Figure 1

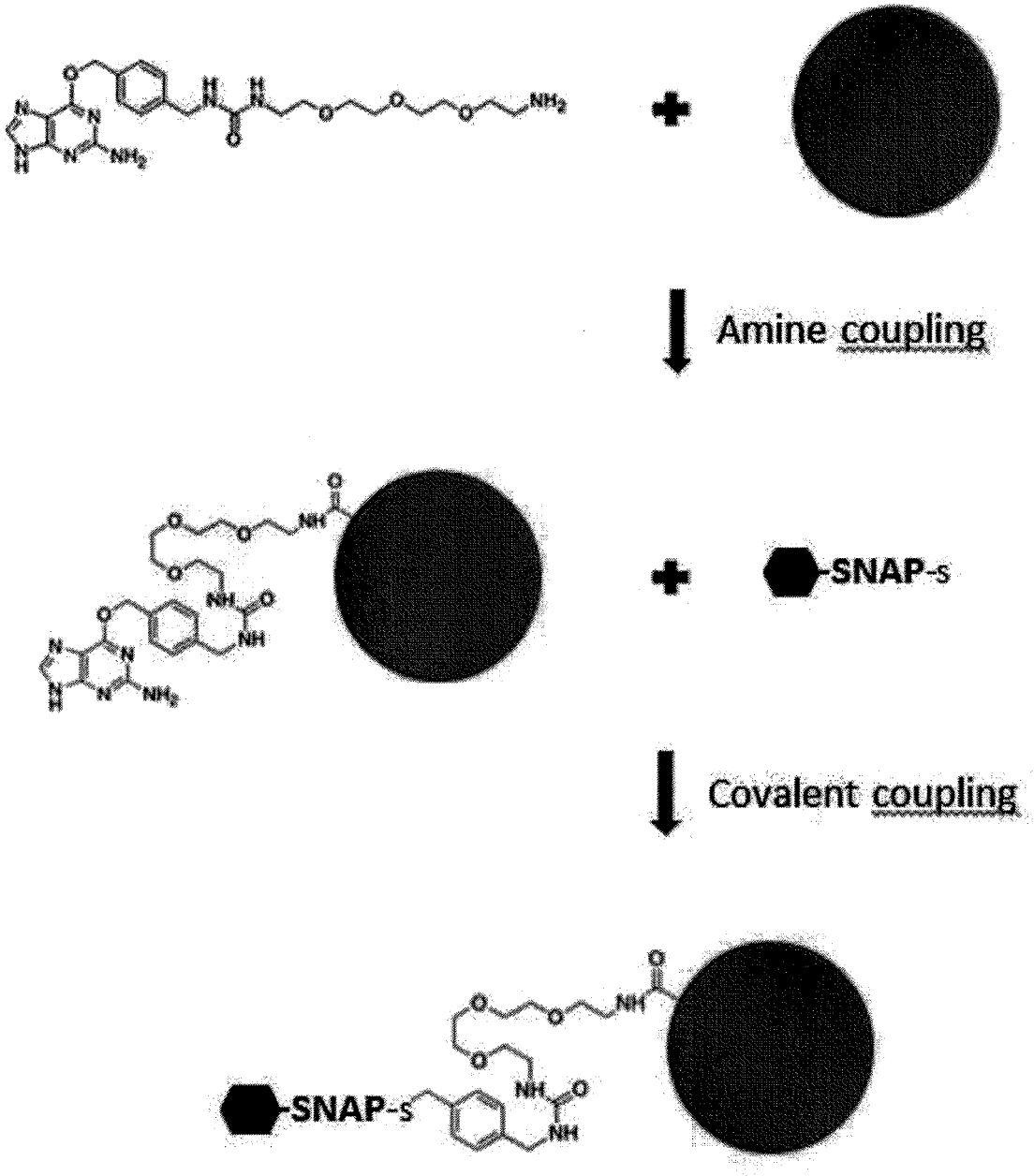


Figure 2

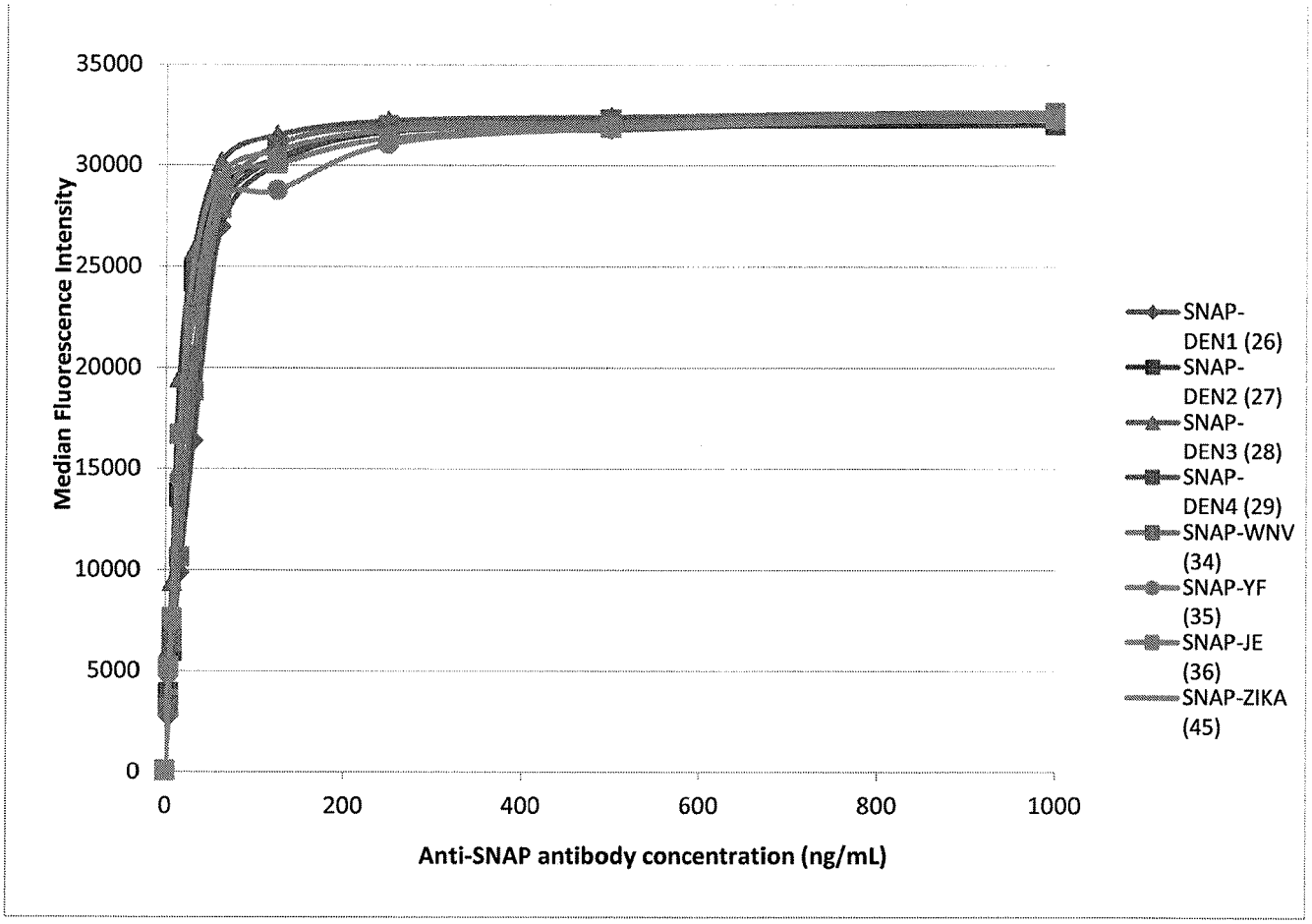

35000
30000
25000
20000
15000
10000
5000
0
Median Fluorescence Intensity
0
200
400
600
800
1000
Anti-SNAP antibody concentration (ng/mL)
SNAP-DEN1 (26)
SNAP-DEN2 (27)
SNAP-DEN3 (28)
SNAP-DEN4 (29)
SNAP-WNV (34)
SNAP-YF (35)
SNAP-JE (36)
SNAP-ZIKA (45)

Figure 3

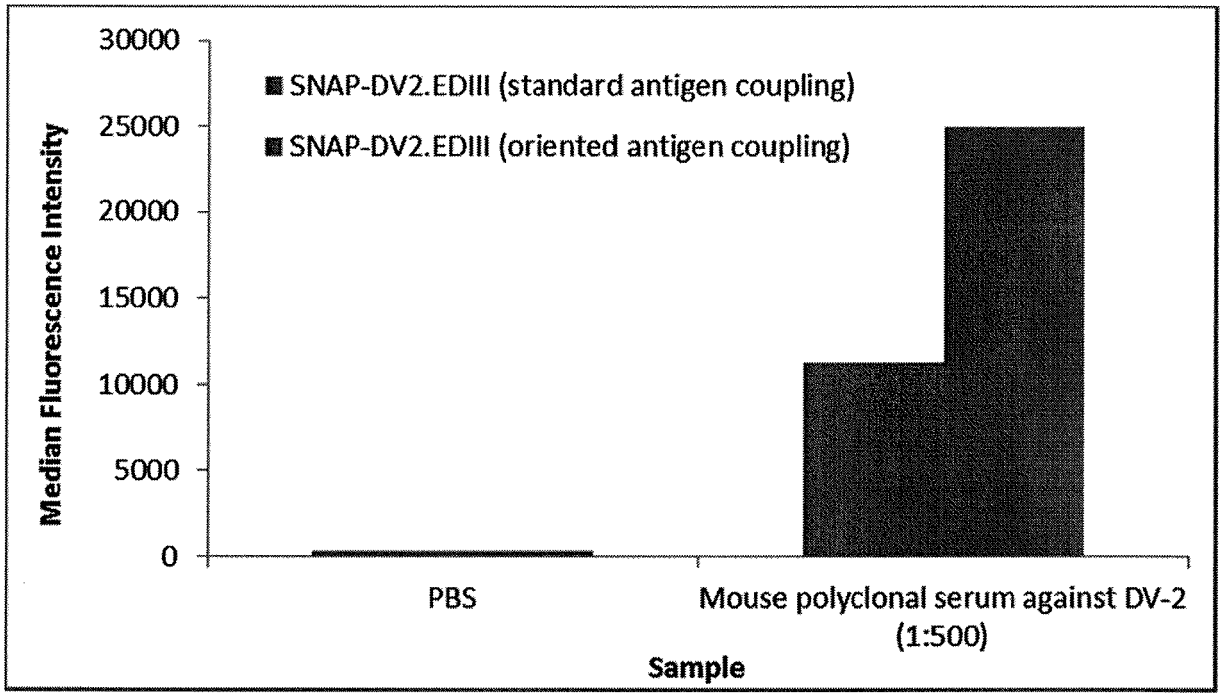

30000
25000
20000
15000
10000
5000
0
Median Fluorescence Intensity
SNAP-DV2.EDIII (standard antigen coupling)
SNAP-DV2.EDIII (oriented antigen coupling)
PBS
Mouse polyclonal serum against DV-2 (1:500)
Sample

Figure 4

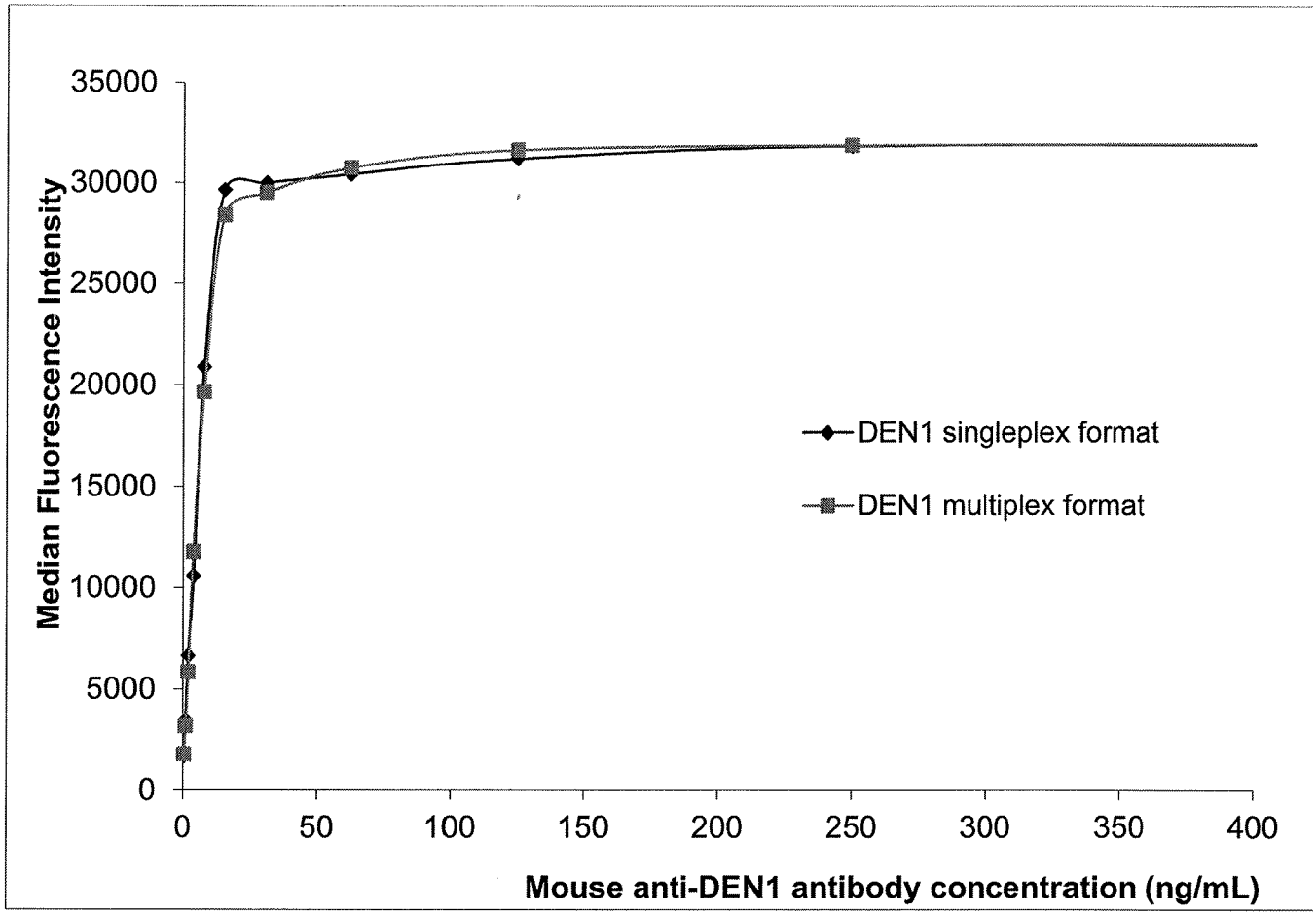

35000
30000
25000
20000
15000
10000
5000
0
Median Fluorescence Intensity
0
50
100
150
200
250
300
350
400
Mouse anti-DEN1 antibody concentration (ng/mL)
DEN1 singleplex format
DEN1 multiplex format

Figure 5

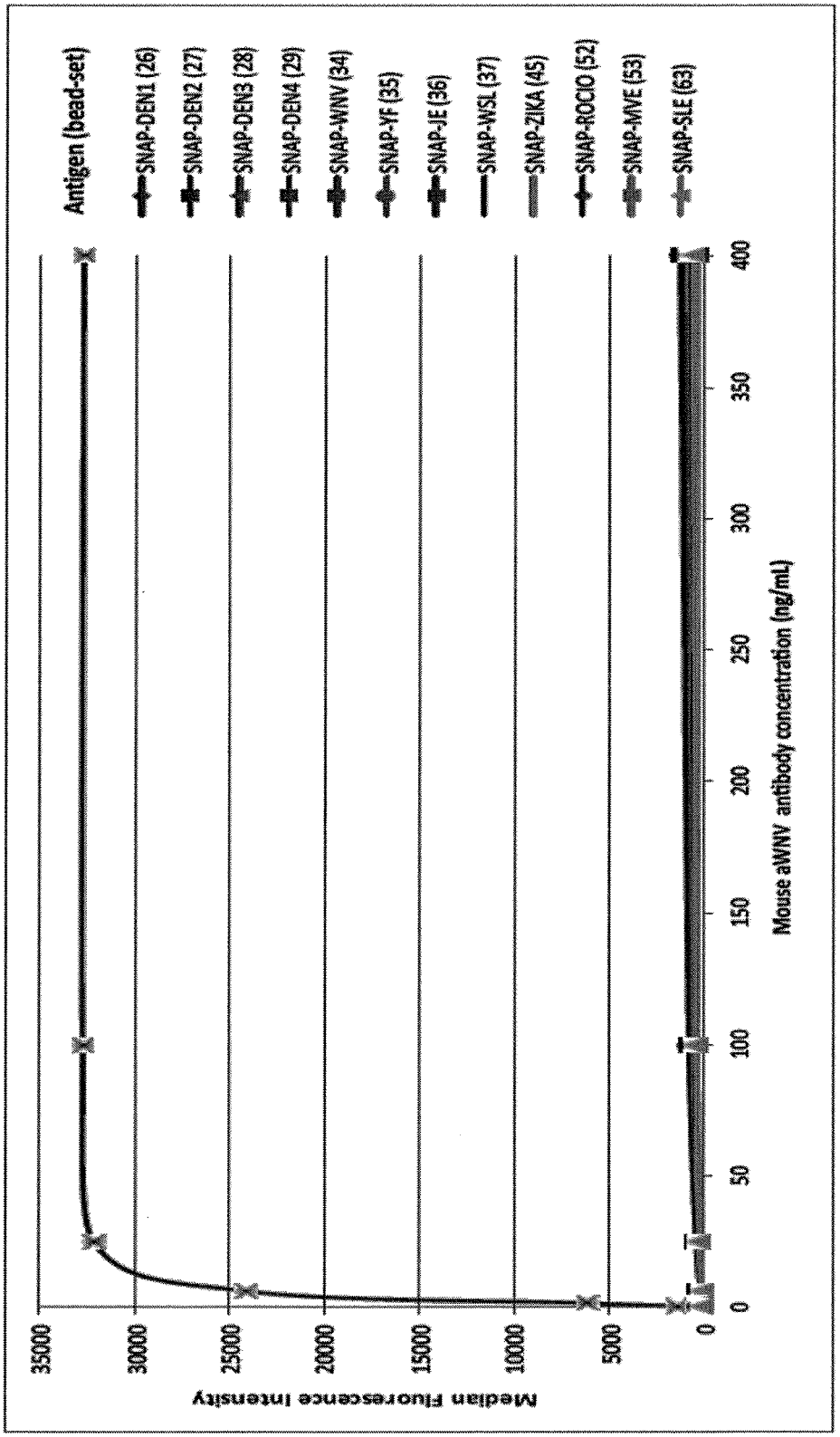
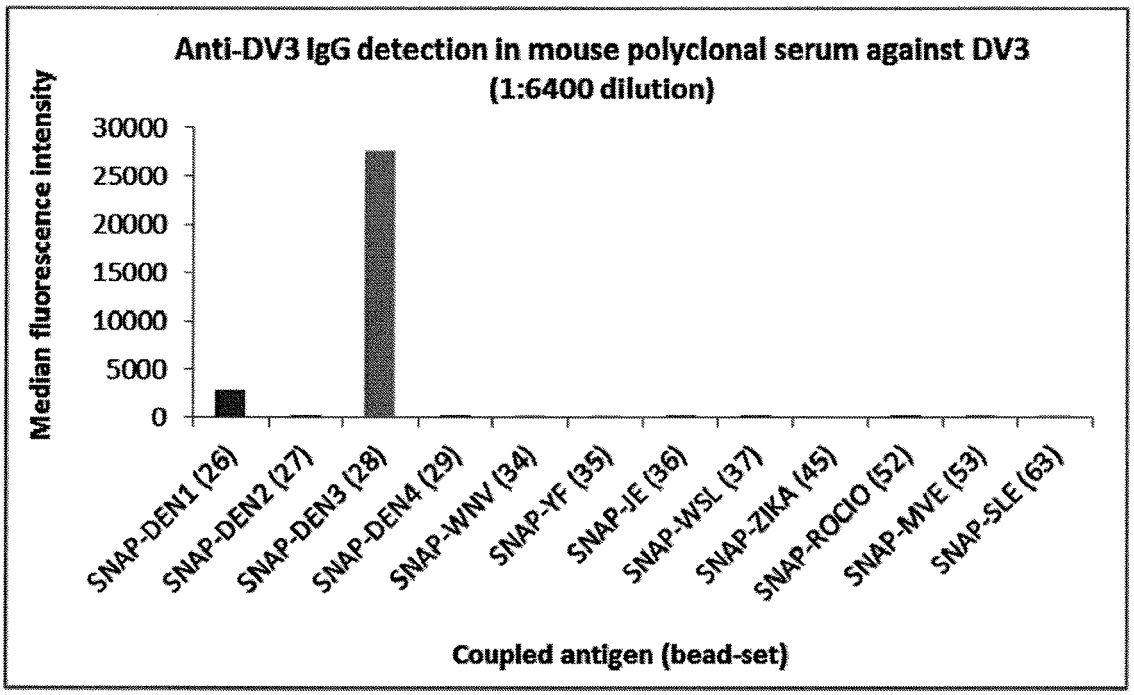

Antigen (bead-set)
SNAP-DEN1 (26)
SNAP-DEN2 (27)
SNAP-DEN3 (28)
SNAP-DEN4 (29)
SNAP-WNV (34)
SNAP-YF (35)
SNAP-JE (36)
SNAP-WSL (37)
SNAP-ZIKA (45)
SNAP-ROCIO (52)
SNAP-MVE (53)
SNAP-SLE (63)
Median Fluorescence Intensity
35000
30000
25000
20000
15000
10000
5000
0
0
50
100
150
200
250
300
350
400
Mouse aWNV antibody concentration (ng/mL)

Figure 6

A


Anti-DV3 IgG detection in mouse polyclonal serum against DV3
(1:6400 dilution)
Median fluorescence intensity
30000
25000
20000
15000
10000
5000
0
SNAP-DEN1 (26)
SNAP-DEN2 (27)
SNAP-DEN3 (28)
SNAP-DEN4 (29)
SNAP-WNV (34)
SNAP-YF (35)
SNAP-JE (36)
SNAP-WSL (37)
SNAP-ZIKA (45)
SNAP-ROCIO (52)
SNAP-MVE (53)
SNAP-SLE (63)
Coupled antigen (bead-set)

B

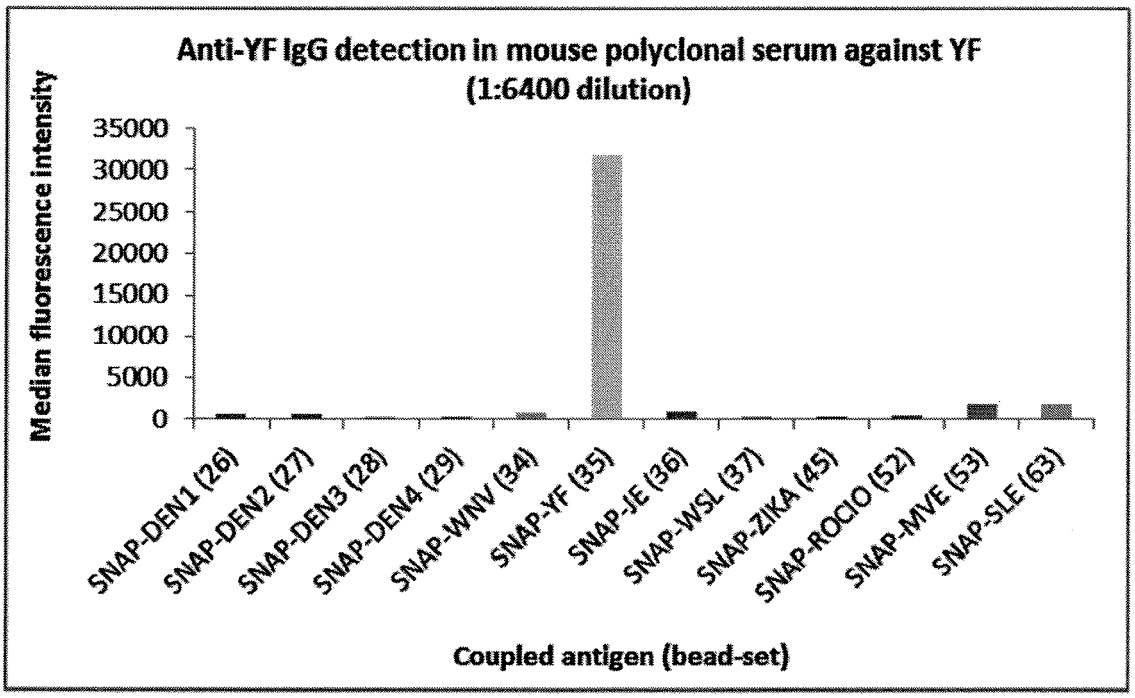

Anti-YF IgG detection in mouse polyclonal serum against YF
(1:6400 dilution)
Median fluorescence intensity
35000
30000
25000
20000
15000
10000
5000
0
SNAP-DEN1 (26)
SNAP-DEN2 (27)
SNAP-DEN3 (28)
SNAP-DEN4 (29)
SNAP-WNV (34)
SNAP-YF (35)
SNAP-JE (36)
SNAP-WSL (37)
SNAP-ZIKA (45)
SNAP-ROCIO (52)
SNAP-MVE (53)
SNAP-SLE (63)
Coupled antigen (bead-set)

Figure 7

Figure 7A

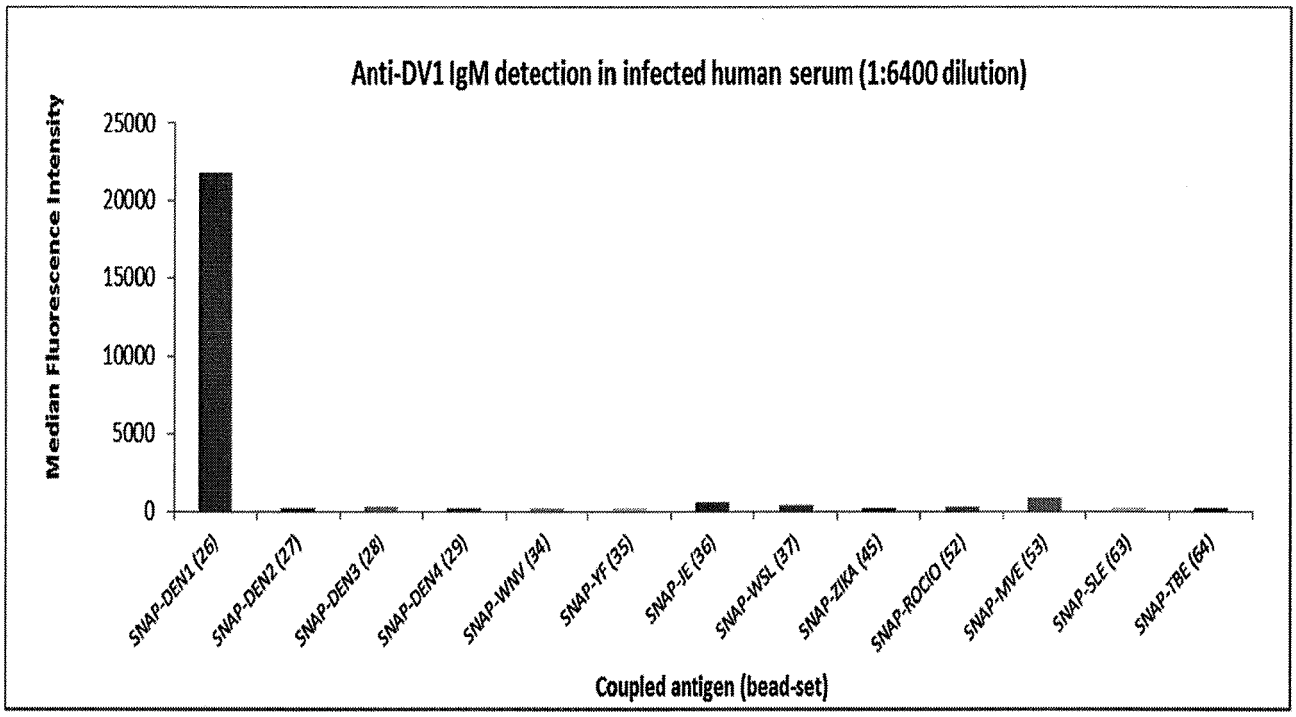


Figure 7B

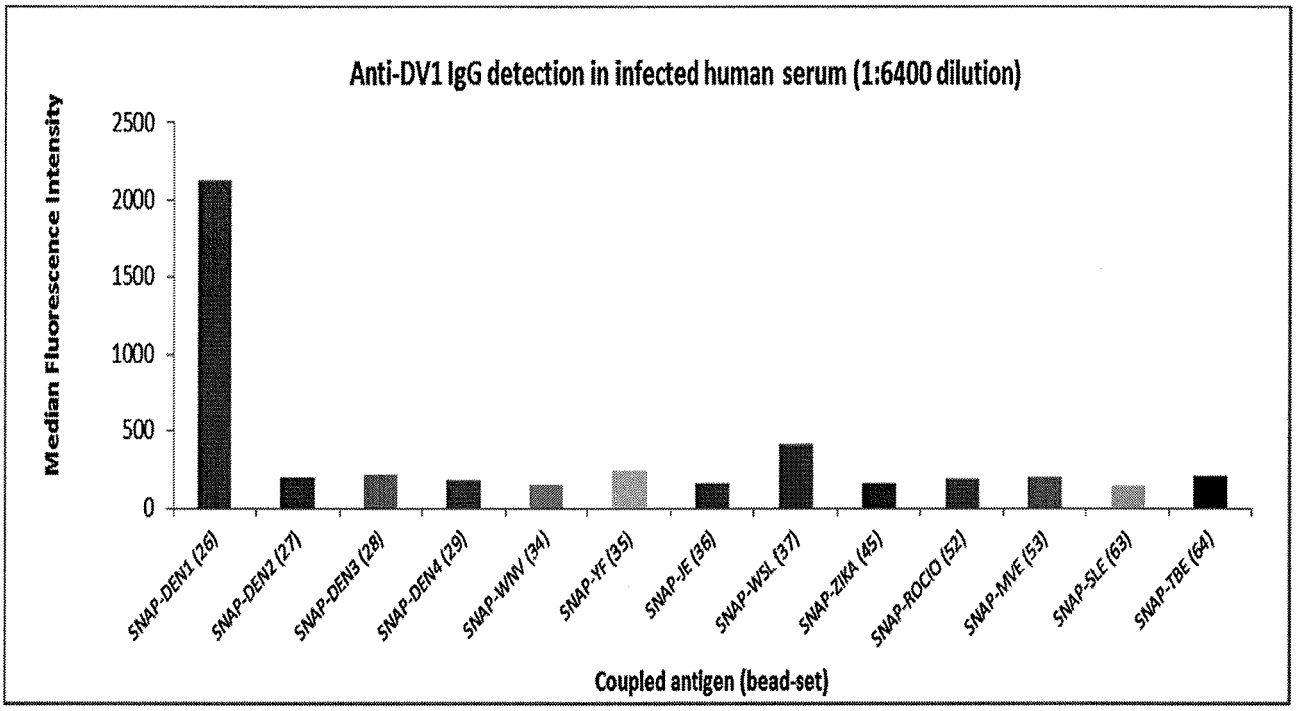


Figure 8

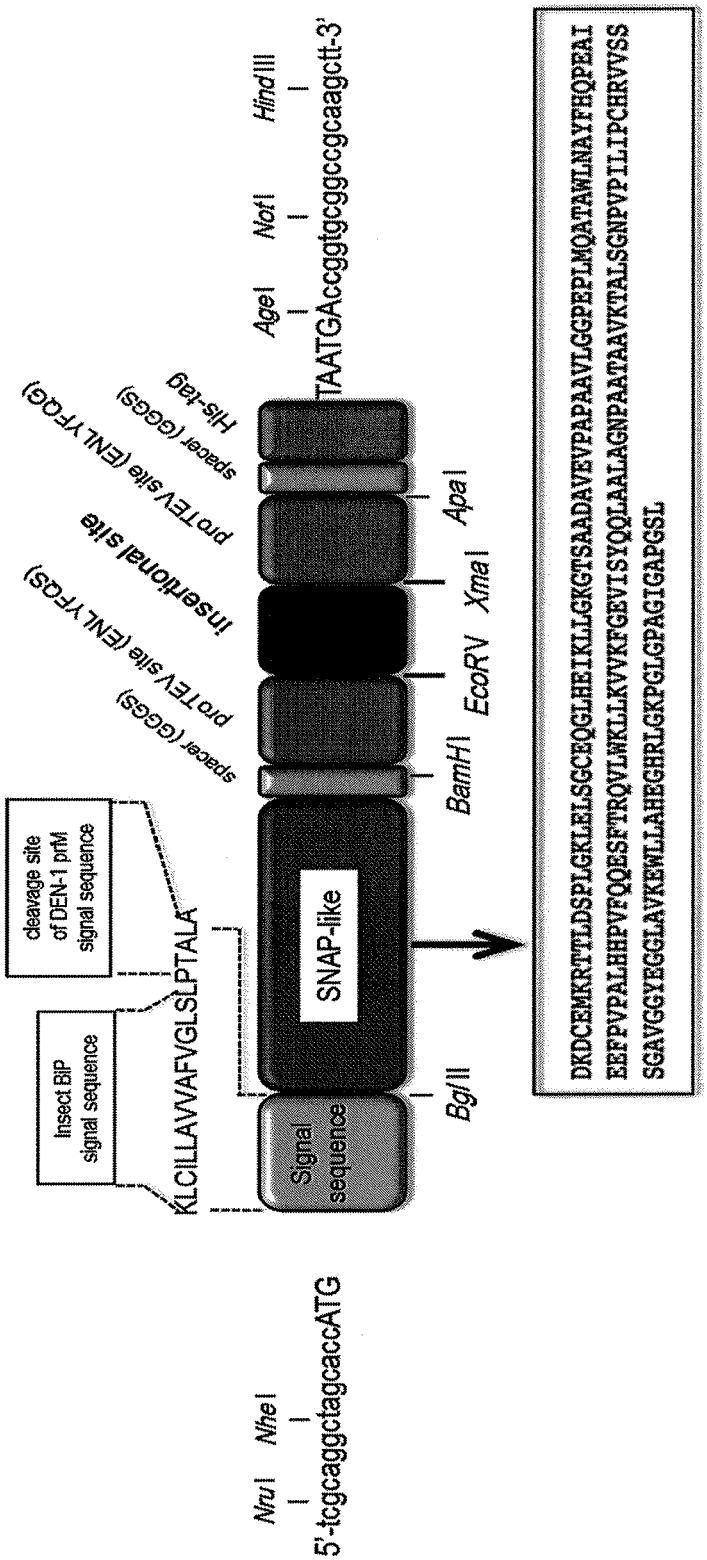

5'-tcgcaggctagcaccATG
NruI NheI
KLCILLAVVAFVGLSLPTALA
Insect BiP signal sequence
cleavage site of DEN-1 prM signal sequence
Signal sequence
SNAP-like
BglII
BamHI
spacer (GGGS)
proTEV site (ENL YFQS)
insertional site
proTEV site (ENL YFQG)
spacer (GGGS)
His-tag
EcoRV
XmaI
ApaI
AgeI
NotI
HindIII
TAATGAccggtgcggccgcaagctt-3'
DKDCEMKRTTLDSPLGKLELSGCEQGLHEIKLLGKGTSAADAVEVPAPAAVLGGPEPLMQATAWLNAYFHQPEAI
EEFPVPALHHPVFQQESFTRQVLWKLLKVVKFGEVISYQQLAALAGNPAATAAVKTALSGNPVPILIPCHRVVSS
SGAVGGYEGGLAVKEWLLAHEGHRLGKPGLGPAGIGAPGSL

