

# Probing GFP Chromophore Analogs as anti-HIV agents targeting LTR-III G-Quadruplex

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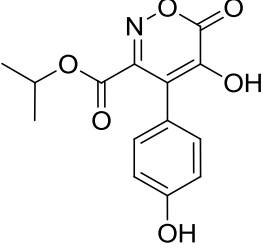
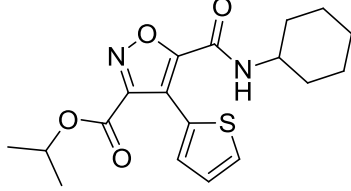
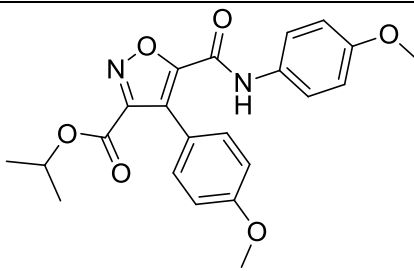
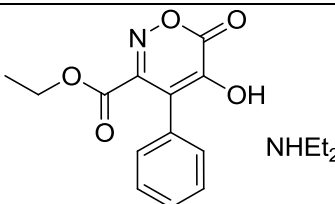
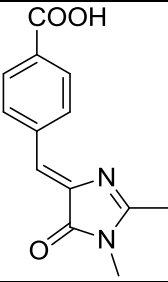
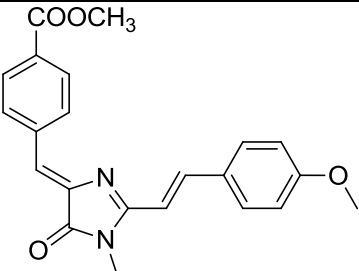
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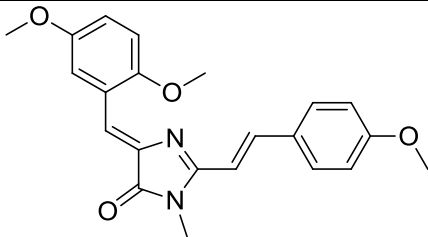
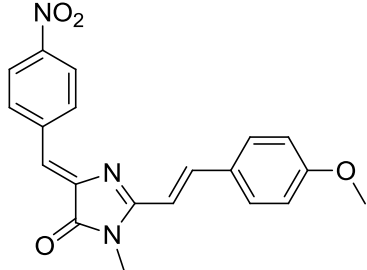
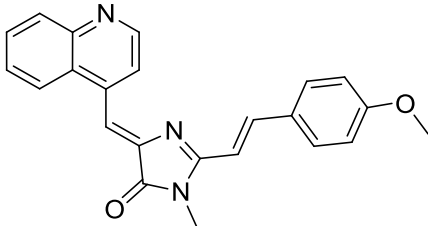
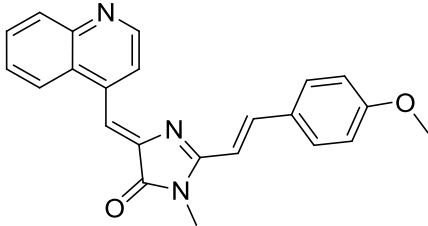
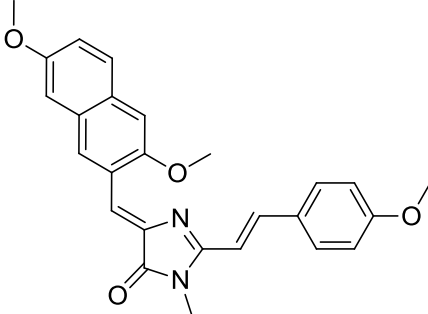
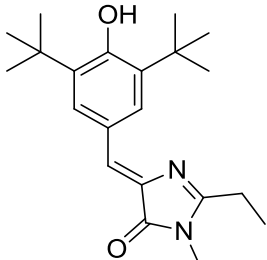
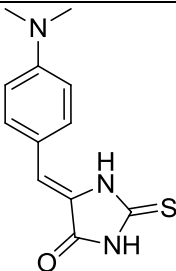
† these authors contributed equally to this work

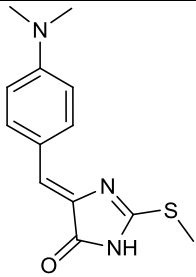
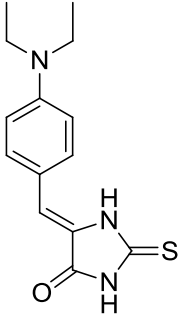
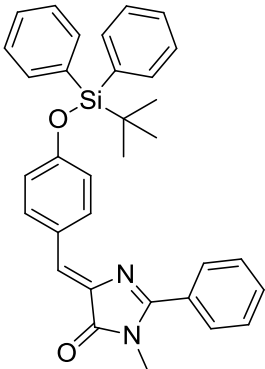
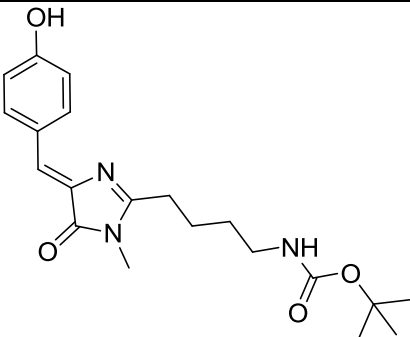
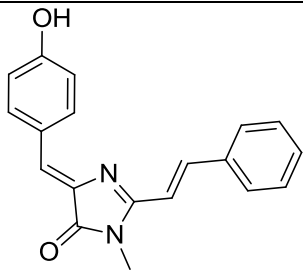
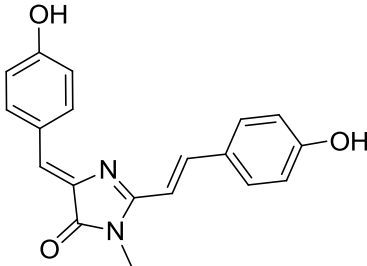
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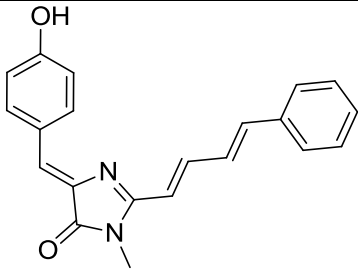
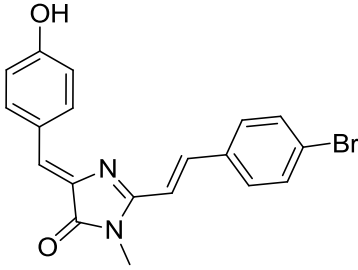
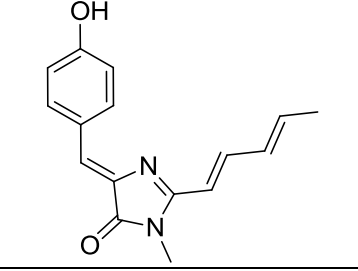
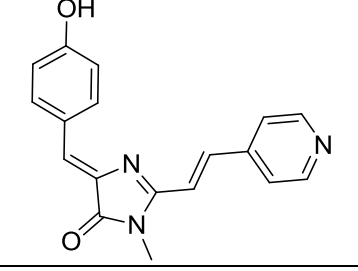
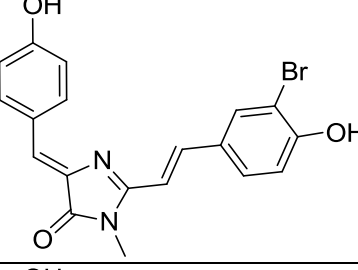
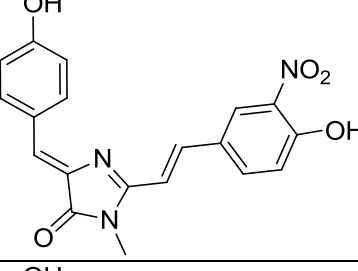
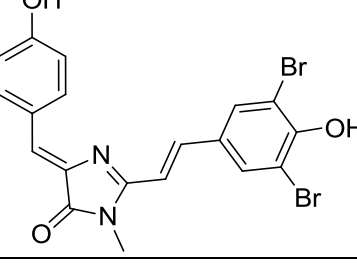
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**Table S1. Primary screening of GFP chromophore analogs and their intermediates for the stabilizing properties of FAM/TAMRA-labeled LTR-III G-quadruplex.**

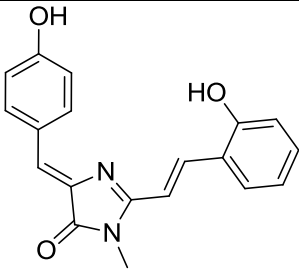
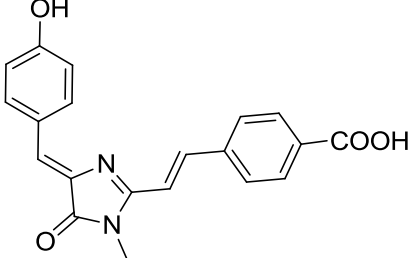
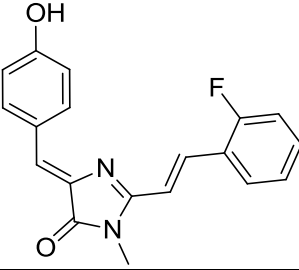
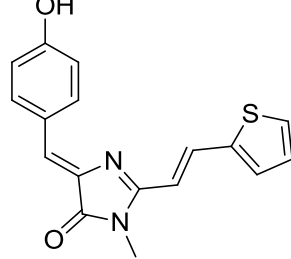
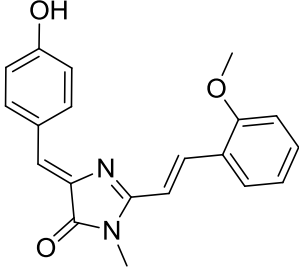
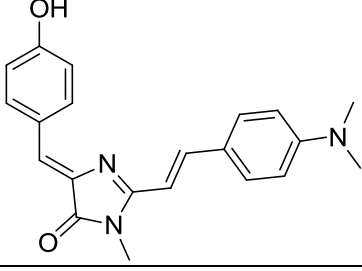
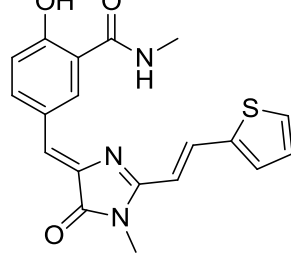
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3	AL 45		0.2
4	AL 58		0.1
5	AI 89		-0.5
6	AI 116		0.8

7	AI 118		-0.1
8	AI 119		1.4
9	AL 122		-0.6
10	AL 125		1.7
11	AI 126		1.6
12	AL 135.2		-1.3
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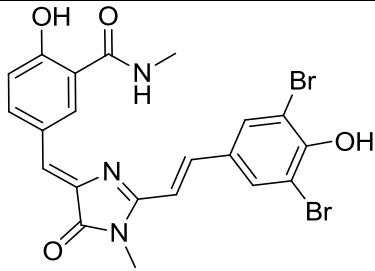
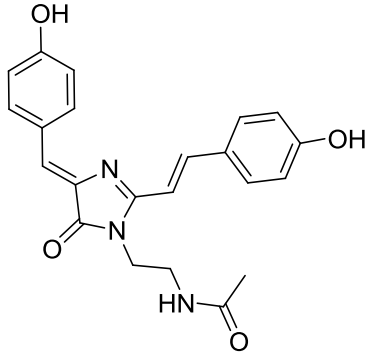
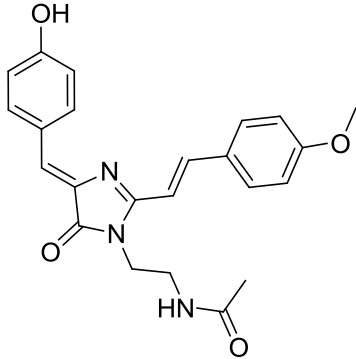
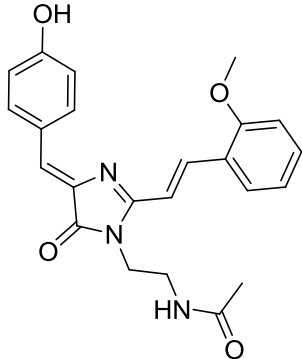
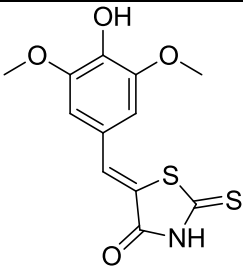
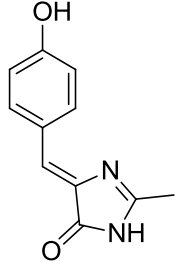
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19	ccA 2		0.4

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21	ccA 7		0.8
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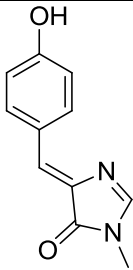
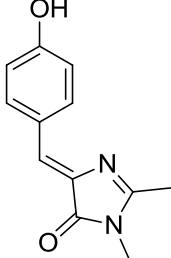
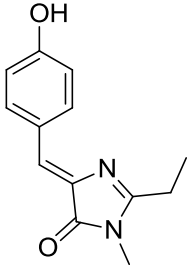
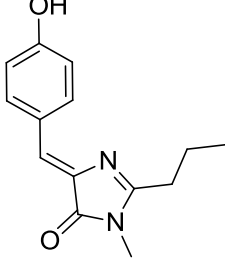
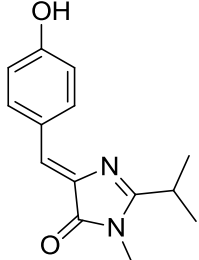
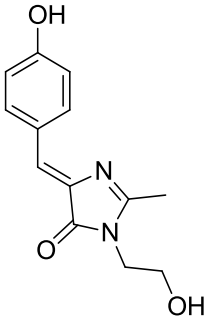
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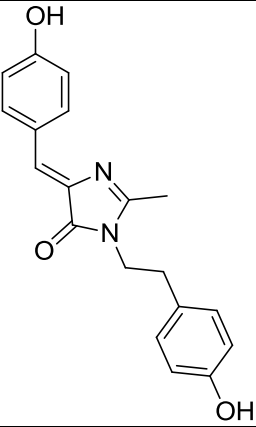
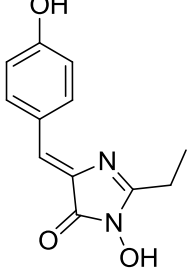
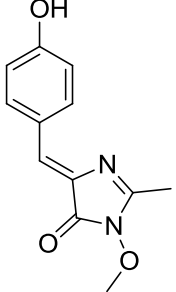
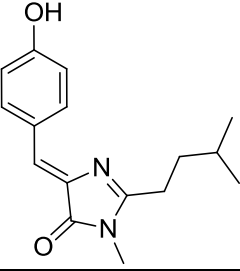
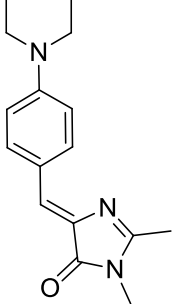
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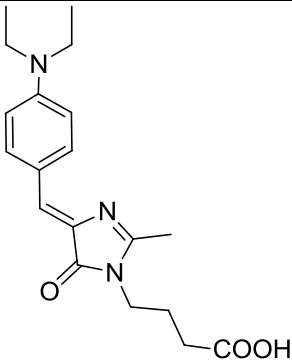
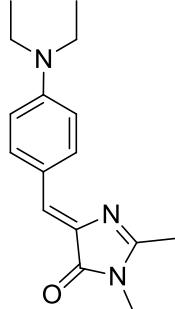
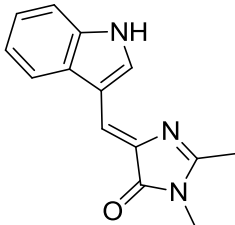
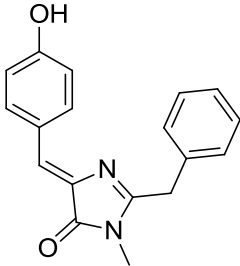
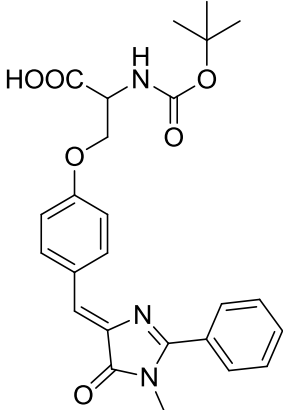
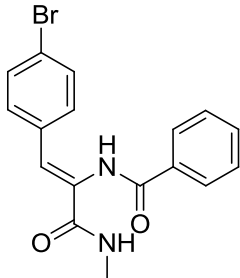
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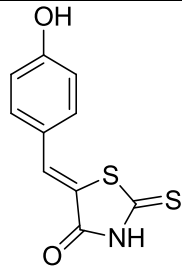
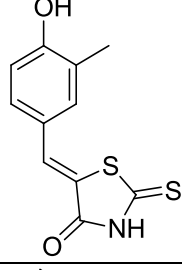
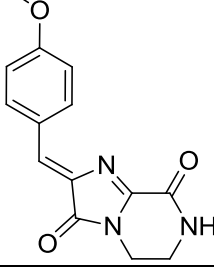
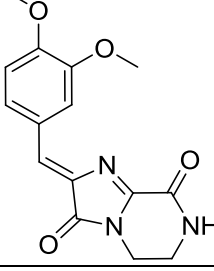
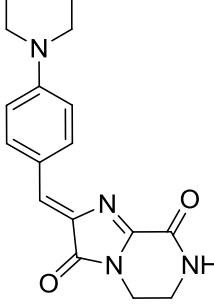
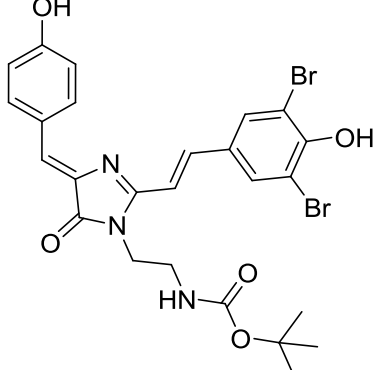
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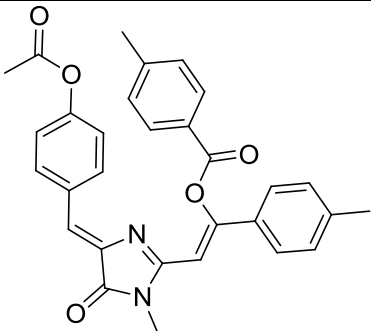
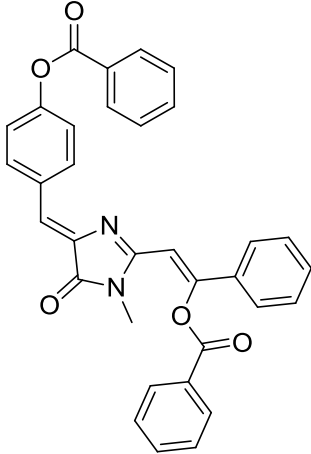
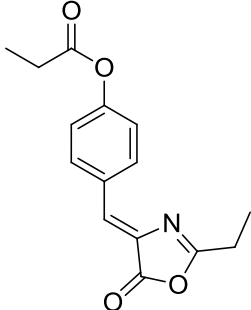
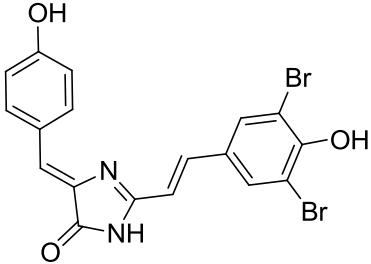
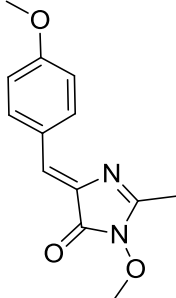


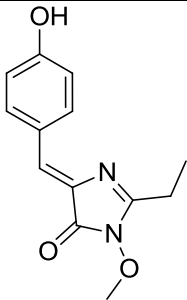
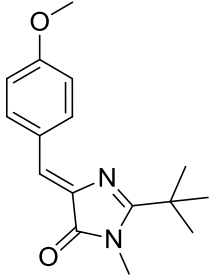
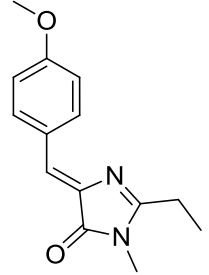
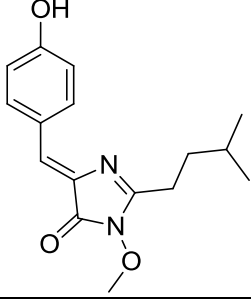
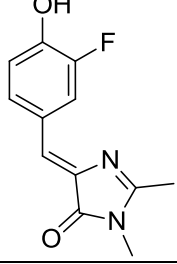
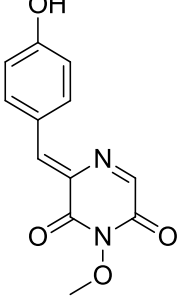
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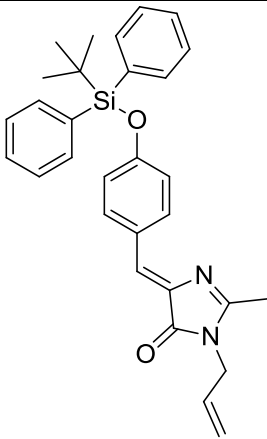
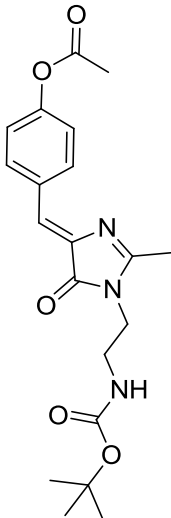
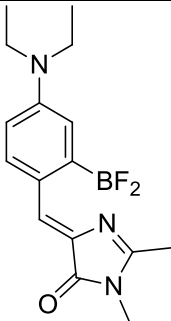
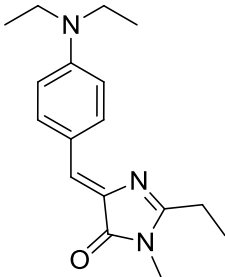
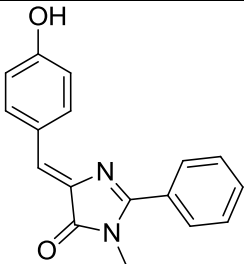
46	GA 14		0.1
47	GA 15		-0.1
48	GA 16		0.3
49	GA 18		-0.1
50	GC 01		0.4

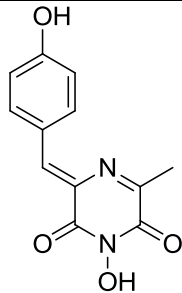
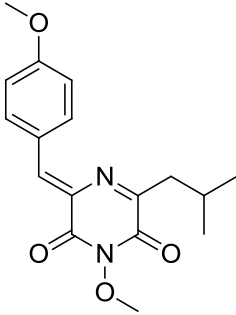
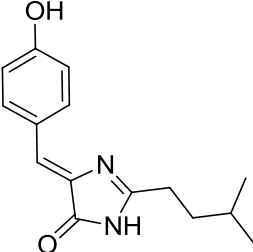
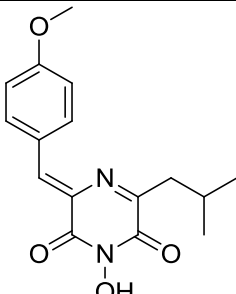
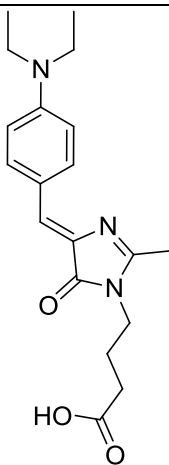
51	GC 03		0.4
52	GC 04		0
53	GC 07		-0.4
54	GFP-2-Bn		-1.5
55	GR 161		-0.2
56	GR 83		-0.8

57	HBR		-0.2
58	HMBR		-0.6
59	JL 06.1		0.1
60	JL 06.2		0.4
61	JL 19		0.1
62	M 165		-0.5

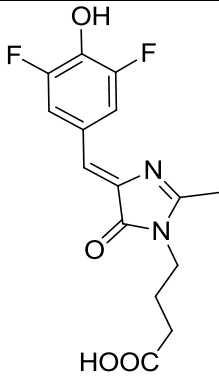
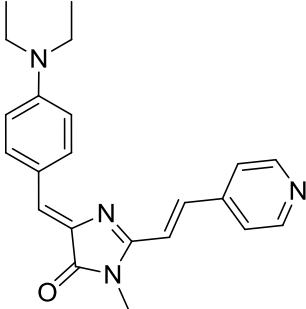
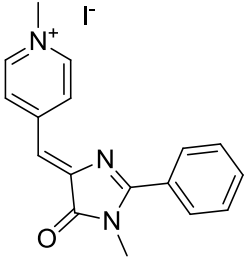
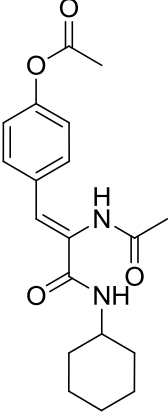
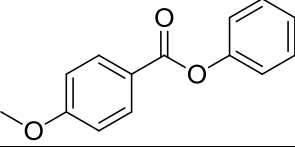
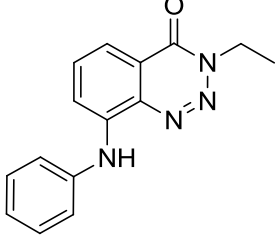
63	M 202		-0.6
64	M 228		-0.8
65	M 292		-0.6
66	M 295		-0.5
67	M 312		-0.2

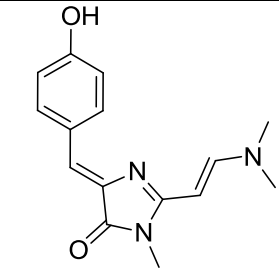
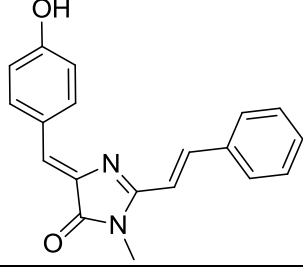
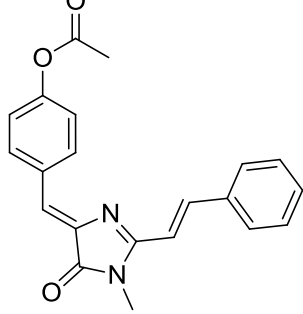
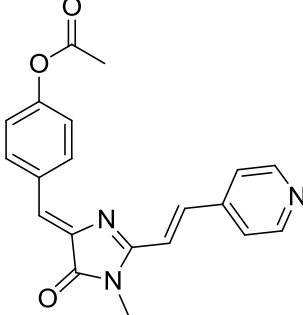
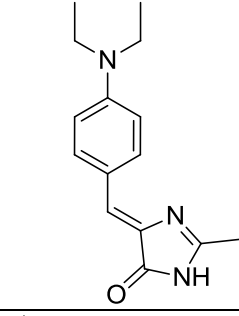
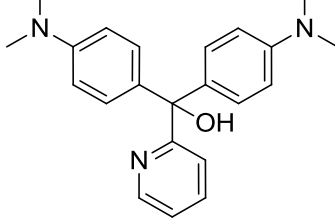
68	M 316		-0.3
69	M 440		-0.1
70	M 497a2		-0.4
71	M 552		0
72	M 556		-0.2
73	M 577		0.1

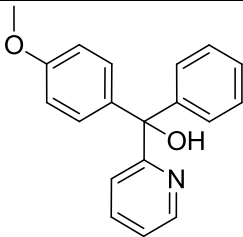
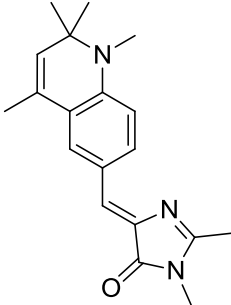
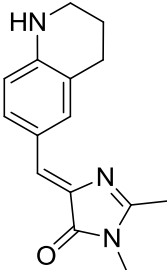
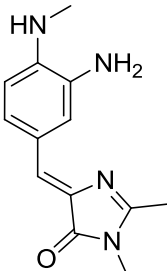
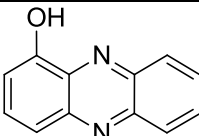
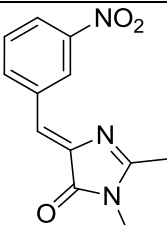
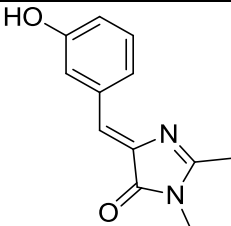
74	M 653		-0.2
75	M 678		-0.4
76	M 739		-0.4
77	M 747		0.6
78	M 750		-0.2

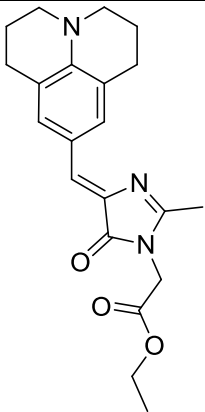
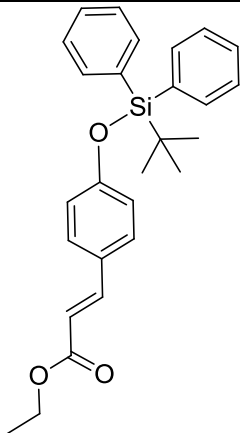
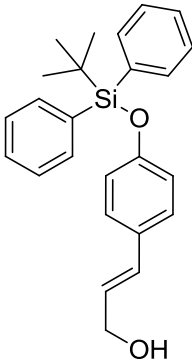
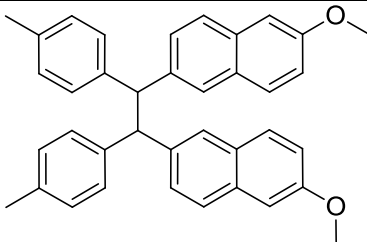
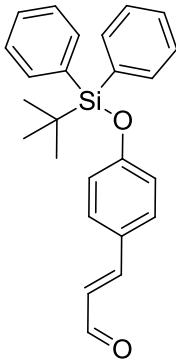
79	M 800	 <chem>Oc1ccc(cc1)/C=C2/C(=O)N(O)C(=O)N=C2C</chem>	-0.2
80	M 802	 <chem>COc1ccc(cc1)/C=C2/C(=O)N(C(C)C)C(=O)N=C2C</chem>	-2.3
81	M 803	 <chem>Oc1ccc(cc1)/C=C2/C(=O)N(C(C)C)C(=O)N=C2C</chem>	-0.1
82	M 813	 <chem>COc1ccc(cc1)/C=C2/C(=O)N(C(C)C)C(=O)N=C2C</chem>	2.9
83	M 820	 <chem>CCN(CC)c1ccc(cc1)/C=C2/C(=O)N(CCC(=O)O)C(=O)N=C2C</chem>	0.1

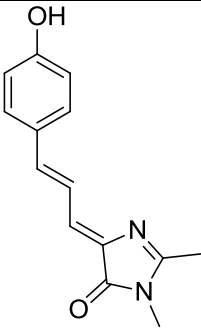
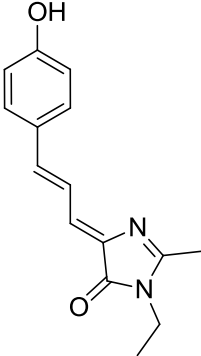
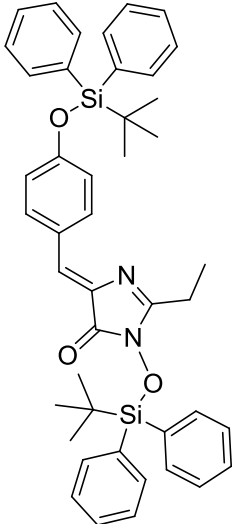
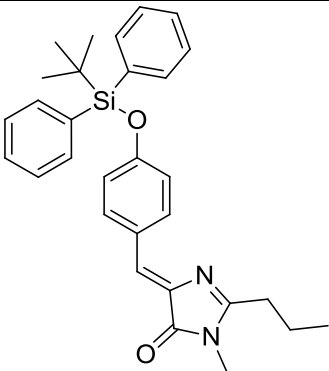


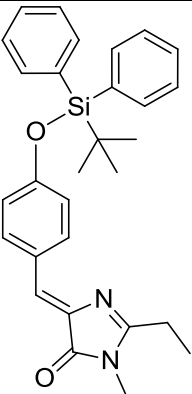
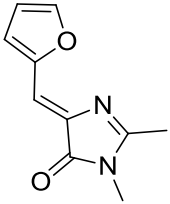
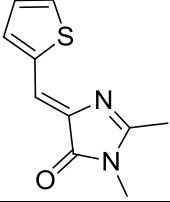
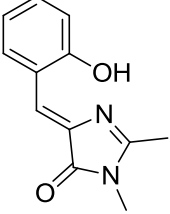
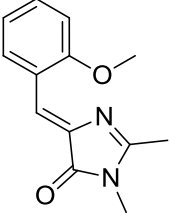
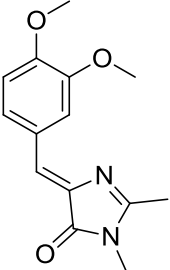
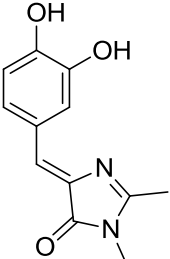
84	M 894		-0.3
85	M 895		0.8
86	M 903.2		2.8
87	M 920		-0.4
88	M 939		-1.1
89	M 958A		-0.7

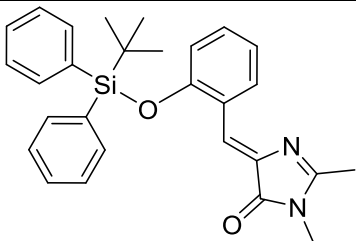
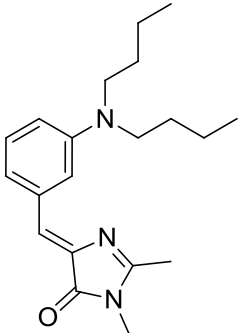
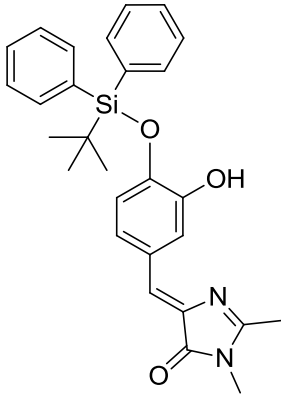
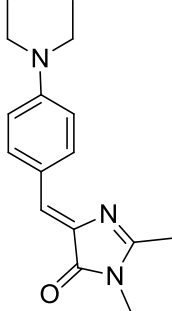
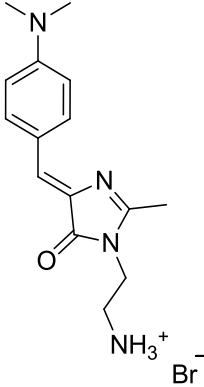
90	M 995a		0.1
91	M 996a		0.1
92	M 1009A		0.5
93	M 1009B		0.5
94	M 1045		0.1
95	M 1122		-0.6

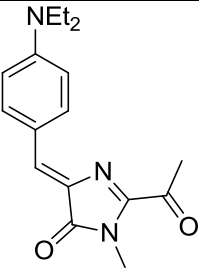
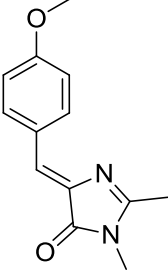
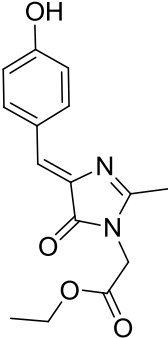
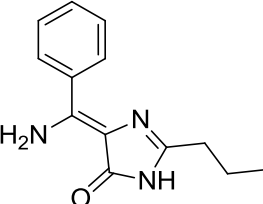
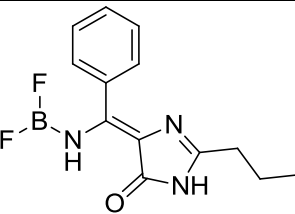
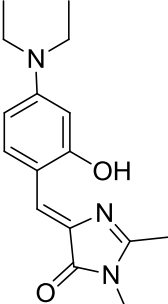
96	M 1136		-0.7
97	M 1152		0.6
98	M 1157		0
99	M 1165		0.9
100	M 1255		-0.6
101	M 1257		-0.9
102	M 1300		0.2

103	M 1343		0
104	M 1352		-0.5
105	M 1359		0.1
106	M 1362.2		-0.6
107	M 1373.2		-0.5

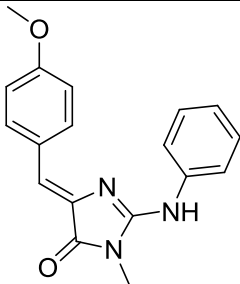
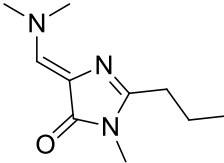
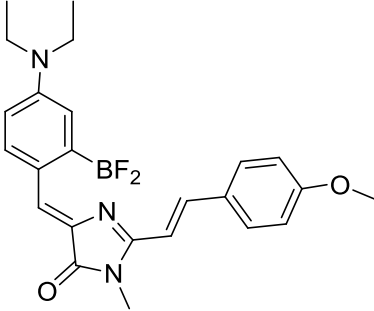
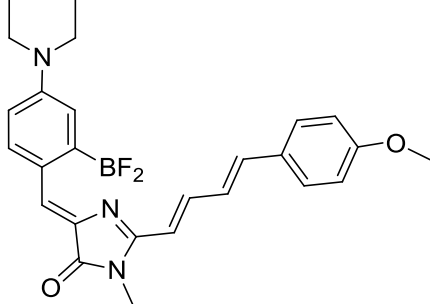
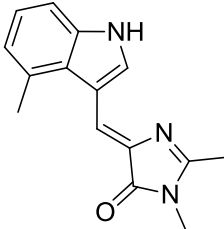
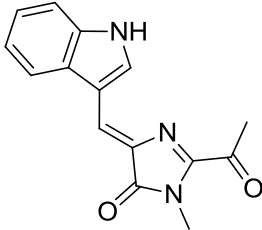
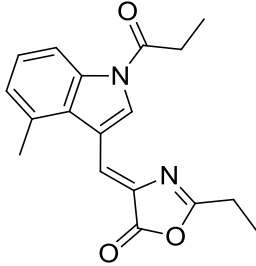
108	M 1378		-0.7
109	M 1379.2		-0.2
110	M 1505		-0.3
111	M 1550		-0.1

