VS Technology Corporation

- challenging new stage -

AUTOMATICON WARSZAWA

Apixel VISION EXPERT DAY

AUTOMATICON 2016

Warsaw 2/03/2016

VS Technology / Japan

March 2nd / Automaticon

by Masayuki KANEKO

Network ネットワーク

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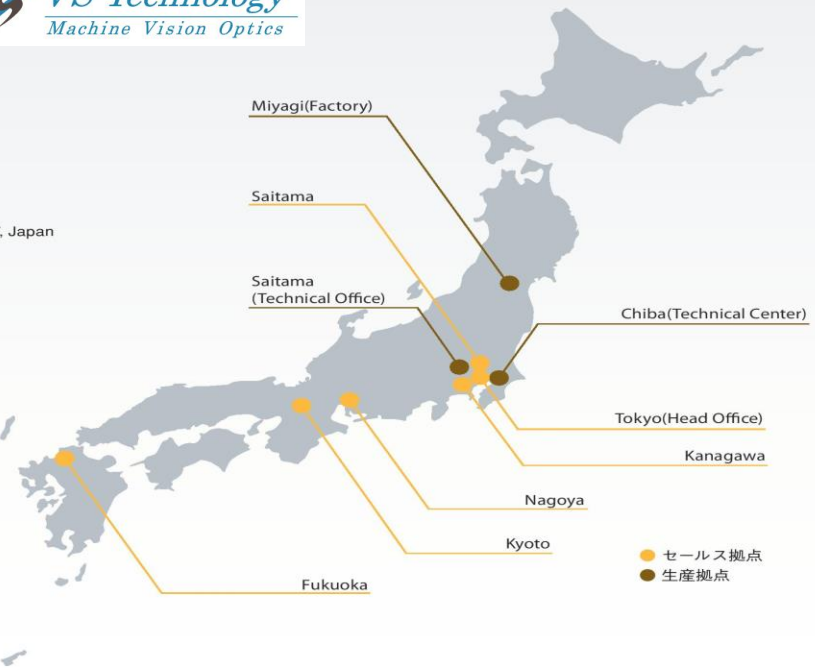

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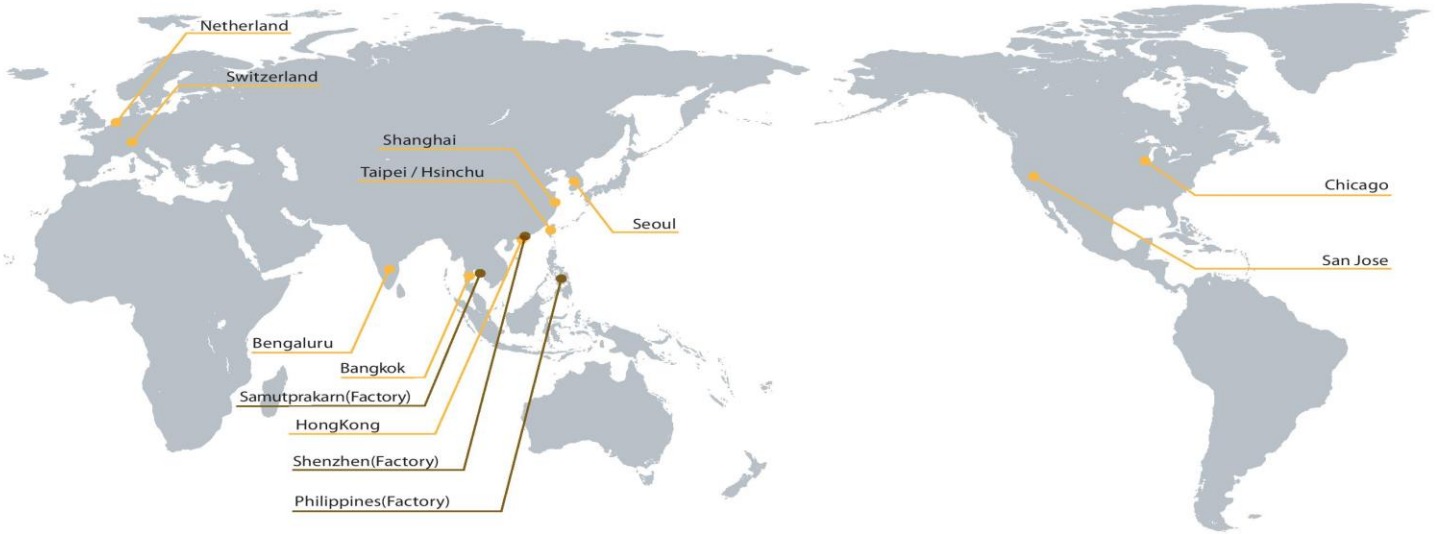

