German Patent
and Trade Mark Office

(10) **DE 10 2010 026 585 B4** 2016.02.04

(12)Patent specification

(21) File number: **10 2010 026 585.3**
(22) Date of filing: **08.07.2010**
(43) Date of publication of application: **03.02.2011**
(45) Date of publication of the mention of the grant of the patent: **04.02.2016**

(51) Int Cl.: ***G01N 21/63*** (2006.01)

(66) Domestic priority:
10 2009 033 580.3 16.07.2009

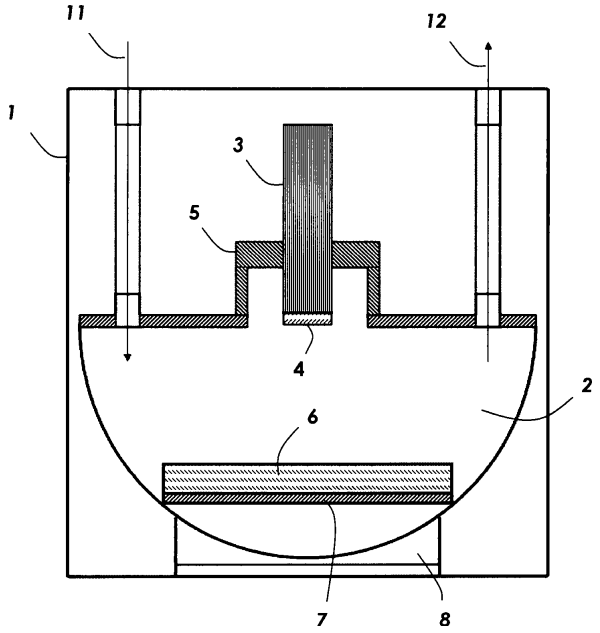
(73) Patent proprietor:
Mihailescu, Eugen, 40589 Düsseldorf, DE;
Mihailescu, Silvan, Dr., 40477 Düsseldorf, DE

(72) Inventor:
Mihailescu, Eugen, 4000 Düsseldorf, DE;
Mihailescu, Silvan, Dr., 40477 Düsseldorf, DE

(56) References cited:
See the following page

(54) Title: **Method and device for detecting atmospheric fresh air**

(57) Main claim: Method for the detection of atmospheric fresh air, named the flow method, characterised in that
1. the detection of atmospheric fresh air is performed by the detection and the evaluation of a luminescence phenomenon and
2. the atmospheric fresh air serves as or acts as an excitation source for the detected luminescence phenomenon, whereby first
3. a reference experiment is performed in which,
3.1 in a light-tight closed measuring room,
3.2 which is empty, respectively in which the walls of the measuring room are in contact with a gaseous medium,
3.3 indoor ambient air without any content of atmospheric fresh air is supplied or is passed through, whereby air without any content of atmospheric fresh air behaves according to the kinetic gas theory and
3.4 while the indoor ambient air without any content of atmospheric fresh air is being supplied or is passed through the measuring room, the luminescence emission inside the measuring room is measured and only then
4. the main experiment is performed, in which
4.1 atmospheric fresh air or a mixture of gases is supplied to the light-tight closed measuring room or is passed through the light-tight closed measuring room and
4.2 while the atmospheric fresh air or the gas mixture is being supplied or passed through the measuring room, the luminescence emission inside the measuring room is measured and after that
5. the optained data are evaluated by comparing the data aquired in the reference experiment with the data acquired in the main experiment.



(56) References cited:

DE	**000002033323**	**C3**
DE	**699 24 639**	**T2**
GB	**2 133 528**	**A**
GB	**2 404 319**	**A**
US	**2009 / 0 114 736**	**A1**
US	**3 536 898**	**A**
WO	**2005/ 040 767**	**A2**
JP	**H07- 83 830**	**A**

Adler, S. L.: Can the flyby anomaly be attributed to earth-bound dark matter? Phys. Rev. D, Vol. 79, No.2, Jan. 2009, S.023505

On the internet:JURL: https://arxiv.org:0808.0899/ Sept. 2008L

Description

Technical field

[0001] The present invention concerns two methods for the detection of atmospheric fresh air. Atmospheric fresh air is a mixture of different permanent gases, among which nitrogen (N_2; 78.10 % by vol.), oxygen (O_2; 20.95 % by vol.), argon (Ar; 0.933 % by vol.) and carbon dioxide (CO_2; 0.033 % by vol.) predominate.

State of the art

[0002] It is known that atmospheric fresh air can be analyzed and detected with measuring equipment using a variety of processes, methods and devices. Analytical devices that can be used include mass spectrometers, particle spectrometers, absorption spectrometers and gas chromatographs. These measuring devices enable the chemical analysis of the air, so that the gaseous chemical elements, aerosols, trace gases, small ions and water vapor present in the air sample can be determined quantitatively.

[0003] For certain applications, such as in tracing leaks or in alarm devices for atmospheric fresh air penetrating a system, it is necessary to make a statement regarding the source or the origin of the air. In certain processes it is necessary to distinguish between whether indoor ambient air or atmospheric fresh air penetrates a system or is present within.

[0004] In the case of methods in which leaks are determined by secondary effects, the presence of leaks can be determined, but leakages cannot be located. A leakage can be located by a thermal conductivity vacuum gauge. The measuring principle of a thermal conductivity vacuum gauge is based on the fact that the thermal conductivity of gases is dependent on pressure. One disadvantage of this method is its relative lack of sensitivity, so that only large leaks can be located. Another disadvantage is that environmental and system parameters have a negative effect on the accuracy.

[0005] Locating leaks with ultrasound uses the fact that the atmospheric air flowing into a leak generates sound waves in the ultrasonic range. The ultrasonic sound can be detected with a sensor. A disadvantage of the ultrasound detection is its low detection threshold.

[0006] Locating leaks with helium as a tracer gas enables the search for leaks without interrupting or impairing the supply area. This way of searching for leaks with helium can be used for all water-bearing pipes and systems, such as district-heating, refrigeration, cooling-water and drinking-water networks. Helium is an inert

noble gas that does not have any negative influences on the environment. The main disadvantage of locating leaks with helium as a tracer gas is that the measuring results depend quite much on varying conditions, such as wind speed, wind direction and temperature.

[0007] Unlike the methods known so far, the present invention is not based on a chemical analysis of the atmospheric fresh air. The present invention uses instead two new physical phenomena caused by the atmospheric fresh air in order to detect the atmospheric fresh air. The present invention uses a special energetic property of the Earth's atmosphere or of the atmospheric fresh air, which can cause excitation effects. This special energetic property of the Earth's atmosphere to cause an excitation effect is apparently primary based on the emission and the storage of a special kind of solar radiation in the Earth's atmosphere.

[0008] Two main energetic influences are important regarding the invention: a special solar influence and a special terrestrial influence. The two new luminescence phenomena applied in the invention are caused apparently primary by the special solar influence, which is based on a special kind of solar radiation, that is emitted by the sun and which is also contained in the Earth's atmosphere.

[0009] A special terrestrial influence is apparently also contained in the Earth's atmosphere and is apparently involved in the special energetic component of the Earth's atmosphere that causes the new excitation phenomena applied in the invention. According to the present knowledge, this special terrestrial influence is, however, secondary and complementary. The following three current research fields A, B and C are connected with the new luminescence phenomena described and applied in the invention:

A.

[0010] It is likely that the special kind of solar radiation used in the invention also causes an anomaly in the radioactive decay rates of certain nuclides in research laboratories on Earth. This anomaly caused by a special component of the solar radiation has been subject of research at the Brookhaven National Laboratory (BNL) in the USA, at the Physikalisch-Technische-Bundesanstalt (PTB) – The National Metrology Institute of Germany and at the Lomonosov Moscow State University (LMSU). Concerning this see the following publications:
http://arxiv.org/abs/0808.3283, http://arxiv.org/abs/1010.2225,
https://arxiv.org/abs/1012.4174, http://arxiv.org/abs/1106.1678,
http://arxiv.org/abs/1106.2374 and https://arxiv.org/abs/1203.3107.

[0011] In connection with this radioactive decay anomaly, significant cyclical fluctuations were found in the radioactive decays rates of up to 0.35 % compared to the radioactive equilibrium state, or the secular equilibrium, that are caused by a special component of the solar radiation. The particular form of solar radiation that causes this anomaly is, however, unknown today. This, because no form of solar

radiation is known so far which has, or might have, an influence on the decay rate of radioactive samples on Earth. Since the 1930s it is generally believed that the radioactive decay rates cannot be influenced by any kind of energy fields or particles known so far – see "*Radiations from Radioactive Substances*" by Sir E. Rutherford, J. Chadwick, and C. Ellis in Cambridge University Press, 1930, Chapter VII, page 167.

[0012] Connected with this radioactive decay anomaly caused by a special kind of solar radiation are also findings obtained in a long-term experiment performed at the Geological Survey of Israel Laboratory (GSI) in Jerusalem. During that long-term experiment, which lasted several years, characteristic daily and annual fluctuations in the radioactive decay rate of the natural radionuclide radon-222 (Rn-222) up to 20 % compared to the secular equilibrium were found.

[0013] In http://www.dnr.mo.gov/env/hwp/docs/ri2k.pdf the expected secular equilibrium state in the above-mentioned long-term experiment performed at the Geological Survey of Israel Laboratory (GSI) in Jerusalem is presented. The radioactive equilibrium state or the secular equilibrium state for radon samples (radon-222) is presented on page 10 and in Fig. 4-4 on page 21. The secular equilibrium state with a constant, unchanging radioactivity emission, is expected to occure 20 to 30 days after start of the experiment for a radon sample (radon-222).
Concerning the long-term experiment performed at the Geological Survey of Israel Laboratory (GSI) in Jerusalem with cyclical fluctuations of the alpha and gamma emission from a radon sample (radon-222) of up to 20 % compared with the expected secular equilibrium state, the following publications are important:
The first publication of the long-term experiment published under the title *"Experimental replication of radon signals that occur in the geological environment"* by Gideon Steinitz and Oksana Piatibratova, published under the GSI Report 17/2008 from July 2008, see:
https://www.researchgate.net/publication/264120472_Experimental_replication_of_radon_signals_that_occur_in_the_geological_environment.

Important are the following features of the experimental setup and the following findings:

a) the experimental setup was air-tight sealed and possesses 3.0 mm thick steel walls, see pages 1 and 15,

b) the experiment was performed in an open shack at ground level in the Earth's atmosphere, see pages 1, 15 and 51,

c) the expected secular equilibrium of gamma rays was 2.25 $x10^6$ counts (see page 21, Fig. 5). The maximum gamma ray emission level was 2.72 $x10^6$ counts (see page 38, Fig. 24 and page 39, Fig. 25), corresponding to an increase of 20.9 % compared to the expected secular equilibrium,

d) fluctuations in the radioactive decay rate from one day to the next day (peak-to-peak) of up to 20 % for the detected gamma rays and up to 50 % for the detected alpha rays were found, see page 29,

e) a pronounced diurnal periodicity in the gamma rays emission was found at the gamma-C detector, see page 38, Fig. 24, page 39, Fig. 25 and page 40, Fig. 27,

f) a pronounced annual periodicity in the alpha rays emission and in the gamma rays emission was found, see page 19, Fig. 3 and page 21, Fig. 5,

g) the finding that the emission of alpha rays was either increased or reduced, compared to the expected secular equilibrium state, see page 52: *"e) Some of the fluctuations are below the equilibrium value (Alpha-H) indicating an apparent deficit."* and

h) the absence of the stationary equilibrium state or the absence of the secular equilibrium state for the alpha rays emission and for the gamma rays emission during the long-term experiment, see the pages 51 and 52.

[0014] The publication *"Possible effect of solar tides on radon signals"* by Gideon Steinitz, Oksana Piatibratova and Peter Kotlarsky published in the Journal of Environmental Radioactivity, vol. 102, 2011, pages 749 - 765, from August 2011 (available online since 7th May, 2011) see https://www.sciencedirect.com/science/article/pii/S0265931X11000749

The following issues and findings are important:

a) the description on page 750 and page 755 of the expected radioactivity level, or the expected secular equilibrium, which is expected to occur 20 days after the start of the experiment,

b) the description of the found fluctuations in the radioactivity emission of up to 20 % compared to the expected radioactivity level in the *Abstract* of the publication on page 749: *"Internal and external gamma and alpha detectors recorded variations of the radiation, up to around 20 % of the equilibrium level."*

c) the description of two experiments performed in the year 2008 with a different experimental setup, performed on the south wall of a laboratory at the GSI in Jerusalem with findings comparable to those obtained during the long-term experiment,

d) the finding that the special kind of solar radiation which causes the radioactive decay anomaly is capable of penetrating the concrete south wall of the experimental laboratory at the GSI in Jerusalem and after that also the 5.0 cm thick lead shield of the experimental container. This was found in connection with the two experiments performed in the year 2008, see the *Abstract* of the publication,

e) the found annual periodicity in the alpha rays emission and in the gamma rays emission during the long-term experiment in Fig. 7 and Fig. 8 on page 755,

f) the finding that the emission of alpha rays also performed negative fluctuations, see page 763: *"g) Some of the fluctuations were "negative" – below the equilibrium value (Alpha-H), indicating an apparent deficit."*

g) the absence of the secular equilibrium state in the alpha rays emission and in the gamma rays emission during the long-term experiment on page 755,

h) the conclusion that the found radioactive decay anomaly cannot be explained by the influencing factors known so far. On page 764: *"The phenomena, and above all their statistical characteristics, cannot be explained by applying the different terms raised in the past such as exhalation, diffusion, advection, transport in porous media, stack effect, atmospheric influence (variation of pressure, temperature, humidity). They rather pose a contradiction of them."*

[0015] The publication *"Corroboration for the influence of a component of solar irradiance on subsurface radon signals"* from April 2012, see https://presentations.copernicus.org/EGU2012/EGU2012-1209_presentation.pdf

therein:

a) the annual periodicity found in the emission of alpha and gamma rays during 5 years (2007 to 2012) in the GSI long-term experiment, whereby it is striking that the average annual level of the alpha rays emission increases constantly in the years 2007 to 2012,

b) the comparison between the findings obtained in the two experiments carried out in 2008 (lab) and the findings obtained in the long-term experiment during the years 2007 to 2012 (field),

c) the absence of the secular equilibrium state in the alpha rays emission and in the gamma rays emission during the long-term experiment.

