

**Access to phosphorylindenopyrazole scaffold via a metal-free domino  
reaction of diazoalkylphosphonates with 3-bromophthalides**

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<sup>b</sup>Academy of Scientific and Innovative Research, New Delhi 110001, India

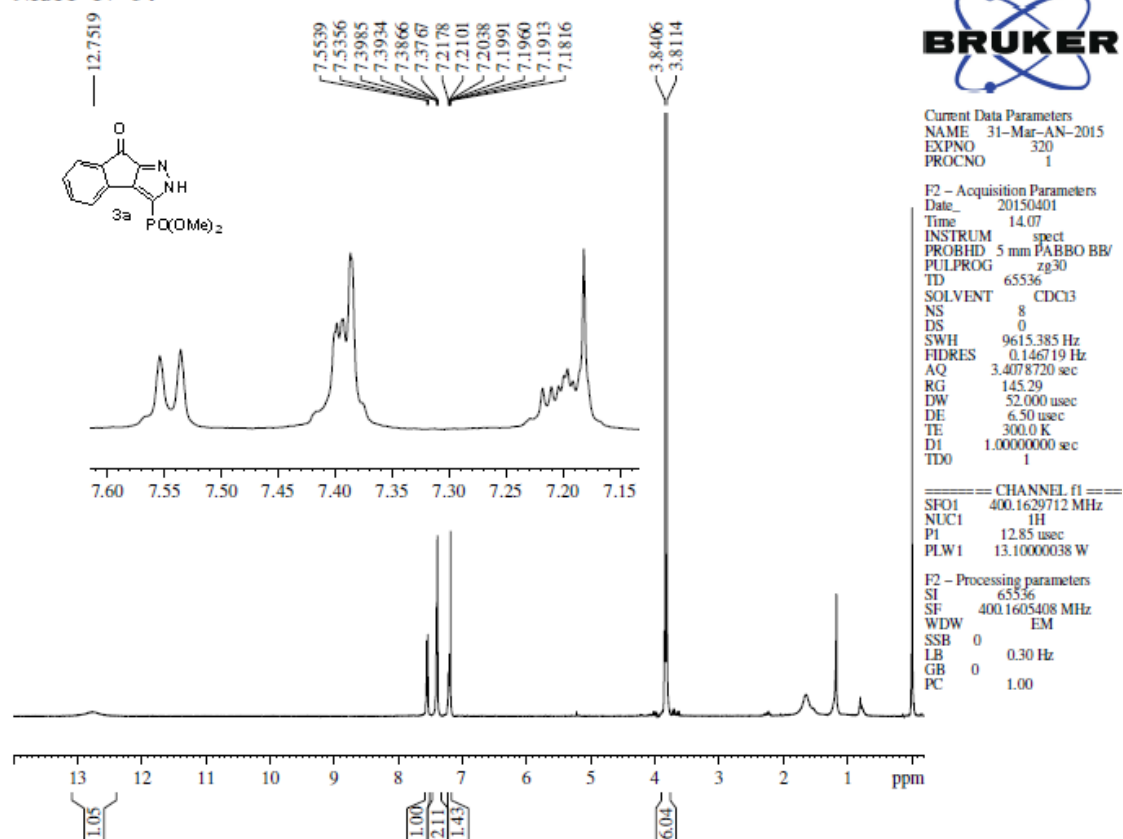
\* Corresponding author. e-mail: namrata.rastogi@cdri.res.in

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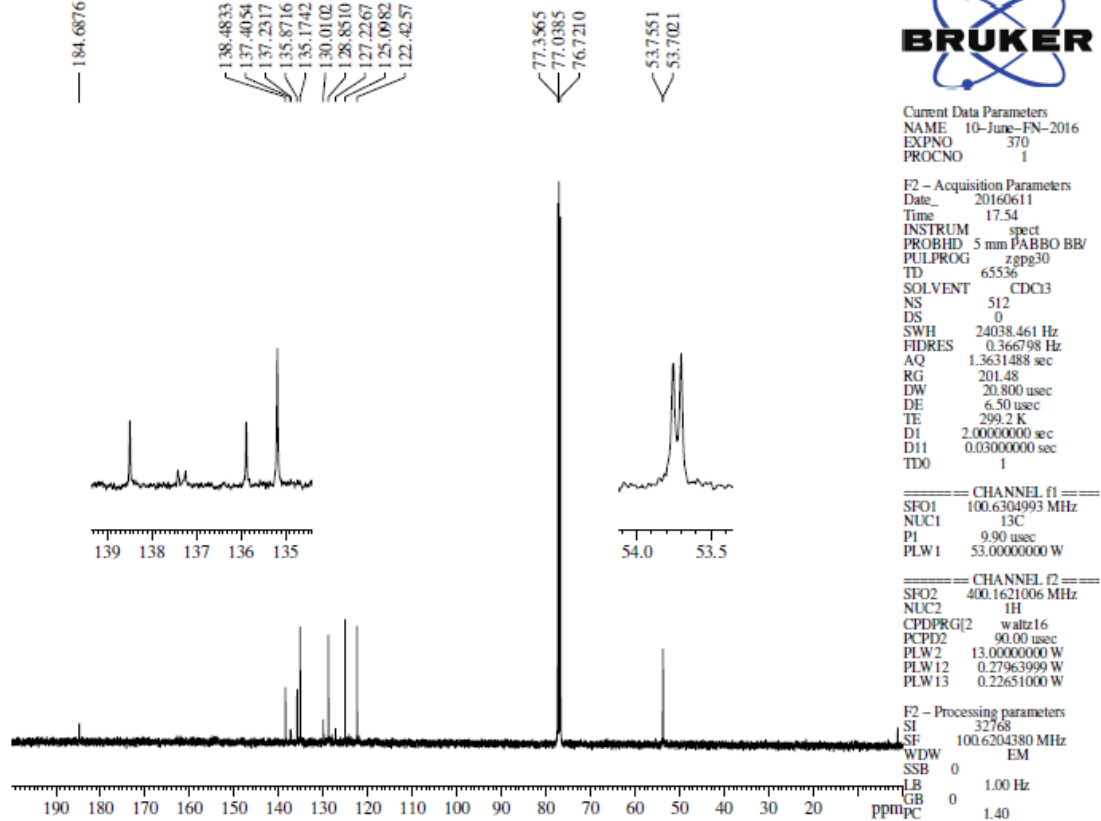
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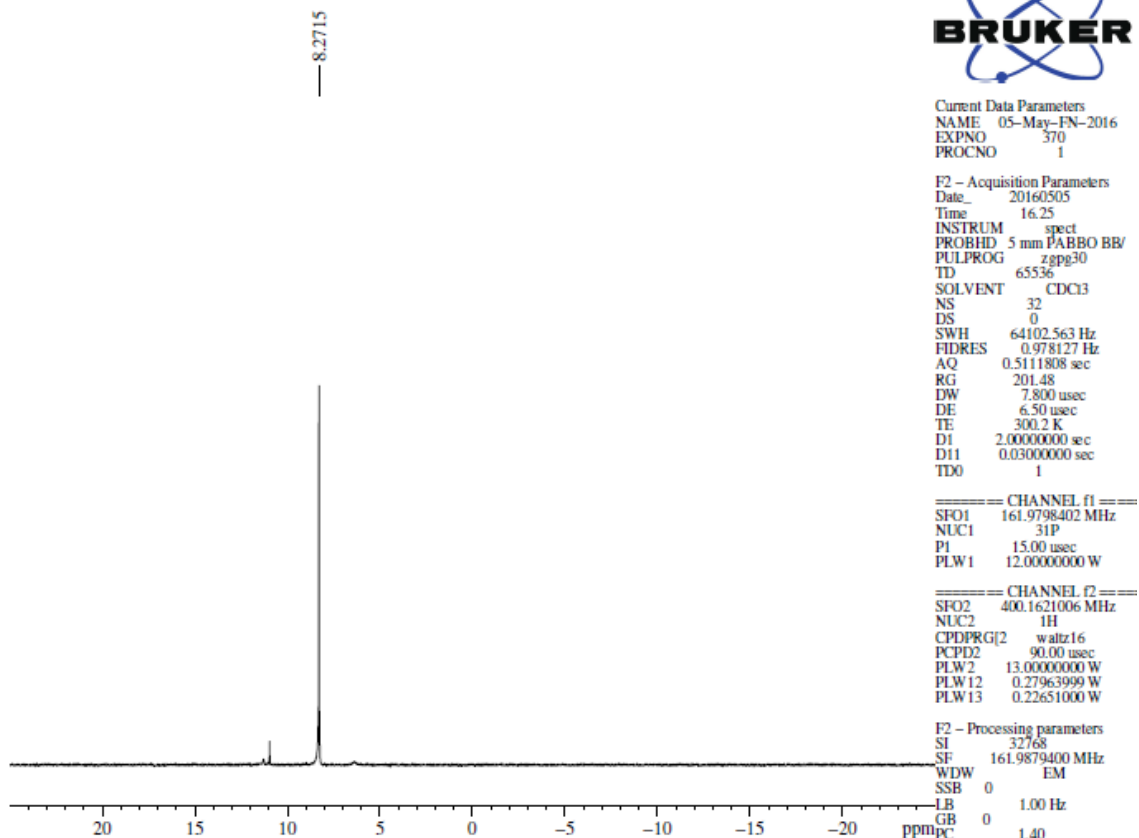
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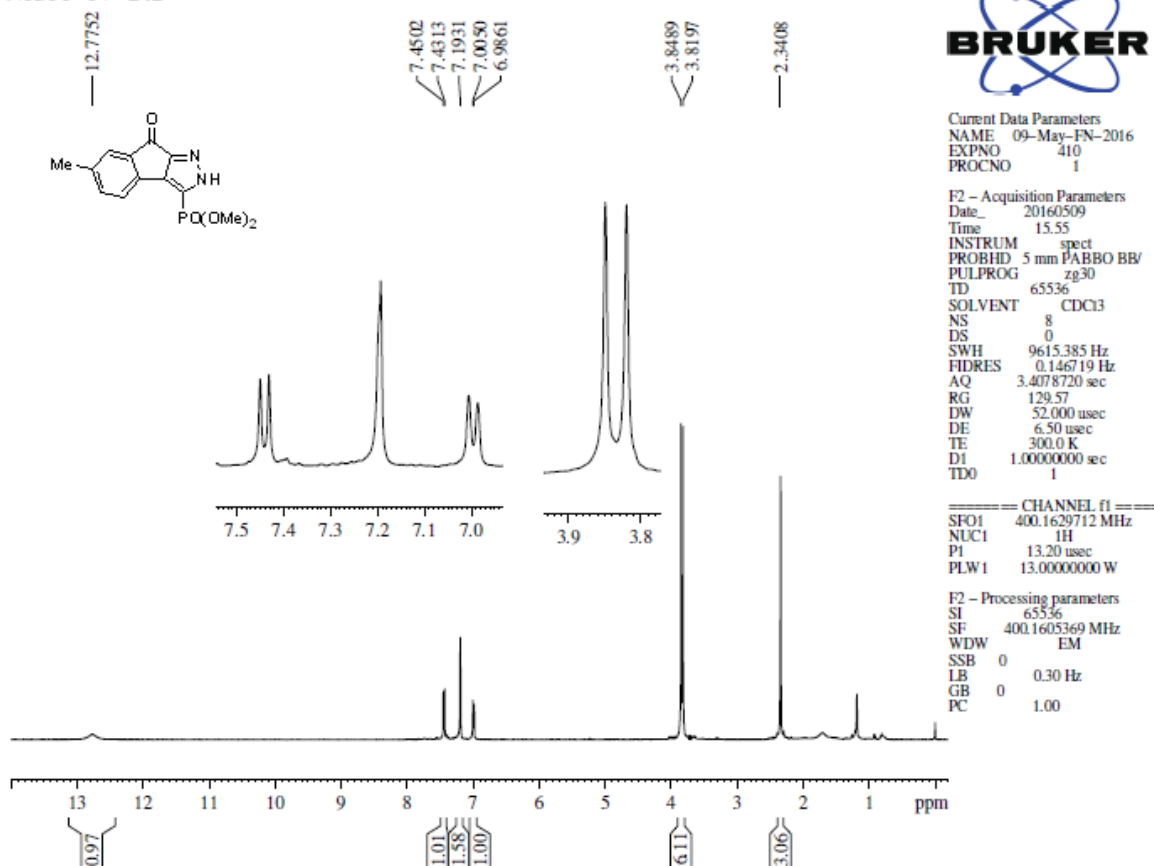
Figure 1: <sup>1</sup>H NMR spectrum of 3a

NRAT-IV-34

Figure 2: <sup>13</sup>C NMR spectrum of 3a

Figure 3:  $^{31}\text{P}$  NMR spectrum of 3a

NRAT-IV-242

Figure 4:  $^1\text{H}$  NMR spectrum of 3b

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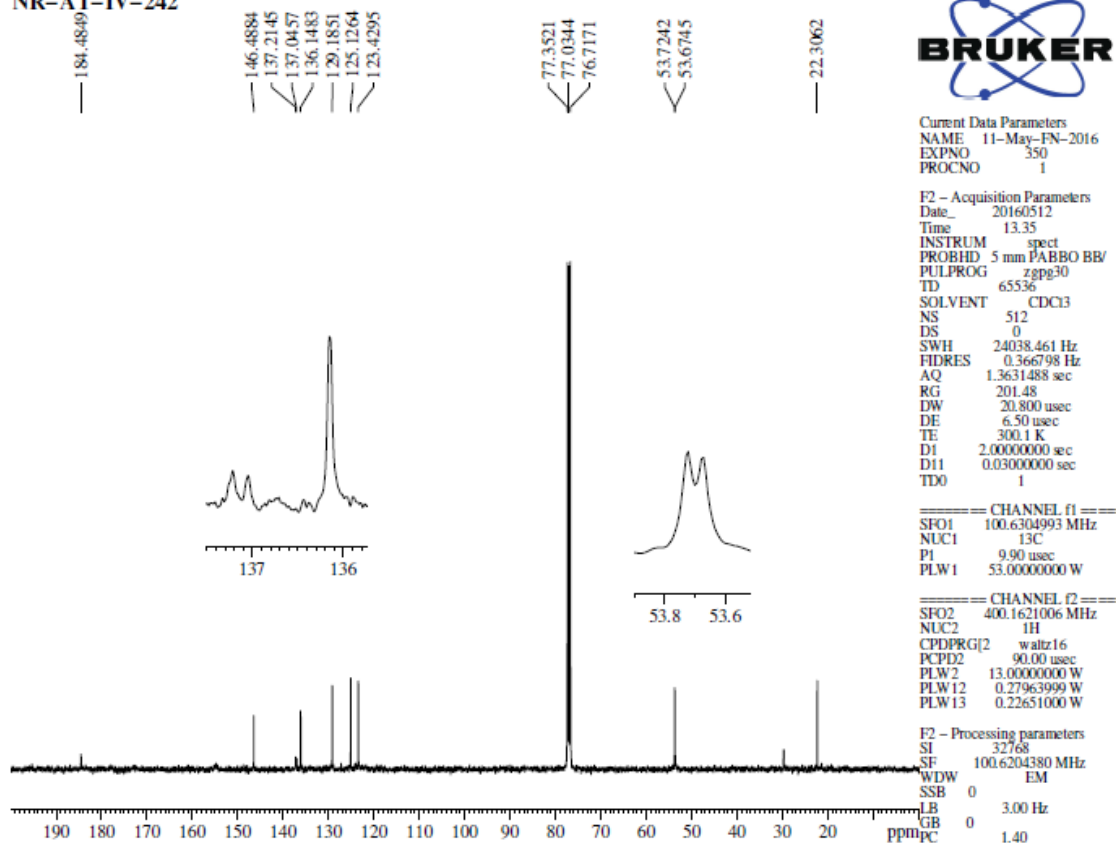


Figure 5:  $^{13}\text{C}$  NMR spectrum of 3b

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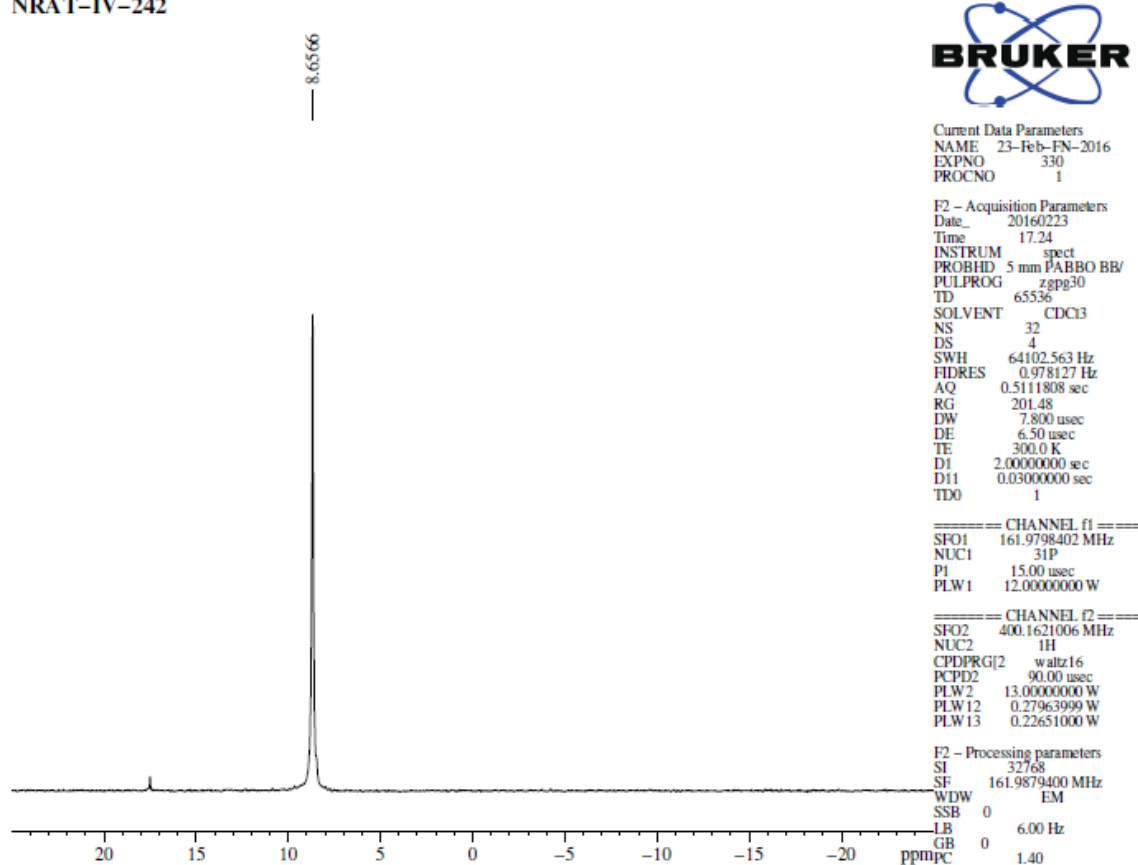
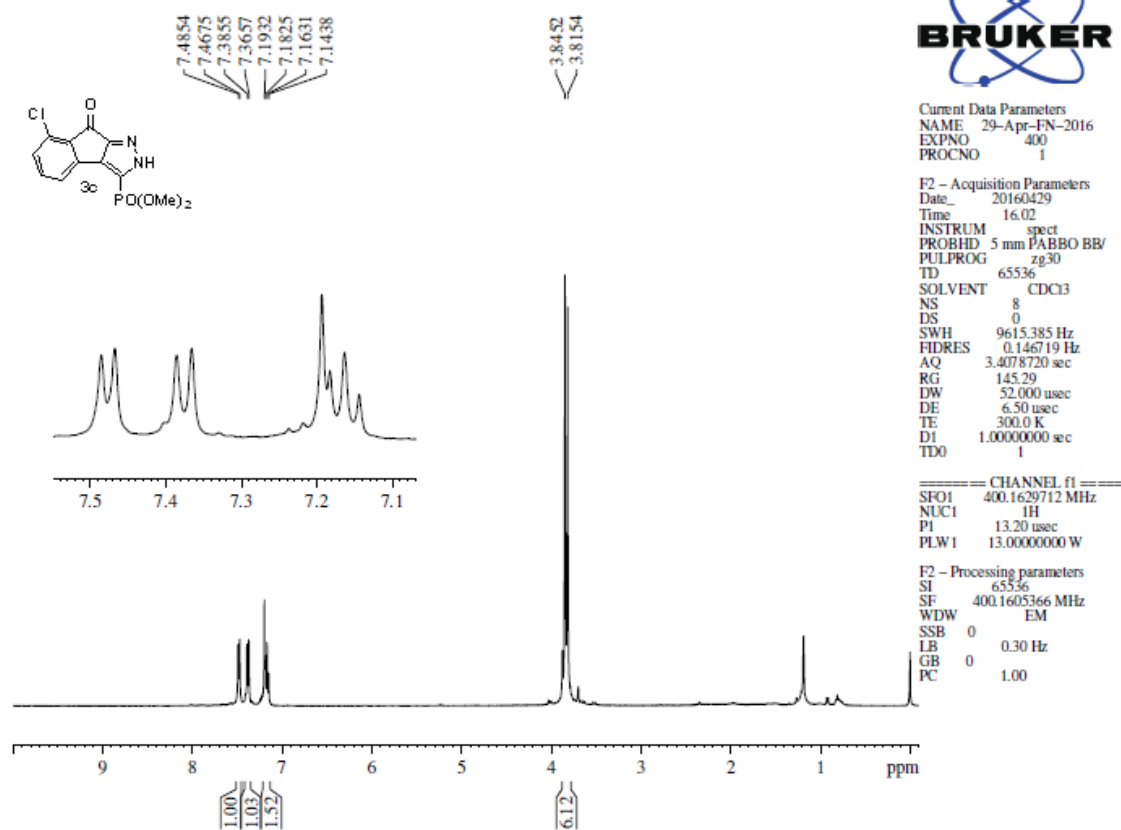
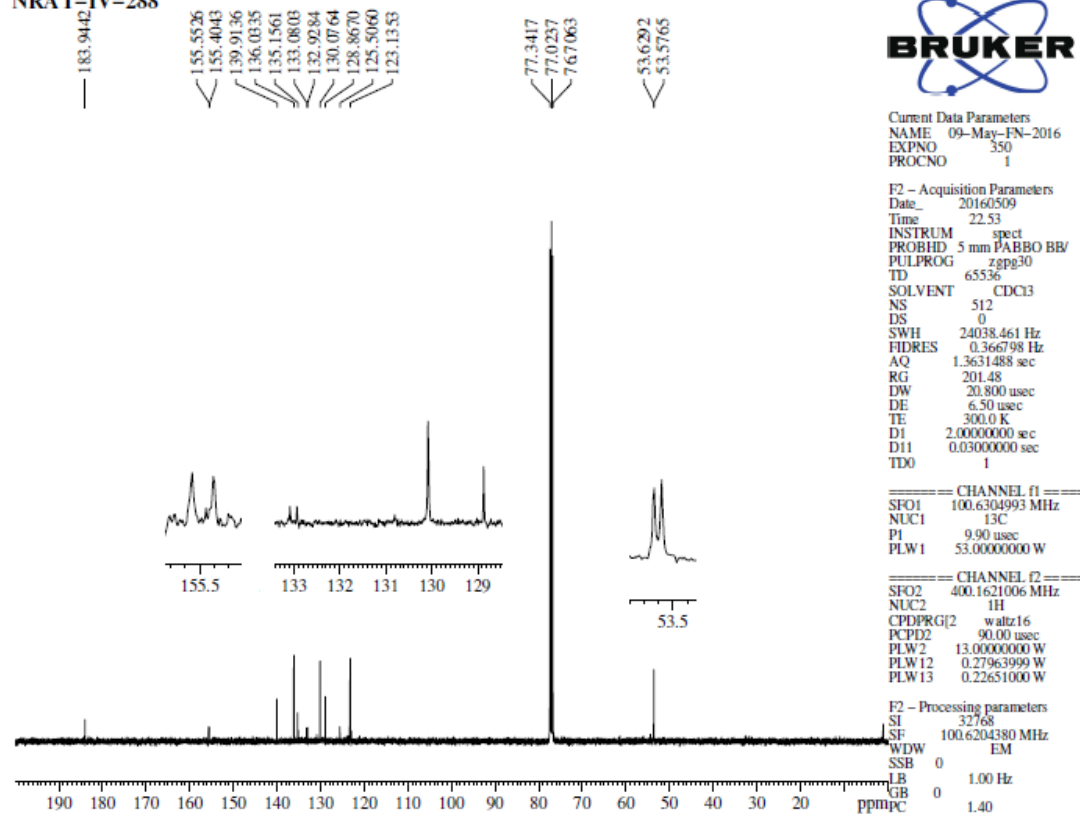


