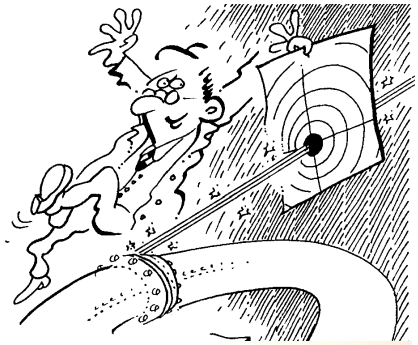
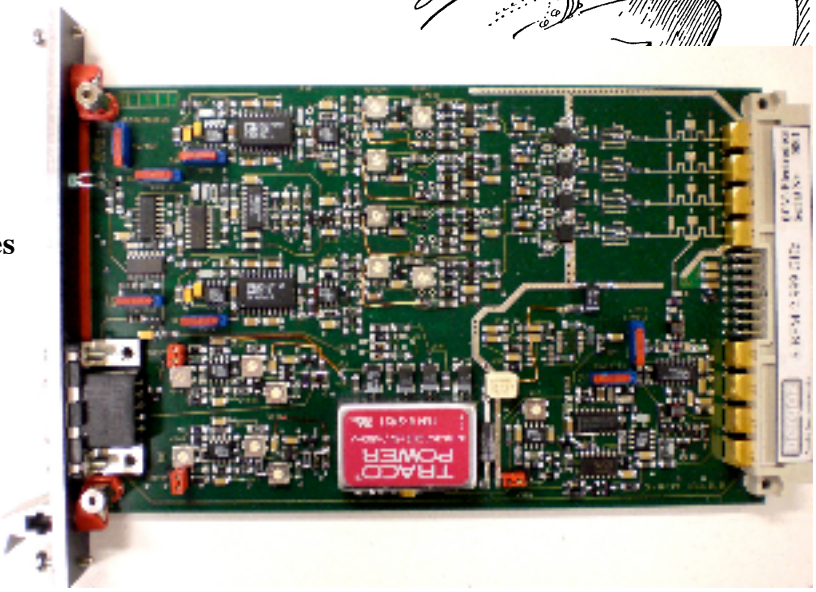
S-BPM

S-band / L-band BPM Electronics





Beam position measurement

Non-interceptive

For linacs, microtrons and transfer lines

Single bunch, macropulse and CW

Beam charge range > 1000

The S-band / L-band Beam Position Monitor (S–BPM) is an electronics module for fast analog processing of beam pickups signals

Single-pass bunch and macropulses can be measured thanks to parallel processing of inputs

Macropulses and single bunches up to 2 MHz repetition rate can be measured individually. X and Y coordinates are memorized until the next macropulse of bunch.

CW beam can be measured continuously. The X and Y coordinates are available permanently. Beam position motions up to 5 MHz can be observed.

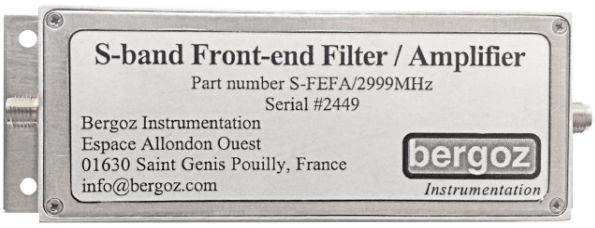
X and Y outputs are strong analog ±2V signals

S-band / L-band BPM is compatible with Bergoz' multiplexed BPM and Log-ratio BPMs. They can be plugged in the same chassis.

Precise phase matching of input signals is not required.

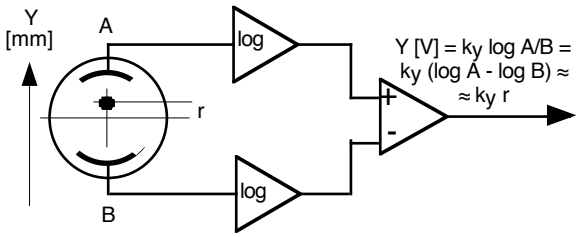
Front-end Filter / Amplifier FEFA

One Front-end Filter / Amplifier is required for every BPM pickup electrode. It is tuned to the beam RF or harmonic. It is powered from the S–BPM module via the coaxial cable linking them together. It must be installed close to the BPM pickup block, e.g. 1 meter.