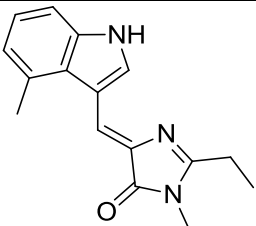
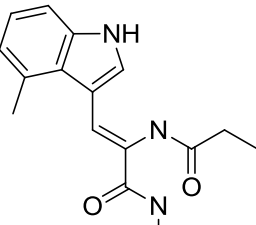
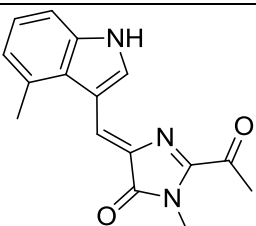
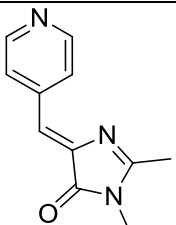
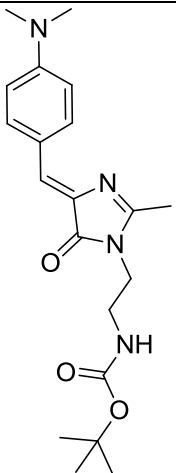
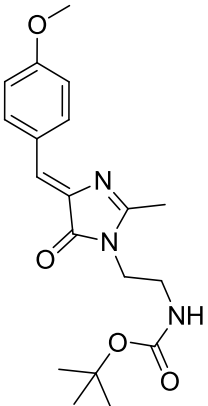
112	M 1557		-0.1
113	M 1583.2		-0.5
114	M 1583.3		0.1
115	M 1583.4		0.2
116	M 1583.5		0.1
117	M 1583.6		0
118	M 1583.7		-1.4

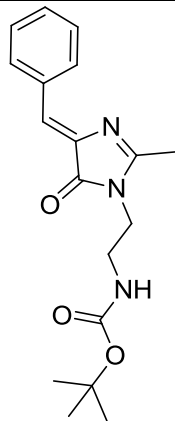
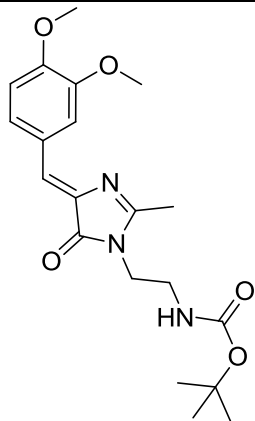
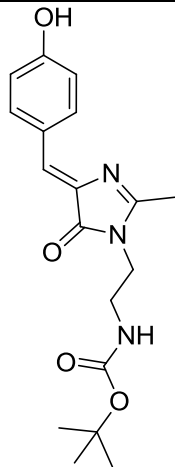
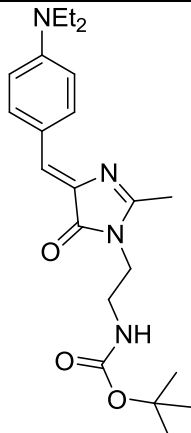
119	M 1586		-0.3
120	M 1600		-0.4
121	M 1620		0.4
122	M 1661		0.4
123	M 1668		0.2

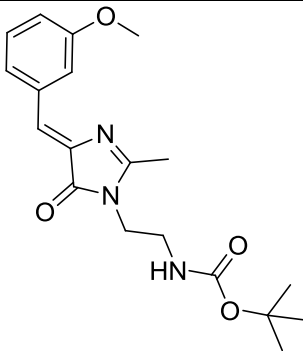
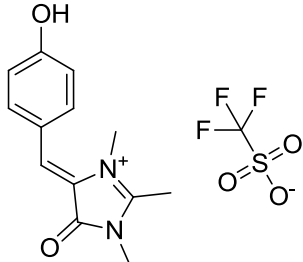
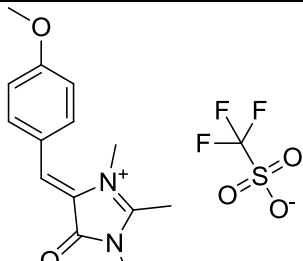
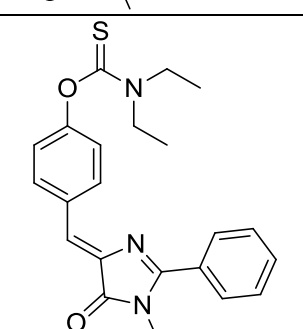
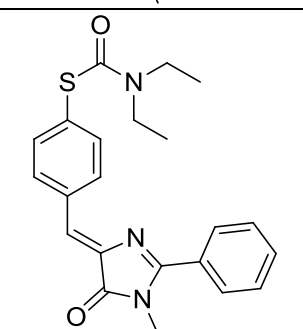
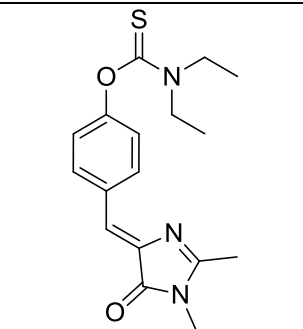
124	M 1706		-0.4
125	M 1814		-0.3
126	M 1831.1		-0.2
127	M 1862		-1.1
128	M 1878.1		-1.5
129	M 1933		-0.3

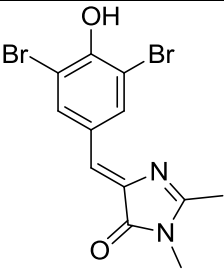
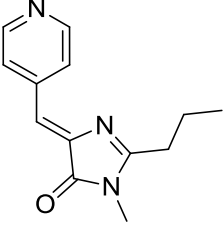
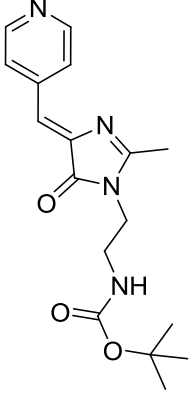
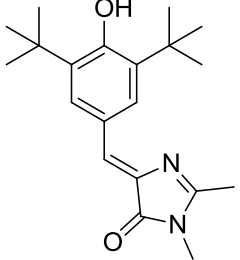
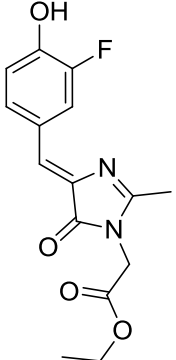
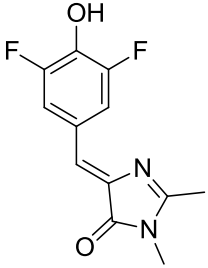


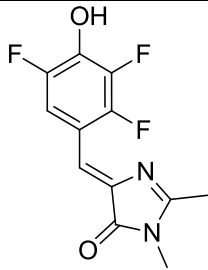
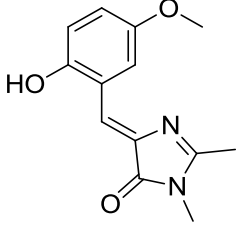
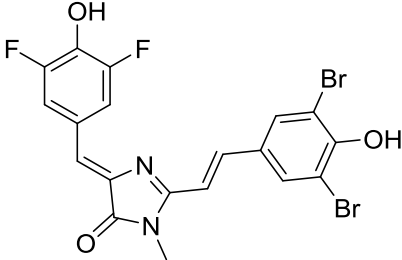
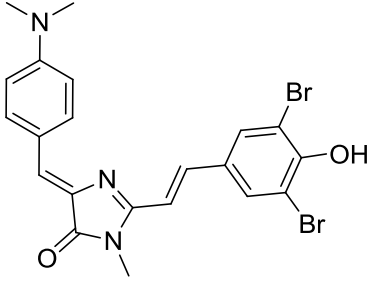
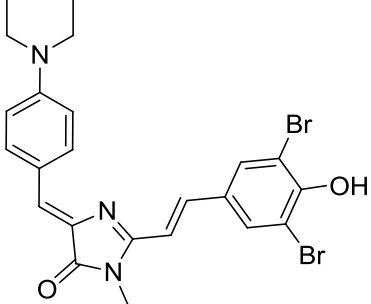
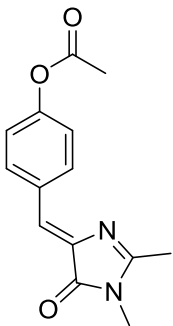
130	M 1944b		-0.3
131	M 1945.1		-0.6
132	M 1971a		-0.3
133	M 1971c		0.6
134	M 1974		0
135	M 1975		-0.6
136	M 1977		0

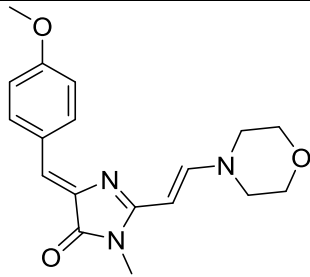
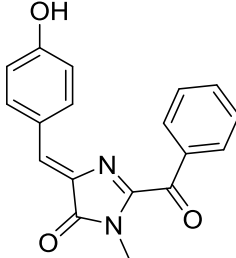
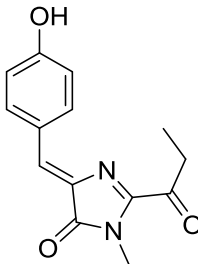
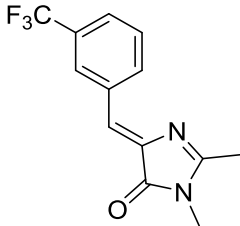
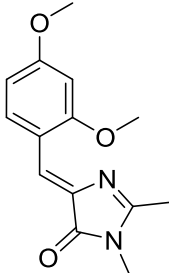
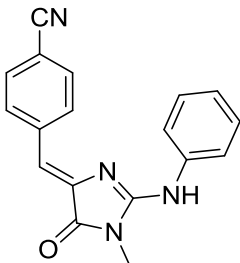
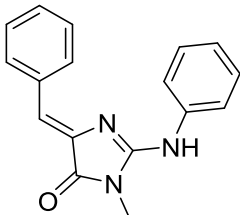
137	M 1978		-0.1
138	M 1979		-0.1
139	M 1981		1.7
140	M 1998		-0.4
141	M 2022a		-0.2
142	M 2022b		0

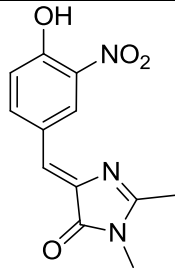
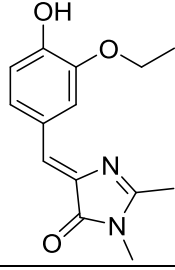
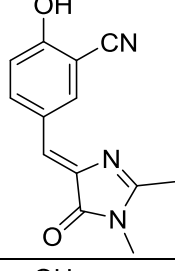
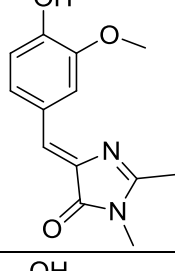
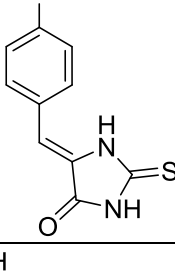
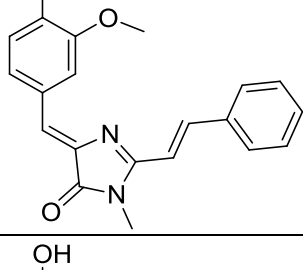
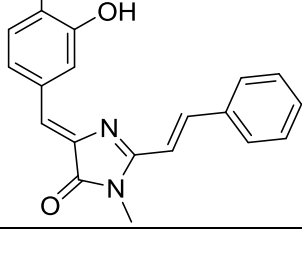
143	M 2022d		-0.3
144	M 2022e		0
145	M 2022f		-0.5
146	M 2026c		0.2

147	M 2026f		-0.4
148	M 2059		-0.7
149	M 2060		-0.2
150	M 2069		-0.4
151	M 2075		0.3
152	M 2081		0.1

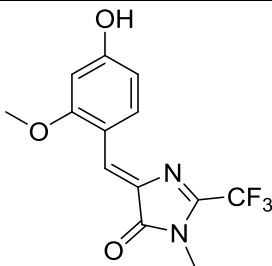
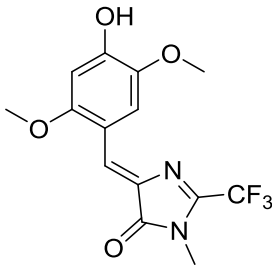
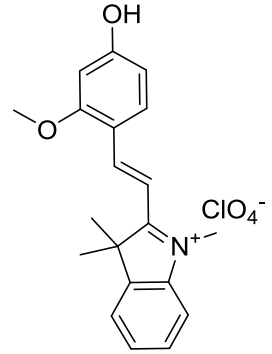
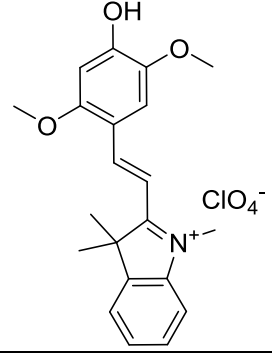
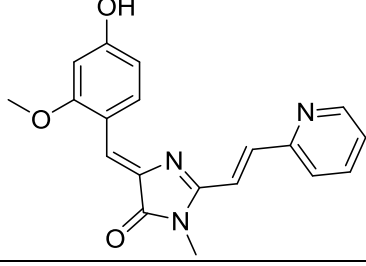
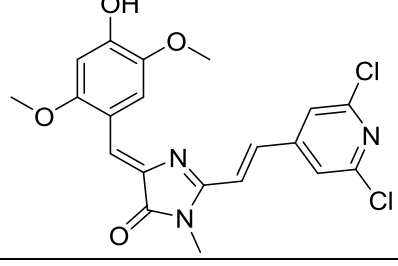
153	M 906		-2.7
154	M 2237		-0.3
155	M 2250.2		-0.1
156	M 2273.1		0.2
157	M 2286.1		-0.3
158	M 2296		-0.4

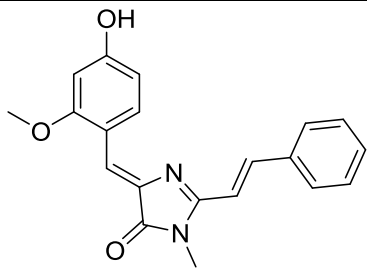
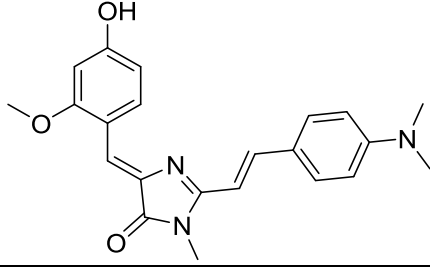
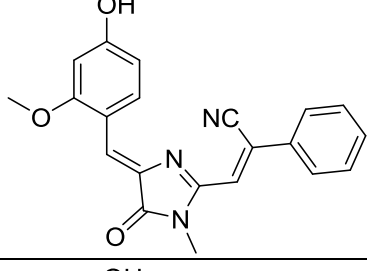
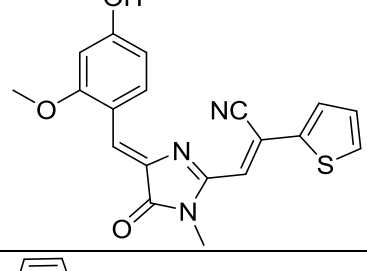
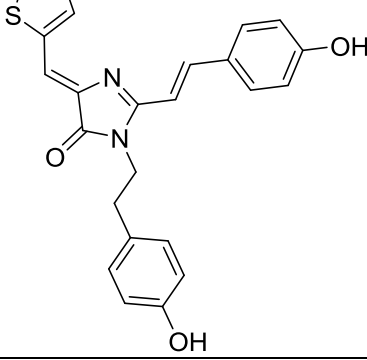
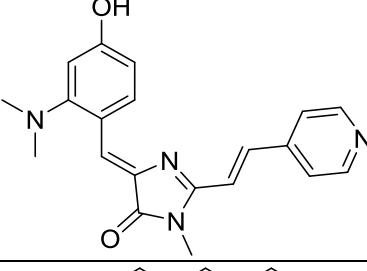
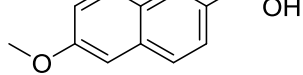
159	M 2301		0.2
160	M 2360		-0.3
161	M 2368b2		-0.9
162	M 2368c		0
163	M 2368d		0.1
164	M 2370		0

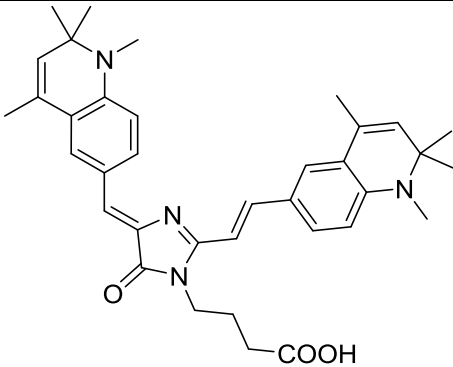
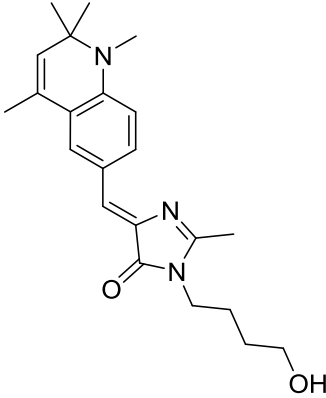
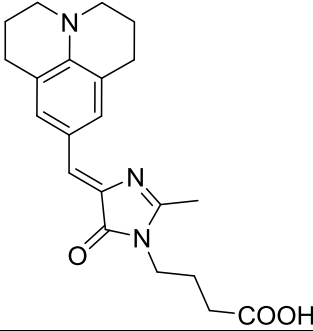
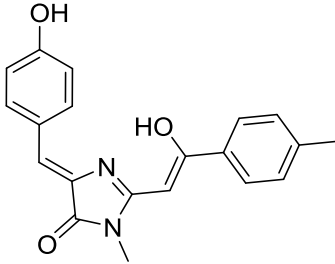
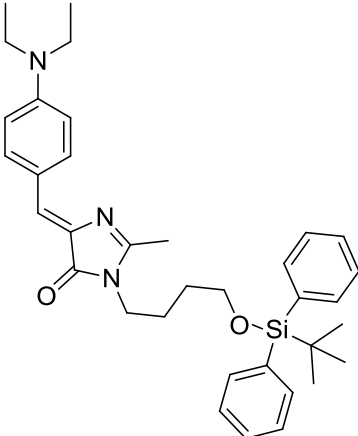
165	M 2371c		-0.1
166	M 2372a		0.1
167	M 2372B		-0.2
168	M 2375		-0.2
169	M 2379		0.1
170	M 2385a		-0.1
171	M 2385b1		-0.1

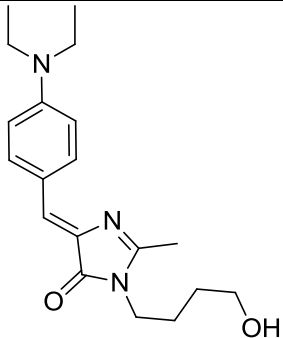
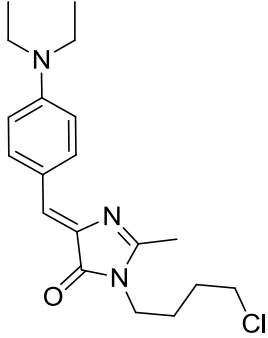
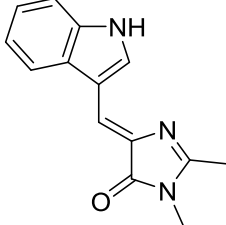
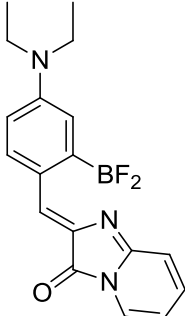
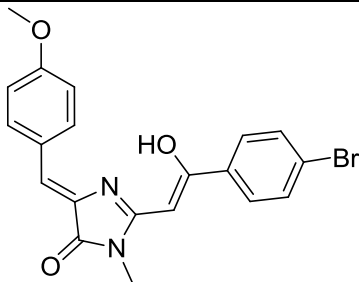
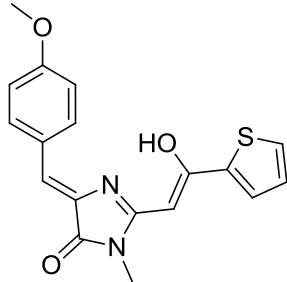
172	M 2482		-1.2
173	M 2486		0
174	M 2489.2		-0.5
175	M 2491		-0.2
176	M 2497		0
177	M 2499a		0.1
178	M 2499b		0.3

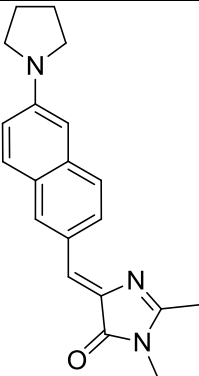
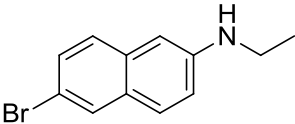
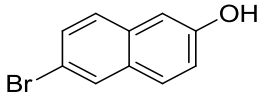
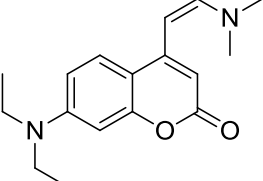
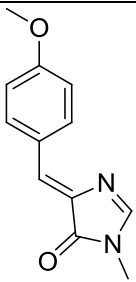
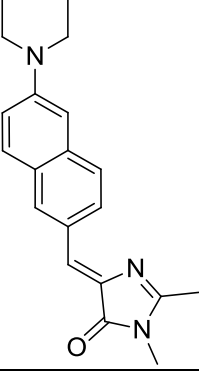
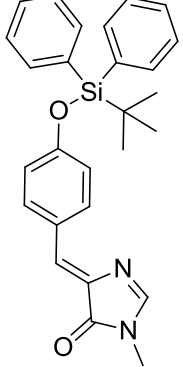


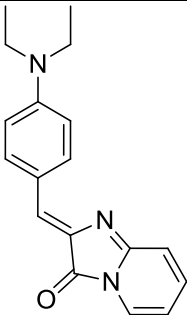
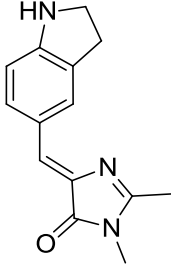
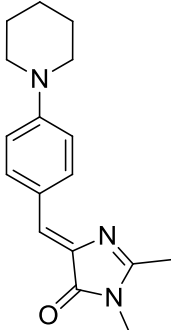
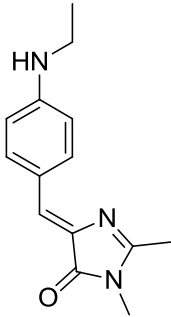
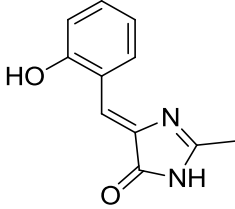
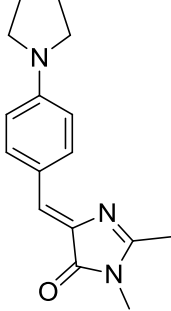
179	M 2738c		0.4
180	M 2738d		1.4
181	M 2761a		0.5
182	M 2761b		0.8
183	M 2766		1.1
184	M 2767		1.4

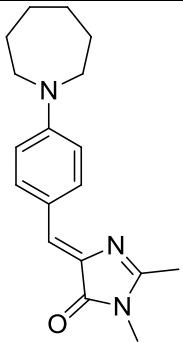
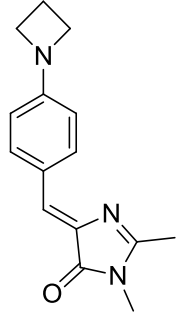
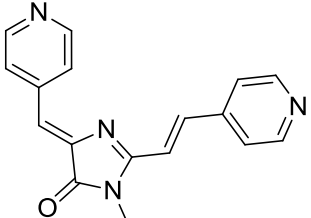
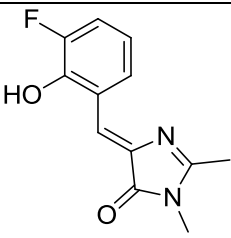
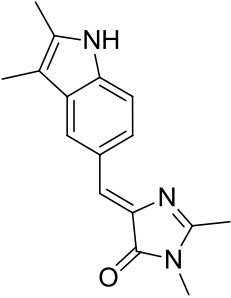
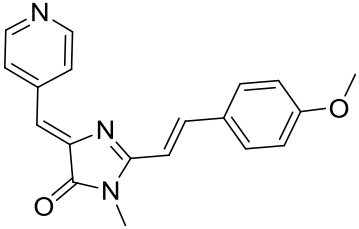
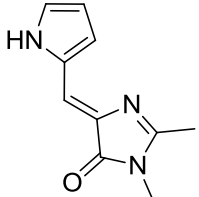
185	MID 145		0.9
186	MID 147		0.4
187	MID 151		0.2
188	MID 153		2
189	MID 161		-2.6
190	MID 213		0.9
191	N 49		-0.1

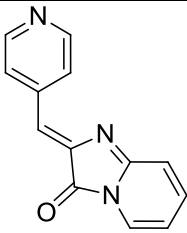
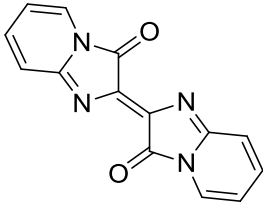
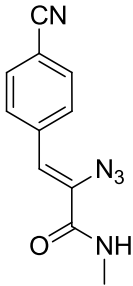
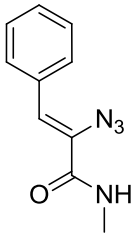
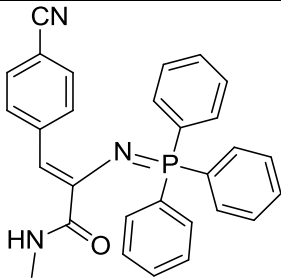
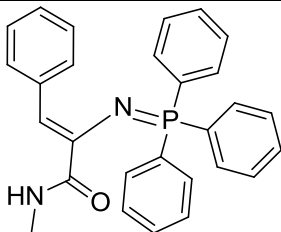
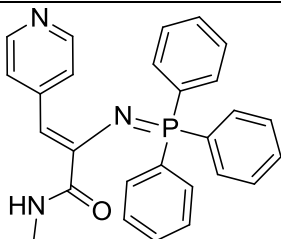
192	N 62		0.6
193	N 141		0.2
194	N 152		0.3
195	N 154		-0.1
196	N 162		0.2

197	N 182		-0.1
198	N 189		0.2
199	N 357		0.1
200	N 367		0.3
201	N 537		-0.3
202	N 539.1		0

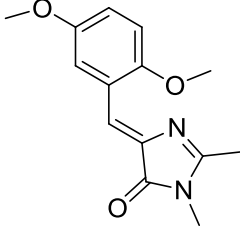
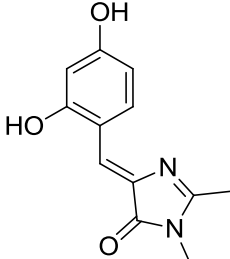
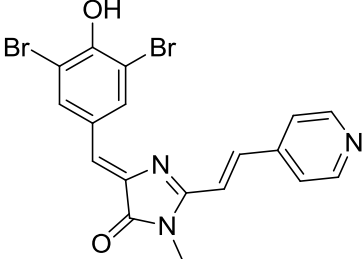
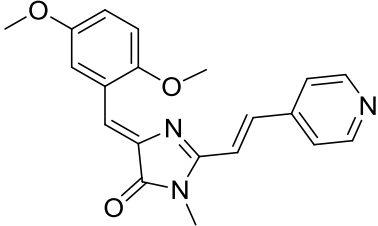
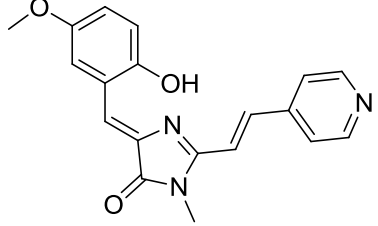
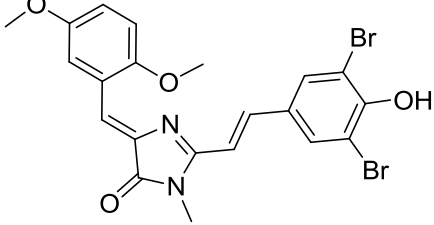
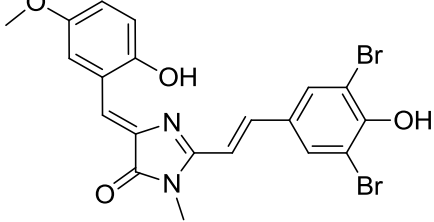
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204	N 576.2		0
205	N 576.3		0
206	N 582.1		0
207	N 599.2		-0.7
208	N 601.23		-0.7
209	N 624		-0.5

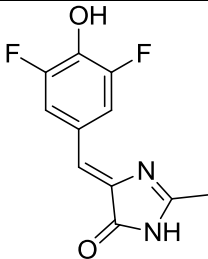
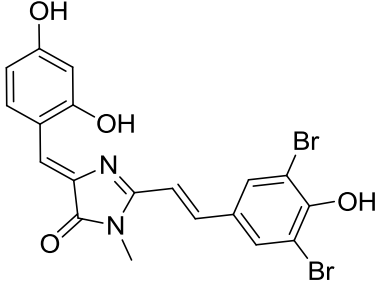
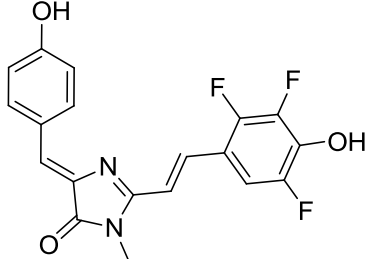
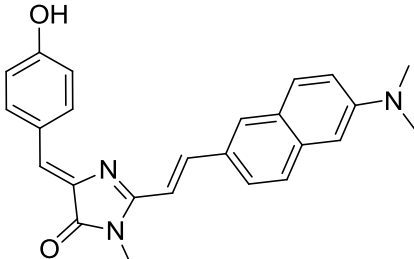
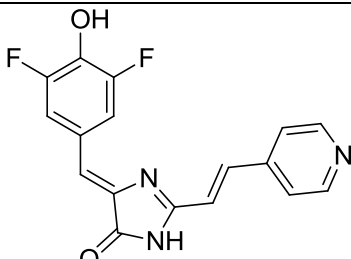
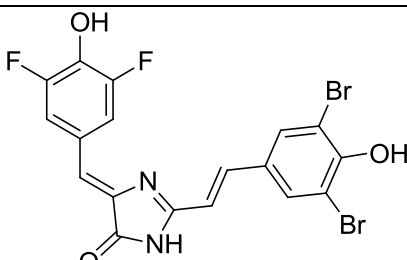
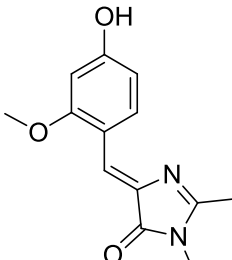
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211	N 652.3		0.3
212	N 665		-0.3
213	N 683.1		5
214	N 702.1		0
215	N 704		-0.2

216	N 708.2		0.2
217	N 710.12		0.1
218	N 768		0.9
219	N 781		0
220	N 792		0.2
221	N 813		0.6
222	N 815		-0.1

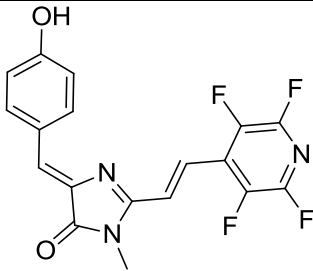
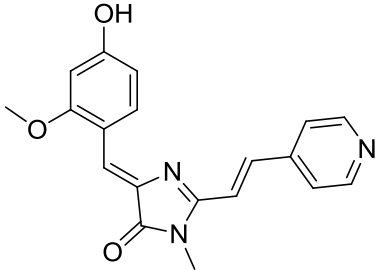
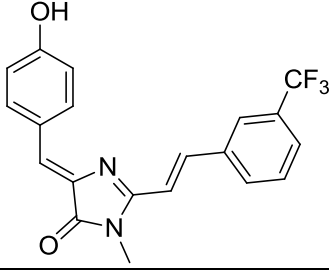
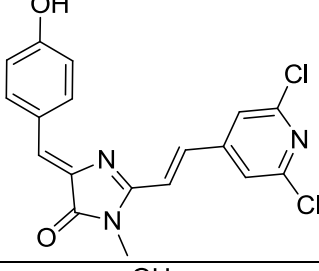
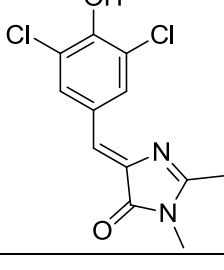
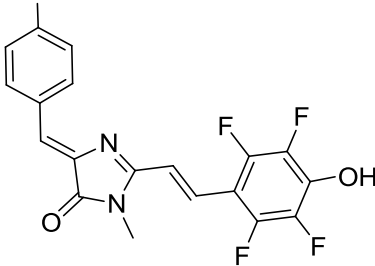
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224	N 817.2		-0.1
225	N 830A		-0.1
226	N 830b		-0.2
227	N 831		0
228	N 832		-0.5
229	N 833		-0.6

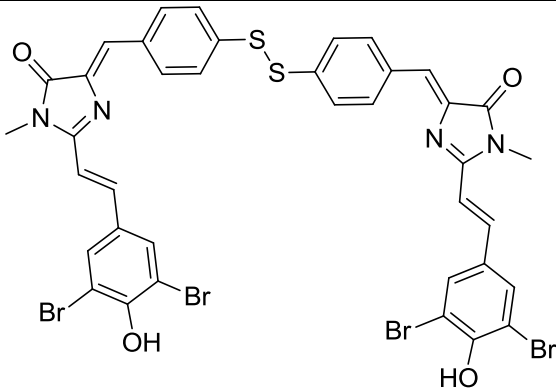
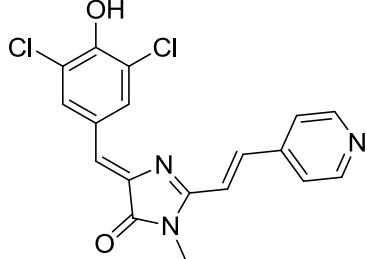
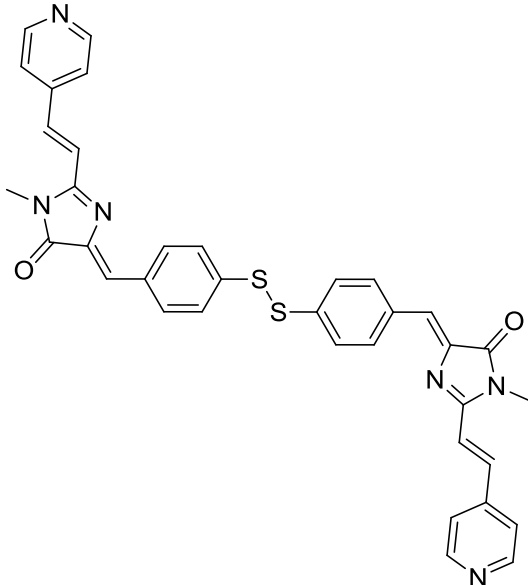
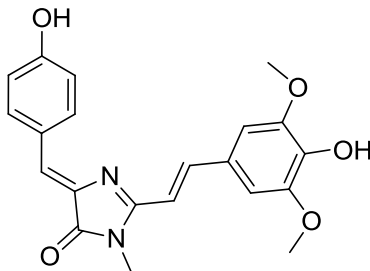
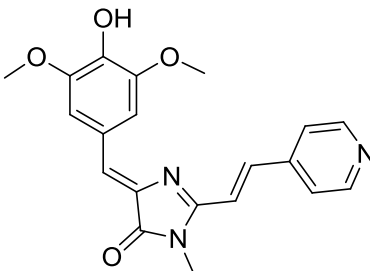


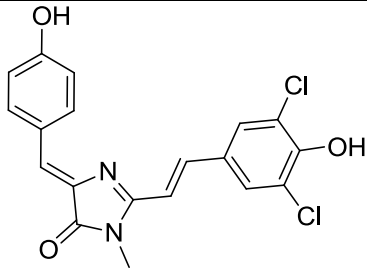
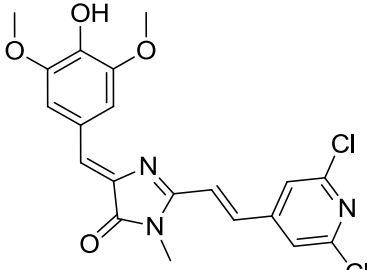
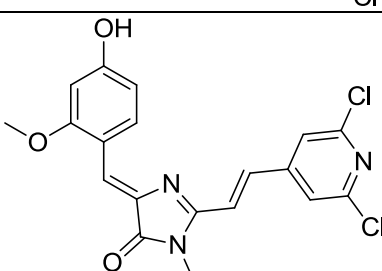
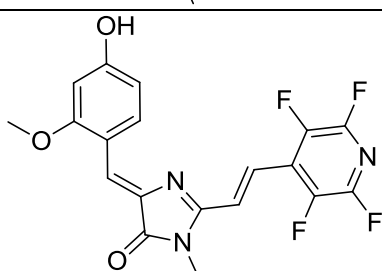
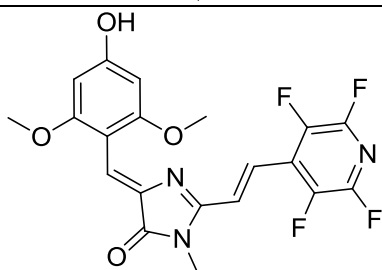
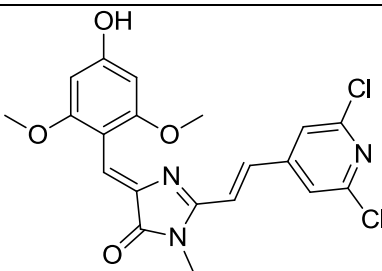
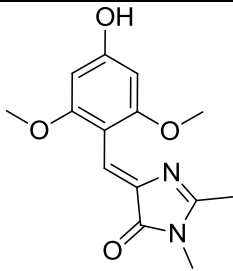
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231	N 844.1		-0.1
232	N 848.1		-1.8
233	N 848.2		2.6
234	N 848.3		2.9
235	N 851A		1.4
236	N 851B		1.2

