



The difference
between
good data
and great data
is in the code.





VeraCode® technology. A digital revolution.

Illumina's unique VeraCode digital holographic code technology delivers unparalleled data quality for a multitude of bioassay formats. Precision and verifiability—that's the promise contained in every VeraCode microbead.

Unique code technology

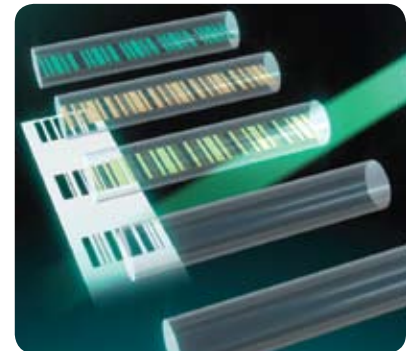
VeraCode's breakthrough technology is based on the use of cylindrical glass microbeads that:

- Measure 240µm in length x 28µm in diameter
- Contain a unique holographic code
- Are highly stable
- Provide information, such as target of interest in multiplex assays
- Enable tracking of critical identifiers
- Can easily carry high-density codes (24-bit), for virtually unlimited bead types

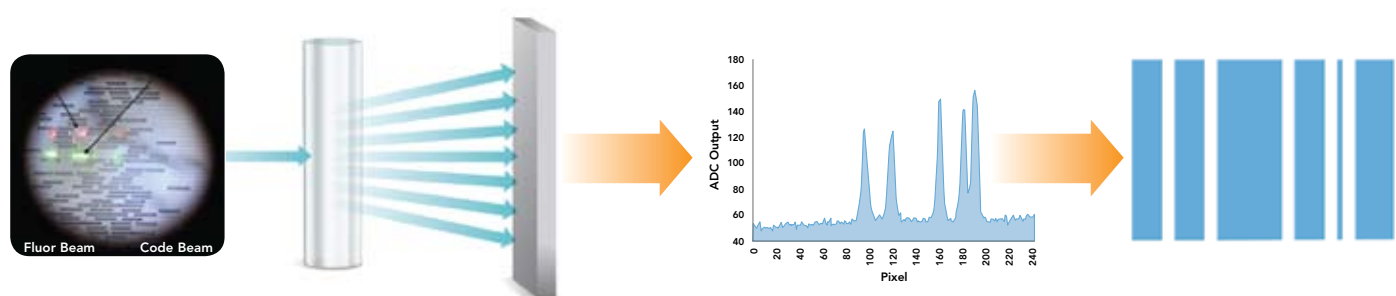
Making the code

The VeraCode digital code uses a patented holographic inscribing and detection process:

- The center of each bead supports a nanometer-scale, permanent change to index of refraction when exposed to ultraviolet light
- This index change forms a hologram that is imprinted via a local structural change of the glass matrix
- Successive writing of holograms into one microbead produces a specific pattern, or holographic code



Each Illumina VeraCode bead contains a code that identifies the bead type. This information is combined with the assay readout for downstream analysis.



Code detection

The holographic code image in each microbead diffracts an incident laser beam into multiple components. These components make up the optical "signature" of the bead code, which can be read using a CCD camera contained within the BeadXpress® Reader.

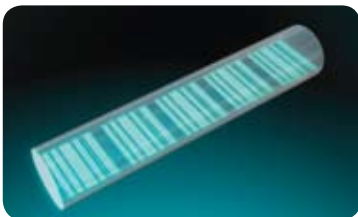


100% verifiability means true precision.

Imagine the possibilities

This versatile technology is the solution for applications that benefit from robust, multiplex-based testing methods. With a number of unique product offerings by Illumina, you can apply the code to fit your project needs.

- Biomarker research and validation
- Pharmaceutical development
- Industrial testing
- Agriculture
- Clinical research
- Molecular diagnostic assay development



Why the code?

The unique digital holographic code contained within each VeraCode microbead enables customizable tracking of multiplex assay markers and critical identifiers such as sample ID, laboratory ID, and reagent kits. Up to 24 bits of information inscribed in each code allows for an unprecedented level of error checking, improving the robustness of the optical readout process and providing a level of reliability that sets a new standard in multiplex testing.



Why the glass?

The high-purity silica glass used to make VeraCode microbeads has physical properties that make it an ideal substrate for attachment of biomolecules. The beads' surface chemistry enables easy development of a wide variety of nucleic acid and protein-based assays. The glass purity also minimizes any fluorescent background, so there is no interference with readout, providing a highly stable platform for reliable and reproducible results.



