PREPARING OPTIMAL LABORATORY ROOM FOR GONIOMETRIC MEASUREMENTS

SSL RESOURCE

SSL Resource Oy
Vesalantie 6, FI-24910 Halikko As, Salo, FINLAND
E-mail: info@sslresource.com

MOTIVATION

- Is the need of a goniometer room size over-estimated?
- Are the laboratory construction plans over-specified?
  - ⇒ Costs of laboratory construction
  - ⇒ Total investment decision more challenging

LABORATORY ROOM

- Suitable size for gonio laboratory depends on luminaire under test (LUT)
  - Beam width
  - Dimensions
  - Required measurement accuracy Δ
- The narrower the beam the longer the measurement distance
- The dimension of LUT often limits the minimum room length.

Table 1. Dimensions for laboratory room.

Luminaire length	Minimum room size (H/W and L) for Δ<1.5%	
	Height / Width	Length
D	1.5 x D [m]	5 x D [m] + 1 m
1.5 m	2.3 m	8.5 m

EFFECTIVE GONIO-LAB ROOM BUILD-UP

- SSL Resource provides fully ready system with needed black materials for the back wall and the floor.
  - Their delivery sizes are fitted to goniometer delivery package.
- You only need to have a laboratory space
- For a room size of L = 8.5 m, H = 2.5 m, W = 2.5 m, you need only 5 m^2 of the carpet and diffuse black paper

Table 2. Darkening materials.

Product	Material	Installation	Advantage
SSL-Black-1 Back wall material	Special low diffuse reflectance black paper	Black paper attached onto plywood for easy installation on the back wall	- No painting - No damage on the wall structures
SSL-Black-2 Floor material underneath goniometer	Special diffuse black needle-pierced carpet	Just spread out the carpet on the floor from the roll of a delivery	- No painting - No permanent modification - Stray light elimination from floor near the back wall

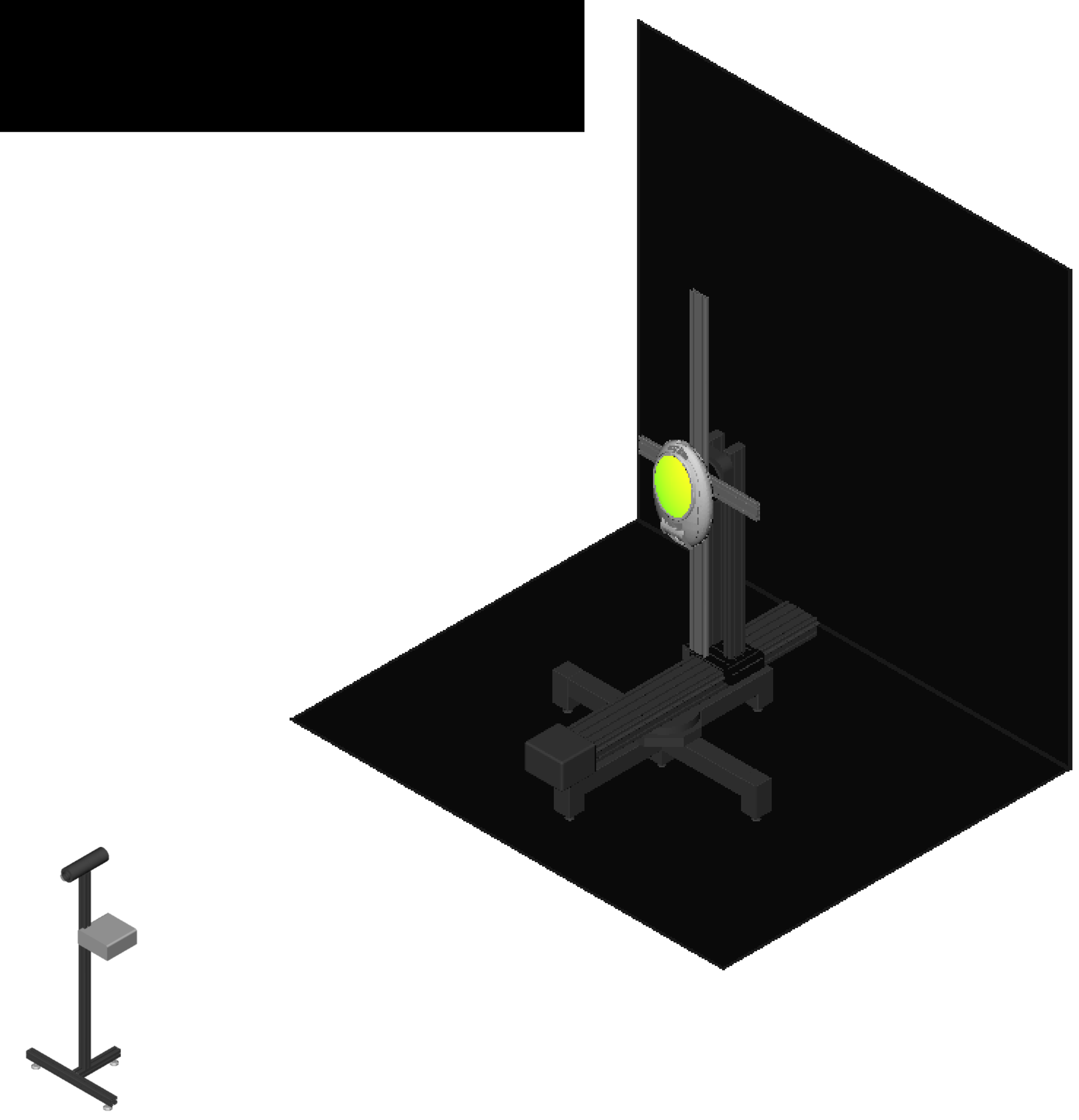

Fig. 1. Goniolaboratory room after installation of darkening material.

