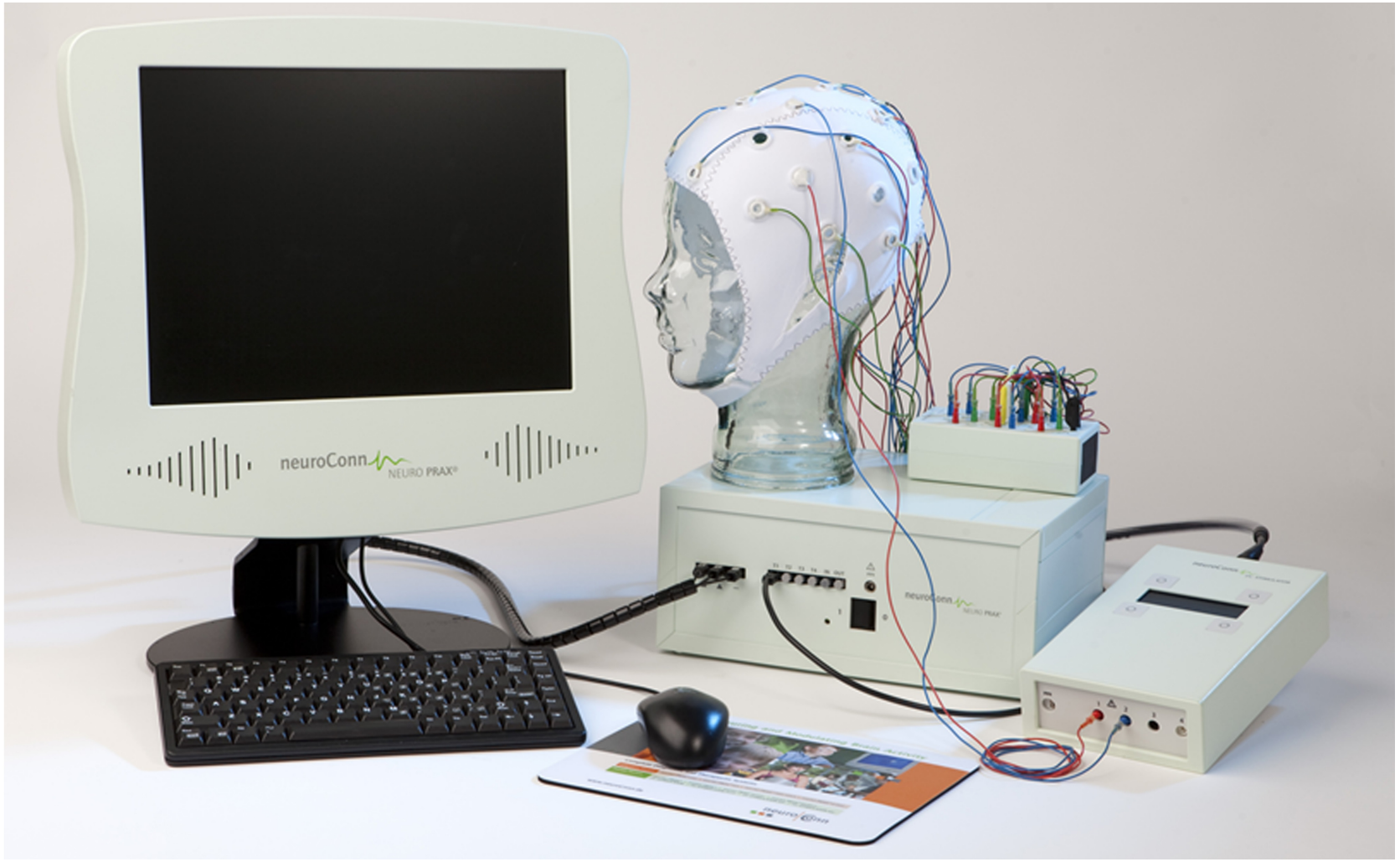
NEURO **PRAX**® TMS/tES – Application Note

Part I: EEG & tDCS TCP/IP



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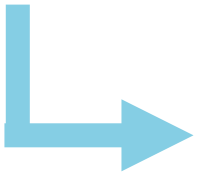
neuroConn´s full-band EEG system NEURO **PRAX**® TMS/tES measures EEG-Signals and Evoked Potential during:

- **TMS** (transcranial magnetic stimulation)
- **tES** (transcranial electric stimulation)



tDCS (transcranial direct current stimulation)
tACS (transcranial alternating current stimulation)
tRNS (transcranial random noise current stimulation)

The special NEURO **PRAX**® TMS/tES hard- and software offers:

- short recovery time 3-5 ms after TMS pulse
- high dynamic input range and resolution
- online artefact correction software for TMS and tACS artefacts
- full-band recording (0-1200 Hz) of EEG, EMG, ECG, EOG, …
- online data interface to Brainsight® TMS navigation software
- export functions for analysis software (BESA, EMSE, ...)

