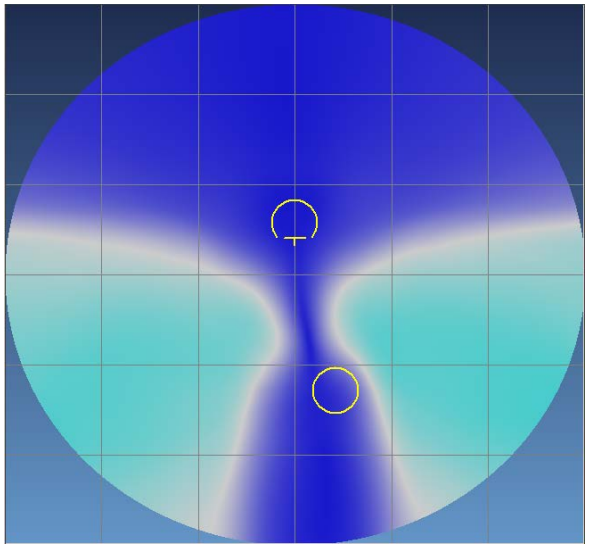
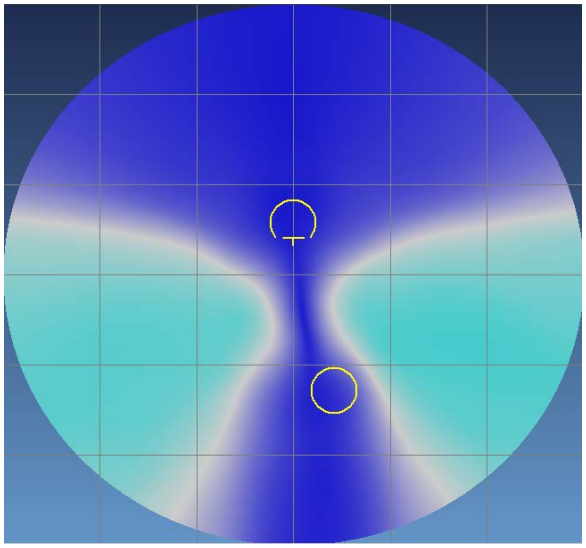
INFINITY

FREEFORM LENS

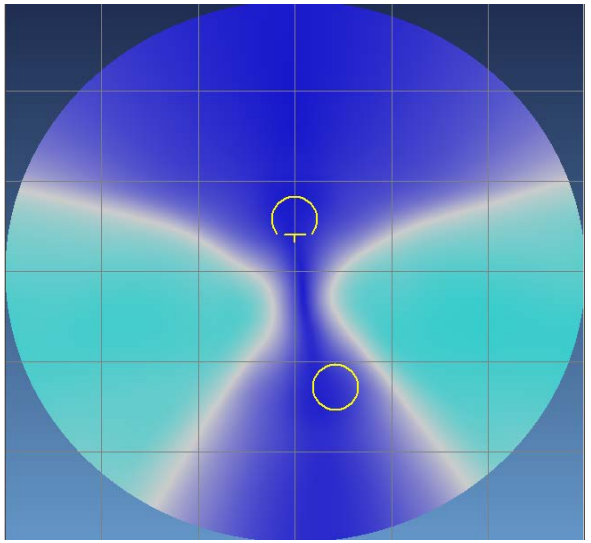
DIN 80-10-10



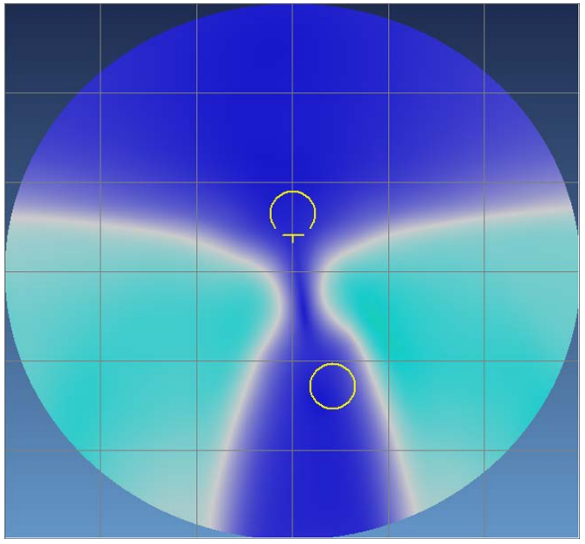
DIN 40-20-40



DIN 10-10-80

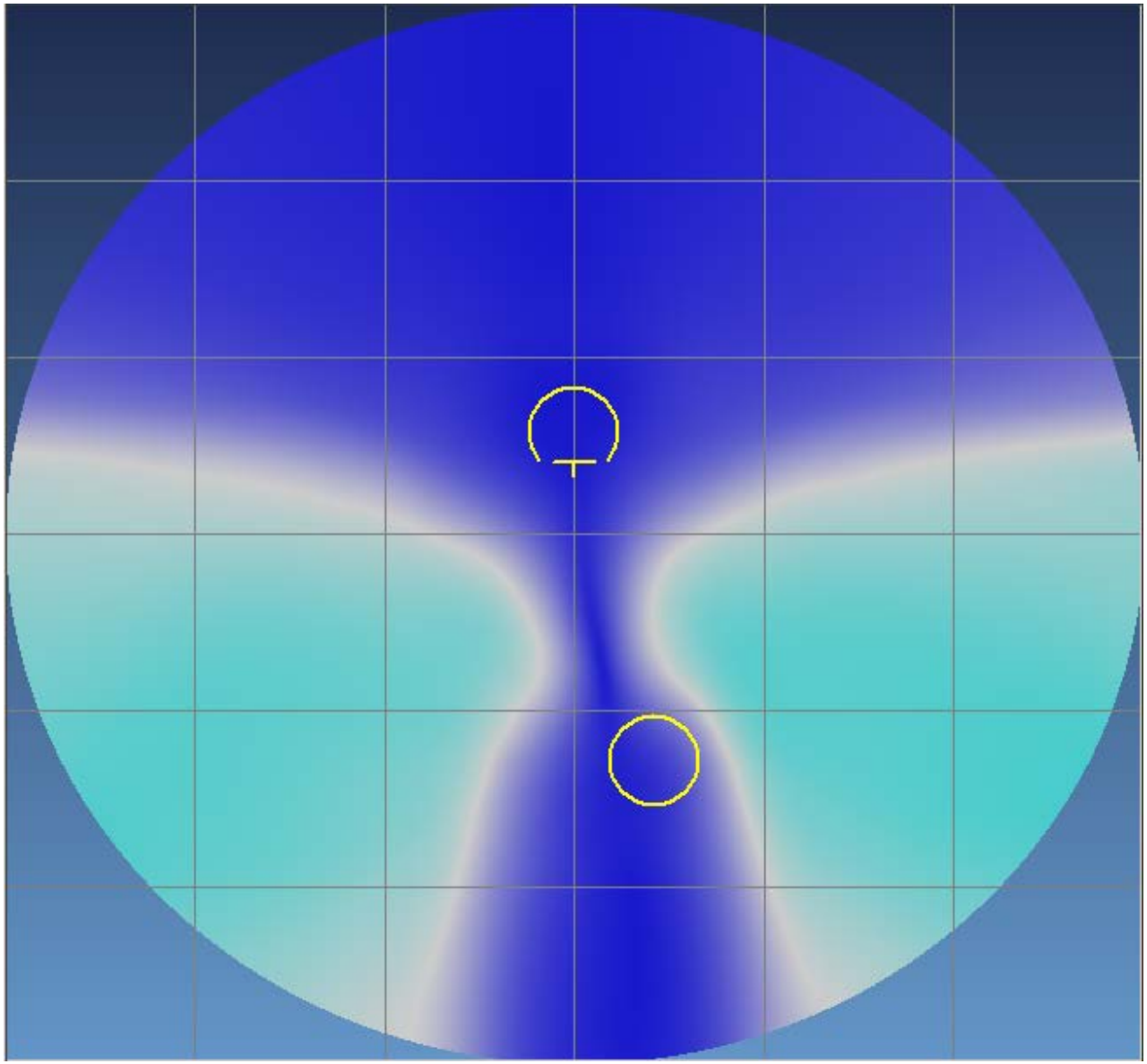


Conventional Freeform

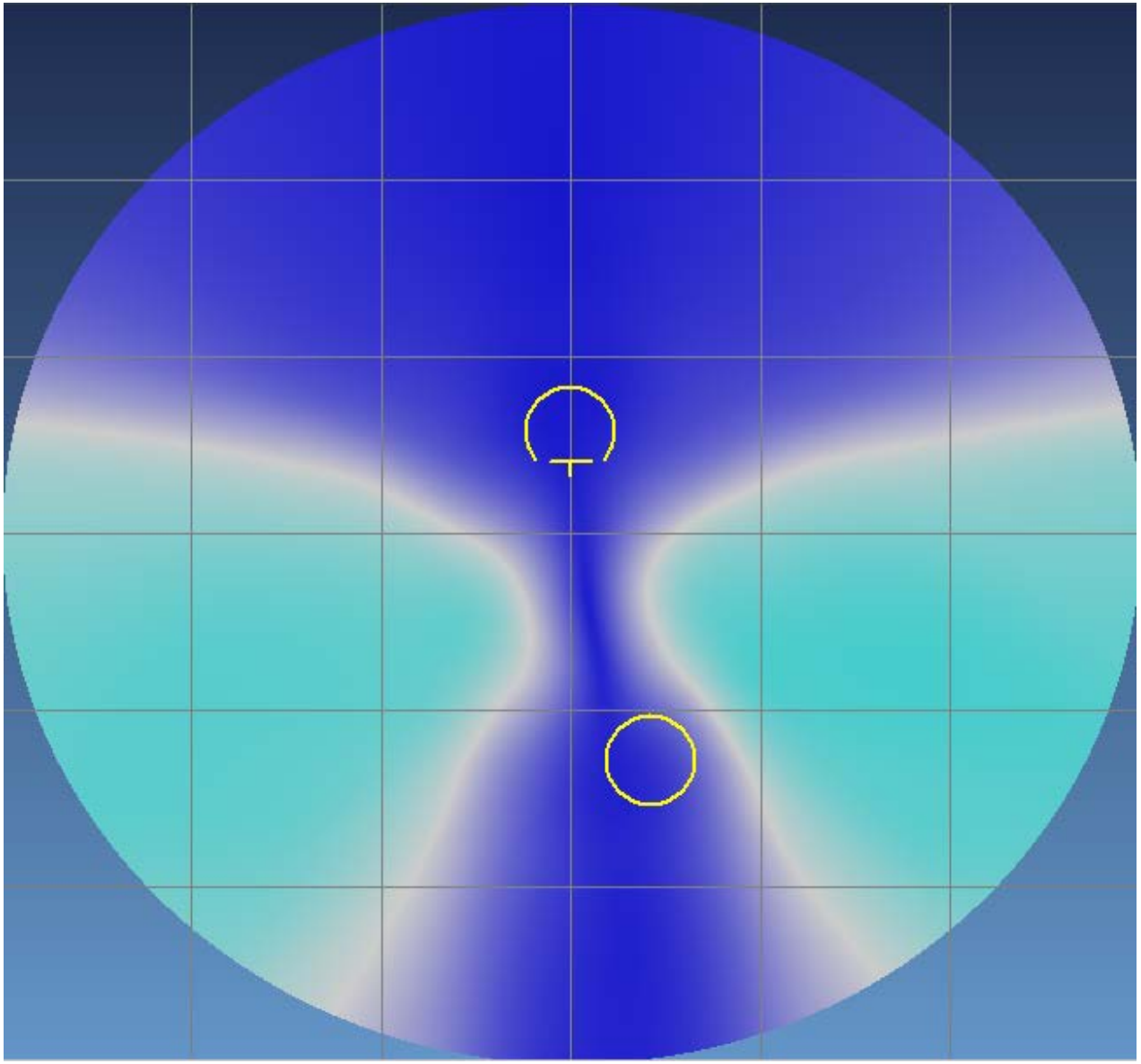


LENS	DISTANCE (10mm AGC)	INTERMEDIATE (4mm BGC)	NEAR (22mm BGC)	30 BELOW (30mm BGC)
DIN: 80-10-10	72mm + 10%	7mm + 40%	20mm + 5%	23mm + 10%
DIN: 40-20-40	68mm + 5%	8mm + 60%	23mm + 20%	34mm + 60%
DIN: 10-10-80	64mm - 5%	8mm + 60%	30mm + 60%	40mm + 90%
Conventional Freeform COMPARISON	66mm	5mm	19mm	21mm

