

LAB - ON - A - CHIP TECHNOLOGY



DNA, RNA, protein
and cell analysis

Agilent 2100 bioanalyzer



Agilent Technologies

Applied lab-on-a-chip technology - the 2100 bioanalyzer

Miniaturization of analytical instrumentation has a number of advantages over conventional techniques. These advantages are mainly in the areas of improved data precision and reproducibility, short analysis times, minimal sample consumption, improved automation and integration of complex workflows. The Agilent 2100 bioanalyzer was the first commercially available instrument to use microfluidics technology for the analysis of biological samples. Today, it is the industry standard for RNA sample QC and has replaced gel electrophoresis for this application. It is also rapidly replacing gel electrophoresis for DNA fragment analysis and SDS-PAGE analysis of protein samples. A unique feature of the bioanalyzer is that it can be used for both electrophoretic separation and flow cytometric analysis of cell fluorescence parameters. This versatility makes the Agilent 2100 bioanalyzer an indispensable tool for the molecular biologist and biochemist.

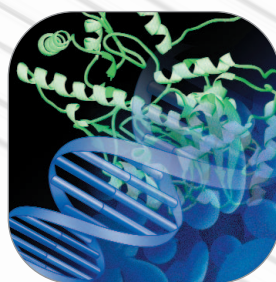
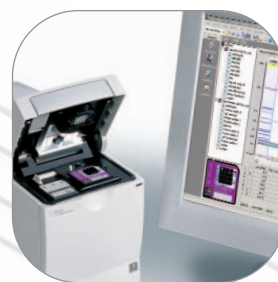
Automated, fast analysis with excellent data quality for analytical biochemistry

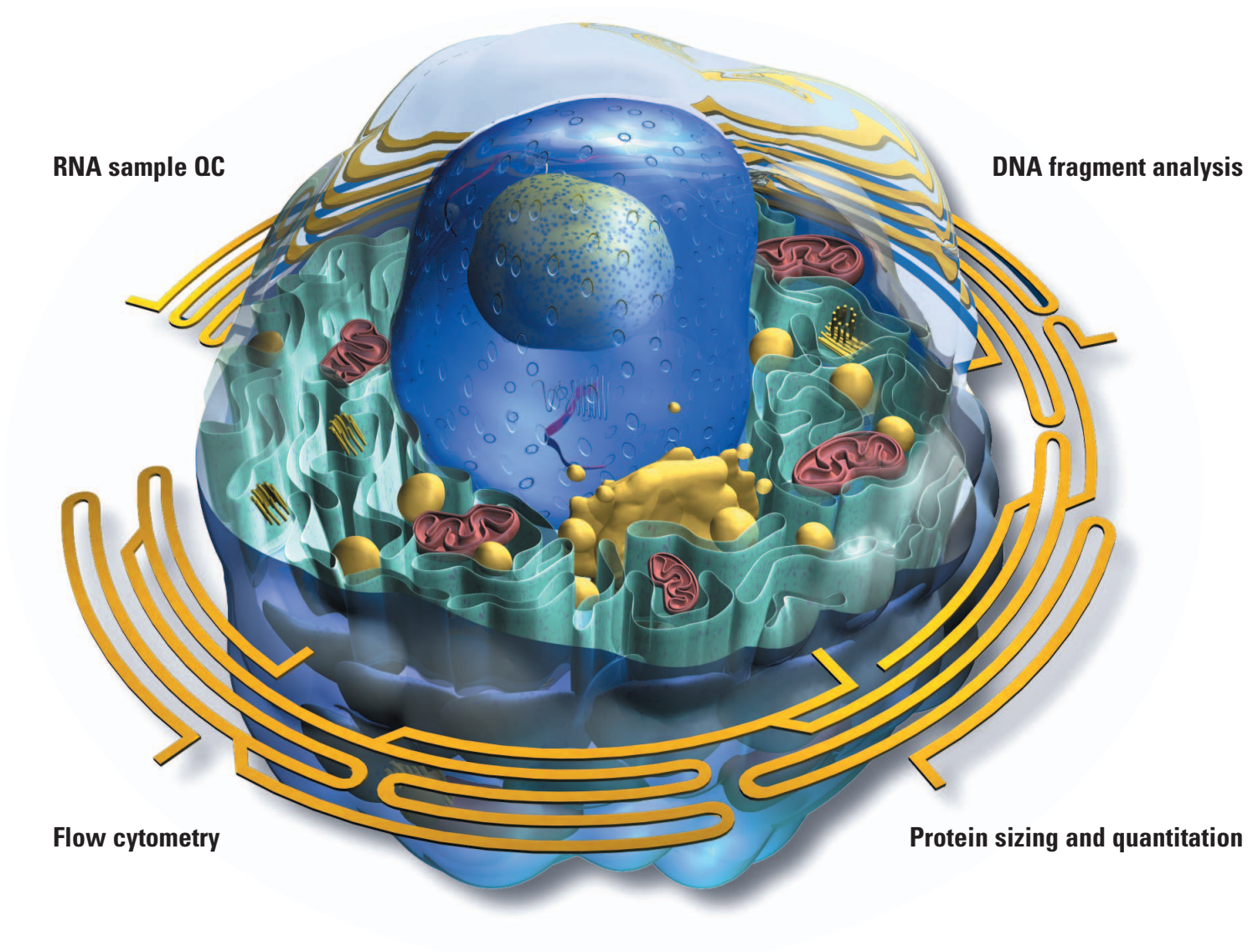
> The Agilent lab-on-a-chip system includes:

