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(54) 標題：保護生物體免受人工電磁輻射負面影響的方法

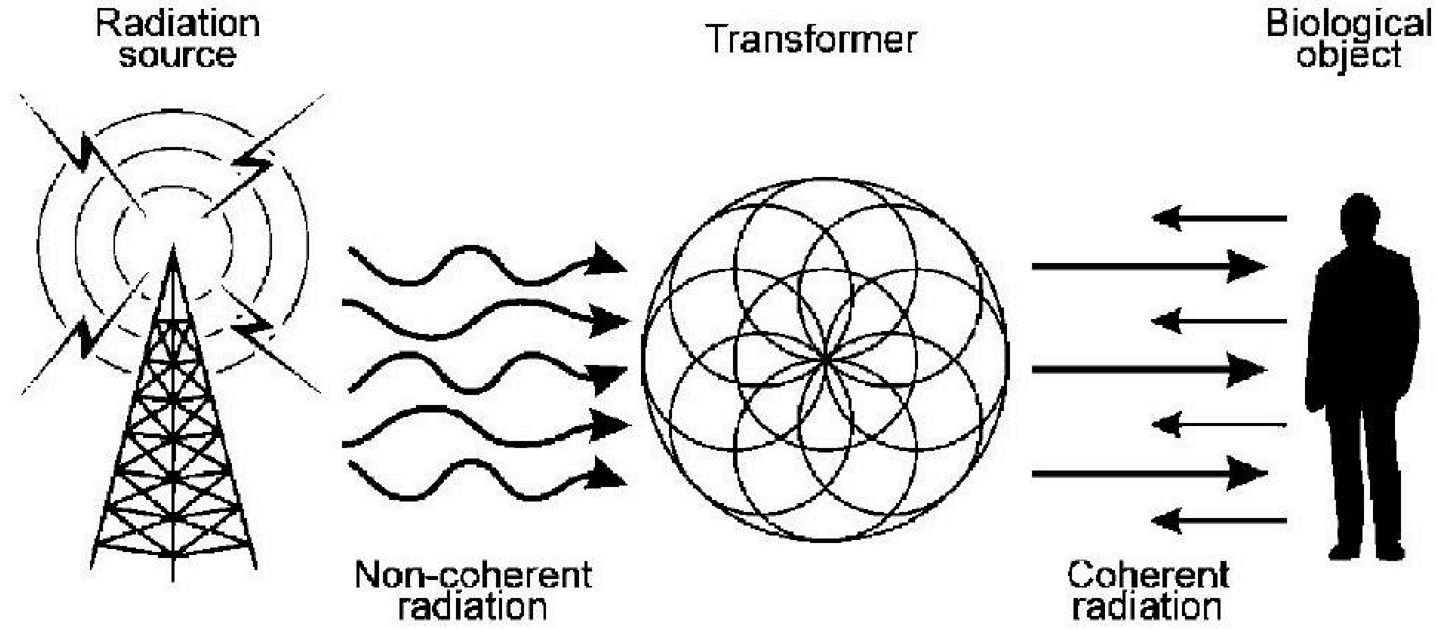

FIG. 1 圖 **1**

(57) Abstract: The method for protecting biological objects (BO) from the negative influence of technogenic electromagnetic (EM) radiation in a wide range of frequencies, which consists of creating a coherent field in the form of a fractal matrix around a biological object using a fractal-matrix as coherent transducer based on a self-affine annular raster lattice (resonator) formed from ringed topological lines, which create a slit-like raster, and is a universal Fourier transformer that harmonizes the amplitude, phase, frequency and polarization vector of external technogenic radiation and the BO's own EM radiation. The transformation of external radiation occurs in accordance with the Fourier transform with the formation of a coherent matrix of EM wave superpositions. The coherent matrix does not conflict with the BO. The transformation does not affect the functioning of the technical devices. The coherent transformer can be placed on the BO , or between the BO and the source.

(57) 摘要：本方法用於保護生物體（BO）免受寬頻範圍內人工電磁（EM）輻射的負面影響，其原理是在生物體周圍利用基於自相似環狀光柵格（諧振器）的分形矩陣作為相干換能器，形成分形矩陣形式的相干場。該環狀光柵由環狀拓撲線構成，形成狹縫狀光柵，是一種通用的傅立葉變換器，能協調外部人工輻射與生物體自身電磁輻射的振幅、相位、頻率及偏振向量。外部輻射的轉換依據傅立葉變換進行，形成電磁波疊加的相干矩陣。此相干矩陣與生物體不產生衝突，且轉換過程不影響技術設備的運作。相干換能器可置於生物體上，或置於生物體與輻射源之間。

METHOD FOR PROTECTING BIOLOGICAL OBJECTS FROM THE NEGATIVE INFLUENCE OF TECHNOGENIC ELECTROMAGNETIC RADIATION

保護生物體免受技術性電磁輻射負面影響的方法

FIELD OF INVENTION 發明領域

The invention relates to methods for protecting biological objects from the negative influence of technogenic electromagnetic radiation in a wide range of frequencies. The invention relates to protective technologies, industrial and sanitary hygiene, and occupational safety.

本發明涉及一種在寬頻範圍內保護生物體免受技術性電磁輻射負面影響的方法。本發明關於防護技術、工業及衛生衛生學以及職業安全領域。

BACKGROUND ART 背景技術

The invention relates to methods for protecting biological objects (BO) from technogenic electromagnetic (EM) radiation in a wide range of frequencies and can be used in the everyday life of each person to protect against the negative influence of surrounding technogenic radiation, including 5G mobile communication systems (3.5 – 28GHz).

本發明涉及保護生物物體（BO）免受技術性電磁（EM）輻射的方法，涵蓋廣泛頻率範圍，並可應用於每個人的日常生活中，以防護周遭技術性輻射的負面影響，包括 5G 行動通訊系統（ 3.5 – 28GHz ）。

Known methods for protecting, blocking, scattering and absorbing a signal: RU2194376, RU2265898, RU2234175.

已知的保護、阻擋、散射及吸收信號的方法有：RU2194376、RU2265898、RU2234175。

Patent RU2194376 / WO1997034459 relates to a method of transferring a layer onto a detail which shields against electromagnetic radiation. The layer is transferred with a predetermined extension directly or indirectly on to the detail with the help of a known printing method.

專利 RU2194376 / WO1997034459 涉及一種將層轉移到細節上的方法，用以屏蔽電磁輻射。該層以預定的延展性，直接或間接透過已知的印刷方法轉移到該細節上。

Patent RU2265898 relates to protection from electromagnetic emission. It describes mesh of electric-conductive material which is positioned on dielectric transparent film with applied transparent electric-conductive layer, made either of indium, or of tin, or of indium/tin alloy with thickness, approximately equal to 0.1 of skin layer, and the very mesh is applied with thickness not exceeding skin-layer by printer or plotter using electric-conductive compound, consisting of ultra-dispersive electric-conductive powder with stable electric conductivity and average size of particles 10.0-600.0 nm, polymer linking component, organic solvent and surfactant with certain ratio of components. The obtained effect is forming of

專利 RU2265898 涉及電磁輻射防護。其描述了一種電導性材料網格，該網格置於帶有透明電導層的介電透明薄膜上，該透明電導層由錮、錫或錮/錫合金製成，厚度約為皮膚層厚度的 0.1 倍，而該網格本身則以不超過皮膚層厚度的厚度，通過印表機或繪圖機使用電導性化合物塗佈，該化合物由超細分散電導性粉末（具有穩定的電導性且粒徑平均為 10.0-600.0 奈米）、聚合物結合劑、有機溶劑及表面活性劑按一定比例組成。所獲得的效果是形成

transparent screens, screening properties of which do not depend on falling angle of electromagnetic emission, also light and simple to manufacture.

透明屏幕，其屏蔽性能不受電磁輻射入射角度影響，且輕便且易於製造。

Patent DE10039125A1 / RU2234175 discloses electromagnetic absorber granulate consisting of a highly porous glass and/or ceramic granulate coated or filled with ferrite and/or an electrically conducting material. An independent claim is also included for a process for the production of a coated absorber granulate comprising finely grinding the ferrite and/or electrically conducting material, and applying with a binder as suspension to the glass and/or ceramic granulate. Preferred Features: The electrically conducting material is a metal and/or carbon. The granulate grain size is $0.2-5\ \mathrm{mm}$ and the coating has a thickness of 10-300 mu m. The ferrite is made of an $\mathrm{Mn-Zn, Ni-Zn, Ba, Sr}$ ferrite or a $\mathrm{Sc-, Co-}$, or $\mathrm{Ti-}$ substituted hexaferrite with a garnet structure.

專利 DE10039125A1 / RU2234175 公開了一種電磁吸收劑顆粒，該顆粒由高度多孔的玻璃和 / 或陶瓷顆粒組成，並塗覆或填充有鐵氧體和 / 或導電材料。該專利還包含一項獨立權利要求，涉及一種製造塗覆吸收劑顆粒的工藝，包括將鐵氧體和 / 或導電材料細磨，並以結合劑作為懸浮液塗覆於玻璃和 / 或陶瓷顆粒上。優選特徵：導電材料為金屬和 / 或碳。顆粒粒徑為 $0.2-5\ \mathrm{mm}$ ，塗層厚度為 10-300 微米。鐵氧體由 $\mathrm{Mn-Zn, Ni-Zn, Ba, Sr}$ 鐵氧體或 $\mathrm{Sc-, Co-}$ ，或 $\mathrm{Ti-}$ 取代的具有石榴石結構的六方鐵氧體製成。

The shortcoming of these methods is the loss of the signal, its distortion, a change of the natural background, inconvenience, and complexity of use.

這些方法的缺點是信號損失、信號失真、自然背景的改變，以及使用上的不便和複雜性。

Before proceeding to the description of the invention, it should be noted that all methods for protecting a biological object from technogenic EM radiation come down to reducing the intensity of the EM pulse, reducing the exposure time, or increasing the distance from the biological object to the radiation source, which leads to inconvenience or the inability to properly use the source of EM radiation, especially when using it to transmit large amounts of information.

在進入發明說明之前，應當指出，所有保護生物體免受人工電磁輻射的方法，歸根究底都是降低電磁脈衝的強度、縮短暴露時間，或增加生物體與輻射源之間的距離，這些措施往往導致使用上的不便，甚至無法妥善利用電磁輻射源，尤其是在用於傳輸大量資訊時。

SUMMARY OF INVENTION 發明摘要

The task for which the claimed invention is intended is to protect a biological object, in particular the human body, from the negative influence of technogenic EM radiation of a wide range of frequencies without reducing the effectiveness of the sources generating it and without imposing additional requiremlents on them.

本發明所聲稱的任務是保護生物體，特別是人體，免受寬頻率範圍內人為電磁輻射的負面影響，同時不降低產生該輻射源的效能，且不對其施加額外要求。

In this aspect, it is most rational to change the structure of the EM pulse arising from the radiation source, transforming it into a form safe for the BO , without losing its effectiveness.

在這方面，最合理的做法是改變輻射源產生的電磁脈衝結構，將其轉化為對生物體安全的形式，而不損失其效能。

The restructuring of technogenic EM radiation in the proposed method implies changing its amplitude-frequency spectrum from an arbitrary form to a coherent form through the influence of a coherent field created by a transformer

所提出方法中對人為電磁輻射的重構，意味著通過變壓器所創造的相干場影響，將其振幅頻譜從任意形式轉變為相干形式。

that initiates the process of counter-harmonization of amplitudes, phases, frequencies, polarization vectors, and the EM radiation incident on it.

該變壓器啟動了振幅、相位、頻率、偏振向量及入射電磁輻射的反諧波化過程。

This process, which is implemented by using a coherent transformer (resonator), is proven and protected (Russian Federation Patent No. 2231137, No. 2217181 , No. 2284062) and is later described in more detail.

此過程是透過使用相干變壓器（諧振器）來實現，已被證明並受保護（俄羅斯聯邦專利號 2231137、2217181、2284062），後文將有更詳細的描述。

The coherent transformer can be placed on the biological object BO , next to it, on the source of technogenic radiation, or between the BO and the source (FIG. 1).

相干變壓器可以放置於生物物體（BO）上、其旁邊、在技術性輻射源上，或置於 BO 與輻射源之間（見圖 1）。

DESCRIPTION OF DRAWINGS 圖示說明

In order to understand the invention better and appreciate its practical applications, the following pictures are provided and referenced. Figures are given as examples only and in no way shall limit the scope of the invention.

為了更好地理解本發明並體會其實際應用，提供並引用以下圖片。圖示僅作為範例，絕不限制本發明的範圍。

FIG. 1 depicts that the coherent transformer placed on the biological object next to it, on the source of technogenic radiation, or between the biological object and the source.

圖 1 顯示相干轉換器放置於生物體旁、人工輻射源上，或位於生物體與輻射源之間。

FIG. 2 presents an image of a self-affine lattice fixed on a solid medium (FIG. 2a), and a photograph of the holographic response resulting from the incoherent EM radiation’s interaction with the slit topological surface of the lattice (FIG. 2b).

圖 2 顯示固定於固體介質上的自相似格子影像（圖 2a），以及非相干電磁輻射與格子狹縫拓撲表面相互作用所產生的全息響應照片（圖 2b）。

FIG. 3 depicts a wafer of silicon carbide (SiC), which is a source of coherent, nearly monochrome radiation at a distance of 100 nm from the surface of the wafer.

圖 3 描繪一片碳化矽（SiC）晶片，該晶片在距離晶片表面 100 奈米處發出相干、近單色的輻射源。

FIG. 4 depicts affine transformations of a vector.

圖 4 描繪向量的仿射變換。

FIG. 5 is the result of performing affine transformations.

圖 5 是執行仿射變換後的結果。

FIG. 6 depicts appearance of a self-affine structure.

圖 6 顯示自相似結構的外觀。

FIG. 7 modeling result for incident radiation with a frequency of 2 periods per 1 rotation by the angle φ; FIG 7a - amplitude; FIG 7b - phase.

圖 7 為入射輻射頻率為每轉 1 角度 φ 2 週期的模擬結果；圖 7a - 振幅；圖 7b - 相位。

FIG. 8 is presented periodic behavior of incident radiation of 64 periods per 1 rotation by angle φ. FIG 8a - amplitude; FIG 8b - phase.

圖 8 顯示入射輻射頻率為每轉 1 角度 φ 64 週期的週期性行為。圖 8a - 振幅；圖 8b - 相位。

FIG. 9 is presented distribution of strength E across the wafer's surface under the steady state; various projections.

圖 9 顯示穩態下晶圓表面強度 E 的分佈；多種投影。

FIG. 10 is presented distribution of the amplitude's spectral power density on the wafer's surface through time $t > t_{\text{est.}}$ FIG 10a - amplitude; FIG 10b phase.

圖 10 展示了晶圓表面振幅頻譜功率密度隨時間的分佈 $t > t_{\text{est.}}$ 圖 10a - 振幅；圖 10b 相位。

FIG. 11 is presented result of the experiment while illuminating the surface of the resonator's wafer by a halogen lamp.

圖 11 展示了用鹵素燈照射諧振器晶圓表面的實驗結果。

FIG. 12 is presented the resonator's surface lying in plane $x0y$ with the origin at the center of the resonator. The z-axis is orthogonal to this plane.

圖 12 展示了位於平面 $x0y$ 上的諧振器表面，原點位於諧振器中心。 z 軸垂直於此平面。

FIG. 13 presents influence on 3 points with an ungrounded center.

圖 13 展示了對三個點的影響，中心未接地。

FIG. 14 is presented electric field strength above the resonator. Development of a spatial wave from the surface of the resonator (lower graph), side view.

圖 14 為共振器上方的電場強度。共振器表面空間波的發展（下方圖表），側視圖。

FIG. 15 is the strength distribution over height, to a height of 0.03 mm , with influence on 3 points with an ungrounded center.

圖 15 為高度分佈的強度，至 0.03 毫米高度，影響三個點且中心未接地。

FIG. 16 is impulse effect on two opposite points with ungrounded resonator center.

圖 16 為對兩個相對點的脈衝作用，且共振器中心未接地。

FIG. 17 is electric field strength above the resonator. Development of a spatial wave from the surface of the resonator (lower graph), side view.

圖 17 為共振器上方的電場強度。共振器表面空間波的發展（下方圖表），側視圖。

FIG. 18 is electric field strength on the surface of the resonator (lower graph, $z = 0$) and so on in layers above the surface: 0.1 mm; 0.2 mm; 0.3 mm.

圖 18 為共振器表面（下方圖表， $z = 0$）及表面以上各層： 0.1 mm; 0.2 mm; 0.3 mm 的電場強度。

FIG. 19 is electric field strength for the steady state, when using a resonator with a double-sided design, side view.

圖 19 為使用雙面設計共振器時，穩態下的電場強度，側視圖。

FIG. 20 is electric field strength: (a) on the resonator's surface; (b) at a distance of 0.1 mm above the surface of the resonator; © at a distance of 0.2 mm ; (d) at a distance of 0.3 mm ; (e) at a distance of 0.4 mm ; (f) at a distance of 0.5 mm ; (g) at a distance of 0.6 mm ; (h) at a distance of 0.7 mm ; (i) at a distance of 0.8 mm ; (k) at a distance of 0.9 mm ; (l) at a distance of 1 mm ; (m) at a distance of 1.1 mm ; (n) of at a distance 1.2 mm ; (o) at a distance of 1.3 mm ; § at a distance of

1.4 mm ; ® at a distance of 1.5 mm ; (s) at a distance of 1.6 mm ; (t) at a distance of 1.7 mm .

圖 20 為電場強度：(a) 共振器表面；(b) 共振器表面上方 0.1 毫米處；(c) 0.2 毫米處；(d) 0.3 毫米處；(e) 0.4 毫米處；(f) 0.5 毫米處；(g) 0.6 毫米處；(h) 0.7 毫米處；(i) 0.8 毫米處；(k) 0.9 毫米處；(l) 1 毫米處；(m) 1.1 毫米處；(n) 1.2 毫米處；(o) 1.3 毫米處；(§) 1.4 毫米處；(®) 1.5 毫米處；(s) 1.6 毫米處；(t) 1.7 毫米處。

FIG. 21 presents dynamics of changes in the strength of the field above the wafer.

圖 21 呈現晶片上方場強變化的動態。

FIG. 22 presents distribution of field strength E above the resonator from 0.28 to $14.18(\mathrm{~V/m})$ with incident radiation at 2.4 GHz ;

圖 22 顯示了在 2.4 GHz 入射輻射下，諧振器上方從 0.28 到 $14.18(\mathrm{~V/m})$ 的場強 E 分佈；

FIG. 23 presents distribution of field intensity I above the resonator from 0.08 to $201.05\left(\mathrm{~W/m^2}\right)$ with incident radiation at 2.4 GHz .

圖 23 顯示了在 2.4 GHz 入射輻射下，諧振器上方從 0.08 到 $201.05\left(\mathrm{~W/m^2}\right)$ 的場強度 I 分佈。

FIG. 24 presents simplified versions of planar projections of the spatial structural-holographic self-affine matrix of the resonator’s coherently transforming field response.

圖 24 展示了諧振器相干轉換場響應的空間結構全息自相似矩陣的平面投影簡化版本。

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

優選實施例的詳細說明

The claimed method is based on self-affine holographic objects’ ability to transform the EM pulses interacting with them according to their characteristics.

所述方法基於自相似全息物體根據其特性轉換與之相互作用的電磁脈衝的能力。

Holography (from ancient Greek: ödos - whole, γpá $\varphi\omega$ - I writing) is based on two physical phenomena - diffraction and interference of EM waves. The physical idea is that under the imposition of several wave pulses, under certain conditions, an interference pattern occurs, that is, a spatial regular system of maxima and minima of the intensity of electromagnetic radiation in the form of a stationary field having a fractal self-affine structure.

全息術（源自古希臘語：ὅλος - 整體，γραφή - 我書寫）基於兩種物理現象——電磁波的繞射與干涉。其物理理念是，在多個波脈衝疊加下，在特定條件下會產生干涉圖樣，即一種空間規律的電磁輻射強度最大值與最小值的系統，呈現出具有分形自相似結構的靜態場。

According to contemporary scientific concepts, when interacting with external EM radiation, any regular structure creates a periodic EM field (superposition).

根據當代科學觀念，任何規則結構在與外部電磁輻射相互作用時，都會產生週期性的電磁場（疊加現象）。

In order for this interference pattern to be stable for the time necessary to observe, and in order for it to be recorded, these EM pulses must be harmonized spatially and temporally across frequencies and amplitudes. Such EM waves are called coherent.

為了使該干涉圖樣在觀察所需時間內保持穩定，並能被記錄，這些電磁脈衝必須在頻率與振幅上空間與時間上協調一致。這樣的電磁波稱為相干波。

Based on the principle of superposition, if EM waves coincide in phase, then they add with each other and produce a resultant wave with an amplitude equal to the sum of their amplitudes. If they meet in antiphase, then they cancel each other out. If two opposite EM pulses are identical in phase, amplitude, frequency, and polarization vectors, then their amplitudes are multiplied.

根據疊加原理，若電磁波相位相合，則它們會相互相加，產生一個振幅等於各自振幅總和的合成波。若它們相位相反，則會相互抵消。若兩個相反的電磁脈衝在相位、振幅、頻率及偏振向量上完全相同，則其振幅會相乘。

The resulting interaction of two coherent waves is a fractal standing wave. That is, the interference pattern will be stable in time (phase), in amplitude (power), polarization vector (direction), and frequency (stability). Since any fractal

兩個相干波的相互作用結果是一個分形駐波。也就是說，干涉圖樣在時間（相位）、振幅（功率）、偏振向量（方向）及頻率（穩定性）上都將保持穩定。由於任何分形

construct is a self-affine structure, that is, formed from its own analogues, this property underlies the production and restoration of holograms in its individual fragments.

結構都是一種自相似結構，也就是由其自身的類似結構所組成，這一特性是其個別片段中全息圖製作與還原的基礎。

To obtain a holographic response, the resonator must either itself have the ability to transform the radiation incident on it into a coherent form, or the incident radiation must initially be coherent. The hologram arising from the resonator carries not only the same characteristics and properties as the radiation incident on the resonator, but also the specific features of the resonator topology itself. As a result, if the resonator initiates a coherent transformation of incoherent EM radiation incident on it, the resulting hologram has the same ability to transform an EM pulse of the corresponding frequency range that interacts with it into a coherent state.

要獲得全息響應，諧振器本身必須具備將入射輻射轉換為相干形式的能力，或者入射輻射本身必須是相干的。由諧振器產生的全息圖不僅攜帶與入射輻射相同的特性和屬性，還包含諧振器拓撲結構本身的特定特徵。因此，若諧振器對入射的非相干電磁輻射啟動相干轉換，所產生的全息圖便具備將與之相互作用的相應頻率範圍內的電磁脈衝轉換為相干狀態的能力。

The strength and intensity of the coherent field fall in proportion to the square of the distance from the resonator. Thus, the given EM field can transform EM radiation interacting with it into a coherent form, if its strength and intensity is not lower than the strength and intensity of the opposite radiation. Such interaction is possible due to the fractality of the resonator, not only when the frequencies coincide, but also when they are similar at multiple scales.

相干場的強度與強度隨距離諧振器的平方成反比下降。因此，若該電磁場的強度和強度不低於相反輻射的強度和強度，則該電磁場能將與之相互作用的電磁輻射轉換為相干形式。這種相互作用的可能性源於諧振器的分形特性，不僅在頻率相同時發生，也在多尺度上頻率相似時發生。

FIG. 2 presents an image of a self-affine lattice fixed on a solid medium (FIG. 2a), and a photograph of the holographic response resulting from the incoherent EM radiation's interaction with the slit topological surface of the lattice (FIG. 2b).

圖 2 展示了一個固定在固體介質上的自相似格子影像（圖 2a），以及由非相干電磁輻射與格子狹縫拓撲表面相互作用所產生的全息響應照片（圖 2b）。

It is known that coherence (cohaerens - in communication) is the harmonized flow in time and in space of several oscillatory processes.

眾所周知，相干（cohaerens—在通訊中）是多個振盪過程在時間和空間上的協調流動。

The term "coherence" means the absence of conflicts, consistency, and communication. When applied to EM radiation, it refers to consistency and communication between EM oscillations and waves. Because radiation is distributed across time and space, it is possible to estimate the coherence of oscillations radiated by a source at various points in time at any particular point in space, as well as the coherence of oscillations radiated at a particular point in time at various points in space [8]. Oscillations are called fully coherent if the difference of their phases at the observation point remains constant in time and, when these oscillations are added, determines the amplitude and intensity of the summed

「相干」一詞意指無衝突、一致性與連結。應用於電磁輻射時，指的是電磁振盪與波之間的一致性與連結。由於輻射分布於時間與空間中，因此可以估算在空間特定點於不同時間點由源輻射出的振盪相干性，以及在特定時間點於不同空間點輻射出的振盪相干性[8]。當觀察點的振盪相位差隨時間保持不變，且這些振盪相加時決定了總振幅與強度，則稱該振盪為完全相干。

(resulting) oscillation. Oscillations (waves) are called partially coherent if the difference of their phases changes very slowly (compared with the observation time), and incoherent if the phase difference changes randomly.

