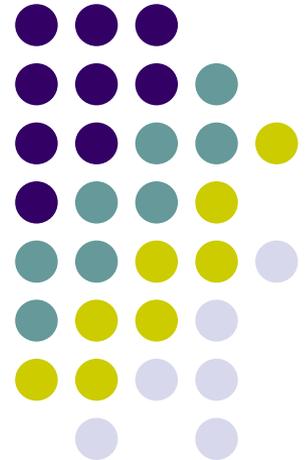


X-Ray Service Providers

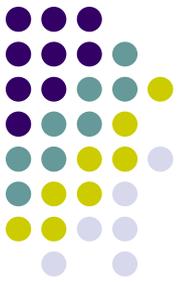
**Equipment Performance Evaluations,
Panoramic, Cephalometric & misc.**

Presented by Lisa Bruedigan
X-Ray Inspector & Trainer

Texas Department of State Health Services
9/3/10



Disclaimer



Any images or discussion of specific products is in no way meant to be a promotion of those products.

Equipment Performance Evaluations

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.: _____

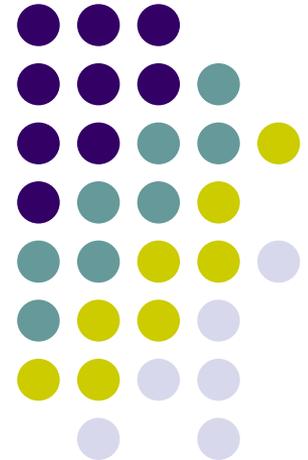
Survey Instrument Used: _____ Exposed sensor/detector Enclosed sensor/detector

Instrument Calibration Date: _____ Technician Signature: _____

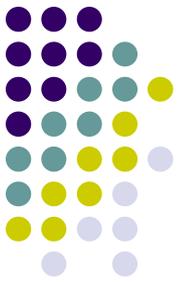
X-RAY UNIT IDENTIFICATION (FROM CONTROL PANEL)

Manufacturer: _____ Location/Room: _____

Model No.: _____ Serial No.: _____

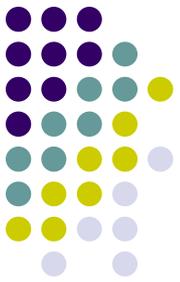


EPE's



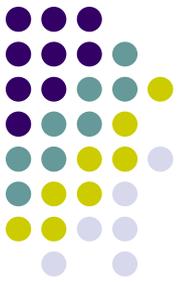
- You are not required to use our form
- You are required to provide all of the information listed on our form.
- <http://www.dshs.state.tx.us/radiation/forms>

EPE's



Check periodically for updated EPE form

- Older dental EPE states “...timer accuracy is to be done at no time greater than 0.5 second”
- Newer dental EPE mirrors rule “...to be performed at .5 second”. I
- If there is not a .5 second, it is understood that the testing is performed at the next setting that is as close as possible.

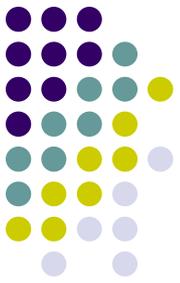


EPE's

- What testing is required?
 - Timer Accuracy
 - Exposure Reproducibility
 - kVp
 - Tube Stability
 - Collimation
 - Entrance Exposure

EPE ...

Reproducibility



Is it reproducible or not?

89mr, 96mr, 87mr, 98mr

$$CV = 0.058$$

189msec, 196 msec, 187msec, 198msec

$$CV = 0.028$$

379msec, 415msec, 385msec, 399msec

$$CV = 0.041$$

EPE

X-ray Field Collimation Dental Systems-Intraoral



Intraoral Units –

- If the SSD is 18 cm or more, the field must be restricted to no more than 7 cm.
- If the SSD is less than 18 cm, the field must be restricted to no more than 6 cm.
- Remember, the extension cone is not always the collimating device. The x-ray image must be made on a film or fluorescent screen.

EPE Collimation ...

Dental Extraoral Systems

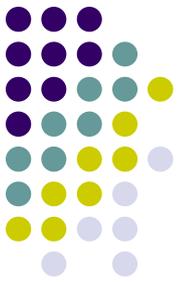


Panoramic Units –

- The x-ray field must be restricted to the image slit in the transverse axis.
- The x-ray field may not exceed the slit in the vertical axis by more than a total of .5 inches.
- The misalignment must be recorded in the EPE report.
- Do not write the size of the image slit in the section for misalignment. The slit dimension must be known to verify compliance with the x-ray field size measurement.

EPE Collimation ...

Dental - Panoramic

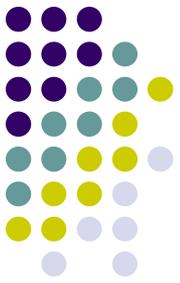


If the x-ray field is misaligned *within* the panoramic image slit and if you align the beam:

- The misalignment should be written as a negative
- Example $-.2''$ transverse and $-.3''$ vertical
- A violation will **not** be issued for negative misalignments
- We accept $0'' \times 0''$. It is not misaligned according to rule.

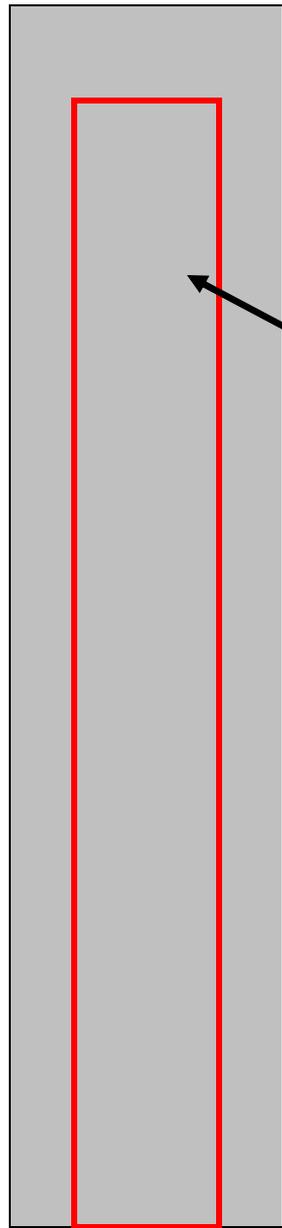
EPE Collimation ...

