Functional Health
and
COVID-19 Diagnosis System

VibraHT

Version 10.2.1.954

MANUAL

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CONTENT

1 Introduction

Welcome to the VibraImage World! Thank you for your purchase of VibraHT system. This Manual written to help you enjoy vibraimaging and open new features in well-known objects!

VibraHT diagnoses functional health, COVID-19 and psychophysiological parameters of a person by reflex head movement analysis basis vibraimage (VI) technology and artificial intelligence (AI).

A vibraimage is the image, each point of which reflects spatial and temporal parameters of vibration and movement of an object. VibraImage technology relates to biometrics, and can be used for measuring, processing and analysis of the psychophysiological state of living biological objects, fixed in space (quasi-stationary), e.g., standing or sitting in one spot.

1.1 Basic applications

Software VibraHT is designed to monitor the level of functional health, COVID-19 diagnosis, and psychophysiological parameters calculation and is suitable for:

- Monitor any disease or pathology;
- Comparison of functional health status for several people;
- Estimation of health dynamics for fitness, sport and wellness;
- COVID-19 diagnoses;
- Medical, psychophysiological and psychological research providing.

1.2 Computer and Camera Requirements

1.2.1 Basic parameters

- Resolution, TVL, more than   400
- Noise level of vibraimage, bit, less than   0,1
- Frame speed, FPS, not less than   25

1.2.2 Digital (web) camera requirements

- Resolution, pixel, not less   640 x 480
- USB compatible   USB 2.0, USB 3.0
- Frame speed, FPS, more than   25
- Exposition control   main and auto
- Color mode (b/w preferable in settings)   b/w
- Flicker mode   Flicker 50 Hz and 60 Hz

1.2.3 System requirements for computer

- Operation System   Windows 7/8/10 or later 64-bit only
- Processor   Intel I5 or higher
- RAM   more than 4 Gb
- HDD   more than 100 Mb free space
- USB port   1 free USB ports version USB 2.0
- Installed software   Microsoft Office Excel 2010 (64-bit only) and higher
- Video capture   WDM-compatible video device

1.3 Package contents

1. VibraHT software   -   1
2. Activation code   -   1
3. User's manual   -   1
4. Digital USB camera (hardware)   -   1 (option)
5. Microphone (hardware)   -   1 (option)
6. Personal computer (hardware)   -   1 (option)

Attention!

Hardware with the specified parameters isn't included in the delivery. User gets the hardware for the VibraHT system themselves.

Rcommended to use Microsoft LifeCam Studio webcam or similar with parameters not worse than this webcam.

1.4 Requirements for a relative position of a person and a camera

The basis of the VibraHT program is vibraimage technology which can provide a high-quality result only by analyzing high-quality video. To do this, you must fulfill all requirements of paragraph 1.2.2, 1.2.3. As well as to meet the requirements of paragraph 1.2.1 it is necessary:

1 the tested person to sit in front of a camera and without leaning on the elbows, neck, back and head

2 fix the camera (on the monitor, on the tripod, etc.) in front of the tested person

3 face lighting should be uniform

4 the camera should be focused on the person's face

Fig. 1.1 shows the ideal position of a person in front of the camera, and fig. 1.2 – the ideal image of the person in the frame.
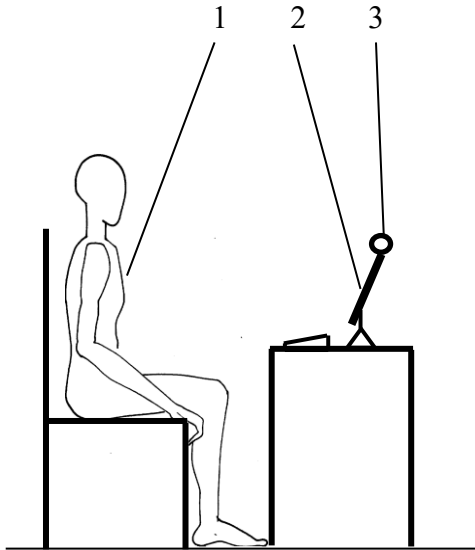

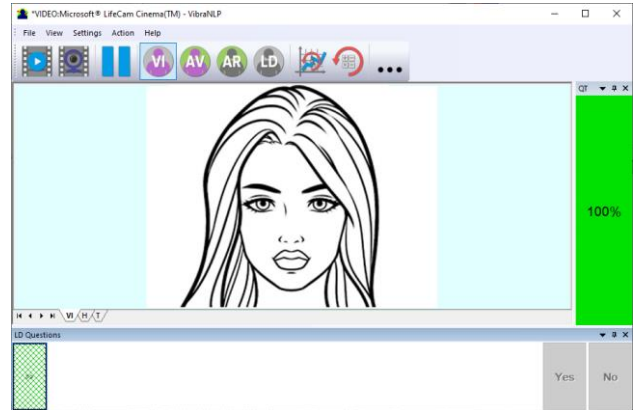
Fig. 1.1 Ideal test conditions

Fig. 1.2 Ideal image of the person in the frame

For convenience, you can enable the Automatic video quality test in the settings section (see section 4.4), then an assessment as a percentage of video quality will appear on the left side of the program.

VI10HT

2 VibraHT software installation

It is necessary to execute the following actions for installation of VibraHT program on your computer:

1. Go to Web page http://www.psymaker.com/support/downloads/
2. Download file setupVibraHT.exe by link http://www.psymaker.com/downloads/setupVibraHT.exe
3. Run file setupVibraHT.exe
4. Select language for installation procedure.
5. Press button «Next» in the appeared window of the beginning installation.
6. Accept the license agreement and to press button «Next» in the appeared window.
7. In the appeared window, specify a way to the catalogue where files of the program will be written down, then to press button «Next».
8. Press button «Next» in the appeared window, allows installation of software files on your computer.
9. Selecting an additional icon allows to display the icon on the computer desktop.
10. Press button «Install» at the start of installation.
11. Press button «Finish» at the end of installation.
12. VibraHT program icon appears after the end of installation in system menu on desktop of your computer.
13. To reboot a computer.
14. Verify that the camera is connected to the computer and run the program.

Note: VibraHT has 3 free starts without activation procedure (DEMO mode) but with requirement an access to the Internet.

2.1 VibraHT software activation

1. Procedure of activation is done once at the first start of the program.
2. Before the program activation it is need to buy this version of the program in the online store Psymaker http://www.psymaker.com/store/
3. Activation procedure requests access to the Internet for receiving answer code from server.
4. Activation code has the structureVI10_xxxxxxxx_HT.
5. VibraHT supports dongle of Vibraimage PRO and HT dongle.

2.1.1 Standard activation

1. Run VibraHT program to begin an activation.

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2. At the first start of the program the activation window will be displayed (Fig. 2.1).
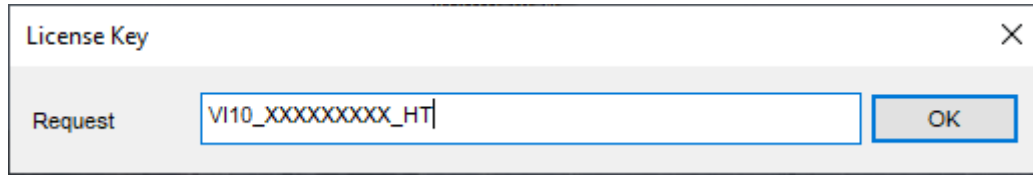

Fig. 2.1. Activation window.

3. In the field «Request» it is necessary to enter the activation code received by e-mail or specified by the seller (Fig.2.1)

Attention!

Please, be careful and paste code without additional gaps!

4. After input of activation code to press the button «OK».

5. The activation code will be checked up through the Internet and, VibraHT will start automatically in case of successful end of activation procedure.

6. Start to work with the system in accordance with this manual.

2.2 VibraHT reinstallation

Note, it is recommended to uninstall the VibraHT program before any upgrade software or hardware on PC and to reinstall after this upgrade.

For this purpose, it is necessary to execute the following actions:
1. Connect to the Internet a computer on which one of VibraHT has been installed.
2. Start program to reinstall on a new computer.
3. In the menu «Help» (Fig. 2.2) choose the item «About HealthTest…» (Fig. 2.2).

Fig. 2.2. Menu «Help»

4. In the opened window press the button «**Unregister key**» (Fig. 2.3).
5. Close the program.
6. Connect a new computer to Internet.
7. On the new computer install the program and make registration of an «old» modification activation code through the Internet, according to recommendations of section 2.1.
8. After successful program registration the given activation code will be fixed to the given computer.

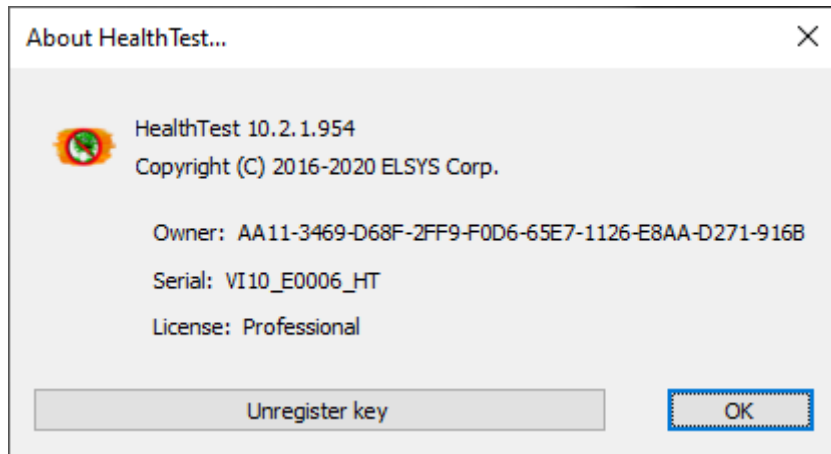*Fig. 2.3. Information about the program*

2.3 First start

1. After successful activation of the program at the first start, if you are not connected to a camera, you will see the program window shown on Fig. 2.4.
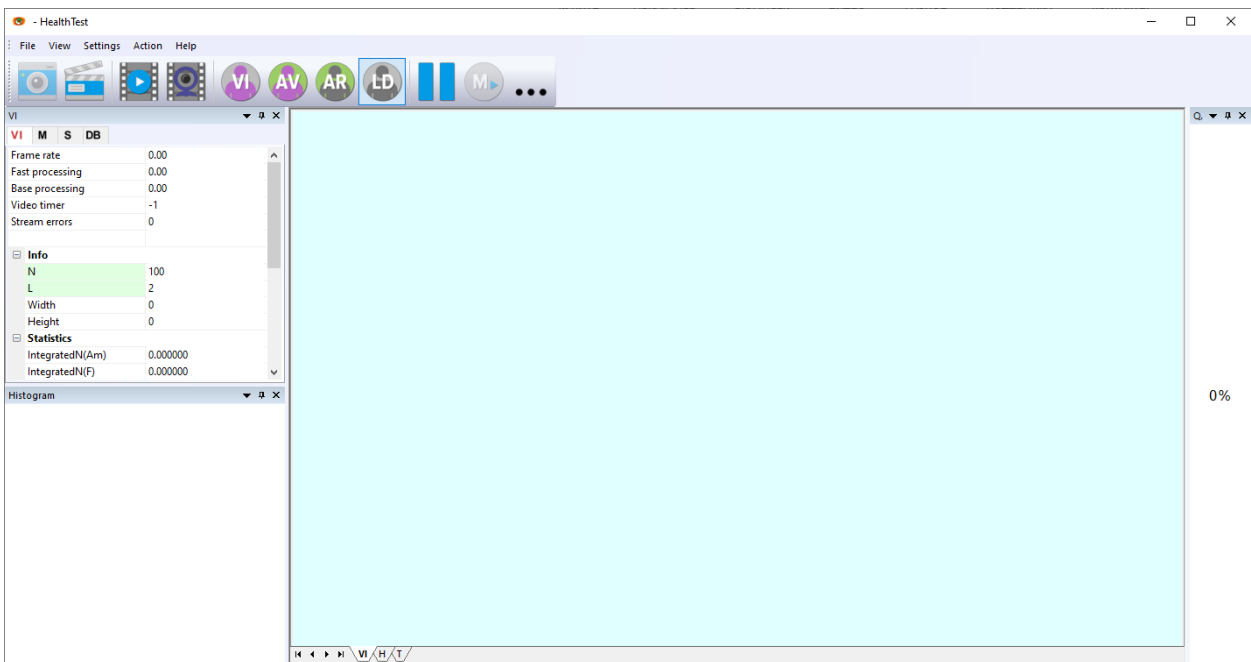
Fig. 2.4. First start

2. Select program language (Fig. 2.5) in the menu "**Settings**" => "**Language**". By default language is English.

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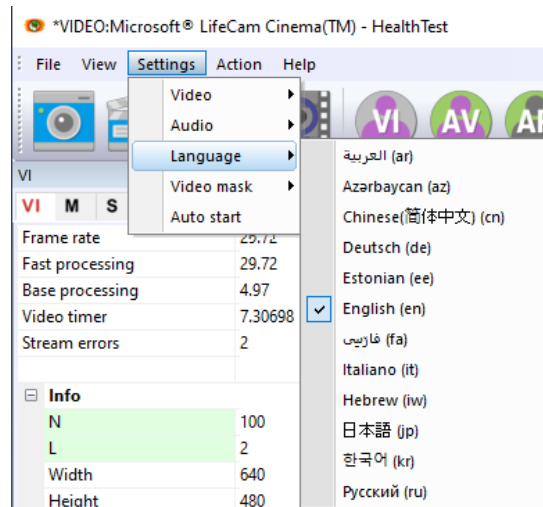
Fig. 2.5. Selecting a language

3. Select a camera in the menu "**Settings**" => "**Video**" (on a Fig. 2.6 – Microsoft Lifecam Cinema).

   If the program does not see your camera, check the connection of the camera to the computer. After selecting a camera, an image will appear on the screen.
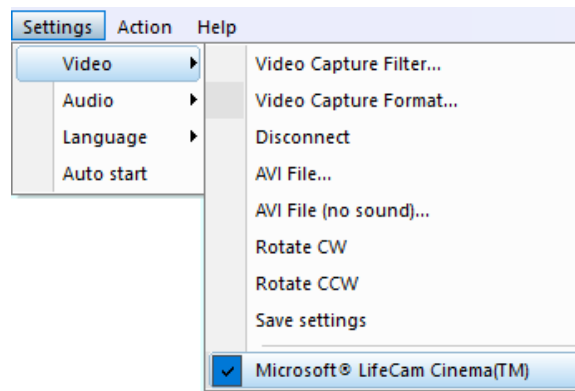
Fig. 2.6. Selecting a camera

4. Set the camera parameters (see section 2.4).
5. Check video quality (see section 2.4.5). It should be more than 80%, that is, the column on the left side of the program should be green and, if necessary, eliminate the causes of low-quality video (1-5 errors).
6. Specify the catalogue where video files, files of images and files of statistics will be save (see section 3.4.4).
7. Press button in the toolbar to start measurement. Duration of a measurement is 60 sec by default. It is recommended to set duration 180 sec in the information panel (mode «M») to increase accuracy of the measurement more than 90 % (see section 3.4.2).
8. After that time result for analyzing will open automatically (see section 5).

2.4 Camera's setting

Correct camera settings is very important operation for the next vibraimage processing, because mistakes in image quality have great influence to the vibraimage processing results.

2.4.1 Video camera choice

It is necessary to select in the main menu **«Settings»** => «**Video**» => «.../**name used camera**/...». In figure 2.6 the process of selecting camera «Microsoft LifeCam Cinema» is shown. If the camera is connected, selected and works, then on the left of the name there will be an icon « ✔ » (Fig. 2.7), and the menu will be extended with the **«Video capture filter...»** and **«Video capture format...»**.

VibraHT system allows to processing as the «alive» video signal acting from a video camera, and the video data, before written down and saved as an AVI-file. On default the system works with a signal from a video camera. Subitems **«AVI File … F3»** and **«AVI File (no sound)… Ctrl+F3 »** are intended for a choice for the analysis of an external videofile.

2.4.2 Video capture filter

Select «**Video capture filter......**» in the submenu «**Video**» (Fig. 2.7) for open menu of the camera settings. Item «**Video capture filter...**» appears in the menu only in case of the correct installation of camera drivers and correct choice of operating camera.