[0016] The publication *"Analysis of Gamma Radiation from a Radon Source: Indications of a Solar Influence"* by Peter A. Sturrock, Gideon Steinitz, Ephraim Fischbach, Daniel Javorsek II, Jere H. Jenkins from May 1, 2012, see https://arxiv.org/abs/1205.0205. Therein the experimental data for the years 2007 to 2010 of the gamma rays emission in the GSI long-term experiment together with a description of the correlation of the obtained experimental results with the findings of the BNL in the USA and the PTB in Germany.

[0017] The findings in the long-term experiment performed at the GSI in Jerusalem, as described above, correlate with the findings described in the present invention regarding the diurnal periodicity, the annual periodicity and the excitation effect caused by a special kind of solar radiation (see Fig. 7 of the invention). In addition, the fact that during the long-term experiment the experimental setup was placed in an open shack at ground level in direct contact with the Earth's atmosphere, had possibly a favorable effect on the found substantial fluctuations in the radioactivity decay by up to 20 %, compared with the expected secular equilibrium.

[0018] In https://arxiv.org/abs/1106.1470 from June 7, 2011, the possible kind of solar radiation which causes the radioactive decay anomaly found in laboratory experiments on Earth is discussed. Based on the analysis of the BNL and PTB data, it seems possible that the special kind of solar radiation which causes the radioactive decay anomaly, possesses features of the electromagnetic force, see page 4:

"Although the preceding considerations are compatible with the inference that neutrellos are in fact neutrinos, there is at least one major difference: to account quantitatively for existing experimental data, the interaction strength of neutrellos with decaying nuclei must be significantly greater than the strength of the known interactions of neutrinos with protons, neutrons, electrons, or with other neutrinos as described by the standard electroweak model. As an example, to produce a fractional peak-to-trough variation in tritium of order 10^-3 (which is the nominal value suggested by the BNL, PTB, and Falkenberg data) requires an input of energy ΔE ≈

5 eV. Although this is small on the scale of the energies carried by incoming solar neutrinos, a value of ΔE this large is more characteristic of an electromagnetic interaction than a weak interaction."

[0019] This point of view presented in the above mentioned publication regarding the electromagnetic properties of the special kind of solar radiation that causes the radioactive decay anomaly is confirmed by the new luminescence phenomena described in the present invention, that are apparently primary caused by a special kind of solar radiation that is present in the Earth's atmosphere. A kind of solar radiation which possesses electromagnetic properties can basically cause a luminescence phenomenon that can be detected. It is quite likely that the same kind of solar radiation causes the radioactive decay anomaly, by impact on the atomic nucleus of certain nuclides and causes also the new luminescence phenomena described in the present invention, by exciting the atomic shell of certain chemical elements.

[0020] Cyclical fluctuations with diurnal variations and an annual periodicity, as found in the long-term experiment at the GSI in Jerusalem, are also important features of the new luminescence phenomena described in the present invention (see Fig. 7 of the invention). In the present invention, however, other features and influencing factors are described (see Fig. 7). For example, high air humidity, as found in the atmosphere during rainy weather, fog or snow, apparently binds the special kind of solar radiation present in the atmosphere to a certain degree and reduces the corresponding force field of that special kind of solar radiation present in the Earth's atmosphere.

[0021] During the development the charge version of the invention, the behavior of solids in the force field of the special kind of solar radiation was researched. It was found that solids behave very selectively and in a very differentiated way in the force field of the special kind of solar radiation present in the Earth's atmosphere. The type of materials used for the measuring room of the invention and the type of solid samples, which in the charge version of the invention were temporary exposed in the Earth's atmosphere, had a great influence on level of the luminescence signal detected inside the measuring room of the invention, see Fig. 7 of the invention.

[0022] Based on the findings optained during the development the charge version of the invention, it can be assumed that the force field that causes the new luminescence phenomena used in the invention can be stored in solids at 300K and 1,013 hPa for a period of seconds to several years. The force field of the special kind of solar radiation can be apparently stored for months to years in certain natural rocks (e.g. in granite or granodiorite) and in certain natural minerals (e.g. in hydrothermal quartz). For instance, a circular sample of hydrothermal quartz with 18.0 x 4.0 cm (diameter x high), as described in connection with Fig. 8 and Fig. 9 of the invention, caused a luminescence signal at 290 K and 1,013 hPa in the measuring room of the inventive device even after this sample was stored for 3 years inside the measuring

room, respectively after that quartz sample was exposed to direct solar radiation for a period of 2.0 hours and then was brought indoors and was stored at 290K and 1,013 hPa for a period of 3 years (1,095 days) inside the measuring room.

[0023] The special kind of solar radiation can also be well stored in technical silicates (e.g. in borosilicate glass, quartz glass, cement, concrete) and in organic materials (e.g. in wood, or Plexiglas). Water also stores this special kind of solar radiation quite well. Atmospheric fresh air also stores this special kind of solar radiation to a certain degree and this property is used in the invention to distinguish atmospheric fresh air from other gases and gas mixtures. On the contrary, steel (St37-2 was tested) and aluminum are showing only minimal storage properties regarding this special kind of solar radiation.

[0024] The differentiated reaction of solids to the special kind of solar radiation, as mentioned above, correlates with the differentiated reaction of nuclides regarding a special kind of solar radiation that causes the radioactivity decay anomaly. On this issue, see http://arxiv.org/abs/1211.2138 from November 9th, 2012. In the *Abstract* of this publication on page 1 it is concluded: *"This result is consistent with our finding that different nuclides have different sensitivities to whatever external influences are responsible for the observed periodic variations."* For example, the nuclides barium-133 and caesium-137, react very differently to the special kind of solar radiation that causes the radioactive decay anomaly, see *Conclusions* on page 5 of the publication: *"Our purpose here has been to present new data, for Ba-133 and Cs-137, which were measured on the same detector system for the same time period, where one isotope (Ba-133) exhibited a clear annual periodicity and the other (Cs-137) did not. This result, in addition to the results of decay experiments listed in Table 1, indicates that the failure to observe the annual (or other) periodicity in one isotope does not exclude that possibility in others. In light of Table 1, we can state in general that our studies to date suggest the following: (a) not all nuclides exhibit variability in decay constants; (b) among nuclides that do exhibit this variability, the patterns of variability (e.g., amplitude and phase of any oscillation) are not all the same; and (c) for nuclides that do exhibit variability, the patterns themselves may vary over time."*

[0025] The findings connected with the storage property of solids and those connected with the different behavior of nuclides regarding a special kind of solar radiation are indicating that matter reacts in a very selective and complex manner to the special kind of solar radiation that causes the new luminescence phenomena used in the invention and that also causes apparently the radioactive decay anomaly. The very complex and selective mode of interacting with matter seems to be a characteristic feature of this special kind of solar radiation.

[0026] The fluctuations in the radioactivity level of up to 20 % compared to the secular equilibrium, as found in the long-term experiment at the GSI in Jerusalem, which was performed in the Earth's atmosphere in an open shack, are significantly higher than the fluctuations in the radioactivity level of up to 0.35 % compared to the secular

equilibrium found indoors at the BNL in the USA, at the PTB in Germany and at the Lomonosov Moscow State University. However, at all four above mentioned research institutes a correlation was found between the radioactivity decay anomaly and a special kind of solar radiation.

[0027] The differences in the level of the found radioactivity fluctuations mentioned above are apparently not due entirely to the different reaction of the nuclides regarding a special kind of solar radiation. For instance, in the long-term experiment carried out at the GSI in Jerusalem in an open shack in the Earth's atmosphere, fluctuations in the radioactivity level of up to 20 % compared to the secular equilibrium were found in connection with the decay of the radium-226 nuclide and its daughter nuclide radon-222. At the PTB in Germany and at the Lomonosov Moscow State University, fluctuations of only up to 0.35 % were found indoors for the radium-226 nuclide, the parent nuclide of the radon-222 nuclide, see http://arxiv.org/abs/0808.3283, http://arxiv.org/abs/1012.4174 and http://arxiv.org/abs/1211.2138 .

[0028] These quite different experimental findings mentioned above are consistent with the finding described in the present invention, that the sun emits a special kind of solar radiation and that this special kind of solar radiation is also present in the Earth's atmosphere as a second, additional and indirect force field component of the special kind of solar radiation. It is likely that the special kind of solar radiation, which is present in the Earth's atmosphere as an additional force field component, had an additional effect on the experimental setup during the long-term experiment at the GSI in Jerusalem performed in an open shack in the Earth's atmosphere and this additional force field component present in the Earth's atmosphere caused the found massive cyclical fluctuations in the radioactivity of up to 20 % compared to the secular equilibrium state. The bottom plate of 10-cm-thick concrete on which the experimental setup in the long-term experiment at the GSI in Jerusalem stands (see https://www.researchgate.net/publication/264120472_Experimental_replication_of_radon_signals_that_occur_in_the_geological_environment page 1 and http://www.sciencedirect.com/science/article/pii/S0265931X11000749 Fig. 2 and on page 752 *"The experiment was located under an open shack in the yard of the GSI, placed on a 10-cm thick cement floor set on the local soil."*) possibly also intensifies the special force field which causes the radioactive decay anomaly to a certain degree, by storing that special force field to a certain degree.

[0029] The following findings from the long-term experiment performed at the GSI in Jerusalem are important:

a) the average annual level of the alpha radiation rises during the years 2007 to 2012,

b) the alpha radiation has only one annual maximum in the summer months, with a level that is up to 38 % higher than the subsequent annual minimum in the winter months,

c) the gamma radiation has two annual maxima, one in the summer months and the other one in the winter months,

d) the maximum for the gamma radiation in the winter months correlates with the maximum in the data of the BNL in the USA, of the PTB in Germany and of the Lomonosov Moscow State University.

[0030] The annual maximum for the alpha radiation and for the gamma radiation in the summer months is only visible in the data from the long-term experiment performed at the GSI in Jerusalem. Apparently due to the use of the natural nuclide radon-222, which seems to be ideally suited for this research project and because the long-term experiment was performed in direct contact with the Earth's atmosphere, the experimental setup used in the GSI long-term experiment in Jerusalem shows a very high sensitivity for the local force field of the special kind of solar radiation with its two components, the direct component emitted by the sun and the indirect, additional atmospheric component, or the second component, present in the Earth's atmosphere.

[0031] The new luminescence phenomenon used in the charge version of the invention possesses also an annual maximum, which is found in the summer months. The new luminescence phenomenon described in connection with the charge version of the invention possesses an annual periodicity that is largely the same as the annual periodicity of the alpha emission found in the long-term experiment at the GSI in Jerusalem.

[0032] The radioactive decay anomaly found in the long-term experiment at the GSI in Jerusalem and the luminescence phenomena described in the invention have some common variables and influencing factors. Therefore, is very likely that these phenomena are the results of effects caused by the same special kind of solar radiation on nuclear processes on the one hand (in the case of the radioactive decay anomaly) and on the electron shell on the other (in the case of the new luminescence phenomena described in this invention).

[0033] Conclusions regarding the solar origin of this special kind of radiation can apparently be drawn by analyzing the radioactive decay anomaly. Conclusions concerning the solar origin and the application potential of this energy form, such as the performed excitation effects and the storage potential in solids, can rather be drawn by the new luminescence phenomena described and applied in this invention.

[0034] The radioactivity decay anomaly and the two new luminescence phenomena described and applied in this invention are energetic processes that are following a regular pattern. UV-VIS emission spectroscopy and high-energy spectroscopy (vacuum-UV spectroscopy to soft X-ray spectroscopy) with atmospheric fresh air as excitation medium can provide some first insights regarding the excitation scheme and can provide some first clues regarding the way how the special kind of solar radiation, that is apparently present in the Earth's atmosphere, acts as an excitation energy on the electron shell of certain chemical elements. Gamma spectroscopy performed in connection with the radioactive decay anomaly can provide some

insights about the way how the special kind of solar radiation acts on the atomic nucleus of certain nuclides.

[0035] After a thorough analysis of the experimental findings obtained in the long-term experiment at the GSI in Jerusalem, the statement that *"The rate of transformation of an element has been found to be a constant under all conditions"* published by Ernest Rutherford, James Chadwick and Charles Ellis in *Radiations from Radioactive Substances*, Cambridge University Press, 1930, page 167, is presently no longer tenable. Fluctuations in the level of the alpha radiation detected inside a steel container

a) up to 50% from one day to the next day (peak-to-peak),
b) up to 38% from the annual maximum to the subsequent annual minimum and
c) a constant increase in the average emission level of the alpha radiation
in the years 2007 to 2012, respectively during five years

indicate that a clear and massive energetic influence by a special kind of solar radiation on the radioactive decay of radon-222 exists.

[0036] The radioactive decay is obviously not solely a random process which follows the radioactive decay law and which is solely determined by the time factor, as has been assumed so far. A special kind of solar radiation is also influencing the radioactive decay. In connection with certain nuclides, such as radon-222, this second influencing factor can act far more powerful than the time factor and can completely override the radioactive decay law and can totally cancel out the secular equilibrium within a radioactive decay chain, as can be found beyond doubt in the data of the long-term experiment performed at the GSI in Jerusalem.