Dental - Panoramic

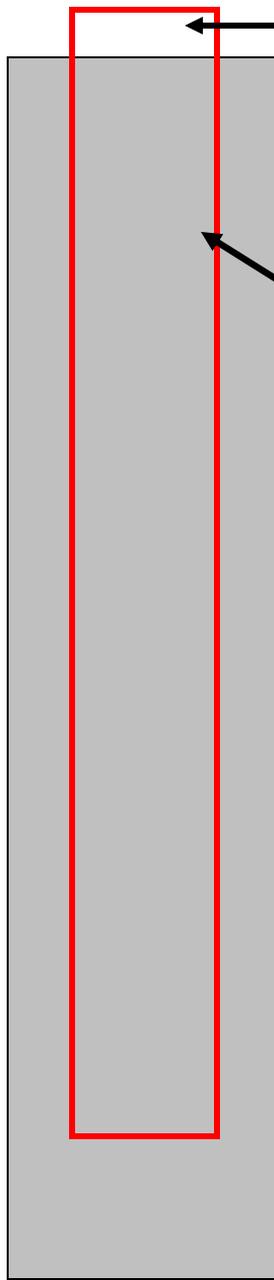


When the x-ray field exceeds the vertical or transverse line of the panoramic image slit

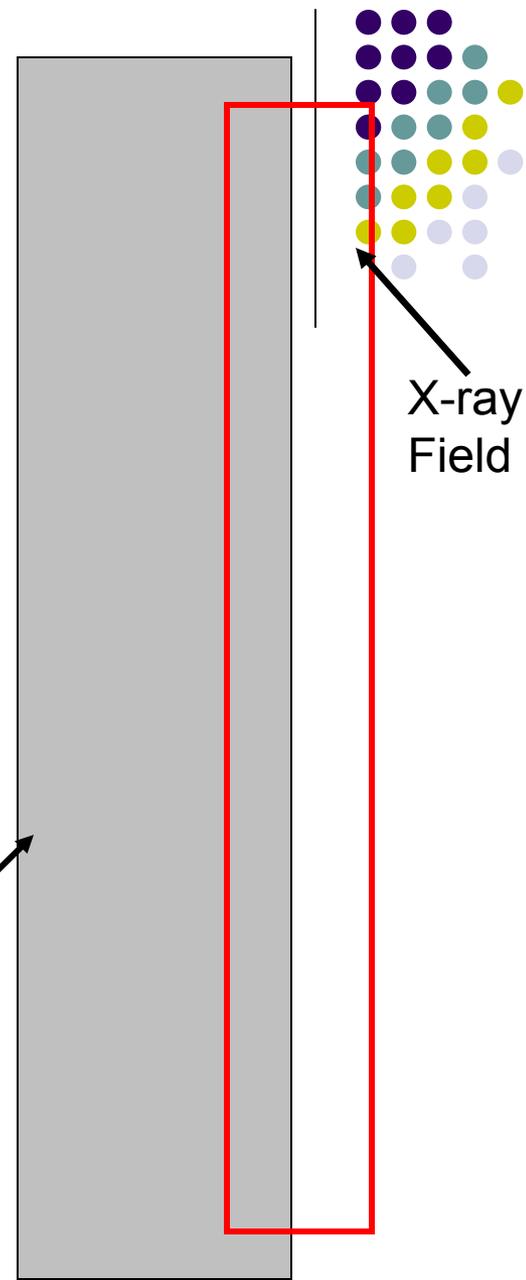
- The misalignment should be written with the first # as the width and second # as length
- Misalignment: .4" x 0"
- Misalignment: 0" x .5"
- A violation would be issued for (b) and
- A violation would not be issued for (c)



NO VIOLATION

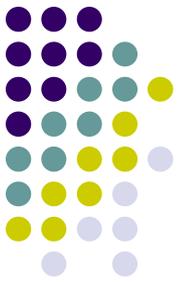


NO VIOLATION



VIOLATION

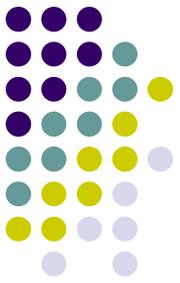
EPE Collimation ... Dental - Panoramic



- For Pano units, the x-ray field size is not the film but the size of the x-ray beam within the image slit.
- Entrance Exposure is not regulated of panoramic units.

EPE Collimation ...

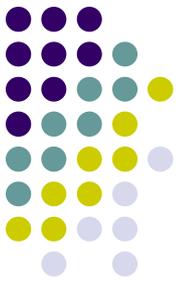
Dental - Cephalometric



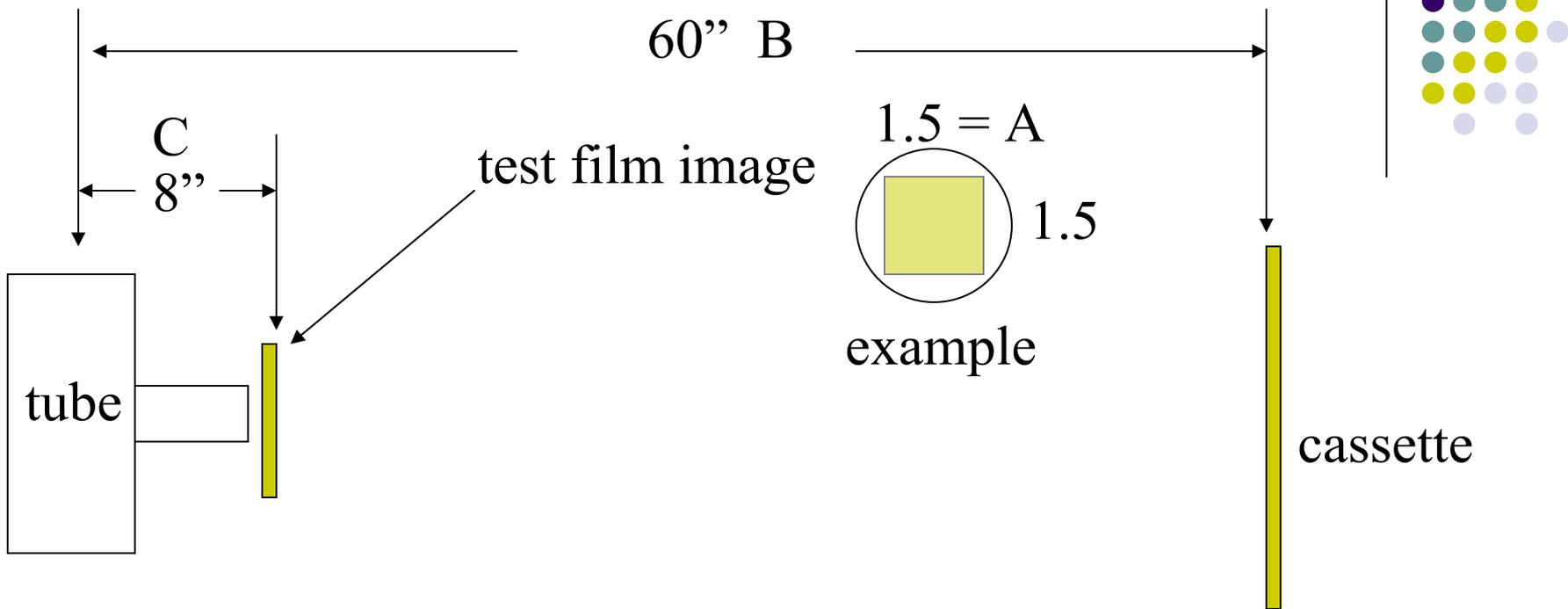
- Cephalometric units –
 - The x-ray field must not exceed the image receptor (x-ray film/cassette) by more than 2% of the source to image distance (SID) for the length and width of a rectangular receptor.
 - The x-ray field must **not exceed** 2% of the SID for the diagonal of the image receptor when circular or polygon collimation is used.
 - Entrance Exposure is not regulated.

