bluechiip™
Tracking Solutions

Enabling Productivity and Complete Audit Trail

Traceability, Efficiency & Quality throughout the sample lifecycle

ISCT – June 2020

Unique patented MEMS technology combining secure wireless tracking with integrated temperature sensing for extreme environments

Trends in Biobanking

Increased sample retrieval rate

PRODUCTIVITY

Minimise total cost of sample ownership

Increased demand for advanced therapies

SAMPLE VALUE

ID technologies need to keep up with higher value samples

Criticality sample history

SAMPLE QUALITY

Maximise specimen integrity via adequate cold chain handling and reporting

Increasing demand for -196C° storage

CRYO TECH

Utilisation of cryo-safe technology and processes

Bluechiip introduction

Click here to view the introduction video
https://www.bluechiip.com/investor/company-overview/

Bluechiip core technology

Unique patented MEMS technology combining secure wireless tracking with integrated temperature sensing for extreme environments

Bluechiip MEMS chip

- No line of sight needed
- Multiformat
- Customisable

Bluechiip enabled readers

- Single point
- Multi point
- Mobile

Sample Manager SW

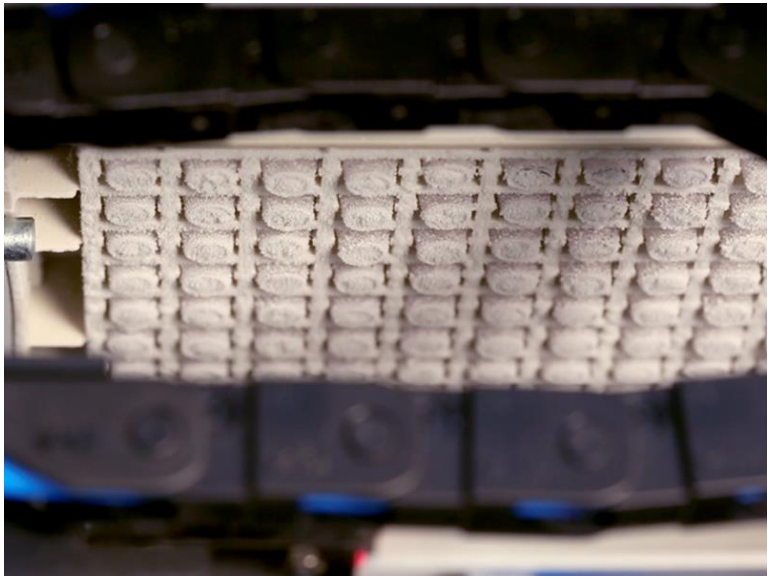
- Bluechiip Stream or
- API (RESTFUL)
- Compatible with LIMS

Available sample ID technologies

	Barcodes	Bluechiip
Non-visual ID Reads through frost	✗	✓
Reliable reading in bulk Scan a whole box of frozen vials	✗	✓
Guaranteed unique ID Removes risk of duplicate ID	✗	✓
On-board sensor Senses temperature on each scan	✗	✓
Robust ID Scratchproof and not detachable	✗	✓

Limitations with Barcodes: FROST

- Barcode scanners not reliable scanning frozen samples
- Vendors use different methods to remove frost
  - Slow, unreliable and heat the sample (Scrapers, Alcohol baths, Air knives or Dehumidifiers/heaters)
- Bluechiip eliminates risk. Reads through frost



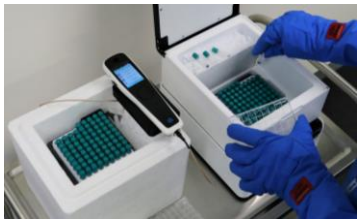
Limitations with Labels: UNRELIABLE

- Labels can be difficult to read, detach or degrade
- Bluechiip eliminates risk. It cannot be detached

