

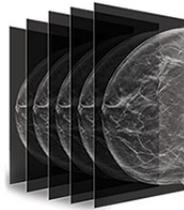


Never stop looking®

PowerLook® Tomo Detection Software

Version 1.1

Labeling and User Manual



Regulatory Requirements:

PowerLook® Tomo Detection Software complies with the regulatory requirements of the following:

- EN ISO 13485:2012 entitled Medical devices.
- Quality Management Systems Requirements for regulatory purposes, FDA 21 CFR Part 820 entitled Quality System Regulation (QSR).
- Medical Device Vigilance System MEDDEV 2.12/1
- European Medical Device Directive 93/42/EEC
- Canadian Medical Devices Regulations SOR 98-282

**PowerLook® Tomo Detection
Software**

 CE 0473

 Manufacturer:

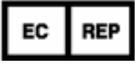
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European Authorized Representative:

 EC REP

MDSS GmbH
Schiffgraben 41
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Explanation of Symbols used marking the PowerLook® Tomo Detection Software:

Symbol	Description
	Manufacturer
	Date of Manufacture
	Refer to Manual
	<u>WARNING</u> Warnings are directions which, if they are not followed, can cause fatal or serious injuries to a patient or users.
	<u>CAUTION</u> Cautions are directions which, if they are not followed, can cause damage to the equipment described in this manual.
	<u>NOTE</u> Notes provide advice and highlight unusual points. A note is not intended as an instruction.
	CE Mark
	Authorized representative in the European Community
SN	Serial Number
REF	Model or Catalogue Number

 **CAUTION:** Federal law restricts the sale, distribution, and use of this device to or on the order of a physician.

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1 Overview of Manual

This manual describes the PowerLook® Tomo Detection Software and provides training to radiologists on the use of the PowerLook® Tomo Detection Software.

- Section 2 provides the PowerLook® Tomo Detection Software device labeling.
- Section 3 describes how a radiologist should use the PowerLook® Tomo Detection Software.
- Section 4 includes reference documentation

1.1 Reference Documents

- DTM144, PowerLook AMP Service Manual
- 5415896-3-1EN GE SenoClaire Operator Manual

2 PowerLook® Tomo Detection Software Device Labeling

2.1 Indications for Use

The iCAD PowerLook® Tomo Detection Software is a computer-assisted detection (CAD) software device intended to be used concurrently by radiologists while reading GE SenoClaire breast tomosynthesis exams. The system detects up to five soft tissue densities (masses, architectural distortions and asymmetries) in the 3D tomosynthesis images. The detections are blended with the standard 2D synthetic image and the CAD-enhanced 2D synthetic image is viewed on a mammography review workstation.

The CAD-enhanced 2D synthetic image assists radiologists in identifying densities (masses, architectural distortions and asymmetries) that may be confirmed or dismissed by the radiologist in the digital breast tomosynthesis (DBT) images.

2.2 Device Description

The iCAD PowerLook® Tomo Detection Software in conjunction with the GE SenoClaire Digital Breast Tomosynthesis and a mammography review workstation create a CAD-enhanced 2D synthetic image that can allow radiologists to review tomosynthesis images more quickly with no impact to the radiologist's performance. The product detects soft tissue densities (masses, architectural distortions and asymmetries) in the 3D tomosynthesis images. A blending algorithm then processes the CAD detections from the 3D planes and merges them onto GE's existing 2D volume preview ("V-Preview") synthetic image and the mammography review workstation displays the CAD-enhanced 2D synthetic image.

2.3 Warnings



- Blended areas on the Enhanced V-Preview image may obscure other areas of interest that may have been visible on the unenhanced V-Preview image.

- Incorrect implementation of the CAD-enhanced synthetic image can lead to an inability to view the CAD-enhanced image or the inability to navigate into the 3D dataset using the product.
- The CAD does not detect any microcalcifications and also may miss some soft tissue densities (masses, architectural distortions and asymmetries) so a complete review of the whole set of images indicated by the GE Senoclaire DBT system is necessary to identify calcifications and other breast lesions that CAD may have missed.
- The safety and effectiveness in patients with breast implants has not been established for views that include the implant. When non-displaced implant views are analyzed by the system, the CAD enhanced V-Preview images should not be used.
- The safety and effectiveness of CAD has not been established for non-standard mammographic views (e.g., magnification/compression views). When these views are analyzed by the system, the CAD enhanced V-Preview images should not be used.
- The safety and effectiveness of CAD has not been established for the following standard mammographic views (CC, ML, LM, SIO, XCCL, XCCM).

2.4 Adverse Effects

The PowerLook® Tomo Detection Software may increase your false-positive rates for both screening and diagnostic mammography. Increased false-positives may lead to unnecessary additional imaging radiation exposure, biopsy, patient anxiety, etc.

2.5 Clinical Study

The pivotal reader study used a multi-reader, multi-case (MRMC) cross-over design with an enriched sample of 240 cases and 20 tomosynthesis radiologist readers to compare clinical performance of radiologists using CAD-enhanced synthetic 2D V-Preview images with GE DBT images (“with CAD”) to that of radiologists using GE DBT without CAD-enhanced 2D V-Preview images (“without CAD”).

The co-primary objectives of the pivotal reader study were to determine:

- 1) Whether radiologist performance when using CAD with GE DBT images is non-inferior to radiologist performance when using GE DBT images without CAD, and
- 2) Whether radiologist reading time when using CAD with GE DBT images is superior to (shorter than) radiologist reading time when using GE DBT images without CAD.

Radiologist performance was assessed by measuring Area Under the Receiver Operating Characteristic (ROC) Curve (AUC) for the detection of malignant lesions in the pivotal reader study.

