Examples of Radio Environment in the Factories

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Introduction

- There are some applications to ensure End-to-End(E2E) latency in the factories.

- However, users would like to use wireless communications for "last hop" in their manufacturing systems.

- If there are wireless communications in the systems, it makes difficult to ensure E2E latency in the systems.

Why?

This presentation shares examples of Radio Environment in the Factories.

Observations

- We have evaluated wireless environment at several factories in operation and found issues to be resolved.

More Information   https://www.nict.go.jp/en/press/2017/03/01-1.html

Features of Wireless Communication in Factories

1. **Wide Variety** of Applications
2. **Severe Environment** for Wireless Communication
3. **Uncoordinated** and Independent Systems

1. Wide Variety Wireless Applications
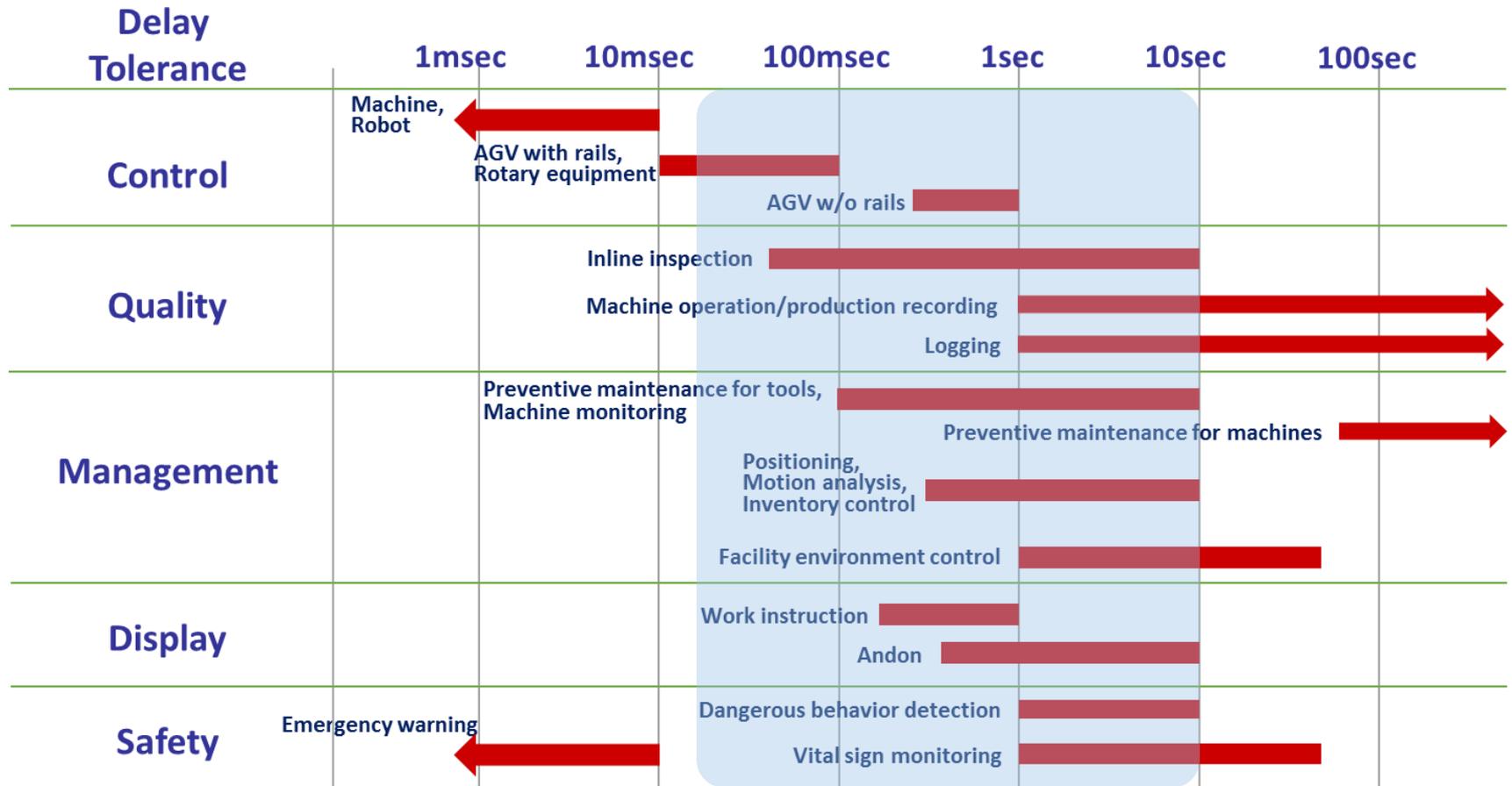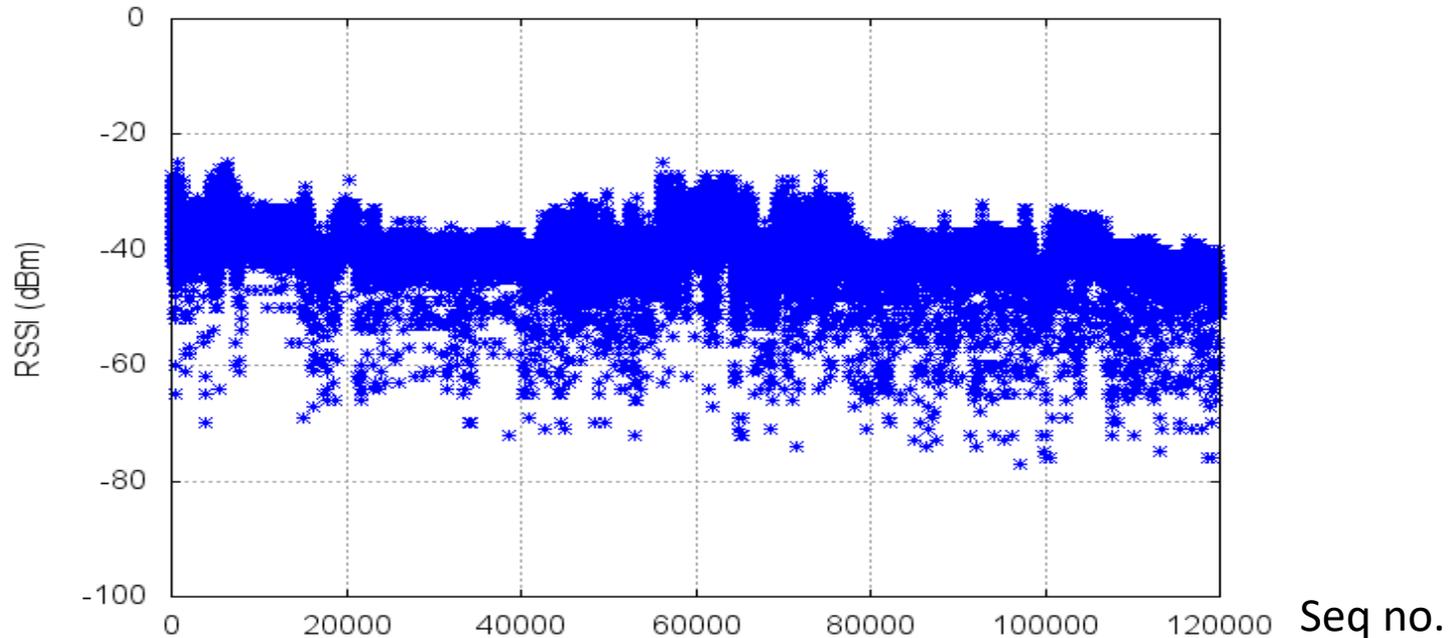

Difficult to ensure E2E latency

Source: Flexible Factory Project

2. Severe Wireless Environment

① Fluctuation of Signal Strength
② Internal noises at 1.9GHz and 2.4GHz

