



8th EURADOS Webinar (28/10/2021)
**Intercomparisons of personal dosimeters:
Lessons learnt**

General results (photon doseimeters)

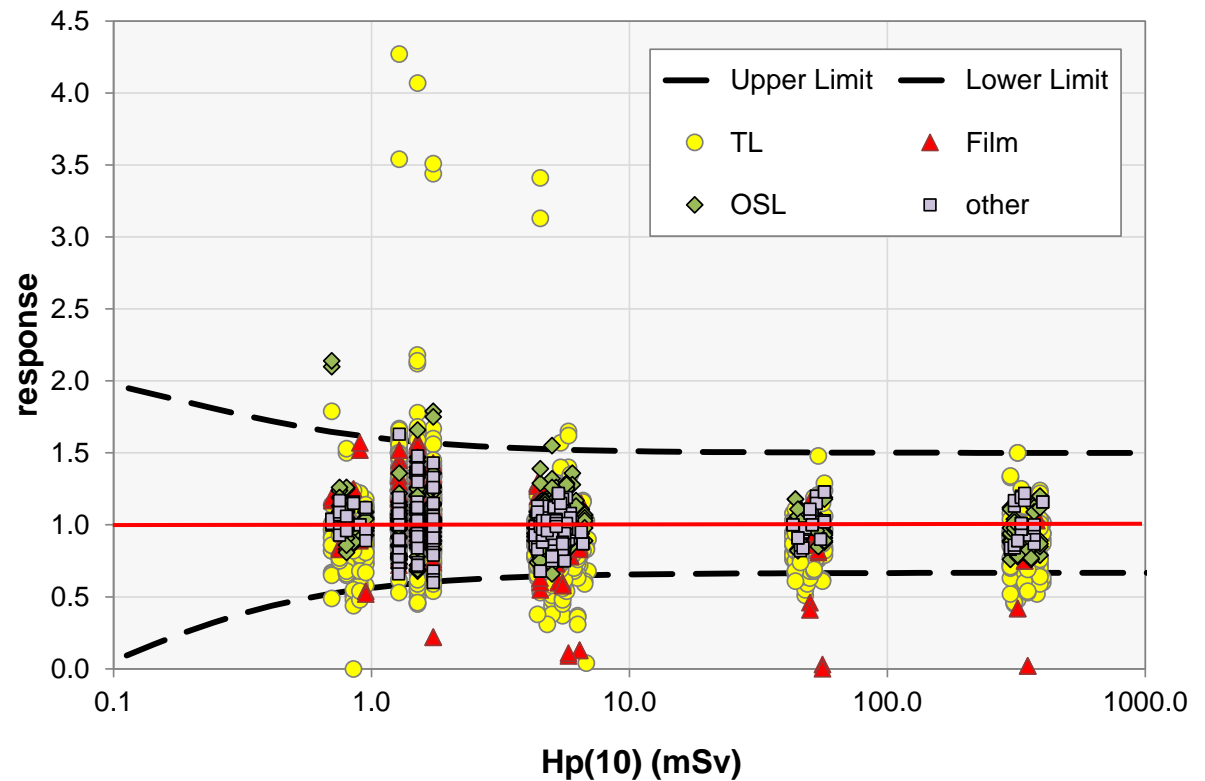
Hannes Stadtmann - Seibersdorf Laboratories (AT)

Whole body dosimeters



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Trumpet curve for $H_p(10)$



$$\text{response: } R = \frac{H_{p,\text{participant}}}{H_{p,\text{reference}}}$$

$$\frac{1}{F} \left(1 - \frac{2H_0}{H_0 + H_c} \right) \leq R \leq F \left(1 + \frac{H_0}{2H_0 + H_c} \right)$$