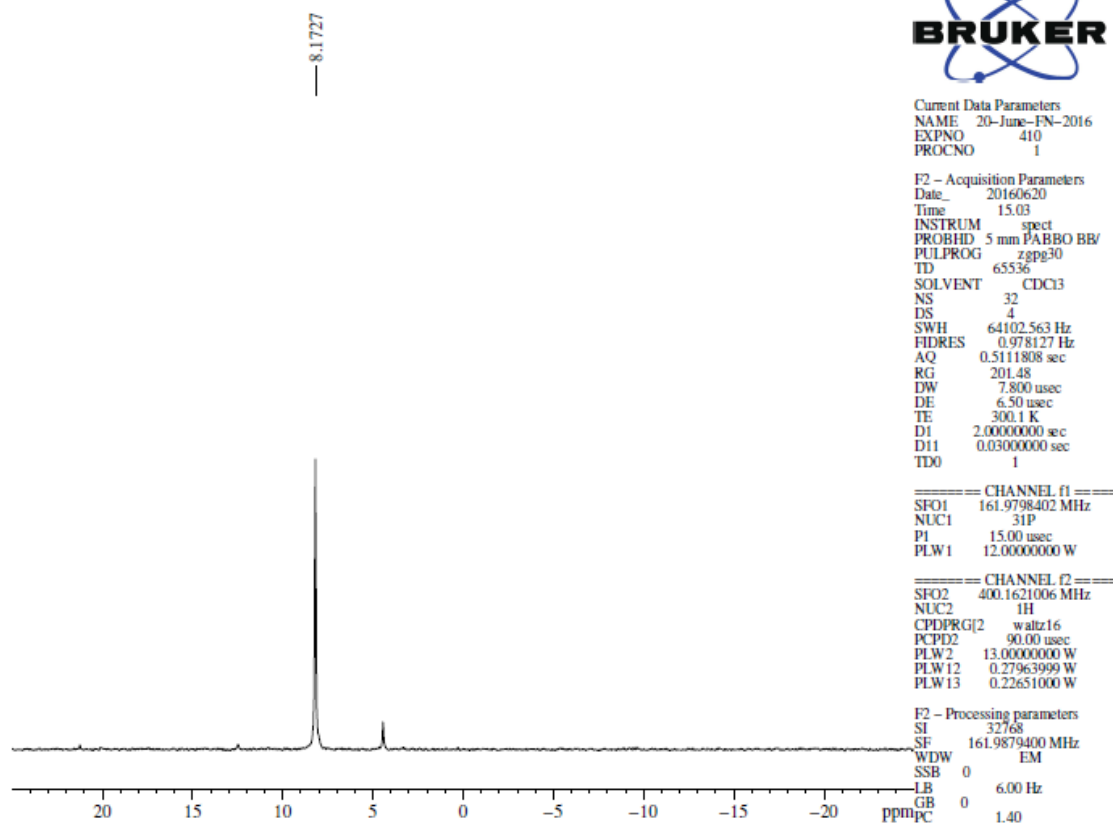
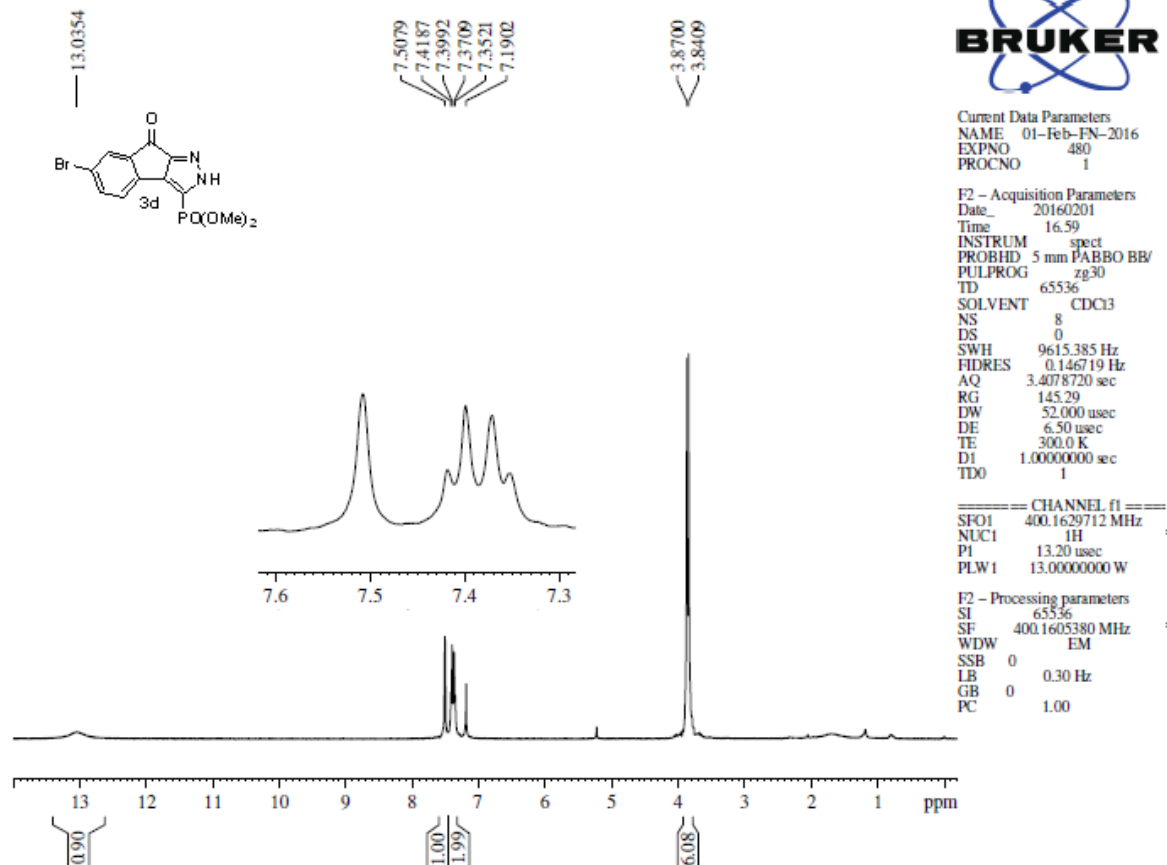
Figure 6:  $^{31}\text{P}$  NMR spectrum of 3b

NRAT-IV-288

Figure 7: <sup>1</sup>H NMR spectrum of 3c

NRAT-IV-288

Figure 8: <sup>13</sup>C NMR spectrum of 3c

Figure 9:  $^{31}\text{P}$  NMR spectrum of 3cFigure 10:  $^1\text{H}$  NMR spectrum of 3d

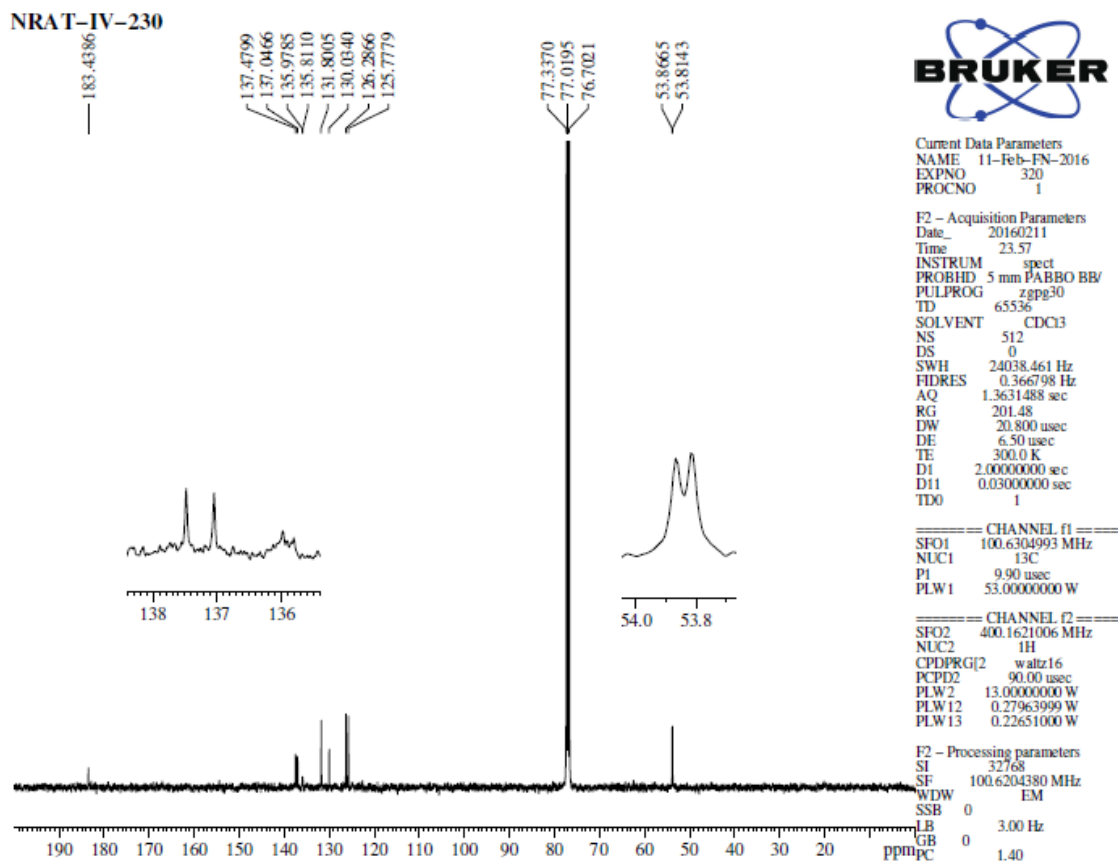


Figure 11:  $^{13}\text{C}$  NMR spectrum of 3d

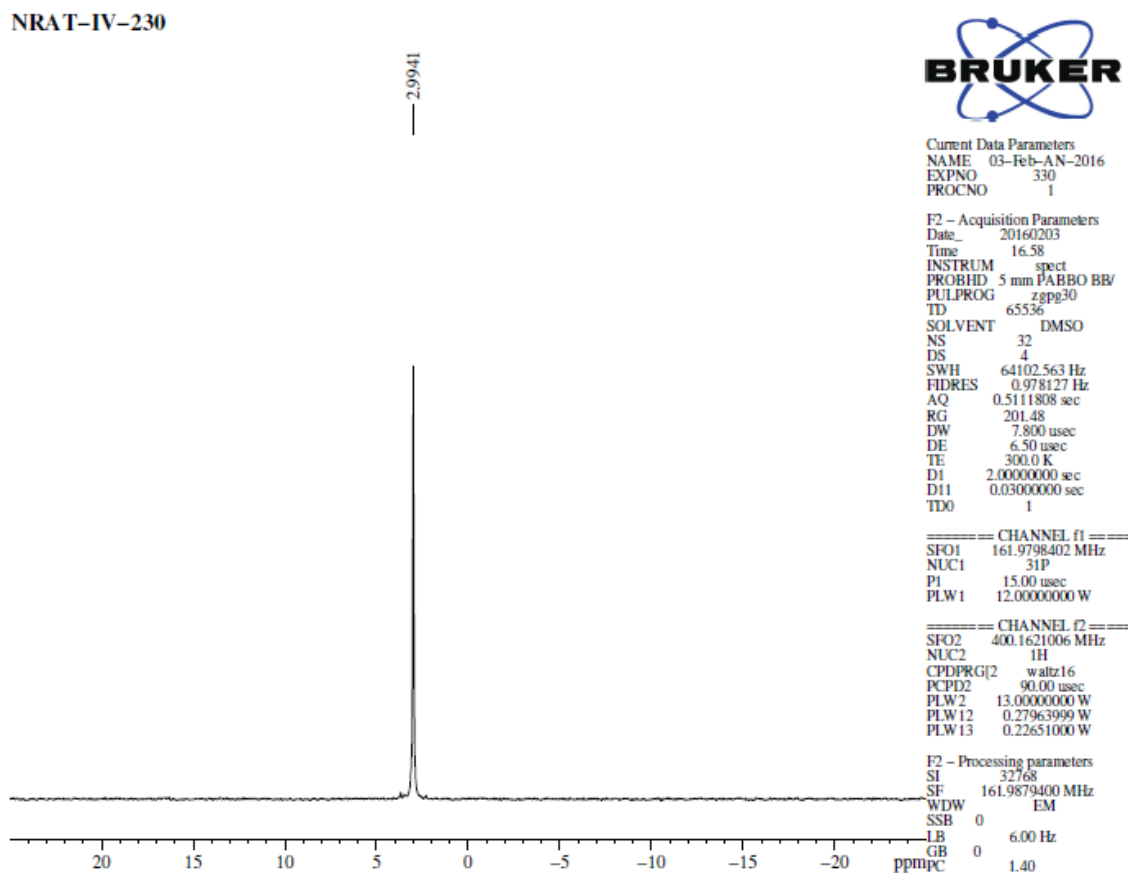


Figure 12:  $^{31}\text{P}$  NMR spectrum of 3d



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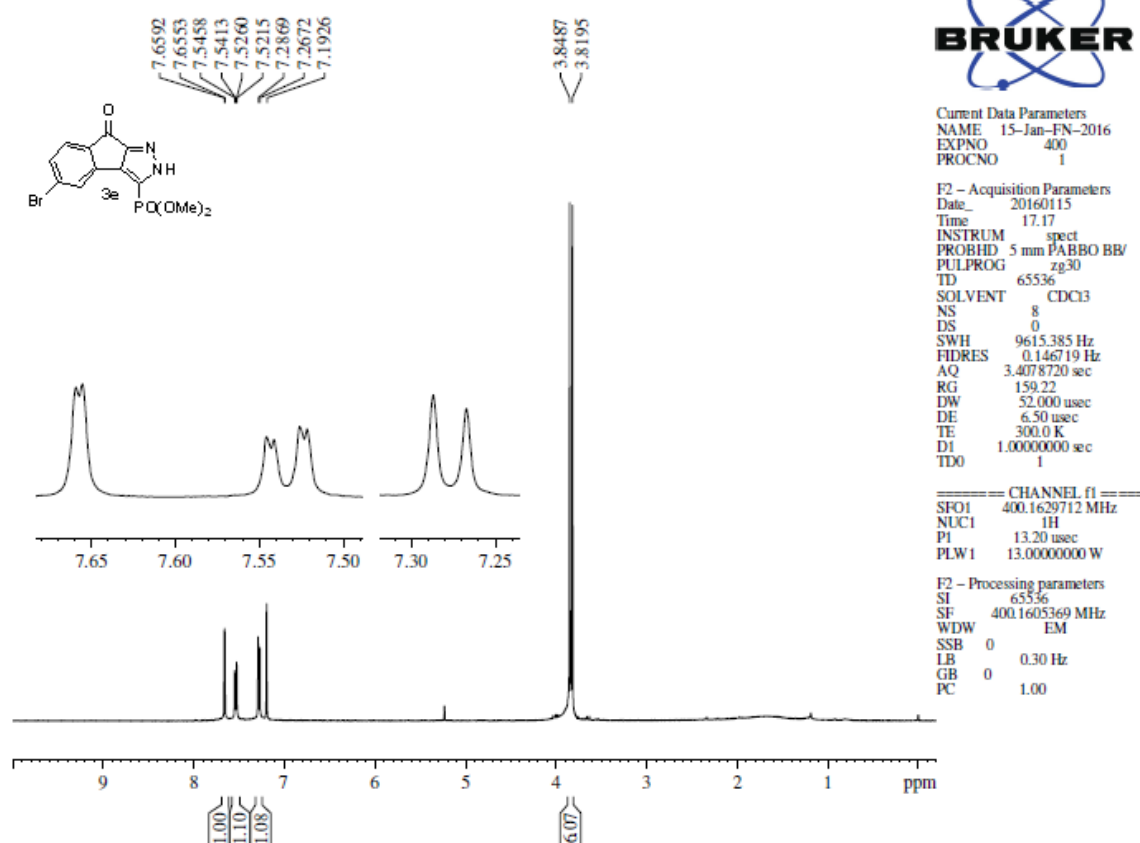


Figure 13: <sup>1</sup>H NMR spectrum of 3e

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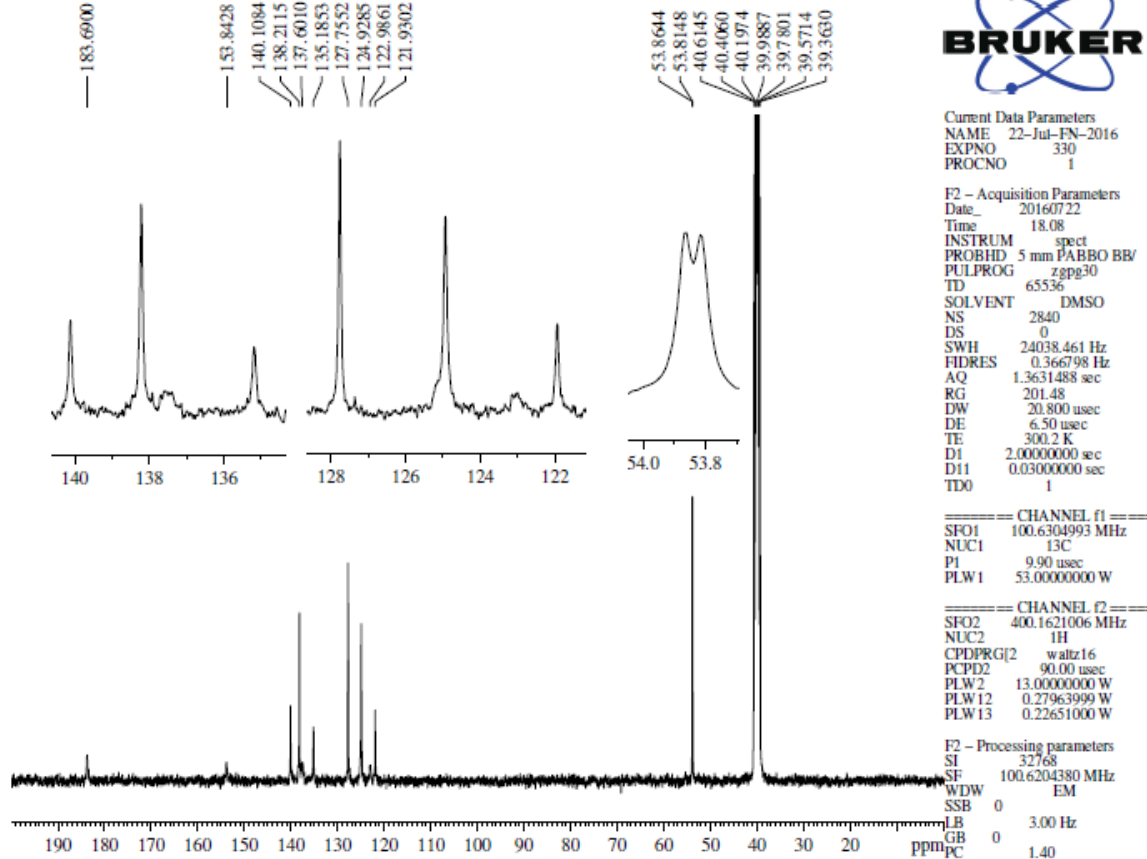


Figure 14: <sup>13</sup>C NMR spectrum of 3e

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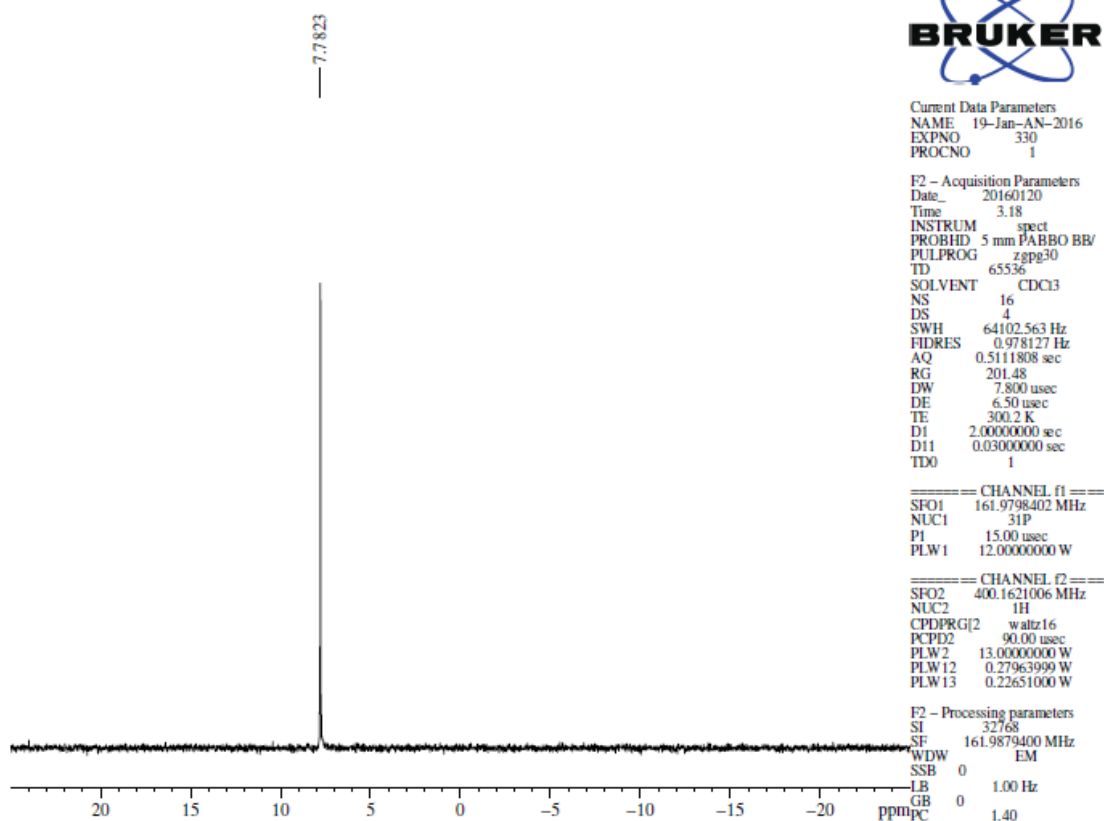


Figure 15: <sup>31</sup>P NMR spectrum of 3e

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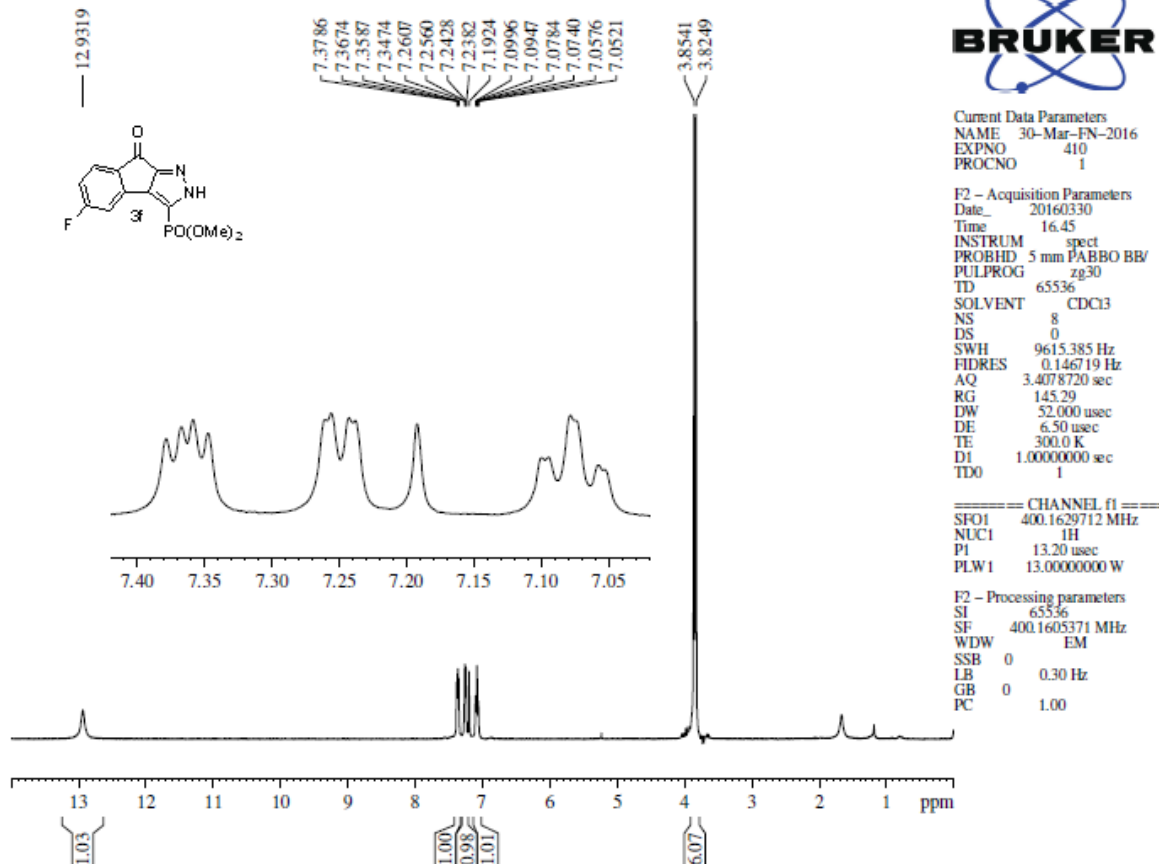