- Agilent 2100 bioanalyzer
- System software
- Desktop or laptop PC
- Start-up, operational and compliance services
- Electrophoresis and/or flow cytometry option
- Printer
- Accessories

> Advantages of lab-on-a-chip technology:

- Minimal sample consumption and fast results
- Improved assay accuracy and precision
- Digital data for convenient archiving and storage
- Various data display options
- Ease-of-use with simplified sample comparison
- Minimum exposure to hazardous materials





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Agilent 2100 bioanalyzer - a wide range of applications with a single compact system

A multi-purpose platform for streamlined workflows from disease and drug discovery/development to the QA/QC of biopharmaceuticals, the Agilent 2100 bioanalyzer is the most successful microfluidics-based platform for the analysis of proteins, DNA, RNA and cells. It is the industry's only platform with the ability to cover your entire workflow with a single compact system. As the first commercial, analytical instrument based on lab-on-a-chip technology, the 2100 bioanalyzer has proven to be an excellent alternative to messy and labor-intensive gel electrophoresis. It replaces the subjective, time-consuming techniques associated with agarose gels or SDS-PAGE with fast, automated, high quality digital data.

This versatile platform is designed to streamline protein quality control, protein expression/purification analysis, RNA sample QC, analysis of PCR and RT-PCR products and gene silencing, as well as integrated cell-based analysis.

The Agilent 2100 bioanalyzer with lab-on-a-chip technology provides scientists with a more convenient and productive way to gather and store experimental data. The automation and standardization of different processes on a chip save time and increase lab productivity.

Applicability to sample classes is based on the use of pre-packaged kits that include sample-specific reagents and chips. LabChip® kits for a variety of RNA, DNA, protein and cell assays are currently available and the range of kits specially tailored to meet your needs is continuously being expanded.

1 Fast and easy operation Add sample



- Ready-to-use reagent kits.
- Quick-start instructions.
- Chip preparation in less than 5 minutes.
- Minimal use of hazardous chemicals and waste disposal.
- Sample volumes in the μL -range.

2 Automation Start chip run



- Start analysis at the press of a button.
- Predefined protocols.
- System uses internal standards to calculate results.

3 Digital data in 30 minutes Watch real-time data display



- Automated data analysis.
- Digital data can be filed in a database or shared.
- No user-dependent data interpretation.



"The Agilent 2100 bioanalyzer saves us time and provides the reliable information we need about the quality of RNA. Assurance of high RNA quality allows us to work faster and more efficiently."

Margareta Faxén
Center for Genomics Research (CGR), Stockholm, Sweden

When combined with the new expert software, the Agilent 2100 bioanalyzer is an ideal tool for the development and manufacture of biopharmaceuticals in regulated environments.

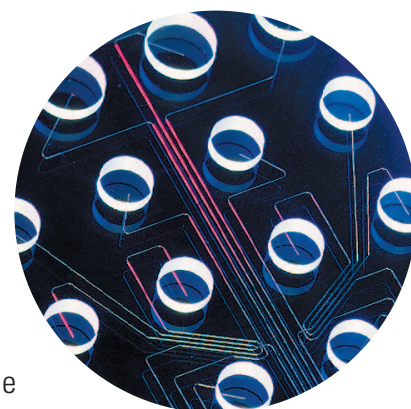
The expert software is the first element of Agilent's plan to further develop the Agilent 2100 bioanalyzer system into a solution supporting compliance.



For more information visit:
www.agilent.com/chem/labonachip

On-chip electrophoresis - automated quality control, sizing and quantitation

The electrophoresis option for the Agilent 2100 bioanalyzer enables scientists working with nucleic acids or proteins to carry out automated quality control, sizing and quantification. The system uses micro-fabrication technology to transfer laboratory processes onto miniature glass chips that contain a network of interconnected channels and reservoirs. Filling the channels with a gel matrix and the wells with buffer or sample, allows electrophoresis to be carried out on a miniaturized scale. Choosing the appropriate LabChip kit (containing chips, buffer, gel, intercalating dye and standards) enables the analysis of DNA, RNA or protein samples. This integration of sample preparation, fluid handling and biochemical analysis offers several advantages over traditional gel electrophoresis in terms of speed, automation, sample use and data quality.



