Medical Physics Life-Hacks

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BUILDING BRIDGES. CULTIVATING SAFETY. GROWING VALUE.

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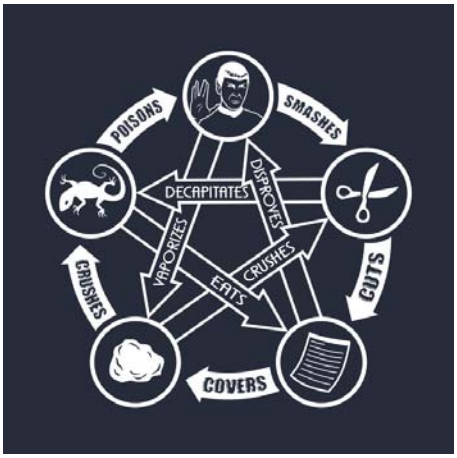
This is an Interactive Session. First, let's play a game



Go to www.pollev.com/aapm2016

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As Physicists, We are Expected to be Experts in Everything

3

What is a Life-Hack?

Securing valuable items on the beach

life·hack
Dictionary result for lifehack
/ˈlīfˌhak/
Noun INFORMAL
noun: **life hack**

1. a strategy or technique adopted in order to manage one's time and daily activities in a more efficient way.
2. a usually simple and clever tip or technique for accomplishing some familiar task more easily and efficiently

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Life Hacks from the World of Imaging

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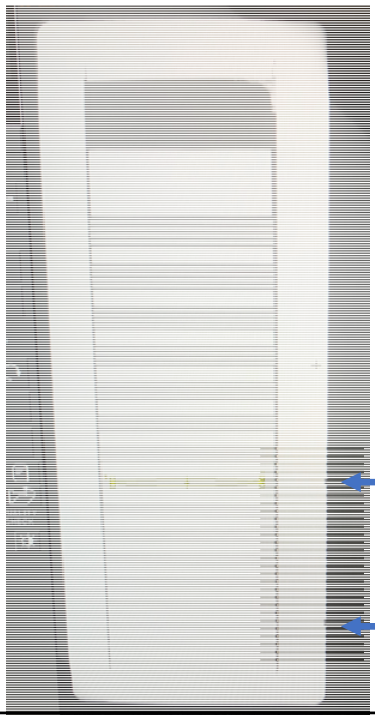

Making the MTF Test on a GE Essential a little easier

The GE Digital Mammography MTF test requires measurements of the 2.09 and 3.93 lp/mm patterns. The numbers are generally not visible at the standard window and level. To easily identify which pattern to use, file away a hole at the correct level with a Dremel. Even a very small indent will be clearly visible at any window setting.

6

Accurately Testing AEC with a Foam Pad

The Hologic Selenia Dimensions system sets target EI values based on the measured thickness. When performing the AEC thickness tracking test on a system that uses the foam pads, place the pad on top of the paddle for an accurate technique.

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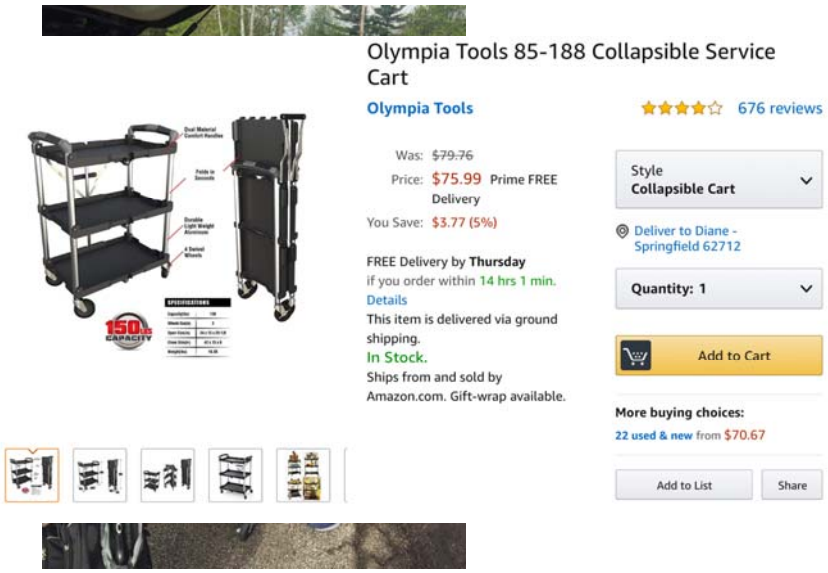
Folding, Rolling Cart for the Consulting Physicist

