March 16, 2023

Magstim Company Ltd.
Daniel Gregory
Head of Health Software
Spring Gardens
Whitland, Carmarthenshire SA340HR
United Kingdom

Re: K223154
Trade/Device Name: Magstim Horizon 3.0 TMS Therapy System, Horizon 3.0 System, Horizon 3.0, H3.0, Horizon 3.0 with StimGuide+
Regulation Number: 21 CFR 882.5805
Regulation Name: Repetitive transcranial magnetic stimulation system
Regulatory Class: Class II
Product Code: OBP
Dated: October 6, 2022
Received: October 6, 2022

Dear Daniel Gregory:

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/combination-products/guidance-regulatory-information/postmarketing-safety-reporting-combination-products); 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 https://www.fda.gov/medical-devices/medical-device-safety/medical-device-reporting-mdr-how-report-medical-device-problems.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance) and CDRH Learn (https://www.fda.gov/training-and-continuing-education/cdrh-learn). 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 (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/contact-us-division-industry-and-consumer-education-dice) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Robert Kang -S

for Pamela Scott
Assistant Director
DHT5B: Division of Neuromodulation
and Physical Medicine Devices
OHT5: Office of Neurological
and Physical Medicine Devices
Office of Product Evaluation and Quality
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: 06/30/2023
See PRA Statement below.

510(k) Number *(if known)*
K223154

Device Name
Horizon 3.0 TMS Therapy System

Indications for Use *(Describe)*
Horizon 3.0 TMS Therapy System is indicated for the treatment of depressive episodes and for decreasing anxiety symptoms for those who may exhibit comorbid anxiety symptoms in adult patients suffering from Major Depressive Disorder (MDD) and 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."

K223154
Traditional 510(k) SUMMARY
Magstim's Horizon® 3.0 TMS Therapy System

Prepared according to the requirements outlined in 21 CFR 807.92

Submitter's Name, Address, Telephone Number, Contact Person and Date Prepared

Magstim® Company Limited
Spring Gardens, Whitland, Carmarthenshire
SA34 OHR, United Kingdom
Phone: +44 (0) 1994 240798
Facsimile: +44 (0) 1994 240061
Contact Person: Daniel Gregory, Head of Health Software (Daniel.gregory@magstim.com)

Date Prepared: March 14, 2023

Trade Name of Device

Horizon® 3.0 TMS Therapy System

Common or Usual Name

Transcranial Magnetic Stimulation System for Neurological and Psychiatric Disorders and Conditions

Classification

21 C.F.R. § 882.5805, Class II, product code OBP

Predicate Devices

K220127 NeuroStar Advanced Therapy, Neuronetics Inc. *(Primary Predicate Device)*, 21 C.F.R § 882.5805, OBP
K211389 Horizon® 3.0 TMS Therapy System, The Magstim® Company Limited *(Secondary Predicate Device)*, 21 C.F.R § 882.5805, OBP

Device Description

The Horizon® 3.0 TMS Therapy System is a computerized, electromechanical medical device that produces and delivers non-invasive, magnetic stimulation using brief duration rapidly alternating, or pulsed, magnetic fields to induce electrical currents directed at spatially discrete regions of the cerebral cortex. This method of cortical stimulation by application of brief magnetic pulses to the head is known as Transcranial Magnetic Stimulation. ("TMS").

The Horizon® 3.0 TMS Therapy System is a non-invasive tool for the stimulation of cortical neurons for the treatment of depressive episodes and for decreasing anxiety symptoms for those who may exhibit comorbid anxiety symptoms in adult patients suffering from Major

Depressive Disorder (MDD) and who have failed to achieve satisfactory improvement from prior antidepressant medication in the current episode.

The Horizon® 3.0 TMS Therapy System is used for patient treatment by prescription only under the supervision of a licensed physician. It can be used in both inpatient and outpatient settings, including physicians' offices, clinics, and hospitals.

Horizon® 3.0 TMS Therapy System is an integrated system consisting of a combination of hardware, software, and accessories. Its technological characteristics are described in further detail below.

Intended Use & Indications for Use

The Horizon® 3.0 TMS Therapy System is intended to produce and deliver non-invasive, magnetic stimulation using brief duration rapidly alternating, or pulsed, magnetic fields to induce electrical currents directed at spatially discrete regions of the cerebral cortex.

Horizon® 3.0 TMS Therapy System is indicated for the treatment of depressive episodes and for decreasing anxiety symptoms for those who may exhibit comorbid anxiety symptoms in adult patients suffering from Major Depressive Disorder (MDD) and who have failed to achieve satisfactory improvement from prior antidepressant medication in the current episode.

Technological Characteristics

Horizon® 3.0 TMS Therapy System and its technological characteristics remain almost identical to that cleared within K211389.