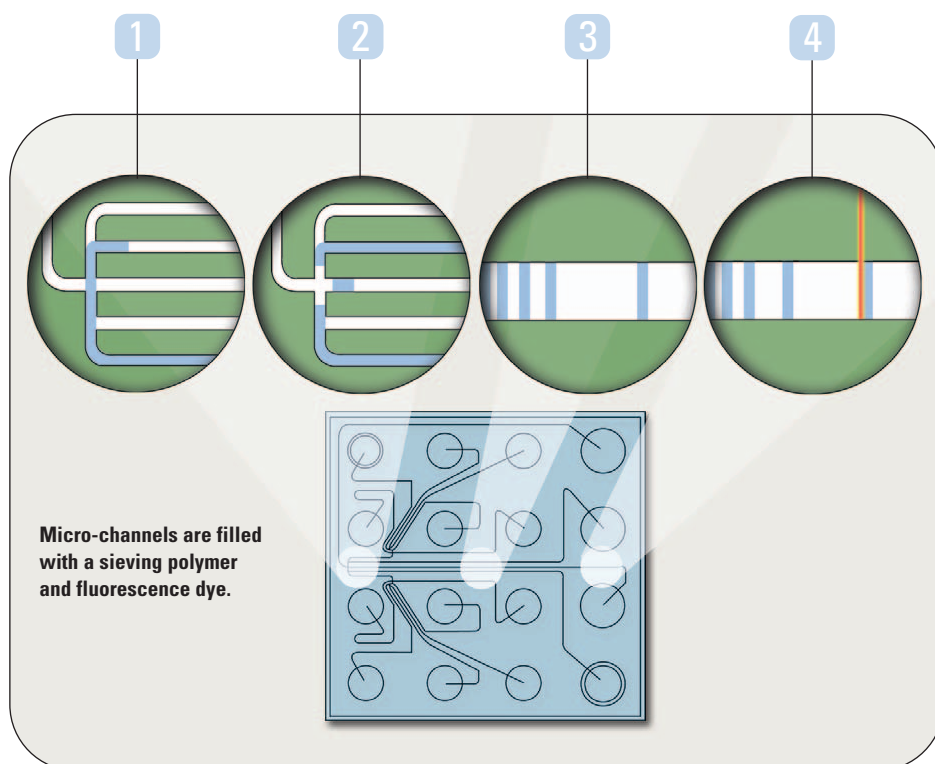
The Agilent 2100 bioanalyzer integrates sample handling, separation and detection and data analysis within a single compact system and has the added advantage of creating highly reproducible digital data.



Agilent 2100 bioanalyzer with electrode cartridge for on-chip electrophoresis.

> Key features:

- Miniaturized fluid pathways ensure short run times.
- Quick-start instructions.
- Micro-fabricated chips yield better reproducibility than conventional technologies.
- Microscale format minimizes sample and reagent consumption.
- GLP and GMP compliance.



- 1 The sample moves through the micro-channels from the sample well.
- 2 The sample is injected into the separation channel.
- 3 Sample components are electrophoretically separated.
- 4 Components are detected by their fluorescence and translated into gel-like images (bands) and electropherograms (peaks).

Protein solutions - optimize protein expression/purification and protein QA/QC

The Agilent protein analysis solution unites fast, standardized methods with quick automated and detailed data analysis for cell lysates, column fractions and purified proteins or antibodies. This approach integrates several tedious manual experimental procedures into a single workflow. Compared to traditional SDS-PAGE, it delivers equal sizing accuracy, better quantitation and much better reproducibility.

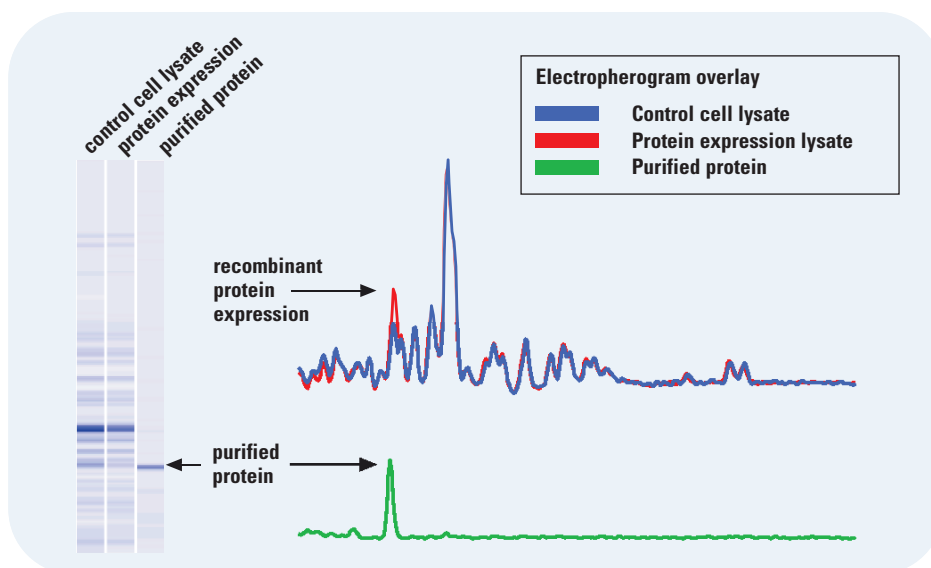


The Protein LabChip kits are used to monitor the presence of a protein during each purification step and are optimized for highest yield and/or purity. In addition, the complete 2100 bioanalyzer system supports GLP and GMP requirements for use in regulated environments. The system is tailored for the QA/QC of protein-based pharmaceuticals.

Two Protein LabChip kits are currently available:

Protein 50 LabChip kit for 5-50 kDa

Protein 200 Plus LabChip kit for 14-200 kDa



Purification of a recombinant protein.

"We use Agilent 2100 bioanalyzers throughout our R&D organization and believe this technology will play an even greater role in streamlining efforts to develop and commercialize important new therapeutics."

Craig Muir
Millennium Pharmaceuticals, Inc. Boston, USA

> Key features:

Fast results

Digital data from the automated analysis of 10 samples in less than 30 minutes.

