GENEASYS PATENT PORTFOLIO

As part of its ongoing activities, Geneasys has filed 354 USPTO patent applications and the corresponding PCTs, all with the filing date 1 June 2011, to provide optimal IP protection for its suite of innovative technological solutions in the field of molecular diagnostics. The filing was designed to specifically protect areas of technology that give Geneasys its strong position in the field of molecular diagnostics. The priority date for all of these applications is 18 June 2010 when the provisional filing was made.

In this document a list of Geneasys' key areas of strength is given, categories of patents filed are listed, and a list of important patents for each area of technological strength is provided.

1.1 KEY AREAS OF STRENGTH OF THE GENEASYS KEYLAB PLATFORM

- **Full integration of the Lab-on-a-Chip (LOC) solution:** The KeyLab centerpiece is a lab-on-a-chip (LOC) device that is fabricated using standard CMOS integrated circuit (IC) and, and a custom Micro-Electro-Mechanical-Systems (MEMS) process exclusively using standard semiconductor processing equipment. A complete LOC device, fully integrating both electronics and microfluidics, is therefore fabricated on a single chip.

- **Design for automated, high-volume manufacturing:** The KeyLab is designed for fully automated fabrication and robotic assembly and loading to allow cost effective manufacture of many millions to billions of modules per year.

- **Large number of tests per panel:** The KeyLab can simultaneously detect up to 1000+ hybridization events or immunoassay conjugation events. This corresponds to a panel of up to several hundred biomarkers being detected simultaneously, to allow for a number of replicates for each biomarker, and therefore provide a high level of confidence in the results generated. The panel size can be adjusted to suit the particular application. The example design with 1000 hybridization sites is an optimization to achieve a significant number of sites at a low cost.

- **Detection of a range of target types:** Diagnostic and analytical objectives of the KeyLab include infectious diseases, genetic disorders, and many other conditions.

- **Low module cost:** Each KeyLab module will cost less than $2.00 to manufacture in high volumes.

- **High speed:** Rapid assay and instantaneous electronic reporting means KeyLab will deliver results within the normal consultation period for a visit to a medical professional.

- **Small size and portability:** The KeyLab is a very small, disposable module, only requiring off-the-shelf devices, like smart phones or tablet computers, as readers.

- **Simplicity of use:** The KeyLab is a sample-in-answer-out system that is fully automated once a sample is deposited. The KeyLab's KeyLOC lab-on-a-chip device performs all the steps of an assay required for molecular diagnostics. It prepares the sample, extracts the targets, performs any necessary amplification reactions, and detects the disease markers present, all in the confines of the KeyLab disposable module. For samples like blood it requires no preprocessing; lanceting the patient's finger is all that is required.

1.2 CATEGORIES OF PATENTS FILED

To protect the IP relating to the above key advantages, Geneasys has filed patents in the following categories.

- Lab-on-a-chip devices
- Modular lab-on-a-chip devices
- Lab-on-a-chip based diagnostic modules
- Dialysis technology
- Polymerase chain reaction (PCR) technology
- Lysis technology
- Incubation technology
- Micromixers
- LOC device electronics
- Lancet integration in diagnostic modules
- Diagnostic module readers
- Sensors
- Packaging
- Smart dispensing microvials

- Novel microfluidic valves
- Reagent dispensing apparatus
- Microfluidic devices for spotting of oligonucleotide probes
- Apparatus for loading of spotting devices
- System for variable microarray spotting
- System for variable loading of reagents into microfluidic devices
- Apparatuses for combined loading and spotting of diagnostic modules
- CMOS IC design

1.3 LISTING OF TOP TWENTY PATENT APPLICATIONS

Table 0-1: Listing of top twenty patent applications

USPTO App. No. Case Ref.	Patent Title	Relevance
13150087 GPC040US	Microfluidic Device with Parallel Nucleic Acid Amplification Section	To provide for multiple amplification reactions and a higher number of targets within one assay, amplification is performed in parallel reaction chambers.
13150074 GCF036US	LOC Device with Parallel DNA and RNA Amplification Functionality	To increase the diagnostic data obtained from a single biological sample by using a single device, a LOC should be capable of simultaneously analyzing RNA as well as DNA.
13150047 GCF023US	LOC Device for Pathogen Detection, Genetic Analysis and Proteomic Analysis with Dialysis, Chemical Lysis, Incubation and Nucleic Acid Amplification	To increase the diagnostic data obtained from a single biological sample by using a single device, a LOC should be capable of simultaneously performing both proteomics and genomics.
13149934 GDA001US	Microfluidic Device for Simultaneous Detection of Multiple Conditions in a Patient	Provides for genetic analysis of a large number of markers simultaneously, which is one of the main advantages of KeyLab.
13149928 GAS001US	Microfluidic Device with Photosensor	To increase functional integration and reduced cost, the detection system should be built into the device.
13150259 GAS080US	LOC Device for Genetic Analysis and Electrochemiluminescent Detection of Target Sequences	Provides for a core capability of the KeyLab integrated system, ECL detection of hybridized probes using on-chip detection electronics.
13149890 GAS104US	Microfluidic Device with Low-Volume Hybridization Chambers for Electrochemiluminescent Detection of Target Sequences	To increase the number of markers which can be evaluated in parallel, amplification is coupled with a dense array of small chambers with independent probes.
13149971 GAS111US	LOC Device with Integral Photosensor for Electrochemiluminescence Based Detection of Targets	Obviates the need for an external imaging system to detect hybridized probes, catering for a fully integrated solution.

USPTO App. No. Case Ref.	Patent Title	Relevance
13149958 GAS012US	Microfluidic Device with Time Delayed Detection of Fluorescence From Hybridized Probes	A core capability of the KeyLab integrated molecular diagnostic system is detection of hybridized probes using on-chip detection electronics.
13150213 GGA001US	Test Module for Gravity-Independent Operation	To reduce functional complexity and cost the devices are designed as capillary propelled systems, leveraging solutions based upon surface physics and surface chemistry rather than inefficient macroscale methods.
13150208 GAL001US	Robotic System for Loading Oligonucleotides into Spotting Devices	To increase efficiency, quality and control, the manufacturing process should include an apparatus to automatically dispense reagents and oligonucleotides into the LOC.
13150234 GCA002US	Apparatus for Dispensing Reagents, Loading Oligonucleotide Spotting Devices and Spotting Oligonucleotide Probes	To increase efficiency, quality and control, the manufacturing process should include an apparatus to automatically dispense reagents and oligonucleotides into the LOC.
13149891 GMO001US	Fabrication System for Lab-on-a-Chip (LOC) Devices with Differing Application Specific Functionality	To significantly increase design flexibility and provide application specific solutions, each functional subsystem is modular and compatible with a single manufacturing process.
13150206 GLE014US	Test Module That Updates Medical Databases	The patient benefits by the instantaneous release of assay results for examination by medical specialists.
13150211 GAS050US	USB-Interfaceable Portable Test Module for Detection of Hybridized Probes	To maintain portability and ease-of-use, the USB port is important for the module to be able to interface with off-the-shelf readers.
13150159 GLE001US	Microfluidic Device with Digital Memory	For the module to transmit data and receive system updates and patient data independent of any specialized external support, integrated electronics to control communications is required.
13150182 GLE007US	LOC Having on-Chip Electronics for Use in a Test Module to Control Module Communications	For the module to transmit data and receive system updates and patient data independent of any specialized external support, integrated electronics to control communications is required.

USPTO App. No. Case Ref.	Patent Title	Relevance
13150018 GPC005US	Microfluidic Device with Temperature Feedback Controlled PCR Section	A core functional section to molecular diagnostic systems, a monitored and controlled integrated PCR section amplifies the target with the requisite sensitivity for detection.
13149900 GBS001US	Microfluidic Device with MST Layer and Overlying Cap	For an assay to be completely self-contained the microfluidic device should integrate both small and large scale features if it is to transport and process the cells and macromolecules of a biological sample.
13149913 GBS003US	Microfluidic Device with Large Channels for Cell Transport and Small Channels Suitable for Biochemical Processes	For an assay to be completely self-contained the microfluidic device should integrate both small and large scale features if it is to transport and process the cells and macromolecules of a biological sample.

1.4 IMPORTANT PATENT APPLICATIONS FOR EACH AREA OF TECHNOLOGICAL STRENGTH

Table 0-2: A selection of important patents relating to Geneasys' KeyLab's fully integrated LOC

USPTO App. No. Case Ref.	Patent Title	Relevance
13149928 GAS001US	Microfluidic Device with Photosensor	Obviates the need for an external imaging system, catering for a fully integrated solution.
13149900 GBS001US	Microfluidic Device with MST Layer and Overlying Cap	The LOC's surface micromachined MST structures provide the high density, small-scale features for transporting nucleic acids. The LOC's CAP provides the larger-scale features for transporting biological fluids. Together they provide for a complete set of microfluidic features for transporting and processing biological samples.
13149911 GBS002US	Microfluidic Device with Laminar Structure	Provides for the use of standard surface and bulk micromachining for LOC fabrication catered for an integrated solution.

