

§ 22. Micro Z Pinch Driven Inertial Confinement Fusion

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Micro Zpinch driven ICF is the new inertial system which has collected concern recently in the past 2 or 3 years (Fig. 1). It succeeded in generating X ray of 1.6MJ in the micro Z pinch whose diameter & length is several cm . This is the result of the U.S. Sandia National Lab. with the pulse power supply of several 10 MJ. It is the system which applies these X-rays to pellet, and performs inertial fusion. The pellet compression experiment was already carried out and the neutron of 2×10^{10} was generated. We should remark that the cost of a self-ignition machine is estimated as 20 billion - 30 billion yen.

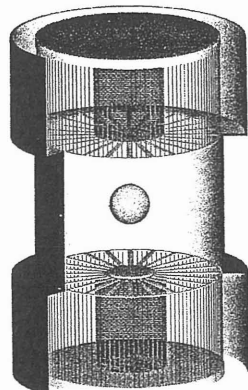
The most serious problem of this system in future is a pulse electric power transmission line to the micro Z pinch located at the center of the reactor chamber. Since the micro Z pinch and transmission line is also exhausted by every shot in a inertial fusion reactor, the amount of consumption may become unrealistic in 30 million shots per year. Amount of these consumption in the one-shot should be decreased at most 100g or less.

Since the micro Z pinch only arranges a slender wire to a double cylinder form, the amount of consumption is small. We has already succeeded in the experiment of slender wires as the transmission line at IPP. When pinch time of the Z pinch is set to 10 - 20ns, a power supply will adopt a Marx generator type. In this case, by considering impedance matching with the transmission line, there cannot be the slender wire type as the lightweight transmission line. If there is a scenario that a little longer pinch also for 200ns - 1microsecond is allowed, we can employ the slender wire transmission line of low inductance, and just to consider the power supply corresponding to it.

Contents of a workshop : At NIFS on December 5 and 6, 2002 , following items were disussed and details will be reported.

- 1.The detailed parameter of a magnetic insulated transmission line.
2. A pulse power supply system .
3. Physics of wire pinch and X ray radiation process.
- 4.Target form and efficient radiation transport.
5. Micro Z pinch driven ICF reactor.

Double-ended hohlraum



Dynamic hohlraum

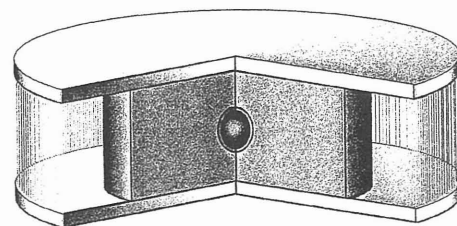


Fig.1 Micro Zpinch driven ICF