[0037] The findings obtained in the long-term experiment performed at the GSI in Jerusalem indicate that a special kind of solar radiation is capable of influencing the existing equilibrium on the level of the atomic nucleus between the strong nuclear force, or the force that is holding the atomic nucleus together, and on the other hand, the electromagnetic force, or the Coulomb force, as the repulsive force between the protons of the atomic nucleus. The special kind of solar radiation can apparently influence the alpha decay in both directions, respectively can increase or reduce it. The energetic influence by this special kind of solar radiation on the atomic nucleus leads apparently to the cyclical fluctuations found in the radioactive decay, with a pronounced diurnal periodicity and annual periodicity. It is important to point out here, that no form of energy or particle is known so far, that is capable of influencing the equilibrium state between the two most powerful interactions on the level of the atomic nucleus, the strong nuclear force and the electromagnetic force. For this reason, it is generally believed that the radioactive decay is not influenceable.

[0038] In http://arxiv.org/abs/0808.3283 on page 3 it is pointed out that according to the findings, the special kind of solar radiation acts on the alpha decay as well as on the beta decay, or acts on the weak interaction: *"The preceding considerations, along*

*with the correlations evident in **Fig.** 4, suggest that the time-dependence of the Si-32/Cl-36 ratio and the Ra-226 decay rate are being modulated by an annually varying flux or field originating from the sun, although they do not specify what this flux or field might be. The fact that the two decay processes are very different (alpha decay for Ra-226 and beta decay for Si-32) would seem to preclude a common mechanism for both."* In http://arxiv.org/abs/1212.2198 on page 6 it is pointed out that according to the findings, the special kind of solar radiation acts on the alpha decay as well as on the beta decay and that the existing models of solar neutrinos are not suitable for describing this special kind of solar radiation: *"The mechanisms of beta- and alpha-decays are obviously very different. While we still have not determined a mechanism by which solar neutrinos would affect the weak interaction associated with beta-decays, the development of a model where the neutrinos could affect both alpha- and beta-decays becomes even more difficult."*

[0039] In http://arxiv.org/abs/1106.2374 the same view is put forward concerning solar neutrinos as the possible cause of the radioactive decay anomaly. On page 5 it is stated: *"These results show that whatever radiation is responsible for influencing decay rates, it propagates essentially freely through the solar radiative and convection zones, suggesting that some flavor of neutrinos may be responsible for decay-rate variations. However, the standard theory of neutrino physics does not provide for a mechanism by which neutrinos could have such an effect, raising the possibility of new physics. In view of these conflicting considerations, it is clearly desirable that we obtain further information relevant to the mechanism by which the sun influences decay rates. If neutrinos or some other particles (or quanta of radiation) influence radioactive atoms, it is conceivable that they may transfer their momentum to the decaying nuclei and thus exert a force on a bulk sample of radioactive material. This raises the possibility of carrying out a "fifth force" type of experiment on a macroscopic radioactive sample, using techniques recently developed to search for deviations from Newton gravity (Fischbach & Talmadge, 1999)."*

[0040] In http://arxiv.org/abs/1106.1470 it is pointed out on page 5 that no mechanism is presently known that could explain how the sun can influence the radioactive decay: *"Although the preceding discussion, along with the analysis in section 2, suggests that the decay process is being influenced in some way by the sun, there is at yet no detailed mechanism to explain how this influence comes about. Our discussion of neutrinos and neutrellos is an attempt to frame a future theory by outlining some of the specific characteristics that it should possess, given the limited experimental data currently available."* In view of the storage of the special kind of solar radiation apparently present in the Earth's atmosphere in solids, as presented in connection with the charge version of the invention, a connection between the special kind of solar radiation and solar neutrinos is also not very probable. This since solar neutrinos are not known to possess the property of being stored for hours and days in solids.

[0041] The new luminescence phenomena described in the present invention does not occur spontaneously, but must be deliberately induced. Research and development were required in order to find the new luminescence phenomena, which are characteristic for the special kind of solar radiation, that is apparently present in the Earth's atmosphere.

[0042] The radioactive decay anomaly, on the other hand, occurs spontaneously and can always be detected as long as suitable nuclides (e.g. radon-222) and suitable detectors are used. Experimental findings obtained by chance are possible. The radioactive decay anomaly was initially found during the subsequent analysis of experimental data.

[0043] Unlike the excitation of the electron shell of certain chemical elements, as described in connection with the two new luminescence phenomena used in the present invention, the special kind of solar radiation acts apparently in a far more complex way on the level of the atomic nucleus. It seems that the special kind of solar radiation can shift the existing equilibrium state between the strong nuclear force and the electromagnetic force on the level of the atomic nucleus in both directions and can apparently increase or reduce, or slow down, the alpha decay. The special kind of solar radiation apparently also influences the weak nuclear force on the level of the atomic nucleus, or the beta decay. Through the radioactive decay anomaly it can be apparently demonstrated that the special kind of solar radiation can influence three of the four known fundamental forces. The special kind of solar radiation influences thereby the strongest known fundamental force or the strong nuclear force on the level of the atomic nucleus. Considering

a) the energetic impact on the atomic nucleus, as found in connection with the radioactive decay anomaly with characteristic cyclical fluctuations of the alpha, beta and gamma radiation,

b) the property to act as an excitation energy on the electron shell, as found in connection with the two new luminescence phenomena described and applied in the invention,

c) the storage of this kind of solar radiation in solids, as described in the charge version of the invention and

d) the technical applicability of this kind of solar radiation, as described in the present invention

the special kind of solar radiation possesses certain important features of a fundamental interaction with infinite range, that can be applied, comparable to the electromagnetic force, or the electromagnetic interaction. The energetic impact on the equilibrium state between the strong nuclear force and the electromagnetic force on the level of the atomic nucleus in experiments performed on Earth, at a mean distance of 150 million kilometers from the sun, indicates that this special kind of solar radiation possesses an infinite range and a quite high relative strength. The relative strength of this special kind of solar radiation must be at least on the level of the electromagnetic force in order to be capable of influencing the equilibrium state between the strong nuclear force and the electromagnetic force on the level of the atomic nucleus in experiments performed on Earth. As presented in

http://arxiv.org/abs/1212.2198, in http://arxiv.org/abs/1106.2374 and in http://arxiv.org/abs/1106.1470 a direct connection between the special kind of solar radiation and solar neutrinos is quite unlikely.

[0044] The sun emits apparently not only the electromagnetic radiation that can be applied on Earth, but also emits another kind of energy that can basically be used and applied on Earth. This special kind of solar energy is apparently available on Earth all day long and throughout the year. Considering the quite high relative strength of this special kind of solar energy, compared with the four fundamental forces or the four interactions and due to its property to act as an excitation energy on the electron shell of certain chemical elements and to be stored in certain solids, this special kind of solar energy possesses important features of a new kind of renewable energy. Due to its features, this special kind of solar energy can be regarded as a new renewable energy with own laws, properties and technical applications.

B.

[0045] It is quite likely that the special energetic component of the Earth's atmosphere that causes the new luminescence phenomena presented and applied in the invention (see **Fig.** 7 – first main subordinate influence connected with the new luminescence phenomena) is also connected to another radioactive decay anomaly found by the GSI in Jerusalem. The experiments performed at the GSI in Jerusalem, presented above in section A, indicate the presence of a special solar influence that causes a radioactive decay anomaly. This special solar influence causes cyclical fluctuations in the radioactive decay, respectively the cyclical daily fluctuations, named *daily radon signals (DR signals)* and the cyclical annual fluctuations, named *annual radon signals (AR signals).*

[0046] A detailed analysis of the radioactive decay anomaly performed at the GSI in Jerusalem showed however that a further energetic influence is always present and has an impact on the radioactive decay. This second energetic influence causes a far more complex non-cyclical radioactivity decay anomaly, named *non-periodic multi-day signal (MD signal)*.

[0047] The following findings published by the GSI in Jerusalem entitled *"Possible effect of solar tides on radon signals"* from August 2011, see
https://www.sciencedirect.com/science/article/pii/S0265931X11000749
are important regarding this:
a) no relationship has been found between the cyclical DR signals and the non-cyclical MD signals. Concerning this on page 756 it is stated: *"A relation between the DR and the MD patterns was not observed.",*
b) the non-cyclical MD signals exhibit an irregular pattern over a period of 4 - 20 days. Regarding this on page 756 it is stated: *"Decomposing the measured signal, highlights the irregular multi-day (MD) signals and the shorter term daily-radon (DR) signals, both superimposed on the annual-radon (AR) signal. Non-periodic MD*

signals, lasting 4 - 20 days and having irregular forms, were superimposed on the AR signal (Fig. 10). The MD signals were registered by all three internal sensors, but in varying relations.“

[0048] The following findings published by the GSI in Jerusalem in the Geophysical Journal International (2013), Volume 193, pages 1110 – 1118 from March 20, 2013 entitled *“Anomalous non-isotropic temporal variation of gamma-radiation from radon (progeny) within air in confined conditions”*, see https://academic.oup.com/gji/article/193/3/1110/608232, are also important:
a) separate energetic influences cause the cyclical DR signals and the non-cyclical MD signals, as presented in the *Summary* on page 1110: *“Separate processes drive the MD and DR signals”*. The cyclical DR signals are not connected with the non-cyclical MD signals, which indicates separate energetic influences, see page 1112: *“This example demonstrates that the DR signal is not related to the MD signal, indicating separate influences. Similar phenomena are found at each sensor.”* (five gamma detectors were installed inside the experimental setup, see Fig. 1 on page 1111),
b) the non-cyclical MD signals are always present, see page 1112: *“The temporal variation is dominated by DR signals which are superimposed on a more subtle MD variation”* and Fig. 5 on page 1113,
c) the energetic influence that causes the non-cyclical MD signals causes a radioactive decay anomaly with fluctuations of up to 15 % between the minimum and the maximum gamma radiation during a period lasting 4 to 20 days, see Fig. 5 on page 1113,
d) the energetic influences that cause the DR and MD signals exhibit a pronounced spatial orientation. A north-south and an east-west orientation of the energetic influences that cause the cyclical DR signals and the non-cyclical MD signals can be seen in the spatial pattern of the radioactive decay anomaly, see page 1117 in *Discussion*:
“(3) The MD and DR signal exhibit systematic spatial variations. The principal axes of the time-space variations seem to be related to the north-south and east-west global orientation axes. (4) The affinity of the MD and DR signals along the vertical axis with the north-south directed radiation patterns, indicates that the north-south axis of the system is actually inclined. If this effect is related to the latitude of the experiment (Jerusalem), then it is probably a further indication that global orientation is involved.”

[0049] The following findings published in the *Proceedings of the Royal Society A* (2013), vol. 469, entitled *“Influence of a component of solar irradiance an radon signals at 1 km depth, Gran Sasso, Italy”* by G. Steinitz, O. Piatibratova and N. Gazit-Yaari from the Geological Survey of Israel, Jerusalem, see http://rspa.royalsocietypublishing.org/content/royprsa/469/2159/20130411.full.pdf
are also important:
a) the non-cyclical MD signals can also be detected in the Gran Sasso National Laboratory (LNGS) in Italy, inside a laboratory placed 1,400 meters deep in the Apennines. Concerning this on page 2 it is stated: *“The mountain ridge towering above the laboratory results in an average depth of 1400 m of the laboratory.”* and on

page 14*: "Two types of signals occur in the temporal variation pattern of radon in the geogas at LNGS – a non-periodic MD signal and a DR signal".* And on page 15 *"a clearly defined non-periodic MD signal occurs in the radon time series of LNGS"*.

b) A causal link between the MD signals and the DR signals was not found. Concerning this on page 6 it is stated: *"Generally, no relationship can be determined between the MD and DR signals (figure 6a), but in some time intervals, lasting several tens of days, an apparent relationship is observed between the amplitude of the DR signal and the MD signal (figure 6b)."*

c) the non-cyclical MD signals and the cyclical DR signals found during the long-term experiment lasting 500 days cannot be attributed to temperature fluctuations, fluctuations in air humidity, fluctuations in air pressure, emanation, diffusion, absorption or advection. The relative air humidity in the underground laboratory remained at a constant level of approx. 93 % (see figure 3 on page 5). On page 8 it is stated: *"Temperature variation is less than 0.5° C during longer intervals (table 1)"*, on page 4: *"The temporal pattern of radon indicates the occurrence of daily and multi-day (MD) signals, which vary following a pattern that differs from those of pressure and temperature."* and on page 15*: "variation patterns in the subsurface regime cannot be accounted for by simple and direct time varying processes in the gas system such as emanation, diffusion, absorption and advection."* and *"absence of above surface atmospheric influence, in particular pressure",*

d) the non-cyclical MD signals and the cyclical DR signals have no conclusive interpretation. On page 14 it is stated: *"The evolving picture is that this is an 'unexplained' issue."*

[0050] Summarizing the findings presented in the three publications mentioned above, it is important to point out that not only a special kind of solar radiation can cause a massive radioactive decay anomaly. A second, separate and additional energetic influence can also cause a massive radioactive decay anomaly. This second energetic influence is also always present. In addition to, or together with the special solar influence, a second and separate energetic influence exists, which can cause a massive radioactive decay anomaly.

[0051] The findings presented in the three publications mentioned above correlate with the statement presented in the paragraph [0008] and [0009], that in addition to a special solar influence, a further special terrestrial influence apparently exists, or is present, which causes the new luminescence phenomena described and applied in the present invention. This special terrestrial influence causes apparently also the non-cyclical MD signals which were detected at ground level in the Earth's atmosphere and also underground, in the Gran Sasso National Laboratory. This special terrestrial-energetic influence can be regarded as an independent terrestrial force field, that possesses a certain similarity to the Earth's magnetic field concerning its terrestrial cause and its terrestrial localization. Like the special kind of solar radiation, this special terrestrial force field can cause a massive radioactive decay anomaly, influencing the alpha decay and the secular equilibrium in a decay chain. In order to have an impact on the radioactive decay, as found in the experiments performed by the GSI in Jerusalem, this special terrestrial force field would have to

possess a higher relative strength than the Earth's gravitational field and also than the Earth's magnetic field (30 µT to 60 µT).

