Claims

1. A shielding device for shielding a magnetically sensitive device, in particular a quantum device, from electromagnetic noise, the shielding device (1) comprising

a main shield body (10) that partially encapsulates an interior space (12) and is provided with an opening (40) that provides access to the interior space (12), with a part of the interior space (12) being an accommodating space (30) for accommodating a magnetically sensitive device (50), in particular a quantum device; and

at least one shield member (20) that is located in the interior space (12) and between the opening (40) and the accommodating space (30), and that is structurally distinct and/or separable from the main shield body (10);

wherein the shield member (20) comprises at least a high permeability layer (21) with a relative electromagnetic permeability of at least 10^5 Henries per meter (H/m) and a low permeability layer (22) that is a superconductive material layer that is superconductive when cooled below a critical temperature, and

the high permeability layer (21) is provided between the opening (40) and the low permeability layer (22).

2. The shielding device of claim 1, comprising a plurality of shield members (20) located in the interior space (12) and between the opening (40) and the accommodating space (30),

wherein, two or more, optionally all, of the plurality of shield members (20) comprise a respective high permeability layer (21) with a relative electromagnetic permeability of at least 10^5 Henries per meter (H/m) and a respective superconductive material layer (22) that is superconductive when cooled below a

critical temperature, and

the respective high permeability layer (21) is provided between the opening (40) and the respective superconductive material layer (22) of the respective shield member (20).

3. The shielding device of claim 1 or 2, where the high permeability layer (21) and the superconductive material layer (22) are separated by a gap.

4. The shielding device of any one of the preceding claims, wherein the relative electromagnetic permeability of the high permeability layer (21) of the at least one shield member (20) and/or of any one or several, or optionally all, of the plurality of shield members (20) is in a range of 1.5 10^5 to 2.5 10^5 Henries, optionally in the range of 1.8 10^5 to 2.2 10^5 Henries.

5. The shielding device of any one of claims 2-4, wherein a distance between adjacent shield members (20) is in a range of 3 times, or less, a diameter of at least one opening provided for letting a structure such as a cable or a stabilizing member pass through, optionally twice the diameter or less, or equal to the diameter or less.

6. The shielding device of any one of claims 1-5, wherein a thickness of the high permeability layer (21) of the at least one shield member (20) and/or of any one or several, or optionally all, of the plurality of shield members (20) is in a range of from 0.2 mm to 3 mm, optionally from 0.2 mm to 1.5 mm or from 0.7 mm to 1.3 mm or from 0.8 mm to 1.2 mm, and/or

wherein a thickness of the superconductive material layer (22) of the at least one shield member and/or of any one or several, or optionally all, of the plurality

of shield members (20) is in a range of from 0.2 mm to 3 mm, optionally from 0.2 mm to 1.5 mm or from 0.7 mm to 1.3 mm or from 0.8 mm to 1.2 mm.

7. The shielding device of any one of the preceding claims, wherein the at least one shield member (20) and/or of any one or several, or optionally all, of the plurality of shield members (20) comprise an additional layer (23), in particular a mechanical support layer, the additional layer (23) is provided between the high permeability layer (21) and the superconductive material layer (22), and the additional layer (23) optionally comprises copper.

8. The shielding device of any one of the preceding claims, wherein a surface of the high permeability layer (21) of the at least one shield member (20) and/or of any one or several, or optionally all, of the plurality of shield members (20) is oriented towards the opening (40), wherein the high permeability layer (21) is optionally parallel to the opening (40); and/or

wherein a surface of the superconductive material layer (22) of the at least one shield member (20) and/or of any one or several, or optionally all, of the plurality of shield members (20) is oriented towards the opening, wherein the superconductive material layer (22) is optionally parallel to the opening (40).

9. The shielding device of any one of the preceding claims, wherein a clearance range is provided between the at least one shield member (20) or any one of, several, or optionally all of the plurality of shield members (20) and the main shield body (10), respectively, and the clearance gap has a width in a range of up to 3 mm, optionally up to 1.5 mm.

10. The shielding device of any one of the preceding claims, wherein the at least one shield member (20) comprises a metal-containing plate (21) and a superconductive plate (22),

Wherein the metal-containing plate (21) of the at least one shield member comprises, optionally consists of, the high permeability layer (21), and the superconductive plate of the at least one shield member (20) comprises, optionally consists of, the superconductive material layer (22).

11. The shielding device of any one of the preceding claims, wherein any one or several, optionally all, of the plurality of shield members (20) comprise a respective metal-containing plate and a respective superconductive plate,

wherein, for any one or several, optionally all, of the plurality of shield members (20), the respective metal-containing plate comprises, optionally consists of, the high permeability layer (21) and the respective superconductive plate comprises, optionally consists of, the superconductive material layer.

12. The shielding device of any one of the preceding claims, wherein the superconductive layer of the at least one shield member (20) and/or of any one or several, or optionally all, of the plurality of shield members (20) comprises any one or more than one of the materials selected from the list consisting of: Al, Ti, Nb, and Sn.

13. The shielding device of any one of the preceding claims, wherein the high permeability layer (21) of the at least one shield member (20) and/or of any one or several, or optionally all, of the plurality of shield members (20) comprises any one or more than one of the materials selected from the list consisting of: Cryophy, Cryperm, A4K, Tokin R, other cryogenic compatible high

permeability materials, typical of hi Ni-iron alloys.

14. The shielding device of any one of the preceding claims, wherein the main shield body (10) comprises at least one of a high permeability layer (21) with a relative electromagnetic permeability of at least 10^5 Henries per meter (H/m) and a superconductive material layer (22) that is superconductive when cooled below a critical temperature.

15. The shielding device of any one of the preceding claims, wherein the main shield body (10) comprises side walls and a bottom wall and the opening (40) is provided on an end of the shielding device (1) that is distant to the bottom wall,

wherein a superconductive material layer, optionally a superconductive layer, is provided on at least one of the inside walls of the side walls and/or bottom wall of the main shield body (10) that is exposed to the interior space (12) on at least a part of the inside wall, optionally on the entire inside wall.

16. A shielding assembly comprising a plurality of shielding devices (1) according to any one of the preceding claims, wherein the plurality of shielding devices (1) are at least partially inserted into one another, from an outermost shielding device to an innermost shielding device.

17. A quantum apparatus, in particular a quantum computer, comprising the shielding device (1) according to any one of claims 1-15 and/or the shielding assembly of claim 16.