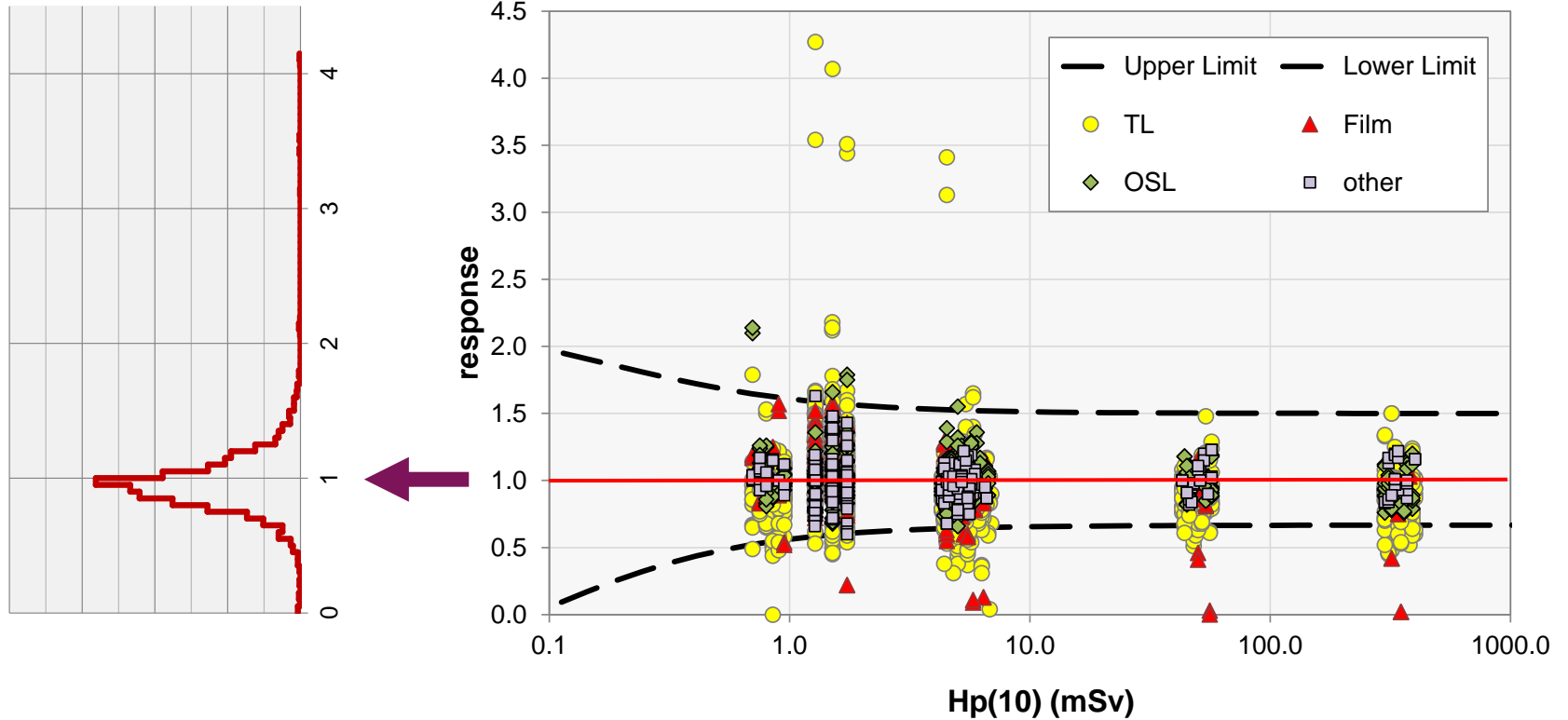
$$F = 1.5 \quad H_0 = 0.085 \text{ mSv}$$

