

Explore Illumina sequencing technology

Massively parallel sequencing with optimized SBS chemistry

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Sequencing by Synthesis (SBS) Technology

Introduction to SBS technology

Illumina sequencing technology, sequencing by synthesis (SBS), is a widely adopted next-generation sequencing (NGS) technology worldwide. Illumina instruments and reagents use a proprietary method that detects single bases as they are incorporated into growing DNA strands with massively parallel capabilities. The latest Illumina SBS technology, XLEAP-SBS chemistry, is our fastest, highest quality, and most robust SBS chemistry to date, enabling streamlined workflows on our market-leading sequencers.



SBS chemistry

A fluorescently labeled reversible terminator is imaged as each dNTP is added and then cleaved to allow incorporation of the next base. Since all four reversible terminator-bound dNTPs are present during each sequencing cycle, natural competition minimizes incorporation bias.¹

The end result is true base-by-base sequencing that enables accurate data for a broad range of applications. The method virtually eliminates errors and missed calls associated with strings of repeated nucleotides (homopolymers).

Further advantages of SBS technology

Illumina sequencing by synthesis technology supports both single-read and paired-end libraries. SBS technology offers a short-insert paired-end capability for high-resolution genome sequencing, as well as long-insert paired-end reads for efficient sequence assembly, *de novo* sequencing, and more.

The combination of short inserts and longer reads increases the ability to fully characterize any genome.

[Learn more about paired-end sequencing](#)

Introduction to NGS ebook

If you are new to NGS, download our comprehensive, yet easy-to-follow, guide to get started. You'll learn about NGS methods, workflows, data analysis solutions, and more in this step-by-step guide.

[Download eBook](#)

Increased speed and greater fidelity with XLEAP-SBS chemistry

XLEAP-SBS chemistry delivers fundamentally advanced SBS chemistry engineered for increased speed, greater fidelity, and more robustness. With up to 2× faster incorporation speed, up to 3× greater accuracy, and engineered for longer reads, XLEAP-SBS chemistry unlocks more sequencing capabilities than ever before.² XLEAP-SBS chemistry is currently available on the following platforms:

- [MiSeq i100 Series](#)
- [NextSeq 1000 & NextSeq 2000 Systems](#)
- [NovaSeq X Series](#)



Sequencing system portfolio

Illumina offers innovative sequencing systems that deliver exceptional data quality and accuracy, at the scale you need.

[See all NGS platforms](#)

Additional SBS technology breakthroughs

Semiconductor sequencing

The Illumina semiconductor sequencing technology couples Illumina SBS chemistry with complementary metal-oxide semiconductor (CMOS) technology. This allows for low instrument costs and a small instrument footprint, all while maintaining the high data accuracy of SBS.

[Learn more about semiconductor sequencing](#)



Two-channel SBS

Find out how this recent evolution of SBS technology enables faster sequencing than the prior version of Illumina SBS technology, with the same high data accuracy.

[Learn more about two-channel SBS](#)

Additional resources

[Getting started with NGS](#)

Learn about NGS and how this technique is revolutionizing scientific research. With more accessibility than ever before, the time is now to get started on NGS.

[Sequencing reagents](#)

Find Illumina instrument-specific sequencing kits, reagents, flow cells, and more.

[Maximum throughput](#)

See how patterned flow cell technology dramatically increases sequencing data throughput.

[Improving data quality with XLEAP-SBS chemistry](#)

Read this article to see how XLEAP-SBS chemistry is improving sequencing data quality and how that can impact

[Illumina sequencing innovations powered by XLEAP-SBS chemistry](#)

Learn about the latest Illumina sequencing updates and innovations on

workflows and lower operational costs. the NovaSeq X and NextSeq 1000/2000 Systems with XLEAP-SBS chemistry.

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References

1. Bentley DR, Balasubramanian S, Swerdlow HP, et al. Accurate Whole Human Genome Sequencing using Reversible Terminator Chemistry. *Nature*. 2008;456(7218):53–59. doi:10.1038/nature07517
2. Compared to standard Illumina SBS chemistry.



INNOVATIVE TECHNOLOGIES

At Illumina, our goal is to apply innovative technologies to the analysis of genetic variation and function, making studies possible that were not even imaginable just a few years ago. It is mission critical for us to deliver innovative, flexible, and scalable solutions to meet the needs of our customers. As a global company that places high value on collaborative interactions, rapid delivery of solutions, and providing the highest level of quality, we strive to meet this challenge. Illumina innovative sequencing and array technologies are fueling groundbreaking advancements in life science research, translational and consumer genomics, and molecular diagnostics.

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