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E     ----------AQQNAFYQVLNMPNLNADQRNGFIQSLKDDPSQSANVLGEAQKLNDSQAPK 51 (SEQ ID NO:1)
D     ADAQQNKFNKDQQSAFYEILNMPNLNEEQRNGFIQSLKDDPSQSTNVLGEAKKLNESQAPK 61 (SEQ ID NO:5)
A     --ADNN-FNKEQQNAFYEILNMPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNESQAPK 58 (SEQ ID NO:2)
B     ---ADNKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQAPK 58 (SEQ ID NO:3)
C     ---ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK 58 (SEQ ID NO:4)
Z     ---VDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQAPK 58 (SEQ ID NO:6)
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Figure 1. amino acid sequence alignment

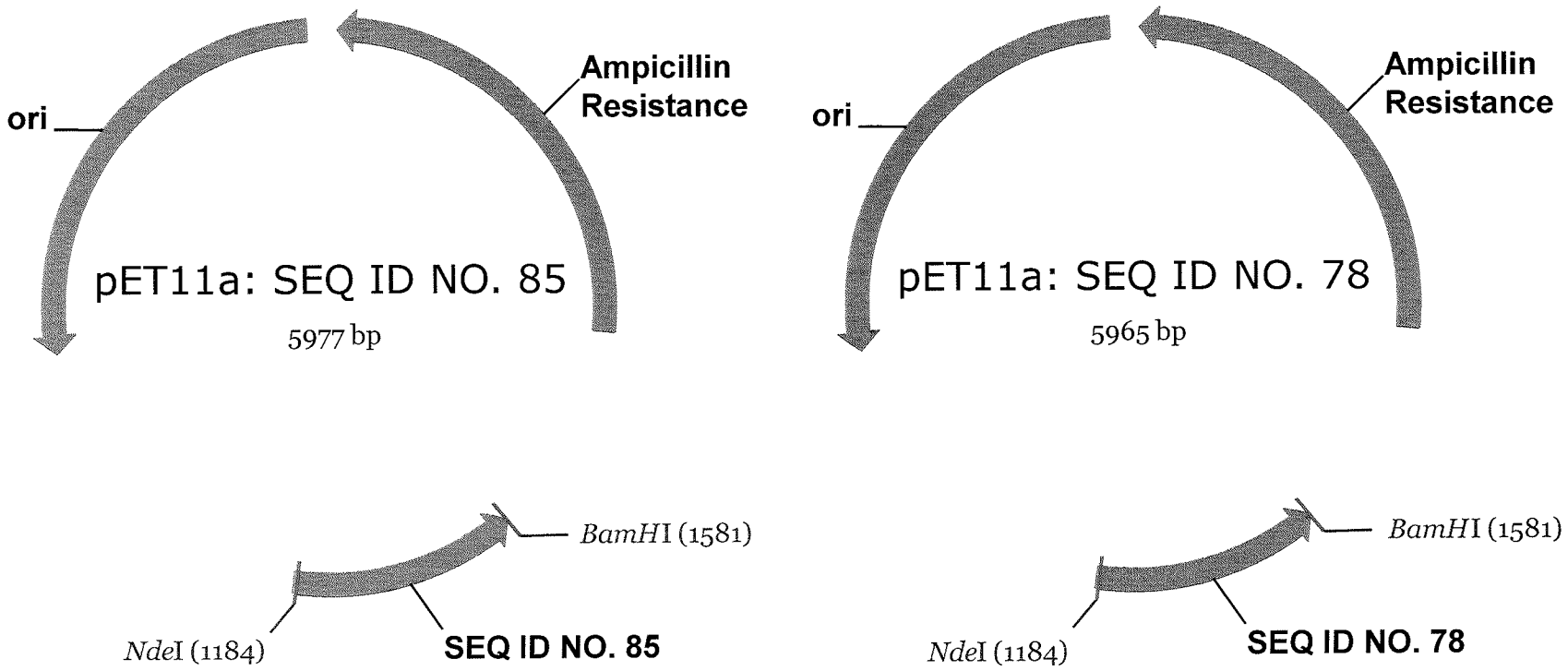
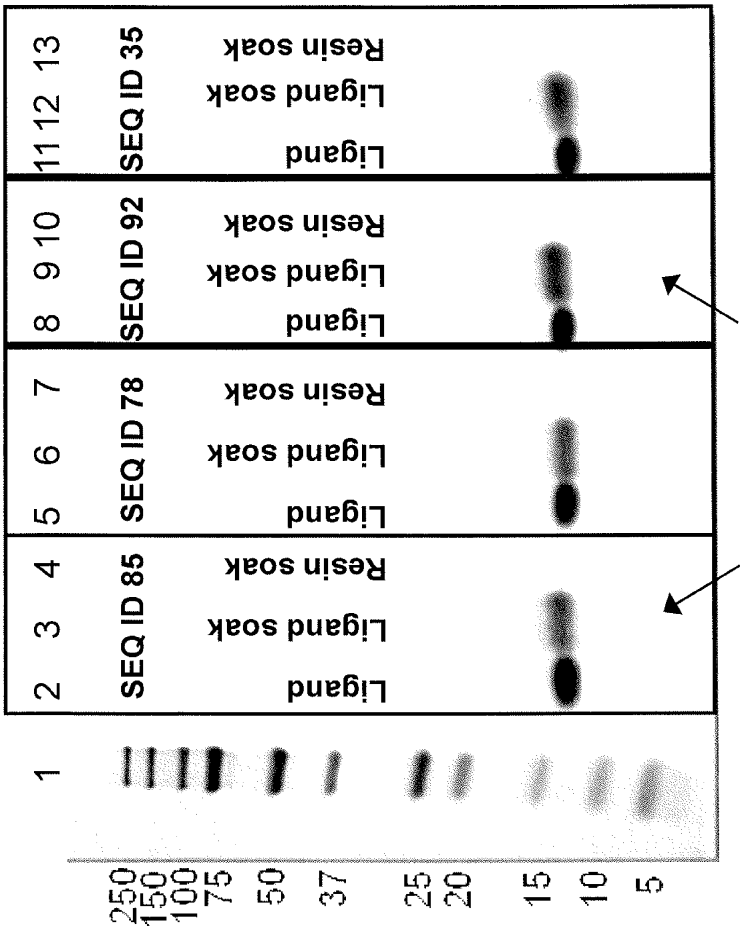
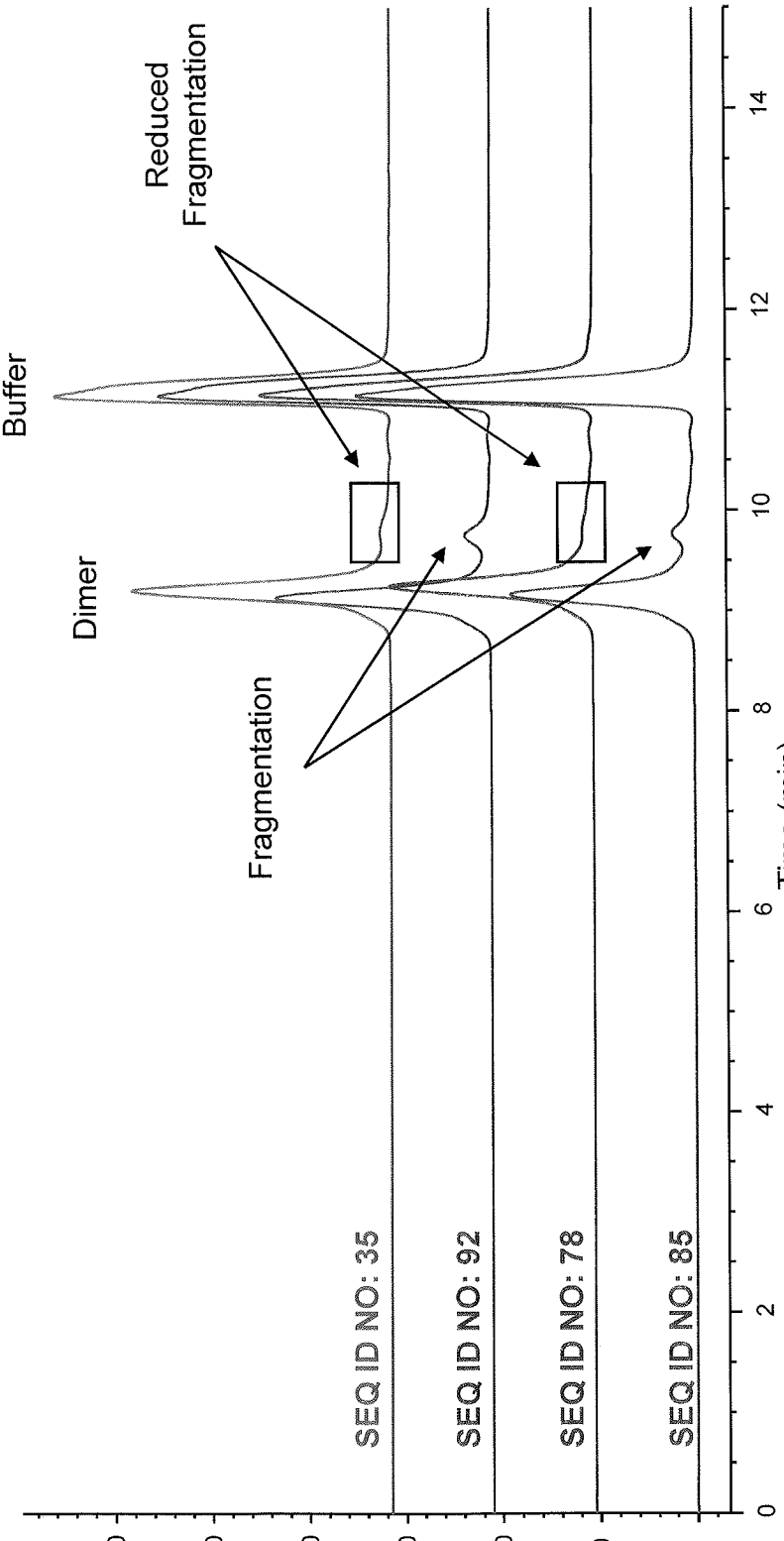