C.

[0052] It is quite likely that the special energetic component of the Earth's atmosphere that causes the new luminescence phenomena presented and applied in the invention (see **Fig.** 7 – first main subordinate influence connected with the new luminescence phenomena) is connected to the so-called *flyby anomaly*. Since the 1990s it has been observed, that after NASA and ESA satellites (Galileo, NEAR, Cassini and Rosetta) passed through the upper layers of the Earth's atmosphere, they encountered a sudden change in energy and velocity at the point closest to the Earth (perigee altitude). Concerning this flyby anomaly, see the publication*: "Anomalous orbital-energy changes observed during spacecraft flybys of earth"* by John D. Anderson, James K. Campbell, John E. Ekelund, Jordan Ellis and James F. Jordan from the Jet Propulsion Laboratory, California Institute of Technology, Pasadena, USA, published in Physical Review Letters on 3rd March, 2008, under: http://virgo.lal.in2p3.fr/NPAC/relativite_fichiers/anderson_2.pdf.

[0053] The sudden change in the velocity of the satellites that occurred at the closest point to the Earth's surface was observed at altitudes of up to 2,000 km above the Earth's surface, see http://arxiv.org/abs/0907.2469 from August 6, 2009. The higher above the Earth's surface the point of the satellites entry into the Earth's atmosphere was, the less pronounced was the flyby anomaly found, so that finally, at altitudes of more than 2,000 km above the Earth's surface it was no longer detected. Concerning this, see page 3 of the above-mentioned publication: *"There is most likely a distance dependence to the anomaly. The net velocity increase is 3.9 mm* s-1 *for the Galileo spacecraft at a closest approach of 960 km, 13.5 mm s-1 for the NEAR spacecraft at 539 km, and 1.8 mm s-1 for the Rosetta spacecraft at 1956 km. The altitude of Rosetta II is 5322 km, perhaps too high for a detection of the anomaly. A third Rosetta Earth swing-by (Rosetta III) is scheduled for 2009-Nov-13 at a more favorable altitude of 2483 km."* (On November 13, 2009 Rosetta III did not exhibit a flyby anomaly).

[0054] In http://arxiv.org/abs/1201.0163 from December 30, 2011 on page 4 it is stated that the flyby anomaly must be linked to a force field that performs a very strong drop in its intensity as the altitude above the Earth's surface increases: *"Thus, one concludes that the flyby anomaly, if real, must be due to a strongly decaying force, which should drop by four orders of magnitude with a modest (about fourfold) increase in distance, from* $r = RE + h \simeq 7000$ *km to* $r \simeq 27000$ *km"*. If the flyby anomaly has an unmodelled terrestrial cause in sense of a special kind of terrestrial force field, it should be expected that as the altitude above the Earth's surface increases, the flyby anomaly will decline in its intensity. This, because a special force field connected to the Earth declines in its intensity as the altitude above the Earth's surface increases.

[0055] In http://arxiv.org/abs/0903.0109 from February 28, 2009, the flyby anomaly is seen in connection with an additional force field linked to the Earth's rotation. Concerning this on page 2 it is stated: *"In view of (1) and (2), the source of the additional field should be in a today unknown relation to the rotation of the Earth."* This opinion that the flyby anomaly might be connected with an additional force field linked to the Earth's East-West rotational movement correlates with the finding that the force field which causes the radioactive decay anomaly exhibits a pronounced East-West orientation. On this subject, see [0048] and https://academic.oup.com/gji/article/193/3/1110/608232 page 1117, *Discussion*: *"The MD and DR signals exhibit systematic spatial variations. The principal axes of the time-space variations seem to be related to the north-south and east-west global orientation axes. The affinity of the MD and DR signals along the vertical axis with the north-south directed radiation patterns indicates that the north-south axis of the system is actually inclined. If this effect is related to the latitude of the experiment (Jerusalem) then it is probably a further indication that global orientation is involved."*

[0056] Also in http://arxiv.org/abs/0903.0109 the equation for the flyby anomaly proposed by John D. Anderson from the Jet Propulsion Laboratory, California Institute of Technology, Pasadena, USA is analyzed in order to determine its further implications. It was found that it is likely that the cause of the flyby anomaly are unknown gravity-like forces which, in a great approximation, can be described as a force field, see the *Discussion* section on page 7: *"We have analyzed the consequences of the assumptions that the approximation formula given by Anderson is valid for all possible spacecraft flyby manoeuvers on the Earth and that the flyby anomaly is a "real" effect which can be described by a force field belonging to some unknown interaction between the Earth and the spacecraft. By a "real" effect we mean that the conclusion from the radio Doppler data to the anomalous velocity changes is correct and that the anomaly is not (totally or to a considerable part) due to unexplained influences on the propagation of the radio signals or to any kind of mismodelling in the domain of conventional celestial mechanics or other applied branches of physics. Since the mass of the spacecraft does not enter the equation (1), it seems that the velocity changes are caused by unknown gravity-like forces, which, in a classical approach, are to be described by a force field. As we have seen, such a force field inevitably contains velocity-dependent terms in order to be in accordance with (1). Equation (1), however, has been published by Anderson et al. [1] as an "empirical prediction formula" which may have only approximative character."*

[0057] In https://arxiv.org/abs/0805.2895, http://arxiv.org/abs/0903.4879 and http://arxiv.org/abs/1112.5426 Stephen Adler from the Institute for Advanced Study, Princeton, USA discusses the possibility that the flyby anomaly is caused by a sort of particle bound to the Earth that Stephen Adler assigns to the so-called dark matter, which performs a similar effect as gravity. This sort of particle would consequently have to be present in the Earth's atmosphere.

[0058] In the publication *"The Puzzle of the Flyby Anomaly"* by Slava G. Turyshev and Viktor T. Toth from July 23, 2009, see http://arxiv.org/abs/0907.4184, the specific energy gain which the satellites encountered as they passed through the Earth's atmosphere is analysed. The energy gain at the point closest to the Earth's surface reached a maximum of 92.2 ± 0.9 J/Kg, see Table 1 on page 4.

[0059] The dependence of the flyby anomaly on the altitude of the satellites entry into the Earth's atmosphere, see http://arxiv.org/abs/0907.2469, then the strong dependence of the flyby anomaly on latitude, as expressed in the equation proposed by John D. Anderson for the flyby anomaly in http://virgo.lal.in2p3.fr/NPAC/relativite_fichiers/anderson_2.pdf and finally the correlation between the flyby anomaly and an additional force field, which is connected to the Earth's rotation, as described under http://arxiv.org/abs/0903.0109, are some of the most important features of the flyby anomaly. These features are consistent with the presence of a special kind of energy field in the Earth's atmosphere, as described in the present invention.

[0060] The findings presented above, the theoretical simulations and the modelling of the flyby anomaly are consistent with the presence of a special kind of energy field in the Earth's atmosphere, as assumed in the present invention. A special kind of energy which is bound to the $5x10^{15}$ tons of the Earth's atmospheric mass, or is stored to a certain degree in the Earth's atmosphere, and whose energetic impact on the electron shell of elements can cause new luminescence phenomena which are used to detect atmospheric fresh air, as presented in this invention, could also possess a gravity component or could generate a gravity-like force field that is present up to a height of about 2,000 km above the Earth's surface. In view of the features and properties of this special energetic component of the Earth's atmosphere, that can apparently cause characteristic luminescence phenomena, this special energetic component of the Earth's atmosphere might, under certain flyby and navigational conditions, have an impact on the NASA and ESA satellites and cause or at least contribute to the observed flyby anomalies.

[0061] The special energetic component of the Earth's atmosphere, which causes the new luminescence phenomena presented in the invention, can be considered as an independent force field present in the Earth's atmosphere, which possesses both a terrestrial and a solar force field component. In the findings obtained in the long-term experiments carried out by the GSI in Jerusalem, the energetic impact of these two different force field components, the solar and the terrestrial force field components, on the atomic nuclei of certain nuclides is presented. Concerning this see http://gji.oxfordjournals.org/content/193/3/1110.abstract figure 5 on page 1113 and http://rspa.royalsocietypublishing.org/content/469/2159/20130411 figure 6 on page 7. The special solar force field component correlates apparently with the cyclical radioactive decay anomaly found, or with the DR signals and the AR signals. The special terrestrial force field component, on the other hand, correlates apparently with the non-cyclical radioactive decay anomaly found, or with the MD signals.

[0062] The above described two energetic influences which are present in the Earth's atmosphere and which apparently form the special energetic component of the Earth's atmosphere correlate with the opinion of the authors put forward in http://www.sciencedirect.com/science/article/pii/S0265931X11000749 that two external influences act on the experimental setup in the long-term experiment at the GSI in Jerusalem, which cause the periodic signals and on the other hand the non-periodic signals. Concerning this on page 764 it is stated: *"This supports the proposition, that a component in solar radiation is involved in driving the periodic signals. Lacking an obvious reason for an internal process, the generation of the non-periodic MD signal is probably also due to external forcing. It is thus suggested, that an external forcing leads to periodic and non-periodic interactions inside the tank, resulting in a spatially non homogeneous radiation pattern."*

[0063] The special energetic component of the Earth' atmosphere

a) which even at night can cause a luminescence phenomenon, that can be used to detect atmospheric fresh air, as presented in this invention,

b) whose impact on an experimental setup which is placed at ground level in the Earth's atmosphere causes apparently a massive radioactive decay anomaly, see https://www.researchgate.net/publication/264120472_Experimental_replication_of_radon_signals_that_occur_in_the_geological_environment.

c) and which is quite likely involved in the flyby anomaly

has so far not been taken into consideration in the kinetic gas theory, which describes the energetic relations in gases, such as the Earth's atmosphere. The kinetic gas theory which was developed by Ludwig Boltzmann, Rudolf Clausius and James Clerk Maxwell in the second half of the 19th century does not take into account this new kind of energetic relations in the Earth's atmosphere, that were newly found during the normal progress in science.

[0064] The Earth's atmosphere does not consist only of a mixture of molecular and atomic gases held together by the Earth's gravity. The Earth's atmosphere apparently also contains a special energetic component that can cause excitation effects and that is apparently connected to the flyby anomaly. The excitation effects caused by the special energetic component of the Earth's atmosphere are the cause of the two new luminescence phenomena presented in this invention. It is quite likely that the kinetic gas theory concerning the Earth's atmosphere will need to be updated, expanded and revised in order to describe precisely the newly found energetic relations in the Earth's atmosphere.

Description of the invention

[0065] The task of the invention consists in the development of a method which enables to differentiate between atmospheric fresh air on the one hand and indoor

ambient air or another gaseous medium on the other. This task of the invention is solved through two different methods, according to the claims 1 and 2.

[0066] According to the claims 1 and 2, the two methods are characterized by the fact that the detection of atmospheric fresh air is accomplished by the detection and the evaluation of a luminescence phenomenon within a lightproof measuring room. According to the method of claim 1, the inventive device consists of a lightproof housing that encloses a measuring room in which a gaseous medium is present, or into which a gaseous medium can be introduced, or through which a gaseous medium can be passed.

[0067] The measuring room possesses walls made of metal or a metal compound, e.g. stainless steel or aluminum, or of a technical silicate, e.g. glass. The measuring room can be shaped in a cubic shape, in the shape of a hollow sphere or in the form of a reflector, but can also possess any other suitable shape.

[0068] At least one luminescence detector is placed inside the measuring room of the inventive device. Photomultiplier tubes (PMTs) or digital cameras, e.g. CCD cameras, thermoelectrically cooled CCD cameras, EBCCD cameras, EMCCD cameras, or ICCD cameras can be used as luminescence detectors. The luminescence detector can also be configured as a large-scale detector array. As far as the detector is concerned, it should be ensured that the detector surface is as large as possible.

[0069] In a advantageous version of the inventive device the measuring room can be configured in such a way, that a conduit system or at least one or more sections of a conduit system, e.g. a pipe, are forming the measuring room. In this case two versions are possible. In a first version, different luminescence detectors are located spaced apart from each other inside a single lightproof pipe. In a second version, a number of lightproof measuring room - sections located side by side and spaced apart from one another are placed in the conduit system, in which one or even more luminescence detectors are present. Finally, it is also possible to arrange a number of compact devices in the conduit system, spaced apart from each other. This version could be quite easy to implement.

[0070] When atmospheric fresh air is supplied to the measuring room of the inventive device, according to the method of claim 1, a luminescence phenomenon inside the measuring room can be detected with a suitable detector. This luminescence phenomenon is most intense when pure atmospheric fresh air is supplied to the measuring room or is passed through the measuring room. When indoor ambient air is supplied to the measuring room, without any fresh air content, the luminescence signal is totally absent. When gaseous elements, such as oxygen or nitrogen, without any fresh air content, are supplied to the measuring room, the luminescence signal is also totally absent.

[0071] The luminescence phenomenon that occurs inside the measuring room follows

a regular pattern. The intensity of the luminescence phenomenon depends primarily on the concentration of the atmospheric fresh air in the gaseous medium which is supplied to the measuring room or that is present therein.

[0072] The luminescence phenomenon caused by the atmospheric fresh air was initially found in connection with an experimental setup which possesses a measuring room with walls made of stainless steel. In a further development step, the measuring room with walls made of stainless steel was replaced with a comparable measuring room with walls made of glass. In that measuring room with walls made of glass, the luminescence signal was more intense when atmospheric fresh air was supplied to the measuring room. The obvious conclusion was that the luminescence phenomenon depends on the concentration of atmospheric fresh air in the gaseous medium supplied to the measuring room as well as on the material used for the walls of the measuring room.

