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12-GHz Rain Fade Measurements Using DBS Signals

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Introduction

- 12 GHz DBS is transmitting from 101° W
- ACTS is at 100°
- For ACTS sites (except Alaska) a 3rd frequency
- Inexpensive and easy implementation
- Significant enhancement of ACTS measurements

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Required Hardware

- RCA Model DRD203RW Advanced DBS receiver system
  - Antenna, LNA, Receiver = $900
  - 75Ω cable from antenna to receiver = $30
  - RS232 cable from receiver to PC = $10
- PC - an older model (286 or 386) is good enough

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Subscription to DirecTV

- Personal subscription
  - $29.95 per month
  - >30 channels
- Commercial subscription
  - $59.95 per month
  - >30 channels

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Channels and Strength

Channel	Xponder	Signal	Content
224	15	91	Disney
206	*2*	*90*	*ESPN*
245	2	90	Bloomberg
201	7	90	Preview
220	8	90	TCM
225	8	90	Discovery
254	11	90	Travel
247	19	90	AmerTalk
272	19	90	EncoreLV
210	27	90	
229	27	90	USA
276	27	90	EncoreTS
100	4	89	Preview
200	4	89	Preview
202	4	89	

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Required Software - Inquiry

Path: geraldo.cc.utexas.edu!usenet
From: Wolf_Vogel@mail.utexas.edu (Wolfhard J Vogel)
Newsgroups: rec.video.satellite.dbs
Subject: ***Hacker Challenge***
Date: 11 May 1995 02:47:39 GMT
Organization: The University of Texas at Austin
Lines: 9
Message-ID: <3ortsb$4r1@geraldo.cc.utexas.edu>
NNTP-Posting-Host: slip-13-7.ots.utexas.edu
X-Newsreader: WinVN 0.90.4

The RCA DBS unit has an RS232 port, so it is probably possible to read the state of the receiver (e.g., the mail messages or signal level) or to control the unit without the remote. The manual, of course, does not even mention the purpose of the connector.

Will a hacker rise to the challenge and figure out the protocol?

If you have the time and the skills - please let me know the result and I will be forever grateful. Thanks.

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Required Software - Response I

Date: Fri, 12 May 1995 01:01:31 -0400
To: Wolf_Vogel@mail.utexas.edu (Wolfhard J. Vogel)
From: an174356@anon.penet.fi
Organization: Anonymous forwarding service
Reply-To: an174356@anon.penet.fi
Date: Mon, 15 May 1995 10:56:48 UTC
Subject: DBS Hacking

Maybe this partial explanation of the DBS codes will be useful. I am working on completing this sometime in the future. Wait times were determined by trial and error. Good luck.

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Response II

SIGNAL STRENGTH:

TO DBS-Box:

Command-prefix Byte: 0xFA ; send first
Wait 15msec
Command-byte to request signal strength: 0x10
Wait 15msec

FROM DBS-Box:

Acknowledged-Command Byte: 0xF0
*** Error *** Command-Prefix Not Sent: 0xFB
Signal-Strength Byte: 0xSS
Command-Completed-OK Byte: 0xF4

X= DBS-Box Signal Strength Number
Y= CNR (dB)

$$y=(a+c\ln x+e(\ln x)^2+g(\ln x)^3)/(1+b\ln x+d(\ln x)^2+f(\ln x)^3)$$

a= 0.254791	e= -0.116899
b= -0.749124	f= -0.016554
c= 0.157723	g= 0.019983
d= 0.192953	

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Response III

Change CHANNEL:

TO DBS-Box:

Command-prefix Byte: 0xFA ; send first
Wait 15msec
Command-byte to change channel: 0x46
Wait 600msec

FROM DBS-Box:

Acknowledged-Command Byte: 0xF0
*** Error *** Command-Prefix Not Sent: 0xFB

TO DBS-Box:

Channel=0xHHLL
Channel-Byte HI: 0xHH
Wait 600msec
Channel-Byte LO: 0xLL
Wait 600msec

FROM DBS-Box:

Acknowledged-Parameter Byte: 0xF2
Command-Completed-OK Byte: 0xF4

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Response IV

TRANSPONDER ID:

TO DBS-Box:

Command-prefix Byte: 0xFA ;send first
Wait 15msec
Command-byte to get status: 0x03
Wait 1sec

FROM DBS-Box:

Acknowledged-Command Byte: 0xF0
*** Error *** Command-Prefix Not Sent: 0xFB

36 Bytes returned by DBS-Box:

```
|B01|,|B02|,..|B13|,..|B36|
                  |_______ Command-complete-OK byte: 0xF4
            |_____________ Transponder Number
```

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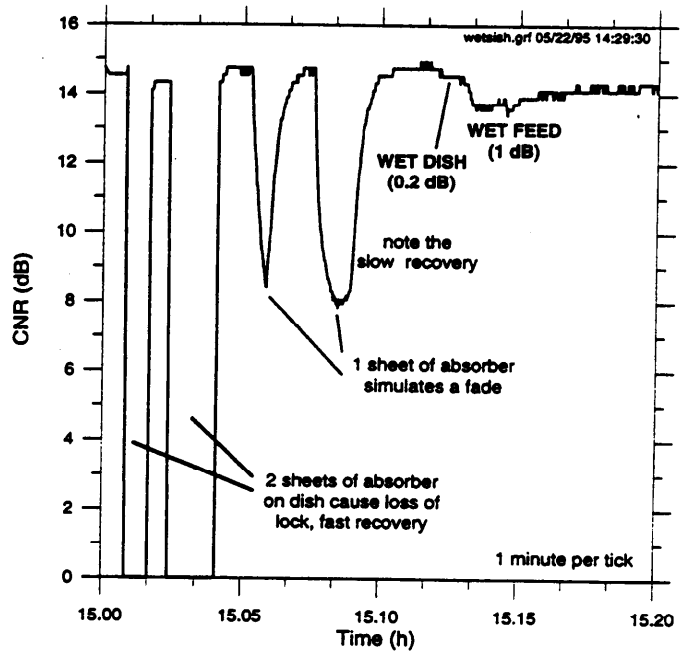
Receiver Dynamics



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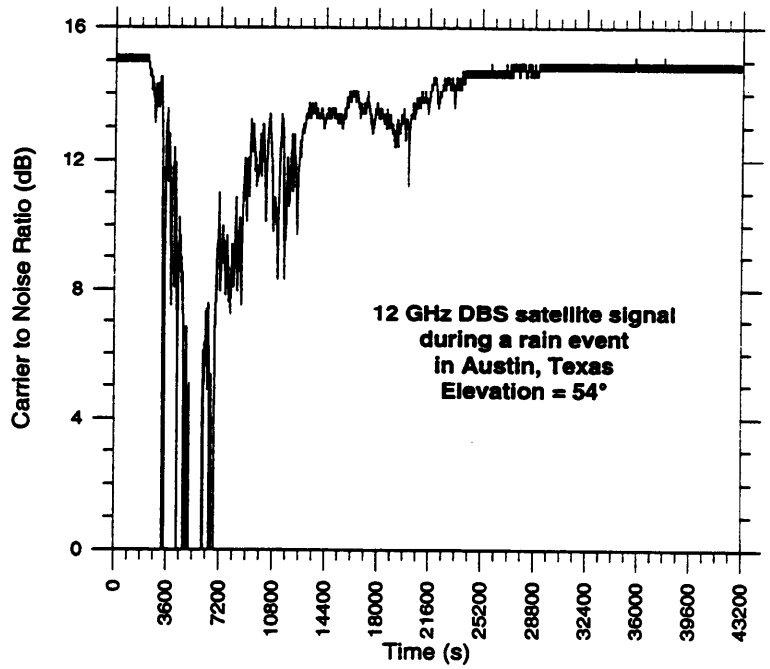
Rain Fade Event



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Conclusion

- CNR has a long time constant
- 1 measurement / 10 s is adequate
- fade measurement margin 10-12 dB
- Valuable addition to 20/30 measurements

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