

# Muon Microscopy Projects in J-PARC

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We reports the current status of the muon microscopies beeing developped at J-PARC. The transmission muon microscope  $T\mu M$  is an analog of the transmission electron microscope (TEM). By employing the strongest penetration power into materials of muons, the  $T\mu M$  allows us to observes thicker objects compare than the TEM. The  $T\mu M$  can visualize distribution of the electromagnetic field in the specimen of sub-milimeter scale. This capability is usefull to improve power-devices, like power-semiconductor devices, ceramic condensers, magnets, piezo-devices, and so on by visualizing the internal electric- or magnetic- field of the devices. We are developping the 5MeV  $T\mu M$  at U-line, which empyles muon-cyclotron to accelerate ultra-slow muon beam, and we are planning to construct the 40MeV  $T\mu M$  at H-line by collabolation with muon g-2/EDS experiment. One of the key technologies is muon beam cooling to generate high brightness muon beam. We are constructing multi-step beam cooling system which procuces muon beam fosued into 30 nm spot. We are also developping the canning positive muon microscope ( $S\mu^+M$ ) which is an analog of the scanning electron microscope (SEM). As an application of the multi-step muon beam cooling, the focused muon beam is used to scanning-imaging. The  $S\mu^+M$  will works as scanning muon spin rotation microscope, and it visualizes distribution of the magnetic properties or hydrogen-status on the surface of the specimen. The scanning negative muon microscope ( $S\mu^-M$ ) is also planed to develop. The  $S\mu^-M$  will visualize the distribution of elements, isotopes and chemical situations on the specimen.