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Wed-Af-Po.02-01: Conceptual design of the hidden sector spectrometer magnet made with MgB_2 cable for the SHiP experiment and qualification of the technology demonstrator.

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The SHiP experiment, located at CERN in the ECN3 North Area cavern, aims to detect feebly interacting particles, potentially shedding light on neutrino mass and dark matter. A key component of the detector is the Hidden Sector Spectrometer, potentially the first large-scale, energy-efficient experimental magnet using superconducting MgB_2 cables. This technology, initially developed for the High Luminosity upgrade of the Large Hadron Collider (HL-LHC) at CERN, has now been adapted for electromagnets, cooled to about 20 K.
We present the current status of the proof-of-principle demonstrator, which features a coil wound from MgB_2 cable on radial plates and mounted inside an iron yoke. The demonstrator has been successfully tested in gaseous helium at 20 K. In the upcoming phase, the demonstrator will be upgraded to test indirect cooling of the MgB_2 cables, while the yoke will remain at ambient temperature.
This work is a validation step toward the design of the spectrometer magnet for SHiP, focusing on achieving high homogeneity with a magnetic field strength of 0.6 Tm over a large aperture of 4 m x 6 m. The main features of the conceptual magnet design are outlined. Challenges for the production are also presented.

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