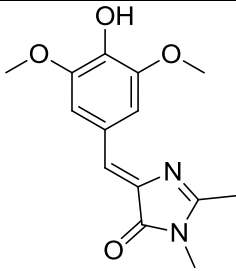
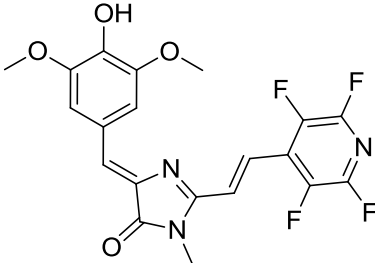
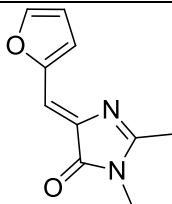
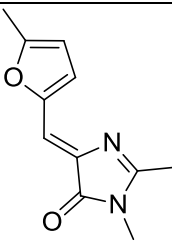
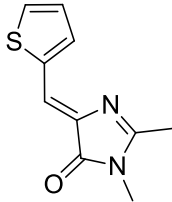
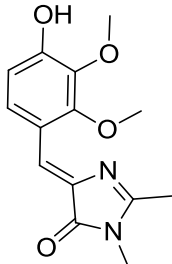
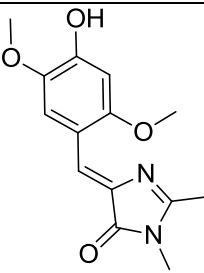
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238	N 855		0.4
239	N 860C		-0.2
240	N 861		0
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242	N 864		-2.3
243	N 865		0.8

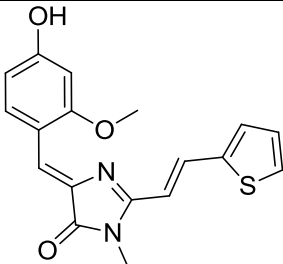
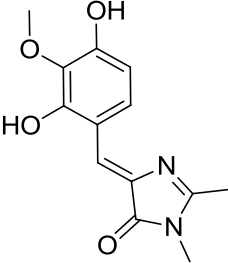
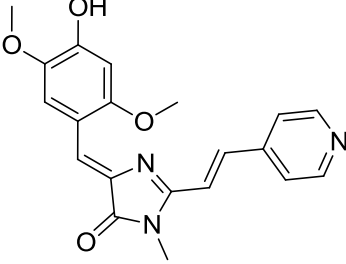
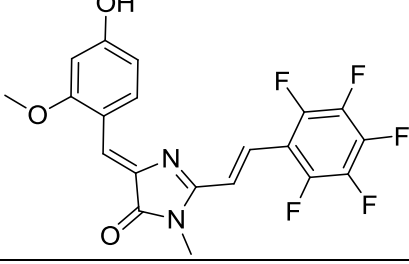
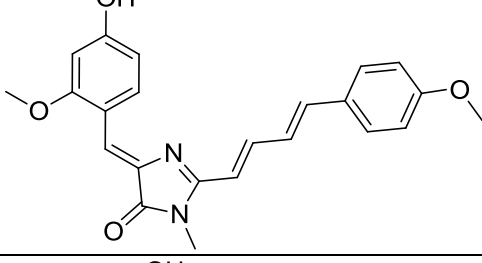
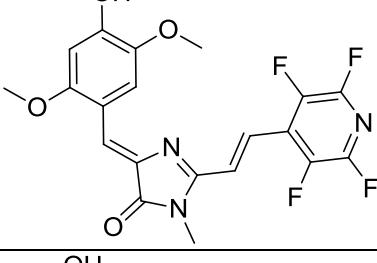
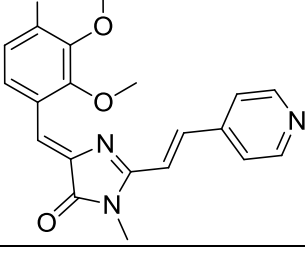
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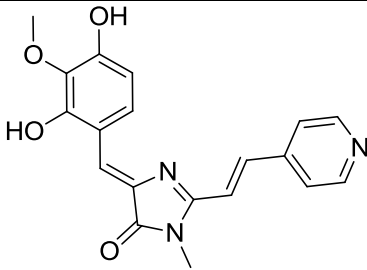
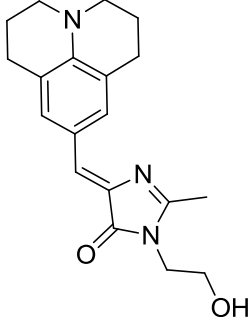
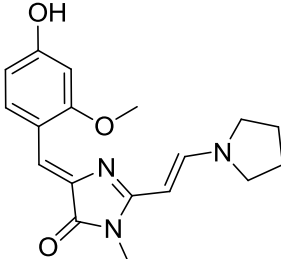
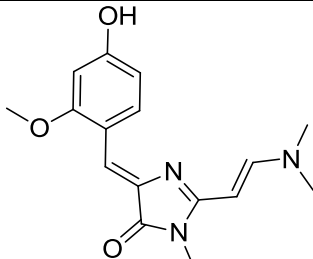
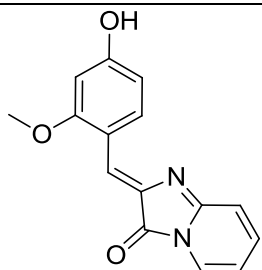
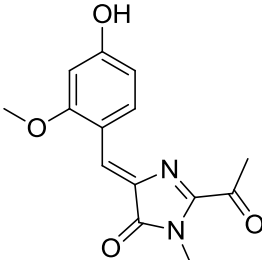
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245	N 871B		0.4
246	N 873		0.4
247	N 886		-0.2
248	N 892		-1
249	N 893		-0.4

250	N 898		0.1
251	N 901		0.4
252	N 904		-1.2
253	N 906		0.1
254	N 908		2.4

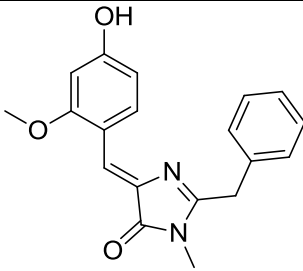
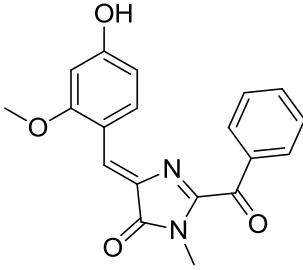
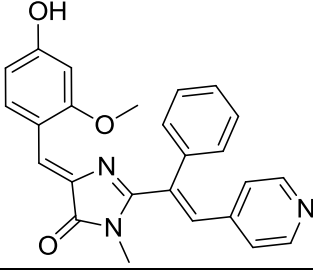
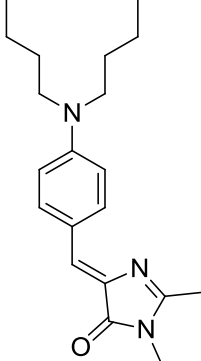
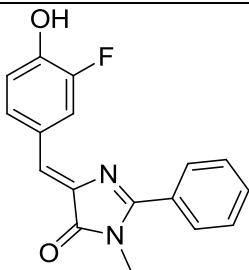
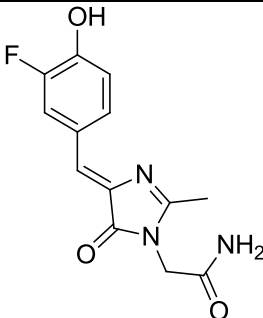
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256	N 960a		5.3
257	N 960b		0.7
258	N 967		0.8
259	N 971		0.1
260	N 973		2.3
261	N 976		0.5

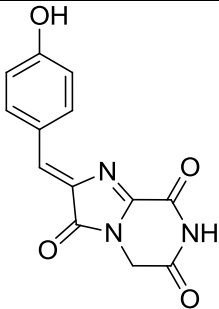
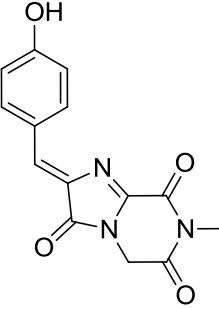
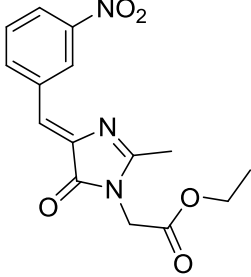
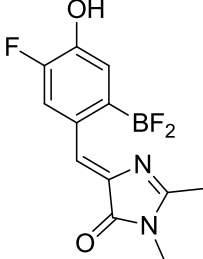
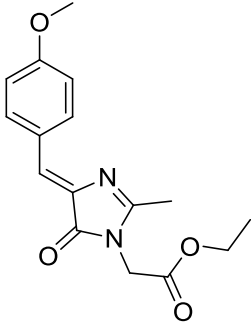
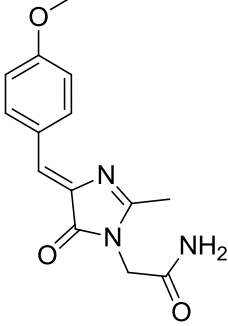
262	N 979		-0.2
263	N 980		1
264	N 1019		-0.3
265	N 1020		-0.2
266	N 1021		0.3
267	N 1027.1		-0.1
268	N 1036		0.5

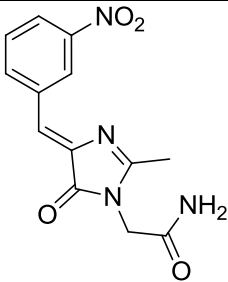
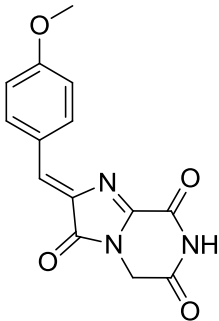
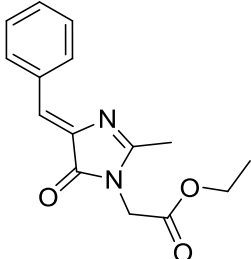
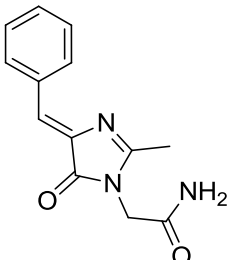
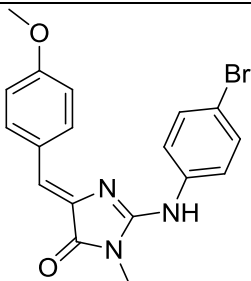
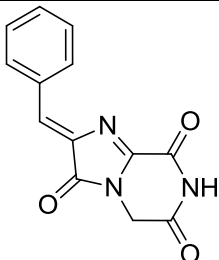
269	N 1039		1.1
270	N 1042		1.4
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272	N 1049		1.8
273	N 1052		4.6
274	N 1056		0
275	N 1068.2		7.1

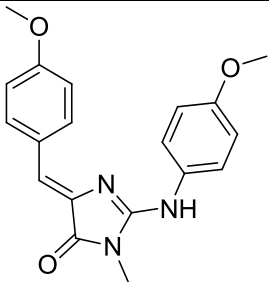
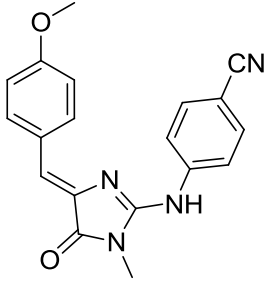
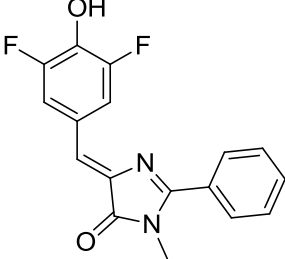
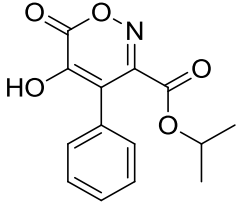
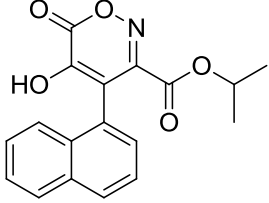
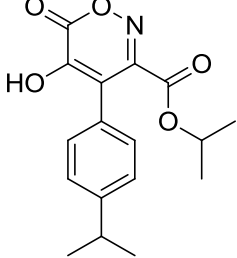
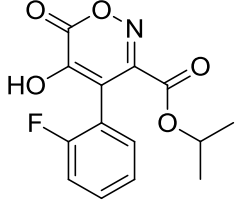
276	N 1069		2.7
277	N 111		1
278	N 1118		3
279	N 1122		2.3
280	N 1123		0.3
281	N 1124		1.3

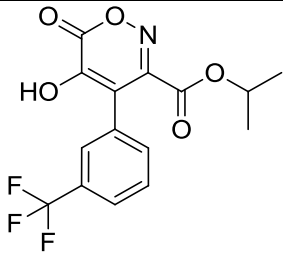
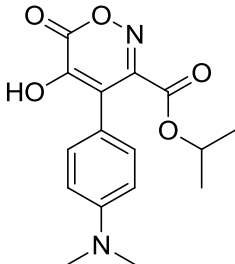
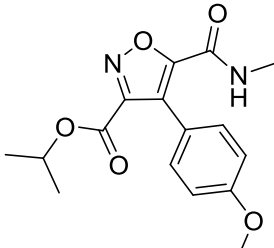
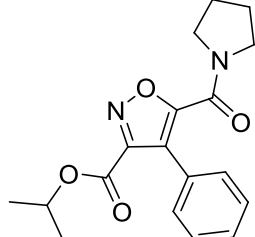
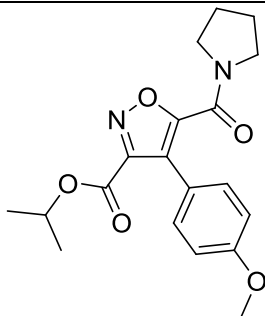
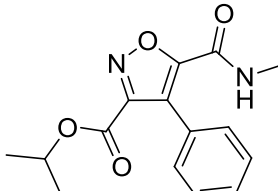
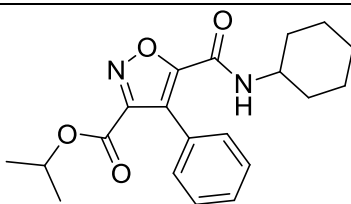


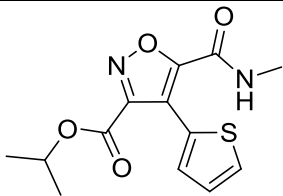
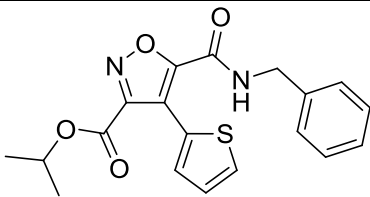
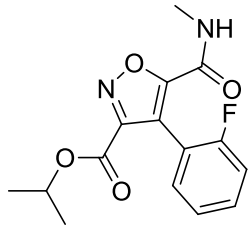
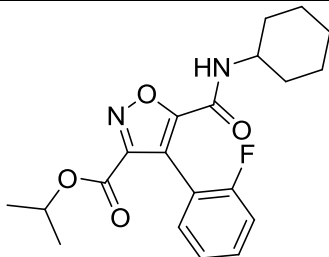
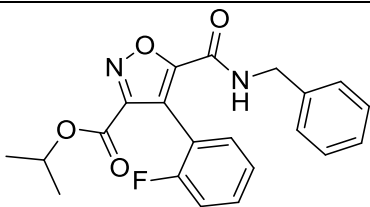
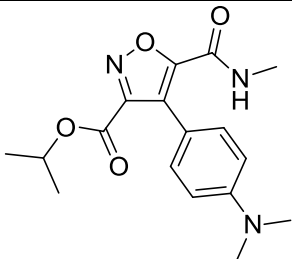
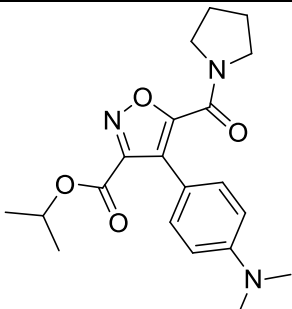
282	N 1135		0
283	N 1139		0.6
284	N 1142		0.1
285	SA 33		0.2
286	SA 49.1		0
287	SA 99		0.1

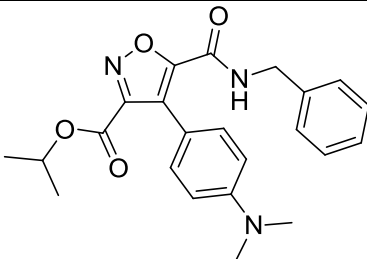
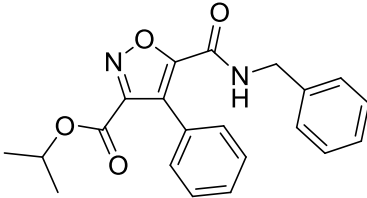
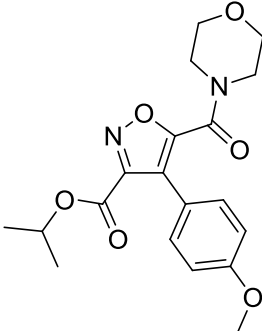
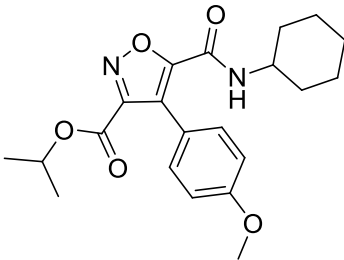
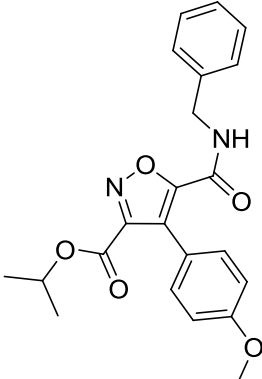
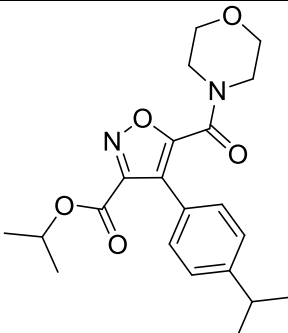
288	SA 102		0.2
289	SA 108		-0.1
290	SA 111		-0.1
291	SA 113		0.1
292	SA 117		-0.2
293	SA 120		-2.1

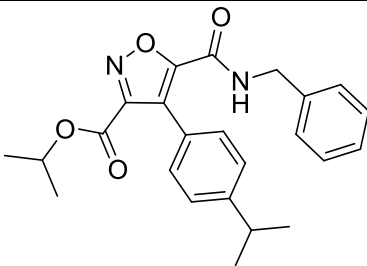
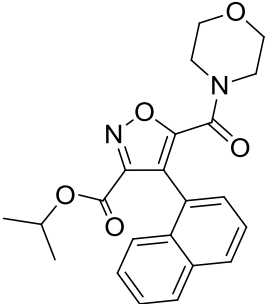
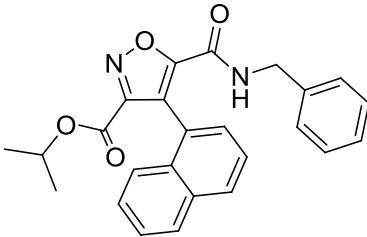
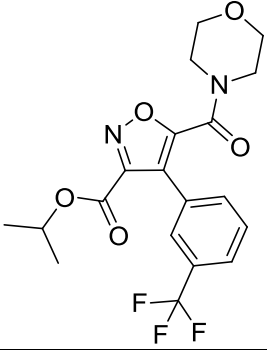
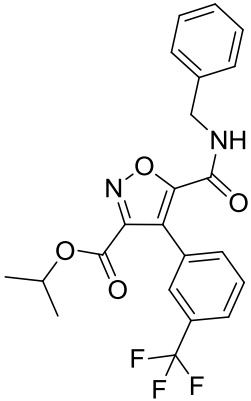
294	SA 128		0.1
295	SA 130		0.4
296	SA 148		-1.3
297	SA 152		-0.3
298	SA 158		0.2
299	SA 160.1		0.1

300	SA 168		-0.4
301	SA 179		0.7
302	SA 198		-0.5
303	SA 300A		0.1
304	SA 300B		-0.9
305	SA 300D		-1.2
306	SA 305A		-0.7

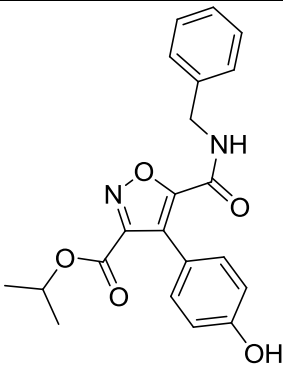
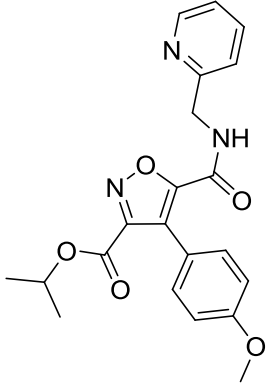
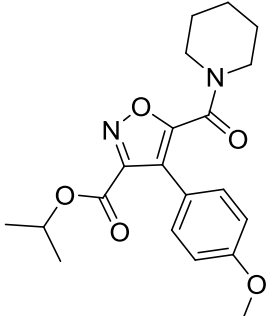
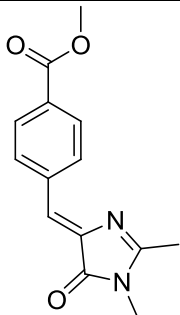
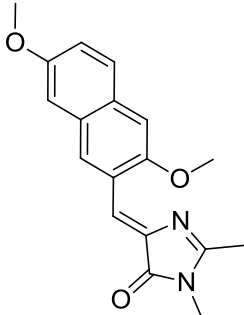
307	SA 305B		-0.5
308	SA 305C		-0.6
309	SA 306B		-0.3
310	SA 307A		-0.3
311	SA 309		-0.5
312	SA 325A		-0.5
313	SA 325E		-0.6

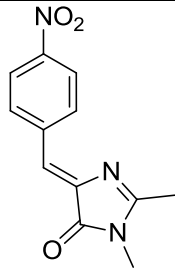
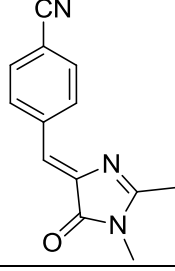
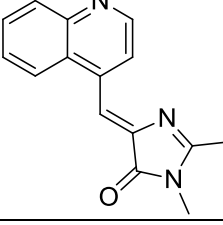
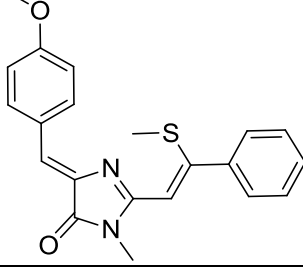
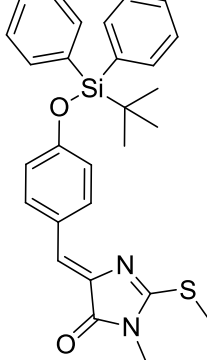
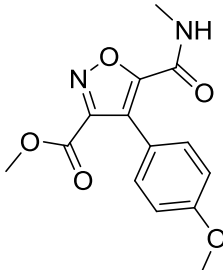
314	SA 330A		-0.5
315	SA 330E		-0.7
316	SA 331A		-0.7
317	SA 331D		-0.7
318	SA 331E		-0.9
319	SA 332.1		-0.4
320	SA 332.2		-0.4

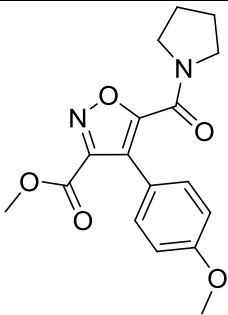
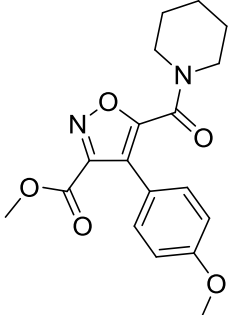
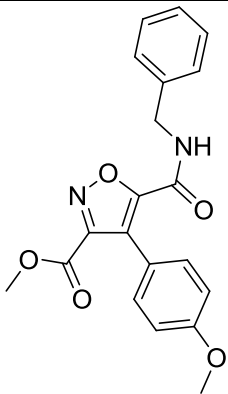
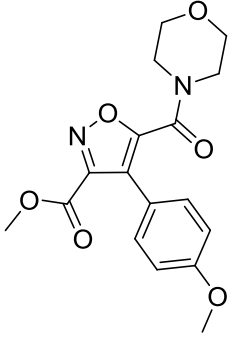
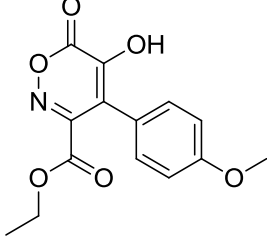
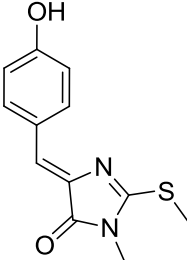
321	SA 332E1		-0.6
322	SA 333		-0.4
323	SA 341A		-0.7
324	SA 341B		-0.2
325	SA 341C		-0.2
326	SA 342A		-0.3

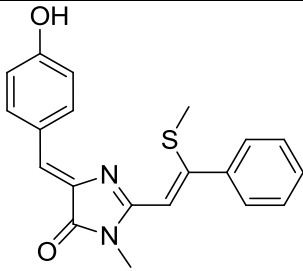
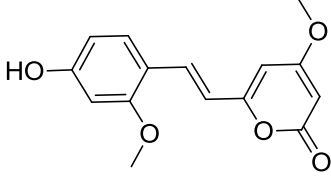
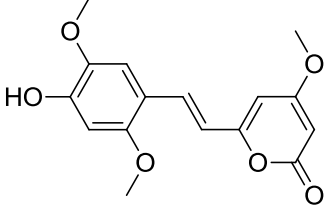
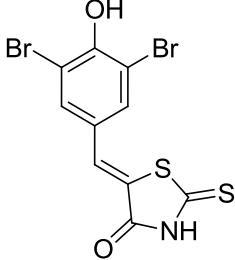
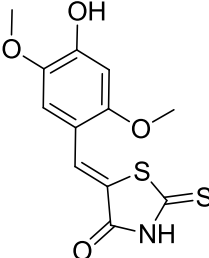
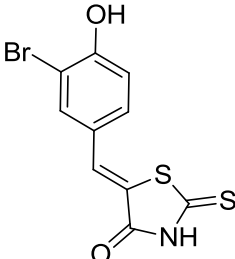
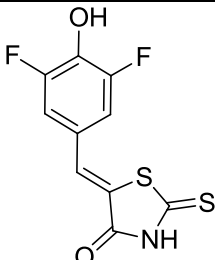
327	SA 342B		-0.5
328	SA 343A		-0.4
329	SA 343B		-0.9
330	SA 344A		-0.5
331	SA 344B		-0.7

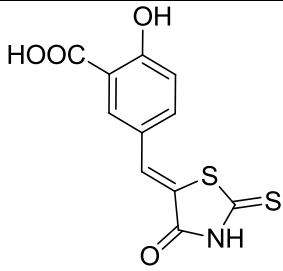
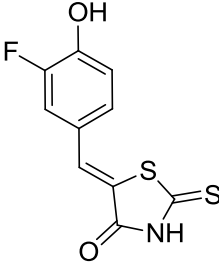
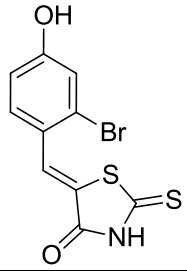
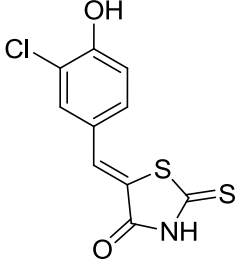
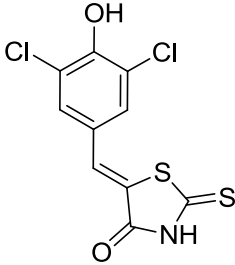
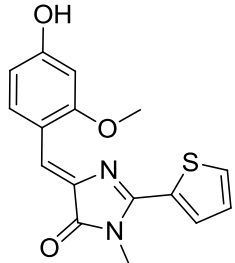
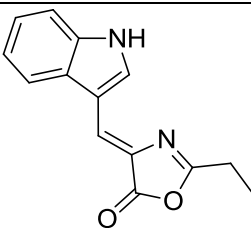


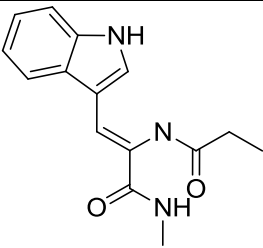
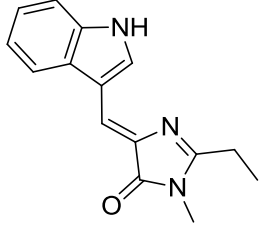
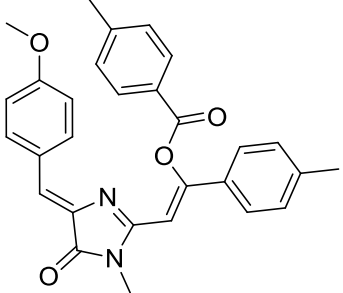
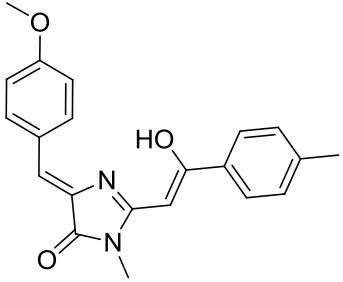
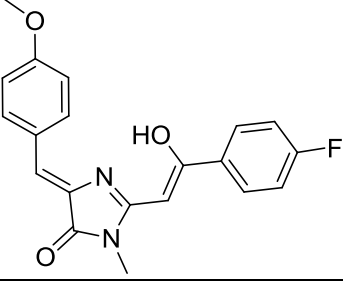
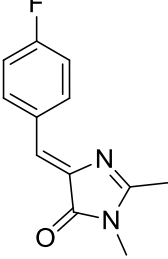
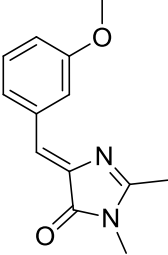
332	SA 345B		-0.8
333	SA 350C		-0.6
334	SA 375		-0.4
335	SA 400		0
336	SA 410		-0.2

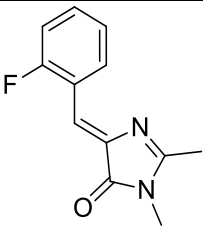
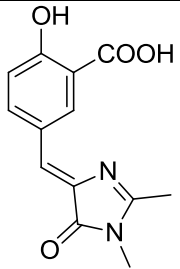
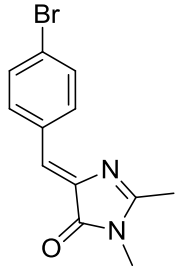
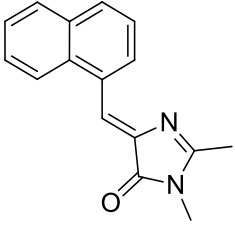
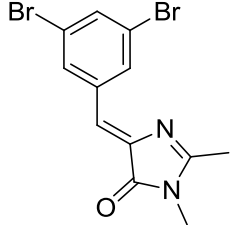
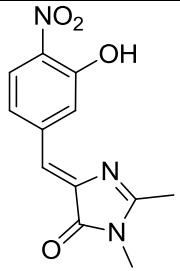
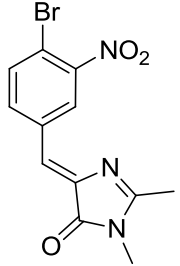
337	SA 412		0
338	SA 433		-0.4
339	SA 471		-0.1
340	SA 474.1		0
341	SA 497		-0.4
342	SA 561A		-0.3

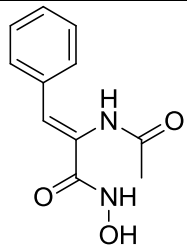
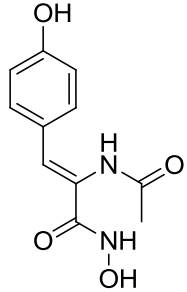
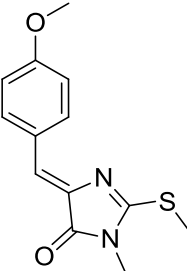
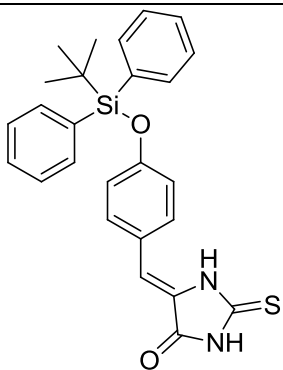
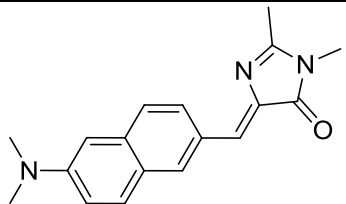
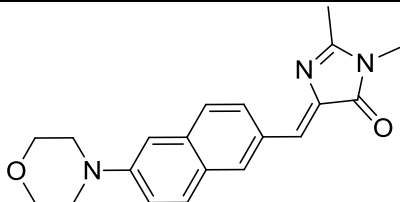
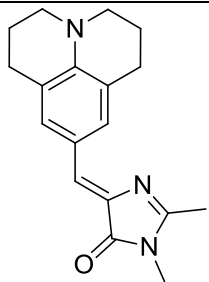
343	SA 561B		-0.6
344	SA 561C		-1
345	SA 561D		-0.4
346	SA 561E		-0.7
347	SA 562B		-1
348	SA 581		1

349	SA 599.21		-0.3
350	SAI 32		0.4
351	SAI 89		1.1
352	SAI 112		0.3
353	SAI 115		-0.3
354	SAI 117		-0.2
355	SAI 118		0

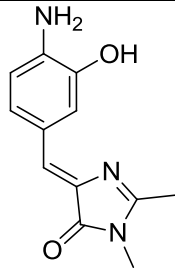
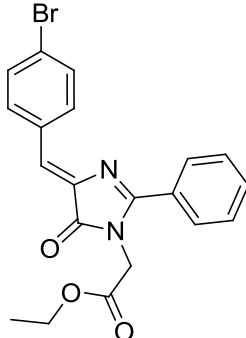
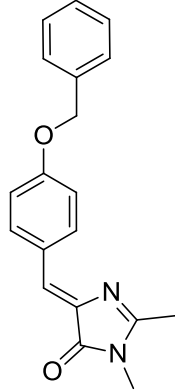
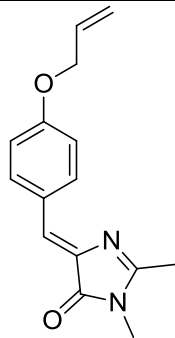
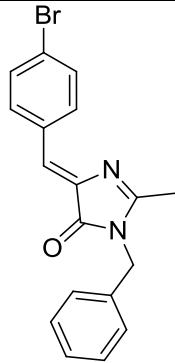
356	SAI 120		0.6
357	SAI 121		0.9
358	SAI 122		0.1
359	SAI 125		0.6
360	SAI 127		-0.2
361	SH 016.3B		0.9
362	SV 11		0

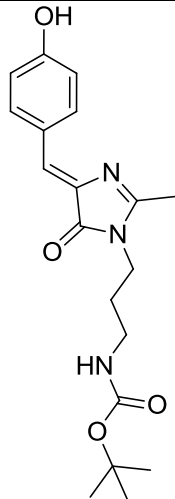
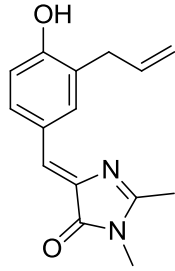
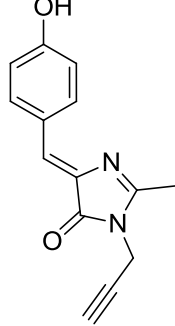
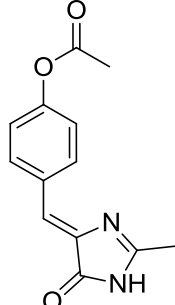
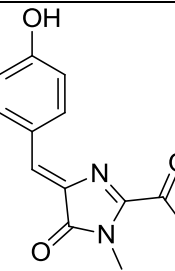
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369	SV 50.11		-0.2

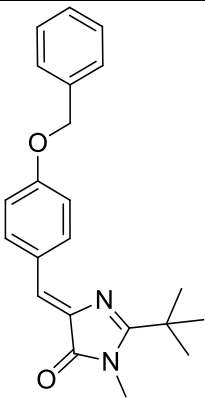
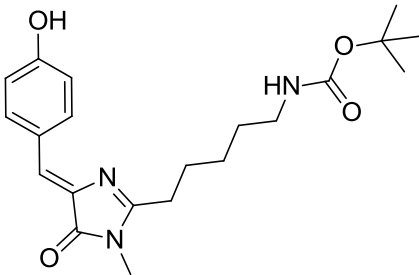
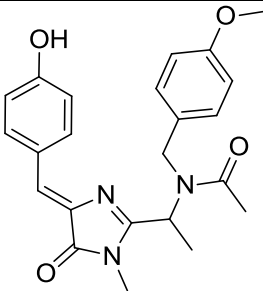
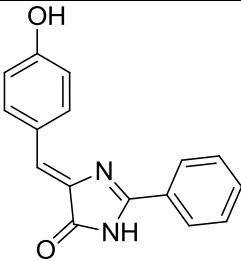
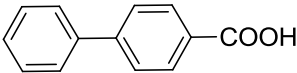
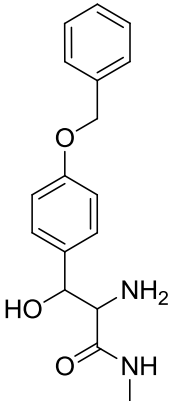
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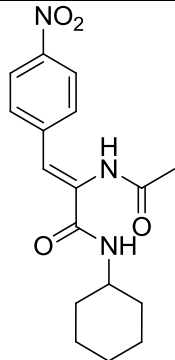
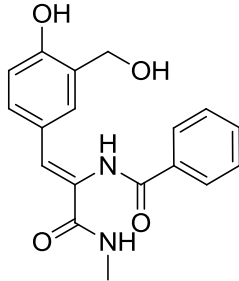
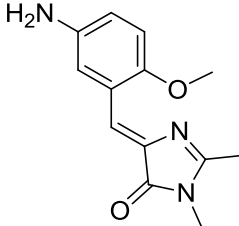
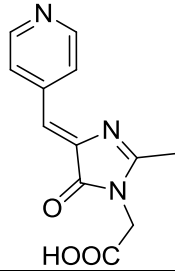
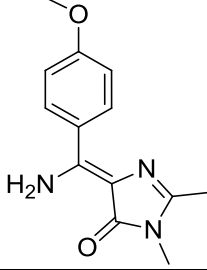
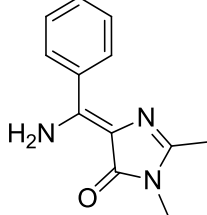
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382	X 002		-0.6
383	X 4		1

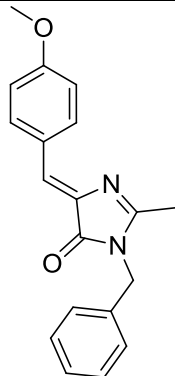
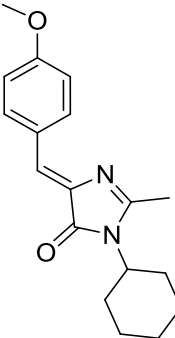
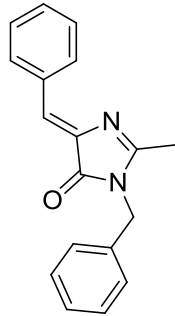
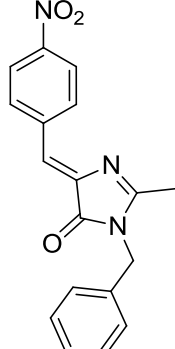
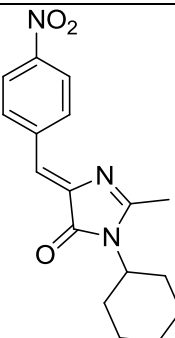


