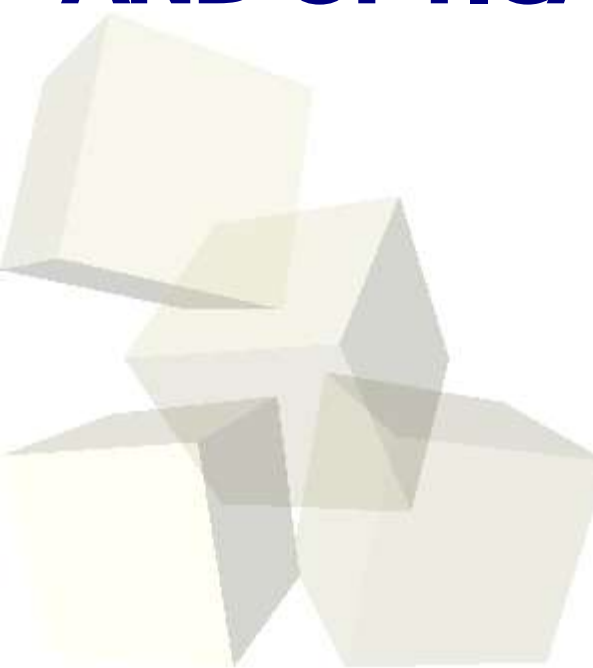




ix evn symposium – bologna, italy

HINTS OF HIGH CORE FARADAY ROTATIONS FROM A JOINT ANALYSIS OF VLBA AND OPTICAL POLARIZATION DATA



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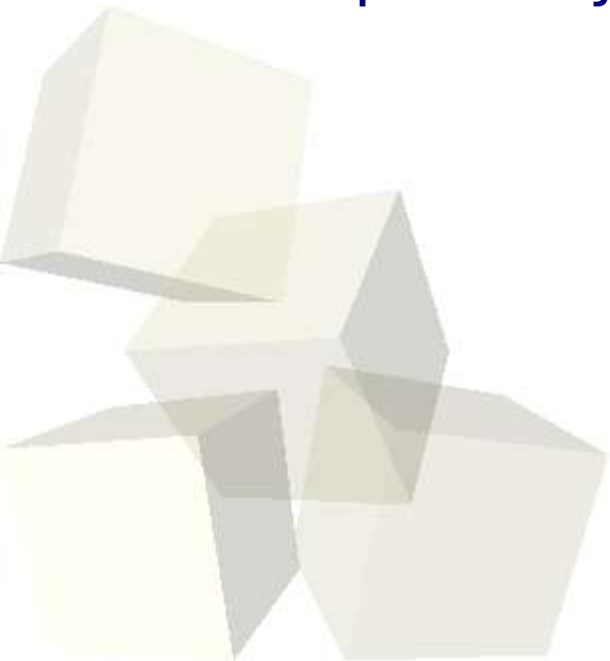


- Motivation
- Correlations
- Some Interesting Cases
- Feasibility
- Conclusions



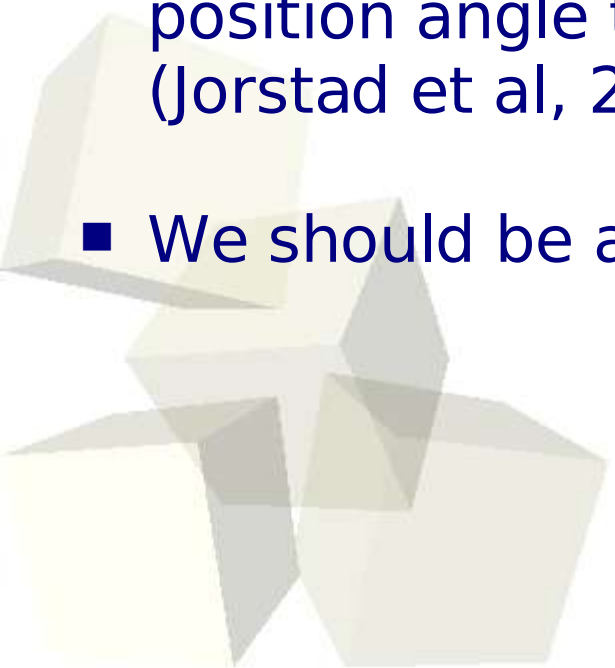


- Blazars are powered by synchrotron radiation
 - ◆ Range: from Radio to (soft) X-ray
 - ◆ The same process is responsible of emission at all wavelengths
- Should we expect a correlation among all those wavelengths?
 - ◆ Extrinsic phenomenae
 - ◆ Cospatiality?



