

Spectral Properties and Quenching Range of Black Hole Quencher BHQ-1™, BHQ-2™ & BHQ-10™

Black Hole Quenchers™ (BHQs™) are the gold standard among quenchers in molecular biology, especially for quantitative PCR (qPCR) and other fluorescence-based assays. Unlike traditional quenchers, BHQs™ are true dark quenchers without native emission, which reduces background noise and increases detection sensitivity.

Jena Bioscience now offers BHQ-1™-, BHQ-2™- and BHQ-10™- labeled nucleotides to quench fluorescence across different spectral ranges:

BHQ-1 has an absorption maximum at 534 nm and a quenching range between 480 - 580 nm, making it suitable for quenching commonly used green and yellow fluorophores like Cy3, Fluorescein and Rhodamine. BHQ-2, with an absorption maximum at 579 nm, is used to quench in the range 560 – 670 nm and is most effective in quenching orange and red dyes such as Cy5, AZDye 594 and Texas Red.

BHQ-10 is a water-soluble quencher with an absorption maximum at 615 nm and a quenching range of 480-550 nm. This makes BHQ-10 suitable for quenching blue and green fluorophores like AZDye 488, Fluorescein and Rhodamine (Table 1).

Table 1: Spectral properties and quenching range of Black Hole Quencher BHQ-1™, BHQ-2™ & BHQ-10™.

Please note: It is important that the emission peak of the fluorescent dye and the absorption peak of the quencher have a large overlap range that ensures efficient resonant energy transfer and thus efficient quenching.

Dye	Quencher		
	BHQ-1™	BHQ-2™	BHQ-10™
	λ_{exc} 534 nm ϵ 34.0 L mmol ⁻¹ cm ⁻¹	λ_{exc} 579 nm ϵ 38.0 L mmol ⁻¹ cm ⁻¹	λ_{exc} 516 nm ϵ 28.7 L mmol ⁻¹ cm ⁻¹
IR750	-	-	-
ATTO 680	-	-	-
IR680LT	-	-	-
ATTO 655	-	-	-
AZDye 647	-	-	-
Cy5	-	X	-
ATTO 647N	-	X	-
ATTO 643	-	X	-
STAR RED	-	X	-

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ATTO 594	-	X	-
AZDye 594	-	X	-
Texas Red	-	X	-
STAR 580	-	X	-
AZDye 555	X	X	-
ATTO 550	X	X	-
Cy3	X	X	-
ATTO 532	X	-	-
5/6-Rhodamine	X	-	X
ATTO 488	X	-	X
5/6-Fluorescein	X	-	X
AZDye 488	X	-	X
ATTO 425	X	-	X
DEAC	X	-	X
AMCA	-	-	-
AZDye 405	-	-	-