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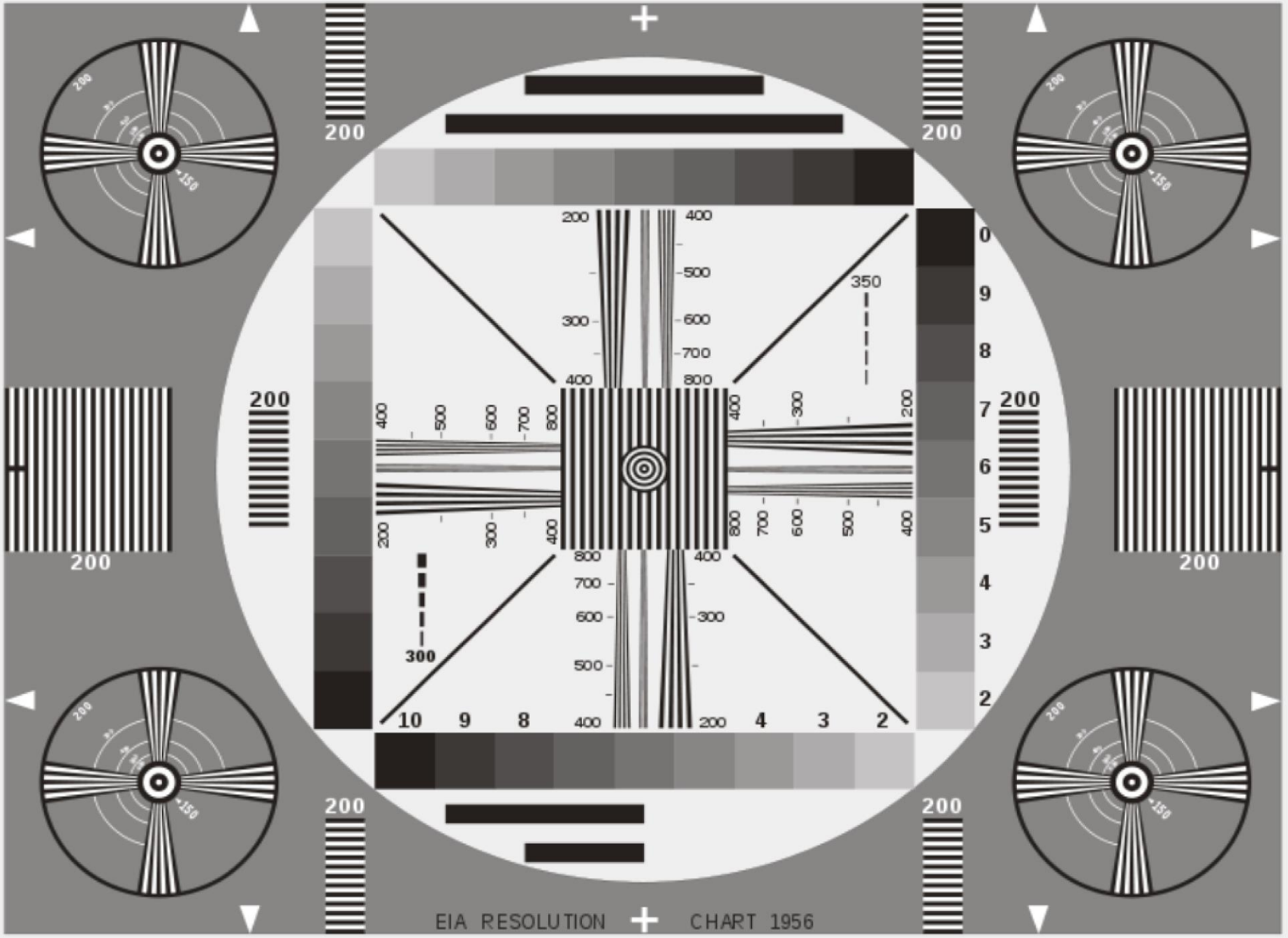
" What is the "best Lens" ?

Myths of "Megapixel" resolution

Resolution(Rozdzielczość) and MTF

Resolution is determined by photographing a chart with lines of various widths, and seeing how far down the lens can still separate and reproduce the lines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EIA RESOLUTION CHART 1956

Spatial Frequency

Spatial frequcny is a measure of the fineness of a grid. It counts the „number of black-white pairs contained in 1mm“.

Resolution and MTF

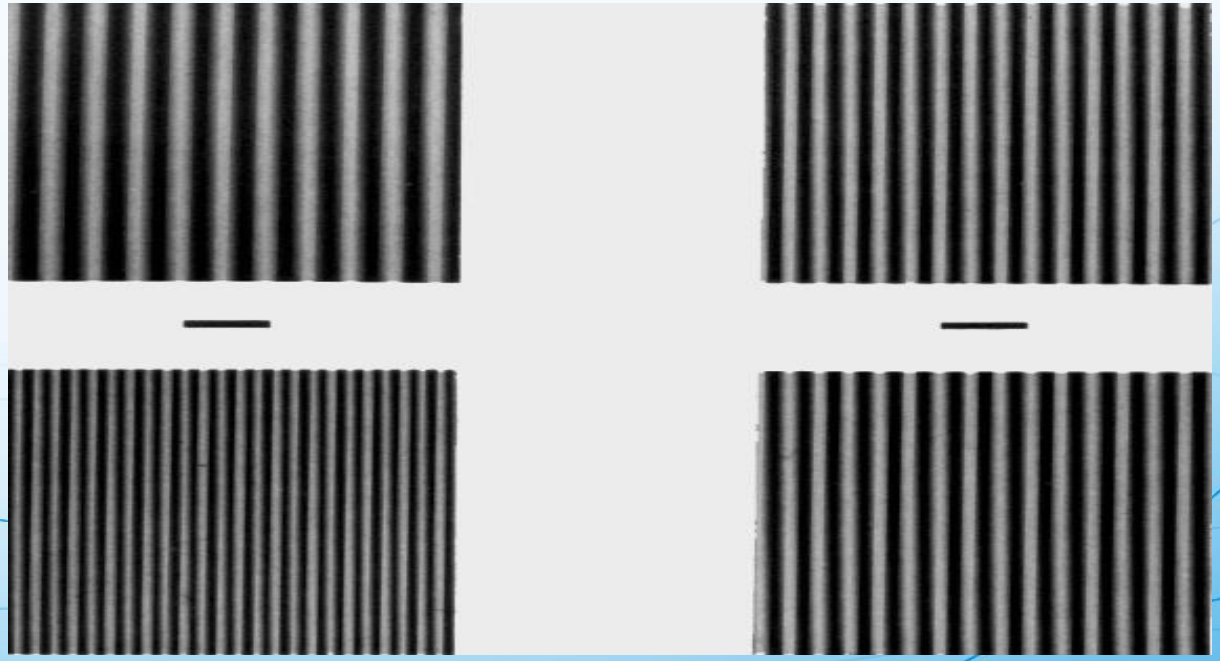
Why a high resolution lens does not necessarily give good image quality?

