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A device for characterizing the circumferential strain dependence of the critical current in MgB_2 wires and tapes

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From several years now at CEA/Saclay has been lunched a program that aims at developing design tools and technologies for conduction-cooled MgB_2 magnets. In the framework of this program, a device for investigating the circumferential strain dependence of the critical current density in MgB_2 wires and tapes has been designed. It has to be integrated into the existing test facility which provides 600 A dc current power, 3 T background field, and is conduction-cooled down to 4 K by a two-stage GM cryocooler. In this device a new spring geometry is investigated, where the conductor is tested in a magnet-like configuration by applying a uniformly distributed circumferential strain (up to 1%) to a ring-shape spring. The paper focuses on the mechanical design, analytic calculations, and numerical simulations of the spring geometry. Moreover, experimental tests on a mock-up model of the device are performed in order to validate the working principle and the materials properties.

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