Status report on L 1527 analysis

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Giles

The source was observed during two nights in Nov. 2007. Due to the inadvertent change in the sharc-ii gain between nights 1 and 2, its non-trivial to combine these.

I have analyzed the data in two different ways: (method 1) "my way" that follows the recipe outlined in my DG Tau memo of May 2007; and (method 2) "John's way" in which I tried to replicate the result that John sent to Brenda on March 13. Since I had access to the zamin directory that John used, this was not too hard.

John was able to combine the data for the two nights because he uses the second term in the background subtraction code which fits for a gain change. I accomplished the same thing by determining the magnitude of the gain change (a factor of 7.8) and then adding (ln(7.8)/25)/sec(z) to the tau for night 2.

Both methods use smoothed tau. I use values from Mike. John uses the same values, though I think he may have produced them himself. (Though recall that for my method the tau values are modified to reflect the inadvertent gain change.) Both John and I used the RGM file that is posted on the teamsite. Both methods use the standard flag values (see my DG Tau memo) with the following differences:

	method 1	method 2
sharpinteg_2	-w -em	-c
ps, pm	6, 6	9.5, 12.0
bg	10, 0	5, 5
pointing corr.	yes (fitgauss)	no
i.p. corr.	yes	no

The source is very easy to see in every single cycle so pointing corrections (for method 1 only) were done using fitgauss. For a few files, the fit was bad, so interpolation of FAZO/FZAO was carried out for these.

The plots that follow show results obtained with the two methods. In all cases, red is 3 sigma, blue is 2 sigma, and vectors are plotted every ~4 arcseconds using skipv=2 (i.e. not independent of one another). The key does not show up in the "ps" output so I will give it here: 4% is equivalent to 19". (I am showing P, not inferred B.) The Method 2 result that I show in Figure 1 below (right hand map) is identical to the one that John sent out on March 13 except that it shows more vectors (skipv=2 instead of skipv=4).

Figure 1: left shows Method 1 result and right shows Method 2 result:

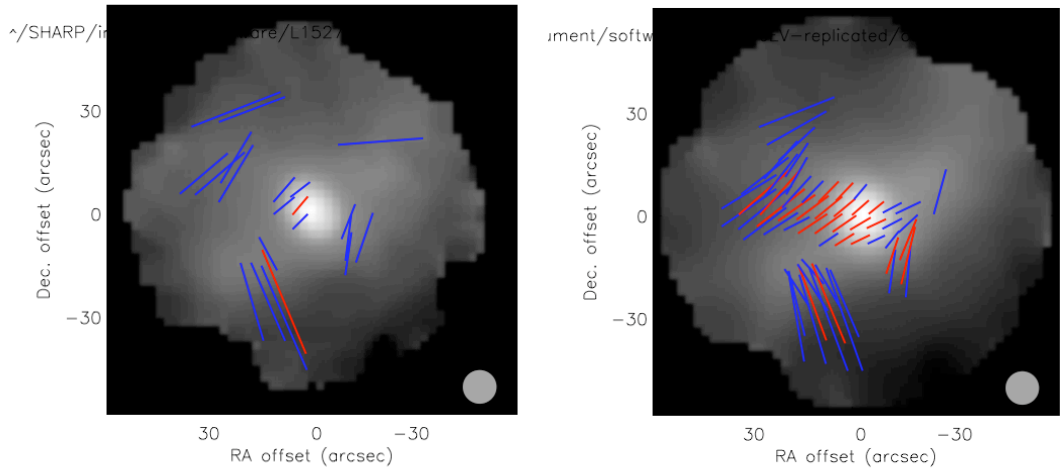


Figure 2: left shows Method 2 result, but with i.p. correction added; and right shows Method 2 result, but with i.p. correction and pointing correction ("list4"; see below):

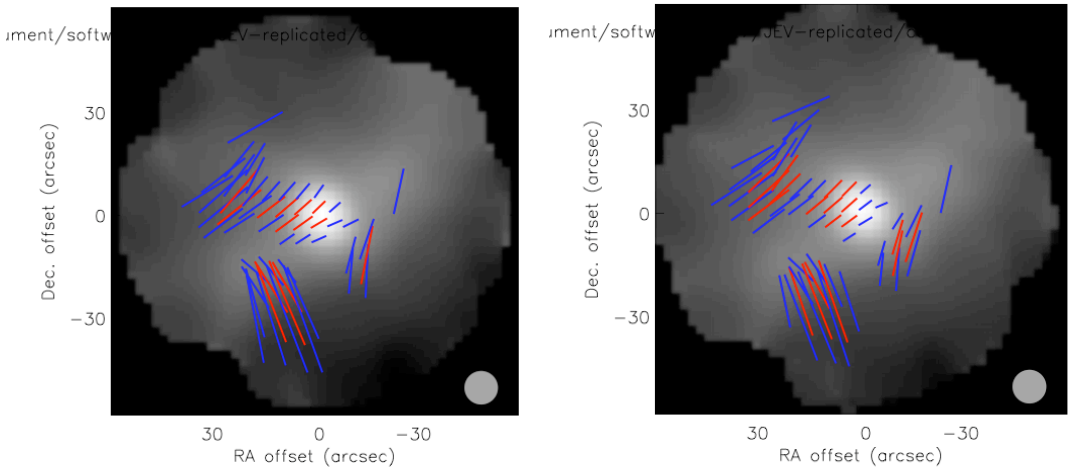
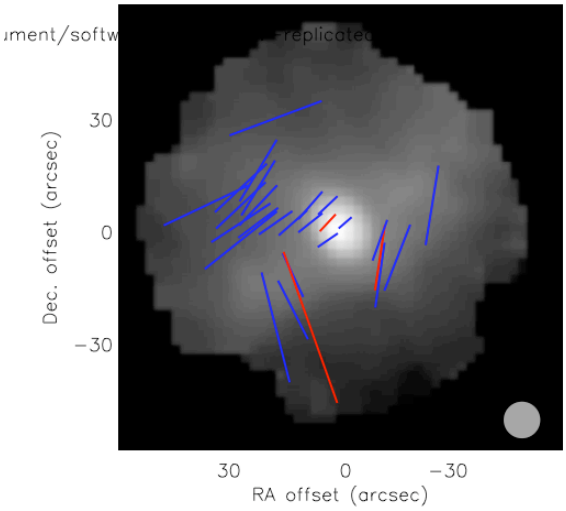