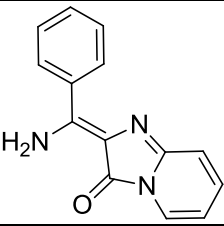
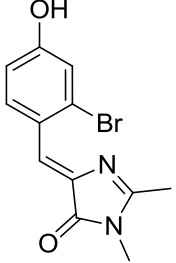
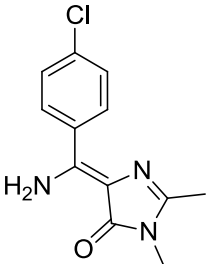
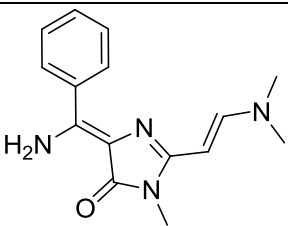
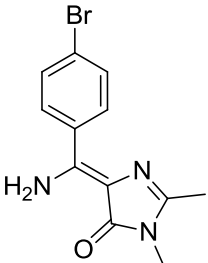
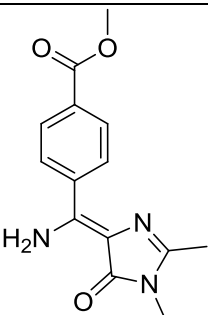
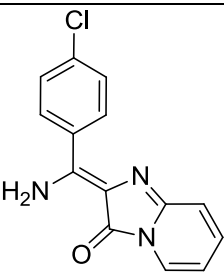
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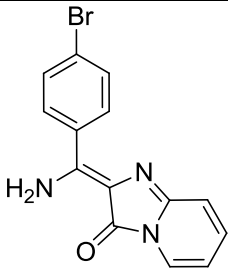
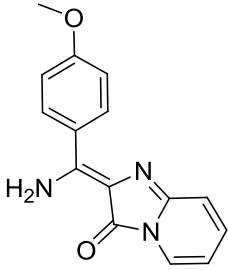
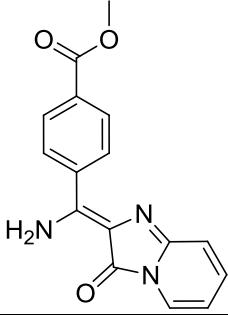
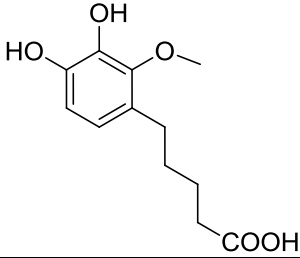
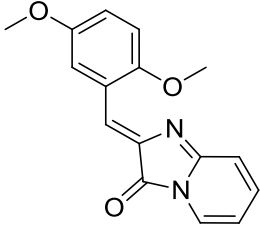

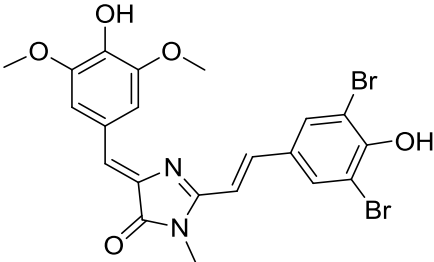
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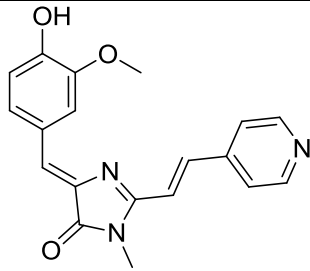
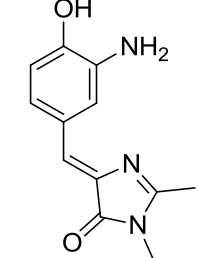
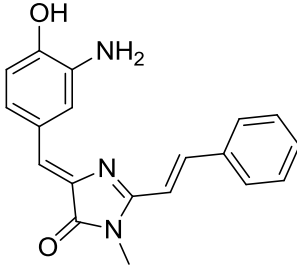
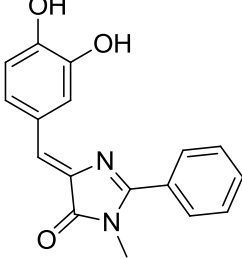
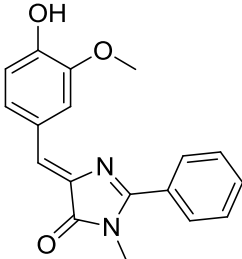
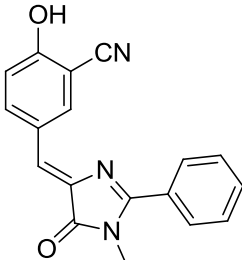
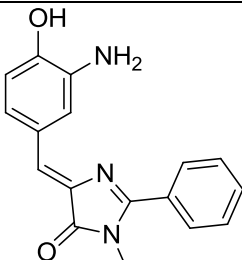
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397	X 24		-0.5
398	X 26		-0.1
399	X 27		-0.1

400	X 28		-0.3
401	X 29		-0.6
402	ZS 62		0
403	ZS 69		-0.4
404	ZS 99		-0.2
405	ZS 109		-0.7

406	ZS 128		-0.3
407	ZS 129		-0.2
408	ZS142		-1.4
409	ZS 143		-0.9
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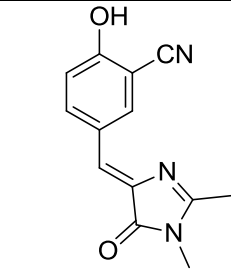
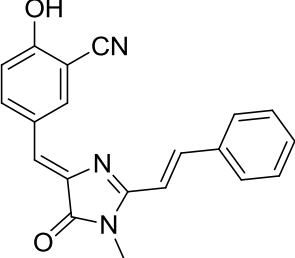
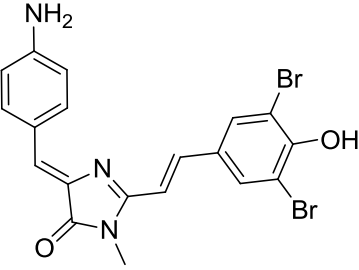
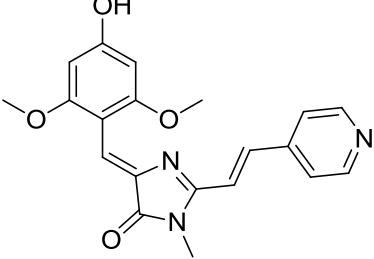
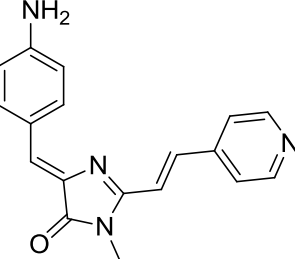
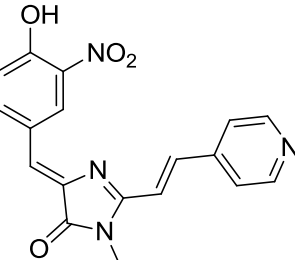
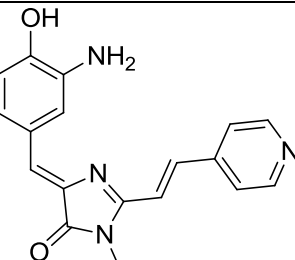
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412	ZS 174		-0.3
413	ZS 178		-0.3
414	ZS 182		0
415	ZS 190		-0.5
416	ZS 199		-0.4
417	ZS 228		0.3

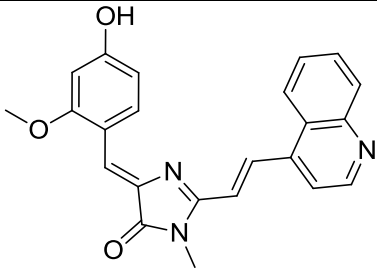
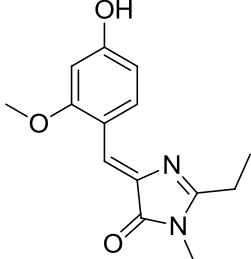
418	ZS 229		0.3
419	ZS 233		-0.1
420	ZS 234		0
421	ZS 235		0.1
422	ZS 236		-1.2
423	ZS 256		0.2
424	ZS 260.1		7.8

425	ZS 285b		0.5
426	ZS 286		0.3
427	ZS 289a		-0.1
428	ZS 291		0.4
429	ZS 292		-0.2
430	ZS 295		0
431	ZS 297		0.1

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432	ZS 298		-0.2
433	ZS 300a		-0.1
434	ZS 309		0.3
435	ZS 316		0.4
436	ZS 319.2		2
437	ZS 321		1.3
438	ZS 325		1.6

439	ZS 331		3.3
440	ZS 362		0.2

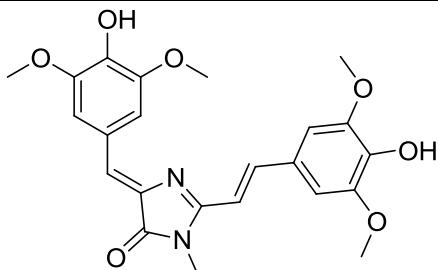
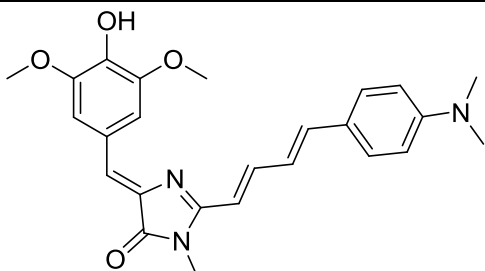
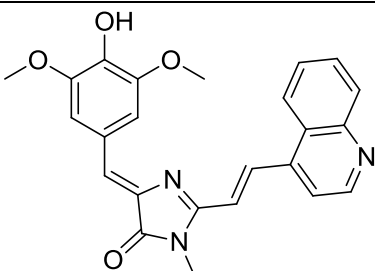
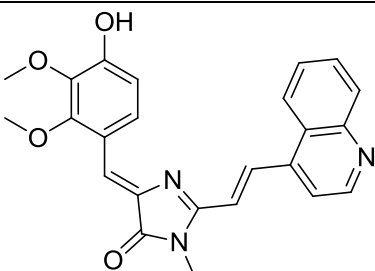
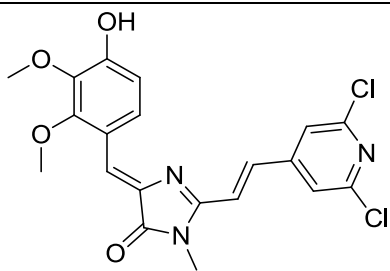
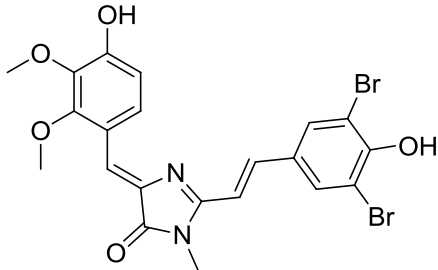
<sup>a</sup> -  $\Delta T_m = T_m^{\text{LTR-III+ligand}} - T_m^{\text{LTR-III}}$

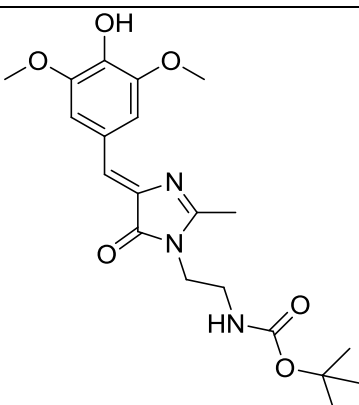
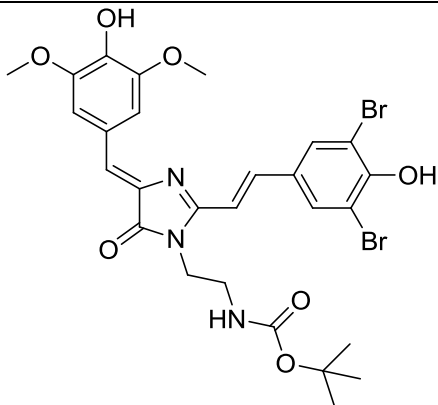
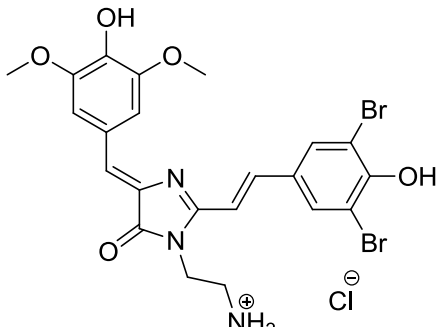
**Table S2. Comparison of stabilization of model G4s and double stranded control sequence by primary screening lead compounds.**

$\Delta T_m^a$	LTR III	Telo	Pu39	Duplex
ZS 260.1	7.8±0.3	0.7±0.2	0.9±0.6	0.1±0.09
N 1068.2	7.1±0.3	1.2±0.2	0±0.4	0.1±0.04
N 960a	5.3±0.2	1±0.7	0.5±0.01	-0.5±0.07
N 683.1	5±0.1	-0.1±0.04	1.4±0.6	0±0.04
N 1052	4.6±0.2	3.9±0.1	2.1±0.2	-0.1±0.04
ZS 320	3.6±0.2	0.6±0.1	0±0.3	-0.1±0.07
ZS 331	3.3±0.2	2.5±0.3	0.8±0.2	-0.2±0.1
AL 267	3±0.2	0.5±0.2	0.2±0.2	0.2±0.04
M 813	2.9±0.2	-0.6±0.9	-1.5±1	0±0.04
MID 155	2.9±0.3	0.1±0.04	0±0.04	-0.1±0.04
N 848.3	2.9±0.1	1.1±0.2	0.7±0.3	0.1±0.09
M 903.2	2.8±0.3	0.4±0.1	-1±0.5	0.1±0.07
N 848.2	2.6±0.2	2.1±0.01	0.1±0.4	0.4±0.04
N 908	2.4±0.2	0.1±0.1	-0.7±0.2	0±0.04

<sup>a</sup> -  $\Delta T_m = T_m^{\text{DNA target+ligand}} - T_m^{\text{DNA target}}$

**Table S3. Primary screening of newly synthesized GFP chromophore analogs for the stabilizing properties of FAM/TAMRA-labeled LTR-III G-quadruplex.**

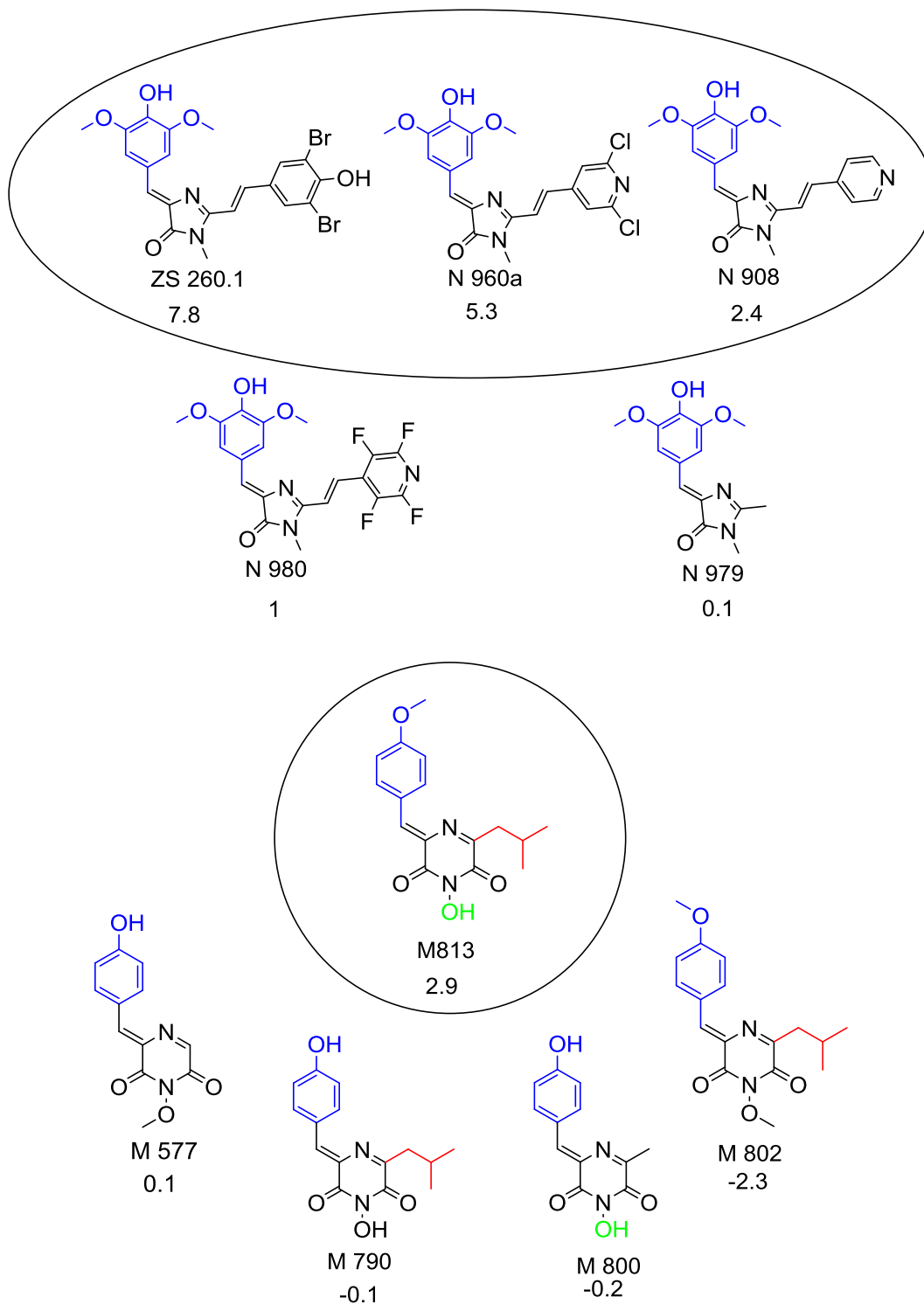
No	code	Structure	LTR-III $\Delta T_m^a$
441	N1193		14
442	N1195		4.2
443	N1196		11.7
444	N1197		11.3
445	N1198		6.5
446	N1199		4.3

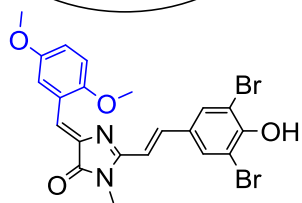
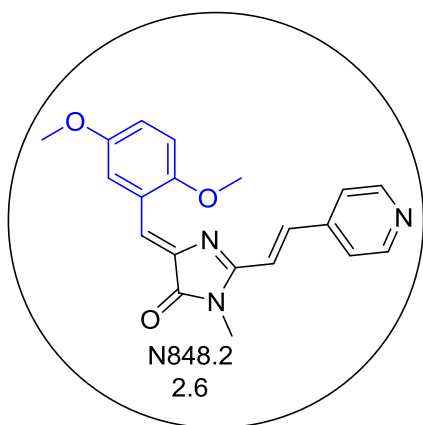
447	AR556		-1.1
448	AR558		0.7
449	AR559		1.2

<sup>a</sup> -  $\Delta T_m = T_m^{\text{LTR-III+ligand}} - T_m^{\text{LTR-III}}$

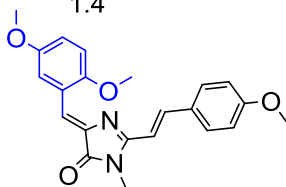
**Supplement S4. Structural motifs of the lead compounds in comparison with the other structurally related compounds.**

Figure S4-1. The comparison of the substituents at 5-position of the GFP chromophore core,  $\Delta T_m$  values are shown under the chemical formulas

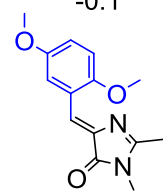




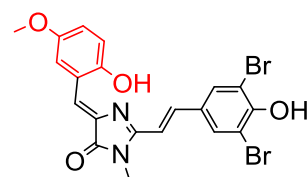
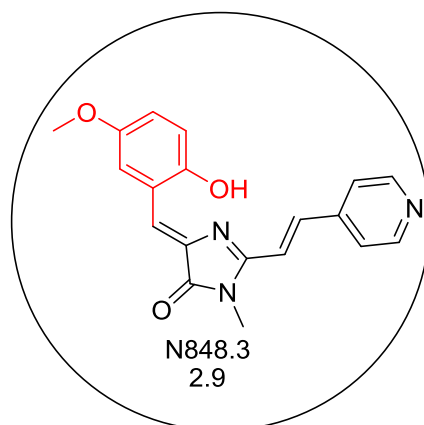
N 851A  
1.4



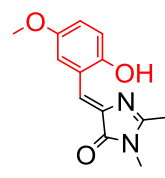
Al 118  
-0.1



N 840  
-2.5



N 851B  
1.2



M 2360  
-0.3

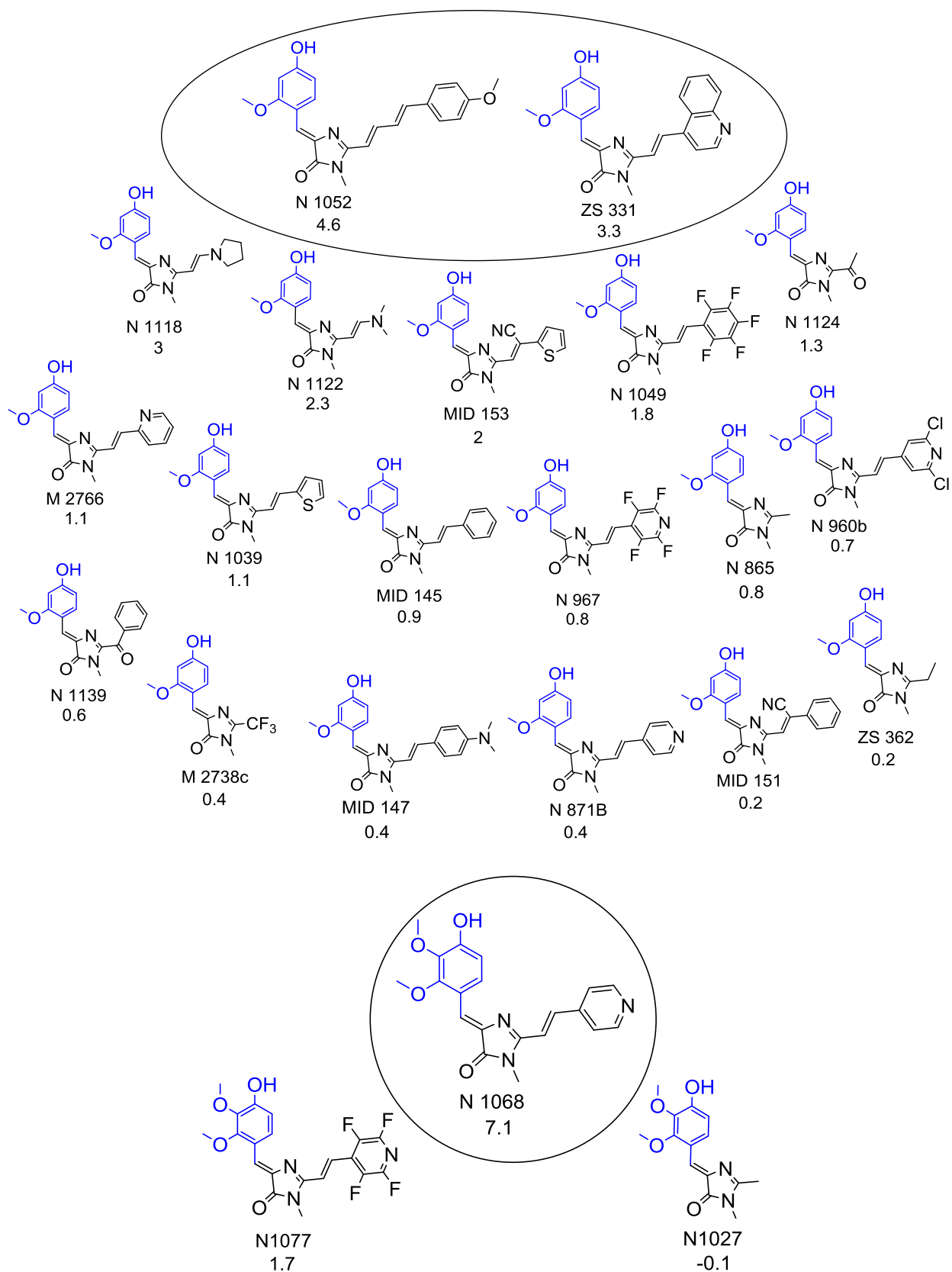
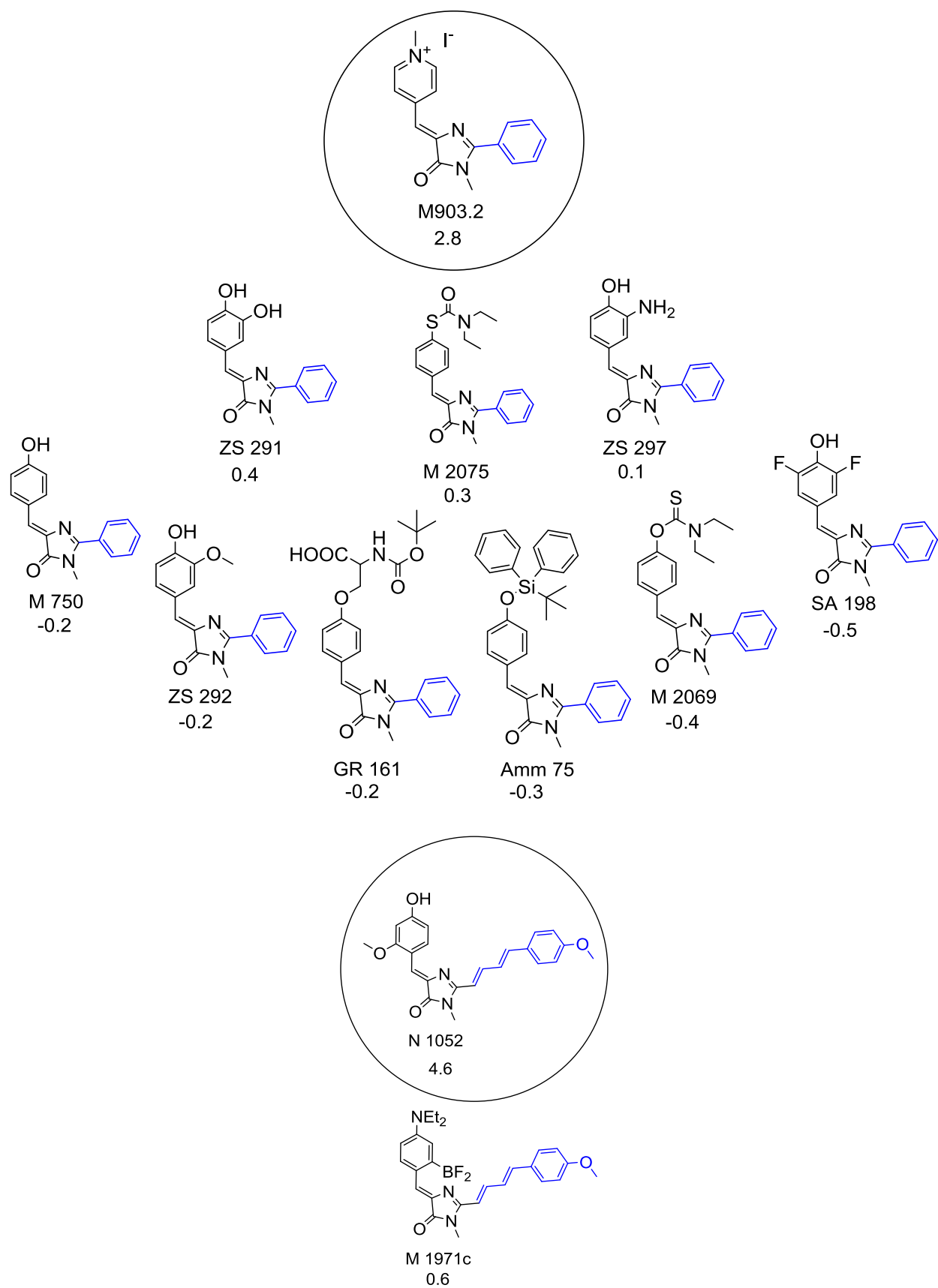
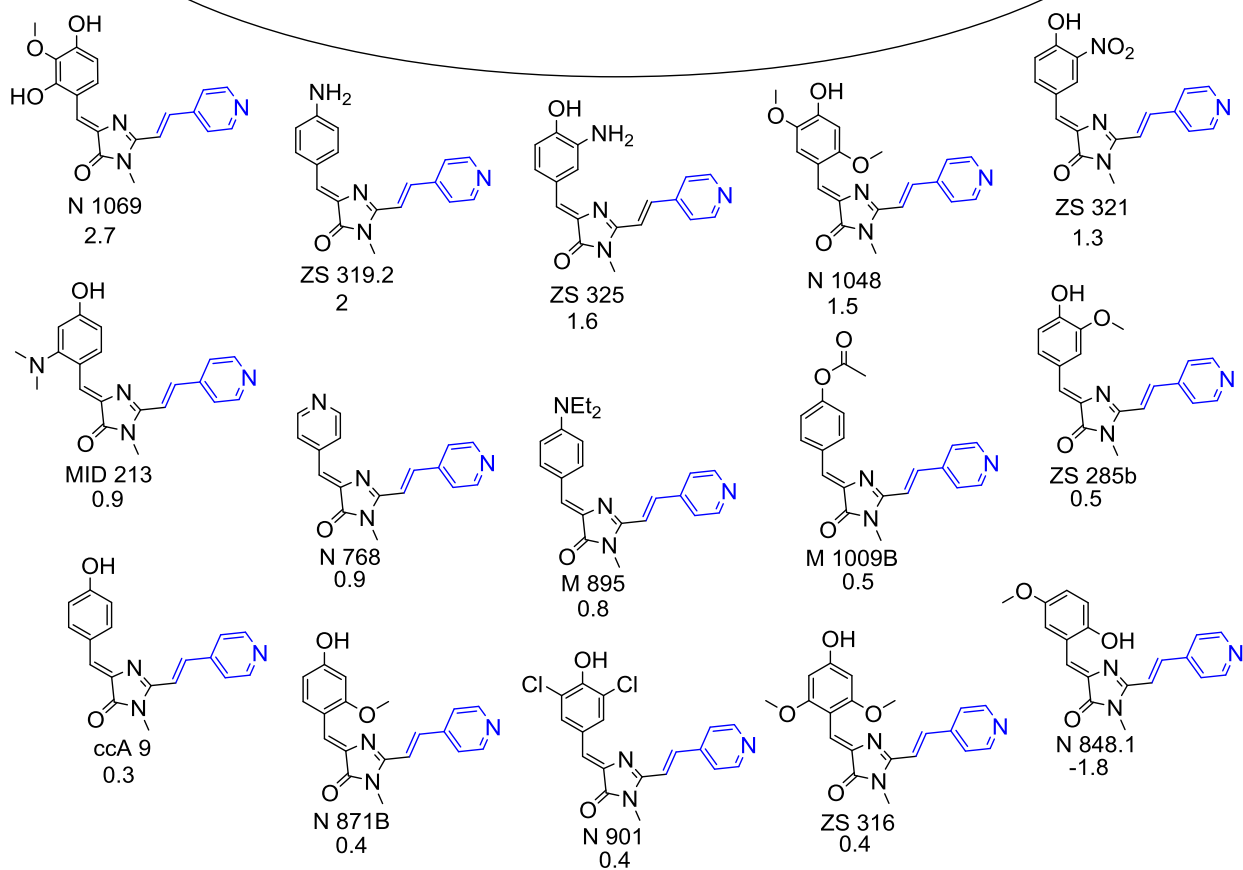
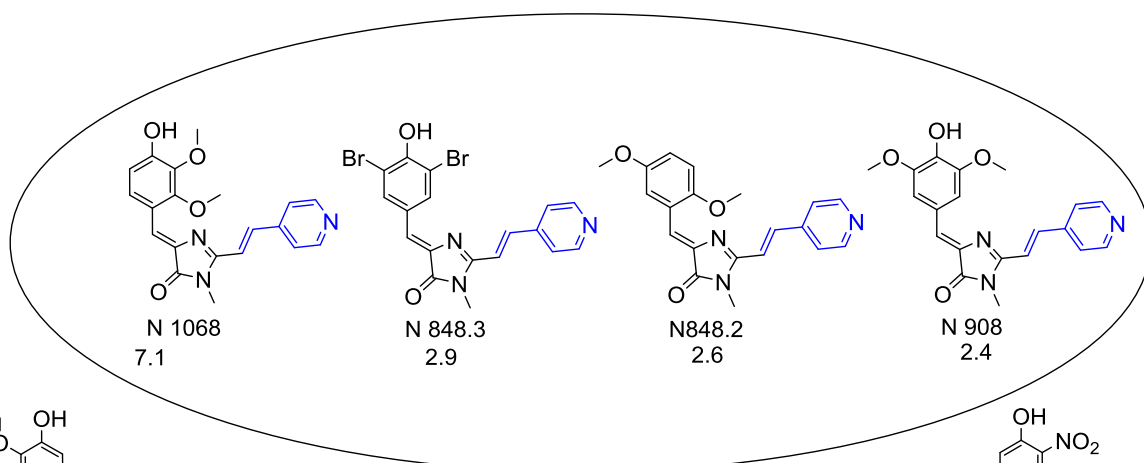
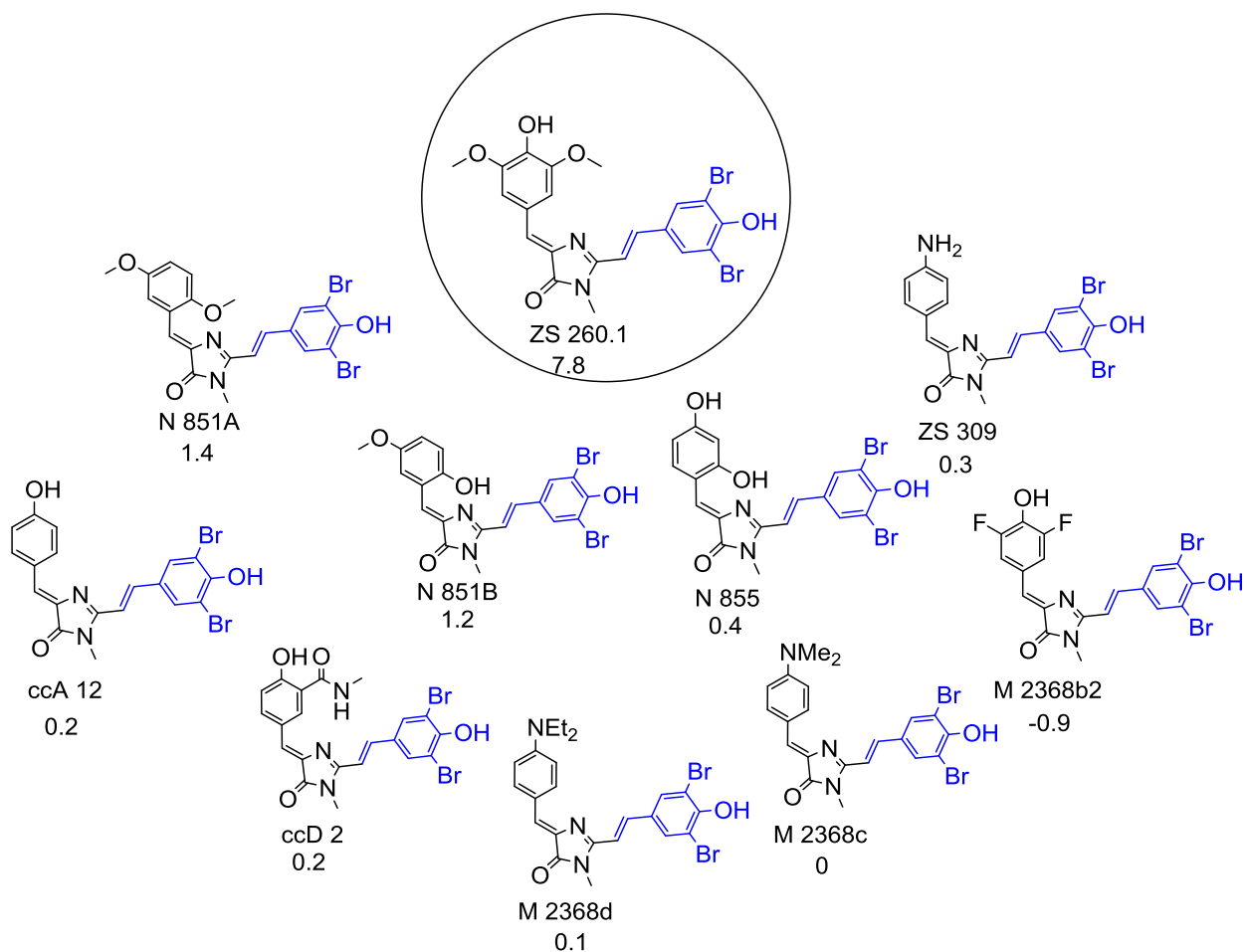




Figure S4-2 The comparison of the substituents at 2-position of the GFP chromophore core,  $\Delta T_m$  values are shown under the chemical formulas







**Table S5. Comparison of stabilization of model G4s and double stranded control sequences by newly synthesized compounds.**

$\Delta T_m^a$	LTR III	Telo	Pu39	Duplex
N1193	14±0.5	9.5±0.1	3.8±0.04	0.6±0.1
N1196	11.7±0.5	8.7±0.2	7.2±0.4	0.5±0.1
N1197	11.3±0.2	4.6±0.2	7±0.7	-0.4±0.2
N1198	6.5±0.3	0.9±0.2	0.1±0.1	0±0.1
N1199	4.3±0.2	0.9±0.1	0±0.2	0±0.1
N1195	4.2±0.1	0.9±0.3	1.8±0.1	0.1±0.1

<sup>a</sup> -  $\Delta T_m = T_m^{\text{DNA target+ligand}} - T_m^{\text{DNA target}}$

**Table S6. Titration experiments for N1193, N1196, N1197 at various DNA:ligand molar ratios**

Ligand	LTR-III G4/ligand molar ratio		
	1:50	1:20	1:2
N1193	13.1±0.2 <sup>a</sup>	9.1±0.6	2.4±0.6
N1196	11.3±0.3	7.9±0.4	2±1
N1197	11.4±0.2	8.5±0.3	2.3±0.5

<sup>a</sup> -  $\Delta T_m = T_m^{\text{LTR-III+ligand}} - T_m^{\text{LTR-III}}$

## **Supplement S7. Synthetic procedures for the synthesized GFP chromophore analogues**

### **1. General**

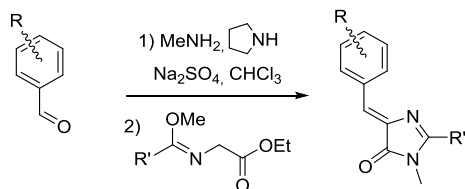
Commercially available reagents were used without additional purification. E. Merck Kieselgel 60 was used for column chromatography. Thin layer chromatography (TLC) was performed on silica gel 60 F<sub>254</sub> glass-backed plates (MERCK). Visualization was effected by UV light (254 or 312nm) and staining with KMnO<sub>4</sub>.

