

Summary of MTCA Workshop in Japan 2025
and
Status of MTCA at J-PARC in 2025

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J-PARC Center

December 2025

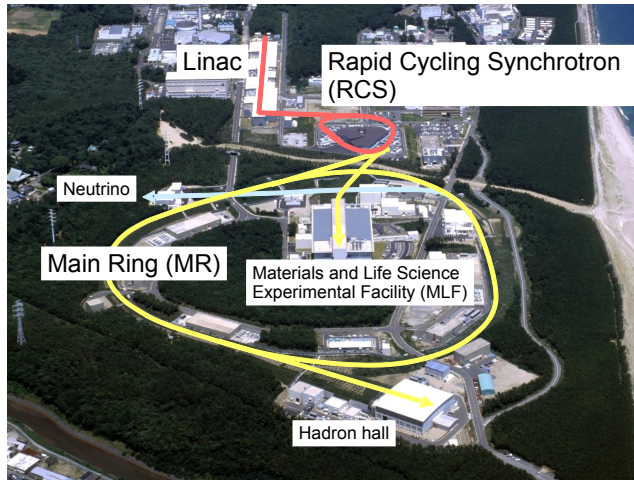
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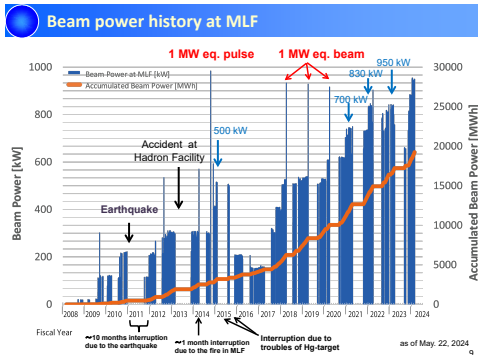
Japan Proton Accelerator Research Complex (J-PARC)



J-PARC Consists of 400 MeV linac, 3 GeV RCS, 30 GeV Main Ring, and experimental facilities (MLF, Hadron, Neutrino).

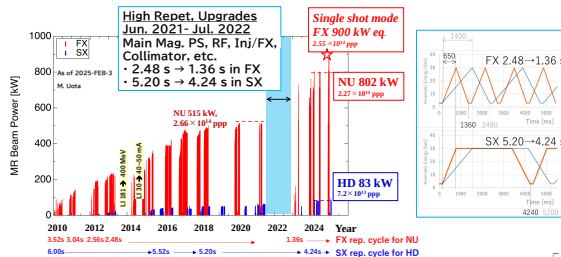
- Very high intensity proton beam
- Secondary particles used for material/life science and nuclear/particle physics

Beam power history of J-PARC



Power Trend of MR

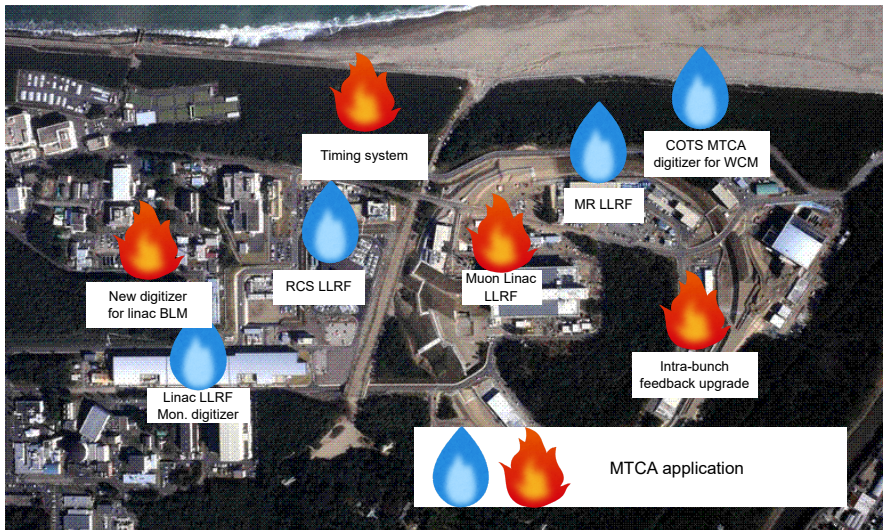
- Base scenario of power up: Higher repetition and More p+/pulse