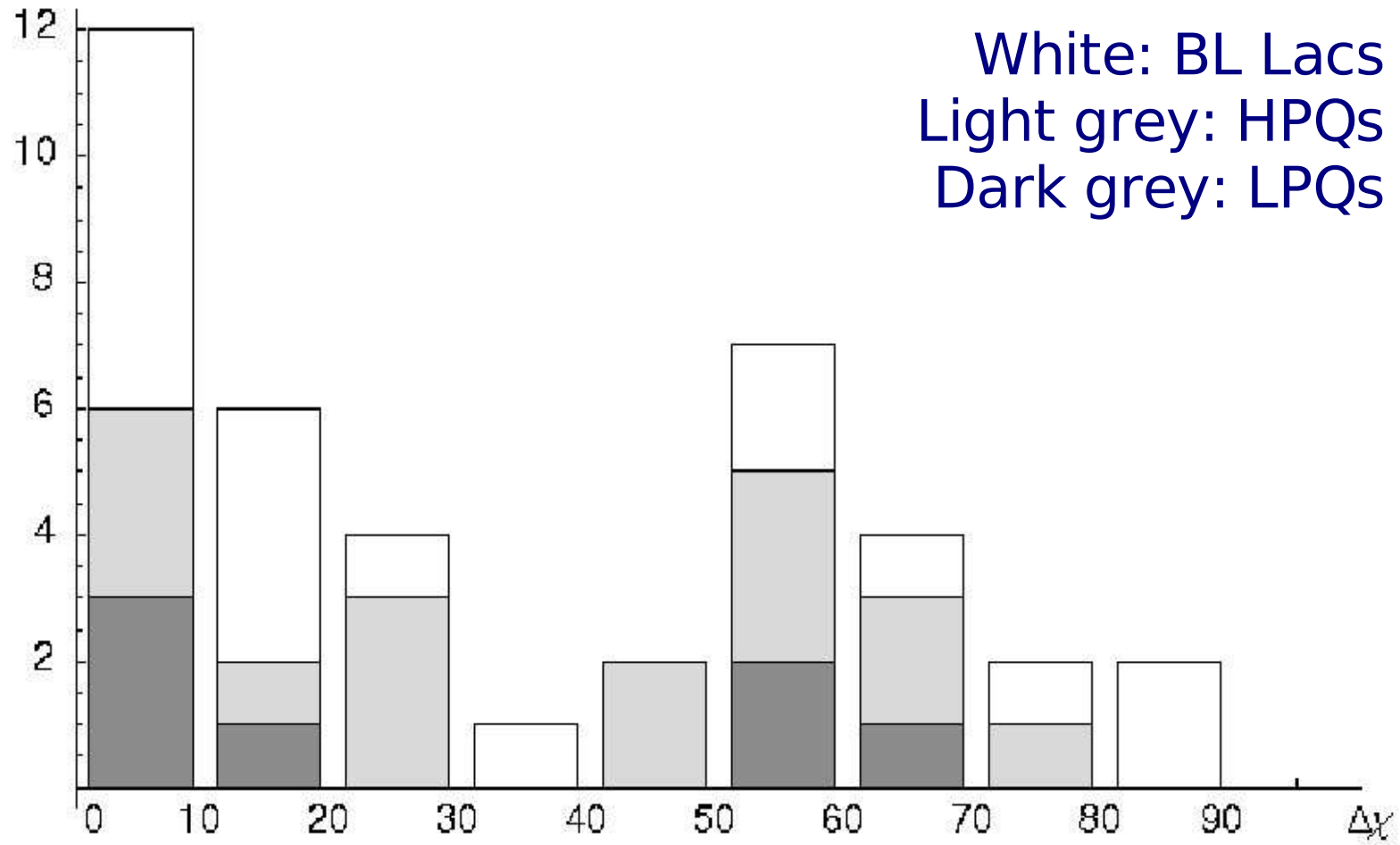


- “We have found a striking correlation between optical and high frequency VLBI core polarization angles, corrected for the observed FR” (Gabuzda et al, 2006)
- “The 43GHz core and optical EVPAs [of 0420-014] varied in a similar manner, following each other remarkably well over a range of $\sim 80^\circ$ ” (D’Arcangelo et al, 2007)
- “In highly optically polarized sources the optical polarization position angle