Example①:
Fluctuation of Signal Strength
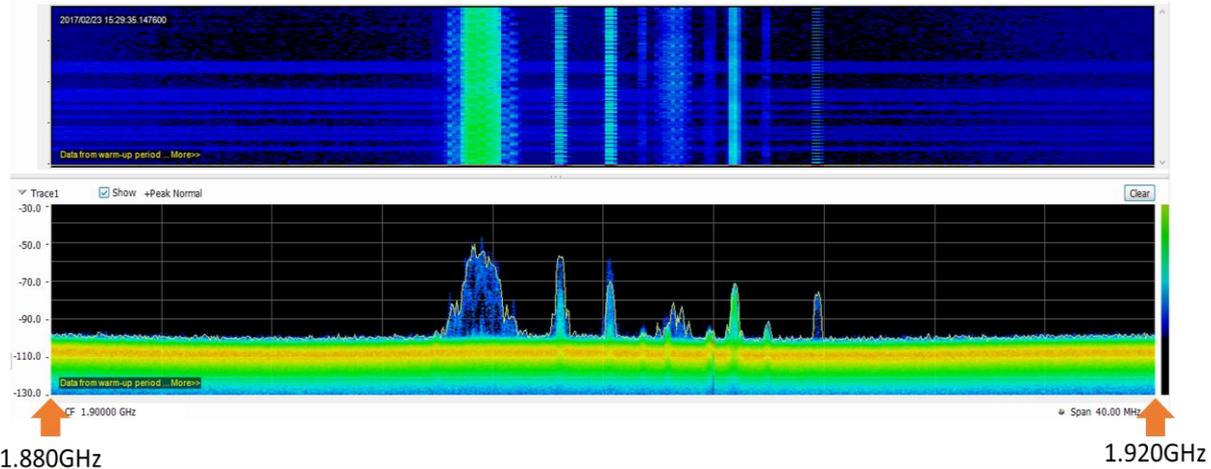
RSSI Fluctuation in Factory (LOS)

Seq no.

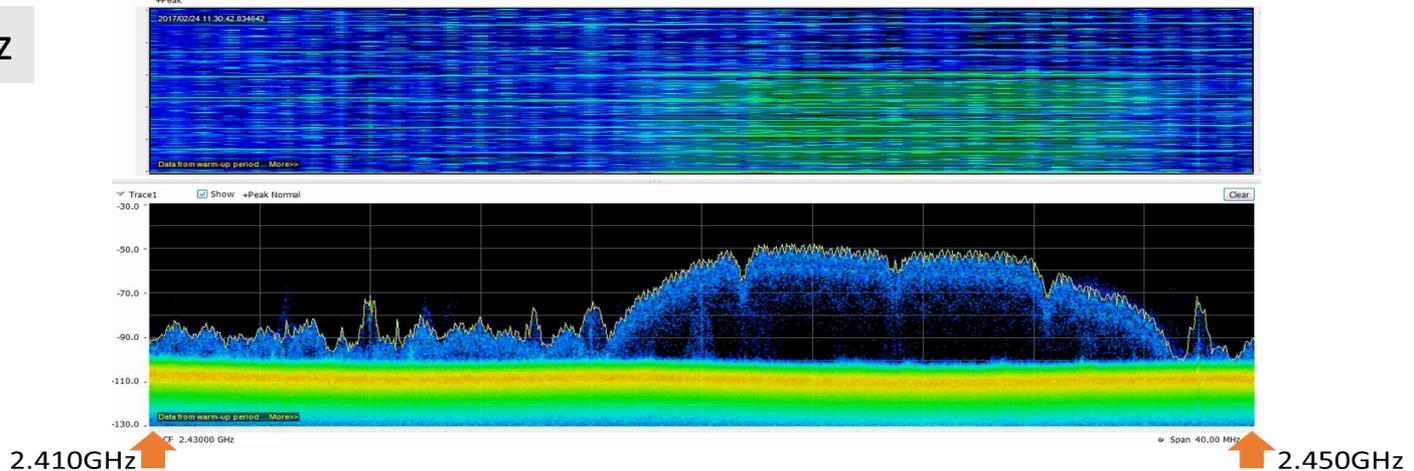Motions of materials, parts, products, and carriers in a closed space.

Example②:
Noises observed at 1.9GHz and 2.4GHz

1.9GHz

1.880GHz
1.920GHz

2.4GHz

2.410GHz
2.450GHz

Some kinds of manufacturing machines may be interference sources for wireless communications

3.   Uncoordinated Independent Systems

- Step-by-step installation
- Coexistence of heterogeneous and legacy devices/systems.

