**Crystalotherapy salt caves are rich in healthy salt ions and absorb hazardous electromagnetic radiation from mobile and wireless technology.**

*by Dr. Basilis Masoulas*[i]

## I. Summary.

*Since 2008, the Crystalotherapy Salt Caves have been installed inside hotels, shopping malls, clinics and have been managed as independent wellness shops at the centers of cities in Europe, USA and the Middle East, offering wellness, health and entertainment services to people of all ages. The Crystalotherapy Salt Caves are ISO certified for Quality and Environment and comply with all norms and regulations. This paper presents the results of three studies regarding (a) the air inside the Crystalotherapy Salt Caves as compared to the sea air, and (b) the attenuation of the electromagnetic radiation from the Crystalotherapy Salt Caves. The measurements of salt microelements (Na, K, Ma and ClNa) inside a Crystalotherapy Salt Cave were compared with the same measurements at the sea and the found results demonstrated that – compared to the sea air - the air inside the Crystalotherapy Salt Cave is on 76 times richer in Na and ClNa. In other words, inhaling the air inside the Crystalotherapy Salt Cave for* ***1 hour equals to 3.16 days*** *at the sea in terms of Na and ClNa. Besides that, inside the salt cave one would also inhale K and Mg, microelements that the sea air does not include. The measurements on the attenuation of electromagnetic radiation, have demonstrated that the salt materials used at the walls and ceiling of the Crystalotherapy Salt Caves absorb 90% of the electromagnetic radiation from mobile phones, Wi-Fi networks, computers, antennas of mobile telephony. These beneficial attributes to people lead us to propose that Crystalotherapy Salt Caves and their salt materials are used in residential and commercial constructions.*

## II. Halo therapy - General

Salt Therapy or Halo therapy is known from ancient times as a body and mind rejuvenation experience. Mineral salt has also been used for healing and even religious purposes in its natural form. Hippocrates, in his island Kos, used salt for healing purposes. In the early 20th century salt therapy became popular again, when doctors found that salt miners in Poland had significantly less health problems. This observation led to the creation of rejuvenation and rehabilitation clinics inside the gallerias of the old salt mines. Patients with respiratory and skin problems were relaxing there every day for 15-20 minutes. The results were very positive, as the condition of patients was making visible improvements. Today, salt therapy is known in many countries of the world. It's most common application is to stay in a suitably shaped salt cave made by mineral rock salt as in this simple way anyone can rejuvenate body and spirit.

In recent years, researches and studies have proven the beneficial effects of the halo therapy against stress, in the reduction of smoking, during pregnancy, both for the mother and for the embryo, for sport performance enhancement, as well as in the cases of insomnia, fatigue, allergies, migraines, pains in the waist, neck, legs, skeletal disorders, osteoporosis, rheumatism, viral & immune disorders, respiratory infections (chant, bronchitis, etc.), cardiovascular, gastro-intestinal, skin diseases, flue, aging, increased body weight[ii].

## III. The Crystalotherapy Salt Caves – Studies.

Today, the most famous and in the same time most convenient (regarding the modern way of living in the cities) method of salt therapy is by staying inside suitably shaped salt caves. The objective of the Crystalotherapy Salt Caves is to recreate the natural, biological and rehabilitating conditions found at the Polish salt mines, at a room easily accessible to people of all ages by offering them the possibility to benefit from it when they leave their work or when they visit a city.

