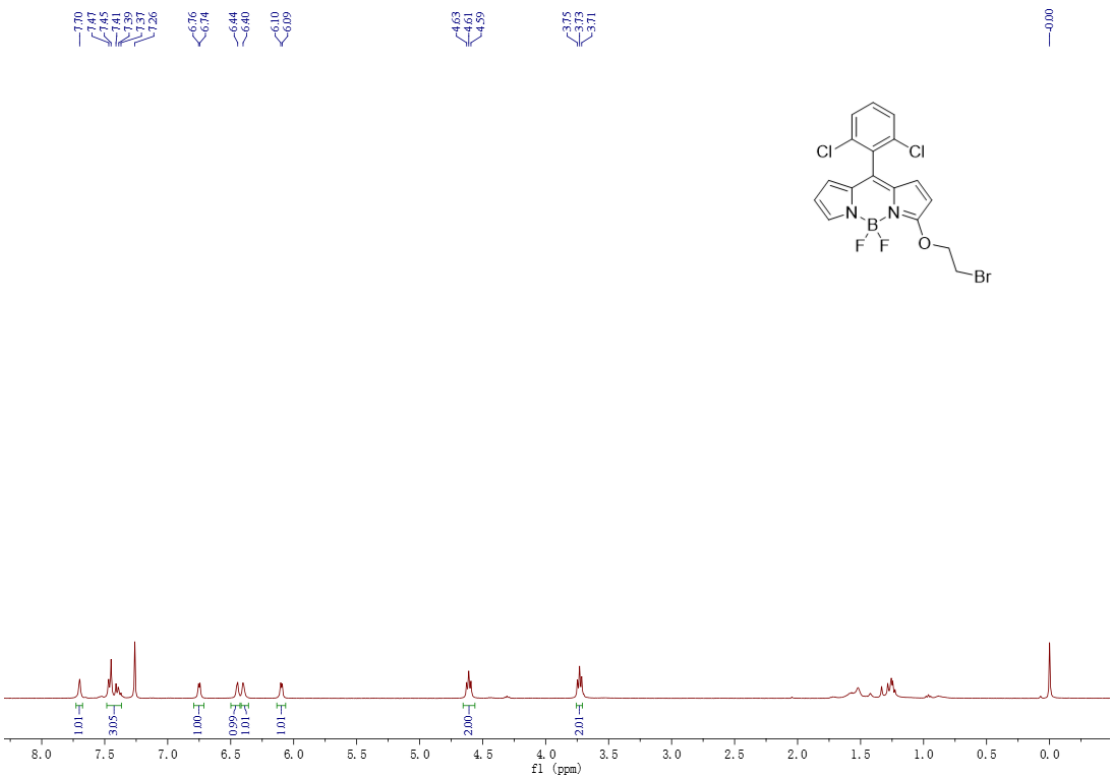
^{13}C NMR spectrum of **3g** in $CDCl_3$ (101 MHz)



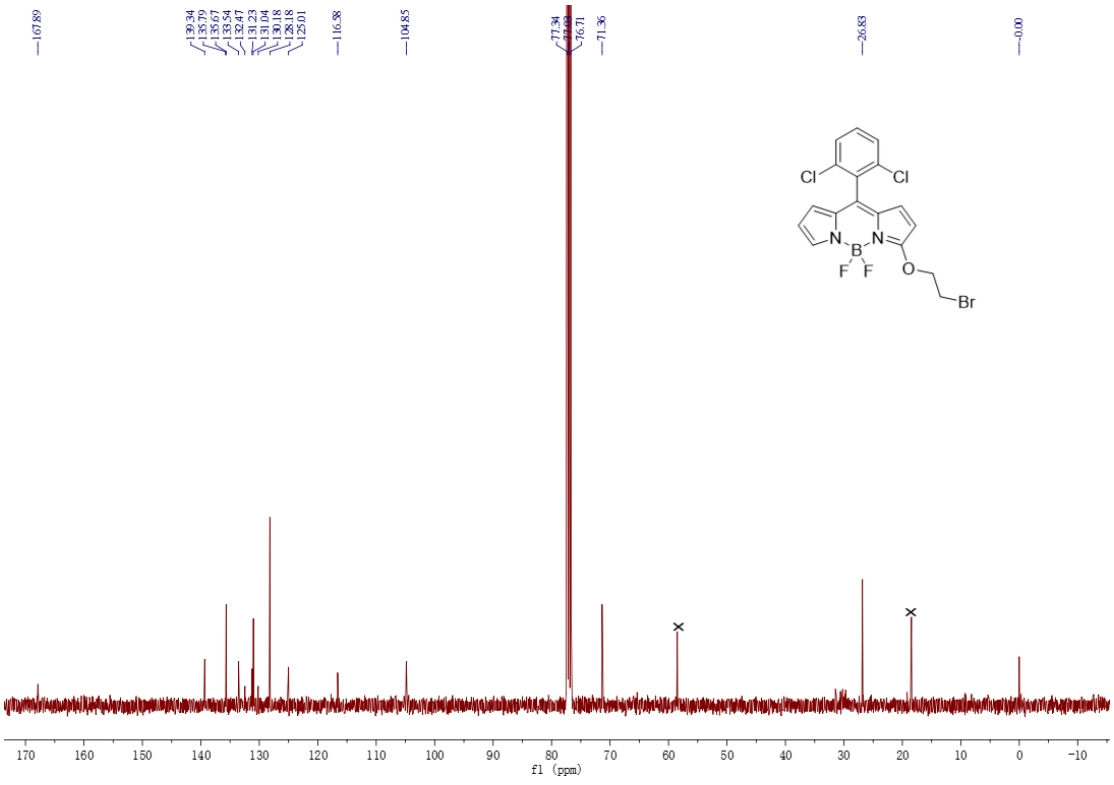
^{1}H NMR spectrum of **3h** in $CDCl_3$ (400 MHz)



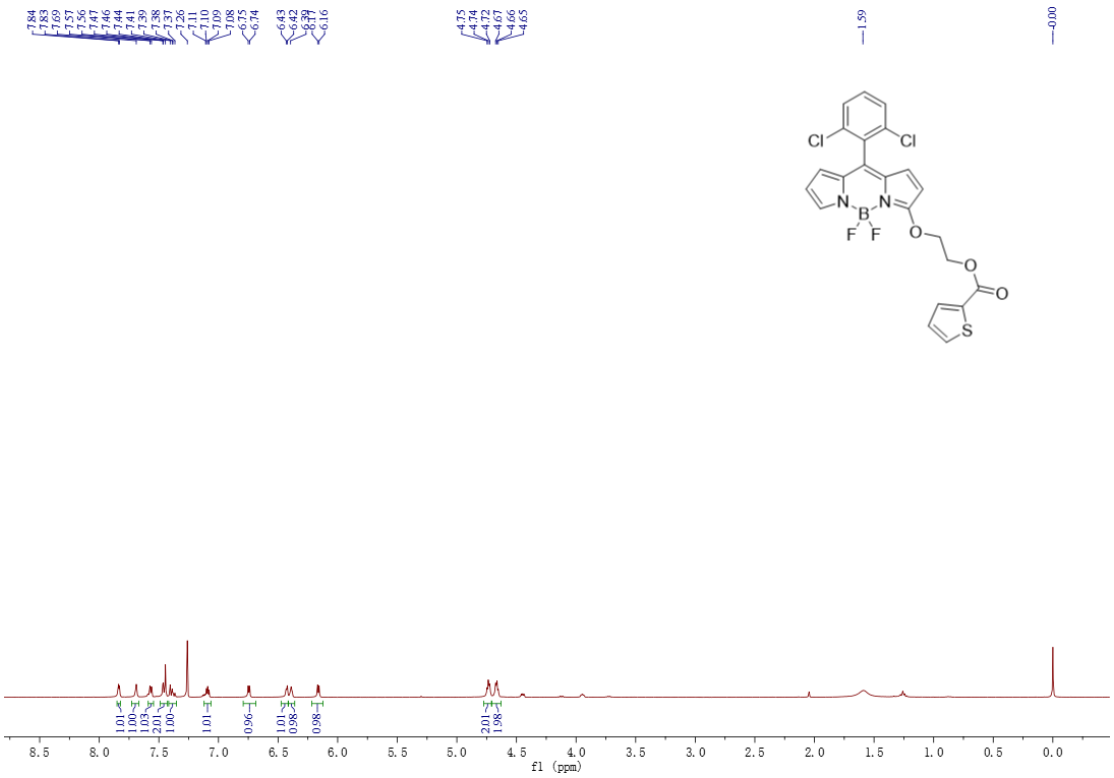
^{13}C NMR spectrum of **3h** in $CDCl_3$ (101 MHz)



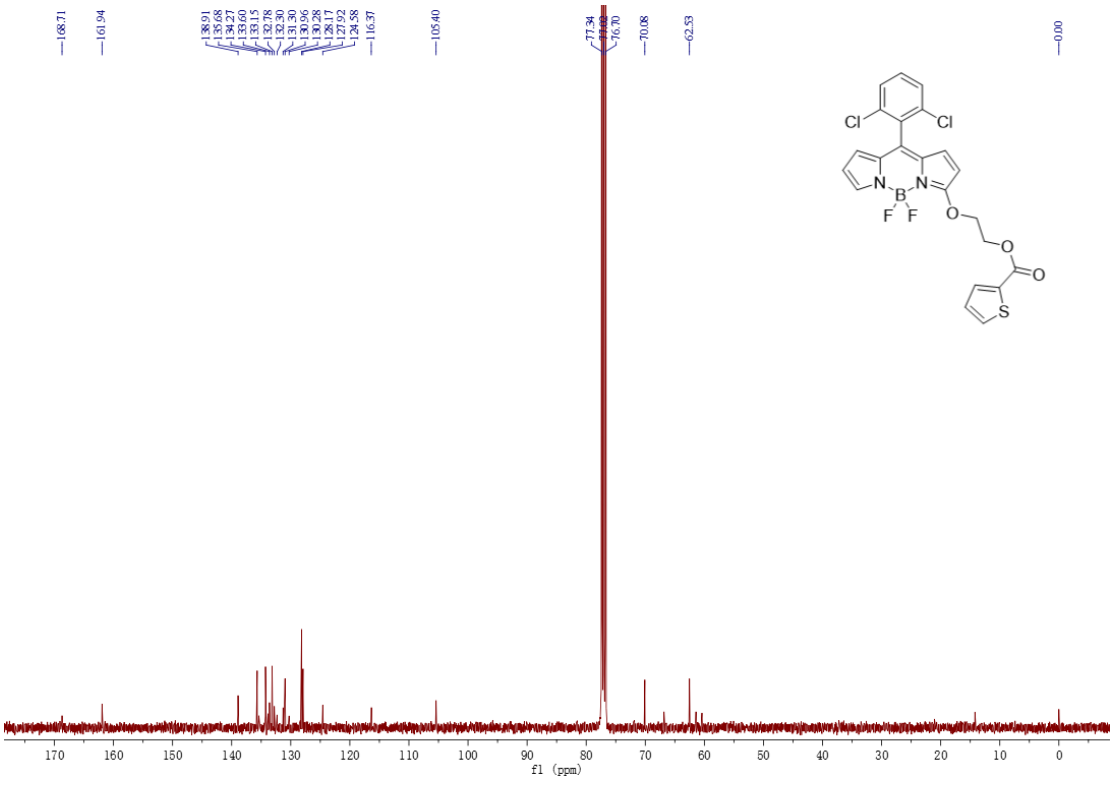
^{1}H NMR spectrum of **3i** in $CDCl_3$ (400 MHz)



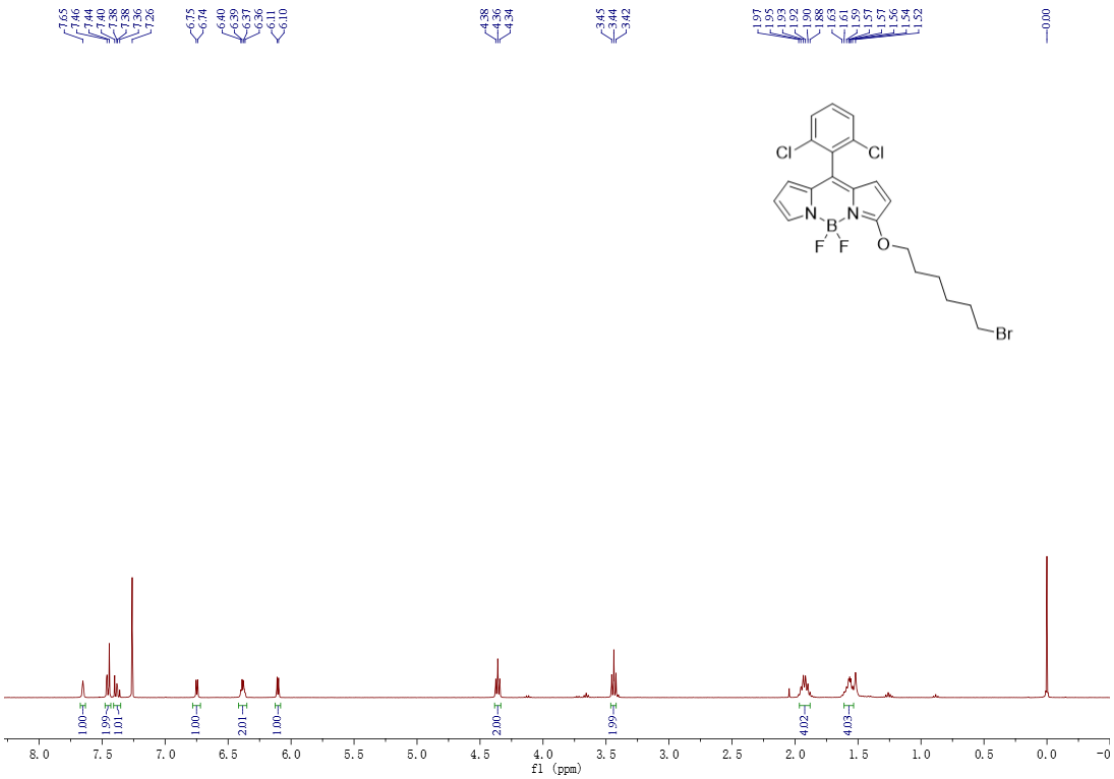
^{13}C NMR spectrum of **3i** in $CDCl_3$ (101 MHz)



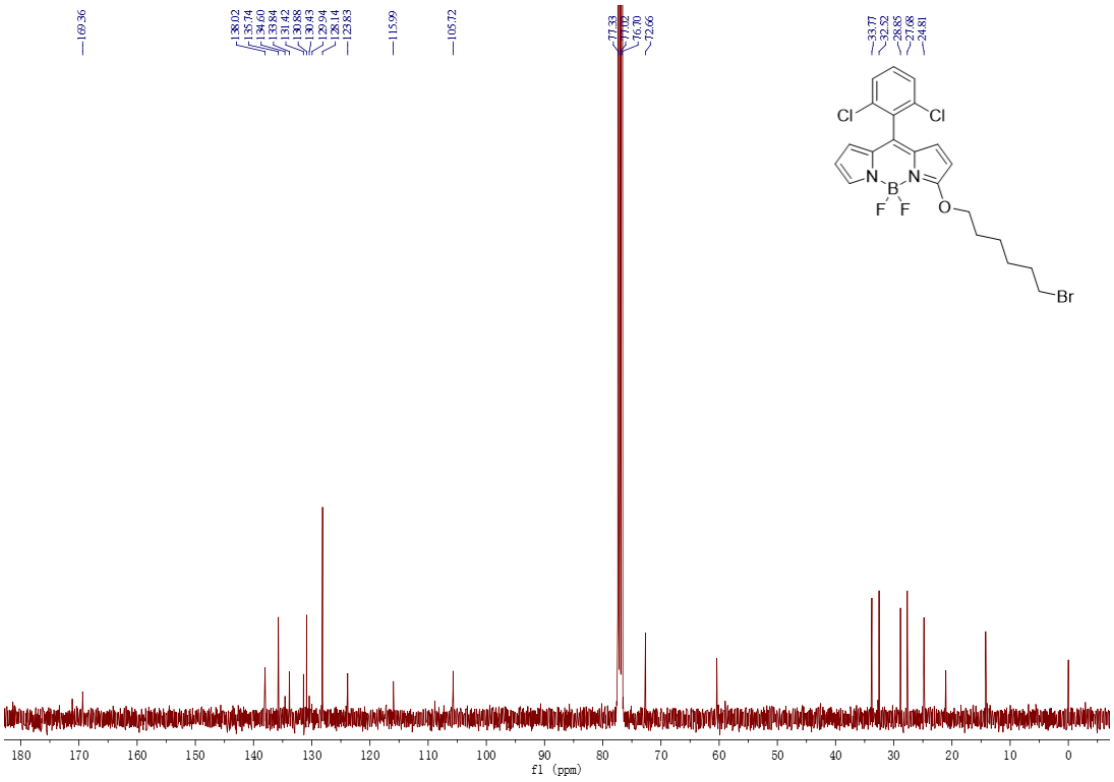
^{1}H NMR spectrum of **3ia** in $CDCl_3$ (400 MHz)