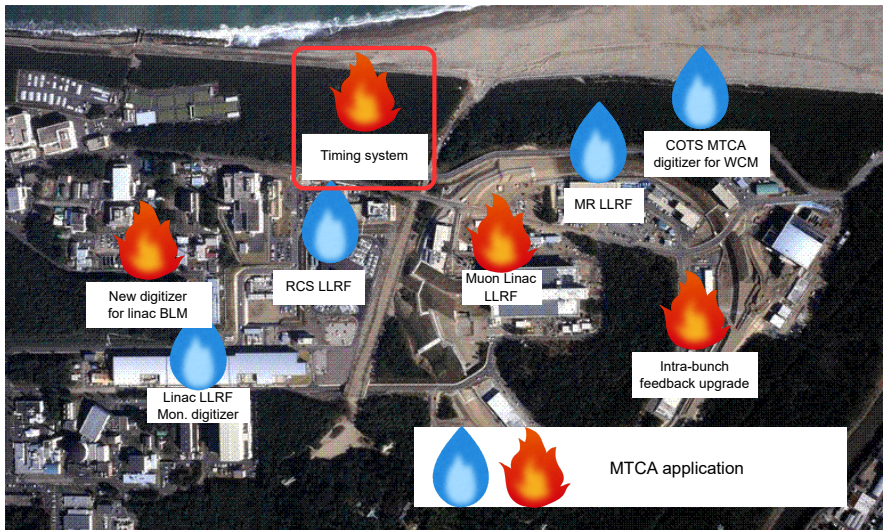
Design output beam power (RCS: 1 MW, MR-FX: 750 kW) has been achieved.

- MTCA systems contributed to the achievement

MTCA applications in J-PARC

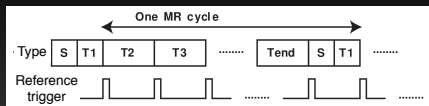


MTCA applications in J-PARC



J-PARC timing system

Operating principle of scheduled timing



Type sequence:

- A type sequence represents operation in a MR cycle
- End code or jump code indicates the end of cycle
- Changing type sequence, accelerator operation is switched
- Special word "S" sent additionally at the beginning of type sequence

RT2020, F. Tamura

Development of next-generation timing system for The Japan Proton Accelerator Research Complex

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Protocol

(1) Null event: sent when idle

	1	2	3	4	5	6	7	8	9	10	11	12
Null	k28.5	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0

E(null)=D0.0 (0x00)

(2) Trigger event

	1	2	3	4	5	6	7	8	9	10	11	12
Trig	k28.5	E(trig)	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0

E(trig)=D1.0 (0x01)

(3) Type event: before trigger

	1	2	3	4	5	6	7	8	9	10	11	12
Type	k28.5	E(type)	type1	type2	type3	type4	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0

E(type)=D2.0 (0x02)

(4) S event: at beginning of type sequence

	1	2	3	4	5	6	7	8	9	10	11	12
S	k28.5	E(S)	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0

E(S)=D3.0 (0x03)

(5) S count event

	1	2	3	4	5	6	7	8	9	10	11	12
Scnt	k28.5	E(Scnt)	Scnt1	Scnt2	Scnt3	Scnt4	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0

E(Scnt)=D4.0 (0x04)

(6) Trig count event

	1	2	3	4	5	6	7	8	9	10	11	12
Tcnt	k28.5	E(Tcnt)	Tcnt1	Tcnt2	Tcnt3	Tcnt4	b0.0	b0.0	b0.0	b0.0	b0.0	b0.0

E(Tcnt)=D5.0 (0x05)

- Many reserved events

RT2020, F. Tamura

Development of next-generation timing system for The Japan Proton Accelerator Research Complex

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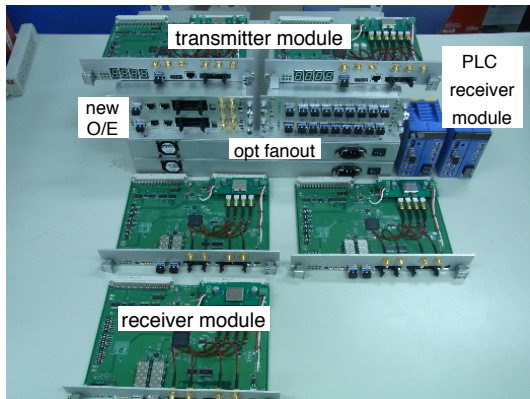
J-PARC employed a dedicated timing system (not WR or MRF).

- It is a kind of event timing system
- Functionality is optimized for synchrotron

F. Tamura, H. Takahashi, N. Kamikubota, Y. Ito and N. Hayashi, "Development of Next-Generation Timing System for the Japan Proton Accelerator Research Complex," in IEEE Transactions on Nuclear Science, vol. 68, no. 8, pp. 2043-2050, Aug. 2021, doi: 10.1109/TNS.2021.3083791.