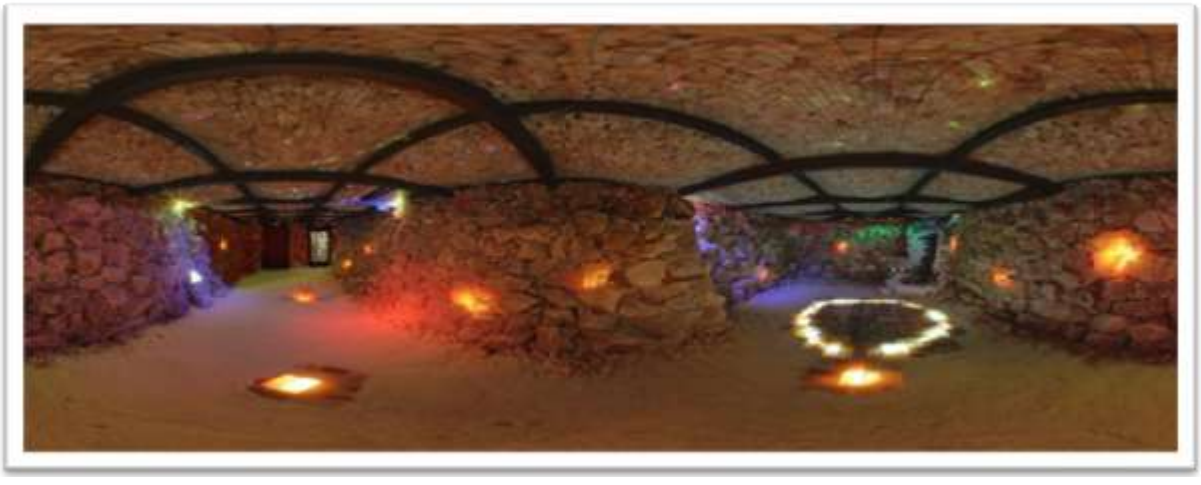

**Photo 1.** The Crystalotherapy salt cave in Athens.

A Crystalotherapy Salt Cave fulfills completely the above objective, considering the following:

- it has the form of a real cave and is build with ISO certified technology for quality, health and environment;
- visitors may relax for 30 – 45 minutes on comfortable zero gravity chairs, listen to sounds of nature, to the water falling from the cascade, and in the same time benefit from the improvement of their health;
- it can be installed at any closed room, hence it can be installed even in the center of big cities and
- the interior of a Crystalotherapy Salt Cave is carefully designed in order to re produce the temperature, humidity, the unique microclimate and in general the conditions which can be found at the world famous salt mines and sanatoria of Wieliczka and Bochnia in Poland.

The unique healing attributes of this microclimate are due to the enriched air that circulates inside the Crystalotherapy Salt Cave. This air is rich in salt ions and trace elements. Its cleanliness and purity, which excludes and in the same time destroys bacteria and other microorganisms, is taken care to be preserved through the exclusive use of natural materials and the very large quantities of salt used at the cave. The walls, floor and ceiling of Crystalotherapy Salt Cave are completely covered with tones of 4 different types of carefully selected mineral salt and Dead Sea salt. Nor gyps neither other artificial materials have been used (such as those used in other "caves" for decoration purposes-stalactites and ease of construction), as the use of gyps in similar environments rich in salt ions tends to create nests for bacteria, hence it is excluded from Crystalotherapy Salt Caves. Furthermore the two water features (the cascade and the salina) inside the cave are recycling saline water and in this way the air inside the cave is further enriched with salt ions.

Currently, Crystalotherapy Salt Caves operate in many cities and countries in Europe, USA and the Middle East. They can be found inside hotels, shopping malls, clinics, or as independent Halo therapy shops.

The first Crystalotherapy Salt Cave was designed and installed in February 2008 in the center of Athens, Greece. For 3.5 years this salt cave provided halo therapy, wellness, health, and entertainment services to more than 45.000 people[iii]. It had received significant free media coverage and became a landmark of the city of Athens. In 2011 the continuous social unrest at the center of Athens (demonstrations, strikes, etc.) increased the customer requests to move the cave to another location. In October 2011, the Athens cave was transferred to the Ellinikon suburb of Athens, inside a rehabilitation clinic (Physio Lab). Furthermore, another cave was installed at the suburb of Glyfada.[iv]

**Photo 2**. The Crystalotherapy salt cave at the Physio Lab clinic (cascade on the right side).

Scientific studies were performed inside Crystalotherapy Salt Caves regarding the following:

a. salt ion (Na, K, MG, ClNa) concentration in the air of the Crystalotherapy Salt Cave of Ellinikon compared with the air of the sea at the Saronic bay of Athens (see below under III.A).
b. the behavior of Crystalotherapy Salt Caves when exposed to electromagnetic radiation from mobile phones, Wi-Fi networks, computers, antennas of mobile telephony, 2G and 3G (see below under III.B).

In the following two sections the results of these studies are presented.