USPTO App. No. Case Ref.	Patent Title	Relevance
13149891 GMO001US	Fabrication System for Lab-on-a-Chip (LOC) Devices with Differing Application Specific Functionality	The LOC fabrication system provides for any combination of functional units to be combined using a single manufacturing process into designs that meet any diagnostic or analytical objective.
13150018 GPC005US	Microfluidic Device with Temperature Feedback Controlled PCR Section	When combined, electronics and MEMS provide crucial integrated functionality, such as temperature controlled PCR, that if implemented otherwise would be expensive and inefficient.

Table 0-3: A selection of important patents relating to Geneasys' KeyLab's automated, high-volume manufacture:

USPTO App. No. Case Ref.	Patent Title	Relevance
13150208 GAL001US	Robotic System for Loading Oligonucleotides into Spotting Devices	Provides for an automated, high-volume manufacturing environment as it provides fast dispensing of volumetrically and spatially precise oligonucleotides into the spotting device.
13150234 GCA002US	Apparatus for Dispensing Reagents, Loading Oligonucleotide Spotting Devices and Spotting Oligonucleotide Probes	Provides for a combined apparatus for dispensing reagents into the LOC, loading of oligonucleotide spotting devices, and spotting those oligonucleotides into the LOC.
13150125 GMV004US	Microvial with Digital Memory for Storage of Oligonucleotide Specification Data	Provides for the LOC to store all data associated with oligonucleotides catering for automatic high-scale assembly, particularly in the areas of quality assurance and management.
13150229 GSL001US	System for Variable Loading of Reagents into Microfluidic Device for Genetic Analysis	Provides for loading of various reagent combinations for different analytical and diagnostic objectives catering for an automated, high throughput manufacturing system with ability to address a wide range of market segments.

Table 0-4: A selection of important patents relating to Geneasys' KeyLab's large number of tests per panel

USPTO App. No. Case Ref.	Patent Title	Relevance
13149954 GAS010US	Microfluidic Device with Hybridization Chambers and Corresponding Diffusion Barriers	The diffusion barrier minimizes probe backflow, providing maximal areal density of probes and for large panel sizes.
13149947 GAS008US	Microfluidic Device with Low-Volume Hybridization Chambers	A low-volume hybridization chamber provides for maximal areal density of chambers and for large panel sizes.
13150224 GPA005US	Oligonucleotide Spotting Robot for High Density Spotting of Oligonucleotides	Provides for scalable panel sizes, of high chamber density, to be loaded with oligonucleotides automatically.
13149919 GBS006US	Microfluidic Test Module Incorporating Surface Micro-Machined Chips and Interconnecting Cap	For high functional expandability, microfluidic multichips provides for fluidic integration of multiple chips to generate complex systems catering for further expansion panel sizes.

Table 0-5: A selection of important patents relating to Geneasys' KeyLab's flexibility to detect a range of targets

USPTO App. No. Case Ref.	Patent Title	Relevance
13149992 GCF002US	Loc Device for Pathogen Detection with Dialysis, Lysis and Parallel Nucleic Acid Amplification	Provides for detection of nucleic acids of pathogenic origin. Refers to the functional units of dialysis for pathogen selection, thermal or chemical lysis chambers for nucleic acid extraction, and parallel amplification chambers for multiple simultaneous separately optimized amplification reactions.
13150020 GCF011US	Loc Device for Genetic Analysis with Dialysis, Chemical Lysis, Incubation and Nucleic Acid Amplification	Provides for detection of nucleic acids for genetic analysis. Refers to the functional units of: dialysis for cell selection, chemical lysis chambers, incubation chambers for restriction digestion and/or ligation, and amplification chambers.
13150047 GCF023US	LOC Device for Pathogen Detection, Genetic Analysis and Proteomic Analysis with Dialysis, Chemical Lysis, Incubation and Nucleic Acid Amplification	Provides for analysis of a sample's proteomic content via a homogeneous immunoassay probe system in addition to simultaneously detecting pathogens and performing genomic analysis.

USPTO App. No. Case Ref.	Patent Title	Relevance
13150074 GCF036US	LOC Device with Parallel DNA and RNA Amplification Functionality	Provides for analysis of a sample's RNA content (for example, from RNA viruses or other RNA) in addition to analysis of DNA.
13149934 GDA001US	Microfluidic Device for Simultaneous Detection of Multiple Conditions in a Patient	Provides for genetic analysis of a large number of markers simultaneously, which is one of the main advantages of KeyLab.
13150093 GDA002US	Microfluidic Device for Analysis of Mitochondrial DNA	Provides for genetic analysis to detect mitochondrial DNA for characterizing mutations or human mitochondrial disorders or analyzing degraded samples.

Table 0-6: A selection of important patents relating to Geneasys' KeyLab's low module cost

USPTO App. No. Case Ref.	Patent Title	Relevance
13149928 GAS001US	Microfluidic Device with Photosensor	Obviates the need for an expensive external imaging system, catering for achieving an inexpensive solution.
13149944 GAS007US	Microfluidic Device with Low Mass Probe Spots	Provides for low probe cost, catering for achieving an inexpensive solution.
13150142 GAS033US	LOC with Low-Volume Hybridization Chamber and Reagent Reservoir for Genetic Analysis	Provides for low assay reagent costs, catering for achieving an inexpensive solution.
13150269 GAS098US	Microfluidic Device with Electro-Chemiluminescent Probes and Integrated Photosensor for Detection of Target Molecules	Eliminates the excitation light source and associated optical and filter elements, catering for achieving an inexpensive integrated solution.
13150213 GGA001US	Test Module for Gravity-Independent Operation	Capillary driven flow systems obviate the need for expensive active components such as pumps.

Table 0-7: A selection of important patents relating to Geneasys' KeyLab's short assay duration

USPTO App. No. Case Ref.	Patent Title	Relevance
13149909 GDI001US	Microfluidic Device with Dialysis Section	Integration of a dialysis section increases the sensitivity, signal-to-noise ratio, and dynamic range of the assay system, which by eliminating sample preparation significantly speeds diagnostics.
13150151 GMI001US	Microfluidic Device with Mixing Section	Integrated mixing sections provide for the mixing of reagents with the sample.
13150035 GPC011US	Microfluidic Device for Rapid PCR Amplification	The small volumes of the integrated PCR provide for rapid nucleic acid amplification, increasing overall assay speed, catering for high speed diagnostics.
13149891 GMO001US	Fabrication System for Lab-on-a-Chip (LOC) Devices with Differing Application Specific Functionality	Integration of all functional sections within a LOC greatly speeds the diagnostic time by eliminating all manual procedures, catering to this is the fabrication system that makes integration possible.
13150206 GLE014US	Test Module That Updates Medical Databases	In addition to rapid assaying, provides for instantaneous updating of external database with results for inspection by medical specialists and organizations.

Table 0-8: A selection of important patents relating to Geneasys' KeyLab's USB key format and portability

USPTO App. No. Case Ref.	Patent Title	Relevance
13150211 GAS050US	USB-Interfaceable Portable Test Module for Detection of Hybridized Probes	In addition to providing the module's power and signaling requirements, the ubiquitous USB port caters for the module to interface with any off-the-shelf readers.
13150185 GLE008US	LOC Having USB Device Driver for Use in a Test Module to Control USB Connection	The USB device controller, being integral to the LOC device, obviates the need for USB controller chips outside of the LOC and provides for the module to interface with any off-the-shelf readers.
13150182 GLE007US	LOC Having on-Chip Electronics for Use in a Test Module to Control Module Communications	Integrated electronics for controlling communications caters for the module to receive or transmit data with external off-the-shelf readers.

USPTO App. No. Case Ref.	Patent Title	Relevance
13149952 GRE001US	Microfluidic Test Module for Interfacing with a Mobile Telephone	GRE001US is an example of a particular off-the-shelf reader for module integration for which IP coverage has been filed.

Table 0-9: A selection of important patents relating to Geneasys' KeyLab's ease of use

USPTO App. No. Case Ref.	Patent Title	Relevance
13149931 GAS002US	Microfluidic Device with Sample Inlet and Probe Hybridization Section	An integrated sample inlet provides for delivery of the sample in the small, volumetrically efficient, quantities required by a microfluidic device, catering for a sample-in-answer-out module design.
13149967 GDI015US	Microfluidic Device with Dialysis Device, LOC and Interconnecting Cap	An integrated dialysis section obviates the need for external sample preparation, catering for a sample-in-answer-out module design.
13150099 GLY001US	Microfluidic Device with Chemical Lysis Section	An integrated chemical lysis section obviates the need for external sample preparation to extract the nucleic acids, catering for a sample-in-answer-out module design.
13150018 GPC005US	Microfluidic Device with Temperature Feedback Controlled PCR Section	An integrated amplification section caters for a sample-in-answer-out module because it amplifies the target nucleic with the requisite sensitivity for detection.
13149951 GAS009US	Microfluidic Device for PCR and Probe Hybridization	An integrated hybridization section obviates the need for external sample analysis, catering for a sample-in-answer-out module.
13150105 GRR002US	Microfluidic Device with Total Reagent Storage	All reagents (for example, anticoagulant, lysing agents, and polymerases) are stored within the module, catering for a sample-in-answer-out module.