Figure 2. plasmid map



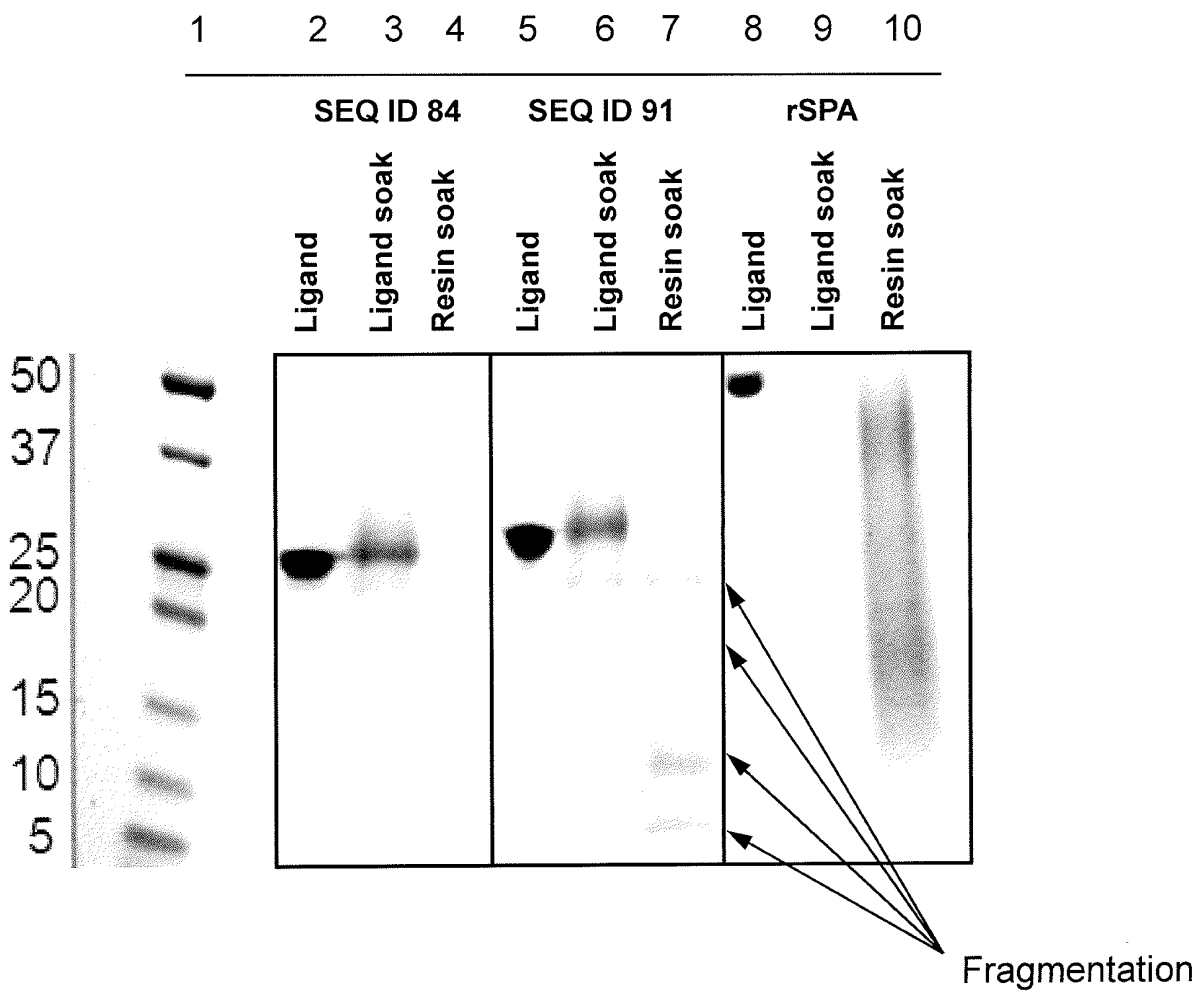
Z domain dimer non-Fab ($A_{29}K$)	SEQ ID NO: 85
Z domain Δ 4 AA dimer-only second domain has deletion non-Fab ($A_{29}K$)	SEQ ID NO: 78
C domain dimer AA	SEQ ID NO: 92
C domain Δ 4 AA dimer-only second domain has deletion	SEQ ID NO: 35

Figure 3. SDS-PAGE comparison of ligands (before and after extended caustic soak) and immobilized ligands (after extended caustic soak)



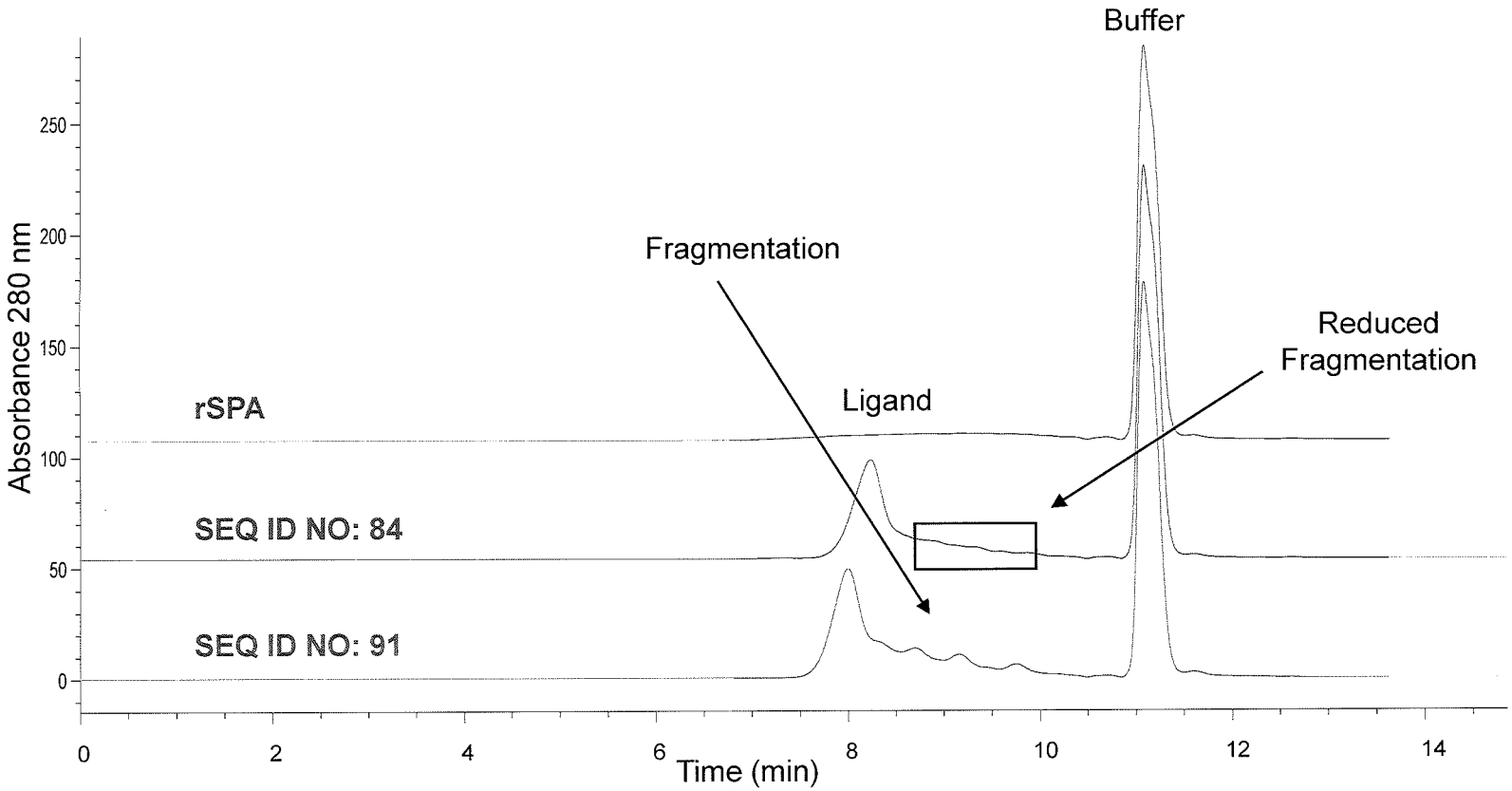
C domain Δ 4 AA dimer-only second domain has deletion	SEQ ID NO: 35
C domain dimer AA	SEQ ID NO: 92
Z domain Δ 4 AA dimer-only second domain has deletion non-Fab ($A_{29}K$)	SEQ ID NO: 78
Z domain dimer non-Fab ($A_{29}K$)	SEQ ID NO: 85