### III.A. Salt ion concentration inside the Crystalotherapy Salt Cave.

In December 2012, salt ion concentration was measured inside the Crystalotherapy Salt Cave at the Physio Lab clinic (at the Crystalotherapy Salt Cave at Ellinikon). The objective was to measure the salt ion concentration created by (i) the mineral salt rocks on the walls and the ceiling, (ii) the Dead Sea salt positioned on the floor of the cave, and (iii) the two natural halo generators (cascade and salina).

The certified Laboratory which performed the study used the same specialized devise (SKC 224-PCMTX8, pump through put 2.0 liters/hour):

a. inside the salt cave Crystalotherapy: the pump was positioned for 12 hours on the salt cascade (see photo 3) and measured the *Total Air born Particle Mass*; the temperature and humidity levels inside the cave were 19$^{o}$ to 21$^{o}$ Celsius and 50% - 65% respectively (standard conditions in every Crystalotherapy Salt Cave);


**Photo 3**. The sampling set up inside the Crystalotherapy Salt Cave salt (pump on the cascade).

b. On a boat at the marina at the Ellinikon suburb, on the Saronic bay of Athens (see photo 4); the same pump was installed outside the north west side of the boat; the temperature and humidity during the 46 hours of sampling period was 7 to 17 and 52% - 92% respectively; the wind speed was 2 to 7 meters / second and the air direction was north west (blowing on the pump).

**Photo 4.** The marina at the Ellinikon Suburb

At the Laboratory, the same *analytical method* was applied to both samples: OSHA ID-206, modified Na, Mg: DA-AAS, modified K: DA-AES. The results of the measurements are presented in the Table below[v].

| Comparative measurements in µg/Nm3 | **Air of Crystalotherapy Salt Cave** | **Sea Air** | **Ratio of Salt Cave vs. Sea air** |
|---|---|---|---|
| **Natrium (Na)** | 85,50 | 4,44 | 76,61 |
| **Kalio (K)** | 16,20 | 0 | NA |
| **Magnesium (Mg)** | 3,99 | 0 | NA |
| **Salt (Chlorium Natrium)** | 217,00 | 11,30 | 76,40 |

Comparing the two sets of results presented on the table above, we observe that:

- Natrium (Na) concentration in the sea air is 76,61 times less than that close to the cascade of the Crystalotherapy Salt Cave. In other words, inside the Crystalotherapy Salt Cave one will inhale 76,6 times more Na than at the sea (for the same period of time).
- Salt concentration in the sea air is 76,40 times less than that close to the cascade of the Crystalotherpay Salt Cave. In other words, inside the Crystalotherapy Salt Cave one will inhale 76,4 times more salt than at the sea within the same period.
- Inside the Crystalotherapy Salt Cave one would also inhale a significant amount of K and Mg.

The above proves that it is very beneficial to people's health to spend time regularly inside a Crystalotherapy Salt Cave.

### III.B. Electromagnetic radiation and Salt caves Crystalotherapy.

Two studies on the behavior of Crystalotherapy Salt Caves when exposed to electromagnetic radiation were performed by two independent certified radiologists & electrical engineers. The frequencies tested are those normally found inside houses and office buildings from mobile phones, Wi-Fi networks, computers, antennas of mobile telephony, 2G and 3G (GSM900, DCS1800, UMTS).

***The 1st study***[vi], was performed on 16.12.2009 at the Crystalotherapy Salt Cave of Athens. It focused on measuring the behavior of the salt rock used on the walls and the ceiling of Crystalotherapy Salt Caves when exposed to high and low frequencies. The instruments used to measure high radiation frequencies were: "Aaronia Spectran HF-60105", "Aaronia Spectran Hyperlog 60100" and "Cornet Microsystems ET-85EX". The instrument used to measure low radiation frequencies was "Aaronia Spectran NF-5035". The methodology applied was to measure the interaction of mineral salt rock used on the walls and ceiling of the Crystalotherapy Salt Caves. The specimen was positioned between the radiation source and measurement instrument (Photo 5 below presents the sampling set up). Thereafter the respective measurements were compared with those measurements which have been taken place (i) without the presence of the specimen and (ii) with the presence of a common stone of similar mass.

**Photo 5.** Spectrum analyzer with tiaxial probe (receiver) to the right and transmitter (RefRad 3000 reference source with directional antenna) to the left of the salt rock.