Figure 16: <sup>1</sup>H NMR spectrum of 3f

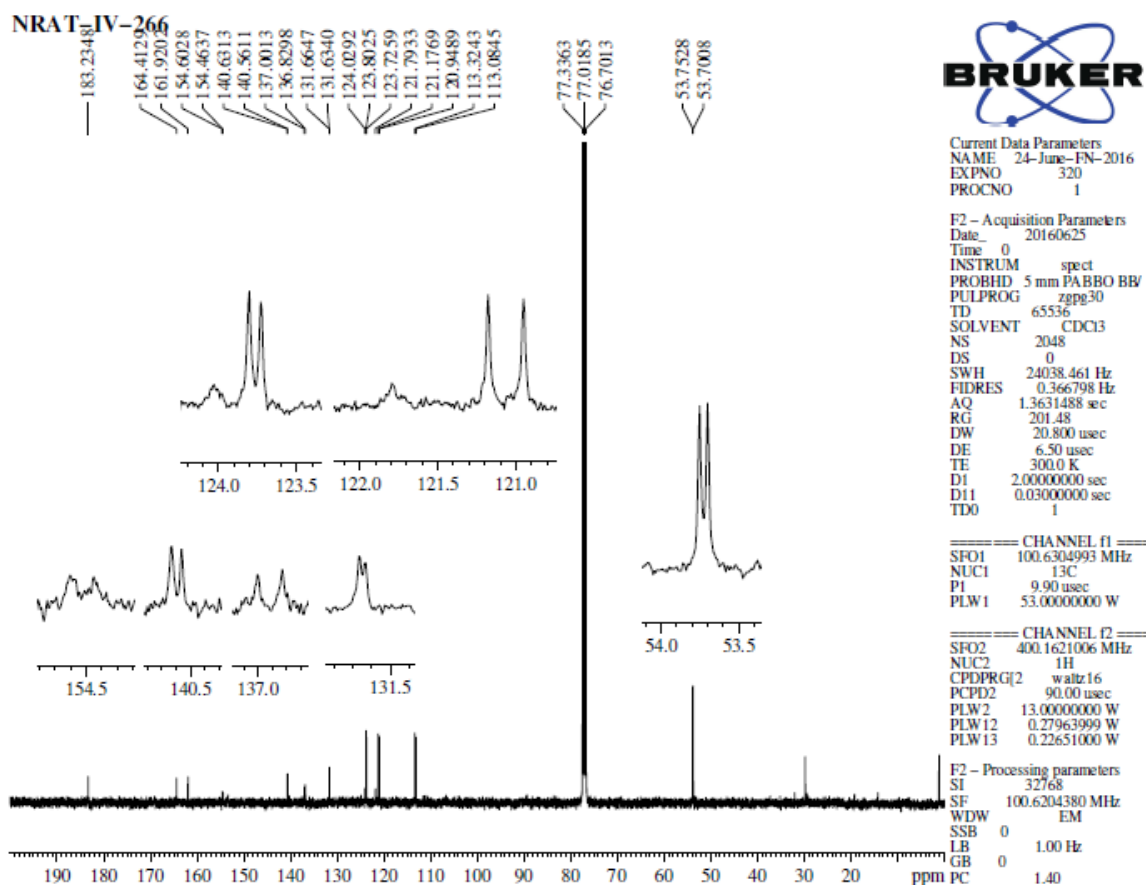


Figure 17:  $^{13}\text{C}$  NMR spectrum of 3f

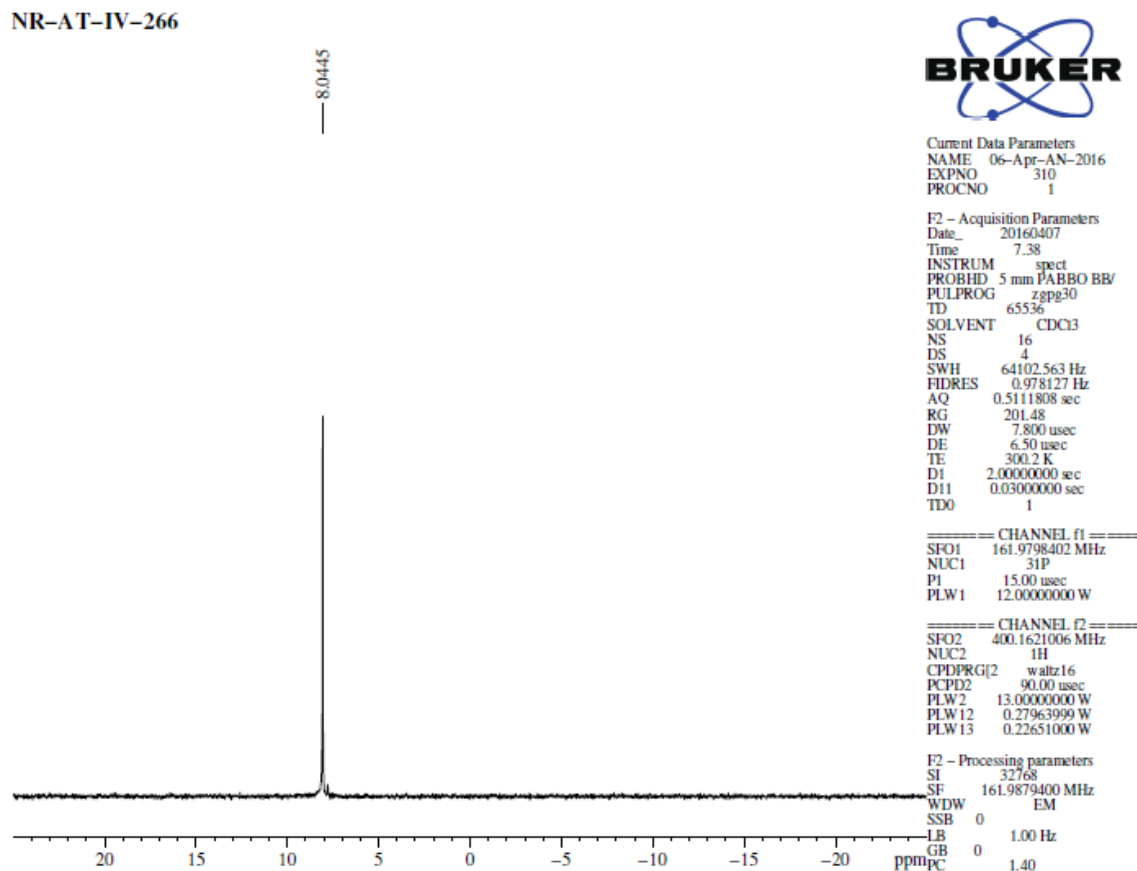


Figure 18:  $^{31}\text{P}$  NMR spectrum of 3f

NRAT-214

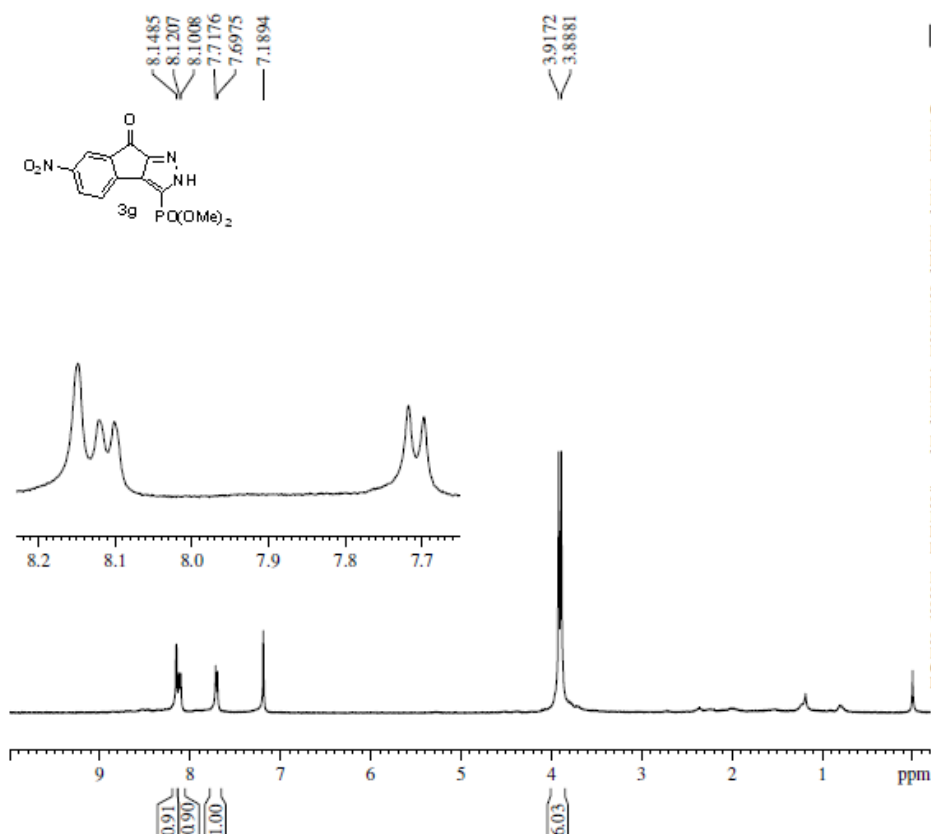


Figure 19: <sup>1</sup>H NMR spectrum of 3g

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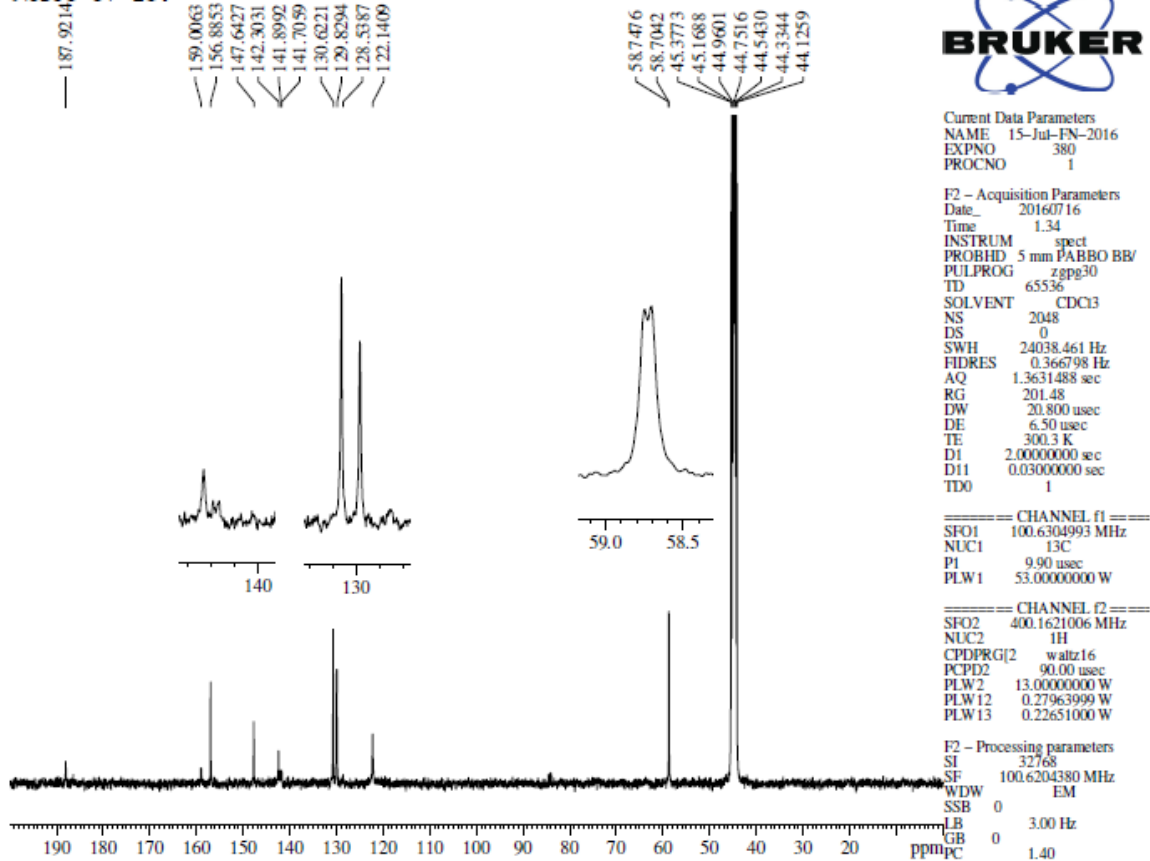
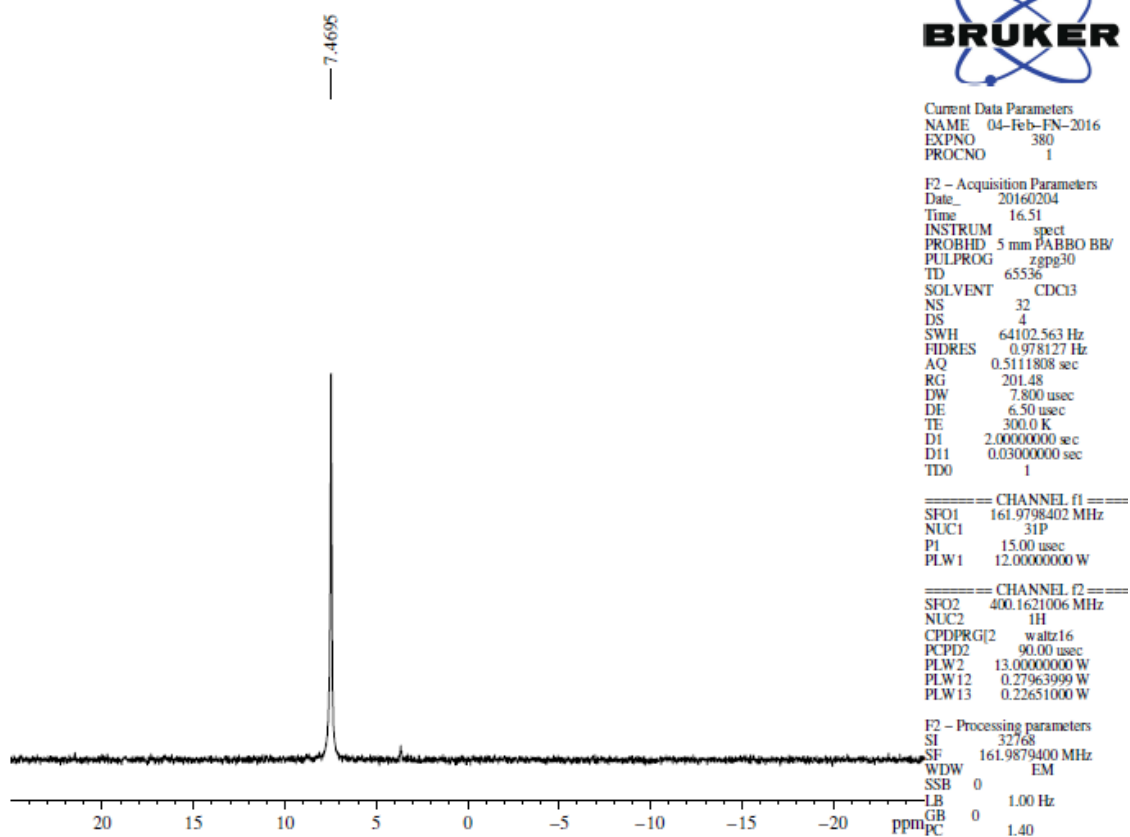
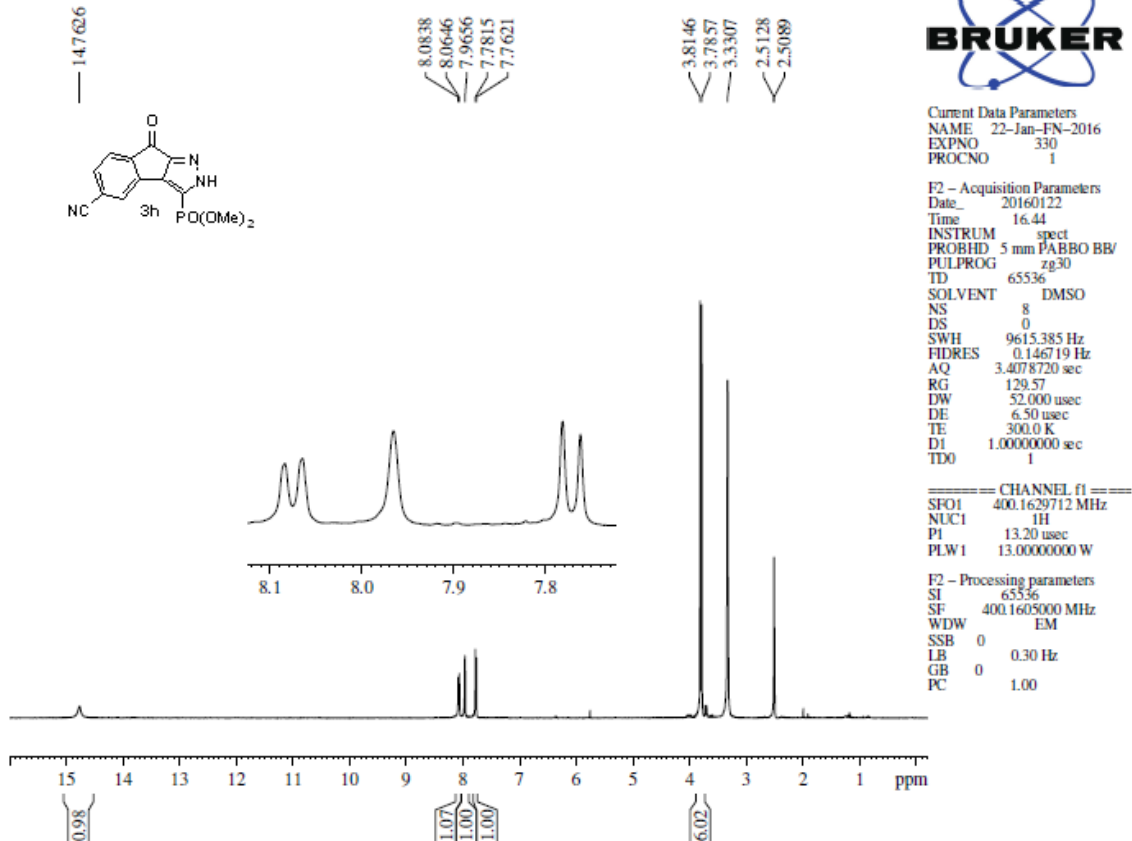


Figure 20: <sup>13</sup>C NMR spectrum of 3g

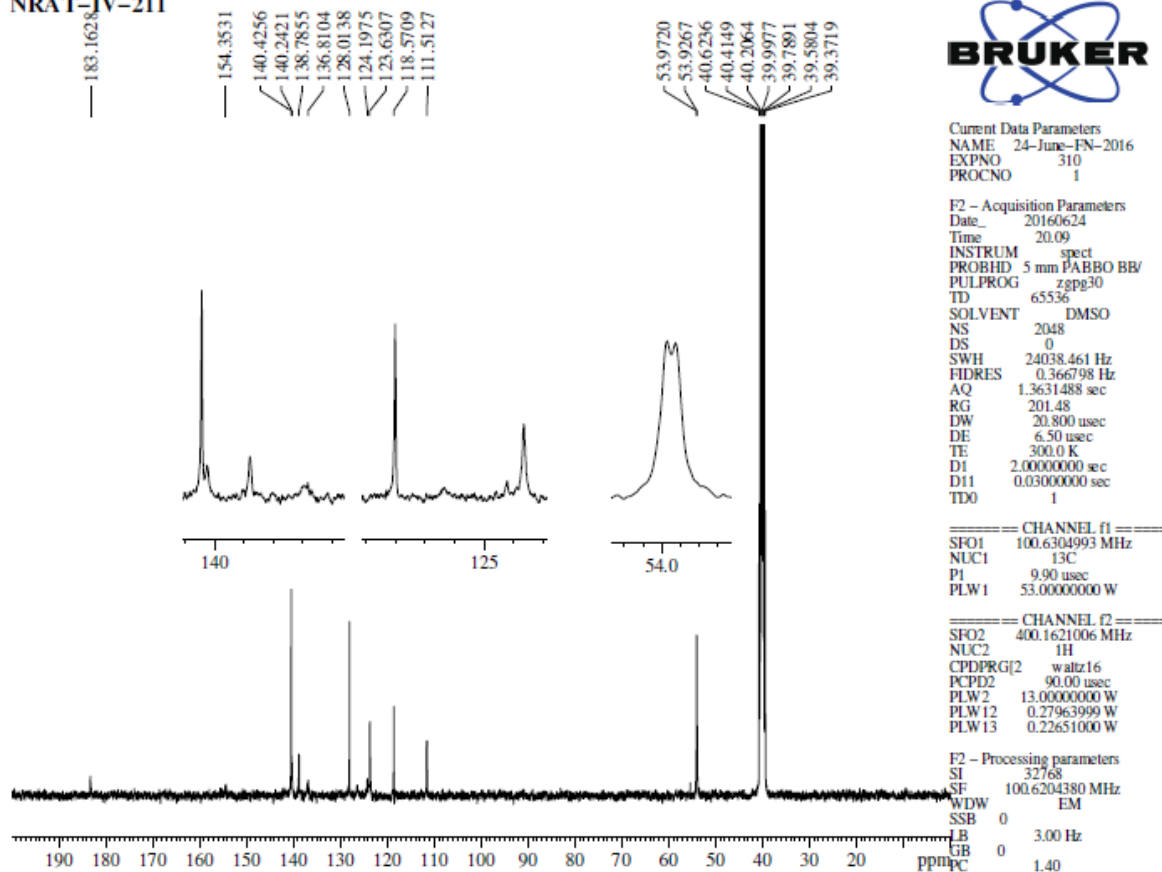
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Figure 21:  $^{31}\text{P}$  NMR spectrum of 3g

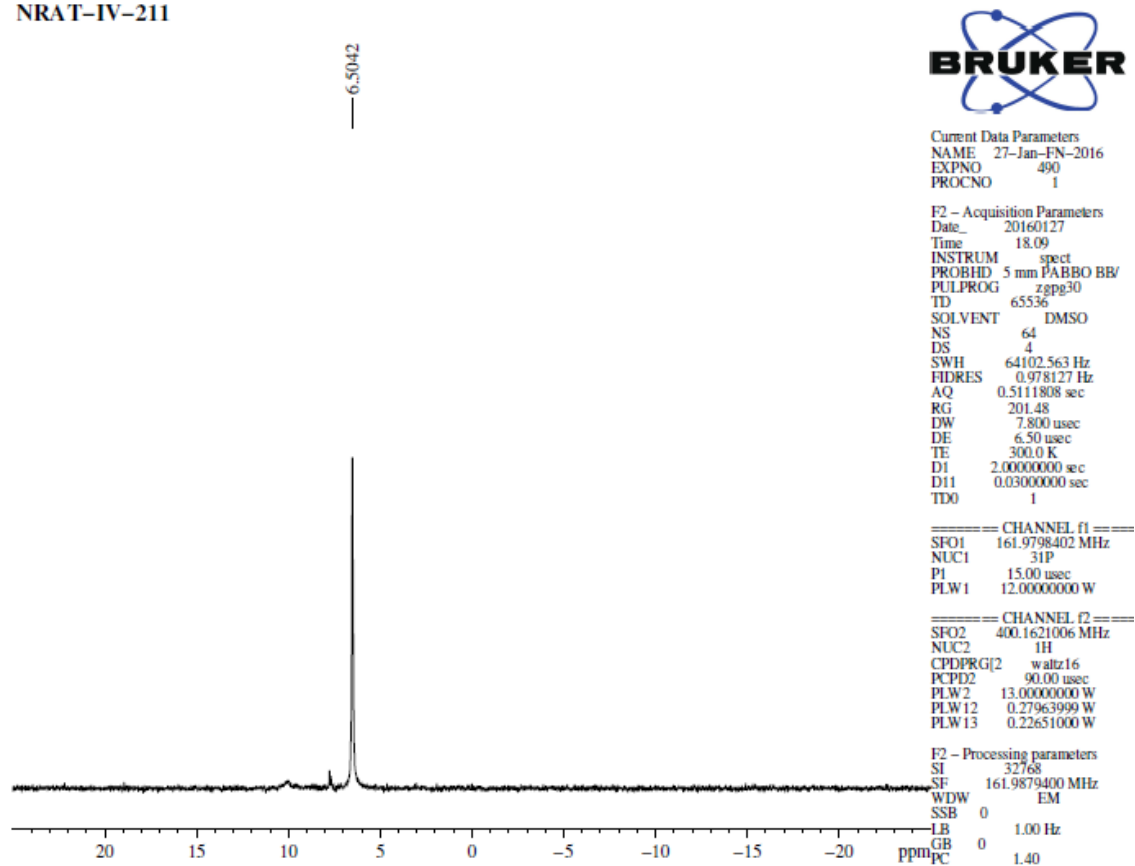
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Figure 22:  $^1\text{H}$  NMR spectrum of 3h

NRAT-IV-211

Figure 23:  $^{13}\text{C}$  NMR spectrum of 3h

NRAT-IV-211

Figure 24:  $^{31}\text{P}$  NMR spectrum of 3h

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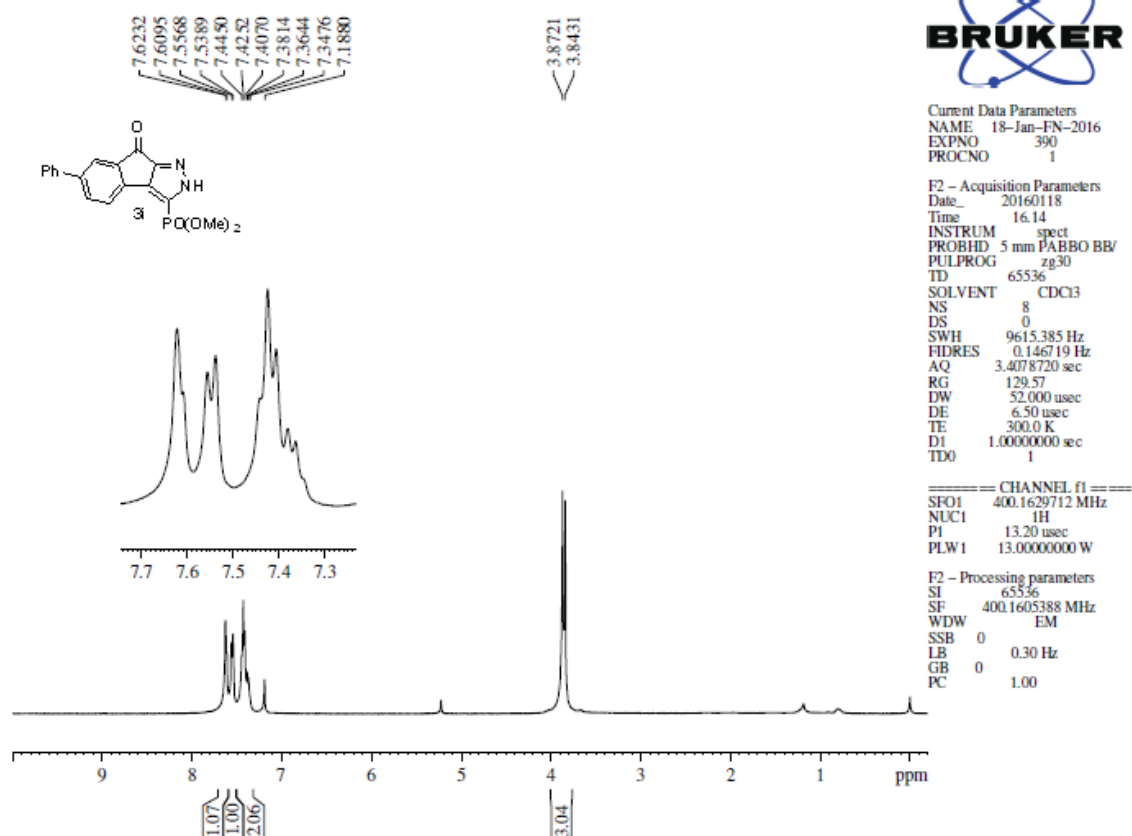


Figure 25: <sup>1</sup>H NMR spectrum of **3i**

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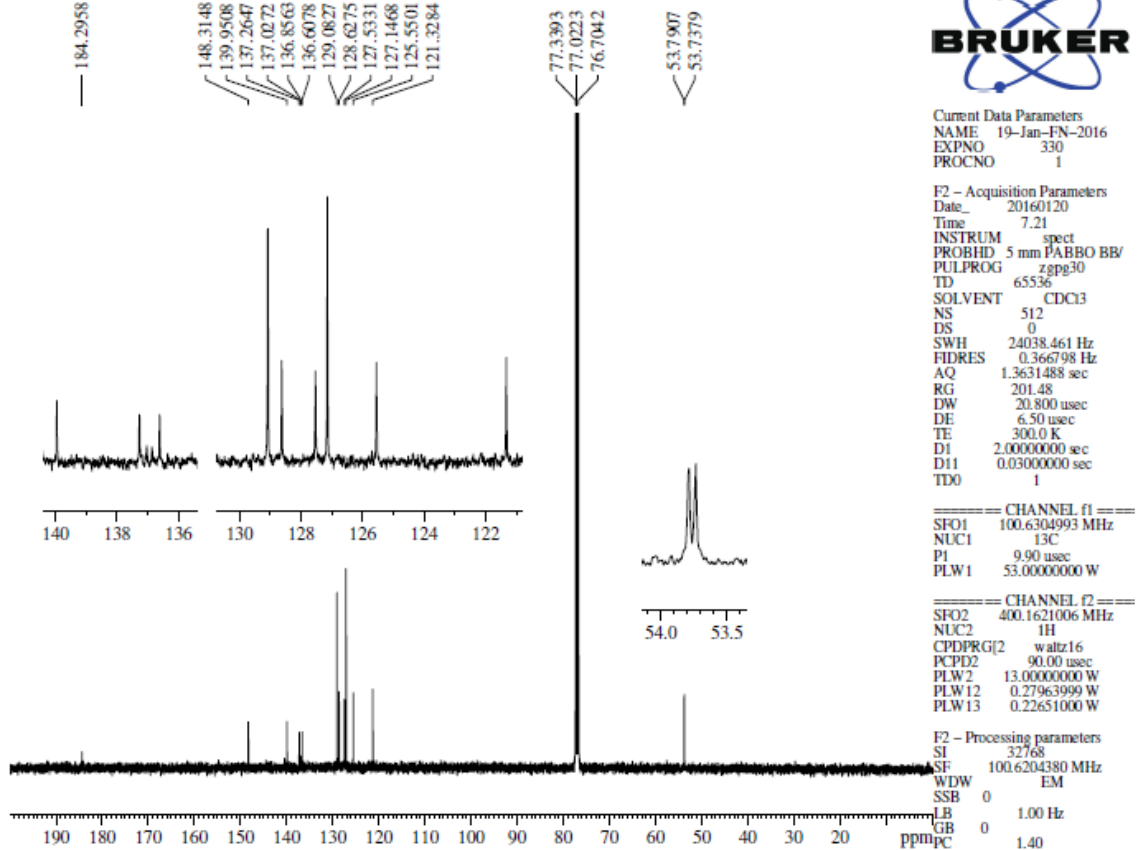


