



User Guide

CODESNA_HRV software

Autonomic Nervous System Analysis

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Description

- **CODESNA_HRV is intended for the analysis of HRV recorded files (R-R interval in msec)**
- **The software implements 2 analysis methods**
 - CODESNA method (patented)
 - The method known as « Task Force 1996 »

Delivered markers

- **CODESNA method**

- Total power in msec²
- Standard deviation
- Orthosympathetic activity (in msec² and %) and in real time
- Parasympathetic activity (in msec² and %) and in real time
- Level of global stress (centered on 100%, Stress if >100, no stress if < 100%)
- Resting factor R (R>1 means physiological rest).
- Time spent in Orthosympathetic and Parasympathetic mode
- Respiration (cycles /minutes) – more accurate at rest
- Entropy of Orthosympathetic and Parasympathetic (level of opposition between both Systems in %)

- **Method from « Task Force 1996» specification**

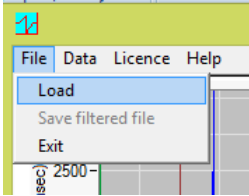
- HF, LF, VLF en msec²
- Total Power in msec²
- RMSSD in msec
- Option to separate LF/HF using respiratory frequency (or to choose the default 0.15 Hz)

Characteristics

- Compatible with various RR file type: Polar (*.sdf), Suunto (*.hrm), (R-R column in msec) *.txt, *.xml
- Real time and average of orthosympathetic and parasympathetic activities
- Arythmia/artifacts automated detection and alert within choosen analysis segment
- Artifacts filtering (automated and user selectable)
- Capability of saving filtered files (with filter activated)
- User friendly analysis (« drag and drop » cursors)
- Multi-files analysis over the same pre-selected window and concatenation of the results in a single *.csv file
- Export any selected segment to a *.csv files (both real time and average results)

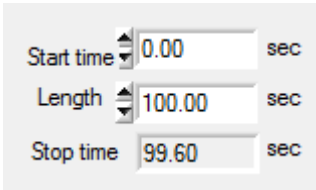
Save/concatenate the results of several files into one *.csv file (Excel)

1



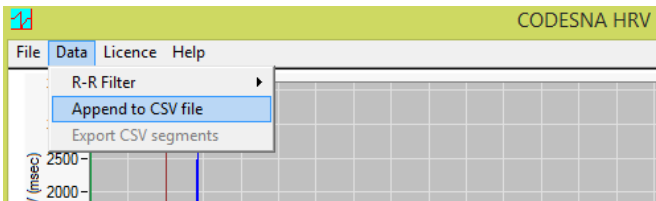
Load the first file to analyse

2



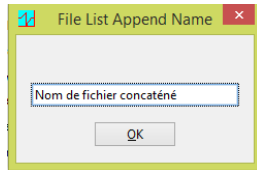
Choose the wanted analysis segment (this will remain the same for all incoming files to load)

