Supporting Information

Synthesis of a Visibly Emissive 9-nitro-2,3-dihydro-1H-pyrimido[1,2-a]quinoxalin-5-amine Scaffold with Large Stokes Shift and Live Cell Imaging

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Author Contributions

‡These authors contributed equally.

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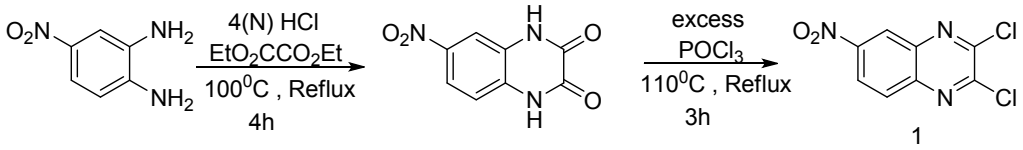
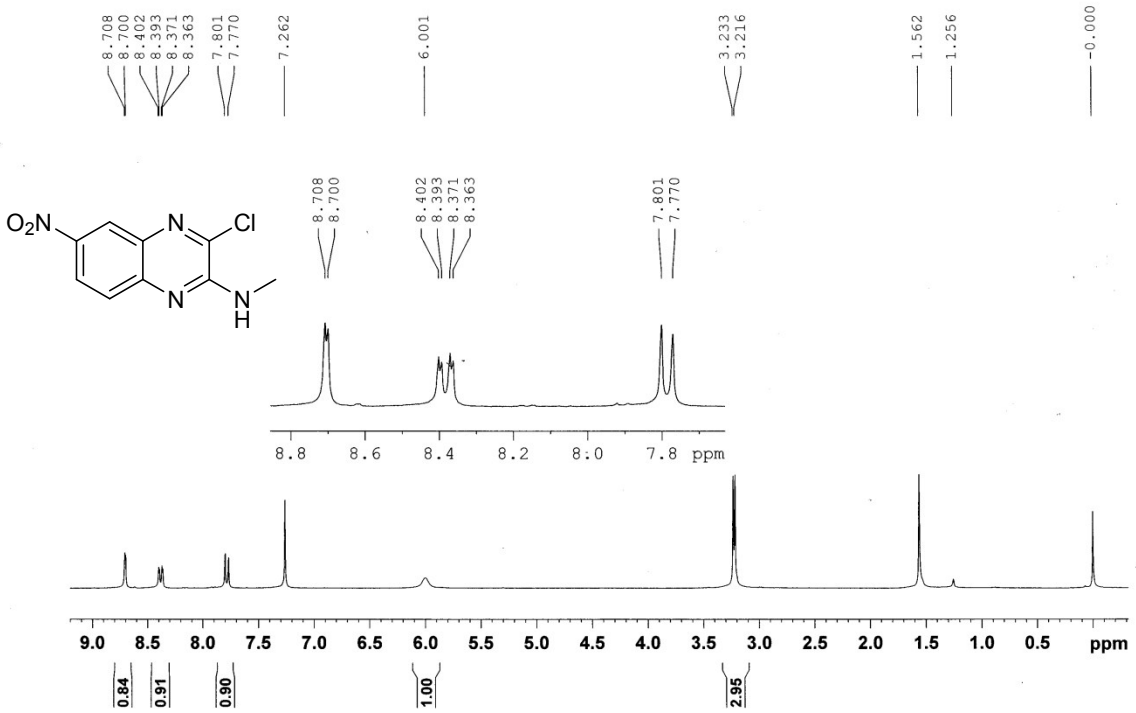
S1 Synthesis :



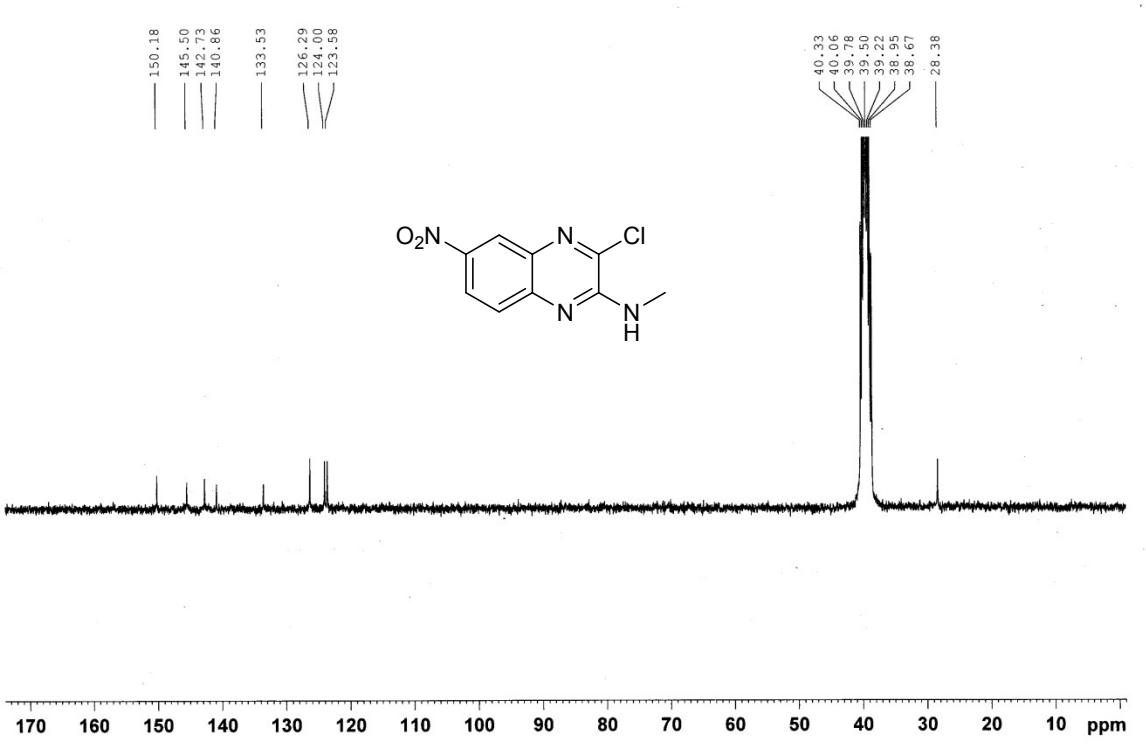
Scheme S1 Synthesis of 2,3-dichloro-6-nitroquinoxaline[1]

S 2 ^{1}H-NMR and ^{13}C-NMR spectra of (**2a-2h**), (**3a-3h**), (**4a-4h**) and (**5a,5c-5e**) :

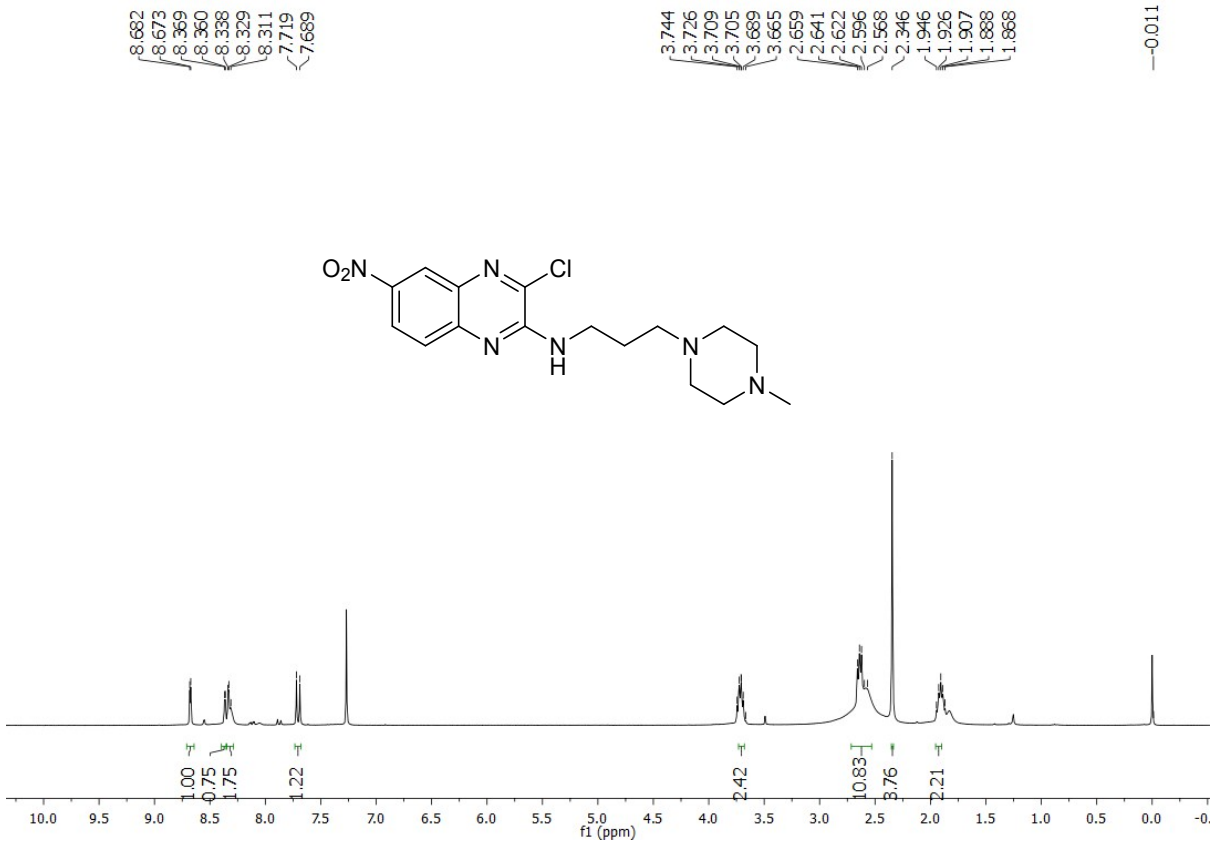
^{1}H-NMR ($CDCl_3$, 300 MHz) of **2a**



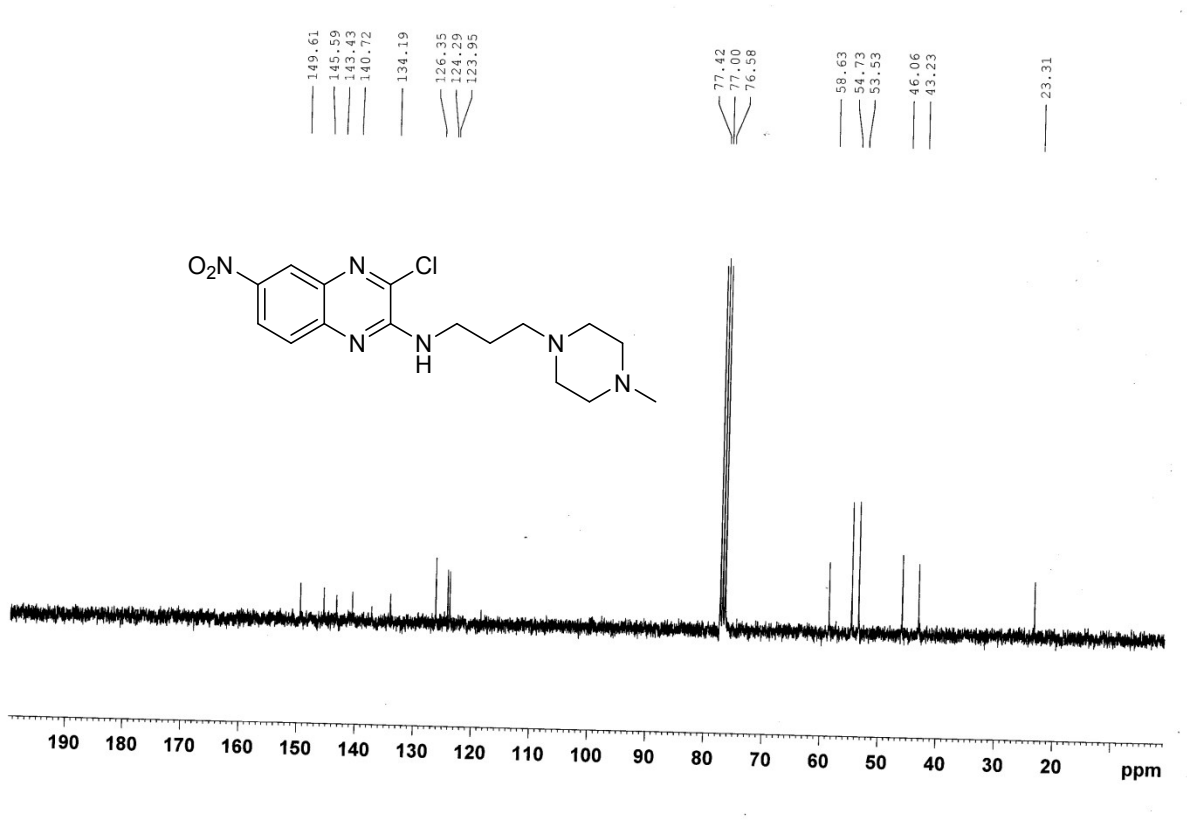
^{13}C-NMR (DMSO-d_6, 75 MHz) of **2a**



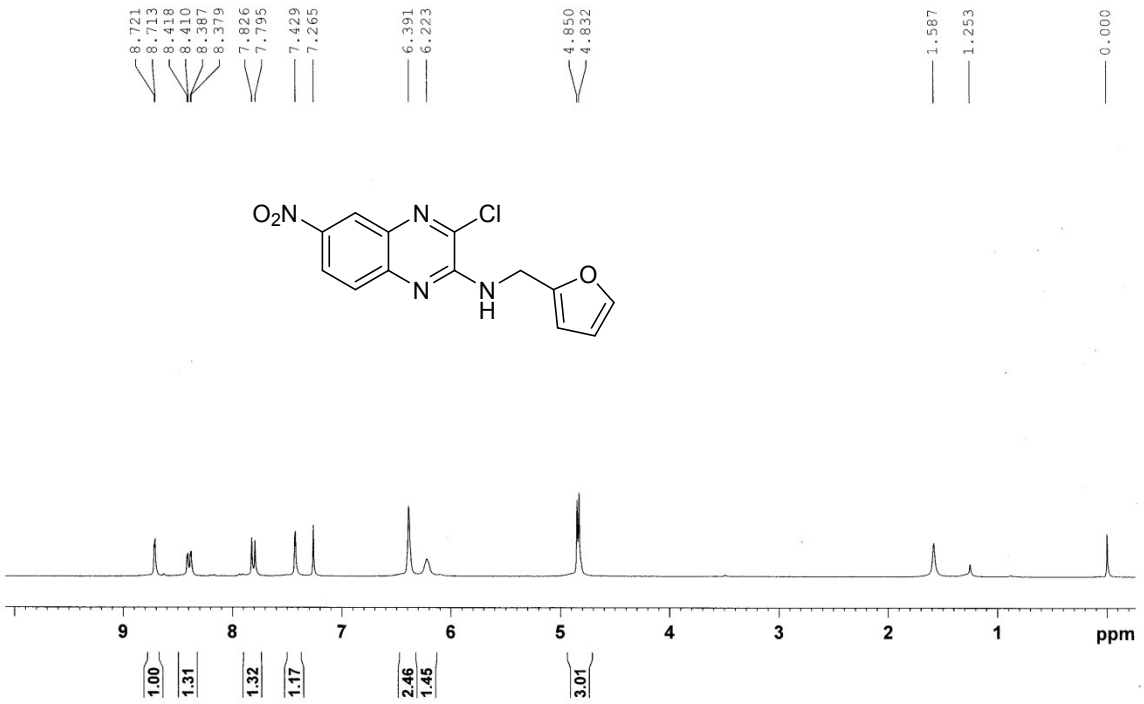
^{1}H-NMR ($CDCl_3$, 300 MHz) of **2b**



^{13}C-NMR ($CDCl_3$, 75 MHz) of **2b**



^{1}H-NMR ($CDCl_3$, 300 MHz) of **2c**



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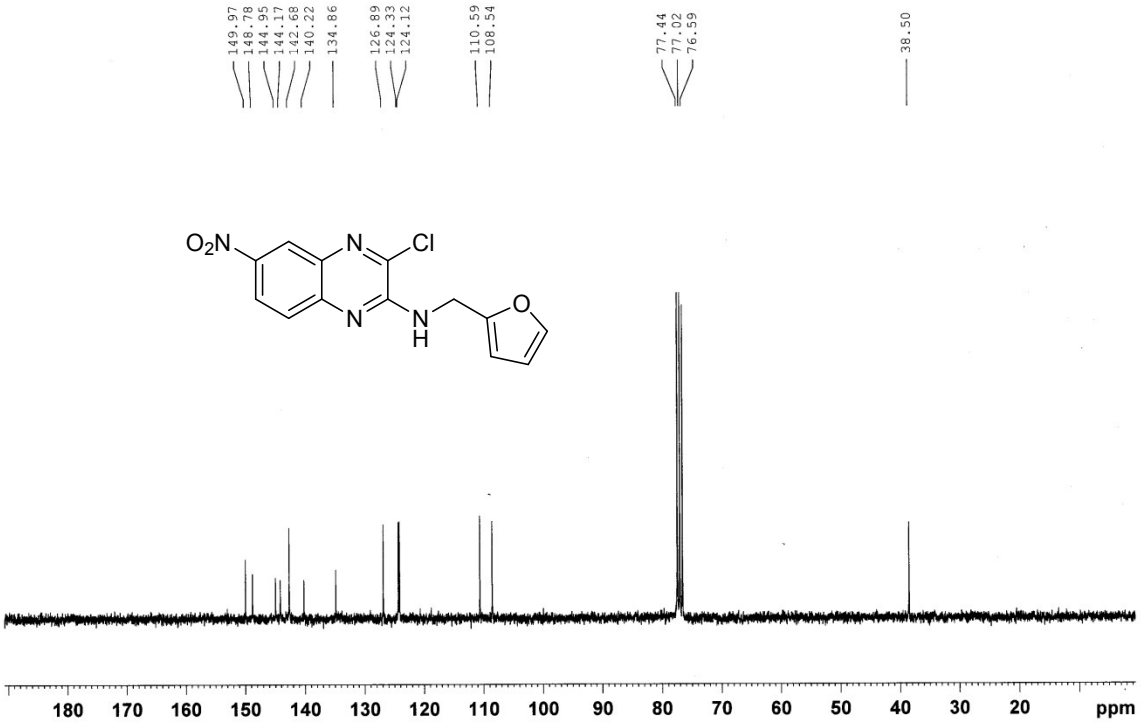
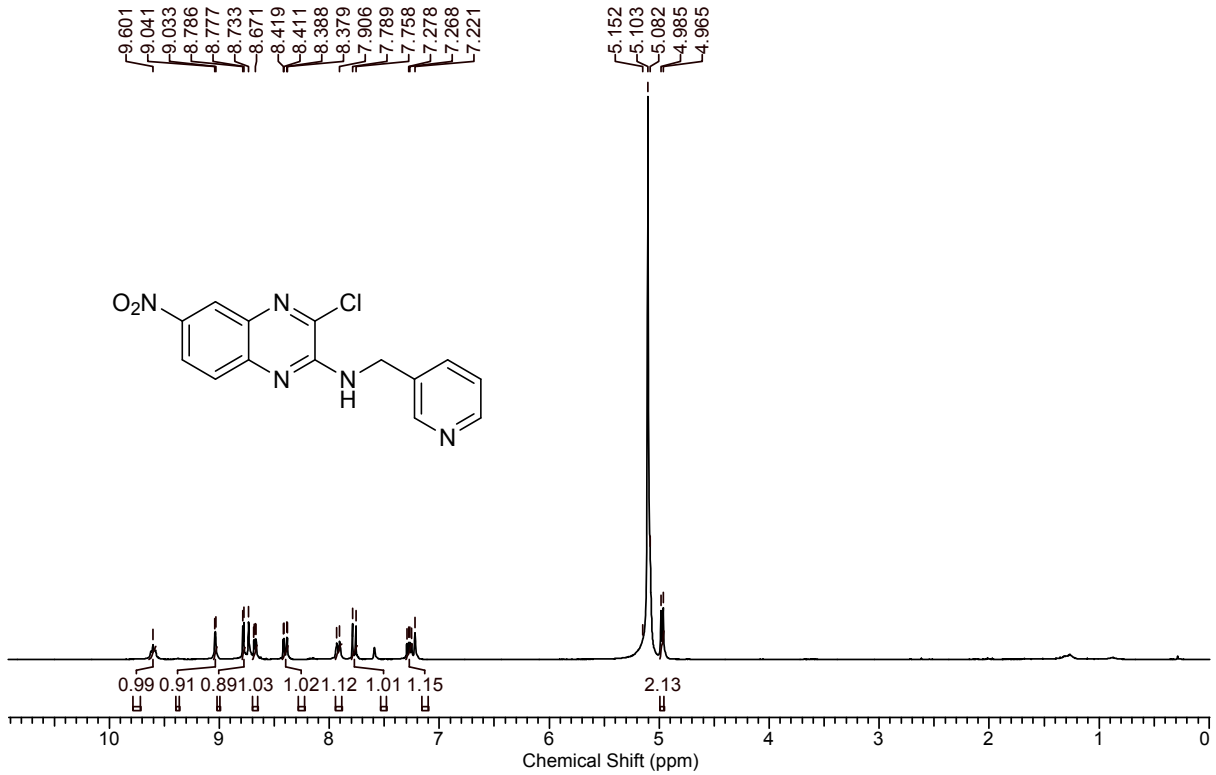
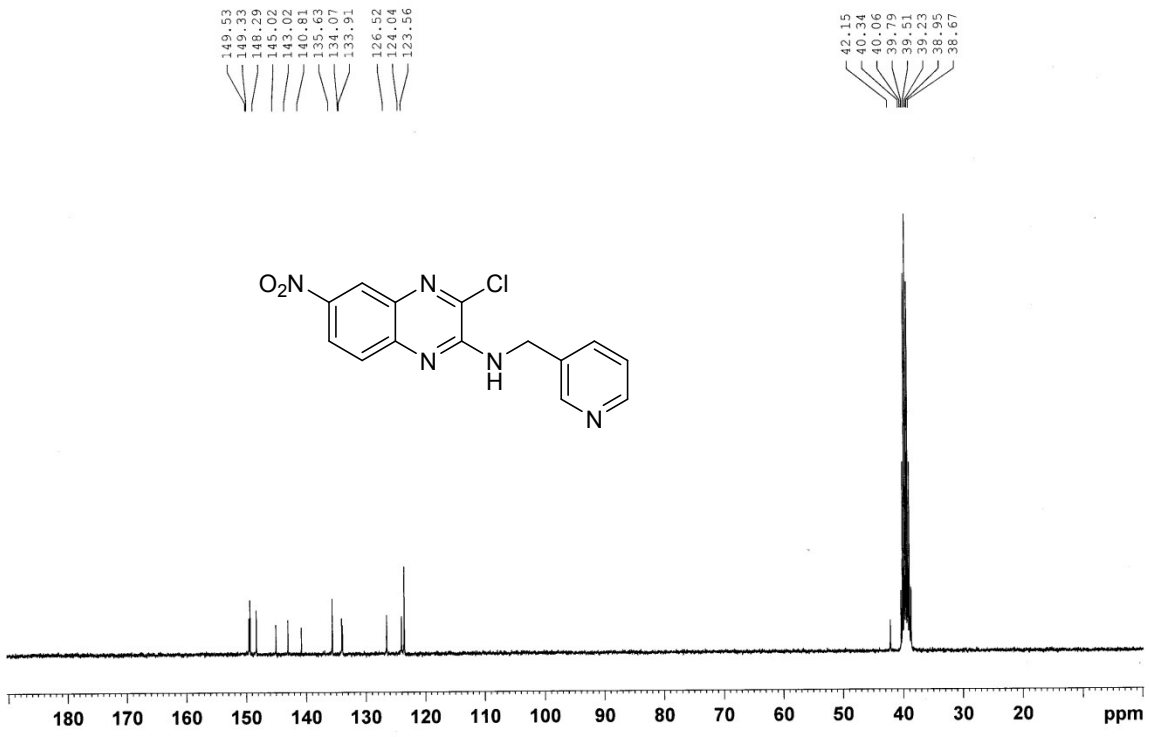


