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TITLE: Trimodal Mammography with Perfect Coregistration

PRINCIPAL INVESTIGATOR: Ke Li

RECIPIENT: University of Wisconsin System
21 N. Park St. Ste 6401, Madison, WI 53715-1218

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Fort Detrick, Maryland 21702-5012

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6. AUTHOR(S)
Ke Li

Email: kli23@wisc.edu

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5e. TASK NUMBER

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

University of Wisconsin System
Madison, WI 53715-1218

8. PERFORMING ORGANIZATION REPORT NUMBER

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U.S. Army Medical Research and Materiel Command
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13. SUPPLEMENTARY NOTES

14. ABSTRACT
This project aims at developing a trimodel x-ray mammography imaging system to improve both sensitivity and specificity in breast cancer screening and diagnosis, particularly for radiologically dense breasts. In the proposed system, three complementary image datasets will be generated from a single data acquisition: the first is the conventional absorption contrast mammography image, the second is a novel phase contrast mammography image with enhanced edges and reduced anatomical background, the major confounding factor in reading mammography; the imaging characteristics suggest that this contrast mechanism would be preferable for cancer mass detection. The third image is the dark-field mammogram, which is sensitive to the local distribution of microcalcifications, calcified vessels, and other small objects in the breast. The proposed system will be constructed, optimized, and evaluated using mastectomy specimens.

15. SUBJECT TERMS-

NONE LISTED

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			USAMRMC
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1. INTRODUCTION:

This project aims at developing a trimodel x-ray mammography imaging system to improve both sensitivity and specificity in breast cancer screening and diagnosis, particularly for radiologically dense breasts. In the proposed system, three complementary image datasets will be generated from a single data acquisition: the first is the conventional absorption contrast mammography image, the second is a novel phase contrast mammography image with enhanced edges and reduced anatomical background, the major confounding factor in reading mammography; the imaging characteristics suggest that this contrast mechanism would be preferable for cancer mass detection. The third image is the dark-field mammogram, which is sensitive to the local distribution of microcalcifications, calcified vessels, and other small objects in the breast. The proposed system will be constructed, optimized, and evaluated using mastectomy specimens.

2. KEYWORDS:

Early breast cancer detection, dense breast, mammography, x-ray phase contrast imaging, x-ray dark field imaging, Talbot-Lau interferometer, prototype imaging system

3. ACCOMPLISHMENTS: The PI is reminded that the recipient organization is required to obtain prior written approval from the awarding agency Grants Officer whenever there are significant changes in the project or its direction.

What were the major goals of the project?
List the major goals of the project as stated in the approved SOW. If the application listed milestones/target dates for important activities or phases of the project, identify these dates and show actual completion dates or the percentage of completion.

As stated in the approved SOW, the major goals of the project include:

1. Develop a grating interferometer for a trimodal mammography system
2. Integrate the grating interferometer into existing digital mammography system
3. Objective and quantitative performance evaluation of the proposed system
4. Subjective performance evaluation of the proposed system using mastectomy specimens

Specific task for this reporting period (01/15/2018-01/14-2019) include:

1. Human subject recruitment (46%)
2. Acquisition of multi-contrast images of mastectomy specimens of the recruited subjects (46%)

What was accomplished under these goals?

For this reporting period describe: 1) major activities; 2) specific objectives; 3) significant results or key outcomes, including major findings, developments, or conclusions (both positive and negative); and/or 4) other achievements. Include a discussion of stated goals not met. Description shall include pertinent data and graphs in sufficient detail to explain any significant results achieved. A succinct description of the methodology used shall be provided. As the project progresses to completion, the emphasis in reporting in this section should shift from reporting activities to reporting accomplishments.

A. Major activities

During this reporting period (01/15/2018-01/14-2019), the following major activities were performed:

1. A total of 16 female subjects undergoing mastectomy have been recruited; among them, 7 subjects received bilateral mastectomy, providing a total of 23 specimens.
2. Multi-contrast imaging of these 23 freshly dissected specimens has been performed using the prototype trimodal mammography system constructed during this project.

B. Specific objectives

The major objective of Year 3 is to acquire multi-contrast images freshly dissected mastectomy specimens using the prototype trimodal mammography system.

C. Key outcomes

C.1 Multi-contrast images of human mastectomy specimens

- Major finding: As shown in Figures 1-2, compared with conventional x-ray absorption contrast images, x-ray phase contrast images of the mastectomy specimens provide complementary soft tissue information and effectively enhanced the boundaries between glandular and adipose tissues.

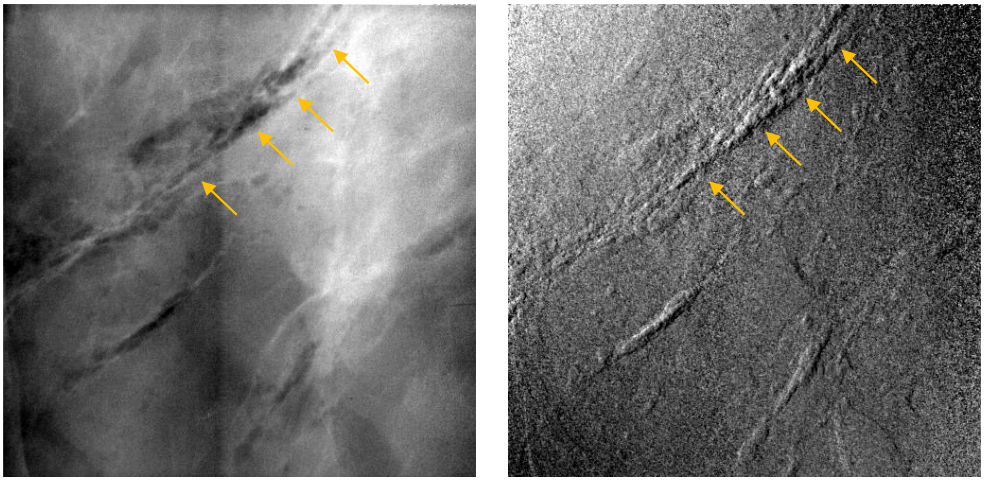

Figure 1: Absorption contrast (left column) and differential phase contrast (right column) images of mastectomy specimens. The arrows point to adipose tissue.