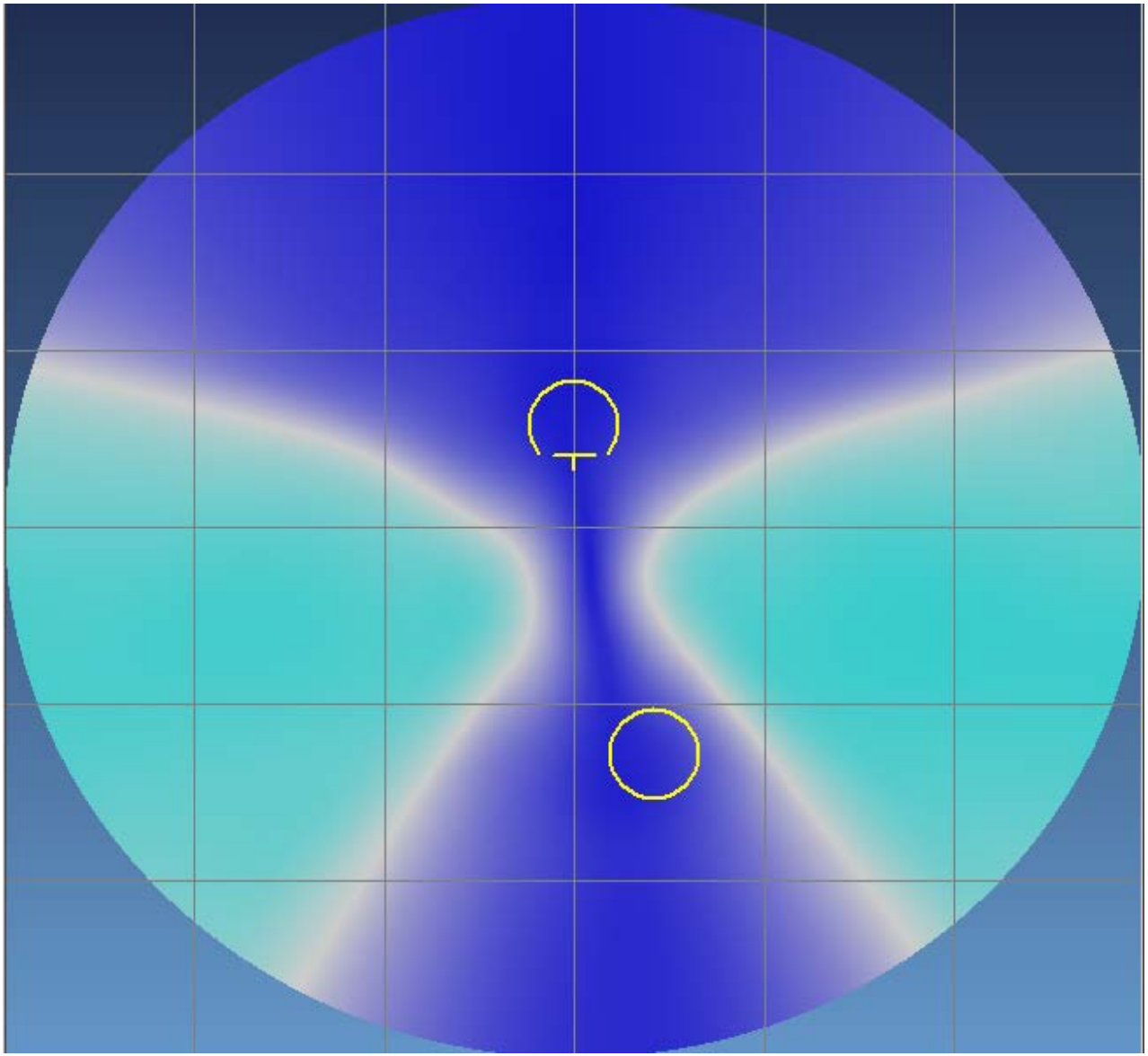
DIN 80-10-10



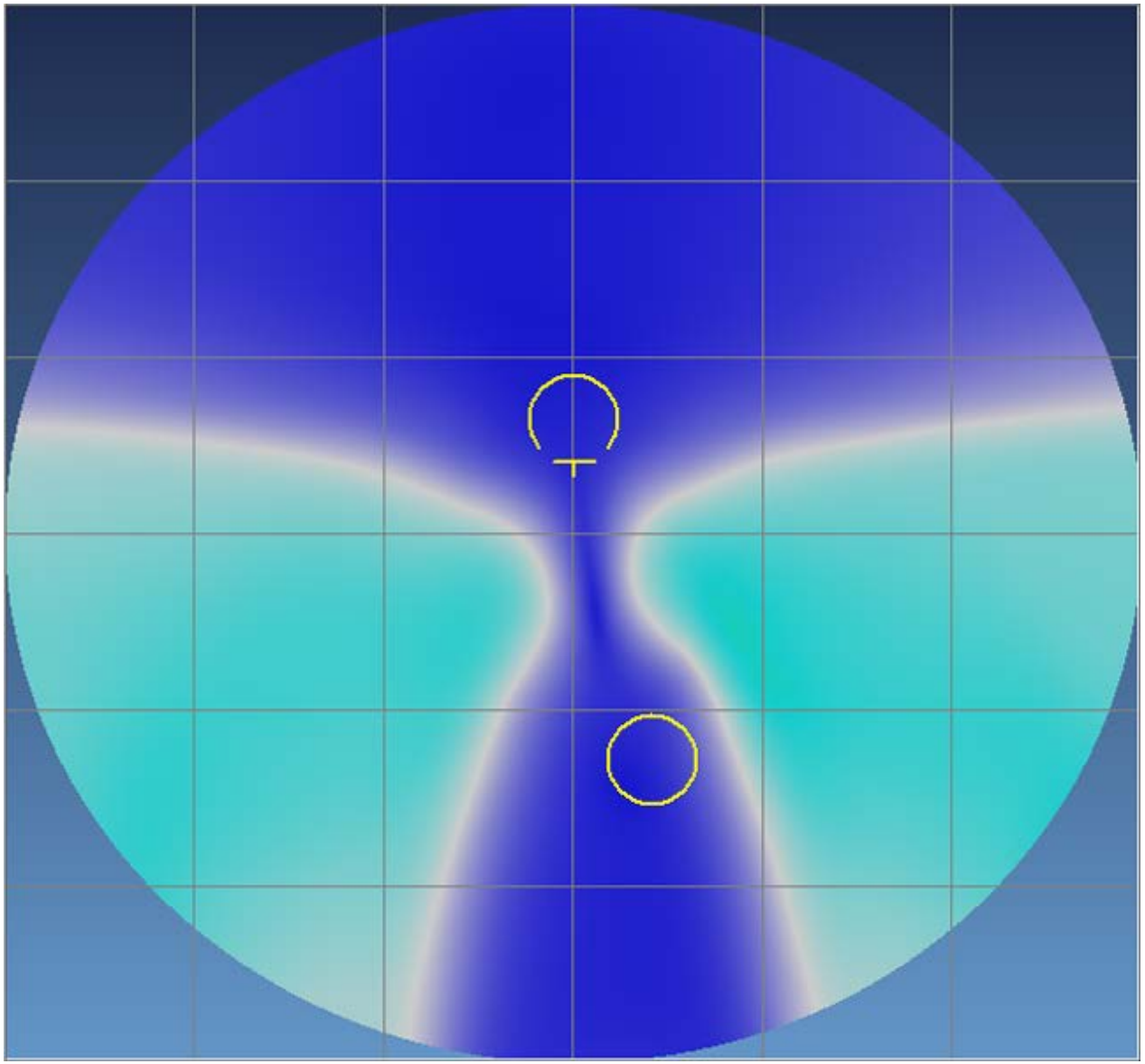
DIN 40-20-40



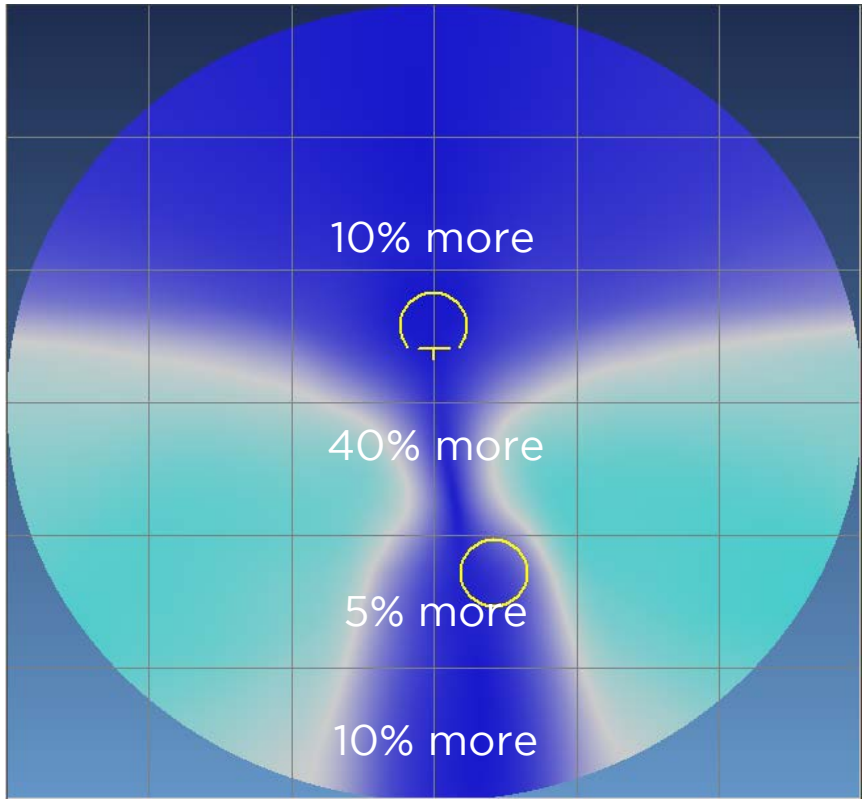
DIN 10-10-80



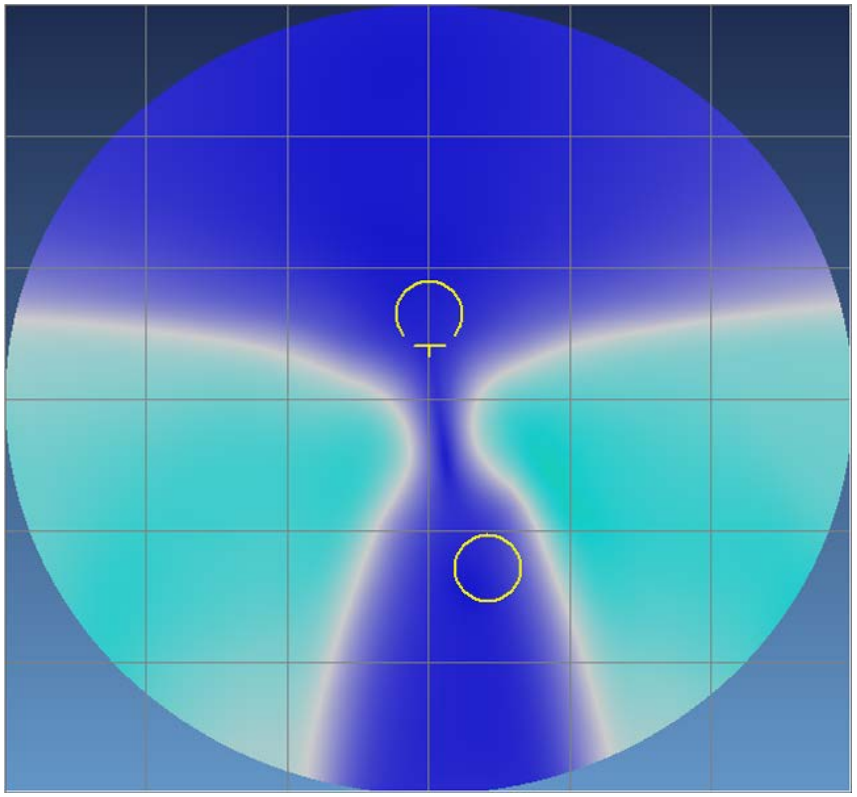
Conventional Freeform



DIN 80-10-10

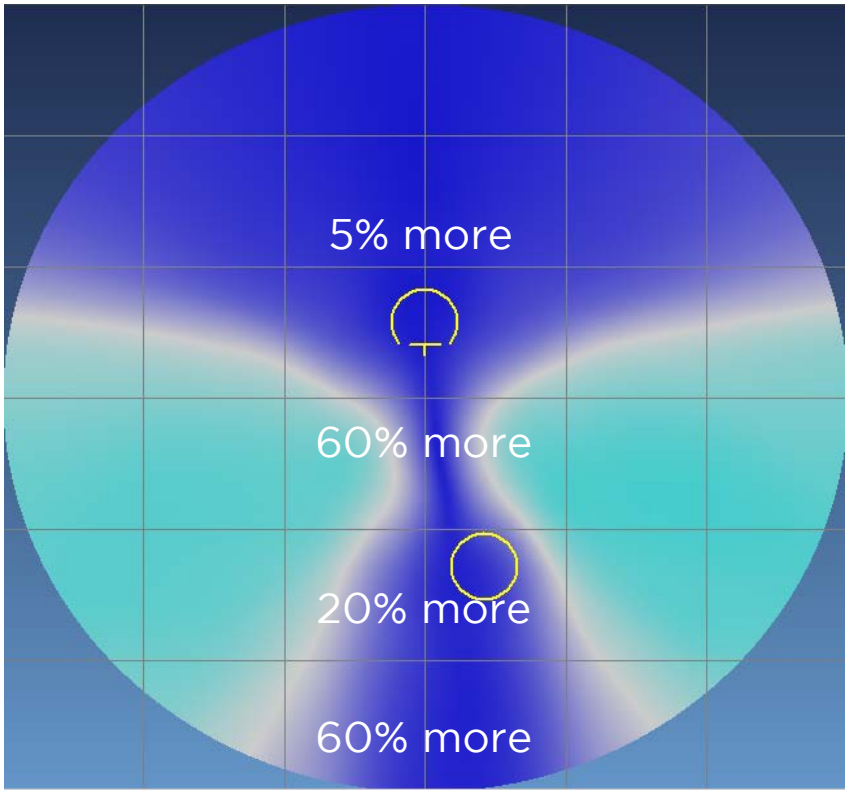


Conventional Freeform

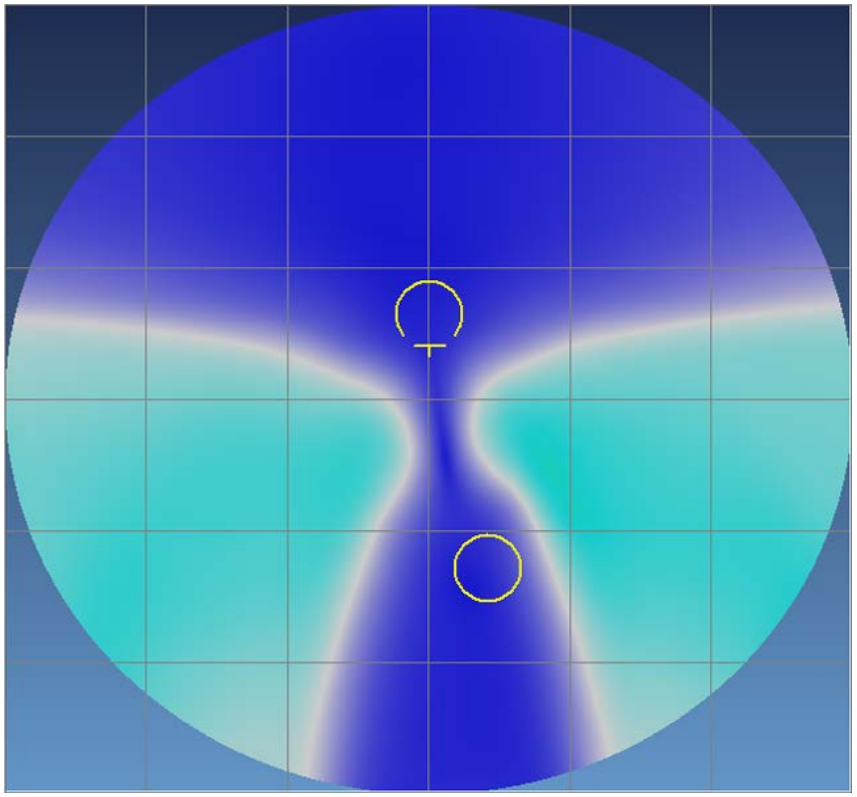


LENS	DISTANCE (10mm AGC)	INTERMEDIATE (4mm BGC)	NEAR (22mm BGC)	30 BELOW (30mm BGC)
DIN: 80-10-10	72mm **+ 10%**	7mm **+ 40%**	20mm **+ 5%**	23mm **+ 10%**
CONVENTIONAL COMPARISON	66mm	5mm	19mm	21mm

DIN 40-20-40

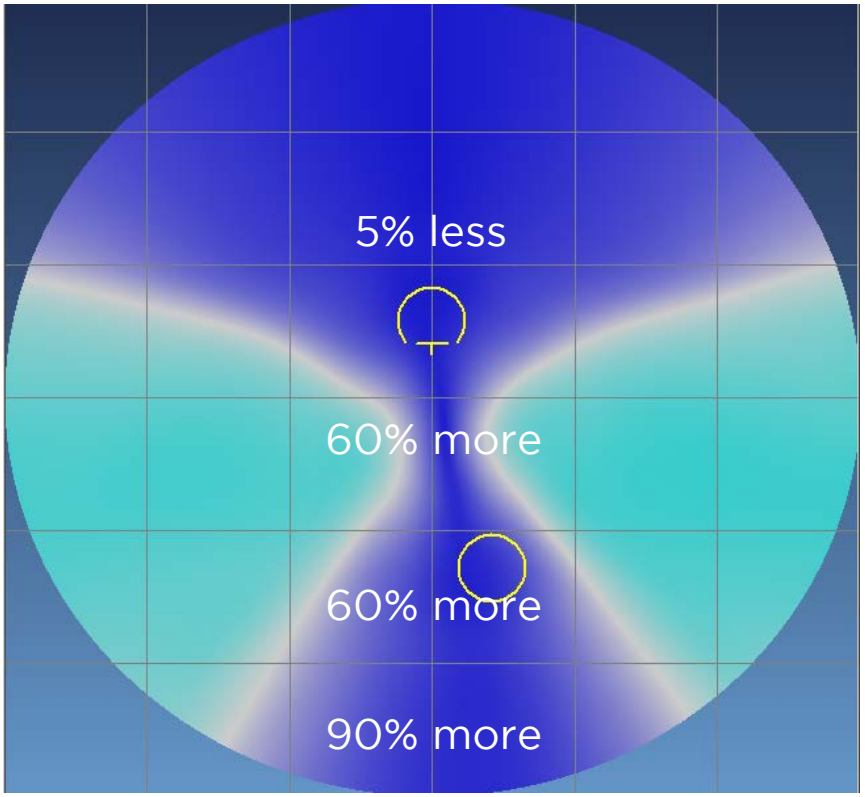


Conventional Freeform

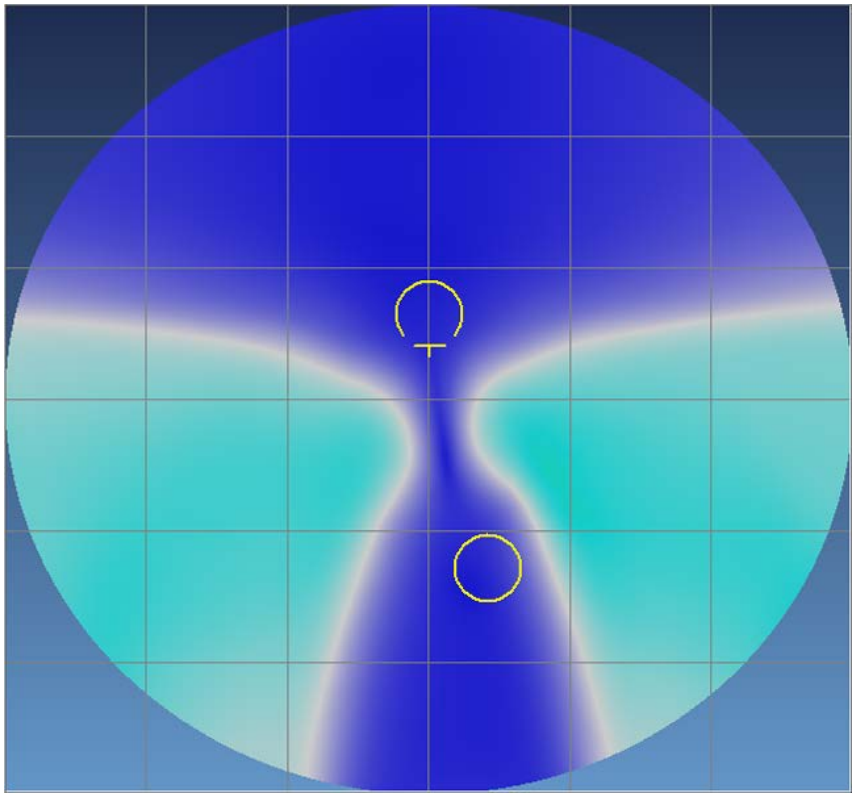


LENS	DISTANCE (10mm AGC)	INTERMEDIATE (4mm BGC)	NEAR (22mm BGC)	30 BELOW (30mm BGC)
DIN: 40-20-40	68mm **+ 5%**	8mm **+ 60%**	23mm **+ 20%**	34mm **+ 60%**
CONVENTIONAL COMPARISON	66mm	5mm	19mm	21mm

