

SEQUENCE LISTING

<110> F. Hoffmann-La Roche AG
Roche Diagnostics GmbH

<120> DNA Polymerases With Increased 3'-Mismatch Discrimination

<130> 27221 WO-HS

<140> Not yet assigned

<141> Not yet assigned

<150> US 61/443,133

<151> 2011-02-15

<160> 42

<170> FastSEQ for windows Version 4.0

<210> 1

<211> 834

<212> PRT

<213> Thermus sp.

<220>

<223> Thermus sp. Z05 DNA polymerase (Z05)

<400> 1

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Met Lys Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val Leu Leu
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Val Asp Gly His His Leu Ala Tyr Arg Thr Phe Phe Ala Leu Lys Gly
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Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly Phe Ala
      35      40      45
Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala Val Phe
 50      55      60
Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu
 65      70      75      80
Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln
      85      90      95
Leu Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Phe Thr Arg Leu
      100      105      110
Glu Val Pro Gly Phe Glu Ala Asp Asp Val Leu Ala Thr Leu Ala Lys
      115      120      125
Lys Ala Glu Arg Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Arg
      130      135      140
Asp Leu Tyr Gln Leu Val Ser Asp Arg Val Ala Val Leu His Pro Glu
      145      150      155      160
Gly His Leu Ile Thr Pro Glu Trp Leu Trp Glu Lys Tyr Gly Leu Lys
      165      170      175
Pro Glu Gln Trp Val Asp Phe Arg Ala Leu Val Gly Asp Pro Ser Asp
      180      185      190
Asn Leu Pro Gly Val Lys Gly Ile Gly Glu Lys Thr Ala Leu Lys Leu
      195      200      205
Leu Lys Glu Trp Gly Ser Leu Glu Asn Ile Leu Lys Asn Leu Asp Arg
      210      215      220
Val Lys Pro Glu Ser Val Arg Glu Arg Ile Lys Ala His Leu Glu Asp
      225      230      235      240
Leu Lys Leu Ser Leu Glu Leu Ser Arg Val Arg Ser Asp Leu Pro Leu
      245      250      255
Glu Val Asp Phe Ala Arg Arg Arg Glu Pro Asp Arg Glu Gly Leu Arg
      260      265      270
Ala Phe Leu Glu Arg Leu Glu Phe Gly Ser Leu Leu His Glu Phe Gly
      275      280      285
Leu Leu Glu Ala Pro Ala Pro Leu Glu Glu Ala Pro Trp Pro Pro Pro
      290      295      300
Glu Gly Ala Phe Val Gly Phe Val Leu Ser Arg Pro Glu Pro Met Trp

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| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 305 | Ala | Glu | Leu | Lys | Ala | Leu | Ala | Ala | Cys | Lys | Glu | Gly | Arg | Val | His | 320 |
| | | | | | 325 | | | | | 330 | | | | | 335 | Arg |
| Ala | Lys | Asp | Pro | Leu | Ala | Gly | Leu | Lys | Asp | Leu | Lys | Glu | Val | Arg | Gly | |
| | | | 340 | | | | | 345 | | | | | 350 | | | |
| Leu | Leu | Ala | Lys | Asp | Leu | Ala | Val | Leu | Ala | Leu | Arg | Glu | Gly | Leu | Asp | |
| | | 355 | | | | | 360 | | | | | 365 | | | | |
| Leu | Ala | Pro | Ser | Asp | Asp | Pro | Met | Leu | Leu | Ala | Tyr | Leu | Leu | Asp | Pro | |
| | | 370 | | | | 375 | | | | | 380 | | | | | |
| Ser | Asn | Thr | Thr | Pro | Glu | Gly | Val | Ala | Arg | Arg | Tyr | Gly | Gly | Glu | Trp | |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 | |
| Thr | Glu | Asp | Ala | Ala | His | Arg | Ala | Leu | Leu | Ala | Glu | Arg | Leu | Gln | Gln | |
| | | | | 405 | | | | | 410 | | | | | 415 | | |
| Asn | Leu | Leu | Glu | Arg | Leu | Lys | Gly | Glu | Lys | Leu | Leu | Trp | Leu | Tyr | | |
| | | | 420 | | | | | 425 | | | | 430 | | | | |
| Gln | Glu | Val | Glu | Lys | Pro | Leu | Ser | Arg | Val | Leu | Ala | His | Met | Glu | Ala | |
| | | 435 | | | | | | 440 | | | | 445 | | | | |
| Thr | Gly | Val | Arg | Leu | Asp | Val | Ala | Tyr | Leu | Lys | Ala | Leu | Ser | Leu | Glu | |
| | | 450 | | | | 455 | | | | | 460 | | | | | |
| Leu | Ala | Glu | Glu | Ile | Arg | Arg | Leu | Glu | Glu | Glu | Val | Phe | Arg | Leu | Ala | |
| 465 | | | | | 470 | | | | | 475 | | | | | 480 | |
| Gly | His | Pro | Phe | Asn | Leu | Asn | Ser | Arg | Asp | Gln | Leu | Glu | Arg | Val | Leu | |
| | | | | 485 | | | | | 490 | | | | | 495 | | |
| Phe | Asp | Glu | Leu | Arg | Leu | Pro | Ala | Leu | Gly | Lys | Thr | Gln | Lys | Thr | Gly | |
| | | | 500 | | | | | 505 | | | | | 510 | | | |
| Lys | Arg | Ser | Thr | Ser | Ala | Ala | Val | Leu | Glu | Ala | Leu | Arg | Glu | Ala | His | |
| | | 515 | | | | | 520 | | | | | 525 | | | | |
| Pro | Ile | Val | Glu | Lys | Ile | Leu | Gln | His | Arg | Glu | Leu | Thr | Lys | Leu | Lys | |
| | | 530 | | | | 535 | | | | | 540 | | | | | |
| Asn | Thr | Tyr | Val | Asp | Pro | Leu | Pro | Gly | Leu | Val | His | Pro | Arg | Thr | Gly | |
| 545 | | | | | 550 | | | | | 555 | | | | | 560 | |
| Arg | Leu | His | Thr | Arg | Phe | Asn | Gln | Thr | Ala | Thr | Ala | Thr | Gly | Arg | Leu | |
| | | | | 565 | | | | | 570 | | | | | 575 | | |
| Ser | Ser | Ser | Asp | Pro | Asn | Leu | Gln | Asn | Ile | Pro | Ile | Arg | Thr | Pro | Leu | |
| | | | 580 | | | | | 585 | | | | | 590 | | | |
| Gly | Gln | Arg | Ile | Arg | Arg | Ala | Phe | Val | Ala | Glu | Ala | Gly | Trp | Ala | Leu | |
| | | 595 | | | | | 600 | | | | | 605 | | | | |
| Val | Ala | Leu | Asp | Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Val | Leu | Ala | His | Leu | |
| | | 610 | | | | 615 | | | | | 620 | | | | | |
| Ser | Gly | Asp | Glu | Asn | Leu | Ile | Arg | Val | Phe | Gln | Glu | Gly | Lys | Asp | Ile | |
| 625 | | | | | 630 | | | | 635 | | | | | | 640 | |
| His | Thr | Gln | Thr | Ala | Ser | Trp | Met | Phe | Gly | Val | Ser | Pro | Glu | Ala | Val | |
| | | | | 645 | | | | | 650 | | | | | 655 | | |
| Asp | Pro | Leu | Met | Arg | Arg | Ala | Ala | Lys | Thr | Val | Asn | Phe | Gly | Val | Leu | |
| | | | 660 | | | | | 665 | | | | | 670 | | | |
| Tyr | Gly | Met | Ser | Ala | His | Arg | Leu | Ser | Gln | Glu | Leu | Ala | Ile | Pro | Tyr | |
| | | 675 | | | | | 680 | | | | | 685 | | | | |
| Glu | Glu | Ala | Val | Ala | Phe | Ile | Glu | Arg | Tyr | Phe | Gln | Ser | Phe | Pro | Lys | |
| | | 690 | | | | 695 | | | | | 700 | | | | | |
| Val | Arg | Ala | Trp | Ile | Glu | Lys | Thr | Leu | Glu | Glu | Gly | Arg | Lys | Arg | Gly | |
| 705 | | | | | 710 | | | | | 715 | | | | | 720 | |
| Tyr | Val | Glu | Thr | Leu | Phe | Gly | Arg | Arg | Arg | Tyr | Val | Pro | Asp | Leu | Asn | |
| | | | | 725 | | | | | 730 | | | | | 735 | | |
| Ala | Arg | Val | Lys | Ser | Val | Arg | Glu | Ala | Ala | Glu | Arg | Met | Ala | Phe | Asn | |
| | | | 740 | | | | | 745 | | | | | 750 | | | |
| Met | Pro | Val | Gln | Gly | Thr | Ala | Ala | Asp | Leu | Met | Lys | Leu | Ala | Met | Val | |
| | | 755 | | | | | 760 | | | | | 765 | | | | |
| Lys | Leu | Phe | Pro | His | Leu | Arg | Glu | Met | Gly | Ala | Arg | Met | Leu | Leu | Gln | |
| | | 770 | | | | 775 | | | | | 780 | | | | | |
| Val | His | Asp | Glu | Leu | Leu | Leu | Glu | Ala | Pro | Gln | Ala | Arg | Ala | Glu | Glu | |
| 785 | | | | | 790 | | | | | 795 | | | | | 800 | |
| Val | Ala | Ala | Leu | Ala | Lys | Glu | Ala | Met | Glu | Lys | Ala | Tyr | Pro | Leu | Ala | |
| | | | | 805 | | | | | 810 | | | | | 815 | | |
| Val | Pro | Leu | Glu | Val | Glu | Val | Gly | Ile | Gly | Glu | Asp | Trp | Leu | Ser | Ala | |
| | | | 820 | | | | | 825 | | | | | 830 | | | |
| Lys | Gly | | | | | | | | | | | | | | | |

<210> 2
 <211> 832
 <212> PRT
 <213> Thermus aquaticus

<220>
 <223> Thermus equaticus DNA polymerase (Taq)

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 Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly Phe Ala
 35 40 45
 Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Asp Ala Val Ile Val
 50 55 60
 Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Gly Gly
 65 70 75 80
 Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln Leu
 85 90 95
 Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Leu Ala Arg Leu Glu
 100 105 110
 Val Pro Gly Tyr Glu Ala Asp Asp Val Leu Ala Ser Leu Ala Lys Lys
 115 120 125
 Ala Glu Lys Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Lys Asp
 130 135 140
 Leu Tyr Gln Leu Leu Ser Asp Arg Ile His Val Leu His Pro Glu Gly
 145 150 155 160
 Tyr Leu Ile Thr Pro Ala Trp Leu Trp Glu Lys Tyr Gly Leu Arg Pro
 165 170 175
 Asp Gln Trp Ala Asp Tyr Arg Ala Leu Thr Gly Asp Glu Ser Asp Asn
 180 185 190
 Leu Pro Gly Val Lys Gly Ile Gly Glu Lys Thr Ala Arg Lys Leu Leu
 195 200 205
 Glu Glu Trp Gly Ser Leu Glu Ala Leu Leu Lys Asn Leu Asp Arg Leu
 210 215 220
 Lys Pro Ala Ile Arg Glu Lys Ile Leu Ala His Met Asp Asp Leu Lys
 225 230 235 240
 Leu Ser Trp Asp Leu Ala Lys Val Arg Thr Asp Leu Pro Leu Glu Val
 245 250 255
 Asp Phe Ala Lys Arg Arg Glu Pro Asp Arg Glu Arg Leu Arg Ala Phe
 260 265 270
 Leu Glu Arg Leu Glu Phe Gly Ser Leu Leu His Glu Phe Gly Leu Leu
 275 280 285
 Glu Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Glu Gly
 290 295 300
 Ala Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp
 305 310 315 320
 Leu Leu Ala Leu Ala Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro
 325 330 335
 Glu Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu
 340 345 350
 Ala Lys Asp Leu Ser Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro
 355 360 365
 Pro Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn
 370 375 380
 Thr Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu
 385 390 395 400
 Glu Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu
 405 410 415
 Trp Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu
 420 425 430
 Val Glu Arg Pro Leu Ser Ala Val Leu Ala His Met Glu Ala Thr Gly
 435 440 445
 Val Arg Leu Asp Val Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala

| | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 450 | Glu | Glu | Ile | Ala | Arg | Leu | 455 | Glu | Ala | Glu | Val | Phe | 460 | Arg | Leu | Ala | Gly | His |
| 465 | Pro | Phe | Asn | Leu | Asn | Ser | 470 | Arg | Asp | Gln | Leu | 475 | Glu | Arg | Val | Leu | Phe | 480 |
| | | | | 485 | Pro | Ala | Ile | Gly | Lys | Thr | Glu | 490 | Glu | Lys | Thr | Gly | Lys | 495 |
| | | | 500 | Ala | Ala | Val | Leu | Glu | Ala | Leu | Arg | 505 | Glu | Ala | His | Pro | Ile | |
| | | 515 | Lys | Ile | Leu | Gln | Tyr | 520 | Arg | Glu | Leu | 525 | Lys | Leu | Lys | Ser | Thr | |
| | 530 | Ile | Asp | Pro | Leu | Pro | 535 | Asp | Leu | Ile | His | 540 | Arg | Thr | Gly | Arg | Leu | |
| 545 | His | Thr | Arg | Phe | Asn | Gln | 550 | Thr | Ala | Thr | Ala | 555 | Thr | Gly | Arg | Leu | Ser | 560 |
| | | | | 565 | Gln | Asn | Ile | Pro | Val | Arg | Thr | 570 | Pro | Leu | Gly | Gln | | |
| | | | 580 | Arg | Ala | Phe | Ile | 600 | Glu | Gly | Trp | 605 | Leu | Val | Ala | | | |
| | | 595 | Arg | Gln | Ile | Glu | Leu | 610 | Arg | Val | Leu | 615 | Ala | His | Leu | Ser | Gly | |
| | 610 | Asp | Tyr | Ser | Gln | Ile | 615 | Val | Phe | Gln | Glu | 620 | Arg | Asp | Ile | His | Thr | |
| 625 | Glu | Thr | Ala | Ser | Trp | Met | 630 | Phe | Gly | Val | Pro | 635 | Arg | Glu | Ala | Val | Asp | Pro |
| | | | 645 | Ala | Ala | Lys | Thr | Ile | Asn | Phe | Gly | 650 | Val | Leu | Tyr | Gly | | |
| | | | 660 | His | Arg | Leu | Ser | Gln | Glu | Leu | Ala | 665 | Ile | Pro | Tyr | Glu | Glu | |
| | | 675 | Ala | Phe | Ile | Glu | Arg | Tyr | Phe | Gln | Ser | 680 | Phe | Pro | Lys | Val | Arg | |
| | 690 | Trp | Ile | Glu | Lys | Thr | 695 | Leu | Glu | Glu | Gly | 700 | Arg | Arg | Gly | Tyr | Val | |
| 705 | Glu | Thr | Leu | Phe | Gly | Arg | 710 | Arg | Arg | Tyr | Val | 715 | Pro | Asp | Leu | Glu | Ala | Arg |
| | | | 725 | Arg | Glu | Ala | Ala | Glu | Arg | Met | Ala | 730 | Met | Ala | Phe | Asn | Met | Pro |
| | | 740 | Gln | Thr | Ala | Ala | Asp | Leu | Met | Lys | Leu | 745 | Ala | Met | Val | Lys | Leu | |
| | | 755 | Pro | Arg | Leu | Glu | Glu | Met | Gly | Ala | Arg | 760 | Leu | Leu | Gln | Val | His | |
| | 770 | Glu | Leu | Val | Leu | Glu | Ala | Pro | Lys | Glu | Arg | 775 | Ala | Glu | Ala | Val | Ala | |
| 785 | Arg | Leu | Ala | Lys | Glu | Val | Met | Glu | Gly | Val | Tyr | 780 | Pro | Leu | Ala | Val | Pro | |
| | | | 805 | Val | Gly | Ile | Gly | Glu | Asp | Trp | Leu | 810 | Ser | Ala | Lys | Glu | | |
| | | | 820 | | | | | 825 | | | | 830 | | | | | | |

<210> 3
 <211> 830
 <212> PRT
 <213> Thermus filiformis

<220>
 <223> Thermus filiformis DNA polymerase (Tfi)

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 Met Leu Pro Leu Leu Glu Pro Lys Gly Arg Val Leu Leu Val Asp Gly
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 His His Leu Ala Tyr Arg Thr Phe Phe Ala Leu Lys Gly Leu Thr Thr
 20 25 30
 Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly Phe Ala Lys Ser Leu
 35 40 45
 Leu Lys Ala Leu Lys Glu Asp Gly Glu Val Ala Ile Val Val Phe Asp
 50 55 60
 Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu Ala Tyr Lys Ala

