REPORT on 報告

Special Aspects of Cerebral Bioelectrical Activity Changes Upon Exposure of Brain to Electromagnetic Radiation, Emitted by Mobile Phone, and Possible Correction Thereof by Combination of AIRES SHIELD Pro and Mobile Phone Pilot Studies

腦部暴露於行動電話所發射之電磁輻射時，腦部生物電活動變化的特殊面向及 AIRES SHIELD Pro 與行動電話結合的初步研究可能的矯正效果

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SUMMARY 摘要

Study subjects are 21-year old male volunteers. The set of methods is comprised of physiological and statistical study methods. The purpose of the work is to assess aspects of cerebral bioelectrical activity upon brain exposure to electromagnetic radiation, emitted by the modern mobile phone in the conversation mode, and possible compensation of emerging negative physiological effects by means of the AIRES SHIELD Pro corrective device. Feasibility and efficiency of the AIRES SHIELD Pro corrective device use to mitigate negative impact of electromagnetic radiation, emitted by the mobile phone, has been justified. Selection of physiological parameters, sensitive to impact of electromagnetic radiation, emitted by the mobile phone, has also been justified.

研究對象為 21 歲男性志願者。研究方法包括生理學及統計學方法。研究目的在於評估現代行動電話於通話模式下所發射電磁輻射對腦部生物電活動的影響面向，以及利用 AIRES SHIELD Pro 矯正裝置對產生之負面生理效應可能的補償效果。研究證實 AIRES SHIELD Pro 矯正裝置在減輕行動電話所發射電磁輻射負面影響上的可行性與效能，並合理選擇對行動電話電磁輻射敏感的生理參數。

CONTENTS 目錄

INTRODUCTION 引言

Studies of impact, produced by electromagnetic field (EMF) and radiation (EMR), emitted by mobile phones (MP), on biological organisms have actively been conducted over the last two decades. However, the literature showed no clear correlation of negative impact with radiation, emitted by MP, at least until 2000. In order to clarify this issue, the WHO established the INTERPHONE project. Studies were conducted in 13 countries. 12,800 people participated in the studies. 20 mln pounds were spent. The findings of the studies made it possible for the WHO specialists to confirm connection between MP use and brain tumors, manifestation of Alzheimer and Parkinson diseases, epileptic seizures provocation. Preliminary findings were published in The Daily Telegraph in 2009. The mobile phone is a source of complex-modulated electromagnetic radiation of SHF (centimeter) band. Depth of MP SHF EMR with frequency up to 1000 MHz penetration into the brain makes up to 1.93 cm (6). Thus, it is possible that MP EMR directly impacts not only the cells of closely adjacent areas, but also on the whole brain, including liquid media thereof. This changes functional state of the central nervous system (CNS), which is reflected in the bioelectrical activity pattern (BEA) of the brain (1, 3, 4, 7, 8, 10, 13, 14, 16, 17). However, not all researches support the idea of weak EMR, emitted by mobile phones, negatively impacting the brain (14). The opinion is favored by the researchers, focusing their attention on exposure to energy of radiation, emitted by mobile phones, which is measured by SAR (Specific Absorption Rate). Modern phones, generally, have SAR below the acceptable standards. Moreover, manufacturers state that receiver sensitivity is better in expensive phones and smartphones, which enables to increase communication distance and also to use less powerful transmission unit of the basic station. From their vantage point, this suggests that modern mobile communication is harmless.

過去二十年來，針對行動電話（MP）所發射的電磁場（EMF）與電磁輻射（EMR）對生物體影響的研究持續進行。然而，文獻中並未顯示出行動電話輻射與負面影響之間有明確的相關性，至少在 2000 年之前是如此。為釐清此問題，世界衛生組織（WHO）成立了 INTERPHONE 計畫。該研究在 13 個國家展開，共有 12,800 人參與，耗資 2,000 萬英鎊。研究結果使 WHO 專家得以確認行動電話使用與腦瘤、阿茲海默症及帕金森氏症的表現，以及癲癇發作誘發之間的關聯。初步結果於 2009 年刊登於《每日電訊報》。行動電話是複雜調變的超高頻（SHF，公分波段）電磁輻射源。行動電話超高頻電磁輻射頻率高達 1000 MHz，穿透腦部的深度可達 1.93 公分（6）。因此，行動電話電磁輻射不僅可能直接影響鄰近區域的細胞，也可能影響整個大腦，包括其中的液態介質。 這改變了中樞神經系統（CNS）的功能狀態，這反映在大腦的生物電活動模式（BEA）中（ $1, 3, 4, 7, 8, 10, 13, 14, 16, 17$ **）。然而，並非所有研究都支持手機所發出的微弱電磁輻射（EMR）會對大腦產生負面影響的觀點（14）。研究者普遍認為，應關注手機所發射輻射能量的暴露，該能量以 SAR（比吸收率）來衡量。現代手機的 SAR 通常低於可接受標準。此外，製造商聲稱高價手機和智慧型手機的接收靈敏度較佳，這使得通訊距離得以延長，且基站的發射單元功率可相應降低。從這個角度來看，現代行動通訊被認為是無害的。**

The purpose of this paper is to assess aspects of cerebral BEA upon exposure to EMR of the modern phone in the conversation mode and possible compensation of emerging negative physiological effects, using the AIRES SGIELD Pro corrective device.

本文的目的是評估在現代手機通話模式下暴露於電磁輻射時，大腦生物電活動（BEA）的相關變化，以及使用 AIRES SHIELD Pro 校正裝置對可能出現的負面生理效應進行補償的可能性。

STUDY POPULATION, SCOPE AND METHODS

研究對象、範圍與方法

We used Prestigio modern smartphone in this study. 13 apparently healthy 21year old male volunteers participated in the study. The tests conformed to ethical principles of the Declaration of Helsinki of the World Health Organization 2000 and were performed by double-blind method with the informed consent from the volunteers. The statistical group included 6 persons. The entry condition was stability of the functional state of the body (according to EEG and ECG values) during one-two weeks of the study (April 5, 2019 - April 18, 2019).

本研究使用了 Prestigio 現代智慧型手機。共有 13 名表面健康的 21 歲男性志願者參與本研究。測試遵循世界衛生組織 2000 年《赫爾辛基宣言》的倫理原則，並在志願者知情同意下，以雙盲法進行。統計組包含 6 人。入組條件為在研究期間（一至兩週，2019 年 4 月 5 日至 2019 年 4 月 18 日）身體功能狀態（根據腦電圖與心電圖數值）穩定。

EEG and ECG values were recorded, using Etsefalan 13103 software solution with integrated EEG and ECG recording and analysis programs. Cerebral BEA (EEG) was recorded, using 16 monopolar leads according to the international 10-20 system of electrode placement in the $0 - 70$ Hz bandwidth with 250 Hz sampling frequency. The electrodes were placed symmetrically in the prefrontal (Fp1, Fp2), postfrontal (F3, F4), frontotemporal (F7, F8), central (C3, C4), midtemporal (T3, T4), posttemporal (T5, T6), bregmatic (P3, P4) and occipital (O1, O2) regions, while integrated reference electrodes were placed on ear lobes. The even electrodes were placed on the right side.

腦電圖（EEG）與心電圖（ECG）數值使用 Etsefalan 13103 軟體解決方案記錄，該軟體整合了 EEG 與 ECG 的記錄與分析程式。腦部 BEA（EEG）採用 16 個單極導聯，依國際 10-20 電極放置系統，在 $0 - 70$ Hz **頻帶以 250 Hz 取樣頻率記錄。電極對稱置於前額葉（Fp1、Fp2）、後前額葉（F3、F4）、前顳葉（F7、F8）、中央區（C3、C4）、中顳葉（T3、T4）、後顳葉（T5、T6）、頂骨區（P3、P4）及枕葉（O1、O2）區域，整合參考電極置於耳垂。偶數電極置於右側。**

The scenarios for the study:

研究情境：

EEG and ECG recording and analysis according to the requirements and criteria of functional diagnostics (visual analysis) and selection of subjects in to the statistical group. 13 subjects.

根據功能診斷的要求與標準（視覺分析）進行腦電圖（EEG）與心電圖（ECG）記錄與分析，並將受試者選入統計組。共 13 名受試者。

Recording I - background EEG (2min); eyes opening and closing test; II background with eyes closed (audio frequency oscillator - 2 min); III - EEG recording with the mobile phone On (MP ON - muted conversation mode), in the fronto-temporal region on the right side (5 min); IV - recording after MP is off (MT after test -2min). 6 selected subjects.

記錄 I - 基線腦電圖（2 分鐘）；睜眼與閉眼測試；II - 閉眼基線（音頻振盪器 - 2 分鐘）；III - 手機開啟時的腦電圖記錄（MP ON - 靜音通話模式），記錄於右側額顳區（5 分鐘）；IV - 手機關閉後的記錄（MT 測試後 - 2 分鐘）。選出 6 名受試者。

Recording I - background EEG (2min); eyes opening and closing test; recording II - background with eyes closed (audio frequency oscillator - 2 min); III - EEG recording with the mobile phone On + AIRES SHIELD (MP+ - muted conversation mode), in the fronto-temporal region on the right side (5 min); IV EEG recording after MP+ is off and after test (2min). 6 selected subjects.

記錄 I - 基線腦電圖（2 分鐘）；睜眼與閉眼測試；記錄 II - 閉眼基線（音頻振盪器 - 2 分鐘）；III - 手機開啟並搭配 AIRES SHIELD 的腦電圖記錄（MP+ - 靜音通話模式），記錄於右側額顳區（5 分鐘）；IV - MP+ 關閉後及測試後的腦電圖記錄（2 分鐘）。選出 6 名受試者。

The subjects did not know if scenario II or III was used during the study.

受試者並不知道研究中使用的是情境二還是情境三。

Five random 5 -second segments were studied in each scenario sample. Power spectrum, amplitude, EEG bands index, asymmetry of the dominant rhythm, correlation analysis were evaluated. As the sample was small (6 subjects), integrity of the findings was assessed, using non-parametric sign test.

每個情境樣本中隨機選取五段五秒鐘的片段進行研究。評估了功率譜、振幅、腦波頻段指數、主導節律的不對稱性及相關分析。由於樣本數較少（6 名受試者），使用非參數符號檢定來評估結果的完整性。

FINDINGS AND DISCUSSION OF IN-HOUSE STUDIES

內部研究的發現與討論

Five subjects of the statistical group had stable EEG patterns of the same type. Alpha activity prevailed in the EEG of the above-mentioned subjects while waves were distributed by the amplitude with decrement from the back of the head to the forehead. Frequency: 9.8 ± 0.2 oscillations per second. Amplitude: $80.0 \pm 7.0 \mu$ V. Index: $85 \pm 17\%$. No significant variations of the average alpha activity frequency and the average amplitude were seen in the subjects during the background recording from one study to another.

統計組中有五名受試者的腦電圖模式穩定且屬同一類型。上述受試者的腦電圖中以α波活動為主，波形振幅由後腦勺向額頭逐漸減弱。頻率：9.8 ± 0.2 次振盪每秒。振幅：$80.0 \pm 7.0 \mu$ V 。指數：$85 \pm 17\%$ 。在背景記錄期間，從一次研究到另一研究，受試者的平均α波活動頻率及平均振幅均無顯著變化。

The sixth subject was specifically included into the statistical group for comparison. This subject had an unstable EEG pattern not only during the three studies, but also during the first background study, scattering of low-amplitude beta rhythm, diffused vascular pulsations were observed in the subject as well. Nevertheless, values of basic rhythms, their distribution and correlation were within the limits.

第六個受試者特別被納入統計組以供比較。該受試者在三次研究期間以及第一次背景研究中，腦電圖（EEG）模式均不穩定，觀察到低振幅β節律的散布及彌漫性血管脈動。然而，基本節律的數值、其分布及相關性仍在正常範圍內。

Hyperventilation (HV) is a functional test, adopted in the clinical electroencephalography. This test causes development of hypoxia and hypercapnia forced physiologically substantiated change of the functional state of the CNS. Generally, aftereffects of the HV include development of slow wave activity, while, in pathological cases it provokes development paroxysmal activity. When the test is over, BEA shift towards slow wave activity prevalence continues no more than 5-15s.

過度換氣（HV）是一項功能性測試，廣泛應用於臨床腦電圖學。此測試會引發缺氧與高碳酸血症，從而生理性地改變中樞神經系統的功能狀態。一般而言，HV 的後效應包括慢波活動的發展，而在病理情況下則會誘發陣發性活動。測試結束後，腦電活動（BEA）向慢波活動優勢的轉變持續時間不超過 5 至 15 秒。

In all subjects of the statistical group, including the sixth subject, HV aftereffects stayed within the above-mentioned limits of BEA changes, no paroxysmal activity was detected. Development of spectral power density in the slow wave area of EEG band and in the alpha band, enhancement of coherence in all bands, increase of the correlation coefficient in the temporal leads (to a lesser extent in the sixth subject, B-v) were observed. The ATTACHMENT hereto includes examples of encephalic asymmetry visualization based on reciprocal functions: cross-spectrum (CS), coherency (COH), cross-correlation (CC) after the HV in the patient with a stable BEA pattern (Fig. $2\ \mathrm{A1}-\mathrm{A3}^1$) and in the sixth subject (Fig. $3\ \mathrm{A1}-\mathrm{A3}^1$)

在統計組的所有受試者中，包括第六位受試者，HV 後效應均維持在上述 BEA 變化的範圍內，未檢測到陣發性活動。觀察到 EEG 頻帶中慢波區域和α波段的頻譜功率密度發展，所有頻帶的相干性增強，顳葉導聯的相關係數增加（第六位受試者 B-v 中程度較輕）。隨附文件中包含基於互反函數的腦不對稱性視覺化範例：交叉頻譜（CS）、相干性 (COH) 、交叉相關（CC），分別在具有穩定 BEA 模式的患者（圖 $2\ \mathrm{A1}-\mathrm{A3}^1$ ）及第六位受試者（圖 $3\ \mathrm{A1}-\mathrm{A3}^1$ ）HV 後呈現。

The main differences between the subjects of the statistical group and the sixth subject were evident upon exposure to the MP and MP+, i.e. in the presence of the AIRES SHIELD. As for the statistical group, $7-13$ seconds after the MP was turned on,

統計組受試者與第六位受試者之間的主要差異在於暴露於 MP 和 MP+時，即在 AIRES SHIELD 存在的情況下。至於統計組，MP 啟動後 $7-13$ 秒，

EEG pattern changed gradually. The pattern with a prevailing alpha activity (Fig. 1A) was replaced by the pattern with a prevailing slow wave activity (Fig. 1B), dominance of delta waves with an emphasis on the MP side ($p \leq 0.01$) was observed, thus reflecting change of the functional state of the brain. The BEA pattern was similar upon exposure to the MP and during the MP aftereffect as well as after the HV. However, while after the HV EEG promptly went back to the background values, even 2 minutes after the MP was turned off, EEG slow wave activity still prevailed. Positron-emission tomography (J.am.Med. Association, 2010) showed that brain cells absorb glucose with 2.4 speed in the areas where the MP is applied (orbitofrontal cortex and the front part of the temporal cortex), indicating hyperactivation of these areas upon exposure to EMR, emitted by the MP. It is to be noted that prolonged hyperactivation may cause damage to these parts of the brain, which are responsible for learning, memory, planning and development of motor programs. General BEA pattern upon exposure to EMR, emitted by the MP, and during the MP aftereffect is similar to the BEA pattern in the hypnotic sleep or meditation, i.e. altered state of consciousness. It should be noted that during aftereffect of EMR, emitted by the MP, prevalence of slow wave activity continued for more than $2-3\ \mathrm{min}$. Extension of such a condition is most hazardous for children's mind during the process of formation thereof $(11,12)$.

腦電圖（EEG）模式逐漸改變。以α波活動為主的模式（圖 1A）被以慢波活動為主的模式取代（圖 1B），觀察到以δ波為主且偏重於 MP 側（ $p \leq 0.01$ ）的現象，反映出大腦功能狀態的改變。BEA 模式在暴露於 MP 及 MP 後效應期間，以及 HV 後均相似。然而，在 HV 後，腦電圖迅速回復至背景值，卻在 MP 關閉後即使過了 2 分鐘，腦電圖的慢波活動仍然佔優勢。正子斷層掃描（J.am.Med. Association, 2010）顯示，在 MP 作用的區域（眼眶前額皮質及顳葉前部），大腦細胞吸收葡萄糖的速度是正常的 2.4 倍，表明這些區域在暴露於 MP 所發射的電磁輻射（EMR）時處於過度活化狀態。值得注意的是，長時間的過度活化可能會損害這些負責學習、記憶、規劃及運動程序發展的大腦區域。 暴露於微處理器（MP）所發射的電磁輻射（EMR）時，以及在微處理器後效期間，一般的 BEA 模式類似於催眠睡眠或冥想中的 BEA 模式，即意識的改變狀態。值得注意的是，在微處理器所發射的 EMR 後效期間，慢波活動的盛行持續超過 $2-3\ \mathrm{min}$ 。此種狀態的延長對於兒童心智在形成過程中尤為危險 $(11,12)$ 。

As for combination with the AIRES SHIELD, when the MP was turned off, cerebral bioelectrical activity immediately went back to the initial state, similar to aftereffect of the HV (Fig. 1B). Even though there was a visual similarity of the initial EEG pattern (the background prior to turning on of the MP) and the pattern after exposure to the MP in combination with the AIRES SHIELD, statistical analysis showed valid ($\mathrm{P} \leq 0.05$) differences. The differences included increased frequency of alpha rhythm from 9.8 ± 0.2 to11.6 ± 0.3 oscillations per second. Neurophysiologists of the late $20\mathrm{c}-21\mathrm{c}(2,5,9)$ believe that the higher alpha rhythm frequency is, the higher the speed of information perception and processing thereof is. However, this conclusion has to be experimentally tested within the framework of future studies on efficiency of the AIRES SHIELD, used as the device, neutralizing negative impact of exposure to EMR, emitted by the MP. Findings of the comparative BEA encephalic asymmetry (ECA) changes assessment (see ECA visualization patterns and data, provided by G.N. Lukyanov) upon exposure to EMR, emitted by the MP with and without the AIRES SHIELD showed that when the MP was used in combination with the AIRES SHIELD, coherence structure changed, i.e. electrons arrangements, indicating harmonized behavior of oscillation processes and interactions of brain structures and parts. Harmonization is necessary for 'cost-free' optimization of processes in the CNS. In complex systems harmonization is performed not only and not so much through oscillation phases, but also via correlations. Our study also showed change of

至於與 AIRES SHIELD 的結合，當微處理器（MP）關閉時，大腦生物電活動立即回復到初始狀態，類似於高壓（HV）後效應（圖 1B）。儘管初始腦電圖（MP 開啟前的背景）與結合 AIRES SHIELD 後暴露於 MP 的腦電圖模式在視覺上相似，統計分析卻顯示出顯著（$\mathrm{p} \leq 0.05$）差異。這些差異包括α節律頻率從 9.8 ± 0.2 增加到 11.6 ± 0.3 次振盪每秒。晚期 $20\mathrm{c}-21\mathrm{c}(2,5,9)$ 的神經生理學家認為，α節律頻率越高，信息感知與處理的速度越快。然而，這一結論必須在未來針對 AIRES SHIELD 作為中和微處理器所發射電磁輻射（EMR）負面影響裝置的效率研究框架內進行實驗驗證。 比較 BEA 腦部不對稱性（ECA）變化評估的結果（參見由 G.N. Lukyanov 提供的 ECA 視覺化模式和數據），在暴露於由微處理器（MP）發射的電磁輻射（EMR）時，使用與不使用 AIRES SHIELD 的情況下顯示，當 MP 與 AIRES SHIELD 結合使用時，協同結構發生變化，即電子排列改變，顯示出腦部結構與部分的振盪過程及相互作用行為趨於和諧。這種和諧對中樞神經系統（CNS）中「無成本」的過程優化是必要的。在複雜系統中，和諧不僅通過振盪相位實現，更重要的是通過相關性來完成。我們的研究同時顯示了

correlation links structure between cortical parts of the brain. Comparing different stages of the study, we see that the structure has become more sophisticated: against the background of exposure and after exposure, in particular, in the frontal region, where behavioral programs are developed, and in the right temporal region, where the operating MP is located. As a result, the brain gradually becomes more resilient to negative impact of EMR, emitted by the MP.