After a choice of the «**Video capture filter...**» the window «**Settings**» will open. Settings window differs depends on camera type. The first tab of this window is usually devoted to the image setup (Brightness, Contrast, etc.). In a figure 2.8 the window «**Settings**» for the camera «**Microsoft LifeCam Cinema**» is shown. Camera Microsoft LifeCam Cinema has low noise level and is preferable for vibraimage applications among webcams., even better to use «**Microsoft LifeCam Studio**».
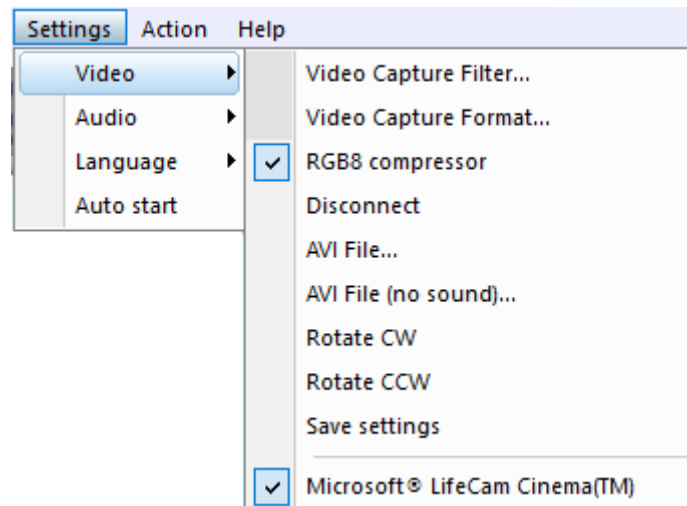
Fig. 2.7. Opening of the camera's settings menu («Video capture filter...»).

After a choice of the "**Video capture filter…"** the window "**Settings**" will open. Settings window differs depends on camera type. Figure 2.8 shows the "Properties" window for the Microsoft LifeCam Cinema.
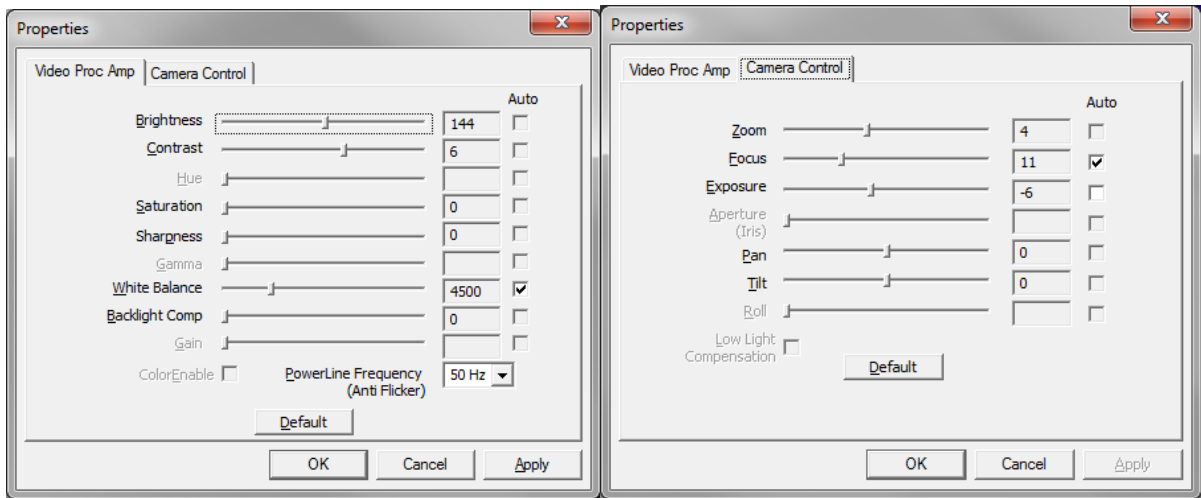
Fig. 2.8. Windows with settings for «Microsoft LifeCam Cinema»

- When adjusting the camera settings, you must fulfill the following general requirements:

- The **«Brightness», «Contrast»** and others parameters should be configured so that the image of the object was the maximum contrast.

- Switch on **«Flicker»** mode for setting lighting power line frequency (repayment flicker), in most countries it is 50 Hz.

- If your camera supports, then switch on the black-and-white image **«B/W mode».** If the camera works only in color mode, it is recommended to set **«Saturation»** parameter to minimum value.

- Depending on the experimental conditions and light to use automatic or manual setting **«Exposure»** parameter. If constant lighting, it is recommended to use the manual adjustment. If changes (for example, an object depends on the lighting street lighting), it is better to use the automatic adjustment mode setting.

Parameters «**Zoom**» and «**Focus**» is recommended to use in the manual mode and change their values not due to electronic image processing, but by approaching/removing the camera from the object.

Note, program settings are set by default at each new turn on the camera. If the video conditions don't change it is recommended to save your settings using item «Save Settings» from the submenu «Video» (Fig. 2.7).

2.4.3 Video capture format

Select «**Video capture filter...**» in the submenu «**Video**» (Fig. 2.7) for open menu of the camera settings. Item «**Video capture format...**» appears in the menu only in case of the correct installation of drivers of the camera and a choice of the working camera. Frame rate is necessary to set 30 and the frame size to set («Output Size») not less than 640 x 480 px (Fig. 2.9).
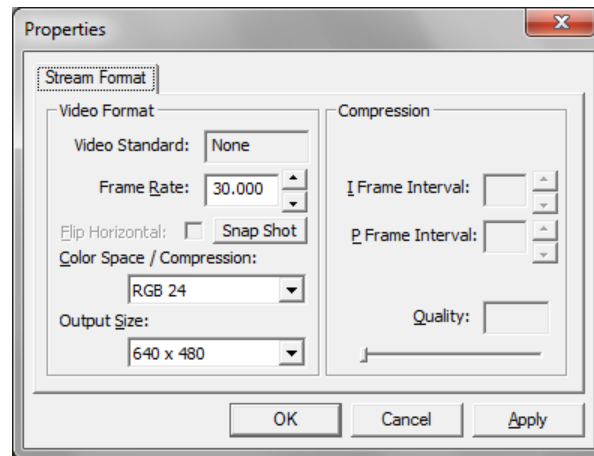
Fig. 2.9. Window «Video capture format».

Note, after changing camera settings in the program VibraHT frame rate «In» must be in the range of 25 – 30 FPS.

2.4.4 Checking the settings on the test table

During the first start of Vibraimage system and periodically it is recommended to test image quality by the test table. It is required to place a test pattern opposite to the camera so that the image of the table occupies the entire space of the frame. To achieve the optimal contrast range of object is need to stand in camera settings auto regulation of illumination in case of unstable illumination (Fig. 2.10) and manual regulation of illumination in case of a constant illumination (Fig. 2.11). The inscription «Warning! Low quality (1)» in the upper left corner of the image is normal, because there is no a person's face on the video.
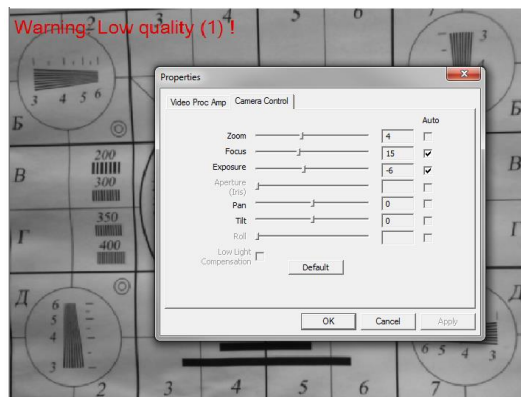
Fig. 2.10. Checking the camera settings on the test table, automatic regulation of the exposure (mode is recommended for unstable object illumination).
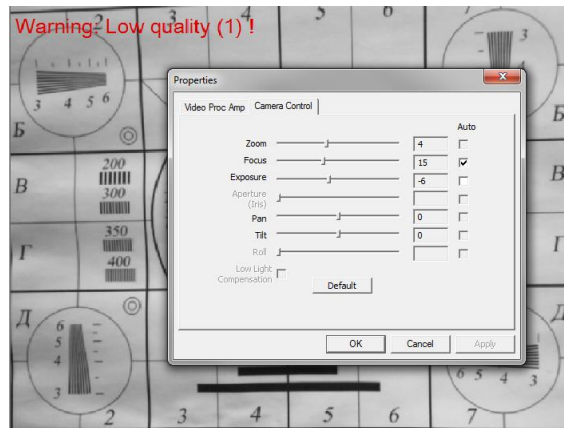
Fig. 2.11. Checking the camera settings on the test table, manual regulation of the exposure (mode is recommended for stable object illumination).

2.4.5 Video quality auto checking function

The VibraHT program has built-in automatic quality control function image quality control during the test. Since the calculation of human reaction using the video image, the quality control for the processed video is necessary to obtain a correct test result. Error message and the low quality of video will appear on top of the **QT** column on the left side of the program (Fig. 2.12), but only if the **"Quality test"** mode in information panel (mode S) is switch on as by default.

If the quality test is enabled, the final result will appear only if there is no video error message for more than 80% of the measurement time.
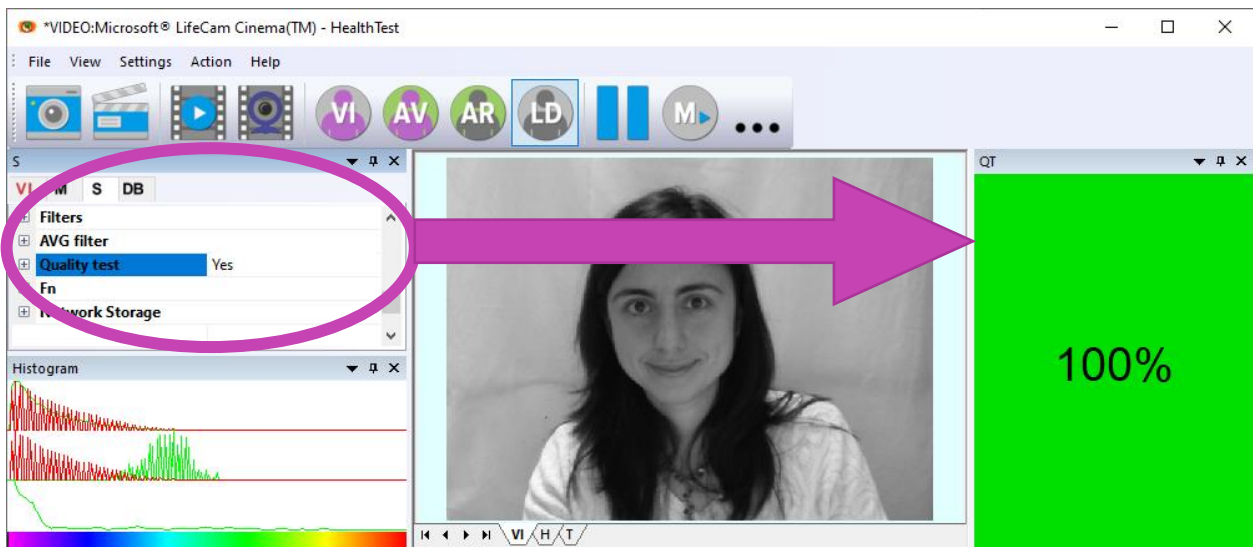
Fig. 2.12. Switch on "Quality test"

Program gives error indication if the image quality is lower than standard vibraimage requests:

- **Error 1** – indicates when facial image is lower than necessary. For cancel this error is need to move checked person closer to camera or start zoom function on camera. (Fig. 2.13).
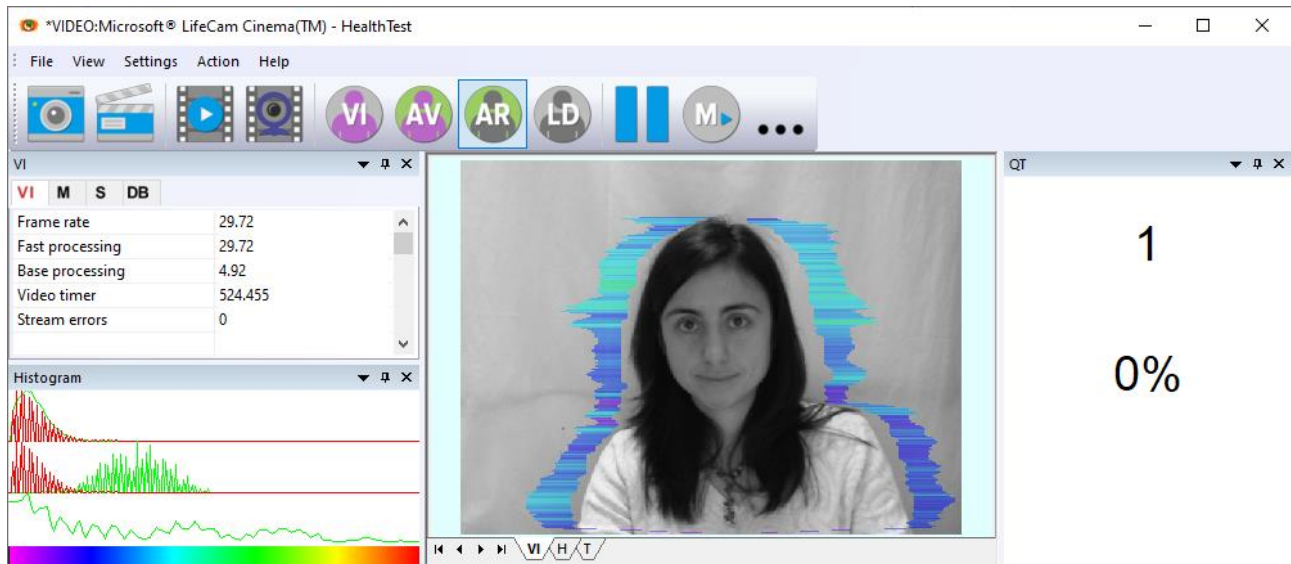
Fig. 2.13. Error 1 at the low video quality. Checking the cause is convenient in AR mode.

- **Error 2** – indicates when camera noise level is higher than necessary. The reason of this error could be low illumination, incorrect camera settings or camera vibration. (Fig. 2.14).
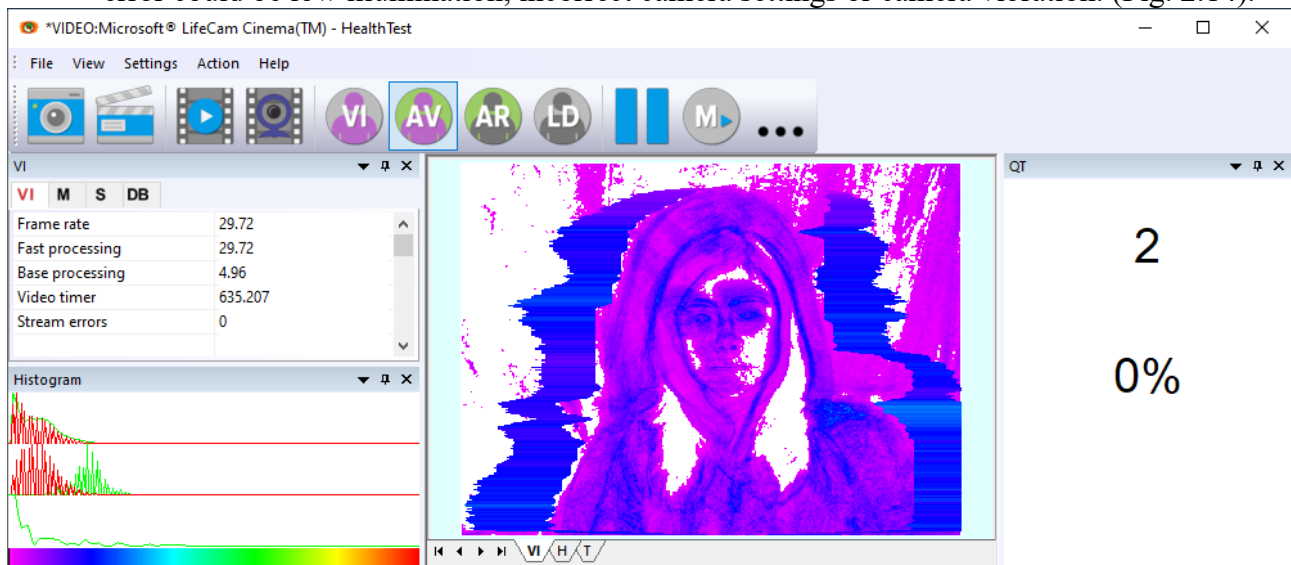
Fig. 2.14. Error 2 at the low video quality. Checking the cause is convenient in AV mode.

