

## **Normal-eye Zernike and RMS norms from the OCO (Oklahoma College of Optometry) 2006 database**

The following tables list means and standard deviations for absolute Zernike coefficients (Table 1) and RMS wavefront error values (Table 2) for a sample of 2,560 normal, healthy adult eyes measured at ten sites. These data were published in the following reference:

Salmon TO, van de Pol C. Normal-eye Zernike coefficients and root-mean-squared wavefront errors. *J Cataract Refr Surg* 2006; 32: 2064-2073

**Table 1.** Mean absolute Zernike coefficients  $\pm$  standard deviation ( $\mu\text{m}$ ) for pooled data (OD and OS combined) for four pupil diameters. From the OCO database.

Zernike term	6.0 mm	5.0 mm	4.0 mm	3.0 mm
$Z_3^{-3}$	0.106 $\pm$ 0.088	0.069 $\pm$ 0.056	0.040 $\pm$ 0.033	0.019 $\pm$ 0.016
$Z_3^{-1}$	0.143 $\pm$ 0.118	0.082 $\pm$ 0.069	0.045 $\pm$ 0.038	0.021 $\pm$ 0.018
$Z_3^1$	0.090 $\pm$ 0.076	0.056 $\pm$ 0.047	0.033 $\pm$ 0.027	0.015 $\pm$ 0.013
$Z_3^3$	0.081 $\pm$ 0.066	0.052 $\pm$ 0.043	0.030 $\pm$ 0.026	0.014 $\pm$ 0.013
$Z_4^{-4}$	0.038 $\pm$ 0.033	0.023 $\pm$ 0.020	0.012 $\pm$ 0.011	0.005 $\pm$ 0.004
$Z_4^{-2}$	0.027 $\pm$ 0.023	0.017 $\pm$ 0.015	0.009 $\pm$ 0.008	0.003 $\pm$ 0.003
$Z_4^0$	0.128 $\pm$ 0.096	0.064 $\pm$ 0.049	0.028 $\pm$ 0.022	0.010 $\pm$ 0.008
$Z_4^2$	0.048 $\pm$ 0.039	0.026 $\pm$ 0.023	0.013 $\pm$ 0.013	0.005 $\pm$ 0.005
$Z_4^4$	0.043 $\pm$ 0.038	0.025 $\pm$ 0.022	0.013 $\pm$ 0.012	0.005 $\pm$ 0.005
$Z_5^{-5}$	0.025 $\pm$ 0.022	0.011 $\pm$ 0.010	0.004 $\pm$ 0.003	0.001 $\pm$ 0.001
$Z_5^{-3}$	0.024 $\pm$ 0.021	0.010 $\pm$ 0.009	0.003 $\pm$ 0.003	0.001 $\pm$ 0.001
$Z_5^{-1}$	0.028 $\pm$ 0.024	0.012 $\pm$ 0.011	0.004 $\pm$ 0.004	0.001 $\pm$ 0.001
$Z_5^1$	0.020 $\pm$ 0.018	0.009 $\pm$ 0.008	0.003 $\pm$ 0.003	0.001 $\pm$ 0.001
$Z_5^3$	0.018 $\pm$ 0.016	0.008 $\pm$ 0.007	0.003 $\pm$ 0.002	0.001 $\pm$ 0.001
$Z_5^5$	0.023 $\pm$ 0.021	0.010 $\pm$ 0.009	0.003 $\pm$ 0.003	0.001 $\pm$ 0.001
$Z_6^{-6}$	0.019 $\pm$ 0.018	0.007 $\pm$ 0.006	0.002 $\pm$ 0.002	0.000 $\pm$ 0.000
$Z_6^{-4}$	0.014 $\pm$ 0.014	0.005 $\pm$ 0.005	0.001 $\pm$ 0.001	0.000 $\pm$ 0.000
$Z_6^{-2}$	0.012 $\pm$ 0.011	0.004 $\pm$ 0.004	0.001 $\pm$ 0.001	0.000 $\pm$ 0.000
$Z_6^0$	0.024 $\pm$ 0.020	0.008 $\pm$ 0.007	0.002 $\pm$ 0.002	0.000 $\pm$ 0.000
$Z_6^2$	0.016 $\pm$ 0.016	0.006 $\pm$ 0.006	0.002 $\pm$ 0.002	0.000 $\pm$ 0.000
$Z_6^4$	0.017 $\pm$ 0.016	0.006 $\pm$ 0.006	0.002 $\pm$ 0.002	0.000 $\pm$ 0.000
$Z_6^6$	0.020 $\pm$ 0.018	0.007 $\pm$ 0.006	0.002 $\pm$ 0.002	0.000 $\pm$ 0.000

For 3rd through 5th order aberrations, n=2,205 for 6.0 mm and n=2,560 for 5.0, 4.0, 3.0 mm. For 6th order aberrations, n=1871 for 6.0 mm and n=2,008 for 5.0, 4.0, 3.0 mm.