（產生的）振盪。當振盪（波）的相位差變化非常緩慢（相較於觀察時間）時，稱為部分相干；若相位差隨機變化，則稱為非相干。

Thus, "coherence" means consistency and communication between EM oscillations. EM radiation is distributed across time and space, so it is possible to estimate the coherence of oscillations radiated by a source at various points in time at any particular point in space (temporal coherence) or the coherence of oscillations radiated at a particular point in time at various points in space (spatial coherence). These properties lead to the conclusion that energy losses at a point of coherent radiation are minimized.

因此，「相干性」意指電磁振盪之間的一致性與相互作用。電磁輻射分布於時間與空間中，因此可以估算在空間特定點於不同時間輻射出的振盪相干性（時間相干性），或在特定時間於不同空間點輻射出的振盪相干性（空間相干性）。這些特性導致結論：在相干輻射點的能量損失被最小化。

An example of obtaining coherent radiation using a novel approach is creating regular structures on the surface of solids. These structures then act as resonators. An example of this approach [9] is the use of a SiC wafer with a regular structure in the form of parallel grooves, which initiates the production of coherent radiation with a peak at the corresponding wavelength (FIG. 3).

利用新穎方法獲得相干輻射的例子是於固體表面製造規則結構。這些結構隨後充當諧振器。此方法的例子[9]是使用具有平行溝槽規則結構的 SiC 晶片，該結構啟動在相應波長處產生峰值的相干輻射（圖 3）。

Of interest is the case where it would be possible to generate EM oscillations on not a single frequency, but a wide range of frequencies, while preserving interrelationships between them such that they remain coherent, not only in time, but also in space, like a laser. To do this, we need to use, as a foundation, a certain resonator on a planar substrate, similar to the given example, but with a topographical surface in the form of fractally arranged circles with specific interrelationships.

值得關注的是，若能在非單一頻率，而是在寬頻範圍內產生電磁振盪，並保持它們之間的相互關係，使其不僅在時間上，且在空間上也保持相干，如同雷射一般，將會是非常有趣的情況。為此，我們需要以某種平面基板上的共振器作為基礎，類似於所給的範例，但其拓撲表面呈現以分形排列的圓形，並具有特定的相互關係。

A device that generates coherent radiation with such properties would find application in a diversity of fields, including for spatial encoding of data, because it can transform incident radiation into a coherent form with properties containing information about the incident radiation.

具備此類特性的相干輻射產生裝置，將可應用於多種領域，包括用於資料的空間編碼，因為它能將入射輻射轉換成具有包含入射輻射資訊特性的相干形式。

So-called self-affine structures generated in the form of annular slits open unexpected possibilities for use in scientific research and technology. In [1] a selfaffine fractal is defined as a structure that is invariant after simultaneous yet quantitatively different changes in the scale along different spatial axes. The affine transformation of a vector from the origin to point (x_1, y_1), to a vector from point (b_1, b_2) to point (x_2, y_2) is defined as:

所謂的自相似結構以環狀狹縫的形式產生，為科學研究與技術應用開啟了意想不到的可能性。在文獻[1]中，自相似分形被定義為在不同空間軸向上同時但數量上不同的尺度變化後仍保持不變的結構。從原點到點（ x_1, y_1 ）的向量，經仿射變換至從點（ b_1 ， b_2 ）到點（ x_2, y_2 ）的向量，其定義為：

$$x_2 = a_{11}x_1 + a_{12}y_1 + b_1$$
$$y_2 = a_{21}x_1 + a_{22}y_1 + b_2$$

System (1) can be represented as a matrix:

系統（1）可表示為矩陣：

$$T = \begin{bmatrix} a_{11} & a_{12} & b_1 \\ a_{21} & a_{22} & b_2 \end{bmatrix}$$

and illustrated in FIG. 4.

如圖 4 所示。

Affine transformations can also define a rotation by angle a about the origin.

仿射變換也可以定義以原點為中心，旋轉角度為 a 的旋轉。

After performing transformations representing the multiplication of points of the figure by the scale factor $m_1 = 2^i$ and rotations by an angle proportional to the coefficient $m_2 = 2^j$, and overlaying the original drawing, we obtain the figure shown in FIG. 5.

在對圖形的點進行乘以比例因子 $m_1 = 2^i$ 及按係數 $m_2 = 2^j$ 成比例的角度旋轉的變換後，並將原始圖形疊加，我們得到如圖 5 所示的圖形。

The appearance of such a structure is presented in FIG. 6.

此結構的外觀如圖 6 所示。

Modeling. During the modeling, a stationary model and two-dimensional and three-dimensional non-stationary models were analyzed.

建模。在建模過程中，分析了靜態模型以及二維和三維非靜態模型。

Stationary model. For the stationary case, the interaction of EM radiation waves with the wafer's surface can be written as follows:

靜態模型。對於靜態情況，電磁輻射波與晶圓表面的相互作用可表示如下：

$$\frac{\partial^2 \mathbf{E}}{\partial \varphi^2} + \frac{\partial^2 \mathbf{E}}{\partial \gamma^2} = \left(h^2 - \varepsilon \left(\frac{a}{c} \right)^2 \right) \mathbf{E}$$

where k is the wave number, ε is the wafer's dielectric constant, ω is the cyclic frequency, c is the speed of light; r is the length of the radius vector, φ is the polar angle, $\mathbf{E}$ is the electric component of the strength vector.

其中 k 是波數， ε 是晶圓的介電常數， ω 是週期頻率， c 是光速； r 是半徑向量長度， φ 是極角， $\mathbf{E}$ 是強度向量的電場分量。

The following type of model was used during modeling:

建模過程中使用了以下類型的模型：

$$\frac{\partial^2 E}{\partial \varphi^2} + \frac{\partial^2 E}{\partial r^2} = -a^2 E - b$$

where E is a function proportional to the strength of the radiation; r is the length of the radius vector, φ is a polar angle, a and b are constants.

其中 E 是與輻射強度成正比的函數； r 是半徑向量的長度， φ 是極角， a 和 b 是常數。

During calculations on a computer, the radiation's periodic behavior was changed relative to the size of the wafer, when the wavelength of the incident radiation and the periodic behavior of the resonator's surface pattern were compared, taking into account its dimensions.

在電腦計算過程中，當比較入射輻射的波長與諧振器表面圖案的週期行為並考慮其尺寸時，輻射的週期性行為相對於晶圓的大小發生了變化。

The obtained modeling results, shown in the figures FIG. 7 and FIG. 8, show that the strength of the electric field, after interacting with the self-affine fractal lattice, is redistributed so that the graphs of the field distribution over the surface become regular, a trait that remains almost unchanged when changing the frequency of the incident radiation over a wide range.

所得的模擬結果如圖 FIG. 7 和 FIG. 8 所示，顯示電場強度在與自相似分形晶格相互作用後被重新分配，使得表面上的場分佈圖變得規則，且在入射輻射頻率在寬廣範圍內變化時，該特性幾乎保持不變。

Non-stationary model. The fractal served as the foundation for building the mathematical model.

非穩態模型。分形結構作為建立數學模型的基礎。

The rings on the surface are grooves about 1.3 microns deep and 1μ m wide. The minimum distance between the "grooves" is 1μ m. The wafer's outer diameter was 6 mm . When interacting with the conductor, an electric field causes charges to shift and increases the concentration of charges in the “grooves” relative to adjacent areas.

表面上的環狀結構是深約 1.3 微米、寬度為 1μ m 的溝槽。「溝槽」之間的最小距離為 1μ m 。晶圓的外徑為 6 毫米。當與導體相互作用時，電場會使電荷移動，並使「溝槽」中的電荷濃度相較於相鄰區域增加。

Therefore, during modeling, it was assumed that the medium’s charges would be concentrated more in the “grooves” than in other areas. When the potential reaches some critical value, there is a discharge along the shortest distance between the grooves.

因此，在建模過程中，假設介質中的電荷會較多集中在「溝槽」中，而非其他區域。當電位達到某個臨界值時，會沿著溝槽之間最短距離發生放電。

Non-stationary two-dimensional model. In this case, the mathematical model looks like this:

非穩態二維模型。在此情況下，數學模型如下所示：

$$\frac{\partial E}{\partial t} = D\left(\frac{\partial^2 E}{\partial x^2} + \frac{\partial^2 E}{\partial y^2}\right) - aE$$

where D and a are coefficients, E is the electric field’s strength, x and y are coordinates, and t is time. The discharge criteria is implemented as follows: if $|E| > E_{rp}$, then $E = 0$.

其中 D 和 a 為係數， E 為電場強度， x 和 y 為座標， t 為時間。放電條件實現如下：若 $|E| > E_{rp}$ ，則 $E = 0$ 。

The main result of the modeling is that regardless of the conditions at the boundary, the steady-state solution is stable and soliton-like. Its shape does not change with changing boundary conditions. This means that the resonator’s selfaffine surface transforms radiation in such a way that the result of this process does not depend on the characteristics of the radiation incident on it.

模擬的主要結果是，無論邊界條件如何，穩態解都是穩定且類似孤立子。其形狀不會隨邊界條件的變化而改變。這意味著共振器的自相似表面以一種方式轉換輻射，使得該過程的結果不依賴於入射輻射的特性。

The results of the calculations for the two-dimensional model (5) are given in the figures FIG. 9 and FIG. 10. FIG. 9 shows distribution of strength E across the wafer’s surface under the steady state; various projections. FIG. 10 shows

二維模型（5）的計算結果如圖 FIG. 9 和 FIG. 10 所示。FIG. 9 顯示了穩態下晶圓表面強度 E 的分佈；各種投影。FIG. 10 顯示了

distribution of the amplitude’s spectral power density on the wafer’s surface through time $\gg$ test. Amplitude is presented in FIG. 10a, phase - in FIG. 10b.

晶圓表面振幅的頻譜功率密度隨時間 $\gg$ 測試的分佈。振幅見 FIG. 10a，位相見 FIG. 10b。

For comparison, the result of the experiment while illuminating the wafer’s surface (illuminating the surface of the resonator’s wafer by a halogen lamp) is presented in FIG. 11. The figure clearly shows a luminous “scaly” dome (hologram), similar to the results of a computational experiment.

作為比較，圖 FIG. 11 展示了用鹵素燈照射晶圓表面（照射共振器晶圓表面）的實驗結果。圖中清晰顯示出一個發光的「鱗片狀」穹頂（全息圖），與計算實驗的結果相似。

Non-stationary three-dimensional model. A three-dimensional model was considered:

非靜態三維模型。考慮了一個三維模型：

$$\frac{\partial E}{\partial t} = D\left(\frac{\partial^2 E}{\partial x^2} + \frac{\partial^2 E}{\partial y^2} + \frac{\partial^2 E}{\partial z^2}\right) - aE$$

Technically, this model only differs from the two-dimensional model by the presence of a third spatial coordinate z. However, this makes it possible to create a more complete representation of the interaction of the self-affine topological surface with radiation, and obtain the spatial distribution of strength E. The resonator’s surface lies in plane $x0y$ with the origin at the center of the resonator and the z-axis is orthogonal to this plane (FIG. 12).

從技術上來說，這個模型與二維模型的唯一区別在於多了一個第三個空間座標 z 。然而，這使得能夠更完整地呈現自相似拓撲表面與輻射的相互作用，並獲得強度的空間分佈 E 。共振器的表面位於平面 $x0y$ 上，原點設在共振器的中心，且 z 軸與該平面垂直（見圖 12）。

Impulse effect on three opposite points with an ungrounded resonator

未接地諧振器對三個相對點的脈衝作用

center. Result of modeling with an impulse effect on three points positioned at an angle of 120° from each other (FIG. 13).

中心。對三個彼此成 120° 角度位置的點施加脈衝作用的模擬結果（圖 13）。

The graphs of the distribution of the electric field strength above the resonator in the figure FIG. 14. Development of a spatial wave from the surface of the resonator (lower graph) is provided by the side view. The graphs were made for heights z above the surface of the resonator, from $z = 0$, lower graph, to $z = 0.02$ mm for the last, upper graph. The wave attenuates after a height of 0.02 mm .

圖 FIG. 14 中共振器上方電場強度分佈的圖表。共振器表面空間波的發展（下方圖表）由側視圖呈現。圖表繪製於共振器表面以上的高度 z ，從 $z = 0$ （下方圖表）到 $z = 0.02$ 毫米（最上方圖表）。波在高度 0.02 毫米後衰減。

The figure FIG. 15 also illustrates the strength distribution over height, to a height of 0.03 mm , with influence on 3 points with an ungrounded center.

圖 FIG. 15 也展示了高度分佈的強度，至 0.03 毫米 高度，影響三個無接地中心點。

Impulse effect on two opposite points with ungrounded resonator

對兩個相對點施加脈衝效應，且共振器未接地

center. The field acts on diametrically opposite points on the surface of the resonator, which lie in the middle of the radii, a two-sided circuit (FIG. 16).

中心。場作用於共振器表面直徑相對的點，這些點位於半徑中間，為雙面電路（FIG. 16）。

One of the modeling results is presented in FIG. 17 where electric field strength above the resonator is shown. This shows the development of a spatial wave from the surface of the resonator (lower graph), side view. The graphs of the

其中一個模擬結果呈現在 FIG. 17，顯示共振器上方的電場強度。此圖展示了從共振器表面發展出的空間波（下方圖表），側視圖。圖表的

distribution of the electric field strength in the figure were made for heights z above the surface of the resonator, from $z = 0$, lower graph, to $z = 0.2$ mm for the last, upper graph. The wave attenuates above a distance of 0.2 mm .

圖中電場強度的分佈是在共振器表面以上高度 z 處測量，從 $z = 0$ （下方圖表）到 $z = 0.2$ mm （最後一個上方圖表）。波在距離 0.2 毫米以上時衰減。

The figure FIG. 18 also illustrates the strength by height in the same sections from different positions. Electric field strength on the surface of the resonator (lower graph, $z = 0$) and so on in layers above the surface: 0.1 mm ; 0.2 mm; 0.3 mm. When $z > 0.2$ mm, the wave decays.

圖 18 同時展示了不同位置相同截面中隨高度變化的強度。共振器表面（下方圖表， $z = 0$ ）的電場強度，以及表面以上各層：0.1 毫米； 0.2 mm; 0.3 mm 。當達到 $z > 0.2$ mm 時，波開始衰減。

Above the coordinate $z = 0.2$ mm, the electric field strength becomes very small. The figure shows that it extends in breadth and the strength magnitude drops sharply with distance from the origin.

在座標 $z = 0.2$ mm 以上，電場強度變得非常微弱。圖中顯示其寬度延展，且強度隨距離原點的增加急劇下降。

and two-sided circuit. The development of an electric field during rotation and given influence on two opposite points on both sides of the resonator was investigated. The figure FIG. 19 presents the results of the calculation for the steady state, for a side view.

以及雙面電路。研究了旋轉過程中電場的發展及其對諧振器兩側兩個相對點的影響。圖 FIG. 19 展示了穩態下的計算結果，為側視圖。

The figures FIG. 20 from FIG. 20a to FIG.20t present the same result layer by layer for heights from 0 mm to 1.7 mm above the resonator's surface.

圖 FIG. 20 從 FIG. 20a 到 FIG. 20t 分別呈現了從諧振器表面上方 0 毫米到 1.7 毫米高度的分層結果。

The figure FIG. 21 presents the results of modeling using a threedimensional non-stationary model (6), i.e., dynamics of changes in the strength of the field above the waffer. The upper left figure is time moment 1 . The middle left figure is time moment 2 . The lower left figure is time moment 3 . The upper right figure is time moment 4 . The middle right figure is time moment 5 , and the lower right figure is time moment 6.

圖 FIG. 21 展示了使用三維非穩態模型（6）進行建模的結果，即晶圓上方電場強度變化的動態。左上圖為時間點 1，左中圖為時間點 2，左下圖為時間點 3，右上圖為時間點 4，右中圖為時間點 5，右下圖為時間點 6。

The change in the development of the wave along the z-axis, which is orthogonal to the wafer's surface, can be seen clearly in the figures FIG. 22 and FIG. 23. The wafer is located on the left and occupies the position whose borders are denoted in the middle left figure by two bars. Given a wafer with a diameter of 6 mm , the wavelength along the z-axis is approximately 1.1 mm . The radiation incident upon the wafer was white noise. FIG. 22 shows distribution of field strength E above the resonator from 0.28 to $14.18(\mathrm{~V/m})$ with incident radiation at 2.4 GHz. FIG. 23 shows distribution of field intensity I over the resonator from 0.08 to $201.05\left(\mathrm{~W/m^2}\right)$ with incident radiation at 2.4 GHz .

沿著與晶圓表面正交的 z 軸波動發展的變化，在圖 FIG. 22 和 FIG. 23 中清晰可見。晶圓位於左側，佔據中左圖中由兩條線標示邊界的位置。以直徑為 6 毫米的晶圓為例，沿 z 軸的波長約為 1.1 毫米。照射在晶圓上的輻射為白噪音。圖 FIG. 22 顯示了在 2.4 GHz 入射輻射下，諧振器上方場強 E 從 0.28 到 $14.18(\mathrm{~V/m})$ 的分布。圖 FIG. 23 顯示了在 2.4 GHz 入射輻射下，諧振器上場強度 I 從 0.08 到 $201.05\left(\mathrm{~W/m^2}\right)$ 的分布。

Thus, the self-affine surface topography transforms the radiation incident on it into a coherent form, even for a wide range of frequencies.

因此，自相似表面形貌將照射在其上的輻射轉換為相干形式，即使在寬頻率範圍內亦是如此。

It was shown in [1] that a coherent transformer, when excited by EM radiation, forms a stationary, multi-frequency coherent wave (hologram) in space, which is stable and soliton-like regardless of the boundary conditions [2]. Its shape does not change with changing boundary conditions. This means that the result of this transformation does not depend on the characteristics of the radiation incident on it.

在文獻[1]中已證明，當相干變壓器受到電磁輻射激發時，會在空間中形成一個穩定的多頻率相干波（全息圖），其特性類似孤子，且不受邊界條件影響[2]。其形狀不會隨邊界條件的改變而改變。這意味著此轉換的結果不依賴於入射輻射的特性。

Our experiments have demonstrated that a semiconducting wafer with a self-affine topography on its surface transforms a broad spectrum of incident radiation into a coherent form. It redistributes the incident radiation in terms of its wavelength as well as its phase, in accordance with its topography. Its use opens up fundamentally new opportunities for creating a variety of devices:

我們的實驗顯示，表面具有自相似拓撲結構的半導體晶片，能將寬頻譜的入射輻射轉換為相干形式。它根據其拓撲結構，重新分配入射輻射的波長及相位。其應用開啟了創造各種裝置的根本新機會：

coherent transformers that harmonize the interaction of several wave fronts;

能協調多個波前相互作用的相干變壓器；

broadband resonators with distribution of energy through a space that is self-similar and carries information about the amplitude, wavelength, and phase of incident radiation.

具有能量分布於自相似空間的寬頻共振器，該空間攜帶有關入射輻射振幅、波長及相位的信息。

This development will find application in the form of a protective device that transforms external radiation, including 5G communication systems (3.5-28 GHz), into a form that is harmonized with the inherent radiation of an organism's cells, thus making it safe for a biological object.

該技術將以一種保護裝置的形式應用，該裝置能將外部輻射，包括 5G 通訊系統（3.5-28 GHz），轉化為與生物體細胞固有輻射相協調的形式，從而使其對生物體安全無害。

Based on the fact that biological objects are open physical systems that have an EM nature and function under conditions of constant exchange of energy and matter with the environment, they have a specific design for fixing the set of the molecular structural lattice's nodal centers, which are interconnected in a unified spatial matrix. Since the molecular structural lattice reflects a specific model of the fundamental interrelationships of the object, it is possible to consider the biological organization as an organization that initiates a constant EM superposition. This superposition is able to react by means of its own resonance to any particular

基於生物體是開放的物理系統，具有電磁性質，並在與環境持續交換能量和物質的條件下運作，它們擁有一種特定的結構，用以固定分子結構晶格節點中心的集合，這些節點在統一的空間矩陣中相互連結。由於分子結構晶格反映了物體基本相互關係的特定模型，因此可以將生物組織視為一種啟動持續電磁疊加的組織。

external impulse, causing changes in the molecular structure that gave rise to it, making it possible to have a targeted effect on the biological object.

這種疊加能夠通過自身的共振對任何特定的外部脈衝作出反應，導致引發該脈衝的分子結構發生變化，從而實現對生物體的定向作用。

As a result of the counter-harmonization of technogenic radiation interacting with the BO's own electromagnetic radiation, which is a superposition of cellular metabolism processes, the coherent transformer used in this method initiates optimization of the organism's adaptive physiological characteristics, thereby making the interaction conflict-free, which is proven by experimental data.

由於技術性輻射與生物體自身電磁輻射（細胞代謝過程的疊加）之間的反諧波作用，本方法中使用的相干轉換器啟動了生物體適應性生理特徵的優化，從而使相互作用無衝突，這一點已由實驗數據證實。

The essence of the claimed method is as follows.

所聲明方法的本質如下。

The method for protecting biological objects from the negative influence of technogenic EM radiation in a wide range of frequencies, which includes creating around a biological object (BO) or between it and the source of technogenic EM radiation a special EM field in the form of a fractal coherent matrix (hologram), using a fractal-matrix coherent transformer to create the field.

保護生物體免受技術性電磁輻射負面影響的方法，涵蓋在生物體周圍或其與技術性電磁輻射源之間創建一種特殊的電磁場，該電磁場呈現為分形相干矩陣（全息圖），並利用分形矩陣相干轉換器來產生此場。

The coherent transformer used is a self-affine lattice (resonator), formed from circular topological lines, creating a slit-like raster.

所使用的相干轉換器是一種自相似晶格（諧振器），由圓形拓撲線構成，形成狹縫狀的光柵。

The resonator's structural lattice is a Fourier transformer that harmonizes the amplitudes, phases, frequencies and polarization vectors of external technogenic radiation and the BO's inherent EM radiation. The coherent field that forms around the resonator resonates with the surrounding EM waves, including with the inherent radiation of the human body's biological cells, transforming it into a consistent form, and makes the interaction conflict-free.

諧振器的結構晶格是一個傅立葉變換器，能協調外部技術性電磁輻射與生物物體固有電磁輻射的振幅、相位、頻率及偏振向量。環繞諧振器形成的相干場與周圍的電磁波共振，包括人體生物細胞的固有輻射，將其轉化為一致的形式，使相互作用無衝突。

The resonator's coherently transforming impulse forms a spatial matrix whose multilevel gradation is a set of annular raster lattices symmetric with at least the three orthogonal basis vectors X, Y, Z with a subsequent release to multidimensionality N and with the formation of a spatial monostructural form with an infinite number of inherent components satisfying Noether's theorem, which requires the formation of the maximum spatial symmetry of the object's field structure, and the condition of interaction in the form of a self-affine hypersphere.

諧振器相干轉換的脈衝形成一個空間矩陣，其多層次分級是一組環狀光柵晶格，至少與三個正交基向量 $\mathrm{X}, \mathrm{Y}, \mathrm{Z}$ 對稱，隨後釋放至多維度 N，並形成一個具有無限固有組件的空間單結構形式，滿足諾特定理，該定理要求形成物體場結構的最大空間對稱性，以及以自相似超球體形式的相互作用條件。

$$\sum_{k=1}^{n} X^k + \sum_{k=1}^{n} Y^k + \sum_{k=1}^{n} Z^k + \cdots + \sum_{k=1}^{n} N^k - 0$$

where X, Y, Z, N are the fractalization vectors of the system of a annular self-affine circuit, $k = 1..n$ is the number of circuit elements.

其中 X, Y, Z, N 是環狀自相似電路系統的分形向量， $k = 1..n$ 是電路元件的數量。

According to the Noether theorem, each continuous symmetry of a physical system corresponds to a certain law of conservation. In our case, the symmetry of the diffraction grating, formed from annular topological lines, unambiguously forms a coherent EM field, which is a hologram as a stable wave structure. This is confirmed by the principle of holograms (D. Gabor - Yu.N. Denisyuk), according to which any wave superposition carries the same properties as the regular structure that generated it.