大腦皮層各部分之間相關連結結構的變化。比較研究的不同階段，我們發現該結構變得更加精細：在暴露期間及暴露後，特別是在前額區域（行為程序發展的地方）和右側顳葉區域（MP 運作所在處），結構變化尤為明顯。結果，大腦逐漸變得更能抵抗由 MP 發射的電磁輻射的負面影響。

A different pattern of exposure to the MP was observed in the sixth subject. When the MP was turned on, bursts of alpha activity with 11-13 oscillations per second frequency were recorded against the background of slow wave rhythms. Amplitude of such alpha activity was the greatest before the MP was turned off ($4^{\text{th}}, 5^{\text{th}}$ minute). It was similar to sleep spindles at the end of exposure to the MP and during aftereffect of the MP in combination with the AIRES SHIELD. In this case, subject to unsteadiness of the initial EEG pattern, tension of cortical vessels was evident, which was manifested by vascular pulsations, sharpness of alpha waves peaks due to high-frequency activity. This BEA pattern is an indicator of shift in the activity - inactivity balance towards slight predominance of activation processes as a result of the brain cortex excitation. Upon exposure to the MP and the MP+ (in combination with the AIRES SHIELD), the brain, first of all, responded to low-frequency modulating signal (2 oscillations per second). Afterwards the brain searched for the optimum way to compensate changes, caused by exposure to the MP: corrective regulatory structures of the diencephalic system were engaged. In the latter case bursts of alpha waves against the background of slow wave activity mostly indicated that the process of the BEA changes correction involved not only regulatory subcortical structures, but also the cardiovascular system, which was manifested by synchronization with ECG (electrode 18, see Fig. 3). As is shown in the diagrams below, benchmarking clearly demonstrated that exposure to the MP disrupts fractional structure of EEG, which is characteristic to background studies (see the first diagram). Such a structure reflects interaction of structures of the central nervous system (see the diagram in the middle). Upon exposure to the MP in the presence of the AIRES SHIELD, destructive influence of the working mobile phone is significantly weakened (see the third diagram). The calculation was specifically performed by electrodes on the left side, including the reference electrode A1 to exclude possible physical artefact from the MP, placed at the right ear.

第六位受試者呈現出不同的微處理器（MP）暴露模式。當微處理器開啟時，在慢波節律的背景下，記錄到每秒 11 至 13 次振盪的阿爾法波爆發。此類阿爾法波的振幅在微處理器關閉前（ $4^{\text{th}}, 5^{\text{th}}$ 分鐘）達到最大。這與微處理器暴露結束時及與 AIRES SHIELD 結合使用時的睡眠紡錘波相似。在此情況下，由於初始腦電圖（EEG）模式的不穩定，皮質血管張力明顯，表現為血管脈動及因高頻活動導致的阿爾法波峰值銳利。此 BEA 模式顯示活動與非活動平衡向激活過程略微偏移，反映大腦皮質的興奮。暴露於微處理器及微處理器+（與 AIRES SHIELD 結合）時，大腦首先對低頻調製信號（每秒 2 次振盪）作出反應。 隨後，大腦尋找最佳方式來補償因暴露於行動電話（MP）所引起的變化：間腦系統的矯正調節結構被啟動。在後者情況下，慢波活動背景下的α波爆發多半表示 BEA 變化矯正過程不僅涉及調節性皮下結構，還包括心血管系統，這由與心電圖（電極 18，見圖 3）的同步化所顯示。如下方圖表所示，基準測試清楚顯示暴露於行動電話會破壞腦電圖（EEG）的分數結構，這是背景研究的特徵（見第一張圖表）。此結構反映中樞神經系統結構間的互動（見中間圖表）。在使用 AIRES SHIELD 的情況下暴露於行動電話時，工作中手機的破壞性影響顯著減弱（見第三張圖表）。計算特別由左側電極進行，包括參考電極 A1，以排除放置於右耳的行動電話可能產生的物理性干擾。

From the standpoint of modern science, a biological organism is a multiplecomponent, dissipative, fractally organized, non-linear, self-regulating system. The prime objective of a biological system being a single structure is survival in the changing environment. The system has a multi-layer subordinate structure with dynamically arranged hierarchy of self-regulating processes. Resonance response to biologically significant multi-frequency impacts of informational nature is a basic

從現代科學的觀點來看，生物有機體是一個多組件、耗散性、分形組織的非線性自我調節系統。生物系統作為一個整體結構的主要目標是在變化的環境中生存。該系統具有多層次的從屬結構，並擁有動態排列的自我調節過程層級。對於具有生物意義的多頻率資訊性衝擊的共振反應是其基本特性。

property of biological systems. However, the system is non-linear, therefore, response depends on the initial state and requires non-linear approach to assessment of the state change. Otherwise, analysis of the calculations may be incorrect. Thus, a significant discrepancy may be detected upon visual comparison of EEG pattern and visualized encephalic asymmetry. It is due to the fact that when EEG spectrum is broken down into bands, using the Fourier filters, coherence seemingly enhances over all bands, including alpha and beta ones, nevertheless, the BEA pattern includes virtually no alpha or beta waves. The main conclusions are confirmed by more precise processing of EEG signals, the findings of which are presented by prof. G.N. Lukyanov in the diagrams below.

生物系統的特性。然而，該系統是非線性的，因此反應取決於初始狀態，且需要非線性方法來評估狀態變化。否則，計算分析可能會不正確。因此，在視覺比較腦電圖（EEG）模式與視覺化腦部不對稱時，可能會發現顯著差異。這是因為當使用傅立葉濾波器將 EEG 頻譜分解成不同頻段時，表面上所有頻段的相干性似乎都增強了，包括α波和β波，然而，BEA 模式幾乎不包含α波或β波。主要結論已由更精確的 EEG 信號處理所證實，相關發現由 G.N. Lukyanov 教授在下方圖表中呈現。

CONCLUSIONS **結論**

THE PILOT STUDIES HAVE SHOWN SIGNIFICANT CHANGES OF EEG VALUES UPON EXPOSURE TO EMR, EMITTED BY THE MP, INDICATING PROLONGED DECREASED FUNCTIONAL ABILITY OF THE CNS.

初步研究顯示，暴露於由微處理器（MP）發射的電磁輻射（EMR）後，EEG 數值發生顯著變化，顯示中樞神經系統（CNS）功能能力持續下降。

COMBINATION OF THE MP AND THE AIRES SHIELD Pro DEVICE NORMALIZES ANALYZED EEG PARAMETERS AND OPTIMIZES THE STRUCTURE OF CORRELATIONS, WHICH MAKES IT POSSIBLE TO STATE NOT ONLY RESTORATION OF THE INITIAL FUNCTIONAL STATE LEVEL, BUT ALSO ENHANCEMENT THEREOF, FOLLOWING EXPOSURE TO EMR, EMITTED BY THE MP.

MP 與 AIRES SHIELD Pro 裝置的結合使分析的腦電圖參數正常化，並優化相關結構，這不僅表明初始功能狀態水平的恢復，還顯示在受到 MP 發射的電磁輻射影響後功能有所提升。

THE FINDINGS INDICATE EFFICIENCY OF THE COMBINATION OF THE MP AND THE AIRES SHIELD Pro, SERVING AS A DEVICE, NEUTRALIZING NEGATIVE IMPACT OF EMR, EMITTED BY THE MP.

研究結果顯示 MP 與 AIRES SHIELD Pro 結合的效能，該裝置能中和 MP 發射的電磁輻射所帶來的負面影響。

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ATTACHMENTS: **附件：**

List of Abbreviations: **縮寫列表：**

BEA - bioelectrical activity

BEA - 生物電活動

WHO - World Health Organization

WHO - 世界衛生組織

HV - hyperventilation **HV - 過度換氣**
MP - mobile phone

MP - 行動電話

MP+ - mobile phone in combination with AIRES SHIELD

MP+ - 行動電話結合 AIRES SHIELD

AT - after test

AT - 測試後

SHF - centimeter band electromagnetic radiation

SHF - 公分波段電磁輻射

ECA - encephalic asymmetry

ECA - 腦部不對稱

CNS - central nervous system

CNS - 中樞神經系統

ECG - electrocardiogram **ECG - 心電圖**
EMR - electromagnetic radiation

EMR - 電磁輻射

EMF - electromagnetic field

EMF - 電磁場

EEG - electroencephalogram

EEG - 腦電圖

SAR - Specific Absorption Rate

SAR - 特定吸收率

2. List of Subjects:

2. 主題列表：

I. Development of optimum leads layout, recording scenarios:

I. 最佳導線佈局的開發，記錄場景：

O-a G.R. 28.08.1998 **O-a G.R. 1998 年 8 月 28 日**
R-a E.I. 30.071955 **R-a E.I. 1955 年 7 月 30 日**
M-a M.G. 15.06.1963 **M-a M.G. 1963 年 6 月 15 日**
II. Study according to Scenario I - qualification stage:

II. 根據情境一的研究—資格階段：

M-v V.A. 3.02.1998 **M-v V.A. 1998 年 2 月 3 日**
T-v D.N. 8.06.1997 **T-v D.N. 1997 年 6 月 8 日**
K-v A.R. 30.03.1997 **K-v A.R. 1997 年 3 月 30 日**
K-v A.D. 27.12.1997 **K-v A.D. 1997 年 12 月 27 日**

R-v A.M. 20.11.1997 **R-v A.M. 1997 年 11 月 20 日**
V-n N.A. 19.12.1997 **V-n N.A. 1997 年 12 月 19 日**
K-v A.S. 3.06.1997 **K-v A.S. 1997 年 6 月 3 日**
N-v T.G. 30.07. 1998

N-v T.G. 1998 年 7 月 30 日

A-v A.G. 21.12.1997 **A-v A.G. 1997 年 12 月 21 日**
B-v R.A. 24.101997 **B-v R.A. 1997 年 10 月 24 日**
III. Study according to Scenarios II and III:

III. 根據情境 II 和 III 的研究：

T-v D.N.
K-v A.D.
M-v V.A.
N-v T.G.
A-v A.G.
B-v R.A.

3. Figures: **3. 圖表：**

Fig.1. A1 **圖 1. A1**
Background **背景**
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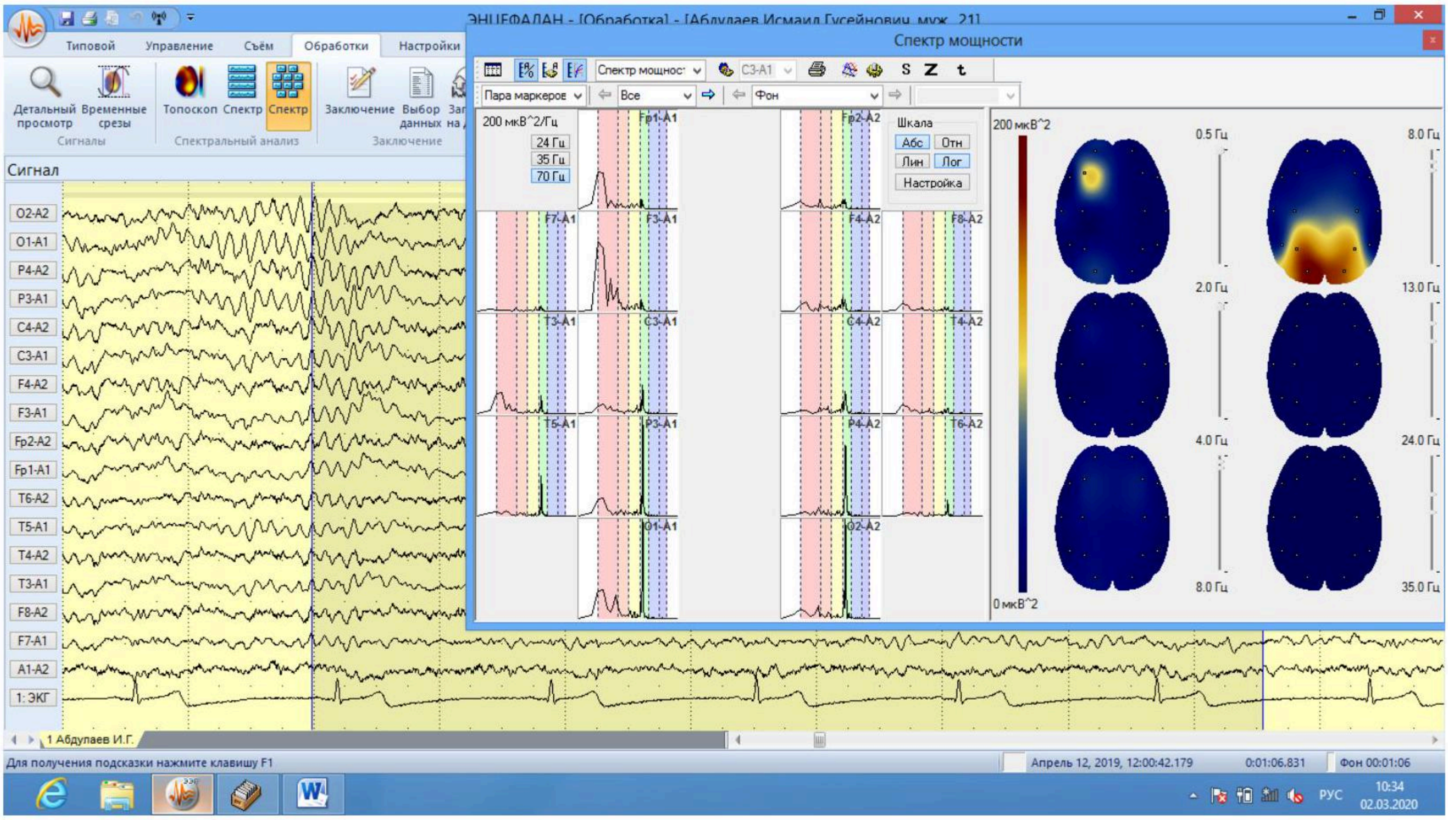
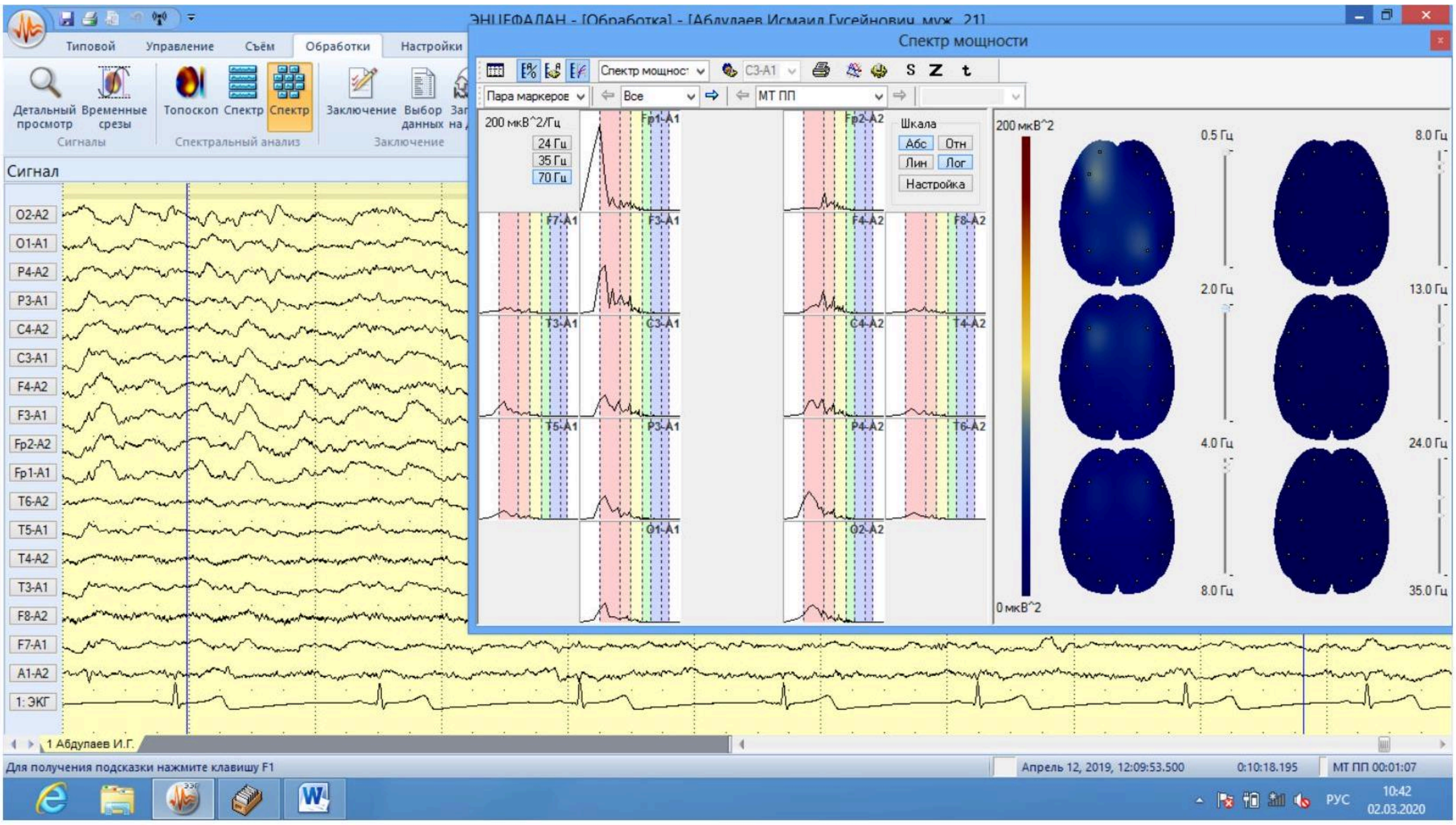


