

!C¥Xaw!w,Ë!b"t²W^{ao1}CÀ,±±~î¾4¹!C!pªG±zn'ú,Œ!B³]©w©!«·s®Œ·Ç±±~î¥d!A½Đž!ü,Ó±±~î¥d!AµM«á«öª@ªU
[ªº®e]!C

só.sÅã¥Ü!b [¹CÀ,±±"7¾¹] ²M³æ±Wªº,ê°T¡C

«ö@U¥H·s¼W¹CÀ,±±"ĩ¼¹jC

«ö@U¥H²³/₄°£©Ö¿í'ú^{a01}CÀ,±±'î³/₄¹¡C

«ö@U¥HÀËμø [¶¶¥³]©w]iA±z¥i¥H|b|¹³B¿ï¼Ü°¼|nª,Ë,mjC

«ö@U¥H'ú,Œ©î@Œ·Ç¹¹CA,±±î¾¹¡C

«ö@U¥H±Ò°Ê [°ÃÃø±Æ,Ñ]iC

|C¥X±±~3/4¹ IDjB¥Ø«e«ü-£µ¹UÓ ID º¹CÀ,±±~3/4¹;A¥H□î|w,Ë¹CÀ,±±~3/4¹º³s±µºδjC

«ü¥X_l¹,Ë,m¥i¥í¼t°Ó´£´Ñ^{ao}º@e^aí;C²M°£_l¹@Ö´úºè¶]ô¥H´´íí´´t²í¹w³]Ë;C

«ö@U¥HÄÜ\$ó«ü-£µ¹ζΓ´úª01CÀ,±±´ŕ¼¹¥§ ID¡C

±q¹²M³æ□ζĩ³/₄Ü¹CÀ,³s±μ[°]đ_iA¥H«ü¬£μ¹±z^{a01}CÀ,±±¬ĩ³/₄¹¡C

!P@É"îÃp«¬ ("Ò!pÂù«ò¶|s,|æ·n±i) ©M²£«~!WºÙ ("Ò!p Microsoft SideWinder [Auto Detect]) !C¥X¹CÀ,±
±"î¾¹!C!pªG!³!C¥X¹CÀ,±±"î¾¹ªº«ù©W²£«~!WºÙ!A´N¿î¾Ü,Ó!WºÙ!C
!pªG¥¹/₄!C¥X±zªº¹CÀ,±±"î¾¹²£«~!WºÙ©îÃp«¬!A½D«ö¤@¤U [!Ûq] "Ó«Ø¥ß¹CÀ,±
±"î¾¹!A©Î!w,Ë¹,Ë,mªºÅXºÊµ{!i³nÅé!C

|p^aG±z¹³!w,Ë^o!Đ;A½D«ô¤@¤U¥H¶}]±Ò [.s¼WµwÅé°ëÆF]iA¨ä¥íÅý±z!w,Ë¹CÀ,±±·î¾¹aoÅX°Êµ{!;iC

|p^aG±z^ˆS_l^{3l}w,Ë^o°D_jA_lÓ¥B¹CÀ,±±^ˆ3/4¹²M³æ□□^ˆS_l^{3l}C¥X,Ó±±^ˆ3/4¹;_lA^{1/2}D«ö□@□U¥H«ü©w¹CÀ,±±^ˆ3/4^{1a0}^ˆS©Ê_lC

«ü©w¹CÀ,±±`î¾¹¤Wªº¶b¼¼Æ¡CÁóµM!³`Ò¥~ª¬ªp¡A¡ýÂù¶b¹CÀ,±±`î¾¹³q±`¡³
´£`Ñ¡V¤W¡B¡V¤U¡B¡V«e¤¡V«áªºÊ§@¡C¤T¶b¹CÀ,±±`î¾¹³q±`¥]St,`¬y»Ö±±`î¡C¥¶¶b¹CÀ,±
±`î¾¹¹«h³q±`¥]St,`¬y»Ö©M¤è¡V²ë¡C