- **Error 3** – indicates when computer input frame rate is lower than necessary. Requested norm for processed frame rate is more than 25 f/s. This errors indication was done for deleting unqualified staff influence during results control. If the actual input speed is less than 25, then the program will show error 3 (Fig. 2.15).
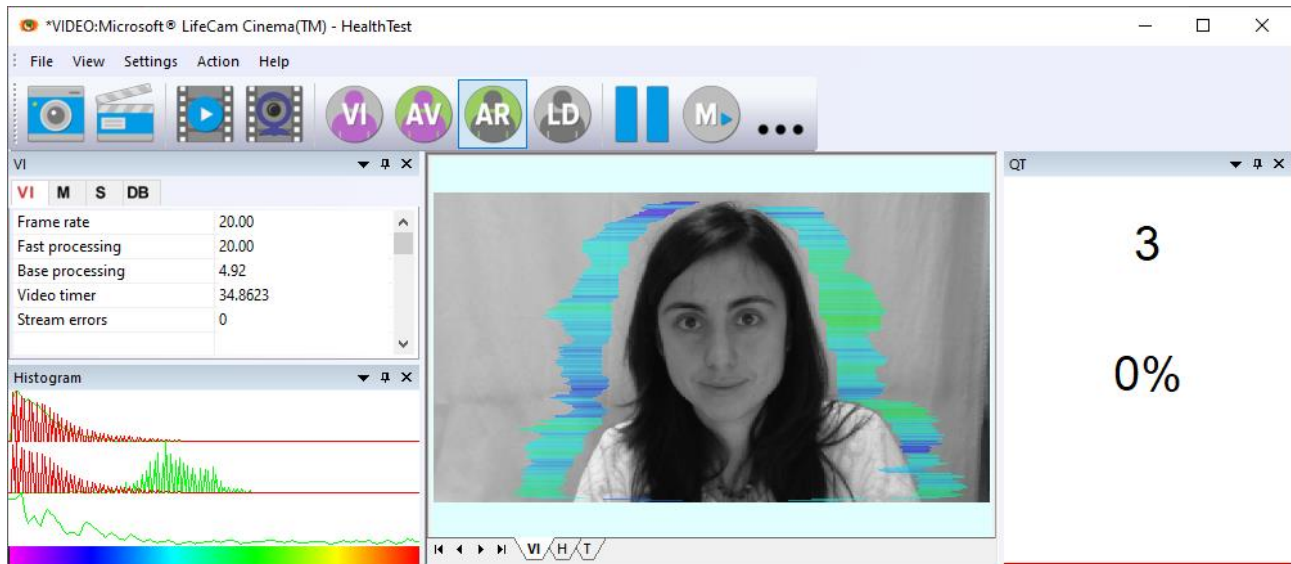
Fig. 2.15. Error 3 at the low video quality. Checking the cause is convenient in AR mode.

- **Error 4** – error-contrast image (Fig. 2.16).
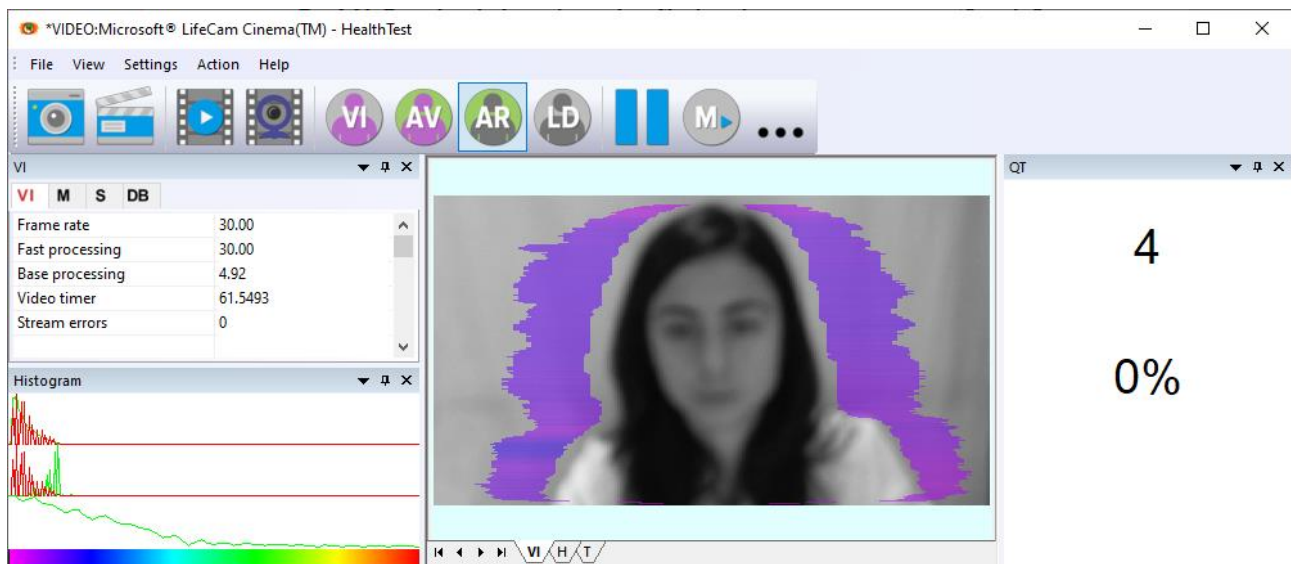
Fig. 2.16. Error 4 at the low video quality. Checking the cause is convenient in AR mode.

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- **Error 5** – due to nonuniformity lighting of the face (Fig. 2.17)
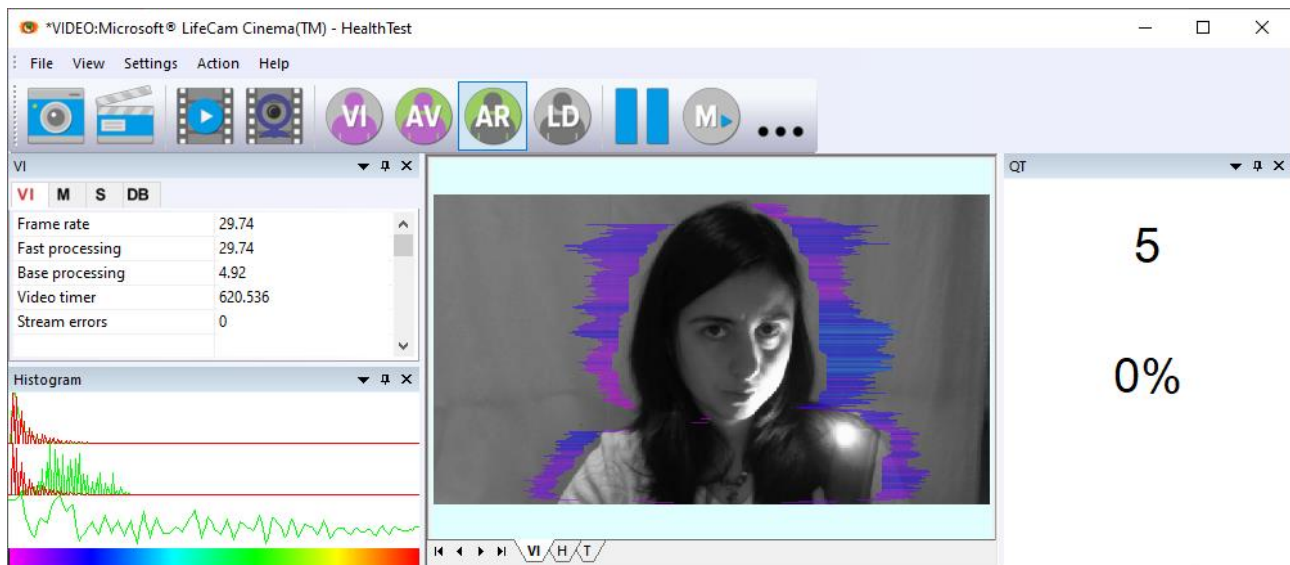
Fig. 2.17. Error 5 at the low video quality. Checking the cause is convenient in AR mode.

Error 1

The size of the person's head image in the picture elements (pixels), which determines the accuracy of recorded vibrations, requires constant monitoring during testing. When tested with a video image analysis there are no severe restrictions on the movement of the test person, as required by the contact method. This person feels natural, which increases the accuracy of test results.

However, the natural behavior can lead to the fact that during the test response deviates from the camera and the size of the human head image becomes less than required. To resolve this issue vibraimage system constantly monitors a person's head size of the image and displays an error message (1) in the window "QT" in the case of reducing the size below the limit. In addition, vibraimage program includes a permanent face detection algorithm, which ensures elimination of errors from a lack of a real image of the person in the frame during testing.

Error 2

Temporary noise signal from the video camera includes a video camera noise and illumination instability and can significantly affect the test results. In this case, at the slightest noise level exceeds the specified threshold, the system automatically displays an error message (2) in "QT" column.

Error 3

Despite the fact that the television camera may transmit to 30 frame/sec with the set resolution, it does not guarantee that the computer receives and processes the incoming video data in real time. And any deviation from the information processing in real time resulting in a loss of information and hence reduce the reliability of the test. By reducing the actual input frames frequencies and processing frequencies below the set limit, the system automatically displays a warning error (3). To fix the error, reduce the Zoom of the camera, if you used it to increase the size of the face. Check the processor load of your computer, close the resource-intensive programs.

Error 4

t occurs with uneven illumination of a person's face. For example, light falls on the side. Try turning the test person to the light or changing the angle of incidence of the light from the lamp. Also occurs if the test person is at an angle to the camera.

Error 5

It occurs if the image is not contrasty, for example, when the camera is not properly focused. To fix the cause of the error manually or automatically adjust the focus of the camera.

Note, before the start of the test should ensure that the program processed the image of a human WITHOUT ERRORS or disable the quality test.
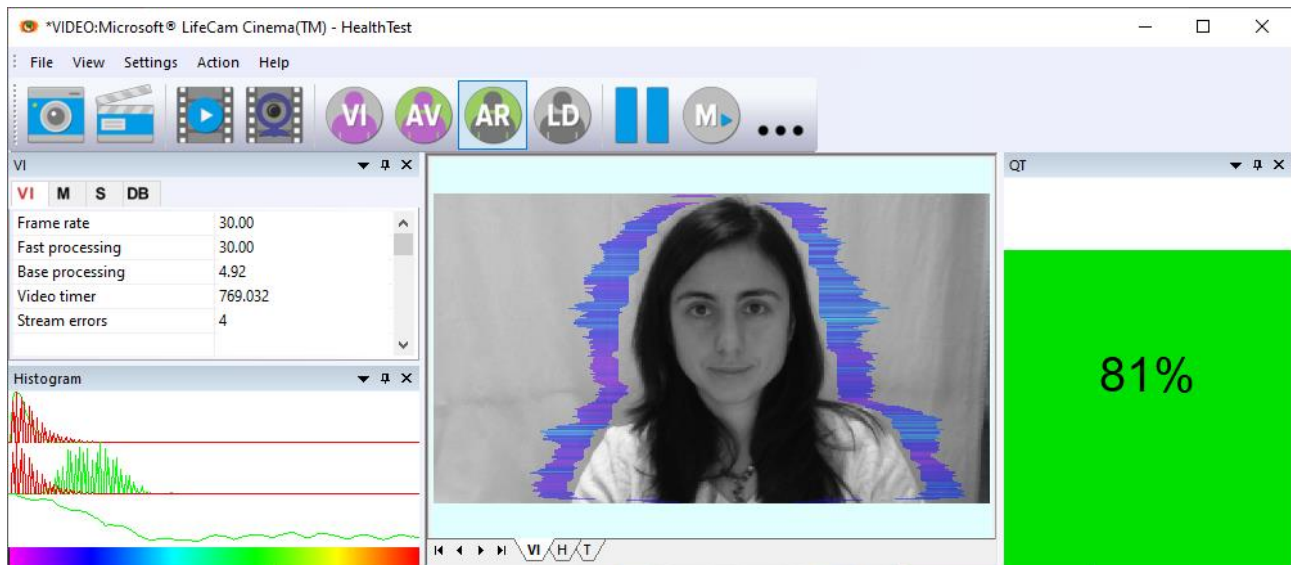
Fig. 2.18. An example of a quality column operation. Head image size and other parameters are correct.

Quality column shows time % during the testing when image quality is equal 100 %. When we have quality indication 81 % (fig 2.18), that means 81 % of testing time image quality doesn't have error and 19 % of testing time image quality includes errors with the number 1 - 5.
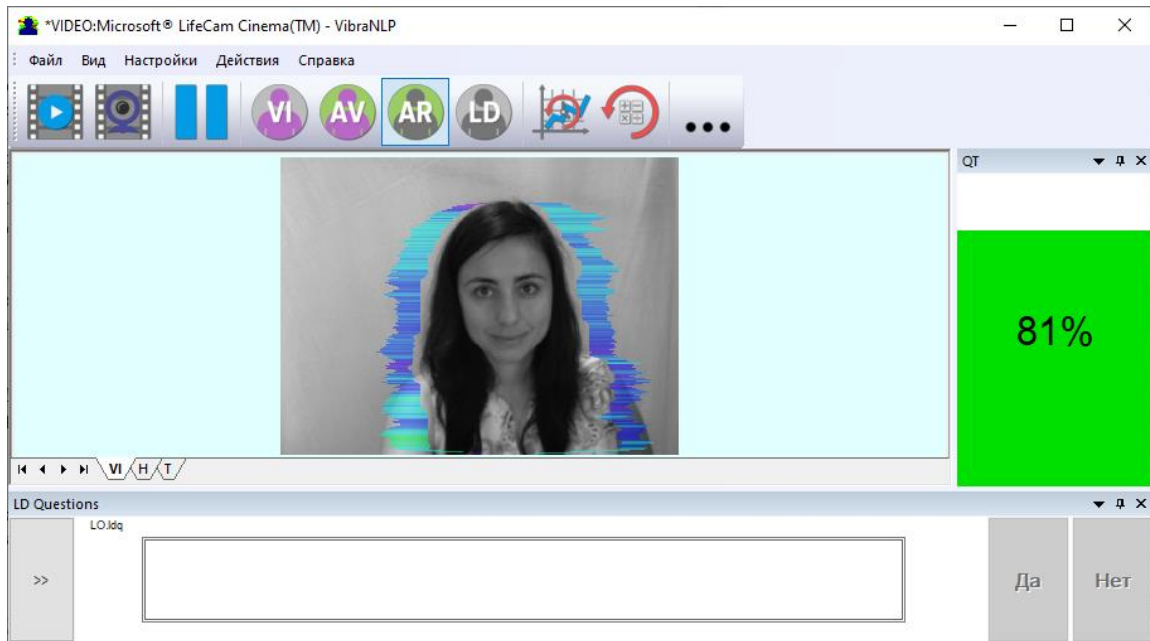
Fig. 2.25. Quality test shows 81 %

Pressing button R reset image quality to the beginning 100 %. In lie detection mode and M mode image quality is very important and testing with image quality lower 80 % could not be acceptable for processing.

3 VibraHT. Users manual

VibraHT is designed to research psychophysiological and psychoemotional characteristics of living biological objects. It also can be applied for any objects performed periodic oscillatory movements. The main purpose of this mode is to use the vibraimage system for psychophysiological, psychological research and diagnostics of human functional health.

Video from camera or video file are displayed in basic window after starting the VibraHT.

