4200 TapeStation System

18th September 2015

Agilent PLuF NGS QC System offering

Ease of use

2100 Bioanalyzer system

Industry Standard for NGS sample and library QC

2200 TapeStation system

- Ready-to-use ScreenTape Technology
- Scalable throughput 2-96 samples
- **Genomic DNA analysis**
- **DNA Integrity Number (DIN)**

ScreenTape devices need to be manually exchanged for 96 well plate run (hands on every 20-25 minutes)

4200 TapeStation system

- **96 sample walk away system**
- Ready-to-use ScreenTape Technology
- Scalable throughput 1-96 samples
- Genomic DNA analysis
- DNA Integrity Number (DIN)
- **Increased product portfolio with D5000 / HS D5000**

Automation & Throughput

Agilent PLuF NGS QC System offering

✓ **Seamless transition:** **excellent correlation** with 2100 Bioanalyzer system

full compatibility with 2200 TapeStation system

✓ **Ease-of-use:** enabled by ready-to-use ScreenTape technology, **automated sample loading**, intuitive and user friendly software for instrument control and data analysis – **no messing with bottles and fragile capillaries**

✓ **Analytical Sensitivity & Precision:** sensitive, reproducible, and user-independent detection and quantification of impurities and main products

Rev 1. - 18th September 2015

Introducing the 4200 TapeStation System

Made in Germany

Complete System includes

- Bundle laptop
- 4200 TapeStation Software
  (no license - free upgrades on webpage)
  - 4200 TapeStation Controller
  - TapeStation Analysis Software
  - LabAdvisor
  - Agilent Information Center (AIC)
- Vortexer with adaptor
- Plastic consumable start up kit
- TapeStation Test Tape
- ScreenTape Assay Quick Guides

- Installation & Familarization service
- 1st year warranty

Rev 1. - 18th September 2015

4200 TapeStation Instrument

Open Lid

Instrument locked during run

All moving parts covered

Power Button

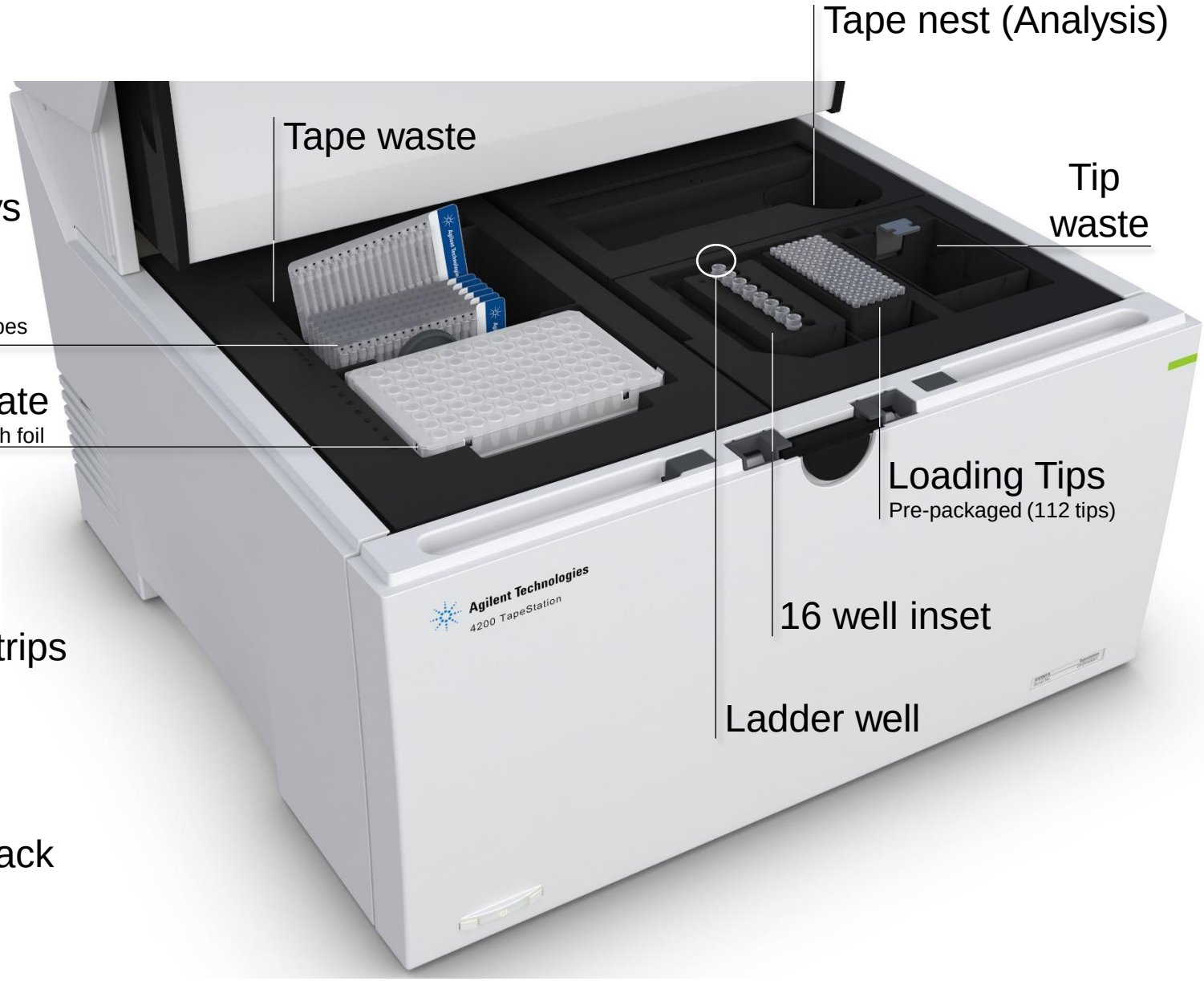
Status Indicator

Rev 1. - 18th September 2015

4200TapeStation Instrument

User Interface

- No mix & match betweeen ScreenTape assays
  - only one assay type per run



- No combination of 96 well plate and Tube strips

- System performs automatic upfront scann
  - # Loading tips
  - # ScreenTape devices in ScreenTape rack

Rev 1. - 18th September 2015

4200 TapeStation ScreenTape Portfolio

more details in appendix

	DNA					RNA	
	D1000	**HS D1000**	**D5000**	**HS D5000**	**Genomic DNA**	**RNA**	**HS RNA**
Sizing range	35 to 1000bp	35 to 1000bp	100 to 5000bp	100 to 5000bp	200 to >60kbp	100 to 6000nt	100 to 6000nt
Required sample volume	1µl of sample	2µl of sample	1µl of sample	2µl of sample	1µl of sample	1µl of sample	2µl of sample
							
Quantification range	0.1 – 50ng/µl	10 – 1000pg/µl	0.1 – 50ng/µl	10 – 1000pg/µl	10 – 100ng/µl	25 – 500ng/µl	500 – 10,000pg/µl
Limit of detection	LOD 0.1 ng/uL	LOD 5 pg/uL	LOD 0.1 ng/uL	LOD 5 pg/uL	LOD 0.5 ng/uL	LOD 5 ng/µL	LOD 100 pg/µL

NEW

Launch with 4200 TapeStation system

DNA Integrity Number equivalent (DIN)

RNA Integrity Number equivalent (RIN^e)

Rev 1. - 18th September 2015

4200 TapeStation Features and Benefits - Overview

- ✓ **Automated:** fully automated sample processing from 1-96 samples
- ✓ **Scalable throughput:** any sample number from 1 to 96 samples
- ✓ **Flexible:** easy to switch between assays, 96-well plate and 8x PCR strips are compatible
- ✓ **Fast results:** 1 sample in about 1-2 min; 96 well plate <90 min; no system set up time
- ✓ **Low hands-on time:** ready-to-use ScreenTape devices and automated sample transfer
- ✓ **Constant cost / sample:** discrete ScreenTape lanes,
  partially used ScreenTape devices are good to use for two weeks
- ✓ **Low sample volume:** 1 µl, or max 2 µl of sample required
- ✓ **Zero carry-over:** discrete ScreenTape lanes and disposable pipette tips
- ✓ **No evaporation:** sample plates can be covered with foil

Rev 1. - 18th September 2015

Agilent 4200 TapeStation Controler Software

Easy and automated

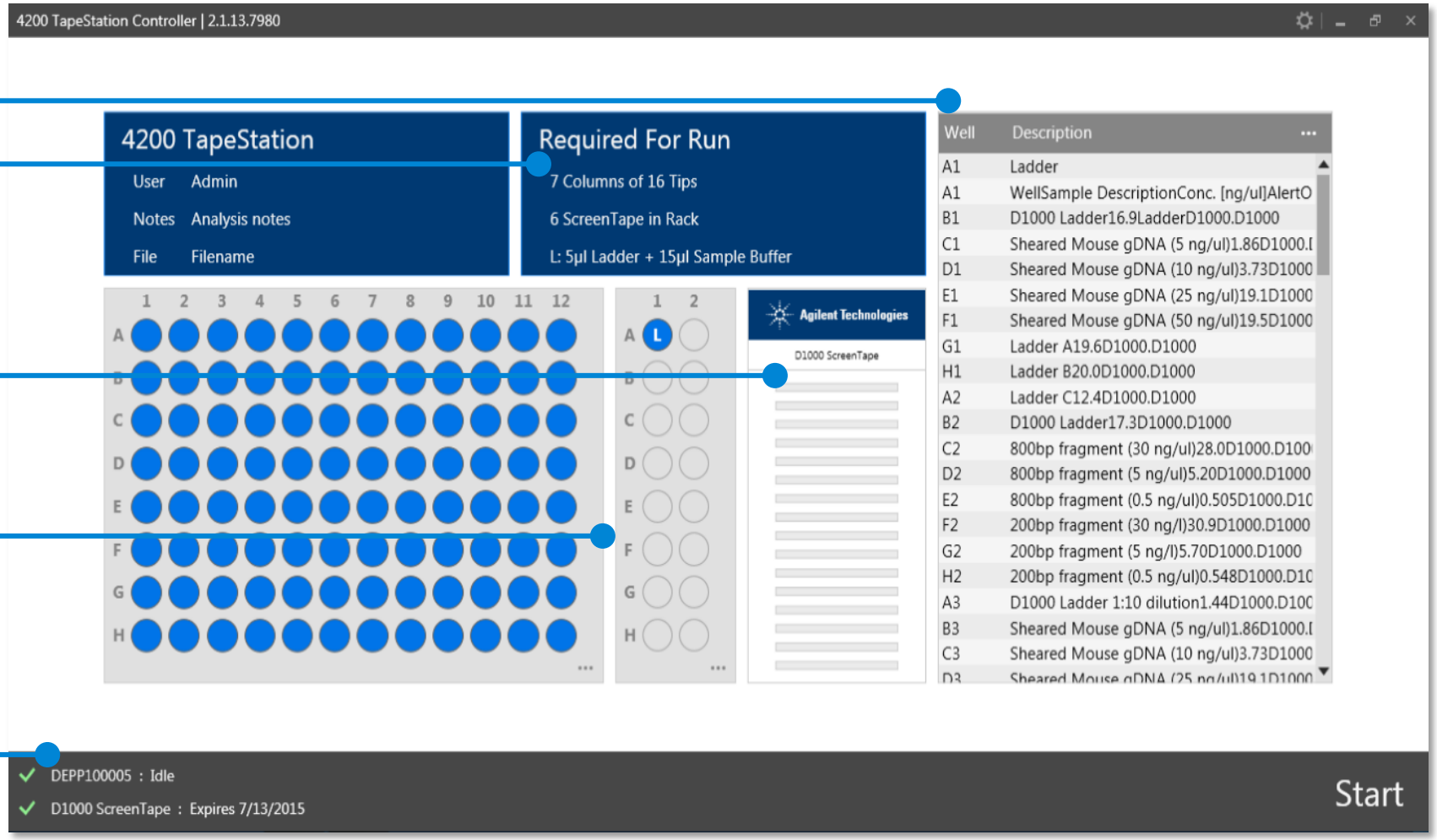
Easy population of sample descriptions
Sample names can be entered by copy/paste or imported from a previous file

Required Consumables
Software calculates the required consumables based on number of samples for analysis

Automatic Assay Selection
Barcode recognises assay type and available number of ScreenTape lanes for analysis

Intuitive sample selection
Full flexibility for sample selection independent on sample location.

