

# Custom Peptides Modifications

Note: This list is not all inclusive. Additional modifications available upon request.  
Some modifications are sequence dependent and will be assessed during the quotation process.

## BIOTIN

| Modification | Notation   | Location                          |
|--------------|------------|-----------------------------------|
| Biotin       | Biotin-    | Side chain (Lysine)<br>N-terminus |
| LC-Biotin    | Biotin-LC- | Side chain (Lysine)<br>N-terminus |

## CHELATOR

| Modification | Notation           | Location                                       |
|--------------|--------------------|------------------------------------------------|
| DOTA         | -K(DOTA)<br>-DOTA- | Side chain (Lysine or Ornithine)<br>N-terminus |
| NOTA         | -K(NOTA)<br>NOTA-  | Side chain (Lysine or Ornithine)<br>N-terminus |

## CONJUGATION

| Modification            | Conjugation Molecule                                                        | Location                                                                        |
|-------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Carrier Protein         | KLH<br>Cationized BSA<br>BSA<br>OVA<br>CRM197                               | Peptide is conjugated to certain residues of the carrier protein (upon request) |
| Drug Conjugation        | Dastinib<br>Doxorubicin<br>Digoxigenin<br>TaxolLanolidomide<br>Pomalidomide | N-terminus or side chain                                                        |
| Peptide oligonucleotide | DNA<br>RNAs<br>iRNA                                                         | N-terminus C-terminus<br>Internal                                               |

## CYCLIC PEPTIDES

| Modifications                         | Details            | Location                                                                              |
|---------------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Lactam Ring                           | upon request       | Head-to-tail<br>Side-chain-to-head<br>Side-chain-to-tail-<br>Side-chain-to-side-chain |
| Disulfide bridge S-S bond cyclization | upon request       | 1-4 pairs<br>1-2 pairs with one free cysteine                                         |
| Hydrocarbon-stapled peptide           | upon request       | i & i+3 i & i+4i & i+7                                                                |
| Thioether-bridge                      | upon request       | Head-to-tail<br>Side-chain-to-head<br>Side-chain-to-side-chain                        |
| Thiolactone                           | Side-chain-to-tail | Cysteine to C-terminal or side-chain                                                  |

## GLYCOSYLATION

| Modification | Notation                                                                                                                                                                                                                                                     | Location |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Glucose      | Ser( $\beta$ -D-GlcNAc), Thr( $\beta$ -D-GlcNAc),<br>Asn( $\beta$ -D-GlcNAc), Ser( $\beta$ -D-Glc), Thr( $\beta$ -D-Glc),<br>Asn( $\beta$ -D-Glc)                                                                                                            | Backbone |
| Galactose    | Ser( $\alpha$ -D-GalNAc)/(Tn Antigen),<br>Thr( $\alpha$ -D-GalNAc)Ser( $\alpha$ -D-Gal),<br>Thr( $\alpha$ -D-Gal),<br>Ser(Gal $\beta$ (1-3)GalNAc)/(TF Antigen),<br>Thr(Gal $\beta$ (1-3)GalNAc)/(TF Antigen),<br>Ser( $\beta$ -D-Gal), Thr( $\beta$ -D-Gal) | Backbone |
| Mannose      | Ser( $\alpha$ -D-Man), Thr( $\alpha$ -D-Man)                                                                                                                                                                                                                 | Backbone |

## LIPIDS

| Modification                      | Notation                            | Location               |
|-----------------------------------|-------------------------------------|------------------------|
| Farnesylation                     | Far-                                | C (Cysteine)           |
| Geranylation                      | Ger-                                | C (Cysteine)           |
| Myristoylation                    | Myr-                                | N-terminus             |
| Palmitoylation                    | Palmi-                              | N-terminus             |
| Octadecanedioic acid              | X=Octadecanedioic acid              | N-terminus, side chain |
| Oleic acid                        | X=Oleic acid                        | N-terminus, side chain |
| Heptadecanoic acid (Stearic acid) | X=Heptadecanoic acid (Stearic acid) | N-terminal, side chain |

## METHYLATION

| Modification               | Notation             | Location                        |
|----------------------------|----------------------|---------------------------------|
| Methylation (mono)         | -K(Me1)-<br>-R(Me1)- | Side chain (Lysine or Arginine) |
| Methylation (di)           | -K(Me2)-             | Side chain (Lysine)             |
| Methylation (Asymmetrical) | -R(asy-Me2)-         | Side chain (Arginine)           |
| Methylation (Symmetrical)  | -R(sym-Me2)-         | Side chain (Arginine)           |
| Methylation (Tri)          | -K(Me3)-             | Side chain (Lysine)             |