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|
| 65 | Gly | Arg | Ala | Pro | Thr | 70 | Pro | Glu | Asp | Phe | 75 | Pro | Arg | Gln | Leu | Ala | Leu | 80 | Ile |
| | | | | | 85 | | | | | | | 90 | | | | | 95 | | |
| Lys | Glu | Leu | Val | Asp | Leu | Leu | Gly | Leu | Val | Arg | Leu | Glu | Val | Pro | Gly | | | | |
| | | | 100 | | | | | 105 | | | | | 110 | | | | | | |
| Phe | Glu | Ala | Asp | Asp | Val | Leu | Ala | Thr | Leu | Ala | Arg | Lys | Ala | Glu | Arg | | | | |
| | | 115 | | | | | 120 | | | | | 125 | | | | | | | |
| Glu | Gly | Tyr | Glu | Val | Arg | Ile | Leu | Ser | Ala | Asp | Arg | Asp | Leu | Tyr | Gln | | | | |
| | 130 | | | | | 135 | | | | | 140 | | | | | | | | |
| Leu | Leu | Ser | Asp | Arg | Ile | His | Leu | Leu | His | Pro | Glu | Gly | Glu | Val | Leu | | | | |
| | 145 | | | | 150 | | | | | 155 | | | | | 160 | | | | |
| Thr | Pro | Gly | Trp | Leu | Gln | Glu | Arg | Tyr | Gly | Leu | Ser | Pro | Glu | Arg | Trp | | | | |
| | | | 165 | | | | | | 170 | | | | | 175 | | | | | |
| Val | Glu | Tyr | Arg | Ala | Leu | Val | Gly | Asp | Pro | Ser | Asp | Asn | Leu | Pro | Gly | | | | |
| | | | 180 | | | | | 185 | | | | | 190 | | | | | | |
| Val | Pro | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Leu | Lys | Leu | Leu | Lys | Glu | Trp | | | | |
| | | 195 | | | | | 200 | | | | | 205 | | | | | | | |
| Gly | Ser | Leu | Glu | Ala | Ile | Leu | Lys | Asn | Leu | Asp | Gln | Val | Lys | Pro | Glu | | | | |
| | 210 | | | | | 215 | | | | | 220 | | | | | | | | |
| Arg | Val | Trp | Glu | Ala | Ile | Arg | Asn | Asn | Leu | Asp | Lys | Leu | Gln | Met | Ser | | | | |
| | 225 | | | | 230 | | | | | 235 | | | | | 240 | | | | |
| Leu | Glu | Leu | Ser | Arg | Leu | Arg | Thr | Asp | Leu | Pro | Leu | Glu | Val | Asp | Phe | | | | |
| | | | 245 | | | | | | 250 | | | | | 255 | | | | | |
| Ala | Lys | Arg | Arg | Glu | Pro | Thr | Gly | Lys | Gly | Leu | Lys | Ala | Phe | Leu | Glu | | | | |
| | | 260 | | | | | | 265 | | | | 270 | | | | | | | |
| Arg | Leu | Glu | Phe | Gly | Ser | Leu | Leu | His | Glu | Phe | Gly | Leu | Leu | Glu | Ala | | | | |
| | | 275 | | | | | 280 | | | | | 285 | | | | | | | |
| Pro | Lys | Glu | Ala | Glu | Glu | Ala | Pro | Trp | Pro | Pro | Pro | Gly | Gly | Ala | Phe | | | | |
| | 290 | | | | | 295 | | | | | 300 | | | | | | | | |
| Leu | Gly | Phe | Leu | Leu | Ser | Arg | Pro | Glu | Pro | Met | Trp | Ala | Glu | Leu | Leu | | | | |
| | 305 | | | | 310 | | | | | 315 | | | | | 320 | | | | |
| Ala | Leu | Ala | Gly | Ala | Lys | Glu | Gly | Arg | Val | His | Arg | Ala | Glu | Asp | Pro | | | | |
| | | | 325 | | | | | | 330 | | | | | 335 | | | | | |
| Val | Gly | Ala | Leu | Lys | Asp | Leu | Lys | Glu | Ile | Arg | Gly | Leu | Leu | Ala | Lys | | | | |
| | | 340 | | | | | | 345 | | | | 350 | | | | | | | |
| Asp | Leu | Ser | Val | Leu | Ala | Leu | Arg | Glu | Gly | Arg | Glu | Ile | Pro | Pro | Gly | | | | |
| | | 355 | | | | | 360 | | | | | 365 | | | | | | | |
| Asp | Asp | Pro | Met | Leu | Leu | Ala | Tyr | Leu | Leu | Asp | Pro | Gly | Asn | Thr | Asn | | | | |
| | 370 | | | | | 375 | | | | | 380 | | | | | | | | |
| Pro | Glu | Gly | Val | Ala | Arg | Arg | Tyr | Gly | Gly | Glu | Trp | Lys | Glu | Asp | Ala | | | | |
| | 385 | | | | 390 | | | | | 395 | | | | | 400 | | | | |
| Ala | Ala | Arg | Ala | Leu | Ser | Glu | Arg | Leu | Trp | Gln | Ala | Leu | Tyr | Pro | | | | | |
| | | | 405 | | | | | 410 | | | | | | 415 | | | | | |
| Arg | Val | Ala | Glu | Glu | Arg | Leu | Leu | Trp | Leu | Tyr | Arg | Glu | Val | Glu | | | | | |
| | | 420 | | | | | 425 | | | | | 430 | | | | | | | |
| Arg | Pro | Leu | Ala | Gln | Val | Leu | Ala | His | Met | Glu | Ala | Thr | Gly | Val | Arg | | | | |
| | | 435 | | | | | 440 | | | | | 445 | | | | | | | |
| Leu | Asp | Val | Pro | Tyr | Leu | Glu | Ala | Leu | Ser | Gln | Glu | Val | Ala | Phe | Glu | | | | |
| | | 450 | | | | 455 | | | | | 460 | | | | | | | | |
| Leu | Glu | Arg | Leu | Glu | Ala | Glu | Val | His | Arg | Leu | Ala | Gly | His | Pro | Phe | | | | |
| | 465 | | | | 470 | | | | 475 | | | | | 480 | | | | | |
| Asn | Leu | Asn | Ser | Arg | Asp | Gln | Leu | Glu | Arg | Val | Leu | Phe | Asp | Glu | Leu | | | | |
| | | | 485 | | | | | | 490 | | | | | 495 | | | | | |
| Gly | Leu | Pro | Pro | Ile | Gly | Lys | Thr | Glu | Lys | Thr | Gly | Lys | Arg | Ser | Thr | | | | |
| | | 500 | | | | | | 505 | | | | | 510 | | | | | | |
| Ser | Ala | Ala | Val | Leu | Glu | Leu | Leu | Arg | Glu | Ala | His | Pro | Ile | Val | Gly | | | | |
| | | 515 | | | | | 520 | | | | | 525 | | | | | | | |
| Arg | Ile | Leu | Glu | Tyr | Arg | Glu | Leu | Met | Lys | Leu | Lys | Ser | Thr | Tyr | Ile | | | | |
| | | 530 | | | | 535 | | | | | 540 | | | | | | | | |
| Asp | Pro | Leu | Pro | Arg | Leu | Val | His | Pro | Lys | Thr | Gly | Arg | Leu | His | Thr | | | | |
| | 545 | | | | 550 | | | | | 555 | | | | 560 | | | | | |
| Arg | Phe | Asn | Gln | Thr | Ala | Thr | Ala | Thr | Gly | Arg | Leu | Ser | Ser | Ser | Asp | | | | |
| | | | 565 | | | | | | 570 | | | | | 575 | | | | | |
| Pro | Asn | Leu | Gln | Asn | Ile | Pro | Val | Arg | Thr | Pro | Leu | Gly | Gln | Arg | Ile | | | | |
| | | | 580 | | | | | 585 | | | | | 590 | | | | | | |
| Arg | Lys | Ala | Phe | Ile | Ala | Glu | Glu | Gly | His | Leu | Leu | Val | Ala | Leu | Asp | | | | |
| | | 595 | | | | | 600 | | | | | 605 | | | | | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Val | Leu | Ala | His | Leu | Ser | Gly | Asp | Glu |
| 610 | | | | | | 615 | | | | | 620 | | | | |
| Asn | Leu | Ile | Arg | Val | Phe | Arg | Glu | Gly | Lys | Asp | Ile | His | Thr | Glu | Thr |
| 625 | | | | | 630 | | | | | 635 | | | | | 640 |
| Ala | Ala | Trp | Met | Phe | Gly | Val | Pro | Pro | Glu | Gly | Val | Asp | Gly | Ala | Met |
| | | | | 645 | | | | | 650 | | | | | 655 | |
| Arg | Arg | Ala | Ala | Lys | Thr | Val | Asn | Phe | Gly | Val | Leu | Tyr | Gly | Met | Ser |
| | | | 660 | | | | | 665 | | | | | 670 | | |
| Ala | His | Arg | Leu | Ser | Gln | Glu | Leu | Ser | Ile | Pro | Tyr | Glu | Glu | Ala | Ala |
| | | 675 | | | | | 680 | | | | | 685 | | | |
| Ala | Phe | Ile | Glu | Arg | Tyr | Phe | Gln | Ser | Phe | Pro | Lys | Val | Arg | Ala | Trp |
| 690 | | | | | | 695 | | | | | 700 | | | | |
| Ile | Ala | Lys | Thr | Leu | Glu | Gly | Arg | Lys | Lys | Gly | Tyr | Val | Glu | Thr | |
| 705 | | | | | 710 | | | | | | | | | 720 | |
| Leu | Phe | Gly | Arg | Arg | Arg | Tyr | Val | Pro | Asp | Leu | Asn | Ala | Arg | Val | Lys |
| | | | | 725 | | | | | 730 | | | | | 735 | |
| Ser | Val | Arg | Glu | Ala | Ala | Glu | Arg | Met | Ala | Phe | Asn | Met | Pro | Val | Gln |
| | | | 740 | | | | | 745 | | | | | 750 | | |
| Gly | Thr | Ala | Ala | Asp | Leu | Met | Lys | Leu | Ala | Met | Val | Lys | Leu | Phe | Pro |
| | | 755 | | | | 760 | | | | | | 765 | | | |
| Arg | Leu | Arg | Pro | Leu | Gly | Val | Arg | Ile | Leu | Leu | Gln | Val | His | Asp | Glu |
| 770 | | | | | 775 | | | | | | 780 | | | | |
| Leu | Val | Leu | Glu | Ala | Pro | Lys | Ala | Arg | Ala | Glu | Glu | Ala | Ala | Gln | Leu |
| 785 | | | | | 790 | | | | | 795 | | | | | 800 |
| Ala | Lys | Glu | Thr | Met | Glu | Gly | Val | Tyr | Pro | Leu | Ser | Val | Pro | Leu | Glu |
| | | | | 805 | | | | | 810 | | | | | 815 | |
| Val | Glu | Val | Gly | Met | Gly | Glu | Asp | Trp | Leu | Ser | Ala | Lys | Glu | | |
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<210> 4
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 <212> PRT
 <213> Thermus flavus

<220>
 <223> Thermus flavus DNA polymerase (Tf1)

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| <400> 4 | | | | | | | | | | | | | | | |
| Met | Ala | Met | Leu | Pro | Leu | Phe | Glu | Pro | Lys | Gly | Arg | Val | Leu | Leu | Val |
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| Asp | Gly | His | His | Leu | Ala | Tyr | Arg | Thr | Phe | Phe | Ala | Leu | Lys | Gly | Leu |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Thr | Thr | Ser | Arg | Gly | Glu | Pro | Val | Gln | Ala | Val | Tyr | Gly | Phe | Ala | Lys |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Ser | Leu | Leu | Lys | Ala | Leu | Lys | Glu | Asp | Gly | Asp | Val | Val | Val | Val | Val |
| | | 50 | | | | 55 | | | | 60 | | | | | |
| Phe | Asp | Ala | Lys | Ala | Pro | Ser | Phe | Arg | His | Glu | Ala | Tyr | Glu | Ala | Tyr |
| 65 | | | | | 70 | | | | 75 | | | | | | 80 |
| Lys | Ala | Gly | Arg | Ala | Pro | Thr | Pro | Glu | Asp | Phe | Pro | Arg | Gln | Leu | Ala |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Leu | Ile | Lys | Glu | Leu | Val | Asp | Leu | Leu | Gly | Leu | Val | Arg | Leu | Glu | Val |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Pro | Gly | Phe | Glu | Ala | Asp | Asp | Val | Leu | Ala | Thr | Leu | Ala | Lys | Arg | Ala |
| | | 115 | | | | | 120 | | | | | 125 | | | |
| Glu | Lys | Glu | Gly | Tyr | Glu | Val | Arg | Ile | Leu | Thr | Ala | Asp | Arg | Asp | Leu |
| | 130 | | | | | 135 | | | | | 140 | | | | |
| Tyr | Gln | Leu | Leu | Ser | Glu | Arg | Ile | Ala | Ile | Leu | His | Pro | Glu | Gly | Tyr |
| 145 | | | | | 150 | | | | 155 | | | | | | 160 |
| Leu | Ile | Thr | Pro | Ala | Trp | Leu | Tyr | Glu | Lys | Tyr | Gly | Leu | Arg | Pro | Glu |
| | | | | 165 | | | | | 170 | | | | | 175 | |
| Gln | Trp | Val | Asp | Tyr | Arg | Ala | Leu | Ala | Gly | Asp | Pro | Ser | Asp | Asn | Ile |
| | | | 180 | | | | | 185 | | | | | 190 | | |
| Pro | Gly | Val | Lys | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Gln | Arg | Leu | Ile | Arg |
| | | 195 | | | | | 200 | | | | | 205 | | | |
| Glu | Trp | Gly | Ser | Leu | Glu | Asn | Leu | Phe | Gln | His | Leu | Asp | Gln | Val | Lys |
| 210 | | | | | | 215 | | | | | 220 | | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Ser | Leu | Arg | Glu | Lys | Leu | Gln | Ala | Gly | Met | Glu | Ala | Leu | Ala | Leu |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 |
| Ser | Arg | Lys | Leu | Ser | Gln | Val | His | Thr | Asp | Leu | Pro | Leu | Glu | Val | Asp |
| | | | | 245 | | | | | 250 | | | | | 255 | |
| Phe | Gly | Arg | Arg | Thr | Pro | Asn | Leu | Leu | Gly | Gly | Leu | Arg | Ala | Phe | Leu |
| | | | 260 | | | | 265 | | | | | | 270 | | |
| Glu | Arg | Leu | Glu | Phe | Gly | Ser | Leu | Leu | His | Glu | Phe | Gly | Leu | Leu | Glu |
| | | 275 | | | | | 280 | | | | | 285 | | | |
| Gly | Pro | Lys | Ala | Ala | Glu | Glu | Ala | Pro | Trp | Pro | Pro | Pro | Glu | Gly | Ala |
| | | | | | | | 295 | | | | | 300 | | | |
| Phe | Leu | Gly | Phe | Ser | Phe | Ser | Arg | Pro | Glu | Pro | Met | Trp | Ala | Glu | Leu |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 |
| Leu | Ala | Leu | Ala | Gly | Ala | Trp | Glu | Gly | Arg | Leu | His | Arg | Ala | Gln | Asp |
| | | | | 325 | | | | | 330 | | | | | 335 | |
| Pro | Leu | Arg | Gly | Leu | Arg | Asp | Leu | Lys | Gly | Val | Arg | Gly | Ile | Leu | Ala |
| | | | 340 | | | | | 345 | | | | | 350 | | |
| Lys | Asp | Leu | Ala | Val | Leu | Ala | Leu | Arg | Glu | Gly | Leu | Asp | Leu | Phe | Pro |
| | | 355 | | | | | 360 | | | | | 365 | | | |
| Glu | Asp | Asp | Pro | Met | Leu | Leu | Ala | Tyr | Leu | Leu | Asp | Pro | Ser | Asn | Thr |
| | | 370 | | | | 375 | | | | | 380 | | | | |
| Thr | Pro | Glu | Gly | Val | Ala | Arg | Arg | Tyr | Gly | Gly | Glu | Trp | Thr | Glu | Asp |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 |
| Ala | Gly | Glu | Arg | Ala | Leu | Leu | Ala | Glu | Arg | Leu | Phe | Gln | Thr | Leu | Lys |
| | | | | 405 | | | | | 410 | | | | | 415 | |
| Glu | Arg | Leu | Lys | Gly | Glu | Glu | Arg | Leu | Leu | Trp | Leu | Tyr | Glu | Glu | Val |
| | | | 420 | | | | | 425 | | | | | 430 | | |
| Glu | Lys | Pro | Leu | Ser | Arg | Val | Leu | Ala | Arg | Met | Glu | Ala | Thr | Gly | Val |
| | | 435 | | | | | 440 | | | | | 445 | | | |
| Arg | Leu | Asp | Val | Ala | Tyr | Leu | Gln | Ala | Leu | Ser | Leu | Glu | Val | Glu | Ala |
| | 450 | | | | | 455 | | | | | 460 | | | | |
| Glu | Val | Arg | Gln | Leu | Glu | Glu | Val | Phe | Arg | Leu | Ala | Gly | His | Pro | |
| 465 | | | | | 470 | | | | 475 | | | | | 480 | |
| Phe | Asn | Leu | Asn | Ser | Arg | Asp | Gln | Leu | Glu | Arg | Val | Leu | Phe | Asp | Glu |
| | | | | 485 | | | | | 490 | | | | | 495 | |
| Leu | Gly | Leu | Pro | Ala | Ile | Gly | Lys | Thr | Glu | Lys | Thr | Gly | Lys | Arg | Ser |
| | | | 500 | | | | | 505 | | | | | 510 | | |
| Thr | Ser | Ala | Ala | Val | Leu | Glu | Ala | Leu | Arg | Glu | Ala | His | Pro | Ile | Val |
| | | 515 | | | | | 520 | | | | | 525 | | | |
| Asp | Arg | Ile | Leu | Gln | Tyr | Arg | Glu | Leu | Thr | Lys | Leu | Lys | Asn | Thr | Tyr |
| | | 530 | | | | 535 | | | | | 540 | | | | |
| Ile | Asp | Pro | Leu | Pro | Ala | Leu | Val | His | Pro | Lys | Thr | Gly | Arg | Leu | His |
| 545 | | | | | 550 | | | | | 555 | | | | | 560 |
| Thr | Arg | Phe | Asn | Gln | Thr | Ala | Thr | Ala | Thr | Gly | Arg | Leu | Ser | Ser | Ser |
| | | | 565 | | | | | 570 | | | | | | 575 | |
| Asp | Pro | Asn | Leu | Gln | Asn | Ile | Pro | Val | Arg | Thr | Pro | Leu | Gly | Gln | Arg |
| | | | 580 | | | | | 585 | | | | | 590 | | |
| Ile | Arg | Arg | Ala | Phe | Val | Ala | Glu | Gly | Trp | Val | Leu | Val | Val | Leu | |
| | | 595 | | | | | 600 | | | | 605 | | | | |
| Asp | Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Val | Leu | Ala | His | Leu | Ser | Gly | Asp |
| | | 610 | | | | 615 | | | | 620 | | | | | |
| Glu | Asn | Leu | Ile | Arg | Val | Phe | Gln | Glu | Gly | Arg | Asp | Ile | His | Thr | Gln |
| 625 | | | | | 630 | | | | | 635 | | | | | 640 |
| Thr | Ala | Ser | Trp | Met | Phe | Gly | Val | Ser | Pro | Glu | Gly | Val | Asp | Pro | Leu |
| | | | 645 | | | | | | 650 | | | | | 655 | |
| Met | Arg | Arg | Ala | Ala | Lys | Thr | Ile | Asn | Phe | Gly | Val | Leu | Tyr | Gly | Met |
| | | | 660 | | | | | 665 | | | | | 670 | | |
| Ser | Ala | His | Arg | Leu | Ser | Gly | Glu | Leu | Ser | Ile | Pro | Tyr | Glu | Glu | Ala |
| | | 675 | | | | | 680 | | | | | 685 | | | |
| Val | Ala | Phe | Ile | Glu | Arg | Tyr | Phe | Gln | Ser | Tyr | Pro | Lys | Val | Arg | Ala |
| | | 690 | | | | 695 | | | | | 700 | | | | |
| Trp | Ile | Glu | Gly | Thr | Leu | Glu | Glu | Gly | Arg | Arg | Arg | Gly | Tyr | Val | Glu |
| 705 | | | | | 710 | | | | | 715 | | | | | 720 |
| Thr | Leu | Phe | Gly | Arg | Arg | Arg | Tyr | Val | Pro | Asp | Leu | Asn | Ala | Arg | Val |
| | | | 725 | | | | | | 730 | | | | | 735 | |
| Lys | Ser | Val | Arg | Glu | Ala | Ala | Glu | Arg | Met | Ala | Phe | Asn | Met | Pro | Val |
| | | | 740 | | | | | 745 | | | | | 750 | | |
| Gln | Gly | Thr | Ala | Ala | Asp | Leu | Met | Lys | Leu | Ala | Met | Val | Arg | Leu | Phe |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | | 755 | | | | 760 | | | | | 765 | | | | | |
| Pro | Arg | Leu | Gln | Glu | Leu | Gly | Ala | Arg | Met | Leu | Leu | Gln | Val | His | Asp | |
| | 770 | | | | | 775 | | | | | 780 | | | | | |
| Glu | Leu | Val | Leu | Glu | Ala | Pro | Lys | Asp | Arg | Ala | Glu | Arg | Val | Ala | Ala | |
| 785 | | | | | 790 | | | | | 795 | | | | | 800 | |
| Leu | Ala | Lys | Glu | Val | Met | Glu | Gly | Val | Trp | Pro | Leu | Gln | Val | Pro | Leu | |
| | | | 805 | | | | | | 810 | | | | | 815 | | |
| Glu | Val | Glu | Val | Gly | Leu | Gly | Glu | Asp | Trp | Leu | Ser | Ala | Lys | Glu | | |
| | | | 820 | | | | | 825 | | | | | 830 | | | |

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 <212> PRT
 <213> Thermus sp.