DIN 10-10-80



Conventional Freeform



LENS	DISTANCE (10mm AGC)	INTERMEDIATE (4mm BGC)	NEAR (22mm BGC)	30 BELOW (30mm BGC)
DIN: 10-10-80	64mm - 5%	8mm + 60%	30mm + 60%	40mm + 90%
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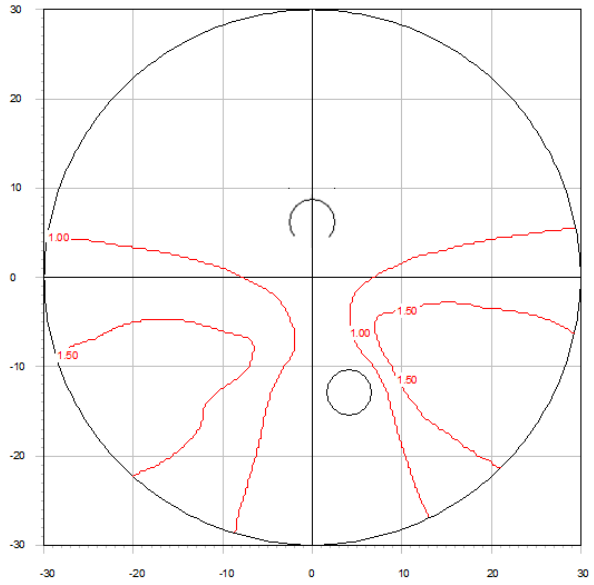
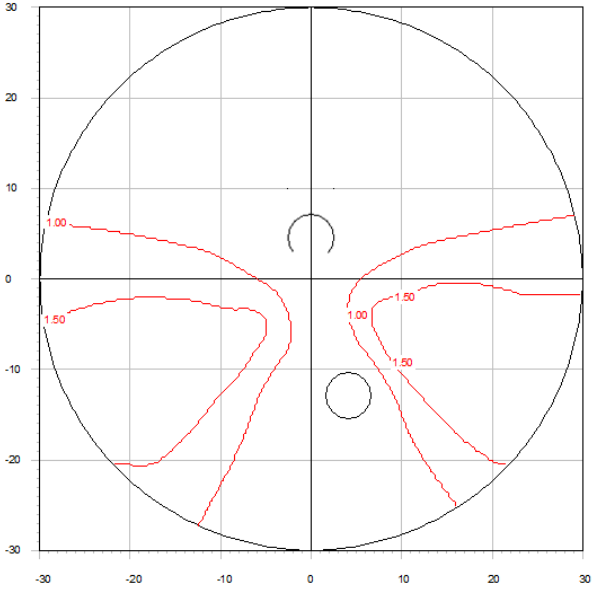
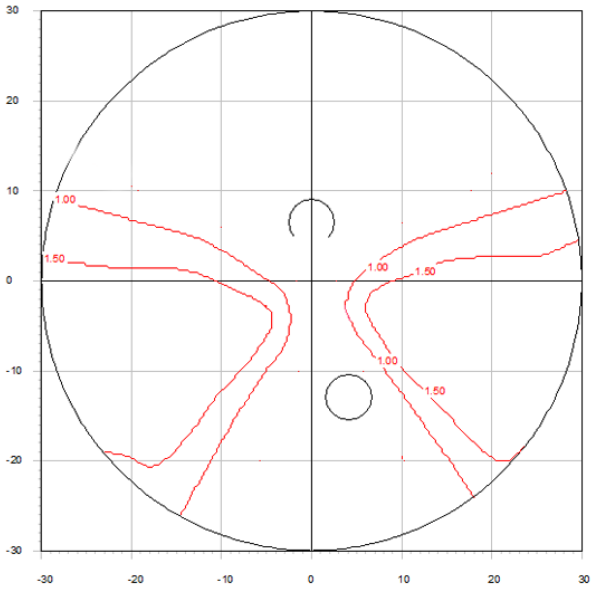
DIN 80-10-10



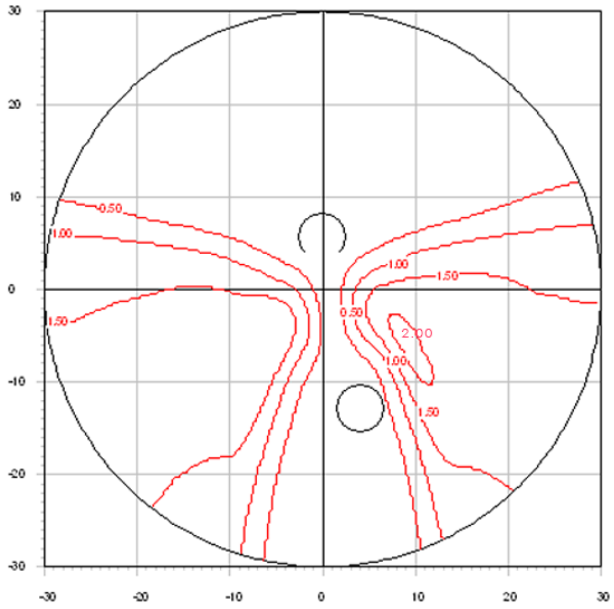
DIN 40-20-40



DIN 10-10-80



Conventional Freeform



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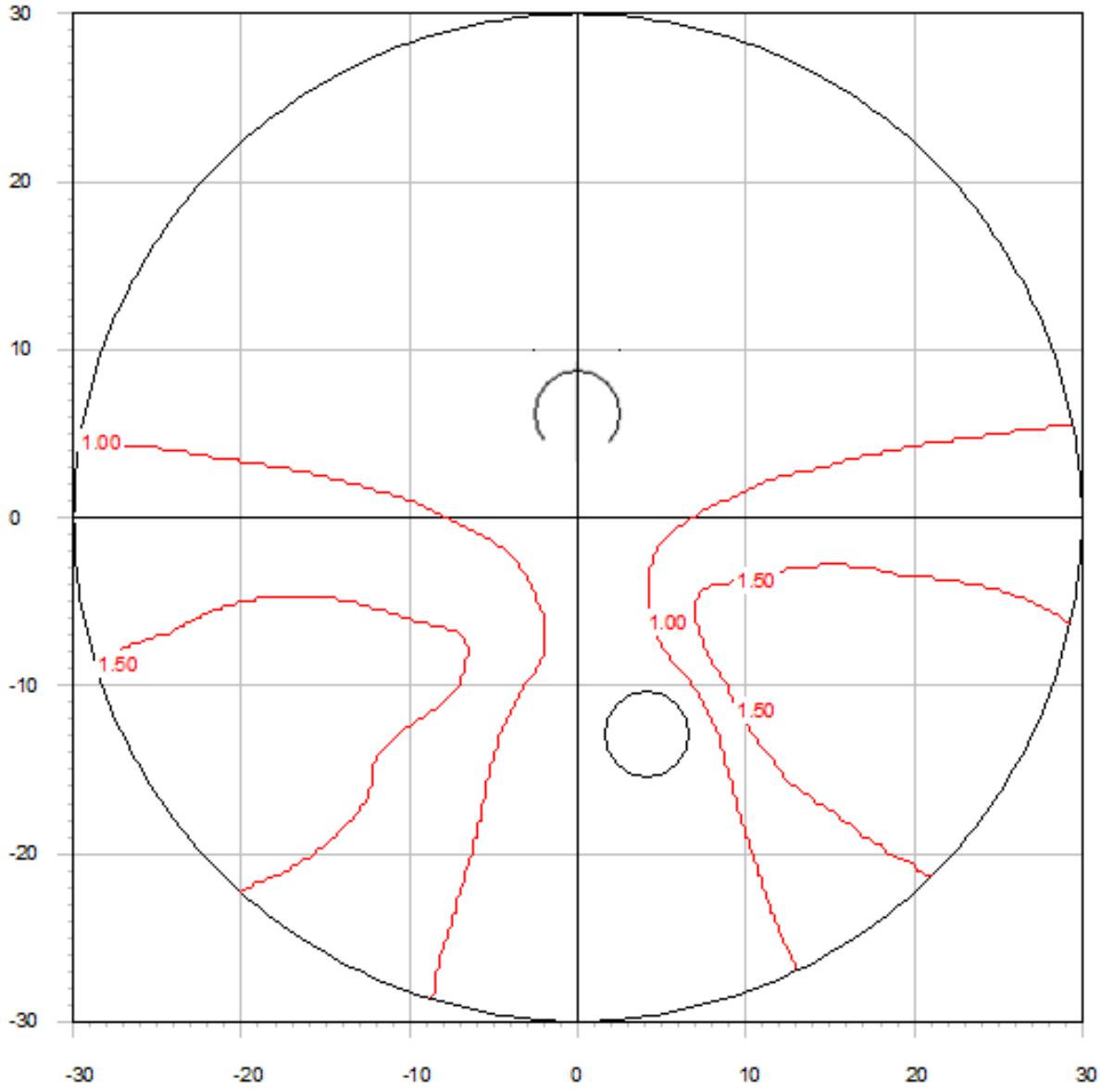
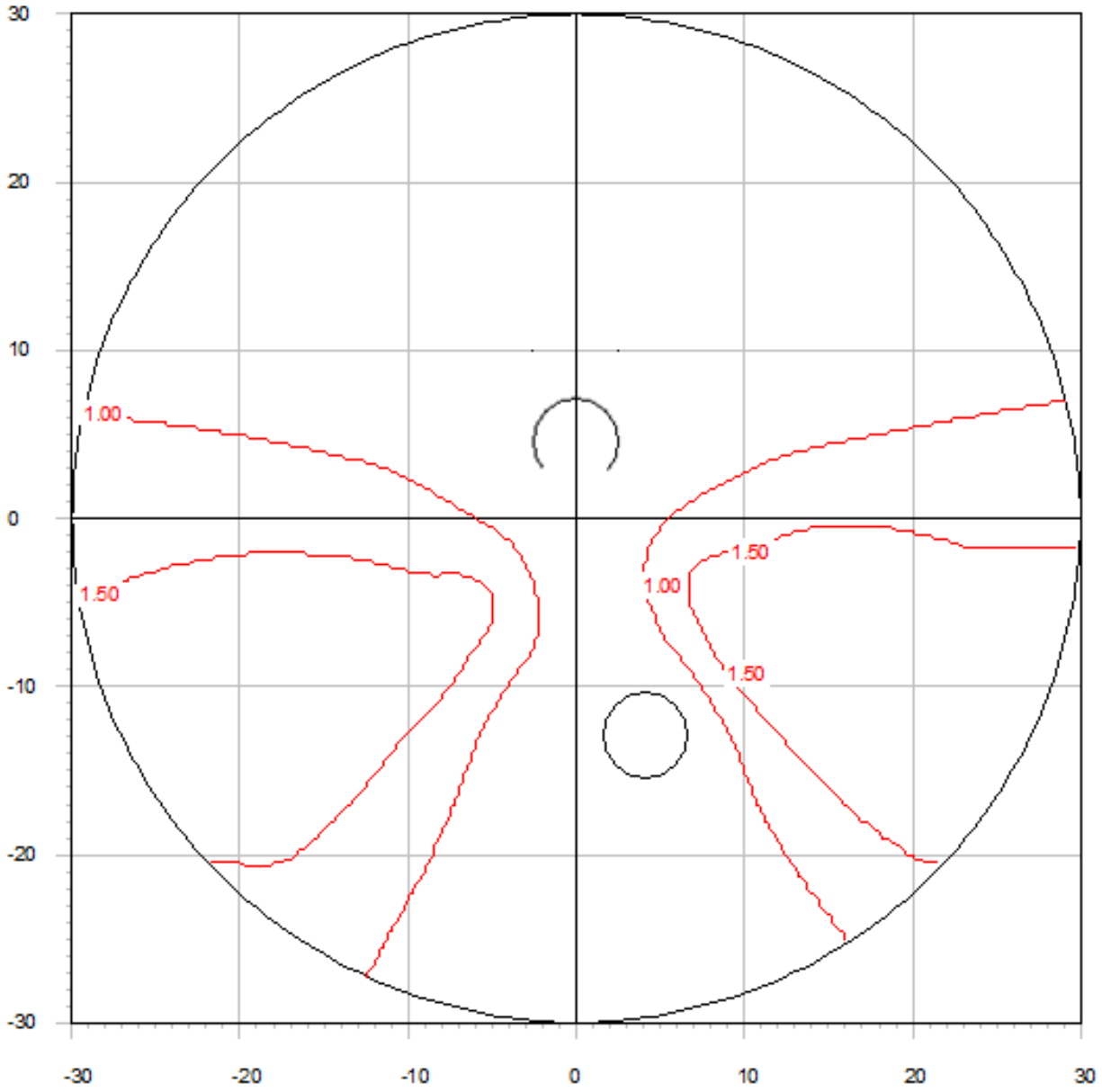
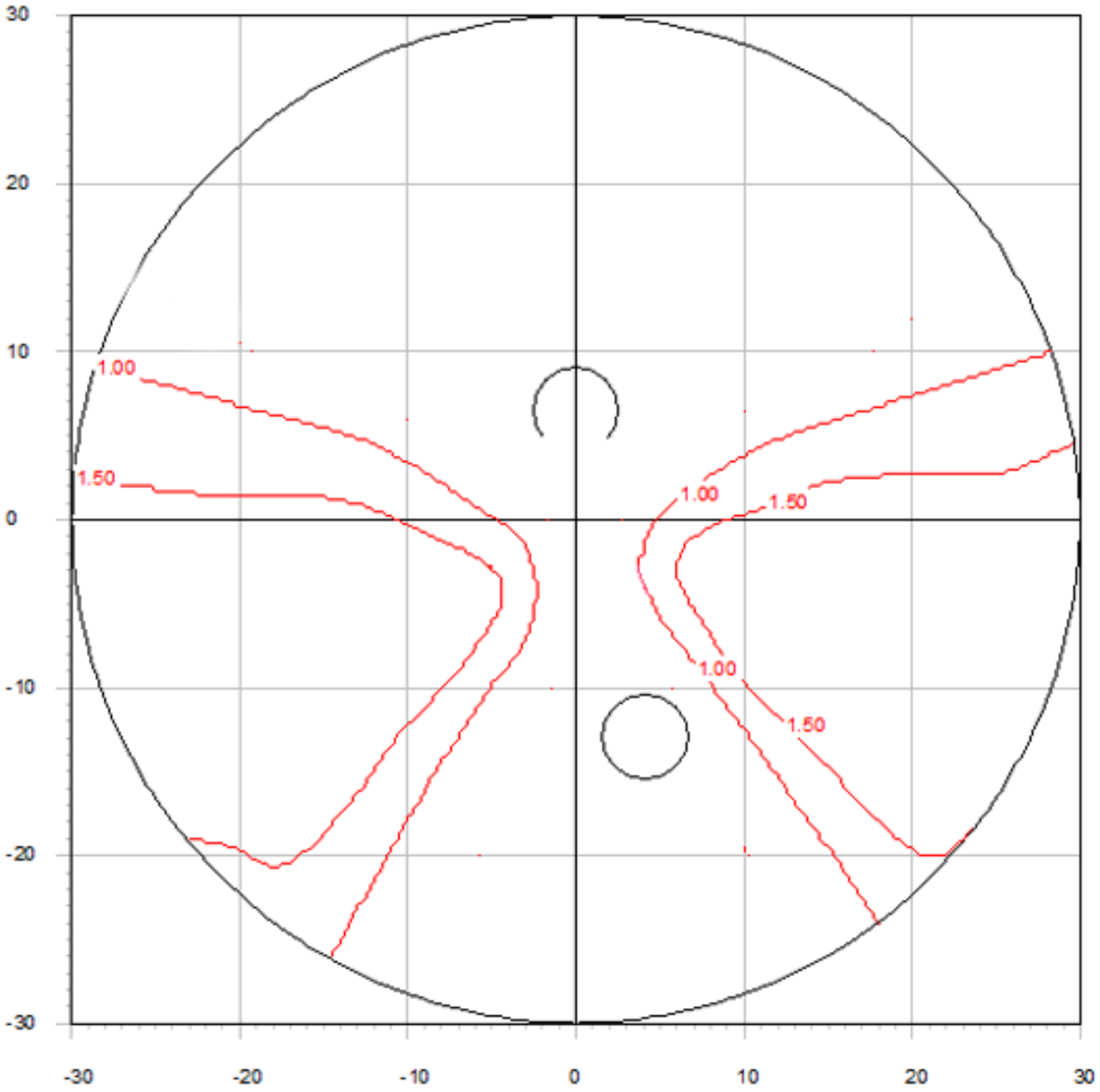
DIN 80-10-10



