March 22, 2019

Nexstim Plc
Anna Honkanen
Senior Manager, Quality and Regulatory Affairs
Elimaenkatu 9b
00510 Helsinki, Finland

Re: K182700
Trade/Device Name: Nexstim Navigated Brain Therapy (NBT) System 2
Regulation Number: 21 CFR 882.5805
Regulation Name: Repetitive Transcranial Magnetic Stimulation System
Regulatory Class: Class II
Product Code: OBP
Dated: December 5, 2018
Received: December 10, 2018

Dear Anna Honkanen:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. Although this letter refers to your product as a device, please be aware that some cleared products may instead be combination products. The 510(k) Premarket Notification Database located at https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm identifies combination product submissions. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part

801); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803) for devices or postmarketing safety reporting (21 CFR 4, Subpart B) for combination products (see https://www.fda.gov/CombinationProducts/GuidanceRegulatoryInformation/ucm597488.htm); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820) for devices or current good manufacturing practices (21 CFR 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/) and CDRH Learn (http://www.fda.gov/Training/CDRHLearn). Additionally, you may contact the Division of Industry and Consumer Education (DICE) to ask a question about a specific regulatory topic. See the DICE website (http://www.fda.gov/DICE) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Pamela D. Scott -S

for Carlos L. Peña, PhD, MS
Director
Division of Neurological
and Physical Medicine Devices
Office of Device Evaluation
Center for Devices and Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: 06/30/2020
See PRA Statement below.

510(k) Number *(if known)*
K182700

Device Name

Nexstim Navigated Brain Therapy (NBT®) System 2

Indications for Use *(Describe)*

Nexstim Navigated Brain Therapy (NBT®) System 2 is indicated for the treatment of Major Depressive Disorder in adult patients who have failed to achieve satisfactory improvement from prior antidepressant medication in the current episode.

Type of Use *(Select one or both, as applicable)*

☒ Prescription Use (Part 21 CFR 801 Subpart D) ☐ Over-The-Counter Use (21 CFR 801 Subpart C)

CONTINUE ON A SEPARATE PAGE IF NEEDED.

This section applies only to requirements of the Paperwork Reduction Act of 1995.

DO NOT SEND YOUR COMPLETED FORM TO THE PRA STAFF EMAIL ADDRESS BELOW.

The burden time for this collection of information is estimated to average 79 hours per response, including the time to review instructions, search existing data sources, gather and maintain the data needed and complete and review the collection of information. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden, to:

Department of Health and Human Services
Food and Drug Administration
Office of Chief Information Officer
Paperwork Reduction Act (PRA) Staff
PRAStaff@fda.hhs.gov

"An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB number."

510(k) Summary

provided in accordance with 21 CFR §807.92(c)

Submission Date:	19 November 2018
510(k) Number:	K182700
Submitter:	Nexstim Plc Elimaenkatu 9b 00510 Helsinki, Finland
Submitter and Official Contact:	Ms. Anna Honkanen Senior Manager, Quality and Regulatory Affairs Nexstim Plc Elimaenkatu 9b 00510 Helsinki, Finland +011 358 (9) 2727 170 anna.honkanen@nexstim.com
Manufacturing Site:	Nexstim Plc Elimaenkatu 9b 00510 Helsinki, Finland
Trade Name:	Nexstim Navigated Brain Therapy (NBT®) System 2
Classification Name:	Repetitive Transcranial Magnetic Stimulator For Treatment Of Major Depressive Disorder
Primary Classification Regulation and Product Code:	21 CFR §882.5805 / OBP
Secondary Classification Regulation and Product Code:	21 CFR §882.1870 / GWF 21 CFR §882.4560 / HAW 21 CFR §890.1375 / IKN

Substantially Equivalent Devices:

Proposed Device	*Predicate 510(k) Number*	*Predicate Manufacturer / Model*
Nexstim Navigated Brain Therapy (NBT®) System 2	K173620	Tonica Electronik A/S / Mag Vita TMS Therapy System w/ Theta Burst Stimulation

510(k) Summary

provided in accordance with 21 CFR §807.92(c)

K171902	Nexstim, Plc / Nexstim NBT® System 2

The Nexstim Navigated Brain Therapy (NBT®) System 2 was in K171902 determined to be equivalent to other legally marketed rTMS devices for use of the 10 Hz Standard Depression Treatment Protocol for treating patients with MDD as stated in the indication for use statement.

