



RECENT STUDIES ON THE VIBRATION RESPONSE OF NSLS-II GIRDER SUPPORT SYSTEM

S. Sharma and C. Spataro, NSLS-II, BNL, Upton, NY, USA

INTRODUCTION

The designs of various girder support systems were reviewed recently in a MEDSI School tutorial [1]. A comparison of their horizontal transmissibility values in (2-100 Hz) band showed that the NSLS-II girder support system had a lower transmissibility of 1.07, despite its first natural frequency being the lowest (~30 Hz). Detailed vibration tests and finite element (FE) analyses have been performed to understand this anomaly and to assess the role of viscoelastic damping pads underneath the NSLS-II girders.



Viscoelastic Pad



Integrated Motion vs Frequency

CONCLUSION

FE analyses and experiments results show that viscoelastic pads supporting the girders increase effective damping ratios of the girders by a factor of ~ 3 , thus lowering the transmissibility ratios. Random vibration analyses were carried out using equivalent damping ratio, and uncorrelated rms motion between the magnets was estimated to be ~ 17.2 nm above the 1st natural frequency of 30.4 Hz.

f _{n,i}	FE Anal- ysis (Hz)	Experi- mental (Hz)	Mode Shape (X, Y, Z: Hor., Ver., Beam)
1	30.4	30.0	X-Translation - Roll
2	46.4	43.8	Yaw
3	66.6	61.9	Bend (Y-Z Plane)
4	81.3	77.5	Bend (X-Z Plane)
5	84.1	89.1	Pitch

REFERENCES

[1] S. Sharma, "Storage ring issues for low-emittance storage rings," MEDSI School 2, Grenoble, France, 2019.

[7] C. Spataro et al. "Recent site vibration studies at NSLS-II," MEDSI2014, Melbourne, Australia.