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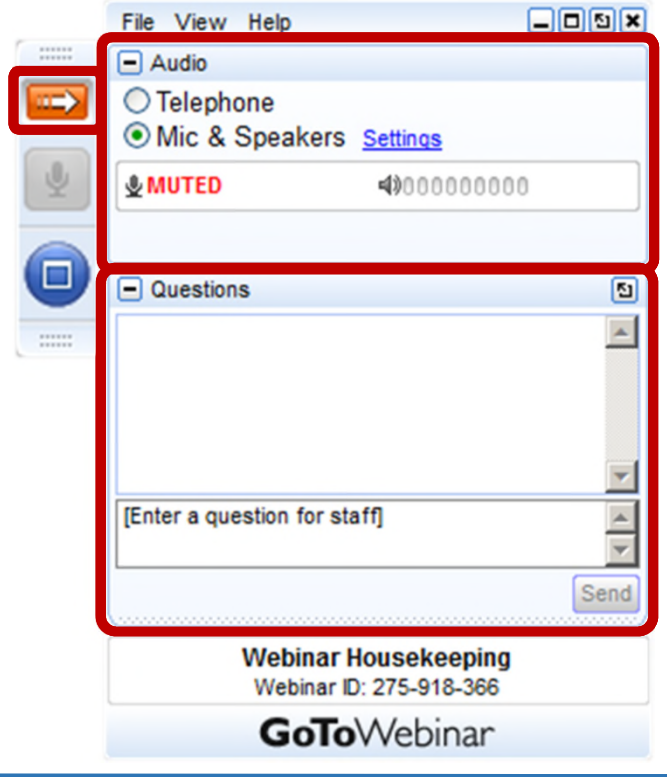
Inspiring people and enabling discovery about life

Housekeeping

- Attendees are on Mute
- Headset is Recommended!
- Questions addressed at end of Webinar and in a Q&A follow-up document



Your Participation

Open and hide your control panel

Join audio:

- Choose "Mic & Speakers" to use VoIP
- Choose "Telephone" and dial using the information provided

Submit questions and comments via the Questions panel

Note: Today's presentation is being recorded and will be provided when available.

