



Fermilab/AD/TEV
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Specification for Passive Band Pass / Anti-aliasing Filter for the Tevatron BPM System

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Scope

This note specifies an analog RF band pass filter to select the 53 MHz component of a complex analog signal presented by the Tevatron Beam Position Monitors. The filter serves an anti-aliasing function to permit digital under-sampling of the 53 MHz signal with a ~75 MHz A-D converter. Additionally, the impulse response of the filter must facilitate differentiation of impulses separated by 400 nanoseconds.

Features

Electrical Specifications

Generic Filter Type – Band pass

Filter Characteristic – Gaussian or Bessel preferred, Butterworth acceptable (see Impulse Response spec)

Source and Load Impedance – 50 ohms

Continuous Peak Input Signal – ± 30 volt impulses at 21 MHz repetition rate

Maximum Continuous Signal Power within 3 dB Bandwidth – 20 dBm

Center Frequency – 53.10 MHz

3 dB Bandwidth – approximately 6 to 8 MHz (see Impulse Response spec)

Flatness Across Pass Band – better than 1 dB over band ± 0.5 MHz of center frequency

Maximum Insertion Loss at Center Frequency – 3 dB

Minimum Return Loss – 15 dB over band ± 0.5 MHz of center frequency

Stop Band Attenuation – 50 dB or greater (relative to 53 MHz carrier) for all frequencies less than 30 MHz and greater than 95 MHz up to 250 MHz

Impulse Response – Envelope of impulse response must be down to $\leq 2\%$ of peak envelope response at all times ≥ 400 ns after impulse

Physical and Environmental Specifications

Package – circuit board mount package w/solder pins. Maximum height 0.54 inches. Package board area less than 1 sq inch is desired, with a maximum of 1.5 sq inch.

Environmental – hermetically sealed package

Identification – individual package ID with series/serial number.

Storage Temperature Range – -20 to +45 degrees Celsius

Operating Temperature Range – +20 to +40 degrees Celsius

Shock – Withstand 1.5G without change in electrical performance greater than 0.1 dB insertion loss and 2 degrees transmission phase anywhere in 3 dB bandwidth

Matching of Filter Pairs (option #1, bid separately)

Filters will be used in pairs. Over the full 3 dB bandwidth paired filters are matched to within 0.1 dB insertion loss and to within 2 degrees transmission phase. Provide documentation of test results to assist with rework and spare organization.

Quantity

The total number of filters ordered is 1,350 Printed Circuit Board mount components as specified above.

Delivery

The initial delivery shall be a minimum quantity of 27 filters ASAP ARO. Following our approval of the performance of the initial quantity, delivery of the remaining 1,323 components shall follow ASAP. These delivery times are to be specified in the bid responses.

Acceptance Criteria

Delivered filters will be tested against the above specifications.

References

Change Log

Version	Issue Date	Concurrence	Description of Change
1.0		SW	Original
1.1		RGF	Added Quantity & Delivery paragraphs

Concurrence

The following persons concur with this document.

Steve Wolbers 5/19/04
Steve Wolbers, Project Manager (date)

Bob Webber 5/27/04
Bob Webber, Deputy Project Manager (date)

Jim Steimel 5-19-04
Jim Steimel, Technical Coordinator (date)