根據諾特定理，物理系統的每一個連續對稱性都對應著某種守恆定律。在我們的情況中，由環狀拓撲線形成的繞射光柵的對稱性，明確地形成了一個相干電磁場，該場作為穩定的波動結構即為全息圖。這一點由全息圖原理（D. Gabor - Yu.N. Denisyuk）所證實，該原理指出任何波的疊加都具有與產生它的規則結構相同的性質。

During the proposed exposure to a coherently transformed EM field, the complex of the wave characteristics of the inherent radiation of the cells of a biological object is brought into a resonant state that is determined by strict fractalmatrix schematization, which causes the system to respond. Such counterharmonization of the wave characteristics, by eliminating conflict, leads to the stabilization of all metabolic processes and, as a result, an increase in the BO's adaptive abilities under conditions of exposure to technogenic EM radiation [3, 4].

在所提議的暴露於相干轉換的電磁場期間，生物體細胞固有輻射的波動特性複合體被帶入由嚴格的分形矩陣示意圖決定的共振狀態，這使系統產生反應。這種波動特性的反諧波化，通過消除衝突，導致所有代謝過程的穩定，從而在暴露於人工電磁輻射的條件下，提高生物體的適應能力[3, 4]。

The wave characteristics and stabilization of the metabolic processes of the BO are harmonized by exposing it to an EM field coherently transformed by the resonator's self-affine annular grating. For the resonator's self-affine annular grating, we used the fractal-planar projection of a special spatial structuralholographic construction, fixed on a solid medium and formed from annular topological slit-like lines that create a raster (RF Patent No. 2231137, No. 2217181, No. 2284062).

生物體的波動特性與代謝過程的穩定性，通過暴露於由諧振器自相似環形光柵相干轉換的電磁場中而達成和諧。對於諧振器的自相似環形光柵，我們使用了一種特殊空間結構全息構造的分形平面投影，該構造固定於固體介質上，由環形拓撲狹縫狀線條形成光柵（俄羅斯專利號 2231137、2217181、2284062）。

The figures FIG. 24a and FIG. 24b show simplified versions of planar projections of the spatial structural-holographic self-affine matrix of the resonator's coherently transforming field response.

圖 24a 和圖 24b 顯示了諧振器相干轉換場響應的空間結構全息自相似矩陣的平面投影簡化版本。

The coherently transforming resonator can be made in various embodiments, depending on its location, and be directly on the BO (attached to clothing, hung from a cord, etc.), near the biological object BO (for example, in the same room), attached to the source of technogenic EM radiation (mobile phone, computer, home appliances, etc.) or be between the BO and the radiation source.

相干轉換諧振器可根據其位置製作成多種形式，並可直接置於生物物體（BO）上（附著於衣物、掛於繩索等）、靠近生物物體（例如在同一房間內）、附著於人工電磁輻射源（手機、電腦、家用電器等），或置於生物物體與輻射源之間。

The proposed method for protecting biological objects from technogenic EM radiation contributes to a reduction (elimination) of the negative influence of technogenic EM radiation on the BO, especially with the spread of 5G

所提出的保護生物物體免受人工電磁輻射影響的方法，有助於減少（消除）人工電磁輻射對生物物體的負面影響，尤其是在 5G 通訊系統普及的情況下。

communication systems. This method makes it possible to protect a biological object from the negative influence of broadband EM radiation.

此方法使得能夠保護生物物體免受寬頻電磁輻射的負面影響。

The claimed method has no analogues and can be used in the daily life of a person that exists among a large number of electronic devices emitting an EM field.

所述方法無任何類似技術，可用於日常生活中，適用於存在大量發射電磁場電子設備的人群。

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CLAIMS 權利要求

The method for protecting a biological object from the negative influence of technogenic electromagnetic radiation in a wide range of frequencies, characterized in that it includes creating around the biological object or between the biological object and the source of technogenic electromagnetic radiation a special electromagnetic field in the form of a fractal coherent matrix.

一種用於保護生物體免受技術性電磁輻射在寬頻範圍內負面影響的方法，其特徵在於包括在生物體周圍或生物體與技術性電磁輻射源之間創建一種特殊的電磁場，該電磁場呈現為分形相干矩陣。

The protection method according to claim 1, characterized in that the field is created using a fractal-matrix coherent transformer which is a self-affine lattice of annular topological lines creating a slit-like raster.

根據權利要求 1 所述的保護方法，其特徵在於該場是利用分形矩陣相干變換器創建的，該變換器是一種由環狀拓撲線組成的自相似格子，形成狹縫狀光柵。

The protection method according to claim 1, characterized in that the coherent transformer forms an electromagnetic field in the form of a spatial holographic matrix.

根據權利要求 1, characterized 所述的保護方法，其中相干變換器形成空間全息矩陣形式的電磁場。

The protection method according to claim 1, characterized in that the transformer's electromagnetic field transforms the technogenic electromagnetic radiation into the form of a spatial coherent matrix of harmonized electromagnetic wave superpositions.

根據權利要求 1 所述的保護方法，其特徵在於變換器的電磁場將技術性電磁輻射轉換為空間相干矩陣形式的和諧電磁波疊加。

The protection method according to claim 1, ch aracterized in that depending on the nature of the negative influence, different options for placement of the coherent transformer are used: on a biological object.

根據權利要求 1, ch 所述的保護方法，其特徵在於根據負面影響的性質，採用不同的相干變換器放置方案：置於生物體上。

The protection method according to claim 1, ch aracterized in that depending on the nature of the negative influence, different options for placement of the coherent transformer are used: on a source of technogenic electromagnetic radiation.

根據權利要求 1, ch 所述的保護方法，其特徵在於根據負面影響的性質，採用不同的相干變換器放置方案：置於技術性電磁輻射源上。

The protection method according to claim 1, ch aracterized in that depending on the nature of the negative influence, different options for placement of the coherent transformer are used: between a biological object and a source of technogenic electromagnetic radiation.

根據權利要求 1, ch 所述的保護方法，其特徵在於根據負面影響的性質，採用不同的相干轉換器放置方式：置於生物體與技術性電磁輻射源之間。

AMENDED CLAIMS **修正後的權利要求**

received by the International Bureau on 01 October 2020 (01.10.2020)

於 2020 年 10 月 1 日（01.10.2020）由國際局接收

The method for transforming an electromagnetic radiation in a range of frequencies, characterized in that said electromagnetic radiation is transformed into the coherent electromagnetic radiation.

一種在一定頻率範圍內轉換電磁輻射的方法，其特徵在於將所述電磁輻射轉換為相干電磁輻射。

The method according to claim 1 , characterized in that the electromagnetic radiation is transformed using a fractal-matrix coherent transformer, which is an electromagnetic field formed by a self-affine lattice of annular topological lines creating a slit-like raster.

根據權利要求 1 所述的方法，其特徵在於，利用分形矩陣相干變換器轉換電磁輻射，該變換器為由環狀拓撲線自相似晶格形成的電磁場，該晶格形成狹縫狀光柵。

The method according to claim 1, characterized in that the coherent transformer is an electromagnetic field in the form of a regular spatial holographic matrix.

根據權利要求 1 所述的方法，其特徵在於，該相干變換器為規則空間全息矩陣形式的電磁場。

The method according to claim 1, characterized in that the transformer's electromagnetic field transforms the electromagnetic radiation into the form of a spatial coherent matrix of harmonized electromagnetic wave superpositions.

根據權利要求 1 所述的方法，其特徵在於，該變換器的電磁場將電磁輻射轉換為空間相干矩陣形式的和諧電磁波疊加。

The method according to claim 1 , characterized in that the placement of the coherent transformer, providing said formed electromagnetic field, is used: on a biological object.

根據權利要求 1 所述的方法，其特徵在於，提供所述形成電磁場的相干變換器的放置位置用於生物物體上。

The method according to claim 1 , characterized in that the placement of the coherent transformer, providing said formed electromagnetic field, is used: on a source of the electromagnetic radiation.

根據權利要求 1 所述的方法，其特徵在於所述提供所形成電磁場的相干變換器的放置位置用於：放置於電磁輻射源上。

The method according to claim 1 , characterized in that the placement of the coherent transformer, providing said formed electromagnetic field, is used: between a biological object and a source of the electromagnetic radiation.

根據權利要求 1 所述的方法，其特徵在於所述提供所形成電磁場的相干變換器的放置位置用於：置於生物體與電磁輻射源之間。

The method according to claim 1 , characterized in that the range of frequencies of the electromagnetic radiation is from $2,4\mathrm{Ghz}$ to 28 Ghz .

根據權利要求 1 所述的方法，其特徵在於電磁輻射的頻率範圍為從 $2,4\mathrm{Ghz}$ 至 28 GHz。

The method according to claim 1 , characterized in that the electromagnetic radiation to be transformed into the coherent form is a technogenic electromagnetic radiation emitted by any technical devices and systems.

根據權利要求 1 所述的方法，其特徵在於待轉換為相干形式的電磁輻射為由任何技術裝置及系統所發射的人工電磁輻射。

Statement under Article 19(1)

根據第 19(1)條的聲明

In view of the PCT INTERNATIONAL SEARCH REPORT Office Action, amendments for the CLAIMS are being proposed.

鑑於 PCT 國際檢索報告的辦公行動，現正提出對權利要求的修正。

The independent Claim 1 now defines a method of transforming the electromagnetic radiation (electromagnetic field) in a range of frequences into a coherent electromagnetic radiation. The observed deficiences and unclear terms were removed from claims in order Claim 1 to describe the method as a technical solution to transform an electromagnetic radiation (electromagentic field) in a range of frequencies into its coherent form of the frequency-amplitude spectrum.

獨立權利要求 1 現定義了一種將一定頻率範圍內的電磁輻射（電磁場）轉換為相干電磁輻射的方法。為使權利要求 1 描述該方法作為一種技術解決方案，將電磁輻射（電磁場）在一定頻率範圍內轉換為其頻率-振幅譜的相干形式，已移除觀察到的缺陷及不明確用語。

The claims 2 to 7 were amended to remove unclear and non-technical terms that have been identified in the International Search Report.

權利要求 2 至 7 已修正，刪除國際檢索報告中指出的不明確及非技術性用語。

A new Claim 8 has been added, in order to define the range of frequences $2.4-28\mathrm{GHz}$ of the electromagnetic radiation to be transformed.

新增了第 8 項權利要求，以定義待轉換電磁輻射的頻率範圍 $2.4-28\mathrm{GHz}$ 。

A new Claim 9 has been added, in order to define a particular type of electromagnetic radiation to be transformed which is emitted by technical systems and devices, otherwise known as technogenic electromagnetic radiation.

新增了第 9 項權利要求，以定義一種特定類型的電磁輻射，該輻射由技術系統和裝置發出，亦稱為人工電磁輻射。

DRAWINGS **圖示**

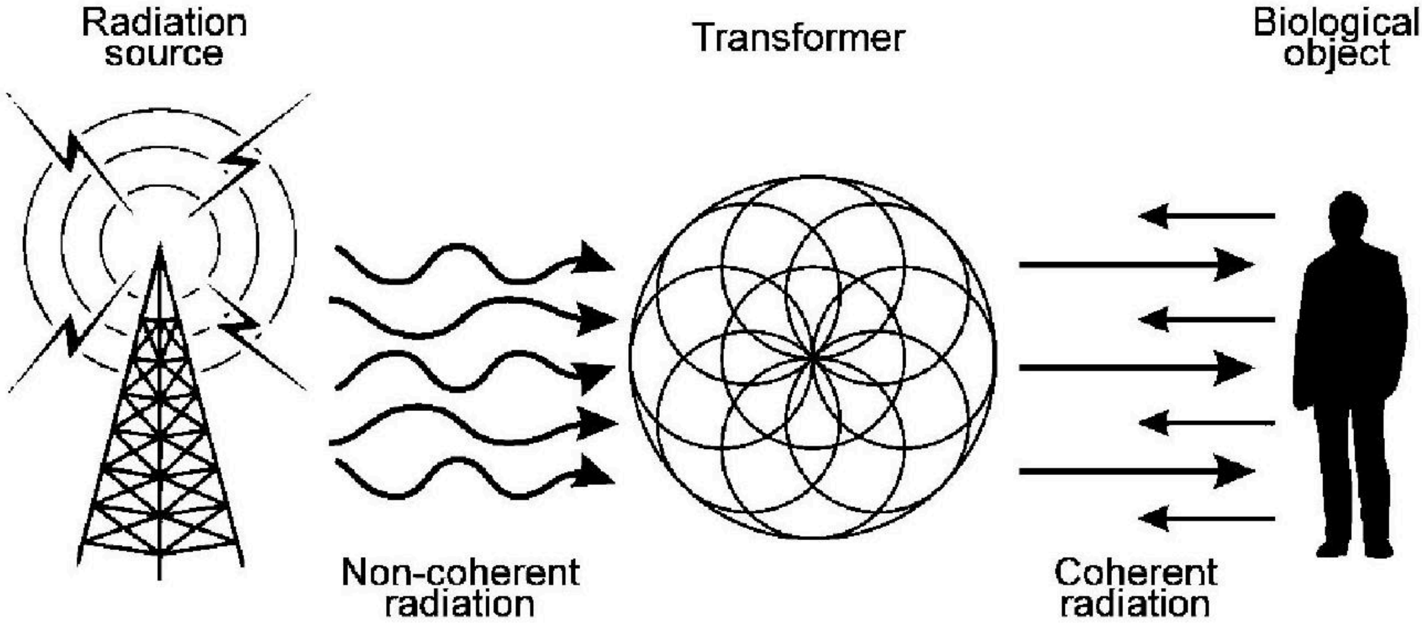


FIG. 1 圖 **1**

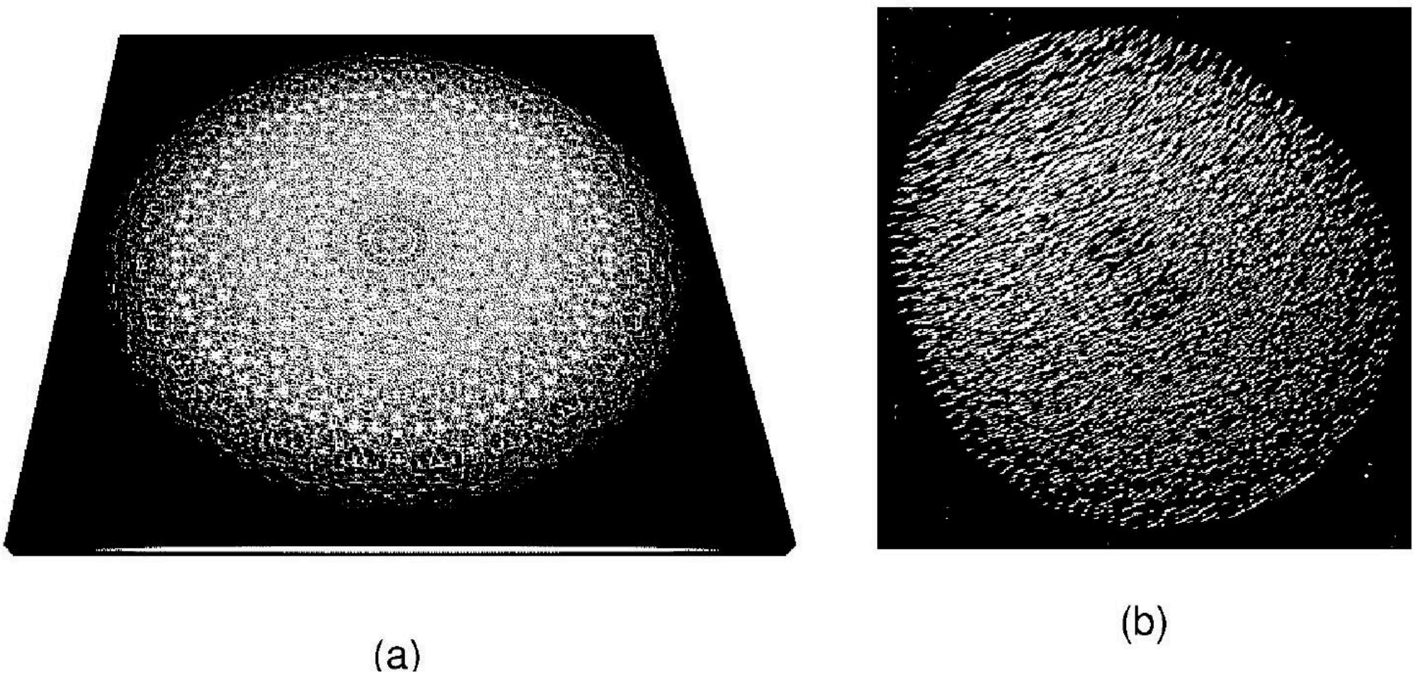


FIG. 2 圖 **2**

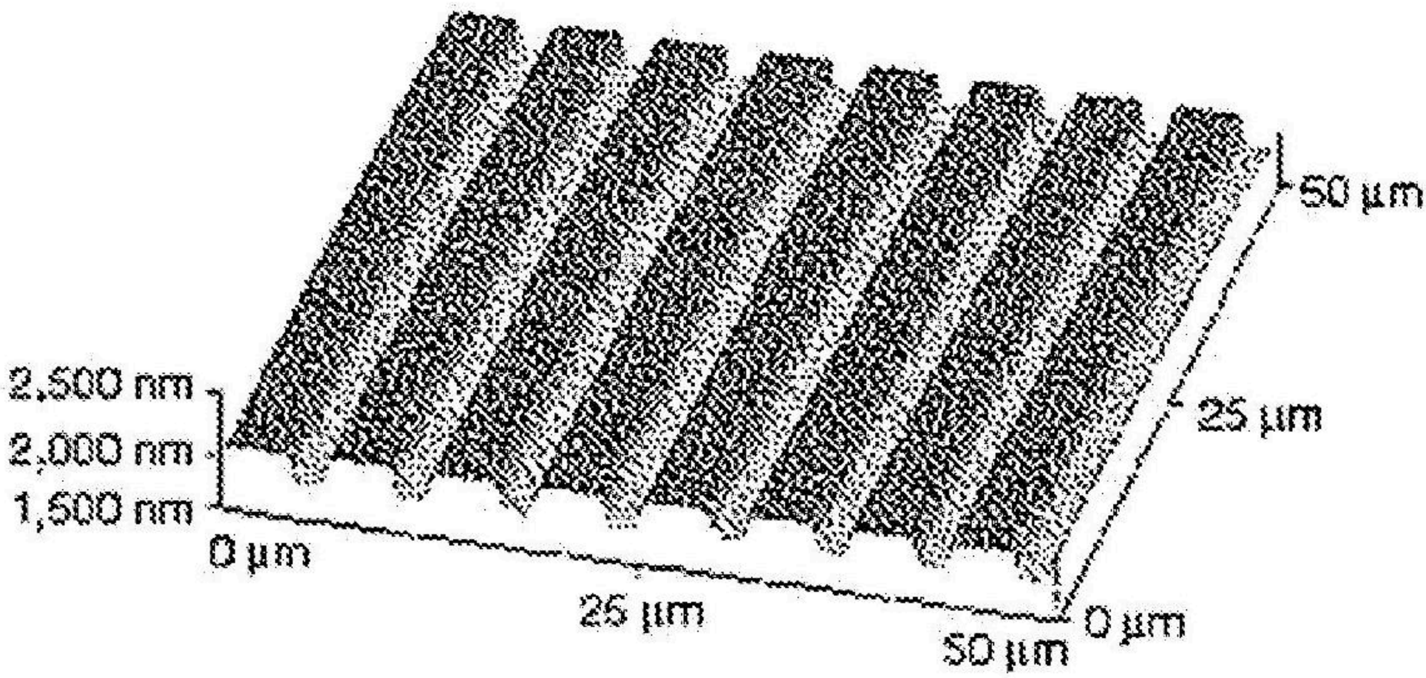


FIG. 3 圖 **3**

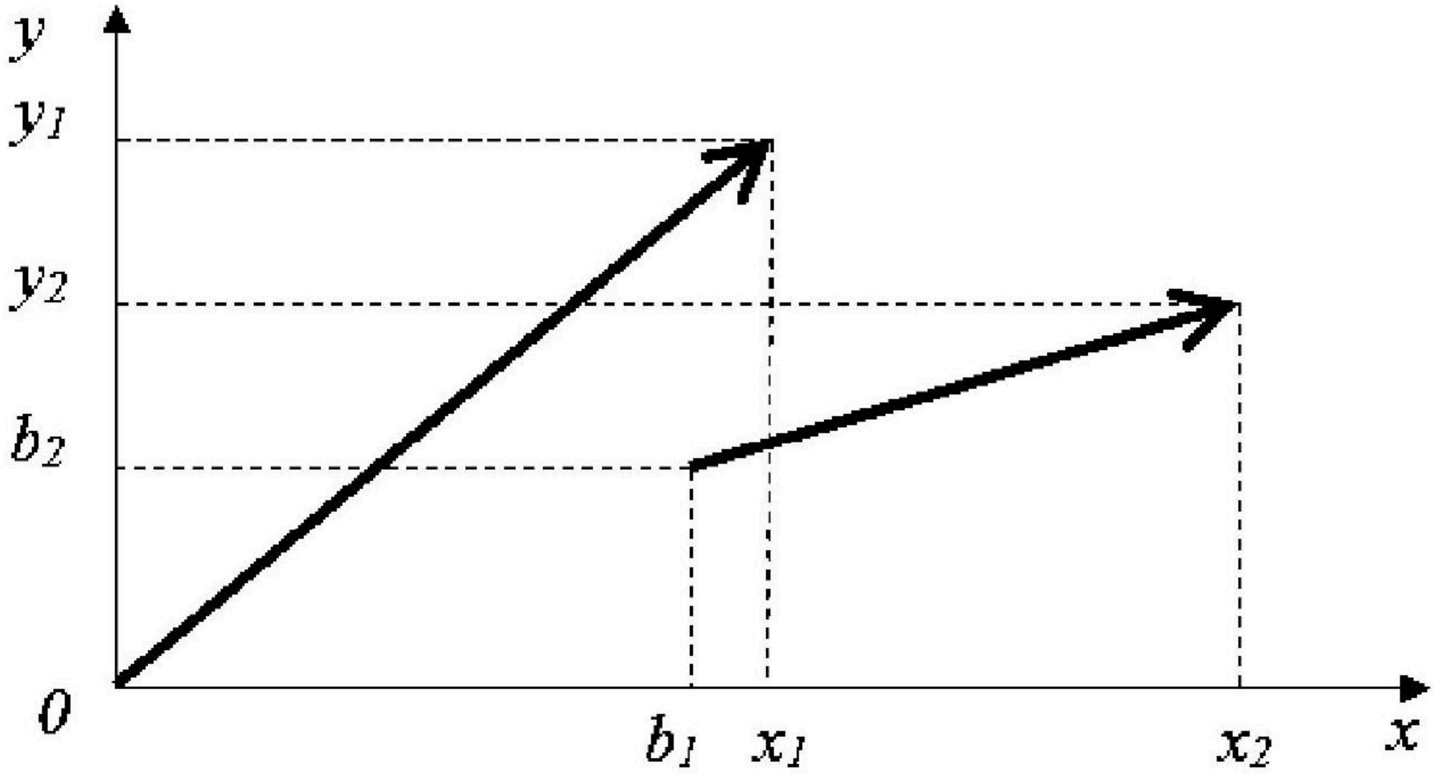
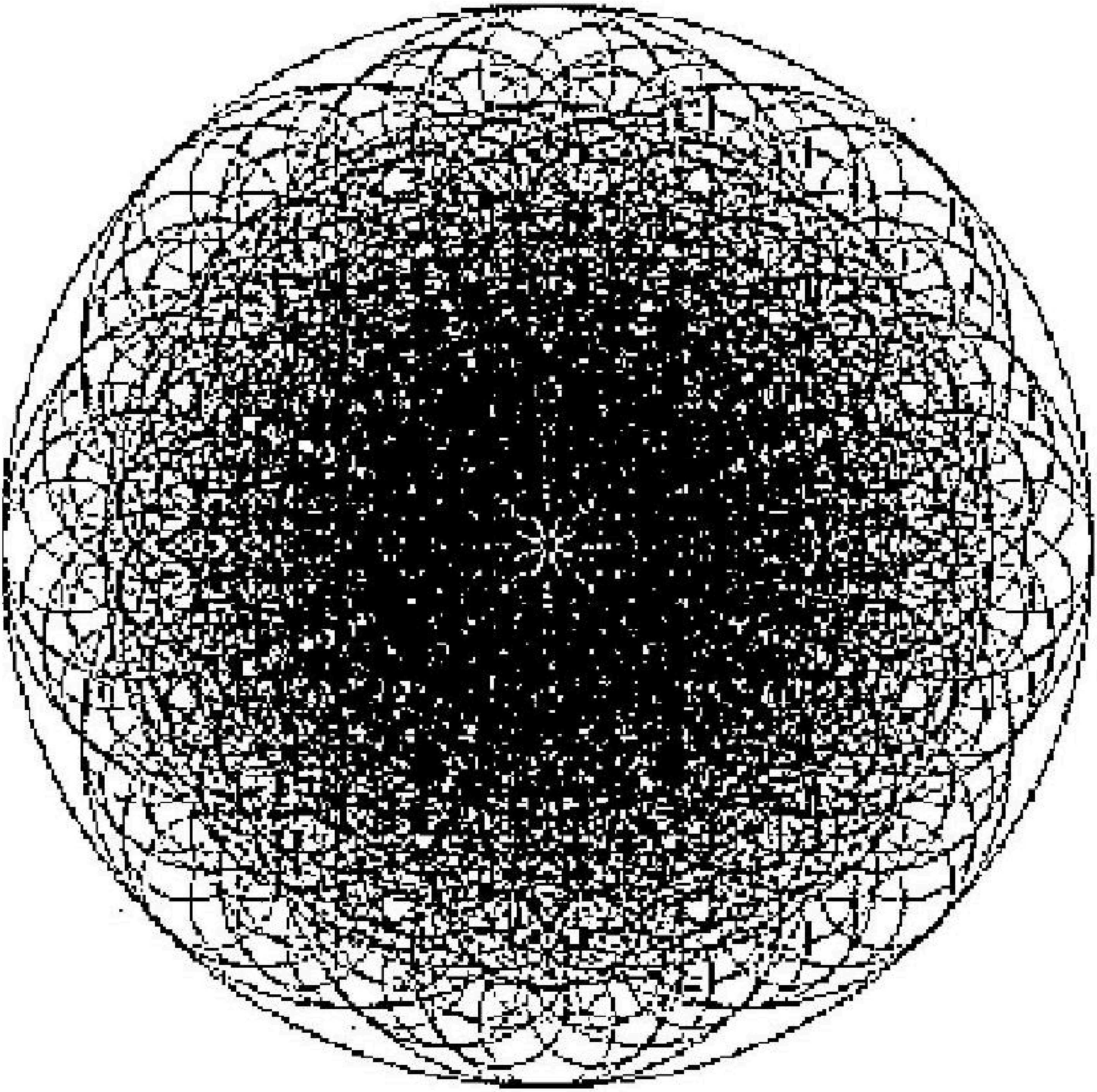


