SUPPLEMENT 1

**DESIGN SEARCH WITH TWO PLASTIC MATERIALS**

**MACRO 1**

LOG

CORE 16 ! use 16 cores for speed

DSEARCH 1 QUIET ! start DSEARCH; put best lens in library 1

SYSTEM !

ID DSEARCH SMARTPHONE LENS ! Design name

OBB 0 41.5 0.9 ! infinite object, semi field 41.5 degrees, semi ap. 0.9

UNI MM ! lens will be in millimeters

WAVL CDF ! use visual wavelengths at C, d, and F lines

END ! end of system section

GOALS ! define the goals here

ELEMENTS 4 ! we want a four-element lens

BACK 0.4 SET ! ask for 0.4 mm back focus distance

FNUM 2.5 10 ! ask for F/2.5, weight of 10

!TOTL 6 10! optionally total length

THSTART 0.5 ! global search use thicknesses 0.5 mm

RSTART 15 ! and starting radius of 15 mm

ASPH Q ! use conic constant in quick mode

ASPH 3 ! allow three aspheric terms: CC, 4th, 6th power of aperture

DELAY OFF ! these runs are fast, so don’t ask to continue on timeout

ANNEAL 10 1 Q ! anneal each case, temp 10 degrees, cool 1, including quick

SNAP 5 ! redraw PAD screen every five passes

STOP FIRST ! put the stop in front

STOP FIXED ! and keep it

QUICK 60 60 ! run quick mode 60 passes, then real mode 60

GLASS POS ! Requesting specific glass

U ZEON480R ! Plastic material from Unusual catalogue

GLASS NEG ! For negative lens

U OKP4 ! Plastic material

NGRID 4 ! 6x6 grid of rays in pupil

NPASS 80 ! 80 passes in the MACro when finished

OPD ! correct OPDs

FOV 0 .2 .4 .6 .8 1 ! correct six field points

FWT 5 4 3 3 3 3 ! with these weights

COVER .3 1.51872 64 ! the cover glass will be 0.3 mm thick with this glass model

END ! end of goals section

SPECIAL PANT ! special PANT section starts here

RDR .001 ! due to small lenses, reduce derivative increments

TLIMIT 2 .1 ! limits on thicknesses and spaces

SLIMIT 5 .1

END !

SPECIAL AANT ! start of special AANT section; these go into the merit fn.

ACC 1.2 .1 ! center thickness no more than 1.2 mm

ACM .25 .1 ! and no thinner than 0.25 mm

ACA 60 ! avoid critical angle; 60 degrees from surface normal

AEC .2 10 ! keep edges over 0.2 mm

M .8 1 A P ILLUM .2 ! controll ilumination in three field points

M .45 1 A P ILLUM .8 ! 45 % illumination, weight 1 at 0.8 field

M .36 1 A P ILLUM 1 ! 36 % illumination, weight of 1 at edge of field 1

END

GO

**MACRO 2**

**DESIGN SEARCH WITH GLASS MODEL**

LOG

CORE 16

DSEARCH 1 QUIET ! Save best design in library location 1

SYSTEM !

ID DSEARCH SMARTPHONE LENS ! Name of design

OBB 0 42.5 .9 ! infinite object, semi field 42.5 degrees, semi aperture 0.9

UNI MM ! Units in millimeters

WAVL CDF ! use visual wavelengths at C, D, and F lines

END !

GOALS ! define the goals here

ELEMENTS 5 ! request a four-element lens with a cover glass

BACK 0.3 SET ! ask for 0.3 mm back focus distance

FNUM 2.5 100 ! ask for F/2.5, weight of 100

THSTART 1 ! global search use thicknesses 1 mm

RSTART 120 ! and starting radius of 120 mm

ASPH Q ! use conic constant even in quick mode

ASPH 3 ! three aspheric terms: CC, 4th, 6th power of aperture

DELAY OFF ! these runs are fast, so don’t ask to continue on timeout

ANNEAL 10 1 Q ! anneal each case, temp 10 degrees, cool 1, including quick

SNAP 5 ! redraw PAD screen every five passes

STOP FIRST ! the stop in front

STOP FIXED ! and fix it there

QUICK 50 50 ! run quick mode 50 passes, then real mode 50

NGRID 6 ! 6x6 grid of rays in pupil

NPASS 80 ! 80 passes in the MACro when finalizing

OPD ! correct OPD

FOV 0 .2 .4 .6 .8 1 ! correct six field points

FWT 5 4 3 3 4 4 ! with these weights

COVER .3 1.5168 64 ! the cover glass with glass model

PLASTIC 1 3 5 7 ! the four elements will be plastic

END !

