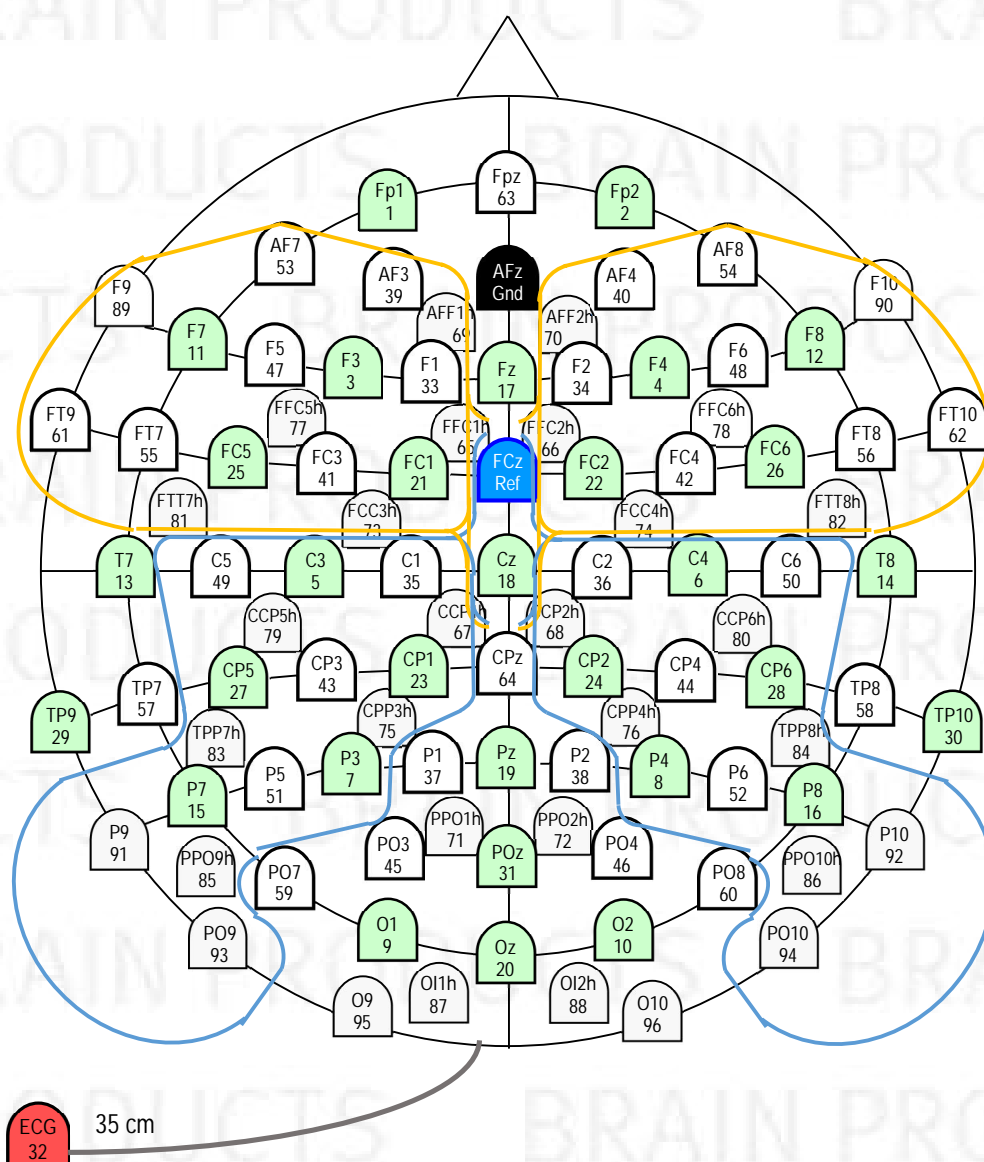




96Ch Standard BrainCap-MR for 3T

With four carbon wire loops as indicated (Rev001)

Electrode Layout and Channel Assignment



Electrode Nomenclature according to:
Oostenveld, R. & Praamstra, P. The five percent electrode
system for high-resolution EEG and ERP measurements.
Clinical Neurophysiology 2001; 112: 713-719

Details

For ordering please give Article Number, Cap Cut, Exit Point, and Size
(e.g. *BC-MR3-96, C-Cut, Exit FFCz, 56, with CWL*):

- Article Number: *BC-MR3-96 with CWL*
- Cap Cut: *C-Cut or A-Cut*
- Exit Point: *Cable Tree Exiting at FFCz or Cable Tree Exiting at CPz*
- Size (head circumference, given in cm):
 - Adult caps: *54, 56, 58, 60, 62, 64* (average male: 58, average female: 56)
 - Children caps: *52 (5-10 years), 54 (11-14 years)*

The catalogue-number comprises the cap as described. For further information about accessories or consumables, please visit our website or contact our local distributor.