FIG. 4 圖 **4**



Result of performing affine transformations

FIG. 5 圖 **5**

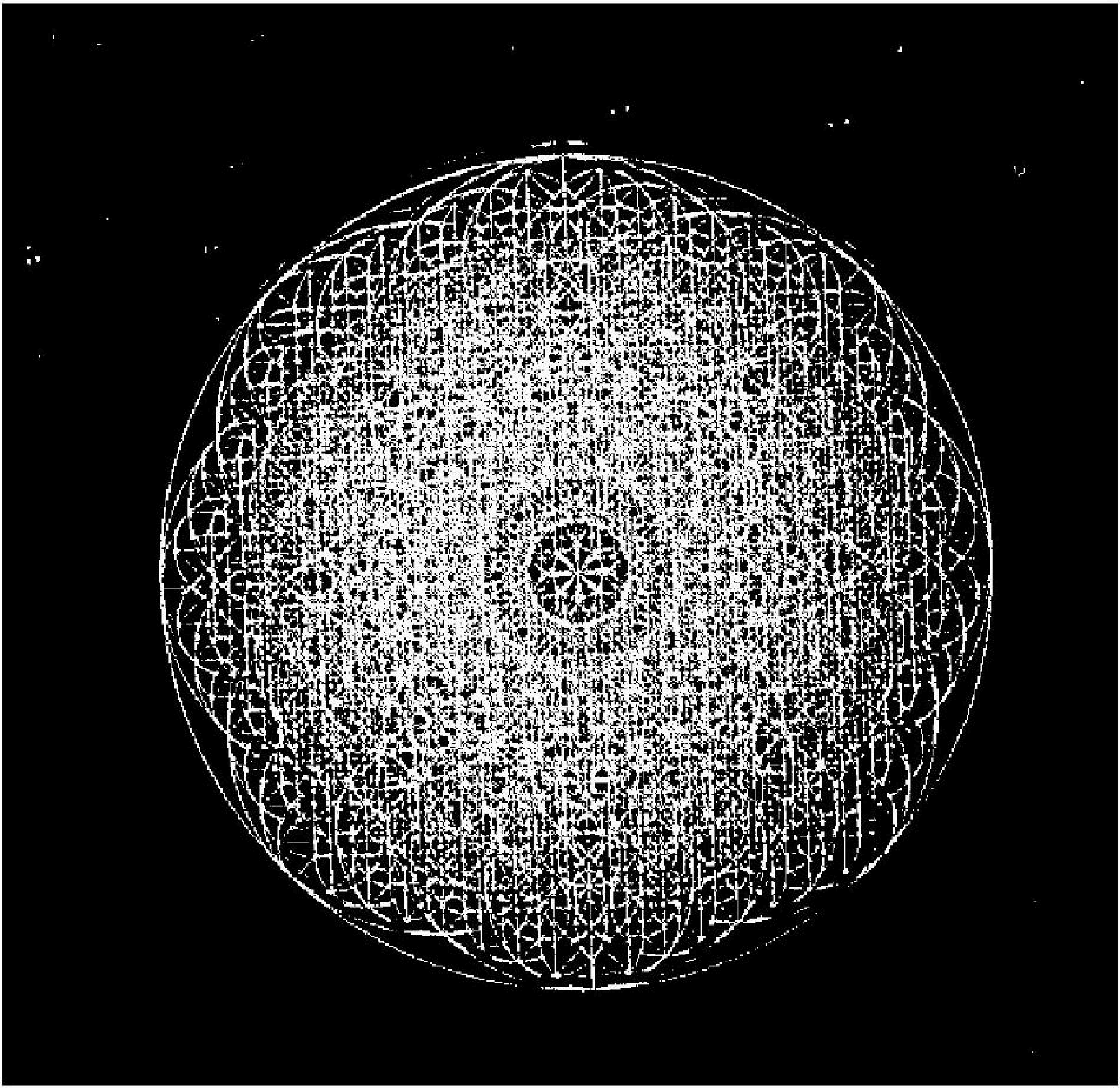


FIG. 6 圖 **6**

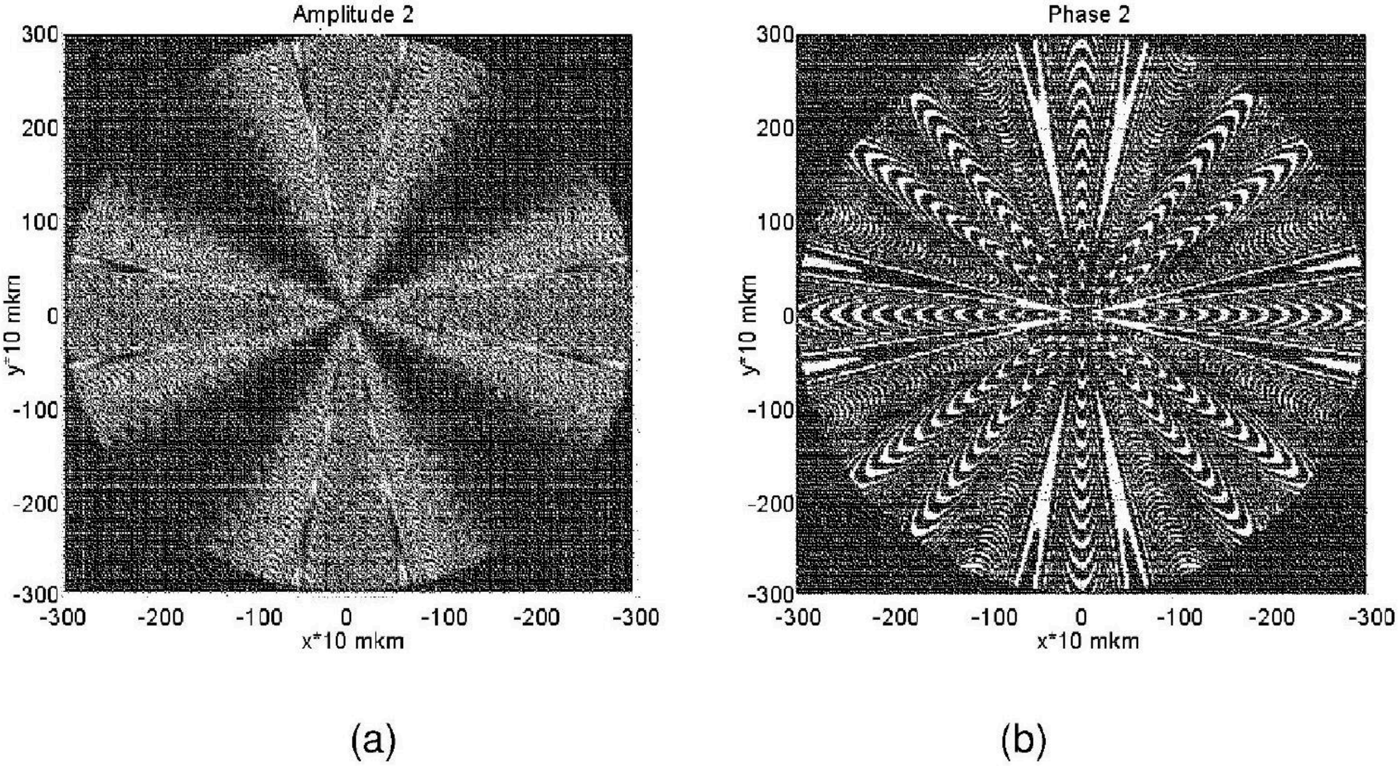


FIG. 7 圖 7

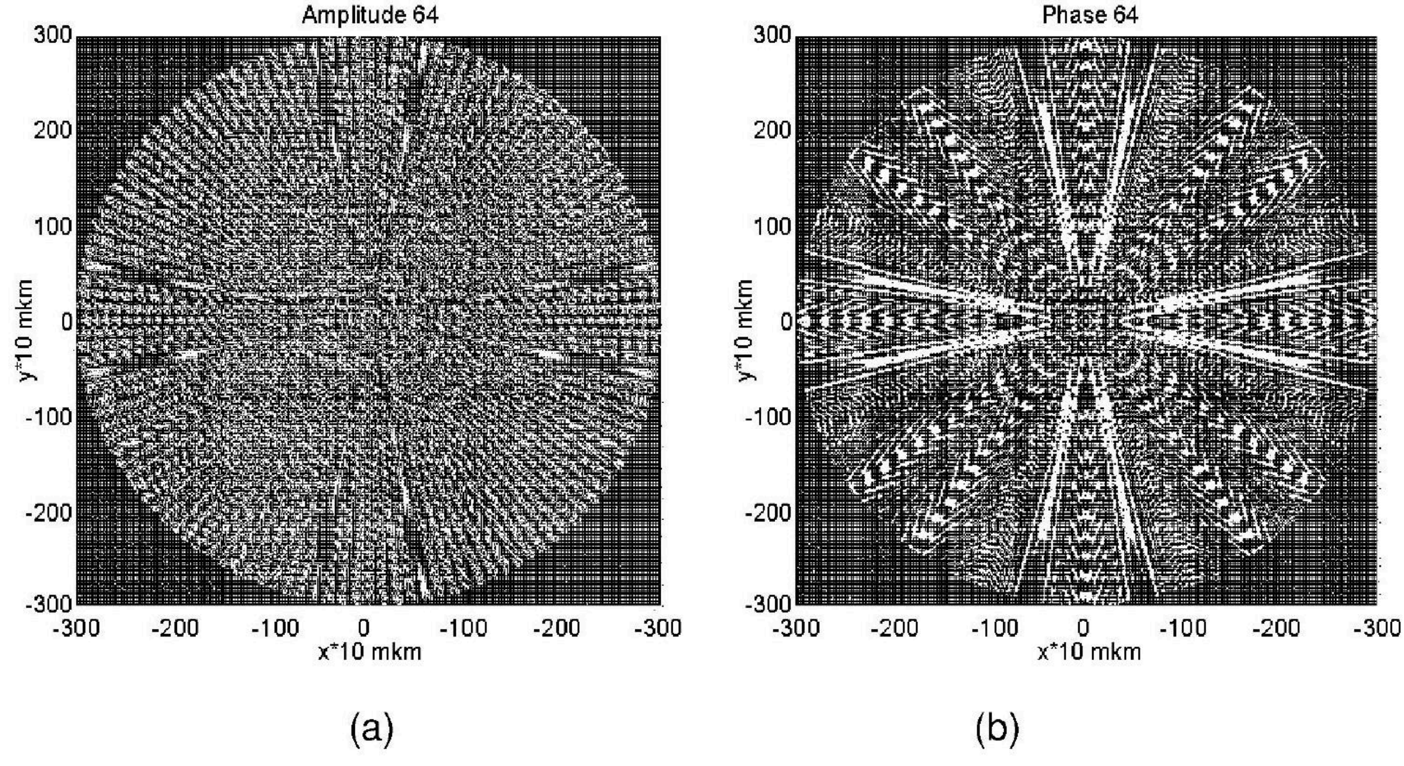


FIG. 8 圖 8

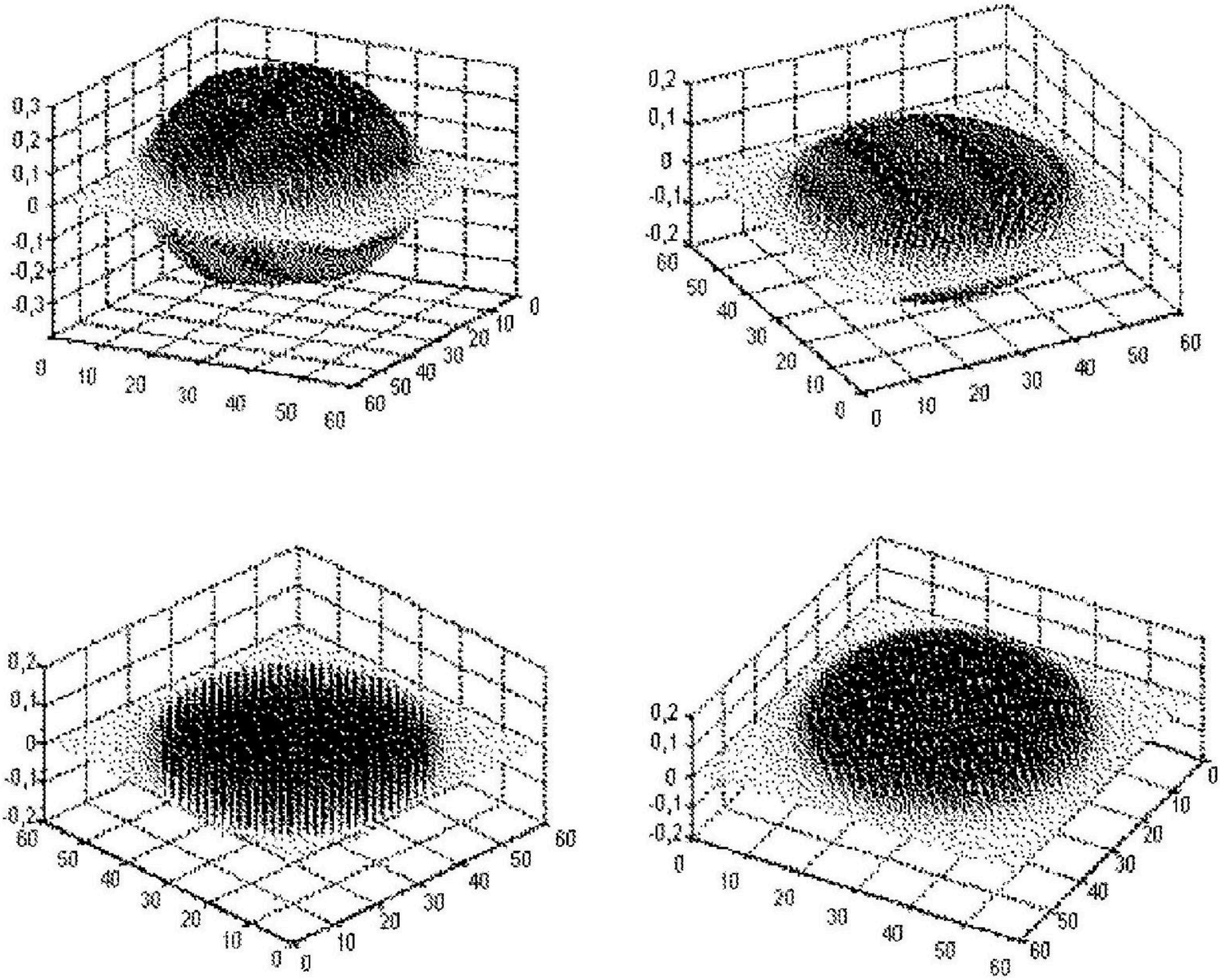


FIG. 9 圖 **9**

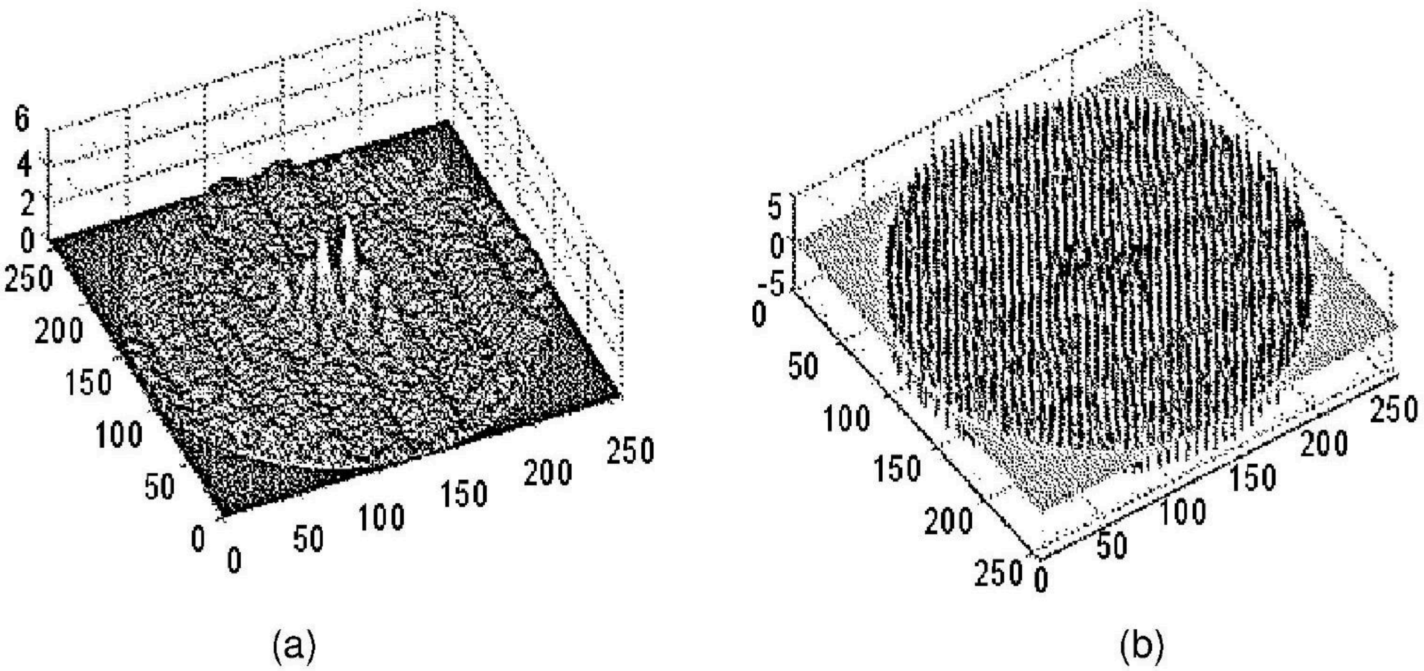


FIG. 10 圖 **10**

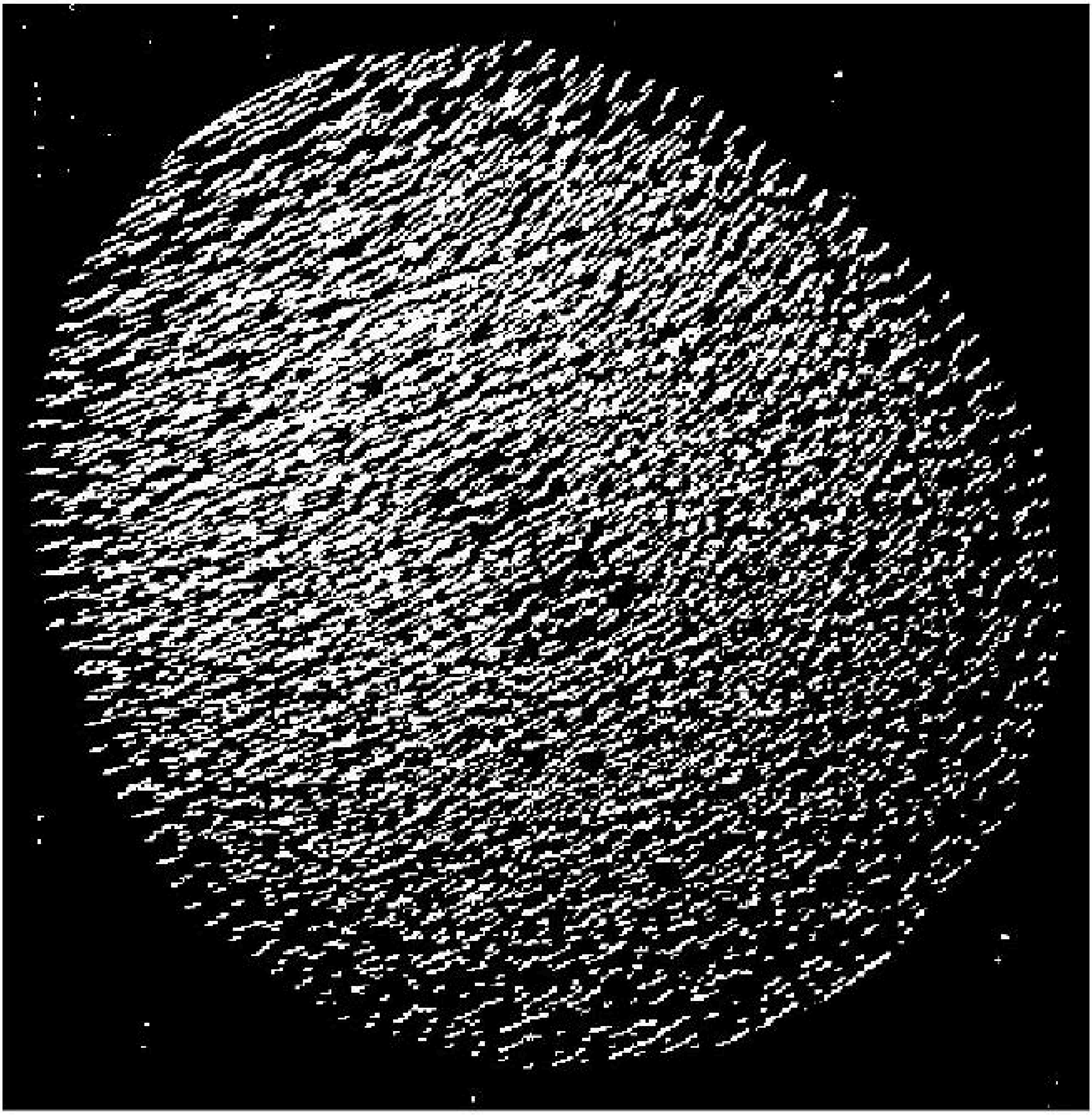
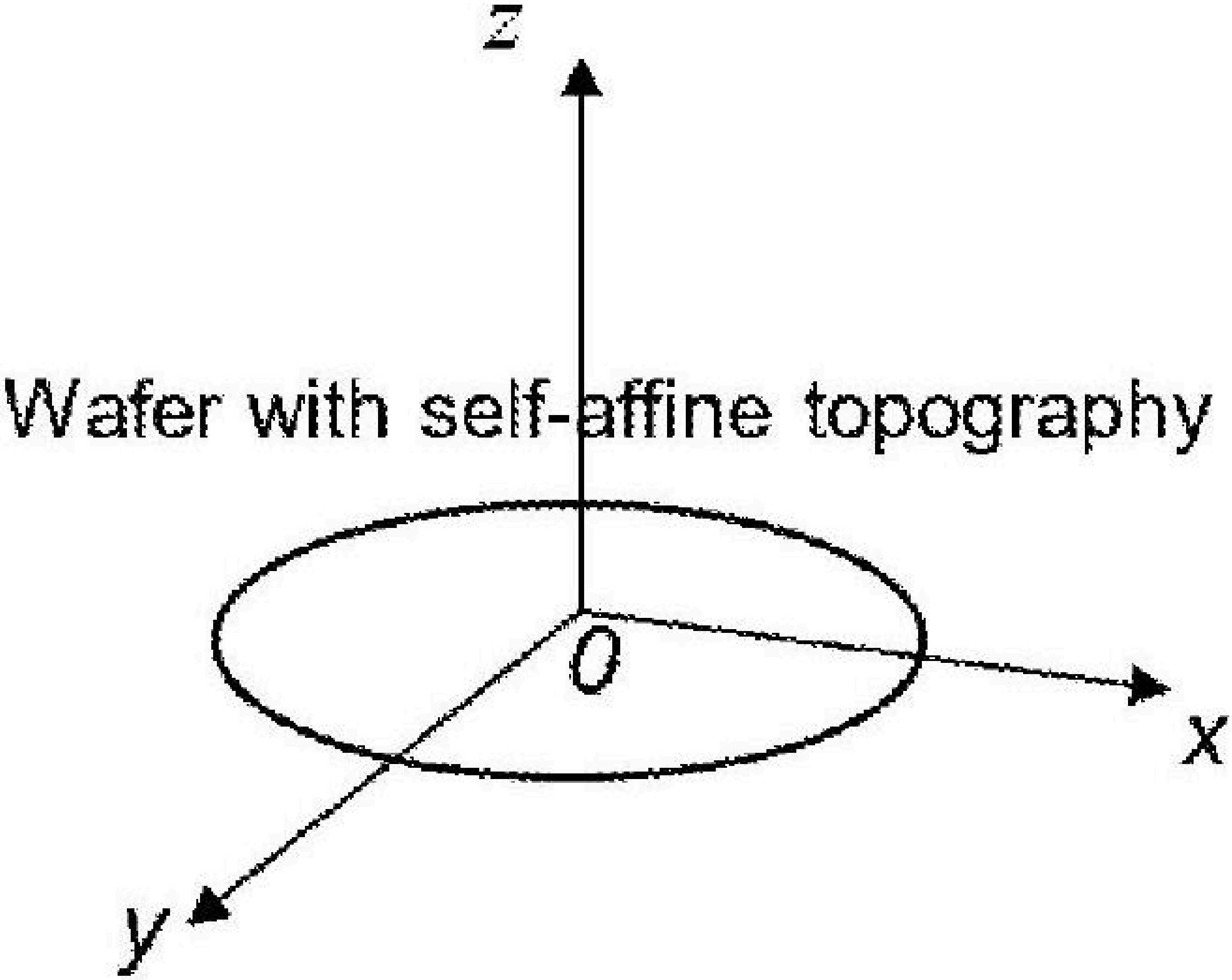