Allows you to slide the CTDI phantom into and out of a trunk and onto a table. No lifting required.



Courtesy of Diane Elmer

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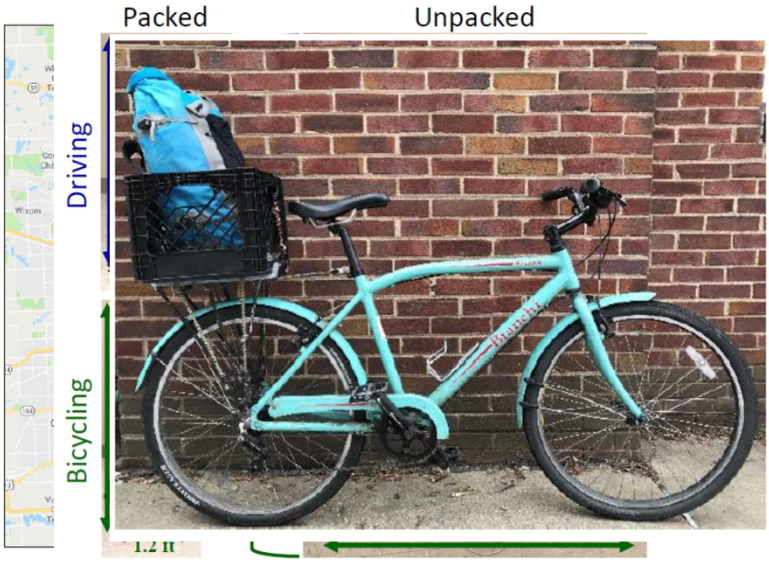
Medical Physics By Bicycle

- For facilities within a 15-mile radius of home, can a bike be used to carry equipment for mammography and R/F testing?
- Reduced weight of kit from 34.2 kg to 4.2 kg.
- Reduced volume from 82.2 liters to 5.9 liters
- Acrylic blocks were stored at sites.



Courtesy of Matt Vanderhoek

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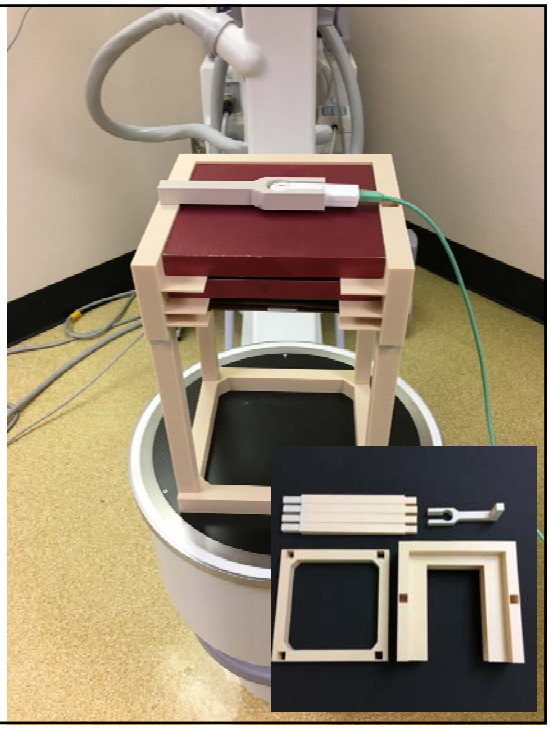
3D Printed Sensor and Attenuator Holder

