

**Depleted and Enriched Uranium in Lebanon, a Scientific Approach
to the Clarification of whether Uranium was used in the
Israeli/Lebanon Conflict.**

By Dr. Mohammed Ali Kobeissi*

The interpretations and content of this report are the sole responsibility of the author**.

1- The reporting of the use of Uranium by Israel and its denial by its officials

Since the declaration (Daily Star, An-Nahar) on August 20th-06 by the author of this article on the presence of high level of nuclear radiation in one of the missiles craters in Khiam caused by the Israeli bombardments, the dispute about the origin and cause of such radiation is still taking place in the media.

On December 7th-06, The Daily Star has reported again on the presence of Uranium in a soil sample obtained from the Khiam town bomb crater caused by Israeli air force bombardments. The report was taken from an interview given by the British expert, Dr. Chris Busby to the Environment and Development magazine in its December-06 issue. In a detailed article written by Robert Fisk in the Independent (UK, October 28-06), followed by a long report in the As-Safir paper(Lebanon, October 30-06), all stating that enriched Uranium has been found in the Khiam crater. Both, The Independent and AS-Safir, have relied on results in a report obtained from Dr. Chris Busby and his co-worker Dai Williams. In a conference arranged in Linz (Austria) on the Use of Dirty Weapons by Israel on Lebanon, where I took part in the Lectures of that Conference, a copy of that report was also submitted to me on October 26-06 by Williams. Such report at that time has created an atmosphere of anxiety among the Lebanese citizens and confusions among the scientific community.

This situation has created also panic in the social and health stream in Lebanon. In several of these reporting and on Web sites, the dispute on whether the soil of Khiam crater contains enriched Uranium or depleted Uranium (DU) is still taking place and yet no definite conclusion is established, while it is well known that in the modern wars depleted uranium has been used. The Lebanese Council for Scientific

Research and UNEP are still declaring that no DU has been found in their investigation on samples taken from places of the war actions.

In this article I would like to clarify this affaire, based on the study of the British team as well as on my investigations and measurements on about 11 craters soil samples that I have recently carried out in two reputable Laboratories in Europe.

2- Historic Background

a-) In the War Zone in South Lebanon

The 33 days war waged on Lebanon by Israel starting on July 12th-06, has left a large part of the Lebanese infrastructure in a complete destruction. Weapons of highly powerful explosives were used with a tremendous efficiency, so that homes, high rise buildings and high way bridges have been flattened to the ground. Road communications between the cities in south Lebanon and elsewhere in the country were cut using weapons such as bunker busters. Hundreds of thousands of civilians of the population were forced to leave the south to other safe community places in the country. Children suffered the most and many were killed and some were burned in indiscriminate attacks.

During the first 20 days of the war, I remained in my residential area in South Lebanon witnessing the Israeli war planes throwing missiles on towns, including schools, markets, moving cars and fleeing civilians and massacres have been committed by the Israelis. The craters caused by these missiles ranged from small size of depth of 4 meters to about 10 meters and larger in some cases. I do not know why the fear did not penetrate into the senses of my existence. May be the barbarism committed by the Israelis toward life creates a much higher values in man's consciousness, where during that war the roots of freedom develops into transcendental noble values, where Death becomes a small instant of time to arrive to a nirvana state of celestial values.

b-) South Beirut under Attacks

On August 2-06, I moved to a residential place on a hill, overlooking the southern city of Beirut. During my staying there I saw how that part of the city was rained by the Israeli missiles causing huge clouds of dusts mixed with flames of fires.

Being a nuclear physicist and expert in nuclear radiation measurements, these phenomena brought to my mind the possible use by the Israelis of missiles and

bombes equipped with Depleted Uranium (DU) as was the case in the two Gulf wars on Irak.

Directly after the cessation of the bombardment on August 14th-06, and knowing the effect of the use of DU on the health of the population, I went to South Beirut to explore and see at the first hand the destruction there. The whole section looked like Berlin during World War II as was presented as a comparison by the media: flattened high rise buildings were sandwiched to the ground, black dust, suspected to be Uranium Oxides, covered the remaining of concretes, and bad smells originated from dead human bodies buried under the ruins and from the weapons chemicals.

3-Radiation Activities in the Craters of the Khiam Town

On August 20th and after I returned to my residence in the south, I received a telephone call from the town of Khiam stating the detection of strong radiations in one of the missiles craters in a residential area of the town and asking for my help. Using a very sensitive Geiger-Muller counter(GM), I went down to the bottom of the crater. The counter registered 850 nSV/h (850 nSV per hour) at the deep point. This dose was about 14 times more than the measured dose value of 50 nSV/h I have obtained at the surface area in the surroundings of that crater. This event was reported in the Lebanese press in the next day (Daily Star, Al-Akhbar, An-Nahar).