## MULTIPLE ANTIGENIC PEPTIDE

| Modification    | Notation                 | Location                                        |
|-----------------|--------------------------|-------------------------------------------------|
| MAPS 4-branched | (sequence)-MAPS 4 branch | C-terminus of Peptide to N-terminus of scaffold |
| MAPS 8-branched | (sequence)-MAPS 8 branch | C-terminus of Peptide to N-terminus of scaffold |

## PHOSPHO AMINO ACIDS

| Modification     | Notation | Location |
|------------------|----------|----------|
| Phosphoserine    | -pS-     | Backbone |
| Phosphothreonine | -pT-     | Backbone |
| Phosphotyrosine  | -pY-     | Backbone |

## PEG (POLYETHYLGLYCOL)

| Modification | Notation                                                                   | Location                                      |
|--------------|----------------------------------------------------------------------------|-----------------------------------------------|
| PEG          | PEG2<br>PEG3<br>PEG4<br>PEG5<br>PEG6<br>PEG8,<br>PEG10<br>PEG12<br>PEG2000 | N-terminus<br>Side chain (Lysine)<br>Backbone |

## SULFATION

| Modification | Notation  | Location       |
|--------------|-----------|----------------|
| Sulfation    | -Y(S03H)- | Tyr side chain |

| Modification                                                                                                                   | Notation   | Location                       |
|--------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------|
| (N - $\gamma$ - 1 - (4,4 - dimethyl - 2,6 - dioxo-cyclohex - 1 - ylidene)ethyl) - L - $\alpha,\beta$ - diami- nopropionic acid | Dab(Dde)   | Backbone                       |
| 2-aminobenzoic acid                                                                                                            | 2-Abz      | N-terminus                     |
| 3-Ala(2-thienyl)-OH                                                                                                            | Thi        | Backbone                       |
| 3-maleimidopropionic acid                                                                                                      | Mpa        | N-terminus Side-chain (Lysine) |
| 6 - aminohexanoic acid                                                                                                         | LCAhx      | Backbone                       |
| Aminooxyacetic acid                                                                                                            | AoA        | N-terminus                     |
| Benzyloxycarbonyl                                                                                                              | Z          | N-terminus                     |
| Citrulline                                                                                                                     | Cit        | Backbone                       |
| Cysteic Acid                                                                                                                   | Cya        | Backbone                       |
| Cysteine (reduced)                                                                                                             | C(reduced) | Backbone                       |
| Dehydroleucine                                                                                                                 | DeLeu      | Backbone                       |
| Dehydroproline                                                                                                                 | DePro      | Backbone                       |
| Diethylamine                                                                                                                   | DEA        | C-terminal                     |
| Diphenylethylenediamine                                                                                                        | D-Pen      | Backbone                       |
| L - 2 - aminocaproic acid                                                                                                      | Nle        | Backbone                       |
| L - $\alpha$ - t - butylglycine                                                                                                | Tle        | Backbone                       |
| L - $\alpha, \beta$ - diaminopropionic acid                                                                                    | Dap        | Backbone                       |
| L-Allothreonine                                                                                                                | Allo-Thr   | Backbone                       |
| N-methyl-alanine                                                                                                               | N-Me-Ala   | Backbone                       |
| N-methyl-glycine                                                                                                               | N-Me-Gly   | Backbone                       |
| N-methyl-leucine                                                                                                               | N-Me-Leu   | Backbone                       |
| N-methyl-norvaline                                                                                                             | N-Me-Nva   | Backbone                       |
| N-methyl-phenylalanine                                                                                                         | N-me-Phe   | Backbone                       |
| Ornithine                                                                                                                      | Orn        | Backbone                       |
| Proparagylglycine                                                                                                              | Pra        | Backbone                       |
| 3-Ala(2-thienyl)-OH                                                                                                            | Thi        | Backbone                       |
| Pyroglutamic acid                                                                                                              | pGlu       | N-terminus                     |
| $\alpha$ - aminoisobutyric acid                                                                                                | Aib        | Backbone                       |
| $\beta$ -cyclohexyl-L-alanine                                                                                                  | Cha        | Backbone                       |
| $\beta$ -cyclopropy -L-alanine                                                                                                 | Cpa        | Backbone                       |