1.5 TOP PATENT APPLICATIONS

Table 0-10: The most important patents spanning the solution space covered by Geneasys' IP portfolio

USPTO App. No. Case Ref.	Patent Title	Relevance
13150087 GPC040US	Microfluidic Device with Parallel Nucleic Acid Amplification Section	To provide for multiple amplification reactions and a higher number of targets within one assay, amplification is performed in parallel reaction chambers.
13150074 GCF036US	LOC Device with Parallel DNA and RNA Amplification Functionality	To increase the diagnostic data obtained from a single biological sample by using a single device, a LOC should be capable of simultaneously analyzing RNA as well as DNA.
13150047 GCF023US	LOC Device for Pathogen Detection, Genetic Analysis and Proteomic Analysis with Dialysis, Chemical Lysis, Incubation and Nucleic Acid Amplification	To increase the diagnostic data obtained from a single biological sample by using a single device, a LOC should be capable of simultaneously performing both proteomics and genomics.
13149934 GDA001US	Microfluidic Device for Simultaneous Detection of Multiple Conditions in a Patient	Provides for genetic analysis of a large number of markers simultaneously, which is one of the main advantages of KeyLab.
13149928 GAS001US	Microfluidic Device with Photosensor	To increase functional integration and reduced cost, the detection system should be built into the device.
13150259 GAS080US	LOC Device for Genetic Analysis and Electrochemiluminescent Detection of Target Sequences	Provides for a core capability of the KeyLab integrated system, ECL detection of hybridized probes using on-chip detection electronics.
13149890 GAS104US	Microfluidic Device with Low-Volume Hybridization Chambers for Electrochemiluminescent Detection of Target Sequences	To increase the number of markers which can be evaluated in parallel, amplification is coupled with a dense array of small chambers with independent probes.
13149971 GAS111US	LOC Device with Integral Photosensor for Electrochemiluminescence Based Detection of Targets	Obviates the need for an external imaging system to detect hybridized probes, catering for a fully integrated solution.

USPTO App. No. Case Ref.	Patent Title	Relevance
13149958 GAS012US	Microfluidic Device with Time Delayed Detection of Fluorescence From Hybridized Probes	A core capability of the KeyLab integrated molecular diagnostic system is detection of hybridized probes using on-chip detection electronics.
13150213 GGA001US	Test Module for Gravity-Independent Operation	To reduce functional complexity and cost the devices are designed as capillary propelled systems, leveraging solutions based upon surface physics and surface chemistry rather than inefficient macroscale methods.
13150208 GAL001US	Robotic System for Loading Oligonucleotides into Spotting Devices	To increase efficiency, quality and control, the manufacturing process should include an apparatus to automatically dispense reagents and oligonucleotides into the LOC.
13150234 GCA002US	Apparatus for Dispensing Reagents, Loading Oligonucleotide Spotting Devices and Spotting Oligonucleotide Probes	To increase efficiency, quality and control, the manufacturing process should include an apparatus to automatically dispense reagents and oligonucleotides into the LOC.
13149891 GMO001US	Fabrication System for Lab-on-a-Chip (LOC) Devices with Differing Application Specific Functionality	To significantly increase design flexibility and provide application specific solutions, each functional subsystem is modular and compatible with a single manufacturing process.
13150206 GLE014US	Test Module That Updates Medical Databases	The patient benefits by the instantaneous release of assay results for examination by medical specialists.
13150211 GAS050US	USB-Interfaceable Portable Test Module for Detection of Hybridized Probes	To maintain portability and ease-of-use, the USB port is important for the module to be able to interface with off-the-shelf readers.
13150159 GLE001US	Microfluidic Device with Digital Memory	For the module to transmit data and receive system updates and patient data independent of any specialized external support, integrated electronics to control communications is required.
13150182 GLE007US	LOC Having on-Chip Electronics for Use in a Test Module to Control Module Communications	For the module to transmit data and receive system updates and patient data independent of any specialized external support, integrated electronics to control communications is required.

USPTO App. No. Case Ref.	Patent Title	Relevance
13150018 GPC005US	Microfluidic Device with Temperature Feedback Controlled PCR Section	A core functional section to molecular diagnostic systems, a monitored and controlled integrated PCR section amplifies the target with the requisite sensitivity for detection.
13149900 GBS001US	Microfluidic Device with MST Layer and Overlying Cap	For an assay to be completely self-contained the microfluidic device should integrate both small and large scale features if it is to transport and process the cells and macromolecules of a biological sample.
13149913 GBS003US	Microfluidic Device with Large Channels for Cell Transport and Small Channels Suitable for Biochemical Processes	For an assay to be completely self-contained the microfluidic device should integrate both small and large scale features if it is to transport and process the cells and macromolecules of a biological sample.
13150058 GCF028US	LOC Device for Genetic Analysis with Dialysis and Nucleic Acid Amplification	To increase the diagnostic data obtained from a single biological sample by using a single device, a LOC should be capable of simultaneously analyzing RNA as well as DNA.
13149919 GBS006US	Microfluidic Test Module Incorporating Surface Micro-Machined Chips and Interconnecting Cap	For high functional expandability, microfluidic multichips provides for fluidic integration of multiple chips to generate complex systems catering for further expansion panel sizes.
13149937 GAS004US	Microfluidic Device with Temperature Feedback Controlled Hybridization Chambers	To provide for high specificity in the hybridization step, and therefore accurate diagnostic performance, precise temperature control is employed.
13150109 GAS025US	LOC with Integral Led Driver for Excitation Led	Provides for excitation of fluorescently-labelled probes, driven automatically by the LOC electronics.
13150192 GAS045US	Genetic Analysis LOC with Hybridization Array with Calibration Photosensor Output Subtracted in a Differential Circuit From The Output of Hybridization Photosensors	To increase the detection sensitivity and improve performance, on-chip correction for background signal levels and noise is advantageous.

USPTO App. No. Case Ref.	Patent Title	Relevance
13150207 GAS049US	Portable Test Module for Fluorescence Excitation of Probe Nucleic Acid Sequences	Provides for a key aspect of KeyLab, hand-held portability, with full integrated functionality within the module.
13150266 GAS088US	Genetic Analysis LOC Device with Electrochemiluminescent Probes and Integrated Photosensor for Detection of Target Sequences	To increase functional integration and reduce cost, a core requirement is that the detection system should be built into the device.
13150272 GAS091US	Genetic Analysis LOC Device with Thick Electrodes for Electrochemiluminescent Detection of Target Sequences	To increase the sensitivity of the detection system, coupling between the electrodes and the photosensor is enhanced with thick electrodes.
13149950 GAS105US	Microfluidic Device for PCR, Probe Hybridization and Electrochemiluminescent Detection of Probe-Target Hybrids	To increase the number of markers which can be evaluated in parallel, amplification is coupled with a dense array of small chambers with independent probes.
13150046 GAS132US	LOC Device for Detecting Target Nucleic Acid Sequences Using Electrochemiluminescent Probes and Calibration Probes with Detection Photosensors and Calibration Photosensors	To increase the ECL detection sensitivity and improve performance, on-chip correction for background signal levels and noise is advantageous.
13150098 GAS147US	Microfluidic Test Module with Photosensor	To increase functional integration within the module, the photosensor for detection should be built into the device.
13150105 GRR002US	Microfluidic Device with Total Reagent Storage	All reagents (for example, anticoagulant, lysing agents, and polymerases) are stored within the LOC, catering for sample-in-answer-out capability.
13150150 GVA004US	Microfluidic Device with Fault-Tolerant Multiple Valve Assembly	To improve the reliability of the LOC during operation, redundant valve arrays are included to reduce the chance of blockages.
13150154 GVA005US	Microfluidic Device with Surface Tension Valve At Reagent Reservoir Outlet	To provide for reliable operation of modules pre-loaded with reagents, surface tension valves automatically release reagents when the sample reaches the valve.

