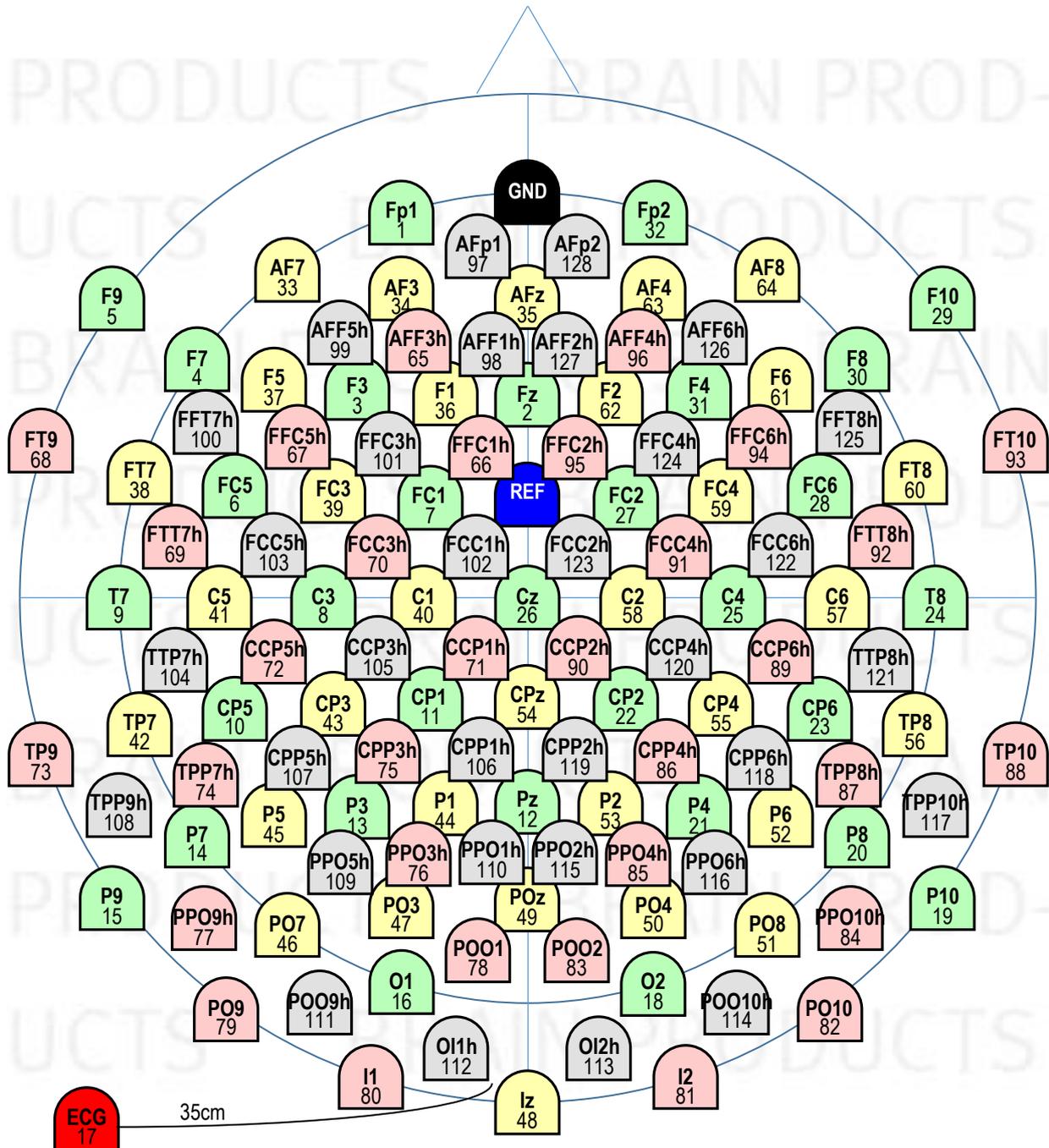




128Ch Wet-Sponge R-Net for BrainAmp MR for 3 Tesla

Electrode Layout and Channel Assignment



Details for Users

Electrodes

All electrodes are with Ag/AgCl-sensors and come with current-limiting resistors on both ends and, if applicable, inline after a quarter of lambda at 3 T (58cm). This results in these overall resistor values for each electrode:

- Ch1-16, 18-128 10kOhm
- Ch17 (ECG) 20 kOhm
- Ref 15kOhm
- Gnd 15kOhm

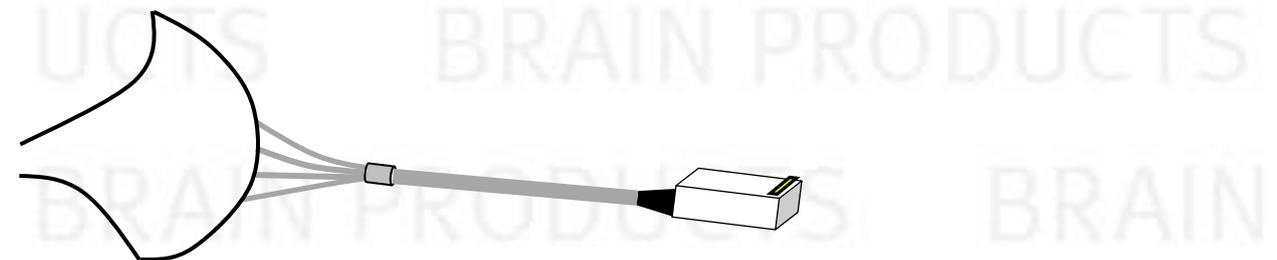
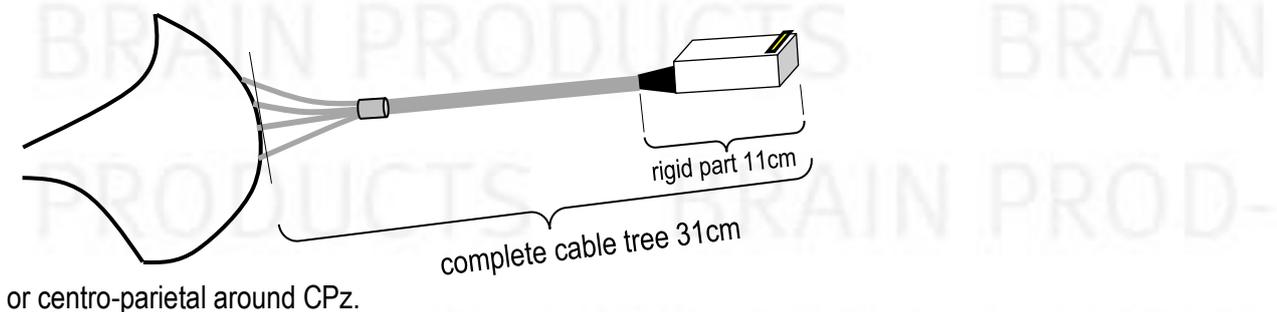
All cables are white, except Ch17 = black cable. Ref & Gnd come with 4 cables each, one for each amplifier. All electrodes are number-labelled (1, 2, ...) near sensor.

The ECG electrode drops down 35 cm beyond the occipital cap rim. The cable runs inside a spiral tube to avoid direct contact with the skin. The ECG is not a sponge-based electrode, it has another shape, suited to be attached to skin with a double-sided adhesive ring (washer), and requires gel.

The cables leave the cap radially from the area around FFCz or CPz and straight/tight to a uniting point after approx. 5 cm. After the uniting point, one cable tree for each 32 electrodes continues to the BrainCap-connector-boxes.

Exit Point of Cable Tree

In R-Net-MR3 the exit point of the cable tree can be either fronto-central around FFCz



Upon ordering, one of these options needs to be chosen. The decision depends upon the headcoil being used.

Options: Exit FFCz, Exit CPz

Termination

Each cable tree leads to a Connector box. From here the nets are connected to BrainAmp-MR with 10 cm round ribbon-cables. These round ribbon cables are delivered with the BrainAmp MR system (from April 2020; prior to April 2020 30 cm flat ribbon cables were delivered). The 10 cm round ribbon-cables can be re-ordered from BrainProducts (Cat.-No. BP-345-2000) or from Easycap (Cat.-No. KB-P50F-P50F-R-10).