Sizing and quantitation in one assay

Allows relative and absolute quantitation (semi-quantitative) of individual sample proteins.

Automatic staining/destaining

Eliminates the manual steps required for SDS-PAGE.

Minimal sample consumption

Only 4 µL of protein sample required per analysis.

No gel drying or storage

Data is automatically stored in digital format which can be easily retrieved and shared.

Analysis of a large variety of proteins

Cell lysates, column fractions, antibodies and purified proteins.

Easy comparison

Software electropherogram overlay feature and result flagging enable small differences between samples to be identified.

Digital operation

Enables precise observation of experiments.

Various data display options

Results shown in gel-like image, electropherogram and tabular formats.

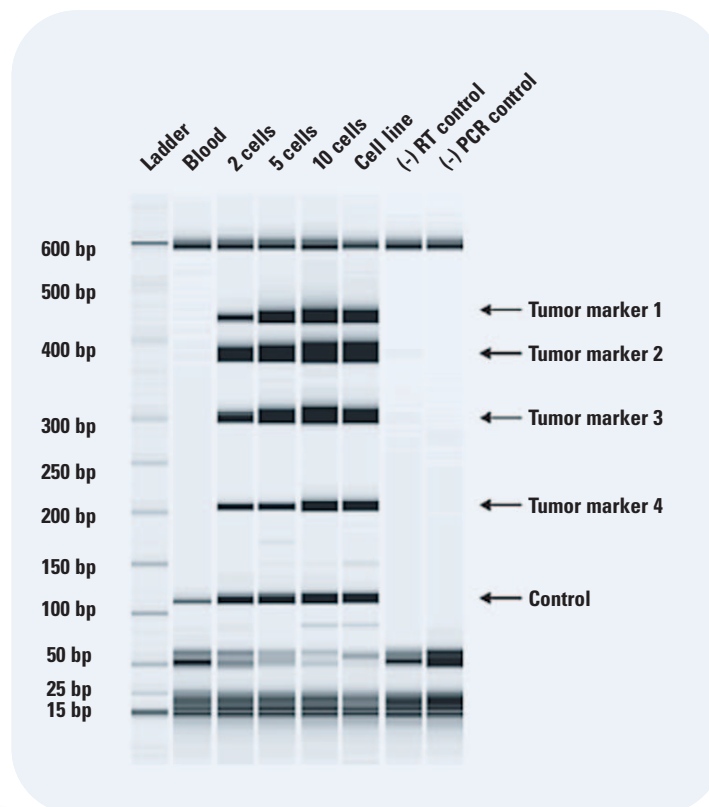
DNA solutions - precise analysis of multiplex PCR and RT-PCR products

Agilent DNA LabChip kits make it easier than ever to get size and concentration information for each fragment of your PCR sample. The superior resolution and linear dynamic range are especially useful in the context of multiplex (RT-)PCR. You simply add your DNA sample, start the chip run and watch the real-time data display. The system uses internal standards to calculate the results and shows them on the screen. The entire process, including the data analysis, is automated.



The DNA 1000 LabChip kit can be used in conjunction with specific (RT-)PCR kits or assays to quantify the expression of specific genes in cancer diagnostics and cancer research, as well as other application areas. It can also be used to detect and quantify genetically modified organisms.

The Agilent 2100 bioanalyzer is the tool of choice for automated sizing and quantitation of PCR and RT-PCR products with unprecedented accuracy, in singular or multiplex mode.



Multiplex PCR analysis of four tumor markers for early metastasis detection.
Data kindly provided by AdnaGen

> Key features:

Sizing accuracy

Normalization to two internal markers and a ladder.

Quantitation accuracy and reproducibility

Automated quantitation of each DNA fragment against internal standards.

High resolution of a large number of bands

Critical for any multiplex PCR application.

Broad linear dynamic range

Enables the detection of less abundant products, e.g. low abundance messages in multiplex RT-PCR amplifications or non-specific amplifications.

Sensitivity

LIF detection for fragments down to 0.1 ng.

Minimal sample consumption

Only 1 μ L of material required per analysis.

Quick and easy sample comparison

One-click overlay, scaling or zooming features.

Improved assay precision

Pre-packaged reagents and standardized assay protocols yield highly reproducible data.

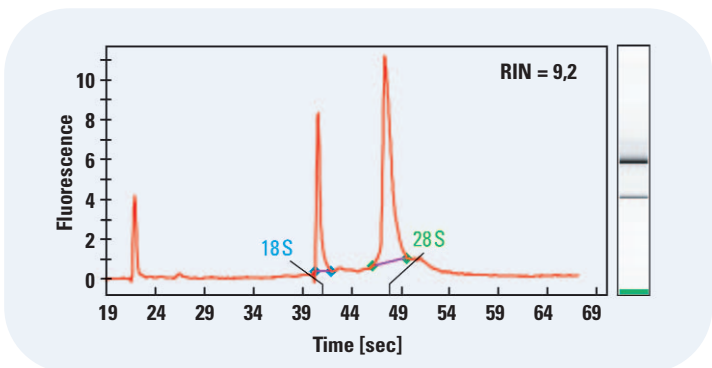
RNA solutions - quality assurance for gene expression sample preparation

The integrity of RNA samples is essential in the context of gene expression analysis via microarray technology or real-time PCR. Agilent provides RNA assays that enable rapid characterization of total or mRNA samples, with unmatched sensitivity and with minimal sample consumption. Agilent RNA assays are now an established industry standard. The introduction of the RNA Integrity Number (RIN), specially developed by Agilent, makes it possible for scientists to objectively measure and communicate the quality of RNA used in experiments.