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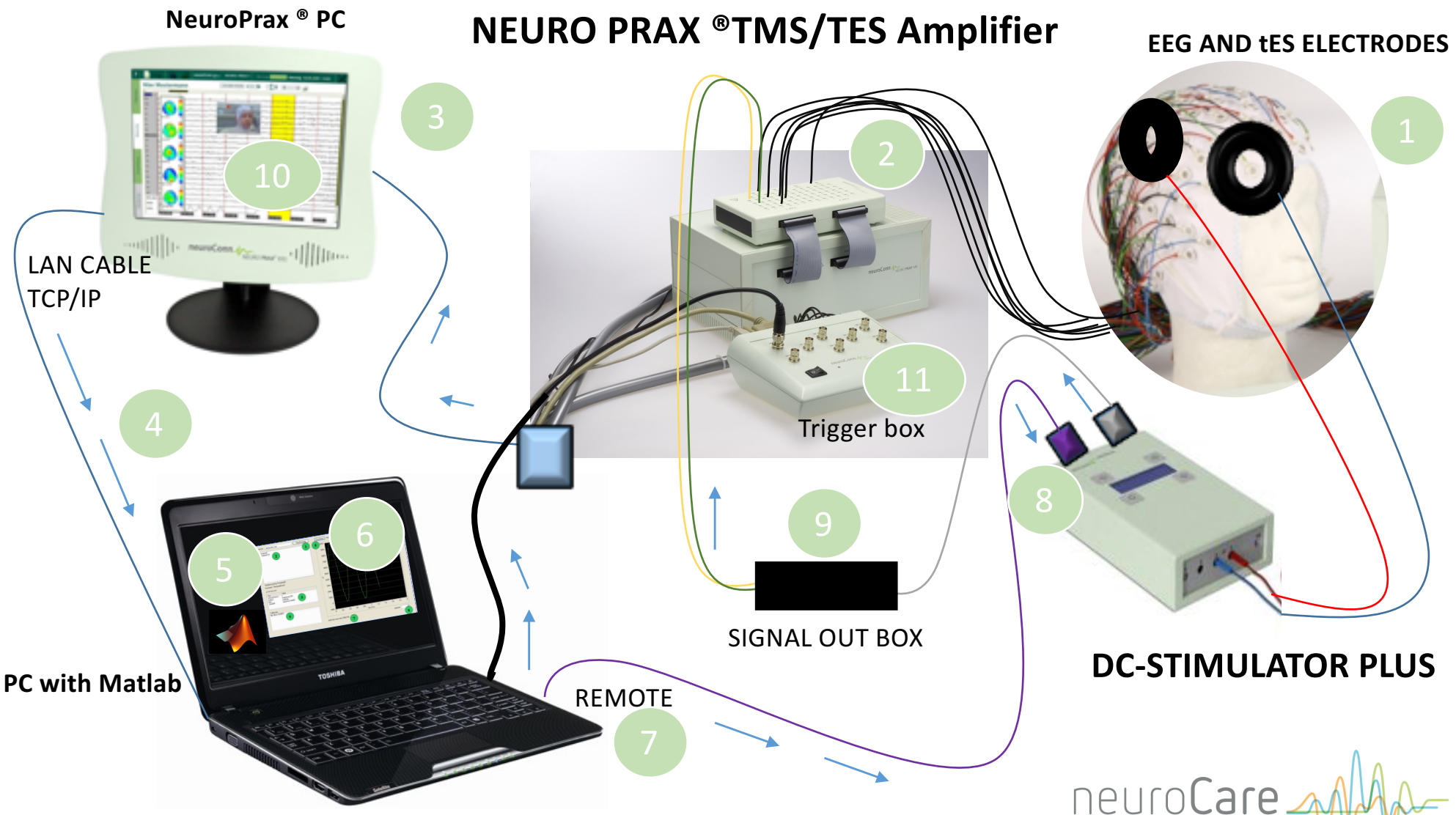

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1. EEG electrodes from 32/ 64/ 128 electrodes and the special donut stimulation electrodes (anode and cathode)
2. The EEG electrodes are connected to the NEURO **PRAX**® TMS/tES input box of the amplifier.
3. The NEURO **PRAX**® TMS/tES amplifier is connected to the NEURO **PRAX**® TMS/tES panel PC.
4. The NEURO **PRAX**® TMS/tES panel PC is connected via a direct LAN cable or the same network to the external panel PC with Matlab.
5. In Matlab there is a special example to read data online from the NEURO **PRAX**® TMS/tES amplifier with a TCP/IP protocol.
6. In the Matlab computer you can program your special algorithm to detect e.g. slow wave sleep stages.
7. Once these stages are detected you can generate your particular stimulation parameters and output them with: sound card or DAC board.

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8. This stimulation parameters can be entered into the DC-STIMULATOR PLUS with the REMOTE option. The DC-STIMULATOR PLUS will follow the particular given stimulation online.
9. The output current of the DC-STIMULATOR PLUS can be recorded with the NEURO **PRAX**® TMS/tES amplifier to monitor exactly how the stimulation is changing during the experiment. This is done using the SIGNAL OUT function and the SIGNAL OUT BOX.
10. In the case of tDCS and tACS, the NEURO **PRAX**® TMS/tES system can reject online the stimulation noise from the EEG data. Therefore, one can still monitor the actual EEG state during stimulation. During tDCS there is not special corrections but the amplifier will follow the offset and recover fast after the fade in. The high dynamic input range avoids saturation of the amplifier.
11. To be able to monitor each of the changes given a particular experiment or condition, the PC with matlab can send triggers via the trigger box to the NEURO **PRAX**® TMS/tES amplifier. These triggers will be used as markers in the EEG data for the different conditions used in the experiment.

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