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MUMBAI THIRUVANANTHAPURAM KOLKATA HYDERABAD CHENNAI BANGALORE AIZAWL

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Department of Atomic Energy

**POKHRAN – II TESTS WERE FULLY SUCCESSFUL; GIVEN INDIA
CAPABILITY TO BUILD NUCLEAR DETERRENCE: DR. KAKODKAR AND
DR. CHIDAMBARAM**

18:35 IST

The Union government has reiterated that the Pokhran-II nuclear tests in May'98 were fully successful. Addressing a press conference in Mumbai this morning, Dr. Anil Kakodkar, Chairman, Atomic Energy Commission (AEC) and Dr. R. Chidambaram, Principal Scientific Advisor and former Chairman, Atomic Energy Commission said, "The Pokhran-II tests had achieved their scientific objectives and had given India the capability to build fission and thermonuclear fusion weapons from low yields up to around 200 kilo tonnes (kt)." The statement comes after doubts raised by two scientists Mr. K. Santhanam and Mr. P. K. Iyengar on the success of the Pokhran-II nuclear tests conducted by India on 11th and 13th May, 1998. Mr. Kakodkar also said that on the basis of the capability, India had the ability to meet national security requirements and did not need to conduct more nuclear tests. The AEC Chairman however did not comment on issue of whether India should sign the CTBT Treaty, saying that a number of other factors needed to be taken into consideration for arriving at any decision.

Giving out the scientific details on the success of the May 1998 tests, Dr. Chidambaram, architect of the Pokhran-II tests, said that a number of yield measurement methods based on seismology, radio-chemistry and cavity measurements had confirmed the yield of the tests. He said that reputed US seismologist Professor Jack Evernden, who has professed taking into consideration geological and seismological differences between test sites, had made estimations of the May 1998 tests and they were consistent with India's results. Dr. Chidambaram said that a number of papers had been written on the results of the tests and they had been peer-reviewed in International Journals of repute. He also said that India now had the computer simulation capability to predict the yields - of nuclear weapons-fission, boosted fission and two-state thermonuclear - of designs related to those tested in May' 98.

Expressing distress over the objections raised by Shri P. K. Iyengar, the Principal Scientific Advisor said that even P. K. Iyengar agreed with the yield of the tests however the conclusions drawn by him on the efficiency were purely speculative in nature. Dr. Chidambaram wondered how without the knowledge of the design, the nature of fission-fusion break-up and quantity of thermonuclear material, Mr. Iyengar could calculate the efficiency the fuel burnt as 10%. He said, "no one outside the design team had the data to calculate fission-fusion yield break-up or any other significant parameter related to fusion burn". Responding to the doubts raised by Mr. Santhanam, Dr. Chidambaram said that the size of the crater depended on the depth of burial and nature of the rock medium. The Principal Scientific Advisor said that India was the only country, which had given out so much information on the tests and further information could not be revealed because of proliferation-related sensitivities.

A point by point response to the major doubts raised on the Pokhran – II tests as given by Dr. Chidambaram is given below.

Doubt -1

"If one goes by the numbers for the total nuclear yield put out by the Department of Atomic Energy, which I see no reason to dispute, the yield of the thermonuclear device detonated on May 11, 1998, was around 40 kilotons... In my opinion that ratio (of fission energy to fusion energy) must have been around 1:1... Therefore, by my estimate, the fusion yield could not have been more than 20kt... This suggests that the fusion core burnt only partially, perhaps less than 10 per cent.." (P.K. Iyengar, August 2000, repeated recently)

Response- 1

The important point is that Dr. P.K. Iyengar does not dispute the yield of the thermonuclear test. We do not understand, however, how, without knowledge of the design and, therefore, without knowledge of the fusion-fission breakup and the quantity of thermonuclear material in the device and its isotopic composition, he has tried to calculate the efficiency of fusion burn.

Doubt- 2

"The fission bomb yield from DRDO's seismic instrumentation was 25 kiloton..." (K Santhanam & Ashok Parthasarathi, The Hindu, 17 September, 2009)

Response – 2

The BARC estimate of the yield for the fission device is 15 kiloton (not 25 kiloton) and for the thermonuclear device 45 kiloton. One of the methods used for the estimation of the device yield was close-in acceleration measurement, for which both DRDO and BARC had set up instrumentation. It soon became apparent that after discussion among the two groups of specialists that the DRDO data had anomalies and had to be rejected and that the BARC data, which had the expected waveforms, would be accepted.

Doubt -3

"..The fission bomb left a crater 25 metres in diameter. If the TN device had really worked with a yield of 50 kiloton, it should have left a crater almost 70 metres in diameter..." (K. Santhanam & Ashok Parthasarathi, The Hindu, 17 September, 2009)

Response- 3

The surface feature produced at Ground Zero depends on the depth of burial and the rock medium around the shot point and the rock medium between the shot point and the ground. These were all different for the two device tests. The fission device was emplaced in rhyolite medium. The medium for the Pokhran-I test was shale and sandstone. The geology in the Pokhran region is inhomogenous. The propagation of the shock wave is affected by every interface. 3 – D simulation calculations of the rock mechanical effects done by BARC scientists, after considering all these factors, accounted for the observed effects in the thermonuclear test.

Incidentally, dimensions in rock mechanics scale by the power (1/3.4) for underground nuclear explosions- for chemical explosions, they scale by the power (1/3) or as cube root; the difference comes from the latent heat absorbed in the former case for vaporizing and melting the rocks around the point of detonation.

Doubt- 4

"Dr. P.K. Iyengar.... Informed me that trace levels of these same (radio) isotopes (sodium-22 and manganese-54) were detected in Apsara, a pure fission reactor" (K. Santhanam & Ashok Parthasarathi, The Hindu, 17 September, 2009)

Response – 4

The tail of the fission neutron spectrum extends to beyond the excitation energy of these reactions. But the fusion neutrons are of 14 MeV. That is why isotopes like Mn-54 and Na-22 are found in significant (not trace) quantities in the rock samples from the thermonuclear device site rock samples. If one sees the gamma-ray spectrum of a typical rock sample of the thermonuclear test site, published in refereed journals by BARC scientists, sharp peaks for these radioisotopes are seen, not just bumps in the background! In the Mn-54/Ce-144 ratios from the samples of the two test sites, reproduced by R. Ramachandran in his Frontline article of 25th September, 2009, this ratio for the thermonuclear test samples is seen as a high multiple of the ratio for the fission test samples"

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