<220>
 <223> Thermus sp. sps17 DNA polymerase (Sps17)

<400> 5

| | | | | | | | | | | | | | | | | |
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| Met | Leu | Pro | Leu | Phe | Glu | Pro | Lys | Gly | Arg | Val | Leu | Leu | Val | Asp | Gly | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| His | His | Leu | Ala | Tyr | Arg | Thr | Phe | Phe | Ala | Leu | Lys | Gly | Leu | Thr | Thr | |
| | | 20 | | | | | 25 | | | | | 30 | | | | |
| Ser | Arg | Gly | Glu | Pro | Val | Gln | Ala | Val | Tyr | Gly | Phe | Ala | Lys | Ser | Leu | |
| | | 35 | | | | | 40 | | | | 45 | | | | | |
| Leu | Lys | Ala | Leu | Lys | Glu | Asp | Gly | Glu | Val | Ala | Ile | Val | Val | Phe | Asp | |
| 50 | | | | | 55 | | | | | 60 | | | | | | |
| Ala | Lys | Ala | Pro | Ser | Phe | Arg | His | Glu | Ala | Tyr | Glu | Ala | Tyr | Lys | Ala | |
| 65 | | | | 70 | | | | | 75 | | | | | 80 | | |
| Gly | Arg | Ala | Pro | Thr | Pro | Glu | Asp | Phe | Pro | Arg | Gln | Leu | Ala | Leu | Ile | |
| | | | 85 | | | | | | 90 | | | | | 95 | | |
| Lys | Glu | Leu | Val | Asp | Leu | Leu | Gly | Leu | Val | Arg | Leu | Glu | Val | Pro | Gly | |
| | | 100 | | | | | 105 | | | | | 110 | | | | |
| Phe | Glu | Ala | Asp | Asp | Val | Leu | Ala | Thr | Leu | Ala | Lys | Lys | Ala | Glu | Arg | |
| | | 115 | | | | 120 | | | | | 125 | | | | | |
| Glu | Gly | Tyr | Glu | Val | Arg | Ile | Leu | Ser | Ala | Asp | Arg | Asp | Leu | Tyr | Gln | |
| 130 | | | | | 135 | | | | | 140 | | | | | | |
| Leu | Leu | Ser | Asp | Arg | Ile | His | Leu | Leu | His | Pro | Glu | Gly | Glu | Val | Leu | |
| 145 | | | | 150 | | | | | 155 | | | | | 160 | | |
| Thr | Pro | Gly | Trp | Leu | Gln | Glu | Arg | Tyr | Gly | Leu | Ser | Pro | Glu | Arg | Trp | |
| | | | 165 | | | | | | 170 | | | | | 175 | | |
| Val | Glu | Tyr | Arg | Ala | Leu | Val | Gly | Asp | Pro | Ser | Asp | Asn | Leu | Pro | Gly | |
| | | 180 | | | | | 185 | | | | | 190 | | | | |
| Val | Pro | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Leu | Lys | Leu | Leu | Lys | Glu | Trp | |
| | | 195 | | | | 200 | | | | | 205 | | | | | |
| Gly | Ser | Leu | Glu | Ala | Ile | Leu | Lys | Asn | Leu | Asp | Gln | Val | Lys | Pro | Glu | |
| | 210 | | | | 215 | | | | | 220 | | | | | | |
| Arg | Val | Arg | Glu | Ala | Ile | Arg | Asn | Asn | Leu | Asp | Lys | Leu | Gln | Met | Ser | |
| 225 | | | | 230 | | | | | 235 | | | | | 240 | | |
| Leu | Glu | Leu | Ser | Arg | Leu | Arg | Thr | Asp | Leu | Pro | Leu | Glu | Val | Asp | Phe | |
| | | | 245 | | | | | | 250 | | | | | 255 | | |
| Ala | Lys | Arg | Arg | Glu | Pro | Asp | Trp | Glu | Gly | Leu | Lys | Ala | Phe | Leu | Glu | |
| | | 260 | | | | | 265 | | | | | 270 | | | | |
| Arg | Leu | Glu | Phe | Gly | Ser | Leu | Leu | His | Glu | Phe | Gly | Leu | Leu | Glu | Ala | |
| | | 275 | | | | 280 | | | | | 285 | | | | | |
| Pro | Lys | Glu | Ala | Glu | Glu | Ala | Pro | Trp | Pro | Pro | Pro | Gly | Gly | Ala | Phe | |
| | 290 | | | | 295 | | | | | 300 | | | | | | |
| Leu | Gly | Phe | Leu | Leu | Ser | Arg | Pro | Glu | Pro | Met | Trp | Ala | Glu | Leu | Leu | |
| 305 | | | | 310 | | | | | 315 | | | | | 320 | | |
| Ala | Leu | Ala | Gly | Ala | Lys | Glu | Gly | Arg | Val | His | Arg | Ala | Glu | Asp | Pro | |
| | | | 325 | | | | | | 330 | | | | | 335 | | |
| Val | Gly | Ala | Leu | Lys | Asp | Leu | Lys | Glu | Ile | Arg | Gly | Leu | Leu | Ala | Lys | |
| | | 340 | | | | | 345 | | | | | 350 | | | | |
| Asp | Leu | Ser | Val | Leu | Ala | Leu | Arg | Glu | Gly | Arg | Glu | Ile | Pro | Pro | Gly | |
| | 355 | | | | 360 | | | | | | 365 | | | | | |
| Asp | Asp | Pro | Met | Leu | Leu | Ala | Tyr | Leu | Leu | Asp | Pro | Gly | Asn | Thr | Asn | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 370 | Pro | Glu | Gly | Val | Ala | Arg | Arg | Tyr | Gly | Gly | Glu | Trp | Lys | Glu | Asp | Ala |
| 385 | Ala | Ala | Arg | Ala | Leu | Leu | Ser | Glu | Arg | Leu | Trp | Gln | Ala | Leu | Tyr | Pro |
| | Arg | Val | Ala | Glu | Glu | Glu | Arg | Leu | Leu | Trp | Leu | Tyr | Arg | Glu | Val | Glu |
| | Arg | Pro | Leu | Ala | Gln | Val | Leu | Ala | His | Met | Glu | Ala | Thr | Gly | Val | Arg |
| | Leu | Asp | Val | Pro | Tyr | Leu | Glu | Ala | Leu | Ser | Gln | Glu | Val | Ala | Phe | Glu |
| | Leu | Glu | Arg | Leu | Glu | Ala | Glu | Val | His | Arg | Leu | Ala | Gly | His | Pro | Phe |
| | Asn | Leu | Asn | Ser | Arg | Asp | Gln | Leu | Glu | Arg | Val | Leu | Phe | Asp | Glu | Leu |
| | Gly | Leu | Pro | Pro | Ile | Gly | Lys | Thr | Glu | Lys | Thr | Gly | Lys | Arg | Ser | Thr |
| | Ser | Ala | Ala | Val | Leu | Glu | Leu | Leu | Arg | Glu | Ala | His | Pro | Ile | Val | Gly |
| | Arg | Ile | Leu | Glu | Tyr | Arg | Glu | Leu | Met | Lys | Leu | Lys | Ser | Thr | Tyr | Ile |
| | Asp | Pro | Leu | Pro | Arg | Leu | Val | His | Pro | Lys | Thr | Gly | Arg | Leu | His | Thr |
| | Arg | Phe | Asn | Gln | Thr | Ala | Thr | Ala | Thr | Gly | Arg | Leu | Ser | Ser | Ser | Asp |
| | Pro | Asn | Leu | Gln | Asn | Ile | Pro | Val | Arg | Thr | Pro | Leu | Gly | Gln | Arg | Ile |
| | Arg | Lys | Ala | Phe | Ile | Ala | Glu | Glu | Gly | His | Leu | Leu | Val | Ala | Leu | Asp |
| | Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Val | Leu | Ala | His | Leu | Ser | Gly | Asp | Glu |
| | Asn | Leu | Ile | Arg | Val | Phe | Arg | Glu | Gly | Lys | Asp | Ile | His | Thr | Glu | Thr |
| | Ala | Ala | Trp | Met | Phe | Gly | Val | Pro | Pro | Glu | Gly | Val | Asp | Gly | Ala | Met |
| | Arg | Arg | Ala | Ala | Lys | Thr | Val | Asn | Phe | Gly | Val | Leu | Tyr | Gly | Met | Ser |
| | Ala | His | Arg | Leu | Ser | Gln | Glu | Leu | Ser | Ile | Pro | Tyr | Glu | Glu | Ala | Ala |
| | Ala | Phe | Ile | Glu | Arg | Tyr | Phe | Gln | Ser | Phe | Pro | Lys | Val | Arg | Ala | Trp |
| | Ile | Ala | Lys | Thr | Leu | Glu | Glu | Gly | Arg | Lys | Lys | Gly | Tyr | Val | Glu | Thr |
| | Leu | Phe | Gly | Arg | Arg | Arg | Tyr | Val | Pro | Asp | Leu | Asn | Ala | Arg | Val | Lys |
| | Ser | Val | Arg | Glu | Ala | Ala | Glu | Arg | Met | Ala | Phe | Asn | Met | Pro | Val | Gln |
| | Gly | Thr | Ala | Ala | Asp | Leu | Met | Lys | Leu | Ala | Met | Val | Lys | Leu | Phe | Pro |
| | Arg | Leu | Arg | Pro | Leu | Gly | Val | Arg | Ile | Leu | Leu | Gln | Val | His | Asp | Glu |
| | Leu | Val | Leu | Glu | Ala | Pro | Lys | Ala | Arg | Ala | Glu | Glu | Ala | Ala | Gln | Leu |
| | Ala | Lys | Glu | Thr | Met | Glu | Gly | Val | Tyr | Pro | Leu | Ser | Val | Pro | Leu | Glu |
| | Val | Glu | Val | Gly | Met | Gly | Glu | Asp | Trp | Leu | Ser | Ala | Lys | Ala | | |

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<220>
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Lys Ser 50 Leu Leu Lys Ala Leu 55 Lys Glu Asp Gly Tyr 60 Lys Ala Val Phe
Val 65 Val Phe Asp Ala Lys 70 Ala Pro Ser Phe Arg 75 His Glu Ala Tyr Glu
Ala Tyr Lys Ala Gly 85 Arg Ala Pro Thr Pro 90 Glu Asp Phe Pro Arg Gln
Leu Ala Leu Ile 100 Lys Glu Leu Val Asp 105 Leu Leu Gly Phe Thr Arg Leu
Glu Val Pro Gly Tyr Glu Ala Asp 120 Asp Val Leu Ala Thr 125 Leu Ala Lys
Lys Ala 130 Glu Lys Glu Gly Tyr 135 Glu Val Arg Ile Leu Thr Ala Asp Arg
Asp 145 Leu Tyr Gln Leu Val 150 Ser Asp Arg Val Ala 155 Val Leu His Pro Glu
Gly His Leu Ile Thr 165 Pro Glu Trp Leu Trp 170 Glu Lys Tyr Gly Leu Arg
Pro Glu Gln Trp 180 Val Asp Phe Arg Ala 185 Leu Val Gly Asp Pro Ser Asp
Asn Leu Pro 195 Gly Val Lys Gly Ile 200 Gly Glu Lys Thr Ala 205 Leu Lys Leu
Leu Lys 210 Glu Trp Gly Ser Leu 215 Glu Asn Leu Leu Lys 220 Asn Leu Asp Arg
Val 225 Lys Pro Glu Asn Val 230 Arg Glu Lys Ile Lys 235 Ala His Leu Glu Asp
Leu Arg Leu Ser Leu 245 Glu Leu Ser Arg Val 250 Arg Thr Asp Leu Pro Leu
Glu Val Asp Leu 260 Ala Gln Gly Arg Glu 265 Pro Asp Arg Glu Gly Leu Arg
Ala Phe Leu 275 Glu Arg Leu Glu Phe 280 Gly Ser Leu Leu His 285 Glu Phe Gly
Leu Leu Glu Ala Pro Ala Pro 295 Leu Glu Glu Ala Pro 300 Trp Pro Pro Pro
Glu Gly Ala Phe Val Gly Phe Val Leu Ser Arg 315 Pro Glu Pro Met Trp
305 Ala Glu Leu Lys Ala 325 Leu Ala Ala Cys Arg 330 Asp Gly Arg Val His Arg
Ala Ala Asp Pro 340 Leu Ala Gly Leu Lys Asp Leu Lys Glu Val Arg Gly
Leu Leu Ala 355 Lys Asp Leu Ala Val 360 Leu Ala Ser Arg Glu Gly Leu Asp
Leu Val Pro Gly Asp Asp Pro 375 Met Leu Leu Ala Tyr 380 Leu Leu Asp Pro
Ser 385 Asn Thr Thr Pro Glu 390 Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp
Thr Glu Asp Ala Ala 405 His Arg Ala Leu Leu 410 Ser Glu Arg Leu His Arg
Asn Leu Leu Lys Arg Leu Glu Gly Glu 425 Glu Lys Leu Leu Trp Leu Tyr
His Glu Val 435 Glu Lys Pro Leu Ser 440 Arg Val Leu Ala His 445 Met Glu Ala
Thr Gly Val Arg Arg Asp Val 455 Ala Tyr Leu Gln Ala 460 Leu Ser Leu Glu
Leu Ala Glu Glu Ile Arg Arg Leu Glu Glu Glu Val Phe Arg Leu Ala
465 Gly His Pro Phe Asn 470 Leu Asn Ser Arg Asp 475 Gln Leu Glu Arg Val Leu
Phe Asp Glu Leu Arg Leu Pro Ala Leu 505 Gly Lys Thr Gln Lys Thr Gly
Lys Arg Ser 515 Thr Ser Ala Ala Val 520 Leu Glu Ala Leu Arg 525 Glu Ala His

Pro Ile Val Glu Lys Ile Leu Gln His Arg Glu Leu Thr Lys Leu Lys
 530 535 540
 Asn Thr Tyr Val Asp Pro Leu Pro Ser Leu Val His Pro Arg Thr Gly
 545 550 555
 Arg Leu His Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly Arg
 565 570 575
 Ser Ser Ser Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu
 580 585 590
 Gly Gln Arg Ile Arg Arg Ala Phe Val Ala Glu Ala Gly Trp Ala Leu
 595 600 605
 Val Ala Leu Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu
 610 615 620
 Ser Gly Asp Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Lys Asp Ile
 625 630 635 640
 His Thr Gln Thr Ala Ser Trp Met Phe Gly Val Pro Pro Glu Ala Val
 645 650 655
 Asp Pro Leu Met Arg Arg Ala Ala Lys Thr Val Asn Phe Gly Val Leu
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 Tyr Gly Met Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr
 675 680 685
 Glu Glu Ala Val Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys
 690 695 700
 Val Arg Ala Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Lys Arg Gly
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 Tyr Val Glu Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Asn
 725 730 735
 Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn
 740 745 750
 Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val
 755 760 765
 Lys Leu Phe Pro Arg Leu Arg Glu Met Gly Ala Arg Met Leu Leu Gln
 770 775 780
 Val His Asp Glu Leu Leu Leu Glu Ala Pro Gln Ala Arg Ala Glu Glu
 785 790 795 800
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 Val Pro Leu Glu Val Glu Val Gly Met Gly Glu Asp Trp Leu Ser Ala
 820 825 830
 Lys Gly

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 <212> PRT
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<220>
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 35 40 45
 Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala Val Phe
 50 55 60
 Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu
 65 70 75 80
 Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln
 85 90 95
 Leu Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Phe Thr Arg Leu
 100 105 110
 Glu Val Pro Gly Tyr Glu Ala Asp Asp Val Leu Ala Thr Leu Ala Lys
 115 120 125
 Asn Pro Glu Lys Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Arg

Tyr Gly Met Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile Pro Tyr
 675 680 685
 Glu Glu Ala Val Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys
 690 695 700
 Val Arg Ala Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Lys Arg Gly
 705 710 715 720
 Tyr Val Glu Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Asn
 725 730 735
 Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn
 740 745 750
 Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val
 755 760 765
 Lys Leu Phe Pro Arg Leu Arg Glu Met Gly Ala Arg Met Leu Leu Gln
 770 775 780
 Val His Asp Glu Leu Leu Leu Glu Ala Pro Gln Ala Gly Ala Glu Glu
 785 790 795 800
 Val Ala Ala Leu Ala Lys Glu Ala Met Glu Lys Ala Tyr Pro Leu Ala
 805 810 815
 Val Pro Leu Glu Val Glu Val Gly Met Gly Glu Asp Trp Leu Ser Ala
 820 825 830
 Lys Gly

<210> 8
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<220>
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<220>
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 <222> (3)...(3)
 <223> Xaa = Met, Ile, Ala, Leu or Thr

<220>
 <221> VARIANT
 <222> (5)...(5)
 <223> Xaa = Phe, Ile, Val, Tyr or Met

<220>
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 <222> (6)...(6)
 <223> Xaa = any amino acid other than Asn

<220>
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 <222> (7)...(7)
 <223> Xaa = Met, Thr or Ala

<220>
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 <223> Xaa = Val, Ile or Met

<220>
 <221> VARIANT
 <222> (12)...(12)
 <223> Xaa = Thr or Ser

<400> 8
 Glu Arg Xaa Ala Xaa Xaa Xaa Pro Xaa Gln Gly Xaa Ala Ala Asp
 1 5 10 15

<210> 9

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<211> 15
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<213> Artificial Sequence

<220>
<223> synthetic DNA polymerase domain motif

<220>
<221> VARIANT
<222> (3)...(3)
<223> Xaa = Met or Ile

<220>
<221> VARIANT
<222> (5)...(5)
<223> Xaa = Phe or Ile

<220>
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<223> Xaa = any amino acid other than Asn

<220>
<221> VARIANT
<222> (7)...(7)
<223> Xaa = Met or Thr

<220>
<221> VARIANT
<222> (9)...(9)
<223> Xaa = Val or Ile

<400> 9
Glu Arg Xaa Ala Xaa Xaa Xaa Pro Xaa Gln Gly Thr Ala Ala Asp
 1           5           10           15