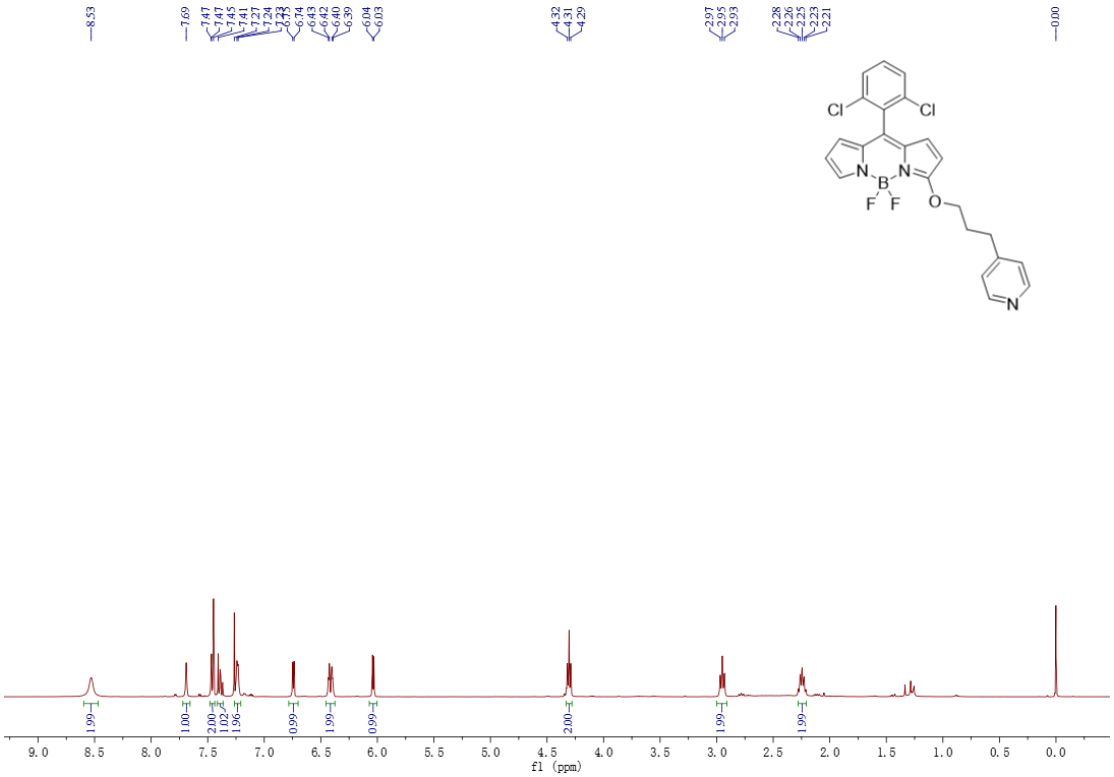
^{13}C NMR spectrum of **3ia** in $CDCl_3$ (101 MHz)



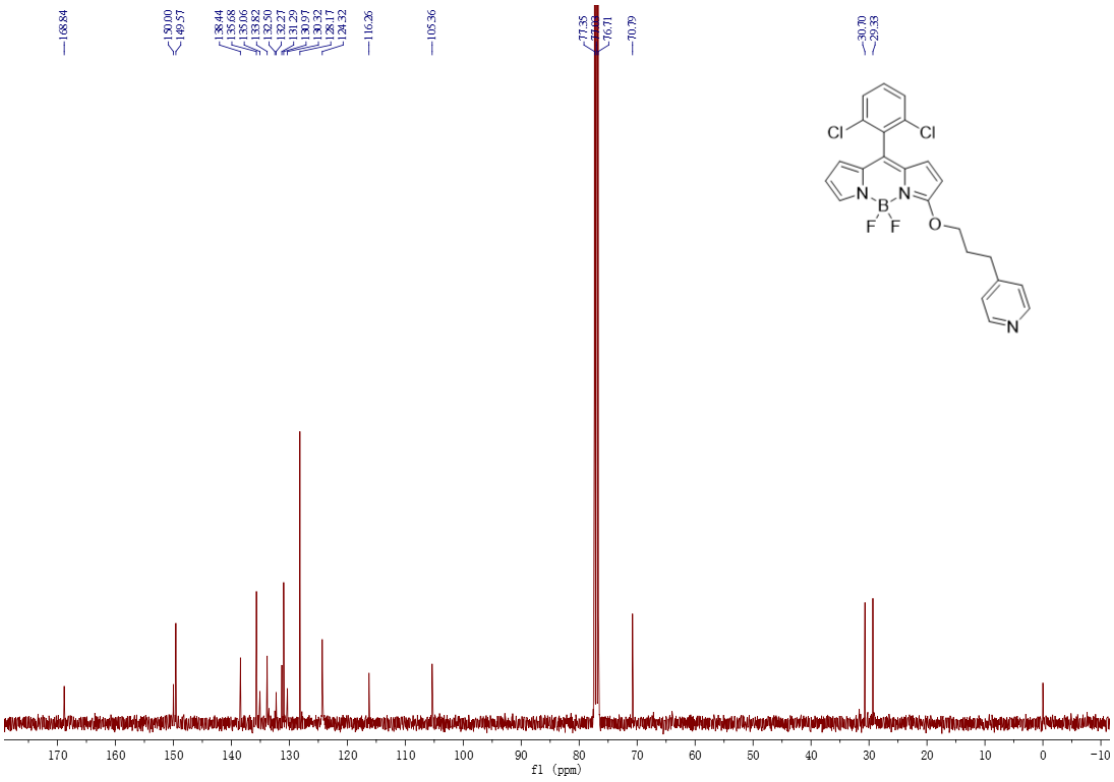
^{1}H NMR spectrum of **3j** in $CDCl_3$ (400 MHz)



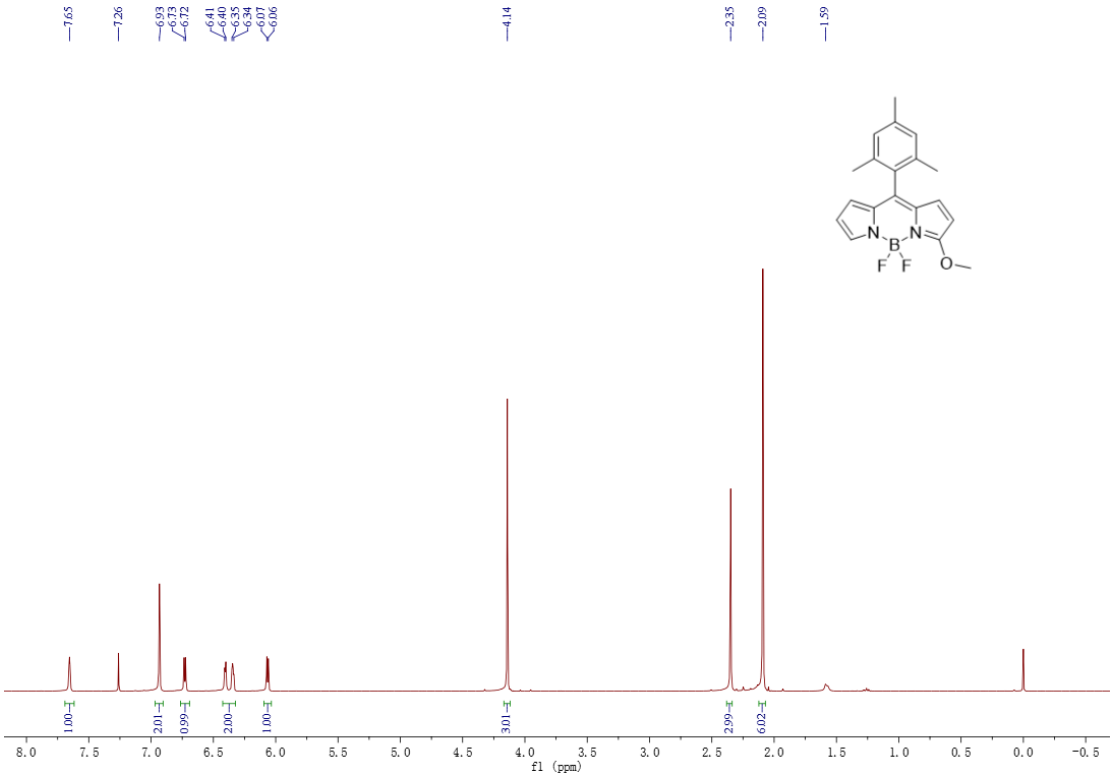
^{13}C NMR spectrum of **3j** in $CDCl_3$ (101 MHz)



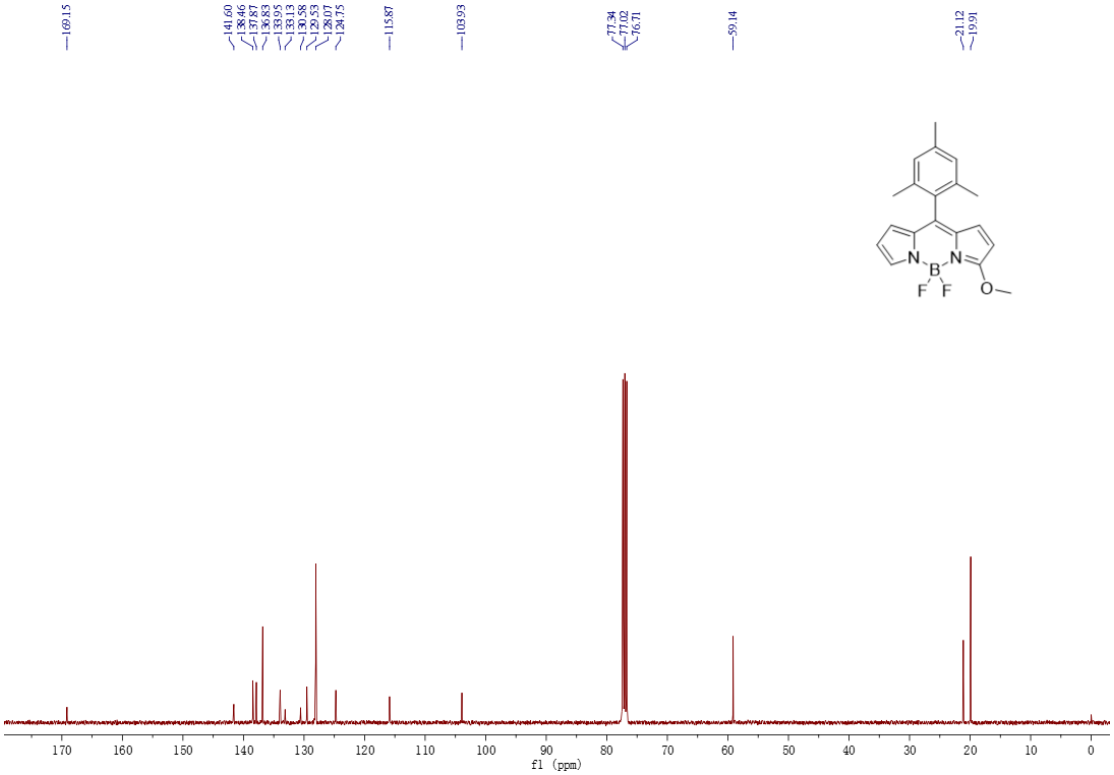
^{1}H NMR spectrum of **3k** in $CDCl_3$ (400 MHz)



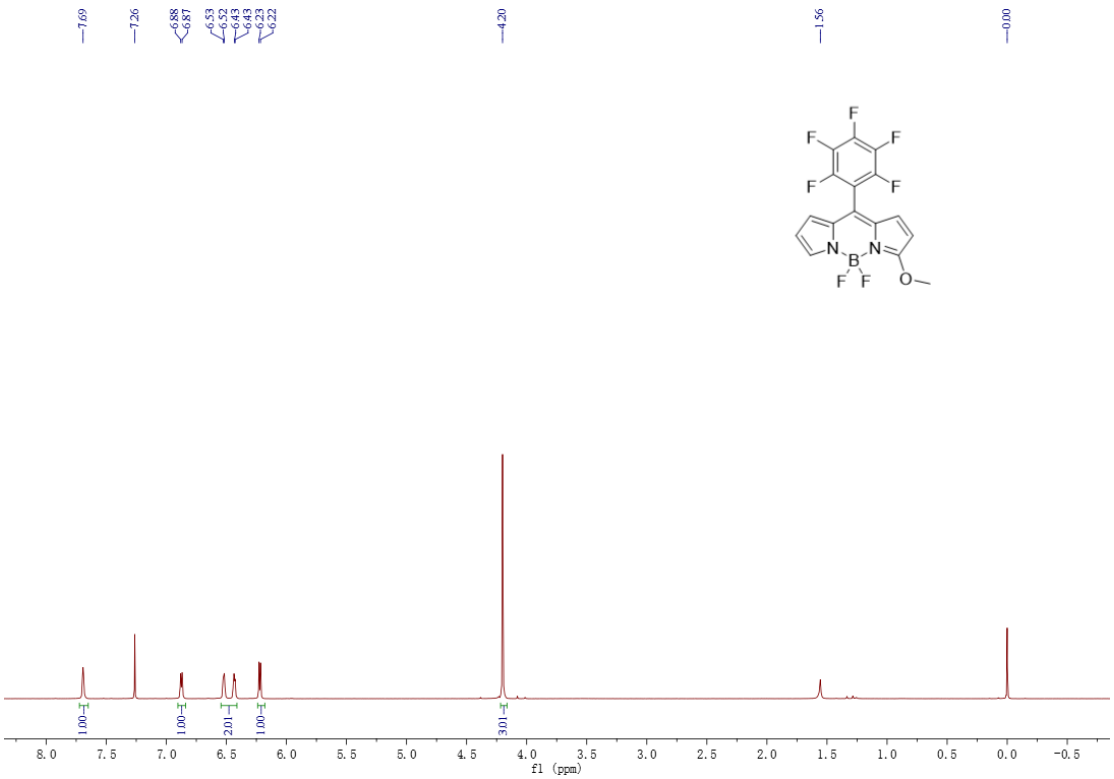
^{13}C NMR spectrum of **3k** in $CDCl_3$ (101 MHz)



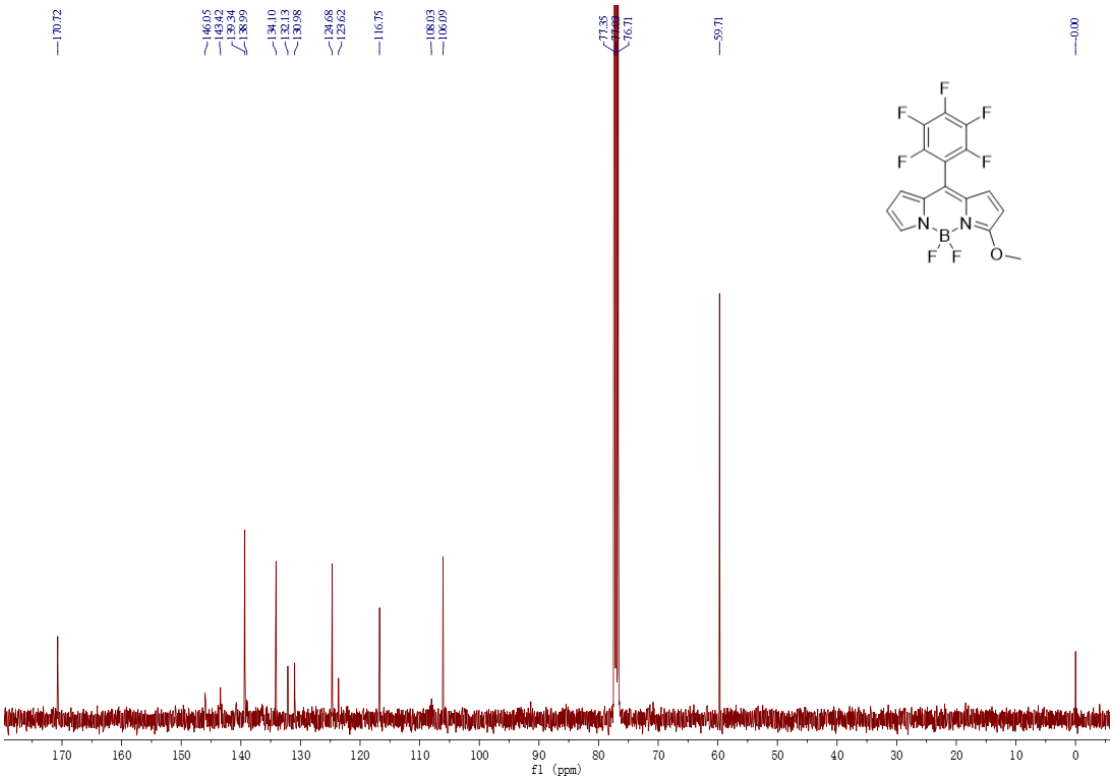
^{1}H NMR spectrum of **3l** in $CDCl_3$ (400 MHz)