Figure 3: Method 2 result, but with i.p. and pointing corrections added, and with smoothing done just as in method 1 (compare this with left image of Figure 1):



Conclusion: A marginally significant detection of polarization is indicated, and this conclusion seems fairly robust and independent of analysis method used. What is required is to do a reduced-chi-squared test in order to check the validity of the result, and to (hopefully) improve the significance. Some ideas for the latter appear in the "additional notes" below.

Additional notes:

(Note 1) I looked at every single sharpinteg map (I, Q, and U) and did not find any obvious garbage. But I could look again, or I could try to learn how to use Mike's reduced-chi-square code in "outlier-rejection" mode.

(Note 2) I could look at the Q and U rather than q and u. Then I could try to subtract an overall DC level from the Q and U maps. This could be done in matlab. Tristan plans to do this for the DG Tau data.

(Note 3) Only 55% of our 144 polarimetry pixels are usable. (For the others, either H or V is labeled as a "bad pixel" in the RGM.) This is down from something like 73% in August. I don't know what caused the change. The number of pixels labeled on our run-median teamsite RGM files as dead or noisy has grown from the August run to the November run. Several of us are working to understand this. We could try to reduce the number of bad pixels by "unflagging" supposedly noisy pixels. This "unflagging" could gain us 30% more data, assuming that sharc-ii was in fact not truly noisier in November than in previous runs (e.g., February, August).

(Note 4) Based on a comparison with DG Tau, the source is not 15 Jy, as stated in our Table of Sources. It is more like 8 Jy. Maybe the flux in the Table is just wrong. Alternatively, either SHARP or SHARC-II has lost a factor of 2 in sensitivity since Feb. 2007, or DG Tau is really 10 Jy, not 5 Jy as given in the published literature. Yet another possibility is that the DSOS was not working properly in November. I think this can have a significant effect on signal strength.

(Note 5) "listfiles" used for analysis:

Here is "list4"; used for Method 1 analysis:

40543_int.fits 0.050 -140 92
40544_int.fits 0.049 -143 92
40545_int.fits 0.048 -143 93
40546_int.fits 0.048 -142 91
40547_int.fits 0.047 -142 91
40548_int.fits 0.046 -143 90
40549_int.fits 0.046 -144 89
40550_int.fits 0.045 -141 91
40551_int.fits 0.045 -139 90
40552_int.fits 0.044 -141 90
40553_int.fits 0.044 -143 89
40554_int.fits 0.043 -145 89
40635_int.fits 0.1247 -133 91
40636_int.fits 0.1241 -134 91
40637_int.fits 0.1235 -135 90
40638_int.fits 0.1228 -136 89
40639_int.fits 0.1221 -136 88
40640_int.fits 0.1211 -136 88
40641_int.fits 0.1202 -137 88
40642_int.fits 0.1193 -136 88
40644_int.fits 0.1158 -136 88
40645_int.fits 0.1147 -136 88
40646_int.fits 0.1135 -136 88

40647_int.fits 0.1123 -136 88

40648_int.fits 0.1109 -136 88

40649_int.fits 0.1106 -137 88

40651_int.fits 0.1090 -137 88

40652_int.fits 0.1075 -138 88

40653_int.fits 0.1060 -139 88

40654_int.fits 0.1055 -139 88

40655_int.fits 0.1039 -138 87

40656_int.fits 0.1030 -137 88

40657_int.fits 0.1014 -138 88

40658_int.fits 0.1007 -138 88

40659_int.fits 0.1000 -138 88

Here is "list"; used for Method 2 analysis:

40543_int.fits 0.050

40544_int.fits 0.049

40545_int.fits 0.048

40546_int.fits 0.048

40547_int.fits 0.047

40548_int.fits 0.046

40549_int.fits 0.046

40550_int.fits 0.045

40551_int.fits 0.045

40552_int.fits 0.044

40553_int.fits 0.044

40554_int.fits 0.043

40635_int.fits	0.045
40636_int.fits	0.045
40637_int.fits	0.045
40638_int.fits	0.045
40639_int.fits	0.045
40640_int.fits	0.045
40641_int.fits	0.045
40642_int.fits	0.045
40644_int.fits	0.044
40645_int.fits	0.044
40646_int.fits	0.044
40647_int.fits	0.044
40648_int.fits	0.044
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40656_int.fits	0.047
40657_int.fits	0.047
40658_int.fits	0.048
40659_int.fits	0.049