Ordering Information

For ordering please give **Article Number**, **Exit Point**, and **Size**
(e.g. *RNP-BA-MR3-128*, *Exit FFCz*, *57*):

- Article Number: ***RNP-BA-MR3-128***
- Exit Point: ***Cable Tree Exiting at FFCz*** or ***Cable Tree Exiting at CPz***
- Size (head circumference, given in cm):

61	Adult XL
59	Adult L
57	Adult M
55	Adult S
53	Child/Adolescent L
51	Child/Adolescent M
49	Child/Adolescent S

The catalogue-number comprises the cap as described, serial number, this document; a memory-stick with manual and bvef-file, and the saltwater net accessory kit SNAK, consisting of 35 spare sponges and 5 pedestals, all packed in a labelled cardboard box. For further information about accessories or consumables, please visit our website or contact our local distributor.

Please adhere to Manual

The manual explains in detail how to prepare, mount, and adjust the cap. Maintenance, cleaning, and disinfection are covered, and what to do when repair is needed. There are several features to improve fit. Please adhere to manual.

Theta/Phi-Coordinates

Please find a table with Theta/Phi-Coordinates of all electrode sites at the end of this file.

Table of Coordinates for RNP-BA-MR3-128

Ch-No.	Name	Theta	Phi
1	Fp1	-90	-72
2	Fz	45	90
3	F3	-60	-51
4	F7	-90	-36
5	F9	-113	-36
6	FC5	-69	-21
7	FC1	-31	-46
8	C3	-45	0
9	T7	-90	0
10	CP5	-69	21
11	CP1	-31	46
12	Pz	45	-90
13	P3	-60	51
14	P7	-90	36
15	P9	-113	36
16	O1	-90	72
17	ECG		
18	O2	90	-72
19	P10	113	-36
20	P8	90	-36
21	P4	60	-51
22	CP2	31	-46
23	CP6	69	-21
24	T8	90	0
25	C4	45	0
26	Cz	0	0
27	FC2	31	46
28	FC6	69	21
29	F10	113	36
30	F8	90	36
31	F4	60	51
32	Fp2	90	72
33	AF7	-90	-54
34	AF3	-74	-68
35	AFz	67	90
36	F1	-49	-68
37	F5	-74	-41
38	FT7	-90	-18
39	FC3	-49	-29
40	C1	-23	0
41	C5	-68	0
42	TP7	-90	18
43	CP3	-49	29

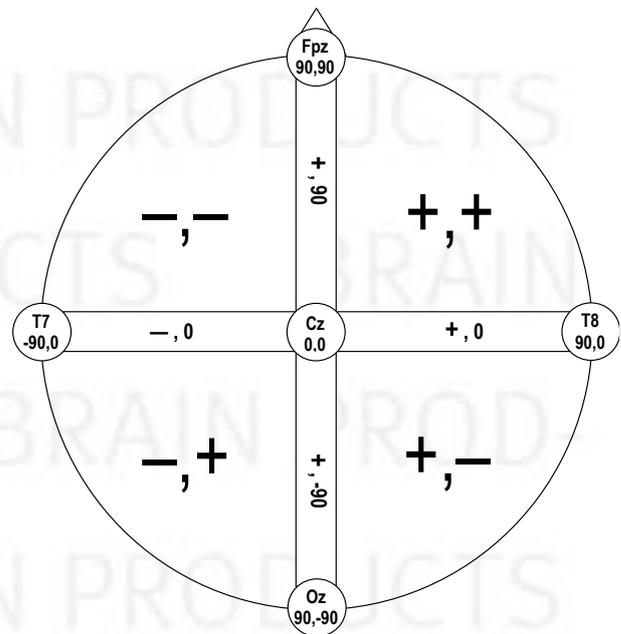
44	P1	-49	68
45	P5	-74	41
46	PO7	-90	54
47	PO3	-74	68
48	Iz	112	-90
49	POz	67	-90
50	PO4	74	-68
51	PO8	90	-54
52	P6	74	-41
53	P2	49	-68
54	CPz	22	-90
55	CP4	49	-29
56	TP8	90	-18
57	C6	68	0
58	C2	23	0
59	FC4	49	29
60	FT8	90	18
61	F6	74	41
62	F2	49	68
63	AF4	74	68
64	AF8	90	54
65	AFF3h	-62	-67
66	FFC1h	-35	-73
67	FFC5h	-62	-35
68	FT9	-113	-18
69	FTT7h	-79	-10
70	FCC3h	-35	-19
71	CCP1h	-16	45
72	CCP5h	-57	12
73	TP9	-113	18
74	TPP7h	-81	29
75	CPP3h	-46	48
76	PPO3h	-62	67
77	PPO9h	-101	45
78	POO1	-79	82
79	PO9	-113	54
80	I1	-112	72
81	I2	112	-72
82	PO10	113	-54
83	POO2	79	-82
84	PPO10h	101	-45
85	PPO4h	62	-67
86	CPP4h	46	-48
87	TPP8h	81	-29

