MINDMEDIA
NEURO AND BIOFEEDBACK SYSTEMS

BioTrace+
What's new

V2013

An overview of the new functionality of
BioTrace+ V2013

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About this document

BioTrace+ V2013 is the latest release of the software platform for NeXus. This version contains new or improved functionality. It also includes general improvements for more stability, better quality, and higher performance.

Please read the BioTrace+ User Manual before using the software. The BioTrace+ User Manual also describes how to update BioTrace+.

Visit our website for more information about BioTrace+, NeXus, or Mind Media:
www.mindmedia.info

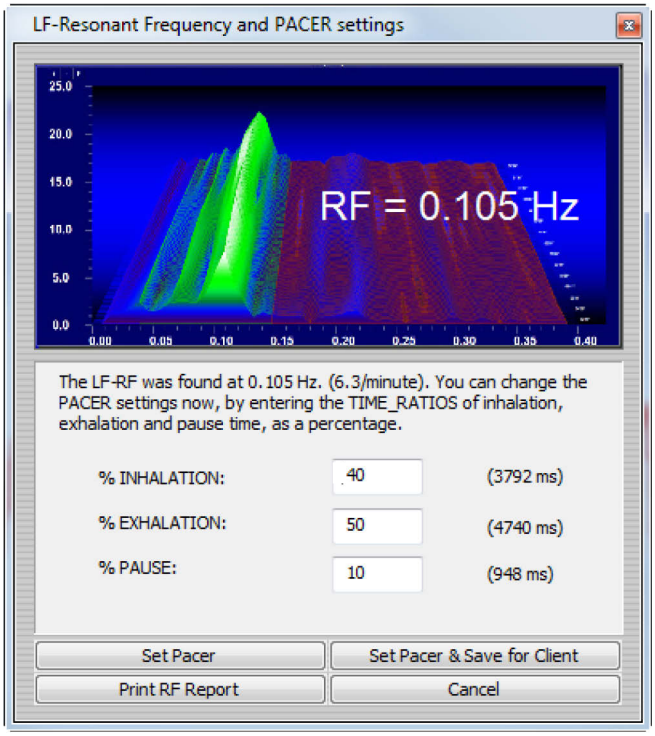
1. Improved HRV functionality

BioTrace+ now includes new heart rate variability (HRV) and resonance frequency (RF) functionality.

Resonant frequency calculation

The session overview screen mode has a new function that automatically calculates the resonant frequency of the heart rate variability (derived from BVP or ECG). Go to the session overview mode, right click and choose 'Analysis Functions' > 'HRV Resonant Freq'.

This function will search for compatible segments, and calculate which of these segments withholds the highest peak frequency in the HRV-Low Frequency range. If no segment is present or valid, the entire session will be used to calculate the HRV resonant frequency.



Calculated HRV Resonant Frequency screen

The resonant frequency can be set as a respiration pacer setting for a particular screen or client.

The calculation of the resonant frequency can be printed in an RF Report, showing the peak frequency found, and if applicable, the segment withholding the peak frequency.

See "Appendix I - RF report" for an example of a Resonant Frequency Report.

Load and save patient pacer settings

The pacer settings can be saved in the client's data, and loaded manually if necessary. When saving a pacer setting for a particular client and starting a recording for this client, the software will automatically set the pacer to achieve the client's resonant frequency.

If the resonant frequency is not the desired pacer frequency for the client, a custom pacer frequency can be set.

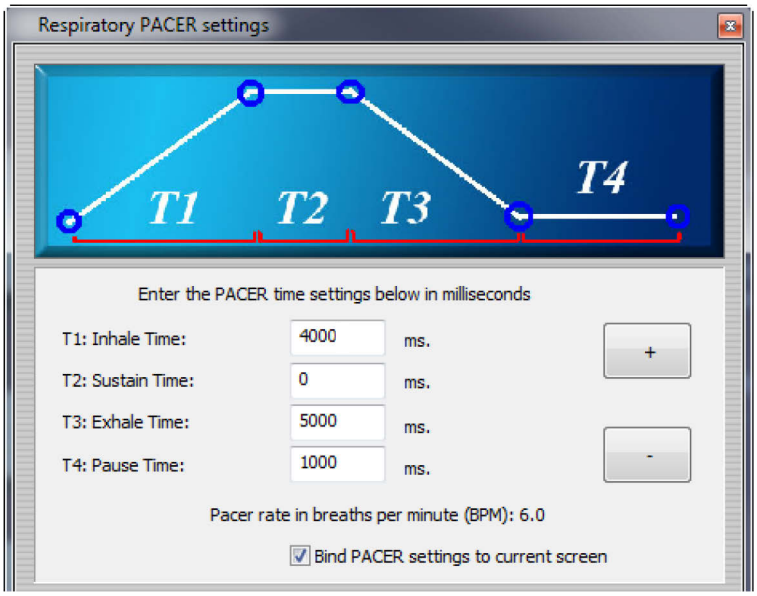
The pacer settings can be saved in "LF-Resonant Frequency and Pacer Settings" by clicking 'Set Pacer & Save for Client'.

