

# Interlacing and HD for DATV Express

PHIL  
LONGHURST  
GW8BVI

# GB3ZZ the Bristol Digital Amateur Television Repeater

DVB S

- ▶ *Run by Severnside Television Group*
- ▶ 23cm 1.3 GHz output
- ▶ DVB-S 4 MS/s
- ▶ Two channel MUX
- ▶ **Widescreen 16:9**
- ▶ 23cm and 70cm inputs
- ▶ **HD-compatible inputs**



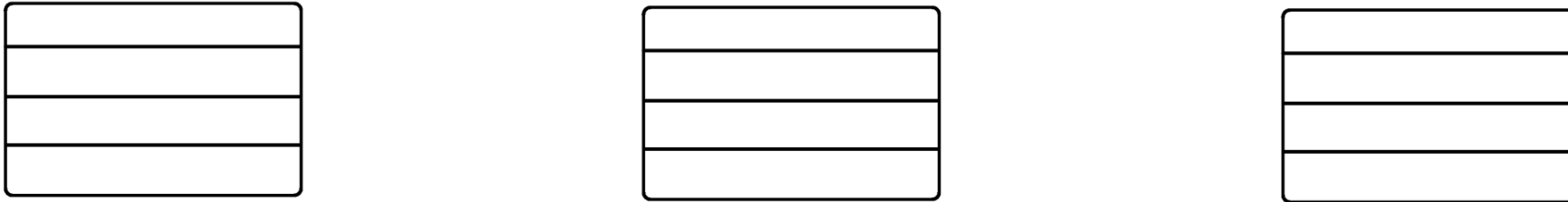
What do I  
need to  
receive  
**GB3ZZ**  
on 1.3GHz



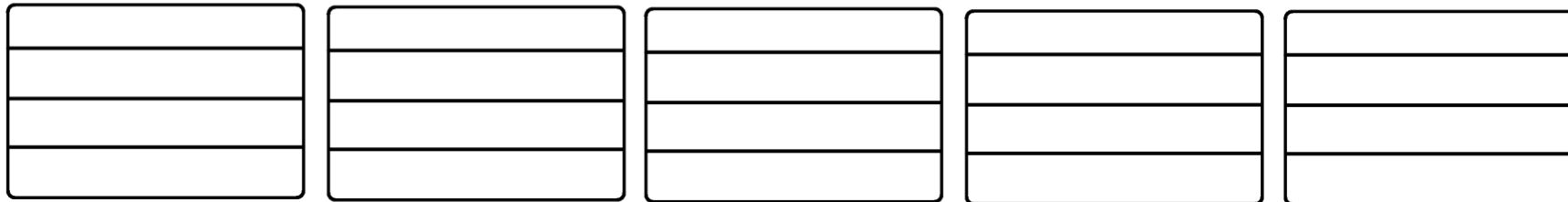
# INTERLACING: 1930s

Lossy video compression technology

## 25 Hz progressive scan (25P)



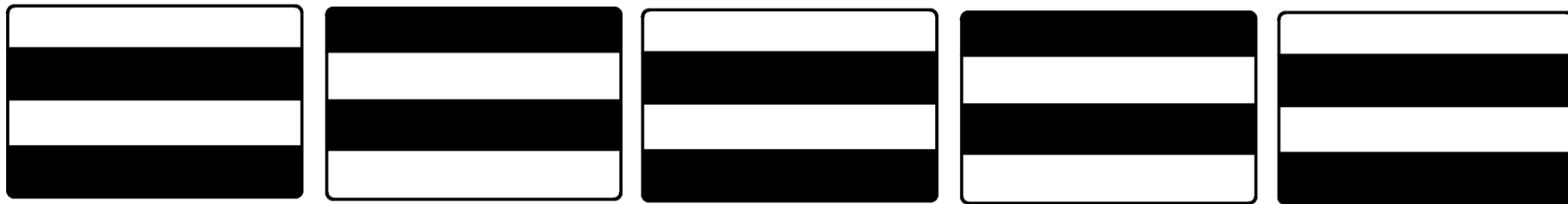
## 50 Hz progressive scan (50P)