Figure 26: <sup>13</sup>C NMR spectrum of **3i**



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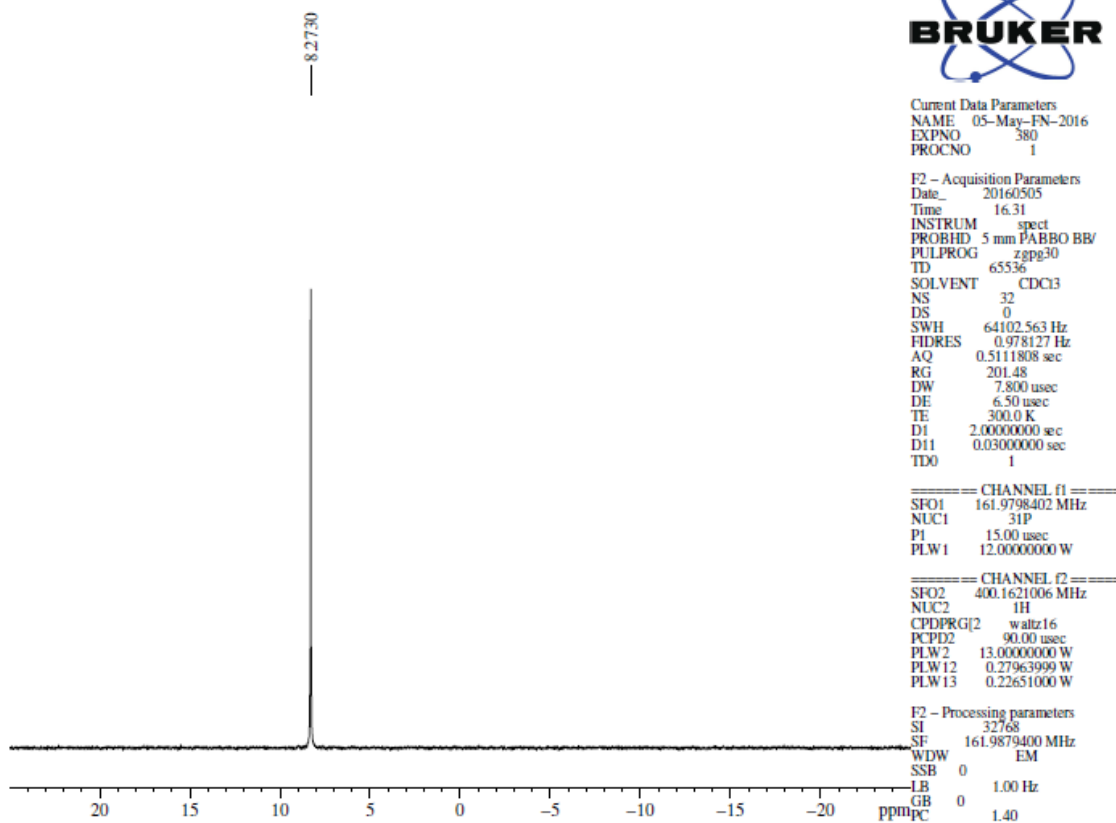


Figure 27: <sup>31</sup>P NMR spectrum of 3i

NRAT IV 218

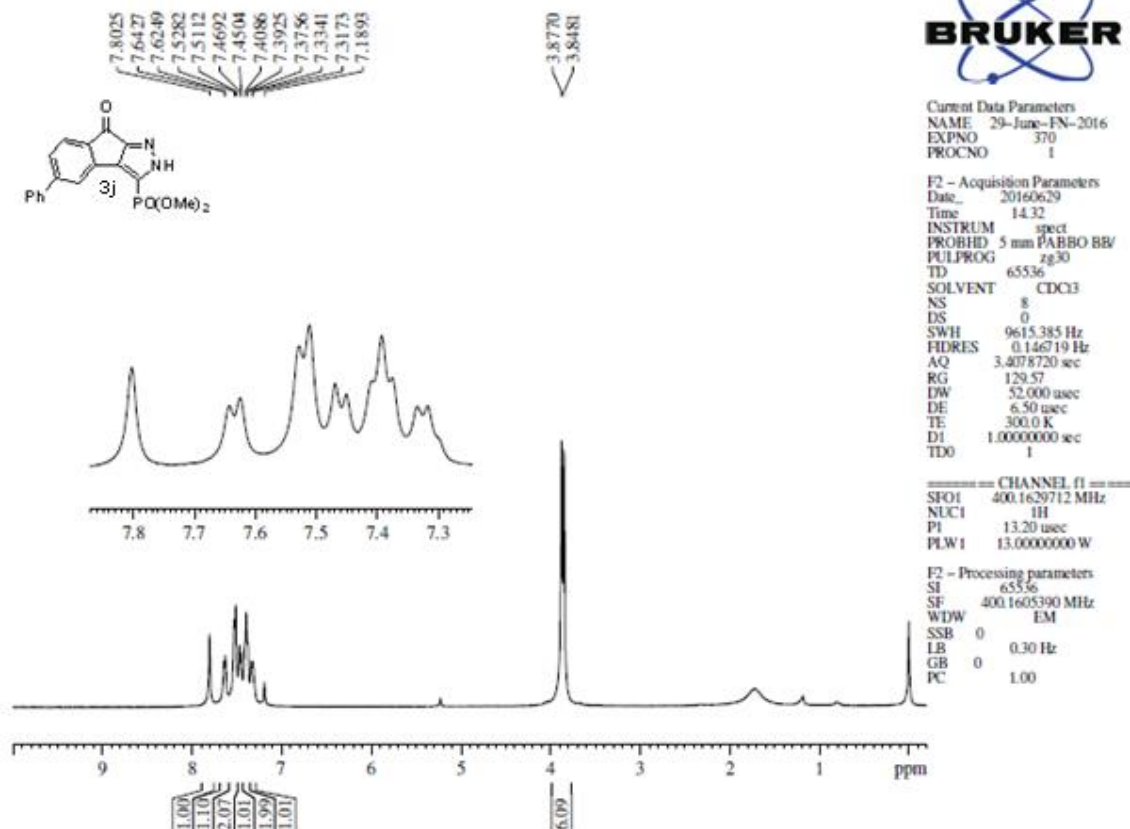
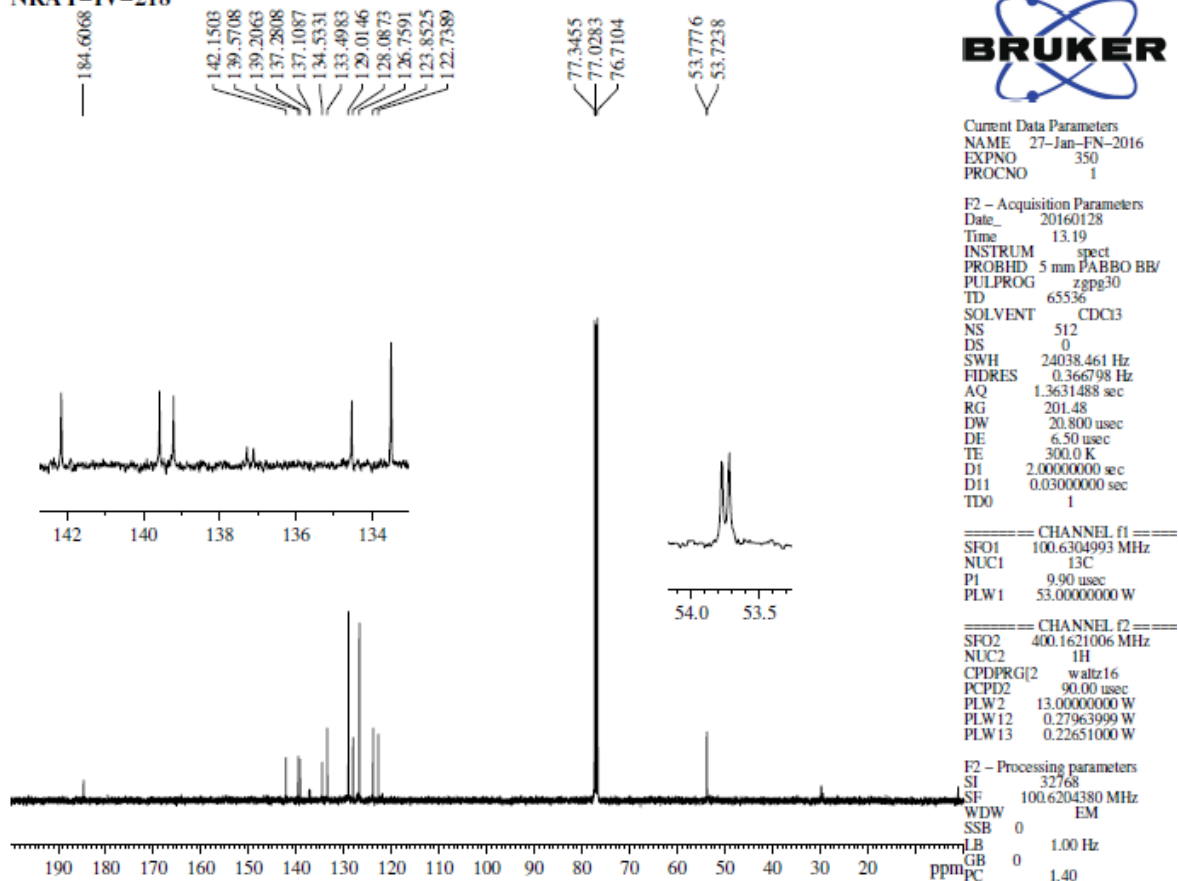


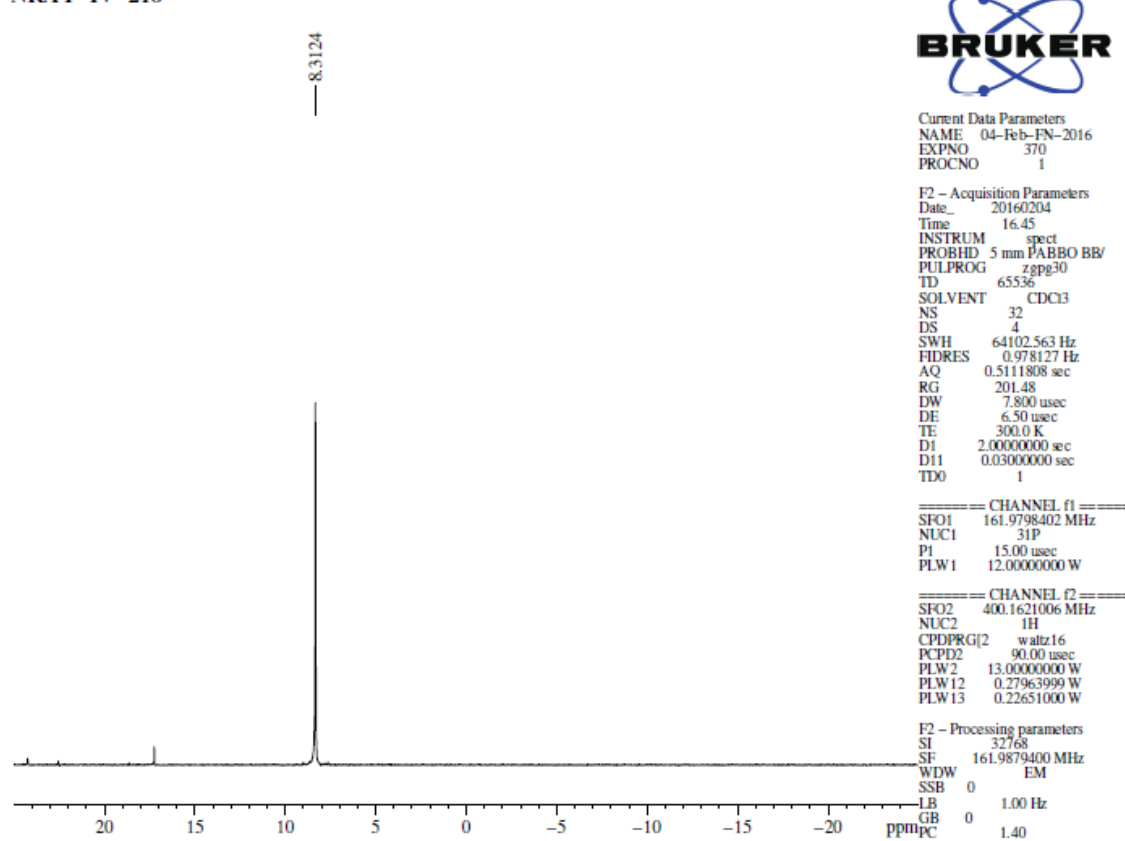
Figure 28: <sup>1</sup>H NMR spectrum of 3j



NRAT-IV-218

Figure 29:  $^{13}\text{C}$  NMR spectrum of 3j

NRAT-IV-218

Figure 30:  $^{31}\text{P}$  NMR spectrum of 3j

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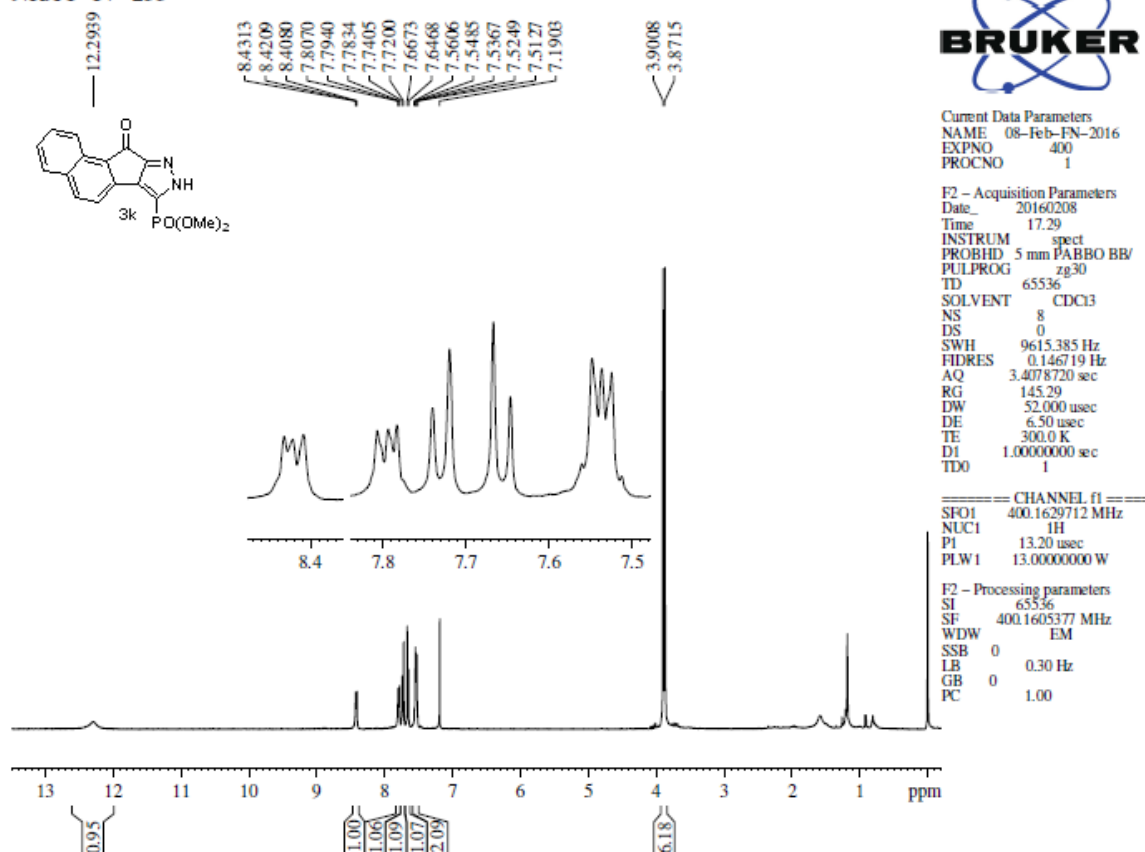


Figure 31: <sup>1</sup>H NMR spectrum of 3k

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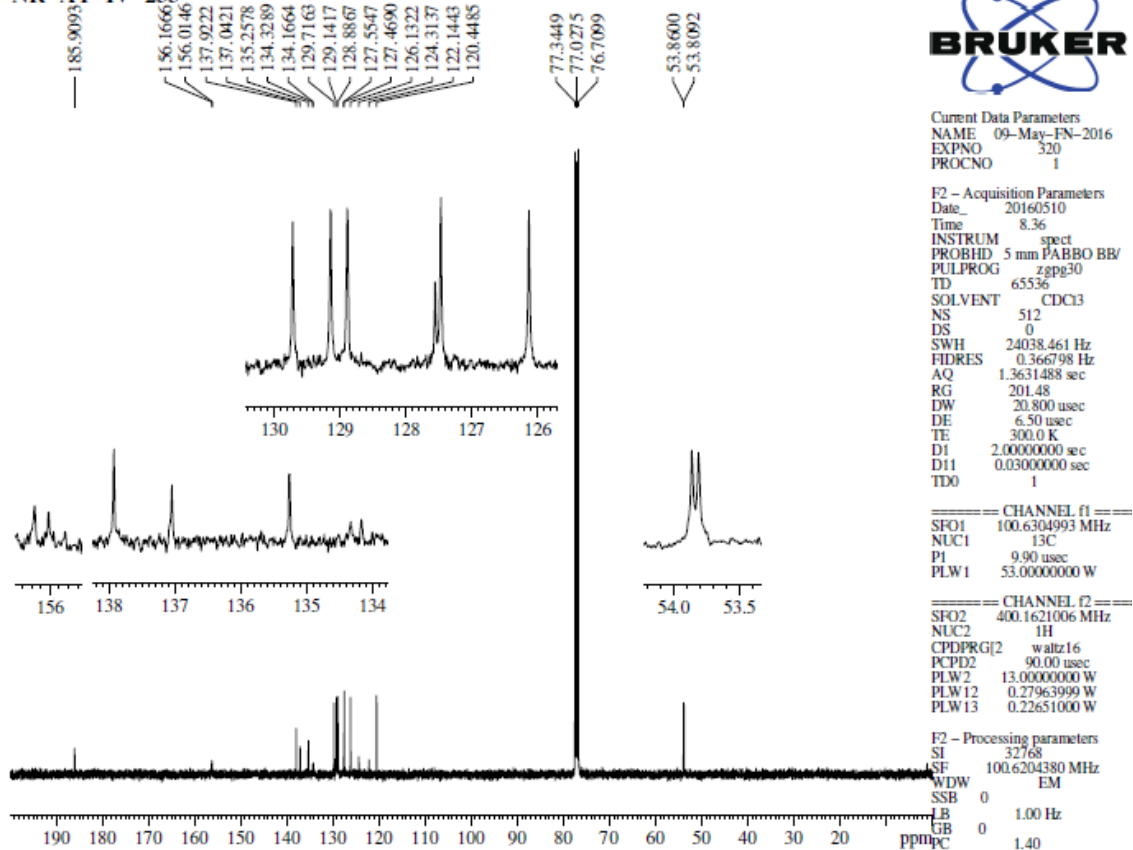


Figure 32: <sup>13</sup>C NMR spectrum of 3k

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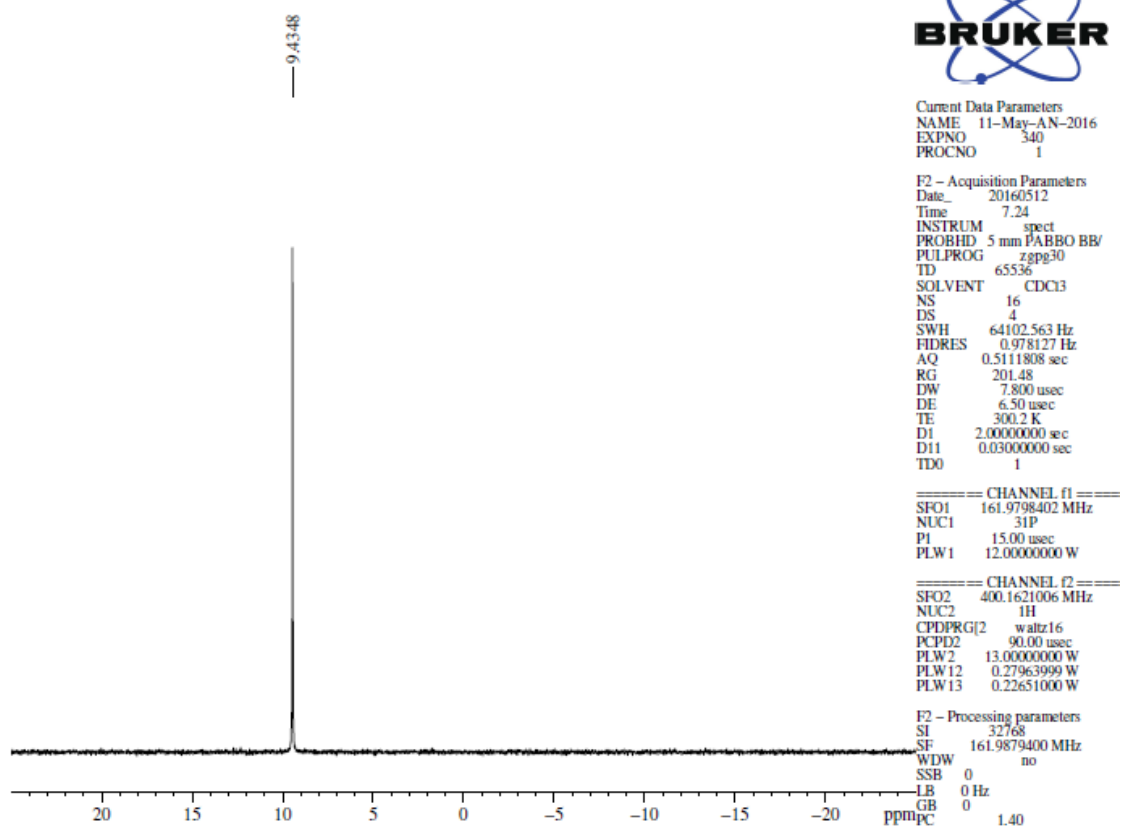


Figure 33: <sup>31</sup>P NMR spectrum of 3k

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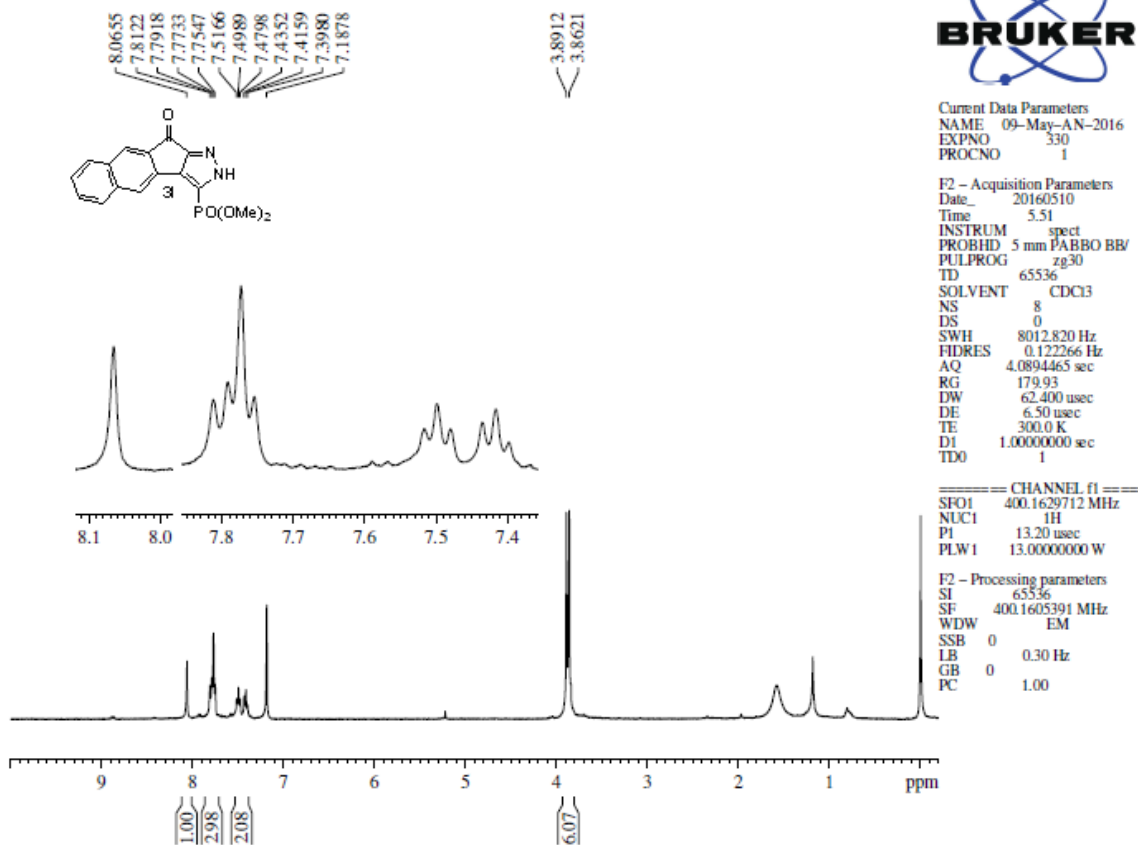


Figure 34: <sup>1</sup>H NMR spectrum of 3l

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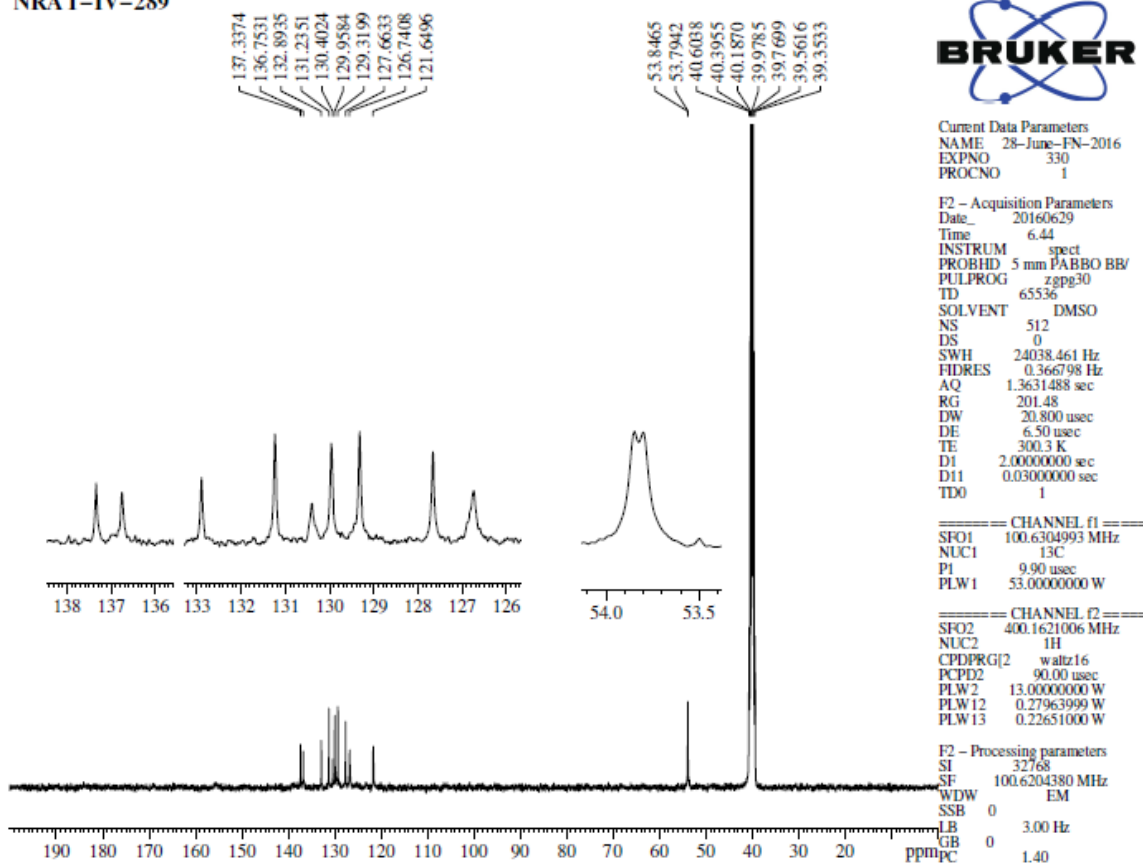


