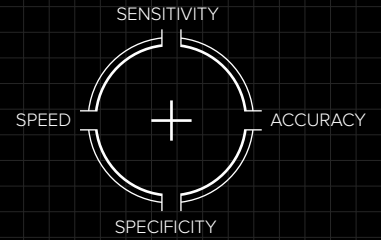


# THE SCIENCE OF ACCELERATING RESEARCH



No compromise

## MASSARRAY SYSTEM

- Genotyping
- Somatic mutation profiling
- Methylation analysis
- Quantitative gene expression and copy number variant analysis
- Molecular typing of pathogens

For Research Use Only. Not for use in diagnostic procedures.



## OVERVIEW

Next-generation sequencing and genome-wide association studies have revolutionized the genetic landscape, leading to the discovery of genetic markers with potential relevance for personalized medicine and pharmacogenomics. However, all genetic marker candidates – whether they are particular polymorphic loci, gene transcripts, or methylated regions – require further validation in order to advance to the next stage of utility and potentially lead to a molecular diagnostic test.

An ideal validation method should be flexible and scalable in throughput to evaluate a varying number and type of markers. The MassARRAY® System, available in 96- and 384-well formats, affords this capability.

### MASSARRAY SYSTEM – AN IDEAL GENETIC ANALYSIS SYSTEM

The MassARRAY System offers matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) for high accuracy and sensitivity, robust chemistry for reproducible results, and advanced data analysis software to meet the needs of any genomic laboratory.

The MassARRAY System is a scalable platform with a suite of applications for quantitative and qualitative nucleic acid analysis, which provides flexible assay design, fast time-to-results, and the ability to run from tens to thousands of samples daily. These features make it the ideal genetic analysis system for validation and fine mapping studies in basic and translational research settings.



### THE COMPLETE SOLUTION FOR GENOMIC ANALYSIS

#### High performance

Accurate MALDI-TOF MS detection provides unparalleled specificity and sensitivity for the most reliable results.

#### Maximum flexibility

Analyze any combination of SNPs and samples to meet varying study requirements.

#### Highly scalable

96- and 384-well options for low to high-throughput applications.

#### Easy to use

Data acquisition software streamlines your workflow, and robust assay design software automates primer design and optimization to maximize efficiency and minimize experimental variability.

#### A variety of genomic applications

Ready-to-use reagent sets for somatic mutation analysis, genotyping, methylation analysis, and quantitative applications (gene expression and copy number variation) provide a broad and flexible menu with short turnaround time.



Amplify

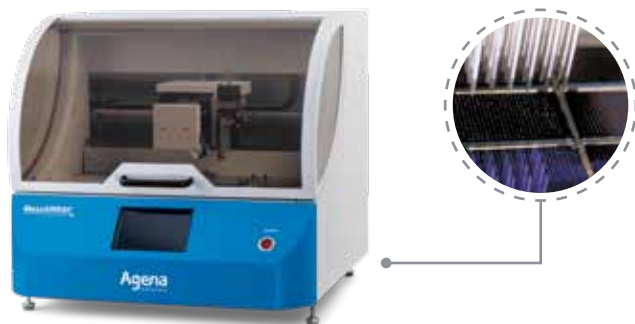
## INDIVIDUAL SYSTEM COMPONENTS

### MASSARRAY ANALYZER 4

The MassARRAY Analyzer 4 is a benchtop MALDI-TOF mass spectrometer specifically designed for genomic research applications. With the ability to automatically process up to two multiplexed 96- or 384-well SpectroCHIP Arrays per run, the MassARRAY Analyzer 4 can analyze from dozens to over 100,000 genotypes per day, and from tens to thousands of samples.

### MASSARRAY APPLICATION SOFTWARE

The MassARRAY Analyzer 4 includes integrated data analysis software specific to your application. Application software provides interactive visualization of the data and enables you to evaluate and manage results and generate reports.