FIG. 11 圖 **11**



Wafer orientation relative to the coordinate system

晶圓相對於座標系的方向

FIG. 12 圖 **12**

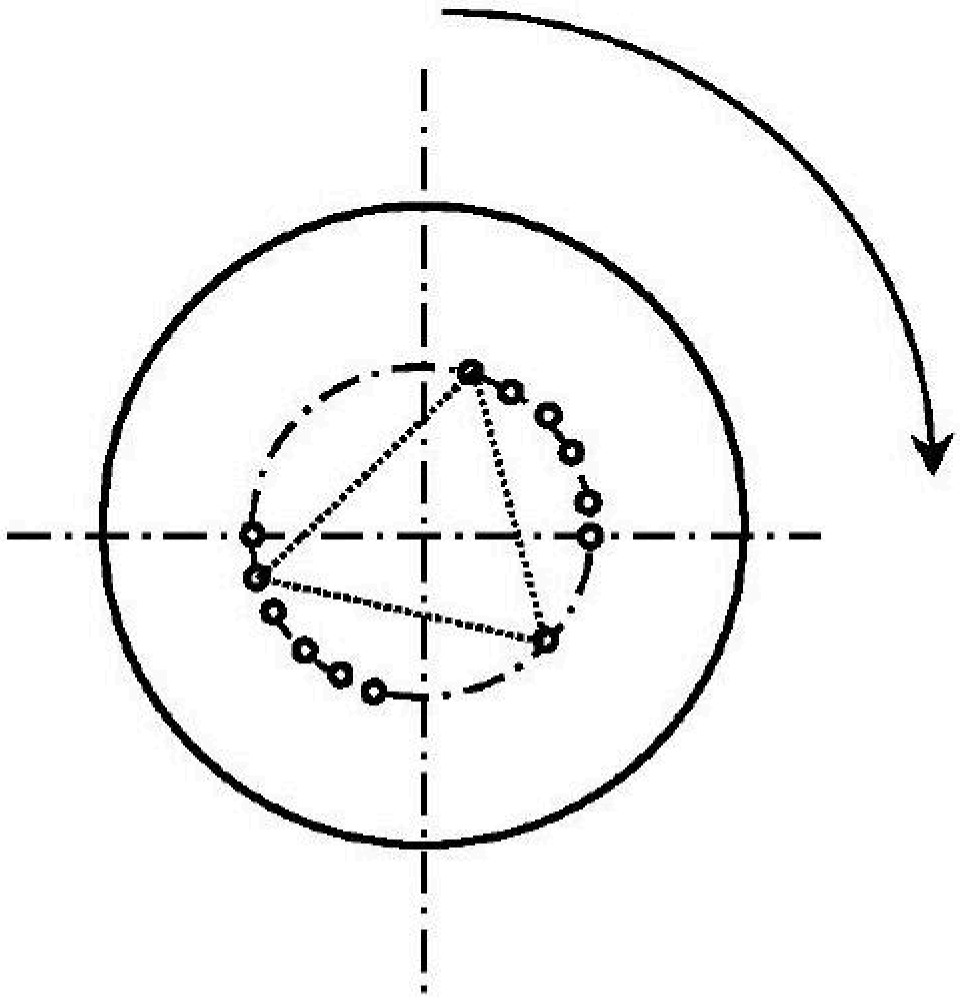
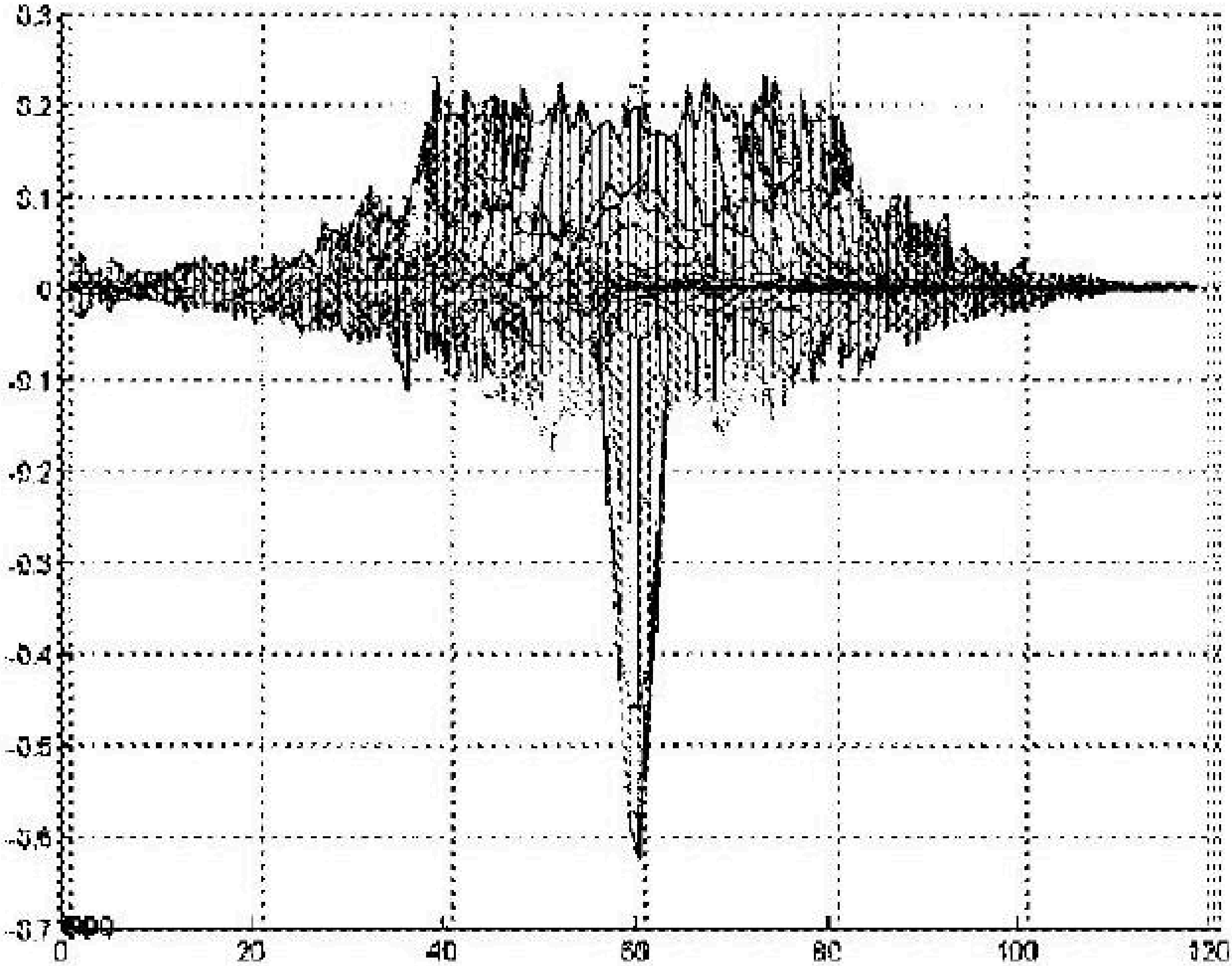


FIG. 13 圖 **13**



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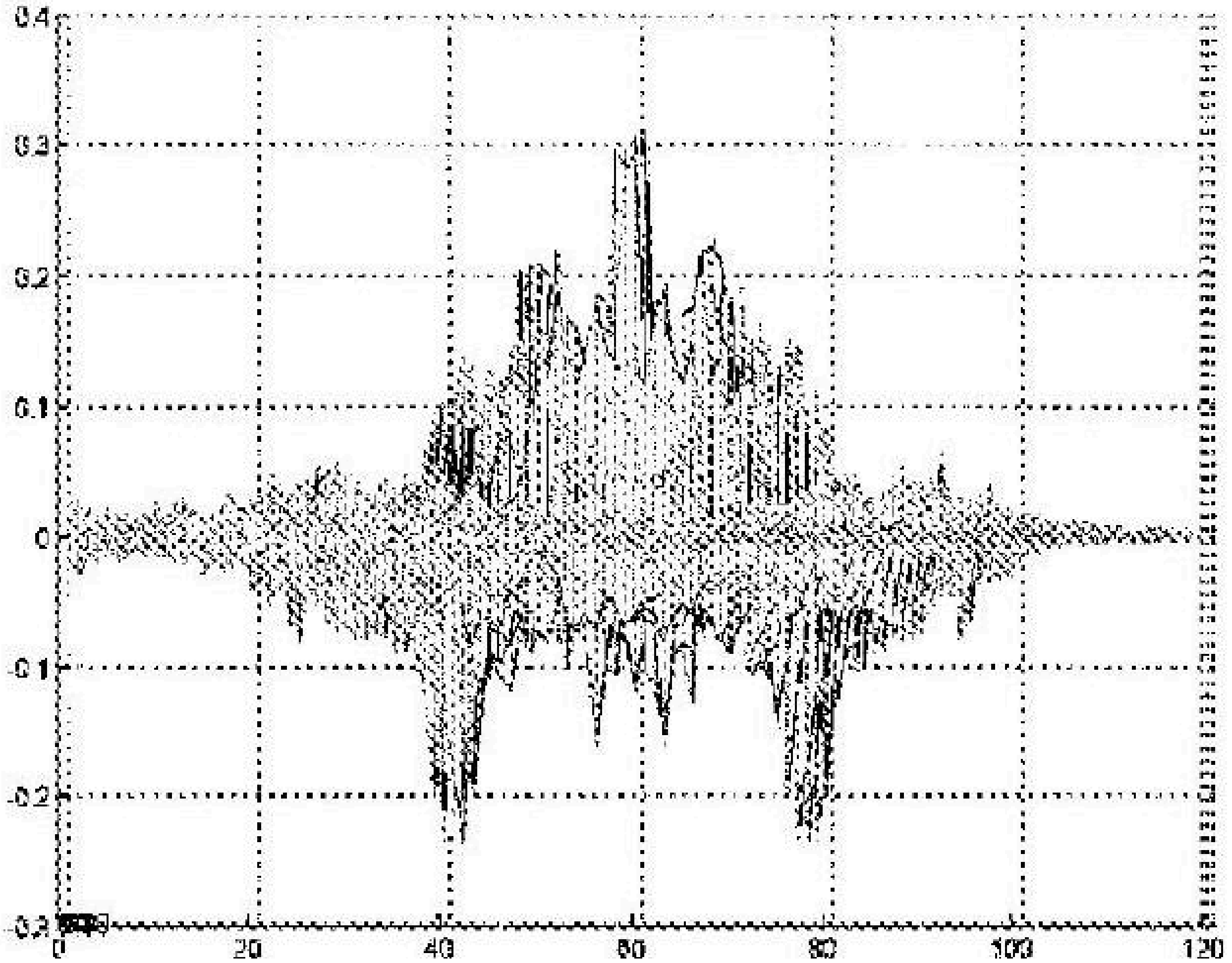

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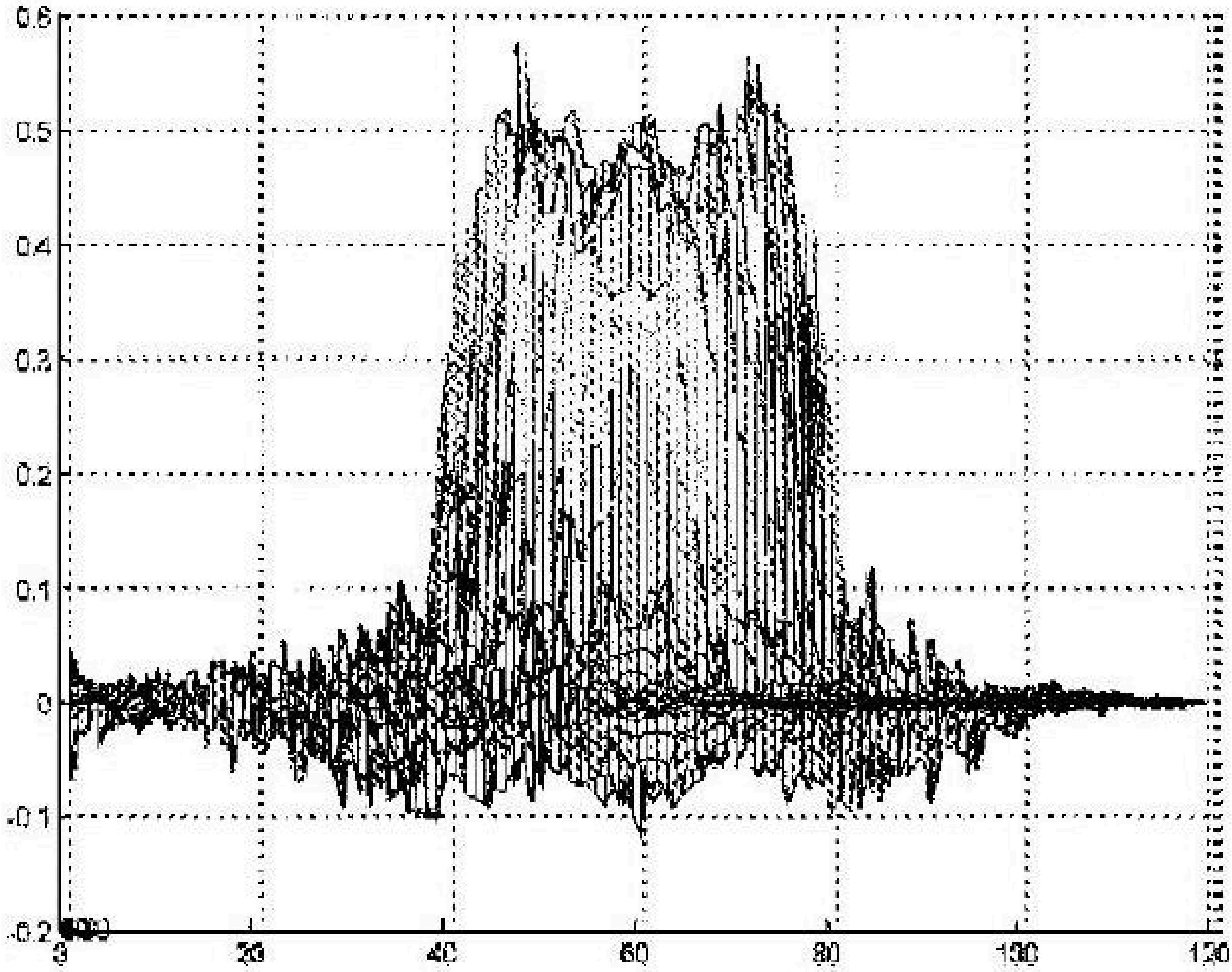
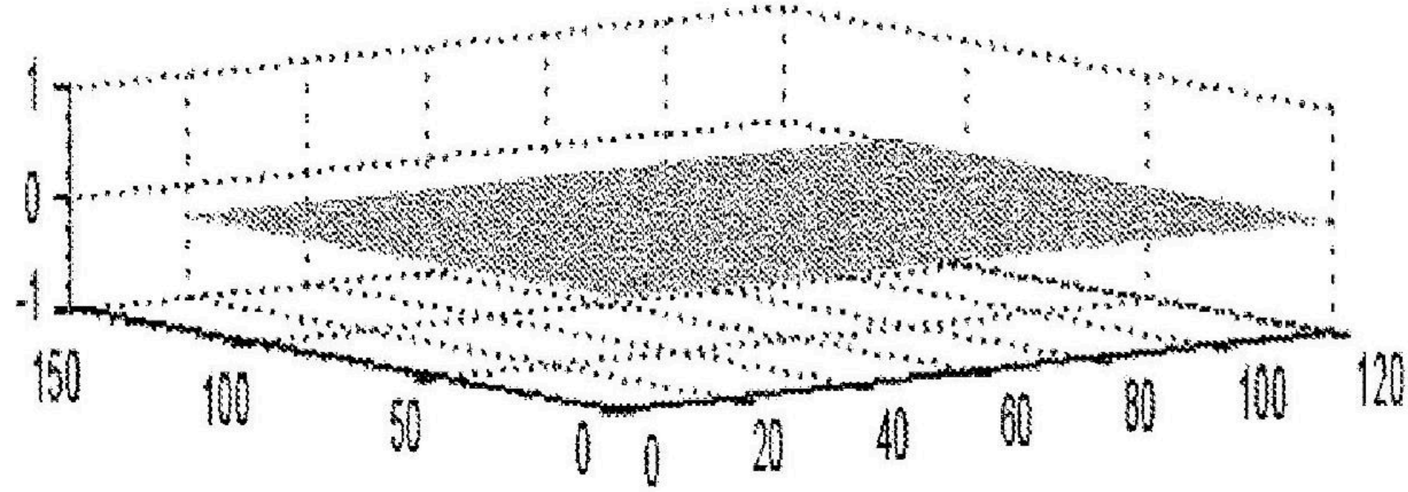


FIG. 14 圖 **14**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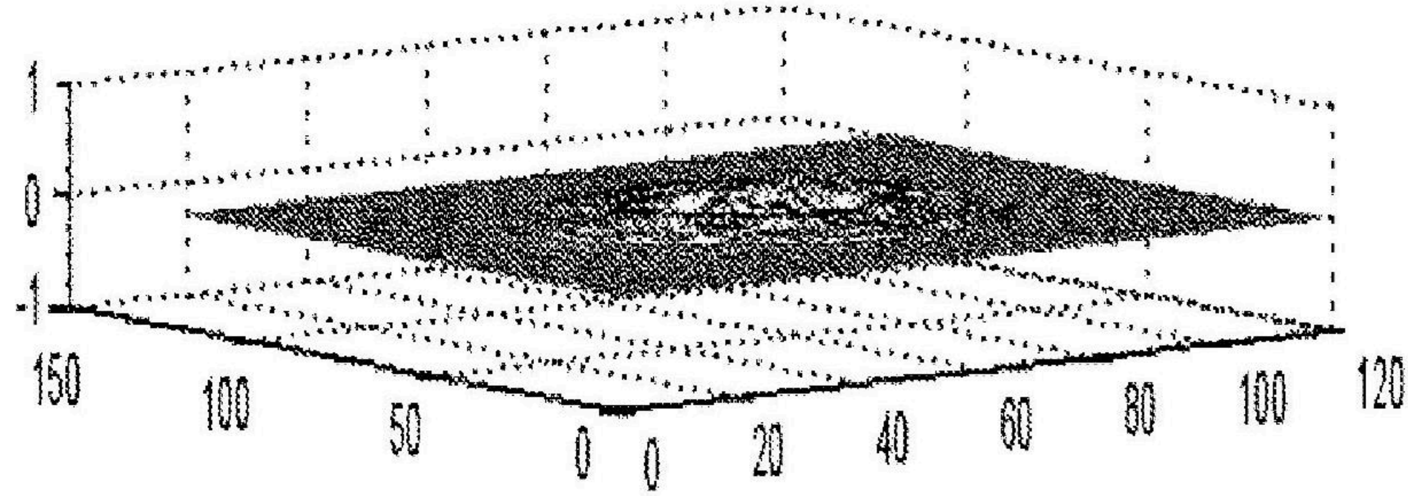
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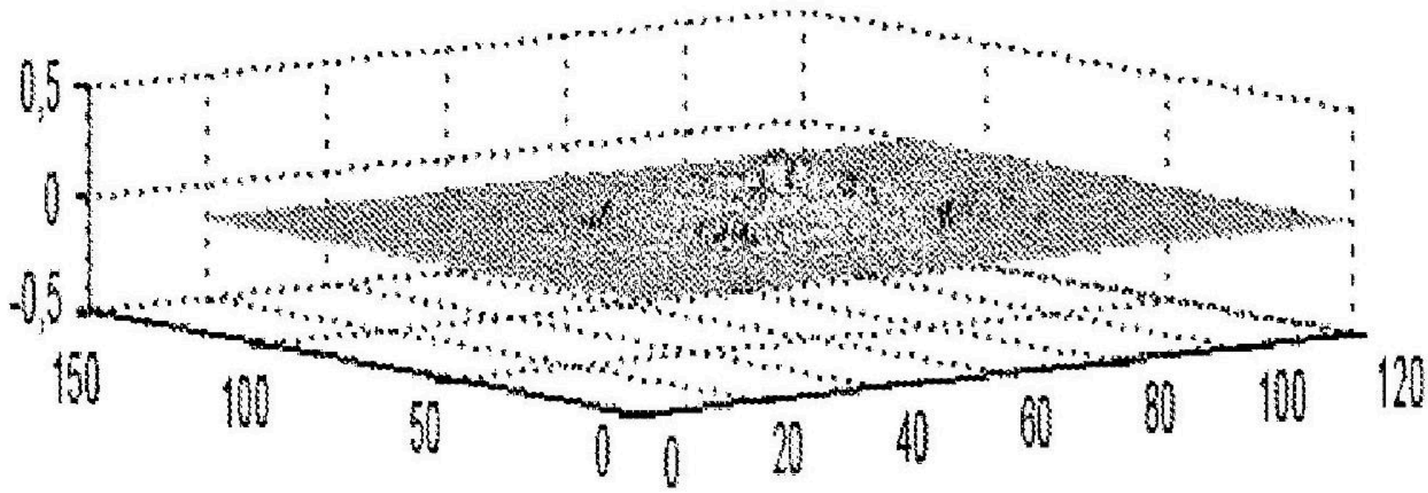
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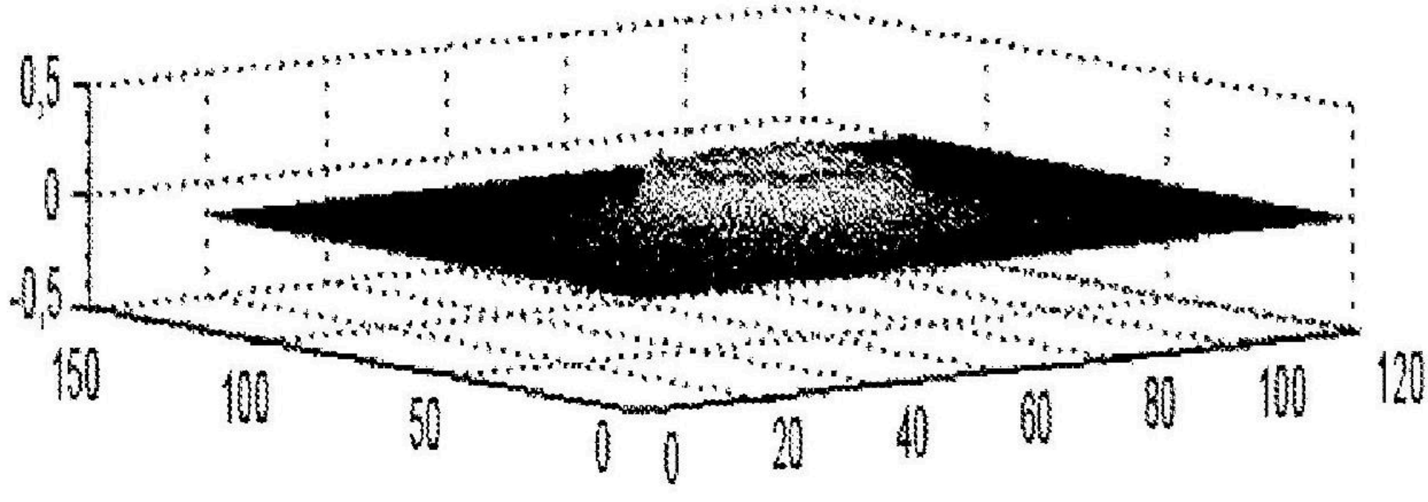
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FIG. 15 圖 **15**