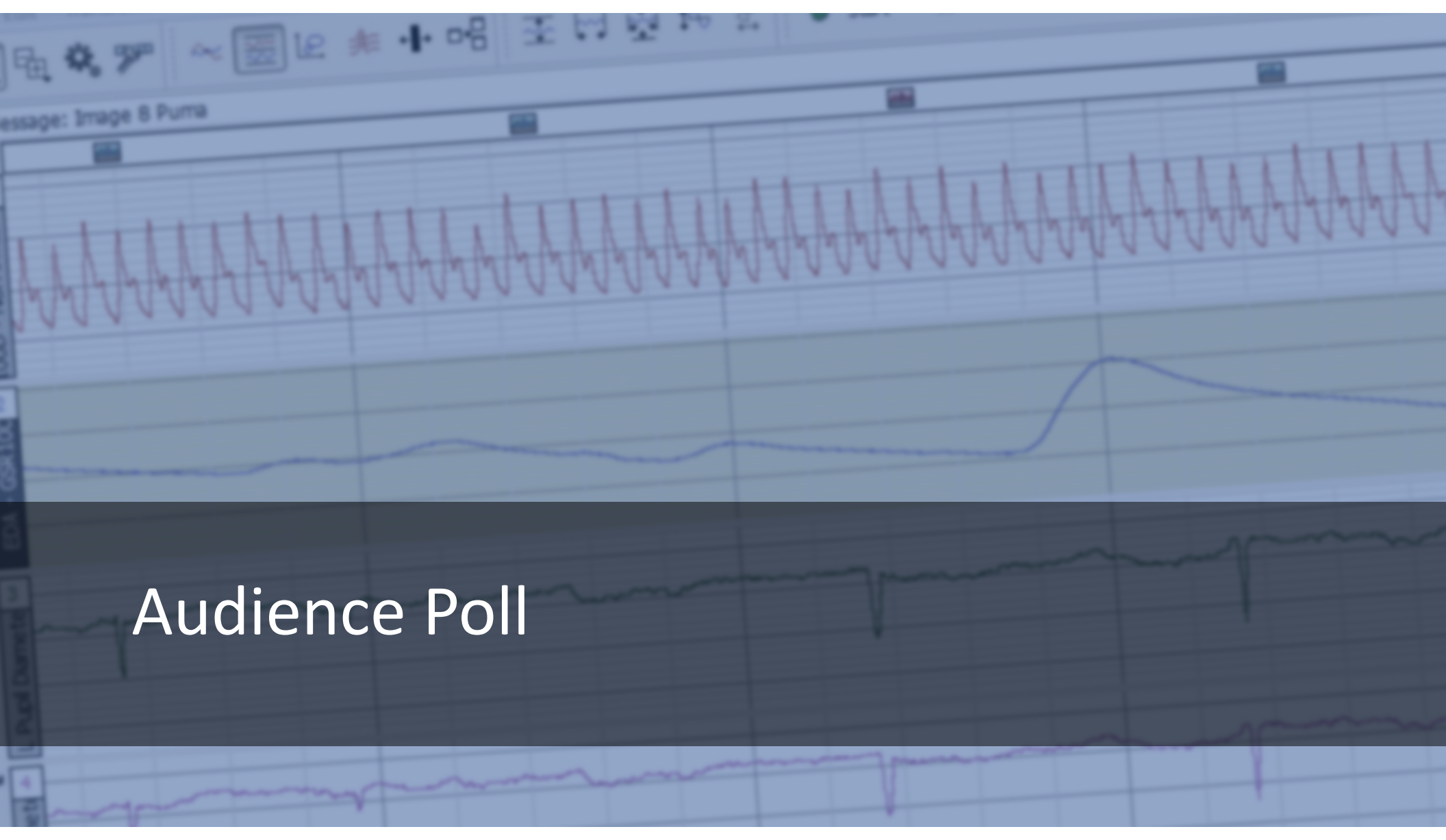
BIOPAC Guide to EEG II

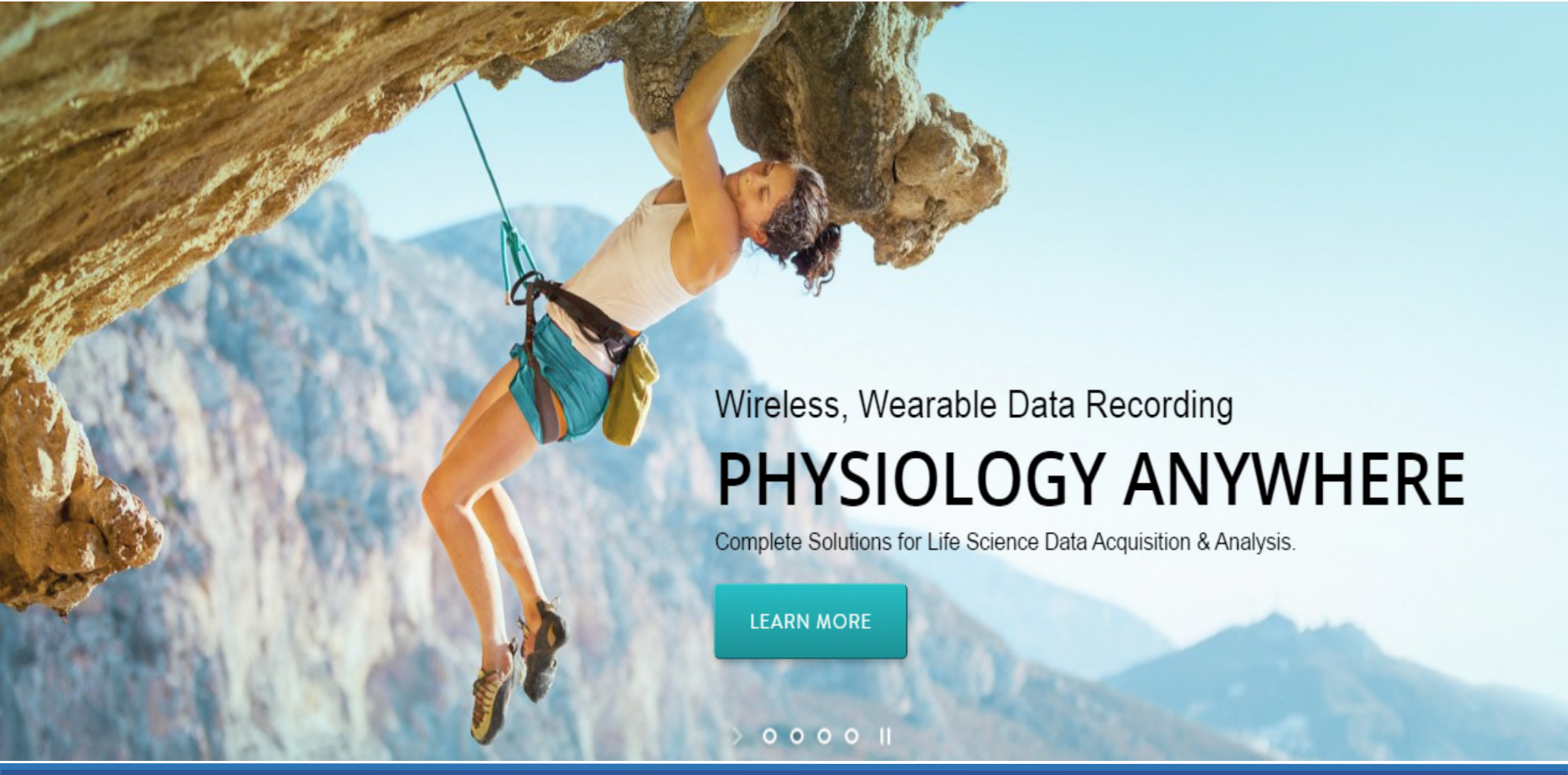
Frazer Findlay
CEO, BIOPAC Systems, Inc.

Chris Berka
CEO, Advanced Brain Monitoring

BIOPAC® Systems, Inc.