Coexistence of different wireless technologies

New system using Wi-Fi

Legacy system using original communication protocols
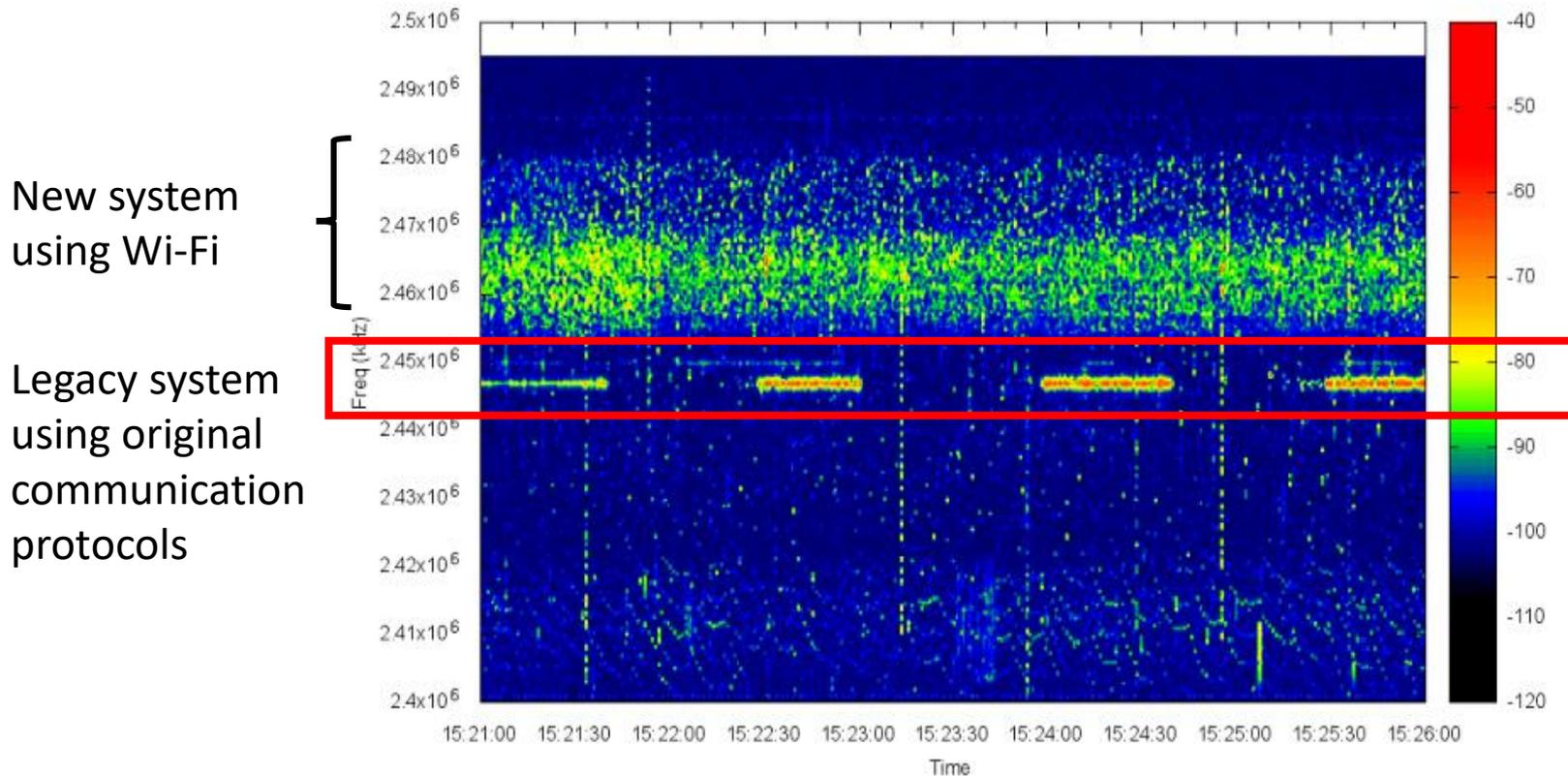
Legacy wireless communication dose worse to Wi-Fi