### MASSARRAY NANODISPENSER RS1000

The MassARRAY Nanodispenser RS1000 is a benchtop dispensing instrument employing advanced robotics for the rapid transfer of nanoliter volumes of sample onto SpectroCHIP Arrays. Its standard configuration holds up to two 96- or 384-well microtiter plates. One plate of samples is transferred in less than 10 minutes.

### MASSARRAY LIQUID HANDLER

The MassARRAY Liquid Handler epMotion® is a highly flexible workstation that offers a cost-effective solution for automating manual steps in the MassARRAY workflow. Agena Bioscience has designed and included custom application methods that will greatly improve both the workflow and walk-away-time by automating 90% of post-PCR hands-on processing. To further simplify the operation of the MassARRAY Liquid Handler epMotion, Agena Bioscience offers a line of automation reagent sets with increased reagent fill volumes that ensure processing of 10 complete plates. There is no need to customize or optimize the MassARRAY Liquid Handler epMotion.



Analyze



## APPLICATIONS

The MassARRAY System is a flexible platform that allows you to perform a variety of DNA analysis applications. The following research-use-only applications are available.

### SOMATIC MUTATION PROFILING

Oncogene mutations are key to cancer research; recent research studies suggest genetic variants play a significant role in tumorigenesis, pathogenesis, and disease progression<sup>1,2</sup>. Agena Bioscience's family of research-use-only somatic mutation panels can help you accelerate translational and clinical research studies:

- **OncoCarta™ Panel:** Confirm mutation profiles in tumor samples across 19 key oncogenes.
- **OncoFOCUS™ Panel:** Validate tumor samples using a highly focused panel for *BRAF*, *EGFR*, *KRAS*, and *NRAS* mutation analysis.
- **LungCarta™ Panel:** Profile lung adenocarcinoma samples for disease-specific signatures.
- **UltraSEEK™ Oncogene Panel:** Detect low frequency mutations in complex tumor and circulating plasma samples at ≤ 1% frequency.

### GENOTYPING

iPLEX® is the leading technology for SNP genotyping. The MassARRAY System is widely used for fine mapping and validation of large scale genome discovery studies, as well as development of routine genetic tests for applications such as human sample identification and inherited disease profiling.

MassARRAY combines the benefits of a simple and accurate primer extension chemistry with state-of-the-art MALDI-TOF mass spectrometry to quickly and cost-effectively characterize genotypes with the highest levels of accuracy and reproducibility. The iPLEX assay has been used in hundreds of published studies to design assays at a multiplexing level of up to 36-plex. Agena Bioscience offers a number of research-use-only genotyping panels, including:

- **iPLEX Pro Sample ID Panel:** Screen DNA extracted from FFPE samples, cell lines, and/or tissues in order to identify sample mismatch, sample duplication, and/or sample identification, and to quantify input DNA prior to further genotyping assays.

- **iPLEX ADME PGx Pro Panel:** Genotype and screen for genetic variations that may influence absorption, distribution, metabolism, and excretion of drugs and compounds, in 191 of the most biologically-relevant pharmacogenetic ADME markers in 36 genes.

- **Hemo ID™ Blood Group Genotyping Panel:** Type 101 antigens in 16 blood group systems, and 23 platelet/neutrophil antigens.

### METHYLATION ANALYSIS

MassARRAY EpiTYPER® for quantitative DNA methylation analysis combines base-specific enzymatic cleavage with MALDI-TOF mass spectrometry. This combination creates a highly accurate, sensitive, and high-throughput method for the quantitative analysis of DNA methylation. MassARRAY EpiTYPER is scalable and allows you to analyze multiple CpGs on a single amplicon without compromising accuracy, sensitivity, or reproducibility. The EpiTYPER software provides convenient solutions for data analysis and export.

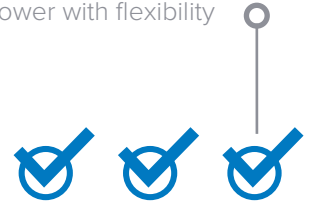
### MOLECULAR TYPING OF PATHOGENS

The MassARRAY System sets a new precedent for rapid, accurate molecular identification of microbes, viruses, and other haploid organisms. By combining the sensitivity of PCR and the accuracy of MALDI-TOF mass spectrometry, you can analyze one or more target regions on multiple samples in a convenient, homogeneous assay format.