10% of outliers are accepted

ISO 14146:2010

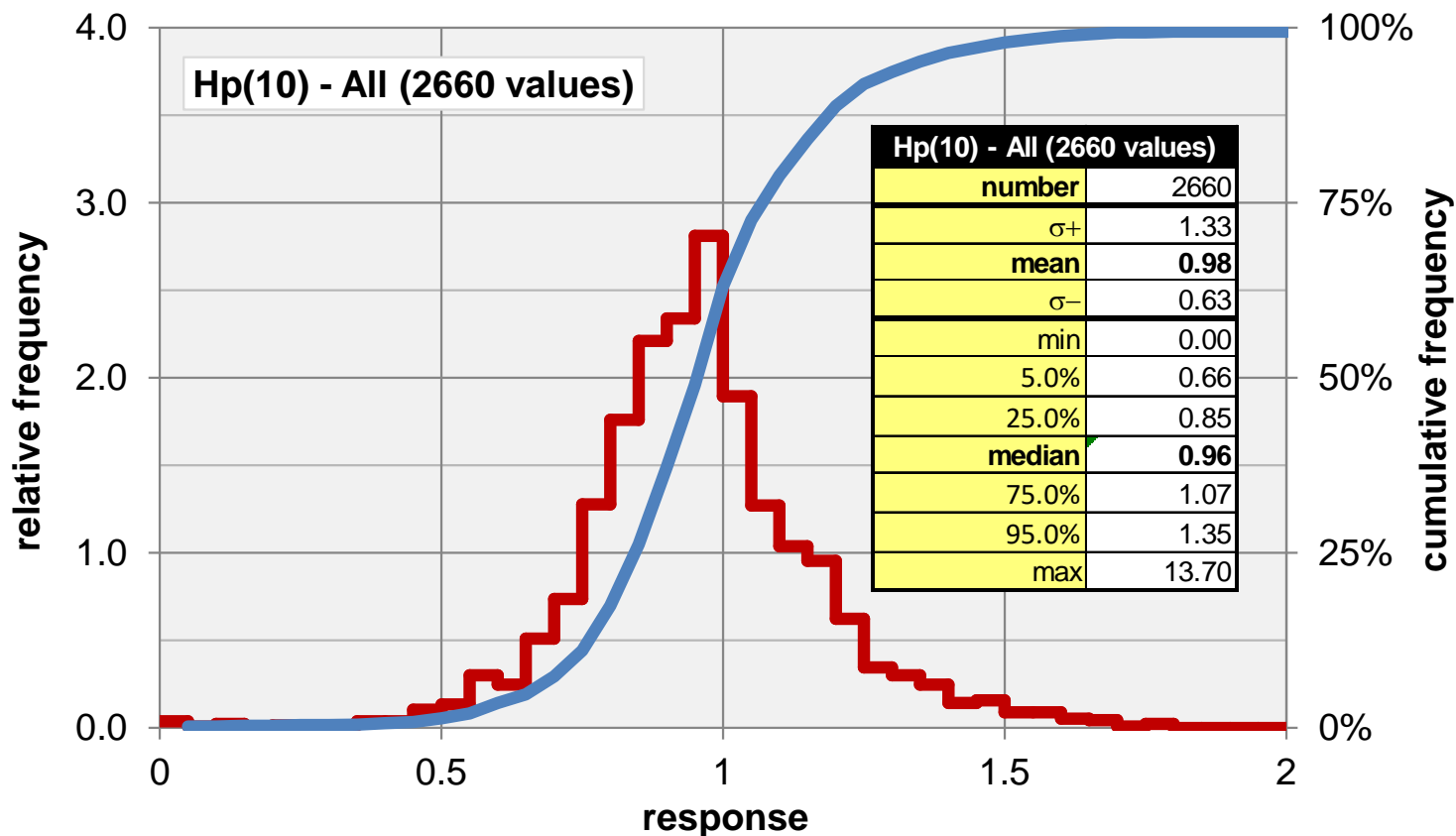
IC2018_{ph}

Trumpet curve for $H_p(10)$

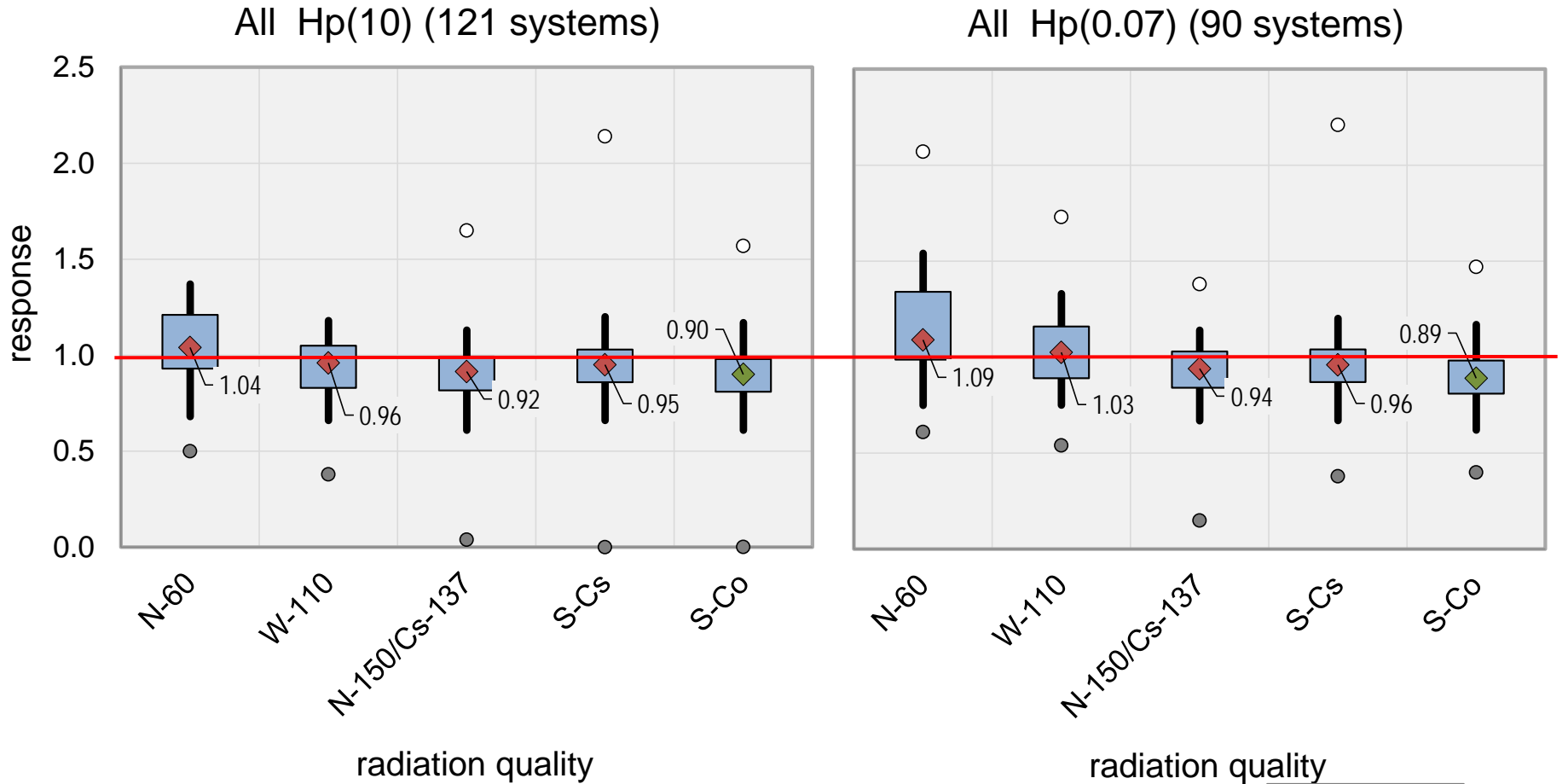


