

## **Product Information**

Version 2.5

# ***Labeled nucleotides***

***with 10x - 50x signal enhancement  
for enzymatic nucleic acid labeling***

### **Genovoxx GmbH**

Maria Goeppert-Strasse 1

23562 Luebeck

Germany

Tel: +49 (0) 451 290 33 60

Fax: +49 (0) 451 290 33 33

[www.genovoxx.com](http://www.genovoxx.com)

# ***Labeled nucleotides***

***with 10x - 50x signal enhancement  
for enzymatic nucleic acid labeling***

## **Contents:**

	Page
1. General product information	3
2. Current product list	4
3. Application Areas of 10x - 50x labeled nucleotides	5
4. Labeled nucleotides with AnyBase-Dyes	6
5. Labeled nucleotides with 10x dye per one nucleotide	7
6. Current dye-list	7
7. How to choose the right nucleotide label	8
8. Customer modifications of nucleotide structure, linker or label	9
9. Ordering information	10

## 1. GENERAL PRODUCT INFORMATION FOR LABELED NUCLEOTIDES

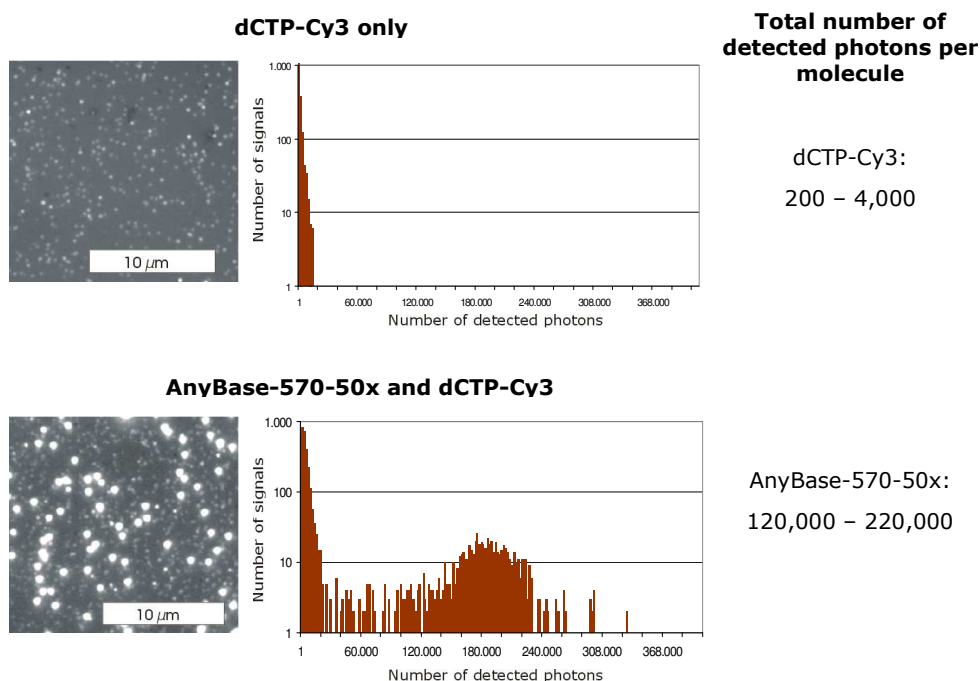
- **10x to 50x** signal enhancement of fluorescent signals for nucleotides
- For enzymatic nucleic acid labeling in FISH, microarray and blot-hybridization experiments.
- Incorporation of every nucleotide into nucleic acids leads to a **10x to 50x** stronger signal enhancement compared to conventional dyes.

Nucleotide modification	Enhancement factor	Features
<b>1. AnyBase-Dyes</b>	20x – 50x	<ul style="list-style-type: none"> <li>○ Substitute for Cy3™ and Cy5™</li> <li>○ Large dye-molecules with 10x to 50x fluorescence intensity at 570 nm and 670 nm</li> </ul>
<b>2. 10x Dyes</b>	10x	<ul style="list-style-type: none"> <li>○ Whole spectral range</li> <li>○ 10 conventional dye molecules per single nucleotide molecule</li> </ul>
<b>3. 10x Biotin</b>	10x	<ul style="list-style-type: none"> <li>○ 10 Biotin molecules per single nucleotide molecule</li> </ul>

Related products: **Streptavidin** with 10x – 50x signal enhancement

### Comparison of fluorescent intensities

Comparison of dCTP-Cy3 and **dCTP-AnyBase-570-50x** nucleotides on the same surface at the single molecule level<sup>1</sup>:



<sup>1</sup>Measurements were performed at the single molecule level with a single photon sensitivity. This applies to all comparative numbers in this comparison.