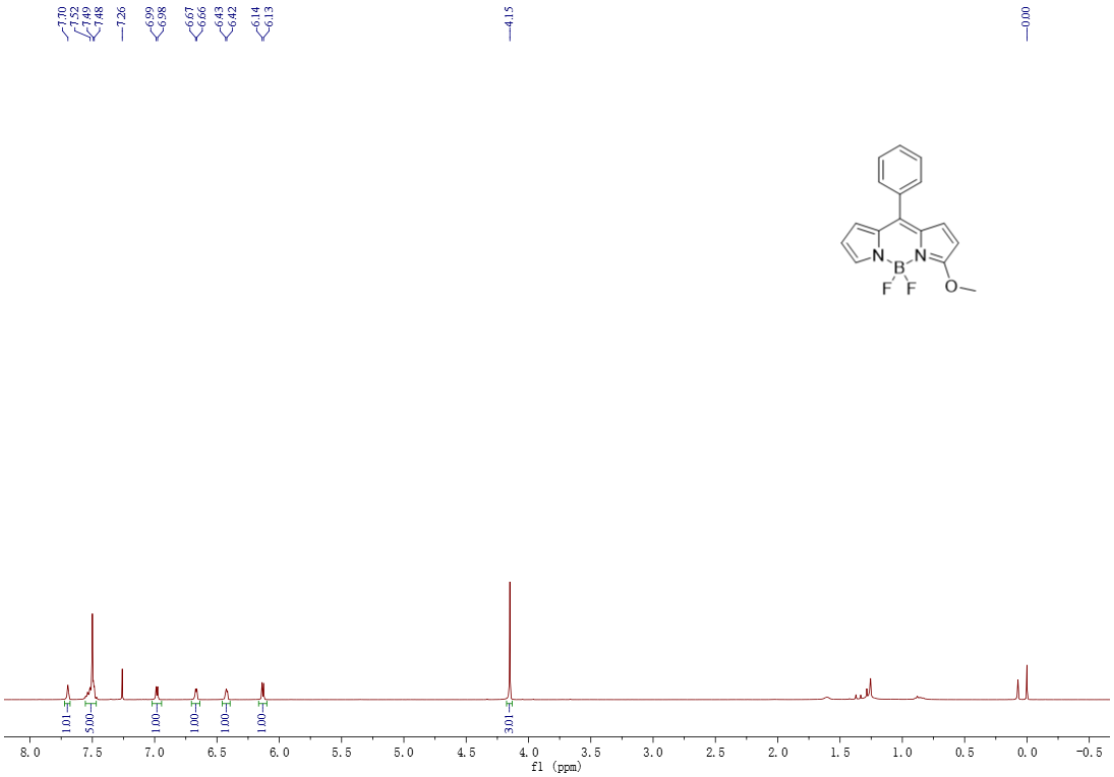
^{13}C NMR spectrum of **3l** in $CDCl_3$ (101 MHz)



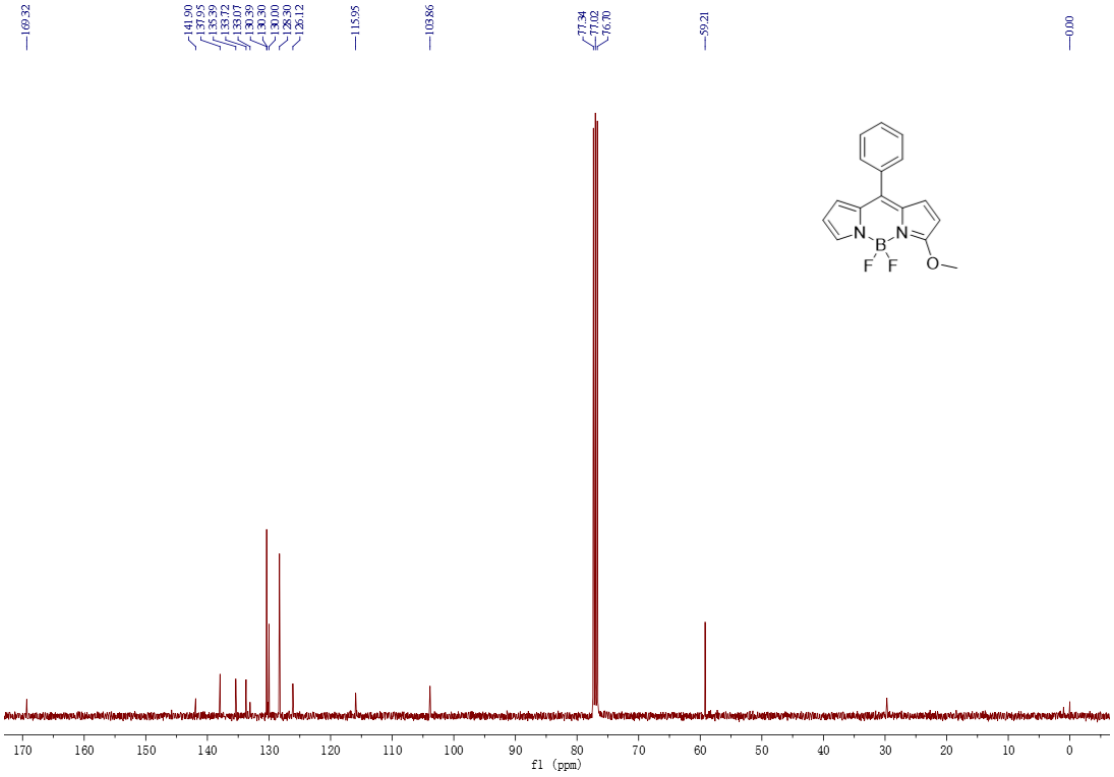
^{1}H NMR spectrum of **3m** in $CDCl_3$ (400 MHz)



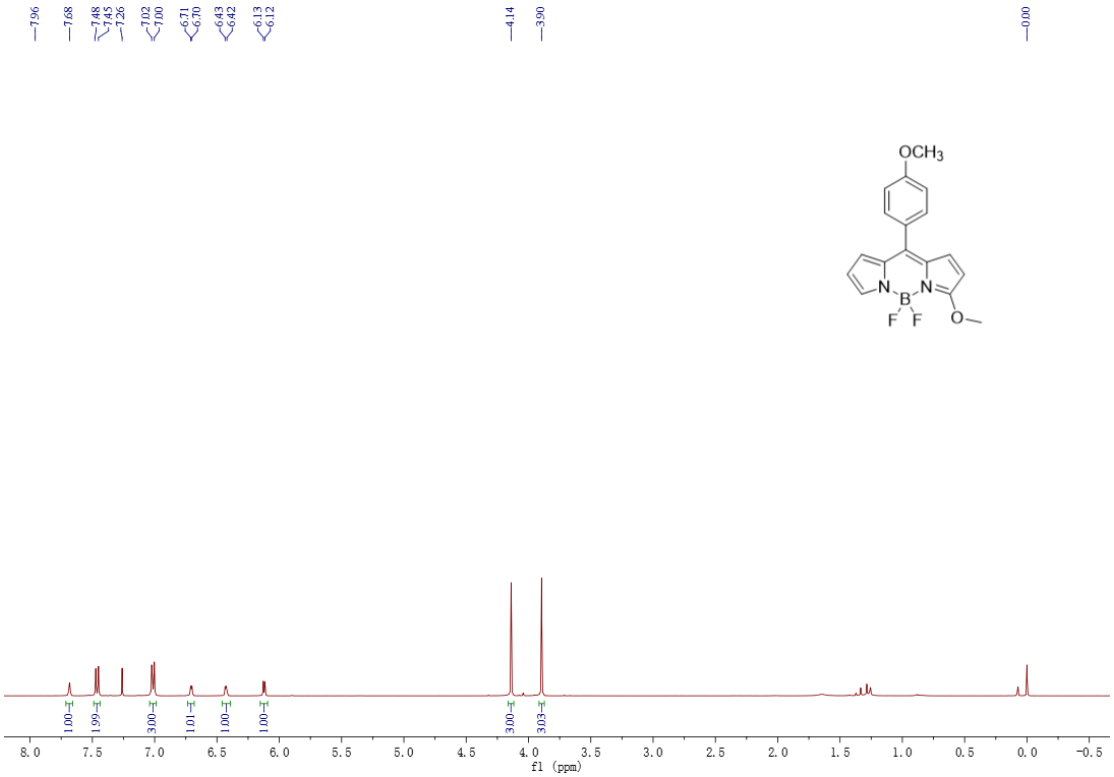
^{13}C NMR spectrum of **3m** in $CDCl_3$ (101 MHz)



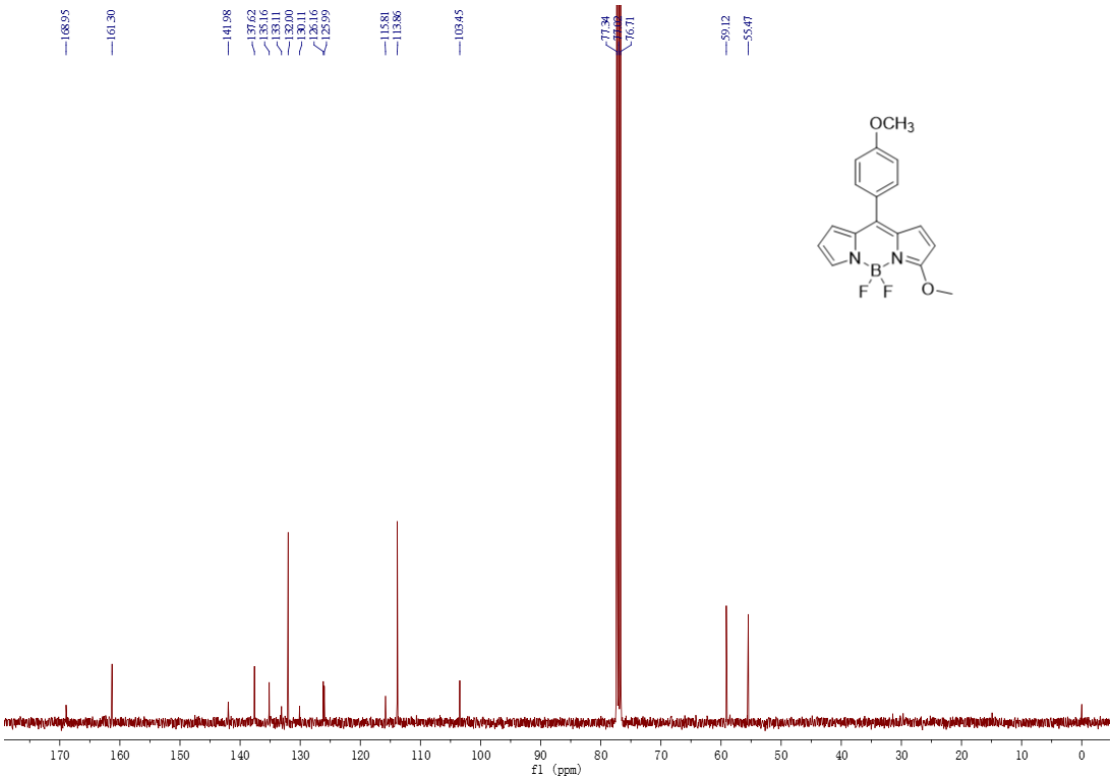
^{1}H NMR spectrum of **3n** in $CDCl_3$ (400 MHz)



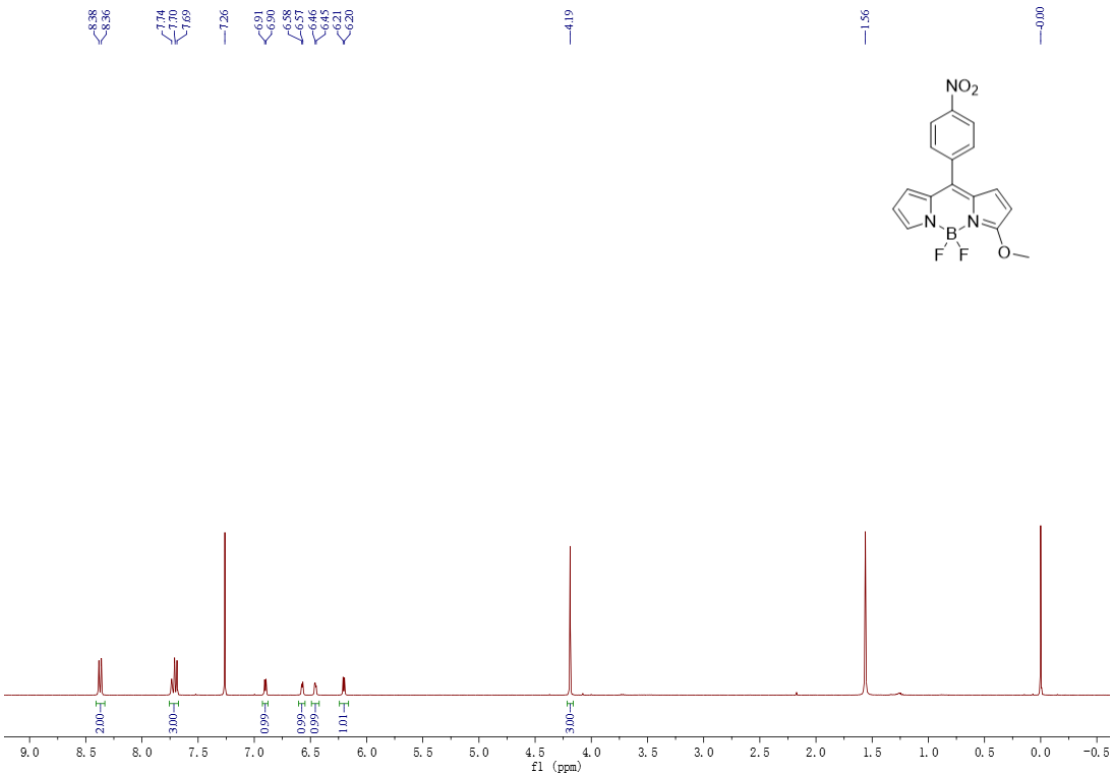
^{13}C NMR spectrum of **3n** in $CDCl_3$ (101 MHz)



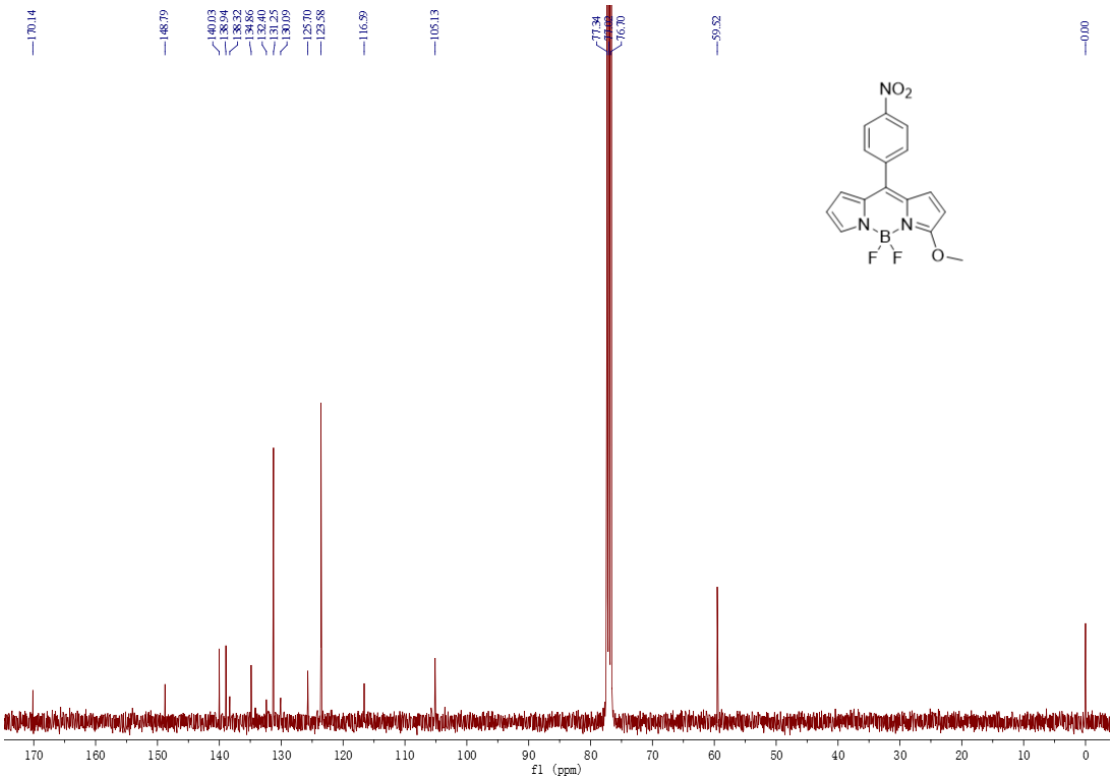
^{1}H NMR spectrum of **3o** in $CDCl_3$ (400 MHz)