<210> 10
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<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic DNA polymerase domain motif

<220>
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<222> (6)...(6)
<223> Xaa = any amino acid other than Asn

<400> 10
Glu Arg Met Ala Phe Xaa Met Pro Val Gln Gly Thr Ala Ala Asp
 1           5           10           15

<210> 11
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic polymerase domain motif

<400> 11
Glu Arg Met Ala Phe Ser Met Pro Val Gln Gly Thr Ala Ala Asp
 1           5           10           15

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<210> 12
 <211> 35
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> synthetic region from polymerase domain of Thermus
 sp. Z05 DNA polymerase (Z05)

<400> 12
 Pro Asp Leu Asn Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg
 1 5 10 15
 Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys
 20 25 30
 Leu Ala Met
 35

<210> 13
 <211> 35
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> synthetic region from polymerase domain of Thermus
 aquaticus DNA polymerase (Taq)

<400> 13
 Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg
 1 5 10 15
 Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys
 20 25 30
 Leu Ala Met
 35

<210> 14
 <211> 35
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> synthetic region from polymerase domain of Thermus
 filiformus DNA polymerase (Tfi)

<400> 14
 Pro Asp Leu Asn Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg
 1 5 10 15
 Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys
 20 25 30
 Leu Ala Met
 35

<210> 15
 <211> 35
 <212> PRT
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<220>
 <223> synthetic region from polymerase domain of Thermus
 flavus DNA polymerase (Tfl)

<400> 15
 Pro Asp Leu Asn Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg
 1 5 10 15

Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys
 20 25 30
 Leu Ala Met
 35

<210> 16
 <211> 35
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 <213> Artificial Sequence

<220>
 <223> synthetic region from polymerase domain of Thermus
 sp. Sps17 DNA polymerase (Sps17)

<400> 16
 Pro Asp Leu Asn Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg
 1 5 10 15
 Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys
 20 25 30
 Leu Ala Met
 35

<210> 17
 <211> 35
 <212> PRT
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<220>
 <223> synthetic region from polymerase domain of Thermus
 thermophilus DNA polymerase (Tth)

<400> 17
 Pro Asp Leu Asn Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg
 1 5 10 15
 Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys
 20 25 30
 Leu Ala Met
 35

<210> 18
 <211> 35
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> synthetic region from polymerase domain of Thermus
 caldophilus DNA polymerase (Tca)

<400> 18
 Pro Asp Leu Asn Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg
 1 5 10 15
 Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys
 20 25 30
 Leu Ala Met
 35

<210> 19
 <211> 35
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> synthetic region from polymerase domain of

Thermotoga maritima DNA polymerase (Tma)

```
<400> 19
Pro Gln Leu Met Ala Arg Asp Arg Asn Thr Gln Ala Glu Gly Glu Arg
 1           5           10           15
Ile Ala Ile Asn Thr Pro Ile Gln Gly Thr Ala Ala Asp Ile Ile Lys
          20          25          30
Leu Ala Met
          35
```

```
<210> 20
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<212> PRT
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```

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<220>
<223> synthetic region from polymerase domain of
      Thermotoga neopolitana DNA polymerase (Tne)
```

```
<400> 20
Pro Gln Leu Met Ala Arg Asp Lys Asn Thr Gln Ser Glu Gly Glu Arg
 1           5           10           15
Ile Ala Ile Asn Thr Pro Ile Gln Gly Thr Ala Ala Asp Ile Ile Lys
          20          25          30
Leu Ala Met
          35
```

```
<210> 21
<211> 35
<212> PRT
<213> Artificial Sequence
```

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<220>
<223> synthetic region from polymerase domain of
      Thermosipho africanus DNA polymerase (Taf)
```

