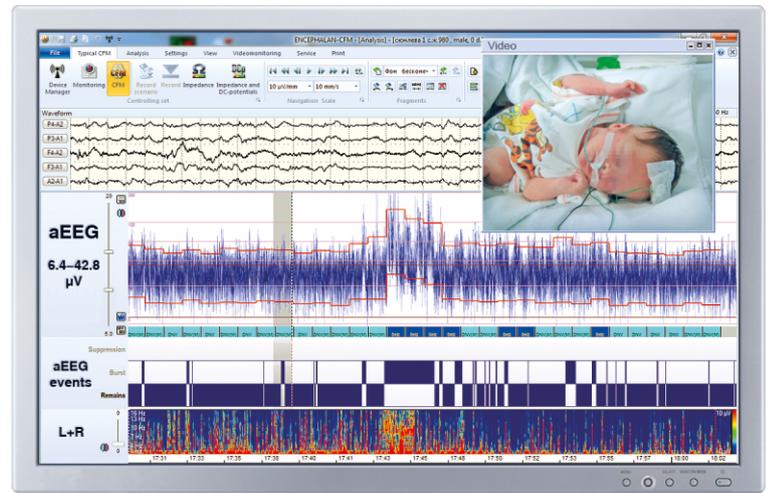


# Cerebral function monitor "Encephalan-CFM"



Modern tool for monitoring electrical brain activity to detect pathological changes in cerebral functions and hypoxic-ischemic encephalopathy in the newborns



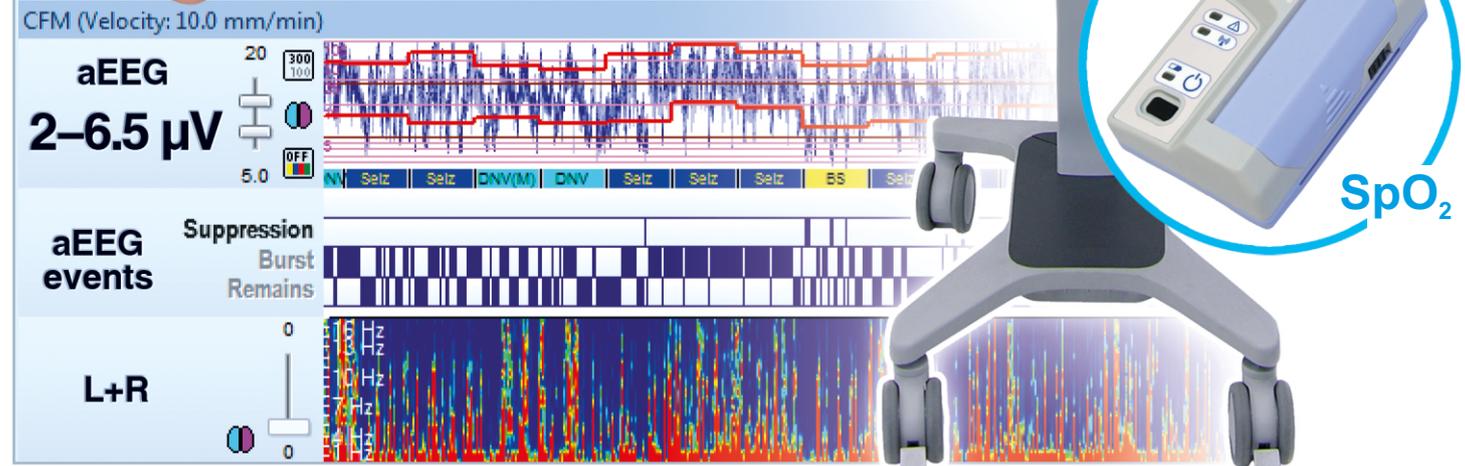
Full HD video



aEEG



SpO<sub>2</sub>



Dynamics of changes in newborn brain activity, which cannot be traced during short-term EEG study, is clearly represented during continuous EEG monitoring in the form of amplitude-integrated EEG (aEEG) via few EEG derivations (from 1 to 5)



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Taganrog

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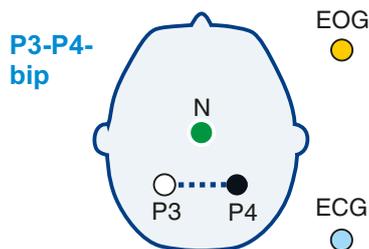
## Continuous cerebral function monitoring (aEEG) allows:

- Evaluating general functional state of CNS and neurological status.
- Detecting paroxysmal activity, evaluating its severity, duration and manifestation frequency.
- Monitoring the dynamics of patient's state at therapeutic interventions.
- Monitoring aEEG changes in states causing hypoxia neonatorum – asphyxia, cerebral perfusion disorders, brain traumatic injuries during delivery, etc.
- Evaluating the necessity of neuroprotective treatment application for hypoxic-ischemic encephalopathy.

