EXAMPLE FORM
EQUIPMENT PERFORMANCE EVALUATION
DENTAL RADIOGRAPHIC UNIT
25 TAC §289.232(i)(7)(A)

Facility Name:_____ **Registration No.:**_____ **Date:** _____

Service Company:_____ **Service Company Registration No.:** _____

Survey Instrument Used:_____ ☐ **Exposed sensor/detector** ☐ **Enclosed sensor/detector**

Instrument Calibration/ Intercomparison Date:_____ **Technician Signature:**_____

X-RAY UNIT IDENTIFICATION (FROM CONTROL PANEL)

Manufacturer:_____ Location/Room: _____

Model No.:_____ Serial No.:_____

TIMER ACCURACY **( ) Pass ( ) Fail**

Regulation –The accuracy of the timer shall meet the manufacturer's specifications. If the manufacturer's specifications are not obtainable, the timer accuracy shall be ±10 percent of the indicated time with the testing performed at 0.5 second. (See 25 TAC §289.232(i)(6)(H)(*i*))

SELECT ONE: ☐ Manufacturer's specifications which are_____ **OR**

☐ Intraoral units ±10 % tolerance with testing performed at 0.5 second (500 milliseconds)

☐ Panoramic units ±10% tolerance with testing performed at_____ seconds

Document time used for testing:_____ msec; **OR** _____ pulses; **OR** _____ seconds

Perform four measurements: 1._____ 2._____ 3._____ 4. _____

EXPOSURE REPRODUCIBILITY **( ) Pass ( ) Fail**

Regulation –When all technique factors are held constant, the coefficient of variation of exposures for both manual and AEC systems shall not exceed 0.05. (See 25 TAC §289.232(i)(6)(I)) (See pages 3 and 4 for instructions.)

Technique factors selected:_____ mA_____ kVp_____ time

Perform four measurements:

1._____ mR

2. _____ mR

3._____ mR

4._____ mR

$$C = \frac{s}{\bar{X}} = \frac{1}{\bar{X}} \left| \sum_{i=1}^{n} \frac{(X_i - \bar{X})^2}{n-1} \right|^{1/2}$$

S = estimated standard deviation of the population
$\bar{X}$ = mean value of observations in sample
X_i = ith observation in sample
N = number of observations in sample

Coefficient of variation:
(Must not exceed .05) _____

EQUIPMENT PERFORMANCE EVALUATION - DENTAL UNIT Serial No. _____

KVP TEST

( ) Pass ( ) Fail

Regulation – **If the registrant possesses the manufacturer's kilovolt peak specifications, the radiation machine shall meet those specifications.** Otherwise, the measured kVp shall be accurate to within ±10 percent of the indicated setting at no less than three points over the usual operating range of the machine. (For units with fewer than three fixed kVp settings, the units shall be checked at those settings.) (See 25 TAC §289.232(i)(6)(J))

SELECT BELOW:

((Measured kVp - Indicated kVp) ÷Indicated kVp) x 100 = % of Deviation

☐ Manufacturer's specifications which are_____**OR**

☐ ±10% of the indicated setting used

1. Indicated kVp_____Measured kVp_____Deviation_____%
2. Indicated kVp_____Measured kVp_____Deviation_____%
3. Indicated kVp_____Measured kVp_____Deviation_____%
4. Indicated kVp_____Measured kVp_____Deviation_____%

TUBE STABILITY

( ) Pass ( ) Fail

Regulation –The tube shall remain physically stable during exposures. In cases where tubes are designed to move during exposure the registrant shall assure proper and free movement of the unit. (See 25 TAC § 289.232(i)(6)(K))

For **intraoral machines only**: Tube stable in all orientations? Yes ( ) No ( )

For **panoramic and cephalometric machines only**: Free movement where designed? Yes ( ) No ( )

COLLIMATION

( ) Pass ( ) Fail

Regulation– 25 TAC §289.232 (i)(6)(L) Field limitation shall meet the requirements of 25 TAC §289.232(i)(11)(B) and 25 TAC §289.232(i)(12)

Intraoral: Minimum source to skin distance (SSD)_____cm X -ray field size at tip of cone_____cm
Field size ≤ to 7cm if the minimum SSD is 18cm or more; ≤ to 6cm if the minimum SSD is less than 18 cm

Panoramic:
Image receptor slit size: (Circle inch or centimeter) Transverse_____in/cm Vertical_____in/cm
X-ray field size: Transverse_____in/cm Vertical_____in/cm
X-ray field misalignment at image receptor slit: Transverse_____in/cm Vertical_____in/cm

(Misalignment cannot exceed 0.0 inches in the transverse axis and 0.5 inches in the vertical axis.)