Advanced Brain Monitoring

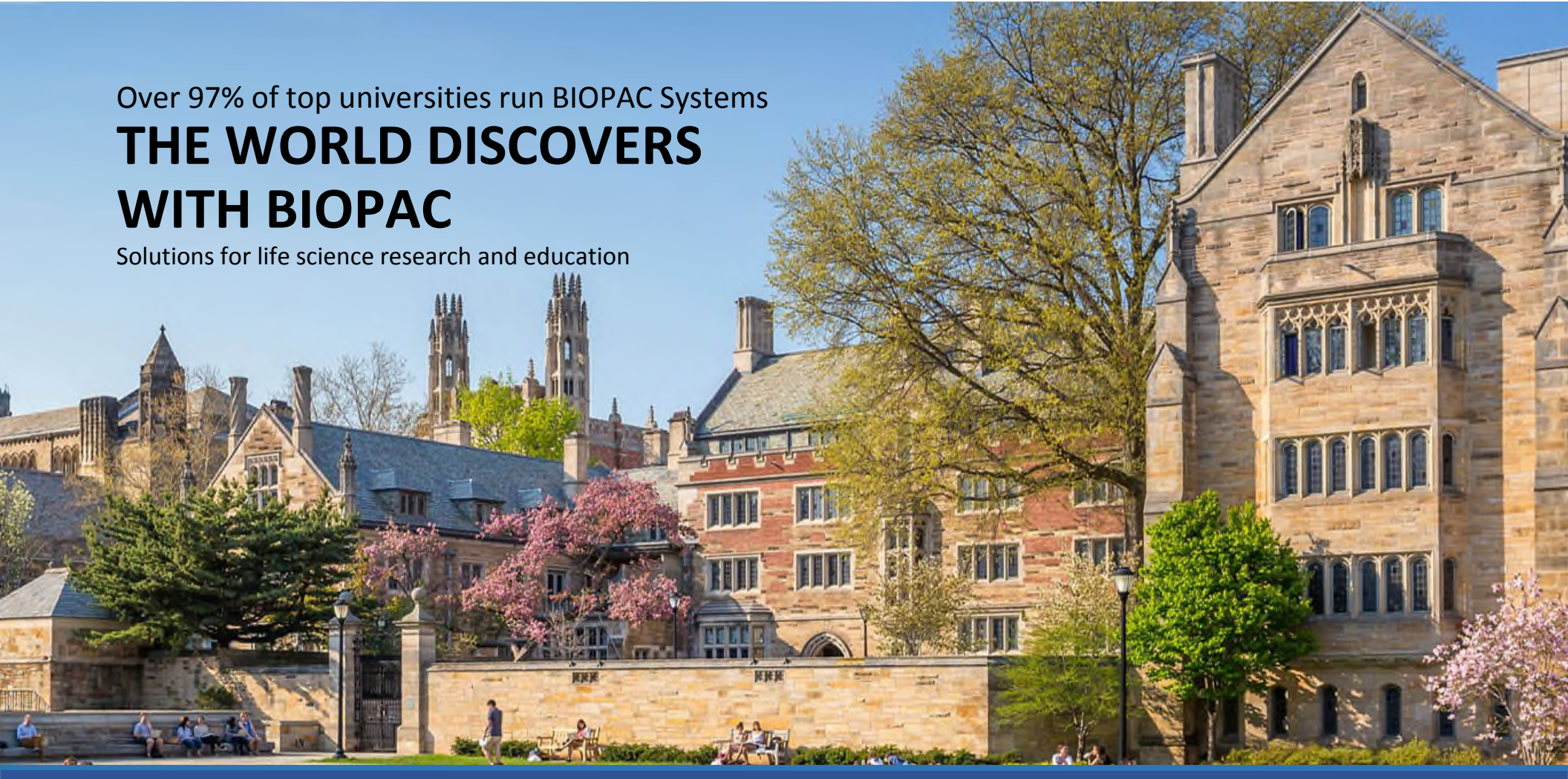

Audience Poll



Over 97% of top universities run BIOPAC Systems

THE WORLD DISCOVERS WITH BIOPAC

Solutions for life science research and education



THE WORLD DISCOVERS WITH BIOPAC

BIOPAC systems are cited over 27,000

THE WORLD DISCOVERS WITH BIOPAC

BIOPAC Systems cited ~4,000 times for EEG

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INTRODUCTION

Wireless EEG with B-ALERT

Subject Setup

Recording wireless EEG

Recording wireless EEG with other signals

Cognitive States Metrics - background

Recording Cognitive States Metrics and Analysis

Summary

Q&A

Tools
Trends
Techniques
Technology

…Ask about the T4 conference

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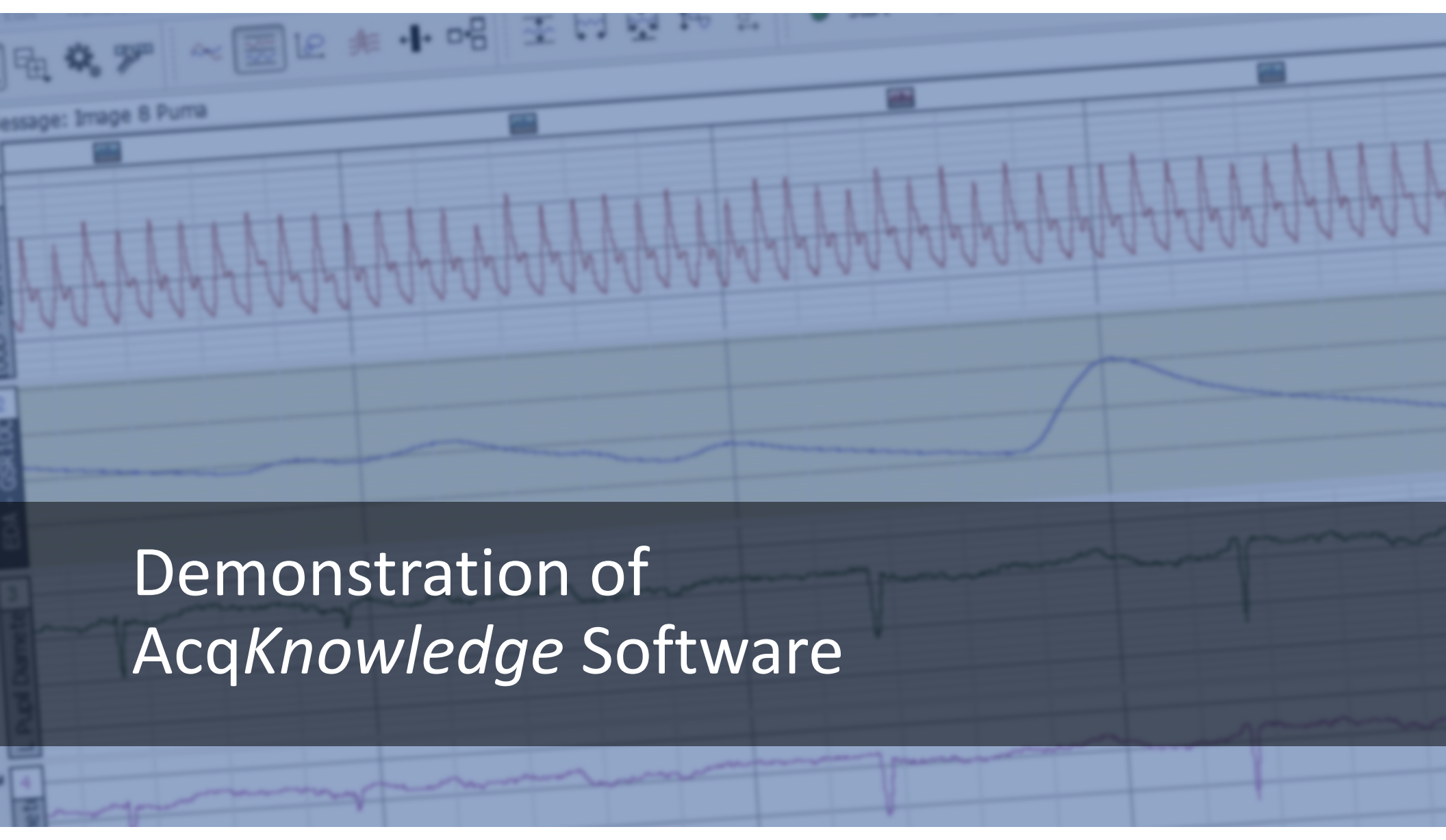


Demonstration of Acq*Knowledge* Software

Combining EEG with other Physiological Signals

MP160 System

16-Channels of
Tethered or
Wireless Signals

B-Alert System

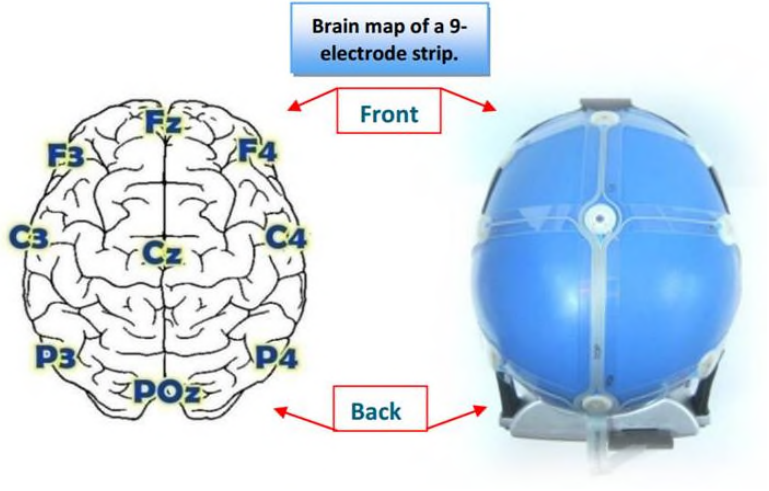
9-Channels of EEG
and Cognitive
States Metrics