## 2. CURRENT PRODUCT LIST

Product Number	Substrate	dye 570	dye 670	Quantity
<b>N-0100</b> <b>AnyBase-Dye</b> <b>50x</b>	<b>dATP dCTP</b> <b>dGTP dUTP</b> <b>UTP, CTP</b>	Example:  dCTP-AnyBase-570-50x	Example:  dCTP-AnyBase-670-50x	10 nmol 25 nmol
<b>N-0200</b> <b>AnyBase-Dye</b> <b>20x</b>	<b>dATP dCTP</b> <b>dGTP dUTP</b> <b>UTP, CTP</b>	Example:  dCTP-AnyBase-570-20x	Example:  dCTP-AnyBase-670-20x	10 nmol 25 nmol
<b>N-0300</b> <b>AnyBase-Dye</b> <b>10x</b>	<b>dATP dCTP</b> <b>dGTP dUTP</b> <b>UTP, CTP</b>	Example:  dCTP-AnyBase-570-10x	Example:  dCTP-AnyBase-670-10x	10 nmol 25 nmol

**Concentration:** 0.2 mM

**Storage Conditions:** Store at 4° C in the dark

**Shipping Conditions:** Shipped at ambient temperature

Product Number	Substrate	dNTP-Dye / Biotin chose from the current dye-list	Quantity
<b>N-0400</b> <b>10xDye</b>	<b>dCTP, dUTP</b> <b>CTP, UTP</b>	Example:  dCTP-10x-Fluorescein	25 nmol
<b>N-0450</b> <b>5xDye</b>	<b>dCTP, dUTP</b> <b>CTP, UTP</b>	Example:  dCTP-5x-Fluorescein	25 nmol
<b>N-0480</b> <b>2xDye</b>	<b>dCTP, dUTP</b> <b>CTP, UTP</b>	Example:  dCTP-2x-Fluorescein	25 nmol
<b>N-0500</b> <b>10xBiotin</b>	<b>dCTP, dUTP</b> <b>CTP, UTP</b>	Example:  dCTP-10x-Biotin	25 nmol

**Concentration:** 0.5 mM

**Storage Conditions:** Store at 4° C in the dark

**Shipping Conditions:** Shipped at ambient temperature

### 3. APPLICATION AREAS OF 10x - 50x LABELED NUCLEOTIDES

- Enzymatic non-radioactive labeling of nucleic acids with common labeling strategies (e.g. nick-translation, random priming, 3'-end labeling, PCR, terminal-transferase-labeling, transcription by T7-RNA Polymerase) as a substitute for conventional labeled nucleotides.
  - Labeled nucleic acids can be used e.g. in hybridization studies, like microarrays, blots, FISH / chromosome mapping
  - Superior signal intensity and stability
  - Incorporation by polymerase with minimal influence from the dye
- Solid phase primer extension, minisequencing, solid phase PCR
- Study of enzymes with fluorescent substrates

**Warning: for research use only.**

#### 4. FEATURES OF LABELED NUCLEOTIDES WITH ANYBASE-DYES

### The brightest labeling for nucleotides available today.

#### Signal properties of labeled nucleotides with AnyBase-Dyes:

Higher signal intensity <sup>1</sup>	10 to 50 fold (10x – 50x)
Increased signal stability and reduced signal bleaching <sup>1</sup>	10 to 50 fold (10x – 50x)
High molar absorption coefficient ( $E_{\max} \text{ M}^{-1} \text{ cm}^{-1}$ )	> 1,000,000
$\lambda_{\text{abs}}$ nm	550 and 650
$\lambda_{\text{em}}$ nm	570 and 670
Quantum yield	0.05 to 0.2

- AnyBase-Dyes have similar spectral properties to Cy3<sup>TM</sup> and Cy5<sup>TM</sup>-Dyes and can be used as substitutes for these dyes.
- **Biological activity:** Labeled nucleotide are biologically active with a variety of DNA and/or RNA polymerases.