# INTERLACING: 1930s

Lossy video compression technology

## 50 Hz interlaced scan (50i)

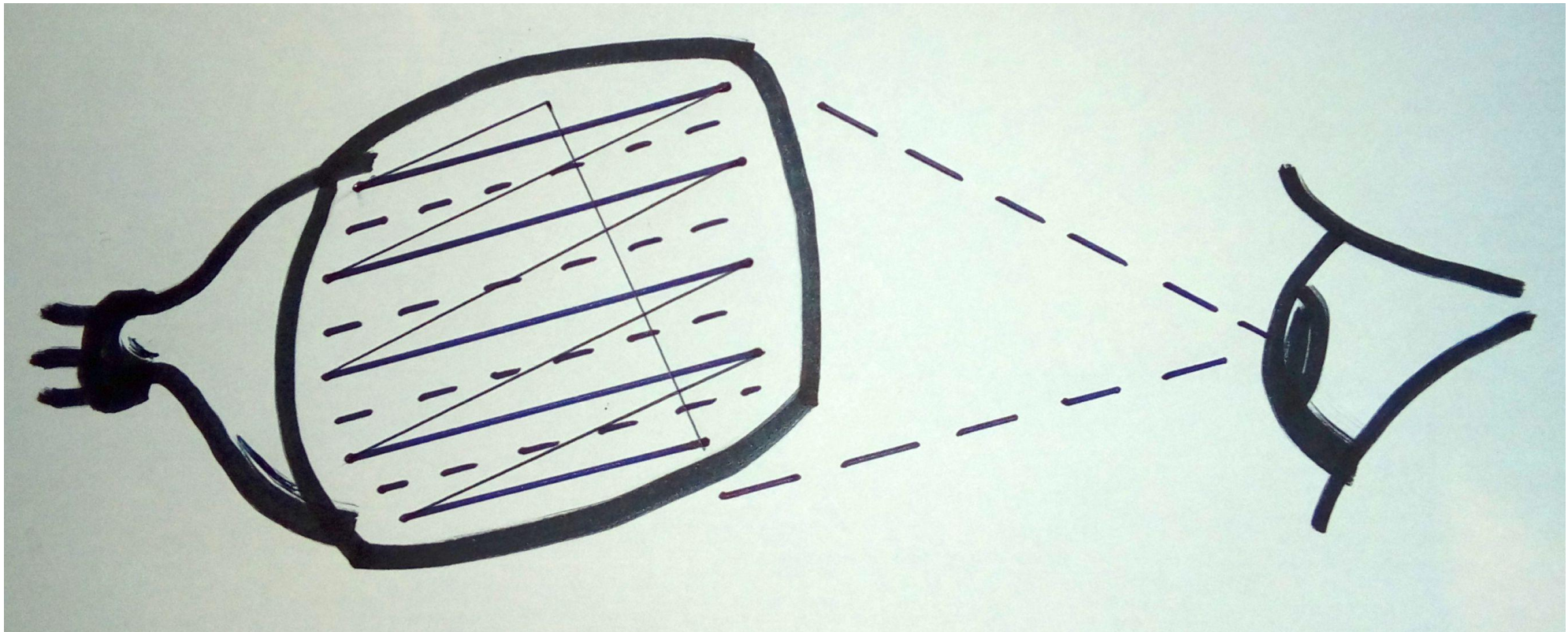


**Alternate "Fields" of ODD numbered lines  
and EVEN numbered lines**

# INTERLACING: 1930s

Lossy video compression technology

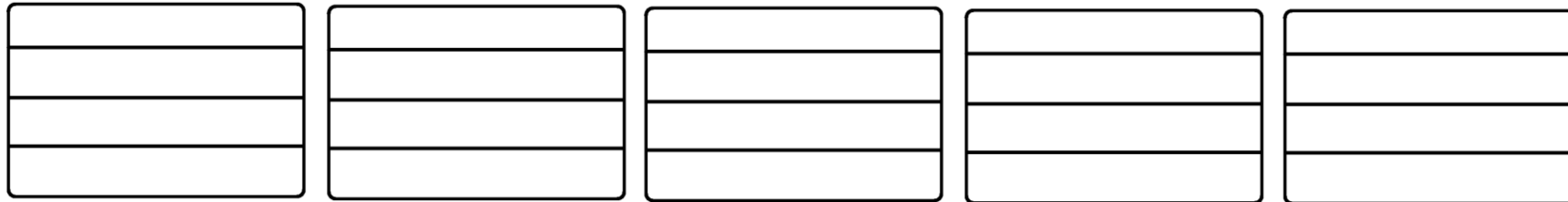
Cathode Ray Tube: Your retina is the **FRAMESTORE!**



