Introduction

Perimeter HPP-850

Introduction to Perimetry

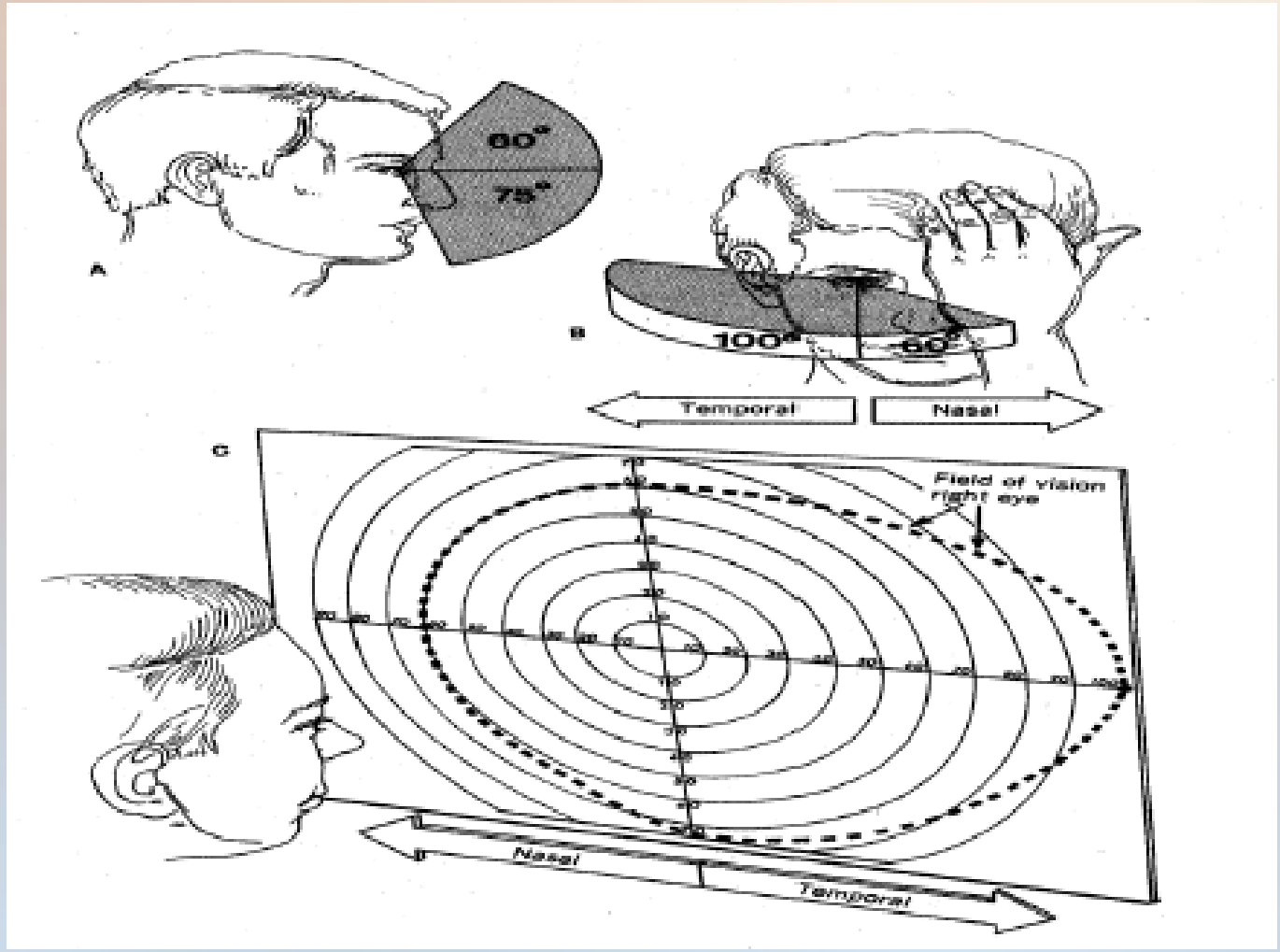
What is Visual Field?

What is Perimeter?

What are we analyzing?

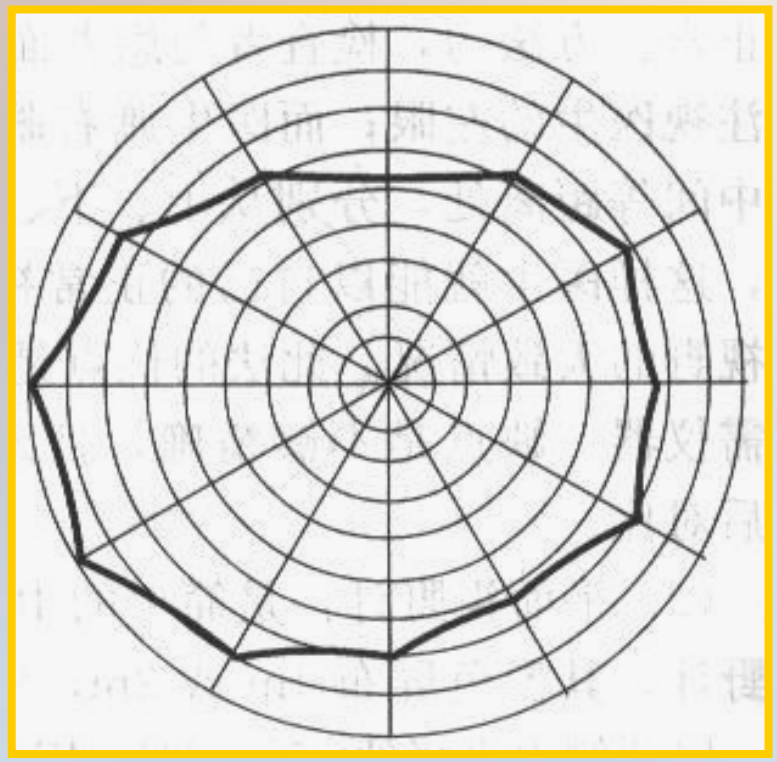
What is Visual Field?

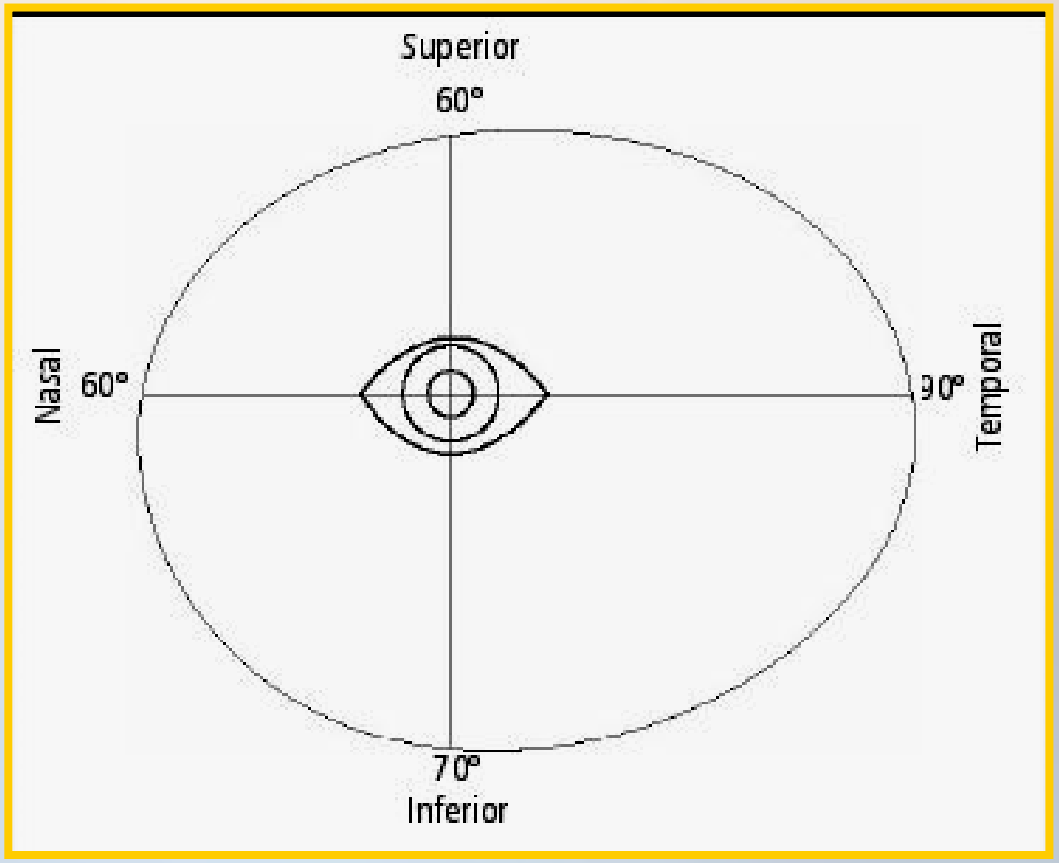
Visual field is Stare at the front fixedly, and the range of space seen is called the visual field.



Normal visual

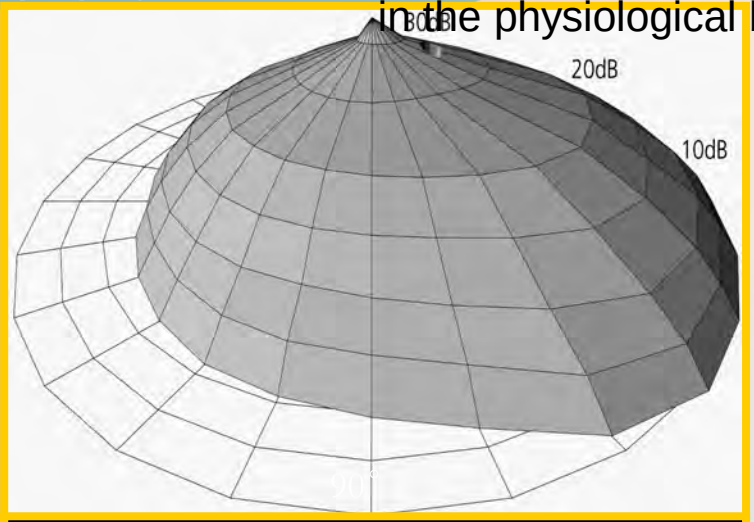
Normal eye:Superior :54°， inferior 74°， nasal 65°， temporal 91°

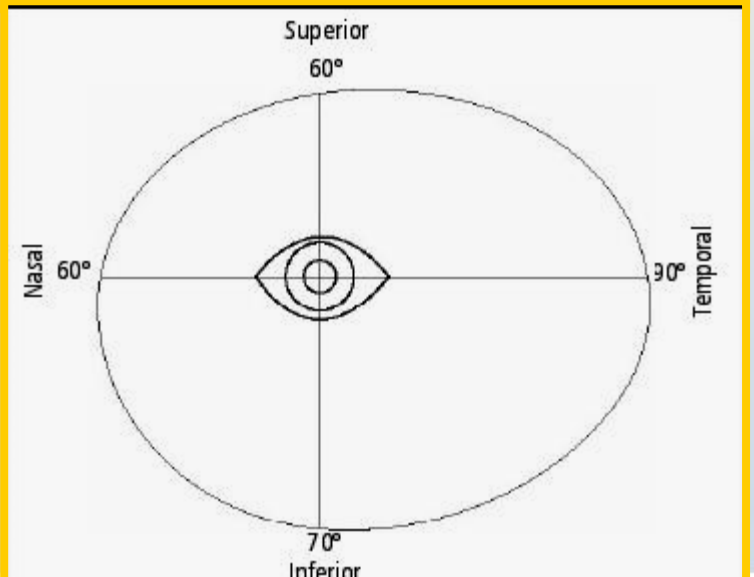


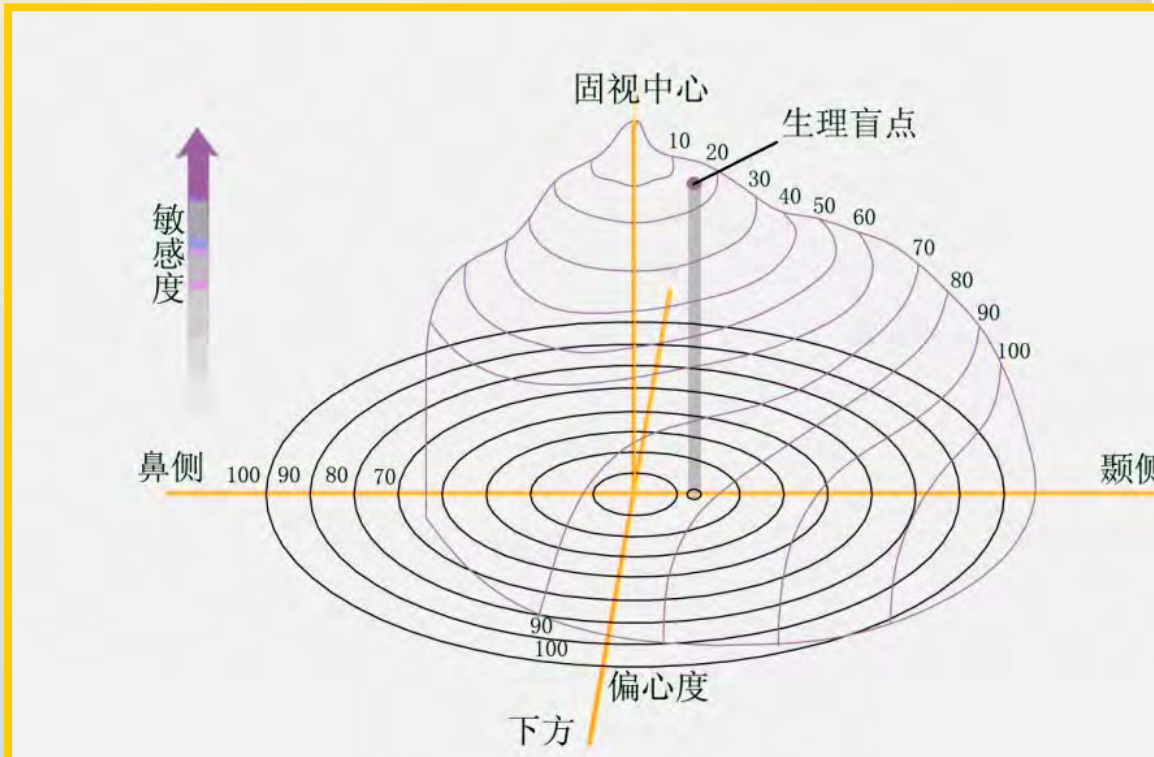


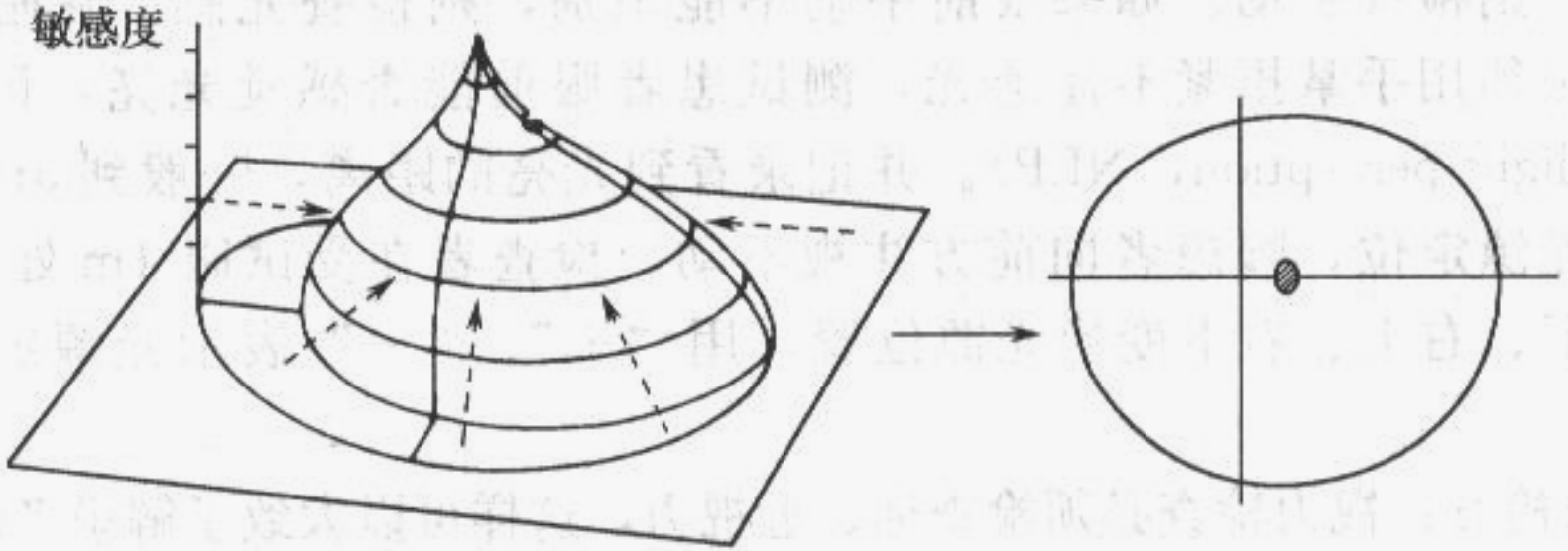
Island of Vision

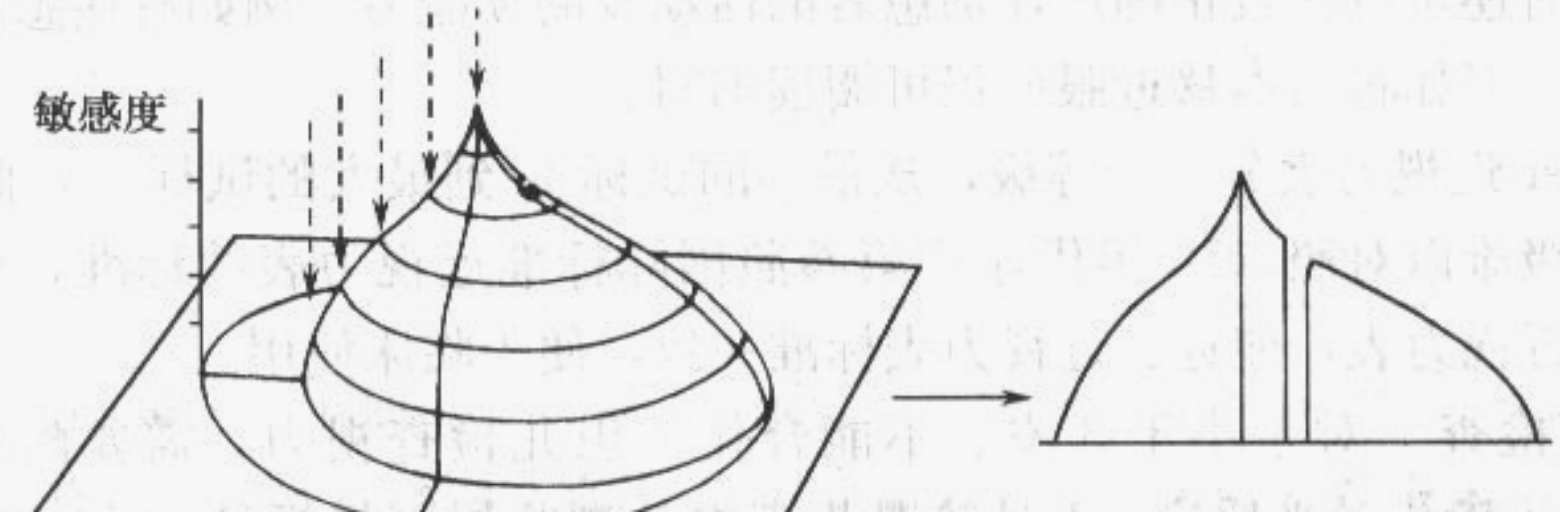
The visual field can be depicted as an island in three dimensions, area represents the area of view,the altitude represents light sensitivity. The sensitivity of normal visual field was highest in the central fixation(macula), decreased gradually with the increase of eccentricity (peripheral part),and lowest in the physiological blind spot(papilla)








敏感度


敏感度

Defect of visual field

1. Growth of age
2. Cloudy refractive medium
3. Near vision
4. Syptomatic visual field defect
5. Maculopathy
6. Optic nerve disease
7. **Glaucoma**

Glaucoma

Definition:

A group of diseases characterized by a progressive loss of retinal ganglion cells manifested by optic nerve damage and recognizable pattern of visual field(VF) loss.