Figure 9

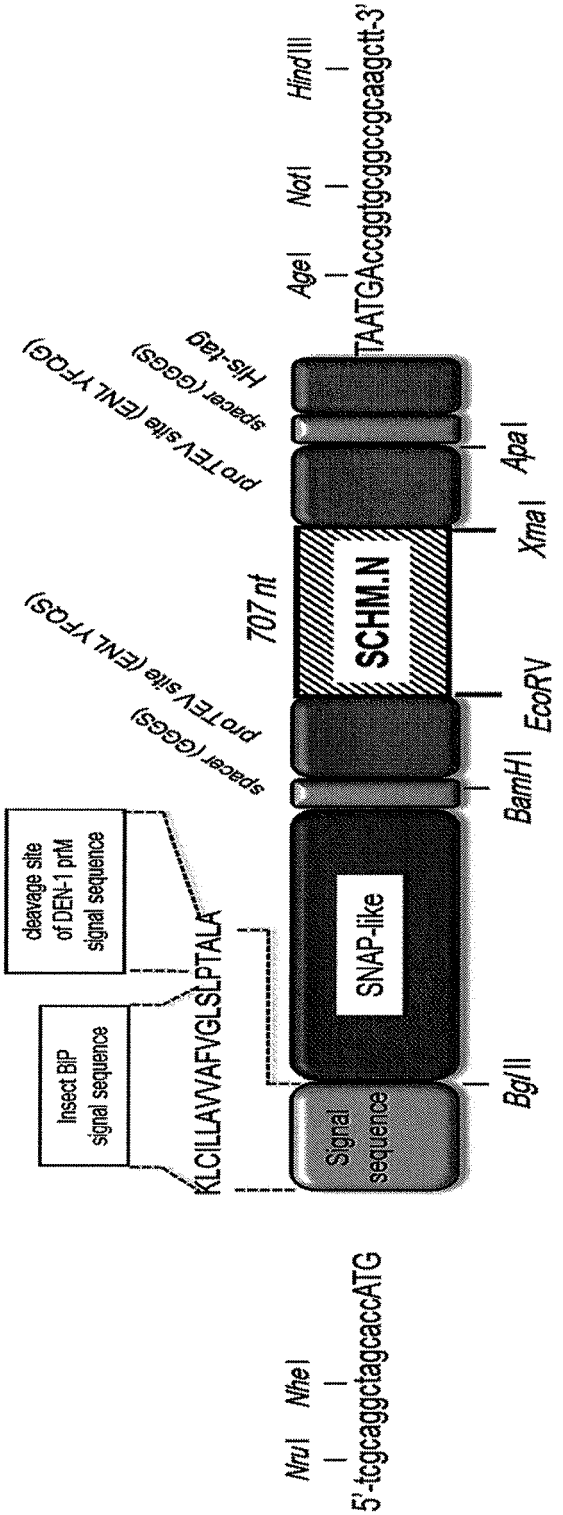

5'-tcgcaggctagcaccATG
NruI
NheI
KLCILLAVVAFVGLSLPTALA
Insect BiP signal sequence
cleavage site of DEN-1 prM signal sequence
Signal sequence
SNAP-like
BglII
BamHI
EcoRV
707 nt
SCHM.N
XmaI
ApaI
spacer (GGGS)
pro TEV site (ENL YFQG)
spacer (GGGS)
pro TEV site (ENL YFQG)
His-tag
AgeI
NotI
HindIII
TAATGAccggtgcggccgcaagctt-3'

Figure 10

Figure 10 A

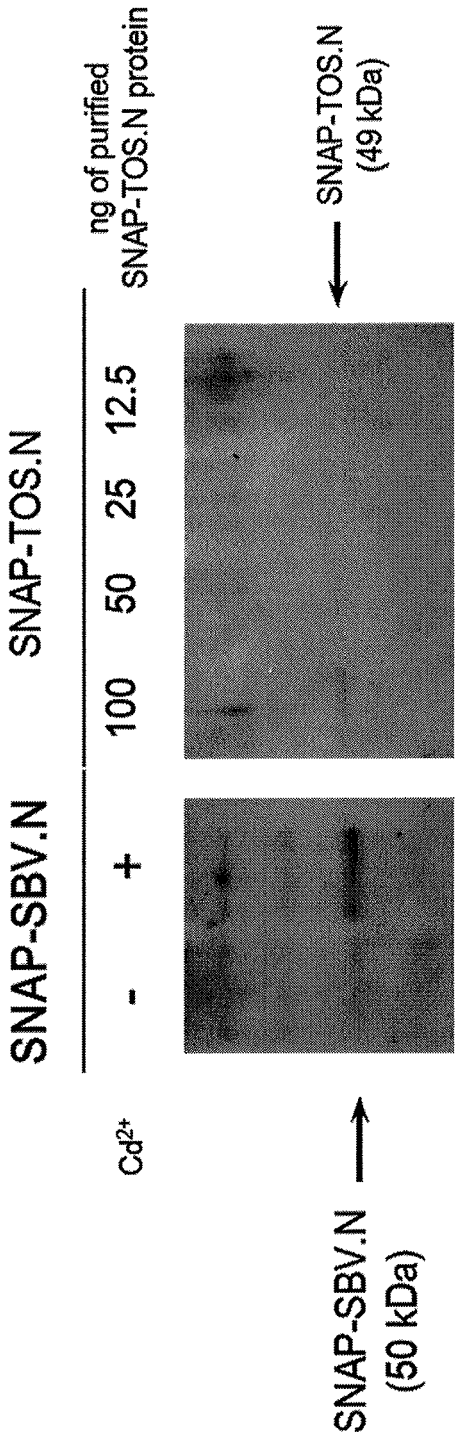


FIGURE 10 (CONTINUED)

Figure 10 B

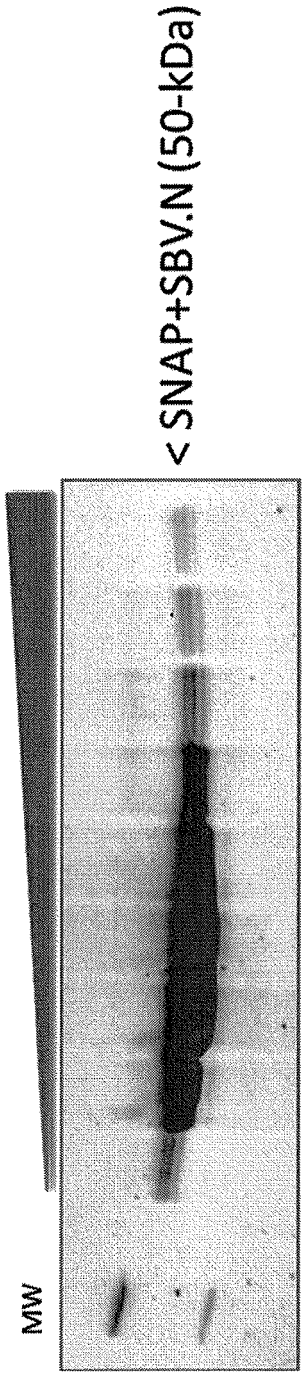


Figure 11

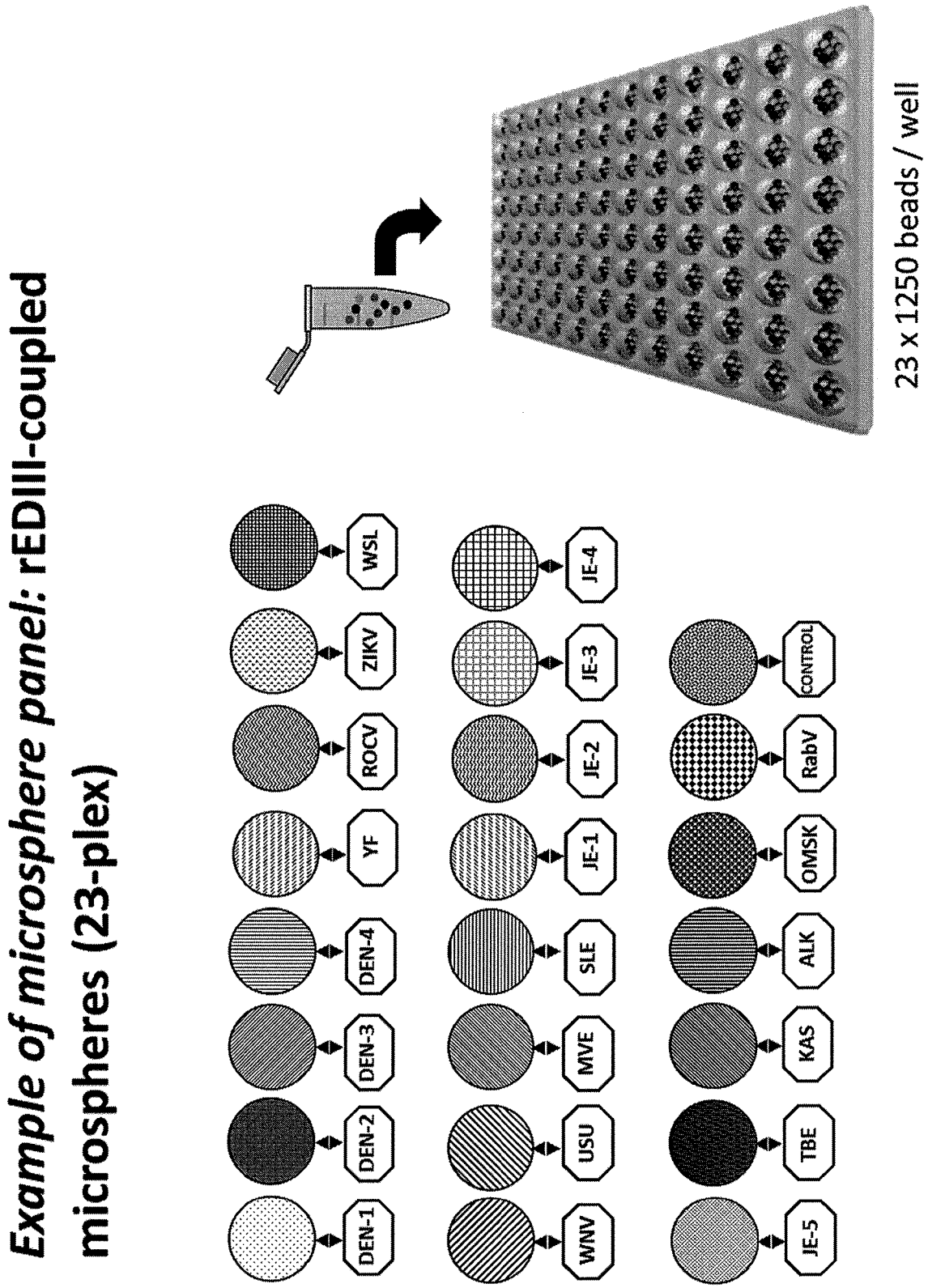

Example of microsphere panel: rEDIII-coupled microspheres (23-plex)
23 x 1250 beads / well
DEN-1
DEN-2
DEN-3
DEN-4
YF
ROCV
ZIKV
WSL
WNV
USU
MVE
SLE
JE-1
JE-2
JE-3
JE-4
JE-5
TBE
KAS
ALK
OMSK
RabV
CONTROL

FIGURE 12

Sequence of chimeric DeSNAPuniv-SARS N protein

Vector: pDeSNAPuniv. Insertion sites of the SARS N sequence are underlined.

BmtI
NruI NheI BglII

```
TCG CGA GCT AGC ACC ATG AAA CTA TGT ATT CTA CTT GCA GTT GTT GCG TTC GTA GGA TTG TCC TTA CCT ACA GCT CTG GCA AGA TCT GAC AAA GAC TGC G  < 100
S   R   A   S   T   M   K   L   C   I   L   L   A   V   V   A   F   V   G   L   S   L   P   T   A   L   A   R   S   D   K   D   C   E
            10          20          30          40          50          60          70          80          90
```

Signal peptide of SNAP — SNAP sequence

>BmrI

```
AA ATG AAA AGA ACT ACA TTG GAT TCA CCA CTT GGG AAG TTG GAA CTG AGT GGA TGC GAG CAA GGA TTG CAT GAA ATT AAG CTA CTG GGA AAA GGA ACT TC  < 200
   M   K   R   T   T   L   D   S   P   L   G   K   L   E   L   S   G   C   E   Q   G   L   H   E   I   K   L   L   G   K   G   T   S
           110         120         130         140         150         160         170         180         190
```

PflMI

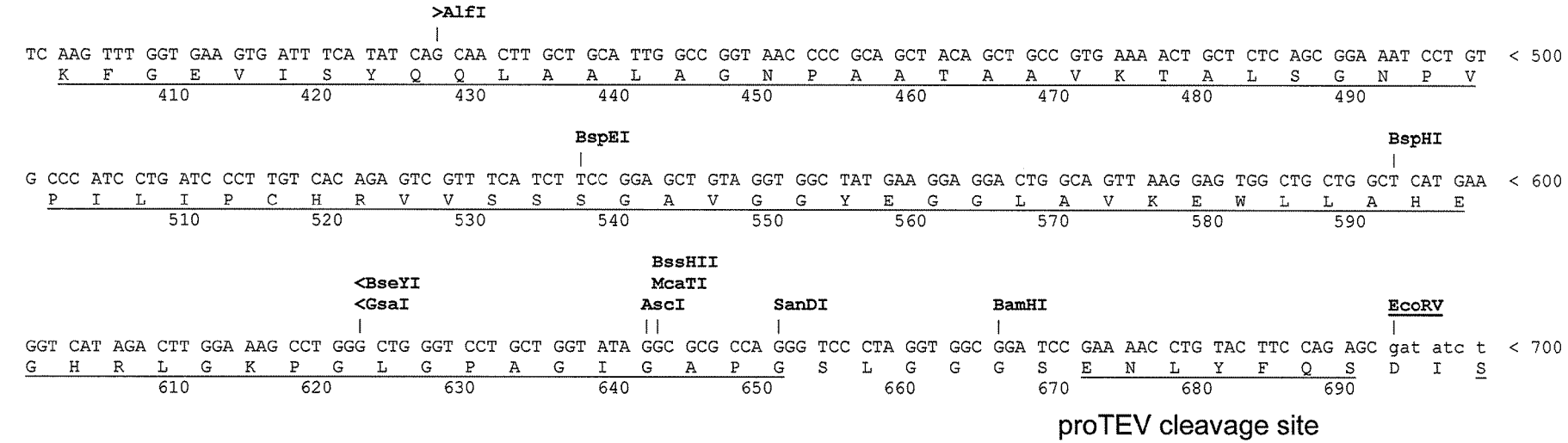
```
T GCT GCT GAT GCA GTT GAA GTT CCA GCA CCA GCA GCT GTT CTT GGA GGT CCT GAG CCC CTC ATG CAA GCC ACA GCC TGG CTT AAC GCA TAT TTC CAC CAG  < 300
  A   A   D   A   V   E   V   P   A   P   A   A   V   L   G   G   P   E   P   L   M   Q   A   T   A   W   L   N   A   Y   F   H   Q
          210         220         230         240         250         260         270         280         290
```

<RpaB5I

```
CCT GAG GCC ATT GAG GAA TTT CCA GTC CCC GCC CTT CAC CAT CCT GTG TTT CAG CAG GAG AGC TTC ACC CGC CAG GTC CTG TGG AAA TTG CTG AAG GTG G  < 400
P   E   A   I   E   E   F   P   V   P   A   L   H   H   P   V   F   Q   Q   E   S   F   T   R   Q   V   L   W   K   L   L   K   V   V
          310         320         330         340         350         360         370         380         390
```

FIGURE 12A

FIGURE 12 (CONTINUED)



Mutated N protein from SARS coronavirus

FIGURE 12B

FIGURE 12 (CONTINUED)

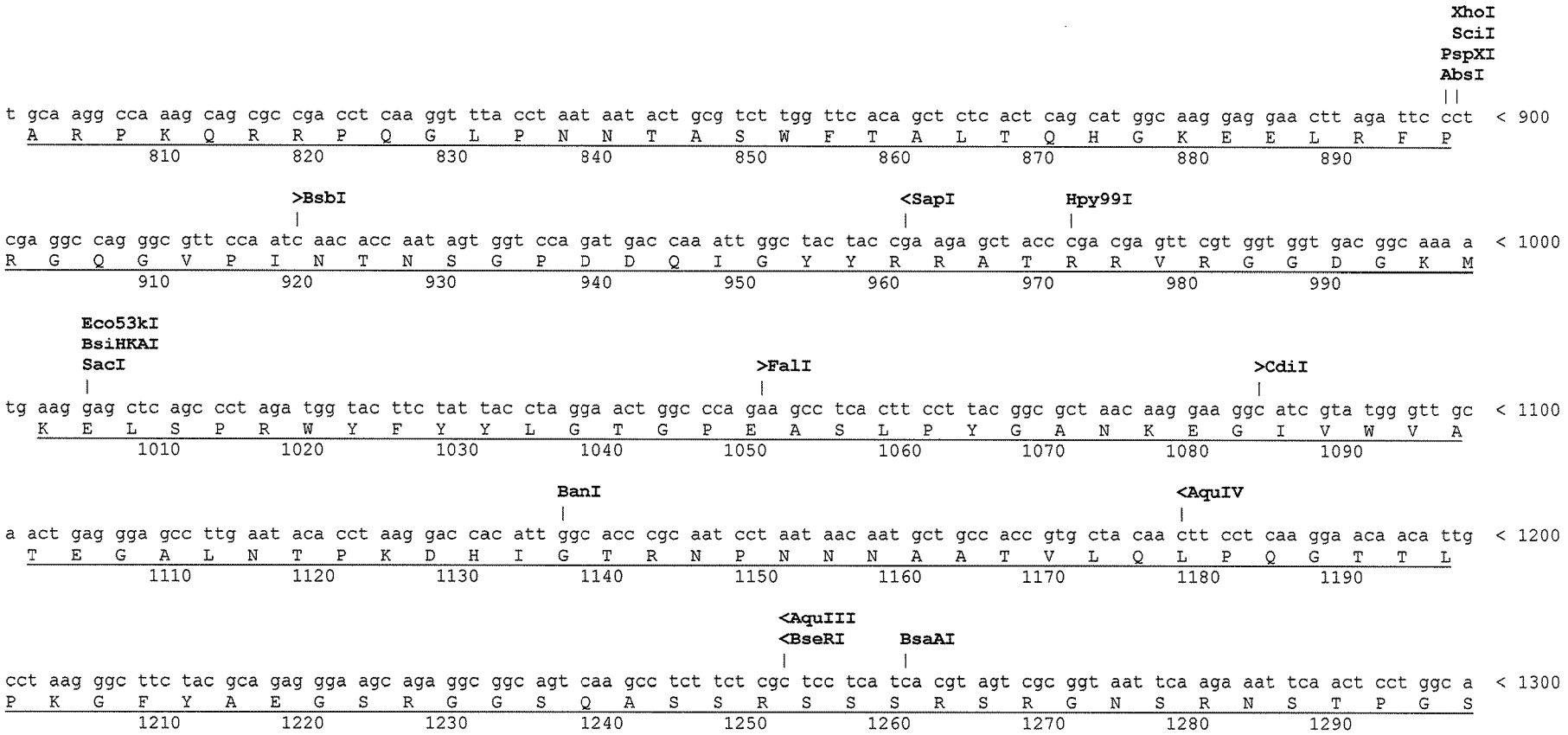


FIGURE 12C

FIGURE 12 (CONTINUED)

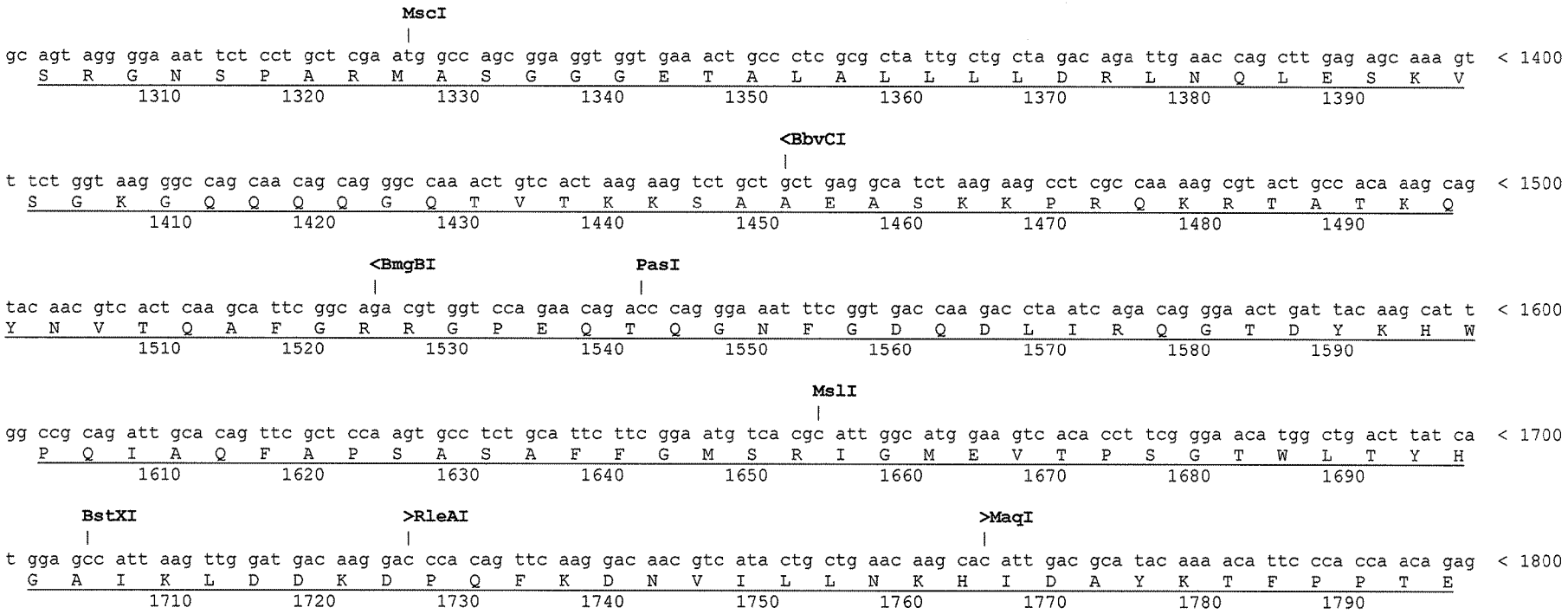


FIGURE 12D

FIGURE 12 (CONTINUED)

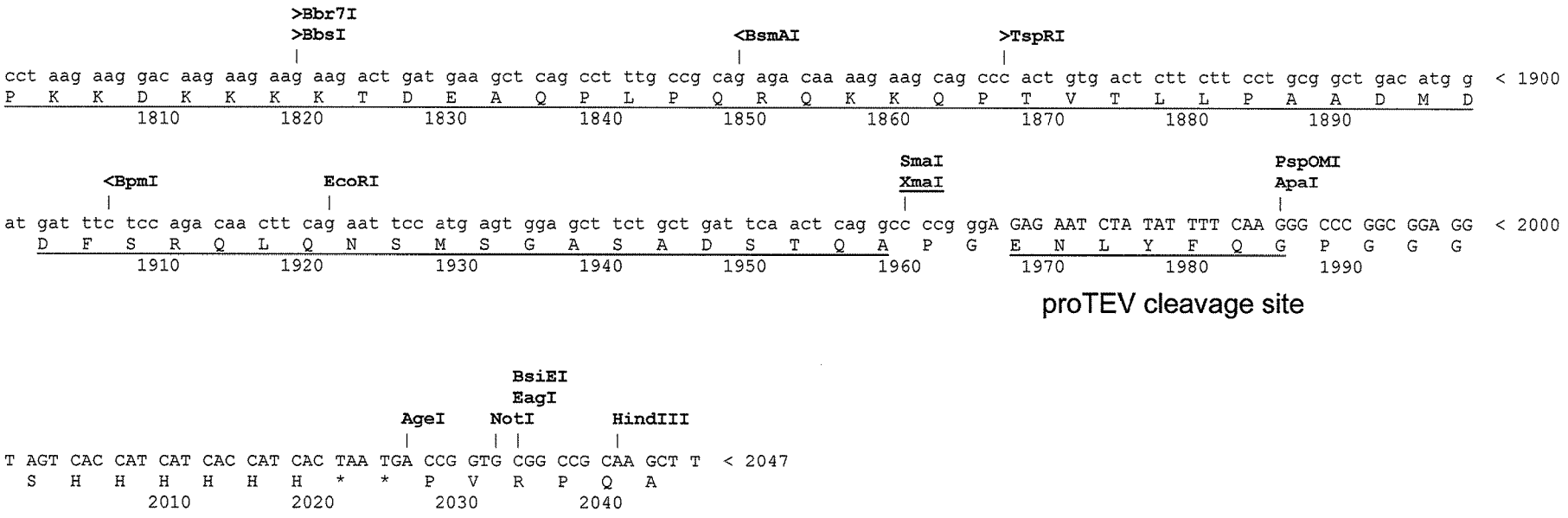


FIGURE 12E

FIGURE 12 (CONTINUED)

TCGCGAGCTAGCACCATGAAACTATGTATTCTACTTGCAGTTGTTGCGTTCGTAGGATTGTCCTTACCTACAGCTCTGGC
AAGATCTGACAAAGACTGCGAAATGAAAAGAACTACATTGGATTCACCACTTGGGAAGTTGGAACTGAGTGGATGCGAGC
AAGGATTGCATGAAATTAAGCTACTGGGAAAAGGAACTTCTGCTGCTGATGCAGTTGAAGTTCCAGCACCAGCAGCTGTT
CTTGGAGGTCCTGAGCCCCTCATGCAAGCCACAGCCTGGCTTAACGCATATTTCCACCAGCCTGAGGCCATTGAGGAATT
TCCAGTCCCCGCCCTTCACCATCCTGTGTTTCAGCAGGAGAGCTTCACCCGCCAGGTCCTGTGGAAATTGCTGAAGGTGG
TCAAGTTTGGTGAAGTGATTTCATATCAGCAACTTGCTGCATTGGCCGGTAACCCCGCAGCTACAGCTGCCGTGAAAACT
GCTCTCAGCGGAAATCCTGTGCCCATCCTGATCCCTTGTCACAGAGTCGTTTCATCTTCCGGAGCTGTAGGTGGCTATGA
AGGAGGACTGGCAGTTAAGGAGTGGCTGCTGGCTCATGAAGGTCATAGACTTGGAAAGCCTGGGCTGGGTCCTGCTGGTA
TAGGCGCGCCAGGGTCCCTAGGTGGCGGATCCGAAAACCTGTACTTCCAGAGCGATATCTCTGATAATGGACCCCAATCA
AACCAACGTAGTGCCCCTCGCATTACATTTGGTGGACCTACAGATTCAACTGACAATAACCAGAATGGAGGTCGCAATGG
TGCAAGGCCAAAGCAGCGCCGACCTCAAGGTTTACCTAATAATACTGCGTCTTGGTTCACAGCTCTCACTCAGCATGGCA
AGGAGGAACTTAGATTCCCTCGAGGCCAGGGCGTTCCAATCAACACCAATAGTGGTCCAGATGACCAAATTGGCTACTAC
CGAAGAGCTACCCGACGAGTTCGTGGTGGTGACGGCAAAATGAAGGAGCTCAGCCCTAGATGGTACTTCTATTACCTAGG
AACTGGCCCAGAAGCCTCACTTCCTTACGGCGCTAACAAGGAAGGCATCGTATGGGTTGCAACTGAGGGAGCCTTGAATA
CACCTAAGGACCACATTGGCACCCGCAATCCTAATAACAATGCTGCCACCGTGCTACAACTTCCTCAAGGAACAACATTG
CCTAAGGGCTTCTACGCAGAGGGAAGCAGAGGCGGCAGTCAAGCCTCTTCTCGCTCCTCATCACGTAGTCGCGGTAATTC
AAGAAATTCAACTCCTGGCAGCAGTAGGGGAAATTCTCCTGCTCGAATGGCCAGCGGAGGTGGTGAAACTGCCCTCGCGC
TATTGCTGCTAGACAGATTGAACCAGCTTGAGAGCAAAGTTTCTGGTAAGGGCCAGCAACAGCAGGGCCAAACTGTCACT
AAGAAGTCTGCTGCTGAGGCATCTAAGAAGCCTCGCCAAAAGCGTACTGCCACAAAGCAGTACAACGTCACTCAAGCATT
CGGCAGACGTGGTCCAGAACAGACCCAGGGAAATTTCGGTGACCAAGACCTAATCAGACAGGGAACTGATTACAAGCATT
GGCCGCAGATTGCACAGTTCGCTCCAAGTGCCTCTGCATTCTTCGGAATGTCACGCATTGGCATGGAAGTCACACCTTCG
GGAACATGGCTGACTTATCATGGAGCCATTAAGTTGGATGACAAGGACCCACAGTTCAAGGACAACGTCATACTGCTGAA
CAAGCACATTGACGCATACAAAACATTCCCACCAACAGAGCCTAAGAAGGACAAGAAGAAGAAGACTGATGAAGCTCAGC
CTTTGCCGCAGAGACAAAAGAAGCAGCCCACTGTGACTCTTCTTCCTGCGGCTGACATGGATGATTTCTCCAGACAACTT
CAGAATTCCATGAGTGGAGCTTCTGCTGATTCAACTCAGGCCCCGGGAGAGAATCTATATTTTCAAGGGCCCGGCGGAGG
TAGTCACCATCATCACCATCACTAATGACCGGTGCGGCCGCAAGCTT

FIGURE 12F

FIGURE 13

Sequence of chimeric DeSNAP+SARS S-RBD

Vector: pMT/BiP/SNAP. Insertion sites of the RBD sequence are underlined.