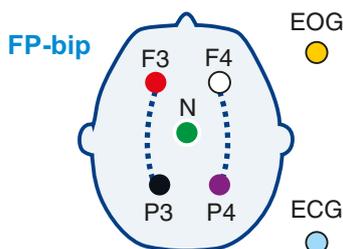
### 3 types of EEG montages for cerebral functions monitoring

EEG derivations on the montages are marked with colors that correspond to the color-coded marking of EEG electrodes and input connectors of the amplifiers on the patient transceiver-recorder of cerebral function monitor "Encephalan-CFM"

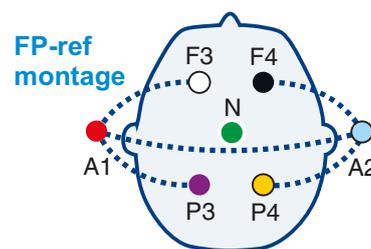
#### 1-channel bipolar variant



#### 2-channel bipolar variant



#### 5-channel monopolar variant

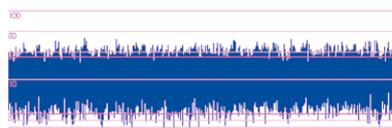


aEEG patterns are of a characteristic view, which corresponds to various normal and pathological brain states, which allows detecting and identifying recorded patterns both manually and automatically.

### Samples of some characteristic aEEG\* patterns

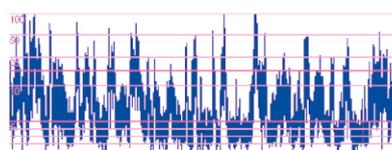
#### Continuous normal voltage pattern

aEEG within the range of 5-10  $\mu\text{V}$ . If there are no pathologies, this pattern is considered to be normal.



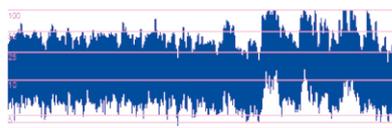
#### Discontinuous "burst-suppression" pattern is characteristic

of severe brain damage connected with neurological diseases of the neonatal period, coma state, severe asphyxia, meningitis-encephalitis and metabolic disturbances.



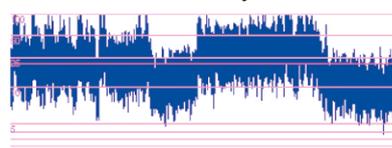
#### Pattern with epileptiform activity

Characterized by a sudden increase of both minimal and maximal amplitude of aEEG. Epiactivity is denoted with rising lower and/or upper edge of aEEG trace.



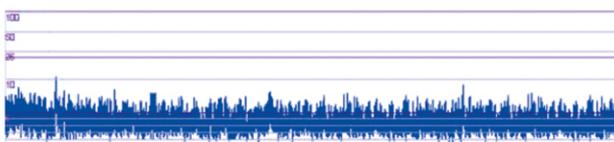
#### Pattern of epistatus. Example of treatment efficiency control.

Vertical markers indicate moments of drugs administration, after which partial aEEG normalization is observed.

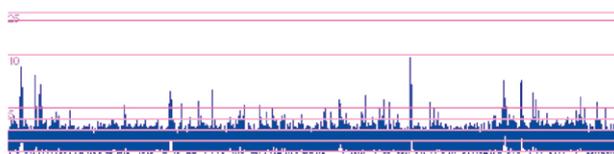


#### Continuous pattern with low voltage

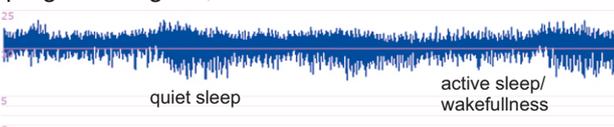
Amplitude less than 10  $\mu\text{V}$ . It's characteristic of severe and moderate severity hypoxic-ischemic encephalopathy, of meningitis, etc.



**Pattern with flat EEG** (less than 3-5  $\mu\text{V}$ ) with periodic bursts of high-amplitude activity speaks for severe brain damages with poor prognosis and high probability of significant neurological defects if patient survives.



**Sleep-waking cycle** is presented with cyclic variations, mainly of the lower border, at the change of sleep stages. Duration of sleep-waking cycle disorder contributes to predicting neurological outcome. If cycles are normalized earlier than 36h, prognosis is good, otherwise it is not.



\* Materials are taken from

"Atlas of amplitude-integrated EEGs in the newborn", Hellstrom-Westas L, de Vries LS, Rosen I. Informa Healthcare, 2008.