SPECIAL PANT !

RDR .001 ! reduce derivative increments for small lenses

TLIMIT 3 .1 ! limits on thicknesses and spaces

SLIMIT 5 .1

END ! end of PANT section

SPECIAL AANT ! start of special AANT section; these go into the merit fn.

ACC 1.5 1! center thickness no more than 1.5 mm with waight of 1

ACM .2 10 ! and no thinner than 0.2 mm, weight of 10

ACA 60 ! avoid critical angle; 60 degrees from surface normal

AEC .2 10 ! keep edges over 0.2 mm

!M 1.35 1 A P YA 1 ! target the chief ray at three field points

!M 0.9 5 A P YA .8! monitor distortion optionally

M .9 1 A P ILLUM .2 ! monitor illumination in three field points

M 0.44 1 A P ILLUM .8

M .38 1 A P ILLUM 1 ! illumination 38 % at edge of field

END

GO

**MERIT FUNCTION**

!AEI 4 7 11 0 10000 .2 50 10 ! automatic

element insertion

PANT

RDR .001 ! due to small lenses, reduce derivative increments

TLIMIT 2 .1 ! limits on thicknesses and spaces

SLIMIT 5 .1

VLIST RD ALL

VLIST TH ALL EXCEPT LB1

VY 1 CC

VY 2 CC

VY 3 CC

VY 4 CC

VY 5 CC

VY 6 CC

VY 7 CC

VY 8 CC

VY 9 CC

VY 10 CC

!VY 1 G 10 ! inserting aspheric coeff.