Because, resolution expresses only the limit value of the lens, and does not tell any about the picture quality.

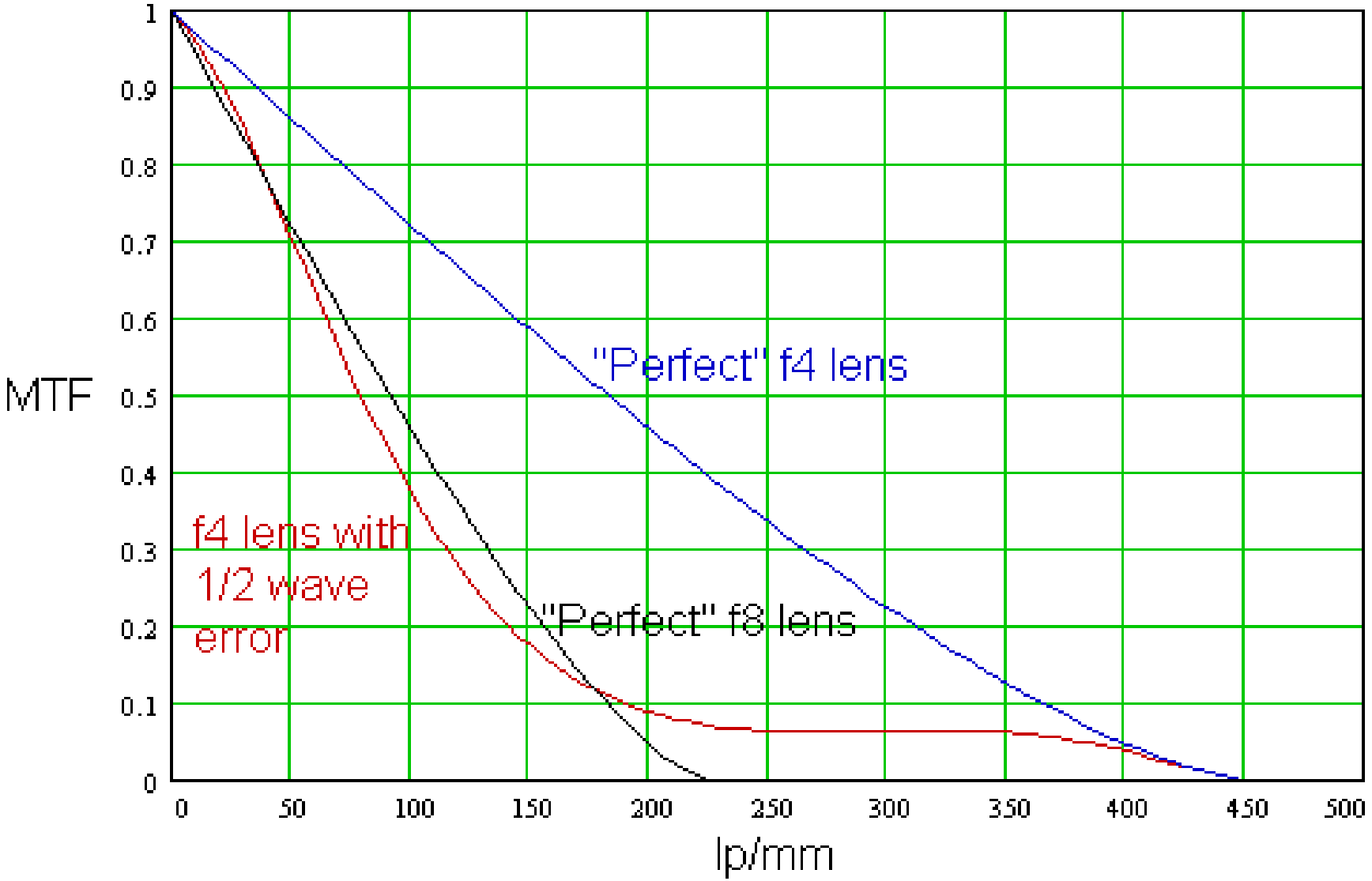
Contrast

- *When the lines are widely separated, 100% faithful contrast is reproduced : white is white, and black is black.*

- *When the lines become so closely spaced, 0% contrast is reproduced : black and white can not be distinguished. The image is a uniform gray.*