J-PARC timing system

Existing modules:



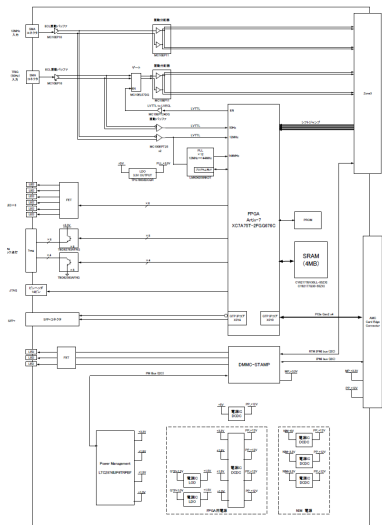
Form factor of existing transmitter/receiver modules:

VME and PLC.

New MTCA timing module is now under construction by Kanadevia (formerly known as Hitachi Zosen).

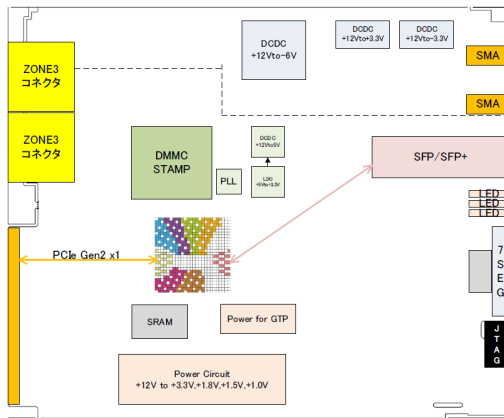
Important step in Japan. First AMC development for J-PARC for other than MEDS (Mitsubishi Electric Defense and Space technologies).

New MTCA timing system



Core logic is the same as VME one.

DMMC Stamp is employed:



Front panel:

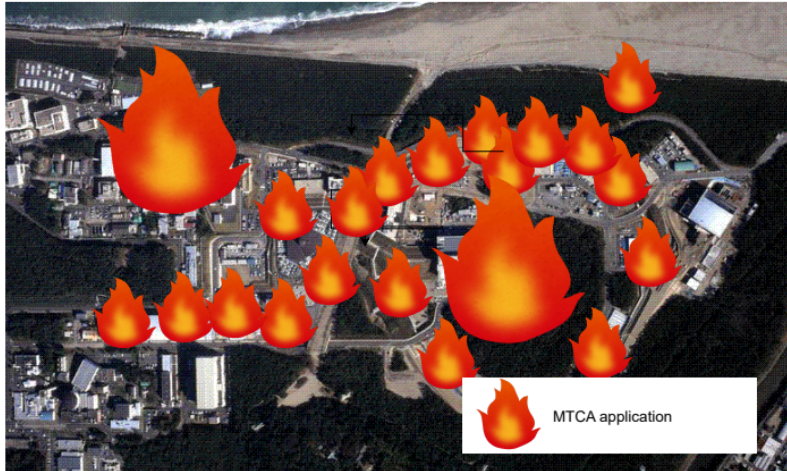


Timing system summary

The transmitter module will be delivered in the end of JFY2025 (March 2026) and the development of the receiver module will follow. If MTCA timing modules are fully deployed, J-PARC will look like...

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3. Summary of MTCA Workshop in Japan 2025



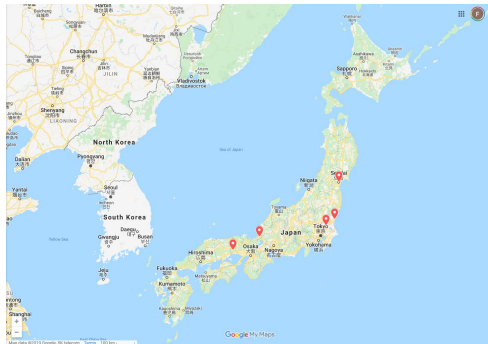
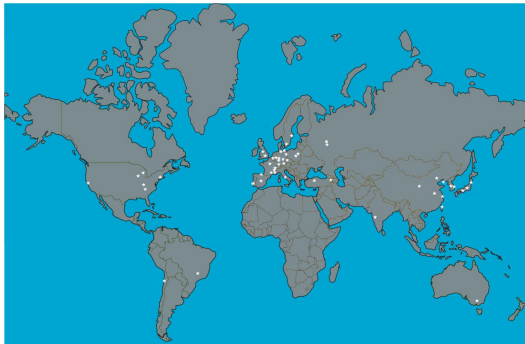
MTCAWS in Japan 2025

KEK, Tsukuba

August 27-29, 2025

Workshop indico: <https://conference-indico.kek.jp/event/326/>

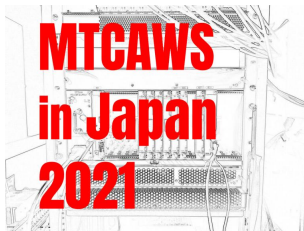
MTCA in the world and Japan



The number applications of MTCA in Japan is increasing.