The proposed change to treat adult patients with MDD that may also exhibit comorbid anxiety symptoms are limited to updates to the IFU only. This change is made to facilitate safe and effective treatment of adult patients with MDD that exhibit comorbid anxiety symptoms and do not raise new or different questions of safety and effectiveness.

The coil positioning mechanism of action with Horizon 3.0 also remains unchanged from that earlier cleared in K211389, with two options available dependent on Horizon 3.0 configuration. Horizon 3.0 with StimGuide+ offers the ability to locate and determine MT and the location of the treatment location with the use of stereotactic navigation, where standard Horizon 3.0 uses the conventional manual measurement approach.

All other aspects of the device compared to the currently marketed Horizon 3.0 device remain unchanged and are identical.

Non-clinical Testing

Due to the minor nature of changes to the current Horizon 3.0 device, only a limited amount of non-clinical testing was necessary, which is later discussed in substantial equivalence.

Magnetic and Electrical field comparative testing was performed to demonstrate the Horizon 3.0 stimulating coil to the Primary Predicate Device. The data provided is consistent with the FDA's guidance "Class II Special Controls Guidance Document: Repetitive Transcranial Magnetic Stimulation (rTMS)" Section 4.

Information has been provided about the magnetic field characteristics including output level linearity, magnetic field spatial distribution, magnetic field strength gradients and the output waveform in accordance with the special controls guidance listed above. Magnetic field spatial distribution information was also superimposed on T1-weighted MRI coronal, sagittal, and axial 1cm slices. The Electric Field Distribution measurements were performed using a human phantom head model filled with a physiologic saline solution. The above testing was performed both on the subject Horizon 3.0 device as well as the predicate Neuronetics device.

The Horizon 3.0 Ez Cool Coil and the NeuroStar Advanced Therapy Coil electric field profiles have also been modeled in COMSOL and according to the finite element modelling (FEM) and statistical analysis, the induced E-field profiles by the Horizon 3.0 Ez Cool Coil and NeuroStar Advanced Therapy Coil are equivalent and have an average difference of ±5% at distances of 1 to 4 cm from the coil surface.

The testing performed is both described in the software section **(Section XVIII)** and performance testing section **(Section XX)**.
No further testing for Electrical Safety, Mechanical Safety, Electromagnetic Compatibility, Alarm Systems, Human Factors, Software verification/validation and Biocompatibility was necessary as previous data submitted as part of K211389 premarket notification remains valid to demonstrate safety and effectiveness and support a determination of substantial equivalence. This is re-iterated in **Sections XII, XIV, XVII and XIX.**

Clinical Testing

No new clinical data is being leveraged for this 510(k) submission and equivalence is being established through a comparison of technological characteristics. As described in the 'Non-clinical Testing' above the Horizon 3.0 including its figure of eight stimulating coil is technologically equivalent to the NeuroStar Advanced Therapy System cleared by the FDA under K220127.

Due to the differing stimulator output power levels between the Horizon 3.0 device and the Primary Predicate NeuroStar Advanced Therapy System (K220127) required to achieve the same stimulating effect, A post-market real-world data analysis, clinical literature review and feedback activity was used to determine that the tolerability profile for the Horizon 3.0 is equivalent to the primary predicate in terms of safety and tolerability even when the power levels are required to be increased to achieve stimulation depths such as 3cm. The observed result is that there was no change in the tolerability profile.

Clinical data that supports that the Horizon 3.0 is safe and effective 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 was demonstrated under K211389, K183376, K182853 and also K180907, K171051, K162935, K171051, K143531.

As discussed throughout this 510(k) notification, Horizon 3.0, including its figure of eight stimulating coil is technologically considered equivalent to the NeuroStar Advanced Therapy System cleared by the FDA under K221027.

As such, the clinical evidence to support the change to the Horizon 3.0 labelling to extend its indication for decreasing anxiety symptoms for those who may exhibit comorbid anxiety symptoms in adult patients suffering from Major Depressive Disorder (MDD) is supported by FDA clearance of the primary predicate device, the NeuroStar Advanced Therapy by Neuronetics Inc. (K221027).

Thus, the clinical data submitted under the above mentioned 510(k) clearances is valid to demonstrate the safety and effectiveness of the Horizon 3.0® TMS Therapy System which is the subject of this 510(k) submission.

Substantial Equivalence

The proposed change to treat adult patients with MDD that may also exhibit comorbid anxiety symptoms are limited to updates to the IFU only. This change is made to facilitate safe and effective treatment of adult patients with MDD that exhibit comorbid anxiety symptoms and do not raise new or different questions of safety and effectiveness.