^{1}H-NMR (Pyridine d_5, 300 MHz) of **2d**



^{13}C-NMR (DMSO-d_6, 75 MHz) of **2d**



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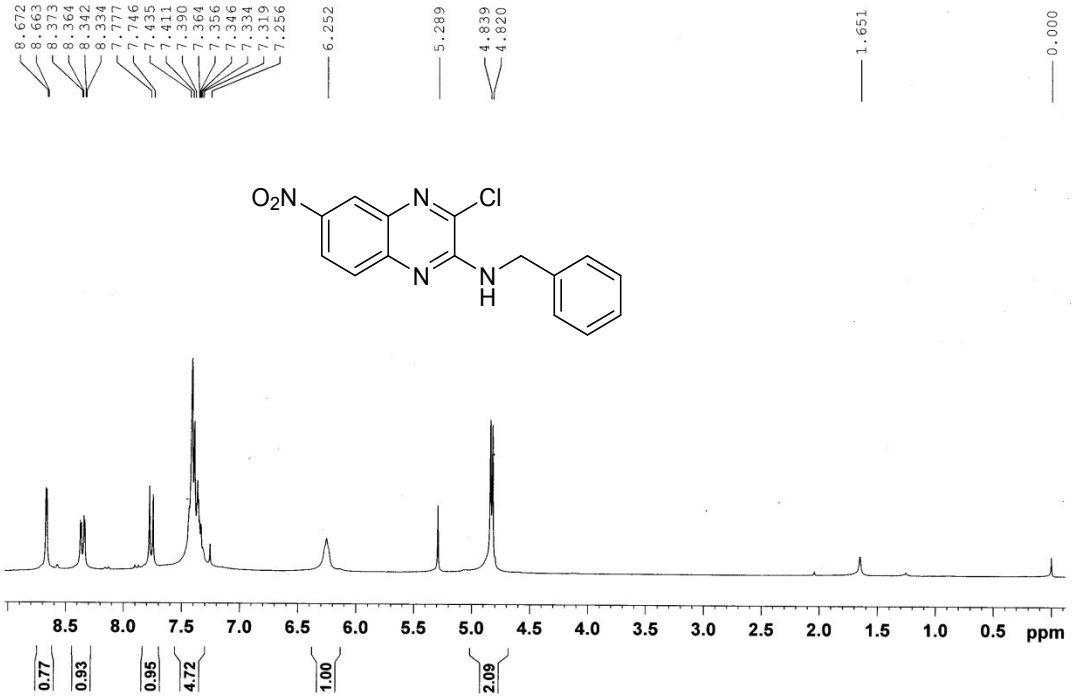

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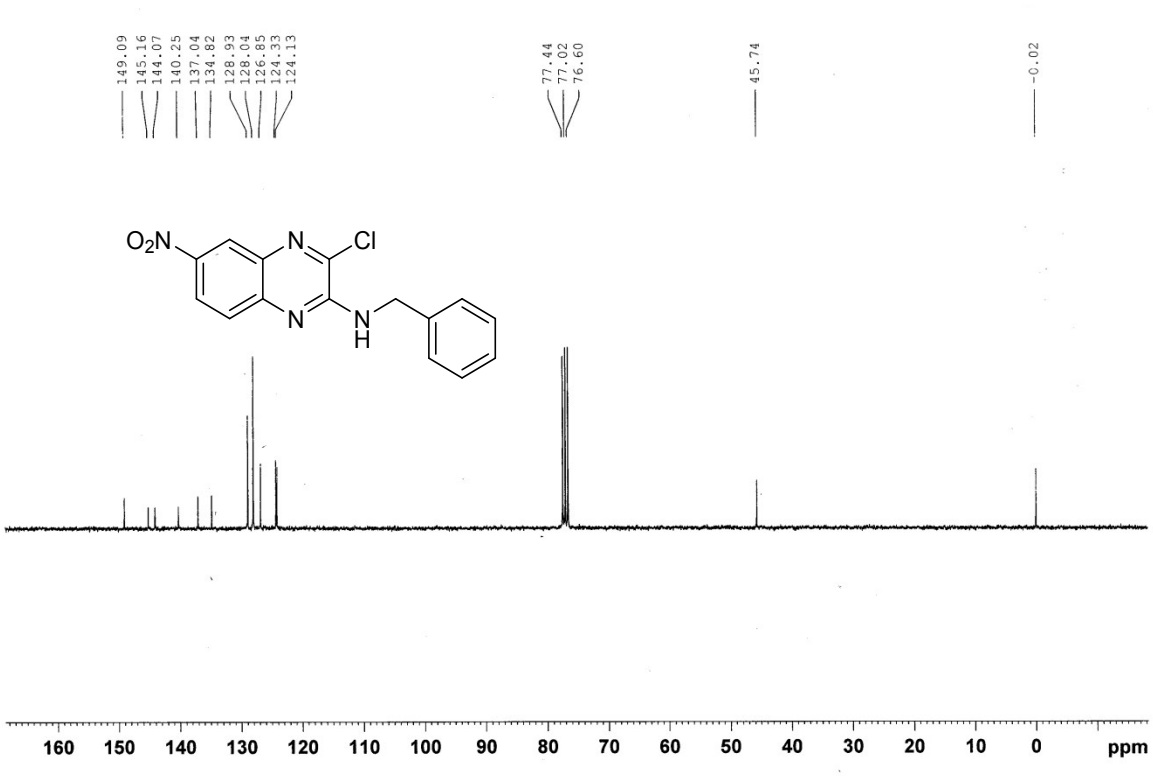

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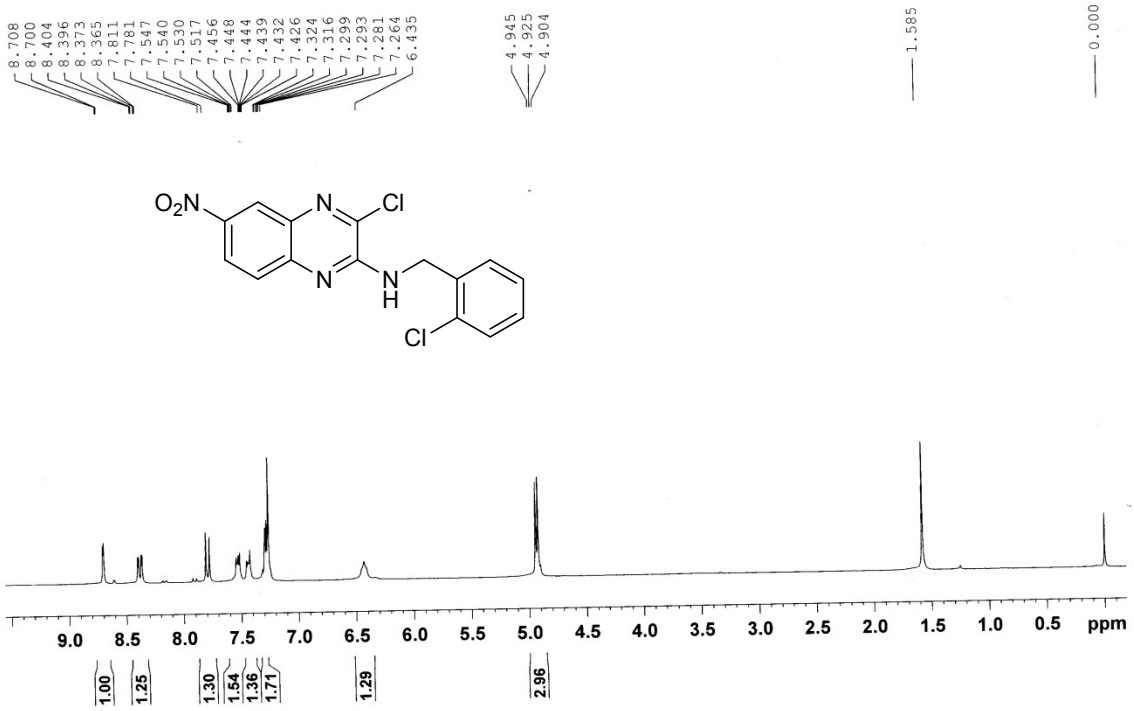

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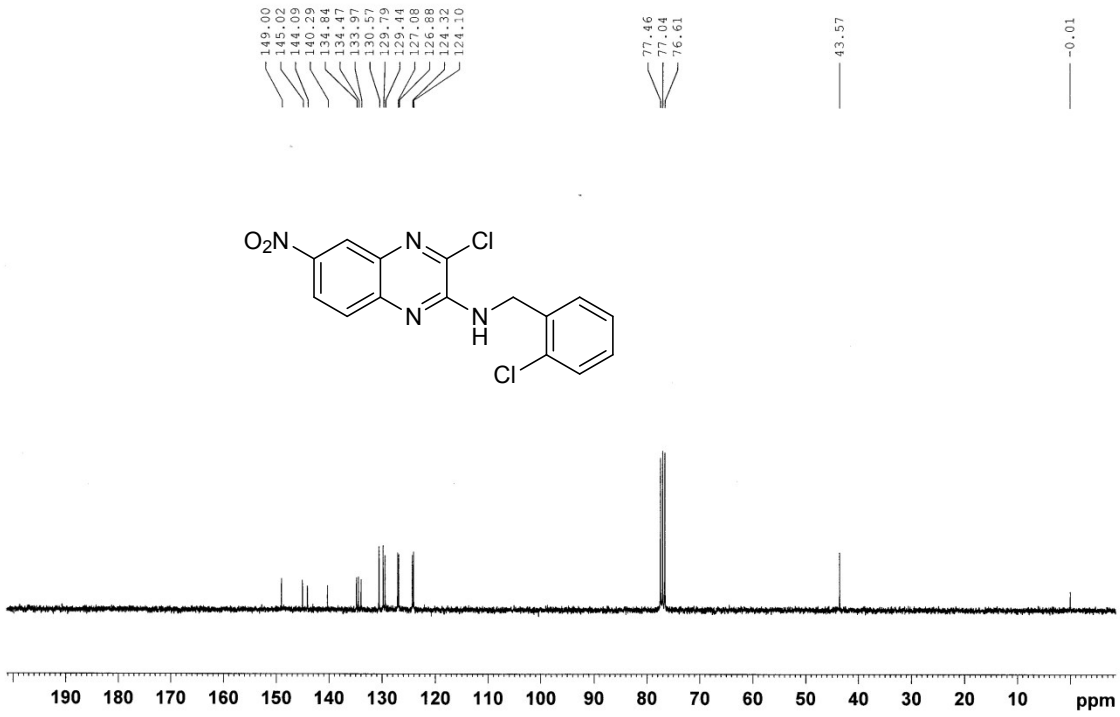

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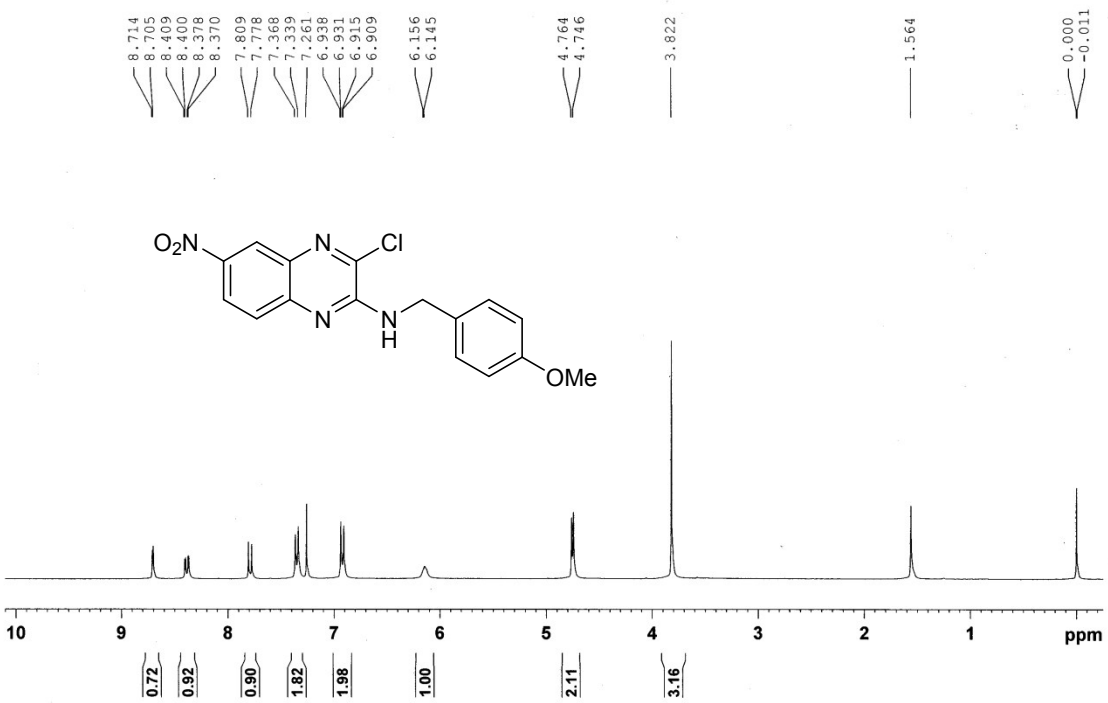

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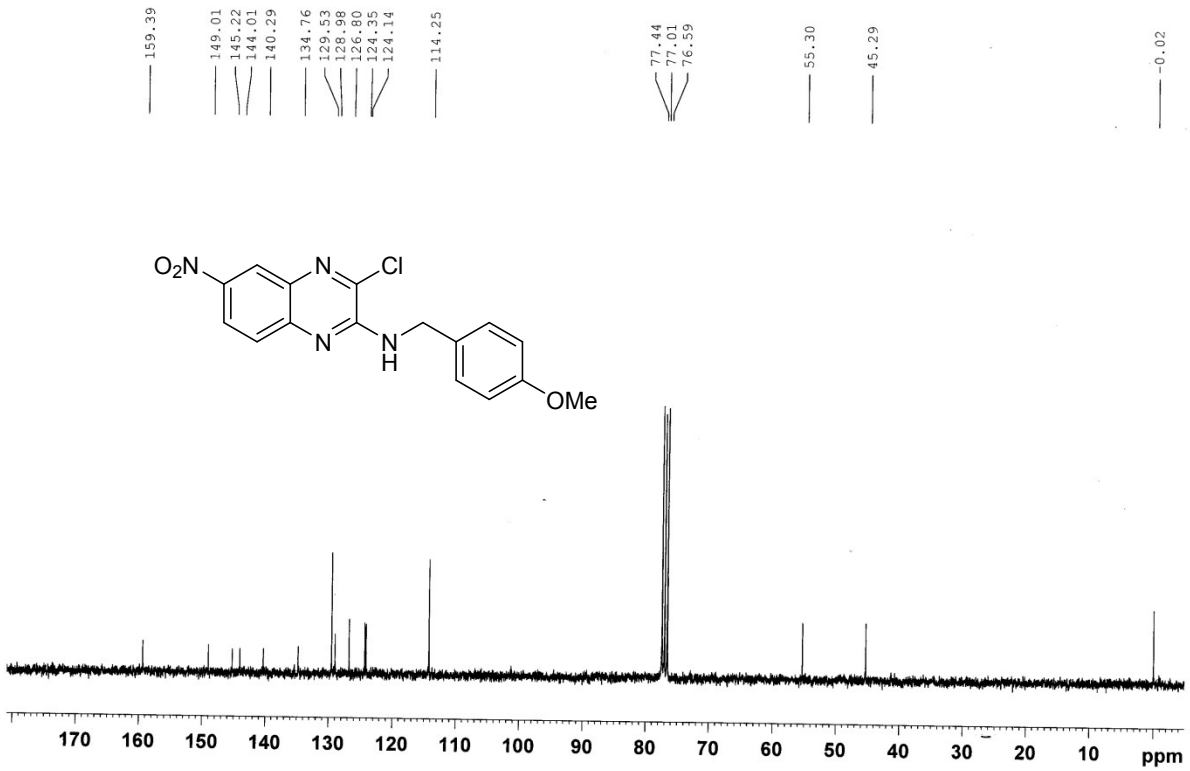

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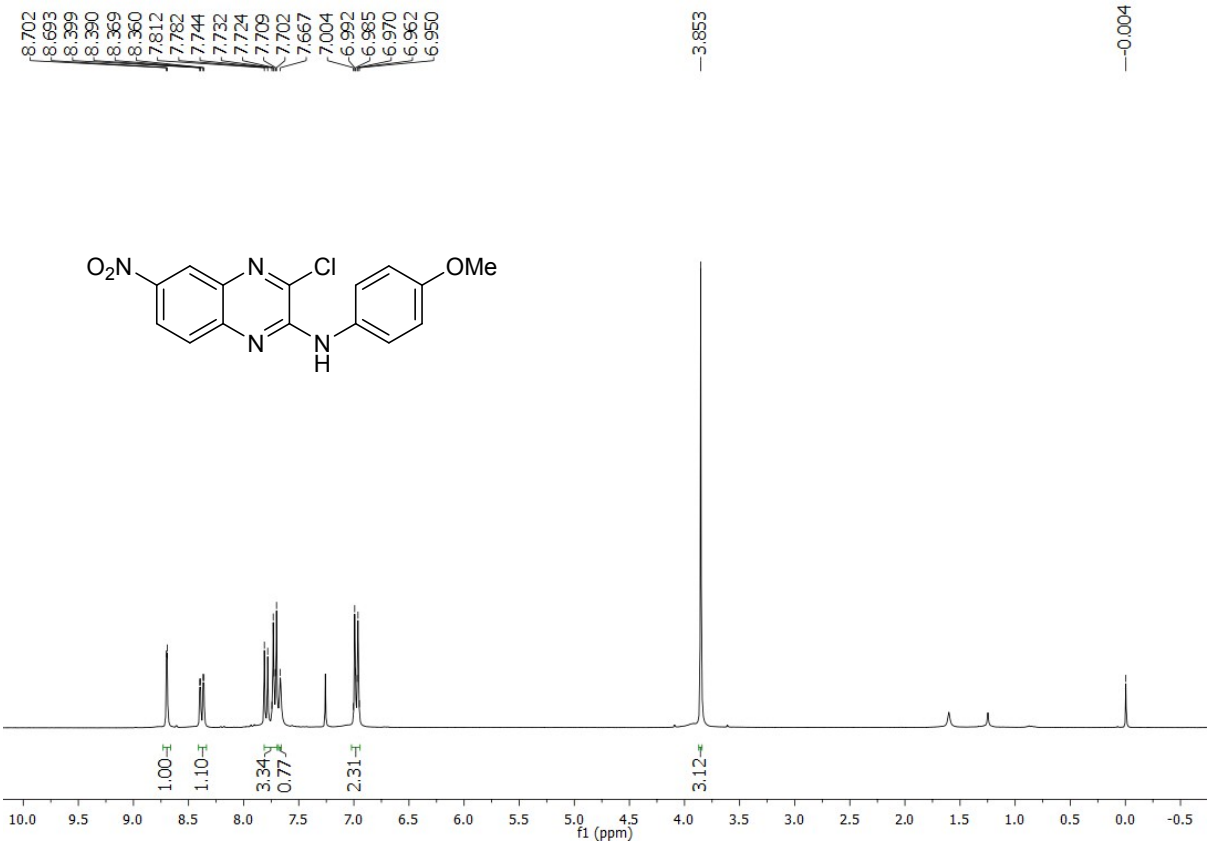