In the "RSP/HRV Pacer settings" these settings can be loaded or new settings can be saved.

Save and load client settings in "RSP/HRV Pacer Settings"

Bind pacer settings

In order to create pacer protocols, it is possible to bind pacer settings to a specific screen, or even unbind a pacer setting from a screen. This comes in handy when creating a resonant frequency protocol featuring multiple screens with various pacer frequencies. This can be set in the "RSP/HRV Pacer Settings":



Bind pacer settings in "RSP/HRV Pacer Settings"

2. Z-score 4 channel

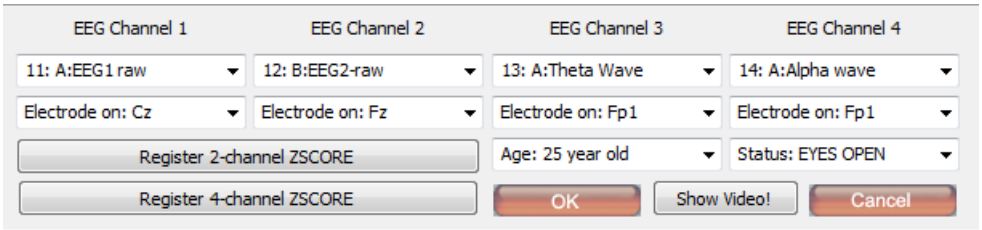
4 Channel Z-score allows for Z-score training of up to 4 individual scalp sites as well as connection between those sites.

With Z-score, EEG Data is compared to the Neuroguide Normative Database in real-time. It is a simplified training where the trainee receives reinforcement as soon as their EEG falls within a set limit such as plus/minus 1.0 Z-scores or standard deviations.

The goal is to train towards norm values. Z-score allows for calculating metrics such as power, asymmetry, ration, phase and coherence amid 8 discreet bandwidths.

This feature is available for NeXus-10 and NeXus-32. 2 Channel Z-score users can easily upgrade to 4 channel.

Press the 'Z' key to open the "Z-Score Configuration and Channel selection".



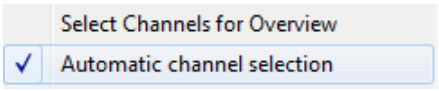
Z-Score configuration and channel selection

3. Improved analysis functions

BioTrace+ now includes improved analysis functions for better and easier analysis of session data.

Automatic channel selection

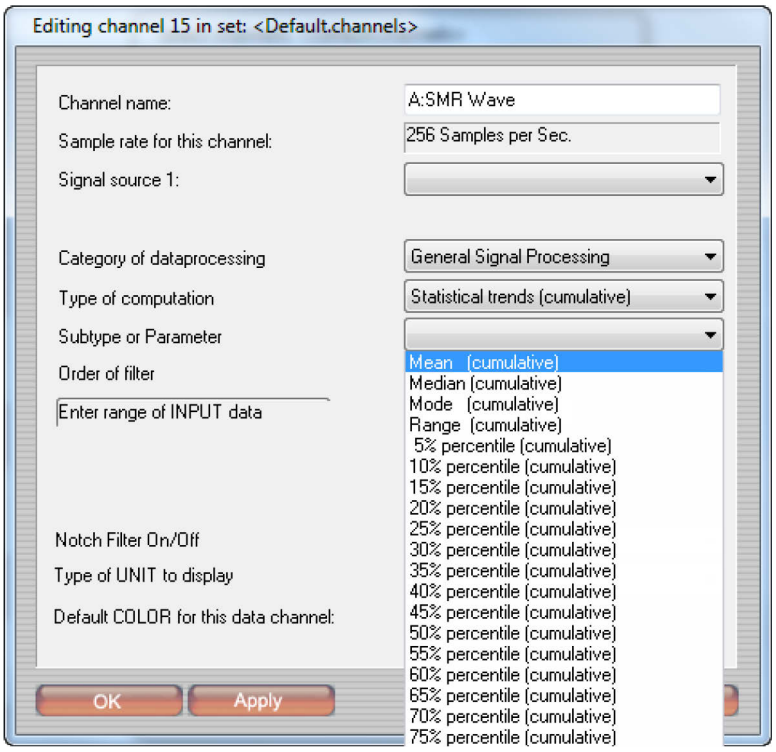
BioTrace+ can now automatically show all the signals from the feedback screen mode in the session overview screen mode by right-clicking in the overview screen mode and selecting 'Automatic channel selection'.



