The Di Marzio-Davis Equations for Percent of MAOFD

(For use with fixed-base stereo cameras)

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The Di Marzio-Davis Equations for % of MAOFD allow you to create a simple table of On-Film Deviation vs. f/number that can be kept in your camera bag, ready for use. After using the Depth of Field scale on your lens (or some other means of calculating DoF) to determine the f/number which provides nominal Depth of Field for the scene you are about to shoot, On-Film Deviation (the amount of "depth" your fixed-base stereo camera will record, expressed as a percentage of Maximum Acceptable OFD) can bedetermined by looking at the table this spreadsheet produces.

For information about the origin of the **Di Marzio-Davis Equations**, see the Notes tab at:
http://home.globalcrossing.net/~zilch0/tools/DiMarzio-Davis.xls

For Free Viewing:

(and for Infinity-focused stereo viewers with lenses matching focal length of the camera lenses)

% of MAOFD = B / (Fc^2 / N / 6000 / Ca)

Where **B** is the stereo base (lens separation) of your stereo camera, **Fc** is the camera focal length, **N** is the f/number indicated on your Depth of Field scale or table, and **Ca** is the permissible Circle of Confusion diameter that was used to calculate Depth of Field.

For Use with Stereo Viewers:

% of MAOFD = B / (Fc * Di * Fv / (6000 * Ca * N * (Fv + Di)))

Where **B** is the stereo base (lens separation) of your stereo camera, **Fc** is the camera focal length, **Di** is the virtual image distance at which the viewer is focused (not the physical lens-to-film distance), **Fv** is the viewer focal length, **N** is the f/number indicated on your Depth of Field scale or table, and **Ca** is the permissible Circle of Confusion diameter that was used to calculate DoF.

How to determine the actual Circle of Confusion diameter that was used to produce a lens barrel Depth of Field scale (or a manufacturer's Depth of Field table).

Reference: http://nzphoto.tripod.com/stereo/3dtake/Di_Marzio_Equation_Technical_Web.pdf

On page 5 of Frank Di Marzio's technical paper, we see this example of how to read the hyperfocal distance for a given f/number:

The following example illustrates how to find the hyperfocal distance for f/8. This depth of field scale is from an old Minolta lens.

With f/8 set to infinity, the nearest distance in good focus is 5m. Consequently since 5m corresponds to half the hyperfocal distance, then at f/8 the hyperfocal distance is 10m.

Here is Frank's equation from page 7, rearranged to solve for Ca, the actual Circle of Confusion used to calculate DoF.

Ca = Fc^2 / Dh / N

Where **Dh** is the hyperfocal distance indicated on the lens barrel's DoF scale, spinning disk DoF calculator, DoF tables, or any other type of DoF calculator; **Fc** is the camera focal length, **Ca** is the **actual** Circle of Confusion diameter used to generate the DoF scale, and **N** is the f/number currently opposing the near and far point distances on the DoF scale.

This equation allows you to determine what CoC value was used by the manufacturer to produce the DoF scale on your lens.
Revisit the example photo of the Minolta lens barrel, above, to see where the values come from.
In that example, Fc = 50mm, Dh = 10000mm, and N = 8mm, for a resulting Ca of 0.03mm.

It doesn't matter which f/number you select to perform this calculation as long as you make sure that a hyperfocal distance can be read easily from the distance scale when the chosen f/number is opposite the Infinity symbol.

The latest version of the spreadsheet that implements these equations can be found at:

http://home.globalcrossing.net/~zilch0/tools/DiMarzio-Davis_for_OFD.xls

(There are underscore characters in the file name, not blanks.)