EPE X-ray Field Collimation

General Radiographic & Dedicated Systems - Rectangular



- A direct measurement may be reported if a fluorescent screen is used.
- If the facility uses only one size cassette and a fluorescent screen is not available, use the instructions that follow to calculate the x-ray field size that would be projected to the image receptor (x-ray film/cassette).

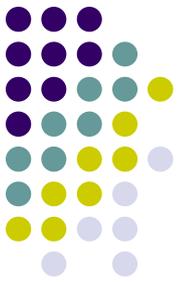


$$X = \frac{A \times B}{C} = \frac{1.5" \times 60"}{8"} = \frac{90"}{8"} = 11.25"$$

**CALCULATING THE PROJECTED X-RAY FIELD
WHEN ONLY ONE SIZE CASSETTE IS AVAILABLE**

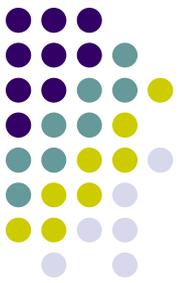
EPE

Rectangular Collimation ...



Instructions:

- Secure the test film to the end of the collimator, or elevate it on a stand under the x-ray tube that is in a vertical position.
- Measure the distance from the focal spot to the test film.
- Measure the distance from the focal spot to the image receptor (x-ray film/cassette).



Example B

-Rectangular Collimation-

Determining x-ray field size projected to the image receptor

$$\frac{A \times B}{C} = X$$

Where:

A = field size determined on the test film

B = SID

C = distance from focal spot to test film

X = field dimension at SID/image receptor

Note: calculation must be done twice – across the image & along the image.

EPE Dental Collimation Section



COLLIMATION

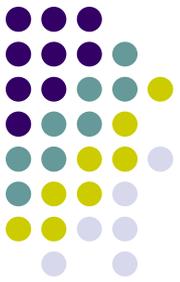
() Pass () Fail

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 \leq to 7cm. if the minimum SSD is 18cm. or more; \leq 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 at the slit: 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: Source to image distance (SID) _____ in./cm. (Misalignment must not exceed 2% of the SID)
Image receptor 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.



EPE Collimation ...

General Radiographic

- **COLLIMATION**

Regulation: 25 TAC §289.227(o)(5)(F):

The following items shall meet the requirements of 25 TAC §289.227(l)(1):

- (i). Numerical indicators of x-ray field size
- (ii). Light field versus x-ray field congruence
- (iii). Operable automatic and semi-automatic collimators
- (iv). Center of x-ray field with center of image receptor

Select type of collimation: Automatic Semi-automatic Manual

Indicated Source to image distance (SID): _____ in OR cm

Measured Source to image distance : _____ in OR cm

Pass () Fail ()

TEST ALL MODES THAT ARE FUNCTIONAL.

- **Manual mode**

Selected field size _____ X _____ in OR cm

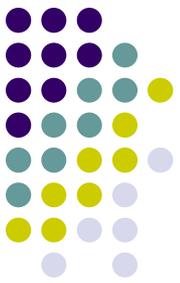
Measured field size _____ X _____ in OR cm

Misalignment within 2% of the SID:

Pass () Fail ()

EPE Collimation ...

General Radiographic



- **Automatic/Semi-automatic mode**

Selected field size: _____ X _____ in OR cm

Measured field size: _____ X _____ in OR cm

Misalignment within 3%/4% total of the SID:

Pass () Fail ()

- **Light field vs. X-ray field**

Light field/X-ray field misalignment: _____ X _____
in OR cm

Light field/X-ray field misalignment within 2% of the SID:

Pass () Fail ()

- **Center alignment**

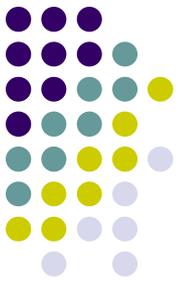
Center misalignment: _____ in OR cm

Center misalignment within 2% of the SID:

Pass () Fail ()

EPE ...

Entrance Exposure

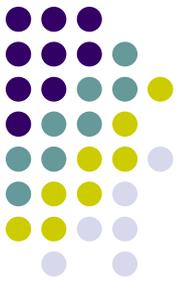


- When is it a direct read?



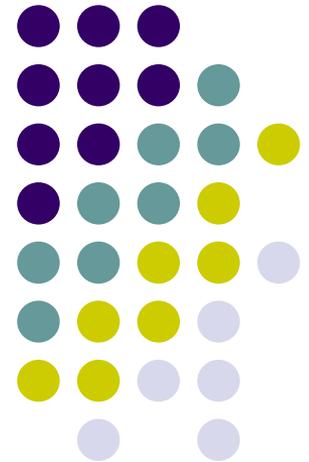
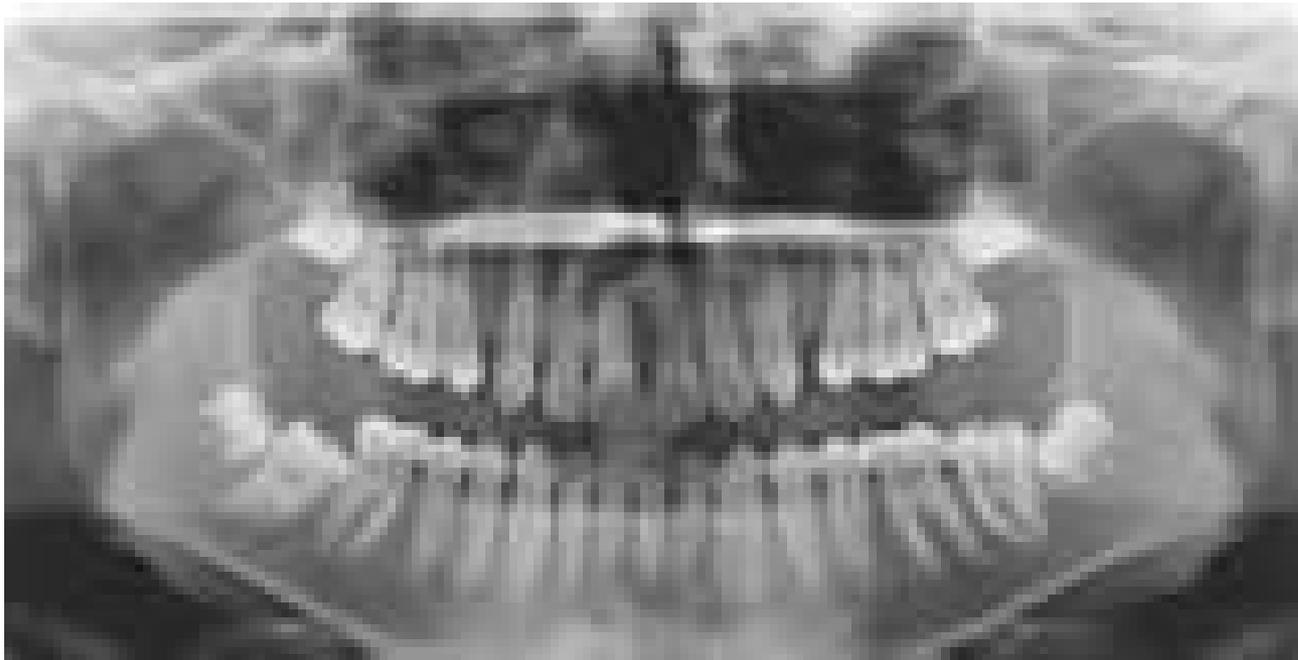
EPE ...