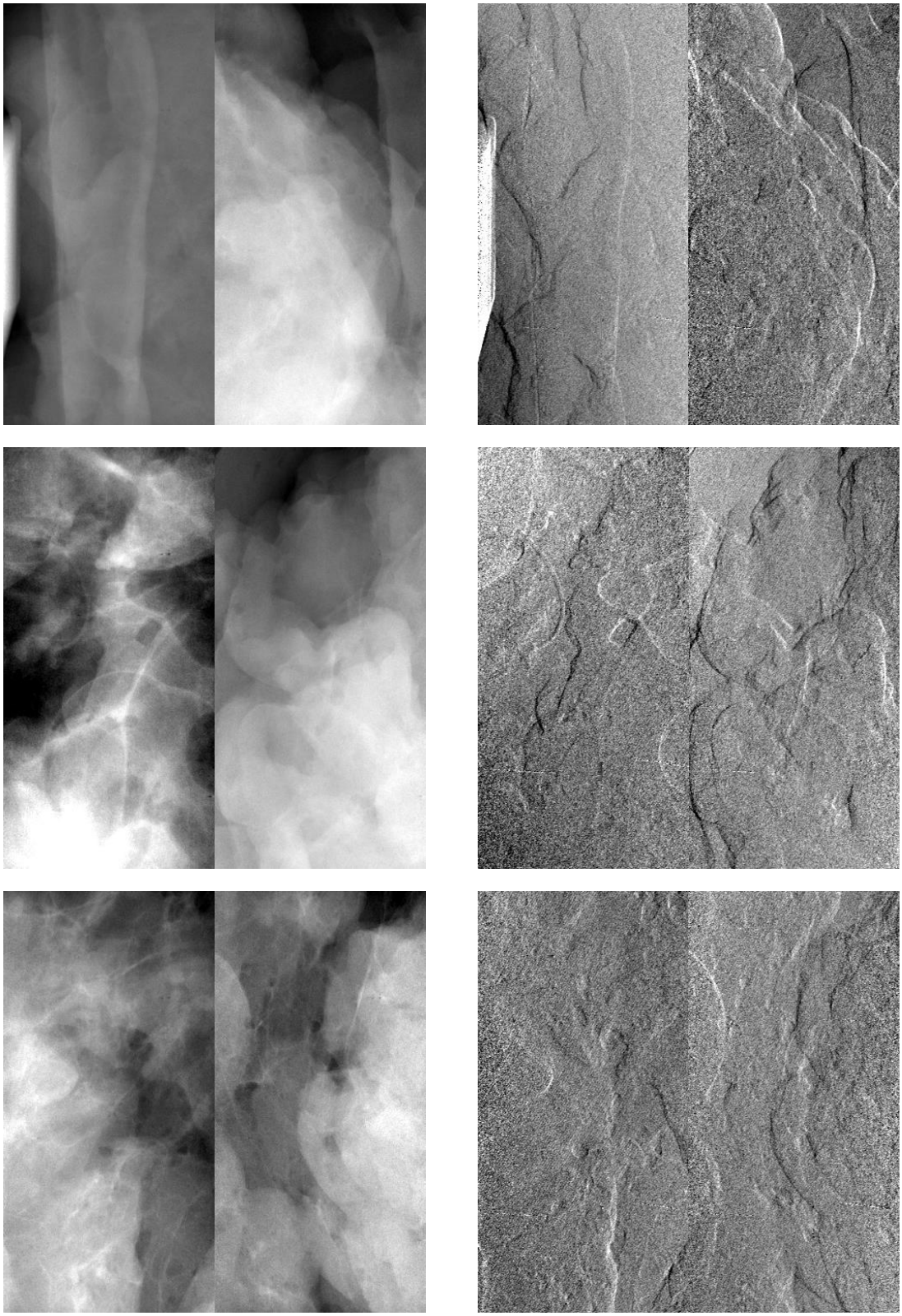

Figure 2 Absorption contrast (left column) and differential phase contrast (right column) images of mastectomy specimens.

C.2 Improvement of phase contrast image uniformity

In our previous reporting period, we observed a so-called vignetting effect in images acquired from the prototype system: in the far left and right edges of the 5 cm x 5 cm field-of-view (FOV), the image noise increased significantly, which degraded image quality, impaired the detectability of local features, and reduced the effective system FOV almost by 30%. Since the noise magnitude of phase contrast images is inversely proportional to the diffraction fringe visibility, we experimentally measured the visibility for every spatial location in the FOV in order to find out the origin of the vignetting effect. As shown in the right image in **Figure 3**, there is significant reduction in fringe visibility when the location gets closer to the left and right edges of the FOV. We found that the effect was induced by the beam divergence of the prototype system. As shown by the schematic illustration in **Figure 4**, when a flat grating was used in a divergent x-ray beam, except the central ray, most x-rays will impinge the grating from certain oblique angles; in certain extreme cases, the beam modulation effect introduced by an ideal grating setup will be completely lost (e.g., ray 3 in Figure 2), which basically eliminate fringe visibility.