USPTO App. No. Case Ref.	Patent Title	Relevance
13150167 GVA009US	Microfluidic Device with a PCR Section with Single Activation, Outlet Valve	To provide for complete amplification and high sensitivity, the timing of sample flow is actively controlled.
13150190 GVA012US	Genetic Analysis LOC with Thermal Boiling-Initiated Valve	To provide for precise control over the timing of assay steps in the LOC, valves release the sample under control of the integrated electronics.
13150214 GVA018US	Fault-Tolerant Multiple Valve Assembly with Liquid Detector Sensor Feedback	To improve the reliability of the diagnostic results, redundant valve arrays are included to reduce the chance of blockages, and any failures are automatically reported.
13150233 GHU001US	Microfluidic Device with Humidifier	To improve diagnostic performance, an on-board humidifier is used to prevent excessive evaporation.
13150244 GHU007US	Microfluidic Device with Humidity Sensor	To further improve performance, the on-board humidifier is operated with closed-loop feedback control.
13150253 GWM002US	Test Module with Waste Storage Incorporating Porous Element	An integrated porous element increases the efficiency of dialysis and provides for increasing the concentration of target molecules.
13149909 GDI001US	Microfluidic Device with Dialysis Section	Integration of a dialysis section increases the sensitivity, signal-to-noise ratio, and dynamic range of the assay system, which by eliminating sample preparation significantly speeds diagnostics.
13150099 GLY001US	Microfluidic Device with Chemical Lysis Section	An integrated chemical lysis section obviates the need for external sample preparation to extract the nucleic acids, catering for a sample-in-answer-out module design.
13150104 GLY002US	Microfluidic Device with Thermal Lysis Section	An integrated thermal lysis section obviates the need for external sample preparation to extract the nucleic acids from gram positive bacteria, catering for a sample-in-answer-out module design.
13150224 GPA005US	Oligonucleotide Spotting Robot for High Density Spotting of Oligonucleotides	Provides for scalable panel sizes, of high chamber density, to be loaded with oligonucleotides automatically.

USPTO App. No. Case Ref.	Patent Title	Relevance
13150022 GPC007US	Microfluidic Device with on-Chip Semiconductor Controlled PCR Section	When combined, electronics and MEMS provide crucial integrated functionality, such as temperature controlled PCR, that if implemented otherwise would be expensive and inefficient.
13150045 GPC018US	Genetic Analysis LOC for Isothermal Amplification of Nucleic Acids	A core functional section to molecular diagnostic systems, an isothermal amplification section amplifies the target with the requisite sensitivity for detection, with lower power requirements.
13150066 GPC031US	Genetic Analysis LOC Device for Multi-Stage Amplification of Nucleic Acid Sequences	For improved diagnostic accuracy, provides for nested amplification of target sequences in the presence of similar genetic material.
13150072 GPC035US	LOC Device with Nucleic Acid Amplification Section and Thermal Insulation Trench	For improved thermal performance and lower power consumption, a trench to insulated the amplification section is advantageous.
13150085 GPC039US	Test Module with Nucleic Acid Amplification Section	A core functional section to molecular diagnostic systems, an amplification section provides the requisite sensitivity for detection.
13150090 GPC041US	Test Module with Parallel Nucleic Acid Amplification Sections	Parallel amplification sections provide a combination of the requisite sensitivity for detection and the ability to detect many targets.
13150143 GPD001US	Oligonucleotide Spotting Device	To inprove throughput and reduce cost, the manufacturing process should include an apparatus to automatically spot oligonucleotide probes into the LOC.
13150129 GRD001US	Reagent Dispensing Apparatus	To support on-chip reagent storage and reduce cost, the manufacturing process should include automatic apparatus to load reagents into the LOC.
13149952 GRE001US	Microfluidic Test Module for Interfacing with a Mobile Telephone	In this example of a particular off-the-shelf reader, operation is enabled in resource-poor settings.
13150229 GSL001US	System for Variable Loading of Reagents into Microfluidic Device for Genetic Analysis	To inprove reagent traceability and reduce cost, the manufacturing process should include robotic apparatus for loading and recording a variety of reagents.

USPTO App. No. Case Ref.	Patent Title	Relevance
13150226 GSS001US	System for Variable Microarray Spotting and Genetic Analysis	To inprove manufacturing throughput and assay robustness, and to reduce the module cost, the manufacturing process should include robotic apparatus for spotting a variety of probe layouts.

1.6 LIST OF GENEASYS' PATENT APPLICATIONS

A list of Geneasys' patent applications is given in the following table.

Table 0-11: List of Geneasys' Patent Applications

Case Ref.	USPTO App. no.	Patent Title
GAL001US	13150208	Robotic System for Loading Oligonucleotides into Spotting Devices
GAS001US	13149928	Microfluidic Device with Photosensor
GAS002US	13149931	Microfluidic Device with Sample Inlet and Probe Hybridization Section
GAS003US	13149933	Microfluidic Device for Detection of Hybridization of Nucleic Acid Targets
GAS004US	13149937	Microfluidic Device with Temperature Feedback Controlled Hybridization Chambers
GAS006US	13149941	Microfluidic Device with Optically Transparent Hybridization Chambers
GAS007US	13149944	Microfluidic Device with Low Mass Probe Spots
GAS008US	13149947	Microfluidic Device with Low-Volume Hybridization Chambers
GAS009US	13149951	Microfluidic Device for PCR and Probe Hybridization
GAS010US	13149954	Microfluidic Device with Hybridization Chambers and Corresponding Diffusion Barriers
GAS012US	13149958	Microfluidic Device with Time Delayed Detection of Fluorescence From Hybridized Probes
GAS013US	13149962	Microfluidic Device with Triggered Photodetection of Fluorescing Probe-Target Hybrid
GAS014US	13149991	Microfluidic Device with Trigger Photodiode in Each Hybridization Chamber
GAS015US	13149999	Microfluidic Device with Sensor-Triggered Photodetection of Fluorescent Probe-Target Hybrid
GAS016US	13150004	Microfluidic Device with Delay-Triggered Photodetection of Fluorescent Probe-Target Hybrid

Case Ref.	USPTO App. no.	Patent Title
GAS017US	13150014	Microfluidic Device with Photodiodes with Controllable Shunts to Detect Fluorescing Hybridized Probes
GAS018US	13150029	Microfluidic Device for Detecting Target Nucleic Acid Sequences with Probes Having Long Fluorescence Lifetime Fluorophores
GAS019US	13150048	Microfluidic Device with Controllable Shunts Peripheral to Integrated Photodiodes
GAS020US	13150065	Microfluidic Device with Controllable Shunts Inside Integrated Photodiodes
GAS021US	13150071	Microfluidic Device with Non-Imaging Optics
GAS022US	13150075	Microfluidic Device with Large Angle of Collection of Emission Light
GAS023US	13150094	Single-Use Microfluidic Device
GAS024US	13150102	LOC with Integral Photosensor for Detection of Hybridization Assay Results
GAS025US	13150109	LOC with Integral LED Driver for Excitation LED
GAS026US	13150118	LOC for Detection of Hybridization of Nucleic Acid Sequences with Fluorescence Resonance Energy Transfer (FRET) Probes
GAS027US	13150122	LOC for Detection of Hybridization of Nucleic Acid Sequences with Primer-Linked Stem-And-Loop Probes
GAS028US	13150126	LOC for Detection of Hybridization of Nucleic Acid Sequences with Primer-Linked Linear Probes
GAS030US	13150130	LOC for Detection of Hybridization of Nucleic Acid Sequences with PCR Amplification Using Primers Covalently Attached to Stem-And-Loop Probes
GAS031US	13150134	LOC for Detection of Hybridization of Nucleic Acid Sequences with Nucleic Acid Amplification Using Primers Covalently Attached to Linear Probes
GAS032US	13150138	LOC for Detection of Hybridization of Nucleic Acid Sequences with PCR Amplification Using Linker Primers
GAS033US	13150142	LOC with Low-Volume Hybridization Chamber and Reagent Reservoir for Genetic Analysis

Case Ref.	USPTO App. no.	Patent Title
GAS034US	13150149	Genetic Analysis LOC with Hybridization Probes Including Positive and Negative Control Probes
GAS035US	13150153	Genetic Analysis LOC with Hybridization Array with Positive Control Chambers Incorporating Probes That Hybridize for any Amplicon
GAS036US	13150157	Genetic Analysis LOC with Hybridization Array with Positive Control Chambers Incorporating Probes with No Quenchers
GAS037US	13150161	Genetic Analysis LOC with Hybridization Array with Positive Control Chambers Incorporating Reporters
GAS038US	13150165	Genetic Analysis LOC with Hybridization Array with Negative Control Chambers Incorporating Probes Designed to Be Noncomplementary to Nucleic Acid Sequences in The Amplicon
GAS039US	13150169	Genetic Analysis LOC with Hybridization Array with Negative Control Chambers Incorporating Probes with No Reporters
GAS040US	13150174	Genetic Analysis LOC with Hybridization Array with Negative Control Comprising Empty Chambers
GAS041US	13150178	Microfluidic Device for Detecting Targets with Probes, Detection Photodiodes and a Calibration Photodiode
GAS042US	13150181	Genetic Analysis LOC with Hybridization Array with Calibration Chamber Containing Probe Designed to Be Noncomplementary to Nucleic Acid Sequences in The Amplicon
GAS043US	13150184	Genetic Analysis LOC with Hybridization Array with Calibration Chamber Containing Probe That Lacks a Reporter
GAS044US	13150188	Genetic Analysis LOC with Hybridization Array with Calibration Chamber Containing Chamber with a Blocked Inlet Spotted with Reporter
GAS045US	13150192	Genetic Analysis LOC with Hybridization Array with Calibration Photosensor Output Subtracted in a Differential Circuit From The Output of Hybridization Photosensors
GAS046US	13150195	Microfluidic Test Module with Low-Volume Hybridization Chamber
GAS047US	13150200	Microfluidic Test Module with Low Mass of Probes