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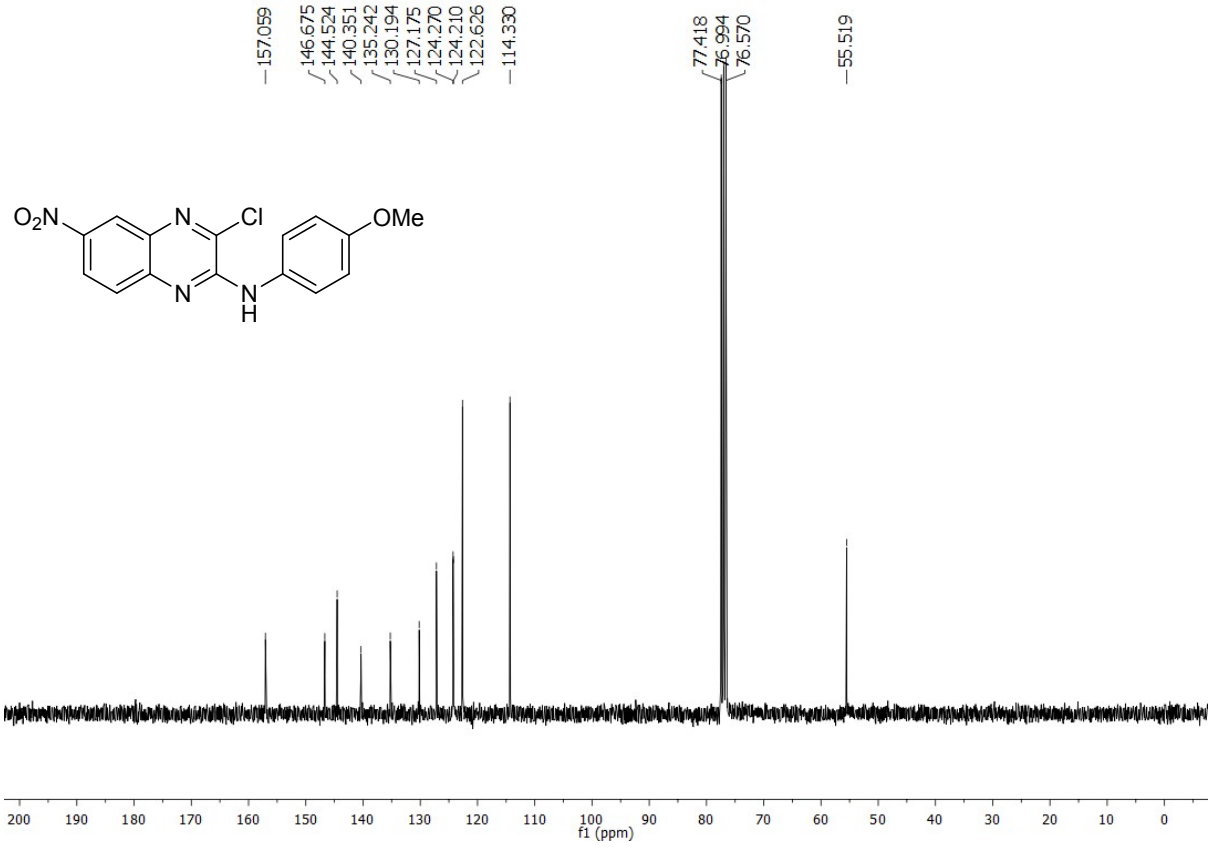
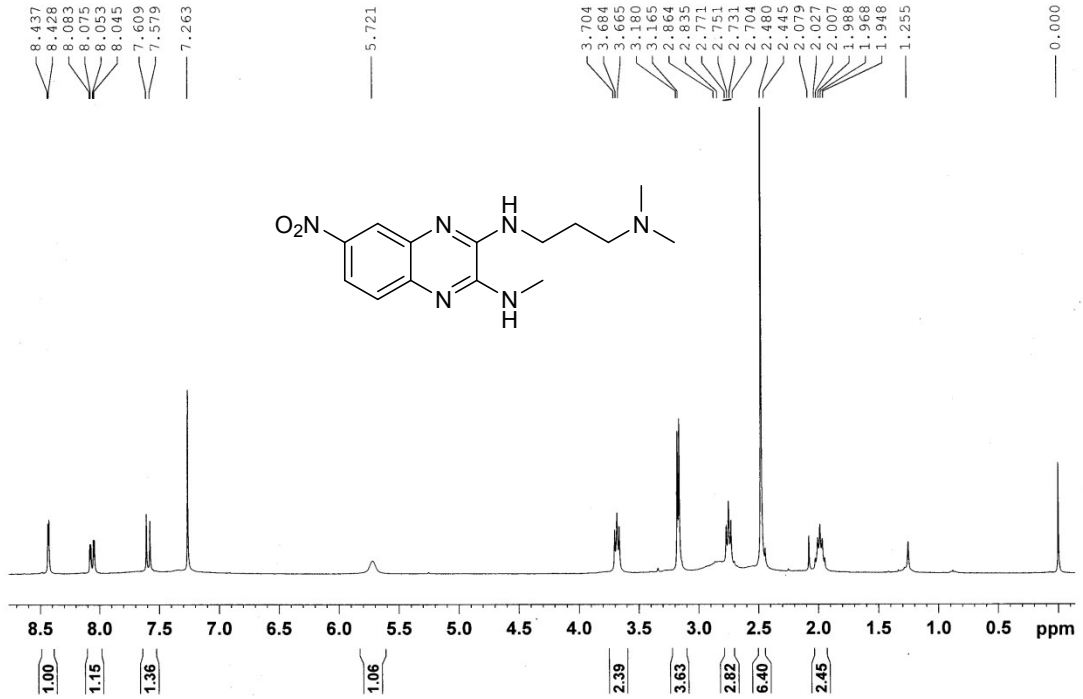


^{1}H-NMR ($CDCl_3$, 300 MHz) of **3a**



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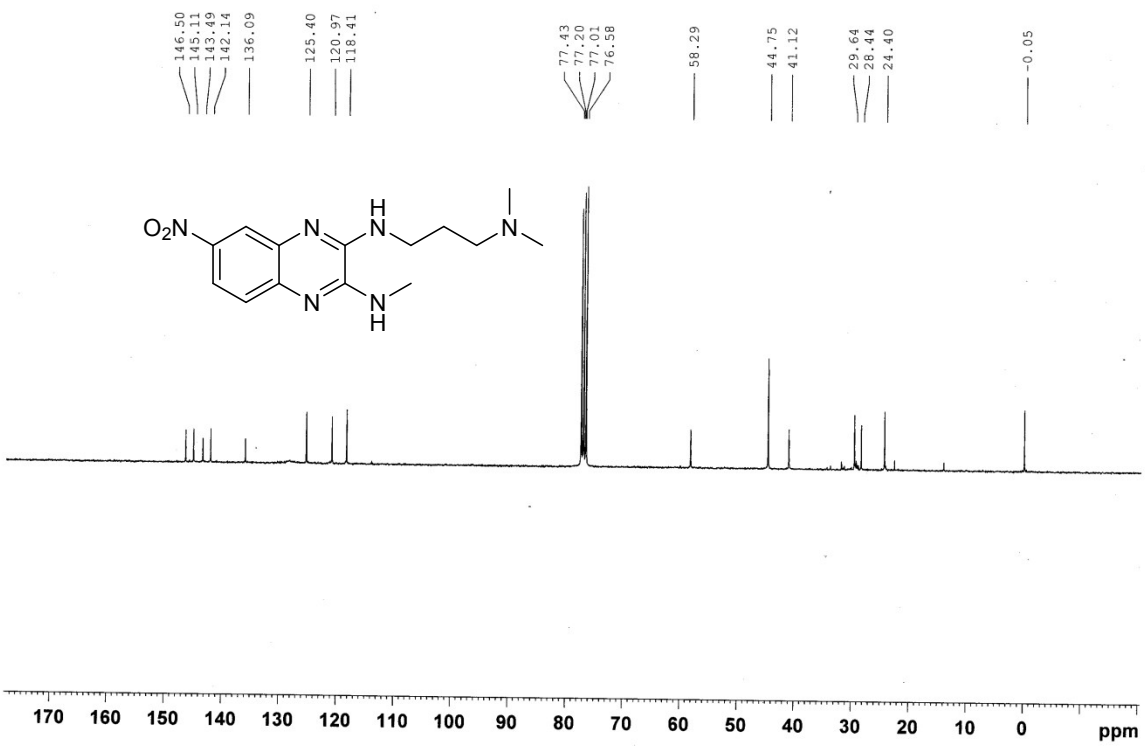

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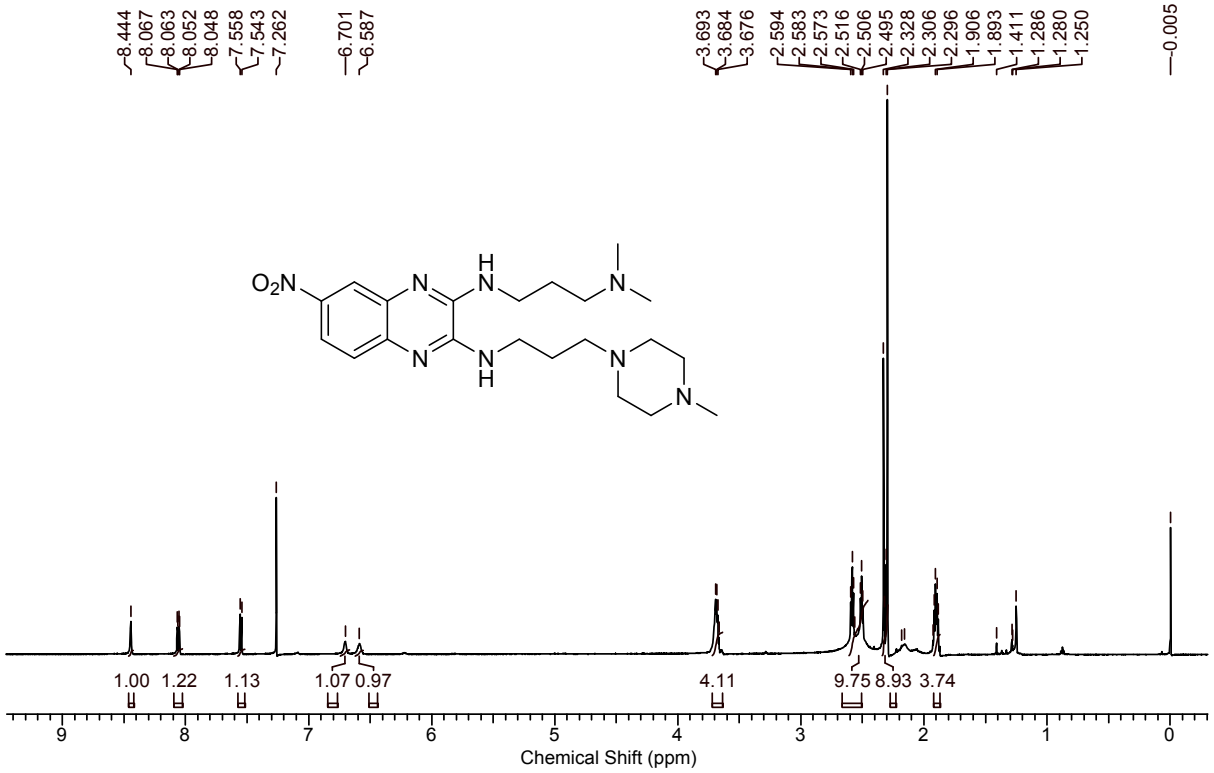

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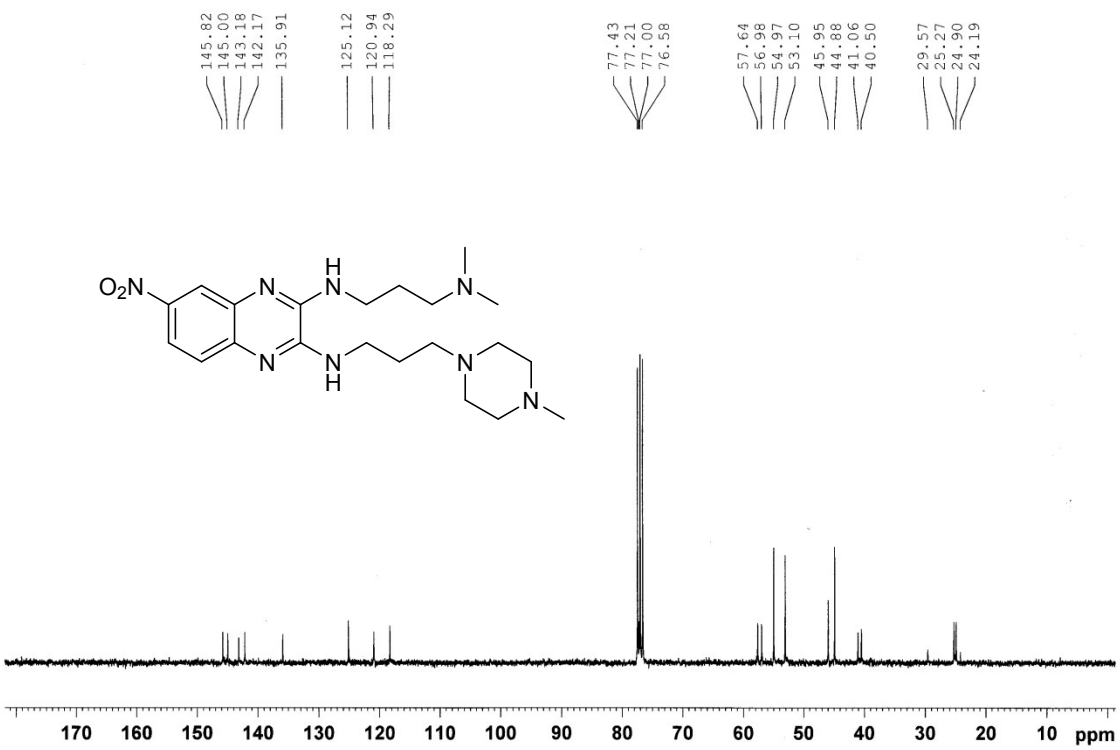

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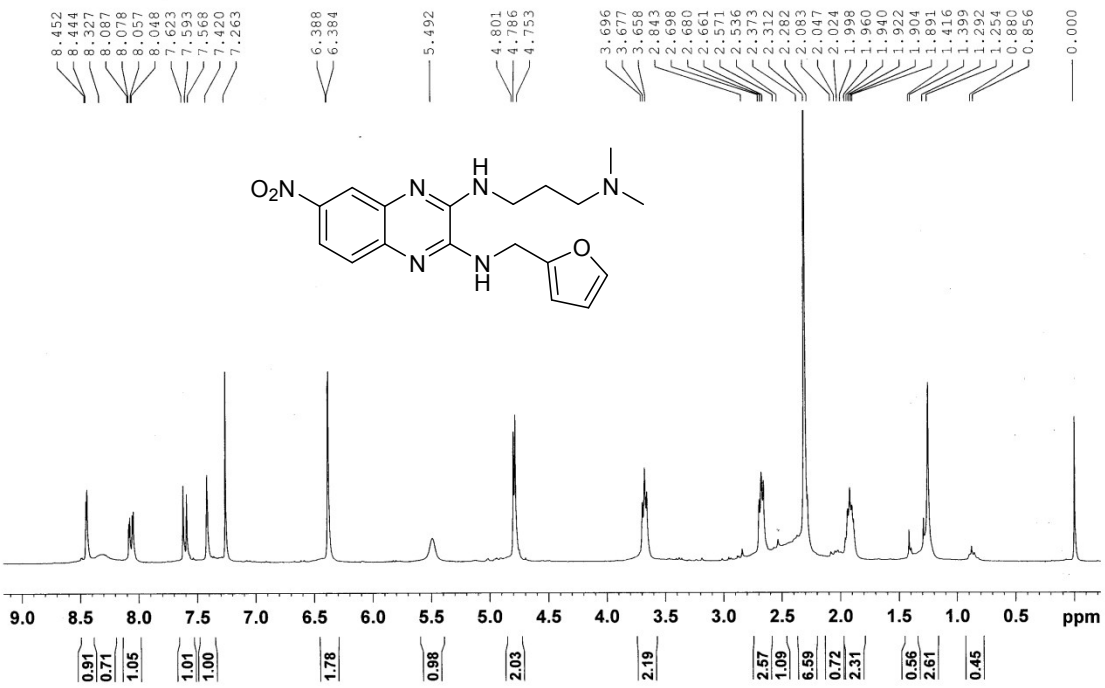

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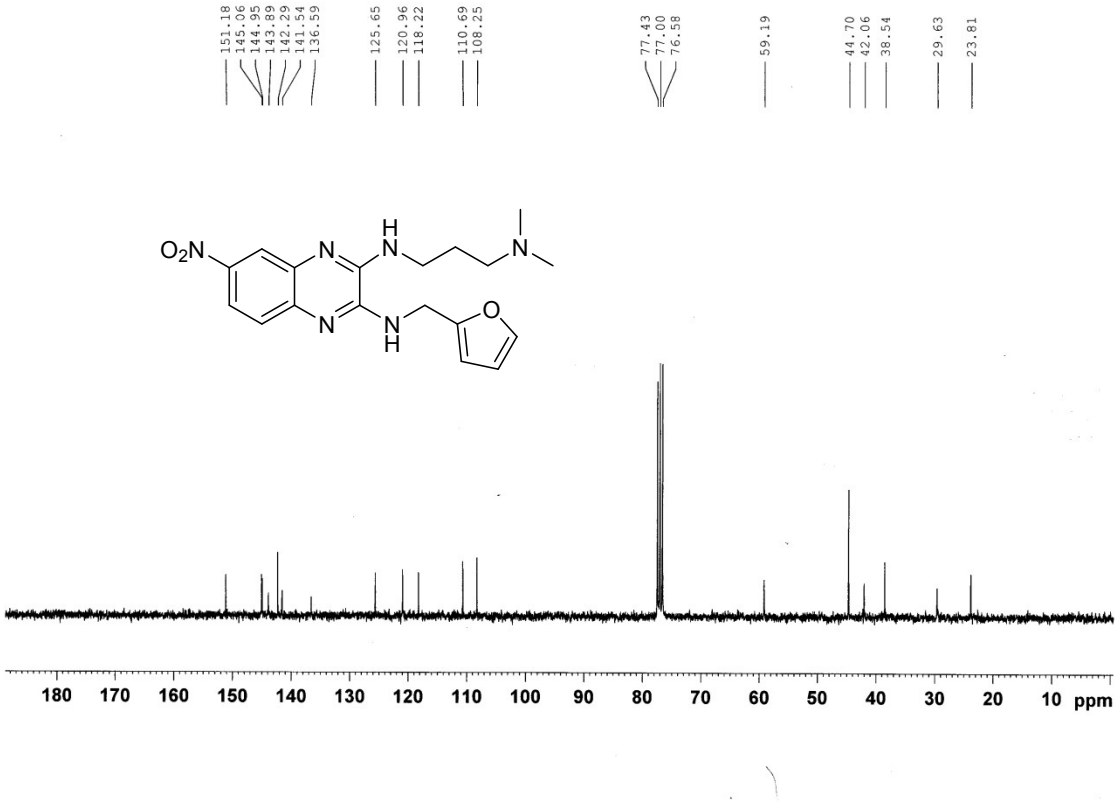

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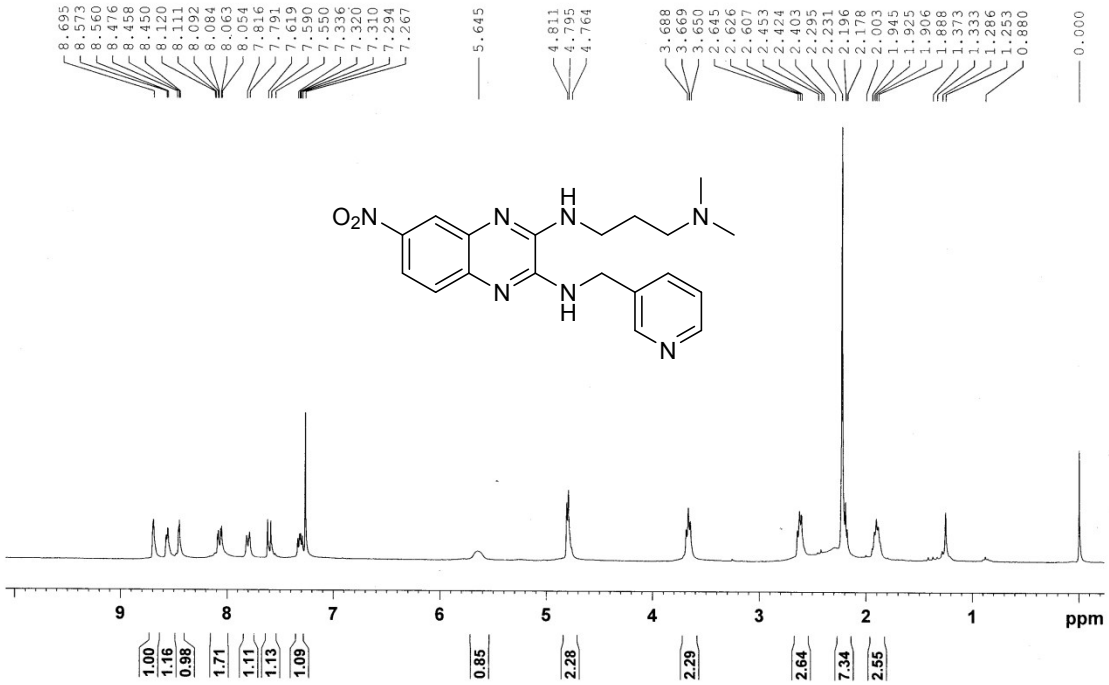

