510(k) SUMMARY[1]

Submitter:	BrainScope® Company, Inc. 4350 East West Highway Suite #1050 Bethesda, MD 20814 Phone: (240) 752-7680 Fax: (240) 752-7679 www.brainscope.com
Contact:	Michael E. Singer, Ph.D. Chief Executive Officer BrainScope Company, Inc. Phone: (240) 752-7677 Fax: (240) 752-7679 Email: michael.singer@brainscope.com
Prepared By:	Sabyasachi Roy, Ph.D. Director Regulatory Affairs, Quality Assurance & Compliance
Device Proprietary Name:	BrainScope One
Device Common Name:	Brain Injury Adjunctive Interpretive Electroencephalograph Assessment Aid
Device Classification Name:	Brain Injury Adjunctive Interpretive Electroencephalograph Assessment Aid
Classification Regulation:	21 CFR § 882.1450
Panel:	Neurology
Product Codes:	PIW, PKQ, OLU
Predicate Device:	Ahead 300 (K161068)

[1] Prepared in accordance with 21 CFR § 807.87(h) and 21 CFR § 807.92(c).

Device Description:
BrainScope One is a portable, non-invasive, non-radiation emitting, point of care device intended to provide results and measures to support clinical assessments and aid in the diagnosis of traumatic brain injury (TBI). It also contains configurable, selectable cognitive performance tests and digitized standard assessment forms intended to provide a panel of measures to support the clinical assessment of head injury. BrainScope One provides healthcare professionals with a set of well-developed and researched concussion assessment tools.

Indications for Use:[2]

The BrainScope One's Indications for Use are as follows:

- BrainScope One is indicated for use as an adjunct to standard clinical practice to aid in the evaluation of patients who are being considered for a head CT, who sustained a closed head injury within 72 hours, present with a Glasgow Coma Scale score (GCS) of 13-15 (including concussion / mild Traumatic Brain Injury (mTBI)), and are between the ages of 18-85 years. BrainScope One should not be used as a substitute for a CT scan.
- The BrainScope One device is intended to record, measure, analyze, and display brain electrical activity utilizing the calculation of standard quantitative EEG (QEEG) parameters from frontal locations on a patient's forehead. The BrainScope One calculates and displays raw measures for the following standard QEEG measures: Absolute and Relative Power, Asymmetry, Coherence and Fractal Dimension. These raw measures are intended to be used for post hoc analysis of EEG signals for interpretation by a qualified user.
- A negative BrainScope One Structural Injury Classification using brain electrical activity in patients who sustained a closed head injury within 72 hours, likely corresponds to those with no structural brain injury visible on head CT.
- A positive BrainScope One Structural Injury Classification using brain electrical activity in patients who sustained a closed head injury within 72 hours, likely corresponds to those with a structural brain injury visible on head CT.
- An equivocal BrainScope One Structural Injury Classification using brain electrical activity in patients who sustained a closed head injury within 72 hours, may correspond to structural brain injury visible on head CT or may indicate the need for further observation or evaluation.
- BrainScope One provides a measure of brain function (EEG Brain Function Index,

[2] The differences between the BrainScop One and its predicate (Ahead 300) do not alter the intended use of the device nor do they affect the safety and effectiveness of the device relative to the predicates. The subject and predicate devices have the same overall intended use.

(BFI)) for the statistical evaluation of the human electroencephalogram (EEG).

- BrainScope One also provides clinicians with quantitative measures of cognitive performance to aid in the assessment of an individual's level of cognitive function. These measures do not interact with any other device measures, and are stand alone.
- BrainScope One also stores and displays electronic versions of standardized clinical assessment tools that should be used in accordance with the assessment tools' general instructions. These tools do not interact with any other device measures, and are stand alone.

