

Emotion Recognition and Behavior Detection System

VibraMed

MANUAL

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1. Introduction

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

VibraImage technology measures micromovement (micro motion, vibration) of person by standard digital, web or television cameras and image processing. Human head microvibration is linked with the vestibular-emotional reflex (VER) of a person and reflects emotion status and personality traits. **VibraMed** system detects human emotions by the control of three dimensional (3D) head-neck movements and fluctuations, accumulated as frame difference in several video frames.

1.1. Basic applications

VibraMed is designed for psychophysiological diagnostics and psychological researches. **VibraMed** solves the following aims:

- behavior detection and psychophysiological control of person;
- psychophysiological personal diagnostics based on corresponding statistic norms;
- vibra-aura (external vibraimage) real time surveillance, research, analysis and interpretation.

1.2. Specifications

1.2.1. Basic parameters

- | | |
|---|----------|
| • Resolution, TVL, more than | 400 |
| • Noise level of VibraImage, bit, less than | 0.1 |
| • Frame speed, frame/sec, more than | 25 |
| • Frequency range, Hz, more than | 0.1 ÷ 10 |

1.2.2. Digital (web) camera requirements

- | | |
|---------------------------------|-----------------------------|
| • Sensor | CCD or CMOS Sensor |
| • Resolution, pixel., more than | 640 x 480 |
| • USB compatible | USB 3. 0. USB 2. 0. USB 1,0 |
| • Frame speed, f/s, more than | 25 |
| • Microphone | external |
| • Exposition control | auto and manual |

- Color mode color and B/W switch
- Flicker mode Flicker 50 Hz and 60 Hz

1.2.3. System requirements for local module computer

- | | | |
|---|----------------------|--|
| • | Operation System | Windows XP Prof/Vista/7/8
with DirectX 9.0 or later |
| • | Processor | Pentium Core Duo 2 2400 MHz
or later |
| • | RAM | more than 1024 Mb |
| • | HDD | more than 10 Gb |
| • | USB port | 1 free USB ports version USB 2.0 |
| • | Installed software 1 | DirectX 9.0 or later |
| • | Installed software 2 | Windows Microsoft.NET Framework
1.1 or later |
| • | Video capture | WDM-compatible video device |

1.3. Package contents

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

2. **VibraMed** software installation

To install **VibraMed** please follow steps below:

1. Go to Web page <http://www.psymaker.com/support/downloads/>
2. Load file Vibraimage8Med.exe <http://www.psymaker.com/downloads/Vibraimage8Med.exe>
3. Run file Vibraimage8Med.exe from archive file
4. Select language for installation procedure (fig. 2.1).

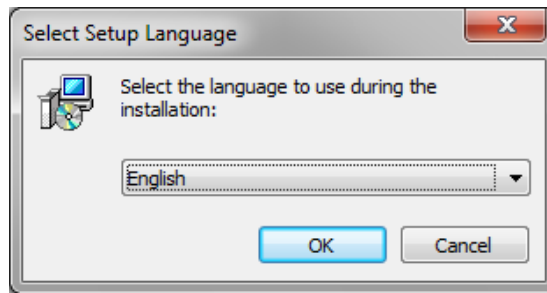


Fig. 2.1. Choice of language installation

1. Press button «Next» in the appeared window of the beginning installation.
2. Accept the license agreement and to press button «Next» in the appeared window.
3. In the appeared window specify a way to the catalogue where files of the program will be written down, then to press button «Next».
4. Press button «Next» in the appeared window, allows installation of software files on your computer.
5. In the appeared window select versions of the program which you want to install on the computer (fig. 2.2).

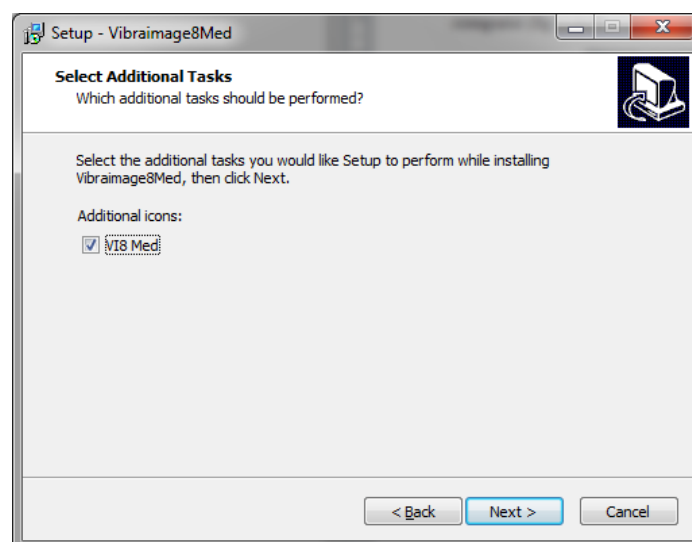


Fig. 2.2. Choice of additional tasks during installation

6. Press button «Install» at the start of installation.
7. If you want to have the **VibraMed** program with other programs, in the appeared window it is necessary to choose item of installation of virtual camera drivers, and press «Next».
8. Press button «Finish» at the end of installation.
9. **VibraMed** program pictogram appears after the end of installation in system menu and on desktop of your computer.
10. To reboot a computer.

2.1. **VibraMed** software activation

Attention:

1. Procedure of activation is made once at the first start of the program.
2. Before the program activation it is necessary to buy this modification of the program in the online shop Psymaker <http://www.psymaker.com/ru/shop/>
3. Activation procedure requests access to the Internet for receiving answer code from server.
4. Activation code has the structure given in the table.

Key type	Software modification
VI7_XXXXXX_MED	VibraMed software is intended for: <ul style="list-style-type: none"> - behavior detection and psychophysiological control of person; - psychophysiological personal diagnostics based on corresponding statistic norms; - vibra-aura (external vibraimage) real time surveillance, research, analysis and interpretation

2.1.1. Standard activation

1. To start activation it is necessary to get starts the program **VibraMed**.
2. At the first start of the program the activation window will be displayed (fig. 2.3).

Fig. 2.3. Activation window

3. In the field «**Request**» it is necessary to enter the activation code received by e-mail or specified by the seller. After input of activation code to press the button «**Get Answer code using HTTP**».

Attention!

Please, be careful and paste code without additional gaps!

4. The activation code will be checked up through the Internet and, in case of successful end of activation procedure, the answer code will be sent (fig. 2.4).

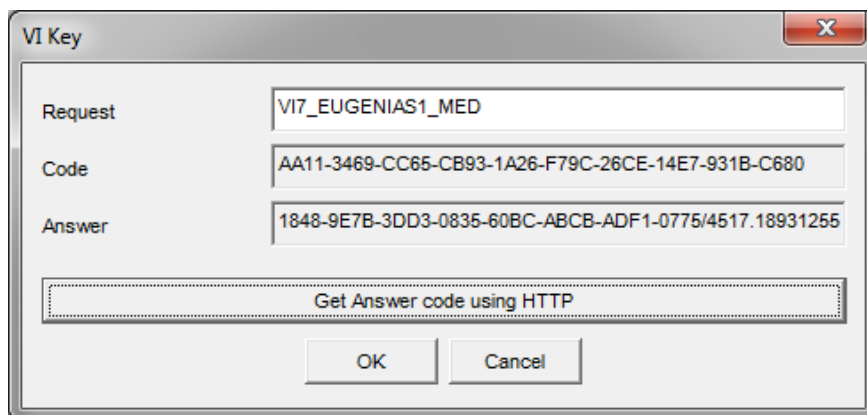


Fig. 2.4. Successful activation

5. Press button «**OK**». **VibraMed** will be automatically started.

Attention!

The first launch must be carried out with administrator rights!

After starting program you will see white screen fig. 2.5

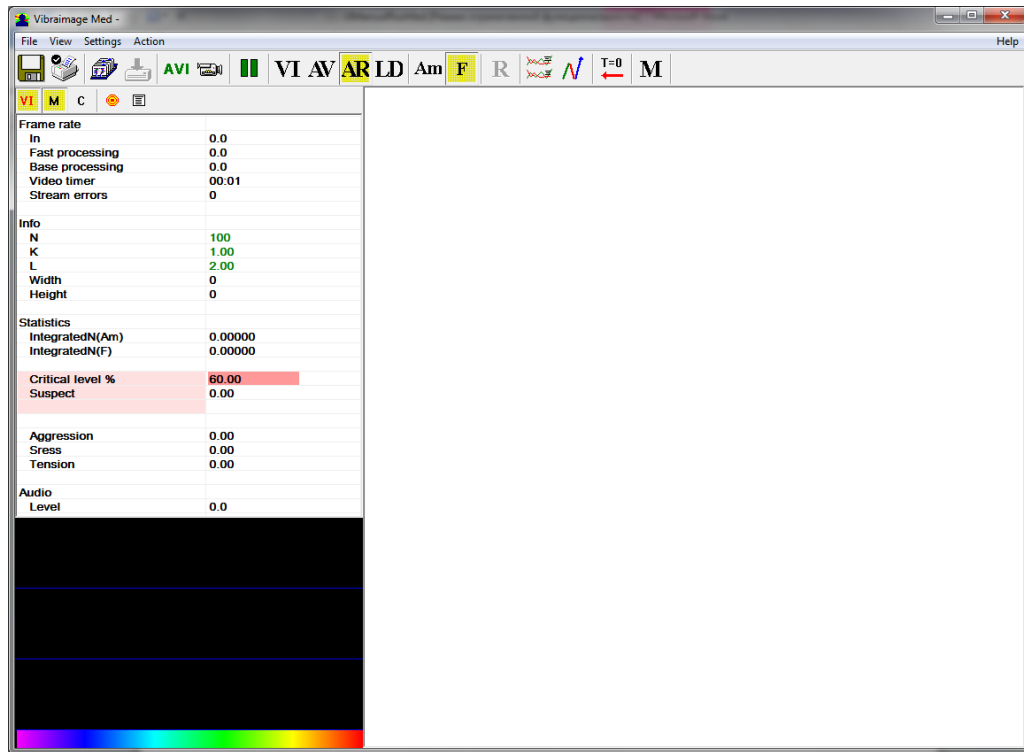


Fig. 2.5. The first start of the program

6. To select program language in the menu «**Settings**» => «**Language**» (fig. 2.6).

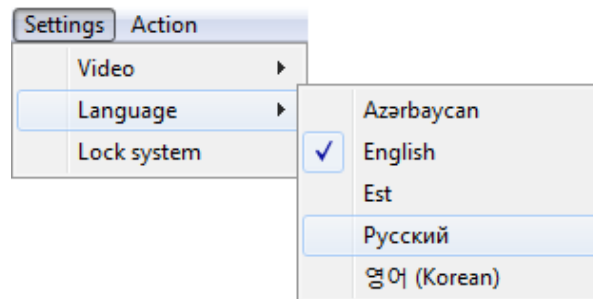


Fig. 2.6. The choice of the program language

7. After connecting to the computer the camera to select the camera for operation in the menu «**Settings** » => «**Video**» (fig. 2.7 – camera Look 1320 V2).

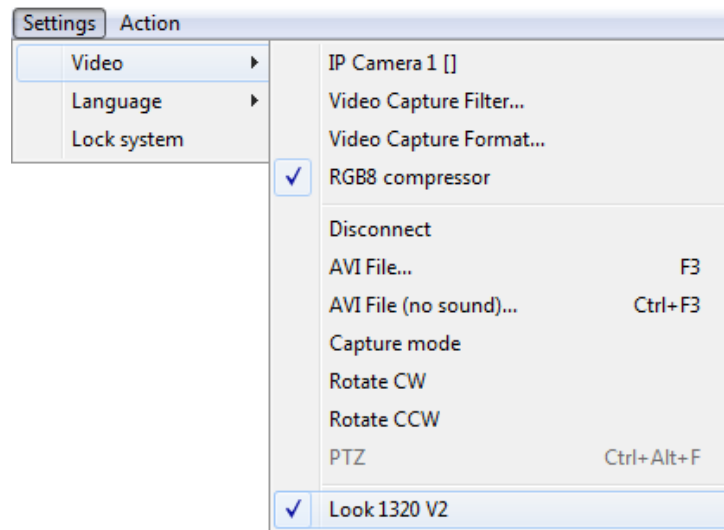


Fig. 2.7. The camera connecting

8. Start operation with system.

2.1.2. DEMO activation

Note, for each modification you have a possibility of the program start in the DEMO mode only 5 times. Then the Internet code is required to be bought.

1. To start activation it is necessary to get starts the program **VibraMed**.
2. At the first start of the program the activation window will be displayed (fig. 2.8).

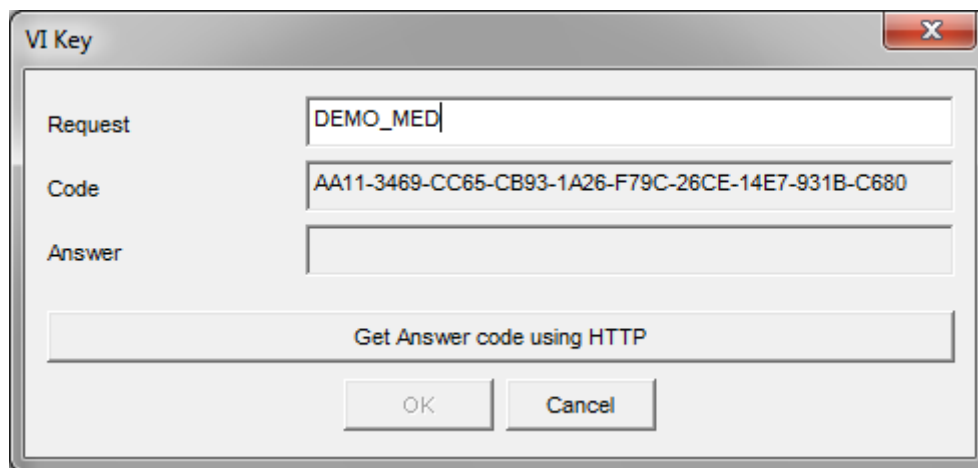


Fig. 2.8. DEMO activation window

3. In the field «**Request**» it is necessary to enter uppercase letters of «**DEMO_MED**» (fig. 2.8). After input of an demo activation code to press the button «**Get Answer code using HTTP**».

4. The activation code will be checked up through the Internet and, in case of successful end of activation procedure, the answer code will be sent and will be appeared in the field «Answer» (fig. 2.9).

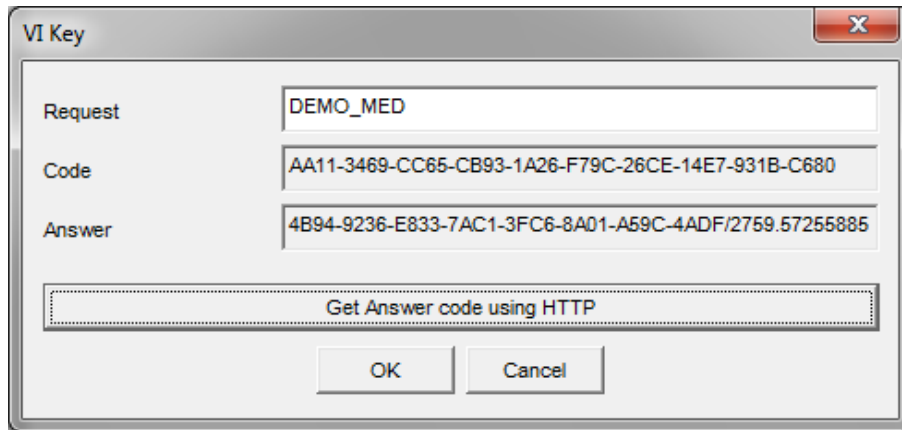


Fig. 2.9. Successful DEMO activation

5. Further items 5-8 as in case «**Standard activation**».

2.2. Reinstallation of **VibraMed**

Note, the ability to reinstall chosen **VibraLite** modification on a new computer is given to user only for **VibraMed** modifications with «+» This operation is also recommended before any upgrade SW or HW on PC.

For this purpose it is necessary to execute the following actions:

1. To connect computer to the Internet.
2. To start **VibraMed** program for reinstallation on a new computer.
3. In a program window, having pressed the mouse right button, to cause the menu and to choose item «About Vibraimage...» (fig. 2.8).

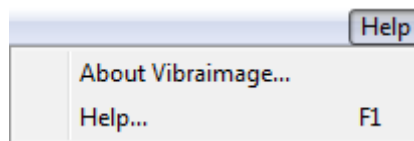


Fig. 2.10. Menu «Help»

4. In the opened window to press the button «**Unregister key**» (fig. 2.11).

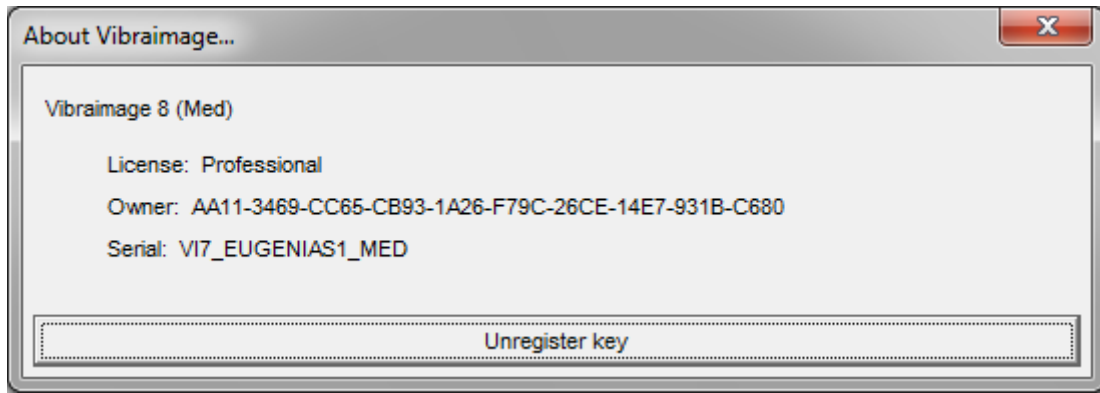


Fig. 2.11. Information about the program

5. Close the program.
6. Connect a new computer to Internet.
7. On the new computer to install the chosen program modification and to 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.

2.3 Camera's setting

2.3.1 Video camera choice

It is necessary to select in the main menu «**Settings**» => «**Video**» => «**.../name used camera/...**». In figure 2.12 the process of selecting the camera «Look 1320 V2» is shown. If the camera is connected, selected and works, then the left of the name there will be an icon «**✓**» (fig. 2.13), and the menu will be extended with the «**Video capture filter...**» and «**Video capture format...**».