Cap

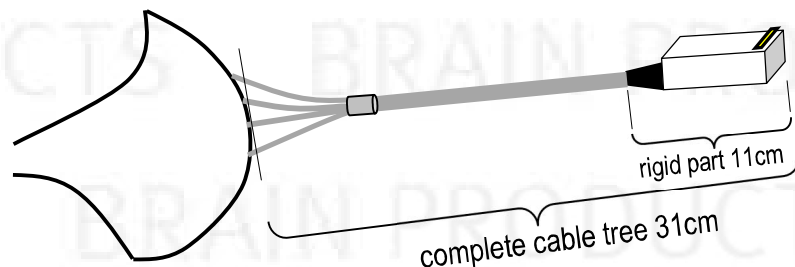
Standard: SubUnion Cap with integrated chin belt, white

Sizes 52 – 64 made from High Precision Fabric

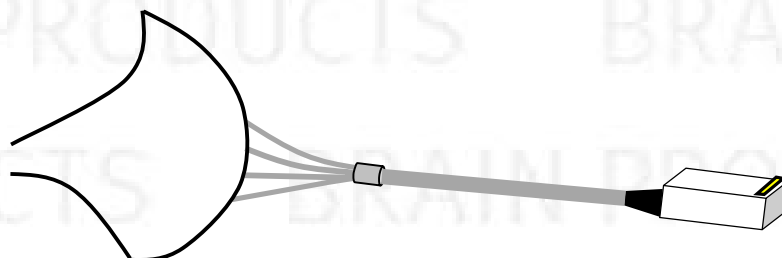
Options: *C-Cut or A-Cut, Size. For further variations, contact us.*

Exit Point of Cable Tree

In MR caps, depending on the headcoil being used, the optimal exit point of the cable tree can be either
fronto-central around FFCz



or centro-parietal around CPz.



Please choose one of these options when ordering, depending on the headcoil being used.

Options: *Exit FFCz, Exit CPz*

Electrodes

All electrodes are Multitrodes for MR with sintered Ag/AgCl sensors. They are buttoned directly into the cap (total height less than 3,5 mm) or can be attached to the skin with washers (double-sided adhesive rings). In the parieto-occipital area, empty electrode housings (double border lines in the layout) provide more comfort.

All electrodes come with current-limiting resistors on both ends; sensor and connector. Drop-down electrodes are made from resistive carbon leadwire. This results in the following overall resistor values for each electrode:

- Ch1-31,33-96 10 kOhm
- Ch32 (ECG) 20 kOhm
- REF, GND 15 kOhm

The electrode housing colours are according to the above figure. All cables are white, except Ch32 (red sensor and carbon leadwire), Ref (blue cable), and Gnd (black cable). All electrodes are name-labelled (Fp1, Fp2, ...) near sensor.

The ECG electrode cable part outside the cap is covered wherever possible in silicone - or if more suitable in a spiral tube - to avoid direct contact with the skin.

All cables are led on the outside of the cap directly to the exit point of the cable tree. Cables are fixed with double-T-nylon threads. The cables leave radially from the area around FFCz or CPz in small branches, leading straight to a uniting point after approx. 5 cm. After the uniting point, one cable tree continues to each BrainCap-connector-box. The overall length of the cable trees is approx. 31 cm.

Termination

Each cable tree leads to a Connector box. From here the caps are connected to BrainAmp-MR with 10 cm round ribbon-cables. 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

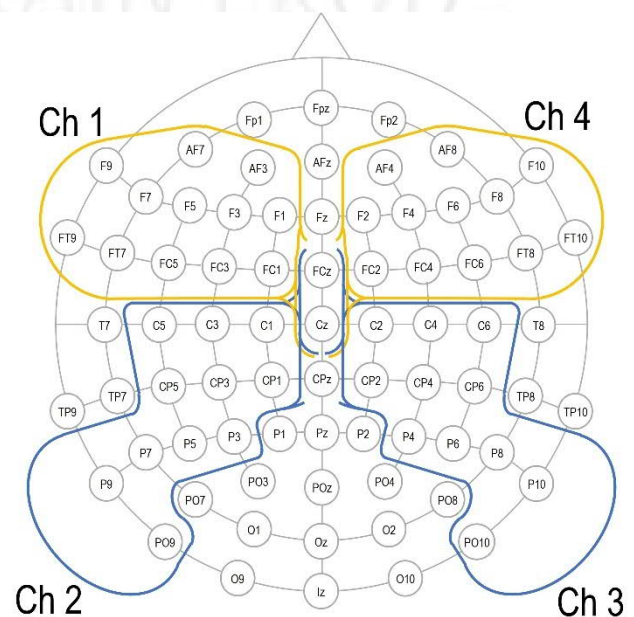
The BrainCap MR is equipped with carbon wire loops (CWL) for better artefact correction.