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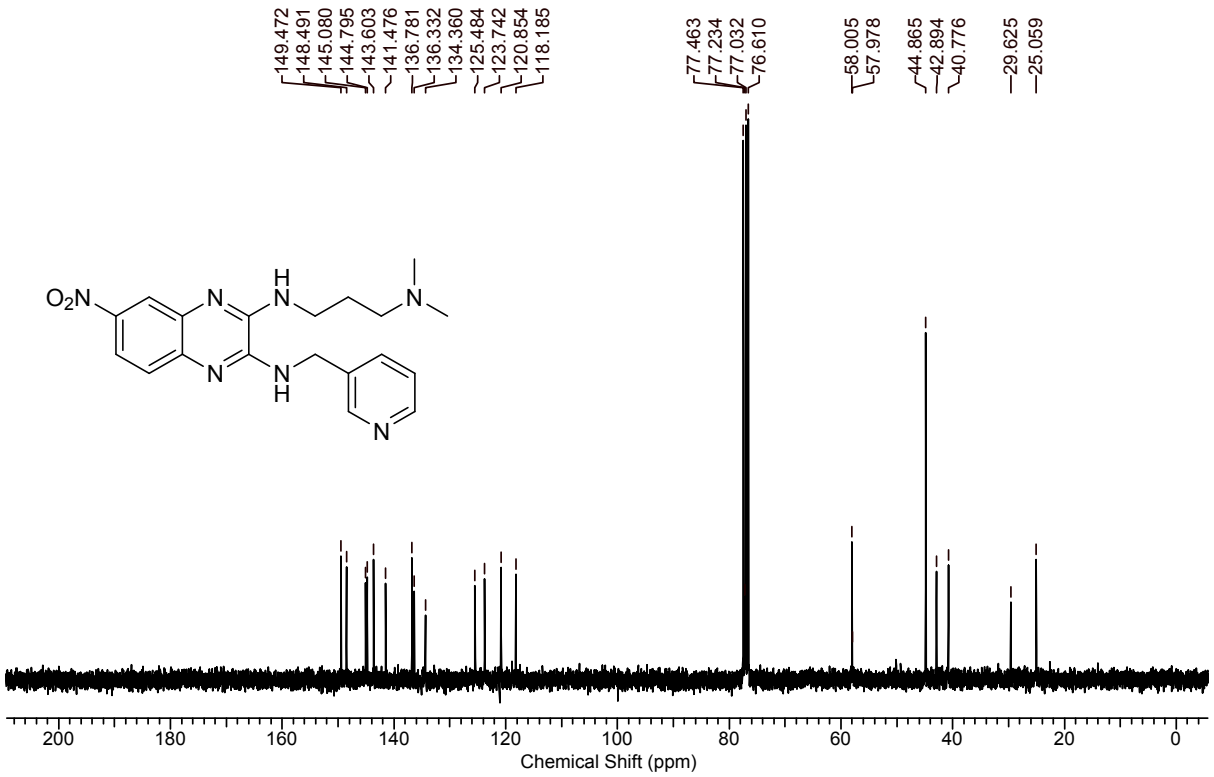

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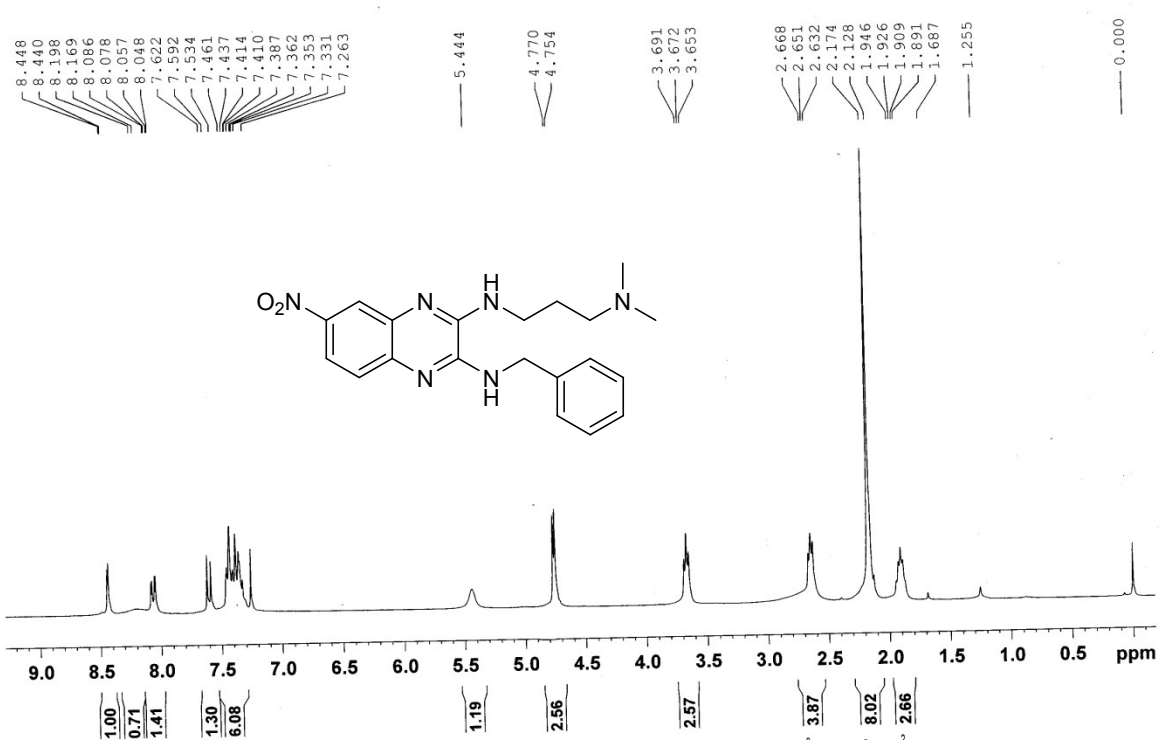

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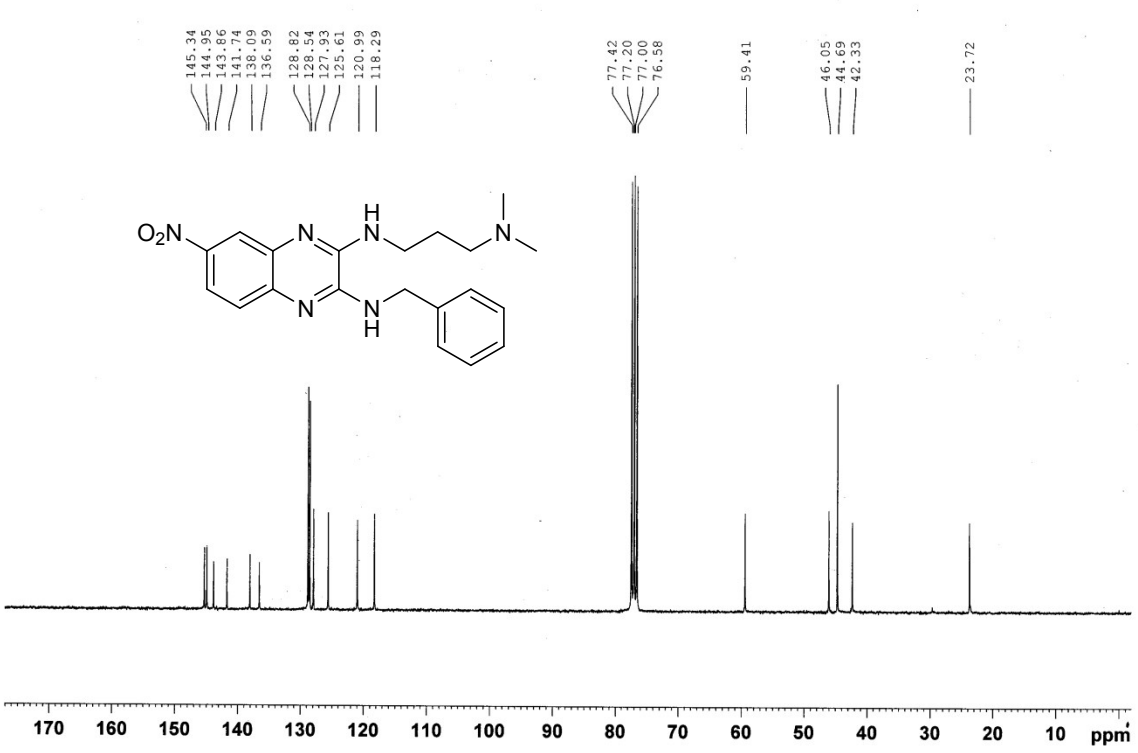
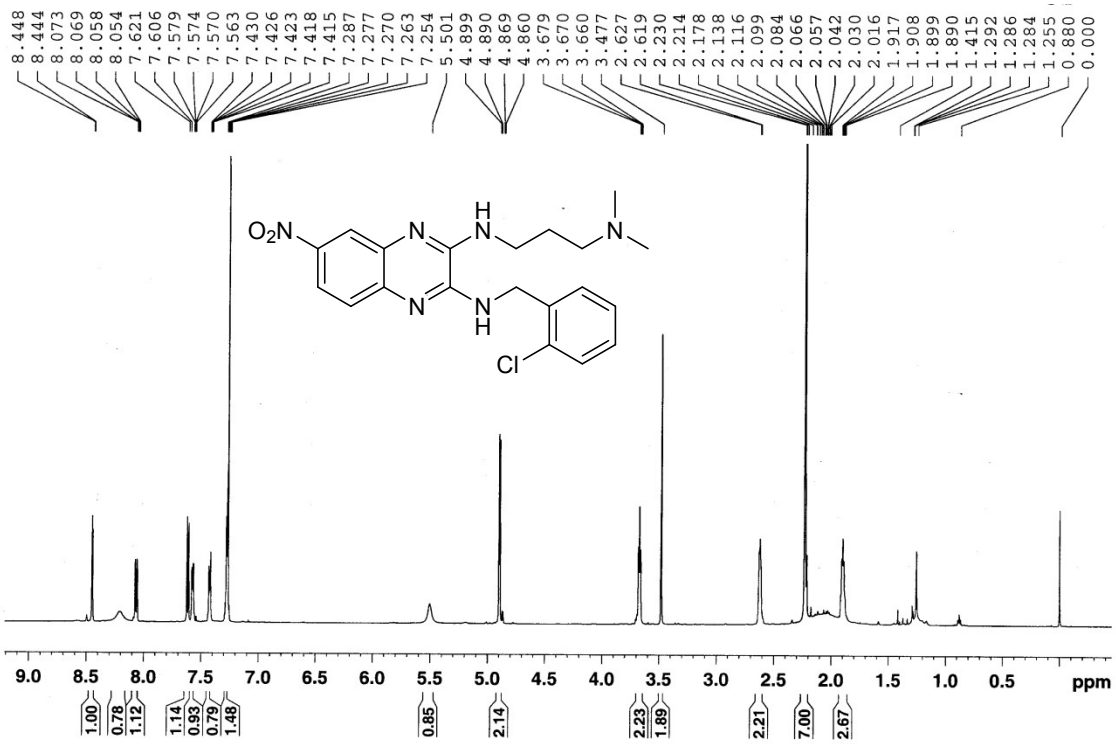
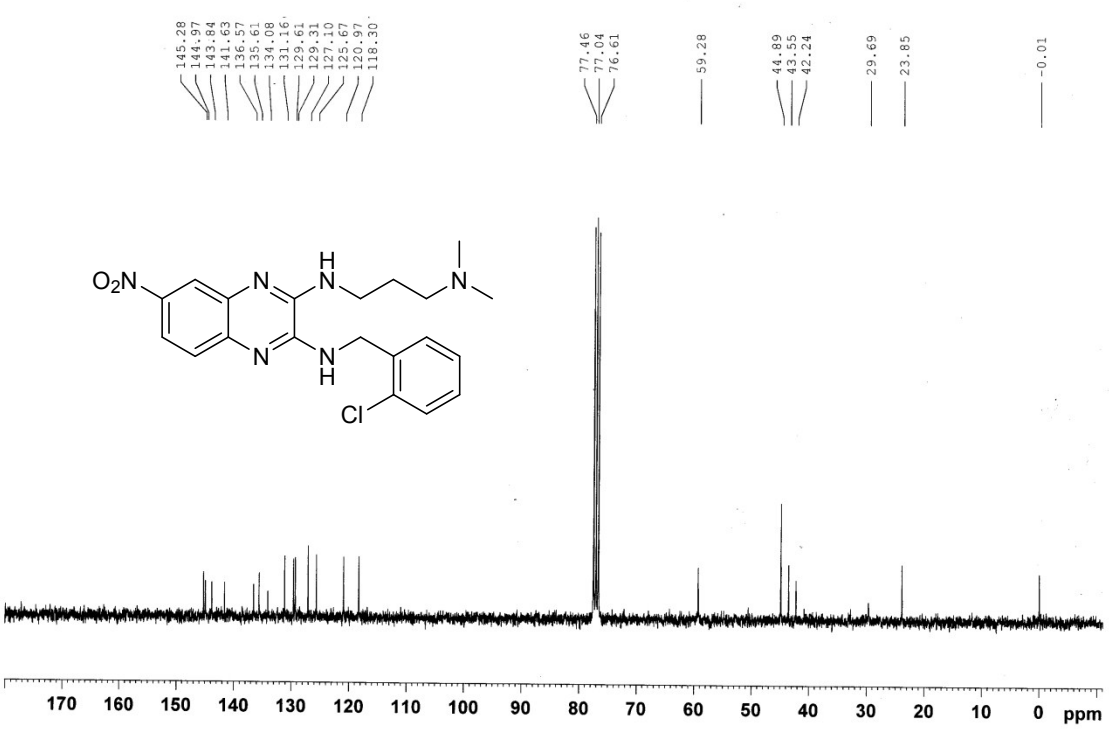


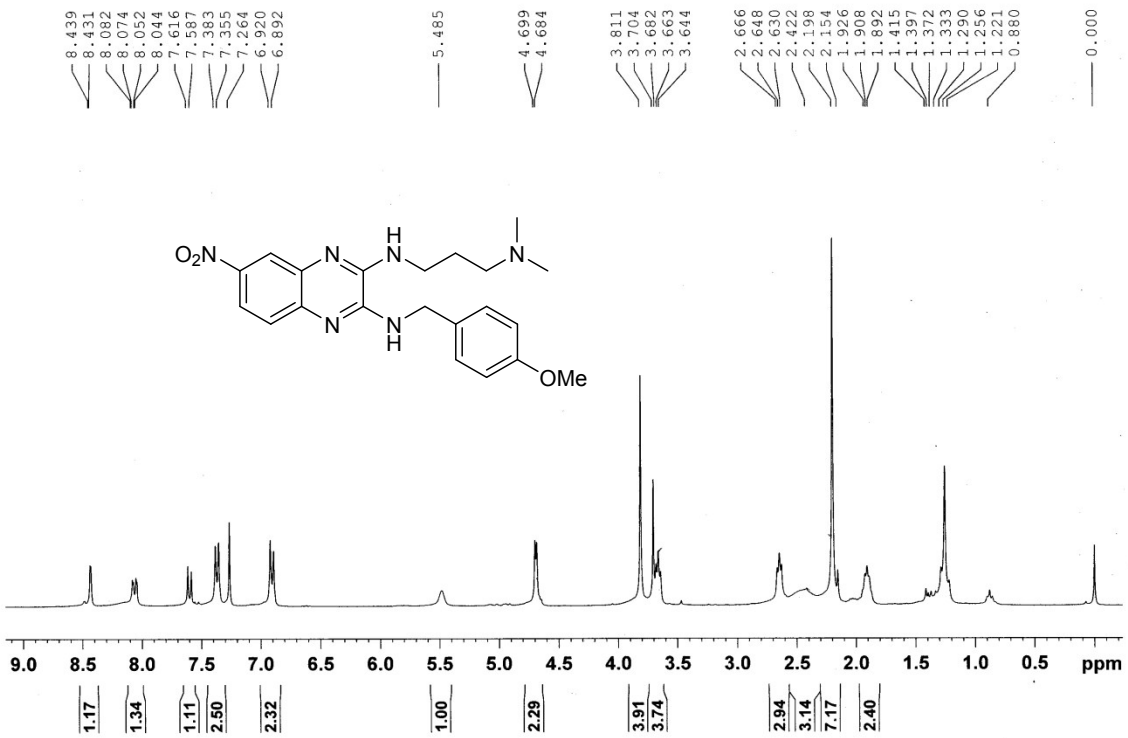
^{1}H-NMR ($CDCl_3$, 600 MHz) of **3f**



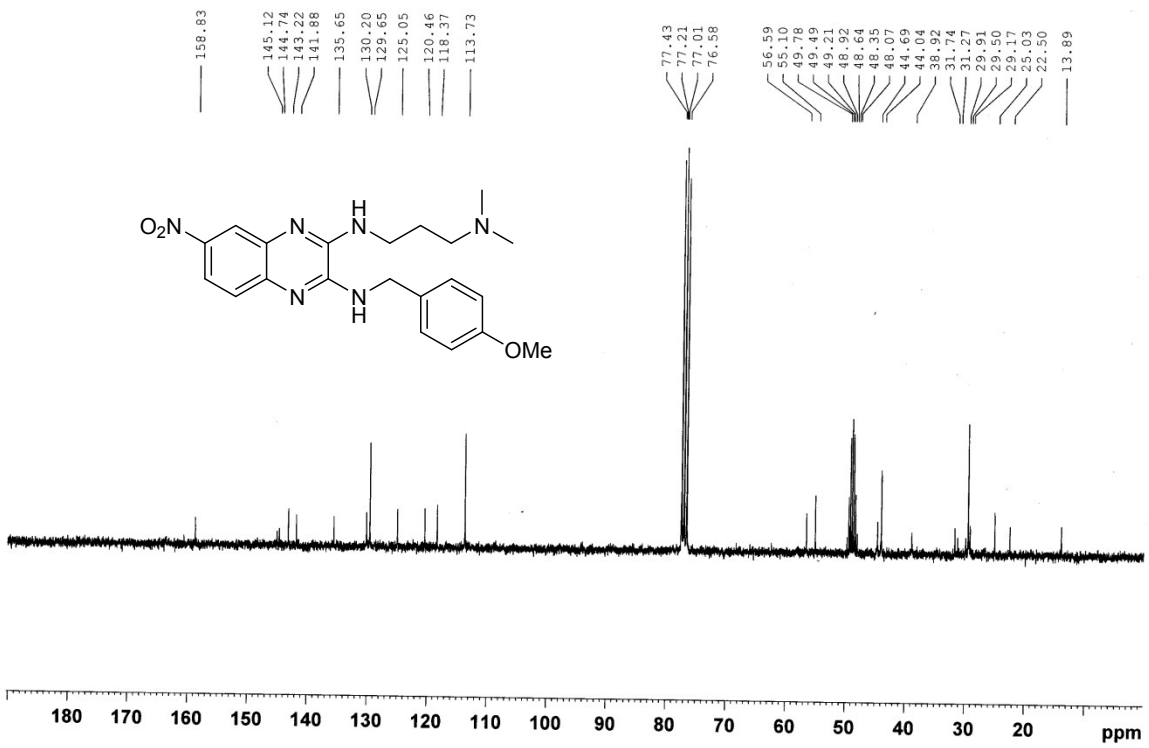
^{13}C-NMR ($CDCl_3$, 75 MHz) of **3f**



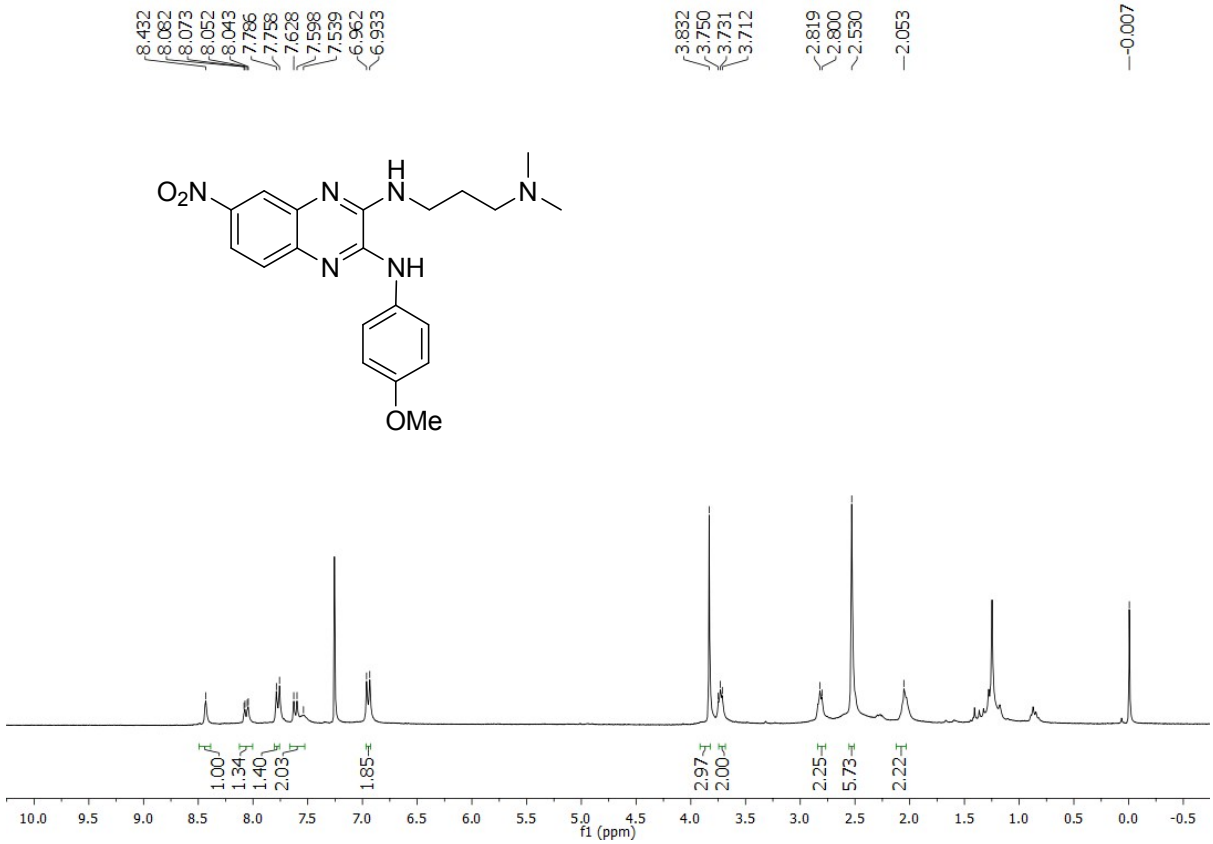
^{1}H-NMR ($CDCl_3$, 300 MHz) of **3g**



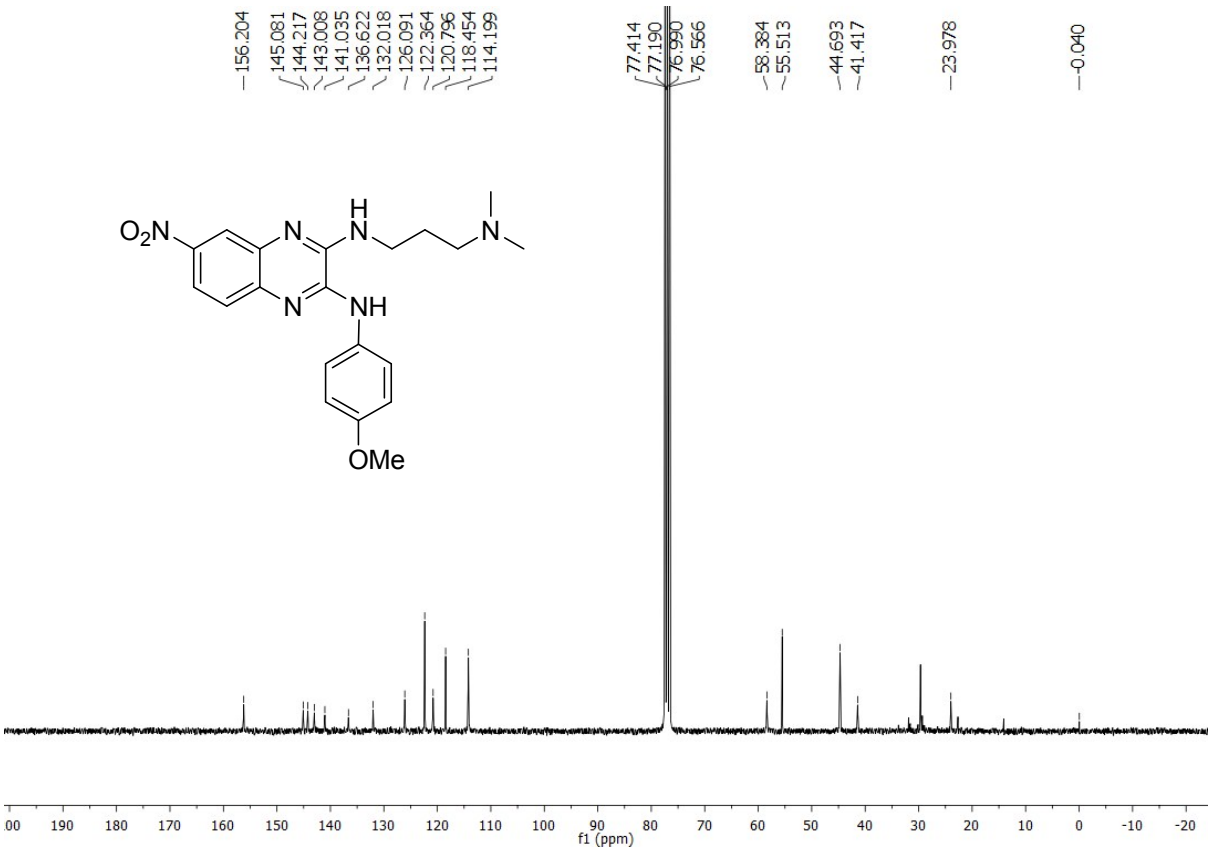
^{13}C-NMR ($CDCl_3$ + 1 drop CD_3OD, 75 MHz) of **3g**