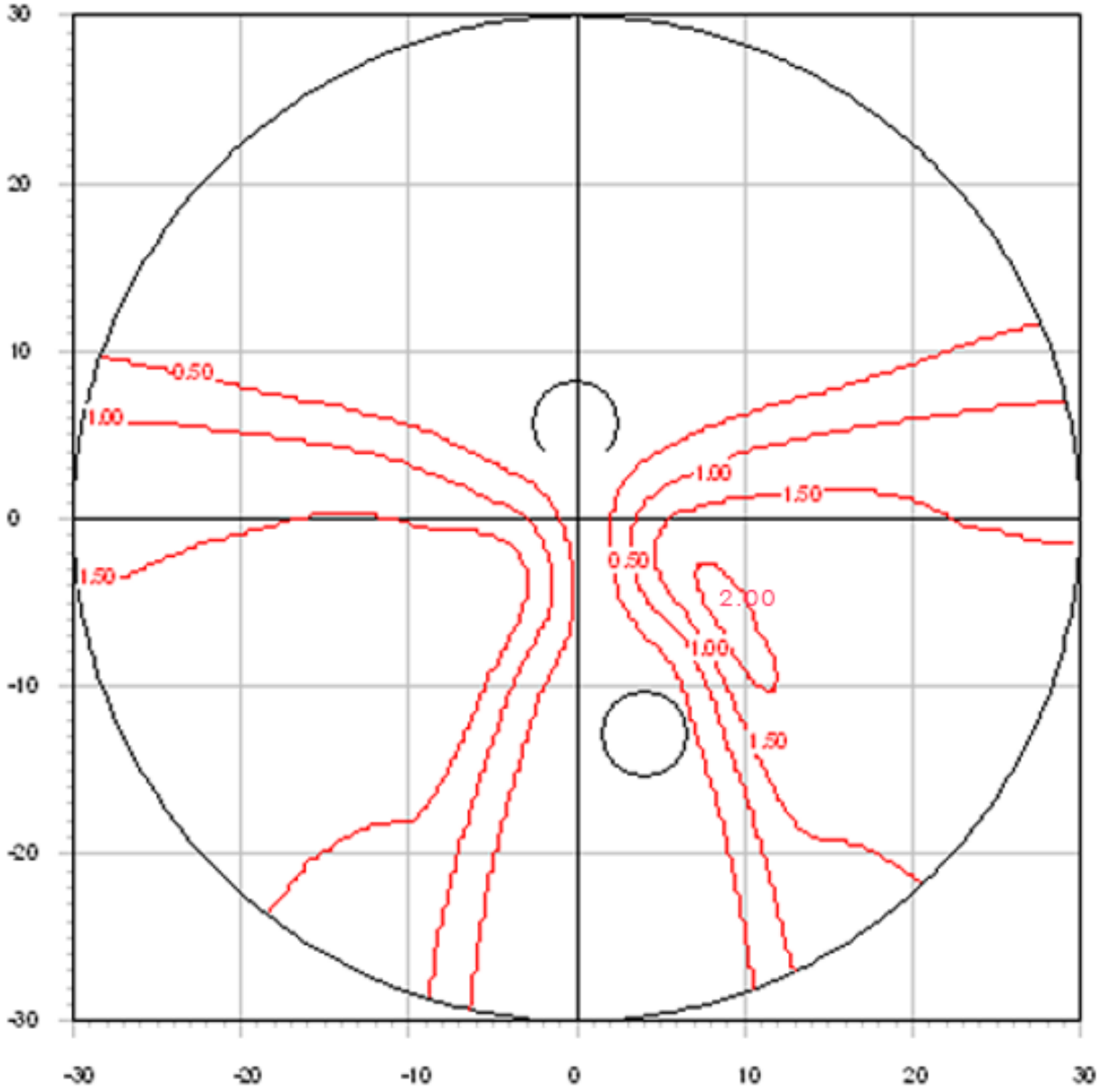
DIN 40-20-40



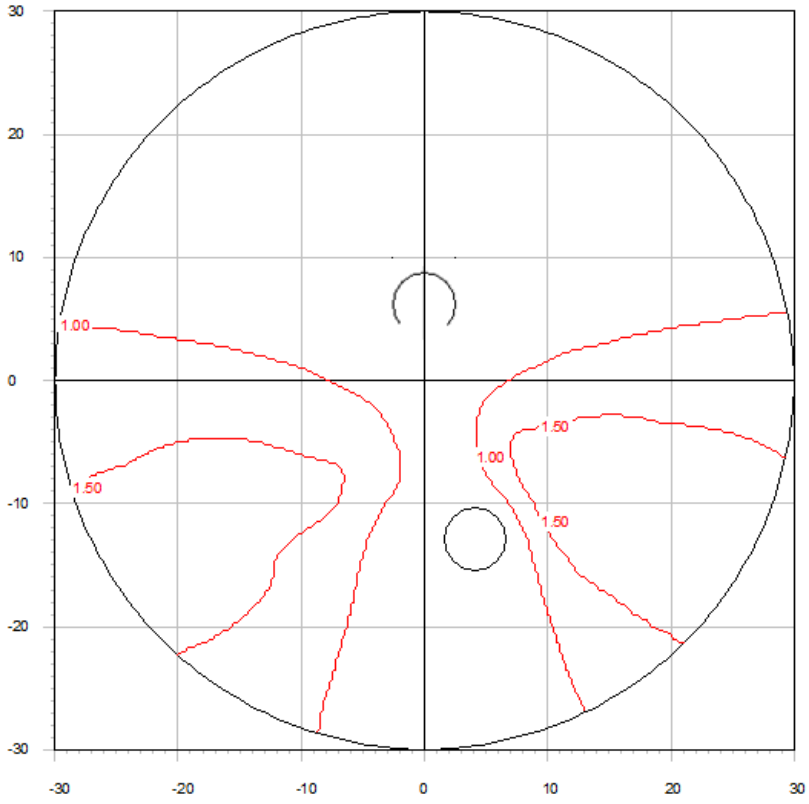
DIN 10-10-80



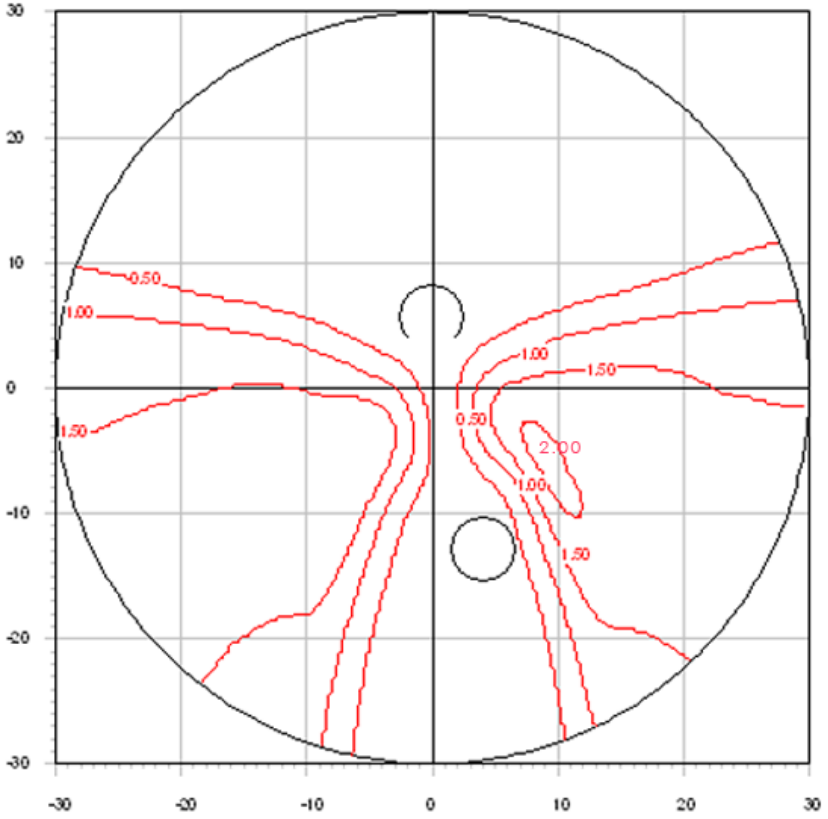
Conventional Freeform



DIN 80-10-10

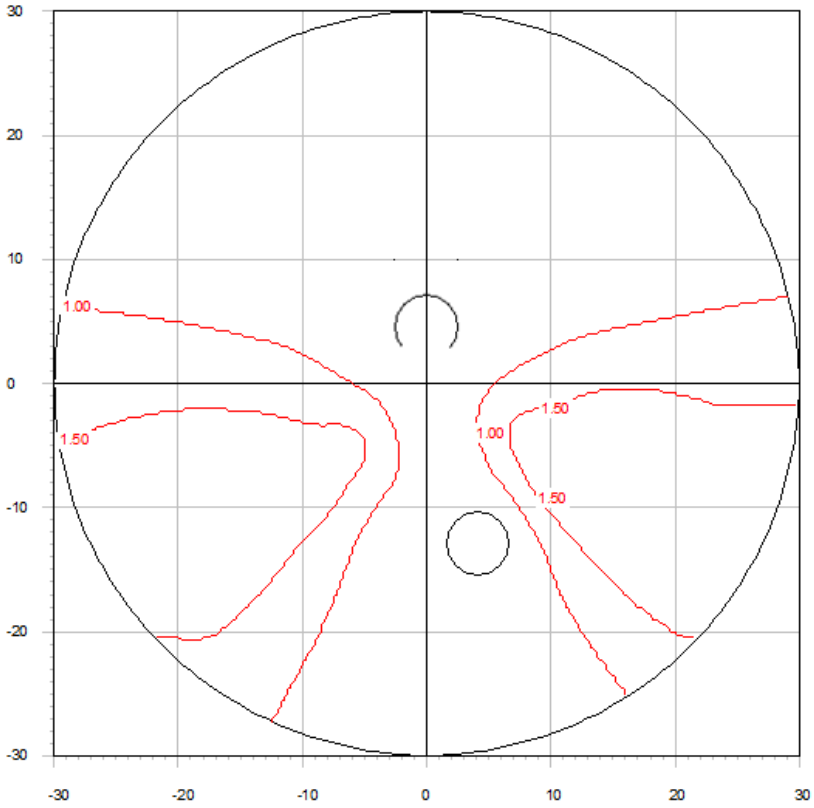


Conventional Freeform

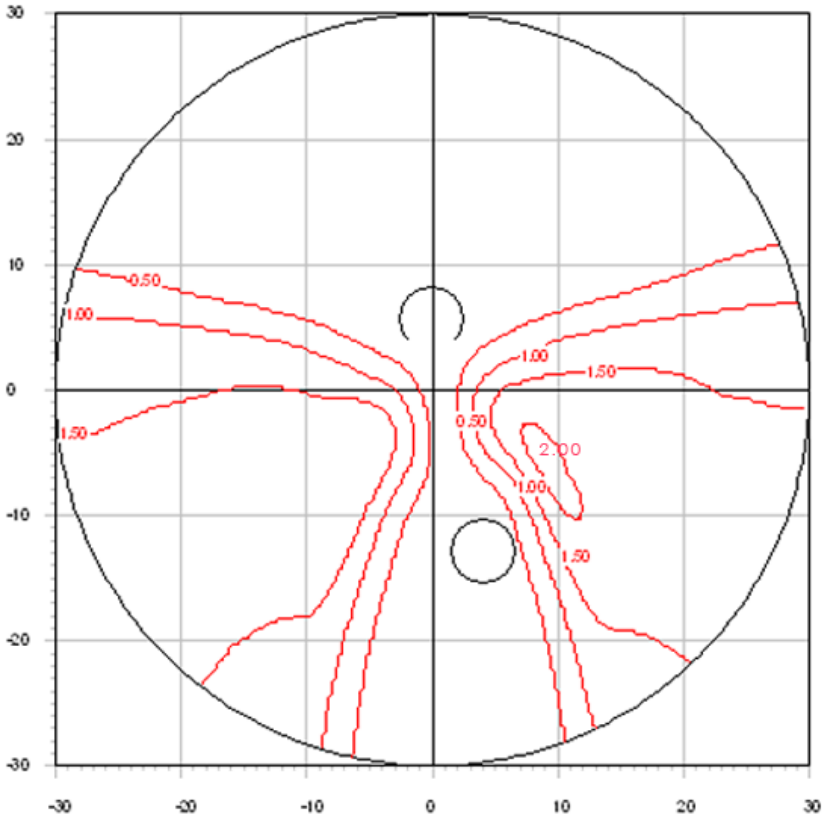


LENS	DISTANCE (10mm AGC)	INTERMEDIATE (4mm BGC)	NEAR (22mm BGC)	30 BELOW (30mm BGC)
DIN: 80-10-10	72mm **+ 10%**	7mm **+ 40%**	20mm **+ 5%**	23mm **+ 10%**
CONVENTIONAL COMPARISON	66mm	5mm	19mm	21mm

DIN 40-20-40

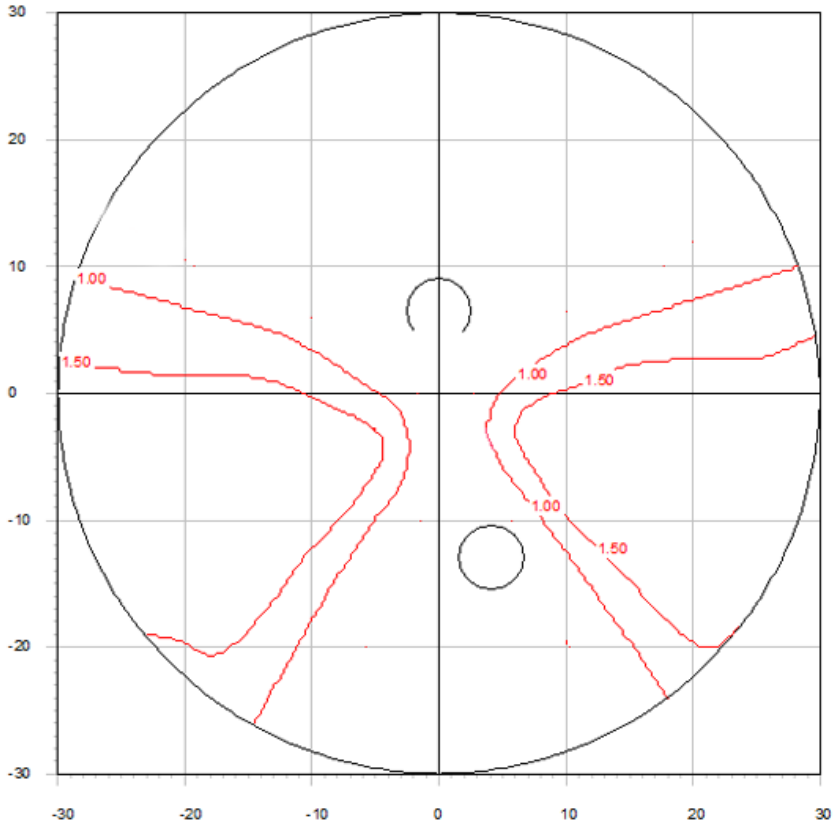


Conventional Freeform

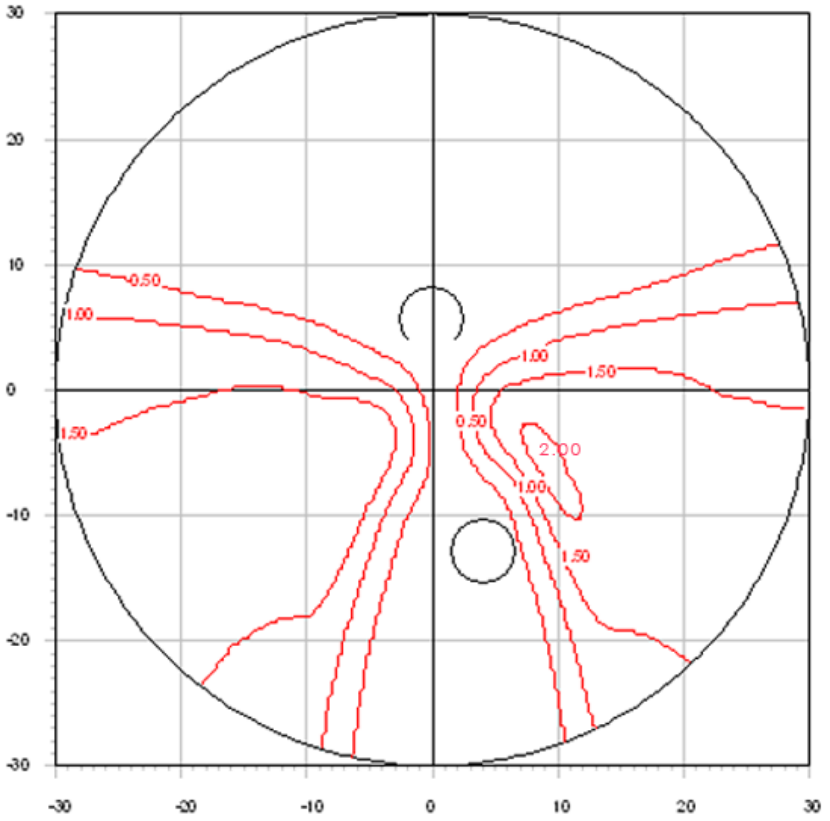


LENS	DISTANCE (10mm AGC)	INTERMEDIATE (4mm BGC)	NEAR (22mm BGC)	30 BELOW (30mm BGC)
DIN: 40-20-40	68mm **+ 5%**	8mm **+ 60%**	23mm **+ 20%**	34mm **+ 60%**
CONVENTIONAL COMPARISON	66mm	5mm	19mm	21mm