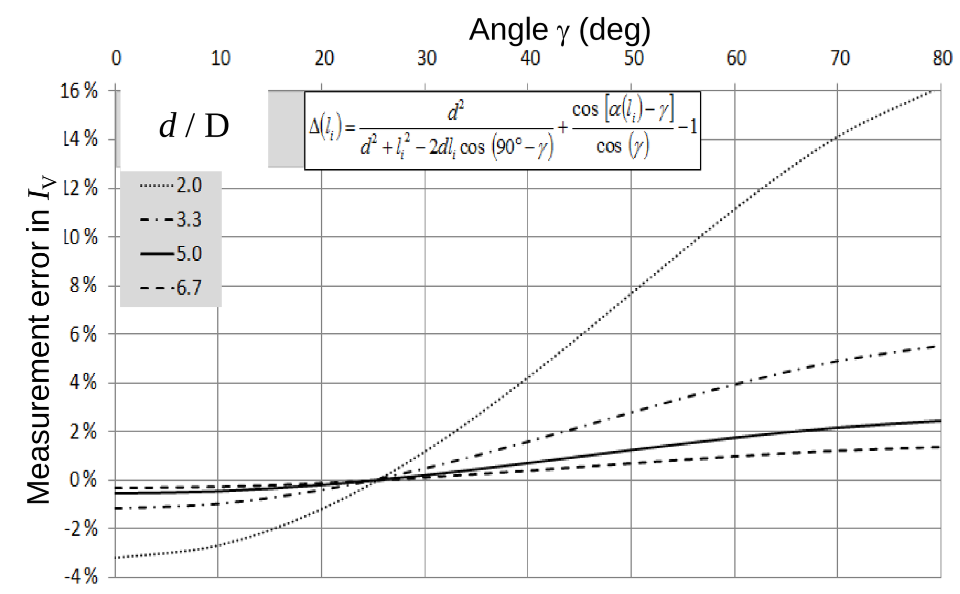

Fig. 2. Measurement error for linear Lambertian light source with different ratios of luminaire length and measurement distance.

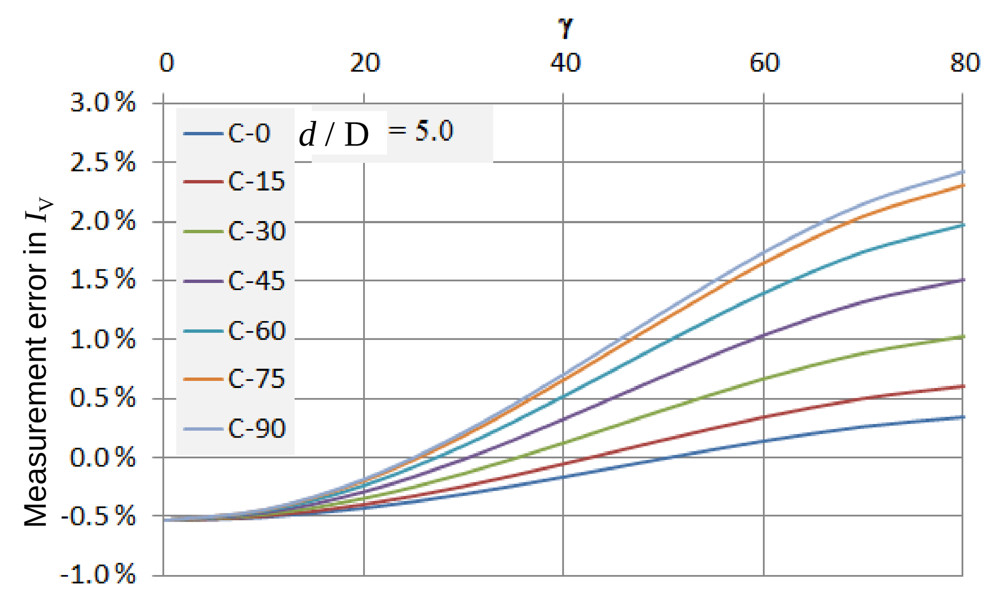

Fig. 3. Measurement error for linear Lambertian light source at different C planes with d/D = 5.0.

Equation 1. Definition of the measurement error. x_0 and y_0 are the width and length of luminous area. n_x and n_y are directivity parameters in x and y perpendicular planes.

$$\Delta = 1 - \frac{D^2}{D^2 + \frac{1}{24}\left[(n_x+3)x_0^2 + (n_y+3)y_0^2\right]}$$

Often for linear sources (LUT along y direction):

$$(n_y+3)y_0^2 \;\rangle\rangle\; (n_x+3)x_0^2 \qquad I_v(\theta_{x/y}) = I_0 \cos^{n_{x/y}}(\theta)$$

Table 3. Measurement errors with different LUT beam widths.

Measurement error Δ	n	$2\theta_{½}$	$d / 2r_0$
1%	1	120°	5.0
	5	59°	7.0
	10	42°	9.0
2%	1	120°	3.5
	5	59°	4.9
	10	42°	6.3

REFERENCES

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