## Display of data on the cerebral function monitor "Encephalan-CFM"

### "Professional" suite

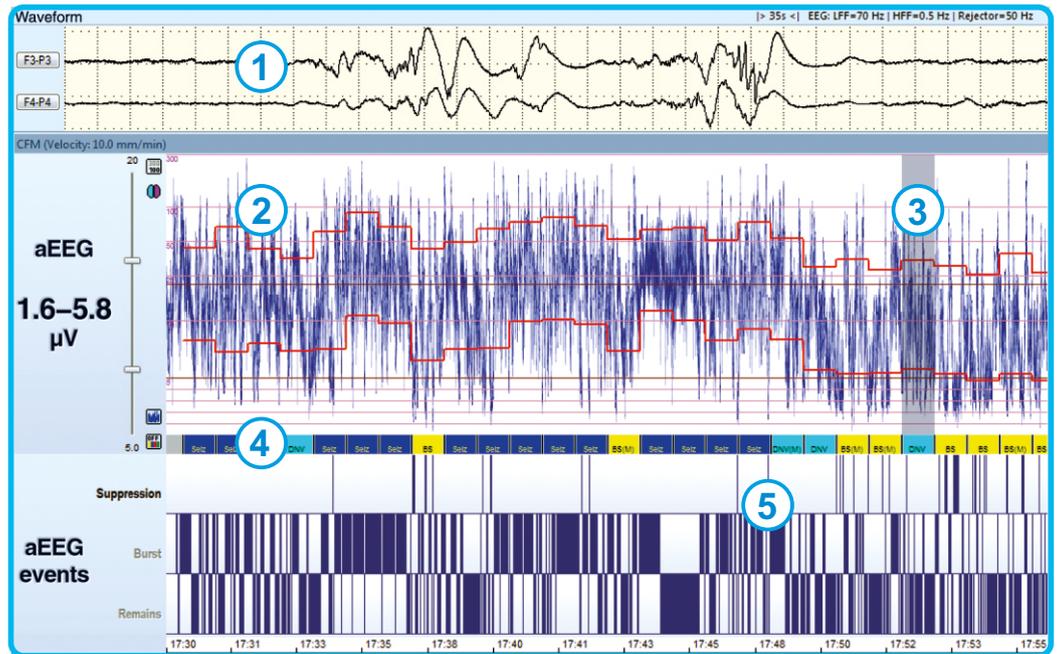
① **EEG signal panel.** Visual presentation of current (native) EEG changes during monitoring.

② **The trend of aEEG** shows the dynamics of amplitude-integrated EEG (aEEG) changes during continuous monitoring of a patient.

Red horizontal lines on aEEG trend show averaged value of lower and upper limit.

For the montages that use at least 2 symmetrical EEG derivations, it is possible to display aEEG trends for the left and the right hemispheres.

In the picture aEEG trend is shown in "insight" mode, which increases the reliability of data interpretation by taking into account the statistical characteristics of the aEEG.



③ Vertical shaded zone in the trend area corresponds to the sliding window with 1 minute duration at which calculation of parameters and aEEG patterns classification is carried out.

④ **Automatic aEEG patterns classification** with minute-by-minute display of results on colored scale. On monitoring completion, final classification results are formed. Color coding of patterns:

<b>CNV</b> continuous normal voltage pattern;	<b>CLV</b> continuous low voltage pattern;
<b>DNV</b> discontinuous normal voltage pattern;	<b>BS</b> "burst-suppression" pattern;
<b>FT</b> flat trace;	<b>Seiz</b> seizure activity.

⑤ **aEEG events** – linear presentation of data ("burst", "suppression" and "remains") to simplify visual analysis of aEEG and interpret the typical aEEG patterns.