Objective of the workshop

- MTCA is expected to be the new standard platform of the control systems for accelerators and physics.
- The goal of this workshop is to boost the application of MTCA in Japan by exchanging the information and experiences.



The last workshop in 2021 was held in a virtual format.
MTCAWS in Japan 2025 is the first workshop in person.

Face-to-face discussion is the most important!

Workshop Program

August 27 (Wed)

- Welcome address by Takeshi Komatsubara (J-PARC Deputy Director)
- Tutorial lecture by Cagil Guemues (DESY)

August 28 (Thu)

- Presentations
- Group photo
- Keynote talk by Shinichro Michizono (KEK)
- Workshop dinner

August 29 (Fri)

- Presentations
- KEK site tour

Numbers

of registration: 70

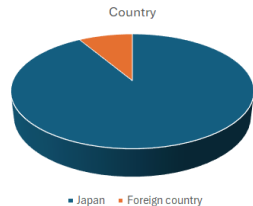
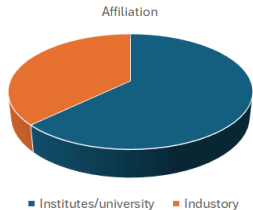
- On-site: 52 (74%) / Online: 18 (26%)
- From institute/university: 44 (63%) /
From industry: 26 (37%)
- From Japan: 64 (91%) /
From foreign countries: 6 (9%)

of tutorial lectures: 1

of keynote talk: 1

of oral presentation: 16

- Including 3 talks from industry

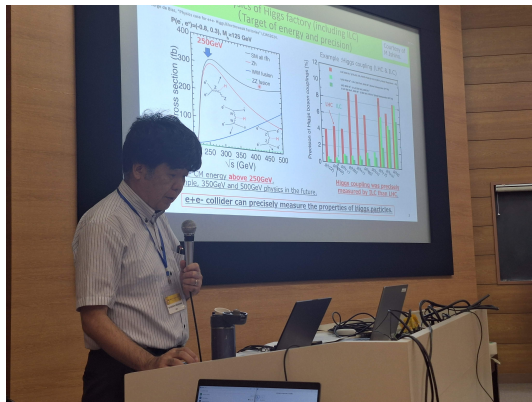


Welcome address and tutorial lecture



Tutorial Lecture: FPGA Development for MicroTCA Platforms: Open-Source Tools and Best Practices by Cagil Gumus (DESY)

Group photo and Keynote talk



Keynote Talk: Future Linear Collider and its LLRF system
by Shinichiro Michizono (KEK)

Talks from accelerators



MicroTCA-based LLRF systems used at the STF at KEK

MicroTCA WS Japan 2025
2025/08/28

Mathieu Omet

(on behalf of the RF group and the ICASA SRF group)



Operation Status of a LLRF Control System at WERC

Tetsuro Kurita¹ Fumihiko Tamura²

¹The Wakasa Wan Energy Research Center

²J-PARC Center

2025/08/28

MTCA workshop for accelerator and physics in Japan 2025



Operational experience of MTCA.4-based BPM electronics for SPring-8

Hirokazu Maesaka
for the SPring-8 diagnostics group

RIKEN SPring-8 Center

MTCA Workshop for Accelerator and Physics in Japan
Aug. 28, 2025

KEK, SPring-8/SACLA, J-PARC, WERC...

- Now, many applications found in Japan

Talks from industry



MMC Software Engineering: Challenges and Solutions

MTCA workshop for accelerator and physics in Japan 2025

2025/8/28

mitsubishi electric defense and space technologies corporation

https://www.mitsubishi-electric.com/defense-and-space-technologies/corporation/

Digitizers

Aug 2025



Sales & Field Application Engineer
Yoshikazu.Kawamatsu@teledyne.com (Kazu)

NAT-MCH Gen4

MTCA workshop for accelerator and physics in Japan 2025

KEK, Tsukuba

August 28th, 2025

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MTCA workshop in Japan 2025, KEK Tsukuba, Aug 28th 2025, "NAT-MCH Gen4" by Heiko Koerte

MEDS, Teledyne SP Devices, NAT

Industry exhibition

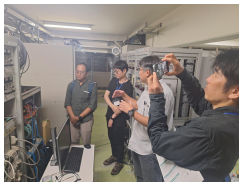


Eight important companies exhibited their products.

- I would like to thank again for their participation
- Company-to-company conversation

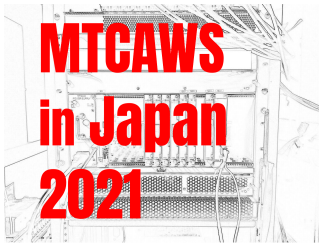


Workshop dinner / KEK tour



PF, STF, cERL

Conclusion



Conclusion