4- The Chasing after the Depleted Uranium (DU)

At that day, I took samples from that crater and other craters in the town and outside it. To make sure that I have collected the right samples I called Dr. Doug Rokke, a former US Army Major and a Lecturer at Jackson Vill University and who is an expert on missiles containing DU, describing to him the appearance of the craters soils and asking him for advice on the collection of the appropriate soil samples to be taken for the investigation. I took the advice of this noble man and extended my samples collection to other towns in the south such as Froun, Ghandouria, Teery, Bint-Jbeil and Ainata, and including dust samples from South Beirut buildings, in order to measure radiation emanated from these samples using Gamma and Alpha Spectroscopy. During the samples collections I have also measured by GM radiation in the other craters from which the samples were obtained using the same counter. These measured doses were about 5 times as the surface dose and not as high as the one I have measured in the very first crater in Khiam. During the process of samples collections, Mr. Dai Williams, who is a co-

worker of Dr. Busby on DU, was present in Lebanon at that time, has asked if he can accompany me to collect few samples to take back to his country England. One of the samples he took, was from the Khiam crater which showed relatively high level of radiations as I mentioned above and which still under dispute.

5- Motivation of the task for Uranium measurements

Having detected such high level of radiations and knowing the effect of such radiation on the health of the Lebanese people and the toxicity of the radio active Uranium, Depleted or enriched, I was prompted to take the initiative, as independent researcher, in collaboration with Green Line Organization in Lebanon, to set up a project to carry out measurements on soil samples that I have taken from craters of various areas in the country and specially the one from Khiam crater, which showed the high activity mentioned above. Then I went to Europe to execute such project in two and highly reputable Laboratories.

I would like to emphasize here that no collaboration between me and the British team of Dr. Chris Busby took place regarding the measurements of samples or interpretations of data. My task of investigation was to be independent of any governmental influence or any other institutions.

6-Methodologies

Several methodologies are used to measure depleted Uranium and we mention only two concerning this article:

a)-The Gamma Spectroscopy Method

This method was used in our measurements, where in the gamma spectra, peaks activities of Uranium isotopes U-238 and U-235 are usually compared to get a value for these isotopes ratio. The value of this ratio depends on the enrichment or depletion of Uranium. For natural Uranium this ratio has a value of 21.7, which corresponds to an enrichment of 0.71% by the U-235 isotope. Any increase in the ratio factor is an indication of the presence of depleted uranium. The opposite is true, where the decrease in this factor is an indication of enrichment in the Uranium content. The validity of any interpretations of such values of the ratio depends on the margin of the uncertainty in the error of measurements.

In general, the errors of the measurements result from uncertainties of the detector efficiency in combination with the sample geometry and the **low samples activities**. The total error of the isotopes ratios in our measurements can be estimated as about 15%. Thus it must be clear that all these factors play an

important role in the interpretations of data and the confidence in their values. In our measurements on the disputed Khiam sample gave a ratio value of 26 between the activities of the two isotopes U-238 and U-235. This ratio corresponds to a percentage enrichment of 0.60 % as compared to the natural enrichment of 0.71%. This former value of enrichment is in contradiction with value obtained by Busby's result of enriched uranium as will be discussed below.

b)- The Mass Spectroscopy Method Used by Busby and Dai Williams at Harwell Laboratory

In this method the ratio of the masses of the isotopes U-238 and U235 is used to determine depleted or enriched Uranium content in the collected samples.

For natural Uranium this ratio is 138 which correspond to an enrichment of 0.72%. Lower values than 138 indicate enrichment above 0.72% and higher values indicate depleted Uranium content.

For the Khiam sample, the published results of the measurement obtained from Harwell Laboratory for Chris Busby and his co-worker Dai Williams, who have evaluated and interpreted them, showed mass ratio of 108, corresponding to an enriched Uranium of 0.91%, which is higher than the natural enrichment of 0.72% . (See bellow) .

Discussion of the results obtained by the author and the Team of Chris Busby

a)- Results obtained by M.A.Kobeissi and co-workers.

