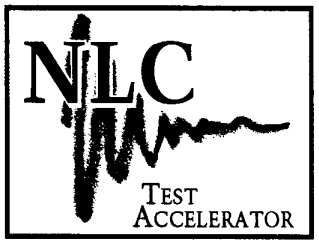

NLCTA-Note #41

January 23, 1995

Subject: NLCTA Four Port Coupler Specifications

Authors: A. Young, R. Koontz, M. Byrne

The attached specification PS-290-321 RO, was written for the acquisition of Four Port Couplers which will distribute RF phase and amplitude signals for the NLCTA.

PS-290-321-00 R0

Four Port Coupler Specification

Approval _____ Date 1/19/95

_____ Date 1/19/95

_____ Date 1/19/95

_____ Date 1/20/95

VR 1/20/95

Function: This coupler is to be used for general purpose 11.424GHz monitor signal distribution in the Next Linear Collider Test Accelerator (NLCTA). It will be used for monitoring both amplitude and phase of various high power pulsed accelerator signals, so it is important that both the amplitude and phase characteristics of the coupler be stable in time and temperature. Eight to ten couplers will be mounted side by side between two water temperature stabilized heat sinks. Each coupler will be fed pulsed power from a type N terminated 3/8" Heliax cable. The assembly contains four 20 db couplers with internal 50 ohm back terminations, and a low pass filter between the first and second coupler to reject frequencies including harmonics above the 11.424 GHz operating frequency. The input VSWR with all output ports properly terminated should not exceed 1.2. As part of this delivery, the vendor shall supply the primary output terminator to attach to the SMA output port of the coupler, and specified to meet the input VSWR requirements of the coupler. Total loss through the primary coupler path should not exceed 3 db. Coupler nominal specifications are shown on the following page.

SPECIFICATION LISTING

Input Frequency:	11.424 GHz ± 500 MHz
Input Power: Peak:	20 watt nominal, 50 watt max
Average:	80mW nominal, 200 mW max
Coupling ratio of each port:	-20db ± 1 db
Coupling ratio stability as function of temperature:	0.05 db/degree C
Directivity of -20 db couplers:	25 db minimum
Max input VSWR:	1.2 with all output ports properly terminated
Max thru loss:	3 db input to terminator
Operating temperature:	40 degrees C nominal, 50 degrees C max
Max allowable phase shift as function of temperature:	0.1 degree per degree C from input to -20 db output coupler ports
Mechanical:	As shown in figure 1
Filter characteristic:	As shown in figure 2
Output terminator:	50 ohms, SMA male, 50 watts peak, 200 milliwatts average

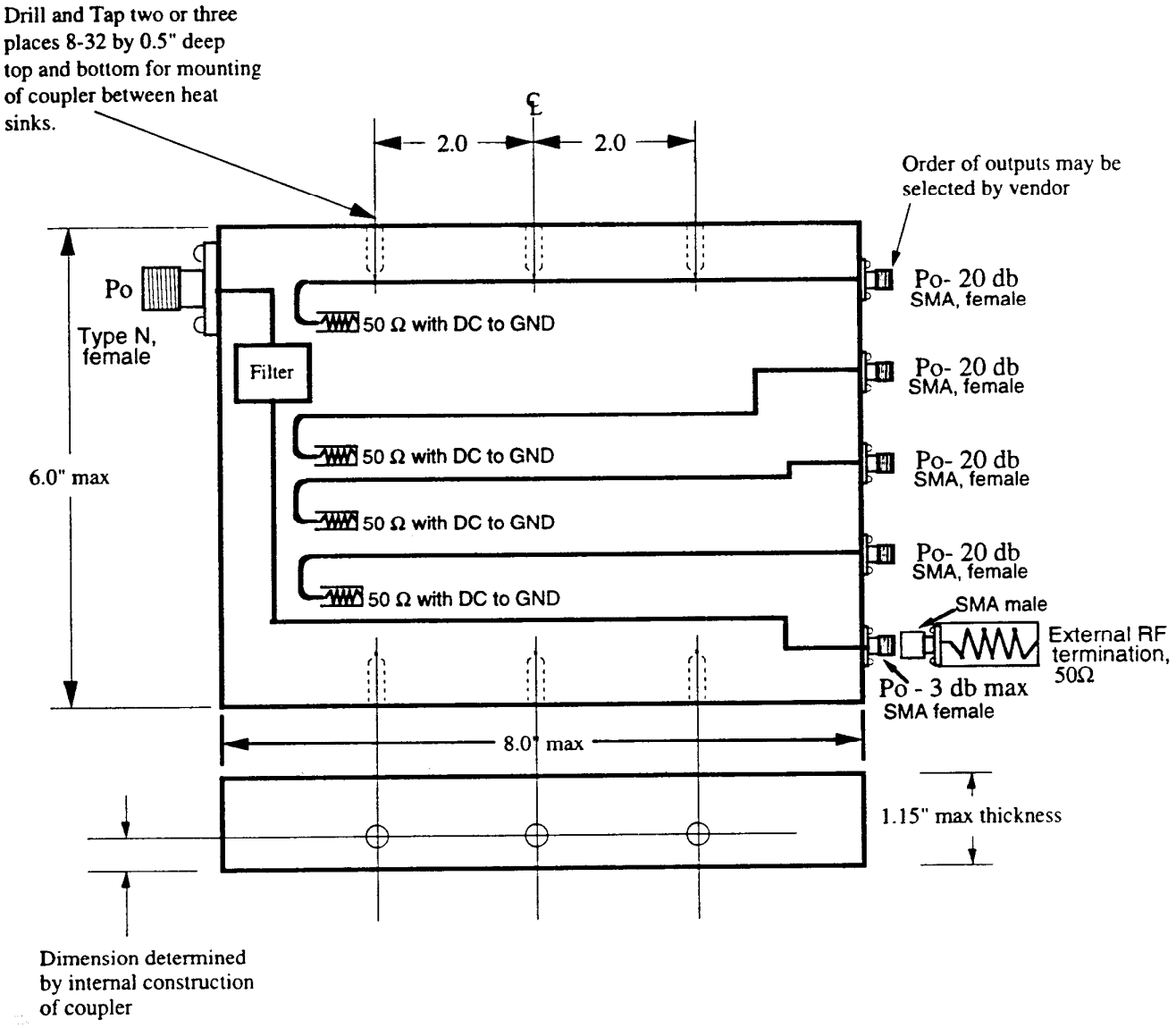
Drill and Tap two or three places 8-32 by 0.5" deep top and bottom for mounting of coupler between heat sinks.
℄
2.0
2.0
Order of outputs may be selected by vendor
Po
Type N, female
50 Ω with DC to GND
Filter
Po- 20 db SMA, female
Po- 20 db SMA, female
50 Ω with DC to GND
Po- 20 db SMA, female
50 Ω with DC to GND
Po- 20 db SMA, female
50 Ω with DC to GND
SMA male
External RF termination, 50Ω
6.0" max
Po - 3 db max SMA female
8.0" max
1.15" max thickness
Dimension determined by internal construction of coupler