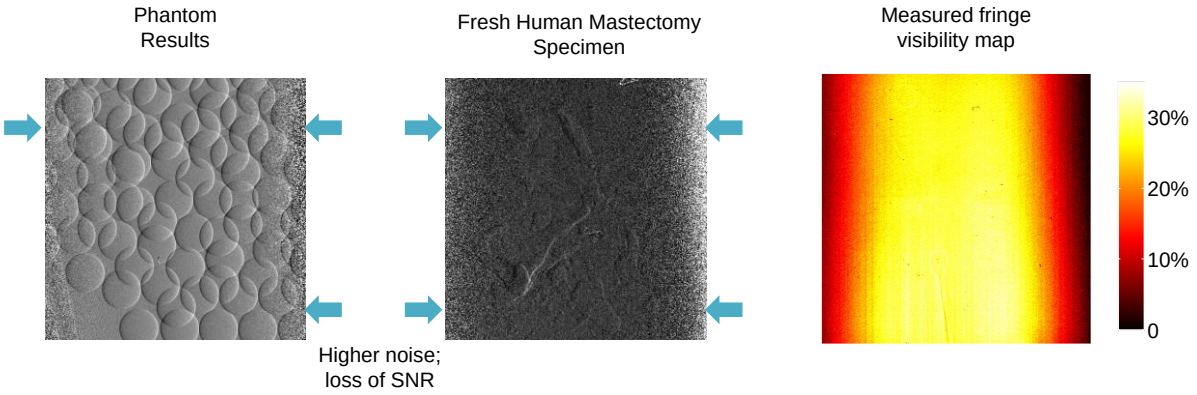

Figure 3: Examples of the vignetting effect. The phase contrast images of the physical phantom and mastectomy specimen acquired from the prototype system demonstrated significant loss of signal-to-noise ratio (SNR) at the left/right peripheral regions of the field-of-view. The experimentally measured fringe visibility map indicates that the loss of visibility contributes to the vignetting effect.

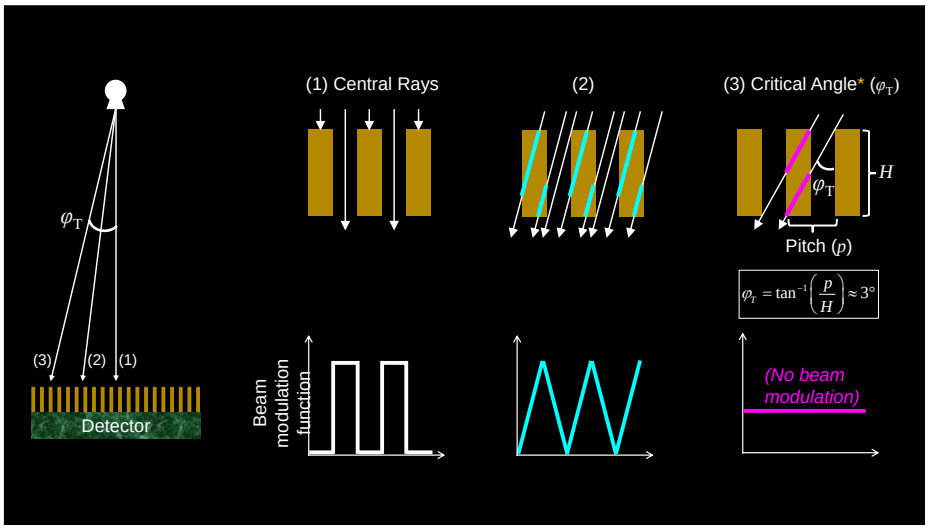

Figure 4: Demonstration of the influence of beam divergence on the wave optical efficiency of the grating interferometer system. Except the central ray (1), x-rays reaching the grating at certain oblique angles experience certain degrees of beam modulation reduction. Beyond a critical angle φ_T, all beam modulation will be lost (ray 3).

- Major finding: This vignetting effect is undesirable since it reduces the effective FOV of the prototype system. To address this technical challenge, we developed a practical method to bend the gratings based on the system geometry and beam divergence of the prototype system. As shown in **Figure 5**, we softened and bent a wood panel, then fixed its shaped based on the desired curvature. Then we fabricated a grating holder using the curved wood panel. The holder sandwiched the grating to force it to bend to the desired curvature. As shown by the visibility map acquired with the curved grating in **Figure 5**, no significant visibility reduction was observed at the edge of the FOV. **Figure 6** shows example mastectomy specimen images acquired without and with the curved grating. Our grating bending method effective reduced the vignetting effect and maximized the utilization of the entire 5 cm × 5 cm grating area.

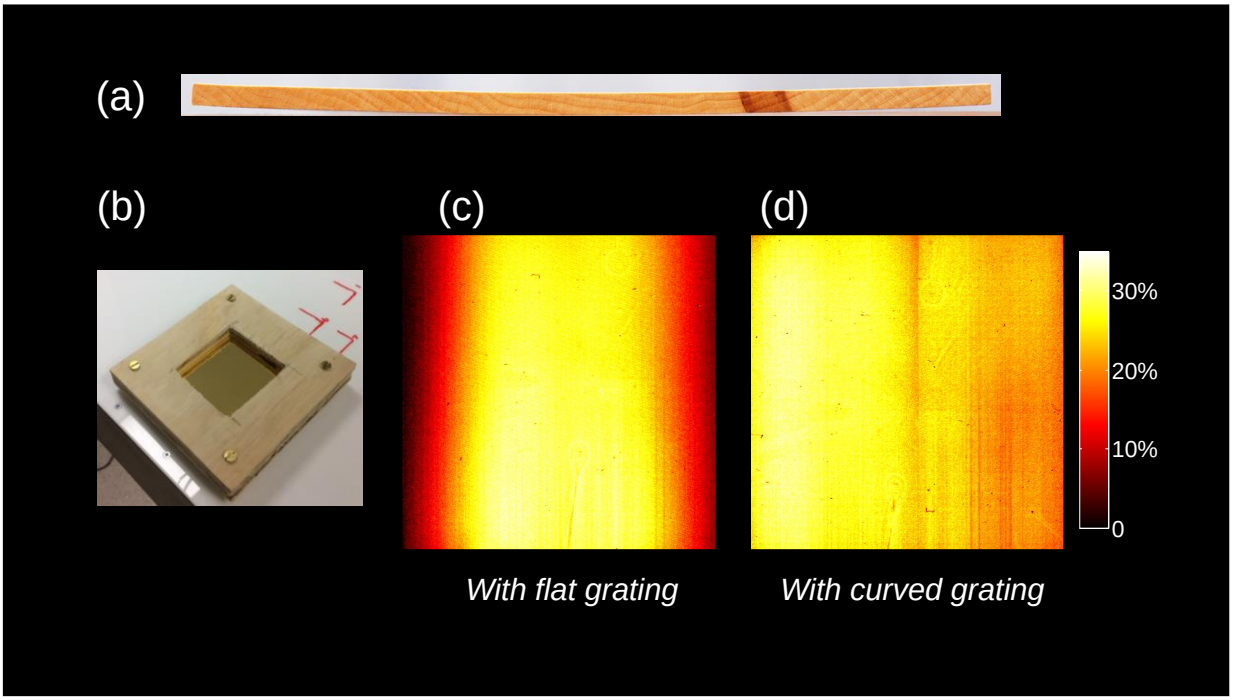

Figure 5: (a) Curved wood panel. (b) Grating holder made of the curved wood panel. (c) Visibility map acquired with the original flat grating. (d) Visibility map acquired using the curved grating.