Sample workflow schematic

Collection sites → Processing → Cryo Banking → Sample Studies

Bulk Registration and Accessioning



Traceable Sample Transport

Accurate Inventory Management

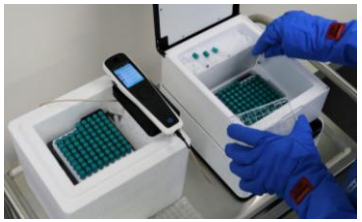
Continuous Monitoring in -80°C or -196°C

Sample Full Audit Trail

Bluechiip enabled workflow benefits

Collection sites → Processing → Cryo Banking → Sample Studies

Bulk registration and accessioning



Traceable Sample Transport

Benefits for Collection Sites and Processing

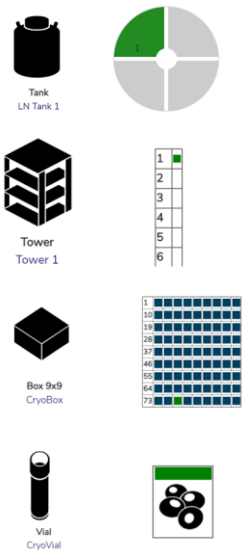
- Intuitive sample registration and data input
- Quick scan and position mapping in the box
- Continuously monitored transport to Processing sites
- Monitored sample consolidation and sorting
- Documented storage allocation after control rate freezing
- Easy sample location before shipping to Banking site

Bluechiip enabled workflow benefits

Collection sites → Processing → **Cryo Banking** → Sample Studies

Benefits for CryoBanking

- Eliminates issues with frost (ref. ISBER forums)
- Works in -80C, -196C, automated or manual
- Highly efficient manual guided storage and retrieval
- Record temperature at the sample level in each scan



Accurate Inventory Management

Continuous monitoring in -80C or -196C

Bluechiip enabled workflow benefits

Collection sites → Processing → Cryo Banking → **Sample Studies**

Sample Full Audit Trail

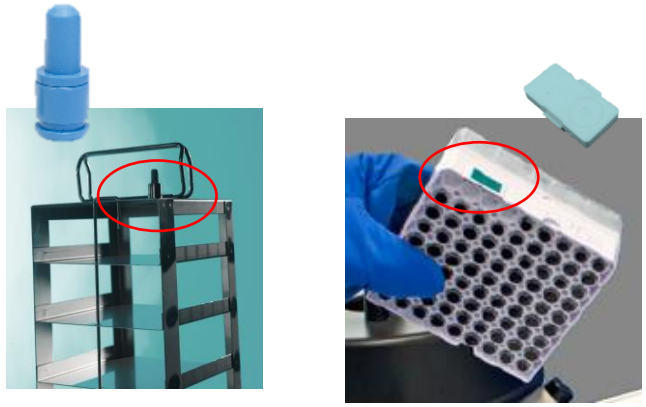
- Thoroughly check sample history before performing study
- Unique ID, Temp, Time, User, Location at the sample level
- Access data anywhere through LIMS interface

Sample Full Audit Trail

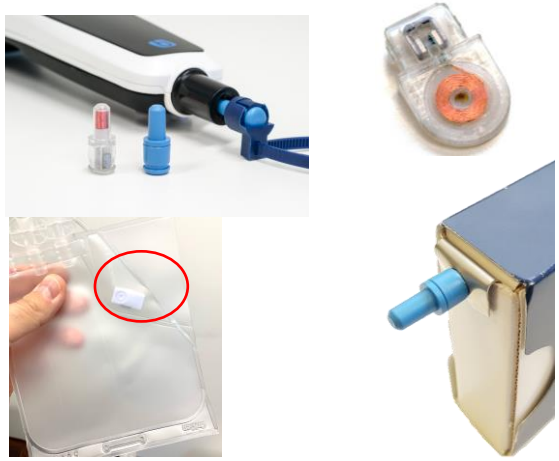
Bluechiip Enabled Tags

- The Bluechiip chip can be configured with many different antenna formats to make different tags. Examples of current product are DeltaTags, CryoTags and BoxTags
- Bluechiip can customise different antenna formats and then encapsulate the tag to be embedded in many consumables such as blood bags, vacutainers, glass vials...