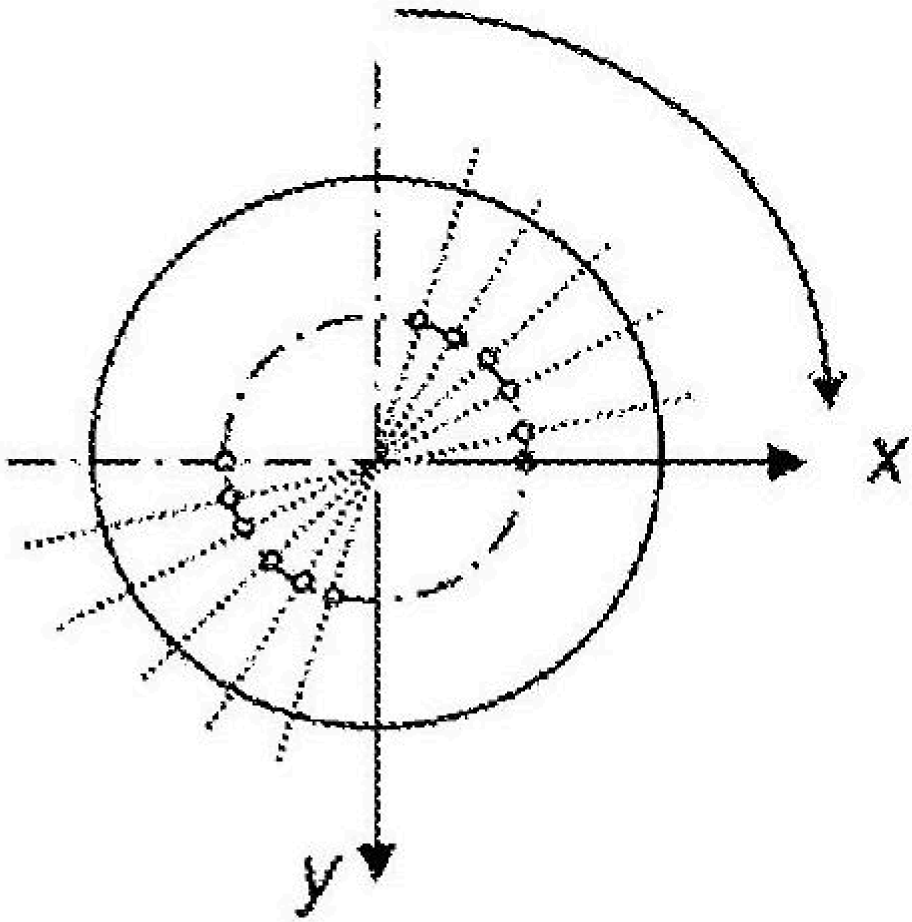
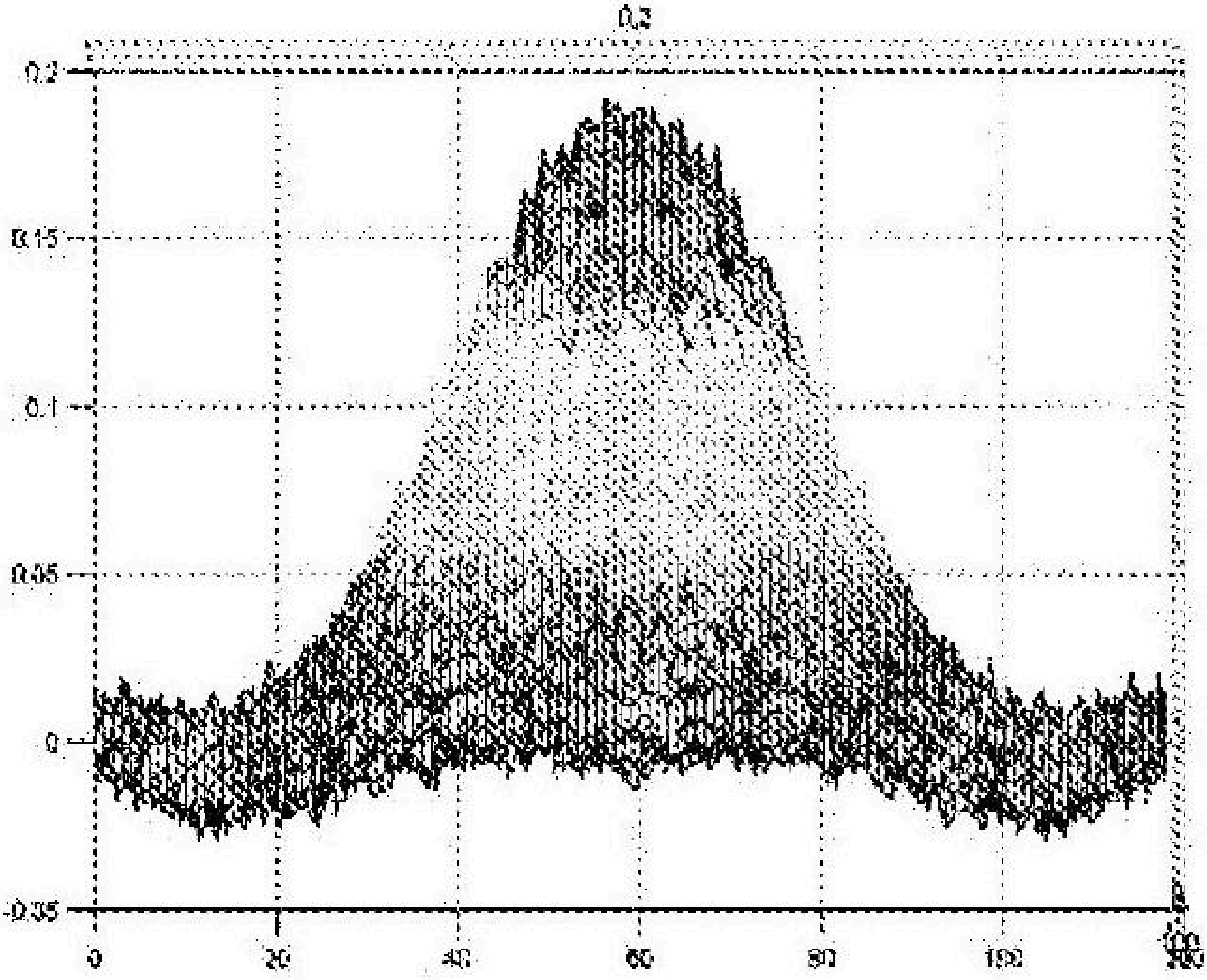


FIG. 16 圖 **16**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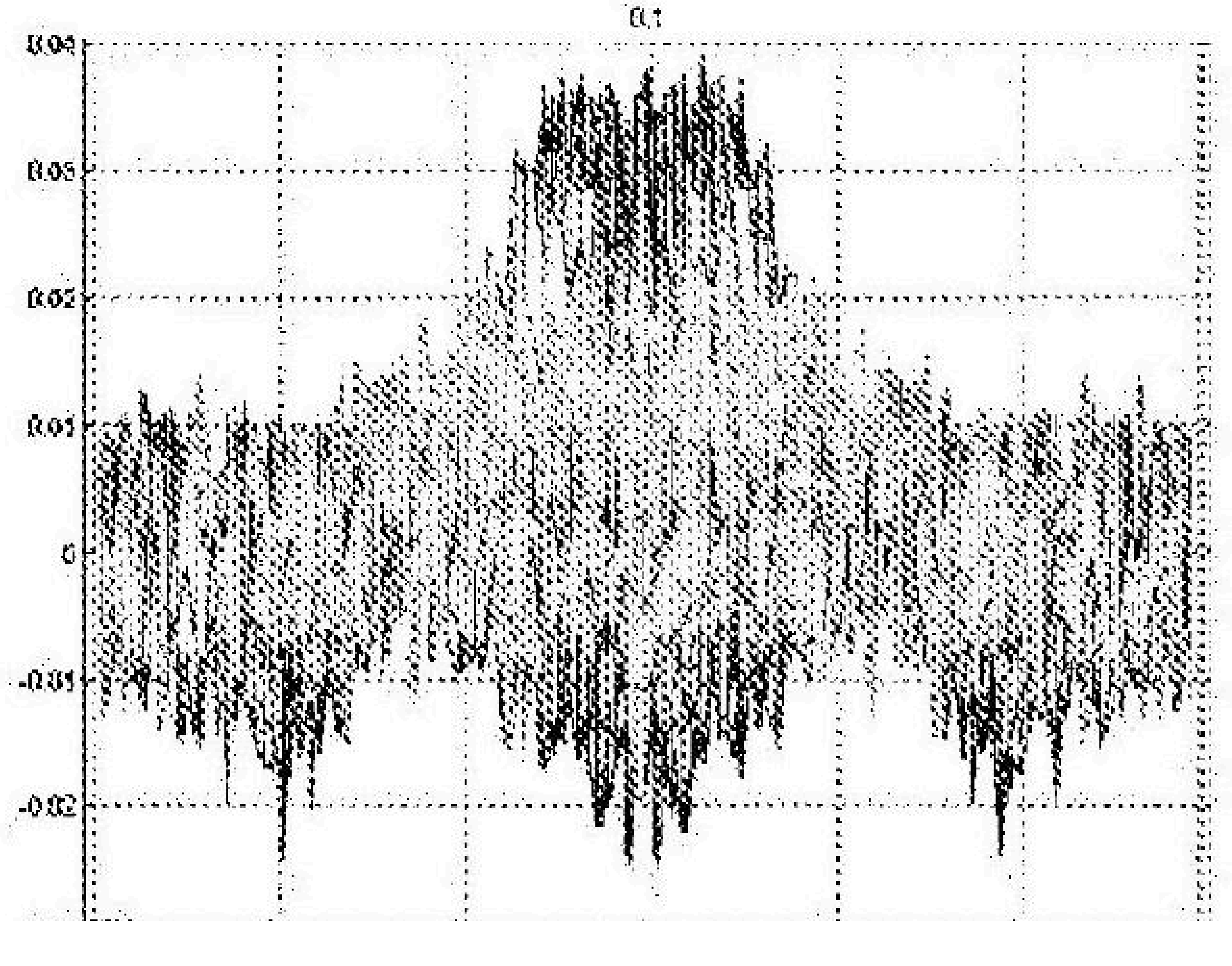
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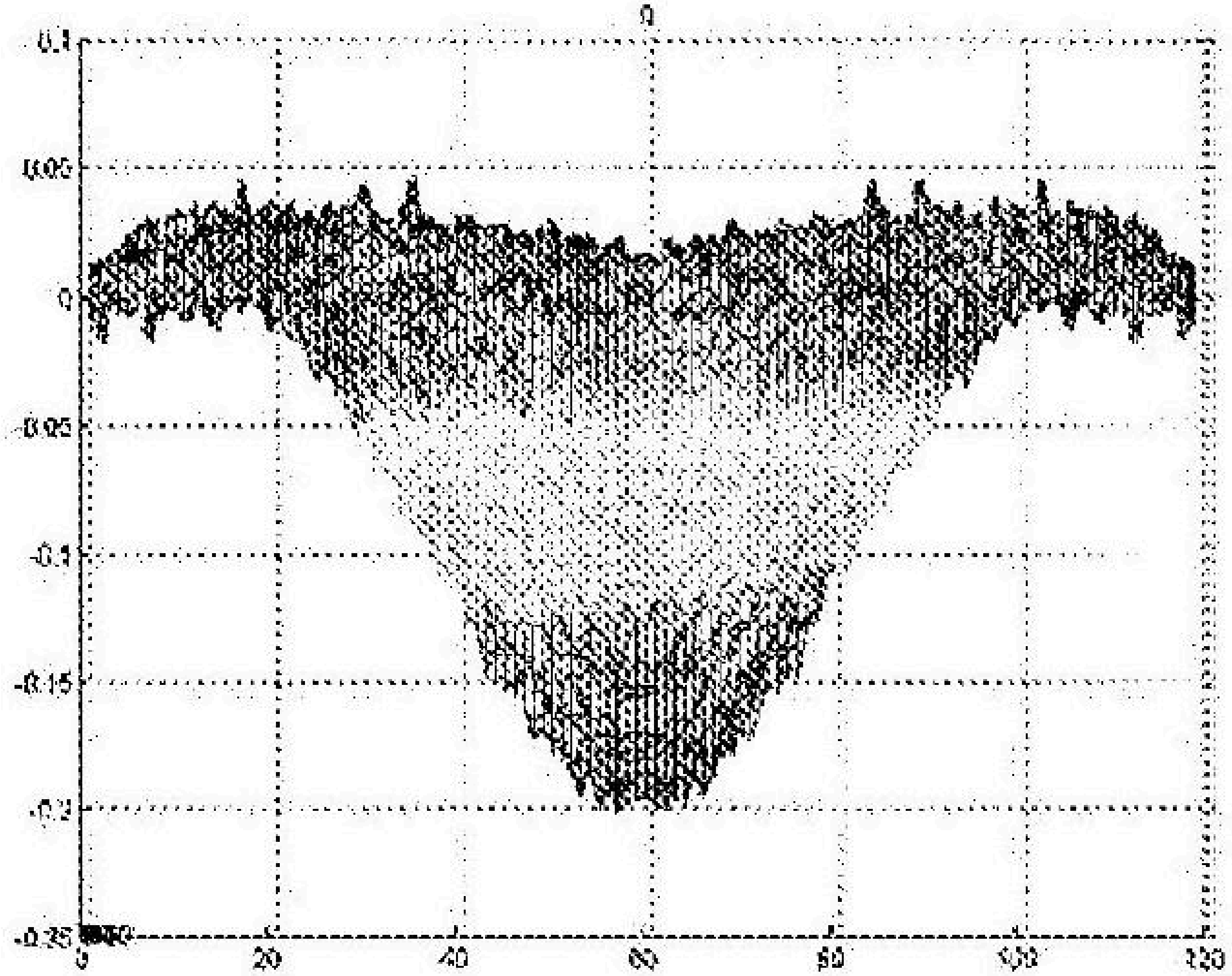

FIG. 17 圖 **17**

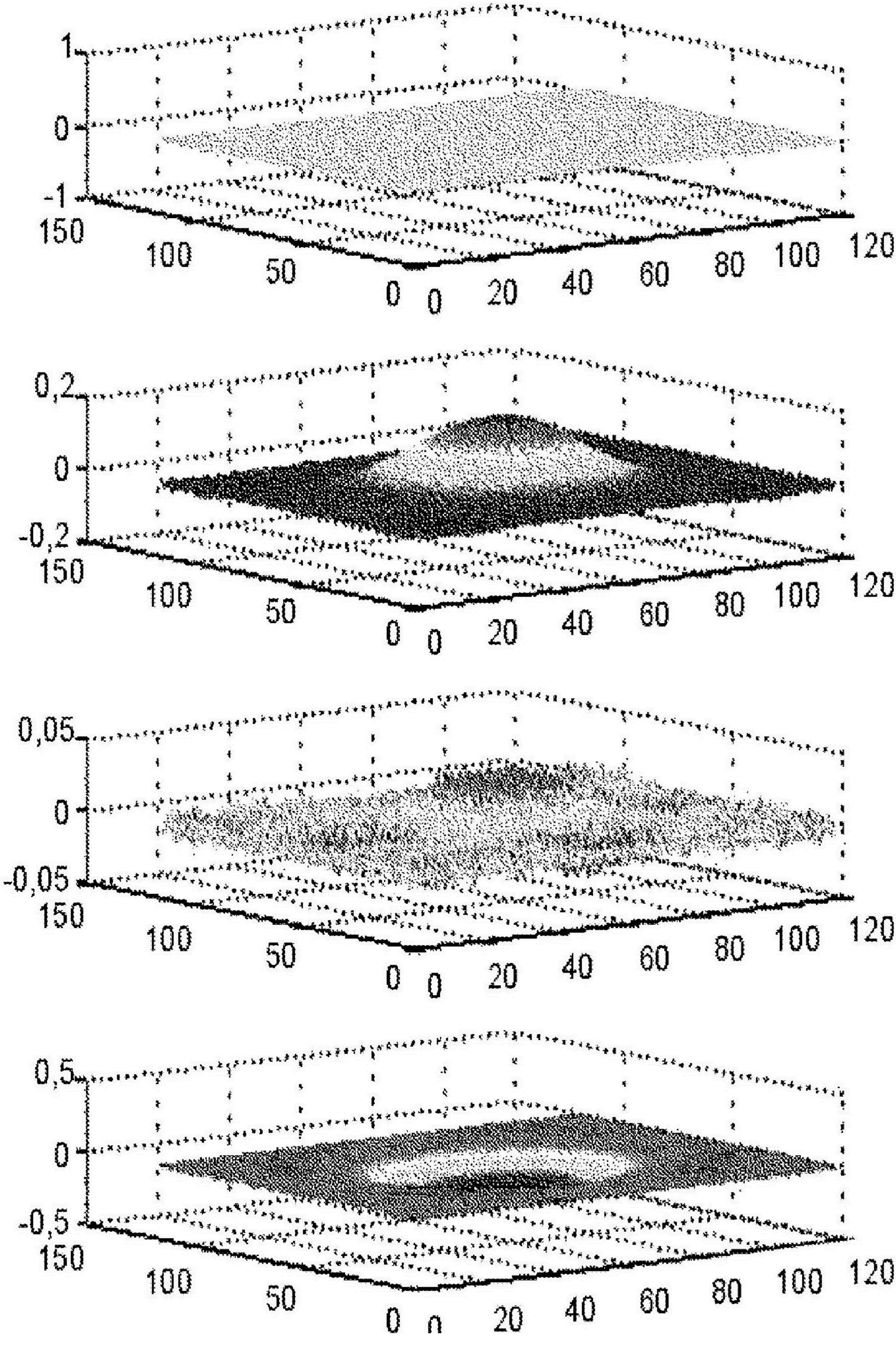
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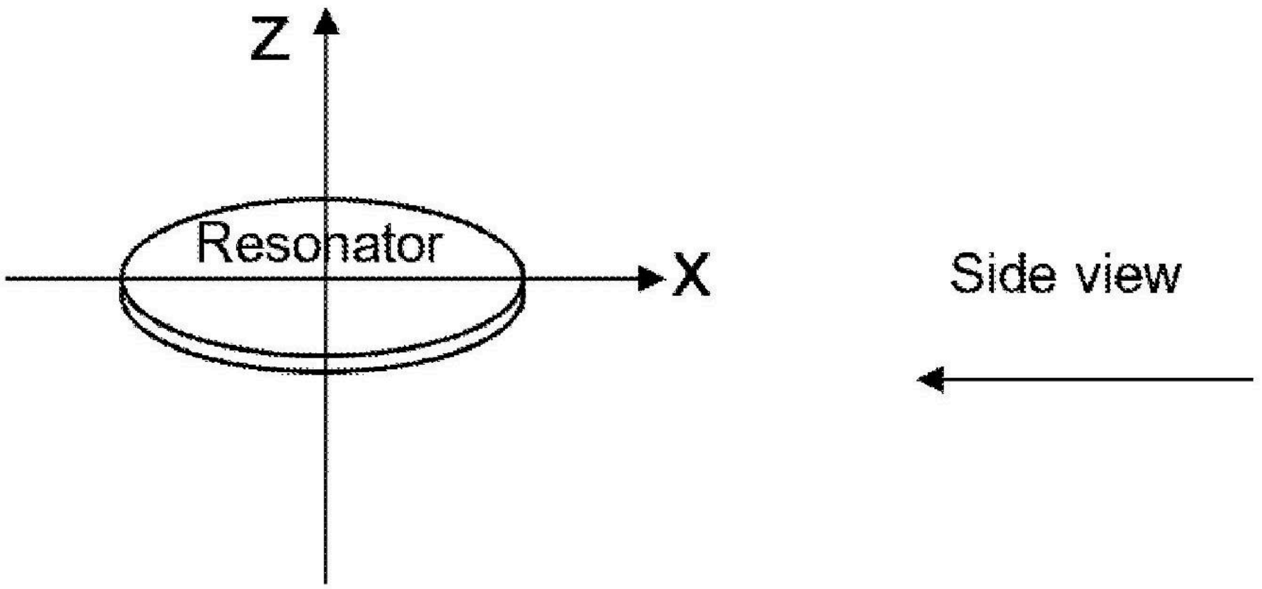
FIG. 18 圖 **18**