510(k) Summary

provided in accordance with 21 CFR §807.92(c)

Purpose of the Submission

The purpose of this submission is to add the Intermittent Theta Burst Protocol as another treatment option for the use of the Nexstim Navigated Brain Therapy (NBT®) System for the treatment of Major Depressive Disorder as stated in the indications for use statement. The Tonica Electronik A/S / Mag Vita TMS Therapy System w/ Theta Burst Stimulation (K173620) has been identified as the predicate device for the addition.

Device Description:

The Nexstim Navigated Brain Therapy (NBT®) System is a non-invasive, repetitive transcranial magnetic stimulation (rTMS) system that delivers repetitive pulsed magnetic fields of sufficient magnitude to induce neural action potentials in the prefrontal cortex to treat the symptoms of major depressive disorder (MDD) without inducing seizure in patients who have failed one (1) antidepressant medication.

The Nexstim NBT System 2 is used for patient treatment by prescription only and must be operated by a trained medical professional. It can be used in both inpatient and outpatient settings including physician's offices and clinics, psychiatric hospitals, and general medical/surgical hospitals with psychiatric units.

The Nexstim NBT System 2 consists of a group of devices designed to localize the stimulation site in the brain and deliver rTMS stimulation using controlling and interpretive software. Operational control of the Nexstim NBT System 2 is provided by the software.

The Nexstim NBT System 2 combines magnetic resonance imaging-based (MRI-based), three dimensional (3D) localization of cortical motor areas of the brain with non-invasive TMS and simultaneous electromyography (EMG) measurement to locate areas of the brain that are capable of evoking muscle responses when stimulated, and to locate the target area for depression therapy.

The Nexstim NBT System 2 software is used to import a patient's MR image slices to generate an accurate 3D model of the patient's head which can be electronically peeled back to reveal the anatomical structures of the brain.

Intended Use:

Nexstim Navigated Brain Therapy (NBT®) System 2 is indicated for the treatment of Major Depressive Disorder in adult patients who have failed to achieve satisfactory improvement from prior antidepressant medication in the current episode.

510(k) Summary

provided in accordance with 21 CFR §807.92(c)

Technology Comparison:

The Nexstim NBT System 2 employs the same technological characteristics as the predicate device.

Characteristic	***Tonica Electronik A/S Mag Vita TMS Therapy System w/ Theta Burst Stimulation (K173620)***	***NexstimNavigated Brain Therapy (NBT®) System 2 (K171902)***	***Nexstim NBT® System 2 (Proposed Device)***	***Discussion of Major Differences***
Intended Use	The MagVita TMS Therapy System w/ Theta Burst Stimulation is indicated for the treatment of Major Depressive Disorder in adult patients who have failed to receive satisfactory improvement from prior antidepressant medication in the current episode.	Nexstim Navigated Brain Therapy (NBT®) System 2 is indicated for the treatment of Major Depressive Disorder in adult patients who have failed to achieve satisfactory improvement from prior antidepressant medication in the current episode.	Same indication for use statement as the Mag Vita TMS (K173620). No change from the indication for use statement cleared in K171902.	
Magnetic Field Intensity	120 % of MT	120 % of MT	120% of MT, No change from the one cleared in K171902 Intensity is the same as that used with the Mag Vita TMS (K173620).	

10Hz Treatment parameters	Magnetic field intensity: 120%of MT Frequency: 10Hz Train duration; 4 secs Inter-train interval 11-26 secs Number of trains: 75 Maximum pulses per session: 3000 Treatment session duration: 18.8-37.5 min Sessions/week: 5 Treatment schedule. 5 daily sessions for 6 weeks	Magnetic field intensity: 120%of MT Frequency: 10Hz Train duration; 4 secs Inter-train interval 26 secs Number of trains: 75 Maximum pulses per session: 3000 Treatment session duration: 37.5 min Sessions/week: 5 Treatment schedule. 5 daily sessions for 6 weeks	Magnetic field intensity: 120%of MT Frequency: 10Hz Train duration; 4 secs Inter-train interval 11-26 secs Number of trains: 75 Maximum pulses per session: 3000 Treatment session duration: 18.8-37.5 min Sessions/week: 5 Treatment schedule. 5 daily sessions for 6 weeks.	The minor protocol change to the inter-train interval parameters was cleared by FDA in the MagVita TMS Therapy System 510(k) submission K171481 for Tonica Eleo A/S and the Neurostar TMS Therapy System (510(k) submission 160703 for Neuronetics, Inc. The Nexstim NBT System 2 is technologically equivalent to the MagVita TMS Therapy System as demonstrated in 510(k) submission K171902/S001, pages 4818-4822.

