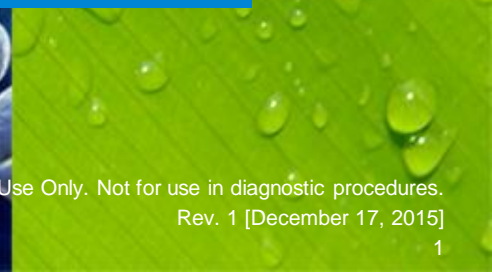




# Automated Electrophoresis Applications for Synthetic Biology

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Product Manager,  
Electrophoresis  
Agilent Technologies



# Outline

2100 Bioanalyzer & 4200 TapeStation Systems

Automated Electrophoresis in Genome Editing

Automated Electrophoresis in Functional Genomics

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# Electrophoresis Product Portfolio



- ## 2100 Bioanalyzer System – Electrophoresis in microchannels
- *Analysis of biomolecules: DNA, RNA, Proteins and Cells*
  - *RIN for user-independent RNA QC*

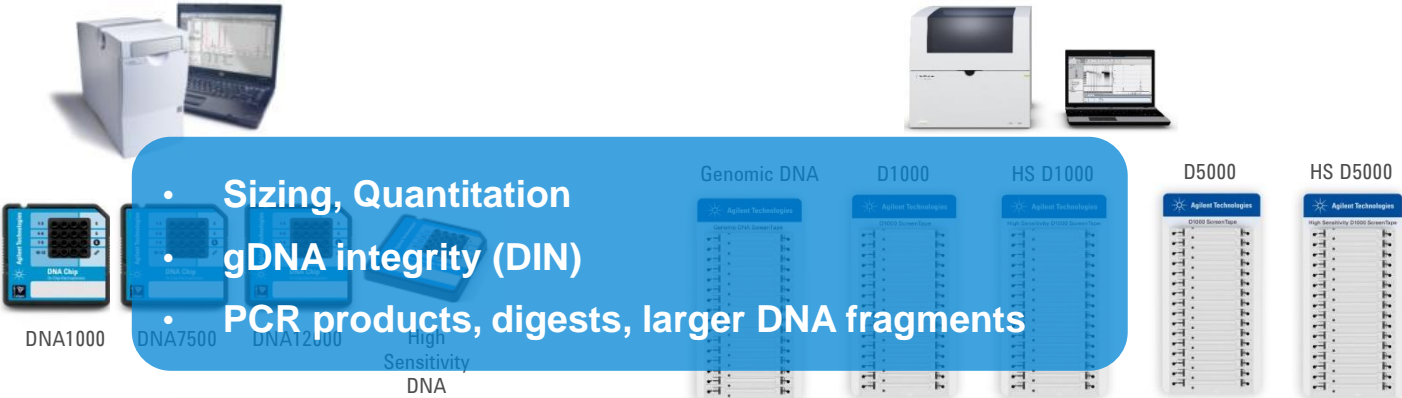
## 4200 TapeStation System - ScreenTape Technology

- *fully scalable from 1-96 samples*
- *96-well plate walkaway*
- *RIN<sup>e</sup> for user-independent RNA QC*
- *DIN for user-independent gDNA QC*



# Assay Portfolio

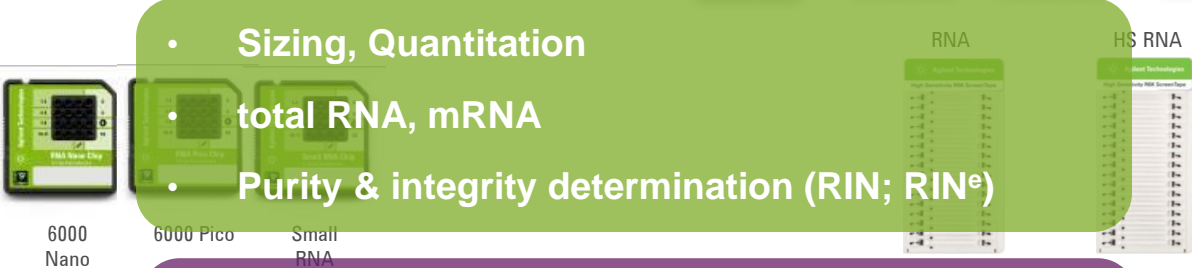
## DNA assays



DNA1000, DNA7500, DNA12000, High Sensitivity DNA, Genomic DNA, D1000, HS D1000, D5000, HS D5000