88	TP10	113	-18
89	CCP6h	57	-12
90	CCP2h	16	-45
91	FCC4h	35	19
92	FTT8h	79	10
93	FT10	113	18
94	FFC6h	62	35
95	FFC2h	35	73
96	AFF4h	62	67
97	AFp1	-79	-82
98	AFF1h	-57	-82
99	AFF5h	-72	-55
100	FFT7h	-81	-29
101	FFC3h	-46	-48
102	FCC1h	-16	-45
103	FCC5h	-57	-12
104	TTP7h	-79	10
105	CCP3h	-35	19
106	CPP1h	-35	73
107	CPP5h	-62	35
108	TPP9h	-101	27
109	PPO5h	-72	55
110	PPO1h	-57	82
111	POO9h	-101	63
112	OI1h	-101	81
113	OI2h	101	-81
114	POO10h	101	-63
115	PPO2h	57	-82
116	PPO6h	72	-55
117	TPP10h	101	-27
118	CPP6h	62	-35
119	CPP2h	35	-73
120	CCP4h	35	-19
121	TTP8h	79	-10
122	FCC6h	57	12

123	FCC2h	16	45
124	FFC4h	46	48
125	FFT8h	81	29
126	AFF6h	72	55
127	AFF2h	57	82
128	AFp2	79	82
Ref	FCz	23	90
Gnd	Fpz	90	90

These values are standardized to a Theta of 90° for the plane through Fpz, T7, T8, Oz.

The signs follow this convention:



Summary Safety Rules for R-Net-MR 3 Tesla

Together, the R-Net MR and the BrainAmp MR / MR plus form a MR-conditional system according to ASTM 2503-20 and IEC 62570:2014.



In this context, the term MR-conditional means that restrictions from the manufacturer regarding field strength and imaging sequences apply to the product. A detailed explanation of the conditions for use can be found in the document *'Performing simultaneous EEG-fMRI measurements - Conditions for the safe use of BrainAmp MR amplifiers and accessories in the MR environment'*. A hard copy can be ordered from Brain Products (BP-265-4000) or downloaded from the website: <https://www.brainproducts.com/downloads.php?kid=5>

A summary of the main safety related points can be found below.

Any safety rules stipulated by the manufacturer of the MRI-Scanner and the local scanning facility must also be followed.

Scanner field strength and MR-sequences:

The R-Net MR3 is designed and approved for field strengths up to 3T.

For MRI sequences used with the R-Net MR3 there is a maximum allowed RF power; at 3 T $B1+rms$ must not exceed 1.5 μT . Note that a 10 cm round ribbon-cable must be used to attach the R-Net MR3 to the BrainAmp MR / MR plus. If a longer cable is used a $B1+rms$ limit of 1 μT applies.

All other conditions specified in the user manual (e.g. position of the amplifier and head coil used) must also be met.

Cable Routing:

No loops in connection cables or electrode leads are allowed. When recording in the MR environment all cables between the R-Net MR3 and the BrainAmp MR / MR plus must be routed as straight as possible and must never form loops or similar (e.g. meander).

Amplifier protection:

To protect amplifiers from RF overload it is important that all connected electrodes have low impedance values during measurements in the MR scanner. Impedance values can be verified by means of the impedance mode in BrainVision Recorder.

This also applies if the R-Net MR3 is used for measurements on imaging phantoms; all electrodes must be connected and have a low impedance. This can be achieved by covering the entire phantom surface with a damp cloth or towel (preferably soaked in salt water) and by making sure that all sponges in the R-Net MR are also soaked in salt water (prepared in the same way as for an EEG measurement). Never perform phantom measurements with the R-Net MR3 connected to the amplifier with unterminated electrodes.

Repair:

The net may not be altered by the customer. For any repair, the net must be sent to Brain Products via the local Brain Products distributor.