#### Comparison of AnyBase-570-20x and AnyBase-670-20x<sup>1</sup> :

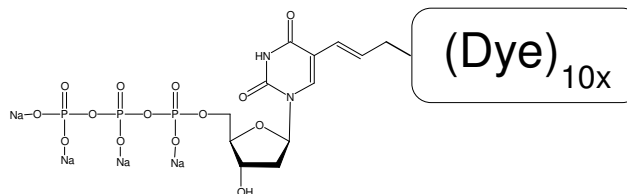
	<b>AnyBase-570-20x</b>	<b>AnyBase-670-20x</b>
Signal intensity <sup>1</sup>	20 fold (20x)	20 fold (20x)
Signal stability <sup>1</sup>	20 fold (20x)	20 fold (20x)
$E_{\max} \text{ M}^{-1} \text{ cm}^{-1}$	~ 4,500,000	~ 5,500,000
$\lambda_{\text{abs}}$ nm/ $\lambda_{\text{em}}$ nm	550 / 565 nm	650 / 667 nm
Quantum yield	~ 0.12	~ 0.1

<sup>1</sup> The fluorescent intensity and stability of commercially available labeled compounds (e.g. dCTP-Cy3, dUTP-TMR) was taken as 1. Measurements were performed at the single molecule level with a single photon sensitivity. This applies to all comparative numbers in this comparison.

**Important note:** Molecular weight of dyes ranges from 10 to 150 kDa. Please be aware that this may influence your results if you have size separation steps in your routine. For this reason we do not recommend to use these dyes within assays based on electrophoretic separation, e.g. Sanger-Sequencing.

## 5. FEATURES OF LABELED NUCLEOTIDES WITH 10X DYE PER ONE NUCLEOTIDE

### Example: dUTP-10x-dye



Features of multiple labeled nucleotides:

- Coupled dyes retain their fluorescent and spectral properties, resulting in a tenfold (10x) increase of signal from each nucleotide.
- Labeled nucleotides suitable for a variety of detection systems can be synthesized by coupling multiple well known dyes to the nucleotide.
- **Biological activity:** Labeled nucleotide are biologically active with a variety of DNA and/or RNA polymerases.

### Current dye-list

Color	Dye	$\lambda_{abs}$ nm	$\lambda_{em}$ nm	$E_{max}$ $M^{-1} cm^{-1}$	Notes
Blue	AMCA	352	444	19,000	
Green	Fluorescein (FITC)	494	520	80,000	
Green	Atto 495	495	527	80,000	Substitute for Alexa <sup>TM</sup> 488 or Cy2 <sup>TM</sup>
Green	Atto 488	501	523	90,000	Substitute for Alexa <sup>TM</sup> 488 or Cy2 <sup>TM</sup>
Yellow	Rhodamine 6G	518	543	90,000	
Yellow	Atto 520	525	545	110,000	
Yellow	Atto 532	532	553	115,000	
Orange	Dy-555	547	572	100,000	Substitute for Alexa <sup>TM</sup> 555 or Cy3 <sup>TM</sup>
Orange	TAMRA	542	568	90,000	
Orange	TMR / TRITC	550	573	91,000	
Orange	Atto 550	554	576	120,000	Substitute for Cy3 <sup>TM</sup> , Alexa <sup>TM</sup> 555, Alexa <sup>TM</sup> 546, Bodipy <sup>TM</sup> 558/568
Orange	Dy-547	557	574	150,000	Substitute for Alexa <sup>TM</sup> 555, Alexa <sup>TM</sup> 546 or Cy3 <sup>TM</sup>
Orange	Atto 565	563	592	120,000	Substitute for Cy3 <sup>TM</sup> , Alexa <sup>TM</sup> 555, Bodipy <sup>TM</sup> 558/568
Red	Atto 590	594	624	120,000	Substitute for Texas Red <sup>TM</sup> , Alexa <sup>TM</sup> 594
Red	Dy-647	653	672	250,000	Substitute for Alexa Fluor <sup>TM</sup> 647 or Cy5 <sup>TM</sup>
Red	Dy-650	653	674	220,000	Substitute for Alexa Fluor <sup>TM</sup> 647 or Cy5 <sup>TM</sup>
Red	Atto 647	645	669	120,000	Substitute for Alexa Fluor <sup>TM</sup> 647 or Cy5 <sup>TM</sup>
Red	Dy-680	690	709	140,000	Substitute for Cy5.5 <sup>TM</sup>

**Other dyes can be coupled upon request.**

**Please inquire for your desirable dye.**

## 6. HOW TO CHOOSE THE RIGHT NUCLEOTIDE LABEL

- Use nucleotides with the same dye or dye with most similar spectral properties. Generally, different substitutes can be used as a good alternative for a definite dye.
- If you wish to use your dye for the multiple labeling, that is not listed in the current product list, please inquire about our custom synthesis service.
- Some dyes are patent protected and may be used only upon licence agreement with the respective company. Use a substitute for this dye or inquire about current state of licence agreements with a particular company.