Figure 35:  $^{13}\text{C}$  NMR spectrum of 3l

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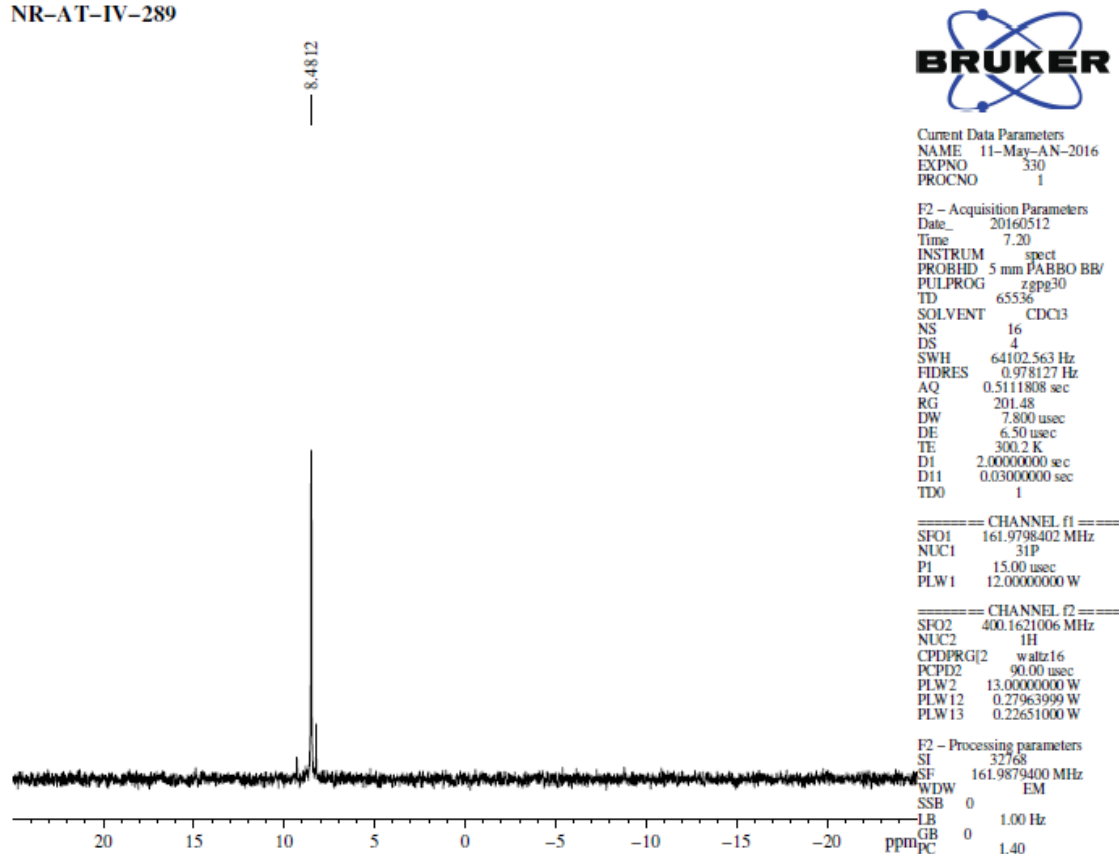


Figure 36:  $^{31}\text{P}$  NMR spectrum of 3l

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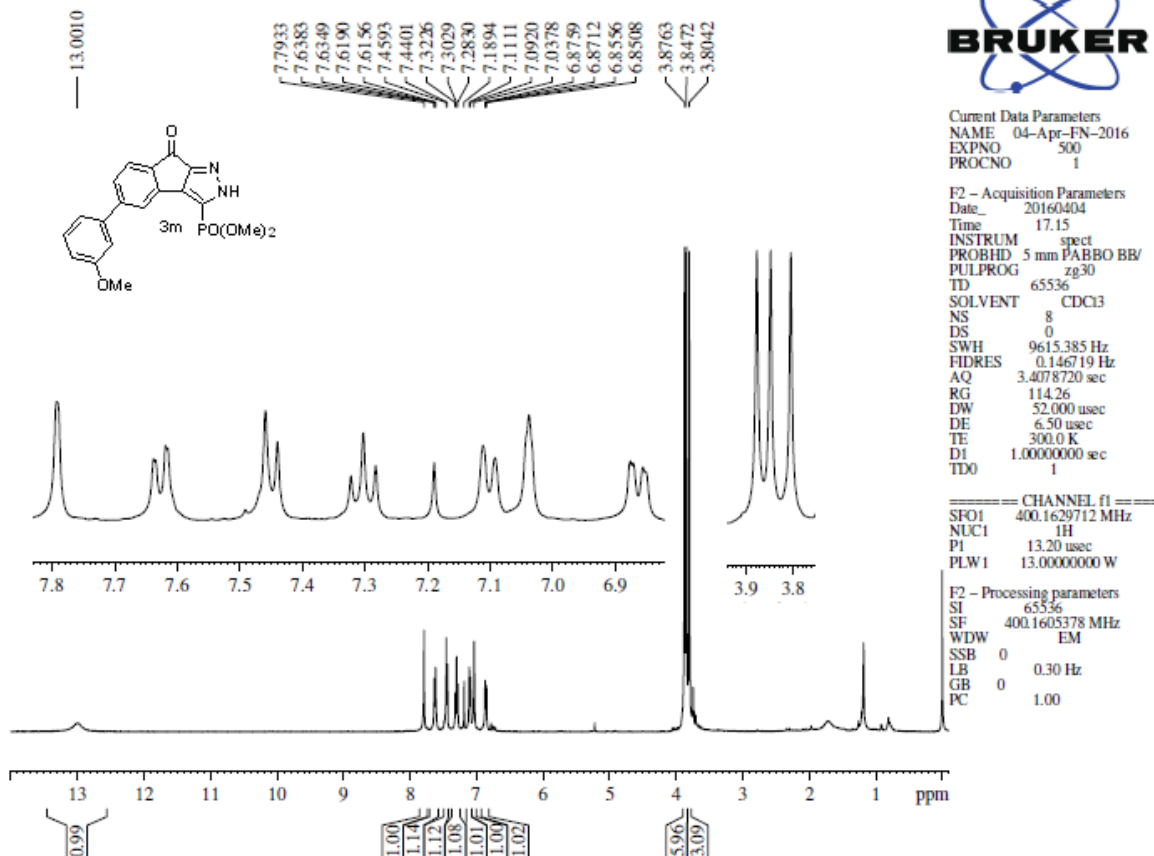


Figure 37: <sup>1</sup>H NMR spectrum of 3m

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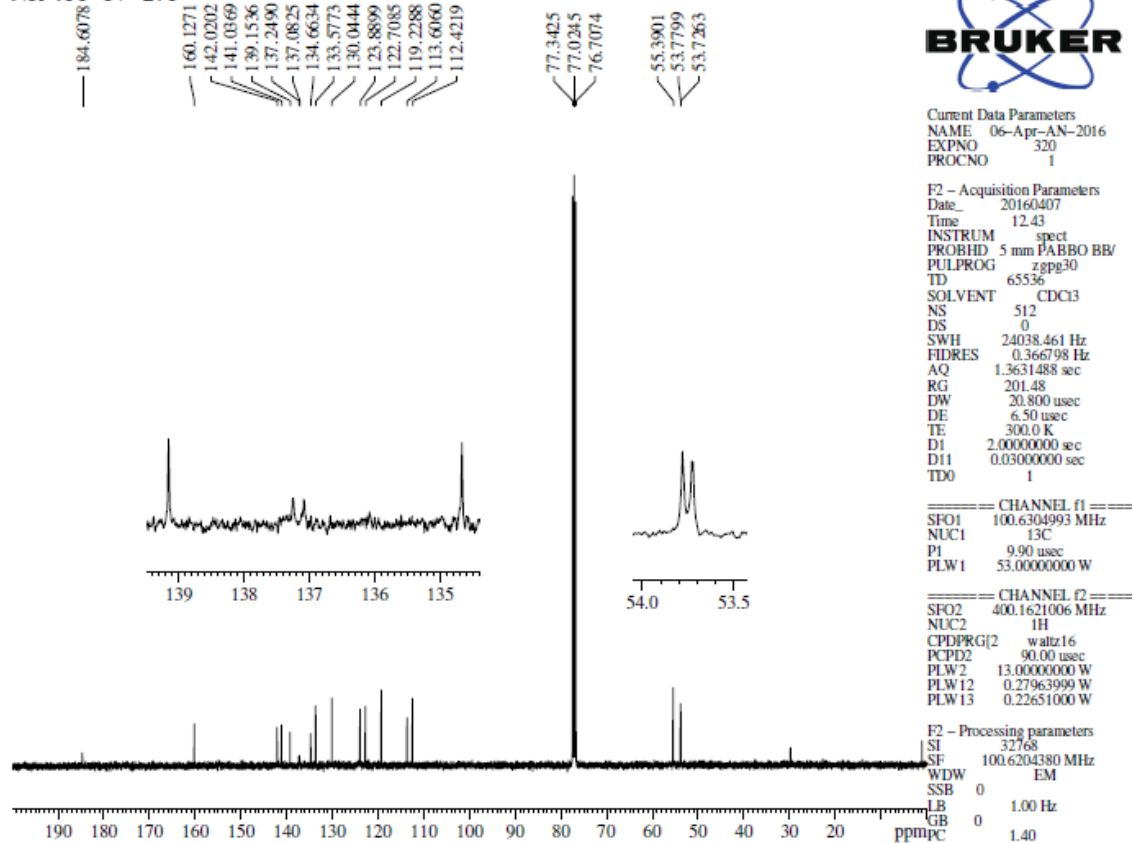
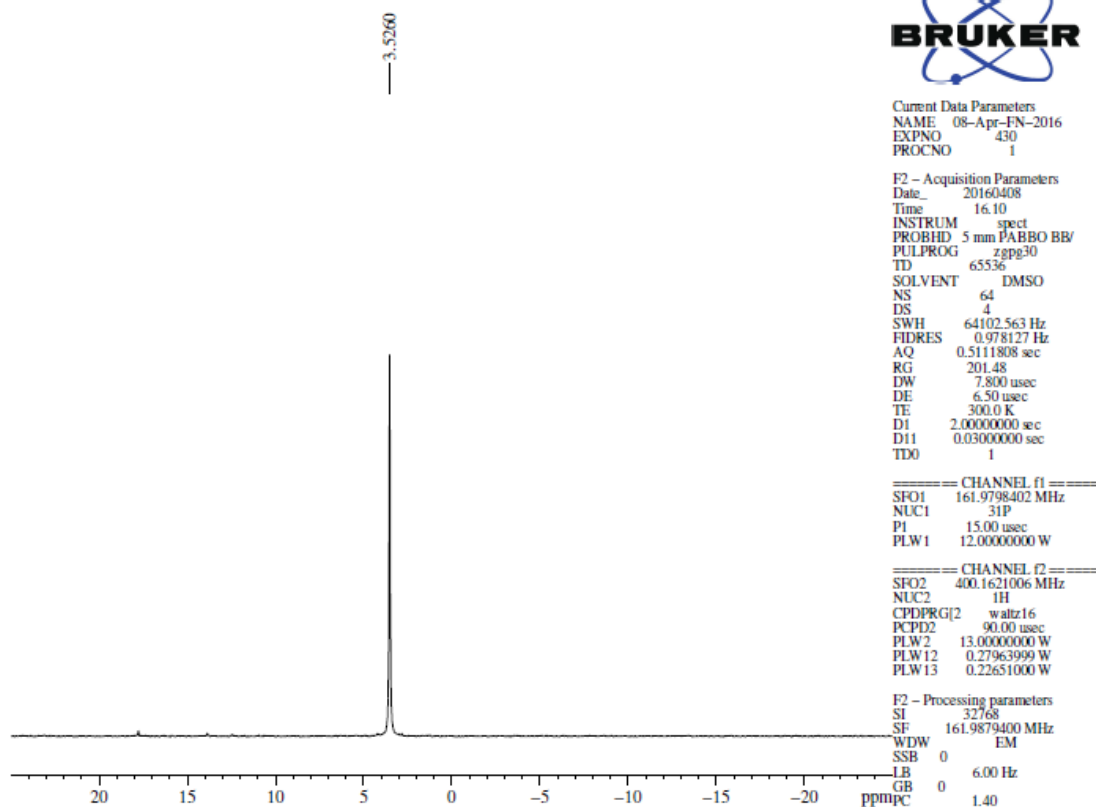
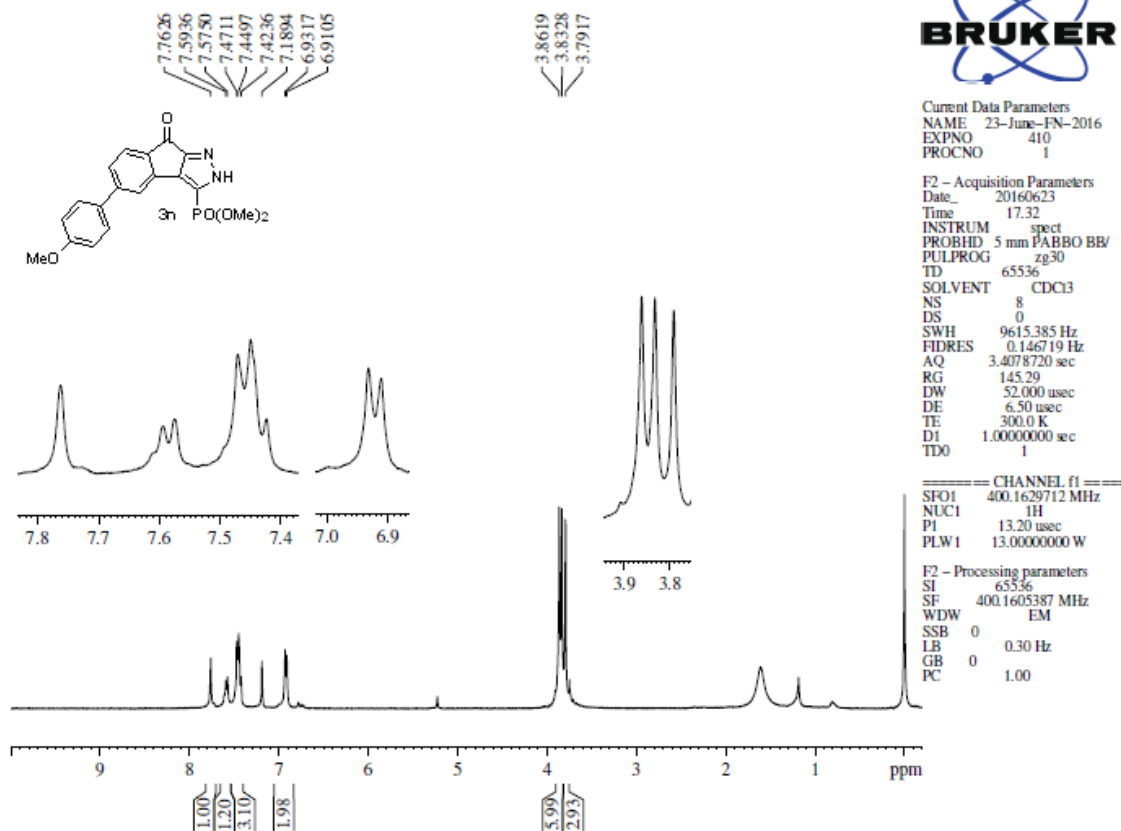


Figure 38: <sup>13</sup>C NMR spectrum of 3m

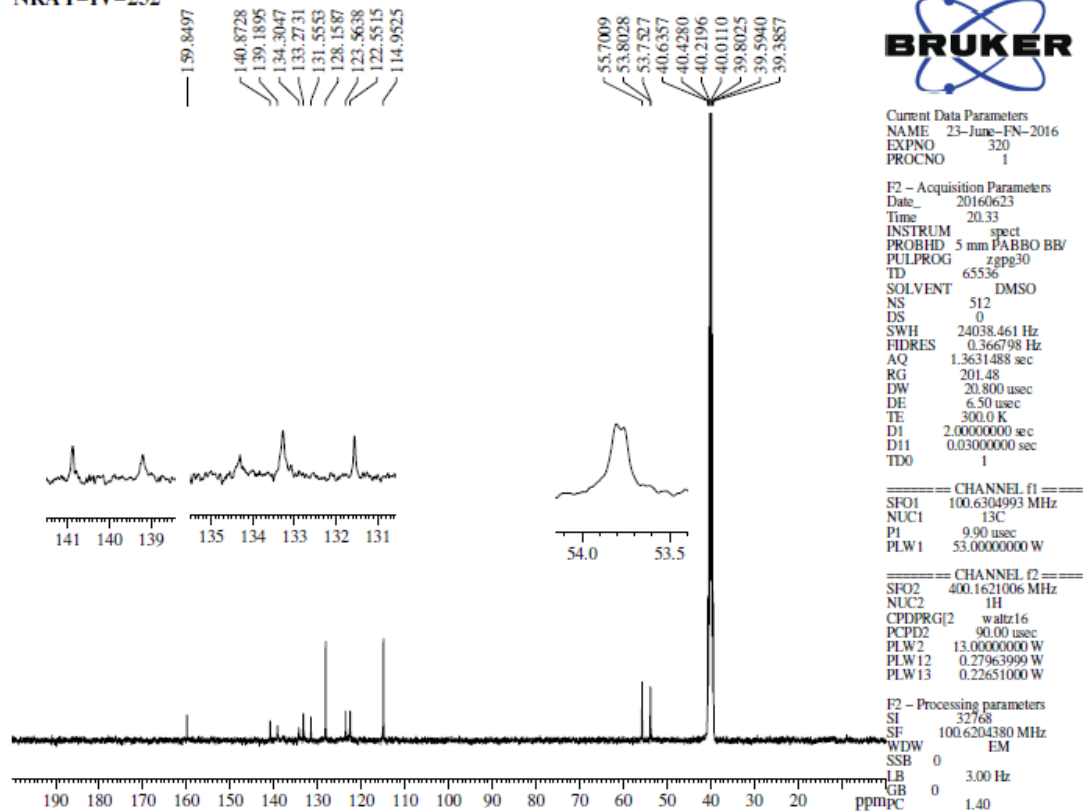
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Figure 39:  $^{31}\text{P}$  NMR spectrum of 3m

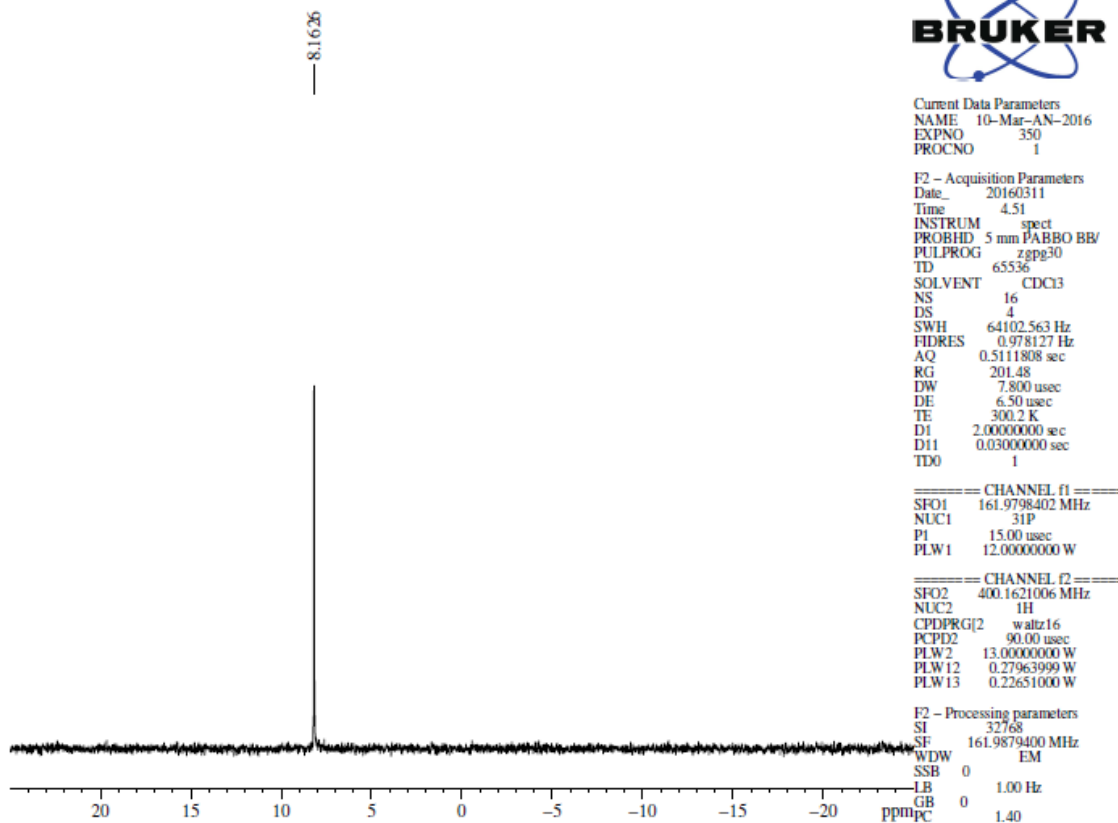
NRAT-IV-252

Figure 40:  $^1\text{H}$  NMR spectrum of 3n

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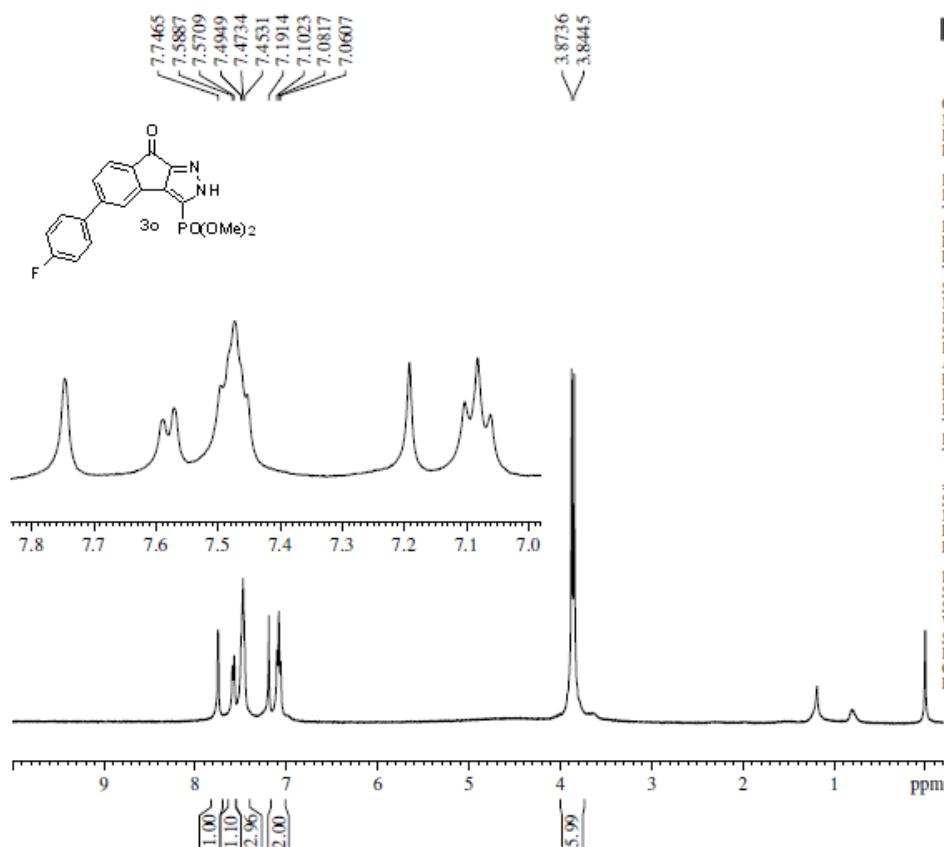
Figure 41:  $^{13}\text{C}$  NMR spectrum of 3n

NR-AT-IV-252

Figure 42:  $^{31}\text{P}$  NMR spectrum of 3n



NRAT-IV-232



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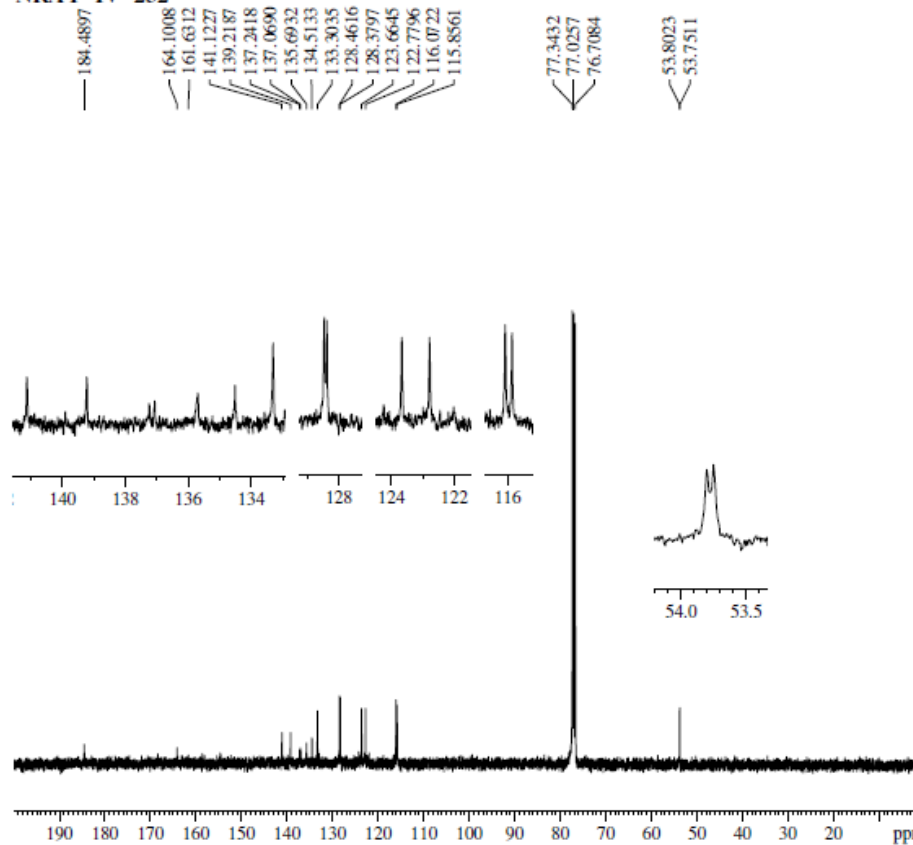
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Figure 43: <sup>1</sup>H NMR spectrum of **3o**

NRAT-IV-232



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Figure 44: <sup>13</sup>C NMR spectrum of **3o**