# INTERLACING TODAY:

Producing interlaced video - discard

**50 Hz progressive scan (50P) - From image sensor**



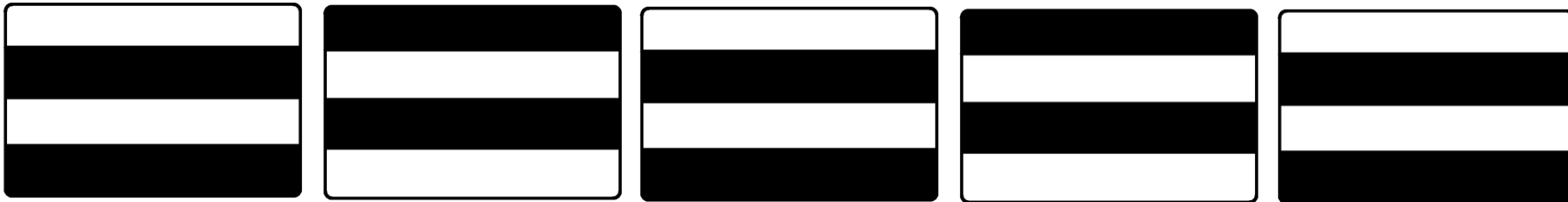
**50 Hz interlaced scan (50i) - Transmitted**



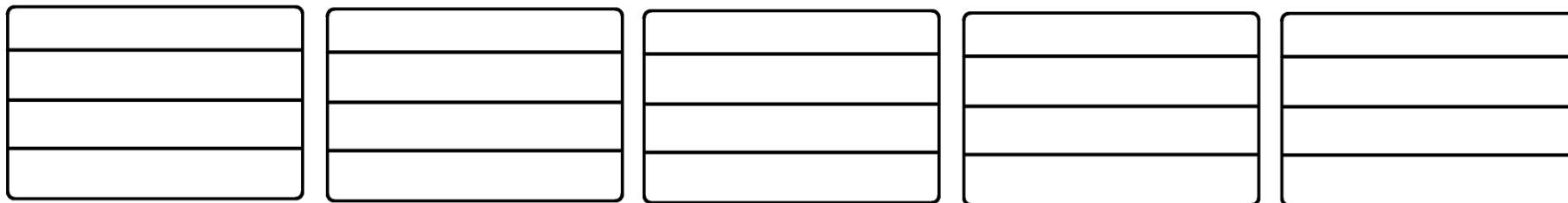
# INTERLACING TODAY:

De-interlacing at the receiver - interpolate

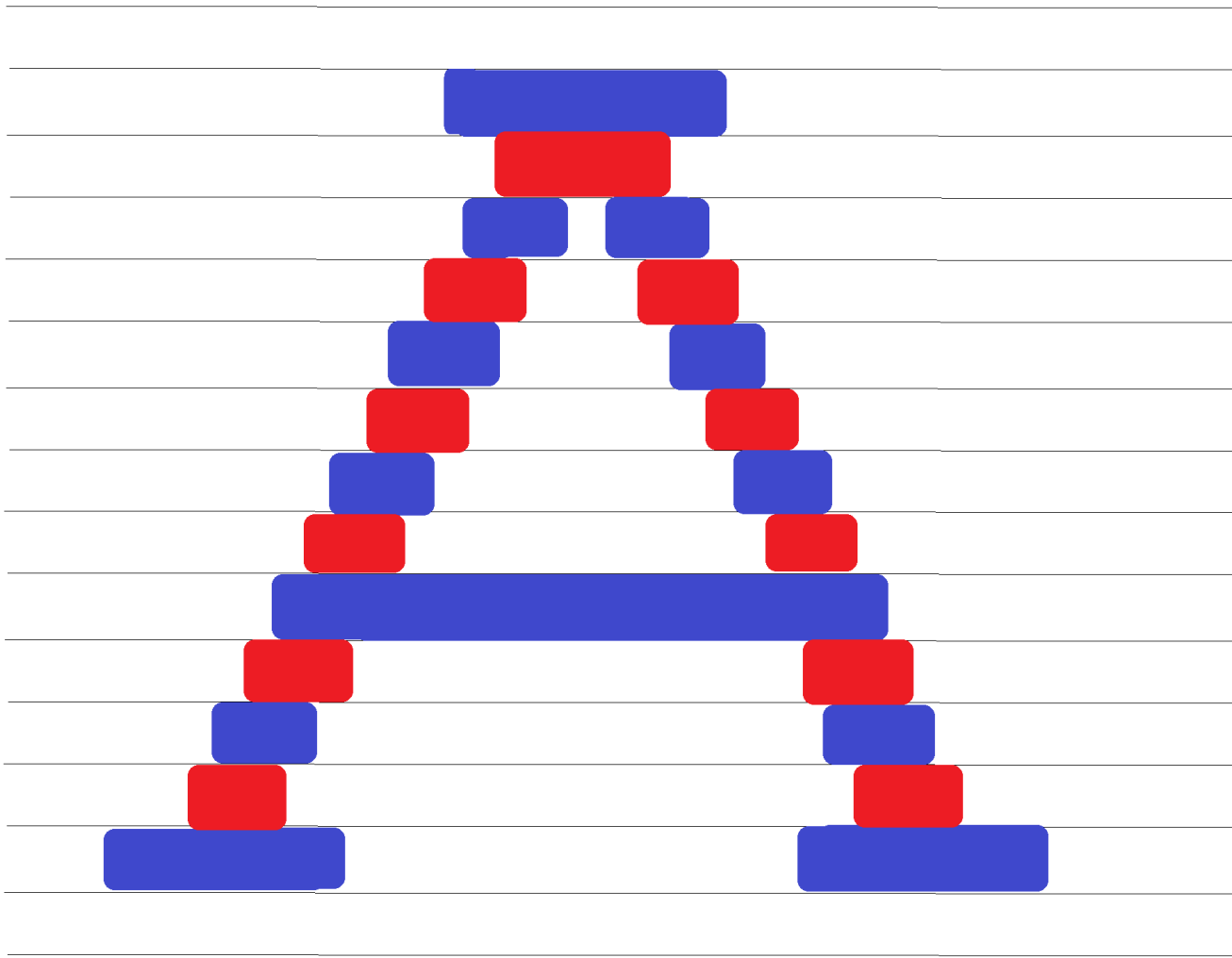
**50 Hz interlaced scan (50i) - Received**