tends to align with the EVPA in the VLBI core” (Jorstad et al, 2007)
- We should be able to find correlations too!





- ...but we don't!

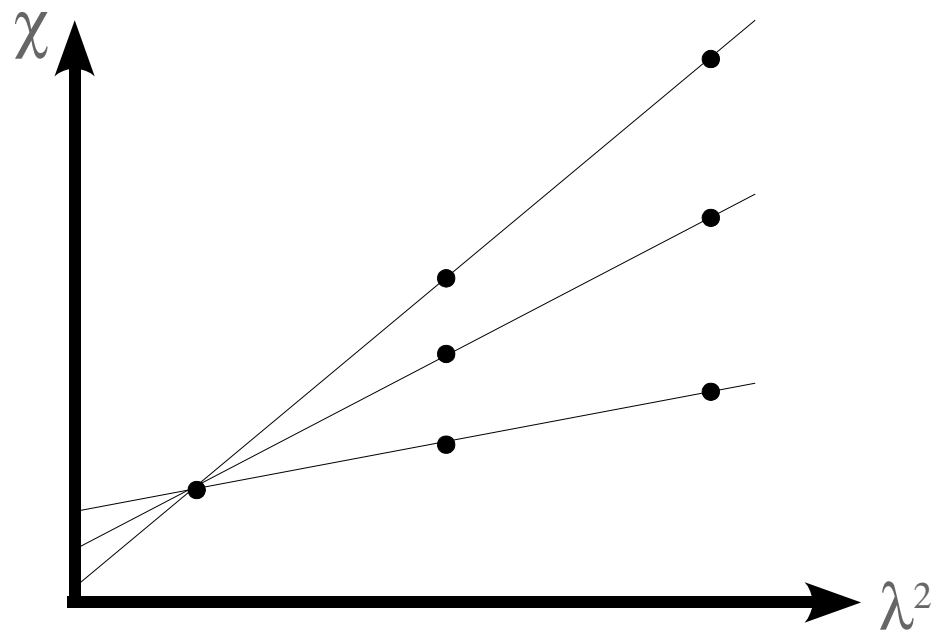
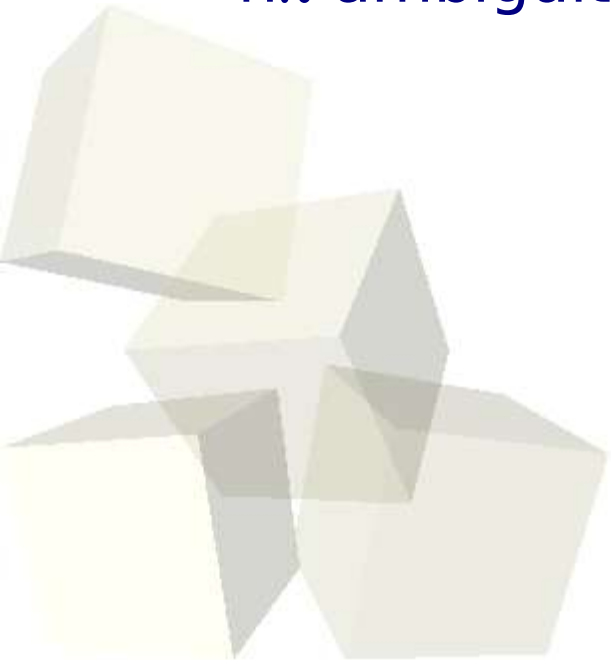




- How can we explain this difference between blazars and quasars?
 - ◆ Either they have indeed different properties or...
 - ◆ Due to their orientation, quasars have normally higher Faraday Rotation

- Are we fitting properly?

