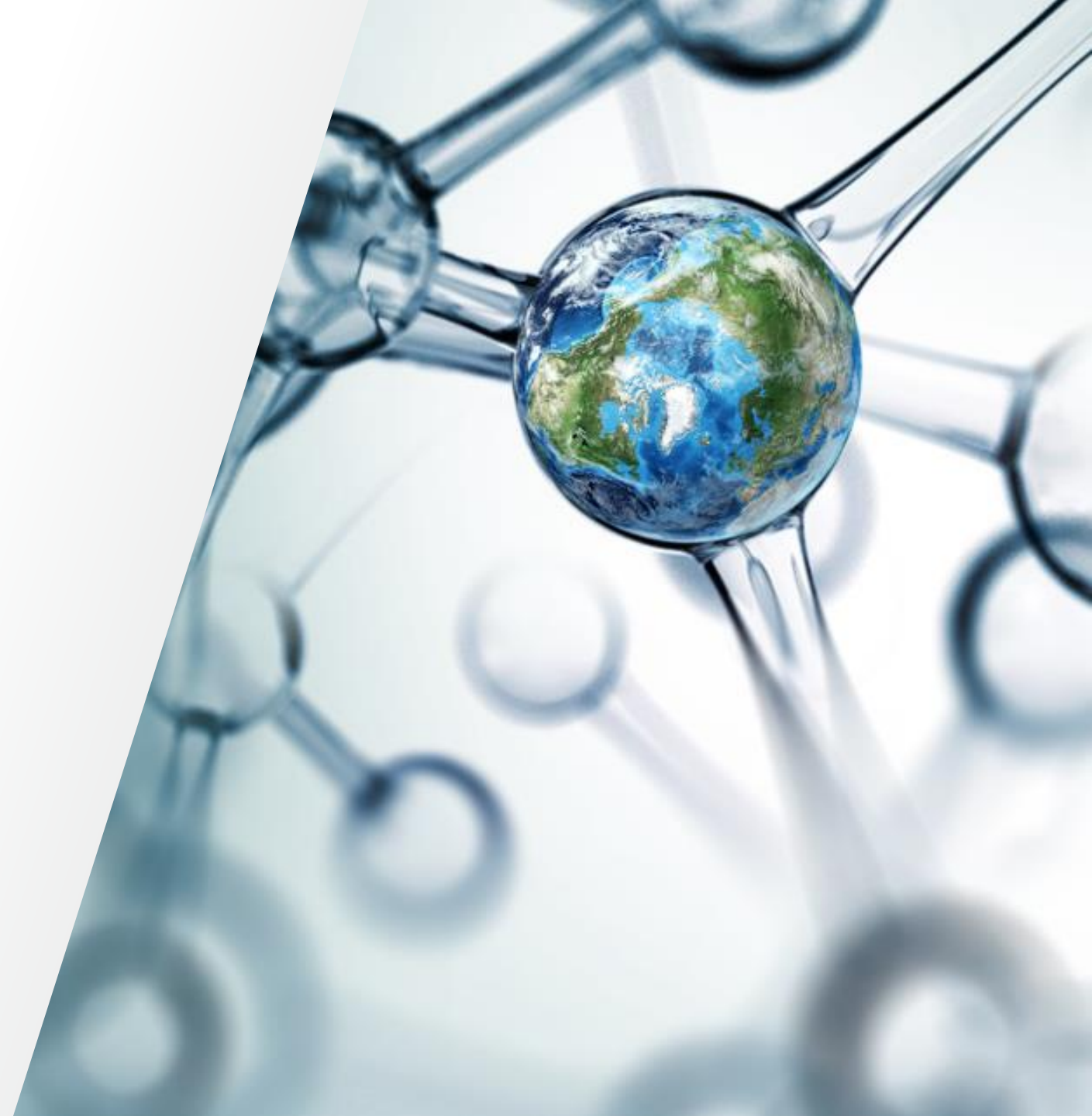


# SEQUENCAGE SARS-COV 2

Amelie EPERCIEUX & Bouchera DOUAH

 The world leader in serving science





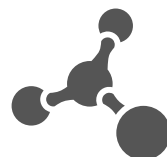
**Who is Thermo Fisher Scientific?**



# Au Service de la Science



**>75,000**  
employees



**5,000**  
R&D scientists/engineers



**\$1B**  
invested in R&D

## Industry-leading scale

- Unparalleled commercial reach
- Unique customer access
- Expanding global footprint

## Unmatched depth of capabilities

- Leading innovative technologies
- Deep applications expertise
- Premier productivity partner
- Comprehensive services offering

# History of Ion Torrent Solution



## History of Ion Torrent solutions in infectious disease research



Simplicity and speed of Ion Torrent sequencing at the forefront of recent outbreak research