“The introduction of Agilent’s RNA integrity number is a milestone for the field of gene expression. It is the first practical and reliable standard for measuring RNA quality.”

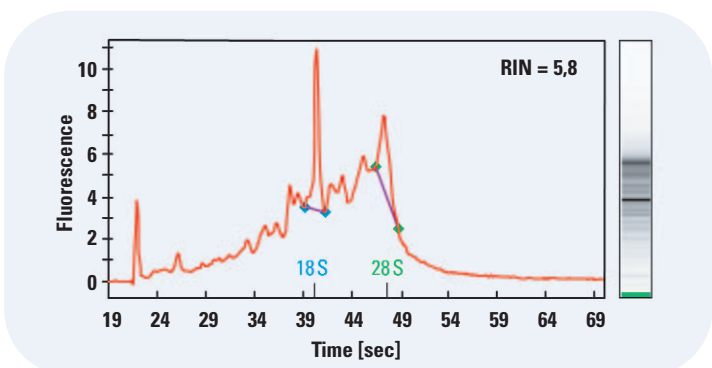
David Ginzinger
Director of the Genome Analysis Core Laboratory
University of California, San Francisco.



Intact total RNA

> Advantages of the LabChip approach:

- Complete automated analysis of 11 or 12 samples in approximately 30 minutes.
- Automated sample alignment, one-click overlay, scaling and zooming features.
- RNase-free reagents and chips to avoid sample degradation during analysis.
- Results shown in gel-like image, electropherogram and tabular formats.



Partially degraded RNA

> Key features:

Automated RNA sample analysis

Using as little as 5 ng of total RNA (RNA 6000 Nano LabChip kit) or 200 pg of total RNA (RNA 6000 Pico LabChip kit), the system automatically calculates the overall RNA concentration and shows the percentage of ribosomal impurities in mRNA samples. It enables the determination of sample integrity.

The **RNA 6000 Nano LabChip kit** is the industry standard for quality control and quantitation of total and mRNA samples. QA of samples ensures that expensive downstream experiments (e.g. microarray analysis) are not jeopardized by RNA sample degradation.

The **RNA 6000 Pico kit** delivers the highest sensitivity for RNA quality control to date, making it the tool of choice for the analysis of RNA from microdissected samples, needle biopsies and first strand cDNA.

RNA Integrity Number - RIN

With the introduction of the RNA Integrity Number (RIN), the quality of RNA is no longer a matter of individual interpretation. The RIN software extension for the expert software provides the first tool to measure RNA quality and grade it on a quantitative scale of 1 to 10. Sample integrity is determined by the entire electrophoretic trace of the RNA sample, including the presence or absence of degradation products. This enables interpretation of an electropherogram, comparison of samples and repeatability of experiments.

On-chip flow cytometry - simplified analysis of cell fluorescence

The Cell fluorescence LabChip kit and the flow cytometry set for the Agilent 2100 bioanalyzer make it possible for all scientists working with cells to perform simple flow cytometry assays. The flow cytometry set adds the capability for pressure-driven microfluidic movement to the electrokinetic liquid movement and electrophoretic separation capabilities of the Agilent 2100 bioanalyzer. This extends the lab-on-a-chip portfolio of the 2100 bioanalyzer from electrophoretic separation assays to automated two-color flow cytometric assays.



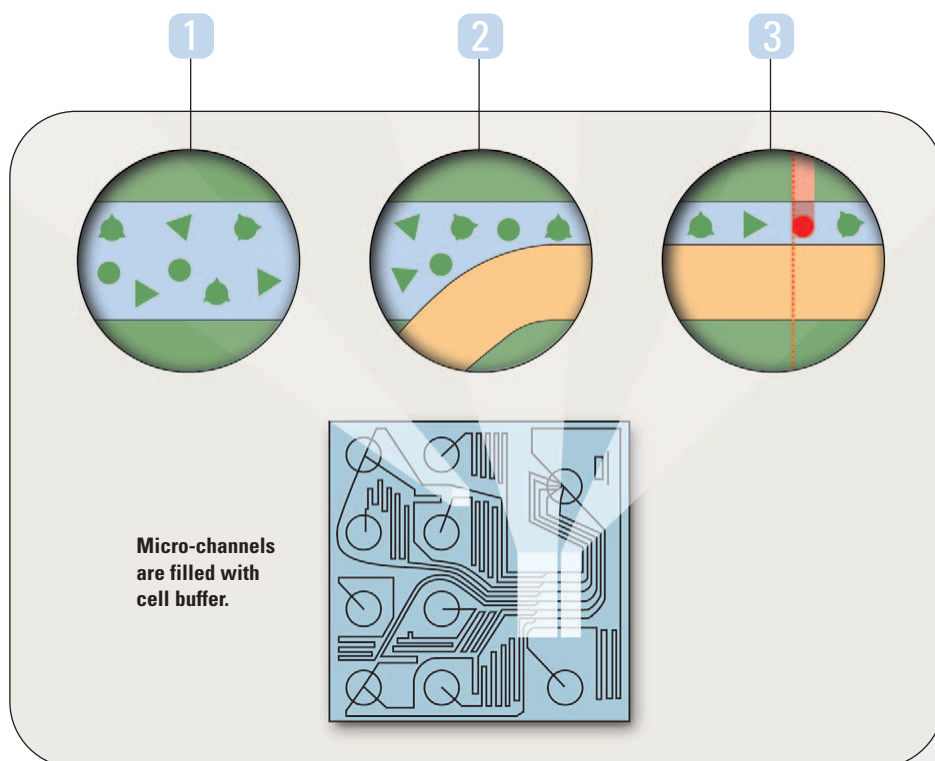
Agilent 2100 bioanalyzer with pressure cartridge and the cell chip included in the flow cytometry set.