System status & Observations
Status, warnings and errors are displayed in the task bar



Rev 1. - 18th September 2015

Agilent TapeStation Analysis Software

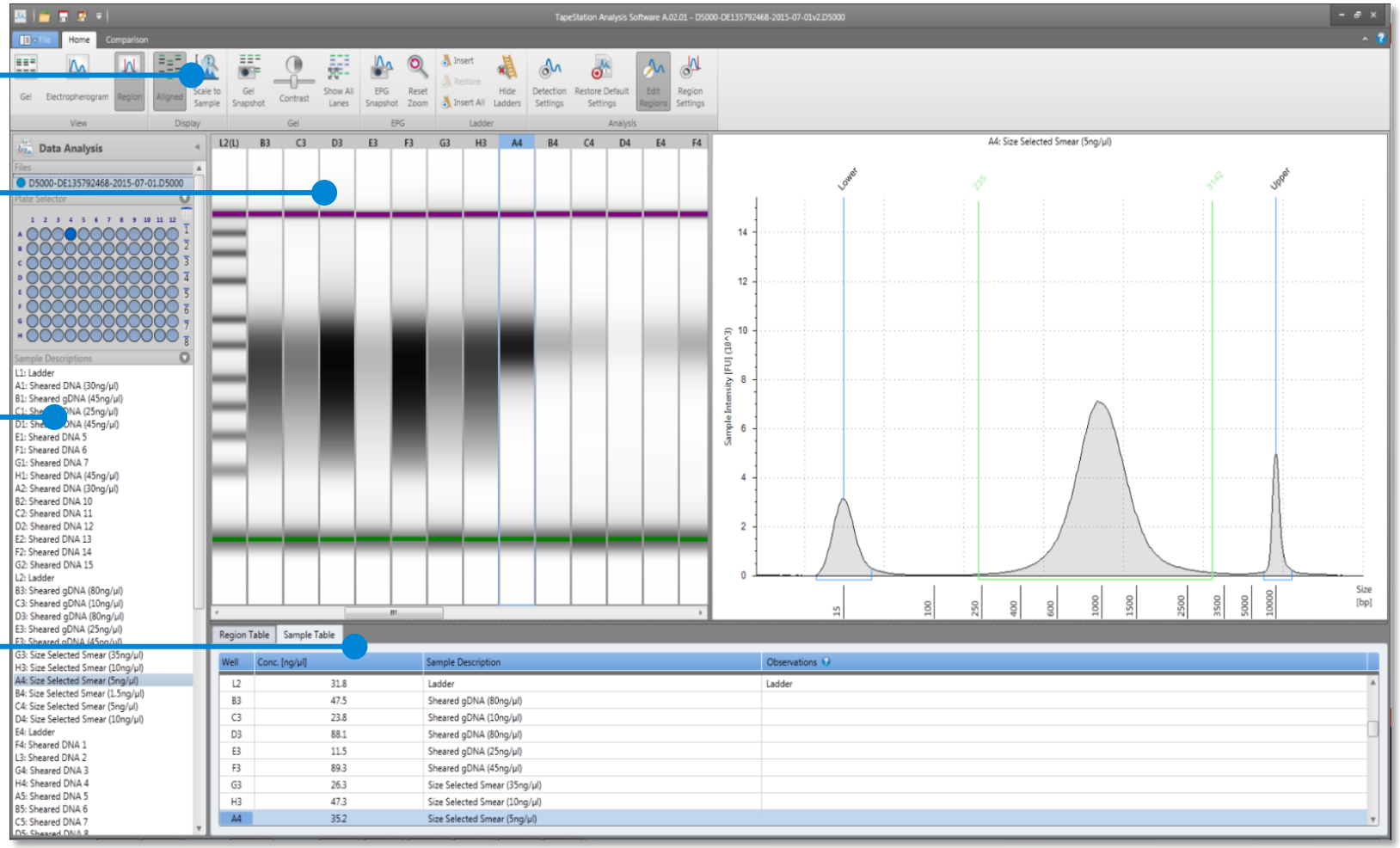
Intuitive and familiar

Analysis Functions
Functions are navigated through a context sensitive ribbon.

Gel and Electropherogram View
Results can be viewed in familiar gel view or Electropherogram view.

Navigation pane
Navigate through experiments and individual lanes. Lanes can be selected in any order from the Plate Selector.

Result Presentation
Customisable views of gel image, eletropherogram and data table.



Rev 1. - 18th September 2015

4200 TapeStation System – Support Features

Agilent Information Center (AIC)

- Software system information repository

Agilent LabAdvisor

- Core test suite
- Troubleshooting test suite

TapeStation TestTape (TSTT) PN 5067-5601

- quick and reliable system troubleshooting
- available for 4200 and 2200 TapeStation systems

- Electrophoresis check
- Light Source (LED) on/off check
- Camera alignment and functionality check

A complete solution for complete success

Automated – walk-away operation with fully automated sample processing

Scalable – 1 up to 96 samples at constant cost / sample

Flexible – ready-to-use ScreenTape technology enable easy switching between assays

Fast – reliable results within 1-2 minutes / sample, <90 min for 96 samples

Rev 1. - 18th September 2015

New! 4200 TapeStation system

A complete solution for complete success

NEW!

True end-to-end sample QC within any NGS workflow

Full range of sizing applications for DNA and RNA

Shipment start: October, 2015

Rev 1. - 18th September 2015

APPENDIX

Rev 1. - 18th September 2015

DNA ScreenTape Assay Portfolio Detail

DNA Kits

Number	Kit	Max # of Samples
5067-5582	D1000 ScreenTape	112
5067-5583	D1000 Reagents	
5067-5586	D1000 Ladder	
5067-5584	High Sensitivity D1000 ScreenTape	112
5067-5585	High Sensitivity D1000 Reagents	
5067-5587	High Sensitivity D1000 Ladder	
5067-5588	D5000 ScreenTape	105
5067-5589	D5000 Reagents	
5067-5590	D5000 Ladder	
5067-5592	High Sensitivity D5000 ScreenTape	105
5067-5593	High Sensitivity D5000 Reagents	
5067-5594	High Sensitivity D5000 Ladder	
5067-5365	Genomic DNA ScreenTape	105
5067-5366	Genomic DNA Reagents	

Rev 1. - 18th September 2015

RNA ScreenTape Assays Portfolio Detail

RNA Kits

Number	Kit	Max # of Samples
5067-5576	RNA ScreenTape	112
5067-5577	RNA Sample Buffer	
5067-5578	RNA Ladder	
5067-5579	High Sensitivity RNA ScreenTape	112
5067-5580	High Sensitivity RNA Sample Buffer	
5067-5581	High Sensitivity RNA Ladder	

Rev 1. - 18th September 2015

TapeStation System - **DNA Applications**

DIN

Genomic DNA QC

NGS Workflow Sample QC

Multiplex PCR analysis

cDNA library QC

Veterinary diagnostics

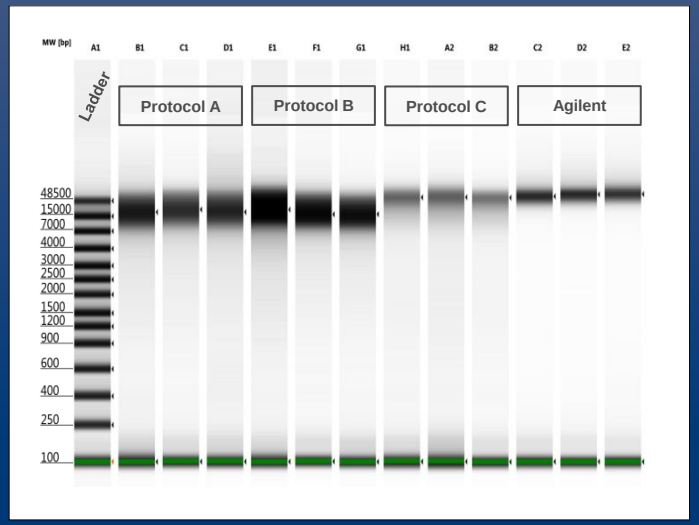
Mycoplasma detection

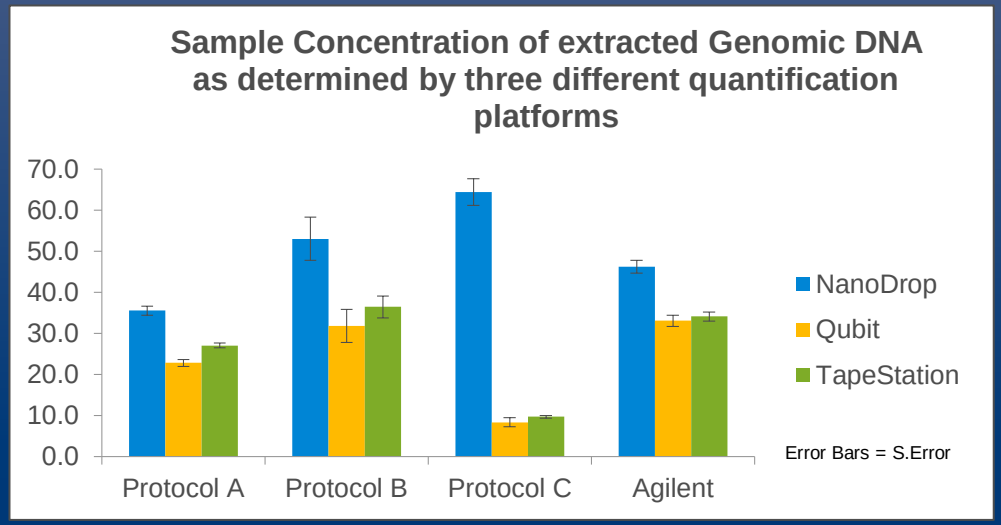
Genotyping

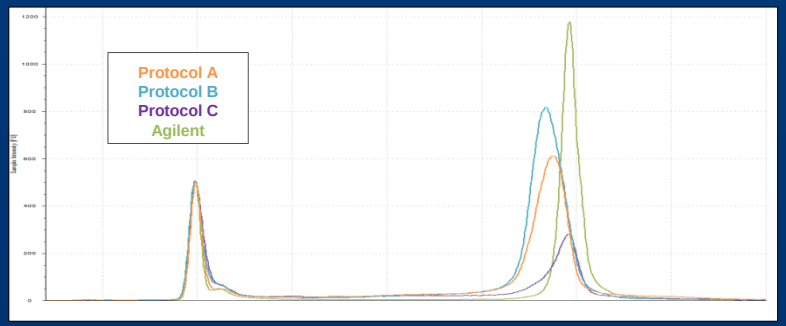
qPCR product QC

Rev 1. - 18th September 2015

Genomic DNA ScreenTape Analysis







Analysis of high molecular weight genomic DNA using the Agilent 2200 TapeStation and Genomic DNA ScreenTape

Determining extraction kit efficiency

Download the application note:

http://www.chem.agilent.com/Library/applications/5991-1797EN.pdf

Rev 1. - 18th September 2015

Genomic DNA ScreenTape Analysis – Sample Preparation

Genomic DNA ScreenTape Assay:

- Easy sample preparation
- Ready to use ScreenTape consumable
- Results in 1 – 2 minutes per sample

Rev 1. - 18th September 2015

Agilent Genomic DNA ScreenTape - Specifications

Analytical Specification	Genomic DNA ScreenTape
Sizing Range	200 to >60,000 bp
Sensitivity[1]	0.5 ng/µl
Sizing Precision[2]	200bp - 15,000bp : 15% CV
Sizing Accuracy[2]	200bp - 15,000bp: ± 15%
Quantitative Precision[3]	15% CV
Quantitative Accuracy[3]	± 20%
Quantitative Range	10 - 100 ng/µL
DIN functional range[4]	5 - 300 ng/µL
Carry Over	N/A
Physical Specification	
Analysis Time (4200 TapeStation system)	16 samples < 25 minutes 96 samples < 140 minutes
Samples per consumable	15
Sample Volume Required	1 µL
Shelf Life	4 months
Box/Kit size	105 samples/box

[1] Signal:noise ratio > 3 for a single peak
[2] Determined using the Genomic DNA Ladder as sample
[3] Average result from various genomic DNA sample types
[4] DIN – DNA Integrity Number

Rev 1. - 18th September 2015

Introducing the DNA Integrity Number (DIN)
A new standard for genomic DNA QC

DIN functionality for the Genomic DNA ScreenTape assay.

