# PHANTOM XY SYSTEM

## Technical Specifications & Clinical Performance Data

Dental Radiographic Quality Assurance | Powered by Science, Delivered by Subscription

| 87.63 | 98.71% | 0.89% | 29,367 | 53 |
|---|---|---|---|---|
| Fleet-Wide Average Q-Score (out of 100) | Overall QA Test Pass Rate | Radiographic Retake Rate | QA Tests Performed | Dental Clinics Deployed |

## PRODUCT OVERVIEW

The Phantom XY System is a hardware-software quality assurance solution enabling dental clinics to perform standardized, objective digital quality assurance testing of digital panoramic, intraoral, and cephalometric radiographic equipment. The system comprises a precision-manufactured test phantom and an integrated cloud-based analytics platform (Phantom Cloud), together delivering continuous, manufacturer-agnostic radiographic quality assurance across all major digital dental X-ray platforms.

### PHANTOM XY HARDWARE

Calibrated physical test phantom providing objective, reproducible image quality measurements across all digital X-ray modalities including intraoral sensors, panoramic OPG units, and cephalometric devices.

### PHANTOM CLOUD PLATFORM

Cloud-based QA management delivering longitudinal performance trending, compliance documentation, regulatory reporting, and automated alert notifications when performance falls below diagnostic threshold.

| Document Type | Prepared By | Date | Classification |
|---|---|---|---|
| Technical Specifications & Clinical Data | MVD Technologies Inc. | May 2026 | Clinical / Sales |

## 1. SYSTEM ARCHITECTURE

Hardware + Cloud Platform Overview

| PHANTOM XY HARDWARE | |
|---|---|
| **Physical Form Factor** | Precision-manufactured calibrated test phantom |
| **Modality Compatibility** | Intraoral sensors, panoramic OPG, cephalometric units |
| **Manufacturer Coverage** | 15+ manufacturers, 32+ device models validated |
| **Setup Time** | Under 2 minutes per device per test |
| **Measurement Parameters** | 17 image quality parameters assessed per test |
| **Q-Score Range** | 0–100 composite score; pass threshold ≥ 70 |
| **Hardware Cost** | $0 — included at no charge with 12-month subscription |
| **Operator Requirement** | Any trained dental staff member |

| PHANTOM CLOUD PLATFORM | |
|---|---|
| **Platform Type** | Cloud-based SaaS — no local installation required |
| **Access** | Any device, any browser |
| **Data Logging** | Real-time automated QA result logging |
| **Trending** | Longitudinal performance trend analysis |
| **Alerts** | Automated alerts when Q-Score falls below threshold |
| **Reporting** | Audit-ready regulatory compliance documentation |
| **Pricing Model** | Subscription-based, predictable monthly cost |
| **Data Coverage** | Full audit trail; timestamped; exportable |

## Q-Score Methodology

The Q-Score is a composite metric (0–100) evaluating 17 image quality parameters from a standardized test phantom exposure. Parameters assessed include:

- Spatial resolution
- Density uniformity
- Artifact detection
- Electronic noise characterization
- Exposure calibration accuracy
- Contrast-to-noise ratio (CNR)
- Geometric accuracy
- Pixel dropout detection
- Software processing consistency
- Tube output consistency

*A Q-Score ≥ 70 constitutes a passing result, indicating the radiographic device is performing within acceptable parameters for clinical diagnostic use. Failing devices are flagged immediately with detailed diagnostic recommendations delivered through the Phantom Cloud interface.*

## Standard QA Workflow — Under 2 Minutes Per Device

| | |
|---|---|
| 1 | **POSITION**<br>Place the Phantom XY test phantom in the radiographic field using standard positioning technique. |
| 2 | **EXPOSE**<br>Acquire a standard exposure using the clinic's routine technique settings — no special exposure parameters required. |
| 3 | **UPLOAD**<br>Upload the resultant image to the Phantom Cloud platform via any connected device — browser-based, no local software. |

**4** **ANALYZE**
Phantom Cloud automatically returns a quantitative Q-Score, pass/fail determination, trend data, and alerts within seconds.

## 2. DEVICE COMPATIBILITY

Panoramic & Intraoral Equipment — Validated Performance Data

The Phantom XY System has been validated across 15 distinct manufacturers and 32 unique radiographic device models, encompassing panoramic OPG units, intraoral sensors, and cephalometric systems. The following performance data were collected across 29,367 QA tests in 53 Ontario dental clinics over a 410-day observation period (January 2025 – March 2026).

