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Final Results of the German SNQ Study

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Extended Abstract*

The SNQ project study, carried out jointly by Kernforschungsanlage Jülich and Kernforschungszentrum Karlsruhe has been completed in May 1981 as planned. The report was prepared in three parts: part I (available as report Jül Spez 113/ KfK 3175)** gives a general description of the project and its scientific motivation; part II is a more detailed record of the technical concept and related research results; part III is a collection of appendices containing original papers and reports and is meant to serve as a basis for the future work on the project.

The main characteristics of the project have already been presented at the ICANS-IV meeting in Tsukuba in 1980 by W. Klose (report KENS-II), with many details given in contributed papers to both, ICANS-IV and the present meeting. We have considered a basic concept (reference design) and several possible future options. In its basic configuration, the source is designed to reach a time average thermal neutron flux of $7 \cdot 10^{14}$ $cm^{-2}s^{-1}$ and a peak flux of $1.3 \cdot 10^{16}$ $cm^{-2}s^{-1}$ at 100 Hz repetition rate, which would make it superior to all existing neutron sources for beam hole research. The proposal includes a 1.1 GeV, 5 mA time average linear accelerator consisting of an Alvarez type low energy part and a disc-and-washer type high energy accelerating structure which operates at a peak current of 100 mA and at RF-frequencies of 108 (Alvarez) and 324 MHz (daw). The target material is proposed to be lead initially. It will be arranged on a 2.5 m diameter wheel rotating at 0.5 rps, to reduce the heat load and radiation damage of the target. The proton beam will impinge on the circumference of the wheel at right angles to its axis. Provisions are proposed for neutron scattering (thermal and cold neutron source) irradiation facilities, neutrino physics, nuclear physics and meson research. With its time

average beam power of 5.5 MW and peak proton current of 100 mA the facility is a major step forward from existing machines in accelerator development as well as target power. However, the study has shown with a high degree of confidence, that this step is feasible within reasonably small extrapolations from proven technologies. Options for future extensions include: increase in proton beam power up to 11 MW time average, use of uranium as target material, addition of a proton pulse compressor to provide pulses of 0,7 μs duration at 66 A and construction of a second target station designed for pulsed neutron work mainly in the epithermal energy range. The estimated cost (in 1980 money) for the basic configuration is 680 million German Marks and another 130 million for the proton pulse compressor. We expect a decision from the government to go ahead with a detailed design study and hardware tests early in 1982. The projected time scale includes a further development period of little less than two years and about eight years of construction time if adequate funding can be provided.

* A full paper will be available from the author.

** This report is in German. The following reports in English are available upon request:

G.S. Bauer and J.E. Vetter "The German Project of a High Power Spallation Neutron Source for Fundamental Research" preprint of a paper to be published in the IIASA-Pergamon Press Conference Proceedings series

J.E. Vetter (ed). "The Basic Concept of the SNQ Linear Accelerator", report KfK 3180 B

G. Schaffer, ed. "IKOR, An Isochronous Pulse Compressor Ring for Proton Beams" report Jül-Spez-114.