- Sizing, Quantitation
- gDNA integrity (DIN)
- PCR products, digests, larger DNA fragments

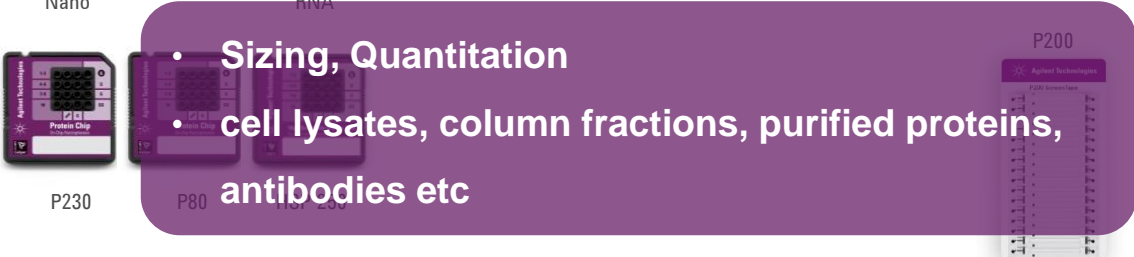
## RNA assays



6000 Nano, 6000 Pico, Small RNA, RNA, HS RNA

- Sizing, Quantitation
- total RNA, mRNA
- Purity & integrity determination (RIN; RIN<sup>e</sup>)

## Protein assays



P230, P80, P200

- Sizing, Quantitation
- cell lysates, column fractions, purified proteins, antibodies etc