3.1 Basic window

In heading of the basic window the following information is indicated (Fig. 3.1):
- type of video source: Video camera or AVI file;
- model of video source: Video camera model or AVI file name;
- name of the program.
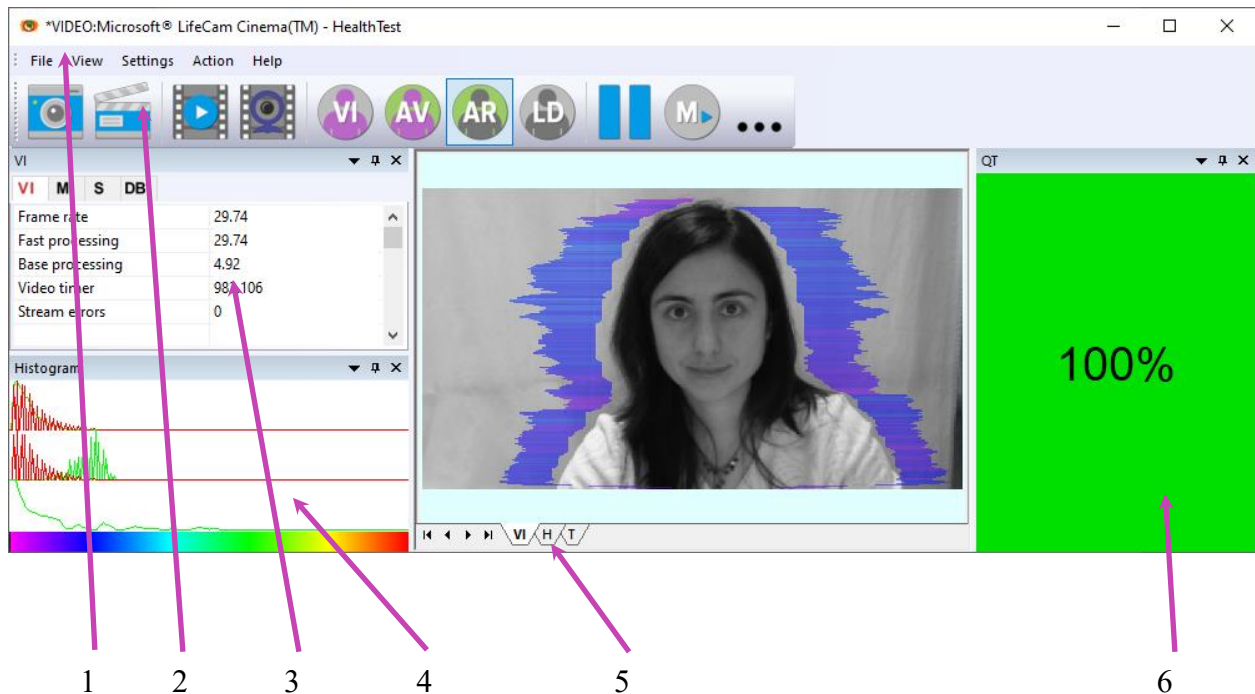
Fig. 3.1. Basic window VibraHT. Application look Visual Studio 2008.

Note, double-clicking with the left mouse button in the image area **resets** all accumulated information about the inter-frame difference and starts a new cycle of data accumulation.

The program for the user's convenience have the ability to change the style of the main elements of the working window. To change the style, use the submenu "**View**" => "**Application styles**" (Figure 3.2.)
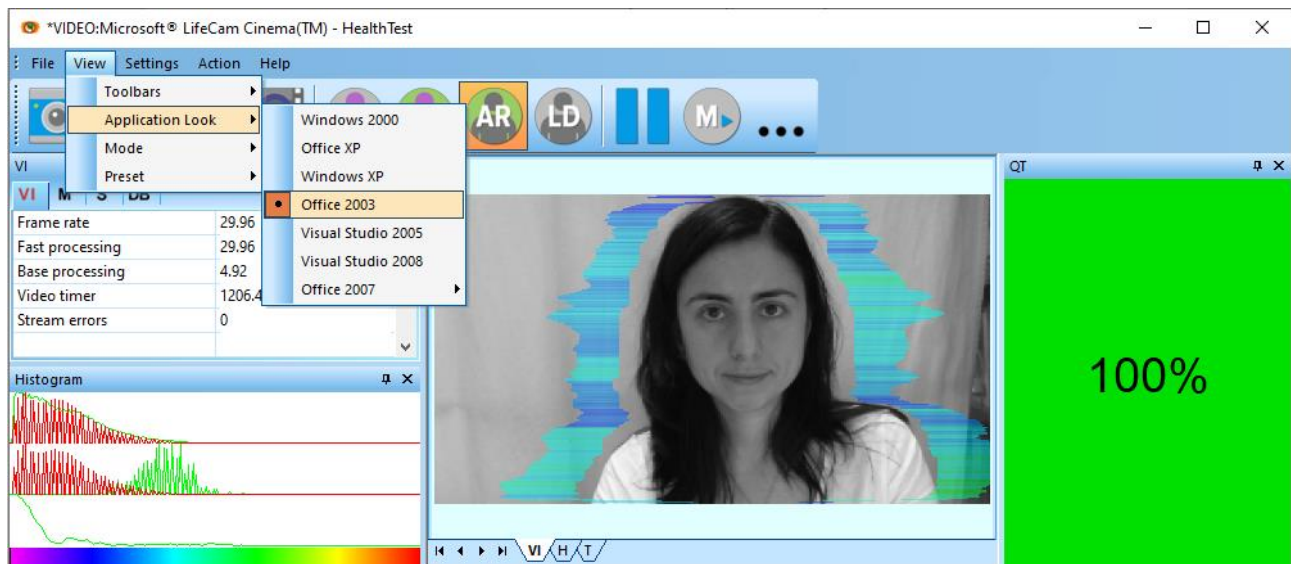
Fig. 3.2. Style Office 2003

3.1.1 Basic window design

In total in the main window of the program in addition to the video area, you can see an additional 6 windows that display information about the parameters of mental and emotional state of a person, and program settings (on Figure 3.3 the windows labeled corresponding numbers):

1. File, View, Settings, Action, Help – main menu.

2. Toolbar – main toolbar.

3. VI, M, S, DB – information panels.

4. Histogram – window for vibraimages parameters histogram in real time mode.

5. Images window for displaying vibraimage (VI), result's histograms (H), information-energy graph (T).

6. QT – image quality window.

User can add or delete windows by submenu «**View**» => «**Toolbar**» (fig. 3.3).
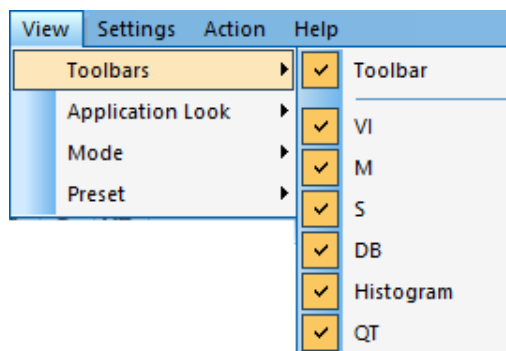
Fig. 3.3. Submenu «Toolbars»

3.1.2 Windows position control

The user can control the placement of additional windows on the screen and the size using the controls elements on the left side of each window title. For each window it is available control menu (fig. 3.4). This menu also appears when you click the left mouse button in finding the mouse pointer in the desired window. In «Docking» mode, window position and size are fixed, and when opening/closing the window will open in a given position. The mode «Floating» window position and size can be changed by the user.

If the window is in a random location on the screen, then double-click the left mouse button on the window, the window will move on the screen in the «default» position.
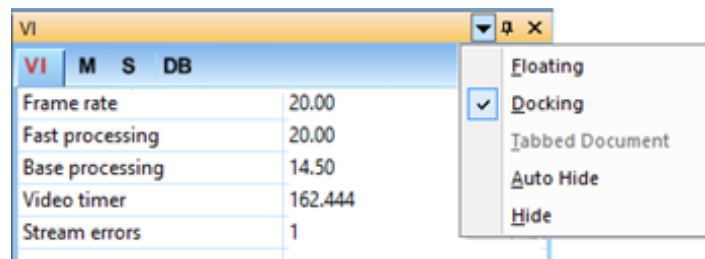
Fig. 3.4. Window control element

Each window can be closed, or by using the window menu or by using a separate control element (fig. 3.5).

Fig. 3.5. Control element «close window»

Each window can be temporarily minimized and moved to the border of the main program window (fig. 3.6). Figure 3.11 additional windows hided and moved to the border of the main window and they icons are highlighted in orange color.
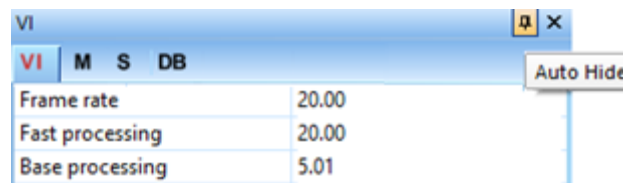
Fig. 3.6. Control element «hide window»

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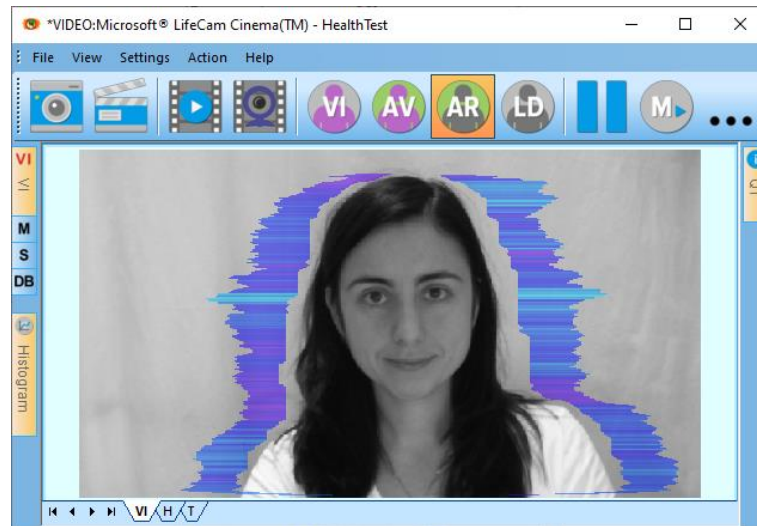
Fig. 3.7. All additional windows are hide.

3.2 Main menu

The main menu contains the following items:

- «**File**»
- «**View**»
- «**Settings**»
- «**Action**»
- «**Help**»

3.2.1 Menu «File»

Menu «**File**» (fig. 3.8) **contains following items**:
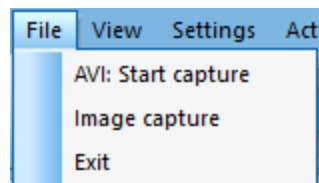
Fig. 3.8. Menu «File»

Item «**AVI: Start Capture**» **-** start record AVI-file. If the database folder is not specified, record of AVI files is blocked.

Item «**Image capture…**» **-** saving the current frame of a window in the database folder.

Item «**Exit**» **-** exit from program.

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3.2.2 Menu «View»

Menu **«View»** (fig. 3.9) defines visible in the basic window information and contains the following items:
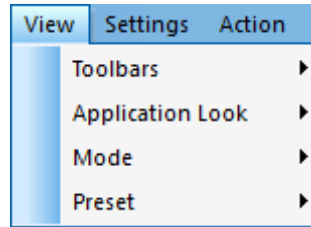
Fig. 3.9. Menu «View»

Item **«Toolbars»** - switch on/off the toolbar (fig 3.3).

Item **«Application Look»** - choose style of program (fig 3.2).

Submenu «**Mode**» defines additional configuration and number of windows with an image displayed in the image area.

Submenu «**Preset**» defines the type of the display image:

Item **«Presets»** menu «**View**» (Fig. 3.10) intended to choice one basic mode in image area.

- In **«VI»** mode [«VibraImage mode»] displays vibraimage of person. Color for every image pixel depends on its amplitude or frequency of vibrations (fig. 3.10a).

- In **«AV»** mode [«Aura - Vibraimage mode»] the contour of the object allocated around the vibraimage. Vibra-aura line size depends on medium line vibration amplitude. Vibra-aura line color depends on maximum line vibration frequency inside vibraimage contour (fig. 3.10b).

- In **«AR»** mode [«Aura on the Real image»] the vibra-aura of the person is shown around his real image (fig. 3.10c).

- In **«LD»** mode [«Lie Detector mode»] image area shows real object image (fig. 3.10d).
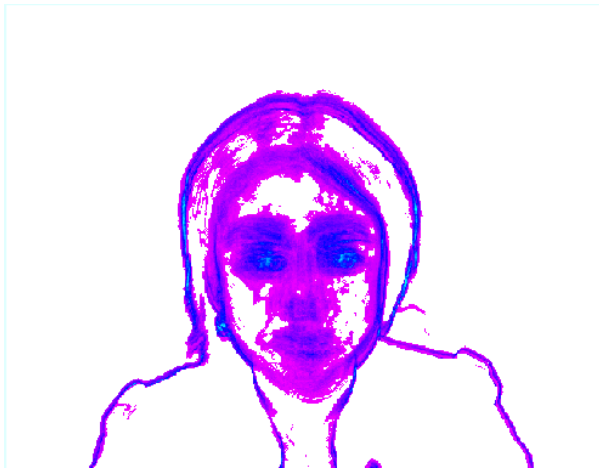
3.10a Mode VI
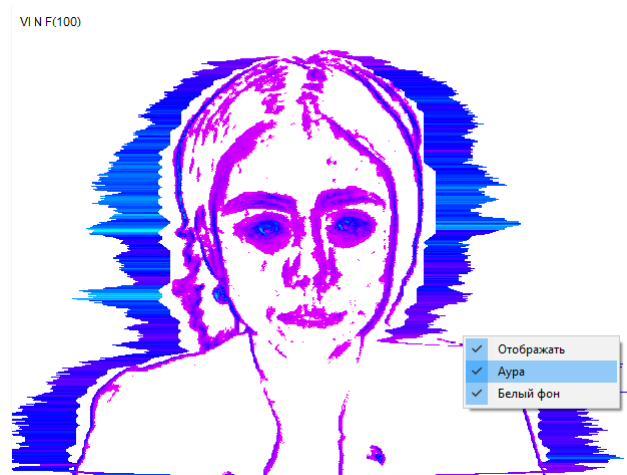
3.10b Mode AV
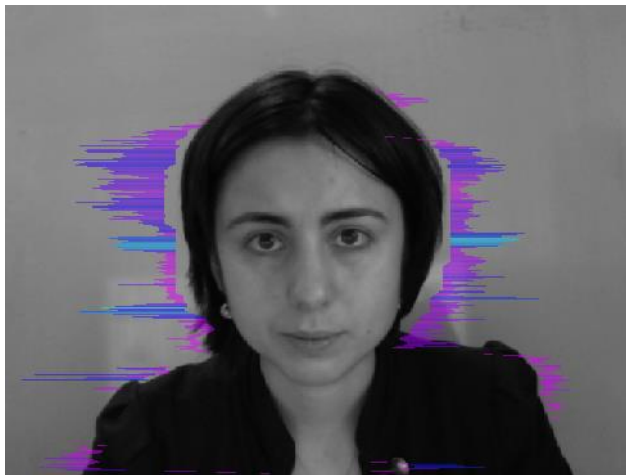
3.10c Mode AR

3.10d Mode LD

3.10 Image area in different modes

3.2.2.1 Submenu «Mode»

Item **«Mode»** (fig. 3.11) selects additional settings of information in image area.
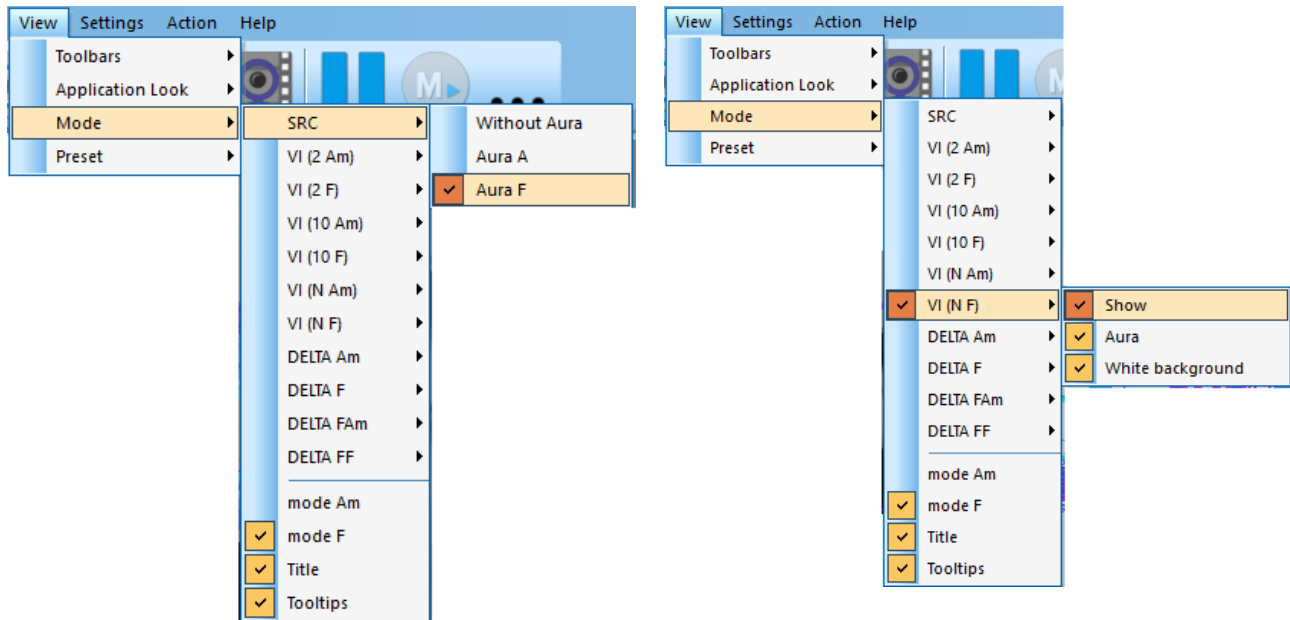
Fig. 3.11. Submenu «Mode»

Note, in different modes VI and AV you have the additional possibility to change color of a background image and to add aura to vibraimage. The same result is possible to receive if to bring the mouse pointer to a window of the chosen image and to press the right button of a mouse (fig. 3.10b).