MERs-CoV  
2014

Ebola  
2016

H1N1  
2017

Zika  
2017

SARS-CoV-2  
2020



# At the forefront of the response to COVID-19

Supporting our customers in every aspect of the fight against the pandemic



**Essential lab equipment  
and personal protection  
equipment**



**Research and analysis**  
Discovery, quantification,  
validation



**Comprehensive solutions**  
Multi-platform accurate and quick  
results



**Treatments and vaccines**  
Development, trials  
and manufacturing

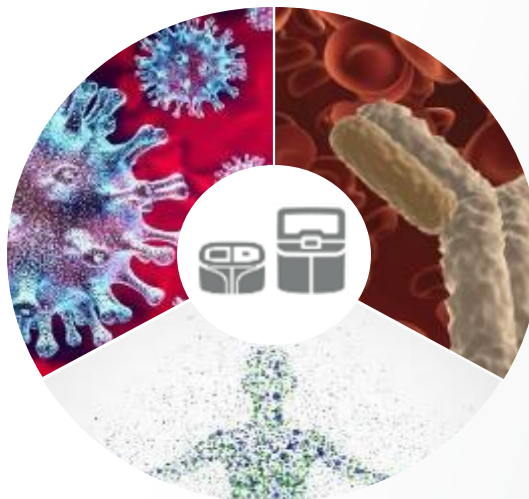




# Ion Torrent NGS | Comprehensive Portfolio of Solutions for SARS-CoV-2 Research

## **Viral research**

Fast, automated and accurate NGS workflows that enable complete SARS-CoV-2 sequencing in as little as one day for epidemiology, contact tracking and tracing



## **Immune response**

Simple, comprehensive end to end solutions with the accuracy you need for deeper insights in immune repertoire and immune response to pathogens

## **Vaccine research**

Scalable NGS solution for a multi-dimensional and cost-effective approach to understand vaccine response and efficacy

**End to end workflows including robust informatics suite**  
**One chemistry, one platform for continuity across SARS-CoV-2 research**

# Complementary Ion Torrent NGS systems for SARS-CoV-2 research

## Targeted NGS workhorse

High throughput and  
broad assay utility



### Ion GeneStudio S5 Series

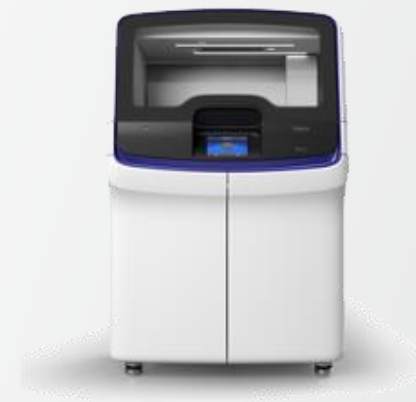
Single platform versatility for infectious disease and broader outbreak research applications

- Immune response
- Microbiome analysis
- Vaccine research and development

Cost-effective and scalable for high throughput sample processing

## From nucleic acid to report in a single day

Hands-off and  
automated workflow



### Genexus Integrated Sequencer

Single platform with a highly automated workflow and broad research capabilities

- Automated cDNA synthesis
- Library prep
- Template prep
- Sequencing and analysis

Setup-and-go, automated workflow for easy addition of in-house NGS

**Fast, automated, and accurate targeted NGS workflows for coronavirus typing in <24 hours**

# Flexible NGS Portfolio Configurable to Your Needs

Ion GeneStudio™ S5



**Fast.**

Ion GeneStudio™ S5 Plus



**Flexible.**

Ion GeneStudio™ S5 Prime



**Powerful.**



**Ion 510™ Chip**  
2–3 M reads  
Up to 400 bp



**Ion 520™ Chip**  
3–6 M reads  
Up to 600 bp



**Ion 530™ Chip**  
15–20 M reads  
Up to 600 bp



**Ion 540™ Chip**  
60–80 M reads  
Up to 200 bp



**Ion 550™ Chip**  
100–130 M reads  
Up to 200 bp



# Ion AmpliSeq SARS-CoV-2 Research Panel Workflow on GeneStudio for High Throughput Scalability

Up to 130 samples can be multiplexed on a single chip



**Sample input**

**Prepare library**

**Prepare template**

**Run sequence**

**Analyze data**

1-10 ng total  
RNA

1-10 ng  
cDNA input  
per pool

AmpliSeq PLUS  
Library Prep Kit

Or

AmpliSeq for Chef  
DL8

Ion Chef™  
Instrument

Ion GeneStudio™ S5 Systems

200 bp sequencing

3 samples (Ion 510™ chip) to  
130 samples (Ion 550™ chip)