[0073] If a solid sample of glass, of rock-forming minerals (e.g. of quartz, feldspar), of deep-seated rock (e.g. of granite, granodiorite), of igneous rock (e.g. of dolerite, rhyolith), of metamorphic rock or metamorphites (e.g. of gneiss, quartzite), or of wood (e.g. of heartwood, plywood or cork) was placed in a measuring room with walls made of stainless steel, a more intense luminescence signal was registered when atmospheric fresh air was supplied to the measuring room, compared with the case when atmospheric fresh air was supplied to the empty measuring room with walls made of stainless steel and without any solid sample placed therein. The obvious conclusion was that the solid samples mentioned above further intensified the luminescence phenomenon.

[0074] A luminescence phenomenon with apparently a similar cause occurs when selected solid samples are exposed for a period of time to the Earth’s atmosphere and were then placed in the measuring room of the inventive device. The method of claim 2 is based on this luminescence phenomenon. If a sample of the above-mentioned solids was exposed in the Earth’s atmosphere for example 3:00h, then was cleaned and, immediately after being cleaned, was placed inside the measuring room, in which only indoor ambient air without any content of atmospheric fresh air was present, a luminescence phenomenon occurred. In this case, the luminescence phenomenon showed a characteristic decay curve under isothermal conditions lasting many hours to several days, see for example **Fig. 9**. If, on the other hand, a sample of the above-mentioned solids was placed in a gaseous oxygen medium or nitrogen medium without any content of atmospheric fresh air for 3:00h, then was removed from that gaseous medium and, immediately afterwards, was placed into the measuring room of the inventive device, no luminescence phenomenon occurred inside the measuring room.

[0075] Now it is known that certain minerals, like quartz and feldspar, have the physical property to store the energy of ionizing radiation to a certain degree. The ionizing radiation is caused mainly by the decay of radionuclides of the uranium-238,

uranium-235 and thorium-232 decay series and by cosmic radiation. During the thermoluminescence process, the charge carriers which are present in the crystal lattice of the quartz and feldspar minerals, in the “traps”, and which originate from ionizing radiation, are released by heating the samples. This causes a luminescence phenomenon that decays within seconds. The charge carriers present in the “traps” of the crystal lattice of the samples are, however, also emptied by normal daylight (UV radiation). In contrast to this, the solid samples of quartz, granite, granodiorite, gneiss, etc. used in the method according to claim 2, have been in use in daylight for many years and were also often exposed to direct solar radiation for several hours. Under such experimental conditions, it can be assumed that the charge carriers are totally emptied from the crystal lattice of the samples, so that the solid samples are completely optically bleached. Nevertheless, the solid samples of quartz, granite, granodiorite, gneiss, etc. cause the luminescence phenomenon described above. No reduction in the intensity of the luminescence signal, which would be an indication of optical bleaching, was found during the experiments carried out for several years with the solid samples mentioned above.

[0076] In view of the experimental findings obtained in connection with various experimental setups, the obvious conclusion was that the intensity of the luminescence phenomenon that occurs in the measuring room depends not only on the concentration of the atmospheric fresh air in the gaseous medium supplied to the measuring room, but also on the material used for the walls of the measuring room and on the material of solid samples present inside the measuring room. Furthermore, the experimental data obtained over many years in connection with various experimental setups indicate that the luminescence phenomenon that occurs in the measuring room is caused by a special energetic property of the Earth’s atmosphere, or by a special kind of energy or by a special kind of particle present in the Earth’s atmosphere.

[0077] The luminescence phenomenon with the extremely long and slowly decay under isothermal conditions, which can be detected inside the measuring room after certain solid samples that were previously temporarily exposed in the Earth’s atmosphere were placed inside the measuring room, is indicating that a special energetic property of the Earth’s atmosphere or a special kind of energy or particle that is contained in the Earth’s atmosphere, can be stored in certain solid samples. The storage of this special kind of energy or particle, that is contained in the Earth’s atmosphere or in the atmospheric fresh air in certain solids causes then the luminescence phenomenon in the measuring room, as described above.

[0078] Minerals, technical silicates, deep-seated rocks, igneous rocks, metamorphic rocks (metamorphites) or wood are apparently storing to a certain degree the special energetic property of the Earth’s atmosphere or the special kind of energy or type of particle which is contained within the Earth’s atmosphere and which can cause an excitation effect. This storage property is depending on the type of solids used in the experiment. According to the findings, metals and metal compounds (e.g. stainless

steel or aluminum) also possess these storage property, but to a considerably lesser extent, compared to minerals, technical silicates, deep-seated rocks, igneous rocks, metamorphic rocks (metamorphites) or wood. According to the findings, the storage of the special kind of energy or special type of particle present in the Earth's atmosphere in certain solids works in a way that is quite well comparable with the storage of electricity in an accumulator.

[0079] According to the findings obtained during many years, the special energetic property of the Earth's atmosphere or the special kind of energy or type of particle contained in the Earth's atmosphere can, like the UV-radiation, cause an excitation phenomenon followed by luminescence emission in the UV-VIS spectral range. According to the findings, this special energetic property of the Earth's atmosphere to cause an excitation effect and to cause a luminescence phenomenon is always present in the Earth's atmosphere (in the troposphere), or in the atmospheric fresh air, but to a different extend, depending mainly on the time of day, on the season and on the weather conditions.

[0080] Using the special energetic property contained in the atmospheric fresh air that can cause an excitation effect and that can cause a luminescence phenomenon on one hand and based on the storage properties of this special kind of energy form contained in the Earth's atmosphere in certain solids on the other, two different inventive methods and two different inventive devices can be implemented: In the first method and in the first version of the inventive device, atmospheric fresh air is supplied to a suitable lightproof measuring room, which is empty, or in which a suitable solid sample, e.g. a sample of wood, mineral, glass or rock is placed. In the measuring room of this first version of the inventive device a luminescence signal in the UV-VIS spectral range can be detected when atmospheric fresh air is supplied to the measuring room. This first version of the inventive device uses directly the special energetic property contained in the atmospheric fresh air that causes an excitation effect and that causes luminescence in order to detect atmospheric fresh air.

[0081] In the second method and in the second version of the inventive device, a sample of wood, mineral, glass or rock is exposed in the atmospheric fresh air for a period of time, then it is cleaned and after that it is placed manually or mechanically, e.g. using a drawer system or a turntable system, into a lightproof measuring room. Inside the measuring room of this second version of the inventive device, a luminescence signal in the UV-VIS spectral range can be detected. This second version of the inventive device uses the storage property of certain solids regarding the special energetic property of atmospheric fresh air to cause an excitation effect and to cause luminescence, in order to detect atmospheric fresh air.

[0082] Inside the measuring room of the inventive device a gas, a gas mixture or indoor ambient air is present. The average kinetic energy of the air molecules for indoor ambient air is 0.04 eV for room temperature at 27° C (300 K). When atmospheric fresh air from the troposphere is supplied to the measuring room of the

inventive device, no additional source of energy is present inside the measuring room except the kinetic energy of the air molecules and the special energetic property of atmospheric fresh air that is able to perform an excitation effect and is able to cause a luminescence phenomenon.

[0083] When atmospheric fresh air from the troposphere is supplied to the measuring room of the inventive device, a luminescence signal in the UV-VIS spectral range (160 to 630 nm) can be detected inside the measuring room. The detectable luminescence signal in the spectral range from 160 to 630 nm possesses particle energies *hv* in the range of 2.0 to 7.8 eV. When atmospheric fresh air at room temperature is supplied to the measuring room, the energetic level of the particles inside the measuring room of 2.0 to 7.8 eV is significant higher than the energetic level of the air molecules, air ions, aerosols and trace gases in the atmospheric fresh air predicted by the kinetic gas theory, which for 27° C (300K) lies in the infrared range at 0.04 eV to 1.40 eV (see **Fig.** 6). This new luminescence phenomenon caused by the atmospheric fresh air from the troposphere inside the measuring room is used in connection with the method of claim 1.

[0084] In connection with the method of claim 2, the intensity of the luminescence signal that can be detected inside the measuring room increases proportionally to the size and to the volume of the solid sample placed inside the measuring room. In connection with the method of claim 2 a round solid sample of natural crystalline quartz (hydrothermal quartz) with the dimensions 18.0 x 4.0 cm (diameter x height) is well suited to cause a luminescence signal, if that solid sample of natural crystalline quartz has been exposed for 3:00 h in atmospheric fresh air and then, after being cleaned, was placed inside the measuring room of the inventive device manually or using a drawer system or a turntable system. The luminescence emission that occurs after the above-mentioned quartz sample has been placed in the measuring room shows under isothermal conditions a specific decay curve with a luminescence life time of hours to several days.

[0085] A photon counting device (photon counting module) consisting of a photomultiplier tube (PMT) with a bialkali photocathode and a quartz glass window, that possesses a spectral sensitivity in the UV-VIS spectral range (160 – 630 nm) and a detector surface of 4.9 cm^2 is, for example, well suited for detecting the luminescence signal caused by the presence of the above-mentioned solid sample of natural crystalline quartz in the measuring room of the inventive device.

[0086] The luminescence detector can be mounted inside the wall of the inventive device or in a detector carrier. The signal of the luminescence detector can be measured with a frequency counter or with some other suitable measuring device.

[0087] The two inventive methods are enabling to differentiate between atmospheric fresh air and other gas mixtures (e.g. indoor ambient air, O_2, N_2, etc.). The differentiation between the atmospheric fresh air and another type of gaseous medium (indoor ambient air, O_2, N_2, etc.) is made by measuring two different

physical phenomena (luminescence phenomena) caused by a physical and energetic property of the Earth's atmosphere or of the atmospheric fresh air. For the differentiation between the atmospheric fresh air and another type of gaseous medium it is not necessary to carry out a chemical analysis of the tested gaseous medium. The tested gaseous medium is not affected in its chemical and physical properties by the two inventive methods.

[0088] Based on the two different inventive methods, two different types of the inventive device can be implemented:
In the flow version of the invention a gaseous medium is passed through the measuring room of the inventive device. When atmospheric fresh air is passed through the measuring room, the special energetic property of the Earth's atmosphere or of the atmospheric fresh air that causes a luminescence phenomenon acts inside the measuring room and causes a luminescence phenomenon therein. The walls of the measuring room in the flow version can be made of metal or of a metal compound, preferably aluminum or stainless steel. The measuring room can be empty, or may contain a suitable solid sample, e.g. a sample of wood, mineral, glass or rock. The flow version is well suited for the detection of atmospheric fresh air or for monitoring a gaseous medium regarding the atmospheric fresh air it contains. The flow version of the invention correlates with the method of claim 1.

[0089] In the charge version of the invention, a suitable solid sample of wood, mineral, glass or rock, is first exposed for a period of time in atmospheric fresh air, then it is cleaned and then it is introduced manually or mechanically, e.g. by means of a drawer system or a turntable system, into the measuring room or it is charged therein. The special energetic property of the Earth's atmosphere or of the atmospheric fresh air, that causes a luminescence phenomenon, acts on the solid sample and is stored inside the solid sample while the solid sample is exposed temporary in the Earth's atmosphere and causes then a luminescence phenomenon when the particular sample is placed inside the measuring room of the inventive device. Since the measuring room is not directly exposed to the atmospheric fresh air, the walls of the measuring room in the charge version of the invention can be made of metal or of a metal compound, preferably aluminum or stainless steel or of glass. The main purpose of the charge version is sampling, in the sense of a temporary examination of a gaseous medium. The charge version of the invention correlates with the method of claim 2.

[0090] The charge version of the invention is well suited for the detection and for the research of the special energetic property of the Earth's atmosphere that causes a luminescence phenomenon in the measuring room of the inventive device. The storage properties of various solids regarding the special energetic property of the atmospheric fresh air that causes a luminescence phenomenon can be well researched using this version of the invention. By comparing different types of solid samples that possess the same geometrical shape and the same dimensions, the charge version enables systematic research work concerning the storage properties of various solids regarding the special energetic property of the atmospheric fresh air

that causes the new luminescence phenomena applied in the present invention.

[0091] An advantageous embodiment of the flow version possesses a number of solid samples instead of a single solid sample inside the measuring room. This advantageous embodiment increases the luminescence signal available inside the measuring room.

[0092] A further advantageous embodiment of the flow version contains a number of solid samples that are assembled together to form a single large solid sample inside the measuring room of the flow version. This advantageous embodiment also increases the luminescence signal available in the measuring room.

[0093] In an further advantageous embodiment of the inventive device a number of luminescence detectors are placed inside the measuring room. This can be implemented in the form of a number of separated detectors or by a single large-scale detector array consisting of a group of detectors. The purpose of this advantageous embodiment is to enlarge the surface of the detector area. In this way the intensity of the available luminescence signal inside the measuring room is increased.

[0094] In a further advantageous embodiment of the inventive device the luminescence detector is placed outside the measuring room and is connected to the measuring room by an optical fiber. This advantageous embodiment can be well suited for certain applications.

Brief description of the drawings

[0095] Further features and advantages of the two inventive methods and of the corresponding inventive devices are described in the drawings.

[0096] In the drawings

[0097] Fig. 1 shows a schematic illustration of the inventive device in the flow version,

[0098] in **Fig.** 2 to **Fig.** 4 a number of advantageous embodiments of the inventive device in the flow version are presented,

[0099] Fig. 5 shows a schematic illustration of the inventive device in the charge version,

[0100] Fig. 6 shows the energetic relations in the measuring room **2** of the inventive device **1** when atmospheric fresh air is supplied to the measuring room **2**,

[0101] Fig. 7 shows the influencing factors which have an impact on the level of the luminescence emission inside the measuring room **2** of the inventive device **1**,

[0102] Fig. 8 shows the measured values of the luminescence emission inside the measuring room **2** for two long-term experiments performed in connection with the flow version of the invention,

[0103] Fig. 9 shows the measured values of the luminescence emission inside the measuring room **2** for three experiments performed in connection with the charge version of the invention.