DeltaTag and SBSTag
Chip on PCB antenna for
9x9, 81 format tubes or
12x8, 96 format tubes
Custom format antennae can be made for a specific size consumable



CryoTags and BoxTags
Chip on Coil atenna for
Tagging CryoBoxes or Storage hierarchy (towers, tanks, shelves...)
Custom format antennae can be made for a specific size consumable



Custom Tags and attachments
Tag and attachment can be customised for your specific application

Bluechiip Enabled Consumables (1/2)

- The Bluechiip chip can be attached to any vial or consumable. Examples of current product are Labcon's ColdPoint Range, Labcon ColdPoint Clearline Range, and Bluechiip 96 Range
- In case other vial brands want to be used, Bluechiip can provide the chip to be embedded in Brooks/FluidX, Thermofisher/Matrix, Micronic, Greiner, etc.

Labcon ColdPoint Range

Manual handling
9x9, 81 format (standard square)
Bluechiip tag in bottom an in box
1D and Human readable on side (optional)
2D on bottom (optional)
Sizes: 0.5 – 1 – 2 – 4 – 5ml
External thread
AVAILABLE NOW

Labcon ColdPoint Clearline Range

Manual and Automated handling
9x9, 81 format (standard square)
8x6, 48 format (SBS)
1D and Human readable on side
Bluechiip tag and 2D on bottom
Bluechiip tag and 1D in box
Sizes: 1.2 - 2 – 3 – 4 - 5ml
Internal and external thread
Q3 2020

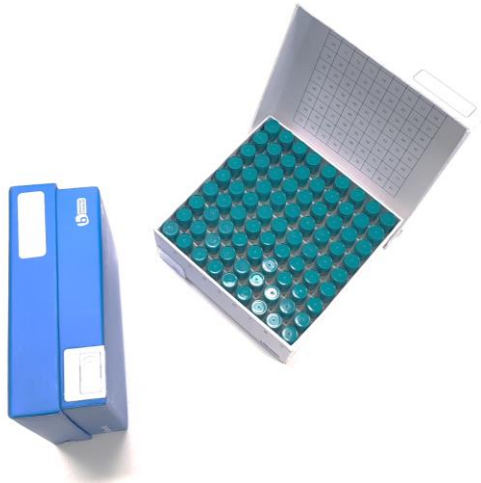
Bluechiip Enabled 96 Range

Manual and Automated handling
12x8, 96 format (SBS)
1D and Human readable on side (optional)
Bluechiip tag and 2D on bottom
Sizes: 0.2 - 0.3 - 0.5 – 1ml
Internal and external thread
Q4 2020

Bluechiip Enabled Consumables (2/2)

- The Bluechiip BoxTag is usually attached to the range of Bluechiip vial boxes to identify them
- However, in case non-bluechiip enabled vials want to be handled or stored under a bluechiip enabled system, the Retrofit Box can be used
- Bluechiip traceability still happens at the box level taking advantage of the enabled hierarchy of storage above the box (tower, shelf, drawer, freeze or tank)
- Non Bluechiip vials must be identified visually or with the aid of a barcode reader
- Bluechiip retrofit boxes are fully compatible with the BoxTracker and Handheld reader to continuously record temperature and ID of the box while handling and in short term transport
- The Retrofit Box is ideal for storing cold legacy samples and make sure they are easy to locate at least at the box level

Bluechiip Retrofit Box
Manual handling, fits any 2m vial
9x9, 81 format (standard square)
Bluechiip BoxTag on box
Can be read with BoxTracker
For 2ml vials and smaller
AVAILABLE NOW



Bluechiip Enabled Readers

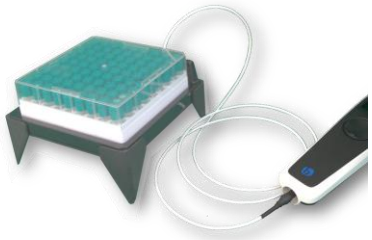
- **Bluechiip readers can be supplied in a finished form or as in reader engines for integration. Examples of current reader products are the Hand-Held reader, Multi-vial reader and reader attachment such as the Box Tracker**
- **In case readers want to be integrated in automation, Bluechiip can provide the reader internal electronics**

