

**Additional File 2: Table S2. Design iteration summary.** Table summarizes features of each design iteration of the housing and frontend (including the headcap, patches, and wires) and assesses water intrusion and signal quality for each (Good vs. Scorable vs. Unscorable ECG – subjective judgment of accuracy level for automated peak detection [always accurate, not always accurate, apnea vs. eupnea not readily distinguishable]; Good vs. Scorable vs. Unscorable EEG – subjective judgment of ability to visually and quantitatively distinguish between SWS and REM [both distinguishable, visual but not quantitative, not readily distinguishable]).

		<i>Features</i>	<i>Design Iteration</i>		
			<i>V1</i>	<i>V2</i>	<i>V3</i>
<b>Logger Housing</b>		<b>Material</b>	High-density polycarbonate	6061-T6 Aluminum	7075-T6 Aluminum
		<b>Pressure test</b>	>10 msw (failed test at 1310 msw [1900 psi])	>2000 msw (passed test to 2068 msw [3000 psi])	>2000 msw (passed test to 2068 psi [3000 psi])
		<b>Solution for light and Bluetooth transmission</b>	Transparent housing	High-density polycarbonate window	High-density polycarbonate window
		<b>Pressure sensor retaining strategy</b>	Stainless steel retaining plate	Stainless steel retaining plate	Stainless steel retaining snap ring
<b>Frontend (Headcap, patches, and wires)</b>	<b>Headcap &amp; patches</b>	<b>Material - bottom layer</b>	Neoprene foam	Neoprene foam	Neoprene foam
		<b>Electrode brand (inside headcap)</b>	Genuine Grass reusable goldcup	Genuine Grass reusable goldcup	Genuine Grass reusable goldcup
		<b>Electrode insulation (inside headcap)</b>	“Light-weight” Teflon®	“Light-weight” Teflon®	“No-tangle” Silicone
		<b>Wire configuration maintenance</b>	Hot glue	None	Permatex® Silicone RTV Sealant
		<b>Material - top layer</b>	Neoprene foam	Neoprene rubber (40A durometer)	Neoprene rubber (40A durometer)
	<b>Wire exit from patch</b>	<b>Wire exit strategy</b>	Wires exit side of patch through abraded marine-grade heat shrink	Wires exit top of patch through 3D mold	Wires exit top of patch through 3D mold
		<b>Chemical bond at wire exit</b>	No	No	Yes
		<b>3D mold potting material</b>	No 3D molds used	Polyurethane resin	Polyurethane resin
		<b>Electrode brand (outside headcap)</b>	Genuine Grass reusable goldcup	Genuine Grass reusable goldcup	Technomed goldcup
		<b>Electrode insulation (outside headcap)</b>	“Light-weight” Teflon®	“Light-weight” Teflon®	Thermoplastic polyurethane
	<b>Wires</b>	<b>Wire shielding</b>	Copper braided	None	Ultra-lightweight Stainless steel
		<b>Wire fortification - EEG</b>	4-ft standard heat shrink (1/4”)	Liquid electrical tape or nylon braided sheathing	4-ft standard heat shrink (3/4”), liquid electrical tape
		<b>Wire fortification - ECG</b>	4-ft standard heat shrink (1/4”)	Liquid electrical tape	4-ft standard heat shrink (1/4”), liquid electrical tape
	<b>Design assessment</b>	<b>Headcap Water intrusion</b>	Most (N=1)	Minimal (N=4); None (N=1)	Minimal (N=4); None (N=1)
<b>Land EEG Signal Quality</b>		Good (N=1)	Good (N=5)	Good (N=5)	
<b>Pre-ICA In-Water EEG Signal Quality</b>		Unscorable (N=1)	Unscorable (N=4); Good (N=1)	Good (N=5)	
<b>Post-ICA In-Water EEG Signal Quality</b>		Good (N=1)	Scorable (N=4); Good (N=1)	Good (N=5)	
<b>ECG Signal Quality</b>		Good (N=1)	Scorable (N=5)	Good (N=5)	
<b>Overall assessment</b>		<b>Good</b>	<b>Scorable</b>	<b>Best</b>	