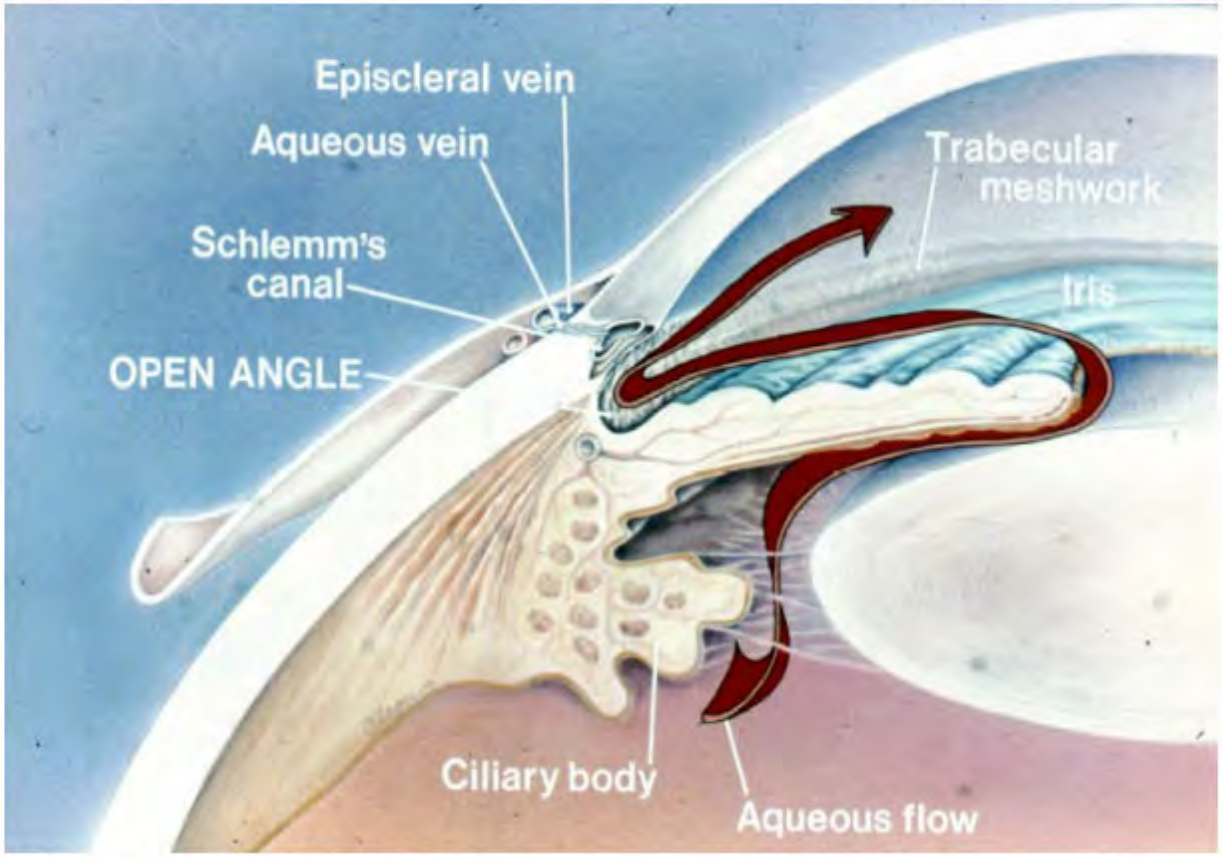
The second leading cause of blindness.

The processe f visual field defect is irreversible.

Visual field defect is the gold standard to identify glaucoma,regular review is very important.

Open Angle Glaucoma

Resistance to aqueous outflow causes increased intraocular pressure (IOP)



Risk Factors

High IOP

Age

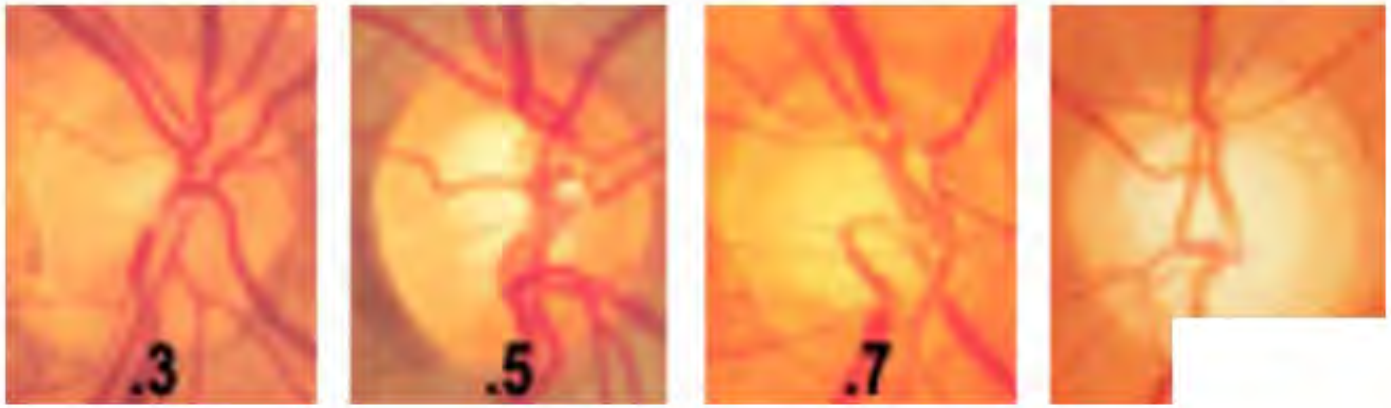
Race

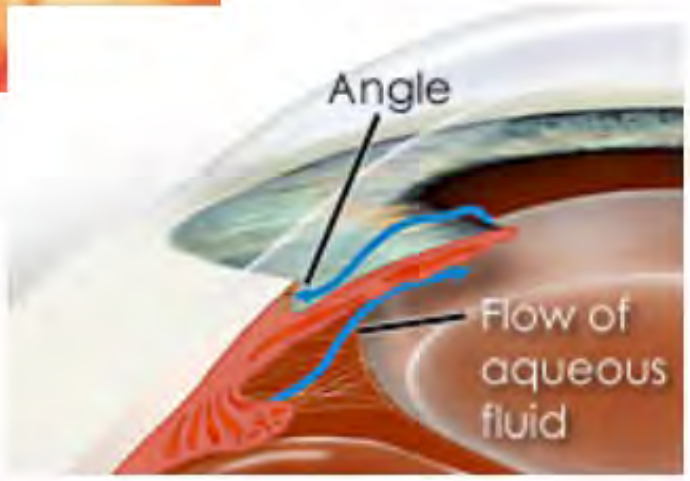
Family History

Diabetes

Myopia

Glaucoma





In general, Glaucoma occurs as a result of increased intraocular pressure (IOP) caused by a malformation or malfunction of the eyes drainage system.

Normal IOP is 10 – 21 mm of mercury.

The increased pressure causes compression of the retina and the optic nerve, and causes progressive, PERMANENT loss of eyesight if left untreated.

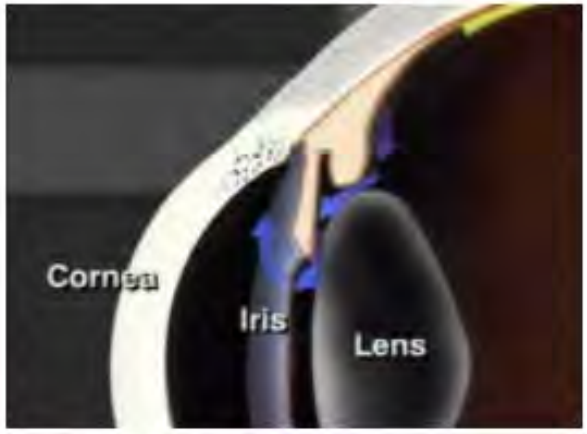
Glaucoma types

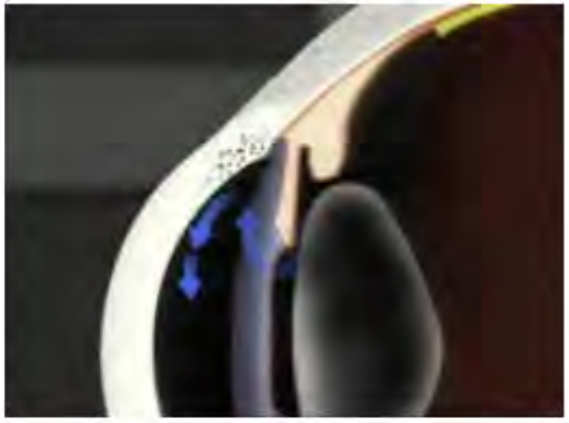
Glaucoma can be classified into several different and unique types:

- Primary Open Angle Glaucoma (POAG)
- Narrow Angle Glaucoma
- Angle – closure Glaucoma (Acute Glaucoma)
- Congenital Glaucoma
- Secondary Glaucoma
- Normal – tension Glaucoma (NTG)

Glaucoma

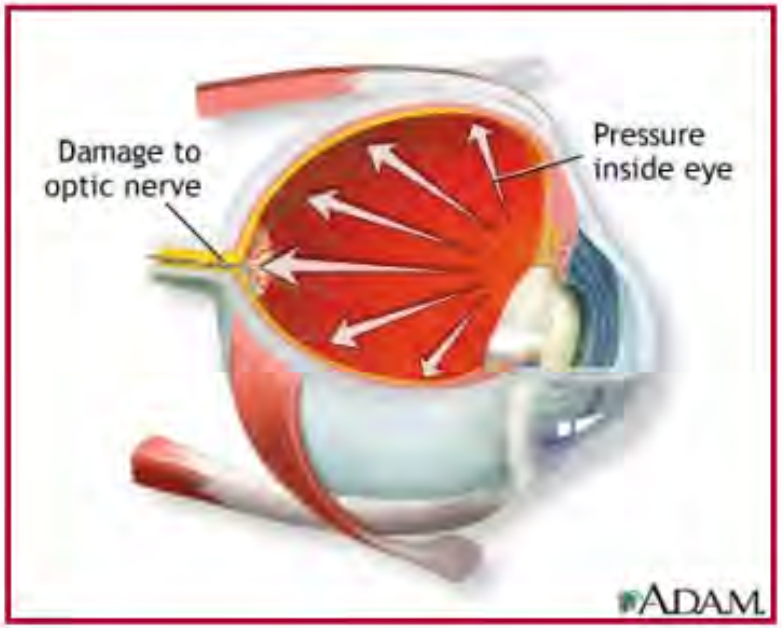
Primary Open Angle Glaucoma is caused when the normal drainage system of the eye becomes partially blocked, causing pressure to build within the eye.





Glaucoma

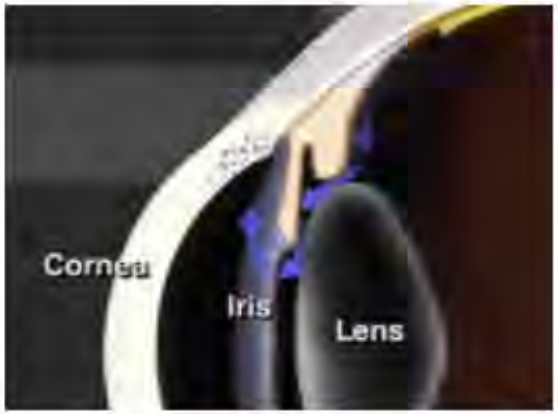
Glaucoma usually affects the perimetry vision first, with sight gradually being lost towards the center of the eye.



Vision loss with Glaucoma

Glaucoma

Angle Closure Glaucoma (Narrow Angle Glaucoma) is caused when the normal drainage system of the eye becomes suddenly blocked, causing pressure to build within the eye at a very rapid rate. Complete blindness can occur in as little as 3 to 5 days!



Normal Eye

Sudden blockage causes pressure to build rapidly.

Glaucoma

Congenital Glaucoma results as a condition from birth. Children are born with conditions such as an abnormal Anterior Chamber angles which prohibit the normal drainage of fluid from the eyes.

This then causes an increase in the pressure within the eye, and results in Retinal and Optic Disc damage.

Glaucoma

Parents normally are the first to recognize the symptoms of Congenital Glaucoma:

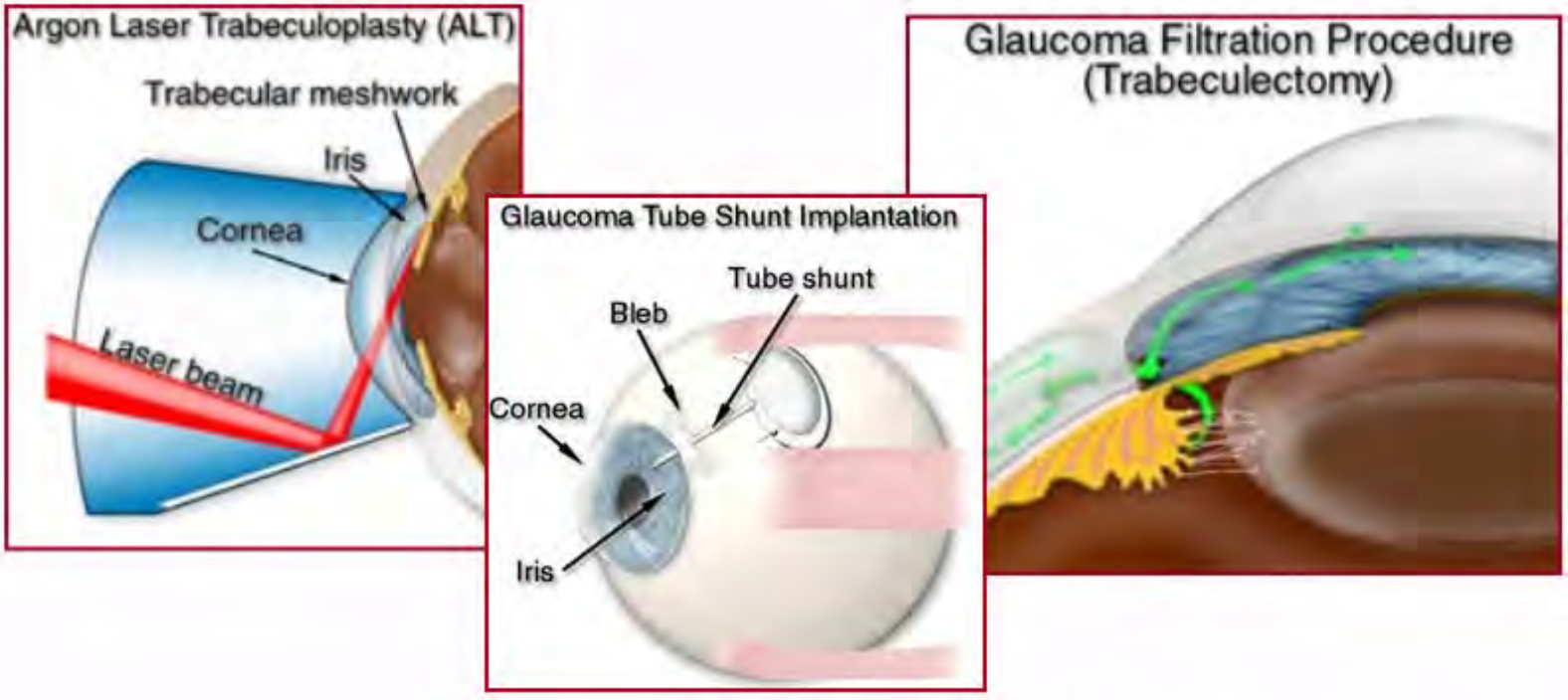
Cloudiness of the cornea due to Edema

Distension of the eye

Photophobia (sensitive to light)

Glaucoma

In most cases, numerous surgeries are required to correct Congenital Glaucoma. Lasers are sometimes used, as well as Filtration Surgery and insertion of Tube shunts:



Glaucoma

Secondary Glaucoma is usually the result of a trauma to the eye, although it can develop due to several causes:

Abnormal deposits in the eye fluid

Uveitis

Lens Changes

Drugs

Hemorrhage

Glaucoma

Pigmentary Glaucoma can develop as a result of small pieces of the Iris breaking off. These small particles can lodge themselves in the normal drainage canals and subsequently interfere with the normal drainage of fluids from the eye.

Glaucoma

Normal Tension Glaucoma occurs when there is damage to the Optic nerve detected in patients who do not have high IOP.

Normal Tension Glaucoma has the same characteristics as Primary Open – Angle Glaucoma.

Glaucoma Diagnosis

Tonometry is often used as a diagnostic tool. The Tonometer is gently pressed against the eyeball, and the resistance (internal pressure) is measured. This requires that the eye be numbed prior to the test.

Puff tonometry utilizes a puff of air with a detector measuring the feedback from the cornea.

Puff tonometry is also available in some automatic refractors.

Glaucoma Diagnosis

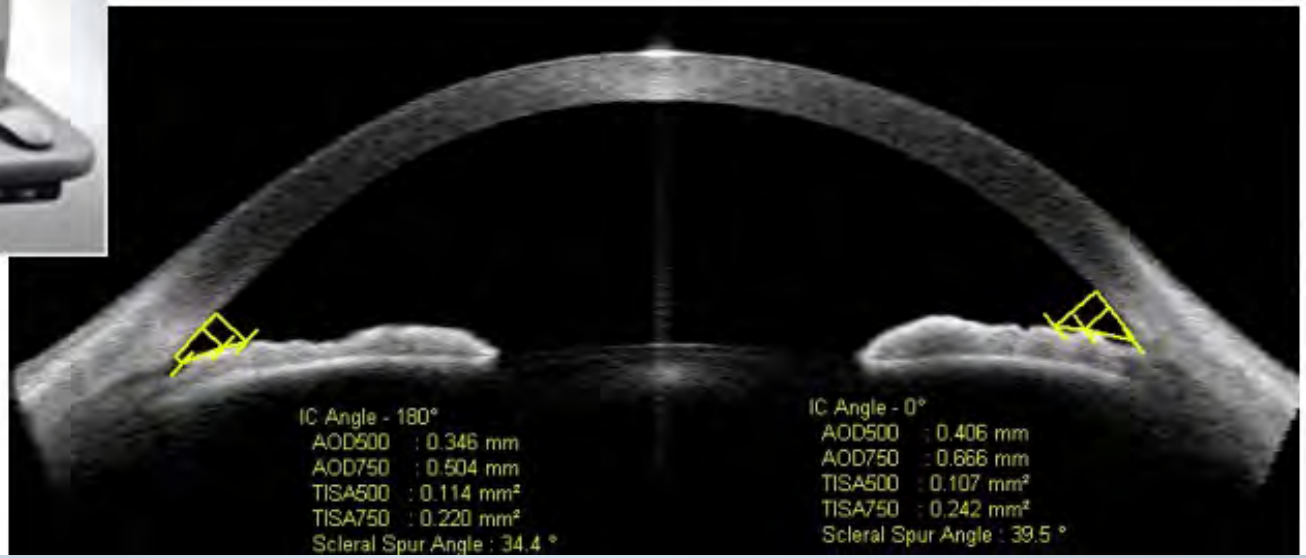
Perimeter is an essential method used to determine if there is any loss of the visual field

Glaucoma Diagnosis

Slit Lamp Examination is another method of diagnosis of patients with suspected Glaucoma.