B-Alert Wireless EEG System

B-ALERT X10

- Nine channel EEG
- Wireless - Bluetooth
- Combine with MP160 for additional channels of data
- Uses linked mastoids for reference signal
- Built-in accelerometer

B-Alert Wireless EEG System

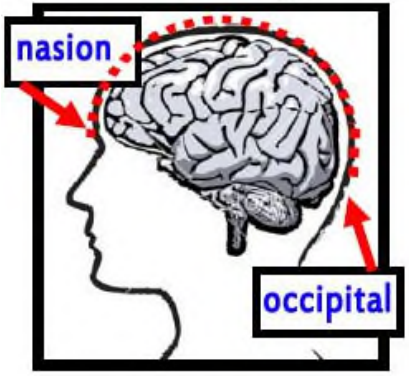


B-ALERT X10

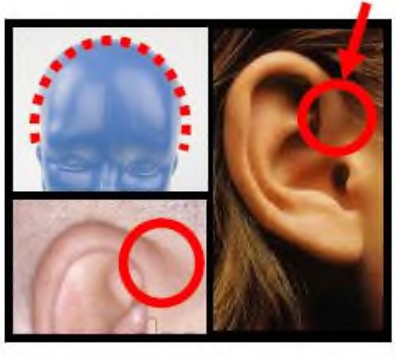
- Locations F3, FZ, F4, C3, CZ, C4, P3, POz, P4
- Leads for ECG
- Synchronize with MP160 using CBLX10 Cable

Correct Fit

Nasion to Occipital



Crus of Helix



B-Alert Sensor Strip Sizing Chart

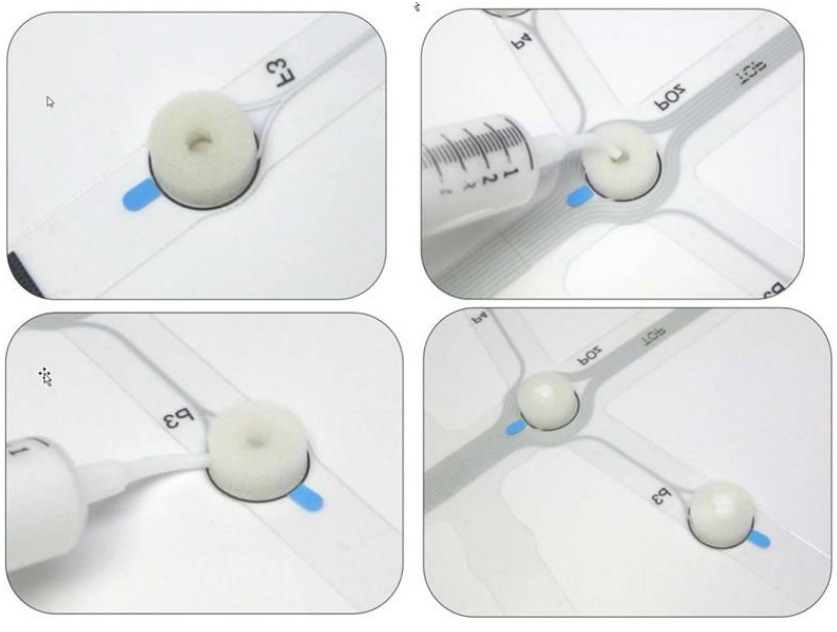
S = Small M = Medium

Nasion to Occipital	Crest of Helix to Crest of Helix																			
	24.5		25.5	26	26.5	27	27.5	28	28.5	29	29.5	30	30.5		31.5	32	32.5	33	33.5	34
30.5	XS	XS	XS	XS	XS	XS	XS	XS	XS	XS	XS	-	-	-	-	-	-	-	-	-
31	XS	XS	XS	XS	XS	XS	XS	XS	XS	XS	XS	-	-	-	-	-	-	-	-	-
31.5	XS	XS	XS	XS	XS	XS	XS	XS	XS	S	S	S	S	S	S	S	S	-	-	-
32	XS	XS	XS	XS	XS	XS	XS	XS	XS	S	S	S	S	S	S	S	S	-	-	-
32.5	XS	XS	XS	XS	XS	XS	S	S	S	S	S	S	S	S	S	S	S	M	M	M
33	XS	XS	XS	XS	XS	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M
33.5	XS	XS	XS	XS	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M
34	XS	XS	XS	S	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M
34.5	XS	XS	XS	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M
35	XS	XS	XS	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M
35.5	XS	XS	XS	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M
36	XS	XS	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	M
36.5	-	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	M
37	-	-	-	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	M
37.5	-	-	-	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	M