Here are some examples of well known dyes used for the nucleic acid labeling and their substitutes:

Commonly used dyes	Possible substitutes	Notes
Alexa Fluor™ 488	Atto 488, Cy2™, variety of Fluorescein-derivates (FITC)	
Alexa Fluor™ 546	AnyBase-570, Cy3™, Atto 550, Atto 565, Dy-547	
Alexa Fluor™ 647	AnyBase-670, Cy5™, Dy-647, Atto 647,	
Cy2™	Atto 488, Alexa™ 488, variety of Fluorescein-derivates (e.g. FITC)	Atto 488 identical to Alexa, much more photostable than Fluorescein
Cy3™	AnyBase-570, Dy-547, Dy-550, Atto 550, Atto 565, Alexa™ 555	Atto 565 brighter and more photostable than Cy3
Cy5™	AnyBase-670, Dy-635, Atto 655, Atto 647, Alexa™ 647	
Cy5.5™	Dy-680, Atto 680, Atto 700,	
Bodipy™ 530/550	Atto 532	
Bodipy™ 558/568	Atto 550, Atto 565	
Bodipy™ 630/650	Atto 635	
Texas Red™	Atto 590	

**Other dyes can be coupled upon request.**

**Please inquire for your desirable dye.**

## 7. CUSTOMER MODIFICATIONS OF NUCLEOTIDE STRUCTURE, LINKER OR LABEL

- Different **nucleotides and their analogs** can be used for the synthesis.
  - **Different base-analogs** can be used for the synthesis.
  - Nucleotides with **sugar-modifications**, e.g. ribonucleotides or dideoxynucleotides, and **phosphate-modifications**, e.g. monophosphates or diphosphates, can be modified with fluorescent dyes or biotin.
  - **Linker position and composition** can be adapted to the requirements of customer.

Examples for nucleotide analogs can be found on the websites of companies:

JenaBioscience GmbH,  
Trilink Biotechnologies Inc.

- Other **dyes, haptens** or **proteins (e.g. enzymes)** can be coupled to nucleotides for better adaptation to customer detection system. The **number of the dyes** coupled to one nucleotide can be adjusted to the customer requirements.

Other dyes are provided for example by the following companies:

Dyomics GmbH,  
Atto-tec GmbH,  
Sigma-Aldrich.

Spectral comparison can be done with a free online program at:

<http://fluorescence.bio-rad.com/>

- Provide us with your requirements for a custom product and we will try to find a way to produce your product.
- **If we can help you with the choice of labeled nucleotides, please contact us.**
- **Please inquire about custom synthesis conditions: [info@genovoxx.de](mailto:info@genovoxx.de)**

## 8. ORDERING INFORMATION

Please submit your order by mail, phone, fax or e-mail:

Mail:                Genovoxx GmbH  
                      Maria Goeppert Strasse 1  
                      23562 Luebeck  
                      Germany  
Phone:             +49-451-290 33 60  
Fax:                +49-451-290 33 33  
e-Mail:            order@genovoxx.de  
Homepage:        www.genovoxx.de

**Prices** are in Euro and do not include taxes or foreign duties (if applicable). There are no packing or transport costs for air mail delivery. However, delivery by courier service will be charged extra. Please check every arriving parcel for any obvious damage before signing the receipt, otherwise compensation for damage is not possible.

All items are shipped by Fedex service. If you wish your order to be shipped by a different carrier, please provide the necessary information with your order.

**Invoices** are payable net **14 days**, either by cheque or by wire transfer to

Deutsche Bank Luebeck;  
BLZ: 23070700  
Account number 9012980  
SWIFT: DEUTDEDB237  
IBAN: DE 84230707000901298000

A **discount of 5%** will be granted for payment in advance.

**Feedback** on the performance of our products is very much appreciated. Please contact us under info@genovoxx.de.

**Quality:** If you are not satisfied with our products, please contact us. Products may not be returned or an invoice annulled without prior written approval from Genovoxx. We are not responsible for damage to material resulting from improper storage or handling after receipt.

**Safety:** All products are sold for **research purpose** only. Some of the products may contain toxic or hazardous compounds. Only qualified professionals and trained laboratory staff familiar with the potential hazards and trained in good laboratory practices should handle them.

**Trademarks:** AnyBase, 10xDye, 20xDye, 50xDye, 100xDye, Dye-10x, Dye-20x, Dye-50x, Dye-100x are trademarks of Genovoxx GmbH, CyDye, Cy are trademarks of GE Corp., Alexa, Alexa Fluor are trademarks of Invitrogen Corp., Atto is a trademark of Atto-Tec GmbH, Dy is a trademark of Dyomics GmbH.