Table 1: Indications for Use Comparison to Predicate devices

Proposed Device: BrainScope One (K# Not Yet Assigned)	Predicate: Ahead 300 (K161068)	Comments
BrainScope One is indicated for use as an adjunct to standard clinical practice to aid in the evaluation of patients who are being considered for a head CT, who sustained a closed head injury within 72 hours, present with a Glasgow Coma Scale score (GCS) of 13-15 (including concussion / mild Traumatic Brain Injury (mTBI)), and are between the ages of 18-85 years. BrainScope One should not be used as a substitute for a CT scan.	The Ahead 300 is indicated for use as an adjunct to standard clinical practice to aid in the evaluation of patients who are being considered for a head CT, who sustained a closed head injury within 72 hours, present with a Glasgow Coma Scale score (GCS) of 13-15, and are between the ages of 18-85 years. The BrainScope One should not be used as a substitute for a CT scan.	Equivalent. Additional clarification in BrainScope One IFU to accommodate use of "concussion", "mTBI" across academia, DoD, CDC and FDA.
The BrainScope One device is intended to record, measure, analyze, and display brain electrical activity utilizing the calculation of standard quantitative EEG (QEEG) parameters from frontal locations on a patient's forehead. The BrainScope One calculates and displays raw measures for the following standard QEEG measures: Absolute and Relative Power, Asymmetry, Coherence and Fractal Dimension. These raw measures are intended to be used for post hoc analysis of EEG signals for interpretation by a qualified user.	The Ahead 300 device is intended to record, measure, analyze, and display brain electrical activity utilizing the calculation of standard quantitative EEG (QEEG) parameters from frontal locations on a patient's forehead. The BrainScope One calculates and displays raw measures for the following standard QEEG measures: Absolute and Relative Power, Asymmetry, Coherence and Fractal Dimension. These raw measures are intended to be used for post hoc analysis of EEG signals for interpretation by a qualified user.	Same
A negative BrainScope One Structural Injury Classification using brain electrical activity in patients who sustained a closed head injury within 72 hours, likely corresponds to those with no structural brain injury visible on head CT.	A negative Ahead 300 Structural Injury Classification using brain electrical activity in patients who sustained a closed head injury within 72 hours, likely corresponds to those with no structural brain injury visible on head CT.	Same
A positive BrainScope One Structural Injury Classification using brain electrical activity in patients who sustained a closed	A positive Ahead 300 Structural Injury Classification using brain electrical activity in patients who sustained a closed head	Same

Proposed Device: BrainScope One (K# Not Yet Assigned)	Predicate: Ahead 300 (K161068)	Comments
head injury within 72 hours, likely corresponds to those with a structural brain injury visible on head CT.	injury within 72 hours, likely corresponds to those with a structural brain injury visible on head CT.	
An equivocal BrainScope One Structural Injury Classification using brain electrical activity in patients who sustained a closed head injury within 72 hours, may correspond to structural brain injury visible on head CT or may indicate the need for further observation or evaluation.	An equivocal Ahead 300 Structural Injury Classification using brain electrical activity in patients who sustained a closed head injury within 72 hours, may correspond to structural brain injury visible on head CT or may indicate the need for further observation or evaluation.	Same
BrainScope One provides a measure of brain function (EEG Brain Function Index, (BFI)) for the statistical evaluation of the human electroencephalogram (EEG).	The Ahead 300 provides a measure of brain function (EEG Brain Function Index, (BFI)) for the statistical evaluation of the human electroencephalogram (EEG).	Same
BrainScope One also provides clinicians with quantitative measures of cognitive performance to aid in the assessment of an individual's level of cognitive function. These measures do not interact with any other device measures, and are stand alone.	The Ahead 300 also provides clinicians with quantitative measures of cognitive performance to aid in the assessment of an individual's level of cognitive function. These measures do not interact with any other device measures, and are stand alone.	Same
BrainScope One also stores and displays electronic versions of standardized clinical assessment tools that should be used in accordance with the assessment tools' general instructions. These tools do not interact with any other device measures, and are stand alone.	The Ahead 300 also stores and displays electronic versions of standardized clinical assessment tools that should be used in accordance with the assessment tools' general instructions. These tools do not interact with any other device measures, and are stand alone.	Equivalent. The BrainScope One contains an expanded number of standard clinical assessment tools (library functions).

Comparison of Technological Characteristics with the Predicate Device:

BrainScope One incorporates additional clarification in the Indications for Use statement of its predicate (Ahead 300) to accommodate widely accepted definitions for “concussion” and “mild Traumatic Brain Injury (mTBI)”. The core capabilities of BrainScope One and its fundamental scientific technology remain unaltered compared to the Ahead 300 (predicate). The device modifications discussed do not alter the BrainScope One’s safety or effectiveness and neither do they change its intended use compared to the Ahead 300 (predicate). BrainScope One is substantially equivalent to the predicate the Ahead 300.