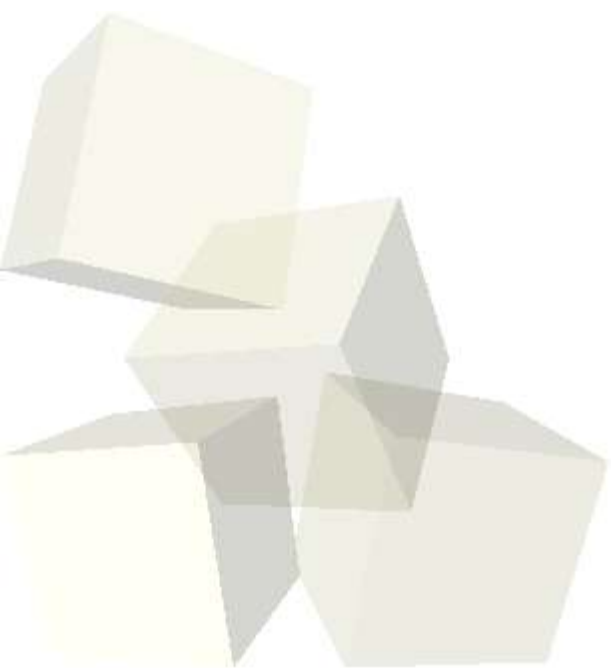
- ◆ $n\pi$ ambiguities





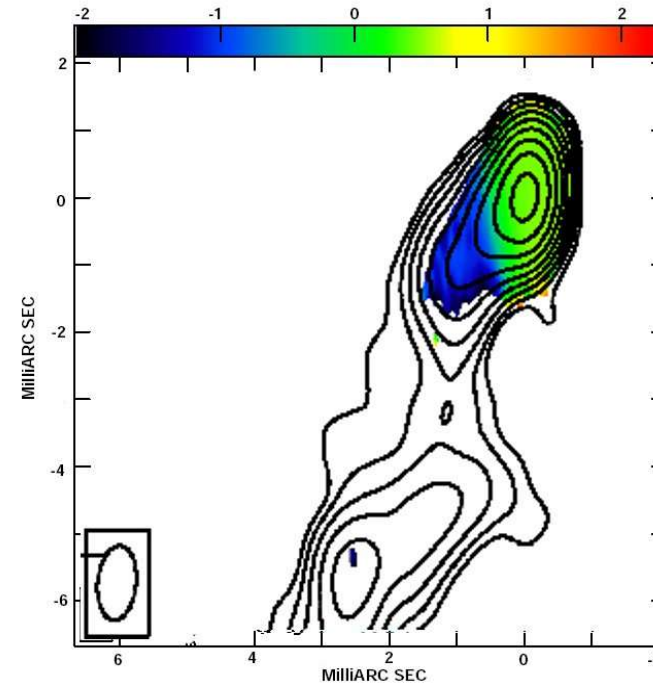
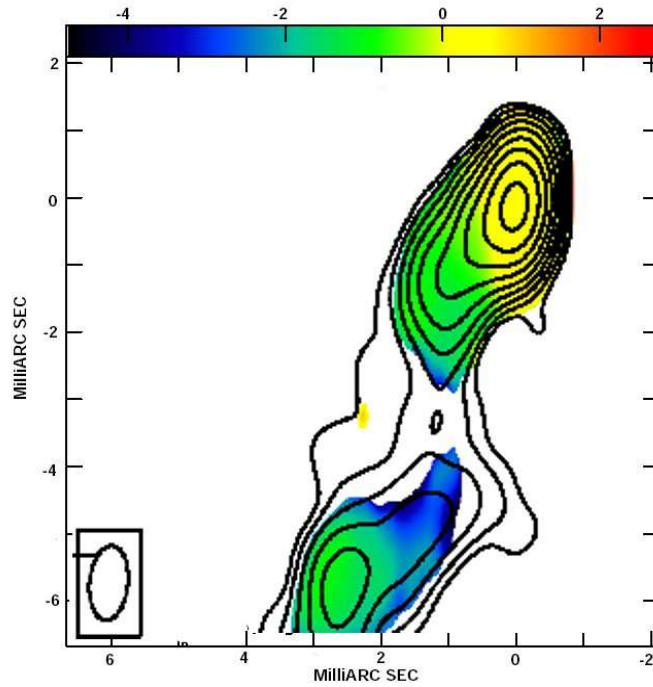