DIN 10-10-80

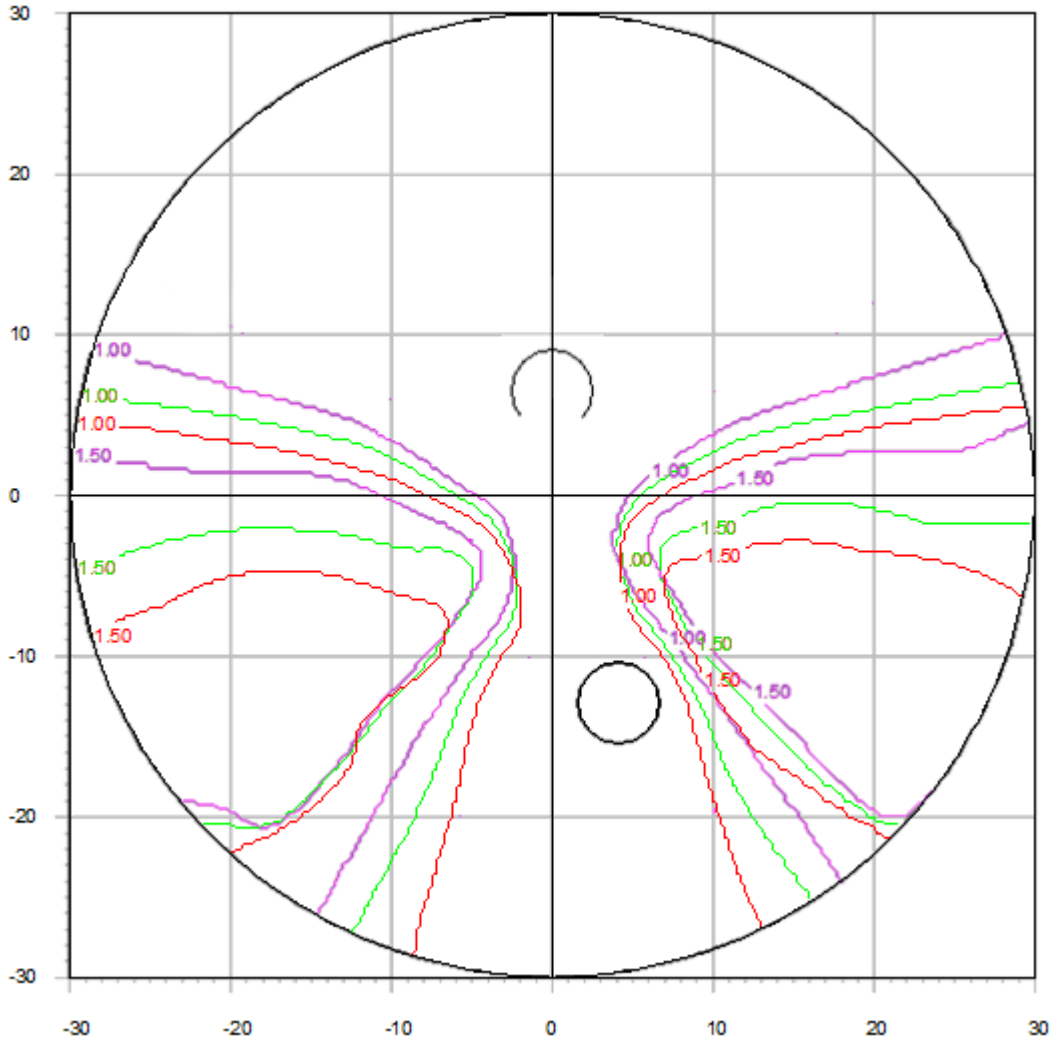


Conventional Freeform



LENS	DISTANCE (10mm AGC)	INTERMEDIATE (4mm BGC)	NEAR (22mm BGC)	30 BELOW (30mm BGC)
DIN: 10-10-80	64mm **- 5%**	8mm **+ 60%**	30mm **+ 60%**	40mm **+ 90%**
CONVENTIONAL COMPARISON	66mm	5mm	19mm	21mm

Comparison between infinity types

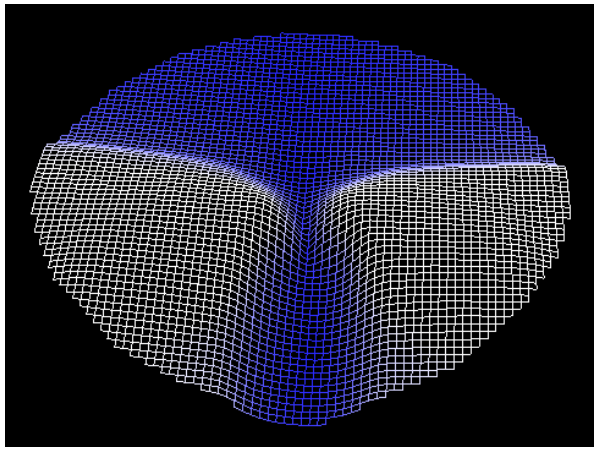


RED: 80-10-10

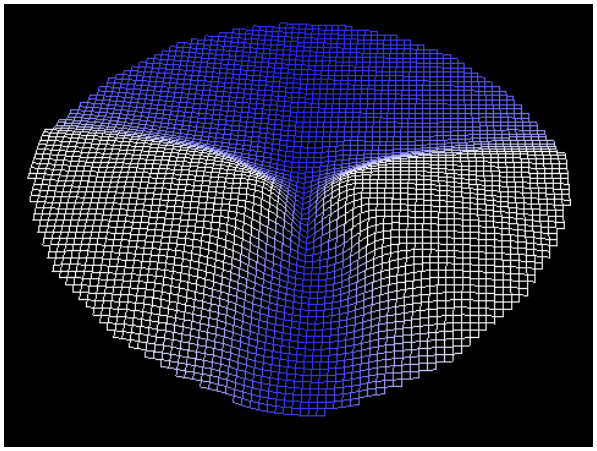
GREEN: 40-20-40

PURPLE: 10-10-80

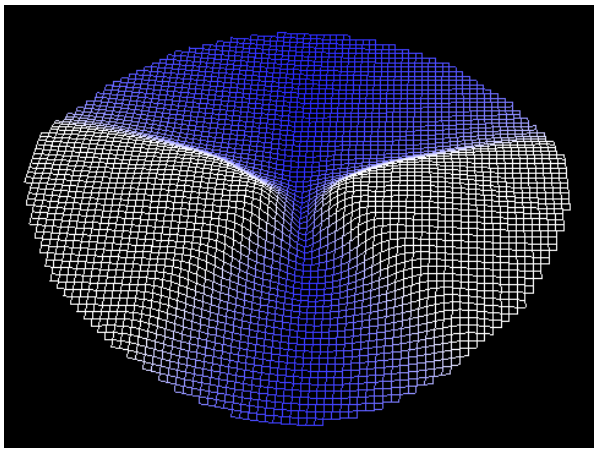
DIN 80-10-10



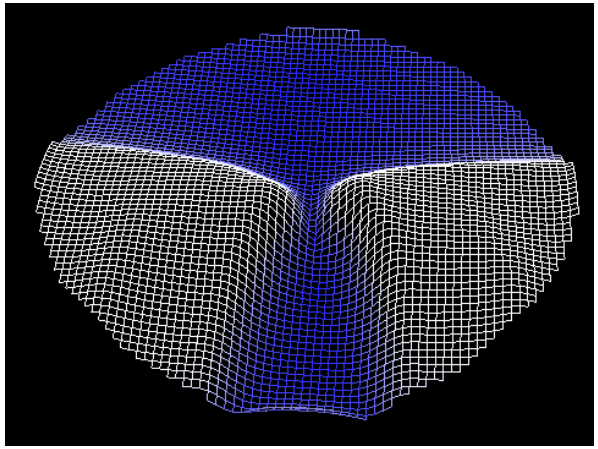
DIN 40-20-40



DIN 10-10-80

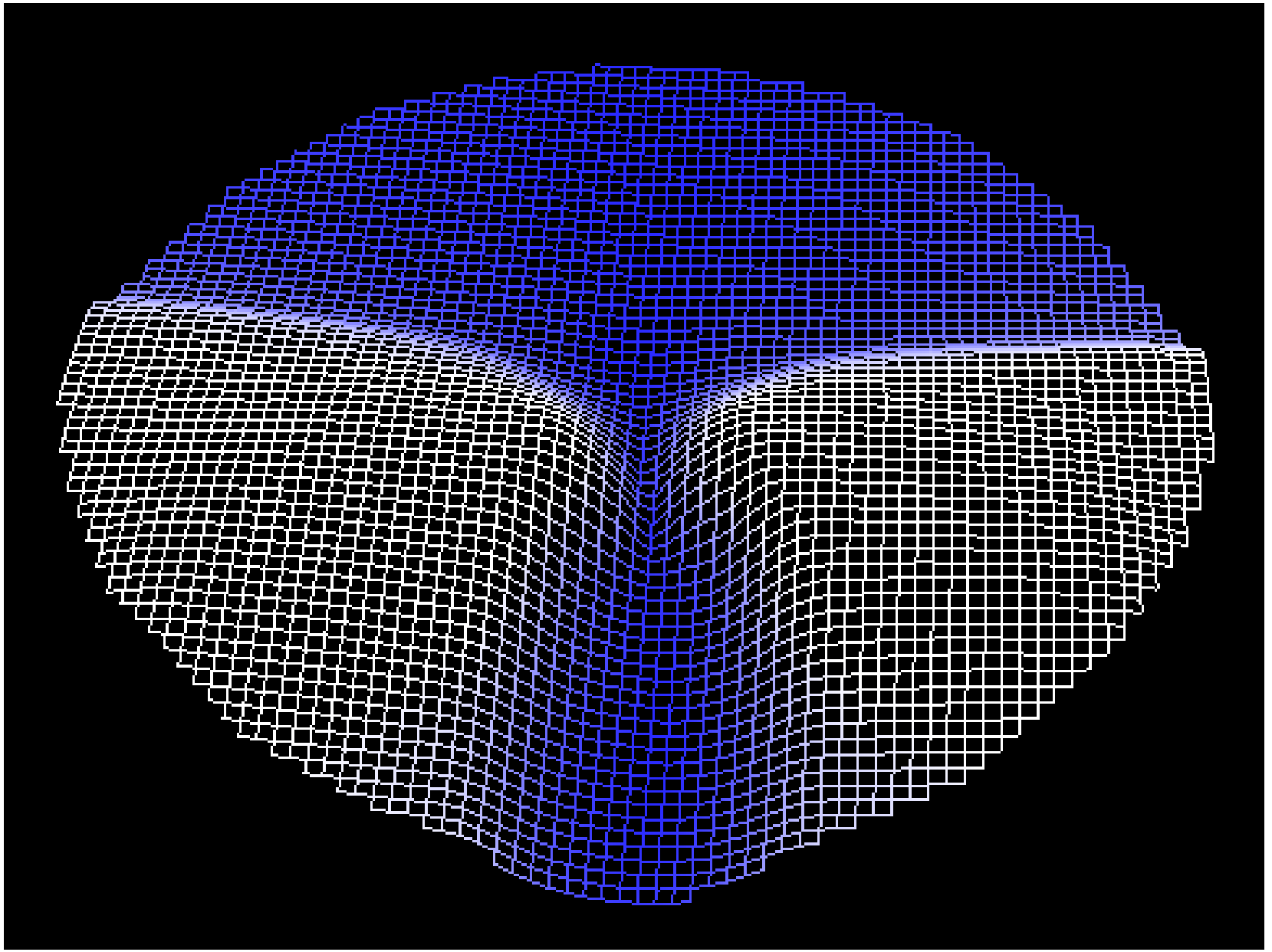


Conventional Freeform

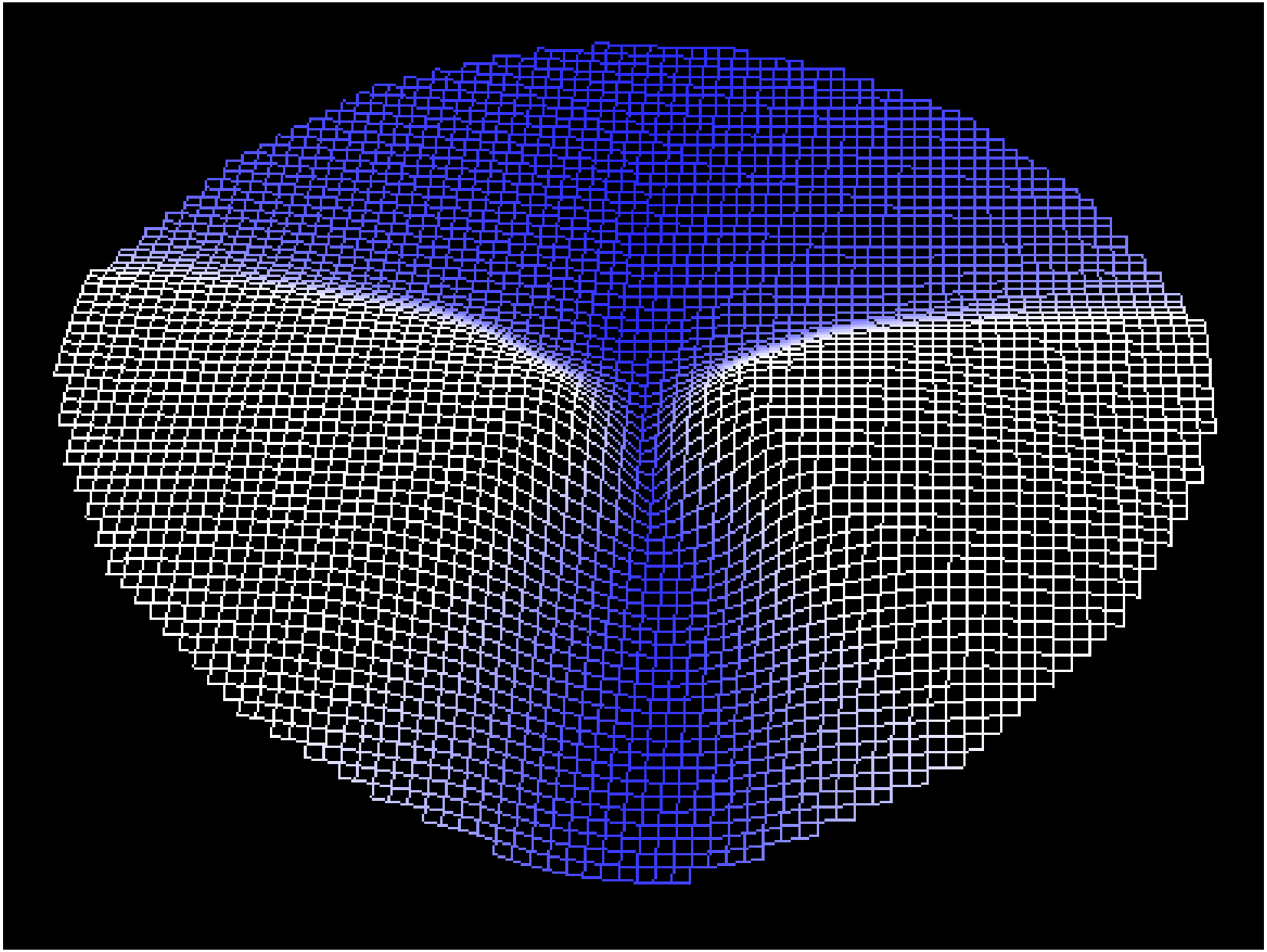


LENS	DISTANCE (10mm AGC)	INTERMEDIATE (4mm BGC)	NEAR (22mm BGC)	30 BELOW (30mm BGC)
DIN: 80-10-10	72mm **+ 10%**	7mm **+ 40%**	20mm **+ 5%**	23mm **+ 10%**
DIN: 40-20-40	68mm **+ 5%**	8mm **+ 60%**	23mm **+ 20%**	34mm **+ 60%**
DIN: 10-10-80	64mm **- 5%**	8mm **+ 60%**	30mm **+ 60%**	40mm **+ 90%**
Conventional Freeform COMPARISON	66mm	5mm	19mm	21mm