New statistical trends

A new real-time statistical computation has been added. During a measurement the cumulative mean, median, mode and range can be derived. By setting the range, the resolution of this statistical calculation can be controlled.

These statistical trend computations can be found in the "General Signal Processing" category when editing a channel.



"Editing channel" screen

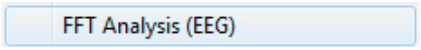
Improved data export function

Improved Matlab Export, client data and session data are now exported as two separate files. EDF+ files have been optimized for export of DC-signals.

Change output format into *.mat by opening the "EXPORT of Session data" dialog box. Select 'Export SELECTED data' in the session overview mode to open this dialog box.

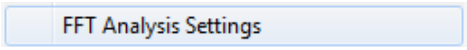
FFT analysis

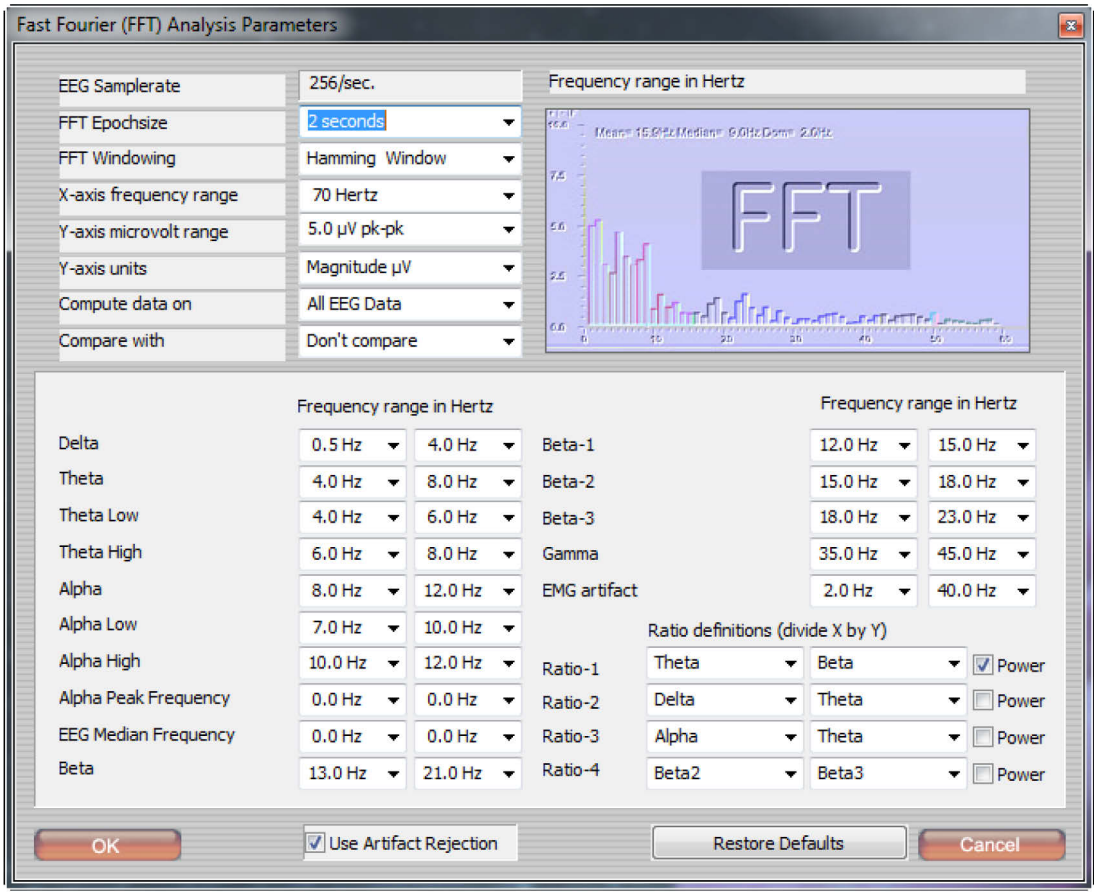
An offline Fast Fourier transfer (FFT) analysis for 2 channels of EEG has been added to the "Analysis Functions:" in the session overview screen mode. This function offers you the possibility to create offline spectra of 2 EEG channels.