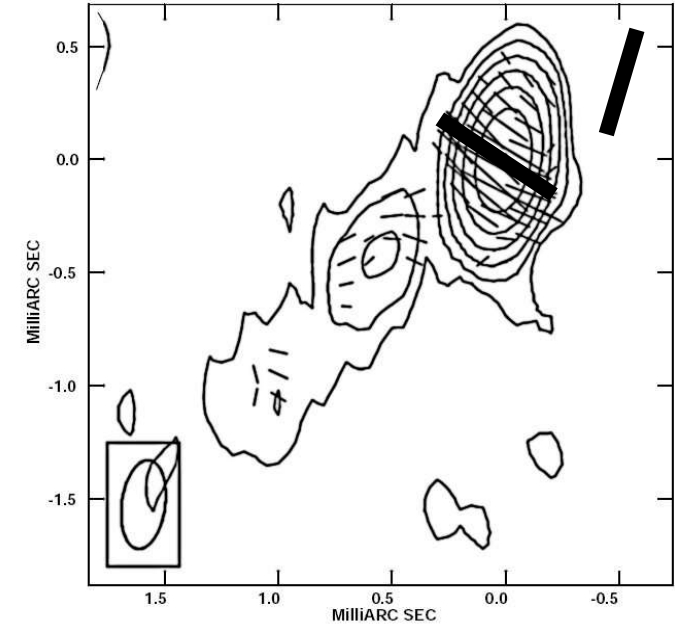
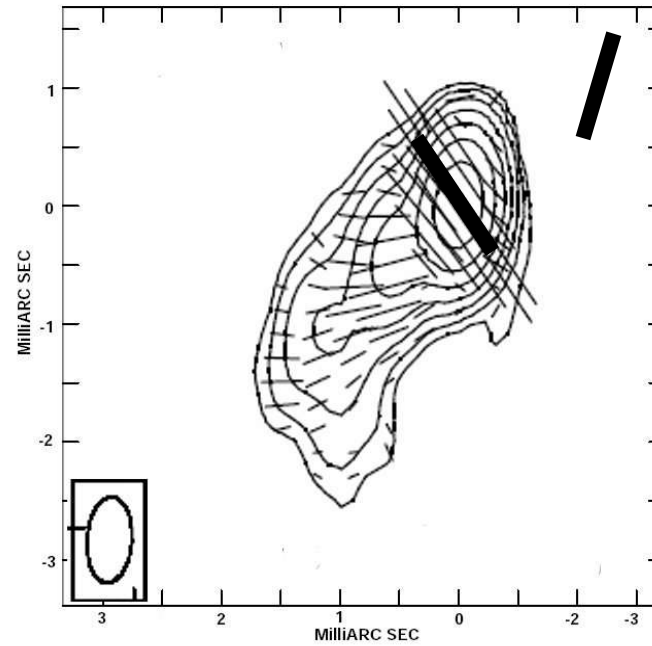
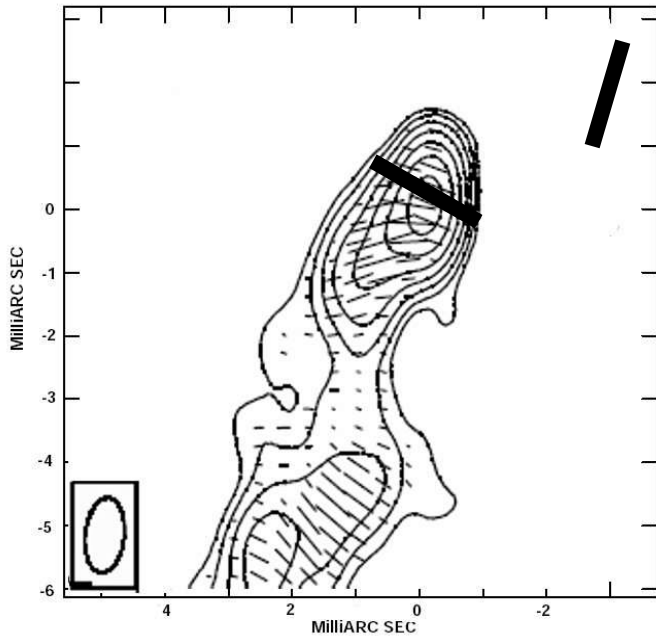
Some Interesting Cases