ISO 14146:2010

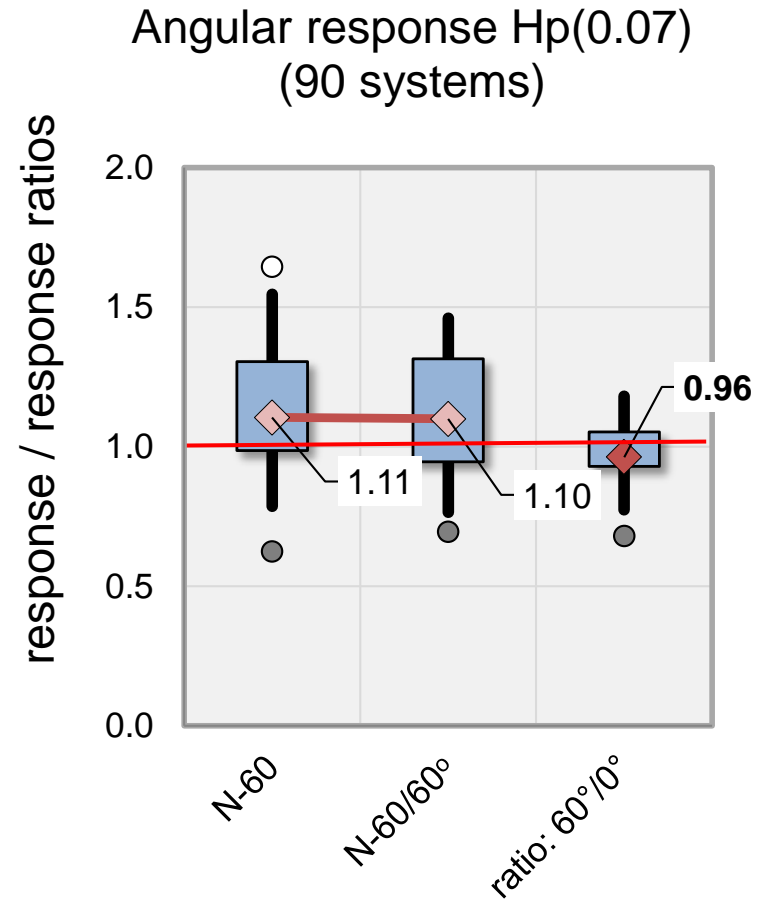
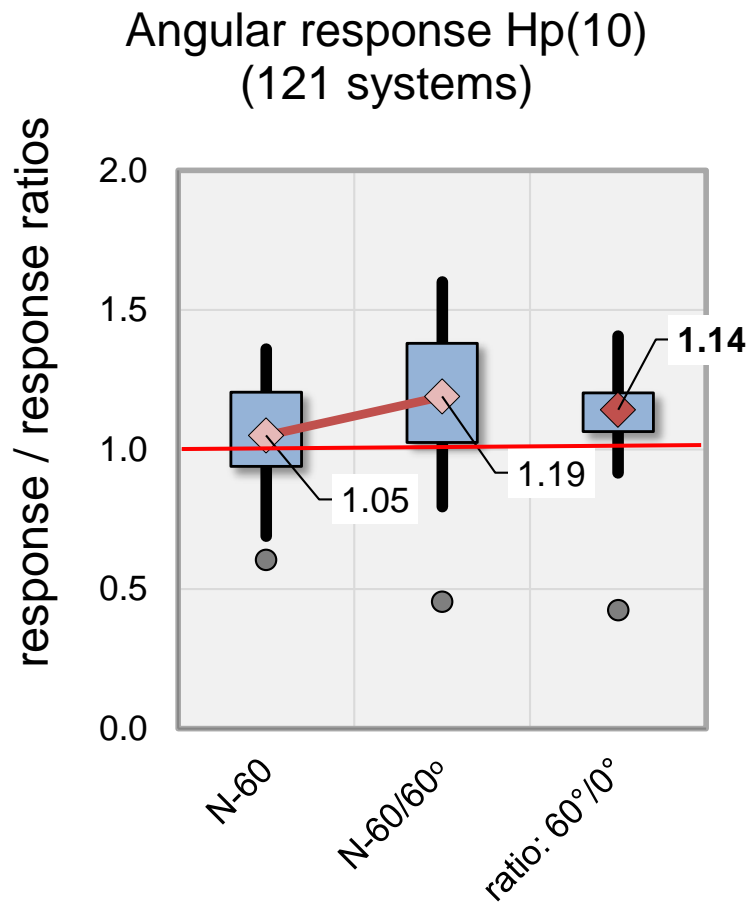
All response values $H_p(10)$