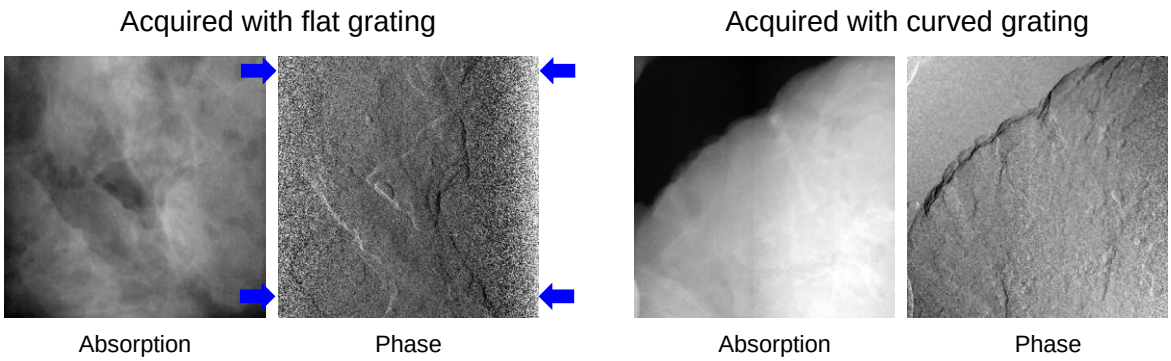

Figure 6: Comparison of multi-contrast images acquired before and after the system upgrade with the curved grating. The previous vignetting problem (pointed by the arrows) is addressed after the system upgrade.

C.3 Dependence of the SNR of differential phase contrast images on interferometer sensitivity

- Major finding: It is a common belief that the signal-to-noise ratio (SNR) of differential phase contrast images will always increase with the sensitivity of the grating interferometer. We performed a detailed theoretical analysis to show that this is not always the case. As a matter of fact, due to the cyclic nature of the signal and impact of the phase wrapping (**Figure 7**), there is an upper limit of sensitivity for a given refraction angle value, beyond which, further increase in sensitivity will lead to a decrease in SNR (**Figure 8**). We have developed a theoretical model that quantitatively predicts the likelihood of phase wrapping and phase contrast SNR for a given interferometer sensitivity level. This model can be used for the optimization of grating interferometer design.

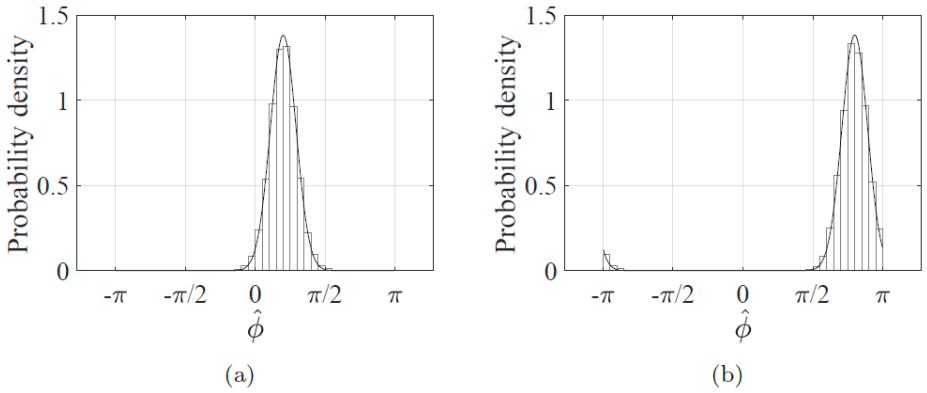

Figure 7: Statistical distributions of the estimated phase signal $\hat{\phi}$. Sensitivity for (a) and (b) are 2×10^5 and 8×10^5, respectively. The bar plots were obtained from numerical simulations. The solid curves were predicted by our theoretical model.

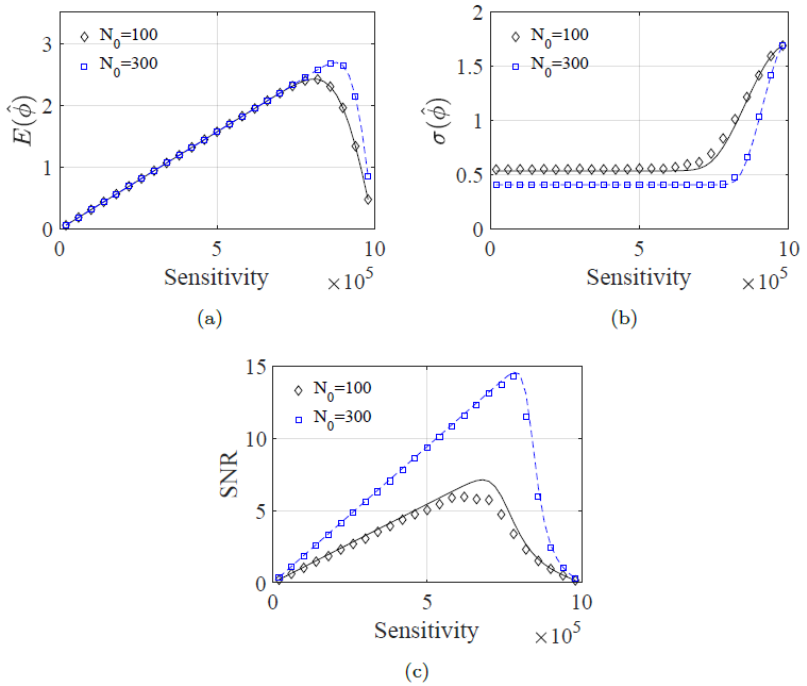

Figure 8: (a) Mean, (b) standard deviation, and (c) SNR of the measured differential phase signal $(\hat{\phi})$ versus the sensitivity factor. N_0 denotes the number of input x-ray photons.

