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M E M O R A N D U M

To/A : The PSC Committee

From/De : The CERN-COPENHAGEN-GRENOBLE-LUND Collaboration

Subject/
Objet : Addendum to proposal CERN/PSCC/78-8/P1
Approved experiment SC 83
Measurements with Neon Ions

This note is a request to the PSC Committee for an extension of the experiment SC 83 described in proposal PSCC/78-8/P1 and in memo PSCC/79-2/M17. It is made following the letter PSCC/80 which stressed the interest of Neon and Argon beams at the SC. In itself a Neon beam would increase significantly the number of species which might result from a fragmentation process of the projectile. With Carbon we can essentially study from Lithiums to carbons, that is 3 elements. The use of Neon would allow to study 7 elements. This would, in particular, test further the validity of the formula for yields production

$$\sigma_i = \sum_i e^{\frac{Q_i}{T}} \quad (T \simeq 9 \text{ MeV})$$

which appears to fit the Carbon results.

From elastic scattering we have found that nuclei presented a 25% "transparency" to Carbons, a behavior which was predicted[1] from the study of p, d and α induced reactions. It would be very interesting to know wether nuclei keep such "transparency" with respect to Neon.

We have observed very large energy losses for large angles (20°) of the projectile fragments. The cross sections are almost identical for such targets as C, Ag and Au. One explanation of this surprising result is that the Carbon projectile interacts collectively with a part of the target nucleus. The size of the participant fraction of the target appears to be the same from C to Au. One expects that going to lighter target than C one might come to the point where the whole target participates in the reaction. The choice of such lighter targets is, however limited (Be, LiH,). Using Neon as a projectile would make this determination of the size of the participant fraction easier and more significant.

It is our intention to look for the Coulomb excitation of giant resonances by fast heavy ions. The SC beam quality is especially welcome for this search. Neon, would be more efficient in this respect than Carbon, due to its higher charge. Another interesting feature of Neon is its smaller range, which decreases the number of nuclear reactions in the detectors.

Neon would probably present some advantages over Carbon in certain coïncidence experiments which we have programed. For example projectile like-target-like fragments coincidence are only possible if the velocity of the target like fragment is large enough. This requires that the masses of projectile and target are comparable (Or that the target's mass is smaller than the projectile's). This condition is obviously easier to reach with Neon.

The observation during our C run of fast protons (up to 200 MeV) at large angles (120°- may be related to collective effects such as sound waves. If this is the case a larger projectile (Neon) sent on a large target would be more suitable.

Finally much of the high energy data were obtained at the Bevalac with Neon beam. Using such beams at CERN would make comparisons easier.

To complement our programm with Neon, which would be rather similar to that we are pursuing with Carbon, we would need approximately 50 shifts in years 1981 (fall) - 1982.

It is clear that most of what has been said would hold even better if Argon ions would be available. However it may be that, due to low intensity,only singles experiments would be realistic.

For the cooperation.

H. NIFENECKER

(1)- R.M. DeVries et J.C. Peng -
Rapport interne Los Alamos LA-UR 79-730.