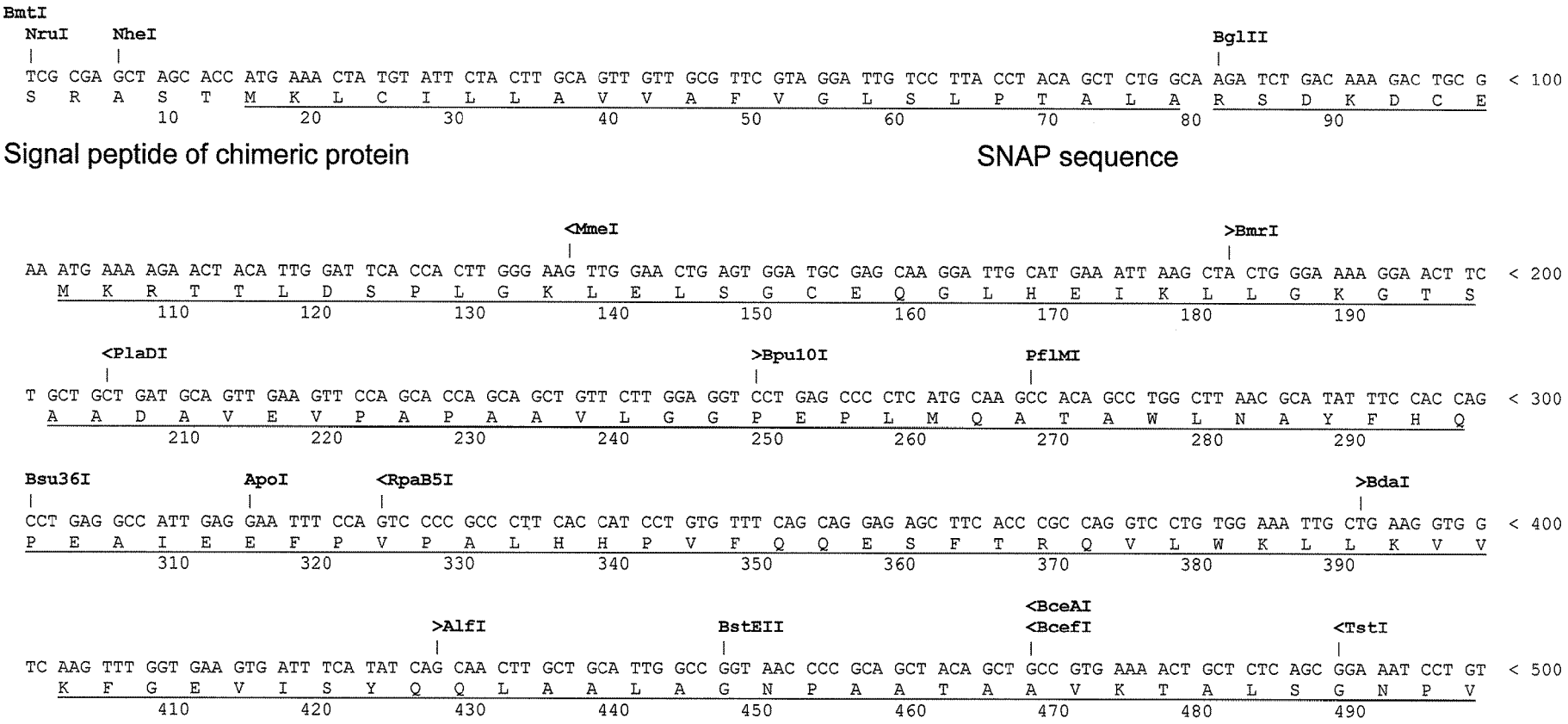
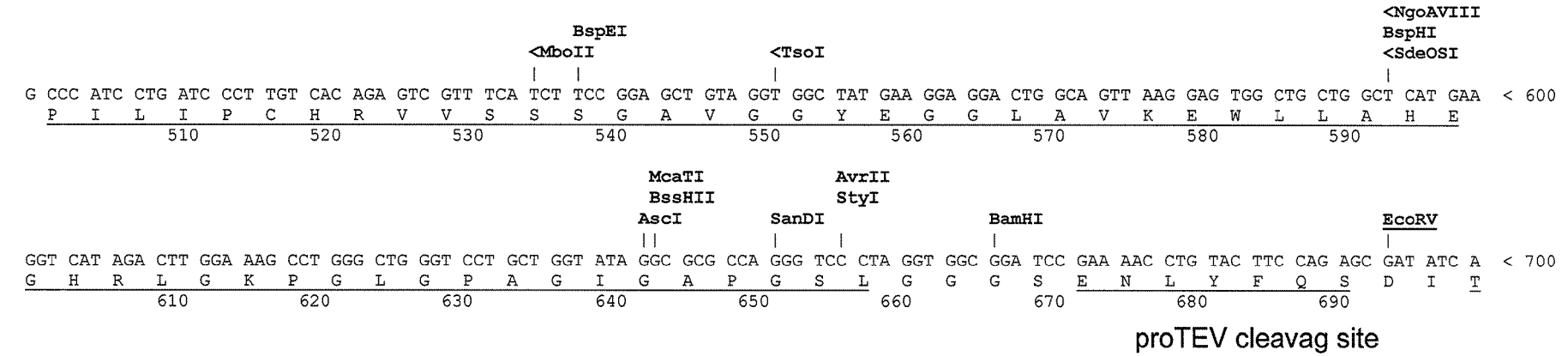


FIGURE 13A

FIGURE 13 (CONTINUED)



Receptor binding domain (RBD) from S protein of SARS virus (Genbank access : NC_004718.3)

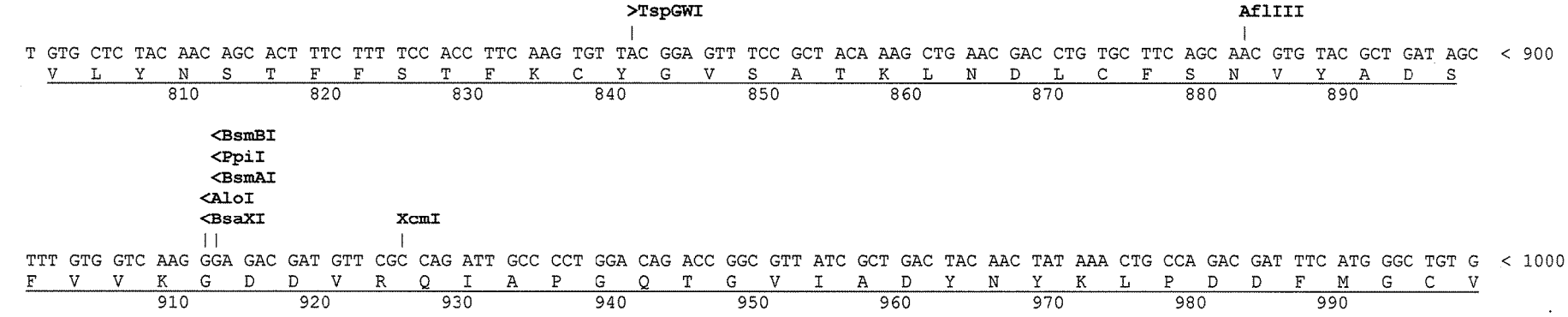


FIGURE 13B

FIGURE 13 (CONTINUED)

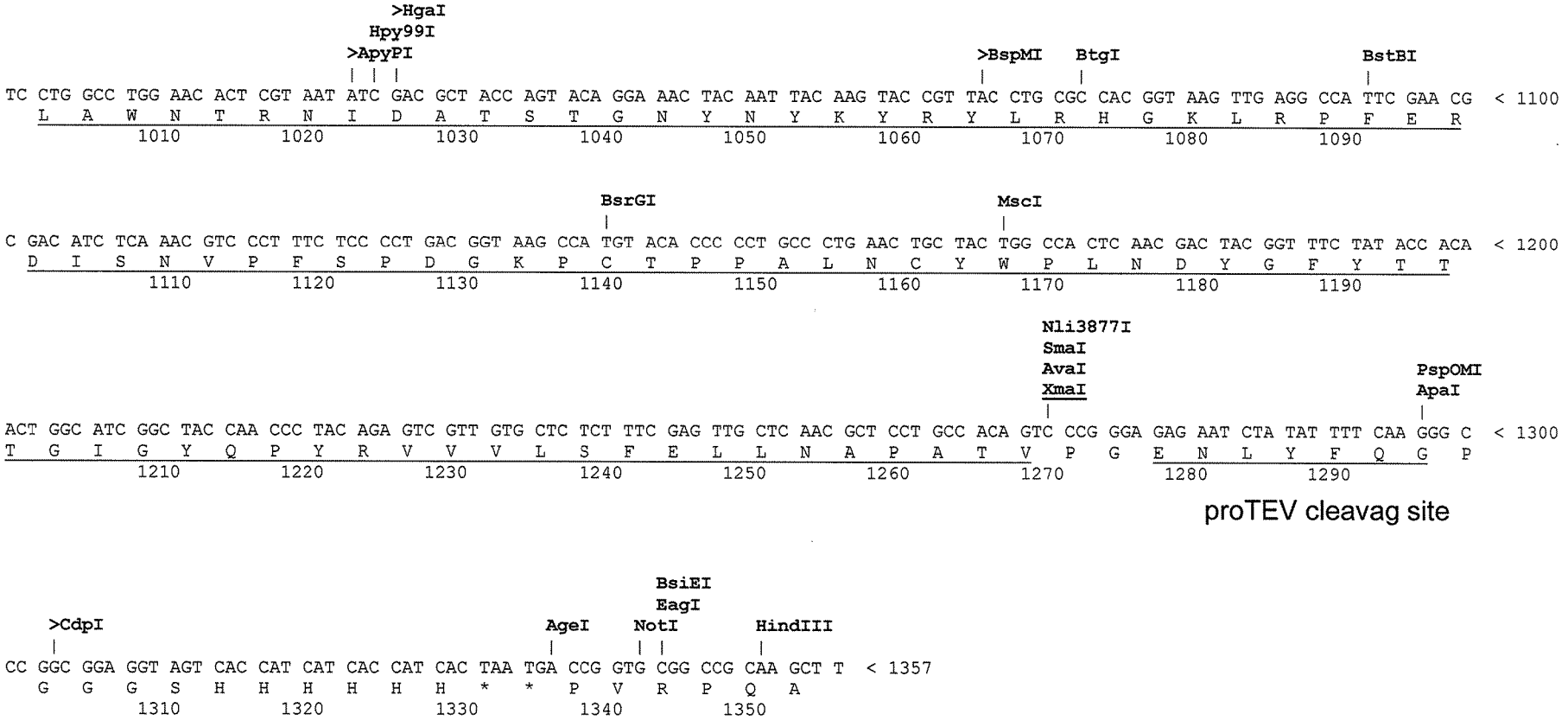


FIGURE 13C

FIGURE 13 (CONTINUED)

TCGCGAGCTAGCACCATGAAACTATGTATTCTACTTGCAGTTGTTGCGTTCGTAGGATTGTCCTTACCTACAGCTCTGGC
AAGATCTGACAAAGACTGCGAAATGAAAAGAACTACATTGGATTCACCACTTGGGAAGTTGGAACTGAGTGGATGCGAGC
AAGGATTGCATGAAATTAAGCTACTGGGAAAAGGAACTTCTGCTGCTGATGCAGTTGAAGTTCCAGCACCAGCAGCTGTT
CTTGGAGGTCCTGAGCCCCTCATGCAAGCCACAGCCTGGCTTAACGCATATTTCCACCAGCCTGAGGCCATTGAGGAATT
TCCAGTCCCCGCCCTTCACCATCCTGTGTTTCAGCAGGAGAGCTTCACCCGCCAGGTCCTGTGGAAATTGCTGAAGGTGG
TCAAGTTTGGTGAAGTGATTTCATATCAGCAACTTGCTGCATTGGCCGGTAACCCCGCAGCTACAGCTGCCGTGAAAACT
GCTCTCAGCGGAAATCCTGTGCCCATCCTGATCCCTTGTCACAGAGTCGTTTCATCTTCCGGAGCTGTAGGTGGCTATGA
AGGAGGACTGGCAGTTAAGGAGTGGCTGCTGGCTCATGAAGGTCATAGACTTGGAAAGCCTGGGCTGGGTCCTGCTGGTA
TAGGCGCGCCAGGGTCCCTAGGTGGCGGATCCGAAAACCTGTACTTCCAGAGCGATATCACCAACCTCTGTCCTTTCGGT
GAAGTGTTTAACGCCACTAAGTTCCCCAGCGTTTACGCTTGGGAGCGTAAGAAAATCTCAAATTGCGTGGCCGACTACTC
TGTGCTCTACAACAGCACTTTCTTTTCCACCTTCAAGTGTTACGGAGTTTCCGCTACAAAGCTGAACGACCTGTGCTTCA
GCAACGTGTACGCTGATAGCTTTGTGGTCAAGGGAGACGATGTTCGCCAGATTGCCCCTGGACAGACCGGCGTTATCGCT
GACTACAACTATAAACTGCCAGACGATTTCATGGGCTGTGTCCTGGCCTGGAACACTCGTAATATCGACGCTACCAGTAC
AGGAAACTACAATTACAAGTACCGTTACCTGCGCCACGGTAAGTTGAGGCCATTCGAACGCGACATCTCAAACGTCCCTT
TCTCCCCTGACGGTAAGCCATGTACACCCCCTGCCCTGAACTGCTACTGGCCACTCAACGACTACGGTTTCTATACCACA
ACTGGCATCGGCTACCAACCCTACAGAGTCGTTGTGCTCTCTTTCGAGTTGCTCAACGCTCCTGCCACAGTCCCGGGAGA
GAATCTATATTTTCAAGGGCCCGGCGGAGGTAGTCACCATCATCACCATCACTAATGACCGGTGCGGCCGCAAGCTT

FIGURE 13D

FIGURE 14

Sequence of chimeric DeSNAPuniv-huCOV.N (human coronavirus)

Vector: pDeSNAPuniv. Insertion sites of Gene N are underlined.

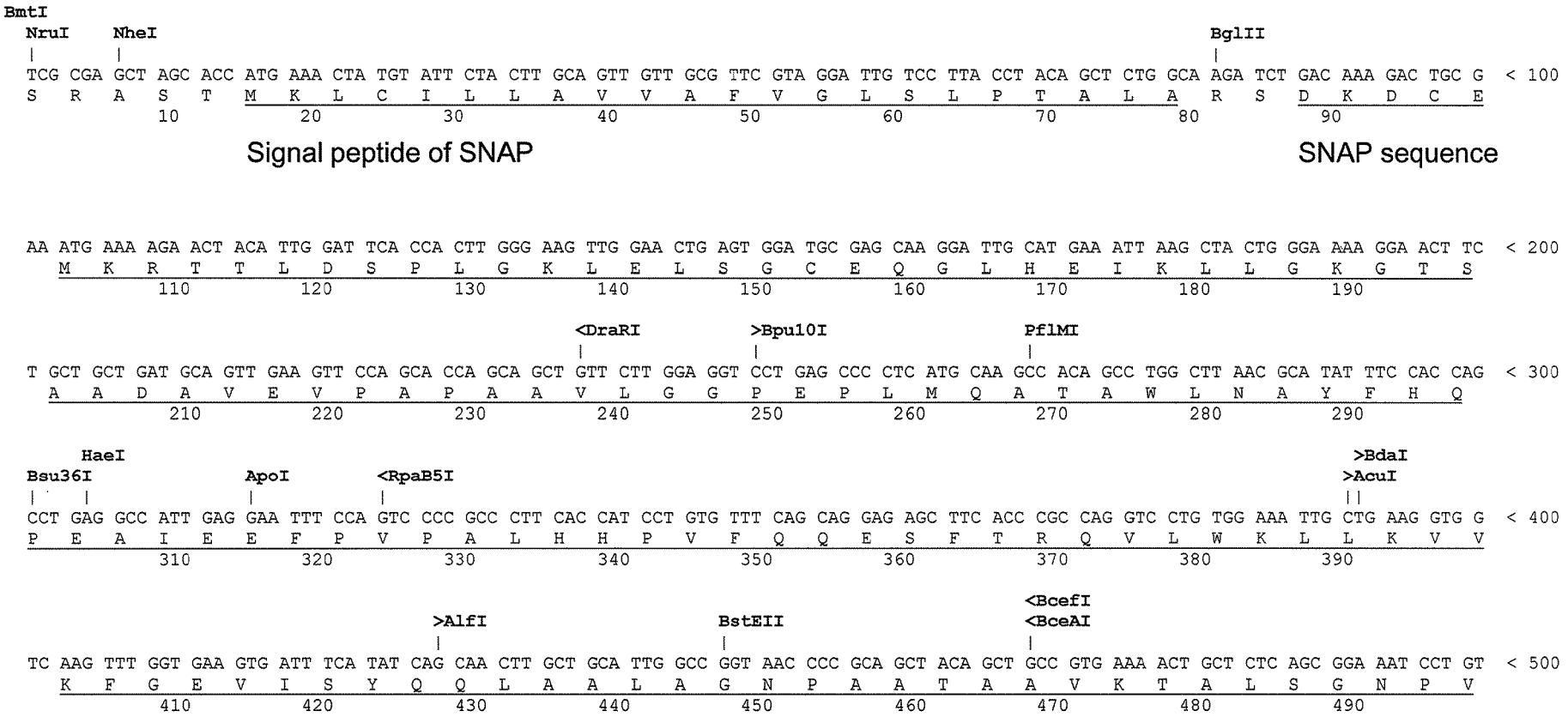
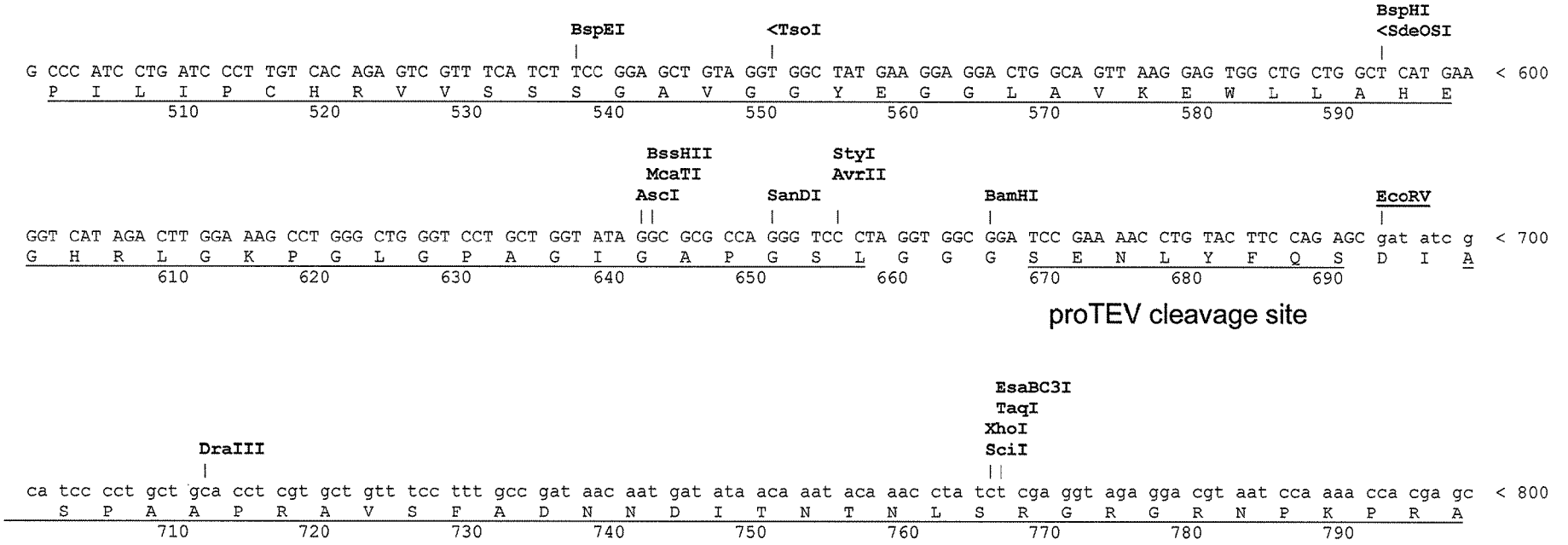


FIGURE 14A

FIGURE 14 (CONTINUED)



Gene N from human betacoronavirus 2cEMC/2012 (Genebank JX869059)

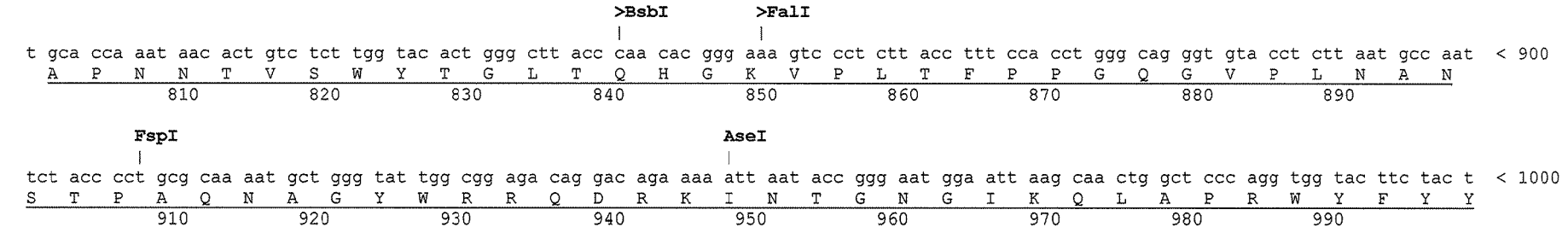


FIGURE 14B

FIGURE 14 (CONTINUED)

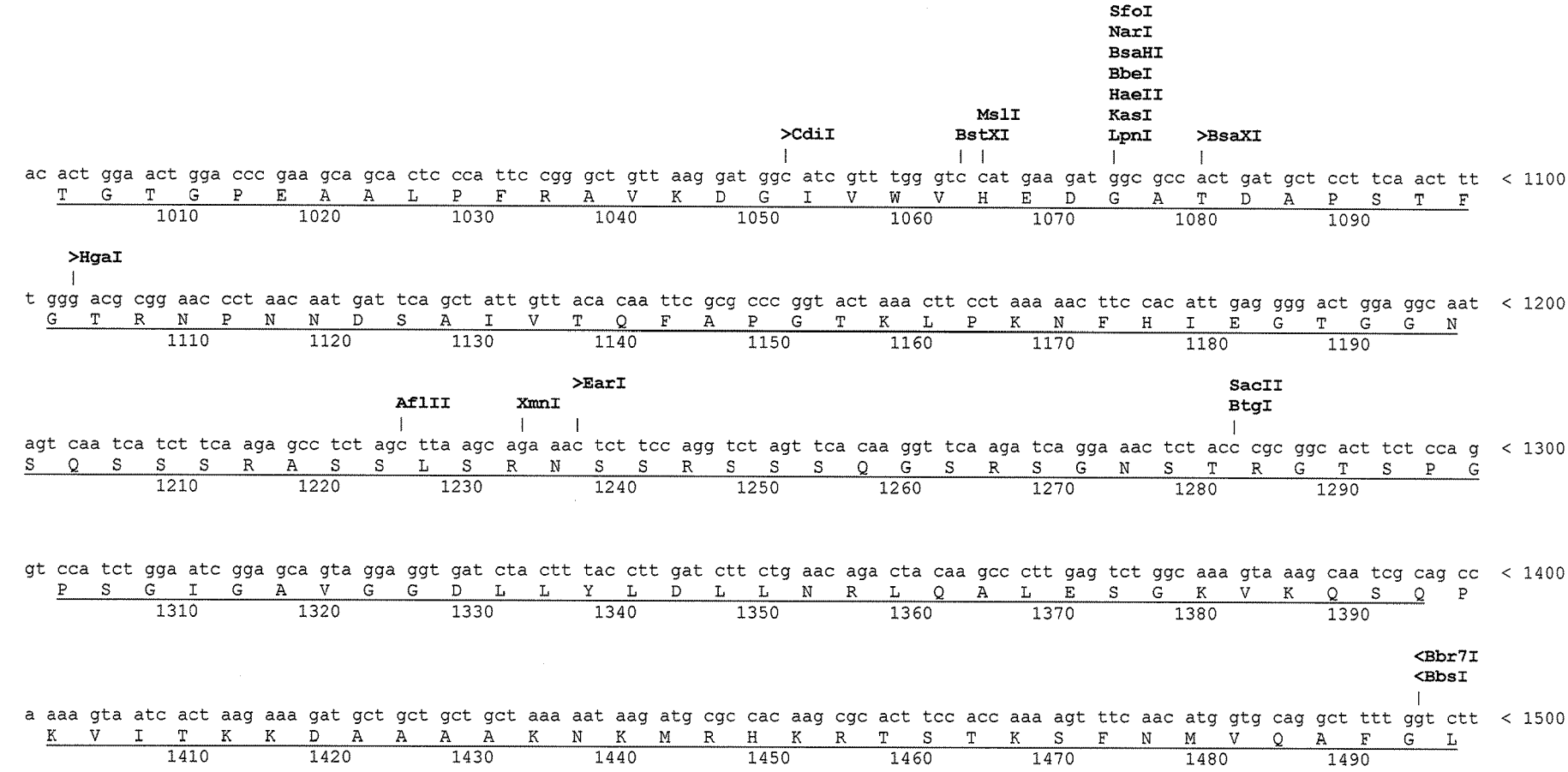
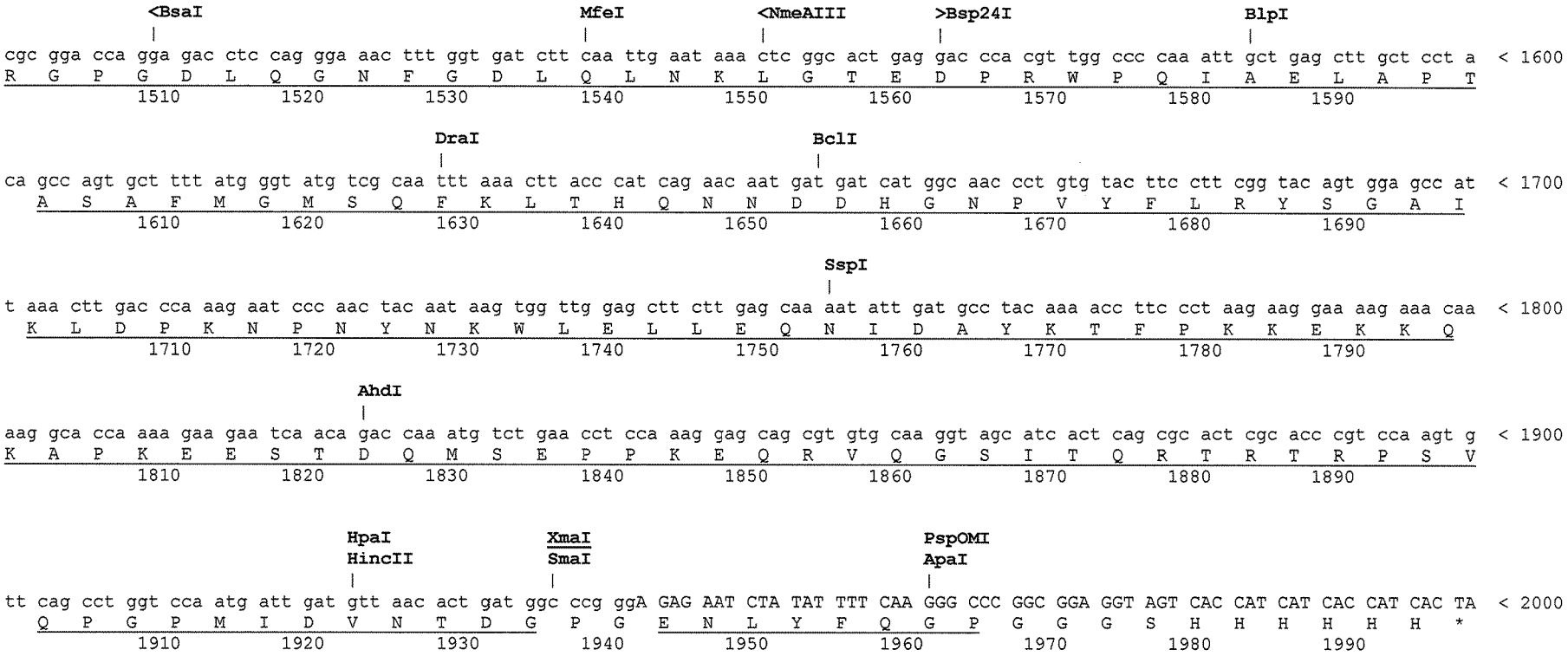


FIGURE 14C

FIGURE 14 (CONTINUED)



proTEV cleavage site

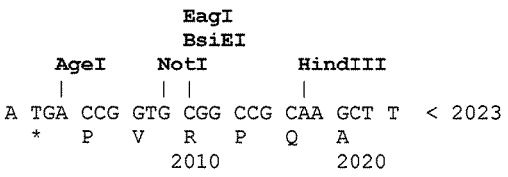


FIGURE 14D

FIGURE 14 (CONTINUED)

TCGCGAGCTAGCACCATGAAACTATGTATTCTACTTGCAGTTGTTGCGTTCGTAGGATTGTCCTTACCTACAGCTCTGGC
AAGATCTGACAAAGACTGCGAAATGAAAAGAACTACATTGGATTCACCACTTGGGAAGTTGGAACTGAGTGGATGCGAGC
AAGGATTGCATGAAATTAAGCTACTGGGAAAAGGAACTTCTGCTGCTGATGCAGTTGAAGTTCCAGCACCAGCAGCTGTT
CTTGGAGGTCCTGAGCCCCTCATGCAAGCCACAGCCTGGCTTAACGCATATTTCCACCAGCCTGAGGCCATTGAGGAATT
TCCAGTCCCCGCCCTTCACCATCCTGTGTTTCAGCAGGAGAGCTTCACCCGCCAGGTCCTGTGGAAATTGCTGAAGGTGG
TCAAGTTTGGTGAAGTGATTTCATATCAGCAACTTGCTGCATTGGCCGGTAACCCCGCAGCTACAGCTGCCGTGAAAACT
GCTCTCAGCGGAAATCCTGTGCCCATCCTGATCCCTTGTCACAGAGTCGTTTCATCTTCCGGAGCTGTAGGTGGCTATGA
AGGAGGACTGGCAGTTAAGGAGTGGCTGCTGGCTCATGAAGGTCATAGACTTGGAAAGCCTGGGCTGGGTCCTGCTGGTA
TAGGCGCGCCAGGGTCCCTAGGTGGCGGATCCGAAAACCTGTACTTCCAGAGCGATATCGCATCCCCTGCTGCACCTCGT
GCTGTTTCCTTTGCCGATAACAATGATATAACAAATACAAACCTATCTCGAGGTAGAGGACGTAATCCAAAACCACGAGC
TGCACCAAATAACACTGTCTCTTGGTACACTGGGCTTACCCAACACGGGAAAGTCCCTCTTACCTTTCCACCTGGGCAGG
GTGTACCTCTTAATGCCAATTCTACCCCTGCGCAAAATGCTGGGTATTGGCGGAGACAGGACAGAAAAATTAATACCGGG
AATGGAATTAAGCAACTGGCTCCCAGGTGGTACTTCTACTACACTGGAACTGGACCCGAAGCAGCACTCCCATTCCGGGC
TGTTAAGGATGGCATCGTTTGGGTCCATGAAGATGGCGCCACTGATGCTCCTTCAACTTTTGGGACGCGGAACCCTAACA
ATGATTCAGCTATTGTTACACAATTCGCGCCCGGTACTAAACTTCCTAAAAACTTCCACATTGAGGGGACTGGAGGCAAT
AGTCAATCATCTTCAAGAGCCTCTAGCTTAAGCAGAAACTCTTCCAGGTCTAGTTCACAAGGTTCAAGATCAGGAAACTC
TACCCGCGGCACTTCTCCAGGTCCATCTGGAATCGGAGCAGTAGGAGGTGATCTACTTTACCTTGATCTTCTGAACAGAC
TACAAGCCCTTGAGTCTGGCAAAGTAAAGCAATCGCAGCCAAAAGTAATCACTAAGAAAGATGCTGCTGCTGCTAAAAAT
AAGATGCGCCACAAGCGCACTTCCACCAAAAGTTTCAACATGGTGCAGGCTTTTGGTCTTCGCGGACCAGGAGACCTCCA
GGGAAACTTTGGTGATCTTCAATTGAATAAACTCGGCACTGAGGACCCACGTTGGCCCCAAATTGCTGAGCTTGCTCCTA
CAGCCAGTGCTTTTATGGGTATGTCGCAATTTAAACTTACCCATCAGAACAATGATGATCATGGCAACCCTGTGTACTTC
CTTCGGTACAGTGGAGCCATTAAACTTGACCCAAAGAATCCCAACTACAATAAGTGGTTGGAGCTTCTTGAGCAAAATAT
TGATGCCTACAAAACCTTCCCTAAGAAGGAAAAGAAACAAAAGGCACCAAAAGAAGAATCAACAGACCAAATGTCTGAAC
CTCCAAAGGAGCAGCGTGTGCAAGGTAGCATCACTCAGCGCACTCGCACCCGTCCAAGTGTTCAGCCTGGTCCAATGATT
GATGTTAACACTGATGGCCCGGGAGAGAATCTATATTTTCAAGGGCCCGGCGGAGGTAGTCACCATCATCACCATCACTA
ATGACCGGTGCGGCCGCAAGCTT

FIGURE 14E

FIGURE 15

Sequence of chimeric huCOV.S1+ DeSNAP (human coronavirus)

Vector: pMT/BiP/SNAP. Insertion sites for Gene S1 are underlined.