Figure 4. SEC comparison of ligands after extended caustic soak



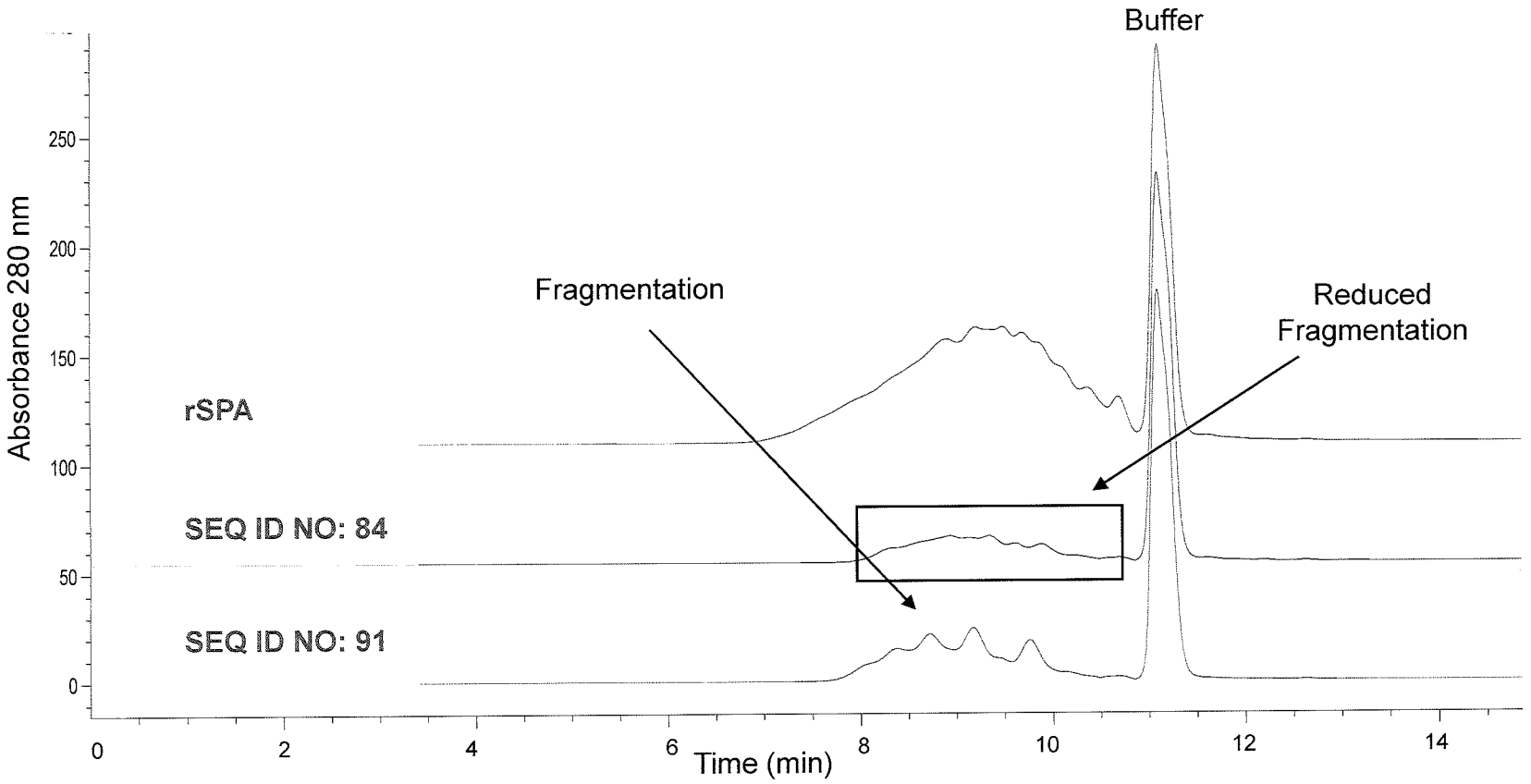
Z domain Δ 4 AA pentamer-first domain does not have deletion non-Fab ($A_{29}K$)	SEQ ID NO: 84
Z domain pentamer non-Fab ($A_{29}K$)	SEQ ID NO: 91

Figure 5. SDS-PAGE comparison of ligands (before and after extended caustic soak) and immobilized ligands (after extended caustic soak)