Successful demonstration of safety and effectiveness of using CAD with GE DBT compared to using GE DBT without CAD was defined as:

- 1) The lower limit of the two-sided 95% confidence interval for the difference in average AUC with CAD – without CAD lies above the negative of the non-inferiority margin, -0.05, and
- 2) The lower limit of the two-sided 95% confidence interval for the difference in average reading time with CAD – without CAD lies below zero, i.e., if reading time decreases.

Secondary objectives of the pivotal reader study included non-inferiority and possible superiority of radiologist sensitivity, specificity and recall rate, and possible superiority of AUC.

Additional objectives of the pivotal study were to determine the results of a CAD standalone performance assessment. The standalone performance assessment measured CAD performance without a radiologist.

2.5.1 Study Cases

Five-hundred and twenty-five (525) GE DBT cases meeting the inclusion and exclusion criteria for this study were retrospectively collected from five (5) image acquisition sites. Two-hundred and forty (240) of these 525 cases were selected for the pivotal reader and standalone studies.

Data from three (3) French sites were collected under iCAD's tomosynthesis data collection protocol in compliance with French Data Protection Law and de-identified; informed consent was waived by the French Data Protection Authority, Commission nationale de l'informatique et des libertés (CNIL). Anonymized collection of existing data from two (2) US sites was performed under the same protocol with Institutional Review Board (IRB) approval for the data collection and waiver of informed consent.

Inclusion Criteria:

1. Female subjects
2. Subjects 18 or more years old
3. Subjects undergoing a bilateral screening or diagnostic tomosynthesis exam with GE Senoclaire, which must include at least bilateral 2D Craniocaudal (CC) FFDM images and bilateral Mediolateral Oblique (MLO) DBT images (2D V-Preview, 3D slabs, 3D planes and 2D projections)
4. Imaging characteristics consistent with Mammography Quality Standards Act (MQSA) in terms of positioning, compression, exposure level, dose, contrast, sharpness, noise and artifacts
5. Subjects with breast implants were permitted if implant-displaced views are available for the required images: 2D CC FFDM images and MLO DBT images (2D V-Preview, 3D slabs, 3D planes and 2D projections)
6. "Regulatory" cases, which are clinical and image data that is controlled by Quality & Regulatory Affairs (QA/RA) and were blinded to R&D (i.e., unavailable to R&D)
7. Recalled, Benign and Cancer cases were required to have additional mammographic views showing the location of the lesion (e.g., magnification and/or spot compression views, screenshots, needle-localization or biopsy images, etc.) and/or annotations by the contributing site radiologists outlining the lesion with the GE MammoWorkstation and/or radiology reports describing the location of the lesion for the truthing process

Exclusion Criteria:

1. Subjects with a personal history of breast cancer
2. Subjects with imaging evidence of previous surgery (e.g., surgical clips visible on images); these women were excluded because readers were not provided patient history or prior exams during the pivotal reader study which would have been important in the assessment of these women's images; subjects with breast reduction surgery were not excluded and were permitted

3. “Development” cases, which are clinical and image data that were not blinded to Research & Development (R&D) (i.e., available to R&D)

All 525 cases were categorized as one of the following types:

- 264 Negative Cases

No BI-RADS 0, 3, 4 or 5 lesions detected by radiologist on tomosynthesis exam interpreted as BI-RADS 1 or 2 and no cancers were found. Negative cases had at least one confirming normal tomosynthesis exam or 2D mammogram (BI-RADS 1 or 2) at least one year (320 or more days) after the study tomosynthesis exam.

- 71 Recalled Cases

Lesion(s) detected by radiologist on screening tomosynthesis exam interpreted as BI-RADS 0 where no biopsy was warranted due to subsequent negative imaging work-up. Data collection sites may not have used BI-RADS 0 if they performed an imaging work-up, when needed, immediately after the screening the exam while the patient was still in the facility. Since the patient had an immediate diagnostic work-up, a final BI-RADS assessment category was used (which does not include BI-RADS 0). Recalled cases had at least one confirming normal tomosynthesis exam or 2D mammogram (BI-RADS 1 or 2) at least one year (320 or more days) after the study tomosynthesis exam.

- 86 Benign Cases

Lesion(s) detected by radiologist on tomosynthesis exam interpreted as BI-RADS 3, 4 or 5 in a patient who had a breast biopsy within one year (365 or less days) of the tomosynthesis exam that was benign. Benign lesions included high-risk lesions lobular carcinoma in-situ, atypical ductal hyperplasia, atypical lobular hyperplasia, and papillomas.

- 104 Cancer Cases

Lesion(s) detected by radiologist on tomosynthesis exam interpreted as BI-RADS 3, 4, or 5 in a patient who had a breast biopsy within one year (365 or less days) of the tomosynthesis exam that was malignant. Malignant lesions did not include high-risk lesions including lobular carcinoma in-situ, atypical ductal hyperplasia, atypical lobular hyperplasia and papillomas.

Each case was truthed by one “expert” breast imaging radiologist. The same individual truthing radiologist truthed every case. The reference standard for Cancer and Benign cases was biopsy proof. The reference standard for Recalled cases was BI-RADS 0 without biopsy and normal imaging at least one year (320 or more days inclusive) later. The reference standard for Negative cases was normal one-year follow-up imaging (320 or more days inclusive).

The 240 cases for the pivotal reader and standalone studies were selected from the 525 cases eligible for the studies. The 240 cases were randomly selected with a stratification tool to meet the stratification targets based on the case and lesion characteristics established by the truthing process. All required targets were met. Case and lesion characteristics for the 240 selected cases are shown in **Table 1**. Selected cases were from women aged 29 – 86 with a median age of 57 (interquartile range 49 – 64) and a mean age of 56.5 (standard deviation 10.8).