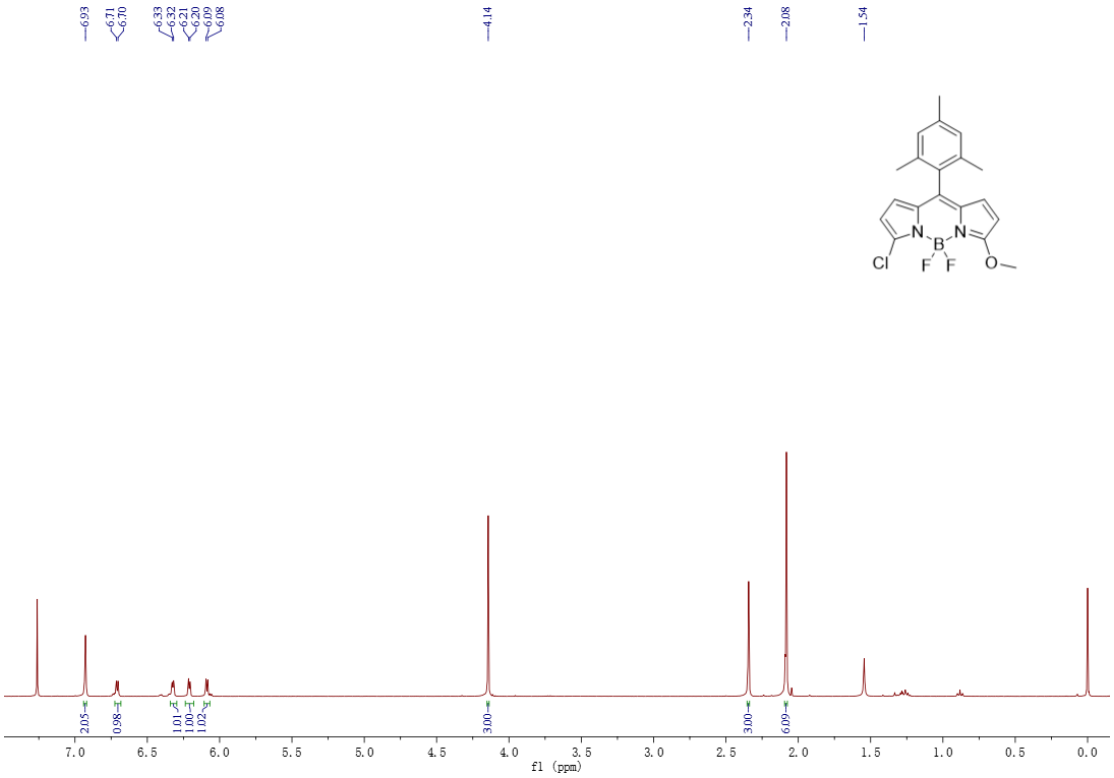
^{13}C NMR spectrum of **3o** in $CDCl_3$ (101 MHz)



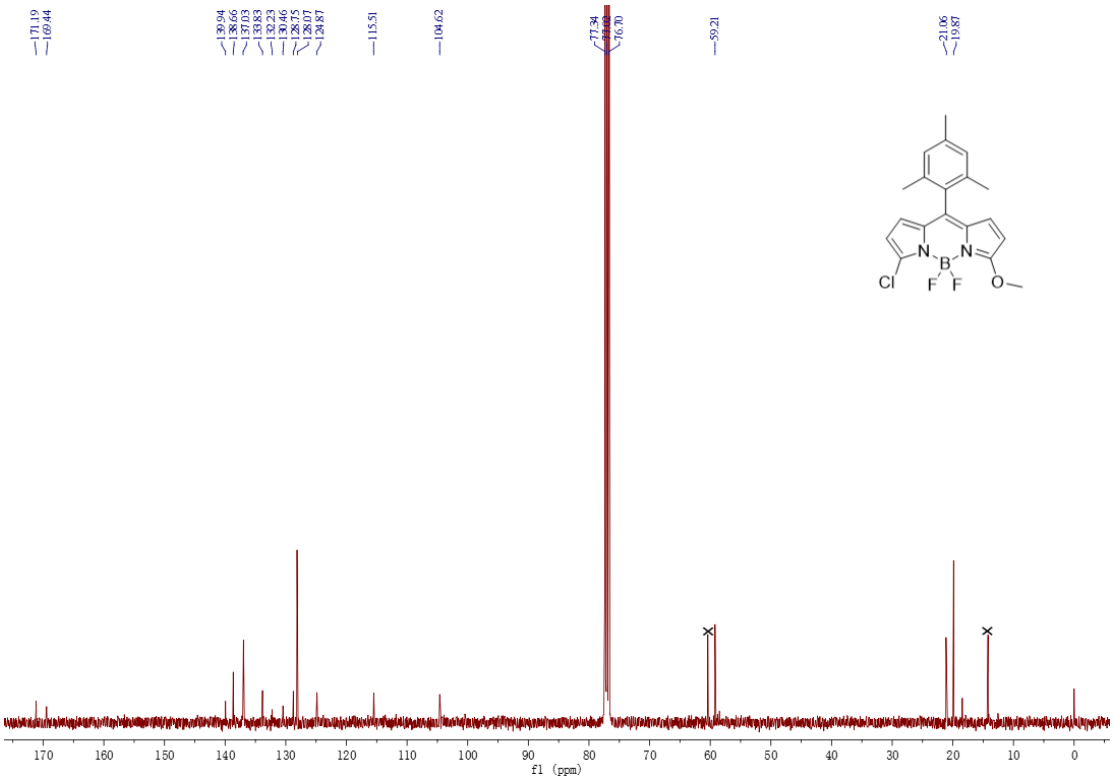
^{1}H NMR spectrum of **3p** in $CDCl_3$ (400 MHz)



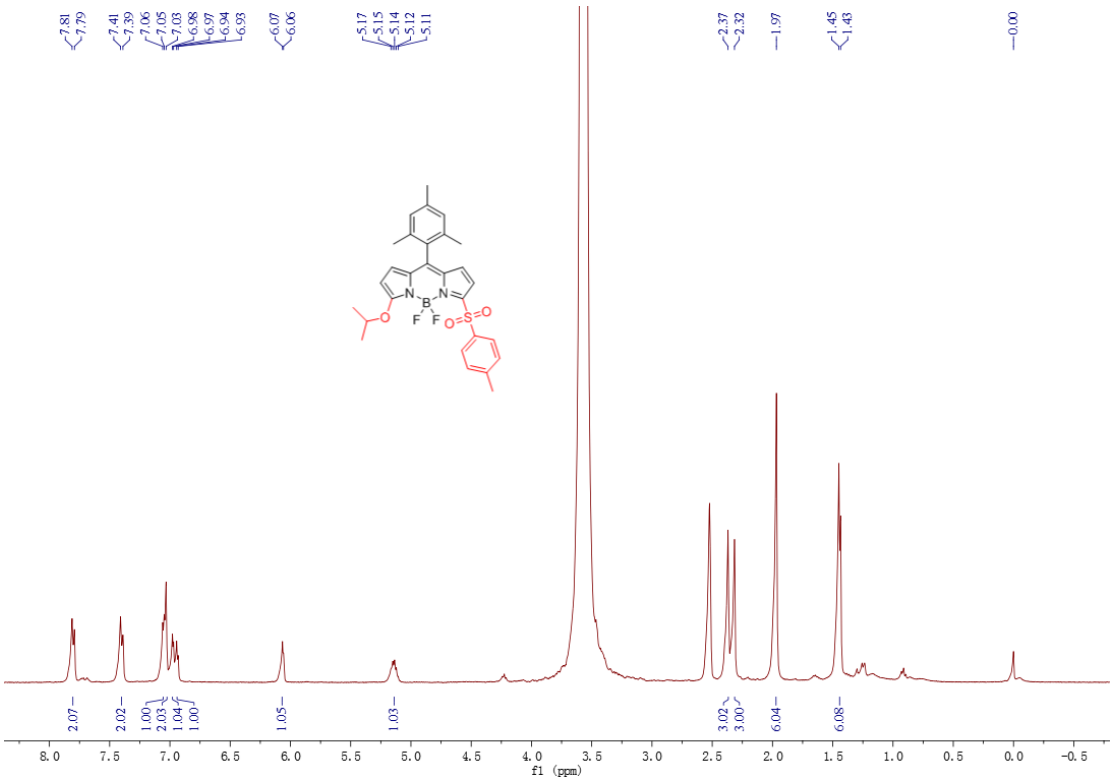
^{13}C NMR spectrum of **3p** in $CDCl_3$ (101 MHz)



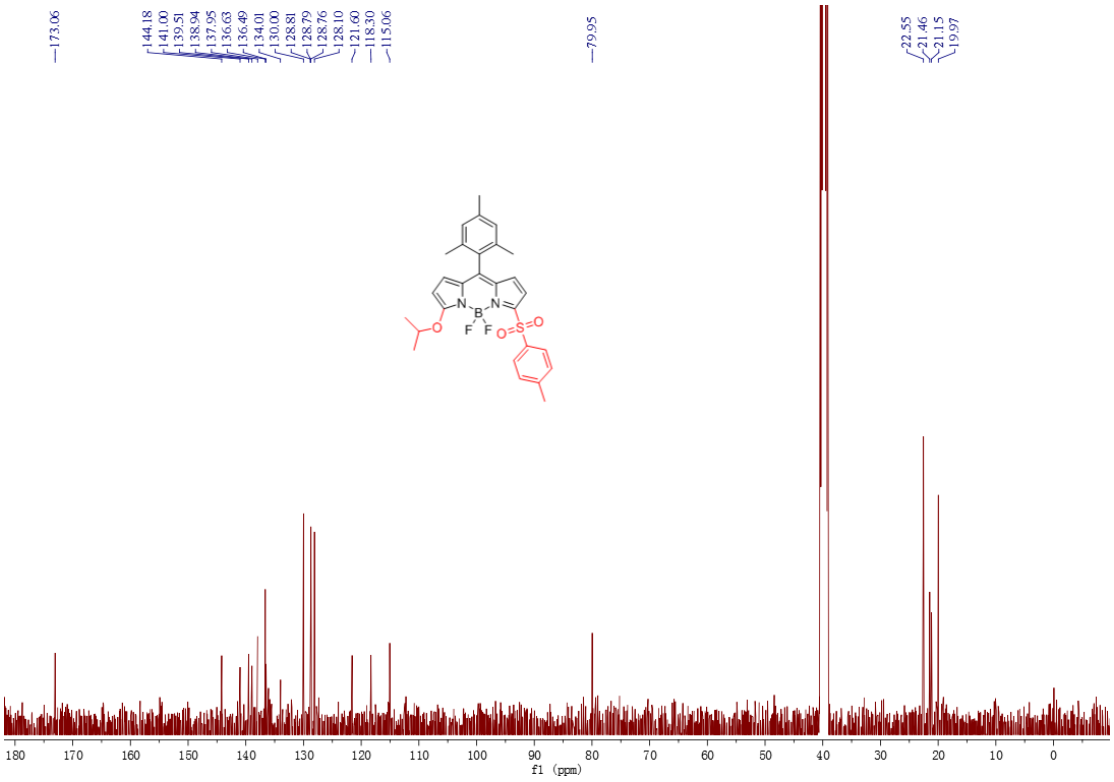
^{1}H NMR spectrum of **4** in $CDCl_3$ (400 MHz)



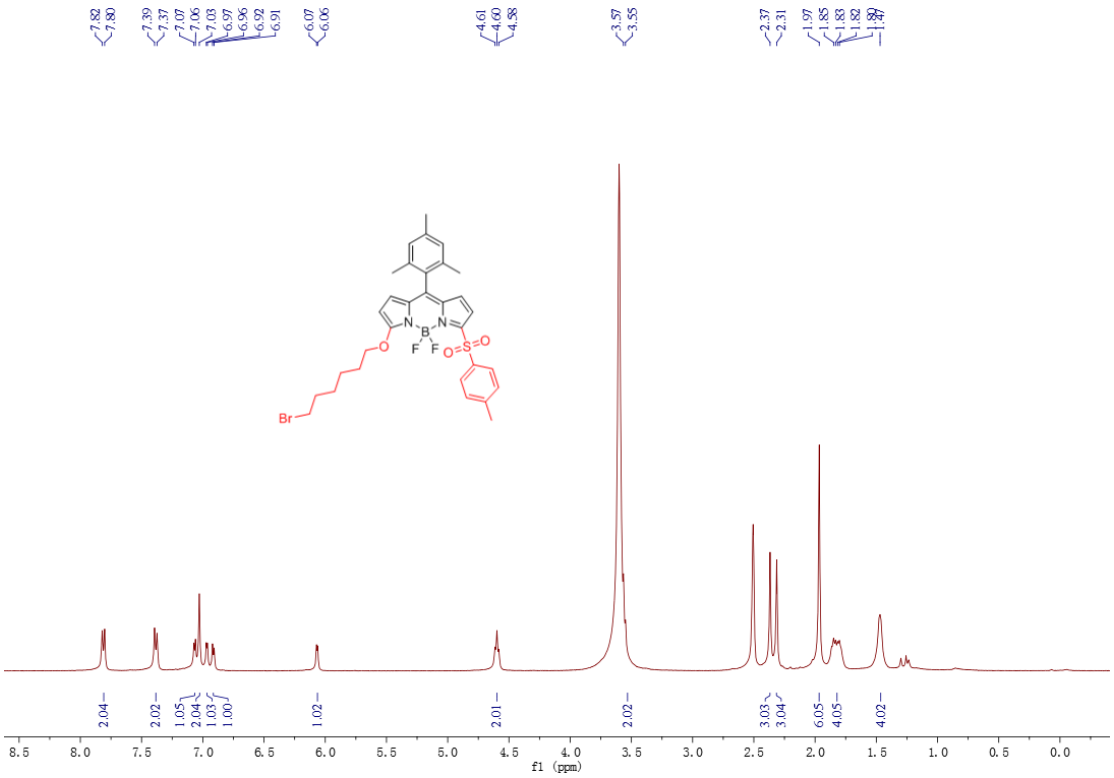
^{13}C NMR spectrum of **4** in $CDCl_3$ (101 MHz)



