Software Development for μSR Experiment at J-PARC

S. NISHIMURA | KEK/J-PARC

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J-PARC MLF S-Line

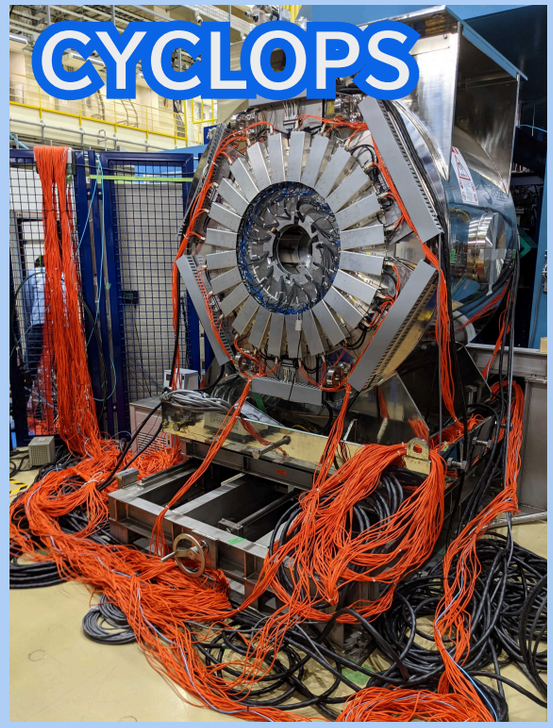
J-PARC MLF MUSE

- High intensity pulsed muon beam

High-rate capable Spectrometer

- ARTEMIS & CYCLOPS
- Segmented scintillation detector with SiPM

	Max B	Detector	Channel
ARTEMIS	0.4 T	10 mm sq. Sci. telescope	1,280 ch
CYCLOPS	5 T	1 mm sq. x45 mm Fiber sci.	3,008 ch



Standard μSR

Sample environment must be stable

- Time required to change sample environment ≒ μSR data acquisition
- ✦ The measurement must be stopped during the change

