

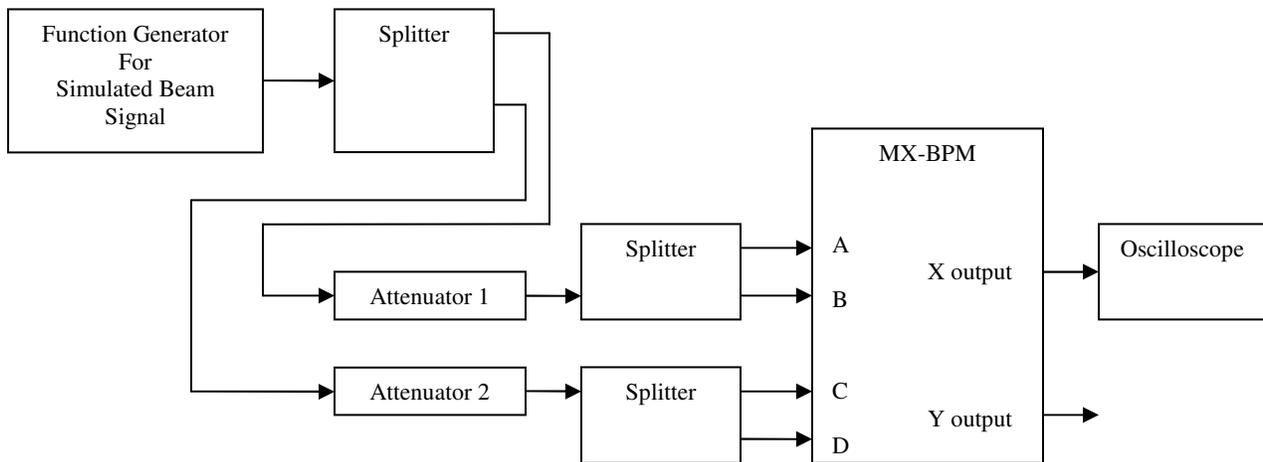
Bergoz MX-BPM tests

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Purpose of the Test

The purpose of this test is to characterize the position signal outputs for the Bergoz MX-BPM electronics with known signal level differences, and compare the position outputs with the expected values and the values provided by the standard RHIC IFE BPM electronics.

Block Diagram of Test Setup for MX-BPM

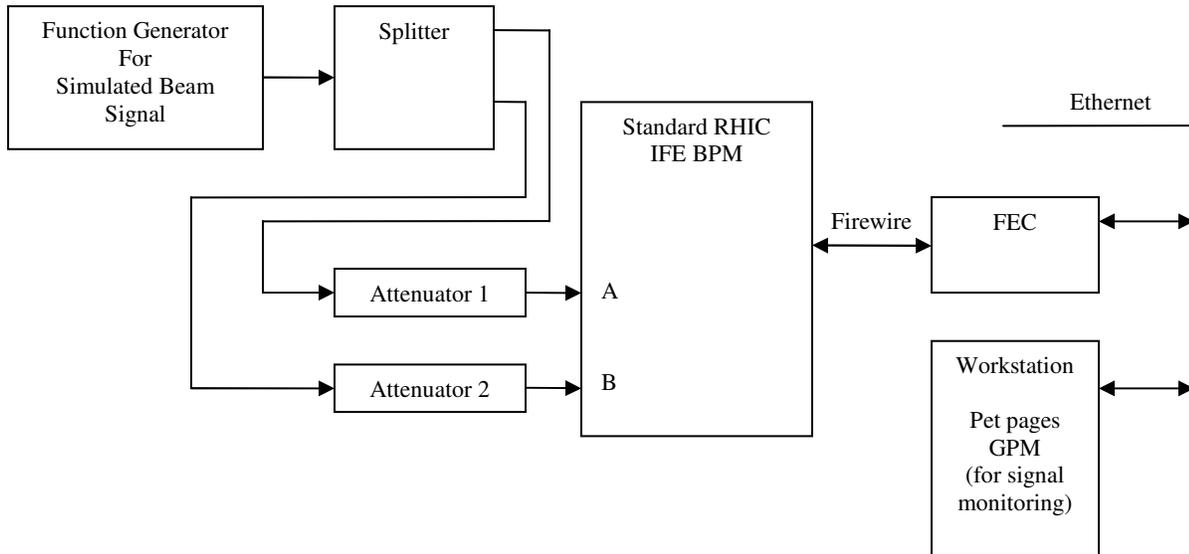


MX-BPM Input Definition

- A - Outside
- B - Top
- C - Inside
- D - Bottom



Block Diagram of Test Setup for Standard RHIC IFE BPM



Results

The following table provides the measured output results with various combinations of attenuator 1 and attenuator 2 values, which simulate known position offsets.

Notes

- Combinations of attenuators were used and matching may not be perfect between them.
- The RHIC Type 3 BPMs (which are used for the DX BPMs) provide an output of 0.455 dB/mm (or 2.198 mm/dB).

			Expected		
			Output	Bergoz MX-BPM	Standard RHIC
Atten 1	Atten 2	Atten Diff	for 0.455 dB/mm	Output (1V/mm)	IFE Output
(dB)	(dB)	(dB)	(mm)	(Volts)	(mm)
3	3	0	0.000	-1.250	-0.400
3	3	0	0.000		0.280
0	3	3	6.593	1.825	6.630
0	3	3	6.593	1.680	
6	10	4	8.791	2.500	8.760
0	6	6	13.187	3.470	12.975
3	10	7	15.385	4.200	15.037
0	9	9	19.780	5.200	19.601
0	10	10	21.978	5.650	21.442
3	13	10	21.978	5.500	
0	13	13	28.571	6.850	
3	16	13	28.571	6.450	
0	16	16	35.165	7.240	
10	3	-7	-15.385	-4.180	

Conclusions

1. The Bergoz MX-BPMs were factory calibrated to 0.2122 V/%. This has been determined to be incorrect.
2. The % value used for the Bergoz MX-BPMs has been determined to be the following:

$$\text{Horizontal \%} = (A - C) / (A + B + C + D)$$

$$\text{Vertical \%} = (B - D) / (A + B + C + D)$$

3. The Volts/% value should therefore be two times the IFE electronics' C5 coefficient for BPM type 3 (The DX BPMs are type 3).

$$\begin{aligned} \text{Bergoz V/\% should} &= 38629 * 2 / (100 * 1000 \text{ microns/mm}) \\ &= \mathbf{0.77258} \end{aligned}$$

The table below provides a column where the Bergoz MX-BPM voltage outputs are corrected from 0.2122 V/% to 0.77258 V/% to provide 1 V/mm output. Note that the output values are very close to the expected values when this correction is applied. Also note that the full scale voltage output for the MX-BPMs is +/- 10 Volts, so values above 10.000 would not be possible.

4. Enhanced signal to noise may be possible when the MX-BPMs are recalibrated to the correct V/% value.

			Expected Output for 0.455 dB/mm (mm)	Bergoz MX-BPM Output (1V/mm) (Volts)	Bergoz MX-BPM corrected to 0.77258 V/% (mm)	Standard RHIC IFE Output (mm)
Atten 1 (dB)	Atten 2 (dB)	Atten Diff (dB)				
3	3	0	0.000	-0.125	-0.455	-0.400
3	3	0	0.000			0.280
0	3	3	6.593	1.825	6.644	6.630
0	3	3	6.593	1.680	6.117	
6	10	4	8.791	2.500	9.102	8.760
0	6	6	13.187	3.470	12.634	12.975
3	10	7	15.385	4.200	15.291	15.037