NMR spectra were recorded on a 700 MHz Bruker Avance III NMR at 303 K and 800 MHz Bruker Avance III NMR at 333 K. Chemical shifts are reported relative to residue peaks of DMSO-d<sub>6</sub> (2.51 ppm for <sup>1</sup>H and 39.5 ppm for <sup>13</sup>C). Melting points were measured on a SMP 30 apparatus. High-resolution mass spectra (HRMS) spectra were recorded on a LTQ Orbitrap Elite (ThermoScientific) using electrospray ionization (ESI). The measurements were done in a positive ion mode (interface capillary voltage −5000 V) or in a negative ion mode (3500 V); interface temperature was set at 275 °C.

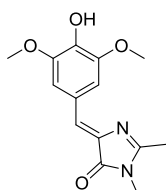
## 2. Synthetic procedures

### 2.1 Preparation of 5-(Z)-benzylidene-2-methyl-3-alkyl/aryl-3,5-dihydro-4H-imidazol-4-ones

General method was reported previously.<sup>1</sup>

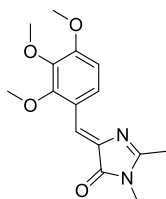


The corresponding aromatic aldehyde (10 mmol) was dissolved in  $\text{CHCl}_3$  (50 mL) and mixed with methylamine solution (40% aqueous, 2.5 mL), pyrrolidine (7 mg, 0.1 mmol) and anhydrous  $\text{Na}_2\text{SO}_4$  (10 g). The mixture was stirred for 48 h at room temperature, filtered and dried over the additional  $\text{Na}_2\text{SO}_4$ . The solvent was evaporated and corresponding ethyl((methoxy)amino)acetate (20 mmol) was added to the residue (5-10 mL of methanol was also added if it wouldn't mixed). The mixture was stirred for 24 h at room temperature, solvents were evaporated and the product was purified by column chromatography ( $\text{CHCl}_3$ -EtOH).



#### (Z)-5-(4-hydroxy-3,5-dimethoxybenzylidene)-2,3-dimethyl-3,5-dihydro-4H-imidazol-4-one (N 979)

$^1\text{H}$  NMR (300 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 9.15 (br. s., 1 H), 7.63 (s, 2 H), 6.90 (s, 1 H), 3.79 (s, 6 H), 3.08 (s, 3 H), 2.33 (s, 3 H). Previously characterized.<sup>2</sup>



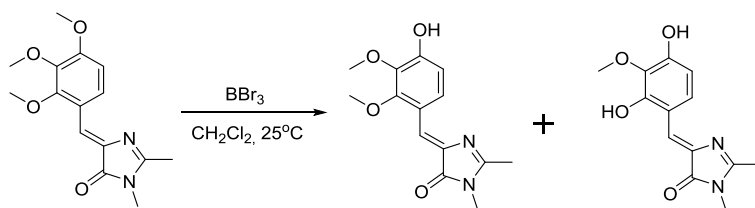
#### (Z)-5-(2,3,4-trimethoxybenzylidene)-2,3-dimethyl-3,5-dihydro-4H-imidazol-4-one (N 1043)

Yellow solid (1.86 g, 64%); mp = 192-195 °C;  $^1\text{H}$  NMR (700 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 8.53 (d,  $J=9.0$  Hz, 1 H), 7.13 (s, 1 H), 6.95 (d,  $J=9.0$  Hz, 1 H), 3.88-3.85 (m, 6 H), 3.77 (s, 3 H), 3.09 (s, 3 H), 2.34 (s, 3 H);  $^{13}\text{C}$  NMR (75 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 169.9, 163.5, 155.4, 153.3, 141.4,

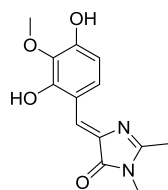
<sup>1</sup> Baldrige A., Kowalik J., Tolbert L. M. *Synthesis* **2010**, 14, 2424.

<sup>2</sup> Paige J.S., Wu K.Y., Jaffrey S.R., *Science*, **2011**, 333 (6042), 642-646.

137.6, 127.6, 120.4, 118.0, 108.4, 61.7, 60.5, 56.0, 26.3, 15.4; HRMS (ESI)  $m/z$ : 291.1337 found (calcd for  $C_{15}H_{19}N_2O_4^+$ ,  $[M+H]^+$  291.1339).

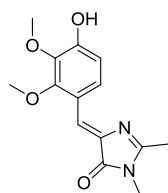


To the solution of (Z)-5-(2,3,4-trimethoxybenzylidene)-2,3-dimethyl-3,5-dihydro-4H-imidazol-4-one (5 mmol) in  $CH_2Cl_2$  (50 mL) borane tribromide in  $CH_2Cl_2$  (1M, 5 mL, 5 mmol) were added. The mixture was stirred for 2 h at room temperature under inert atmosphere. The mixture was diluted with  $CHCl_3$  (100 mL), washed with water (2x50 mL) and brine (2x50 mL) and dried over  $Na_2SO_4$ . The solvent was evaporated and the mixture of products was separated by column chromatography ( $CHCl_3$ -EtOH, 49:1).



**(Z)-5-(2,4-dihydroxy-3-methoxybenzylidene)-2,3-dimethyl-3,5-dihydro-4H-imidazol-4-one (N 1042)**

Orange solid (0.46 g, 35%); mp = 231-234 °C;  $^1H$  NMR (300 MHz,  $DMSO-d_6$ )  $\delta$  ppm 12.71 (br. s., 1 H), 8.41 (br. s., 1 H), 7.37 (d,  $J=8.8$  Hz, 1 H), 7.12 (s, 1 H), 6.58 (d,  $J=8.8$  Hz, 1 H), 3.81 (s, 3 H), 3.12 (s, 3 H), 2.36 (s, 3 H);  $^{13}C$  NMR (75 MHz,  $DMSO-d_6$ )  $\delta$  ppm 167.9, 159.6, 151.3, 146.7, 134.6, 132.3, 125.9, 125.7, 114.4, 104.1, 55.8, 26.4, 15.1; HRMS (ESI)  $m/z$ : 263.1024 found (calcd for  $C_{13}H_{15}N_2O_4^+$ ,  $[M+H]^+$  263.1026).

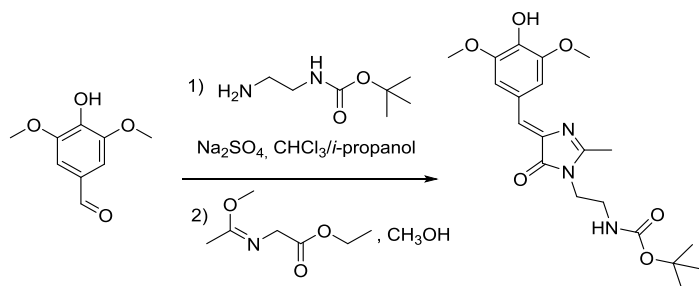


**(Z)-5-(4-hydroxy-2,3-dimethoxybenzylidene)-2,3-dimethyl-3,5-dihydro-4H-imidazol-4-one (N 1027)**

Yellow solid (0.41 g, 30%); mp = 193-196 °C;  $^1H$  NMR (300 MHz,  $DMSO-d_6$ )  $\delta$  ppm 12.44 (br. s., 1 H), 7.75 (d,  $J=8.9$  Hz, 1 H), 7.15 (s, 1 H), 6.64 (d,  $J=9.0$  Hz, 1 H), 3.83 (s, 3 H), 3.67 (s, 3 H), 3.12 (s, 3 H), 2.37 (s, 3 H);  $^{13}C$  NMR (75 MHz,  $DMSO-d_6$ )  $\delta$  ppm 168.1, 160.3, 156.2, 151.9, 136.7, 133.0, 130.4, 124.5, 115.1, 104.1, 59.8, 55.9, 26.4, 15.1; HRMS (ESI)  $m/z$ : 277.1178 found (calcd for  $C_{14}H_{17}N_2O_4^+$ ,  $[M+H]^+$  277.1183).

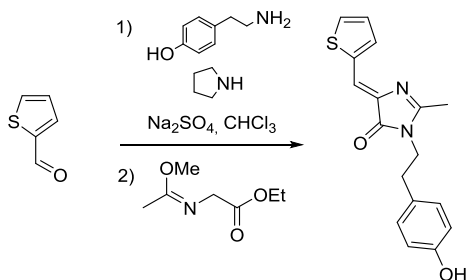


***tert*-butyl (Z)-2-(4-(4-hydroxy-3,5-dimethoxybenzylidene)-2-methyl-5-oxo-4,5-dihydro-1H-imidazol-1-yl)ethyl)carbamate (AR556)**



To a solution of 4-hydroxy-3,5-dimethoxybenzaldehyde (1.82 g, 10 mmol) in  $\text{CH}_2\text{Cl}_2$ /*i*-propanol (50 mL, v/v 10:1) *tert*-butyl (2-aminoethyl)carbamate (2.40 g, 15 mmol) and anhydrous  $\text{Na}_2\text{SO}_4$  (10 g) were added. The mixture was stirred for 48 h at room temperature, filtered and dried over anhydrous  $\text{Na}_2\text{SO}_4$ . The solvent was evaporated under reduced pressure and ethyl 2-((1-methoxyethylidene)amino)acetate (3.18 g, 20 mmol) was added to the residue followed by the addition of methanol (10 mL). The mixture was stirred for 24 h at room temperature, solvents were evaporated and the product was purified by column chromatography on silica gel (0-1% MeOH in  $\text{CH}_2\text{Cl}_2$ ). Yellow solid (2.93 g, 72 %);  $^1\text{H}$  NMR (700 MHz,  $\text{CDCl}_3$ )  $\delta$  ppm 7.50 (s, 2 H), 6.99 (s, 1 H), 5.92 (s, 1 H), 4.91-4.82 (m, 1H), 3.94 (s, 6 H), 3.75 (t,  $J=6.2$  Hz, 2 H), 3.38-3.32 (m, 2 H), 2.38 (s, 3 H), 1.42 (s, 9 H);  $^{13}\text{C}$  NMR (176 MHz,  $\text{CDCl}_3$ )  $\delta$  ppm 170.9, 161.2, 156.0, 147.0, 137.5, 136.7, 128.0, 125.7, 109.4, 79.8, 56.3, 40.3, 39.5, 28.3, 15.6; HRMS (ESI)  $m/z$ : 406.1971 found (calcd for  $\text{C}_{20}\text{H}_{28}\text{N}_3\text{O}_6^+$ ,  $[\text{M}+\text{H}]^+$  406.1973).

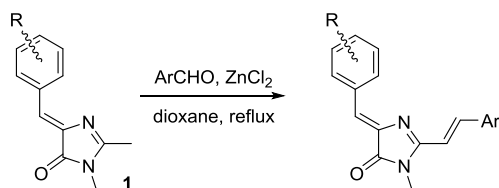
**Preparation of (Z)-3-(4-hydroxyphenethyl)-2-methyl-5-(thiophene-2-ylmethylene)-3,5-dihydro-4H-imidazol-4-one**



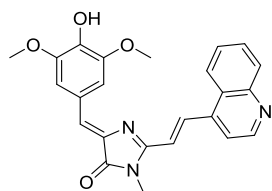
The thiophene-2-carbaldehyde (10 mmol) was dissolved in  $\text{CHCl}_3$  (50 mL) and mixed with 4-(2-aminoethyl)phenol (10.5 mmol), pyrrolidine (7 mg, 0.1 mmol) and anhydrous  $\text{Na}_2\text{SO}_4$  (10 g). The mixture was stirred for 72 h at room temperature, filtered and dried over the additional  $\text{Na}_2\text{SO}_4$ . The solvent was evaporated and ethyl((methoxy)amino)acetate (12 mmol) was added to the residue in 5 mL of methanol. The mixture was stirred for 4 days at room temperature, solvents were evaporated and the product was purified by column chromatography ( $\text{CHCl}_3$ -EtOH 50/1).

Yellow solid (2.22 g, 71%); mp ~200 °C with decomposition;  $^1\text{H}$  NMR (700 MHz, DMSO- $d_6$ )  $\delta$  ppm 9.22 (s, 1 H), 7.84 (d,  $J=5.0$  Hz, 1 H), 7.66 (d,  $J=3.4$  Hz, 1 H), 7.29 (s, 1 H), 7.15 (dd,  $J=5.1, 3.7$  Hz, 1 H), 6.97 (d,  $J=8.4$  Hz, 2 H), 6.67 (d,  $J=8.4$  Hz, 2 H), 3.70 (t,  $J=7.1$  Hz, 2 H), 2.74 (t,  $J=7.1$  Hz, 2 H), 2.05 (s, 3 H);  $^{13}\text{C}$  NMR (75 MHz, DMSO- $d_6$ )  $\delta$  ppm 169.0, 162.3, 156.0, 137.3, 136.1, 134.7, 134.2, 129.8, 128.2, 127.6, 119.0, 115.3, 42.1, 33.5, 15.1; HRMS (ESI)  $m/z$ : 313.1003 found (calcd for  $\text{C}_{17}\text{H}_{17}\text{N}_2\text{O}_2\text{S}^+$ ,  $[\text{M}+\text{H}]^+$  313.1005).

## 2.2 Preparation of 5-(*Z*)-benzylidene-2-(*E*)-arylvinyl-3-methyl-3,5-dihydro-4*H*-imidazol-4-ones

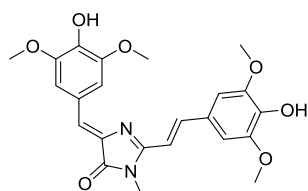


To the solution of 5-(*Z*)-benzylidene-2,3-dimethyl-3,5-dihydro-4*H*-imidazol-4-one (1 mmol) in dioxane (5 mL) anhydrous zinc chloride (30 mg, 0.22 mmol) and corresponding aldehyde (1.2 mmol) were added. The mixture was refluxed for 1-6 h and the solvent was evaporated. The mixture was dissolved in EtOAc (50 mL) and washed by EDTA solution (0.5%, 10 mL), water (3x10 mL) and brine (1x10 mL). The mixture was dried over Na<sub>2</sub>SO<sub>4</sub>. The solvent was evaporated and the product was purified by column chromatography (CHCl<sub>3</sub>-EtOH, typically 19:1).



### 5-((*Z*)-4-hydroxy-3,5-dimethoxybenzylidene)-3-methyl-2-((*E*)-2-(quinolin-4-yl)vinyl)-3,5-dihydro-4*H*-imidazol-4-one (N 1196)

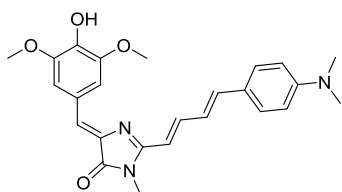
Dark red solid (95 mg, 23%); mp = 273-276°C; <sup>1</sup>H NMR (700 MHz, DMSO-*d*<sub>6</sub>) δ ppm 9.30 (br. s., 1 H), 9.01 (d, *J*=4.6 Hz, 1 H), 8.77 (d, *J*=15.6 Hz, 1 H), 8.28 (d, *J*=8.4 Hz, 1 H), 8.09 - 8.13 (m, 2 H), 7.81 - 7.89 (m, 3 H), 7.74 (t, *J*=7.4 Hz, 1 H), 7.60 (d, *J*=15.6 Hz, 1 H), 7.10 (s, 1 H), 3.92 (s, 6 H), 3.34 (s, 3 H); <sup>13</sup>C NMR (201 MHz, DMSO-*d*<sub>6</sub>) δ ppm 169.7, 158.1, 150.2, 148.3, 147.8, 139.3, 139.0, 137.0, 132.4, 129.8, 129.6, 127.6, 127.2, 125.4, 124.9, 122.7, 120.2, 118.0, 110.4, 55.7, 26.3; HRMS (ESI) *m/z*: 414.1463 found (calcd for C<sub>24</sub>H<sub>20</sub>N<sub>3</sub>O<sub>4</sub><sup>+</sup>, [M-H]<sup>+</sup> 414.1459).



### 5-((*Z*)-4-hydroxy-3,5-dimethoxybenzylidene)-2-((*E*)-4-hydroxy-3,5-dimethoxystyryl)-3-methyl-3,5-dihydro-4*H*-imidazol-4-one (N 1193)

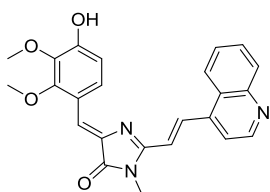
Red solid (62 mg, 39%); mp = 235-238 °C; <sup>1</sup>H NMR (700 MHz, DMSO-*d*<sub>6</sub>) δ ppm 9.13 (s, 1 H), 9.01 (s, 1 H), 7.89 (d, *J*=15.6 Hz, 1 H), 7.74 (s, 2 H), 7.10 (s, 2 H), 7.06 (d, *J*=15.6 Hz, 1 H), 6.92 (s, 1 H), 3.87 (s, 6 H), 3.85 (s, 6 H), 3.29 (s, 3 H); <sup>13</sup>C NMR (176 MHz, DMSO-*d*<sub>6</sub>) δ ppm

170.0, 159.1, 148.1, 147.9, 140.6, 138.5, 138.5, 137.4, 125.7, 125.2, 125.1, 110.9, 110.1, 106.5, 56.2, 56.0, 26.4; HRMS (ESI)  $m/z$ : 439.1516 found (calcd for  $C_{23}H_{23}N_2O_7^-$ ,  $[M-H]^-$  439.1511).



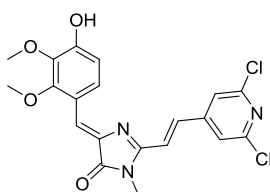
**2-((1E,3E)-4-(4-(dimethylamino)phenyl)buta-1,3-dien-1-yl)-5-((Z)-4-hydroxy-3,5-dimethoxybenzylidene)-3-methyl-3,5-dihydro-4H-imidazol-4-one (N 1195)**

Dark red solid (52 mg, 12%); mp  $\sim 200^\circ\text{C}$  with decomposition;  $^1\text{H}$  NMR (700 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 9.12 (br. s., 1 H), 7.69 - 7.74 (m, 3 H), 7.45 (d,  $J=8.8$  Hz, 2 H), 6.97 - 7.06 (m, 2 H), 6.89 (s, 1 H), 6.74 (d,  $J=9.0$  Hz, 2 H), 6.55 (d,  $J=14.7$  Hz, 1 H), 3.86 (s, 6 H), 3.19 (s, 3 H), 2.98 (s, 6 H);  $^{13}\text{C}$  NMR (201 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 169.7, 158.8, 150.8, 147.8, 141.3, 140.5, 138.4, 137.6, 128.6, 125.2, 124.6, 123.8, 123.0, 113.7, 112.0, 110.0, 56.0, 40.0, 26.1; HRMS (ESI)  $m/z$ : 434.2066 found (calcd for  $C_{25}H_{28}N_3O_4^+$ ,  $[M+H]^+$  434.2074).



**5-((Z)-4-hydroxy-2,3-dimethoxybenzylidene)-3-methyl-2-((E)-2-(quinolin-4-yl)vinyl)-3,5-dihydro-4H-imidazol-4-one (N 1197)**

Red solid (104 mg, 69%); mp =  $216-219^\circ\text{C}$ ;  $^1\text{H}$  NMR (700 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 11.75 (br. s., 1 H), 9.01 (d,  $J=4.6$  Hz, 1 H), 8.59 (d,  $J=15.8$  Hz, 1 H), 8.36 (d,  $J=8.4$  Hz, 1 H), 8.16 (d,  $J=8.8$  Hz, 1 H), 8.12 (d,  $J=8.4$  Hz, 1 H), 8.08 (d,  $J=4.4$  Hz, 1 H), 7.86 (t,  $J=7.5$  Hz, 1 H), 7.6 (t,  $J=7.6$  Hz, 1 H), 7.56 (d,  $J=15.6$  Hz, 1 H), 7.39 (s, 1 H), 6.74 (d,  $J=9.0$  Hz, 1 H), 3.88 (s, 3 H), 3.74 (s, 3 H), 3.36 (s, 3 H);  $^{13}\text{C}$  NMR (176 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 168.5, 156.3, 156.2, 152.0, 150.3, 148.3, 139.5, 136.5, 134.4, 133.0, 130.2, 129.8, 129.7, 127.4, 125.3, 123.2, 120.2, 118.4, 115.7, 104.6, 59.9, 55.9, 26.7; HRMS (ESI)  $m/z$ : 416.1601 found (calcd for  $C_{24}H_{22}N_3O_4^+$ ,  $[M+H]^+$  416.1605).

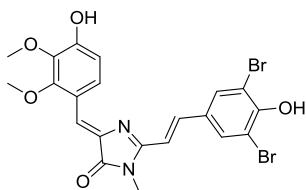


**2-((E)-2-(2,6-dichloropyridin-4-yl)vinyl)-5-((Z)-4-hydroxy-2,3-dimethoxybenzylidene)-3-methyl-3,5-dihydro-4H-imidazol-4-one (N 1198)**

Red solid (94 mg, 60%); mp  $\sim 260^\circ\text{C}$  with decomposition;  $^1\text{H}$  NMR (700 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 8.18 (d,  $J=8.8$  Hz, 1 H), 8.10 (s, 2 H), 7.80 (d,  $J=16.0$  Hz, 1 H), 7.67 (d,  $J=16.0$  Hz, 1 H),

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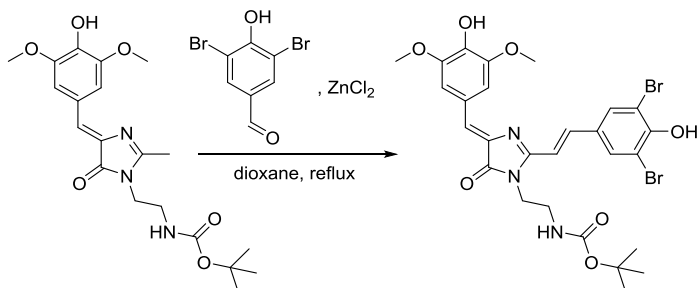
7.39 (s, 1 H), 6.68 (d,  $J=9.0$  Hz, 1 H), 3.87 (s, 3 H), 3.72 (s, 3 H), 3.31 (s, 3 H);  $^{13}\text{C}$  NMR (176 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 168.6, 156.3, 155.9, 152.0, 149.9, 148.8, 136.3, 134.7, 133.8, 130.0, 121.7, 121.3, 115.7, 104.5, 60.0, 55.9, 26.7; HRMS (ESI)  $m/z$ : 432.0530 found (calcd for  $\text{C}_{20}\text{H}_{16}\text{Cl}_2\text{N}_3\text{O}_4^-$ ,  $[\text{M}-\text{H}]^-$  432.0523).



**2-((*E*)-3,5-dibromo-4-hydroxystyryl)-5-((*Z*)-4-hydroxy-2,3-dimethoxybenzylidene)-3-methyl-3,5-dihydro-4*H*-imidazol-4-one (N 1199)**

Red solid (101 mg, 52%); mp  $\sim 250$  °C with decomposition;  $^1\text{H}$  NMR (700 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 8.14 (s, 2 H), 8.00 (d,  $J=9.3$  Hz, 1 H), 7.73 (d,  $J=15.4$  Hz, 1 H), 7.21 - 7.26 (m, 2 H), 6.67 (d,  $J=9.2$  Hz, 1 H), 3.86 (s, 3 H), 3.72 (s, 3 H), 3.30 (s, 3 H);  $^{13}\text{C}$  NMR (176 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 168.5, 156.5, 156.1, 152.2, 151.8, 137.2, 137.2, 136.5, 134.3, 132.2, 130.2, 129.7, 115.8, 113.3, 112.2, 104.4, 59.9, 55.8, 26.6; HRMS (ESI)  $m/z$ : 534.9524 found (calcd for  $\text{C}_{21}\text{H}_{17}\text{Br}_2\text{N}_2\text{O}_5^-$ ,  $[\text{M}-\text{H}]^-$  534.9510).

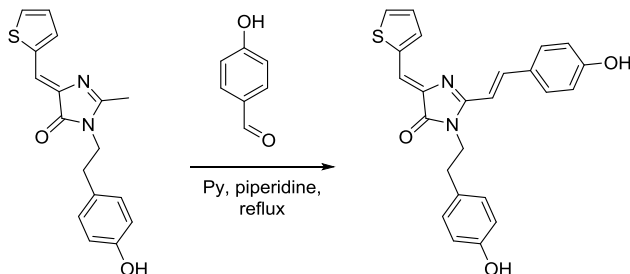
***tert*-butyl (2-(2-((*E*)-3,5-dibromo-4-hydroxystyryl)-4-((*Z*)-4-hydroxy-3,5-dimethoxybenzylidene)-5-oxo-4,5-dihydro-1*H*-imidazol-1-yl)ethyl)carbamate (AR558)**



To the solution of AR556 (405 mg, 1 mmol) in dioxane (5 mL) anhydrous zinc chloride (30 mg, 0.22 mmol) and 3,5-dibromo-4-hydroxybenzaldehyde (340 mg, 1.2 mmol) were added. The mixture was refluxed for 4 h and the solvent was evaporated. The mixture was dissolved in EtOAc (50 mL), washed by EDTA solution (0.5%, 10 mL), water (3x10 mL) and brine (1x10 mL), followed by drying over  $\text{Na}_2\text{SO}_4$ . The solvent was evaporated and the product was purified by column chromatography on silica gel (0-2% EtOH in  $\text{CH}_2\text{Cl}_2$ ). Orange solid (148 mg, 22 %);  $^1\text{H}$  NMR (700 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 10.42 (br s, 1 H), 9.16 (s, 1 H), 8.05 (s, 2 H), 7.79 (d,  $J=15.7$  Hz, 1 H), 7.71 (s, 2 H), 7.14 (d,  $J=15.7$  Hz, 1 H), 6.97 (t,  $J=5.7$  Hz, 1 H), 6.94 (s, 1 H), 3.86 (s, 6 H), 3.78 (t,  $J=5.5$  Hz, 2 H), 3.16-3.10 (m, 2 H), 1.29 (s, 9 H);  $^{13}\text{C}$  NMR (176 MHz,  $\text{CDCl}_3$ )  $\delta$  ppm 169.6, 158.0, 155.6, 152.2, 147.7, 138.4, 137.0, 136.2, 131.8, 129.6, 125.8, 124.9,

113.4, 112.2, 109.9, 77.7, 55.9, 2×C overlap with DMSO, 28.0; HRMS (ESI)  $m/z$ : 666.0442 found (calcd for  $C_{27}H_{30}Br_2N_3O_7^+$ ,  $[M+H]^+$  666.0445).

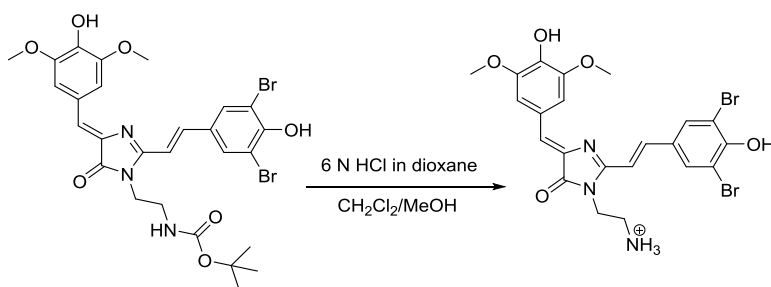
**Preparation of (Z)-3-(4-hydroxyphenethyl)-2-((E)-4-hydroxystyryl)-5-(thiophen-2-ylmethylene)-3,5-dihydro-4H-imidazol-4-one (MID 161)**



To the solution of (Z)-3-(4-hydroxyphenethyl)-2-methyl-5-(thiophene-2-ylmethylene)-3,5-dihydro-4H-imidazol-4-one (1 mmol) in pyridine (5 mL) piperidine (0.02 mL) and corresponding aldehyde (5 mmol) were added. The mixture was refluxed for 15 h and the solvent was evaporated. The mixture was dissolved in EtOAc (35 mL) and washed with phosphate buffer (pH = 7, 3x15 mL), brine (3x25 mL) and dried over  $Na_2SO_4$ . The solvent was evaporated and product was purified by column chromatography (Hexane-EtOAc 3/1).

Orange solid (200 mg, 48%); mp ~200 °C with decomposition;  $^1H$  NMR (700 MHz,  $DMSO-d_6$ )  $\delta$  ppm 10.04 (br. s., 1 H), 9.13 (s, 1 H), 7.87 (d,  $J=5.0$  Hz, 1 H), 7.81 (d,  $J=15.6$  Hz, 1 H), 7.69 (d,  $J=2.9$  Hz, 1 H), 7.59 (d,  $J=8.2$  Hz, 2 H), 7.28 (s, 1 H), 7.16 - 7.18 (m, 1 H), 7.01 (d,  $J=7.8$  Hz, 2 H), 6.85 (d,  $J=7.6$  Hz, 2 H), 6.69 (d,  $J=15.4$  Hz, 1 H), 6.64 (d,  $J=8.2$  Hz, 2 H), 3.93 (t,  $J=6.9$  Hz, 2 H), 2.76 (t,  $J=6.8$  Hz, 2 H);  $^{13}C$  NMR (75 MHz,  $DMSO-d_6$ )  $\delta$  ppm 169.1, 159.7, 159.2, 155.9, 140.3, 138.2, 137.2, 134.3, 134.2, 130.4, 129.9, 128.1, 127.7, 126.3, 118.0, 115.9, 115.2, 109.9, 41.2, 34.2; HRMS (ESI)  $m/z$ : 417.1263 found (calcd for  $C_{24}H_{21}N_2O_3S^+$ ,  $[M+H]^+$  417.1267).

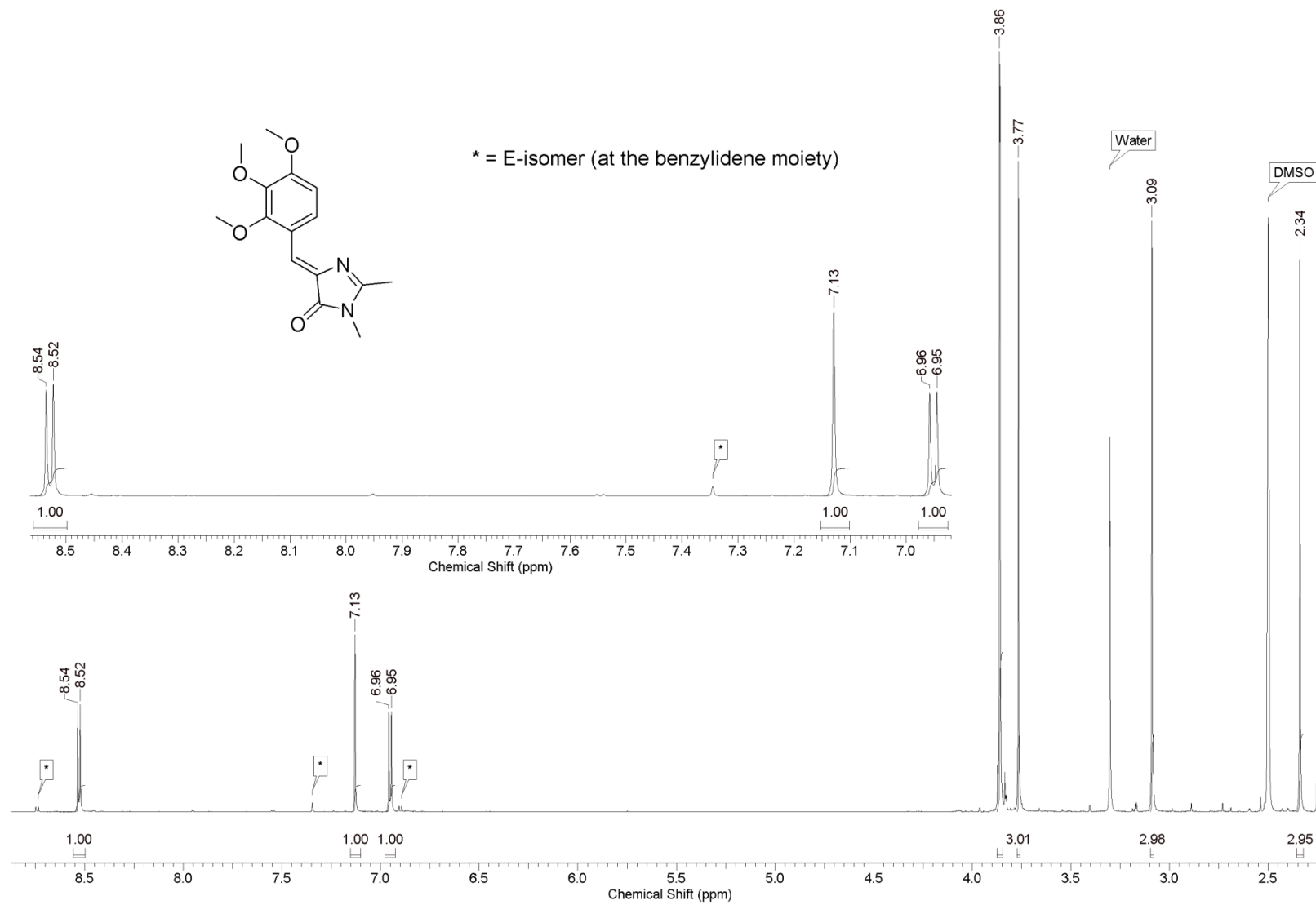
**2-(2-((E)-3,5-dibromo-4-hydroxystyryl)-4-((Z)-4-hydroxy-3,5-dimethoxybenzylidene)-5-oxo-4,5-dihydro-1H-imidazol-1-yl)ethan-1-aminium chloride (AR559)**



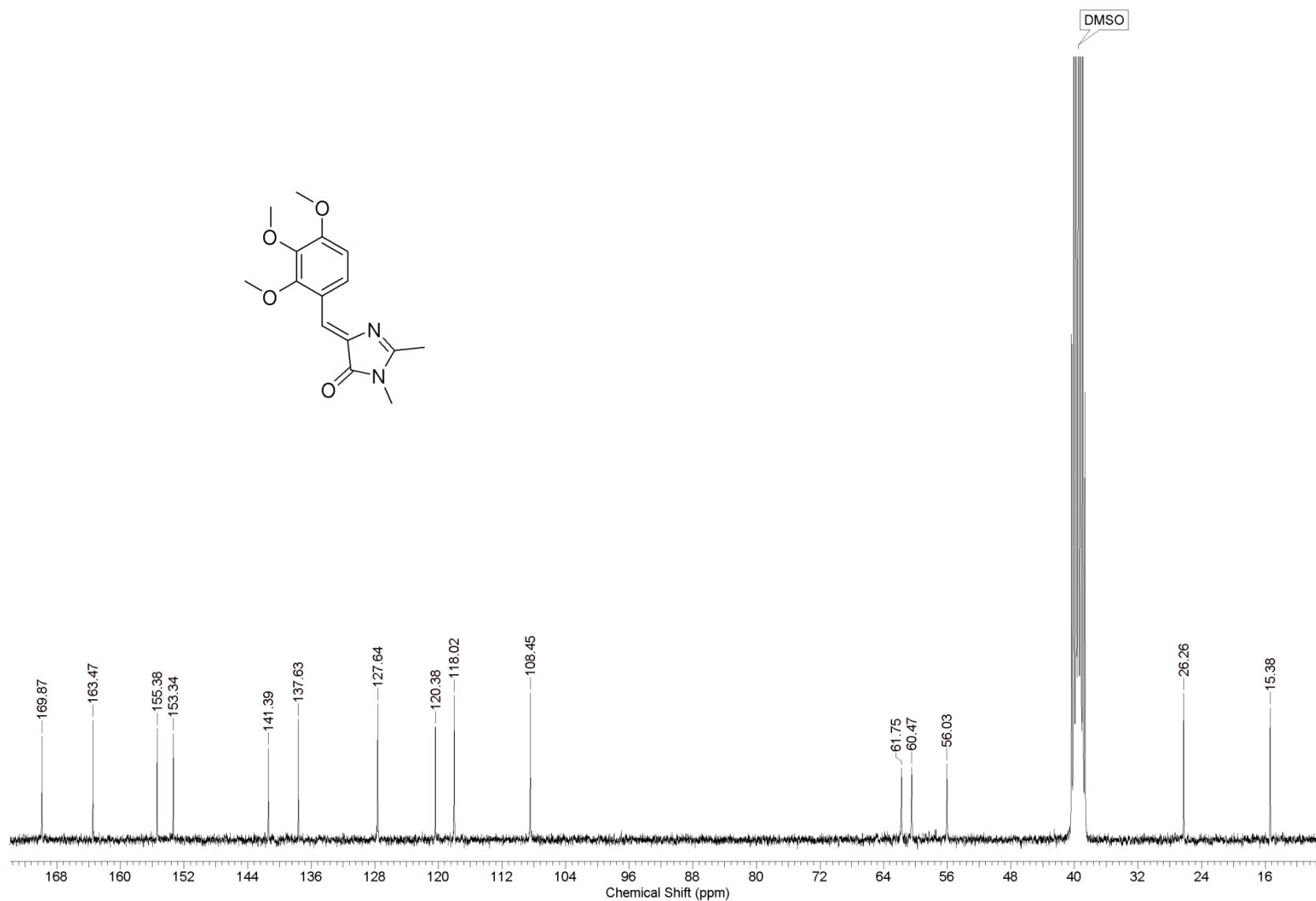
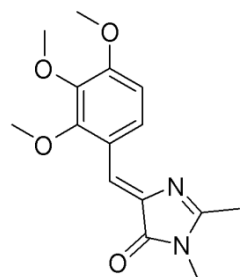
To a solution of AR558 (120 mg, 0.18 mmol) in  $CH_2Cl_2$ /methanol (10 mL, v/v 10:1) 6N HCl in dioxane (0.5 mL) was added and the mixture was stirred for 48 h at room temperature. The

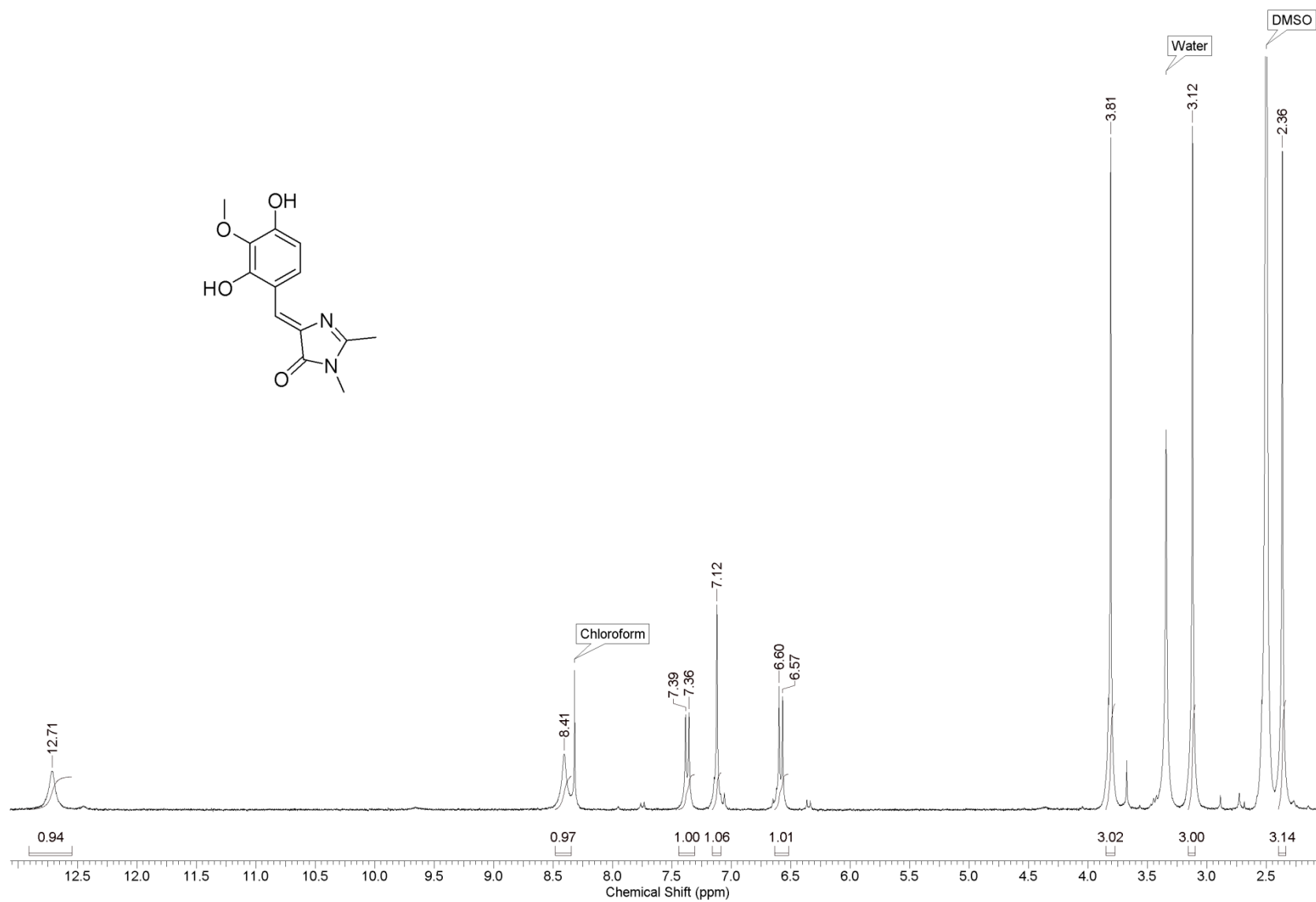
precipitate formed was filtered, washed with cold  $\text{CH}_2\text{Cl}_2$  (2 x 5 mL) and dried in high vacuum. Red solid (85 mg, 83%);  $^1\text{H}$  NMR (700 MHz,  $\text{DMSO}-d_6$ )  $\delta$  ppm 10.47 (br s, 1 H), 9.22 (s, 1 H), 8.12 (s, 2 H), 8.09-7.99 (m, 3 H), 7.83 (d,  $J=15.4$  Hz, 1 H), 7.74 (s, 2 H), 7.21 (d,  $J=15.4$  Hz, 1 H), 7.00 (s, 1 H), 4.05 (t,  $J=5.4$  Hz, 2 H), 3.87 (s, 6 H), 3.12-3.03 (m, 2 H);  $^{13}\text{C}$  NMR (176 MHz,  $\text{CDCl}_3$ )  $\delta$  ppm 170.1, 157.5, 152.0, 147.8, 138.7, 137.0, 136.7, 132.2, 129.9, 126.4, 124.9, 113.4, 112.1, 110.0, 55.9, 40.1, 38.0; HRMS (ESI)  $m/z$ : 565.9918 found (calcd for  $\text{C}_{22}\text{H}_{22}\text{Br}_2\text{N}_3\text{O}_5^+$ ,  $[\text{M}-\text{Cl}]^+$  565.9921).