- A 90° flip in the EVPA could not only mean a thin – thick transition, but a hidden high Faraday rotation
- A $RM \sim 0$ could indicate a lot of things: small FR (unlikely for quasars?), internal FR or... hidden rotation of about 180°
- A fit of the RM which doesn't seem to follow a λ^2 law could indicate we are fitting the wrong angles ($n\pi$ ambiguities)



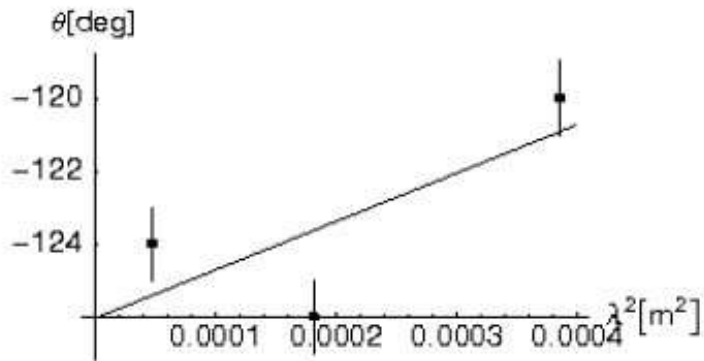
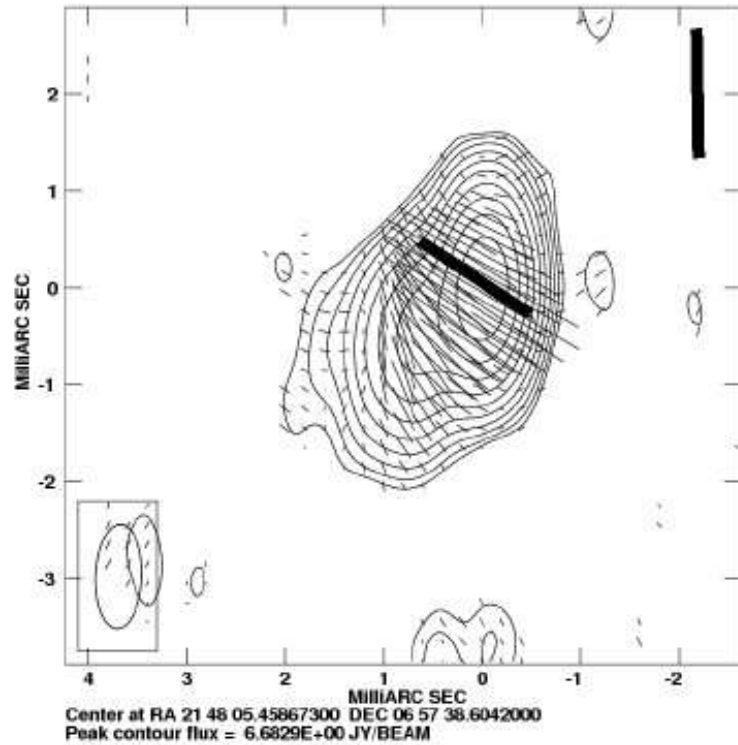


