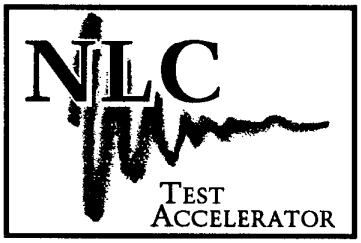


NLCTA-Note #39

January 11, 1995

Subject: Prebuncher Specifications

Authors: J.Wang and H.Hoag

Introduction.

This note records the basic electrical parameters and the mechanical design of the two prebuncher cavities which precede the first 90 cm accelerator section in the NLCTA injector.

Electrical Parameters.

Second Prebuncher:

Operating frequency:	$f_0 = 11.424$ GHz.
Unloaded Q:	$Q_0 = 4614$
Shunt Resistance:	$R = 0.223$ MΩ
R/Q:	$R/Q = 48.3$ Ω
Coupling Coefficient:	ß = 100
Loaded Q:	$Q_L = 45.7$
Beam Current:	$I_b = 2$ A
Beam-induced cavity voltage at 2/2A :	$V_b = 4.42$ KV
Required maximum gradient:	$E_{z\,max} = 7.8$ MV/m
Power dissipated in cavity at $E_{z\,max}$:	$P_0 = 4.013$ KW
Cavity voltage at 4.013 KW:	V = 29.92 KV
Required power input with ß = 100:	$P_{in} = 102.3$ KW
Cavity time constant 2 Q_L/w:	T = 1.27 ns
Total voltage phase-shift after 3 time constants:	f = 0.42 degrees

The cavity will be driven by the output from a 25 dB coupler in the WR 90 feed line to the first 0.9m accelerator section. The peak power to this section is expected to be about 64 MW. Thus, the peak power coupled out is about 200 KW. However, a further 10% is coupled off to feed the first prebuncher (see below). This leaves a maximum of 180 KW to drive the second prebuncher cavity.

First Prebuncher:

The mechanical design of the first prebuncher cavity will be identical to the design of the second prebuncher cavity. All of the parameters listed above will apply, except for the following:

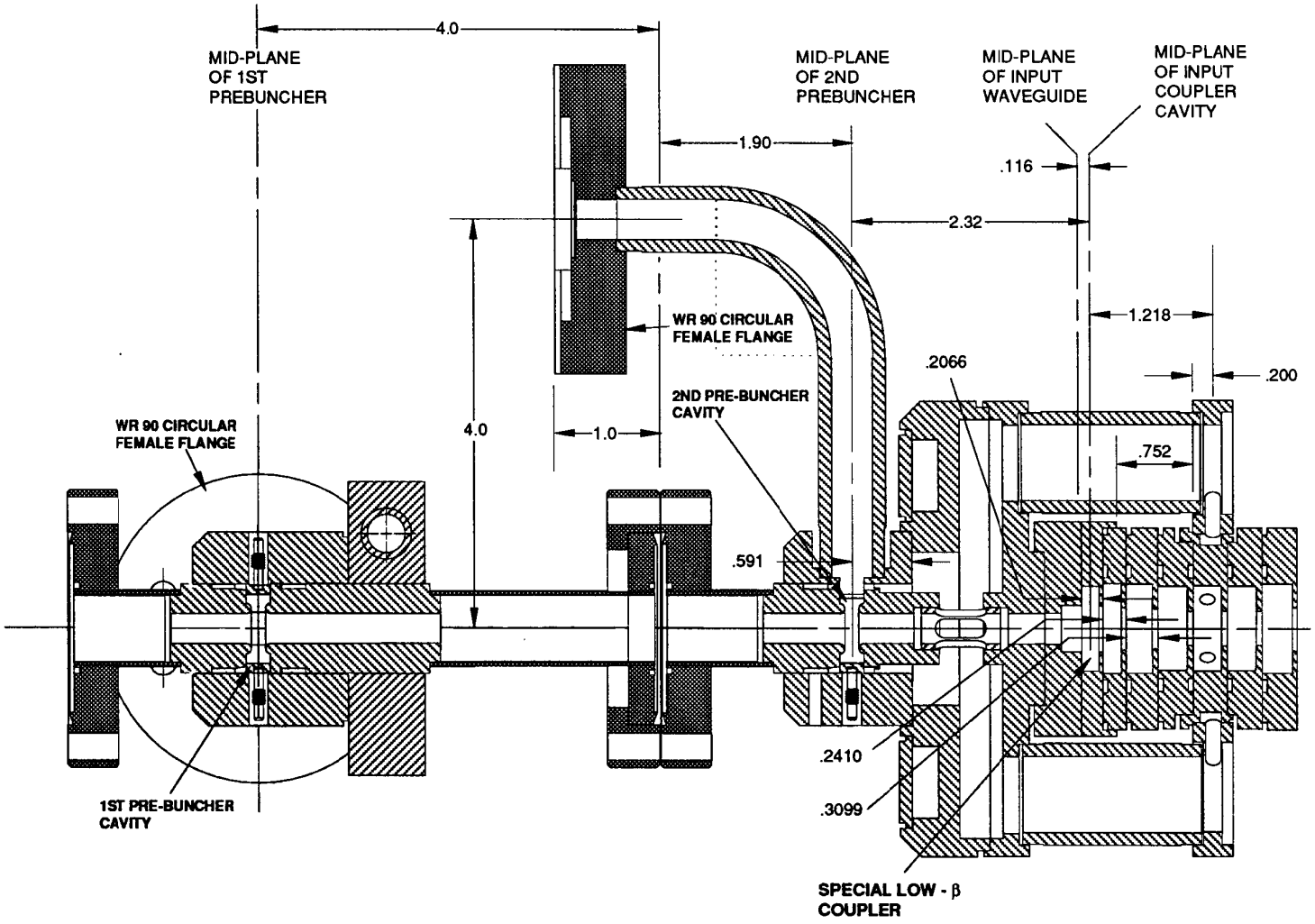
Required maximum gradient:	$E_{z\,max} = 1.94$ MV/m
Power dissipated in cavity at $E_{z\,max}$:	$P_0 = 0.25$ KW
Required power input with ß = 100:	$P_{in} = 6.35$ KW
Total voltage phase shift is negligible	

The cavity will be driven by the output from a 10 dB coupler in the WR 90 feed line to the second prebuncher. Thus, the maximum peak power available to drive the first prebuncher will be about 20 KW.

Mechanical Design

Many features and important dimensions of the assembly of the two prebunchers and the front end of the first injector section are shown in SK-HH-1130 attached. Each cavity is comprised of a copper body with two 'nose-pieces' and a WR 90 feed brazed in. The 'noses' are 0.1" in diameter, and are separated by 0.138". The drift tube diameter is 0.295". The diameter of the cavities will be close to 0.68", but the final value, together with the coupling iris aperture, have yet to be determined by cold test.

Provision is made for three tuning studs on each cavity. These may not be needed because of the low Q_L value. The drawing shows the WR 90 flange for the first prebuncher facing the north wall of the NLCTA enclosure. This will probably be reversed, so that the waveguide connection is made on the aisle side.



UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS IN INCHES TOLERANCES: .X ± .02, .XX ± .01, .XXX ± .005 ANGLES ± .1° BREAK EDGES .010 ± .005 INTERNAL CORNERS .015 R MAX SURFACE FINISHES 32 MAX	STANFORD LINEAR ACCELERATOR CENTER ENGINEERING SKETCH
	SOME DETAILS OF NLCTA 1ST & 2ND PREBUNCHERS AND INPUT COUPLER OF 1ST INJECTOR SECTION
PREPARED BY H. HOAG	SK - HH - 1130
	10 - 20 - 94