Hand-Held reader

Single point reader
Reads enabled Vials and CryoTags/BoxTags
Equipped with a Barcode reader
Portable, WiFi enabled, Battery operated
Resistant to shocks, water and cleaning

Multi-Vial reader

Multipoint reader
Reads and positions enabled Vials in the box
Links vials to that particular box
Compatible with USB barcode guns
WiFi enabled, Optional Battery
Resistant to shocks, water and cleaning
ColdTop available as an accessory to keep samples cold when scanning

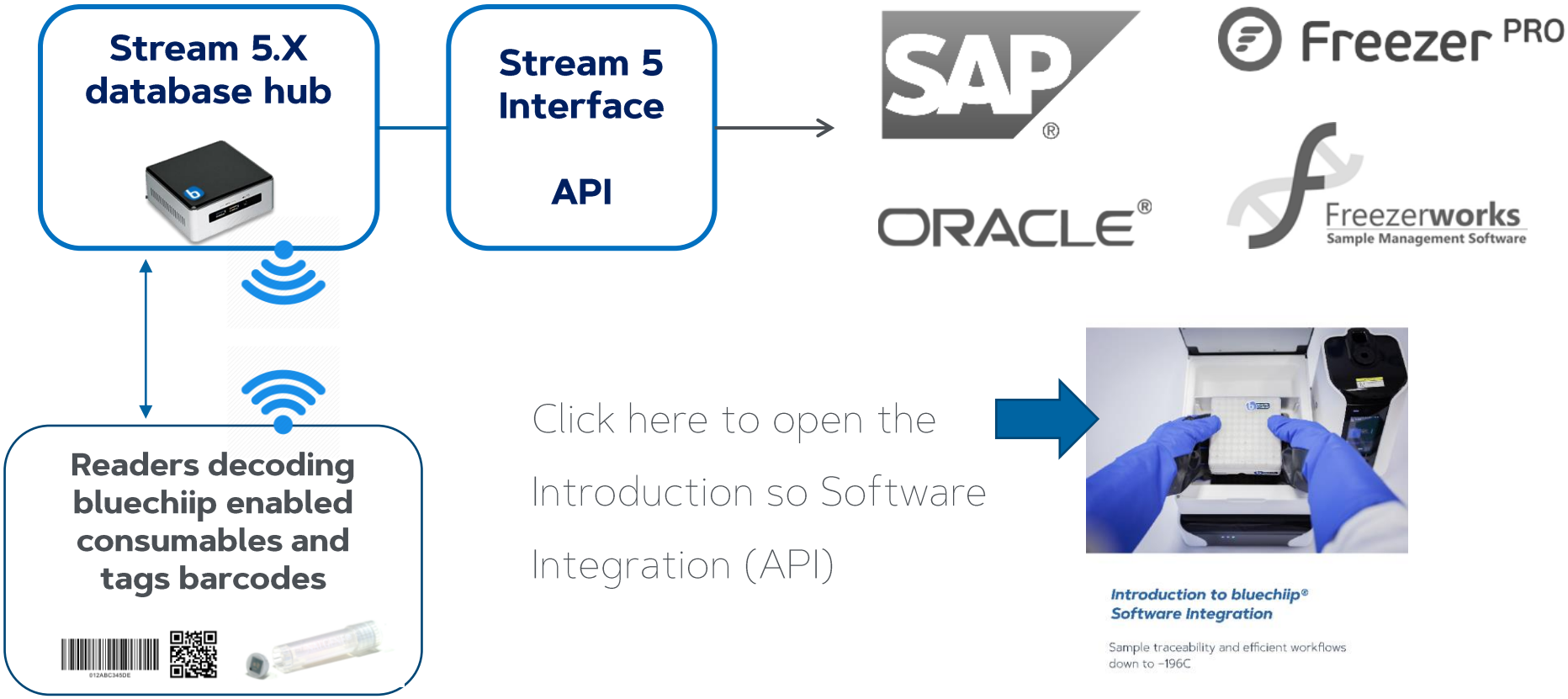


BoxTracker and ReadHeads

Box level or Vial level reader accessory for the Hand-Held Reader
Can continuously monitor Boxes or vials
Can be placed even in -196C liquid phase
Customise your reader and tag to suit your specific application