iTBS Treament parameters	Magnetic field intensity: 120 % of MT Frequency: 50Hz (5 pulses (bursts) per sec) Train duration: 2 secs Inter-train interval: 8 secs Burst pulses: 3 Bursts: 200 Inter-pulse interval: 20 msec Number of trains: 20 Maximum pulses per session: 600 Treatment session duration: 3 min, 9 secs The clinical performance of TBS is dependent on the fact that the stimuli are of equal intensity. At the relevant TBS intensities required in the treatment setting, the individual intensity of the three stimuli is kept constant (i.e. at maximum a 1% drop referred to maximum machine output between	NA	Magnetic field intensity: 120 % of MT Frequency: 50Hz (5 pulses (bursts) per sec) Train duration: 2 secs Inter-train interval: 8 secs Burst pulses: 3 Bursts: 200 Inter-pulse interval: 20 msec Number of trains: 20 Maximum pulses per session: 600 Treatment session duration: 3 min, 9 secs The clinical performance of TBS is dependent on the fact that the stimuli are of equal intensity. At the relevant TBS intensities required in the treatment setting, the individual intensity of the three stimuli is kept constant (i.e. at maximum a 1% drop referred to maximum	The iTBS protocol was cleared by FDA in the Mag Vita TMS Therapy System w/ Theta Burst Stimulation 510(k) submission K173620 for Tonica Electrnik A/S. The Nexstim NBT System 2 is technologically equivalent to the MagVita TMS Therapy System as demonstrated in 510(k) submission K171902/S001, pages 4818-4822

	the first stimuli and the third stimuli in a burst).		machine output between the first stimuli and the third stimuli in a burst).	
Protocols	Standard and iTBS	Standard	Standard 10 Hz and iTBS Same as K173620. 10 Hz cleared in K171902.	
Area of Brain to be Stimulated	DLPFC	DLPFC	DLPFC.	
Coil Material	Copper winding with air core	Copper winding with air core	Copper winding with air core. No change from the coil cleared in K171902	
Coil Windings	97 mm 11 windings	72 mm (coil wing distance 2 mm, coil wind center distance 74 mm) 10 turns/wing	72 mm (coil wing distance 2 mm, coil wind center distance 74 mm) 10 turns/wing Same coil as cleared in K171902.	
Amplitude Range	1.7 SMT	0 to 2.5 SMT	0 to 2.5 SMT No change from that cleared in K171902	
Pulse Length	280 µs	230 µs ± 5 µsec	230 µs ± 5 µsec No change from that cleared in K171902	

Technology Comparison (continued):

Frequency Range	0.1 - 100 Hz	0.1 - 50 Hz	0.1 – 50 Hz, no change from range cleared in K171902. Includes iTBS frequency of 50 Hz	
Characteristic	***Tonica Electronik A/S Mag Vita TMS Therapy System w/ Theta Burst Stimulation (K173620)***	***NexstimNavigated Brain Therapy (NBT®) System 2 (K171902)***	***Nexstim NBT® System 2 (Proposed Device)***	
Coil Positioning Principle	Indirect targeting of treatment target though measured (5 cm) distance and direction from APB. Measure derived from statistical distance of DLPFC from APB.	Individual patient direct targeting of anatomical treatment location (DLPFC). Placing of E-field maximum location on 3D model built from patients individual MRI.	Individual patient direct targeting of anatomical treatment location (DLPFC). Placing of E-field maximum location on 3D model built from patients individual MRI. No change from that cleared in K171902.	
MT Response Detection	Visual qualitative monitoring for APB response	EMG provides qualitative and quantitative data based on which user defines MT.	EMG provides qualitative and quantitative data based on which user defines MT. No change from that cleared in K171902	

510(k) Summary

provided in accordance with 21 CFR §807.92(c)

Summary of Performance Testing:

Sterilization and Shelf Life Verification

The Nexstim NBT System 2 is not shipped sterile, and is not intended to be sterilized by the user.

