MX-BPM – Multiplexed BPM Electronics

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

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 onboard 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 stored by four sample-and-hold circuits under the control of the button scanning clock. The X and Y positions are obtained from the averaged 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**: >75dB
- **Input signals**: +5dBm…–70dBm, 50W
- **Operating frequency**: 60…800MHz
- **Noise rms**: <2mV [0…1 kHz] in +10V @ +5dBm
- **Linearity error**: On-center: <5mV [+5dBm…–35dBm]
- **Sensitivity**: User’s choice. 1 V/mm recommended
- **X and Y gain**: factory set according to vacuum chamber
- **Local oscillator**: Factory-set frequency
- **Intermediate frequency**: 21.4 MHz or 10.7 MHz, depending on \( f_{rev} \)
- **Outputs**:
  - X: \( \pm 10V \), A–B–C+D, or D–B
  - Y: \( \pm 10V \), A+B–C–D, or A–C
  - Sum: A+B+C+D, constant value (\( \approx 3V \))
  - A, B, C and D: >0…<+10V
- **Front panel LED**: PLL in lock
- **Single button sampling address**: Enable and Reset TTL commands
- **Button address**: Two TTL addressing lines
- **Fast gate mode**: Enable TTL command
- **Fast gate**: NIM (50W negative-going –16mA pulse)
- **Power supply**: +15V, <200 mA, –15V, <40 mA
- **Connectors**:
  - Rear connector: DIN41612-M, 24+8 coax
  - Coaxial connectors: 1,0/2.3 (4 units)
  - Front panel connectors: DB9 female for test signal
  - SMA for optional IF output

**Order codes**

- MX-BPM-xxxMHz-
- MX-BPM/xxx MHz-
- MX-BPM/CUS.xxx-

**Options**

- Fast NIM gate: to gate our 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.

**Packaging**

- 19" 3U RF-shielded chassis has up to 16 stations for BPM modules
- Includes:
  - ±15V power supply, 100…240Vac mains voltage
  - One test station
  - DB9 male connector for external commands
  - DB15 female connector per station, all outputs

**Options**

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

**Accessories**

- BPM plug-in module, tuned to xxx-MHz operating frequency
- X and Y sensitivity
- One-time customizing charge for new frequency

- MX-BPM-FG
- MX-BPM-IFOUT
- MX-BPM/RFC/xx
- BPM-KIT
- BPM-XTD
- Module extender card
- BPM-SERV/RF
- Module extender card
- BPM-SERV/CMD
- RF service module
- BPM-LPF/1kHz
- TTL commands service module
- BPM-BPF/500MHz
- X and Y LP-filter
- BPM-CMC/3.0
- SMA-SMA RF input BP-filter
- BPM-CMC/5.0
- 3-mm common mode ferrite
- BPM-CMC/3.0
- 5-mm common mode ferrite

**Distributors**

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