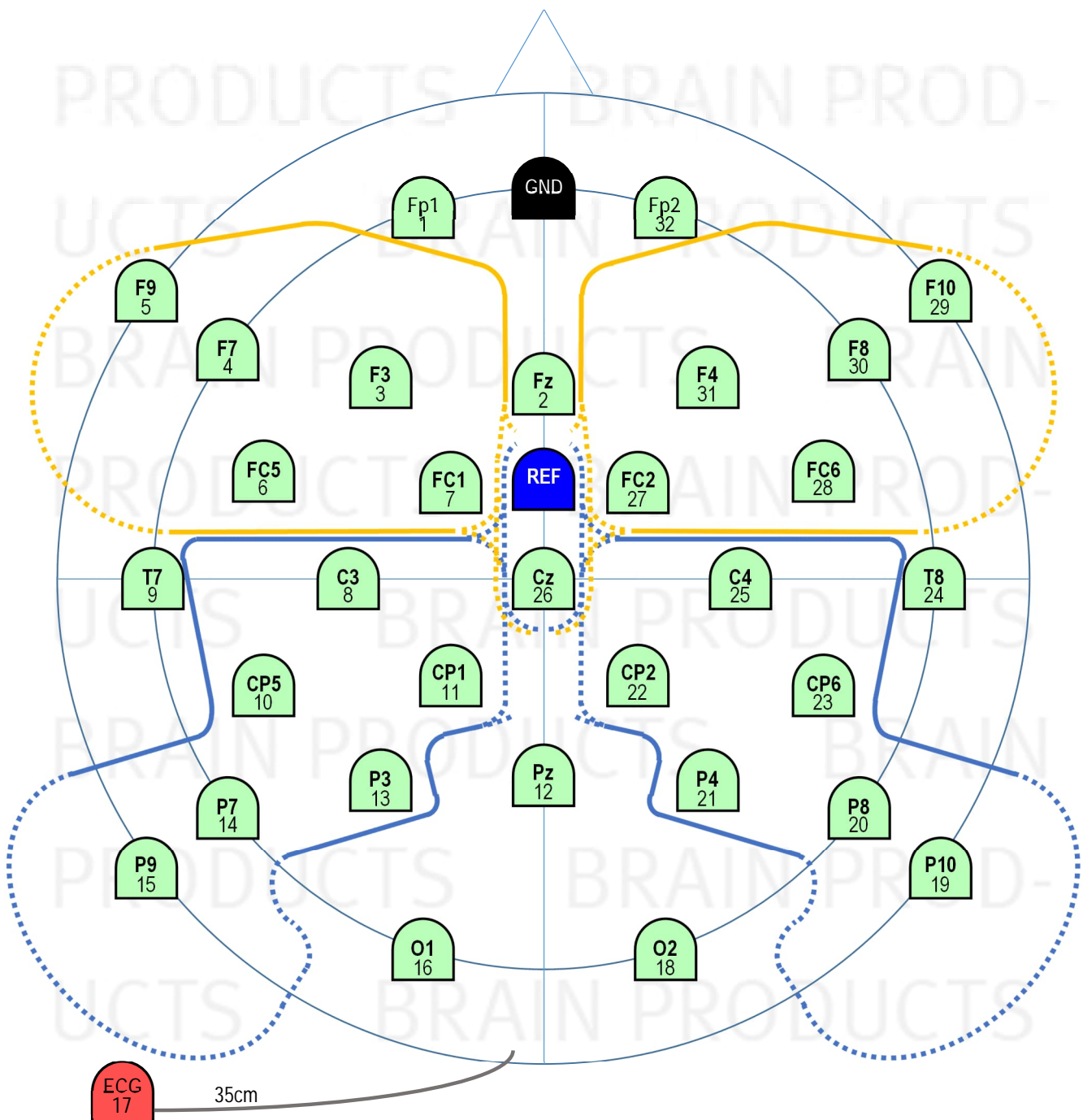




## 32Ch Wet-Sponge R-Net for BrainAmp MR for 3 Tesla With Carbon Wire Loops

### Electrode Layout and Channel Assignment



## Details for Users

For ordering please give Article Number, Exit Point, and Size, and the Carbon Wire Loops (e.g. *RNP-BA-MR3-64, Exit FFCz, size 57, with CarbonWireLoops*):

- Article Number: *RNP-BA-MR3-64 with CWL*
- Exit Point: *Cable Tree Exiting at FFCz or Cable Tree Exiting at CPz, with CWL*
- 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 RNET as described, incl. accessory kit SNAK (spare sponges/pedestals). For further information about accessories / consumables, please visit our website or contact our local distributor.

### 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:

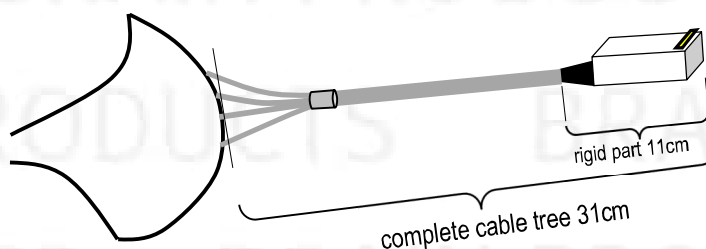
- Ch1-16, 18-64 10kOhm
- Ch17 (ECG) 20 kOhm
- REF, GND 15kOhm

All cables are white, except Ch17 = black cable. Ref & Gnd come with 2 cables each, one for each amplifier. All electrodes are number-labelled (1, 2, ...) near sensor. The ECG electrode extends beyond the occipital cap rim, inside a spiral tube to avoid direct contact with the skin. The ECG is not a sponge-based electrode, it is suited to be attached to the skin with a double-sided adhesive ring (washer), and requires gel.