AT MP
b



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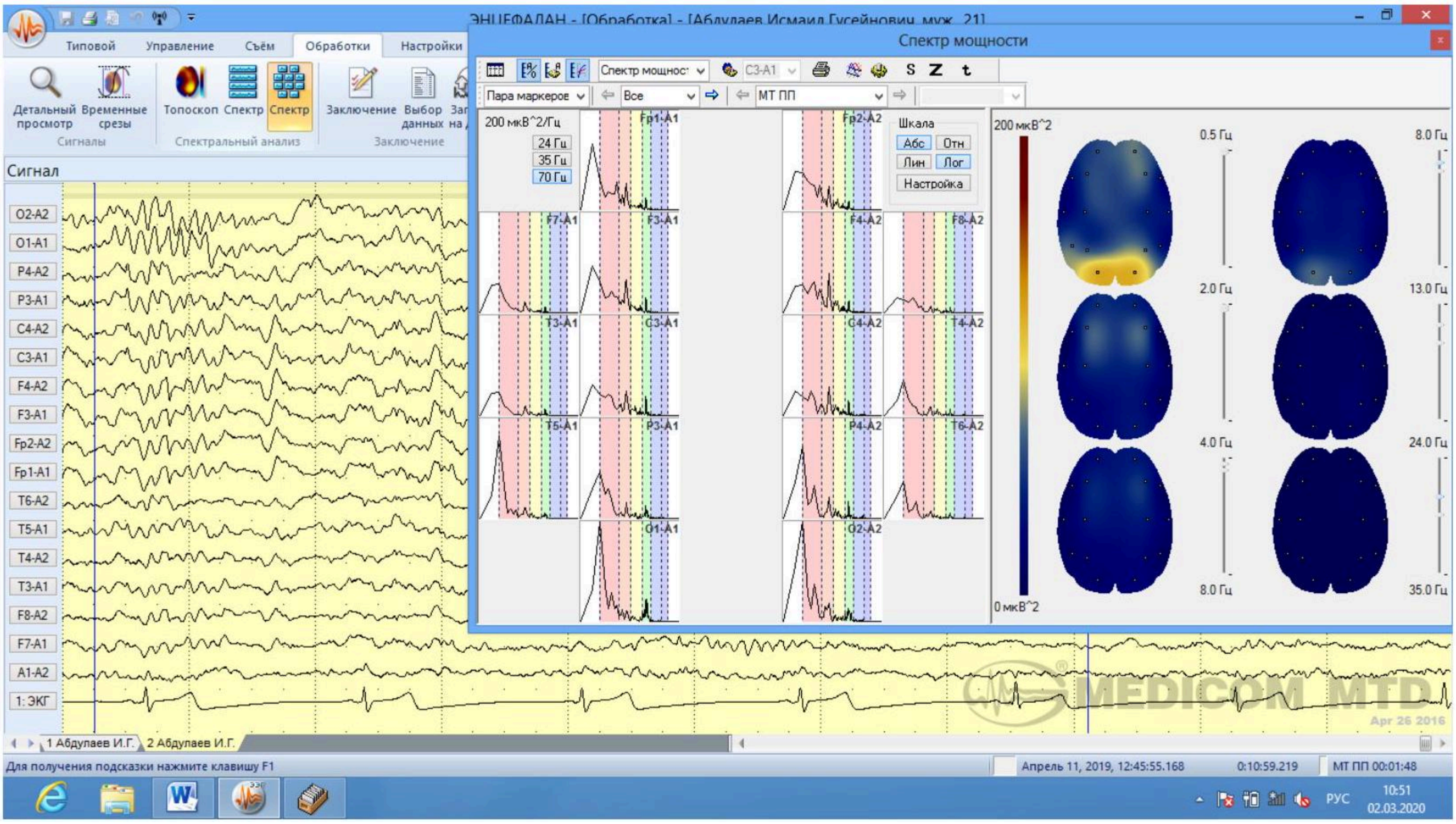
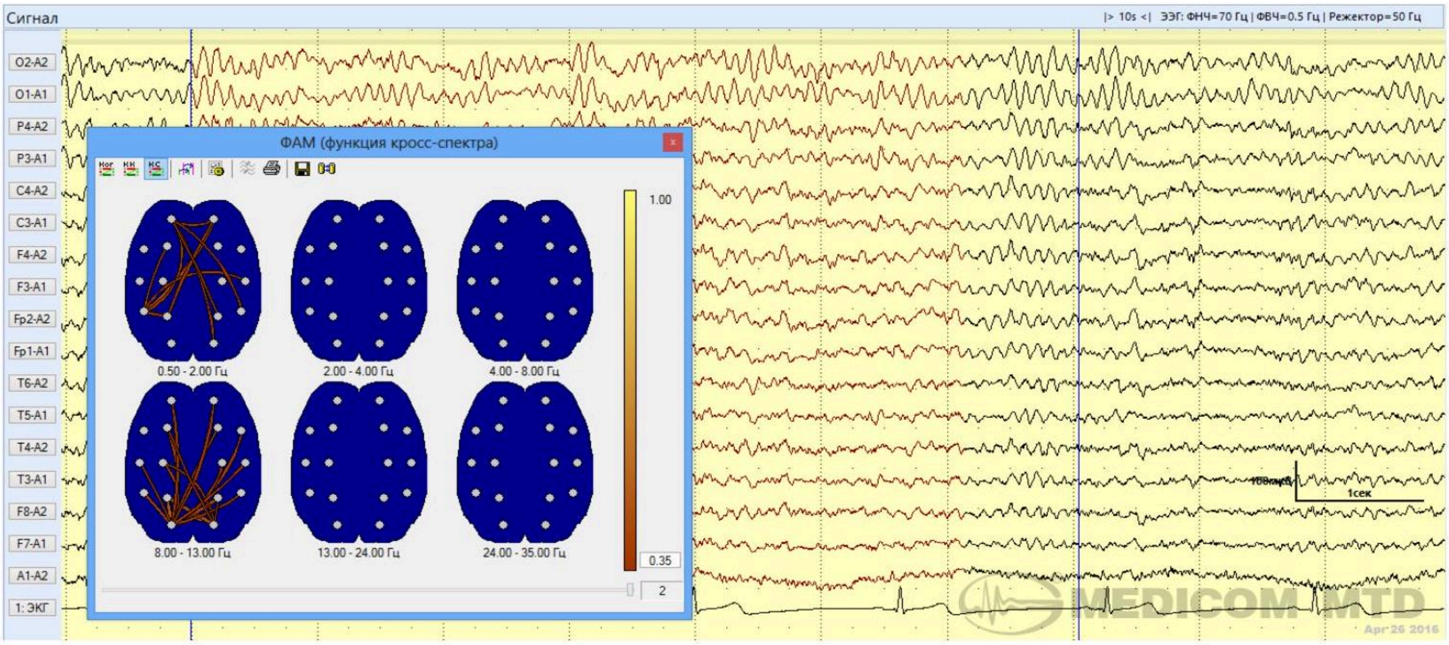


Fig.2. A1 **圖 2. A1**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C3-A1
F4-A2
F3-A1
Fp2-A2
Fp1-A1
T6-A2
T5-A1
T4-A2
T3-A1
F8-A2
F7-A1
A1-A2
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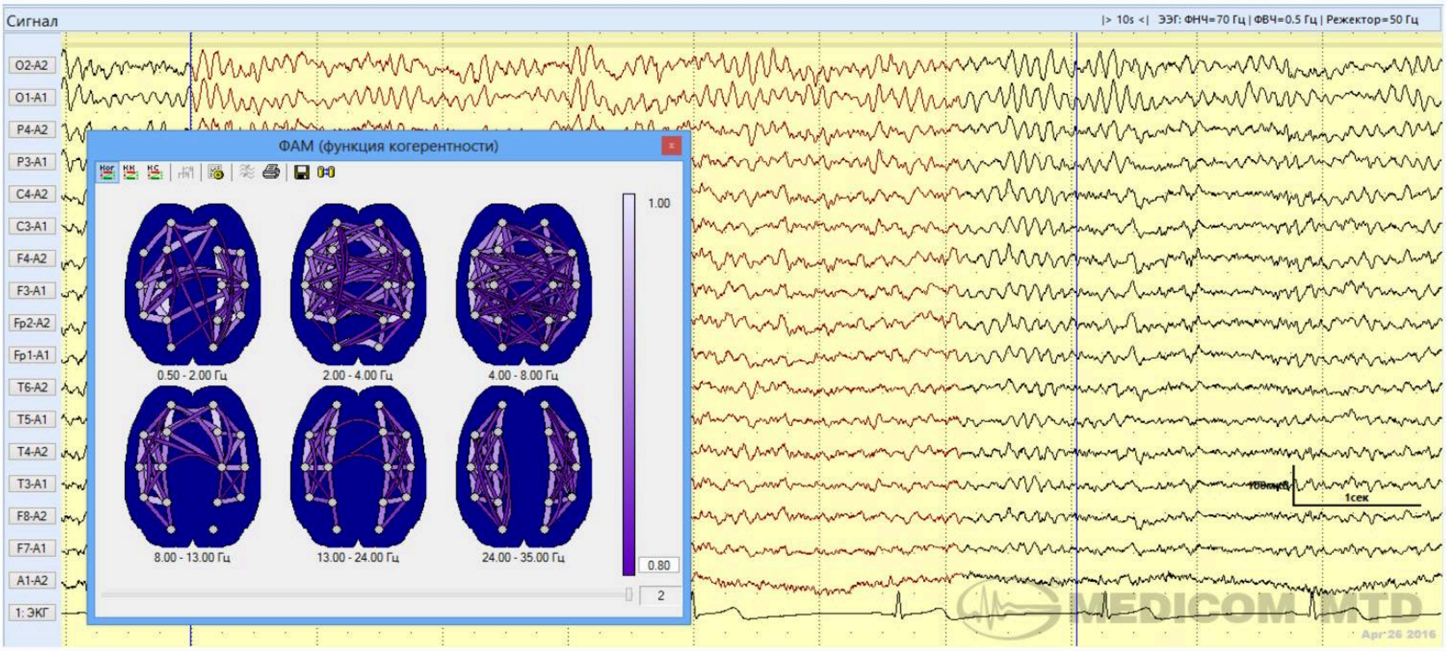
Apr'26 2016

a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C3-A1
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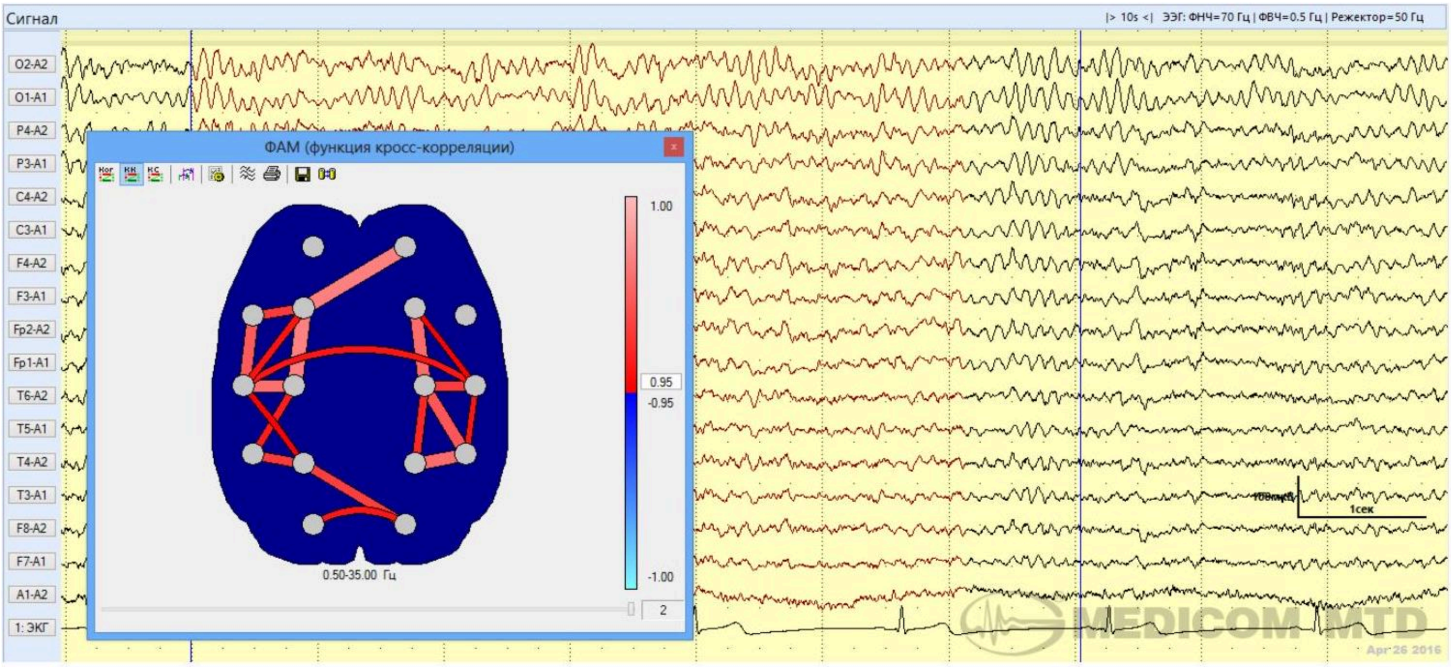

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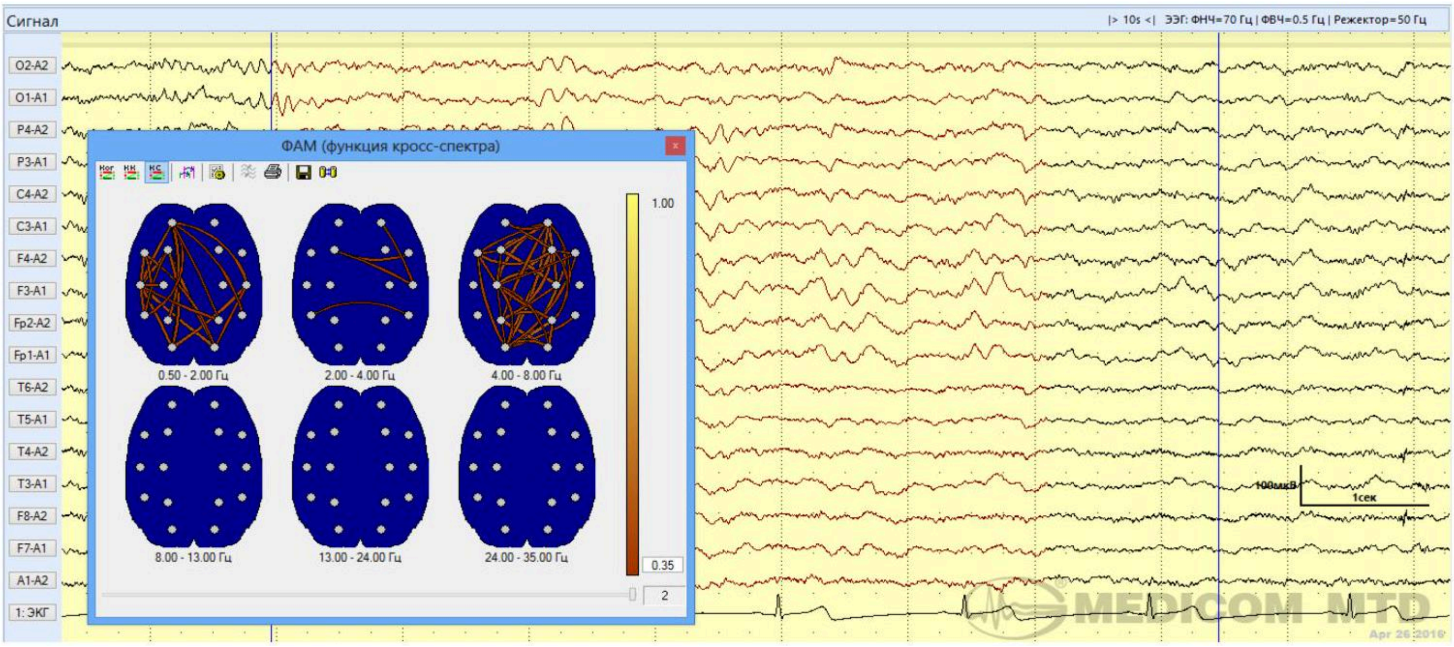
Fig.2. A2 圖 **2. A2**



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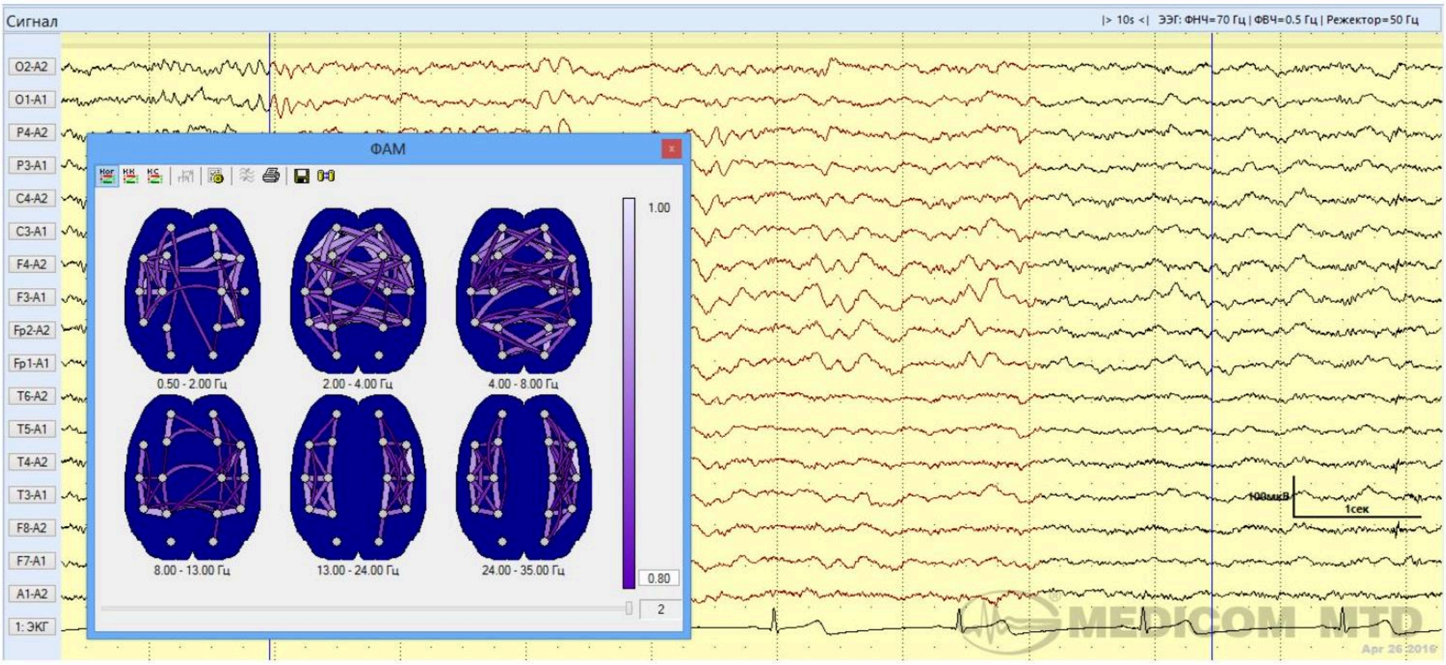