```
<400> 21
Pro Gln Leu Arg Ser Lys Asn Gly Asn Arg Val Gln Glu Gly Glu Arg
 1           5           10           15
Ile Ala Val Asn Thr Pro Ile Gln Gly Thr Ala Ala Asp Ile Ile Lys
          20          25          30
Ile Ala Met
          35
```

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<210> 22
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<213> Artificial Sequence
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```
<220>
<223> synthetic region from polymerase domain of
      Escherichia coli DNA polymerase (E. coli)
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```
<400> 22
Pro Asp Ile Lys Ser Ser Asn Gly Ala Arg Arg Ala Ala Ala Glu Arg
 1           5           10           15
Ala Ala Ile Asn Ala Pro Met Gln Gly Thr Ala Ala Asp Ile Ile Lys
          20          25          30
Arg Ala Met
          35
```

```
<210> 23
<211> 35
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<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic region from polymerase domain of
Deinococcus radiodurans DNA polymerase (Dra)

<400> 23
Pro Gly Leu Ser Ser Arg Asn Arg Val Gln Arg Glu Ala Glu Glu Arg
1 5 10 15
Leu Ala Tyr Asn Met Pro Ile Gln Gly Thr Ala Ala Asp Ile Met Lys
20 25 30
Leu Ala Met
35

<210> 24
<211> 35
<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic region from polymerase domain of
Bacillus stearothermophilus DNA polymerase (Bst)

<400> 24
Pro Asp Ile Thr Ser Arg Asn Phe Asn Val Arg Ser Phe Ala Glu Arg
1 5 10 15
Thr Ala Met Asn Thr Pro Ile Gln Gly Ser Ala Ala Asp Ile Ile Lys
20 25 30
Lys Ala Met
35

<210> 25
<211> 35
<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic region from polymerase domain of
Bacillus caldotenax DNA polymerase (Bca)

<400> 25
Pro Asp Ile Thr Ser Arg Asn Phe Asn Val Arg Ser Phe Ala Glu Arg
1 5 10 15
Met Ala Met Asn Thr Pro Ile Gln Gly Ser Ala Ala Asp Ile Ile Lys
20 25 30
Lys Ala Met
35

<210> 26
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic native consensus motif for region from
polymerase domain of bacterial DNA polymerase

<220>
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<223> Xaa = Met, Ile, Ala, Leu or Thr

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<221> VARIANT
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<220>
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 <222> (9)...(9)
 <223> Xaa = Val, Ile or Met

<220>
 <221> VARIANT
 <222> (12)...(12)
 <223> Xaa = Thr or Ser

<400> 26
 Glu Arg Xaa Ala Xaa Asn Xaa Pro Xaa Gln Gly Xaa Ala Ala Asp
 1 5 10 15

<210> 27
 <211> 13
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> synthetic polymerase motif corresponding to the
 D580X mutation of Z05, modified Z05 D580 motif

<220>
 <221> VARIANT
 <222> (7)...(7)
 <223> Xaa = Ser or Thr

<220>
 <221> VARIANT
 <222> (8)...(8)
 <223> Xaa = any amino acid other than Asp or Glu

<400> 27
 Thr Gly Arg Leu Ser Ser Xaa Xaa Pro Asn Leu Gln Asn
 1 5 10

<210> 28
 <211> 8
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> synthetic conserved DNA polymerase active site
 motif A

<400> 28
 Asp Tyr Ser Gln Ile Glu Leu Arg
 1 5

<210> 29
 <211> 893
 <212> PRT
 <213> Artificial Sequence

<220>

<223> synthetic chimeric CS5 DNA polymerase derived from
N-terminal 5'-nuclease domain of *Thermus* sp. Z05
and C-terminal 3'-5' exonuclease and polymerase
domains of *Thermotoga maritima* DNA polymerases

<400> 29

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Lys | Ala | Met | Leu | Pro | Leu | Phe | Glu | Pro | Lys | Gly | Arg | Val | Leu | Leu |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Val | Asp | Gly | His | His | Leu | Ala | Tyr | Arg | Thr | Phe | Phe | Ala | Leu | Lys | Gly |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Leu | Thr | Thr | Ser | Arg | Gly | Glu | Pro | Val | Gln | Ala | Val | Tyr | Gly | Phe | Ala |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Lys | Ser | Leu | Leu | Lys | Ala | Leu | Lys | Glu | Asp | Gly | Tyr | Lys | Ala | Val | Phe |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Val | Val | Phe | Asp | Ala | Lys | Ala | Pro | Ser | Phe | Arg | His | Glu | Ala | Tyr | Glu |
| 65 | | | | 70 | | | | | | 75 | | | | | 80 |
| Ala | Tyr | Lys | Ala | Gly | Arg | Ala | Pro | Thr | Pro | Glu | Asp | Phe | Pro | Arg | Gln |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Leu | Ala | Leu | Ile | Lys | Glu | Leu | Val | Asp | Leu | Leu | Gly | Phe | Thr | Arg | Leu |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Glu | Val | Pro | Gly | Phe | Glu | Ala | Asp | Asp | Val | Leu | Ala | Thr | Leu | Ala | Lys |
| | | 115 | | | | | 120 | | | | | 125 | | | |
| Lys | Ala | Glu | Arg | Glu | Gly | Tyr | Glu | Val | Arg | Ile | Leu | Thr | Ala | Asp | Arg |
| | 130 | | | | | 135 | | | | | 140 | | | | |
| Asp | Leu | Tyr | Gln | Leu | Val | Ser | Asp | Arg | Val | Ala | Val | Leu | His | Pro | Glu |
| 145 | | | | 150 | | | | | | 155 | | | | | 160 |
| Gly | His | Leu | Ile | Thr | Pro | Glu | Trp | Leu | Trp | Glu | Lys | Tyr | Gly | Leu | Lys |
| | | | 165 | | | | | 170 | | | | | | 175 | |
| Pro | Glu | Gln | Trp | Val | Asp | Phe | Arg | Ala | Leu | Val | Gly | Asp | Pro | Ser | Asp |
| | | 180 | | | | | | 185 | | | | | 190 | | |
| Asn | Leu | Pro | Gly | Val | Lys | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Leu | Lys | Leu |
| | | 195 | | | | | 200 | | | | | 205 | | | |
| Leu | Lys | Glu | Trp | Gly | Ser | Leu | Glu | Asn | Ile | Leu | Lys | Asn | Leu | Asp | Arg |
| | 210 | | | | | 215 | | | | | 220 | | | | |
| Val | Lys | Pro | Glu | Ser | Val | Arg | Glu | Arg | Ile | Lys | Ala | His | Leu | Glu | Asp |
| 225 | | | | 230 | | | | | | 235 | | | | | 240 |
| Leu | Lys | Leu | Ser | Leu | Glu | Leu | Ser | Arg | Val | Arg | Ser | Asp | Leu | Pro | Leu |
| | | | 245 | | | | | | 250 | | | | | 255 | |
| Glu | Val | Asp | Phe | Ala | Arg | Arg | Arg | Glu | Pro | Asp | Arg | Glu | Gly | Leu | Arg |
| | | 260 | | | | | | 265 | | | | | 270 | | |
| Ala | Phe | Leu | Glu | Arg | Leu | Glu | Phe | Gly | Ser | Leu | Leu | His | Glu | Phe | Gly |
| | | 275 | | | | | 280 | | | | | 285 | | | |
| Leu | Leu | Glu | Glu | Ser | Glu | Pro | Val | Gly | Tyr | Arg | Ile | Val | Lys | Asp | Leu |
| | 290 | | | | | 295 | | | | | 300 | | | | |
| Val | Glu | Phe | Glu | Lys | Leu | Ile | Glu | Lys | Leu | Arg | Glu | Ser | Pro | Ser | Phe |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 |
| Ala | Ile | Asp | Leu | Glu | Thr | Ser | Ser | Leu | Asp | Pro | Phe | Asp | Cys | Asp | Ile |
| | | | 325 | | | | | | 330 | | | | | 335 | |
| Val | Gly | Ile | Ser | Val | Ser | Phe | Lys | Pro | Lys | Glu | Ala | Tyr | Tyr | Ile | Pro |
| | | 340 | | | | | | 345 | | | | | 350 | | |
| Leu | His | His | Arg | Asn | Ala | Gln | Asn | Leu | Asp | Glu | Lys | Glu | Val | Leu | Lys |
| | | 355 | | | | | 360 | | | | | 365 | | | |
| Lys | Leu | Lys | Glu | Ile | Leu | Glu | Asp | Pro | Gly | Ala | Lys | Ile | Val | Gly | Gln |
| | 370 | | | | | 375 | | | | | 380 | | | | |
| Asn | Leu | Lys | Phe | Asp | Tyr | Lys | Val | Leu | Met | Val | Lys | Gly | Val | Glu | Pro |
| 385 | | | | 390 | | | | | | 395 | | | | | 400 |
| Val | Pro | Pro | Tyr | Phe | Asp | Thr | Met | Ile | Ala | Ala | Tyr | Leu | Leu | Glu | Pro |
| | | | 405 | | | | | | 410 | | | | | 415 | |
| Asn | Glu | Lys | Lys | Phe | Asn | Leu | Asp | Asp | Leu | Ala | Leu | Lys | Phe | Leu | Gly |
| | | 420 | | | | | | 425 | | | | | 430 | | |
| Tyr | Lys | Met | Thr | Ser | Tyr | Gln | Glu | Leu | Met | Ser | Phe | Ser | Phe | Pro | Leu |
| | | 435 | | | | | 440 | | | | | 445 | | | |
| Phe | Gly | Phe | Ser | Phe | Ala | Asp | Val | Pro | Val | Glu | Lys | Ala | Ala | Asn | Tyr |
| | 450 | | | | | 455 | | | | | 460 | | | | |
| Ser | Cys | Glu | Asp | Ala | Asp | Ile | Thr | Tyr | Arg | Leu | Tyr | Lys | Thr | Leu | Ser |
| 465 | | | | | 470 | | | | | 475 | | | | | 480 |

Leu Lys Leu His Glu Ala Asp Leu Glu Asn Val Phe Tyr Lys Ile Glu
 485 490
 Met Pro Leu Val Asn Val Leu Ala Arg Met Glu Leu Asn Gly Val Tyr
 500 505 510
 Val Asp Thr Glu Phe Leu Lys Lys Leu Ser Glu Glu Tyr Gly Lys Lys
 515 520 525
 Leu Glu Glu Leu Ala Glu Glu Ile Tyr Arg Ile Ala Gly Glu Pro Phe
 530 535 540
 Asn Ile Asn Ser Pro Lys Gln Val Ser Arg Ile Leu Phe Glu Lys Leu
 545 550 555
 Gly Ile Lys Pro Arg Gly Lys Thr Thr Lys Thr Gly Asp Tyr Ser Thr
 565 570 575
 Arg Ile Glu Val Leu Glu Glu Leu Ala Gly Glu His Glu Ile Ile Pro
 580 585 590
 Leu Ile Leu Glu Tyr Arg Lys Ile Gln Lys Leu Lys Ser Thr Tyr Ile
 595 600 605
 Asp Ala Leu Pro Lys Met Val Asn Pro Lys Thr Gly Arg Ile His Ala
 610 615 620
 Ser Phe Asn Gln Thr Gly Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp
 625 630 635 640
 Pro Asn Leu Gln Asn Leu Pro Thr Lys Ser Glu Glu Gly Lys Glu Ile
 645 650 655
 Arg Lys Ala Ile Val Pro Gln Asp Pro Asn Trp Trp Ile Val Ser Ala
 660 665 670
 Asp Tyr Ser Gln Ile Glu Leu Arg Ile Leu Ala His Leu Ser Gly Asp
 675 680 685
 Glu Asn Leu Leu Arg Ala Phe Glu Glu Gly Ile Asp Val His Thr Leu
 690 695 700
 Thr Ala Ser Arg Ile Phe Asn Val Lys Pro Glu Glu Val Thr Glu Glu
 705 710 715 720
 Met Arg Arg Ala Gly Lys Met Val Asn Phe Ser Ile Ile Tyr Gly Val
 725 730 735
 Thr Pro Tyr Gly Leu Ser Val Arg Leu Gly Val Pro Val Lys Glu Ala
 740 745 750
 Glu Lys Met Ile Val Asn Tyr Phe Val Leu Tyr Pro Lys Val Arg Asp
 755 760 765
 Tyr Ile Gln Arg Val Val Ser Glu Ala Lys Glu Lys Gly Tyr Val Arg
 770 775 780
 Thr Leu Phe Gly Arg Lys Arg Asp Ile Pro Gln Leu Met Ala Arg Asp
 785 790 795 800
 Arg Asn Thr Gln Ala Glu Gly Glu Arg Ile Ala Ile Asn Thr Pro Ile
 805 810 815
 Gln Gly Thr Ala Ala Asp Ile Ile Lys Leu Ala Met Ile Glu Ile Asp
 820 825 830
 Arg Glu Leu Lys Glu Arg Lys Met Arg Ser Lys Met Ile Ile Gln Val
 835 840 845
 His Asp Glu Leu Val Phe Glu Val Pro Asn Glu Glu Lys Asp Ala Leu
 850 855 860
 Val Glu Leu Val Lys Asp Arg Met Thr Asn Val Val Lys Leu Ser Val
 865 870 875 880
 Pro Leu Glu Val Asp Val Thr Ile Gly Lys Thr Trp Ser
 885 890

<210> 30
 <211> 893
 <212> PRT
 <213> Artificial Sequence

<220>
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 N-terminal 5'-nuclease domain of *Thermus* sp. Z05
 and C-terminal 3'-5' exonuclease and polymerase
 domains of *Thermotoga maritima* DNA polymerases

<400> 30
 Met Lys Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val Leu Leu

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|
| 1 | Val | Asp | Gly | His | 5 | His | Leu | Ala | Tyr | 10 | Arg | Thr | Phe | Phe | Ala | Leu | 15 | Lys | Gly |
| | | | | 20 | | | | | | | 25 | | | | | 30 | | | |
| | Leu | Thr | Thr | Ser | Arg | Gly | Glu | Pro | Val | Gln | Ala | Val | Tyr | Gly | Phe | Ala | | | |
| | | | 35 | | | | | 40 | | | | | | 45 | | | | | |
| | Lys | Ser | Leu | Leu | Lys | Ala | Leu | Lys | Glu | Asp | Gly | Tyr | Lys | Ala | Val | Phe | | | |
| | | | 50 | | | | 55 | | | | | 60 | | | | | | | |
| | Val | Val | Phe | Asp | Ala | Lys | Ala | Pro | Ser | Phe | Arg | His | Glu | Ala | Tyr | Glu | | | |
| 65 | | | | | 70 | | | | | | 75 | | | | | 80 | | | |
| | Ala | Tyr | Lys | Ala | Gly | Arg | Ala | Pro | Thr | Pro | Glu | Asp | Phe | Pro | Arg | Gln | | | |
| | | | | 85 | | | | | | 90 | | | | | 95 | | | | |
| | Leu | Ala | Leu | Ile | Lys | Glu | Leu | Val | Asp | Leu | Leu | Gly | Phe | Thr | Arg | Leu | | | |
| | | | 100 | | | | | | 105 | | | | | 110 | | | | | |
| | Glu | Val | Pro | Gly | Phe | Glu | Ala | Asp | Asp | Val | Leu | Ala | Thr | Leu | Ala | Lys | | | |
| | | | 115 | | | | | 120 | | | | | 125 | | | | | | |
| | Lys | Ala | Glu | Arg | Glu | Gly | Tyr | Glu | Val | Arg | Ile | Leu | Thr | Ala | Asp | Arg | | | |
| | | | 130 | | | | 135 | | | | | 140 | | | | | | | |
| | Asp | Leu | Tyr | Gln | Leu | Val | Ser | Asp | Arg | Val | Ala | Val | Leu | His | Pro | Glu | | | |
| 145 | | | | | 150 | | | | | | 155 | | | | | 160 | | | |
| | Gly | His | Leu | Ile | Thr | Pro | Glu | Trp | Leu | Trp | Glu | Lys | Tyr | Gly | Leu | Lys | | | |
| | | | | 165 | | | | | | 170 | | | | | 175 | | | | |
| | Pro | Glu | Gln | Trp | Val | Asp | Phe | Arg | Ala | Leu | Val | Gly | Asp | Pro | Ser | Asp | | | |
| | | | 180 | | | | | | 185 | | | | | 190 | | | | | |
| | Asn | Leu | Pro | Gly | Val | Lys | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Leu | Lys | Leu | | | |
| | | | 195 | | | | 200 | | | | | | 205 | | | | | | |
| | Leu | Lys | Glu | Trp | Gly | Ser | Leu | Glu | Asn | Ile | Leu | Lys | Asn | Leu | Asp | Arg | | | |
| | | | 210 | | | | 215 | | | | | 220 | | | | | | | |
| | Val | Lys | Pro | Glu | Ser | Val | Arg | Glu | Arg | Ile | Lys | Ala | His | Leu | Glu | Asp | | | |
| 225 | | | | | 230 | | | | | | 235 | | | | | 240 | | | |
| | Leu | Lys | Leu | Ser | Leu | Glu | Leu | Ser | Arg | Val | Arg | Ser | Asp | Leu | Pro | Leu | | | |
| | | | | 245 | | | | | | 250 | | | | | 255 | | | | |
| | Glu | Val | Asp | Phe | Ala | Arg | Arg | Arg | Glu | Pro | Asp | Arg | Glu | Gly | Leu | Arg | | | |
| | | | 260 | | | | | | 265 | | | | | 270 | | | | | |
| | Ala | Phe | Leu | Glu | Arg | Leu | Glu | Phe | Gly | Ser | Leu | Leu | His | Glu | Phe | Gly | | | |
| | | | 275 | | | | | 280 | | | | | 285 | | | | | | |
| | Leu | Leu | Glu | Glu | Ser | Glu | Pro | Val | Gly | Tyr | Arg | Ile | Val | Lys | Asp | Leu | | | |
| | | | 290 | | | | 295 | | | | | 300 | | | | | | | |
| | Val | Glu | Phe | Glu | Lys | Leu | Ile | Glu | Lys | Leu | Arg | Glu | Ser | Pro | Ser | Phe | | | |
| 305 | | | | | 310 | | | | | | 315 | | | | | 320 | | | |
| | Ala | Ile | Ala | Leu | Ala | Thr | Ser | Ser | Leu | Asp | Pro | Phe | Asp | Cys | Asp | Ile | | | |
| | | | | 325 | | | | | | 330 | | | | 335 | | | | | |
| | Val | Gly | Ile | Ser | Val | Ser | Phe | Lys | Pro | Lys | Glu | Ala | Tyr | Tyr | Ile | Pro | | | |
| | | | | 340 | | | | | 345 | | | | | 350 | | | | | |
| | Leu | His | His | Arg | Asn | Ala | Gln | Asn | Leu | Asp | Glu | Lys | Glu | Val | Leu | Lys | | | |
| | | | 355 | | | | | 360 | | | | | 365 | | | | | | |
| | Lys | Leu | Lys | Glu | Ile | Leu | Glu | Asp | Pro | Gly | Ala | Lys | Ile | Val | Gly | Gln | | | |
| | | | 370 | | | | 375 | | | | | 380 | | | | | | | |
| | Asn | Leu | Lys | Phe | Asp | Tyr | Lys | Val | Leu | Met | Val | Lys | Gly | Val | Glu | Pro | | | |
| 385 | | | | | 390 | | | | | | 395 | | | | 400 | | | | |
| | Val | Pro | Pro | Tyr | Phe | Asp | Thr | Met | Ile | Ala | Ala | Tyr | Leu | Leu | Glu | Pro | | | |
| | | | | 405 | | | | | | 410 | | | | 415 | | | | | |
| | Asn | Glu | Lys | Lys | Phe | Asn | Leu | Asp | Asp | Leu | Ala | Leu | Lys | Phe | Leu | Gly | | | |
| | | | | 420 | | | | | 425 | | | | | 430 | | | | | |
| | Tyr | Lys | Met | Thr | Ser | Tyr | Gln | Glu | Leu | Met | Ser | Phe | Ser | Phe | Pro | Leu | | | |
| | | | 435 | | | | | 440 | | | | | 445 | | | | | | |
| | Phe | Gly | Phe | Ser | Phe | Ala | Asp | Val | Pro | Val | Glu | Lys | Ala | Ala | Asn | Tyr | | | |
| | | | 450 | | | | 455 | | | | | 460 | | | | | | | |
| | Ser | Cys | Glu | Asp | Ala | Asp | Ile | Thr | Tyr | Arg | Leu | Tyr | Lys | Thr | Leu | Ser | | | |
| 465 | | | | | 470 | | | | | | 475 | | | | 480 | | | | |
| | Leu | Lys | Leu | His | Glu | Ala | Asp | Leu | Glu | Asn | Val | Phe | Tyr | Lys | Ile | Glu | | | |
| | | | | 485 | | | | | | 490 | | | | 495 | | | | | |
| | Met | Pro | Leu | Val | Asn | Val | Leu | Ala | Arg | Met | Glu | Leu | Asn | Gly | Val | Tyr | | | |
| | | | | 500 | | | | | 505 | | | | | 510 | | | | | |
| | Val | Asp | Thr | Glu | Phe | Leu | Lys | Lys | Leu | Ser | Glu | Glu | Tyr | Gly | Lys | Lys | | | |
| | | | 515 | | | | | 520 | | | | | 525 | | | | | | |
| | Leu | Glu | Glu | Leu | Ala | Glu | Glu | Ile | Tyr | Arg | Ile | Ala | Gly | Glu | Pro | Phe | | | |
| 530 | | | | | | | 535 | | | | | 540 | | | | | | | |

Asn Ile Asn Ser Pro Lys Gln Val Ser Arg Ile Leu Phe Glu Lys Leu
 545 550 555 560
 Gly Ile Lys Pro Arg Gly Lys Thr Thr Lys Thr Gly Asp Tyr Ser Thr
 565 570 575
 Arg Ile Glu Val Leu Glu Glu Leu Ala Gly Glu His Glu Ile Ile Pro
