



## BaseBand Beam Position Monitor Electronics

For beam with repetition rate  $\leq 25$  MHz  
Tracks the beam during energy ramp

Optimized for proton/carbon beams  
Handles  $>70$ dB beam intensity range  
Up to 40dB additional gain preamplifier

BB-BPM module was originally developed by A. Kalinin and redesigned by S. Artinian. It is based on Robert E. Shafer's original concept. The BaseBand BPM is a log amplifier-based beam position monitor.

Output signals are analog voltages:

X&Y narrowband outputs for close orbit measurement

X&Y wideband outputs for machine study, to see orbit changes or instabilities during the ramp

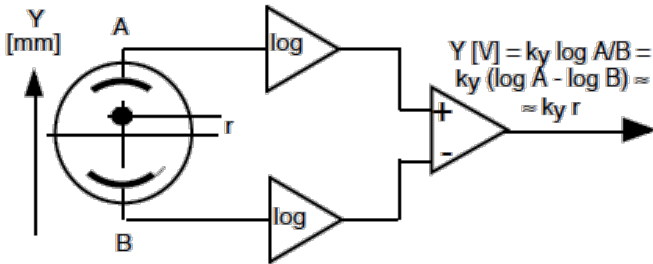
To prevent noise pickup by way of ground loops:

- The front-end amplifiers and filters are powered via their RF output coaxial cables
- The front-end amplifiers gain is controlled by fiber optic signals

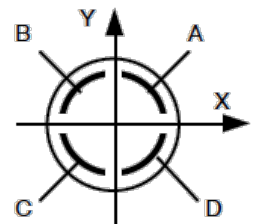
## Operating principle

Based on the pioneering work of Robert E. Shafer at Los Alamos Laboratory, the BaseBand BPM derives beam position from logarithm of the ratio of opposite pickup signals:  $\text{Log}(A/B)$ .

Position measured by this method is more linear, over a wider range, than difference-over-sum.



The position of the beam from rotated pickups is obtained by axes translation to the vertical resp. horizontal plane by wideband analog circuits.



## Front-end Filter and Amplifier BB-BPM-FEFA

Four BB-BPM-FEFA are required for each BB-BPM plug-in module, one per pickup.

BB-BPM-FEFA has been specifically developed to measure low intensity ion beams. It is best to install it very close to the stripline or shoebox pickups to minimize capacitive loading. Control of BB-BPM-FEFA gain is done by FO fiber optics, one per front-end amplifier.

A single control FO can be daisy-chained to all front-end amplifiers. The FO signal is under user's control.

The user must provide FO with a high level to switch the gain from 0dB to nominal value.



## MANUFACTURER

**BERGOZ Instrumentation**  
www.bergoz.com  
Espace Allondon Ouest  
01630 Saint Genis Pouilly, France  
info@bergoz.com

## DISTRIBUTORS

**U.S.A.:** GMW Associates  
www.gmw.com  
sales@gmw.com

**Japan:** Hayashi-Repic Co.  
www.h-repic.co.jp  
sales@h-repic.co.jp

**India:** GEEBEE International  
www.geebinternational.com  
info@geebinternational.com

**China:** Beijing Conveyi Limited  
www.conveyi.com  
sales@conveyi.com

## Specifications

	<b>BB-BPM-FEFA Amplifier and filter</b>	<b>BB-BPM Log-Ratio processor</b>
Input intensity range	0dB or +40dB switchable gain	>70dB continuous gain
Frequency range	200kHz - ≤25MHz	200kHz - ≤25MHz
Input signal	High impedance 2.5Vmax	-70dBm - +5dBm
Input noise floor	25nV/√Hz	<-70dBm
Controls	Gain control by FO Daisy chain	N/A
Power supply max	+15V, 1.5W supplied by BB-BPM	±15V, 9W includes supply to BB-BPM-FEFA
<b>Additional outputs</b>	50Ω unity gain pickup image	None
<b>Outputs</b>	<b>When measured in 50Ω load or 100Ω differential load</b>	<b>When measured in high-impedance load</b>
X & Y Narrowband for close orbit on front panel DB9	-2V...0...+2V 0V on center 25MHz bandwidth	-5V...0...+5V 0V on center 25MHz bandwidth
X & Y Wideband for machine study on front panel DB9	-2V...0...+2V 0V on center 25MHz bandwidth	-5V...0...+5V 0V on center 25MHz bandwidth
<b>X&amp;Y gains Orthogonal PU</b>	0.75V for ½ radius	1.5V for ½ radius
<b>X&amp;Y gains Rotated PU</b>	0.5V for ½ radius	1.0V for ½ radius
Output noise rms for input >1mV	<0.1% of pickup radius, e.g. 100µm in 100mm radius	<1% of pickup radius, e.g. 100µm in 100mm radius
<b>Linearity error</b> As % of pickup radius	<b>On-center</b> <0.1% e.g. 100µm in 100mm radius	<b>Off-center</b> <1% e.g. 100µm in 100mm radius
<b>Temperature drift as % of pickup radius</b>	300 ppm/K e.g. 30µm/K in 100mm radius	

## Order codes

BB-BPM-xxMHz BB-BPM-FEFA/xxdB	Base-Band BPM plug-in module W40mm, L80mm, H22mm front-end filter and amplifier with F.O. selectable gain 0dB or xxdB. Features four 3-mm mounting holes.
BPM-RFC/xx	19"x3U RF-shielded chassis with xx wired stations (power-limited to up to 8 stations) AC mains 90-245Vac, 50/60Hz
<b>Accessories:</b> BPM-Cxx PTFE BPM-RHCxx	SMA-SMA coaxial cable with connector dielectric, xx meters Radiation-tolerant SMA-SMA Radox coaxial cable with PEEK connector dielectric, xx meters
BPM-KIT BPM-E,	Table-top test kit for one XX- with SMA inputs and BNC output
BPM-XTD BPM-SERV/RF	Module extender card RF service module Passive module. Brings the pickup signals from the back connectors to front panel BNCs

## Packaging

BB-BPM module is 3U-high x 160mm shielded Euromodule; 20-mm wide.

Interchangeable / plug-compatible with other Bergoz Instrumentation's BPM modules.

BB-BPM can be installed in same chassis as LR-BPM, S-BPM and MX-BPM for mixed application.

## MANUFACTURER

**BERGOZ Instrumentation**  
www.bergoz.com  
Espace Allondon Ouest  
01630 Saint Genis Pouilly, France  
info@bergoz.com

## DISTRIBUTORS

**U.S.A.:** GMW Associates  
www.gmw.com  
sales@gmw.com  
**Japan:** Hayashi-Repic Co.  
www.h-repic.co.jp  
sales@h-repic.co.jp

**India:** GEEBEE International  
www.geebeinternational.com  
info@geebeinternational.com

**China:** Beijing Conveyi Limited  
www.conveyi.com  
sales@conveyi.com