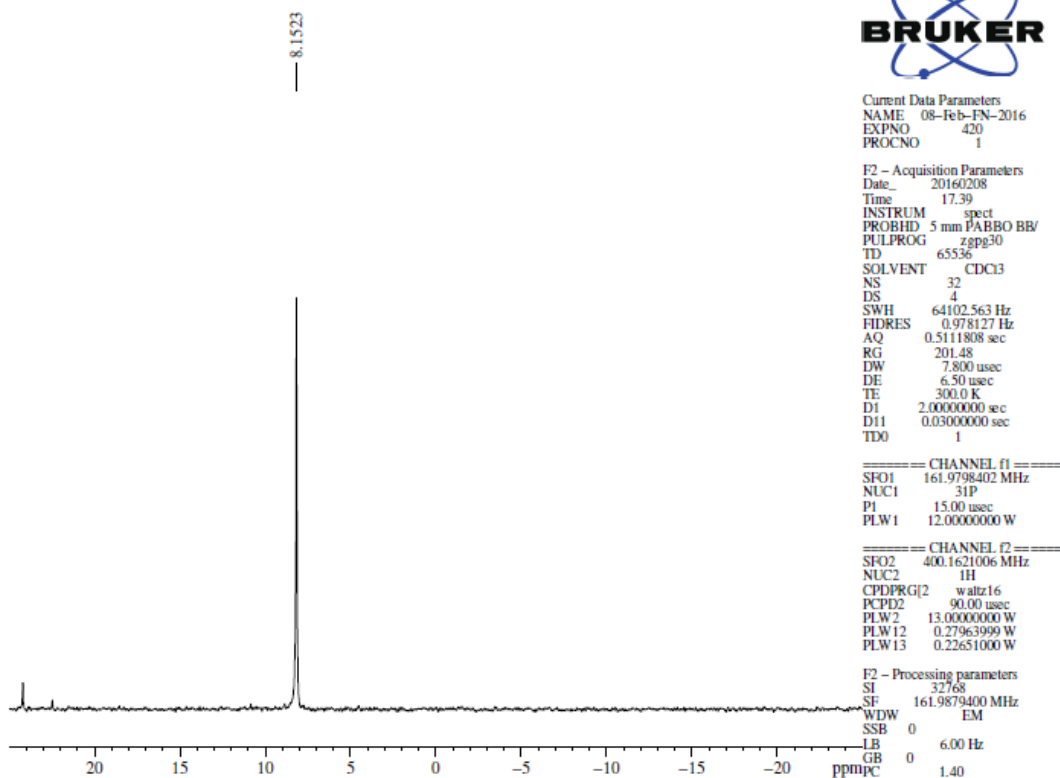
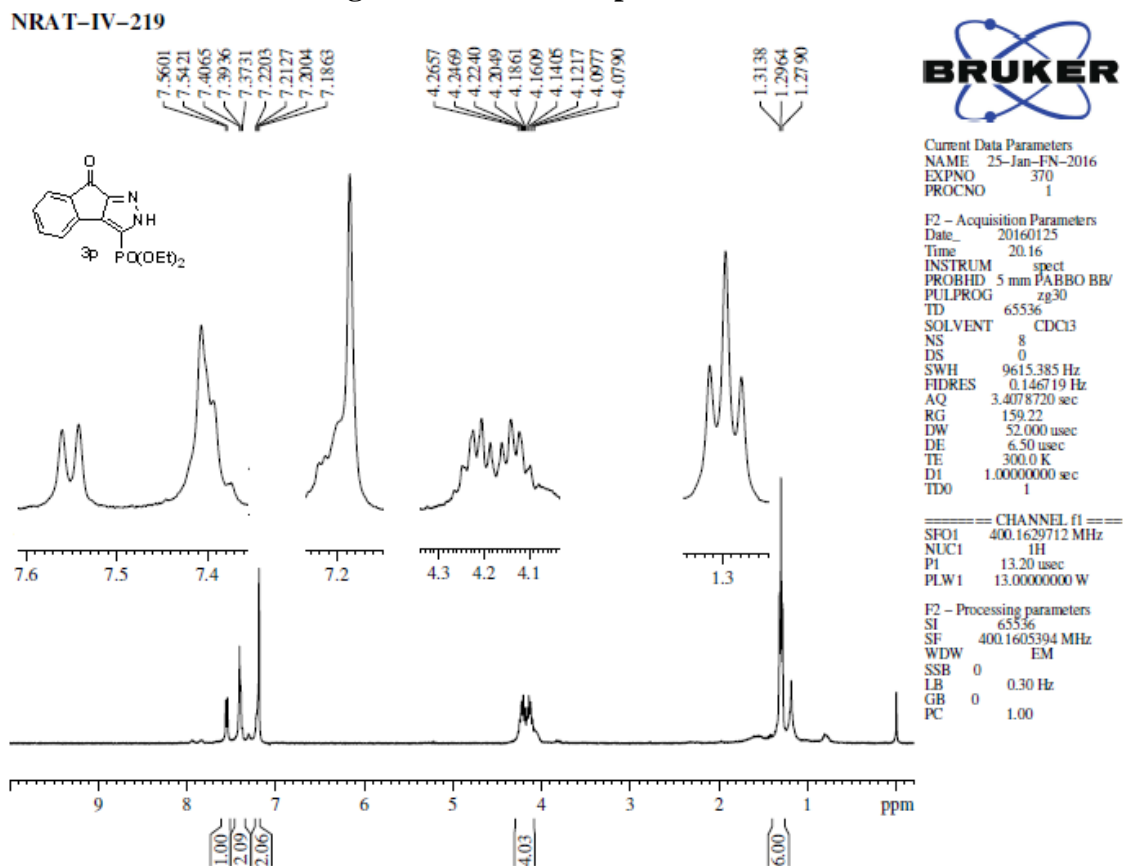


Figure 39:

Figure 45: <sup>31</sup>P NMR spectrum of 3oFigure 46: <sup>1</sup>H NMR spectrum of 3p

NR-AT-IV-219

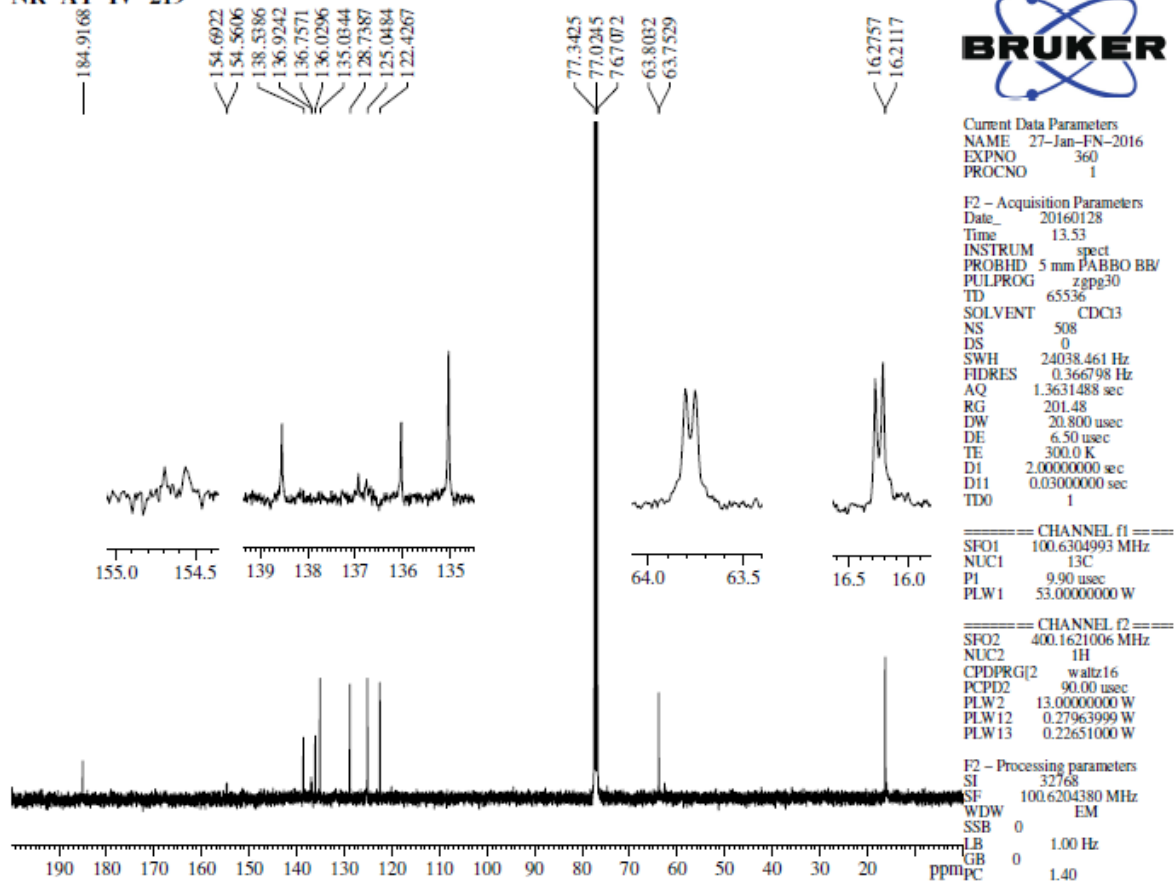


Figure 47:  $^{13}\text{C}$  NMR spectrum of 3p

NRAT-IV-219

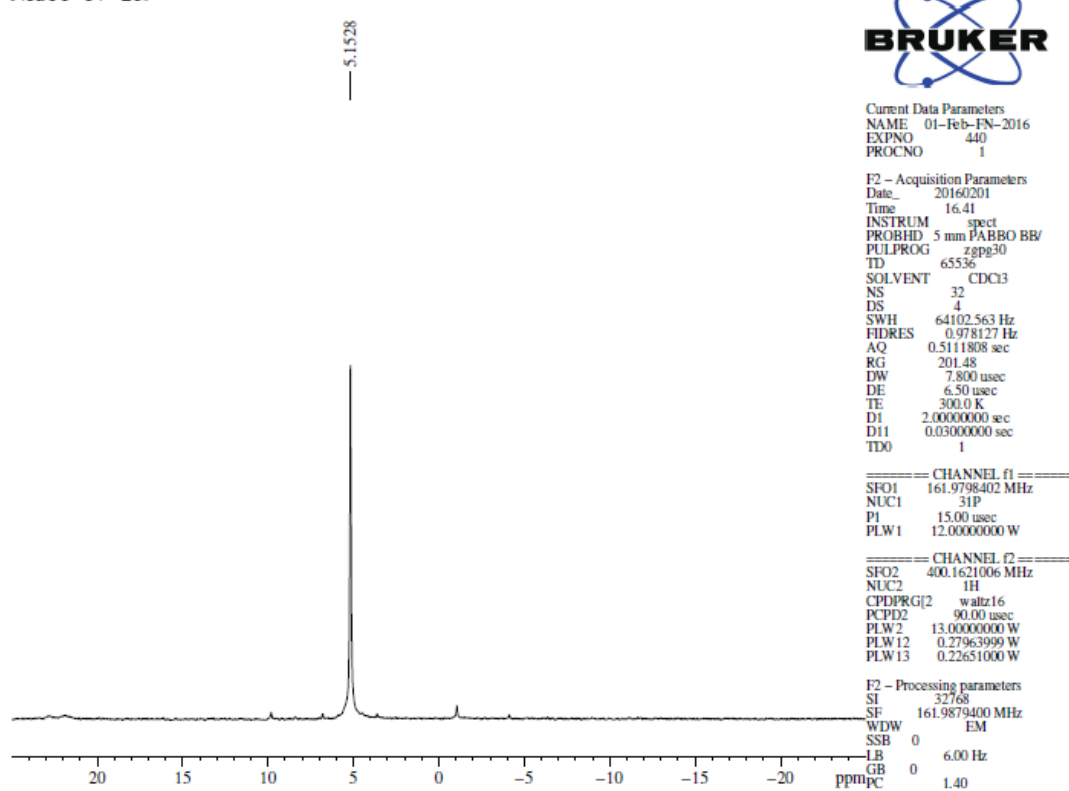
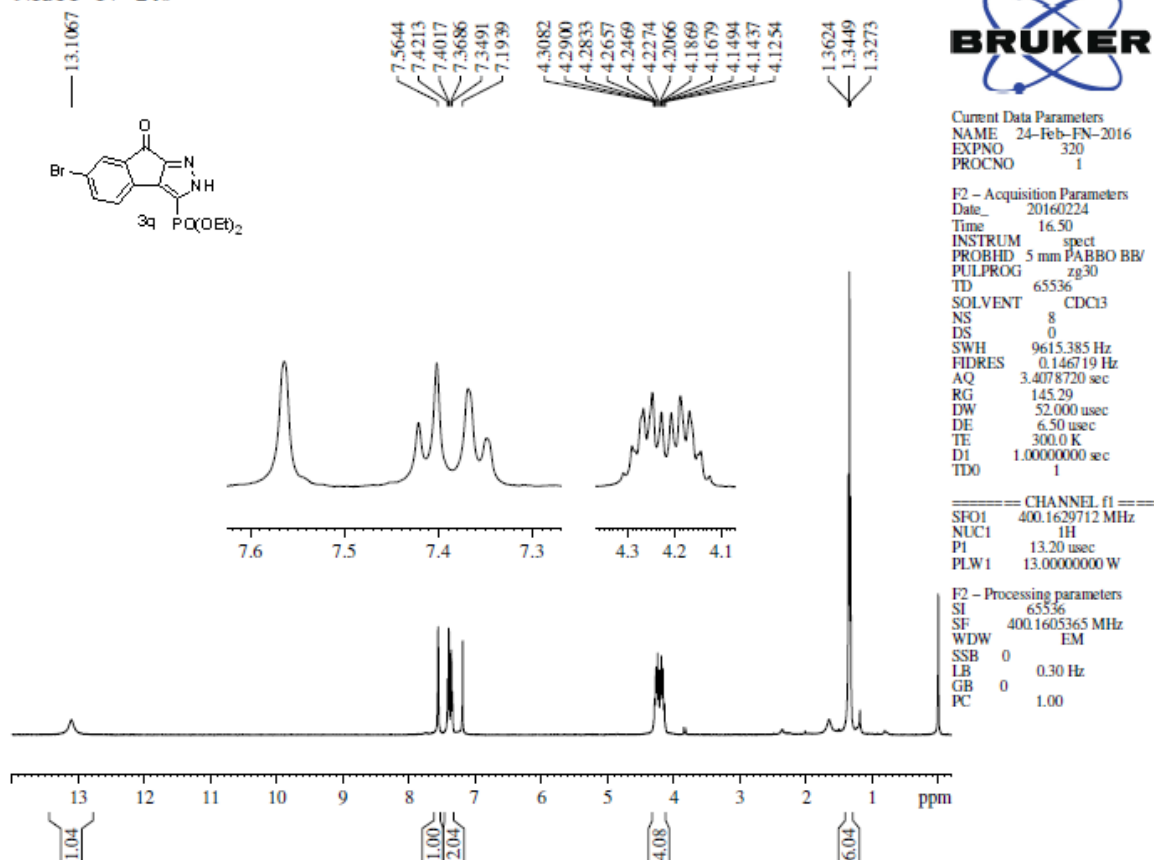
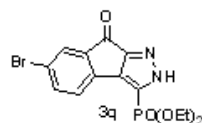
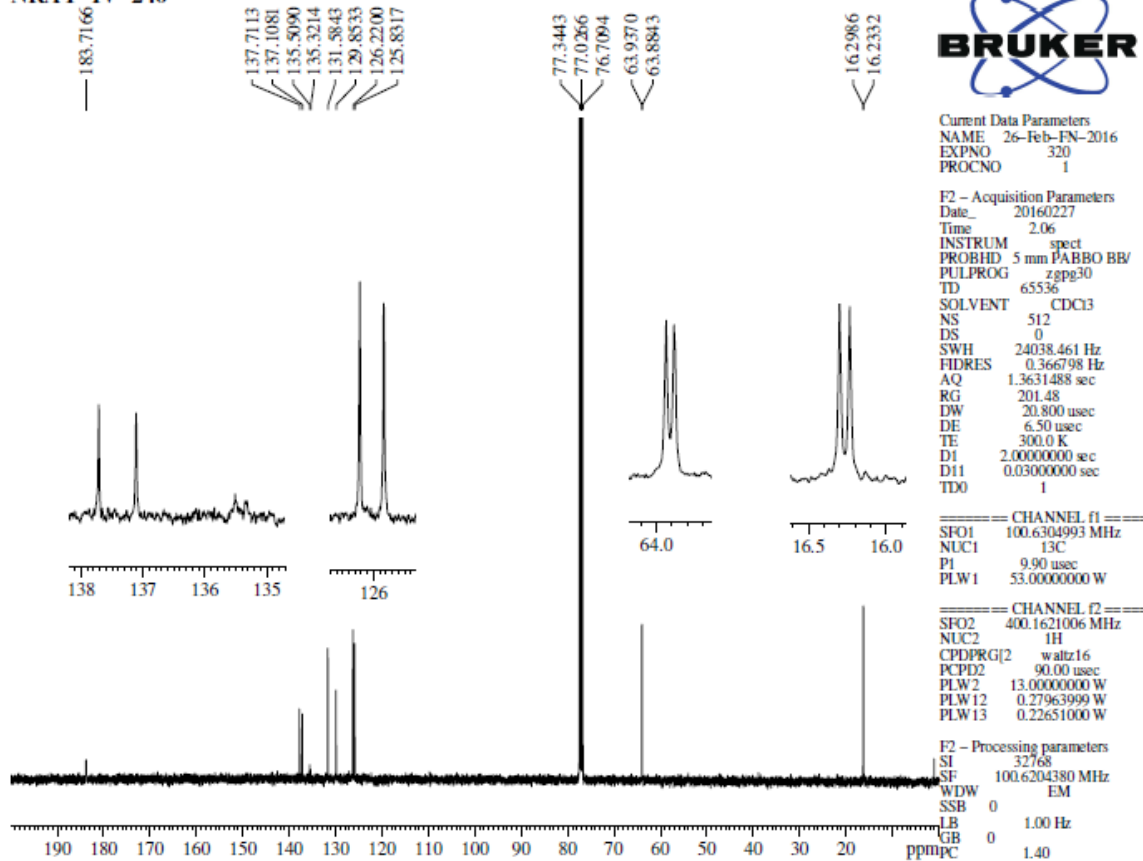