- Custom 3D printed holder for meter and aluminum plates that sets the meter at the correct height every time.
- Attenuators near sensor geometric magnification and smaller attenuators.
- For 3D printer plans, contact Kent at ogdenk@upstate.edu



Courtesy of Kent Ogden

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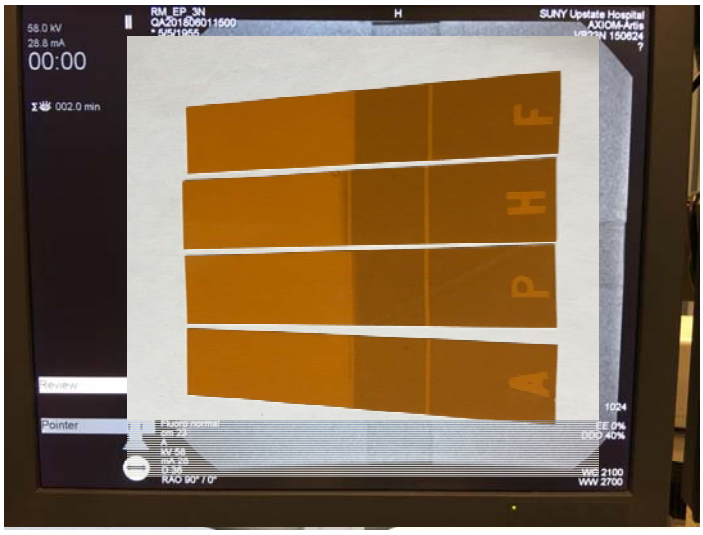
Fluoroscopy Collimation Check I

- 3D printed Gaf-Chromic film strip holders that attach to the face of an image receptor.
- Holders include metal strips to identify on the image where the edge of the field is.



Courtesy of Kent Ogden

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Fluoroscopy Collimation Check II

- The Joint Commission fluoroscopy standards require evaluation of the collimator accuracy in fluoroscopy systems. To check for xrays outside the FOV, you need some external sensor…
- Lanex 400 screens work well
- Supertech sells a handy tool as well.

Courtesy of Carl Keener

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Microphone Cases as MRI or CT Phantom Cases

- Microphone cases are hard-sided, quality cases that can be modified with foam to hold a variety of phantoms.

Courtesy of Carl Keener

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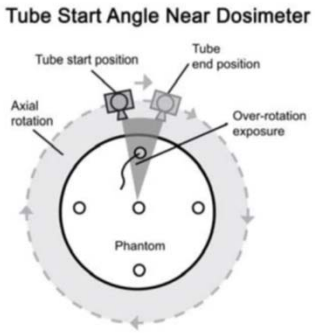
Toshiba/Canon CTDI Testing at 12 o'clock

- Toshiba/Canon systems use an arbitrary start angle for ramp-up.
- This leads to the beam being on for slightly more than 360°.
- When measuring CTDI in the periphery, this can lead to inconsistent results.



12 o'clock position	
Measurement 1 (mR)	758.8
Measurement 2 (mR)	660.6
Measurement 3 (mR)	795.6
Average of above 3 measurements (mR)	

Image source: Toshiba CTDI 10-Scan Method white-paper.

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Toshiba/Canon CTDI Testing at 12 o'clock

- To properly account for the arbitrary scan start angle, a series of 10 scans, timed to include a 10% rotation offset, will provide a proper CTDI reading.
- For solid-state systems, increase the wait time to ensure that the system does not reset during the exposures.

Rotation time	Wait time on scanner (acquisition interval)
0.4s	1.3s
0.5s	1.1s
0.75s	1.6s
1s	1.1s
1.5s	3.1 sec

0	**12 o'clock position**	
1	Measurement 1 (mR)	639.2
2	Measurement 2 (mR)	639.3
3	Measurement 3 (mR)	639.7
4	Average of above 3 measurements (mR)	

Image source: Toshiba CTDI 10-Scan Method white-paper.