Case Ref.	USPTO App. no.	Patent Title
GAS048US	13150204	Diagnostic Test Module with a LOC with Integral Photosensor and Excitation LED for Detection of Hybridization Assay Results
GAS049US	13150207	Portable Test Module for Fluorescence Excitation of Probe Nucleic Acid Sequences
GAS050US	13150211	USB-Interfaceable Portable Test Module for Detection of Hybridized Probes
GAS054US	13150216	Test Module with Low-Volume Hybridization Chamber and Low-Volume Reagent Reservoir
GAS055US	13150220	Test Module with Long Fluorescence Lifetime Probes
GAS056US	13150223	Test Module with Transition Metal-Ligand Complex Fluorophore
GAS057US	13150225	Test Module with Lanthanide Metal-Ligand Complex Fluorophore
GAS058US	13150228	Test Module with Probes Suspended in Fluid
GAS059US	13150231	Test Module with Time Delayed Detection of Fluorescence From Hybridized Probe
GAS060US	13150236	Test Module with Controlled Exposure of Fluorophores to Excitation Light Source
GAS061US	13150238	Single-Use Test Module for Detection of Hybridization of Targets with Oligonucleotide Probes
GAS062US	13150241	Single-Use Genetic Test Module
GAS063US	13150243	Single-Use Test Module with Excitation Source
GAS065US	13150245	Test Module with LED for Simultaneous Excitation of Oligonucleotide Probes
GAS066US	13150247	Test Module with Excitation Light and Lens for Simultaneous Excitation of Oligonucleotide Probes
GAS067US	13150249	Test Module with Excitation Light and Prisms for Simultaneous Excitation of Oligonucleotide Probes
GAS068US	13150252	Test Module with Excitation Light and Mirrors for Simultaneous Excitation of Oligonucleotide Probes
GAS069US	13150256	Test Module with Laser for Excitation of Oligonucleotide Probes

Case Ref.	USPTO App. no.	Patent Title
GAS070US	13149897	Test Module Incorporating Spectrometer
GAS080US	13150259	LOC Device for Genetic Analysis and Electrochemiluminescent Detection of Target Sequences
GAS081US	13150262	LOC Device for Detecting Target Nucleic Acid Sequence with Electrochemiluminescent Metalorganic Complex
GAS082US	13150265	LOC Device for Electrochemiluminescent Detection Using a Ruthenium Organic Complex
GAS083US	13150248	LOC Device for Detecting Target Nucleic Acid Sequences Using Electrochemiluminescence of a Luminophore in The Presence of An Electrochemical Coreactant
GAS084US	13150251	Genetic Analysis LOC Device for Electrochemiluminescent Detection of Target Nucleic Acid Sequences
GAS085US	13150257	Genetic Analysis LOC Device for Detection of Target Sequences with Electrochemiluminescent Luminophore and Functional Moiety for Quenching Photon Emissions
GAS086US	13150260	Genetic Analysis LOC Device with Electrochemiluminescent Probes Having a Functional Moiety for Quenching Photon Emissions Configured to Change Proximity to a Luminophore Upon forming a Probe-Target Hybrid
GAS087US	13150263	LOC Device for Detection of Target Sequences with Electrochemiluminescent Probes in Hybridization Chambers
GAS088US	13150266	Genetic Analysis LOC Device with Electrochemiluminescent Probes and Integrated Photosensor for Detection of Target Sequences
GAS089US	13150268	LOC Device for Genetic Analysis and Electrochemiluminescent Detection of Target Sequences
GAS090US	13150270	Genetic Analysis LOC Device for Electrochemiluminescent Detection of Target Sequences with Working Electrode in Contact with Photosensor

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GAS091US	13150272	Genetic Analysis LOC Device with Thick Electrodes for Electrochemiluminescent Detection of Target Sequences
GAS092US	13150239	LOC Device for Electrochemiluminescent Detection of Target Sequences with Electrodes Profiled for Greater Peripheral Edge Length
GAS093US	13150255	LOC Device for Electrochemiluminescent Detection with Electrode Pairs Having Complementary and Mutually Interdigitated Finger formations
GAS094US	13150258	LOC Device for Electrochemiluminescent Detection Using Electrode Pairs Optically Coupled to Photodiode
GAS095US	13150261	LOC Device for Electrochemiluminescent Detection of Target Sequences with Probes Between a Working Electrode and a Photosensor
GAS096US	13150264	LOC Device for Electrochemiluminescent Detection of Target Sequences Using Transparent Electrodes
GAS097US	13150267	Microfluidic Device for Electrochemiluminescent Detection of Target Sequences
GAS098US	13150269	Microfluidic Device with Electrochemiluminescent Probes and Integrated Photosensor for Detection of Target Molecules
GAS099US	13150271	Microfluidic Device with Sample Inlet, Electrochemiluminescent Probes and Integrated Photosensor for Detection of Target Sequences
GAS100US	13149932	Microfluidic Device for Detection of Nucleic Acid Targets with Electrochemiluminescent Probes
GAS101US	13149935	Microfluidic Device with Temperature Feedback Controlled Hybridization Chambers for Electrochemiluminescent Detection of Targets
GAS102US	13149942	Microfluidic Device with Optically Transparent Hybridization Chambers for Electrochemiluminescent Detection of Targets
GAS103US	13149946	Microfluidic Device with Low-Volume Electrochemiluminescence-Based Probe Spots
GAS104US	13149890	Microfluidic Device with Low-Volume Hybridization Chambers for Electrochemiluminescent Detection of Target Sequences

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GAS105US	13149950	Microfluidic Device for PCR, Probe Hybridization and Electrochemiluminescent Detection of Probe-Target Hybrids
GAS106US	13149956	Microfluidic Device with Array of Chambers and Corresponding Diffusion Barriers for Electrochemiluminescent Detection of Targets
GAS108US	13149960	Microfluidic Device with Non-Imaging Optics for Electrochemiluminescent Detection of Targets
GAS109US	13149965	Microfluidic Device with Electrochemiluminescent Probes and Photosensor with Large Angle of Collection for Probe Emitted Light
GAS110US	13149968	Single Use Microfluidic Device with Photosensor for Electrochemiluminescent Detection of Targets
GAS111US	13149971	LOC Device with Integral Photosensor for Electrochemiluminescence Based Detection of Targets
GAS112US	13149973	LOC Device with Integral Driver for Excitation of Electrochemiluminescent Luminophores
GAS113US	13149975	LOC Device for Detection of Targets with Electrochemiluminescent Resonant Energy Transfer Probes
GAS114US	13149979	LOC Device for Detecting Hybridization of Target Nucleic Acid Sequences with Electrochemiluminescent Resonant Energy Transfer, Primer-Linked, Stem-And-Loop Probes
GAS115US	13149981	LOC Device for Detecting Hybridization of Target Nucleic Acid Sequences with Electrochemiluminescent Resonant Energy Transfer, Primer-Linked, Linear Probes
GAS117US	13149984	LOC Device for Amplifying and Detecting Target Nucleic Acid Sequences Using Electrochemiluminescent Resonant Energy Transfer, Stem-And-Loop Probes with Covalently Attached Primers
GAS118US	13149986	LOC Device for Amplifying and Detecting Target Nucleic Acid Sequences Using Electrochemiluminescent Resonant Energy Transfer, Linear Probes with Covalently Attached Primers