3



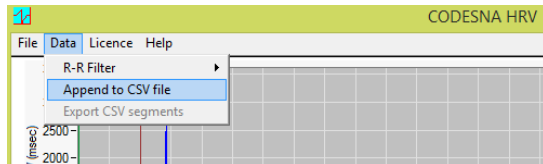
Save the results into the file

4



Choose the file name to keep all the results

5



Save the results into the named file

6

Redo steps 1 and 5 for all files to analyse and concatenate

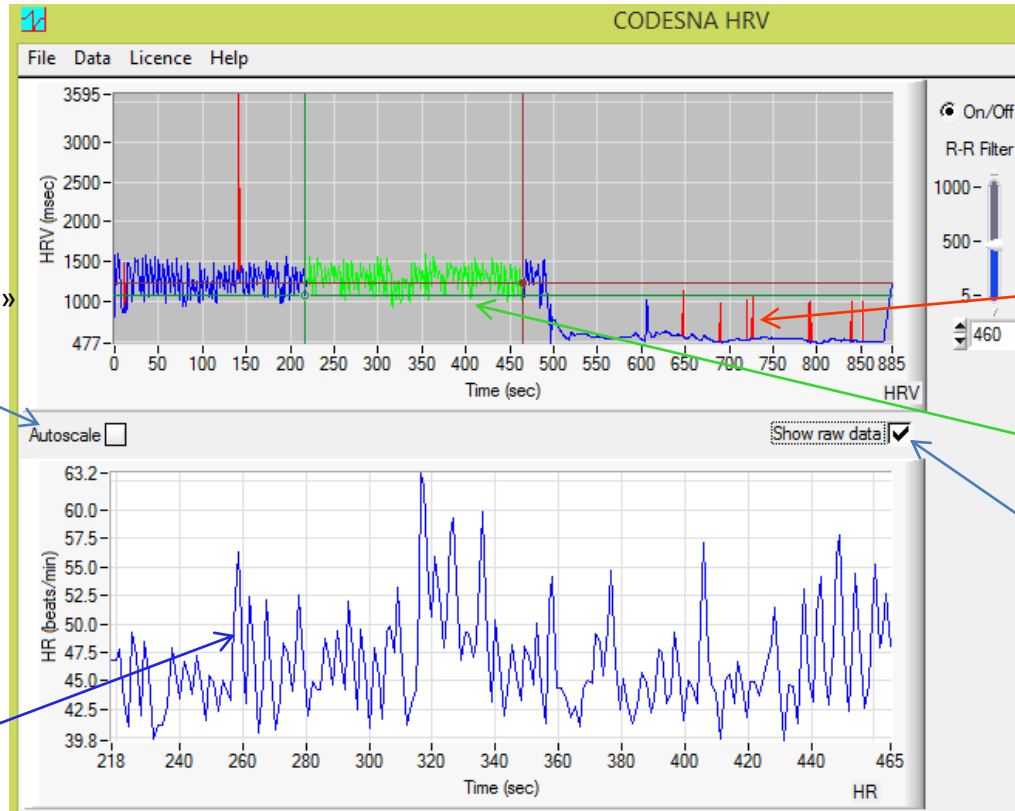
Exemple of concatenated results

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Date	Start(sec)	Stop(sec)	HR(bts/min)	Stress(%)	Ortho(msec	Para(msec^2)	Para Entrop	Symp Entrop	RFactor	Fatigue(%)	RMSSD(mse	LF(msec^2)	HF(msec^2)	Respiration	File Name
2	29.10.2014	54.56	426.38	70.03	93.52	1257.81	1432.01	0.71	1.57	1.771	0.492	39.409	725.61	943.39	12.95	C:\Normal_
3	03.12.2009	54.56	425.67	47.15	121.53	15683.68	10127.58	26.29	3.51	0.244	0.036	214.704	4729.78	16377.23	14.30	C:\Patholog

- * The total power is not directly printed to the file; to calculate it, you just need to add the Ortho and Para power : $P_total(msec^2) = Ortho(msec^2) + Para(msec^2)$
Similarly, for VLF calculation: $VLF = P_total - (HF + LF)$

- ** An additional parameter (experimental for now) is calculated among various results, named « Fatigue ». If Fatigue = > 1, this might indicate an ANS fatigue.

User Interface



ON/OFF filter with manual setting

Filtered artifacts. In red, raw data. In blue, filtered signal

R-R segment of choice

Display/Hide the raw data (In red if Filter is ON)