Almost all the samples we have investigated and measured their ratio factor in Europe showed normal behavior of natural Uranium content except the one taken from the Khiam crater under dispute. The sample of this crater showed a much higher content of Uranium and its decay products than those obtained from other samples we have investigated and obtained from other locations in the South. This activity of that sample is in line also with the high counting I have measured earlier in that crater with Geiger Muller detector. As we mentioned above the ratio factor of this sample was 26 as compared with 21.7 for natural Uranium. This might indicate that the soil of that crater is contaminated with depleted Uranium. This factor corresponds to an enrichment of 0.60% as compared with the value of 0.71% of natural Uranium and compared with 0.91% stated by Busby..

b)-Results obtained by Busby and Williams

Some of the samples taken by Dai Williams were reported as normal but again for the Khiam sample, the published results of the measurements obtained from Harwell Laboratory for Chris Busby and co-worker Dai Williams, who have evaluated and interpreted them, showed mass ratio of 108 as compared to 138 for natural uranium. This value of 108 corresponds to an enriched Uranium of 0.91%, which is higher than the natural enrichment of 0.72% . This value contradicts strongly our result of 0.60 % enrichment, which indicates the presence of depleted Uranium. The percentage error stated in Busby's report was given as 20%.

Conclusion:

Based on the above we conclude that in **our measurements** the percentage enrichment ranges as: $0.48 < 0.60 < 0.70$ indicating depleted uranium content in the disputed Khiam crater.

On the other hand, in Busby's results, the percentage enrichment ranges as: $0.73 < 0.91 < 1.1$ which indicates enriched uranium.

The results obtained from both methodologies show definite contradiction. I believe the cause lies in the following factors:

- 1- **Instrumental and procedural.** In order to obtain believable results high precision instrumentation and procedures must be followed. The results from both methodologies are subject to errors uncertainties which can put doubt on any obtained values with such margin of errors.
- 2- The choice of appropriate samples collection is very crucial in this case. I have found for example that enrichment in one sample A taken from the disputed Khiam crater was 0.72%, a normal natural enrichment, while the enrichment obtained from sample B taken from the same crater as A but from an opposite location within the crater, was 0.60%, which indicates possible content of DU. This shows inhomogeneous distribution of radioactive elements in the crater soil.
- 3- The more important cause of the discrepancy in the results given above is the question of how much is the amount of Uranium delivered by the missile explosion to the location soil of the crater. Since this amount will determine the activity of the samples as well as the quantity of the DU mass. Such amount will play a crucial role in the precision of the measurements, since

for small contaminating amount, it will be very difficult to measure small activity and mass of Uranium in such increases without a large margin in uncertainty in the achieved values of the measurements of enrichment or depletion. This depends also on the methodologies used in this case

I believe that more investigations on the appropriate soil samples in our possession are necessary to obtain a definite answer to whether Depleted Uranium or Enriched Uranium has been used by the Israelis. The results given above are not conclusive enough to give a final answer to this affair. In a future task, we will use a more precise different methodology to obtain a decisive answer to the uranium problem in Lebanon.

Based on the above results and the immoral behavior of Israel in its wars and attacks on Lebanon, one can not exclude the use of missiles equipped with DU by Israel.

Morality and Duty of Institutions

Few thoughts should be given related to the moral duty of the press and the scientific communities in Lebanon and abroad regarding the use of Uranium by Israel in its wars on that country.

In the last few decades and so, several wars have been conducted against humanity, where dirty weapons, such as depleted uranium, have been used. The effect of such crime on the health and social life of the people, who were subject to such attacks, was catastrophic in countries like Yugoslavia, Afghanistan and Iraq. The case in Lebanon is still pending for further studies and investigation. Thus it is the moral duty of the press and the media to enlighten the public in a scientific approach about the health effect of the use of Uranium on the population of Lebanon. The press and other media must adder to the principles of creating awareness among the population about the danger of nuclear radiation be it artificial or natural radiation.

Governmental scientific or non scientific institutions should not threaten nor prevent the press or the scientists, from enlightening the Lebanese people in a humane manner about the possible presence of Uranium in Lebanon, caused by

Israeli wars against that country, so that preventive actions can be taken. Any action against enlightenment is crime toward the Lebanese people.

The Ministry of Health and the Ministry of Environment in Lebanon must have the moral duty also to take more dynamic actions and to approach the Lebanese people on the ground to assure them their safe locations and their psychological health . The present government is not doing enough in that direction.

- **University Professor of Physics and Researcher,**

email : makobeissi@yahoo.com

** Detailed information on data and results can be obtained from Green Line Organization in Lebanon or from the author. The author would like to thank the Green Line for the financing the project.