- In **«SRC»** mode shows source video from camera without processing (fig. 3.11). It is additional possibility to display the aura on the real image of person constructed on the analysis of pixels vibration amplitude or frequency or pixels vibration frequencies. The length of the beam vibra-aura in this case will be determined by the average value of the points parameter in a row, and the color of the beam vibra-aura – by the maximum value.

- In **«VI (2 Am)»** and **«VI (2 F)»** modes display vibraimage, processed during 2 frames and constructed on the basis of amplitude **Am** and frequency **F** analysis of vibration. It is additional possibility to change color of background image and to add vibra-aura to vibraimage.

- In **«VI (10 Am** and **«VI (10 F)»** modes display vibraimage, processed during 10 frames and constructed on the basis of amplitude **Am** and frequency **F** vibration analysis.

- In **«VI (N Am)»** and **«VI (N F)»** modes display vibraimage, processed during N frames and constructed on the basis of amplitude Am and frequency F vibration analysis. The number of frames, corresponding to parameter N, is set in «VI» information panel. It is additional possibility to change color of background image and to add aura to vibraimage.

- In **«Delta Am»** and **«Delta F»** display frame difference on the basis of amplitude Am and frequency F vibration analysis in base processing mode without filter preprocessing. It is additional possibility to change color of background image.

Note. In this mode the vibra-aura will be based on the vibraimage which has been accumulated for N frames!

- In **«View mode Delta FA»** and **«View mode Delta FA»** modes display frame difference on the basis of amplitude Am and frequency F vibration analysis in fast processing mode without filter preprocessing. It is additional possibility to change color of background image.
- In **«mode Am»** visualization and calculation of object parameters processed by pixel vibration amplitude.
- In **«mode F»** visualization and calculation of object parameters processed by pixel vibration frequency.
- Item **«Title»** [Title] switch on displaying a name of mode or AVI file in the upper left corner of each image window.
- Item **«Tooltips»** – enable/disable output tips.

Submenu **"Preset"** defines the type of the display image: the real image (mode LD), vibraimage (mode VI), the aura on the real image (mode AR), the aura on vibraimage (mode AV). Also, you can configure the corresponding buttons on the Toolbar (fig. 3.12).
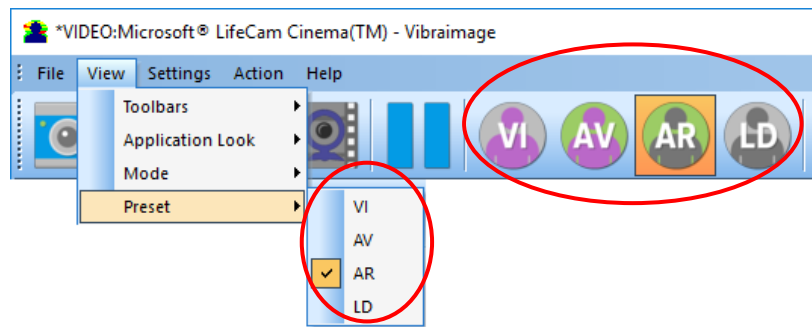
Fig. 3.12. Buttons and menu items defining type of displayed image

3.2.3 Menu "Settings"

Menu **«Settings»** (fig. 3.13) allows choosing video (fig. 2.6) or audio source, language (fig. 2.5), video mask and auto start program and contains the following items:
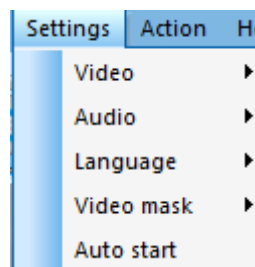
Fig. 3.13. Menu «Settings»

3.2.3.1 Submenu «Video»

Submenu **«Video»** contains settings of video modes. It can differ depend on connected devices. For example, this menu contains the following items (fig. 3.14). You can choose as video source one from many installing in PC video-devices or load external video file.
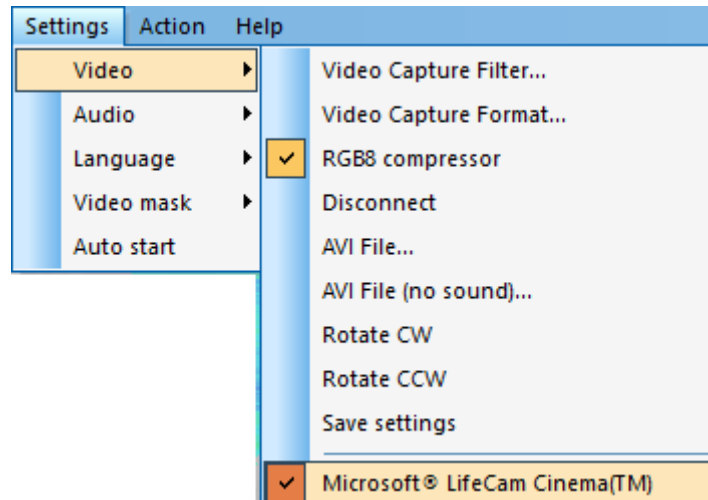
Fig. 3.14. Submenu «Video»

Subitem **«Video Capture Filter…» -** by pressing the window of video device setting (contrast, exposition, brightness) opens. Each device has the especial window of settings.

Subitem **«Video Capture Format…» -** change video capture format.

Subitem **« RGB8 compressor »** are intended for management of a videofile record format. If this item is chosen, that, for economy of a space on a hard disk, the videofile saved in a black-and-white format.

Subitem **«Disconnect»** allows to disconnect all video camera or videofile

Subitems «**AVI File…**» and «**AVI File (no sound)…**» [AVI File (no sound)…] are intended for selecting for the analysis of an external video file

Subitems **«Rotate CW»** and **«Rotate CCW»** allow allow to make turn of an input video image on 90 and 270 degrees before its processing in the VibraHT.

Subitem **«Save settings»** allows to save current camera settings in the Windows registry in order to load them at next startup programs with this camera

The bottom menu allows you to choose a used device video capture from multiple installed on this computer.

3.2.3.2 Submenu «Audio»

Submenu **«Audio»** contains settings of audio modes. It can differ depend on connected devices. For example, this menu contains the following items (fig. 3.15). You can choose as video source one from many installing in PC video-devices or load external video file.
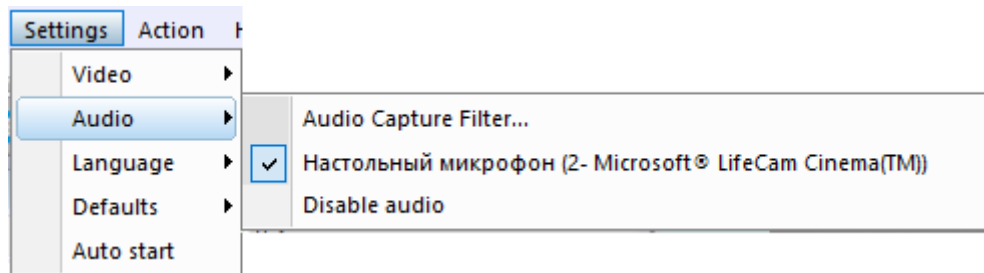
Fig. 3.15. Submenu «Audio»

Subitem **«Audio Capture Filter…»** - the window of audio device setting. This subitem exist only when you choose videosource. Each device has the especial window of settings.

Subitem **«Disable audio»** allows disconnecting all audiosource.

Menu between these subitems allows choosing used audio device capture from multiple installed on this computer.

3.2.4 Menu «Action»

Menu «**Action**» (fig. 3.16) **contains the following items**:
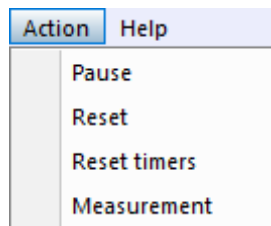
Fig. 3.16. Menu «Action»

Item **«Pause»** - stop last accepted frame of data in image area of windows.

Item **«Reset»** - reset all saved up information and statistics about frames and start new cycle collection of information.

Item **«Reset timers»** - reset to «0» all timers: video file timer, graph timer. The conclusion video and construction of graph begins all over again.

At a choice of item **«Measurement»** the system makes accumulation, averaging and a display of parameters for the specified time period. The results display is made in the information panel in a mode «M». In the same place in seconds value of the averaging period **«Duration»** is set.

3.3 Toolbar

Панель инструментов программы VibraHT toolbar (fig. 3.17) contains following buttons.

Fig. 3.17. VibraHT toolbar.

All toolbar buttons (fig. 3.17) duplicated the corresponding items in the menu system. When the tool tip determines the assignment of toolbar buttons. Note, the selected toolbar button is highlighted in color or volume, depending on the main window style.

–AVI files download for PDD analysis;

–AVI files download for PDD analysis;

–AVI files download for PDD analysis;

– live video camera connection;

– choice of internal vibraimage mode (VI);

– choice of external vibraimage (vibra-aura) around internal video image mode (AV);

– choice of external vibraimage (vibra-aura) around real video image mode (AR);

– choice real video image mode (LD);

– pause on image and program operations;

– start of measurement;

– open the folder where you saved the images and measurement's data.

3.4 Information column

Indication of information column (fig. 3.18) depends on using mode:

Fig. 3.18. Modes of the information column

- In the mode «VI» information about adjustments of system and results of data vibraimage processing is displayed;

- In the mode «M» the average values of vibraimage parameters which have been calculated and are average for the certain period are displayed;

- In the mode «S» settings of basic parameters for vibraimage processing are configured;

- In the mode «DB» input and selection of the demographic information and a folder for archive storage is configured.

Note, values of parameters in fields which are allocated by a green font, can be changed by the user (fig. 3.20, parameters N, L - it is possible to change in Information table). For this purpose it is necessary to bring the mouse pointer to the chosen field and twice to click the left button of a mouse.

In the down part of information panel displays three windows with results of the frequency analysis (fig. 3.19). In the first window the frequency analysis vibraimage on the whole frame (by red color - amplitude, green color - frequency of vibration pixels) is displayed. In the second window the frequency and amplitude histograms for external vibraimage (aura), and in the third - spectrums of the frequency analysis with application of FFT of two parameters (A1X and F1X) are displayed.
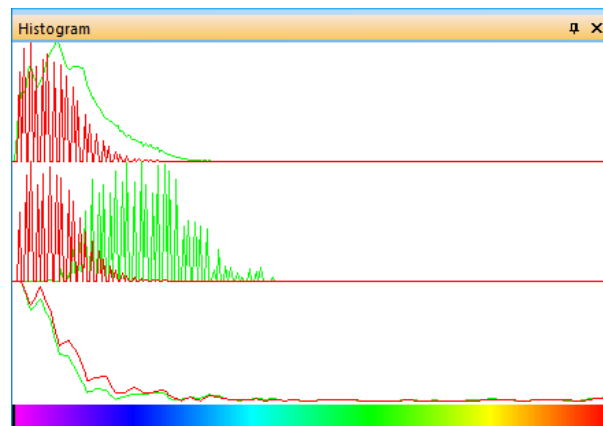
Fig. 3.19. Histograms windows

3.4.1 Information column. VI mode

In the mode «**VI**» information panel (fig. 3.20) displays following information:

VI	⊡ ✕
Frame rate	29.96
Fast processing	29.96
Base processing	4.97
Video timer	3732.65
Stream errors	113
⊟ **Info**	
N	100
L	2
Width	640
Height	480
⊟ **Statistics**	
IntegratedN(Am)	6.385629
IntegratedN(F)	6.439371
Critical level %	60.0 %
Suspect	17.9
Aggression	22.1
Stress	23.0
Tension	9.1
⊟ **Audio**	
Level	0.0

Fig. 3.20. Information column in the VI mode

Frame rate:

- «**In**» – Number of the frames per second, received from the video source;

- «**Fast processing**» – Maximum number of the processed frames per second used for calculation. Selected by user;

- «**Base processing**» – Number of the processed frames per second used in base algorithm. Selected by user;

- «**Video Timer**» – For camera mode-displays time of supervision. For recorded video - time of current video-file record. For viewing a video-file - time from the file beginning);

- «**Stream errors**» – The counter of mistakes that increases if time between the next accepted frame unstably. This mistake can arise, if productivity of a computer suffices or poor-quality video is loaded;

Info:

- **N** – Number of the frames for accumulation. Selected by user;

- **L** – Palette Threshold. Defines a threshold in the displayed image, value of brightness less threshold is considered «black». Selected by user;

- **Width** and **Height** – Displays the current video camera or avi file resolution;

Statistics:

- **IntegratedN(Am)** – Average frame amplitude vibraimage intensity processed for the N frames;

- **IntegratedN(F)** – Average frame frequency vibraimage intensity processed for the N frames;

- **«Critical level %»** – Threshold of a psychoemotional status of the person exposed in % in case of which exceeding on the remote terminal the warning message will be issued;

- **«Suspect»** – Calculated level of suspect for object in frame;

- **«Aggression»** – Calculated level of anger for object in frame;

- **«Stress»** – Calculated level of stress for object in frame;

- **«Tension»** – Calculated level of tension for object in frame;

Audio:

- **«Level»** – current level of audio signal.

3.4.2 Information column. M mode

In a mode «**M**» an information column (fig. 3.21) allows to control average for the period parameters value of psycho-emotional person conditions and their deviation from the established norm. The basic applicability of the given mode is use of vibraimage system for medical diagnostics and psychological researches.