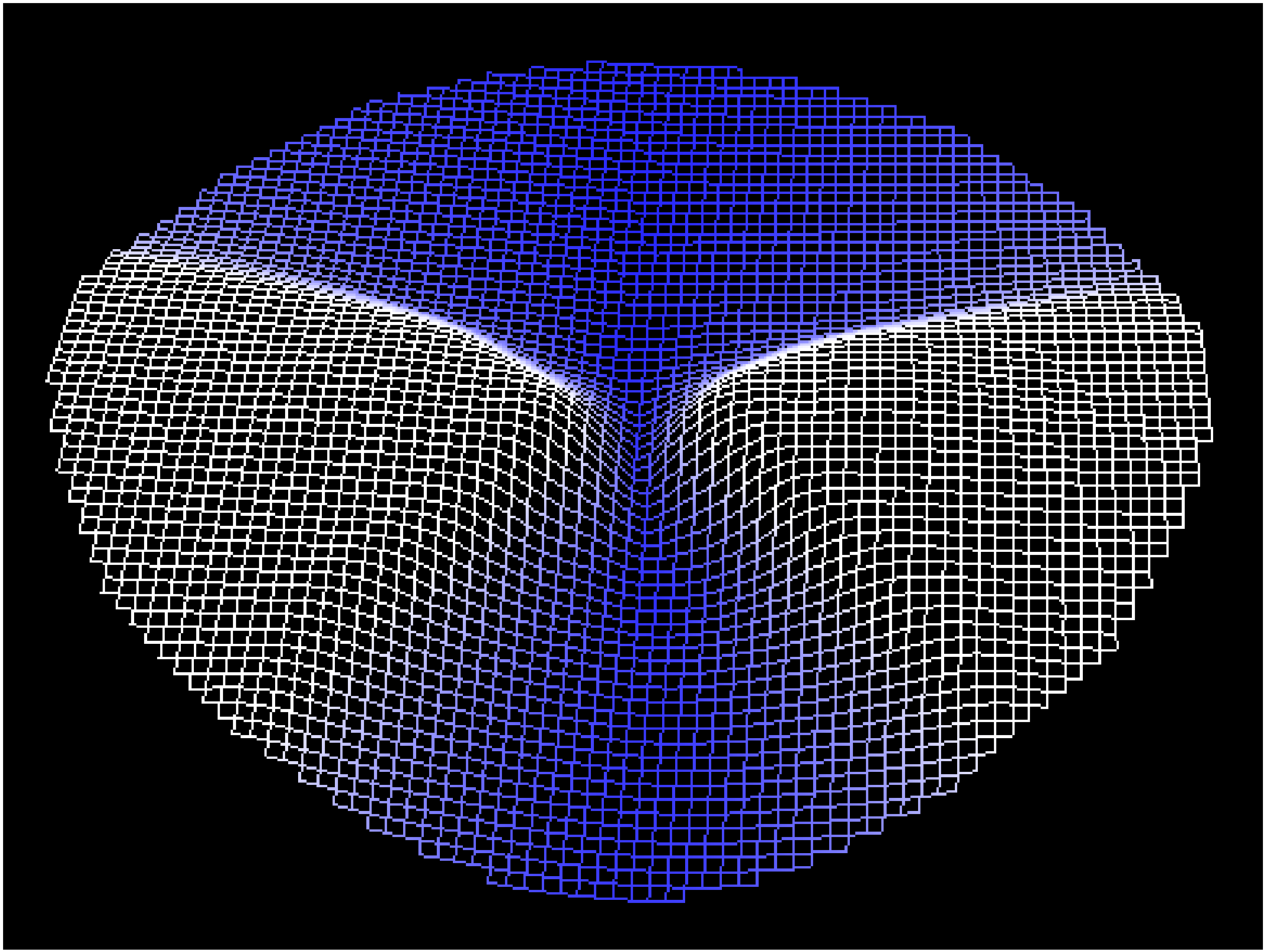
DIN 80-10-10



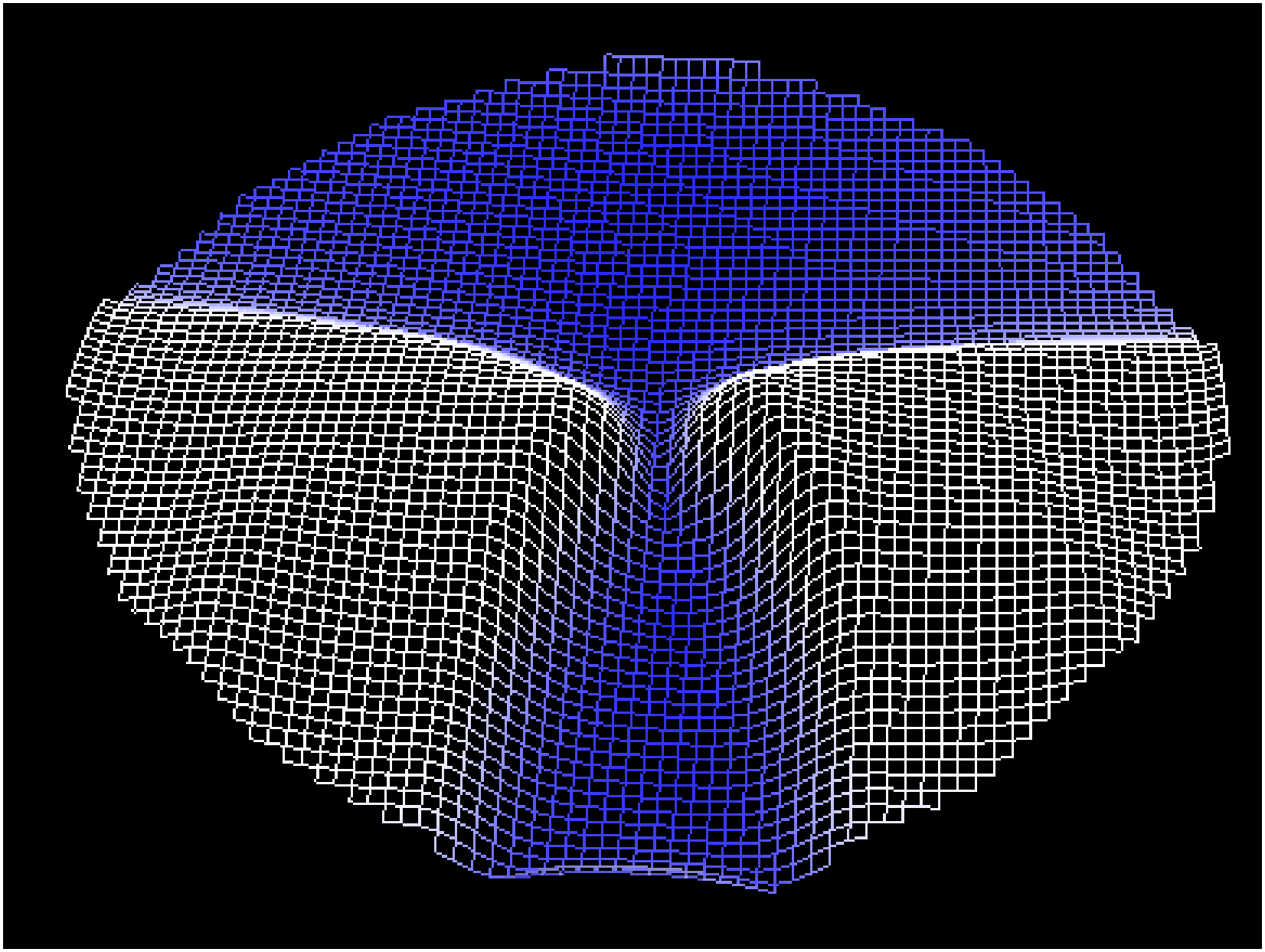
DIN 40-20-40



DIN 10-10-80

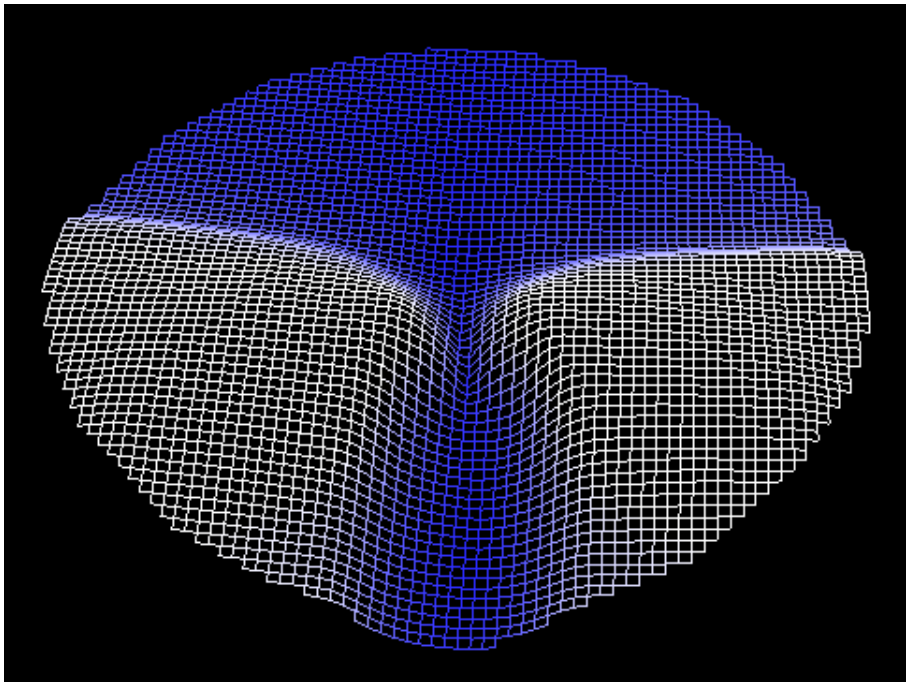


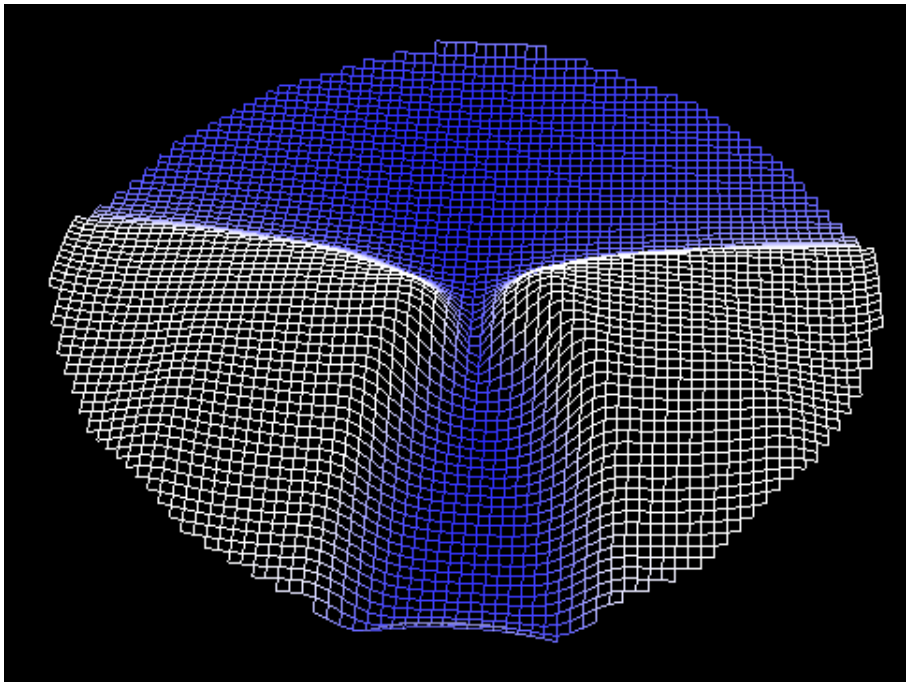
Conventional Freeform



DIN 80-10-10

Conventional Freeform





LENS	DISTANCE (10mm AGC)	INTERMEDIATE (4mm BGC)	NEAR (22mm BGC)	30 BELOW (30mm BGC)
DIN: 80-10-10	72mm **+ 10%**	7mm **+ 40%**	20mm **+ 5%**	23mm **+ 10%**
CONVENTIONAL COMPARISON	66mm	5mm	19mm	21mm

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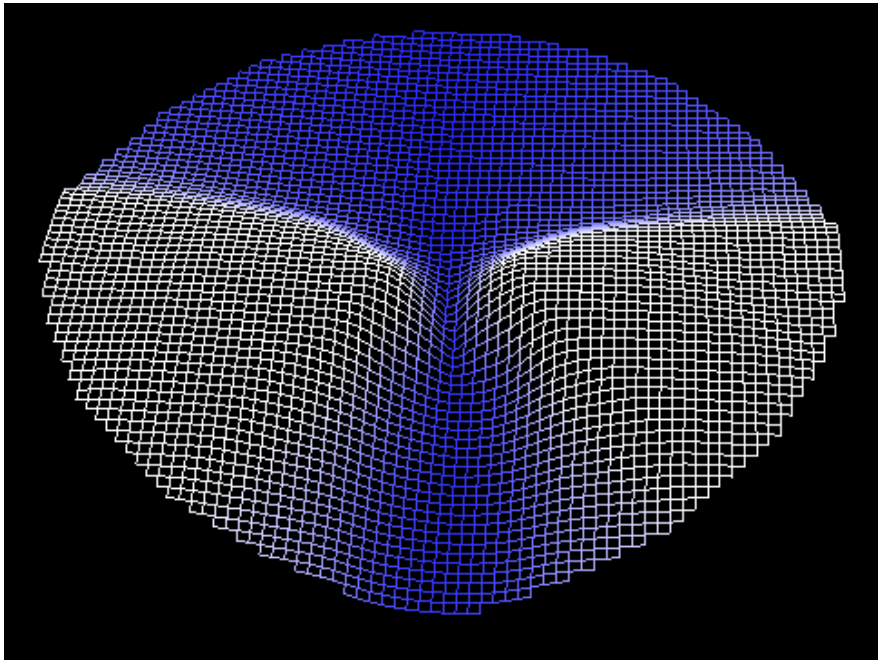