«Ü©W²Ä▯T¶b¬O▯è!V½L©î½ñªO;C

«ü©w²Ä▯T¶b¬O Z ¶b¡C

«ü©w¹CĀ,±±·î³¼¹▣Wªº«ö¶s¼⁄EjC

«ü©w±N±±~ĩ¾13]p-°1¼ÒÀÀ,|æ¾1¾¼PÁa±i©î·n±ijC

«ü¥X±z!³Ä²±±¾É!V±±·î¾¹¡A¥!³q±`!³·âÓ·!¥|Ó«ö!s¡C

«ü©w±±î¾1¬°µê|V½L¡C

«ü©w¹CÀ,±±·î¾¹¹³μøÄ± (POV) ÀY²¬¡CPOV ¬àÁý±z«ü©wÂsÄýμe±ª«Áéªº¡¡,m©Mªè¡V¡C

ˆEˆÑªÄ¶||;A¥HÅý±zÁäºJ!Ûq¹CÀ,±±ˆˆ¼¹ªº!WºÛ;C,Ó!WºÛ±N¥X²{!bªw!w,Ë!b¹q,£ªWªº¥!¥!±±ˆˆ¼¹²M³æªº;C

«Ü©W±±T̃¼¹¬O·n±ìjC

13C NMR (CDCl₃) δ: 155.1 (C=O), 134.1 (C=C), 128.1 (C=C), 127.1 (C=C), 126.1 (C=C), 125.1 (C=C), 124.1 (C=C), 123.1 (C=C), 122.1 (C=C), 121.1 (C=C), 120.1 (C=C), 119.1 (C=C), 118.1 (C=C), 117.1 (C=C), 116.1 (C=C), 115.1 (C=C), 114.1 (C=C), 113.1 (C=C), 112.1 (C=C), 111.1 (C=C), 110.1 (C=C), 109.1 (C=C), 108.1 (C=C), 107.1 (C=C), 106.1 (C=C), 105.1 (C=C), 104.1 (C=C), 103.1 (C=C), 102.1 (C=C), 101.1 (C=C), 100.1 (C=C), 99.1 (C=C), 98.1 (C=C), 97.1 (C=C), 96.1 (C=C), 95.1 (C=C), 94.1 (C=C), 93.1 (C=C), 92.1 (C=C), 91.1 (C=C), 90.1 (C=C), 89.1 (C=C), 88.1 (C=C), 87.1 (C=C), 86.1 (C=C), 85.1 (C=C), 84.1 (C=C), 83.1 (C=C), 82.1 (C=C), 81.1 (C=C), 80.1 (C=C), 79.1 (C=C), 78.1 (C=C), 77.1 (C=C), 76.1 (C=C), 75.1 (C=C), 74.1 (C=C), 73.1 (C=C), 72.1 (C=C), 71.1 (C=C), 70.1 (C=C), 69.1 (C=C), 68.1 (C=C), 67.1 (C=C), 66.1 (C=C), 65.1 (C=C), 64.1 (C=C), 63.1 (C=C), 62.1 (C=C), 61.1 (C=C), 60.1 (C=C), 59.1 (C=C), 58.1 (C=C), 57.1 (C=C), 56.1 (C=C), 55.1 (C=C), 54.1 (C=C), 53.1 (C=C), 52.1 (C=C), 51.1 (C=C), 50.1 (C=C), 49.1 (C=C), 48.1 (C=C), 47.1 (C=C), 46.1 (C=C), 45.1 (C=C), 44.1 (C=C), 43.1 (C=C), 42.1 (C=C), 41.1 (C=C), 40.1 (C=C), 39.1 (C=C), 38.1 (C=C), 37.1 (C=C), 36.1 (C=C), 35.1 (C=C), 34.1 (C=C), 33.1 (C=C), 32.1 (C=C), 31.1 (C=C), 30.1 (C=C), 29.1 (C=C), 28.1 (C=C), 27.1 (C=C), 26.1 (C=C), 25.1 (C=C), 24.1 (C=C), 23.1 (C=C), 22.1 (C=C), 21.1 (C=C), 20.1 (C=C), 19.1 (C=C), 18.1 (C=C), 17.1 (C=C), 16.1 (C=C), 15.1 (C=C), 14.1 (C=C), 13.1 (C=C), 12.1 (C=C), 11.1 (C=C), 10.1 (C=C), 9.1 (C=C), 8.1 (C=C), 7.1 (C=C), 6.1 (C=C), 5.1 (C=C), 4.1 (C=C), 3.1 (C=C), 2.1 (C=C), 1.1 (C=C), 0.1 (C=C).