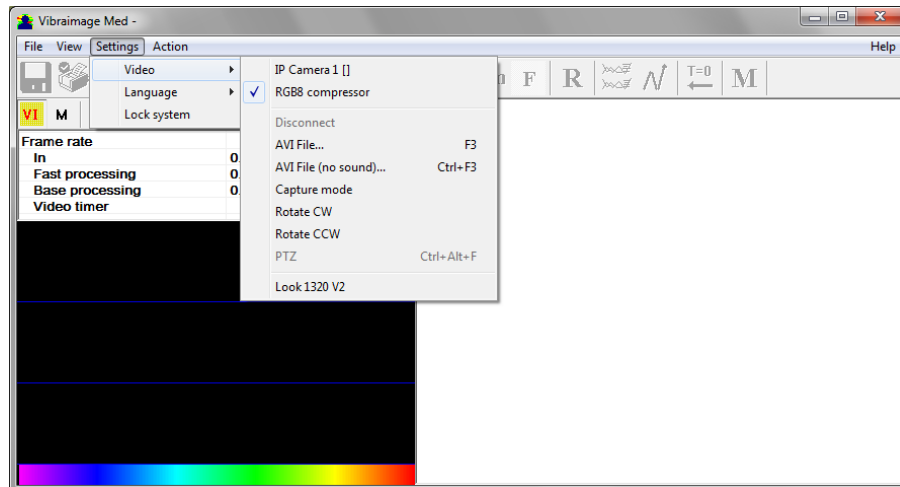


Fig. 2.12. Example of camera choice

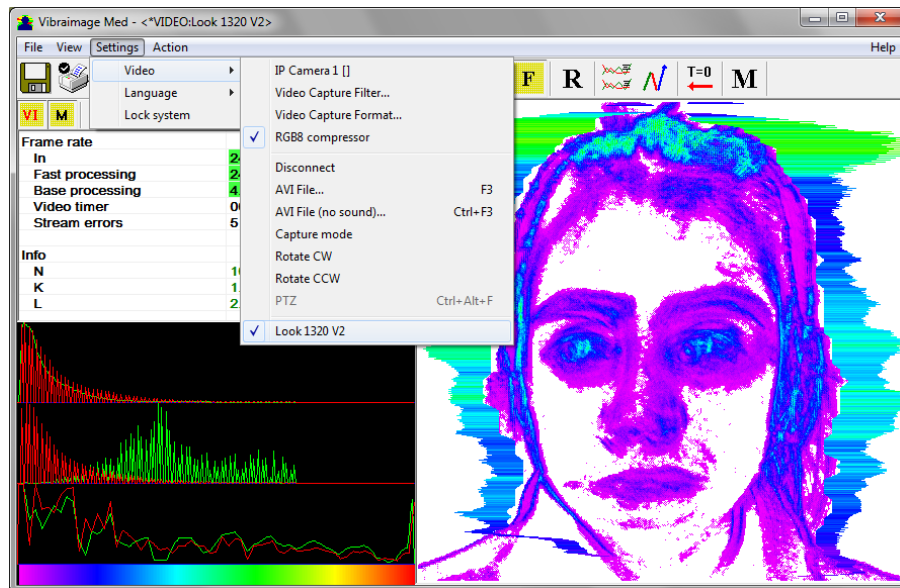


Fig. 2.13 The camera «Look 1320 V2» is selected

2.3.2 Video capture filter

To open the menu of the camera settings you must be select «**Video capture filter.....**» in the submenu «**Video**» (fig. 2.14). Item «**Video capture filter...**» appears in the menu only in case of the correct installation of drivers of the camera and a choice of the working camera.

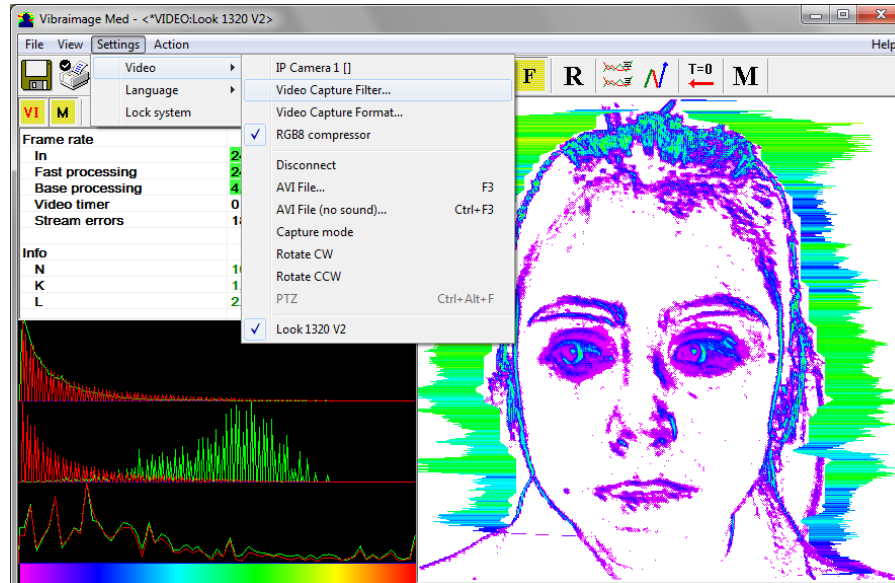


Fig. 2.14. Opening of the camera's settings menu («Video capture filter....»)

After a choice of the «**Video capture filter...**» the window «**Settings**» will open. Settings window differs depends on camera type. The first tab of this window is usually devoted to the image setup (Brightness, Contrast, etc.). In a figure 2.15 the window «**Settings**» for the camera «**Microsoft LifeCam Cinema**», and in a figure 2.15 for the camera «**Look 1320 V2**» is shown. Camera Microsoft LifeCam Cinema has low noise level and is preferable for vibraimage applications among webcams.

«**Brightness**», «**Contrast**» and other parameters should be set up so that image of object has more contrast. Switching on/off flicker-effect from artificial lighting could be necessary for some illumination types.

Depending on the experimental conditions and light is necessary to select auto or manual settings «**Focus**», «**Exposure**». If the illumination is constant, then it is recommended to use manual configuration, if you change (for example, the illumination of an object depends on street lighting), it is better to use automatic configuration. The «**Scale**» (Zoom) is recommended to select based on two factors. Firstly you need to have maximum image size of control object and it is preferably to stand maximum zoom level. From the other side high level of electronic zoom in some cameras could go down the frame rate and it is necessary to control this parameter and fixed frame rate more than 25 f/s. So for webcam Microsoft LifeCam Cinema the optimal meaning of zoom for personal control is 4, see Fig. 2.15. For other cameras is possible to adjust other optimal zoom settings.

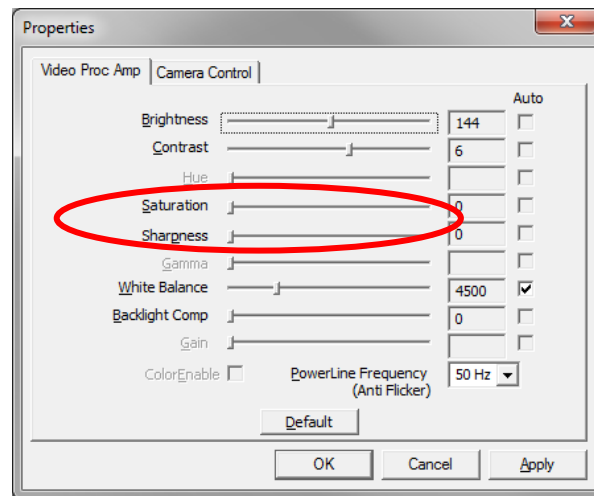


Fig. 2.15. Video setting, camera « Microsoft LifeCam Cinema»

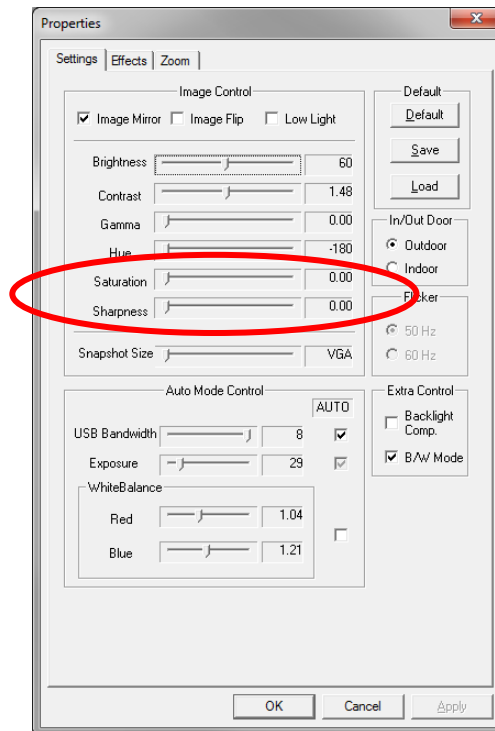


Fig. 2.16 Window «Settings», video setting, camera «Look 1320 V2»

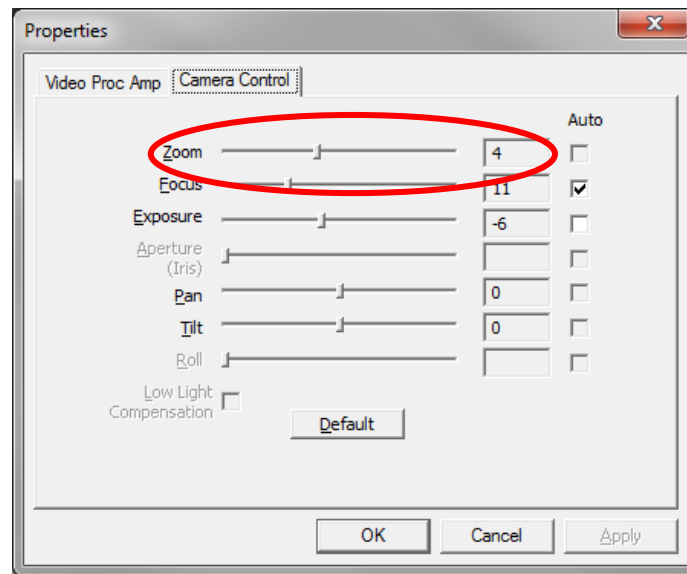


Fig. 2.17. Zoom setting, camera « Microsoft LifeCam Cinema»

2.3.3 Video capture format

To open the menu of the camera settings you must be select «**Video capture filter...**» in the submenu «**Video**» (fig. 2.18). 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") 640 x 480 elements (fig. 2.19).

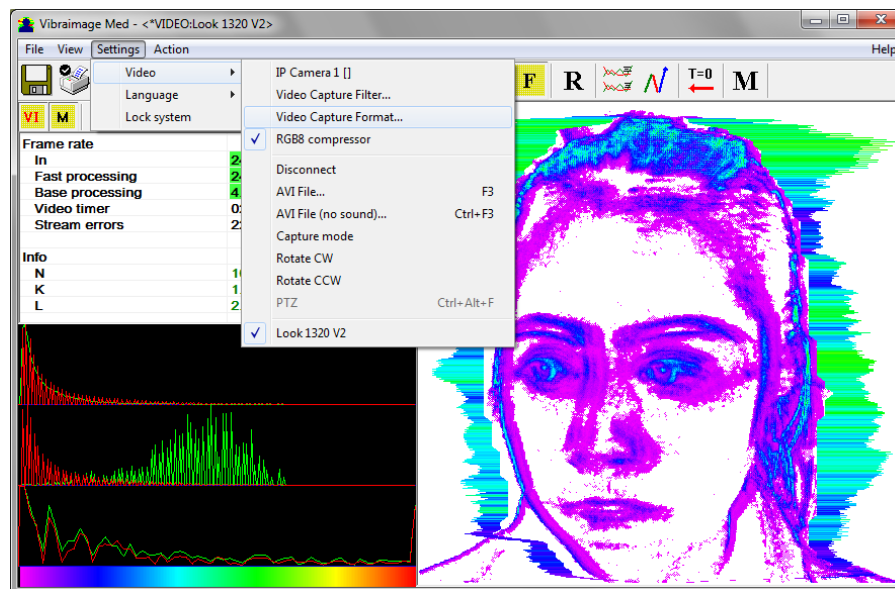


Fig. 2.18. Opening the settings window «Video capture format»

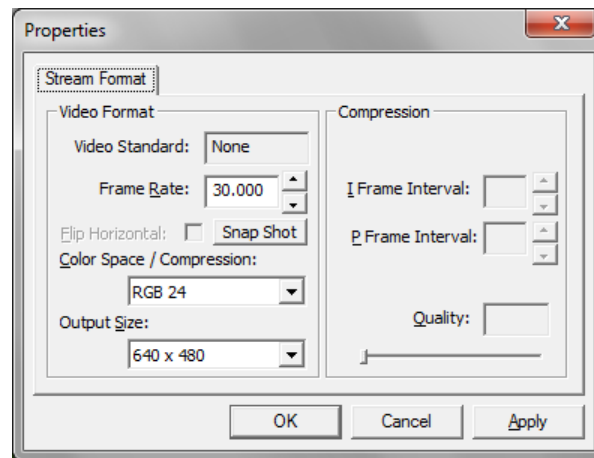


Fig. 2.19. Window «Video capture format»

Note, when changing camera settings in the program **VibraMid** frame rate «In» should be in the range of 25 - 30 frames/s. The parameter IntegratedN (Am) must be minimum, but not exceeding 0.1.

2.3.4 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. 2.20) and manual regulation of illumination in case of a constant illumination (fig. 2.21).

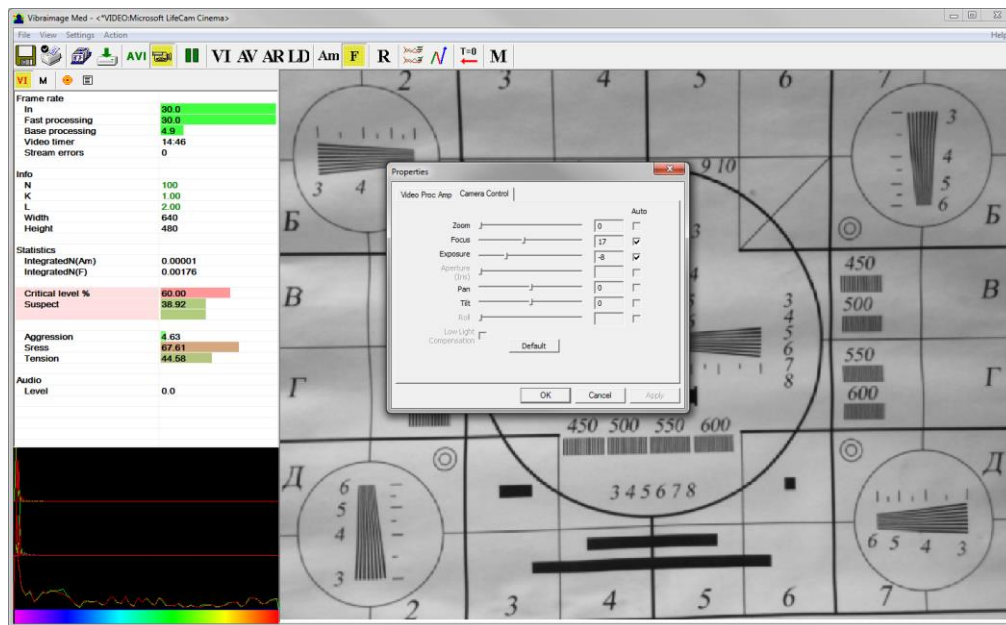


Fig. 2.20. Checking the camera settings on the test table, automatic regulation of the exposure (mode is recommended for unstable object illumination).

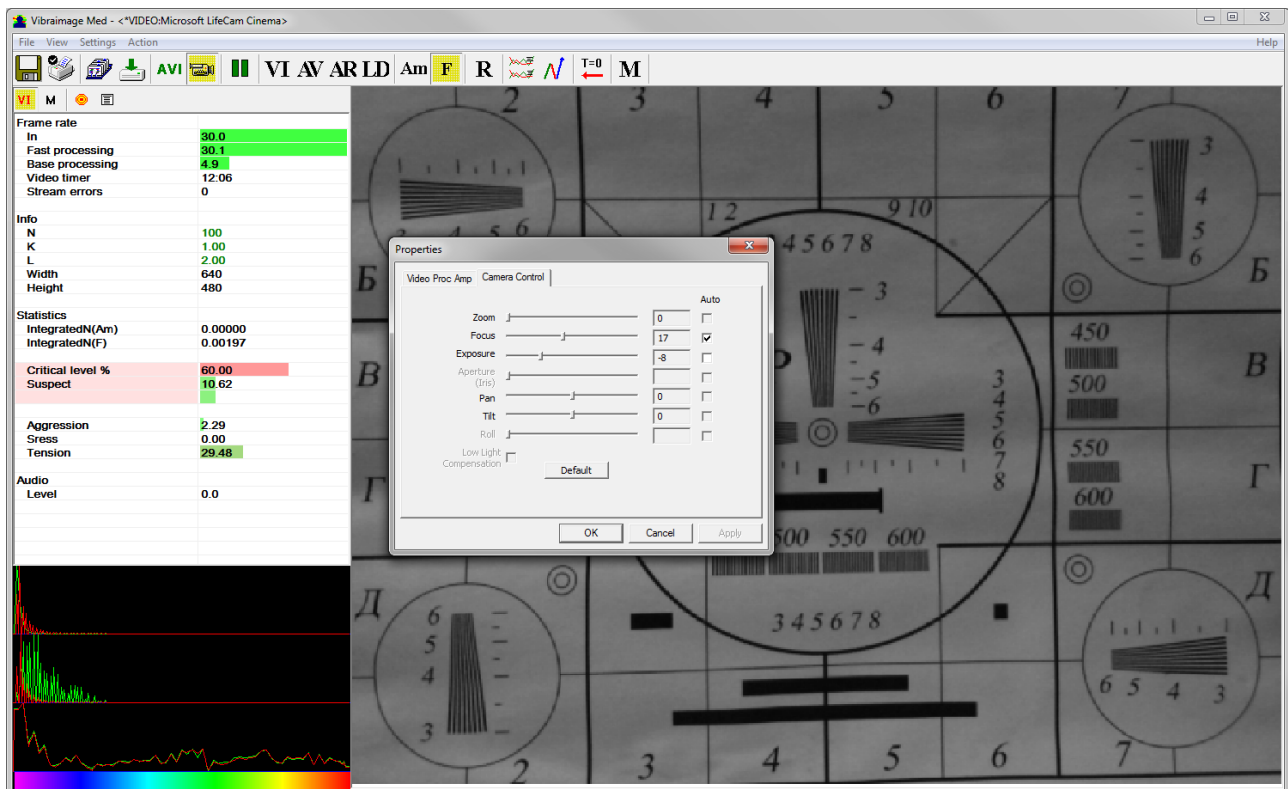



Fig. 2.21. Checking the camera settings on the test table, manual regulation of the exposure (mode is recommended for stable object illumination).

2.3.5 Video quality auto checking function

Vibraimage program has auto checking function and image quality control during the test.

Auto checking function switch on in Information table  in the section «Face detection» «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 near to camera or start zoom function on camera.

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.

Error 3 – indicates when computer input frequency rate is lower than necessary. Requested norm for processed frame frequency is more than 24 f/s. This errors indication was done for deleting unqualified staff influence during results control.

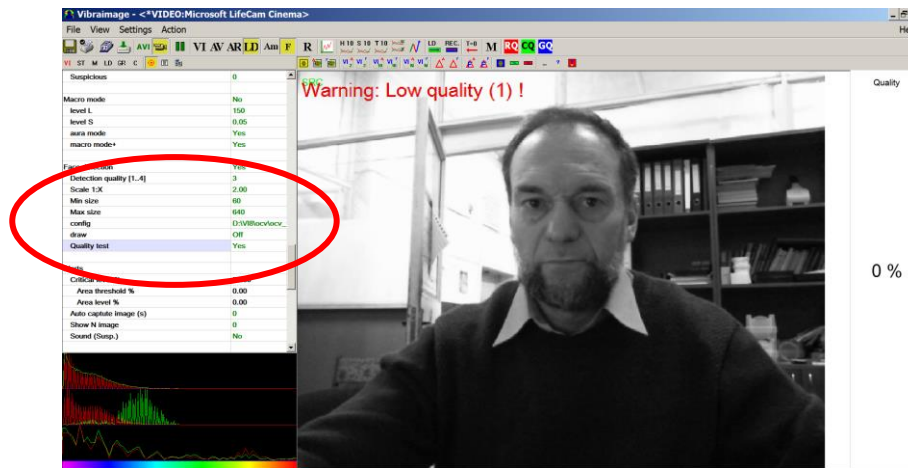


Fig. 2.18. Quality test indication stands Yes in settings and Error 1 shows in the image window.
Head image size is lower than requested.

For correct operation of the quality test it is necessary to switch on «Face detection» (Face detection – Yes). If you do not want to look frame around face you should «draw» switch off, see fig. 2.18.