What opportunities for training and professional development has the project provided?
If the project was not intended to provide training and professional development opportunities or there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe opportunities for training and professional development provided to anyone who worked on the project or anyone who was involved in the activities supported by the project. "Training" activities are those in which individuals with advanced professional skills and experience assist others in attaining greater proficiency. Training activities may include, for example, courses or one-on-one work with a mentor. "Professional development" activities result in increased knowledge or skill in one's area of expertise and may include workshops, conferences, seminars, study groups, and individual study. Include participation in conferences, workshops, and seminars not listed under major activities.

The University of Wisconsin-Madison requires that all graduate students and postdoctoral researchers supported by federal funding utilize Individual Development Plans to set academic and career goals and facilitate conversations with their mentors. The university offers a collection of resources and tools to support mentees, mentors, and PIs in implementing IDPs. These include a UW-Madison IDP template, workshops for mentees (both face-to-face and online videos), peer learning groups for mentees, as well as guidelines for mentors.

How were the results disseminated to communities of interest?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe how the results were disseminated to communities of interest. Include any outreach activities that were undertaken to reach members of communities who are not usually aware of these project activities, for the purpose of enhancing public understanding and increasing interest in learning and careers in science, technology, and the humanities.

We published results in peer reviewed journals such as Physics in Medicine and Biology and conference proceedings such as Proceeding of SPIE. The results were also disseminated to the breast imaging research community via our presentations at medical imaging conferences such as AAPM Annual Meeting and SPIE Medical Imaging Conference.

What do you plan to do during the next reporting period to accomplish the goals?
If this is the final report, state "Nothing to Report."

Describe briefly what you plan to do during the next reporting period to accomplish the goals and objectives.

A No-Cost Extension (NCE) request of this project has been approved to extend this project to September 14, 2019. During the NCE period, we will continue our effort in recruiting more human subjects and imaging mastectomy specimens of the recruited subjects. As specified in the Statement of Work, our goal is to image a total of 50 specimens. In addition to image acquisition, the clinical co-investigators will perform subjective evaluation of the acquired mastectomy images to explore the potential impact of the trimodal imaging technology on breast cancer diagnosis. The evaluation results will be submitted to peer-reviewed journals on breast imaging.

4. IMPACT: Describe distinctive contributions, major accomplishments, innovations, successes, or any change in practice or behavior that has come about as a result of the project relative to:

What was the impact on the development of the principal discipline(s) of the project?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe how findings, results, techniques that were developed or extended, or other products from the project made an impact or are likely to make an impact on the base of knowledge, theory, and research in the principal disciplinary field(s) of the project. Summarize using language that an intelligent lay audience can understand (Scientific American style).

The major accomplishment of Year 3 is demonstration of human mastectomy specimens trimodal mammography imaging within 30 minutes after surgical dissection using the prototype system developed in this project. Upon further radiologist evaluation, imaging results of these fresh breast specimens will advance knowledge about the bio-signature of breast cancer in x-ray phase contrast and dark field images. In addition, we have made a technical innovation during this reporting period to improve the image uniformity of phase contrast images using a novel grating bending method.

What was the impact on other disciplines?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe how the findings, results, or techniques that were developed or improved, or other products from the project made an impact or are likely to make an impact on other disciplines.

Nothing to Report.

What was the impact on technology transfer?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe ways in which the project made an impact, or is likely to make an impact, on commercial technology or public use, including:

- *transfer of results to entities in government or industry;*
- *instances where the research has led to the initiation of a start-up company; or*
- *adoption of new practices.*

Nothing to Report.

What was the impact on society beyond science and technology?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe how results from the project made an impact, or are likely to make an impact, beyond the bounds of science, engineering, and the academic world on areas such as:

- *improving public knowledge, attitudes, skills, and abilities;*
- *changing behavior, practices, decision making, policies (including regulatory policies), or social actions; or*
- *improving social, economic, civic, or environmental conditions.*

Nothing to Report.

5. CHANGES/PROBLEMS: The Project Director/Principal Investigator (PD/PI) is reminded that the recipient organization is required to obtain prior written approval from the awarding agency Grants Officer whenever there are significant changes in the project or its direction. If not previously reported in writing, provide the following additional information or state, "Nothing to Report," if applicable:

Changes in approach and reasons for change
Describe any changes in approach during the reporting period and reasons for these changes. Remember that significant changes in objectives and scope require prior approval of the agency.

Nothing to Report.

Actual or anticipated problems or delays and actions or plans to resolve them
Describe problems or delays encountered during the reporting period and actions or plans to resolve them.

Nothing to Report.

Changes that had a significant impact on expenditures
Describe changes during the reporting period that may have had a significant impact on expenditures, for example, delays in hiring staff or favorable developments that enable meeting objectives at less cost than anticipated.

Nothing to Report.

Significant changes in use or care of human subjects, vertebrate animals, biohazards, and/or select agents
Describe significant deviations, unexpected outcomes, or changes in approved protocols for the use or care of human subjects, vertebrate animals, biohazards, and/or select agents during the reporting period. If required, were these changes approved by the applicable institution committee (or equivalent) and reported to the agency? Also specify the applicable Institutional Review Board/Institutional Animal Care and Use Committee approval dates.

Significant changes in use or care of human subjects

Nothing to Report.

Significant changes in use or care of vertebrate animals.

Nothing to Report.

Significant changes in use of biohazards and/or select agents

Nothing to Report.

6. PRODUCTS: List any products resulting from the project during the reporting period. If there is nothing to report under a particular item, state "Nothing to Report."