Carrying out the invention

[0104] The inventive device **1** presented in **Fig.** 1 possesses a measuring room **2** configured as a reflector. A luminescence detector **3** is mounted in the center of a detector carrier **5** and the window **4** of the luminescence detector **3** is placed within the measuring room **2**. The detector carrier **5** is made of metal or of a metal alloy, e.g. stainless steel or aluminum. In this version of the inventive device **1** the window **4** of the luminescence detector **3** is placed in the focus region of the measuring room **2** configured as a reflector. In this version of the inventive device **1** a solid sample **6**, e.g. a sample of wood, mineral, glass or rock is present inside the measuring room **2**. The solid sample **6** is placed on a sample table **7**. The sample table **7** is made of a solid material, preferably metal or a metal alloy, e.g. steel, stainless steel or aluminum. Due to the symmetrical alignment of the luminescence detector **3,** the reflector-like measuring room **2** and the solid sample **6** along the vertical axis of symmetry of the inventive device **1**, the luminescence signal occurring in the measuring room **2** can be used properly. The measuring room **2** is mounted into a suitable mount **8**, which enhanced the stability of the measuring room **2** and of the solid sample **6** placed therein.

[0105] The inventive device **1** in the flow version possesses at least one inlet (inlet port) **11** and at least one outlet (outlet port) **12** for a gaseous medium. The inlet and outlet ports **11** and **12** can be placed in different positions, see **Fig.** 1, **Fig.** 2, **Fig.** 3 and **Fig.** 4 or can be implemented as a single unit.

[0106] In **Fig.** 2 an advantageous embodiment of the inventive device **1** in the flow version is presented. The solid sample **6** consists in this embodiment of a number of parts **9** and **10**, which are forming a functional unit. In this configuration the inventive device **1** possesses a cubic measuring room **2**. The inlet and outlet ports **11** and **12** for the gaseous medium are located in this configuration on two different side walls of the measuring room **2**.

[0107] In **Fig.** 3 a further advantageous embodiment of the inventive device **1** in the flow version is presented. In this embodiment the luminescence detector is configured as a detector array **13**. The purpose of this layout is to enlarge the available detector surface.

[0108] In **Fig.** 4 another advantageous embodiment of the inventive device **1** in the flow version is presented. In this embodiment the luminescence detector **3** is connected with the measuring room **2** by an optical fiber **14**. In this embodiment the luminescence detector **3** is placed outside the inventive device **1**.

[0109] In **Fig.** 5 the inventive device **1** in the charge version is presented. **Fig.** 5 shows a section view through this version of the inventive device **1**. Inside the measuring room **2** of the inventive device **1** in the charge version a luminescence detector **3** is mounted. In this configuration of the inventive device **1** the solid sample **6** is inserted into the measuring room **2** by a turntable **15**. For this purpose, the turntable **15** possesses one or more suitable recesses **16** for holding the solid sample **6**. The turntable **15** is made of a metal or of a metal alloy, e.g. aluminum or stainless steel. An inlet **11** or an outlet **12** for a gaseous medium is not provided in the charge version of the inventive device **1**.

[0110] In **Fig.** 6 the energetic relations inside the measuring room **2** of the inventive device **1** in the flow version are presented. This for the case that atmospheric fresh air from the troposphere is supplied to the flow version.

[0111] When atmospheric fresh air at room temperature is supplied to the measuring room **2** of the inventive device **1**, then according to the kinetic theory of gases and to the Maxwell-Boltzmann distribution law of molecular velocities in gases, no luminescence signal in the UV-VIS spectral range should occur inside the measuring room **2** of the inventive device **1**. The expected energetic level of the air particles (air molecules, air ions, aerosols and trace gases) when atmospheric fresh air from the troposphere is supplied to the measuring room **2** of the inventive device **1** is defined by the following parameters:
The average kinetic energy of the gas particles inside the measuring room is defined by the following relationship: average E_{kin} = 3/2 kT = 0.04 eV at 27° C (300K). Specific thermal capacity of air at constant volume CV air = 715 J/kg·K → average speed of the air molecules Vm = 510 m/s at 27° C (300K).
The maximum kinetic energy of the gas particles inside the measuring room is defined by the following relationship: maximum E_{kin} at 27° C (300K) according to the Maxwell-Boltzmann distribution of molecular velocities in gases: less than 1 molecule per 24.8 liters air (1 mole) at 27° C/1,013 hPa possesses V > 3.060 m/s, or E_{kin} > 1.40 eV. The measuring rooms **2** of the various inventive devices **1** used for experimental purposes had a volume of 10.0 to 20.0 liters.

[0112] When atmospheric fresh air from the troposphere is supplied to the measuring room **2** of the inventive device **1** the expected energetic level of the air particles (air molecules, air ions, aerosols and trace gases) lies, according to the Maxwell-Boltzmann distribution law of molecular velocities in gases, in a range between 0.04 eV and 1.40 eV for room temperature and lies consequently in the infrared spectral range. This expected energetic level of the air particles inside the measuring room **2** is not sufficient to cause an excitation process, followed by luminescence emission in

the UV-VIS spectral range. In order to cause an excitation process followed by a luminescence signal in the UV-VIS spectral range, the excitation energy respectively the kinetic energy of the air particles in the measuring room **2** would have to be much higher, or at least in the range of UV radiation, which is not the case at room temperature.

[0113] When atmospheric fresh air is supplied to the measuring room **2** of the inventive device **1**, a luminescence signal in the UV-VIS spectral range at 160 nm to 630 nm can be detected inside the measuring room **2**. This luminescence signal follows a regular pattern. The energetic level of the particles inside the measuring room **2,** that can be detected, possesses particle energies of 2.0 eV to 7.8 eV and is thereby significant higher than the expected energetic level of the air particles in the atmospheric fresh air defined by the kinetic theory of gases, which lay in the range of 0.04 eV to 1.40 eV.

[0114] The luminescence phenomenon in the UV-VIS spectral range that can be detected inside the measuring room **2** when atmospheric fresh air is supplied to the measuring room **2** of the inventive device **1** is not consistent with the present theoretical models regarding the nature and the contents of the atmospheric fresh air in the troposphere, as a gas mixture consisting solely of air molecules, air ions, aerosols and trace gases. In the troposphere (up to 12 km above the sea level) the “airglow” of the ionosphere (as found in the atmosphere at 70 km above the sea level) is not present. In the troposphere no ionized atoms, ionized molecules, or free electrons are present in the atmospheric fresh air, which could possibly explain the luminescence phenomenon that can be detected inside the measuring room **2** when atmospheric fresh air is supplied to the measuring room **2** of the inventive device **1.**

[0115] In **Fig.** 7 the influencing factors that possess an effect on the level of the luminescence emission inside the measuring room **2** of the inventive device **1** are presented. The most important influence factor is the sun, respectively the solar radiation. A solid sample of quartz, granite or granodiorite which has been temporarily exposed to direct solar radiation before being placed inside the measuring room **2**, causes a significantly higher initial emission in the measuring room **2**, compared to the case of exposing the same solid sample for the same period of time in atmospheric fresh air during nighttime.

[0116] The Earth’s atmosphere or the atmospheric fresh air possesses the second important influence on the level of luminescence emission inside the measuring room **2** of the inventive device **1**. The two new inventive methods for the detection of atmospheric fresh air presented in this invention are based on this influence.

[0117] The material of the solid sample used in the charge version of the inventive device **1** possesses also an important influence on the level of luminescence emission inside the measuring room **2**. The level of the luminescence emission inside the measuring room **2** depends largely on the material of the solid sample. The volume of the solid sample used in the charge version of the inventive device **1** also influences

the level of the luminescence emission inside the measuring room **2**. The greater the volume of the solid sample, that was temporarily exposed in the Earth's atmosphere and was then placed inside the measuring room **2** was, the higher was the level of the luminescence emission detected inside the measuring space **2**.

[0118] A further influencing factor are the diurnal variations. The initial level of the luminescence emission found in the measuring room **2** of the charge version of the invention is significantly higher, if the solid sample has been exposed in the Earth's atmosphere during daytime hours. If the same solid sample is exposed in the Earth's atmosphere during nighttime for the same period of time and under comparable weather conditions and is then placed inside the measuring room **2**, the initial level of the luminescence emission is significantly lower, see **Fig.** 9. A diurnal periodicity was also found in the flow version of the invention. Under stable sunny weather conditions the maximum emission level found in the flow version of the invention occurs in the early afternoon hours (2 – 4 p.m.), while the minimum emission level occurs in the night hours (2 – 4 a.m.).

[0119] The experimental findings obtained in connection with various experimental setups also indicate the existence of an annual periodicity. In spring and summer the level of the luminescence emission inside the measuring room **2** of the flow version of the invention is significantly higher than in winter.

[0120] The temperature and the weather have also a significant influence on the level of luminescence emission inside the measuring room **2** of the inventive device **1**. The level of the luminescence emission inside the measuring room of the charge version of the invention found in connection with a quartz sample or a granite sample, which has been placed in the measuring room after having been temporarily exposed in the Earth's atmosphere, reacts extremely sensitive to changes of the temperature inside the measuring room. Under stable isothermal conditions, a remarkable and extremely stable coupling between the temperature inside the measuring room and the level of the luminescence emission occurs. After the solid sample remained approximately 72h in the measuring room, respectively after the level of the luminescence emission inside the measuring room reached a largely stable plateau under isothermal conditions, even slight changes of the temperature inside the measuring room in the range of ± 0.2° C lead to an increase or to a reduction of the luminescence emission, depending on whether the temperature of the measuring room has been increased or reduced. This coupling between the temperature inside the measuring room and the level of the luminescence emission can be observed for days, weeks or even months. Regarding the influence of the weather on the level of the luminescence emission inside the measuring room **2**, in the flow version of the invention it was for example found, that during periods of sunny weather with comparatively low relative air humidity, the level of the luminescence emission is significantly higher than the level of the luminescence emission measured at the same time of day, but during rain, fog or snow, with comparatively high relative air humidity.

[0121] The solar radiation possesses both a direct and an indirect effect on the level

of luminescence emission inside the measuring room **2** of the inventive device **1**. Direct solar radiation on a quartz sample or on a granite sample causes a significantly higher initial emission level inside the measuring room, compared to the initial emission level caused by the same solid sample that has not been exposed to direct solar radiation, but was instead exposed during nighttime temporarily in the Earth's atmosphere. Indirectly, the solar radiation has an effect on the level of luminescence emission inside the measuring room **2** in the sense of the detected diurnal periodicity, the annual periodicity and of the detected weather influence.

[0122] Based on the experimental findings obtained in connection with various experimental setups during many years, the conclusion that can be drawn is that the solar radiation causes new kind of excitation phenomena. The excitation energy that causes the new excitation phenomena is emitted by the sun, is apparently present in the Earth's atmosphere and can be well stored in certain solids like quartz or granite.

[0123] It is quite likely that the storage property of the Earth's atmosphere regarding the special kind of solar excitation energy is less pronounced than the storage property of selected solids, like quartz or granite, regarding this special kind of solar excitation energy. The two new luminescence phenomena applied in the two methods of the invention are apparently primarily caused by the storage property of the Earth's atmosphere and of certain solids, like quartz or granite, regarding the special kind of solar excitation energy.

[0124] In **Fig.** 8 the detected luminescence emission inside the measuring room **2** of the inventive device **1** for two experiments performed with the flow version of the invention are presented. In the first experiment atmospheric fresh air was supplied to the measuring room **2**, that was empty respectively that had no solid sample within. The measuring room **2** consisted of stainless steel (stainless steel reflector, as presented in **Fig.** 1). In the second experiment atmospheric fresh air was supplied to the measuring room **2**, in which a round solid sample of natural quartz with the dimensions 18.0 x 4.0 cm (diameter x height) was mounted. The same measuring room of stainless steel was used in both experiments.

[0125] In the first experiment with the empty measuring room (lower graph in **Fig.** 8), the level of the luminescence emission inside the measuring room before atmospheric fresh air was supplied to the measuring room was 25 cps (counts per second). After the supply of atmospheric fresh air to the measuring room started, the detected emission level rose to approx. 60 cps within seconds and remained in the range of 50 cps to 150 cps for 22 hours, during which atmospheric fresh air continued to be supplied to the measuring room. After atmospheric fresh air stopped being supplied to the measuring room, the level of luminescence emission dropped within seconds from about 70 cps to the initial level of 25 cps, as found before atmospheric fresh air began to be supplied to the measuring room.

[0126] In the second experiment with a solid sample of natural quartz mounted inside the measuring room (upper graph in **Fig.** 8), the level of the luminescence emission

inside the measuring room before atmospheric fresh air was supplied to the measuring room was 40 cps (counts per second). After the supply of atmospheric fresh air to the measuring room started, the detected emission level rose to approx. 230 cps within seconds and remained in the range of 50 cps to 300 cps for 27 hours, during which atmospheric fresh air continued to be supplied to the measuring room. After atmospheric fresh air stopped being supplied to the measuring room, the level of luminescence emission dropped within seconds from about 50 cps to the initial level of 40 cps, as found before atmospheric fresh air began to be supplied to the measuring room.

[0127] In **Fig.** 9 the detected luminescence emission inside the measuring room **2** of the inventive device **1** for three experiments performed with the charge version of the invention are presented. The three experiments were performed in the same measuring room made of glass, respectively inside a mirrored glass reflector.

[0128] The level of the luminescence emission detected inside the empty measuring room was 18 cps (± 3 cps), see the lower graph in **Fig.** 9. This emission level of 18 cps (± 3 cps) was the reference emission level for the experiments performed subsequently with the round solid sample of natural quartz with the dimensions 18.0 x 4.0 cm (diameter x height).

[0129] The middle graph in **Fig.** 9 shows the level of luminescence emission detected inside the measuring room after the round quartz sample had been placed inside the measuring room, after it was exposed in the atmospheric fresh air for a period of 2.00 h at night. The experiment was performed at 290 K and 1,013 hPa. The initial level of the luminescence emission immediately after the round quartz sample was placed inside the measuring room was 58 cps. For a period of time of 2.00 hours (7,200 seconds) a significant luminescence emission was detected inside the measuring room. Two hours (7,200 seconds) after the start of the experiment with the round quartz sample, the level of luminescence emission inside the measuring room did not reach the reference emission level of 18 cps (± 3 cps).