Where the labelling has been updated, this has been performed appropriately to identify various contraindications and instructions relevant to the usage of the device as per special controls. Labelling can be found in **Section XV.**

The focus component of both the subject device and the primary predicate device when considering the extension to the indication for use is the stimulating coil.

Whilst the coil construction characteristics of the Ez Cool Coil and the NeuroStar Advanced Therapy are different, the magnetic field characteristics of the coils are equivalent which is pertinent to treatment delivery effectiveness. Earlier in K143531, the FDA determined that Magstim figure of eight stimulating coils are substantially equivalent to the NeuroStar Advanced Therapy System coil for the treatment of Major Depressive Disorder in adult patients who have failed to achieve satisfactory improvement from medication in the current episode. This decision was later further substantiated in a retrospective open-label study titled “Comparative Efficacy of Repetitive Transcranial Magnetic Stimulation for Treatment of Depression Using 2 Different Stimulation Devices: A Retrospective Open-Label Study” where the authors Oliveira-Maia, Garcia-Guarniz, et al, conclude that there was no statistically significant differences between outcomes in Magstim and NeuroStar treated patients which is suggestive of equivalent antidepressant efficacy between devices.[1]

To further substantiate this argument, the Horizon 3.0 Ez Cool Coil and the NeuroStar Advanced Therapy Coil were modeled in COMSOL and according to the finite element modelling (FEM) and statistical analysis, the induced E-field profiles by the Horizon 3.0 Ez Cool Coil and NeuroStar Advanced Therapy Coil are equivalent and have an average difference of ±5% at distances of 1 to 4 cm from the coil surface. For further information on the modelling, please refer to **Section XX.**

[1] *(Garcia-Guarniz AL, Sinanis A, Pascual-Leone A, Press D. Comparative efficacy of repetitive transcranial magnetic stimulation for treatment of depression using 2 different stimulation devices: A retrospective open-label study. J Clin Psychiatry 2016;77:e743.)*

The conclusions taken from the COMSOL modelling were further qualified via magnetic field characteristics and electric field testing performed according to the requirements of FDA Guidance Document ""Class II Special Controls Guidance Document: Repetitive Transcranial Magnetic Stimulation (rTMS) Systems". The testing performed further emphasized the substantial equivalence of the Horizon 3.0 compared to its primary predicate device, the NeuroStar Advanced Therapy System (K220127).

Thus, in summary, as a treatment of adult patients with MDD that may exhibit comorbid anxiety symptoms, the Horizon 3.0 figure of eight stimulating coil is considered equivalent to the NeuroStar Advanced Therapy System coil cleared by the FDA in K220127 and does not raise new or different questions of safety and effectiveness.

All other aspects of the device compared to the currently marketed Horizon 3.0 device remain unchanged and are identical.

Conclusion

In summary, the intended use and indications for use for Horizon 3.0 and it predicate devices are identical.

The minor modifications to Horizon 3.0 to extend the indications for use do not raise new or different questions regarding safety and effectiveness. Where non-clinical testing was performed, this was performed according to well established methods recognized either as an FDA recognized standard, FDA guidance document, scientific literature or via an approach previously accepted by the FDA.

Although the indications have been modified, the overall operating principles of TMS devices for stimulating the cerebral cortex remains the same. Regardless of indication, the same type of energy output is used and the same principles apply to determining a MT hotspot and positioning of the coil for delivery of brief duration, rapidly alternating, or pulsed, magnetic fields to induce electrical currents that are directed at spatially discrete regions of the cerebral cortex.

Non-clinical test data collected via well-established methods demonstrates that Horizon 3.0 is as safe and effective as its predicate devices (K211389 and K220127).

Thus, the information and data provided in this 510(k) premarket notification submission support a finding of substantial equivalence for the Horizon 3.0 for the treatment of depressive episodes and for decreasing anxiety symptoms for those who may exhibit comorbid anxiety symptoms in adult patients suffering from Major Depressive Disorder (MDD) and who have failed to achieve satisfactory improvement from prior antidepressant medication in the current episode.

A tabular comparison of device characteristics can be found on the following page.