Entrance Exposure

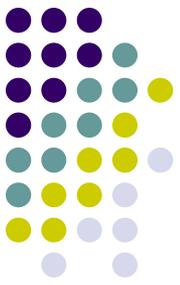


- Medical radiographic units
 - Where do you get the technique factors to test Entrance Exposure?
 - What does the inspector do?
 - We ask the technologist first
 - Then we confirm with the technique chart

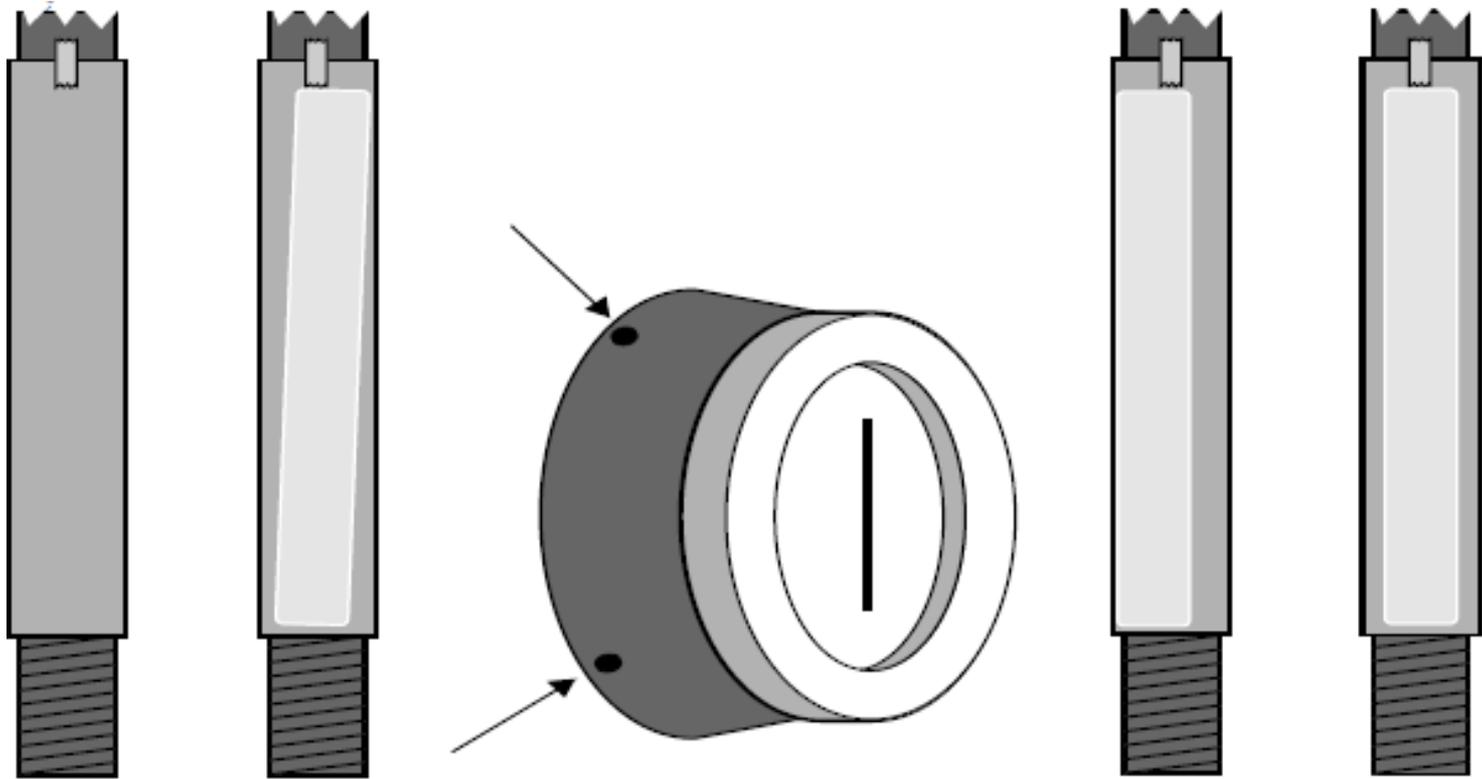
Panoramic Beam Alignment for Film Systems



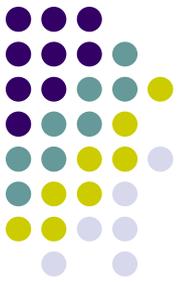
Beam Alignment for Film Systems ...



... the good old days when life was simple

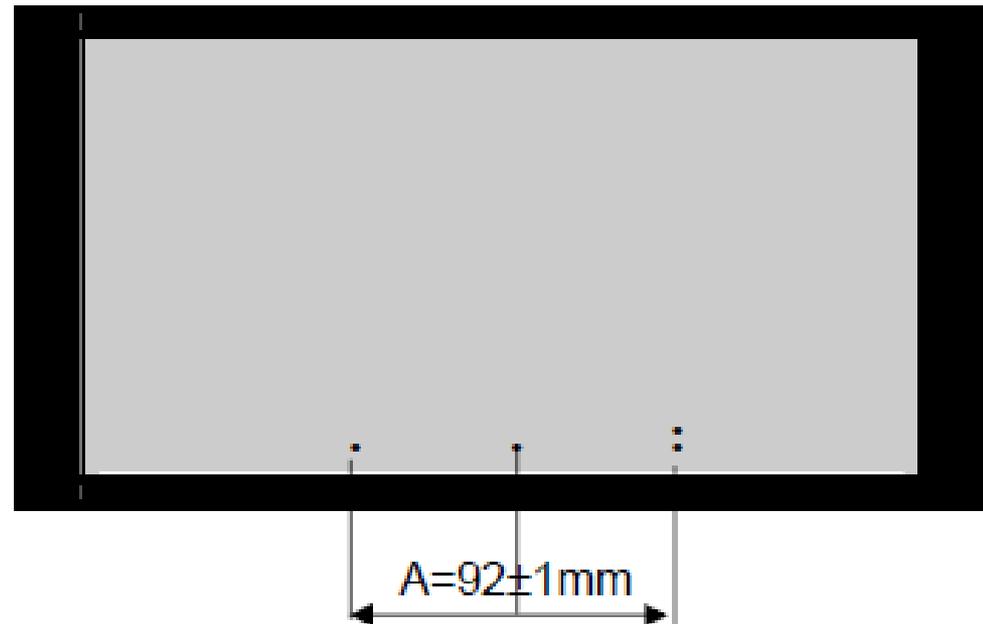


Beam Alignment for Film Systems ...

