From: AIPS sign-on <aips@aoc.nrao.edu>
To: abridle@NRAO.EDU
Cc: nkassim@aoc.nrao.edu
Subject: Cas question
Date: Wed, 9 Mar 1994 11:47:43 -0700

greetings Allan;

i have been working on a 74=>330 MHz spectral index image of CAS-A with 25" resolution. we also have made 74/1400 and 330/1400 spectral index images. we see a curious feature on all spectral index maps made with our 74 MHz data: this is a "flat" spot near the center of the source near the region of overall lowest intensity at all bands. here the spectral index flattens to about -0.55 from the average of -0.76.

we have been pulling our hair trying to come up with a scientific explanantions. our first idea, that is was absorption due to line of sight ionized gas, seemed unlikely because 1) it would require such a coincidence that this thing would line up right in front of Cas A and 2) it should cause much higher absorption at lower frequencies, and 3) it's emission measure (i need to look more carefuly at this ) would be such that it would be a huge thermally emitting source at higher frequencies (not seen I presume).

our latest idea is that ther is thermal material mixed inside Cas A. it would cause the flattening (not seen between 330 and 1400, i.e. points to absorption process of some sort) but since it is in the region of overall lowest emission from the source it wouldn't really put much of a dent in the overall flux at lower frequencies.

a toy model that bill erickson feels explains this flattening would be an opaque solid ball inside Cas A, i.e. it would block the emission from the back of the shell, but not the ring or the front. thus again not causing a huge dent in the overall low frequency spectrum.

i'm telling you this not only because you are knowledgable about low frequency stuff and would in any case find it interesting, but also i think it was some of your early low frequency observations that indicated a turnover in the spectrum of Cas A at low (10 MHz?) frequencies, and i'm wondering if this may be connected with what we see. what did you attribute this to? would it cause what we're seeing at 74 MHz? maybe the coincidence of a line of sight cloud is not so wacky an idea if you saw evidence of it at lower frequencies. but again, why wouldn't we see an HII region at higher frequencies?

anyway, you don't neccesarily have to answer me now, i just wanted you to be aware of the puzzle we're investigating. any ideas/comments you might have would be greatly appreciated, and i'll keep you posted if we learn anything new. i hope this feature is real, it would point nicely to how interesting high resolution low freq. work can be, and it would also be another feather in the cap of the VLA and show that the 74 MHz system is worth something (though I gather it has little future, with priority going to upgrading L and P band to wide band systems).

and we are certainly not ruling out that it is an artifact of our bizarre low frequency imaging techniques. but it can't hurt to think about the science (and it's more fun anyway!)

Thanx for listening,

Namir

PS: respond to my regular address nkassim@shimmer.nrl.navy.mil not to this address at the AOC.

From: abridle (Alan Bridle)
To: nkassim@shimmer.nrl.navy.mil
Subject: Cas A
Date: Wed, 9 Mar 1994 15:54:05 -0500

Hi Namir,

Thank you for the message about Cas A, it was interesting to hear what you are up to there.

Here's the answer to your easy question -- in my old papers I thought only about the total line-of-sight absorption (diffuse interstellar medium) as a contributor to the turnover. This was largely because other low-latitude sources for which we had 10 MHz data also showed flattening or turnovers and the effect appeared to depend on latutude and longitude in a plausible way as well as being consistent with the then-available models of the ISM and pulsar dispersion measures.

I have not reexamined any of that since about 1970(!) to see if any of the assumptions or parameterizations might have changed. But I was not explicitly thinking about associated HII regions or thermal matter, just what is on the general line of sight (presumably a statistical mix of HII region edges and truly diffuse stuff).

With regards to what might cause radially dependent spectral indices I presume you have eliminated all possible primary-beam effects. The only other thing that comes to mind other than the possibilities you were considering is some sort of field-alignment effect. If the mean perpendicular field in the center of the remnant is higher than that at the edges, you might be looking at lower-energy electrons there than you are at the edges. This might flatten the spectrum a little, but you can probably decide from the total spectral curvature whether there is any hope of flattening it enough to explain your data. A difference in mean field alignment might arise if, for example, the field is very well organised in the remnant rim. I don't recall what the polarimetry says about this for Cas A.

I'll think about the problem some more, but that was the only idea that came to me on the spur of the moment!

Cheers,

Alan

From: Namir E. Kassim <nkassim@shimmer.nrl.navy.mil>
To: abridle@NRAO.EDU
Subject: request
Date: Thu, 17 Nov 94 15:53:45 EST

Hi Alan;

It was nice to see you the other day, and my very best wishes for an improving situation for you at home.

I wanted to ask you if you mind my listing you as a reference for a few jobs I may apply for. None require that you send anything. They ask for 3 "or more" references and I wanted to know if it was OK to add your name as one of my additional references. You should only have to do something if they are interested enough in me to contact you.

Thanx,

Namir

PS: I'm glad you got me thinking about the issues related to why we might see one lobe of Cygnus-A turning over at low frequency before the other. I've since discussed the matter with both Craig Sararzin and Dan Harris. Dan guessed correctly as to which lobe should be turning over based on the assumed geometry, along the lines you had discussed with me. However Craig dug out a Rotation Measure map for Cygnus A which seemed to imply a different result. In any case it's interesting and I'm glad you enlightened me a bit.

Also, I was encouraged to hear that you felt that our GPS VLA experiment to develop a technique for removing ionospheric faraday rotation would be important vis a vis the impact it could have on low frequency polarimetry. I'll keep you informed about how that proceeds.

From abridle Thu Nov 17 23:29:59 1994
X-VM-v5-Data: ([nil nil nil nil nil nil nil nil nil]
["76" "Thu" "17" "November" "1994" "23:29:46" "-0500" "Alan Bridle" "abridle " nil "5" "Re: request" "^From:" nil nil "11"])
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id AA16091; Thu, 17 Nov 1994 23:29:46 -0500
Message-Id: <9411180429.AA16091@polaris.cv.nrao.edu>
References: <9411172053.AA08482@shimmer.nrl.navy.mil>
From: abridle (Alan Bridle)
To: Namir E. Kassim <nkassim@shimmer.nrl.navy.mil>
Subject: Re: request
Date: Thu, 17 Nov 1994 23:29:46 -0500

Hi Namir,

I'll be happy to write letters for you as needed,

Regards, Alan