## Flow Cytometry Assay

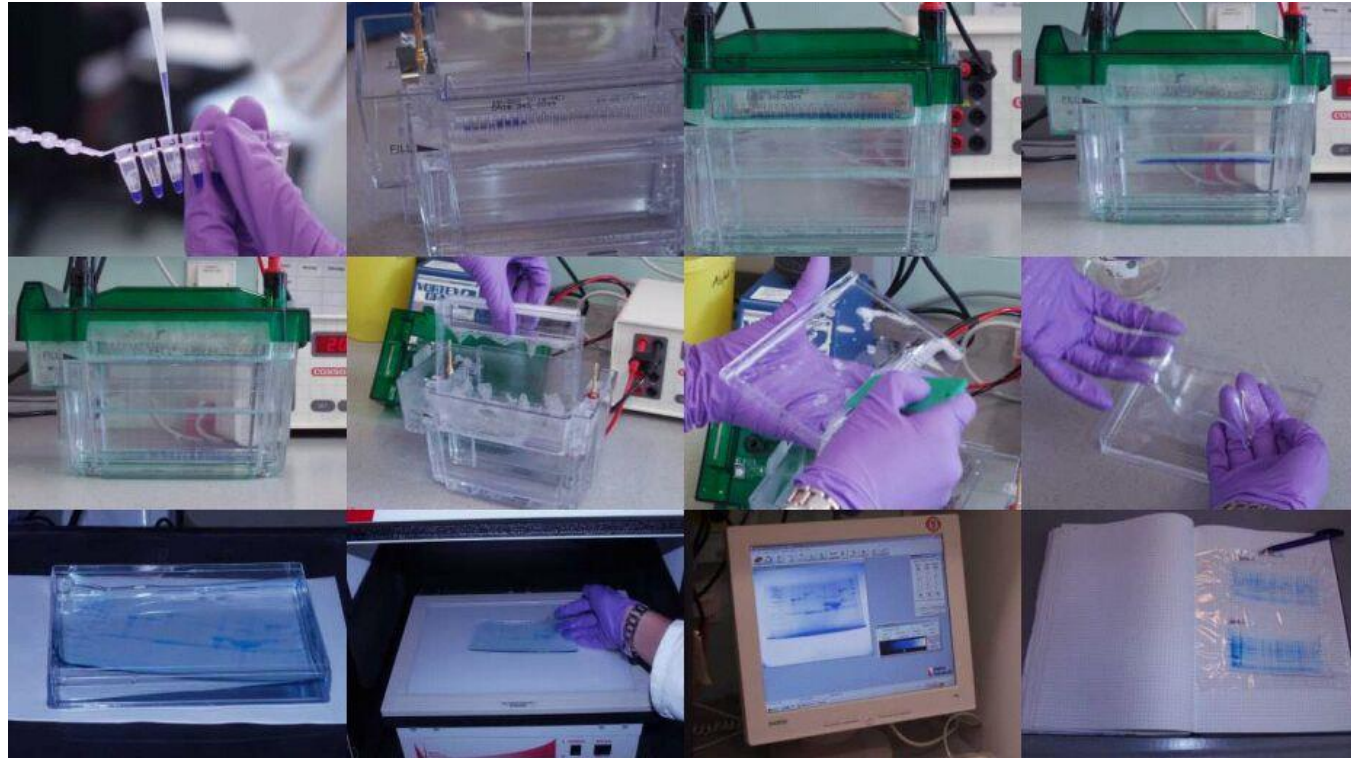


Flow Cytometry

- Two color detection
- Analysis of protein