See "Appendix II - FFT report" for an example of a FFT report.

FFT Analysis settings can be changed through 'Configuration' > 'FFT Analysis Settings' in the top menu.





"FFT Analysis Parameters" configuration

4. Improved protocol automation

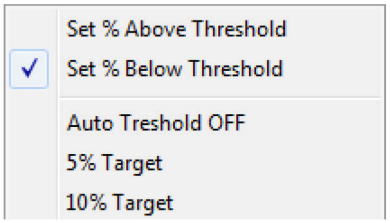
BioTrace+ now includes various functions that can be used to improve protocol automation.

This functionality will be integrated gradually in upcoming releases.

Set threshold target using numerical indicator

A numerical indicator, linked to an object using an automatic threshold, will enable the user to quickly change the target level of the automatic threshold.

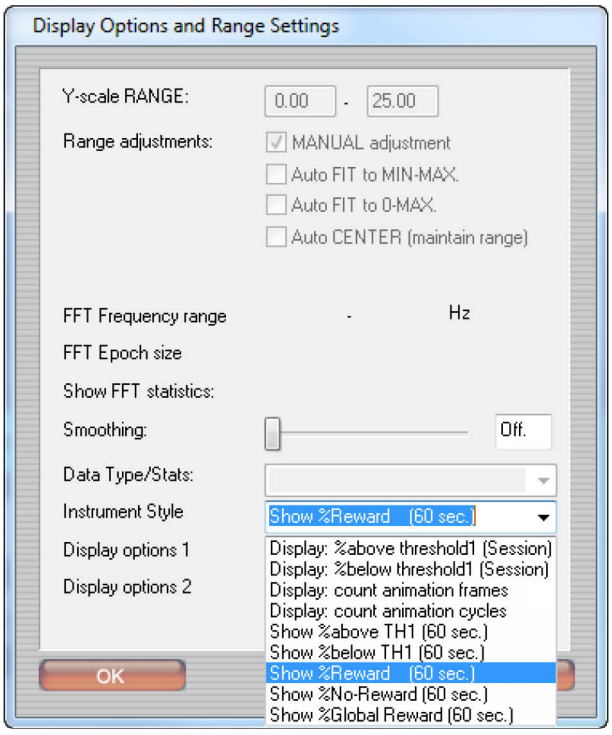
The numerical indicator, if set as described here, will show a button "AT" (Automatic Threshold). This button will open the target percentage list.



Set thresholds target

New numerical indicator display options

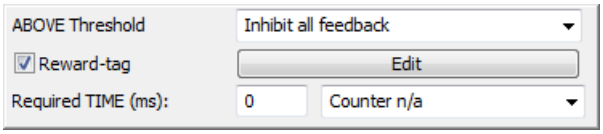
The numerical indicator instrument now features new "instrument styles". Among these new functions is the option to 'Show %Reward'. This can be used in combination with the reward-tag of the object/instrument the numerical indicator is linked to.



Display options and range settings

Add reward-tags

The object-menu "Feedback Options & Thresholds" now makes it easier to track a reward state. Above and/or below threshold can be selected as "Reward". This reward-tag can be used in combination with the aforementioned ‘show %reward’ function. The software will show the percentage of time the reward criteria is met.



Feedback options & thresholds

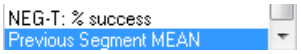
New button actions

The button actions offer numerous possibilities to automate protocols (e.g. hyperlinking to screens, starting protocols). The following button actions have been added to the list:

- Set threshold based on earlier recorded segment (set a threshold for a specific channel, based on the (mean)value of this channel during a segment recorded earlier in that session)
- Push object settings (Push various feedback settings to a specific object in the same feedback screen; color settings/feedback and threshold settings/display options and ranges etc.)
- Open visual content control (opens the video or animation box if this object is present on the primary or secondary screen)
- Open "Frequency Control Panel" (in addition to the shortcut ‘Shift' + 'C’, the "Frequency Control Panel" can now be loaded using a button)

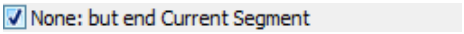
New display options and ranges

Objects can now benefit from a feature called ‘calculate mean value of previous segment’. In combination with the ‘set threshold based on segment’ option (see "New button actions"), the user can provide a reward, only if a particular criteria is met.