Table 2, Technological Comparison to Predicate Device

Topic / Area	Proposed Device: BrainScope One	Primary Predicate: Ahead 300	Comments
Platform	Trimble T41 mobile device, Android OS	Trimble T41 mobile device, Android OS	Same
Processed EEG Bandwidth	1kHz sampled data with DC to 300Hz bandwidth and 100Hz sampled data with 0.67Hz to 43Hz bandwidth	1kHz sampled data with DC to 300Hz bandwidth and 100Hz sampled data with 0.67Hz to 43Hz bandwidth	Same
Common Mode Rejection Ratio (CMRR)	< -100 dB (or better)	< -100 dB (or better)	Same
System Noise Floor	< 0.4 µV in 0.67 Hz to 43Hz bandwidth	< 0.4 µV in 0.3 Hz to 43Hz bandwidth	Same
ADC Resolution	45 nV/bit	45 nV/bit	Same
ADC Sampling Rate	1000 Hz, down sampled to 100 Hz for algorithm processing	1000 Hz, down sampled to 100 Hz for algorithm processing	Same
Electrode Placement System	The International 10-20 System	The International 10-20 System	Same
Electrode Positions Utilized	Fp1, Fp2, Fpz, AFz, F7, F8, A1, A2	Fp1, Fp2, Fpz, AFz, F7, F8, A1, A2	Same
Electrode Material	Single use Ag/AgCl electrode sensor array headset with solid gel	Single use Ag/AgCl electrode sensor array headset with solid gel	Same
Real Time EEG Display	Yes	Yes	Same
Classification Algorithm (Structural	Three tier classification with results of Negative,	Three tier classification with results of Negative, Equivocal and Positive	Same

Topic / Area	Proposed Device: BrainScope One	Primary Predicate: Ahead 300	Comments
Injury Classification)	Equivocal and Positive outputs.	outputs.	
Results Presentation and Reporting Features	Specific raw measures. EEG playback. Structural injury classification and brain function index display. Cognitive performance raw and standard scores including percentiles. Electronic versions of Standard Clinical Assessments.	Specific raw measures. EEG playback. Structural injury classification and brain function index display. Cognitive performance raw and standard scores including percentiles. Electronic versions of Standard Clinical Assessments.	Equivalent. BrainScope One has an expanded list of library functions (standard clinical assessments).

Performance Data:

No clinical or non-clinical performance data was submitted to support the device modification being made. All clinical performance data from the Ahead 300 (predicate) submission still apply.

The BrainScope One device, like its predicate (Ahead 300) is compliant to following standards:

- IEC 60601-1/A1:2012 Medical Electrical Equipment - Part 1: General Requirements for Basic Safety and Essential Performance
- IEC 60601-1-2/A1;2007 Medical electrical equipment - Section1.2 Collateral standard: Electromagnetic compatibility - Requirements and tests
- IEC 60601-1-6/A1:2013 General Requirements For Basic Safety And Essential Performance - Collateral Standard: Usability
- IEC 60601-2-26:2012 Particular requirements for the basic safety and essential performance of electroencephalographs
- ANSI/AAMI EC12:2000/(R)2010 Disposable ECG Electrodes
- ANSI/AAMI/ISO 10993-1:2009 Biological evaluation of medical devices – Part 1: Evaluation and testing within a risk management process
- ANSI/AAMI/ISO 10993-5:2009 Biological Evaluation of Medical Devices – Part 5: Tests for In Vitro Cytotoxicity
- ANSI/AAMI/ISO 10993-10:2010 Biological evaluation of medical devices – Part 10: Test for irritation and skin sensitization

- MIL-STD-810G, Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests
- IEC 60529 (2004) Degree of Protection Provided by Enclosures
- ASTM D4169 – 09, Standard Practice for Performance Testing of Shipping Containers and Systems

Conclusion:

BrainScope One's fundamental scientific technology remain unaltered compared to the predicate (Ahead 300). The device modifications do not alter the BrainScope One's safety or effectiveness and neither do they change its intended use. BrainScope One is substantially equivalent to the predicate the Ahead 300.