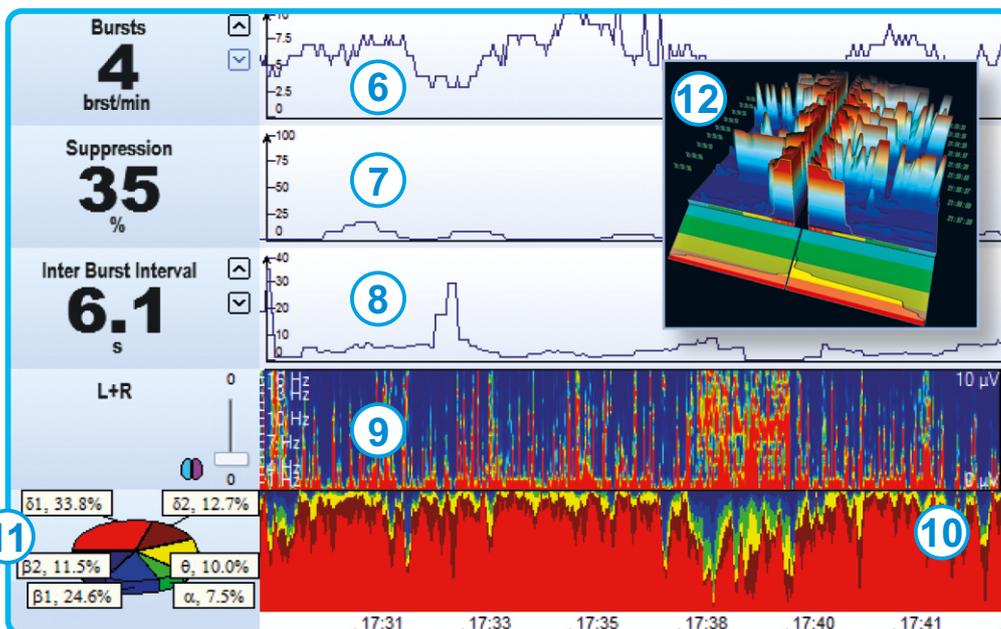
### "Elite" suite. Additional capabilities

⑥ **Display of aEEG bursts dynamics.** Digital data panel indicates the current value of bursts per minute.

⑦ **Display of aEEG suppression manifestation** below the minimal threshold of aEEG amplitude (level of 3-5  $\mu\text{V}$ ).

⑧ **Display of dynamics of interburst interval changes.**

⑨ **Trend of density spectral array** visually presents the dynamics of spectral EEG content and power both summarized and individually for each hemisphere.



Digital data panel (on the left) displays current value of the selected spectral parameter – spectral power, spectral index, median frequency, spectral edge frequency, weighted average frequency.

⑩ **Trend of spectral power indices by ranges (SPIR)** shows ratio dynamics of spectral power of EEG rhythms in the form of color bands, width of which varies with changes in each rhythm index. SPIR trend allows detecting sleep-waking cycles and evaluating the efficiency of medical treatment.

⑪ **On the SPIR pie chart** the ratio of spectral indices is displayed in percent, calculated by the current time position.

⑫ **Three-dimensional visualization of compressed spectra** by the cerebral hemispheres, displayed mirrored, allows evaluating the dynamics of change in the EEG spectral parameters characterizing the functional state of the brain, pathological manifestations and the presence of various EEG phenomena.

## Optional capabilities of videomonitoring and pulse oximetry



If a video camera is present in a sales package, digital videomonitoring **1** accurately synchronized with the EEG is provided.

Videomonitoring provides additional objective information on a patients' state and their motor or convulsive activity.

If **wireless pulse oximeter module** is present in sales package, values of **pulse rate (PR)** **2** and **oxygen saturation (SpO<sub>2</sub>)** **3** are recorded synchronously with the EEG, and trends of these parameters are displayed in the same time frame with other trends of cerebral function monitor.



## Simultaneous cerebral function monitoring in several patients in ICU and resuscitation department

Information from patient transceivers-recorders (up to 4 pcs.) is transmitted via wireless channels (Bluetooth®) to the central station.

Data on each patient is displayed in a specified window on the central station monitor.

Any window may be displayed in full-screen mode for detailed viewing and analysis.

Digital videomonitoring synchronized with EEG recording of one of the patients is available.

## Main technical characteristics and possible completeness of "Encephalan-CFM" monitor

### Autonomous patient transceiver-recorder ABP-5

- 7 electrode connectors (touchproof) allow recording up to 5 EEG, EOG and ECG derivations in various combinations (see types of montages);
- Adjustable high- and low-pass filters;
- Wireless data transfer - Bluetooth®;
- Type of memory card of the patient transceiver-recorder (for data backup or autonomous data recording) – MicroSD;
- Power – 1 AA rechargeable battery or mains/USB adapter;
- Weight – up to 110 g.

**Defibrillation proof connector** protects the patient transceiver-recorder ABP-5 and a patient during resuscitation.

**Wireless pulse oximeter module** for recording the level of arterial blood saturation with oxygen (SpO<sub>2</sub>) using various types of sensors, including disposable neonatal ones.

**Wireless Poly-4 module** allows recording additional signals synchronously with ABP-5 by 4 channels from the following list: ECG, EMG, temperature, respiratory effort, airflow, movement activity (optional software for neuromonitoring "Encephalan-NM" is required).

**Wireless phono- and photostimulation unit** for carrying out functional tests during EEG monitoring.

**Personal computer – Real Time Work Station** for processing signals from the patient transceiver-recorder, analyzing and displaying results. Controlled with a keyboard or touch screen.

**Equipment Trolley.**

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