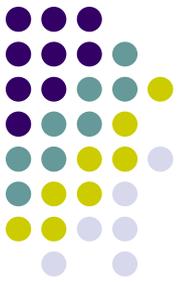


- Position the centering tool on the chin rest
- Make an exposure & process the film.
- To establish whether the unit is centered for panoramic function, verify that the center distance between the white dots is $92\text{mm} \pm 1\text{mm}$.

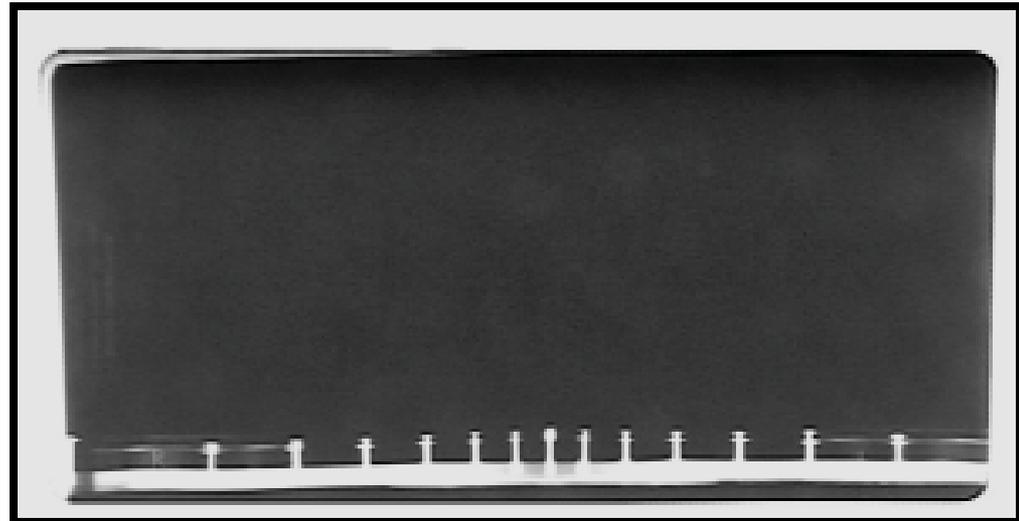
DentX Strato
Beam Alignment in Pano Mode



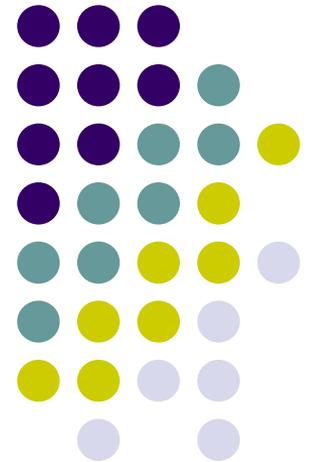
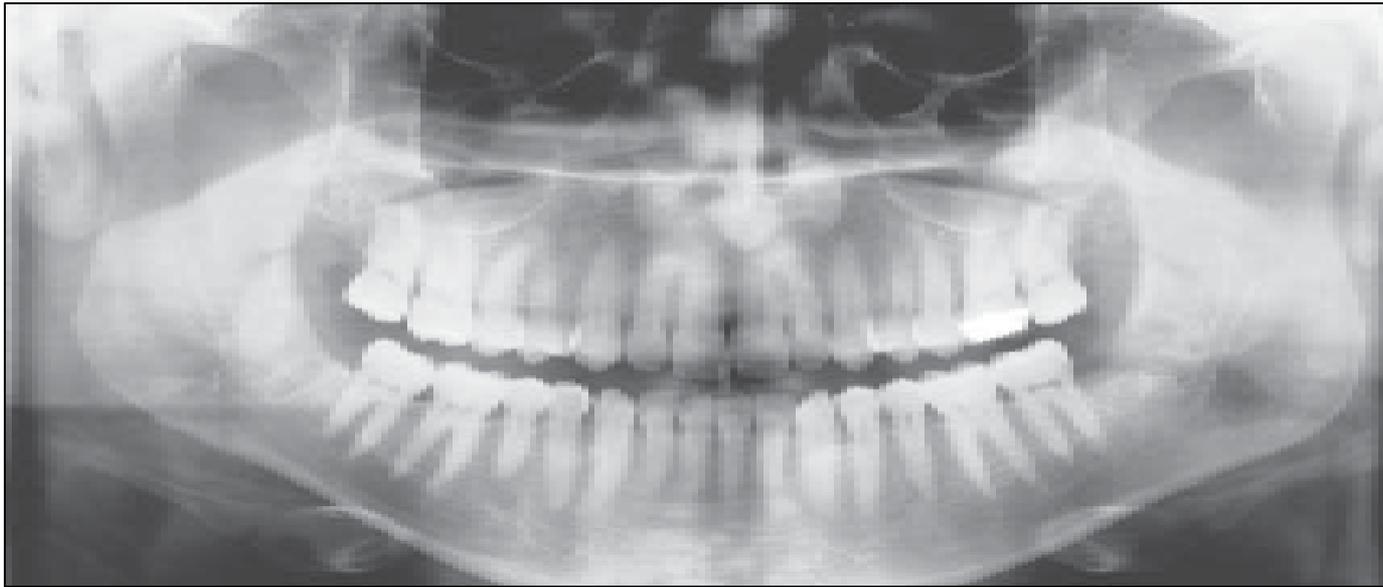
Beam Alignment for Film Systems ...



