

The Visor2™ system provides industry-leading precision, reliability, and consistency for TMS sessions. Visor2 leverages meticulous digitization procedures to reliably create an easily navigable 3D head-space for targeting, functional mapping, and analysis. Real-time visualization of coil positioning and magnetic induction ensures maximized accuracy. Archived TMS session-information allows users to easily fine-tune, analyze and replicate any previous procedure with absolute confidence.

Visor2 Features Overview

Available Packages:

- Visor2 LT – Neuronavigation package
- Visor2 XT – Extended neuronavigation package

Brain Visualization

Available in LT and XT

- MRI/fMRI images, freely rotating cutting planes, 3D regions, rendered compartments, curvilinear displays
- Surface-rendering of scalp, brain and cortex
- TMS info: stimulation focus, forward induced electric field calculation based on coil configuration, coil projection on the 3D head model of the brain
- Head model and anatomical details

Patient Registration/Digitization

Available in LT and XT

- Head registration is based on anatomical landmarks, rendering a point-to-point estimate, which is refined by a shape-based transformation to output the navigable 3-D Brain-Space
- Automatically records hundreds of scalp fiducial markers (head shape points) by simply moving digitizer stylus over the scalp and face, most accurate head digitization procedure available

Segmentation & Head Modeling

Available in LT and XT

- Simple, 3-step workflow: Import patient data, specify fiducials, generation of 3-D head models
- Automatic processing of imported MRI (DICOM, Analyze, Nifti) to obtain realistic models of the scalp and the brain
- Head model co-registration based on selected anatomical landmarks and recorded head shape points
- Option to use individual MRI or a standard MRI
- Transform subject's MRI, targeted or identified locations, to Talairach/MNI system
- Curvilinear display, depth peeling with superior precision

Coil Management

Available in LT and XT

- Customized tracking-tools, compatible with all major TMS coils, ensure precise positioning and targeting
- Semi-automatic coil calibration procedure to register coil dimensions and relative positioning
- Option to check coil calibration on a continual basis, even during and after the TMS session, to ensure absolute confidence in the recorded coil position
- Multiple coil management option: easily switch among different TMS coils during the session

Targeting

Available in LT and XT

- Targets for coil positioning based on MRI, EMG or coordinates (e.g. in Talairach system)
- Intuitive target view: accurate positioning of coil over desired stimulation target indicating distance to target, and orientation of coil relative to desired orientation
- Adjust target threshold-precision in terms of distance and orientation
- Multiple, customizable 3-D and 2-D views for a variety of targeting protocols and tasks
- Accuracy check during the session and upon completion
- 2 mm overall accuracy of navigation

Offline Analysis Capabilities

Available in LT and XT

- Review of all recorded stimulation sites and corresponding position of the TMS coil
- Review of the electromagnetic induction for each stimulated site
- Preparation of subject stimulation plans based on stimulation target, coil type, induced electric field strength, rate of TMS, and duration of stimulation at each site

Compatible Interfacing

Available in LT and XT

- Direct link with Matlab®, MS Excel®, MS Word® and various other applications, automation of all analysis activities possible (e.g. in HTML or Matlab®)

MRI Import Formats

Available in LT and XT

- DICOM
- Analyze
- Nifti
- ASA

Export Formats – Image Markers and Stimulated Sites

Available in LT and XT

- DICOM
- ASA

Induced Electrical Field Calculation / Display

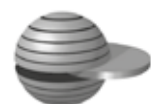
Available only in XT

- Done in real-time, computation of the induced electrical field takes in to account both the specific make/model of the TMS coil as well as the digitized head model
- Select MRI curvilinear surfaces for Induction-visualization at different brain depths
- Employs specific TMS coil configuration data, for optimal induction calculation / display

Functional Mapping

Available only in XT

- Navigated TMS can be run with, or without, EMG recording
- Automatic extraction of the peak-to-peak amplitudes of the motor-evoked potentials from TMS
- Visor is fully-compatible with up to 8 channels EMG amplifiers, TMS induced EMG responses are processed online and mapped in real-time on the brain, creating TMS-induced response maps
- Creates a color-coded map from MEP responses, colors are based on the peak-to-peak amplitudes
- Amplitude maps are calculated for each recorded channel, EMG, independently and simultaneously
- Review of simultaneously-recorded EMG/TMS data and the induction responses
- Possible extension with EEG: Visor2 is compatible with EEG amplifiers of up to 64 channels (TMS-Compatible EEG systems, including ANT's - for research purposes only)