The NBT Head Tracker has a shelf life of 2 years.

The Nexstim Focal and Cooled Coils have a useful product life of two (2) million pulses or two (2) years from date of manufacture, whichever comes first.

No other Nexstim NBT System 2 component has a shelf life.

Biocompatibility Verification

Patient contact materials which are part of the Nexstim NBT System 2 were designed to comply with the following standard:

- *ISO 10993-1: 2009, Biological evaluation of medical devices – Part 1: Evaluation and testing within a risk management process.*

and were determined to be safe to use with patients.

Software Verification and Validation

Software for the Nexstim NBT System 2 was designed and developed according to a robust software development process, and were rigorously verified and validated.

Software information is provided in accordance with internal documentation and the following Standards and guidance documents:

- *FDA guidance: The content of premarket submissions for software contained in medical devices, 11 May 05.*
- *FDA guidance: Off-the-shelf software use in medical devices, 09 Sep 99.*
- *FDA guidance: General principles of software validation; Final guidance for industry and FDA staff, 11 Jan 02.*
- *FDA guidance: Content of premarket submissions for management of cybersecurity in medical devices, 02 Oct 14.*
- *FDA guidance: Cybersecurity for Networked Medical Devices Containing Off-The-Shelf (OTS) software, 14 Jan 05.*
- *IEC 62304: 2006, Medical device software – Software life cycle processes.*

Test results indicate that the Nexstim NBT System 2 software complies with its predetermined specifications, and the Standards and guidance documents.

510(k) Summary

provided in accordance with 21 CFR §807.92(c)

Electrical Safety Verification

The Nexstim NBT System 2 was tested for performance in accordance with the following Standards:

- *IEC 60601-1: 2005, Am1: 2012, Medical electrical equipment - Part 1: General requirements for basic safety and essential performance.*
- *ANSI/AAMI ES 60601-1: 2005, Am2: 2010, US National differences to IEC 60601-1: 2005.*

Test results indicated that the Nexstim NBT System 2 complies with the Standards.

Electromagnetic Compatibility (EMC) Verification

The Nexstim NBT System 2 was tested for performance in accordance with the following Standard:

- *IEC 60601-1-2: 2007, Medical electrical equipment – Part 1-2: General requirements for basic safety and essential performance – Collateral standard: Electromagnetic compatibility – Requirements and tests.*
- *FCC 47 CFR §15, Telecommunication Chapter I--Federal Communications Commission Subchapter A—General- Radio Frequency Devices.*

Test results indicated that the Nexstim NBT System 2 complies with the Standards.

Performance Testing – Bench Verification

The Nexstim NBT System 2 was tested for performance in accordance with internal documentation and the following FDA Guidance Documents and Standards:

- *Guidance for Industry and Food and Drug Administration Staff Class II Special Controls Guidance Document: Repetitive Transcranial Magnetic Stimulation (rTMS) Systems.*

Test results indicated that the Nexstim NBT System 2 complies with its predetermined specification and the applicable Standard.

Performance Testing – Usability Validation

The Nexstim NBT System 2 was tested for usability in accordance with the following Standards:

- *IEC 60601-1-6: 2010, Medical electrical equipment – Part 1-6: General requirements for basic safety and essential performance – Collateral standard: Usability.*
- *IEC 62366: 2007, Medical devices – Application of usability engineering to medical devices.*

Test results indicated that the Nexstim NBT System 2 complies with the applicable Standards.

510(k) Summary

provided in accordance with 21 CFR §807.92(c)

Conclusion

Verification and validation activities were conducted to establish the performance and safety characteristics of the Nexstim NBT System 2. The results of these activities demonstrate that the Nexstim NBT System 2 is as safe, as effective, and performs as well as or better than the predicate device.

Therefore, the Nexstim NBT System 2 is considered substantially equivalent to the predicate device.