**50 Hz progressive scan (50P) - Goes to Display**







## INTERLACING TODAY:

Intelligent,  
motion adaptive  
De-interlacing  
algorithm  
re-constructs  
missing picture  
information

# Full HD

# 1080

INTERLACING  
TODAY:

Digital SD and  
1080i HD  
broadcasts still  
use interlacing

# SD & HD Broadcast TV

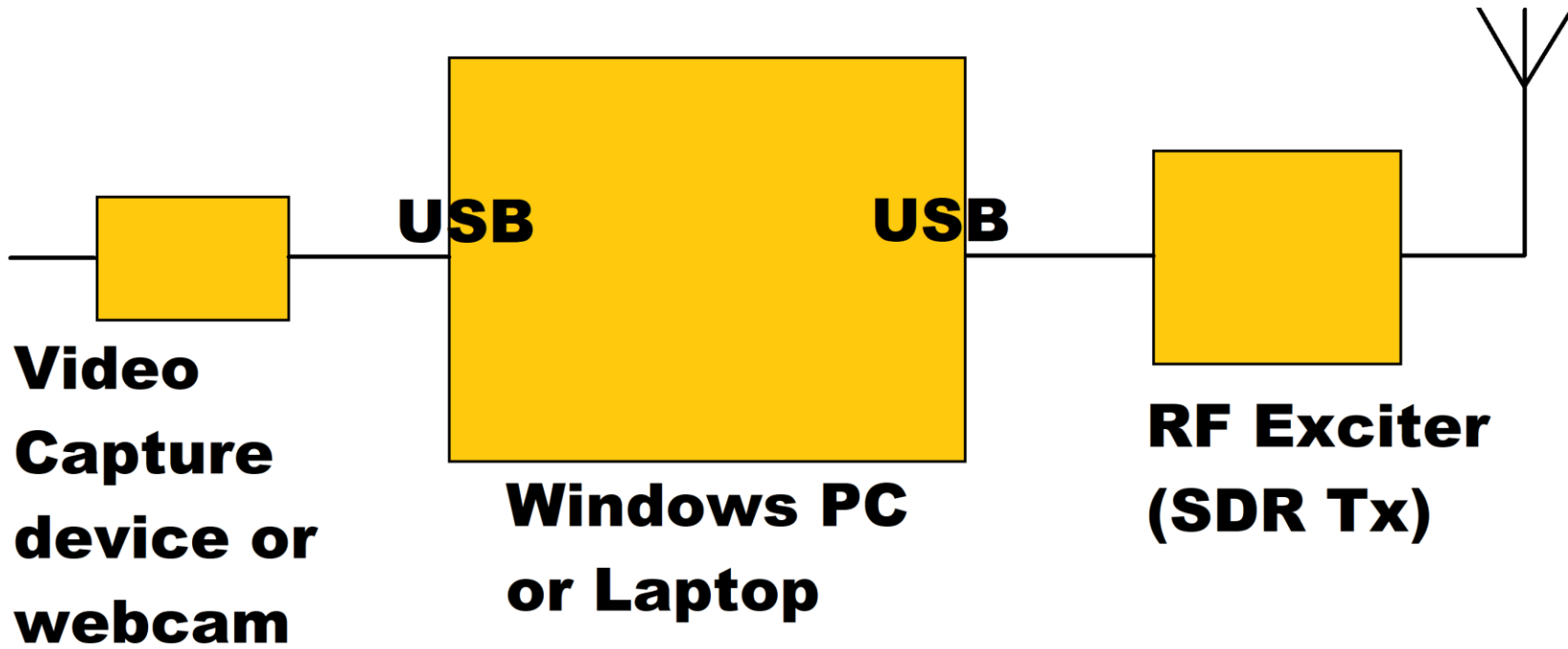
- ▶ Commonly used picture resolutions
- ▶ 576i (SD) = 625 line interlaced
- ▶ 720p - 50Hz
- ▶ 1080i - 25Hz interlaced
- ▶ 1080p - 25Hz progressive (film)
- ▶ 1080p – 50Hz not well supported