A broad range of cell parameters and a variety of cell samples can be measured, combining the ease of use of a fluorescence microscope with the information quality you would expect from a flow cytometer.

Six samples, each 10 μ L with 20,000 pre-stained cells, are loaded onto the chip and the fluorescence intensities measured in two channels.

> The on-chip flow cytometry system offers:

- Short setup time with no complex adjustment of instrument parameters.
- On-chip staining provides the added benefit of minimal reagent and cell consumption.
- Automated analysis of 1 to 6 samples on a single chip.
- Two-color fluorescence detection for a broad range of cell analysis applications.
- Short analysis times.



1 Pressure-driven flow is used to move cells in a controlled manner through the micro-channels of the chip.

2 Cells are hydrodynamically focused to a portion of the channel by a side stream of buffer.

3 Cells pass the fluorescence detector in single file.

Agilent cell solutions enable the easy acquisition of cell-based parameters, simplifying the daily routine in many molecular and cell biology labs.

The flow cytometric assays are extensively documented and pre-defined, which allows you to start work immediately. In addition, the optical parameters are fixed, which eliminates the need for compensation or adjustment. It is also possible to create custom-designed assays with the aid of intuitive software tools. This broadens the applicability of the system significantly.

Agilent on-chip flow cytometry can be used to determine a variety of parameters from many eukaryotic cell lines and primary cells. Pre-stained cells are loaded onto the chip and the fluorescence intensities in two channels for approx. 750 single cells per sample are measured within 25 minutes.

> Key features:

- Easy to use.
- Low cell consumption - important when working with precious cells.
- On-chip staining procedure saves expensive antibody reagents.
- Automated analysis of up to 6 samples.

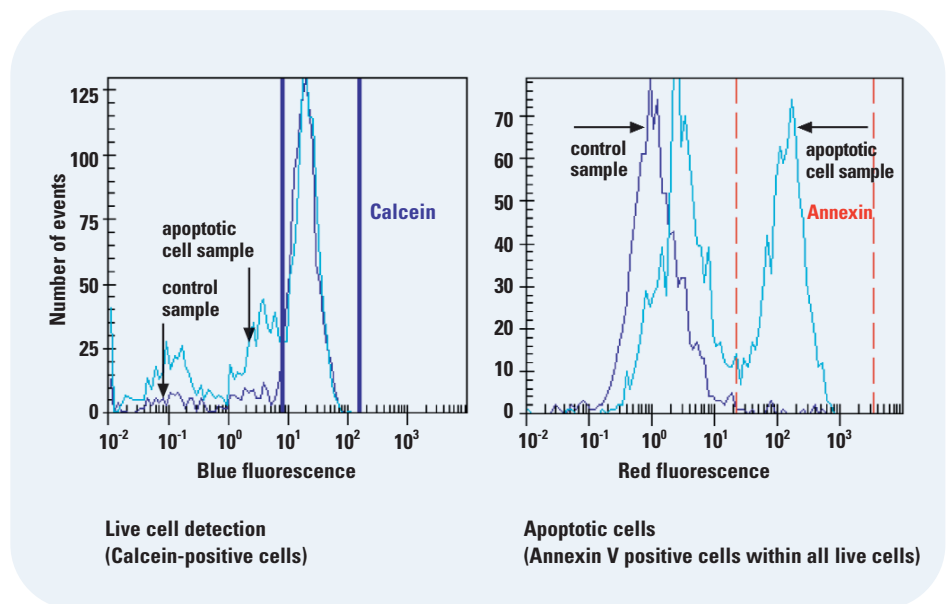
> Cell assay applications:

Cellular protein expression

- Cell surface protein expression via antibody staining.
- Measurement of intracellular and nuclear protein expression via antibody staining.

Detection of GFP expression

- Transfection efficiency monitoring .
- Determine the percentage of GFP expressing cells within live cell population.



Analysis of an apoptotic cell sample, resulting in 44 % apoptotic cells within the live cell population.

“The fastest, easiest and most versatile instrument for analyzing RNA, DNA, cells and proteins. With its new flow cytometry set, the 2100 bioanalyzer can be converted into a ready-to-use flow cytometer in just a minute.”

Dr. Eric Gottwald, Karlsruhe Research Center
Institute for Medical Engineering and Biophysics, Germany

Gene silencing

- Optimization of siRNA transfection procedure.
- Correlation of siRNA uptake and gene knockdown.
- Verification of RNAi silencing by cellular protein expression measurement.
- Detection of siRNA.