### QUANTITATIVE GENE EXPRESSION AND COPY NUMBER VARIANT ANALYSIS

Quantitative gene expression (QGE) analysis on the MassARRAY System combines competitive PCR with MALDI-TOF mass spectrometry, enabling a highly accurate, sensitive, and high-throughput method for QGE analysis. MassARRAY QGE is scalable, allowing you to perform assays without compromising accuracy, sensitivity, or reproducibility. In addition, the method does not use chemiluminescence, fluorescence or other secondary labeling approaches, making it cost-effective, in addition to enabling higher levels of multiplexing (up to 24-plex) and unparalleled precision. MassARRAY QGE is the method of choice for validation of microarray data, for the investigation of coding and noncoding transcripts – and whenever sensitivity and accuracy are required in transcription analysis.

Balancing power with flexibility



## FROM SAMPLE TO RESULTS IN A DAY

Use our online Assay Design Suite software to develop your assays, or purchase one of our pre-designed panels. You can also use the expert services of the scientists in our Assays by Agena team to help with everything from designing custom panels to running the assays for you in our lab.

Starting with purified DNA or RNA, genetic analysis on the MassARRAY System can be accomplished in a single day. The workflow consists of the following steps:

### Prepare and run sample

After DNA or RNA extraction, the MassARRAY biochemistry is performed in either 96- or 384-well formats. Locus-specific multiplexed PCR reactions are used to amplify regions of interest, then excess nucleotides are removed by adding shrimp alkaline phosphatase, and the extension or fragmentation reaction is performed.

### Transfer analyte

The extension or fragmentation products (analyte) are desalted, then transferred using the MassARRAY

Nanodispenser RS1000 to a SpectroCHIP® Array (Chip), a silicon Chip with pre-dispensed matrix crystal.

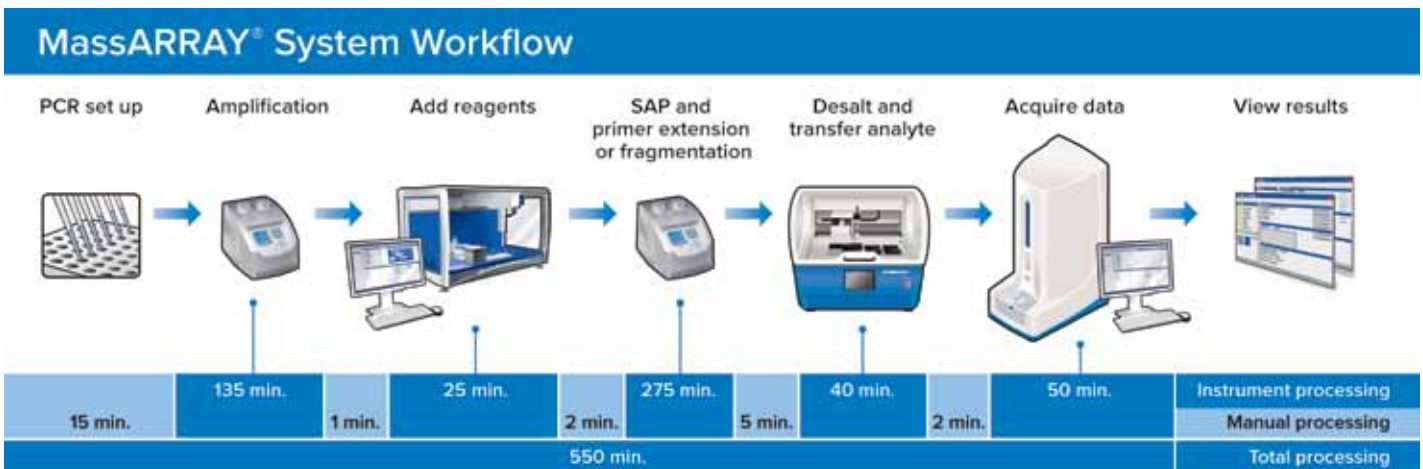
### Acquire data

The Chip is loaded into the MassARRAY Analyzer 4 MALDI-TOF mass spectrometer, where the analyte/matrix co-crystals are desorbed and ionized. The analyte molecules are accelerated and their time-of-flight is measured.