Saving time

Frequent change of sample environment

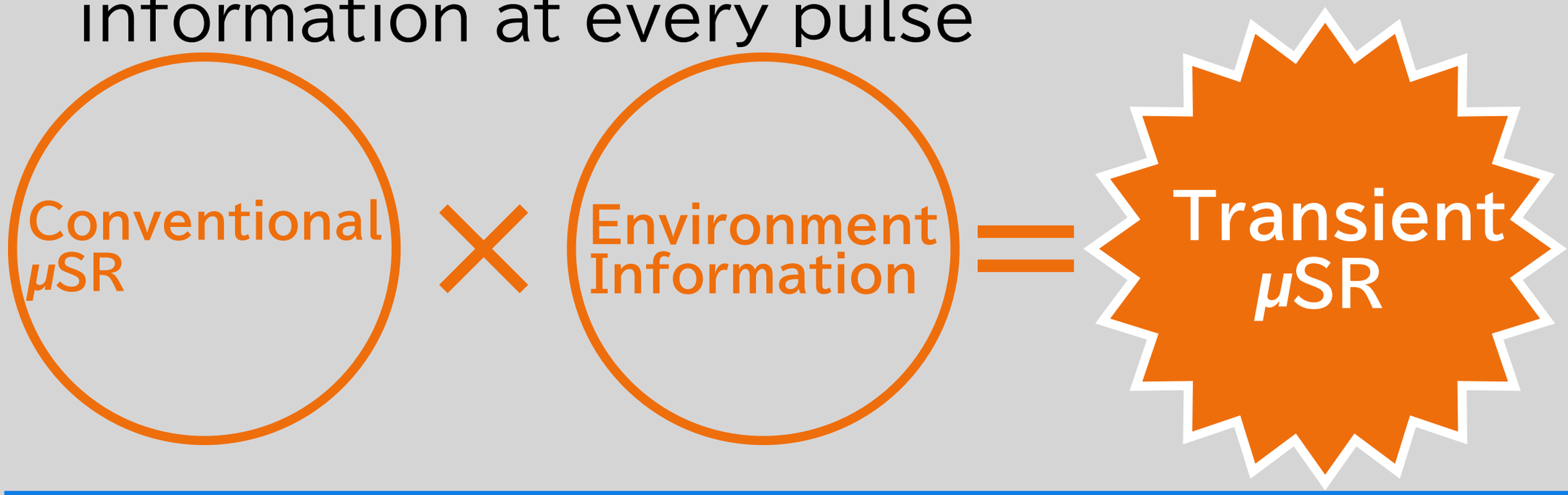
Much stable measurement

→ Monitoring & changing sample environment during the measurement

Transient μSR

New μSR measurement actively changing the environment during the measurement

- Matching the μSR result and environment information at every pulse

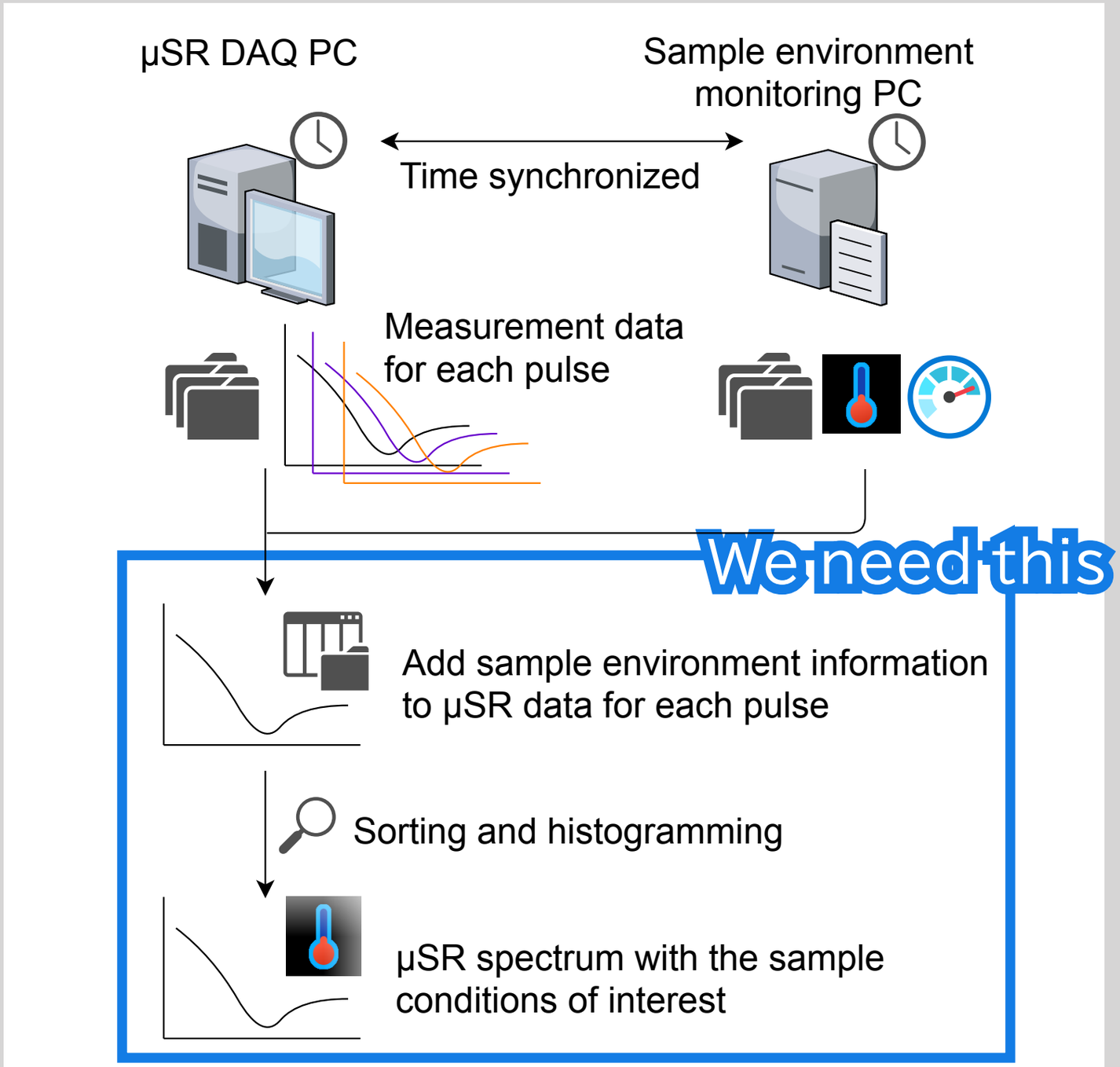


