

On February 12, 1989 the last underground nuclear explosion was made at the Semipalatinsk nuclear test site. One day after the explosion, in Chagan village, about 100 km away from the nuclear test site, an abrupt increase of radiation level was confirmed. The level was 150-200 times higher than the usual background level. This situation was not unique for high military officials. The cause was leakage of inert radioactive gases, xenon and krypton, from a crack. A radioactive cloud of these gases mixed with air after some hours came to the populated areas of Jana-Semeisky district and Beskaragaisky district (figure 1), and the dose equivalent of the population just from this explosion ranged from 0.03 to 0.05 mSv. How dangerous was it? The natural radiation dose per year is considered to be about 1 mSv (Hoshi M., 1993), so the population received, just from a single explosion, addition of 3 to 5% to their annual dose.

The nuclear explosion was the last one at the Semipalatinsk nuclear test site. It was the last case of radiation exposure of the population living around this area. From the historical point of view, it was this explosion, that gave rise to the struggle for prohibition of nuclear explosions at the nuclear test site near Semipalatinsk.

In 1992, by the insistence of the government of the Kazakhstan Republic, the Defense Department of the former USSR prepared a special report on the radiation exposure doses of the populations of 4 regions of the Kazakhstan Republic. The parameters were calculated based on previously secret technical data for 97 atmospheric and 26 on-the-ground nuclear explosions. The above mentioned report gave the doses of external and internal irradiation and also their totals for the population of 711 areas in Semipalatinsk, Pavlodar, Karaganda and East Kazakhstan regions of the Kazakhstan Republic. It must be note that in this report the exposure doses are much higher than the officially reported doses, given previously to the USSR government as a top secret document (1962).

The experience of exposure to ionizing radiation of the population, living around the Semipalatinsk nuclear test site is unique. The 87 atmospheric, 26 on the ground, and 346 underground nuclear explosions, officially reported (the exact number is unknown to date), were the cause of considerable exposure and contamination of the soil with radioactive substances of vast territories of the Kazakhstan Republic, including its Semipalatinsk, East-Kazakhstan, Pavlodar and Karaganda regions, and the Altaisky region of the Russian Federation. Approximately one million people were exposed to repeated acute and chronic irradiation with various ionizing radiation doses.

1.1. Period of atmospheric and on-the-ground explosions (1949-1963)

On August 29, 1949, 7⁰⁰ a.m. the first atomic bomb explosion in the USSR was made at the Semipalatinsk nuclear test site. The altitude of explosion was 38 meters above the ground (military experts said "on the table"), and the energy released was equivalent to 20 kilotons of TNT. Wind velocity was 45-50 kilometers per hour. Two hours after the explosion a huge radioactive cloud came to the large populated areas of Budene, Dolon, Tcheremushki, Mostik, Malaya Vladimirovka, Bolshaya Vladimirovka, Kanonerka and others. The distance from the hypocenter to these populated areas was 70-120 kilometers. The doses of irradiation on the ground in some populated areas because of radioactive fallout were millions of times higher, than the natural level, because of radioactive fallout. The maximal doses of gamma-rays on the ground in Tcheremushki and Dolon villages were more than 200 roentgen because of the fallout. The data on external gamma ray doses in the populated areas of Dolon, Tcheremushki and Mostik are shown in the table 1.1.

Table 1.1. The dynamics of formation of doses of external irradiation in populated areas of Dolon, Cheremushki, Mostik (after atomic bomb explosion in 1949)

	Time after beginning of exposure (days)					Total accumulated dose
	1	7	30	90	365	
for the open (cGy)	81	130	160	170	190	200
for population (cSv)	60	96	120	130	140	160

Significant values of exposure are evident. The population received 64% of the dose during the first week after the explosion, 85% of the dose during the first three months. The level of radioactivity from the fallout 3.5 years after the explosion was higher than the background level.