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GAS119US	13149990	LOC Device for PCR Using Adaptor Primers and Target Detection Using Electrochemiluminescent Resonant Energy Transfer Probes
GAS120US	13149995	LOC Device with Low Volume Hybridization Chambers and Reagent Reservoirs for Genetic Analysis Using Electrochemiluminescent Target Detection
GAS121US	13150001	LOC Device with Electrochemiluminescent Probes Including Positive and Negative Control Probes
GAS122US	13150006	LOC Device with Electrochemiluminescent Probes for Detecting Targets in a Fluid and a Positive Control Probe for Detecting a Nucleic Acid Sequence Known to Be Present
GAS123US	13150008	LOC Device with Electrochemiluminescent Probes for Detecting Targets in a Fluid and a Positive Control Probe without a Quencher for Luminophore Emissions
GAS124US	13150011	LOC Device with Hybridization Chamber Array with Positive Control Chamber Containing Electrochemiluminescent Reporter
GAS125US	13150017	LOC Device for Detecting Target Nucleic Acid Sequences in a Fluid Using Hybridization Chamber Array and Negative Control Chamber Containing Electrochemiluminescent Probe Designed to Be Non-Complementary to any Sequence in The Fluid
GAS126US	13150021	LOC Device for Detecting Target Nucleic Acid Sequences Using Hybridization Chamber Array and Negative Control Chamber Containing Probes without Electrochemiluminescent Reporter
GAS127US	13150024	LOC Device for Electrochemiluminescent Detection of Target Nucleic Acid Sequences Using Hybridization Chamber Array and Negative Control Chamber without Probes
GAS128US	13150030	LOC Device for Electrochemiluminescent Detection of Target Nucleic Acid Sequences with Calibrated Photodetection of Probes in Hybridization Array
GAS129US	13150033	LOC Device for Electrochemiluminescent Detection of Target Nucleic Acid Sequences in a Fluid with Calibration Chamber Containing Probes Designed to Be Non-Complementary with any Nucleic Acid Sequences in The Fluid

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GAS130US	13150033	LOC Device for Detecting Target Nucleic Acid Sequences Using Electrochemiluminescent Probes and Calibration Probes Lacking a Luminophore
GAS131US	13150041	LOC Device with Hybridization Chambers Containing Probes for Electrochemiluminescent Detection of Target Nucleic Acid Sequences in a Fluid and Calibration Chamber Containing Probes Sealed From The Fluid
GAS132US	13150046	LOC Device for Detecting Target Nucleic Acid Sequences Using Electrochemiluminescent Probes and Calibration Probes with Detection Photosensors and Calibration Photosensors
GAS133US	13150050	Microfluidic Test Module with Low Volume Hybridization Chambers for Electrochemiluminescent Detection of Target Nucleic Acid Sequences in a Fluid
GAS134US	13150053	Microfluidic Test Module with Low Mass Electrochemiluminescent Probe Spots
GAS135US	13150057	Test Module with Integral Photosensor for Electrochemiluminescent Detection of Hybridization
GAS136US	13150061	Portable Test Module for Excitation of Electrochemiluminescent Probes
GAS137US	13150064	USB-Interfaceable Portable Test Module for Electrochemiluminescent Detection of Targets
GAS138US	13150068	Test Module with Low-Volume Hybridization Chambers and Reagent Reservoir for Electrochemiluminescent Detection of Target Nucleic Acid Sequences
GAS139US	13150073	Test Module Using Transition Metal-Ligand Complex, Electrochemiluminescent Luminophores
GAS140US	13150077	Test Module Using Lanthanide Metal-Ligand Complex, Electrochemiluminescent Luminophores
GAS141US	13150080	Test Module with Suspended Electrochemiluminescent Probes
GAS142US	13150084	Single-Use Test Module for Electrochemiluminescent Detection of Targets
GAS143US	13150088	Single-Use Test Module for PCR Amplification of Targets and Electrochemiluminescent Detection of Targets

Case Ref.	USPTO App. no.	Patent Title
GAS144US	13150091	Single-Use Test Module with Driver for Excitation of Electrochemiluminescent Luminophores
GAS146US	13150095	LOC Device for Detection of Target Nucleic Acid Sequences Using Electrodes Configured for Electrochemiluminescence of Luminophores without a Coreactant
GAS147US	13150098	Microfluidic Test Module with Photosensor
GBS001US	13149900	Microfluidic Device with MST Layer and Overlying Cap
GBS002US	13149911	Microfluidic Device with Laminar Structure
GBS003US	13149913	Microfluidic Device with Large Channels for Cell Transport and Small Channels Suitable for Biochemical Processes
GBS005US	13149916	Microfluidic Device with Surface Micro-Machined Chips and Interconnecting Cap
GBS006US	13149919	Microfluidic Test Module Incorporating Surface Micro-Machined Chips and Interconnecting Cap
GCA001US	13150232	Apparatus for Dispensing Reagents and Loading Oligonucleotide Spotting Devices
GCA002US	13150234	Apparatus for Dispensing Reagents, Loading Oligonucleotide Spotting Devices and Spotting Oligonucleotide Probes
GCA003US	13149948	Apparatus for Loading Oligonucleotide Spotting Devices and Spotting Oligonucleotide Probes
GCF001US	13149989	LOC Device for Pathogen Detection with Dialysis, Lysis and Nucleic Acid Amplification
GCF002US	13149992	LOC Device for Pathogen Detection with Dialysis, Lysis and Parallel Nucleic Acid Amplification
GCF003US	13149997	LOC Device for Pathogen Detection with Dialysis, Lysis and Tandem Nucleic Acid Amplification
GCF004US	13150002	LOC Device for Pathogen Detection with Dialysis, Thermal Lysis and Nucleic Acid Amplification
GCF005US	13150007	LOC Device for Pathogen Detection with Dialysis, Thermal Lysis and Parallel Nucleic Acid Amplification
GCF006US	13150009	LOC Device for Pathogen Detection with Dialysis, Thermal Lysis and Tandem Nucleic Acid Amplification

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GCF007US	13149892	LOC Device for Pathogen Detection with Dialysis, Thermal Lysis, Nucleic Acid Amplification and Prehybridization Filtering
GCF008US	13150012	LOC Device for Pathogen Detection with Dialysis, Chemical Lysis and Nucleic Acid Amplification
GCF009US	13150016	LOC Device for Pathogen Detection with Dialysis, Chemical Lysis and Parallel Nucleic Acid Amplification
GCF010US	13149893	LOC Device for Pathogen Detection with Dialysis, Chemical Lysis and Tandem Nucleic Acid Amplification
GCF011US	13150020	LOC Device for Genetic Analysis with Dialysis, Chemical Lysis, Incubation and Nucleic Acid Amplification
GCF012US	13150023	LOC Device for Genetic Analysis with Dialysis, Chemical Lysis, Incubation and Parallel Nucleic Acid Amplification
GCF013US	13150027	LOC Device for Genetic Analysis with Dialysis, Chemical Lysis, Incubation and Tandem Nucleic Acid Amplification
GCF014US	13150032	LOC Device for Genetic Analysis with Dialysis, Chemical Lysis and Nucleic Acid Amplification
GCF015US	13150036	LOC Device for Genetic Analysis with Dialysis, Chemical Lysis and Parallel Nucleic Acid Amplification
GCF016US	13149895	LOC Device for Genetic Analysis with Dialysis, Chemical Lysis and Tandem Nucleic Acid Amplification
GCF020US	13150039	LOC Device for Pathogen Detection and Genetic Analysis with Chemical Lysis, Incubation and Nucleic Acid Amplification
GCF021US	13150044	LOC Device for Pathogen Detection and Genetic Analysis with Chemical Lysis, Incubation and Parallel Nucleic Acid Amplification
GCF022US	13149899	LOC Device for Pathogen Detection and Genetic Analysis with Chemical Lysis, Incubation and Tandem Nucleic Acid Amplification
GCF023US	13150047	LOC Device for Pathogen Detection, Genetic Analysis and Proteomic Analysis with Dialysis, Chemical Lysis, Incubation and Nucleic Acid Amplification

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GCF024US	13150052	LOC Device for Pathogen Detection, Genetic Analysis and Proteomic Analysis with Dialysis, Chemical Lysis, Incubation and Parallel Nucleic Acid Amplification
GCF025US	13149904	LOC Device for Pathogen Detection, Genetic Analysis and Proteomic Analysis with Dialysis, Chemical Lysis, Incubation and Tandem Nucleic Acid Amplification
GCF027US	13150055	LOC Device for Pathogen Detection with Dialysis, Incubation and Nucleic Acid Amplification
GCF028US	13150058	LOC Device for Genetic Analysis with Dialysis and Nucleic Acid Amplification
GCF029US	13150060	LOC Device for Genetic Analysis with Dialysis, Incubation, and Nucleic Acid Amplification
GCF030US	13149918	LOC Device for Pathogen Detection and Genetic Analysis with Dialysis and Nucleic Acid Amplification
GCF031US	13150063	LOC Device for Pathogen Detection and Genetic Analysis with Incubation, Nucleic Acid Amplification and Prehybridization Filtering
GCF032US	13149921	LOC Device for Genetic Analysis Which Performs Nucleic Acid Amplification After Sample Preparation in a Dialysis Section
GCF033US	13149924	LOC Device for Genetic Analysis Which Performs Nucleic Acid Amplification Before Removing Non-Nucleic Acid Constituents in a Dialysis Section
GCF034US	13150067	LOC Device with Parallel Nucleic Acid Amplification Functionality
GCF035US	13150070	LOC Device with Parallel Incubation and Parallel Nucleic Acid Amplification Functionality
GCF036US	13150074	LOC Device with Parallel DNA and RNA Amplification Functionality
GCF037US	13149927	LOC Device with Parallel Incubation and Parallel DNA and RNA Amplification Functionality
GDA001US	13149934	Microfluidic Device for Simultaneous Detection of Multiple Conditions in a Patient
GDA002US	13150093	Microfluidic Device for Analysis of Mitochondrial DNA
GDA003US	13150097	Microfluidic Device for Amplifying Mitochondrial DNA in a Biological Sample