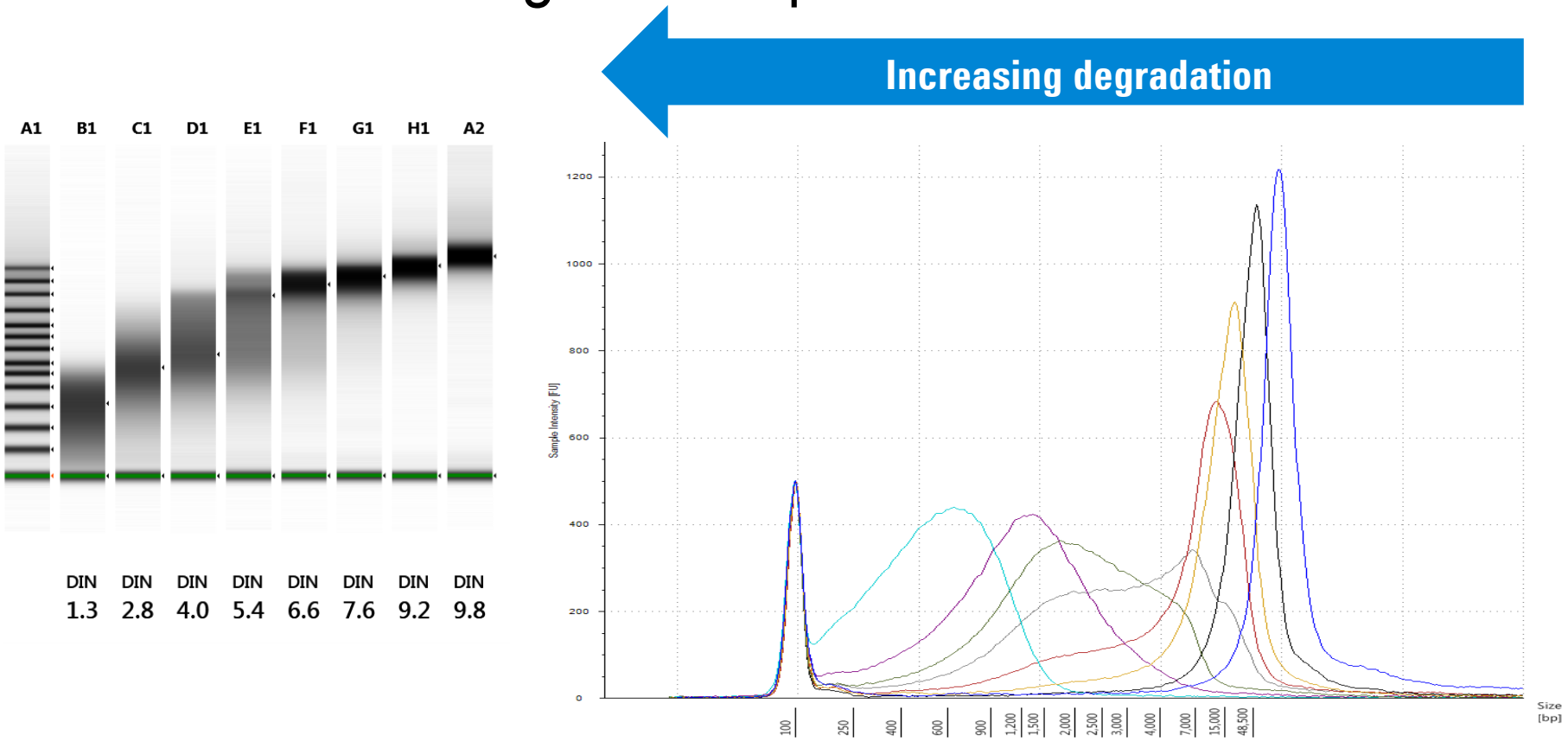
- Automated numerical software assessment of sample integrity.
- Independent of sample concentration and analyst.
- full range of eukaryotic samples from degraded to intact gDNA.

Benefits:

- Easy interpretation of results.
- Ensures repeatability of experiments.
- Enables comparison of samples by defining a DIN value or threshold for specific type of samples or preparation

Rev 1. - 18th September 2015

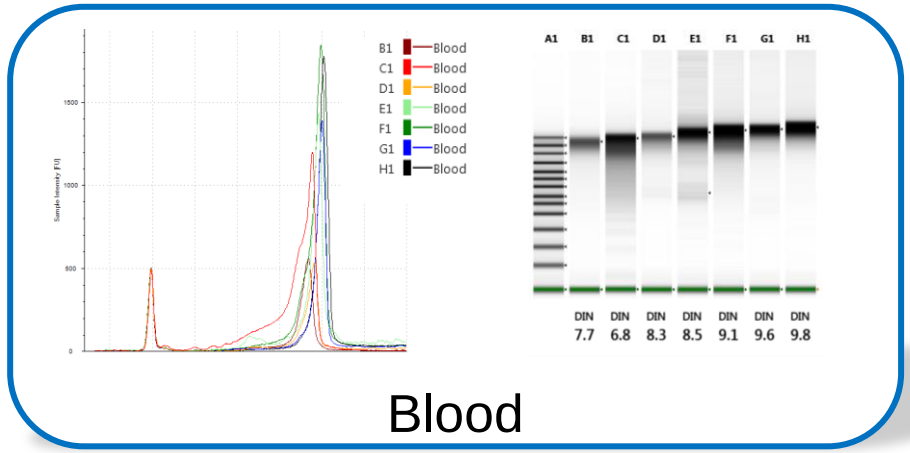
DNA Integrity Number (DIN) measures DNA Integrity across the widest range of samples



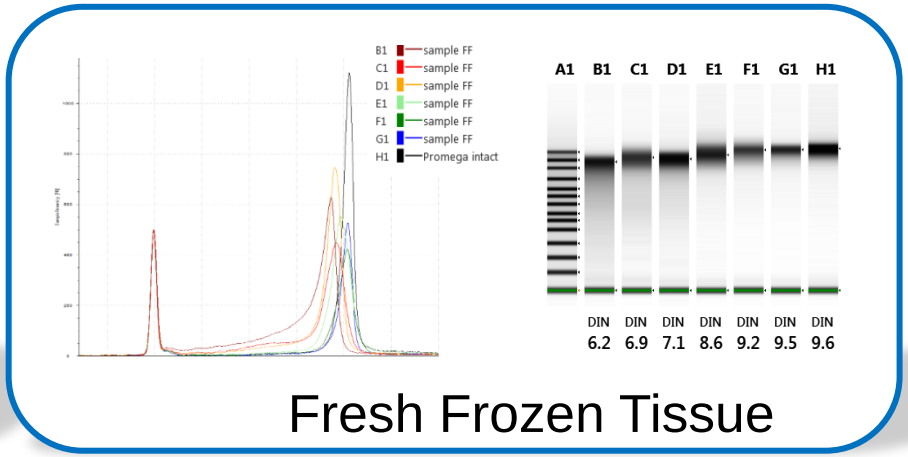
Automatic assignment of an integrity number in the range of 1 to 10 (highly degraded to highly intact).

Rev 1. - 18th September 2015

Example DNA Integrity Number (DIN) results from various eukaryotic tissue samples