High intensity pulse muon beam is useful

Development of Transient μSR

Analysis tool

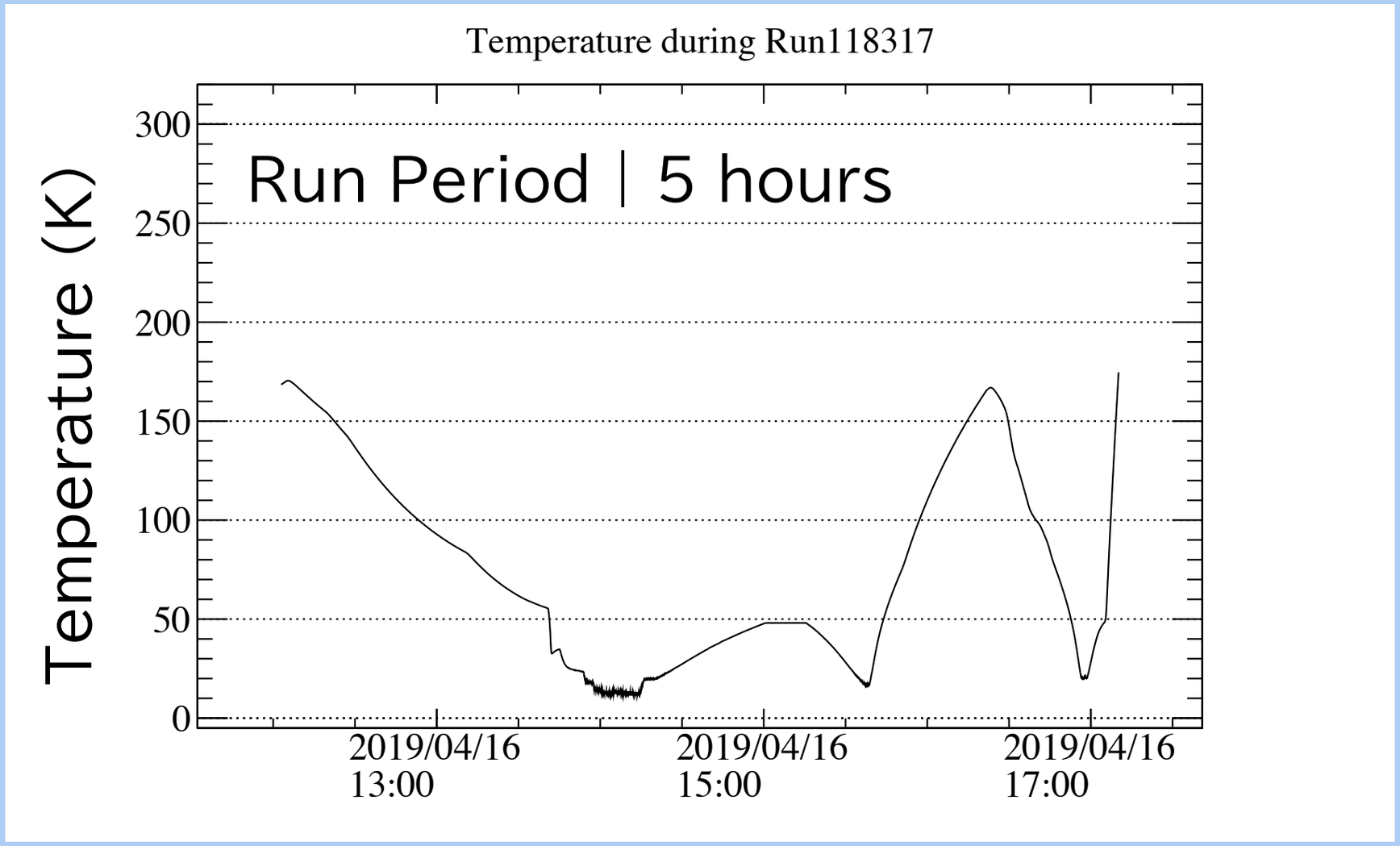
- Integration of μSR data and sample environment data
- Creating histogram
- It works by just installing ROOT with default option
- Anyone can use it
  - Even if you do not know how to use ROOT
  - You can analyze the data with just a click of a button