The MassARRAY Analyzer 4 is designed to detect DNA within a mass range of approximately 4,500 Da to 9,000 Da, and can distinguish between analytes separated by 16 Da or more. (Analytes are typically 18-25 nucleotides.) Peak area ratios provide a quantitative readout.

### View results

Data acquired by the MassARRAY Analyzer 4 is processed using software specific to your application, allowing you to view and analyze the data and print reports.



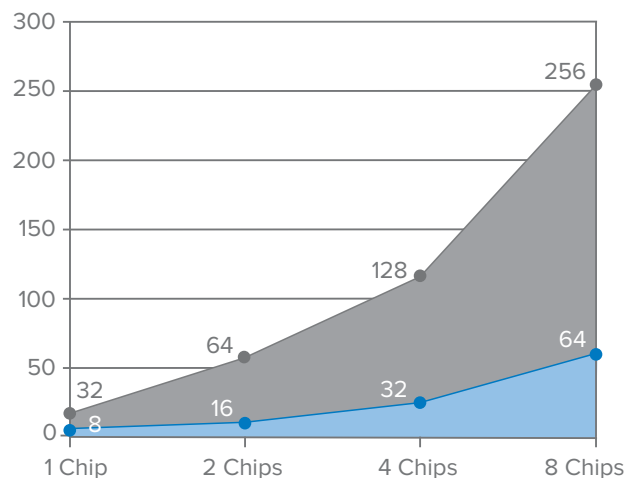
Total amplification and extension cycling time can be reduced by 110 minutes with the Veriti Thermal Cycler.

## FLEXIBLE SAMPLE THROUGHPUT WITH THE MASSARRAY 384/96 SYSTEMS

The MassARRAY System is offered in two different configurations to meet your throughput needs. The throughput of the MassARRAY System depends upon the well format for a given panel.

With a 1-well panel, such as the iPLEX Pro Sample ID Panel, up to 768 samples per day can be typed in 96-well mode, or 3,072 samples in 384-well mode.

With a 12-well panel, such as the OncoFOCUS Panel, up to 256 samples can be run within a single day in 384-well mode. The system will also run in 96-well mode for smaller sample studies, from 8 to 64 samples per day, reducing the amount of sample batching required. (Figure 1).



**Figure 1.** Sample throughput on the MassARRAY system  
■ 96 format, 12 well assay    ■ 384 format, 12 well assay

## PUBLISHED STUDIES USING THE MASSARRAY SYSTEM

Visit <http://agenabioscience.com/genetics> to search our online database to find published studies using the MassARRAY System in your area of interest.



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The MassARRAY System, OncoCarta Panel, OncoFOCUS Panel, LungCarta Panel, UltraSEEK Oncogene Panel, iPLEX Pro Sample ID Panel, iPLEX ADME PGx Pro Panel, Hemo ID Blood Group Genotyping Panel, MassARRAY EpiTYPER and MassARRAY QGE are for Research Use Only. Not for use in diagnostic procedures.

Agena Bioscience's patented nucleic acid analysis by mass spectrometry methods and products are protected under United States patent rights including but not limited to 5,869,242; 6,024,925; 6,238,871; 6,258,538; 6,300,076; 6,440,705; 6,500,621; 6,558,623; 6,569,385; 6,979,425; 6,994,969; 7,019,288; 7,025,933; 7,285,422; 7,332,275; 7,390,672; 7,419,787; 7,501,251; 7,888,127; 8,003,317; 8,034,567; 8,315,805; and 8,349,566 and patents pending including but not limited to US20050272070 and US20130017960, and foreign counterparts including but not limited to, EP0815261B1, EP173622B1, EP1727911B1, EP1546385B1, EP1332000B1, EP1613723B1, EP1660680B1, and EP2107129B1.

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