

# BPM-AFE



## *BPM Analog Frontend*

**BPM-AFE is an analog frontend to process RF signals from beam position pickup electrodes. It delivers an output signal which can be directly entered into fast 14-bit ADCs. It is specially developed for transfer lines and linacs. It can be customized to any RF frequency up to 1 GHz.**

**Non-interceptive beam position measurement**

**Four parallel processing path**

**Mezzanine board to PCI specifications**

**The Beam Position Monitor Analog Frontend (BPM-AFE) is an electronics module for fast analog processing of beam pickup signals**

**Customizable to any bunch frequency up to 1 GHz**

**Four input signals processed in parallel, allows single-pass position measurement**

**Input signals are down-converted by independent superheterodyne receivers to an intermediate frequency (IF)**

**IF output signals are differential and galvanically isolated, for direct input into fast ADC (e.g. AD6644)**

**Output signals are adjustable up to 4Vpp to take advantage of full ADC input aperture**

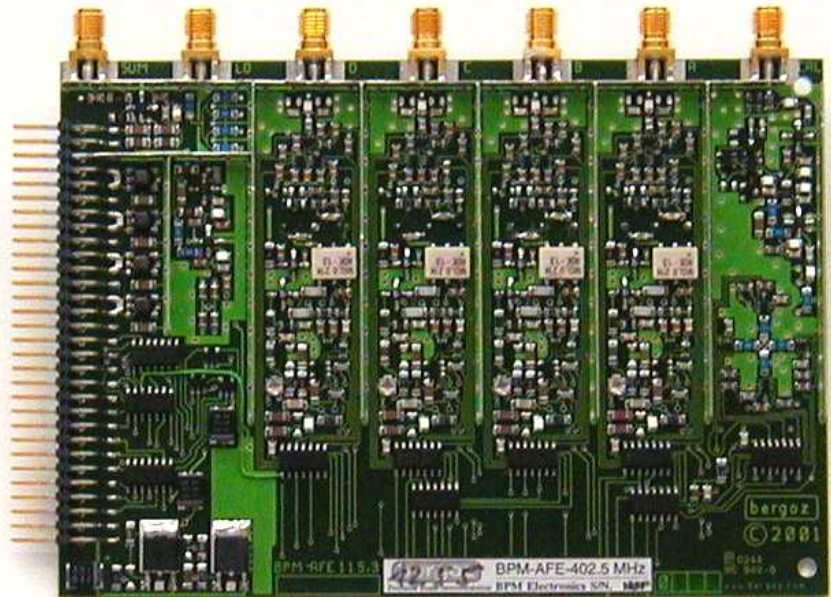
**High phase accuracy and low harmonic distortion by current feedback amplifiers**