## UAAD

| Modification              | Notation            | Location | Dalton Increase |
|---------------------------|---------------------|----------|-----------------|
| Heavy Isotope Amino Acids |                     |          |                 |
| Ala (13C1)                | A(13C3)             | Backbone | 1               |
| Ala (15N)                 | Ala (15N)           | Backbone | 1               |
| Ala (13C3)                | Ala(13C3)           | Backbone | 3               |
| Ala (U-13C3, U-15N)       | Ala(U-13C3, U-15N)  | Backbone | 4               |
| Arg (U-13C6, U-15N4)      | Arg(U-13C6, U-15N4) | Backbone | 7               |
| Asn (U-13C4, U-15N2)      | Asn(U-13C4, U-15N2) | Backbone | 6               |
| Asp (U-13C4, 15N)         | Asp(U-13C4, 15N)    | Backbone | 5               |
| Cys (U-13C3, 15N)         | Cys(U-13C3, 15N)    | Backbone | 4               |
| Gln (U-13C5, U-15N2)      | Gln(U-13C5, U-15N2) | Backbone | 7               |
| Glu (U-13C5, 15N)         | Glu(U-13C5, 15N)    | Backbone | 6               |
| Gly (U-13C2, 15N)         | Gly(U-13C2, 15N)    | Backbone | 3               |
| Ile (U-13C6)              | Ile(U-13C6)         | Backbone | 6               |
| Leu (U-13C6, 15N)         | Leu(U-13C6, 15N)    | Backbone | 7               |
| Lys (U-13C6, U-15N2)      | Lys(U-13C6, U-15N2) | Backbone | 8               |
| Met (U-13C5, 15N)         | Met(U-13C5, 15N)    | Backbone | 6               |
| Phe (U-13C9, 15N)         | Phe(U-13C9, 15N)    | Backbone | 10              |
| Pro (U-13C5, 15N)         | Pro(U-13C5, 15N)    | Backbone | 6               |
| Ser (U-13C3, 15N)         | Ser(U-13C3, 15N)    | Backbone | 4               |
| Thr (U-13C4, 15N)         | Thr (U-13C4, 15N)   | Backbone | 5               |
| Val (U-13C5, 15N)         | Val (U-13C5, 15N)   | Backbone | 6               |

## UAAD

| Modification    | Notation | Location |
|-----------------|----------|----------|
| D-Amino Acids   |          |          |
| D-Alanine       | D-Ala    | Backbone |
| D-Arginine      | D-Arg    | Backbone |
| D-Asparagine    | D-Asn    | Backbone |
| D-Aspartic Acid | D-Asp    | Backbone |
| D-Cysteine      | D-Cys    | Backbone |
| D-Glutamic Acid | D-Glu    | Backbone |
| D-Glutamine     | D-Gln    | Backbone |
| D-Histidine     | D-His    | Backbone |
| D-Isoleucine    | D-Ile    | Backbone |
| D-Leucine       | D-Leu    | Backbone |
| D-Lysine        | D-Lys    | Backbone |
| D-Methionine    | D-Met    | Backbone |
| D-Phenylalanine | D-Phe    | Backbone |
| D-Proline       | D-Pro    | Backbone |
| D-Serine        | D-Ser    | Backbone |
| D-Threonine     | D-Thr    | Backbone |
| D-Tryptophan    | D-Trp    | Backbone |
| D-Tyrosine      | D-Tyr    | Backbone |
| D-Valine        | D-Val    | Backbone |

## FLUORESCENT DYE LABELS

| Modifications           | Ex/Em      | Location                                                           |
|-------------------------|------------|--------------------------------------------------------------------|
| <b>Mca</b>              | 325/393 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>EDANS</b>            | 335/493 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>FAM</b>              | 492/518 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>FITC</b>             | 494/519 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>HiLyte™Fluor 488</b> | 502/527 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>CyLyte Fluor 3</b>   | 550/564 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>HiLyte™Fluor 555</b> | 550/566 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>TAMRA</b>            | 541/568 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>Rox</b>              | 568/591 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>CyLyte Fluor 5</b>   | 648/663 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>HiLyte™Fluor 647</b> | 650/675 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| <b>CyLyte Fluor 7</b>   | 750/773 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |

## FRET/TR-FRET PAIRS

| Dye              | Quencher         | Ex/Em      | Location                                                           |
|------------------|------------------|------------|--------------------------------------------------------------------|
| Mca              | Dnp              | 325/393 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| EDANS            | Dabcyl           | 335/493 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| FAM              | QXL®520          | 492/518 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| FITC             | QXL®520          | 494/519 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| HiLyte™Fluor 488 | QXL®520          | 502/527 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| CyLyte Fluor 3   | QXL®570          | 550/564 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| HiLyte™Fluor 555 | QXL®570          | 550/566 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| TAMRA            | QXL®570          | 541/568 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| ROX              | QXL®610          | 568/591 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| CyLyte Fluor 5   | QXL®670          | 648/663 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| HiLyte™Fluor 647 | HiLyte™Fluor555  | 650/675 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| CyLyte Fluor 7   | IR-QXL®          | 750/773 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| Europium (Eu)    | HiLyte™Fluor 647 | 650/675 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |
| Europium (Eu)    | CyLyte Fluor 5   | 648/663 nm | Side chain (Lysine)<br>N-terminus(additional options upon request) |

## N & C TERMINAL MODIFICATIONS

| N-terminal                      |                                     |                                    |
|---------------------------------|-------------------------------------|------------------------------------|
| 2-Aminobenzoic acid (2-Abz)     | FAM - Fluorescent Dye               | PEG5                               |
| 3-maleimidopropionyl (Mpa)      | FITC - Fluorescent Dye              | PEG6                               |
| Acetyl                          | Formylation                         | PEG8                               |
| Aminooxyacetic acid (AoA)       | HiLyte™ Fluor 488 - Fluorescent Dye | Pyroglutamic acid (Pyr) or (pGlu)  |
| Benzyloxycarbonyl (Z)           | HiLyte™ Fluor 555 - Fluorescent Dye | QXL®520 - Quencher                 |
| Biotin                          | HiLyte™ Fluor 647 - Fluorescent Dye | QXL®570 - Quencher                 |
| Biotin-LC                       | HiLyte™ Fluor 750 - Fluorescent Dye | QXL®610 - Quencher                 |
| Bromoacetylation                | Mca - Fluorescent Dye               | QXL®670 - Quencher                 |
| CyLyte Fluor3 - Fluorescent Dye | Myristylation                       | ROX - Fluorescent Dye              |
| CyLyte Fluor5 - Fluorescent Dye | PEG12                               | Succinylation                      |
| CyLyte Fluor7 - Fluorescent Dye | PEG2                                | Sulforhodamin101 - Fluorescent Dye |
| DABCYL - Quencher               | PEG2000                             | TAMRA - Fluorescent Dye            |
| Dnp - Quencher                  | PEG3                                |                                    |
| DOTA                            | PEG4                                |                                    |

## C-terminal

|                                         |                                        |                                             |
|-----------------------------------------|----------------------------------------|---------------------------------------------|
| AFC - Fluorescent Dye                   | K-(CyLyte Fluor3) - Fluorescent Dye    | K-(QXL®570) - Quencher                      |
| Alcohols and thiols                     | K-(CyLyte Fluor5) - Fluorescent Dye    | K-(QXL®610) - Quencher                      |
| Aldehydes                               | K-(CyLyte Fluor7) - Fluorescent Dye    | K-(QXL®670) - Quencher                      |
| AMC - Fluorescent Dye                   | K-(DABCYL) - Quencher                  | K-(ROX) - Fluorescent Dye                   |
| Amide                                   | K-(Dnp) - Quencher                     | (Peptide)-Rh110-(Peptide) - Fluorescent Dye |
| Aminoluciferin - Fluorescent Dye        | K-(FAM) - Fluorescent Dye              | K-(Sulforhodamin101) - Fluorescent Dye      |
| N-Alkyl amides                          | K-(FITC) - Fluorescent Dye             | K-(TAMRA) - Fluorescent Dye                 |
| Cysteamide                              | K-(HiLyte™ Fluor488) - Fluorescent Dye | Nitrile                                     |
| Dap(Dnp) - Fluorescent Dye              | K-(HiLyte™ Fluor555) - Fluorescent Dye | pNA(p-nitroanilide) - Fluorescent Dye       |
| Diethylamide (DEA)                      | K-(HiLyte™ Fluor647) - Fluorescent Dye | Phosphonate                                 |
| Esters                                  | K-(HiLyte™ Fluor750) - Fluorescent Dye | Thiol Esters                                |
| Halogenmethyl and acyloxymethyl ketones | K(LC-Biotin)-amide                     | Thiols(-SH)                                 |
| Hydrazides                              | K-(Mca) - Fluorescent Dye              |                                             |
| K(Biotin)-amide                         | K-(QXL®520) - Quencher                 |                                             |