figure 1

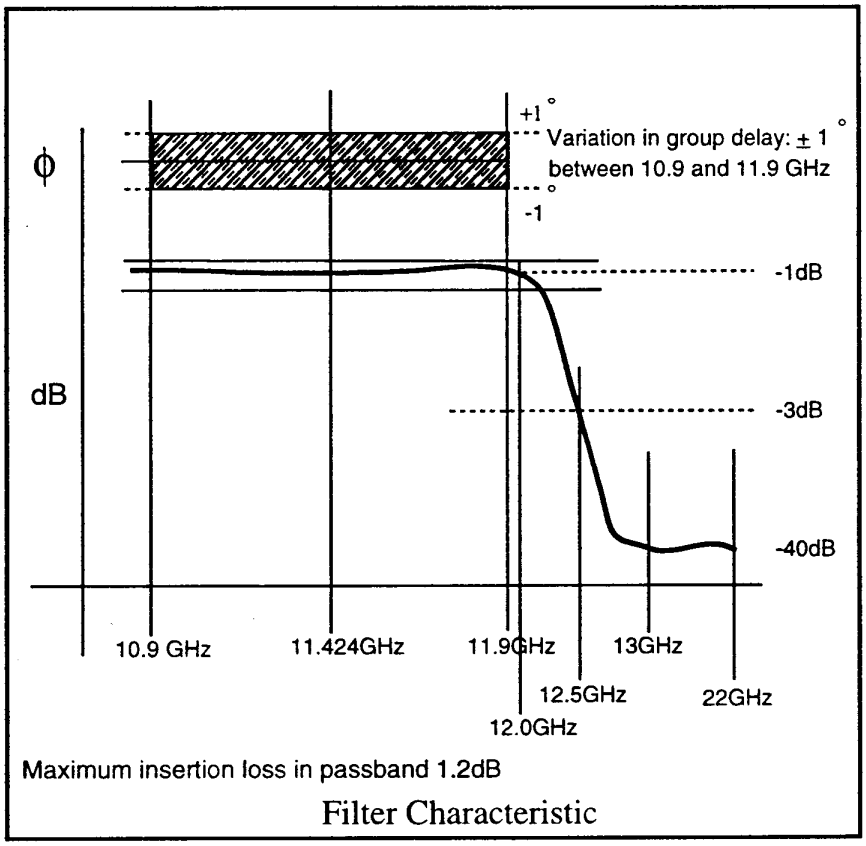
+1°
Variation in group delay: ± 1°
between 10.9 and 11.9 GHz
-1°
ϕ
-1dB
dB
-3dB
-40dB
10.9 GHz
11.424GHz
11.9GHz
13GHz
12.5GHz
22GHz
12.0GHz
Maximum insertion loss in passband 1.2dB
Filter Characteristic

figure 2