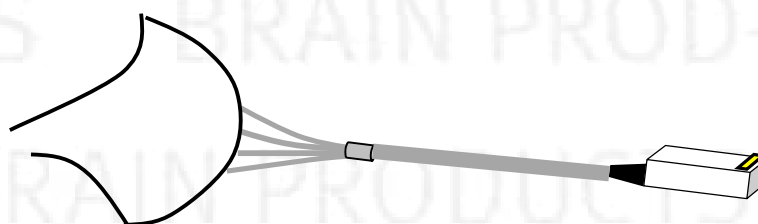
The cables leave the cap radially from the area around FFCz or CPz and straight to a uniting point after approx. 5 cm. After the uniting point, one cable tree for each 32 electrodes continues to the BrainCap-connector-boxes.

### Exit Point of Cable Tree

Exit point of the cable tree can be either fronto-central around FFCz



or centro-parietal around CPz:



Upon ordering, one of these options needs to be chosen. The decision depends upon the headcoil being used.  
*Options: Exit FFCz, Exit CPz*

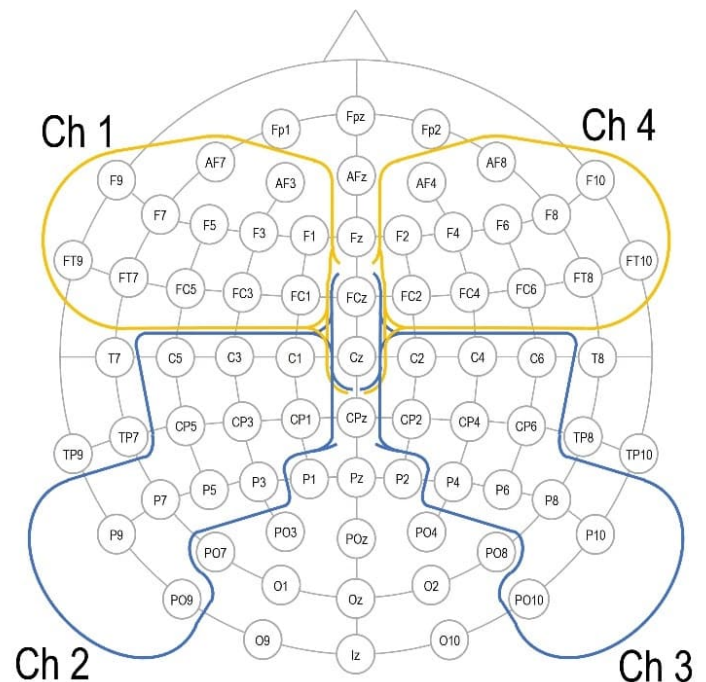
## Termination

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).

## Carbon Wire Loops

The RNET MR3 is equipped with carbon wire loops (CWL) for better artefact correction.

The loops - bipolar channels 1 - 4 - terminate into a connector box for a BrainAmp ExG. In the connector, there is a 5k-resistor both at the (bipolar) plus and minus ending, plus ~150  $\Omega$  per meter loop-cable.



Note that the connector box for the CWLs must never be left open during simultaneous EEG-fMRI.

It must be connected to the BrainAmp ExG MR or be terminated by using a termination socket (available upon request). This CWL add-on is only suitable for a maximum field strength of up to 3T.

## 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

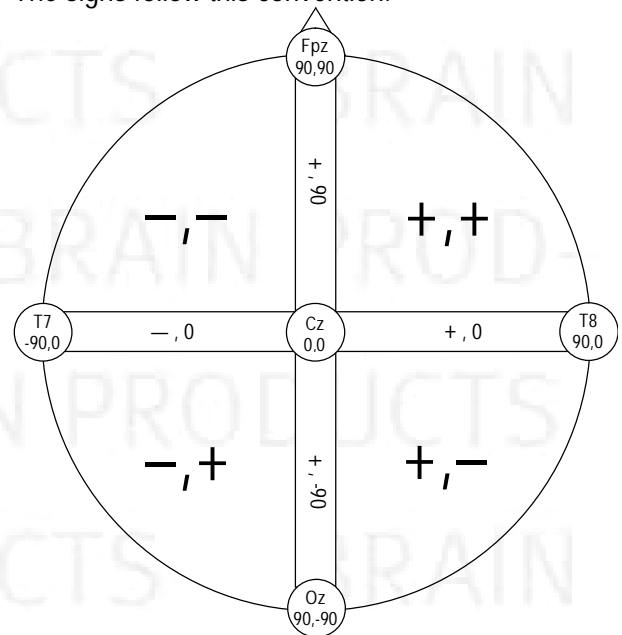
Please find a table with Theta/Phi-Coordinates of all electrode sites at the end of this file.

Table of Coordinates for RNP-BA-MR3-32

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
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  $\mu$ T. 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 $\mu$ T 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.