Left window (M / T12):

Config	
Progress	0%
Duration (s)	60

T12
- Aggression (P7) — 32.0 0.0
- Stress (P6) — 14.4 0.0
  - V — 14.4
  - S — 0.0
  - Vi — 0.0
  - N Min — 20.0
  - cMin — 0.0
  - N Max — 40.0
  - cMax — 0.0
- Tension/Anxiety (... — 14.1 0.0
- Suspect (P19) — 18.6 0.0
- Balance (P16) — 74.1 0.0
- Charm (P17) — 86.5 0.0
- Energy (P8) — 35.7 0.0
- Self regulation (P... — 80.3 0.0
- Inhibition (F6) — 30.5 0.0
  - V — 30.5
  - S — 0.0
  - Vi — 0.0
  - N Min — 10.0
  - cMin — 0.0
  - N Max — 25.0
  - cMax — 0.0
- Neuroticism (F9) — 45.2 0.0
- Depression (P29) — 13.3 0.0
- Happiness (P30) — 36.5 0.0

P
A
F
S

Right window (M):

Config	
Progress	0%
Duration (s)	60

T12

P
- P1 — 32.406887
- P2 — 11.960446
- P4 — 1.406103
- Health (P21) — 0.000000
- Health' (P22) — 0.000000
- ΣVi (P23) — 0.000000
- Extraversion (P26) — 0.000000
- Stability (P27) — 0.000000
- Depression (P29) — 0.167654
- Happiness (P30) — 0.477065

A
- A1 (fast) — 0.001291
- A1 — 1.684823
- A2 — 90.528961
- A3 — 20.744160
- A4 (fast) — 0.055197
- A4 — 1.220708

F
- F1 (fast) — 0.000369
- dF1 (fast) — 0.001558
- F1 — 0.039861
- F2 — 95.500702
- F3 — 22.232098
- F4 — 103.586311
- F5 (fast) — 0.052619
- F5 — 0.180845
- F6 — 0.334255
- F7 — 0.180210
- F8 — 0.378456
- F9 — 0.157287

S
- S1 — -56.719582
- S2 — 4.232549
- S3 — -0.505578
- S4 — -0.294470
- S5 — 0.098859
- S6 — 0.004931
- S7 — 4.867149

Fig. 3.21. Information column in the M mode

Value of the averaging period is set in seconds in a field **«Duration»**. Start of the beginning of information accumulation is made by a choice of item «**Measurement**» the menu «**Action**» or pressing of the toolbar button [M▶]. After start of an accumulation and averaging mode in the top of an information column there is a running line "Progress", displaying a course of data accumulation process. Also you can see «Progress» in percent in the window QT (fig. 3.22).
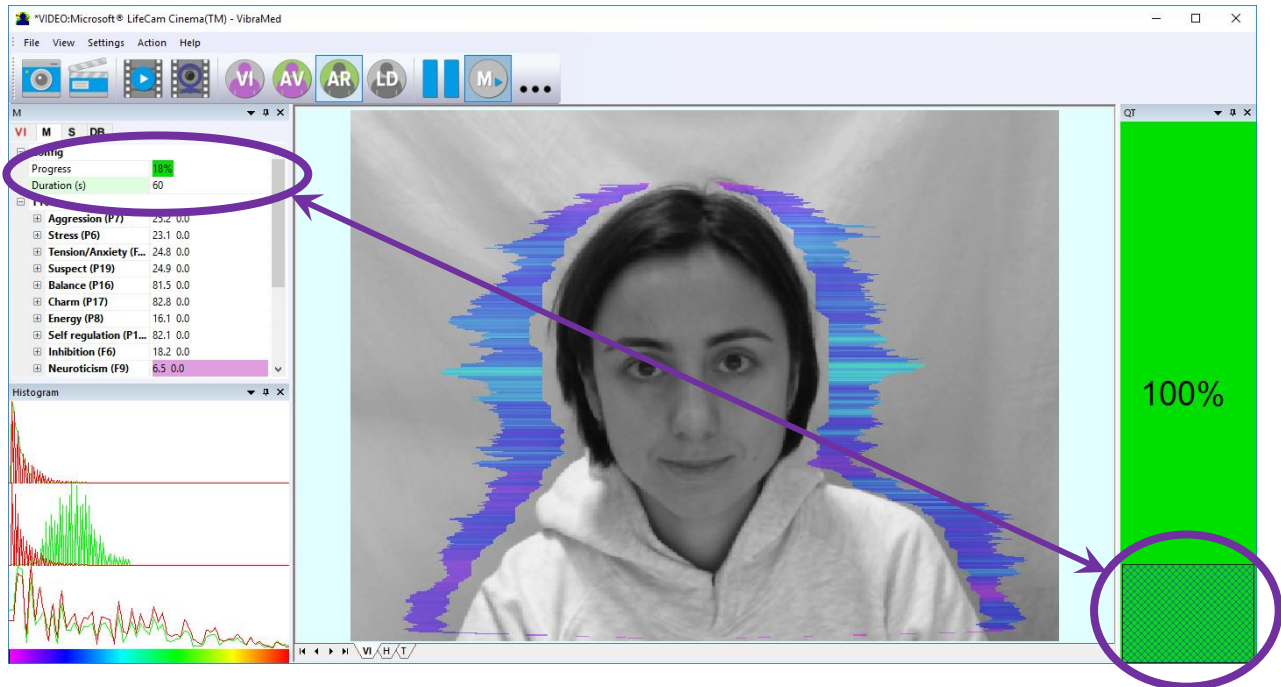
Fig. 3.22. Progress of the measurement.

Information panel in "**M**" mode displays the following information:

- Measurement parameters:

  line "**Progress**", displaying a course of data accumulation process and value of the averaging period in seconds in a field **"Duration"**.

- Basic T1 – T12 parameters describing psycho-emotional condition of the person: Aggression, Stress, Tension/Anxiety, Suspect, Balance, Charm, Energy, Self regulation, Inhibition, Neuroticism, Depression, Happiness (see p. 5.2).

  For each parameter there are following numerical values:

V –	The value of the parameter average for the set period
S –	root-mean-square deviation of parameter
Vi –	The variability of the parameter over a specified period
cMin –	The minimal value of parameter for the period
cMax –	The maximal value of parameter for the period
NMin –	The minimal value of parameter for a normal condition of the person
NMax –	The maximal value of parameter for a normal condition of the person

Note Values of cMin, cMax parameter, are displayed only when measurement mode "M" starts and the information for the specified period of time is saved up.

Note, after finishing of the information accumulation some lines of an information panel can be highlighted by color:

- ▭ – parameters, which values less than the set limits are allocated.
- ▭ – parameters, which values more than the set limits are allocated.

Note, for correct diagnostics psycho-emotion conditions of the person speed of data input from the camera should be within the limits of 25-30 frame/second.

- The group of parameters **P** registers features of mathematical Processing of vibrations:

  P1 – Dispersion of vibration density for frequency distribution at 10 processing frames

  P2 – Center density distribution displacement of frequency at 10 processing frames

  P3 – Center density distribution displacement of frequency at N processing frames

  P4 – Parameter «**Health**» (Health level for general oncology);

  P21 – Parameter «**Health'**» (Health level for prostate oncology);

  P22 – $\sum Vi$ – the average of the «**Health**» (Mean value of health level);

  P23 – Extraversion level

  P26 – Stability level

  P27 – Dispersion of vibration density for frequency distribution at 10 processing frames

  P28 – Depression level

  P29 – Happiness level

- The group of parameters **A1-A4** registers amplitude of vibrations:

  A1 – Frame difference between two consecutive frames

  A2 – Frame difference accumulated in 10 consecutive frames

  A3 – Frame difference accumulated in N consecutive frames

  A4 – Value of parameter A1 filtered on 10 frames

- The group of parameters **F1-F9** registers frequency of vibrations (amount of changing points):

  F1 – Calculated value of changed signal pixels amount in 2 consecutive frames

  F1 fast – Calculated value of changed signal pixels amount in frames difference in fast processing mode

dF1 (fast) –	The average value of changes in the quantity of elements (the increment) for F1 (fast) parameter
F2 –	Averaged value of changed signal pixels amount in 10 consecutive frames
F3 –	Average value of elements quantity which have changed for the period of N frames
F4 –	Changed pixels maximum frequency during N processed frames
F5 –	Current **tension level** (%). Ratio of «high» frequency density to «low» frequency for parameter F1. Its speed of element changing in frames difference.
F5 (fast) –	The average value of the rate of elements change in the fast processing mode calculation
F6 –	**Inhibition parameter**. Average value of the F1 parameter period (in seconds), determined during period F6N. Value of parameter F6N is set in section [Filters] an "S" information panel and defines quantity of the frame processed in Fast Processing mode
F7 –	Root-mean-square deviation for F6 parameter
F8 –	Not average (current) value of F6 parameter (in seconds), showing the current time period of F1 parameter changing
F9 –	**Neuroticism parameter**

- The group of parameters **S1-S7** registers symmetry of vibrations between left and right parts of person body:

S1 –	Ratio (symmetry) of amplitude left to the right changed pixels inside the object in 2 consecutive frames
S2 –	Difference between the left and right average amplitude of object vibration in 10 frames
S3 –	Difference between the left and right average amplitude of object vibration in N frames
S4 –	Ratio of the changed pixels quantity in the left part of object to the changed pixels in the right part in 2 consecutive frames
S5 –	Ratio of the changed pixels quantity in the left object part to the changed pixels quantity in the right object part calculated in 10 frames
S6 –	Ratio of the changed pixels quantity in the left object part to the changed pixels quantity in the right object part calculated in N frames
S7 –	Difference between the maximal frequency of vibrations of the left and right object parts in N frames

After the end of the information gathering, the results of the "frequency analysis" and the results of the analysis of the change in the person's psychophysiological state will be available. To do this, open the corresponding tab in the main image window (fig. 3.23, 3.24).
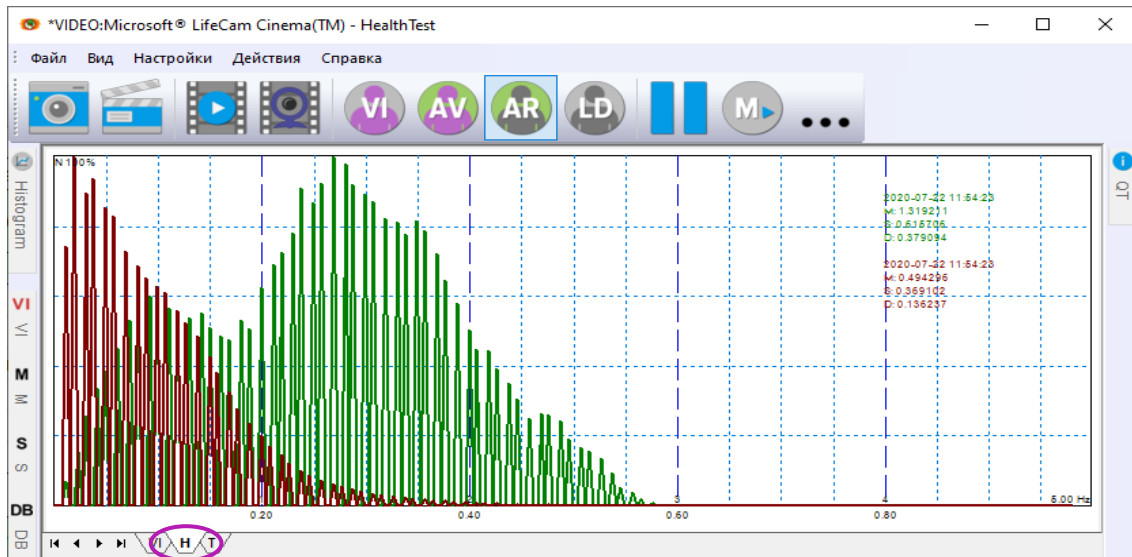
Fig. 3.23. Results of frequency analysis

Each histogram characterizes by the following parameters:
- M – the center of weights of frequency distribution (average value of microvibrations frequency);
- S – root-mean-square deviation of frequency distribution;
- D – a dispersion of frequency distribution.
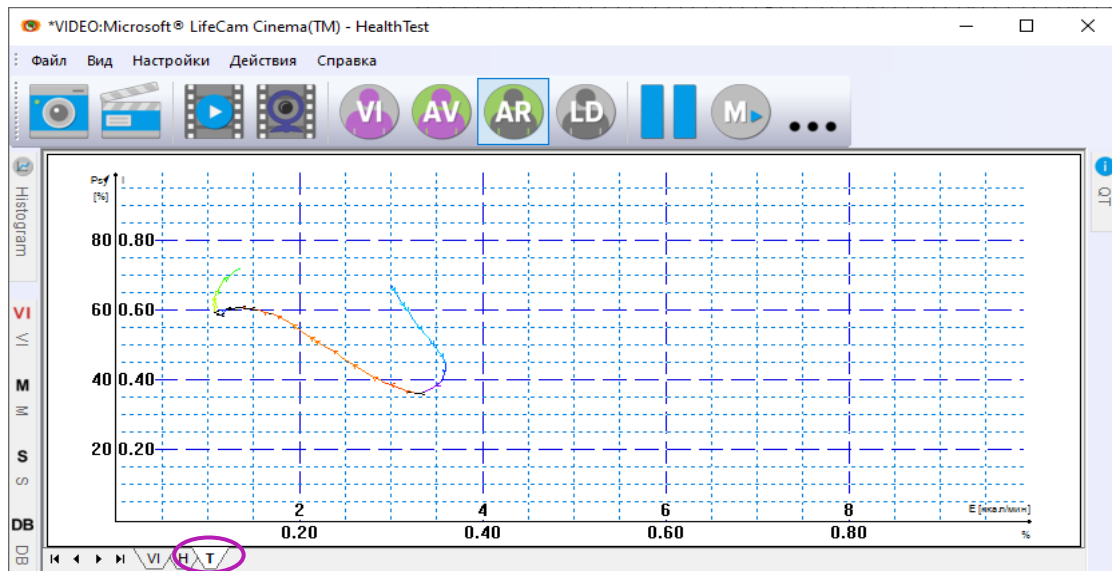
Fig. 3.24. Information-energy graph

Graphs are saved to an external file (you choose it in information column in mode DB) automatically after the measurement is completed.

| a) | b) | c) |
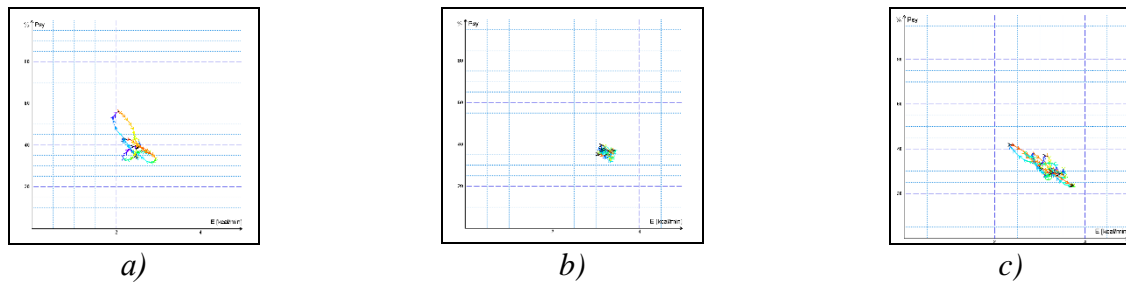
Fig. 3.25 (a, b, c). Change person psycho-energy conditions for the chosen period. a) change around the average value, b) stable condition, indicating a high degree of self-control person, c) periodic change psycho-energetic state along a certain trajectory, usually characteristic for an interview, type a question-answer

Change of psycho-energy state of the person during a controlled time frame is visually reflected in a graphics (fig. 3.25). Only the person who is in weakened, or on the contrary in a status of high concentration (fig. 3.25-b), can be in the fixed psycho-energy state during such insignificant time, as 1 minute. The majority of people is made by noticeable oscillations of psycho-energy state, even for short periods, depending on the thoughts (fig. 3.25-a) and under the influence of an environmental situation (fig. 3.25-c).

3.4.3 Information column. S mode

Information table (fig. 3.26) allows adjusting vibraimage parameters and displays the following information:

Frame Rate Settings

Fast processing   Frequency (fps) for processing «fast» parameters of vibraimage, noted by a word «fast»

Base processing   Frequency (fps) for processing «base» parameters of vibraimage, noted by a word «base»

FPS proc. period   Frequency of the frames (fps) during calculation period

Downrate   Reduce input frame rate. At value 3, will be processed every third frame.

S   ✕

VI   M   S   DB

⊟ **Frame rate**	
Fast processing	0.0
Base processing	5.0
FPS proc. period	2.00
Downrate	0
⊟ **Main**	
N(2)	2
N(10)	10
N	100
L	2.00
Apply global filter	No
⊟ **Filters**	
Single points	Yes
Extended	8
Extended (fast)	8
Stretch	No
Max speed contour	No
Am scale	16
Space	4
color image	No
BT div	1
⊟ **Crop**	
crop X	0
crop Y	0
crop X pos	0
crop Y pos	0
⊟ **F6**	
F6 HF	0
F6 LF	10
F6 N	100
FPS filter	No
E-Monster	No
Auto downrate	No
Fixed contour	Off
Stab. X	0
Stab. Y	0
⊟ **State levels**	
Ag	80
St	80
Tn	80

S   ✕

VI   M   S   DB

⊟ **State levels**	
Ag	80
St	80
Tn	80
⊟ **disable ***	
disable Am	No
disable F	No
disable 2x(fast)	No
disable VI(10)	No
disable VI(2)	No
disable FFT	Yes
disable Entropy	No
disable Audio	Yes
⊟ **Motion detector**	
Motion detector	No
level	0.1
auto reset	No
skip frames	20
⊟ **AVG filter**	
Aggression	10
Stress	10
Tension	10
Suspicious	0
⊟ **Quality test**	Yes
Enable	Yes
light level	5
FPS max	100
FPS min	24
face delay	2
⊟ **Fn**	
X1	
X2	
X3	
X4	
X5	
⊟ **Network Storage**	
enable FTP	No
configuration file	.\ftp\ftp.xml

Fig. 3.26. Information column. S mode.

Frame Rate Settings

Fast processing	Frequency (fps) for processing «fast» parameters of vibraimage, noted by a word «fast»
Base processing	Frequency (fps) for processing «base» parameters of vibraimage, noted by a word «base»
FPS proc. period	Frequency of the frames (fps) during calculation period
Downrate	Reduce input frame rate. At value 3, will be processed every third frame.