How to read the MTF curve

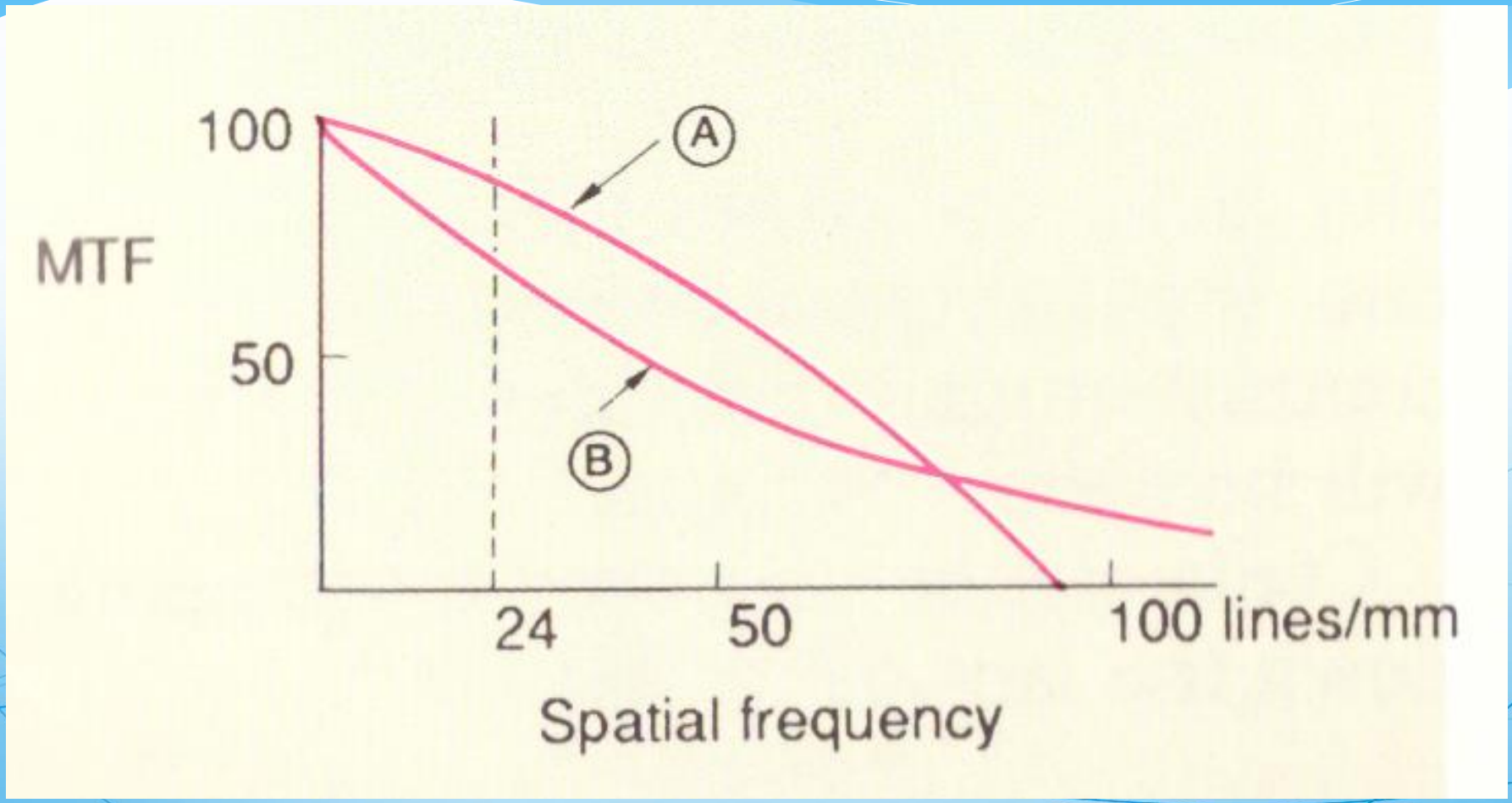


Shortcoming of Resolution

Image Size	Spatial frequency corresponding to 4MHz
1"	16.5 lines/mm
2/3"	24.0 lines/mm
1/2"	33.0 lines/mm

- *NTSC system limits the transmission bandwidth to 4MHz*
- *Therefore, 75 lines/mm or 100 lines/mm does not make an important difference!*
- *What is more import is the reproducibility(=contrast) at 24 lines/mm, for example on 2/3“*

Between Lens Ⓐ and Lens Ⓑ, Which is better?