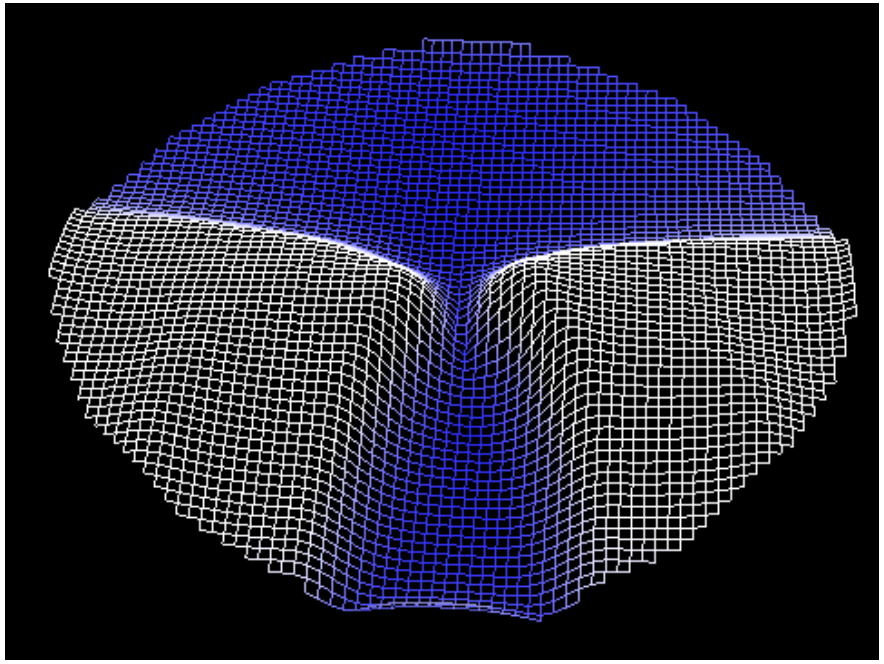

LENS	DISTANCE (10mm AGC)	INTERMEDIATE (4mm BGC)	NEAR (22mm BGC)	30 BELOW (30mm BGC)
DIN: 40-20-40	68mm **+ 5%**	8mm **+ 60%**	23mm **+ 20%**	34mm **+ 60%**
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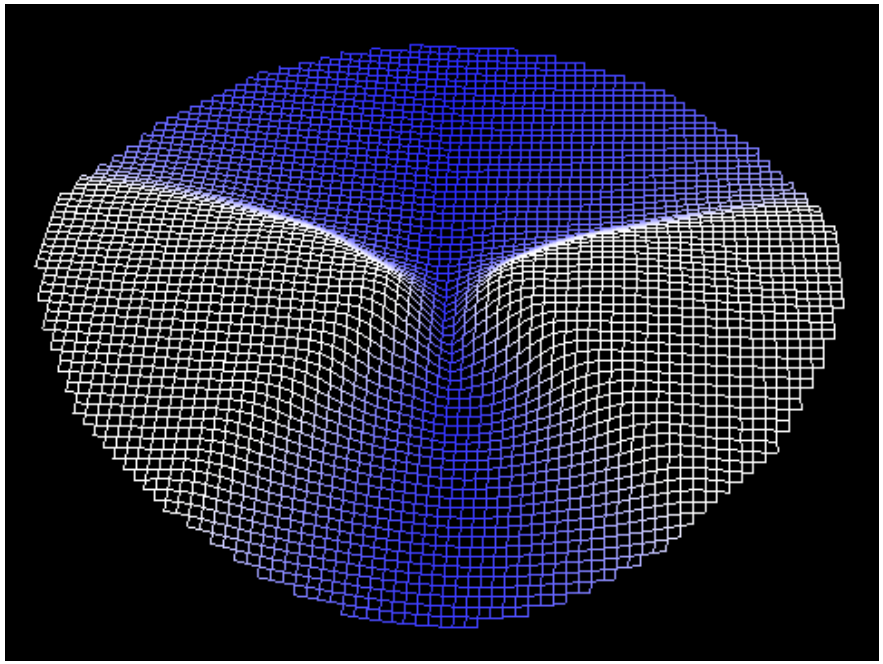
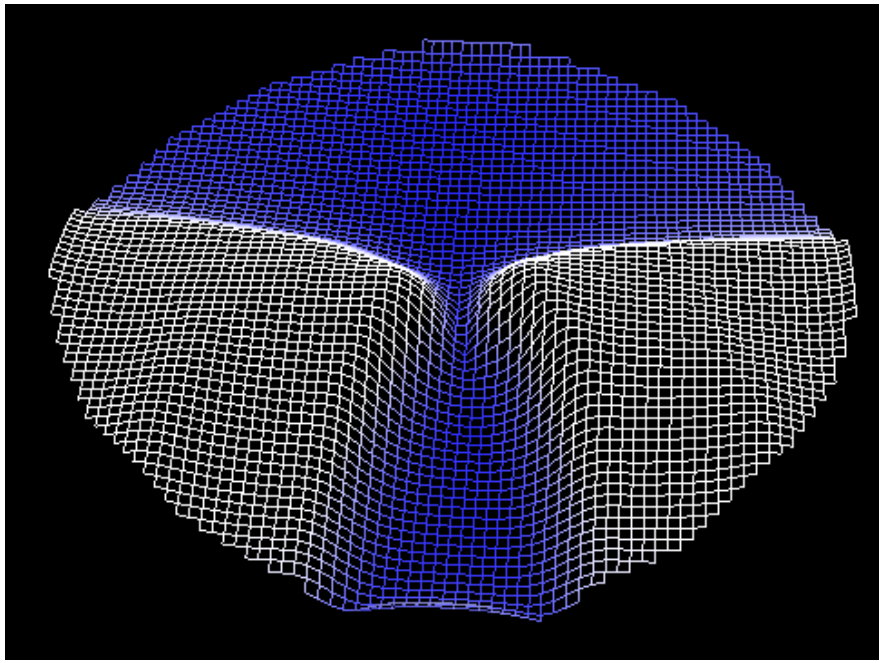
DIN 10-10-80

Conventional Freeform





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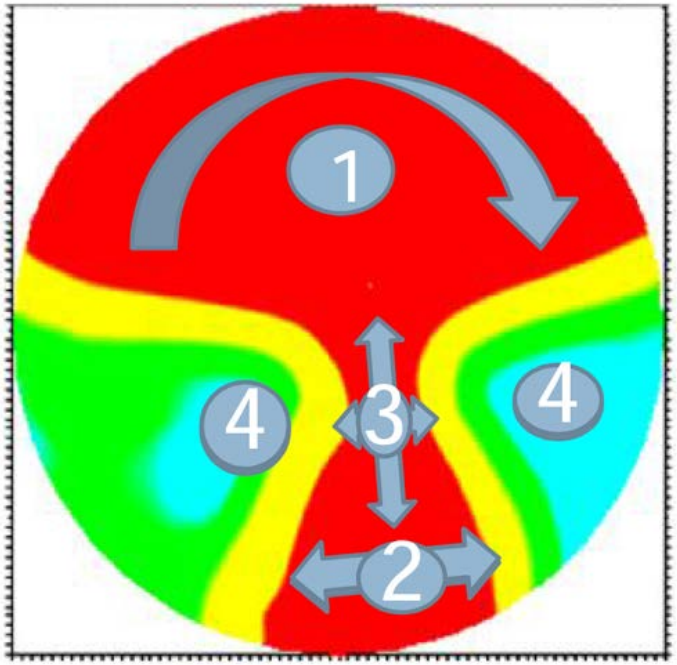
DIN: 10-10-80	64mm **- 5%**	8mm **+ 60%**	30mm **+ 60%**	40mm **+ 90%**
CONVENTIONAL COMPARISON	66mm	5mm	19mm	21mm

A.F.S. PROCESS

Atoric Front Surface (A.F.S.) freeform combined with the back surface freeform creates a lens with minimum distortion.

Limitation of Back Side Technology



Although Back Side PALs gains improvement over Conventional PALs:

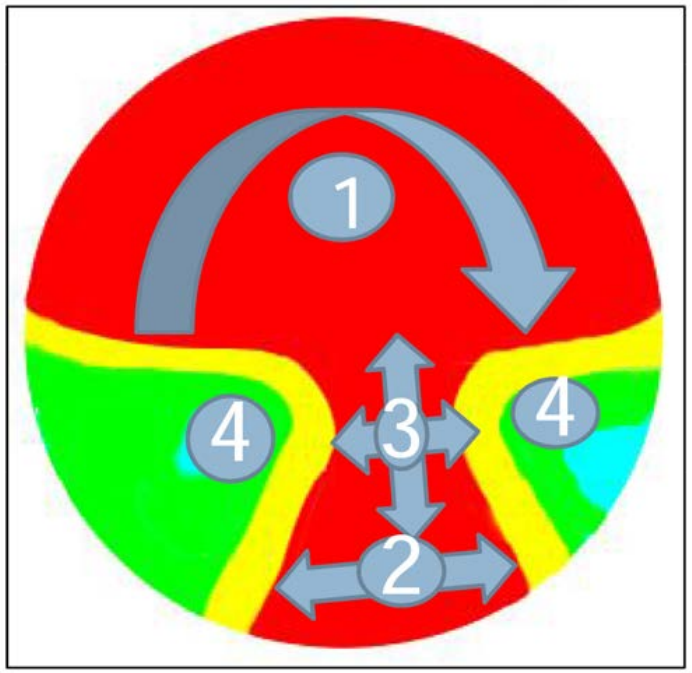
- Widen usable zones up to 20-30%
- Reduce side distortions 20-30%

Optimization still under limitation of certain value of 1 +2 + 3 + 4

1 = width of far zone
2 = width of near zone
3 = width of intermediate zone
4 = degree of side distortions

There is a trade off between 4 parameters
- increase 1: decrease 2 – 3(x-axis), increase 4
- increase 2: decrease 1 – 3(x-axis), increase 4
- increase 3(x-axis): decrease 1 – 2, increase 4
- decrease 4: decrease 1 – 2 – 3(x-axis), increase 3(y-axis).

Re-design new optimization for back side PALs



Re-designed & Re-optimized BS PALs, objective :

- to widen 1 Far zone 30% more
- to widen 2 Near zone 30% more
- to widen 3 Mid zone 30% more
- to reduce side distortions 30% less

New optimization by using Multiple of Front Free Form to the Back side Free Form

1 = width of far zone
2 = width of near zone
3 = width of intermediate zone
4 = degree of side distortions

New Front Free Form surface create new Optimization where as:

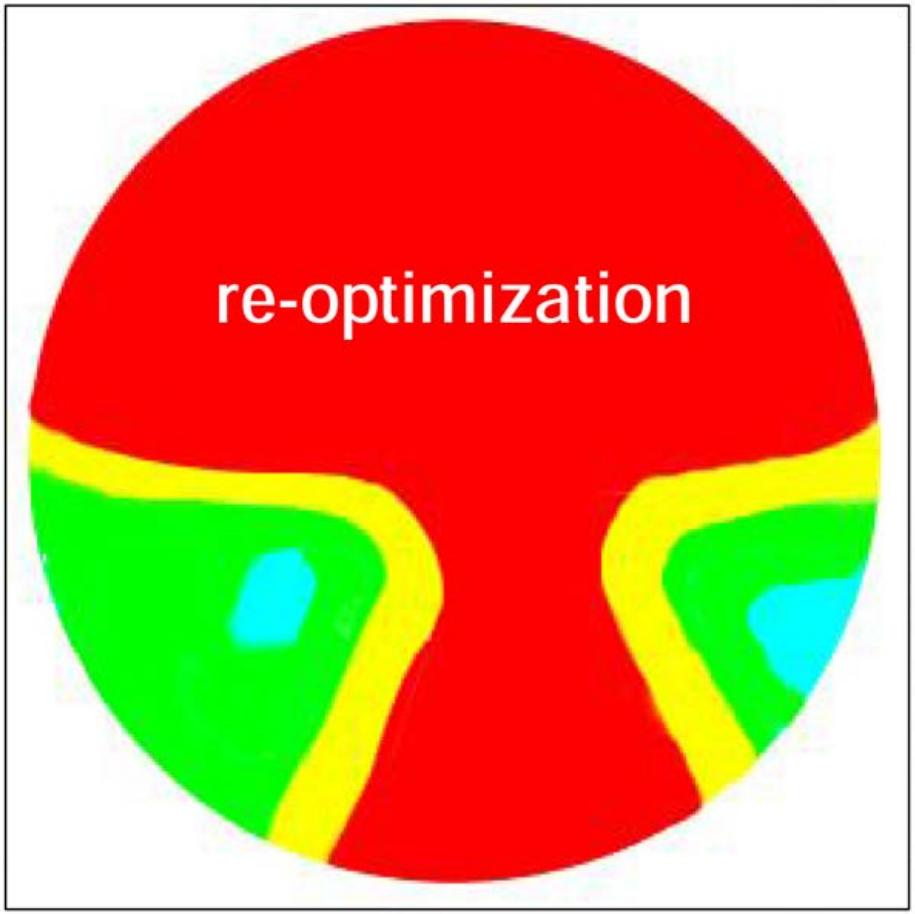
- increase 1: by 30%
- increase 2: by 30%
- increase 3: (x – axis) 30%, (y-axis remain same)
- decrease 4: 30%

Concept of Front Freeform surface design

With a new Front Freeform surface

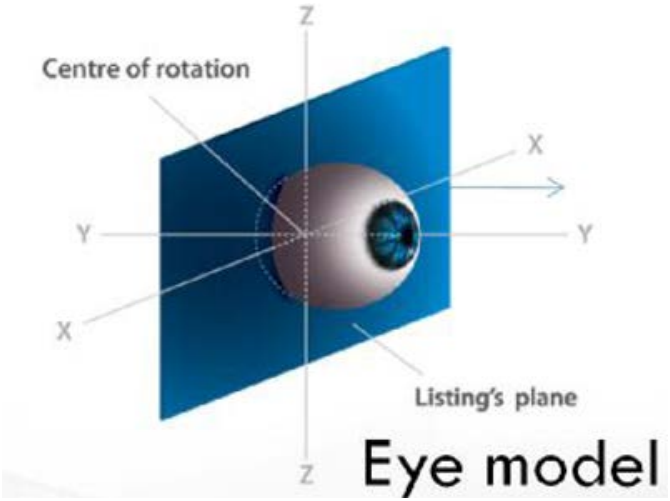
A Re-optimized Back side PALs.

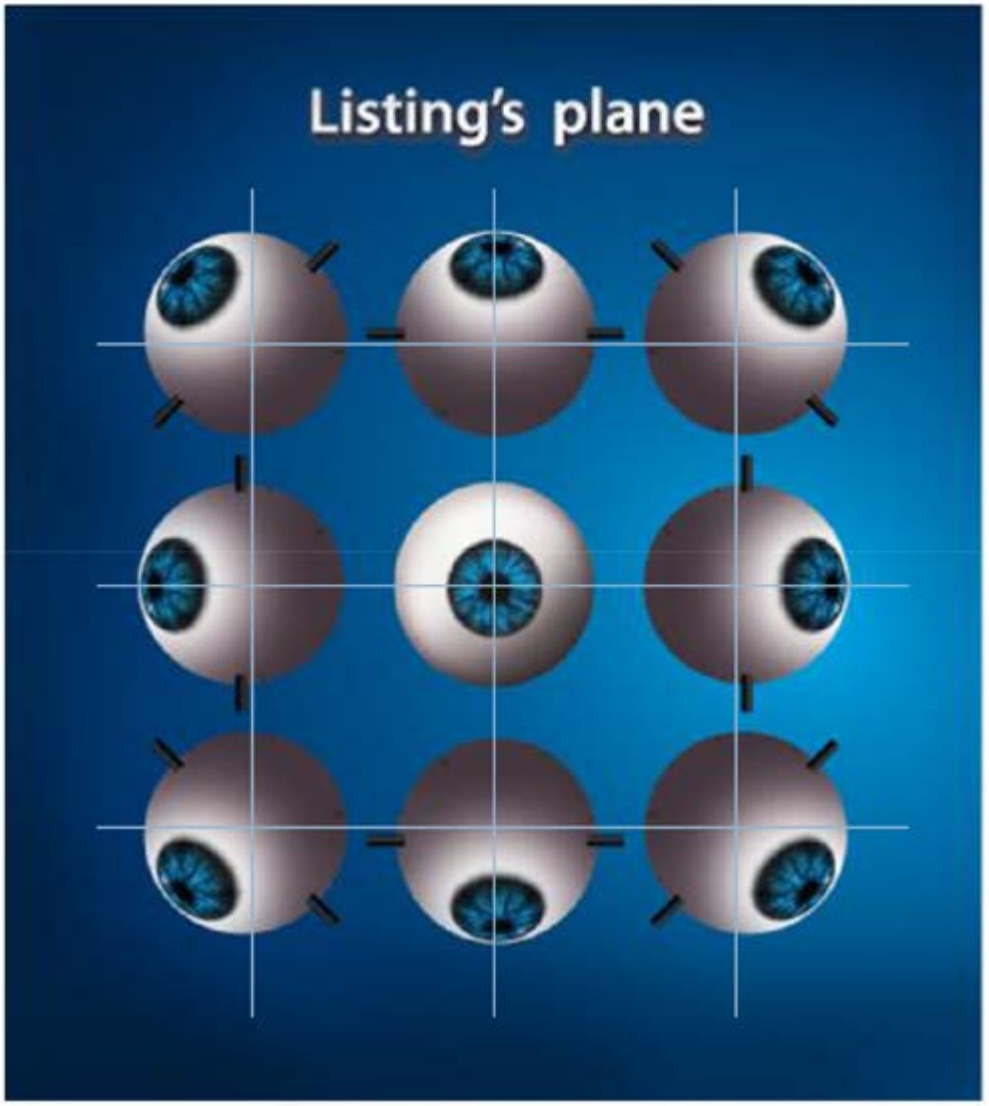
Find an appropriated model of Front FF



Concept of Front Freeform surface design

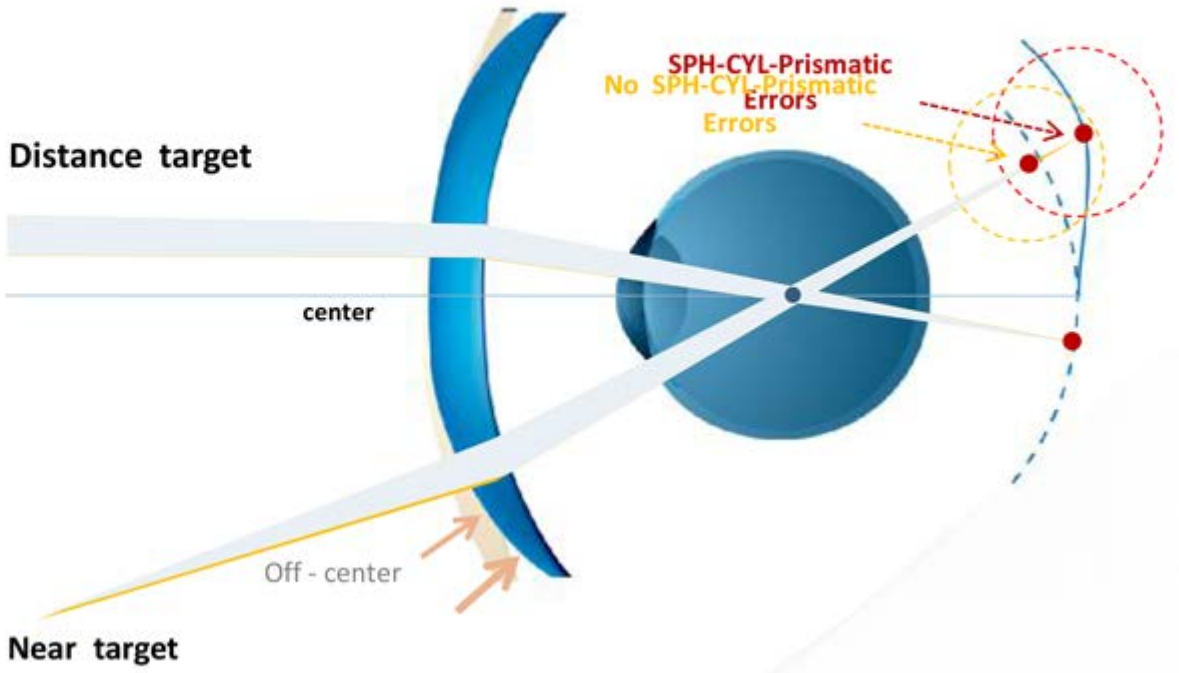
New front Freeform surface must help reducing oblique aberrations created from eye rotation model over all view zones.