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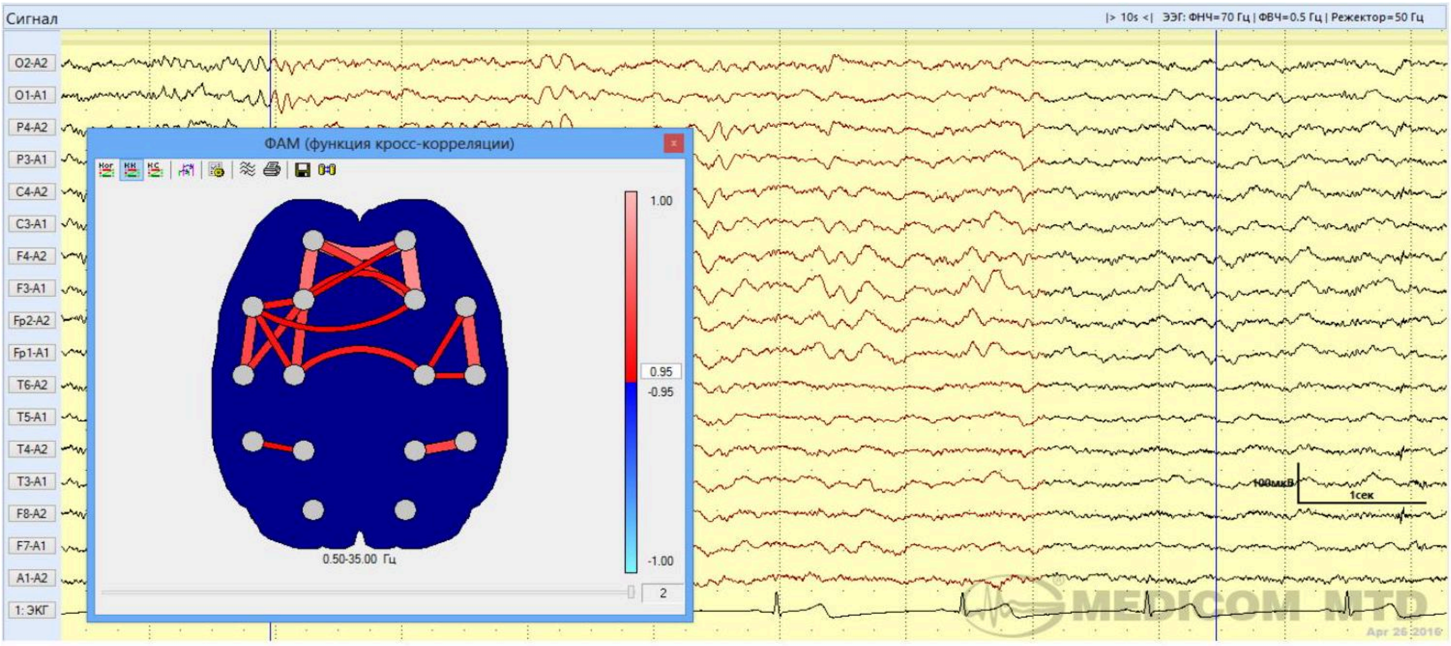

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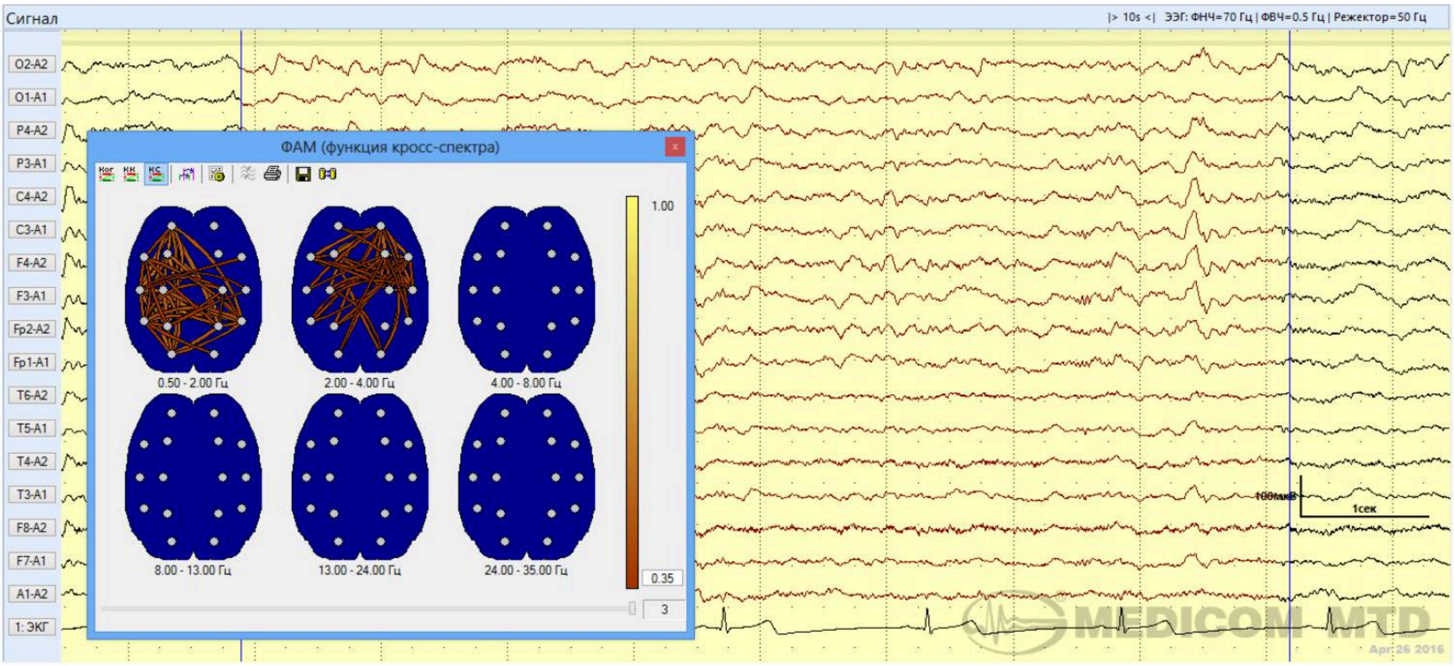
Fig.2. A2 [1] 圖 **2. A2** [1]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P4-A2
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C4-A2
C3-A1
F4-A2
F3-A1
Fp2-A2
Fp1-A1
T6-A2
T5-A1
T4-A2
T3-A1
F8-A2
F7-A1
A1-A2
1: ЭКГ
ФАМ (функция кросс-спектра)
1.00
0.35
3
0.50 - 2.00 Гц
2.00 - 4.00 Гц
4.00 - 8.00 Гц
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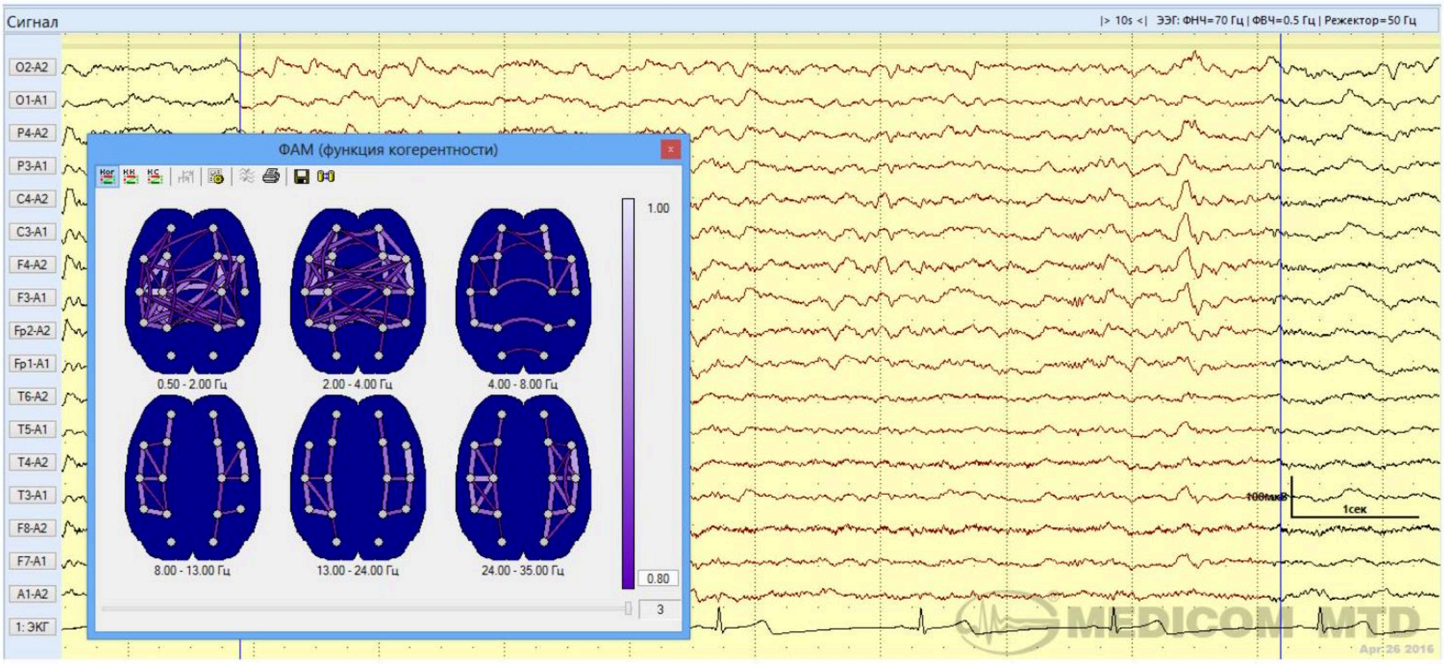
100мкВ
1сек
MEDICOM MTD
Apr 26 2016

a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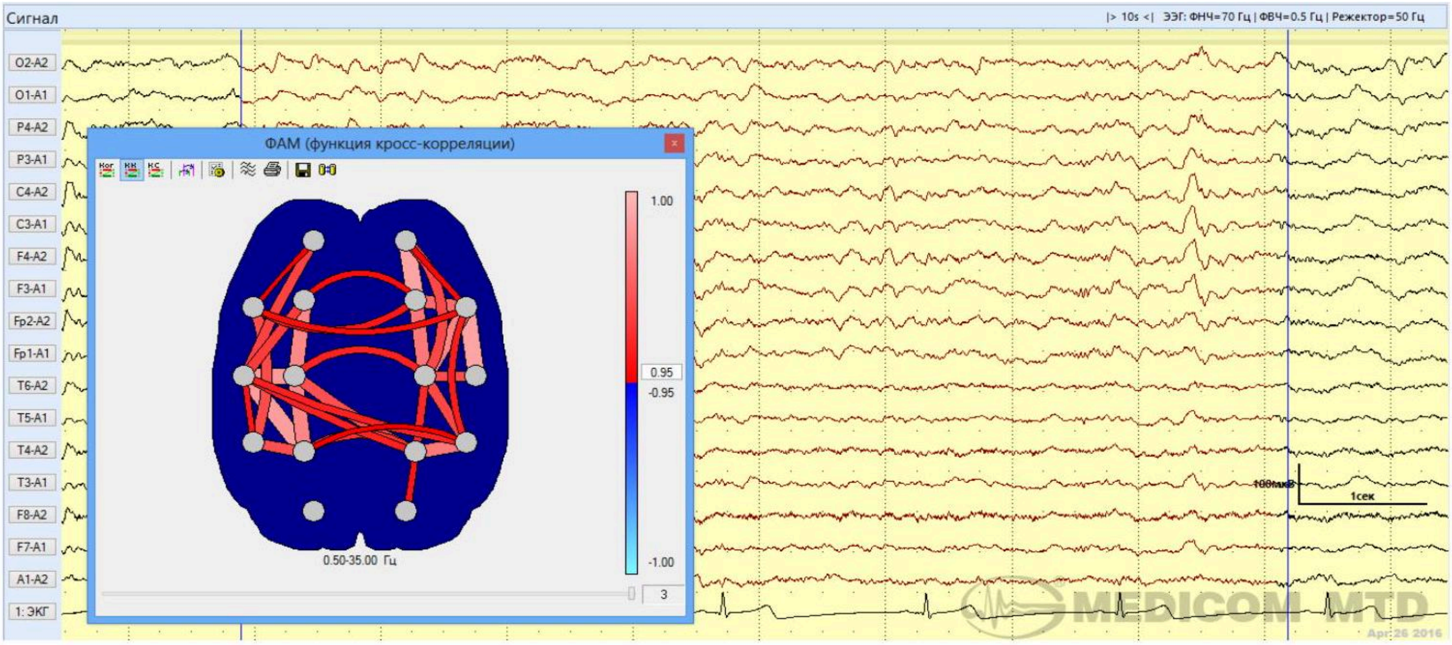
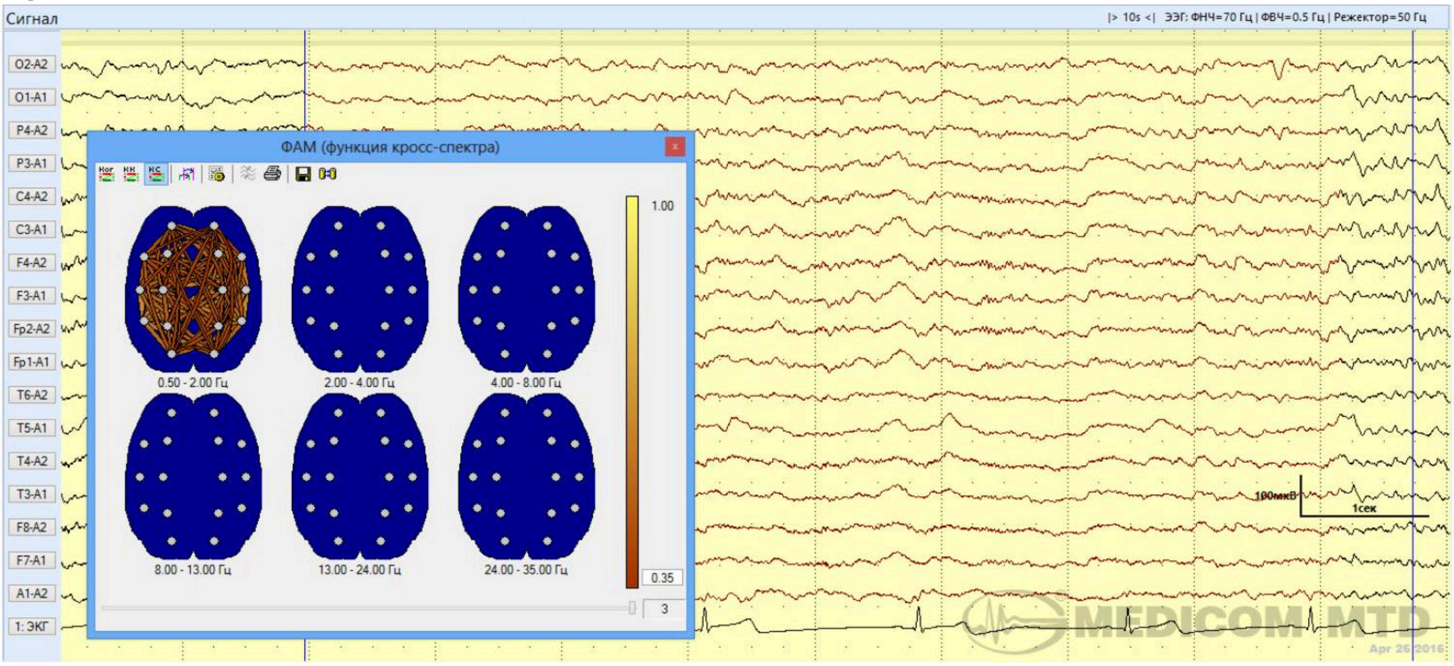
P4-A2
P3-A1
C4-A2
C3-A1
F4-A2
F3-A1
Fp2-A2
Fp1-A1
T6-A2
T5-A1
T4-A2
T3-A1
F8-A2
F7-A1
A1-A2
1: ЭКГ
ФАМ (функция когерентности)
1.00
0.80
3
0.50 - 2.00 Гц
2.00 - 4.00 Гц
4.00 - 8.00 Гц
8.00 - 13.00 Гц
13.00 - 24.00 Гц
24.00 - 35.00 Гц
100мкВ
1сек
MEDICOM MTD
Apr 26 2016

b



c

Fig.2. A3 圖 **2. A3**



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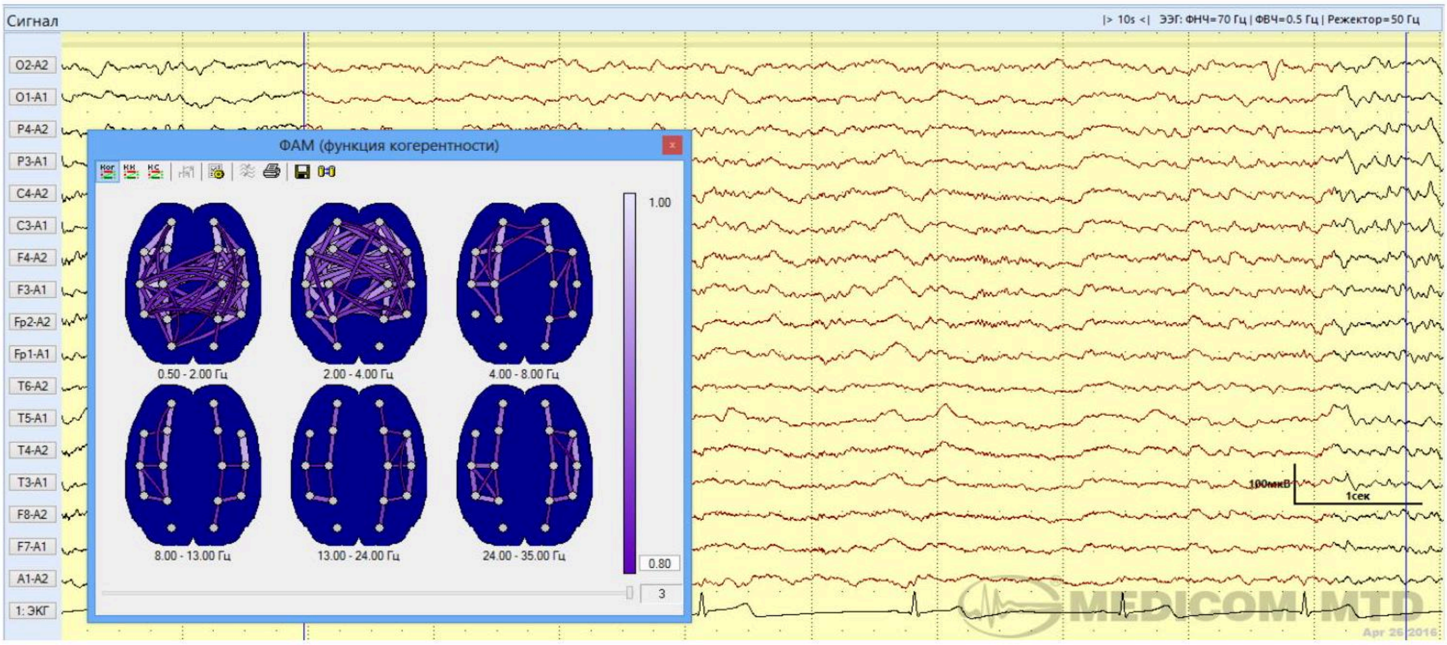