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Need a good scattering phantom?

- Often times, finding a good scattering phantom to do a safety survey can be tricky. What if you didn't bring Lucite?
- Go to the bathroom, get the trashcan, and put some water in it.

Courtesy of Steven Jackson

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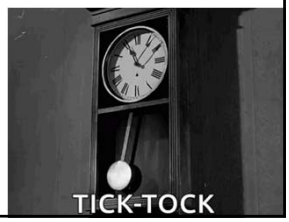
Shorten the Time to Marinade a PET Phantom

- The ACR instructions specify activities of FDG to prepare the phantom.
- Instructions specify a 1 hour wait between first dose draw and start of imaging.
- Use Decay Equation to correct target activity and shorten your wait time.
- Make sure to correct your injection time for SUV calculations.

$$A = A_0 * \left(\frac{1}{2}\right)^{T/110}$$

	60 min uptake	30 minute uptake	20 minute uptake
Target	0.42	0.35	0.33
Target	0.99	0.82	0.77



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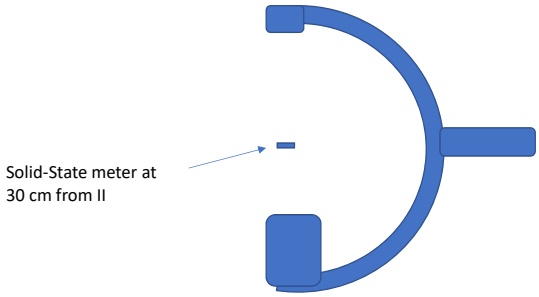
All-in-One: Reference Dose and DAP Chart in Excel

- Dropdowns
  - Preconfigured field sizes
  - Preconfigured Ref Points
  - Vlookup() or Match()
- User input in cGy and cm
- EXAMPLE Mobile C-Arm:
  - Ref Point well defined @ 30cm OID
  - Field Area well defined @ OID
- SOLUTION:
  - Measure at Reference Point
  - Let correction factors do the rest!

Courtesy of Steven LaFontaine

DAP				REF Point	30 cm from Imager	
Units	9 Inch OEC II	mGy	m^2	Units		mGy
PRE	0.1045	mGy*m^2		Pre	7.84	mGy
Meas	0.692046506					cGy
POST	0.2478	mGy*m^2		Post	14.69	mGy
Target	0.1433	mGy*m^2		Target	6.85	mGy
Calc	0.139178877	mGy*m^2		Calc	6.92	mGy
Diff	-2.88%			Diff	1.03%	
☐ Table Factor	+0%	☑ C-Arm Ref-DAP		-51%	☐ Custom	+0%



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Open-Mic Time for Imaging Hacks

Get a Free "I'm a Physicist" Roll of Duct Tape for Sharing your Hack

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Life Hacks from the World of Therapy

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Keeping a Calendar of Due Dates in Excel

- For items that have recurring due dates, keep an Excel document with the most recent date it was completed and use an equation to calculate when it is next due.
- Use Conditional Formatting to highlight upcoming items
- Use Filtering to Sort by Date.