Torrent Suite  
Software

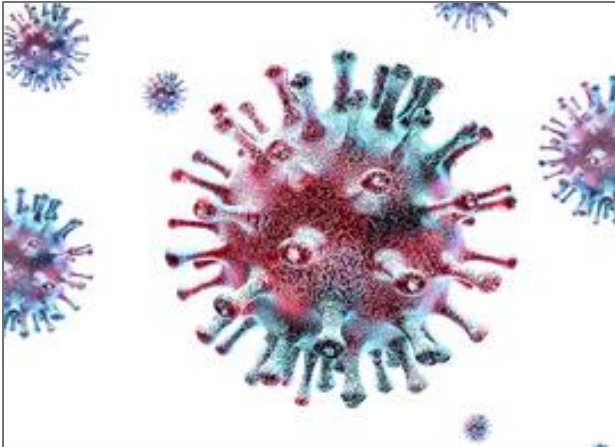
+

Ion SARS-CoV-2  
Research Plug in  
package

# Ion AmpliSeq SARS-CoV-2 Research Panel



One assay surveying complete SARS-CoV-2 genome for epidemiological investigation



Pool	No. Total Amplicons
1	247 (242 unique)*
2	

- Amplicon length range: **125-275 bp**
- 237 amplicons specific to SARS-CoV-2 + 5 human expression controls
- **>99% coverage of SARS-CoV-2 genome (~30kb)**
- All potential serotypes covered

**Intelligent design provides exceptional protection against naturally occurring variation and ensures robust performance even as the virus rapidly mutates**

# Introducing the Ion AmpliSeq SARS-CoV-2 Insight Research Assay for Ion GeneStudio S5 System\*



Sample Input



Prepare Library



Prepare template



Run Sequence



Analyze Data

1-10 ng total  
RNA

1-10 ng  
cDNA input  
per pool

**Ion AmpliSeq SARS-CoV-2  
Insight Research Assay**

**Manual Kit (A51305)**

**Chef Ready Kit (A51306)**

Ion Chef™  
Instrument

Ion GeneStudio™ S5  
Systems

Ion 510™, Ion 520™, Ion  
530™, Ion 540™, or Ion  
550™ chip  
(3 to 200 samples)

200 bp sequencing

Torrent Suite Software  
+

**Ion AmpliSeq SARS-CoV-2  
Insight Research Assay  
Plug-In Suite**

**+  
SARS\_CoV\_2\_lineageID  
Plug-In**

\* Workflow validated with NGS Reverse Transcription kit (A45003) for cDNA synthesis