Äã¥Üçíú^{ao±±î¾¹} IDjCYn«ü©w¹CÀ,±±î¾¹µ¹¹ IDjA½Ð«ö¤@¤U [¹CÀ,±±î¾¹] ²M³æ¤W^{ao±±î¾¹}WºÜ;C

|C¥X¥i¥î^{ao1}CÀ,±±·î³/₄¹iC«ô¤@¤U±z·Qn³]i^{·°3}/₄iñ,Ë,m^{ao}±±·î³/₄¹(!bÄ~©ÓÄ³¥îμ{!i¤¤)iA!A«ô [½T©w]iC

«Ü©w¹CÀ,±±·î¾¹·ä¹³ðè!V½L©î½ñªO;A©î¹±Ò¥ît¥~³s±µªðè!V½L©î½ñªO;C

±N,Ë,m±±î«³]-°¹w³]È;CUSB ±±î³/4¹a0³]©w-O±q,Ë,m¥»`¤¤`ú±o;C`ä¥L±±î³/4¹«h@Ú³/4Ú±
±î³/4¹Äp«-î´Ó`î¥î¤@`ë³]©w;C

«ö@U¥H±Ò°Ê [Ě,m@ŒŸç°ëÆF]iA¥|¥i¥H¥Î´Ó³]©w¹CÀ,±±˘Ŧ¾¹¶bªº¾¼°Ê½d³ò;C

¥î´Ó´ú,Œ|æ°Ê^{ao1}/₂d³ò;C|p^aG´ú,Œ^æè¶|δ^{ao}¥|Ó[°]³£μL^ak¥p³;_i,l[°];_iA¹/₂Đ¹Á,Œ«·s@Œ·Ç¹CÀ,±±[°]î³/₄¹;_iC

$$\forall i: \text{Ó}^{\text{ú}}_i \tilde{\text{Ö}}_i \text{æ}^{\text{°}\hat{\text{E}}\text{a}01/2\text{d}30\text{i}} \text{C}_i \text{p}^{\text{a}} \text{G} \mu \text{L}^{\text{a}} \text{K}_i \text{I}^{\text{í}} \text{ú}_i \tilde{\text{Ö}} \text{æ}^{\text{°}\hat{\text{E}}\text{a}03/2\text{d}30\text{i}} \text{Y}^{\text{a}} \text{I}^{\text{í}} \text{ú}_i \text{A}^{1/2} \text{D}^{\text{A}}_i \tilde{\text{Ö}} \ll \text{s} \tilde{\text{Ö}} \cdot \text{Ç}^{\text{1}} \text{C}^{\text{A}}_i \pm \pm \tilde{\text{I}}^{3/4}_i \text{C}_i$$

¥Ŧ¥H´ú,Œ¹CÀ,±±´Ŧ¼¹ªµøÄ± (POV) ÀY²¯;C±z³|!h¥Ŧ¥H´ú,Œ¥|Ó POV ÀY²¯;C²Ä¤@Ó POV ÀY²¯-O-ø!âª;A²Ä¤G-
Ó-OÂÄ!âª;A²Ä¤TÓ-OŦ|Â!âª;A²Ä¥|Ó-OºŦ!âª;C!pªG¨â¤£¥¿½T!^À³;AY»Ý¨óSU,Ŧ¨MºÝÃD;A½D«ö [ºÄÄø±Æ,Ŧ]
«öŦ|S;C

´ú,Œ¹CÀ,±±î¾¹ªº«ö¶s;C¤@!_«ö¤@Ó«ö¶s;C±zªº¹CÀ,±±î¾¹»s³yºÓ·|·M©w«ö¶s½s,¹ªº«ü¬E;C