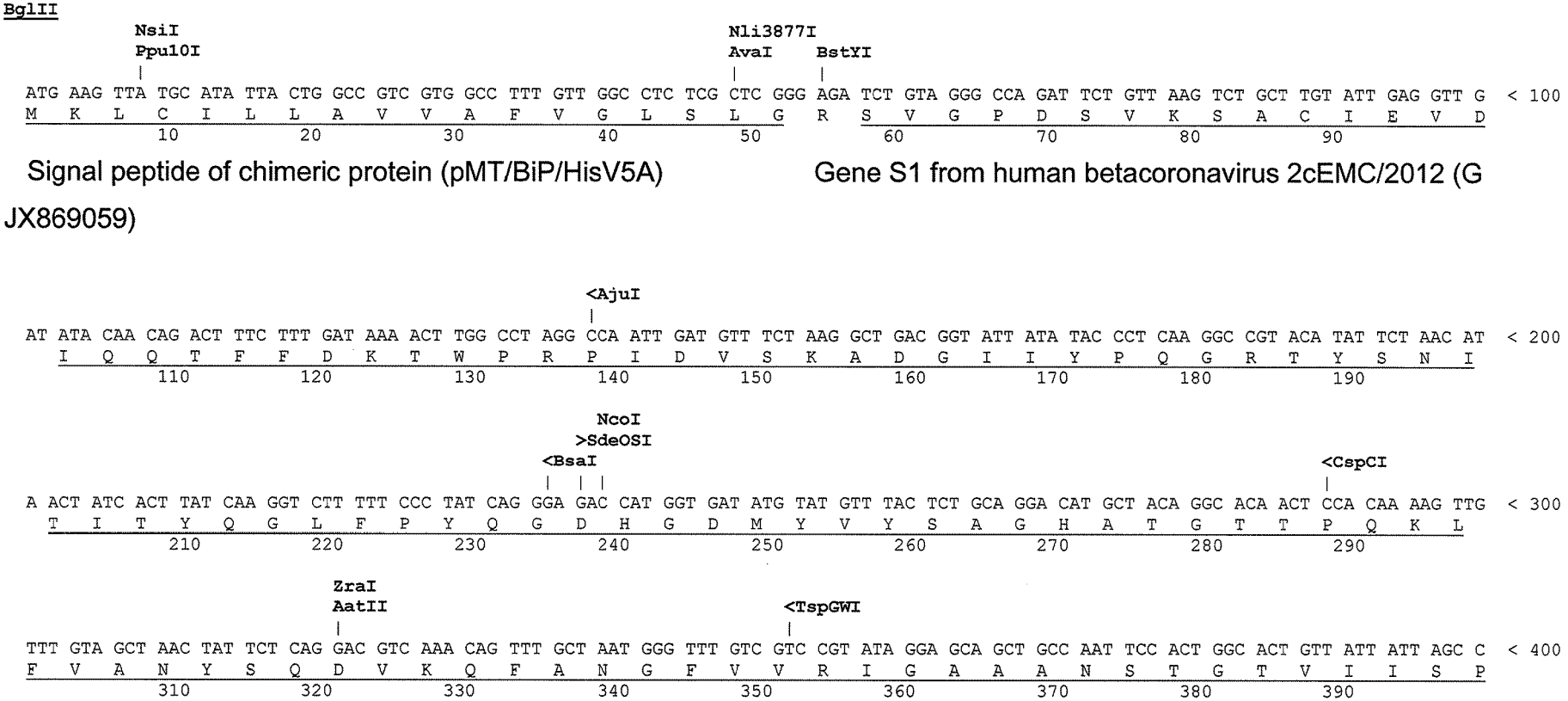


FIGURE 15A

FIGURE 15 (CONTINUED)

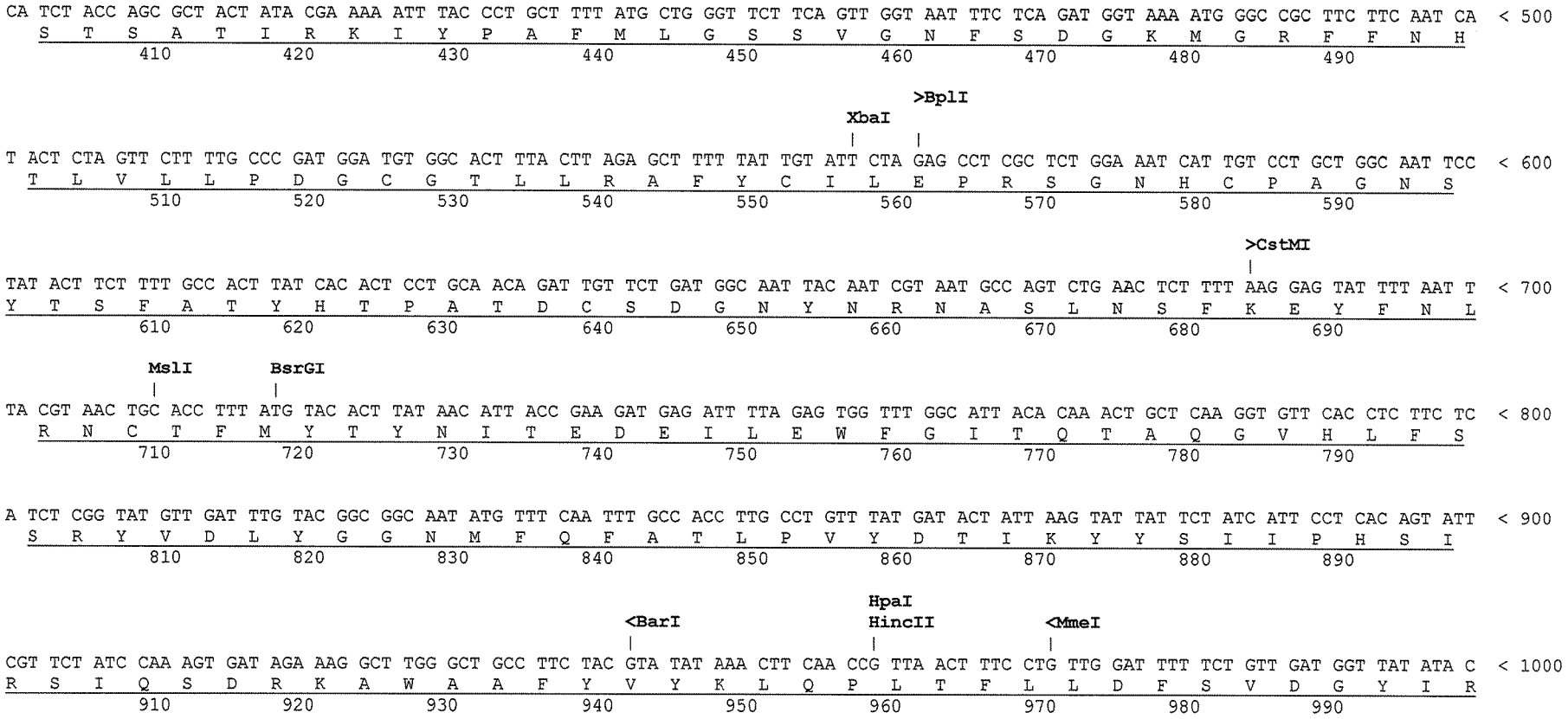


FIGURE 15B

FIGURE 15 (CONTINUED)

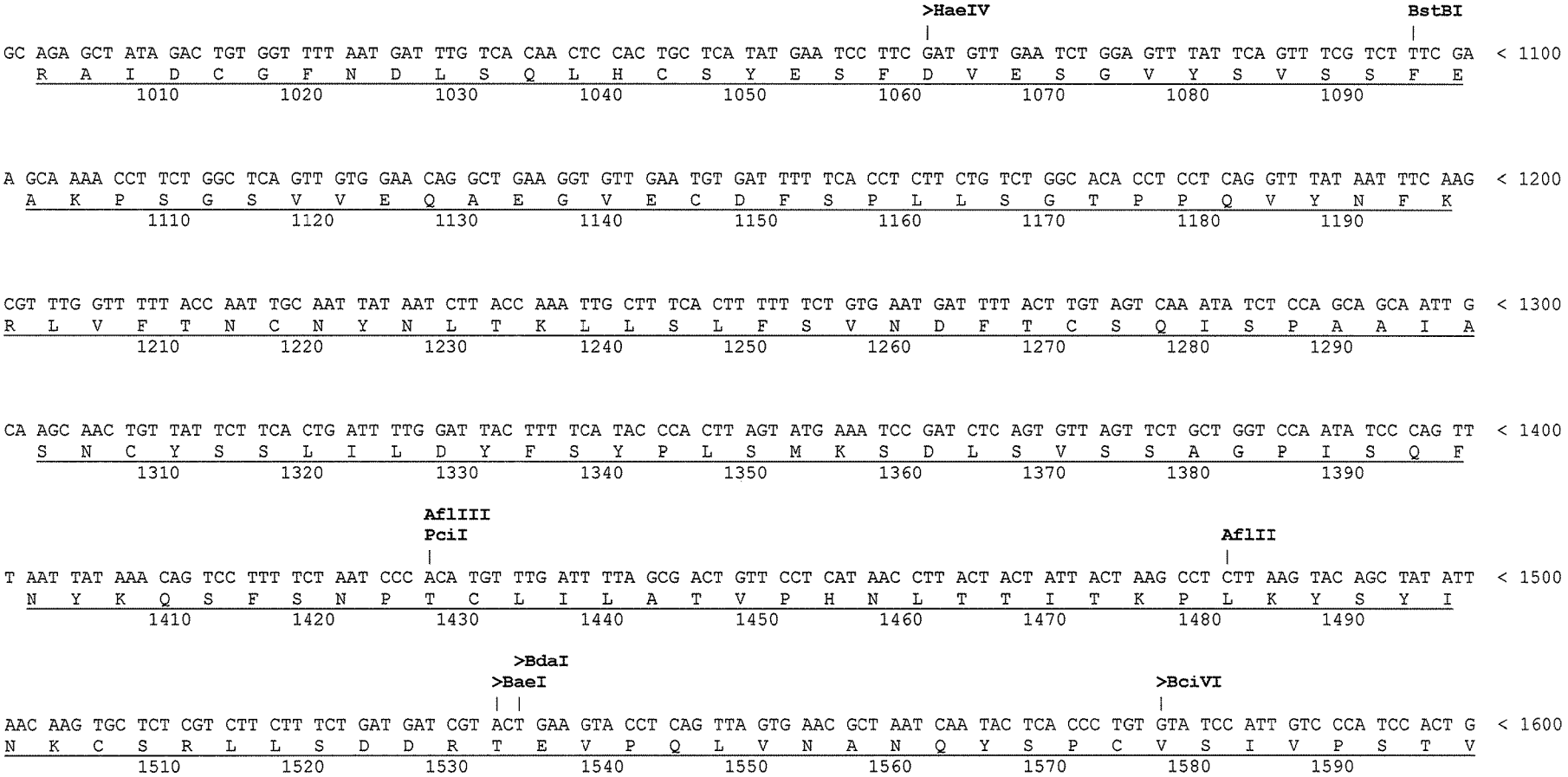


FIGURE 15C

FIGURE 15 (CONTINUED)

```
TG TGG GAA GAC GGT GAT TAT TAT AGG AAA CAA CTA TCT CCA CTT GAA GGT GGT GGC TGG CTT GTT GCT AGT GGC TCA ACT GTT GCC ATG ACT GAG CAA TT  < 1700
   W   E   D   G   D   Y   Y   R   K   Q   L   S   P   L   E   G   G   G   W   L   V   A   S   G   S   T   V   A   M   T   E   Q   L
           1610        1620        1630        1640        1650        1660        1670        1680        1690

A CAG ATG GGC TTT GGT ATT ACA GTT CAA TAT GGT ACA GAC ACC AAT AGT GTT TGC CCC AAG CTG GAA TTT GCT AAT GAC ACA AAA ATT GCC TCT CAA TTA  < 1800
  Q   M   G   F   G   I   T   V   Q   Y   G   T   D   T   N   S   V   C   P   K   L   E   F   A   N   D   T   K   I   A   S   Q   L
           1710        1720        1730        1740        1750        1760        1770        1780        1790

                  SspI
                   |
GGC AAT TGC GTG GAA TAT TCC CTC TAT GGT GTT TCG GGC CGT GGT GTT TTT CAG AAT TGC ACA GCT GTA GGT GTT CGA CAG CAG CGC TTT GTT TAT GAT G  < 1900
G   N   C   V   E   Y   S   L   Y   G   V   S   G   R   G   V   F   Q   N   C   T   A   V   G   V   R   Q   Q   R   F   V   Y   D   A
           1810        1820        1830        1840        1850        1860        1870        1880        1890

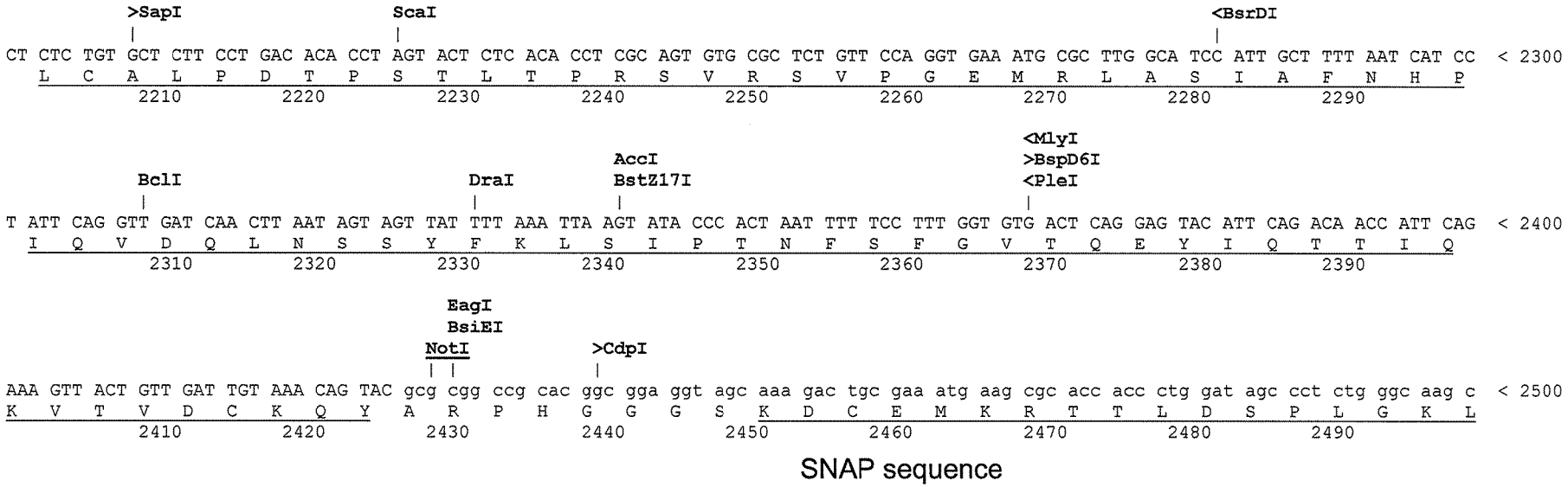
                                                          <DraRI
                                                            |
CG TAC CAG AAT TTA GTT GGC TAT TAT TCT GAT GAT GGC AAC TAC TAC TGT TTG CGT GCT TGT GTT AGT GTT CCT GTT TCT GTC ATC TAT GAT AAA GAA AC  < 2000
   Y   Q   N   L   V   G   Y   Y   S   D   D   G   N   Y   Y   C   L   R   A   C   V   S   V   P   V   S   V   I   Y   D   K   E   T
           1910        1920        1930        1940        1950        1960        1970        1980        1990

T AAA ACC CAC GCT ACT CTA TTT GGT AGT GTT GCA TGT GAA CAC ATT TCT TCT ACC ATG TCT CAA TAC TCC CGT TCT ACG CGA TCA ATG CTT AAA CGG CGA  < 2100
  K   T   H   A   T   L   F   G   S   V   A   C   E   H   I   S   S   T   M   S   Q   Y   S   R   S   T   R   S   M   L   K   R   R
           2010        2020        2030        2040        2050        2060        2070        2080        2090

                        >Bsp24I
                           |
GAT TCT ACA TAT GGC CCC CTT CAG ACA CCT GTT GGT TGT GTC CTA GGA CTT GTT AAT TCC TCT TTG TTC GTA GAG GAC TGC AAG TTG CCT CTT GGT CAA T  < 2200
D   S   T   Y   G   P   L   Q   T   P   V   G   C   V   L   G   L   V   N   S   S   L   F   V   E   D   C   K   L   P   L   G   Q   S
           2110        2120        2130        2140        2150        2160        2170        2180        2190
```

FIGURE 15D

FIGURE 15 (CONTINUED)



SNAP sequence

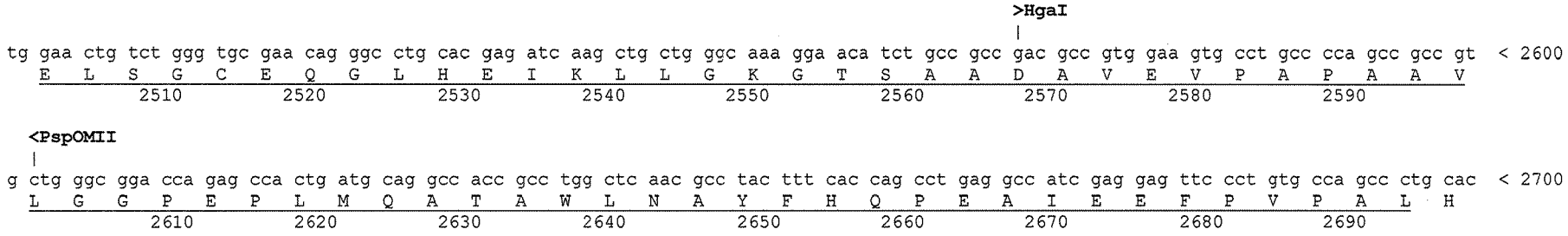


FIGURE 15E

FIGURE 15 (CONTINUED)

```
cac cca gtg ttc cag cag gag agc ttt acc cgc cag gtg ctg tgg aaa ctg ctg aaa gtg gtg aag ttc gga gag gtc atc agc tac cag cag ctg gcc g  < 2800
H   P   V   F   Q   Q   E   S   F   T   R   Q   V   L   W   K   L   L   K   V   V   K   F   G   E   V   I   S   Y   Q   Q   L   A   A
            2710        2720        2730        2740        2750        2760        2770        2780        2790

       BsrFI
       NaeI
       NgoMIV                                                <BsrBI                                  EcoHI
       >NmeDI                                          >Bpu10I   <TstI                 <AlwI        NciI
       |                                                 |   |     |                     |            |
cc ctg gcc ggc aat ccc gcc gcc acc gcc gcc gtg aaa acc gcc ctg agc gga aat ccc gtg ccc att ctg atc ccc tgc cac cgg gtg gtg tct agc tc  < 2900
   L   A   G   N   P   A   A   T   A   A   V   K   T   A   L   S   G   N   P   V   P   I   L   I   P   C   H   R   V   V   S   S   S
            2810        2820        2830        2840        2850        2860        2870        2880        2890

  KasI
  SfoI
  NarI
  BanI                                                                                                          <BspMI
  BbeI                                                                                                  SbfI
  |                                                                                                     |   |
t ggc gcc gtg ggg ggc tac gag ggc ggg ctc gcc gtg aaa gag tgg ctg ctg gcc cac gag ggc cac aga ctg ggc aag cct ggg ctg ggt cct gca ggt  < 3000
  G   A   V   G   G   Y   E   G   G   L   A   V   K   E   W   L   L   A   H   E   G   H   R   L   G   K   P   G   L   G   P   A   G
            2910        2920        2930        2940        2950        2960        2970        2980        2990

     BssHII
     McaTI                                                                  PspOMI
    AscI          SanDI                                                   ApaI
    ||            |                                                       |
ata ggc gcg cca ggg tcc ctg gag cat cat cat cat cat cat tga tga cgg gcc c  < 3055
I   G   A   P   G   S   L   E   H   H   H   H   H   H   *   *   R   A
            3010        3020        3030        3040        3050
```

FIGURE 15F

FIGURE 15 (CONTINUED)

ATGAAGTTATGCATATTACTGGCCGTCGTGGCCTTTGTTGGCCTCTCGCTCGGGAGATCTGTAGGGCCAGATTCTGTTAA
GTCTGCTTGTATTGAGGTTGATATACAACAGACTTTCTTTGATAAAACTTGGCCTAGGCCAATTGATGTTTCTAAGGCTG
ACGGTATTATATACCCTCAAGGCCGTACATATTCTAACATAACTATCACTTATCAAGGTCTTTTTCCCTATCAGGGAGAC
CATGGTGATATGTATGTTTACTCTGCAGGACATGCTACAGGCACAACTCCACAAAAGTTGTTTGTAGCTAACTATTCTCA
GGACGTCAAACAGTTTGCTAATGGGTTTGTCGTCCGTATAGGAGCAGCTGCCAATTCCACTGGCACTGTTATTATTAGCC
CATCTACCAGCGCTACTATACGAAAAATTTACCCTGCTTTTATGCTGGGTTCTTCAGTTGGTAATTTCTCAGATGGTAAA
ATGGGCCGCTTCTTCAATCATACTCTAGTTCTTTTGCCCGATGGATGTGGCACTTTACTTAGAGCTTTTTATTGTATTCT
AGAGCCTCGCTCTGGAAATCATTGTCCTGCTGGCAATTCCTATACTTCTTTTGCCACTTATCACACTCCTGCAACAGATT
GTTCTGATGGCAATTACAATCGTAATGCCAGTCTGAACTCTTTTAAGGAGTATTTTAATTTACGTAACTGCACCTTTATG
TACACTTATAACATTACCGAAGATGAGATTTTAGAGTGGTTTGGCATTACACAAACTGCTCAAGGTGTTCACCTCTTCTC
ATCTCGGTATGTTGATTTGTACGGCGGCAATATGTTTCAATTTGCCACCTTGCCTGTTTATGATACTATTAAGTATTATT
CTATCATTCCTCACAGTATTCGTTCTATCCAAAGTGATAGAAAGGCTTGGGCTGCCTTCTACGTATATAAACTTCAACCG
TTAACTTTCCTGTTGGATTTTTCTGTTGATGGTTATATACGCAGAGCTATAGACTGTGGTTTTAATGATTTGTCACAACT
CCACTGCTCATATGAATCCTTCGATGTTGAATCTGGAGTTTATTCAGTTTCGTCTTTCGAAGCAAAACCTTCTGGCTCAG
TTGTGGAACAGGCTGAAGGTGTTGAATGTGATTTTTCACCTCTTCTGTCTGGCACACCTCCTCAGGTTTATAATTTCAAG
CGTTTGGTTTTTACCAATTGCAATTATAATCTTACCAAATTGCTTTCACTTTTTTCTGTGAATGATTTTACTTGTAGTCA
AATATCTCCAGCAGCAATTGCAAGCAACTGTTATTCTTCACTGATTTTGGATTACTTTTCATACCCACTTAGTATGAAAT
CCGATCTCAGTGTTAGTTCTGCTGGTCCAATATCCCAGTTTAATTATAAACAGTCCTTTTCTAATCCCACATGTTTGATT
TTAGCGACTGTTCCTCATAACCTTACTACTATTACTAAGCCTCTTAAGTACAGCTATATTAACAAGTGCTCTCGTCTTCT
TTCTGATGATCGTACTGAAGTACCTCAGTTAGTGAACGCTAATCAATACTCACCCTGTGTATCCATTGTCCCATCCACTG
TGTGGGAAGACGGTGATTATTATAGGAAACAACTATCTCCACTTGAAGGTGGTGGCTGGCTTGTTGCTAGTGGCTCAACT
GTTGCCATGACTGAGCAATTACAGATGGGCTTTGGTATTACAGTTCAATATGGTACAGACACCAATAGTGTTTGCCCCAA
GCTGGAATTTGCTAATGACACAAAAATTGCCTCTCAATTAGGCAATTGCGTGGAATATTCCCTCTATGGTGTTTCGGGCC
GTGGTGTTTTTCAGAATTGCACAGCTGTAGGTGTTCGACAGCAGCGCTTTGTTTATGATGCGTACCAGAATTTAGTTGGC
TATTATTCTGATGATGGCAACTACTACTGTTTGCGTGCTTGTGTTAGTGTTCCTGTTTCTGTCATCTATGATAAAGAAAC
TAAAACCCACGCTACTCTATTTGGTAGTGTTGCATGTGAACACATTTCTTCTACCATGTCTCAATACTCCCGTTCTACGC
GATCAATGCTTAAACGGCGAGATTCTACATATGGCCCCCTTCAGACACCTGTTGGTTGTGTCCTAGGACTTGTTAATTCC
TCTTTGTTCGTAGAGGACTGCAAGTTGCCTCTTGGTCAATCTCTCTGTGCTCTTCCTGACACACCTAGTACTCTCACACC
TCGCAGTGTGCGCTCTGTTCCAGGTGAAATGCGCTTGGCATCCATTGCTTTTAATCATCCTATTCAGGTTGATCAACTTA
ATAGTAGTTATTTTAAATTAAGTATACCCACTAATTTTTCCTTTGGTGTGACTCAGGAGTACATTCAGACAACCATTCAG
AAAGTTACTGTTGATTGTAAACAGTACgcgcggccgcacggcggaggtagcaaagactgcgaaatgaagcgcaccaccct
ggatagccctctgggcaagctggaactgtctgggtgcgaacagggcctgcacgagatcaagctgctgggcaaaggaacat
ctgccgccgacgccgtggaagtgcctgccccagccgccgtgctgggcggaccagagccactgatgcaggccaccgcctgg
ctcaacgcctactttcaccagcctgaggccatcgaggagttccctgtgccagccctgcaccacccagtgttccagcagga
gagctttacccgccaggtgctgtggaaactgctgaaagtggtgaagttcggagaggtcatcagctaccagcagctggccg
ccctggccggcaatcccgccgccaccgccgccgtgaaaaccgccctgagcggaaatcccgtgcccattctgatcccctgc
caccgggtggtgtctagctctggcgccgtgggggctacgagggcgggctcgccgtgaaagagtggctgctggcccacga
gggccacagactgggcaagcctgggctgggtcctgcaggtataggcgcgccagggtccctggagcatcatcatcatcatc
attgatgacgggccc

FIGURE 15G

FIGURE 16

Sequence of chimeric DeSNAP+huCoV.S-RBD

Vector: pMT/BiP/SNAP. Insertion sites of the RBD sequence are underlined.

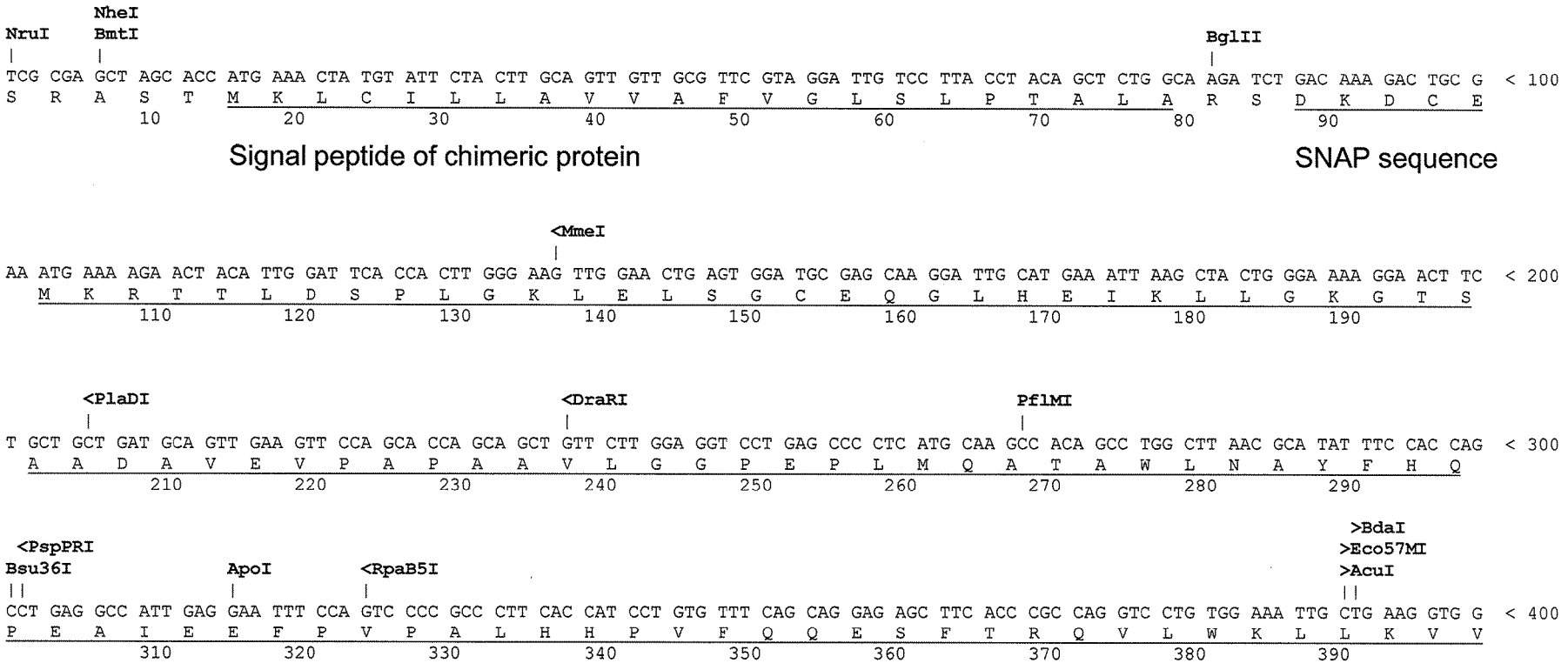
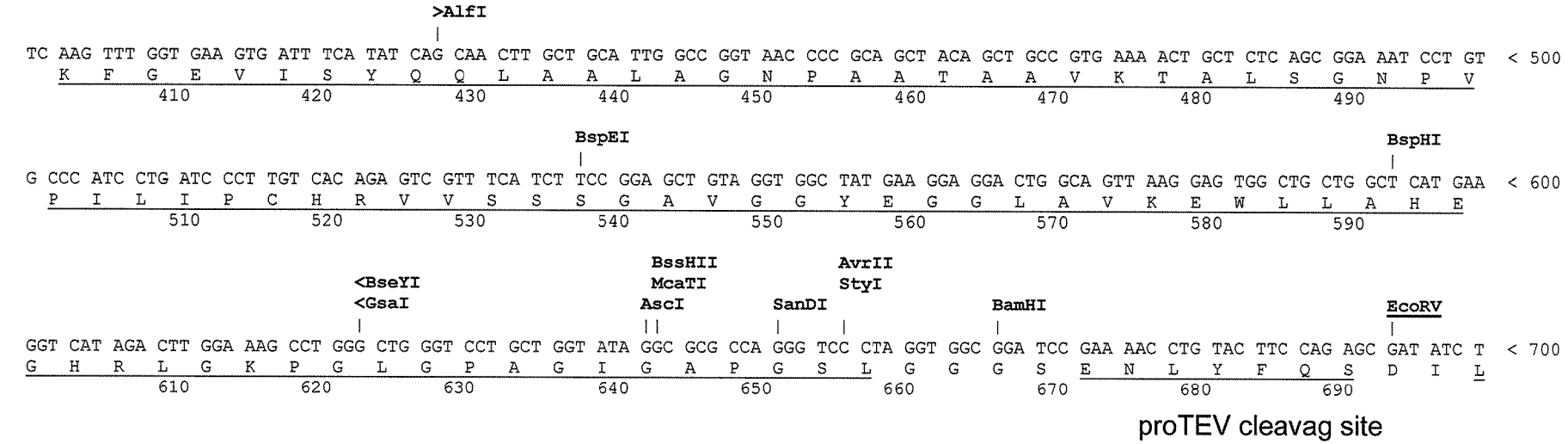


FIGURE 16A

FIGURE 16 (CONTINUED)



Putative receptor binding domain (RBD) from S protein of human betacoronavirus 2cEMC/2012 (Genebank JX869059)

