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

AGS DIVISION TECHNICAL NOTE

No. 44

Fred Pallas

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BACKLEG WINDINGS

(Description and locations of backleg windings on the Alternating Gradient Synchrotron)

Insulated (fibreglas and epoxy) copper windings are installed on eight (8) of the backlegs of the main ring magnets of the Alternating Gradient Synchrotron. These windings are designed to either increase or decrease the flux generated by the main ring magnet windings. The increase in flux tends to bend the accelerated beam inward. Conversely, the decrease in flux bends the accelerated beam outwards away from the center of the accelerator ring.

The purpose of these windings is to create an orbit "bump" toward the outside radius of the machine.

These windings are used in conjunction with additional external beam equipment for the ejection of a slow external beam from the accelerator.

The backleg windings are fabricated from hollow OFHC copper conductors, 5/8 x 5/8 inches square cross section with a 3/8-in. diameter water passage. Net cross sectional area of 0.2861-ins.^{2} equivalent to 344,205 cir mils.

Connecting bus between magnets and to 1000 amp power supply is 500 MCM rubber sheathed copper conductor with a resistance of 0.021 ohms/thousand feet. Approximately 1000 feet was used.

BACKLEG WINDINGS

Magnet	No. Turns	Winding Length	Cooling Water Required			Electrical		
			Velocity	Flow	Pressure	Resistance	Power	Voltage
E6	5	89.68 ft	2.7 ft/sec.	0.93 gal/min.	6.2 psi	0.0027 ohms	2.7 kW	2.7 Volts
E7	5	89.68	2.7	0.93	6.2	0.0027	2.7	2.7
E20	6	92.62	2.7	0.93	6.2	0.0027	2.7	2.7
F1	6	92.62	2.7	0.93	6.2	0.0027	2.7	2.7
F14	5	89.68	2.7	0.93	6.2	0.0027	2.7	2.7
F15	5	89.68	2.7	0.93	6.2	0.0027	2.7	2.7
G8	5	89.68	2.7	0.93	6.2	0.0027	2.7	2.7
G9	6	92.62	2.7	0.93	6.2	0.0027	2.7	2.7
Total	43	726.26	21.6	7.44	49.6	0.0216	21.6	21.6

Windings are connected in series with 500 MCM copper conductor.

Windings are water cooled, series connected in pairs. Each pair independently connected to supply line.

Design power = 1000 amps

Temperature rise $\Delta t = 20^{\circ}F$.

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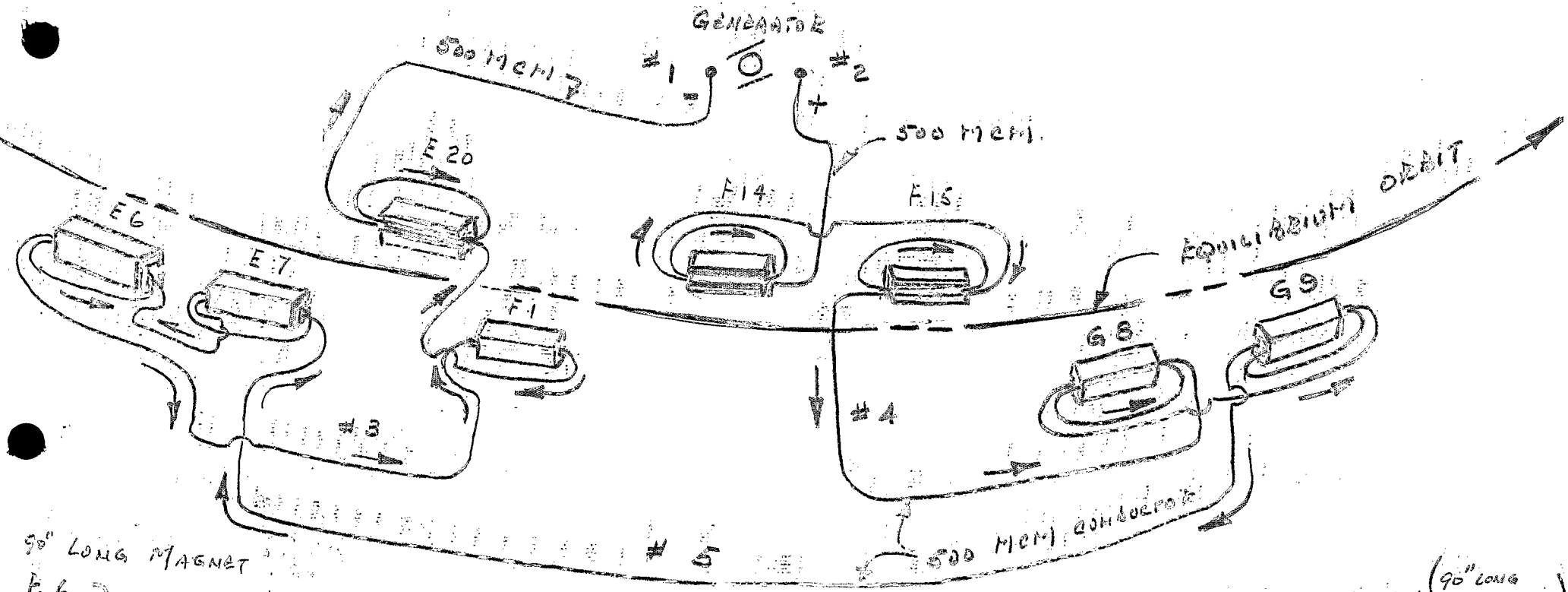
BACK LEG WINDING INSTALLATION

30 JANUARY 1968.

1000 AMPERE POWER SUPPLY

SERIES WOUND.



90" LONG MAGNET
E6 } 5 TURNS
E7
BENDS BEAM INWARD.

75" SHORT MAGNET
E20 } 6 TURNS
F1
BENDS BEAM OUTWARD

90" LONG MAGNET
F14 } 5 TURNS
F15
BENDS BEAM OUTWARD

G8 - 5 TURNS (90" LONG MAGNET)
G9 6 TURNS (75" SHORT MAGNET)
BENDS BEAM INWARD