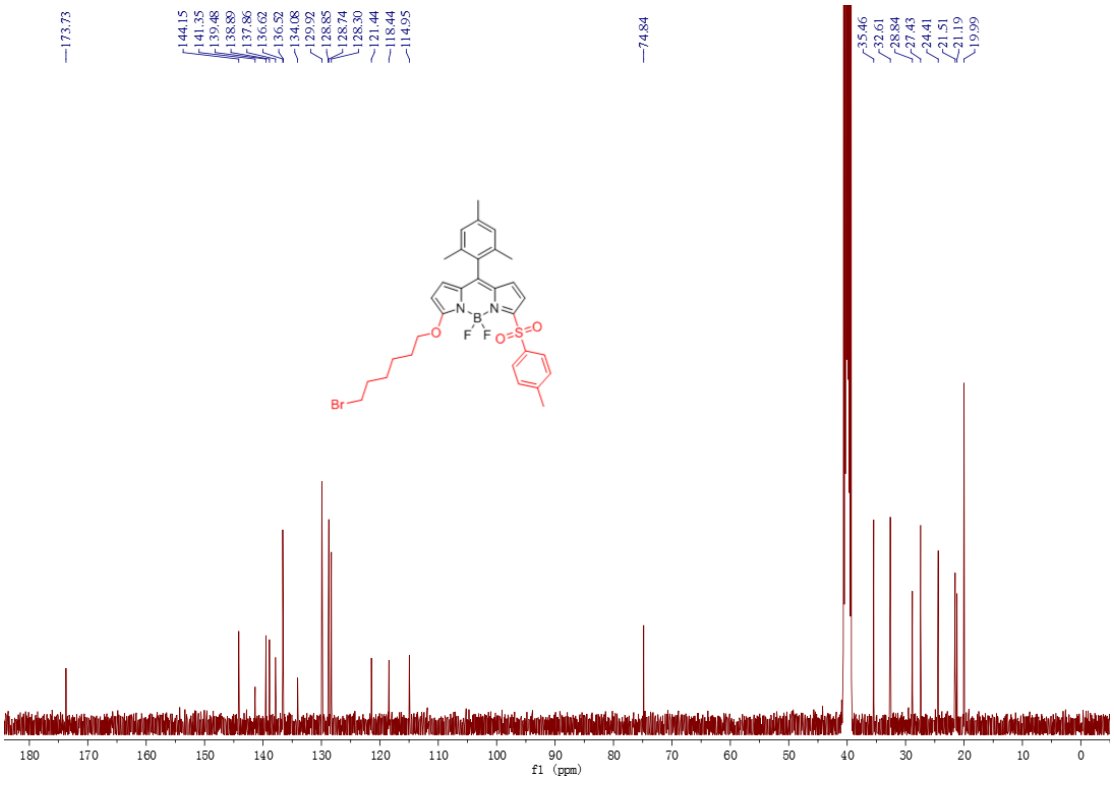
^{1}H NMR spectrum of **5a** in d_6-DMSO (400 MHz)



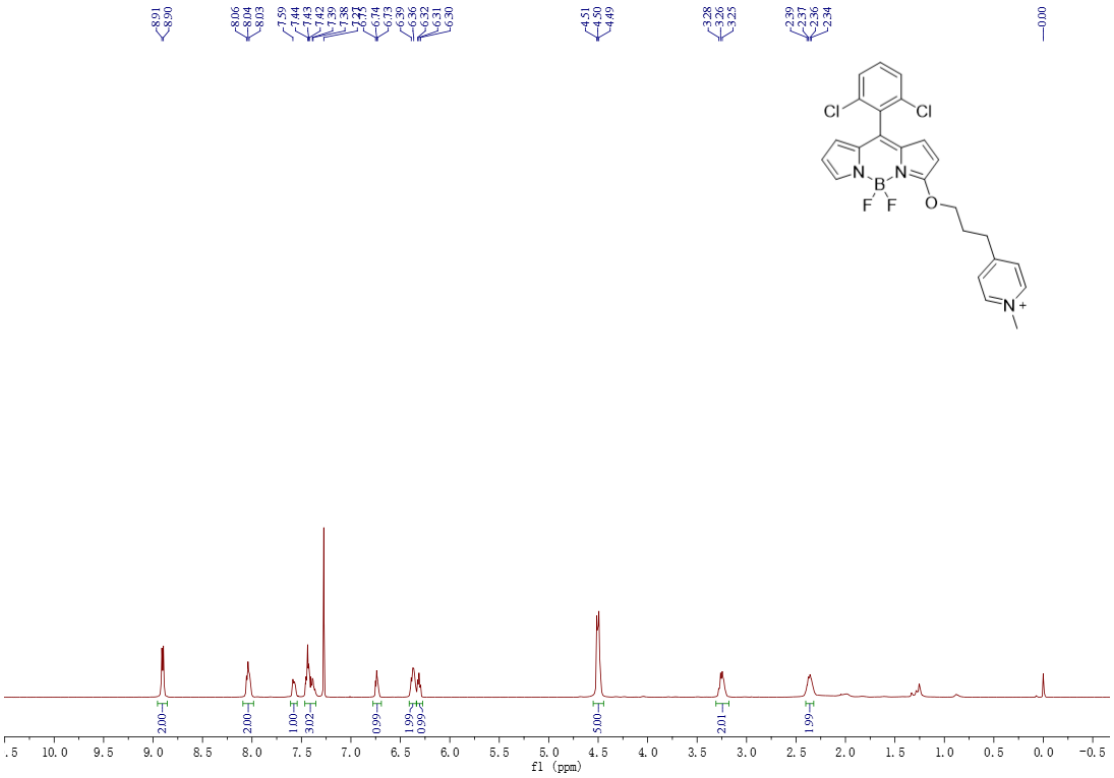
^{13}C NMR spectrum of **5b** in d_6-DMSO (101 MHz)



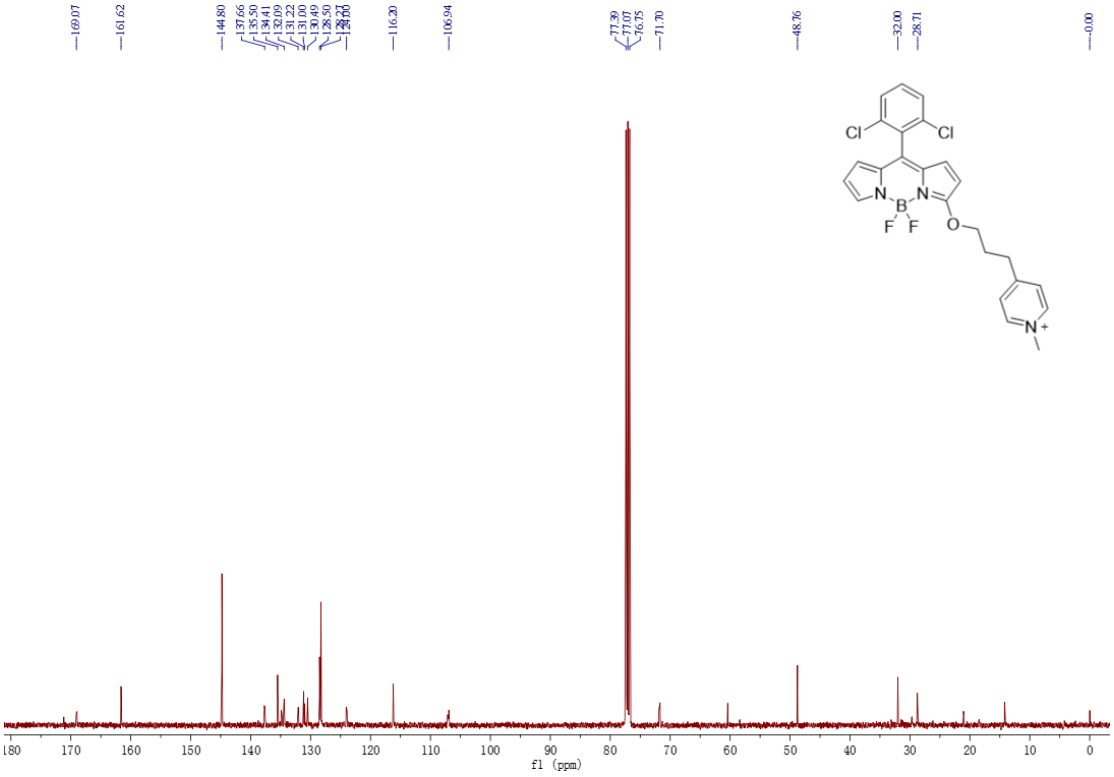
^{1}H NMR spectrum of **9** in d_6-DMSO (400 MHz)



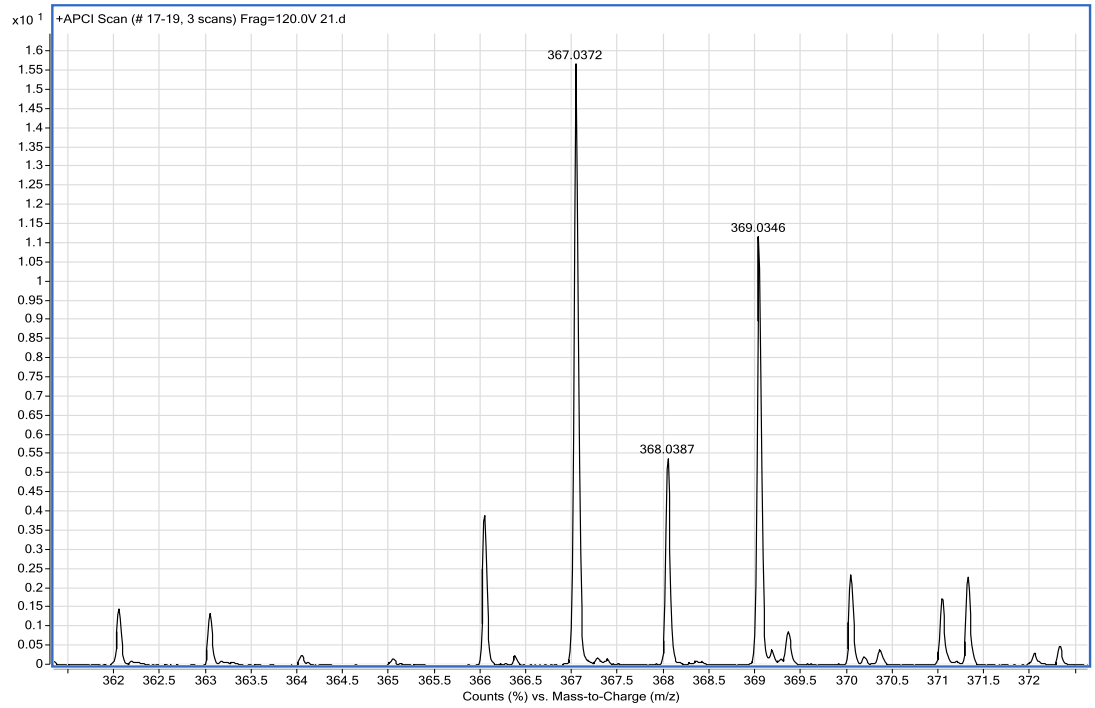
^{13}C NMR spectrum of **9** in d_6-DMSO (101 MHz)



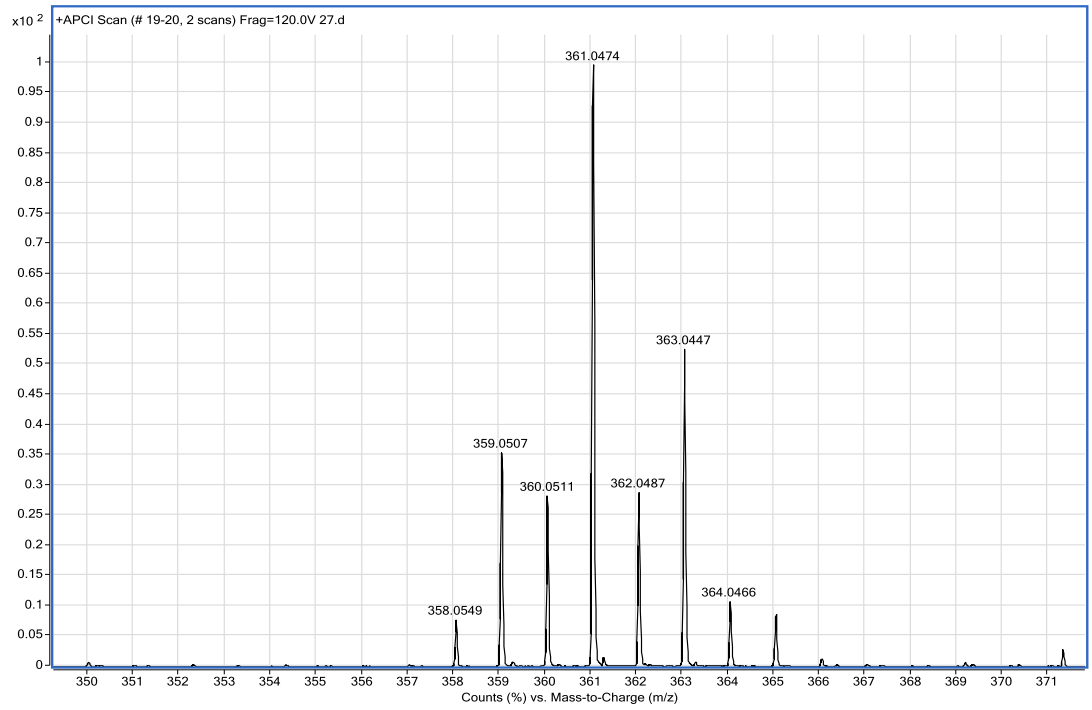
^{1}H NMR spectrum of **6** in $CDCl_3$ (400 MHz)



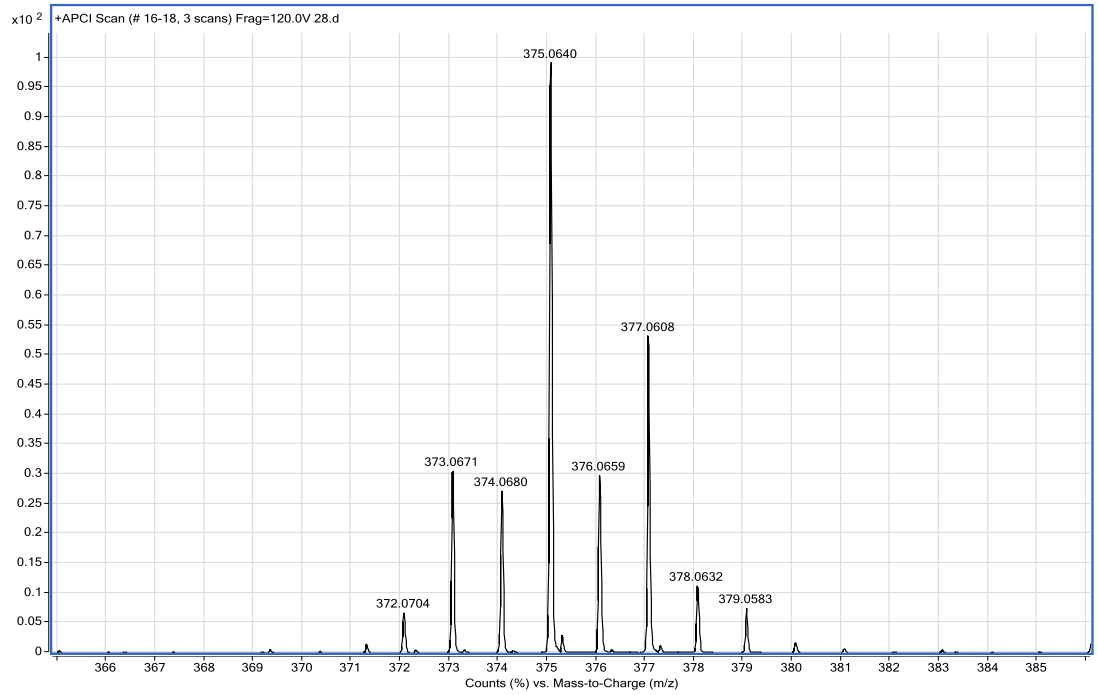
^{13}C NMR spectrum of **6** in $CDCl_3$ (101 MHz)