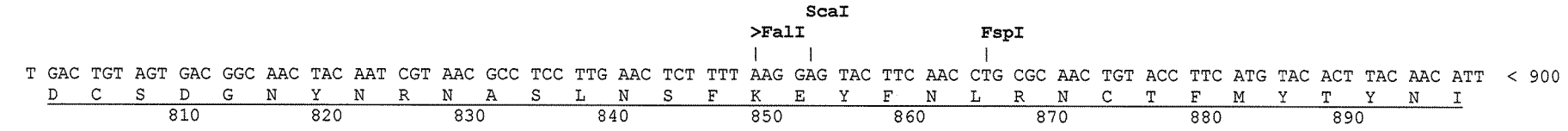


FIGURE 16B

FIGURE 16 (CONTINUED)

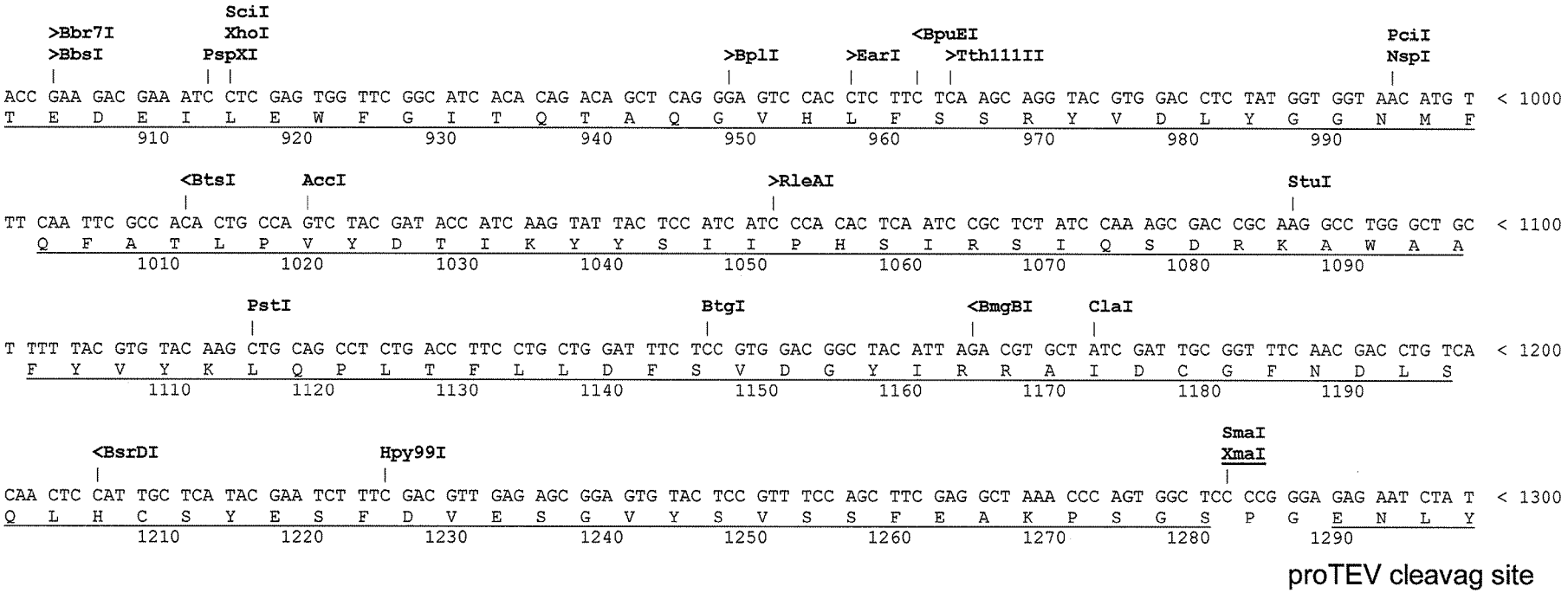


FIGURE 16C

FIGURE 16 (CONTINUED)

TCGCGAGCTAGCACCATGAAACTATGTATTCTACTTGCAGTTGTTGCGTTCGTAGGATTGTCCTTACCTACAGCTCTGGC
AAGATCTGACAAAGACTGCGAAATGAAAAGAACTACATTGGATTCACCACTTGGGAAGTTGGAACTGAGTGGATGCGAGC
AAGGATTGCATGAAATTAAGCTACTGGGAAAAGGAACTTCTGCTGCTGATGCAGTTGAAGTTCCAGCACCAGCAGCTGTT
CTTGGAGGTCCTGAGCCCCTCATGCAAGCCACAGCCTGGCTTAACGCATATTTCCACCAGCCTGAGGCCATTGAGGAATT
TCCAGTCCCCGCCCTTCACCATCCTGTGTTTCAGCAGGAGAGCTTCACCCGCCAGGTCCTGTGGAAATTGCTGAAGGTGG
TCAAGTTTGGTGAAGTGATTTCATATCAGCAACTTGCTGCATTGGCCGGTAACCCCGCAGCTACAGCTGCCGTGAAAACT
GCTCTCAGCGGAAATCCTGTGCCCATCCTGATCCCTTGTCACAGAGTCGTTTCATCTTCCGGAGCTGTAGGTGGCTATGA
AGGAGGACTGGCAGTTAAGGAGTGGCTGCTGGCTCATGAAGGTCATAGACTTGGAAAGCCTGGGCTGGGTCCTGCTGGTA
TAGGCGCGCCAGGGTCCCTAGGTGGCGGATCCGAAAACCTGTACTTCCAGAGCGATATCTTGTTGCGTGCTTTCTACTGC
ATCCTCGAACCTCGTTCTGGTAACCACTGTCCTGCCGGAAATAGCTACACTAGCTTCGCCACTTACCACACACCCGCCAC
TGACTGTAGTGACGGCAACTACAATCGTAACGCCTCCTTGAACTCTTTTAAGGAGTACTTCAACCTGCGCAACTGTACCT
TCATGTACACTTACAACATTACCGAAGACGAAATCCTCGAGTGGTTCGGCATCACACAGACAGCTCAGGGAGTCCACCTC
TTCTCAAGCAGGTACGTGGACCTCTATGGTGGTAACATGTTTCAATTCGCCACACTGCCAGTCTACGATACCATCAAGTA
TTACTCCATCATCCCACACTCAATCCGCTCTATCCAAAGCGACCGCAAGGCCTGGGCTGCTTTTTACGTGTACAAGCTGC
AGCCTCTGACCTTCCTGCTGGATTTCTCCGTGGACGGCTACATTAGACGTGCTATCGATTGCGGTTTCAACGACCTGTCA
CAACTCCATTGCTCATACGAATCTTTCGACGTTGAGAGCGGAGTGTACTCCGTTTCCAGCTTCGAGGCTAAACCCAGTGG
CTCCCCGGGAGAGAATCTATATTTTCAAGGGCCCGGCGGAGGTAGTCACCATCATCACCATCACTAATGACCGGTGCGGC
CGCAAGCTT

FIGURE 16D

FIGURE 17

Sequence of chimeric DeSNAPuniv-shortLruA (leptopsirosis)

Vector: pDeSNAPuniv. Insertion sites of the LruA sequence are underlined.

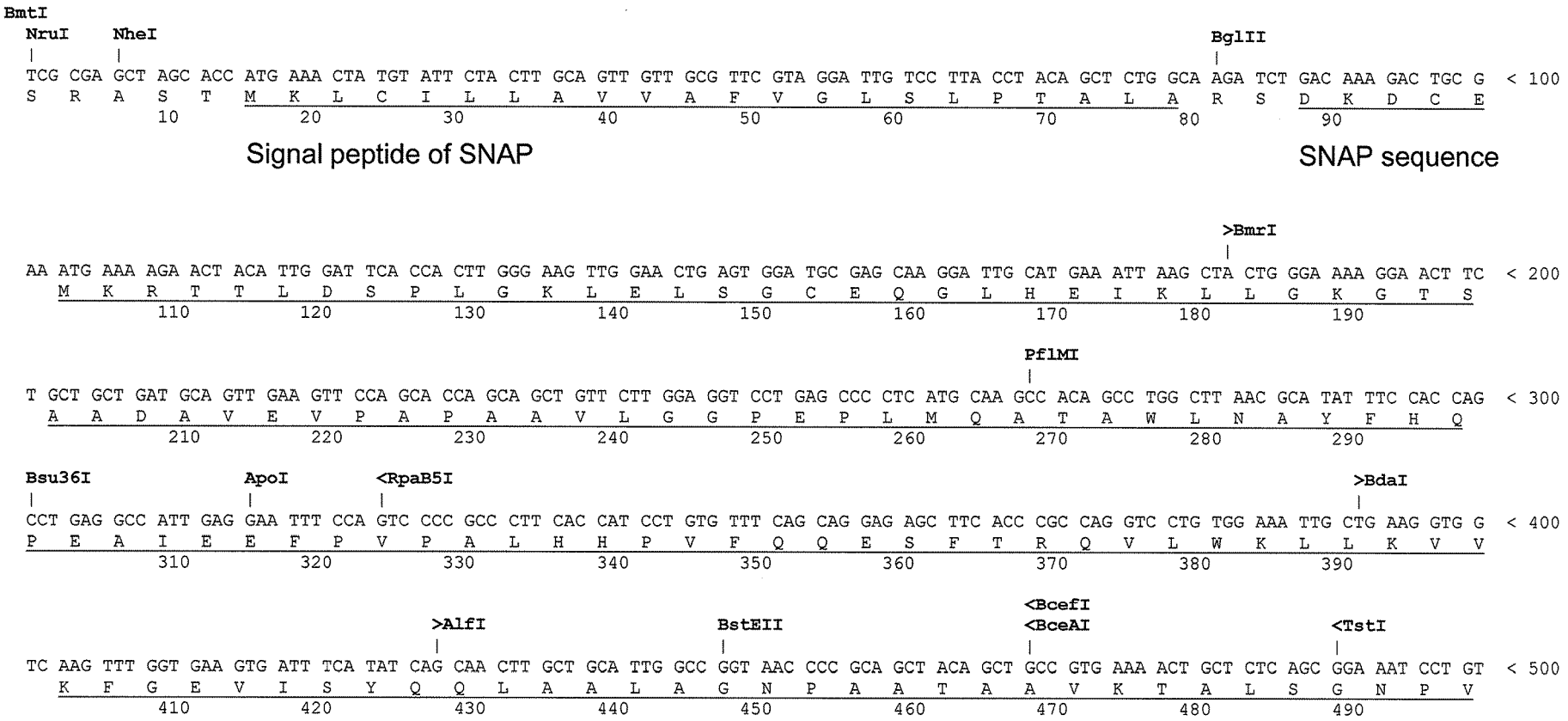
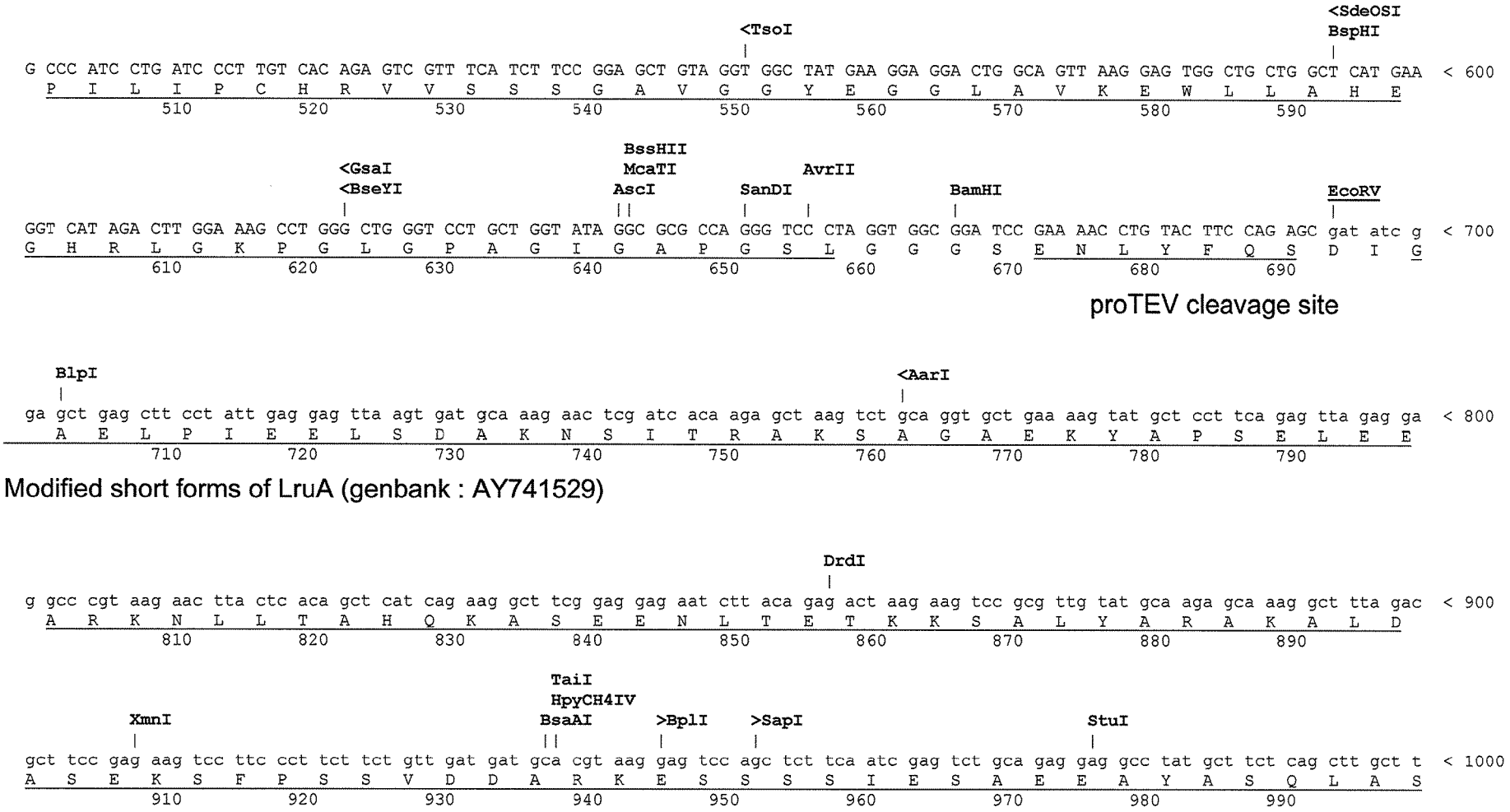


FIGURE 17A

FIGURE 17 (CONTINUED)



Modified short forms of LruA (genbank : AY741529)

FIGURE 17B

FIGURE 17 (CONTINUED)

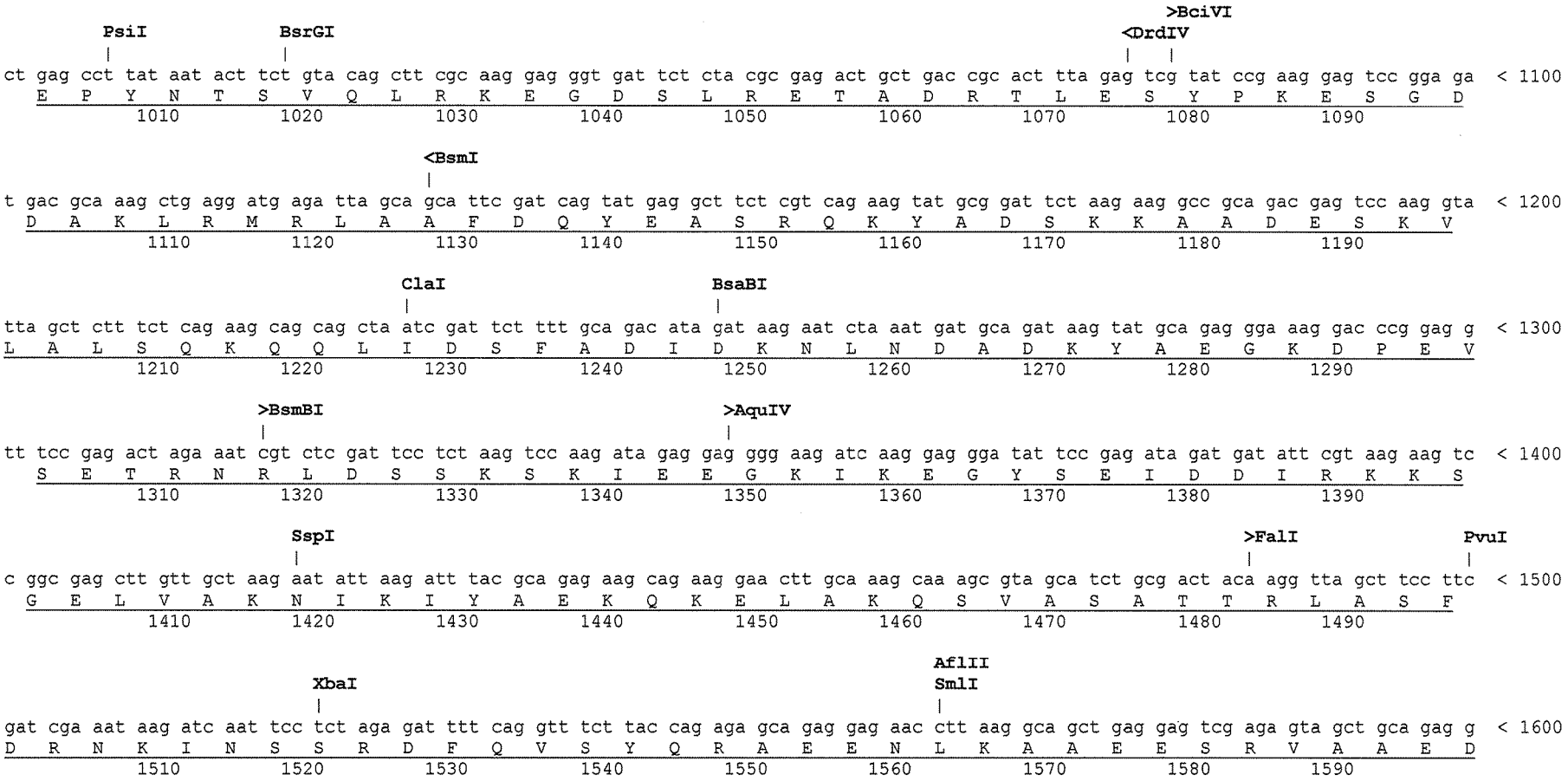


FIGURE 17C

FIGURE 17 (CONTINUED)

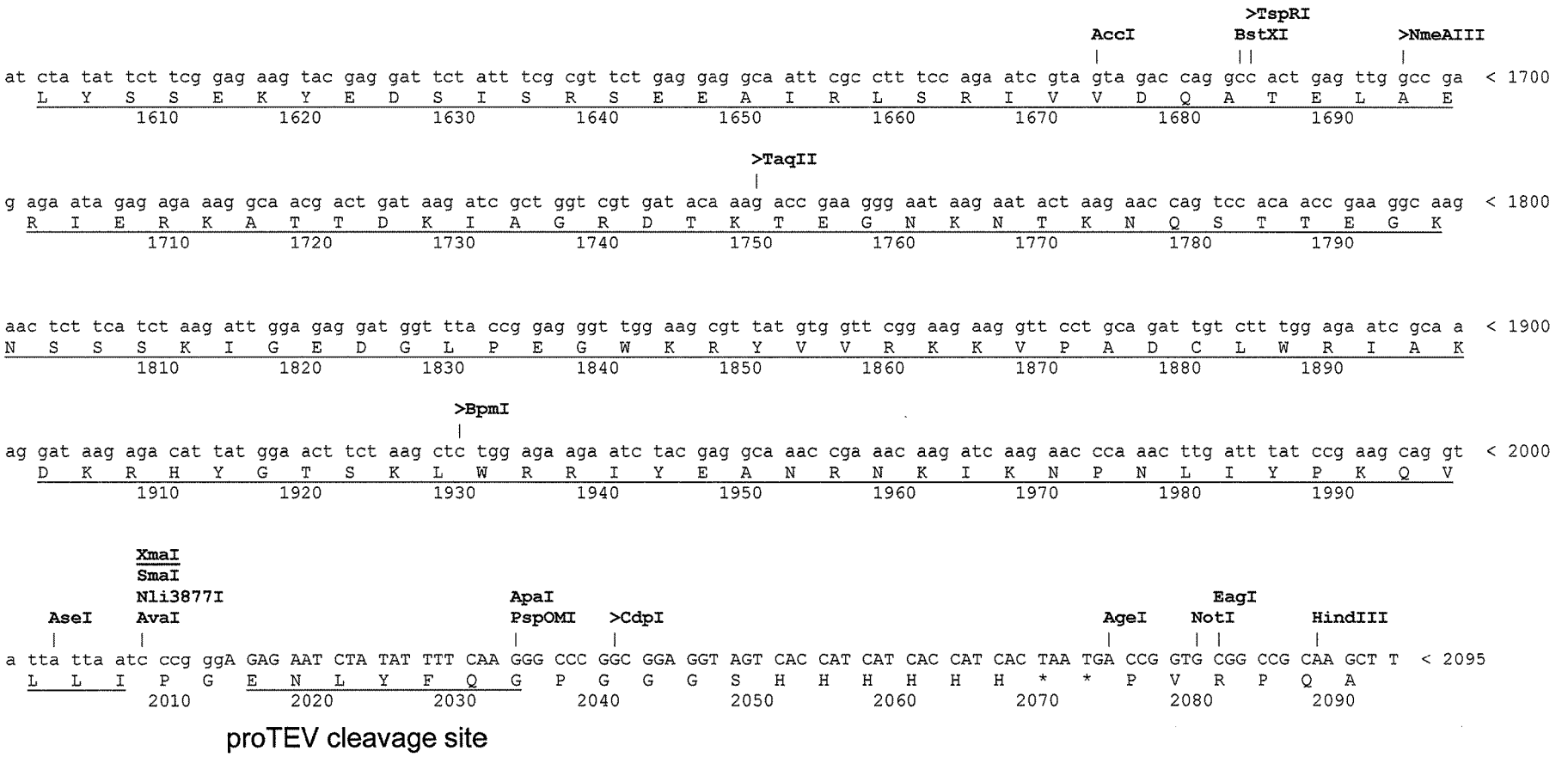


FIGURE 17D

FIGURE 18

Sequence of chimeric DeSNAPuniv-shortLruB (leptopsirosis)

Vector: pDeSNAPuniv. Insertion sites of the LruB sequence are underlined.

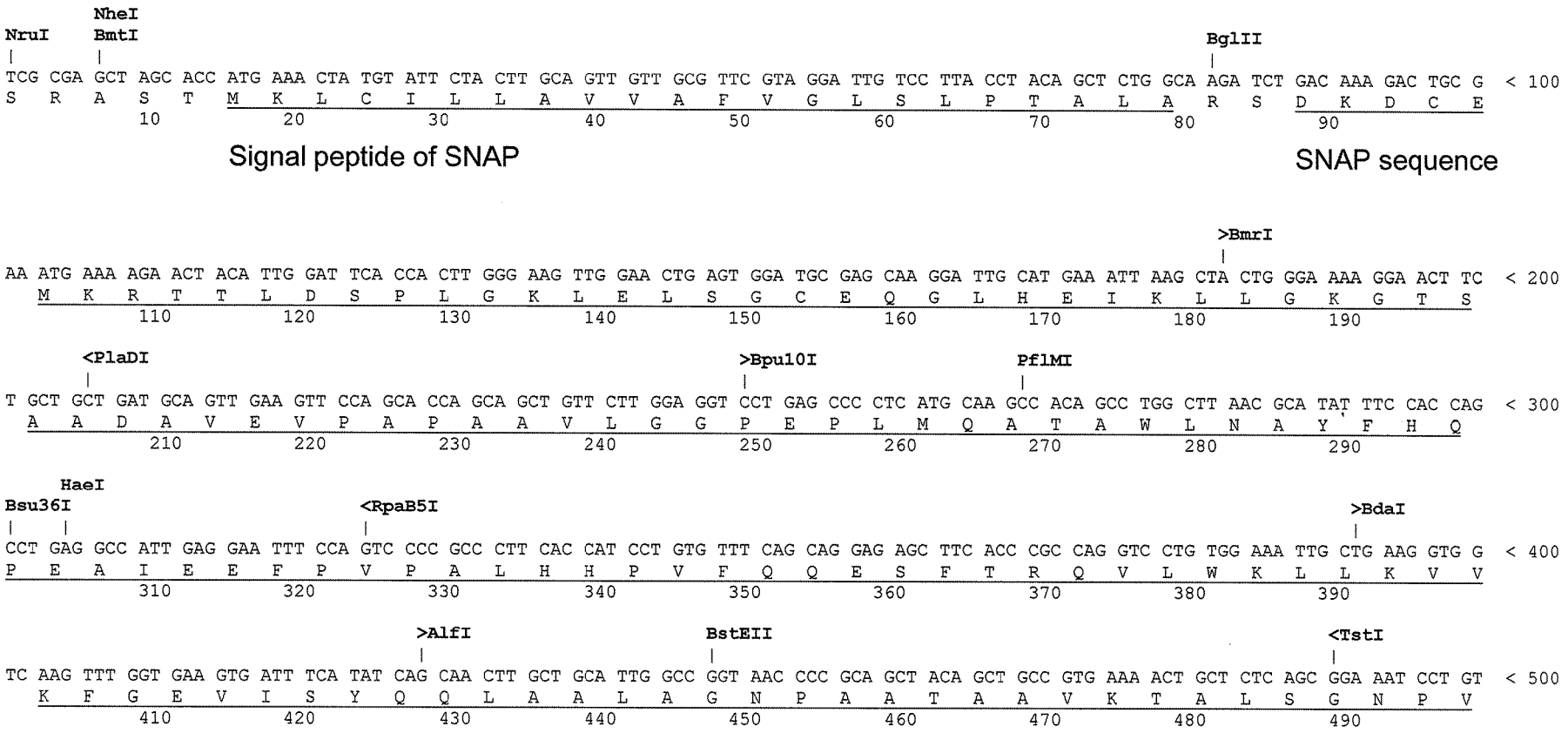
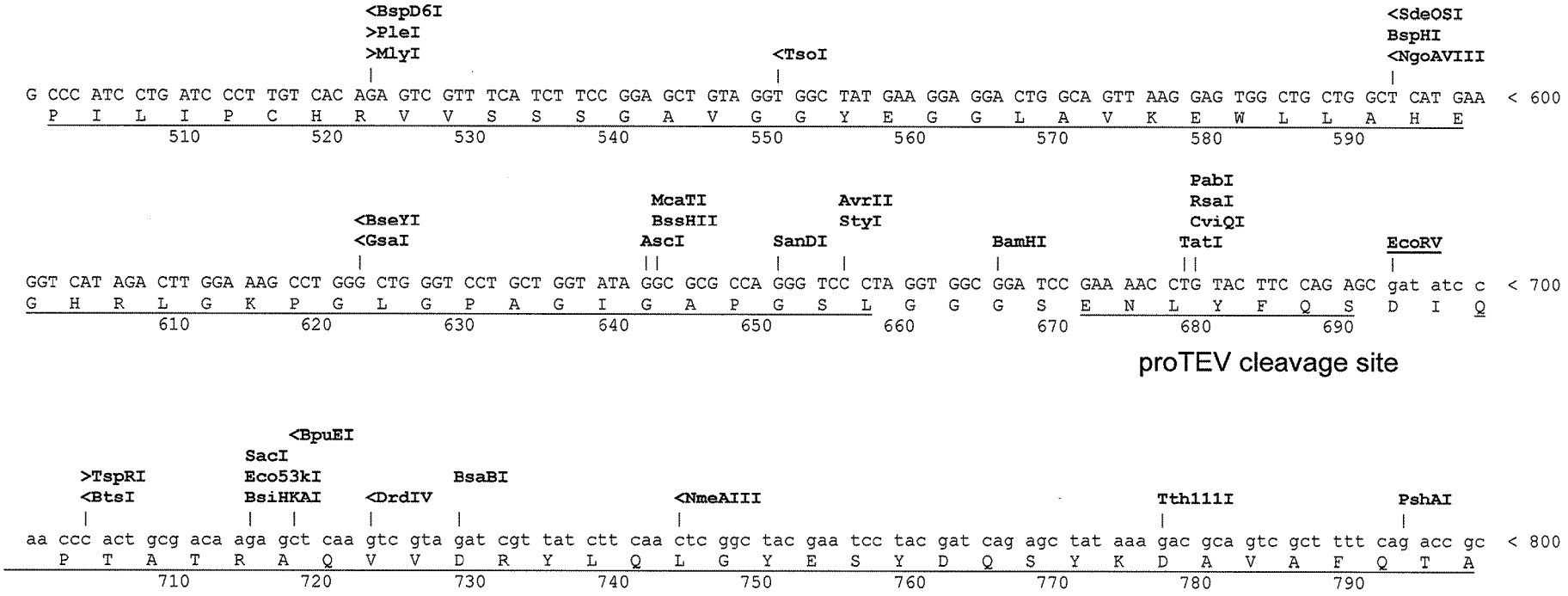


FIGURE 18A

FIGURE 18 (CONTINUED)



Modified short forms of LruB (genbank : AY741530)

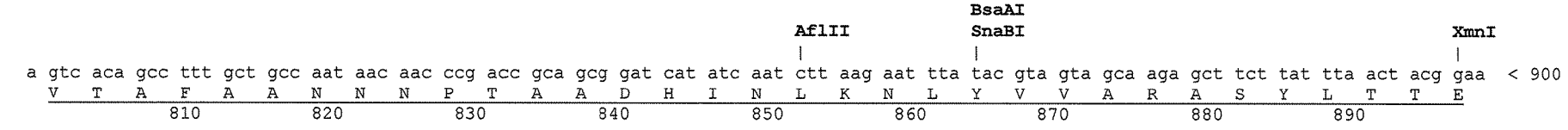


FIGURE 18B

FIGURE 18 (CONTINUED)

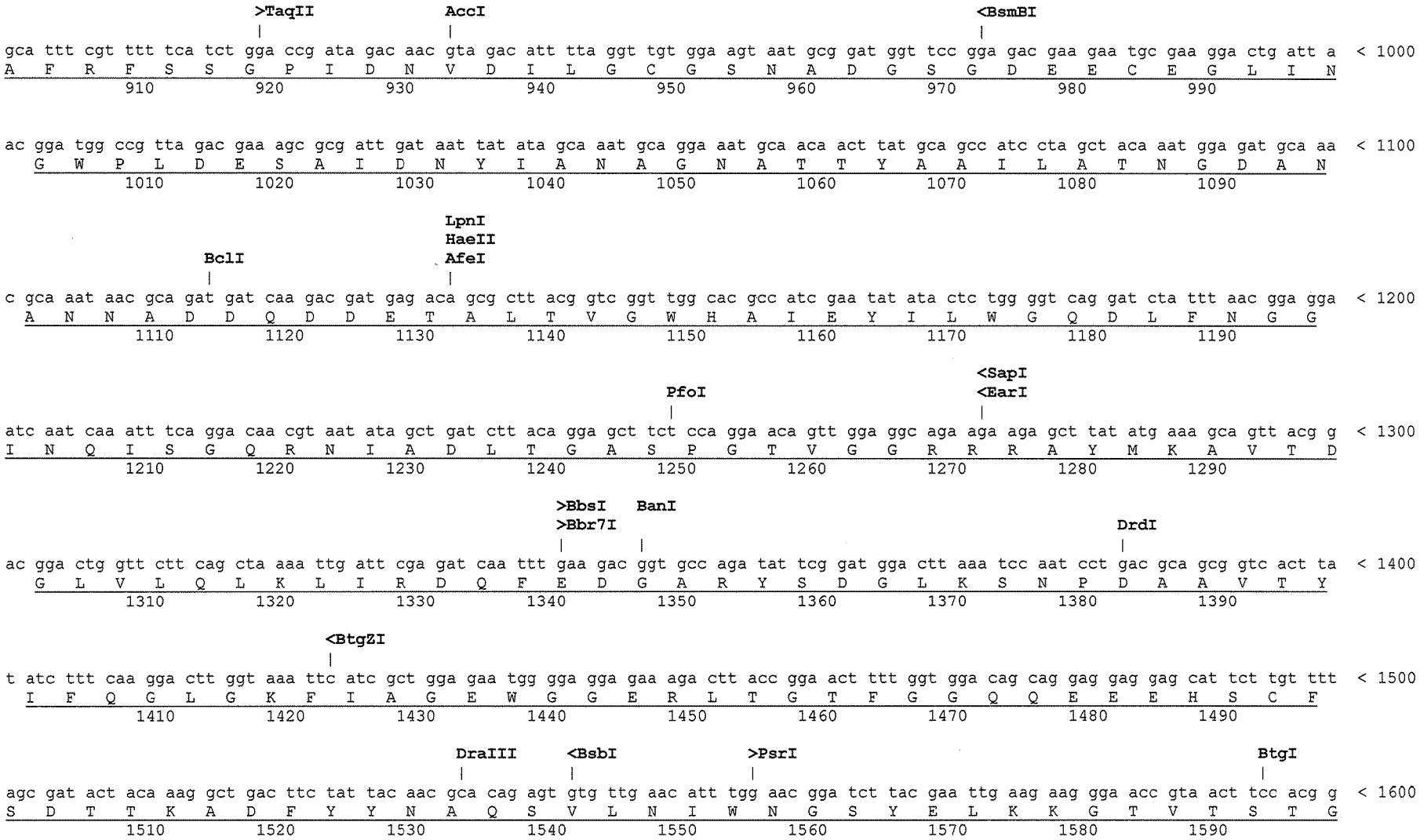


FIGURE 18C

FIGURE 18 (CONTINUED)

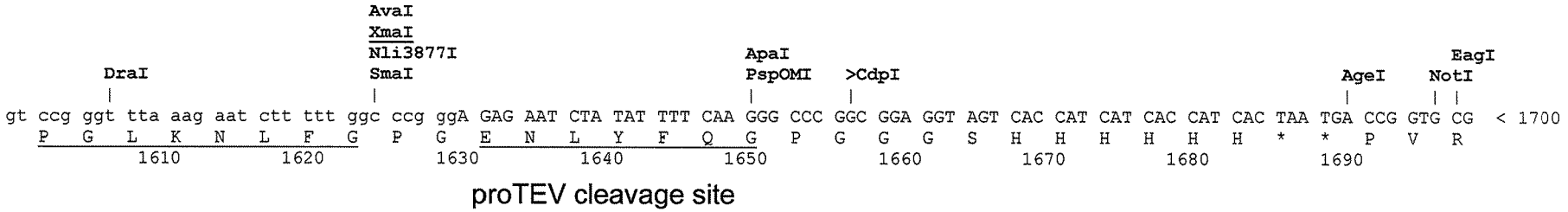


FIGURE 18D

FIGURE 19

Sequence of chimeric DeSNAPuniv-LipL32 (leptopsirosis)

Vector: pDeSNAPuniv. Insertion sites of the LruB sequence are underlined.