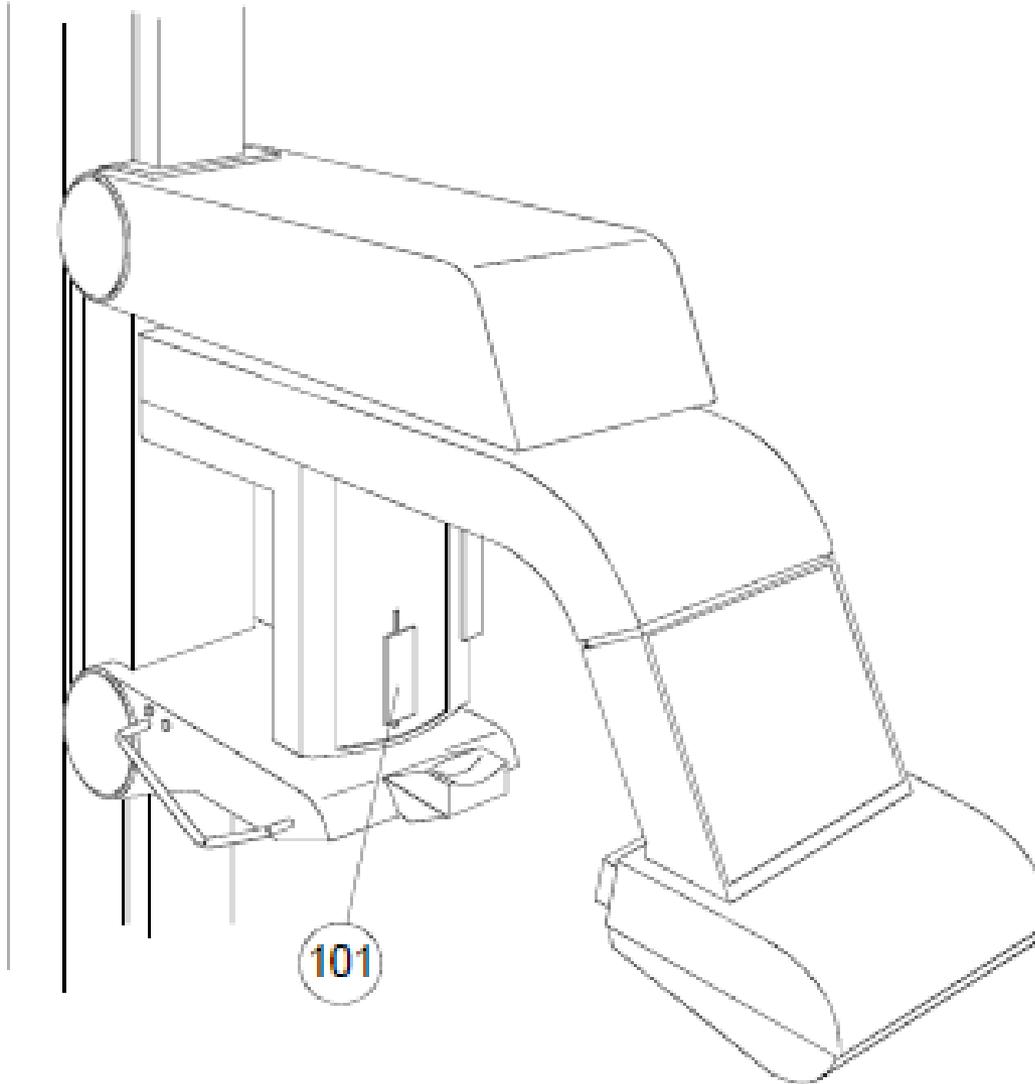
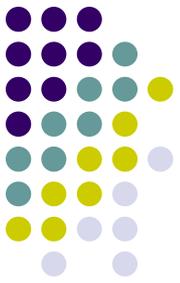
**Panoramic Corp
Pin Test**



Panoramic Beam Alignment for Early Digital Systems

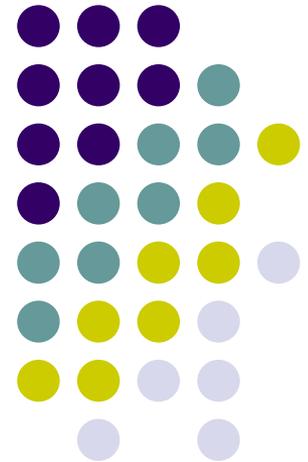


Beam Alignment of Early Digital Systems

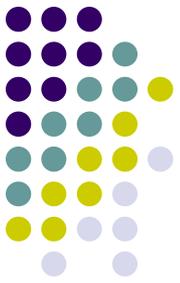


DentX RotoGraph

Cone Beam Systems

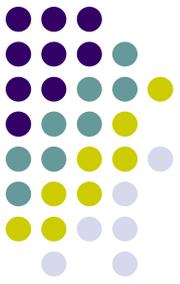


Cone Beam Systems ...



- Early units designed to operate similar to traditional CT units
- Newer models operate more like digital panoramic units.

Cone Beam Systems ...



Xoran MiniCAT



Cone Beam Systems ...



Xoran MiniCAT

Recommended Quality Control Tests

1. CT Number Accuracy

Water Number: _____

(Should be 0 ± 100 units)

Water STD: _____

(Should be 30 ± 20 units)

2. Water Phantom Artifacts

Circle one: Yes / No

No ring artifacts should be visible.

3. CT Number Linearity

Correlation coefficient: _____

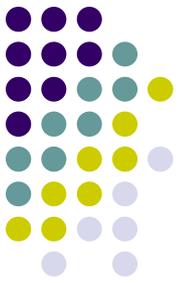
(Should be less than 1 and higher than 0.95)

4. Spatial Resolution

Highest visible line pairs per centimeter: _____

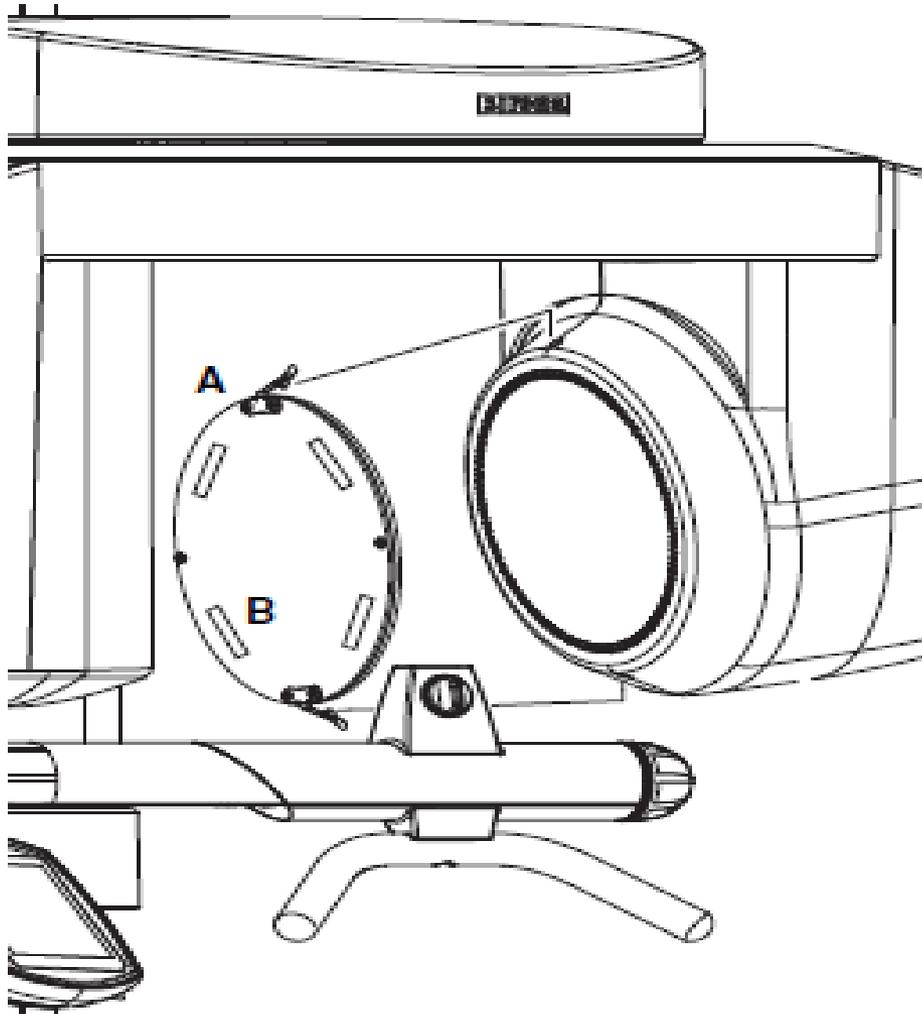
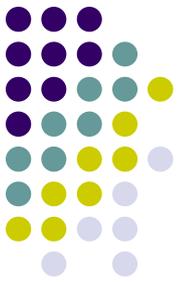
(Should be 15 lp/cm, the highest frequency pattern)