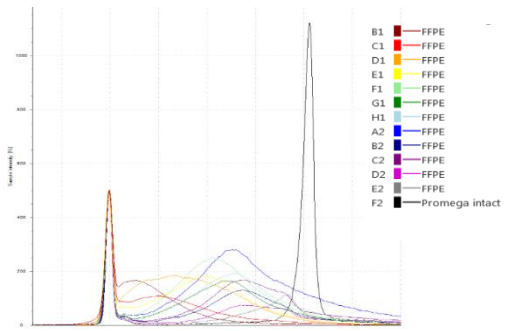


Blood



Fresh Frozen Tissue

FFPE

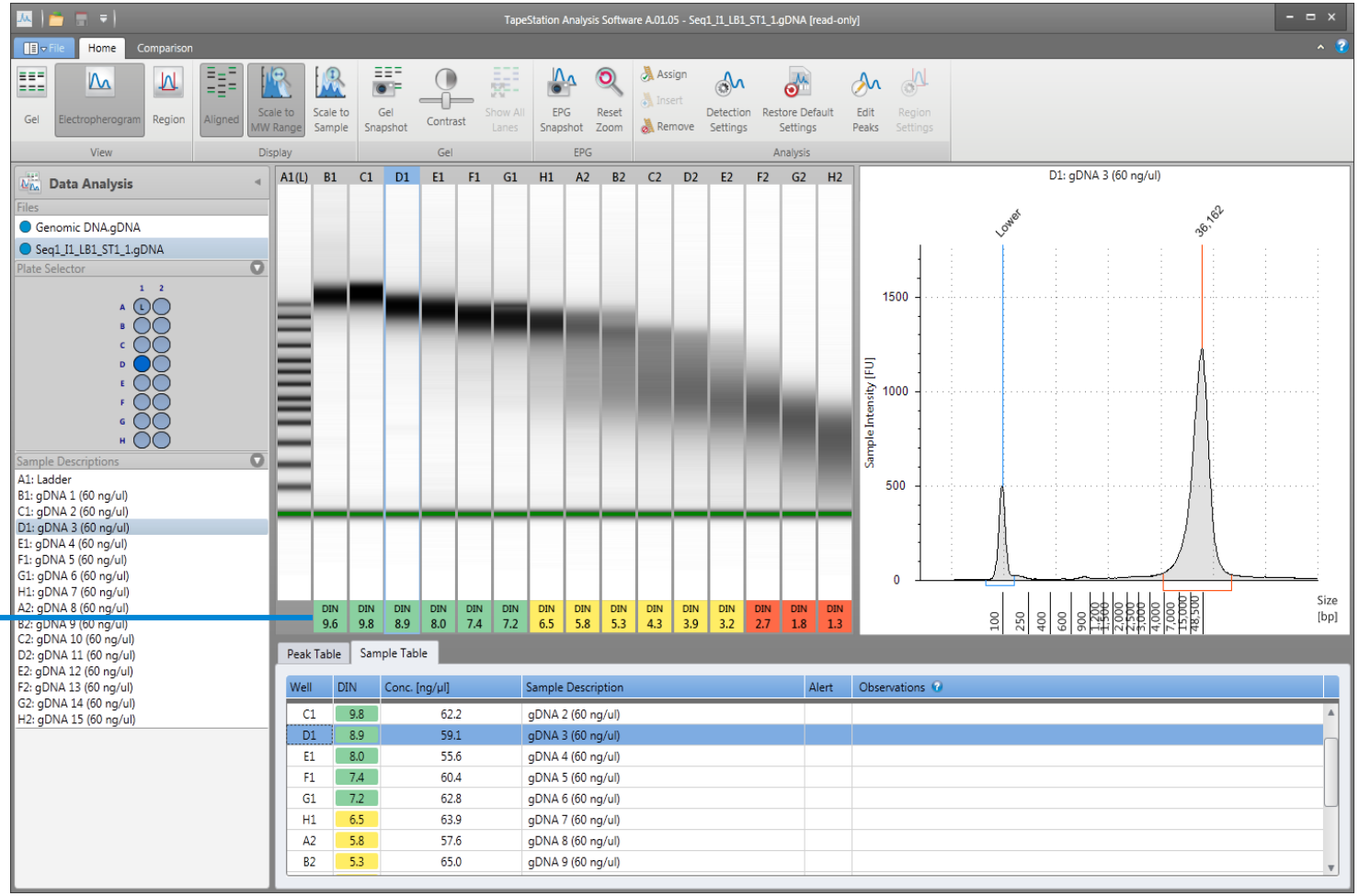


Rev 1. - 18th September 2015

Easy Visualisation of gDNA Integrity Thresholds

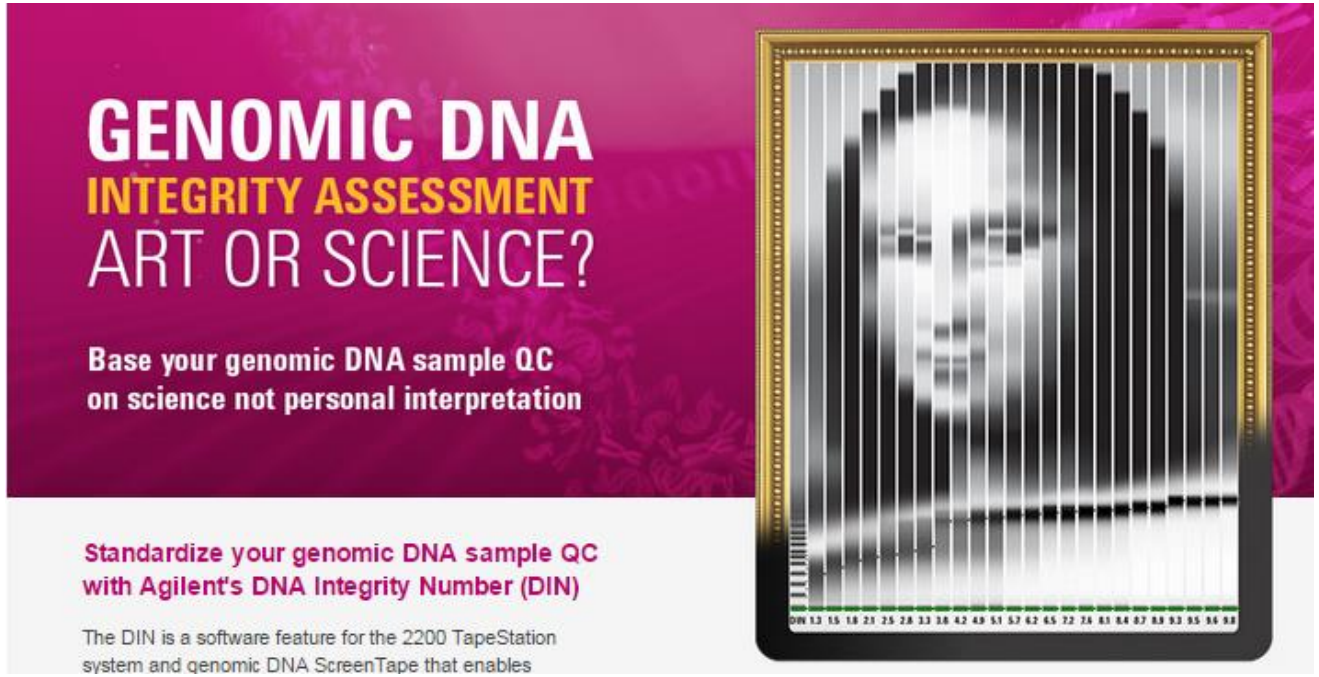
Once a threshold for integrity is determined a colour range can be set for easy visualisation

DNA Integrity Number (DIN)



Rev 1. - 18th September 2015

Find out more about the DNA Integrity Number (DIN)



Visit our product pages here:

- www.agilent.com/genomics/ArtorScience

- Datasheet: Agilent Genomic DNA ScreenTape Datasheet

Rev 1. - 18th September 2015

Published DNA Integrity Number (DIN) Thresholds

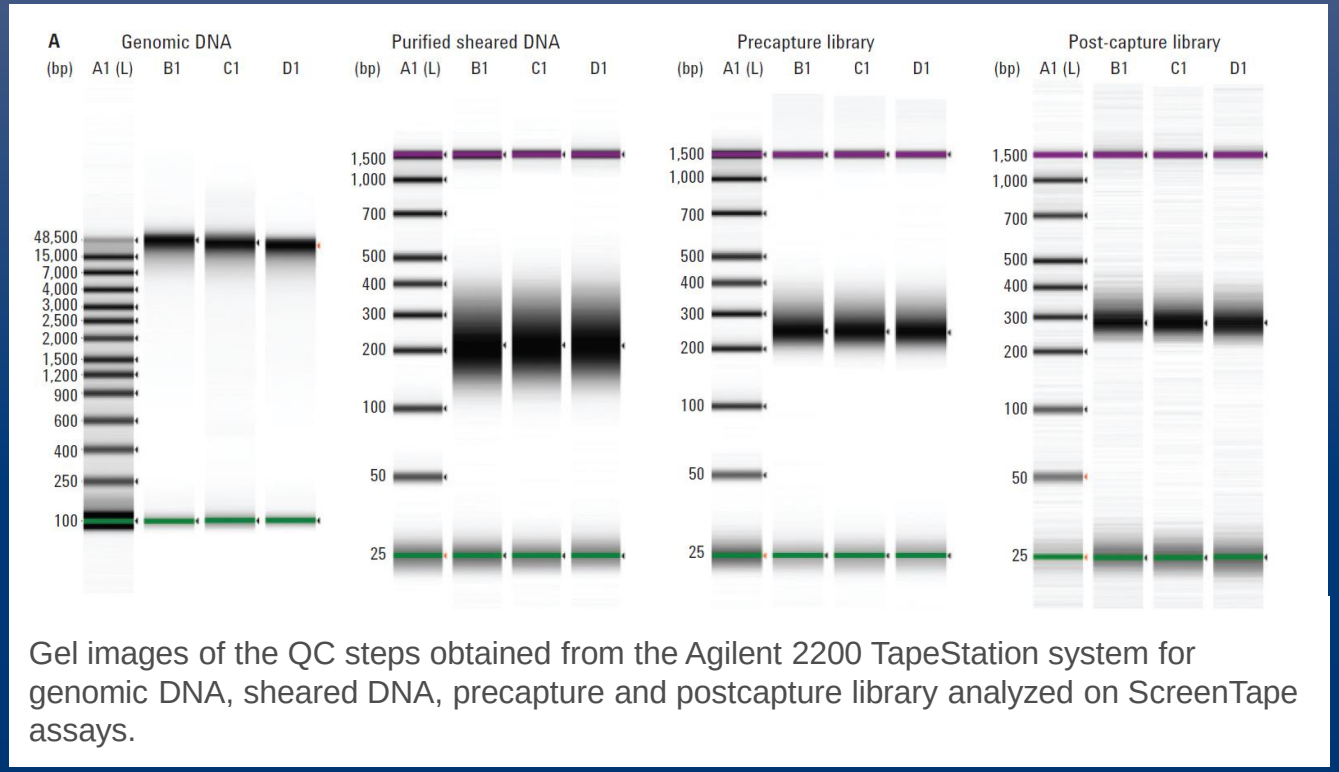
External Collaborations	Material tested	Downstream application	DIN threshold determined for successful downstream results	AppNote
Theragen **ETEX**	~ 800 FFPE cancer samples DNA extraction done by customer, Extraction method not available	WGS (whole genome sequencing): HiSeq 2500 Library Preparation: SureSelect^{XT}HQ kit	DIN >3	http://www.chem.agilent.com/Library/applications/5991-5360EN.pdf
UC Davis 100K Pathogen Genome Project	Bacterial (Campylobacter, Staphylococcus, Listeria, Escherichia, Salmonella) Lysis: Kapa Express Extract kit (KK7102) Purification: Extraction kit Qiagen QIAamp DNA Mini (51306)	WGS (whole genome sequencing): BGI@UCD HiSeq2000, multiplexed, pair-end (2x100bp) Illumina seq. libraries Library Preparation: Kapa HPT Library Preparation kit (KK8234)	DIN >7	http://www.chem.agilent.com/Library/applications/5991-5442EN.pdf

The D1000 ScreenTape Assay

- Use as little as 1µl of precious sample
- Rapid time to result, at around 1 minute per sample
- Detection of DNA fragments as low as 5pg/µl
- Ideally suited for the QC of libraries in the NGS workflow
- Also ideal for these applications:
  - qPCR product QC
  - Mycoplasma detection
  - cDNA library QC

Rev 1. - 18th September 2015

DNA ScreenTape Literature for NGS Workflow Integration



Gel images of the QC steps obtained from the Agilent 2200 TapeStation system for genomic DNA, sheared DNA, precapture and postcapture library analyzed on ScreenTape assays.

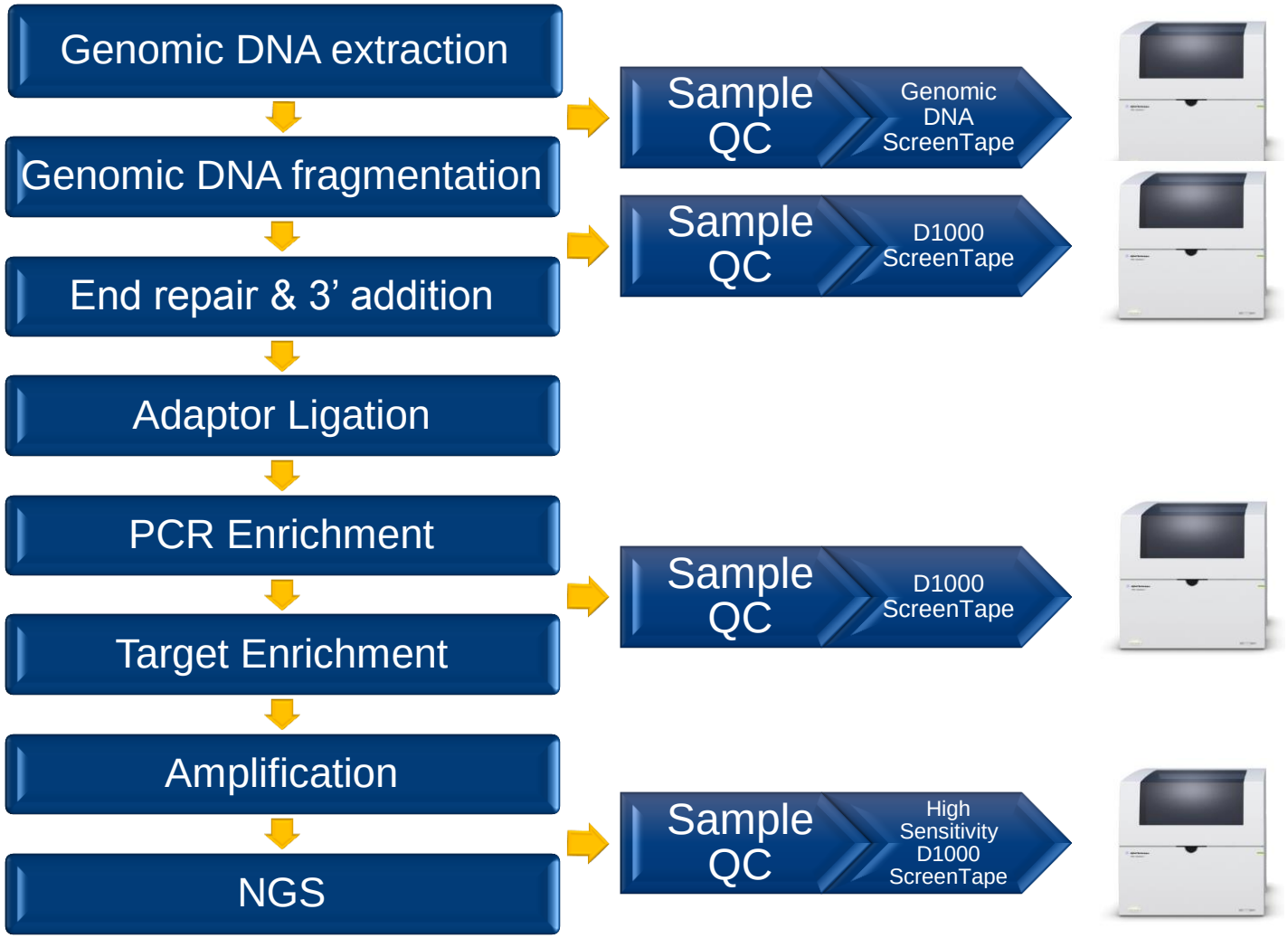
End to End Sample Quality Control for Next Generation Sequencing Library Preparation and SureSelect Target Enrichment on the Agilent 2200 TapeStation System