[0130] The upper graph in **Fig.** 9 shows the level of luminescence emission detected inside the measuring room after the round quartz sample had been placed inside the measuring room, after it was exposed in the atmospheric fresh air for a period of 2.00h at daytime. The experiment was performed at 290 K and 1,013 hPa. The initial level of the luminescence emission immediately after the round quartz sample was placed inside the measuring room was 175 cps. For a period of time of 2 hours (7,200 seconds) a significant luminescence emission was detected inside the measuring room. Two hours (7,200 seconds) after the start of the experiment with the round quartz sample, the level of luminescence emission inside the measuring room did not reach the reference emission level of 18 cps (± 3 cps).

Reference list

1 Inventive device
2 Measuring room
3 Luminescence detector
4 Window of the luminescence detector
5 Detector carrier
6 Solid sample
7 Sample table
8 Mount
9 Part of **6**
10 Part of **6**
11 Inlet (inlet port)
12 Outlet (outlet port)
13 Detector array
14 Optical fiber
15 Turntable
16 Recess(es) in **15**

Claims

1. Method for the detection of atmospheric fresh air, named the flow method, characterized in that

1. the detection of atmospheric fresh air is performed by the detection and the evaluation of a luminescence phenomenon and

2. the atmospheric fresh air serves as or acts as an excitation source for the detected luminescence phenomenon, whereby first

3. a reference experiment is performed in which,

3.1 in a light-tight closed measuring room,

3.2 which is empty, respectively in which the walls of the measuring room are in contact with a gaseous medium,

3.3. indoor ambient air without any content of atmospheric fresh air is supplied or is passed through, whereby air without any content of atmospheric fresh air behaves according to the kinetic gas theory and

3.4. while the indoor ambient air without any content of atmospheric fresh air is being supplied or is passed through the measuring room, the luminescence emission inside the measuring room is measured and only then

4. the main experiment is performed, in which

4.1 atmospheric fresh air or a mixture of gases is supplied to the light-tight closed measuring room or is passed through the light-tight closed measuring room and

4.2 while the atmospheric fresh air or the gas mixture is being supplied or passed through the measuring room, the luminescence emission inside the measuring room is measured and after that

5. the optained data are evaluated by comparing the data aquired in the reference experiment with the data acquire in the main experiment.

2. Method for the detection of atmospheric fresh air, named the charge method, characterized in that

1. the detection of atmospheric fresh air is performed by the detection and the evaluation of a luminescence phenomenon and

2. the atmospheric fresh air serves as or acts as an excitation source for the detected luminescence phenomenon, whereby first

3. a reference experiment is performed in which,

3.1 in a light-tight closed measuring room,

3.2. indoor ambient air without any content of atmospheric fresh air is present, whereby indoor ambient air without any content of atmospheric fresh air behaves according to the kinetic gas theory and

3.3. while the indoor ambient air without any content of atmospheric fresh air is present inside the measuring room, the luminescence emission inside the measuring room is measured and only then
4. the main experiment performed, in which
4.1 a solid sample is placed in the light-tight closed measuring room, whereby
4.2 the solid sample placed in the measuring room has been previously exposed in the Earth's atmosphere or in atmospheric fresh air for a period in the range of 2.00 h and after the solid sample has been placed in the measuring room,
4.3. the luminescence emission inside the measuring room is measured and after that
5. the obtained data are evaluated by comparing the data acquired in the reference experiment with the data acquire in the main experiment.

3. Device (**1**) for detecting atmospheric fresh air according to the method of claim 1, characterized in that the device (**1**) consists of a light-tight closed casing which encloses a measuring room (**2**) in which a gaseous medium is present and in which a gaseous medium can be supplied, or through which a gaseous medium can be passed and that at least one luminescence detector (**3**) is mounted inside the measuring room (**2**) or at least one luminescence detector (**3**) is placed outside the measuring space (**2**) and in this case the luminescence detector (**3**) is connected to the measuring room (**2**) by an optical fiber (**14**).

4. Device (**1**) as claimed in claim 3 for implementing the method of claim 1, characterized in that the measuring room (**2**) is made of metal or of a metal compound, e.g. stainless steel or aluminum and possesses a cubic shape, or possesses the form of a reflector or of a hollow sphere.

5. Device (**1**) as claimed in claim 3 for implementing the method of claim 1, characterized in that the luminescence detector (**3**) consists of a photomultiplier tube (PMT) or is a digital camera, e.g. a CCD digital camera, a thermoelectrically cooled CCD digital camera, a EBCCD digital camera, a EMCCD digital camera or a ICCD digital camera.

6. Device (**1**) as claimed in claim 3 for implementing the method of claim 1, characterized in that the luminescence detector (**3**) is configured as a detector array (**13**).

7. Device (**1**) as claimed in claim 3 for implementing the method of claim 1, characterized in that the device (**1**) possesses at least one inlet (**11**) and at least one outlet (**12**) for passing a gaseous medium through the measuring room (**2**).

8. Device (**1**) as claimed in claim 3 for implementing the method of claim 1, characterized in that a conduit system or at least one or more portions of a conduit system form the measuring room (**2**), whereby the conduit system and / or the portions of the conduit system consists of a light-tight closed housing.

9. Device (**1**) as claimed in claim 3 for implementing the method of claim 1, characterized in that the measuring room (**2**) can contain a single solid sample (**6**) or a solid sample consisting of a number of parts (**9**, **10**), which are mounted inside the measuring room **(2)** and that are made of

- a rock-forming mineral (e.g. quartz, feldspar), or of
- a deep-seated rock (e.g. granite, granodiorite), or of
- an igneous rock (e.g. dolerite, rhyolith), or of
- a metamorphic rock (e.g. gneiss, quartzite), or of
- glass, or of
- wood (e.g. heartwood, plywood, cork).

10. Device (**1**) for detecting atmospheric fresh air according to the method of claim 2, characterized in that the device (**1**) consists of a light-tight casing which encloses a measuring room (**2**) and that at least one luminescence detector (**3**) is mounted inside the measuring room (**2**).

11. Device (**1**) as claimed in claim 10 for implementing the method of claim 2, characterized in that the device (**1**) possesses a manual access to the measuring room (**2**) or possesses a mechanical device e.g. a turntable system (**15**) or a drawer system by which a solid sample (**6**) can be temporary placed inside the measuring room (**2**).

12. Device (**1**) as claimed in claim 10 for implementing the method of claim 2, characterized in that the solid sample (**6**) that is temporary placed inside the measuring room **(2)** is made of

- a rock-forming mineral (e.g. quartz, feldspar), or of
- a deep-seated rock (e.g. granite, granodiorite), or of
- an igneous rock (e.g. dolerite, rhyolith), or of
- a metamorphic rock (e.g. gneiss, quartzite), or of
- glass, or of
- wood (e.g. heartwood, plywood, cork).

13. Device (**1**) as claimed in claim 10 for performing the method of claim 2, characterized in that the measuring room (**2**) is made of metal or of a metal compound, e.g. stainless steel or aluminum, or of glass and possesses a cubic shape, or possesses the form of a reflector or of a hollow sphere.

14. Device (**1**) as claimed in claim 10 for performing the method of claim 2, characterized in that the luminescence detector (**3**) consists of a photomultiplier tube (PMT), or is a digital camera, e.g. a CCD digital camera, a thermoelectrically cooled CCD digital camera, a EBCCD digital camera, a EMCCD digital camera or a ICCD digital camera.

7 pages of drawings follow

Fig. 1

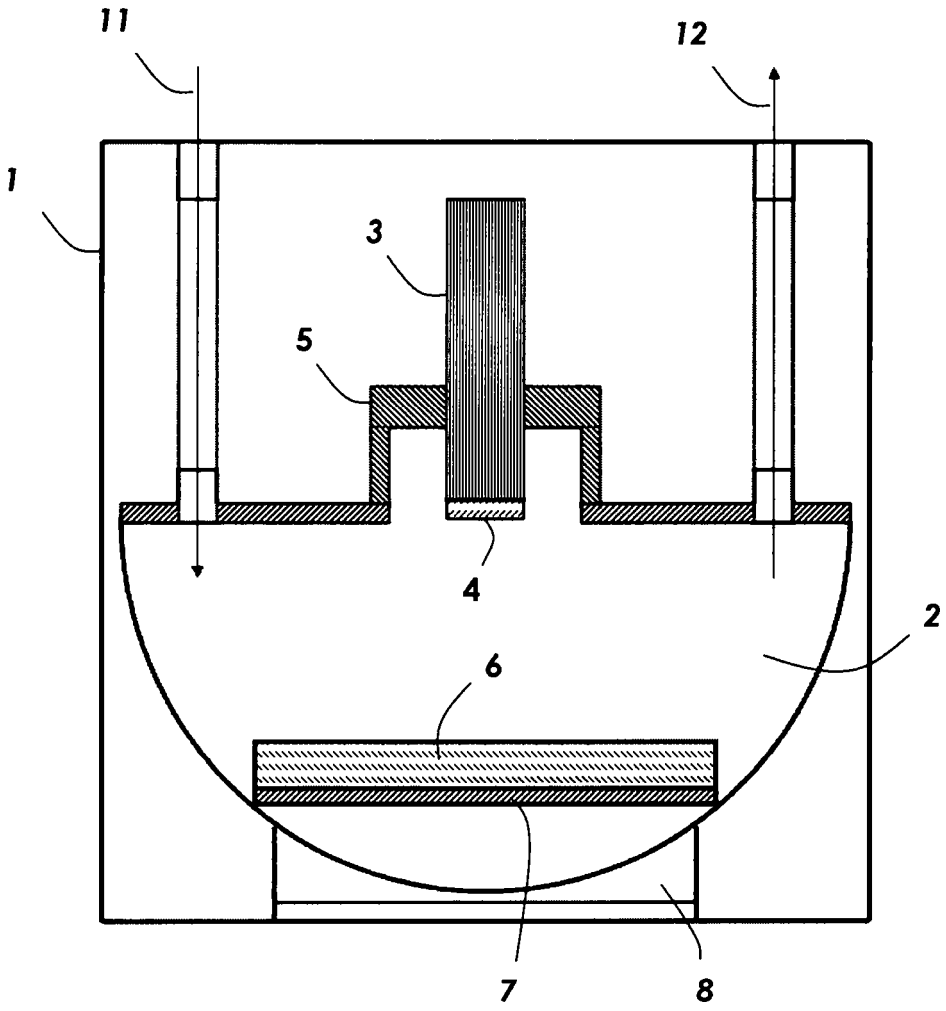


Fig. 2

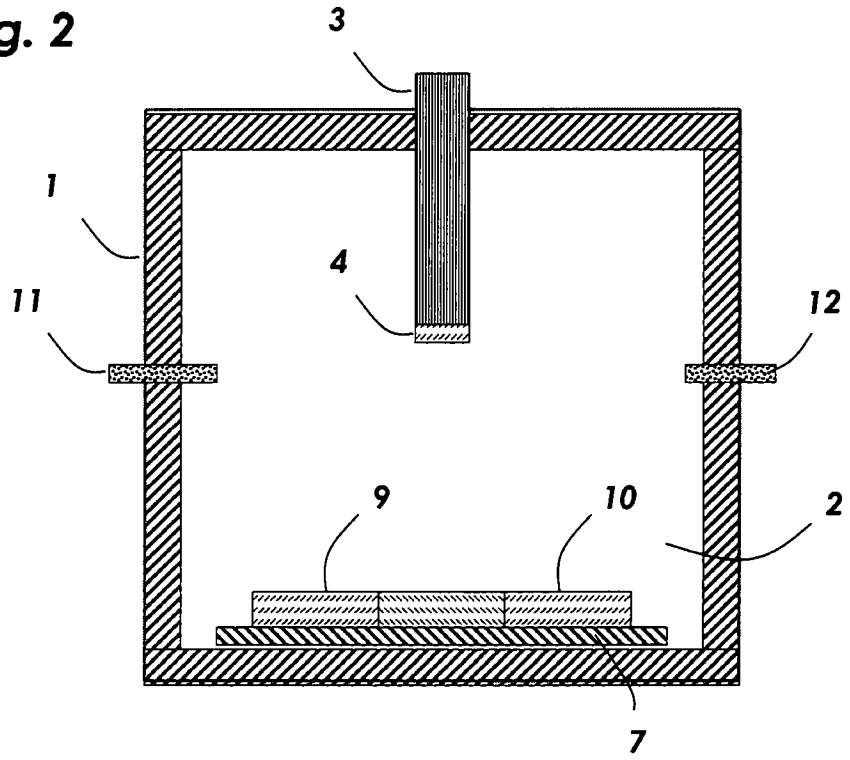
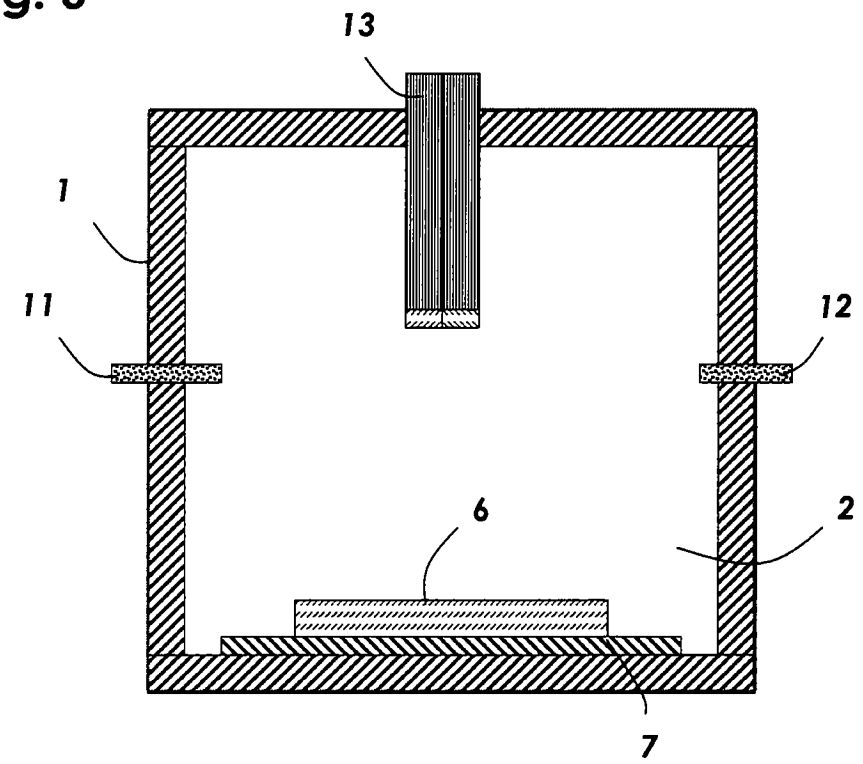


