

Lee Teng Summer Intern Mentor Volunteer Form

Name of mentor: **Tim Berenc**

Name of administrative assistant for mentor: **Lucy Sanchez**

Argonne division: **ASD**

Argonne office location and office phone: **(mentor) C4243, x5186**

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Project description:

RF Noise Suppression for the APS Storage Ring

Amplitude and phase noise in the Advanced Photon Source (APS) Storage Ring radio-frequency (RF) system has a direct impact on electron beam quality. A large source of noise in the RF system is caused by 60Hz power line harmonic related noise in the 1MW klystrons which drive the accelerating cavities. Presently, conventional proportional-integral-derivative (PID) control is employed in the amplitude and phase control loops. Applying adaptive noise cancelling techniques [1] to the existing RF system has shown improved performance. This project will entail experimental and theoretical development of an adaptive noise cancelling system for the Storage Ring RF systems.

References:

- [1] "Adaptive Noise Cancelling: Principles and Applications", B. Widrow et. al, Proceedings of the IEEE, Vol. 63, No. 12, December 1975.

List any skills a student might have that are of particular interest:

Electrical engineering student with coursework in feedback control theory, signal processing (i.e., fast fourier transforms and power spectral densities), and RF concepts.

Strong motivation and independence in experiment and data analysis.

Experience with MATLAB/Simulink

List any special safety training needs you would have for your Lee Teng intern:

ANL ESH377: Electrical Safety Awareness

ANL ESH364: Radiofrequency and Microwave Safety Awareness