- **Publications, conference papers, and presentations**
  Report only the major publication(s) resulting from the work under this award.

  Journal publications. *List peer-reviewed articles or papers appearing in scientific, technical, or professional journals. Identify for each publication: Author(s); title; journal; volume: year; page numbers; status of publication (published; accepted, awaiting publication; submitted, under review; other); acknowledgement of federal support (yes/no).*

Published journal publication:

Ji X, Zhang R, Chen GH, Li K. "Impact of anti-charge sharing on the zero-frequency detective quantum efficiency of CdTe-based photon counting detector system: cascaded systems analysis and experimental validation." Physics in medicine and biology. Vol. 63, pp.095003 (2018). https://doi.org/10.1088/1361-6560/aab9c9

Accepted journal publication:

- Ji X, Feng M., Zhang R, Chen GH, Li K. "An experimental method to directly measure DQE(k) at k = 0 for 2D x-ray imaging systems." Physics in medicine and biology (accepted)

Publications under review:

- Ji X, Zhang R, Chen GH, Li K. "Is high sensitivity always desirable for a phase contrast imaging system?" Physics in medicine and biology

Books or other non-periodical, one-time publications. *Report any book, monograph, dissertation, abstract, or the like published as or in a separate publication, rather than a periodical or series. Include any significant publication in the proceedings of a one-time conference or in the report of a one-time study, commission, or the like. Identify for each one-time publication: Author(s); title; editor; title of collection, if applicable; bibliographic information; year; type of publication (e.g., book, thesis or dissertation); status of publication (published; accepted, awaiting publication; submitted, under review; other); acknowledgement of federal support (yes/no).*

Nothing to Report.

Other publications, conference papers, and presentations. *Identify any other publications, conference papers and/or presentations not reported above. Specify the status of the publication as noted above. List presentations made during the last year (international, national, local societies, military meetings, etc.). Use an asterisk (*) if presentation produced a manuscript.*

Conference papers

- Li K, Zhang R, Garrett J, Ge Y, Ji X, Chen GH. "Design, Construction, and Initial Results of a Prototype Multi-Contrast X-Ray Breast Imaging System." Proceedings of SPIE—the International Society for Optical Engineering. 2018;10573:105730W
- Zhang R, Li K, Garrett J, Chen GH. "Human-Compatible Multi-Contrast Mammographic Prototype System." Proceedings of SPIE—the International Society for Optical Engineering. 2019; 10948
- Ji X., Zhang R, Li K, Chen GH, "Is high sensitivity always good for a grating-based differential phase contrast imaging system?" Proceedings of SPIE—the International Society for Optical Engineering. 2019; 10948
- Ji X., Feng M, Zhang R, Chen GH, Li K, "A new experimental method for direct DQE(k) measurement at k=0." Proceedings of SPIE—the International Society for Optical Engineering. 2019; 10948

Conference presentations

- Zhang R, Li K, Garrett J, Chen GH, "Initial Evaluation of a Prototype Multi-Contrast X-Ray Breast Imaging System: Radiation Dose Performance." AAPM 2018 Annual Meeting, Nashville, TN
- Ji X., Zhang R, Chen GH, Li K, "How Does Anti-Charge Sharing Impact the Zero-Frequency DQE of Photon Counting Detector Systems? Theoretical Framework and Experimental Validation." AAPM 2018 Annual Meeting, Nashville, TN

- **Website(s) or other Internet site(s)**
  List the URL for any Internet site(s) that disseminates the results of the research activities. A short description of each site should be provided. It is not necessary to include the publications already specified above in this section.

Nothing to Report.

- **Technologies or techniques**
  Identify technologies or techniques that resulted from the research activities. In addition to a description of the technologies or techniques, describe how they will be shared.

Nothing to Report.

- **Inventions, patent applications, and/or licenses**
  Identify inventions, patent applications with date, and/or licenses that have resulted from the research. State whether an application is provisional or non-provisional and indicate the application number. Submission of this information as part of an interim research performance progress report is not a substitute for any other invention reporting required under the terms and conditions of an award.

Nothing to Report.

- **Other Products**
  Identify any other reportable outcomes that were developed under this project. Reportable outcomes are defined as a research result that is or relates to a product, scientific advance, or research tool that makes a meaningful contribution toward the understanding, prevention, diagnosis, prognosis, treatment, and/or rehabilitation of a disease, injury or condition, or to improve the quality of life. Examples include:
  - *data or databases;*
  - *biospecimen collections;*
  - *audio or video products;*
  - *software;*
  - *models;*
  - *educational aids or curricula;*
  - *instruments or equipment;*
  - *research material (e.g., Germplasm; cell lines, DNA probes, animal models);*
  - *clinical interventions;*
  - *new business creation; and*
  - *other.*

- Video recording of a SAM Imaging Symposium presentation delivered at the 2018 AAPM Annual Meeting:
  Link: https://vimeo.com/aapm/review/288790203/c73cb8e755
  Title: Multi-Contrast X-Ray Breast Imaging Prototype System

7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

What individuals have worked on the project?
Provide the following information for: (1) PDs/PIs; and (2) each person who has worked at least one person month per year on the project during the reporting period, regardless of the source of compensation (a person month equals approximately 160 hours of effort). If information is unchanged from a previous submission, provide the name only and indicate "no change."