Cephalometric, Digital Panoramic, CBCT
Source to image distance (SID) _____in/cm
Image Receptor, Detector, FOV, Diaphragm size: _____in/cm x _____in/cm
Measured x-ray field size: _____in/cm x _____in/cm
X-ray field misalignment: _____in/cm x _____in/cm

Alternative Results (please see attachments for documentation)

ENTRANCE EXPOSURE (EE)

( )Pass ( ) Fail

Regulation – The in-air exposure limits for an average adult intraoral bite wing examination shall not exceed **450 mR for 60 kVp and above; 600 mR for less than 60 kVp.** (See 25 TAC §289.232(i)(6)(M)) (See page 5 for instructions.)

Technique factors, for **intraoral bite wing** examination only, selected: kVp_____ mA(s)_____ time _____
Source to Skin Distance (SSD)_____in/cm Source to Detector Distance (SDD)_____in/cm

Tip of cone is positioned ½ inch or less from surface of instrument housing or detector. Yes ( ) N o ( )

☐ Calculated Measurement **OR** ☐ Direct Measurement
Detector Meas._____mR

EE: mR

EXPOSURE REPRODUCIBILITY CALCULATIONS
EXAMPLE

$$C = \frac{s}{\overline{X}} = \frac{1}{\overline{X}}\left[\sum_{i=1}^{n}\frac{(X_i - \overline{X})^2}{n-1}\right]^{1/2}$$

Where:

C = coefficient of variation
s = estimated standard deviation of the population
$\overline{X}$ = mean value of observations in sample
X_i = ith observation in sample
n = number of observations in sample

In this example, the exposures are considered to be reproducible.

Example:

The four (n) exposures (X_i) measured 409 mR, 387 mR, 391 mR, and 410 mR.

STEP 1 Determine the mean value ($\overline{X}$) of the four exposures taken.

$(409\ mR + 387\ mR + 391\ mR + 410\ mR) \div 4 = 399.25\ mR$

STEP 2 Find the difference between each exposure and the mean value (disregard sign).

409.00 mR	387.00 mR	391.00 mR	410.00 mR
-399.25 mR	-399.25 mR	-399.25 mR	-399.25 mR
9.75 mR	12.25 mR	8.25 mR	10.75 mR

STEP 3 Square each of the differences

$9.75^2 = 95.06$ $12.25^2 = 150.06$
$10.75^2 = 115.56$ $8.23^2 = 67.73$

STEP 4 Divide each number by 3 (n-1) and add the results

95.06 - 3 = 31.69
150.06 - 3 = 50.02
68.06 - 3 = 22.69
115.56 - 3 = 38.52
142.92

STEP 5 For s, determine the square root of the above number

$\sqrt{142.92} = 11.96$

STEP 6 Divide s by the mean value ($\bar{x}$)

11.96 - 399.25 = .0299 = C = the coefficient of variation

STEP 7 If C=0.05 or less, the exposures are considered to be reproducible

ENTRANCE EXPOSURE (EE) CALCULATIONS
EXAMPLE – (DENTAL – BITE WING)

SENSOR/DECTECTOR ENCLOSED WITHIN A HOUSING

$$EE = mR\ (MEASURED)\ x \left[\frac{SDD}{SSD} \right]^2$$

Where:

EE = entrance exposure
mR (MEASURED) = indicated exposure
SDD = source (target) to enclosed detector distance
SSD = source to surface (skin) distance

For this example only: SDD = 24 cm. SSD = 21 cm.
Detector = 2cm. below housing surface Measurement = 374 mR
(Verify that all units of measurements are the same – either inches or centimeters)

STEP 1 **Set the control panel** with the technique factors (kVp, mA, time) that the facility uses for an average person intraoral bite wing examination.

STEP 2 **Measure the SSD**. To obtain an accurate EE, have the operator position the tube over the detector housing as if they were positioning a patient. Measure from the target to the housing surface. (21 cm.)

STEP 3 **Measure the SDD**. Place the tip of the cone 1.5 cm. or less from the housing surface. Measure from the target to the surface of the housing and add the predetermined distance of the detector below the surface.
22 cm.+2 cm. = 24 cm.

STEP 4 Divide the SDD by the answer in Step 2.
24 ÷ 21 = 1.143

STEP 5 Square the answer in Step 4.
1.143 x 1.143 = 1.307

STEP 6 Multiply the measurement reading in mR by the answer in Step 5.
374 x 1.307 = 489 mR

STEP 7 Compare the answer in Step 6 to the regulatory limits of 450 mR when 60 kVp or above is used.