Improved sequence script editor

The "SCRIPT editor" is now equipped with the option to end a current (or previously created) segment. Without this function, the current segment will only stop when a new segment is created.



Open the "SCRIPT editor" by pressing the 'Q' key or by selecting 'Screen' > 'Edit Sequence Script' in the top menu.

5. Trial functionality

This trial editor automates various aspects crucial to trial based training:

- Trial runs (positivity, negativity, positivity-transfer, negativity-transfer)
- Cue screen (showing an very brief explanatory text to the client)
- Reward screen (if reward criteria is met)
- VEOG calibration
- Real-time VEOG correction
- Real-time DC-drift correction
- Real-time Artifact rejection
- Repeat trials if failed due to artifact

After completion of the trial based training, the user can choose to analyze the data using the Averaged Response. If required, the user can redefine the artifact criteria in the editor and reanalyze the data in the Averaged Response.

The trial editor also makes it possible to define various trial screen sets. These sets can be chosen during the trial-run by using the keyboard's function keys (F1=SET1, F2=SET2 etc.).

This functionality will be integrated gradually in upcoming releases.

6. Improved system performance

BioTrace+ V2013 includes some new functions for improved system performance.

Higher sample rates

It is now possible to select sample rates of up to 8192 Hz when recording via USB (only for NeXus-10 MKII). Press the 'I' key to open the "Sensor Input and Sample rate configuration" and select 'Unlock samplerates' for changing sample rates (e.g. 8192 SPS).

New video engine

The video engine is replaced in order to extend the video capabilities of BioTrace+. The main advantages of the new engine are the support of multiple captures simultaneously, the capability of modifying/manipulating the video (replay) on the fly, transparency, shrinking, altering speed etc.

These capabilities will be integrated gradually in upcoming releases.

New driver for NeXus-32

BioTrace+ now also offers compatibility with Windows XP and Windows 7 64 Bit systems for the NeXus-32.

7. Miscellaneous improvements

BioTrace+ V2013 also includes various miscellaneous improvements.

Extension to 128 data-channels

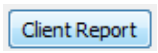
BioTrace+ now offers up to 128 channels. Sessions recorded using older versions of BioTrace can simply be recomputed to this new channel set. The existing channel set will simply be extended to 128 channels, showing ‘undefined channels’ from 81 to 128. Sessions recorded in or recomputed this version, are backwards compatible to older versions only supporting 80 channels.

Quickly replay/ pause a session

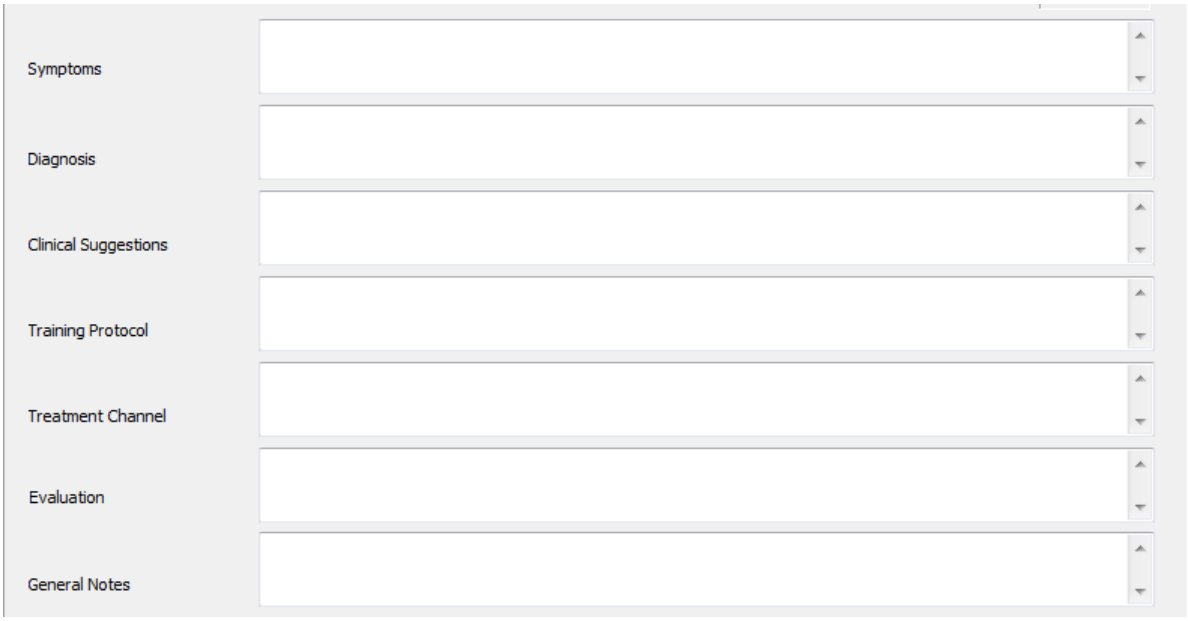
A new shortcut has been added. Hit spacebar for quickly replay or pause a session during replay mode.