Apoptosis

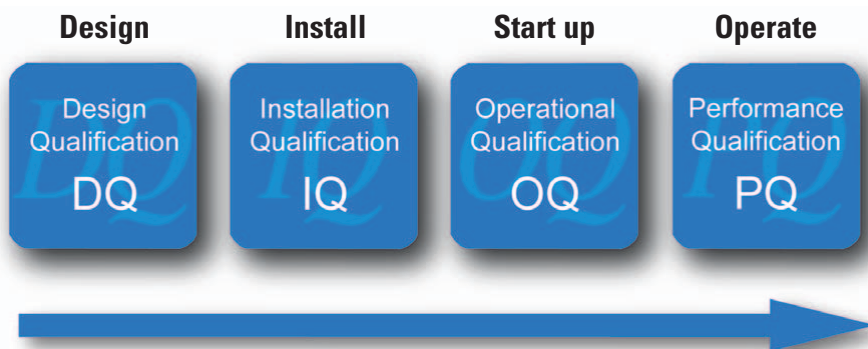
- Annexin-V assay.
- Intracellular antibody staining of active caspase-3.
- Analysis of internucleosomal DNA degradation.



For more information visit:
www.agilent.com/chem/labonachip

2100 expert software - get the most out of your digital data

The Agilent 2100 expert software delivers on-chip electrophoresis and on-chip flow cytometry applications in one software package. It provides data review and evaluation modes and is delivered without a license key. It can be downloaded from the web and shared among interested researchers. The 2100 expert software platform is designed for intuitive use. It provides easy instrument control, access to real-time data, automated data analysis and valuable tools for further data evaluation. For scientists working in regulated environments, the 2100 expert software supports software and hardware IQ and OQ/PV in a dedicated validation context.



Design Qualification (DQ)

DQ defines the functional and operational specifications of the 2100 bioanalyzer system and ensures that it has all the necessary functions and performance criteria.

Documents provided for the 2100 bioanalyzer system include:

- Declaration of System Validation.
- Declaration of Conformity for instrument to manufacturing specification.
- Declaration of Conformity for instrument according to ISO/IEC Guide 22 and CEN/CENELEC EN 45014.
- Declaration of Conformity for chips and reagents.

Installation Qualification (IQ)

IQ ensures that the Agilent 2100 bioanalyzer instrument and the 2100 expert software are installed correctly upon delivery.

Operational Qualification (OQ)

OQ is the process of demonstrating that an instrument will function according to its operational specifications in the selected environment.

Performance Qualification (PQ)

Customers are responsible for the PQ which demonstrates that the 2100 bioanalyzer performs according to a specification appropriate for its routine use and produces reliable, consistent and accurate data.

Paving the way for compliance

Biopharmaceutical companies bear the extra costs and workload associated with quality control and regulatory compliance. For companies to achieve compliance, laboratory and production procedures have to be standardized and reproducible, while meeting good laboratory practice (GLP) and good manufacturing practice (GMP). Agilent helps to ensure consumer safety while minimizing the impact to biopharmaceutical companies with the 2100 bioanalyzer for standardized, reliable quality control. Agilent supports the validation process with DQ documentation and IQ and OQ/PV tools and services.

The security pack software for the 2100 bioanalyzer supports all 21 CFR Part 11 requirements. This includes the handling of electronic records, data security, data integrity and audit traceability. The 2100 expert software is prerequisite for the 2100 expert security pack functionality.



"I believe Agilent provides the most complete range of compliance and validation services in the world. It offers global, multi-vendor, multi-product packages that let you make one call for virtually all your compliance needs."

Dr. Ludwig Huber
International compliance expert



> 2100 expert software features:

- Data presented as electropherogram, gel-like image and customizable peak tables for electrophoresis assays, histogram and dot plot view and tables for flow cytometry assays.
- Automated integration with standard settings or manual integration, which allows the definition of start and end points, as well as manual baseline definition of peaks.
- Data comparison enables the comparison of results from different chips.
- Standard and advanced user modes.
- Result flagging tool - rule definition for color-coded flagging of results.
- Validation context which provides tools for IQ and OQ.
- Numerous export and print features facilitate easy documentation for reports and presentations.



For more information visit:
www.agilent.com/chem/labonachip

Support - 24 hour instrument repair, extended system warranty, application consulting and compliance services

Hardware and software support services

All Agilent 2100 bioanalyzer system components carry a one year factory warranty. The 2100 bioanalyzer instrument is covered by the premium repair service of either 24 hour instrument express exchange or return for repair with loaner. This significantly reduces the instrument downtime.

The premium warranty service can be extended in the following ways to ensure maximum uptime:

- One year or multi-year warranty extensions for all major Agilent 2100 bioanalyzer system components including, PC, printer, software and express exchange for the instrument. In addition, this warranty extension provides an annual system PM (Preventive Maintenance) service.
- One year or multi-year express exchange warranty extension for the Agilent 2100 bioanalyzer instrument, with the option of including the Agilent bundle PC and printer.
- One year or multi-year software warranty extension, comprised of unlimited feature support, automated, free-of-charge software updates and software status bulletins.



Assay support services

Two on-site assay related support services are available:

- Start-up services to familiarize the new user with the hardware, software and an application of choice.
- Operational services including troubleshooting for application-related problems and user training for a LabChip kit of your choice. Running customer samples is included in this training.