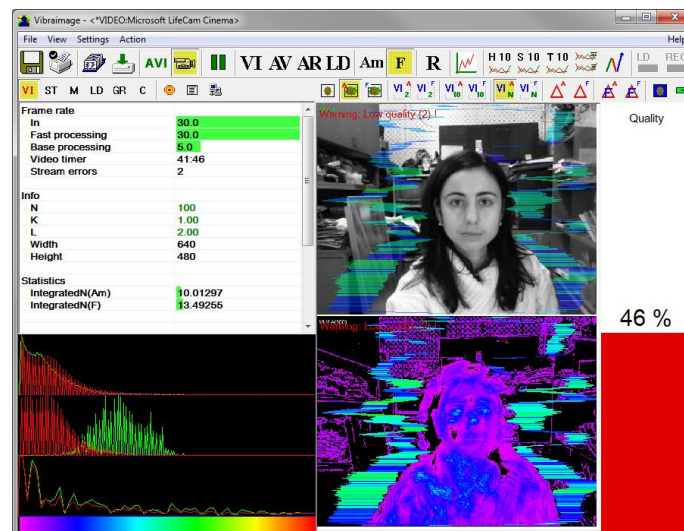


Fig. 2.19 Quality test indication stands Yes in settings and Error 2 shows in the image window.
Camera vibrations is strong and on the image there is a noise.

The figure 2.19 shows an example of strong camera vibrations. For good vibraimage you should mount the camera on a fixed support so that the vibration of the support was minimal. If the camera is mounted on a table, while working with the program you should not lean on the table.

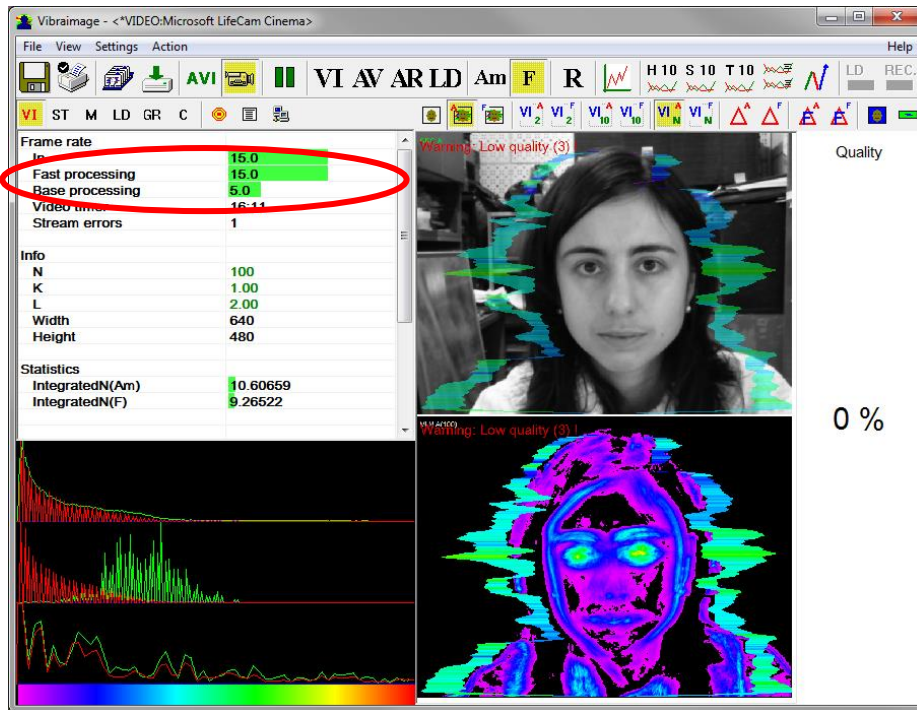


Fig. 2.20 Example of error 3. Frame rate «In» less than 24 f/s. You should set the "Brightness", "Contrast" and others in submenu "Video Capture Filter" to increase this value.

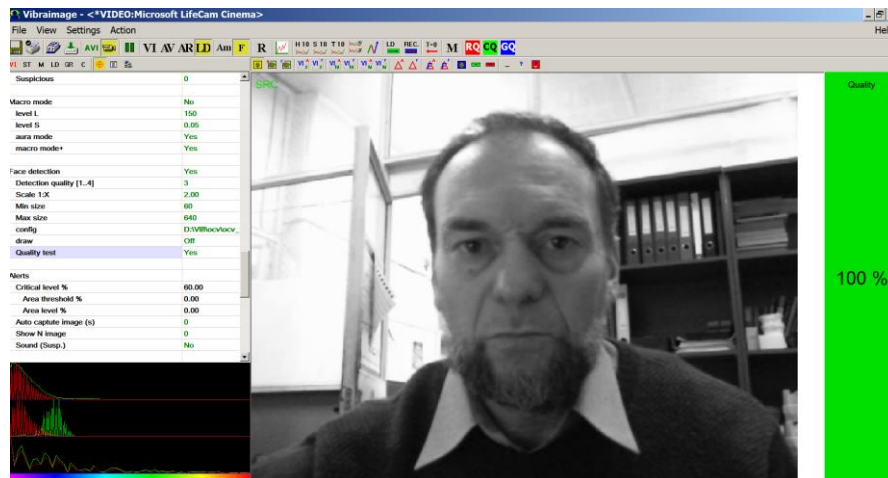


Fig. 2.21. Quality test indication stands Yes in settings and Quality 100% shows in the image window. Head image size and other parameters are correct.

Quality column shows time % during the testing when image quality is equal 100%. When we have quality indication 91 %, that means 91% of testing time image quality hasn't errors and 9% of testing time image quality includes errors with the number 1 or 2 or 3.

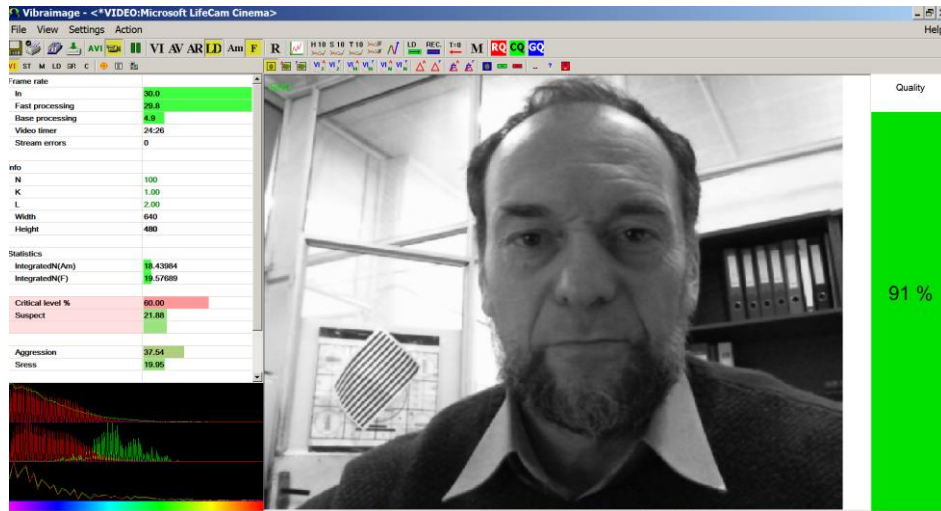


Fig. 2.22. Quality test indication 91 %

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. Advanced user can cancel Quality test in settings, see Fig 2.23.

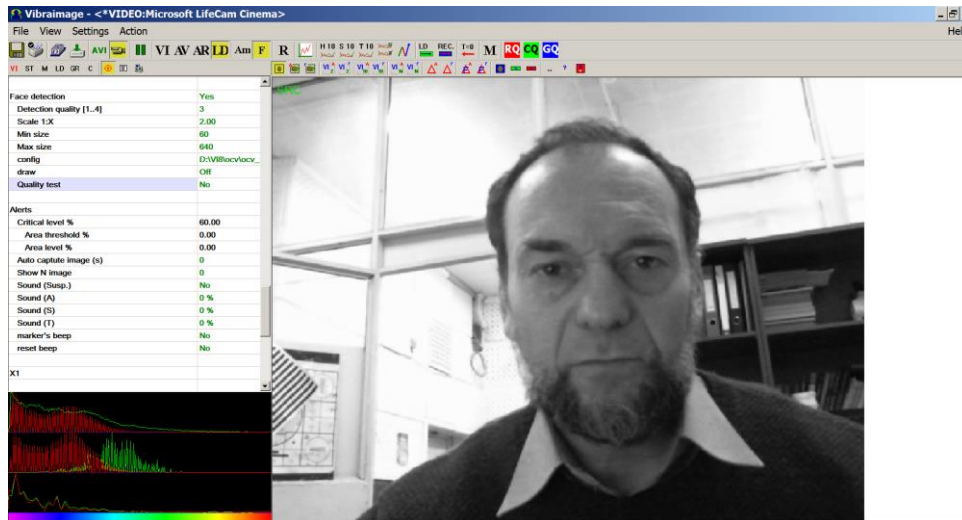


Fig. 2.23. Quality test No in settings

3. **VibraMed**. User's manual

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

VibraMed is intended for studying of psycho-physiological and psycho-emotional characteristics of living biological objects and also can be applied to the lifeless objects making periodic vibrational motions. The main application is medical diagnostics.

After start of **VibraLite** in the main window there is an image from connected video device.

3.1. Main window

Main window (fig. 3.1) consists of the following parts:

- image area (on right side);
- information column (on left side);
- toolbar (on top).

In an information column (at the left side on the screen) it is displayed, calculated by the program, values of person emotion level parameters.

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 program.

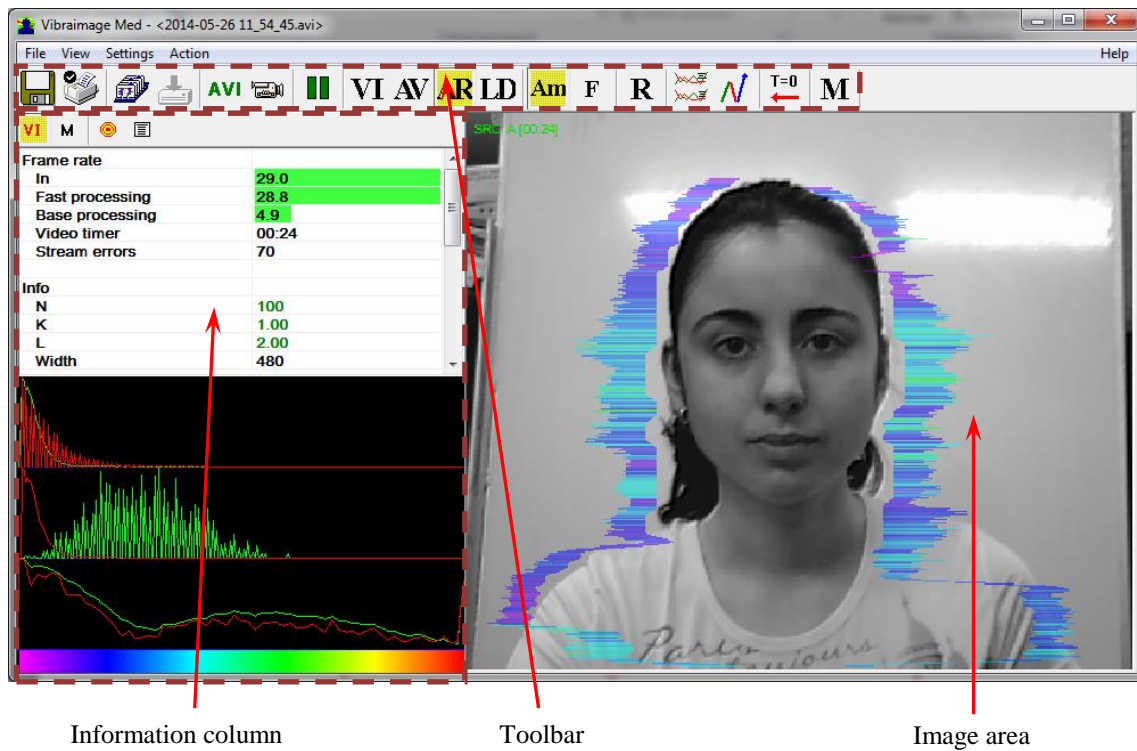


Fig. 3.1. Main window *VibraMed*

Note, double click by the left button of a mouse in the image field of makes **RESET** of all saved up information and statistics about frames and start new cycle collection of information.

3.2. Main menu

The main menu contains the following items:

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

3.2.1 Menu «File»

Menu «**File**» (fig. 3.2) contains following items:

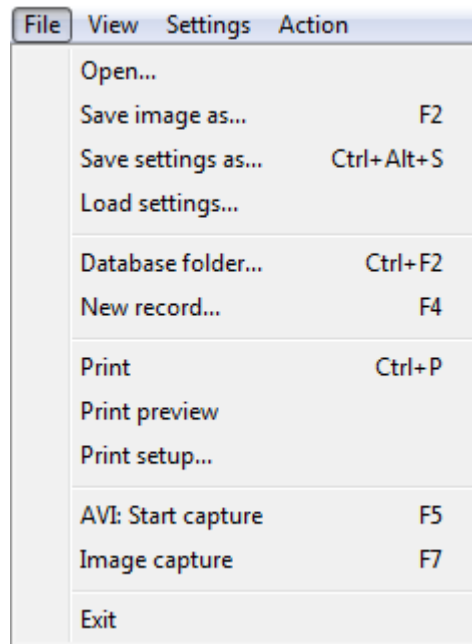


Fig. 3.2. Menu «File»

Item «**Open...**» - for viewing and printing the saved file of XML format with parameters of system for the supervision interval.

Item «**Save image as...**» - saving the current frame of a window in BMP, JPG, PNG or GIF-file.

Item «**Save settings as ...**» it is intended for saving of the current system settings to the external file.

Item «**Load settings ...**» it is intended for loading before saved the system settings from an external file.

Item «**Database folder...**» - changing folder where archive data is kept. If the database folder is not specified, record of AVI or BMP files is blocked.

Note

Until you specify a folder to archive record of AVI and BMP files in the archive will be blocked.

Item «**New record...**» - Create a new record in archive folder. Further saving of AVI and BMP files in archive will be made in the folder connected to a name of entered record.

Item «**Print**» - printing the current frame from image area.

Item «**Print Preview**» - printing preview of current frame from image area.

Item **Print Setup...**» - set printing options.

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

Item «**Image capture...**» - stop record AVI-file.

Item «**Exit**» - exit from program.

3.2.2 Menu «View»

Menu «**View**» (fig. 3.3) defines visible in the basic window information and contains the following items:

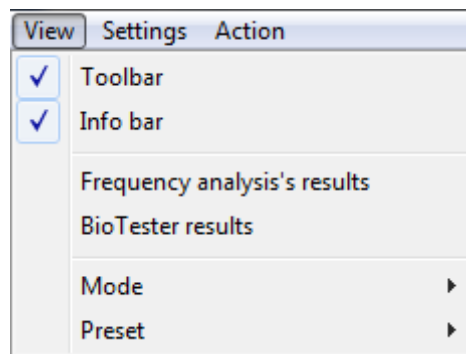


Fig. 3.3. Menu «View»

Item «**Toolbar**» - switch on/off the toolbar.

Item «**Info bar**» - switch on/off the information panel.

Item «**Frequency analysis's results**» - show/hide histogram of frequency analysis of the set values (fig. 3.4).

Item «**BioTester results**» - show/hide window with biotester analysis results (fig. 3.5).

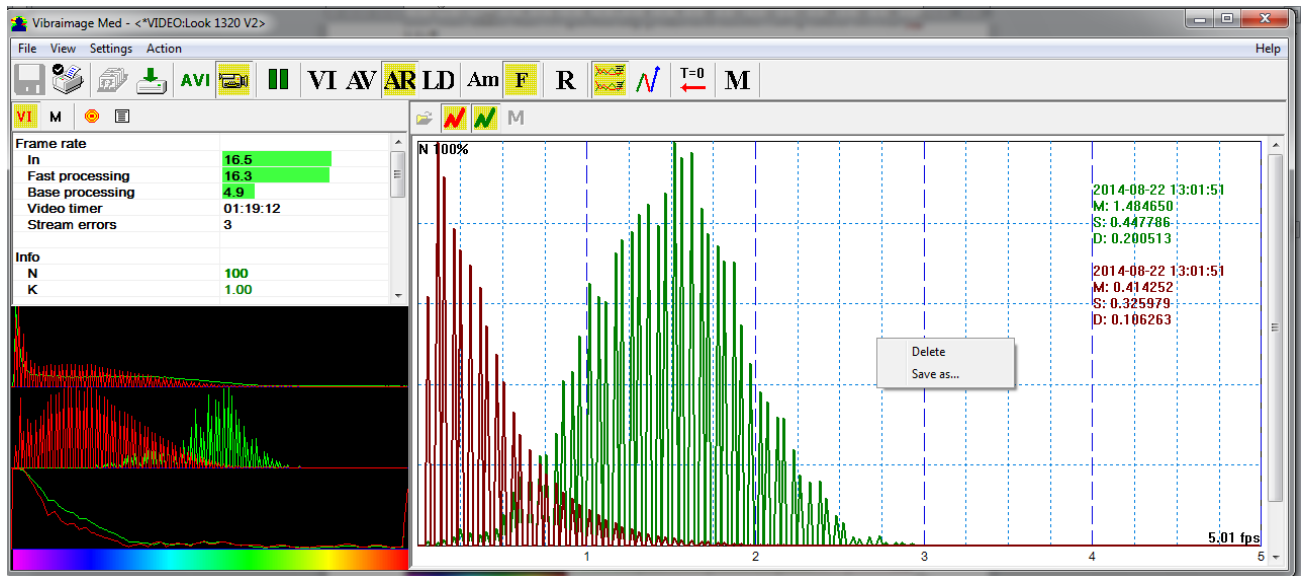


Fig. 3.4. Frequency analysis's results

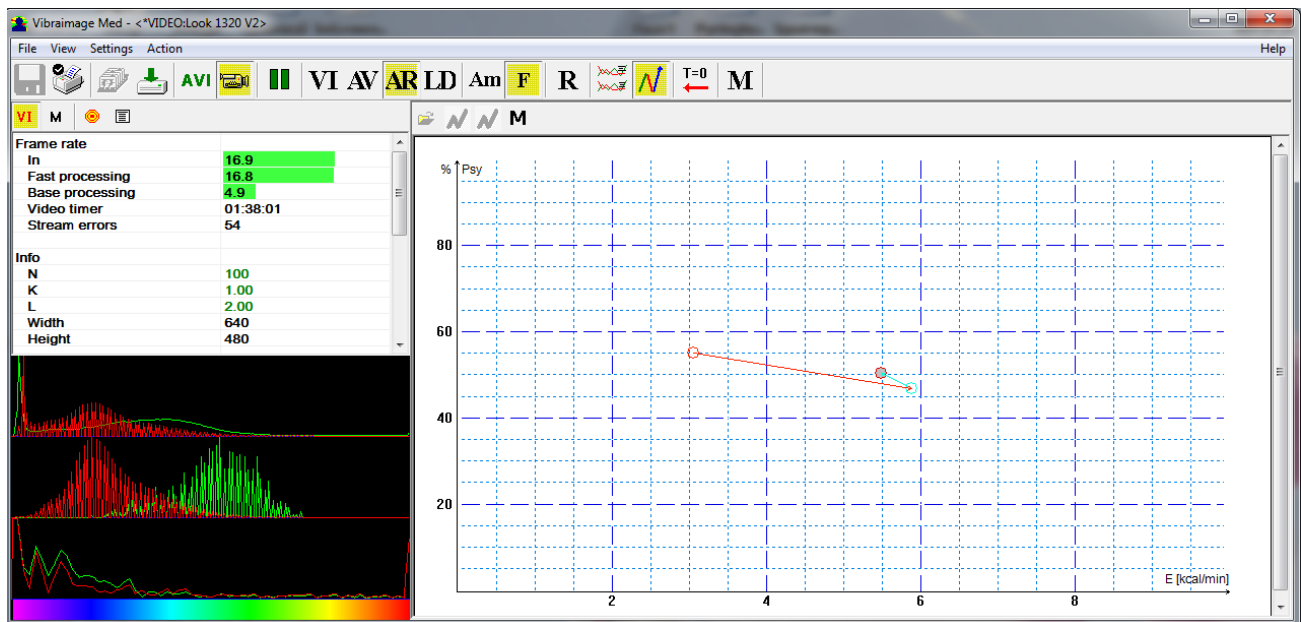


Fig. 3.5. BioTester results

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: the real image (mode LD), vibraimage (mode VI), the vibra-aura on the real image (mode AR), the vibra-aura on vibraimage (mode AV). Also, you can configure the corresponding buttons on the toolbar.

