

From root Mon Jul 17 11:14:16 1995  
X-VM-v5-Data: ([nil nil nil nil t nil nil nil nil]  
["699" "Mon" "17" "July" "1995" "09:14:01" "-0600" "Frazer Owen" "fowen@aoc.nrao.edu"  
"<199507171514.JAA21593@pilabo.aoc.nrao.edu>" "18" "Very low frequencies" "^From:" nil nil "7" nil nil nil nil]  
nil)  
Received: from pilabo.aoc.nrao.edu by polaris.cv.nrao.edu (AIX 3.2/UCB 5.64/4.03)  
id AA35372; Mon, 17 Jul 1995 11:14:13 -0400  
Received: by pilabo.aoc.nrao.edu (8.6.10/1.3pmg)  
id JAA21593; Mon, 17 Jul 1995 09:14:01 -0600  
Message-Id: <199507171514.JAA21593@pilabo.aoc.nrao.edu>  
X-Sun-Charset: US-ASCII  
From: Frazer Owen <fowen@aoc.nrao.edu>  
To: abridle  
Subject: Very low frequencies  
Date: Mon, 17 Jul 1995 09:14:01 -0600

Alan,

I am going to be on a NASA review panel for small missions shortly. I think the reason for my participation will be the issue of low frequencies for space. I suspect you are at least generally familiar with the ideas for some sort of a synthesis instrument working from 1 to 30 MHz with resolution down to the interstellar limit. The issue in two committees have have previously taken part in is whether the science is worth such a space mission ( $\leq$  \$100M). I have some ideas about what is worth doing but I wonder if you could give me your perspective, either pro or con, with examples assuming you are pro ? I just need to be prepared with the best arguments.

Best wishes,

Frazer

From abridle Tue Aug 1 09:23:12 1995  
X-VM-v5-Data: ([nil nil nil nil nil nil nil nil nil]  
["3408" "Tue" "1" "August" "1995" "09:23:05" "-0400" "Alan Bridle" "abridle" nil "66" "Re: Very low frequencies"  
"^From:" nil nil "8" nil nil nil nil]  
nil)  
Received: by polaris.cv.nrao.edu (AIX 3.2/UCB 5.64/4.03)  
id AA36717; Tue, 1 Aug 1995 09:23:05 -0400  
Message-Id: <9508011323.AA36717@polaris.cv.nrao.edu>  
In-Reply-To: <199507171514.JAA21593@pilabo.aoc.nrao.edu>  
References: <199507171514.JAA21593@pilabo.aoc.nrao.edu>  
From: abridle (Alan Bridle)  
To: Frazer Owen <fowen@aoc.nrao.edu>  
Subject: Re: Very low frequencies  
Date: Tue, 1 Aug 1995 09:23:05 -0400

Frazer Owen writes:

>  
> I am going to be on a NASA review panel for small missions  
> shortly. I think the reason for my participation will be the issue  
> of low frequencies for space. I suspect you are at least generally  
> familiar with the ideas for some sort of a synthesis instrument working  
> from 1 to 30 MHz with resolution down to the interstellar limit. The  
> issue in two committees have have previously taken part in is whether  
> the science is worth such a space mission (<=/ \$100M). I have some ideas  
> about what is worth doing but I wonder if you could give me your perspective,  
> either pro or con, with examples assuming you are pro ? I just need to be  
> prepared with the best arguments.  
>

Hi Frazer, your message was perfectly timed to coincide with my departure to Canada so I only just got it.

I don't think things have changed much since the Low Frequency Astrophysics from Space meeting in January 1990 (Springer Lecture Notes in Physics #362 ed by N.Kassim and K.Weiler). At that meeting it was fairly clear that (a) anything above about 10 MHz was better done from the ground and (b) everything below 5 MHz could be seriously compromised by terrestrial interference if in near-Earth or even lunar orbit. The general thrust of this meeting was that an exploratory project to examine the terrestrial RFI spectrum below 5 MHz would be absolutely essential before making any commitment to low-frequency radio science. The situation was last, and best, explored by RAE-2 in lunar orbit in 1968, and there is an excellent summary of the problem in Mike Kaiser's paper (Figure 2, page 5). Bill Erickson's paper (p. 59) is also an excellent summary of the situation.

Everyone in the know said the situation should now be much worse, not better, than in 1968. There was therefore some support for LORAE as a diagnostic experiment, and little enthusiasm (beyond the proponents) for any of the larger-scale orbital projects proposed at that time. This was a big disappointment to the organizers of the meeting and many more optimistic statements are written into their accounts in the proceedings. The views espoused by Nick Rees at the end of his talk were much closer to the general discussion (a panel discussion on these issues was not reported in the proceedings, possibly because it was not recorded but also possibly because it was so negative in its impact on the more ambitious proposals). I gather that several of the NASA brass who attended the meeting were convinced not to

go ahead with the large space array.

Obviously the back side of the Moon is the best place for really ambitious work below 10 MHz, and lunar orbit is about a thousand times better than earth orbit. But RFI rejection methods would be needed for all but trivial work even in lunar orbit. LORAE would at least make that quantitative in a modern context, and would certainly be worth doing if it could be piggybacked on someone else's lunar-orbital project.

While it's nice to think into the far future for lunar-backside I personally feel it's so far in the future that there are more important things to devote time and money to. If there ever seems to be any political momentum towards a far-side lunar base (I haven't seen it on any funding-related horizon yet) then the low-frequency radio astronomers should indeed be vocal as a possible client.

Hope this helps,

A.