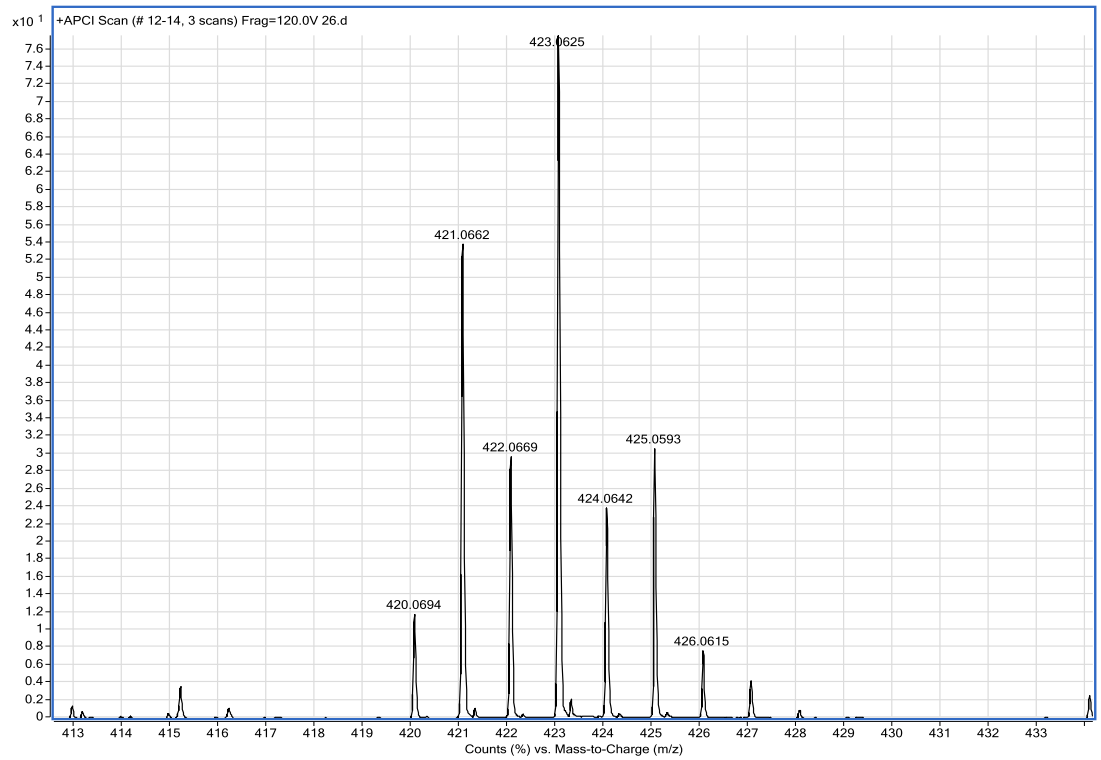
HRMS of **3a**



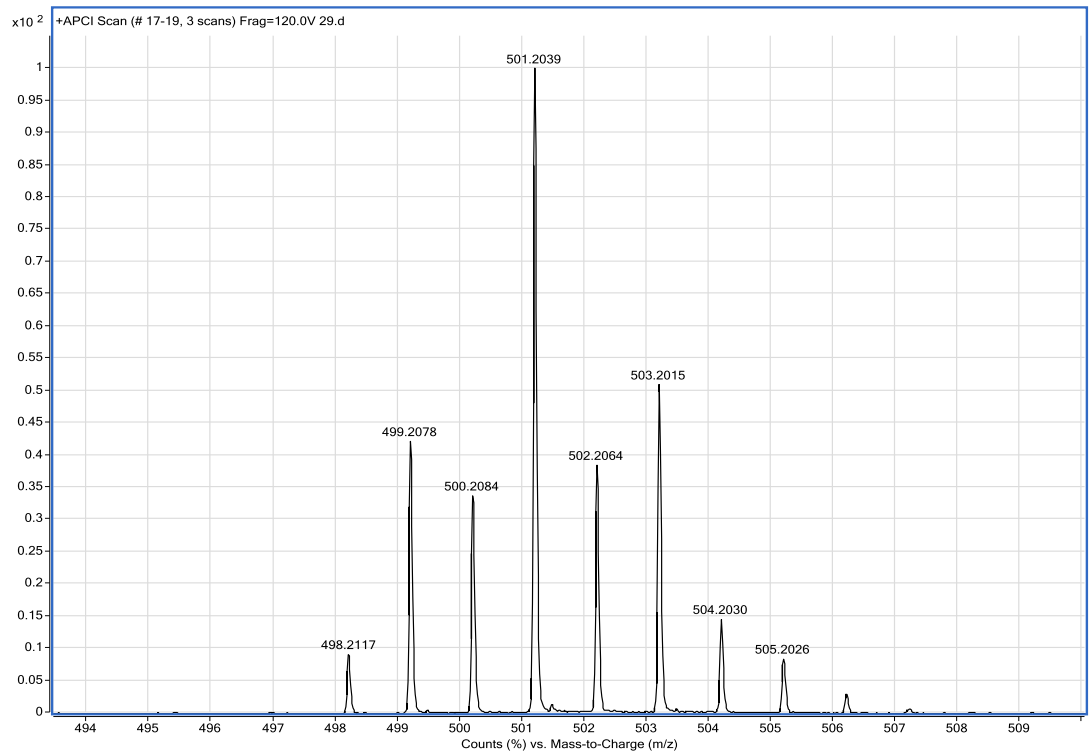
HRMS of **3b**



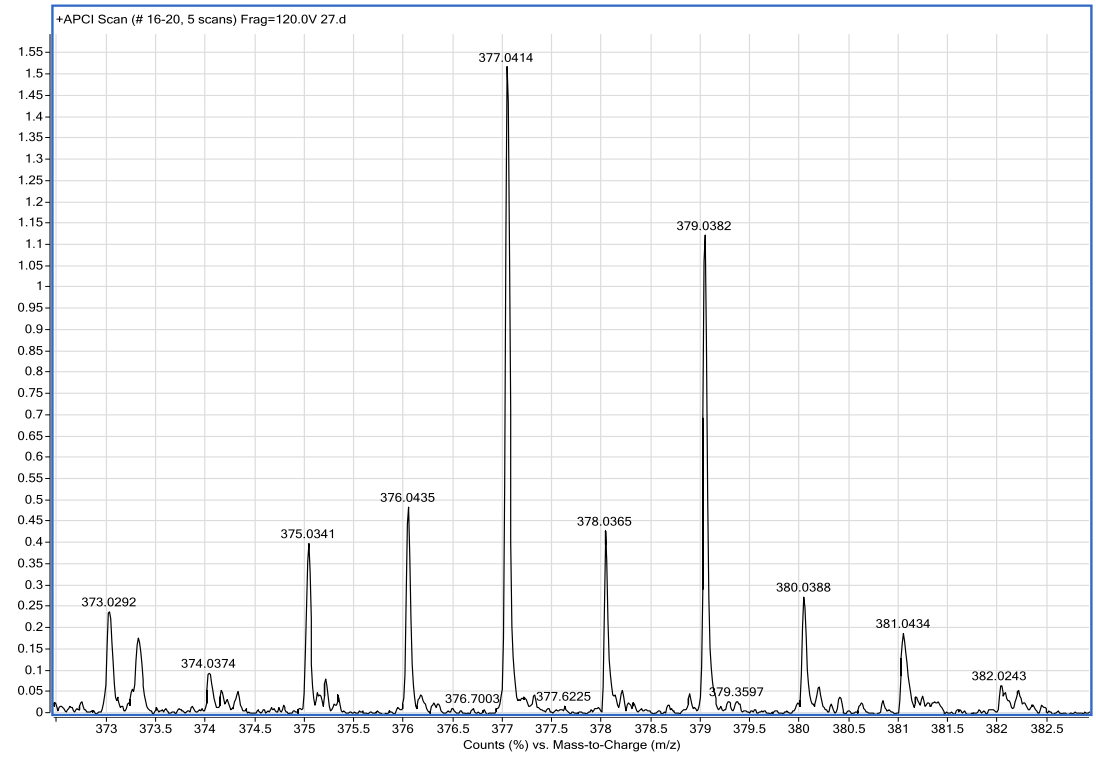
HRMS of **3c**



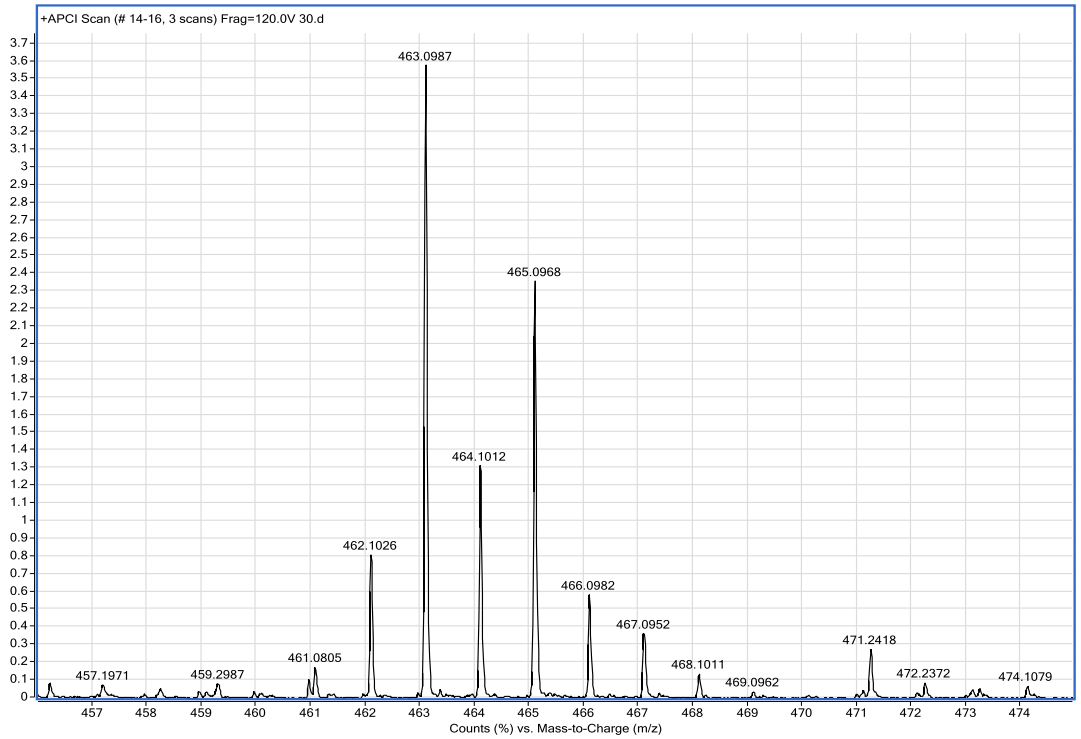
HRMS of **3d**



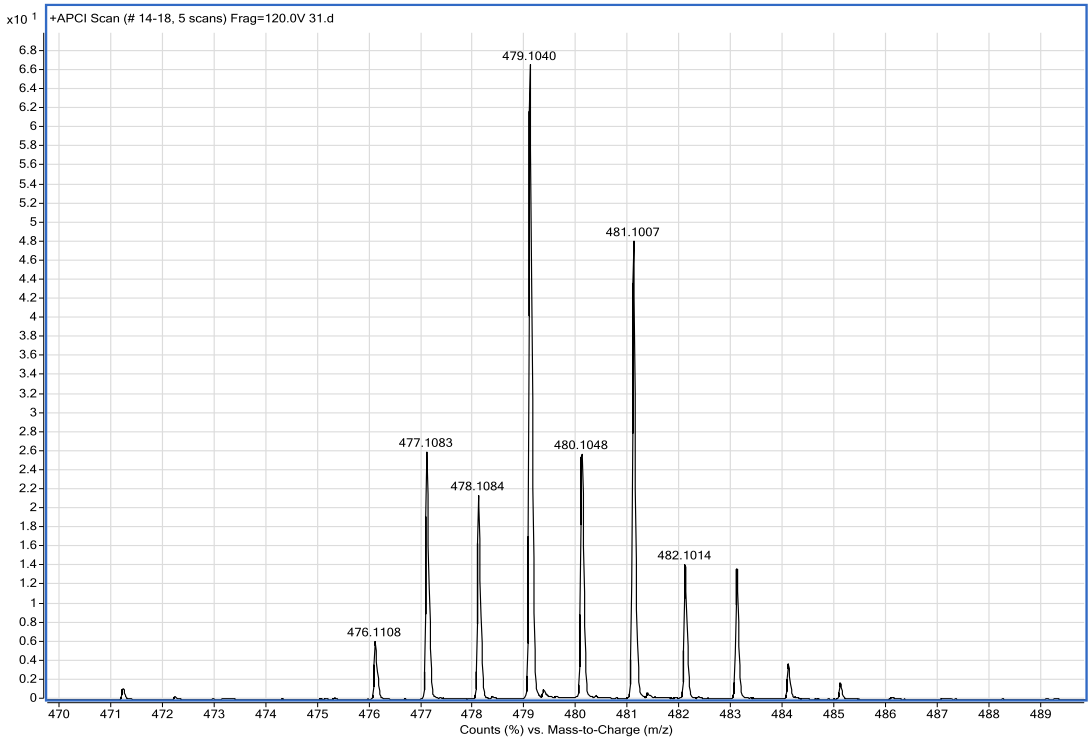
HRMS of **3e**



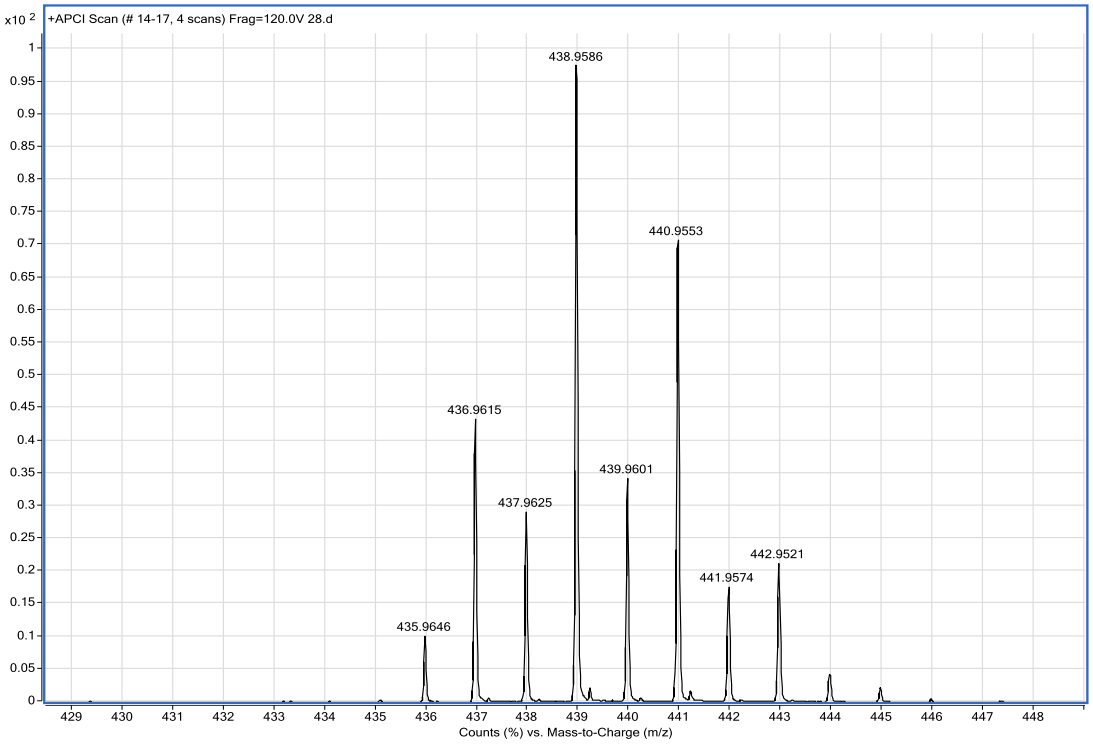
HRMS of **3f**



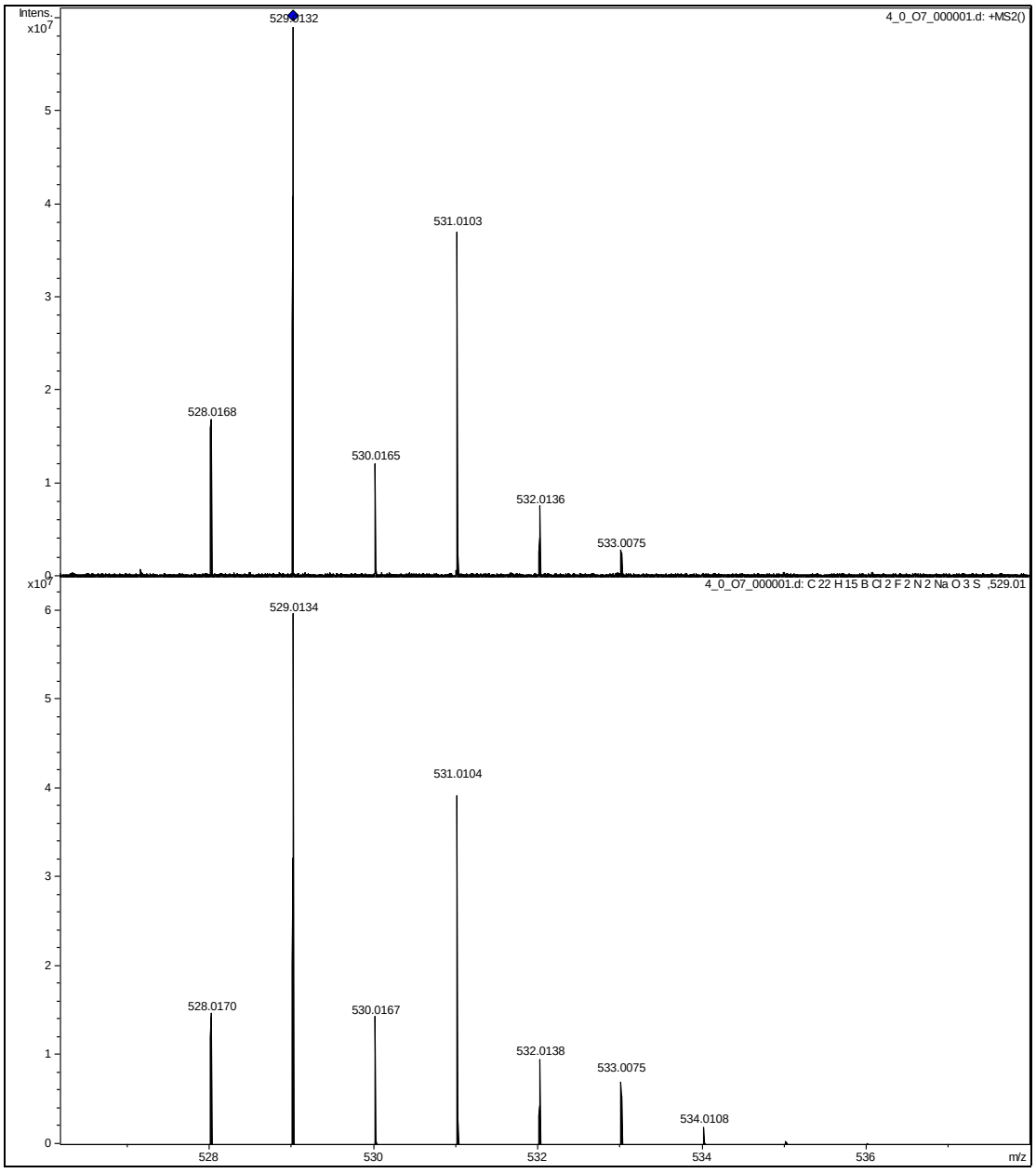
HRMS of **3g**



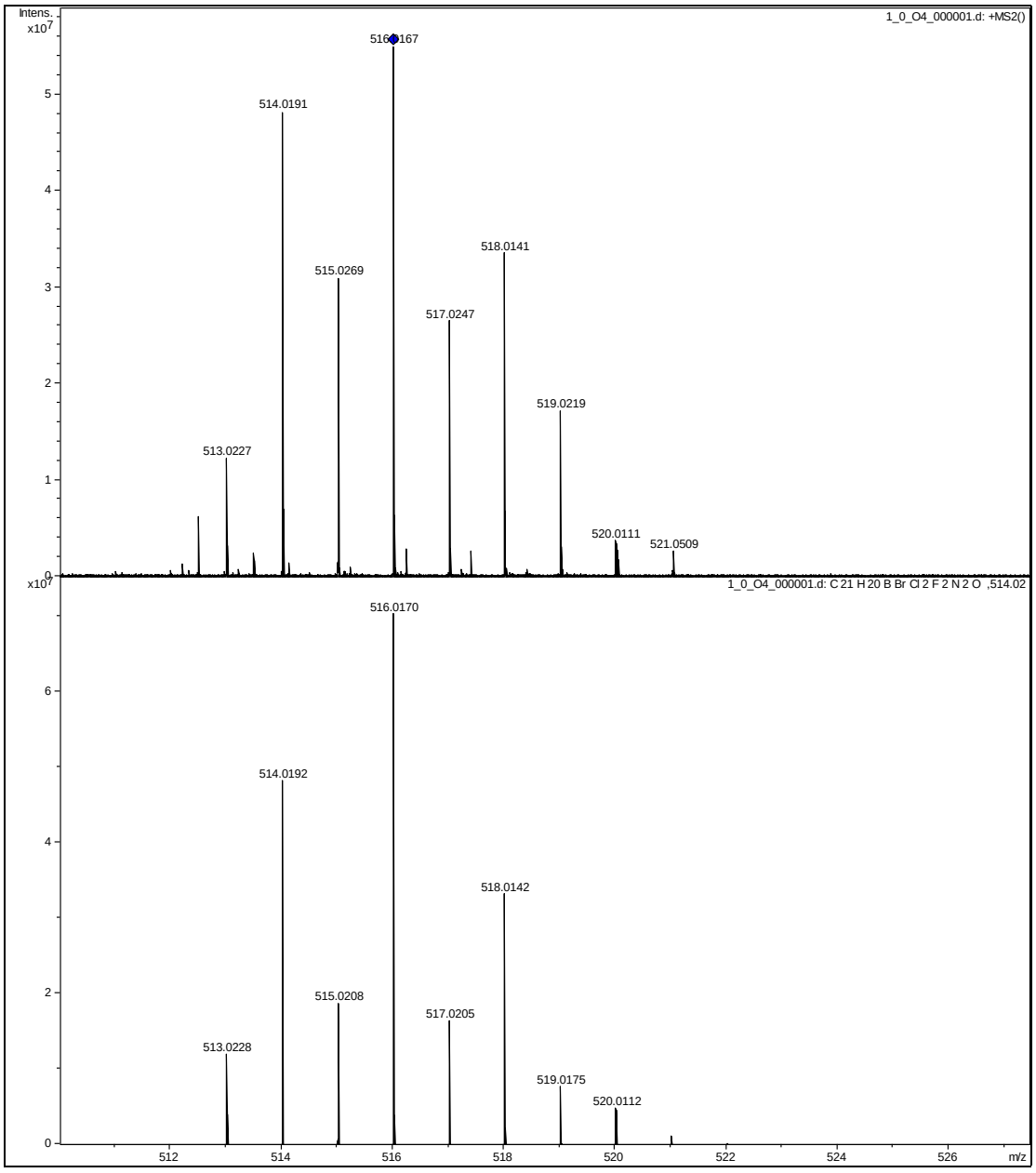
HRMS of **3h**


x10 2
