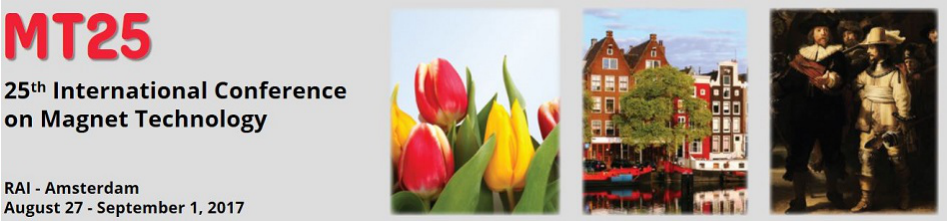

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Development of low resistance splicing between Nb3Sn and NbTi wires to make superconducting wigglers on the base of Nb3Sn superconductor

Tuesday, 29 August 2017 09:30 (15 minutes)

During the last decade nine multipole superconducting wigglers were manufactured in BINP on the base of NbTi superconductor. These wigglers are operating in various synchrotron radiation centers worldwide. High magnet design parameters were achieved by using the NbTi wire of high NbTi/Cu ratio, up to a factor of 2, and by grading current density in coils. So, further increase in the magnet parameter is limited by the properties of NbTi conductor. Also important peculiarity of the BINP wigglers is the design of the magnet where superconducting coils were separately manufactured and connected with splicing resistance well below of 0.1 nOhm at operating current about 1 kA. It benefits in significant decrease of heat load on cryocoolers because the total amount of splicing in one wiggler is more than 200. There are demands in superconducting wigglers and undulators for higher magnet parameters that can be realized by using the Nb3Sn wire. The ultimate aim of the current work is to make an Nb3Sn superconducting wiggler with separate coils which terminals will be connected with NbTi wires with low splicing resistance, below 0.1 nOhm. During assembling of such wiggler these coils will be connected via NbTi terminals by existing in BINP technology. This presentation reports on first results of testing of five samples of Nb3Sn-NbTi connection. Experimental setup will be described. The samples represent a two turn loops made of Nb3Sn and NbTi wires. The loops were charged by currents up to 500 A, and the resistance of these superconducting wire connection was evaluated by the current decay via a Hall sensor. All samples have demonstrated very low resistance, estimated as several fOhm, because during several days no current decay was detected by voltmeter in the range of several hundreds micro volts with sensitivity of 1 micro volt.

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