Glaucoma Diagnosis

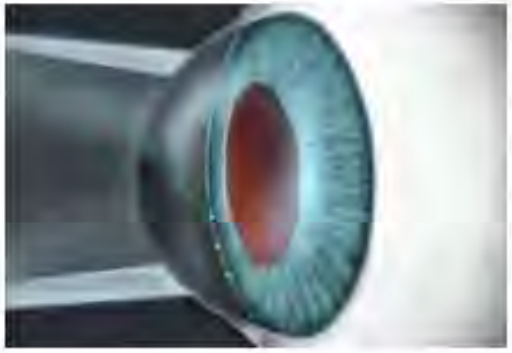
Angle Measurements can be performed with the Visante OCT.



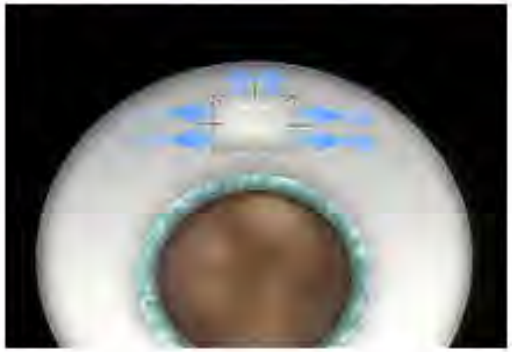
Glaucoma Treatment

- Medication
- Laser Surgery
- Filtration Surgery

Medications are available in several forms.



Laser surgery can reduce the need for medications

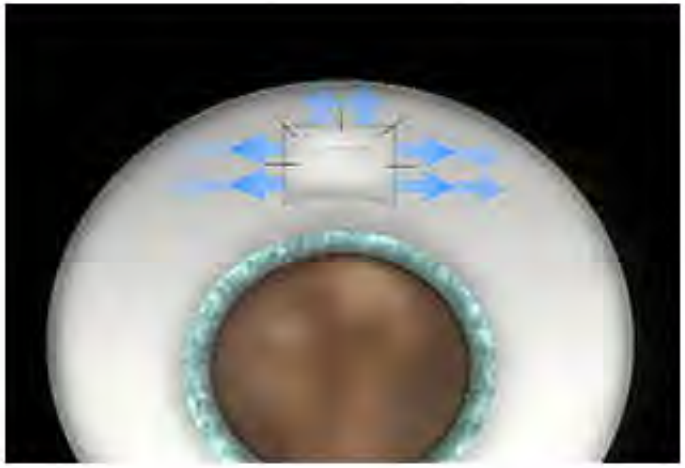


Filtration Surgery creates a new drainage channel

Glaucoma Treatment

- Laser Iridotomy
- Filtration Surgery

In Laser Iridotomy, a small hole is cut in the Iris



Filtration Surgery creates a new drainage channel

Perimeter History

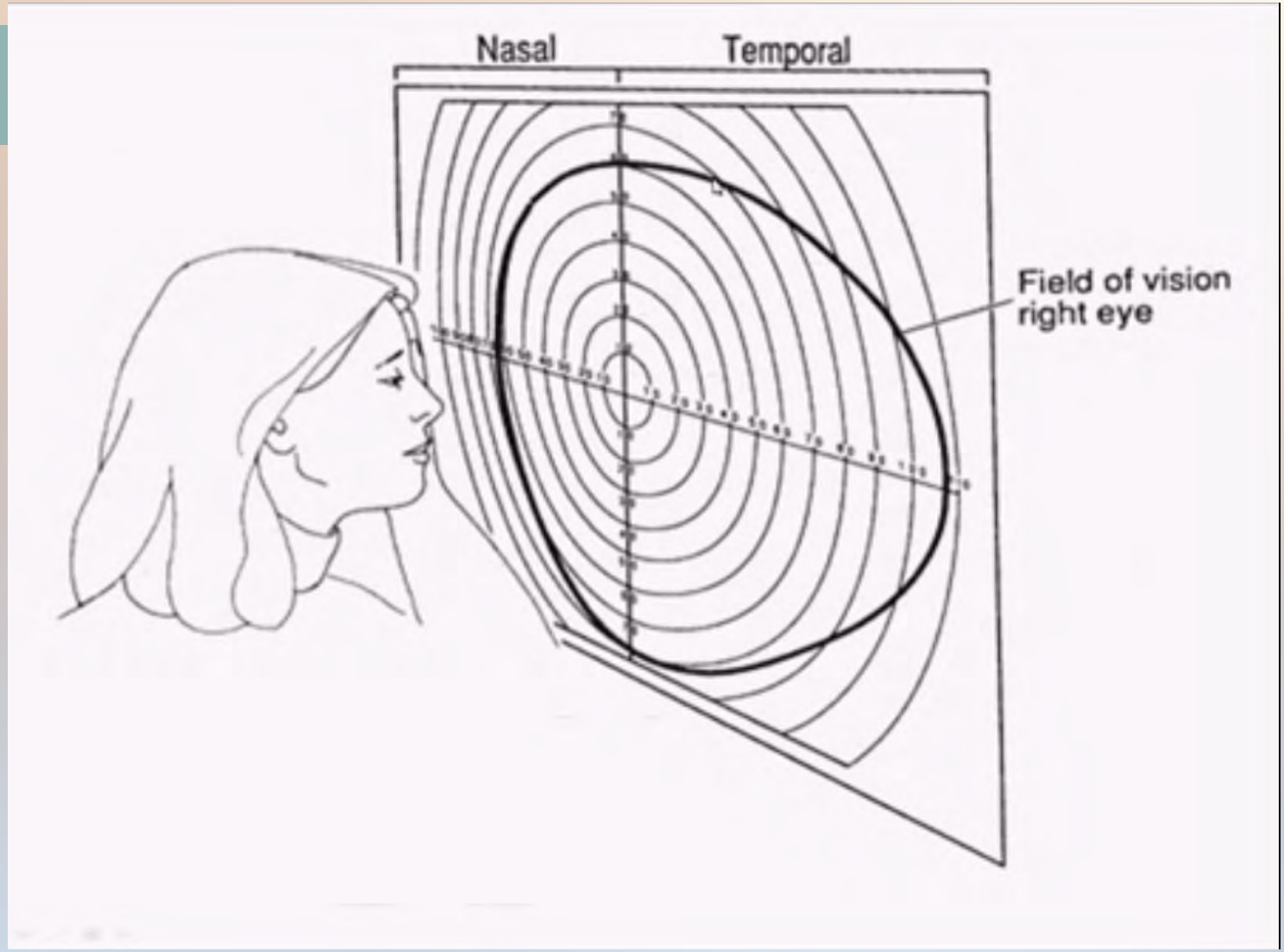
B.C.400, Hippocrates, proposed - hemianopia - visual field and visual field defects.

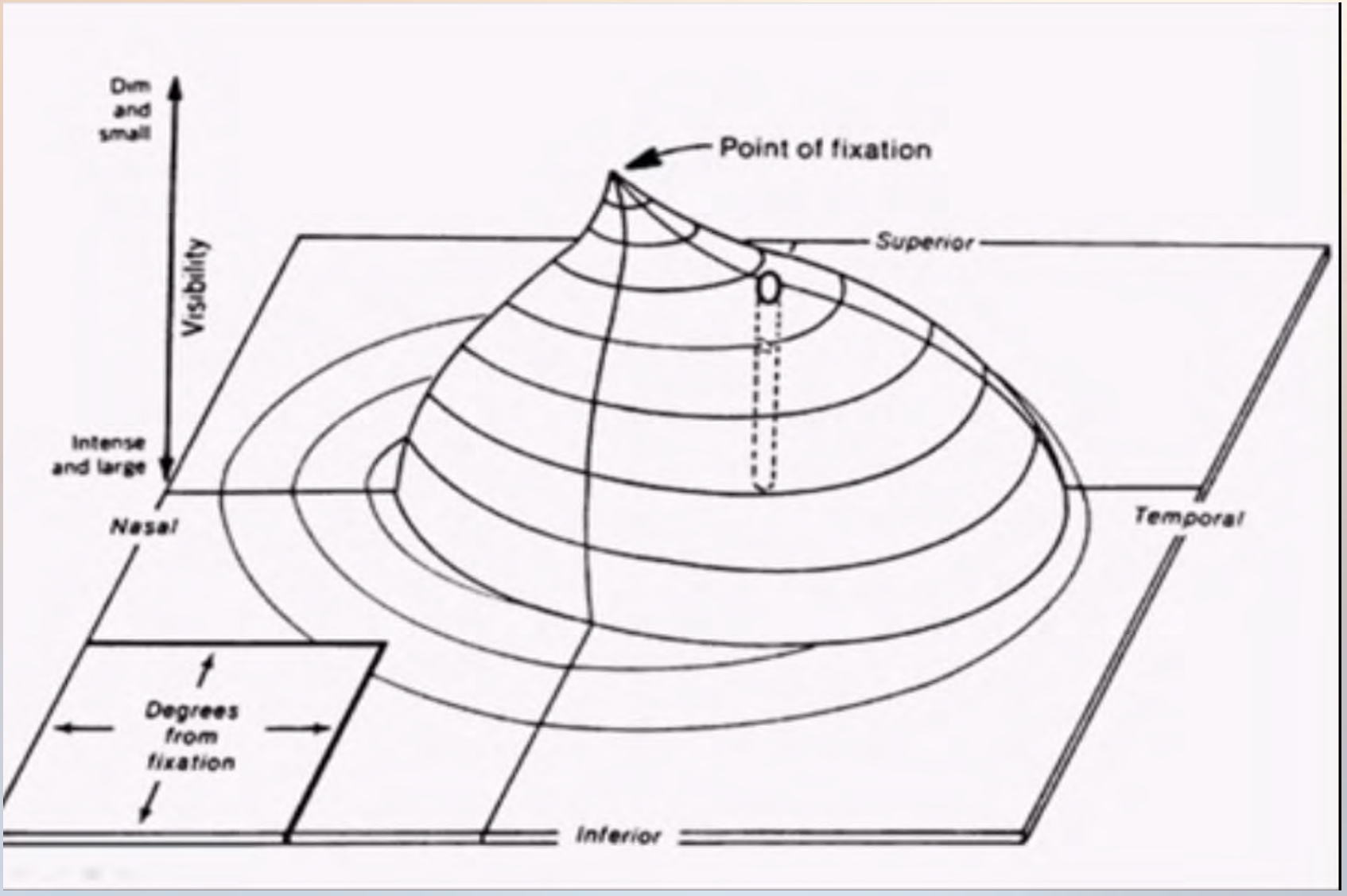
In the mid-19th century, von Graefe's planar perimeter and Aubert's bowed field of vision introduced visual field examinations into the clinic.

Beginning in 1945, with the Goldmann hemispherical field of view as the representative, a variety of perimeter appeared, established a strict background light and stimulating light brightness standards, providing a standard for visual field examination, widely used in glaucoma, retina, central Analysis of neurological diseases.

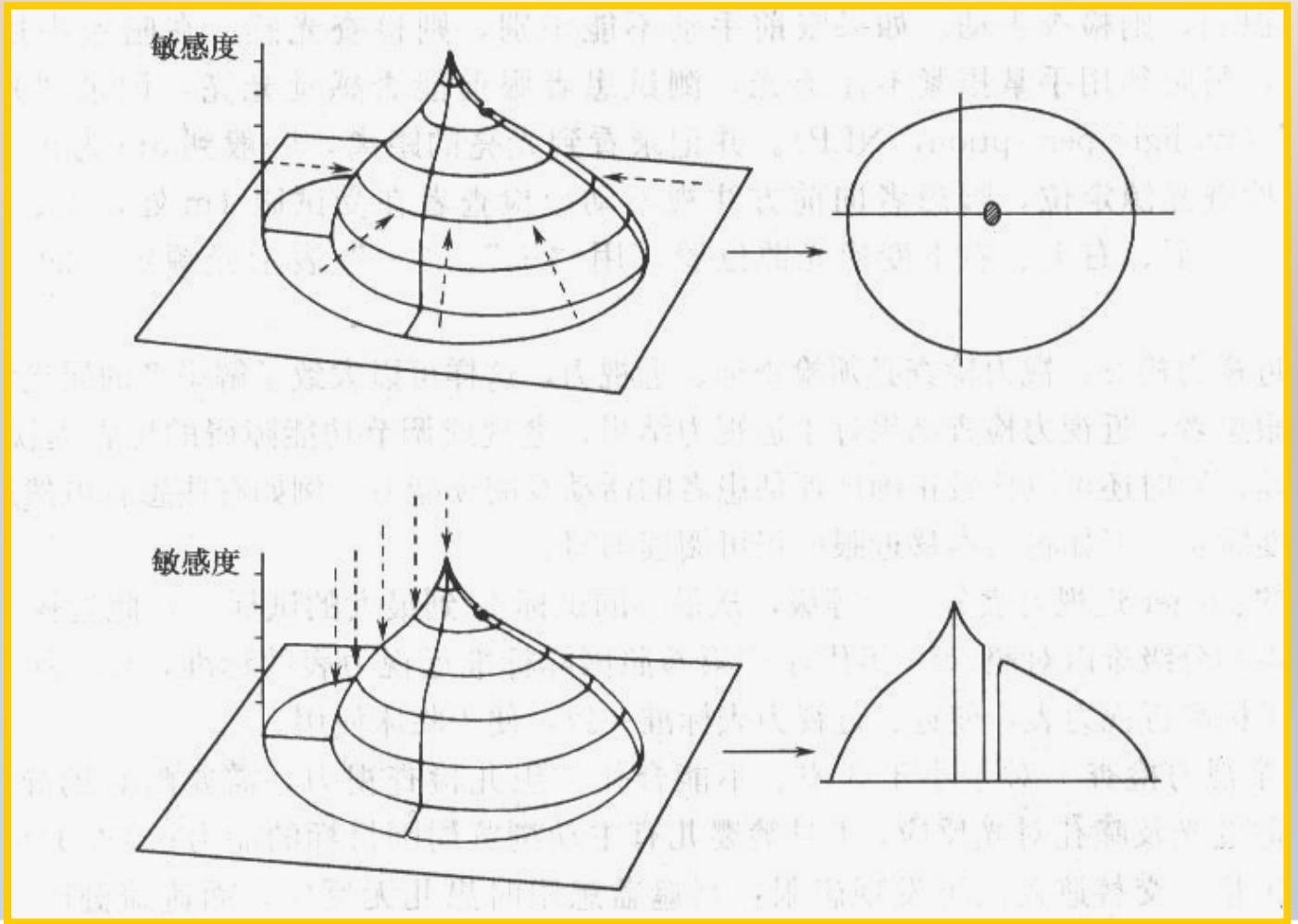
Since the 1970s, computer automatic vision meters have come out, entering the static quantitative field of view of computer control.

Perimeter history


Nasal
Temporal
Field of vision
right eye


Dim and small
Visibility
Intense and large
Point of fixation
Superior
Nasal
Temporal
Degrees from fixation
Inferior

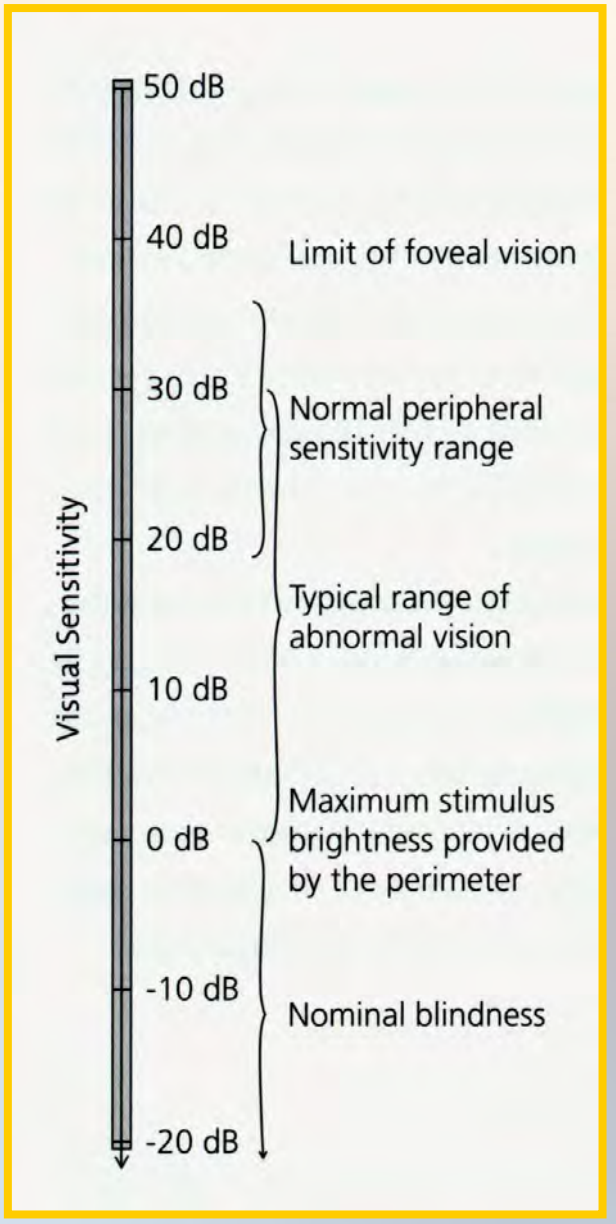
Kinetic perimetry is for testing visual field.
Static perimetry is for testing visual acuity.



The maximum sensitivity of a healthy young person is slightly below 40 dB, while the normal sensitivity in the center 30° field of view is between 20 and 40 dB.

If there is a visual field defect, the sensitivity will be greatly reduced.

Retinal visual acuity is highest in the fovea of the macula, and the farther away from it, the lower the sensitivity.



Visual Field Test

A visual field test is an eye examination that can detect dysfunction in central and peripheral vision which may be caused by various medical conditions such as glaucoma, stroke, pituitary disease, brain tumours or other neurological deficits.

Visual field testing can be performed clinically by keeping the subject's gaze fixed while presenting objects at various places within their visual field. Simple manual equipment can be used such as in the tangent screen test or the Amsler grid. When dedicated machinery is used it is called a perimeter.

Perimeter Standards

The standards of Perimetry are:

1. **Background Illumination**:31.5ASB
2. **Spot Intensity:**

is controlled by filter wheels, directly related to the bowl intensity.

3. **Spot Size**:

The size of the spot can be size I,II,III,IV,or V.

Size V spot is the largest

The default spot size is size III

4. **Spot Duration**(How long the spot is displayed):

The default time duration is 200mS (milliseconds) + or – 10mS

Duration can be changed to 500 mS for older patients.