### Panoramic / OPG Device Performance by Manufacturer

| Manufacturer | Model | Avg Q-Score | Pass Rate | Total Tests |
|---|---|---|---|---|
| **Sirona** | Orthophos S | **94.87** | 98.76% | 1,128 |
| **Sirona** | Orthophos XG 3 | **90.97** | 99.14% | 350 |
| **Sirona** | Orthophos XG 5 | **92.14** | 99.07% | 215 |
| **Sirona** | Orthophos SL | **95.99** | 95.89% | 146 |
| **Sirona** | Orthophos XG | **94.86** | 100.00% | 129 |
| **Carestream** | CS 8100 | **80.50** | 99.74% | 755 |
| **Carestream** | CS 9600 | **94.69** | 99.18% | 122 |
| **Planmeca** | Pro Max | **89.06** | 98.68% | 606 |
| **Planmeca** | Pro One | **90.79** | 98.70% | 307 |
| **Sorodex** | Cranex | **79.18** | 99.07% | 430 |
| **Owandy** | I-MAX | **90.67** | 99.53% | 213 |
| **Owandy** | I-MAX Touch | **88.72** | 99.37% | 159 |
| **Kavo** | OP 3D | **91.05** | 100.00% | 182 |
| **Instrumentarium** | OP30 | **88.46** | 97.04% | 203 |
| **Instrumentarium** | OP300 | **75.83** | 100.00% | 174 |
| **Acteon** | X-Mind Prime | **89.60** | 99.42% | 172 |
| **Acteon** | Trium | **89.16** | 100.00% | 118 |
| **Gendex** | GXDP-300 | **80.60** | 100.00% | 173 |
| **Gendex** | GXDP-700 | **85.97** | 99.22% | 128 |
| **Gendex** | Orthoralix 9000 | **82.76** | 99.31% | 144 |
| **Villa** | Rotograph Evo | **78.75** | 99.61% | 255 |
| **Vatech** | PaX-i3D Green | **91.90** | 98.97% | 97 |

| | | | | |
|---|---|---|---|---|
| **Belmont** | Bel-Cypher N | **92.07** | 95.89% | 73 |
| **Air Techniques** | Pro Vecta S | **92.51** | 98.48% | 66 |

*Table 1. QA performance metrics by panoramic/extraoral device. Q-Score range 0–100; pass threshold ≥ 70. Data from 29,367 tests across 53 Ontario clinics, Jan 2025–Mar 2026.*

■ Q-Score ≥ 90: Excellent ■ Q-Score 80–89: Good ■ Q-Score 70–79: Acceptable (Monitor) ■ Q-Score < 70: FAIL — Immediate Action Required

### Intraoral Sensor Market Distribution

Analysis of 96,861 radiographic exposures logged through Phantom Cloud reveals the intraoral sensor distribution across participating clinics:

| Manufacturer | Models | Total Exposures | Market Share |
|---|---|---|---|
| **Dexis** | Titanium, Platinum, IXS | 52,192 | 53.9% |
| **Schick** | 33, 33 AE | 8,593 | 8.9% |
| **Carestream / Kodak** | RVG 6200, RVG 5100 | 7,152 | 7.4% |
| **Acteon** | SOPIX | 4,359 | 4.5% |
| **Air Techniques** | ScanX Plate | 3,082 | 3.2% |
| **Owandy** | OPTEO | 1,288 | 1.3% |
| **Woodpecker** | i-Sensor | 929 | 1.0% |
| **Planmeca** | ProSensor | 333 | 0.3% |
| **Other / Unknown** | Various | 18,933 | 19.5% |

*Table 2. Intraoral sensor/imaging plate manufacturer distribution across 96,861 logged exposures.*

*The Phantom XY System's manufacturer-agnostic design enables consistent QA assessment across this highly fragmented sensor market, providing a uniform standard of image quality measurement regardless of the underlying hardware platform.*

## 3. CLINICAL PERFORMANCE DATA

Retake Rate Analysis & Patient Safety Impact

Retake rate — the proportion of radiographic exposures repeated due to diagnostic inadequacy — is the primary measurable indicator of radiographic quality and its direct patient safety impact. Each retake represents an additional, unnecessary radiation exposure. Published literature reports typical retake rates of 5–10% in facilities without systematic QA programs, with some environments reporting rates as high as 15%.