XS = extra small strip available on request

- = head dimensions outside the suitable range for ABM strips

B-Alert Setup



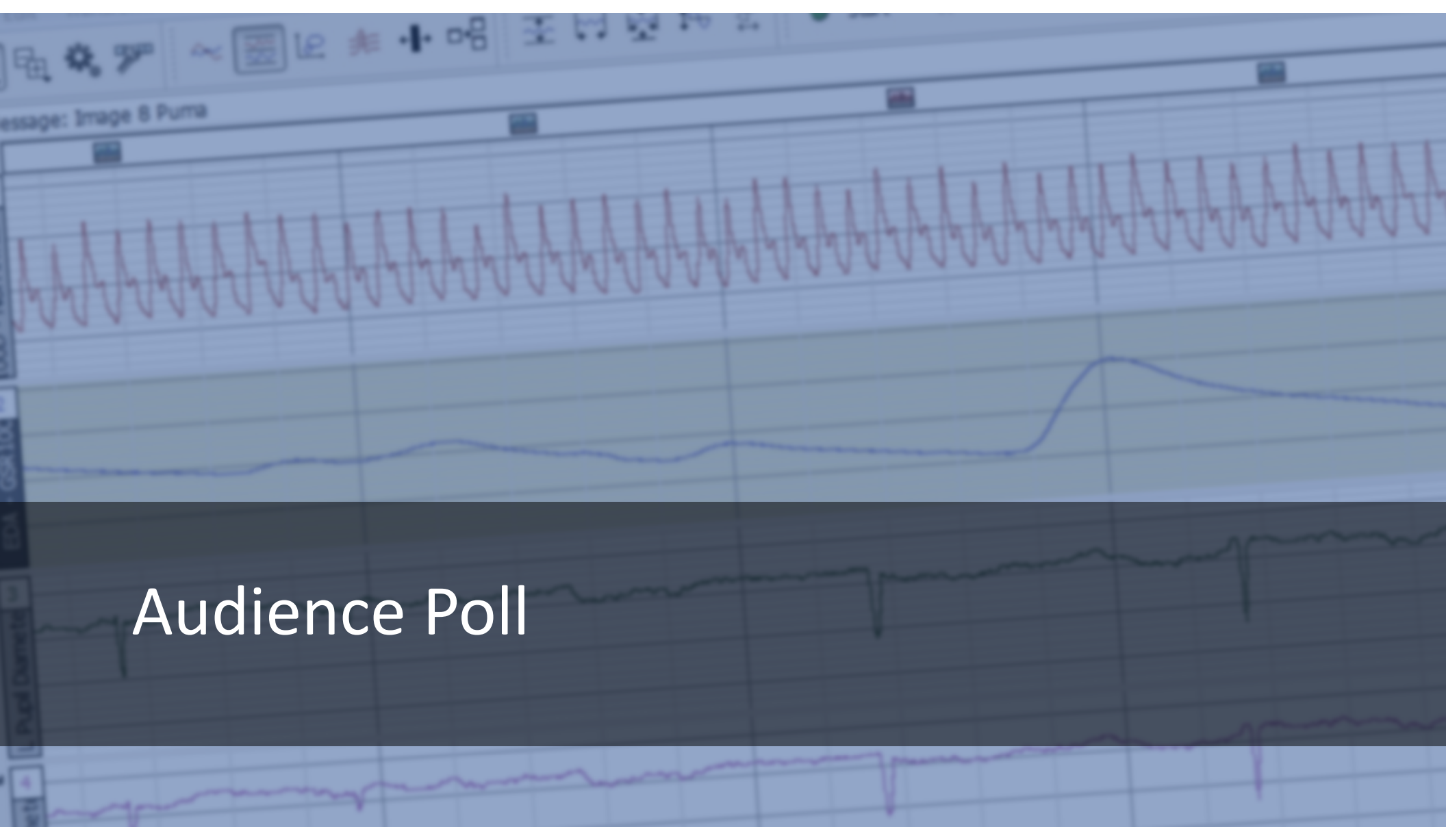
B-ALERT X10

- Electrode array
- Adhesive foam pads
- Fill cavity with gel
- Apply array to the subject

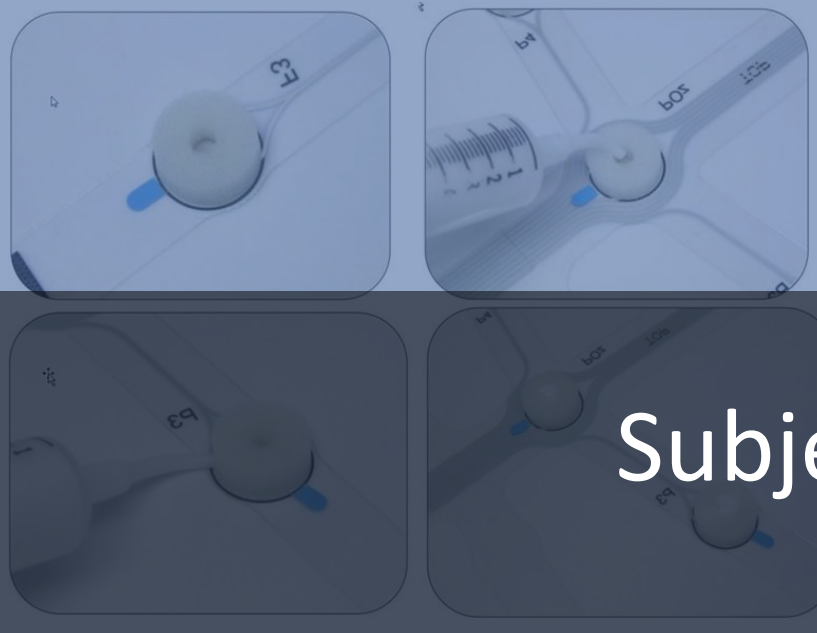
Fuzzy side of neoprene

Triangle Strip Connector

Mastoid Leads


Audience Poll

B-Alert Setup



B-ALERT X10

- Electrode array
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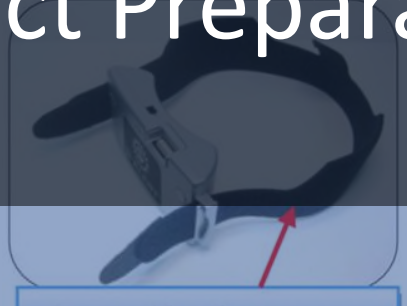
Subject Preparation