Example:

Name:	*Mary Smith*
Project Role:	*Graduate Student*
Researcher Identifier (e.g. ORCID ID):	*1234567*
Nearest person month worked:	*5*

Contribution to Project:	*Ms. Smith has performed work in the area of combined error-control and constrained coding.*
Funding Support:	*The Ford Foundation (Complete only if the funding support is provided from other than this award).*

Name:	*Ke Li*
Project Role:	*PI*
Nearest person month worked:	*3*
Contribution to Project:	*Dr. Li has performed work in the acquisition of multi-contrast images of mastectomy specimens.*
Name:	*Guang-Hong Chen*
Project Role:	*Co-Investigator*
Nearest person month worked:	*2*
Contribution to Project:	*Dr. Chen has performed work in the optimization of the trimodal image acquisition protocol.*
Name:	*John Garrett*
Project Role:	*Assistant Scientist*
Nearest person month worked:	*3*
Contribution to Project:	*Dr. Garrett has performed work in the acquisition of multi-contrast images of mastectomy specimens.*
Name:	*Ran Zhang*
Project Role:	*Assistant Scientist*
Nearest person month worked:	*1*
Contribution to Project:	*Dr. Zhang has performed work in the acquisition of multi-contrast images of mastectomy specimens.*
Name:	*Amy Fowler*
Project Role:	*Co-Investigator*
Nearest person month worked:	*1*
Contribution to Project:	*Dr. Fowler has provided guidance on the development of the prototype system from the perspective of a clinical breast radiologist. She has also participated in subject recruitment.*
Funding Support:	*UW-Madison ICTR KL2 Scholars Program*
Name:	*Frederick Kelcz*
Project Role:	*Co-Investigator*
Nearest person month worked:	*1*
Contribution to Project:	*Dr. Kelcz has performed work in subject recruitment.*
Name:	*Andreas Friedl*
Project Role:	*Co-Investigator*
Nearest person month worked:	*1*
Contribution to Project:	*Dr. Friedl has performed pathological analysis of the mastectomy specimens..*
Name:	*Kelley Salem*
Project Role:	*Post-doc*
Nearest person month worked:	*1*
Contribution to Project:	*Dr. Salem has performed work in subject recruitment.*

Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

If the active support has changed for the PD/PI(s) or senior/key personnel, then describe what the change has been. Changes may occur, for example, if a previously active grant has closed and/or if a previously pending grant is now active. Annotate this information so it is clear what has changed from the previous submission. Submission of other support information is not necessary for pending changes or for changes in the level of effort for active support reported previously. The awarding agency may require prior written approval if a change in active other support significantly impacts the effort on the project that is the subject of the project report.

Li, Ke

ACTIVE

U01 EB021183 (Chen, GH)
Project title: One Stop Shop Imaging for Acute Ischemic Stroke Treatment
Funding agency: NIH/NIBIB
Project goal: Develop and validate revolutionary imaging technologies that will result in the availability of a new image guided workflow for the diagnosis, triage, and endovascular treatment of patients presenting with an acute ischemic stroke due to a large artery occlusion.
Start and end date: 9/30/2015-6/30/2019
Role: Co-investigator
Level of effort: 3.6 calendar months
Point of contact at the funding agency: SASTRE, ANTONIO SASTREA@MAIL.NIH.GOV

R01 EB020521-01 (Chen, GH and Li, K)
Project title: Multi-Contrast X-Ray Breast Imaging
Funding agency: NIH/NIBIB
Project goal: Develop a phase contrast digital breast tomosynthesis system and evaluate its potential utility in improving the sensitivity and specificity of breast cancer diagnosis through pilot human subject studies.
Start and end date: 01/01/2016-12/31/2019
Role: co-PI
Level of effort: 5.4 calendar months
Point of contact at the funding agency: SHABESTARI, BEHROUZ
SHABESTB@MAIL.NIH.GOV

Chen, Guang-Hong

ACTIVE

U01 EB021183 (Chen, GH)
Project title: One Stop Shop Imaging for Acute Ischemic Stroke Treatment
Funding agency: NIH/NIBIB
Project goal: Develop and validate revolutionary imaging technologies that will result in the availability of a new image guided workflow for the diagnosis, triage, and endovascular treatment of patients presenting with an acute ischemic stroke due to a large artery occlusion.
Start and end date: 9/30/2015-6/30/2019
Role: PI
Level of effort: 3.84 calendar months
Point of contact at the funding agency: SASTRE, ANTONIO SASTREA@MAIL.NIH.GOV

R01 EB020521-01 (Chen, GH and Li, K)
Project title: Multi-Contrast X-Ray Breast Imaging
Funding agency: NIH/NIBIB
Project goal: Develop a phase contrast digital breast tomosynthesis system and evaluate its potential utility in improving the sensitivity and specificity of breast cancer diagnosis through pilot human subject studies.
Start and end date: 01/01/2016-12/31/2019
Role: co-PI
Level of effort: 2.88 calendar months
Point of contact at the funding agency: SHABESTARI, BEHROUZ SHABESTB@MAIL.NIH.GOV

Kelcz, Frederick

ACTIVE

R01 EB020521-01 (Chen, GH and Li, K)
Project title: Multi-Contrast X-Ray Breast Imaging
Funding agency: NIH/NIBIB
Project goal: Develop a phase contrast digital breast tomosynthesis system and evaluate its potential utility in improving the sensitivity and specificity of breast cancer diagnosis through pilot human subject studies.
Start and end date: 01/01/2016-12/31/2019
Role: Co-investigator
Level of effort: 1.2 calendar months
Point of contact at the funding agency: SHABESTARI, BEHROUZ SHABESTB@MAIL.NIH.GOV

Fowler, Amy

ACTIVE

Translational Cancer Research Grant (Fowler)
Project Title: Impact of Activating Mutations in the Estrogen Receptor Alpha Gene on Quantitative 18F-Fluoroestradiol Imaging of Breast Cancer
Funding agency: Mary Kay Charitable Foundation
Project goal: The goal of this research is to determine the impact of endocrine-resistant ER variants on the quantitative accuracy of FES PET imaging using a cohort of breast cancer patient-derived xenograft tumors.
Role: Principal Investigator
Start and end date: 07/01/18-06/30/20
Level of effort: 0.6 calendar months

KL2TR000428 (PI: Drezner)
Project Title: [18F]FFNP-PET Imaging of Progesterone Receptor as a Biomarker of Endocrine Sensitivity in Patients with Breast Cancer
Funding agency: NIH/NCATS-Institutional Clinical and Translational Science (ICTR)
Project goal: Goal is to test 1) the precision and accuracy of quantitative FFNP-PET imaging and 2) whether it can distinguish endocrine-sensitive from endocrine-resistant ERα+PR+ breast cancers.
Role: KL2 Scholar
Start and end date: 01/01/2016-present
Level of effort: 9 calendar months
Point of contact at the funding agency: PEGGY HATFIELD pmhatfie@wisc.edu