**IF bandwidth adjustable by separate independent high-pass and low-pass filters provide flexibility**

**Low power dissipation and temperature drift are achieved with passive mixers**

**Excellent in-band transient response**

**Abuse-tolerant, by design. Hot-swap.**



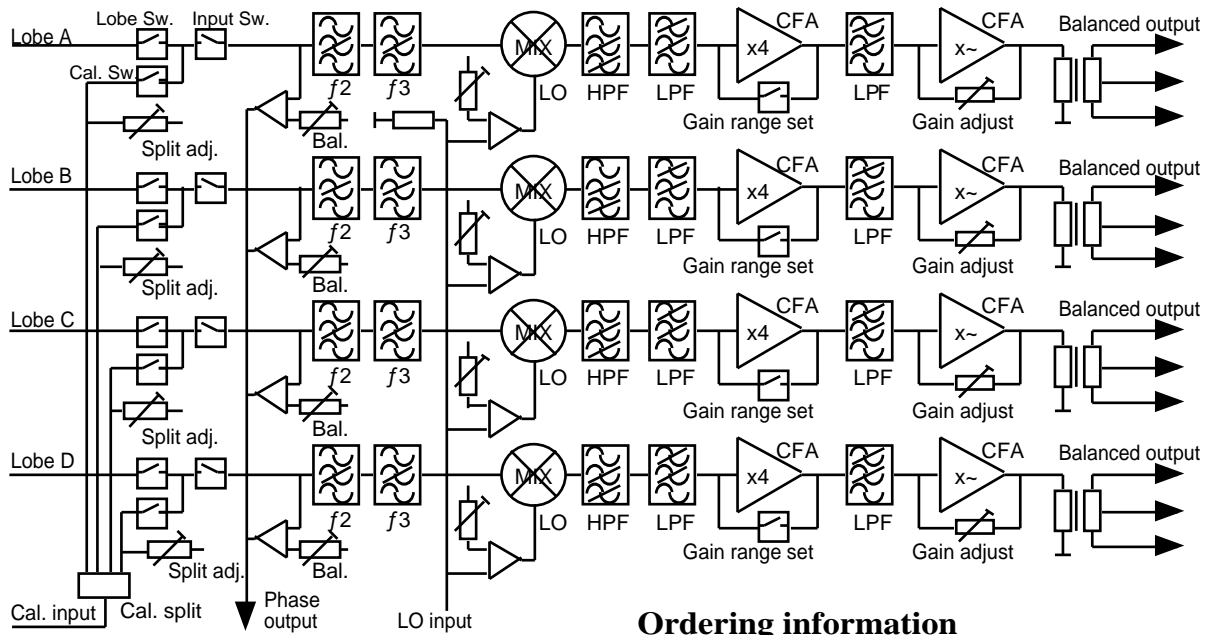
### **Signal processing**

Input signals into each superheterodyne channel can either be the Calibration signal or the signal from the lobe, controlled by the Lobe, Input and Calibration switches. Each channel switches are controlled individually. Calibration signals are balanced to identical level for each receiver, and can be sent to any lobe for detection by another channel, under the control of the switches. Calibration signal frequency is independent of the superheterodyne receiver frequency.

Switch-selected input signals are summed to produce a phase reference signal. Each channel is otherwise processed independently. Two successive trap filters reject unwanted harmonics. A passive double-balanced mixer processes the signal with a common Local Oscillator (LO) signal. The common LO signal is distributed to each mixer after buffering. The resulting Intermediate Frequency (IF) is filtered by two cascaded high-pass and low-pass filters to reject the unwanted mixing products.

The IF filtered signal is amplified by two stages of high gain x bandwidth current-feedback amplifiers. The first stage can be switched between two gain levels, while the second stage gain is adjustable by potentiometer in a range 1:4. A balun at the output produces a balanced signal with floating ground reference from each single-ended IF signal. v.1.0

## Block Diagram



## Specifications

Board size:	3.800" (96.5mm) high 5.383" (136.73mm) wide with 2 mounting holes per PCI specifications
Operating frequency	Customizable 60 MHz < $f_0$ < 1 GHz
RF input signal	+2 dBm max
IF output signal	4Vpp max
Overall gain	Adjustable in 1:4 range Fixed range switching x1/x4 by TTL control
Intermediate frequency	Customizable 10 MHz < IF < 100 MHz
IF output bandwidth	Customizable 10 MHz < IFBW < 20 MHz
IF harmonics distortion	< 50 dBc
Sum output	Pot adjustable 0-4 dB above input level Sum balanced to 0.1 dB. On option, sum balanced to 0.01 dB
Sum phase error	< 3 degrees
Calibration	By external calibration signal
Calibration switching	< 50-ns switching, >50 dB isolation
Calibration signal	+13 dBm max
Calibration balancing	Splitter and switches compensated to <0.1 dB error. On option: <0.01 dB.
RF harmonics rejection	> 40dB at $f_2$ , > 60dB at $f_3$
Crosstalk	Channel to channel: < 50 dB Calibration to channel: < 60 dB
Connectors	Male HE10 60 pins (30x2) right angle header SMA jack right angle 50-ohm for RF signals (7)
Power supply	+12V regulated, from PCI bus
Temperature drift	< $10^{-3}$ per degree

## Ordering information

BPM-AFE-xxxMHz BPM Frontend PCI mezzanine

### On-board factory-installed options:

BPM-AFE/CLM Calibration signal level matching error <0.01dB

### Maintenance accessories:

BPM-AFE/KIT Table-top test kit featuring  
AC-DC power supply  
Single-ended 50-ohm output  
SMAs for each channel

RF-COMP/04-xxxMHz

Superheterodyne detector with 4 inputs. Resolves 0.001 dB channel-to-channel difference  
Phase independent !

BPM-AFE/SCH

Incl. 4 Cannon pin probes  
Schematics, layouts and test procedures. Incl. rights to use and reproduce.

### One-time Customizing:

BPM-AFE/CUS-xxxMHz

Customize BPM-AFE to xxxMHz operating frequency

## Distributors

**U.S.A. :** GMW Associates  
955 Industrial Rd.  
San Carlos, CA 94070, U.S.A.  
Fax: (650) 802-8298 - Tel.: (650) 802-8292  
sales@gmw.com

**Japan :** REPIC Corporation  
28-3 Kita Otsuka 1-Chome  
Toshima-ku, Tokyo 170-0004, Japan  
Fax: 03-3918-5712 - Tel.: 03-3918-5326  
sales@repic.co.jp

## Manufacturer

BERGOZ Instrumentation  
Espace Allondon Ouest  
01630 Saint Genis Pouilly, France  
Fax: +33-450.426.643 - Tel.: +33-450.426.642  
sales@bergoz.com