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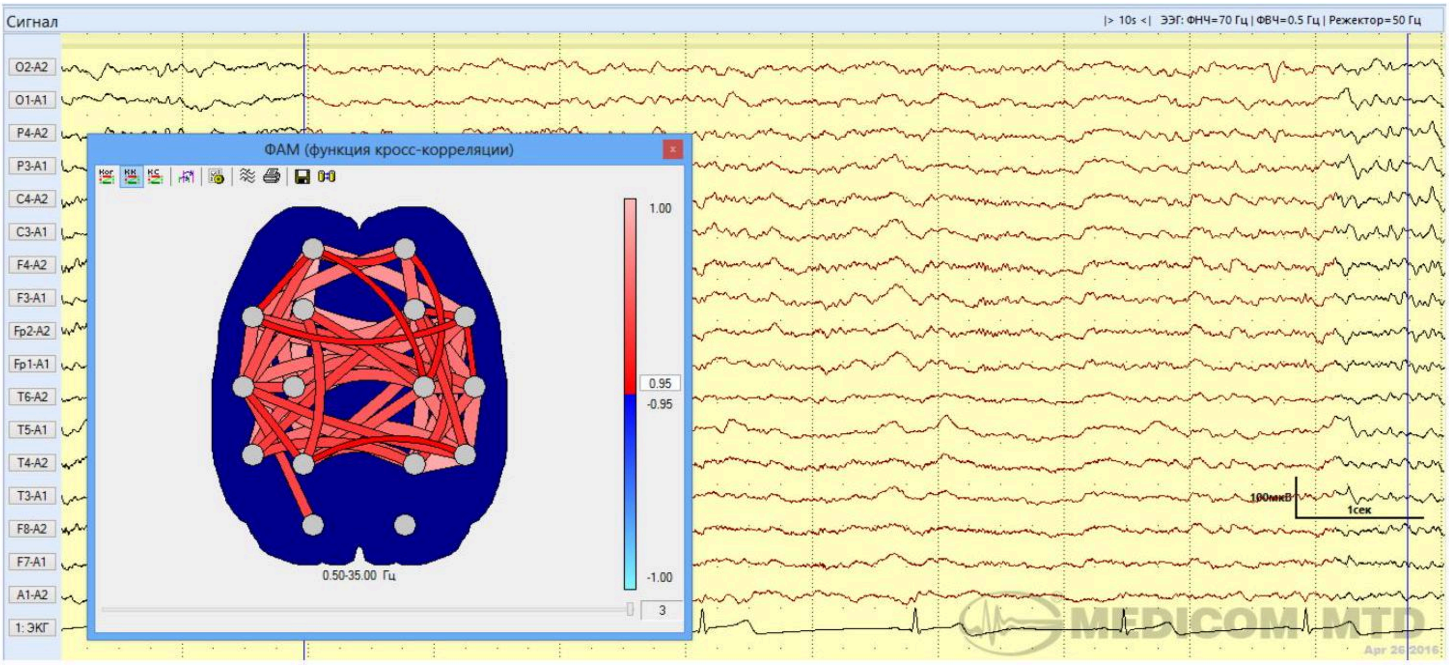
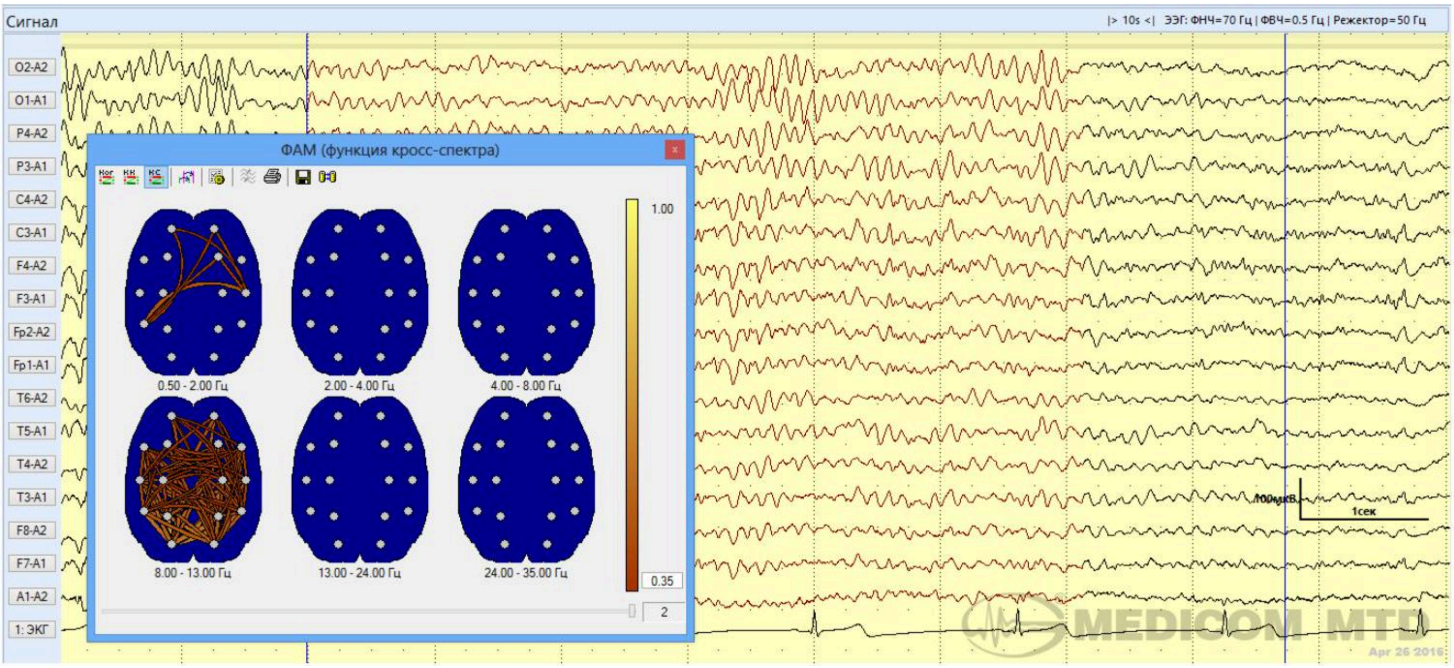


C

Fig.2. A3 [1] 圖 **2. A3** [1]



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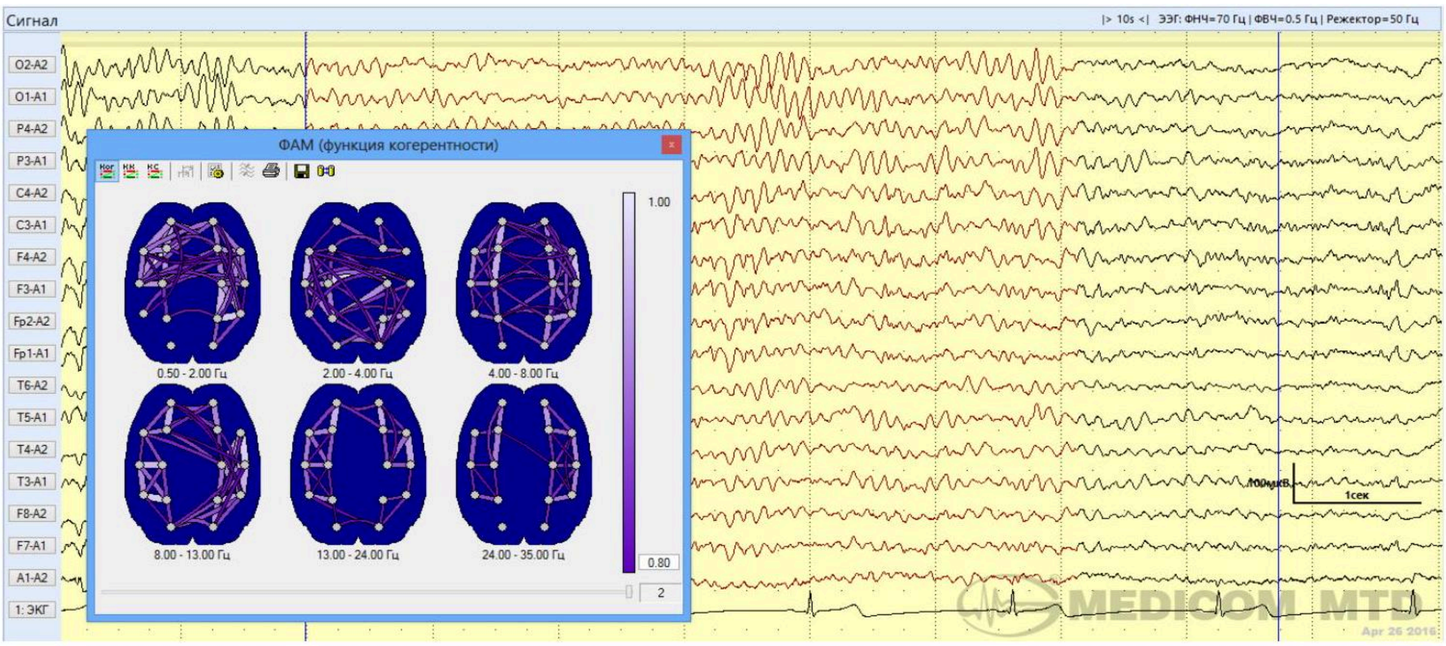
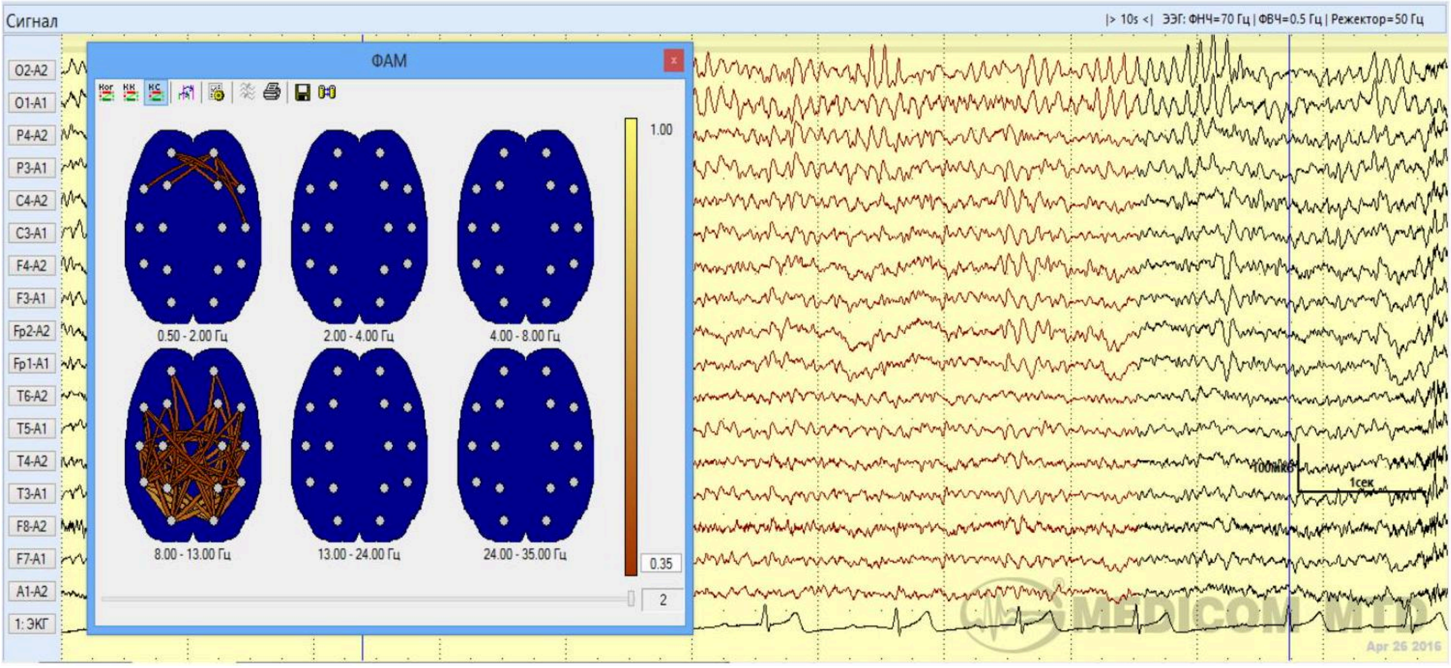


b
c
Fig.3. A1 **圖 3. A1**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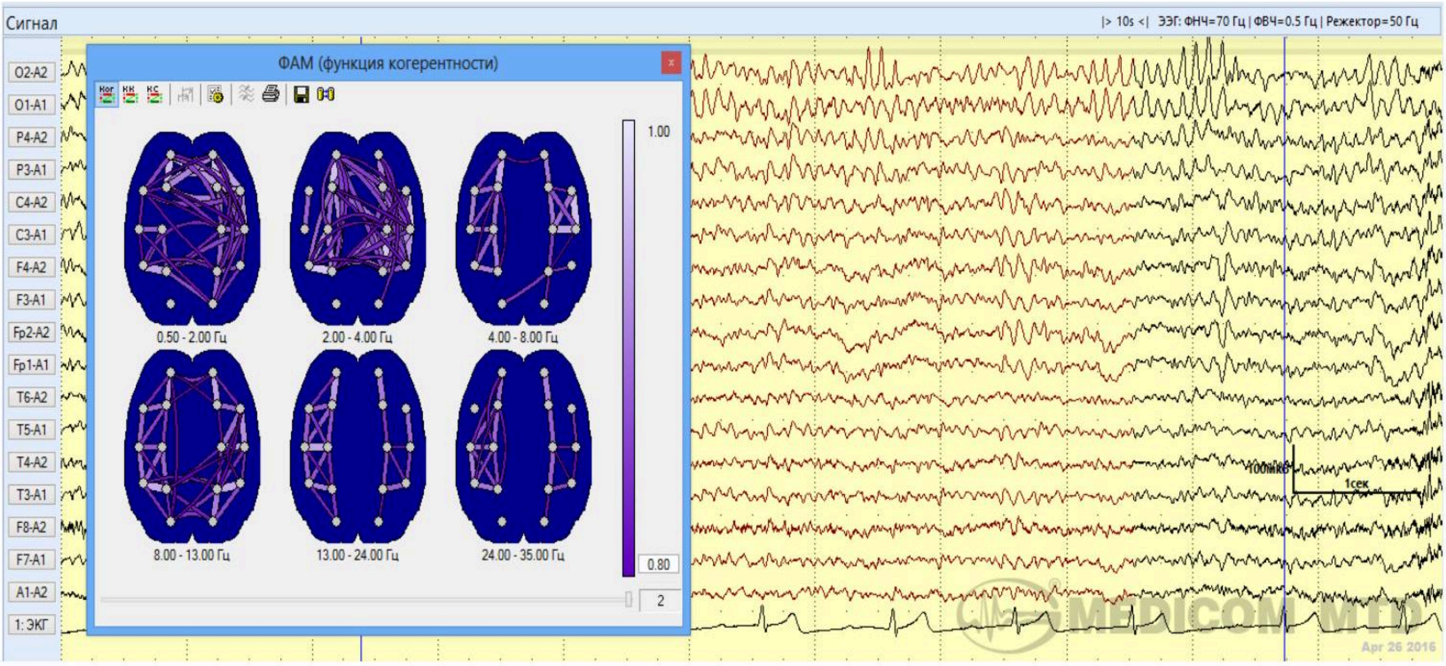
O1-A1
P4-A2
P3-A1
C4-A2
C3-A1
F4-A2
F3-A1
Fp2-A2
Fp1-A1
T6-A2
T5-A1
T4-A2
T3-A1
F8-A2
F7-A1
A1-A2
1: ЭКГ
0.50 - 2.00 Гц
2.00 - 4.00 Гц
4.00 - 8.00 Гц
8.00 - 13.00 Гц
13.00 - 24.00 Гц
24.00 - 35.00 Гц
1.00
0.35
2
100мкВ
1сек
MEDICOM MTD
Apr 26 2016

a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O2-A2
O1-A1
P4-A2
P3-A1
C4-A2
C3-A1
F4-A2
F3-A1
Fp2-A2
Fp1-A1
T6-A2
T5-A1
T4-A2
T3-A1
F8-A2
F7-A1
A1-A2
1: ЭКГ
0.50 - 2.00 Гц
2.00 - 4.00 Гц
4.00 - 8.00 Гц
8.00 - 13.00 Гц
13.00 - 24.00 Гц
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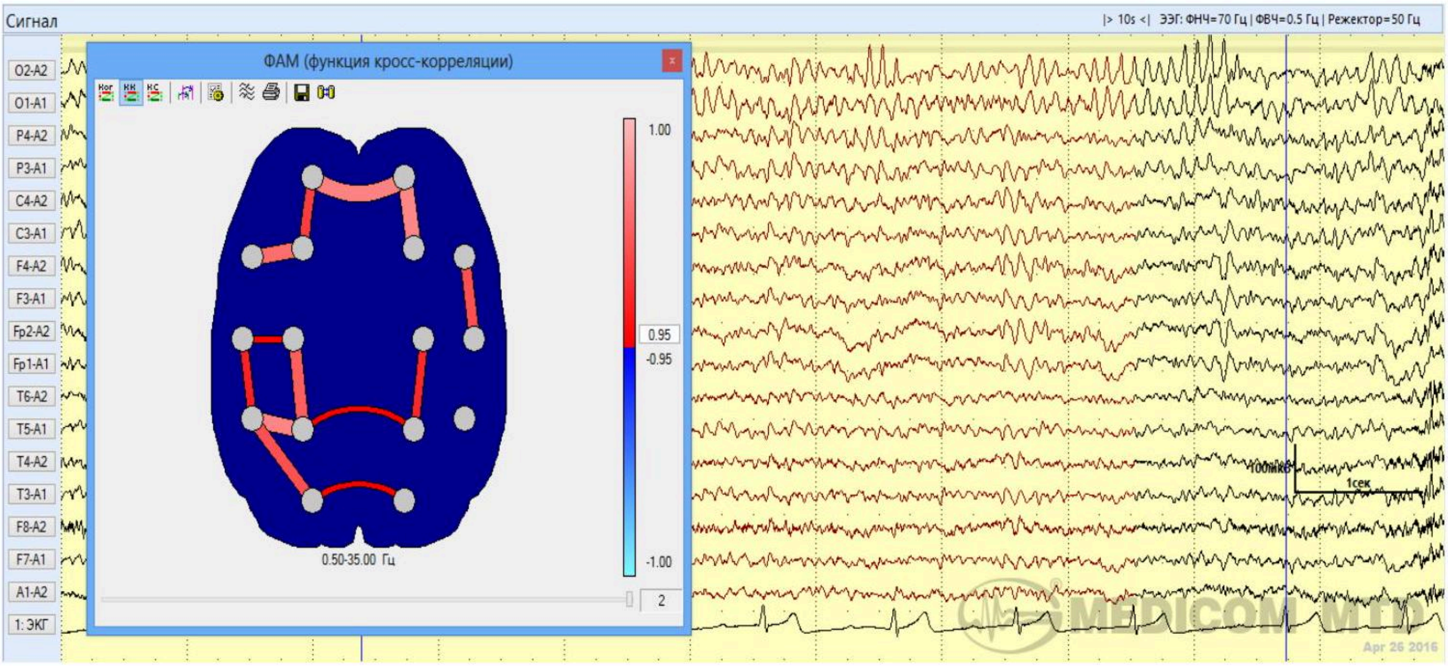
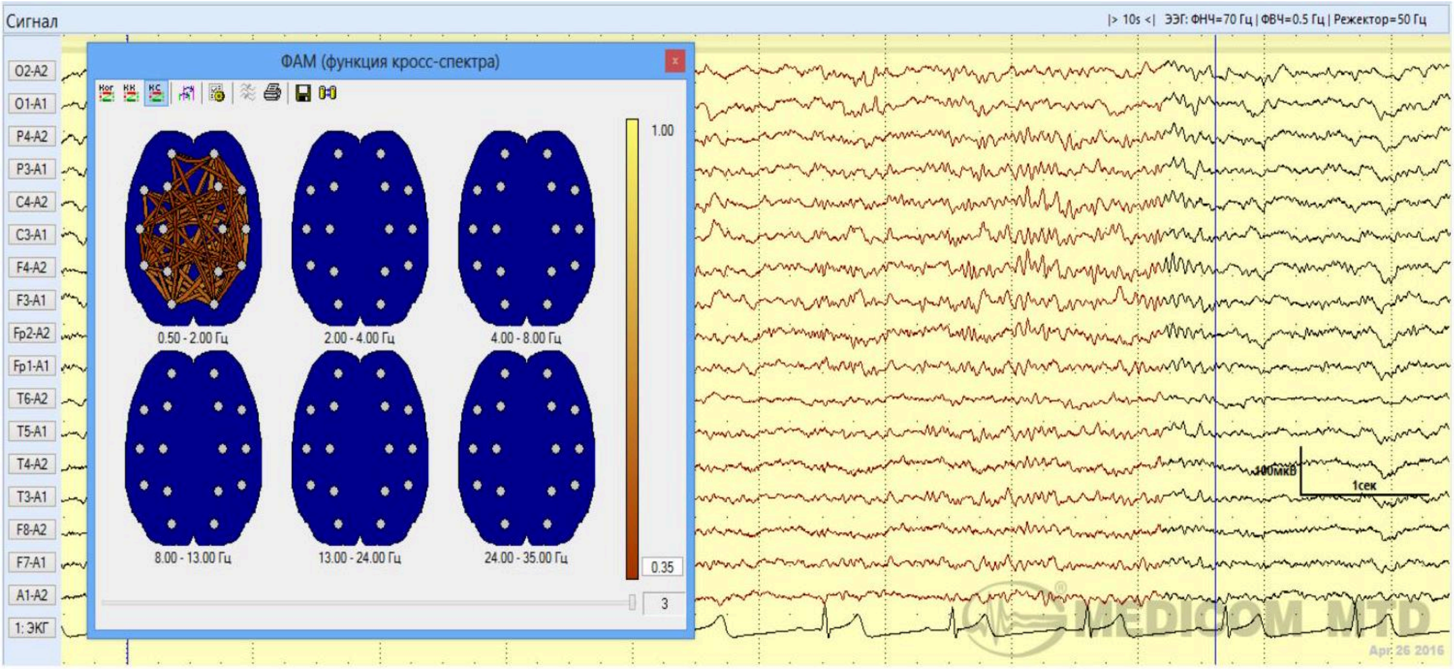
1.00
0.80
2
100мкВ
1сек
MEDICOM MTD
Apr 26 2016