NOTE: In this DOD Breakthrough Award, Dr. Amy Fowler was listed as a co-investigator with an effort of 1.2 calendar months per year from Years 2 to 3. However, Dr. Fowler was selected to become one of the KL2 awardees at our institution (listed above). This award requires a 75% commitment of research time, and the goal of this award is to establish Dr. Fowler as a clinician-scientist, enabling the clinical translation of new technologies, such as that which will be developed in our project. Due to the scientific overlap between Dr. Folwer's proposed work on the DOD award and the career development goals defined in her KL2 award, her contribution to Dr. Li's DOD award is synergistic with her ICTR KL2 research project. Both investigators are studying novel imaging methods for improved detection and characterization of breast cancer. Furthermore, one of Dr. Fowler's career goals is to move breast imaging to both a more molecular and quantitative level.

COMPLETED

Collaborative Cancer Research Award (Fowler)
Funding agency: UW-Madison Carbone Cancer Center
Project Title: Positron Emission Tomography/Magnetic Resonance Imaging of Estrogen Receptor Expression in Non-Invasive Breast Cancer
Project goal: The study objective is to test the diagnostic accuracy of FES PET combined with dynamic contrast enhanced magnetic resonance imaging for measuring ER in patients with non-invasive breast cancer.
Role: Principal Investigator
Start and end date: 01/01/18-12/31/18
Level of effort: 0.24 calendar months
Point of contact at the funding agency: Ana Garic, ana.garic@wisc.edu

Friedl, Andreas

ACTIVE

UM1 CA186716-02 (Dipaola & Liu)
Project Title: Wisconsin and New Jersey Alliance in Precision Experimental Therapeutics
Funding agency: RBHS -CANCER INSTITUTE OF NEW JERSEY
Project goal: To merge two strong prior Phase I (U0l) sites to create the Wisconsin and New Jersey Alliance in Precision Experimental Therapeutics (WIN-Alliance). This group, as a synergistic, multidisciplinary and multi-institutional model, will develop and evaluate innovative, early phase experimental therapeutic clinical trials to improve clinical outcomes
Start and end date: 03/19/2014-02/28/2019
Role: Co-investigator
Level of effort: 0.36 calendar months
Point of contact at the funding agency: Ivy, S. Percy ivyp@ctep.nci.nih.gov

U01 CA189283-01A1 (Seewaldt)
Project Title: Combined breast MRI/biomarker Strategies to Identify Aggressive Biology
Funding agency: NIH/NCI
Project goal: The goal of this research is to test from the bench to the clinic the hypothesis that loss of the tumor suppressor WWOX 1) in preclinical models mechanistically activates of glycolysis in metastatic TNBC via transcriptional activation HIF1α and 2) in primary and metastatic TNBC activates metabolism as measured by Fluorescence Lifetime Imaging (FLIM).
Start and end date: 8/1/2015-7/31/2020
Role: Co-investigator
Level of effort: 0.3 calendar months
Point of contact at the funding agency: MAZURCHUK, RICHARD V mazurchukrv@mail.nih.gov

R01 EB020521-01 (Chen, GH and Li, K)
Project title: Multi-Contrast X-Ray Breast Imaging
Funding agency: NIH/NIBIB
Project goal: Develop a phase contrast digital breast tomosynthesis system and evaluate its potential utility in improving the sensitivity and specificity of breast cancer diagnosis through pilot human subject studies.
Start and end date: 01/01/2016-12/31/2019
Role: Co-investigator
Level of effort: 0.6 calendar months
Point of contact at the funding agency: SHABESTARI, BEHROUZ SHABESTB@MAIL.NIH.GOV

5R01CA142833-08 (Friedl & Hahn)
Project Title: Mechanisms of Cell Migration on 3D Aligned Matrices
Funding agency: NIH/NCI
Project goal: This project investigates the molecular mechanisms by which breast cancer cells are able to recognize and make use of aligned collagen for efficient invasion leading to metastasis.
Start and end date: 12/17/2009-11/30/2020
Role: PI
Point of contact at the funding agency: WOODHOUSE, ELIZABETH elisa@mail.nih.gov

2018-19 Fall Competition Award (Friedl)
Project Title: Stromal Syndecan-1 in Breast Carcinoma Metastasis
Funding agency: UW-Madison
Project goal: It has been documented that Syndecan-1 (Sdc1), a cell surface heparan sulfate proteoglycan, regulates the in vitro organization of a fibroblast-constructed extracellular matrix (ECM) that thus creates an invasion-permissive microenvironment. Therefore, we seek to characterize the role of stromal Sdc1 in cancer progression in vivo.
Start and end date:07/01/2018-06/30/2019
Role: PI
Level of effort: 0.12 calendar months
Point of contact at the funding agency: Marsha Mailick arsha.mailick@wisc.edu

What other organizations were involved as partners?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe partner organizations – academic institutions, other nonprofits, industrial or commercial firms, state or local governments, schools or school systems, or other organizations (foreign or domestic) – that were involved with the project. Partner organizations may have provided financial or in-kind support, supplied facilities or equipment, collaborated in the research, exchanged personnel, or otherwise contributed.
Provide the following information for each partnership:
Organization Name:
Location of Organization: (if foreign location list country)
Partner's contribution to the project (identify one or more)

- *Financial support;*
- *In-kind support (e.g., partner makes software, computers, equipment, etc., available to project staff);*
- *Facilities (e.g., project staff use the partner's facilities for project activities);*
- *Collaboration (e.g., partner's staff work with project staff on the project);*
- *Personnel exchanges (e.g., project staff and/or partner's staff use each other's facilities, work at each other's site); and*
- *Other.*

Nothing to Report.

8. SPECIAL REPORTING REQUIREMENTS

COLLABORATIVE AWARDS: N/A

QUAD CHARTS: N/A

9. APPENDICES: No appendix to attach.