Some Interesting Cases: 2230+114

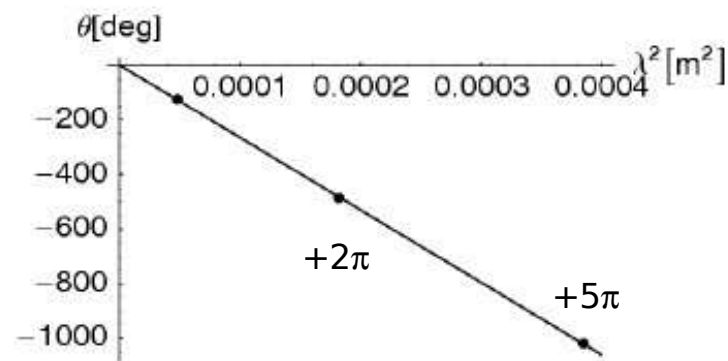
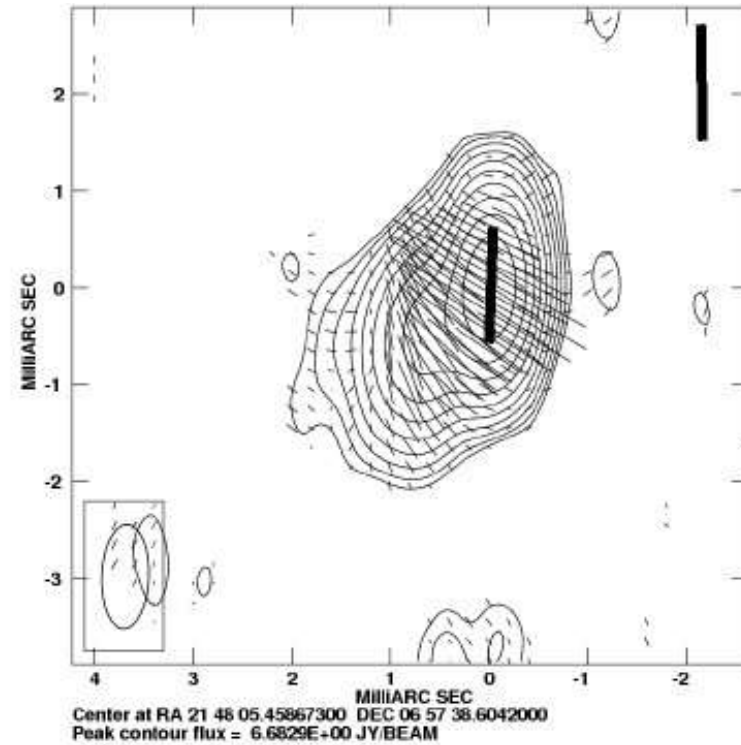




Some Interesting Cases: 2145+067



RM ~ 0



RM ~ 46,000 rad/m²



- We can find at least one fit with high RM, of the order of some tens of thousands, for each source, being the residuals of $\sim 1^\circ$ or even less
- HFR of the same order was previously found by Zavala & Taylor (2004) and Jorstad et al (2006)
- In the majority of the cases there is a fit which aligns the optical and radio core EVPA
- How do we know that's actually the case?
 - ◆ With our current data we cannot distinguish between different scenarios
 - ◆ We have obtained time for new observations with up to 6 wavelengths between 7mm and 2cm.



- Note: If the RM is of that magnitude...
 - ◆ we must be very careful when studying FR in quasar cores
 - ◆ we cannot rely on $\chi_{7\text{mm}}$ as a good approximation to χ_0
 - ◆ the physical properties in the quasar cores could be more dramatic than previously thought

- Be prepared for when the time comes!
 - ◆ High core FR would of course imply that we have to consider different planning in our (your!) polarization observations
 - ◆ Planning to observe too widely spaced wavelengths would mean a big loss of information
 - ◆ New observations checking deeper properties of this HFR would probe physics in the core of quasars



- A correlation between optical and radio core EVPA has been found in BL lacs. This correlation has not been found *yet* in quasars.
- There are some “hints” which suggest that high FR is happening. In that case, the correlation searched could still exist, being only hidden.
- We can fit $RM \sim 10^4 \text{ rad/m}^2$, in agreement with previous results. Unfortunately, with our current data we are not able to distinguish the cases in which HFR is indeed happening.
- Observations with more wavelengths could help us to discriminate. Also, they would be helpful in case some other phenomena (such as internal FR) is occurring.
- Future plans for observations should take into account HFR