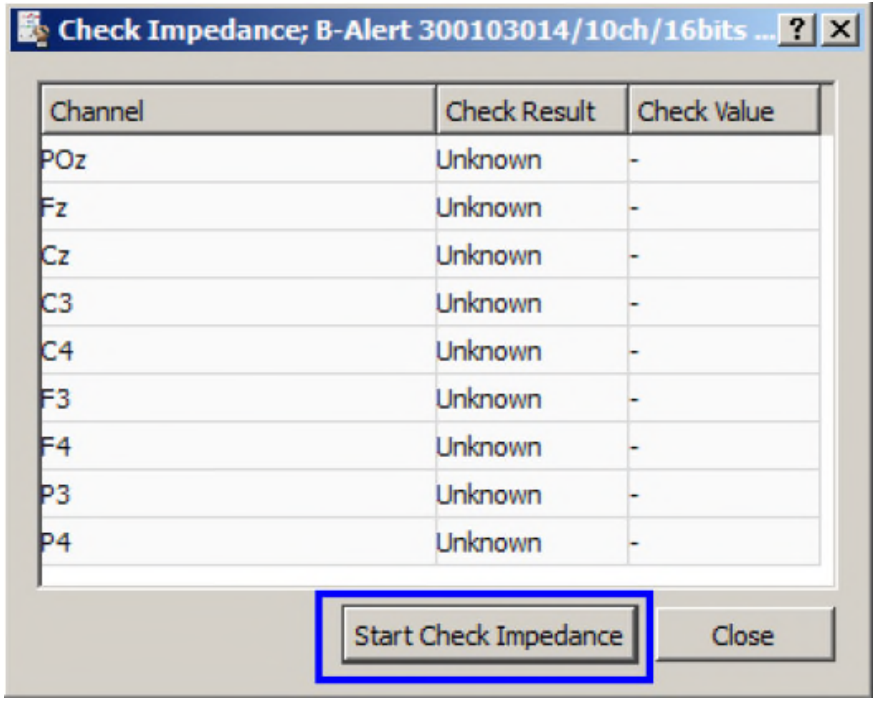


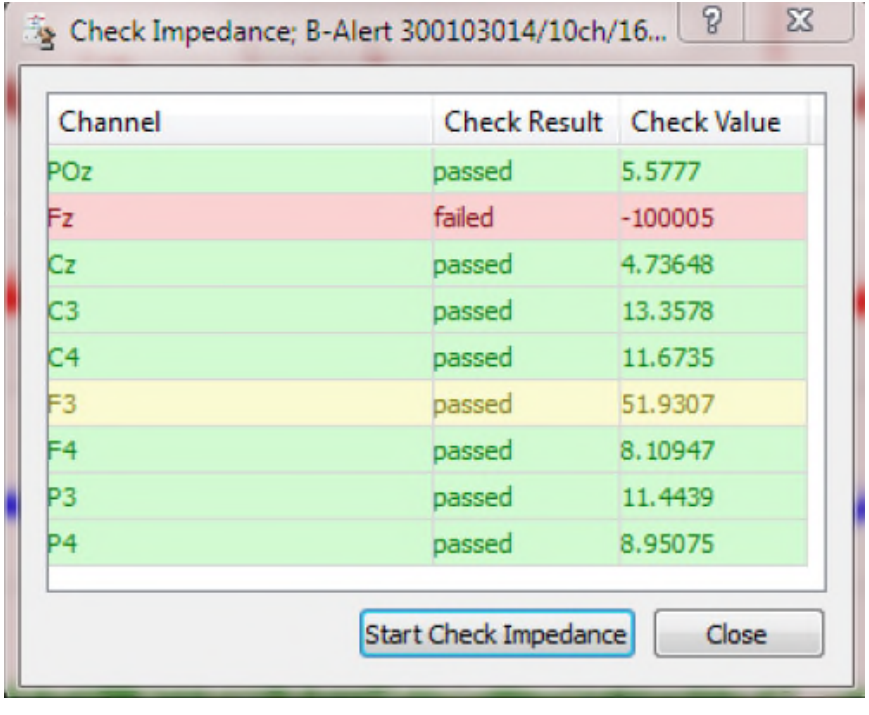
Fuzzy side of neoprene

Triangle Strip Connector

Mastoid Leads

Impedance Check





Demonstration of Acq*Knowledge* Software with B-Alert

Combining EEG with other Physiological Signals

MP160 System

16-Channels of Tethered or Wireless Signals

CBLX10

Isolated Synchronization Cable

B-Alert System

9-Channels of EEG and Cognitive States Metrics

Tools Trends Techniques Technology

…Ask about the T4 conference

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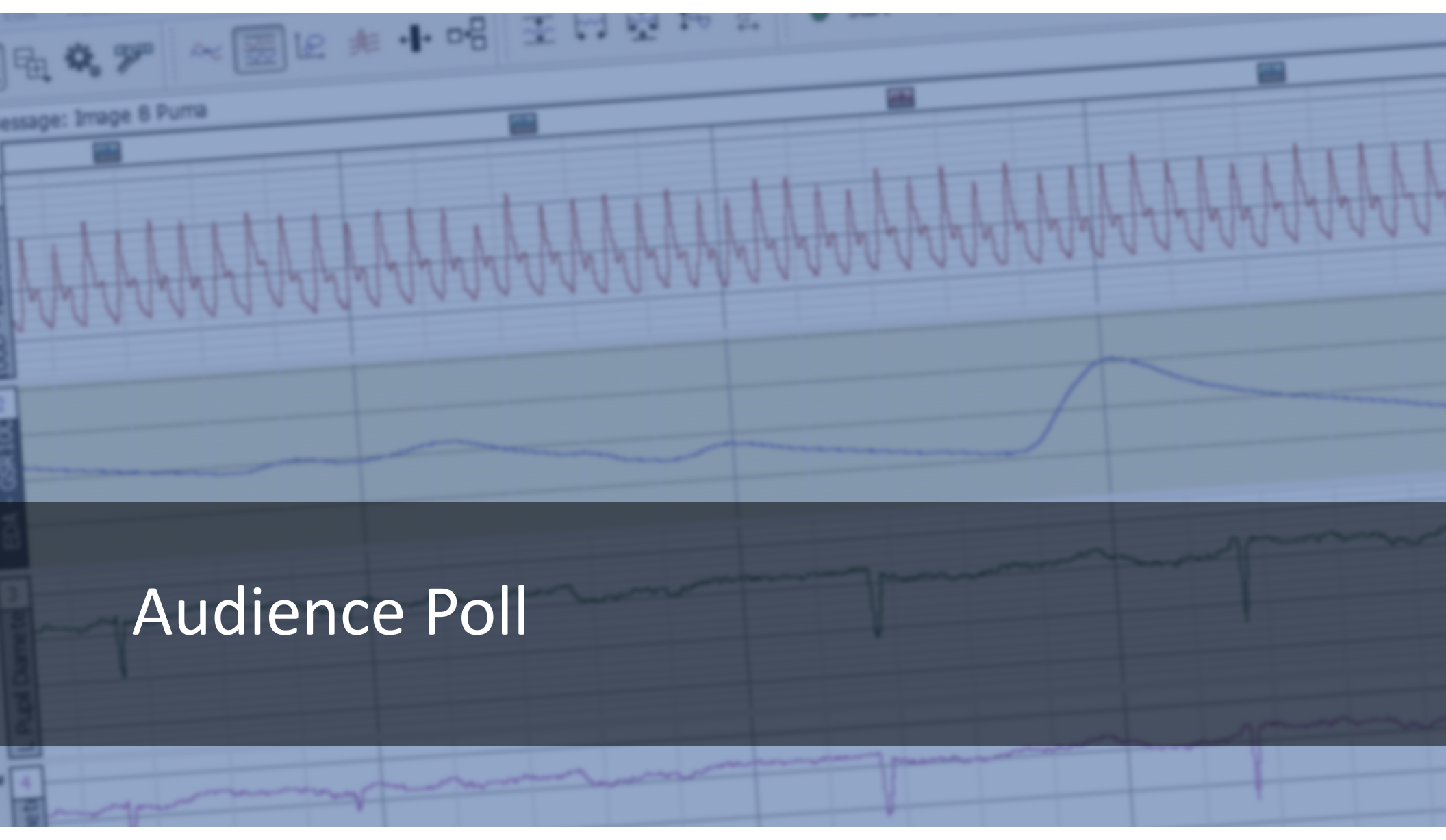
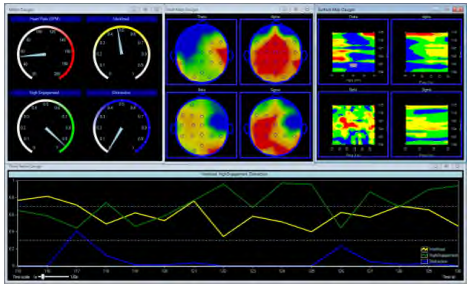
Demonstration of Acq*Knowledge* Software with B-Alert


Audience Poll



The B-Alert Cognitive State Metrics[1]

Four (4) EEG-based classifications that span a continuum from highly engaged and processing sensory inputs, to fatigued and inattentive.