Fig. 3



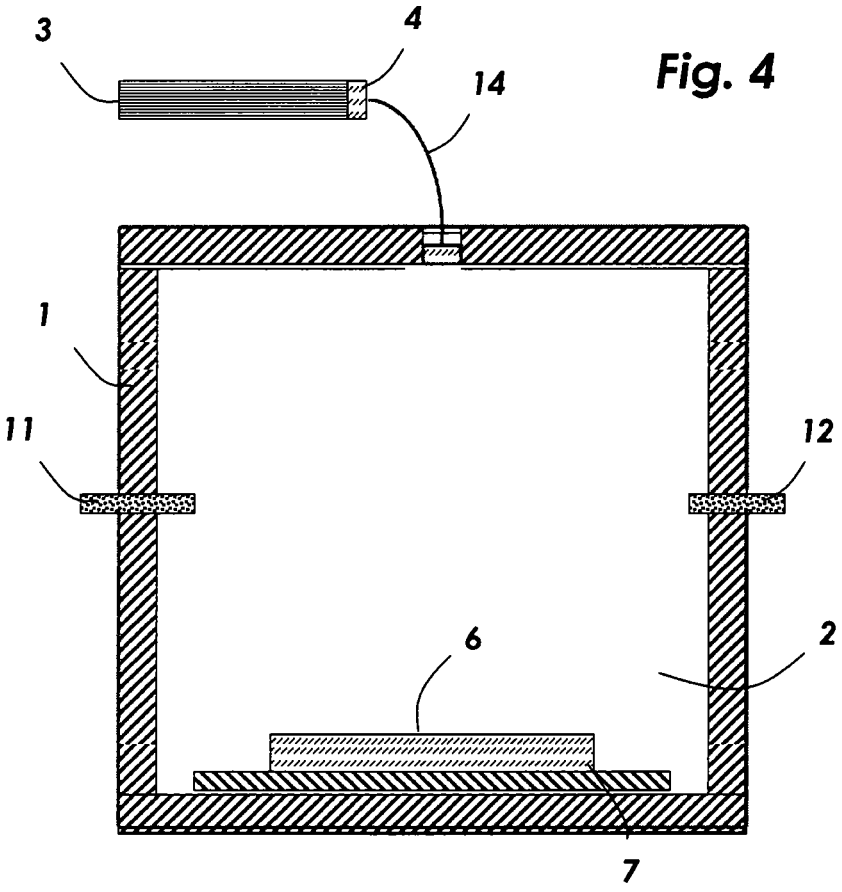


Fig. 4

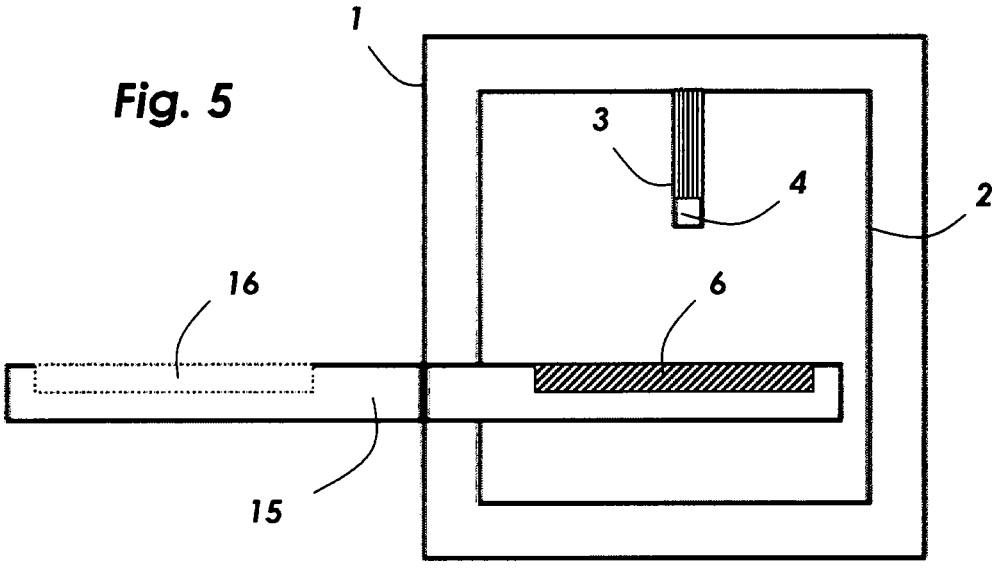


Fig. 5

Fig. 6

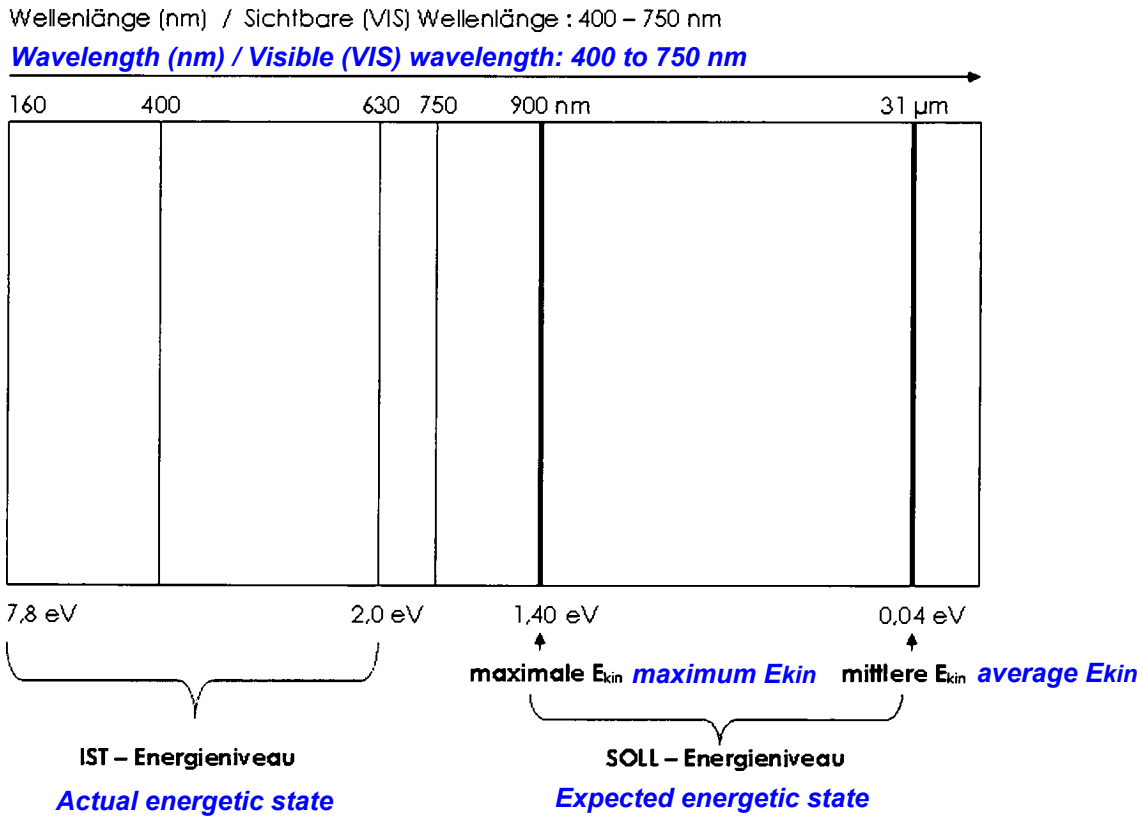

Wellenlänge (nm) / Sichtbare (VIS) Wellenlänge : 400 – 750 nm
Wavelength (nm) / Visible (VIS) wavelength: 400 to 750 nm
160
400
630
750
900 nm
31 µm
7,8 eV
2,0 eV
1,40 eV
0,04 eV
maximale Ekin maximum Ekin
mittlere Ekin average Ekin
IST – Energieniveau
Actual energetic state
SOLL – Energieniveau
Expected energetic state

Fig. 7

Influencing factor	Type of influence	Found in
solar radiation	main influence	both versions
Earth’s atmosphere	main subordinate influence	both versions
used material type	main subordinate influence	both versions
sample volume	secondary influence	both versions
diurnal variations	secondary influence	both versions
annual periodicity	secondary influence	charge version
temperature	secondary influence	charge version
weather	secondary influence	both versions

Fig. 8

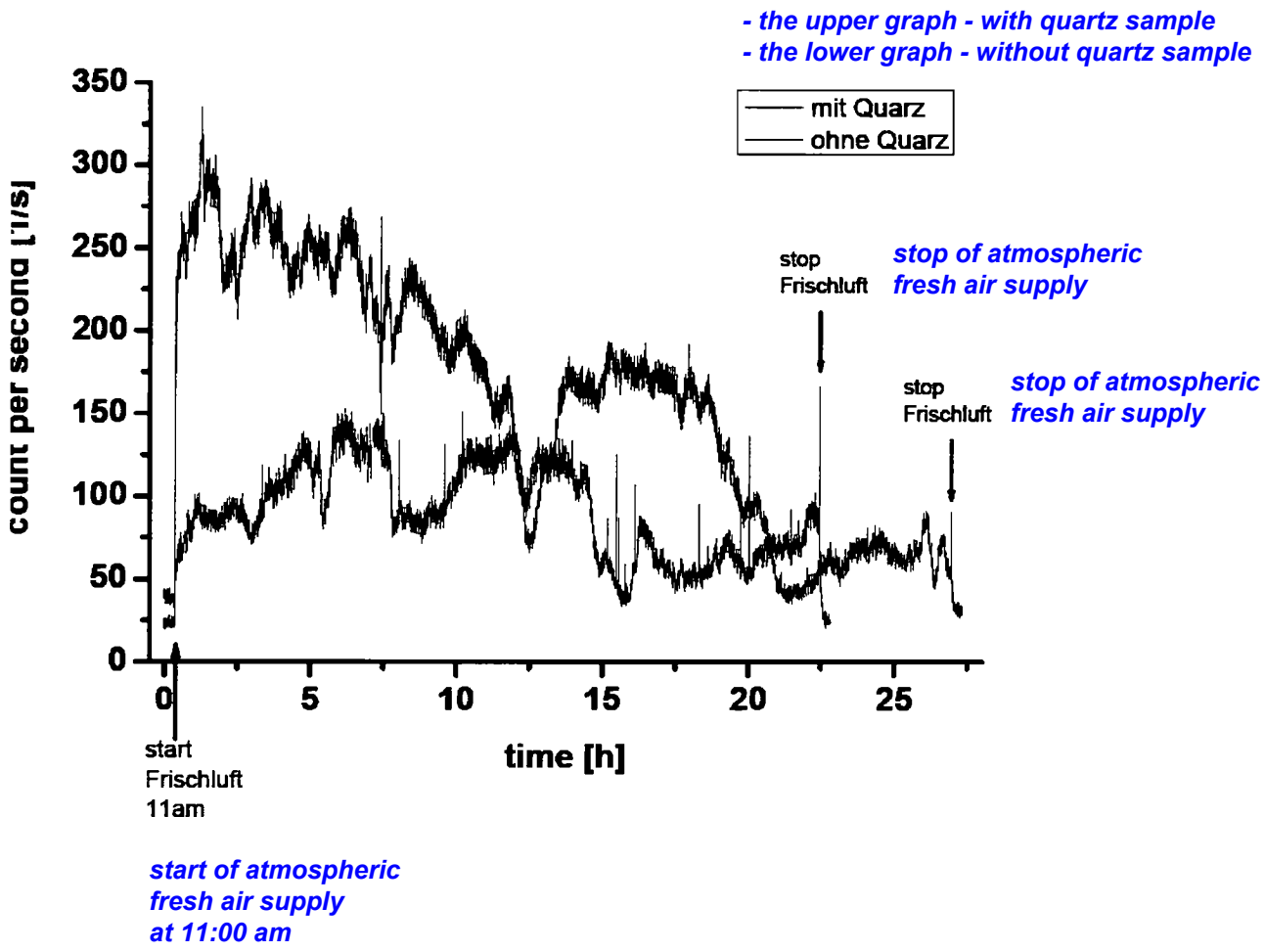

- the upper graph - with quartz sample
- the lower graph - without quartz sample
mit Quarz
ohne Quarz
count per second [1/s]
350
300
250
200
150
100
50
0
0
5
10
15
20
25
time [h]
stop
Frischluft
stop of atmospheric
fresh air supply
stop
Frischluft
stop of atmospheric
fresh air supply
start
Frischluft
11am
start of atmospheric
fresh air supply
at 11:00 am

Fig. 9

- the upper graph - with quartz sample, from 2007/10/01 - 12:55h
- the middle graph - with quartz sample, from 2007/10/02 - 00:40h
- the lower graph - without quartz sample, from 2007/10/01 - 22:30h