# Getting on the air with Digital Amateur Television (DATV)

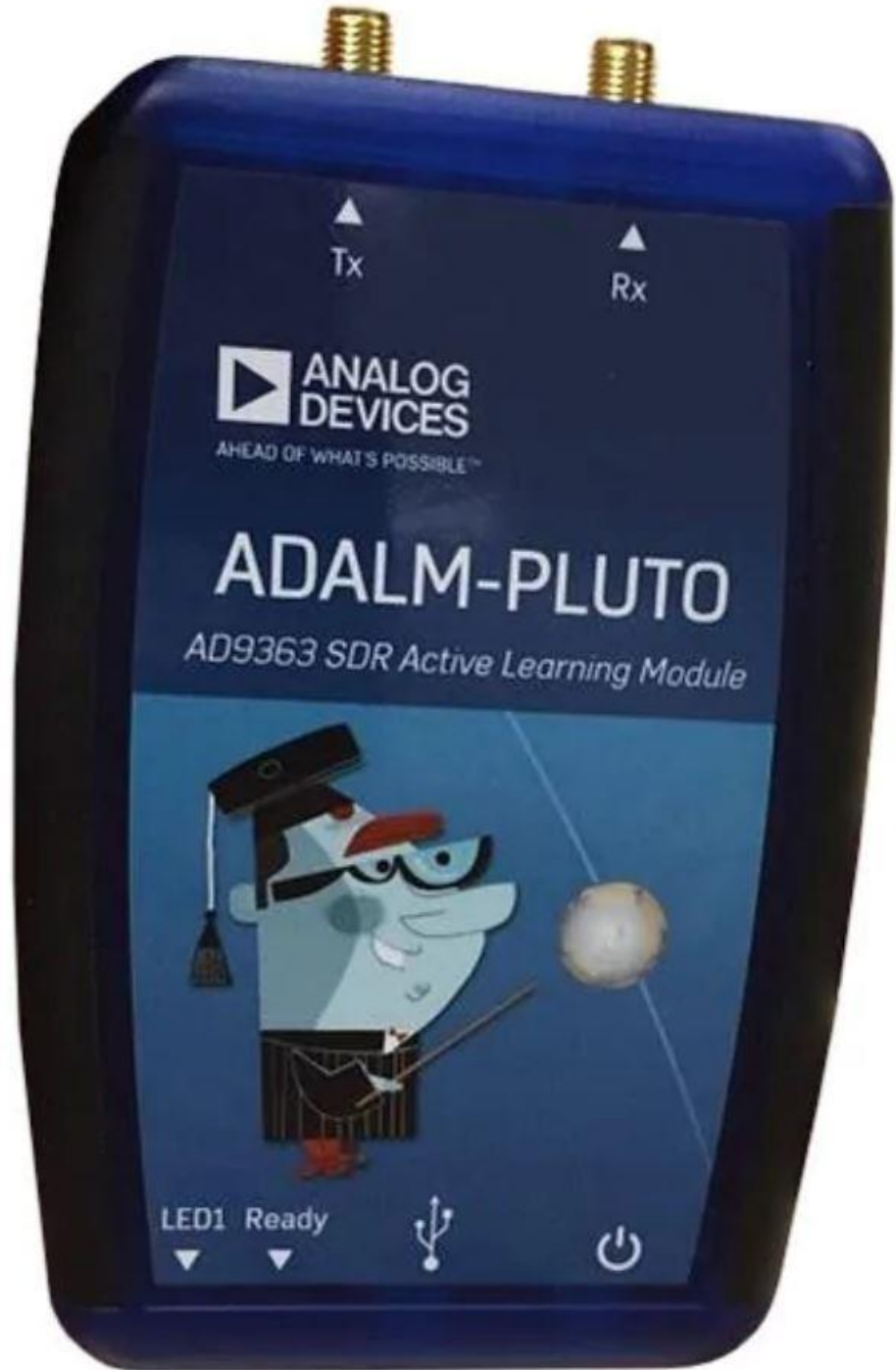
## ▶ SOFTWARE

▶ *BATC* Portsdown – for Raspberry Pi

▶ **DATV Express – for Windows PC**  
covered in this talk