Download the application note:

https://www.chem.agilent.com/Library/applications/5991-3654EN.pdf

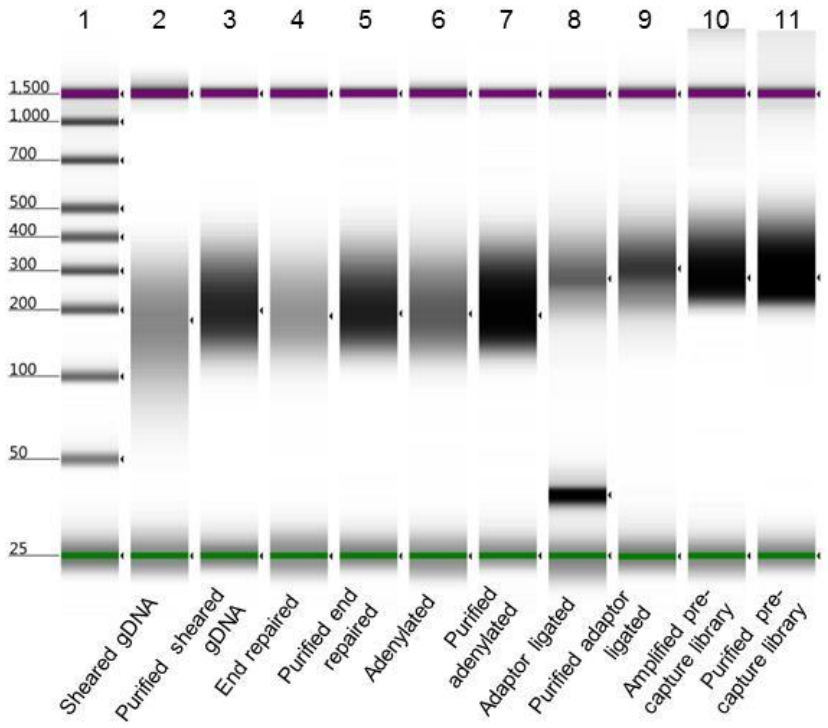
Rev 1. - 18th September 2015

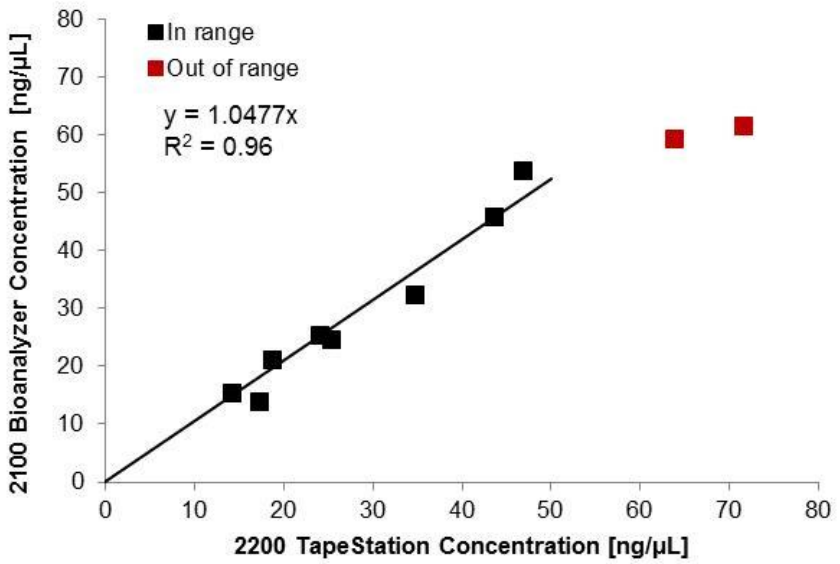
Sample Preparation for Next Generation Sequencing using SureSelect and Haloplex



Rev 1. - 18th September 2015

D1000 ScreenTape Assay in the SureSelect Workflow



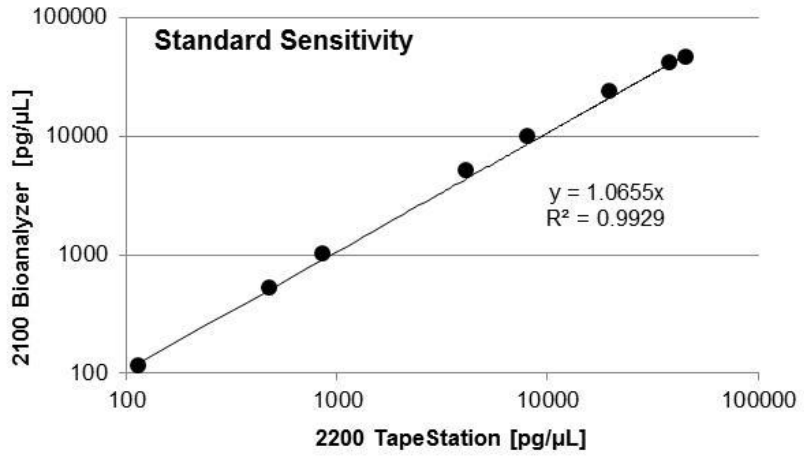


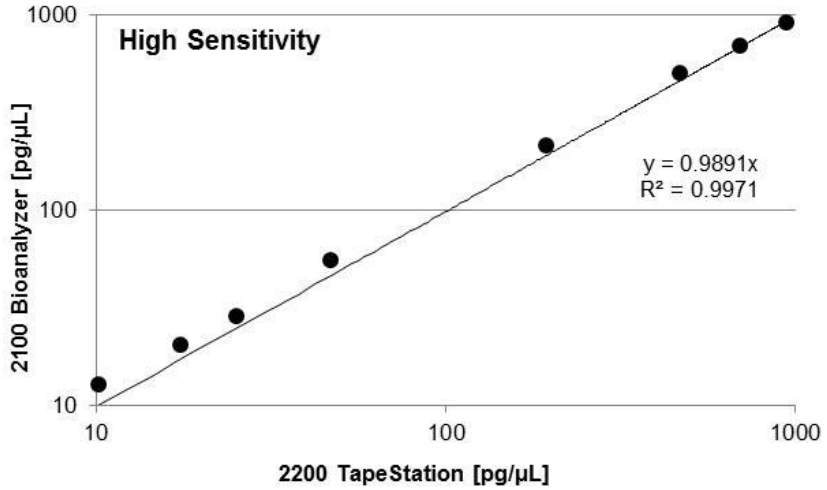
A) Samples from various stages of the Agilent SureSelect NGS library prep workflow run on the D1000 ScreenTape assay

B) Quantification of samples from A) run against the 2100 Bioanalyzer showing excellent alignment. The two samples shown in red are out of range for both systems, but still show reasonable quantitative alignment.

Rev 1. - 18th September 2015

D1000 ScreenTape Assays
Quantitative Performance versus 2100 Bioanalyzer system





A) A plot of quantification of a 750bp fragment with the standard D1000 ScreenTape assay and the DNA 1000 chip of the 2100 Bioanalyzer system

B) Plot of quantification of a 750bp fragment with the High Sensitivity D1000 ScreenTape assays and the High Sensitivity DNA chip of the 2100 Bioanalyzer system

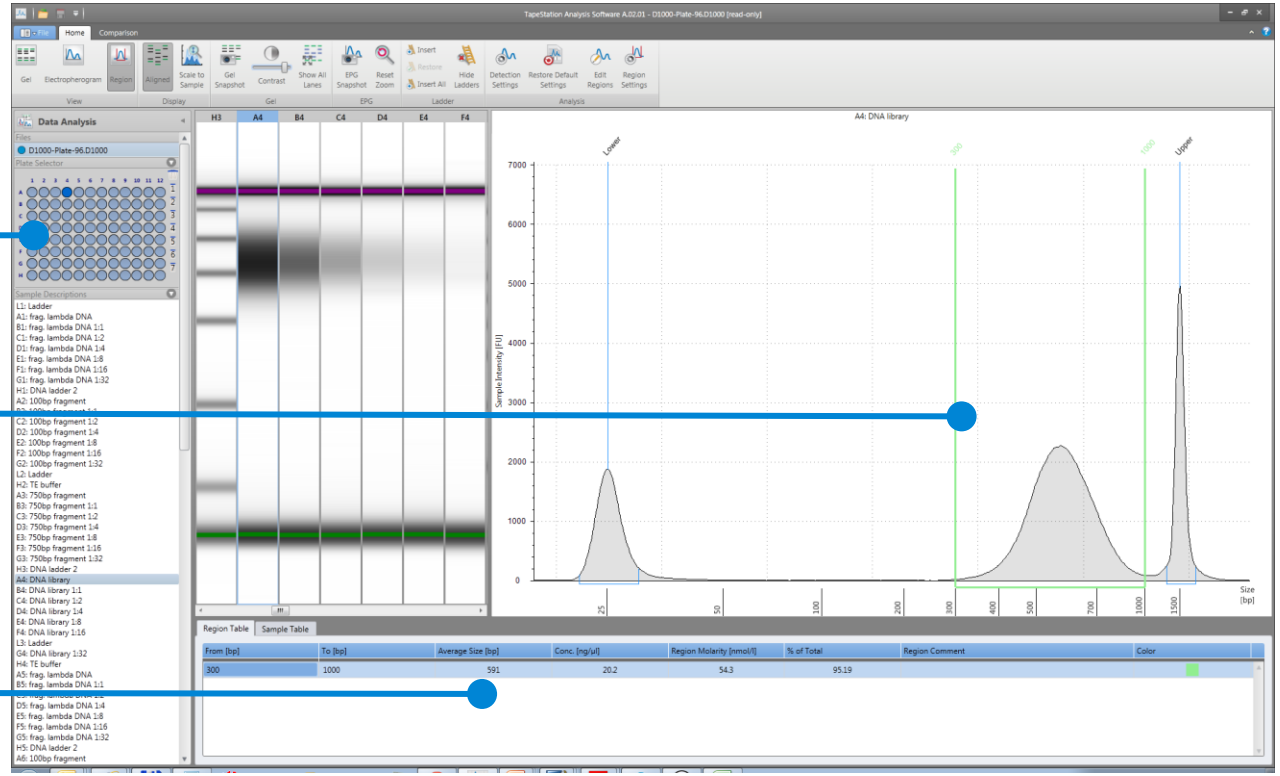
Rev 1. - 18th September 2015

TapeStation System Features for NGS Sample QC

96 well plate capability
Generate results from a 96 well plate, meeting higher throughput needs.

Regions easily defined
Regions are applied either manually or automatically

Region Table
Data presented in a table, includes average size, concentration and molarity.



- **Highest Analytical Sensitivity:** Single band sensitivity is as low as 5pg/µL for High Sensitivity D1000 ScreenTape
- **Report Generation:** Simple reporting tool generates reports to .pdf, .csv and Word formats with the region table incorporated with every sample.