^{1}H-NMR ($CDCl_3$, 300 MHz) of **3h**



^{13}C-NMR ($CDCl_3$, 75 MHz) of **3h**



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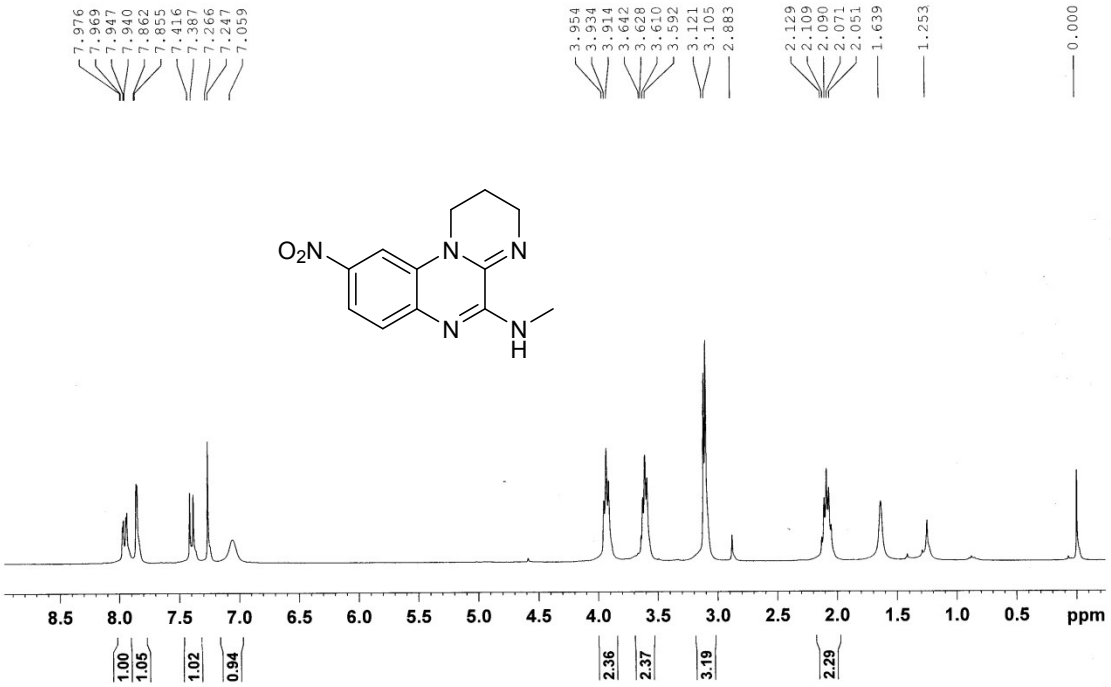
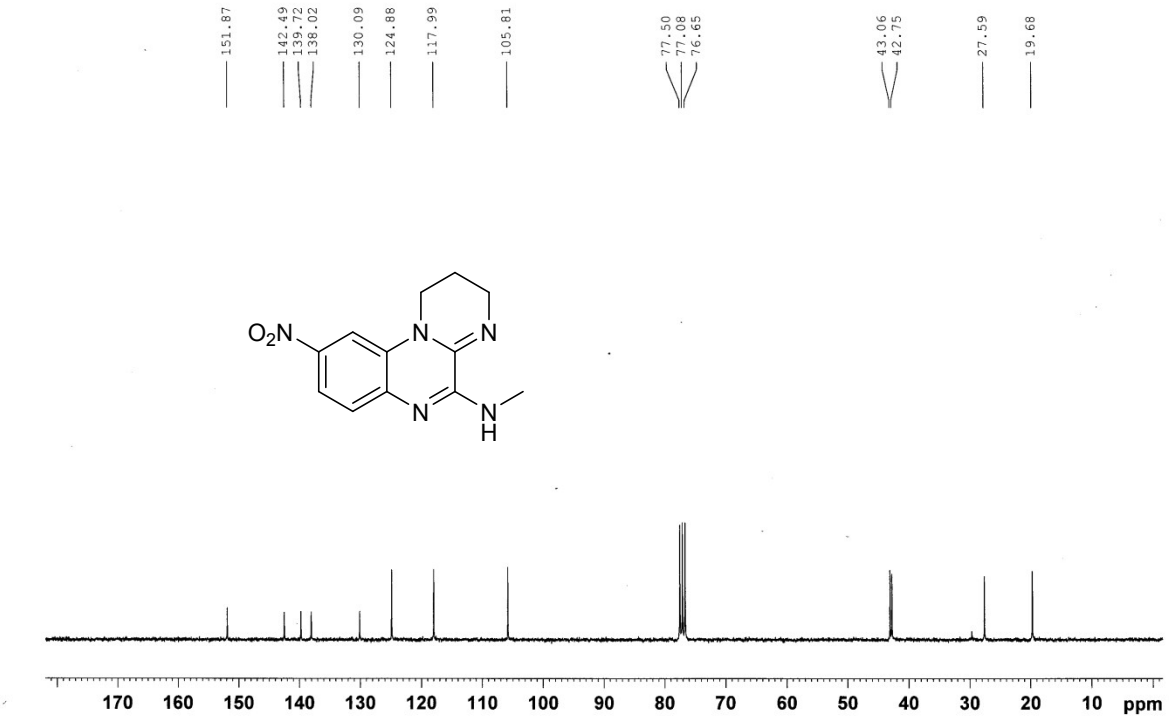
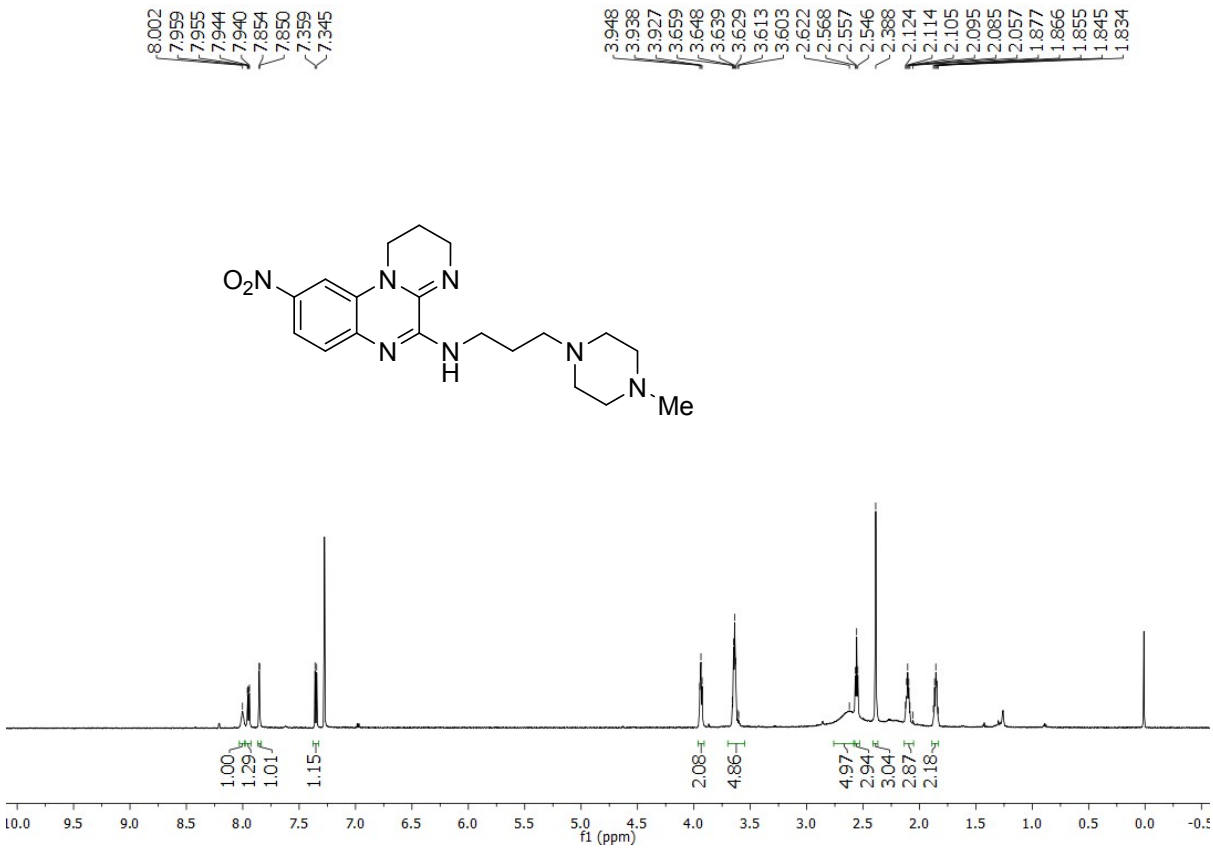