Table 1: Stratified Dataset

Case Characteristic Criteria	240 Selected Cases
Patient Criteria	
Breast density	121/240 (50.4%)
<ul style="list-style-type: none"> • Almost entirely fatty or scattered areas of fibroglandular density • Heterogeneously dense or Extremely dense breasts 	119/240 (49.6%)
Negative Cases Criteria	
BI-RADS 1 or 2: not suspicious, no recall, no biopsy, not cancer	102/240 (42.5%)
<ul style="list-style-type: none"> • BI-RADS 1 	75/102 (73.5%)
<ul style="list-style-type: none"> • BI-RADS 2 	27/102 (26.5%)
Recalled Cases Criteria	
BI-RADS 0: suspicious, recall, but no biopsy warranted	20/240 (8.3%)
<ul style="list-style-type: none"> • Soft tissue densities <ul style="list-style-type: none"> ◦ Soft tissue densities and calcifications 	16/20 (80.0%) 1/20 (5.0%)
<ul style="list-style-type: none"> • Calcifications only 	4/20 (20.0%)
Benign Cases Criteria	
BI-RADS 3, 4 or 5: suspicious, recall, biopsy-proven benign, not cancer	57/240 (23.8%)
<ul style="list-style-type: none"> • Soft tissue densities <ul style="list-style-type: none"> ◦ Soft tissue densities and calcifications 	40/57 (70.2%) 5/57 (8.8%)
<ul style="list-style-type: none"> • Calcifications only 	17/57 (29.8%)
Cancer Cases Criteria	
BI-RADS 3, 4 or 5: suspicious, recall, biopsy-proven cancer	61/240 (25.4%)
<ul style="list-style-type: none"> • Soft tissue densities <ul style="list-style-type: none"> ◦ Soft tissue densities and calcifications 	48/61 (78.7%) 9/61 (14.8%)
<ul style="list-style-type: none"> • Calcifications only 	13/61 (21.3%)
<ul style="list-style-type: none"> • Invasive cancer (all ≤ 2.5 cm in size) <ul style="list-style-type: none"> ◦ Proportion ≤ 1.4 cm in size ◦ Proportion invasive lobular cancer 	50/61 (82.0%) 27/50 (54.0%) 7/50 (14.0%)
<ul style="list-style-type: none"> • DCIS (no size restriction) 	11/61 (18.0%)

2.5.2 Study Readers

All 20 readers had American Board of Radiology certification, qualified to interpret mammograms under MQSA and had completed eight hours of initial training in breast tomosynthesis as required by the FDA. Readers were currently reading tomosynthesis exams, having interpreted more than 500 tomosynthesis exams in the last two years.

Readers had a range of experience in the interpretation of breast images with 55% (11/20) of readers devoting less than 75% of their professional time to breast imaging for the last 3 years and 45% (9/20) devoting 75% or more of their professional time to breast imaging for the last 3 years. Additional reader characteristics are provided in **Table 2**. None of the readers were involved with acquisition of any of the study cases.

Table 2: Summary of Study Reader Experience: N (%) unless otherwise noted

	Radiologists (N = 20)
<i>Years in Practice</i>	
Median (IQR)	14.5 (8.0 - 20.5)
Range	1.0 - 43.0
Mean (SD)	15.45 (10.86)
<i>Specialized Mammography Training</i>	
Yes	5 (25)
No	15 (75)
<i>Average Hours Spent in a Clinical Day</i>	
7	1 (5)
8	2 (10)
9	1 (5)
9.5	16 (80)
<i>75% or More of Professional Time Devoted to Breast Imaging for the Last 3 Years</i>	
Yes	9 (45)
No	11 (55)
IQR = interquartile range, 25th percentile through 75th percentile. SD = standard deviation.	

Readers did not participate in the truthing process for any of the pivotal reader or standalone study cases.

Readers were trained on the reading procedures of this study with 30 tomosynthesis cases. Since the readers were fully certified to interpret tomosynthesis exams and were currently reading tomosynthesis exams in their clinical practices, no additional tomosynthesis interpretation training was provided. The training provided to the readers in the study focused on use of the CAD-enhanced 2D V-Preview image to assist in identifying soft tissue densities (masses, architectural distortions and asymmetries) and using the GE MammoWorkstation to efficiently navigate to the corresponding locations in the 3D planes of potential lesions identified by the reader on the CAD-enhanced 2D V-Preview image. The readers then trained to confirm or dismiss the finding as they typically do so in their clinical practices.

During the training, the readers were instructed that the iCAD PowerLook® Tomo Detection Software enhances soft tissue densities, but not calcifications. As a result, if a mass is detected above or below a group of calcifications in the 3D planes, blending of the mass into the CAD-enhanced 2D V-Preview image may obscure the group of calcifications. Therefore, readers were trained not to rely on the CAD-enhanced 2D V-Preview images for assistance in identifying calcifications. Rather, readers should use the 3D slabs, 3D planes and standard 2D V-Preview images and rely primarily on the 2D FFDMs for detection and characterization of calcifications.

The readers were not informed of the proportion of case types included in the pivotal reader study, but were instructed that the cases included a mixture of screening and diagnostic exams with a

higher proportion of cancer cases than typically found in these populations. The 30 training cases were not included in the 240 pivotal reader study cases.