 580 585 590
 Leu Ile Leu Glu Tyr Arg Lys Ile Gln Lys Leu Lys Ser Thr Tyr Ile
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 Asp Ala Leu Pro Lys Met Val Asn Pro Lys Thr Gly Arg Ile His Ala
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 Ser Phe Asn Gln Thr Gly Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp
 625 630 635 640
 Pro Asn Leu Gln Asn Leu Pro Thr Lys Ser Glu Glu Gly Lys Glu Ile
 645 650 655
 Arg Lys Ala Ile Val Pro Gln Asp Pro Asn Trp Trp Ile Val Ser Ala
 660 665 670
 Asp Tyr Ser Gln Ile Glu Leu Arg Ile Leu Ala His Leu Ser Gly Asp
 675 680 685
 Glu Asn Leu Leu Arg Ala Phe Glu Glu Gly Ile Asp Val His Thr Leu
 690 695 700
 Thr Ala Ser Arg Ile Phe Asn Val Lys Pro Glu Glu Val Thr Glu Glu
 705 710 715 720
 Met Arg Arg Ala Gly Lys Met Val Asn Phe Ser Ile Ile Tyr Gly Val
 725 730 735
 Thr Pro Tyr Gly Leu Ser Val Arg Leu Gly Val Pro Val Lys Glu Ala
 740 745 750
 Glu Lys Met Ile Val Asn Tyr Phe Val Leu Tyr Pro Lys Val Arg Asp
 755 760 765
 Tyr Ile Gln Arg Val Val Ser Glu Ala Lys Glu Lys Gly Tyr Val Arg
 770 775 780
 Thr Leu Phe Gly Arg Lys Arg Asp Ile Pro Gln Leu Met Ala Arg Asp
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 Arg Asn Thr Gln Ala Glu Gly Glu Arg Ile Ala Ile Asn Thr Pro Ile
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 Gln Gly Thr Ala Asp Ile Ile Lys Leu Ala Met Ile Glu Ile Asp
 820 825 830
 Arg Glu Leu Lys Glu Arg Lys Met Arg Ser Lys Met Ile Ile Gln Val
 835 840 845
 His Asp Glu Leu Val Phe Glu Val Pro Asn Glu Glu Lys Asp Ala Leu
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 Pro Leu Glu Val Asp Val Thr Ile Gly Lys Thr Trp Ser
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 <223> synthetic error-prone (mutagenic) PCR
 amplification forward primer

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21

<210> 32
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 <212> DNA
 <213> Artificial Sequence

<220>
 <223> synthetic error-prone (mutagenic) PCR
 amplification reverse primer

<400> 32
ataaccaact ggtagtggcg tgtaa 25

<210> 33
<211> 1491
<212> DNA
<213> Artificial Sequence

<220>
<223> synthetic amplicon encoding polymerase domain of Z05
D580G DNA polymerase amplified by error-prone (mutagenic)
PCR between B1pI and BglII restriction sites

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ggaacgcctc aaggggagagg aaaagctcct ttggctctac caagagggtg aaaagcccct 180
ctcccgggtc ctggcccaca tggaggccac cggggtaagg ctggacgtgg cctatctaaa 240
ggcccttttc ctggagcttg cggaggagat tcgccgcctc gagggaggagg tcttccgcct 300
ggcggggcac cccttcaacc tgaactcccc tgaccagcta gagcgggtgc tctttgacga 360
gcttaggctt cccgcccttg gcaagacgca aaagacgggg aagcgtcca ccagcggcg 420
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ggagggtggg gtggggatcg gggaggactg gctttcggc aagggtgat atcagatctc 1380
cctgattatg cgtcagtcta tgaagaaaaa tcgtatacag atggacgaag agagaatcct 1440
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<212> DNA
<213> Artificial Sequence

<220>
<223> synthetic wild-type BRAF V600K target
polynucleotide

<400> 34
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gtttgaacag ttgtctggat ccattttgtg gatggtaaga attgaggcta 110

<210> 35
<211> 110
<212> DNA
<213> Artificial Sequence

<220>
<223> synthetic mutant BRAF V600R target polynucleotide

<400> 35
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<210> 36
<211> 921

<212> PRT

<213> Deinococcus radiodurans

<220>

<223> Deinococcus radiodurans DNA polymerase (Dra)

<400> 36

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ala | Asp | Ala | Ser | Pro | Asp | Pro | Ser | Lys | Pro | Asp | Ala | Leu | Val | Leu |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Ile | Asp | Gly | His | Ala | Leu | Ala | Phe | Arg | Ser | Tyr | Phe | Ala | Leu | Pro | Pro |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Leu | Asn | Asn | Ser | Lys | Gly | Glu | Met | Thr | Asp | Ala | Ile | Val | Gly | Phe | Met |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Lys | Leu | Leu | Leu | Arg | Leu | Ala | Arg | Gln | Lys | Ser | Asn | Gln | Val | Ile | Val |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Val | Phe | Asp | Pro | Pro | Val | Lys | Thr | Leu | Arg | His | Glu | Gln | Tyr | Glu | Gly |
| 65 | | | | | 70 | | | | | 75 | | | | 80 | |
| Tyr | Lys | Ser | Gly | Arg | Ala | Gln | Thr | Pro | Glu | Asp | Leu | Arg | Gly | Gln | Ile |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Asn | Arg | Ile | Arg | Ala | Leu | Val | Asp | Ala | Leu | Gly | Phe | Pro | Arg | Leu | Glu |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Glu | Pro | Gly | Tyr | Glu | Ala | Asp | Asp | Val | Ile | Ala | Ser | Leu | Thr | Arg | Met |
| | | 115 | | | | 120 | | | | | | 125 | | | |
| Ala | Glu | Gly | Lys | Gly | Tyr | Glu | Val | Arg | Ile | Val | Thr | Ser | Asp | Arg | Asp |
| | 130 | | | | | 135 | | | | | 140 | | | | |
| Ala | Tyr | Gln | Leu | Leu | Asp | Glu | His | Val | Lys | Val | Ile | Ala | Asn | Asp | Phe |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 |
| Ser | Leu | Ile | Gly | Pro | Ala | Gln | Val | Glu | Glu | Lys | Tyr | Gly | Val | Thr | Val |
| | | | | 165 | | | | | 170 | | | | | 175 | |
| Arg | Gln | Trp | Val | Asp | Tyr | Arg | Ala | Leu | Thr | Gly | Asp | Ala | Ser | Asp | Asn |
| | | | 180 | | | | | 185 | | | | | 190 | | |
| Ile | Pro | Gly | Ala | Lys | Gly | Ile | Gly | Pro | Lys | Thr | Ala | Ala | Lys | Leu | Leu |
| | | 195 | | | | 200 | | | | | | 205 | | | |
| Gln | Glu | Tyr | Gly | Thr | Leu | Glu | Lys | Val | Tyr | Glu | Ala | Ala | His | Ala | Gly |
| | 210 | | | | | 215 | | | | | 220 | | | | |
| Thr | Leu | Lys | Pro | Asp | Gly | Thr | Arg | Lys | Lys | Leu | Leu | Asp | Ser | Glu | Glu |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 |
| Asn | Val | Lys | Phe | Ser | His | Asp | Leu | Ser | Cys | Met | Val | Thr | Asp | Leu | Pro |
| | | | | 245 | | | | | 250 | | | | | 255 | |
| Leu | Asp | Ile | Glu | Phe | Gly | Val | Arg | Arg | Leu | Pro | Asp | Asn | Pro | Leu | Val |
| | | | 260 | | | | | 265 | | | | | 270 | | |
| Thr | Glu | Asp | Leu | Leu | Thr | Glu | Leu | Glu | Leu | His | Ser | Leu | Arg | Pro | Met |
| | | 275 | | | | 280 | | | | | | 285 | | | |
| Ile | Leu | Gly | Leu | Asn | Gly | Pro | Glu | Gln | Asp | Gly | His | Ala | Pro | Asp | Asp |
| | 290 | | | | | 295 | | | | | 300 | | | | |
| Leu | Leu | Glu | Arg | Glu | His | Ala | Gln | Thr | Pro | Glu | Glu | Asp | Glu | Ala | Ala |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 |
| Ala | Leu | Pro | Ala | Phe | Ser | Ala | Pro | Glu | Leu | Ala | Glu | Trp | Gln | Thr | Pro |
| | | | | 325 | | | | | 330 | | | | | 335 | |
| Ala | Glu | Gly | Ala | Val | Trp | Gly | Tyr | Val | Leu | Ser | Arg | Glu | Asp | Asp | Leu |
| | | | 340 | | | | | 345 | | | | | 350 | | |
| Thr | Ala | Ala | Leu | Leu | Ala | Ala | Ala | Thr | Phe | Glu | Asp | Gly | Val | Ala | Arg |
| | | 355 | | | | 360 | | | | | | 365 | | | |
| Pro | Ala | Arg | Val | Ser | Glu | Pro | Asp | Glu | Trp | Ala | Gln | Ala | Glu | Ala | Pro |
| | 370 | | | | | 375 | | | | | 380 | | | | |
| Glu | Asn | Leu | Phe | Gly | Glu | Leu | Leu | Pro | Ser | Asp | Lys | Pro | Leu | Thr | Lys |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 |
| Lys | Glu | Gln | Lys | Ala | Leu | Glu | Lys | Ala | Gln | Lys | Asp | Ala | Glu | Lys | Ala |
| | | | | 405 | | | | | 410 | | | | | 415 | |
| Arg | Ala | Lys | Leu | Arg | Glu | Gln | Phe | Pro | Ala | Thr | Val | Asp | Glu | Ala | Glu |
| | | | 420 | | | | | 425 | | | | | 430 | | |
| Phe | Val | Gly | Gln | Arg | Thr | Val | Thr | Ala | Ala | Ala | Ala | Lys | Ala | Leu | Ala |
| | | 435 | | | | 440 | | | | | | 445 | | | |
| Ala | His | Leu | Ser | Val | Arg | Gly | Thr | Val | Val | Glu | Pro | Gly | Asp | Asp | Pro |
| | 450 | | | | | 455 | | | | | 460 | | | | |
| Leu | Leu | Tyr | Ala | Tyr | Leu | Leu | Asp | Pro | Ala | Asn | Thr | Asn | Met | Pro | Val |
| 465 | | | | | 470 | | | | | 475 | | | | | 480 |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Ala | Lys | Arg | Tyr | Leu | Asp | Arg | Glu | Trp | Pro | Ala | Asp | Ala | Pro | Thr |
| Arg | Ala | Ala | Ile | Thr | Gly | His | Leu | Val | Arg | Glu | Leu | Pro | Pro | Leu | Leu |
| Asp | Asp | Ala | Arg | Arg | Lys | Met | Tyr | Asp | Glu | Met | Glu | Lys | Pro | Leu | Ser |
| Gly | Val | Leu | Gly | Arg | Met | Glu | Val | Arg | Gly | Val | Gln | Val | Asp | Ser | Asp |
| Phe | Leu | Gln | Thr | Leu | Ser | Ile | Gln | Ala | Gly | Val | Arg | Leu | Ala | Asp | Leu |
| Glu | Ser | Gln | Ile | His | Glu | Tyr | Ala | Gly | Glu | Glu | Phe | His | Ile | Arg | Ser |
| Pro | Lys | Gln | Leu | Glu | Thr | Val | Leu | Tyr | Asp | Lys | Leu | Glu | Leu | Ala | Ser |
| Ser | Lys | Lys | Thr | Lys | Leu | Thr | Gly | Gln | Arg | Ser | Thr | Ala | Val | Ser | Ala |
| Leu | Glu | Pro | Leu | Arg | Asp | Ala | His | Pro | Ile | Ile | Pro | Leu | Val | Leu | Glu |
| Phe | Arg | Glu | Leu | Asp | Lys | Leu | Arg | Gly | Thr | Tyr | Leu | Asp | Pro | Ile | Pro |
| Asn | Leu | Val | Asn | Pro | His | Thr | Gly | Arg | Leu | His | Thr | Thr | Phe | Ala | Gln |
| Thr | Ala | Val | Ala | Thr | Gly | Arg | Leu | Ser | Ser | Leu | Asn | Pro | Asn | Leu | Gln |
| Asn | Ile | Pro | Ile | Arg | Ser | Glu | Leu | Gly | Arg | Glu | Ile | Arg | Lys | Gly | Phe |
| Ile | Ala | Glu | Asp | Gly | Phe | Thr | Leu | Ile | Ala | Ala | Asp | Tyr | Ser | Gln | Ile |
| Glu | Leu | Arg | Leu | Leu | Ala | His | Ile | Ala | Asp | Asp | Pro | Leu | Met | Gln | Gln |
| Ala | Phe | Val | Glu | Gly | Ala | Asp | Ile | His | Arg | Arg | Thr | Ala | Ala | Gln | Val |
| Leu | Gly | Leu | Asp | Glu | Ala | Thr | Val | Asp | Ala | Asn | Gln | Arg | Arg | Ala | Ala |
| Lys | Thr | Val | Asn | Phe | Gly | Val | Leu | Tyr | Gly | Met | Ser | Ala | His | Arg | Leu |
| Ser | Asn | Asp | Leu | Gly | Ile | Pro | Tyr | Ala | Glu | Ala | Ala | Thr | Phe | Ile | Glu |
| Ile | Tyr | Phe | Ala | Thr | Tyr | Pro | Gly | Ile | Arg | Arg | Tyr | Ile | Asn | His | Thr |
| Leu | Asp | Phe | Gly | Arg | Thr | His | Gly | Tyr | Val | Glu | Thr | Leu | Tyr | Gly | Arg |
| Arg | Arg | Tyr | Val | Pro | Gly | Leu | Ser | Ser | Arg | Asn | Arg | Val | Gln | Arg | Glu |
| Ala | Glu | Glu | Arg | Leu | Ala | Tyr | Asn | Met | Pro | Ile | Gln | Gly | Thr | Ala | Ala |
| Asp | Ile | Met | Lys | Leu | Ala | Met | Val | Gln | Leu | Asp | Pro | Gln | Leu | Asp | Ala |
| Ile | Gly | Ala | Arg | Met | Leu | Leu | Gln | Val | His | Asp | Glu | Leu | Leu | Ile | Glu |
| Ala | Pro | Leu | Asp | Lys | Ala | Glu | Gln | Val | Ala | Ala | Leu | Thr | Lys | Lys | Val |
| Met | Glu | Asn | Val | Val | Gln | Leu | Lys | Val | Pro | Leu | Ala | Val | Glu | Val | Gly |
| Thr | Gly | Pro | Asn | Trp | Phe | Asp | Thr | Lys | | | | | | | |

<210> 37
 <211> 892
 <212> PRT
 <213> Thermosipho africanus

 <220>
 <223> Thermosipho africanus DNA polymerase (Taf)

 <400> 37

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Gly | Lys | Met | Phe | Leu | Phe | Asp | Gly | Thr | Gly | Leu | Val | Tyr | Arg | Ala |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Phe | Tyr | Ala | Ile | Asp | Gln | Ser | Leu | Gln | Thr | Ser | Ser | Gly | Leu | His | Thr |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Asn | Ala | Val | Tyr | Gly | Leu | Thr | Lys | Met | Leu | Ile | Lys | Phe | Leu | Lys | Glu |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| His | Ile | Ser | Ile | Gly | Lys | Asp | Ala | Cys | Val | Phe | Val | Leu | Asp | Ser | Lys |
| | 50 | | | | | 55 | | | | 60 | | | | | |
| Gly | Gly | Ser | Lys | Lys | Arg | Lys | Asp | Ile | Leu | Glu | Thr | Tyr | Lys | Ala | Asn |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 |
| Arg | Pro | Ser | Thr | Pro | Asp | Leu | Leu | Leu | Glu | Gln | Ile | Pro | Tyr | Val | Glu |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Glu | Leu | Val | Asp | Ala | Leu | Gly | Ile | Lys | Val | Leu | Lys | Ile | Glu | Gly | Phe |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Glu | Ala | Asp | Asp | Ile | Ile | Ala | Thr | Leu | Ser | Lys | Lys | Phe | Glu | Ser | Asp |
| | | 115 | | | | | 120 | | | | | 125 | | | |
| Phe | Glu | Lys | Val | Asn | Ile | Ile | Thr | Gly | Asp | Lys | Asp | Leu | Leu | Gln | Leu |
| | 130 | | | | | 135 | | | | | 140 | | | | |
| Val | Ser | Asp | Lys | Val | Phe | Val | Trp | Arg | Val | Glu | Arg | Gly | Ile | Thr | Asp |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 |
| Leu | Val | Leu | Tyr | Asp | Arg | Asn | Lys | Val | Ile | Glu | Lys | Tyr | Gly | Ile | Tyr |
| | | | | 165 | | | | | 170 | | | | | 175 | |
| Pro | Glu | Gln | Phe | Lys | Asp | Tyr | Leu | Ser | Leu | Val | Gly | Asp | Gln | Ile | Asp |
| | | | 180 | | | | | 185 | | | | | 190 | | |
| Asn | Ile | Pro | Gly | Val | Lys | Gly | Ile | Gly | Lys | Lys | Thr | Ala | Val | Ser | Leu |
| | | 195 | | | | | 200 | | | | | 205 | | | |
| Leu | Lys | Lys | Tyr | Asn | Ser | Leu | Glu | Asn | Val | Leu | Lys | Asn | Ile | Asn | Leu |
| | 210 | | | | | 215 | | | | | 220 | | | | |
| Leu | Thr | Glu | Lys | Leu | Arg | Arg | Leu | Leu | Glu | Asp | Ser | Lys | Glu | Asp | Leu |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 |
| Gln | Lys | Ser | Ile | Glu | Leu | Val | Glu | Leu | Ile | Tyr | Asp | Val | Pro | Met | Asp |
| | | | | 245 | | | | | 250 | | | | | 255 | |
| Val | Glu | Lys | Asp | Glu | Ile | Ile | Tyr | Arg | Gly | Tyr | Asn | Pro | Asp | Lys | Leu |
| | | | 260 | | | | | 265 | | | | | 270 | | |
| Leu | Lys | Val | Leu | Lys | Lys | Tyr | Glu | Phe | Ser | Ser | Ile | Ile | Lys | Glu | Leu |
| | | 275 | | | | | 280 | | | | | 285 | | | |
| Asn | Leu | Gln | Glu | Lys | Leu | Glu | Lys | Glu | Tyr | Ile | Leu | Val | Asp | Asn | Glu |
| | 290 | | | | | 295 | | | | | 300 | | | | |
| Asp | Lys | Leu | Lys | Lys | Leu | Ala | Glu | Glu | Ile | Glu | Lys | Tyr | Lys | Thr | Phe |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 |
| Ser | Ile | Asp | Thr | Glu | Thr | Thr | Ser | Leu | Asp | Pro | Phe | Glu | Ala | Lys | Leu |
| | | | | 325 | | | | | 330 | | | | | 335 | |
| Val | Gly | Ile | Ser | Ile | Ser | Thr | Met | Glu | Gly | Lys | Ala | Tyr | Tyr | Ile | Pro |
| | | | 340 | | | | | 345 | | | | | 350 | | |
| Val | Ser | His | Phe | Gly | Ala | Lys | Asn | Ile | Ser | Lys | Ser | Leu | Ile | Asp | Lys |
| | | 355 | | | | | 360 | | | | | 365 | | | |
| Phe | Leu | Lys | Gln | Ile | Leu | Gln | Glu | Lys | Asp | Tyr | Asn | Ile | Val | Gly | Gln |
| | 370 | | | | | 375 | | | | | 380 | | | | |
| Asn | Leu | Lys | Phe | Asp | Tyr | Glu | Ile | Phe | Lys | Ser | Met | Gly | Phe | Ser | Pro |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 |
| Asn | Val | Pro | His | Phe | Asp | Thr | Met | Ile | Ala | Ala | Tyr | Leu | Leu | Asn | Pro |
| | | | | 405 | | | | | 410 | | | | | 415 | |
| Asp | Glu | Lys | Arg | Phe | Asn | Leu | Glu | Glu | Leu | Ser | Leu | Lys | Tyr | Leu | Gly |
| | | | 420 | | | | | 425 | | | | | 430 | | |
| Tyr | Lys | Met | Ile | Ser | Phe | Asp | Glu | Leu | Val | Asn | Glu | Asn | Val | Pro | Leu |
| | | 435 | | | | | 440 | | | | | 445 | | | |
| Phe | Gly | Asn | Asp | Phe | Ser | Tyr | Val | Pro | Leu | Glu | Arg | Ala | Val | Glu | Tyr |
| | 450 | | | | | 455 | | | | | 460 | | | | |
| Ser | Cys | Glu | Asp | Ala | Asp | Val | Thr | Tyr | Arg | Ile | Phe | Arg | Lys | Leu | Gly |
| 465 | | | | | 470 | | | | | 475 | | | | | 480 |
| Arg | Lys | Ile | Tyr | Glu | Asn | Glu | Met | Glu | Lys | Leu | Phe | Tyr | Glu | Ile | Glu |
| | | | | 485 | | | | | 490 | | | | | 495 | |
| Met | Pro | Leu | Ile | Asp | Val | Leu | Ser | Glu | Met | Glu | Leu | Asn | Gly | Val | Tyr |
| | | | 500 | | | | | 505 | | | | | 510 | | |
| Phe | Asp | Glu | Glu | Tyr | Leu | Lys | Glu | Leu | Ser | Lys | Lys | Tyr | Gln | Glu | Lys |
| | | 515 | | | | | 520 | | | | | 525 | | | |
| Met | Asp | Gly | Ile | Lys | Glu | Lys | Val | Phe | Glu | Ile | Ala | Gly | Glu | Thr | Phe |

| | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 530 | Asn | Leu | Asn | Ser | Ser | Thr | 535 | Gln | Val | Ala | Tyr | Ile | 540 | Leu | Phe | Glu | Lys | Leu |
| 545 | Asn | Ile | Ala | Pro | Tyr | 550 | Lys | Lys | Thr | Ala | Thr | 555 | Gly | Lys | Phe | Ser | Thr | Asn |
| | | | | | 565 | Glu | Glu | Leu | Ser | Lys | 570 | Glu | His | Glu | Ile | Ala | Lys | Leu |
| | Leu | Leu | Glu | Tyr | Arg | Lys | Tyr | Gln | 585 | Lys | Leu | Lys | Ser | Thr | Tyr | Ile | Asp | |
| | Ser | Ile | Pro | Leu | Ser | Ile | Asn | Arg | Lys | Thr | Asn | Arg | Val | His | Thr | Thr | | |
| | Phe | His | Gln | Thr | Gly | Thr | 610 | Ser | Thr | Gly | Arg | Leu | Ser | Ser | Ser | Asn | Pro | |
| 625 | Asn | Leu | Gln | Asn | Leu | Pro | 630 | Thr | Arg | Ser | Glu | 635 | Gly | Lys | Glu | Ile | Arg | |
| | Lys | Ala | Val | Arg | Pro | Gln | Arg | Gln | Asp | Trp | Trp | Ile | Leu | Gly | Ala | Asp | | |
| | Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Val | 665 | Leu | Ala | His | Val | Ser | Lys | Asp | Glu | |
| | Asn | Leu | Leu | Lys | Ala | Phe | Lys | Glu | Asp | Leu | Asp | Ile | His | Thr | Ile | Thr | | |
| | Ala | Ala | Lys | Ile | Phe | Gly | Val | Ser | Glu | Met | Phe | Val | Ser | Glu | Gln | Met | | |
| 705 | Arg | Arg | Val | Gly | Lys | Met | Val | Asn | Phe | Ala | Ile | Ile | Tyr | Gly | Val | Ser | | |
| | Pro | Tyr | Gly | Leu | Ser | Lys | Arg | Ile | Gly | Leu | Ser | Val | Ser | Glu | Thr | Lys | | |
| | Lys | Ile | Ile | Asp | Asn | Tyr | Phe | Arg | Tyr | Tyr | Lys | Gly | Val | Phe | Glu | Tyr | | |
| | Leu | Lys | Arg | Met | Lys | Asp | Glu | Ala | Arg | Lys | Lys | Gly | Tyr | Val | Thr | Thr | | |
| | Leu | Phe | Gly | Arg | Arg | Arg | Tyr | Ile | Pro | Gln | Leu | Arg | Ser | Lys | Asn | Gly | | |
| 785 | Asn | Arg | Val | Gln | Glu | Gly | Glu | Arg | Ile | Ala | Val | Asn | Thr | Pro | Ile | Gln | | |
| | Gly | Thr | Ala | Ala | Asp | Ile | Ile | Lys | Ile | Ala | Met | Ile | Asn | Ile | His | Asn | | |
| | Arg | Leu | Lys | Lys | Glu | Asn | Leu | Arg | Ser | Lys | Met | Ile | Leu | Gln | Val | His | | |
| | Asp | Glu | Leu | Val | Phe | Glu | Val | Pro | Asp | Asn | Glu | Leu | Glu | Ile | Val | Lys | | |
| | Asp | Leu | Val | Arg | Asp | Glu | Met | Glu | Asn | Ala | Val | Lys | Leu | Asp | Val | Pro | | |
| 865 | Leu | Lys | Val | Asp | Val | Tyr | Tyr | Gly | Lys | Glu | Trp | Glu | | | | 880 | | |
| | | | | | 885 | | | | | 890 | | | | | | | | |

<210> 38
 <211> 893
 <212> PRT
 <213> Thermotoga maritima

<220>
 <223> Thermotoga maritima DNA polymerase (Tma)

<400> 38
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 Tyr Tyr Ala Leu Asp Arg Ser Leu Ser Thr Ser Thr Gly Ile Pro Thr
 20 25 30
 Asn Ala Thr Tyr Gly Val Ala Arg Met Leu Val Arg Phe Ile Lys Asp
 35 40 45
 His Ile Ile Val Gly Lys Asp Tyr Val Ala Val Ala Phe Asp Lys Lys
 50 55 60
 Ala Ala Thr Phe Arg His Lys Leu Leu Glu Thr Tyr Lys Ala Gln Arg
 65 70 75 80
 Pro Lys Thr Pro Asp Leu Leu Ile Gln Gln Leu Pro Tyr Ile Lys Lys

| | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Val | Glu | Ala | 85 | Leu | Gly | Met | Lys | Val | 90 | Leu | Glu | Val | Glu | Gly | 95 | Tyr | Glu |
| Ala | Asp | Asp | Ile | 100 | Ile | Ala | Thr | Leu | Ala | 105 | Val | Lys | Gly | Leu | Pro | Leu | Phe | |
| Asp | Glu | Ile | Phe | 115 | Ile | Val | Thr | Gly | Asp | 120 | Lys | Asp | Met | Leu | Gln | Leu | Val | |
| Asn | Glu | Lys | Ile | 130 | Lys | Val | Trp | Arg | Ile | 135 | Val | Lys | Gly | Ile | Ser | Asp | Leu | |
| Glu | Leu | Tyr | Asp | 145 | Ala | Gln | Lys | Val | Lys | 150 | Glu | Lys | Tyr | Gly | Val | Glu | Pro | |
| Gln | Gln | Ile | Pro | 165 | Leu | Leu | Ala | Leu | Thr | 170 | Gly | Asp | Glu | Ile | Asp | Asn | | |
| Ile | Pro | Gly | Val | 180 | Thr | Gly | Ile | Gly | Glu | 185 | Lys | Thr | Ala | Val | Gln | Leu | Leu | |
| Glu | Lys | Tyr | Lys | 195 | Asp | Leu | Glu | Asp | Ile | 200 | Leu | Asn | His | Val | Arg | Glu | Leu | |
| Pro | Gln | Lys | Val | 210 | Arg | Lys | Ala | Leu | Leu | 215 | Arg | Asp | Arg | Glu | Asn | Ala | Ile | |
| Leu | Ser | Lys | Lys | 225 | Leu | Ala | Ile | Leu | Glu | 230 | Thr | Asn | Val | Pro | Ile | Glu | Ile | |
| Asn | Trp | Glu | Glu | 245 | Leu | Arg | Tyr | Gln | Gly | 250 | Tyr | Asp | Arg | Glu | Lys | Leu | Leu | |
| Pro | Leu | Leu | Lys | 260 | Glu | Leu | Glu | Phe | Ala | 265 | Ser | Ile | Met | Lys | Glu | Leu | Gln | |
| Leu | Tyr | Glu | Glu | 275 | Ser | Glu | Pro | Val | Gly | 280 | Tyr | Arg | Ile | Val | Lys | Asp | Leu | |
| Val | Glu | Phe | Glu | 290 | Lys | Leu | Ile | Glu | Lys | 295 | Leu | Arg | Glu | Ser | Pro | Ser | Phe | |
| Ala | Ile | Asp | Leu | 305 | Glu | Thr | Ser | Ser | Leu | 310 | Asp | Pro | Phe | Asp | Cys | Asp | Ile | |
| Val | Gly | Ile | Ser | 325 | Val | Ser | Phe | Lys | Pro | 330 | Lys | Glu | Ala | Tyr | Tyr | Ile | Pro | |
| Leu | His | His | Arg | 340 | Asn | Ala | Gln | Asn | Leu | 345 | Asp | Glu | Lys | Glu | Val | Leu | Lys | |
| Lys | Leu | Lys | Glu | 355 | Ile | Leu | Glu | Asp | Pro | 360 | Gly | Ala | Lys | Ile | Val | Gly | Gln | |
| Asn | Leu | Lys | Phe | 370 | Asp | Tyr | Lys | Val | Leu | 375 | Met | Val | Lys | Gly | Val | Glu | Pro | |
| Val | Pro | Pro | Tyr | 385 | Phe | Asp | Thr | Met | Ile | 390 | Ala | Ala | Tyr | Leu | Leu | Glu | Pro | |
| Asn | Glu | Lys | Lys | 405 | Phe | Asn | Leu | Asp | Asp | 410 | Leu | Ala | Leu | Lys | Phe | Leu | Gly | |
| Tyr | Lys | Met | Thr | 420 | Ser | Tyr | Gln | Glu | Leu | 425 | Met | Ser | Phe | Ser | Phe | Pro | Leu | |
| Phe | Gly | Phe | Ser | 435 | Phe | Ala | Asp | Val | Pro | 440 | Val | Glu | Lys | Ala | Ala | Asn | Tyr | |
| Ser | Cys | Glu | Asp | 450 | Ala | Asp | Ile | Thr | Tyr | 455 | Arg | Leu | Tyr | Lys | Thr | Leu | Ser | |
| Leu | Lys | Leu | His | 465 | Glu | Ala | Asp | Leu | Glu | 470 | Asn | Val | Phe | Tyr | Lys | Ile | Glu | |
| Met | Pro | Leu | Val | 485 | Asn | Val | Leu | Ala | Arg | 490 | Met | Glu | Leu | Asn | Gly | Val | Tyr | |
| Val | Asp | Thr | Glu | 500 | Phe | Leu | Lys | Lys | Leu | 505 | Ser | Glu | Glu | Tyr | Gly | Lys | Lys | |
| Leu | Glu | Glu | Leu | 515 | Ala | Glu | Glu | Ile | Tyr | 520 | Arg | Ile | Ala | Gly | Glu | Pro | Phe | |
| Asn | Ile | Asn | Ser | 530 | Pro | Lys | Gln | Val | Ser | 535 | Arg | Ile | Leu | Phe | Glu | Lys | Leu | |
| Gly | Ile | Lys | Pro | 545 | Arg | Gly | Lys | Thr | Thr | 550 | Lys | Thr | Gly | Asp | Tyr | Ser | Thr | |
| Arg | Ile | Glu | Val | 565 | Leu | Glu | Glu | Leu | Ala | 570 | Gly | Glu | His | Glu | Ile | Ile | Pro | |
| Leu | Ile | Leu | Glu | 580 | Tyr | Arg | Lys | Ile | Gln | 585 | Lys | Leu | Lys | Ser | Thr | Tyr | Ile | |
| Asp | Ala | Leu | Pro | 595 | Lys | Met | Val | Asn | Pro | 600 | Lys | Thr | Gly | Arg | Ile | His | Ala | |
| | 610 | | | | | | | 615 | | | | | 620 | | | | | |

| | | | | | | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Ser 625 | Phe | Asn | Gln | Thr | Gly 630 | Thr | Ala | Thr | Gly | Arg 635 | Leu | Ser | Ser | Ser | Asp 640 |
| Pro | Asn | Leu | Gln | Asn 645 | Leu | Pro | Thr | Lys | Ser 650 | Glu | Glu | Gly | Lys | Glu 655 | Ile |
| Arg | Lys | Ala | Ile 660 | Val | Pro | Gln | Asp | Pro 665 | Asn | Trp | Trp | Ile | Val 670 | Ser | Ala |
| Asp | Tyr | Ser 675 | Gln | Ile | Glu | Leu | Arg 680 | Ile | Leu | Ala | His | Leu 685 | Ser | Gly | Asp |
| Glu | Asn 690 | Leu | Leu | Arg | Ala | Phe 695 | Glu | Glu | Gly | Ile | Asp 700 | Val | His | Thr | Leu |
| Thr 705 | Ala | Ser | Arg | Ile | Phe 710 | Asn | Val | Lys | Pro | Glu 715 | Glu | Val | Thr | Glu | Glu 720 |
| Met | Arg | Arg | Ala | Gly 725 | Lys | Met | Val | Asn | Phe 730 | Ser | Ile | Ile | Tyr | Gly 735 | Val |
| Thr | Pro | Tyr | Gly 740 | Leu | Ser | Val | Arg | Leu 745 | Gly | Val | Pro | Val | Lys 750 | Glu | Ala |
| Glu | Lys | Met 755 | Ile | Val | Asn | Tyr | Phe 760 | Val | Leu | Tyr | Pro | Lys 765 | Val | Arg | Asp |
| Tyr | Ile 770 | Gln | Arg | Val | Val | Ser 775 | Glu | Ala | Lys | Glu | Lys 780 | Gly | Tyr | Val | Arg |
| Thr 785 | Leu | Phe | Gly | Arg | Lys 790 | Arg | Asp | Ile | Pro | Gln 795 | Leu | Met | Ala | Arg | Asp 800 |
| Arg | Asn | Thr | Gln | Ala 805 | Glu | Gly | Glu | Arg | Ile 810 | Ala | Ile | Asn | Thr | Pro 815 | Ile |
| Gln | Gly | Thr | Ala | Ala 820 | Asp | Ile | Ile | Lys 825 | Leu | Ala | Met | Ile | Glu 830 | Ile | Asp |
| Arg | Glu | Leu 835 | Lys | Glu | Arg | Lys | Met 840 | Arg | Ser | Lys | Met | Ile 845 | Ile | Gln | Val |
| His | Asp 850 | Glu | Leu | Val | Phe | Glu 855 | Val | Pro | Asn | Glu | Glu 860 | Lys | Asp | Ala | Leu |
| Val 865 | Glu | Leu | Val | Lys | Asp 870 | Arg | Met | Thr | Asn | Val 875 | Val | Lys | Leu | Ser | Val 880 |
| Pro | Leu | Glu | Val | Asp 885 | Val | Thr | Ile | Gly | Lys 890 | Thr | Trp | Ser | | | |

<210> 39
 <211> 893
 <212> PRT
 <213> Thermotoga neopolitana

<220>
 <223> Thermotoga neopolitana DNA polymerase (Tne)

| | | | | | | | | | | | | | | | | |
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| <400> 39 | Met | Ala | Arg | Leu | Phe | Leu | Phe | Asp | Gly | Thr | Ala | Leu | Ala | Tyr | Arg | Ala |
| 1 | Tyr | Tyr | Ala | Leu | Asp | Arg | Ser | Leu | Ser | Thr | Ser | Thr | Gly | Ile | Pro | Thr |
| | | | 20 | | | | | | 25 | | | | | 30 | | |
| Asn | Ala | Val | Tyr | Gly | Val | Ala | Arg | Met | Leu | Val | Lys | Phe | Ile | Lys | Glu | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| His | Ile | Ile | Pro | Glu | Lys | Asp | Tyr | Ala | Ala | Val | Ala | Phe | Asp | Lys | Lys | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |
| Ala | Ala | Thr | Phe | Arg | His | Lys | Leu | Leu | Val | Ser | Asp | Lys | Ala | Gln | Arg | |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 | |
| Pro | Lys | Thr | Pro | Ala | Leu | Leu | Val | Gln | Gln | Leu | Pro | Tyr | Ile | Lys | Arg | |
| | | | | 85 | | | | | 90 | | | | | 95 | | |
| Leu | Ile | Glu | Ala | Leu | Gly | Phe | Lys | Val | Leu | Glu | Leu | Glu | Gly | Tyr | Glu | |
| | | 100 | | | | | 105 | | | | | | 110 | | | |
| Ala | Asp | Asp | Ile | Ile | Ala | Thr | Leu | Ala | Val | Arg | Ala | Ala | Arg | Phe | Leu | |
| | | 115 | | | | | 120 | | | | | 125 | | | | |
| Met | Arg | Phe | Ser | Leu | Ile | Thr | Gly | Asp | Lys | Asp | Met | Leu | Gln | Leu | Val | |
| | 130 | | | | | 135 | | | | | 140 | | | | | |
| Asn | Glu | Lys | Ile | Lys | Val | Trp | Arg | Ile | Val | Lys | Gly | Ile | Ser | Asp | Leu | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | |
| Glu | Leu | Tyr | Asp | Ser | Lys | Lys | Val | Lys | Glu | Arg | Tyr | Gly | Val | Glu | Pro | |
| | | | | 165 | | | | | 170 | | | | | 175 | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| His | Gln | Ile | Pro | Asp | Leu | Leu | Ala | Leu | Thr | Gly | Asp | Asp | Ile | Asp | Asn |
| Ile | Pro | Gly | 180 | Thr | Gly | Ile | Gly | 185 | Glu | Lys | Thr | Ala | Val | Gln | Leu |
| Gly | Lys | Tyr | 195 | Arg | Asn | Leu | Glu | 200 | Ile | Leu | Glu | His | Ala | Arg | Glu |
| Pro | Gln | Arg | Val | Arg | Lys | Ala | Leu | Leu | Arg | Asp | Arg | Glu | Val | Ala | Ile |
| 225 | Leu | Ser | Lys | Lys | Leu | Ala | Thr | Leu | Val | Thr | Asn | Ala | Pro | Val | Glu |
| Asp | Trp | Glu | Glu | Met | Lys | Tyr | Arg | Gly | Tyr | Asp | Lys | Arg | Lys | Leu | Leu |
| Pro | Ile | Leu | Lys | Glu | Leu | Glu | Phe | Ala | Ser | Ile | Met | Lys | Glu | Leu | Gln |
| Leu | Tyr | Glu | Glu | Ala | Glu | Pro | Thr | Gly | Tyr | Glu | Ile | Val | Lys | Asp | His |
| Lys | Thr | Phe | Glu | Asp | Leu | Ile | Glu | Lys | Leu | Lys | Glu | Val | Pro | Ser | Phe |
| 305 | Ala | Leu | Asp | Leu | Glu | Thr | Ser | Ser | Leu | Asp | Pro | Phe | Asn | Cys | Glu |
| Val | Gly | Ile | Ser | Val | Ser | Phe | Lys | Pro | Lys | Thr | Ala | Tyr | Tyr | Ile | Pro |
| Leu | His | His | Arg | Asn | Ala | His | Asn | Leu | Asp | Glu | Thr | Leu | Val | Leu | Ser |
| Lys | Leu | Lys | Glu | Ile | Leu | Glu | Asp | Pro | Ser | Ser | Lys | Ile | Val | Gly | Gln |
| Asn | Leu | Lys | Tyr | Asp | Tyr | Lys | Val | Leu | Met | Val | Lys | Gly | Ile | Ser | Pro |
| 385 | Val | Tyr | Pro | His | Phe | Asp | Thr | Met | Ile | Ala | Ala | Tyr | Leu | Leu | Glu |
| Val | Tyr | Pro | His | Phe | Asp | Thr | Met | Ile | Ala | Ala | Tyr | Leu | Leu | Glu | Pro |
| Asn | Glu | Lys | Lys | Phe | Asn | Leu | Glu | Asp | Leu | Ser | Leu | Lys | Phe | Leu | Gly |
| Tyr | Lys | Met | Thr | Ser | Tyr | Gln | Glu | Leu | Met | Ser | Phe | Ser | Ser | Pro | Leu |
| Phe | Gly | Phe | Ser | Phe | Ala | Asp | Val | Pro | Val | Asp | Lys | Ala | Ala | Glu | Tyr |
| Ser | Cys | Glu | Asp | Ala | Asp | Ile | Thr | Tyr | Arg | Leu | Tyr | Lys | Ile | Leu | Ser |
| 465 | Met | Lys | Leu | His | Glu | Ala | Glu | Leu | Glu | Asn | Val | Phe | Tyr | Arg | Ile |
| Met | Pro | Leu | Val | Asn | Val | Leu | Ala | Arg | Met | Glu | Phe | Asn | Trp | Val | Tyr |
| Val | Asp | Thr | Glu | Phe | Leu | Lys | Lys | Leu | Ser | Glu | Glu | Tyr | Gly | Lys | Lys |
| Leu | Glu | Glu | Leu | Ala | Glu | Lys | Ile | Tyr | Gln | Ile | Ala | Gly | Glu | Pro | Phe |
| Asn | Ile | Asn | Ser | Pro | Lys | Gln | Val | Ser | Asn | Ile | Leu | Phe | Glu | Lys | Leu |
| 545 | Gly | Ile | Lys | Pro | Arg | Gly | Lys | Thr | Thr | Lys | Thr | Gly | Asp | Tyr | Ser |
| Arg | Ile | Glu | Val | Leu | Glu | Glu | Ile | Ala | Asn | Glu | His | Glu | Ile | Val | Pro |
| Leu | Ile | Leu | Glu | Phe | Arg | Lys | Ile | Leu | Lys | Leu | Lys | Ser | Thr | Tyr | Ile |
| Asp | Thr | Leu | Pro | Lys | Leu | Val | Asn | Pro | Lys | Thr | Gly | Arg | Phe | His | Ala |
| 610 | Ser | Phe | His | Gln | Thr | Gly | Thr | Ala | Thr | Gly | Arg | Leu | Ser | Ser | Asp |
| 625 | Pro | Asn | Leu | Gln | Asn | Leu | Pro | Thr | Lys | Ser | Glu | Glu | Gly | Lys | Glu |
| Arg | Lys | Ala | Ile | Val | Pro | Gln | Asp | Pro | Asp | Trp | Trp | Ile | Val | Ser | Ala |
| Asp | Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Ile | Leu | Ala | His | Leu | Ser | Gly | Asp |
| Glu | Asn | Leu | Val | Lys | Ala | Phe | Glu | Glu | Gly | Ile | Asp | Val | His | Thr | Leu |
| Thr | Ala | Ser | Arg | Ile | Tyr | Asn | Val | Lys | Pro | Glu | Glu | Val | Asn | Glu | Glu |
| 690 | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 705 | Met | Arg | Arg | Val | Gly | 710 | Lys | Met | Val | Asn | Phe | 715 | Ser | Ile | Ile | Tyr | Gly | 720 | Val |
| | | | | | 725 | | | | | | | | | | | | 735 | | |
| | Thr | Pro | Tyr | Gly | Leu | Ser | Val | Arg | Leu | Gly | Ile | Pro | Val | Lys | Glu | Ala | | | |
| | | | | 740 | | | | | | 745 | | | | | | | 750 | | |
| | Glu | Lys | Met | Ile | Ile | Ser | Tyr | Phe | Thr | Leu | Tyr | Pro | Lys | Val | Arg | Ser | | | |
| | | | 755 | | | | | | 760 | | | | | | | | 765 | | |
| | Tyr | Ile | Gln | Gln | Val | Val | Ala | Glu | Ala | Lys | Glu | Lys | Gly | Tyr | Val | Arg | | | |
| | | | 770 | | | | 775 | | | | | | 780 | | | | | | |
| | Thr | Leu | Phe | Gly | Arg | Lys | Arg | Asp | Ile | Pro | Gln | Leu | Met | Ala | Arg | Asp | | | |
| | | | | | | 790 | | | | | | | | | | 800 | | | |
| | Lys | Asn | Thr | Gln | Ser | Glu | Gly | Glu | Arg | Ile | Ala | Ile | Asn | Thr | Pro | Ile | | | |
| | | | | | 805 | | | | | | | | | | | 815 | | | |
| | Gln | Gly | Thr | Ala | Ala | Asp | Ile | Ile | Lys | Leu | Ala | Met | Ile | Asp | Ile | Asp | | | |
| | | | | 820 | | | | | 825 | | | | | | | 830 | | | |
| | Glu | Glu | Leu | Arg | Lys | Arg | Asn | Met | Lys | Ser | Arg | Met | Ile | Ile | Gln | Val | | | |
| | | | 835 | | | | | 840 | | | | | | | | | | | |
| | His | Asp | Glu | Leu | Val | Phe | Glu | Val | Pro | Asp | Glu | Glu | Lys | Glu | Glu | Leu | | | |
| | | | 850 | | | | 855 | | | | | | | | | | | | |
| | Val | Asp | Leu | Val | Lys | Asn | Lys | Met | Thr | Asn | Val | Val | Lys | Leu | Ser | Val | | | |
| | | | | | | 870 | | | | | | | | | | 880 | | | |
| | Pro | Leu | Glu | Val | Asp | Ile | Ser | Ile | Gly | Lys | Ser | Trp | Ser | | | | | | |
| | | | | | 885 | | | | | 890 | | | | | | | | | |

<210> 40