Add a client report

In the "Client and Session Database" a client report can now be added. This can be performed with the button 'Client Report':

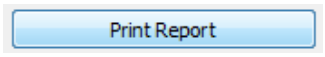


This will open the "Client Diagnostic Report" screen where additional information of the client can be added or edited.



Client diagnostic report

It is also possible to print this client report by pressing 'Print Report'.



Improved user manual

The BioTrace+ user manual has updated content and an improved structure for better finding information This manual is included in BioTrace+ and can be found in the top menu under 'Help' > 'Read the software manual'.

General fixes

The following functions have been fixed, improved, or added for more stability, better quality, and higher performance of BioTrace+:

- The export of rate signals like respiration rate and heart rate;
- The computation of the Interbeat Intervals;
- The second parameter for the automatic artifact functionality;
- The printing of the client report;
- The notch filter;
- Enabling/disabling intro sound;
- The import routine of new patients when editing patient properties;
- The data/time selection of the overview screen;
- Texts, translations, and images;
- Splash screen when running the software;
- The edit channel dialog when canceling the changes to the data channel/computation;
- Locking thresholds;
- Labeling for the Neuroguide export.

Appendices

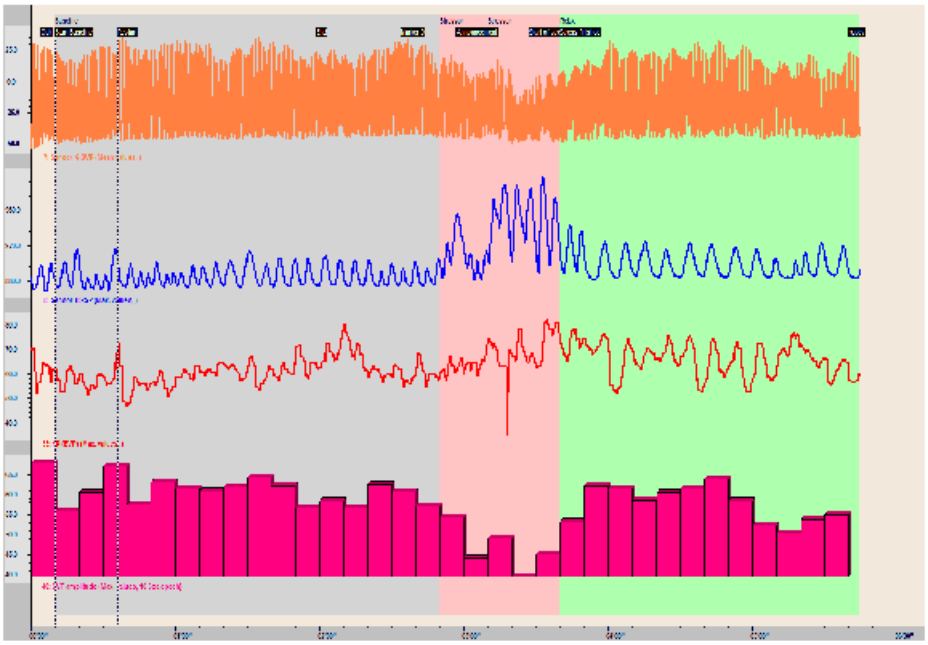
Appendix I - RF report

BioTrace+ Physiological Data Report
My Clinic - 222 Princess Anne StreetFredericksburg, VA 22401

MINDMEDIA

Concise Client and Session information:

Client: John,Sample [ID=000026]
Session: stress test short
Date and Time: 17:31:53 17-04-2008 Duration: 5min45sec.