**0.89%**

**System-Wide Retake Rate**

**96,861 total exposures | 866 retakes | 53 clinics**

**5–11× lower than industry-reported baseline of 5–10%**

**~3,977 to 8,820 unnecessary radiation exposures prevented during study period**

### Retake Reason Analysis

Categorized analysis of 866 retake events provides actionable intelligence for clinic quality improvement:

| Retake Reason | Count | Percentage | Category |
|---|---|---|---|
| Patient moved during imaging | 233 | 26.91% | Operator-dependent |
| Tooth apex not in frame | 176 | 20.32% | Operator-dependent |
| Wrong positioning | 129 | 14.90% | Operator-dependent |
| Overlapping | 110 | 12.70% | Operator-dependent |
| Other | 89 | 10.28% | Mixed |
| Cone cut | 63 | 7.27% | Operator-dependent |
| Poor image quality | 39 | 4.50% | Equipment-related |
| Software error during acquisition | 20 | 2.31% | Equipment-related |
| Over/under exposed | 7 | 0.81% | Equipment-related |

*Table 3. Categorized retake reason analysis, 866 retake events.*

*Equipment-related retake causes (poor image quality, over/underexposure, software errors) total only 7.62% of all retakes — directly validating the Phantom XY System's effectiveness in maintaining radiographic equipment within optimal operating parameters.*

## 4. DEPLOYMENT & MARKET ADOPTION

Ontario Clinical Network — 410-Day Observation Period

| | | | |
|---|---|---|---|
| **53** | **24** | **171** | **29,367** |
| Participating Clinics | Ontario Municipalities | Registered Clinical Users | QA Tests Performed |
| **96,861** | **71.63** | **15** | **32** |
| Radiographic Exposures | Avg QA Tests / Day | Manufacturers Tested | Unique Device Models |

### Quarterly Growth Trajectory

| Quarter | New Clinics Enrolled | Cumulative Total | Q-o-Q Growth |
|---|---|---|---|
| Q1 2025 (Jan–Mar) | 10 | **10** | — |
| Q2 2025 (Apr–Jun) | 8 | **18** | -20% |
| Q3 2025 (Jul–Sep) | 8 | **26** | 0% |
| Q4 2025 (Oct–Dec) | 15 | **41** | +87.5% |
| Q1 2026 (Jan–Mar) | 12 | **53** | -20% |
| Q1 2026 Additional* | +25 | **78+** | — |

**25 additional Ontario clinics confirmed enrolled in March 2026. Table 4. Quarterly clinic enrollment trajectory.*

### High-Compliance Clinic Performance — Top 15 by Weekly Testing Frequency

| Clinic | Avg Tests / Week | Total Tests | Weeks Active |
|---|---|---|---|
| Monarch Fennell | **49.88** | 1,696 | 34 |
| Monarch Dentistry Bunting | **41.26** | 1,444 | 35 |
| Rowntree Gate Dental | **34.60** | 173 | 5 |
| Monarch Erin Mills | **34.41** | 1,273 | 37 |
| Monarch Dentistry Tremont | **33.33** | 1,200 | 36 |
| Monarch Kitchener | **29.06** | 1,046 | 36 |
| Monarch Dentistry Colborne | **27.31** | 983 | 36 |
| Bogart Dental | **26.54** | 345 | 13 |
| Royal City Dental | **23.84** | 1,311 | 55 |
| Monarch Niagara Kalar | **21.62** | 800 | 37 |
| Monarch Dentistry Centennial | **21.42** | 707 | 33 |
| Sun Dent Family Dental Etobicoke | **20.68** | 1,158 | 56 |
| Don River Dental | **20.69** | 269 | 13 |
| The Children's Dental Centre | **20.06** | 1,023 | 51 |
| Wexford Dental | **19.35** | 600 | 31 |