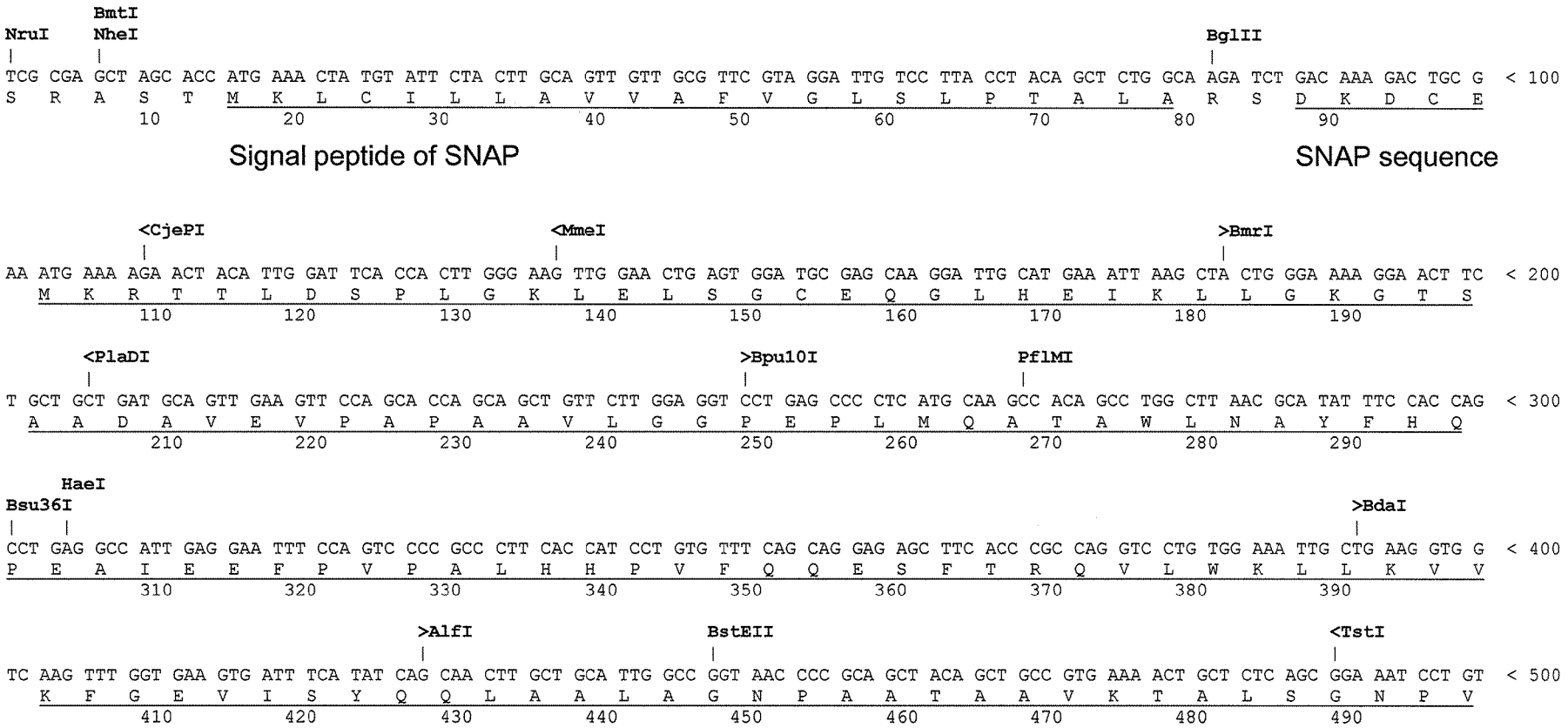
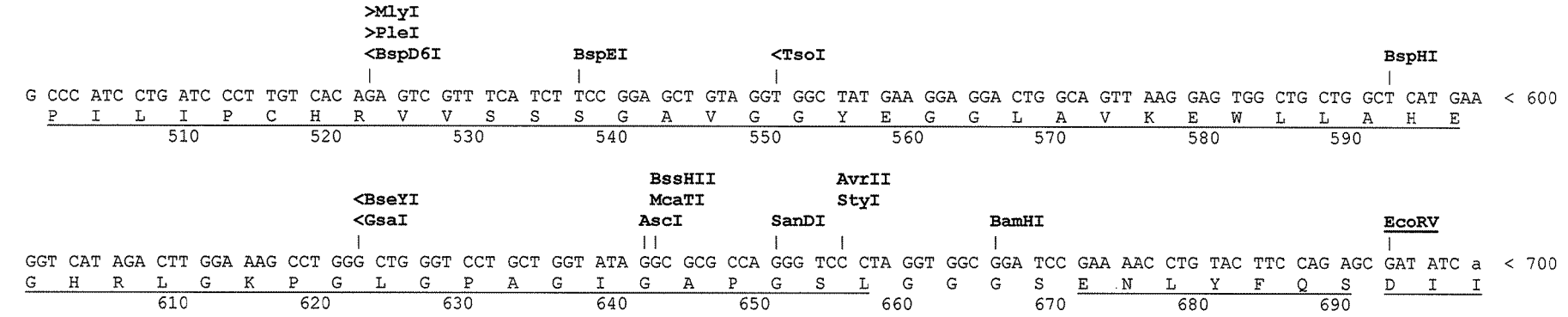
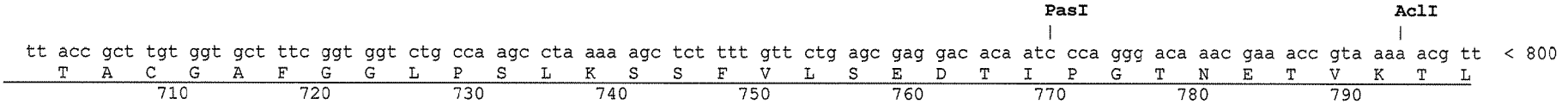


FIGURE 19A

FIGURE 19 (CONTINUED)



proTEV cleavage site



Modified short forms of LipL32 (genbank : AB094433.2)

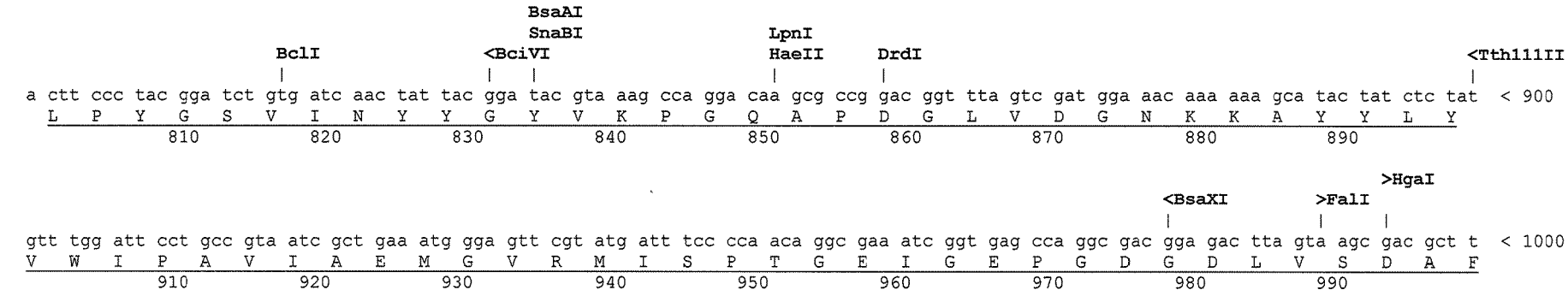


FIGURE 19B

FIGURE 19 (CONTINUED)

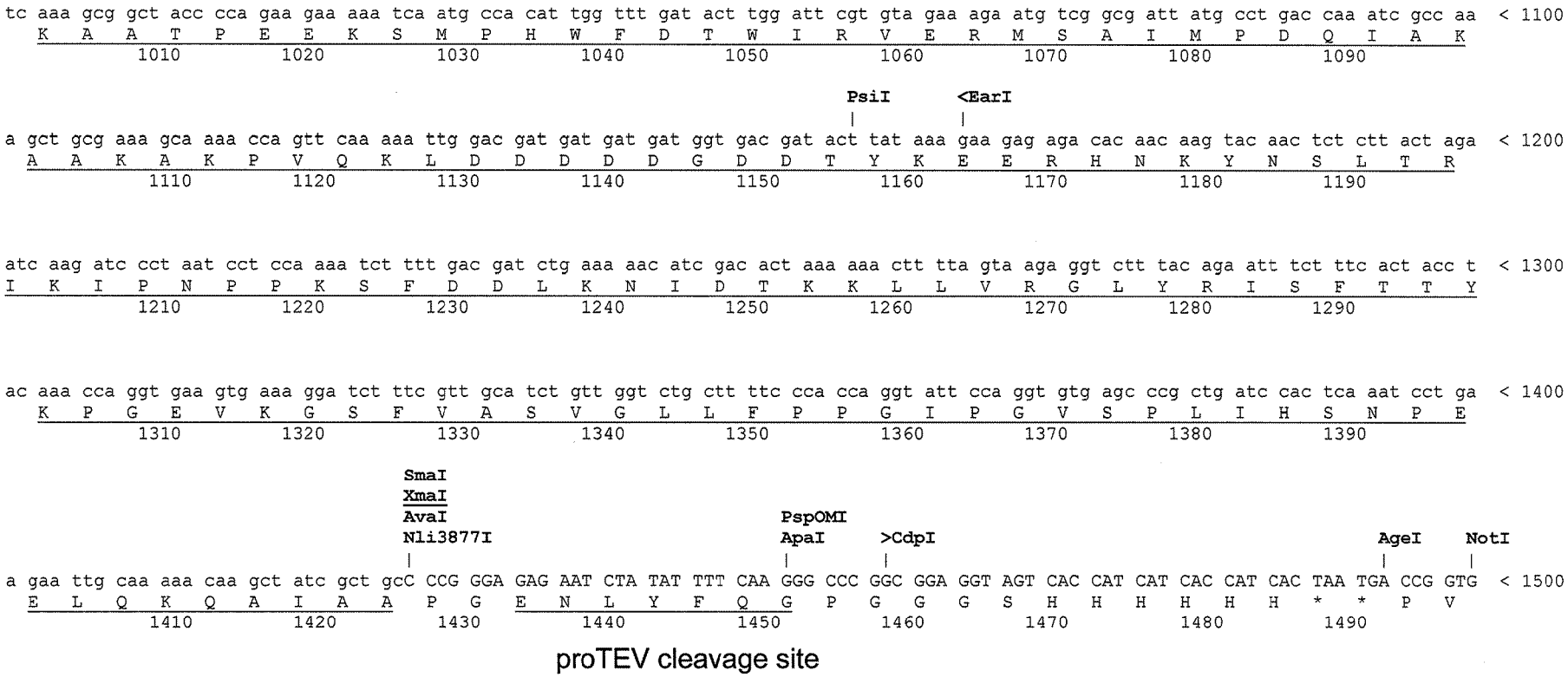


FIGURE 19C

FIGURE 19 (CONTINUED)

TCGCGAGCTAGCACCATGAAACTATGTATTCTACTTGCAGTTGTTGCGTTCGTAGGATTGTCCTTACCTACAGCTCTGGC
AAGATCTGACAAAGACTGCGAAATGAAAAGAACTACATTGGATTCACCACTTGGGAAGTTGGAACTGAGTGGATGCGAGC
AAGGATTGCATGAAATTAAGCTACTGGGAAAAGGAACTTCTGCTGCTGATGCAGTTGAAGTTCCAGCACCAGCAGCTGTT
CTTGGAGGTCCTGAGCCCCTCATGCAAGCCACAGCCTGGCTTAACGCATATTTCCACCAGCCTGAGGCCATTGAGGAATT
TCCAGTCCCCGCCCTTCACCATCCTGTGTTTCAGCAGGAGAGCTTCACCCGCCAGGTCCTGTGGAAATTGCTGAAGGTGG
TCAAGTTTGGTGAAGTGATTTCATATCAGCAACTTGCTGCATTGGCCGGTAACCCCGCAGCTACAGCTGCCGTGAAAACT
GCTCTCAGCGGAAATCCTGTGCCCATCCTGATCCCTTGTCACAGAGTCGTTTCATCTTCCGGAGCTGTAGGTGGCTATGA
AGGAGGACTGGCAGTTAAGGAGTGGCTGCTGGCTCATGAAGGTCATAGACTTGGAAAGCCTGGGCTGGGTCCTGCTGGTA
TAGGCGCGCCAGGGTCCCTAGGTGGCGGATCCGAAAACCTGTACTTCCAGAGCGATATCATTACCGCTTGTGGTGCTTTC
GGTGGTCTGCCAAGCCTAAAAAGCTCTTTTGTTCTGAGCGAGGACACAATCCCAGGGACAAACGAAACCGTAAAAACGTT
ACTTCCCTACGGATCTGTGATCAACTATTACGGATACGTAAAGCCAGGACAAGCGCCGGACGGTTTAGTCGATGGAAACA
AAAAAGCATACTATCTCTATGTTTGGATTCCTGCCGTAATCGCTGAAATGGGAGTTCGTATGATTTCCCCAACAGGCGAA
ATCGGTGAGCCAGGCGACGGAGACTTAGTAAGCGACGCTTTCAAAGCGGCTACCCCAGAAGAAAAATCAATGCCACATTG
GTTTGATACTTGGATTCGTGTAGAAAGAATGTCGGCGATTATGCCTGACCAAATCGCCAAAGCTGCGAAAGCAAAACCAG
TTCAAAAATTGGACGATGATGATGATGGTGACGATACTTATAAAGAAGAGAGACACAACAAGTACAACTCTCTTACTAGA
ATCAAGATCCCTAATCCTCCAAAATCTTTTGACGATCTGAAAAACATCGACACTAAAAAACTTTTAGTAAGAGGTCTTTA
CAGAATTTCTTTCACTACCTACAAACCAGGTGAAGTGAAAGGATCTTTCGTTGCATCTGTTGGTCTGCTTTTCCCACCAG
GTATTCCAGGTGTGAGCCCGCTGATCCACTCAAATCCTGAAGAATTGCAAAAACAAGCTATCGCTGCCCCGGGAGAGAAT
CTATATTTTCAAGGGCCCGGCGGAGGTAGTCACCATCATCACCATCACTAATGACCGGTGCGGCCGCAAGCTT

FIGURE 19D

FIGURE 20

Sequence of chimeric DeSNAPuniv-HEV.C protein

Vector: pDeSNAPuniv. Insertion sites of the HEV.C sequence are underlined.

```
                NheI
NruI            BmtI                                                                                BglII
|               |                                                                                   |
TCG CGA GCT AGC ACC ATG AAA CTA TGT ATT CTA CTT GCA GTT GTT GCG TTC GTA GGA TTG TCC TTA CCT ACA GCT CTG GCA AGA TCT GAC AAA GAC TGC G  < 100
S   R   A   S   T   M   K   L   C   I   L   L   A   V   V   A   F   V   G   L   S   L   P   T   A   L   A   R   S   D   K   D   C   E
                10          20          30          40          50          60          70          80          90

                Signal peptide of SNAP                                                                                SNAP sequence

AA ATG AAA AGA ACT ACA TTG GAT TCA CCA CTT GGG AAG TTG GAA CTG AGT GGA TGC GAG CAA GGA TTG CAT GAA ATT AAG CTA CTG GGA AAA GGA ACT TC  < 200
   M   K   R   T   T   L   D   S   P   L   G   K   L   E   L   S   G   C   E   Q   G   L   H   E   I   K   L   L   G   K   G   T   S
              110         120         130         140         150         160         170         180         190

                                                                >Bpu10I
                                                                |
T GCT GCT GAT GCA GTT GAA GTT CCA GCA CCA GCA GCT GTT CTT GGA GGT CCT GAG CCC CTC ATG CAA GCC ACA GCC TGG CTT AAC GCA TAT TTC CAC CAG  < 300
  A   A   D   A   V   E   V   P   A   P   A   A   V   L   G   G   P   E   P   L   M   Q   A   T   A   W   L   N   A   Y   F   H   Q
              210         220         230         240         250         260         270         280         290

Bsu36I
|
CCT GAG GCC ATT GAG GAA TTT CCA GTC CCC GCC CTT CAC CAT CCT GTG TTT CAG CAG GAG AGC TTC ACC CGC CAG GTC CTG TGG AAA TTG CTG AAG GTG G  < 400
P   E   A   I   E   E   F   P   V   P   A   L   H   H   P   V   F   Q   Q   E   S   F   T   R   Q   V   L   W   K   L   L   K   V   V
              310         320         330         340         350         360         370         380         390

                                                                                                    <TstI
                                                                                                    |
TC AAG TTT GGT GAA GTG ATT TCA TAT CAG CAA CTT GCT GCA TTG GCC GGT AAC CCC GCA GCT ACA GCT GCC GTG AAA ACT GCT CTC AGC GGA AAT CCT GT  < 500
   K   F   G   E   V   I   S   Y   Q   Q   L   A   A   L   A   G   N   P   A   A   T   A   A   V   K   T   A   L   S   G   N   P   V
              410         420         430         440         450         460         470         480         490
```

FIGURE 20A

FIGURE 20 (CONTINUED)

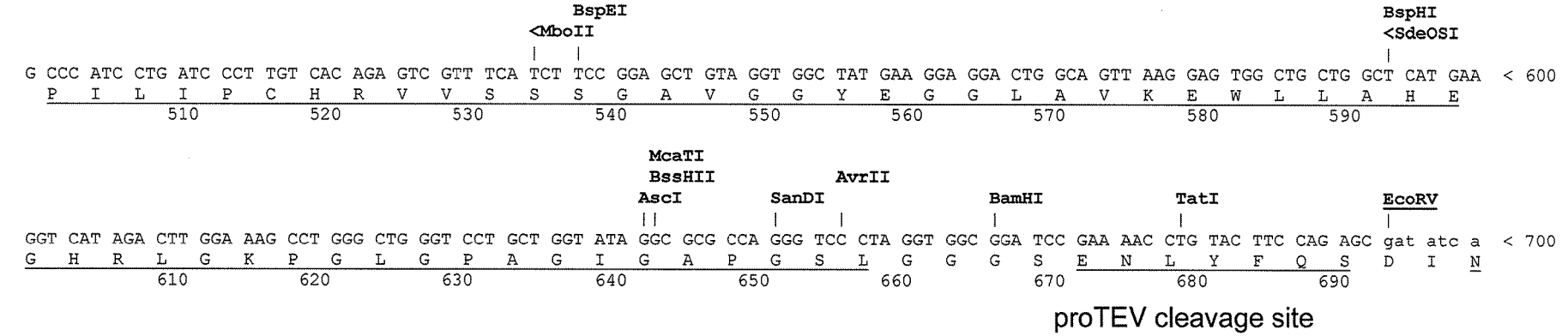


FIGURE 20B

FIGURE 20 (CONTINUED)

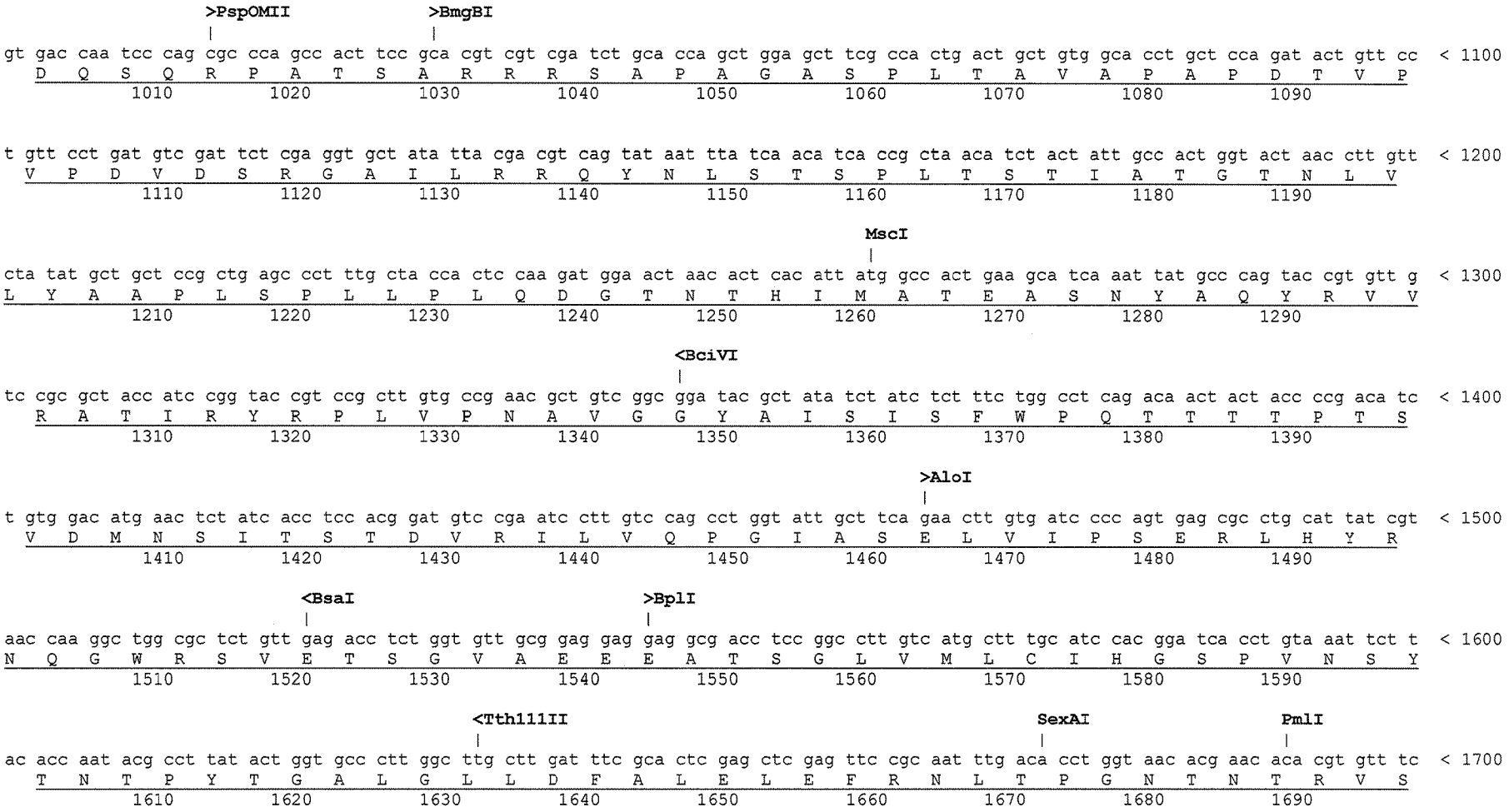


FIGURE 20C

FIGURE 20 (CONTINUED)

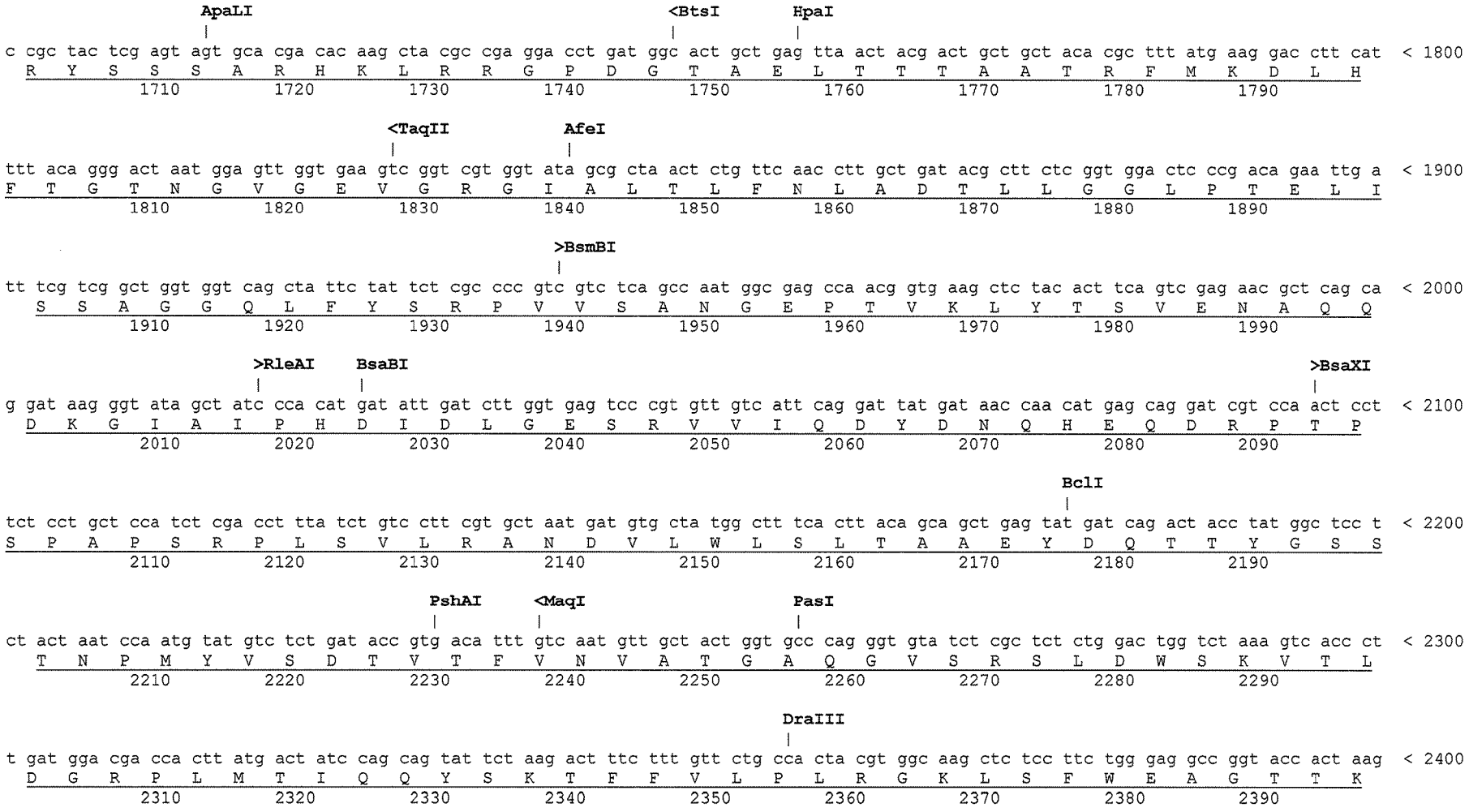


FIGURE 20D

FIGURE 20 (CONTINUED)

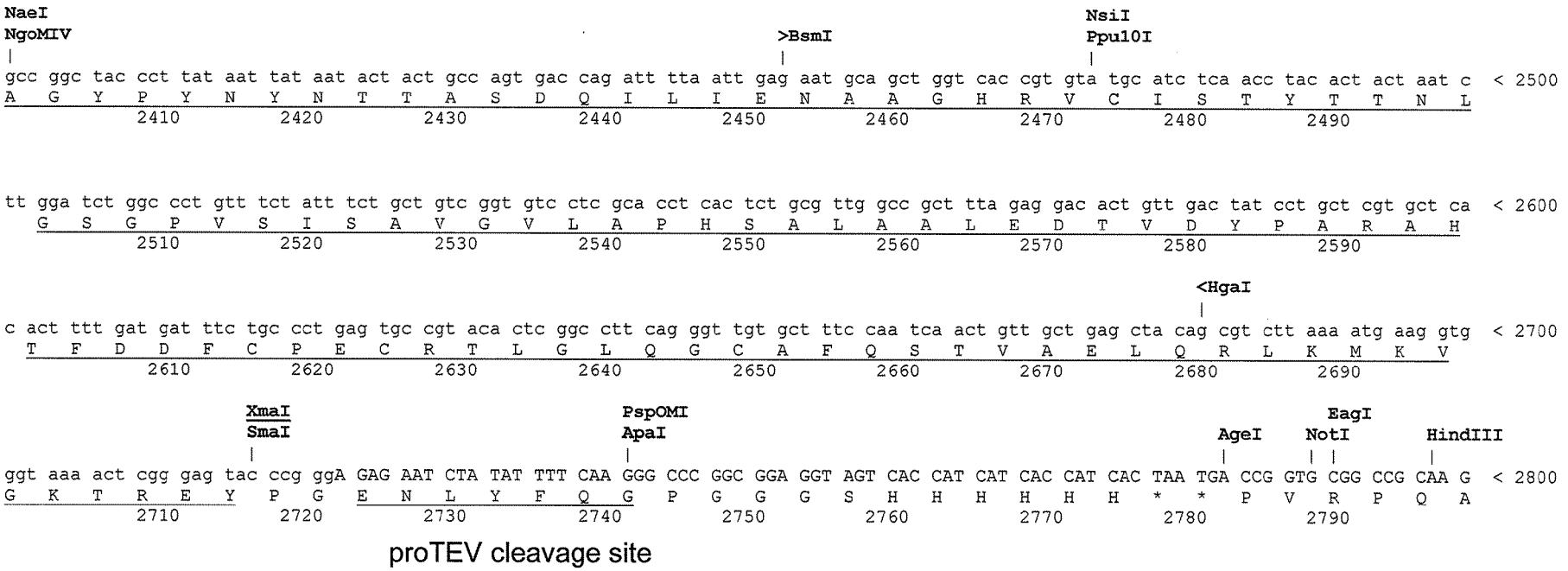


FIGURE 20E

FIGURE 20 (CONTINUED)