!VY 2 G 10

!VY 3 G 10

!VY 4 G 10

VLIST G ALL

END

AANT P

AEC

ACC

M 0.400000E+00 0.100000E+02 A CONST 1.0 / DIV FNUM

GNO 0.000000 3.000000 4 2 0.000000

GSR 0.000000 5.000000 4 2 0.75000000

GTR 0.000000 5.000000 4 2 0.5000000

GNO 0.000000 4.5000000 4 2 0.750000

GNO 0.000000 4.5000000 4 2 0.5000

GNO 0.000000 2.000000 4 2 0.900000

GNO 0.000000 7.5000000 4 2 1.000000

GSR 0.000000 3.8000000 4 2 1.000000

GTR 0.000000 2.5000000 4 2 1.000000

GNO 0.000000 2.000000 4 1 0.000000

GSR 0.000000 5.000000 4 1 0.75000000

GTR 0.000000 5.000000 4 1 0.5000000

GNO 0.000000 4.5000000 4 1 0.750000

GNO 0.000000 4.5000000 4 1 0.50000

GNO 0.000000 2.000000 4 1 0.900000

GTR 0.000000 2.7000000 4 1 1.000000

GSR 0.000000 4.0000000 4 1 1.000000

GNO 0.000000 6.5000000 4 1 1.000000

GNO 0.000000 2.000000 4 3 0.000000

GSR 0.000000 5.000000 4 3 0.75000000

GTR 0.000000 5.000000 4 3 0.5000000

GNO 0.000000 4.5000000 4 3 0.750000

GNO 0.000000 3.5000000 4 3 0.50000

GNO 0.000000 2.000000 4 3 0.900000

GNO 0.000000 7.000000 4 3 1.000000

GSR 0.000000 2.7000000 4 3 1.000000

GTR 0.000000 2.5000000 4 3 1.000000

M 0 6 A P OPD 1 0 1

GSO 0.000000 0.145406 6 M 0.000000

GNO 0.000000 0.116325 6 M 0.200000

GNO 0.000000 0.087244 6 M 0.400000

GNO 0.000000 0.087244 6 M 0.600000

GNO 0.000000 0.116325 6 M 0.800000

GNO 0.000000 0.116325 6 M 1.000000

M 0 0.2 A P OPD 1 0 -1

!GNO 0.000000 0.094362 6 M 0.9900000

GNO 0.000000 0.094362 6 M 0.950000

GNO 0.000000 0.094362 6 M 0.80000

GNO 0.000000 0.94362 6 M 0.50000

GNO 0.000000 0.94362 6 M 0.40000

GNO 0.000000 0.094362 6 M 0.30000

GNO 0.000000 1.294362 6 M 0.20000

GNO 0.000000 0.524362 6 M 0.60000

ACC 1.5 1 ! center thickness no more than 1.0 mm

ACM .25 1000 ! and no thinner than 0.2 mm

ACA 60 ! avoid critical angle; 60 degrees from surface normal

AEC .2 50 ! keep edges over 0.2 mm

!CTT 1.6 10 6

M .92 30 A P ILLUM .2

M .75 20 A P ILLUM .8

M .60 40 A P ILLUM .9

M .52 60 A P ILLUM 1

M 2.5 150 A FNUM

!M 5.4 20 A TOTL

CTT 0.8 25 8

!M 0.1 0.6 A P YA 1

!M 0.1 0.2 A P YA 0.8

M 0.05 3 A P YA 1

M 0 3 A P YA .7

M 0 2 A P YA .4

END

SNAP 5/DAMP 1.100000

SYNOPSYS 10

LENS DATA

smartphone lens with two plastic materials

ID DSEARCH ASPHERIC CAMERA LENS ! ident 571 24-FEB-25 14:13:29

ID1 DSEARCH CASE WAS 0000000000000000000010111 23

LENS SPECIFICATIONS:

SYSTEM SPECIFICATIONS

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OBJECT DISTANCE (TH0) INFINITE FOCAL LENGTH (FOCL) 4.4965

OBJECT HEIGHT (YPP0) INFINITE PARAXIAL FOCAL POINT 0.4794

MARG RAY HEIGHT (YMP1) 0.9000 IMAGE DISTANCE (BACK) 0.4898

MARG RAY ANGLE (UMP0) 0.0000 CELL LENGTH (TOTL) 5.4180

CHIEF RAY HEIGHT (YPP1) 0.0000 F/NUMBER (FNUM) 2.4981

CHIEF RAY ANGLE (UPP0) 41.5000 GAUSSIAN IMAGE HT(GIHT) 3.9935

ENTR PUPIL SEMI-APERTURE 0.9000 EXIT PUPIL SEMI-APERTURE 0.5436

ENTR PUPIL LOCATION 0.0000 EXIT PUPIL LOCATION -2.2367

WAVL (uM) .7400000 .5650000 .5200000 .5000000 .6250000

.6200000 .6000000

WEIGHTS 1.000000 1.000000 1.000000 1.000000 1.000000

1.000000 1.000000

COLOR ORDER 2 1 3 4 5 6 7

UNITS MM

APERTURE STOP SURFACE (APS) 1 SEMI-APERTURE 0.95186

FOCAL MODE ON

MAGNIFICATION -4.51385E-12

GLOBAL OPTION ON

POLARIZATION AND COATINGS ARE IGNORED.

SURFACE DATA

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SURF RADIUS THICKNESS MEDIUM INDEX V-NUMBER

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0 INFINITE INFINITE AIR

1 3.95716 O 0.42484 ZEON480R 1.52680 58.31 UNUSUAL

2 -13.48917 O 0.37702 AIR

3 -3.91295 O 0.22648 OKP4 1.61072 28.39 UNUSUAL

4 13.41450 O 0.10751 AIR

5 5.64024 O 1.09623 ZEON480R 1.52680T 58.31 UNUSUAL

6 -2.49992 O 0.66939 AIR

7 -39.15881 O 0.59976 ZEON480R 1.52680P 58.31

8 -17.34873 O 1.69121 AIR

9 -2.63284 O 0.22556 ZEON480R 1.52680 58.31 UNUSUAL

10 6.27949 O 0.48983 AIR

IMG INFINITE

KEY TO SYMBOLS

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A SURFACE HAS TILTS AND DECENTERS B TAG ON SURFACE

G SURFACE IS IN GLOBAL COORDINATES L SURFACE IS IN LOCAL COORDINATES

O SPECIAL SURFACE TYPE P ITEM IS SUBJECT TO PICKUP

S ITEM IS SUBJECT TO SOLVE M SURFACE HAS MELT INDEX DATA

T ITEM IS TARGET OF A PICKUP

SPECIAL SURFACE DATA

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SURFACE NO. 1 -- CONIC + POWER-SERIES ASPHERE

G 3 0.007193 (R\*\*4) G 6 -0.045348 (R\*\*6) G 10 -0.002998 (R\*\*8)

G 16 0.001241 (R\*\*10) G 18 -0.003667 (R\*\*12) G 19 -0.002599 (R\*\*14)