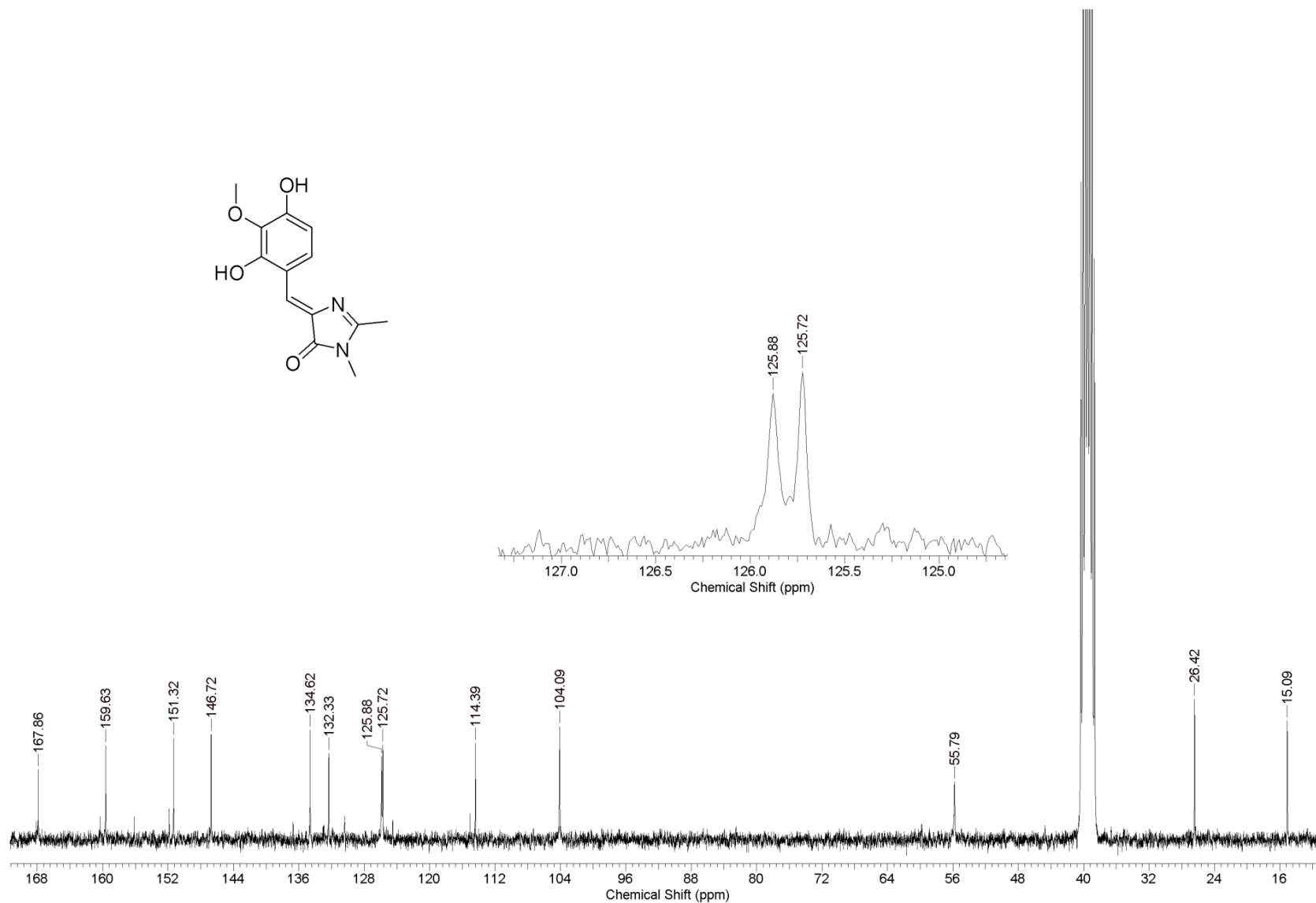
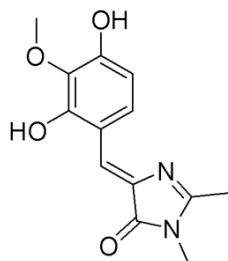
### 3. Copies of $^1\text{H}$ and $^{13}\text{C}$ NMR spectra