Main settings

N(2)	Minimum number of accumulated frames. By default, 2
N(10)	Average number of accumulated frames. By default, 10
N	Maximum number of accumulated frames. By default, 100
L	Threshold of a palette. Defines a threshold of displayed image, value of less brightness considers as «black»
Apply global filter	If this parameter is included, all the remaining calculated parameters change on processed by filters.

Filters

Single points	Removes single points, surrounded by black
Extended	It is intended for reduction of noise of a video camera. Delete video noise in bit. By default, 8.
	This filter is important, when the object is motionless, and values changed because of camera noise.
Extended (fast)	Delete video noise for fast processing.
Stretch	Scale normalization filter to a range 0-255 after its «trimming» by filter Extended
Max speed contour	At the included mode, calculation fast parameters are made only inside of aura contour, at switched off - on the whole frame.
Am scale	Multiplication factor used for vibraimage visualization in a «amplitude» mode
Space	Reduce vibraimage on borders of motionless contrast objects.
Color image	No – Black and white real image in image area. Yes – color image in image area.

Crop X, Crop Y	If real image size more than 640x480 pixels, than will be use only 640x480 pixels from center part of image.
Crop X pos, Crop Y pos	When cropping images define the coordinates (position of the upper-left corner) of the clipping region
F6 HF	Sets in % frequency of a cut for the filter of high frequencies at processing F1_fast parameter.
F6 LF	Sets in % frequency of a cut for the filter of low frequencies at processing F1_fast parameter.
F6 N	Number of averaging frame at calculation of F6 parameter
FPS filter	It is used for exact synchronization with a binding to the concrete frame at work with AVI files. Frequency of the input frame from the camera divided on set Base processing frequency and for processing will undertake each N frame.
E-Monster	Switch to the E-monster mode. The program opens the person face deformed by latent emotions though externally he can constrain these emotions. If the emotional condition of the person is like to normal, then the the program image is like to real video. Accordingly, than more emotions overflows the person and then more especially deformed his image in Monsters Detector mode (E-Monster).
Auto downrate	Automatic calculation of **Downrate** parameter is made in view of frequency of the input frames, Base processing frequency and computing capacity of a computer.
Fixed contour	In this mode vibra-aura around the human contour will be built around a fixed path, and not to repeat the contours of the body.
Stab. X	Image stabilization in the X coordinate entered when significant vibrations image on the X-axis.
Stab. Y	Image stabilization in the Y coordinate entered when significant vibrations image on the Y-axis.
State levels Ag, St, Tn	Suspicious level in the Aggression parameters (Ag), «Stress» (St), «Tension» (Tn) is set. When exceeding level of danger the system gives out a sound signal and fixes a frame.
Disable	**Note**: Canceling of parameter calculation is use for increase calculation speed of other parameters.
Disable Am	Canceling of vibration amplitude calculation.

Disable F	Canceling of vibration frequency calculation.
Disable 2x(fast)	Canceling of 2 frames parameters fast calculation.
Disable VI(10)	Canceling of 10 frames parameters calculation.
Disable VI(2)	Canceling of 2 frames parameters calculation.
Disable FFT	Canceling of Fast Fourier Transformation frequency processing.
Disable Entropy	Canceling of Entropy processing.
Disable Audio	Canceling audio analysis.

Motion detector

Motion detector	Delete emotion calculation for object with motion amount less than threshold.
Level	Threshold level of Integrated10 for emotion calculation.
Auto reset	Reset emotion calculation for macro movement.
Skip frames	Skip frames with the frame difference more than threshold.

Lie detection

Enable	Enable LD mode.
Stat periods Base periods	Before you begin the process of «lie detection» system during the **«Base period»** (in seconds) collects information to determine the maximum and minimum current values of human parameters that then at «lie detection» time during the **«Stat period»** define «abnormal» change individual values parameters.
Lie threshold	Threshold (in %) for the detection of lie level in view of every calculated parameters and their «weights».
Audio sens. (s)	After the ending of answer, the system continues to expect «lie» calculation during the specified time interval.
Audio level	The sound level used to start / stop lies detection process in the «Audio» mode.
Opposite mode	Alternative method of lie level calculation.
LD mode:	Selection of mode for lie detection.
Audio	Calculation of lie level starts when the level of entrance audio signal exceeds the established threshold. LD calculation stops, when the level of audio signal becomes less than the established threshold

Manual	Accumulation of the information is made in time «Base periods». Calculation of lie level is made only after pressing button «Start LD», the end of processing - after repeated pressing this button.
Auto	Calculation of a lie level works constantly, current values of parameters (Stat period) are compared to values processed for previous Base period.
Compare	**Off** - at the analysis of lie, as test, the interval «Base periods» directly till the moment of started lie detection is used.
	On - at the analysis of lie, as test, the interval «Base periods» which has been marked by the user beforehand is used. When the user includes accumulation the preliminary information, in this field value **«Capture».**
Text	Switch on/off display «text questions» in «LD Question» window.

AVG filter

Aggression	Number of frames for aggression level averaging
Stress	Number of frames for stress level averaging
Tension	Number of frames for tension level averaging
Suspicious	Number of frames for suspect level averaging

Face detection

Face detection	Yes – face detection mode is used. No – without face detection
Detection quality	Quality of face capture. 1 – capture one large person face in the frame (loading of the processor is minimal), 4 – search of all (even small) persons face in the frame (loading of the processor is maximal).
Min size, Max size	Sets in pixels the size of rectangle for search of persons
Config	In VibraMed software for person search use basic algorithm ocv_face.xml only.
Draw	No – not draw rectangle around face, Yes – draw rectangle around more danger single person, All – draw rectangle for all person in frame. For non-danger person rectangle draw green color, but if person suspect level more than «Critical level», than rectangle draw red color.

Quality test

Enable	Switch on mode of automatical check of image quality (see p. 2.4.5)

Light level	Parameter use for define image noise level when illumination is low.
FPS max, FPS min	Maximum and Minimum allowable input frame rate.
Face delay	This parameter determines how long (in seconds) the program can not recognize a human face in the frame before you will get an error message.

Fn

X1-X5	In VibraImage program user can form itself formulas for calculation of new parameters of vibraimage, using any vibraimage parameters.

3.4.4 Information column. DB (data base) mode

In the «**DB**» mode information column (fig. 3.27) adjusts parameters of recorded video information and shows the following information:

DB	⊨ ✕
DB folder...	..\..\Users\Jane\Document...
DB mode	Yes
Selected record	
New record...	
*	Jane
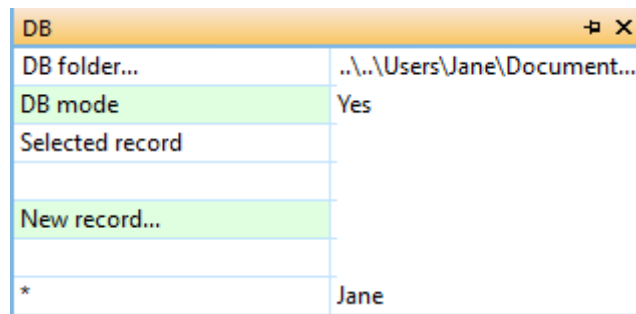
Fig. 3.27. Information column in the DB mode

- «**DB folder**» – way to the database folder for written video files and files of statistics;

- «**DB mode**» – switch on/off DB mode;

- «**Selected record**» – data on current object of research;

- «**New record**» –information about object of research. To delete new record it is necessary to delete the data folder on a disk and having selected the «**DB folder**» item again to select the folder for saving.

4 VibraHT. Assessment of the human functional health level

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. (WHO, 2006). At the same time, there is widely known medical joke that there are no healthy people, there are only unresearch people. From the point of view of the natural sciences, the given joke is closer to the truth than the WHO definition, since nothing ideal exists in the world and we can only talk about some kind of approximation to the absence of diseases. There are a large number of different models and approaches that describe the normal physiological state of a person (Sechenov, 1952; Pokrovsky&Korotko, 2001; Halberg, 1987; Wiener, 1943; Gladyshev, 2014; Saturday, 1994). Moreover, these approaches are fundamentally different internal mechanisms that determine the balance (metabolism) and the interaction between the physiological systems of man (Tamar, 1976). In this case, the normal physiological or psychophysiological state of a person is always associated with the balance or equilibrium of various components. Various methodological approaches are also known that characterize the equilibrium of psychophysiological state of a human, the most famous of which are homeostasis (Cannon, 1932), homeokinesis (Halberg, 1987) and allostasis (Bobrov et al., 2017). Regardless of the terminological subtleties that determine the maintenance of balance, the attachment of basic physiological systems to circadian rhythms is a generally recognized phenomenon (Blank & Blank, 2010), and it was proved that the desynchronization between the temperature and heart rhythms with the circadian rhythm is associated with the presence of cancer (Blank & Blank, 2010).

Therefore, the magnitude of uncorrelation or desynchronization of various physiological signals can be an indicator of pathology or disease, and therefore be a quantitative characteristic of the level of health. The cybernetic approach to person as a black box made it possible to establish the presence of correlations between the spatial, temporal and mathematical characteristics of human head reflex micromotion (Minkin, 2020). It was this approach that laid the foundation for the development of the HealthTest program (HealthTest, 2020), in which the level of health is determined by calculating two main indicators, one of which is the maximum correlation, determined by correlation matrix between 16 calculated characteristics of reflex movements of a human head (Minkin, 2020). The binding of physiological parameters to circadian rhythms mathematically determines the correlation between the physiological parameters themselves. It is possible to use the limited period significantly less than a day for the detection of these correlations. As a second indicator of health, is proposed to use the degree of similarity to the average profile of 16th psychophysiological parameters determined based on 12494 measurements of healthy people (Minkin, 2020).

The third indicator AI is the result of Artificial intelligence work based on comparison with real biochemical analysis with COVID-19.

The researches (Minkin, 2020) have shown a high sensitivity of the VibraHT program indicators to the general level of health. Measurements of the health level of all subjects using a standard measurement period of 180 seconds (3 minutes) showed similar values of indicators, in contrast to the reduced measurement time to 1 minute, in which an unstable determination of the health level was observed. This is due to the detected rhythm of brain activity (Minkin & Blank, 2019), which can exceed the measurement period of 1 minute, which requires an increase in the measurement time to reduce the error.

It is known that most diseases have 3 common periods in their development (Pokrovsky&Korotko, 2001):

1. The hiden (latent, incubation) period between the onset of exposure to the pathogen and the onset of the first symptoms of the disease.

2. The period of the full development (active phase) of the disease, when all the symptoms of the disease appear.

3. The period of disease completion is the recovery and restoration of the normal physiological state of a person or vice versa, irreversible changes leading to the death of the sick person.

Each period can have a different duration depending on the nature of the disease. Naturally, the main task of each diagnostic system is the early diagnosis of any disease, which gives maximum opportunities for using the entire arsenal of modern medical devices for treating the disease. Most early diagnostic tools are focused on identifying a specific disease, which is absolutely rational, since identifying a specific disease is a standard task of traditional medicine. However, in most cases, this problem can be solved only at the second stage of the development of the disease, when significant functional and structural changes occur in the human body and significant manifestations of the disease are observed in the form of temperature, biochemical changes, rash, pain, etc.

Modern technical capabilities allow us to review traditional diagnostic methods and supplement them with technical solutions that use metabolism and homeokinesis, as indicators of general health, which can also be used to identify specific diseases (Blank et al., 2014).

Reflex movements of the human head are an informative indicator of the state of health, allowing you to diagnose the disease at an early stage in the absence of elevated temperature. The using of vibraimage technology (Minkin, 2007; 2020) allows you to receive an unlimited amount of information about the psychophysiological state of the person being studied.

VibraHT allows to obtain reliable behavioral, psycho-emotional and / or functional test person portrait (similar program VibraMed, a detailed description of the link http://psymaker.com/downloads/VibraMedEng10.pdf).

The optimal measurement time required to determine the level of functional health with the VibraHT program is 3 minutes (180 seconds).

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5 How to save and analyze results

After end of the test program VibraHT automatically also creates files with the test results in the directory «C:\Users\user\Documents\HealthTest».

The testing result is recorded in the form of files of the following types:

YYY-MM-DD hh_mm_ss_M.xlsx	**BASE RESULT** for Mental-Functional state. Excel format (fig. 5.1)
YYY-MM-DD hh_mm_ss_histH.png	graphic file with the histogram of frequency distribution (fig. 3.22)
YYY-MM-DD hh_mm_ss_histH.xml	data file with the histogram of frequency distribution. XML format
YYY-MM-DD hh_mm_ss_histT.png	graphic file with graphs of I-E state of a person changes over the period (fig. 3.23, 3.24)
YYY-MM-DD hh_mm_ss_M.xml	testing result for Mental-Functional state. XML format

In all files in names **YYYY-MM-DD** and **hh_mm_ss** date and time of measurement.

5.1 Base results

Base results of psychophysiological research are in Exel file (fig. 5.1) in the sheet HealthTest.
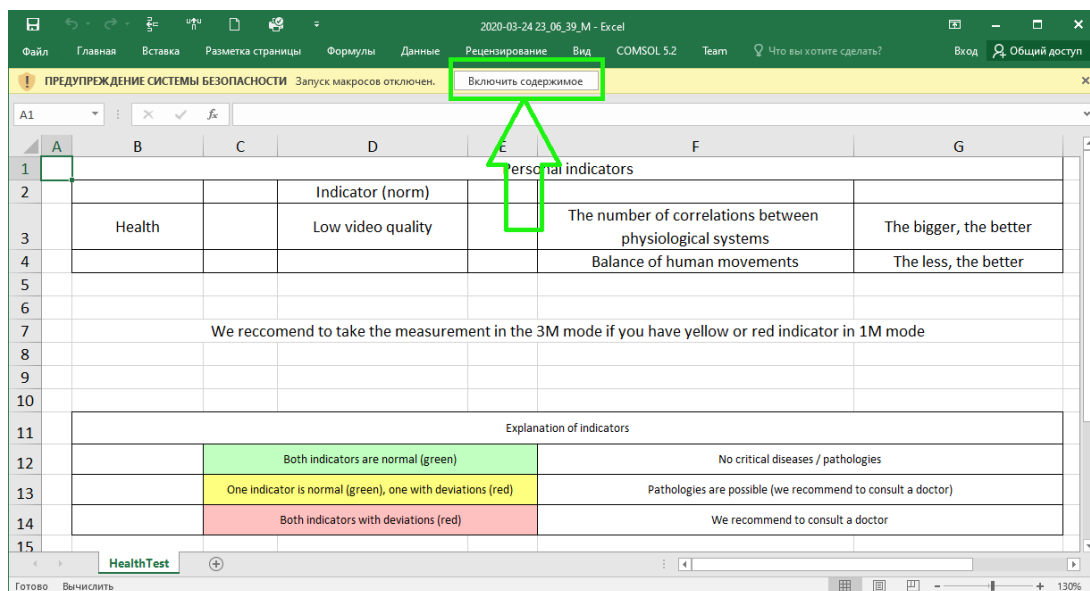
*Fig. 5.1 Running a file with the results. You should **ENABLE MACROS**.*

Concrete interface of Macros function enabled depends on the version of stand Excel program and can differs from fig. 5.1. So you need to use Excel help for starting Macros function in the opened file for calculation your health level.

Some time after turning on the macros, the results will appear on the screen (Fig. 5.2 – 5.4). The duration of the data processing depends on the power and load of your computer and can take 30 seconds.

*Fig. 5.2 Result **HEALTHY**.*

1 If both indicators are normal and displayed in a green cell (Fig. 4.2), then in general we can conclude that there are no diseases or pathologies critical for a person.

*Fig. 5.3 Result **RECOMMEND TO CONSULT A DOCTOR**.*

2 If one of the indicators deviates from the norm (Fig. 5.3), to increase the accuracy of the result, testing should be carried out for 3 minutes.

If the result is repeated, this may mean an implicit balance of physiological, including vestibular-reflex, human systems, the absence of the necessary degree of correlation between the calculated parameters, the lack of balance of human movements (too strong fluctuations) or insufficient number of connections between the physiological systems of the person for normal functioning of the body.

The reason for this may be a violation of the normal functioning of any physiological or psycho-emotional system in the body, and in this case, we *RECOMMEND* you *TO CONSULT A DOCTOR* to accurately identify the disease.

3 If the Health cell is red (Fig. 5.4) and both indicators are not normal we *RECOMMEND* you *TO CONSULT A DOCTOR* to accurately identify the disease.