From root Tue Aug 1 10:38:05 1995

X-VM-v5-Data: ([nil nil nil nil t nil nil nil nil]

["919" "Tue" "1" "August" "1995" "08:38:00" "-0600" "Frazer Owen" "fowen@aoc.nrao.edu"

"<199508011438.IAA04287@pilabo.aoc.nrao.edu>" "21" "Re: Very low frequencies" "^From:" nil nil "8" nil nil nil nil] nil)

Received: from arana.aoc.nrao.edu by polaris.cv.nrao.edu (AIX 3.2/UCB 5.64/4.03) id AA43353; Tue, 1 Aug 1995 10:38:04 -0400

Received: from pilabo.aoc.nrao.edu (pilabo.aoc.nrao.edu [146.88.6.5]) by arana.aoc.nrao.edu (8.6.10/8.6.10) with ESMTP id IAA28176 for <abridle@polaris.cv.nrao.edu>; Tue, 1 Aug 1995 08:38:02 -0600

Received: (from fowen@localhost) by pilabo.aoc.nrao.edu (8.6.10/8.6.10) id IAA04287 for abridle@polaris.cv.nrao.edu; Tue, 1 Aug 1995 08:38:00 -0600

Message-Id: <199508011438.IAA04287@pilabo.aoc.nrao.edu>

X-Sun-Charset: US-ASCII

From: Frazer Owen <fowen@aoc.nrao.edu>

To: abridle@polaris.cv.nrao.edu

Subject: Re: Very low frequencies

Date: Tue, 1 Aug 1995 08:38:00 -0600

Alan,

The current proposal is in solar orbit, so while the earth generated interference is important it is not as important as with a earth-orbiting array. I don't think I should go further into the details of the proposal.

What I really wanted to get from you were comments on the important SCIENCE that could be done if we could observe down to 1 MHz. This seems to be the central question in the current review process. In the previous review I took part in a few months ago (for study grant money), the main argument against an array was that the science was not worth doing. I know the basic arguments from the workshop. These arguments are made in all the proposals. The problem is convincing a panel made up of millimeter and IR astronomers.

I thought maybe you could comment on some of the astrophysics that YOU consider most compelling at low frequencies (if you think it is compelling).

---Frazer

From abridle Tue Aug 1 10:59:19 1995  
X-VM-v5-Data: ([nil nil nil nil nil nil nil nil nil]  
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"^From:" nil nil "8" nil nil nil nil]  
nil)  
Received: by polaris.cv.nrao.edu (AIX 3.2/UCB 5.64/4.03)  
id AA42789; Tue, 1 Aug 1995 10:59:13 -0400  
Message-Id: <9508011459.AA42789@polaris.cv.nrao.edu>  
In-Reply-To: <199508011438.IAA04287@pilabo.aoc.nrao.edu>  
References: <199508011438.IAA04287@pilabo.aoc.nrao.edu>  
From: abridle (Alan Bridle)  
To: Frazer Owen <fowen@aoc.nrao.edu>  
Subject: Re: Very low frequencies  
Date: Tue, 1 Aug 1995 10:59:13 -0400

Frazer Owen writes:

>  
> The current proposal is in solar orbit, so while the earth generated  
> interference is important it is not as important as with a earth-orbiting  
> array. I don't think I should go further into the details of the proposal.  
>

Well that shows they've learned something, I guess; that was not obvious  
from the workshop!

> What I really wanted to get from you were comments on the important  
> SCIENCE that could be done if we could observe down to 1 MHz. This seems to be  
> the central question in the current review process. In the previous review  
> I took part in a few months ago (for study grant money), the main argument  
> against an array was that the science was not worth doing. I know the basic  
> arguments from the workshop. These arguments are made in all the proposals.  
> The problem is convincing a panel made up of millimeter and IR astronomers.  
>  
> I thought maybe you could comment on some of the astrophysics that  
> YOU consider most compelling at low frequencies (if you think it is  
> compelling).

I don't, compared with the astrophysics doable from the ground in the  
10-100 MHz range. But there may be some interesting topics in the  
interstellar medium (absorption and scattering in diffuse electron  
gas, turbulence) and interplanetary medium at the very low frequencies.  
These media will dominate what you can see at the low frequencies, and  
studying the media would be an essential ingredient of understanding what  
they are doing to any sources that could be observed. I have not been  
thinking a lot about these issues as I think there would be much better  
ways to use the \$\$ if they were available. Maybe that says it all?

A.

From root Tue Aug 1 11:04:40 1995

X-VM-v5-Data: ([nil nil nil nil nil nil nil nil nil]

["63" "Tue" "1" "August" "1995" "09:04:33" "-0600" "Frazer Owen" "fowen@aoc.nrao.edu" nil "4" "Re: Very low frequencies" "^From:" nil nil "8" nil nil nil nil])

Received: from arana.aoc.nrao.edu by polaris.cv.nrao.edu (AIX 3.2/UCB 5.64/4.03)  
id AA28722; Tue, 1 Aug 1995 11:04:38 -0400

Received: from pilabo.aoc.nrao.edu (pilabo.aoc.nrao.edu [146.88.6.5]) by arana.aoc.nrao.edu (8.6.10/8.6.10) with ESMTP  
id JAA29070 for <abridle@polaris.cv.nrao.edu>; Tue, 1 Aug 1995 09:04:35 -0600

Received: (from fowen@localhost) by pilabo.aoc.nrao.edu (8.6.10/8.6.10) id JAA04523 for abridle@polaris.cv.nrao.edu;  
Tue, 1 Aug 1995 09:04:33 -0600

Message-Id: <199508011504.JAA04523@pilabo.aoc.nrao.edu>

X-Sun-Charset: US-ASCII

From: Frazer Owen <fowen@aoc.nrao.edu>

To: abridle@polaris.cv.nrao.edu

Subject: Re: Very low frequencies

Date: Tue, 1 Aug 1995 09:04:33 -0600

Thanks Alan. That is what I wanted to hear about.

---Frazer