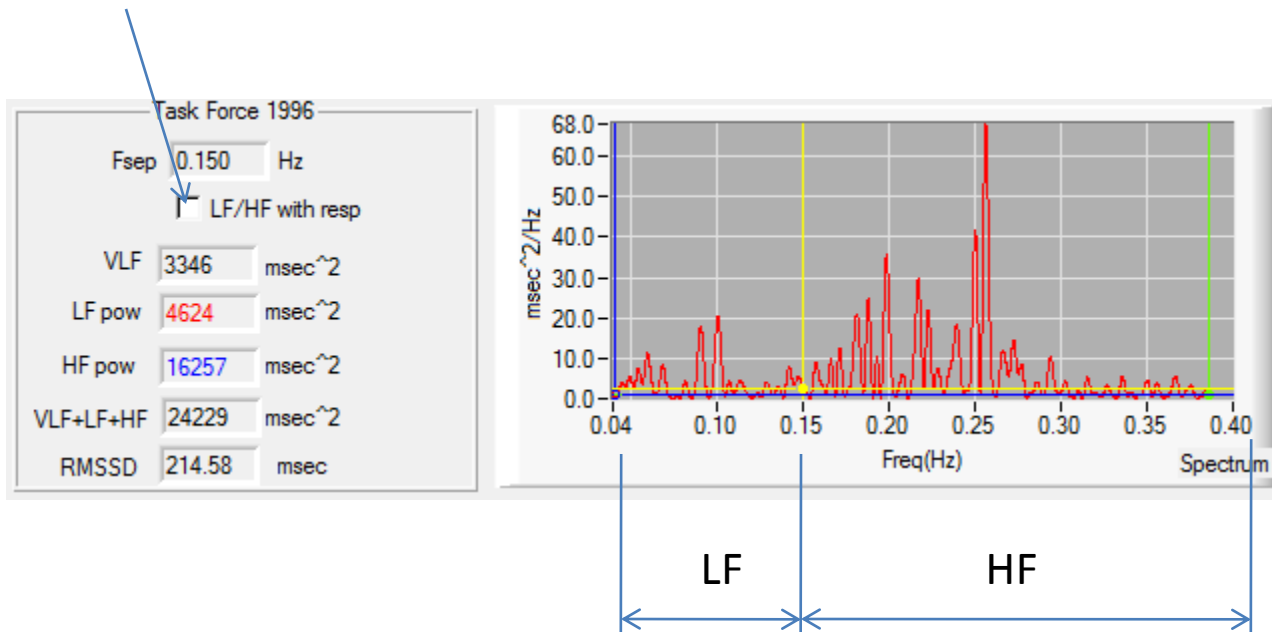
Heart Rate on the segment of choice

Get back after a zoom with mouse's « CTRL+right click »

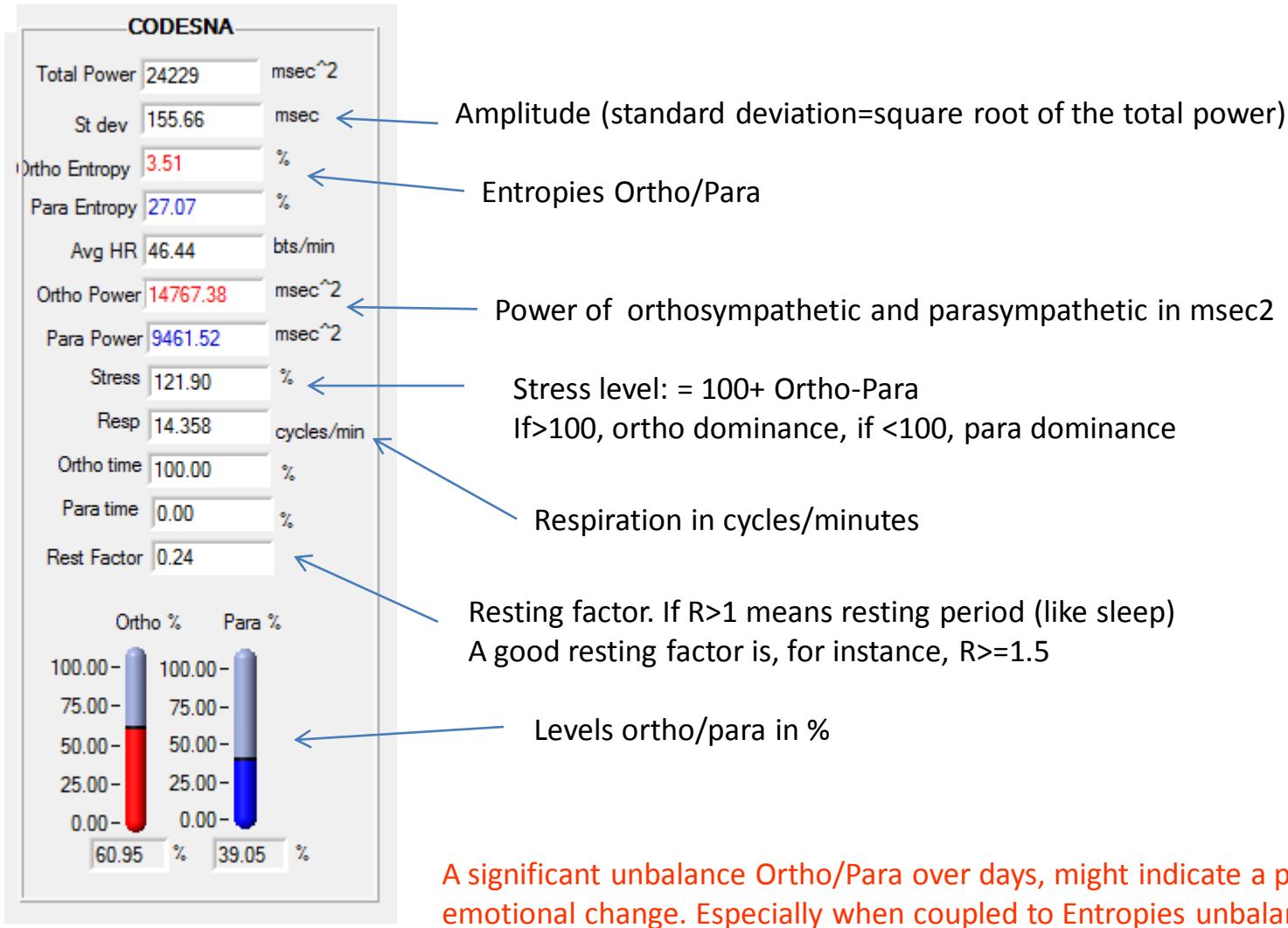
User Interface – Results from « TaskForce 1996 »

