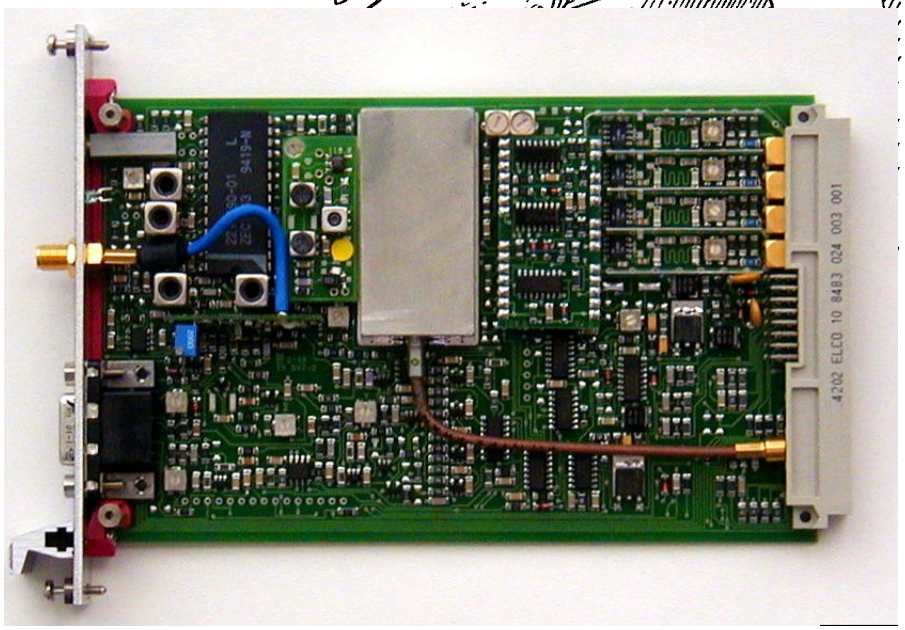
MX-BPM

Multiplexed Beam Position Monitor

Optimized for electron/positron Storage Rings
1 µm X and Y resolution
Handles > 75 dB beam intensity range
Each button sampled up to 10'000 times per second



The Beam Position Monitor (BPM) is an electronics module with superior performance in a very small volume

On-board microstrip filters eliminate the need for costly tubular filters

GaAs switches provide superior button-to-button isolation and low insertion loss

On-board synthesized local oscillator eliminates the problem of external oscillator signal distribution with power splitters

Automatic Gain Control range >90 dB provides optimum level for demodulator, independent of beam intensity, number of bunches

Phase-locked synchronous demodulation gives high linearity and noise suppression

Button signal range –70 dBm…+5 dBm at selected harmonic

X / Y output +-10V

Operating principle

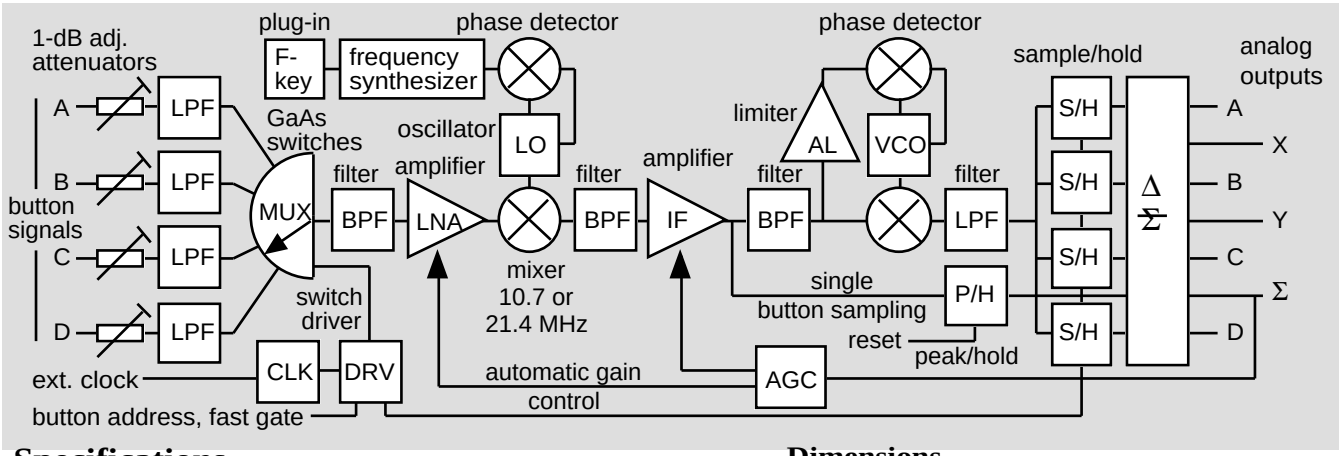
Button scanning mode

The signals from the four button electrodes are fed into the BPM module. The module processes the signals sequentially to give 3 analog output voltages: X, Y and Sum.