A breakthrough in multiplex range and assay flexibility.

VeraCode is the technology solution that grows with your needs and remains relevant during dynamic changes in your research pursuits.

Flexible multiplexing range

Whether you need a single-plex antibody detection assay or a 384-plex genotyping assay, VeraCode is the only technology to offer true multiplexing and assay versatility on one platform, providing researchers with a single powerful solution capable of meeting all of their assay needs.

- 1- to 384-plex-per-sample range is ideal for the development of focused research assays
- Multiplexing levels are achieved by simply pooling uniquely coded beads
- VeraCode microbeads use non-overlapping bead codes providing highly specific detection and unequalled precision

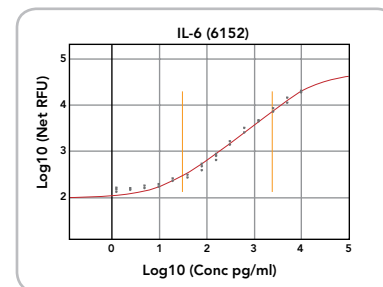
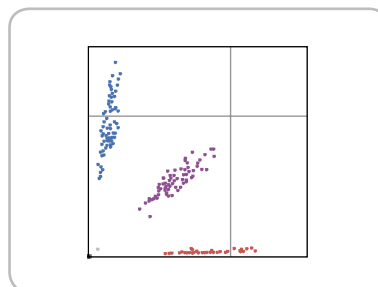
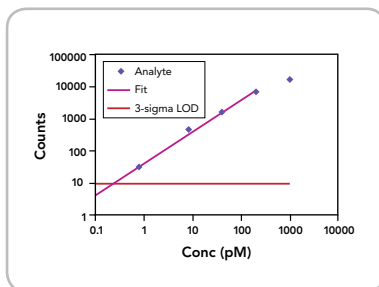


Unparalleled assay flexibility

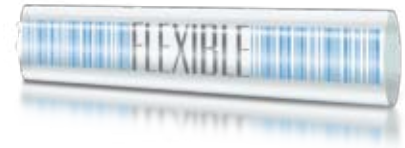
The glass surface of the VeraCode microbeads provides a single, flexible platform for the development of numerous types of solution-based bioassays with the power of microarrays. Existing applications for VeraCode include, but are not limited to:

- Genotyping
- Gene expression
- Protein-based assays

Unmatched versatility in both multiplexing levels and assay applications



Perform multiple assay applications—such as SNP genotyping, gene expression, and protein-based assays—all on a single platform.



Multiplexed assay applications

GoldenGate® genotyping

Illumina has adapted the proven power and flexibility of its GoldenGate Assay for use with the VeraCode technology. The GoldenGate protocol enables:

- Simultaneous genotyping of 96 to 384 SNPs for each sample in a 96-well microplate
- A high degree of multiplexing throughout successive extension and amplification steps
- Minimization of time, volume, and material requirements
- Call rates, reproducibility, and heritability rates >99.9%

Universal capture beads

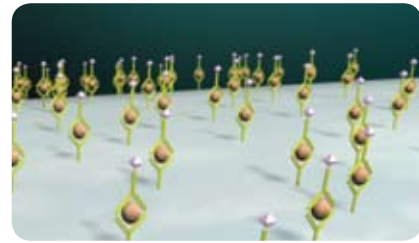
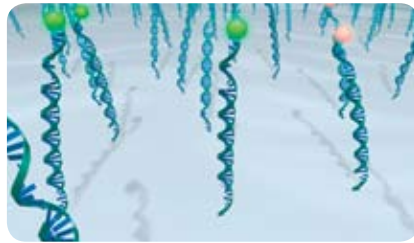
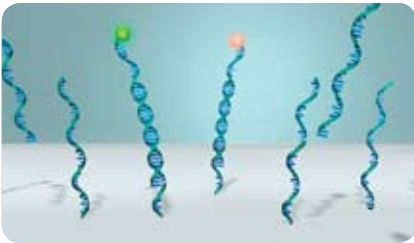
Design your own customized nucleic acid-based assays using VeraCode Universal Capture Bead sets. Each set features a unique oligonucleotide capture sequence and allows easy selection of multiplexing level by simply pooling different tubes of uniquely coded beads.