Cone Beam Systems ...



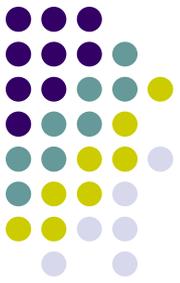
**PlanMeca
ProMax3D**

Cone Beam Systems ...



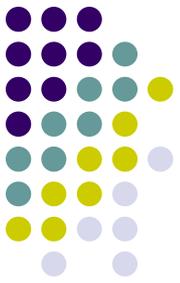
Sirona Galileos
uses a
“distortion
phantom”
for radiation
field alignment.

Cone Beam Systems ...

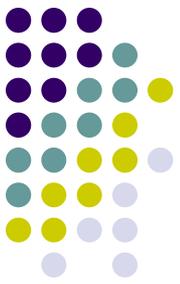


- Testing recommendations vary with each manufacturer. Units will require specific training on how to perform the calibrations.
- Must be an authorized dealer that has been trained by the manufacturer

Cone Beam Systems ...



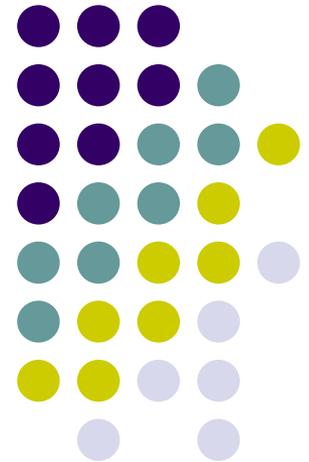
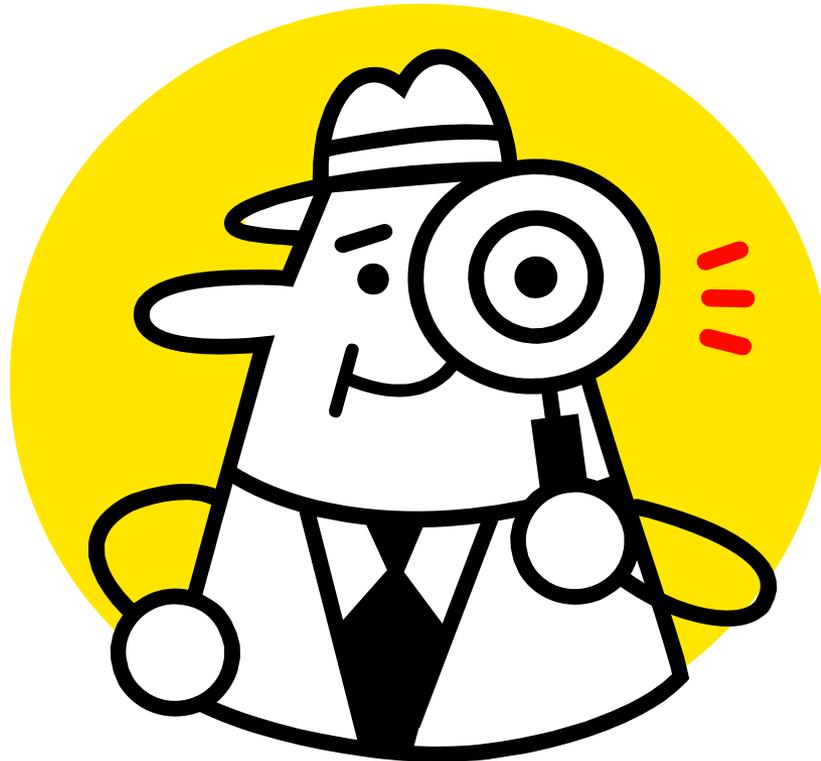
- May be able to contact the manufacturer directly and arrange service with one of their regional service technicians
- As part of the purchase package, the calibration tools are left on site with each unit.

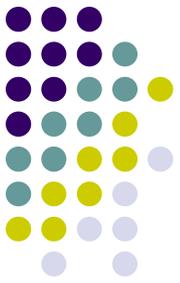


Your turn ...

- Do all of the digital units come with a calibration tool for beam alignment testing?
- If not, is there a fluorescence screen that works with these units?
- Are you able to obtain a test image of known size and measure it?

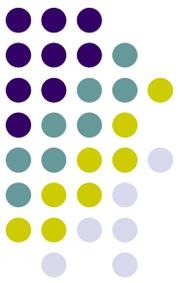
What to expect when it's your turn for an inspection





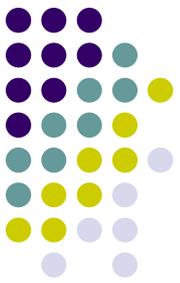
What to expect ...

- Certificate of Registration
 - Conditions on Certificate of Registration
 - The registrant shall comply with the provisions of 25 TAC §289.203, §289.204, §289.205, §289.226, §289.227, §289.228, §289.229, §289.231, §289.232, and §289.233.
- Access to regulations
 - You are not required to have a hard copy



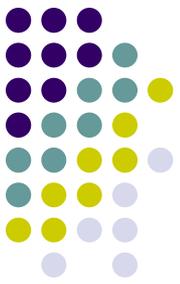
What to expect ...

- Operating & Safety Procedures
 - Include date & signature of individuals & RSO
- Training Records
 - Remember there is a change in the training requirements for those hired after 9/1/93
- Log of all services / installs / demos
 - Include date, name & Registration # & type of service
- Copies of FDA 2579's or equivalent
 - Submitted to the agency?



