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Measurements of the DC field of first vortex penetration on modern SRF materials using a vibrating sample magnetometer

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A vibrating sample magnetometer (VSM) is being developed with the capability to measure field penetration on ellipsoidal superconducting samples intended for use in superconducting radio frequency cavities. The explicit goal of this machine is to perform field penetration measurements on atomic layer deposition (ALD) coated niobium ellipsoids (ie., thin film MgB2, Nb3Sn on Nb), as well as on electropolished (EP) bare/low-temp baked Nb, and pair these measurements with beta detected nuclear magnetic resonance (bNMR) measurements on identical samples. The machine is capable of performing field penetration measurements at temperatures as low as ˜2 kelvin, and for magnetic fields up to ˜450 mT. Additionally, the test stand is based around a 1.5 watt SHI cryocooler, and is thus helium free. To accompany the VSM, an in-house EP setup for both flat and ellipsoidal Nb samples has begun development. This EP test stand, along with the vacuum furnace located at TRIUMF, will allow production of highly polished bare/baked Nb ellipsoids for field penetration measurements. The flat samples then provide a witness to the EP process in order to characterize the post-EP surface roughness. These combined facilities are well suited to measure field penetration on a wide range of modern SRF materials, encompassing ALD thin films, multilayers, and low-temperature baked niobium samples.

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Yes

Footnotes

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