b



c

Fig.3. A2 圖 **3. A2**



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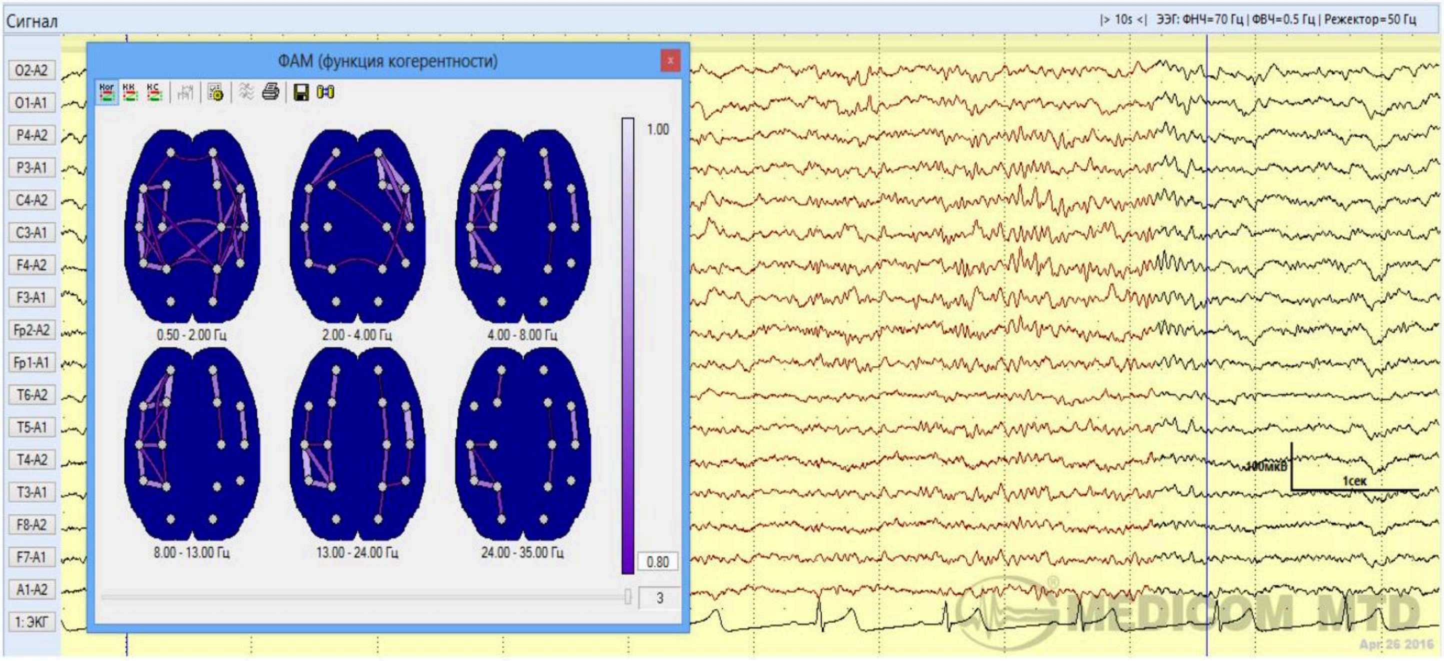

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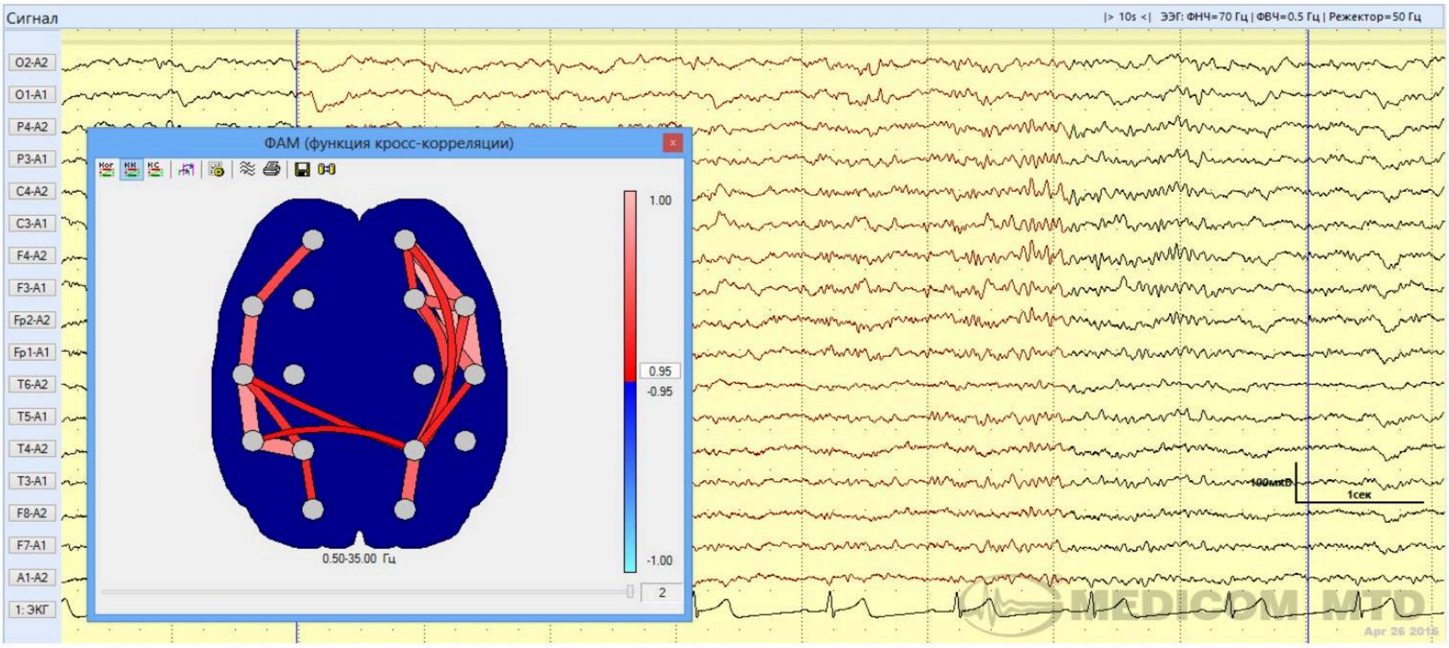
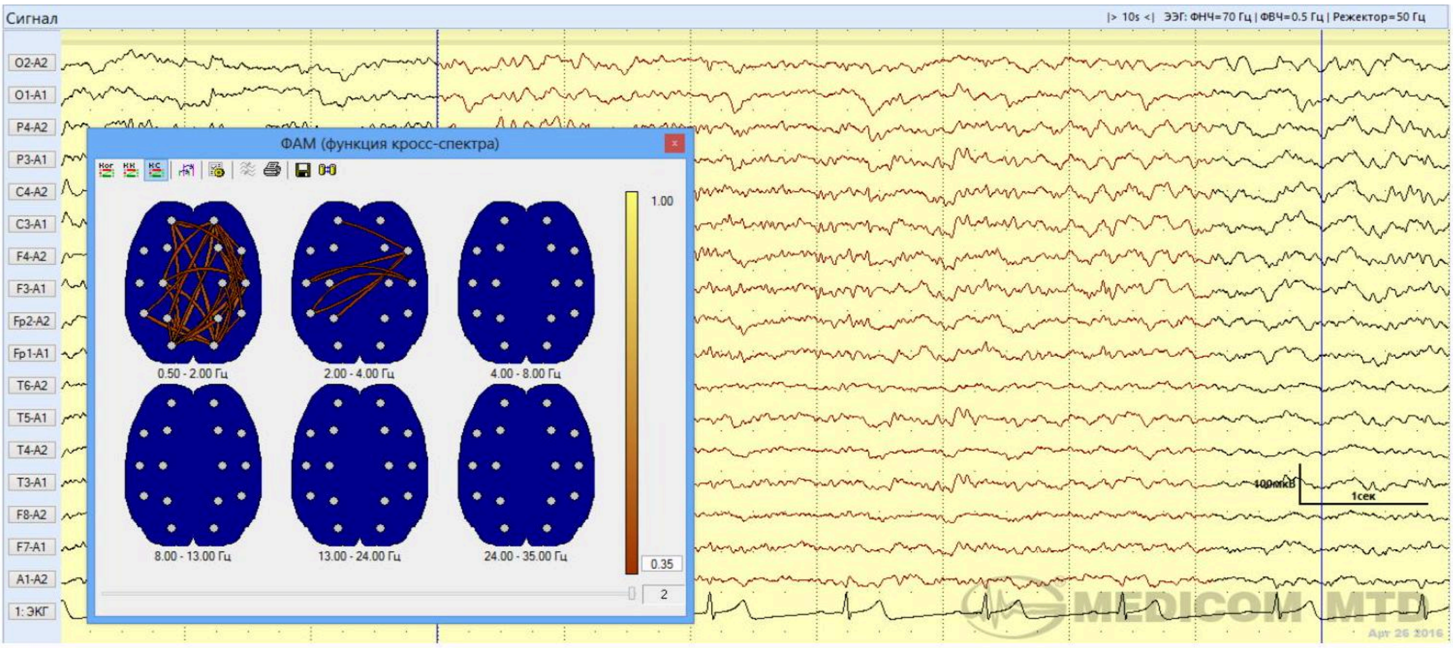


C

Fig.3. A2 [1] **圖 3. A2** [1]



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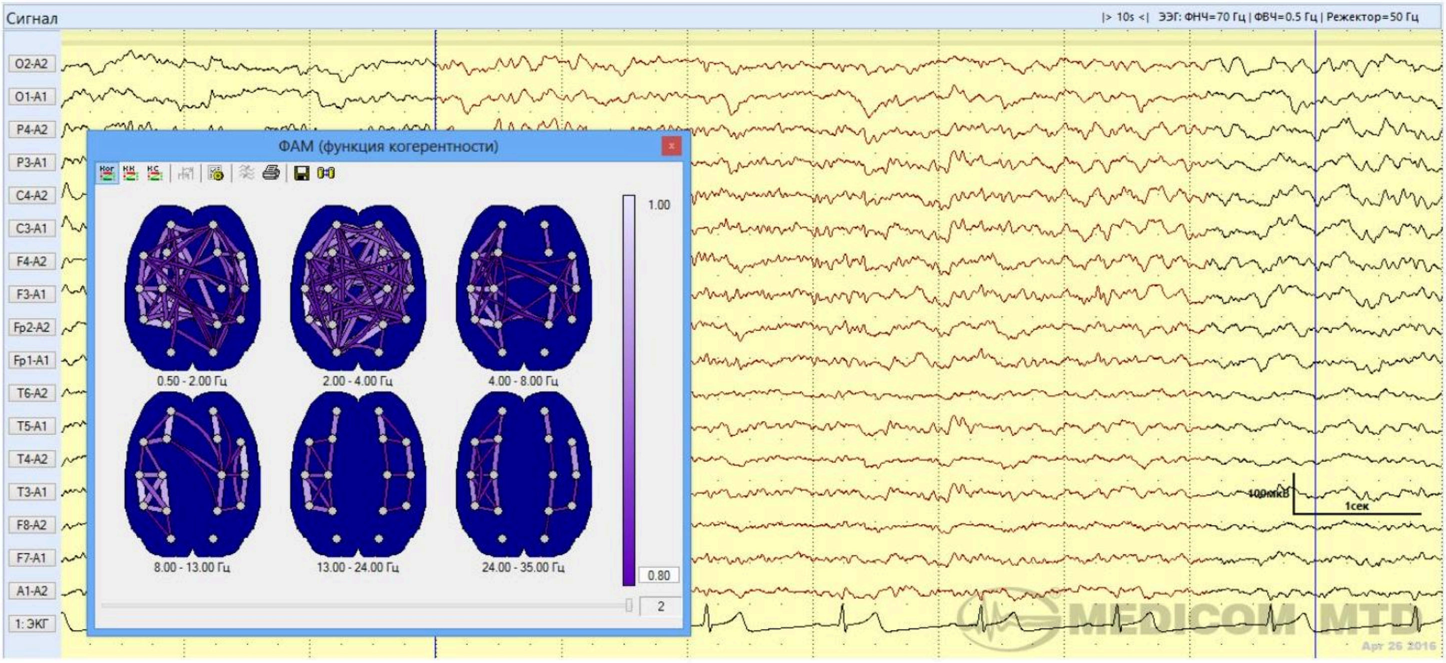
P4-A2
P3-A1
C4-A2
C3-A1
F4-A2
F3-A1
Fp2-A2
Fp1-A1
T6-A2
T5-A1
T4-A2
T3-A1
F8-A2
F7-A1
A1-A2
1: ЭКГ
ФАМ (функция кросс-спектра)
1.00
0.35
2
0.50 - 2.00 Гц
2.00 - 4.00 Гц
4.00 - 8.00 Гц
8.00 - 13.00 Гц
13.00 - 24.00 Гц
24.00 - 35.00 Гц
1сек
MEDICOM MTD

a



Сигнал
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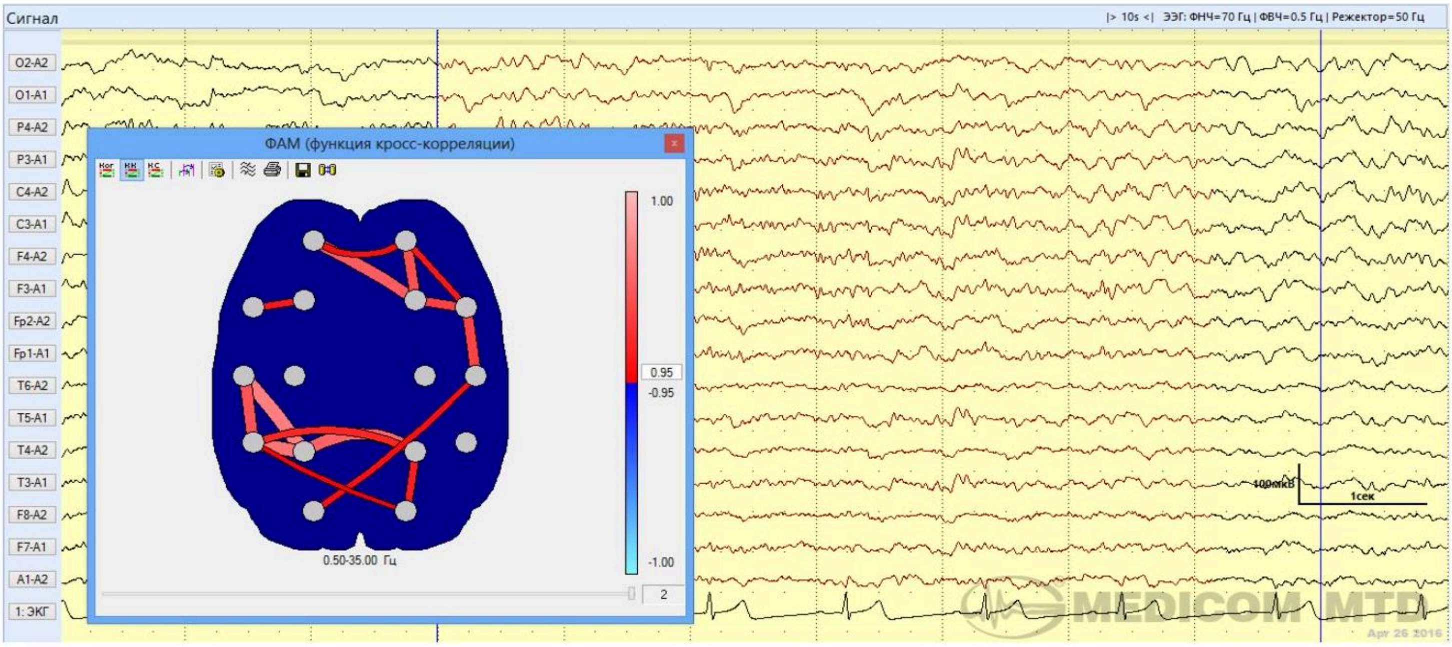
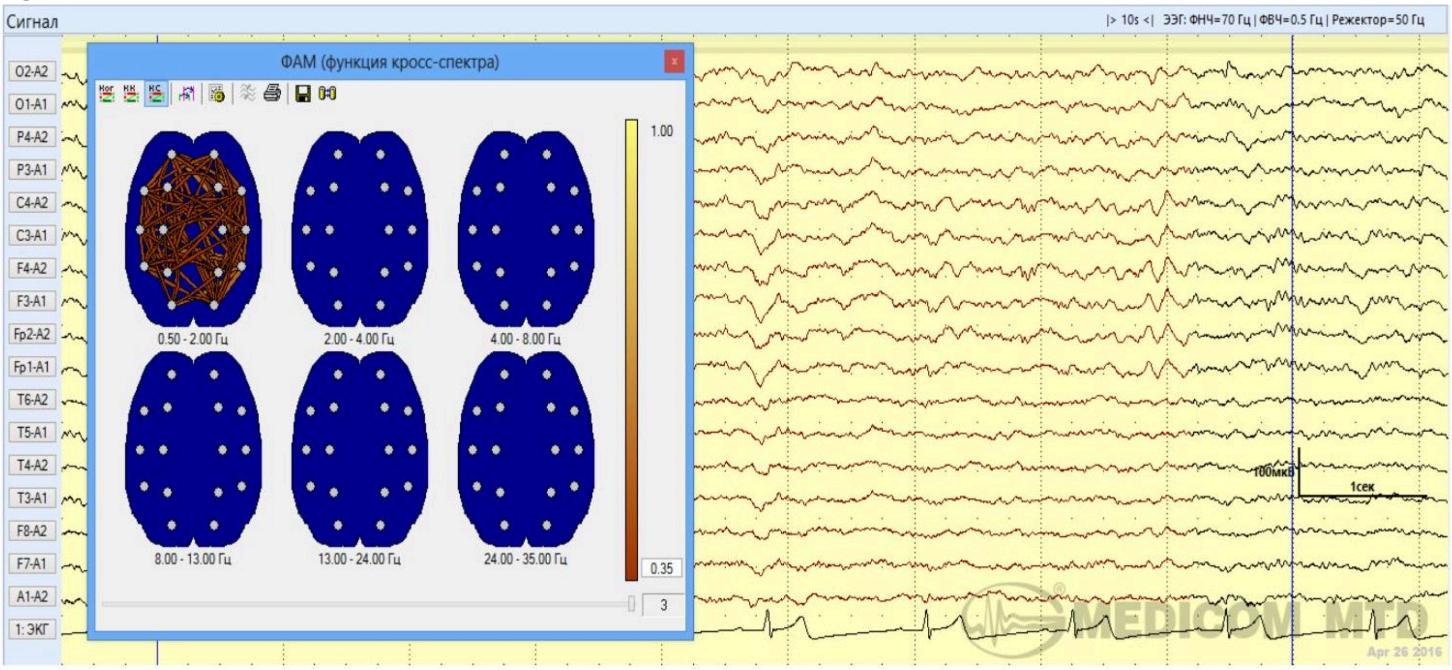
O1-A1
P4-A2
P3-A1
C4-A2
C3-A1
F4-A2
F3-A1
Fp2-A2
Fp1-A1
T6-A2
T5-A1
T4-A2
T3-A1
F8-A2
F7-A1
A1-A2
1: ЭКГ
ФАМ (функция когерентности)
1.00
0.80
2
0.50 - 2.00 Гц
2.00 - 4.00 Гц
4.00 - 8.00 Гц
8.00 - 13.00 Гц
13.00 - 24.00 Гц
24.00 - 35.00 Гц
1сек
MEDICOM MTD