Table 1: Substantial Equivalence Summary

Criteria	**Horizon 3.0 TMS Therapy System** (Subject of this submission)	**HORIZON 3.0 TMS Therapy System** (K211389) *(Secondary Predicate)*	**NeuroStar Advanced Therapy System** (K220127) (*Primary Predicate*)
Manufacturer	Magstim Company Limited	Magstim Company Limited	Neuronetics, Inc.
Device Name	Horizon 3.0 TMS Therapy System	Horizon 3.0 TMS Therapy System	NeuroStar TMS Therapy System
Clearance date		09/14/2021	07/15/2022
510(k) number		K211389	K220127
Device code	OBP	OBP	OBP
Intended Use/ Indications for Use	Horizon® 3.0 TMS Therapy System is indicated for the treatment of depressive episodes and for decreasing anxiety symptoms for those who may exhibit comorbid anxiety symptoms in adult patients suffering from Major Depressive Disorder (MDD) and who have failed to achieve satisfactory improvement from prior antidepressant medication in the current episode.	The Horizon 3.0 TMS Therapy System 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.	The NeuroStar Advanced Therapy System is indicated for the treatment of depressive episodes and for decreasing anxiety symptoms for those who may exhibit comorbid anxiety symptoms in adult patients suffering from Major Depressive Disorder (MDD) and who have failed to achieve satisfactory improvement from prior antidepressant medication in the current episode.
Treatment Parameters			
Magnetic Field Intensity	120% of the MT	120% of the MT	120% of the MT
Stimulus Frequency	10 Hz	10 Hz	10 Hz
Stimulus Train duration	4 sec	4 sec	4 sec
Inter-train interval	11-26 sec	11-26 sec	11-26 sec
Number of trains	75	75	75
Magnetic Pulses per Session	3000	3000	3000
Treatment Session Duration	18.8 min–37.5 min	18.8 min–37.5 min	18.8 min–37.5 min
Sessions/week	5	5	5
Treatment Schedule	5 daily sessions for 6 weeks	5 daily sessions for 6 weeks	5 daily sessions for 6 weeks
Area of brain to be stimulated	Left Dorsolateral Prefrontal Cortex	Left Dorsolateral Prefrontal Cortex	Left Dorsolateral Prefrontal Cortex

Coil Specifications							
	Horizon® MT Remote Coil	Horizon® 3.0 E-z Cool Coil	Horizon® 3.0 E-z Cool Coil (Nav)	Horizon® MT Remote Coil	Horizon® 3.0 E-z Cool Coil	Horizon® 3.0 E-z Cool Coil (Nav)	NeuroStar Stimulating Coil
Waveform	Biphasic	Biphasic	Biphasic	Biphasic	Biphasic	Biphasic	Biphasic
Core Material	Air	Air	Air	Air	Air	Air	Ferromagnetic Core
Pulse Width	330µs	340µs	340µs	330µs	340µs	340µs	180µs

System Specifications			
Amplitude in SMT units (Standard Motor Threshold)	0.28 - 1.9	0.28 - 1.9	0.22 – 2.08
Frequency range (Hz) at 100%	1 – 20	1 - 20	0.1 - 30
Pulse train duration range (sec)	0.1 – 600	0.1 - 600	1-20
Inter-train interval range (sec)	1 – 540	1 - 540	10-60
Maximum # of pulses per session (cumulative exposure)	60000	60000	5000
Maximum output amplitude (V/m) at a depth of 2cm below the coil surface	150 V/m	150 V/m	135 V/m nominal
Maximum magnetic field strength (T) at coil surface	1.0T	1.0T	0.7T
Maximum magnetic field strength (T) at a depth of 2cm	0.4T	0.4T	0.5T
Maximum magnetic field gradient (dB/dt) (kT/s) at coil surface	18 kT/s	18 kT/s	27 kT/s
Maximum magnetic field gradient (dB/dt) (kT/s) at a depth of 2cm	10 kT/s	10 kT/s	11 kT/s

Coil Positioning					
System Configuration	**Horizon 3.0**	**Horizon 3.0 with StimGuide+**	**Horizon 3.0**	**Horizon 3.0 with StimGuide+**	**NeuroStar Advanced Therapy System**
Coil Position Principle for MDD and Comorbid Anxiety Symptoms	Indirect targeting of treatment target through measured distance and direction (5.5cm)	Indirect targeting of treatment target through measured distance and direction (5.5cm) from MT Hotspot using	Indirect targeting of treatment target through measured distance and direction (5.5cm)	Indirect targeting of treatment target through measured distance and direction (5.5cm) from MT Hotspot using	Indirect targeting of treatment target through measured distance and direction (5.5cm) from MT Hotspot. Measure derived from statistical distance of DLPFC from MT hotspot.

	from MT Hotspot. Measure derived from statistical distance of DLPFC from MT hotspot.	stereotactic navigation. Measure derived from statistical distance of DLPFC from MT hotspot.	from MT Hotspot. Measure derived from statistical distance of DLPFC from MT hotspot.	stereotactic navigation. Measure derived from statistical distance of DLPFC from MT hotspot.	
MT Response Principle for MDD and Comorbid Anxiety Symptoms	Visual qualitative monitoring for APB response	Option 1. EMG provides quantitative data based on which user defines MT. Option 2. Visual qualitative monitoring for APB response	Visual qualitative monitoring for APB response	Option 1. EMG provides quantitative data based on which user defines MT. Option 2. Visual qualitative monitoring for APB response	Visual qualitative monitoring for APB response