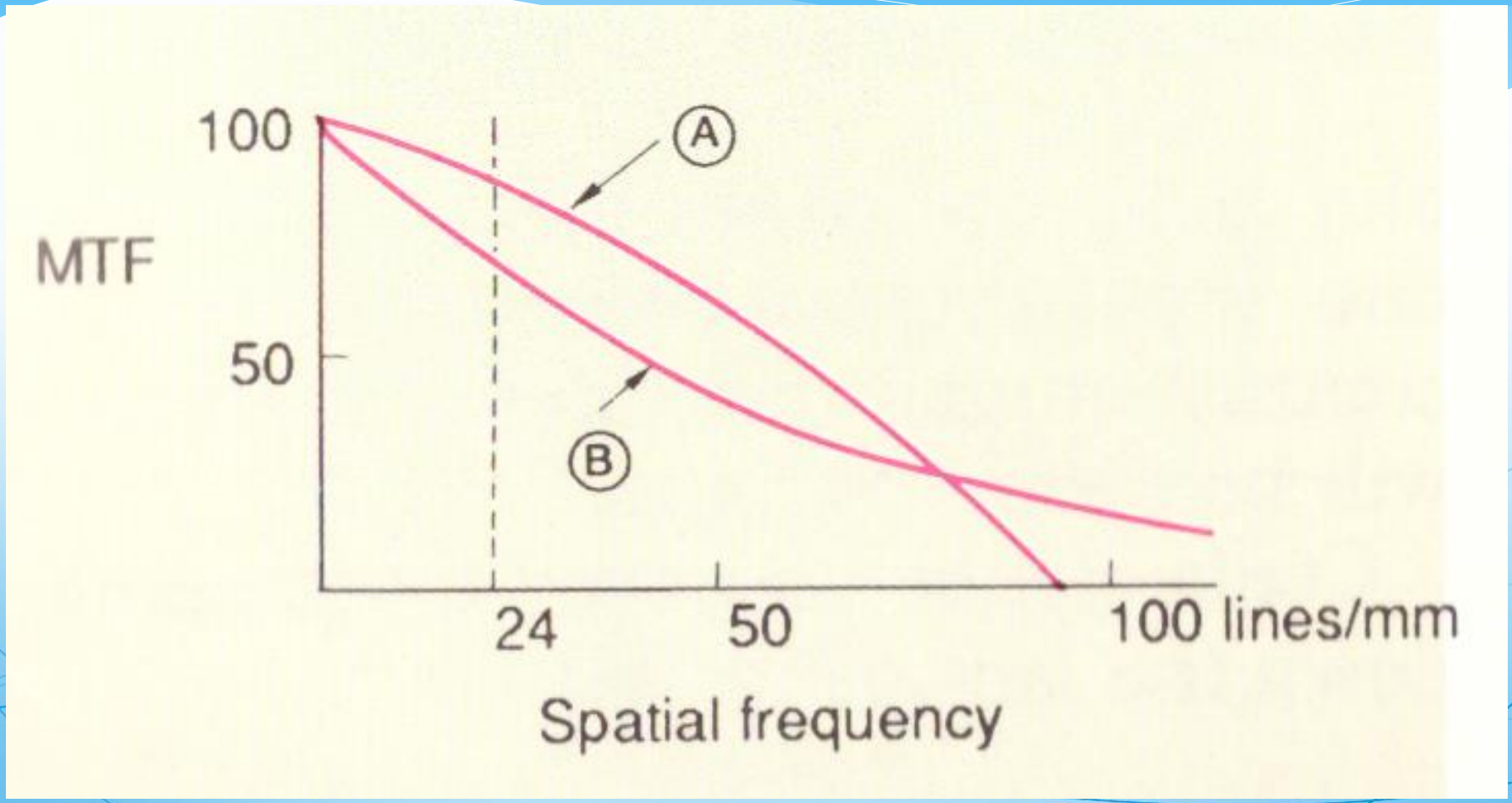


If we compare the Spatial frequcny, Lens Ⓑ wins.

* *The high skirt of MTF curve means that Lens Ⓑ can resolve high spatial frequency*

Lens Ⓑ is a higher resolution than Lens Ⓐ

But, look once again!



* *The transmission band-width of a camera is limited.*

(For a 2/3” camera, it is the contrast at 24 lines/mm corresponding to 4MHz)

* *Lens Ⓐ has the higher MTF at 24 lines/mm than Lens Ⓑ*

Lens Ⓐ is better than Lens Ⓑ!

Table for Format / Number of pixels / spatial frequency

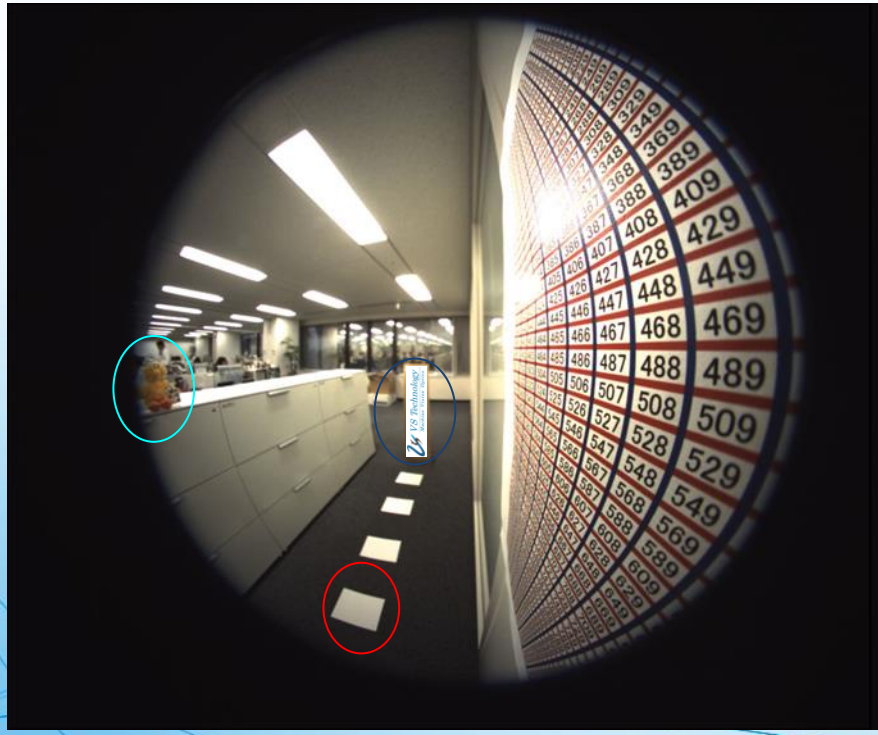
CCTV Format (HxV)	1 MP Line pair par mm	1.3 MP Line pair par mm	1.5 MP Line pair par mm	2 MP Line pair par mm	3 MP Line pair par mm	5 MP Line pair par mm	10 MP Line pair par mm
1/4 inch 3.6x2.7		183	196				
1/3 inch 4.8x3.6	120	137	147	170	208	269	380
1/2 inch 6.4x4.8	90	103	110	127	156	200	285
2/3 inch 8.8x6.6	66			93	114	147	207
1 inch 12.8x9.6	45			64	78	100	143
1.8 inch 23x17.3	25			35	43	56	79
2.5 inch 32x24	18			26	31	40	57

" What is the "best Lens" ?