5.**Spot Speed(**: How fast the spot moves):

This only applies to Kinetic testing

HPP-850 Standard

VS

HPP-850 Expert

Specifications

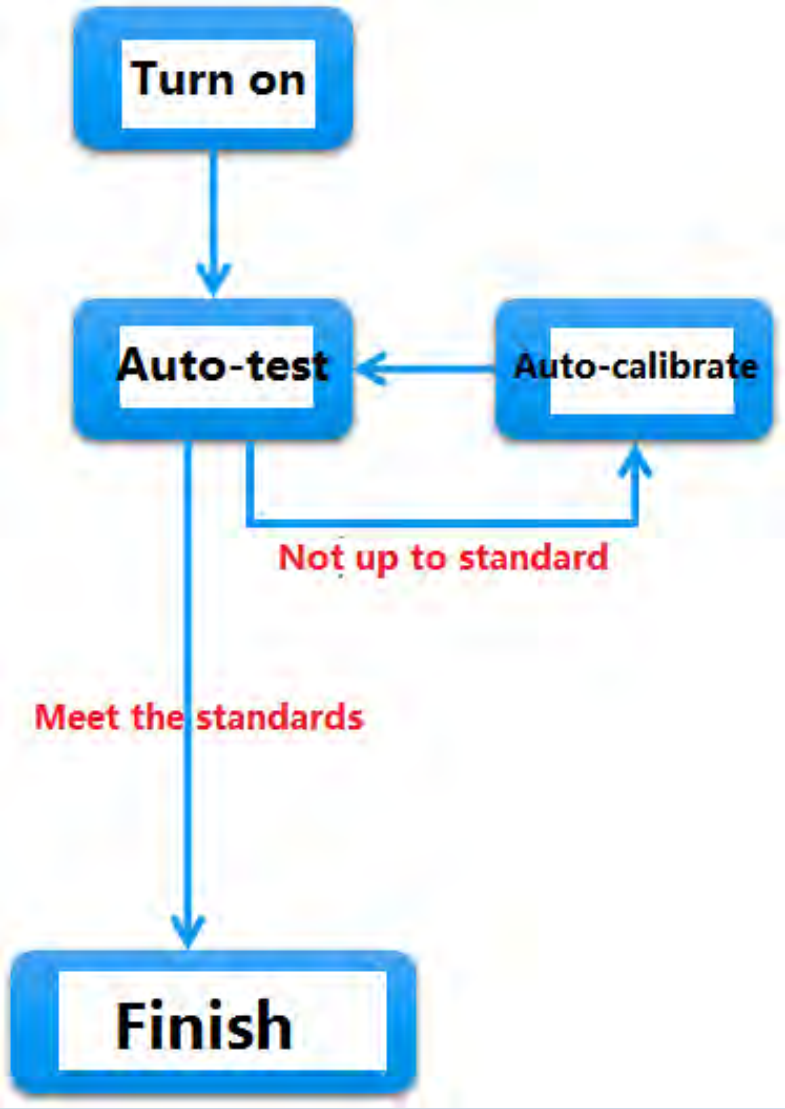
For Your Visible Future

Feature	Standard	Expert
Maximun Temporal Range	90°	
DB Value Range	0 - 51 db	
Testing Distance	300 mm	
Light Source	Halogen	
Background Illumination	White 31.5 asb	White 31.5 asb Yellow 315 asb
Specialty Test Library		
Static Test	•	•
Kinetic Test	No	•
Custom Static Test	•	•
Custom Kinetic Test	No	•
Monocular 150°Visual field (Kinetic)	•	•
Custom Field Editor	No	•
Fixation Control		
Heijl-Krakau Blind Spot Monitor	•	•
Eye Move Alarm	•	•
Video Eye Monitor	•	•
Auto-Chinrest Tracking	•	•
Head Tracking	•	•
Gaze Tracking	•	•
Gaze Curve	•	•
Stimulus		
Stimulus Duration	0.2 Sec	
Stimulus Intensity	0 - 10000 asb	
Stimulus Size	Goldmann III	Goldmann I - V
White-on-White	•	•
Blue-on-Yellow	No	•
General Testing Features		
Fovea Threshold Testing	•	•
Automatic Pupil Measurement	•	•
Operator Interface		
In-built Computer	•	•
Touch Screen Support	•	•
Keyboard & Mouse	•	•
Dimensions and Weight		
Dimensions	660*740*620mm	
Gross Weight	38kg	

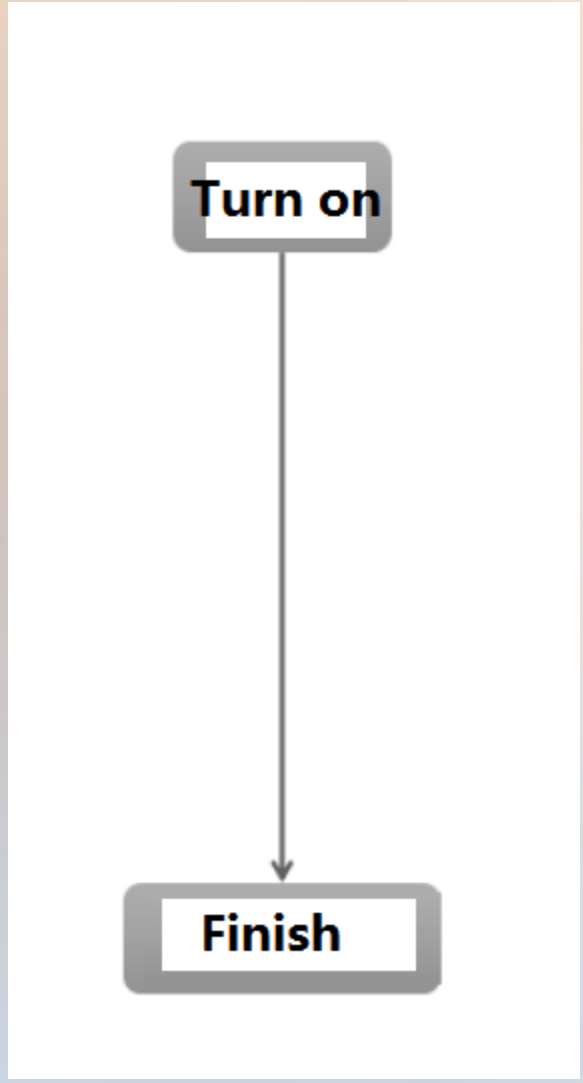
Advantadges of HPP-850

- Autotest and auto-calibration when it turns on
- Stable lightsource Halogen Lamp
- Optical progressive lens
- Optical filter lens design
- Quick and accurate test strategy
- Auto eye monitoring
- Three-Dimensional Fixation Monitor

Autotest and auto-calibration when it turns on

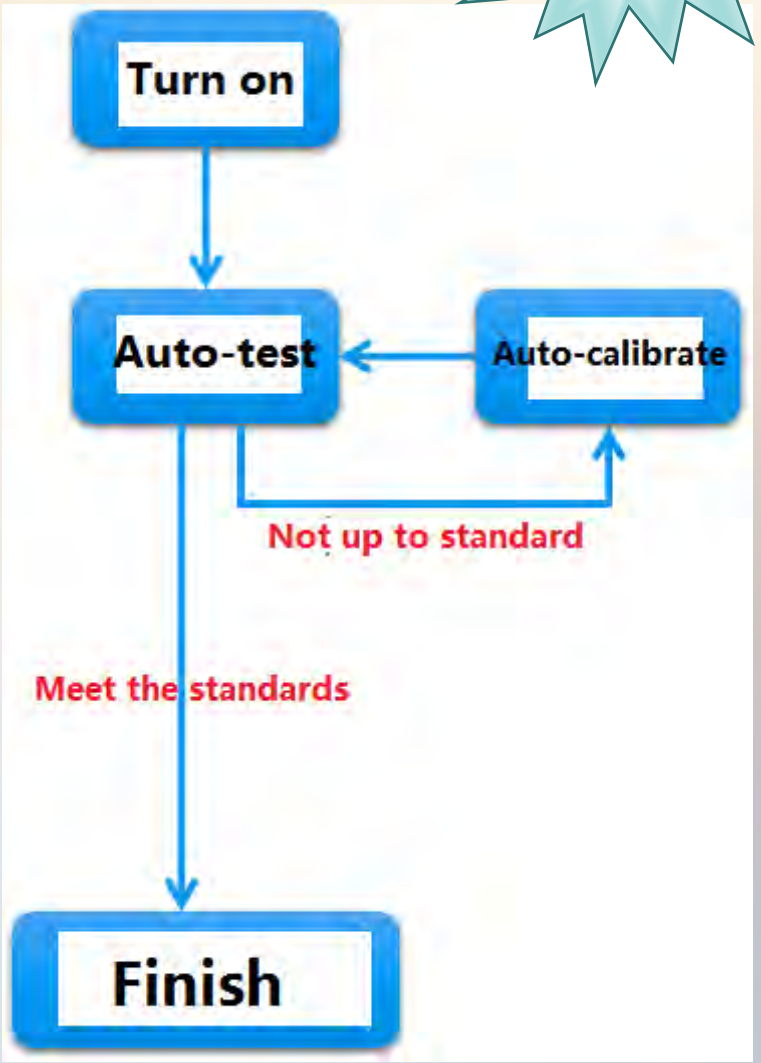


This function is for promising the basic brightness of stimulus spot can always meet the international standard under different checking environment, different electricity conditions and after long using period.



Traditional perimeter

Best



HPP-850

Spot Stimulus Methods

Map LED

Many bulbs are set on the stimulus locations attached on the back of test bowl. Spot brightness and color are controlled by electricity.

Advantages:

- Less heavy
- Cheaper

Disadvantages:

- Stimulus brightness and time are unstable and maybe different.
- Stimulus location are not accurate if it is color perimeter.

Spot Stimulus Methods

Projection

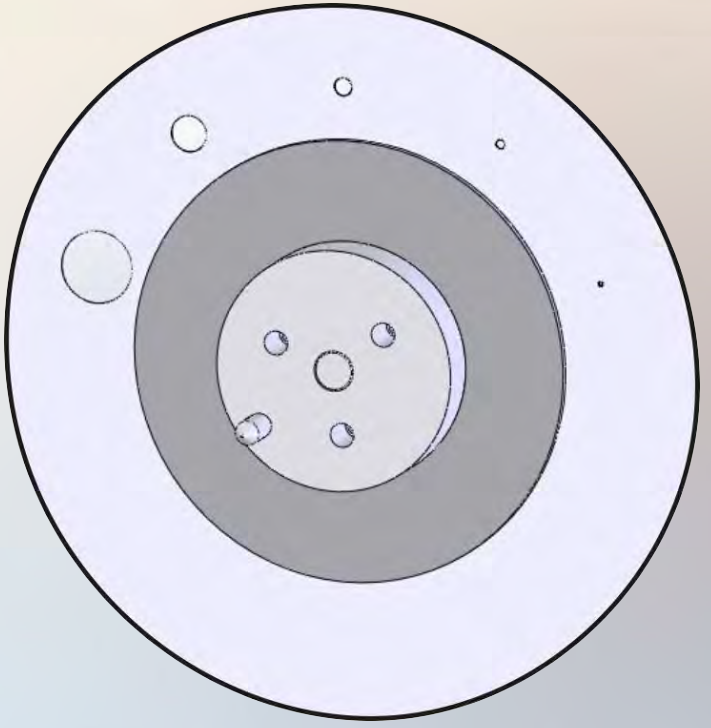
Spot brightness, color and size are changed by lens rotation.

Advantages:

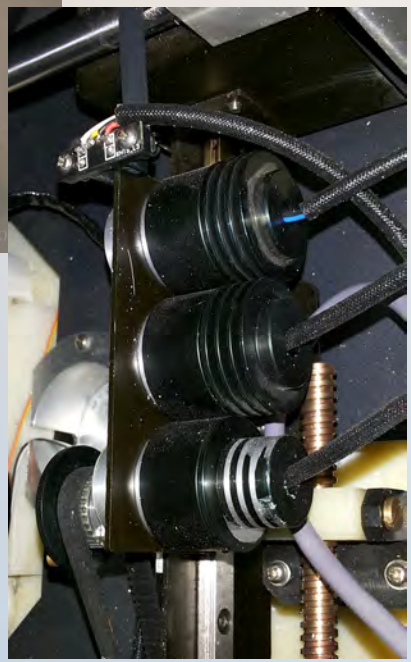
- Static and kinetic tests both are available.
- Stimulus size Goldmann I – V

Disadvantages:

- More expensive than MAP LED one.



Light source:
LED Lamp VS Halogen Lamp



LED Lamp

1.Unstable brightness

2.It takes time to light up

3.Unstable color temprature

Halogen Lamp

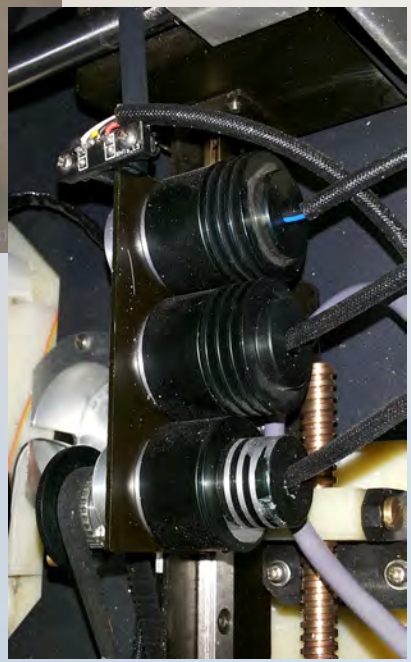
Stable brightness

Stable color temprature

Stable lightsource
Halogen Lamp

Stable brightness
Stable color temprature

Disadvantage of using LED Lamp



1.Unstable brightness
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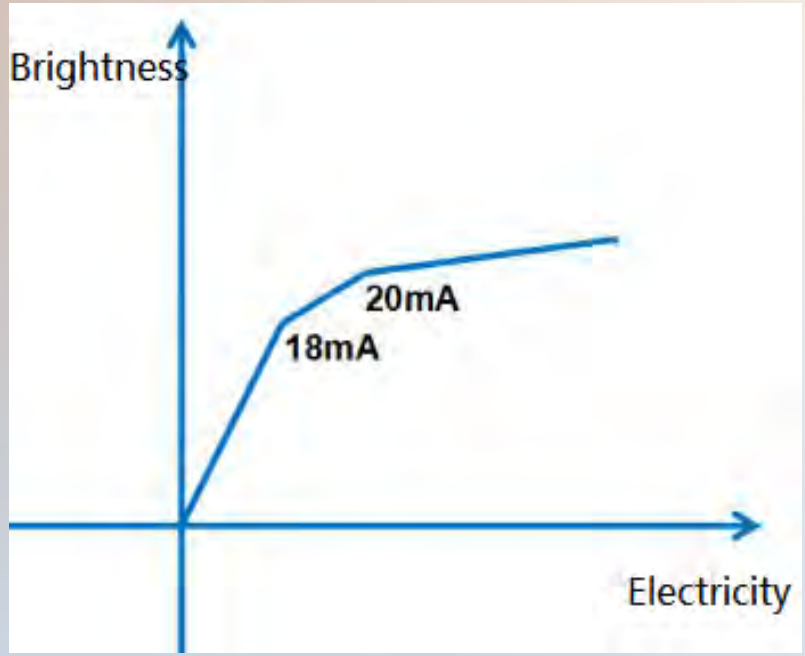
Disadvantage of using LED Lamp

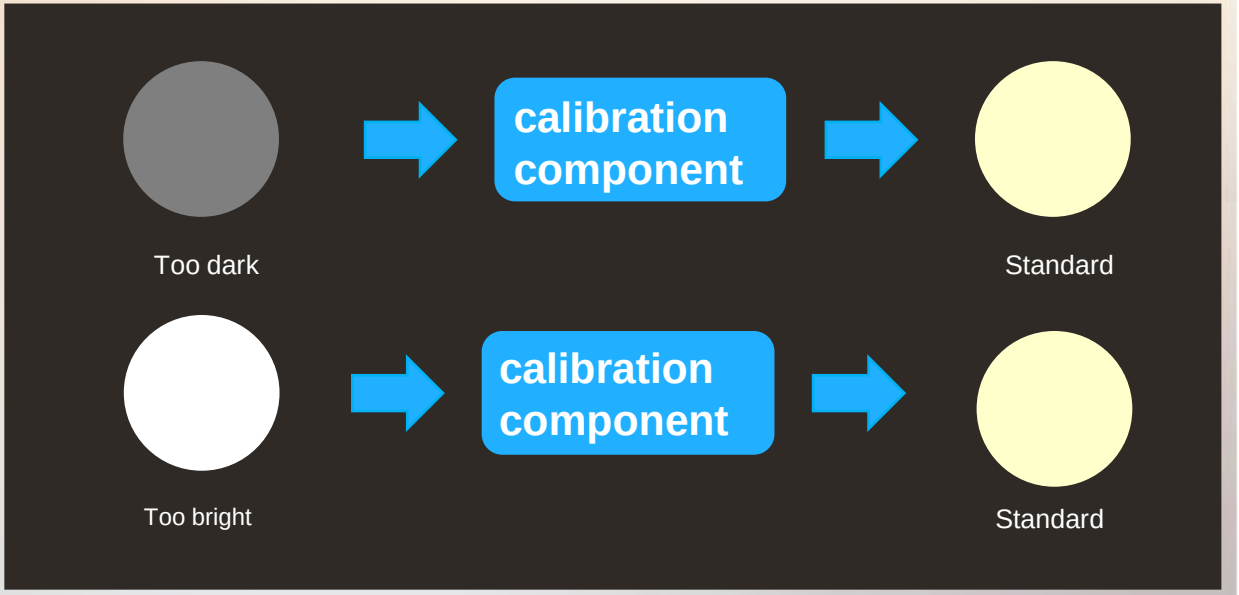


1.Unstable brightness

LED brightness is influenced by electricity,but the brightness and electricity not present stable propotional relation.

It means if you give one LED same electricity,the brightness will have subtle difference,that causes some db value deviation of testing result.

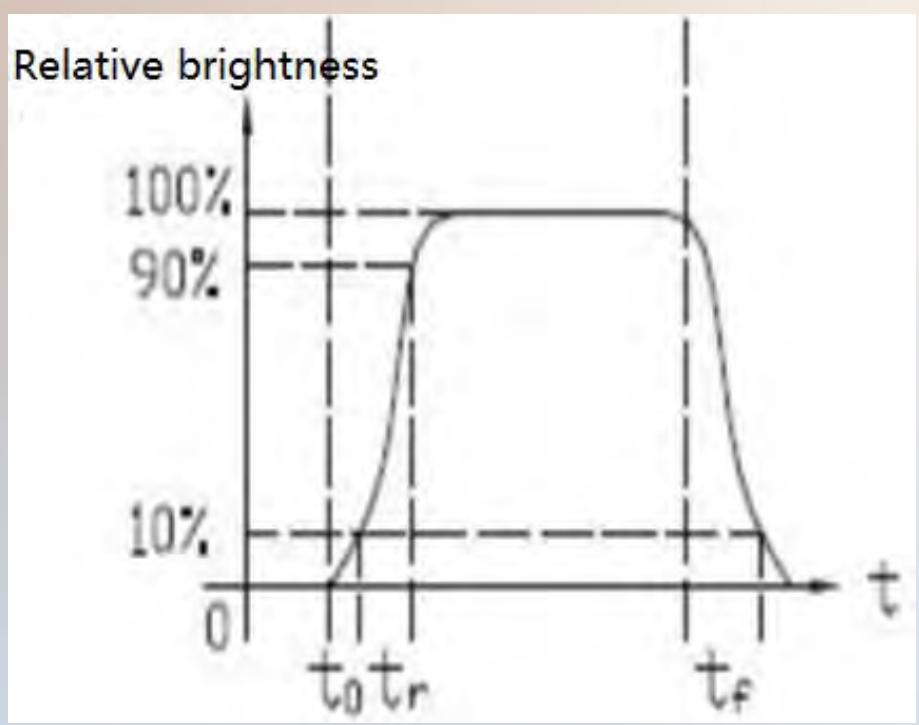
HPP-850 Feature



Brightness metering and calibration while power on

Self-check when power on, adjust the luminance brightness,to make sure the initial projection brightness standard.

Disadvantage of using LED Lamp



2.It takes time to light up

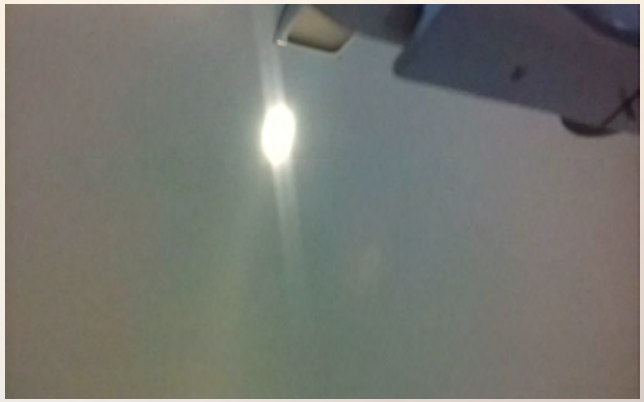
The light up process of LED presents parabola form.