b

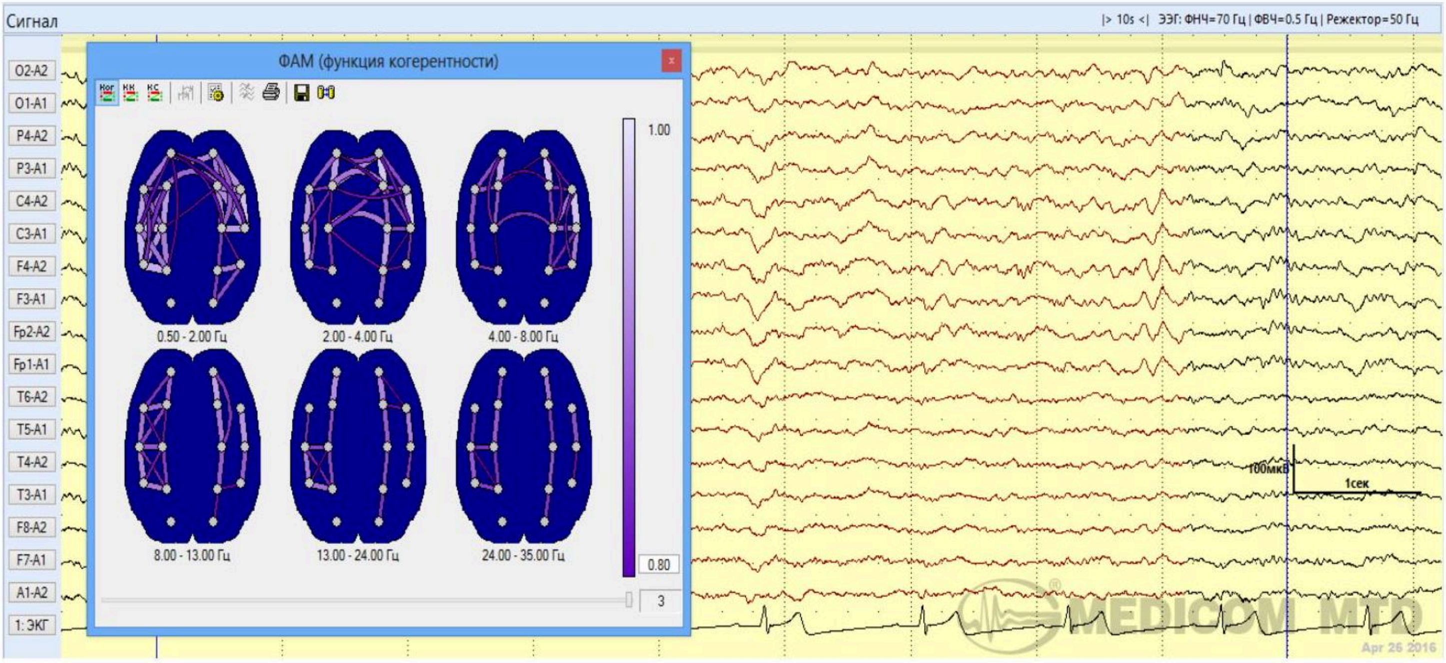


c

Fig.3. A3 圖 **3. A3**



a



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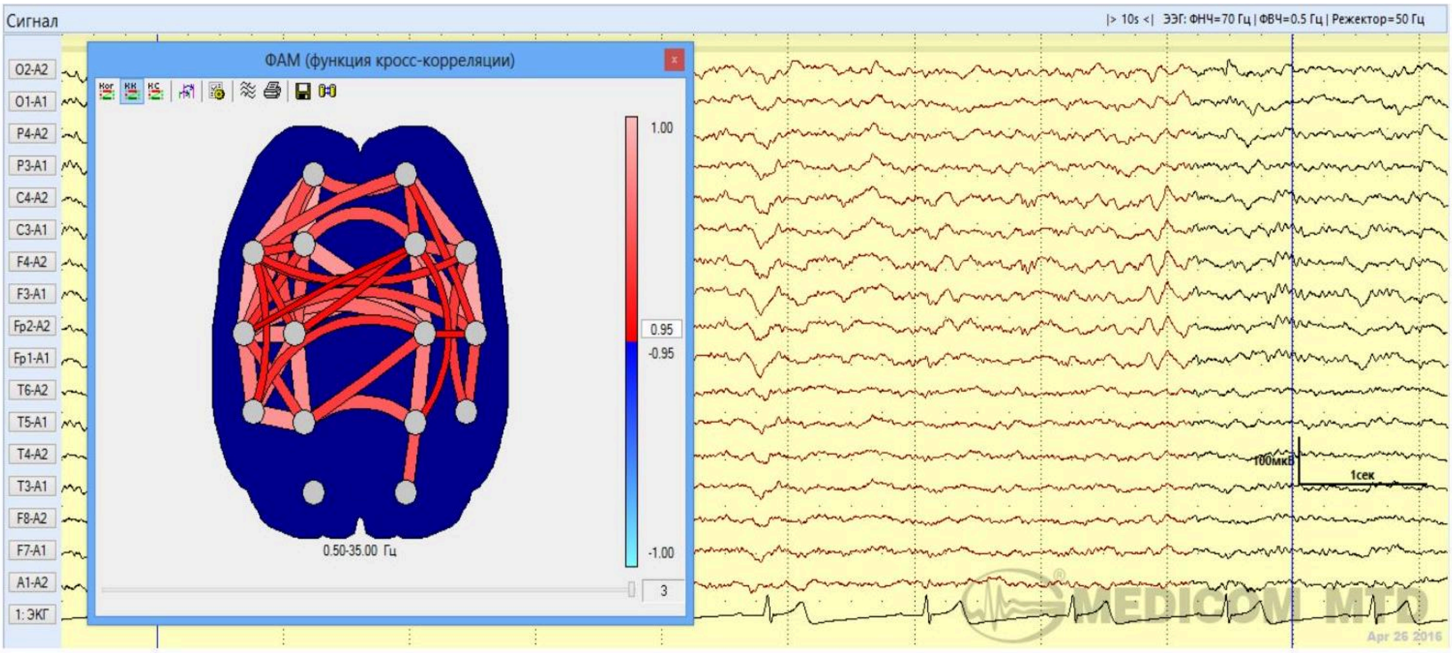
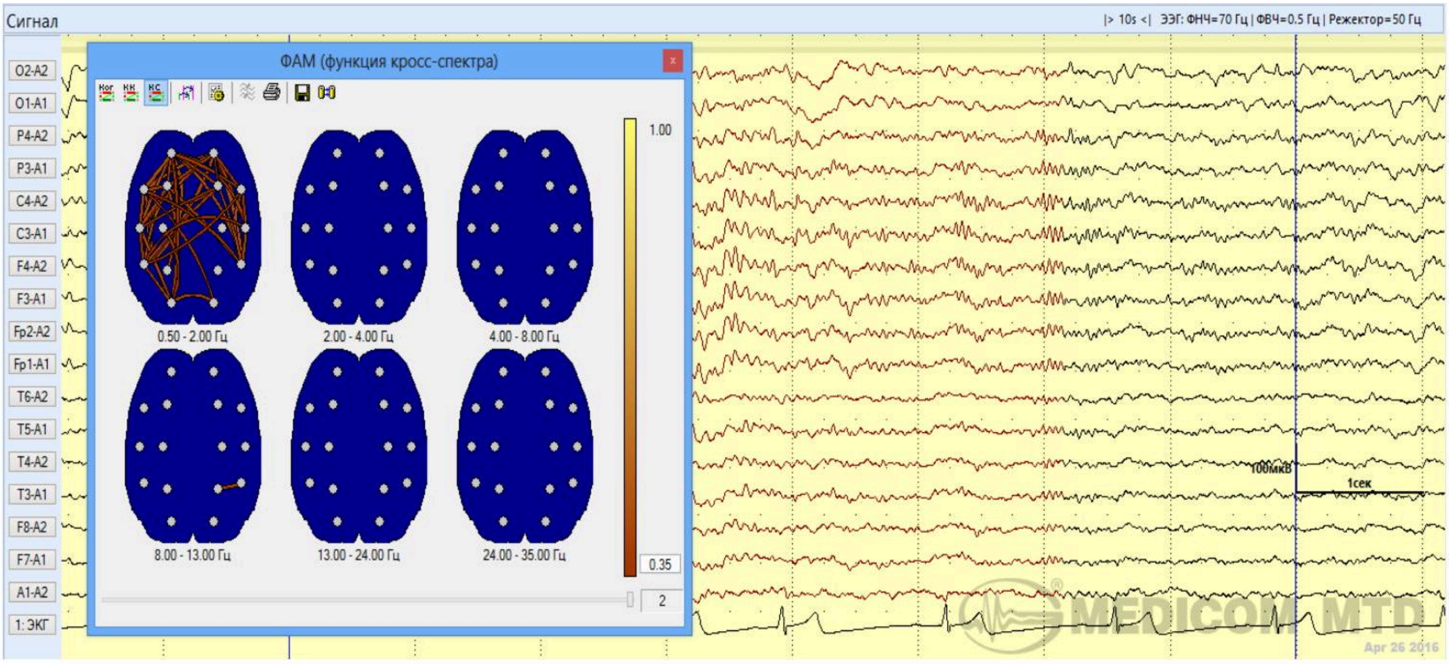


C

Fig.3. A3 [1] **圖 3. A3** [1]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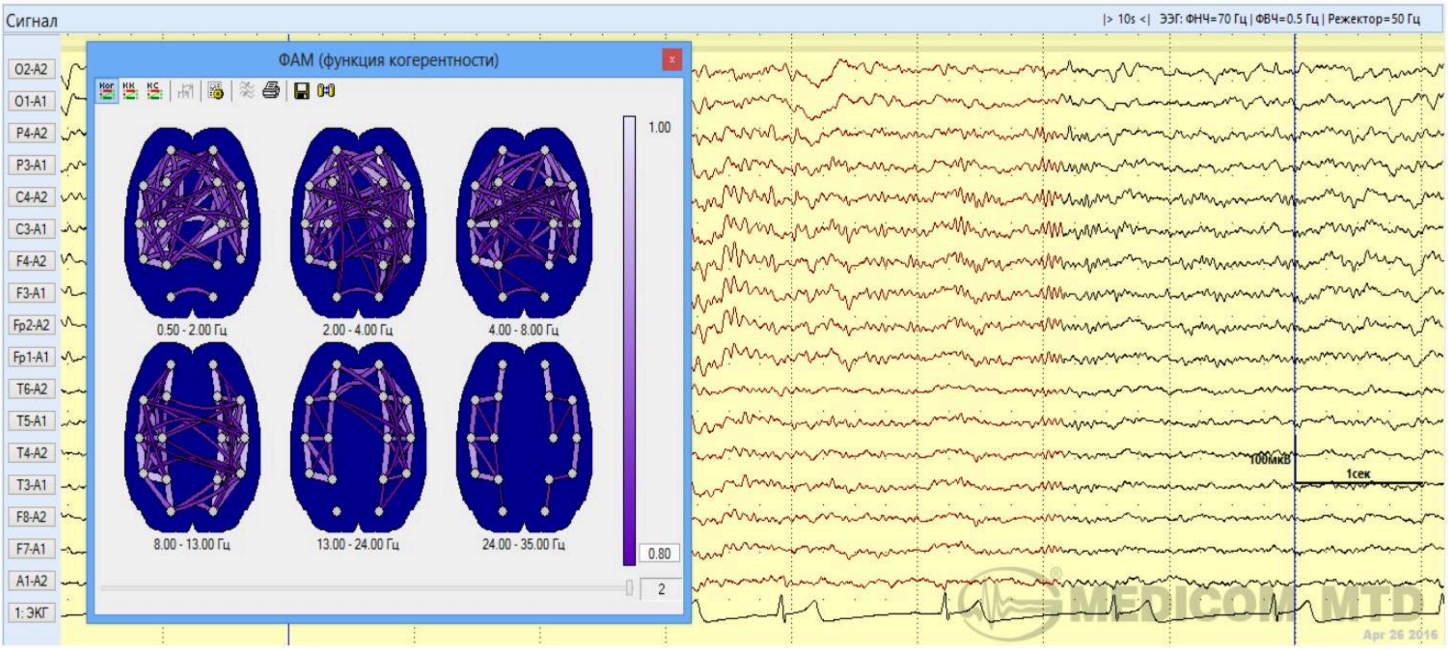
O2-A2
O1-A1
P4-A2
P3-A1
C4-A2
C3-A1
F4-A2
F3-A1
Fp2-A2
Fp1-A1
T6-A2
T5-A1
T4-A2
T3-A1
F8-A2
F7-A1
A1-A2
1: ЭКГ
0.50 - 2.00 Гц
2.00 - 4.00 Гц
4.00 - 8.00 Гц
8.00 - 13.00 Гц
13.00 - 24.00 Гц
24.00 - 35.00 Гц
1.00
0.35
2
100мкВ
1сек
MEDICOM MTD
Apr 26 2016

a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O2-A2
O1-A1
P4-A2
P3-A1
C4-A2
C3-A1
F4-A2
F3-A1
Fp2-A2
Fp1-A1
T6-A2
T5-A1
T4-A2
T3-A1
F8-A2
F7-A1
A1-A2
1: ЭКГ
0.50 - 2.00 Гц
2.00 - 4.00 Гц
4.00 - 8.00 Гц
8.00 - 13.00 Гц
13.00 - 24.00 Гц
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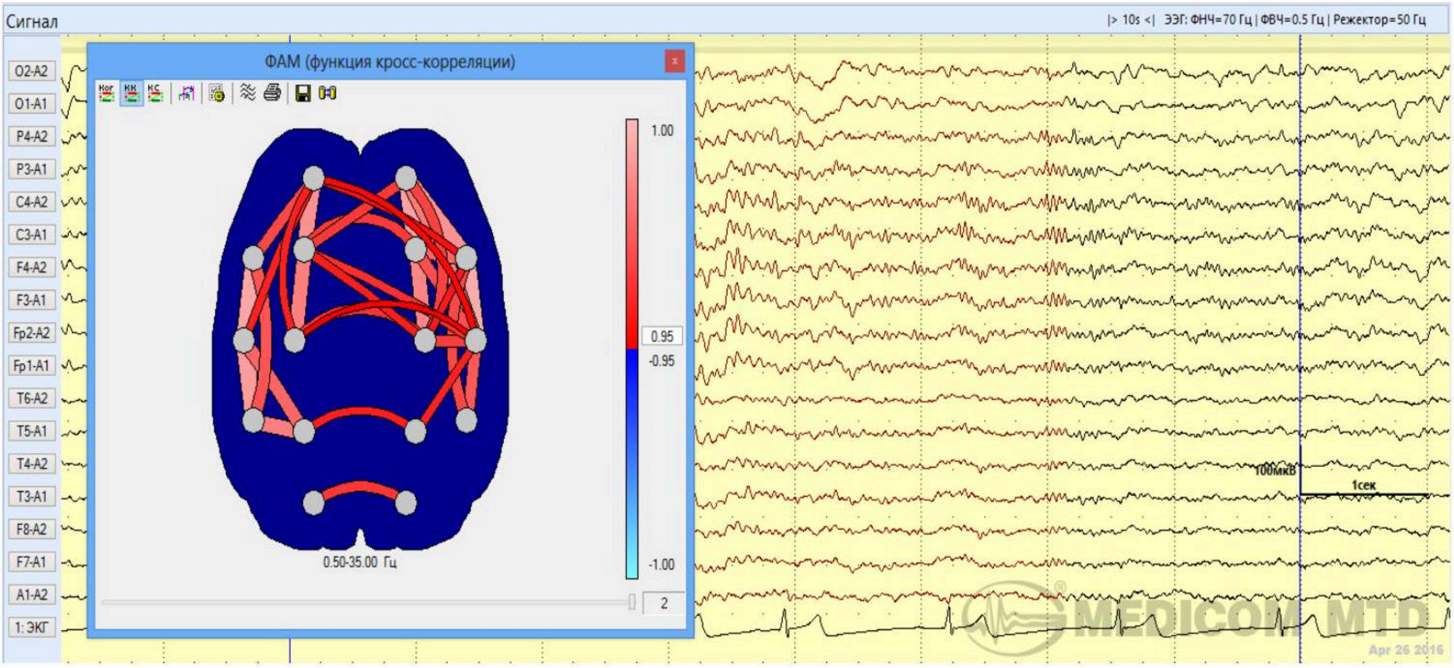
1.00
0.80
2
100мкВ
1сек
MEDICOM MTD
Apr 26 2016