**Table 2.** Mean RMS values  $\pm$  standard deviation ( $\mu\text{m}$ ) for polar and combined Zernike modes, Zernike orders and total higher-order aberrations (Orders 3-5) or four pupil diameters. Pooled from all OD and OS data. From the OCO database.

RMS for	6.0 mm	5.0 mm	4.0 mm	3.0 mm
<b>Polar modes</b>				
Z31	0.185 $\pm$ 0.118	0.109 $\pm$ 0.069	0.061 $\pm$ 0.039	0.029 $\pm$ 0.018
Z33	0.147 $\pm$ 0.091	0.095 $\pm$ 0.058	0.055 $\pm$ 0.035	0.026 $\pm$ 0.017
Z40	0.128 $\pm$ 0.096	0.064 $\pm$ 0.049	0.028 $\pm$ 0.022	0.010 $\pm$ 0.008
Z42	0.060 $\pm$ 0.039	0.034 $\pm$ 0.023	0.018 $\pm$ 0.013	0.007 $\pm$ 0.005
Z44	0.063 $\pm$ 0.042	0.038 $\pm$ 0.025	0.020 $\pm$ 0.013	0.008 $\pm$ 0.005
Z51	0.039 $\pm$ 0.025	0.017 $\pm$ 0.011	0.006 $\pm$ 0.004	0.001 $\pm$ 0.001
Z53	0.033 $\pm$ 0.022	0.014 $\pm$ 0.010	0.005 $\pm$ 0.003	0.001 $\pm$ 0.001
Z55	0.037 $\pm$ 0.025	0.016 $\pm$ 0.011	0.005 $\pm$ 0.004	0.001 $\pm$ 0.001
Z60	0.024 $\pm$ 0.020	0.008 $\pm$ 0.007	0.002 $\pm$ 0.002	0.000 $\pm$ 0.000
Z62	0.023 $\pm$ 0.017	0.008 $\pm$ 0.006	0.002 $\pm$ 0.002	0.000 $\pm$ 0.000
Z64	0.025 $\pm$ 0.018	0.009 $\pm$ 0.007	0.002 $\pm$ 0.002	0.000 $\pm$ 0.000
Z66	0.030 $\pm$ 0.022	0.010 $\pm$ 0.008	0.003 $\pm$ 0.002	0.000 $\pm$ 0.000
<b>Combined modes</b>				
Coma-like (Z31+Z51)	0.192 $\pm$ 0.115	0.112 $\pm$ 0.068	0.062 $\pm$ 0.039	0.029 $\pm$ 0.018
Sph aberr-like (Z40+Z60)	0.133 $\pm$ 0.094	0.065 $\pm$ 0.048	0.029 $\pm$ 0.021	0.010 $\pm$ 0.008
<b>Zernike Orders</b>				
3	0.251 $\pm$ 0.123	0.153 $\pm$ 0.075	0.087 $\pm$ 0.043	0.041 $\pm$ 0.021
4	0.169 $\pm$ 0.090	0.090 $\pm$ 0.046	0.043 $\pm$ 0.022	0.016 $\pm$ 0.008
5	0.067 $\pm$ 0.034	0.030 $\pm$ 0.016	0.010 $\pm$ 0.005	0.002 $\pm$ 0.001
6	0.057 $\pm$ 0.030	0.020 $\pm$ 0.011	0.005 $\pm$ 0.003	0.001 $\pm$ 0.001
<b>Total HO (Orders 3-6)</b>	0.327 $\pm$ 0.130	0.186 $\pm$ 0.078	0.100 $\pm$ 0.044	0.045 $\pm$ 0.021

For 3rd through 5th order aberrations, n=2,205 for 6.0 mm and n=2,560 for 5.0, 4.0, 3.0 mm. For 6th order aberrations, n=1871 for 6.0 mm and n=2,008 for 5.0, 4.0, 3.0 mm.