BNL-104469-2014-TECH

AGS/AD/Tech Note No. 28;BNL-104469-2014-IR

PROGRESS REPORT (7) CONCERNING SHORT COLUMN

T. Sluyters

December 1966

Collider Accelerator Department

Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

DISCLAIMER

Accelerator Department
BROOKHAVEN NATIONAL LABORATORY
Associated Universities, Inc.
Upton, L.I., N.Y.

AGS DIVISION TECHNICAL NOTE

No. 28

Th. Sluyters

December 28, 1966

PROGRESS REPORT (7) CONCERNING SHORT COLUMN

The performance of the short column has been tested without the epoxy outer profilation, as that the column is now "single-walled." With regular conditions of the power equipment the sparking rate is around 10/hour. It is possible that the gradient near the corona rings (13 kV/cm) is too high; the second column (now under construction) has, therefore, modified outer rings to lower the gradient of each section to 10 kV/cm; the spark gaps will then be the limiting gradient of 10.6 kV/cm; corona rings can be added, if necessary.

Though the second short column will be built with the very intention of using it "single-walled," it can always be converted into the double-walled structure.

There are two operating conditions at which an instantaneous improved sparking rate can often be obtained:

a. higher pressures ($\sim 3.10^{-5}$ mmHg); normal operating pressure is $\sim 3.10^{-6}$ mmHg.

b. reduced operating voltage e.g. 700 kV; it would be very convenient to condition a short column at 800 or 850 kV rather than at 750 kV!

Corona spray from the column and our measuring dome has been reduced; but not eliminated; this spray as well as the vacuum equipment caused many hours of operation loss. It was also found that an important part (if not all) of the cathode-current is due to corona-current! Another problem (which can cause a serious delay in our test program) is the non-availability of a non-conducting, unflammable generator belt, our present belt is not any more reliable. The extractor feed-through failed again, though we increased the polyethylene wall thickness.

A test was made to lower the protective resistor from 400 kΩ to 30 kΩ (upper limit of a practical fast bouncer system). The sparking rate was way up for resistors lower than 100 kΩ, due to damage of the inner electrodes. Though the lower limit is not fixed yet, there is no doubt that this surge resistor will be larger than 150 kΩ.

We were able to accelerate 200 mA through the column, due to failures in the power supply unit of the solenoid the beam could not be focused into the emittance area. A support is under construction to mount a triplet inside the vacuum, immediately after the column structure.

Inspection of the inner structure of the column showed a few carbon tracks on the slightly discolored ceramics, a few arcing spots on the corona rings, discoloring of the Ti electrodes and heating effects (blue colored sections around the apertures) on the cathode side of the first, second and fourth electrode as well as on the anode side of the fifth electrode; three bad pitted spots were found on the fourth electrode, two of them caused by the opposite sharp edged screw heads, which have been removed.

The upper layer of the expansion cup (molybdenum) is melted by back streaming electrons, originating from field emission (it happens also without beam!) A tungsten insert will be tried out; in addition we will look into the possibility of improved cooling.

The maximum obtained stress of a single section ceramic-aluminum joint has now been increased to 600 psi; at this pressure the ceramic broke; all 19 ceramic rings have to be ultrasonically checked on eventual internal cracks or voids.

A three section column has been assembled following the final glueing technique. A life test will start this week. An assembling area for the second column has been built in the experimental hall of the AGS.

The 750 KeV fast emittance detector has been built, the arrival of the bellows are, however, delayed for another two months.

Only a few ion source experiments to reduce the large amplitude (50%) 1-5 Mc plasma oscillations could be carried out, because preference was given to the 50 MeV fast emittance detector. Next time we hope to give more details around this work.

W. Schneider will leave Brookhaven National Laboratory, December 31, 1966. R. Amari replaces him. Delays in our scheduled program can be expected due to work overload.

cc: R. Abbott
R. Amari
R. Boley
R. Clipperton
J. Grisoli
V. Kovarik
R. Lane
S. Larson
R. Lockey
I. Polk
W. Schneider
J. Spiro
A. van Steenbergen