expression in cells

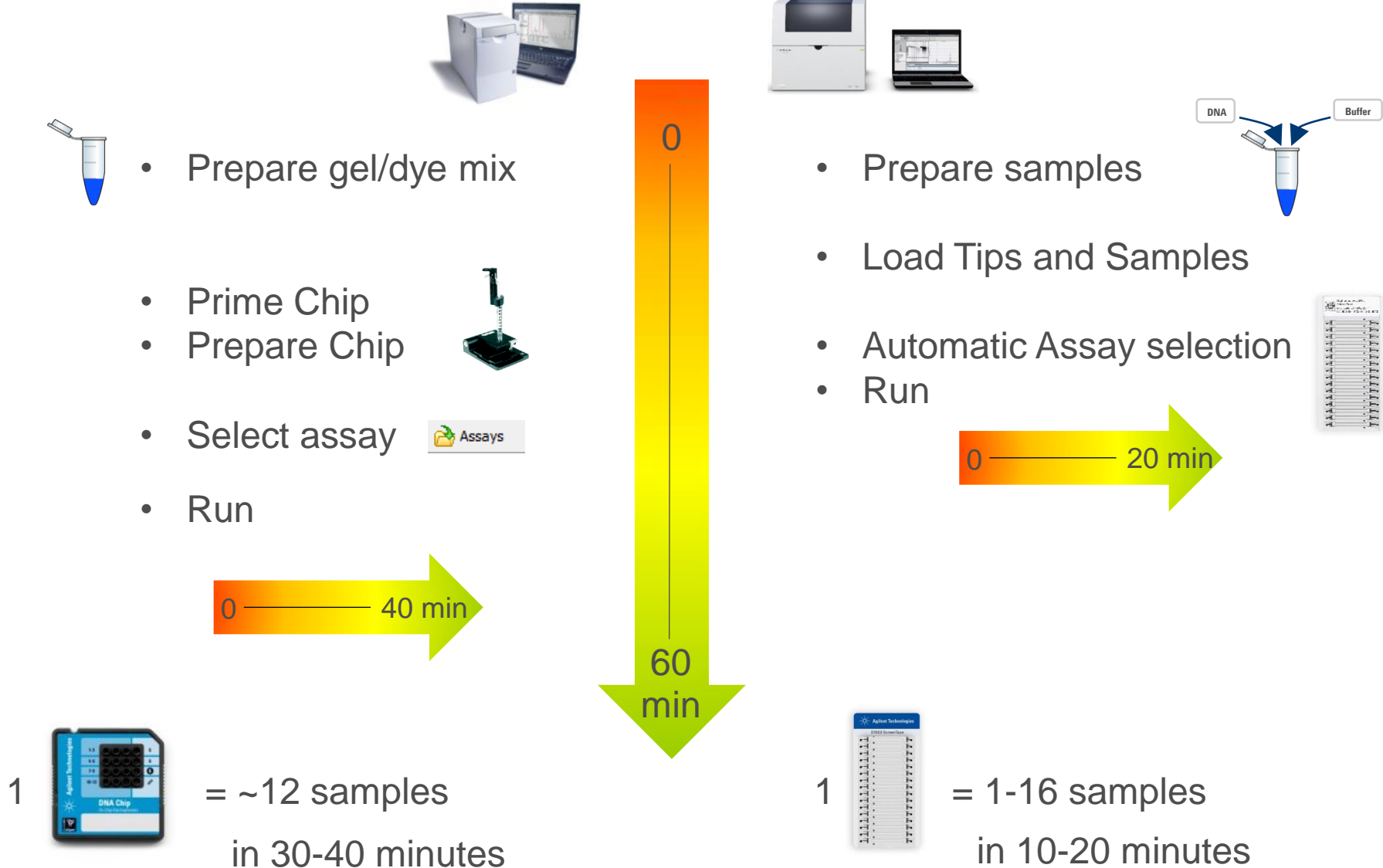
# Slab gel analysis - a bottleneck in Protein & DNA analysis