Rev 1. - 18th September 2015

Agilent D1000 ScreenTape Assays - Sample Preparation

D1000 ScreenTape Assay:

High Sensitivity D1000 ScreenTape Assay:

Rev 1. - 18th September 2015

Agilent D1000 ScreenTape Assays - Specifications

Analytical Specification	D1000 ScreenTape	High Sensitivity D1000 ScreenTape
Sizing Range	35 - 1000 bp	35 - 1000 bp
Typical Resolution	35-300 bp: 15% 300-1000 bp: 10%	35-300 bp: 15% 300-1000 bp: 10%
Sensitivity[1]	0.1 ng/µL	5 pg/µL
Sizing Precision[2]	5 % CV	5 % CV
Sizing Accuracy[2,3]	± 10 %[3]	± 10 %[3]
Quantitative Precision	0.1-1 ng/ul 15% CV 1-50ng/ul: 10% CV	15% CV
Quantitative Accuracy[4]	± 20 % [5]	± 20 % [5]
Quantitative Range	0.1 - 50 ng/µL	10 - 1000 pg/µL
Maximum sample buffer strength	20 mM KCl 60 mM Phosphate Buffer 60 mM Guanidine-HCl 240 mM NaCl 60 mM Acetate	7 mM KCL 20 mM Phosphate Buffer 20 mM Guanidine-HCl 80 mM NaCl 20 mM Acetate
Carry Over	N/A	N/A
Physical Specification		
Analysis Time	16 samples < 20 minutes 96 samples < 90 minutes	16 samples < 20 minutes 96 samples < 120 minutes
Samples per consumable	16	16
Sample Volume Required	1 µL	2 µL
Shelf Life	4 months	4 months
Box/Kit size	112 samples/box	112 samples/box

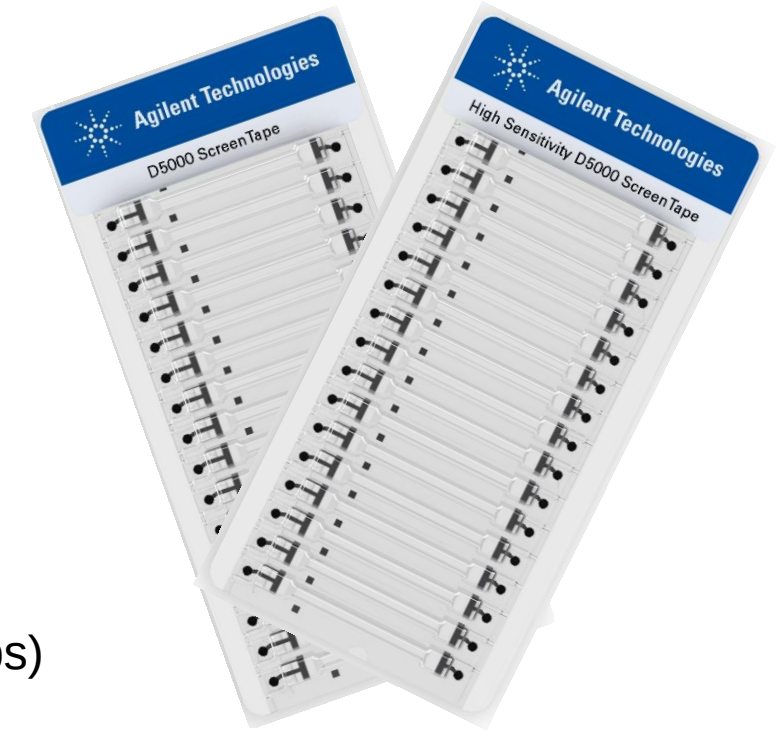
[1] Signal:noise ratio > 3 for a single peak
[2] Measured using one ladder per ScreenTape device
[3] Sizing Accuracy for analysis with electronic ladder: ± 20%
[4] Measured against 2200 TapeStation system

Rev 1. - 18th September 2015

The D5000 ScreenTape Assay

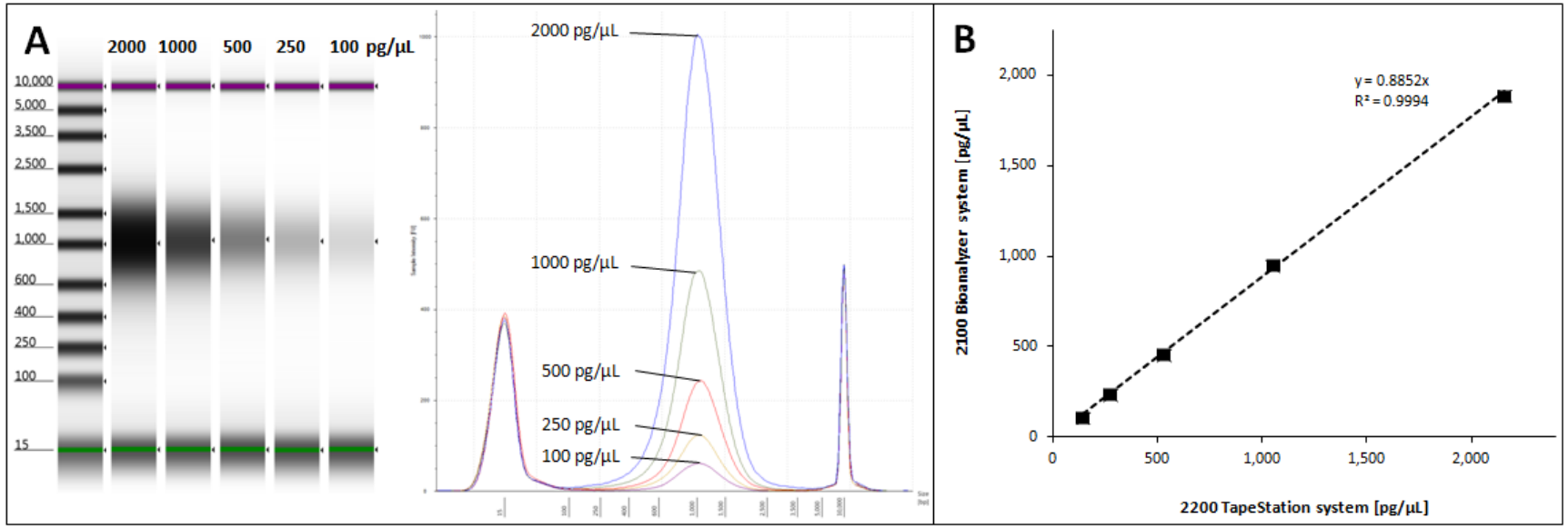
NEW

- Use as little as 1µl of precious sample
- Rapid time to result, at around 1 minute per sample
- Detection of DNA fragments as low as 5pg/µl
- Sizing range: 100 – 5000bp
- Ideally suited for the QC of larger libraries in the NGS workflow
- Also ideal for these applications:
  - qPCR product QC
  - cDNA library QC
- Compatible with 2200 TapeStation system (tube strips)



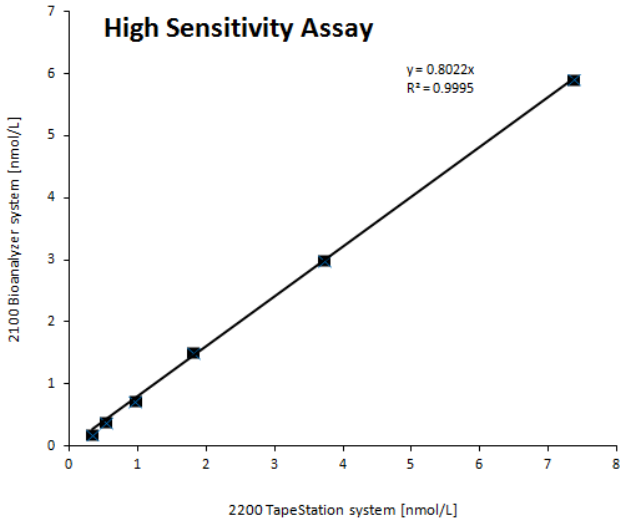
Rev 1. - 18th September 2015

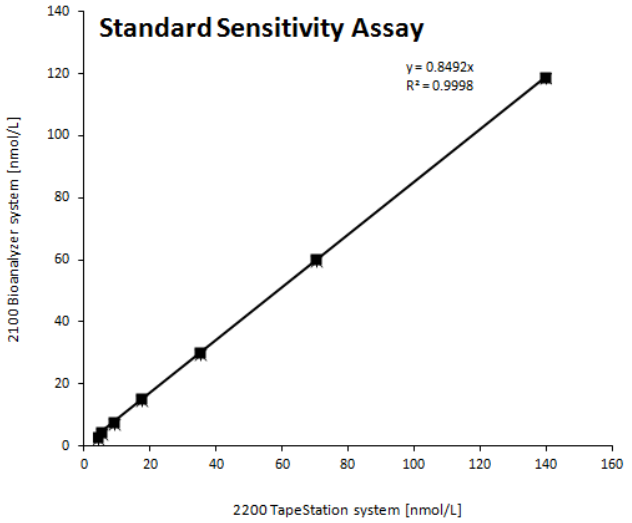
Agilent High Sensitivity D5000 Assay Analysis of DNA Smears



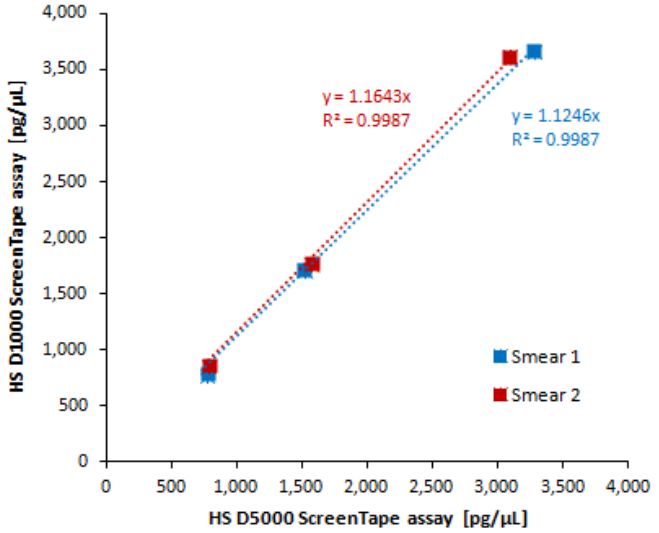
Rev 1. - 18th September 2015

Correlation TapeStation with Bioanalyzer data





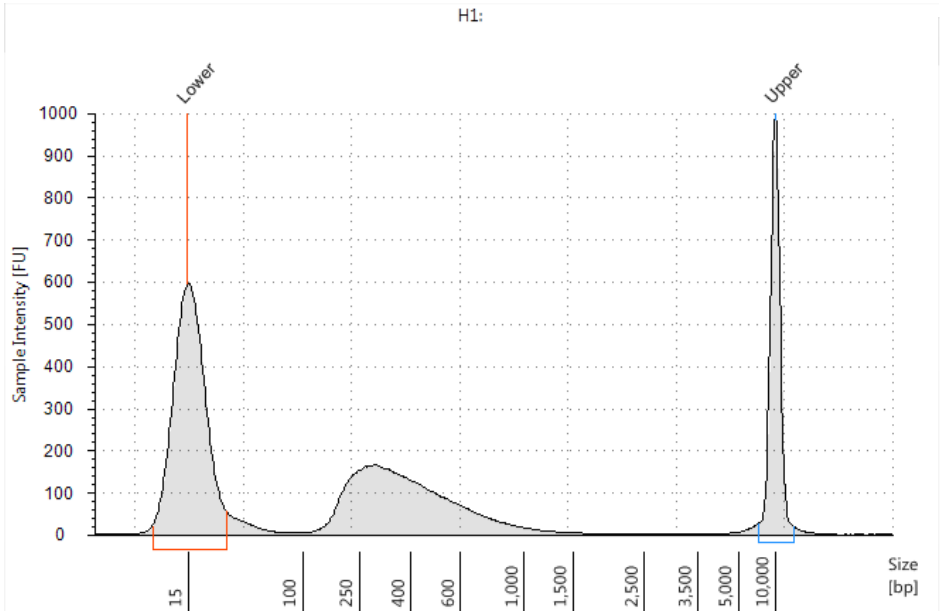
TapeStation system vs. Bioanalyzer system