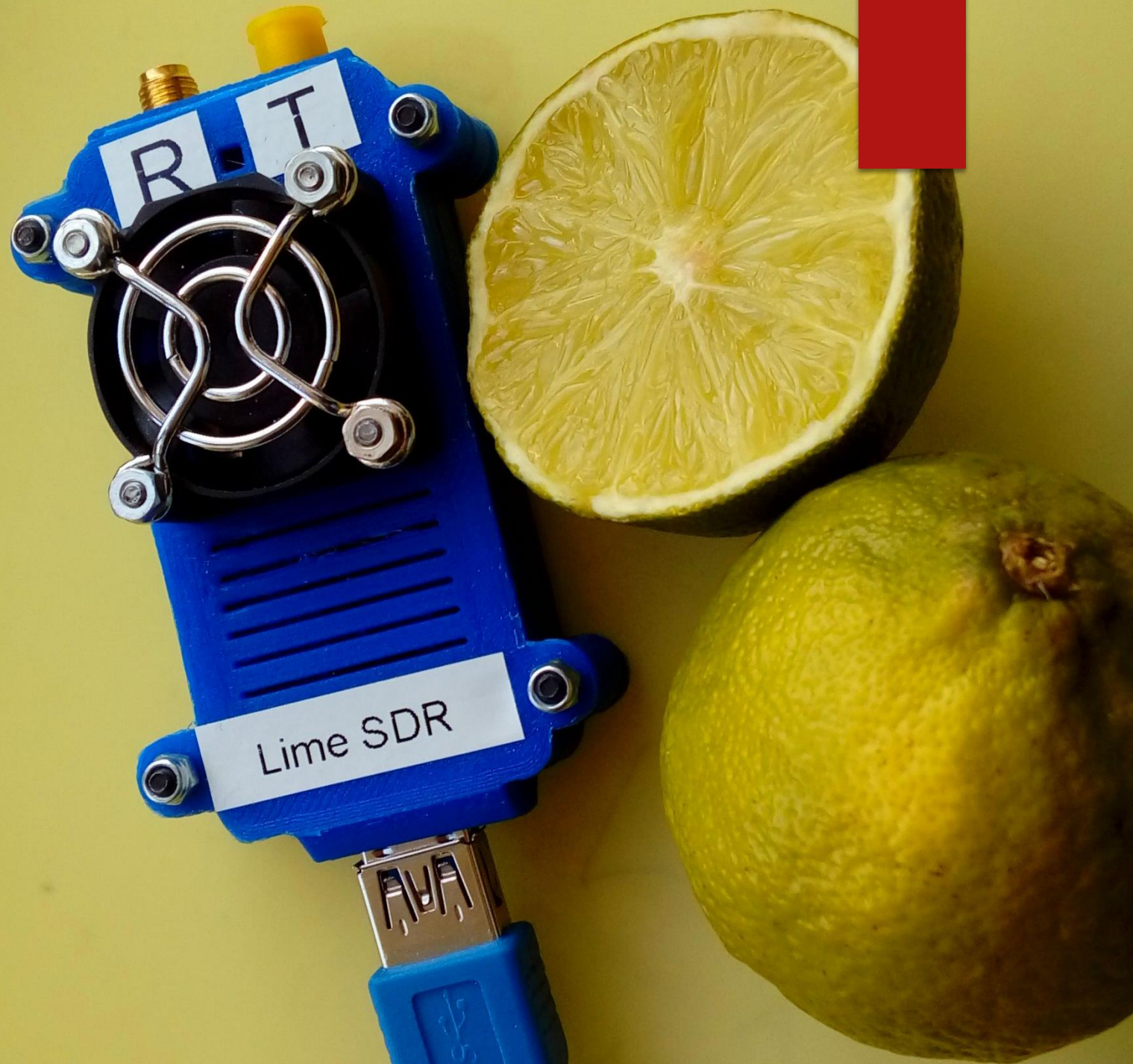


**HARDWARE** you'll need to get on air  
with **free** DATV Express Software



# RF Exciters: PLUTO

RF  
Exciters:  
Lime SDR  
mini



# Digital Capture SD

*Fushicai*  
EasyCap  
(BATC shop)