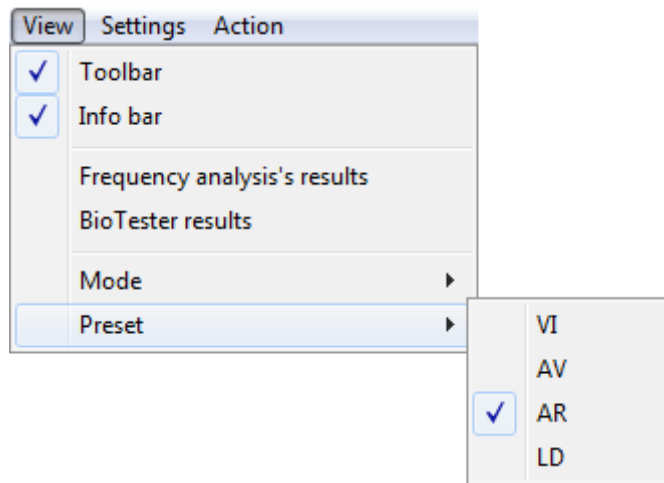


Fig. 3.6. Submenu «Preset»



Fig. 3.7. Buttons defining type of displayed image

3.2.2.1. Submenu «Preset»

In the field of the image area (fig. 3.8.a – 3.8.d), depending on the chosen mode, the user can see the «real» video image, vibraimage, external vibraimage (vibra-aura), or graphs time dependences for control in LD mode, or any other mode.

Note, in the upper left corner of the displayed image the processing mode of the image (fig. 3.8.a) and the time from start viewing the AVI file indicates.

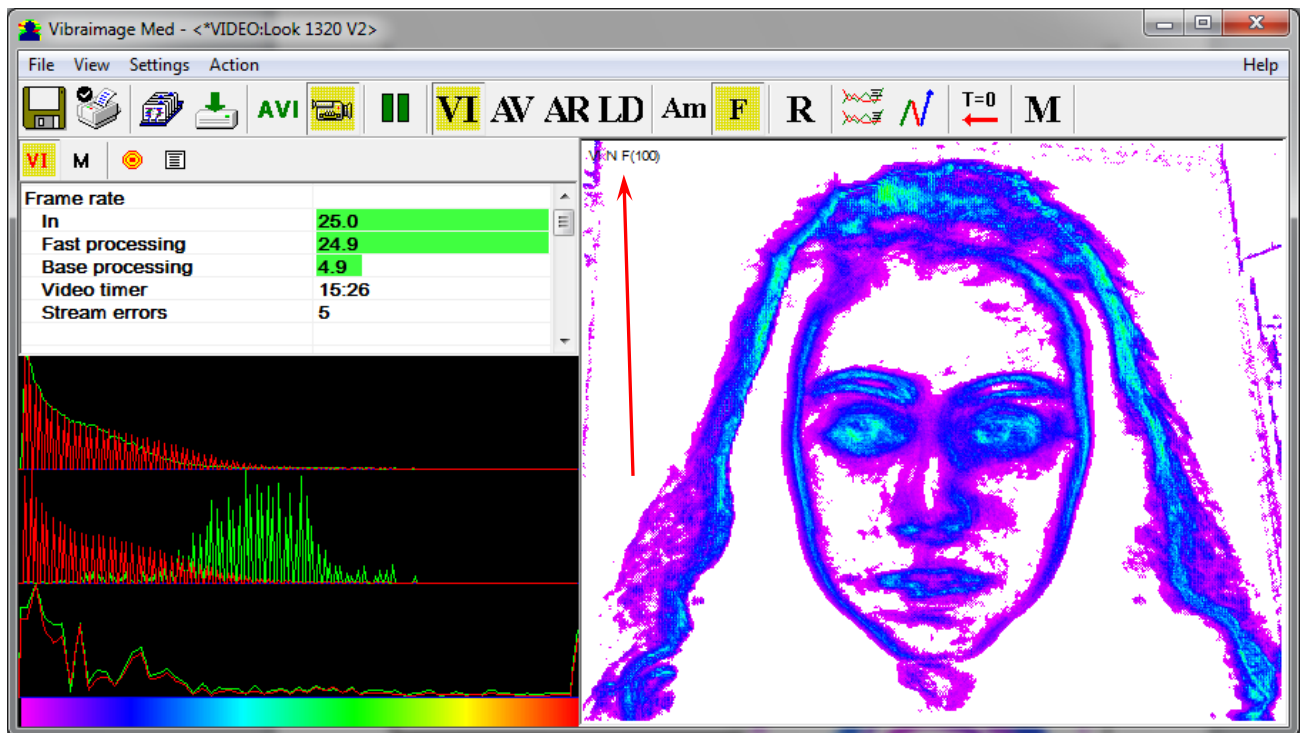


Fig. 3.8.a. VI mode on the white background with the anal(VI) with the analysis of the vibration frequency points (F) and on the accumulation of $N = 100$ frames

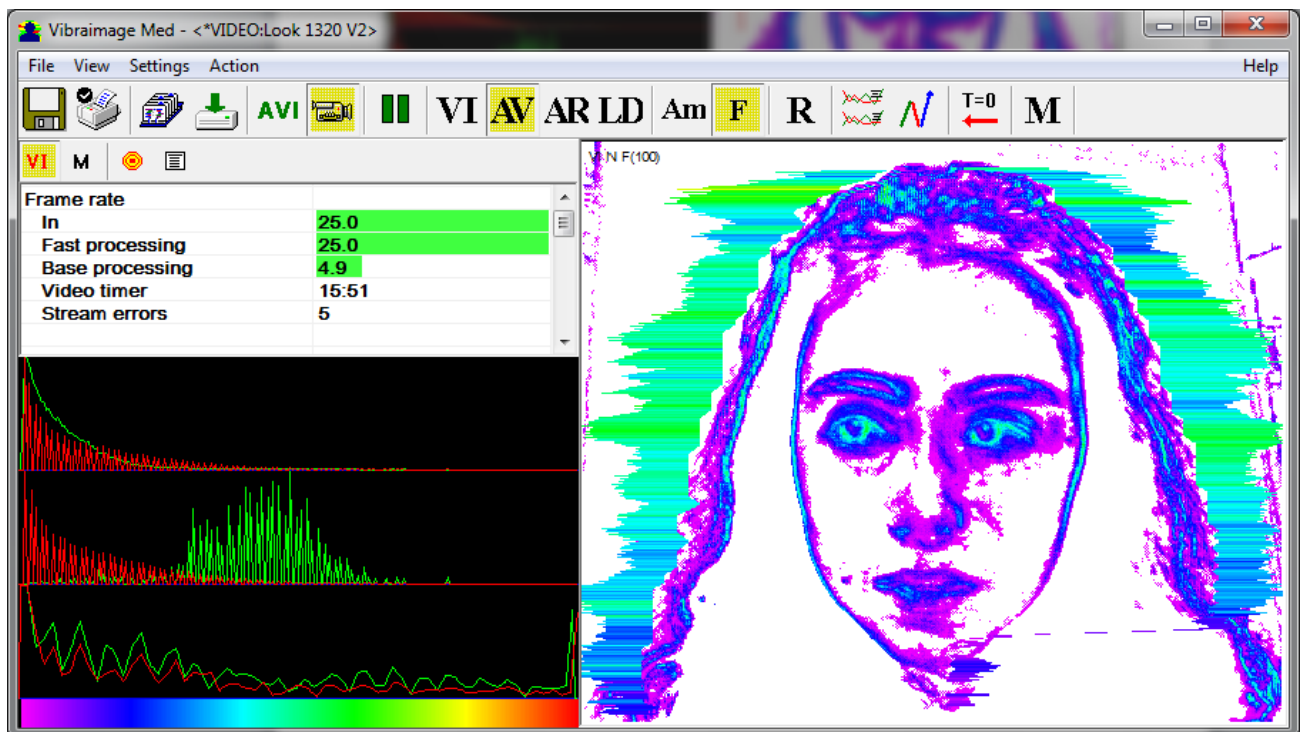


Fig. 3.8.b. AV mode

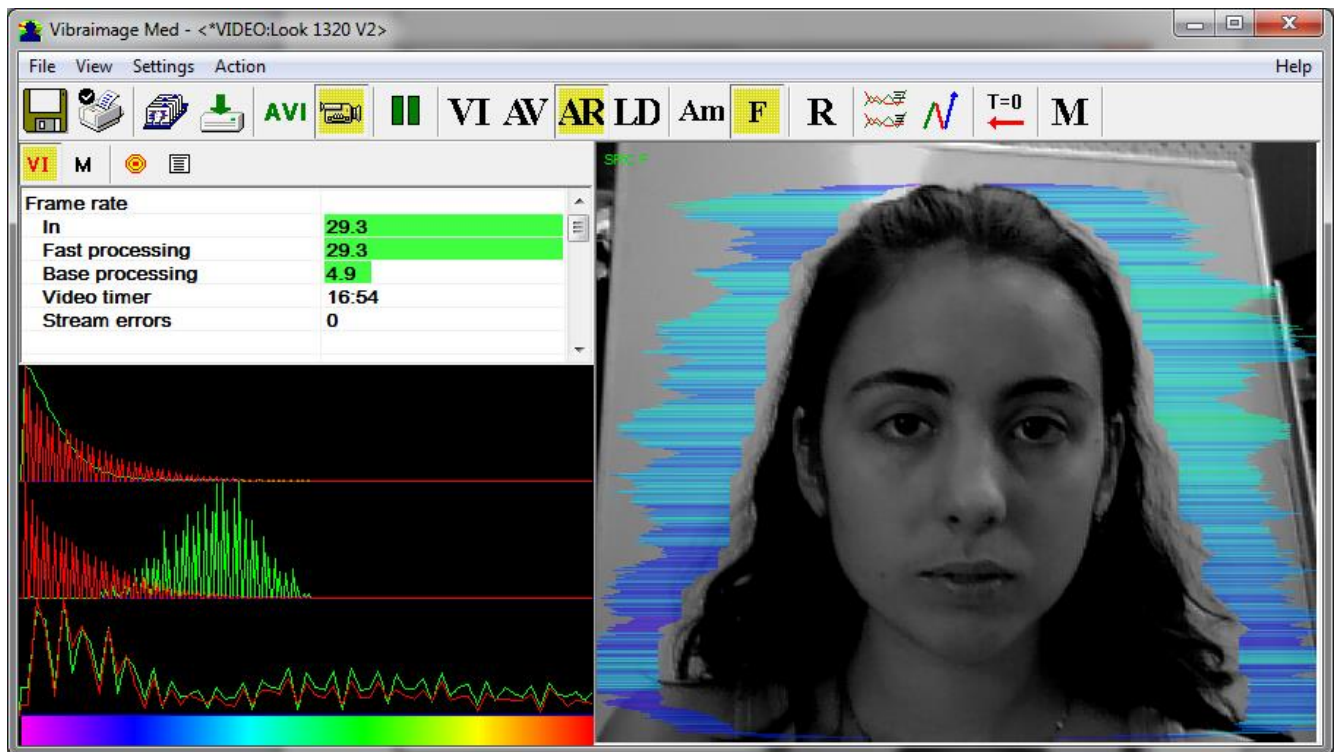


Fig. 3.8.c. AR mode

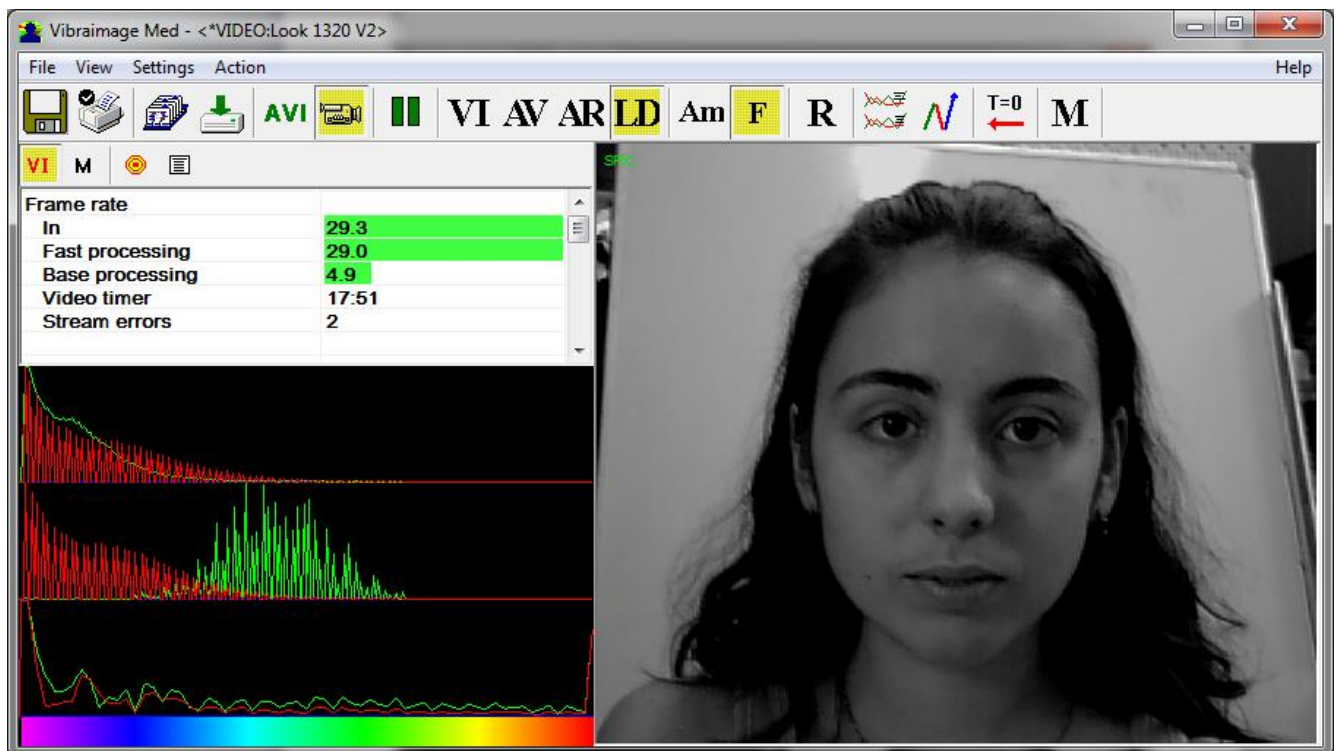


Fig. 3.8.d. LD mode

Item «Presets» menu (fig. 3.5) designed 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. 3.8.a). In **VibraMed** version color for every image pixel depends on its vibrations frequency.
- In «**AV**» mode [«Aura Vibraimage mode»] external vibraimage (aura) allocated around the internal vibraimage or simple vibraimage. Aura line size depends on medium line vibration amplitude. Aura line color depends on maximum line vibration frequency inside vibraimage contour (fig. 3.8.b).
- In «**AR**» mode [«Aura on the Real image»] the aura of the person is shown around his real image (fig. 3.8.c).
- In «**LD**» mode [«Lie Detector mode»] image area shows real object image (fig. 3.8.d).

3.2.2.2. Submenu «Mode»

Item «**Mode**» (fig. 3.9) selects additional settings of information in image area:

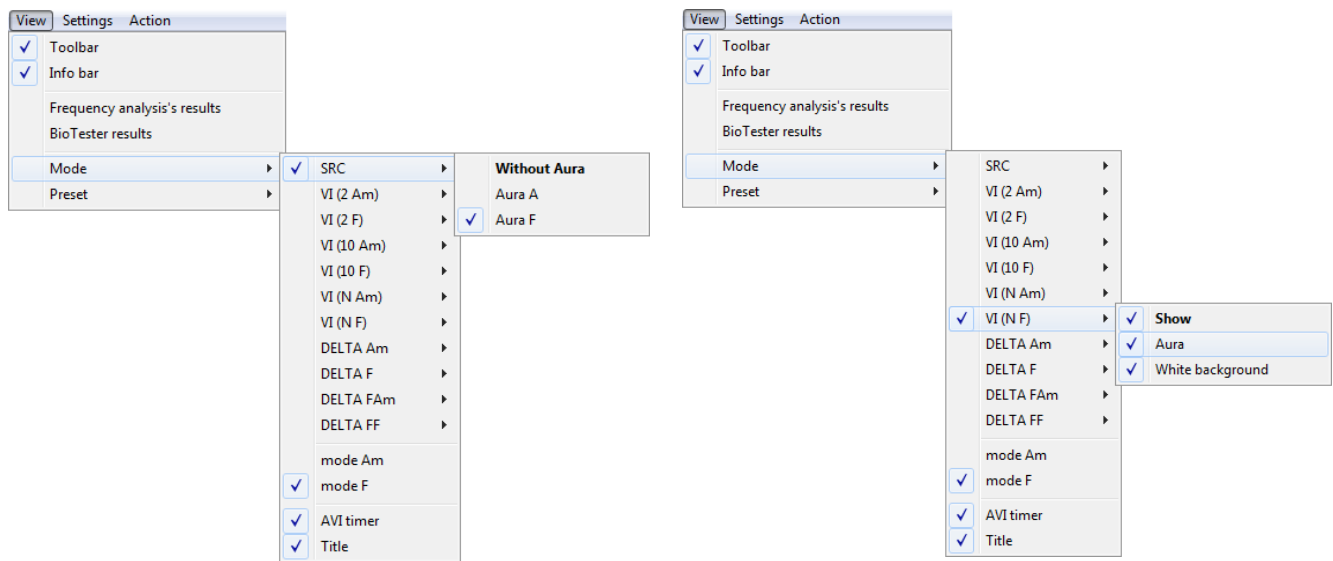


Fig. 3.9. Menu «View». Submenu «Mode»

Note, at a displayed of the image in VI and AV modes it is possible to change color of a background of the image, having chosen main menu item «**White background**».

Note, at the same time in the program can be switched only one display mode.

- In «**SRC**» mode shows source video from camera without processing (fig. 3.8.d). It is additional possibility to display the aura on the real image of person constructed on the analysis of pixels vibration amplitude, 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 (fig. 3.9).

- 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. It is the additional possibility to change color of a background image and to add aura to vibraimage.
- 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. It is the additional possibility to change color of a background image and to add vibra-aura to vibraimage. The number of frames, corresponding to parameter N, is set in information panel in mode «**VI**».
- In «**Delta Am** » and «**Delta F** » modes display frame difference on the basis of amplitude Am and frequency F vibration analysis in base processing mode.

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.
- 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.
- Items «**AVI timer**» and «**Title**» displays (in the left top corner in each of visible windows with images) the name of a processing mode which is used for the given window, and time from the beginning of viewing AVI file.

3.2.3. Menu «Settings»

Menu «**Settings**» (fig. 3.10) allows choosing language, locking system and contains the following items:

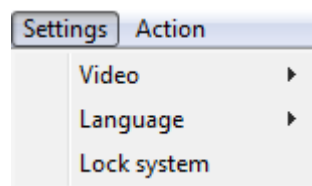


Fig. 3.10. Menu «Settings»

VibraMed allows to process «live» video signal coming from a video camera and video data recorded before and saved as AVI-file. On default the system works with a signal from a video camera.

3.2.3.1 Submenu «Video»

Submenu «**Video**» contains options of video modes. Its can differ depending on connected devices. For example this menu contains the following items (fig.3.11). You can choose as video source one from many installing in PC video-devices or load external video file.