Energy response (0°)

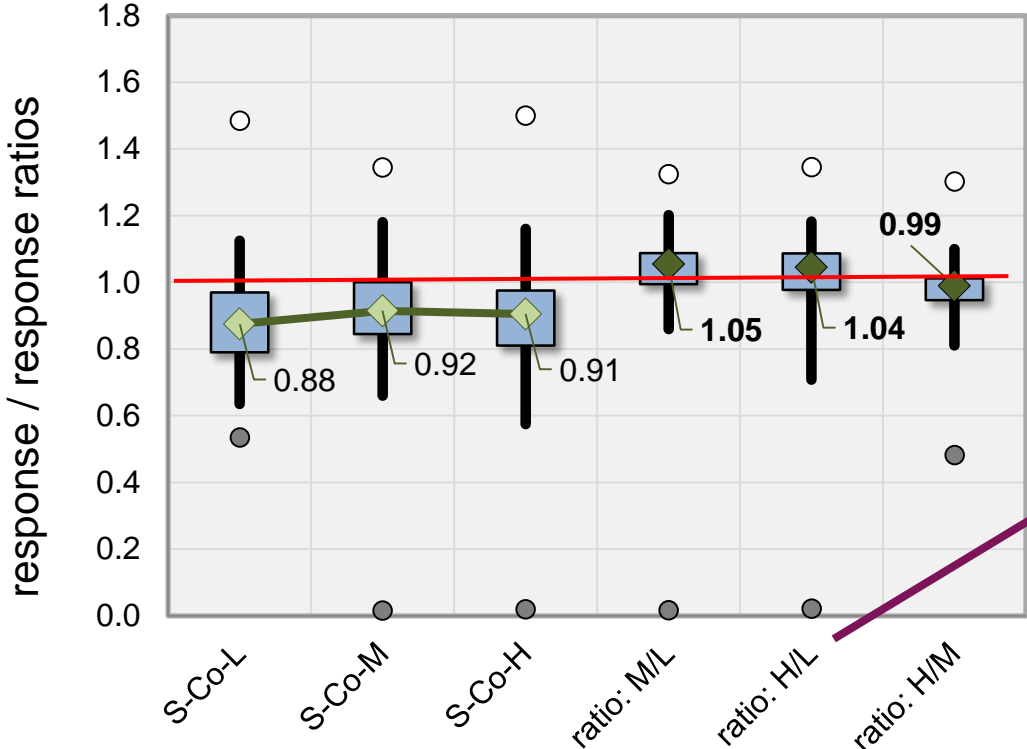


Angular response (0°/60°)



