



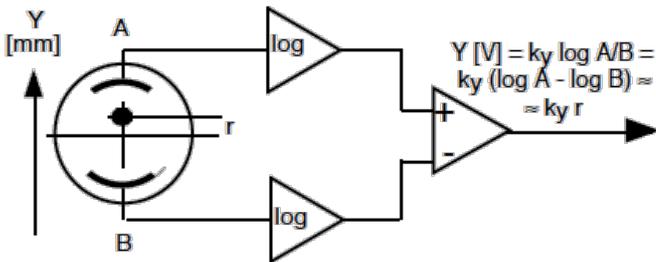
## S-band / L-band Beam Position Measurement Electronics

For linacs, microtrons and transfer lines  
Single bunch, macropulse and CW  
Beam charge dynamic range > 1000

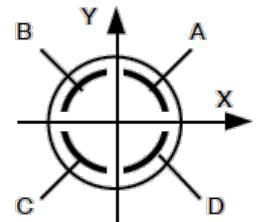
### Operating principle

Based on the pioneering work of Robert E. Shafer at Los Alamos Laboratory, the S-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.



### Signal processing

Signals from the pickups are stretched to produce bursts. This is essential to measure the single pass of a bunch. Four parallel logarithmic amplifiers detect the burst envelopes.

Amplifiers' response is log of amplitude. Logs of opposite pickups are subtracted. If pickups are rotated, axes are translated to obtain X and Y positions. The process is all-analog, wideband.

### Front-end Filter / Amplifier FEFA

One Front-end Filter / Amplifier is required for every BPM pickup electrode. It is tuned to the beam RF or a harmonic and powered by the S-BPM module via the coaxial cable linking them together. S-BPM FEFA must be installed close to the BPM pickup block, i.e. within 1 m.



#### MANUFACTURER

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#### DISTRIBUTORS

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**China:** Beijing Conveyi Limited  
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## Specifications

Operating frequencies	2.856 GHz and 2.999 GHz. For L-band, all filter frequencies are made to order
Inputs	One per pickup, SMA 50 Ω Possibility to configure for orthogonal or rotated pickups
Outputs	X and Y: -2 V...0...+2 V 40 mA max Sum of logs: 0...+2 V 40 mA max
X and Y gain	1.5 V corresponds 1/2 of aperture radius for orthogonal pickups 1.0 V corresponds to 1/2 of aperture radius for rotated pickups
Beam intensity position dependence	
On center	Near zero.
Off-center	Worst case when beam is 6 dB off center (e.g. ±7 mm in a 20 mm radius aperture): ±3 %
Temperature drift	$0.6 \times 10^{-3}$ of aperture per degree, e.g. 25 μm/K in 20 mm radius aperture
Trigger output	> 10 ns trigger after single bunch
Power supply	+15 V, < 300 mA; -15 V < 300 mA

## Order codes

S-FEFA/xxxMHz	Front-end Filter / Amplifier Operating frequency xxxMHz One unit for each pickup electrode
S-BPM	S-band / L-band plug-in module

### On-board factory-installed options:

S-BPM-SH	Sample and Hold on X and Y outputs
S-BPM-TRG	Beam Trigger, built-in
S-BPM-SUM	Sum of log (A,B,C,D)

### Accessories:

BPM-RFC/xx	RF-chassis, ≤16 stations 19" rack-mountable 3U-high EMI-RFI-shielded chassis for 100~245 V 50~60 Hz mains power
BPM-KIT	Table-top test kit 100~245 V 50~60 Hz powered kit Pickup inputs on SMAs Outputs on BNCs and DB15
BPM-XTD	Module extender card
BPM-SERV/RF	RF service module Passive module. Brings the pickup signals from the back connectors to front panel BNCs

## Modes of operation

### Track-Continuous

Advised for CW beams or macropulses longer than 1 μs	
No trigger needed	
Output bandwidth	5 MHz
Resolution in function of input power (per input):	
-5 dBm to -30 dBm	1/10'000 of aperture radius
-30 dBm to -50 dBm	1/2'000 of aperture radius
-50 dBm to -60 dBm	1/660 of aperture radius

### Sample & Hold

Advised for single pulse or macropulses shorter than 1 μs	
Requires LR-BPM-SH option	
Requires trigger (built-in or external)	
Processing time	~450 ns
Hold time	≤ 100 ms
Pulses rep. rate	Up to 2 MHz
Resolution in function of input power (per input):	
-5 dBm to -20 dBm	1/200 of aperture radius
-20 dBm to -40 dBm	1/100 of aperture radius

### Track & Hold

Advised for single pulse or macropulses shorter than 50 ns	
Requires LR-BPM-SH option	
Requires trigger (built-in or external)	
Processing time	~110 ns
Hold time	~70 ns
Pulses rep. rate	Up to 5 MHz
Resolution in function of input power (per input):	
-5 dBm to -20 dBm	1/200 of aperture radius
-20 dBm to -40 dBm	1/100 of aperture radius

## Packaging

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

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

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

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