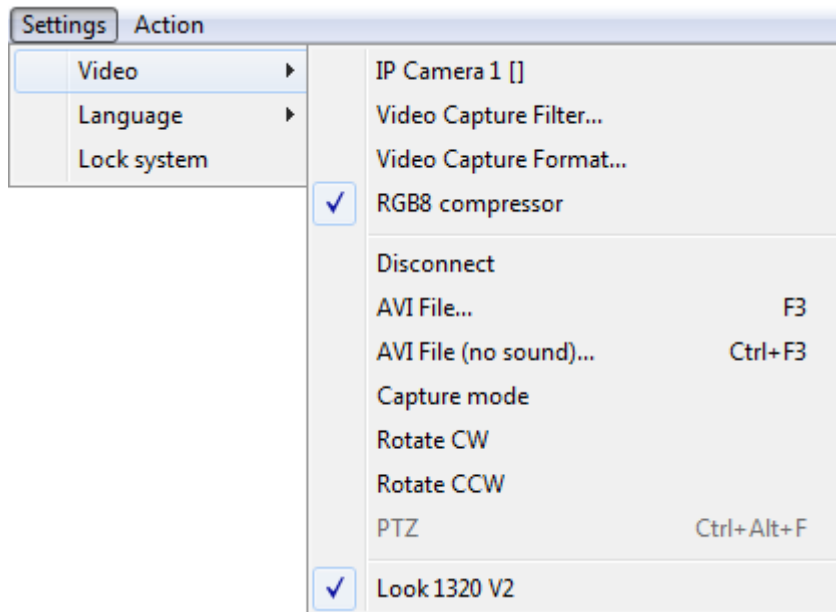


Fig. 3.11. Submenu «Video»

The subitem « **IP camera 1** » allows setting network parameters for access to IP camera. After setting up an IP camera in the submenu "Video" menu "Settings" there is an additional item to be set other IP camera.

Note

For network cameras from different manufacturers field contents may be vary. Value of parameters «**Host**», «**Port**», «**User**» and «**Password**» (fig.3.12) it is necessary to receive at the your local network administrator.

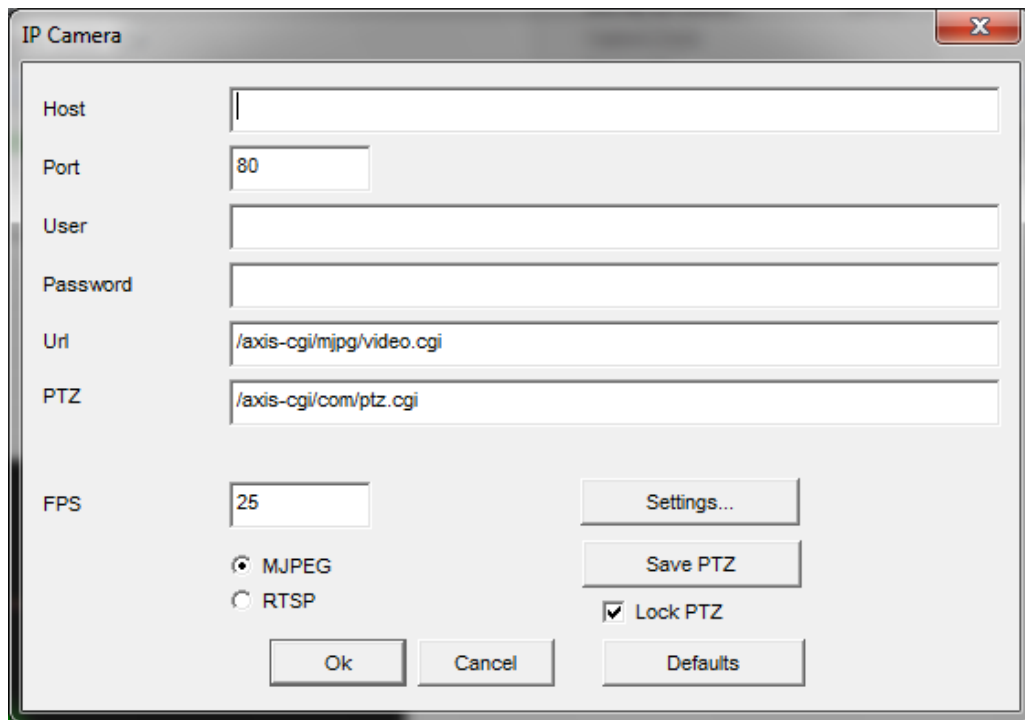


Fig. 3.12. Settings window of the network IP camera

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 videocamera 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.

The subitem «**Capture mode**» is intended for working with cameras in which driver support separate streams of video output on the screen and write to the file. When this mode delay set the camera to record video and back are minimal.

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 **VibraMed**.

The subitem «**PTZ**» is available to all IP cameras and allows to set up parameters of PTZ-cameras.

The bottom menu allows you to choose a used device video capture (as, for example, "Look 1320 V2") from multiple installed on this computer.

3.2.4. Menu «Action»

Menu «**Settings**» (fig. 3.13) contains the following items:

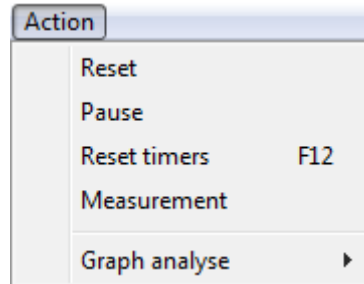




Fig. 3.13. Menu «Action»

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

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

Item «**Reset timer**» (on toolbar button ) - 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**» (or corresponding toolbar button ) 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.

3.2.4.1. Submenu «Graph analyze»

At a choice of item «**Graph analyze**» it will be open submenu gathering of the information about frequency distribution in vibraimage (fig. 3.14). Histogram of frequency distribution appears in area of images (fig. 3.15).

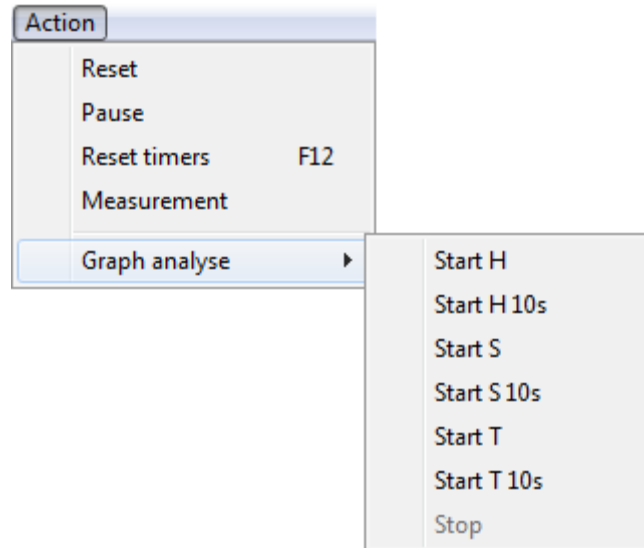


Fig. 3.14. Submenu «Graph analyze»

Items «**Start H 10s**» and «**Start H**» are intended for accumulation and viewing of the frequency information. Start of command «**Start H 10s**» gathering of information is made for 10 seconds, and the window of frequency information viewing is showed automatically after 10 seconds. After start of command «**Start H**» the time of data accumulation is defined by the user, and the window of viewing of the frequency information is showed only after a choice of item «**Stop**».

The analysis of the frequency information after its processing with the help of Fast Fourier Transform (FFT) (commands «**Start S 10s**» and «**Start S**») shows frequency spectrum.

Items «**Start T 10s**» and «**Start T**» are intended for accumulation and viewing of the information about change in time F6 and F8 parameters. Parameters F6 and F8 define the average and current period of parameter F1fast (A1fast) change with the switch on filters (F6 HF and F6LF). Averaging of changes of the F1fast (A1fast) signal period is made in interval F6N frames.

In a window with the frequency histogram (fig. 3.4) switch «**N**» determines: will be the graph of amplitude histogram is showed or not (the graph is painted by red color). Switch «**N**» determines: will be the histogram of frequency is showed whether or not (the graph is painted by green color).

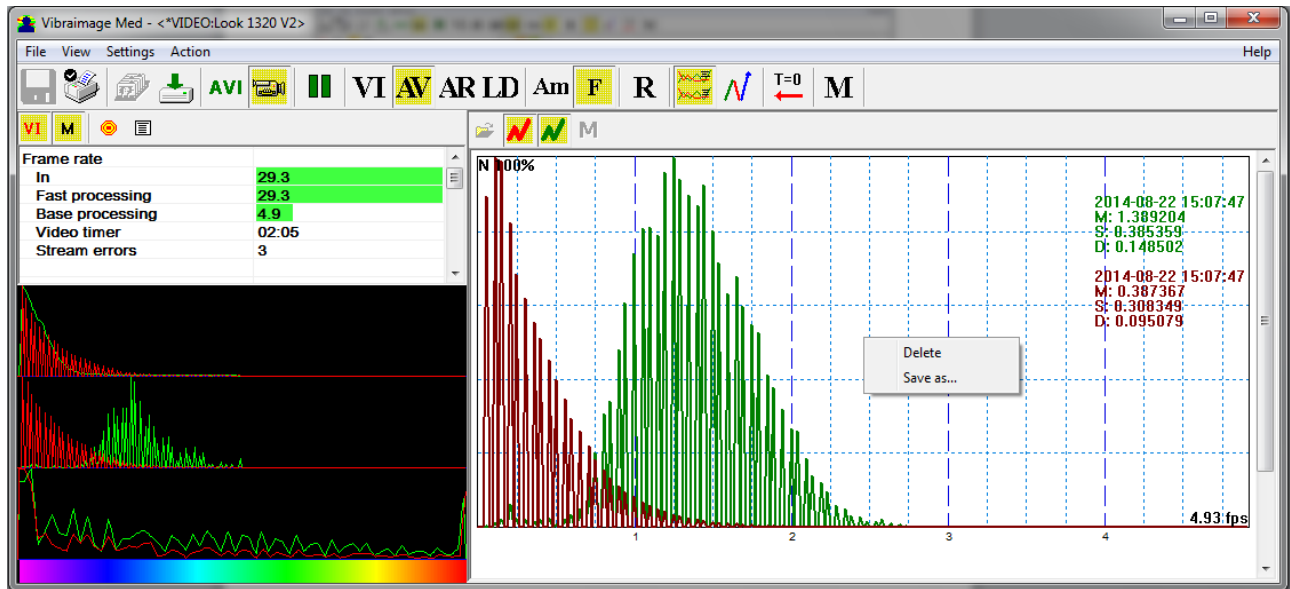



Fig. 3.15. The frequency histogram for a «normal» condition of the person

To save the resulting graphics to an external file you must click the right mouse button on the graph and select item «**Save as...**» (fig. 3.15). Pressing on button «**Load**»  the user can load earlier saved data and to compare them with just received.

For removing the received graph of the frequency analysis is necessary to bring the mouse pointer to the chosen diagram, press the right mouse button and to choose item «**Delete**» (fig. 3.15).

3.3. Toolbar

Toolbar of **VibraMed** shown on the fig. 3.16.



*Fig. 3.16. Toolbar of **VibraMed***

Tools panel of **VibraMed** program includes functions corresponding to buttons on the Tools panel from left to right:



– saving current image;



– printing current image;



– image capture;



– AVI file - start record;



– loading AVI file;



– connection of operating video source, for example, webcams;



– pausa;



– switching on/off VI mode;



– switching on/off AV mode;



– switching on/off AR mode;



– switching on/off LD mode;



– switching on/off VI-«Am» mode;



– switching on/off VI-«F» mode;



– R – Reset all accumulated information about frame difference;



– «Results of the frequency analysis» - switching in a mode of frequency analysis graph display;



– switching in a mode of testing psycho-energy condition graph display;



– T=0, reset timer of video files to «0»;







– switching on/off mode of accumulation and averaging of parameters for the certain period.

3.4. Information column

Indication of information column (fig. 3.17) depends on using mode:



Fig. 3.17. Modes of the information column

- In the mode  information about adjustments of system and results of data vibraimage processing is displayed;
- In the mode  the average values of vibraimage parameters which have been calculated and are average for the certain period are displayed;
- In the mode  settings of basic parameters for work with **VibraMed** are configured;
- In the mode  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. 3.19, parameters N, K, 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 bottom part of information panel displays three windows with results of the frequency analysis (fig. 3.18). 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 selected in «GR» submenu of the information panel are displayed.

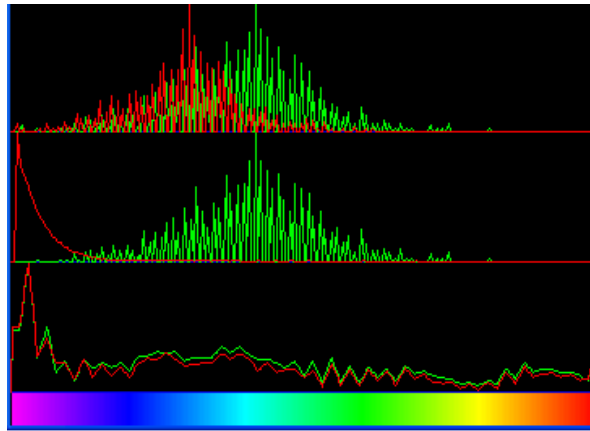


Fig. 3.18. Histograms windows

3.4.1. Information column. VI mode

In the mode «**VI**» information panel (fig. 3.19) displays following information:

VI	M		
Frame rate			
In	29.3		
Fast processing	29.3		
Base processing	4.9		
Video timer	03:06		
Stream errors	3		
Info			
N	100		
K	1.00		
L	2.00		
Width	480		
Height	400		
Statistics			
IntegratedN(Am)	15.63473		
IntegratedN(F)	16.01584		
Critical level %	60.00		
Suspect	21.21		
Aggression			
Sress	33.24		
Tension	20.11		
Audio			
Level	0.0		

Fig. 3.19. 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 which 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;
- **K.** – Gain Factor. 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;
- **«Anger»** – 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. 3.20) 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.

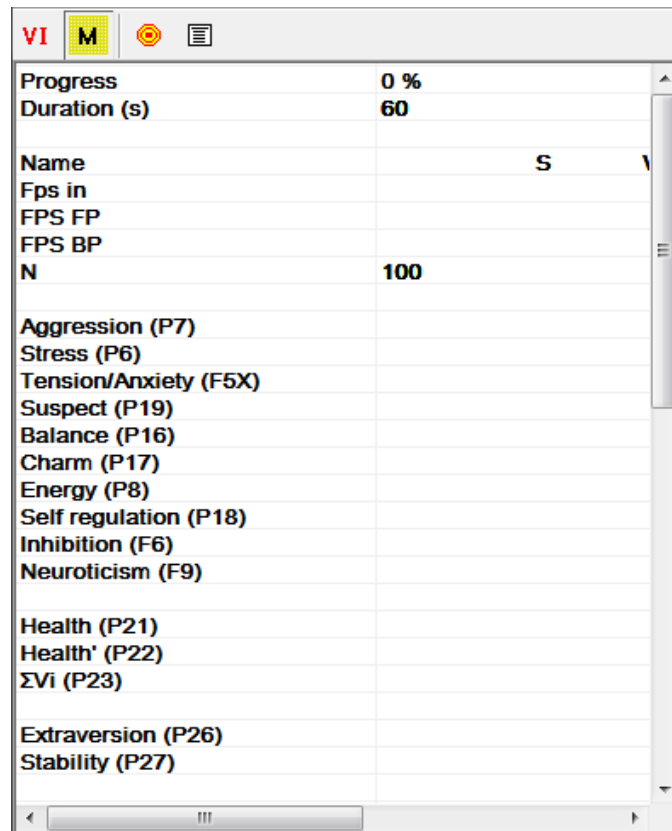



Fig. 3.20. Information column in the M mode

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 . After start of a accumulation and averaging mode in the top of an information column there is a running line [«Progress»], displaying a course of data accumulation process.

Information column in the «**M**» mode shown following information:

- Speed of input frame from the camera [«FPS_in»], speed of frame processing for a base processing mode [«FPS_BP»] and speed of frame processing for a fast processing mode [«FPS_FP»];
- Current values of based processed VibraImage parameters A1-A4, F1-F9, S1-S7, P1-P4

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
- 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 – Ratio of «high» frequency density to «low» frequency for parameter F1. Characterized tension parameter.
- F6 – F5 – current tension level (%)
- F7 – Average value of the F1 parameter period (in seconds), determined during readout F6N. Value of parameter F6N is set in section [Filters] an information column in a mode of system parameters setup and defines quantity of the frame processed in Fast Processing mode
- F8 – F6 - Inhibition parameter
- F9 – Root-mean-square deviation for F6 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

The group of parameters P1-P4 registers features of mathematical Processing of vibrations:

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

P2 – Dispersion of vibration density for frequency distribution at N processing frames



P3 – Center density distribution displacement of frequency at 10 processing frames

P4 – Center density distribution displacement of frequency at N processing frames

- Current values of fast processing **VibraMed** parameters A1 fast, A4 fast, F1 fast, F5 fast;
- Basic parameters describing psycho-emotional condition of the person: Aggression, Stress, Tension/Anxiety, Suspect, Balance, Charm, Energy, Self-regulation, Inhibition, Neuroticism.
- For each parameter the following numerical values are displayed:
 - V – The value of the parameter average for the set period
 - S – root-mean-square deviation of parameter
 - 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" has been began and the information for the specified period of time is saved up.

Note, after ending of the information accumulation some lines of an information column can be allocated 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.

3.4.3. Information table

Information table (fig. 3.21) 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.

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
K	Gain factor.
L	Threshold of a palette. Defines a threshold of displayed image, value of less brightness considers as «black»
Parallelization	Parallel number of processing in multi core systems. Default 0- for Core 2 Duo
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



VI M  	
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
K	1.00
L	2.00
Parallelization	0
Apply global filter	No
Filters	
Single points	Yes
Extended	8
Extended (fast)	8
Stretch	No
Max speed contour	No
Am scale	16.00
Space	4.00
color image	No
crop X	0
crop Y	0
crop X pos	0
crop Y pos	0
F6 HF	0
F6 LF	10
F6 N	100
FPS filter	No
Auto downrate	No
Fixed contour	No
State levels	
Ag	80.00
St	80.00
Tn	80.00
AVG filter	
Aggression	10
Stress	10
Tension	10
Suspicious	0
Micro default	Set

Fig. 3.21.Information table

Space	<p>Reduce vibraimage on borders of motionless contrast objects. Frame difference $D(x, y)$ is multiplied by the factor K</p> $K = (1 - (SV * MB) / 100);$ <p>where SV - parameter of the filter, MB - the maximal difference between levels of brightness of a point (x, y) and the next points in the initial image</p> <p>Note</p> <p>Switching off filters accelerate the computer functionality.</p> <p>Advanced user could switch filters from default settings.</p> <p>Attention, switching-off below parameters calculation could automatically stop calculation and sets of other characteristics which used values of the switched off parameter.</p>
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.
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.

Suspicious thresholds
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.

AVG filter

Anger

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

Micro defaults

Switch on Micro mode. Use for single men mode.

3.4.4. Information column. DB (data base) mode.

In the «DB» mode information column (fig. 3.22) adjusts parameters of recorded video information and shows the following information:

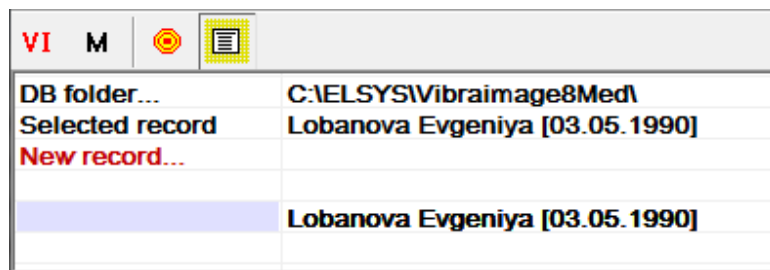


Fig. 3.22. Information column in the DB mode

- «DB folder» – way to the database folder for written video files and files of statistics;
- «Selected record» – data on current object of research.
- «New record»: «Name», «Birth date», «Comments» – The demographic information on object of research (fig. 3.23, 3.24). 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.