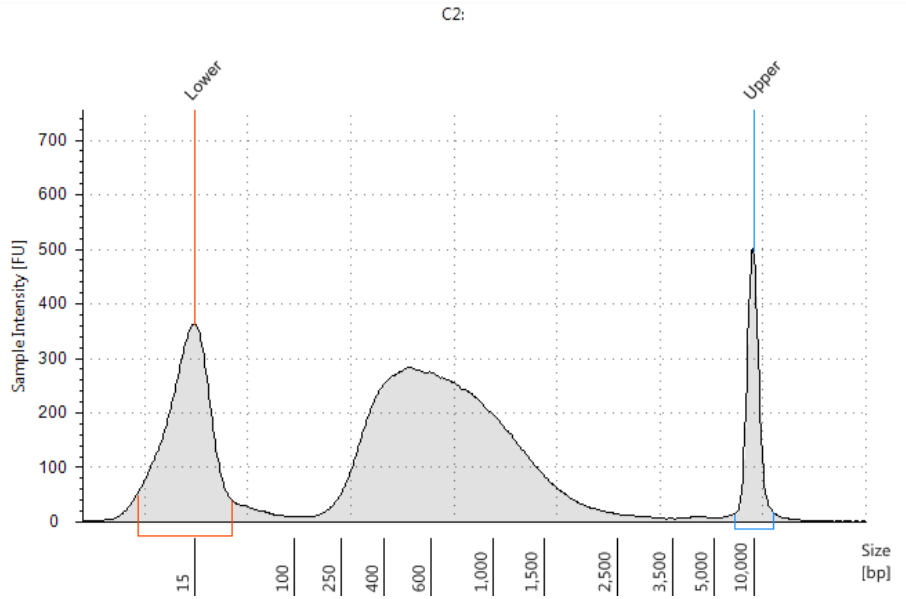
TapeStation system: HS_D1000 vs. HS_D5000

Rev 1. - 18th September 2015

SureSelect QXT Libraries



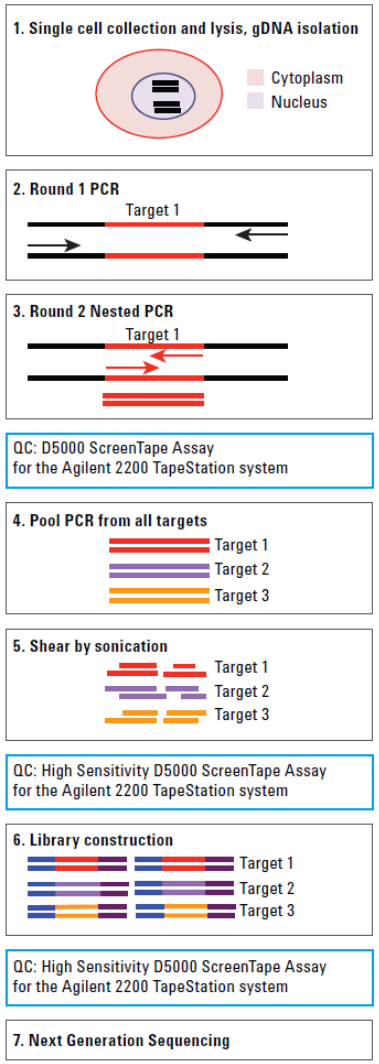
Fragmented Library QC

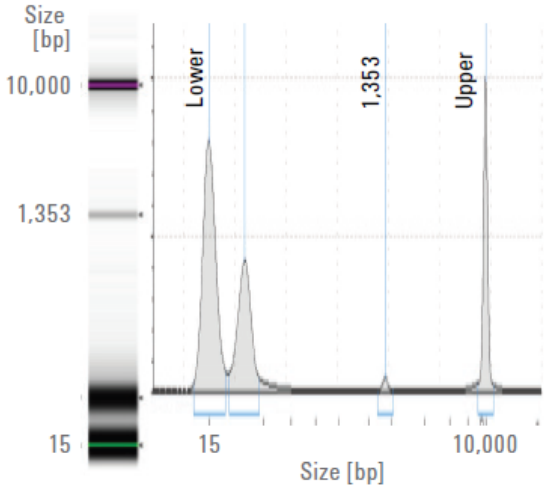


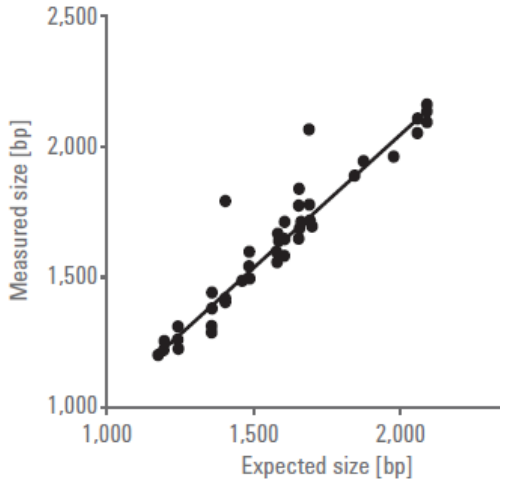
Precapture Library QC

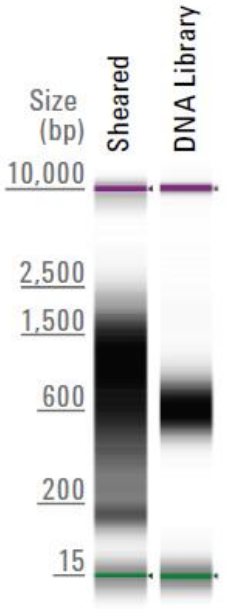
Rev 1. - 18th September 2015

Quality Control of Single Cell DNA Samples with the Agilent D5000 ScreenTape Assays









Agilent Application Note: Morris& Eberwine, Penn University (5991-5259EN)

Agilent D5000 ScreenTape Assays - Sample Preparation

D5000 ScreenTape Assay:

High Sensitivity D5000 ScreenTape Assay:

Rev 1. - 18th September 2015

Agilent D5000 ScreenTape Assay - Specifications

Analytical Specification	D5000 ScreenTape	High Sensitivity D5000 ScreenTape
Sizing Range	100 - 5000 bp	100 - 5000 bp
Typical Resolution	400-5000 bp: 15%	400-5000 bp: 15%
Sensitivity[1]	0.1 ng/µL	5 pg/µL
Sizing Precision[2]	5 % CV	10 % CV
Sizing Accuracy[2]	± 10 %	± 15 %
Quantitative Precision	0.1-1 ng/ul 15% CV 1-50ng/ul: 10% CV	15% CV
Quantitative Accuracy[3]	± 20 %	± 25 %
Quantitative Range	0.1 - 50 ng/µL	10 - 1000 pg/µL
Maximum sample buffer strength	250mM KCl 250mM Tris-HCl 125mM NaCl 50mM Acetate 25mM MgCl2 25mM BSA 25mM Guanidine-HCl	25mM KCl 25mM Tris-HCl 12.5mM NaCl 5.0mM Acetate 2.5mM MgCl2 2.5mM BSA 2.5mM Guanidine-HCl
Carry Over	N/A	N/A
Physical Specification		
Analysis Time	16 samples < 25 minutes 96 samples < 135 minutes	16 samples < 20 minutes 96 samples < 120 minutes
Samples per consumable	15	15
Sample Volume Required	1 µL	2 µL
Shelf Life	4 months	4 months
Box/Kit size	105 samples/box	105 samples/box

[1] Signal:noise ratio > 3 for a single peak
[2] Determined using D5000 /HS D5000 ladder as sample
[3] Measured against 2200 TapeStation system

Rev 1. - 18th September 2015

TapeStation Systems - **RNA Applications**

RNA Sample QC

RNA Sample QC for microarray

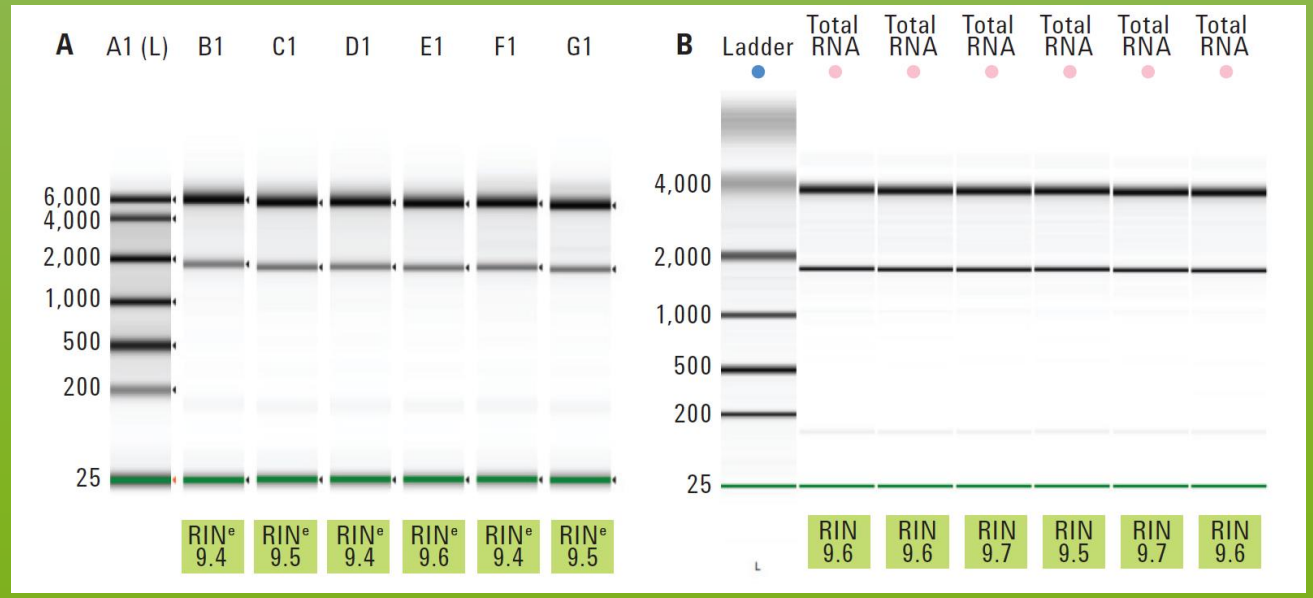
RNA Sample QC for quantitative RT-PCR

RNA Sample QC for NGS

Gene expression profiling

Rev 1. - 18th September 2015

RNA ScreenTape Literature for Total RNA QC



Gel images of total RNA samples run on the 2200 TapeStation (A) and the 2100 Bioanalyzer (B) prior to SureSelect Strand Specific Library Preparation

Quality Control for SureSelect Strand-Specific RNA Library Preparation Using the Agilent 2200 TapeStation System

Download the application note:

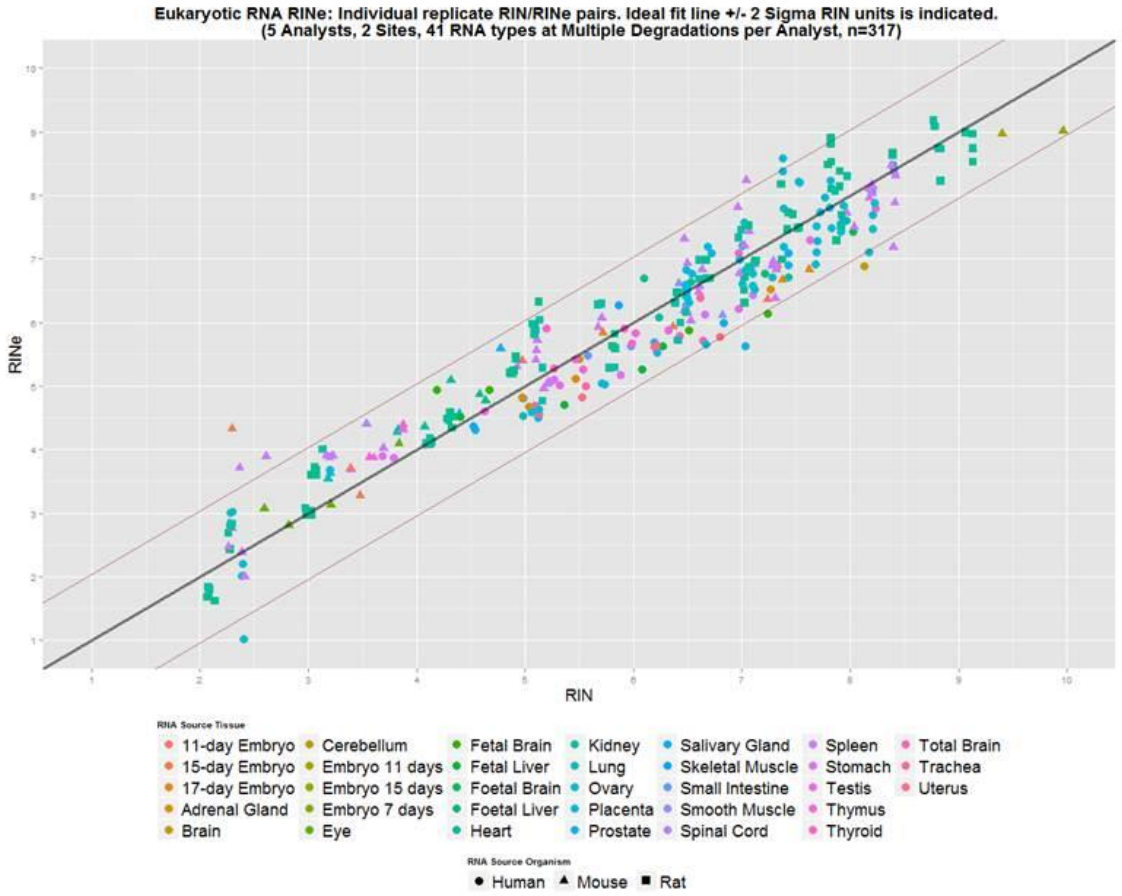
http://www.chem.agilent.com/library/applications/5991-4116EN.pdf