Transient μSR Measurement

First Transient μSR experiment @ S-Line

- Target Material | MnSi （Changing temperature）



MnSi Transient μSR

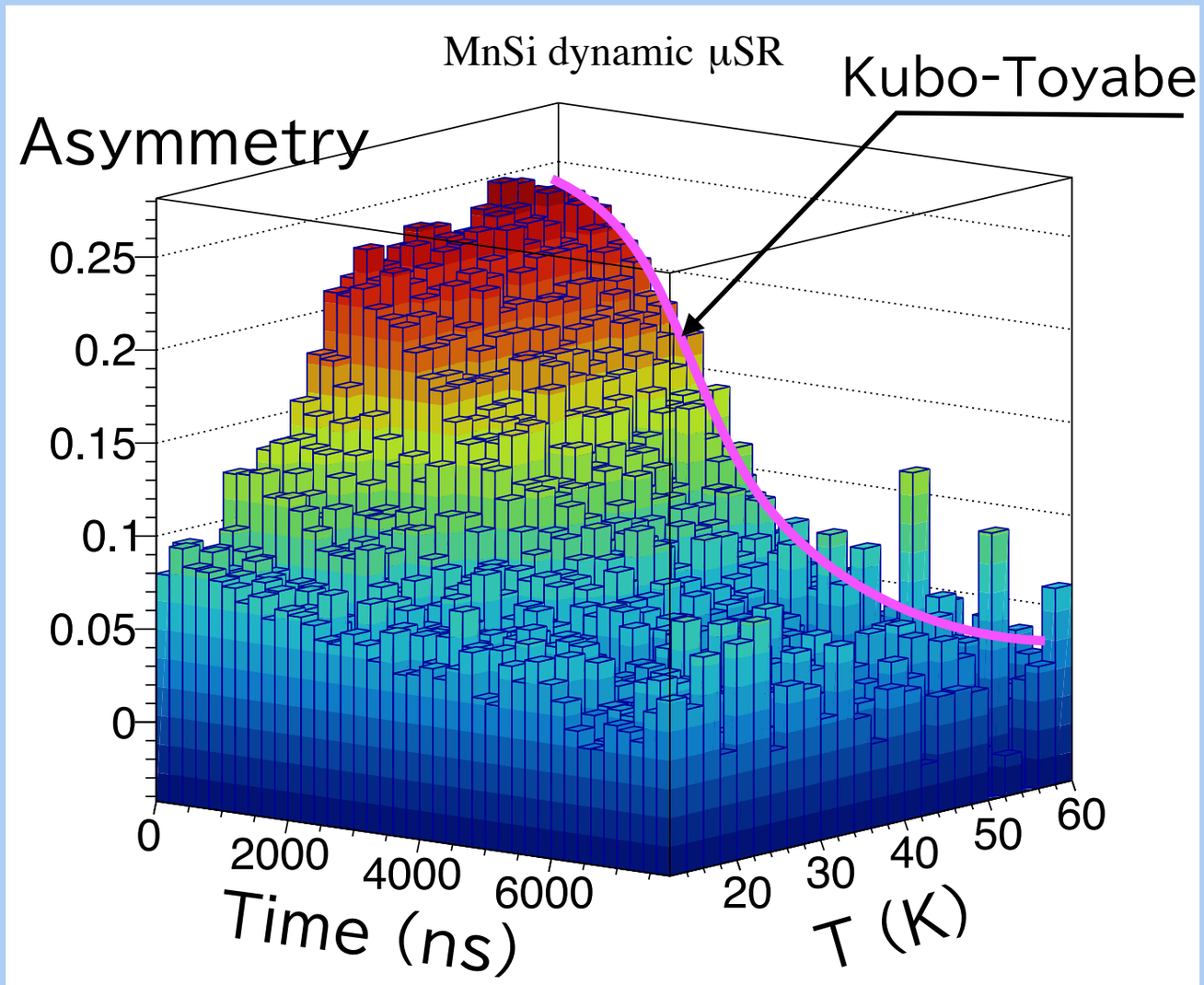
MnSi ZF

- Kubo-Toyabe was observed
- Reasonable T_k (~30 K)