+APCI Scan (# 14-17, 4 scans) Frag=120.0V 28.d
438.9586
440.9553
436.9615
439.9601
437.9625
442.9521
441.9574
435.9646
Counts (%) vs. Mass-to-Charge (m/z)

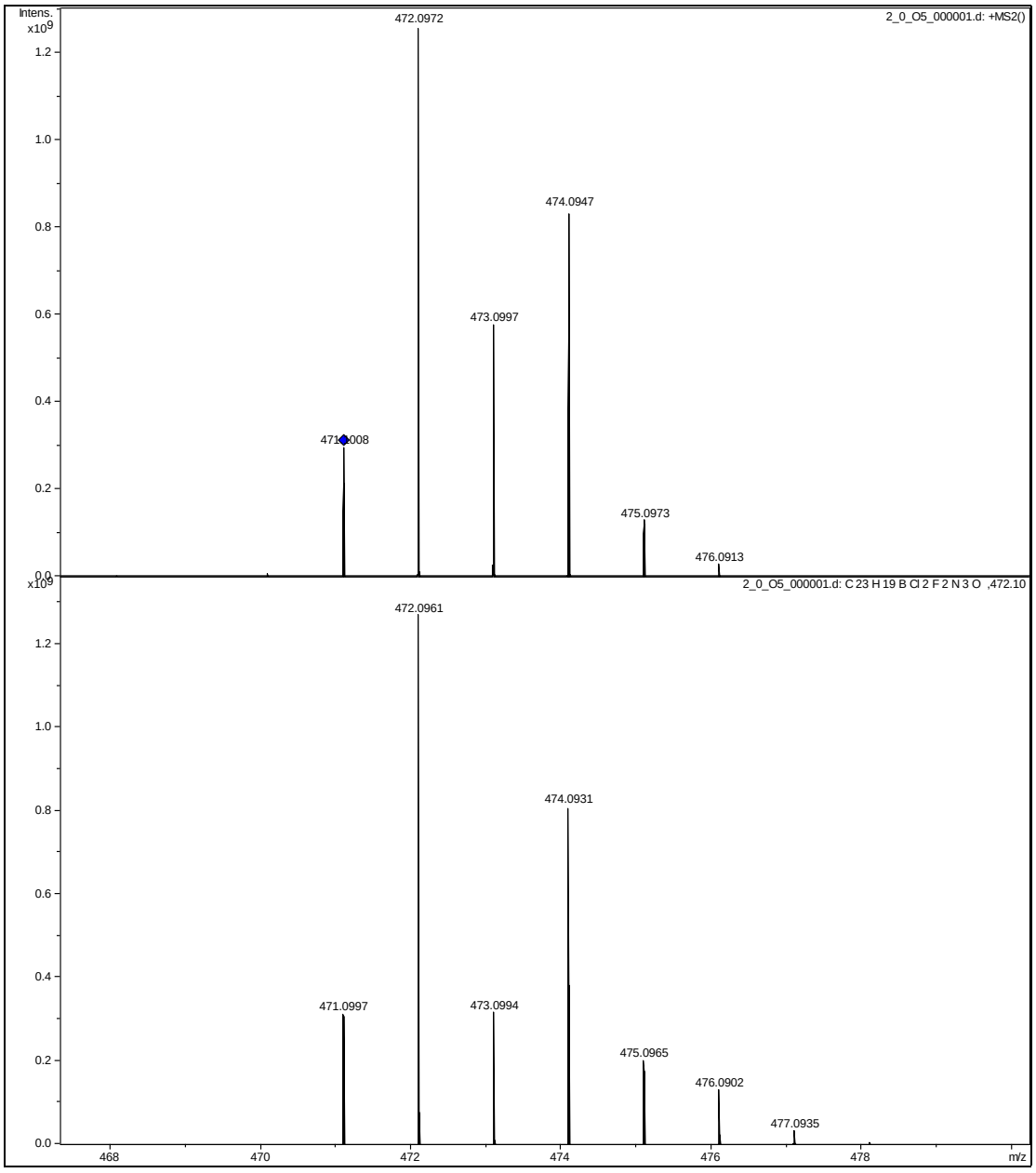
HRMS of **3i**



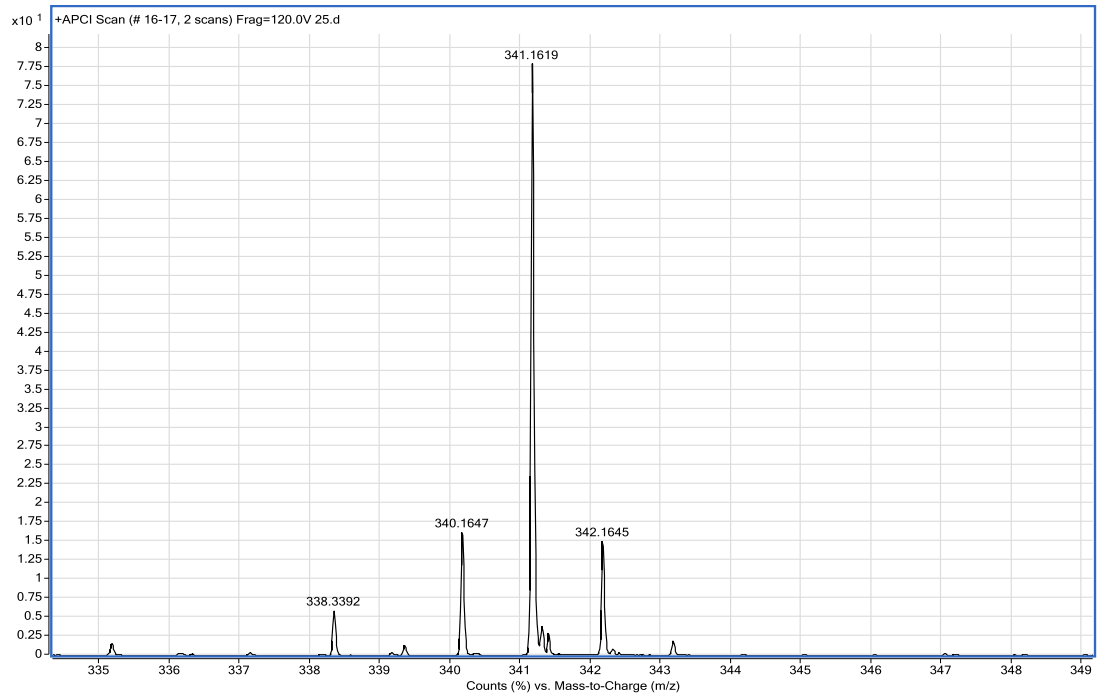
Observed (top) and calculated (bottom) HRMS for **3ia**.



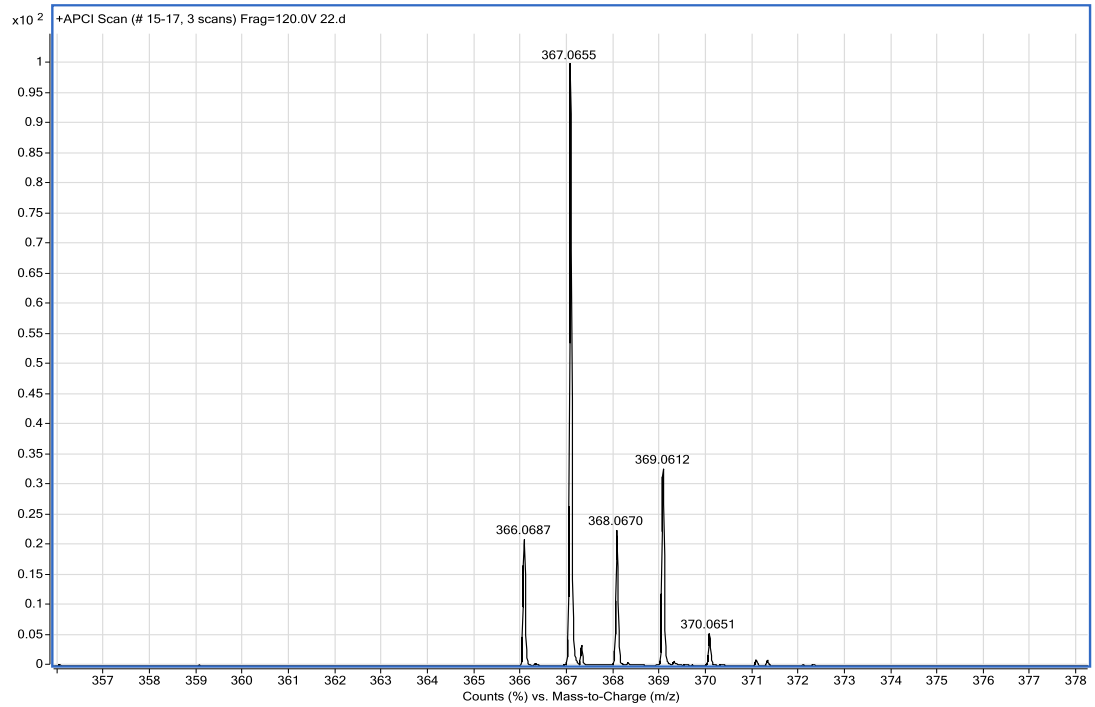
Observed (top) and calculated (bottom) HRMS for **3j**.



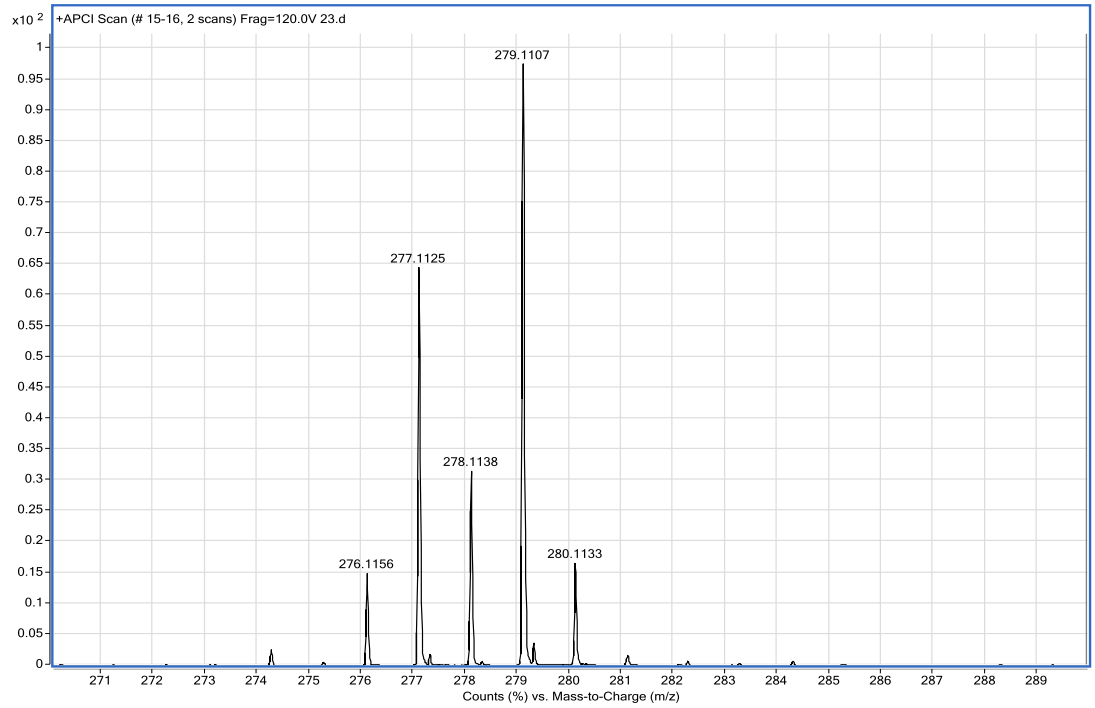
Observed (top) and calculated (bottom) HRMS for **3k**.