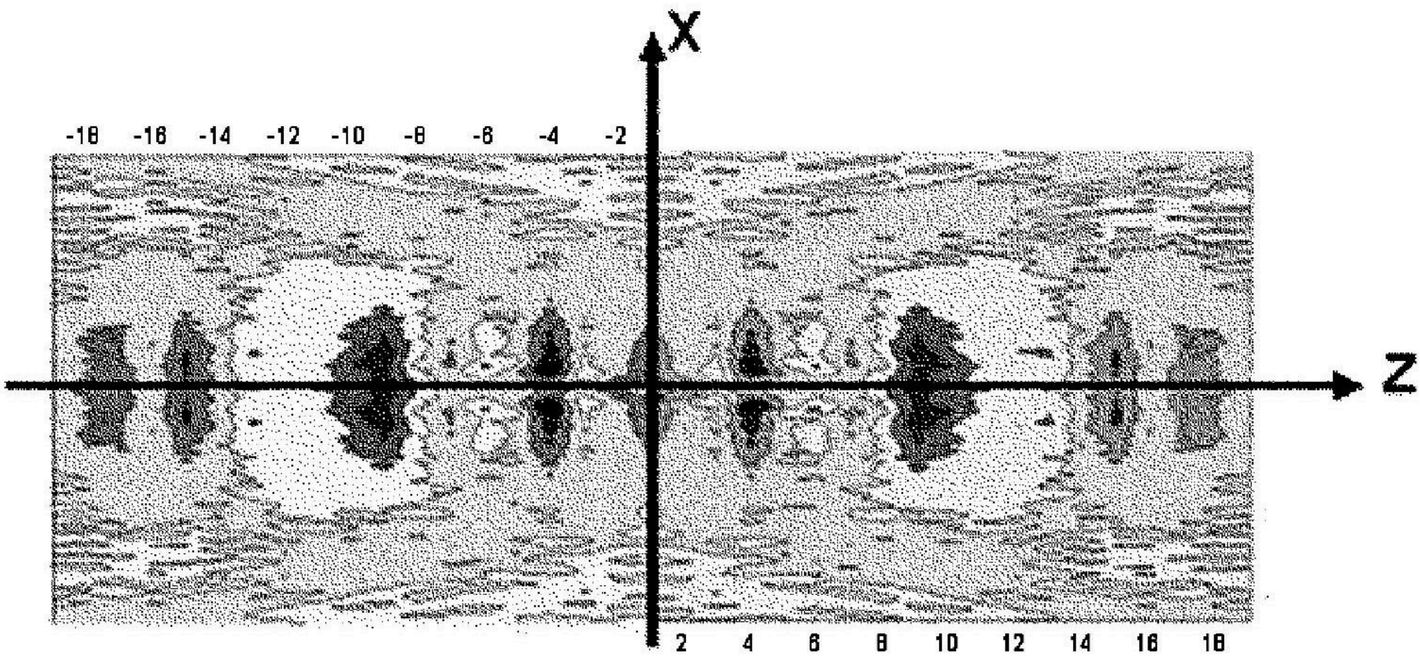
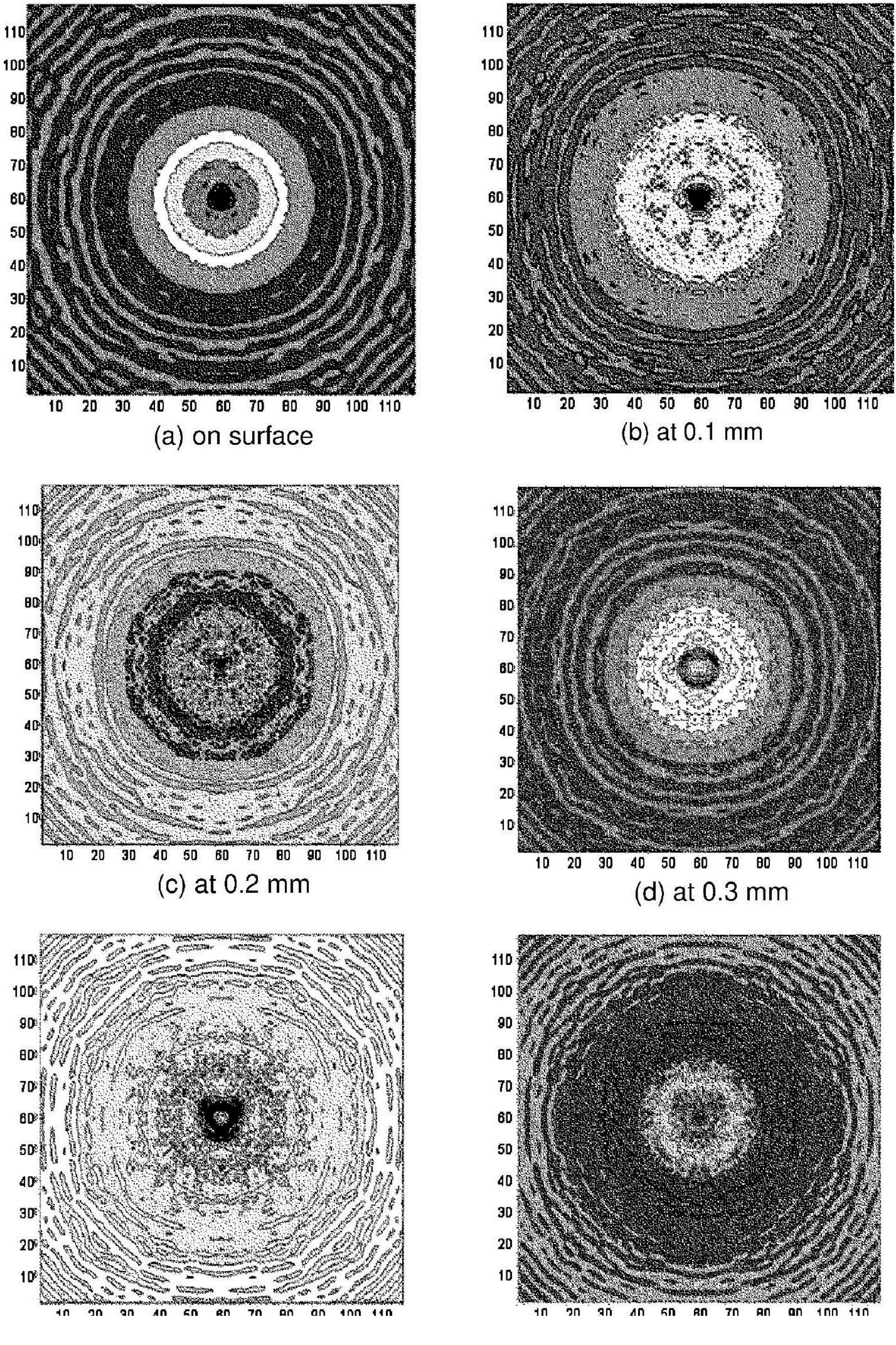