4 If the AI result is red it means tested person has COVID-19 diagnosis.

VI10HT

Fig. 5.4 ***STRONGLY RECOMMEND TO CONSULT A DOCTOR***

Fig. 5.5 ***COVID-19 DIAGNOSIS***

5 If you see no result at the end of the test (Fig. 5.6), this means a low-quality video in the testing process. To avoid this, during the next test, turn off the automatic "**Quality Test**" in the "**Settings**" menu or improve the video quality by following the tips in section 1.3 and 4.4.

Fig. 5.6 Lack of result due to low video quality

5.2 Sheets Measurement, dMeasurement

Measurement sheet shows the results of psychoemotional testing (fig. 5.7) for the whole measurement period (similar to the VibraMed program). Data in a main table (Testing result for mental-functional state) in the Exel file based on data from a Reference table with yellow row and column headers (fig. 5.8).

In the reference table there are parameters M, S, Vi, bmin, cmin, bmax, cmax (see p. 3.4.2) according to each parameter T1 – T10. Parameter M is the same as parameter Avg in the main table. Parameters bmin and bmax are the same as parameters Nmin and Nmax from p. 3.4.2

Conditionally positive emotions are Balance, Charm, Energy, Self-regulation (T5 – T8). Conditionally negative emotions are Aggression, Stress, Tension, Suspect (T1 – T4). Conditionally physiological emotions are Inhibition and Neuroticism (T9, T10). In a row "Positive" (fig. 5.1) there are average value for parameters M and Vi for T1 – T4. By analogy, values in rows "Negative" and "Physiological" are calculating. Emotion distribution charts (fig. 5.4) display part of positive, negative or physiological parameters indicating by corresponding color.

At the beginning of the main table, there are data about testing person (name, gender, age, ID), date and time of measurement and $\sum Vi$ – the average of the «Health» (mean value of health level).

Further there are values of parameters T1-T12 during the test minimum (Min), maximum (Max), average (Avg) and variability (Vi). For example on fig. 5.6 for parameter T1 Agression with normal value between bmin 20 and bmax 50: Min – 15,2; Max – 38,9; Avg – 26,0 and Vi – 16,5.

At the bottom of the file there are extraversion and stability levels and result for mental functional state (normal or recommended a professional consultation). Quality 100 % mean that during whole test quality test of image is 100 %.

Testing Result for mental-functional state

Name	.		ID		
Gender			Date		28.10.20 16:39
Age			Σ Vi	18,7127	

10 Parameter Results

Parameter	Min	Avg	Max	Vi	Parameter	Min	Avg	Max	Vi
Aggression (20 ~ 50)	15,2	26,0049	38,9	16,5	Stress (20 ~ 40)	21,0	36,9247	44,7	13,4
Tension (15 ~ 40)	8,7	28,8417	54,7	27,5	Suspect (20 ~ 50)	20,5	31,212	41,3	11,8
Balance (50 ~ 100)	42,8	68,8086	81,8	7,6	Charm (40 ~ 100)	29,6	52,0433	80,9	28,5
Energy (10 ~ 50)	6,0	10,2669	27,5	33,0	Self-Regulation (50 ~ 100)	44,3	61,0706	81,3	12,4
Inhibition (10 ~ 25)	13,5	20,7742	33,8	18,0	Neuroticism (10 ~ 50)	1,8	37,4459	45,6	18,2
Depression (20 ~ 50)	16,5	29,96	35,3	12,1	Happiness (50 ~ 100)	47,7	60,43	68,8	7,9

Parameter Chart	Emotion distribution Chart

Frequency Histogram

Mf	0,948	S	0,452

Psy variability - Mental basal metabolism

Psy change rate	48,9-67,2	Kcal/min	1,4-2,7

Result [Quality 100% / 13]

Extraversion	70,555	Stability	76,3556

Comments	

Fig. 5.7 The results of psycho-emotional testing for the entire period.

	M	S	Vi (S/M)	bMin	cMin	bMax	cMax
Aggression	26,00	4,30	16,55	20,00	15,16	50,00	38,91
Stress	36,92	4,93	13,36	20,00	20,99	40,00	44,74
Tension	28,84	7,94	27,54	15,00	8,73	40,00	54,66
Suspect	31,21	3,70	11,84	20,00	20,46	50,00	41,31
Balance	68,81	5,26	7,64	50,00	42,83	100,00	81,84
Charm	52,04	14,85	28,54	40,00	29,63	100,00	80,87
Energy	10,27	3,39	33,02	10,00	6,04	50,00	27,49
Self-Regulation	61,07	7,57	12,40	50,00	44,32	100,00	81,26
Inhibition	20,77	3,74	18,03	10,00	13,55	25,00	33,83
Neuroticism	37,45	6,81	18,20	10,00	1,77	50,00	45,57
Depression	29,96	3,63	12,12	20,00	16,53	50,00	35,28
Happiness	60,43	4,76	7,87	50,00	47,66	100,00	68,81
Positive	48,05	41,4%	20,40	39,4%			
Negative	30,74583	26,5%	17,3225	33,5%			
Physiological	37,15398	32,0%	14,0529	27,1%			
Sat	0,003319						

Fig. 5.8 Reference table in the result Exel file
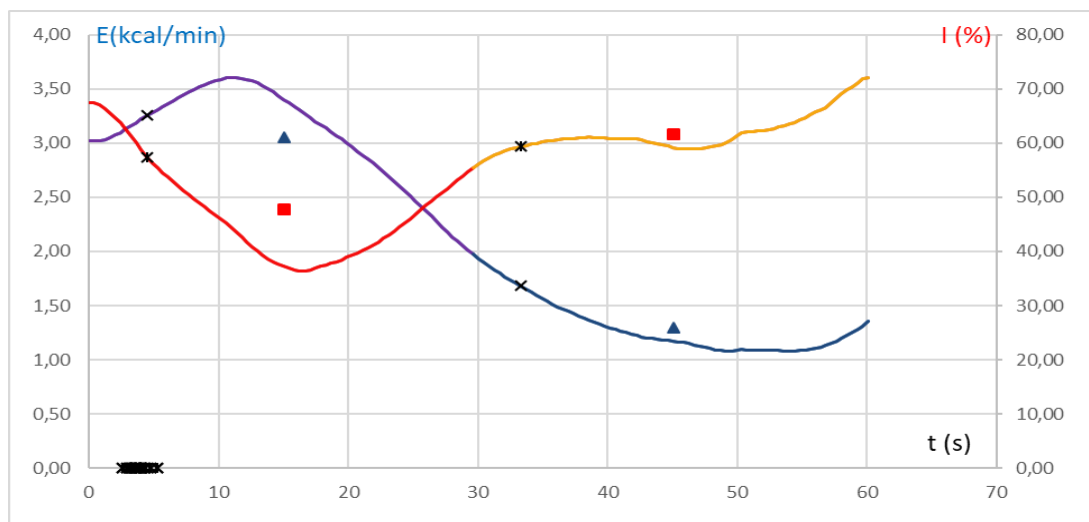
Fig. 5.9 Change in time of the psycho-energy diagram

Frequency Histogram and Psy variability - Mental basal metabolism (I-E graphs) described in p. 3.4.2, 4.2. Symbol "×" on this diagram is start of measurement. For more information there is one extra chart (fig. 5.10) where you can see correlation between information and energy during measurement.
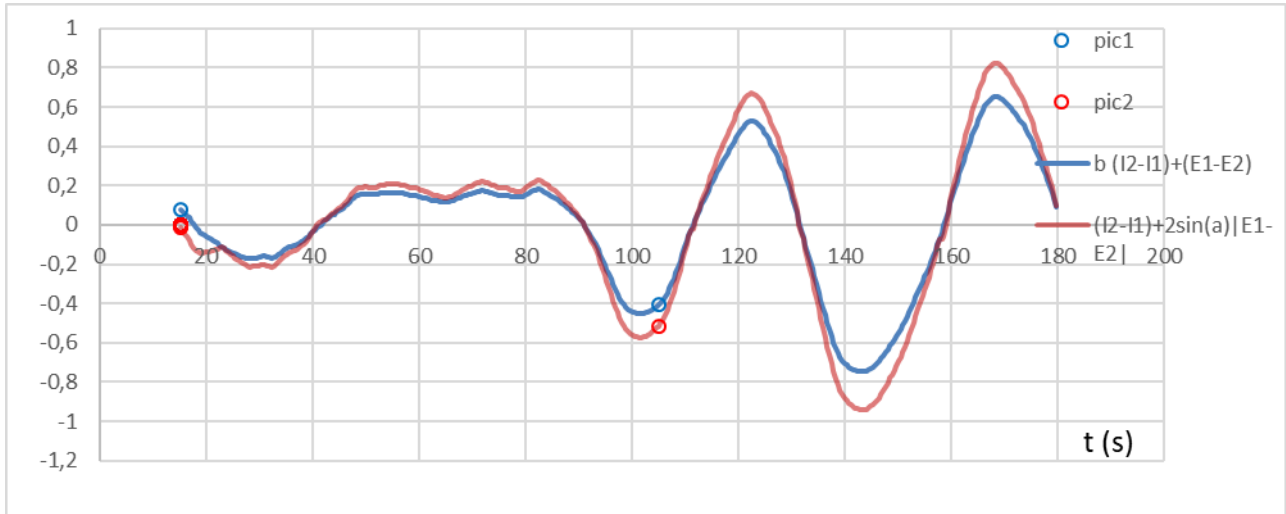
Fig. 5.10 Correlation between information and energy during measurement

The dMeasurement tab (fig 5.11) shows results similar to those shown in the Measurement tab only for the first half of the "1st Test" and for the second "2nd Test", as well as the "D Test" reference table for the difference between the "2nd Test" and "1st Test" ... This can be used, for example, when measuring with open eyes in the first part of the test and closed in the second half.

Testing Result for mental-functional state

Name	.		ID	
Gender			Date	28.10.20 16:39
Age			Σ Vi	0

10 Parameter Results

Parameter	Min	Avg	Max	Vi	Parameter	Min	Avg	Max	Vi
Aggression (20 ~ 50)	4,8	0,8042	1,8	-6,8	Stress (20 ~ 40)	9,7	3,7415	-0,4	-7,7
Tension (15 ~ 40)	3,4	4,8303	3,6	-7,6	Suspect (20 ~ 50)	6,9	2,9886	-1,8	-5,7
Balance (50 ~ 100)	14,2	1,6326	-2,4	-2,2	Charm (40 ~ 100)	-1,1	-18,2287	-11,6	5,0
Energy (10 ~ 50)	1,3	-0,5505	-15,3	-30,4	Self-Regulation (50 ~ 100)	-3,1	-6,6823	-7,2	0,2
Inhibition (10 ~ 25)	0,7	-0,1937	-4,5	-4,8	Neuroticism (10 ~ 50)	-0,3	-10,329	-10,6	5,4
Depression (20 ~ 50)	4,1	2,21	1,9	-2,3	Happiness (50 ~ 100)	9,6	4,07	3,6	-2,0

Parameter Chart	Emotion distribution Chart

Frequency Histogram

Mf	0,98/0,92	S	0,47/0,43

Psy variability - Mental basal metabolism

Psy change rate	48,9-67,2	Kcal/min	1,4-2,7

Result [Quality 100%]

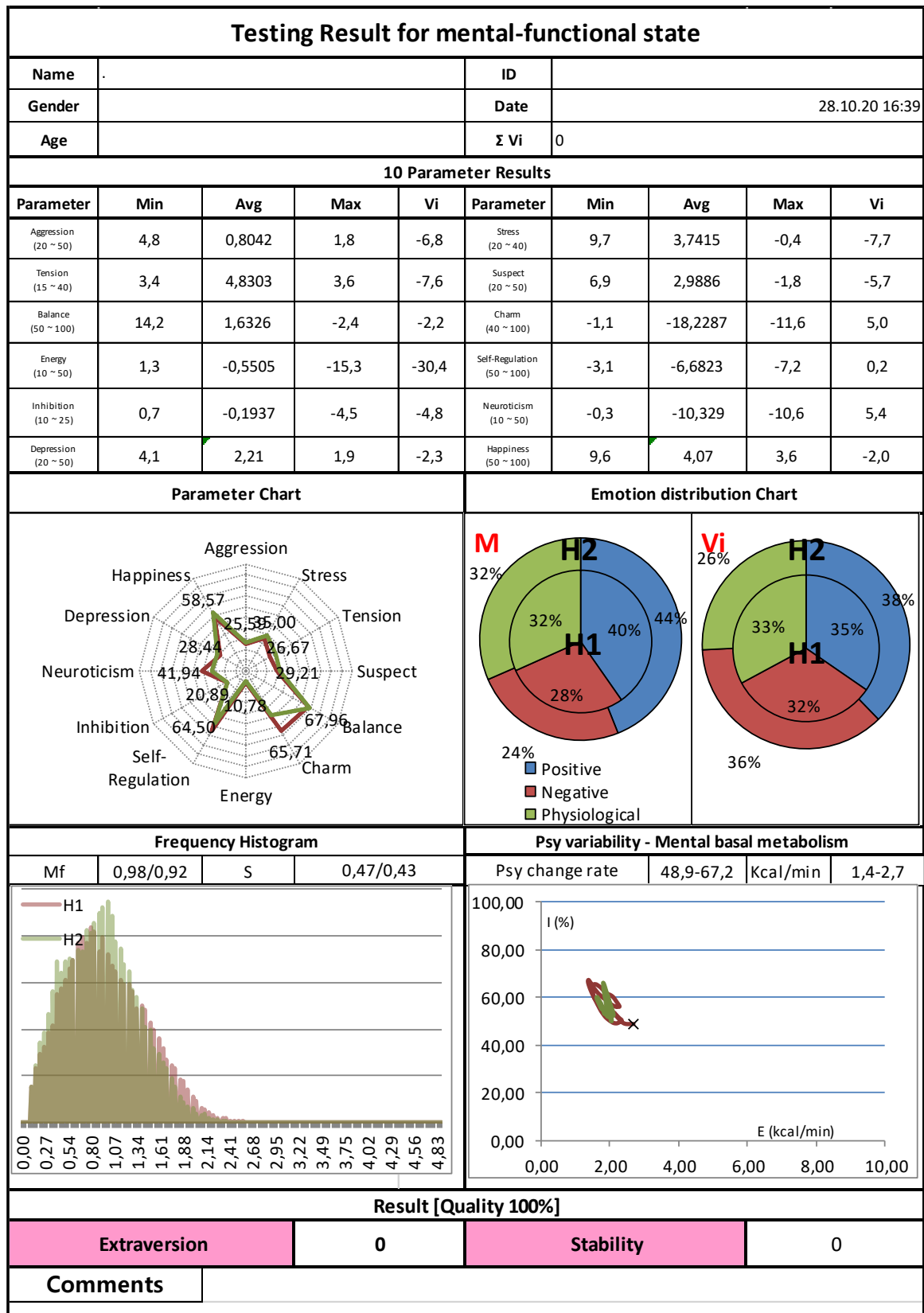| Extraversion	0	Stability	0

Comments	

Fig. 5.11. Differential results of psychoemotional testing.

Also, the file of PPS measurement results by the VibraHT program contains additional sheets with measurement and calculation data:

COR	Tab to view the correlation between the parameters of the tested person and the average obtained on a sample of more than 15,000 measurements.
refM	Correspondence of the parameters of the human head micromovements to the average statistical standards (template)
log_ref	Measurement parameters data to calculate Measurement
log	Measurement parameters data to calculate dMeasurement
IE_Gr	Graph of time changes in the psychoenergetic diagram
correl_IE	correlation between the parameters IE
info	Changing the PPS during a measurement
M	Data for sheet Measurement
dM	Data for sheet dMeasurement
M1	Data with measurement results of the first part of testing
M2	Data with measurement results of the second part of testing
FFT	The spectrum of the PPS change signal determined by the fast Fourier transform
FH	Frequency histogram digital data
FH1	Frequency histogram digital data of the first part of testing
FH2	Frequency histogram digital data of the second part of testing
FT_RAW	Change in the information and energy components of the PPS during the measurement
FT_GR	Change in the information and energy components of the PPS during the measurement
FT	derivative of the changing in the information and energy components of the PPS during the measurement
P	Results of PPS changes in relative units
YNQ	Possibility to link PPS changes to a conscious response
FH_info	Data of measurement modes
lang	Translation of terms into different languages
Video_info	Settings data of the webcam used at the time of measurement

6 Warranty

Maintenance service and service regulations of VibraHT system is carried out according to this Manual and instructions of used hardware maintenance (a computer, the camera, etc.).

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