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 Ω 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.



Theta / Phi Coordinates for BC-MR-96

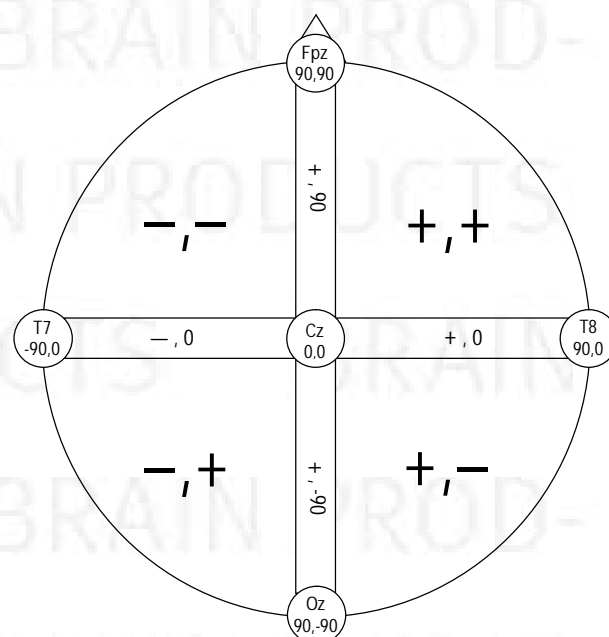
Channel-Number	Name	Theta	Phi
1	Fp1	-90	-72
2	Fp2	90	72
3	F3	-60	-51
4	F4	60	51
5	C3	-45	0
6	C4	45	0
7	P3	-60	51
8	P4	60	-51
9	O1	-90	72
10	O2	90	-72
11	F7	-90	-36
12	F8	90	36
13	T7	-90	0
14	T8	90	0
15	P7	-90	36
16	P8	90	-36
17	Fz	45	90
18	Cz	0	0
19	Pz	45	-90
20	Oz	90	-90
21	FC1	-31	-46
22	FC2	31	46
23	CP1	-31	46
24	CP2	31	-46
25	FC5	-69	-21
26	FC6	69	21
27	CP5	-69	21
28	CP6	69	-21
29	TP9	-113	18
30	TP10	113	-18
31	POz	67	-90
32	ECG	-	-

Channel-Number	Name	Theta	Phi
33	F1	-49	-68
34	F2	49	68
35	C1	-23	0
36	C2	23	0
37	P1	-49	68
38	P2	49	-68
39	AF3	-74	-68
40	AF4	74	68
41	FC3	-49	-29
42	FC4	49	29
43	CP3	-49	29
44	CP4	49	-29
45	PO3	-74	68
46	PO4	74	-68
47	F5	-74	-41
48	F6	74	41
49	C5	-68	0
50	C6	68	0
51	P5	-74	41
52	P6	74	-41
53	AF7	-90	-54
54	AF8	90	54
55	FT7	-90	-18
56	FT8	90	18
57	TP7	-90	18
58	TP8	90	-18
59	PO7	-90	54
60	PO8	90	-54
61	FT9	-113	-18
62	FT10	113	18
63	Fpz	90	90
64	CPz	22	-90

Channel- Number	Name	Theta	Phi
65	FFC1h	-35	-73
66	FFC2h	35	73
67	CCP1h	-16	45
68	CCP2h	16	-45
69	AFF1h	-57	-82
70	AFF2h	57	82
71	PPO1h	-57	82
72	PPO2h	57	-82
73	FCC3h	-35	-19
74	FCC4h	35	19
75	CPP3h	-46	48
76	CPP4h	46	-48
77	FFC5h	-62	-35
78	FFC6h	62	35
79	CCP5h	-57	12
80	CCP6h	57	-12
81	FTT7h	-79	-10
82	FTT8h	79	10
83	TPP7h	-81	29
84	TPP8h	81	-29
85	PPO9h	-101	45
86	PPO10h	101	-45
87	OI1h	-101	81
88	OI2h	101	-81
89	F9	-113	-36
90	F10	113	36
91	P9	-113	36
92	P10	113	-36
93	PO9	-113	54
94	PO10	113	-54
95	O9	-112	72
96	O10	112	-72

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

The signs follow this convention:



Summary of Safety Rules for BrainCap-MR3

Together, the BrainCap 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 it can be downloaded from the Brain Products website.

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 BrainCap MR is designed and approved for field strengths up to 3T.

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

All other conditions specified in the BrainAmp MR user manual 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 BrainCap MR 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 BrainCap MR 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 electrode gel and filling all electrodes with gel. Never perform phantom measurements with the BrainCap MR connected to the amplifier with unterminated electrodes.

Repair:

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