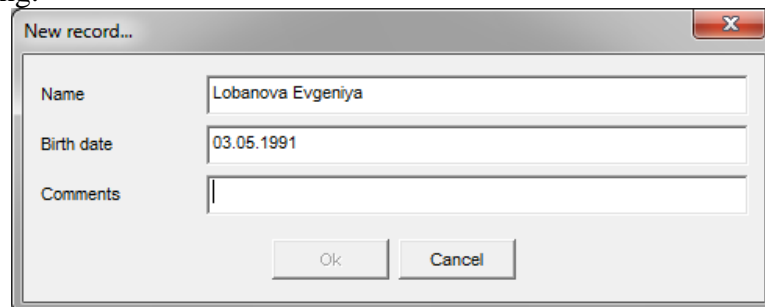


Fig. 3.23. Create «New record»



VI	M		
DB folder...	C:\ELSYS\Vibraimage8Med\		
Selected record	Lobanova Evgeniya [03.05.1990]		
New record...			
	Lobanova Evgeniya [03.05.1990]		

Fig. 3.24. Viewing new record in the information column

4. **VibraMed**. Emotion Recognition and Behavior Detection System

In medical imaging and biometrics, **VibraImage** is a recent, psychologically-based, emotional-recognition visual imaging technology that measures pixels microvibrations in terms of digital frequency and amplitude parameters. The visualization of a 3-dimensional object fluctuation, based on vibration parameters, can thus be correlated to various mental states, such as anger, tension, aggression, etc., as well as mood, normal states, and subconscious reflections. Vibraimage can be characterized as one of primary images as visible spectrum, such as infrared, x-ray, MRI or ultrasound imaging. Vibraimage technology is currently being tested in areas such as terrorist recognition, emotional recognition, interpersonal video-dating interactions, as well as for personal use. Visualization of every pixels vibration became possible only in 21st century with the development of digital cameras and high power computers. Long ago, past scientists, such as Aristotle, had realized that biological object movement parameters characterize emotions; thus vibraimage technology is a potential realization of this goal. **VibraMed** system realizes remote and auto monitoring of emotions levels, such as stress, aggression and tension, and detects lie in a real time mode. **VibraMed** also allows to register and analyze human activity characteristics from recorded video files (AVI format) and to analyze medical, psychological and emotional human state for different applications.

VibraMed goals

- Cognitive control of emotions;
- Psychological and medical monitoring;
- Psychophysiological detection;
- Training and relax control for fitness and sport applications;
- Meditation and aura control;
- Live and recorded video processing.

The direct link between reflex movement and brain activity was discovered in 1863 by the famous Russian physiologist Ivan Sechenov in his publication «Reflexes of Brain». Charles Darwin in his book «The expression of the emotions in man and animals», 1872, also declared that reflex movements associated with emotions. Nobel laureate and the famous researcher of aggression Konrad Lorenz claims, that amplitude and intensity of reflex movements characterized the aggression. (On Aggression, 1966). According to the action of vestibular system functions and mechanical movement, person stands with the head in a balanced vertical position, continuously and reflexively performing three-dimension micromovements or vibrations. The dependence between head vibration parameters and emotional state characterized by the vestibular-emotional reflex (VER) or vestibular-energy reflex.

Vibraimage technology is the realization of medicine, psychology, modern computers and television sciences for human emotion recognition. **Vibraimage** plans to do human emotion control so precise, like physics measurements!

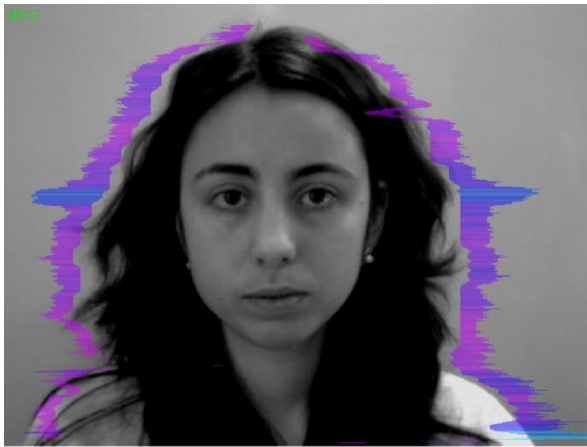
4.1. M mode

The average values of personal psychophysiological parameters, their deviation and variability are measured in the «**M**» mode. The main goals of this mode are application of vibraimage system for accuracy security checking, medical diagnostics and psychological testing and researches. M mode is based on measurement and calculation of psychophysiological parameters T1-T10 and checking its math variability during testing period. For vibraimage visual control in this chapter are given the pictures characterizing changes of said psychophysiological parameters T1-T10.

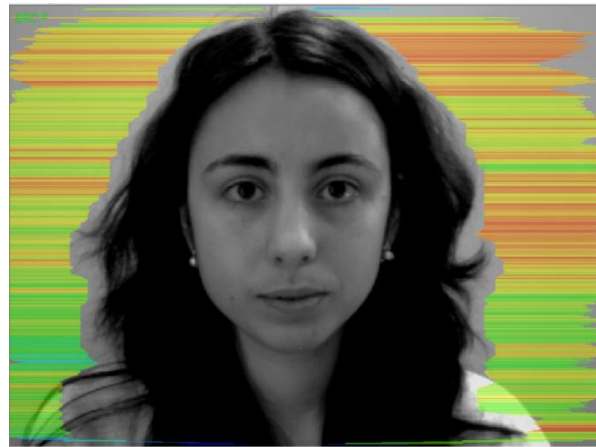
The mathematical expectation M, standard deviation (SD) S and variability V are calculating for the following human psychophysiological parameters:

T1 – Aggression (P7);

The parameter is determined by the frequency histogram and represents the maximum allocation of the frequency and SD vibration frequency of the human face. The higher value of the maximum distribution and higher SD value gives the greater value of the parameter T1.



A)

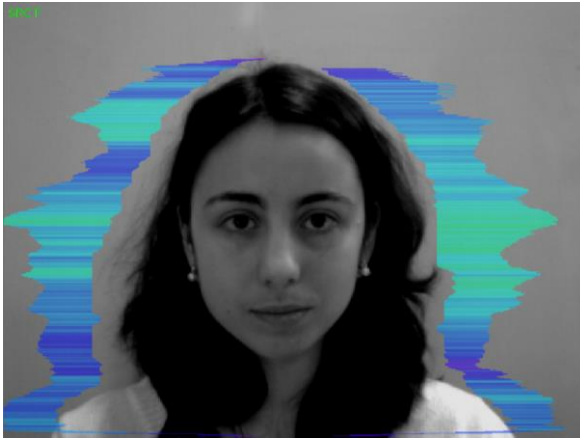


B)

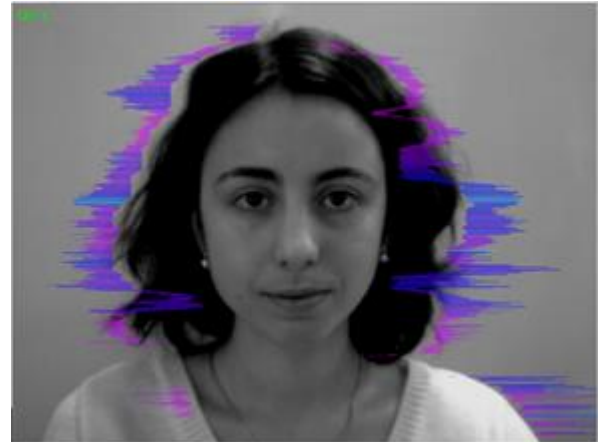
Fig. 4.1 Aggression A) T1 = 18 %, B) T1 = 60 %

T2 – Stress (P6);

Parameter is determined by degree of the external vibraimage (vibra-aura) asymmetry, means asymmetry of micromovements from the left and right parts of the persons head. The great difference in amplitude and frequency movements for the left and right parts of the face (head) characterizes the increased T2 parameter level.



A)

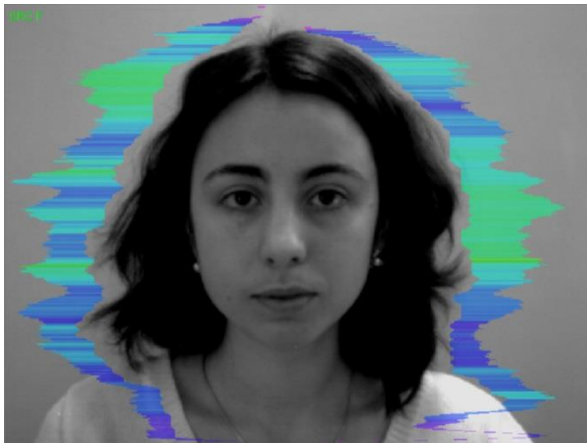


B)

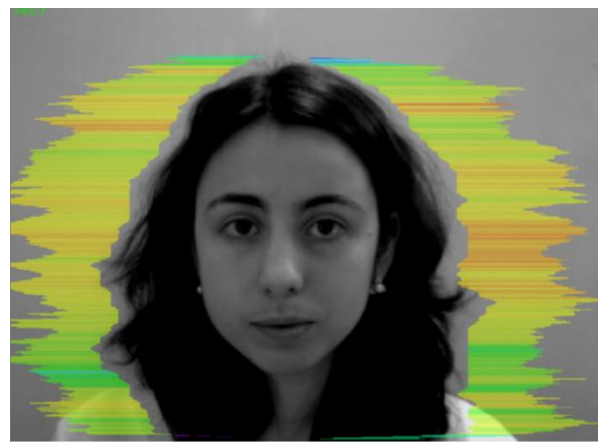
Fig. 4.2 Stress A) $T2 = 17\%$, B) $T2 = 45\%$

T3 – Tension/Anxiety (F5X);

Parameter is determined by the relation of high-frequency part of a range of vibrations to the general power in a range of micromovements frequency for human head. High value of high-frequency vibrations density characterizes high value of the T3 parameter.



A)



B)

Fig. 4.3 Tension A) $T3 = 28\%$, B) $T3 = 48\%$

T4 – Suspect (P19);

The parameter is determined as the sum average of the first three conditionally negative emotions (T1, T2, T3) and characterizes the general level of conditionally negative emotions in a person status.

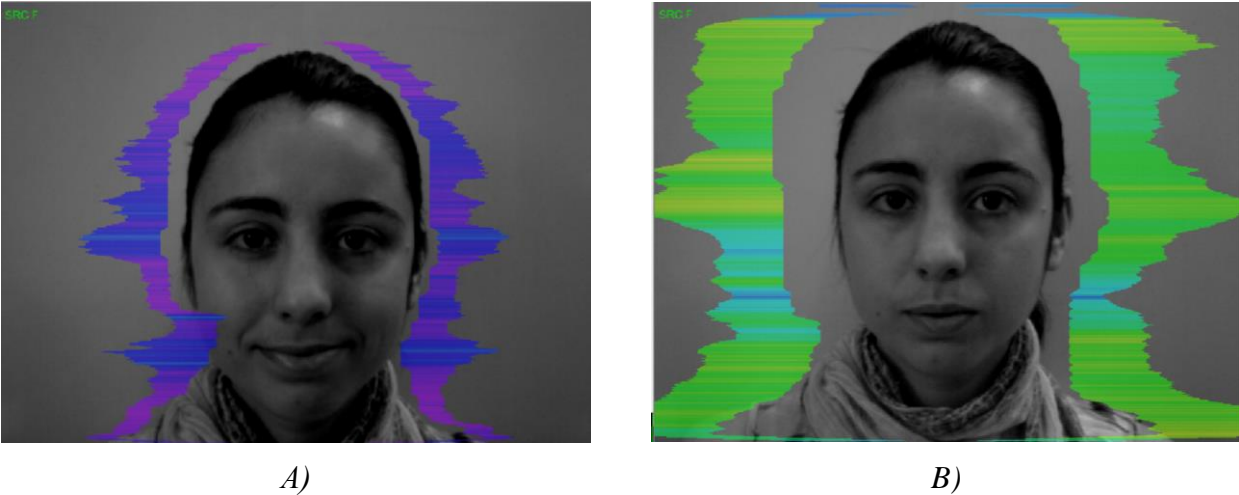


Fig. 4.4 Suspect A) $T4 = 20\%$, B) $T4 = 65\%$

T5 – Balance (P16);

The parameter is determined by the frequency histogram and characterizes the level of similarity of the current frequency histogram to the Gaussian distribution law. The high level of frequency histogram similarity to the normal law is characterized by a high level of balance, and significant deviation from the Gaussian distribution is characterized by a low level of the parameter T5.

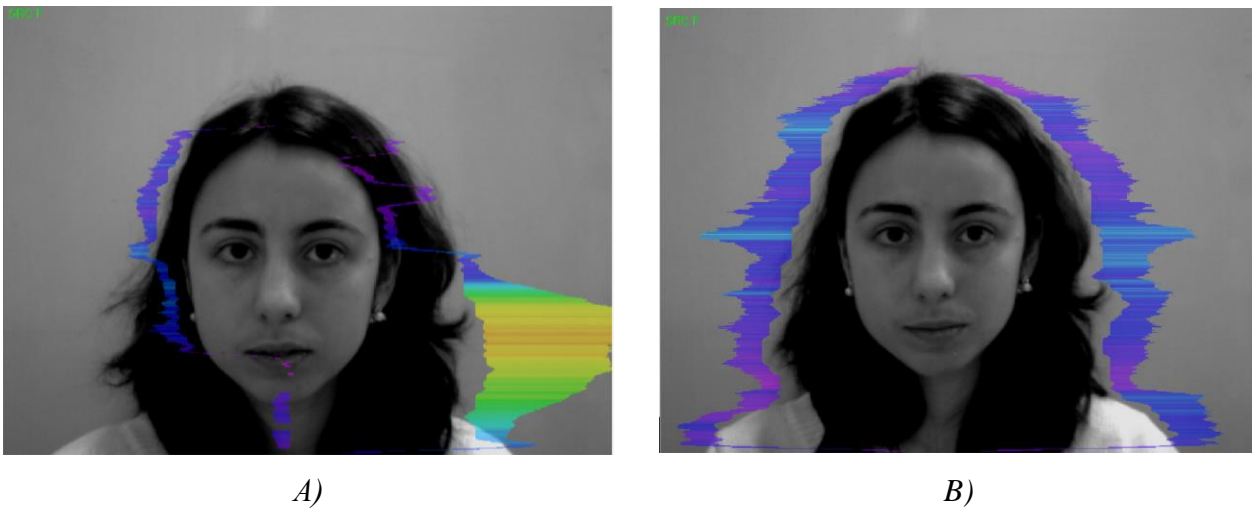
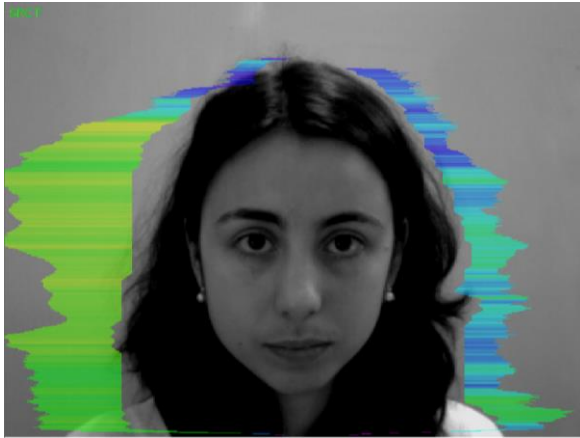


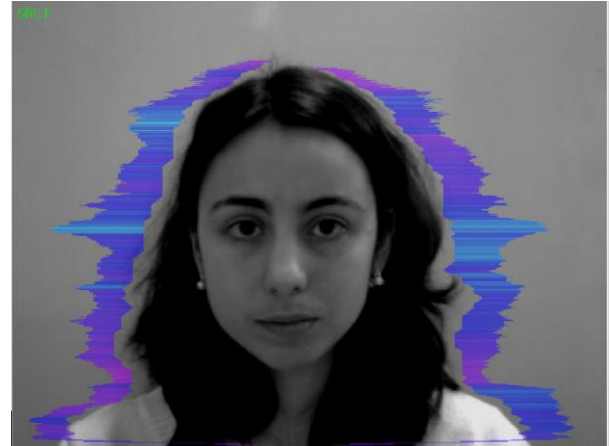
Fig. 4.5 Balance A) $T5 = 10\%$, B) $T5 = 80\%$

T6 – Charm (P17);

The parameter is determined by the symmetry (left-right) of the head and face micromovements, the maximum symmetry of movements (including frequency and amplitude) represents a high level of charm T6.



A)

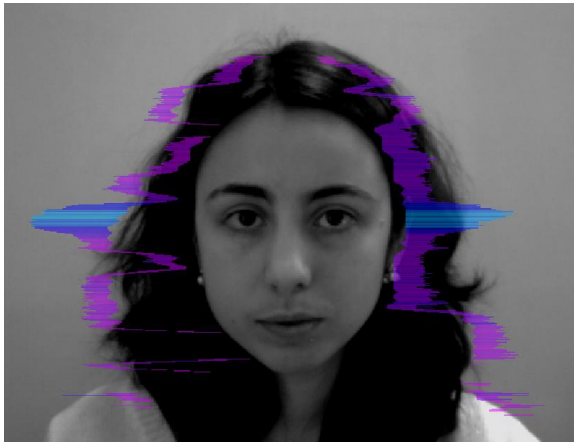


B)

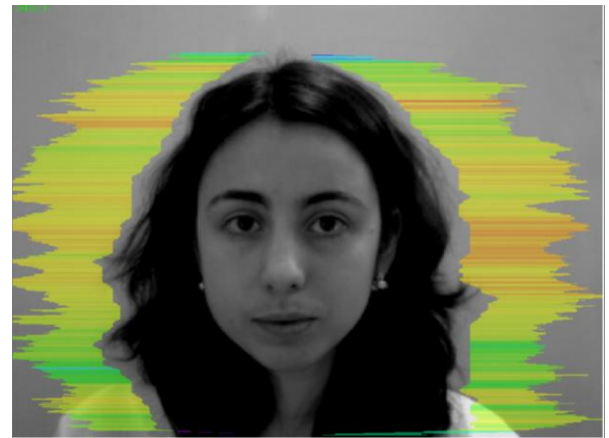
Fig. 4.6 Charm A) $T6 = 40\%$, B) $T6 = 85\%$

T7 – Energy (P8);

The parameter is determined by the frequency histogram and characterizes the difference of the maximum density of the vibration frequency and vibration frequency SD for the face and human head. The higher value of the maximum density and lower SD or variation of vibration gives the higher value of energy T7.



A)



B)

Fig. 4.7 Energy A) $T7 = 3\%$, B) $T7 = 70\%$

T8 – Selfregulation (P18);

The parameter is determined as the sum average for conditionally positive emotions (T5, T6) and characterizes the general level of conditionally positive person emotions at the measurement time.

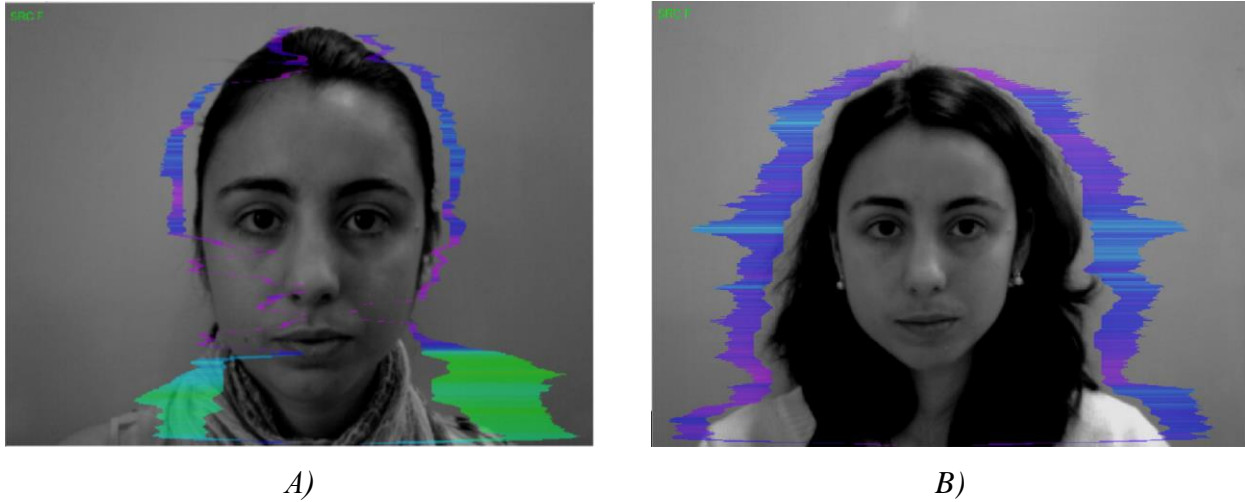


Fig. 4.8 Selfregulation A) $T8 = 30 \%$, B) $T8 = 80 \%$

T9 – Inhibition (F6);

It has a real physical dimension (time in seconds) and characterizes the minimum time of the person reaction for the shown event (the stimulus). The value of the parameter $T1 = 0.1$ means that the reaction time is 0.1 s. The greater the reaction time corresponds to a higher level of inhibition.

