

Quenchers

Great advances have been made in the area of quenchers over the last decade. The limitations of DABCYL and TAMRA for the development of multiplex systems quickly became apparent. These quenchers were not very efficient with the red-shifted dyes. Two different quenching systems were developed to overcome those limitations, the QSY® series and the Black Hole Quenchers (BHQ)®. Both offer specific quenchers for different emission ranges. The QSY quenchers are analogs of fluorescein.

There is now a specific quencher for everything from blue dyes such as Pacific Blue to the extremely red-shifted dyes such as Cy5.5. Although DABCYL has nearly become synonymous with the term “quencher” because of the early Molecular Beacon publications, one can now choose from more specialized quenchers - at little or no added cost. Table 1 will help you determine the appropriate quencher for your application. The more popular dye/quencher combinations are listed in Table 2.

The difference between QSY-7 and QSY-9 is water solubility of the conjugate and is of more concern to the chemist than to the end user. We do allow you to specify, however, if your experiments require one or the other.

Not only does TriLink offer each of these quenchers, we also offer a wide selection for placement on the oligonucleotide. These quenchers can be placed at the 3' or 5' terminus or internally at any deoxy base, which can be modified at the 5 position. There are some limitations based on the companion fluorescent dye chosen.

Figure 1: Quencher Structures

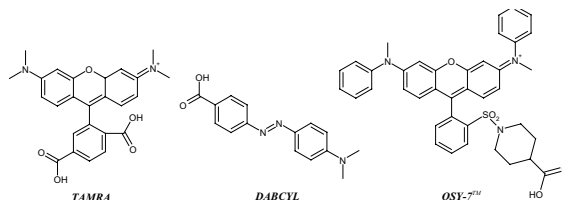


Table 1: Spectral Data of Quenchers

	Abs max	Ext. Coef.	Quenching Range
DABCYL	453 nm	32,000	380-530 nm
QSY-35	472 nm	23,500	410-500 nm
BHQ-1	534 nm	n/a	480-580 nm
QSY-7	560 nm	92,000	500-600 nm
QSY-9	562 nm	85,000	500-600 nm
BHQ-2	579 nm	n/a	550-650 nm
QSY-21	660 nm	89,000	590-720 nm
BHQ-3	672 nm	n/a	620-730 nm

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Table 2: This dye selection chart provides a quick reference to the dyes we provide, spectral ranges and offers a starting point for quencher-dye pairing.

Dyes	Em _{max}	Abs _{max}	Quencher Guidelines*		
P130	376nm	340nm	BHQ-1 Abs _{max} : 534nm	QSY-35 Abs _{max} : 475nm	DABCYL Abs _{max} : 479nm
7-Methoxycoumarin	410nm	358nm			
Cascade Blue	410nm	396nm			
Alexa Fluor® 350	442nm	346nm			
7-Aminocoumarin-X	442nm	353nm			
Pacific Blue	451nm	416nm			
Marina Blue	459nm	362nm			
Dimethylaminocoumarin	468nm	376nm			
BODIPY 493/503	509nm	500nm			
DTAF	516nm	492nm			
6-FAM (Fluorescein)	516nm	496nm	BHQ-2 Abs _{max} : 579nm	QSY-7 & QSY-9 Abs _{max} : 560nm	
Dansyl-X	518nm	335nm			
Oregon Green 500	519nm	499nm			
Alexa Fluor® 488	519nm	495nm			
dT-FAM	520nm	492nm			
Oregon Green 488	521nm	495nm			
Rhodol Green	523nm	496nm			
Oregon Green 514	526nm	506nm			
Rhodamine Green-X	528nm	503nm			
NBD-X	535nm	466nm			
TET	536nm	521nm	QSY-21 Abs _{max} : 661nm		
Alexa Fluor® 430	541nm	434nm			
2', 4', 5', 7'-Tetrabromosulfonefluorescein	544nm	529nm			
6-JOE	548nm	520nm			
BODIPY-530/550	551nm	534nm			
Alexa Fluor® 532	554nm	532nm			
HEX	556nm	535nm			
Carboxyrhodamine 6G	557nm	524nm			
Alexa Fluor® 555	565nm	555nm			
BODIPY 558/568	568nm	559nm			
BODIPY-564/570	570nm	564nm			
Cy3	570nm	550nm			
PyMPO	570nm	415nm			
Alexa Fluor® 546	573nm	556nm			
TAMRA-X/dT-TAMRA	576nm	546nm			
Rhodamine Red-X	580nm	560nm			
BODIPY-576/589	589nm	576nm			
BODIPY-581/591	591nm	581nm			
Alexa Fluor® 568	603nm	578nm			
Texas-Red-X	603nm	583nm			
Cy3.5	604nm	588nm			
Carboxy-X-Rhodamine (ROX)	605nm	580nm			
BODIPY-TR-X	616nm	588nm			
Alexa Fluor® 594	617nm	590nm			
Alexa Fluor® 633	647nm	632nm			
Alexa Fluor® 647	665nm	650nm			
Cy5	670nm	649nm			
Carboxynaphthofluorescein	672nm	602nm			
Alexa Fluor® 660	690nm	663nm			
Cy5.5	694nm	675nm			
Alexa Fluor® 680	702nm	679nm			
Alexa Fluor® 700	723nm	702nm			
Alexa Fluor® 750	775nm	749nm			

*There is no guarantee a quencher will be effective in your construct. Quencher-dye efficiencies must be empirically determined in your experimental conditions.