Astro-Physics
Optimizing Your Field Flattener / Lens / Camera Combination

There are a number of variables that come into play when using refractors with CCD cameras. The large chips and small pixel size in today's cameras make things even more challenging.

Field flatteners are designed with the goal to exactly counter the inherent inward curvature and bring the star size down by a factor of about 50 (down to about 5-6 microns), and make it perfectly round. By and large that's what our field flatteners are designed to do, but this exact cancellation is dependent on the exact focal length of the scope and the exact placement of the flattener optics with respect to the chip.

A small difference in the scope focal length from ideal can require a different chip to flattener distance. If the distance is too short or too long, you will get imperfect cancellation of the field curvature/astigmatism, and you will get slightly larger stars and small amount of oval astigmatism and or coma. Therefore, to get better star shape for large chips, the chip to flattener distance will need to be modified somewhat (perhaps a few mm inward or outward).

The first thing would be to determine the shape of the left over field curvature and whether it is inward or outward (undercorrected or overcorrected). There is a very easy way to determine that by simply measuring the perfect focus point of the corner stars versus the perfect focus point of the stars in the center of the chip. If you have simple field curvature, then all the corner stars will have the same focus points where they are smallest, but if your camera has any tilt, then the field flattener will not correct all the corners the same.

First determine the exact focus point of stars near the center. Then choose a corner star and focus on it. If you have to move the focuser forward (toward the objective lens), then your field curvature is undercorrected and you will need to move the chip back a few mm more. For the 160FF and our QUADTCC telecompressor, we have 1mm spacer rings that you can use to add some distance to your spacing. We sell them in sets of 3 (part # A5025SET).

If you have to move the focuser outward to get sharp corner stars, then your flattener to chip distance is too great and you will have to reduce the distance between flattener and chip.

In either case, just looking at an image with defocused stars in the corners one cannot determine whether the field is inward or outward curving (under or over corrected). Inspection programs like CCD inspector also cannot tell which way the field is curved, but by noting the focus difference and direction between center and corner stars, you can tell which way you need to change the spacing.

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