 <211> 876
 <212> PRT
 <213> Bacillus stearothermophilus

<220>
 <223> Bacillus stearothermophilus DNA polymerase (Bst)

| | | | | | | | | | | | | | | | | |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| <400> 40 | Met | Lys | Asn | Lys | Leu | Val | Leu | Ile | Asp | Gly | Asn | Ser | Val | Ala | Tyr | Arg |
| 1 | | | | | 5 | | | | | 10 | | | | | 15 | |
| | Ala | Phe | Phe | Ala | Leu | Pro | Leu | Leu | His | Asn | Asp | Lys | Gly | Ile | His | Thr |
| | | | | 20 | | | | | 25 | | | | | 30 | | |
| | Asn | Ala | Val | Tyr | Gly | Phe | Thr | Met | Met | Leu | Asn | Lys | Ile | Leu | Ala | Glu |
| | | | | 35 | | | | 40 | | | | | 45 | | | |
| | Glu | Gln | Pro | Thr | His | Ile | Leu | Val | Ala | Phe | Asp | Ala | Gly | Lys | Thr | Thr |
| | | | | 50 | | | 55 | | | | | 60 | | | | |
| | Phe | Arg | His | Glu | Thr | Phe | Gln | Asp | Tyr | Lys | Gly | Gly | Arg | Gln | Gln | Thr |
| | | | | | | 70 | | | | | 75 | | | | 80 | |
| | Pro | Pro | Glu | Leu | Ser | Glu | Gln | Phe | Pro | Leu | Leu | Arg | Glu | Leu | Leu | Lys |
| | | | | | 85 | | | | | 90 | | | | | 95 | |
| | Ala | Tyr | Arg | Ile | Pro | Ala | Tyr | Glu | Leu | Asp | His | Tyr | Glu | Ala | Asp | Asp |
| | | | | | 100 | | | | 105 | | | | | 110 | | |
| | Ile | Ile | Gly | Thr | Met | Ala | Ala | Arg | Ala | Glu | Arg | Glu | Gly | Phe | Ala | Val |
| | | | | 115 | | | | 120 | | | | | 125 | | | |
| | Lys | Val | Ile | Ser | Gly | Asp | Arg | Asp | Leu | Thr | Gln | Leu | Ala | Ser | Pro | Gln |
| | | | | | | | 135 | | | | | 140 | | | | |
| | Val | Thr | Val | Glu | Ile | Thr | Lys | Lys | Gly | Ile | Thr | Asp | Ile | Glu | Ser | Tyr |
| | | | | | | 150 | | | | | 155 | | | | | 160 |
| | Thr | Pro | Glu | Thr | Val | Glu | Lys | Tyr | Gly | Leu | Thr | Pro | Glu | Gln | Ile | |
| | | | | | 165 | | | | 170 | | | | | 175 | | |
| | Val | Asp | Leu | Lys | Gly | Leu | Met | Gly | Asp | Lys | Ser | Asp | Asn | Ile | Pro | Gly |
| | | | | 180 | | | | | 185 | | | | | 190 | | |
| | Val | Pro | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Val | Lys | Leu | Leu | Lys | Gln | Phe |
| | | | | | | | | 200 | | | | | 205 | | | |
| | Gly | Thr | Val | Glu | Asn | Val | Leu | Ala | Ser | Ile | Asp | Glu | Ile | Lys | Gly | Glu |
| | | | | | | 215 | | | | | | 220 | | | | |
| | Lys | Leu | Lys | Glu | Asn | Leu | Arg | Gln | Tyr | Arg | Asp | Leu | Ala | Leu | Leu | Ser |
| | | | | | | 230 | | | | | 235 | | | | | 240 |
| | Lys | Gln | Leu | Ala | Ala | Ile | Cys | Arg | Asp | Ala | Pro | Val | Glu | Leu | Thr | Leu |
| | | | | | 245 | | | | | 250 | | | | | 255 | |
| | Asp | Asp | Ile | Val | Tyr | Lys | Gly | Glu | Asp | Arg | Glu | Lys | Val | Val | Ala | Leu |

| | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Phe | Gln | Glu | 260 | Leu | Gly | Phe | Gln | Ser | 265 | Phe | Leu | Asp | Lys | Met | 270 | Ala | Val | Gln |
| Thr | Asp | Glu | 275 | Gly | Glu | Lys | Pro | Leu | 280 | Ala | Gly | Met | Asp | Phe | 285 | Ala | Ile | Ala |
| Asp | Ser | Val | 290 | Thr | Asp | Glu | Met | Leu | 295 | Ala | Asp | Lys | Ala | Ala | 300 | Leu | Val | Val |
| 305 | Glu | Val | 310 | Val | Gly | Asp | Asn | Tyr | 315 | His | His | Ala | Pro | Ile | 320 | Gly | Ile | Ala |
| Leu | Ala | Asn | 325 | Glu | Arg | Gly | Arg | Phe | 330 | Phe | Leu | Arg | Pro | Glu | 335 | Thr | Ala | Leu |
| Ala | Asp | Pro | 340 | Lys | Phe | Leu | Ala | Trp | 345 | Leu | Gly | Asp | Glu | Thr | 350 | Lys | Lys | Lys |
| Thr | Met | Phe | 355 | Asp | Ser | Lys | Arg | Ala | 360 | Ala | Val | Ala | Leu | Lys | 365 | Trp | Lys | Gly |
| Ile | Glu | Leu | 370 | Arg | Gly | Val | Val | Phe | 375 | Asp | Leu | Leu | Leu | Ala | 380 | Ala | Tyr | Leu |
| 385 | Leu | Asp | 390 | Pro | Ala | Gln | Ala | Gly | 395 | Val | Ala | Ala | Ala | Val | 400 | Ala | Lys | Met |
| His | Gln | Tyr | 405 | Glu | Ala | Val | Arg | Ser | 410 | Asp | Glu | Ala | Val | Tyr | 415 | Gly | Lys | Gly |
| Ala | Lys | Arg | 420 | Thr | Val | Pro | Asp | Glu | 425 | Pro | Thr | Leu | Ala | Glu | 430 | His | Leu | Ala |
| Arg | Lys | Ala | 435 | Ala | Ala | Ile | Trp | Ala | 440 | Leu | Glu | Glu | Pro | Leu | 445 | Met | Asp | Glu |
| Leu | Arg | Arg | 450 | Asn | Glu | Gln | Asp | Arg | 455 | Leu | Leu | Thr | Glu | Leu | 460 | Glu | Gln | Pro |
| 465 | Leu | Ala | 470 | Gly | Ile | Leu | Ala | Asn | 475 | Met | Glu | Phe | Thr | Gly | 480 | Val | Lys | Val |
| Thr | Lys | Arg | 485 | Leu | Gln | Met | Gly | Ala | 490 | Glu | Leu | Thr | Glu | Gln | 495 | Gln | Leu | Gln |
| Ala | Val | Glu | 500 | Arg | Arg | Ile | Tyr | Glu | 505 | Leu | Ala | Gly | Gln | Glu | 510 | Phe | Asn | Ile |
| Asn | Ser | Pro | 515 | Lys | Gln | Leu | Gly | Thr | 520 | Val | Leu | Phe | Asp | Lys | 525 | Leu | Gln | Leu |
| Pro | Val | Leu | 530 | Lys | Lys | Thr | Lys | Thr | 535 | Gly | Tyr | Ser | Thr | Ser | 540 | Ala | Asp | Val |
| 545 | Leu | Glu | 550 | Leu | Ala | Pro | His | His | 555 | Glu | Ile | Val | Glu | His | 560 | Ile | Leu | His |
| Tyr | Arg | Gln | 565 | Leu | Gly | Lys | Leu | Gln | 570 | Ser | Thr | Tyr | Ile | Glu | 575 | Gly | Leu | Leu |
| Lys | Val | Val | 580 | His | Pro | Val | Thr | Gly | 585 | Lys | Val | His | Thr | Met | 590 | Phe | Asn | Gln |
| Ala | Leu | Thr | 595 | Gln | Thr | Gly | Arg | Leu | 600 | Ser | Ser | Val | Glu | Pro | 605 | Asn | Leu | Gln |
| Asn | Ile | Pro | 610 | Ile | Arg | Leu | Glu | Glu | 615 | Gly | Arg | Lys | Ile | Arg | 620 | Gln | Ala | Phe |
| 625 | Val | Pro | 630 | Glu | Pro | Asp | Trp | Leu | 635 | Ile | Phe | Ala | Ala | Asp | 640 | Tyr | Ser | Gln |
| Ile | Glu | Leu | 645 | Arg | Val | Leu | Ala | His | 650 | Ile | Ala | Glu | Asp | Asp | 655 | Asn | Leu | Ile |
| Glu | Ala | Phe | 660 | Arg | Arg | Gly | Leu | Asp | 665 | Ile | His | Thr | Lys | Thr | 670 | Ala | Met | Asp |
| Ile | Phe | His | 675 | Val | Ser | Glu | Glu | Asp | 680 | Val | Thr | Ala | Asn | Met | 685 | Arg | Arg | Gln |
| Ala | Lys | Ala | 690 | Val | Asn | Phe | Gly | Ile | 695 | Val | Tyr | Gly | Ile | Ser | 700 | Asp | Tyr | Gly |
| 705 | Leu | Ala | 710 | Gln | Asn | Leu | Asn | Ile | 715 | Arg | Lys | Glu | Ala | Ala | 720 | Glu | Phe | Ile |
| Glu | Arg | Tyr | 725 | Phe | Ala | Ser | Phe | Pro | 730 | Gly | Val | Lys | Gln | Tyr | 735 | Met | Asp | Asn |
| Ile | Val | Gln | 740 | Glu | Ala | Lys | Gln | Lys | 745 | Gly | Tyr | Val | Thr | Thr | 750 | Leu | Leu | His |
| Arg | Arg | Arg | 755 | Tyr | Leu | Pro | Asp | Ile | 760 | Thr | Ser | Arg | Asn | Phe | 765 | Asn | Val | Arg |
| Ser | Phe | Ala | 770 | Glu | Arg | Thr | Ala | Met | 775 | Asn | Thr | Pro | Ile | Gln | 780 | Gly | Ser | Ala |
| 785 | | | | | | 790 | | | | | | 795 | | | | | | 800 |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Asp | Ile | Ile | Lys | Lys | Ala | Met | Ile | Asp | Leu | Ser | Val | Arg | Leu | Arg |
| | | | | 805 | | | | | 810 | | | | | 815 | |
| Glu | Glu | Arg | Leu | Gln | Ala | Arg | Leu | Leu | Leu | Gln | Val | His | Asp | Glu | Leu |
| | | | 820 | | | | | 825 | | | | | 830 | | |
| Ile | Leu | Glu | Ala | Pro | Lys | Glu | Glu | Ile | Glu | Arg | Leu | Cys | Arg | Leu | Val |
| | | 835 | | | | | 840 | | | | | 845 | | | |
| Pro | Glu | Val | Met | Glu | Gln | Ala | Val | Ala | Leu | Arg | Val | Pro | Leu | Lys | Val |
| | 850 | | | | | 855 | | | | | 860 | | | | |
| Asp | Tyr | His | Tyr | Gly | Pro | Thr | Trp | Tyr | Asp | Ala | Lys | | | | |
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 <213> Bacillus caldotenax

<220>
 <223> Bacillus caldotenax DNA polymerase (Bca)

| | | | | | | | | | | | | | | | |
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| Met | Lys | Lys | Lys | Leu | Val | Leu | Ile | Asp | Gly | Ser | Ser | Val | Ala | Tyr | Arg |
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| Ala | Phe | Phe | Ala | Leu | Pro | Leu | Leu | His | Asn | Asp | Lys | Gly | Ile | His | Thr |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Asn | Ala | Val | Tyr | Gly | Phe | Thr | Met | Met | Leu | Asn | Lys | Ile | Leu | Ala | Glu |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Glu | Glu | Pro | Thr | His | Met | Leu | Val | Ala | Phe | Asp | Ala | Gly | Lys | Thr | Thr |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Phe | Arg | His | Glu | Ala | Phe | Gln | Glu | Tyr | Lys | Gly | Gly | Arg | Gln | Gln | Thr |
| 65 | | | | 70 | | | | | | 75 | | | | | 80 |
| Pro | Pro | Glu | Leu | Ser | Glu | Gln | Phe | Pro | Leu | Leu | Arg | Glu | Leu | Leu | Arg |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Ala | Tyr | Arg | Ile | Pro | Ala | Tyr | Glu | Leu | Glu | Asn | Tyr | Glu | Ala | Asp | Asp |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Ile | Ile | Gly | Thr | Leu | Ala | Ala | Arg | Ala | Glu | Gln | Glu | Gly | Phe | Glu | Val |
| | | 115 | | | | | 120 | | | | | 125 | | | |
| Lys | Val | Ile | Ser | Gly | Asp | Arg | Asp | Leu | Thr | Gln | Leu | Ala | Ser | Pro | His |
| | 130 | | | | | 135 | | | | | 140 | | | | |
| Val | Thr | Val | Asp | Ile | Thr | Lys | Lys | Gly | Ile | Thr | Asp | Ile | Glu | Pro | Tyr |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 |
| Thr | Pro | Glu | Ala | Val | Arg | Glu | Lys | Tyr | Gly | Leu | Thr | Pro | Glu | Gln | Ile |
| | | | 165 | | | | | | 170 | | | | | 175 | |
| Val | Asp | Leu | Lys | Gly | Leu | Met | Gly | Asp | Lys | Ser | Asp | Asn | Ile | Pro | Gly |
| | | | 180 | | | | | 185 | | | | | 190 | | |
| Val | Pro | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Val | Lys | Leu | Leu | Arg | Gln | Phe |
| | | 195 | | | | | 200 | | | | | 205 | | | |
| Gly | Thr | Val | Glu | Asn | Val | Leu | Ala | Ser | Ile | Asp | Glu | Ile | Lys | Gly | Glu |
| | 210 | | | | | 215 | | | | 220 | | | | | |
| Lys | Leu | Lys | Glu | Thr | Leu | Arg | Gln | His | Arg | Glu | Met | Ala | Leu | Leu | Ser |
| | 225 | | | | 230 | | | | | 235 | | | | | 240 |
| Lys | Lys | Leu | Ala | Ala | Ile | Arg | Arg | Asp | Ala | Pro | Val | Glu | Leu | Ser | Leu |
| | | | 245 | | | | | | 250 | | | | | 255 | |
| Asp | Asp | Ile | Ala | Tyr | Gln | Gly | Glu | Asp | Arg | Glu | Lys | Val | Val | Ala | Leu |
| | | | 260 | | | | | 265 | | | | | 270 | | |
| Phe | Lys | Glu | Leu | Gly | Phe | Gln | Ser | Phe | Leu | Glu | Lys | Met | Glu | Ser | Pro |
| | | 275 | | | | | 280 | | | | | 285 | | | |
| Ser | Ser | Glu | Glu | Glu | Lys | Pro | Leu | Ala | Lys | Met | Ala | Phe | Thr | Leu | Ala |
| | 290 | | | | | 295 | | | | | 300 | | | | |
| Asp | Arg | Val | Thr | Glu | Glu | Met | Leu | Ala | Asp | Lys | Ala | Ala | Leu | Val | Val |
| | 305 | | | | 310 | | | | | 315 | | | | | 320 |
| Glu | Val | Val | Glu | Glu | Asn | Tyr | His | Asp | Ala | Pro | Ile | Val | Gly | Ile | Ala |
| | | | 325 | | | | | | 330 | | | | | 335 | |
| Val | Val | Asn | Glu | His | Gly | Arg | Phe | Phe | Leu | Arg | Pro | Glu | Thr | Ala | Leu |
| | | | 340 | | | | | 345 | | | | | 350 | | |
| Ala | Asp | Pro | Gln | Phe | Val | Ala | Trp | Leu | Gly | Asp | Glu | Thr | Lys | Lys | Lys |
| | | 355 | | | | | 360 | | | | | 365 | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Met | Phe | Asp | Ser | Lys | Arg | Ala | Ala | Val | Ala | Leu | Lys | Trp | Lys | Gly |
| Ile | 370 | Glu | Leu | Cys | Gly | Val | 375 | Phe | Asp | Leu | Leu | 380 | Ala | Ala | Tyr |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 |
| Leu | Asp | Pro | Ala | Gln | Gly | Val | Asp | Asp | Val | Ala | Ala | Ala | Ala | Lys | Met |
| | | | | 405 | | | | | 410 | | | | | 415 | |
| Lys | Gln | Tyr | Glu | Ala | Val | Arg | Pro | Asp | Glu | Ala | Val | Tyr | Gly | Lys | Gly |
| | | | 420 | | | | | 425 | | | | | 430 | | |
| Ala | Lys | Arg | Ala | Val | Pro | Asp | Glu | Pro | Val | Leu | Ala | Glu | His | Leu | Val |
| | | 435 | | | | | 440 | | | | | 445 | | | |
| Arg | Lys | Ala | Ala | Ala | Ile | Trp | Ala | Leu | Glu | Arg | Pro | Phe | Leu | Asp | Glu |
| | 450 | | | | | 455 | | | | | 460 | | | | |
| Leu | Arg | Arg | Asn | Glu | Gln | Asp | Arg | Leu | Leu | Val | Glu | Leu | Glu | Gln | Pro |
| 465 | | | | 470 | | | | | | 475 | | | | | 480 |
| Leu | Ser | Ser | Ile | Leu | Ala | Glu | Met | Glu | Phe | Ala | Gly | Val | Lys | Val | Asp |
| | | | 485 | | | | | | 490 | | | | | 495 | |
| Thr | Lys | Arg | Leu | Glu | Gln | Met | Gly | Glu | Leu | Ala | Glu | Gln | Leu | Arg | |
| | | | 500 | | | | | 505 | | | | | 510 | | |
| Thr | Val | Glu | Gln | Arg | Ile | Tyr | Glu | Ala | Gly | Gln | Glu | Phe | Asn | Ile | |
| | 515 | | | | | | 520 | | | | 525 | | | | |
| Asn | Ser | Pro | Lys | Gln | Leu | Gly | Val | Ile | Leu | Phe | Glu | Lys | Leu | Gln | Leu |
| | 530 | | | | | 535 | | | | | 540 | | | | |
| Pro | Val | Leu | Lys | Lys | Ser | Lys | Thr | Gly | Tyr | Ser | Thr | Ser | Ala | Asp | Val |
| 545 | | | | | 550 | | | | | 555 | | | | | 560 |
| Leu | Glu | Lys | Leu | Ala | Pro | Tyr | His | Glu | Ile | Val | Glu | Asn | Ile | Leu | Gln |
| | | | 565 | | | | | | 570 | | | | | 575 | |
| His | Tyr | Arg | Gln | Leu | Gly | Lys | Leu | Gln | Ser | Thr | Tyr | Ile | Glu | Gly | Leu |
| | | | 580 | | | | | 585 | | | | | 590 | | |
| Leu | Lys | Val | Val | Arg | Pro | Asp | Thr | Lys | Lys | Val | His | Thr | Ile | Phe | Asn |
| | | 595 | | | | | 600 | | | | | 605 | | | |
| Gln | Ala | Leu | Thr | Gln | Thr | Gly | Arg | Leu | Ser | Ser | Thr | Glu | Pro | Asn | Leu |
| | 610 | | | | | 615 | | | | | 620 | | | | |
| Gln | Asn | Ile | Pro | Ile | Arg | Leu | Glu | Glu | Gly | Arg | Lys | Ile | Arg | Gln | Ala |
| 625 | | | | | 630 | | | | | 635 | | | | | 640 |
| Phe | Val | Pro | Ser | Glu | Ser | Asp | Trp | Leu | Ile | Phe | Ala | Ala | Asp | Tyr | Ser |
| | | | 645 | | | | | | 650 | | | | | 655 | |
| Gln | Ile | Glu | Leu | Arg | Val | Leu | Ala | His | Ile | Ala | Glu | Asp | Asp | Asn | Leu |
| | | | 660 | | | | | 665 | | | | | 670 | | |
| Met | Glu | Ala | Phe | Arg | Arg | Asp | Leu | Asp | Ile | His | Thr | Lys | Thr | Ala | Met |
| | | 675 | | | | | 680 | | | | | 685 | | | |
| Asp | Ile | Phe | Gln | Val | Ser | Glu | Asp | Glu | Val | Thr | Pro | Asn | Met | Arg | Arg |
| | 690 | | | | | 695 | | | | | 700 | | | | |
| Gln | Ala | Lys | Ala | Val | Asn | Phe | Gly | Ile | Val | Tyr | Gly | Ile | Ser | Asp | Tyr |
| 705 | | | | | 710 | | | | | 715 | | | | | 720 |
| Gly | Leu | Ala | Gln | Asn | Leu | Asn | Ile | Ser | Arg | Lys | Glu | Ala | Ala | Glu | Phe |
| | | | 725 | | | | | | 730 | | | | | 735 | |
| Ile | Glu | Arg | Tyr | Phe | Glu | Ser | Phe | Pro | Gly | Val | Lys | Arg | Tyr | Met | Glu |
| | | | 740 | | | | | 745 | | | | | 750 | | |
| Asn | Ile | Val | Gln | Glu | Ala | Lys | Gln | Lys | Gly | Tyr | Val | Thr | Thr | Leu | Leu |
| | | 755 | | | | | 760 | | | | | 765 | | | |
| His | Arg | Arg | Arg | Tyr | Leu | Pro | Asp | Ile | Thr | Ser | Arg | Asn | Phe | Asn | Val |
| | 770 | | | | | 775 | | | | | 780 | | | | |
| Arg | Ser | Phe | Ala | Glu | Arg | Met | Ala | Met | Asn | Thr | Pro | Ile | Gln | Gly | Ser |
| 785 | | | | | 790 | | | | | 795 | | | | | 800 |
| Ala | Ala | Asp | Ile | Ile | Lys | Lys | Ala | Met | Ile | Asp | Leu | Asn | Ala | Arg | Leu |
| | | | 805 | | | | | | 810 | | | | | 815 | |
| Lys | Glu | Glu | Arg | Leu | Gln | Ala | Arg | Leu | Leu | Leu | Gln | Val | His | Asp | Glu |
| | | | 820 | | | | | 825 | | | | | 830 | | |
| Leu | Ile | Leu | Glu | Ala | Pro | Lys | Glu | Glu | Met | Glu | Arg | Leu | Cys | Arg | Leu |
| | | 835 | | | | | 840 | | | | | 845 | | | |
| Val | Pro | Glu | Val | Met | Glu | Gln | Ala | Val | Thr | Leu | Arg | Val | Pro | Leu | Lys |
| | 850 | | | | | 855 | | | | | 860 | | | | |
| Val | Asp | Tyr | His | Tyr | Gly | Ser | Thr | Trp | Tyr | Asp | Ala | Lys | | | |
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 <220>
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 <223> Xaa = Met, Ile, Ala, Leu or Thr

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 Tyr, Gln, Asp, Glu, Lys, Arg, His, Val or Ile

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