	RSO/LSO TRACKING ITEMs	Last Complete	Next Due Date	Frequency	Priority	NOTES
2	Review lead aprons SOPs and inventories	4/10/2019	4/26/2019	Annually	7 - TJC Required (annual	
3	Bionomics rad waste disposal 2/12/2019		2/1/2019	N/A	2 - Regulatory Requirem	
4	Attend SRS meeting (research safety; GB-139; 1st Tues/month @ 12 pm noon)	4/2/2019	5/7/2019	Monthly	3 - Management desirec	
5	Perform thyroid probe QA (qtrly)	2/7/2019	5/8/2019	Quarterly	1 - Regulatory Requirem	
6	Remove radioiodine out-patient warning from CPRS (if any)	4/23/2019	5/8/2019	Biweekly	5 - Best practice / self-in	
7	Update TMS fluoro safety training course	5/8/2018	5/8/2019	Annually	5 - Best practice / self-in	
8	Scan/return dosimeters for processing	4/9/2019	5/9/2019	Monthly	1 - Regulatory Requirem	
9	Review fluoro patient doses > 5 Gy	4/25/2019	5/10/2019	BiWeekly	5 - Best practice / self-in	
10	Perform quarterly RSO Nuc Med Audit	2/11/2019	5/12/2019	Quarterly	2 - Regulatory Requirem	
11	Attend CEOCC Meeting (Bldg 1; conf room; 2nd Tues/month @ 11am)	4/9/2019	5/14/2019	Monthly	3 - Management desirec	
12	Review dosimetry results and make ALARA reports as needed	4/18/2019	5/18/2019	Monthly	1 - Regulatory Requirem	
13	Complete FEMA NIMS ICS Training for Emergency Response (100/200/700/800 completed; 300/400 are face to face and pending)	2/19/2019	5/20/2019	N/A	3 - Management desirec	
14	Perform DC accuracy/performance testing (qtrly)	2/19/2019	5/20/2019	Quarterly	1 - Regulatory Requirem	
15	Perform storage area surveys (qtrly): wipes+ambient	2/19/2019	5/20/2019	Quarterly	2 - Regulatory Requirem	
16	Attend EMC (emergency) meeting (3rd Tues/month, 1-2pm)	4/16/2019	5/21/2019	Monthly		
17	Provide dosimeters for monthly exchange	4/22/2019	5/22/2019	Monthly	1 - Regulatory Requirem	
18	Monthly Occupational Safety & Health Working Group Meeting	4/30/2019	5/28/2019	Monthly	4 - Best practice / manag	
19	Perform DC linearity test (qtrly)	2/26/2019	5/28/2019	Quarterly	1 - Regulatory Requirem	
20	Perform annual laser safety program review		5/30/2019	Annually	2 - Regulatory Requirem	
21	Perform/document hazard evaluations for all Class 3B and 4 lasers		5/30/2019	N/A	2 - Regulatory Requirem	
22	Provide qtrly dose Summary to services	3/1/2019	5/30/2019	Quarterly	5 - Best practice / self-in	
23	Review of written directives (normally: I-131 and Y-90)	5/1/2019	5/31/2019	Monthly	5 - Best practice / self-in	
24	Update binder/review NM Daily Dose Calibrator Checks	5/1/2019	5/31/2019	Monthly	5 - Best practice / self-in	
25	Update binder/review NM Weekly Wipes and Area Surveys	5/1/2019	5/31/2019	Monthly	5 - Best practice / self-in	
26	RSC/LSC meetings: set time and prepare agenda	3/5/2019	6/3/2019	Quarterly	2 - Regulatory Requirem	
27	Perform DIS waste inventory/surveys/disposals	3/6/2019	6/4/2019	Quarterly	2 - Regulatory Requirem	
28	Perform Packard Cobra II Calibration (quarterly)	3/6/2019	6/4/2019	Quarterly	1 - Regulatory Requirem	
29	Review Nuc Med Policies and Protocols	6/13/2018	6/13/2019	Annually	3 - Management desirec	
30	Reconcile/review Fluoro AU list & training	3/19/2019	6/17/2019	Quarterly	2 - Regulatory Requirem	
31	Attend ICARE Meeting (1pm)	3/21/2019	6/20/2019	Quarterly	3 - Management desirec	
32	Reconcile/review Laser AU, training, and inventory lists	3/21/2019	6/20/2019	Quarterly	2 - Regulatory Requirem	
33	Prepare RSC and LSC minutes for exec mgmt	3/28/2019	6/26/2019	Quarterly	1 - Regulatory Requirem	
34	RSC/LSC meetings: hold meeting and prepare/submit minutes	3/28/2019	6/26/2019	Quarterly	3 - Regulatory Requirem	

