CLAIMS

What is claimed is:

1. A system for applying a superimposed time-varying frequency electromagnetic wave to a target object or a target region that is formed by the target object and a medium surrounding the target object, the system comprising:

a device for generating the superimposed time-varying frequency electromagnetic wave, wherein the device comprises:

at least two output terminals;

an alternating current (AC) wave generator configured to generate an AC driving signal corresponding to an AC electromagnetic wave having a time-varying frequency at a desired sweeping time, and

a direct current (DC) biasing unit electrically coupled in series with the AC wave generator, wherein the DC biasing unit is configured to produce a DC output with a predefined DC bias voltage, receive the AC driving signal, and mix the DC output with the received AC driving signal to produce the superimposed time-varying frequency electromagnetic wave where the time-varying frequency AC electromagnetic wave is riding on the predefined DC bias voltage, and

an actuator provided at one or each of both of a first excitation site and a second excitation site of the target object or the target region and electrically coupled in series with the output terminal of the device,

wherein the device is electrically coupled in series with the first excitation site and the second excitation site of the target object or the target region directly or through the actuator, and

wherein the device is configured to superimpose the DC bias output and the AC driving signal to produce the superimposed time-varying frequency electromagnetic wave to be applied to the target object or the target region to induce a flow of ionic current having a DC component traveling in a pulsating and time-varying manner in the target object and/or in the medium and effect induced vibration of electrons and molecules of the target object and the medium.

2. The system as claimed in claim 1, wherein the DC biasing unit is selected from the group consisting of a switch mode DC power supply, an AC to DC converter, a rechargeable DC battery and an inductive diode filter.

3. The system as claimed in claim 2, wherein the device for generating the superimposed time-varying frequency electromagnetic wave is provided as a prefabricated electronic circuitry.

4. The system as claimed in any one of claims 1 to 3, wherein the DC bias voltage is selected to produce the superimposed time-varying frequency electromagnetic wave that have polar asymmetry or become a unidirectional pulsating wave.

5. The system as claimed in any one of claims 1 to 4, wherein the DC biasing unit is configured to selectively produce the superimposed time-varying frequency electromagnetic wave that has half-wave distortion or full-wave distortion.

6. The system as claimed in any one of claims 1 to 5, wherein the superimposed time-varying frequency electromagnetic wave is in square, triangular, rectangular or sine form.

7. The system as claimed in any one of claims 1 to 6, wherein the DC bias voltage is controlled to vary continuously or in steps and less than a peak voltage of the AC driving signal.

8. The system as claimed in any one of claims 1 to 7, wherein the target object is made of an electrically non-conductive material, and if the first and/or second excitation sites are positioned on the electrically non-conductive target object, the actuator is provided at the respective excitation site to be electrically coupled with the device.

9.The system as claimed in any one of claims 1 to 8, wherein the frequency of the superimposed time-varying frequency electromagnetic wave is between about 100 Hz and about 1 MHz, preferably between about 100 Hz and about 200 KHz.

10. The system as claimed in any one of claims 1 to 9, wherein the sweeping frequency of the superimposed time-varying frequency electromagnetic wave is between about 1 Hz and about 1 KHz, preferably between about 10 Hz and about 100 Hz.

11. The system as claimed in any one of claims 1 to 10, wherein both the first and second excitation sites are positioned on the target object or in the medium in a spaced relation, or one of the first and second excitation sites is positioned on the target object, and the other is positioned in the medium.

12. The system as claimed in any one of claims 1 to 11, wherein the actuator is provided in the form of a coil.

13. The system as claimed in any one of claims 1 to 12, wherein the AC wave generator comprises a control unit configured to generate a signal having the time-varying frequency at the desired sweeping time, and one or more bridge-type circuit coupled to the control unit for receiving the signal generated from the control unit, the bridge-type circuit being driven by the received signal to generate and amplify the AC driving signal of the time-varying frequency AC electromagnetic wave, wherein the bridge-type circuit comprises one or more half-bridge driver integrated circuits (ICs) and one or more Metal Oxide Semiconductor Field Effect Transistors (MOSFETs) coupled to the respective half-bridge driver ICs.

14. The system as claimed in claim 13, wherein the control unit comprises a programmable integrated circuit (IC) for time-varying the frequency of the AC driving signal, and optionally a stabilizer circuit for stabilizing the AC driving signal.

15. A method for applying a superimposed time-varying frequency electromagnetic wave to a target object or a target region that is formed by the target object and a medium surrounding the target object, the method comprising the steps of:

generating a superimposed time-varying frequency electromagnetic wave where an AC driving signal with time varying frequency is riding on a DC output with a predefined DC bias voltage, and

subjecting the target object or the target region to the generated superimposed time-varying frequency electromagnetic wave so as to excite the target object or the target region to induce a flow of ionic current having a DC component traveling in a pulsating and time-varying manner in the target object and/or in the medium and effect induced vibration of electrons and molecules of the target object and the medium.

16. The method as claimed in claim 15, wherein the predefined DC bias voltage is set to be variable or fixed.

17. The method as claimed in claim 15 or 16, wherein the generating step comprises generating the superimposed time-varying frequency electromagnetic wave that have polar asymmetry or become a unidirectional pulsating wave.

18. The method as claimed in any one of claims 15 to 17, wherein the generating step comprises generating the superimposed time-varying frequency electromagnetic wave that have half-wave distortion or full-wave distortion.

19. The method as claimed in any one of claims 15 to 18, wherein the frequency of the superimposed time-varying frequency electromagnetic wave is between about 100 Hz and about 1 MHz, preferably between about 100 Hz and about 200 KHz.

20. The method as claimed in any one of claims 15 to 19, wherein the superimposed time-varying frequency electromagnetic wave has a sweeping frequency between about 1 Hz and about 1 KHz, preferably between about 10 Hz and about 100 Hz.