Rev 1. - 18th September 2015

Agilent RNA ScreenTape Quality Metric – RIN^e

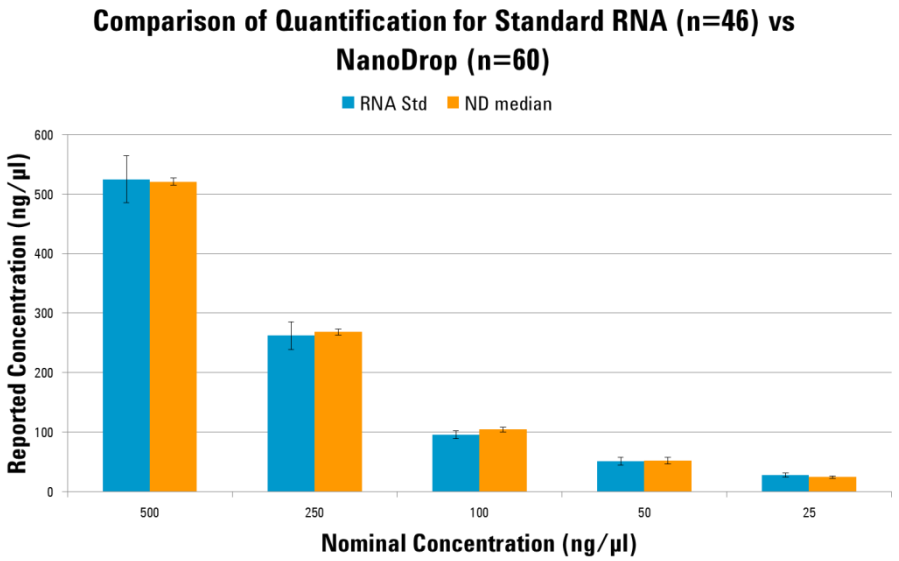
- **Eukaryotic RIN^e validated against Bioanalyzer RIN**
- 41 different tissue types
- Subset of tissues subjected to heat degradation and dilution across concentration range.
- Overall >300 individual RNA data points (see figure)
- Median error ±0.4 RIN units

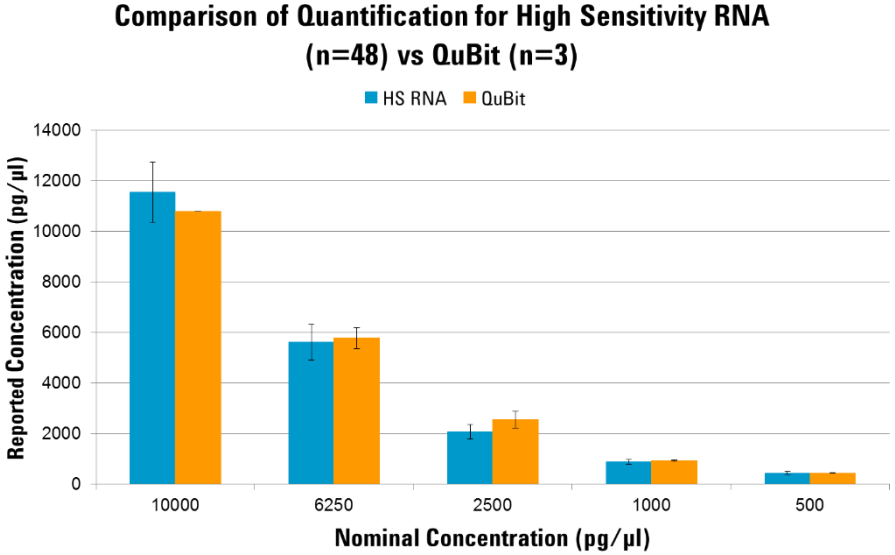
- **Prokaryote RIN^e validation**
- Similar to above, prokaryote samples subjected to heat degradation and dilution across concentration range
- >200 individual RNA data points (not shown)
- Median error < ±0.4 RIN units



Rev 1. - 18th September 2015

RNA ScreenTape Quantification





- Quantitative range : 500-25ng/µl
- **Standard Sensitivity** assay has excellent correlation to Nanodrop measurement

- Quantitative Range : 10,000-500pg/µl
- **High Sensitivity** Assay correlated to QuBit

Rev 1. - 18th September 2015

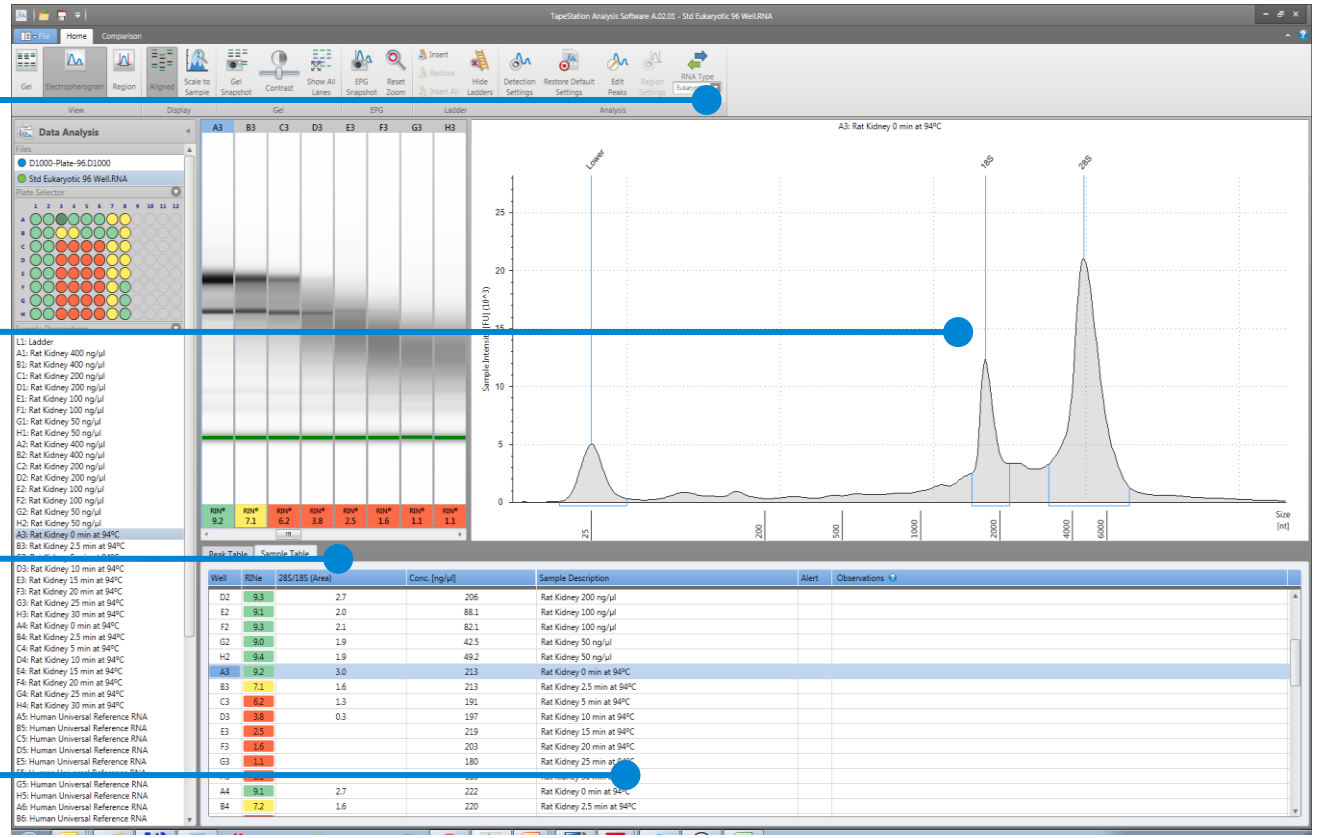
Agilent RNA ScreenTape Results Overview

RNA type switching
Eukaryote and Prokaryote RNA quality assessment available

Bioanalyzer like separation
Performance improvements deliver more Bioanalyzer separation of the large ribosomal subunits

RIN^e optional colour coding
Values for RINe represented below the gel image can be colour coded for rapid identification of RNA quality

RNA data table
RIN^e Colour coding (if implemented) exported to a report along with 28/18S ratios, reliable concentration and description.



- **Equivalent quality metric to Bioanalyzer RIN:** The extensively validated RIN^e is shown to be equivalent to the market leading RNA quality metric RIN from the Bioanalyzer.
- **96 well Compatible:** Accelerate RNA QC to unprecedented levels. Full 96 analysis delivered in as little as 100 minutes with no instrument set up time!

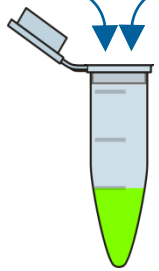
Rev 1. - 18th September 2015

Agilent RNA ScreenTape Assays - Sample Preparation

RNA ScreenTape Assay:

1 µl RNA sample or RNA Ladder

5 µl RNA Sample Buffer



Vortex 1 min
Spin down

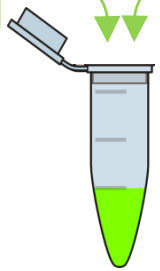
Heat at 72°C
for 3 minutes

Place on ice
for 2 minutes

High Sensitivity RNA ScreenTape Assay:

2 µl RNA sample or HS RNA Ladder

1µl HS RNA Sample Buffer



Vortex 1 min
Spin down

Heat at 72°C
for 3 minutes

Place on ice
for 2 minutes

Agilent RNA ScreenTape - Specifications

Analytical Specifications	RNA ScreenTape		High Sensitivity RNA ScreenTape
Quality Score	RIN^e		RIN^e
RIN^e Functional Range	25-500 ng/µl		1,000-25,000 pg/µl
Quantitative Range	25-500 ng/µl		500-10,000 pg/µl
Quantitative Precision (%CV)	10%		15%
Quantitative Accuracy[1]	+/-20%		+/-30%
Sensitivity[2]	5ng/µl		100pg
Analysis Type	Eukaryotic or Prokaryotic Total RNA QC		Eukaryotic or Prokaryotic Total RNA QC
Maximum sample buffer strength	200mM Tris 20mM EDTA or 50mM NaCl		10mM Tris 1mM EDTA
Physical Specifications			
Analysis Time	16 samples < 20 min 96 samples < 95 min		16 samples < 35 min 96 samples < 180 min
Samples per consumable	16		16
Sample volume required (µl)	1		2
Kit Stability	4 months		4 months
Kit Size	112 samples		112 samples

For total RNA samples

1. Measured against 2200 TapeStation System
2. Signal/noise >3 in water and TE

Rev 1. - 18th September 2015

More information available online….

www.agilent.com/genomics/TapeStation

For more information on pricing, specifications as well as access to application and technical notes, please visit the TapeStation product pages.