FIG. 19 圖 **19**



(a) on surface

(b) at 0.1 mm

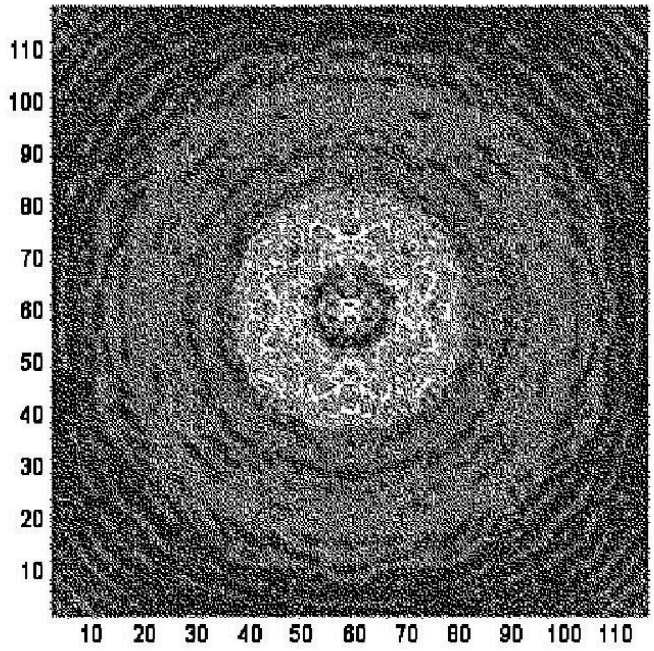
(c) at 0.2 mm

(d) at 0.3 mm

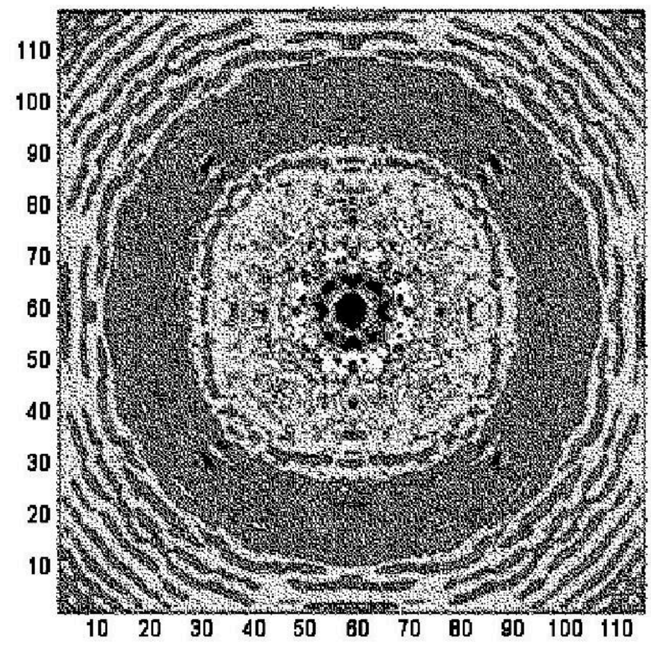
(e) at 0.4 mm

(f) at 0.5 mm

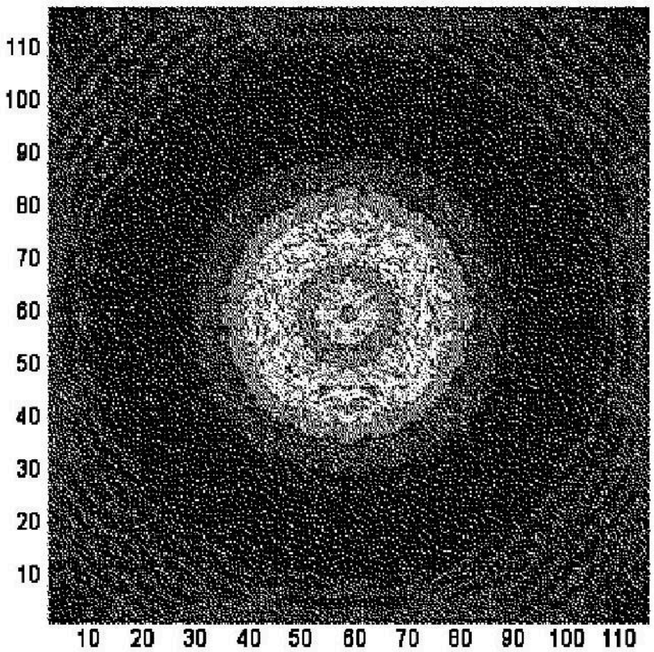
FIG. 20 圖 **20**



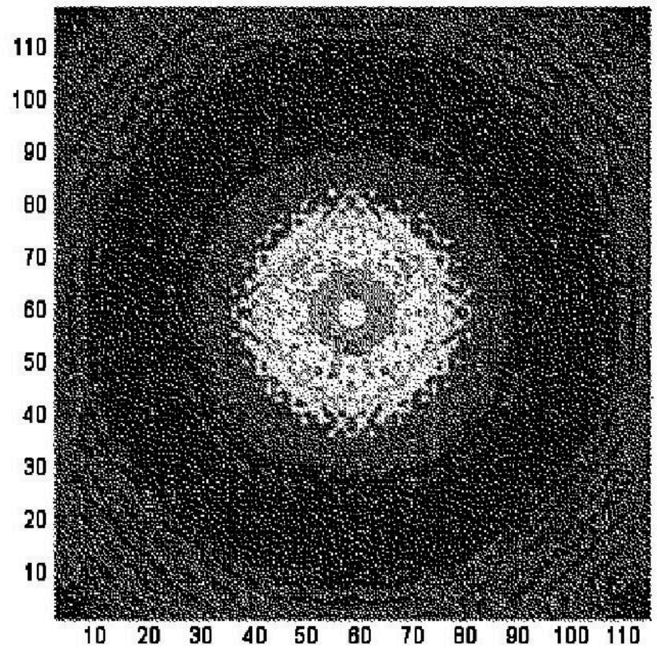
(g) at 0.6 mm



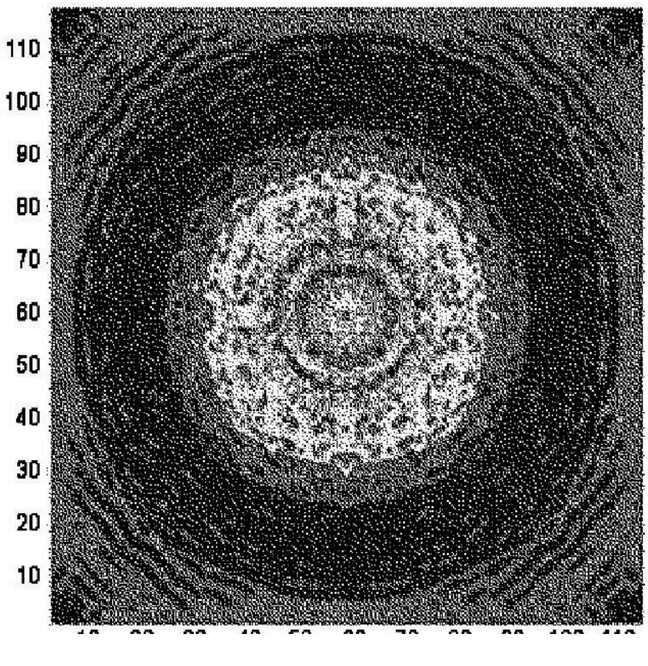
(h) at 0.7 mm

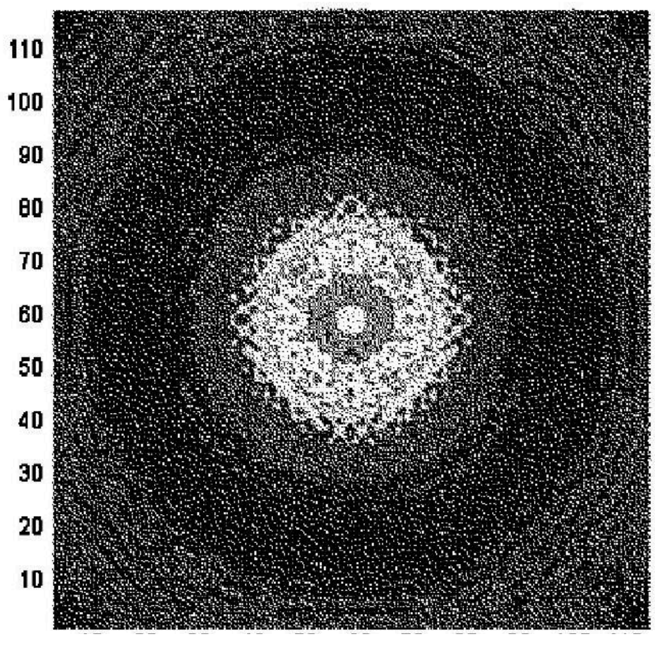


(i) at 0.8 mm



(k) at 0.9 mm





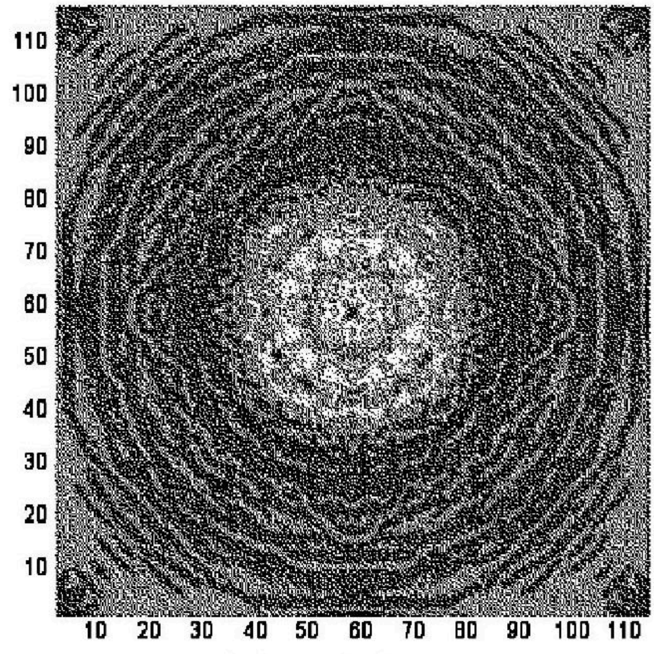
10 20 30 40 50 60 70 80 90 100 110

(l) at 1.0 mm

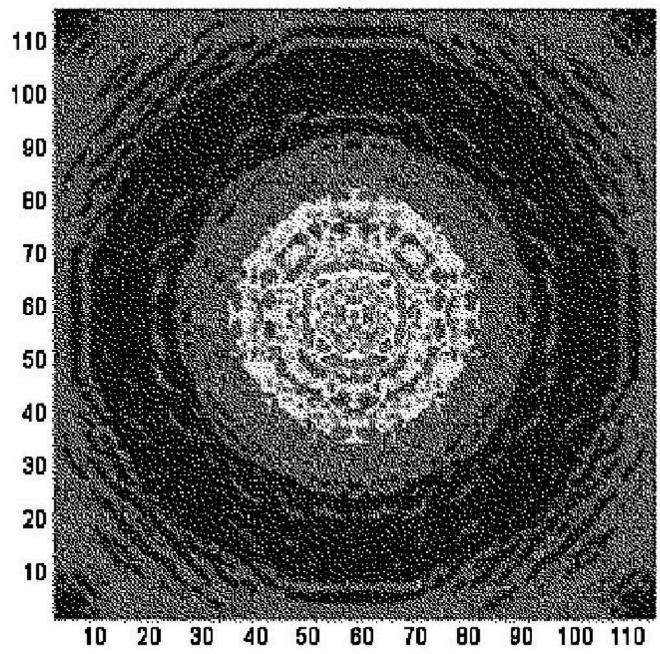
10 20 30 40 50 60 70 80 90 100 110

(m) at 1.1 mm

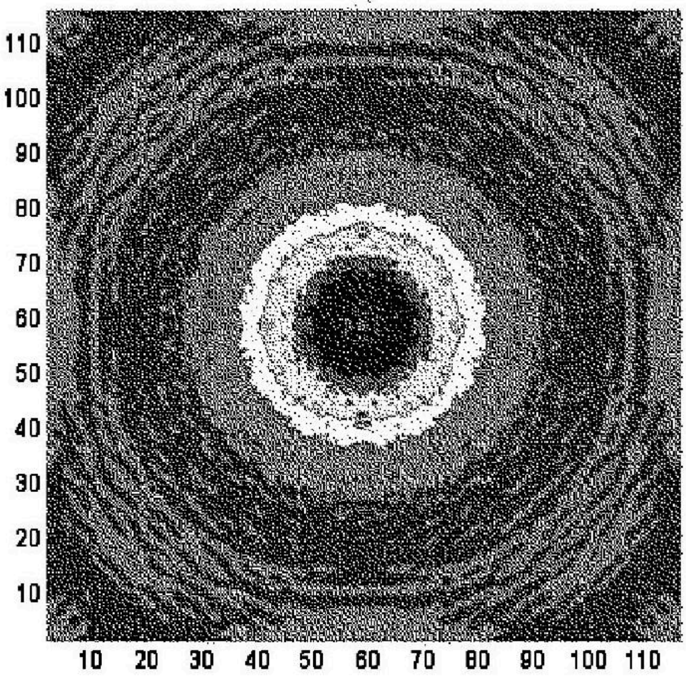
FIG. 20 圖 **20**



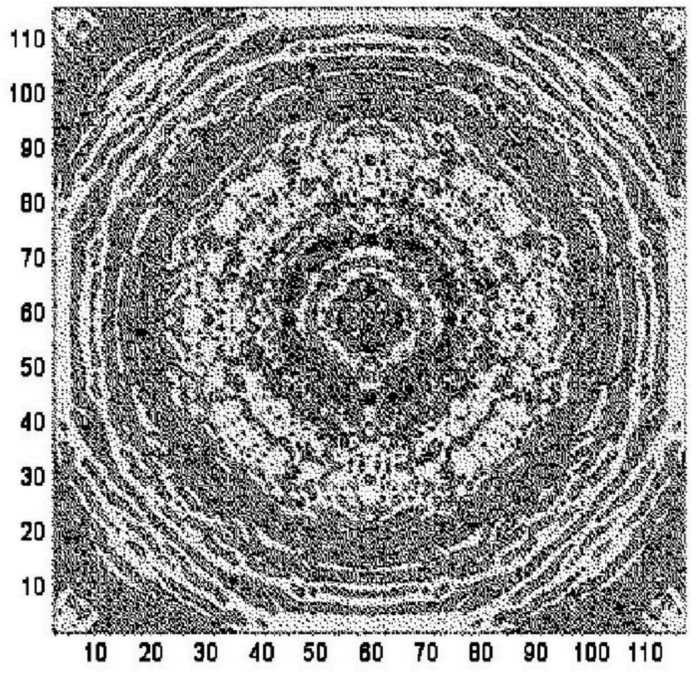
(n) at 1.2 mm



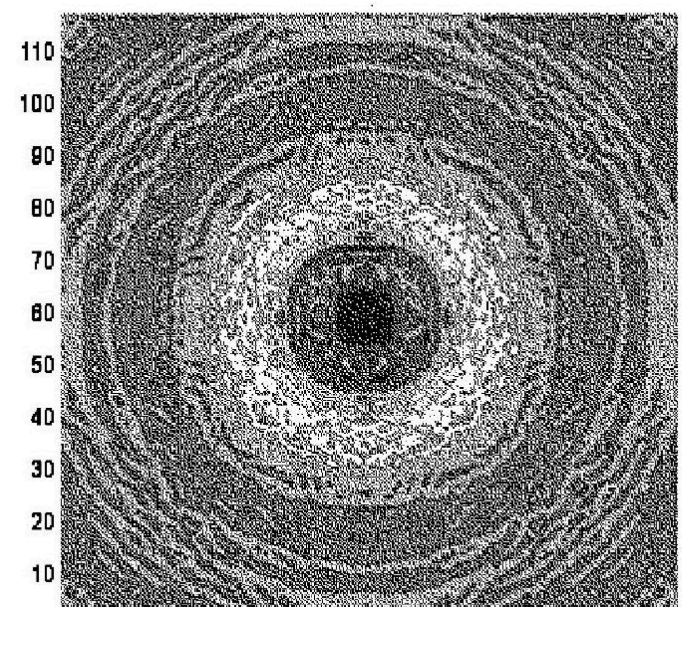
(o) at 1.3 mm

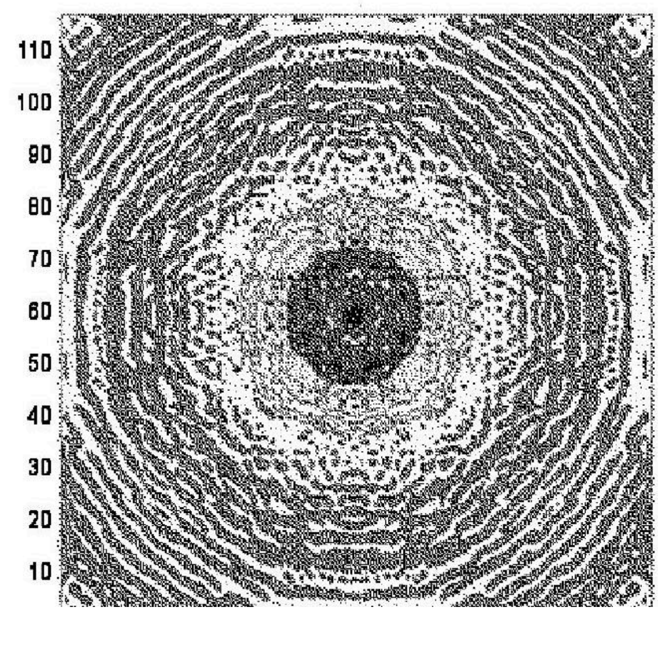


(p) at 1.4 mm



(r) at 1.5 mm





(s) at 1.6 mm

(t) at 1.7 mm

FIG. 20 圖 **20**

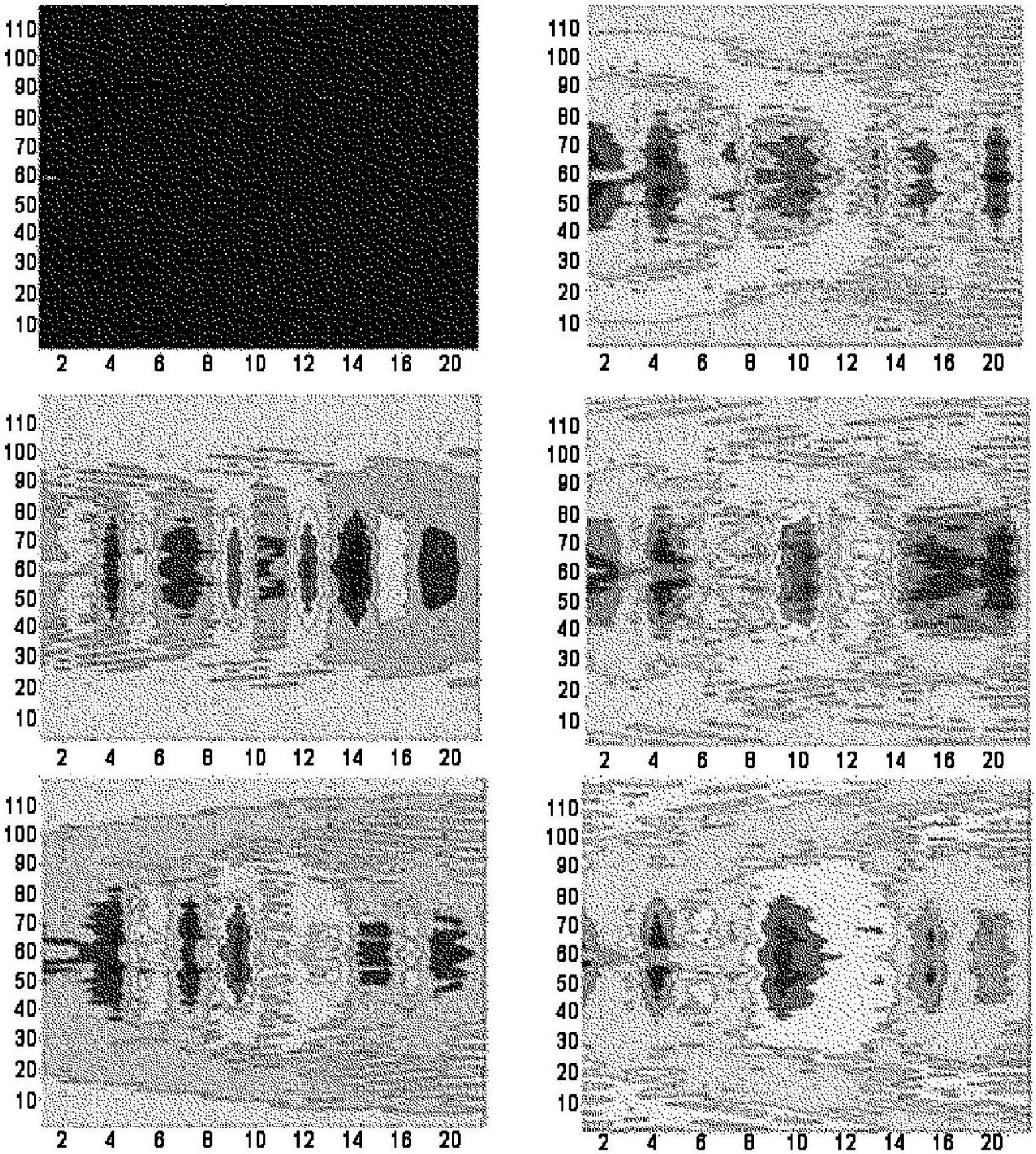
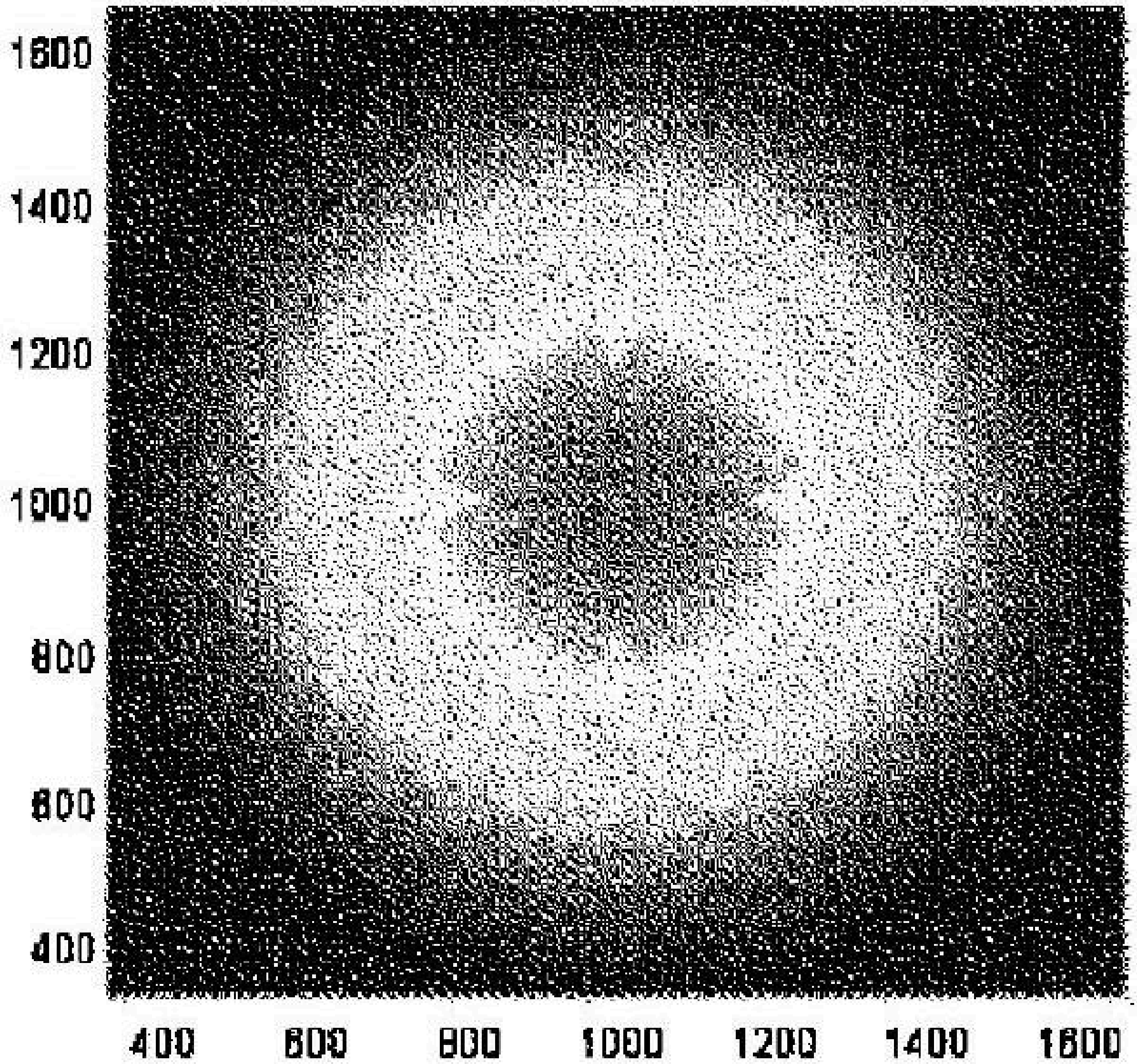


FIG. 21 圖 **21**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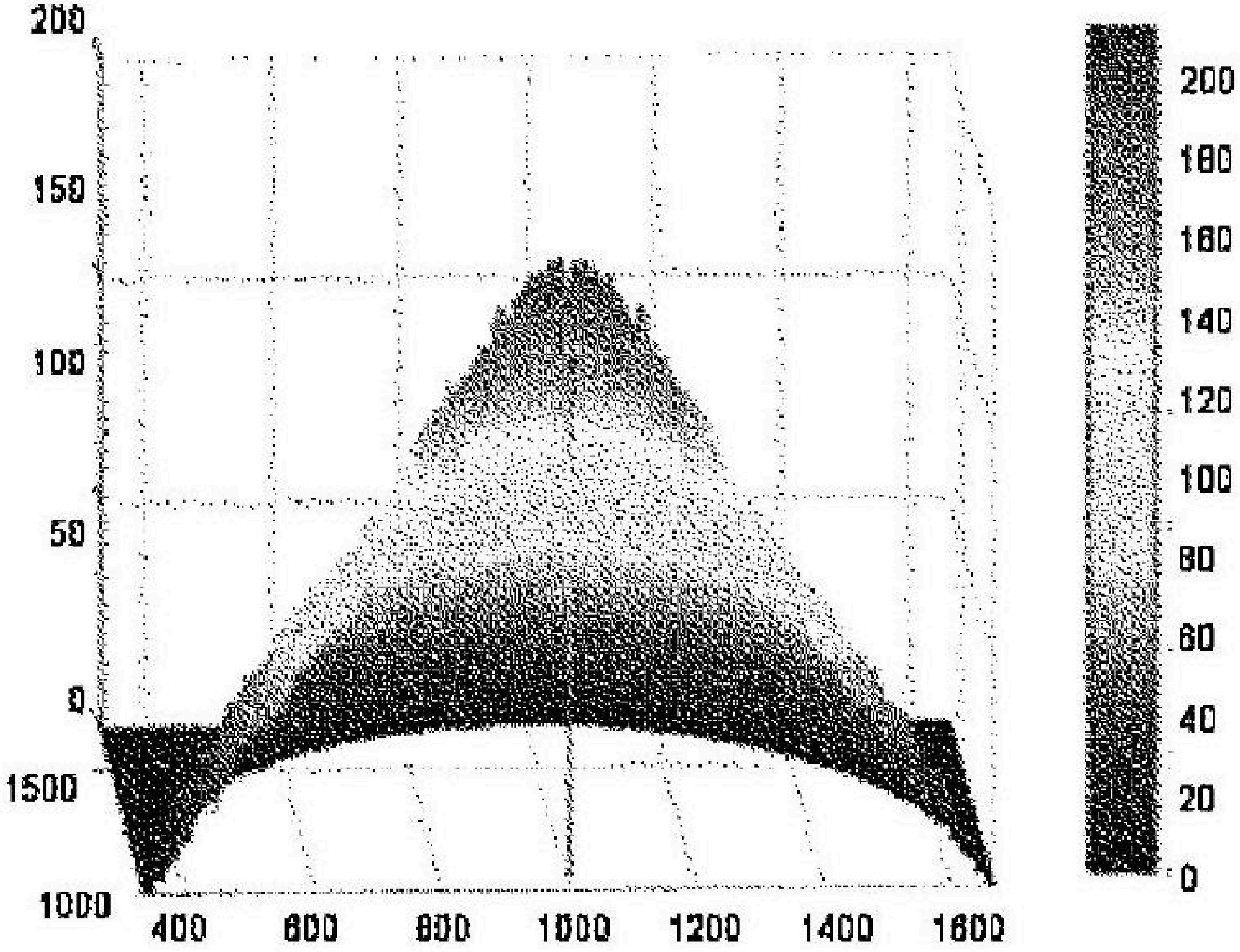

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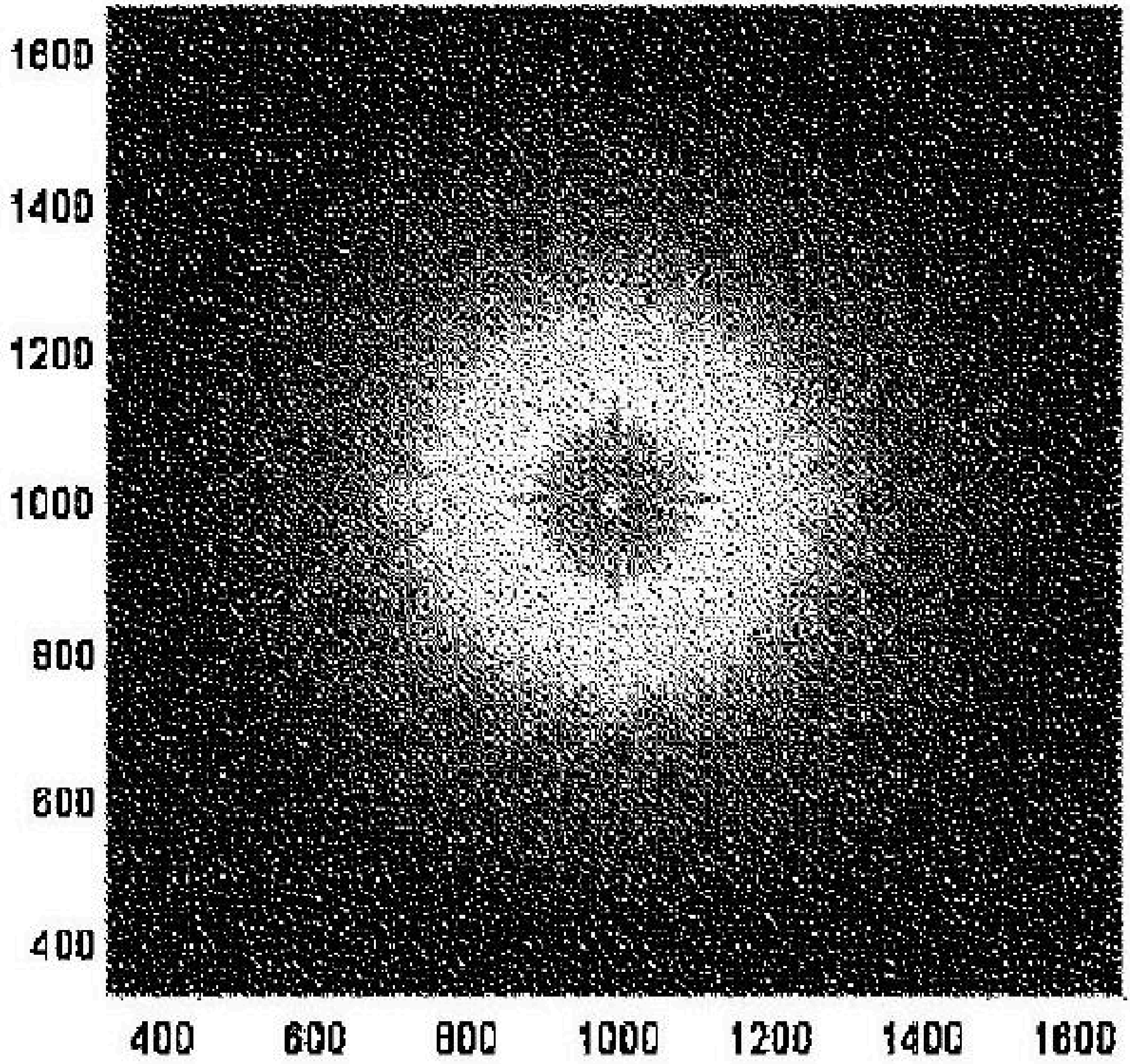
FIG. 22 圖 **22**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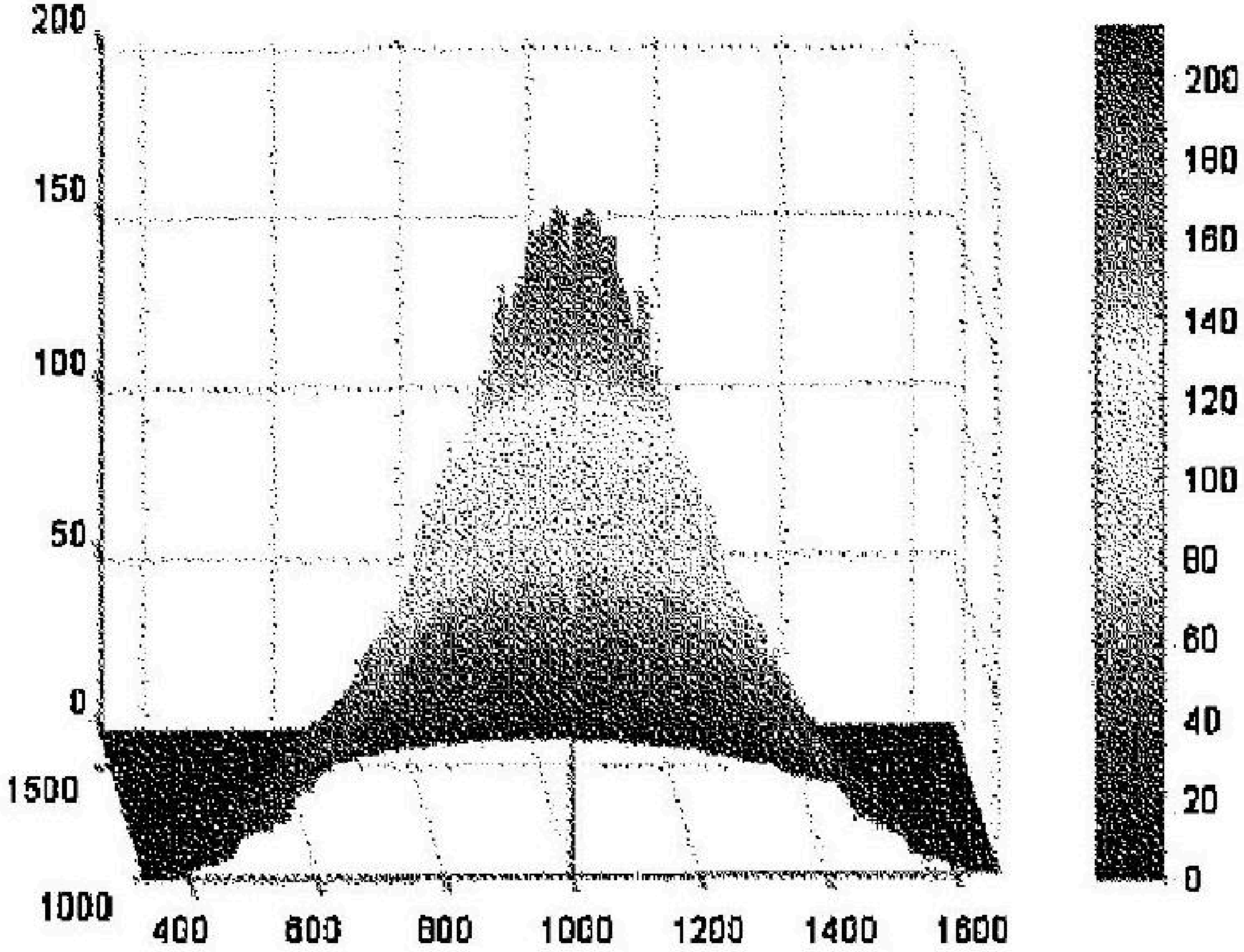

FIG. 23 圖 **23**

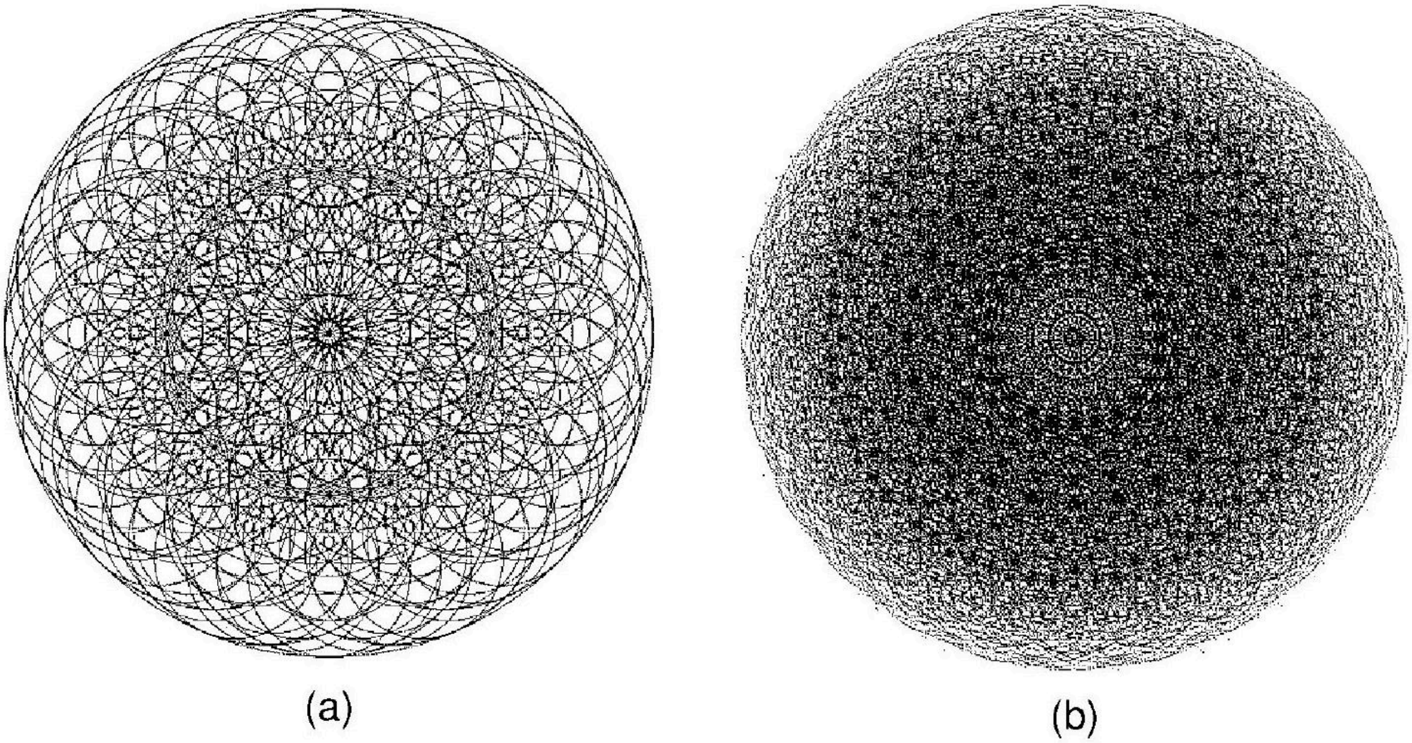

FIG. 24 圖 **24**

INTERNATIONAL SEARCH REPORT 國際檢索報告	International application No PCT/IB2019/058334 國際申請號 PCT/IB2019/058334

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61N1/16
ADD .

A. 主題分類 INV. A61N1/16 附加

According to International Patent Classification (IPC) or to both national classification and IPC

根據國際專利分類（IPC）或同時根據國家分類及 IPC

B. FIELDS SEARCHED **B. 搜尋領域**

Minimum documentation searched (classification system followed by classification symbols)
A61N

搜尋的最少文件（分類系統後接分類符號）A61N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

除最低限度文件外，還搜尋了包含於搜尋範圍內的其他文件

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

國際檢索期間查閱的電子資料庫（資料庫名稱及可行時所使用的檢索詞）

EPO-Internal, WPI Data **EPO-Internal，WPI 資料**

C. DOCUMENTS CONSIDERED TO BE RELEVANT

C. 被認為相關的文件

Category* **類別***	Citation of document, with indication, where appropriate, of the relevant passages **文件引用，並在適當處標示相關段落**			Relevant to claim No. **與權利要求書第 相關**
X	RU 2231137 C1 (SEROV, IGOR) 20 June 2004 (2004-06-20) cited in the application paragraphs [0036], [0043] **RU 2231137 C1（SEROV, IGOR）2004 年 6 月 20 日（2004-06-20）於申請文件第[0036]、[0043]段引用**			1-7
X	RU 2308065 C1 (SEROV IGOR NIKOLAEVICH [RU]) 10 October 2007 (2007-10-10) **RU 2308065 C1（SEROV IGOR NIKOLAEVICH [RU]）2007 年 10 月 10 日（2007-10-10）**			1-7
	paragraphs [0001], [0007], [0008], [0029]; claim 1 **第[0001]、[0007]、[0008]、[0029]段；索賠 1**			

X	RU 2200968 C2 (SEROV IGOR NIKOLAEVICH) 20 March 2003 (2003-03-20) paragraphs [0015], [0016] **RU 2200968 C2（SEROV IGOR NIKOLAEVICH）2003 年 3 月 20 日（2003-03-20）段落 [0015]，[0016]**			1-7
X	US 2011/065975 A1 (KAZAN-SKIY LEONID [HK]) 17 March 2011 (2011-03-17) paragraphs [0019] - [0021] -/-- **US 2011/065975 A1 (KAZANSKIY LEONID [HK]) 2011 年 3 月 17 日（2011-03-17）段落 [0019] - [0021] -/--**			1-7

☐ Further documents are listed in the continuation of Box C.

☐ 進一步的文件列於方框 C 的後續部分。

* Special categories of cited documents
"T" later document published after the international filing date or priority
"A" document defining the general state of the art which is not considered date and not in conflict with the application but cited to understand to be of particular relevance the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date
" X " document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive
"L" document which may throw doubts on priority claim(s) or which is step when the document is taken alone cited to establish the publication date of another citation or other special reason (as specified)
" Y " document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is
" O " document referring to an oral disclosure, use, exhibition or other means
being obvious to a person skilled in the art
" P " document published prior to the international filing date but later than the priority date claimed
" & " document member of the same patent family

*** 特殊類別的引用文件 "T" 於國際申請日或優先權日之後發表的後續文件 "A" 定義一般技術現狀的文件，雖不被視為日期且不與申請案衝突，但為理解發明所依據的原理或理論而特別引用 "E" 較早的申請案或專利，但於國際申請日當日或之後發表 "X" 具有特別相關性的文件；所主張的發明無法被視為新穎或無法被視為具備創作性 "L" 可能對優先權主張產生疑義的文件，或當該文件單獨被引用以確定另一引用文件的發表日期或其他特殊原因（如指定） "Y" 具有特別相關性的文件；當該文件存在時，所主張的發明無法被視為具備創作性 "O" 指口頭揭露、使用、展覽或其他對本領域技術人員顯而易見的方式所提及的文件 "P" 於國際申請日前發表，但晚於所主張的優先權日的文件 " & " 同一專利家族成員文件**

Date of the actual completion of the international search 9 June 2020 **國際檢索實際完成日期 2020 年 6 月 9 日**	Date of mailing of the international search report 22/06/2020 **國際檢索報告寄發日期 2020 年 6 月 22 日**

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016 **國際檢索機構名稱及郵寄地址 歐洲專利局，P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk 電話：（+31-70）340-2040，傳真：（+31-70）340-3016**		

INTERNATIONAL SEARCH REPORT

國際檢索報告

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT **C（續）。被認為相關的文件**		
Category* **類別***	Citation of document, with indication, where appropriate, of the relevant passages **文件引用，並在適當處標示相關段落**	Relevant to claim No. **與權利要求書第____項相關**
A	US 2016/001091 A1 (HASSLER RICHARD MICHAEL [US] ET AL) 7 January 2016 (2016-01-07) paragraphs [0031], [0032] **US 2016/001091 A1（HASSLER RICHARD MICHAEL [美國] 等）2016 年 1 月 7 日（2016-01-07）段落 [0031]，[0032]**	1-7

INTERNATIONAL SEARCH REPORT Information on patent family members **國際檢索報告 專利家族成員資訊**				International application No PCT/IB2019/058334 **國際申請號 PCT/IB2019/058334**
Patent document cited in search report **檢索報告中引用的專利文件**			Patent family member(s) **專利家族成員**	Publication date **公開日期**
RU 2231137 C1 20-06-2004 NONE **RU 2231137 C1 2004-06-20 無**				
RU 2308065	C1	NONE		
RU 2200968	C2	NONE		
US 2011065975	A1	LT	5768 B	26-09-2011
		US	2011065975 A1	17-03-2011
US 2016001091	A1	US	2016001091	07-01-2016
		US	2018126118	10-05-2018