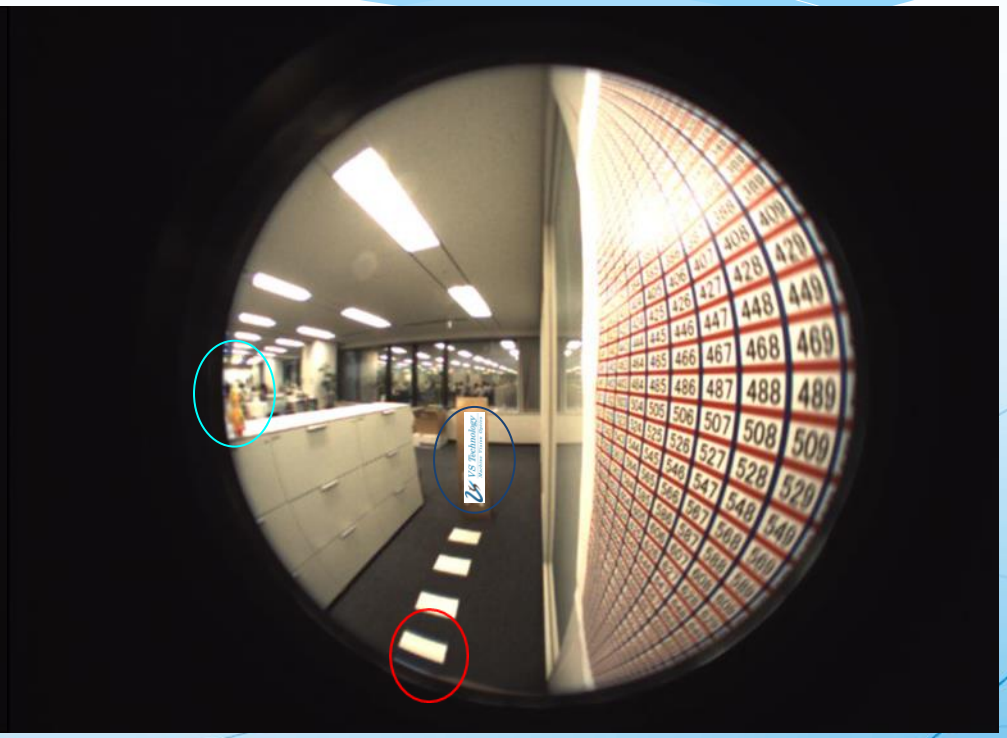
Remember the purpose

Between Lens Ⓐ and Lens Ⓑ, Which is better?

Ⓐ

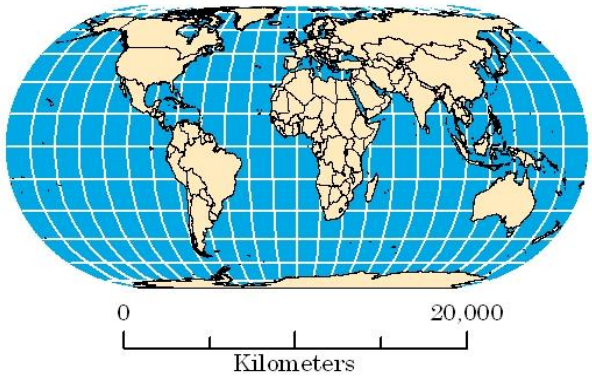


Ⓑ

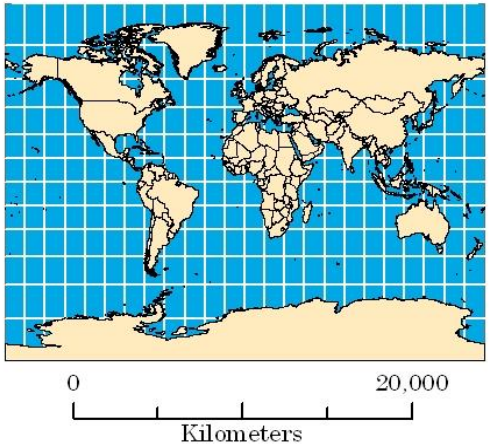


Four World Map Projections

Eckert IV



Gall Stereographic



Polyconic

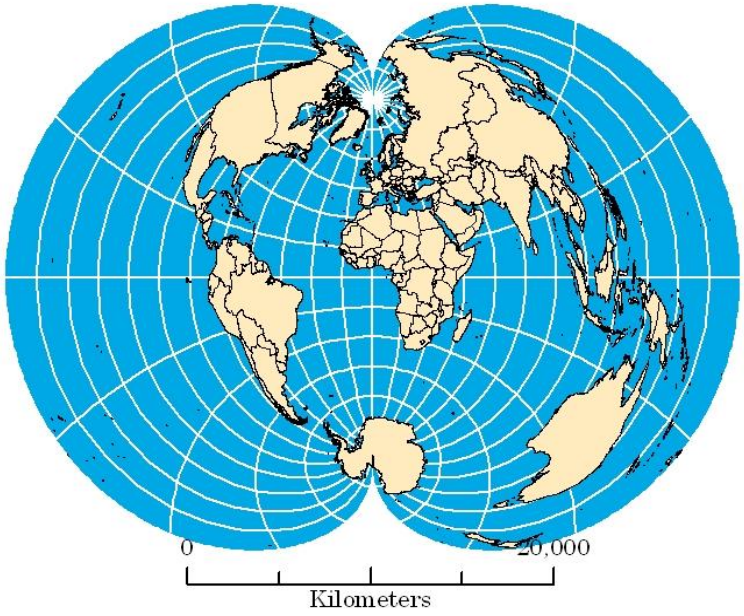
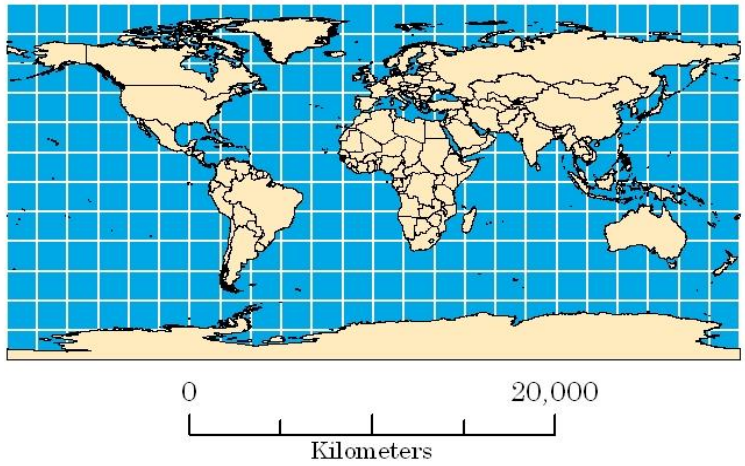