- Unique oligonucleotide bead types offer one-of-a-kind code identifiers
- High-density capture oligonucleotides immobilized on the microbeads provide a flexible and open platform for assay development
- Pre-screened capture sequences avoid cross-reactivity within genome

Carboxyl beads

The VeraCode Carboxyl Bead sets provide a powerful and open base for the development of protein-based assays by enabling the immobilization of specific capture antibodies on a coded carboxyl bead surface, thereby offering a limitless range of assay possibilities.

- Custom multiplex levels are achieved by pooling different tubes of uniquely coded carboxyl microbeads
- Superior low-end precision delivers highly sensitive assays
- Proven sensitivity and specificity demonstrated in a 10-plex cytokine assay



Assay bead kits are conveniently packaged for specific applications.



Extraordinary accuracy and reliability.

The BeadXpress Reader

Assays developed for the VeraCode microbeads are analyzed with Illumina's patented BeadXpress Reader, a high-throughput, two-color laser detection system designed to be compatible with standard laboratory automation. The key features of the BeadXpress system include:

- A fluidic system and reagent carrier that enable the scanning of multiple plates per day without the need to refill system buffers
- An open-platform, two-color laser detection bioassay system that supports the development of single-color assays such as Allele Specific Primer Extension (ASPE), as well as two-color assays such as Illumina's GoldenGate Assay
- Rapid sample throughput rates of 120 samples / hour at 10-plex and 80 samples / hour at 96-plex
- Analysis of standard 8-well strips or 96-well plates



The Illumina BeadXpress Reader employs a dual-color laser detection system to identify and analyze each VeraCode bead.

beadXpress®

Robust performance

VeraCode microbeads provide a highly stable platform. Assays developed with VeraCode microbeads typically include 25 to 30 replicates of each bead type so the data generated is particularly robust. Using the BeadXpress system, VeraCode microbeads are:

- Optically sampled up to a dozen times each, providing about 300 independent data points for each analyte
- Randomly arrayed in the groove cell to minimize scanner errors
- Inscribed with up to 24 bits of information; the initial bits in a code sequence are used for error checking, thereby greatly improving the reliability of the readout and results

Powerful and friendly analysis software

Powerful VersaScan Software provides user-friendly customization of scanning protocols and is compatible with Illumina's proven BeadStudio Data Analysis Software.

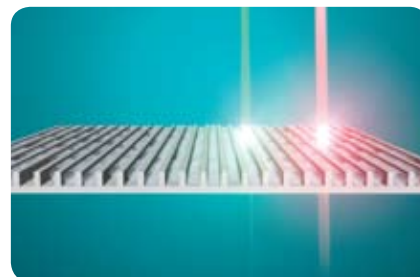
- Enables acquisition and viewing of intensity data, report generation, and data extraction for application-specific data analysis modules
- Generates *.csv and *.idat files for data export to Illumina BeadStudio or third-party data analysis programs

Get into the groove.

One of the patented technologies developed to enable the rapid and accurate readout of the VeraCode microbeads is the transparent groove plate. The groove plate forms the bottom of a fluidic cell that has 8 chambers, one for each well in a column of a standard 96-well plate. Through a unique combination of fluid flow, gravity, and capillary force, the VeraCode microbeads enter the groove plate cell and align closely within the grooves.



Once aligned, the entire cell is read by the optical system for fluorescent measurement and code classification. This approach creates a spatially random array of particles at a high packing density that enables rapid and accurate detection of the unique bead codes and the assay-specific fluorescence results.



Service that's always 100% Illumina.

With your purchase, Illumina will ensure that your BeadXpress system is properly installed and qualified, and will provide ongoing maintenance and service. Illumina also offers:

- Unlimited support by phone from Technical Support Scientists
- A variety of Service Contracts to meet the specific needs of your laboratory
- Customized training packages with our skilled Field Applications Scientists



VeraCode technology.

The difference between good data and great data is in the code.

The revolutionary VeraCode system, with its unique digital holographic code technology, offers:

- Unmatched data precision and verifiability
- Robust performance and customizable tracking
- A flexible single platform for numerous bioassay formats, including genotyping, gene expression, and protein-based assays
- An ideal solution for low- to mid-plex levels: 1 to 384 targets / samples in a single well
- Rapid and accurate high-throughput, two-color laser detection system
- User-friendly analysis software

Learn more at

www.illumina.com/beadXpress



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