

5th May 1964

A condensed report of a talk on the :

"AGS IMPROVEMENT PROGRAMME"

by G.K.Green

1st May 1964

1. Operating conditions AGS at present.

Intensity $4 \cdot 10^{11}$ p/p at 30 GeV/c, repetition rate 2 sec.

Operating period : Monday 08.00 - 24.00 maintenance

Monday at some time another 8 hr maintenance
(exceptionally 16 hr.)

Monday

Average 135 h/w for physicists

10 h/w for machine development.

2. Improvement programme.

The improvement programme has been approved by the Board of Directors of BNL and it will be presented to the AEC in August 1964.

2.1 A 500 MeV linac injector

The 500 MeV linac will have a repetition rate of 30 sec^{-1} , a pulse length of 200 micro-sec. and an instantaneous current of at least 50 mA.

Why 500 MeV?

With the present 50 MeV linac one will be able to obtain 1.5 to $2 \cdot 10^{12}$ p/p, according calculations made with a 500 MeV linac the intensity can be raised to $2 \cdot 10^{13}$ p/p.

So, the intensity will be increased by a factor of ten, which figure justifies the effort to be made. But in fact it is not possible to say which energy is the most favorable one. The quoted intensities will be obtained with 20 turn-injection aiming at radial phase space filling. (5 turn-injection will be tried on the AGS soon)

The linac will consist of 3 separated pre-accelerators, a 200 MeV drift tube linac (working on 200 Me/s) and a 300 MeV iris-loaded waveguide type linac (800 Me/s). The pre-accelerators will be constructed in such a way that they can be operated independently of each other. Two independent sources are planned. The first part of the 200 MeV linac will be exchangeable.

A study is continuing on the 300 MeV linac. The developments on cross bar structures are watched closely while a rectangular wave guide accelerating structure is under consideration at BNL.

Attention will be given to the possible space charge effects due to extreme bunching by the 800 Me/s acceleration.

Note : The pion factory project has been dropped, but one will provide an outlet of the linac beam to a possible experimental area.

2.2 Improvements on the AGS in order to accept the high linac intensity.

A new magnet power supply will be added to obtain a 1 sec repetition rate. The magnet cooling capacity will be increased. The average water temperature will become 85° F, the (Tout-Tin) will increase to 40° F.

It may be necessary to raise the air temperature in the tunnel to 85° F.

A new RF and a new vacuum system will be installed (the vacuum should be lower than 10^{-6} torr).

2.3 Modifications imposed by increased radiation.

The parts of the ring which have now a low induced activity level will become too active when operating at the high intensity. One will try to keep the induced activity levels down by improving operating techniques, dumping beam at certain pre-selected places, reducing injection losses with beam scrapers.

The targets will obtain $4 \cdot 10^{12}$ p/p at the most, so beam ejection is necessary.

The increased radiation in the ring implies :

- additional earth shielding on top of the ring which will require a simple roof structure on top of the present earth cover; the amount of shielding is mainly determined by the sky-shine level at apartments near the site.

all electrical apparatus which presence in the ring is not unavoidable will be moved into a building running on top of the ring shielding.

magnet units, including vacuum chamber, will be provided with special connections to enable quick removal of the unit, similar for cavities, ejection systems; special target tanks. Handling with manipulators is not favored, the philosophy chosen is quick removal of units. Transport of the units per crane operated by a man in a shielded compartment.

The removal of magnet units with a crane will ask for lifting the roof in the region of the main experimental hall.

One is not certain about the effect of the increased radiation on the life time of the magnet coils.

2.4 New experimental areas.

One will start to extend the present experimental area and move the 80" chamber back into a new building.

Internal targets are advocated but the high intensity will require ejection anyway. Internal targetting will be restricted in a small part of the ring (in the existing experimental hall). Three additional external beams are planned.

2.5 Costs and time schedule

Total costs : 50 M\$ (of which 23 M\$ for the linac). But it will be possible to put more money into the improvement project by using extra funds as : operating and capital funds (the latter covers beam transport, separators).

In fact, the programme will cost 65 M\$.

One hopes to obtain approval in July 1965 and the construction will then last for 5 years.

Machine shut-down will be necessary at the end of the programme only and will last for about 8 months.

The effort to carry out the improvement programme is considerable and may effect the operation of the Cosmotron (however, the Cosmotron will continue to operate for at least another two years). A separated AGS-improvement division has been planned.

J.H.B.Madsen

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