Difficult to analyze in 3D

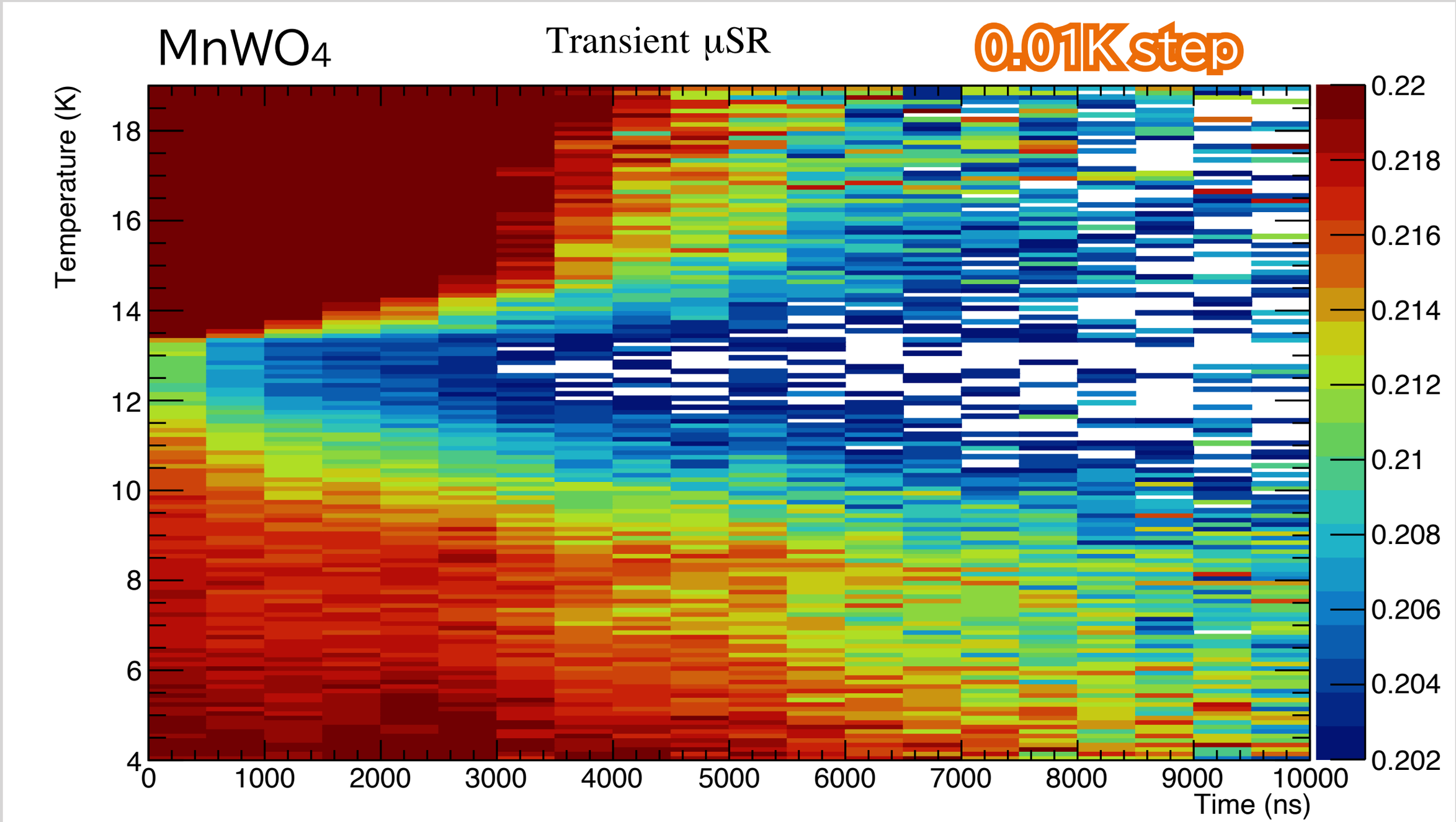
Analyzing tool to create 2D Hist. were developed