Scenario of using wireless technology in the factory

AP

DEV

Data Flow

Control Terminal

Wired Network

What is a bottleneck?
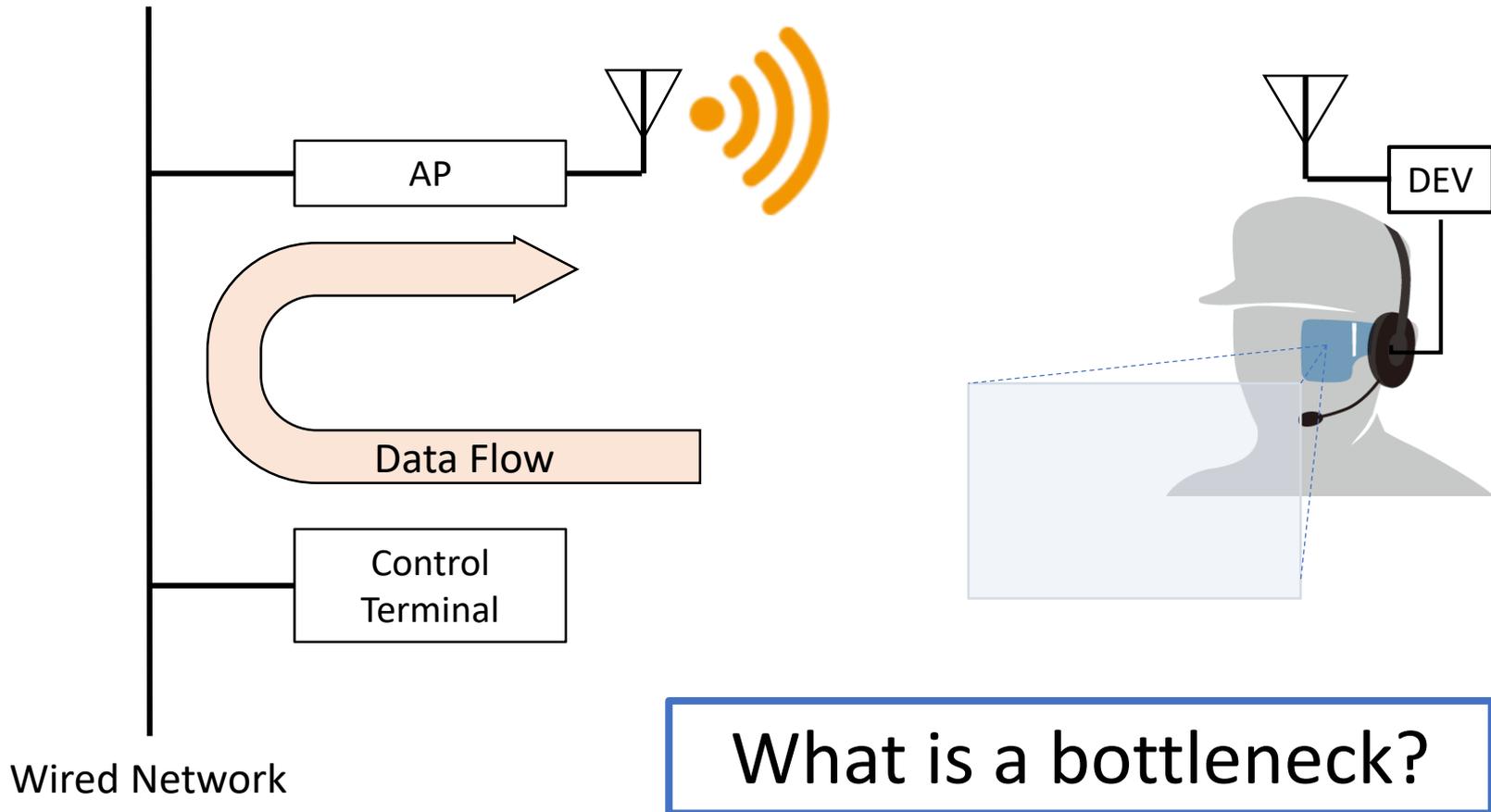
Toward Next Step

- We have evaluated wireless environment at several factories in operation and found issues that need to be resolved.

- Potential solution is sophisticated coordination mechanism.

- Factory IoT will be discussed under the IEEE 802® Network Enhancements Industry Connections Activity.