*Table 5. Top-performing clinics by weekly QA testing frequency.*

## 5. REGULATORY COMPLIANCE

Health Canada Safety Code 30 Alignment

Health Canada Safety Code 30 (Radiation Protection in Dentistry) establishes comprehensive requirements for quality assurance in dental radiography. The Phantom XY System directly addresses all key Safety Code 30 requirements:

| Safety Code 30 Requirement | Phantom XY Capability | Study Evidence |
|---|---|---|
| **Routine QA testing of X-ray equipment** | Automated QA testing with standardized phantom and quantitative Q-Score analysis | 29,367 QA tests; 71.63 tests/day avg. across 53 clinics |
| **Documentation and record-keeping of QA results** | Cloud-based audit trail with timestamped results, device tracking, and exportable reports | 410 days of continuous data collection with full traceability |
| **Monitoring of radiographic retake rates** | Automated retake tracking with categorized reason codes and trend analysis | 0.89% retake rate across 96,861 exposures with detailed reason analysis |
| **Equipment performance monitoring** | Quantitative Q-Score trending with automated alerts for performance degradation | 32 device models from 15 manufacturers continuously monitored |
| **Radiation dose optimization (ALARA)** | Identification of underperforming equipment that may cause overexposure or retakes | Est. 3,977+ unnecessary exposures prevented during study period |
| **Staff training and quality awareness** | Real-time feedback on equipment performance; data-driven quality culture | 171 registered clinical users actively engaged in QA workflows |

*Table 6. Safety Code 30 compliance mapping for the Phantom XY System.*

### Additional Regulatory Frameworks Supported

- Health Canada Radiation Protection Bureau — periodic performance testing of dental X-ray equipment
- IAEA Safety Reports Series — quality control testing protocols including image quality assessment using test phantoms
- Canadian Dental Association (CDA) — evidence-based radiographic protocols including equipment performance monitoring
- Provincial Dental Regulatory Colleges — documented QA protocols as condition of dental facility licensure
- American Dental Association (ADA) / AAOMR — regular performance testing and image quality monitoring programs
- Ontario Occupational Health and Safety Act — radiation workplace requirements for occupational exposure reduction

## 6. SUBSCRIPTION MODEL & PRICING

Phantom XY System + Phantom Cloud

| INCLUDED WITH SUBSCRIPTION | |
|---|---|
| **Phantom XY Hardware** | Calibrated test phantom — $0 equipment cost |
| **Phantom Cloud Platform** | Full cloud QA management, trending, alerts, compliance reporting |
| **Unlimited QA Tests** | No per-test fees — test as frequently as required |

| | |
|---|---|
| **Multi-Device Coverage** | All intraoral sensors and OPG units at the facility |
| **Regulatory Documentation** | Audit-ready reports for provincial regulatory inspections |

*The subscription model eliminates capital expenditure on QA hardware. The Phantom XY physical test phantom is provided at no charge with a 12-month subscription — removing all financial barriers to implementing evidence-based radiographic quality assurance in every dental practice.*

## 7. SUPPORTING CLINICAL EVIDENCE

Peer-Reviewed Literature Summary

The clinical case for dental radiographic quality assurance is established by a robust body of peer-reviewed literature. The following publications form the evidentiary foundation for the Phantom XY System's clinical positioning:

| | | |
|---|---|---|
| **PMC 11447568** | **Quality Assessment of Periapical Radiographs** | *FGDP Guidelines Study, 2024* |
| **Finding:** | Only ~2/3 of intraoral radiographs meet diagnostic acceptability standards. Inadequate contrast and geometric distortion are the primary failure modes. | |
| **PMC 11486910** | **Australian Dentists' Knowledge of Radiographic Interpretive Errors** | *Journal of Dental Research, 2024* |
| **Finding:** | Interpretation errors cause direct, documented patient harm including unnecessary extractions, missed abscesses, false-positive diagnoses, and medicolegal liability. | |
| **PMC 10891473** | **Image Quality Assessment — Hand-Held vs. Wall-Mounted Devices** | *Dentomaxillofacial Radiology, 2024* |
| **Finding:** | Equipment drift causes image quality degradation that is not perceptible during routine clinical use without objective phantom-based testing. | |
| **PMC 9974235** | **Factors Affecting Interpretation of Dental Radiographs** | *BMC Oral Health, 2023* |
| **Finding:** | Radiographic artifacts misidentified as pathology drive unnecessary invasive treatment — a documented risk amplified by suboptimal image quality. | |

**Your patients deserve diagnostically reliable imaging. Every. Single. Time.**

**Contact us: info@mvdxraytech.com | 1-855-MVD-XRAY (683-9729) | www.mvdxraytech.com**