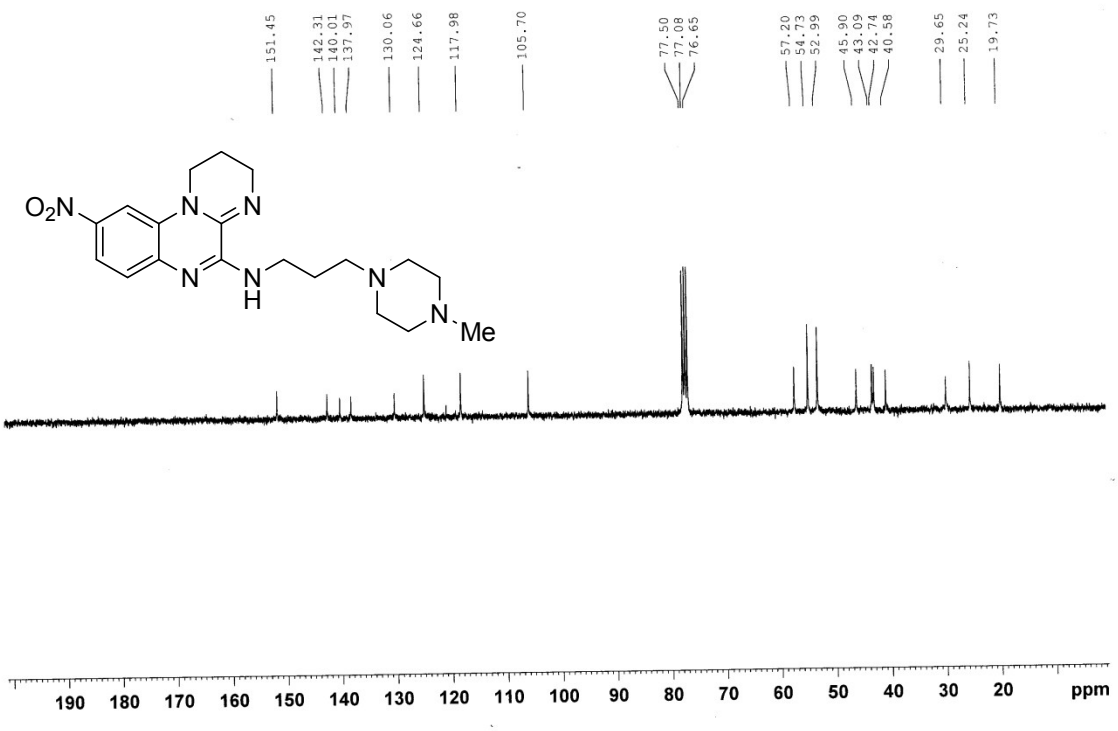
^{13}C-NMR ($CDCl_3$, 75 MHz) of **4a**



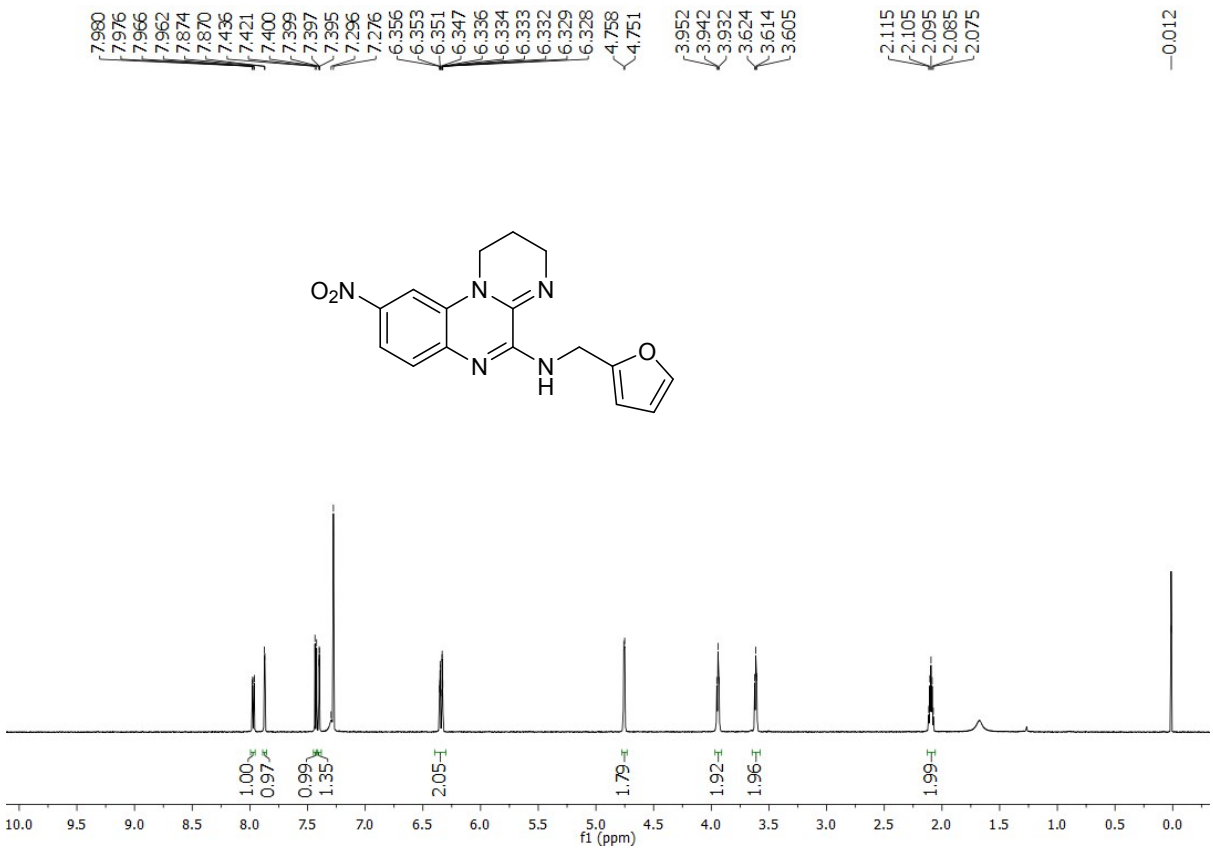
^{1}H-NMR ($CDCl_3$, 600 MHz) of **4b**



^{13}C-NMR ($CDCl_3$, 75 MHz) of **4b**



^{1}H-NMR ($CDCl_3$, 600 MHz) of **4c**



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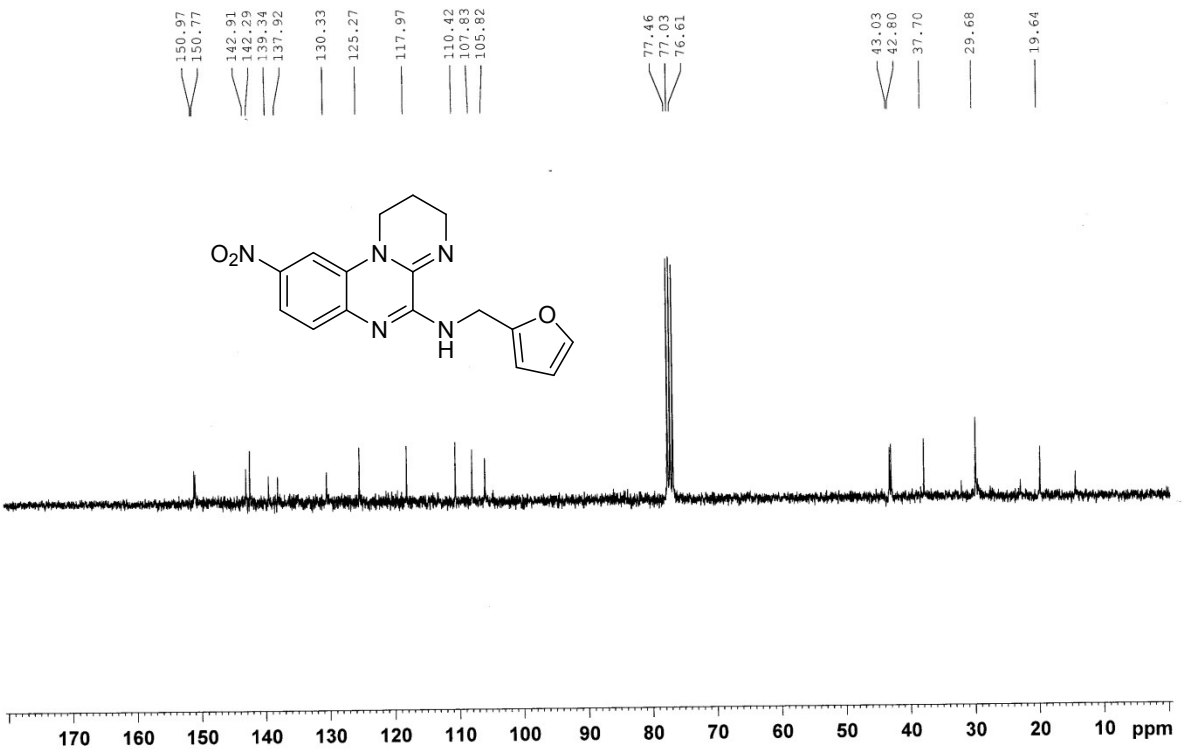
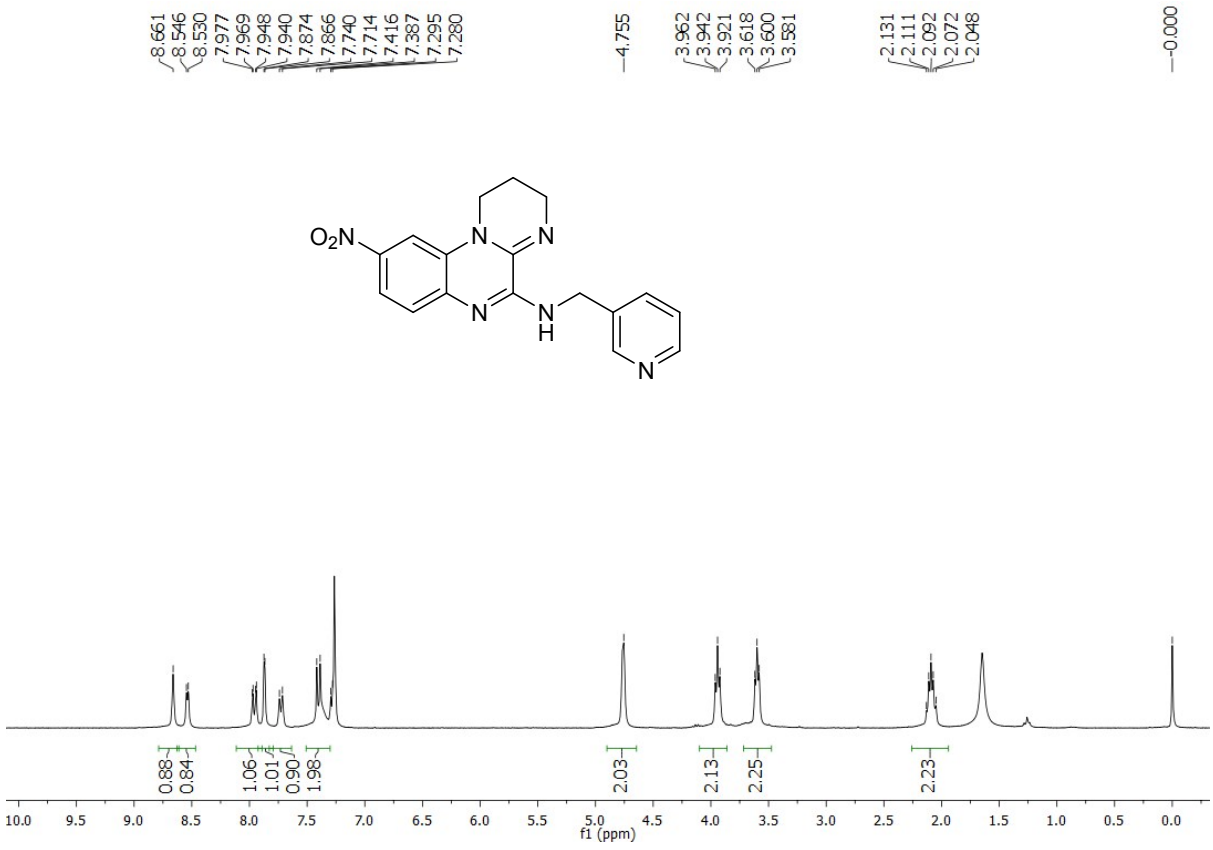
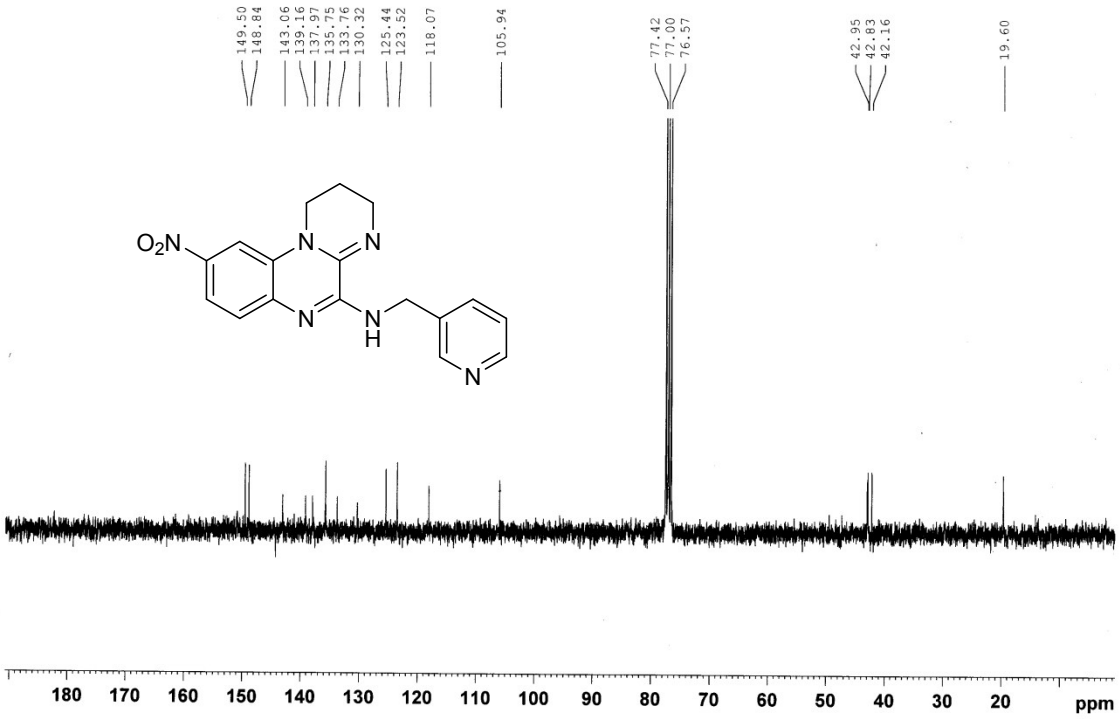