Courtesy of Thomas Huston and Dave Jordan

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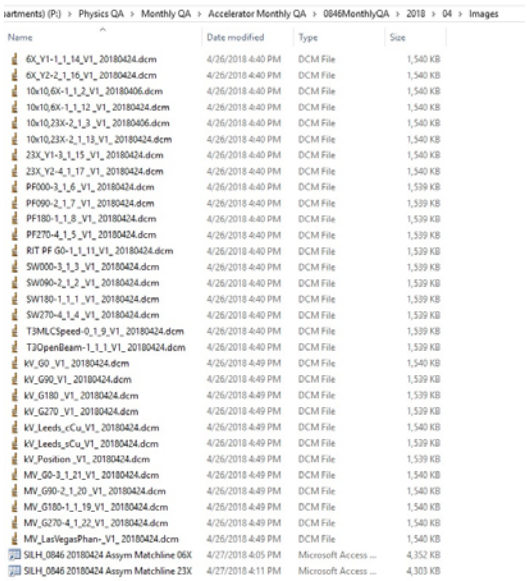
ImageJ Script to rename DICOM files

- Many DICOM Images have indecipherable names. This script for ImageJ will rename all the DICOM images in a folder with the Treatment Unit, Date, Energy, and Field Name or Number.
- For a copy of this Script, email TLembcke@harbinclinic.com



Courtesy of Tyler Lembcke

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Water Tank Hacks

- Use a binder clip on the edge of a water tank with the clip sticking out, along with a lollipop thermometer.

Courtesy of Robin Miller

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Water Tank Hacks

- Use a standard, hardware store clamp to hold a hose in place for filling and emptying a water tank.

Courtesy of Robin Miller

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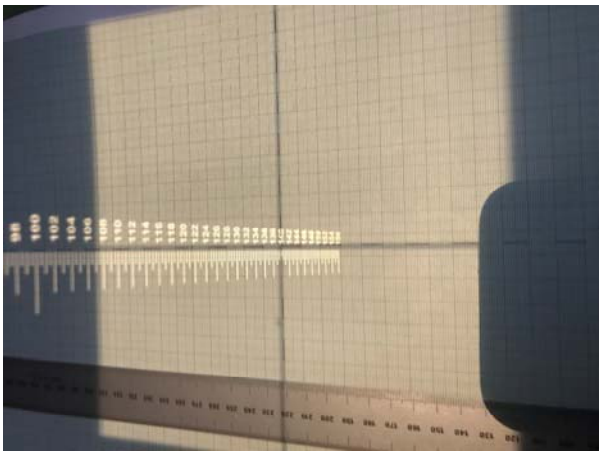
Linear Accelerator Crosshair Deviation Test

Perform Crosshair Deviation at distance of 140cm rather than 100cm

- Lower table position makes it easier to analyze
- Magnification helps to reduce error bars at SAD distance



Crosshair Deviation Verification (mm): (Rotate collimator 90° / 270°)	Tolerance (mm):	1.0
	Table Vert. (cm):	40.0
	Deviation	Result
Crosshair Deviation (X)	0.00	Pass
Crosshair Deviation (Y)	0.00	Pass
Total Crosshair Deviation (at SAD)	0.00	Pass