CONIC CONSTANT (CC) -23.399077

SEMI-MAJOR AXIS (b) -0.176666 SEMI-MINOR AXIS (a) -0.836119

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SURFACE NO. 2 -- CONIC + POWER-SERIES ASPHERE

G 3 -0.055129 (R\*\*4) G 6 -0.031897 (R\*\*6) G 10 0.022044 (R\*\*8)

G 16 -0.030531 (R\*\*10) G 18 0.012914 (R\*\*12) G 19 -0.000114 (R\*\*14)

CONIC CONSTANT (CC) 11.906013

SEMI-MAJOR AXIS (b) -1.045185 SEMI-MINOR AXIS (a) 3.754821

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SURFACE NO. 3 -- CONIC + POWER-SERIES ASPHERE

G 3 -0.013909 (R\*\*4) G 6 0.005843 (R\*\*6) G 10 -0.003737 (R\*\*8)

G 16 0.001344 (R\*\*10) G 18 0.000516 (R\*\*12) G 19 0.000340 (R\*\*14)

CONIC CONSTANT (CC) 1.649342

SEMI-MAJOR AXIS (b) -1.476953 SEMI-MINOR AXIS (a) 2.404007

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SURFACE NO. 4 -- CONIC + POWER-SERIES ASPHERE

G 3 0.006504 (R\*\*4) G 6 0.004272 (R\*\*6) G 10 -0.000683 (R\*\*8)

G 16 -0.000668 (R\*\*10) G 18 3.061340E-05 (R\*\*12) G 19 3.441410E-05 (R\*\*14)

CONIC CONSTANT (CC) 6.587687

SEMI-MAJOR AXIS (b) 1.767930 SEMI-MINOR AXIS (a) 4.869897

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SURFACE NO. 5 -- CONIC + POWER-SERIES ASPHERE

G 3 -0.003682 (R\*\*4) G 6 -0.000390 (R\*\*6) G 10 -0.000332 (R\*\*8)

G 16 7.699974E-05 (R\*\*10) G 18 9.242500E-05 (R\*\*12) G 19 -2.735550E-05 (R\*\*14)

CONIC CONSTANT (CC) -12.974433

SEMI-MAJOR AXIS (b) -0.471023 SEMI-MINOR AXIS (a) -1.629934

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SURFACE NO. 6 -- CONIC + POWER-SERIES ASPHERE

G 3 -0.010409 (R\*\*4) G 6 -0.001771 (R\*\*6) G 10 8.930375E-05 (R\*\*8)

G 16 -0.000280 (R\*\*10) G 18 -4.017360E-05 (R\*\*12) G 19 8.133090E-06 (R\*\*14)

CONIC CONSTANT (CC) 0.229153

SEMI-MAJOR AXIS (b) -2.033853 SEMI-MINOR AXIS (a) 2.254876

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SURFACE NO. 7 -- CONIC + POWER-SERIES ASPHERE

G 3 -0.032641 (R\*\*4) G 6 -0.000530 (R\*\*6) G 10 -0.000907 (R\*\*8)

G 16 -0.000171 (R\*\*10) G 18 -3.478770E-05 (R\*\*12) G 19 1.286680E-05 (R\*\*14)

CONIC CONSTANT (CC) 74.466850

SEMI-MAJOR AXIS (b) -0.518888 SEMI-MINOR AXIS (a) 4.507662

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SURFACE NO. 8 -- CONIC + POWER-SERIES ASPHERE

G 3 -0.013405 (R\*\*4) G 6 -0.001203 (R\*\*6) G 10 -0.000193 (R\*\*8)

G 16 -3.007764E-06 (R\*\*10) G 18 5.978860E-07 (R\*\*12) G 19 3.764290E-06 (R\*\*14)

CONIC CONSTANT (CC) -4.095417

SEMI-MAJOR AXIS (b) 5.604651 SEMI-MINOR AXIS (a) -9.860709

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SURFACE NO. 9 -- CONIC + POWER-SERIES ASPHERE

G 3 -0.024297 (R\*\*4) G 6 0.003002 (R\*\*6) G 10 -0.000253 (R\*\*8)

G 16 1.463536E-05 (R\*\*10) G 18 8.553570E-06 (R\*\*12)

CONIC CONSTANT (CC) -0.056737

SEMI-MAJOR AXIS (b) -2.791200 SEMI-MINOR AXIS (a) 2.710861

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SURFACE NO. 10 -- CONIC + POWER-SERIES ASPHERE