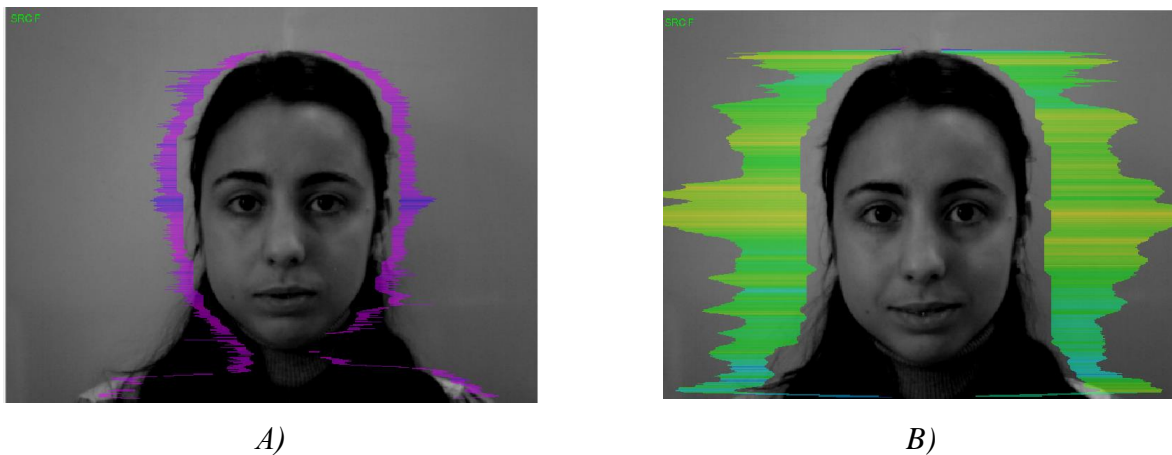


Fig. 4.9 Inhibition A) $T9 = 12 \%$, B) $T9 = 25 \%$

T10 – Neuroticism (F9).

The parameter characterizes the SD measured value of the inhibition level (T9) at the measurement time (default 60 seconds). High level for inhibition SD of psychophysiological state characterized by instability and indicates high level of neuroticism T10.

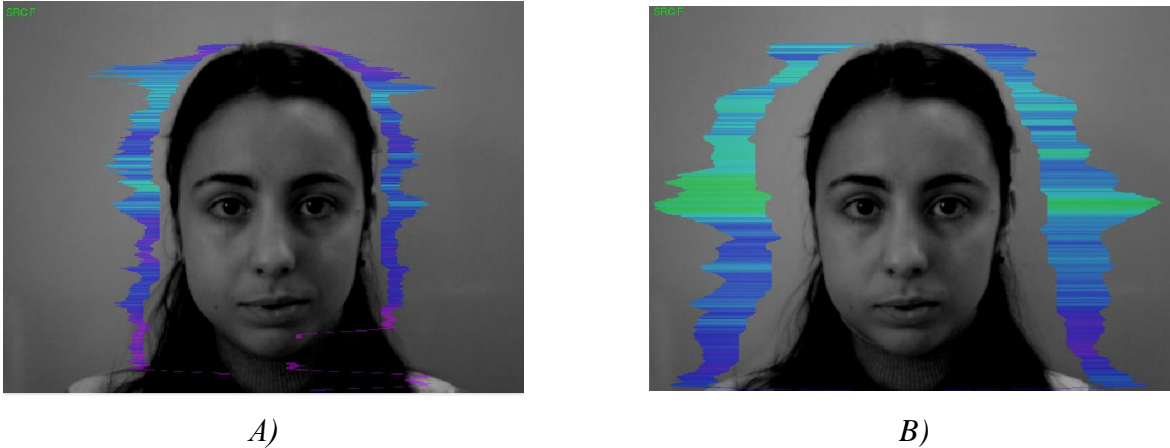


Fig. 4.10 Neuroticism A) $T10 = 10 \%$, B) $T10 = 35 \%$

Set of the $T1$ - $T10$ parameters is selected so that with the maximum information content to record all micromovements of a human head. Thus, the name of each T_i parameter can characterize different psychophysiological characteristics depending on use of **VibraMed**. For the characteristic of each parameter its name is primary not, it can be read the conditional, and a formula by which this parameter is determined. During measurement the current values of measured parameters are displayed in information column (item 3.4.2.).

After the end of information gathering in a mode «M» the user can view results of research in one file of the «*.xls» format (viewing requires existence of the Microsoft Excel program of version 97-2003 above). The example of the contents of such file is given in a fig. 4.11.

The file is saved in each measurement to the selected folder of archive, by default «C/Elsys/Vibraimage8Med/_default».

Also results can be seen in information column or in print preview of results, having selected appropriate item in the File menu. Viewing is recommended before information output on the printing and contains 3 pages (fig. 4.12-4.14). For the printing it is possible to use point in the «File» menu or the toolbar button.

Note:

1. Every from $T1$ - $T10$ psychophysiological parameters measured by vibraimage system are specified to range 0 - 1 (0 - 100) % using fixed coefficients experimentally selected.
2. Mathematical formula by which measured psychophysiological parameter is determined is primary, and a code name (for example, Aggression) is secondary. Psychophysiological meaning of each parameter $T1$ - $T10$ may be varied depending on the experimental conditions.
3. The set of measured parameters $T1$ - $T10$ determines the total psychophysiological (psychosomatic, functional) status of a person based on the integral coefficient K .

Statistical processing of parameters measured in a mode «M» is carried out by the program Vibrastat.

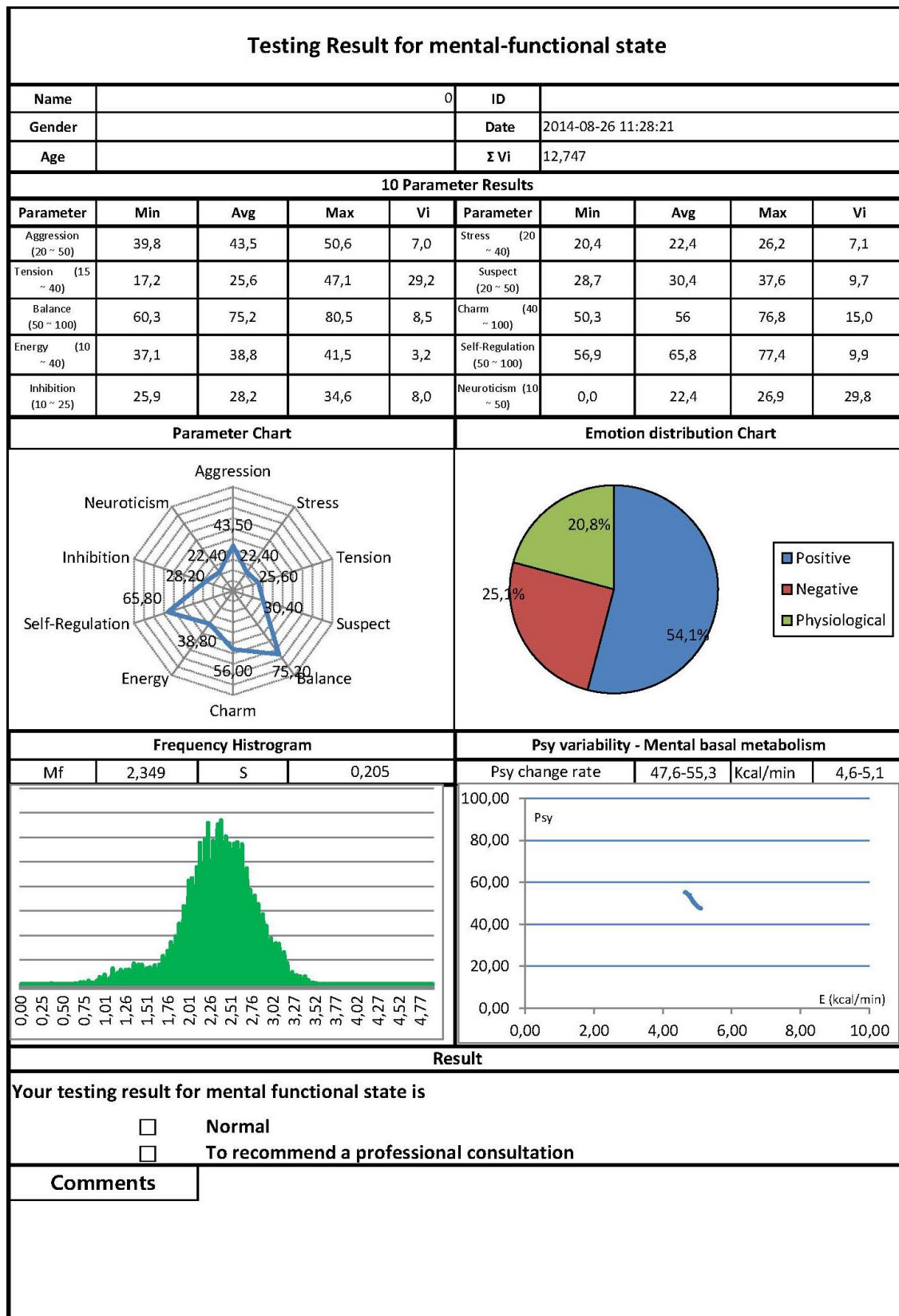


Fig. 4.11. Psycho-emotional status of the person

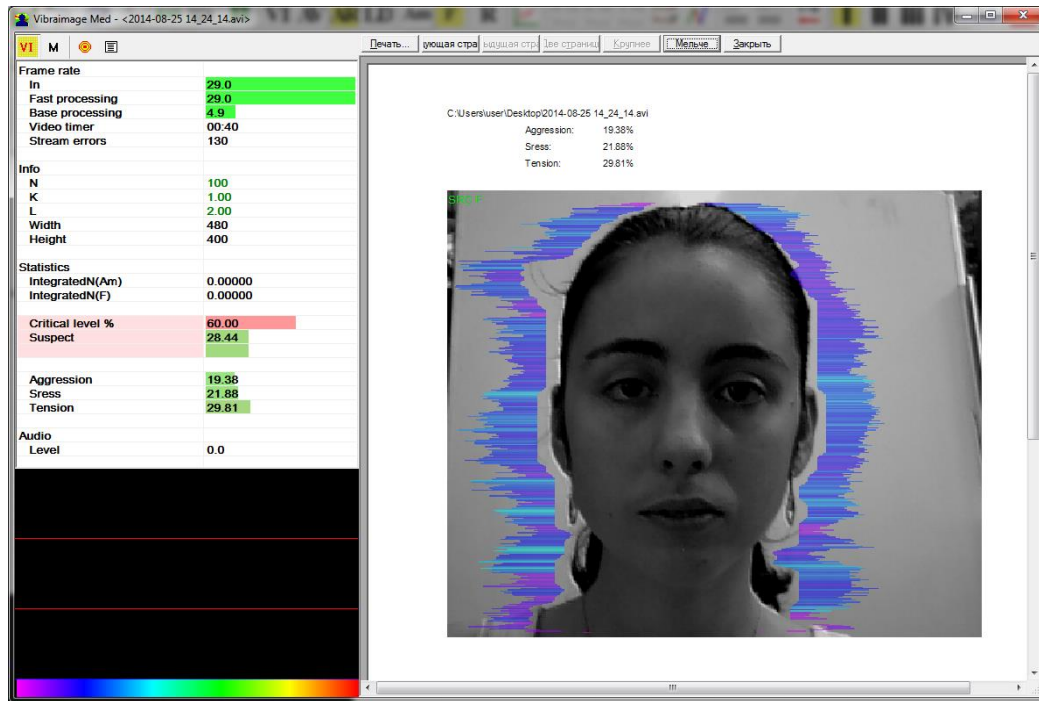


Fig. 4.12. Viewing of researches results in a mode "M". Page 1.

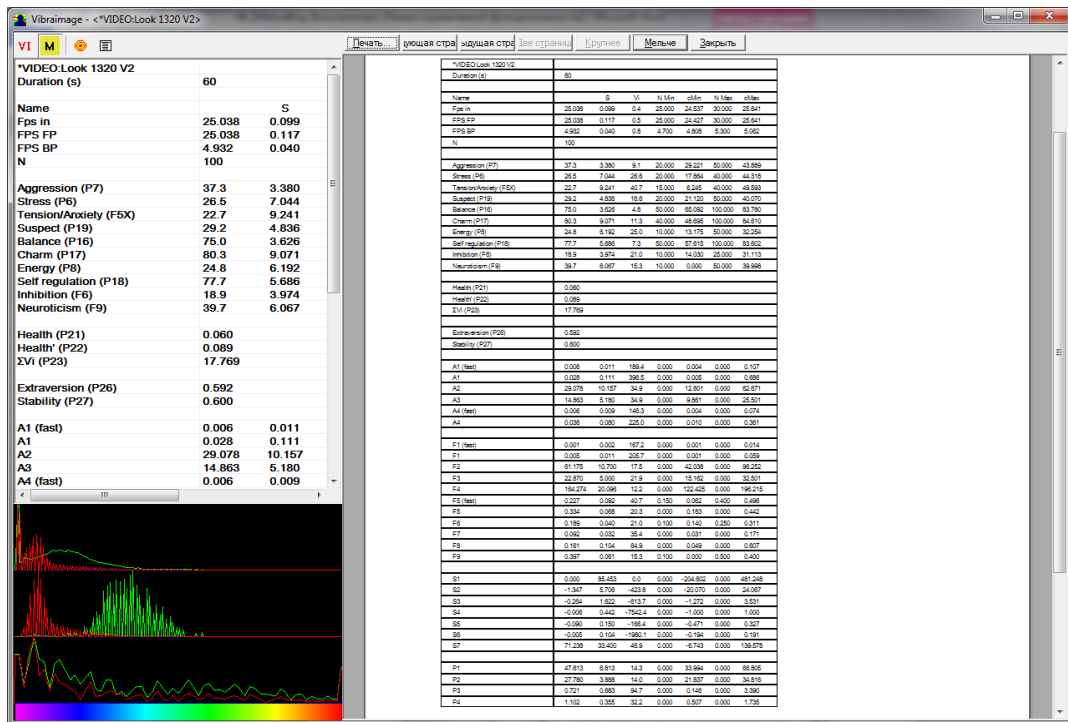


Fig. 4.13. Viewing of researches results in a mode "M". Page 2.

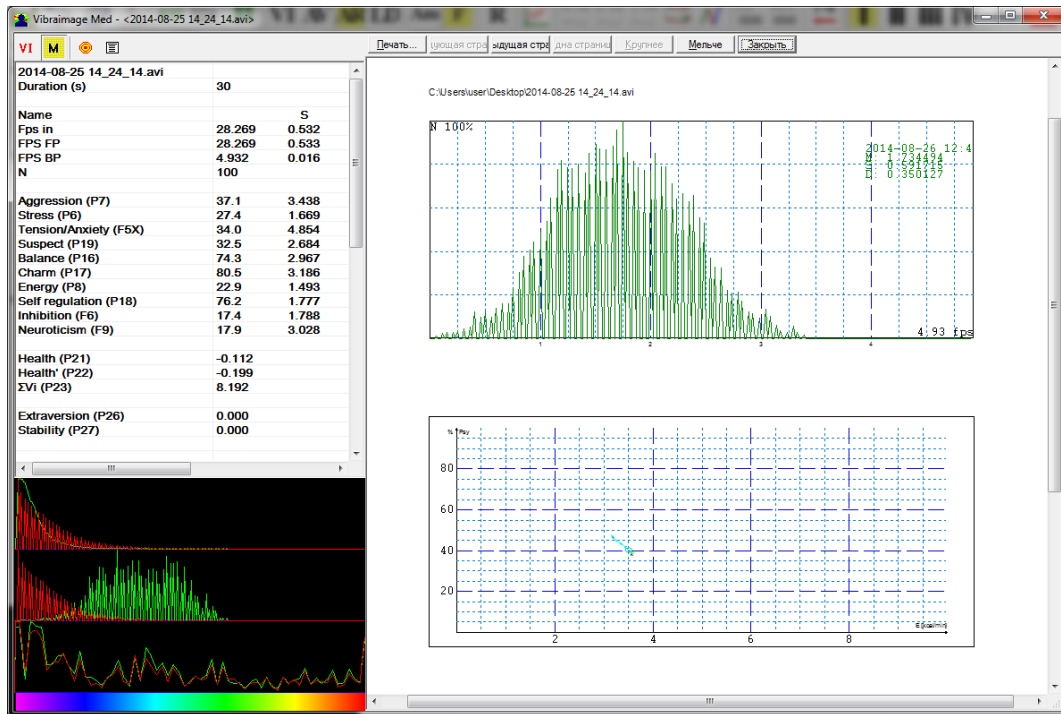


Fig. 4.14. Viewing of researches results in a mode "M". Page 3.

Simultaneously in the database catalogue, fixed for researched person, 8 files will be generated, for example:

- **YYYY-MM-DD HH_MM_SS_measurement_print.png** and **YYYY-MM-DD HH_MM_SS_measurement.png** – graphic files with results of measurements;
- **YYYY-MM-DD HH_MM_SS_measurement.txt** – a text file with results of parameters measurements for the specified period;
- **YYYY-MM-DD HH_MM_SS_measurement.xls** – the document of the Microsoft Excel program with parameters measurements results and which main contents are given in a figure 4.11;
- **YYYY-MM-DD HH_MM_SS_measurement.xml** and **YYYY-MM-DD HH_MM_SS_measurement_log.xml** –files with results of parameters measurements for the specified period. To open a file for viewing and printing the parameters, graph and histograms it is possible, having chosen item «Open...» menu «File»;
- **YYYY-MM-DD HH_MM_SS_measurementH.png** – a graphic file with the histogram of frequency distribution (fig. 4.15), saved up for 10 seconds;
- **YYYY-MM-DD HH_MM_SS_measurementT.png** – a graphic file with graph of person psycho-energy conditions changes for the specified period (see. fig. 4.17). The circle on the graph shows a point of the information accumulation for calculation of the frequency distribution histogram.

In all files in names **YYYY-MM-DD** and **HH_MM_SS** are a measurement date and time.