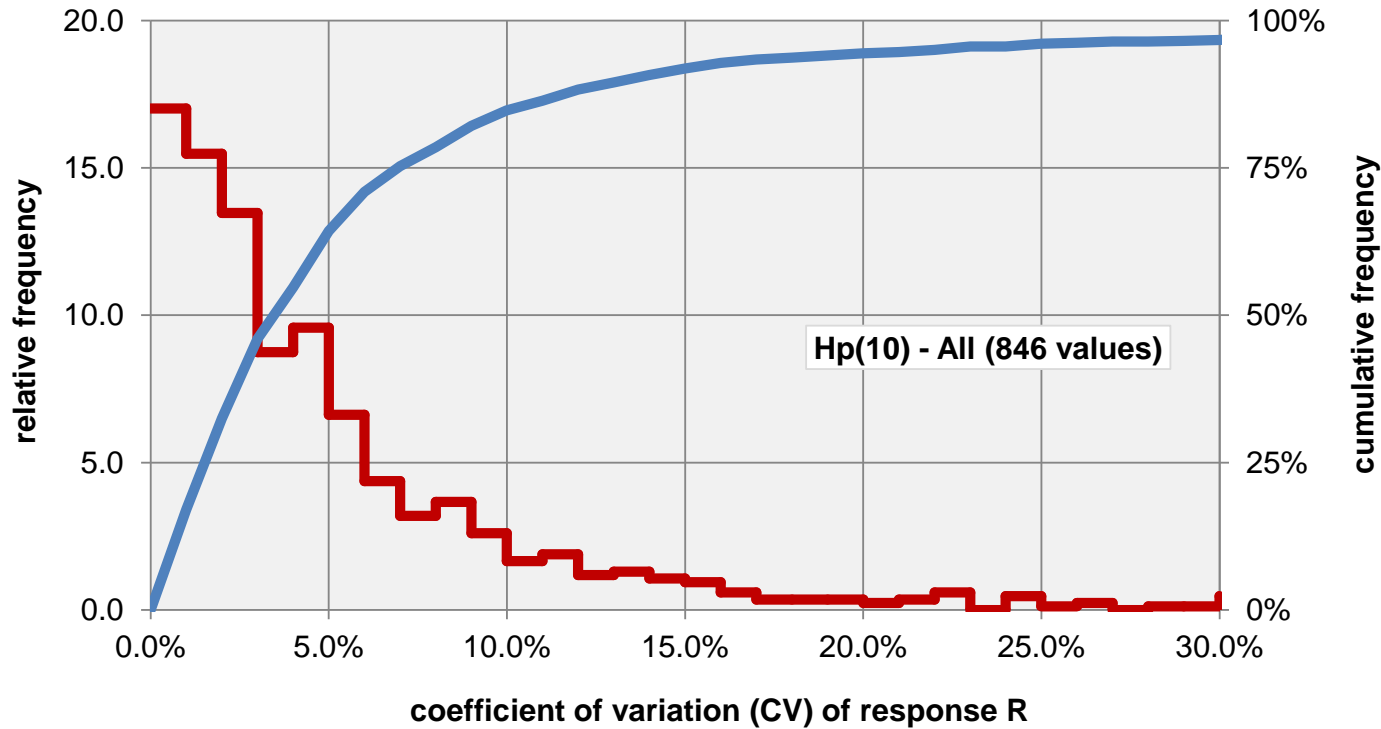
Linearity

Linearity - Hp(10) (121 systems)



ratio: H/L	
number	121
σ^-	1.18
mean	1.00
σ^+	0.83
min	0.02
5.0%	0.71
25.0%	0.98
median	1.04
75.0%	1.09
95.0%	1.18
max	1.35

Reproduceability (CV)



Hp(10)	
number	846
σ^-	17.4%
mean	6.3%
σ^+	-4.8%
min	0.0%
5.0%	0.0%
25.0%	1.5%
median	3.4%
75.0%	6.8%
95.0%	21.4%
max	147.4%

Outliers ISO14146:2010

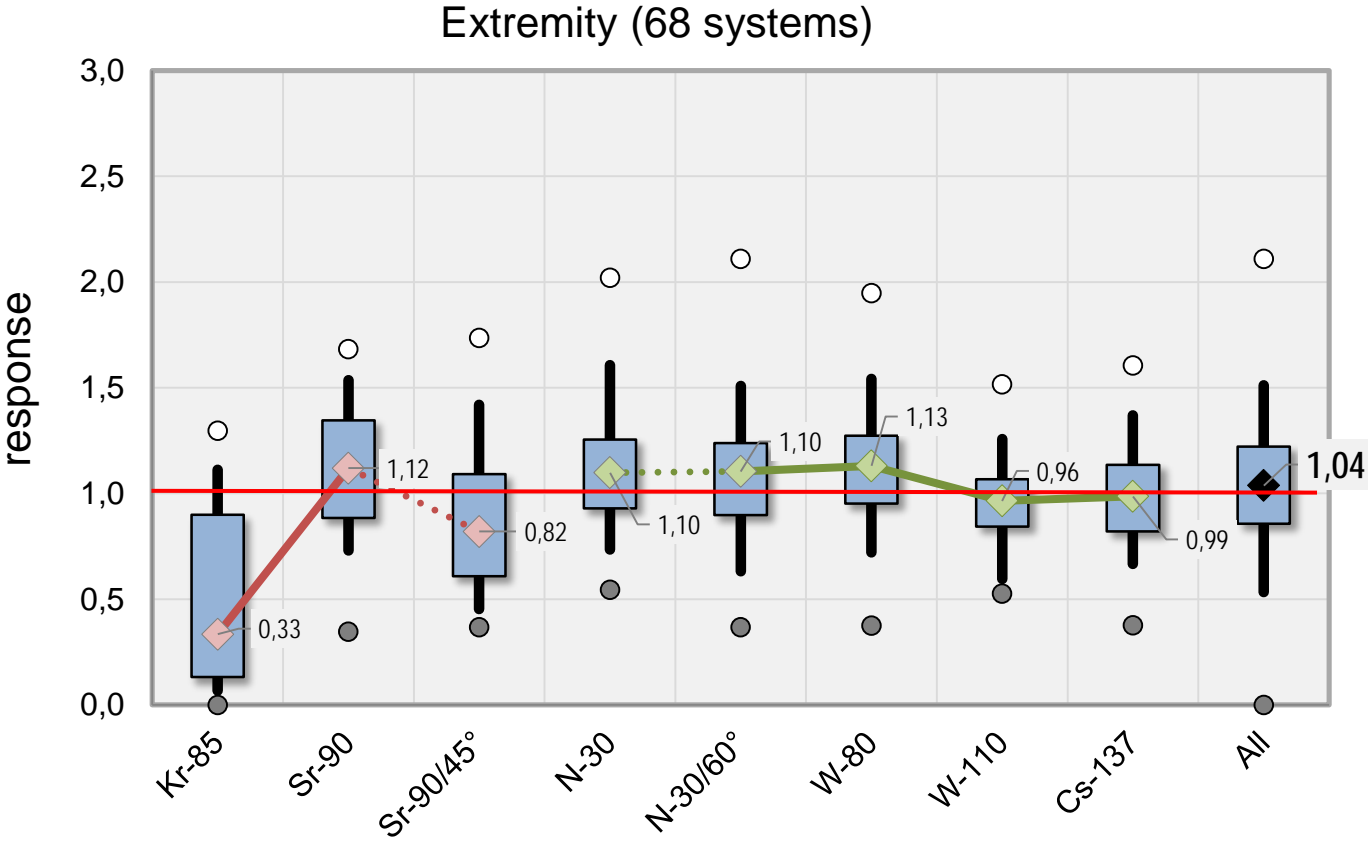
IC2018	Hp(10)		IC2016	Hp(10)		IC2014	Hp(10)
Outliers			Outliers			Outliers	
N-60	4%		N-40	5%		RQR7	5%
N-60/60°	10%		N-40/60°	24%		W-80	5%
W-110	5%		N-150	5%		W-80/60°	9%
S-Cs	4%		N-150/45°	6%		W-150	5%
S-Co	7%		S-Cs	4%		S-Cs	3%
N-150/60°	3%		S-Co	5%		S-Co	6%
N-150/Cs-137	7%		S-Cs/Sr-90	14%		All	5%
All	6%		All	7%			