TCGCGAGCTAGCACCATGAAACTATGTATTCTACTTGCAGTTGTTGCGTTCGTAGGATTGTCCTTACCTACAGCTCTGGC
AAGATCTGACAAAGACTGCGAAATGAAAAGAACTACATTGGATTCACCACTTGGGAAGTTGGAACTGAGTGGATGCGAGC
AAGGATTGCATGAAATTAAGCTACTGGGAAAAGGAACTTCTGCTGCTGATGCAGTTGAAGTTCCAGCACCAGCAGCTGTT
CTTGGAGGTCCTGAGCCCCTCATGCAAGCCACAGCCTGGCTTAACGCATATTTCCACCAGCCTGAGGCCATTGAGGAATT
TCCAGTCCCCGCCCTTCACCATCCTGTGTTTCAGCAGGAGAGCTTCACCCGCCAGGTCCTGTGGAAATTGCTGAAGGTGG
TCAAGTTTGGTGAAGTGATTTCATATCAGCAACTTGCTGCATTGGCCGGTAACCCCGCAGCTACAGCTGCCGTGAAAACT
GCTCTCAGCGGAAATCCTGTGCCCATCCTGATCCCTTGTCACAGAGTCGTTTCATCTTCCGGAGCTGTAGGTGGCTATGA
AGGAGGACTGGCAGTTAAGGAGTGGCTGCTGGCTCATGAAGGTCATAGACTTGGAAAGCCTGGGCTGGGTCCTGCTGGTA
TAGGCGCGCCAGGGTCCCTAGGTGGCGGATCCGAAAACCTGTACTTCCAGAGCGATATCAATAACATGTTCTTTTGCTCT
GTGCATGGAGATGCCACCATGCGCTCTCGGGCTTTCCTGTTCTTGTTCCTCGTGTTTCTGCCTATGCTGCCAGCGCCACC
AGCCGGTCAGCCTTCTGGCCGACGTCGAGGTCGACGTAGCGGAGGTGCAGGTGGTGGTTTCTGGGGTGACCGTATTGATT
CTCAGCCATTCGCTCTCCCTTATATTCATCCAACCAACCCATTCGCACCTGACATTCCAGCCGCAGCTGGTGCTGGAGCT
CGACCTCGGCAGCCAGCCCGCCCACTCGGCTCCGCTTGGCGTGACCAATCCCAGCGCCCAGCCACTTCCGCACGTCGTCG
ATCTGCACCAGCTGGAGCTTCGCCACTGACTGCTGTGGCACCTGCTCCAGATACTGTTCCTGTTCCTGATGTCGATTCTC
GAGGTGCTATATTACGACGTCAGTATAATTTATCAACATCACCGCTAACATCTACTATTGCCACTGGTACTAACCTTGTT
CTATATGCTGCTCCGCTGAGCCCTTTGCTACCACTCCAAGATGGAACTAACACTCACATTATGGCCACTGAAGCATCAAA
TTATGCCCAGTACCGTGTTGTCCGCGCTACCATCCGGTACCGTCCGCTTGTGCCGAACGCTGTCGGCGGATACGCTATAT
CTATCTCTTTCTGGCCTCAGACAACTACTACCCCGACATCTGTGGACATGAACTCTATCACCTCCACGGATGTCCGAATC
CTTGTCCAGCCTGGTATTGCTTCAGAACTTGTGATCCCCAGTGAGCGCCTGCATTATCGTAACCAAGGCTGGCGCTCTGT
TGAGACCTCTGGTGTTGCGGAGGAGGAGGCGACCTCCGGCCTTGTCATGCTTTGCATCCACGGATCACCTGTAAATTCTT
ACACCAATACGCCTTATACTGGTGCCCTTGGCTTGCTTGATTTCGCACTCGAGCTCGAGTTCCGCAATTTGACACCTGGT
AACACGAACACACGTGTTTCCCGCTACTCGAGTAGTGCACGACACAAGCTACGCCGAGGACCTGATGGCACTGCTGAGTT
AACTACGACTGCTGCTACACGCTTTATGAAGGACCTTCATTTTACAGGGACTAATGGAGTTGGTGAAGTCGGTCGTGGTA
TAGCGCTAACTCTGTTCAACCTTGCTGATACGCTTCTCGGTGGACTCCCGACAGAATTGATTTCGTCGGCTGGTGGTCAG
CTATTCTATTCTCGCCCCGTCGTCTCAGCCAATGGCGAGCCAACGGTGAAGCTCTACACTTCAGTCGAGAACGCTCAGCA
GGATAAGGGTATAGCTATCCCACATGATATTGATCTTGGTGAGTCCCGTGTTGTCATTCAGGATTATGATAACCAACATG
AGCAGGATCGTCCAACTCCTTCTCCTGCTCCATCTCGACCTTTATCTGTCCTTCGTGCTAATGATGTGCTATGGCTTTCA
CTTACAGCAGCTGAGTATGATCAGACTACCTATGGCTCCTCTACTAATCCAATGTATGTCTCTGATACCGTGACATTTGT
CAATGTTGCTACTGGTGCCCAGGGTGTATCTCGCTCTCTGGACTGGTCTAAAGTCACCCTTGATGGACGACCACTTATGA
CTATCCAGCAGTATTCTAAGACTTTCTTTGTTCTGCCACTACGTGGCAAGCTCTCCTTCTGGGAGGCCGGTACCACTAAG
GCCGGCTACCCTTATAATTATAATACTACTGCCAGTGACCAGATTTTAATTGAGAATGCAGCTGGTCACCGTGTATGCAT
CTCAACCTACACTACTAATCTTGGATCTGGCCCTGTTTCTATTTCTGCTGTCGGTGTCCTCGCACCTCACTCTGCGTTGG
CCGCTTTAGAGGACACTGTTGACTATCCTGCTCGTGCTCACACTTTTGATGATTTCTGCCCTGAGTGCCGTACACTCGGC
CTTCAGGGTTGTGCTTTCCAATCAACTGTTGCTGAGCTACAGCGTCTTAAAATGAAGGTGGGTAAAACTCGGGAGTACCC
GGGAGAGAATCTATATTTTCAAGGGCCCGGCGGAGGTAGTCACCATCATCACCATCACTAATGACCGGTGCGGCCGCAAG
CTT

FIGURE 20F

FIGURE 21

Sequence of chimeric DeSNAPuniv-HEV.C protein central domain

Vector: pDeSNAPuniv. Insertion sites of the HEV.C sequence are underlined

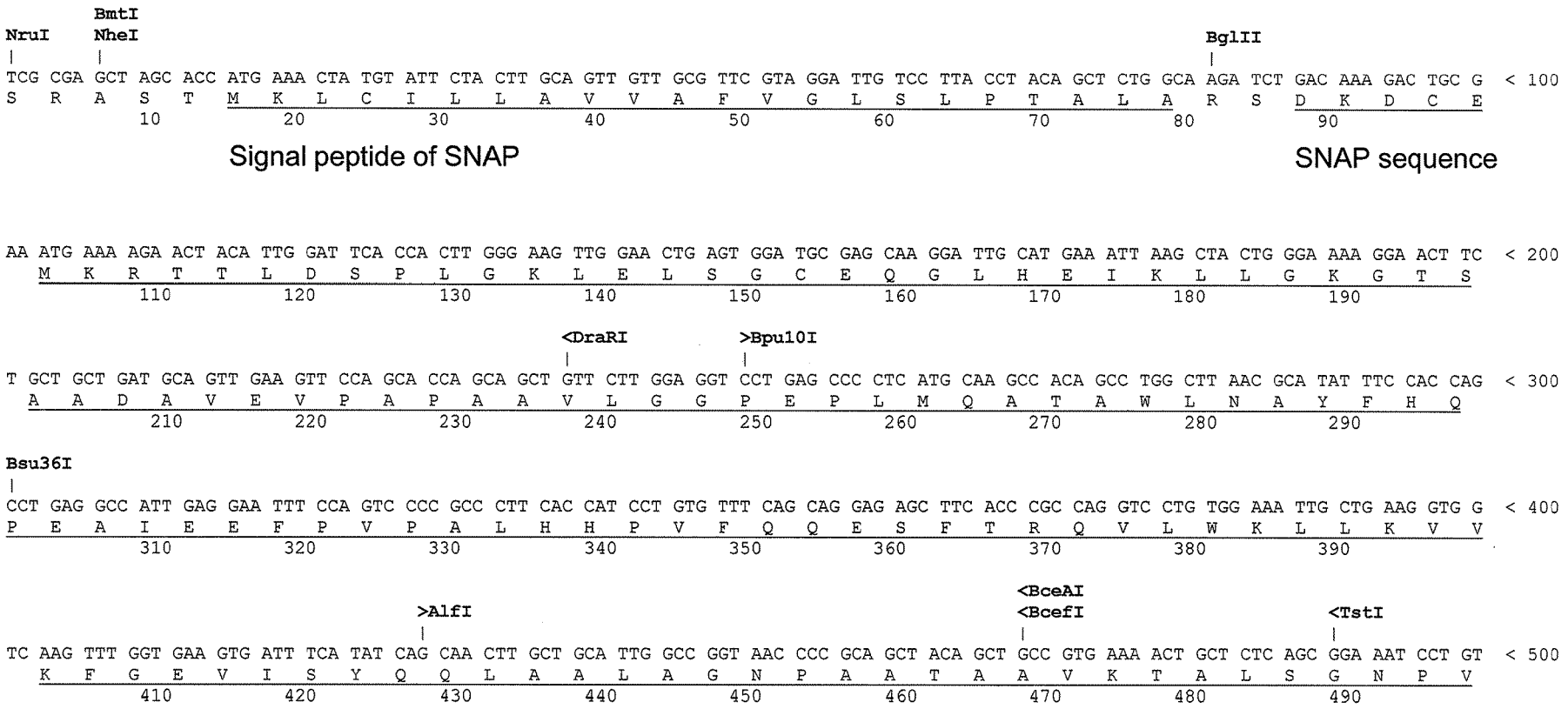


FIGURE 21A

FIGURE 21 (CONTINUED)

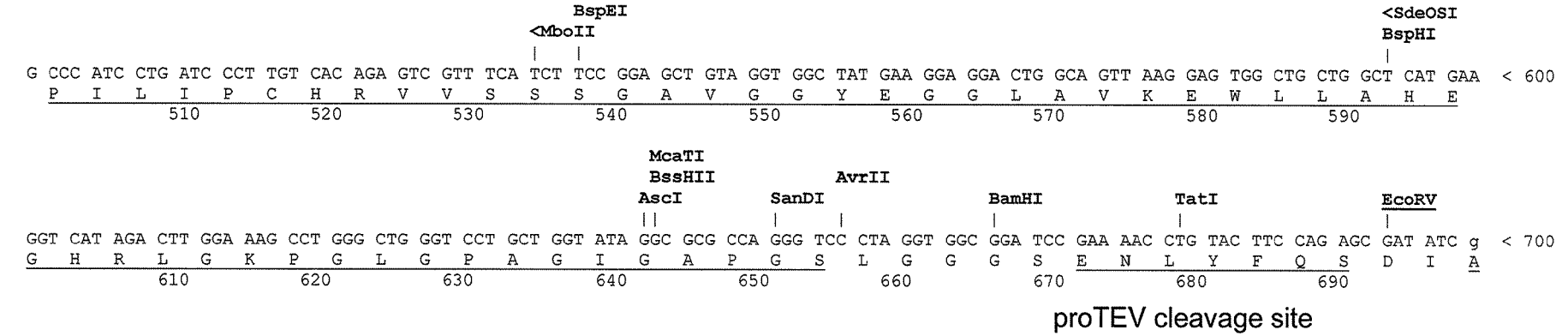


FIGURE 21B

FIGURE 21 (CONTINUED)

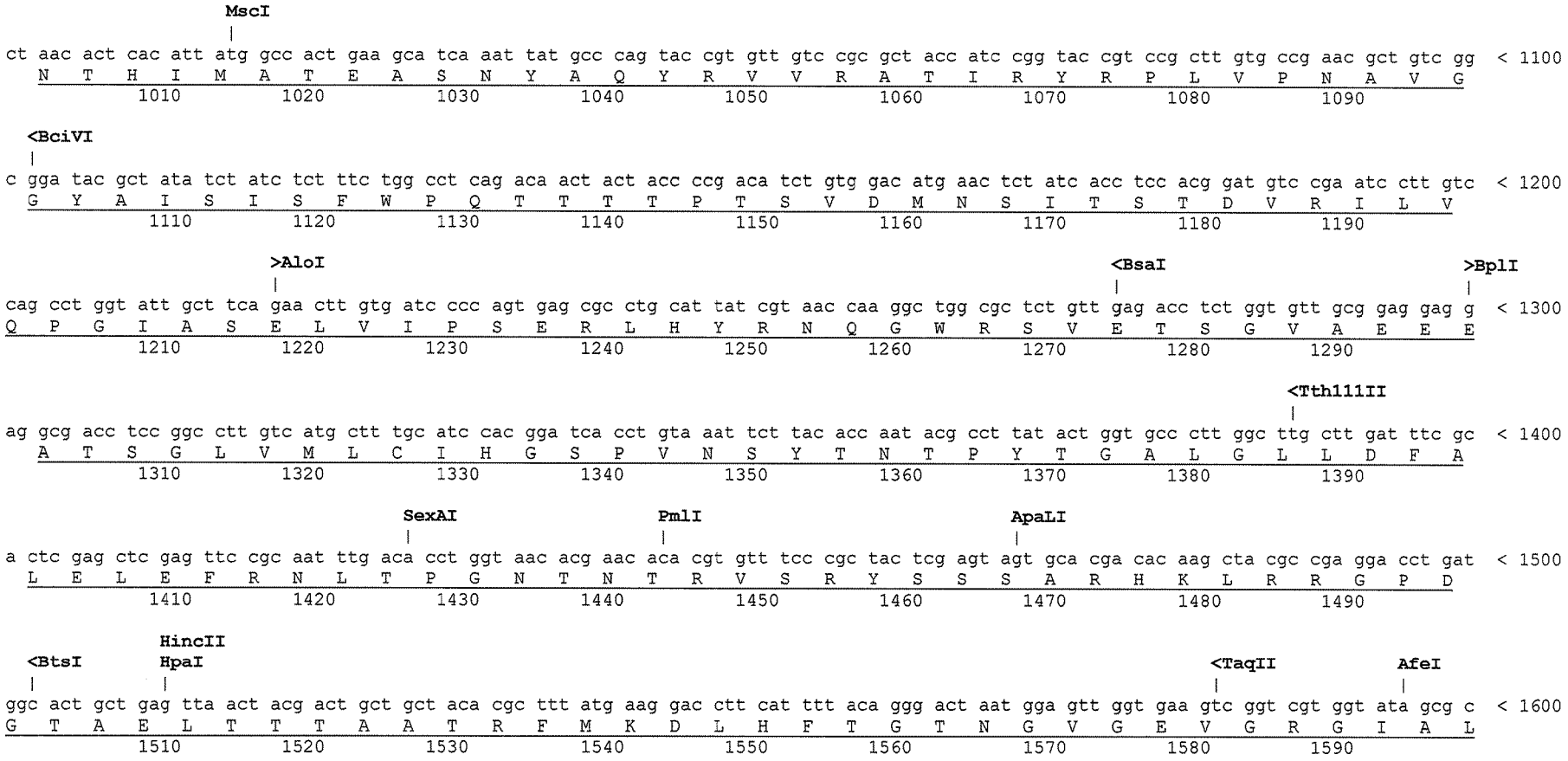


FIGURE 21C

FIGURE 21 (CONTINUED)

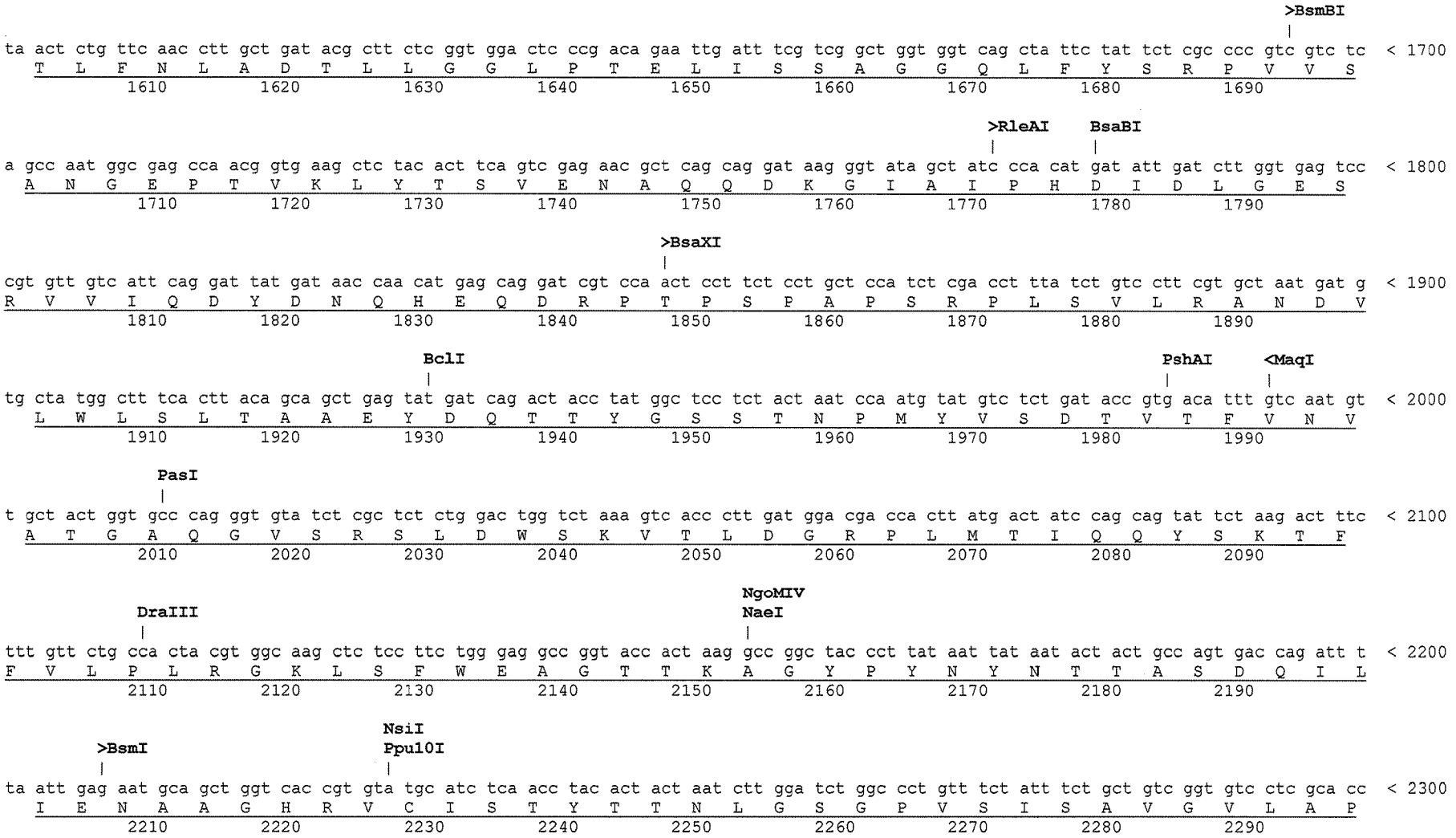
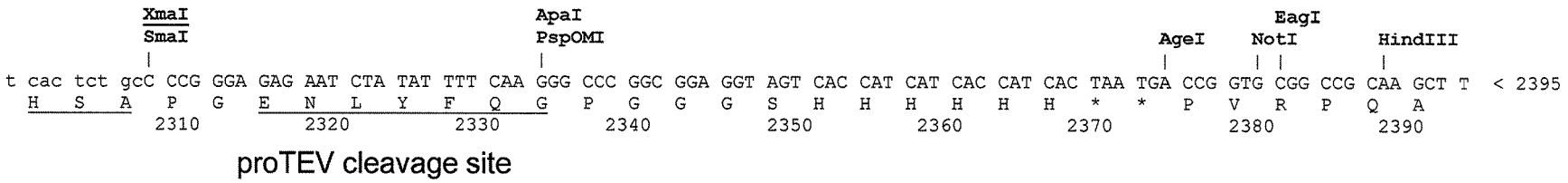


FIGURE 21D

FIGURE 21 (CONTINUED)



TCGCGAGCTAGCACCATGAAACTATGTATTCTACTTGCAGTTGTTGCGTTCGTAGGATTGTCCTTACCTACAGCTCTGGC
AAGATCTGACAAAGACTGCGAAATGAAAAGAACTACATTGGATTCACCACTTGGGAAGTTGGAACTGAGTGGATGCGAGC
AAGGATTGCATGAAATTAAGCTACTGGGAAAAGGAACTTCTGCTGCTGATGCAGTTGAAGTTCCAGCACCAGCAGCTGTT
CTTGGAGGTCCTGAGCCCCTCATGCAAGCCACAGCCTGGCTTAACGCATATTTCCACCAGCCTGAGGCCATTGAGGAATT
TCCAGTCCCCGCCCTTCACCATCCTGTGTTTCAGCAGGAGAGCTTCACCCGCCAGGTCCTGTGGAAATTGCTGAAGGTGG
TCAAGTTTGGTGAAGTGATTTCATATCAGCAACTTGCTGCATTGGCCGGTAACCCCGCAGCTACAGCTGCCGTGAAAACT
GCTCTCAGCGGAAATCCTGTGCCCATCCTGATCCCTTGTCACAGAGTCGTTTCATCTTCCGGAGCTGTAGGTGGCTATGA
AGGAGGACTGGCAGTTAAGGAGTGGCTGCTGGCTCATGAAGGTCATAGACTTGGAAAGCCTGGGCTGGGTCCTGCTGGTA
TAGGCGCGCCAGGGTCCCTAGGTGGCGGATCCGAAAACCTGTACTTCCAGAGCGATATCgctggtgctggagctcgacct
cggcagccagcccgcccactcggctccgcttggcgtgaccaatcccagcgcccagccacttccgcacgtcgtcgatctgc
accagctggagcttcgccactgactgctgtggcacctgctccagatactgttcctgttcctgatgtcgattctcgaggtg
ctatattacgacgtcagtataatttatcaacatcaccgctaacatctactattgccactggtactaaccttgttctatat
gctgctccgctgagccctttgctaccactccaagatggaactaacactcacattatggccactgaagcatcaaattatgc
ccagtaccgtgttgtccgcgctaccatccggtaccgtccgcttgtgccgaacgctgtcggcggatacgctatatctatct
ctttctggcctcagacaactactaccccgacatctgtggacatgaactctatcacctccacggatgtccgaatccttgtc
cagcctggtattgcttcagaacttgtgatccccagtgagcgcctgcattatcgtaaccaaggctggcgctctgttgagac
ctctggtgttgcggaggaggaggcgacctccggccttgtcatgctttgcatccacggatcacctgtaaattcttacacca
atacgccttatactggtgcccttggcttgcttgatttcgcactcgagctcgagttccgcaatttgacacctggtaacacg
aacacacgtgtttcccgctactcgagtagtgcacgacacaagctacgccgaggacctgatggcactgctgagttaactac
gactgctgctacacgctttatgaaggaccttcattttacagggactaatggagttggtgaagtcggtcgtggtatagcgc
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tattctcgccccgtcgtctcagccaatggcgagccaacggtgaagctctacacttcagtcgagaacgctcagcaggataa
gggtatagctatcccacatgatattgatcttggtgagtcccgtgttgtcattcaggattatgataaccaacatgagcagg
atcgtccaactccttctcctgctccatctcgacctttatctgtccttcgtgctaatgatgtgctatggctttcacttaca
gcagctgagtatgatcagactacctatggctcctctactaatccaatgtatgtctctgataccgtgacatttgtcaatgt
tgctactggtgcccagggtgtatctcgctctctggactggtctaaagtcacccttgatggacgaccacttatgactatcc
agcagtattctaagactttctttgttctgccactacgtggcaagctctccttctgggaggccggtaccactaaggccggc
taccttataattataatactactgccagtgaccagattttaattgagaatgcagctggtcaccgtgtatgcatctcaac
ctacactactaatcttggatctggccctgtttctatttctgctgtcggtgtcctcgcacctcactctgcCCCGGGAGAGA
ATCTATATTTTCAAGGGCCCGGCGGAGGTAGTCACCATCATCACCATCACTAATGACCGGTGCGGCCGCAAGCTT

FIGURE 21E

FIGURE 22

Sequence of chimeric DeSNAPuniv- HCV Core antigen

Vector: pDeSNAPuniv. Insertion sites of the HCV C sequence are underlined.

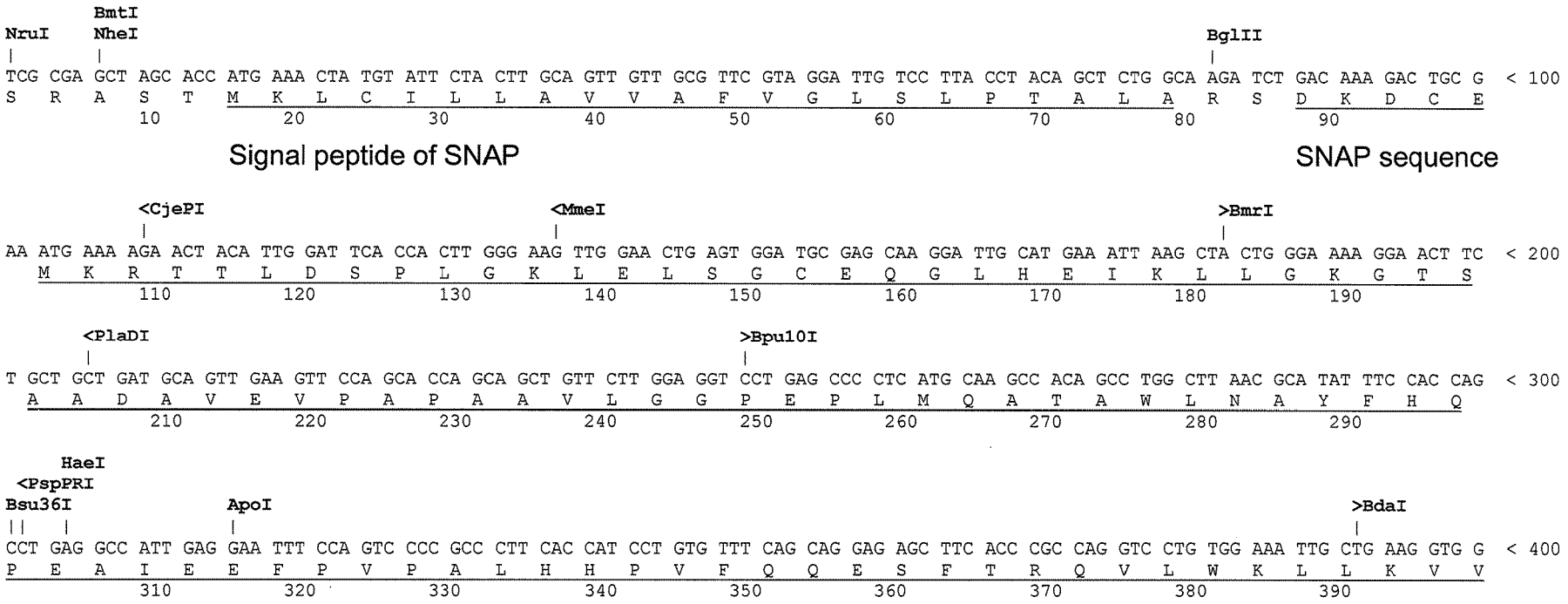


FIGURE 22A

FIGURE 22 (CONTINUED)

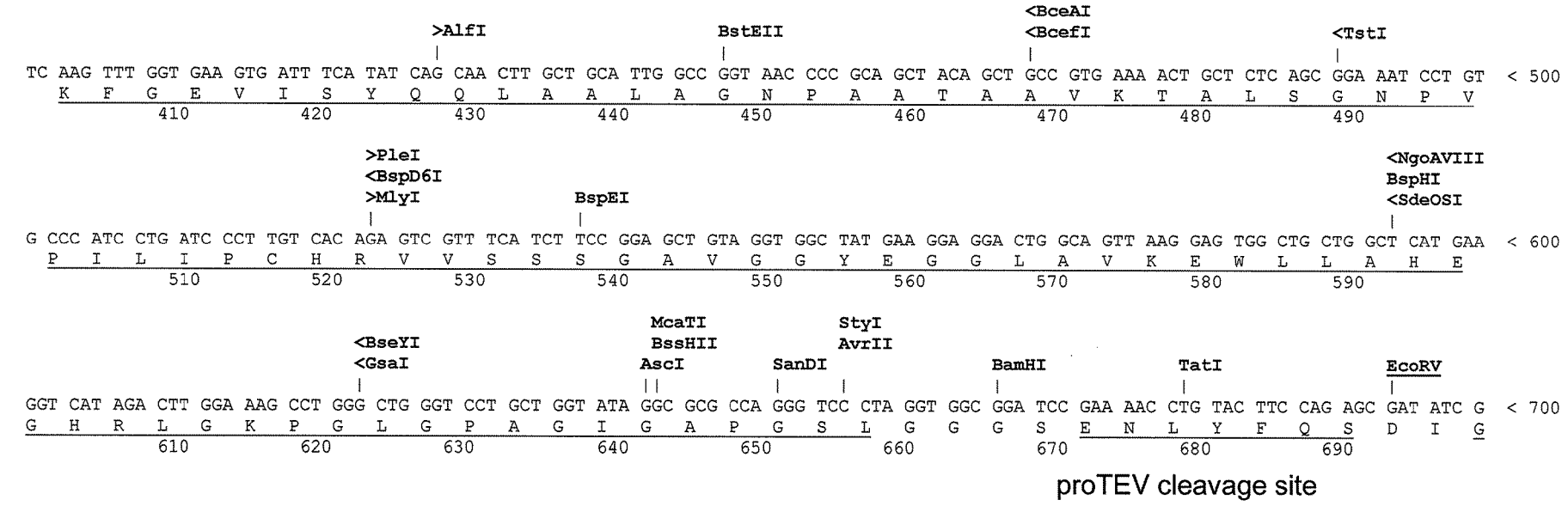
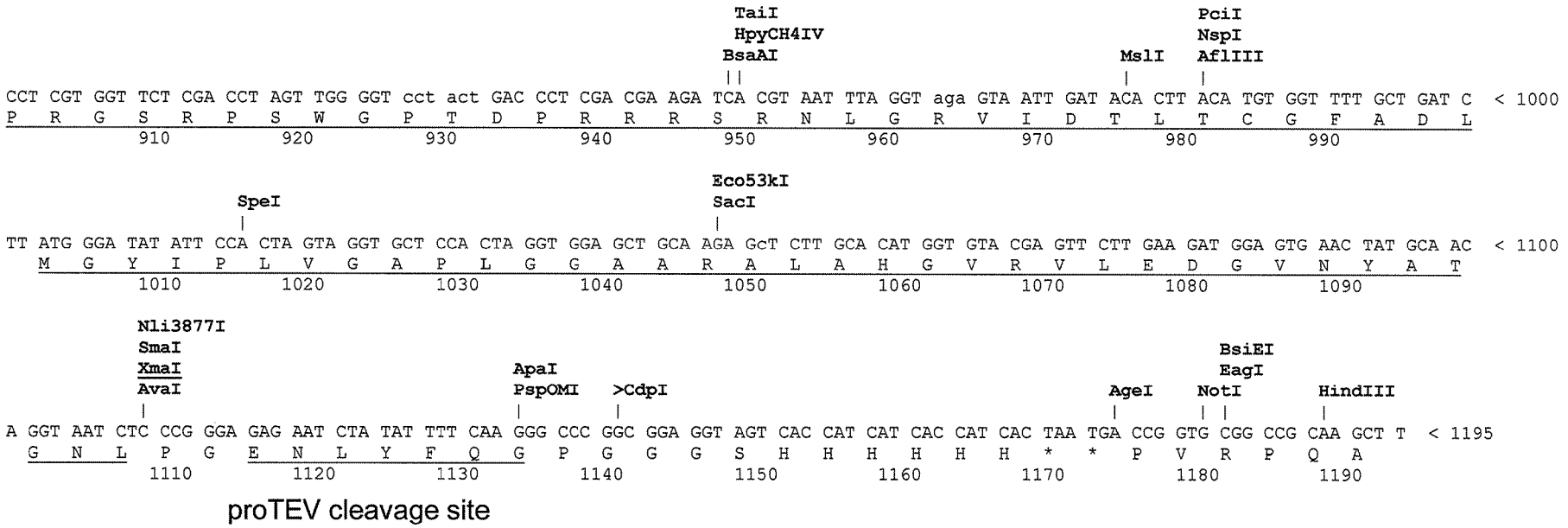


FIGURE 22B

FIGURE 22 (CONTINUED)



proTEV cleavage site

TCGCGAGCTAGCACCATGAAACTATGTATTCTACTTGCAGTTGTTGCGTTCGTAGGATTGTCCTTACCTACAGCTCTGGC
AAGATCTGACAAAGACTGCGAAATGAAAAGAACTACATTGGATTCACCACTTGGGAAGTTGGAACTGAGTGGATGCGAGC
AAGGATTGCATGAAATTAAGCTACTGGGAAAAGGAACTTCTGCTGCTGATGCAGTTGAAGTTCCAGCACCAGCAGCTGTT
CTTGGAGGTCCTGAGCCCCTCATGCAAGCCACAGCCTGGCTTAACGCATATTTCCACCAGCCTGAGGCCATTGAGGAATT
TCCAGTCCCCGCCCTTCACCATCCTGTGTTTCAGCAGGAGAGCTTCACCCGCCAGGTCCTGTGGAAATTGCTGAAGGTGG
TCAAGTTTGGTGAAGTGATTTCATATCAGCAACTTGCTGCATTGGCCGGTAACCCCGCAGCTACAGCTGCCGTGAAAACT
GCTCTCAGCGGAAATCCTGTGCCCATCCTGATCCCTTGTCACAGAGTCGTTTCATCTTCCGGAGCTGTAGGTGGCTATGA
AGGAGGACTGGCAGTTAAGGAGTGGCTGCTGGCTCATGAAGGTCATAGACTTGGAAAGCCTGGGCTGGGTCCTGCTGGTA
TAGGCGCGCCAGGGTCCCTAGGTGGCGGATCCGAAAACCTGTACTTCCAGAGCGATATCGGAGTTTACCTATTGCCGCGA
AGAGGTCCTCGTTTAGGTGTTCGAGCAACTAGAAAgACTTCTGAACGATCACAACCTCGTGGAAGACGACAACCTATTTt
TAAGGCTCGTcgtCCTGAAGGTAGAaCTatgGCTCAGCCTGGTTATCCTatgCCTCTATATGGTAATGAAGGAtgcGGTa
atGCAGGAatgCTACTATCACCTCGTGGTTCTCGACCTAGTTGGGGTcctactGACCCTCGACGAAGATCACGTAATTTA
GGTagaGTAATTGATACACTTACATGTGGTTTTGCTGATCTTATGGGATATATTCCACTAGTAGGTGCTCCACTAGGTGG
AGCTGCAAGAGcTCTTGCACATGGTGTACGAGTTCTTGAAGATGGAGTGAACTATGCAACAGGTAATCTCCCGGGAGAGA
ATCTATATTTTCAAGGGCCCGGCGGAGGTAGTCACCATCATCACCATCACTAATGACCGGTGCGGCCGCAAGCTT

FIGURE 22C

FIGURE 23

Sequence of chimeric DeSNAPuniv-short HCV Core (C)

Vector: pDeSNAPuniv. Insertion sites of the HCV C sequence are underlined.