- ❑ Manual process
- ❑ Difficult to automate
- ❑ Slow
- ❑ Not accurate enough
- ❑ Bad reproducibility
- ❑ No direct comparison



**Automated Electrophoresis has the potential to address this**

# Overview run workflow



# Outline

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Automated Electrophoresis in Genome Editing

Automated Electrophoresis in Functional Genomics



# DNA & RNA Applications in Genome Editing



PCR products

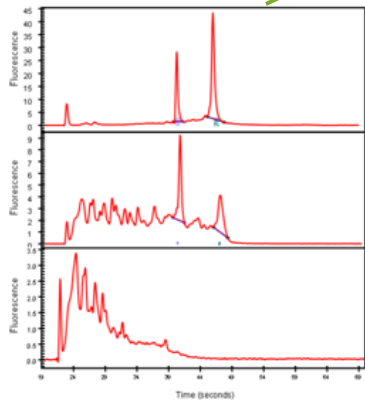
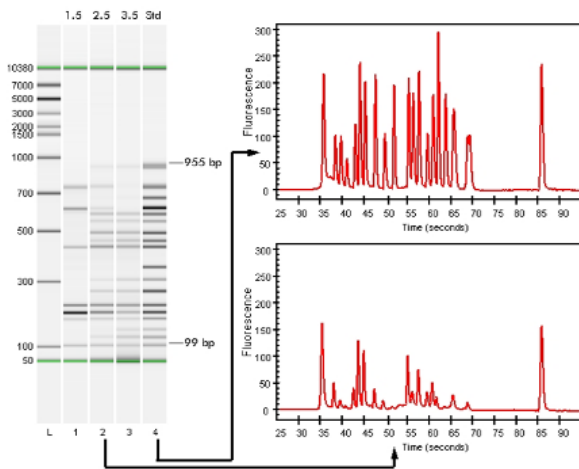
gDNA integrity

Restriction Digest Analysis

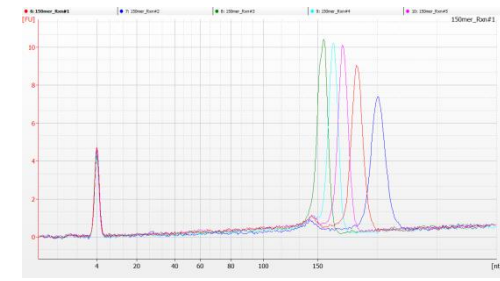
Quality Control in NGS

Total RNA integrity

Quality Control of Oligos



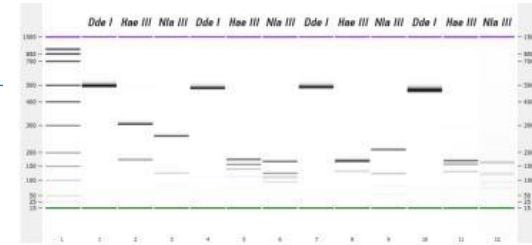
Oligo tailing reaction



# Examples of Electrophoresis in SynBio workflows

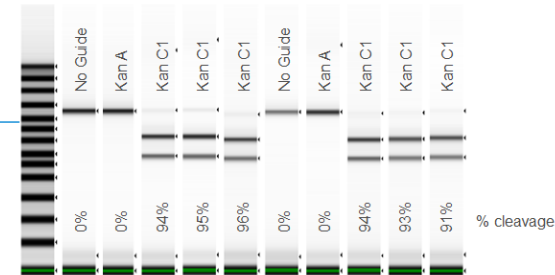
## Vector Assembly

- Starting material QC: Gene of interest after PCR amplification
- Verifying vector composition with restriction analysis
- Vector analysis by NGS (including multiple QC steps)