HRV resonant frequency information:

Segment-01 [Baseline]: Peak.Freq. 0.102Hz (Power: 391.0 ms^2)
Segment-02 [Relax]: Peak.Freq. 0.109Hz (Power: 780.7 ms^2) <-- MAX POWER found at 6.6 cycles/minute.

Automatic Artifact Rejection was OFF. [0] user defined artifact area(s) found.

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Appendix II - FFT report

BioTrace+ Physiological Data Report
My Clinic - 222 Princess Anne StreetFredericksburg, VA 22401

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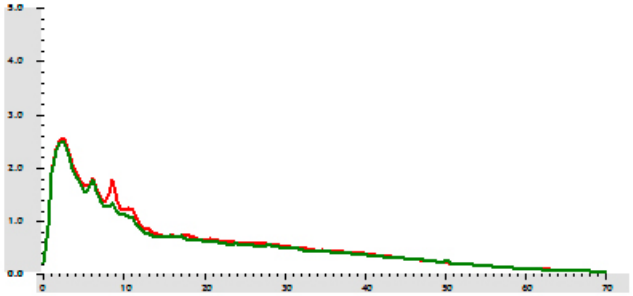
Concise Client and Session information:

Client: John,Sample [ID=000026]
Session: 2xEEG-SCP Recording
Date and Time: 16:30:04 09-03-2005 Duration: 0min13sec.

FFT Spectrum Analysis for 2 channel(s)



Y-Range:	*5.00 µV pk-pk*
X-Range:	*0 - 70 Herz*
Samplerate:	*256 samples/sec.*
FFT Epoch:	*2 Seconds*
FFT points:	*512 Samples*
BIN size:	*0.50 Hz.*
Windowing:	*Hanning Window*
Overlap Step:	*250 milliseconds*
Total Epochs:	*2585*
Rejected:	*52 (2.0 %)*

EEG Channel	Name	Band	Ampl.(µV)	Power (µV2)	Rel.Magn.(%)
10:A:EEG1 raw	Delta	0.5 - 4.0 Hz	14.7	215.0	19.6
	Theta	4.0 - 8.0 Hz	13.3	175.7	17.7
	Theta Low	4.0 - 6.0 Hz	7.0	49.1	9.3
	Theta High	6.0 - 8.0 Hz	6.3	39.1	8.3
	Alpha	8.0 - 12.0 Hz	10.7	113.7	14.2
	Alpha Low	7.0 - 10.0 Hz	8.7	76.3	11.6
	Alpha High	10.0 - 12.0 Hz	4.7	22.4	6.3
	Beta	13.0 - 21.0 Hz	11.5	133.3	15.4
	Beta-1	12.0 - 15.0 Hz	4.9	23.7	6.5
	Beta-2	15.0 - 18.0 Hz	4.4	19.1	5.8
	Beta-3	18.0 - 23.0 Hz	6.6	43.5	8.8
	Gamma	35.0 - 45.0 Hz	7.6	58.2	10.2
	50 Hz	49.0 - 51.0 Hz	0.9	0.8	1.2
	EEG Band	0.5 - 45.0 Hz	75.0	5623.9	100.0
11:B:EEG2-raw	Delta	0.5 - 4.0 Hz	14.3	205.1	20.2
	Theta	4.0 - 8.0 Hz	12.7	161.7	18.0
	Theta Low	4.0 - 6.0 Hz	6.7	45.0	9.5
	Theta High	6.0 - 8.0 Hz	6.0	36.1	8.5
	Alpha	8.0 - 12.0 Hz	9.2	83.9	12.9
	Alpha Low	7.0 - 10.0 Hz	7.6	57.1	10.7
	Alpha High	10.0 - 12.0 Hz	4.2	17.9	6.0
	Beta	13.0 - 21.0 Hz	11.0	120.4	15.5
	Beta-1	12.0 - 15.0 Hz	4.6	21.0	6.5
	Beta-2	15.0 - 18.0 Hz	4.3	18.1	6.0
	Beta-3	18.0 - 23.0 Hz	6.2	38.5	8.8
	Gamma	35.0 - 45.0 Hz	7.3	53.3	10.3
	50 Hz	49.0 - 51.0 Hz	0.9	0.9	1.3
	EEG Band	0.5 - 45.0 Hz	70.8	5016.0	100.0

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