G 3 -0.007540 (R\*\*4) G 6 0.000590 (R\*\*6) G 10 -7.985878E-05 (R\*\*8)

G 16 7.169912E-06 (R\*\*10) G 18 -2.411170E-07 (R\*\*12)

CONIC CONSTANT (CC) -45.864913

SEMI-MAJOR AXIS (b) -0.139964 SEMI-MINOR AXIS (a) -0.937499

THIS LENS HAS NO TILTS OR DECENTERS

SYNOPSYS AI>

**LENS DATA smartphone lens with three plastic materials (cover glass - BK7)**

SPEC

ID DSEARCH ASPHERIC CAMERA LENS ! ident 595 24-FEB-25 13:13:17

ID1 DSEARCH CASE WAS 0000000000000000000011101 29

LENS SPECIFICATIONS:

SYSTEM SPECIFICATIONS

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OBJECT DISTANCE (TH0) INFINITE FOCAL LENGTH (FOCL) 4.5156

OBJECT HEIGHT (YPP0) INFINITE PARAXIAL FOCAL POINT 0.2968

MARG RAY HEIGHT (YMP1) 0.9000 IMAGE DISTANCE (BACK) 0.3000

MARG RAY ANGLE (UMP0) 0.0000 CELL LENGTH (TOTL) 6.6386

CHIEF RAY HEIGHT (YPP1) 0.0000 F/NUMBER (FNUM) 2.5087

CHIEF RAY ANGLE (UPP0) 41.5000 GAUSSIAN IMAGE HT(GIHT) 3.9982

ENTR PUPIL SEMI-APERTURE 0.9000 EXIT PUPIL SEMI-APERTURE 0.8047

ENTR PUPIL LOCATION 0.0000 EXIT PUPIL LOCATION -3.7408

WAVL (uM) .6200000 .6000000 .5200000 .7400000 .6250000

.5900000 .5650000 .5200000 .5000000

WEIGHTS 1.000000 1.000000 1.000000 1.000000 1.000000

1.000000 1.000000 3.000000 1.000000

COLOR ORDER 2 1 3 4 5 6 7 8 9

UNITS MM

APERTURE STOP SURFACE (APS) 1 SEMI-APERTURE 0.95979

FOCAL MODE ON

MAGNIFICATION -4.51916E-12

GLOBAL OPTION ON

GLASS INDEX FROM SCHOTT OR OHARA ADJUSTED FOR SYSTEM TEMPERATURE

SYSTEM TEMPERATURE = 20.00 DEGREES C

POLARIZATION AND COATINGS ARE IGNORED.

SURFACE DATA

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SURF RADIUS THICKNESS MEDIUM INDEX V-NUMBER

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0 INFINITE INFINITE AIR

1 7.05076 O 1.39237 ZEON480R 1.52508 98.29 UNUSUAL

2 -2.29595 O 0.58309 AIR

3 -1.67704 O 1.12143 AL-6265 1.64948 38.47 UNUSUAL

4 -3.51390 O 0.14526 AIR

5 3.51282 O 1.16318 ZEON480R 1.52508 98.29 UNUSUAL

6 -7.55661 O 0.27301 AIR

7 -7.02362 O 0.86157 AL-6261 1.60648 46.27 UNUSUAL

8 0.90683 O 0.79870 AIR

9 INFINITE 0.30000 BK7 1.51629 111.76 SCHOTT

10 INFINITE 0.30000 AIR

IMG INFINITE

KEY TO SYMBOLS

\_\_\_\_\_\_\_\_\_\_\_\_\_\_

A SURFACE HAS TILTS AND DECENTERS B TAG ON SURFACE

G SURFACE IS IN GLOBAL COORDINATES L SURFACE IS IN LOCAL COORDINATES

O SPECIAL SURFACE TYPE P ITEM IS SUBJECT TO PICKUP

S ITEM IS SUBJECT TO SOLVE M SURFACE HAS MELT INDEX DATA

T ITEM IS TARGET OF A PICKUP

SPECIAL SURFACE DATA

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SURFACE NO. 1 -- CONIC + POWER-SERIES ASPHERE

G 1 0.031434 (R\*\*2) G 3 -0.003097 (R\*\*4) G 6 -0.009959 (R\*\*6)

G 10 -0.008601 (R\*\*8) G 16 -0.000618 (R\*\*10) G 18 0.003622 (R\*\*12)

CONIC CONSTANT (CC) -59.788706

SEMI-MAJOR AXIS (b) -0.119934 SEMI-MINOR AXIS (a) -0.919578

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SURFACE NO. 2 -- CONIC + POWER-SERIES ASPHERE