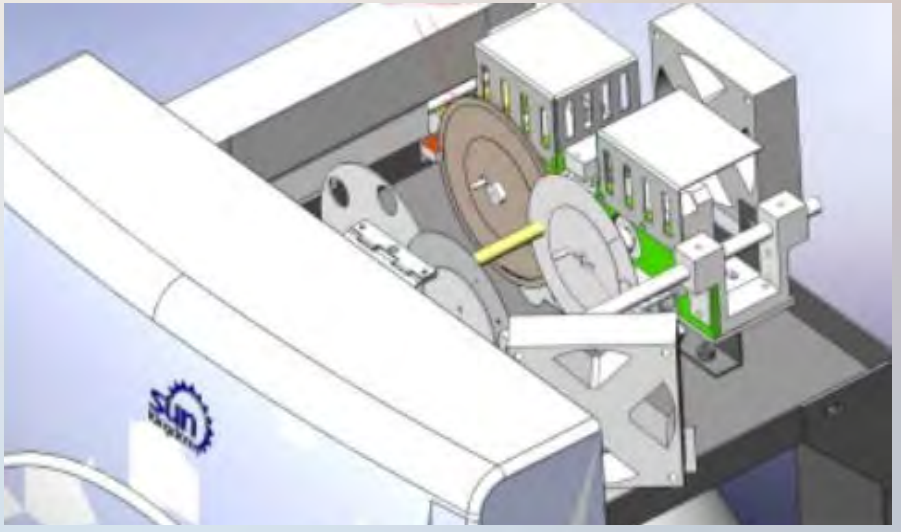
It needs 50-100ms to meet the stable brightness.That means during the 200 of stimulus time,the half sitimulus time can't reach the needed brightness.Then it causes inaccuracy of test value.

HPP-850 Feature

Optical Progressive Lens

HPP-850 inspects the brightness and uniformity of the project light according to the brightness intensity when power on, then adjusts the light transmittance by our optical progressive lens to meet the international standard.





Disadvantage of using LED Lamp

3.Unstable color temprature

There is significant change with LED's color temprature under different temprature.

When white LED presents odb spot,the color temprature is 7500-8000k,we see it as white; when it projects 50 db spot,the color temprature will be 4500-5000k,we see it as yellowish.

HPP-850 Feature

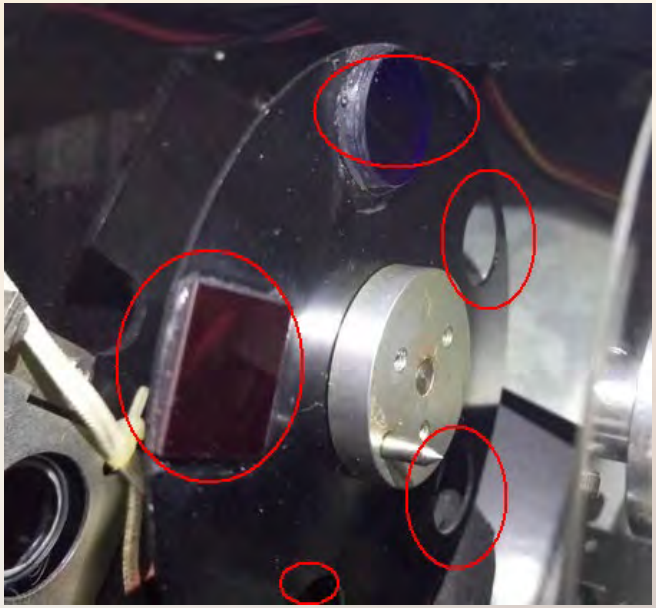
Optical filter lens

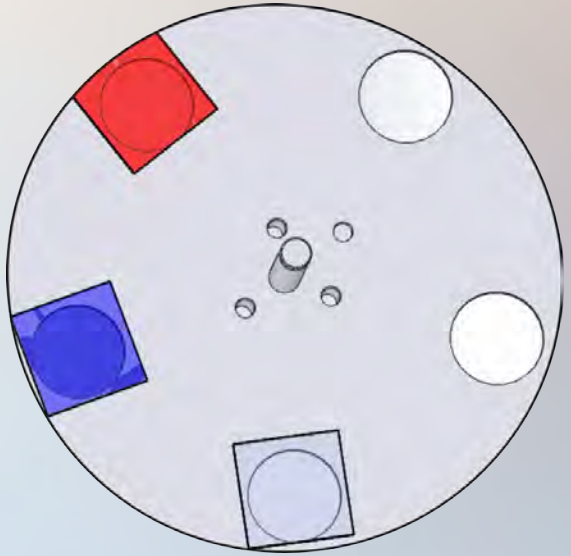
↓

Filter out specific light wavelength

↓

Change the spot color





Best

LED Lamp

Halogen lamp

Optical progressive lens

Optical progressive lens

↓

Control optical transmittance

↓

Change the spot brightness

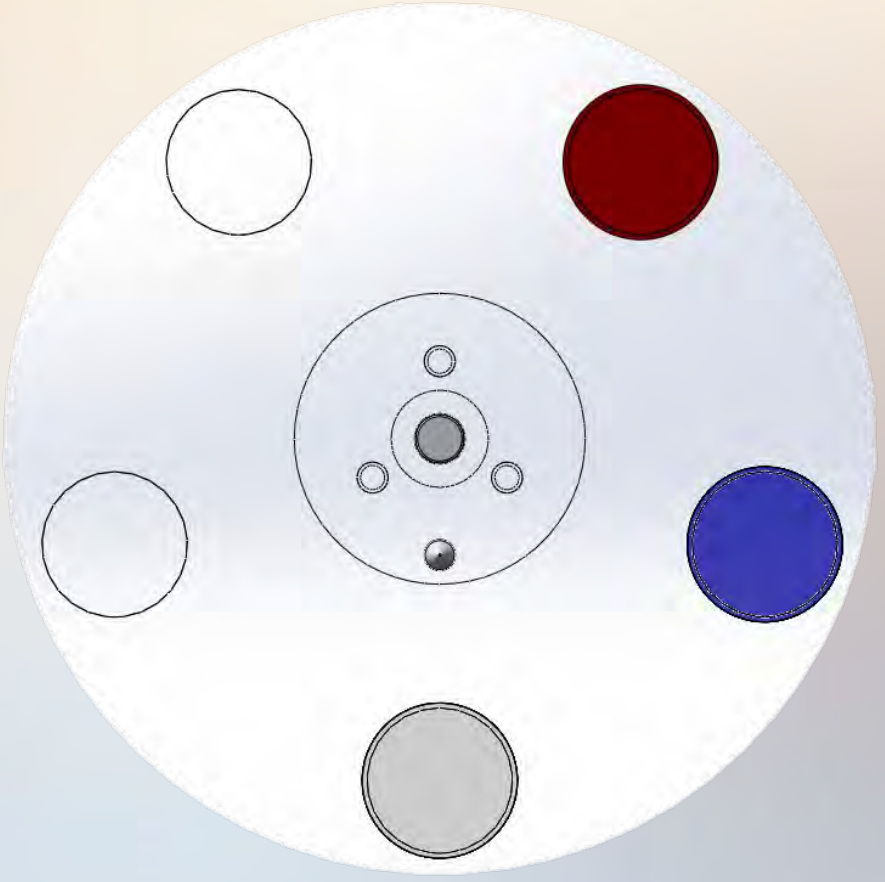
Ensure 51 light spot brightness can meet absolute standard.

Optical filter design

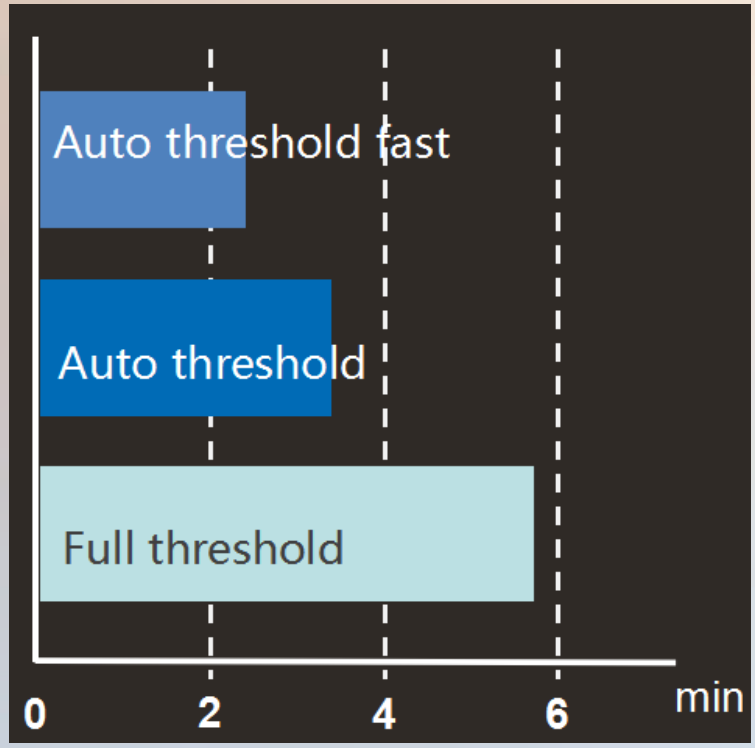
Red & blue optical coating lens

Standard stimulus wavelength:

- Red (610nm): detects the sensitivity of the short wavelength
- Blue (440nm): detects the sensitivity of the long wavelength
- White (580nm): detects the sensitivity of the short & long wavelength



Quick and accurate test strategy

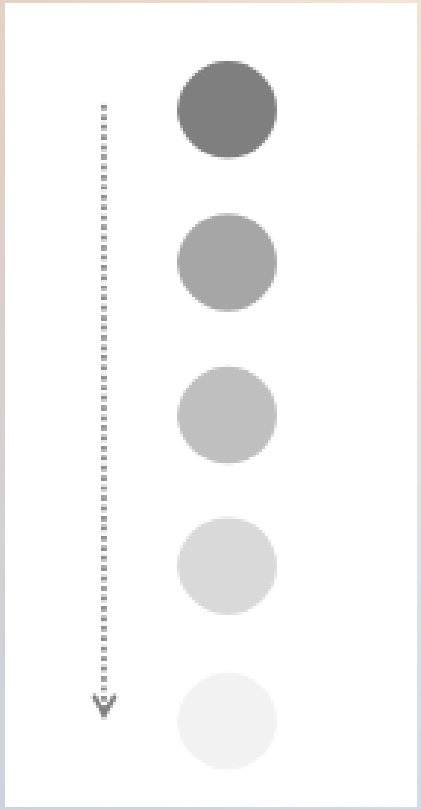


Health visual filed examination time is about 3-4min

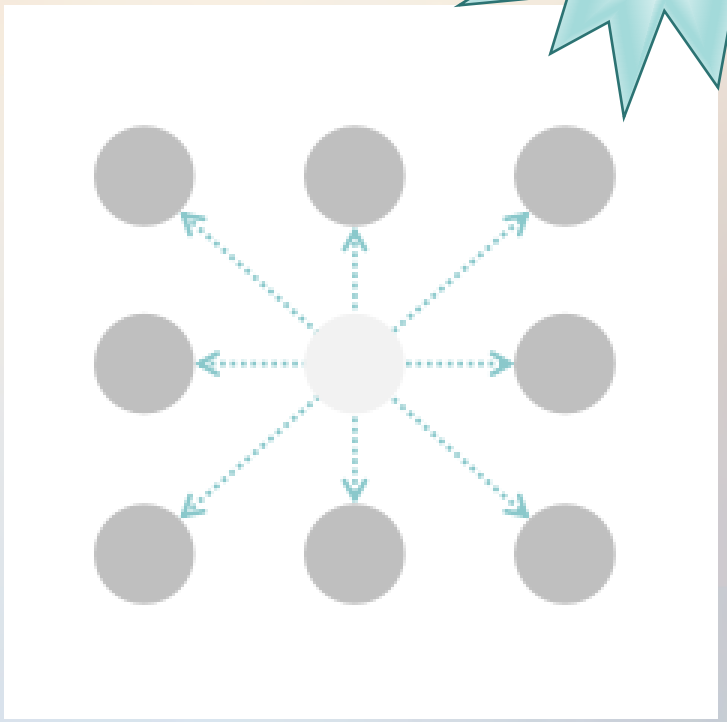
Severe visual field defect is about 5min
(The above data uses detection programme 24-2, Stra
Auto threshold)

Mild field defects can also be accurately detected

Quick and accurate test strategy



Traditional Perimeter



HPP-850 Pure-optical Projection Perimeter

Trial Lens

Ø Using Lens Trial to correct the diopter,to aviod it impact the test results.

Ø Not affecting visual field and eye position monitor.

Ø Lens Trial start infrared light automatically,to avoid the eye position is not accurate caused by the lens refraction. Meanwhile,through calculating the infrared test point to evaluate whether the lens was placed correctly(Head Tracking)

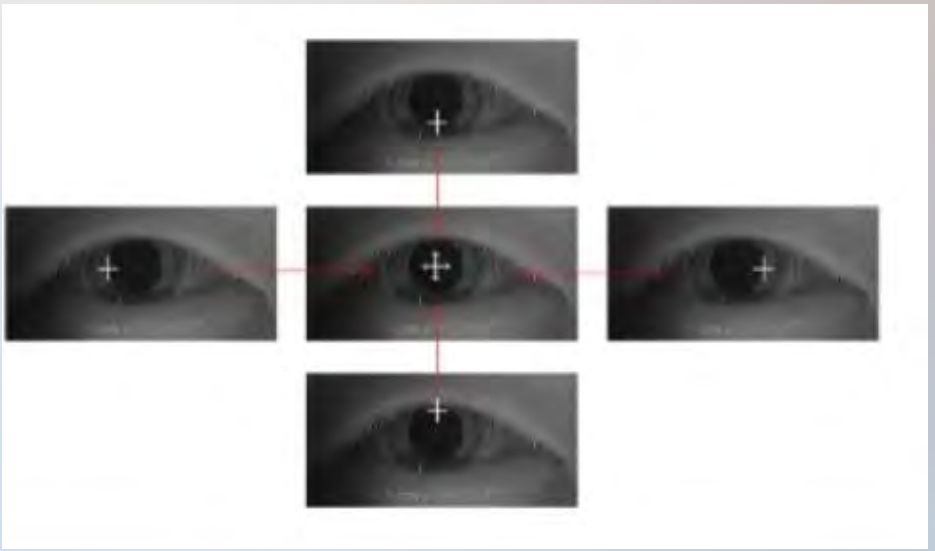
X-Y-Z Fixation & Tracking

Gaze tracking

Infrared light from 3 directions positions tester's eye and obtains accurate gaze graph, to improve the report reliability.

Head tracking

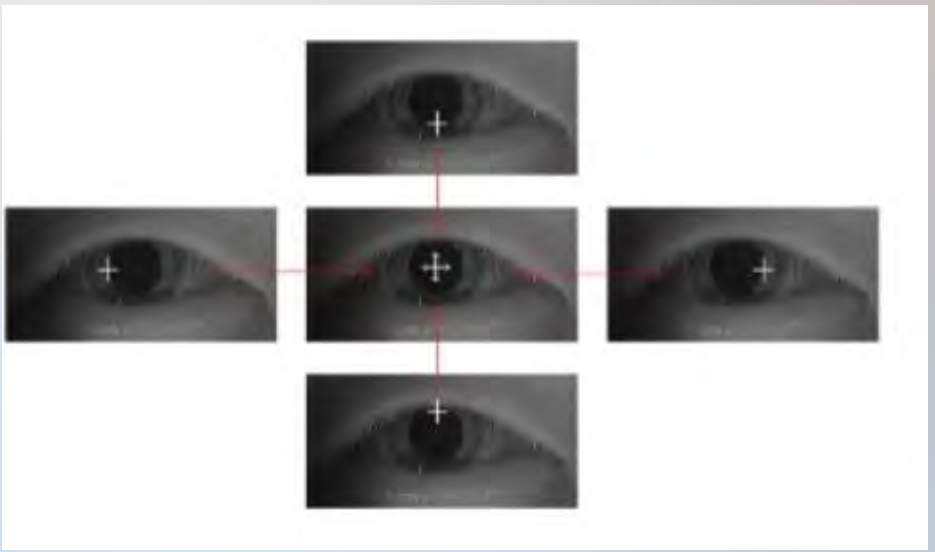
Any tiny movement can be captured by infrared light, and headrest and chinrest will move according to the eye.



X-Y-Z Fixation & Tracking

Gaze Tracking may **not work** well in the following situations:

- Very small pupils, droopy eyelids or long eyelashes.
- Excessively large or dilated pupils.
- High powered trial lenses.
- Excessive eye movements or blinking.
- Cloudy media.
- Very dark iris.
- Dry eye.
- Deep-set eyes.



SWAP (blue-on-yellow)

Blue: stimulus size V
Yellow background illumination: yellow 315asb

SWAP has performed much better than standard perimetry in the early detection of glaucomatous change.

WHY?
Because blue cone will be damaged in the early age of glaucoma.

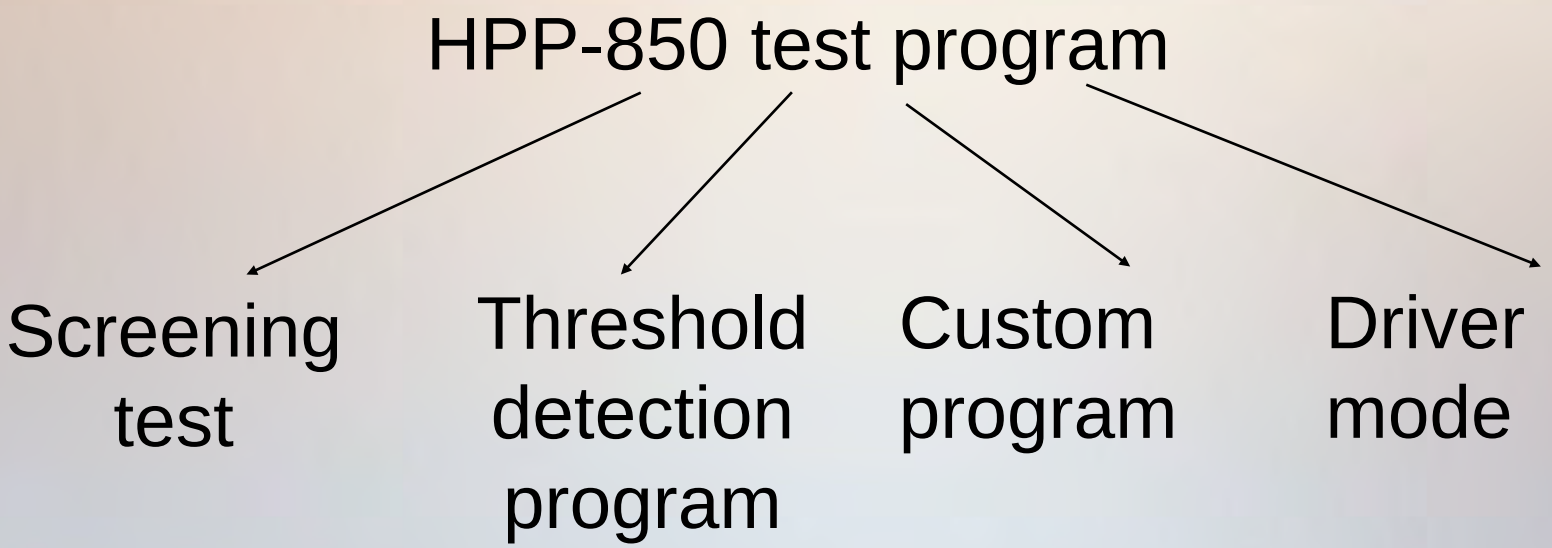
SWAP has been found to be appropriate for early glaucoma detection in:

- Ocular hypertensives
- Glaucoma suspects
- Glaucoma patients with mild to moderate field loss.