Figure 48:  $^{31}\text{P}$  NMR spectrum of 3p

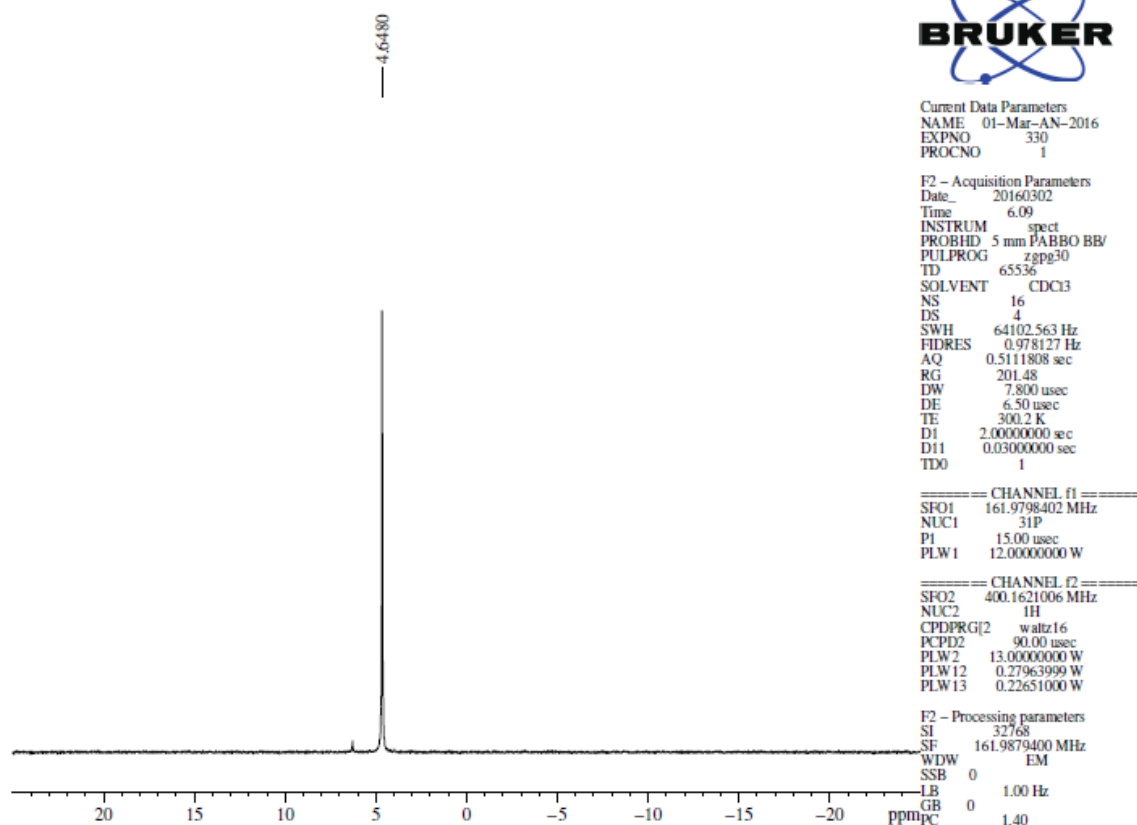
**NRA T-IV-246**



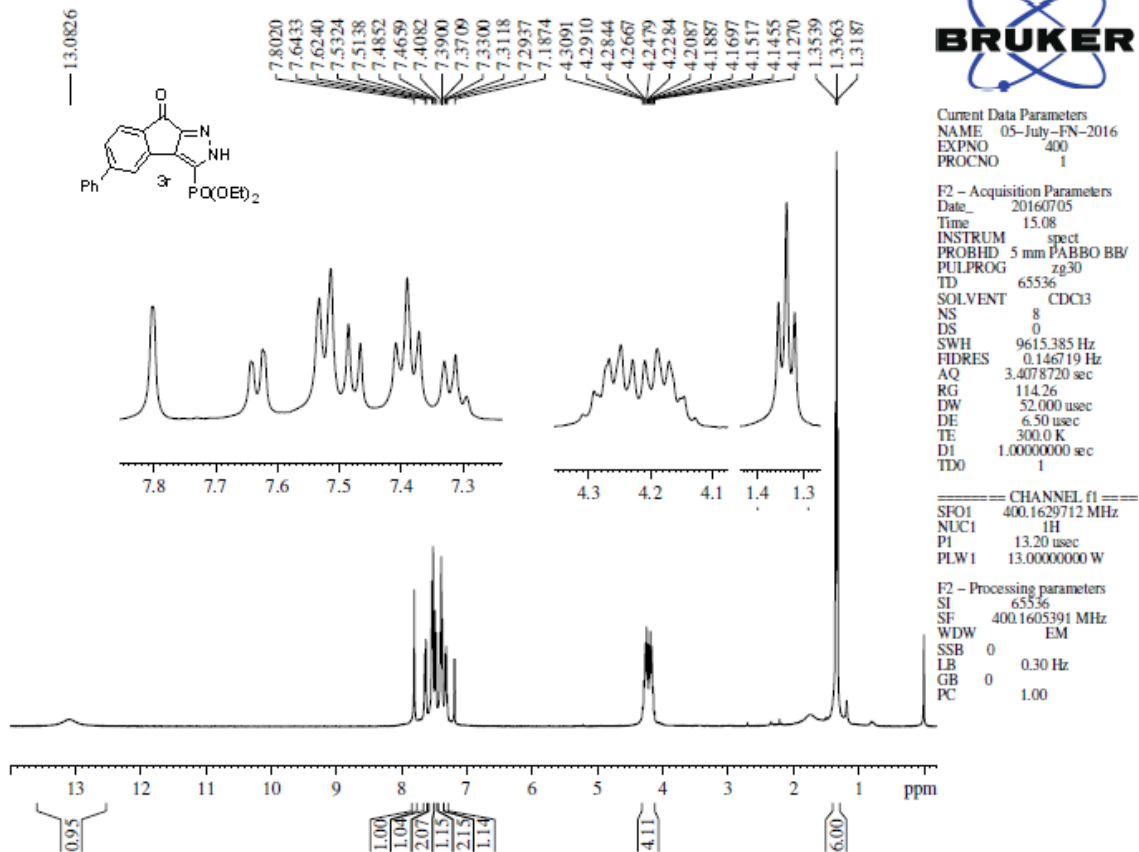
**NRA T-IV-246**



NR-AT-IV-246

Figure 51:  $^{13}\text{P}$  NMR spectrum of 3q

NRAT-V-12



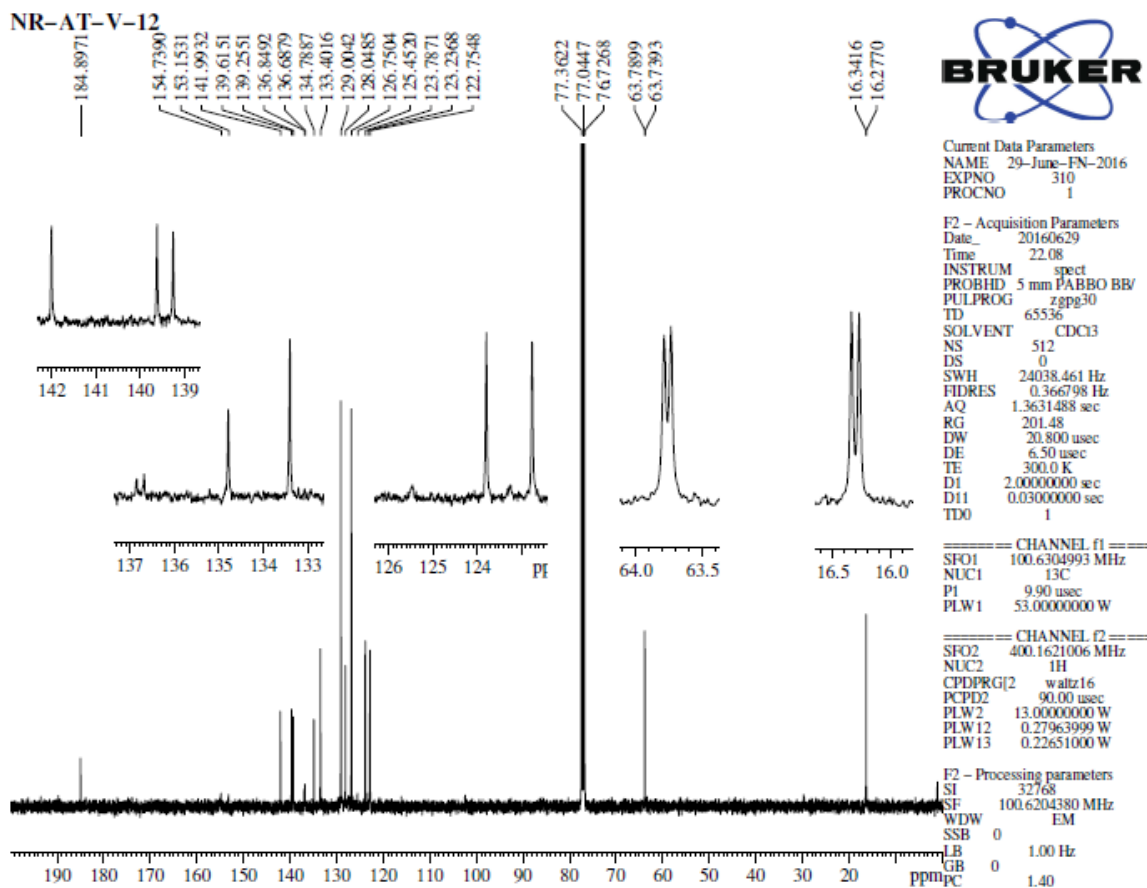


Figure 53:  $^{13}\text{C}$  NMR spectrum of 3r

NRAT-V-12

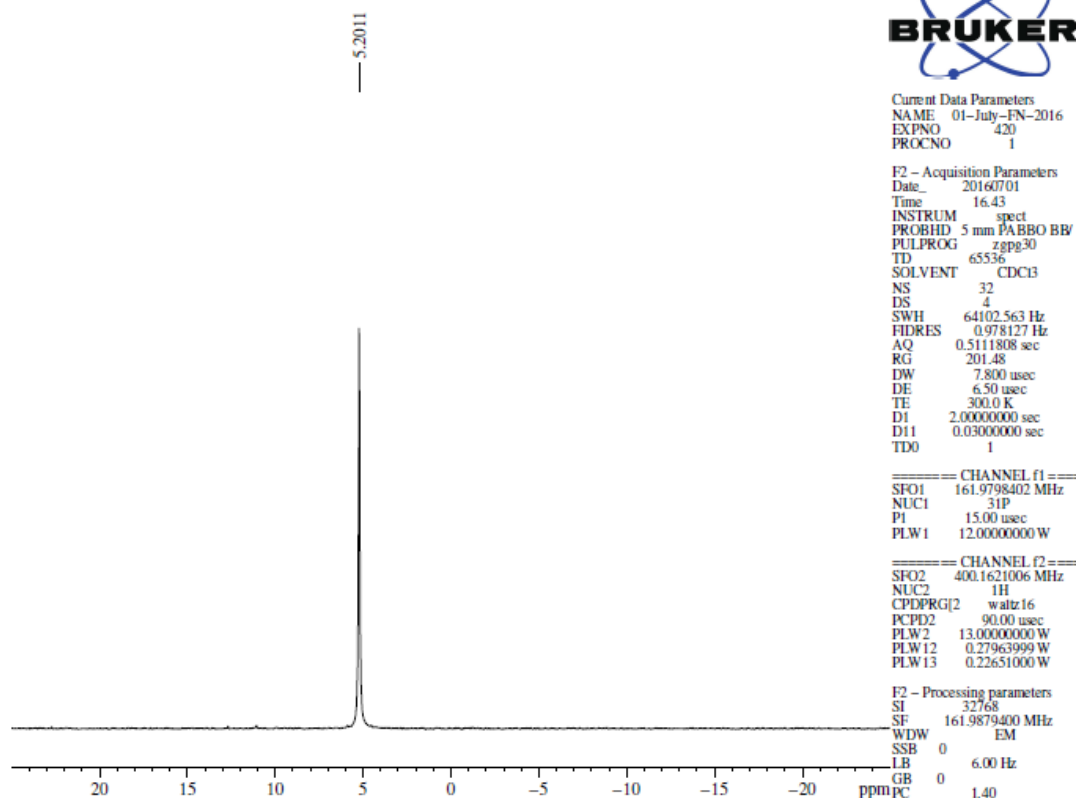


Figure 54:  $^{31}\text{P}$  NMR spectrum of 3r

NRAT-IV-250

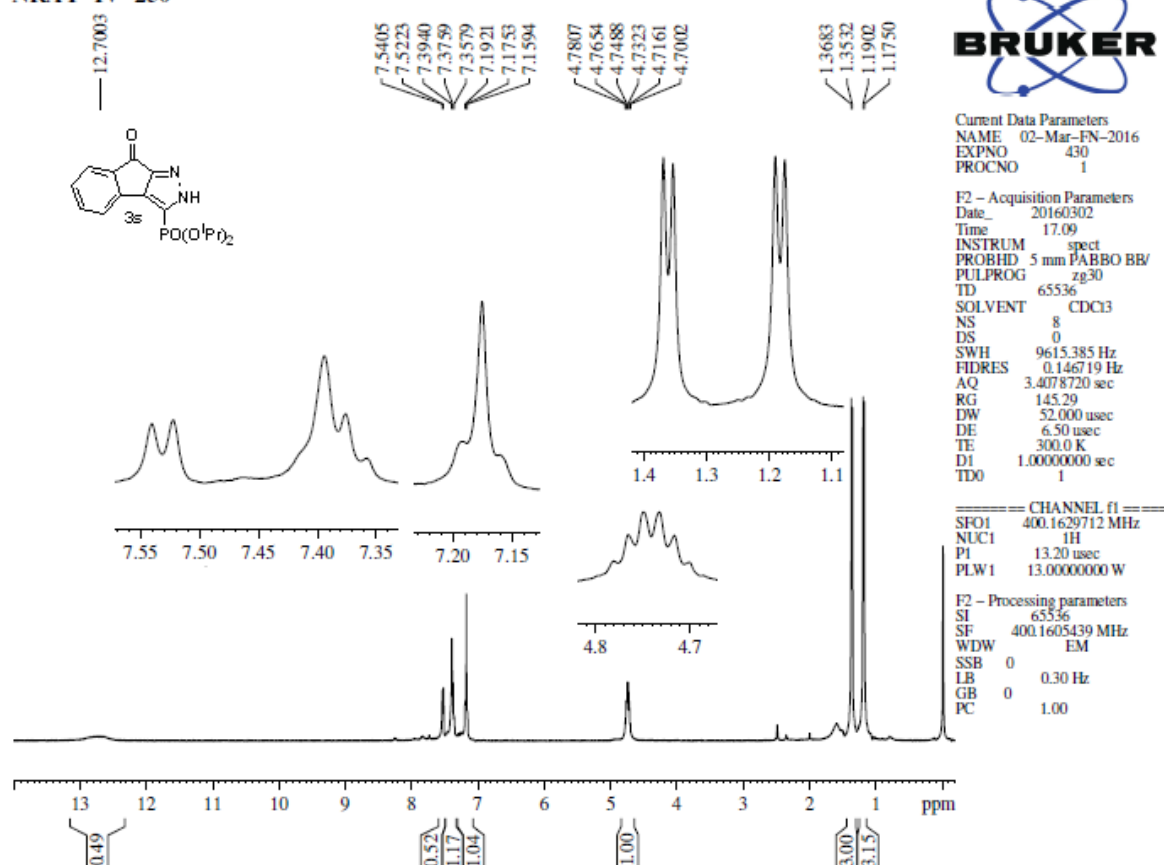


Figure 55: <sup>1</sup>H NMR spectrum of 3s

NR-AT-IV-250

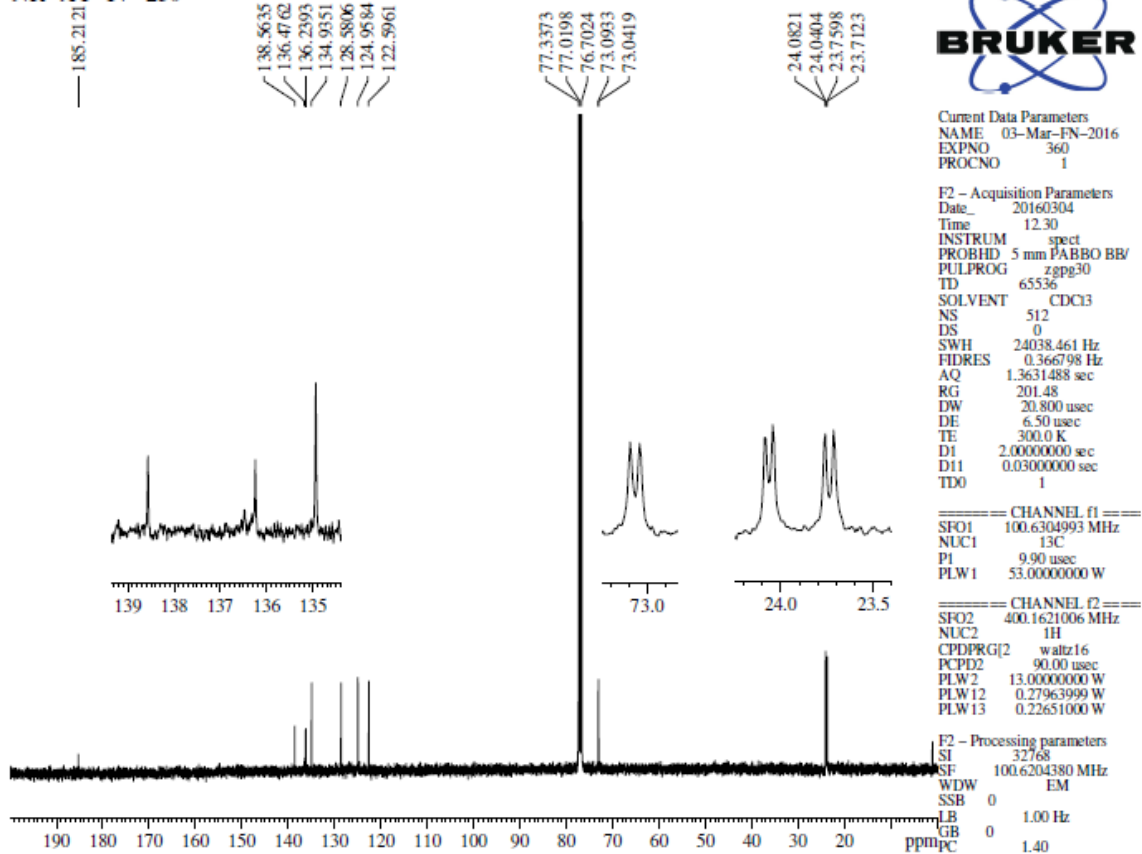


Figure 56: <sup>13</sup>C NMR spectrum of 3s

NR-AT-IV-250

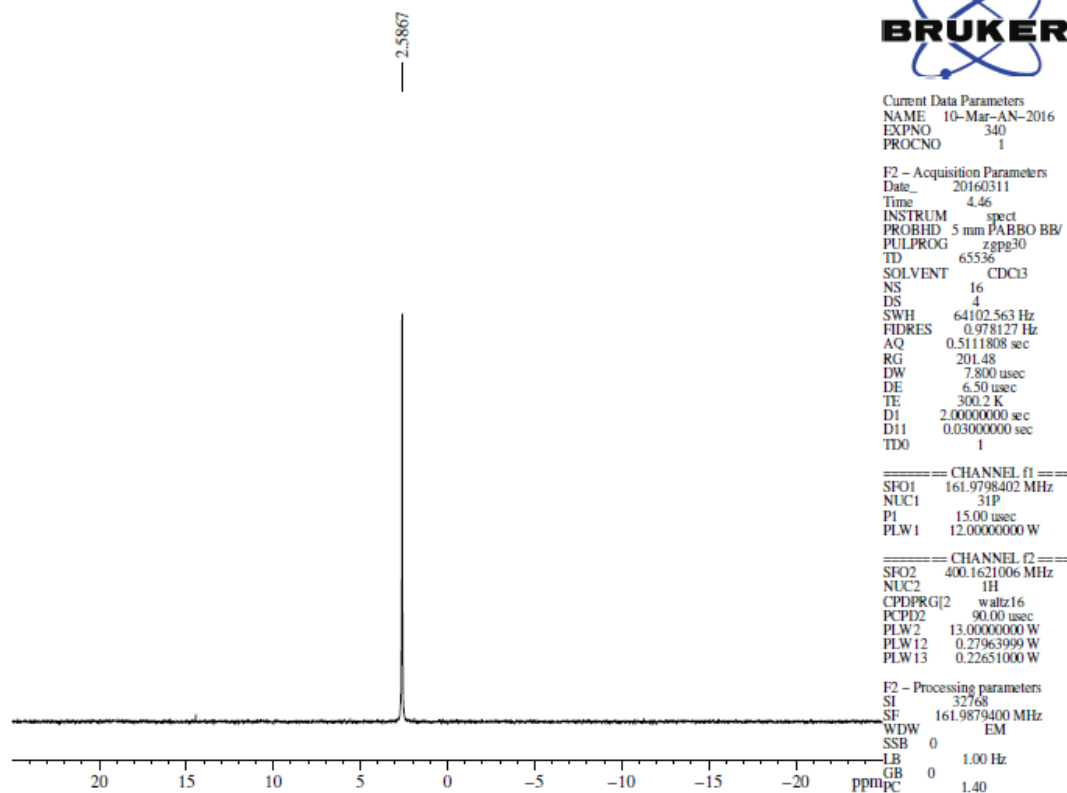


Figure 57: <sup>31</sup>P NMR spectrum of 3s

NRAT-IV-290

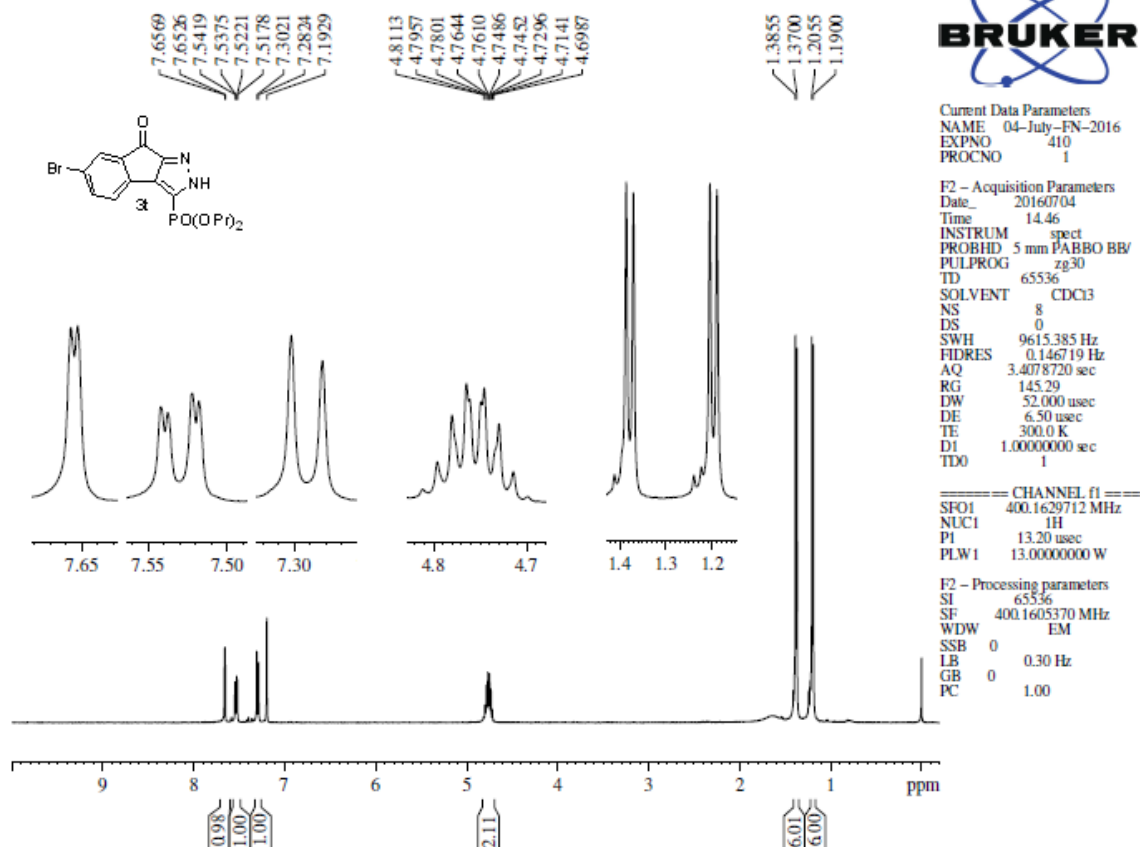


Figure 58: <sup>1</sup>H NMR spectrum of 3t



NRAT-IV-290

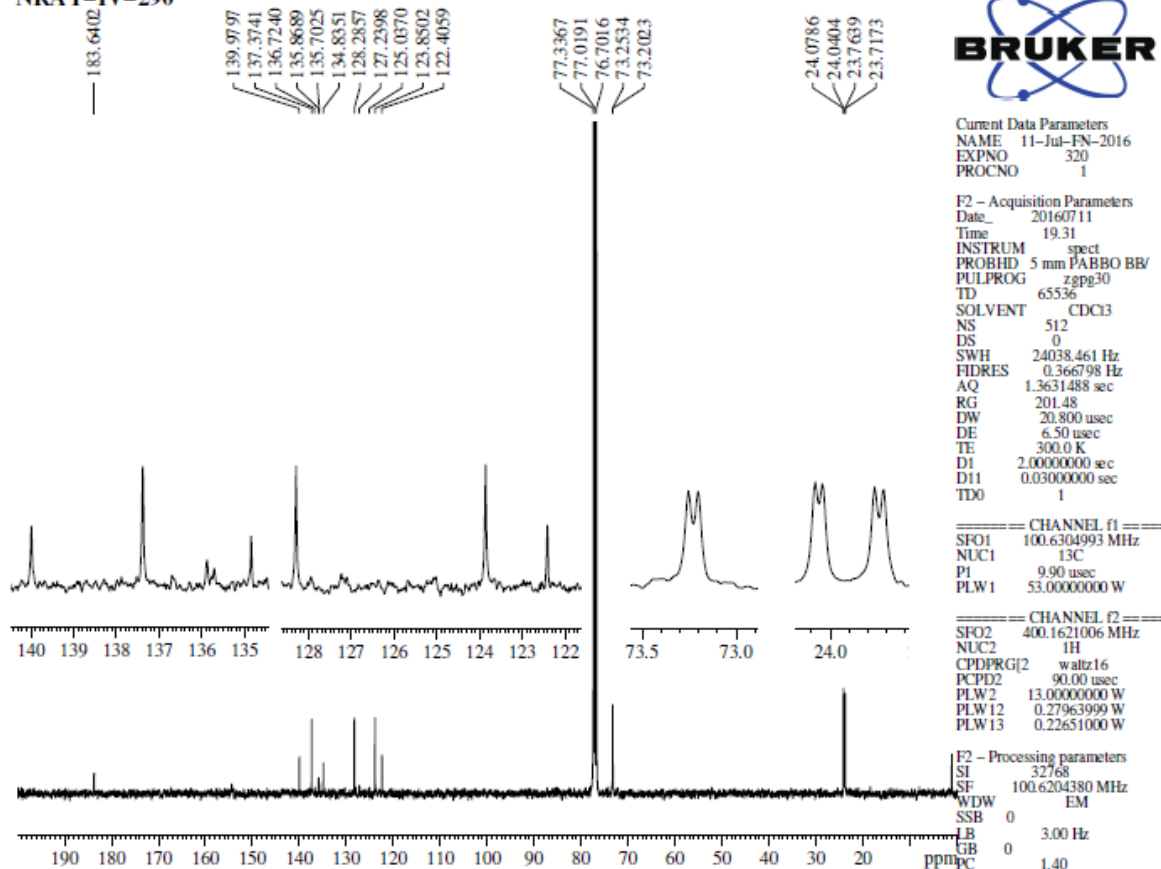


Figure 59:  $^{13}\text{C}$  NMR spectrum of 3t

NRAT IV 290

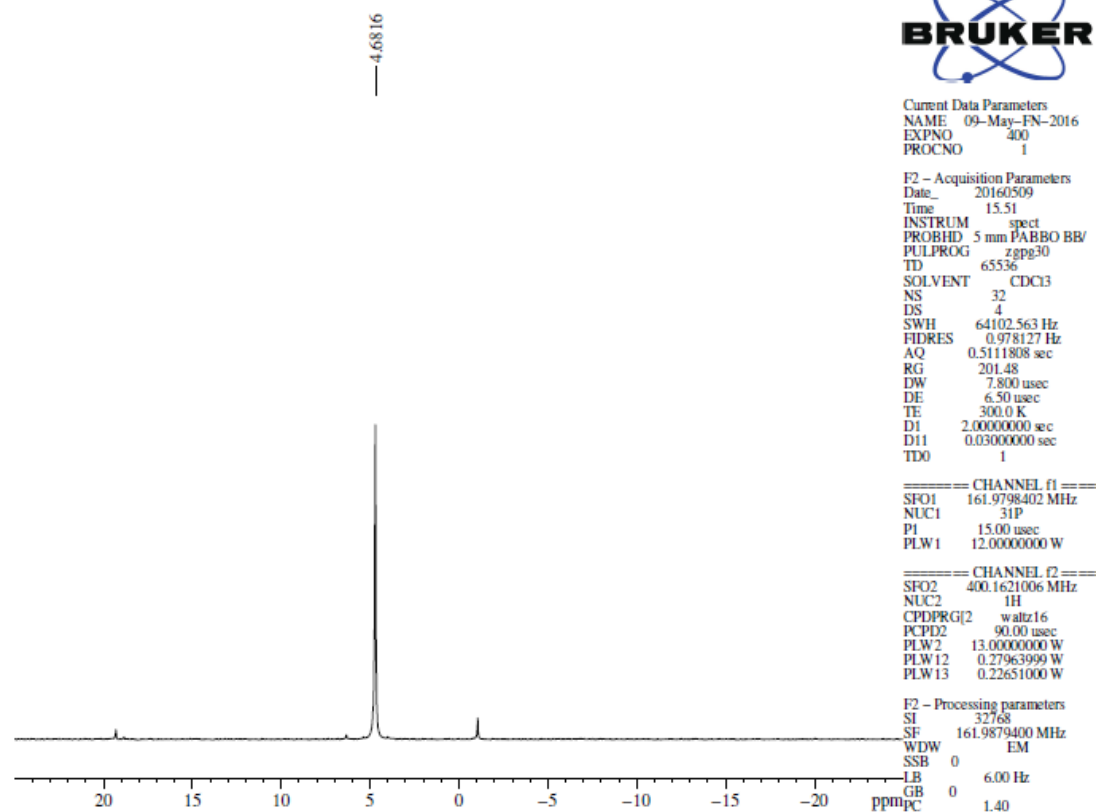
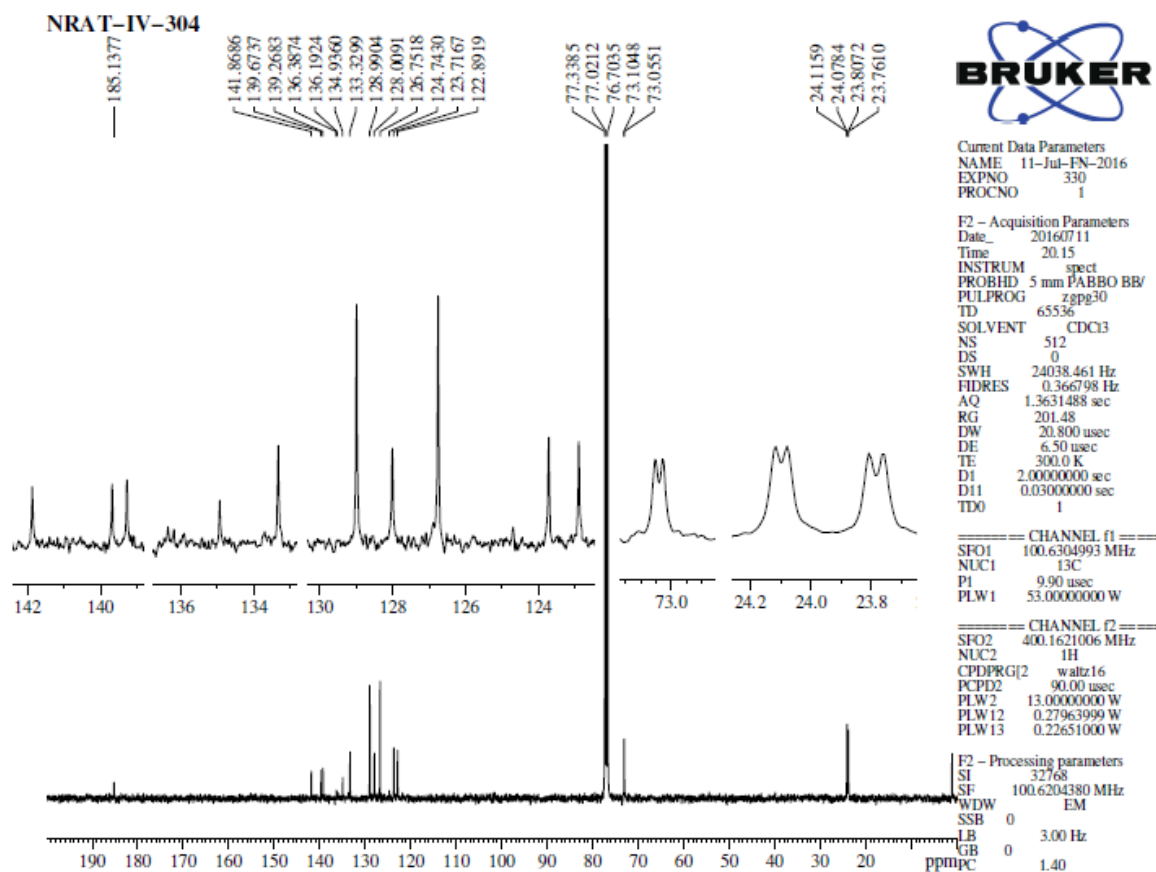
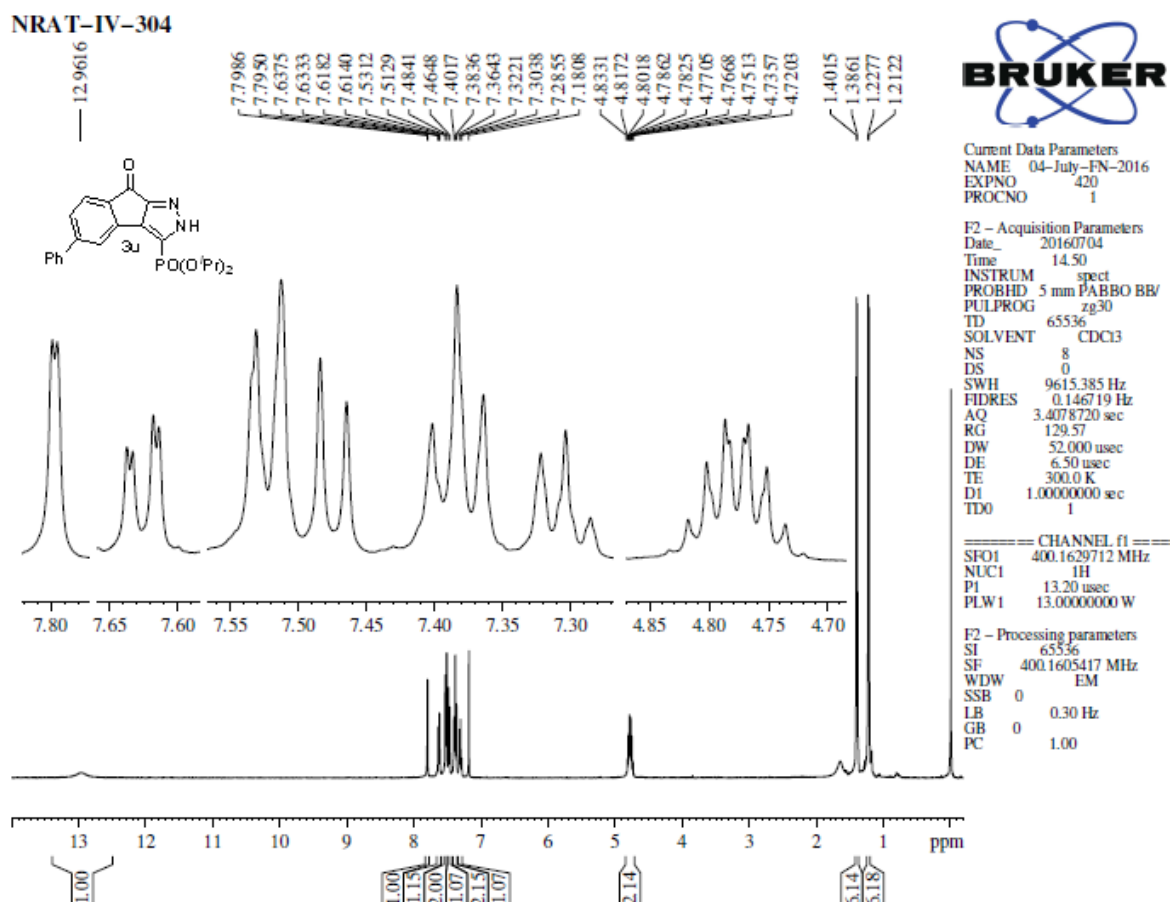
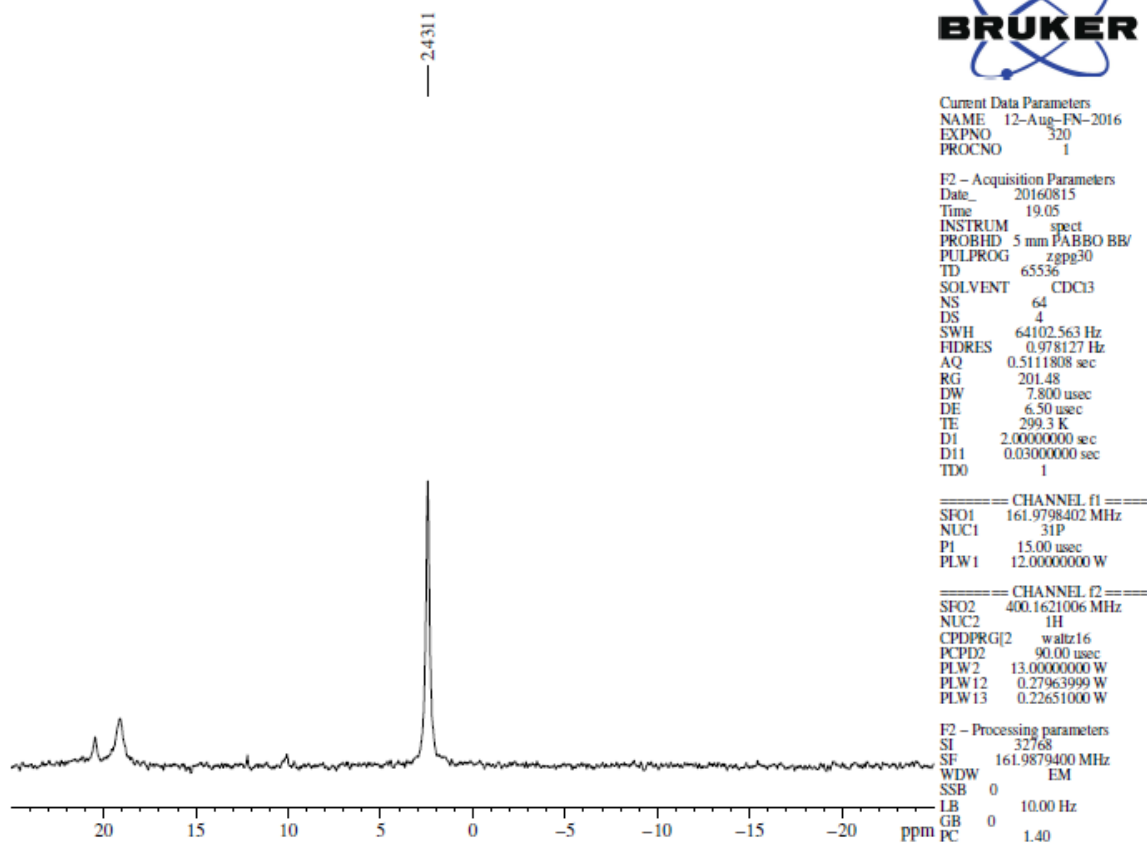
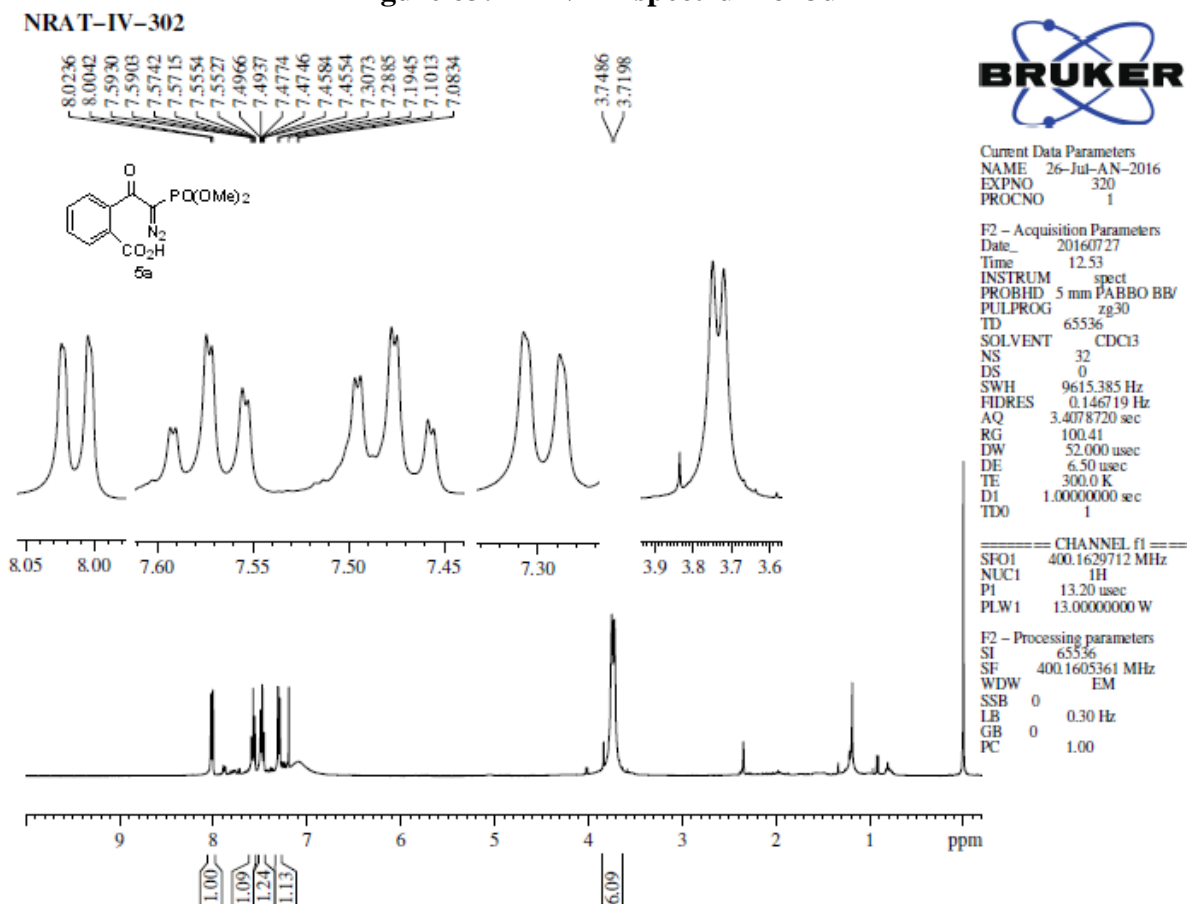