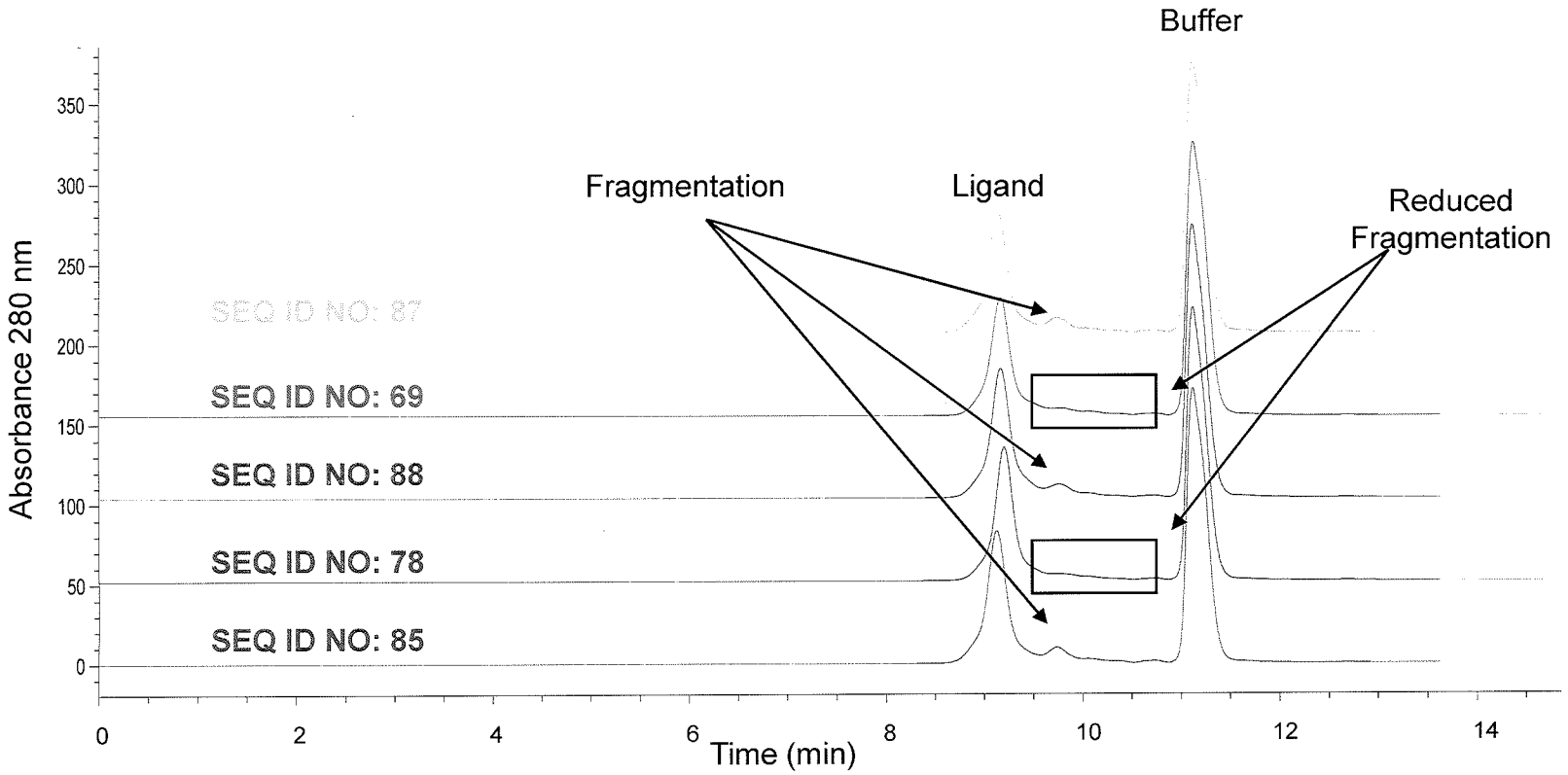
Z domain Δ 4 AA pentamer-first domain does not have deletion non-Fab ($A_{29}K$)	SEQ ID NO: 84
Z domain pentamer non-Fab ($A_{29}K$)	SEQ ID NO: 91

Figure 6. SEC comparison of ligands after extended caustic soak



Z domain Δ 4 AA pentamer-first domain does not have deletion non-Fab ($A_{29}K$)	SEQ ID NO: 84
Z domain pentamer non-Fab ($A_{29}K$)	SEQ ID NO: 91

Figure 7. SEC comparison of immobilized ligands after extended caustic soak



Z domain dimer non-Fab ($A_{29}K$)	SEQ ID NO: 85
Z Domain Δ 1 AA dimer-first domain does not have deletion non-Fab ($A_{29}K$)	SEQ ID NO: 87
Z Domain Δ 2 AA dimer-first domain does not have deletion non-Fab ($A_{29}K$)	SEQ ID NO: 88
Z domain Δ 3 AA pentamer-first domain does not have deletion non-Fab ($A_{29}K$)	SEQ ID NO: 69
Z domain Δ 4 AA dimer-first domain does not have deletion non-Fab ($A_{29}K$))	SEQ ID NO: 78