Bluechiip Stream Sample Data Manager or full API integration

Integrate Stream with your LIMS or ERP and seamlessly share and store data

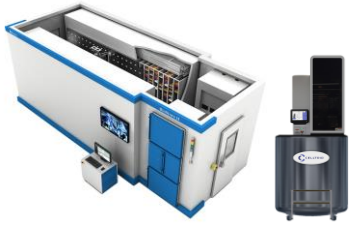


Click here to open the Introduction so Software Integration (API)

Bluechiip potential applications

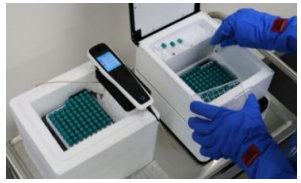
Manual biobanks / R&D / IVF / Cell / Gene Therapies / Cord Blood

- Store and retrieve samples via Bluechiip STREAM Software, Readers and enabled consumables
- Optional integration with sample management software or LIMS
- Faster and more reliable than barcodes and readers with all the bluechiip benefits



Auto biobanks / Population / Disease / Cell / Gene Therapies

- Bluechiip OEM readers integrated in an automated platform under a license agreement
- Integration with other LIMS if STREAM™ does not want to be used
- Potential application handlers, storage, etc...
- Bluechiip consumables offered in a distribution like agreement
- Faster and more reliable option than barcoded consumables and readers with all the bluechiip benefits without taking samples outside of storage