2.5.3 Study Execution

The pivotal reader study radiologists assessed 2D FFDM and DBT exams from women presenting for bilateral screening or diagnostic tomosynthesis exams. The FFDM and DBT exams were assessed with and without CAD with a cross-over design such that each case was read by each reader both with and without CAD. There was a 4-week or more washout period in between readings of the same case with and without CAD. The readings were conducted by Intrinsic Imaging, LLC (Bolton, MA), an imaging Clinical Research Organization (CRO), at their reading facility in San Antonio, TX.

As shown in **Figure 4**, half of the 240 cases were read by each reader with CAD and half without CAD in the first reading session. The cases read by each reader with CAD in the first reading session were read without CAD in second reading session, and the cases read without CAD in the first reading session were read with CAD in the second reading session. A fully crossed design was used such that all of the 240 cases were read by each reader both with and without CAD. The case reading order was randomized separately for each reader.

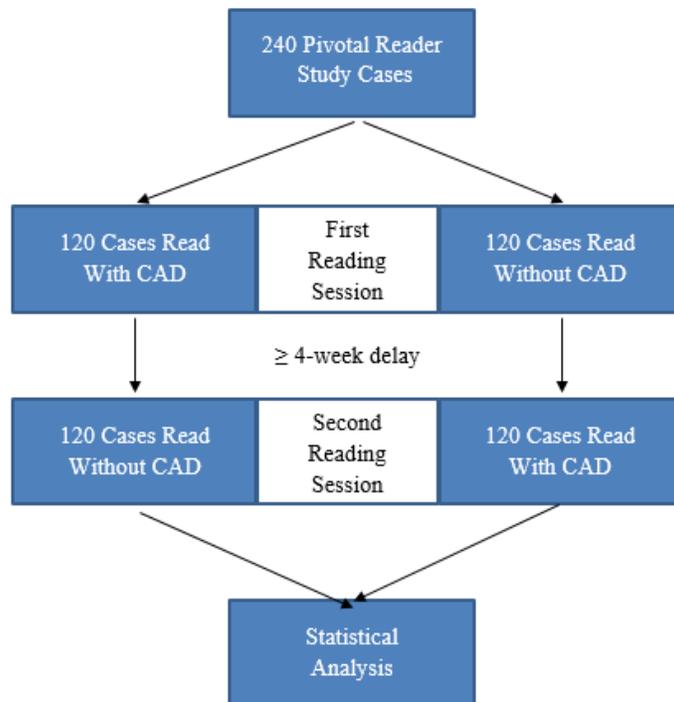


Figure 4: Distribution of Pivotal Reader Study Cases in Reading Sessions

The following images from both breasts of each case were available to each study radiologist in the control arm (cases read without CAD) of the study:

- 2D CC FFDM + standard 2D MLO V-Preview images

- 3D MLO planes
- 3D MLO slabs

The following images from both breasts of each case were available to each study radiologist in the intervention arm (cases read with CAD) of the study:

- 2D CC FFDM + standard 2D MLO V-Preview images
- 2D MLO CAD-enhanced V-Preview with navigation to 3D MLO DBT planes at locations of potential lesions
- 3D MLO slabs
- 3D MLO planes

The readers were not provided prior images or patient history during their review of the pivotal study cases in the control or intervention arms. The GE MammoWorkstation was used by the readers to review and assess the cases.

The reader completed a case report form (CRF) for each case for the two (2) reads (without CAD, with CAD). For each case on each read, the reader first recorded whether or not one or more lesions were suspicious enough in each case that he or she would recommend recall, short-interval follow-up, or tissue diagnosis (Yes or No). If the answer to this question was “Yes”, the reader was asked to provide detailed information on each suspicious finding:

- Location. The reader used a tool in the GE MammoWorkstation to annotate the specific location of the finding on the right CC, left CC for FFDM; right MLO, left MLO for standard V-Preview and 3D Planes.
- Mammographic appearance as soft tissue density, calcifications or mixed soft tissue density and calcifications. If soft tissue density or mixed, also whether non-spiculated mass, spiculated mass, architectural distortion or asymmetry.
- “Forced” BI-RADS assessment category 1, 2, 3, 4a, 4b, 4c, or 5. The case-level forced BI-RADS was computed as the highest lesion-level forced BI-RADS in the case.
- Level of Suspicion (LOS) score 0 through 100%. The case-level LOS was computed as the highest lesion-level LOS in the case.

If the answer to the first question was “No”, the reader was asked to provide a case-level forced BI-RADS assessment category of 1, 2, 3, 4a, 4b, 4c, or 5 and a case-level LOS score (0 through 100%).

Readers also provided breast density (fatty, scattered fibroglandular, heterogeneously dense, extremely dense) for each case. For measuring reading time, the reader clicked “start” when she or he began viewing the images in the case, and “end” when she or he had finished reviewing the images in order to determine whether or not one or more lesions were present in the case for which this reader would recommend recall, short-interval follow-up, or tissue diagnosis. Reading time in seconds was calculated as the time between these entries. The reading time did not include the time needed to document the lesion location with the GE MammoWorkstation tool or to document the lesion and case characteristics in the CRF. Readers were informed that reading time was being measured and that the PowerLook® Tomo Detection Software was intended to reduce reading time, but readers were blinded to the reading time measurements for each case.

Consistency of BI-RADS scores and LOS scores was not forced – i.e., readers were permitted to use the full range of LOS scores for a finding no matter what BI-RADS score they assigned to it.

Lesion matching was performed by a validated electronic matching software tool. A reader's finding was considered to match a breast cancer if the center point of the lesion location identified by the reader as a finding was within or coincident with the final outline of the malignant lesion, extended to the top and bottom delimiting planes of the lesion, as determined by the truthing process. Visual confirmation of this matching was used to confirm that the electronic results were accurate.