Case Ref.	USPTO App. no.	Patent Title
GDA004US	13150100	Microfluidic Device for Detecting Target Nucleic Acid Sequences in Mitochondrial DNA
GDA005US	13150106	Microfluidic Device for Detection of Mitochondrial DNA Via Fluorescence Modulated By Hybridization
GDA006US	13150110	Microfluidic Device for Detection of Mitochondrial DNA Via Electrochemiluminescence Modulated Hybridization
GDA007US	13149939	Microfluidic Device for Genetic and Mitochondrial Analysis of a Biological Sample
GDI001US	13149909	Microfluidic Device with Dialysis Section
GDI002US	13149910	Microfluidic Device with Multi-Layer Dialysis Section
GDI003US	13149912	Microfluidic Device with Flow-Channel Structure for Capillary-Driven Fluidic Propulsion without Trapped Air Bubbles
GDI004US	13149914	LOC Device with Dialysis Section for Separating Leukocytes From Blood
GDI005US	13149917	LOC Device with Dialysis Section for Separating Pathogens From a Biological Sample
GDI006US	13149920	LOC Device with Dialysis Section for Separating Leukocytes and Pathogens From Blood
GDI007US	13149936	LOC Device for Separating Constituents of Intermediate Size From Larger and Smaller Constituents in a Biological Sample
GDI009US	13149953	LOC Device with Dialysis Section for Concentrating Nucleated Cells in a Biological Sample
GDI010US	13149957	LOC Device with Dialysis Section for Removing Cell Debris From a Biological Sample
GDI011US	13149961	LOC with Dialysis Section for Removing Insoluble Sample Constituents From a Nucleic Acid Mixture
GDI013US	13149964	LOC with Dialysis Section for Retaining Insoluble Sample Constituents After Amplification and Passing Soluble Constituents to a Detection Section
GDI014US	13149894	Microfluidic Device with Flow-Channel Structure Having Active Valve for Capillary-Driven Fluidic Propulsion without Trapped Air Bubbles

Case Ref.	USPTO App. no.	Patent Title
GDI015US	13149967	Microfluidic Device with Dialysis Device, LOC and Interconnecting Cap
GDI016US	13149970	Dialysis Device with Multi-Layer Structure
GDI017US	13149972	Dialysis Device with Flow-Channel Structure for Capillary-Driven Fluidic Propulsion without Trapped Air Bubbles
GDI019US	13149974	Dialysis Device for Separating Pathogens From a Biological Sample
GDI023US	13149976	Dialysis Device for Separating Nucleated Cells in a Biological Sample From Other Constituents
GDI028US	13149978	Test Module with Microfluidic Device Having Dialysis Device, LOC and Interconnecting Cap
GDI030US	13149898	Test Module with Microfluidic Device Having LOC and Dialysis Device for Separating Pathogens From Other Constituents in a Biological Sample
GDI039US	13149980	Microfluidic Device with Surface-Micromachined Dialysis Section
GDI040US	13149902	Microfluidic Device with Dialysis Section Having Stomata Tapering Counter to Flow Direction
GDI041US	13149983	LOC Device with Dialysis Section for Removing Erythrocytes From Blood
GGA001US	13150213	Test Module for Gravity-Independent Operation
GGA003US	13150218	Test Module for Orientation-Independent Operation
GHU001US	13150233	Microfluidic Device with Humidifier
GHU002US	13150235	Microfluidic Test Module with a Membrane Seal to Prevent Dehumidification of The Mixture
GHU003US	13150237	Test Module with Humidifier
GHU004US	13150240	Genetic Test Module with Feedback-Controlled Humidifier
GHU006US	13150242	Humidity Sensor
GHU007US	13150244	Microfluidic Device with Humidity Sensor
GHU008US	13150246	Microfluidic Test Module with Humidity Sensor

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GIN001US	13150121	Microfluidic Device with Incubator
GIN002US	13150124	Microfluidic Device with Feedback Controlled Incubation Section
GIN003US	13150128	Microfluidic Device with Incubation Section Having Temperature Feedback
GIN004US	13150132	LOC Device with on-Chip Semiconductor Controlled Incubation Section
GIN005US	13150136	Microfluidic Device with PWM Controlled Incubation Section
GIN006US	13150139	Microfluidic Device with Elongate Incubation Chamber
GIN007US	13150144	Microfluidic Device with Incubation Chamber Between Supporting Substrate and Heater
GIN008US	13150147	Microfluidic Device with Incubator Having Two-Dimensional Control of Input Heat Flux
GLA001US	13150210	Test Module with Inbuilt Lancet
GLE001US	13150159	Microfluidic Device with Digital Memory
GLE002US	13150163	Test Module with Digital Memory
GLE003US	13150166	LOC with Digital Memory to Store Epidemiological Updates
GLE004US	13150170	LOC with Digital Memory to Store Genetic Data Updates
GLE005US	13150175	LOC Device with Digital Memory for Secure Storage of Data
GLE006US	13150179	Test Module with LOC Having on-Chip Electronics for Module Control
GLE007US	13150182	LOC Having on-Chip Electronics for Use in a Test Module to Control Module Communications
GLE008US	13150185	LOC Having USB Device Driver for Use in a Test Module to Control USB Connection
GLE009US	13150187	LOC Device with Integral Controller
GLE010US	13150191	LOC Device with Digital Memory
GLE011US	13150193	LOC Device with Flash Memory

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GLE012US	13150197	Test Module That Updates Epidemiological Databases
GLE013US	13150202	Test Module That Updates Epidemiological Databases with Location Data
GLE014US	13150206	Test Module That Updates Medical Databases
GLY001US	13150099	Microfluidic Device with Chemical Lysis Section
GLY002US	13150104	Microfluidic Device with Thermal Lysis Section
GLY003US	13150107	Microfluidic Device for Chemically and Thermally Lysing Cells
GLY004US	13150111	Test Module with Chemical Lysis Section
GLY005US	13150114	Test Module with Thermal Lysis Section
GLY006US	13150117	Test Module for Chemically and Thermally Lysing Cells
GMI001US	13150151	Microfluidic Device with Mixing Section
GMI002US	13149907	Microfluidic Device with PCR Section and Diffusion Mixer
GMI005US	13150155	Microfluidic Device for Diffusive Mixing in Small Cross Sectional Area Microchannel
GMI008US	13149908	Test Module with Diffusive Mixing in Small Cross Sectional Area Microchannel
GMO001US	13149891	Fabrication System for Lab-on-a-Chip (Loc) Devices with Differing Application Specific Functionality
GMV001US	13150113	Reagent Microvial with Digital Memory
GMV002US	13150116	Reagent Microvial with Authentication Integrated Circuit
GMV003US	13150120	Microvial with Digital Memory for Storage of Reagent Specification Data
GMV004US	13150125	Microvial with Digital Memory for Storage of Oligonucleotide Specification Data
GPA001US	13150212	Oligonucleotide Spotting Robot
GPA003US	13150217	Oligonucleotide Spotting Robot for Spotting Arrays of LOCs

Case Ref.	USPTO App. no.	Patent Title
GPA004US	13150221	Oligonucleotide Spotting Robot for Wafer-Scale Spotting of LOCs
GPA005US	13150224	Oligonucleotide Spotting Robot for High Density Spotting of Oligonucleotides
GPC001US	13149993	Microfluidic Device with Elongate PCR Chambers
GPC002US	13149996	Microfluidic Device with PCR Chamber Between Supporting Substrate and Heater
GPC003US	13150000	Microfluidic Device with PCR Section Having Two-Dimensional Control of Input Heat Flux Density
GPC004US	13150003	Microfluidic Device with Feedback Controlled PCR Section
GPC005US	13150018	Microfluidic Device with Temperature Feedback Controlled PCR Section
GPC006US	13150019	Microfluidic Device with PCR Section Having Short Thermal Cycle Times
GPC007US	13150022	Microfluidic Device with on-Chip Semiconductor Controlled PCR Section
GPC008US	13150025	Microfluidic Device with PWM Controlled PCR Heater
GPC009US	13150028	Microfluidic Device with Small Cross Sectional Area Microchannel
GPC010US	13150031	Microfluidic Device with PCR Chamber for High Rate of Temperature Change
GPC011US	13150035	Microfluidic Device for Rapid PCR Amplification
GPC012US	13150037	Microfluidic Device for PCR Amplification Using Low PCR Mixture Volume
GPC014US	13150040	Test Module for PCR Amplification Using Low PCR Mixture Volume
GPC017US	13150042	Genetic Analysis LOC for PCR Amplification of Nucleic Acids
GPC018US	13150045	Genetic Analysis LOC for Isothermal Amplification of Nucleic Acids
GPC019US	13150049	Genetic Analysis LOC for PCR Amplification of Nucleic Acids From Whole Blood