Figure 8. SEC comparison of ligands after extended caustic soak

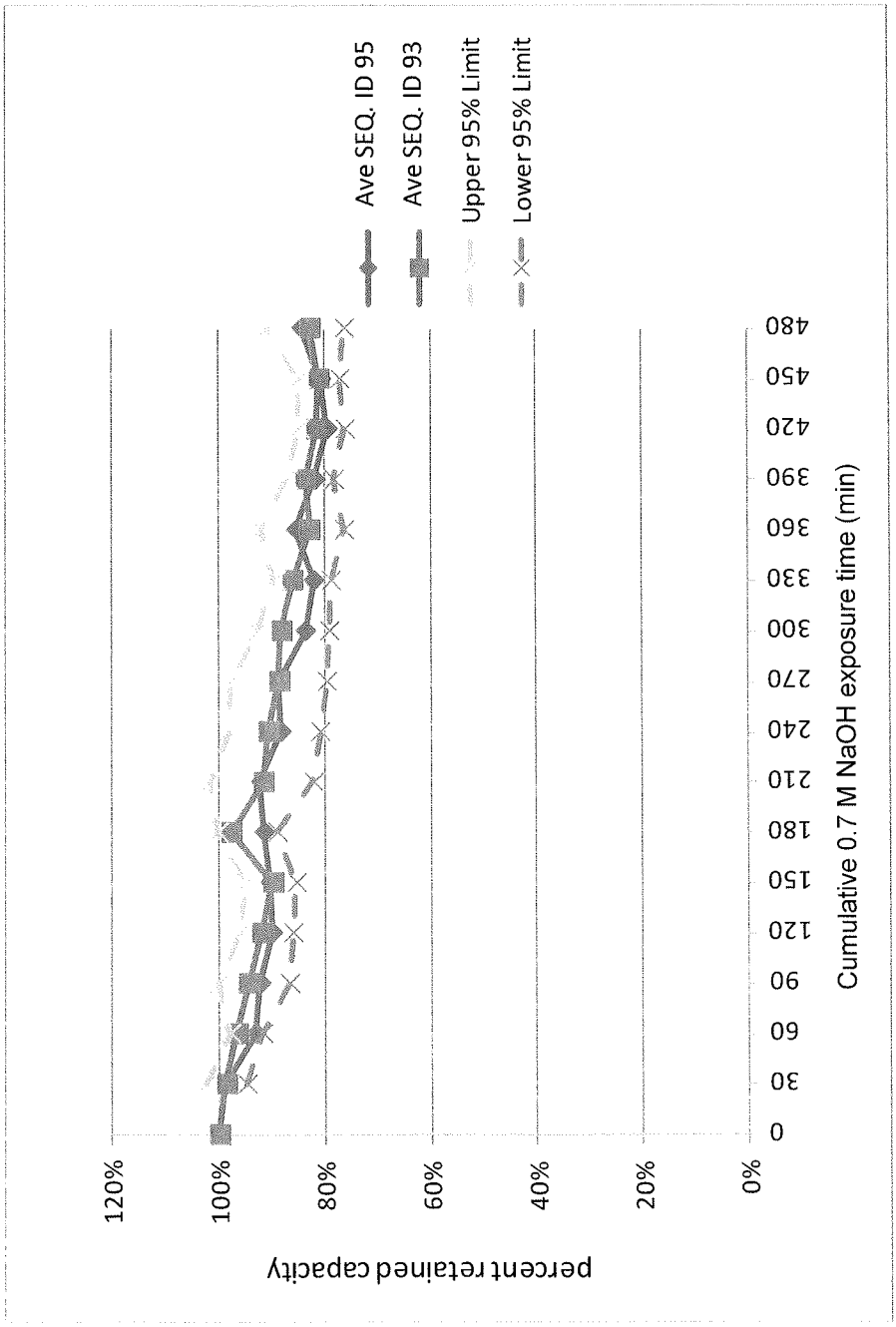

Ave SEQ. ID 95
Ave SEQ. ID 93
Upper 95% Limit
Lower 95% Limit
120%
100%
80%
60%
40%
20%
0%
percent retained capacity
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
Cumulative 0.7 M NaOH exposure time (min)

Figure 9.

SEQUENCE LISTING

SEQ ID NO. 1 wt E domain AA

AQQNAFYQVLNMPNLNADQRNGFIQSLKDDPSQSANVLGEAQKLNDSQAPK

SEQ ID NO. 2 wt A domain AA

ADNNFNKEQQNAFYEILNMPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNES
QAPK

SEQ ID NO. 3 wt B domain AA

ADNKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 4 wt C domain AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQ
APK

SEQ ID NO. 5 wt D domain AA

ADAQQNKFNKDQQSAFYEILNMPNLNEEQRNGFIQSLKDDPSQSTNVLGEAKKL
NESQAPK

SEQ ID NO. 6 Z domain AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 7 wt E domain NA

GCGCAACAAAACGCTTTCTATCAGGTACTGAACATGCCTAACCTGAACGCCG
ATCAGCGTAACGGCTTCATCCAAAGCCTGAAGGACGACCCGAGCCAGTCCGC
AAACGTTCTGGGTGAAGCTCAAAAACTGAACGACAGCCAGGCACCGAAAGC
TGAC

SEQ ID NO. 8 wt A domain NA

GCCGACAACAACTTCAACAAAGAGCAGCAAAACGCTTTCTACGAAATCCTGA
ATATGCCAAATCTGAACGAAGAGCAGCGTAACGGTTTCATCCAATCTCTGAA
AGACGATCCGTCCCAGTCCGCGAATCTGCTGGCGGAGGCTAAAAAGCTGAAC
GAATCCCAGGCTCCGAAA

SEQ ID NO. 9 wt B domain NA

GCAGACAATAAGTTCAATAAAGAGCAGCAGAACGCATTTTACGAGATCCTGC
ATCTGCCGAACCTGAACGAAGAACAACGCAACGGTTTCATTCAGAGCCTGAA
AGACGACCCATCTCAGTCCGCTAACCTGCTGGCGGAAGCAAAGAAGCTGAAC
GATGCACAGGCGCCGAAA

SEQ ID NO. 10 wt C domain NA

GCGGATAACAAATTCAACAAGGAGCAACAGAACGCATTCTATGAAATTCTGC
ACCTGCCGAATCTGACGGAGGAGCAACGTAACGGCTTTATCCAGTCCCTGAA
GGATGATCCGTCTGTGTCTAAAGAGATCCTGGCGGAGGCAAAAAAACTGAAT
GATGCACAAGCTCCGAAA

SEQ ID NO. 11 wt D domain NA

GCCCAACAGAACAAATTTAACAAAGACCAGCAGTCCGCGTTCTACGAGATTC
TGAACATGCCTAACCTGAATGAAGAACAGCGCAACGGTTTTATTCAGTCTCT
GAAGGACGATCCTTCTCAATCCACCAACGTACTGGGCGAAGCGAAGAAACTG
AACGAATCTCAGGCTCCGAAG

SEQ ID NO. 12 Z domain NA

GTAGACAACAAATTCAATAAAGAACAGCAGAACGCTTTCTATGAAATCCTGC
ACCTGCCGAACCTGAACGAAGAACAGCGTAACGCGTTTATCCAGTCCCTGAA
AGACGACCCGAGCCAGAGCGCAAATCTGCTGGCGGAAGCGAAAAAGCTGAA
CGATGCCCAGGCGCCGAAA

SEQ ID NO. 13 B domain Δ 3 AA monomer

KFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQAP
K

SEQ ID NO. 14 C domain Δ 3 AA monomer

KFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 15 Z domain Δ 3 AA monomer

KFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQAP
K

SEQ ID NO. 16 B domain Δ 3 AA dimer-both domains having deletion AA

KFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQAP
KKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQA
PK

SEQ ID NO. 17 C domain Δ 3 AA dimer-both domains having deletion AA

KFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
KFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 18 Z domain Δ 3 AA dimer-both domains having deletion AA

KFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQAP
KKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQA
PK

SEQ ID NO. 19 B domain Δ 3 AA dimer-only second domain has deletion AA

ADNKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDA
QAPKKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLND
AQAPK

SEQ ID NO. 20 C domain Δ 3 AA dimer-only second domain has deletion AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQ
APKKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQ
APK

SEQ ID NO. 21 Z domain Δ 3 AA dimer-only second domain has deletion AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPKKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLND
AQAPK

SEQ ID NO. 22 B domain Δ 3 AA pentamer-all domains have deletion AA

KFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQAP
KKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQA
PKKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQ
APKKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDA
QAPKKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLND
AQAPK