According to the results of the 1st study, the salt rock used on the walls and ceiling of Crystalotherapy Salt Caves proved to be particularly effective in protecting against electromagnetic radiation, with **84.11% absorption rate on the electromagnetic radiation**. According to the respective report, "***if one takes account that the salt rock used as specimen had small dimensions compared to the salt used at the walls of the Crystalotherapy salt cave, we should attribute its performance on its physical properties and the structure of the crystal lattice***".

***The 2nd study***[vii] was performed on 24.8.2011 at the same Crystalotherapy Salt Cave. The measurements focused on the behavior of the mineral salt used on the walls and on the ceiling of Crystalotherapy Salt Caves, when they are exposed to radio frequencies across the whole spectrum of frequencies. The equipment used and measurement set up is presented in Figure 1 (see below). The hypothesis tested was whether any variation on damping properties could be attributed to the thickness of the salt material used. Figures 1 and 2 (see below) present the sampling set up.

In the measurements is evident that the salt rock used in Crystalotherapy Salt Caves (and all other Crystalotherapy product such as salt sauna, salt mosaics, salt sculptures, salt panels) demonstrate important damping properties on electromagnetic radiation. In all cases it was found that the attenuation of the electromagnetic radiation due to the salt rock used at the Crystalotherapy products is less at lower frequencies, and generally range between 5dB-15dB, which are rates much higher than those measured in a common wall found in most buildings (3-4 dB).

Specifically, the results of the measurements provide the following evidence:

One of the walls of the salt cave had ***plasterboard exterior*** and salt rock interior (see on Figure 1 measurements, positions 1 and 2). The measurements on Figure 2 demonstrate that this salt cave wall has better performance (around 10dB attenuation) in the mobile phone frequencies GSM900 (900-1000MHz), and the Wi-Fi (2.4GHz).

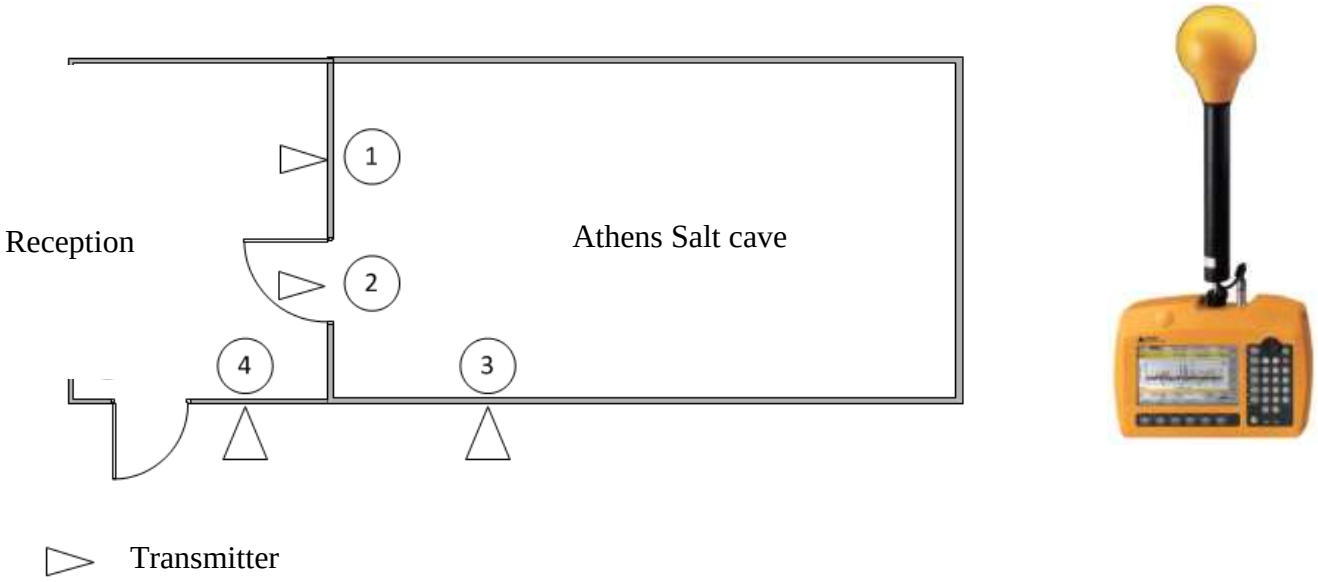


**Figure 1 :** Measurement positions at the Crystalotherapy Salt Cave and measurement instrument used

(Selective Radiation Meter model SRM-3006, by Narda Safety Test Solutions).