Oblique abberations - Optimisation

Side View

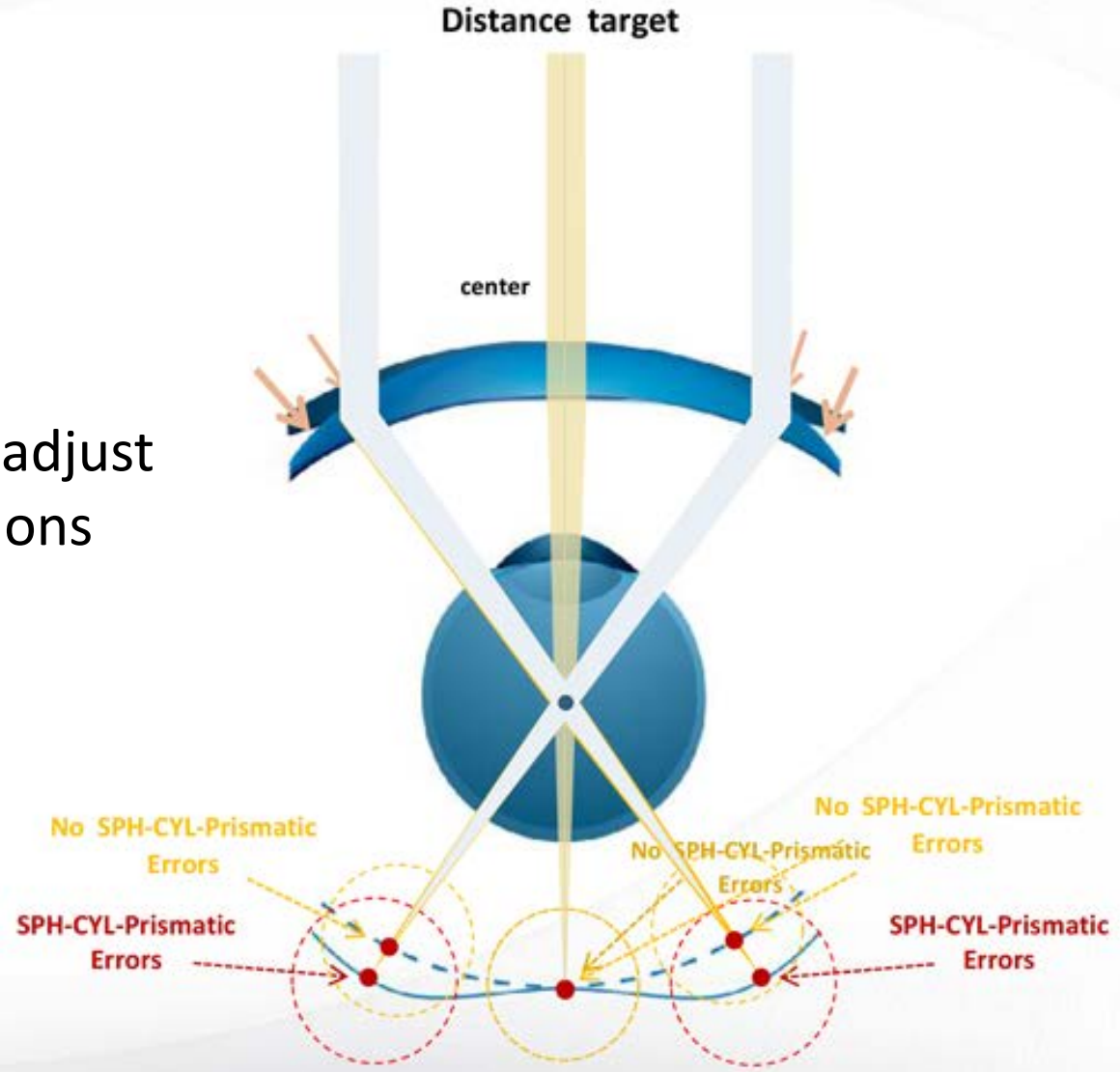


Solution : curve design adjust to suit eye model rotations

Oblique abberations - Optimisation

Top View

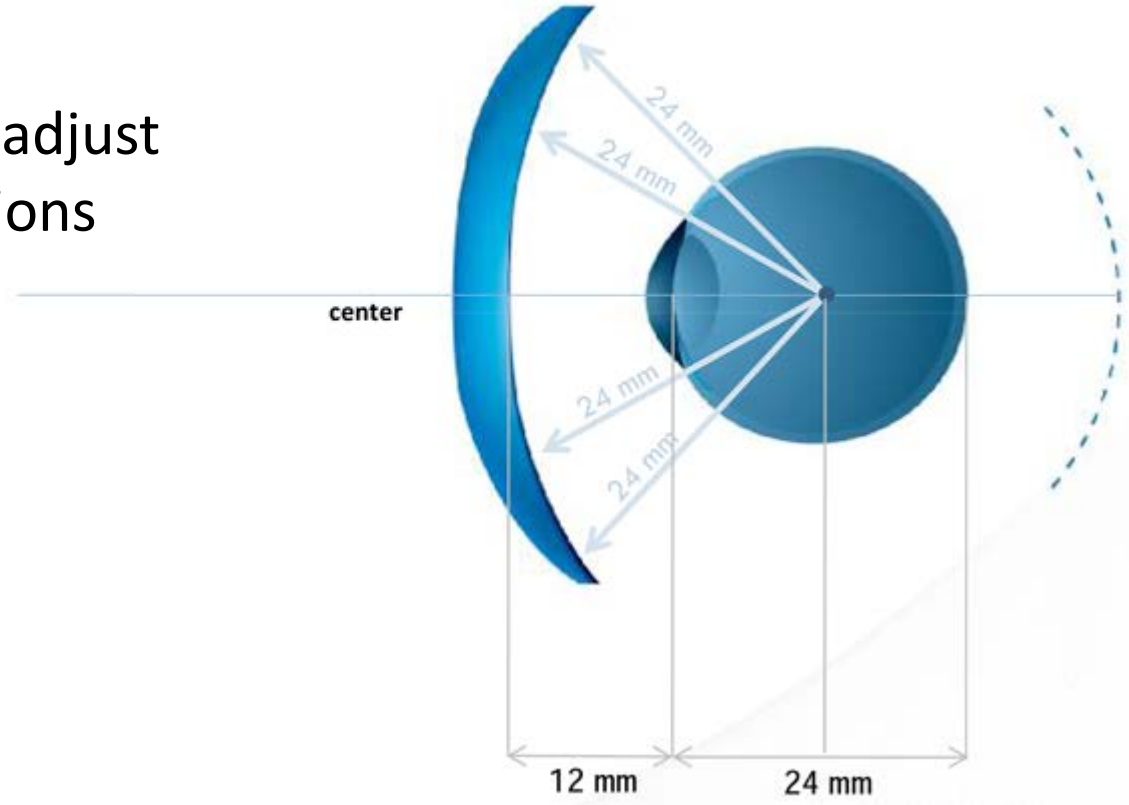
Solution : curve design adjust to suit eye model rotations



Oblique abberations - Optimisation

Side View

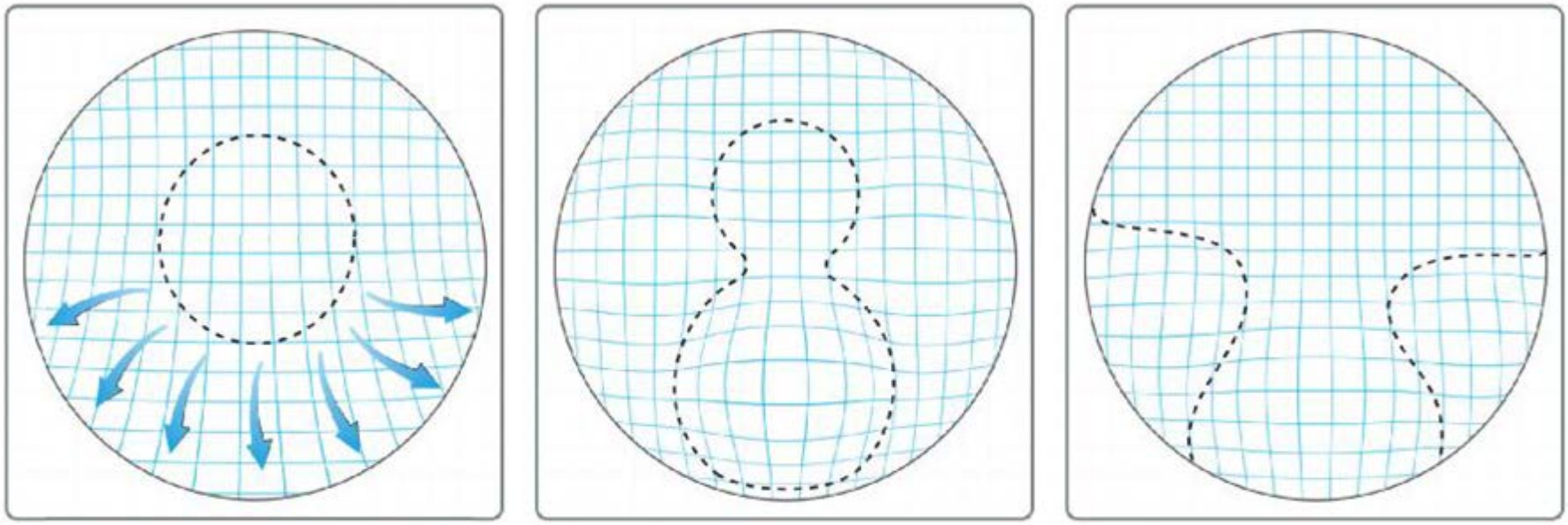
Solution : curve design adjust to suit eye model rotations



A consideration of human eye dimensions

Concept of Re-designed A.F.S.

Multiple Freeform digital surfaces PALs



Front Surface :
Atoric Progression

+

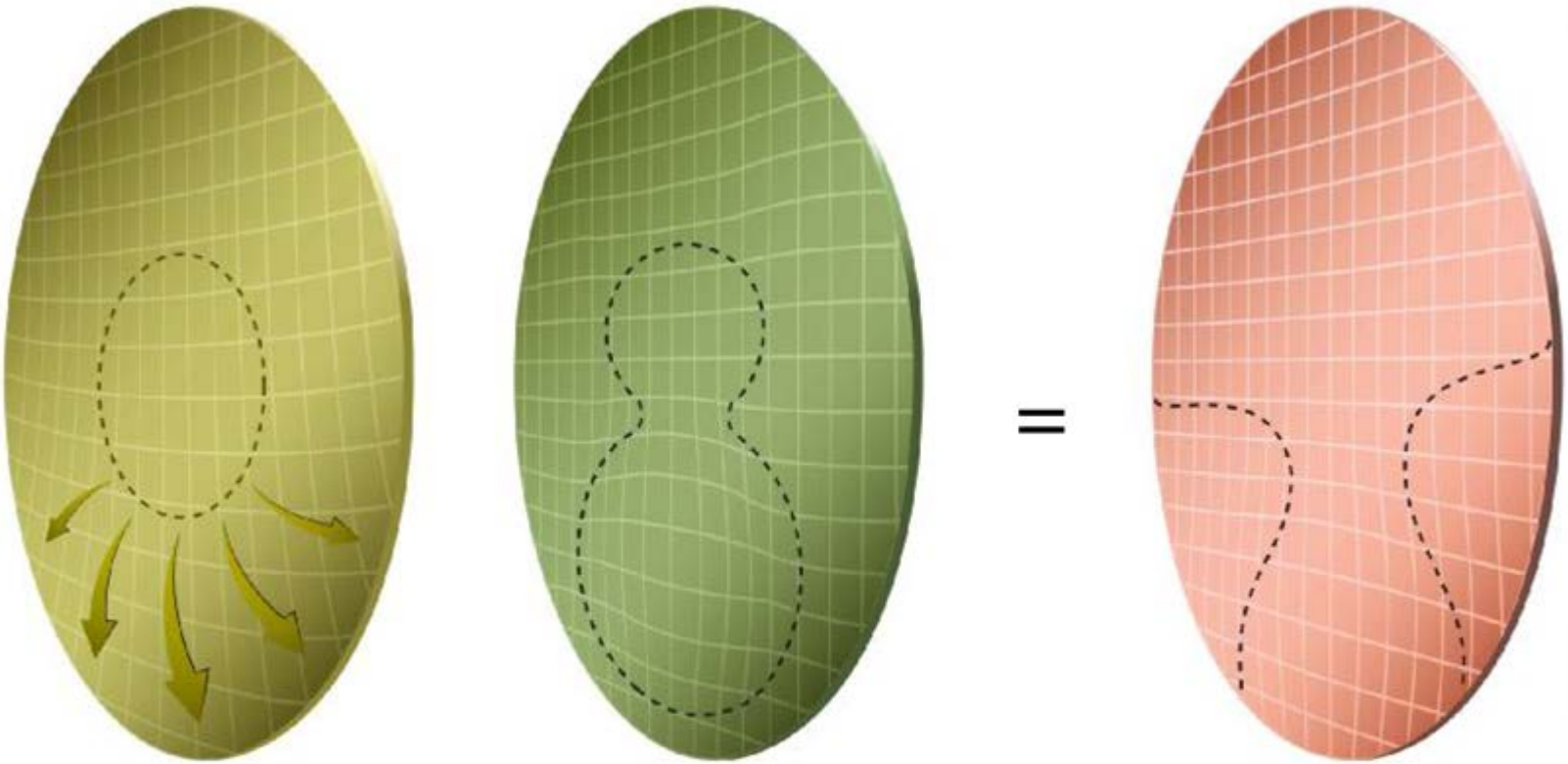
Back Surface :
Soft Progressive

=

Final Result

Concept of Re-designed A.F.S.

Multiple Freeform digital surfaces PALs



Front Surface :
Atoric Progression

Back Surface :
Soft Progressive

Result : PALs
Targeted :
Zones widen 30%
Distortions down 30%

Result from the test wear: Near Zone

9 wearers out of 10, felt significant improvement

1 wearer, felt some improvement

0 wearer, felt no improvement

Conventional FF backside

A.F.S.

Near Vision Zone

Result from the test wear: Mid Zone

8 wearers out of 10, felt significant improvement

2 wearers, felt significant improvement (after 2 days trial)

0 wearer, felt no improvement

Conventional FF backside

A.F.S.

Mid Vision Zone

Result from the test wear:
Improvement of side distortions

Conventional FF backside

Improvement of distortions: Far Vision Zone

Result from the test wear:
Improvement of side distortions

A.F.S.

Improvement of distortions: Far Vision Zone