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;veshFB_HCOCACONH3DNUS
; CP for proton dilute system, no 1H high power decoupling
; 1H->CO->CA->CO->N->H

;p2    1H p90 pulse length
;p11   1H p90 pulse power
;p15   HCO 1st CP contact time
;p16   HN 2nd CP contact time
;p117  13C COCA cp pl
;p17   13C COCA cp time
;p18   CO flip pulse ca. 65 grad
;cnst25 =18060 CO-CA iso diff
;cnst0 ==0
;p10   CO to XY = 5.6u @ 39kHz
;p16   15N p90 power
;p129  15N w16 decoupling
;p19   13C rot res. on CO, to remove ca 32 kHz
;p9    rec. time for rot. res.
;p114  15N NCO power
;p115  13CO NCO power
;p25   NCO cp time
;p17   COCA cp time
;cnst19 H2O remove
;p22   H2O remove 22m
;p23   H2O remove 33m
;p29   1H p180 in SpinEcho
;p17   1H in HtoN cp
;p110  13C 45 kHz power
;p116  H2O remove power
;p130  13C self J dec
;p119  1H pl for HtoCO cp
;cnst31 Wr
;p19   back homoCP
;p29   1H p180 for SpinEcho
;p12   13C power in H to C CP
;p126  CA/CO sp power
;p26   CA/CO sp time

;$OWNER=guest
#include <Avance.incl>
#include <Delay.incl>

define list<loopcounter> t1list=<$VCLIST>
define list<loopcounter> t2list=<$VPLIST>

define delay twait
"twait=d20"

"d0=.5u"
"d10=1u"
"d20=1u"

"in0=inf2/2"
"in2=inf2/2" ;Ca

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"in10=infl/2"
"in3=infl/2" ;Co

"COUNTER=13*12/4"

1 ze
;=====set initial angle=====
1m
"cnst27=(t1list%2)*180" ;CO
20u
"cnst28=(t2list%2)*180" ;CA
20u
"cnst30=cnst27+cnst28"
20u ip2+cnst27 ;co
20u ip23+cnst28;ca
20u ip19+cnst28;ca
20u ip15+cnst28;ca
20u ip31+cnst30;reciever
;=====
; 1H:f1, 13C:f2, 15N:f3
2 10u do:f3
d1 do:f3
1m reset:f1 reset:f2 reset:f3
1u fq=cnst25:f2
1u fq=cnst11:f1

10u pl2:f2 ;13C for NC cp
10u pl1:f1
10u pl8:f3 ; 15N HN cp
;=====Change evolution time=====
20u
"d10=in10*t1list+1u"
20u
"d3=20m-in3*t1list" ;Co
20u
"d0=in0*t2list+1u"
20u
"d2=20m-in2*t2list" ;CA
;=====
p2:f1 ph1

.6u pl19:f1

(p15 ph0):f1 (p15:spf2 ph2):f2 ;;HtoCO
.6u pl1:f1
p11:f1 ph3

;===CO evolution =====
10u
2u pl6:f3
d10 pl26:f2
(center (p26:spf5 ph25):f2 (p11 ph25):f3) ; CA p180
d10

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10u
(p26:spf6 ph25):f2 ; CO p180
10u
2u
(p26:spf5 ph25):f2 ; CA p180
10u pl29:f3

4u pl18:f2 ;
(p18 ph18):f2 ; CO flip for HORROR transfer
.8u fq=cnst0:f2
.8u pl17:f2
(p17:spf17 ph17):f2 ; HORROR
.8u pl10:f2
(p10 ph10):f2
.8u pl9:f2
(p9 ph9):f2 ; remove CO

;===Ca evolution =====
.7u cpd4:f3
d0
d0

1u do:f3
1u pl21:f2
(pl19:spf16 ph23):f2 ; back HORROR

.8u pl18:f2
.8u fq=cnst25:f2
(p18 ph19):f2 ; CO flip for to XY after HORROR transfer
.8u pl15:f2 ;13C for NC cp
.8u pl14:f3 ;15N N-C cp

(p25:spf3 ph15):f2 (p25 ph14):f3 ;;CO to N

.5u pl6:f3
p5:f3 ph16 ; 15N to Z
d2
d2
d3
d3

twait ; H20 dephase and calibr, power for 15N

5u pl7:f1 ; back CP 1H power
5u fq=cnst0:f1
d9

(p27 ph21):f1 ; 1H precompensation pulse ==p16
(p5 ph20):f3 ; 15N to XY
.8u pl8:f3
(pl6:spf4 ph12):f3 (p16 ph11):f1

1u pl29:f3 ; WALTZ power on 15N
1u cpd1:f3

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go=2 ph31
10u do:f3          ;decoupler off

10m wr #0  if #0 zd
;====loop control=====
1m ip23
1m ip19
1m ip15          ;CA
lo to 2 times 2
1m dp23*2
1m dp19*2
1m dp15*2       ;reset CA angle
1m ip2          ;CO
lo to 2 times 2

1m rp23 ;CA
1m rp19 ;CA
1m rp15 ;CA
1m rp2  ;CO

1m t2list.inc
1m t1list.inc

1m
"cnst28=(t2list%2)*180" ;CA
1m
"cnst27=(t1list%2)*180" ;CO
1m
"cnst30=cnst27+cnst28"
20u ip2+cnst27 ;co
20u ip23+cnst28;ca
20u ip19+cnst28;ca
20u ip15+cnst28;ca
20u ip31+cnst30;reciever
lo to 2 times COUNTER

HaltAcqu, 1m          ;jump address for protection files
exit                  ;quit

ph0= 0 2          ; 1H cp
ph1= 1 1 1 1 3 3 3 3 ;1H p90 excite
ph2= 0 0 2 2          ; 13C in 15Nto13C cp
ph3= 3 3 3 3 1 1 1 1 ; 13C p90 calibration

ph17= 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2
ph18= 1 1 1 1 1 1 1 1 3 3 3 3 3 3 3 3
ph19= 1 1 1 1 1 1 1 1
ph10= 2 2 2 2 2 2 2 2 0 0 0 0 0 0 0 0
ph9= 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2 ; CO remove before CA t1
ph23= 2 2 2 2 2 2 2 2 ; back CA to CO cp

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ph4= 0 ; 15N in 1st HN cp
ph13= 0 ; 15N in 1st NCO cp
ph14= 1 3 ; 15N in 2nd CON cp
ph15= 0 ; 13C in 2nd CON cp
ph16= 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
      2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
      0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ; 15N p90 to Z
      0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
ph20= 1 1 1 1 1 1 1 1 3 3 3 3 3 3 3 3 ; 15N p90 to XY
ph12= 0 ; ; 15N in 2nd NH cp

ph22= 0 0 0 0 2 2 2 2
ph26= 1 1 1 1 3 3 3 3 ; H2O suppression
ph24= 1 1 1 1 1 1 1 1

ph11= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ; 1H in 2nd NH cp
      2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

ph21= 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
      0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ; 1H before back NH cp for 1H
precompensation

ph29= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ; 1H p180 in Spin Echo ==ph11
      2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

ph25=0

ph31= 0 2 2 0 2 0 0 2 2 0 0 2 0 2 2 0
      2 0 0 2 0 2 2 0 0 2 2 0 2 0 0 2
      2 0 0 2 0 2 2 0 0 2 2 0 2 0 0 2
      0 2 2 0 2 0 0 2 2 0 0 2 0 2 2 0

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