Separate LF/HF using respiratory frequency. By default, it is 0.15 Hz as defined by the « Task Force » specification.

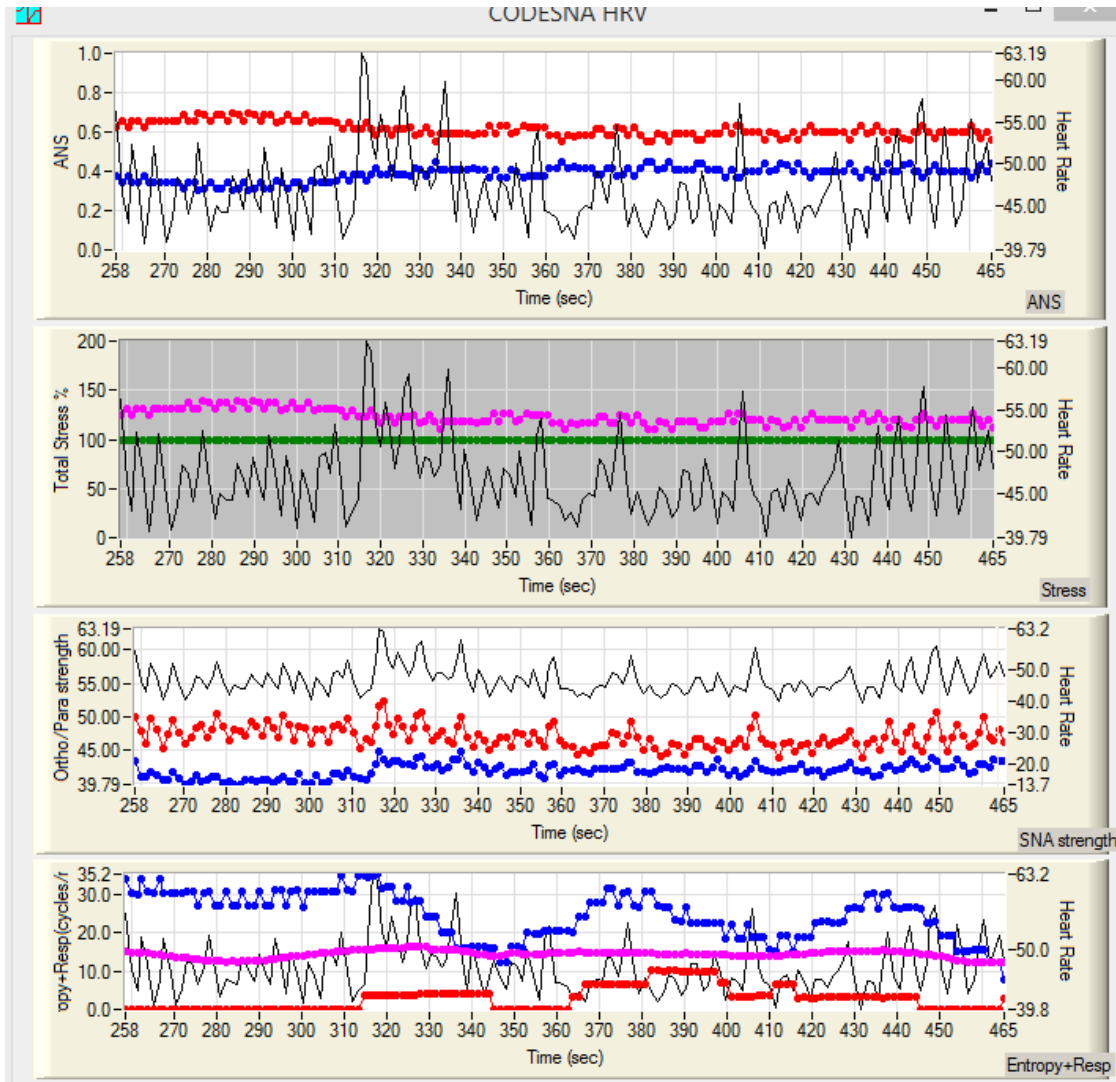
More valid at rest (seated or lying down)