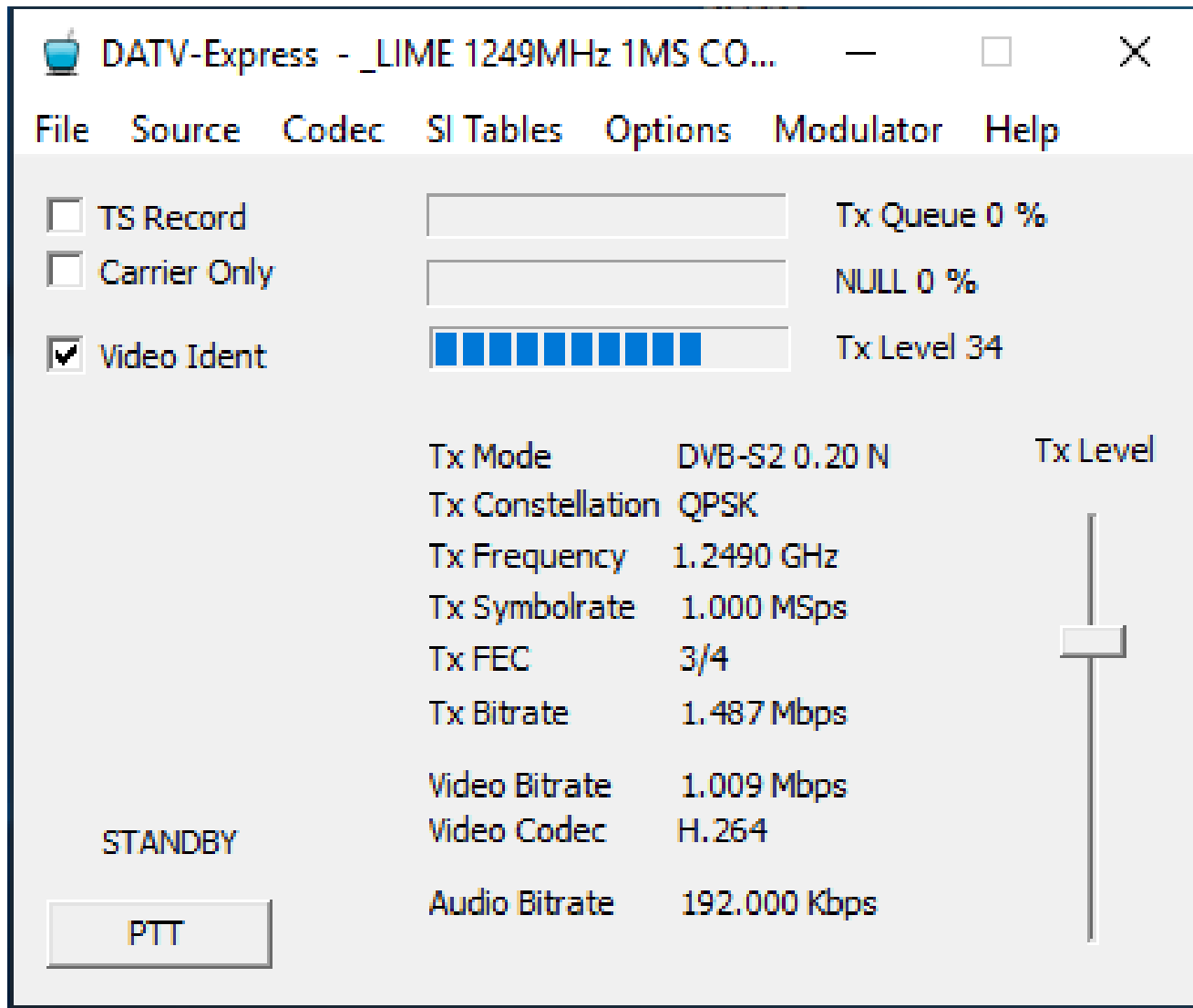




# Digital Capture *HD*

Elgato HD60 S  
HDMI to USB3.0





# DATV Express

Express Settings

Tx Frequency

Tx Symbol Rate