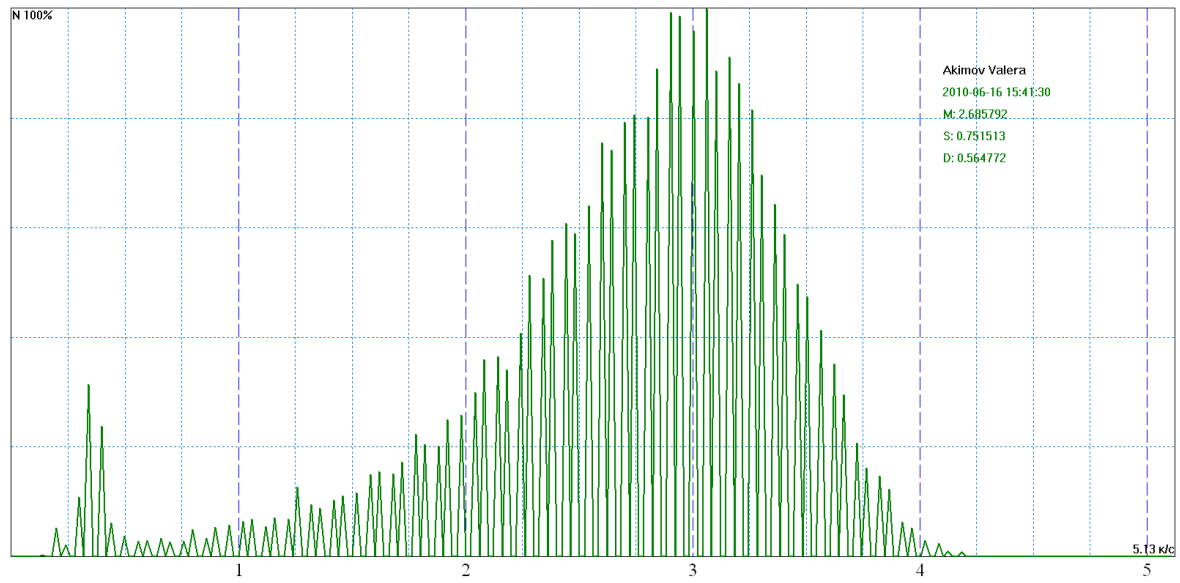
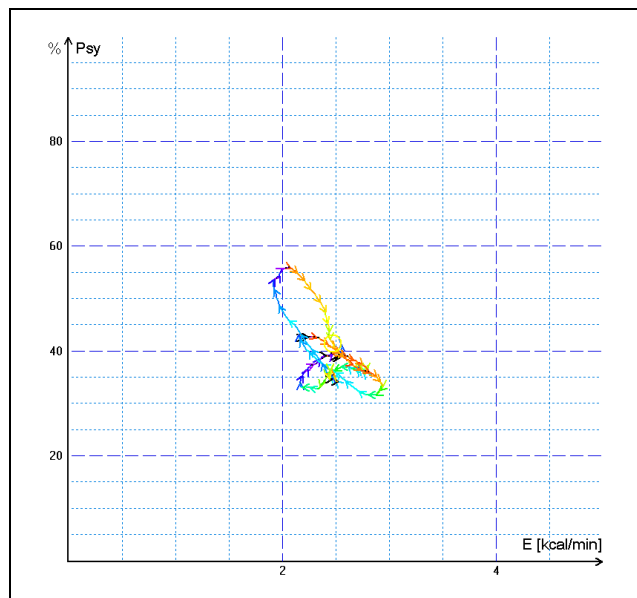
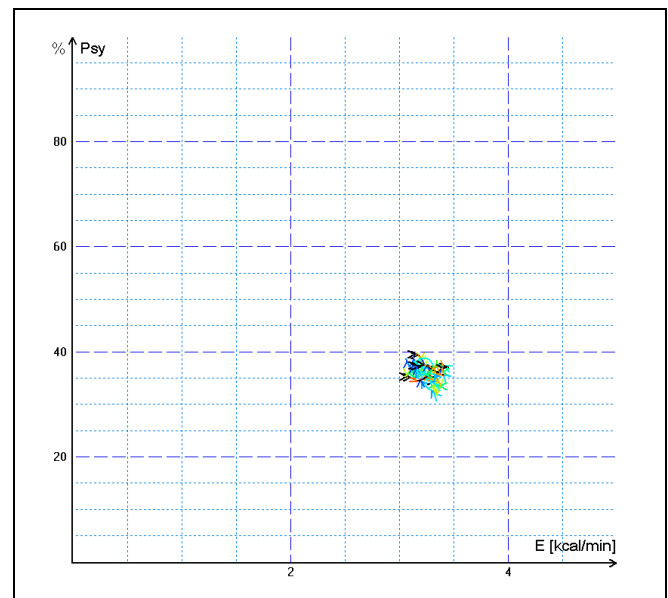


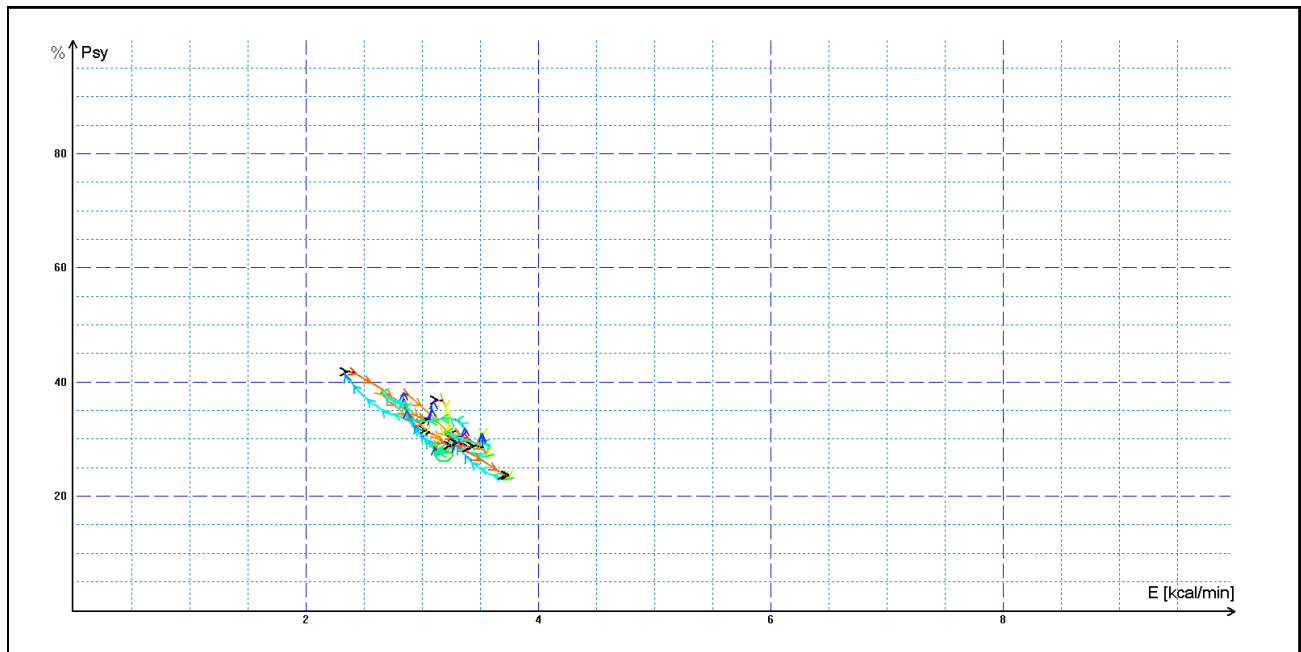
Fig. 4.15. The histogram of vibration frequency distribution



a) changing 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

Fig. 4.16 (a,b,c). Change person psycho-energy conditions for the chosen period

Change of psychoenergy state of the person during a controlled time frame is visually reflected in a graphics (fig. 4.16). Only the person who is in weakened, or on the contrary in a status of high concentration (fig. 4.16-b), can be in the fixed psychoenergy state during such insignificant time, as 1 minute. The majority of people is made by noticeable oscillations of psychoenergy state, even for short periods, depending on the thoughts (fig. 4.16-a) and under the influence of an environmental situation (fig. 4.16-c).

4.2 Definition of emotions

Head movements in space classically associated with vestibular system are studied and discussed in relation to the status of vestibular reflexes (i.e., the vestibulo-ocular, vestibulo-collic, and cervico-ocular reflexes). But it is possible to look on head movements according to the vibraimage system and technology. We supposed that head balance for person without consciously movements could be considered as isolated thermodynamic system and any emission of internal energy would change the balance of this isolated system and realized by movements or vibrations.

Every emotional state characterized by specific energy conversation and work done by the system transfers to micro vibrations, if the person forced to stand or set still. The head vibration parameters (frequency in range 0.1-10 Hz and amplitude) are stable in time for stable emotional state of person. Parameters of vibrations changed only after emotional state alteration. **VibraImage** technics allows to contactless register of person vibration parameters and calculates emotions according to accumulated statistics of comparative testing with EEG, skin galvanic reaction and psychological testing. **VibraImage** technics, parameters and research results are below.

4.2.1. VibraImage parameters

Values of amplitude and frequency of vibrations of a person head differ in each point of space and are displayed as pseudo color image. Integrated processing of parameters values of vibration in each point can give the general information on parameters of the person movement. Vibraimage the person heads displaying amplitude (fig. 4.17) and frequency (fig. 4.18) the distributions of vibrations modulated by a color scale (fig. 4.19), are showed below:



Fig. 4.17. Amplitude vibraimage



Fig. 4.18. Frequency vibraimage

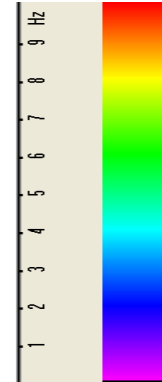


Fig. 4.19. Pseudo color scale of frequency distributions

Each point (pixel) amplitude vibraimage (fig. 4.17) reflects the relative moving of an element of the image saved up for determined time as it is known, that at insignificant moving the frames difference is proportional to the movement of object. For transformation of this relative moving in absolute, it is necessary to have the exact information on distance up to object and a working corner of an objective of the chamber, and then a color scale (fig. 4.19) can be scaled in millimeters or microns. However, at about the same location of faces on the screen, automatically the condition the single relative amplitude vibraimage scale satisfies. This allows to compare the obtained information about moving images to different people.

As against amplitude analyses, each point frequency vibraimage has physical dimension frequencies (Hz) as really displays frequency of signal change in each element of the image. Therefore the resulted color scale (fig. 4.19) scaling in Hz, i.e. violet color frequency vibraimage displays a range of vibrations (0-1) Hz, dark blue displays a range of vibrations (1-4) Hz, green the range of vibrations displays (4-8) Hz, red displays a range of vibrations (8-10) Hz.

On the basis of the given two primary images the technique assumes definition more than 40 integrated vibraimage parameters, reflecting various types of movement and vibration, and the parameters divided into 4 basic groups:

- A – amplitude parameters;
- F – frequency parameters;
- S – symmetry parameters;
- P – spatial and timing parameters of mathematic calculation.

4.2.2. Aura-VibraImage

External (around of a head) interline display of the maximal frequency and average amplitude vibraimage looks as aura and more informatively displays a condition of the person, than internal vibraimage. Color of vibra-aura is coded by the same color scale, as vibraimage (fig. 4.20), and displays the maximal frequency in each line. The size of aura is defined by average amplitude for the given line. Any non-uniformity in color and the size of aura characterizes movements of object and its emotion condition. The normal condition of the person is characterized more uniform external vibraimage (vibra-aura), and for an intense condition of the person are characteristic the big space and color non-uniformity of vibra-aura.

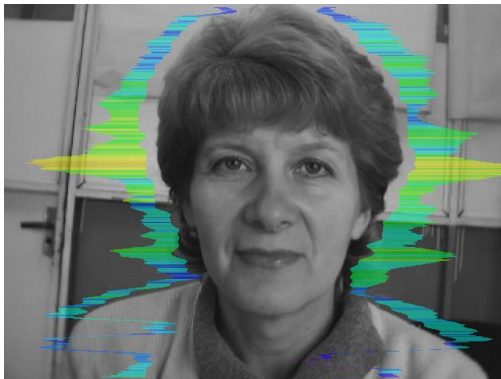


Fig. 4.20. External vibraimage (vibra-aura) of person in normal condition



Fig. 4.21. External vibraimage (vibra-aura) of person in tension condition

Obvious distinctions between images on fig. 4.20 and fig. 4.21 illustrate advantages of the visual analysis of the person condition on external aura in comparison with the visual analysis initial vibraimage. The vibraimage method gives significant freedom of a choice of registration of a condition, and visual supervision of aura allows to estimate quickly and evidently practically all emotion parameters of the person. Brief interpretation of the form and color of aura is resulted on the fig 4.22. This brief information does not limit, and sets to the user of system the basic directions of the analysis of person condition. Getting experience and taking into account the specificity of application, each user of system can diversify and deepen essentially results of the analysis of vibra-aura, open secret secrets of soul and a body of the person.

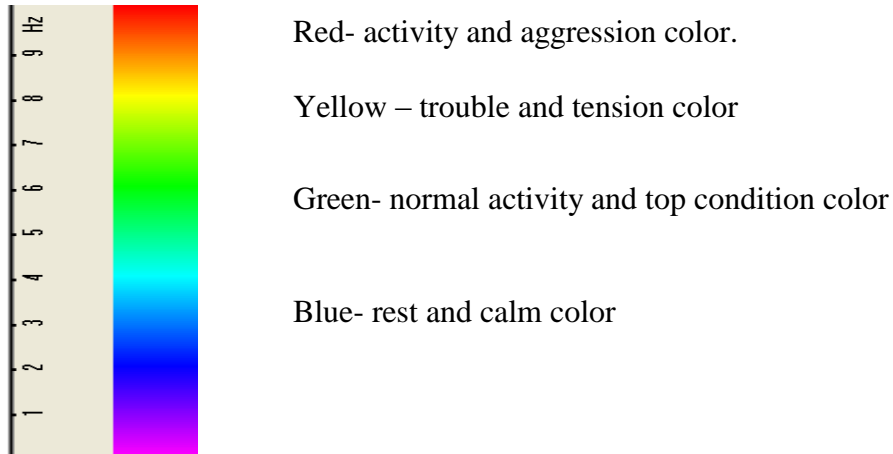


Fig. 4.22. Brief vibra-aura color interpretation

Brief aura form analysis

1. Any aura asymmetry (form, color) characterized deviation from mental or physiological norms.
2. Color irregularity of vibra-aura characterizes psycho-physiological imbalance of a person status.
3. Any breaks in aura uniformity characterized deviation from mental or physiological norms.
4. Ideal aura has mono color, symmetrical and uniform. Any real aura differs from ideal and the question of interpretation is to characterized real aura deviations.

Note!

This brief aura interpretation correspond default vibraimage system settings and based on main rules for right vibraimage scanning:

- uniform and stable object illumination;
- high quality and low nose camera application;
- frontal plane object before camera;
- maximum facial image size on monitor;
- mechanical stabilization of camera.

4.2.3. Vibraimage emotion samples

Normal and top emotional state

Normal condition characterized by aura color and form uniformity around the head, relevant monochrome color in the middle of suggested color scale (fig. 4.23). Activity level is about 0.3–0.6. Stress level is about 0.2–0.5.

Tension level is not more than 0.4.

Every emotion level measured in the range from 0 till 1,0 and minimal value coordinates with minimal emotion intensity.

Frequency distribution histogram is near normal (Gauss) distribution and spectrum of high speed vibraimage signals is near exponential distribution.

Vibra-aura photos samples for normal condition of person are on fig. 4.23 below:



Fig. 4.23. Vibra-aura photos samples for normal condition of persons

Stress state

Stress state characterized by amount gaps in aura form and greatly aura colors non uniformity. Vibra-aura includes every scale colors and sharp color transfer, like red color could transfer to blue (fig. 4.24). Stress level more than 0.7.

Aggression or activity level is low, not more than 0.5 and tension level is high and usually more than 0.4.

Frequency distribution histogram has several modes and high speed vibraimage signals spectrum presents superposition of exponential and uniform distributions.

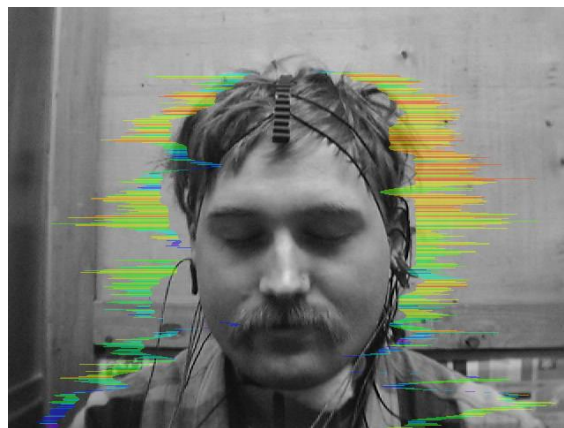


Fig. 4.24. Vibra-aura photos samples for stress condition of person

Aggressive and/or tension state

Aggressive state is not every time coordinates with tension, and tension state is not always coordinates with aggression. But often these two emotions accompany each other. Aggressive state obligatory characterized by high frequency vibrations and red colors in vibra-aura (fig. 4.25). Vibra-aura size is more than normal and gaps could absent, but color and form non uniformity must present. Stress level could be low, less than 0.3.

Anger level is more than 0.7 and tension level is more than 0.4.

Frequency histogram distribution has maximum in right part of the range and distribution has amount dispersion. High speed signals spectrum envelope looks like uniform distribution.

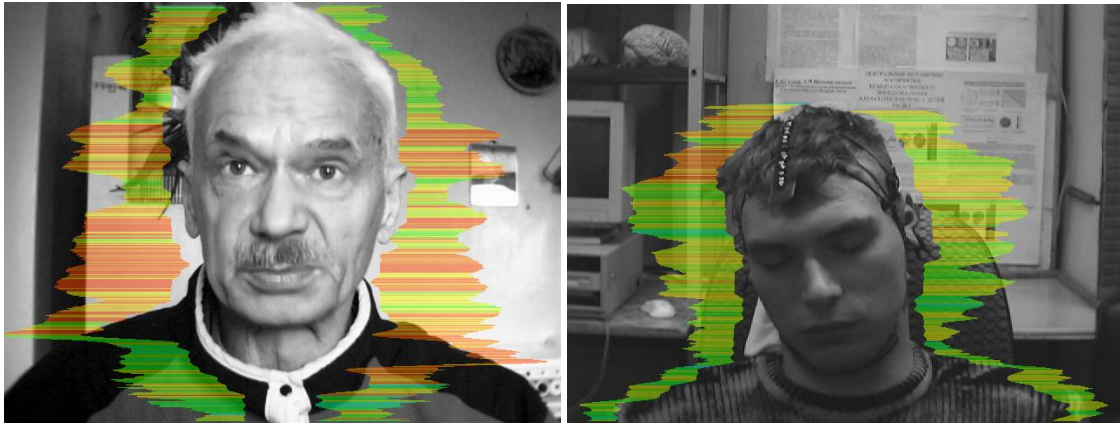
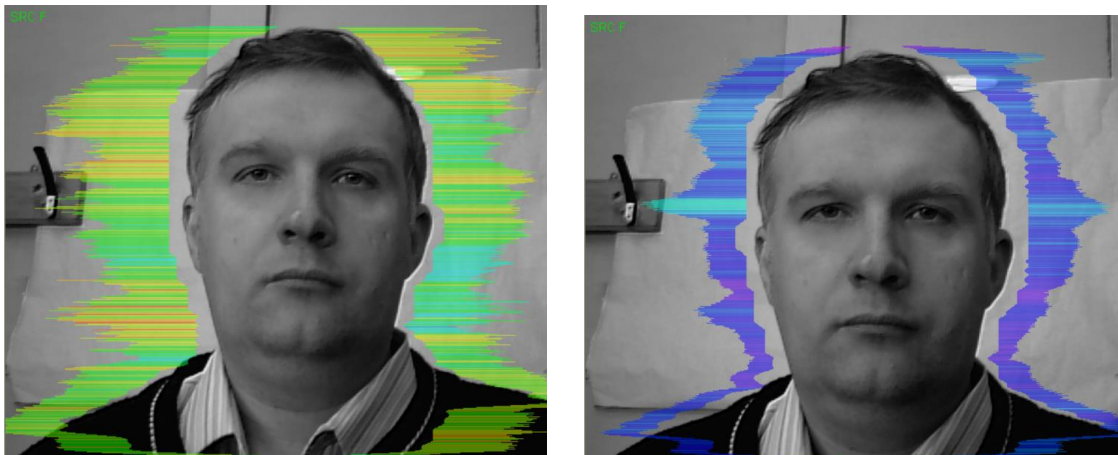


Fig. 4.25. Vibra-aura photos samples for aggression condition of persons.

Meditation

VibraMed system application allows to register distinction not only between the aggressive (abnormally excited) and normal condition of the client, but also and to register a degree of condition change of the person when the person calms down (fig. 4.26) or meditates (fig. 4.27-4.29).



a)

b)

Fig. 4.26. Samples of self-correction person emotional states: a - 10 seconds after the beginning of supervision, b - 100 seconds after (the person have asked to calm down and count up to 100).

5. Warranty

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

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Version **VibraMed**

March 2015

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