Compliance services

For all current Agilent 2100 bioanalyzer instrument bundles*, Agilent offers complete system (IQ) Installation Qualification and (OQ) Operational Qualification services. The Agilent 2100 bioanalyzer IQ and OQ services are exclusively provided by specially trained and certified Agilent service personnel. The complete suite of compliance services comprises qualifying multiple assays, cartridges and instruments.

* "B" and "C" series instruments sold after 2001.



For more information visit:
www.agilent.com/chem/labonachip

Specifications

Agilent 2100 bioanalyzer:

Weight

10 kg (22 lbs)

Dimensions

(width x depth x height)

162 x 412 x 290 mm (6.4 x 16.2 x 11.4 in)

Line voltage

100-240 VAC

Line frequency

50-60 Hz

Power consumption

60 VA

Ambient operating temperature

5-40 °C (41-104 °F)

Safety standards: IEC, EN, CSA, UL

Installation Category II,

Pollution Degree 2

Laser Class 1

International contacts

US/Canada

Phone: Toll-free 1 800 227 9770

Email: bioanalyzer_americas@agilent.com

Europe

Email: bioanalyzer_europe@agilent.com

Japan

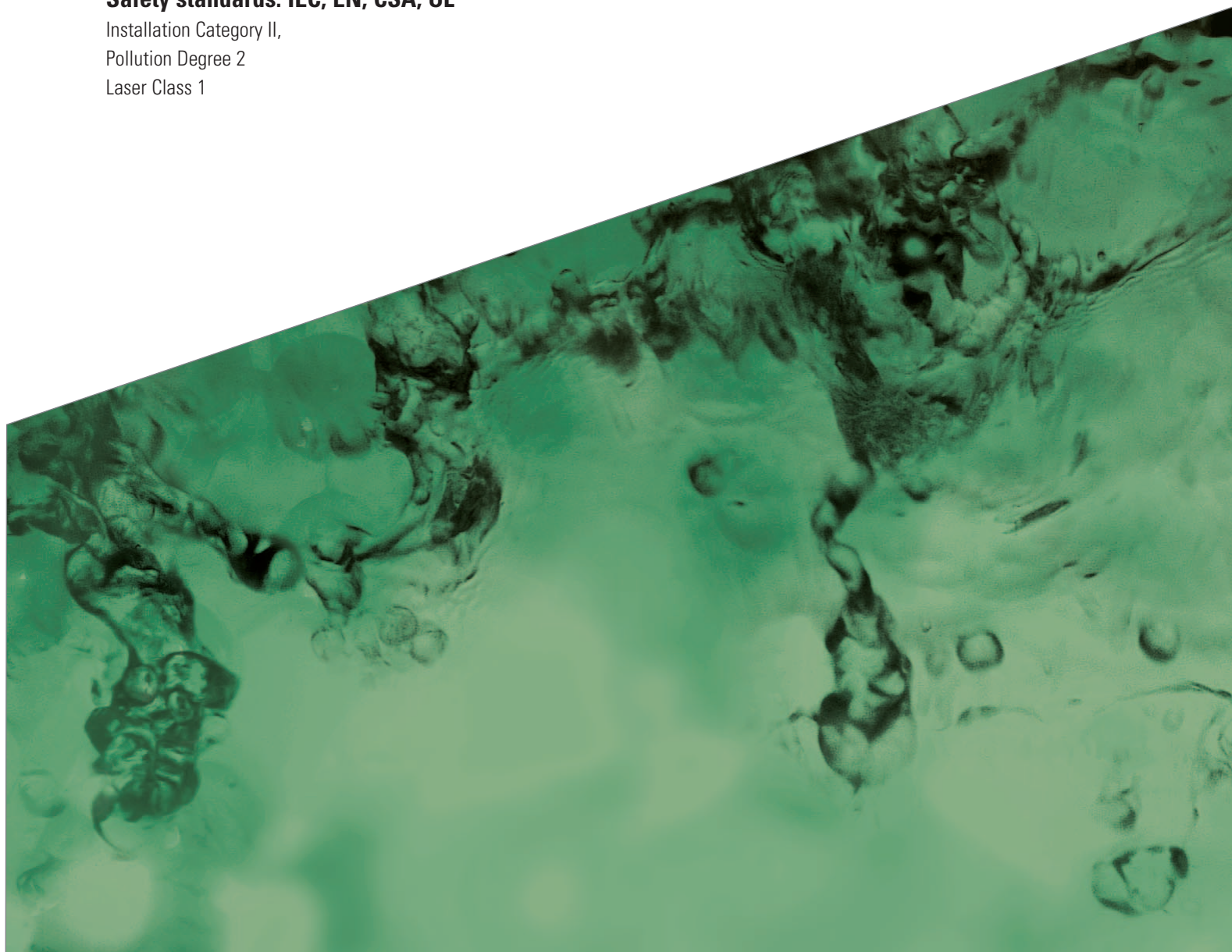
Phone: 0120 477 111

Email: lab_chip@agilent.com

Other Asia Pacific

Phone: +81 422 56 9392

Email: bioanalyzer_ap@agilent.com



Printed in Germany, August 1, 2004
Publication Number 5989-1197EN
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