Extremity doseimeters



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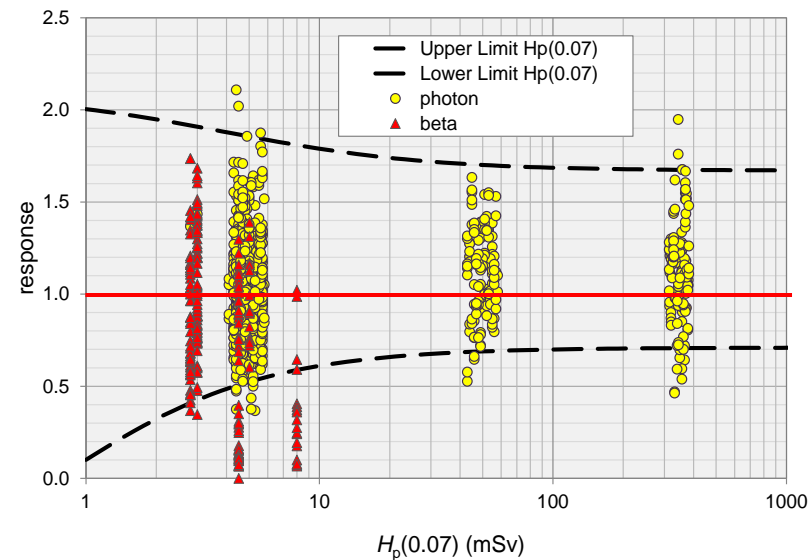
Energy and angular response



IC2019_{ext}

Outliers (ISO14146:2018)

Extremity - Outliers (%)				
Radiation	Quality	Ph	PhB	All
beta	Kr-85/0°		57.9%	57.9%
	Sr-90/0°		1.3%	1.3%
	Sr-90/45°		1.3%	1.3%
	all betas		20.2%	20.2%
photon	N-30/0°	1.7%	1.3%	1.5%
	N-30/60°	3.3%	2.6%	2.9%
	W-80/0°	6.7%	1.6%	3.9%
	W-110/0°	0.0%	0.0%	0.0%
	Cs-137/0°	3.3%	0.0%	1.5%
	all photons	4.4%	1.3%	2.7%
All		4.4%	6.5%	5.7%