User Interface – CODESNA results



User Interface – Real time on the selected segment



Relative Ortho activity
Relative Para activity
Heart rate (right scale)

Stress level in % (=100+Ortho-Para)
Heart rate (right scale)

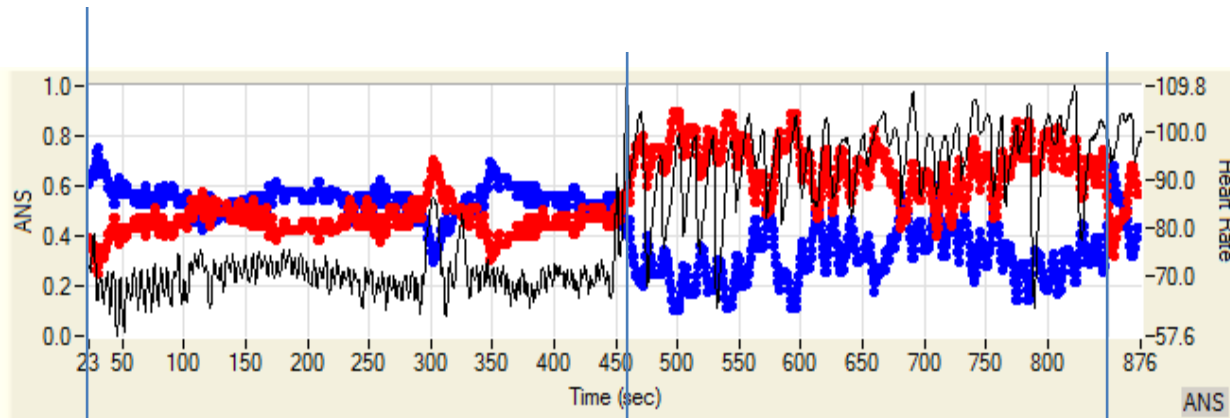
Ortho activity in en beats/min
Para activity in beats/min
Heart rate (right scale)

Ortho Entropy in %
Para Entropy in %
Respiration in cycles/min
Heart rate (right scale)

Samples data files

- The software is delivered with 2 files recorded using a Suunto chest belt (*.sdf)
 - Used protocole: ~7 minutes lying down, ~5 minutes standing up.
- « *Healthy_athlete_with_measurement_spikes.sdf* » healthy athlete record with spikes on the signal. Filter usage is emphasized here.
 - « *Pathological_SNA_athlete.sdf* » pathologically exhausted athlete, formal diagnosis . Autonomic regulation is hectic.

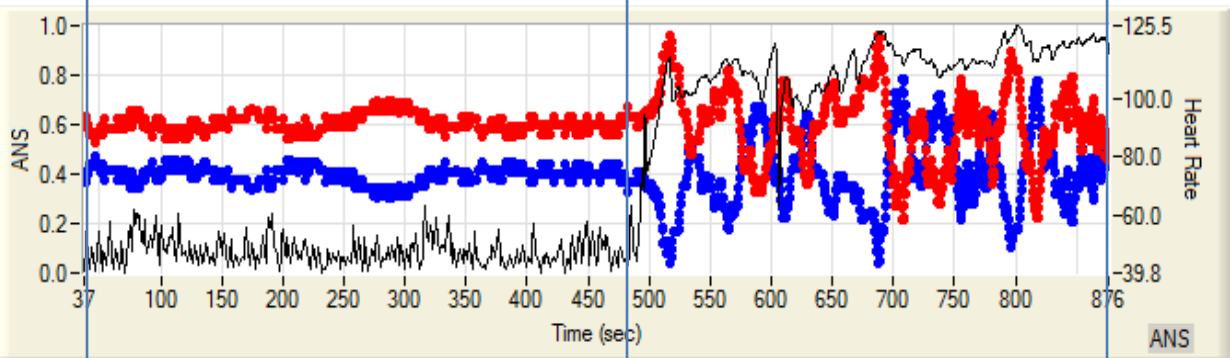
Autonomic regulation for both files



Normal ANS response:

Lying down: Para is dominant (blue)

Standing up: Ortho is dominant (red)



Bad ANS regulation:

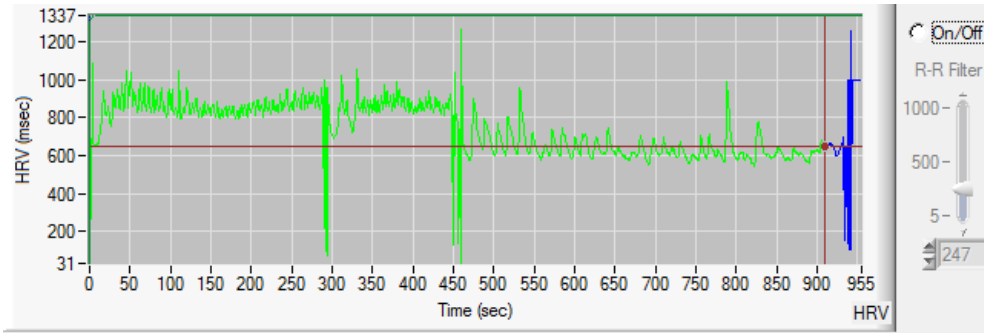
Lying down: Ortho highly dominant (red), without crossing the Para

Standing up: Ortho dominant (red) with small variability and Heart Rate drift

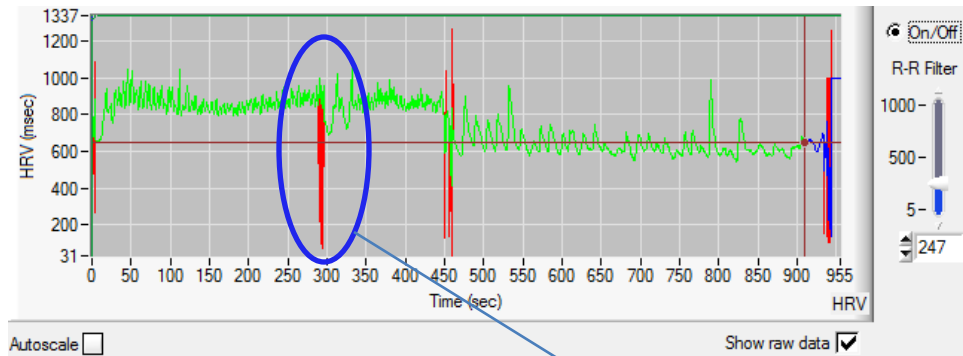
Lying down

Standing up

CODESNA R-R filtering

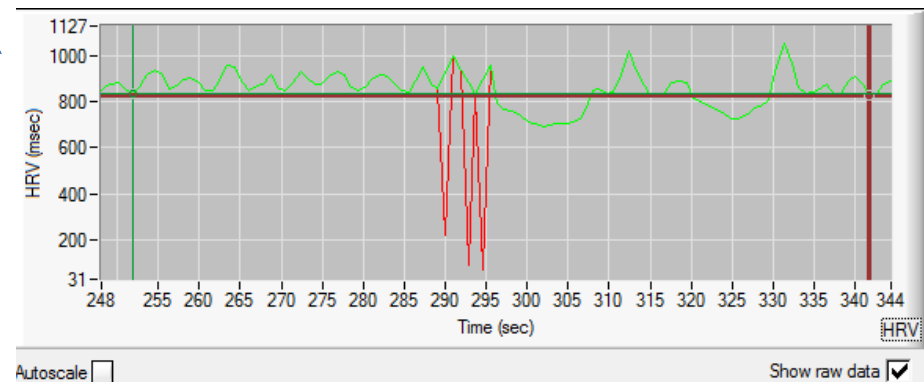


Filter « OFF »



Filter « ON »

Zoom on filtered artifacts



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