Four on-board variable 1-dB attenuators are used to equalize the button signals. Four on-board microstrip low-pass filters eliminate the unwanted beam harmonics before the signals are multiplexed by four GaAs switches. The switches close one at a time under the control of a local clock, sampling each button 2000 times per second. An external clock signal can override this on-board clock, to sample every button up to 10'000 times per second. The outputs of the four switches give a sequential signal, which is filtered by an on-board tunable band-pass filter. This filter allows easy selection of the chosen beam harmonic to be used. A low-noise preamplifier amplifies the signal under automatic gain control. A superheterodyne receiver processes the signal. A mixer gives the intermediate frequency using its own on-board synthesized local oscillator. The LO frequency is given by a string of bits generated by a plug-in programmable frequency key. The automatic gain control of the intermediate frequency amplifier normalizes the sum of all button signals. A PLL synchronous demodulator provides high linearity. The demodulated signal is filtered and memorized by four sample-and-hold circuits under the control of the button scanning clock. The X and Y positions are obtained from the memorized value of the four buttons. Only additions and subtractions are needed to obtain the X and Y positions, because the sum of all four buttons is normalized at all times to a constant value. The Difference over Sum linearity errors are thus avoided.

Single turn sampling

The fast gating mode can be enabled with an external command line, and a fast gate can be applied to define the sampling window.



Specifications

Beam intensity range	> 75 dB
Input signals	+5 dBm…–70 dBm, 50Ω
Operating frequency	60…800 MHz
Noise rms	< 2mV [0…1 kHz] in +-10V @ +5 dBm
	< 5mV [0…1 kHz] in +-10V @ –35 dBm
	< 50mV [0…1 kHz] in +-10V @ –60 dBm
Linearity error	On-center: <5 mV [+5 dBm…–35 dBm]
	2-mm off: <20 mV [+5 dBm…–35 dBm]
Sensitivity	User's choice. 1 V/mm recommended
X and Y gain	factory set according to vacuum chamber
Buttons sampling	2 ksamples/s with internal clock
	Up to 10 ksamples/s with external clock
Local oscillator	Factory-set frequency
Intermediate frequency	21.4 MHz or 10.7 MHz, depending on *f*rev.
Outputs	X: +-10V, A–B–C+D, or D–B
	Y: +-10V, A+B–C–D, or A–C
	Sum: A+B+C+D, constant value (≈3V)
	A, B, C and D: >0…<+10V
Front panel LED	PLL in lock
Single button sampling	Enable and Reset TTL commands
Button address	Two TTL addressing lines
Single button output	Output on "X": >0…<+10V
Fast gate mode	Enable TTL command
Fast gate	NIM (50Ω negative-going –16mA pulse)
Power supply:	+ 15V, <200 mA, – 15V, <40 mA

RF-shielded chassis

19" 3U chassis has up to 16 stations for BPM modules

Includes: +-15V power supply, 100...240 Vac mains voltage
one test station
SMA jack rear panel connector for button inputs
DB9 male connector for external commands
DB15 female connector per station, all outputs

Options

Fast NIM gate: To gate or gate-out specific bunch or bunch train
IF frequency signal Output, for digital I/Q detection

Accessories

Table-top test kit for one BPM. Kit has on-board power supply, SMA connectors for button inputs, DB9 for external commands and DB15 for output signals.

Module extender for one BPM module. Allows one BPM module to be extended out of the chassis. Includes 1.0/2.3 coaxial connector extensions.

RF service module. Same size as BPM module, without electronics. When inserted in a station, connects the button signals from the chassis to four front-panel BNC.

TTL commands service module. Same size as BPM module, without electronics. When inserted in a station, connects the external command signals from the chassis to a front panel DB9.

Dimensions

3U-high by 4TE-wide shielded Euromodule

Connectors

Rear connector:	DIN41612-M, 24+8 coax.
Coaxial connectors	1.0/2.3 (4 units)
Front panel connector	DB9 female for test signals
	SMA for optional IF output

Ordering codes

MX-BPM-xxxMHz-	BPM module, tuned to xxx-MHz operating frequency
-XxxxV/%-YxxxV/%	X and Y sensitivity
MX-BPM/CUS.xxx	One-time customizing charge for new frequency

Options

MX-BPM-FG	Fast NIM gate
MX-BPM-IFOUT	IF output for I/Q detection

Accessories

BPM-RFC/xx	Chassis with xx stations
BPM-KIT	Table-top test kit
BPM-XTD	Module extender
BPM-SERV/RF	RF outputs service module
BPM-SERV/CMD	TTL commands service module
BPM-LPF/1kHz	X and Y output LP-filter
BPM-BPF/500MHz	SMA-SMA RF input BP-filter
BPM-CMC/3.0	3-mm common mode ferrite
BPM-CMC/5.0	5-mm common mode ferrite

Distributors

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