Visor2 System Parts

Computer and Display

- Visor2 Software (LT or XT)
- High Performance PC – Windows 7 32-bit; Intel Core 2, 2.13 GHz; 4 GB RAM; 500 GB HDD
- 23" or 24" LCD monitor

Tracking Tools

- Calibration board and coil tracker
Available for all standard TMS coils and a variety of custom coils
- Referential head band
- Pointer tool

3-Dimensional Optical Tracking System

NDI Spectra® or Vicra® infrared camera (optional)
Manufactured by Northern Digital Inc., Canada
Unit accuracy for one marker: 0.25 mm (rms)

Infrared Camera Mounting Options

- Mobile cart workstation – camera and monitor mount
- Wall mounting system – camera mount only
- Tripod mounting system – camera mount only

Dedicated Visor2 Cart (optional)

- Portable cart with highly flexible arms for monitor and camera
- With a handle at the back of the cart for controlled steering
- Robust and agile wheels with brakes for easy relocation of the system

Two EMG recording options are offered with Visor2 XT

Option 1:

Wireless EMG Recording Module, up to 6 Channels

Dimensions : 114 x 98 x 37 mm (l x w x h)

Bipolar Inputs

Noise : < 1.0 uVrms (at lowest sample rate)
Gain: 19.5 x
Input signal difference: < 0.1 V
Input common mode range : -2V / +2V
Input impedance: > 10¹² Ohm
CMRR: >100 dB
Connector: 4 pin Binder, active shielding

Sampling

Sample frequency: max. 1024 Hz
Resolution: 24 bits, Bipolar 12.2 nV per bit, AUX 0.238 uV per bit
Lowpass: digital FIR filter, cutoff frequency = 0.2 * sample frequency
Trigger input: 1-bit TTL

Bluetooth Communication / Batteries

Bluetooth 1.1 class 2
Used profile: Serial port profile
Line of sight range: > 10 m
Batteries: 2 x type AA rechargeable NiCd or NiMH 1.2V or disposable alkaline 1.5V

Trigger Box and Remote Control

- Connects Visor2 and TMS system, TTL based
- Dual-button remote control for a single-user coil and software control

Reclining Patient Chair (optional)

- Adjustable with a separate remote control
- Maximum load: 180 kg (397 lbs)

ANT's Concurrent EEG/TMS Recording Module (optional)*

Number of channels: 32 or 64-channel EEG
Noise: < 1.0 uVrms (at lowest sample rate)
Input signal difference: < 0.15V
Input common mode range : -2V / +2V
Input impedance: > 10¹² Ohm
CMRR: > 90 dB
Max. sampling rate: 2048 Hz
Resolution: 24 bit, 18.39 nV per bit
Trigger input: 8-bit TTL
Connection to PC: via fiber-optic cable and USB 2.0

*for research purposes only

Option 2:

EMG Recording Module, up to 8 Channels

Dimensions: 210 x 207 x 92 mm (l x w x h)

Bipolar ExG Inputs

Number: 4
Noise: < 1.0 uVrms (at lowest sample rate)
Gain: 26.55 x
Input signal difference: < 0.15V
Input common mode range : -2V / +2V
Input impedance: > 10¹² Ohm
CMRR: > 90 dB
Connector: 4 pin Binder, active shielding

AUX Inputs

Number: 4
Noise: < 20 uVrms (at lowest sample rate)
Gain: 1 x
Input signal range (diff): -3V / +3V
Input common mode range : -4V / +4V
Input impedance: > 10¹² Ohm
CMRR: > 70 dB
Connector: 5 pin Binder

Sampling


Sample frequency: max. 2048 Hz
Resolution: 24 bits, ExG/BIP 18.39 nV per bit, AUX 0.48828 uV per bit
Lowpass: digital FIR filter, cutoff frequency = 0.2 * sample frequency
Trigger input: 8-bit TTL
Fiber length: up to 100m
Required interface: FUSBI, requires USB1.1 or USB2.0 port on PC

External Power Supply

Input: 110-240V AC, 50 - 60 Hz
Output voltage: 10V DC

ANT Neuro: Inspiring technology for the human brain

ANT Neuro was established in 1997, as a spin-off company of The University of Twente, Enschede. It now has offices located in Enschede, Netherlands; Berlin, Germany; and Madison, WI, USA. For more information visit our website

 0124 Visor2™ is compliant with international standards for use in clinical environments. CE marked as a medical device in the EU, according to MDD 93/42/EEC, class IIa. Made in Germany. Manufactured by eemagine GmbH, ISO 13485 certified. Outside the EU, the Visor2™ system is intended for research and educational use only.