A part of data



Demonstration of Analysis Tools for Transient *μ*SR

High temperature resolution

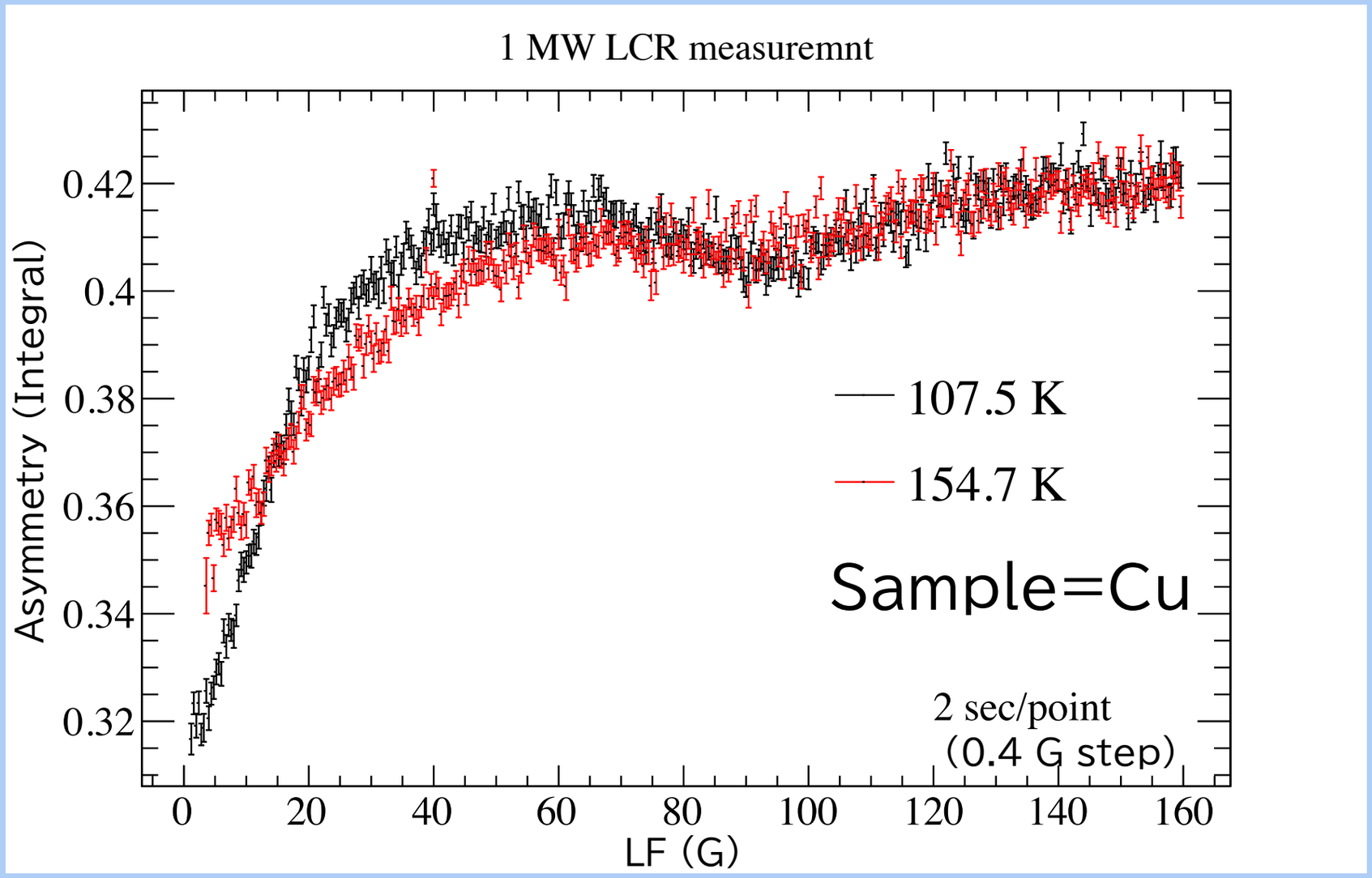


Next: How precisely can we determine the temperature

LCR Measurement

Changing LF during the Run

- Fast scan (2sec/point, 13 min/1scan)



Summary

Transient μSR

- Changing temperature or magnetic field during measurement
  - We can save the time by measuring during heating and cooling
  - Precision measurement of transition point
- New analysis tools
  - Based on ROOT