Patients who may **not** be candidates:

- Patients with significant cataracts or advanced white-on-white field loss.

HPP-850 Test program



Methods of stimulus presentation

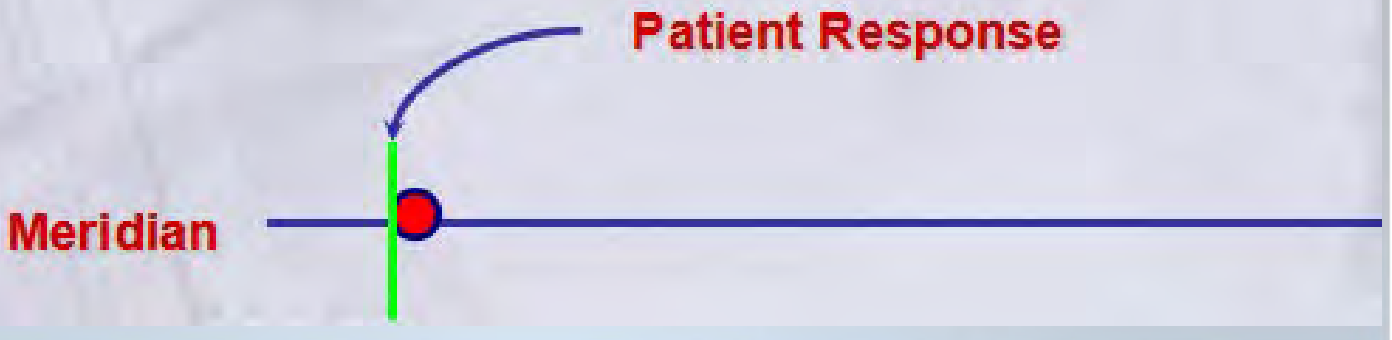
Static perimetry tests different locations throughout the field one at a time.
(Draw the scope outline)
It is used for rapid screening and follow up of diseases involving deficits such as scotomas, loss of peripheral vision and more subtle vision loss.

Kinetic perimetry uses a mobile stimulus moved by an examiner.
(Threshold measurement)
It is useful for mapping visual field sensitivity boundaries. It may be a good alternative for patients that have difficulty with automated perimetry, either due to difficulty maintaining constant gaze, or due to cognitive impairment.

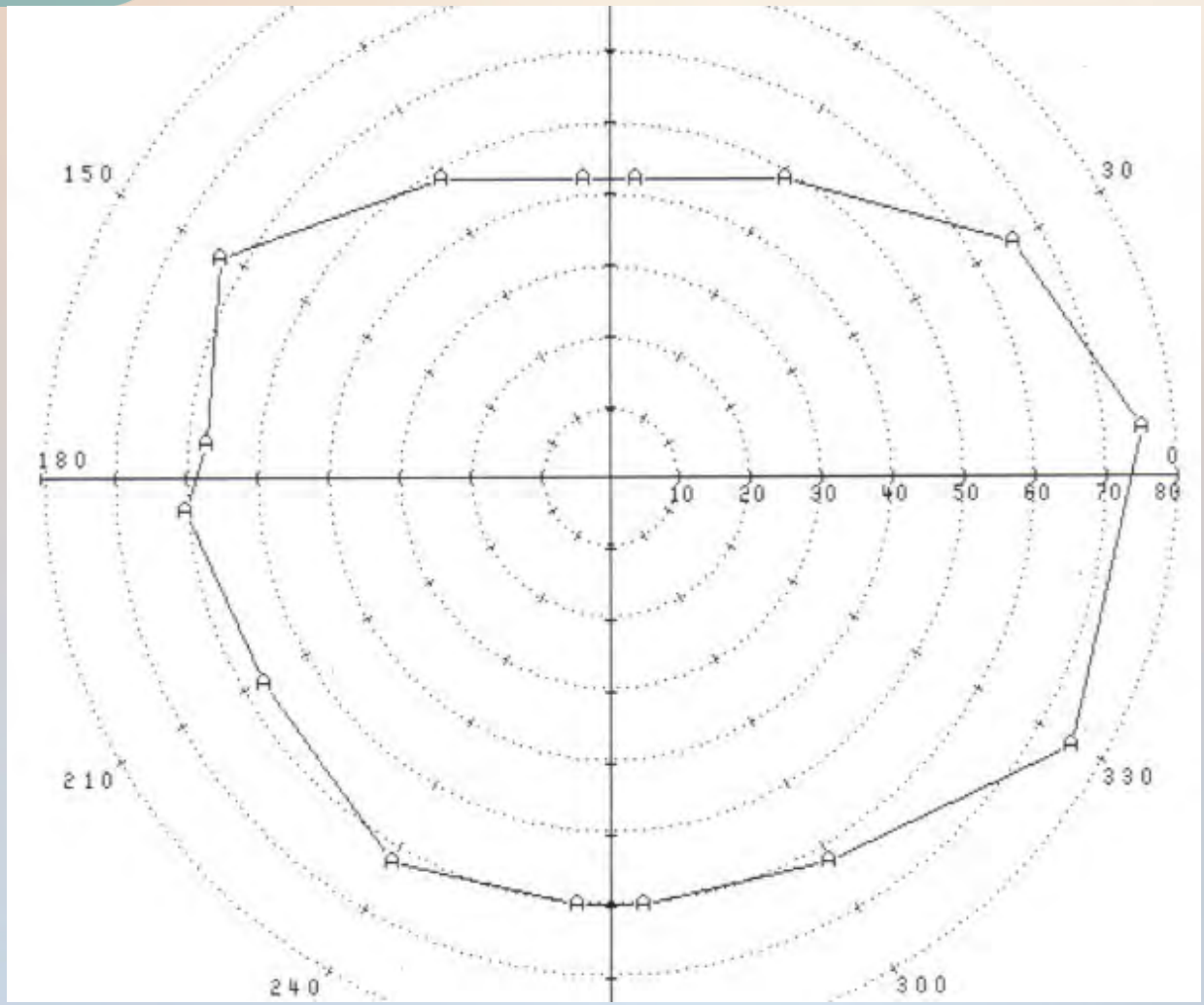
Kinetic Testing

Single intensity; Moving Target

A light spot (Stimulus) is introduced along a particular meridian, following a straight line until a patient response (sees the light spot) is indicated.



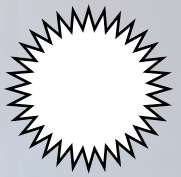
Kinetic test



Static testing

Variable Intensity; Stationary Target

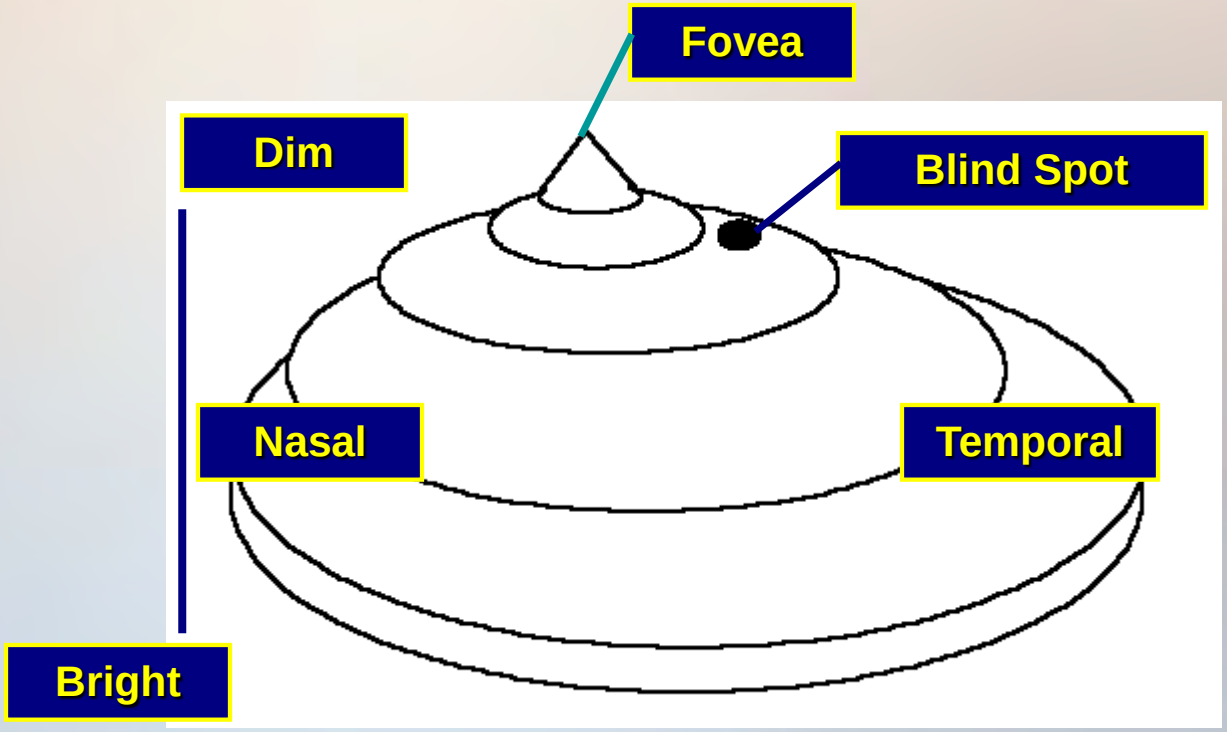
Varies the intensity of the spot over the entire Hill of Vision. Patient does not see the spot move. The spots are projected at different positions on the bowl, but the instrument will return to the spots at different intensities.



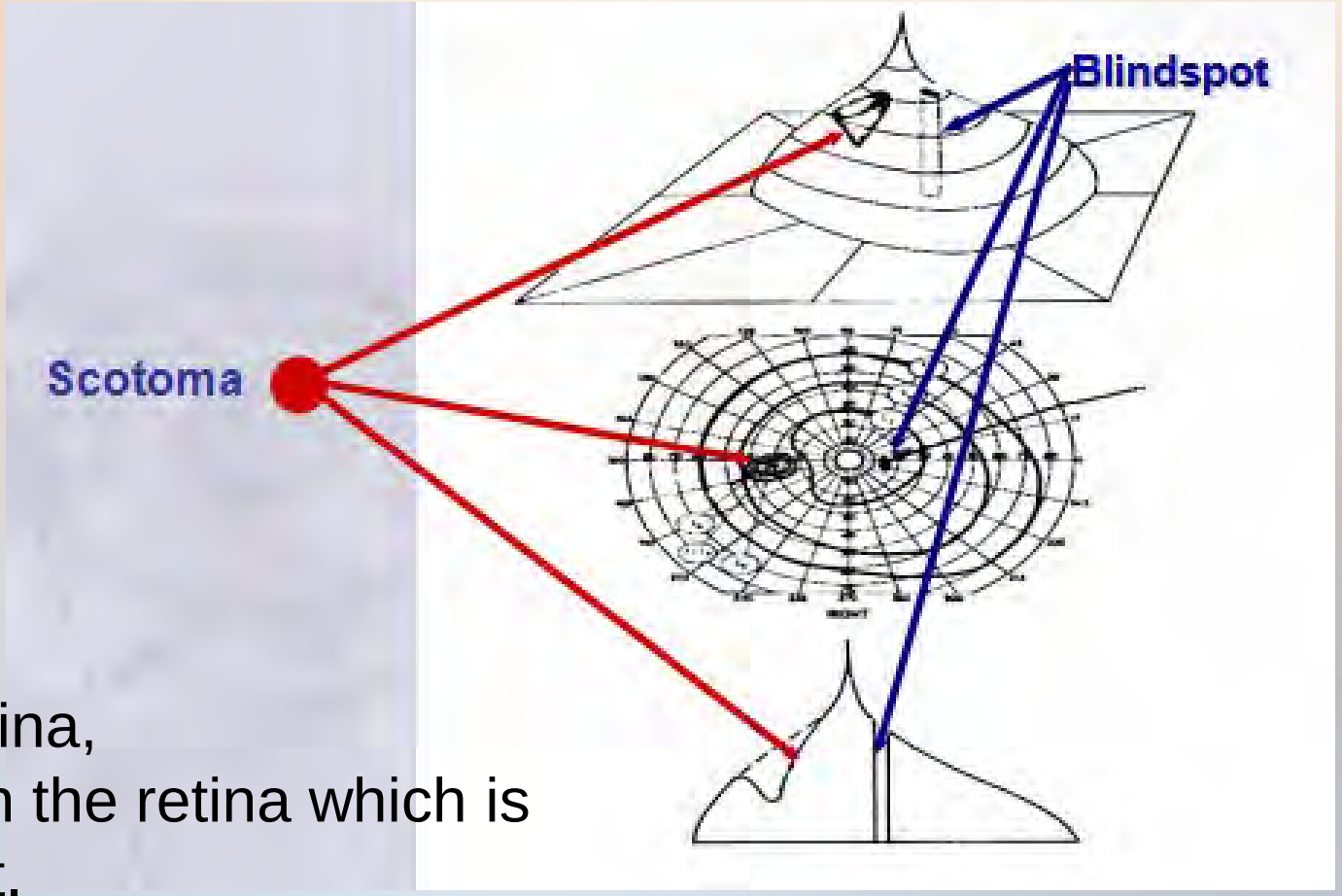
Static test

The “Island” of Vision

A Static test on a normal eye will produce a pattern similar to the one at right.

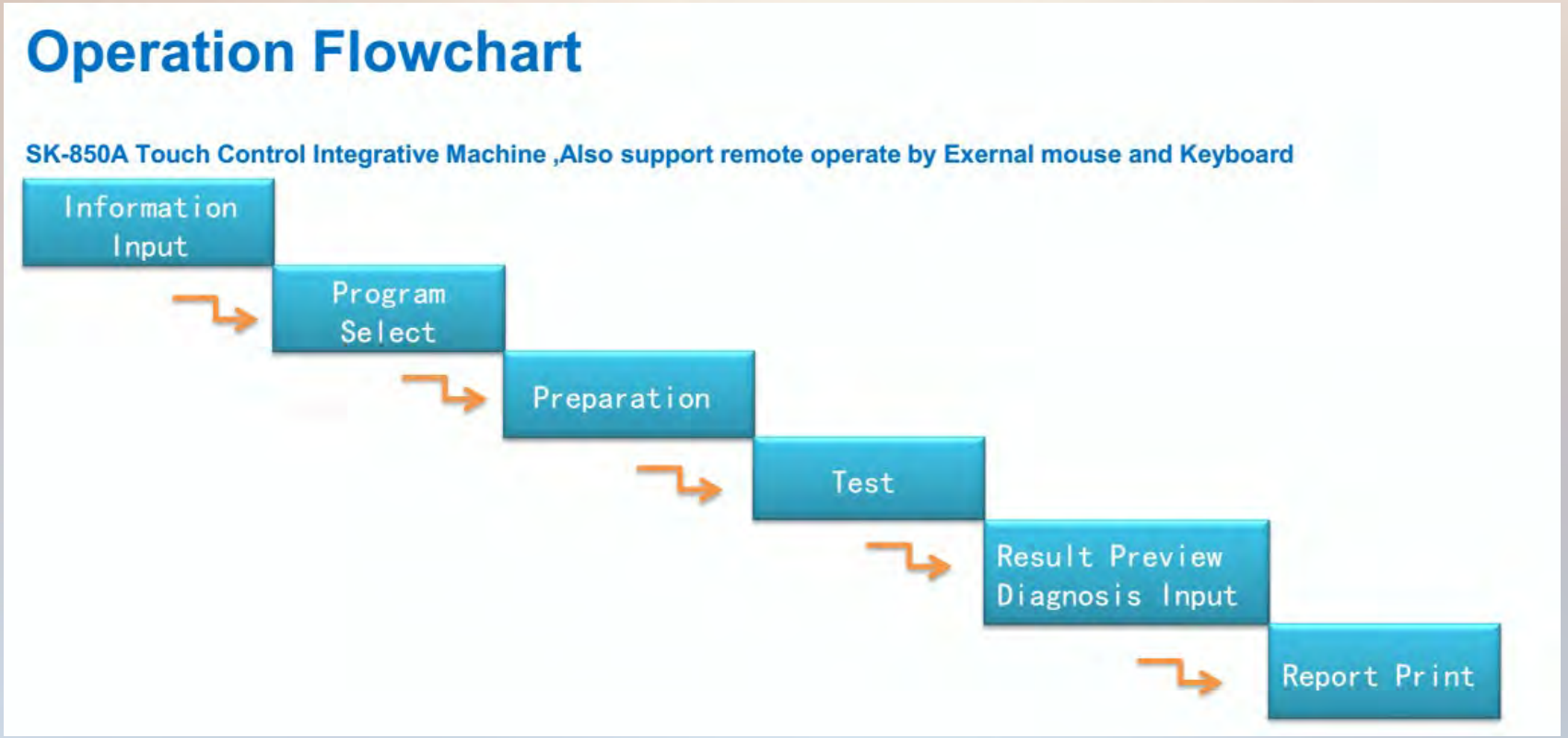


Scotoma



Definition:
A detect in the retina,
an area or point in the retina which is insensitive to light.

Operation Flowchart



Boot turn on the perimeter' s switch in the back, after you press the machine will auto-calibrate itself, it will take about 5 minutes.。

Data Input Press "new" after boot. You can recall the previous patient information for recheck. Name , born date, gender, left/right eye must be filled in 。

Enter **Test interface**

Program Selecting default program is 24-2, you can choose the program as you need

Preparation before test **you need to introduce the whole procedure of test to the patient clearly。**

(1) This device is for testing the visual field, please keep looking forward all the time and stare at the yellow light(yellow fixation light). In the test there would be another light spot blink in your visual field, if you see it, then you press the responder(hand the responder to the patient), don' t try to follow the blinking light with your eye。

(2) If you want to have a rest, then you can hold to press the responder and don' t release, pause the test. Release the button, then the test go on. The test will be ended after the light is off.

(3) You can blink during the test, but at best you blink very fast after you press the button, to avoid missing the next light spot.

(4) Don' t turn your head when testing, try to avoid rolling your eye, your forehead and chin must stick to the head-rest and chinrest.

(5) Help the patient to wear the eye-patch。

Eye-position adjustment **Adjust the pupil to be aligned with the cross in the monitor window。** You can control the position with the direction button under the screen, or you can control it with the adjustment icon on the touch screen. The central "M" can be changed to "A" by pressing. M represents manual it means you need to adjust the patient' s eye position by manual in the test, to make the patient' s eye aligned with the cross in the monitor window; "A" represents Auto it means the machine will change patient eye position automatically, to make the patient' s eye aligned with the cross in the monitor window during the test if happens any small movement.

Start Test After finish the eye position adjustment, press the START icon to start the test. Its system need 3 seconds to reconfirm the patient's eye position, if your eye is not in correct position, there will be a dialog box, press : "Yes", it will re-inspect your eye whether it is in correct position; press:"No", it will skip eye position inspection and start visual field test; press "cancel", it will be back to the last interface.

Test result You can preview the test result by pressing the print icon.

Result **Print**, Select the report which needed be printed. There are 3 types of print result: Singele, 3-in-1, and overview.

Attach: 1. The intention inputting the corrected vision: it need corrected glasses if patient want to acquire the target in 30cm-distance near to him
Request for corrected glasses: metal narrow frame glasses

Notice: don't use plastic big frame glasses, and don't use patient's own glasses.