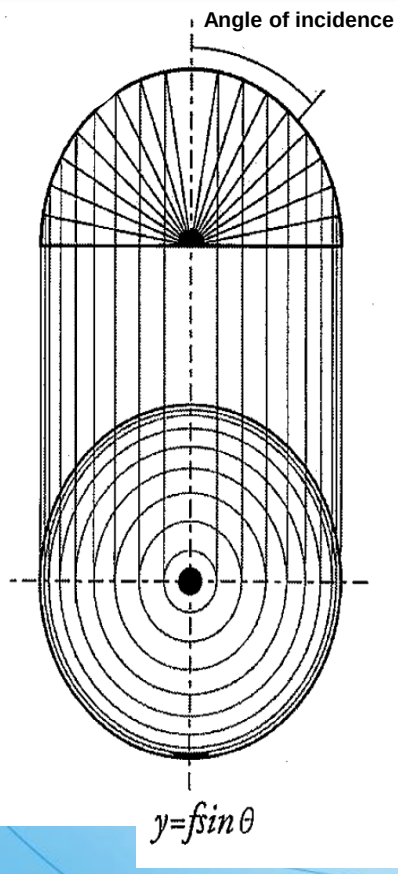
Plate Carree



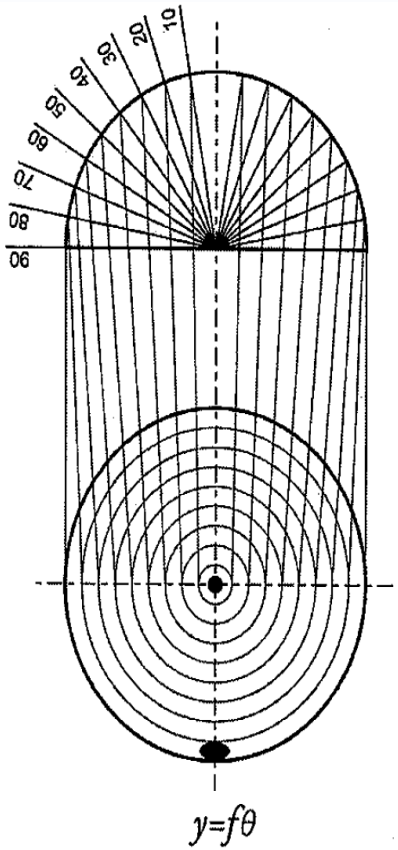
Created by Fritz Kessler 09/14
Source: ESRI Data 2008