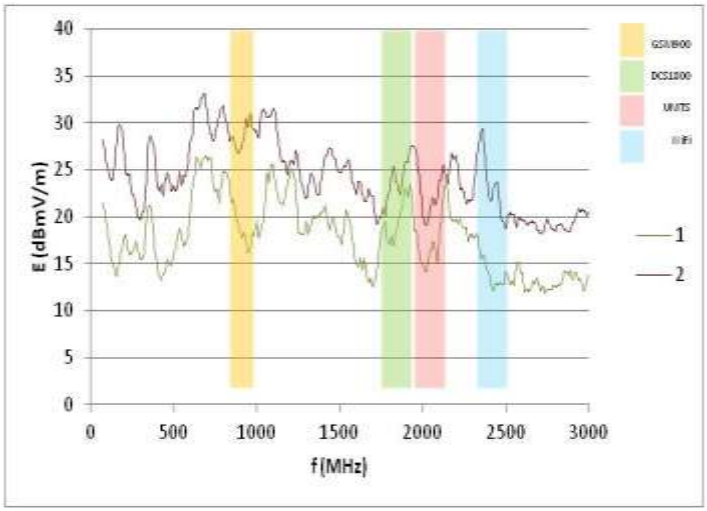


**Figure 2.** Measurements on wall with plasterboard exterior & salt wall interior

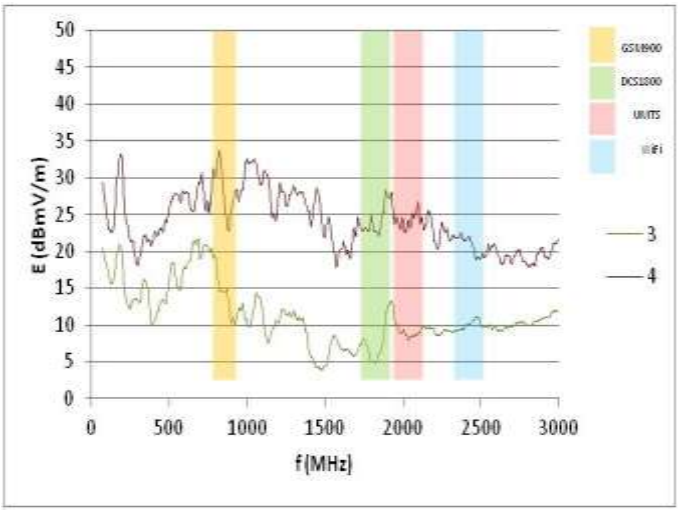


**Figure 3.** Measurements on wall with glass exterior & salt rock interior

One of the walls of the salt cave had ***glass exterior*** and salt rock interior (see on Figure 1 measurements, positions 3 and 4). The measurements on Figure 3 demonstrate that this salt cave wall has very good attenuation (greater than 10dB) at all frequencies above 900MHz, corresponding to mobile phone 2G and 3G (GSM900, DCS1800, UMTS) and the Wi-Fi (2.4GHz).

From the surfaces measured, the best damping properties was that of the salt wall which had ***wooden exterior*** (see on Figure 4 measurements). The measurements on Figure 5 demonstrate that the attenuation of electromagnetic radiation due to this type of salt cave's wall is greater than 10dB across the spectral range of 27 - 3000MHz. This means that it **lets through only 1 / 10 of all sources of electromagnetic radiation**.