What to expect.....

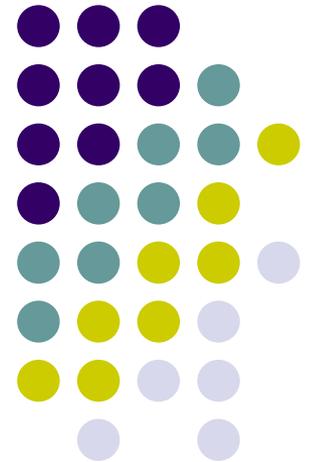
- Documentation of transfers or disposals
- Notice to Employees
- Personnel monitoring records – if applicable
- Calibration records
 - Needed for all of your radiation detection instruments
 - Calibrated at intervals not to exceed 12 months
 - Send out every year or
 - If you intercompare – you must document

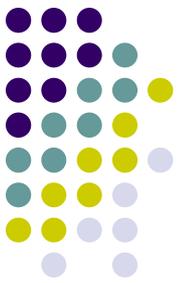


What to expect ...

- Copy of Medical Physicists license or number
 - if applicable
- Any previous violations and response to the Notice of Violation
- Do you do equipment testing in your shop?
 - Check for safe practices
 - Room Set up
 - Proper signage
 - Lead apron & annual check

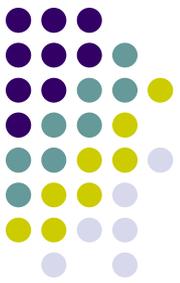
A few items from Registration





A few items from Registration

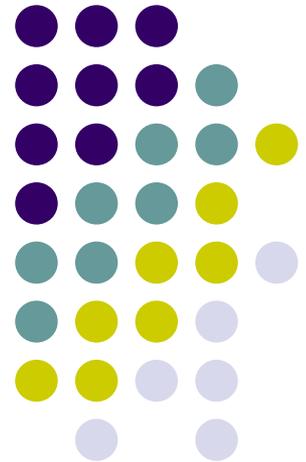
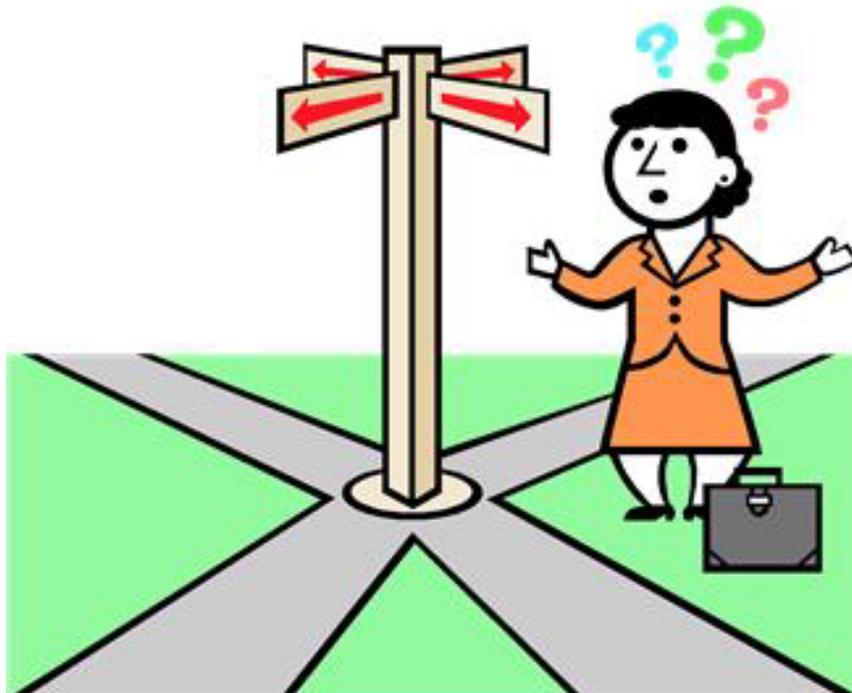
- §289.226(t)(2)(F)
Responsibilities of the Radiation Safety Officer....
 - (F) maintaining records as required by this chapter; and
 - (G) ensuring that personnel are adequately trained and complying with this chapter, the conditions of the certificate of registration, and the operating and safety procedures of the registrant.
- The RSO should be the person making the phone call if they have questions about registration, rules, etc.

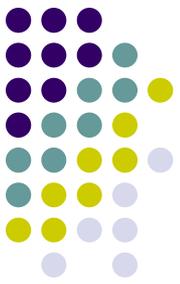


A few items from Registration

- Any out of state service providers?
 - Condition states: The registrant shall notify the Department of State Health Services, X-ray Inspections Group, P. O. Box 149347, Mail Code 2835, Austin, Texas 78714-9347, (512)834-6770, (fax) 512/834-6622, at least three days prior to the start of an assembly and/or installation of radiation producing equipment in the State of Texas. The notification shall include the specific location of activity, name of the person in charge of operations for the registrant, and the inclusive dates of use. If, for a specific case, the three day limitation would pose an undue hardship on the registrant, the registrant may, upon notification to the agency, obtain permission to proceed sooner.

How to Help us Help the Registrants

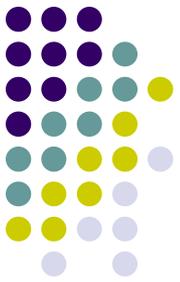




... Help the Registrants

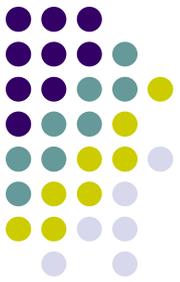
If they have questions or the opportunity presents...

- Ask them to put the “pink copy” in their x-ray notebook
- Remind them to change their equipment inventory
- If you get a blank stare on the 1st two
 - remind them there will be an inspection and they are required to show their paperwork



... Help the Registrants

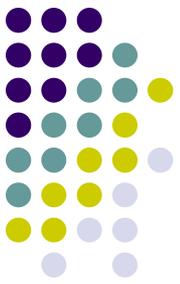
- If they move
 - they must notify Registration within 30 days
- If they take over an existing office
 - they must send in a new application
 - If they didn't get copies of the previous EPE's, they have 30 days to get them done



... Help the Registrants

- ... website
 - Operating & Safety Procedures
 - Forms
 - Application / Amendments
 - Inspection Checklist

	TEXAS DEPARTMENT OF STATE HEALTH SERVICES DAVID L. LAKEY, M.D. COMMISSIONER
<i>CONFIRMATION OF SCHEDULED X-RAY INSPECTION</i>	
NAME: _____	REGISTRATION NUMBER: _____
DATE OF INSPECTION: _____	TIME: _____
Registrant's Contact Person/Person who scheduled inspection: _____	



... Help the Registrants

- And last, but not least
 - If they have questions you can't answer or don't have time for
 - Tell them to call us