A CAD standalone performance assessment was also conducted as part of this pivotal study. The standalone performance assessment measured CAD performance without a radiologist.

2.5.4 Pivotal Study Primary Results

The co-primary endpoints of the pivotal reader study were met. The primary pivotal study results are summarized as follows:

- **Co-Primary Endpoints:**
 - **Area Under the ROC Curve (AUC): Non-inferiority:** Radiologist performance when using CAD with GE DBT images is non-inferior to radiologist performance when using GE DBT images without CAD, for non-inferiority margin $\delta = 0.05$. Average AUC increased by 0.009 (95% CI: -0.012, 0.030; non-inferiority $p < 0.01$), from 0.841 without CAD to 0.850 with CAD. Average empirical ROC plots across readers with and without CAD are similar to each other as shown in **Figure 5**.
 - **Radiologist reading time: Superiority:** Radiologist reading time when using CAD with GE DBT images is superior to (shorter than) radiologist reading time when using GE DBT images without CAD. Reading time improved 29.2% with CAD (95% CI: 21.1%, 36.5%; $p < 0.01$). These values were obtained through back-transformation from statistical inferences performed using the normalizing transformation $\ln(\% \text{ difference} + 100) - \ln(100)$, because % difference was not bell-shaped. The average decrease in reading time was 19.6 seconds (95% CI: 12.6 seconds, 26.6 seconds; $p < 0.01$).

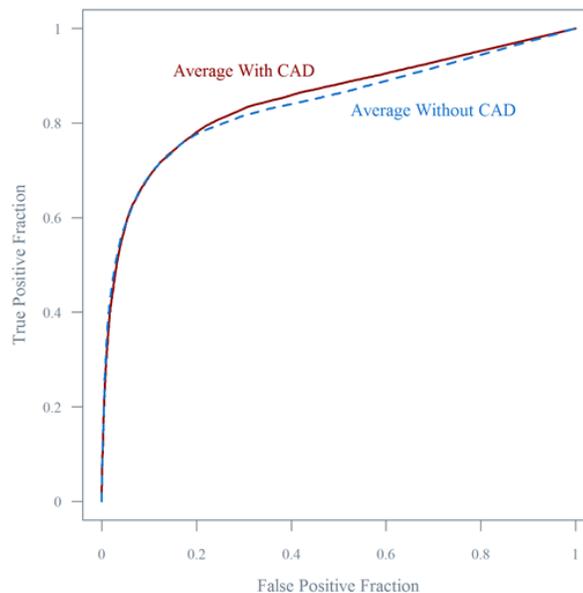


Figure 5: Average of Empirical ROC Plots with and without CAD

2.5.5 Pivotal Study Secondary Results

The first secondary endpoint of the pivotal reader study was met. The secondary pivotal study results are summarized as follows:

- **Secondary Endpoints:**

- **Lesion-level sensitivity: Non-inferiority:** The study demonstrated non-inferior lesion-level sensitivity using CAD with GE DBT compared to using GE DBT without CAD, for non-inferiority margin $\delta = 0.05$. Average lesion-level sensitivity increased by 0.021 (95% CI: -0.007, 0.050; non-inferiority $p < 0.01$), from 0.823 without CAD to 0.845 with CAD.
- **Lesion-level sensitivity: Superiority:** Non-inferior lesion-level sensitivity was proved, so superiority was tested. Superior lesion-level sensitivity was not proved ($p = 0.14$).
- **AUC: Superiority:** Superiority of AUC was not tested because the preceding step in the pre-specified, fixed sequence of hypothesis testing, superior lesion-level sensitivity, was not proved.

The following secondary endpoints were explored. The following were observed in the clinical study:

- **Sensitivity (per-subject):** Average sensitivity was 0.847 without CAD, and 0.871 with CAD.
 - **Sensitivity for Calcifications:** With respect to sensitivity in the subgroup of 13 cancer cases with only calcifications, 0.881 was observed without CAD, and 0.873 with CAD.
 - **Sensitivity for Soft Tissue Densities:** Performance in the subgroup of 48 cancer cases with at least one soft tissue density or mixed lesion was observed to be 0.837 without CAD, and 0.871 with CAD.
- **Specificity:** Average specificity was observed to be 0.527 without CAD, and 0.509 with CAD.
- **Recall rate for non-cancer cases:** Average recall rate was observed to be 0.474 without CAD, and 0.492 with CAD.

2.5.6 CAD Standalone Study

A summary of the results of the standalone testing is shown in **Table 3** below:

Table 3: CAD Standalone Performance

N for Soft Tissue Densities = 52 malignant lesions with 43 soft tissue density only lesions and 9 mixed lesions in 48 cases with 39 soft tissue density only cases and 9 mixed cases.

N for Soft Tissue Densities and Calcifications = 68 malignant lesions with 43 soft tissue density only lesions, 16 calcifications only lesions and 9 mixed lesions in 61 cases with 39 soft tissue density only cases, 13 calcifications only cases and 9 mixed cases.

	Lesion-Level with 95% CIs	Case-Level with 95% CIs
CAD Sensitivity for Soft Tissue Densities	0.923 (48/52) 0.849~0.997	0.917 (44/48) 0.804~0.967
CAD Sensitivity for Soft Tissue Densities and Calcifications*	0.706 (48/68) 0.588~0.824	0.721 (44/61) 0.598~0.818
CAD Detection Rate per Image: 5	--	--

* Note: calcifications are not detected by iCAD’s PowerLook® Tomo Detection Software.

