Ludlum Medical Physics

Medical Imaging
Radiology QA Test Tools

NEW LUDLUM PRODUCT LINE
Medical Physics Products
Medical Physics Products

What are they?

Products used to measure radiation output and to ensure the safety of the medical worker and the patient, as well as the quality of the diagnostic and therapeutic tests administered.**

** Key Difference between MP & HP
Who are the Users of the Medical Physics Products

- **Health Physicist:**
  - Safety of the environment
  - Safety of Employees/Public
  - RSO (Radiation Safety Officer)

- **Medical Physicist:**
  - Safety of the Patient
  - Quality of the Pictures Produced
  - Quality of the Dose Administered

- **QA Tech:**
  - Performs Daily QA Tests (consistency)
  - Reports results to Med. Physicist

- **Service Tech:**
  - Performs Acceptance Tests on Equip
Radiology Medical Imaging QA

A Process that Monitors and Makes Corrections to the Radiation Imaging Equipment, to Ensure the Safety of the Medical Worker, the Patient, and the Quality of the Images Produced.

TWO KEY COMPONENTS

1. Patient/Worker Safety → Dosimetry
   (Safety from Radiation)

2. Photographic Quality of the Picture → Image Quality
   (Proper Interpretation-Diagnosis)

-What makes a good quality picture possible...

...Requires a combination of Photographic Characteristics:
These are: - Contrast, Density and Resolution
   (Shades / Dark-Light / Sharpness)
Monitoring and Making Corrections to Image Quality

**MEASURING IMAGE QUALITY**

**STEP WEDGE**
- Evaluate Scale of Contrast
  - Difference in steps
  (shades of gray)
  
  *Each Step, Twice the Density (thickness)*
  *Of the Previous Step – for x-ray to penetrate.*

**Line Pair Test Pattern**
- Evaluate Resolution
  
  *{Ability to see fine details}*
  
  Lp/mm (Film: 6-10; DR: 2.5-5)

**Sharp edges vs. fuzzy**

Visibility of details
How Does the Image Look to the Radiologist – Outcome of Imaging QA

Image Quality Affects Interpretation of X-ray Examination

Low Contrast Film
Too many shades of gray
Un-sharp edges

High Contrast Film
-Sharp clear edges
Quality Affects Visibility of Information

Low Resolution Lung
Fuzzy edges – Not Clear

High Resolution Lung
Sharp edges – good detail
QUALITY ?

High Contrast Hand
Too Few gray steps....

Good Contrast Hand
Good Range of Gray Steps
Contrast too high – few shades

Good Contrast – broad scale of shades
The Abdomen view above is pictured in Cross-Sectional view and shows multiple cysts (*) in the region of the (P) Pancreas. Most are located between the left (K) Kidney and the (S) Spleen.
Factors Involved in Image Quality - Some Common Terminology

Standard Table-Top / Wall X-ray Unit
- Proper physical/mechanical alignment - Geometry
Correctly Aligned

Angled excessively toward head
Light Field Radiation Field / Match-up

Beam Alignment Test Tool

Test Tool Image

Result of Mis-Aligned Collimator
Generation of X-rays

X-rays are generated when the (cathode) filament inside the X-ray Tube creates free electrons, while a High Voltage is applied, causing these electrons to be driven into a Tungsten target material (anode). The x-rays emanate from the Anode and are focused and allowed to pass through a beryllium window. The opening is aligned to the Collimator housing, which filters and crops the beam to the needed size for the procedure.
PHANTOM

(Attenuation Material)

A mass of material that approximates tissue densities and characteristics in its physical properties that mimic human tissue.

Interacts with x-rays just like human tissue.
Some Tools used to Monitor the quality of the Diagnostic tests

- **Nuc Med Bar Phantom**
  - (Resolution)

- **Light /Radiation Field Tool**
  - (Geometry)

- **CR / DR Test Tool Model L-777**

- **Thyroid Phantom**
  - (Attenuation)
NEW CT Phantom Versions

Classic Separate Section Phantom

Nested style Phantom

Also Available in individual sections or Head/Body only nested versions
Classic Test Tools

Screen Mesh/Resolution;  
Contrast, Fine Resolution tool

Rotating Spoke Test tool – Motion Tracking  
Contrast, gross resolution tool
Classic Test Tools Updated for Digital Use; Measure Contrast, Density, Resolution or just act as Attenuators to adjust (calibrate) imaging equipment

- Mini- CR/DR
- Patient Penetrometer
- Acrylic Modular Phantom
- Low Contrast Resolution
Finally a couple examples of Safety-related Test Tools

Tools for Shielding and general Radiation Protection
NEW

New ‘Dimension Series’ Platform of Instruments

MODEL 9DP
Pressurized Ion Chamber

The MP’s Instrument of Choice to Measure Dose Associated with X-ray tube (collimator) Leakage & Scattered Radiation, as well as shielding verification.

Also Available in H*10 (Ambient Dose) and Low Pressure Versions (9DP-1)
Medical Physics Safety
For Both Medical and general HP applications

- SAFETY -

New DeCon Kit (Environmental)
Clear Pb  Lead Acrylic Shielding (Worker Safety)
MORE SAFETY RELATED EQUIPMENT
Standard Lead and Lead Glass Shielding
Ludlum Measurements is a Manufacturer

If you don’t see it in the catalog or on the website, please call....
We may be able to manufacture it for you........

Questions ?