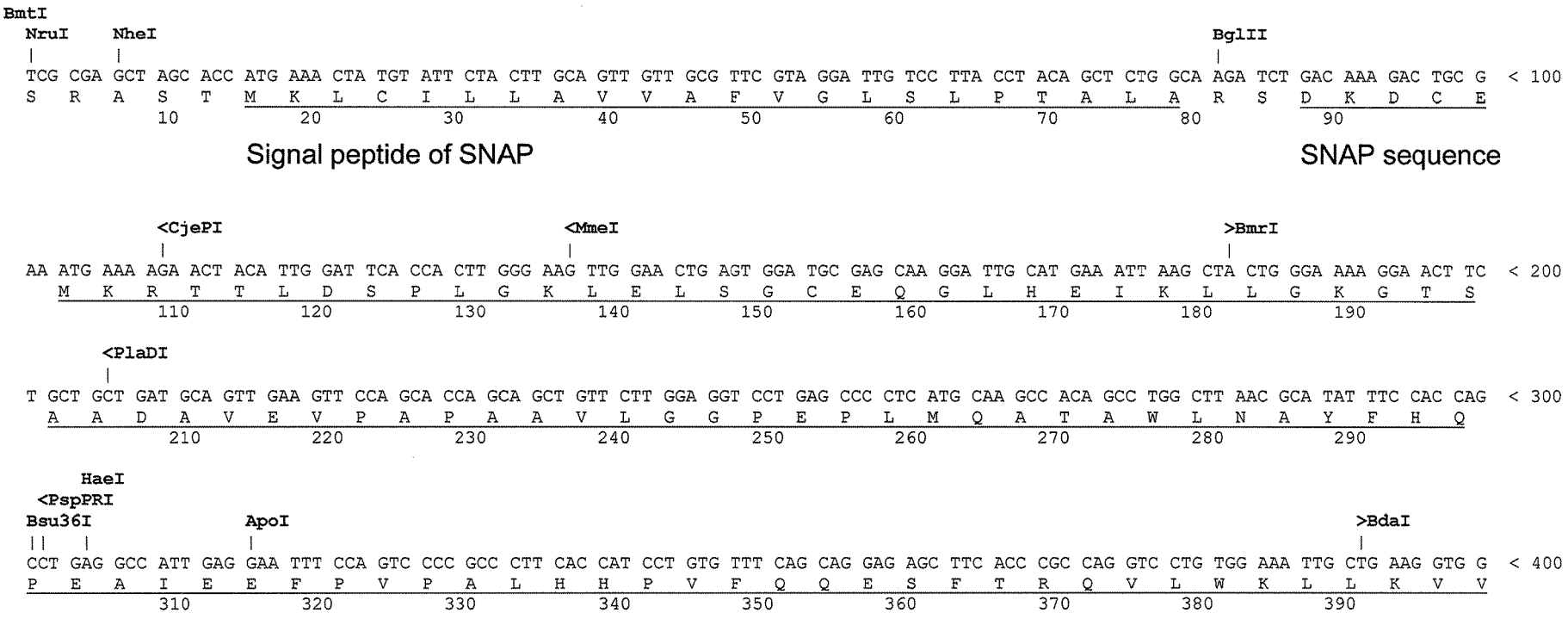
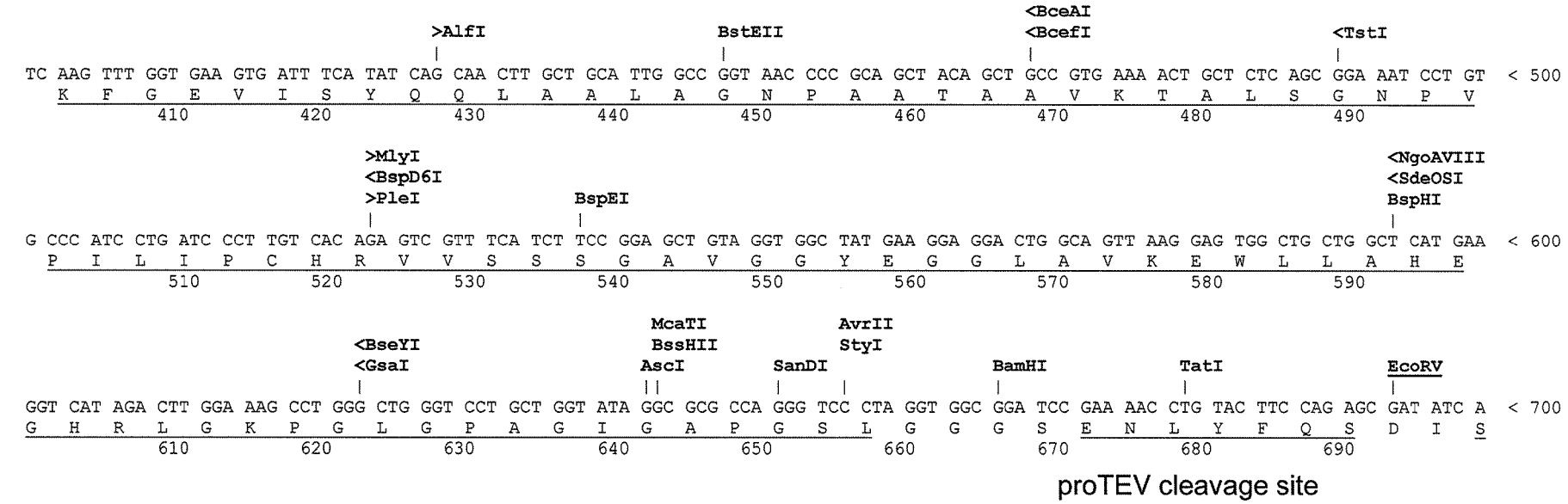


FIGURE 23A

FIGURE 23 (CONTINUED)



Short form of the HCV Core protein from viral strain TCHM-R2/03 of genotype 1b (genbank access GQ913864)

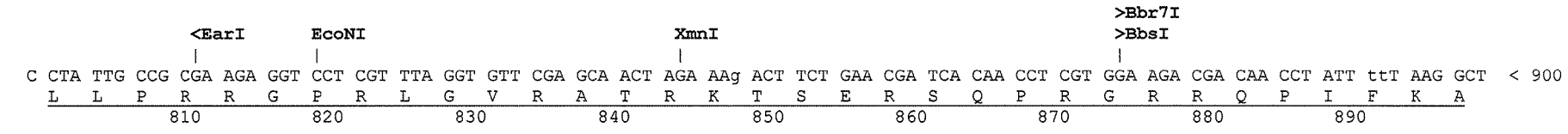
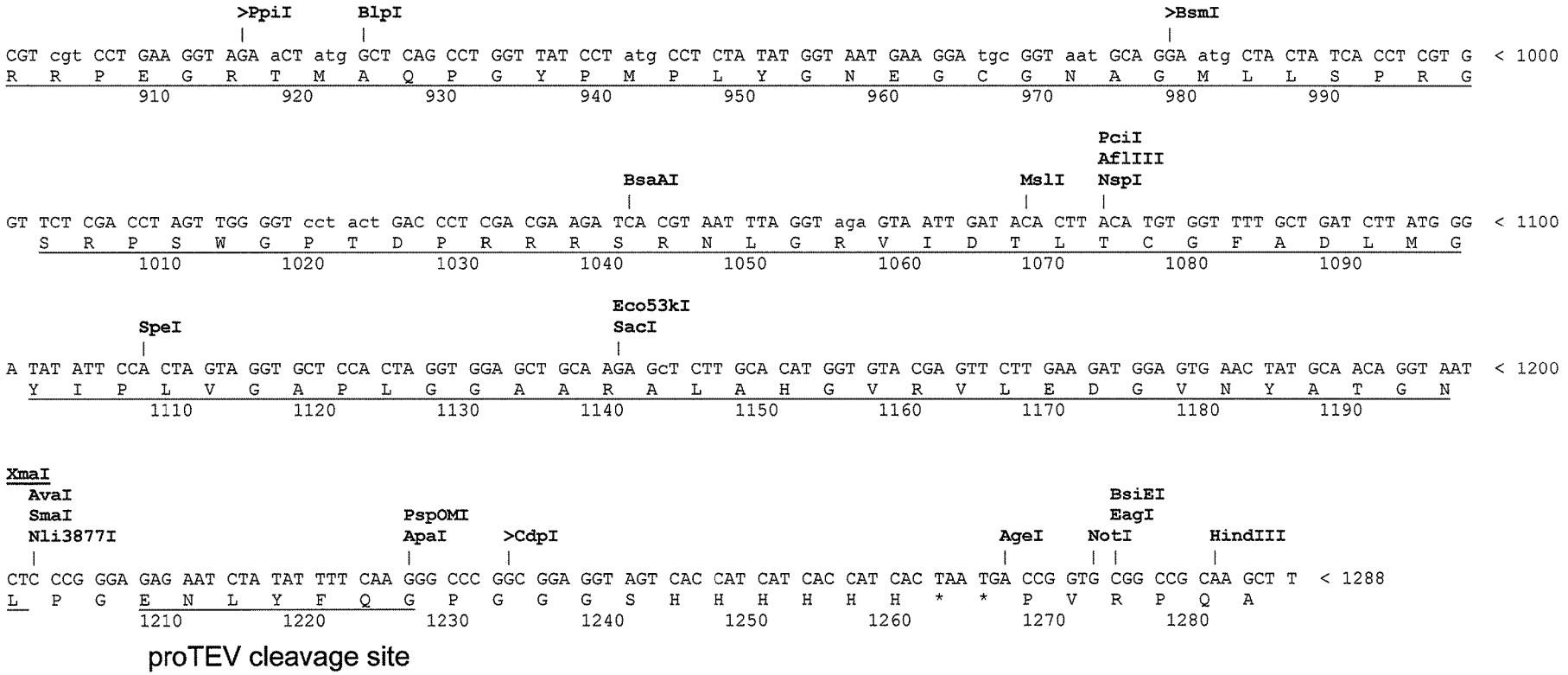


FIGURE 23B

FIGURE 23 (CONTINUED)



proTEV cleavage site

FIGURE 23C

FIGURE 23 (CONTINUED)

TCGCGAGCTAGCACCATGAAACTATGTATTCTACTTGCAGTTGTTGCGTTCGTAGGATTGTCCTTACCTACAGCTCTGGC
AAGATCTGACAAAGACTGCGAAATGAAAAGAACTACATTGGATTCACCACTTGGGAAGTTGGAACTGAGTGGATGCGAGC
AAGGATTGCATGAAATTAAGCTACTGGGAAAAGGAACTTCTGCTGCTGATGCAGTTGAAGTTCCAGCACCAGCAGCTGTT
CTTGGAGGTCCTGAGCCCCTCATGCAAGCCACAGCCTGGCTTAACGCATATTTCCACCAGCCTGAGGCCATTGAGGAATT
TCCAGTCCCCGCCCTTCACCATCCTGTGTTTCAGCAGGAGAGCTTCACCCGCCAGGTCCTGTGGAAATTGCTGAAGGTGG
TCAAGTTTGGTGAAGTGATTTCATATCAGCAACTTGCTGCATTGGCCGGTAACCCCGCAGCTACAGCTGCCGTGAAAACT
GCTCTCAGCGGAAATCCTGTGCCCATCCTGATCCCTTGTCACAGAGTCGTTTCATCTTCCGGAGCTGTAGGTGGCTATGA
AGGAGGACTGGCAGTTAAGGAGTGGCTGCTGGCTCATGAAGGTCATAGACTTGGAAAGCCTGGGCTGGGTCCTGCTGGTA
TAGGCGCGCCAGGGTCCCTAGGTGGCGGATCCGAAAACCTGTACTTCCAGAGCGATATCAGTACgAATCCTAAgCCTCAA
cgtAAgACTAAgCGcAATACTAATCGTCGTCCACAAGATGTTAAGTTTCCGGGtGGcGGtCAAATTGTTGGTGGAGTTTA
CCTATTGCCGCGAAGAGGTCCTCGTTTAGGTGTTCGAGCAACTAGAAAgACTTCTGAACGATCACAACCTCGTGGAAGAC
GACAACCTATTttTAAGGCTCGTcgtCCTGAAGGTAGAaCTatgGCTCAGCCTGGTTATCCTatgCCTCTATATGGTAAT
GAAGGAtgcGGTaatGCAGGAatgCTACTATCACCTCGTGGTTCTCGACCTAGTTGGGGTcctactGACCCTCGACGAAG
ATCACGTAATTTAGGTagaGTAATTGATACACTTACATGTGGTTTTGCTGATCTTATGGGATATATTCCACTAGTAGGTG
CTCCACTAGGTGGAGCTGCAAGAGcTCTTGCACATGGTGTACGAGTTCTTGAAGATGGAGTGAACTATGCAACAGGTAAT
CTCCCGGGAGAGAATCTATATTTTCAAGGGCCCGGCGGAGGTAGTCACCATCATCACCATCACTAATGACCGGTGCGGCC
GCAAGCTT

FIGURE 23D

FIGURE 24

Sequence of chimeric DeSNAPuniv-Schmallenberg NSs protein

Vector: pDeSNAPuniv. Insertion sites of the Schmallenberg NSs gene are underlined.

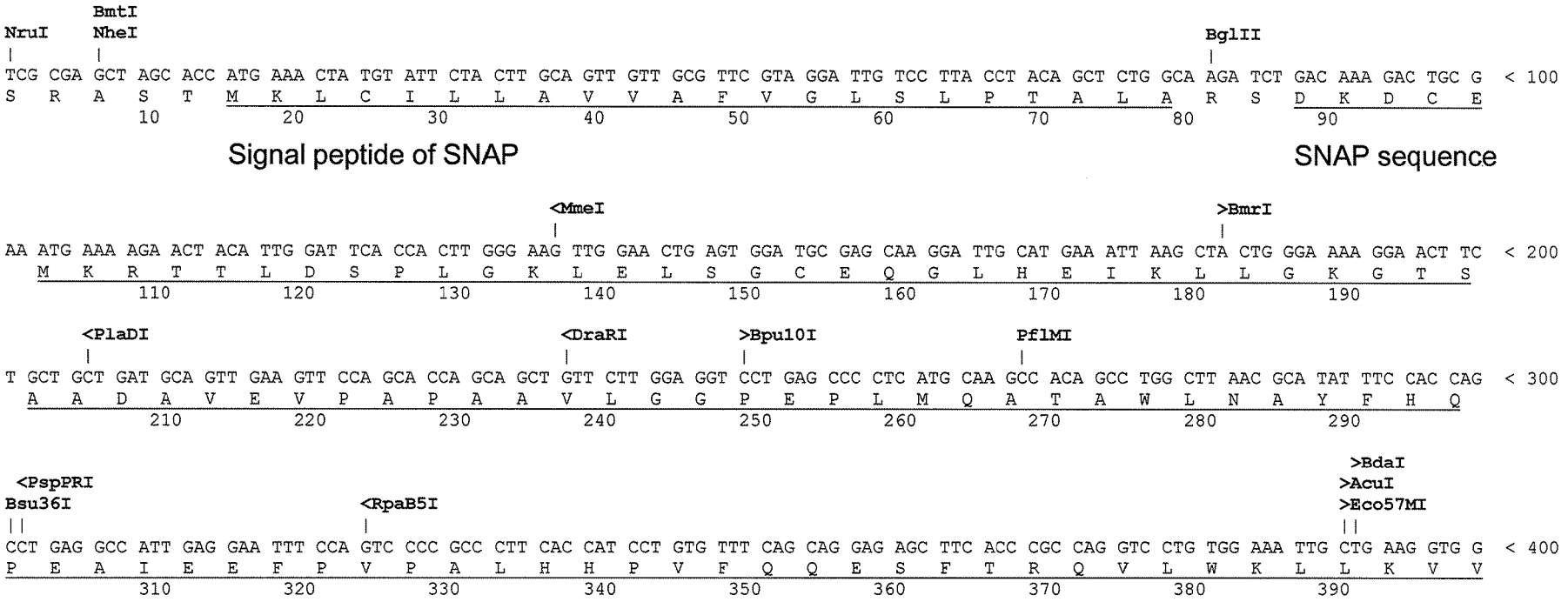
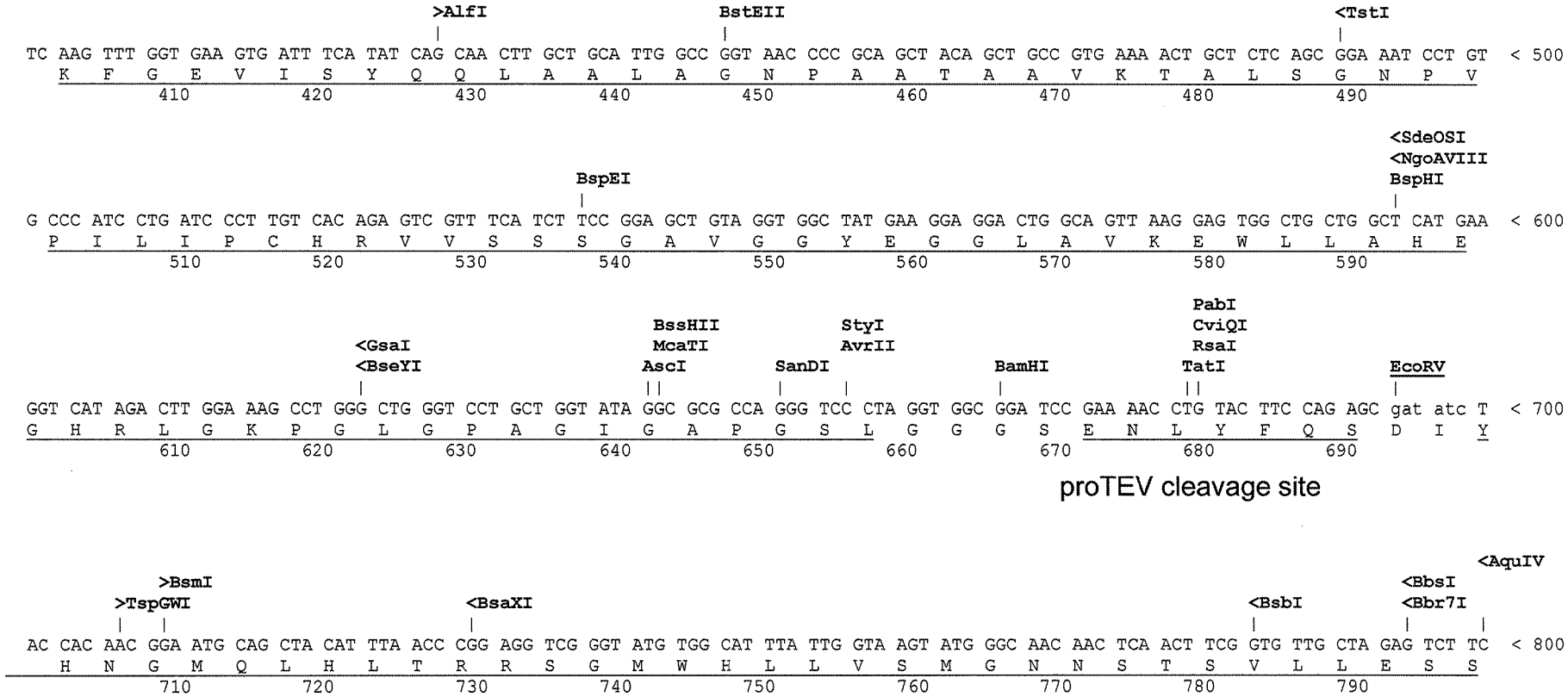


FIGURE 24A

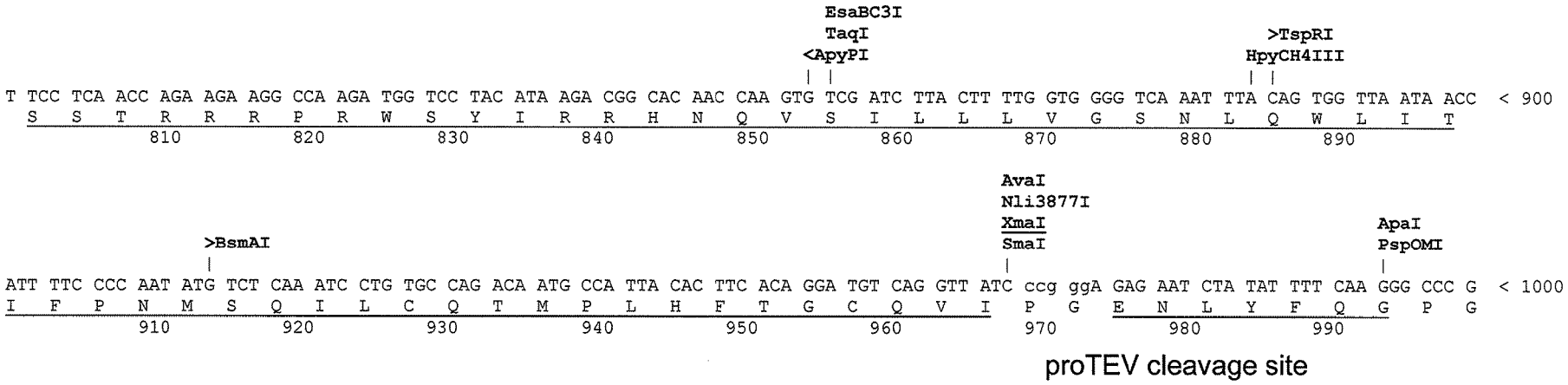
FIGURE 24 (CONTINUED)

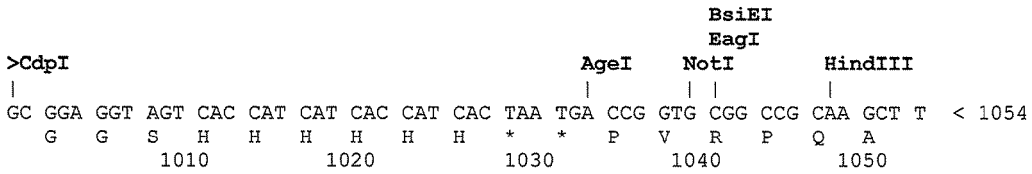


The NSs protein from Schmallenberg virus (Genbank access HE649914)

FIGURE 24B

FIGURE 24 (CONTINUED)





TCGCGAGCTAGCACCATGAAACTATGTATTCTACTTGCAGTTGTTGCGTTCGTAGGATTGTCCTTACCTACAGCTCTGGC
AAGATCTGACAAAGACTGCGAAATGAAAAGAACTACATTGGATTCACCACTTGGGAAGTTGGAACTGAGTGGATGCGAGC
AAGGATTGCATGAAATTAAGCTACTGGGAAAAGGAACTTCTGCTGCTGATGCAGTTGAAGTTCCAGCACCAGCAGCTGTT
CTTGGAGGTCCTGAGCCCCTCATGCAAGCCACAGCCTGGCTTAACGCATATTTCCACCAGCCTGAGGCCATTGAGGAATT
TCCAGTCCCCGCCCTTCACCATCCTGTGTTTCAGCAGGAGAGCTTCACCCGCCAGGTCCTGTGGAAATTGCTGAAGGTGG
TCAAGTTTGGTGAAGTGATTTCATATCAGCAACTTGCTGCATTGGCCGGTAACCCCGCAGCTACAGCTGCCGTGAAAACT
GCTCTCAGCGGAAATCCTGTGCCCATCCTGATCCCTTGTCACAGAGTCGTTTCATCTTCCGGAGCTGTAGGTGGCTATGA
AGGAGGACTGGCAGTTAAGGAGTGGCTGCTGGCTCATGAAGGTCATAGACTTGGAAAGCCTGGGCTGGGTCCTGCTGGTA
TAGGCGCGCCAGGGTCCCTAGGTGGCGGATCCGAAAACCTGTACTTCCAGAGCgatatcTACCACAACGGAATGCAGCTA
CATTTAACCCGGAGGTCGGGTATGTGGCATTTATTGGTAAGTATGGGCAACAACTCAACTTCGGTGTTGCTAGAGTCTTC
TTCCTCAACCAGAAGAAGGCCAAGATGGTCCTACATAAGACGGCACAACCAAGTGTCGATCTTACTTTTGGTGGGGTCAA
ATTTACAGTGGTTAATAACCATTTTCCCCAATATGTCTCAAATCCTGTGCCAGACAATGCCATTACACTTCACAGGATGT
CAGGTTATCccgggAGAGAATCTATATTTTCAAGGGCCCGGCGGAGGTAGTCACCATCATCACCATCACTAATGACCGGT
GCGGCCGCAAGCTT

FIGURE 24C

FIGURE 25

Agent		Antigen-coupled microspheres		Microsphere panels										
				Geographical					Syndromic			Veterinary		
Genus	Species	Abbreviation	Description	Africa	Asia	Europe	Americas	Oceania	Flu-like	Encephalitis	Hemorrhagic fever	Bovine disease	Equine disease
Flavivirus	Dengue virus type 1	SNAP+DEN1.EDIII	Enveloppe Domain III	x	x	x	x	x	x		x		
	Dengue virus type 2	SNAP+DEN2.EDIII	Enveloppe Domain III	x	x	x	x	x	x		x		
	Dengue virus type 3	SNAP+DEN3.EDIII	Enveloppe Domain III	x	x	x	x	x	x		x		
	Dengue virus type 4	SNAP+DEN4.EDIII	Enveloppe Domain III	x	x	x	x	x	x		x		
	Yellow fever virus	SNAP+YF.EDIII	Enveloppe Domain III	x			x		x		x		
	West-Nile virus	SNAP+WNV.EDIII	Soluble form of secreted Enveloppe protein	x	x	x	x	x	x	x			x
		WNV.prM-sE+SNAP	Enveloppe Domain III	x	x	x	x	x	x	x			x
	Usutu virus	SNAP+USU.EDIII	Enveloppe Domain III	x		x				x			x
	Japanese encephalitis virus genotype 3	JE.prM-sE+SNAP	Soluble form of secreted Enveloppe protein		x			x	x	x			
	Japanese encephalitis virus genotype 1	SNAP+JE-1. EDIII	Enveloppe Domain III		x			x	x	x			
	Japanese encephalitis virus genotype 2	SNAP+JE-2. EDIII	Enveloppe Domain III		x			x	x	x			
	Japanese encephalitis virus genotype 3	SNAP+JE-2. EDIII	Enveloppe Domain III		x			x	x	x			
	Japanese encephalitis virus genotype 4	SNAP+JE-4. EDIII	Enveloppe Domain III		x			x	x	x			
	Japanese encephalitis virus genotype 5	SNAP+JE-5. EDIII	Enveloppe Domain III		x			x	x	x			
	Murray Valley encephalitis virus	SNAP+MVE. EDIII	Enveloppe Domain III		x			x	x	x			
	Saint-Louis encephalitis virus	SNAP+SLE. EDIII	Enveloppe Domain III				x		x	x			x
	Zika virus	SNAP+ZIKV. EDIII	Enveloppe Domain III	x	x			x	x				
	Wesselsbron virus	SNAP+WSL. EDIII	Enveloppe Domain III	x					x			x	
	Rocio virus	SNAP+ROCV. EDIII	Enveloppe Domain III				x		x				
	Rabensburg virus	SNAP+RabV.EDIII	Enveloppe Domain III			x							
	Insectivore flavivirus (coll.La Timone)	SNAP+Insectflavi.EDIII	Enveloppe Domain III			x							
	Tickborne encephalitis virus	SNAP+TBE.EDIII	Enveloppe Domain III			x						x	x
	Omsk Hemorrhagic Fever virus	SNAP+OMSK.EDIII	Enveloppe Domain III		x						x		
	Kyasanur Forest Disease virus	SNAP+KAS.EDIII	Enveloppe Domain III		x						x		
	Akhurma virus	SNAP+ALK.EDIII	Enveloppe Domain III		x						x		
Orthobunyavirus	Schmallenberg virus	SNAP+SBV.N	Nucleoprotein N			x						x	
	Akabane virus	SNAP+AKA.N	Nucleoprotein N			x		x				x	
	Aino virus	SNAP+AIN.N	Nucleoprotein N			x		x				x	
	Shamonda virus	SNAP+SHA.N	Nucleoprotein N	x		x						x	
Bunyavirus	Rift Valley fever virus	SNAP+RVF.N	Nucleoprotein N	x		x			x		x	x	
Alphavirus	Chikungunya virus	CHIK.sE2+SNAP	Soluble form of secreted E2 glycoprotein	x	x	x	x	x	x				
	Ross River virus	RR.sE2+SNAP	Soluble form of secreted E2 glycoprotein					x	x				x
	Mayaro virus	MAY.sE2+SNAP	Soluble form of secreted E2 glycoprotein				x		x				

FIGURE 25A

FIGURE 25 (CONTINUED)

	Eastern equine encephalitis virus	EEE.sE2+SNAP	Soluble form of secreted E2 glycoprotein				x			x			x
	Western equine encephalitis virus	WEE.sE2+SNAP	Soluble form of secreted E2 glycoprotein				x			x			x
	Venezuelan equine encephalitis	VEE.sE2+SNAP	Soluble form of secreted E2 glycoprotein				x			x			x
Nairovirus	Crimean-Congo hemorrhagic fever virus	SNAP+CCHF.N	Nucleoprotein N	x	x	x					x	x	
Ebolavirus	Ebola virus (Zaire)	SNAP+EBO.N	Nucleoprotein N	x							x		
Marburgvirus	Marburg virus	SNAP+MAR.N	Nucleoprotein N	x							x		
Arenavirus	Lassa virus	LAS.ectoGP1+SNAP	Ectodomain of Glycoprotein1	x							x		
		LAS.ectoGP2+SNAP	Ectodomain of Glycoprotein2	x							x		
		SNAP+LAS.N	Nucleoprotein N	x							x		
	Junin virus	JUN.ectoGP1+SNAP	Ectodomain of Glycoprotein1				x				x		
		JUN.ectoGP2+SNAP	Ectodomain of Glycoprotein2				x				x		
		SNAP+JUN.N	Nucleoprotein N				x				x		
	Machupo virus	MAC.ectoGP1+SNAP	Ectodomain of Glycoprotein1				x				x		
		MAC.ectoGP2+SNAP	Ectodomain of Glycoprotein2				x				x		
		SNAP+MAC.N	Nucleoprotein N				x				x		
	Sabia virus	SAB.ectoGP1+SNAP	Ectodomain of Glycoprotein1				x				x		
		SAB.ectoGP2+SNAP	Ectodomain of Glycoprotein2				x				x		
		SNAP+SAB.N	Nucleoprotein N				x				x		
	Guanarito virus	GUA.ectoGP1+SNAP	Ectodomain of Glycoprotein1				x				x		
		GUA.ectoGP2+SNAP	Ectodomain of Glycoprotein2				x				x		
		SNAP+GUA.N	Nucleoprotein N				x				x		
Betacoronavirus	Human betacoronavirus (2cEMC/2012)	SNAP+huCOV.N	Nucleoprotein N		x								
		huCOV.S+SNAP	Soluble form of spike S protein		x								
Hepacivirus	Hepatitis C virus genotype 1b (strain TCHM-R2/03)	SNAP+HCV.C	Capsid protein C	x	x	x	x	x					
Hepevirus	Hepatitis E virus	SNAP+HEV.C	Capsid protein C	x	x	x	x	x					
Enterovirus	Enterovirus 71 (strain JL-AFP-EV71-07-03)	SNAP+EV71.VP1	Capsid protein VP1	x	x	x	x	x		x			
Plasmodium	*Plasmodium falciparum*	SNAP+MSP-1(19)+AMA-1 (III)	Proteins MSP-1(19)+AMA-1(III) in tandem	x	x	x	x	x	x	x			
Leptospira	*Leptospira interrogans* serovar Lai str.56601	SNAP+HbpA	The 55 kDa-form of protein HbpA	x	x	x	x	x	x		x	x	

FIGURE 25B