Table 4: Truthing Radiologist’s Visibility Sensitivity*

N for Soft Tissue Densities = 52 malignant lesions with 43 soft tissue density only lesions and 9 mixed lesions in 48 cases with 39 soft tissue density only cases and 9 mixed cases.

N for Soft Tissue Densities and Calcifications = 68 malignant lesions with 43 soft tissue density only lesions, 16 calcifications only lesions and 9 mixed lesions in 61 cases with 39 soft tissue density only cases, 13 calcifications only cases and 9 mixed cases.

	Lesion-Level with 95% CIs	Case-Level with 95% CIs
Standard 2D V-Preview Sensitivity for Soft Tissue Densities	0.519 (27/52) 0.372~0.667	0.521 (25/48) 0.383~0.655
Standard 2D V-Preview Sensitivity for Soft Tissue Densities and Calcifications	0.632 (43/68) 0.506~0.758	0.623 (38/61) 0.497~0.734
CAD-enhanced 2D V-Preview Sensitivity for Soft Tissue Densities	0.904 (47/52) 0.824~0.984	0.917 (44/48) 0.804~0.967
CAD-enhanced 2D V-Preview Sensitivity for Soft Tissue Densities and Calcifications	0.912 (62/68) 0.844~0.979	0.918 (56/61) 0.822~0.964

* Note: If the lesion was judged by the truthing radiologist to be visible enough on the standard 2D V-preview image to be detected in clinical practice by a radiologist without knowledge that the lesion was present in the case, then the lesion was considered visible (i.e., a TP in the sensitivity computation).

2.6 Detailed Device Description

The iCAD PowerLook® Tomo Detection Software processes images from a tomosynthesis acquisition station and produces a DICOM Mammography CAD Structured Report identifying soft tissue densities that can be combined with the GE V-Preview image to create a CAD-enhanced 2D synthetic image to aid in the workflow for the radiologist. Tomosynthesis acquisition stations typically have the following Digital Imaging and Communication in Medicine (DICOM) outputs:

- Two-dimensional (2D) raw X-Ray image projection view, known specifically as a DICOM Digital Mammography X-Ray “For Processing” image. Typically multiple cranio-caudal (CC) images and multiple medio-lateral oblique (MLO) images will be acquired for each breast as the acquisition station is positioned at different angles for each image.
- Two-dimensional (2D) presentation X-Ray image projection view, known specifically as a DICOM Digital Mammography X-Ray “For Presentation” image. Typically multiple cranio-caudal (CC) images and multiple medio-lateral oblique (MLO) images will be acquired for each breast as the acquisition station is positioned at different angles for each image.
- Three-dimensional (3D) presentation X-Ray image reconstructed slices, known specifically as a DICOM Digital Mammography X-Ray “For Presentation” image. Typically there are multiple cranio-caudal (CC) slices and multiple medio-lateral oblique (MLO) slices reconstructed for each breast that are used to simulate a 3D image.



Note: The 3D reconstructed slices can either be thin slices or thick slice (multiple thin slices used to create a single slab) that are derived from the original 2D projection images.

The iCAD PowerLook® Tomo Detection software processes the images from the tomosynthesis acquisition station and produces:

- A DICOM Digital Mammography CAD Structured Report (SR) that can be combined with the GE V-Preview image to create a CAD-enhanced 2D synthetic image

2.7 Conformance to Standards

Refer to the PowerLook AMP® Service Manual for the CE Declaration of Conformity.

2.8 Description of Accessories

There are two “accessory” products used with iCAD’s PowerLook® Tomo Detection Software, an acquisition workstation that is used to acquire 2D and 3D breast tomosynthesis* breast images and a mammography review station.

* Supplied by the GE Corporation.

2.9 Installation

DTM144 PowerLook AMP® Service Manual outlines the installation process, it describes how to system is to be installed, configured and tested to ensure that it meets all product requirements.