Courtesy of Bruce Curran

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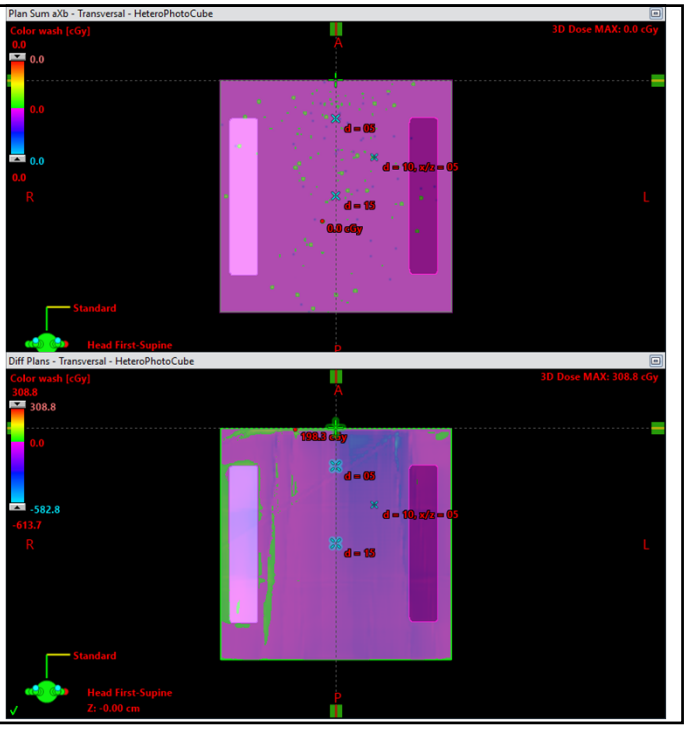
Treatment Planning System QA

- If you have a baseline plan that is run monthly on a static imageset, use Plansum and instead of adding the plans together, subtract one plan from the other.
- Switch to colorwash to see both positive and negative doses.
- No need to check numerical values on points.
- If the subtracted Plansum shows 0.0 all the way around, nothing has changed.

Courtesy of Adam Schoen



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Toilet Cleaning after Lutathera Administration

- Lutathera patients must void after administration, but clean-up can be a problem.
- Solution: lots of saran wrap and disposable toilet wands!

Courtesy of Susan Richardson

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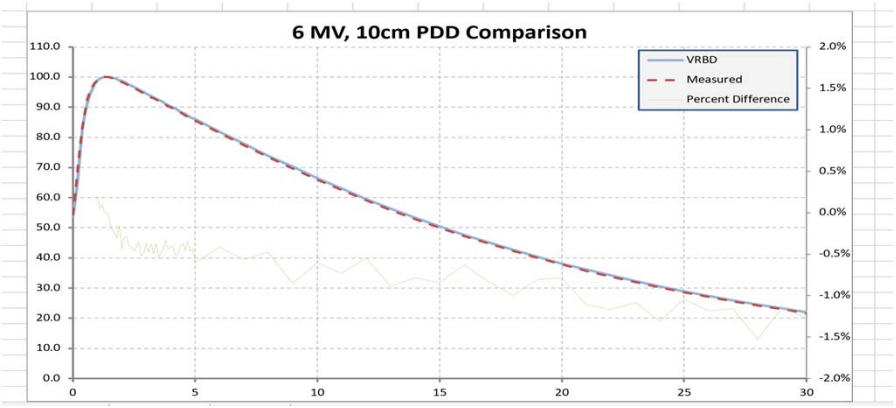
Is your beam data any good?



Comparison data is helpful data. Most linacs are closely matched from the factory:
-Taking data from scratch? Compare to homogenized data from the vendor or a friends.
Barring very small fields or very large fields, data should agree well within 2%

Adapted from a conversation with Gary Shields, MS

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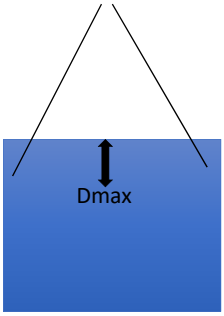
Is your beam data any good?



Think simple:
in your Treatment Planning System do a calculation

10x10 field size at Dmax, 100cGy
did you get 100 mu's?

This works for all photon energies.

**how does your TPS define dose?

Courtesy of R Todd Clark

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Open-Mic Time for Therapy Hacks

Get a Free "I'm a Physicist" Roll of Duct Tape for Sharing your Hack

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Thank You!

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