Perimeter Test Report

Single Report

Patient Data

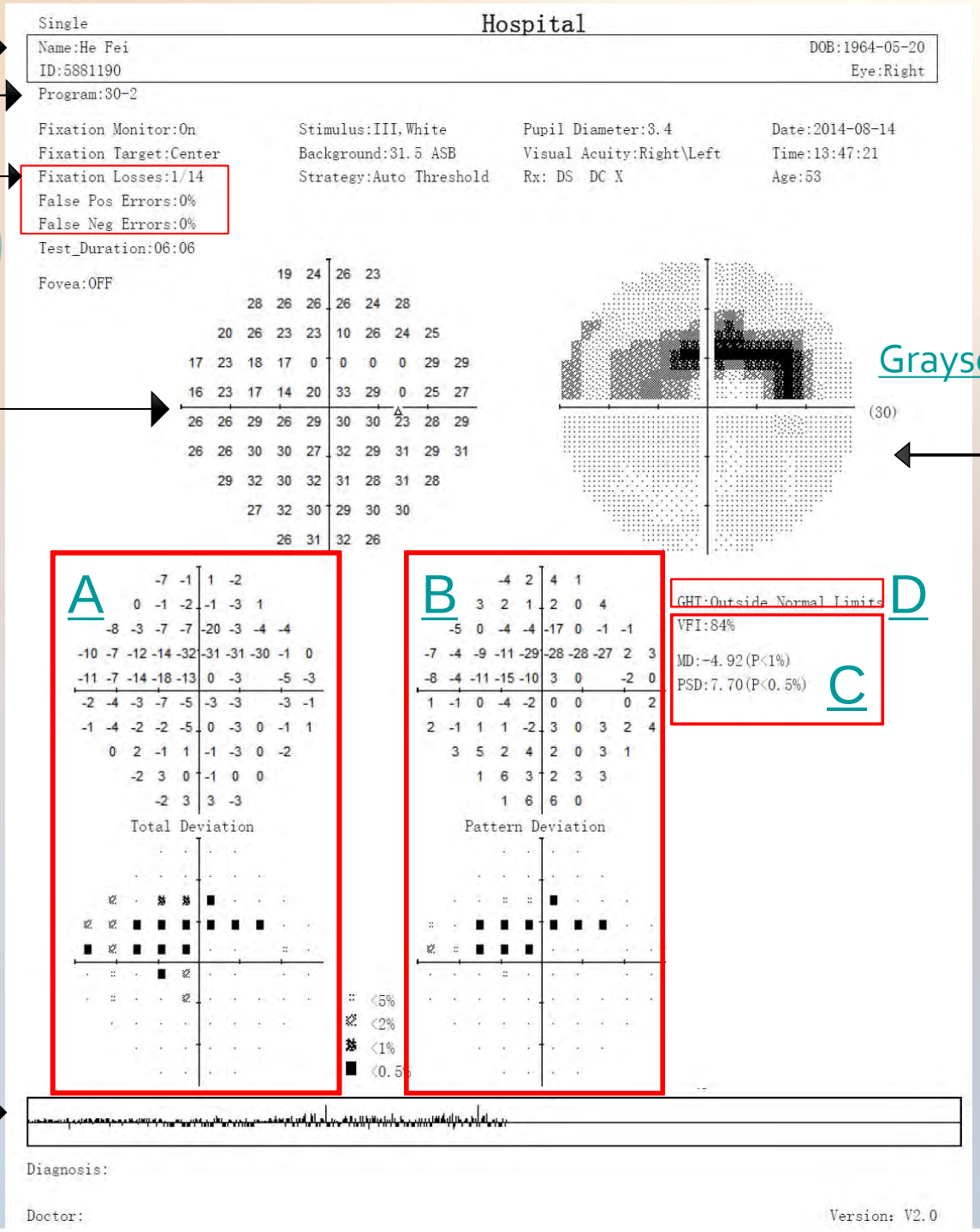
Test Parameters

Reliability Indices

Numeric (dB) Results

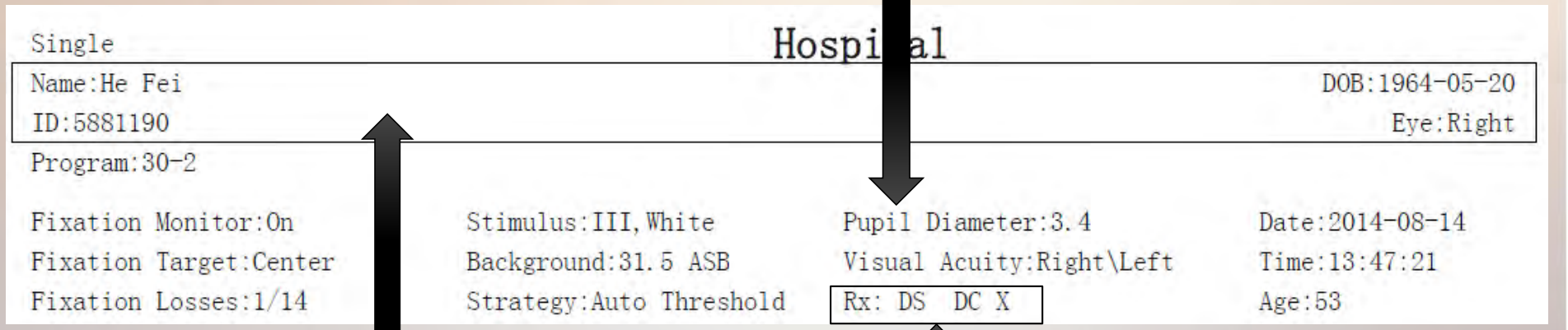
Grayscale Results

Gaze Graph



Patient Data

Pupil Diameter：＜3.3 may afect Total deviation.



Patient Data: modifiable

Refraction：＞30° test is not applicable (with trial lens)

Reliability Indices

Fixation Losses:1/14
False Pos Errors:0%
False Neg Errors:0%

Fixation Losses ≤ 20%

When the fixation monitoring test parameter is set to the blind spot (Heijl-Krakau) mode, proper fixation is checked by projecting 5% of stimuli at the presumed location of the physiological blind spot. Only if the patient indicates seeing the blind spot check stimulus will the instrument record a fixation loss.

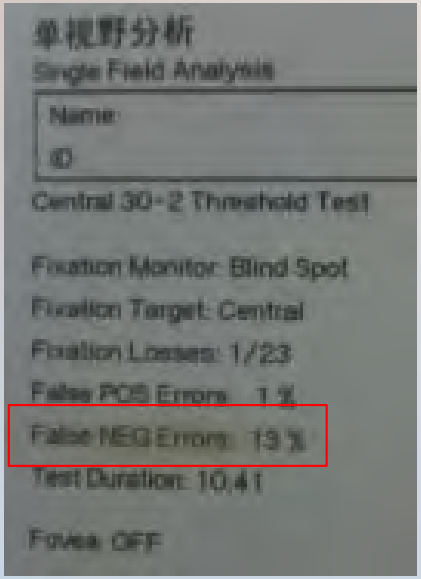
False Positive Errors ≤ 15%

When a patient responds to catch trials in which no stimulus has been projected or responds faster than is humanly possible. This is referred to as a false positive response and is tracked as a false positive error.
"Trigger happy" person

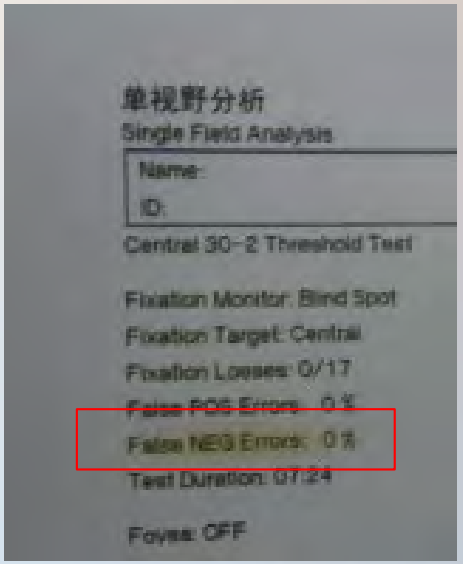
Reliability Indices

False Negative Errors

A stimulus is repeated at a particular location and at a level much brighter than has already been seen. If the patient does not respond to this trial stimulus, a false negative error is recorded.



Left (Glaucoma)

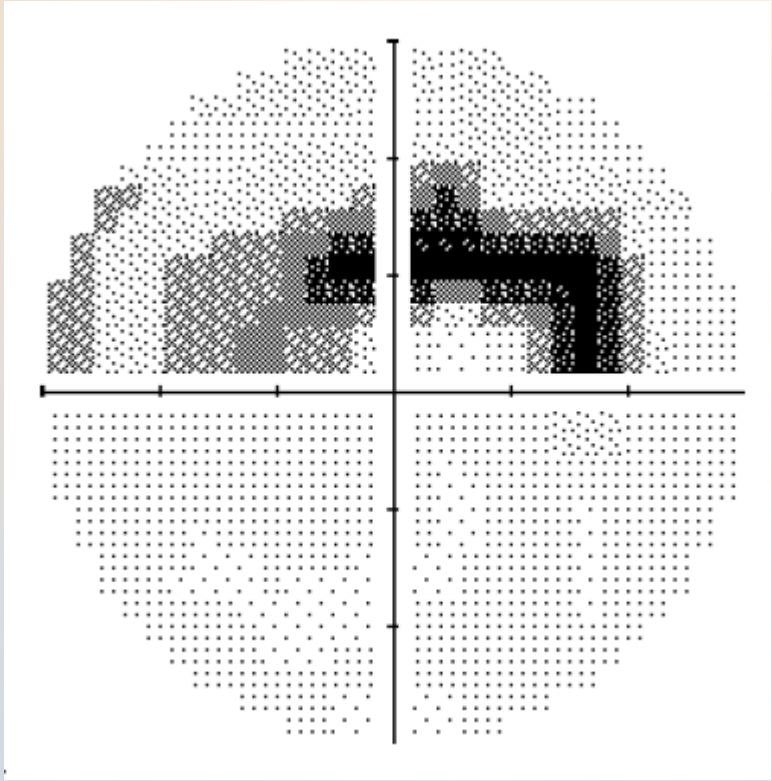


Right (Normal)

Numeric (dB) Results

Tested value(dB)

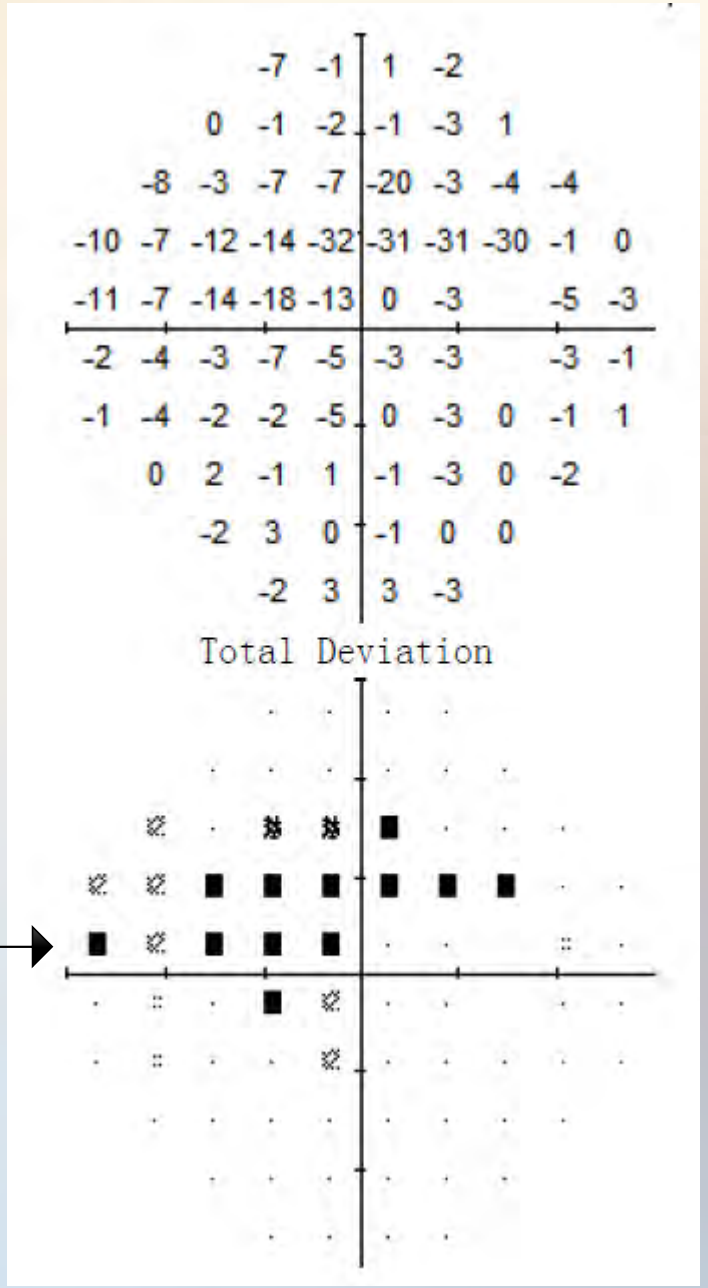
Grayscale Results



Total Deviation A

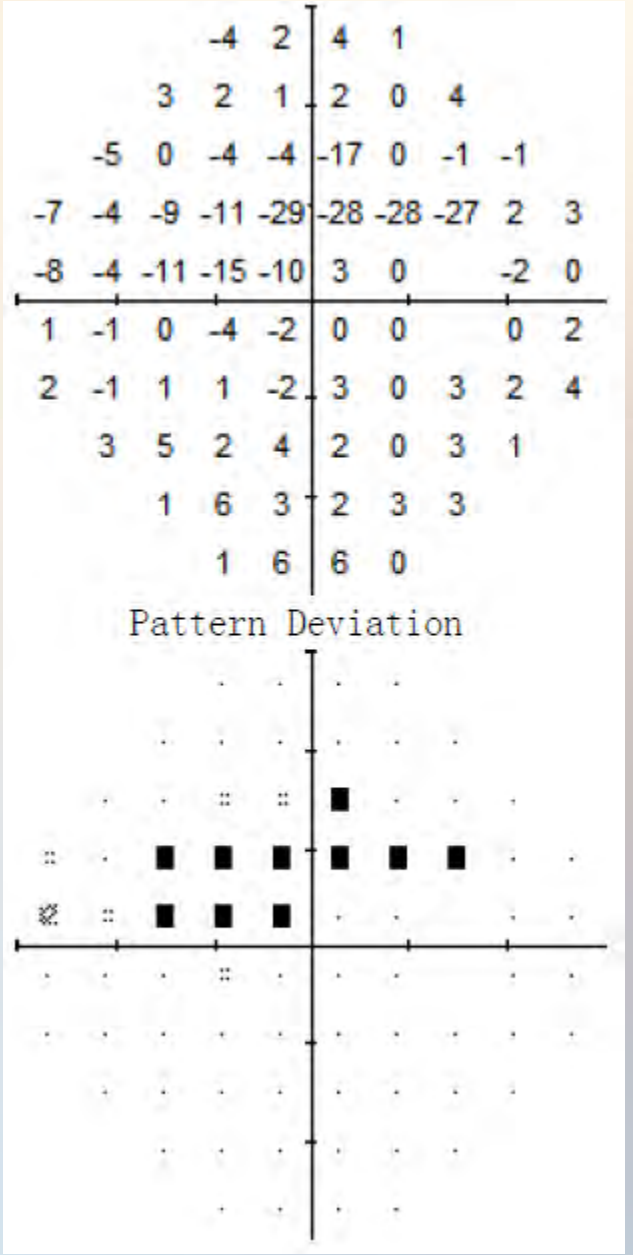
The numeric values of these plots represent the difference in decibels (dB) between the patient's test results and the age-corrected normal values at each tested point in the visual field.

A probability plot, translates the values from the upper plot into shaded symbols which indicate the statistical significance of each decibel deviation.



Pattern Deviation B

The numeric Pattern Deviation shows the deviation in decibels from the age corrected normal values, adjusted for any shift in overall sensitivity (eg. cataracts or small pupils).



Global Indices C

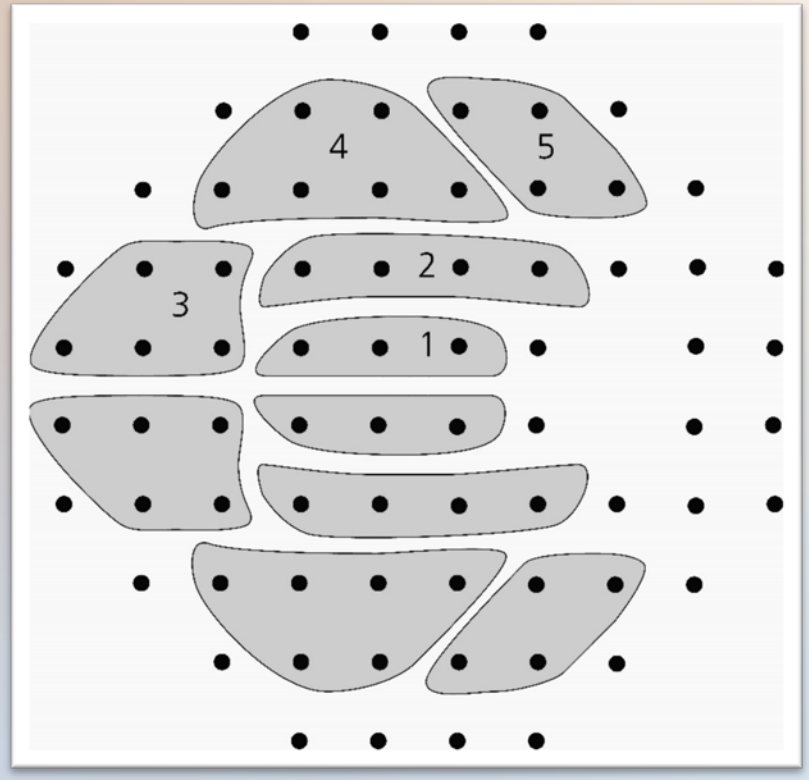
VFI:84%

MD:-4.92(P<1%)

PSD:7.70(P<0.5%)

It is a good indicator of changes in functional vision. It is a helpful tracking factor for diagnosing disease in different course.

The Glaucoma Hemifield Test D



(24-2/30-2)

- Outside Normal Limits
- Borderline
- General Depression
- Anormally High Sensitivity
- Within Normal Limits

Visual Field Index

VFI is a measure of the patient's overall visual function as compared to an age-adjusted normal population.
(means that compared to the normal people with the same age, the tester has better or worse visual field?)

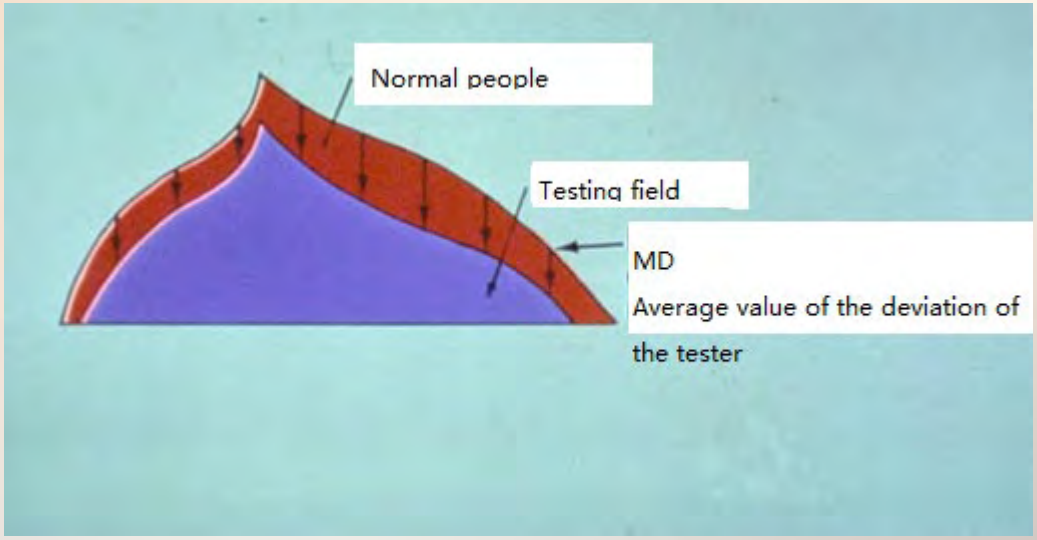
eg.
A VFI of 100% means that the portion of the visual field displays no points that are depressed relative to the age-adjusted normal hill of vision at the 5% level or higher.
A VFI of 0% corresponds to a field with no measured light sensitivity.