3 Radiologist Use of PowerLook® Tomo Detection Software

3.1 GE V-Preview Synthetic Image

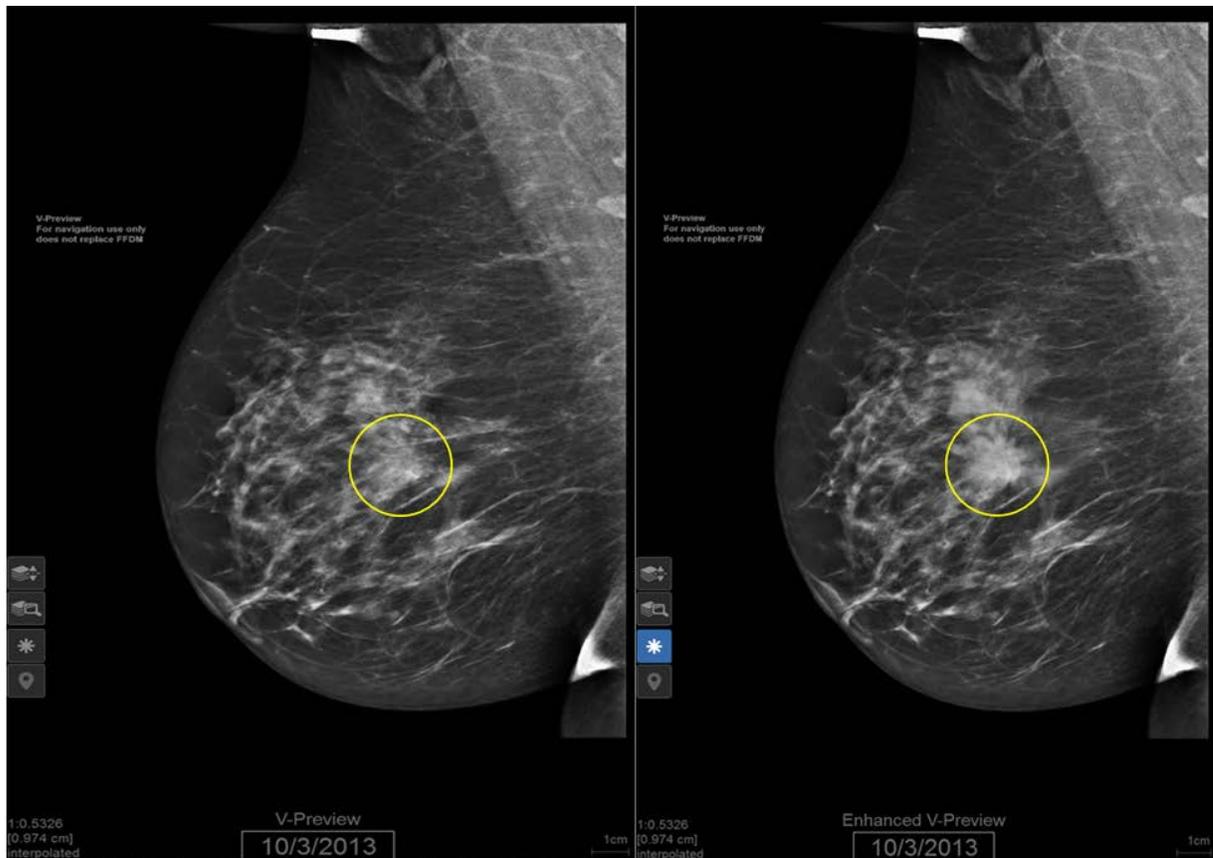
The GE V-Preview is a 2D image generated from the raw DBT projection data that helps the user get an overview of the entire stack, before examining the planes in the corresponding DBT set. V-Preview is a navigation tool, and is not intended for diagnostic use. V-Preview has not been shown to be equivalent to FFDM. It is not intended to replace the FFDM view.

3.2 CAD-Enhanced V-Preview Synthetic Image

Enhanced V-Preview images are additional V-Preview images provided to the user, where V-Preview images are blended with regions from their corresponding DBT images. In these CAD-enhanced V-Preview images, regions of interest detected by the iCAD PowerLook® Tomo Detection Software are overlaid with the related segment of a DBT image containing the structure of the detection as shown in the images below.

V-Preview

CAD-enhanced V-Preview

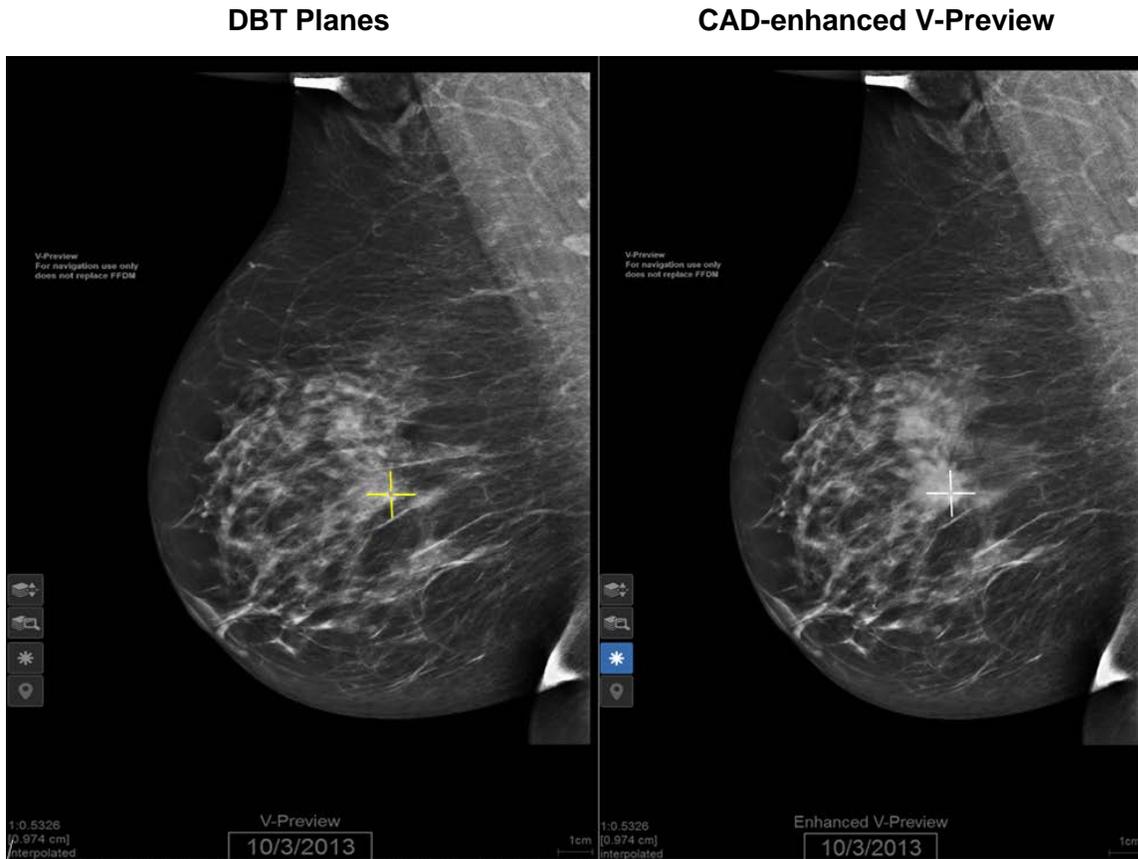


The Enhanced V-Preview image can contain up to five areas of detection. The areas of detection are not marked specifically, so the user is not overtly influenced by the CAD system’s findings.