SEQ ID NO. 23 C domain Δ 3 AA pentamer-all domains have deletion AA

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KFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
KFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
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SEQ ID NO. 24 Z domain Δ 3 AA pentamer-all domains have deletion AA

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QAPKKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLND
AQAPK

SEQ ID NO. 25 B domain Δ 3 AA pentamer-first domain does not have deletion AA

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QAPKKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLND
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NDAQAPKKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKK
LNDAQAPK

SEQ ID NO. 26 C domain Δ 3 AA pentamer-first domain does not have deletion AA

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APKKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQ
APK

SEQ ID NO. 27 Z domain Δ 3 AA pentamer-first domain does not have deletion AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
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DAQAPKKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKL
NDAQAPKKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKK
LNDAQAPK

SEQ ID NO. 28 B domain Δ 4 AA monomer AA

FNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 29 C domain Δ 4 AA monomer AA

FNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 30 Z domain Δ 4 AA monomer AA

FNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 31 B domain Δ 4 AA dimer-both domains having deletion AA

FNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 32 C domain Δ 4 AA dimer-both domains having deletion AA

FNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 33 Z domain Δ 4 AA dimer-both domains having deletion AA

FNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 34 B domain Δ 4 AA dimer-only second domain has deletion AA

ADNKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 35 C domain Δ 4 AA dimer-only second domain has deletion AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQ
APKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQA
PK

SEQ ID NO. 36 Z domain Δ 4 AA dimer-only second domain has deletion AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 37 B domain Δ 4 AA pentamer-all domains have deletion AA

FNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
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NKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 38C domain Δ 4 AA pentamer-all domains have deletion AA

FNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
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FNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 39 Z domain Δ 4 AA pentamer-all domains have deletion AA

FNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
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NKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 40 B domain Δ 4 AA pentamer-first domain does not have deletion AA

ADNKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDA
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QAPKFNKEQQNAFYEILHLPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 41 C domain Δ 4 AA pentamer-first domain does not have deletion AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQ
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PKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAP
KFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 42 Z domain Δ 4 AA pentamer-first domain does not have deletion AA

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QAPKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA

QAPKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 43 wt E domain AA, non-Fab (G29K) AA

AQQNAFYQVLNMPNLNADQRNKFIQSLKDDPSQSANVLGEAQKLNDSQAPK

SEQ ID NO. 44 wt A domain AA, non-Fab (G29K) AA

ADNNFNKEQQNAFYEILNMPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNES
QAPK

SEQ ID NO. 45 wt B domain AA, non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 46 wt C domain AA, non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQ
APK

SEQ ID NO. 47 wt D domain AA, non-Fab (G29K) AA

ADAQQNKFNKDQQSAFYEILNMPNLNEEQRNKFIQSLKDDPSQSTNVLGEAKKL
NESQAPK

SEQ ID NO. 48 Z domain AA, non-Fab (A29K) AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 49 E domain, non-Fab (G29K) NA

GCGCAACAAAACGCTTTCTATCAGGTACTGAACATGCCTAACCTGAACGCCG
ATCAGCGTAACAAATTCATCCAAAGCCTGAAGGACGACCCGAGCCAGTCCGC
AAACGTTCTGGGTGAAGCTCAAAAACTGAACGACAGCCAGGCACCGAAAGC
TGAC

SEQ ID NO. 50 A domain, non-Fab (G29K) NA

GCCGACAACAACTTCAACAAAGAGCAGCAAAACGCTTTCTACGAAATCCTGA
ATATGCCAAATCTGAACGAAGAGCAGCGTAACAAATTCATCCAATCTCTGAA
AGACGATCCGTCCCAGTCCGCGAATCTGCTGGCGGAGGCTAAAAAGCTGAAC
GAATCCCAGGCTCCGAAA

SEQ ID NO. 51 B domain, non-Fab (G29K) NA

GCAGACAATAAGTTCAATAAAGAGCAGCAGAACGCATTTTACGAGATCCTGC
ATCTGCCGAACCTGAACGAAGAACAACGCAACAAATTCATTCAGAGCCTGAA
AGACGACCCATCTCAGTCCGCTAACCTGCTGGCGGAAGCAAAGAAGCTGAAC
GATGCACAGGCGCCGAAA

SEQ ID NO. 52 C domain, non-Fab (G29K) NA

GCGGATAACAAATTCAACAAGGAGCAACAGAACGCATTCTATGAAATTCTGC
ACCTGCCGAATCTGACGGAGGAGCAACGTAACAAATTTATCCAGTCCCTGAA
GGATGATCCGTCTGTGTCTAAAGAGATCCTGGCGGAGGCAAAAAAACTGAAT
GATGCACAAGCTCCGAAA

SEQ ID 53 D domain, non-Fab (G29K) NA

GCCCAACAGAACAAATTTAACAAAGACCAGCAGTCCGCGTTCTACGAGATTC
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GAAGGACGATCCTTCTCAATCCACCAACGTACTGGGCGAAGCGAAGAAACTG
AACGAATCTCAGGCTCCGAAG

SEQ ID NO. 54 Z domain, non-Fab (G29K) NA

GTAGACAACAAATTCAATAAAGAACAGCAGAACGCTTTCTATGAAATCCTGC
ACCTGCCGAACCTGAACGAAGAACAGCGTAACAAATTTATCCAGTCCCTGAA
AGACGACCCGAGCCAGAGCGCAAATCTGCTGGCGGAAGCGAAAAAGCTGAA
CGATGCCCAGGCGCCGAAA

SEQ ID NO. 55 B domain Δ 3 AA monomer domain, non-Fab (G29K) AA

KFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAP
K

SEQ ID NO. 56 C domain Δ 3 AA monomer domain, non-Fab (G29K) AA

KFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 57 Z domain Δ 3 AA monomer domain, non-Fab (A29K) AA

KFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAP
K

SEQ ID NO. 58 B domain Δ 3 AA dimer-both domains having deletion non-Fab (G29K)
AA

KFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAP
KKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQA
PK

SEQ ID NO. 59 C domain Δ 3 AA dimer-both domains having deletion,, non-Fab (G29K) AA

KFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
KFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 60 Z domain Δ 3 AA dimer-both domains having deletion, non-Fab (A29K) AA

KFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAP
KKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQA
PK

SEQ ID NO. 61 B domain Δ 3 AA dimer-only second domain has deletion, non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLND
AQAPK

SEQ ID NO. 62 C domain Δ 3 AA dimer-only second domain has deletion, non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQ
APKKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQ
APK

SEQ ID NO. 63 Z domain Δ 3 AA dimer-only second domain has deletion, non-Fab (A29K) AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLND
AQAPK

SEQ ID NO. 64 B domain Δ 3 AA pentamer-all domains have deletion, non-Fab (G29K) AA

KFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAP
KKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQA
PKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQ
APKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA

QAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLND
AQAPK

SEQ ID NO. 65 C domain Δ 3 AA pentamer-all domains have deletion, non-Fab (G29K) AA

KFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
KFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
KFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
KFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
KFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 66 Z domain Δ 3 AA pentamer-all domains have deletion, non-Fab (A29K) AA

KFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAP
KKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQA
PKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQ
APKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLND
AQAPK

SEQ ID NO. 67 B domain Δ 3 AA pentamer-first domain does not have deletion non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLND
AQAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLN
DAQAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKL
NDAQAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKK
LNDAQAPK

SEQ ID NO. 68 C domain Δ 3 AA pentamer-first domain does not have deletion, non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQ
APKKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQ
APKKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQ
APKKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQ
APKKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQ
APK

SEQ ID NO. 69 Z domain Δ 3 AA pentamer-first domain does not have deletion, non-Fab (A29K) AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLND
AQAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLN
DAQAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKL
NDAQAPKKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKK
LNDAQAPK

SEQ ID NO. 70 B domain Δ 4 AA monomer, non-Fab (G29K) AA

FNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 71 C domain Δ 4 AA monomer, non-Fab (G29K) AA

FNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 72 Z domain Δ 4 AA monomer, non-Fab (A29K) AA

FNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 73 B domain Δ 4 AA dimer-both domains having deletion, non-Fab (G29K) AA

FNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 74 C domain Δ 4 AA dimer-both domains having deletion, non-Fab (G29K) AA

FNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 75 Z domain Δ 4 AA dimer-both domains having deletion, non-Fab (A29K) AA

FNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 76 B domain Δ 4 AA dimer-only second domain has deletion, non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 77 C domain Δ 4 AA dimer-only second domain has deletion, non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQ
APKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQA
PK

SEQ ID NO. 78 Z domain Δ 4 AA dimer-only second domain has deletion, non-Fab (A29K) AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 79 B domain Δ 4 AA pentamer-all domains have deletion, non-Fab (G29K) AA

FNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 80C domain Δ 4 AA pentamer-all domains have deletion, non-Fab (G29K) AA

FNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 81 Z domain Δ 4 AA pentamer-all domains have deletion, non-Fab (A29K) AA

FNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPKF
NKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDAQAPK

SEQ ID NO. 82 B domain Δ 4 AA pentamer-first domain does not have deletion, non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA

QAPKFNKEQQNAFYEILHLPNLNEEQRNkFIQSLKDDPSQSANLLAEAKKLNDAQ
APK

SEQ ID NO. 83 C domain Δ 4 AA pentamer-first domain does not have deletion, non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQ
APKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQA
PKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAP
KFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 84 Z domain Δ 4 AA pentamer-first domain does not have deletion, non-Fab (A29K)

VDNKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPKFNKEQQNAFYEILHLPNLNEEQRNKFIQSLKDDPSQSANLLAEAKKLNDA
QAPK

SEQ ID NO. 85 Z domain dimer AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPKVDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKK
LNDAQAPK

SEQ ID NO. 86 HIS tag NA sequence

CATCACCATCATCACCAC

SEQ ID NO. 87 Z Domain Δ 1 AA dimer-first domain does not have deletion, non-Fab (G29K) AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPKDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKL
NDAQAPK

SEQ ID NO. 88 Z Domain Δ 2 AA dimer-first domain does not have deletion, non-Fab (G29K) AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPKNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLN
DAQAPK

SEQ ID NO. 89 A Domain Δ 4 dimer-first domain has wt B domain N-terminal region AA

ADNKFNKEQQNAFYEILNMPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNES
QAPKFNKEQQNAFYEILNMPNLNEEQRNGFIQSLKDDPSQSANLLAEAKKLNES
QAPK

SEQ ID NO. 90 D Domain Δ 4 dimer-first domain has wt B domain N-terminal region AA

ADNKFNKDQQSAFYEILNMPNLNEEQRNGFIQSLKDDPSQSTNVLGEAKKLNES
QAPKFNKDQQSAFYEILNMPNLNEEQRNGFIQSLKDDPSQSTNVLGEAKKLNES
QAPK

SEQ ID NO. 91 84 Z domain pentamer, non-Fab (A29K) AA

VDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKKLNDA
QAPKVDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLAEAKK
LNDAQAPKVDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSANLLA
EAKKLNDAQAPKVDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDPSQSA
NLLAEAKKLNDAQAPKVDNKFNKEQQNAFYEILHLPNLNEEQRNAFIQSLKDDP
SQSANLLAEAKKLNDAQAPK

SEQ ID NO. 92 C domain dimer AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQ
APKADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLN
DAQAPK

SEQ ID NO. 93 C domain Δ 4 AA pentamer- deletion of all 5 domains with alanine leader at N-terminus, non-Fab (G29K) AA

AFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 94 C domain Δ 4 AA pentamer- deletion of all 5 domains with alanine leader at N-terminus AA

AFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
FNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 95 C domain pentamer - no deletion, non-Fab (G29K) AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
ADNKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
ADNKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
ADNKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK
ADNKFNKEQQNAFYEILHLPNLTEEQRNKFIQSLKDDPSVSKEILAEAKKLNDAQAPK

SEQ ID NO. 96 C domain pentamer – wild type AA

ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK
ADNKFNKEQQNAFYEILHLPNLTEEQRNGFIQSLKDDPSVSKEILAEAKKLNDAQAPK