b



c

Fig. 4. 圖 **4.**

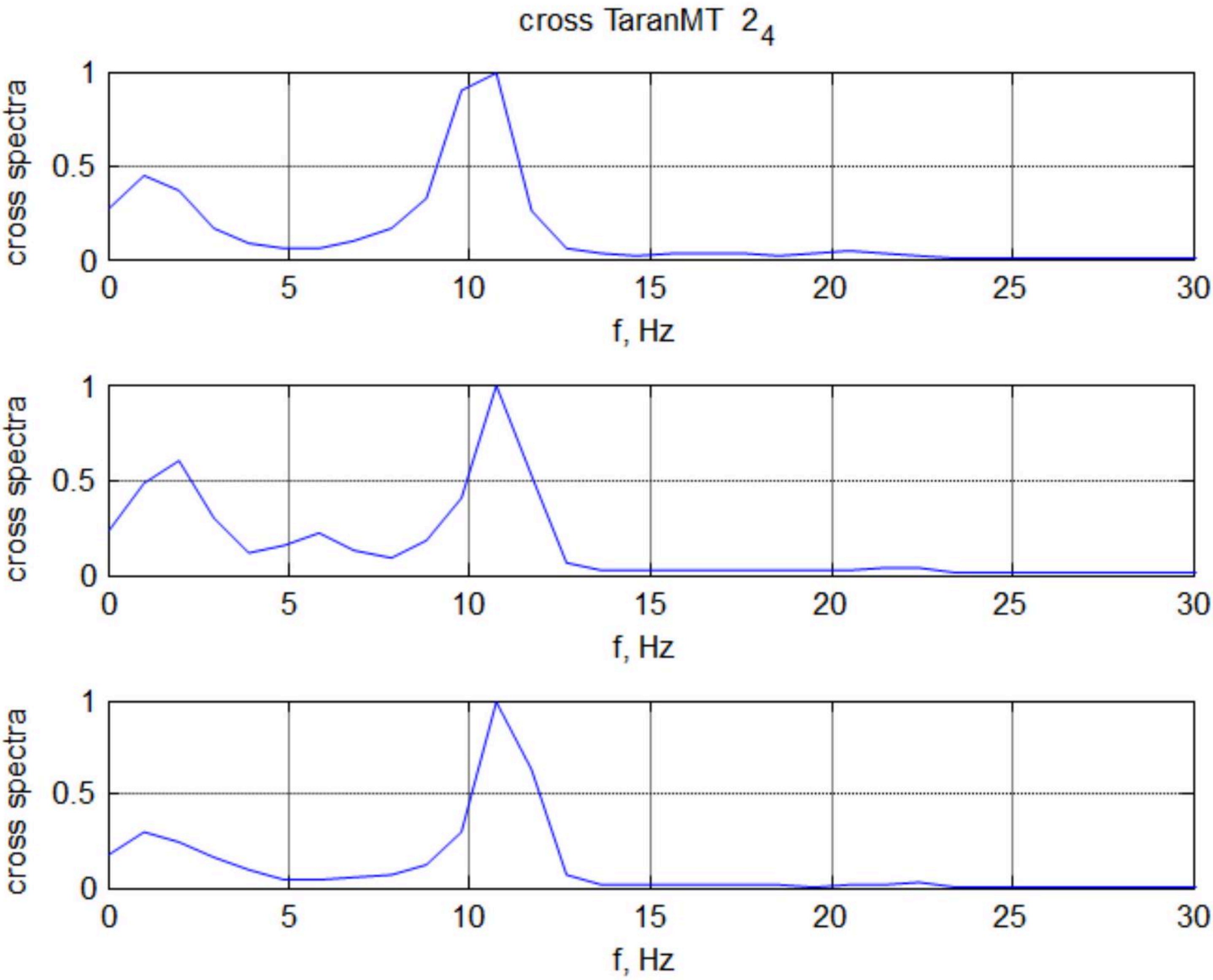
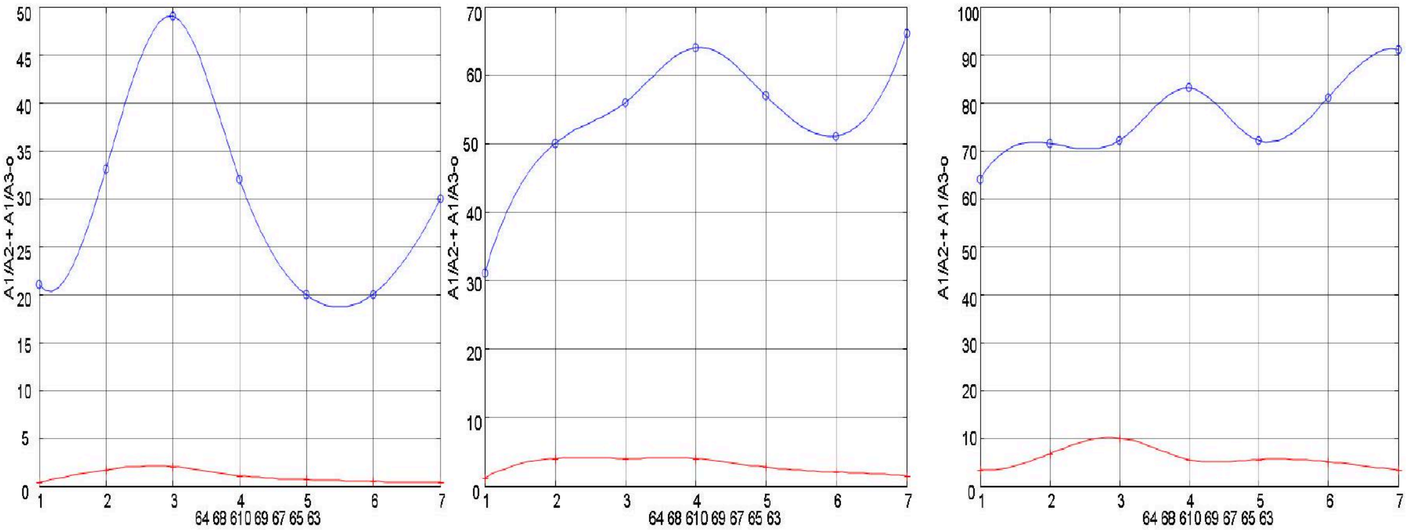
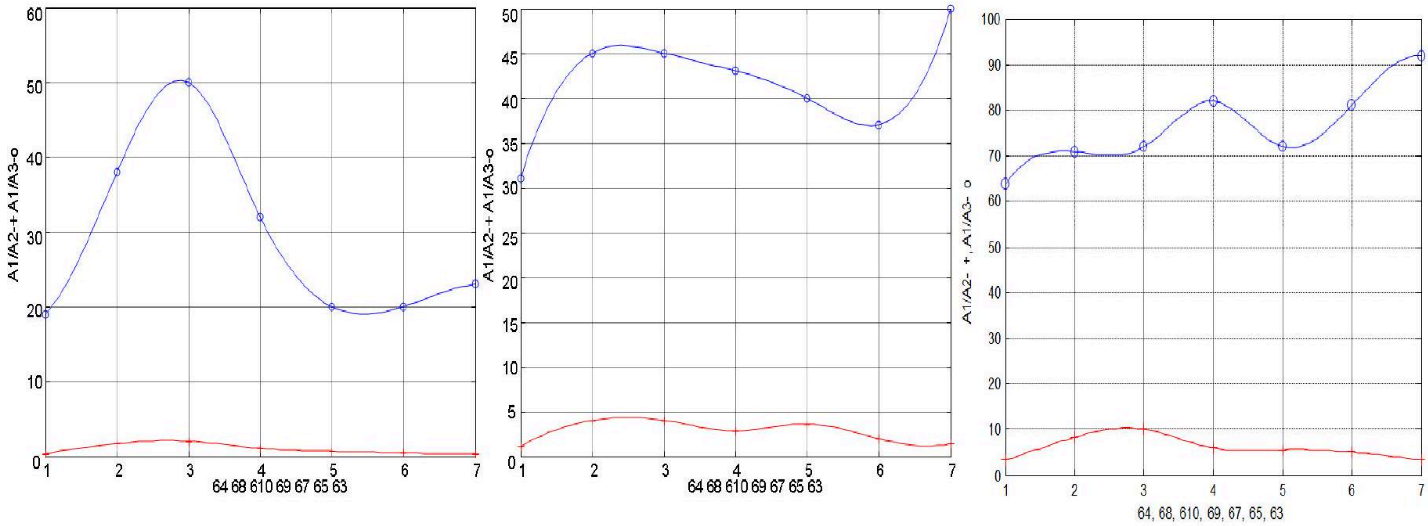


Fig. 5 圖 **5**

Abd_center



Abd_MP_center



4. Figure captions: **4. 圖說：**

Fig. 1 Spectral analysis of EEG rhythms distribution by bands: delta1 + delta2 (0.5-4.0 oscillations per second - color white + red); theta (4.0-8.0 oscillations per second color: yellow); alpha (8.0-13.0 oscillations per second - color: green); beta (13 and higher, color: blue). A - background recording prior to exposure to electromagnetic radiation, emitted by the MP: B - after exposure to the MP; C - after exposure to the MP in combination with AIRES SHIELD.

圖 1 腦電波節律頻帶分布的頻譜分析：delta1 + delta2（0.5-4.0 次振盪/秒 - 顏色為白色+紅色）；theta（4.0-8.0 次振盪/秒 - 顏色為黃色）；alpha（8.0-13.0 次振盪/秒 - 顏色為綠色）；beta（13 次及以上，顏色為藍色）。A - 暴露於微處理器（MP）所發射電磁輻射前的背景記錄；B - 暴露於 MP 後；C - 暴露於 MP 並結合 AIRES SHIELD 後。

Fig.2. A1. Native EEG of A-v I. and examples of processing with Encephalic Asymmetry (ECA) Program during aftereffect of Hyperventilation (HV) functional test - hypoxia, hypercapnia:

圖 2. A1. A-v I.的原始腦電圖及使用腦不對稱（ECA）程式處理的範例，於過度換氣（HV）功能測試後效應期間—缺氧、高碳酸血症：

a - background after HV - rhythm topogram of the cross spectrum (CS);

a - HV 後的背景—交叉頻譜（CS）節律拓撲圖；

b - background after HV - rhythm topogram of the coherence function (COH);

b - 高壓後背景 - 相干函數（COH）節律拓撲圖；

c - background after HV - structure of cross-correlation (CC) positive coefficients distribution.

c - 高壓後背景 - 交叉相關（CC）正係數分布結構。

Fig.2. A2. Native EEG of A-v I. and examples of processing with Encephalic Asymmetry (ECA) Program against the background of exposure to electromagnetic radiation, emitted by the mobile phone (EMR MP):

圖 2. A2. A-v I 的原始腦電圖（EEG）及在行動電話（EMR MP）電磁輻射暴露背景下，使用腦不對稱（ECA）程式處理的範例：

a - against the background of (2min) exposure to EMR MP - rhythm topogram of the cross spectrum (CS);

a - 在（2 分鐘）暴露於 EMR MP 背景下 - 交叉頻譜（CS）節律拓撲圖；

b - against the background of (2min) exposure to EMR MP - rhythm topogram of the coherence function (COH);

b - 在（2 分鐘）電磁輻射（EMR）MP 暴露背景下 - 相干函數（COH）的節律拓撲圖；

c - against the background of (2min) exposure to EMR MP - structure of crosscorrelation (CC) positive coefficients distribution.

c - 在（2 分鐘）電磁輻射（EMR）MP 暴露背景下 - 交叉相關（CC）正係數分布結構。

Fig. 2 .A2 [1]. Native EEG of A-v I. and examples of processing with Encephalic Asymmetry (ECA) Program after exposure to EMR MP:

圖 2.A2 [1] . A-v I.的原始腦電圖（EEG）及暴露於 EMR MP 後使用腦不對稱（ECA）程式處理的範例：

a - background after exposure to EMR MP - rhythm topogram of the cross spectrum (CS);

a - 暴露於 EMR MP 後的背景 - 交叉頻譜（CS）的節律拓撲圖；

b - background after exposure to EMR MP - rhythm topogram of the coherence function (COH);

b - 暴露於電磁輻射後的背景 MP - 相干函數（COH）的節律拓撲圖；

c - background after exposure to EMR MP - structure of cross-correlation (CC) positive coefficients distribution.

c - 暴露於電磁輻射後的背景 MP - 交叉相關（CC）正係數分布的結構。

Fig.2. A3. Native EEG of A-v I. and examples of processing with Encephalic Asymmetry (ECA) Program against the background of exposure to electromagnetic radiation, emitted by the mobile phone in combination with AIRES SHIELD (MP+):

圖 2. A3. A-v I.的原始腦電圖（EEG）及在手機所發射的電磁輻射背景下，結合 AIRES SHIELD（MP+）使用腦不對稱（ECA）程式處理的範例：

a - against the background of (3min) exposure to EMR MP+ - rhythm topogram of the cross spectrum (CS);

a - 在（3 分鐘）暴露於電磁輻射背景下 MP+ - 交叉頻譜（CS）的節律拓撲圖；

b - against the background of (3min) exposure to EMR MP+ - rhythm topogram of the coherence function (COH);

b - 在（3 分鐘）暴露於電磁輻射 MP+ 背景下 - 相干函數（COH）的節律拓撲圖；

c - against the background of (3min) exposure to EMR MP+ - structure of crosscorrelation (CC) positive coefficients distribution.

c - 在（3 分鐘）暴露於電磁輻射 MP+ 背景下 - 交叉相關（CC）正係數分布結構。

Fig.2. A3[1]. Native EEG of A − v I. and examples of processing with Encephalic Asymmetry (ECA) Program after exposure to electromagnetic radiation, emitted by the mobile phone (EMR MP) in combination with AIRES SHIELD (MP+).

圖 2. A3[1] 。 A − v **I. 的原始腦電圖（EEG）及暴露於由行動電話發射的電磁輻射（EMR MP）並結合 AIRES SHIELD（MP+）後，使用腦不對稱（ECA）程式處理的範例。**

a - after exposure to EMR MP+ - rhythm topogram of the cross spectrum (CS);

a - 暴露於 EMR MP+ 後 - 交叉頻譜（CS）的節律拓撲圖；

b - after exposure to EMR MP+ - rhythm topogram of the coherence function (COH);

b - 暴露於電磁輻射後 EMR MP+ - 相干函數（COH）節律拓撲圖；

c - after exposure to EMR MP+ - structure of cross-correlation (CC) positive coefficients distribution.

c - 暴露於電磁輻射後 EMR MP+ - 交叉相關（CC）正係數分布結構。

Fig.3. A2. Native EEG of B-v R. and examples of processing with Encephalic Asymmetry (ECA) Program against the background of exposure to electromagnetic radiation, emitted by the mobile phone (EMR MP).

圖 3. A2. B-v R. 的原始腦電圖（EEG）及在行動電話（EMR MP）電磁輻射背景下，使用腦不對稱（ECA）程式處理的範例。

a - against the background of (2min) exposure to EMR MP - rhythm topogram of the cross spectrum (CS);

a - 在（2 分鐘）暴露於 EMR MP 背景下 - 交叉頻譜（CS）節律拓撲圖；

b - against the background of (2min) exposure to EMR MP - rhythm topogram of the coherence function (COH);

b - 在（2 分鐘）暴露於電磁輻射（EMR MP）背景下 - 相干函數（COH）的節律拓撲圖；

c - against the background of (2min) exposure to EMR MP - structure of crosscorrelation (CC) positive coefficients distribution

c - 在（2 分鐘）暴露於電磁輻射（EMR MP）背景下 - 交叉相關（CC）正係數分布結構

Fig.3. A2 [1]. Native EEG of B-v R. and examples of processing with Encephalic Asymmetry (ECA) Program after exposure to electromagnetic radiation, emitted by the mobile phone (EMR MP). Hereinafter:

圖 3. A2 [1] 。B-v R. 的原始腦電圖（EEG）及暴露於行動電話發射的電磁輻射（EMR MP）後，使用腦不對稱（ECA）程式處理的範例。以下簡稱：

a - after exposure to EMR MP - rhythm topogram of the cross spectrum (CS);

a - 暴露於電磁輻射（EMR MP）後 - 交叉頻譜（CS）的節律拓撲圖；

b - after exposure to EMR MP - rhythm topogram of the coherence function (COH);

b - 暴露於電磁輻射後 EMR MP - 相干函數（COH）節律拓撲圖；

c - after exposure to EMR MP - structure of cross-correlation (CC) positive coefficients distribution.

c - 暴露於電磁輻射後 EMR MP - 交叉相關（CC）正係數分布結構。

Fig.3. A3. Native EEG of B-v R. and examples of processing with Encephalic Asymmetry (ECA) Program against the background of exposure to electromagnetic radiation, emitted by the mobile phone (EMR MP) in combination with AIRES SHIELD (MP+).

圖 3. A3. B-v R. 的原始腦電圖（EEG）及在暴露於手機發射的電磁輻射（EMR MP）並結合 AIRES SHIELD（MP+）背景下，使用腦不對稱（ECA）程式處理的範例。

a - against the background of (3min) exposure to EMR MP+ - rhythm topogram of the cross spectrum (CS);

a - 在（3 分鐘）暴露於 EMR MP+ 背景下 - 交叉頻譜（CS）節律拓撲圖；

b - against the background of (3min) exposure to EMR MP+ - rhythm topogram of the coherence function (COH);

b - 在（3 分鐘）電磁輻射（EMR MP+）曝露背景下 - 相干函數（COH）節律拓撲圖；

c - against the background of (3min) exposure to EMR MP+ - structure of crosscorrelation (CC) positive coefficients distribution.

c - 在（3 分鐘）電磁輻射（EMR MP+）曝露背景下 - 交叉相關（CC）正係數分布結構。

Fig.3. A3[1]. Native EEG of B-v R. and examples of processing with Encephalic Asymmetry (ECA) Program after exposure to electromagnetic radiation, emitted by the mobile phone (EMR MP) in combination with AIRES SHIELD (MP+).

圖 3. A3[1]. B-v R. 的原始腦電圖（EEG）及經由腦不對稱（ECA）程式處理後的範例，該處理於結合 AIRES SHIELD（MP+）的行動電話電磁輻射（EMR MP）曝露後進行。

a - after exposure to EMR MP - rhythm topogram of the cross spectrum (CS);

a - 電磁輻射（EMR MP）曝露後 - 交叉頻譜（CS）節律拓撲圖；

b - after exposure to EMR MP - rhythm topogram of the coherence function (COH);

b - 電磁輻射（EMR）暴露後 MP - 相干函數（COH）節律拓撲圖；

c - after exposure to EMR MP - structure of cross-correlation (CC) positive coefficients distribution.

c - 電磁輻射（EMR）暴露後 MP - 交叉相關（CC）正係數分布結構。

Fig.4. Example of reciprocal spectral power density for signals from electrodes O1 (occipital left) and P1 (sincipital left). The upper figure - before exposure, the figure in the middle - exposure to the MP, bottom figure - exposure to the MP in combination with the resonator (AIRES SHIELD). The diagram in the middle clearly shows an additional peak, emerging at 6 Hz frequency upon exposure to the MP. During exposure to the MP in combination with the resonator (bottom diagram), the peak disappears, which may be considered as return to normal state.

圖 4. 來自電極 O1（左枕部）與 P1（左頂部）信號的互譜功率密度範例。上圖－暴露前，中圖－暴露於 MP，底圖－暴露於 MP 結合共振器（AIRES SHIELD）。中間的圖表清楚顯示在 6 Hz 頻率處出現一個額外峰值，該峰值於暴露於 MP 時產生。當暴露於 MP 結合共振器（底圖）時，該峰值消失，可視為恢復至正常狀態。

Fig. 5. Interaction among signals from electrode couples: C1-P1, C1-F3, C1-Fp1, C1Fp2, C1-F4, C1-C4, C1-P2 (see the electrodes layout according to the scheme 10×20), recorded in one subject. The Figure shows intensity of interaction rated by the maximum value. The blue curves reflect ratio between amplitudes of reciprocal spectral power density peaks at 2 Hz frequency and amplitudes at 10 Hz frequency, while the red curves reflect ratio between amplitudes of reciprocal spectral power density peaks at 2 Hz frequency and amplitudes at 20 Hz frequency for the above-mentioned electrode couples.

圖 5. 電極對之間信號的相互作用：C1-P1、C1-F3、C1-Fp1、C1-Fp2、C1-F4、C1-C4、C1-P2（參見電極佈局示意圖 10×20 ），記錄於同一受試者。圖中顯示以最大值評定的相互作用強度。藍色曲線反映 2 Hz 頻率的互惠頻譜功率密度峰值振幅與 10 Hz 頻率振幅的比率，而紅色曲線反映上述電極對在 2 Hz 頻率的互惠頻譜功率密度峰值振幅與 20 Hz 頻率振幅的比率。

The time interval between the upper and the bottom diagrams makes approximately 1 month. In the diagrams from left to right: left - background without the MP, middle exposure to the MP without the resonator, right - exposure to the MP with the resonator.

上下圖之間的時間間隔約為 1 個月。圖中由左至右依序為：左側 - 無微處理器（MP）背景，中間 - 暴露於無共振器的 MP，右側 - 暴露於有共振器的 MP。