Mean Deviation (MD)

VFI:84%

MD:-4.92(P<1%)

PSD:7.70(P<0.5%)



MD is the average elevation or depression of the patient's overall field compared to the normal reference field.
(means compared to normal people with the same age, MD is an average value of the deviation of the tester)

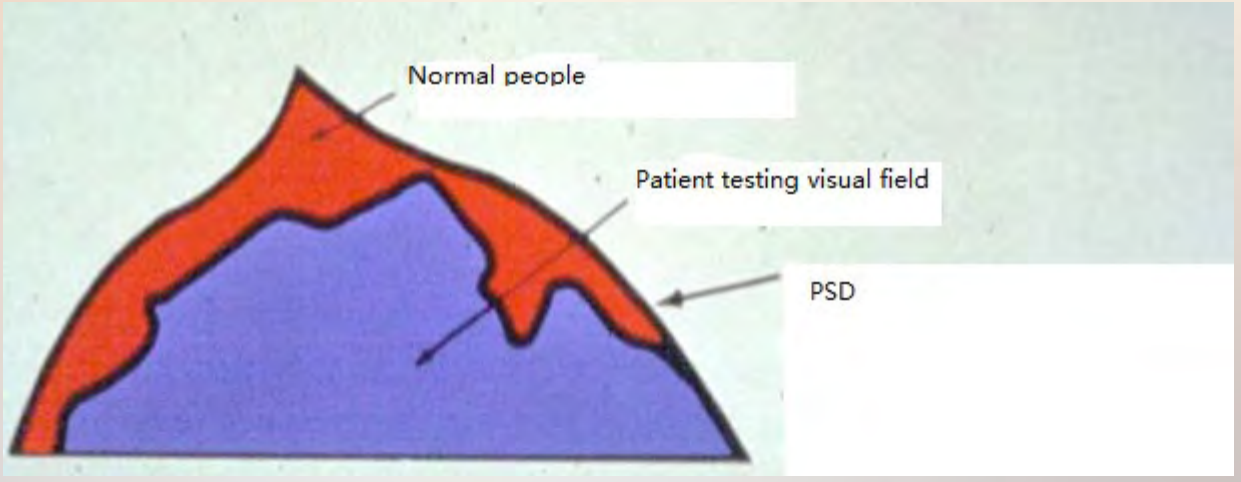
If the deviation is significantly outside the population norms, a "p" value is given. For example, if p < 1%, this means that fewer than 1% of the normal population shows an MD larger than that found in this test.

Pattern Standard Deviation (PSD)

VFI:84%

MD:-4.92(P<1%)

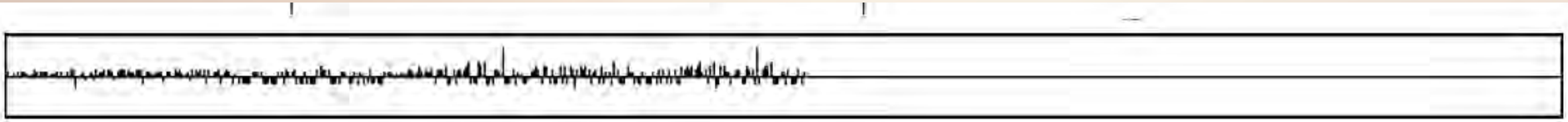
PSD:7.70(P<0.5%)

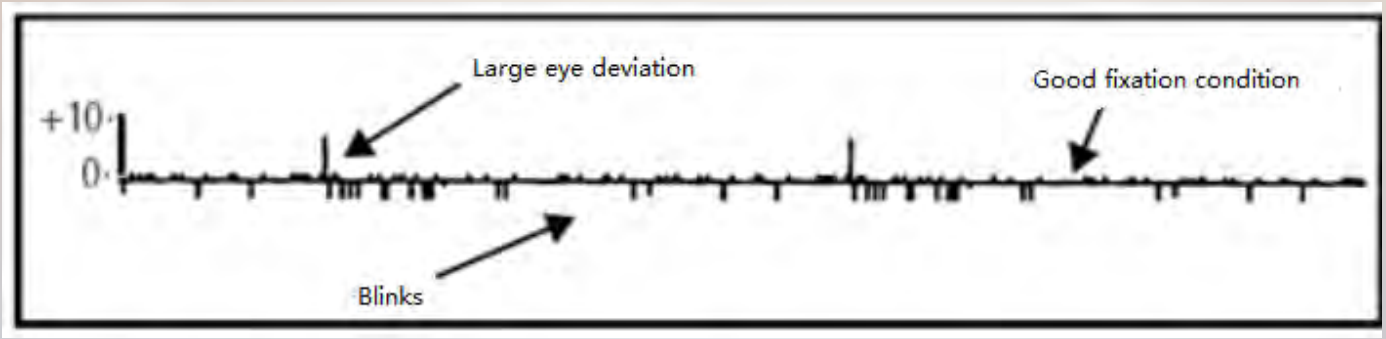


PSD is a measurement of the degree to which the shape of the patient's measured field departs from the normal, age-corrected reference field.

eg.
A low PSD indicates a smooth hill of vision.
A high PSD indicates an irregular hill and may be due either to variability in patient response or to actual field irregularities.

Gaze Graph



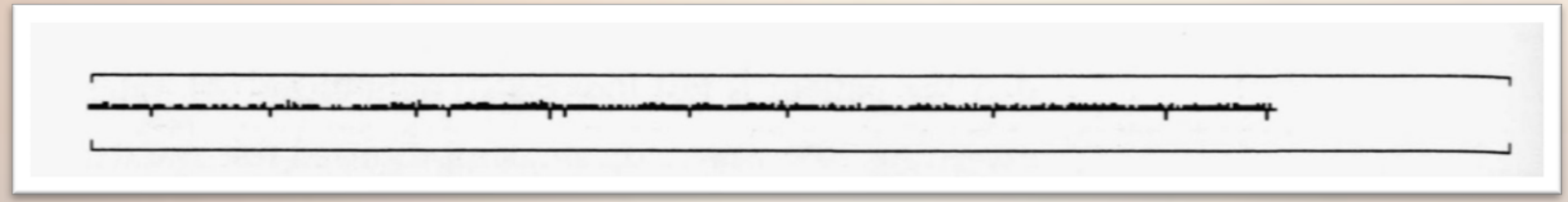


Gaze Graph is gaze tracking to monitor if the tester is a good fixation condition while projecting.

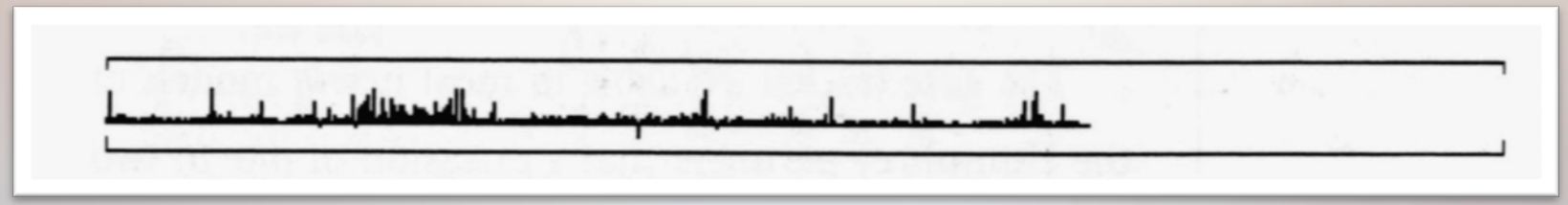
The Upper means large eye deviation.

The Lower means lost of signal, like blinks.

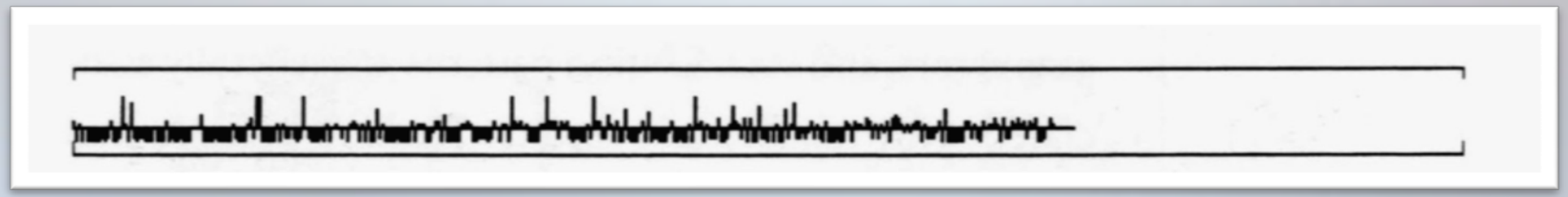
Gaze Graph Analysis



Stable fixation

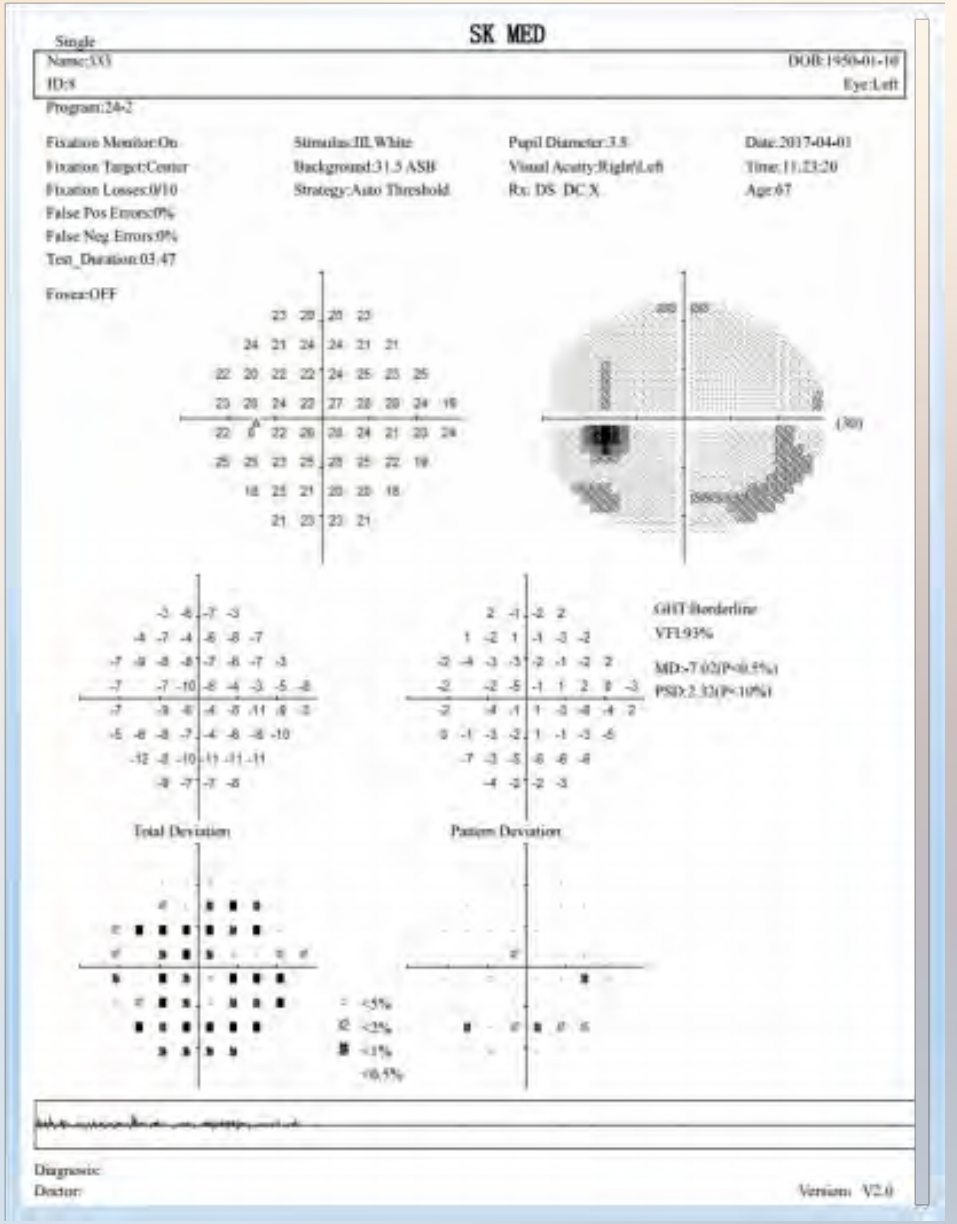


Mostly, tester is in a continuous fixation condition. Report will show a defective area according to the gaze graph.

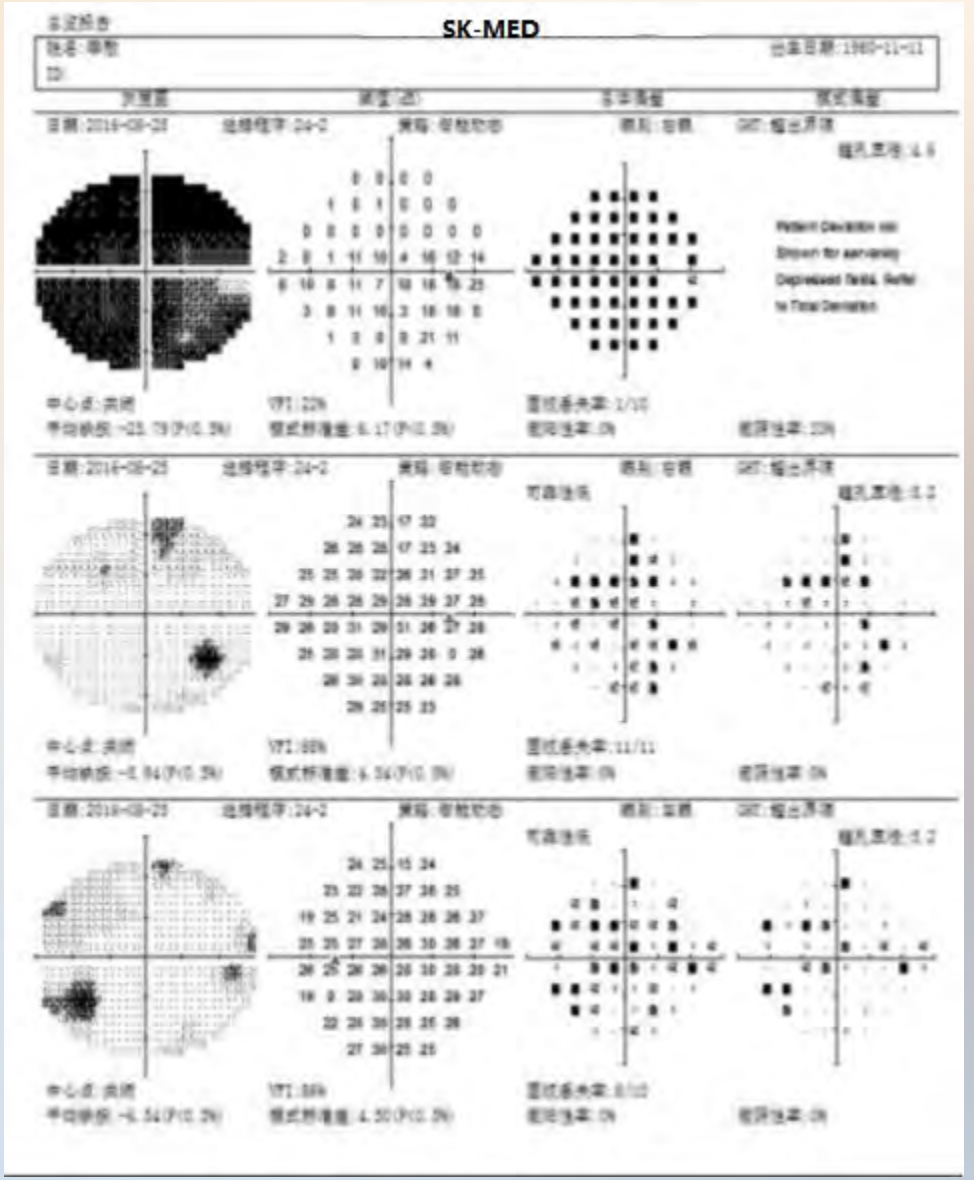


Blink, blepharoptosis,long eyelashes or other reasons will lead to continual lost of signal.

Single Report



The Overview Printout



3-in-1

3-In-1 sbc

Name:Jenny DOB:1989-10-20
ID:Jenny Eye:Left

Program:24-2

Fixation Monitor:On
Fixation Target:Center
Fixation Losses:0/9
False Pos Errors:0/6
False Neg Errors:0/4
Test_Duration:02:57

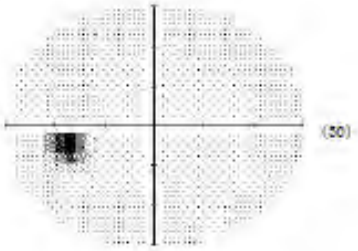
Stimulus:III,White
Background:31.6 ASB
Strategy:Auto Threshold

Pupil Diameter:6.0
Visual Acuity:Right\Left
Rx:300 DS DC X

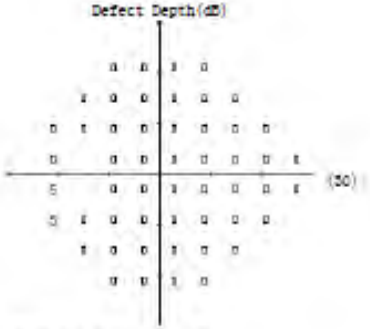
Date:2016-07-02
Time:14:56:05
Age:26

Fovea:OFF

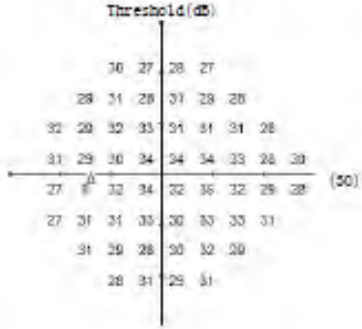
Threshold Gray Tone



Defect Depth(dB)



Threshold(dB)



P=%Within Expected & DS
Central Reference:OFF

Diagnosis:

Doctor:

Version: V2.0

Threshold Test

Test Program	Extend of Visual Field Tested/ Number of Points Tested	Application
10-2	10° / 68 points grid	Macula, retina, nerve, advanced glaucoma
24-2	24° / 54 points grid	Glaucoma, general, nerve
30-2	30° / 76 points grid	Glaucoma, general, nerve, retinal
60-4	30~60° / 60 points	Retina, glaucoma
Nasal Step	50° / 14 points	Glaucoma
Macula	5° / 16 points (2°)	Macula

Screening Test

Central 40	30° /40 points	General screening
Central 64	30° /64 points	General, glaucoma, nerve
Central 76	30° /76 points	General, glaucoma, nerve
Central 80	30° /80 points	General screening
Central Armaly	30° /84 points	Glaucoma
Peripheral 60	30~60 ° /60 points	General, central nerve, retinal, glaucoma
Nasal Step	50 ° /14 points	Glaucoma
Armaly Full Field	50 ° /98 points	Glaucoma
Full Field 81	55 ° /81 points	General, glaucoma, nerve, retinal
Full Field 120	55 ° /120 points	General, glaucoma, nerve, retinal
Full Field 135	87° /135 points Temporal 87°	Full Field
Full Field 246	60° /246 points	Full Field


Thank you
Perimeter HPP-850 Expert