Abstract Submitted for the SES15 Meeting of The American Physical Society

Using Statistical Analysis to Extract Meaningful Beam Position Monitor Data¹ ERIC THOMPSON, Christopher Newport University — BPM data taken from rayTrace measurement at CEBAF consist of betatron orbits, BPM noise, residual dispersions, and malfunctioned BPM signals. To extract meaningful betatron orbits from the noise, as well as identify contributions of different noise sources and their behaviors, model independent analysis (MIA) was conducted on the rayTrace data. Singular value decomposition (SVD, a method of statistical analysis) was used to identify principle components of the BPM data. Our results clearly demonstrate dominant betatron orbits, less dominant residual dispersion, signals from malfunctioned BPMs, and BPM noises. Here the residual dispersion appears as the spatial dependence of the horizontal orbit, which is comparable with Elegant generated dispersion based on the design model. SVD also reveals the temporal dependence related to each principle component, such as kicker strength and energy variation. Finally, convergence checks were performed by varying the number of BPM orbits and number of BPMs used for SVD analysis.

¹We would like to thank Jefferson Lab and the Department of Energy to fund the whole project.

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Date submitted: 05 Nov 2015

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