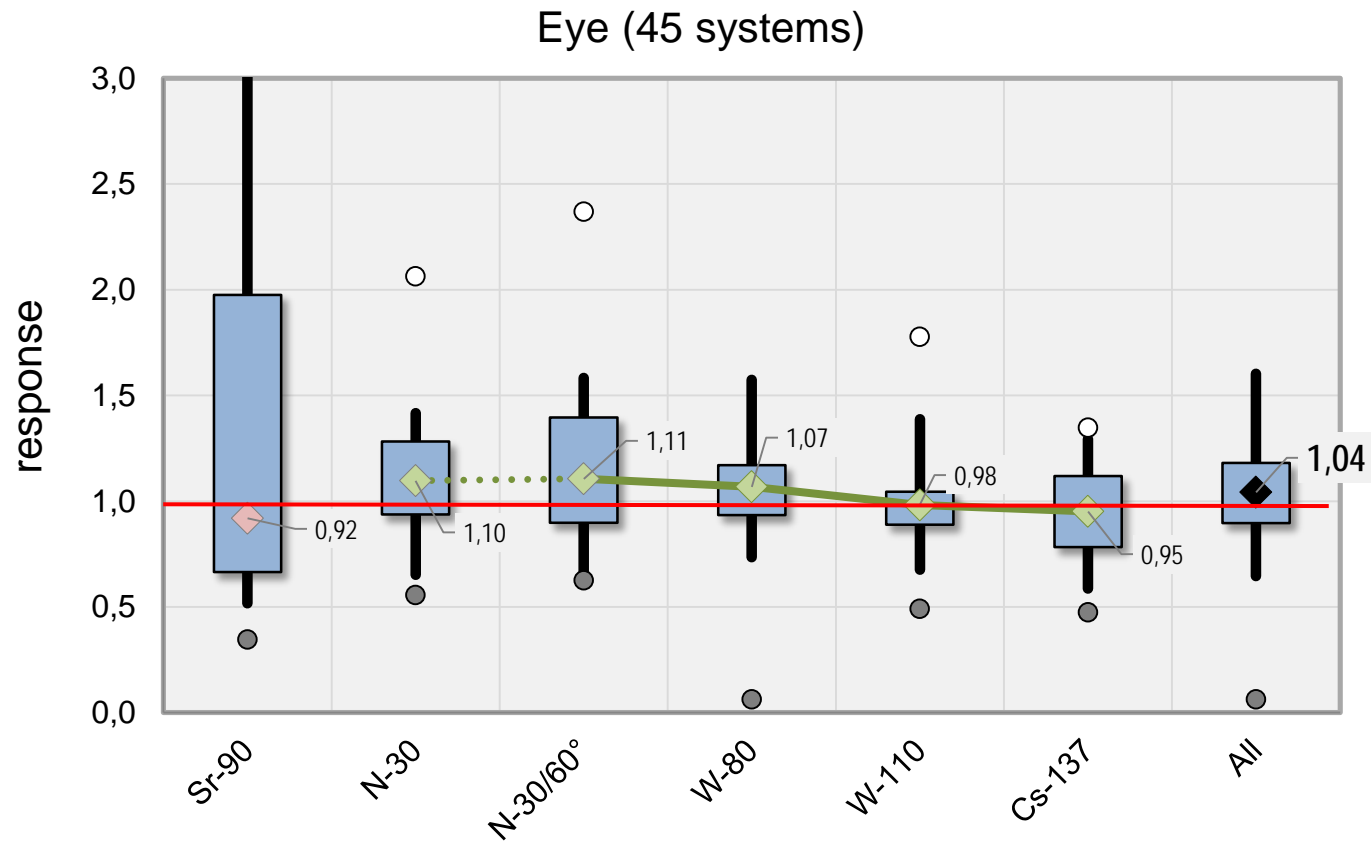
IC2019_{ext}

Eye lense dosemeters



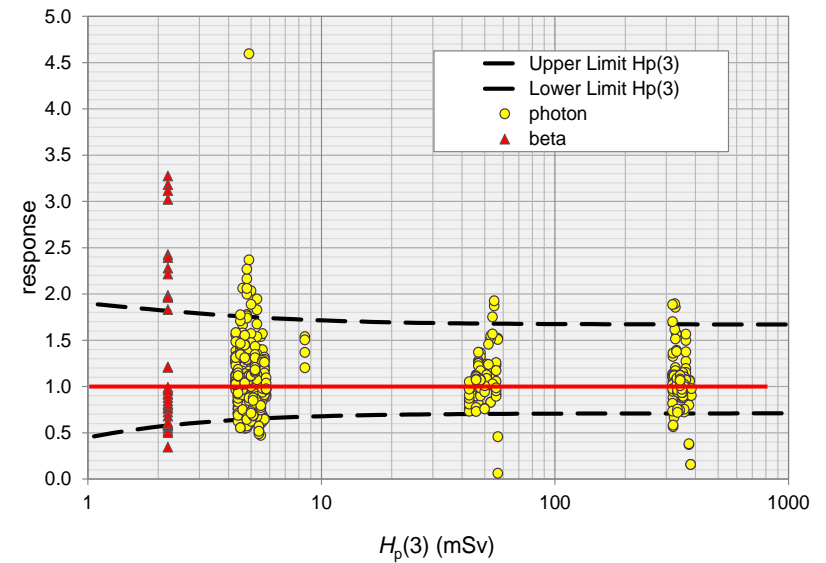
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Energy and angular response



Outliers (ISO14146:2018)

Eye - Outliers (%)				
Radiation	Quality	Ph	PhB	All
beta	Sr-90/0°		44.4%	44.4%
photon	N-30/0°	7.7%	6.3%	7.1%
	N-30/60°	3.7%	16.7%	8.9%
	W-80/0°	9.3%	5.6%	7.8%
	W-110/0°	7.4%	0.0%	4.4%
	Cs-137/0°	13.0%	0.0%	7.8%
	all photons	8.6%	5.6%	7.4%
All		8.6%	10.0%	9.2%



Lessons learnt for whole body doseimeters

- Many different doseimeters (detectors and badges)
- Overall mean response value very close to unity
- Slight over response for low energy spectra
- Slight under response for high energy gammas
- Angular over (under) response for low energy photons for Hp(10) (Hp(0.07))
- Good linearity for most systems
- Good reproducibility (<5%)

For the majority of all tested systems

Lessons learnt for extremity and eye lens dosemeters

- Significant problems for low energy betas for $H_p(0.07)$ and $H_p(3)$

For the majority of all tested systems