Case Ref.	USPTO App. no.	Patent Title
GPC023US	13150051	Genetic Analysis LOC for Amplification of Nucleic Acids Using DNA Polymerases of Thermophiles
GPC027US	13150054	Genetic Analysis LOC for Nucleic Acid Amplification Using An Isothermal Reaction
GPC028US	13150056	Genetic Analysis LOC for Nucleic Acid Amplification Using Recombinase Polymerase Amplification
GPC029US	13150059	Genetic Analysis LOC for Nucleic Acid Amplification Using a Nicking Enzyme and a DNA Polymerase
GPC030US	13150062	Genetic Analysis LOC for Nucleic Acid Amplification Using Nucleic Acid Sequence Based Amplification
GPC031US	13150066	Genetic Analysis LOC Device for Multi-Stage Amplification of Nucleic Acid Sequences
GPC033US	13150069	Genetic Analysis LOC for Non-Specific Nucleic Acid Amplification Prior to Specific Amplification of Particular Sequences
GPC034US	13149906	Genetic Analysis LOC with Non-Specific Nucleic Acid Amplification Section and Subsequent Specific Amplification of Particular Sequences in a Separate Section
GPC035US	13150072	LOC Device with Nucleic Acid Amplification Section and Thermal Insulation Trench
GPC036US	13150076	Microfluidic Device with Nucleic Acid Amplification Chamber Heater Bonded to Chamber Interior
GPC037US	13150079	LOC Device with Nucleic Acid Amplification Section
GPC038US	13150082	Microfluidic Device with Nucleic Acid Amplification Section
GPC039US	13150085	Test Module with Nucleic Acid Amplification Section
GPC040US	13150087	Microfluidic Device with Parallel Nucleic Acid Amplification Section
GPC041US	13150090	Test Module with Parallel Nucleic Acid Amplification Sections
GPC042US	13150092	Microfluidic Device with Parallel DNA and RNA Amplification Section
GPC043US	13150096	Test Module with Parallel DNA and RNA Amplification Sections

Case Ref.	USPTO App. no.	Patent Title
GPD001US	13150143	Oligonucleotide Spotting Device
GPD003US	13150148	Spotting Device for Complete Assay Spotting of LOCs
GPD004US	13150152	Biochemical Deposition Device
GPD005US	13150156	Monolithic Microsystems Technology Device for Oligonucleotide Spotting
GPD006US	13150160	Oligonucleotide Spotting Device with Laminar Structure
GPD007US	13150164	Oligonucleotide Spotting Device with Fluidics on Both Sides of Supporting Substrate
GPD008US	13150168	Oligonucleotide Spotting Device for Operation Under External Microprocessor Control
GPD009US	13150172	Oligonucleotide Spotting Device with Digital Memory
GPD010US	13150176	Spotting Device with Stored Oligonucleotide Specification Data
GPD011US	13150180	Spotting Device for Spotting Fixed Array of LOCs
GPD012US	13150183	Oligonucleotide Spotting Device for Wafer-Scale Spotting of LOCs
GPD013US	13150186	Oligonucleotide Spotting Device for Ejecting Low Volume Droplets
GPD014US	13150189	Oligonucleotide Spotting Device with High Spotting Rate
GPD015US	13150194	Biochemical Deposition Device with High Deposition Rate
GPD016US	13150199	Device for High Density Spotting of Oligonucleotides
GPD017US	13150203	Device for High-Density Deposition of Biochemicals
GPK001US	13149943	Microfluidic Test Module with Flexible Membrane for Internal Microenvironment Pressure-Relief
GRD001US	13150129	Reagent Dispensing Apparatus
GRD002US	13150133	Reagent Dispensing Apparatus with Automatic Collection and Storage of Reagent Data
GRD003US	13150137	Reagent Dispensing Apparatus for Array of Microfluidic Devices

Case Ref.	USPTO App. no.	Patent Title
GRD004US	13150141	Dispensing Apparatus for Wafer-Scale Dispensing of Reagents
GRE001US	13149952	Microfluidic Test Module for Interfacing with a Mobile Telephone
GRE002US	13149955	Microfluidic Test Module for Interfacing with a Laptop Computer
GRE003US	13149959	Microfluidic Test Module for Interfacing with a Dedicated Reader
GRE004US	13149963	Microfluidic Test Module for Interfacing with a Desktop Computer
GRE005US	13149966	Microfluidic Test Module for Interfacing with An Ebook Reader
GRE006US	13149969	Microfluidic Assembly with Test Module and Detachable Indicator Module
GRE007US	13149985	Microfluidic Test Module for Interfacing with Tablet Computer
GRR001US	13150101	Microfluidic Device for Biochemical Processing and Analysis
GRR002US	13150105	Microfluidic Device with Total Reagent Storage
GRR003US	13150108	Microfluidic Device with Low-Volume Reagent Reservoir
GRR004US	13150112	Microfluidic Device with Low Reagent Volumes
GRR005US	13150115	Genetic Analysis LOC with Reagent Reservoir
GRR006US	13150119	Genetic Analysis LOC with In-LOC Storage of All Required Reagents
GRR007US	13150123	Genetic Analysis LOC with Low Oligonucleotide Probe Mass and Low Reagent Volume
GRR008US	13150127	Microfluidic Test Module for Biochemical Processing and Analysis
GRR009US	13150131	Test Module with Low-Volume Reagent Reservoir
GRR010US	13150135	Genetic Test Module with Low Oligonucleotide Probe Mass and Reagent Volumes

Case Ref.	USPTO App. no.	Patent Title
GSA001US	13150078	Method of Analysing The Nucleic Acid Content of a Blood Sample
GSA002US	13150081	Method of Analysing The Nucleic Acid Content of Biological Fluid
GSE001US	13150083	Microfluidic Device with Flow Rate Sensor
GSE002US	13150086	Microfluidic Device with Liquid Sensor
GSE003US	13150089	Microfluidic Device with Capillary Meniscus Marching Velocity Sensor
GSE004US	13149930	Microfluidic Device with Conductivity Sensor
GSL001US	13150229	System for Variable Loading of Reagents into Microfluidic Device for Genetic Analysis
GSR001US	13149922	Microfluidic Test Module with Sample Receptacle
GSR002US	13149925	Test Module with Microfluidic Device Having Laminar Structure and Sample Receptacle
GSS001US	13150226	System for Variable Microarray Spotting and Genetic Analysis
GVA001US	13150140	Microfluidic Device with Thermal Bend Actuated Pressure Pulse Valve
GVA002US	13150146	Microfluidic Device with Thermal Bend Actuated Surface Tension Valve
GVA004US	13150150	Microfluidic Device with Fault-Tolerant Multiple Valve Assembly
GVA005US	13150154	Microfluidic Device with Surface Tension Valve At Reagent Reservoir Outlet
GVA006US	13150158	Microfluidic Device with Active Valve At Reagent Reservoir Outlet
GVA007US	13150162	Microfluidic Device with Reagent Mixing Proportions Determined By Outlet Valve Numbers
GVA008US	13149903	Microfluidic Device with Reagent Mixing Proportions Determined By Number of Active Outlet Valves
GVA009US	13150167	Microfluidic Device with a PCR Section with Single Activation, Outlet Valve

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GVA010US	13150173	Genetic Analysis LOC with Thermal Bend Actuated Pressure Pulse Valve
GVA011US	13150177	Genetic Analysis LOC with Thermal Bend Actuated Surface Tension Valve
GVA012US	13150190	Genetic Analysis LOC with Thermal Boiling-Initiated Valve
GVA013US	13150196	Test Module with Fault-Tolerant Multiple Valve Assembly
GVA014US	13150201	Microfluidic Thermal Bend Actuated Pressure Pulse Valve
GVA015US	13149929	Microfluidic Thermal Bend Actuated Surface Tension Valve
GVA016US	13150205	Microfluidic Boiling-Initiated Valve
GVA017US	13150209	Fault-Tolerant Multiple Valve Assembly
GVA018US	13150214	Fault-Tolerant Multiple Valve Assembly with Liquid Detector Sensor Feedback
GVA019US	13150219	Fault-Tolerant Multiple Valve Assembly with Thermal Bend-Actuator Pressure Pulse Valve
GVA020US	13150222	Fault-Tolerant Multiple Valve Assembly with Thermal Bend-Actuator Surface Tension Valve
GVA021US	13150227	Fault-Tolerant Multiple Valve Assembly with Thermal Boiling-Initiated Valve
GVA022US	13150230	Microfluidic Device with Aperture with Geometry to Promote Unpinned Flow-Through of Fluid
GWM001US	13150250	Microfluidic Device with Waste Storage
GWM002US	13150253	Test Module with Waste Storage Incorporating Porous Element