Tuned-Out ⟷ *Attentive*

Drowsiness & Fatigue Onset

Characterized by:

Delayed or missed responses to stimuli

EEG signs of fatigue include delta frequency bands and theta bursts

Sporadic sleep spindles

Distraction

Characterized by:

Disengagement from sensory processing

Disengagement usually resulting from boredom or fatigue-related inabilities

Low Engagement

Characterized by:

Decreased sensory scanning

Decreased sensory processing

Typically elicited during monotonous tasks

High Engagement

Characterized by:

Processing visual stimuli

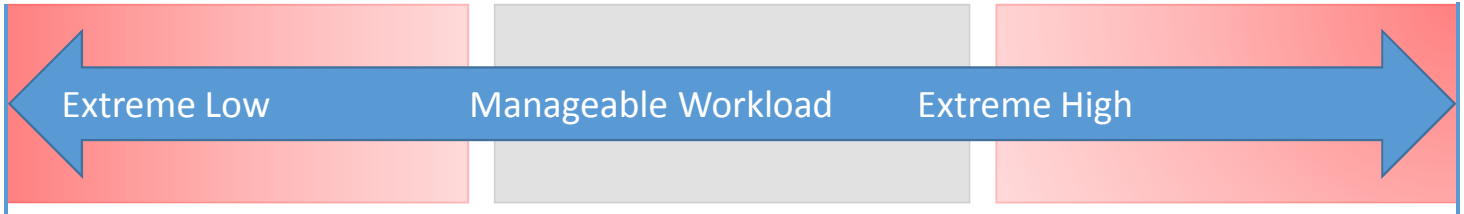
Using comprehensive motor skills and executive resources

A prerequisite for influencing behavior

[1] *Johnson, R. R., D. P. Popovic, et al. (2011). Drowsiness/alertness algorithm development and validation using synchronized EEG and cognitive performance to individualize a generalized model. Biol Psychol 87(2): 241-250 .*

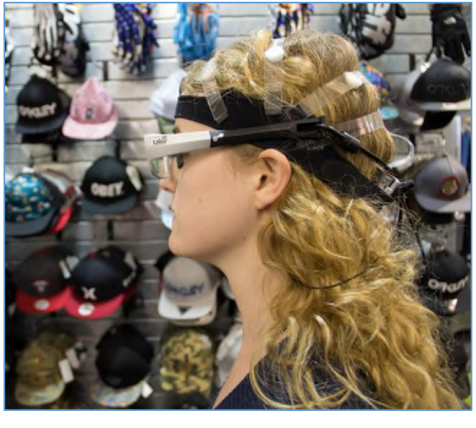
The Cognitive Workload Metric[2]

In training environments, the most effective programs
sustain optimal workload for learning, and avoid extreme measures.



Typically indicative of boredom

Source of errors made during low workload can be partly attributed to inattentiveness

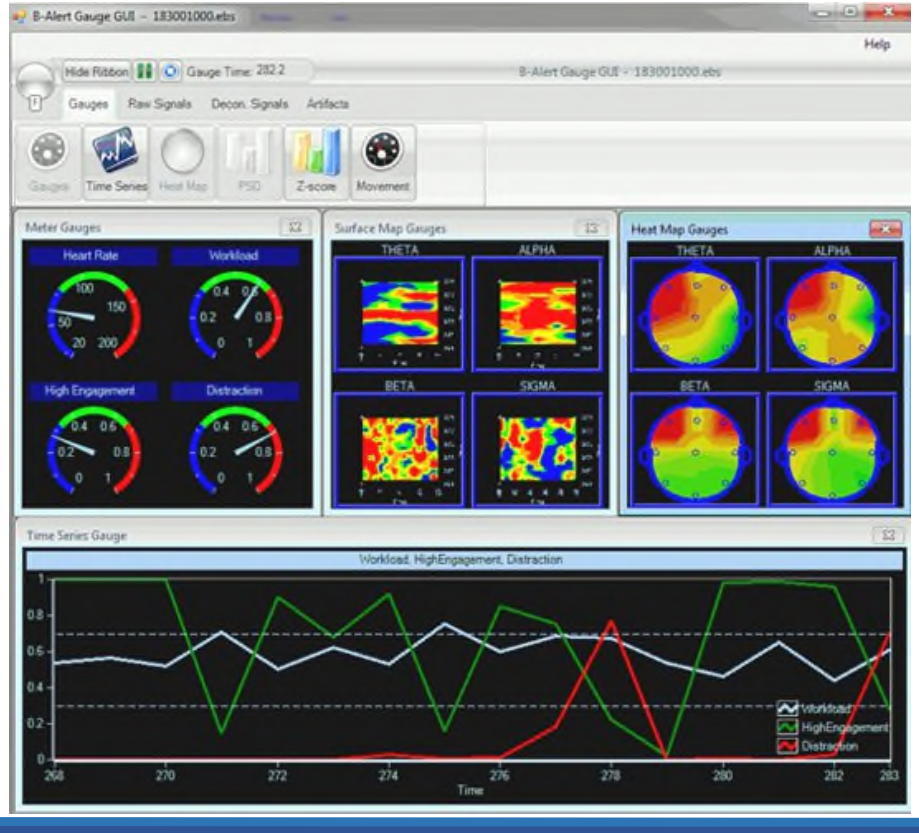


Indicates confusion or struggle to process information as presented

Excessively high workload is unsustainable, and often leads to frustration and/or "giving up."