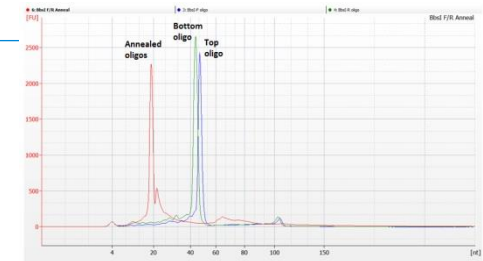
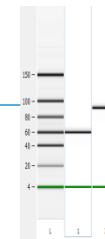
## CRISPR/ Cas9

- DNA target after PCR amplification
- Cleavage efficiency of digestion with Cas9 Nuclease (Detection and Quantitation)

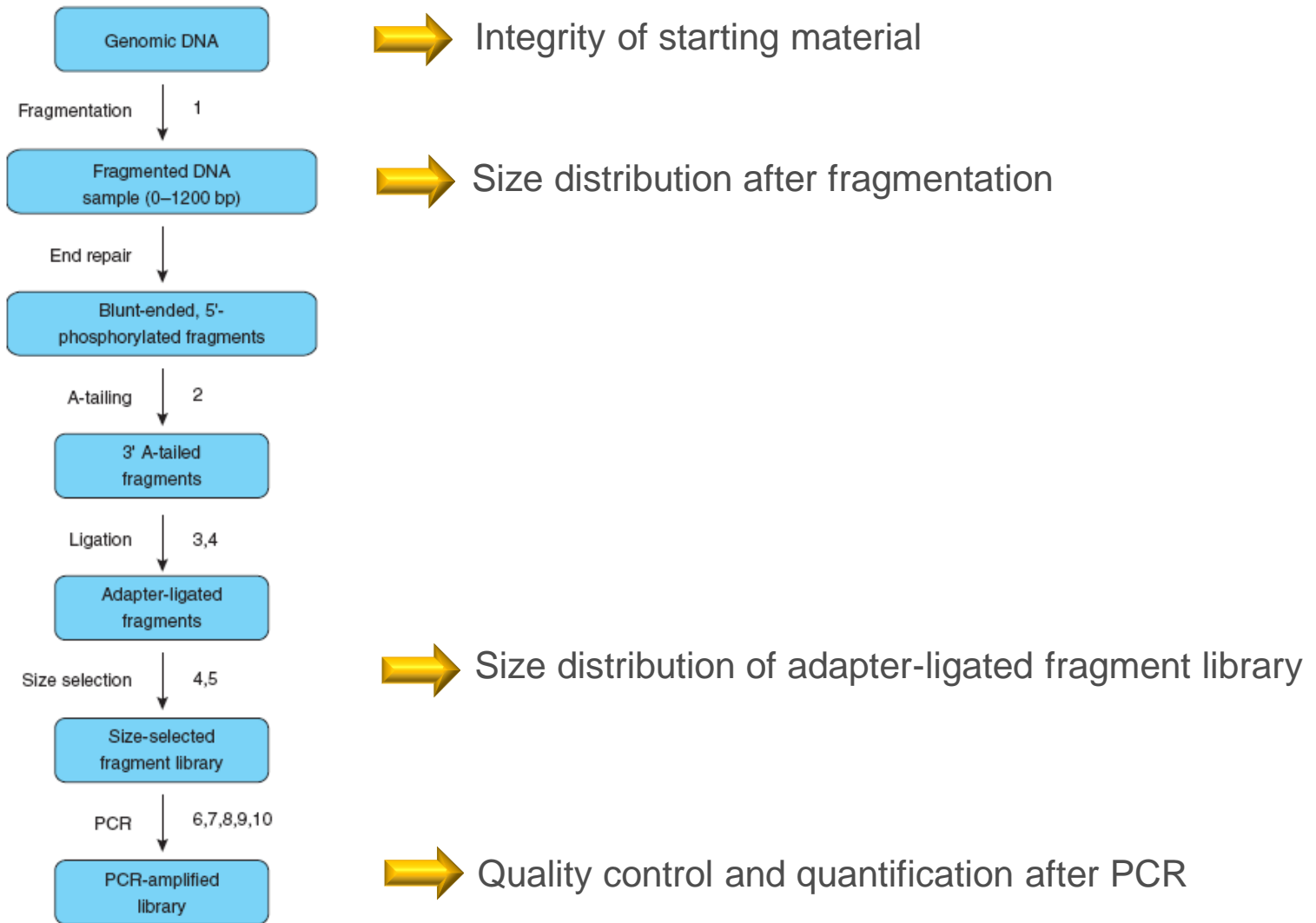


## guide RNA synthesis

- Starting material QC: oligo templates
- Monitoring oligo annealing reactions
- Quantitation and QC of gRNA product



# Example of Electrophoresis in a complex workflow: NGS Quality Control



*Adapted from Quail et al (2008) Nature Methods)*

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**Automated Electrophoresis in Functional Genomics**

# RNA Applications in Functional Genomics



Gene  
Expression

Transcriptome  
Profiling

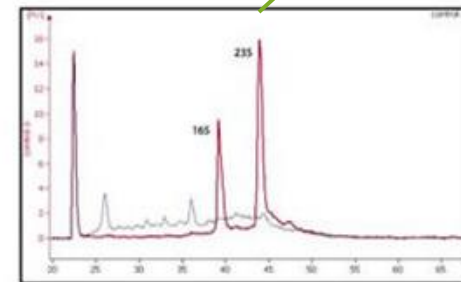
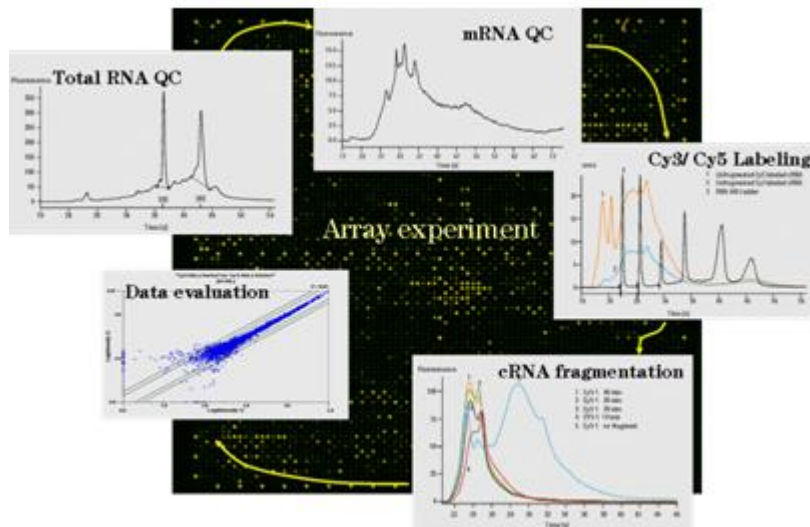
RNA QC for  
microarrays