The yellow circles in the above images are not shown to the user, but are only to point out the enhanced malignant mass in this example. When iCAD's PowerLook® Tomo Detection Software is present, the Enhanced V-Preview image is meant to be used concurrently by radiologists while reading GE SenoClaire DBT images in order to assist them in identifying soft tissue densities (masses, architectural distortions and asymmetries) that may be dismissed by the radiologist in the 3D tomosynthesis images.

3.3 V-Preview Cross-Reference

Using the V-Preview Cross-Reference feature allows the user to click on a region of interest in the Enhanced V-Preview image and navigate to the DBT slab or plane image containing the selected structure. When a mass is clicked on in the Enhanced V-Preview image below (cross hairs in right viewport), the planes in the other viewport automatically navigate to the location of the mass detected by the CAD system in the plane below (cross hairs in left viewport). Keeping the mouse button pressed in the Enhanced V-Preview image, the user is able to scroll through the stacks of planes or slabs by moving the mouse upwards or downwards.

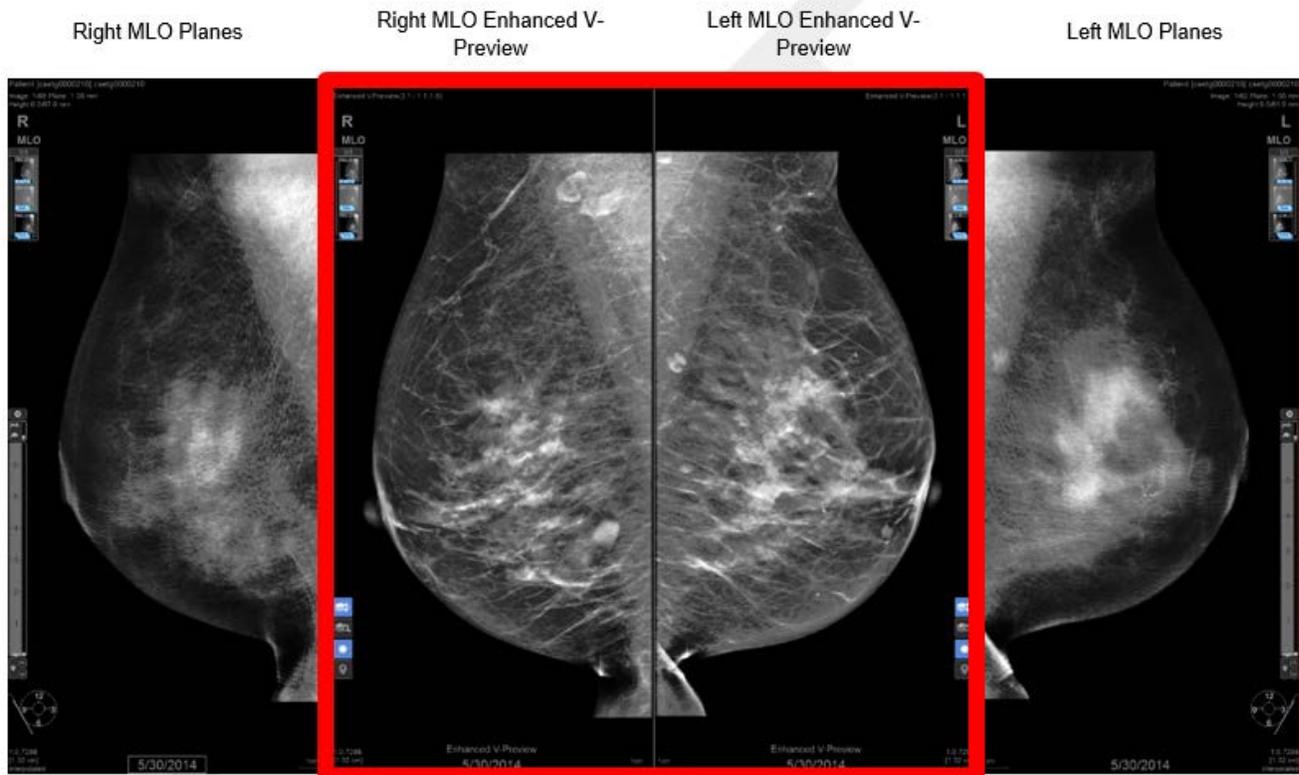


3.4 Recommended Hanging Protocol for Reading with CAD

The recommended hanging protocol for reading with CAD will lead the radiologist through reviewing the 2D CC FFDM and 2D MLO V-Preview images first, then the tomosynthesis 3D MLO planes with the Enhanced V-Preview with navigation and finally the 3D MLO slabs and planes without assistance from iCAD's PowerLook® Tomo Detection Software. The radiologist will assess the images in the hanging protocol to clinically read the images in the case.

Enhanced V-Preview images are additional V-Preview images provided to the radiologist, where V-Preview images are blended with regions from their corresponding DBT images. In these Enhanced V-Preview images, regions of interest detected by the CAD system are overlaid with the related segment of a DBT image containing the structure of the detection.

As shown in **red** below, the Enhanced V-Preview images are displayed on the right side of the left 5MP monitor and the left side of the right 5MP monitor. The corresponding 3D MLO planes are displayed on the left side of the left 5MP monitor and the right side of the right 5MP monitor. Therefore, the 2D Enhanced V-Preview images are displayed on the inside of the 5MP monitors, while the corresponding 3D MLO planes are displayed on the outside of the 5MP monitors.



4 References

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