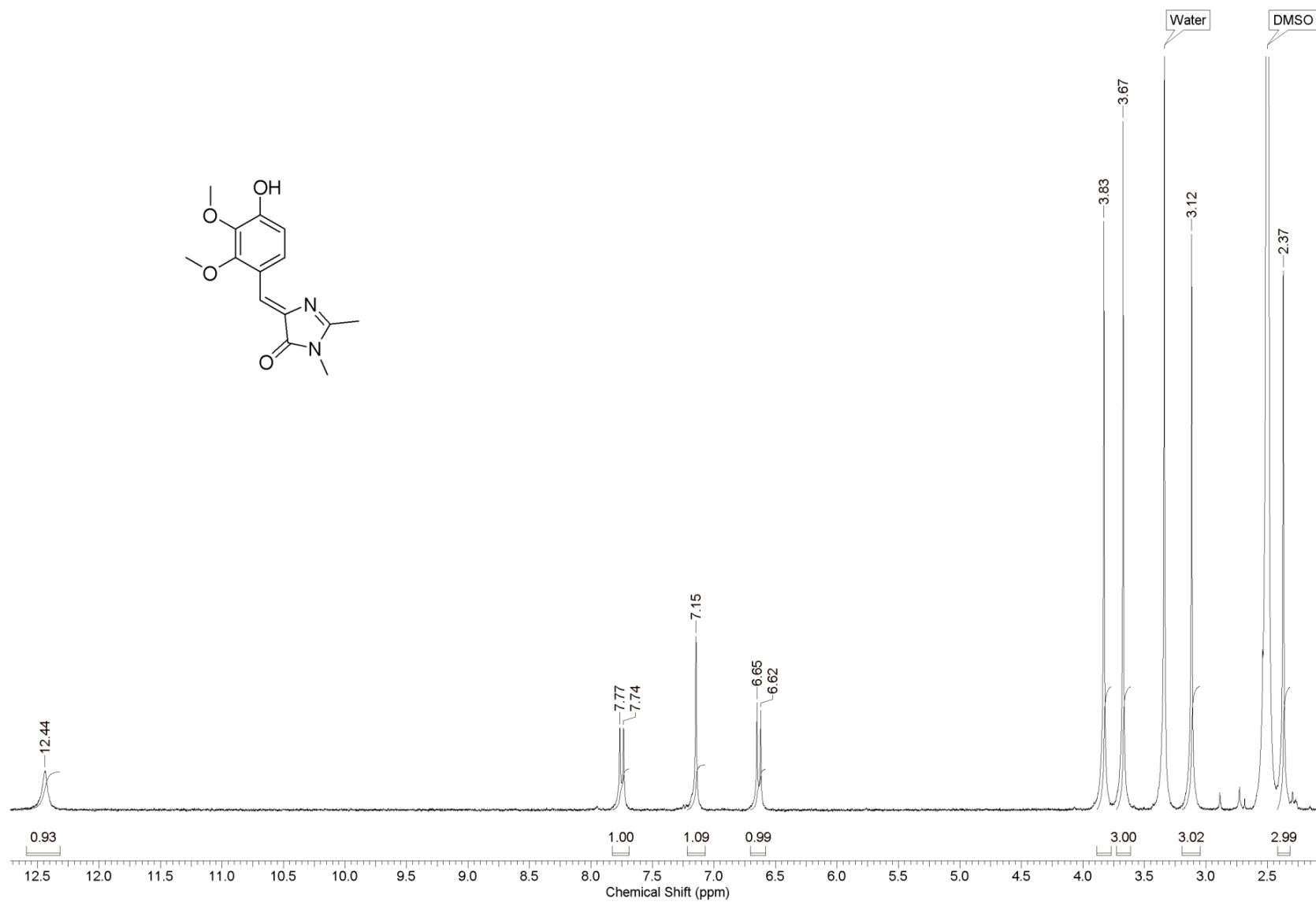


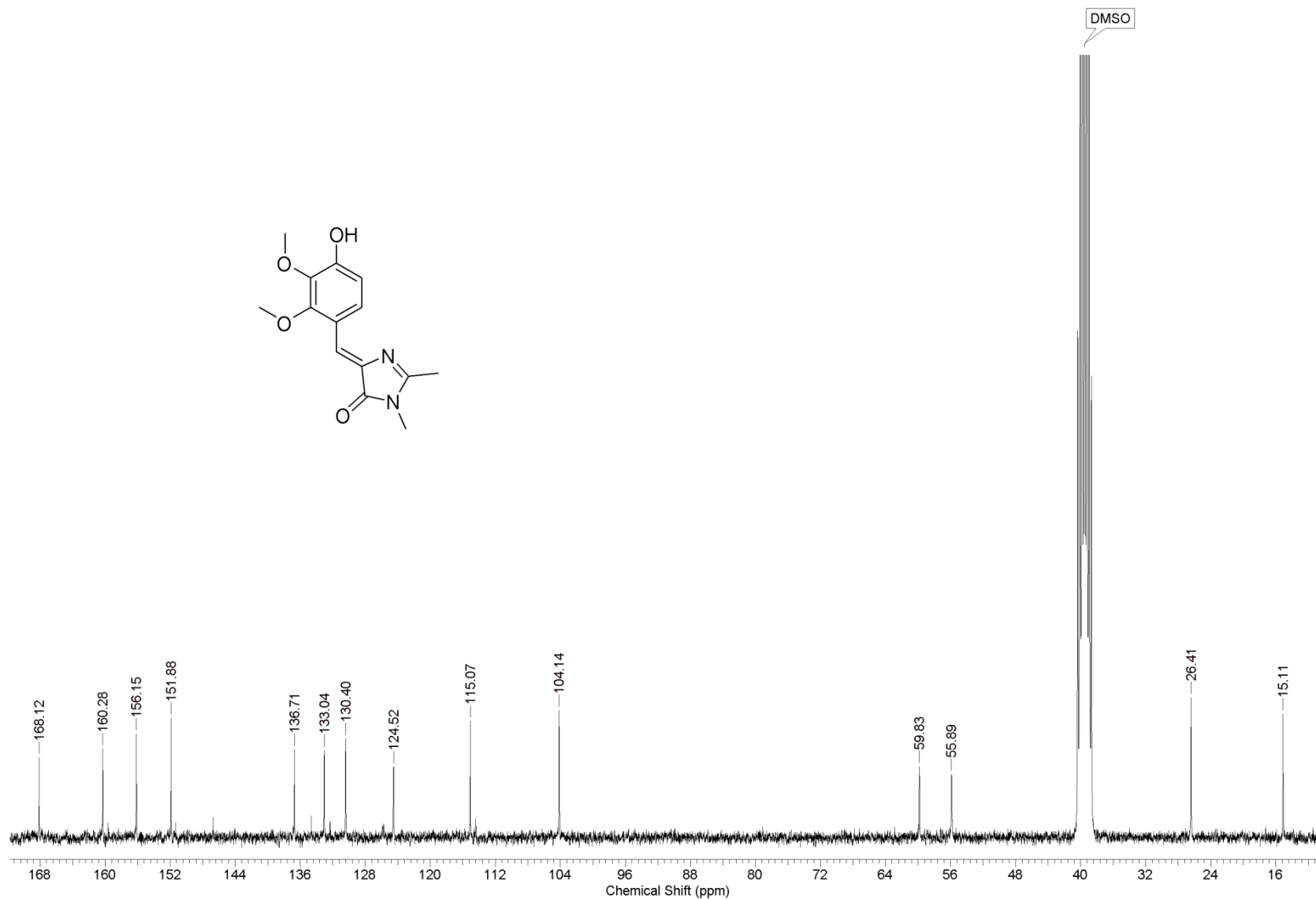


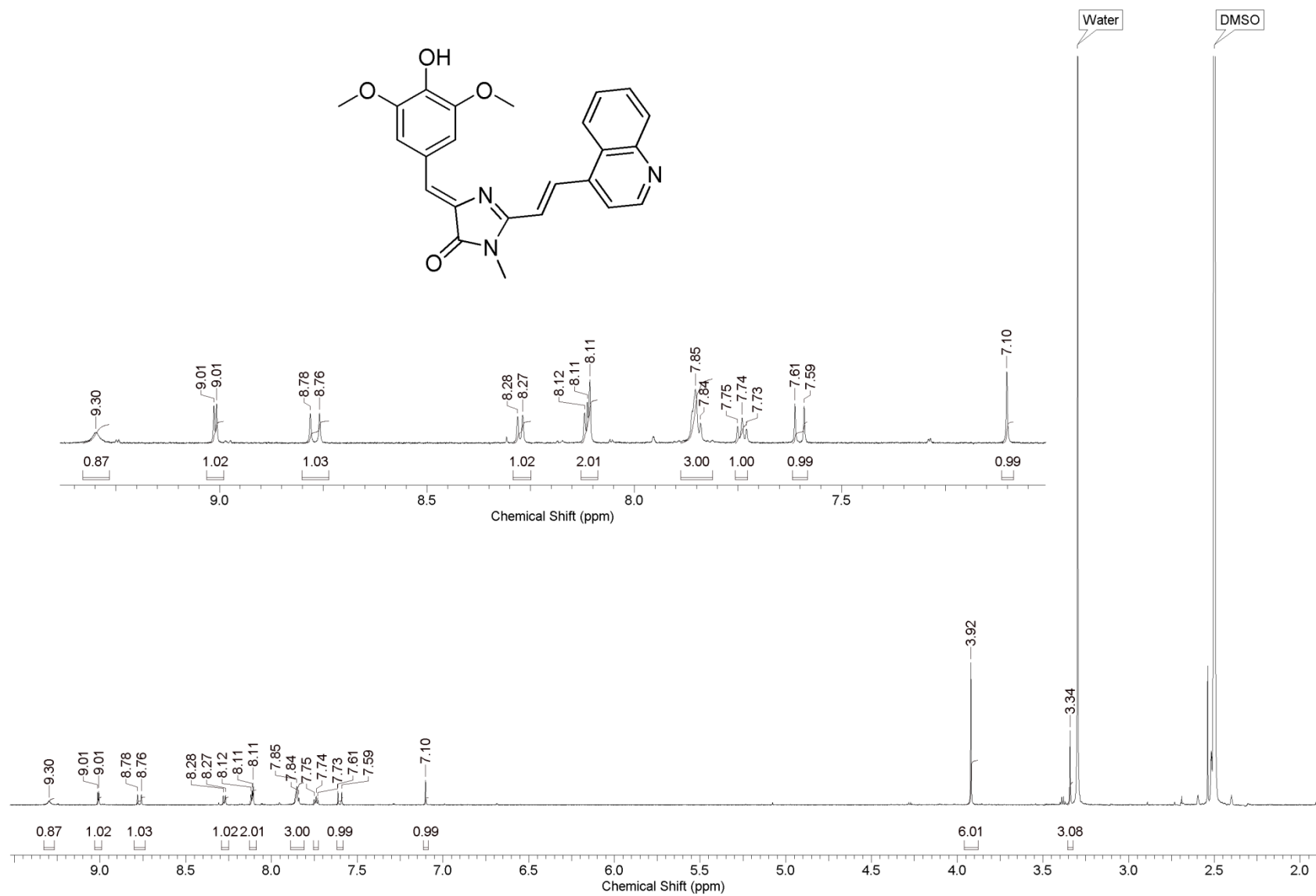


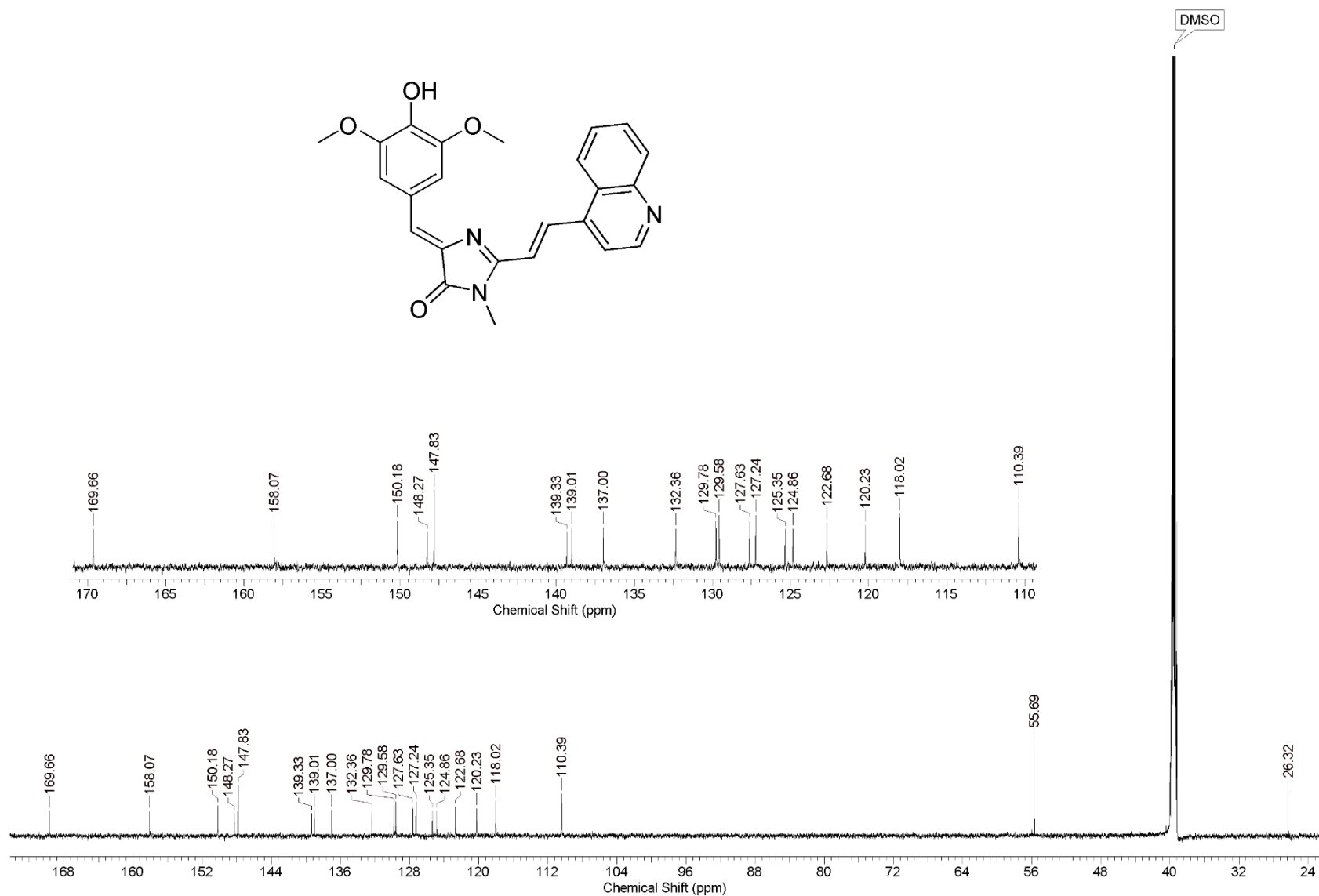


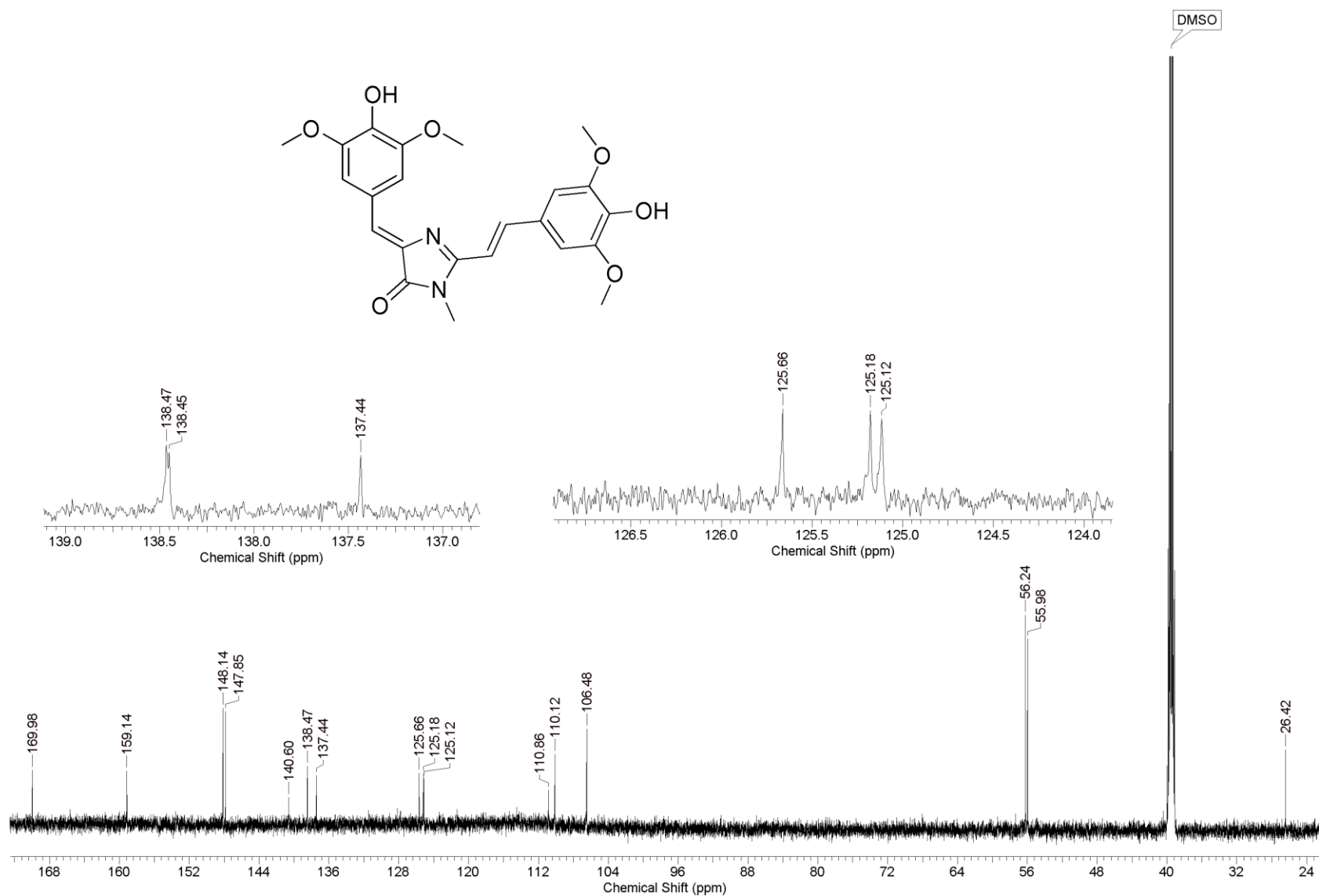




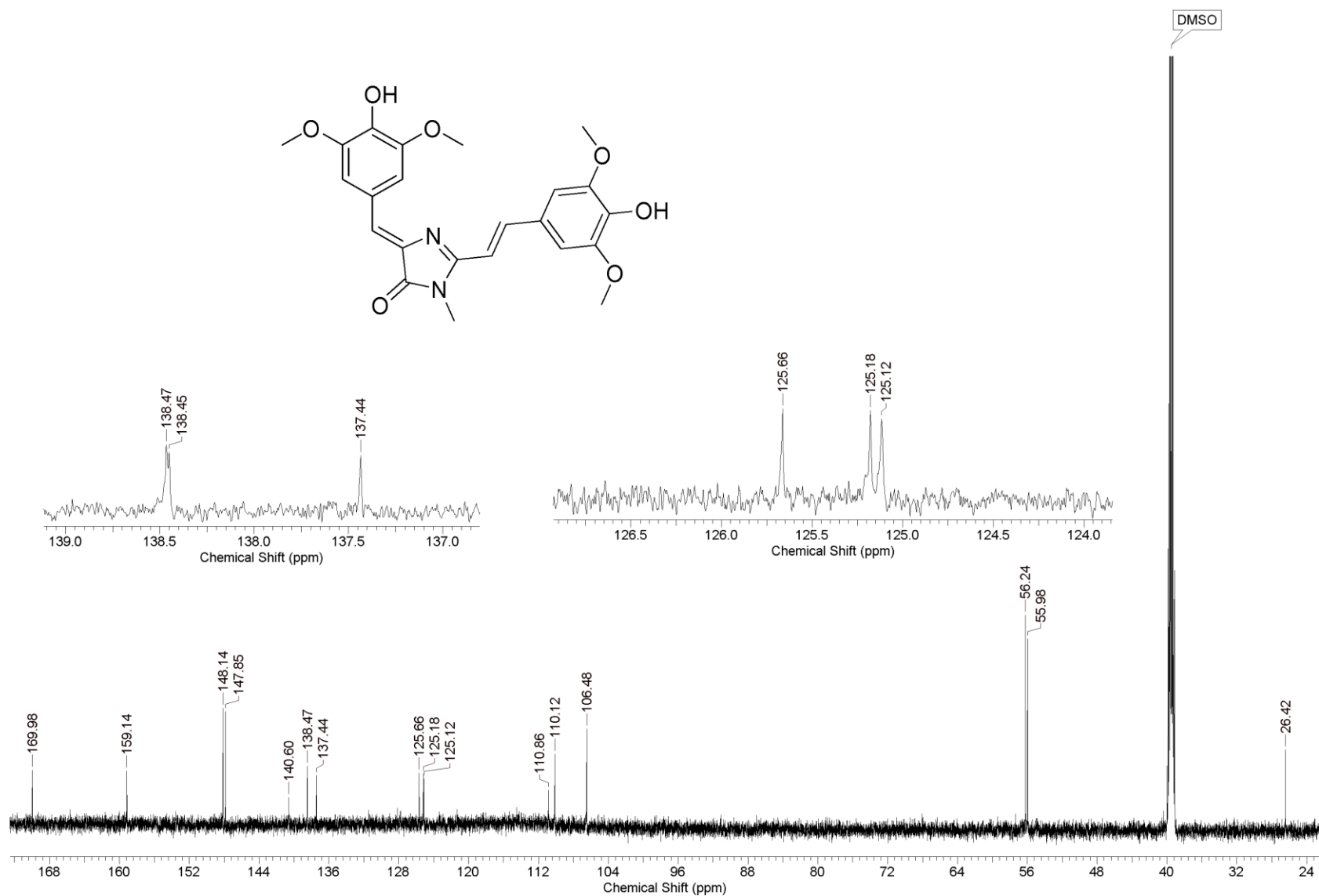


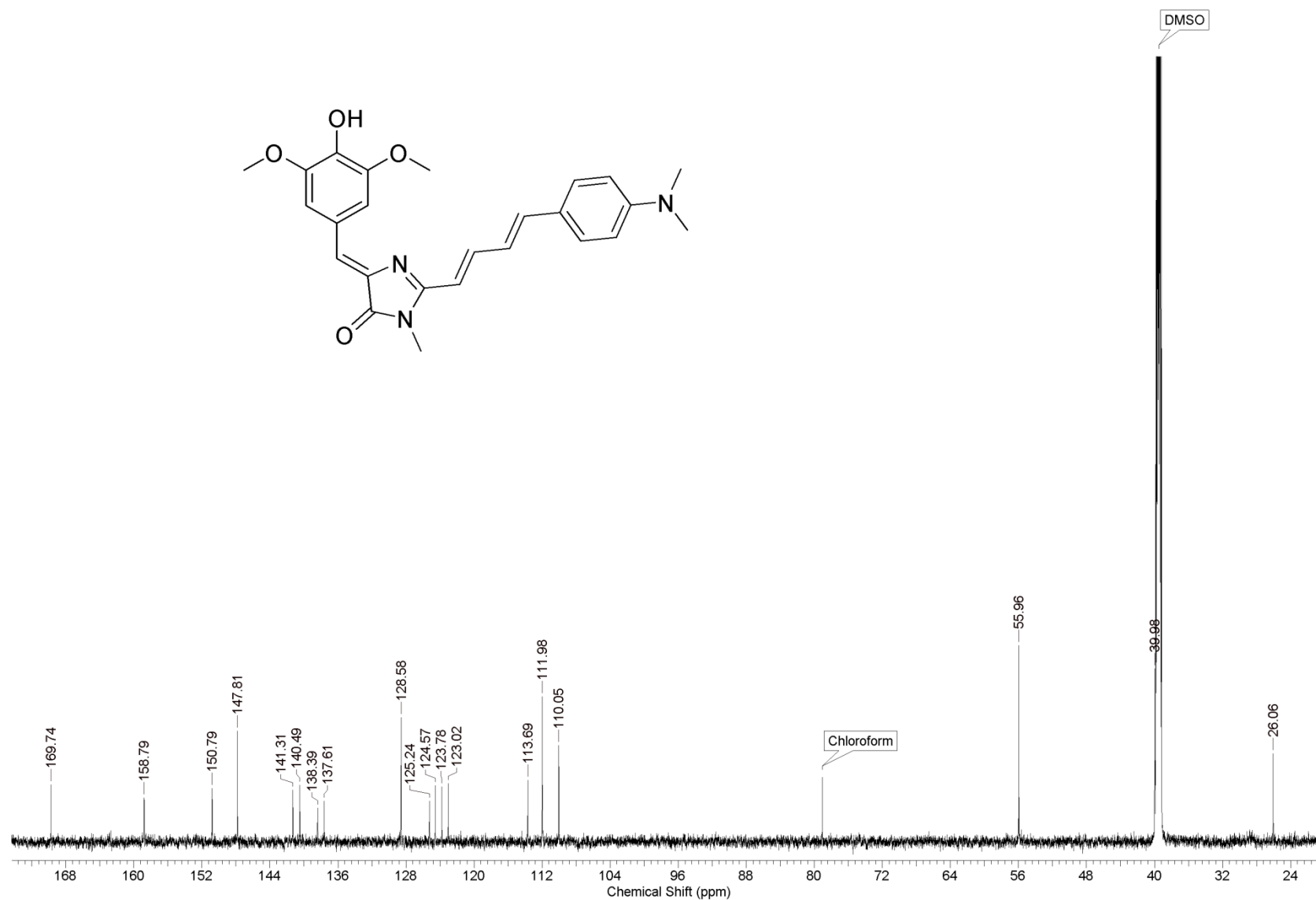


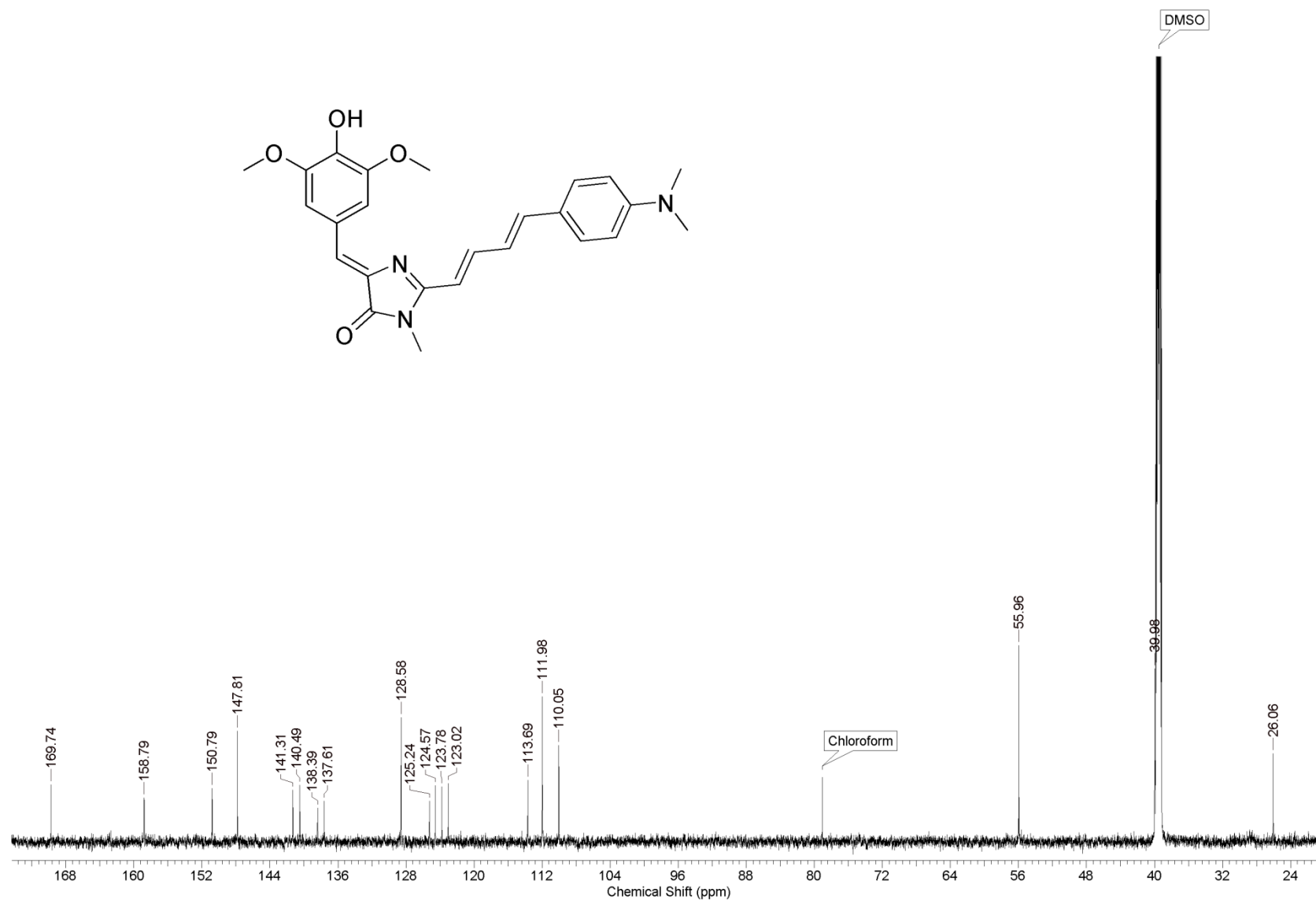


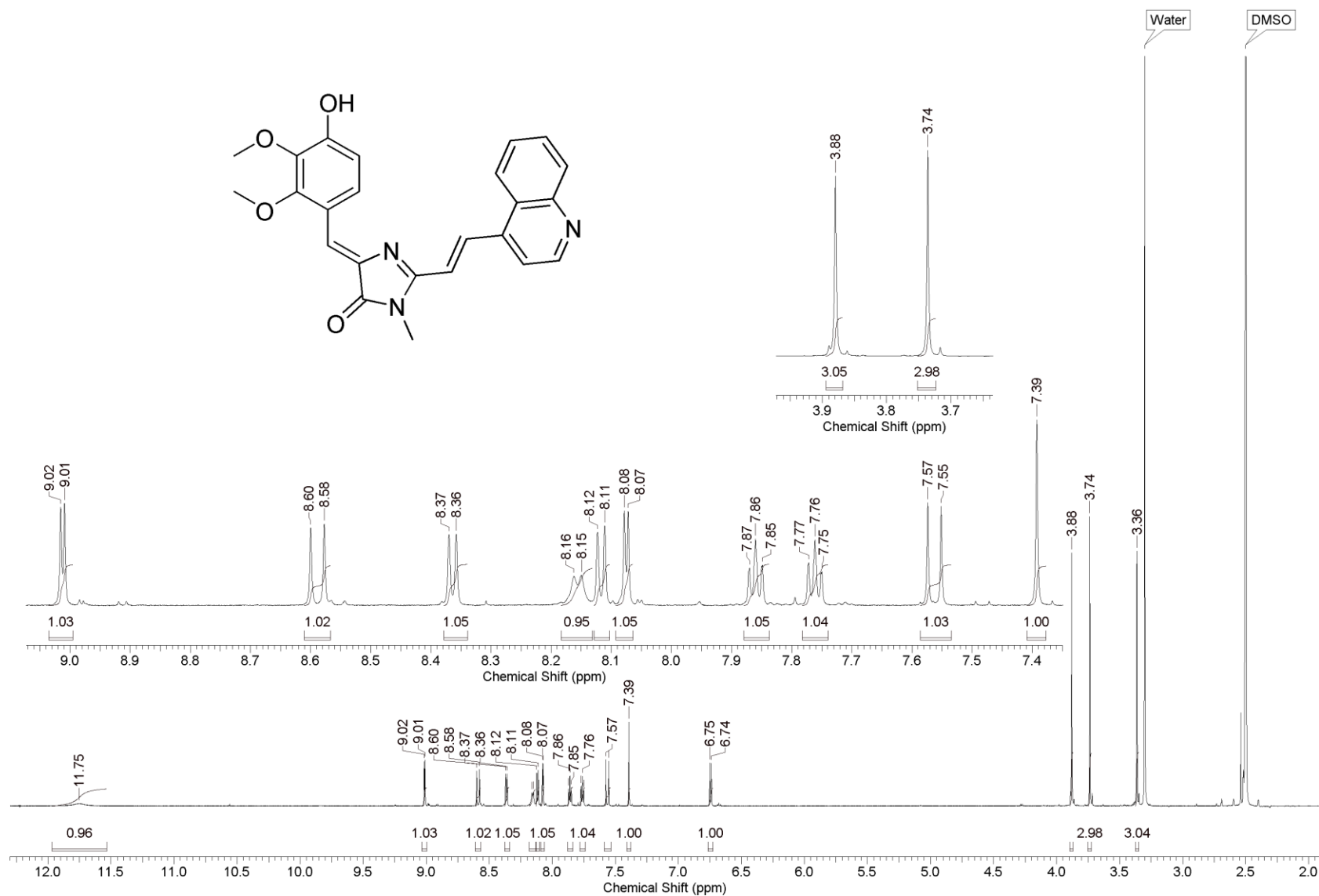


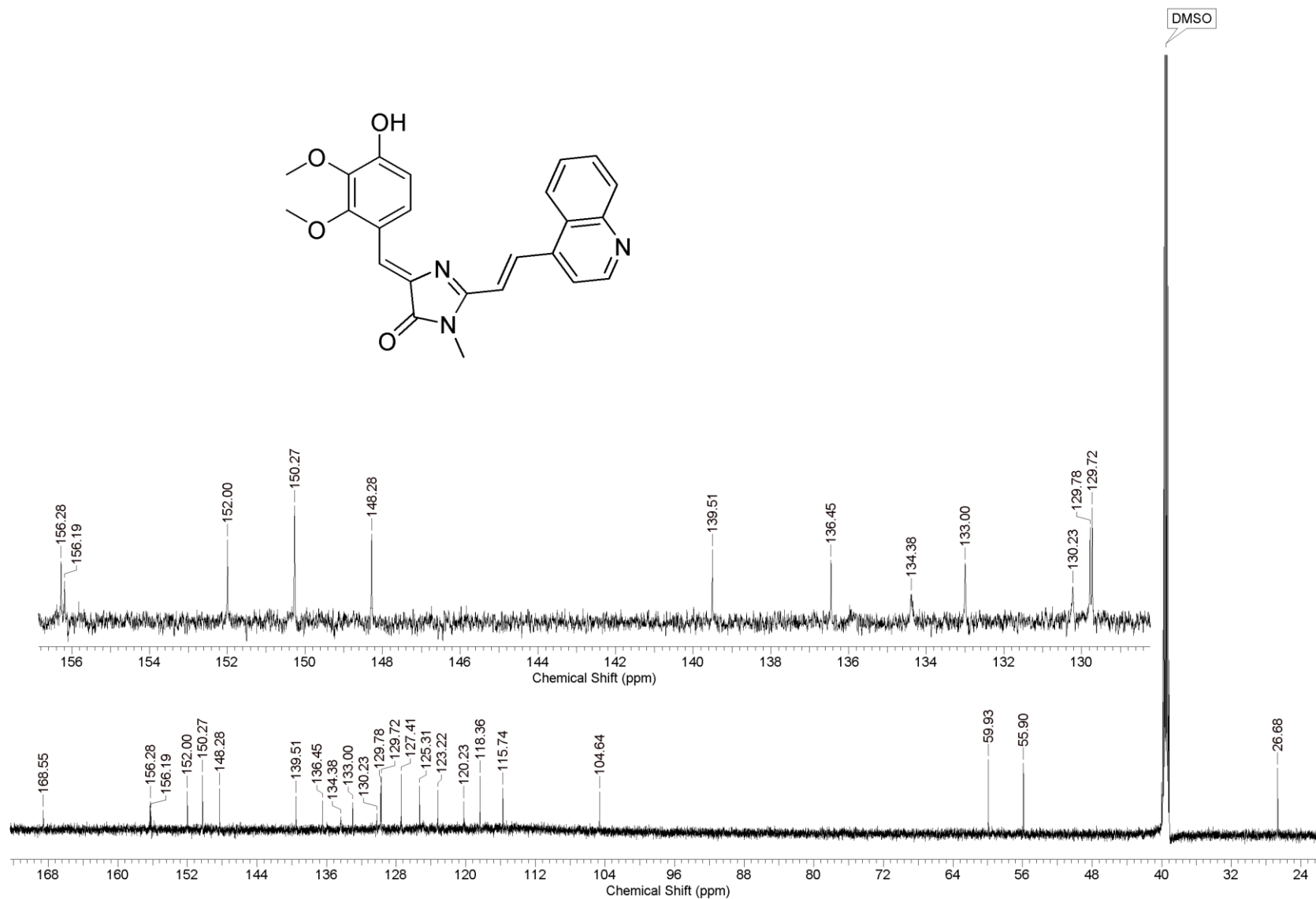


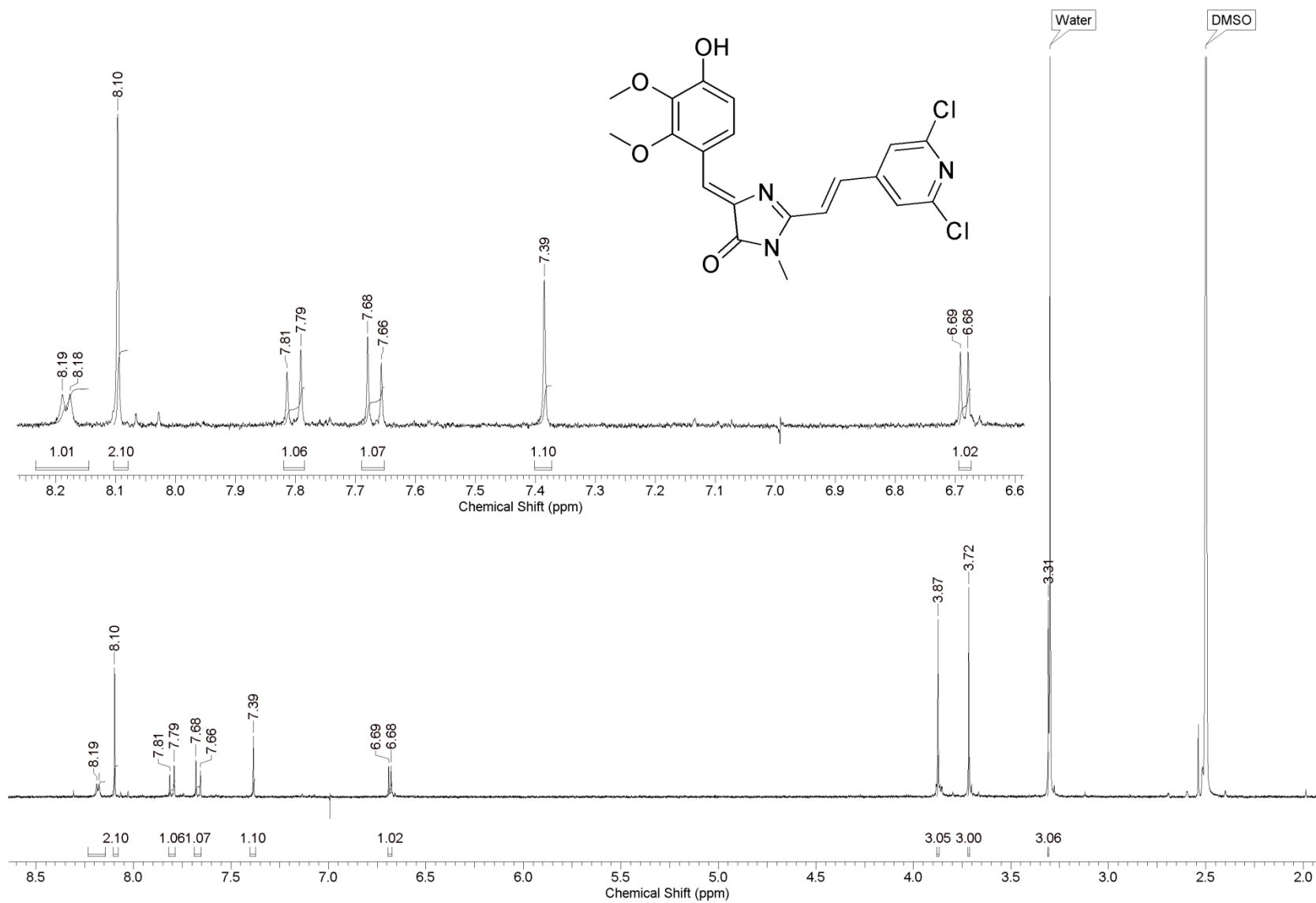


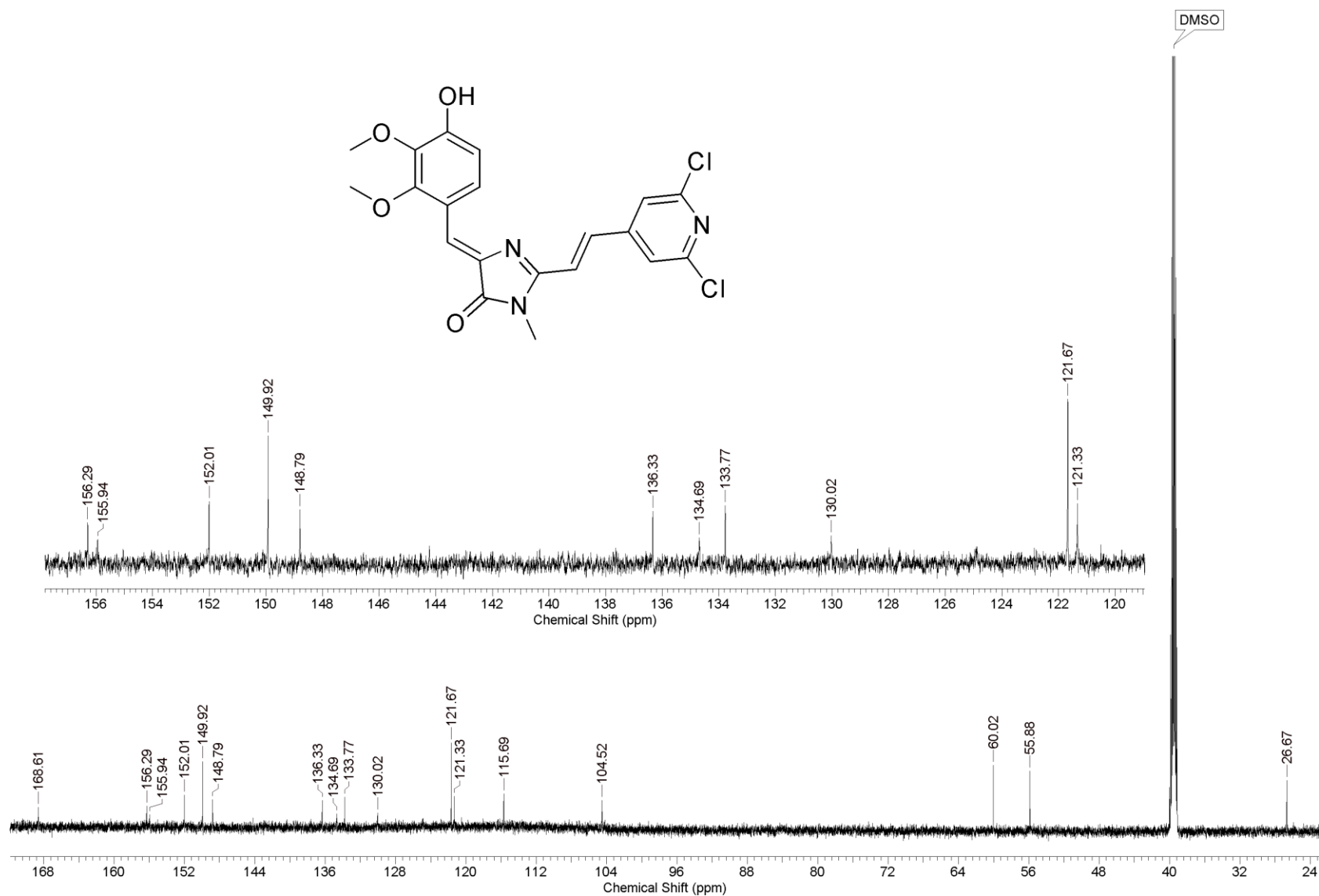


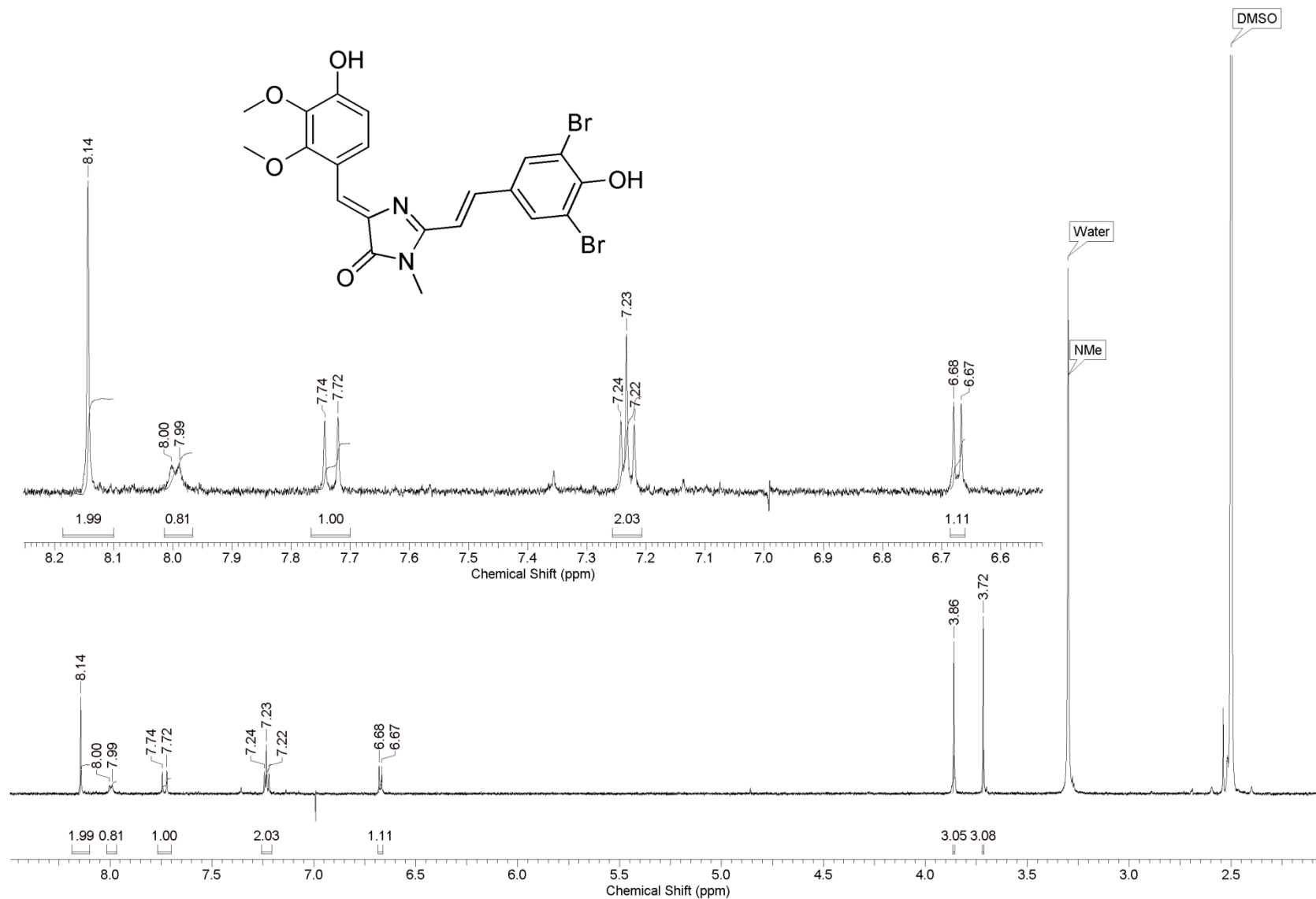




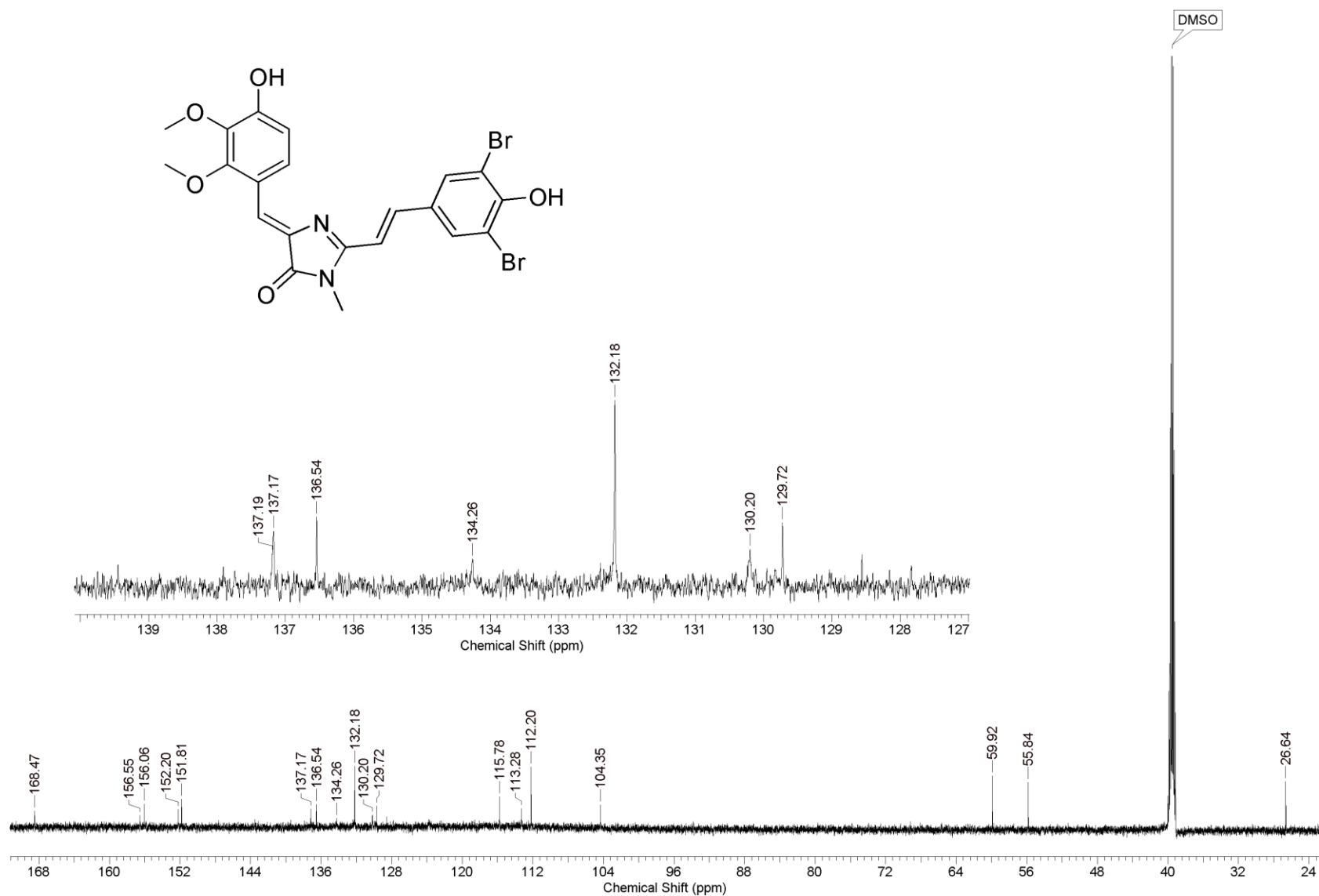


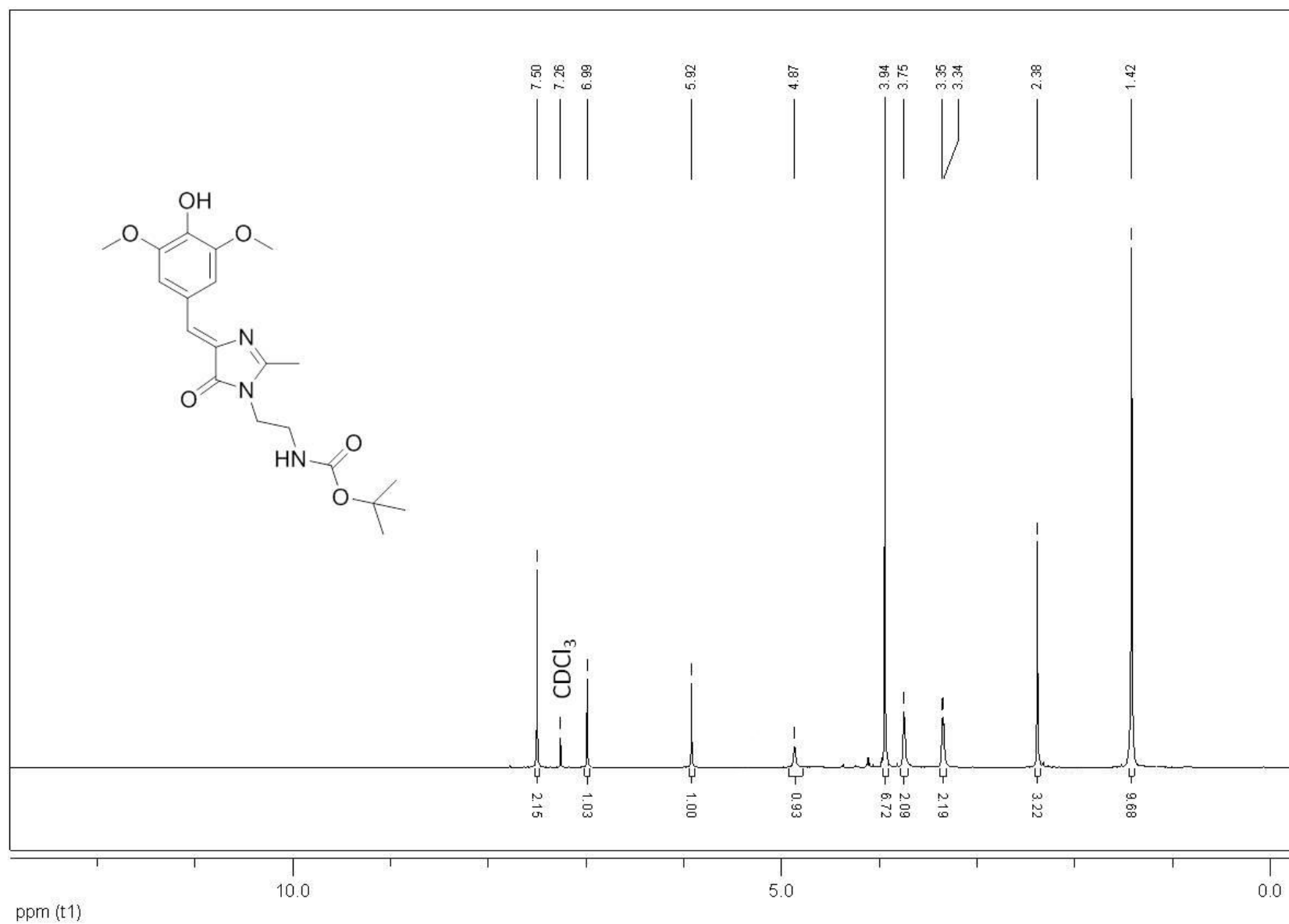


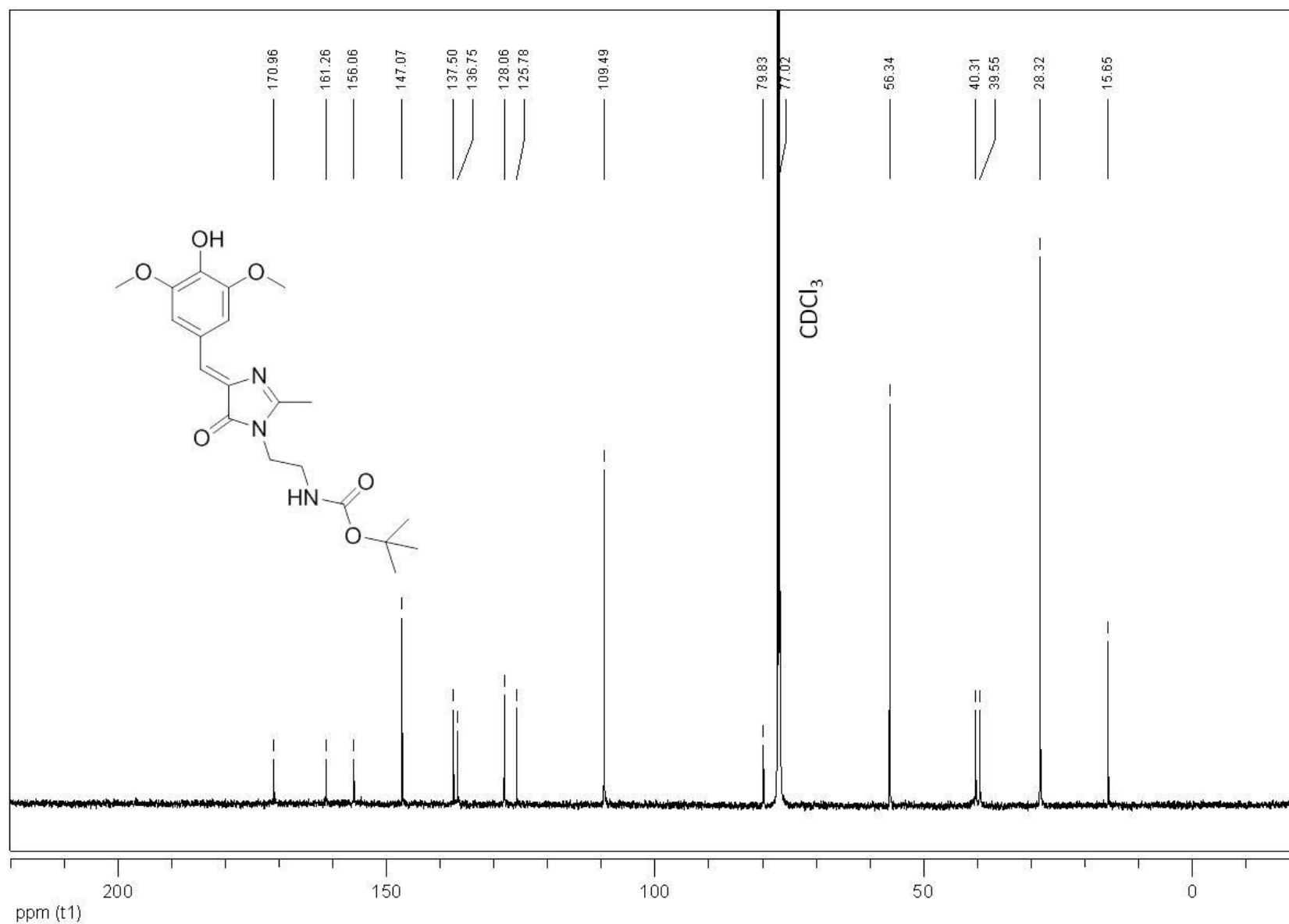


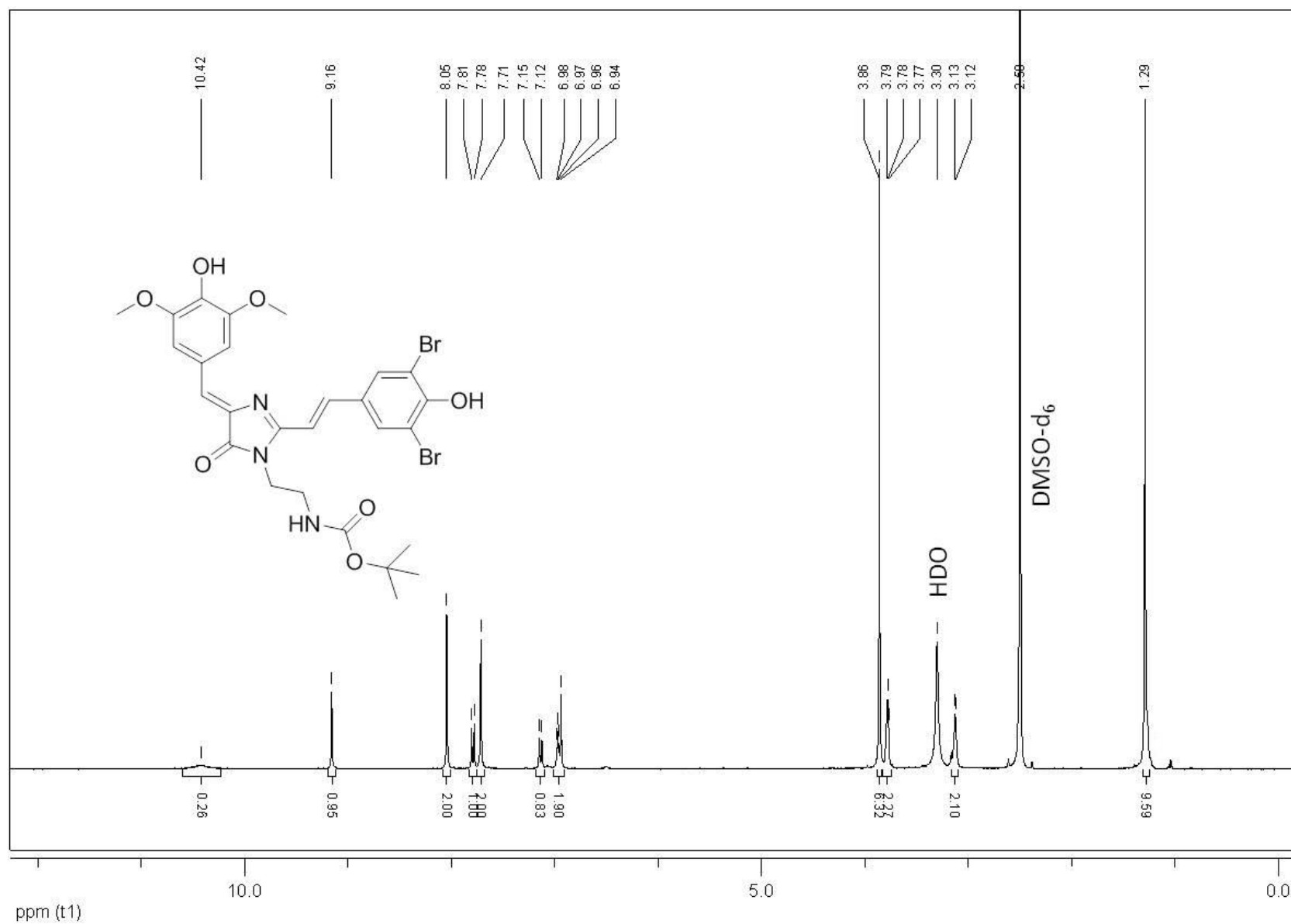


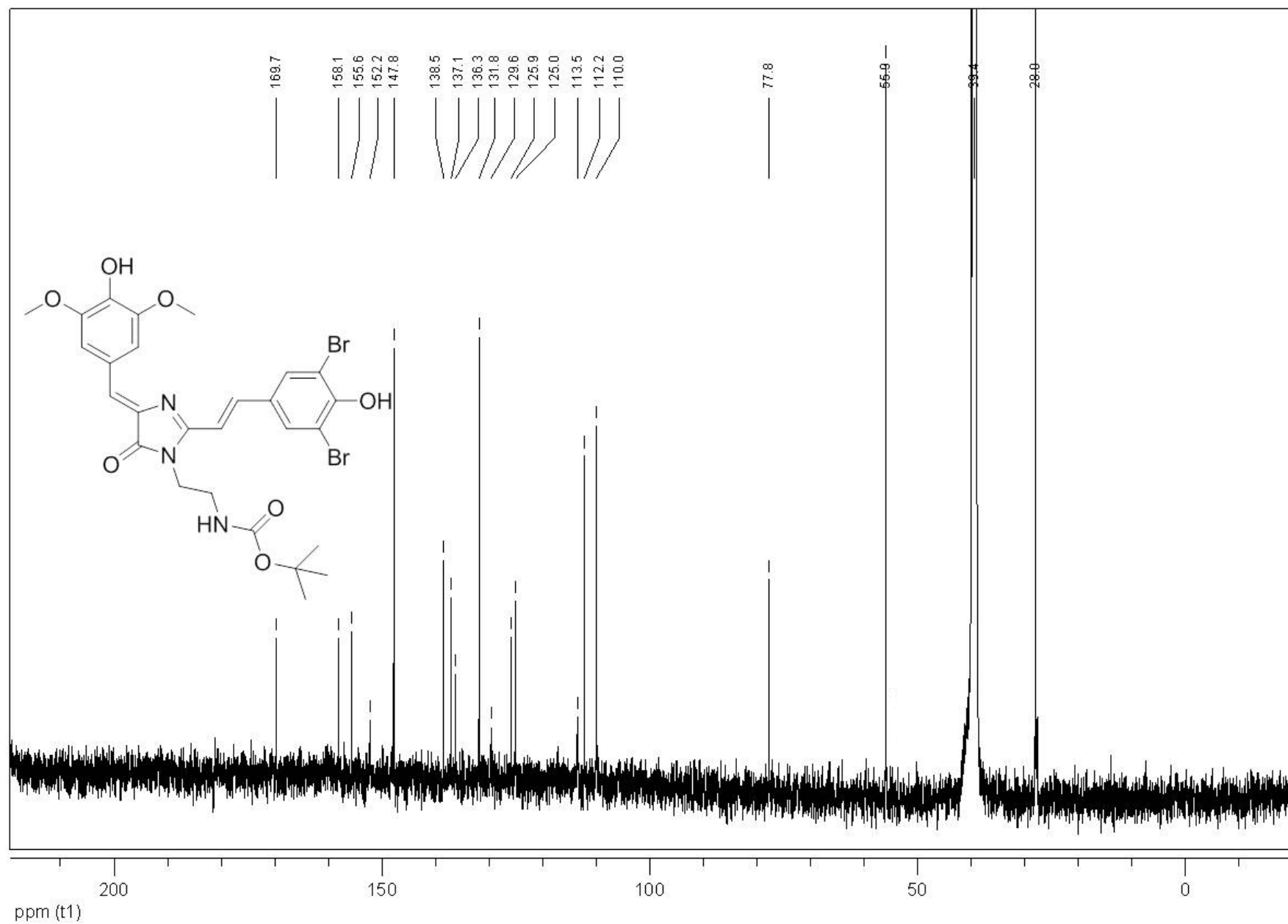


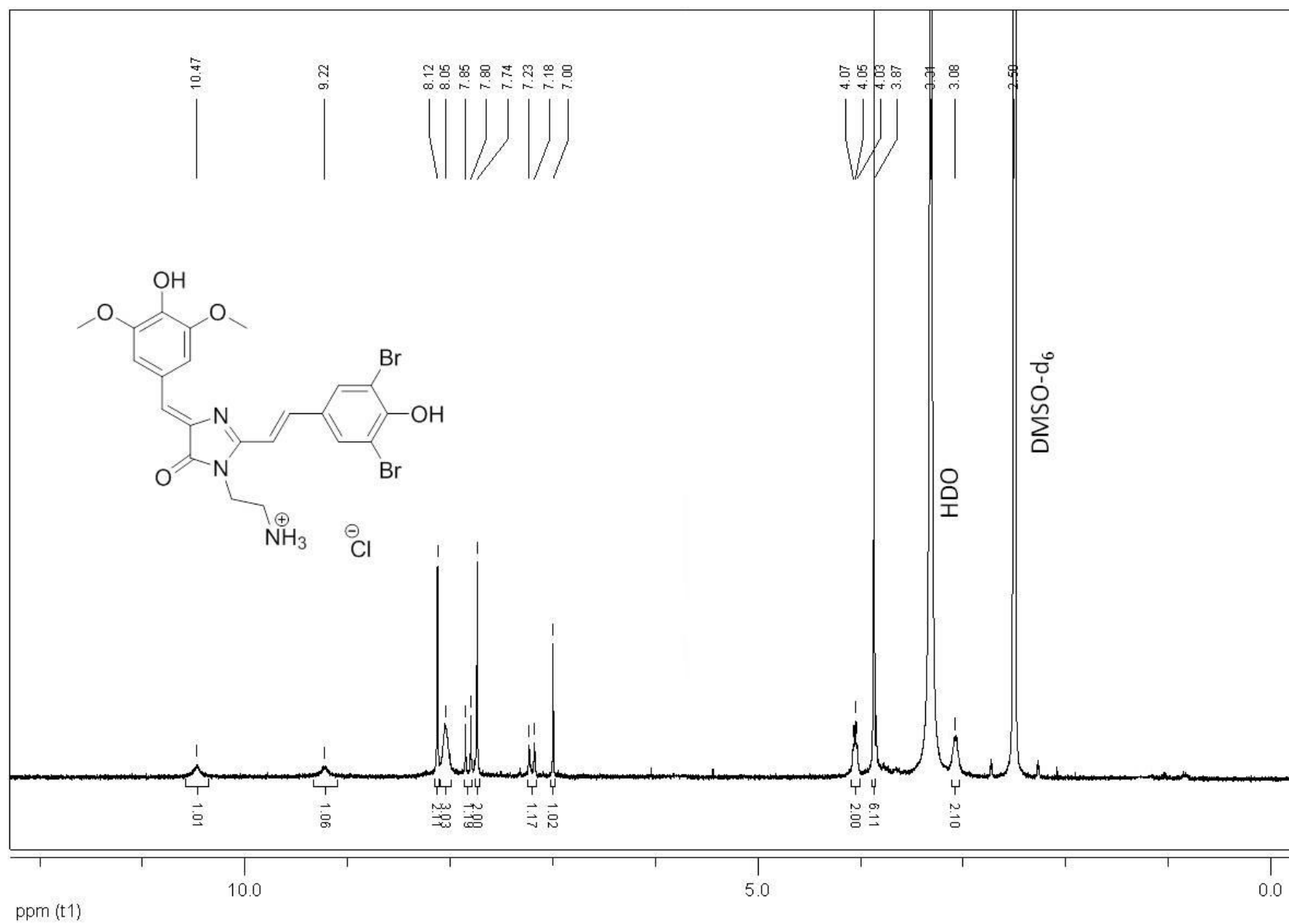


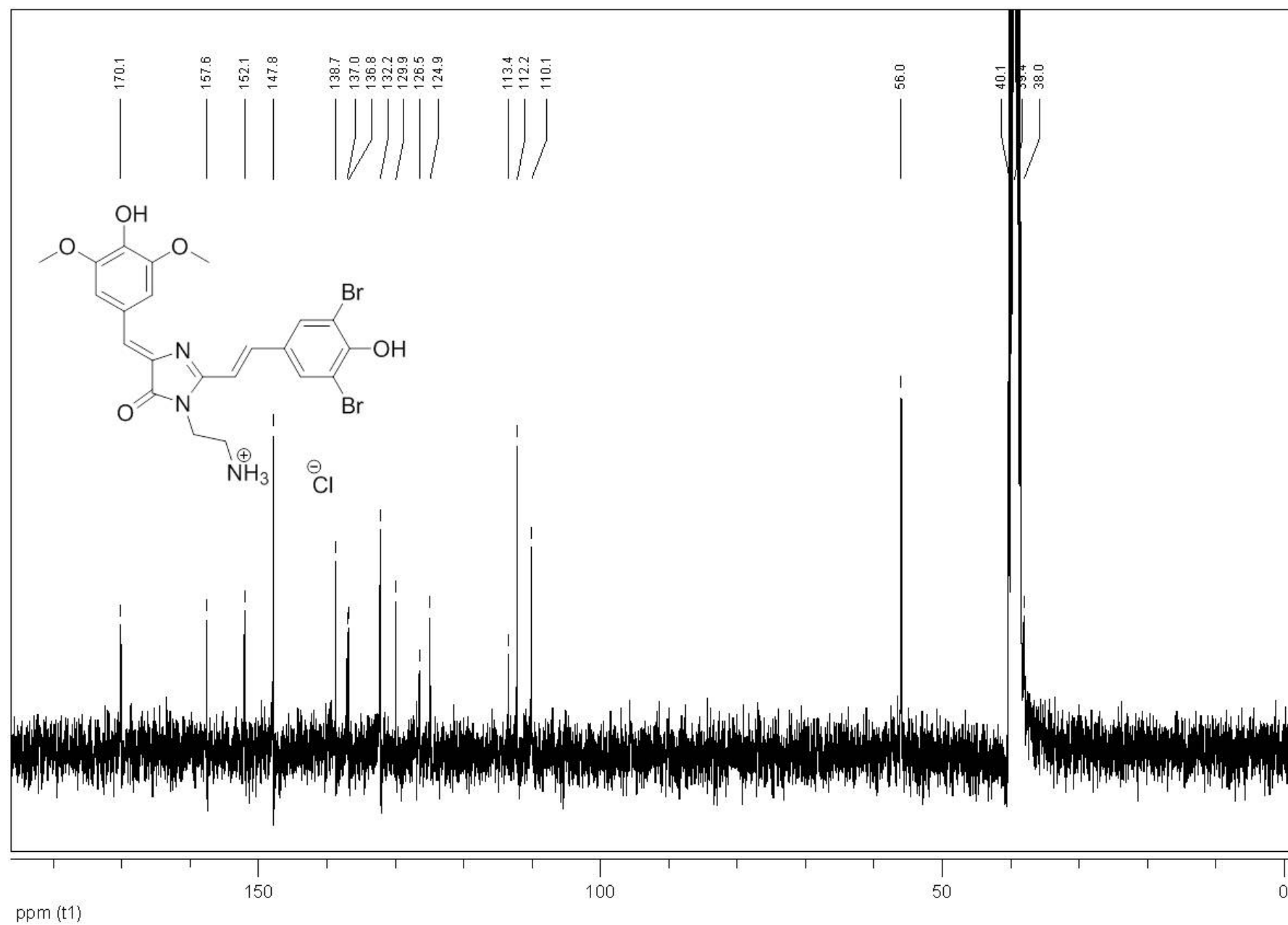




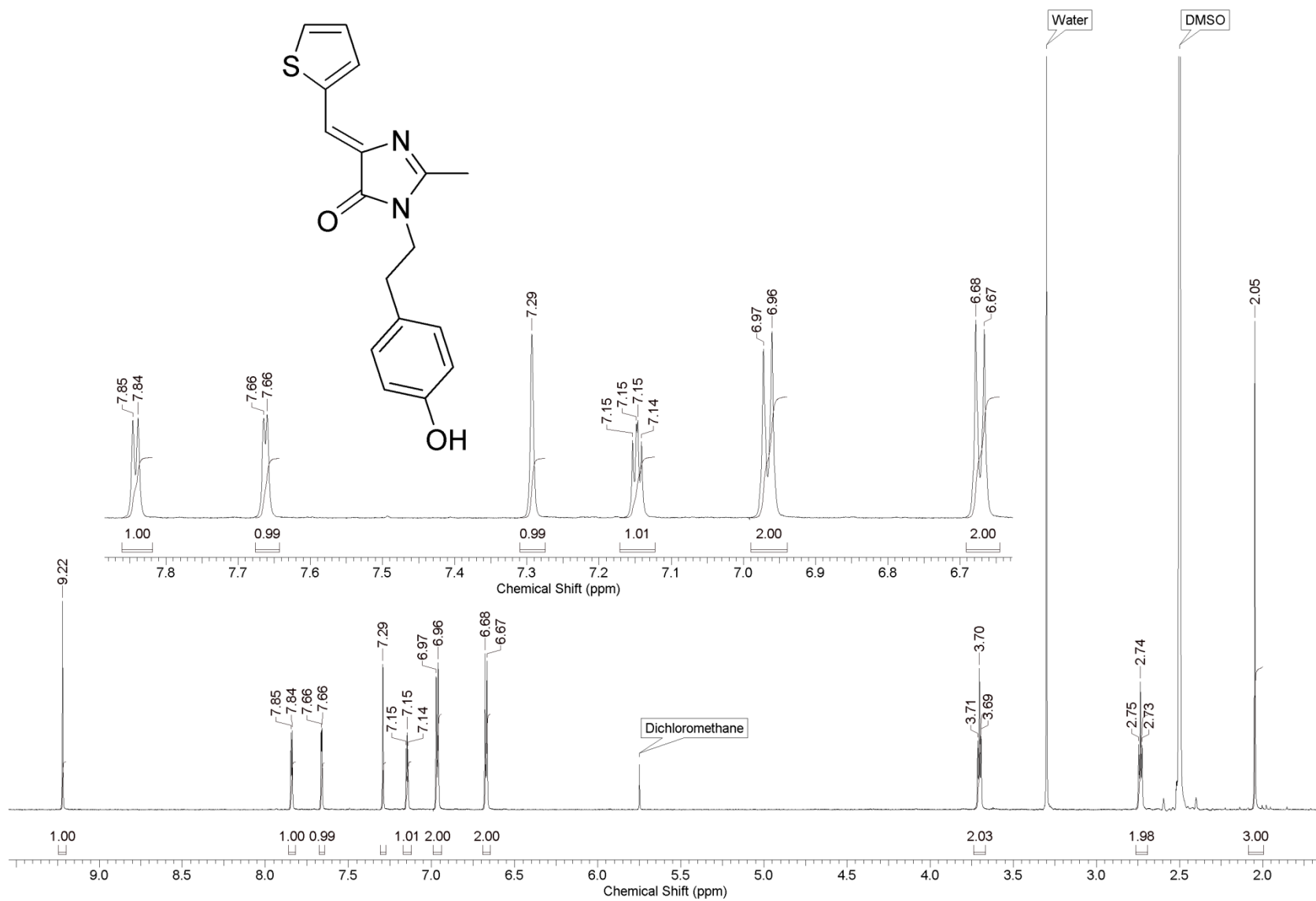




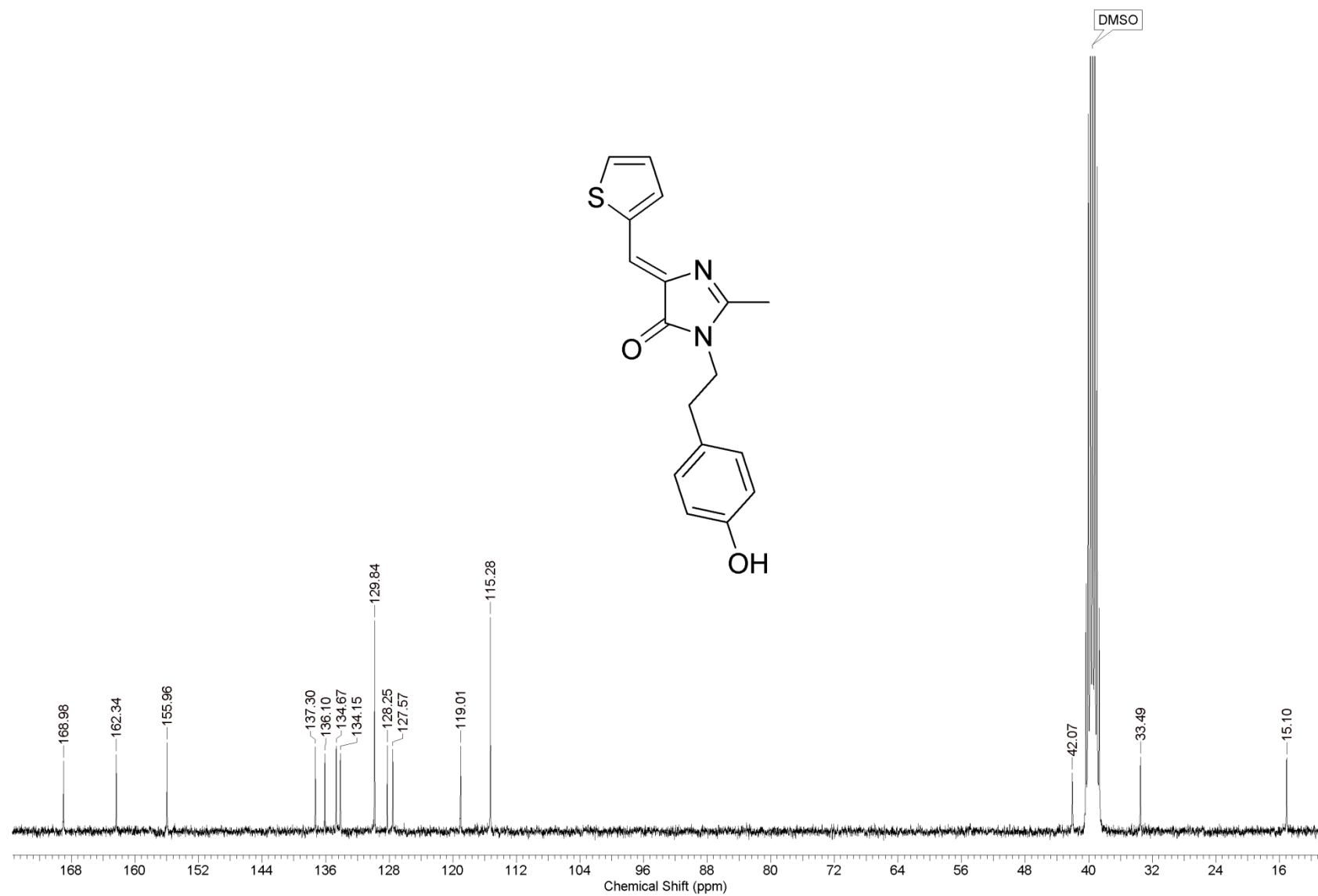




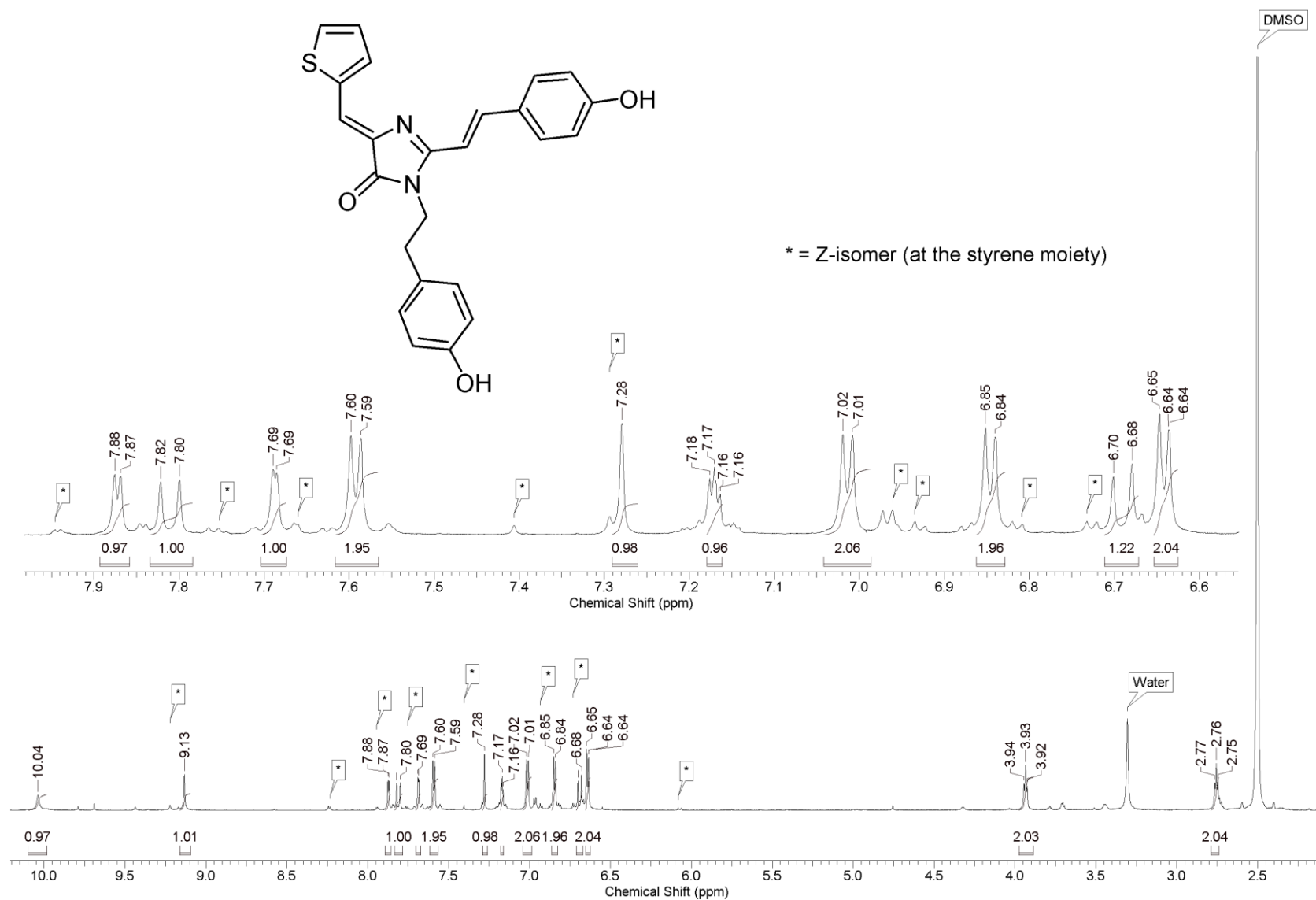
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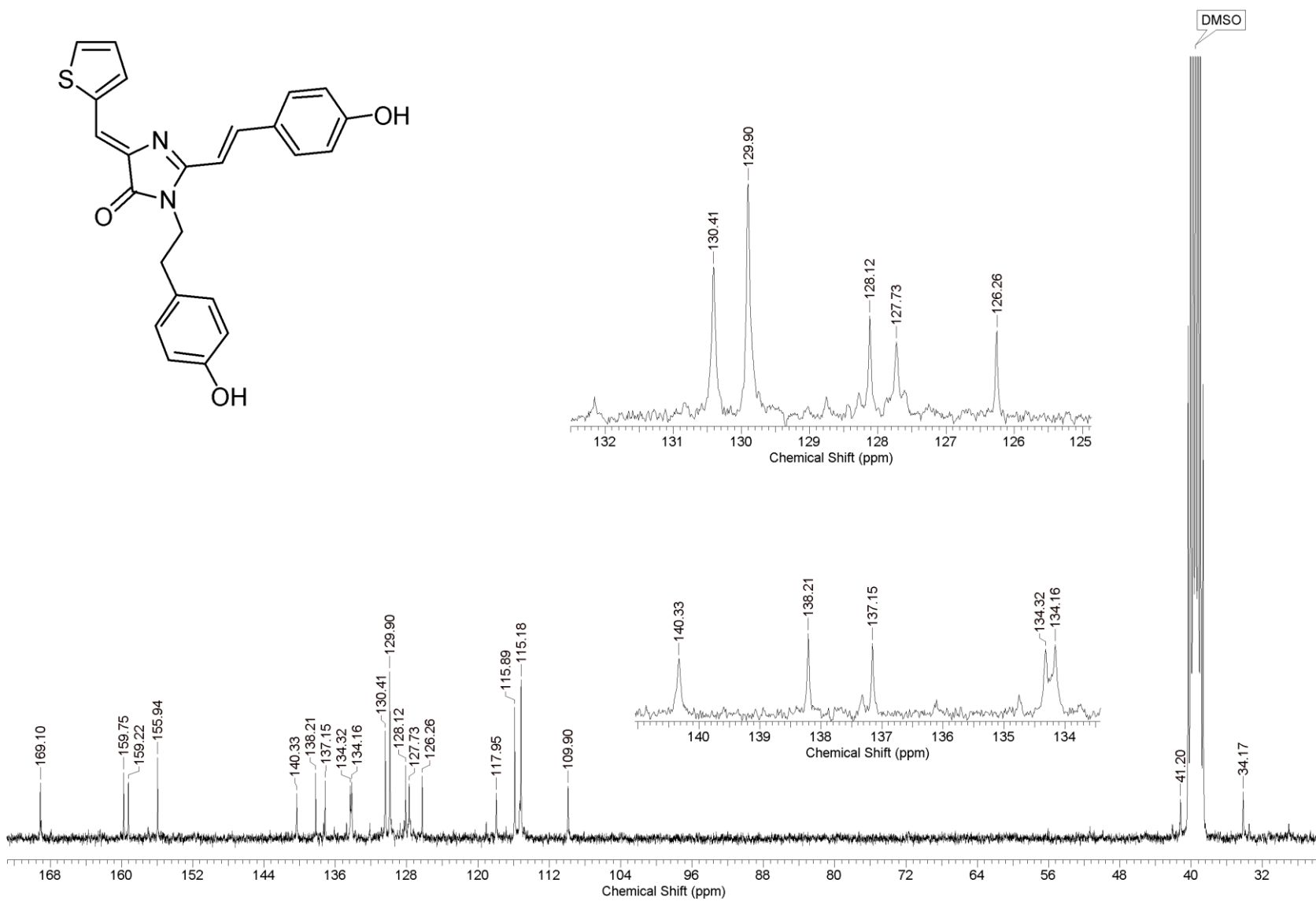






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## Supplement S8. NMR titration data for the LTR-III/ZS260.1 complex

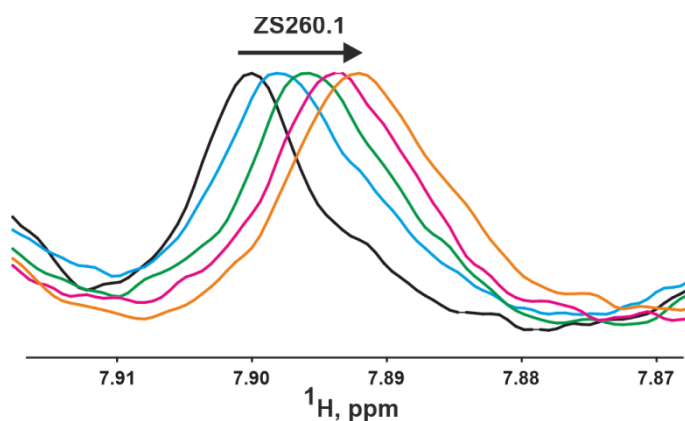


Figure S8-1. Chemical shifts changes in H8 G8 of 50  $\mu\text{M}$  LTR-III upon addition of **ZS260.1** ligand at 20  $^{\circ}\text{C}$ , pH 7.0, 800 MHz.

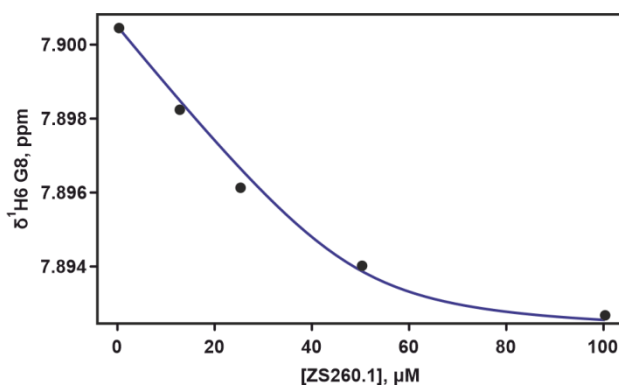


Figure S8-2. The binding curve, describing interaction of LTR-III G4 with **ZS260.1**, approximated by dissociation equation.

## Supplement S9. HIV LTR-III G4 MD simulation parameters

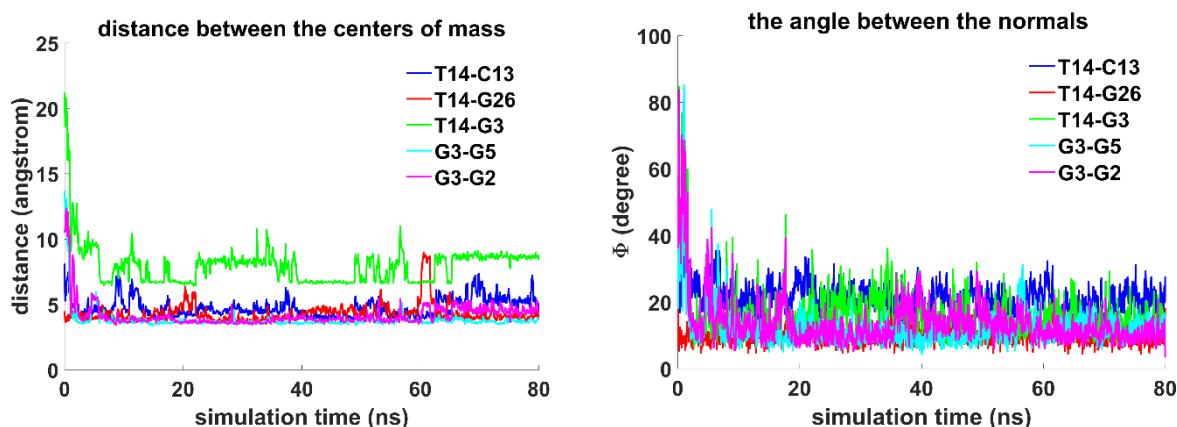


Figure S9-1. Time plots of the center of mass (COM) distances between T14, G3 and surrounding nucleobases (A) and of angles ( $\Phi$ ) between the normals to the nucleobases planes (B). The plots were smoothed using the moving average method (span = 5).

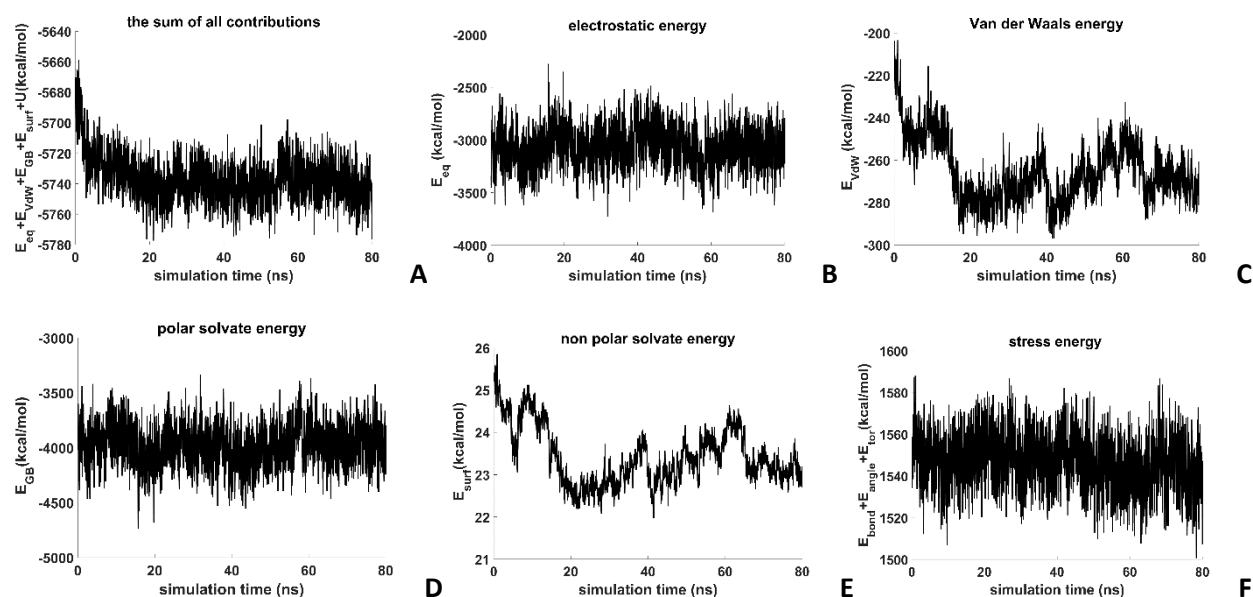
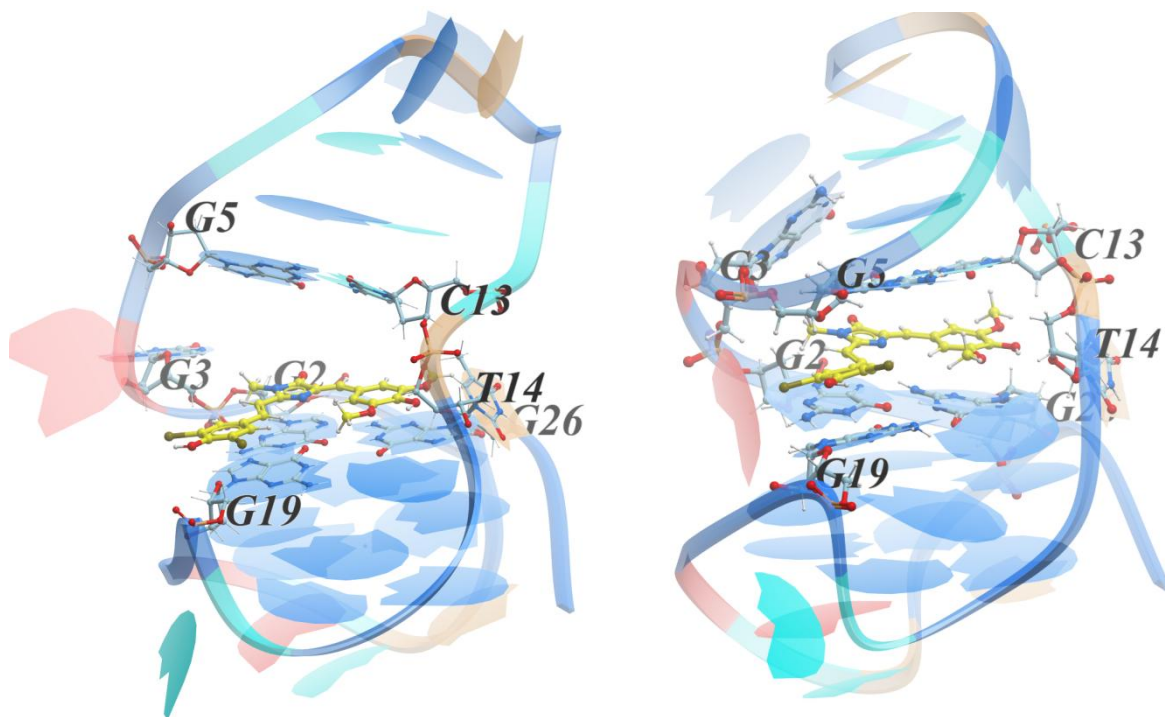


Figure S9-2. Evolution of the contributions to the free energy of the LTR-III structure. The values of parameters on the plots were smoothed using the moving average method (span = 5).  $E_q$  – electrostatic,  $E_{vdw}$  – Van der Waals,  $E_{GB}$  – polar energy of solvation,  $E_{surf}$  – non-polar energy of solvation due to the hydrophobic surface available to the solvent,  $U$  – stress energy.