Difference of projection / How to project a sphere onto plane

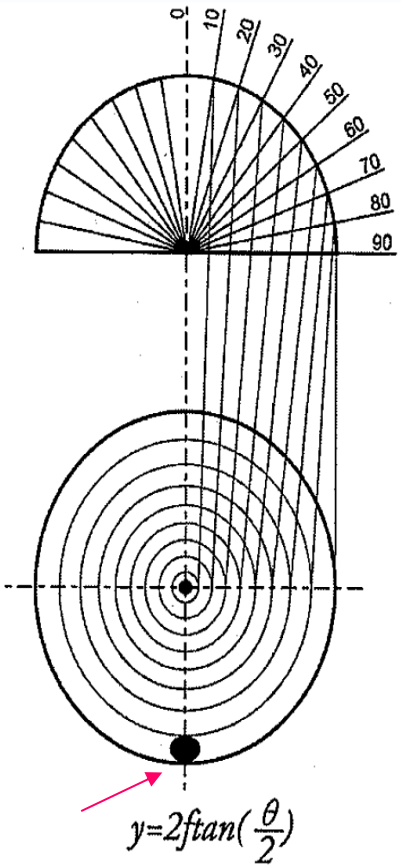
Orthogonal projection



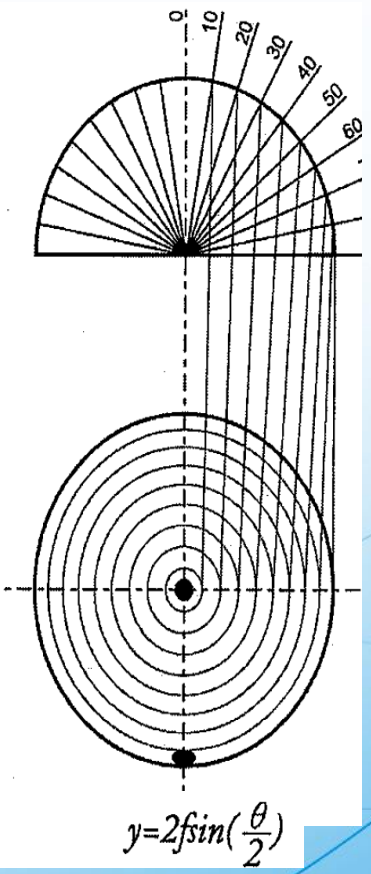
Equidistance projection



Stereographic projection

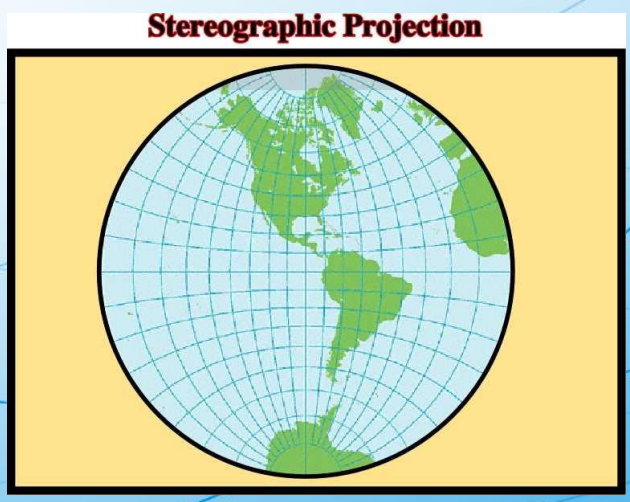


Equisolid angle projection



Stereographic Projection

- Used to map spherical panoramas - it preserves angles
- Areas close to the edge retain their shape, and straight lines are less curved



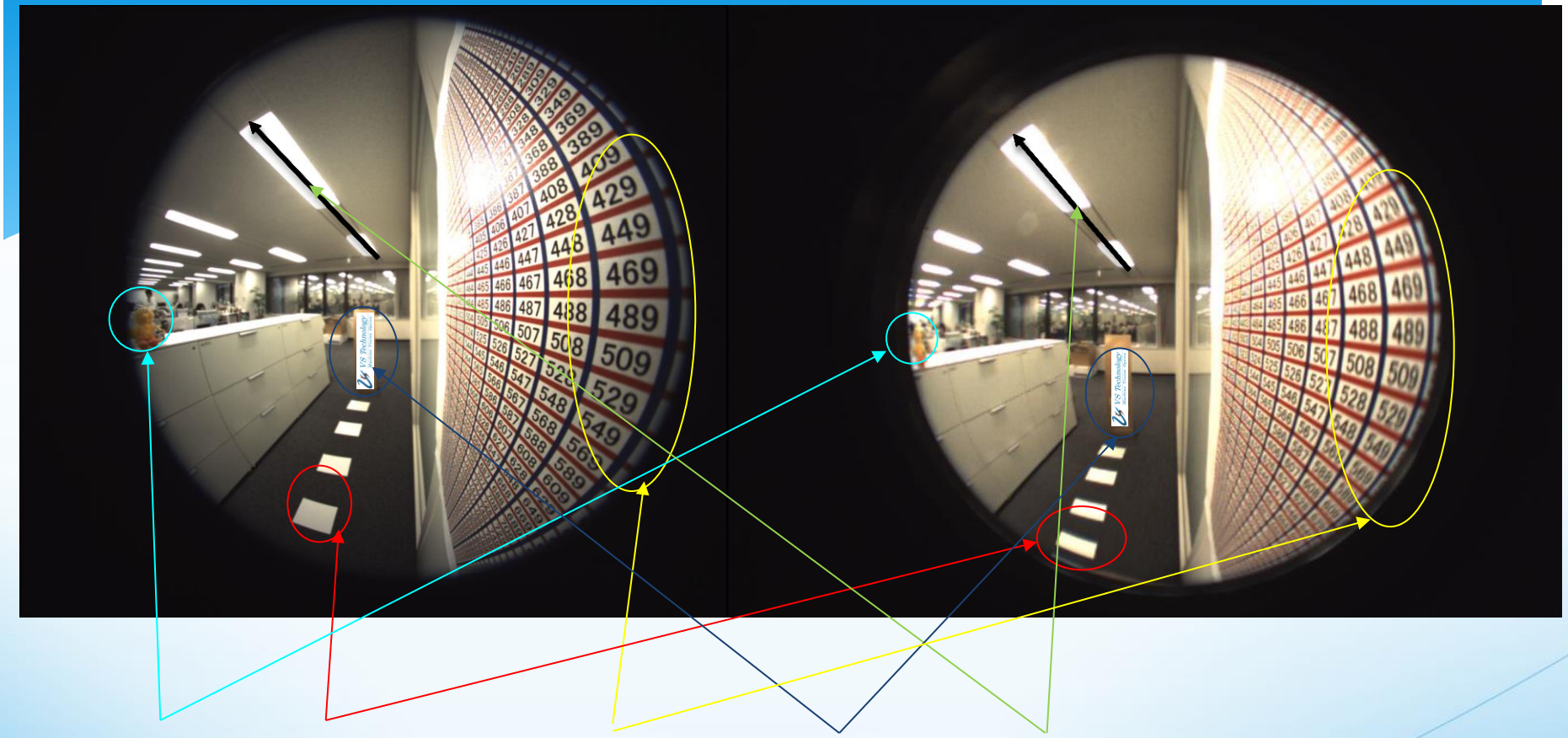
Equidistance projection

- Used to map the airline distances from the center point - distance is proportional to angle

- Distances are correct between points along straight lines through the center only. Distortion of areas and shapes increases dramatically to the edge

Stereographic projection

Equidistance projection



Notice the shape of the BigBird, A4 paper, and Numbers. One keeps the original angle, while another doesn't.

Notice the length and the height difference. One keeps the original length, while another doesn't.

Lens Ⓐ and Lens Ⓑ are both good Lens. You need to decide how and what you want to see!

Conclusion :-

When you choose the lens

1. Mind Contrast vs Resolution

2. Remember Purposes

For further infor, visit

https://www.vst.co.jp

Thank you