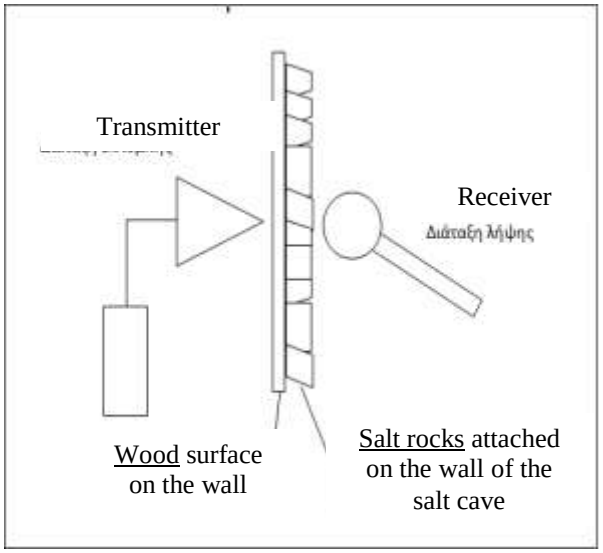


**Figure 4.** Measurement positions of the salt cave wall

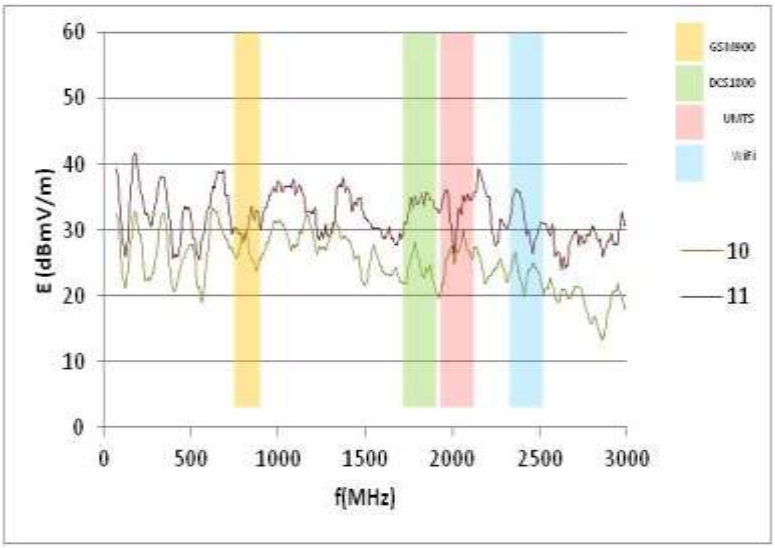


**Figure 5.** Measurements on wall with wooden exterior & salt wall interior

It was also found that this salt rock material on this wall was not the thicker one, which means that the attenuation of the electromagnetic radiation caused by the Crystalotherapy Salt Cave wall is not proportionate to the volume of salt material, but more likely to the properties of the salt material (e.g. composition, crystalline structure).

Consequently such a coating (salt rock on wooden board*)* could be used to reduce the electromagnetic charge that receives a building or a room that is close to strong sources of electromagnetic radiation (e.g. an antenna of mobile telephony, or the computers and other electronic & electrical appliances found in office buildings and houses).

## IV. Conclusions.

This paper presents the results of three independent studies (a) the one regarding the quality of the air inside the Crystalotherapy Salt Caves and (b) the other two regarding Crystalotherapy Salt Caves' behavior towards electromagnetic radiation frequencies found in home and office buildings. During these studies, measurements of salt's healthy microelements inside a Crystalotherapy Salt Cave were compared with similar measurements of the sea air, and the found data demonstrated that compared to the sea air the air inside the Crystalotherapy Salt Caves is 76 times richer in Na and Salt (ClNa) and also contains K and Mg (that sea air does not contain). Additionally, the studies prove that Crystalotherapy Salt Caves absorb nine tenths of the electromagnetic radiation from mobile phones, Wi-Fi networks, antennas of mobile telephony, 2G and 3G (GSM900, DCS1800, UMTS). Therefore it is proposed that Crystalotherapy Salt Caves and their salt materials are used in residential and commercial buildings so that people could benefit from their attributes.

## V. References.

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[ii] Scientific reports and medical papers http://crystalotherapy.gr/en/salt-cave/scientific-reports,

[iii] Salt cave customer feedback http://crystalotherapy.gr/en/customer-experience

[iv] Virtual tour inside the caves of Athens, Ellinikon & Glyfada http://crystalotherapy.gr/en/salt-cave/virtual-tours-at-salt-caves.

[v] Andreou Laboratories technical report http://crystalotherapy.gr/en/salt-cave/quality-a-hse/environmental-reports.

[vi] Aktinovolia.net technical report http://crystalotherapy.gr/en/salt-cave/quality-a-hse/environmental-reports.

[vii] Papanikolaou, N. technical report http://crystalotherapy.gr/en/salt-cave/quality-a-hse/environmental-reports.