Figure 60:  $^{31}\text{P}$  NMR spectrum of 3t





Figure 63:  $^{31}\text{P}$  NMR spectrum of 3uFigure 64:  $^1\text{H}$  NMR spectrum of 5a

NR-AT-IV-302

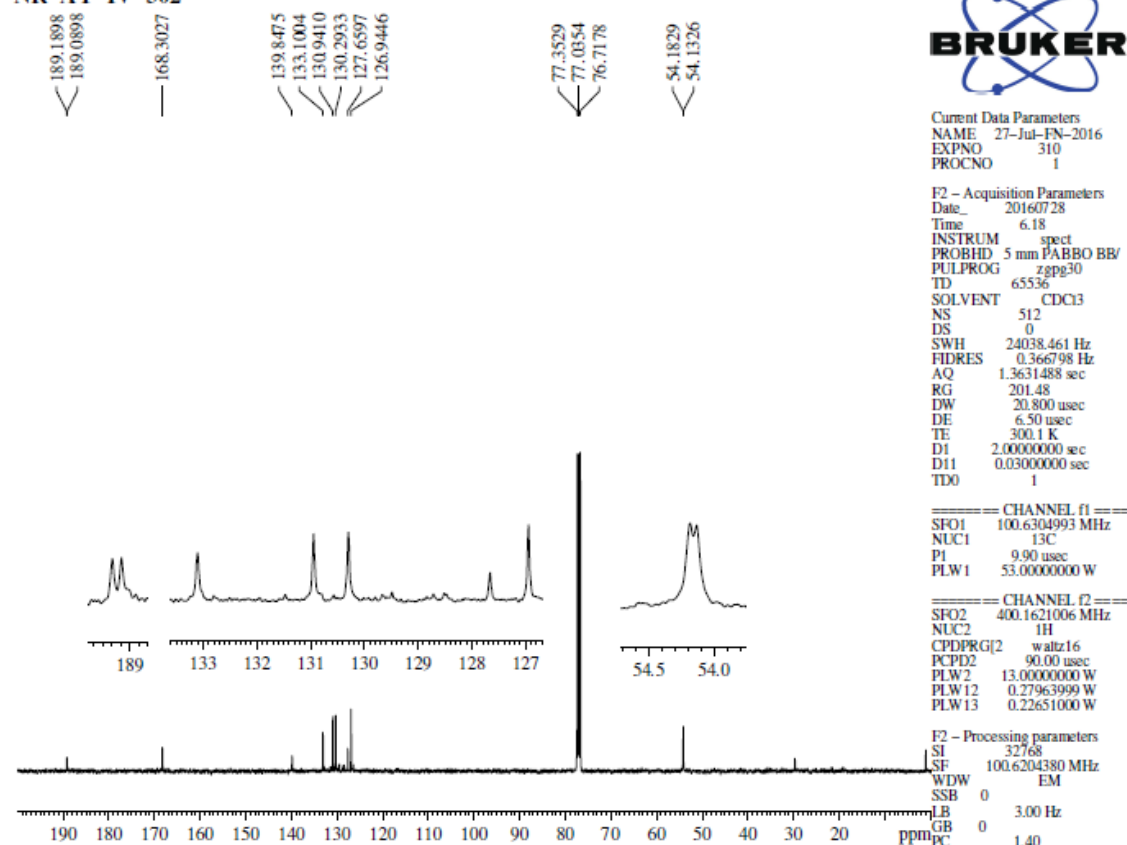


Figure 65: <sup>13</sup>C NMR spectrum of 5a

NRAT-IV-302

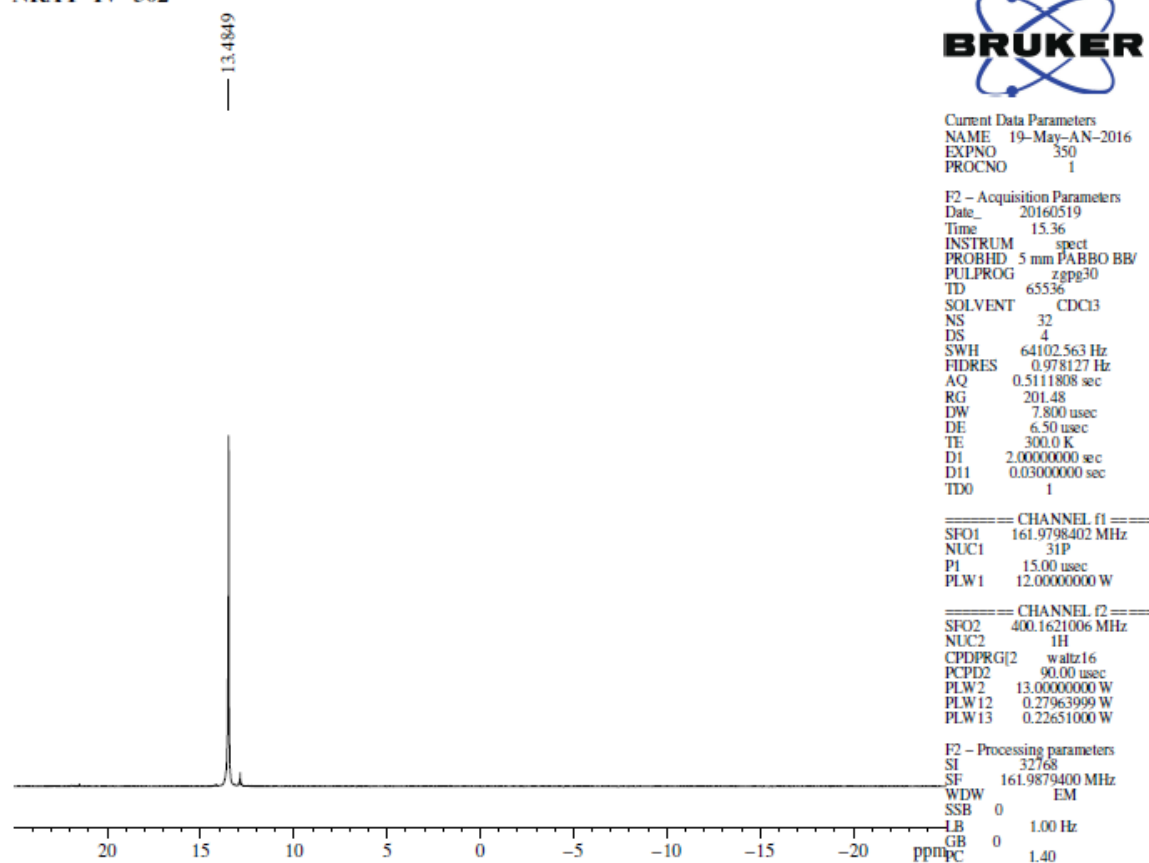
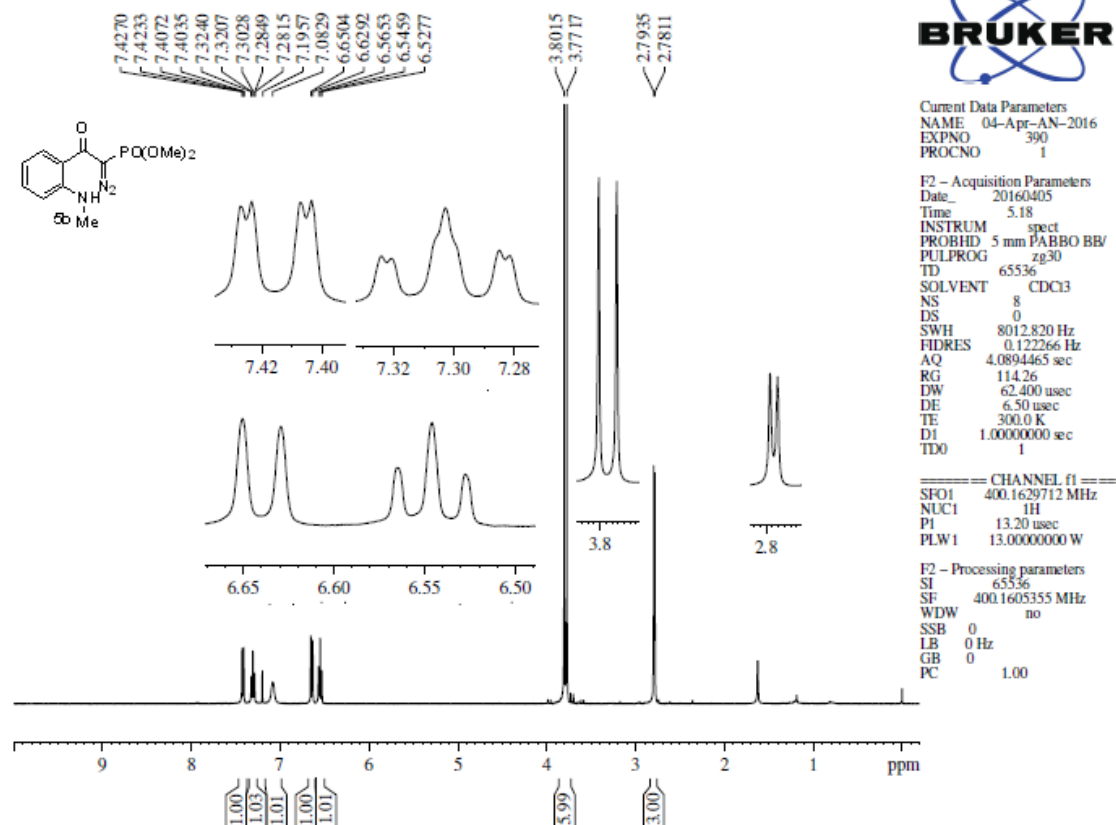
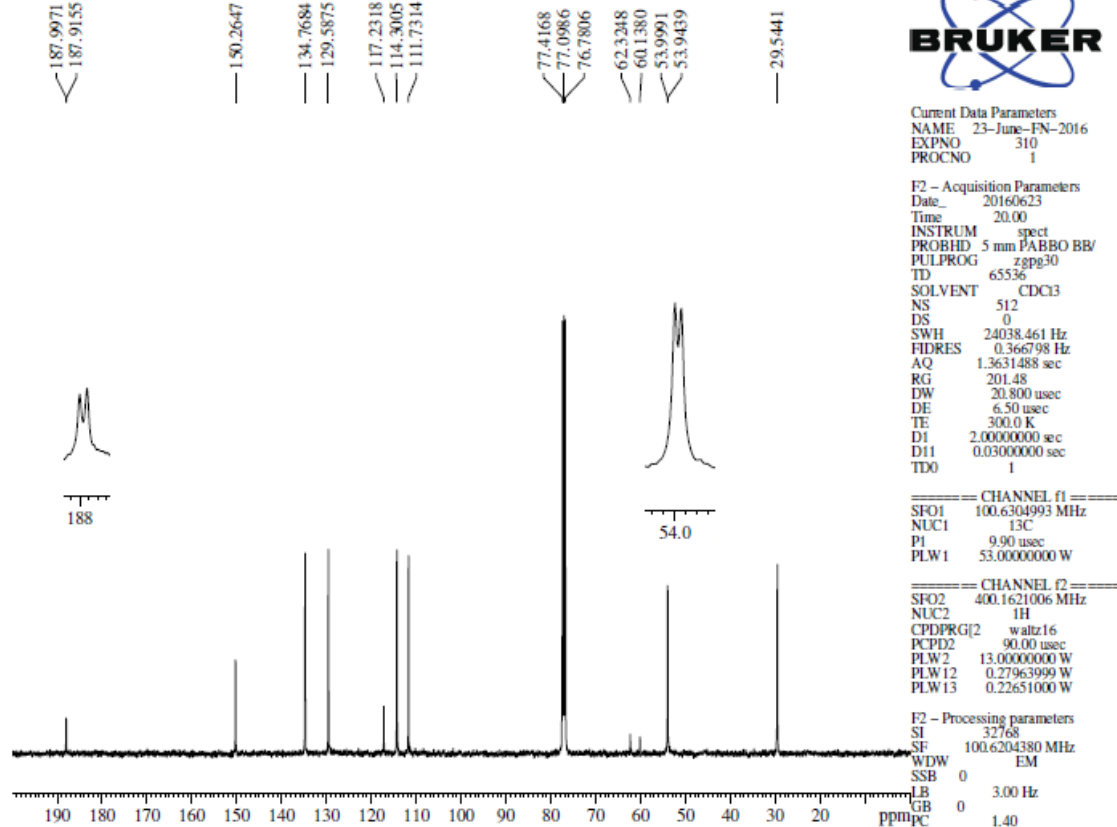


Figure 66: <sup>31</sup>P NMR spectrum of 5a

NR-AT-IV-272

Figure 67: <sup>1</sup>H NMR spectrum of 5b

NRAT-IV-272

Figure 68: <sup>13</sup>C NMR spectrum of 5b

NR-AT-IV-272

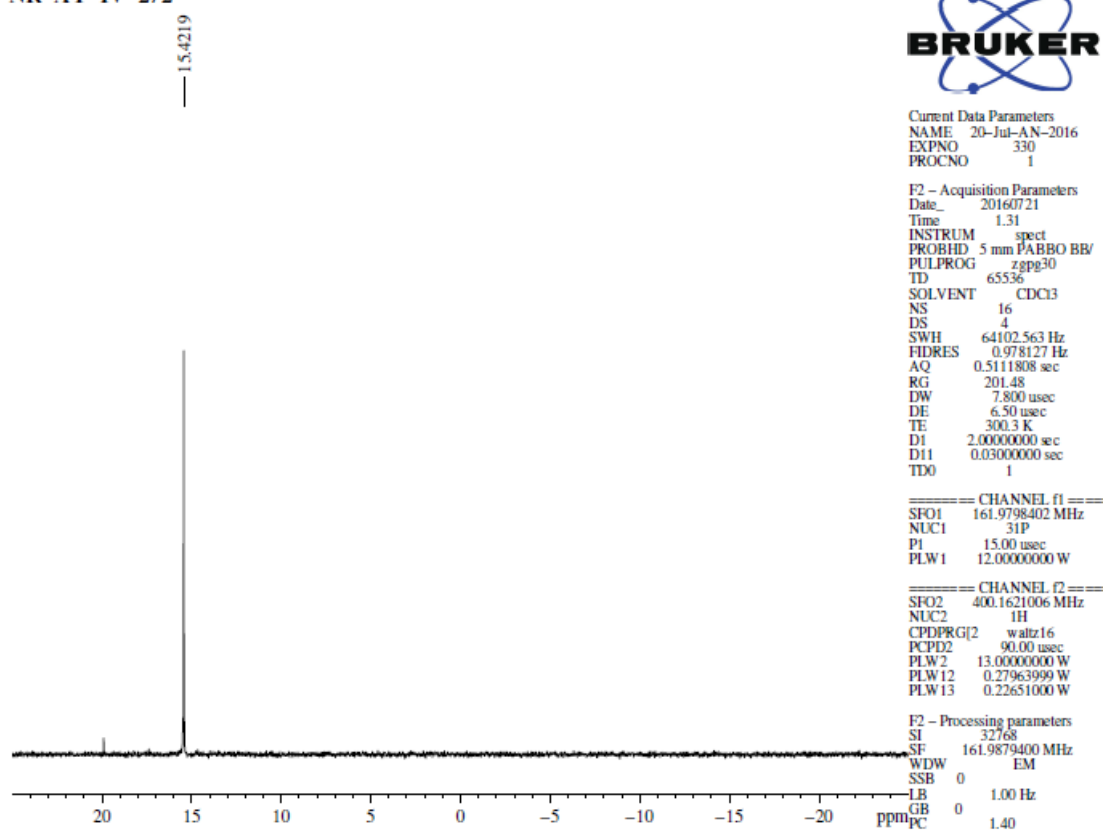
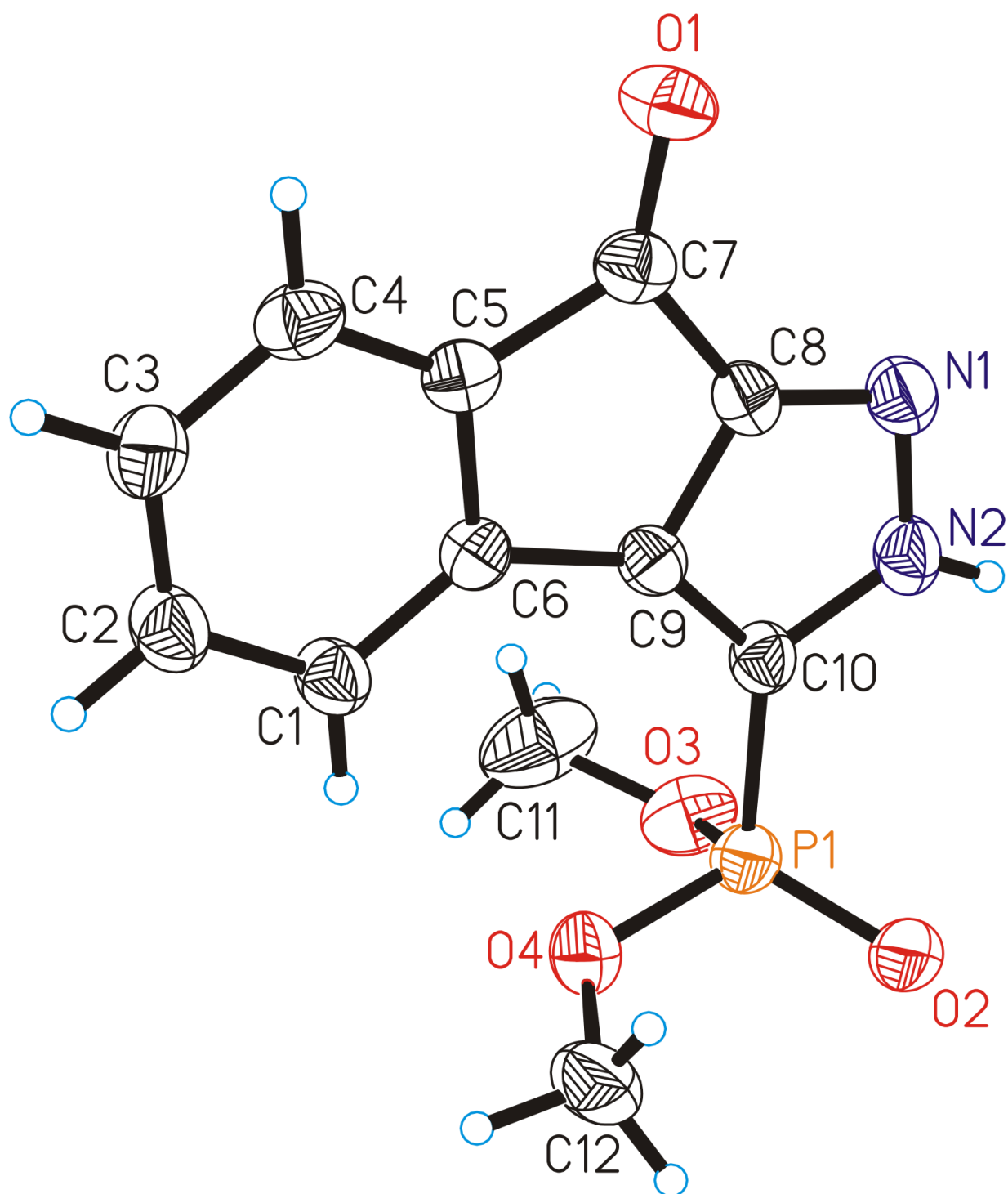


Figure 69:  $^{31}\text{P}$  NMR spectrum of 5b



**Figure 70:** Thermal ellipsoid plot with 30% ellipsoid probability for non-H atoms of the crystal structure of compound 3a determined at 293 K