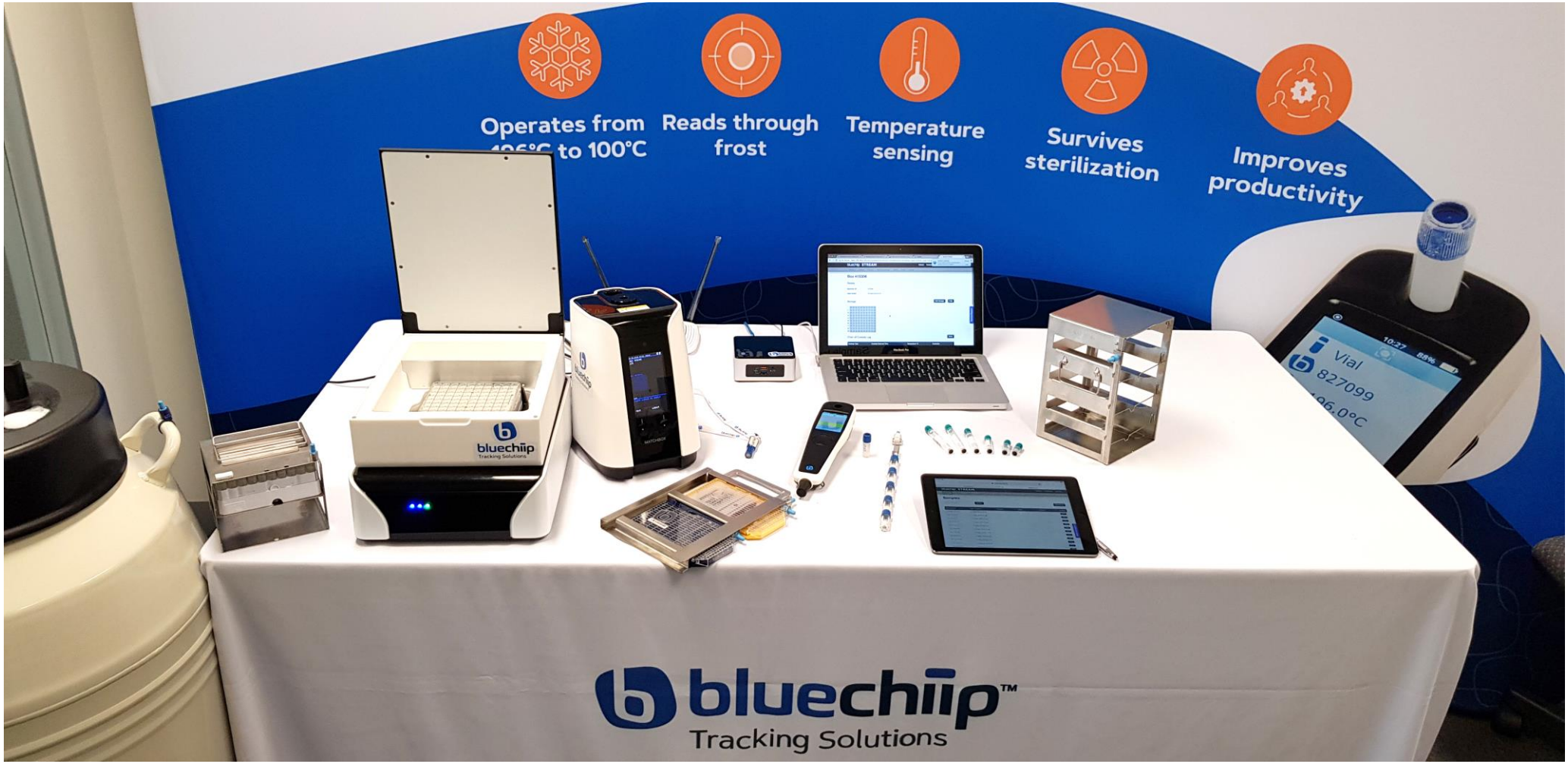


Internal transport or adaptations of bluechiip products for adjacent applications

- Internal or short-term applications for transporting at cold temperatures
- Cell culture products with Bluechiip readers
- Other applications to brainstorm or from user feedback

Non exhaustive list

Starter Kits available



We tailor starter kits or developer kits to different applications and consumable types

References and comments

CIBERES biobank: Bluechiip provides 50% Time saving vs Barcodes when reading ID

https://www.bluechiip.com/bluechiip-sample-management-system-featured-at-isber-shanghai-2019/

MEDPACE CRO: Sample temperature monitoring during handling using a Bluechiip BoxTracker

https://www.bluechiip.com/wp-co

References and comments

ISBER Forum comments regarding <u>issues with barcodes:</u>


Dan Catchpole.msg

Prof Daniel Catchpole (ISBER PRESIDENT): "Humidity that may cause frost of flash frozen samples prior to entry into an automated freezer can be a real problem latter on. Frost and barcodes are not a good mix".


Outlook Item

"Has any one seriously consider developing an automated system using RFID embedded tubes? – this would address the frost issue somewhat"


Outlook Item

Andy Zaayenga: "As Dan mentions, one possible issue with optical barcodes is that they may quickly be covered in frost on bringing out of the store. There are several ways to deal with obscuring frost such as brushing the tube or an air knife. [...] Other technologies include MEMS technology which combines secure wireless sample tracking with integrated temperature reading offered by Bluechiip".


Outlook Item

Billy Schleif: "We also deal with frost on barcodes in Florida as humidity is a constant challenge. Frost build up can also interfere with the actual automation if it is severe enough. Consider using dehumidified lab air".

Summary

Bluechiip Enabled workflow

- ✓ Link ID, temperature, User, Time and Location at the sample level in each scan
- ✓ Sample-level temperature monitoring even out of storage (handling and transport)
- ✓ Quick ID reads even in frost
- ✓ Easily integrated too manual or automated storage (-80C or -196C)
- ✓ Compatible with barcodes as fail-safe
- ✓ Can be integrated with other LIMS (API)

Barcoded workflow

- ✗ Unreliable ID due to frost build-up or damage
- ✗ Defrosting methods are slow and can warm sample
- ✗ Temperature not at the sample level (environment only) and not linked to the sample ID

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