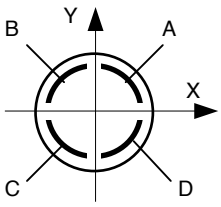
Operating principle

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



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

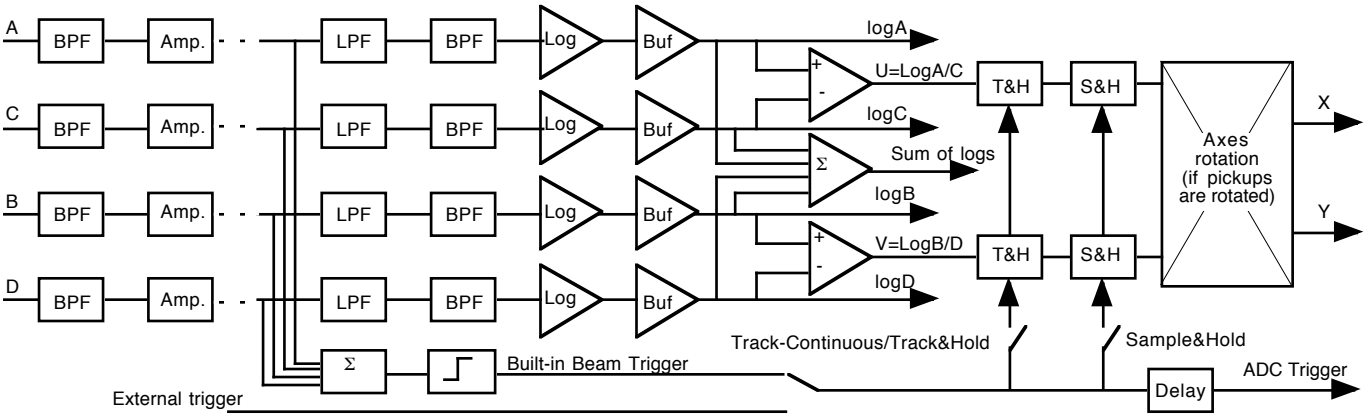
The position of the beam from rotated pickups:



is obtained by axes translation to the vertical resp. horizontal plane by wideband analog circuits.

S–BPM was designed by S. Artinian based on the earlier LR-BPM by A. Kalinin

Block Diagram



Specifications

S–BPM measures beam position from button or stripline pickups. It can measure CW beams or single pass of single bunches and macropulses up to 2 MHz repetition rate.
The position output of CW beams has 5 MHz bandwidth.

The operating frequency is determined by the FEFA Front-End Filter / Amplifier frequency. E.g. S-FEFA/2856MHz.
For S-band, 2 frequencies are standards: 2.856 GHz and 2.999 GHz.
For L-band, all filter frequencies are made to order.

Single bunch range	10 pC ... 10 nC*
Macropulse and CW	36 uA ... 36 mA*
	*assuming 45° pickup subtending angle.
Repetition rate	5 MHz max, or CW
Outputs	X and Y: -2V...0...+2V, 40mA max.
	Logs of A, B, C, D.
	Sum of logs: 0...+2V, 40mA max.
X and Y gain	1.5V = half of radius for orthogonal pickups
	1.0V = half of radius for rotated pickups.
X and Y noise	For CW beam: <200uVrms,
	e.g. 2um rms in a 40-mm pickup aperture.
	For macropulse and single bunch: <7mVrms,
	e.g., 70um rms in a 40-mm pickup aperture.
Intensity dependence	On center: Negligible.
	Off-center: <3% gain error.
Temperature drift	6.10^{-4} of aperture per degree,
	e.g. 25μm/K in a 40-mm pickup aperture.
ADC trigger output	When X and Y ready: positive or negative edge
Power supply	+ 15V, <500 mA; – 15V, <500 mA
	includes power for front-ends.

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 applications.

Ordering information

S-FEFA/xxxxMHz	Front-end filter/amplifier, Operating frequency xxxxMHz, One unit for each pickup electrode
S–BPM	S-band / L-band BPM 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 and D)
S-BPM-ABCD	Direct LogA,B,C and D wideband outputs

Accessories

BPM-RFC/xx	RF-chassis with xx stations, up to 16 19" rack-mountable 3U-high EMI-RFI-shielded chassis for 100~240V 50~60Hz mains power.
BPM-KIT	Table-top test kit, requires +-15Vdc
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.

Distributors

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Instrumentation