## Supplement S10. The conformation of the LTR-III/ZS260.1 complex (additional simulation angles)

The conformations of the complexes with **ZS260.1** within the of the LTR-III structure at the initial, 0 ns (left) and final, 80 ns (right) stages of MD simulations. The DNA shown by rendering with the nucleotides are coloured as follows: G – blue, A – red, T – light brown, C - cyan. Cavity-forming nucleotides and ligand are in ball-and-stick representation. Atoms are represented by the following colours: ligand carbon – yellow, DNA carbon – ice blue, oxygen – red, nitrogen – blue, and hydrogen – white.



## Supplement S11. HIV LTR-III G4/ZS260.1 complex MD simulation parameters

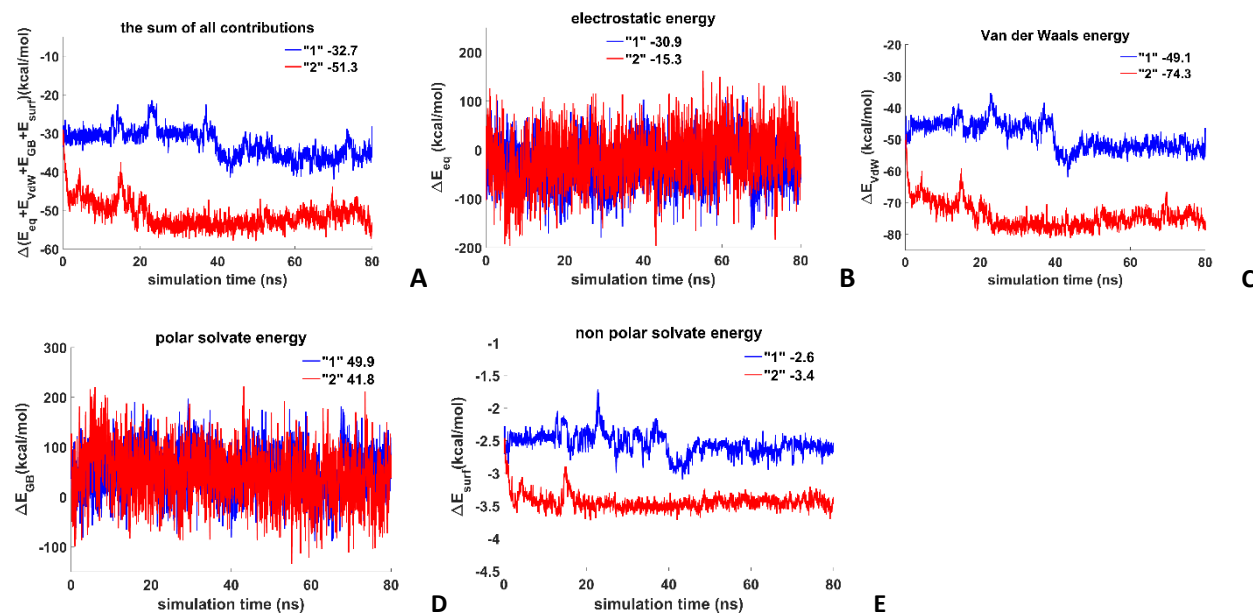


Figure S11-1. Evolution of the contributions to the interaction energy of LTR-III/ZS260.1 complexes. The plots were smoothed using the moving average method (span = 5). In the legends to the graphs, the average values are indicated.  $E_q$  – electrostatic,  $E_{vdw}$  - Van der Waals,  $E_{GB}$  - polar energy of solvation,  $E_{surf}$  - non-polar energy of solvation due to the hydrophobic surface available to the solvent.

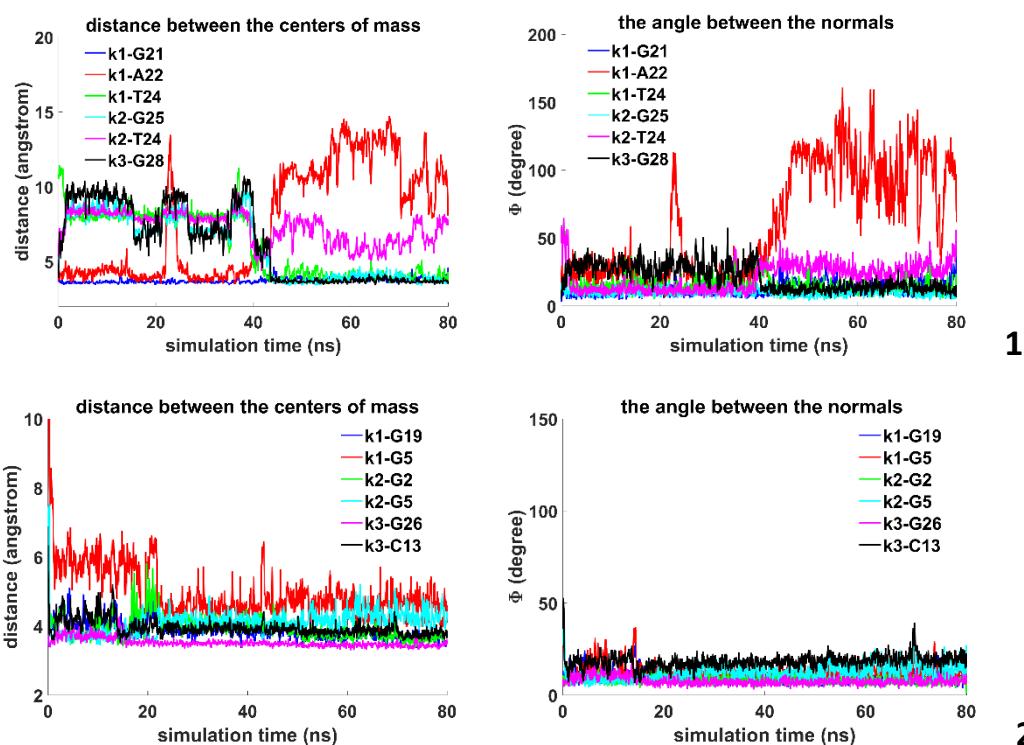


Figure S11-2. Time plots of the center of mass (COM) distances and angles ( $\Phi$ ) between the normals, characterizing the interposition of the ligand and adjacent nucleobases. K1 – COM of dibromophenyl moiety, K2 – COM of imidazolone moiety, K3 – COM of dimethoxyphenyl moiety.



**Table S12. Antiviral activity of the tested compounds in MT4 cells against HIV-1 (st. NL4-3).**

cmpd	EC <sub>50</sub> , μM	CC <sub>50</sub> (MT4), μM	LTR-III (average), °C
N1193	n/a*	2.3±1.1	14
N1196	n/a	>25	11,7
N1197	n/a	1.66±0.79	11,3
ZS260	3.78±0.91	4.1±0.6	8,35
N1068.2	1.78±0.38	3.0±1.0	6,9
N1198	1.78±0.38	2.8±1.1	6,5
N960a	n/a	>25	5,2
N1052	n/a	6.6±3.1	4,5
N1199	3.3±1.1	4.6±2.5	4,3
N1195	3.78±0.91	5.9±2.6	4,2
ZS331	n/a	1.17±0.55	3,7
N848.3	n/a	5.5±2.2	3,3
N848.2	n/a	6.4±1.8	3,2
N683.1	n/a	>25	3,1
ccE4	n/a	>25	2,8
N1069	4.23±1.75	6.0±2.0	2,7
M903.2	n/a	>25	2,3
N1122	n/a	>25	2,3
N1049	2.1±1.4	5.2±2.5	1,8
M813	n/a	0.46±0.16	1,65
AR559	n/a	>25	1,2
N906	n/a	6.6±3.1	0,1
SA120	n/a	>25	-1,35
N840	n/a	>25	-1,55
MID161	7.7±2.2	17.3±5.7	-1,7
M802	n/a	6.6±3.1	-2,3
M2227	n/a	>25	-2,7
AZT	0.0071±0.00043	8.0±1.5	-

\* – not active at non-toxic concentrations