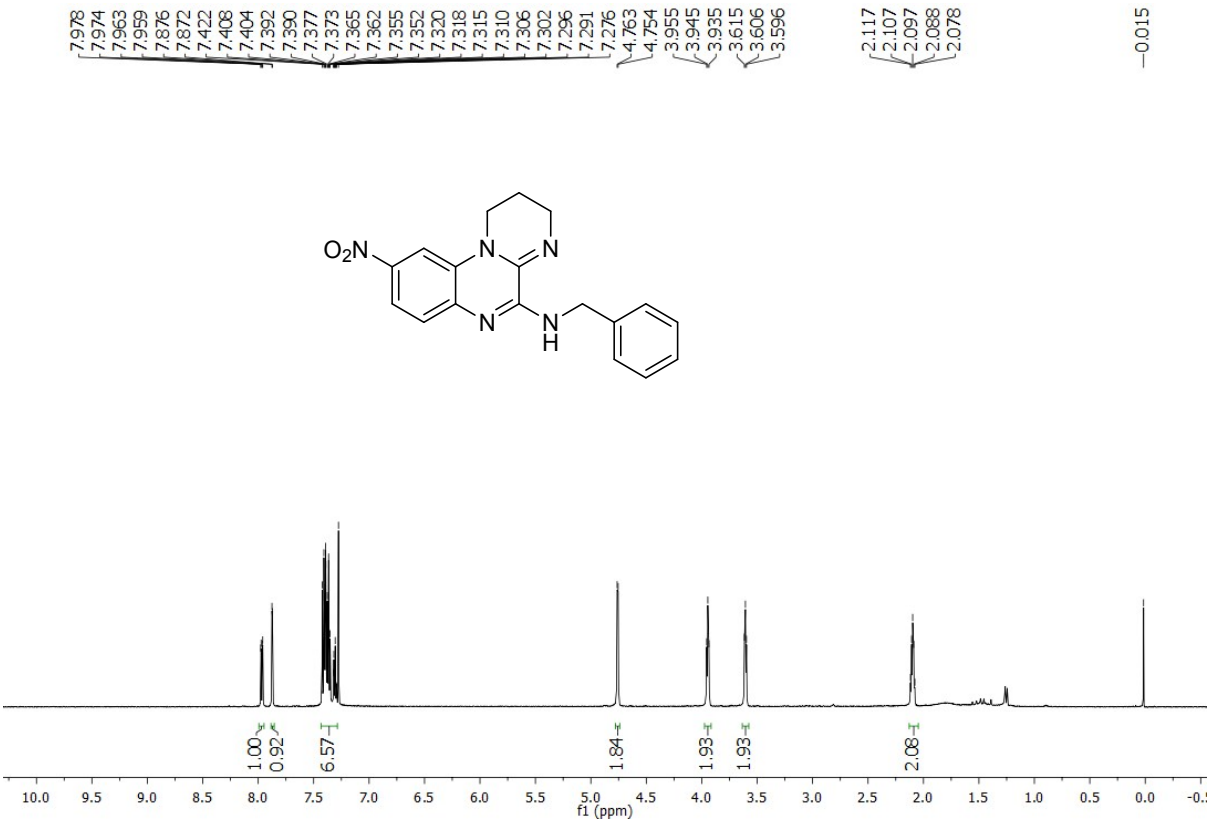
^{1}H-NMR ($CDCl_3$, 300 MHz) of **4d**



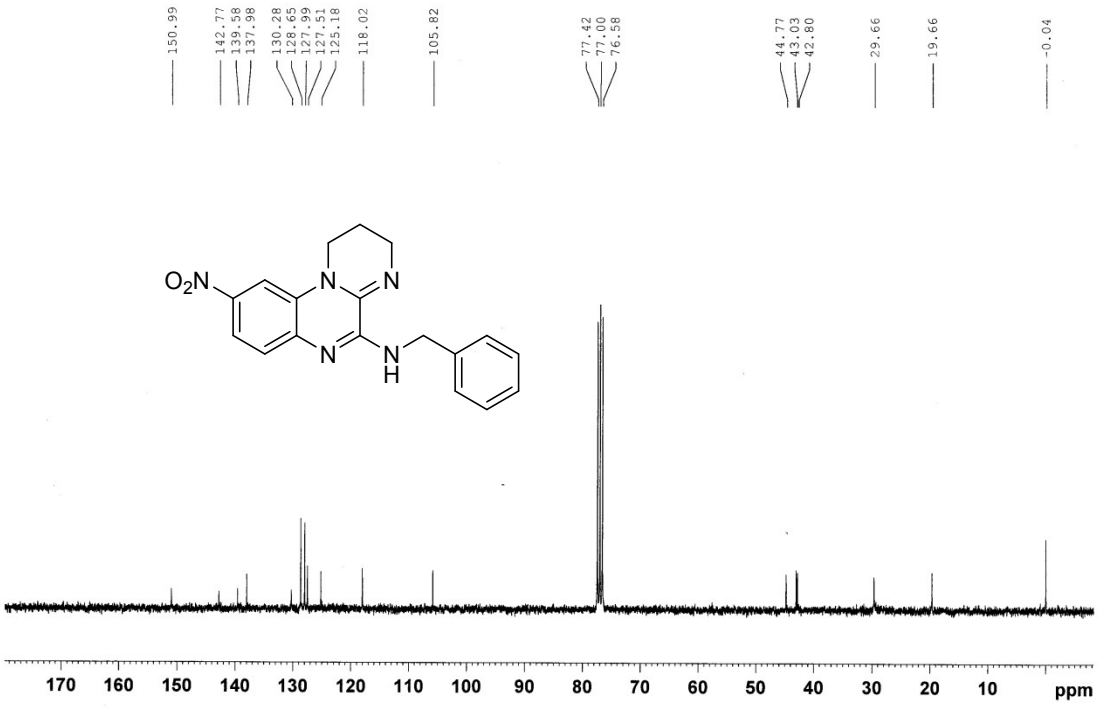
^{13}C-NMR ($CDCl_3$, 75 MHz) of **4d**



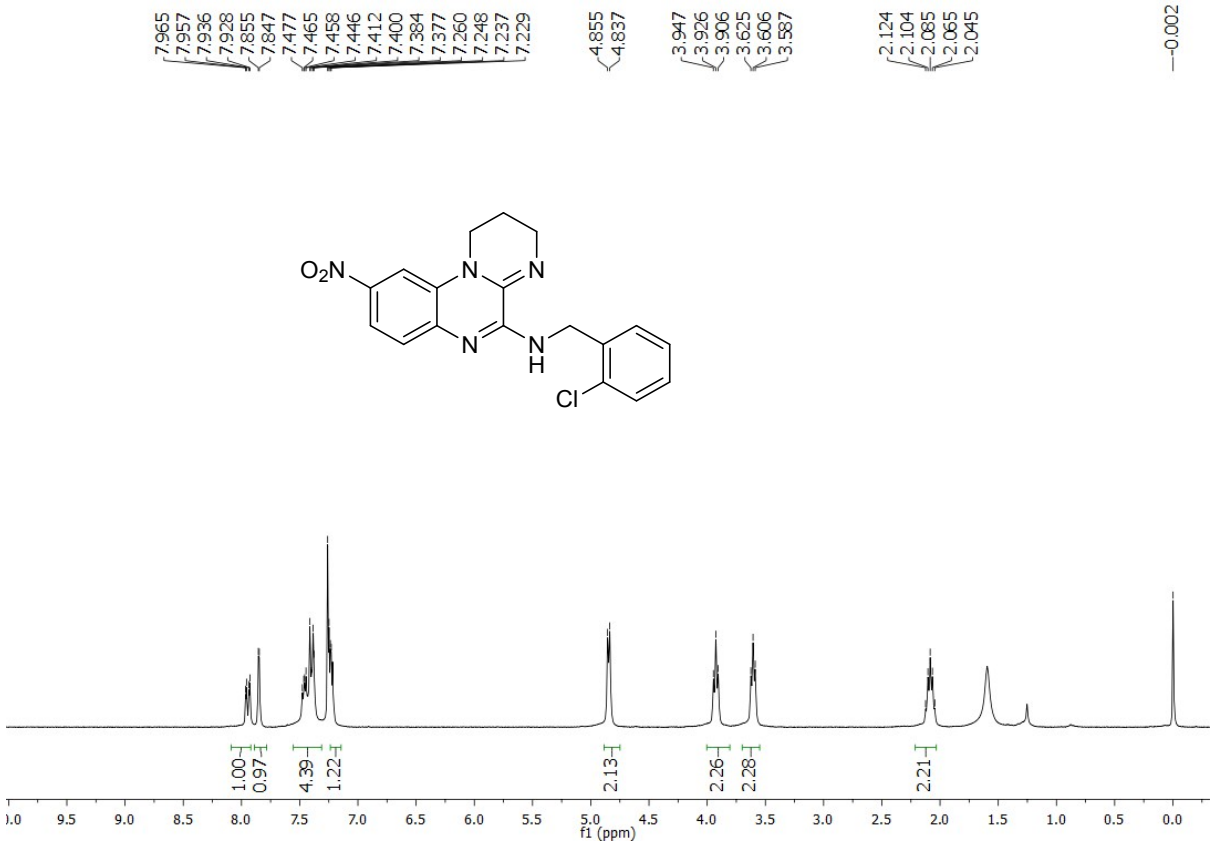
^{1}H-NMR ($CDCl_3$, 600 MHz) of **4e**



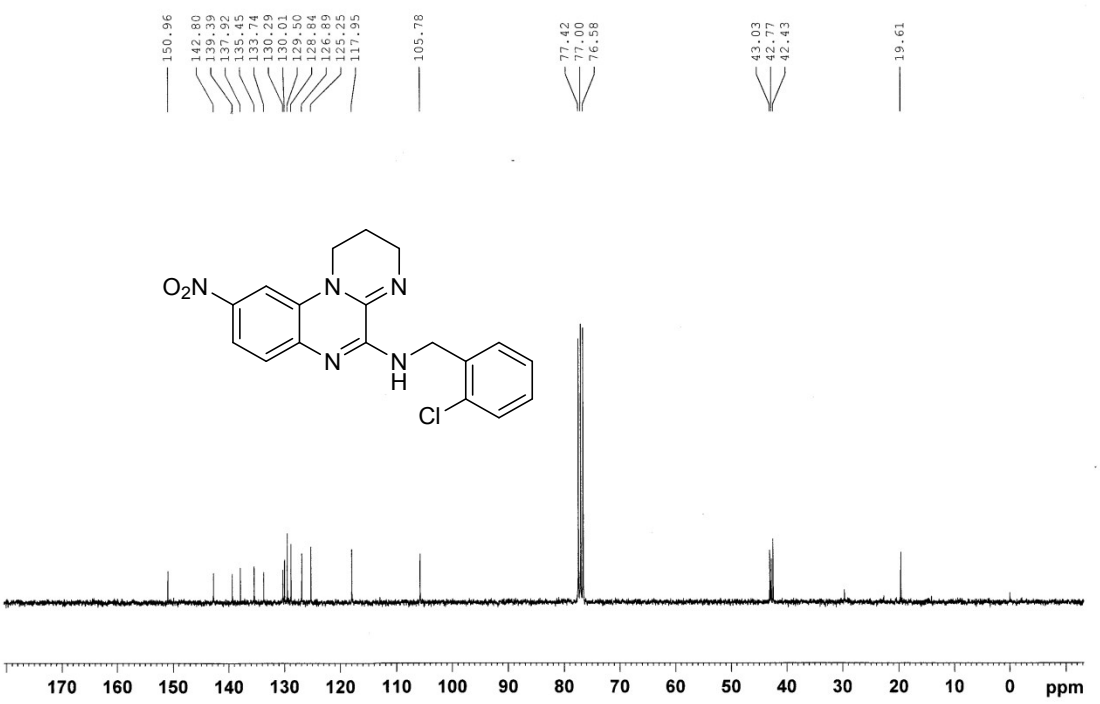
^{13}C-NMR ($CDCl_3$, 75 MHz) of **4e**



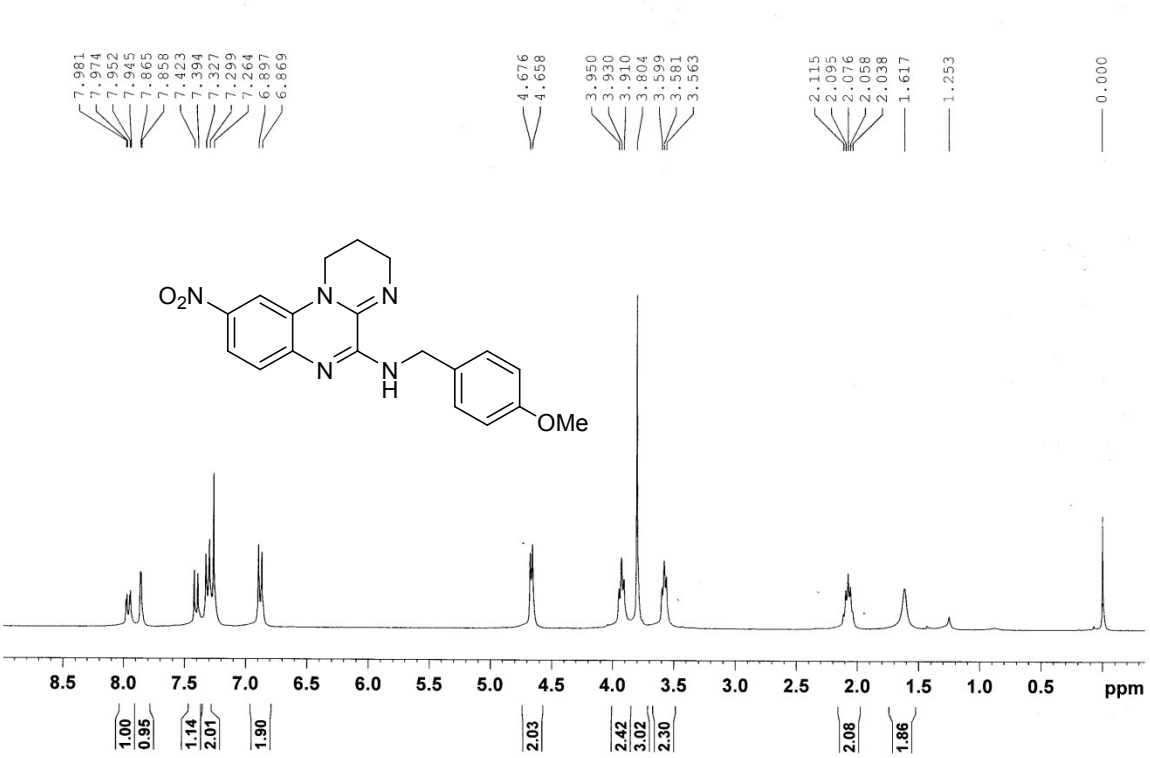
^{1}H-NMR ($CDCl_3$, 300 MHz) of **4f**



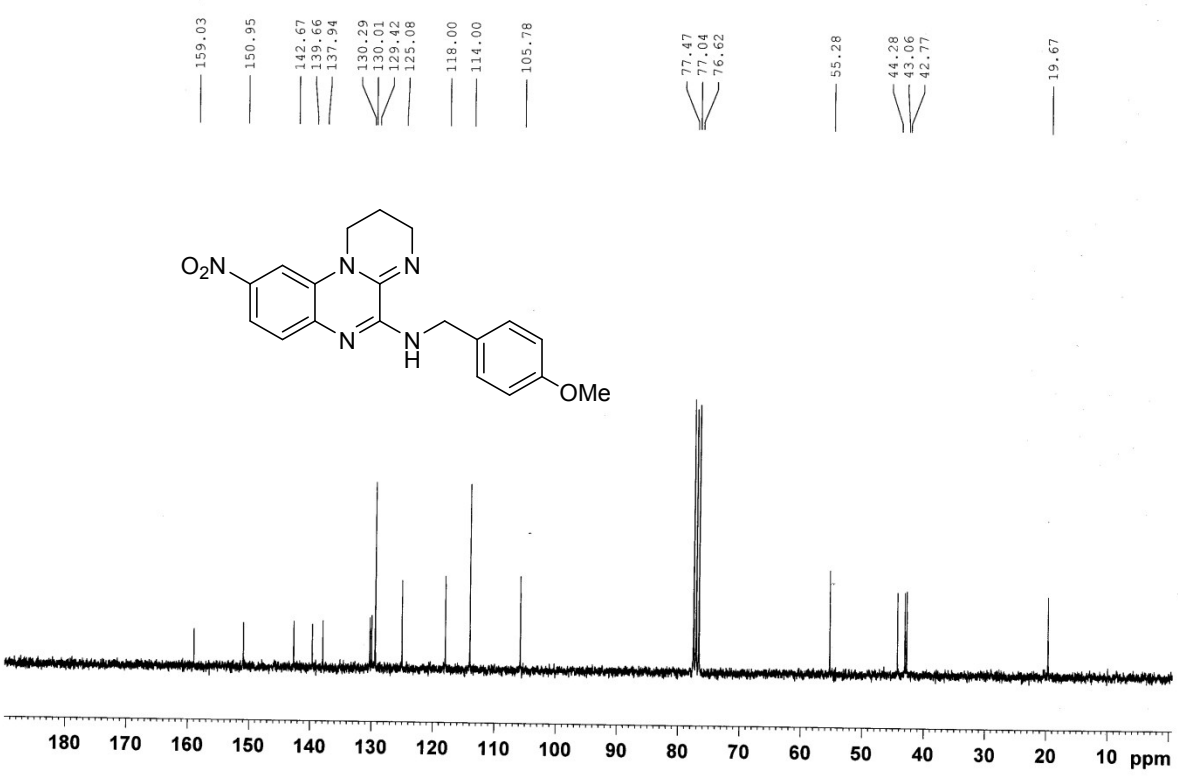
^{13}C-NMR ($CDCl_3$, 75 MHz) of **4f**



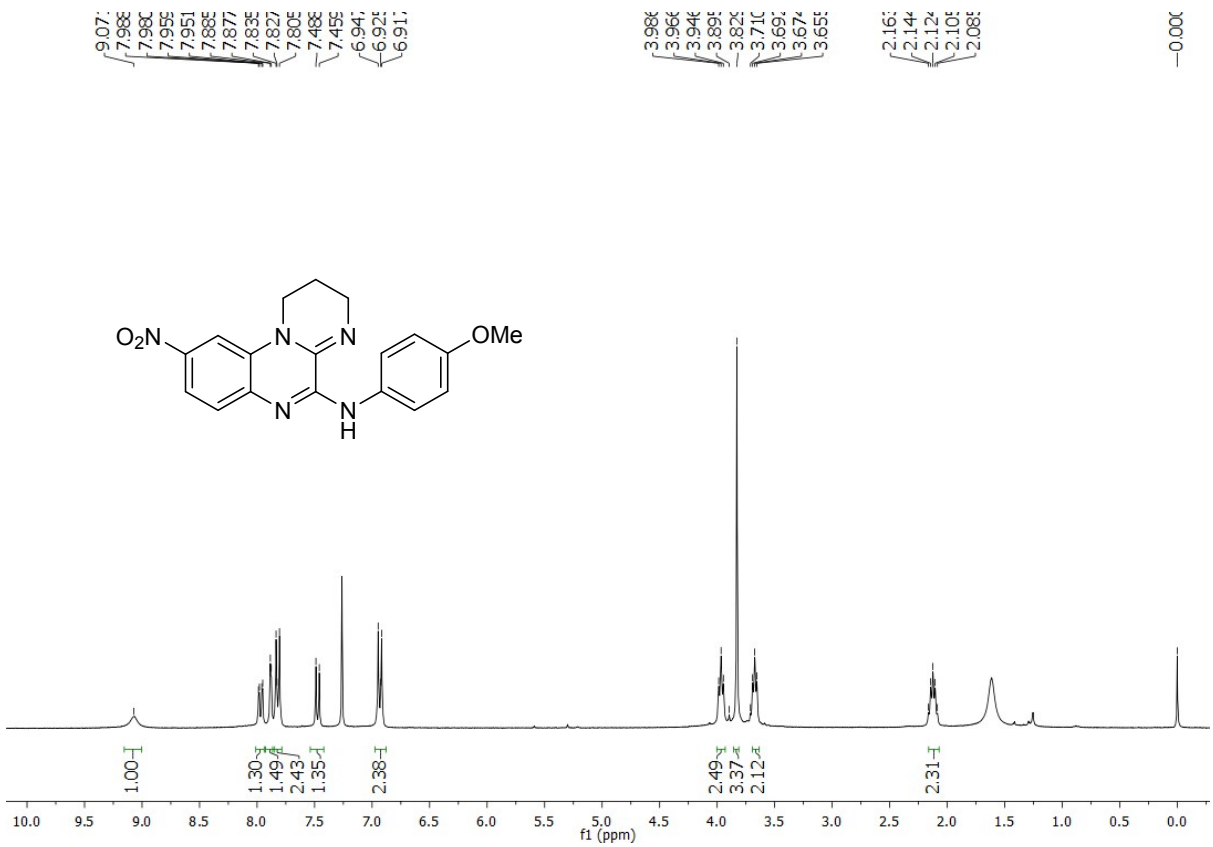
^{1}H-NMR ($CDCl_3$, 300 MHz) of **4g**



^{13}C-NMR ($CDCl_3$, 75 MHz) of **4g**



^{1}H-NMR ($CDCl_3$, 300 MHz) of **4h**



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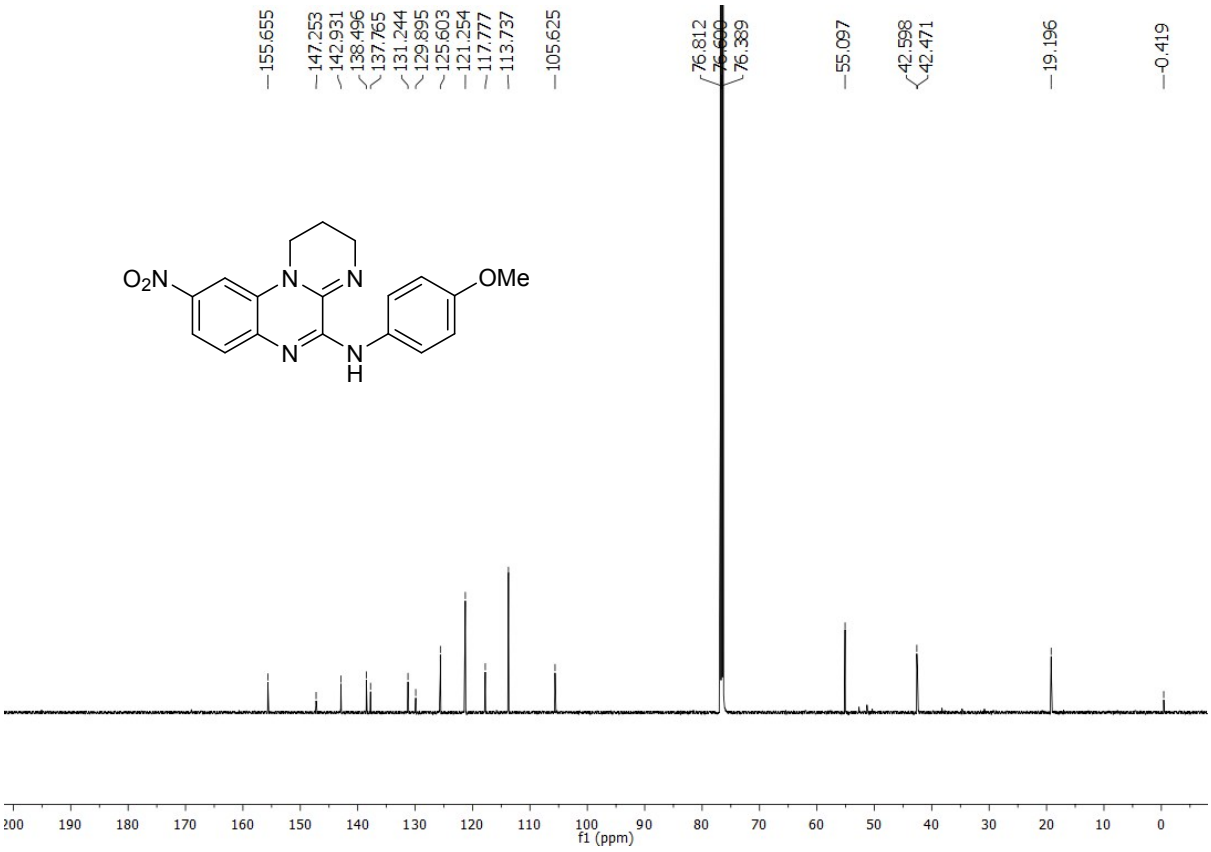
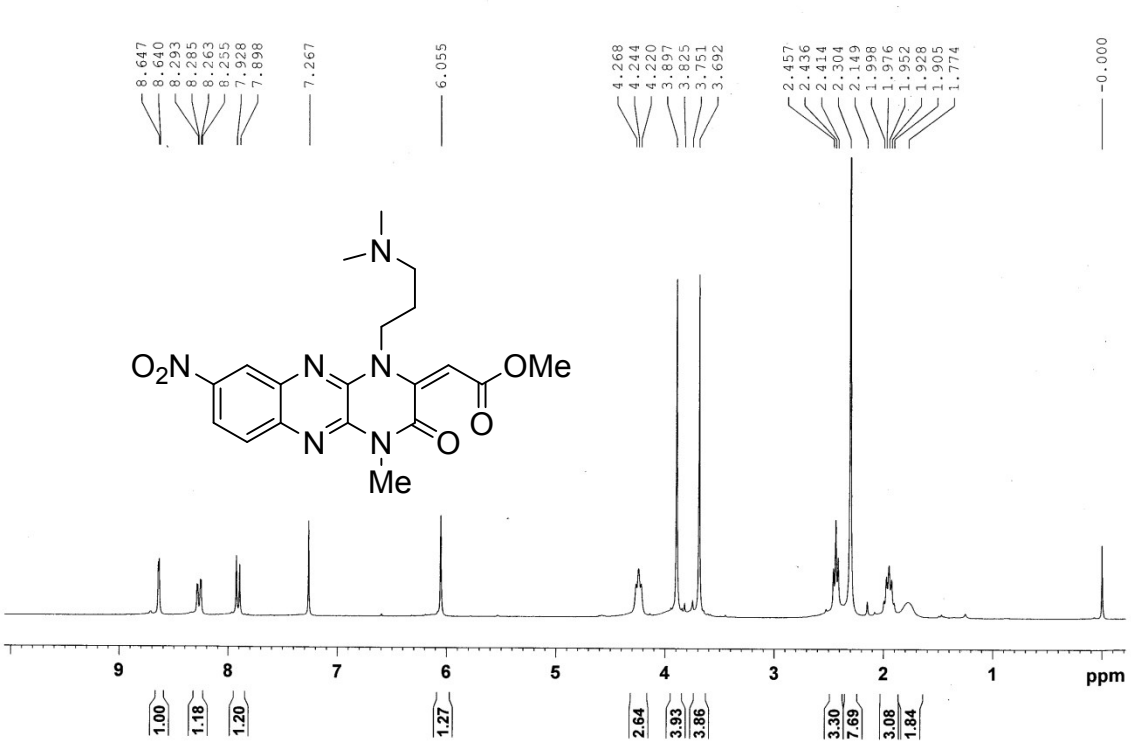
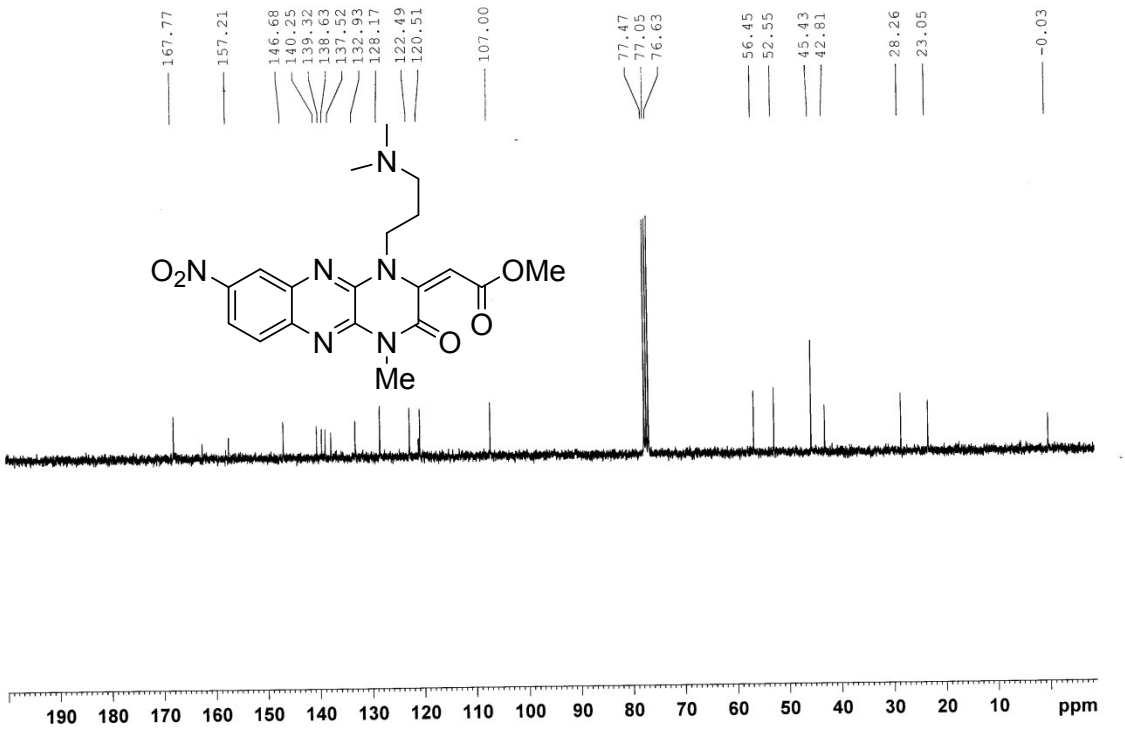


