# Technology Update

## The Strongest Laser of the World

In Romania the EU (European Union) has set up a high-efficiency laser of peta watt class. With it German researchers search for an effective way for an automatic transformation of radioactive wastes. Magurele is a small city not far from Romanian capital Bucharest which gave space to accommodate a research reactor of Soviet Russian design until 1998. While the longest history one could today hardly presume is a technological highlight in the small city. Nevertheless in a short time Magurele has been the station of European laser research projects of Extreme Light Infrastructure (ELI).

Romania since 2007 a member of European Union has set up a research plant here with the financial assistance of EU to the tune of about 360 million Euro. Then it salvages one laser which breaks all the performance records. For the first time the super laser ignited shortly before one year and with that performed as per statement of ELI team a performance of 10 peta watt ($10^{15}$W) with a radiation intensity upto $10^{24}$W/cm$^2$. That is already a world record.

Certainly the laser can do still more. The plant which was constructed by French Techniikkonzern Thales consists of a double arm laser. Each of the two arms is individually useful. These get out of that but also combine with double laser radiation. With full performance it could bring the laser to in total 20 peta watt. With that atom physics should be put forward with highest light field strength.

These so generated electromagnetic energy impact is so strong that it could destroy the electronic equipment located still at 10 Km distance in Bucharest. Therefore the super laser itself which is brought under a building in experimental halls and vacuum isolated investigation chamber, that as if with a atom reactor built with one metre thick concrete walls and foundations.

In that the built up steel shields the laser like a Faraday a cage and protects it from electromagnetic jams from outside. In order to protect the research plant from vibration or earthquake, this rests on more that thousand powerful concrete pillars which are fixed at a depth of 30 metre in soil.

**Fully new possibilities of nuclear physics:** If the researchers want to open to follow the example of new possibilities of nuclear physics with superlaser the abbreviation NP for EU project in Jargon also is named ELI-NP. With that the researchers can investigate the complex phenomena within the atom core and therefore as for example clarify or in the hot place of glowing fire of huge star explosions always heavier chemical elements are agglomerated together out of light atom cores.

Also the reversed process, the core splitting gets investigated with so far unachievable. As for example the question gets so answered how uranium goes through with the splitting of heavier atom core and how with that so generated long level radioactive split products are transformed. A vision is so with the help of laser the disposal problem of radioactive wastes is made safe.

That a laser induced atom transformation or transmutation is principally possible, the research groups in Heinrich Schwoerer of the Institute for Optics and Quantum Electronic of the University of Jena and Joseph Magrill

of the Institute for Tran uranium Elements of European Commission in Karlsruhe have proved already in a laboratory experiment. With a femtosecond laser researchers have been successful in transformation of extremely long-lived radioactive isotopes Jod-129 in the short-lived form Jod-128.

Jod-129 is a spat product of atomic energy. Yearly worldwide about 2 tons of that is produced. It has a half-life of 15.7 million years. The isotope, transformed through transmutation in Jod-128, however has a half-life of only 25 mins and decay then in a stable Xenon isotope. Researchers search for a practically useful way for the transmutation. How this could go on, the group under Joachim Enders, Professor of atom physics at the TU Darmstadt with the help of experiments of ELI-NP wants to find out. "The phenomena of atom splitting are till today not fully understood" says the researcher. Therefore we want to investigate with the superlaser, under which conditions and in which components exactly atom core decay.

For that the researchers require still one further source of ray an intensive monoenergetic gamma ray. In order to generate that the strongly bundled light from superlaser on a fixed light speed electron ray. Out of the alternating effects between both components then come off a gamma ray intensively sufficient in order to penetrate into the atoms and to precisely analyse the inner structure of the atom.

However the researchers must still exert patience. Certainly the super laser is ready for operation, however in order to construct gamma ray source there is tussle between the responsible consortium for that purpose under Italian management and the country Romania. In view of delay in construction the Romanian side the consortium has withdrawn the assignment without hesitation out of which this Romanian deficiency of building was thrown forward. Romania insists that it has to hold the burden.

All negotiation-searches to save the dealt situation stepped uptil now. Now the jurists have been engaged in order to bring finally the dispute to an end. "We must wait for a solution" opines Enders. This however can continue for a while.

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