1

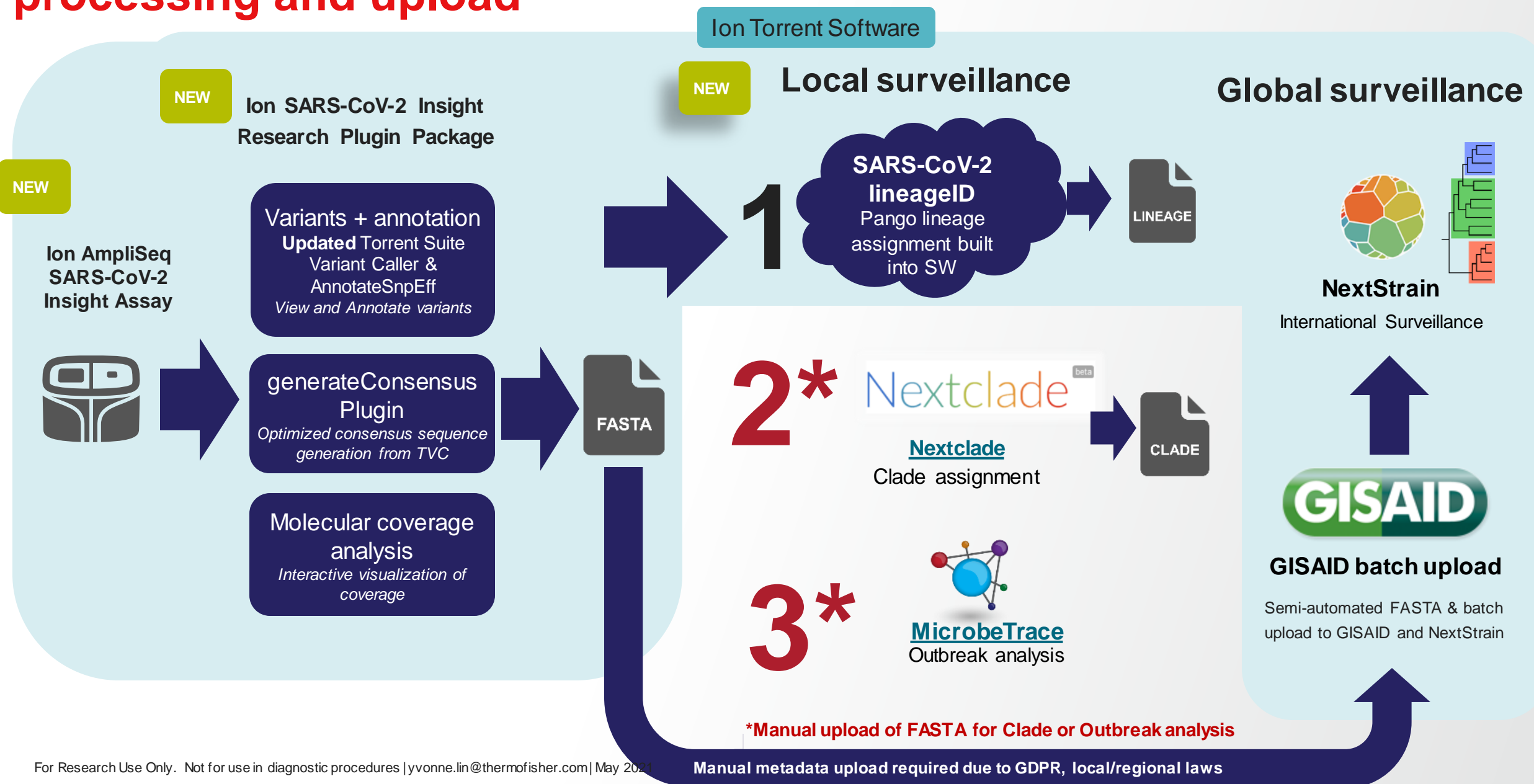
2

242 unique

- 237 amplicons specific to SARS-CoV-2 with **addition of variant-tolerant primers for emerging variants**
- **5 newly-designed human expression controls** for sample confirmation and quality assessment
- Amplicon length range: 125-275 bp
- >99% coverage of SARS-CoV-2 genome (~30kb)
- All potential serotypes covered

**Higher sensitivity for earlier identification of variants in low titer samples (Ct>28) to inform public health guidance and intervention strategies**

# Inform Public Health Measures faster with easier data processing and upload



# Genexus System End to End Workflow

- FFPE
- Tissue
- Bone marrow
- Whole blood
- PBL
- Urine
- Saliva

## Nucleic acid purification and quantitation\*

**Ion Torrent™ Genexus™**  
Purification System (Available 2020)



2 hour turnaround time  
12 FFPE (DNA and RNA)  
6 Plasma

## Genexus Software

## Library preparation to variant interpretation

Report\*

**Ion Torrent™ Genexus™**  
Integrated Sequencer (Available November 2019)

**Ion Torrent™**  
**GX5™ Chip:**  
12–15M  
reads/lane



14 hours for a single-lane run  
(approx. 24 to 30 hours for full chip)  
Up to 32 Samples per run

\*Specimen-to-report workflow will be available after the Ion Torrent™ Genexus™ Purification System and integrated reporting capabilities are added in 2020.

The content provided herein may relate to products that have not been fully validated by Thermo Fisher Scientific and is subject to change without notice.



# Ion AmpliSeq™ SARS-CoV-2 Research Panel\* for Genexus

ThermoFisher  
SCIENTIFIC

Up to 16 samples can be multiplexed on 2 lanes of GX5 chip in a single run on Genexus Integrated Sequencer



**Nucleic acid  
sample input**



**Automate cDNA synthesis  
library prep, template prep,  
sequencing and variant analysis**

1-10 ng total RNA

1 ng cDNA input per pool

- [Web-Page SARS-CoV-2 and GENEXUS](#)

Genexus Integrated Sequencer

Ion AmpliSeq SARS-CoV-2 Research Panel

200 bp sequencing using Ion Torrent GX5 Chip

- Up to 16 samples in a single run using 2 lanes
- Up to 32 samples per chip

View variant report in the Genexus Software using:

- Covid19AnnotateSNPeff plugin
- IRMAreport plugin
- AssemblerTrinity plugin

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

# Complete Informatics Suite

## Ion SARS-CoV-2 Research Plugin Package v1.3.0

Complete workflow from design to interpretation and analysis

### Coverage analysis



#### **SARS\_CoV\_2\_coverageAnalysis**

Statistics, downloadable data files and interactive visualization of coverage over targeted regions of the SARS-CoV-2 genome

### Variant annotation



#### **COVID19AnnotateSnEff**

Identify and annotate variants of interest with public / private databases, and perform multi-sample comparisons

### Consensus sequence



#### **IRMareport**

Align reads to reference, identify low-frequency variants, get consensus sequence

### Assembly construction



#### **AssemblerTrinity**

Complete workflow for genome-guided or de novo viral sequence assembly

# Ion AmpliSeq™ SARS-CoV-2 Research Panel adoption around the world

>40

Countries

>64

publications

>16,000

genomes

uploaded in GISAID using  
our technology





# Thank you