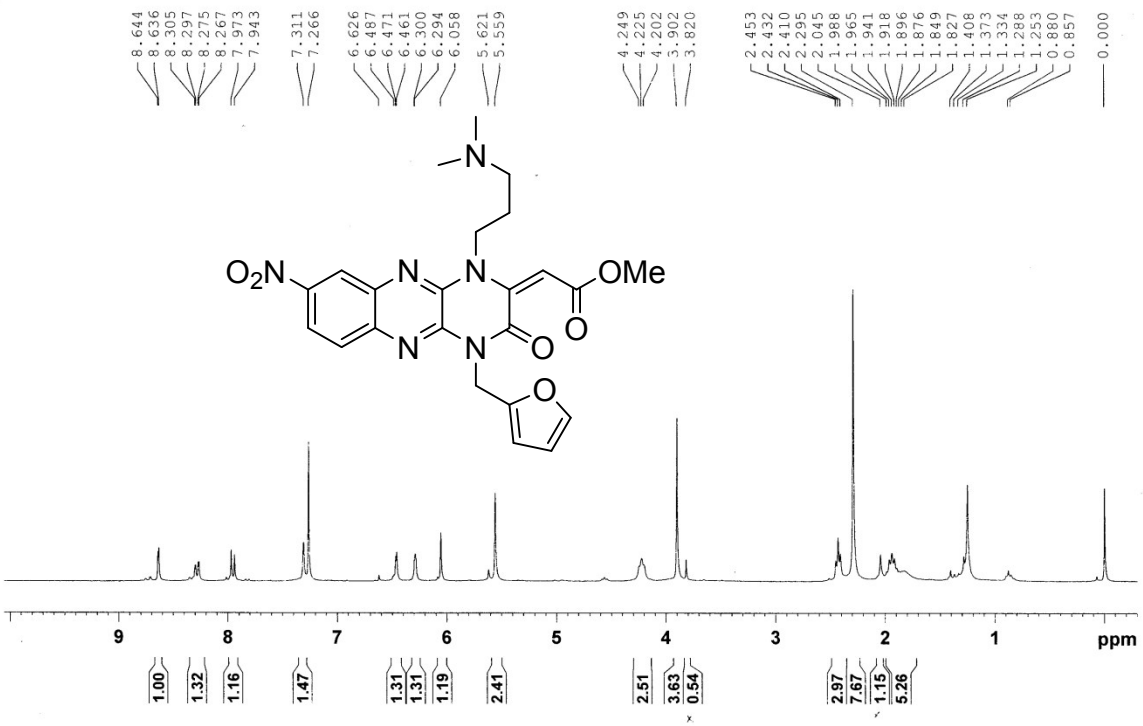
^{1}H-NMR ($CDCl_3$, 300 MHz) of **5a**



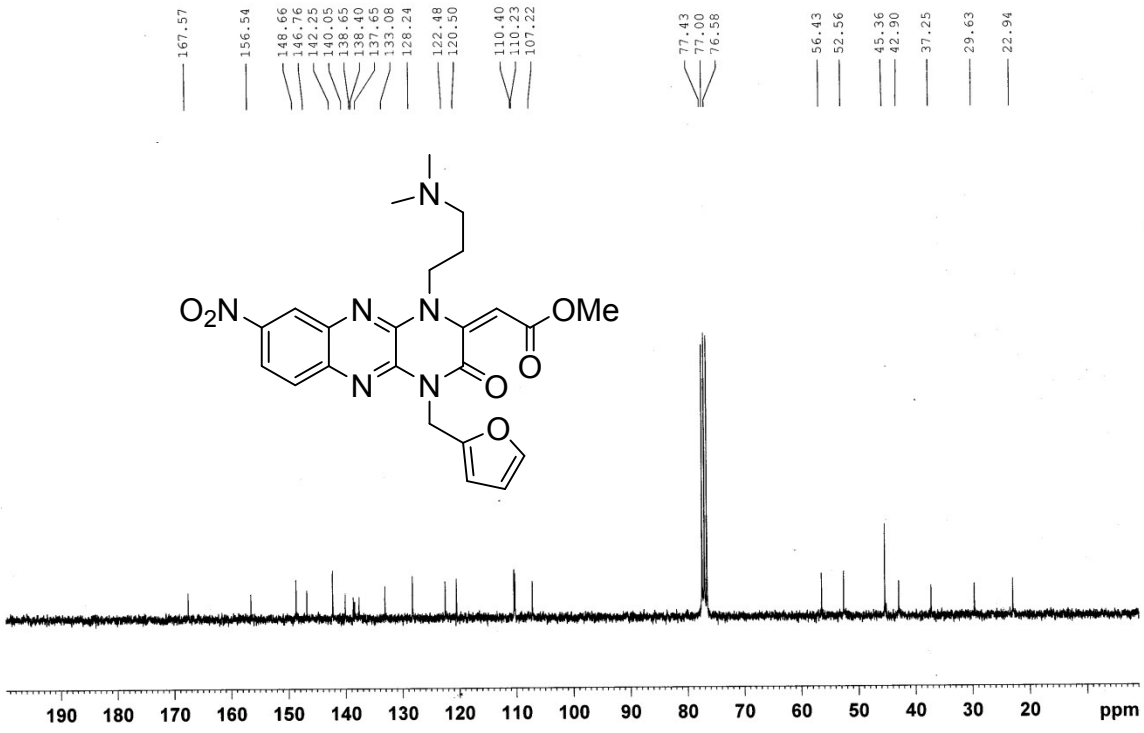
^{13}C-NMR ($CDCl_3$, 75 MHz) of **5a**



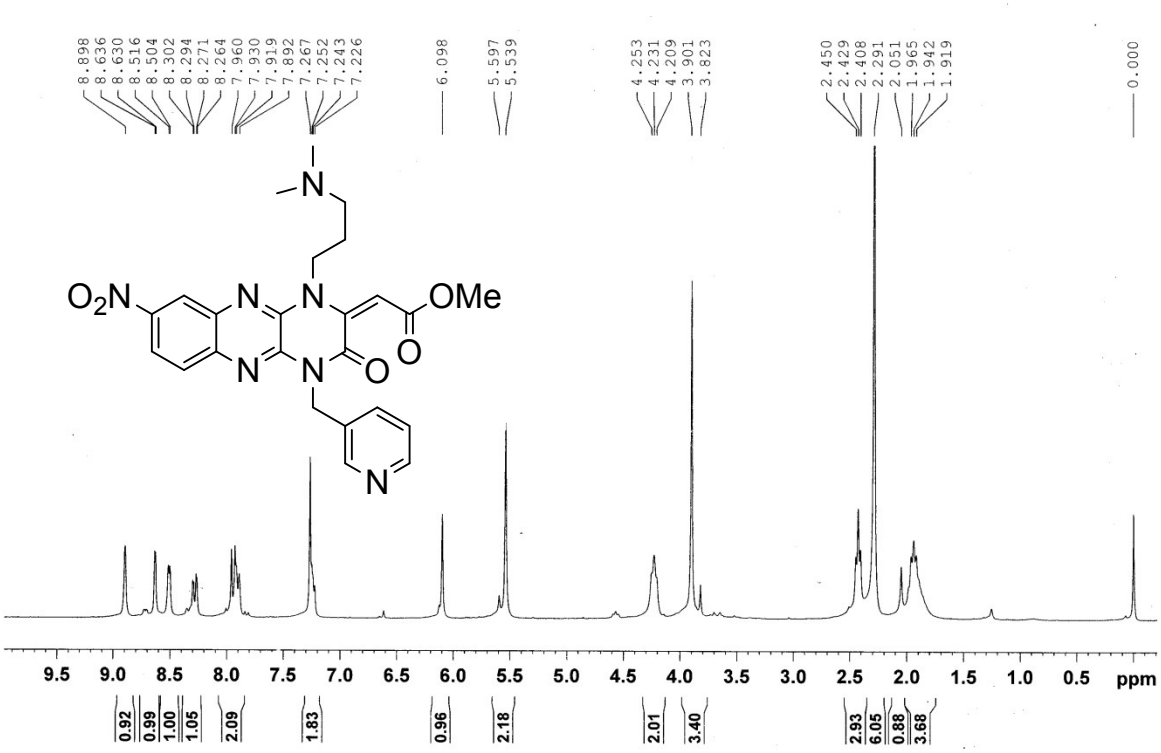
^{1}H-NMR ($CDCl_3$, 300 MHz) of **5c**



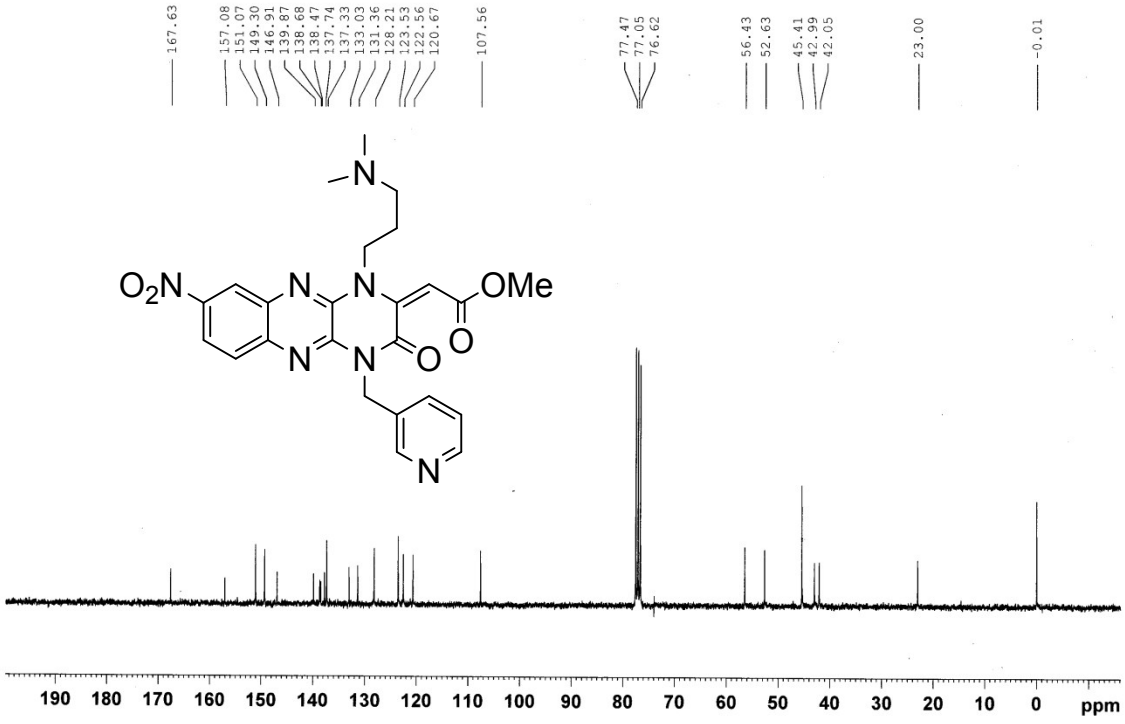
^{13}C-NMR ($CDCl_3$, 75 MHz) of **5c**



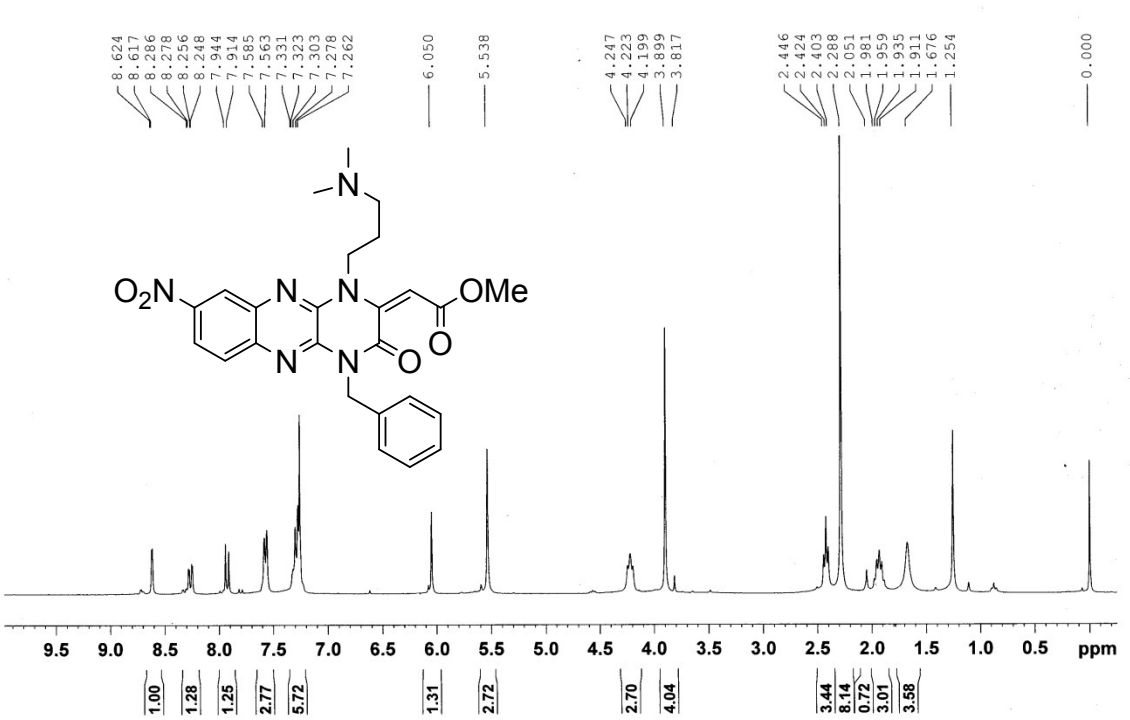
^{1}H-NMR ($CDCl_3$, 300 MHz) of **5d**



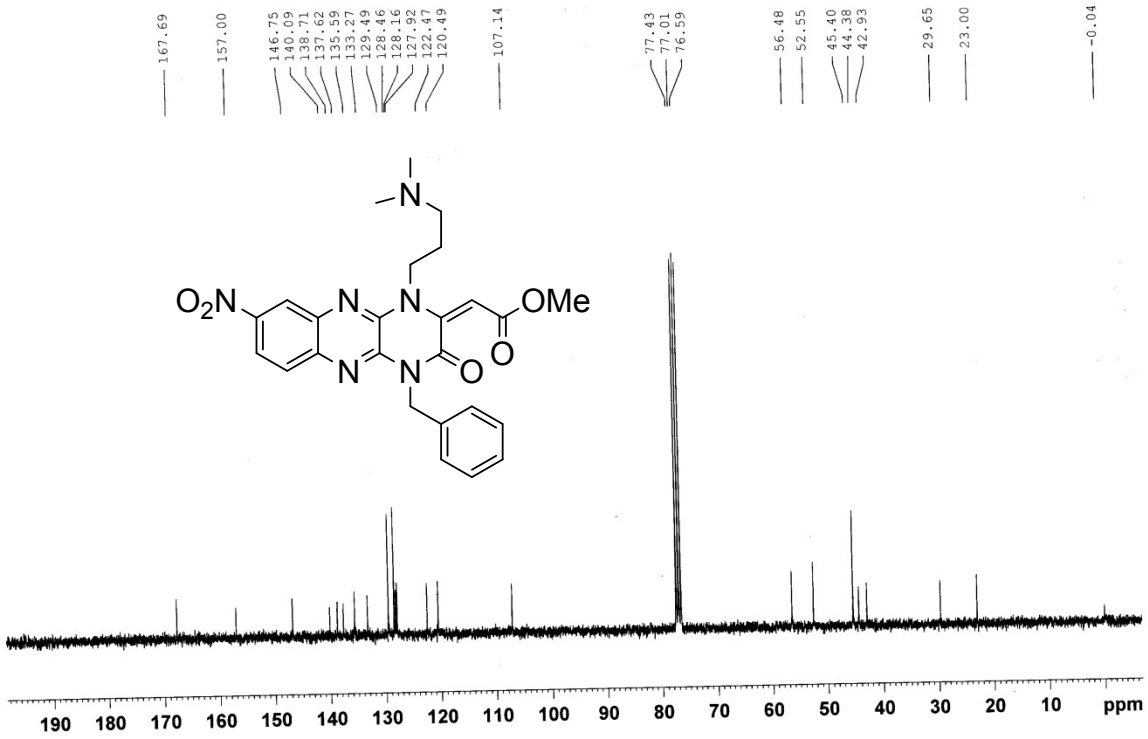
^{13}C-NMR ($CDCl_3$, 75 MHz) of **5d**



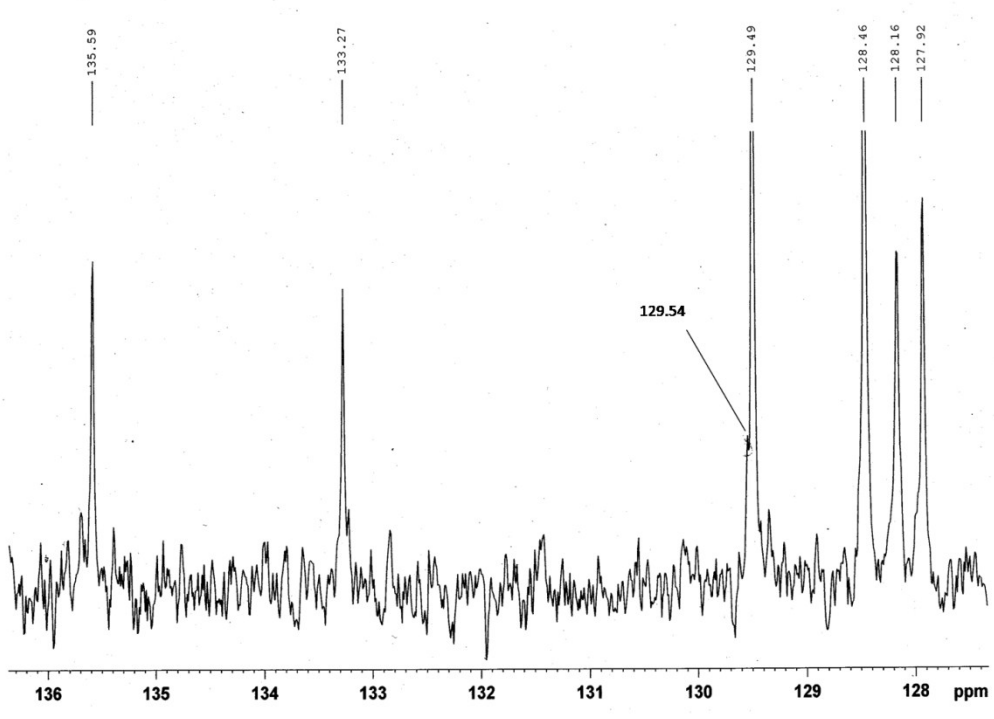
^{1}H-NMR ($CDCl_3$, 300 MHz) of **5e**



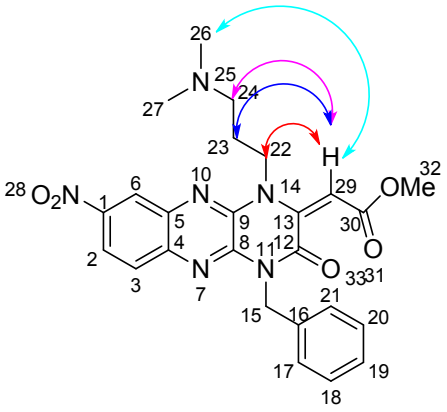
^{13}C-NMR ($CDCl_3$, 75 MHz) of **5e**



^{13}C-NMR ($CDCl_3$, 75 MHz) of **5e** (region expanded δ 128.0 - 136.0)



S 3 ^{1}H-^{1}H NOESY Spectra :



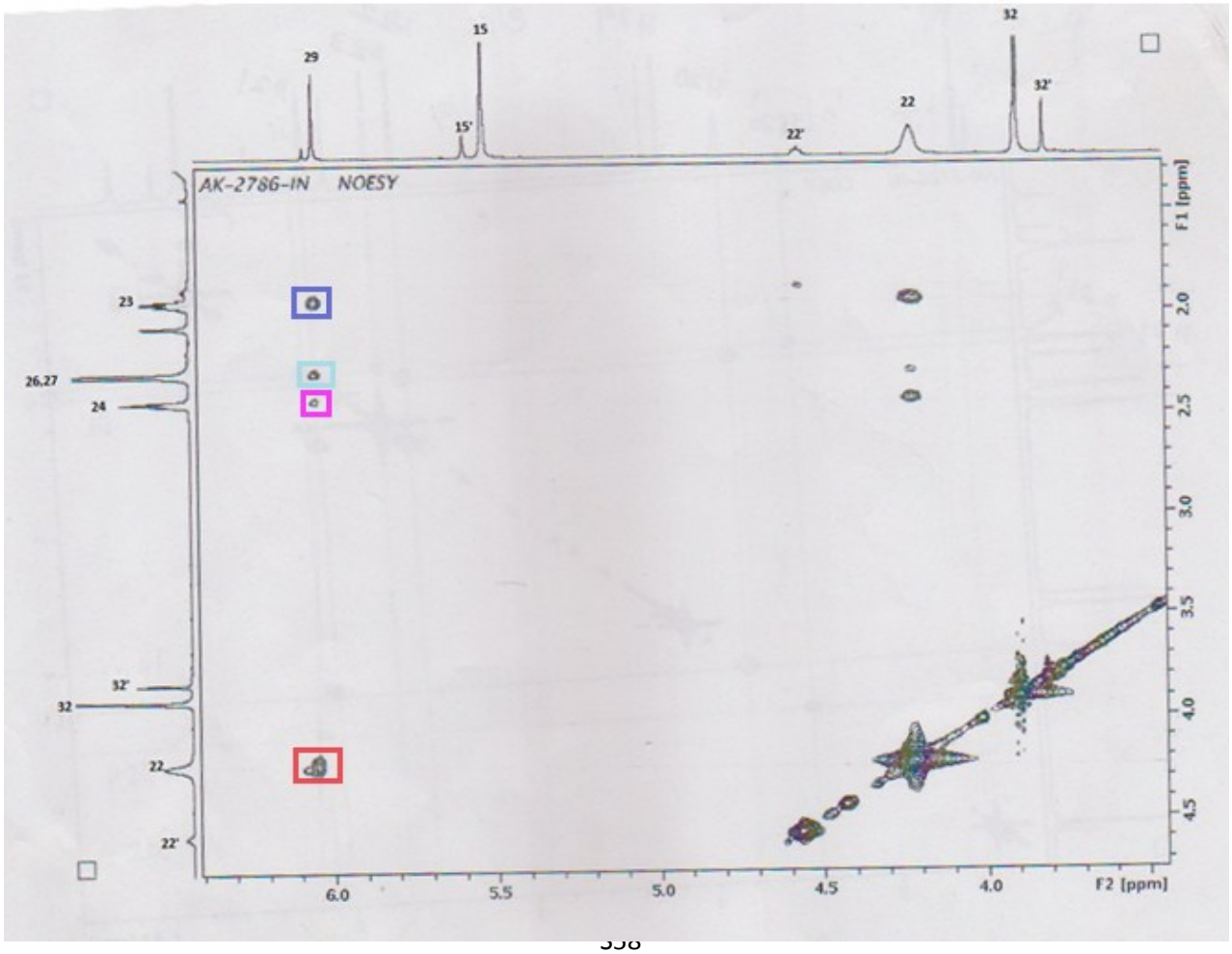


Fig. S1. ^{1}H-^{1}H NOESY spectra of compound **5e**.

S4. Full absorption spectra of (4a-4h) :

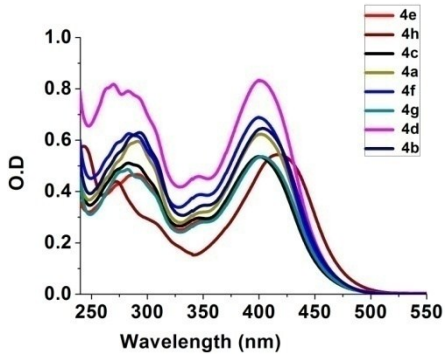


Fig. S2 Full absorption spectra of (**4a-4h**)(50 μM) in Ethanol

COMPOUNDS	λ_{max1}(nm)	λ_{max2}(nm)
4a	400	292
4b	403	293
4c	400	283
4d	402	270
4e	402	292
4f	400	282
4g	403	292
4h	417	272

Table 1 Full absorption spectra of (**4a-4h)**

S5 X-ray crystallography:

Single crystals were grown by slow evaporation of the compounds from methanol and chloroform. Data were collected at 293K on Bruker Kappa APEX2 CCD diffractometer equipped graphite monochromated and MonoCap-collimated with MoKα radiation.[2] Preliminary lattice parameters and orientation matrices were obtained from three sets of frames. Then full data were collected using the ω and ϕ scan method with the frame width of 0.5°. Data were processed with the SAINT+ program for reduction and cell refinement.[3] Multiscan absorption corrections were applied by using the SADABS program for area detector.[4] The structures were solved with SHELXT[4] and refined with SHELXL[6] using Olex2 as GUI.[7]

Table 2 Crystal data and structure refinement for **4c**.

Identification code	**4c** (CCDC no: 1058070)
Empirical formula	$C_{16}H_{15}N_5O_3$
Formula weight	325.33
Temperature/K	296.15
Crystal system	monoclinic
Space group	$P2_1$
a/Å	8.4267(9)
b/Å	10.4362(12)
c/Å	17.949(2)
α/°	90
β/°	100.189(7)
γ/°	90
Volume/Å^3	1553.6(3)
Z	4
ρ_{calc}g/cm^3	1.391
μ/mm^{-1}	0.100
F(000)	680.0
Crystal size/mm^3	0.72 × 0.34 × 0.1
Radiation	MoKα (λ = 0.71073)
2Θ range for data collection/°	4.612 to 54.928
Index ranges	$-10 \le h \le 10$, $-13 \le k \le 13$, $-23 \le l \le 23$
Reflections collected	15689
Independent reflections	6998 [R_{int} = 0.0438, R_{sigma} = 0.0612]
Data/restraints/parameters	6998/239/498
Goodness-of-fit on F^2	0.958
Final R indexes [I>=2σ (I)]	R_1 = 0.0451, wR_2 = 0.0985
Final R indexes [all data]	R_1 = 0.1039, wR_2 = 0.1245
Largest diff. peak/hole / e Å^{-3}	0.18/-0.16

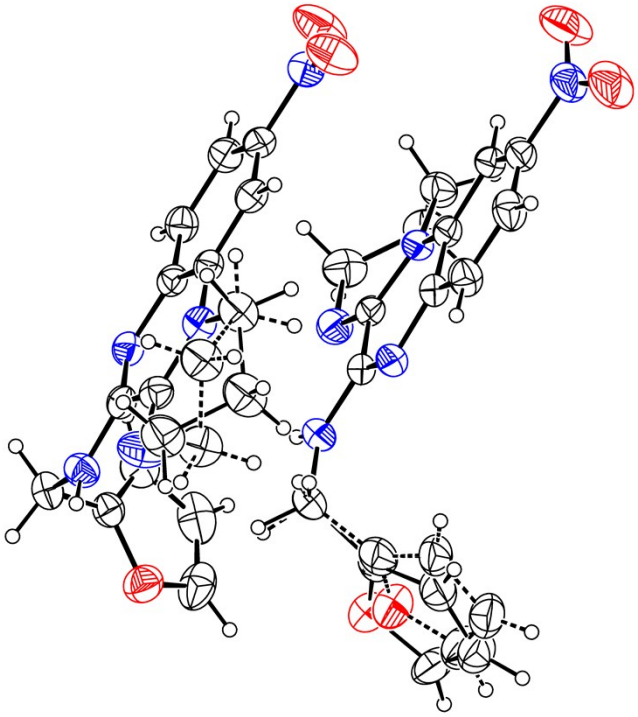


Fig. S3. ORTEP diagram of **4c**, in which thermal elliosoids shown in 30% probability level. The asymmetric unit contains two crystallogrtaphically independent molecules. The five membered ring in one molecule and a six membered ring in another molecule are disordered over two positions.

Table 3 Crystal data and structure refinement for **5e**.

Identification code	**5e** (CCDC no: 1058069)
Empirical formula	$C_{25}H_{26}N_6O_5$
Formula weight	490.52
Temperature/K	296.15
Crystal system	triclinic
Space group	*P-1*
a/Å	5.8603(5)
b/Å	11.0162(13)
c/Å	19.371(2)
α/°	76.719(7)
β/°	87.487(6)
γ/°	80.980(6)
Volume/Å^3	1202.0(2)
Z	2
ρ_{calc}g/cm^3	1.355
μ/mm^{-1}	0.097
F(000)	516.0
Crystal size/mm^3	0.22 × 0.22 × 0.2
Radiation	MoKα (λ = 0.71073)
2Θ range for data collection/°	2.16 to 55.122
Index ranges	-7 ≤ h ≤ 7, -14 ≤ k ≤ 14, -24 ≤ l ≤ 25
Reflections collected	23939
Independent reflections	5490 [R_{int} = 0.0638, R_{sigma} = 0.0924]
Data/restraints/parameters	5490/0/328
Goodness-of-fit on F^2	0.943
Final R indexes [I>=2σ (I)]	R_1 = 0.0558, wR_2 = 0.1352
Final R indexes [all data]	R_1 = 0.1671, wR_2 = 0.1831
Largest diff. peak/hole / e Å^{-3}	0.18/-0.21

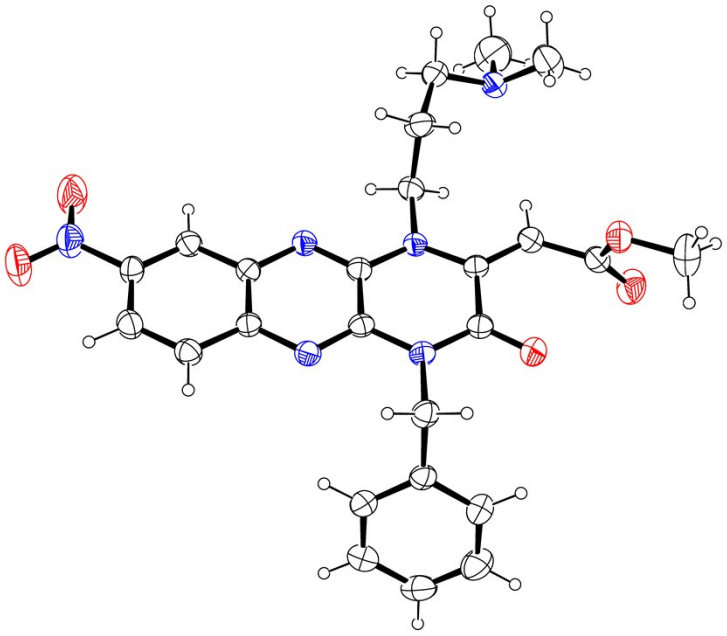


Fig. S4. ORTEP diagram of the asymmetric unit of **5e**, in which thermal elliosoids shown in 30% probability level.

S6 References :

1. J. Deng, E. Feng, S. Ma, Y. Zhang, X. Liu, H. Li, H. Huang, J. Zhu, W. Zhu, X. Shen, L. Miao, H. Liu, H. Jiang and J. Li. *J Med. Chem.* 2011, **54**, 4508.
2. APEXII, Program for Bruker CCD X-ray Diffractometer Control; Bruker AXS, Inc.: Madison, WI, 2006.
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4. G. M. Sheldrick, SADABS, Program for empirical absorption correction of area-detector data; Universität Göttingen: Göttingen, Germany, 2008.
5. G. M. Sheldrick, Acta Cryst., 2015, A71, 3-8.
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