

		CodeV	Zemax	Zemax	Stn		
N	M		Stn/Noll	Fringe		name	Equation
0	0	Z01	Z01	Z01	00	bias	1
1	1	Z02	Z02	Z02	02	Tilt-X	$\rho \cos(\theta)$
1	-1	Z03	Z03	Z03	01	Tilt-Y	$\rho \sin(\theta)$
2	0	Z05	Z04	Z04	04	Power	$2\rho^2 - 1$
2	2	Z04	Z06	Z05	05	1-Astig-X	$\rho^2 \cos(2\theta)$
2	-2	Z06	Z05	Z06	03	1-Astig-Y	$\rho^2 \sin(2\theta)$
3	1	Z08	Z08	Z07	08	1-Coma-X	$(3\rho^3 - 2\rho) \cos(\theta)$
3	-1	Z09	Z07	Z08	07	1-Coma-Y	$(3\rho^3 - 2\rho) \sin(\theta)$
3	3	Z07	Z10	Z10	09	1-Tref-X	$\rho^3 \cos(3\theta)$
3	-3	Z10	Z09	Z11	06	1-Tref-Y	$\rho^3 \sin(3\theta)$
4	0	Z13	Z11	Z09	12	1-Sphera	$6\rho^4 - 6\rho^2 + 1$
4	2	Z12	Z12	Z12	13	2-Astig-X	$(4\rho^4 - 3\rho^2) \cos(2\theta)$
4	-2	Z14	Z13	Z13	11	2-Astig-Y	$(4\rho^4 - 3\rho^2) \sin(2\theta)$
4	4	Z11	Z14	Z17	14	1-Tetr-X	$\rho^4 \cos(4\theta)$
4	-4	Z15	Z15	Z18	10	1-Tetr-Y	$\rho^4 \sin(4\theta)$
5	1	Z18	Z16	Z14	18	2-Coma-X	$(10\rho^5 - 12\rho^3 + 3\rho) \cos(\theta)$
5	-1	Z19	Z17	Z15	17	2-Coma-Y	$(10\rho^5 - 12\rho^3 + 3\rho) \sin(\theta)$
5	3	Z17	Z18	Z19	19	2-Tref-X	$(5\rho^5 - 4\rho^3) \cos(3\theta)$
5	-3	Z20	Z19	Z20	16	2-Tref-Y	$(5\rho^5 - 4\rho^3) \sin(3\theta)$
5	5	Z16	Z20	Z26	20	1-Pent-X	$\rho^5 \cos(5\theta)$
5	-5	Z21	Z21	Z27	15	1-Pent-Y	$\rho^5 \sin(5\theta)$
6	0	Z25	Z22	Z16	24	2-Sphera	$(20\rho^6 - 30\rho^4 + 12\rho^2 - 1)$
6	2	Z24	Z24	Z21	25	3-Astig-X	$(15\rho^6 - 20\rho^4 + 6\rho^2) \cos(2\theta)$
6	-2	Z26	Z23	Z22	23	3-Astig-Y	$(15\rho^6 - 20\rho^4 + 6\rho^2) \sin(2\theta)$
6	4	Z23	Z26	Z28	26	2-Tetr-X	$(6\rho^6 - 5\rho^4) \cos(4\theta)$
6	-4	Z27	Z25	Z29	22	2-Tetr-Y	$(6\rho^6 - 5\rho^4) \sin(4\theta)$
6	6	Z22	Z28		27	1-Hexa-X	$\rho^6 \cos(6\theta)$
6	-6	Z28	Z27		21	1-Hexa-Y	$\rho^6 \sin(6\theta)$
7	1	Z32	Z30	Z23	32	3-Coma-X	$(35\rho^7 - 60\rho^5 + 30\rho^3 - 4\rho) \cos(\theta)$
7	-1	Z33	Z29	Z24	31	3-Coma-Y	$(35\rho^7 - 60\rho^5 + 30\rho^3 - 4\rho) \sin(\theta)$
7	3	Z31	Z32	Z30	33	3-Tref-X	$(21\rho^7 - 30\rho^5 + 10\rho^3) \cos(3\theta)$
7	-3	Z34	Z31	Z31	30	3-Tref-Y	$(21\rho^7 - 30\rho^5 + 10\rho^3) \sin(3\theta)$
7	5	Z30	Z34		34	2-Pent-X	$(7\rho^7 - 6\rho^5) \cos(5\theta)$
7	-5	Z35	Z33		29	2-Pent-Y	$(7\rho^7 - 6\rho^5) \sin(5\theta)$
7	7	Z29	Z36		35	1-Sept-X	$\rho^7 \cos(7\theta)$
7	-7	Z36	Z35		28	1-Sept-Y	$\rho^7 \sin(7\theta)$
8	0	Z41	Z37	Z25	40	3-Sphere	$(70\rho^8 - 140\rho^6 + 90\rho^4 - 20\rho^2 + 1)$
8	2	Z40	Z38	Z32	41	4-Astig-X	$(56\rho^8 - 105\rho^6 + 60\rho^4 - 10\rho^2) \cos(2\theta)$
8	-2	Z42	Z39	Z33	39	4-Astig-Y	$(56\rho^8 - 105\rho^6 + 60\rho^4 - 10\rho^2) \sin(2\theta)$
8	4	Z39	Z40		42	3-Tetr-X	$(28\rho^8 - 42\rho^6 + 15\rho^4) \cos(4\theta)$
8	-4	Z43	Z41		38	3-Tetr-Y	$(28\rho^8 - 42\rho^6 + 15\rho^4) \sin(4\theta)$
8	6	Z38	Z42		43	2-Hexa-X	$(8\rho^8 - 7\rho^6) \cos(6\theta)$
8	-6	Z44	Z43		37	2-Hexa-Y	$(8\rho^8 - 7\rho^6) \sin(6\theta)$
8	8	Z37	Z44		44	1-Octa-X	$\rho^8 \cos(8\theta)$
8	-8	Z45	Z45		36	1-Octa-Y	$\rho^8 \sin(8\theta)$
9	1	Z50	Z46	Z34	50	4-Coma-X	$(126\rho^9 - 280\rho^7 + 210\rho^5 - 60\rho^3 + 5\rho) \cos(\theta)$
9	-2	Z51	Z47	Z35	49	4-Coma-Y	$(126\rho^9 - 280\rho^7 + 210\rho^5 - 60\rho^3 + 5\rho) \sin(\theta)$
10	0	Z61	Z56	Z36	60	4-Sphere	$(252\rho^{10} - 630\rho^8 + 560\rho^6 - 210\rho^4 + 30\rho^2 - 1)$

Table 1:  $\rho$  =normalized radius  
 $\theta$  =theta measured from X axis  
N = radial wave #  
M = circumferential wave #  
Zemax normalization adds:  
coeff =  $\sqrt{N + 1}$  if M=0  
coeff =  $\sqrt{2(N + 1)}$  if M $\neq$  0