RNA QC for  
qPCR

RNA QC for  
NGS

smallRNA  
QC

mRNA  
extraction



C. Bacteria: Total RNA (red) and RiboMinus<sup>™</sup> RNA (blue) isolated from *E. coli*

# Protein Applications in Functional Genomics

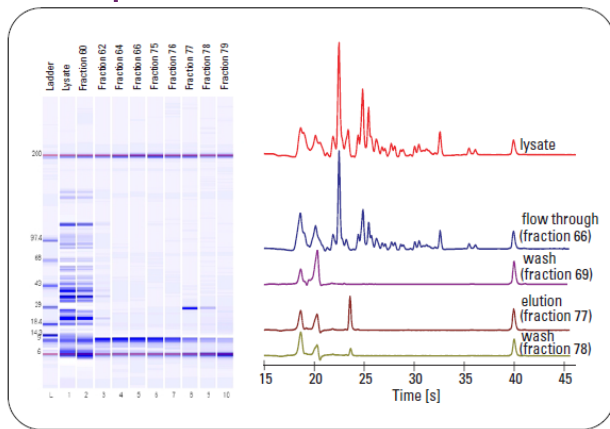


Monitor Protein Purification

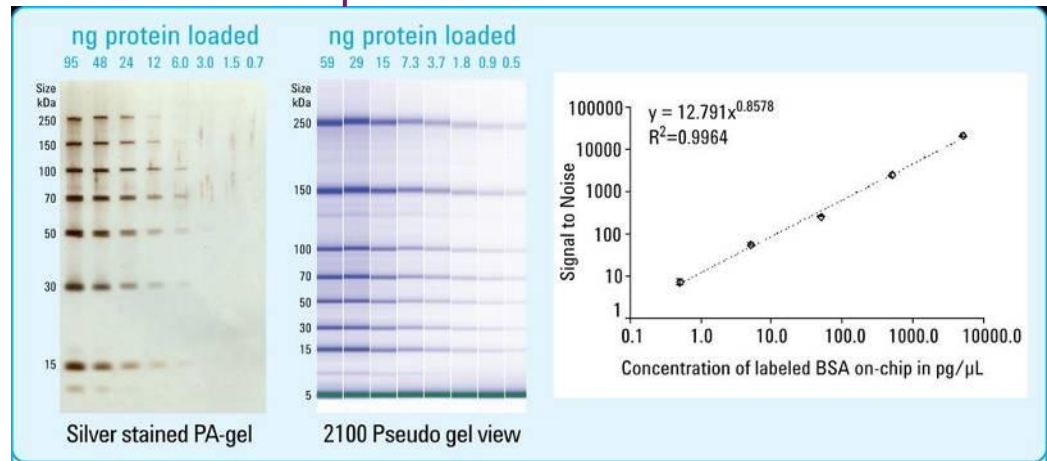
Protein Expression in cell lysates

Protein quantitation

Protein QC prior to MS analysis



**Figure 4**  
Analysis with the Protein 200 assay showing the gel-like image and the corresponding electrochromatograms.



# More Information

[www.agilent.com/genomics/bioanalyzer](http://www.agilent.com/genomics/bioanalyzer)

[www.agilent.com/genomics/tapestation](http://www.agilent.com/genomics/tapestation)

- Application Notes
- Publications
- Data Sheets
- Videos
- Brochures
- Special Offers
- Free Software Downloads



**Alternative to 2D gel electrophoresis – OFFGEL electrophoresis combined with high-sensitivity on-chip protein detection**

Application Note


Christian Wenz  
Andreas Küller




**Performance characteristics of the High Sensitivity Protein 250 assay for the Agilent 2100 bioanalyzer**

Technical Note


Christian Wenz  
Andreas Küller

**Quantification Strategies Using the High Sensitivity Protein 250 Assay for the Agilent 2100 Bioanalyzer**

Technical Note

Christian Wenz  
Andreas Küller

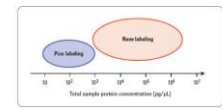



**Additional Pico protocol for the High Sensitivity Protein 250 assay with the Agilent 2100 Bioanalyzer**

Optimized procedure for lowest concentrated samples

Technical Note

Protein Electrophoresis

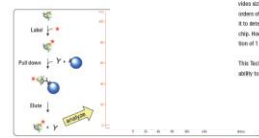



**Immunoprecipitation Sensitivity Protocols Combining Specific Proteins with the Agilent 2100 Bioanalyzer**

Application Note

Protein Electrophoresis

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Germany



**Abstract**  
A new method for the targeted analysis of proteins is presented that combines the specificity of immunoprecipitation with the sensitivity of protein detection on microchips using the High Sensitivity Protein 250 assay for the Agilent 2100 Bioanalyzer. As an alternative to Western blotting, this method is valuable for researchers requiring, for example, in protein expression and purification in pharma, biotech or academic labs. Advantages of this new method in comparison to Western blotting are:  
• More reliable results: higher specificity and sensitivity  
• Better accuracy and precision: less manual steps and direct acquisition of quantitative data  
• Increased productivity: 3 hours versus 1 day analysis time  
• Lower spending for antibodies: 10x less primary and no secondary antibody are needed  
• Lower reagent consumption: environmentally friendly process