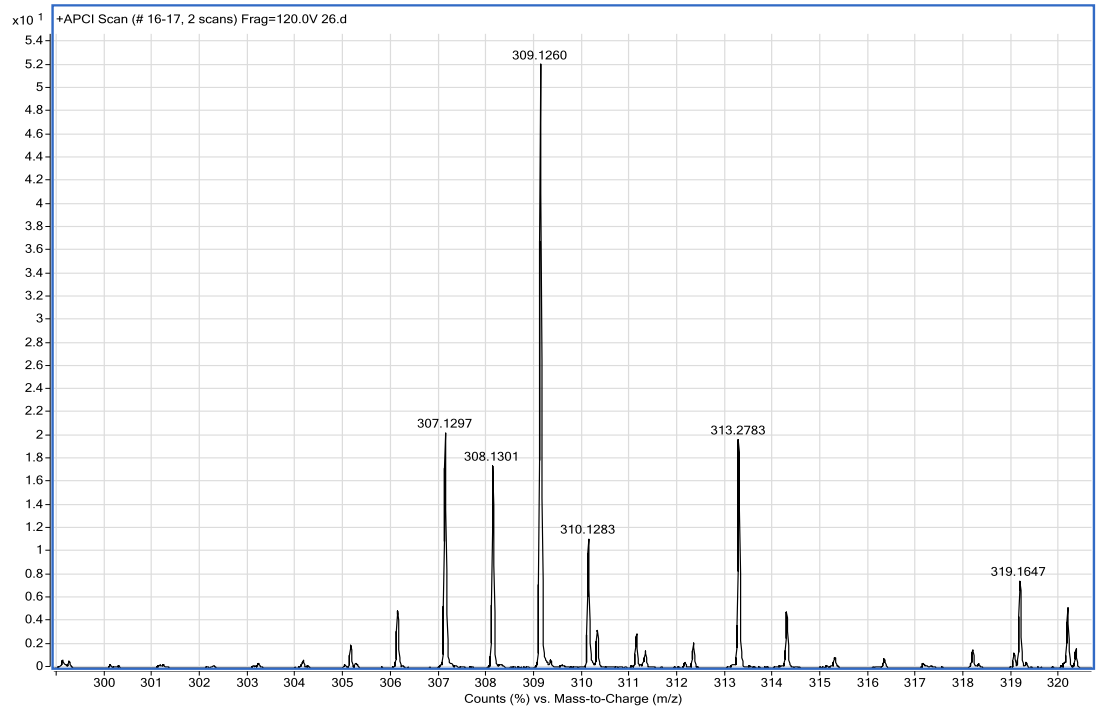
HRMS of **3l**



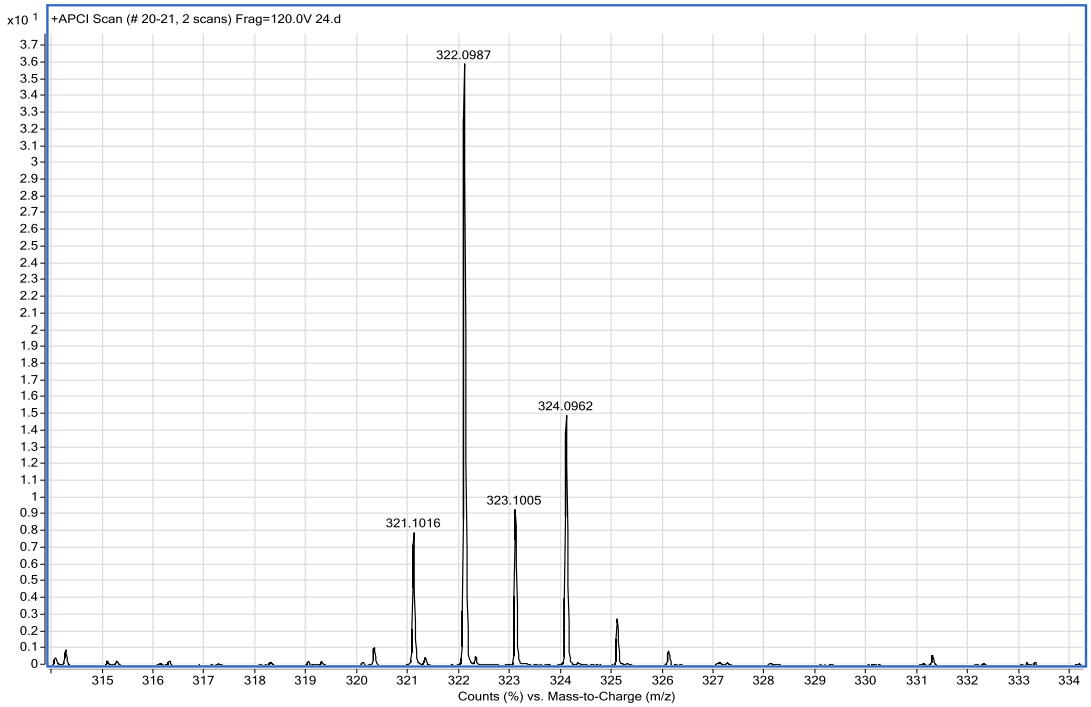
HRMS of **3m**



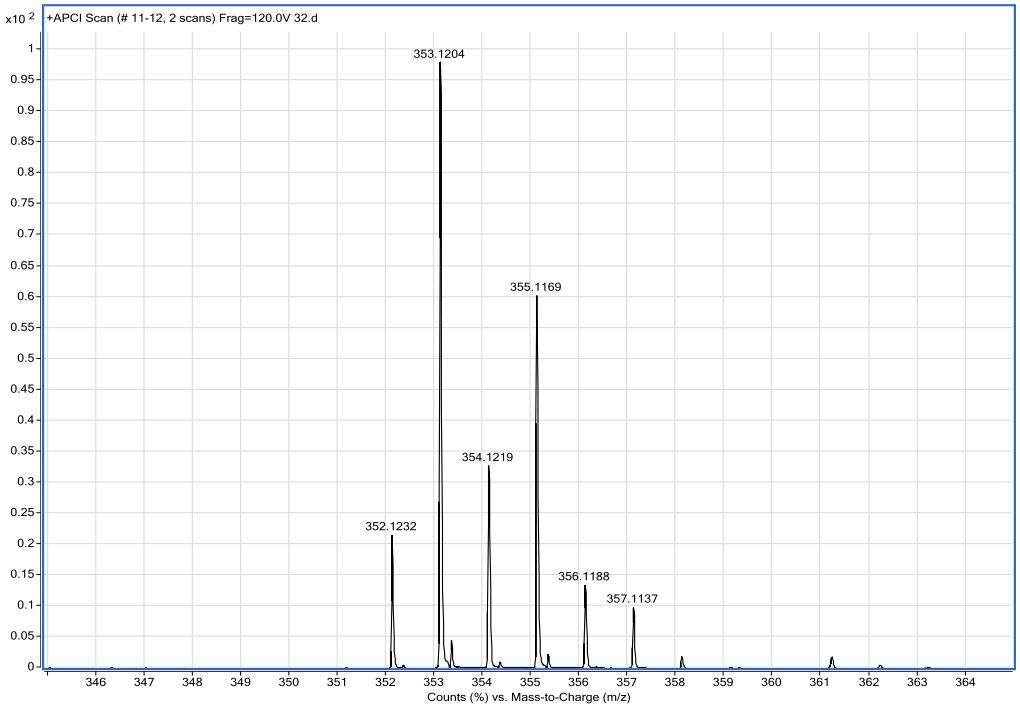
HRMS of **3n**



HRMS of **3o**

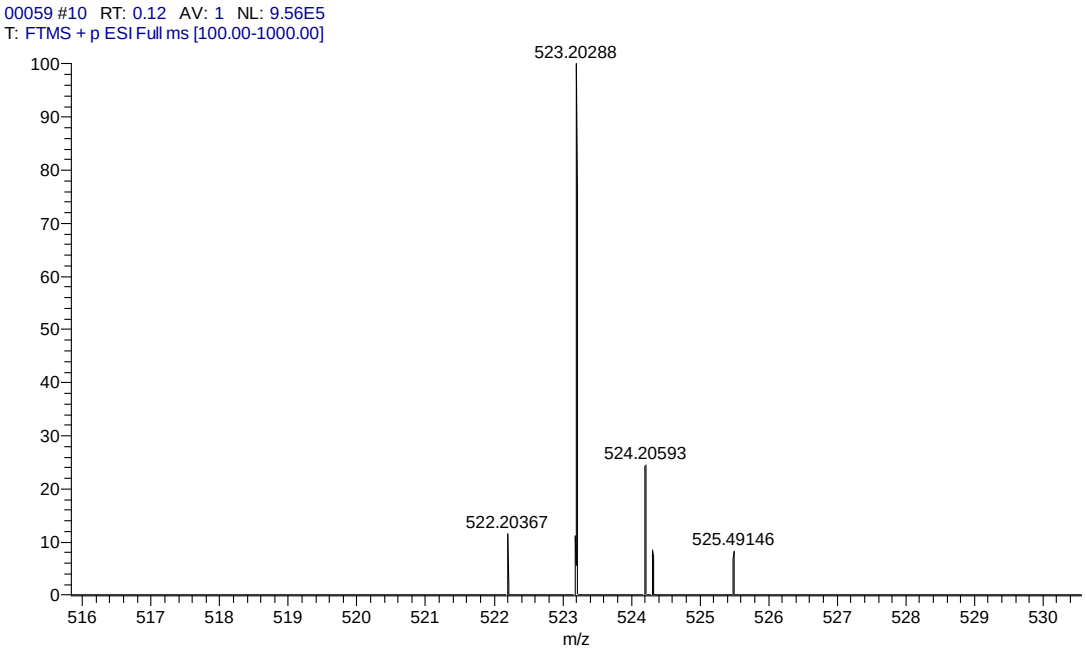


HRMS of **3p**

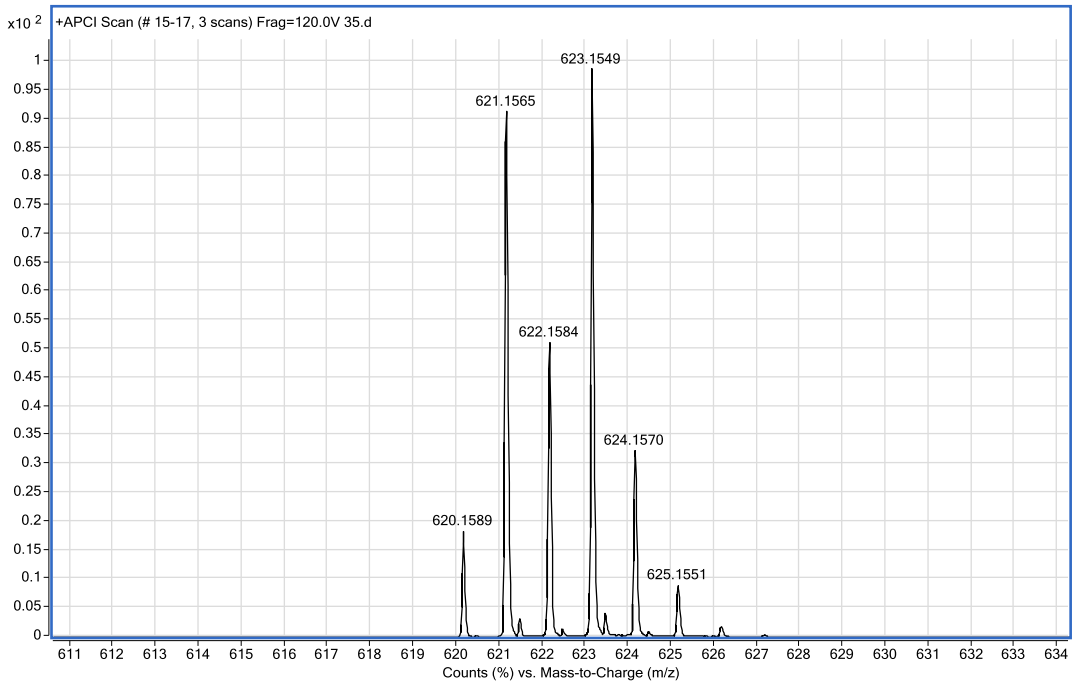


HRMS of **4**

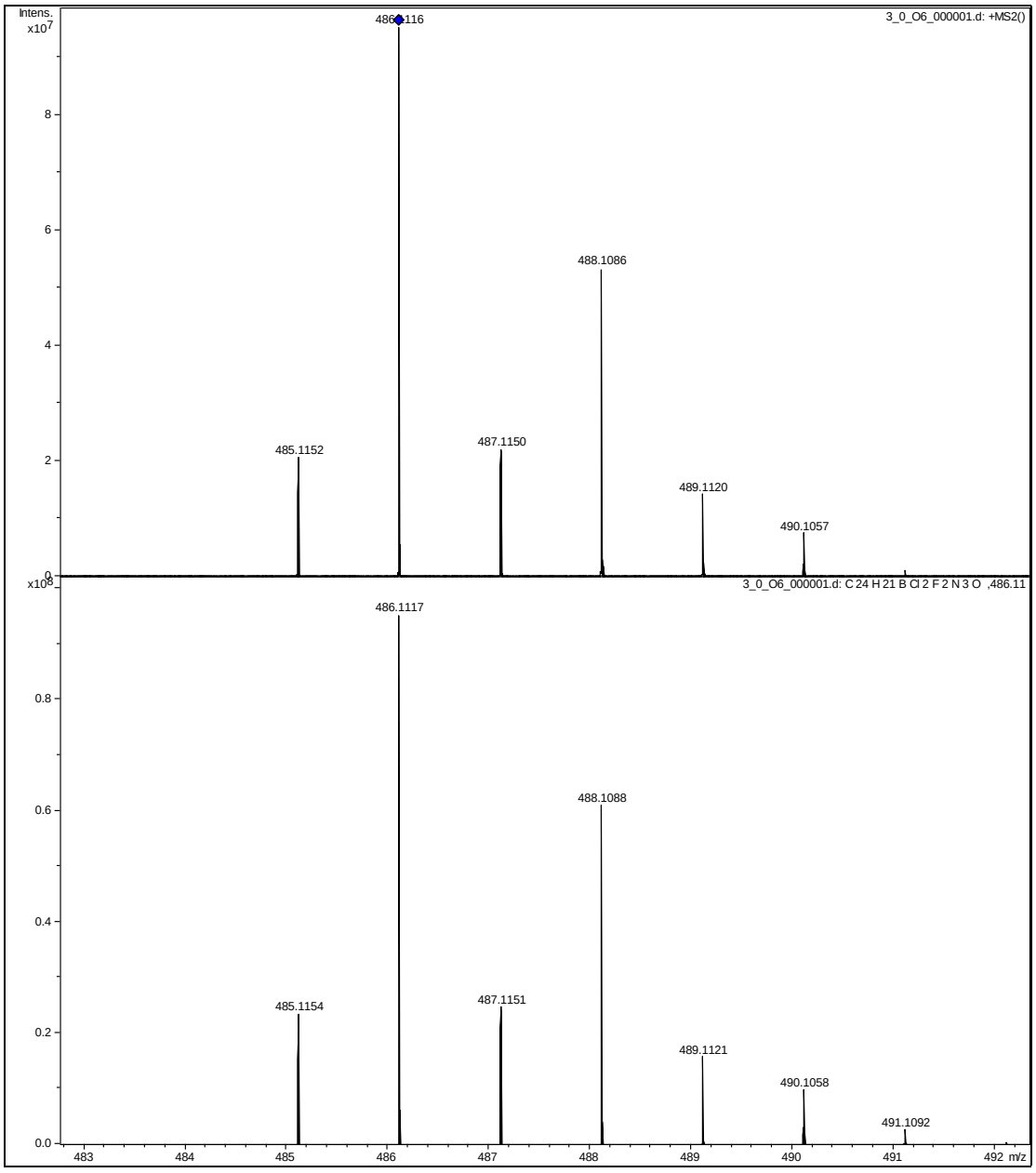
HRMS of **5a**



HRMS of **5a**



HRMS for **5b**



Observed (top) and calculated (bottom) HRMS for **6**.

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