G 1 0.028179 (R\*\*2) G 3 -0.016226 (R\*\*4) G 6 0.001755 (R\*\*6)

G 10 -0.000395 (R\*\*8) G 16 0.000414 (R\*\*10) G 18 -0.000236 (R\*\*12)

CONIC CONSTANT (CC) 0.488084

SEMI-MAJOR AXIS (b) -1.542891 SEMI-MINOR AXIS (a) 1.882127

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SURFACE NO. 3 -- CONIC + POWER-SERIES ASPHERE

G 1 0.043286 (R\*\*2) G 3 -0.020369 (R\*\*4) G 6 0.019464 (R\*\*6)

G 10 -0.001310 (R\*\*8) G 16 6.059113E-05 (R\*\*10) G 18 -0.000109 (R\*\*12)

CONIC CONSTANT (CC) -1.608182

SEMI-MAJOR AXIS (b) 2.757464 SEMI-MINOR AXIS (a) -2.150436

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SURFACE NO. 4 -- CONIC + POWER-SERIES ASPHERE

G 1 0.037228 (R\*\*2) G 3 -0.013308 (R\*\*4) G 6 0.008815 (R\*\*6)

G 10 -0.000136 (R\*\*8) G 16 -6.775944E-05 (R\*\*10) G 18 1.338030E-05 (R\*\*12)

CONIC CONSTANT (CC) -1.133534

SEMI-MAJOR AXIS (b) 26.314578 SEMI-MINOR AXIS (a) -9.615963

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SURFACE NO. 5 -- CONIC + POWER-SERIES ASPHERE

G 1 -0.047968 (R\*\*2) G 3 0.011238 (R\*\*4) G 6 -0.002656 (R\*\*6)

G 10 0.000243 (R\*\*8) G 16 -3.300365E-05 (R\*\*10) G 18 -4.666890E-06 (R\*\*12)

G 19 2.011360E-06 (R\*\*14) G 20 1.544290E-07 (R\*\*16) G 21 -6.178750E-08 (R\*\*18)

CONIC CONSTANT (CC) -5.510383

SEMI-MAJOR AXIS (b) -0.778830 SEMI-MINOR AXIS (a) -1.654053

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SURFACE NO. 6 -- CONIC + POWER-SERIES ASPHERE

G 1 0.073279 (R\*\*2) G 3 0.012848 (R\*\*4) G 6 -0.001985 (R\*\*6)

G 10 -6.624135E-05 (R\*\*8) G 16 5.843818E-05 (R\*\*10) G 18 -2.487180E-05 (R\*\*12)

G 19 2.734510E-06 (R\*\*14) G 20 9.497780E-08 (R\*\*16) G 21 -2.631340E-08 (R\*\*18)

CONIC CONSTANT (CC) 5.303599

SEMI-MAJOR AXIS (b) -1.198777 SEMI-MINOR AXIS (a) 3.009765

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SURFACE NO. 7 -- CONIC + POWER-SERIES ASPHERE

G 1 0.314051 (R\*\*2) G 3 -0.071399 (R\*\*4) G 6 0.007669 (R\*\*6)

G 10 -0.000285 (R\*\*8) G 16 -0.000174 (R\*\*10) G 18 4.647640E-05 (R\*\*12)

G 19 -5.551730E-06 (R\*\*14) G 20 -2.787720E-08 (R\*\*16) G 21 3.825130E-08 (R\*\*18)

CONIC CONSTANT (CC) 3.573874

SEMI-MAJOR AXIS (b) -1.535596 SEMI-MINOR AXIS (a) 3.284120

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SURFACE NO. 8 -- CONIC + POWER-SERIES ASPHERE

G 1 -0.203166 (R\*\*2) G 3 -0.004881 (R\*\*4) G 6 0.000584 (R\*\*6)

G 10 -5.249301E-05 (R\*\*8) G 16 1.156260E-05 (R\*\*10) G 18 -1.639440E-06 (R\*\*12)

G 19 4.199770E-08 (R\*\*14) G 20 3.517760E-09 (R\*\*16) G 21 -1.339820E-10 (R\*\*18)

CONIC CONSTANT (CC) -1.602248

SEMI-MAJOR AXIS (b) -1.505739 SEMI-MINOR AXIS (a) -1.168523

THIS LENS HAS NO TILTS OR DECENTERS

SYNOPSYS AI>