[2] *Berka C, Levendowski DJ, Lumicao MN, Yau A, Davis G, et al (2007). EEG correlates of task engagement and mental workload in vigilance, learning, and memory tasks. Aviat. Space Environ. Med. 78, B231–B244. May 2007.*

B-Alert Cognitive States Metrics



B-ALERT X10

Metrics

- Fatigue
- Stress
- Confusion
- Engagement
- Workload

Regions

- Executive functions (prefrontal cortex)
- Motor control (motor-strip)
- Visual system activity (parietal region)

Demonstration of Acq*Knowledge* Software with B-Alert

Stimulus Presentation with Triggers for Synchronization

SuperLab® - E-Prime® Presentation®

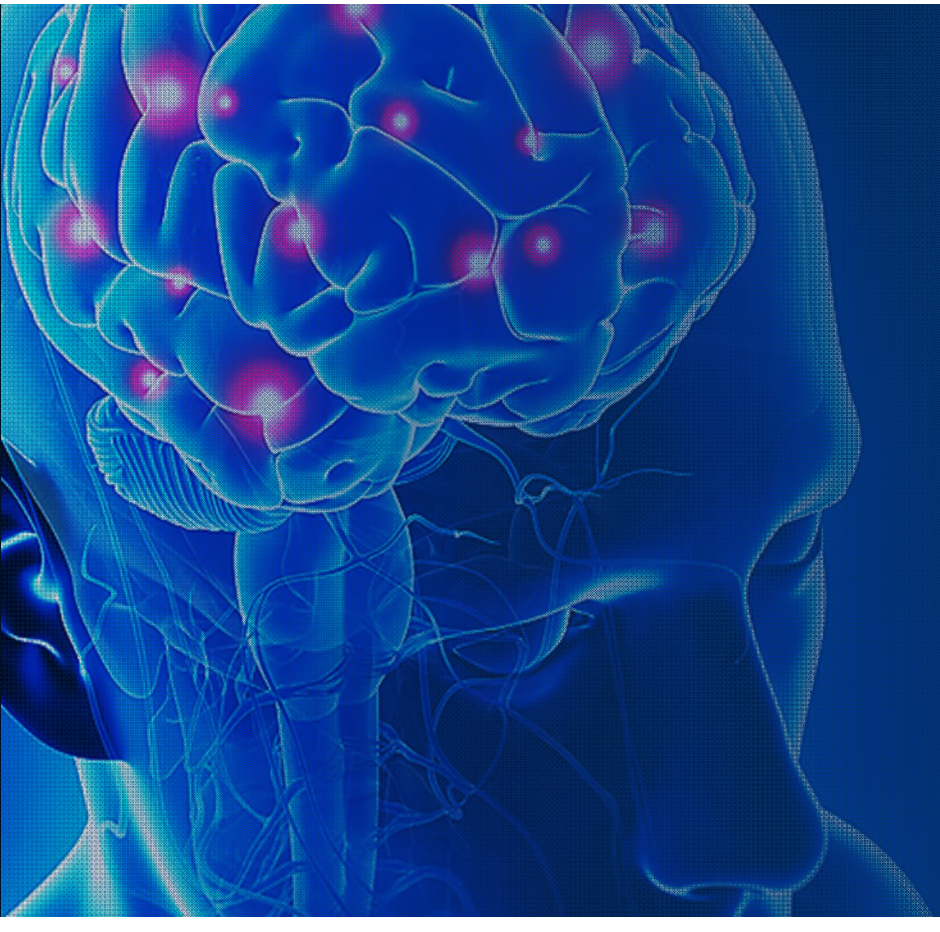
Virtual Reality

BIOPAC VR Solutions offer real-time feedback loops and event marking

Stimulus Presentation Options

STP100C

ESU



SUMMARY

9 Channel wireless EEG

Sizing the subject for the correct array

Linked Mastoids for reference

Cognitive States Metrics

Subject specific Definitions file

Synchronization with other signals

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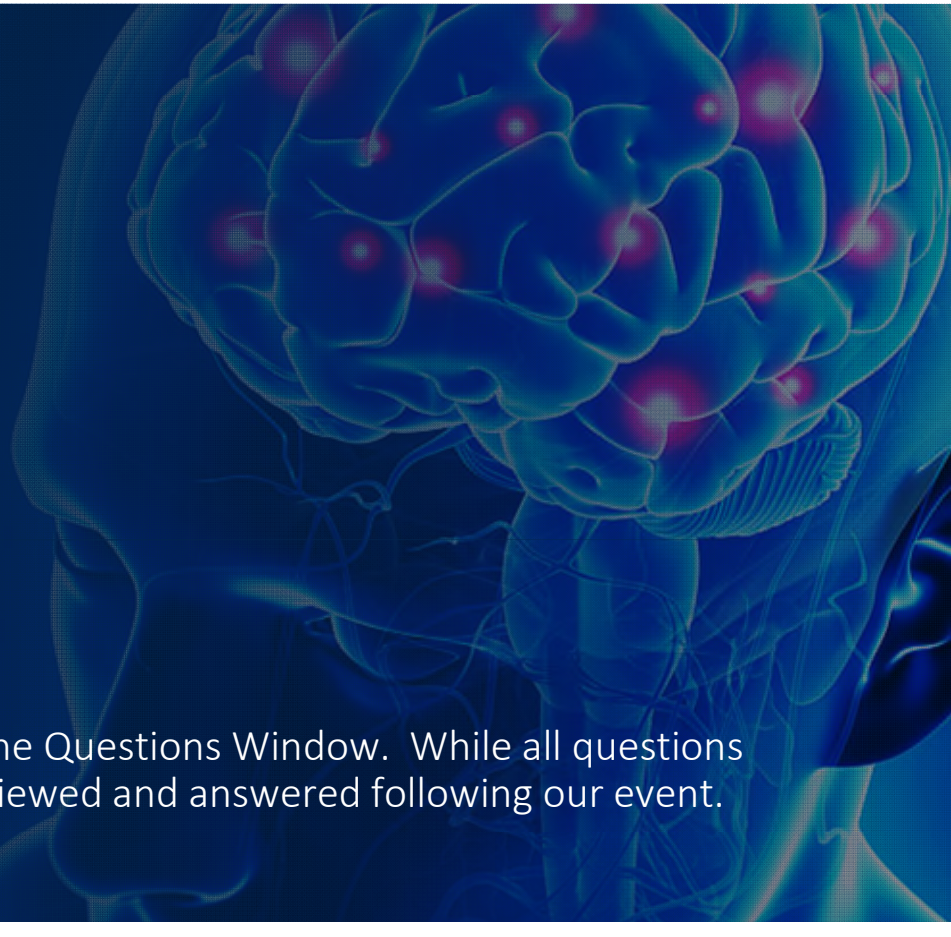
Q&A Session:



Please submit questions for our guest speakers through the Questions Window. While all questions cannot be answered during our live session, all will be reviewed and answered following our event.

Tools
Trends
Techniques
Technology

…Ask about the T4 conference

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BIOPAC Physiology T4 Conference

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- Meet us in Santa Barbara!
- July 24-26, 2017
- University of California at Santa Barbara, USA
- Over 50 Human Physiology workshops!
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