Tx Level

TxMode  DVB-S  DVB-S2  DVB-T

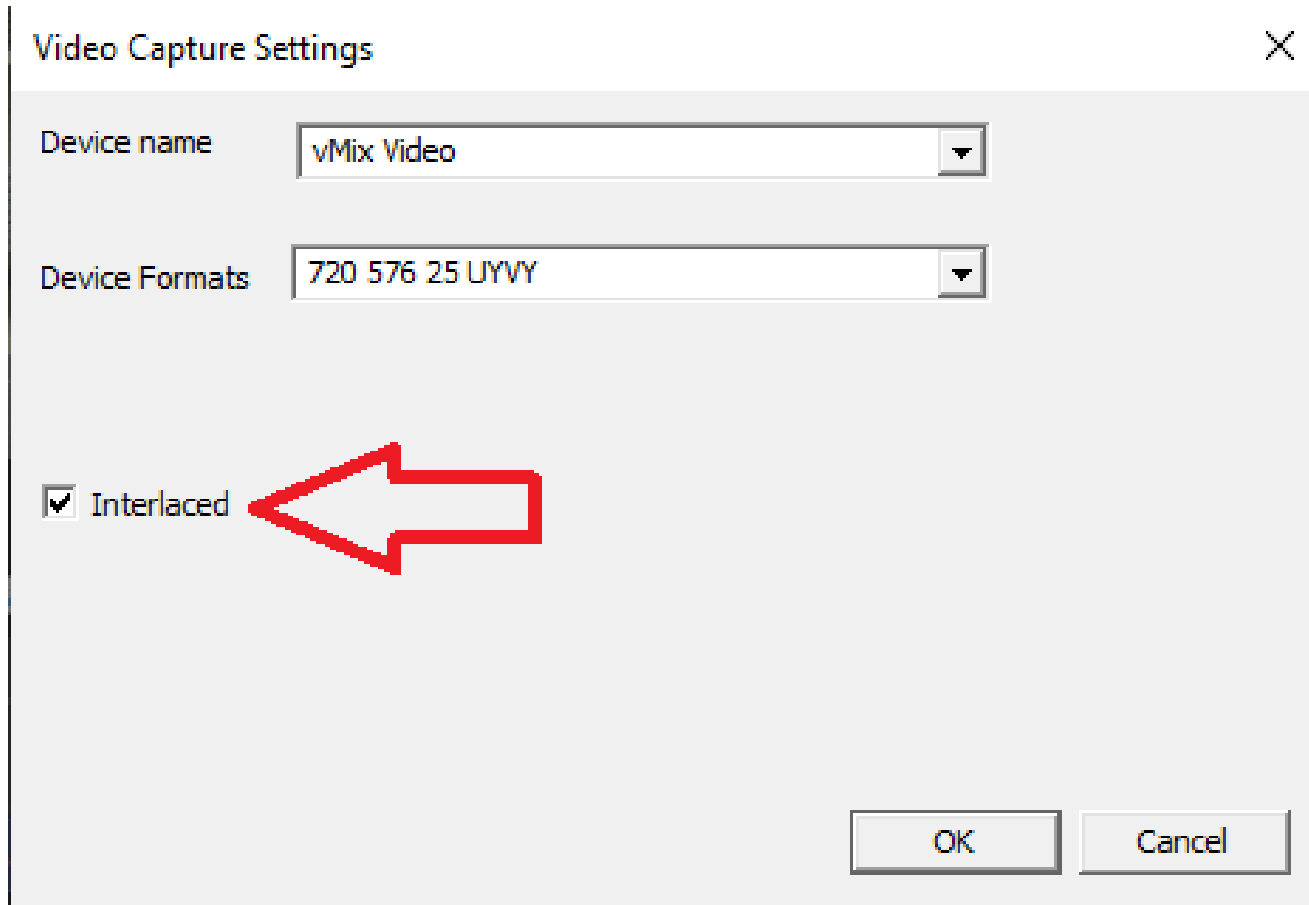
PTT Port  Port A  Port B  Port C  Port D

SDR HW  EXPRESS  LIME  PLUTO  FMCOMMS

SDR IP

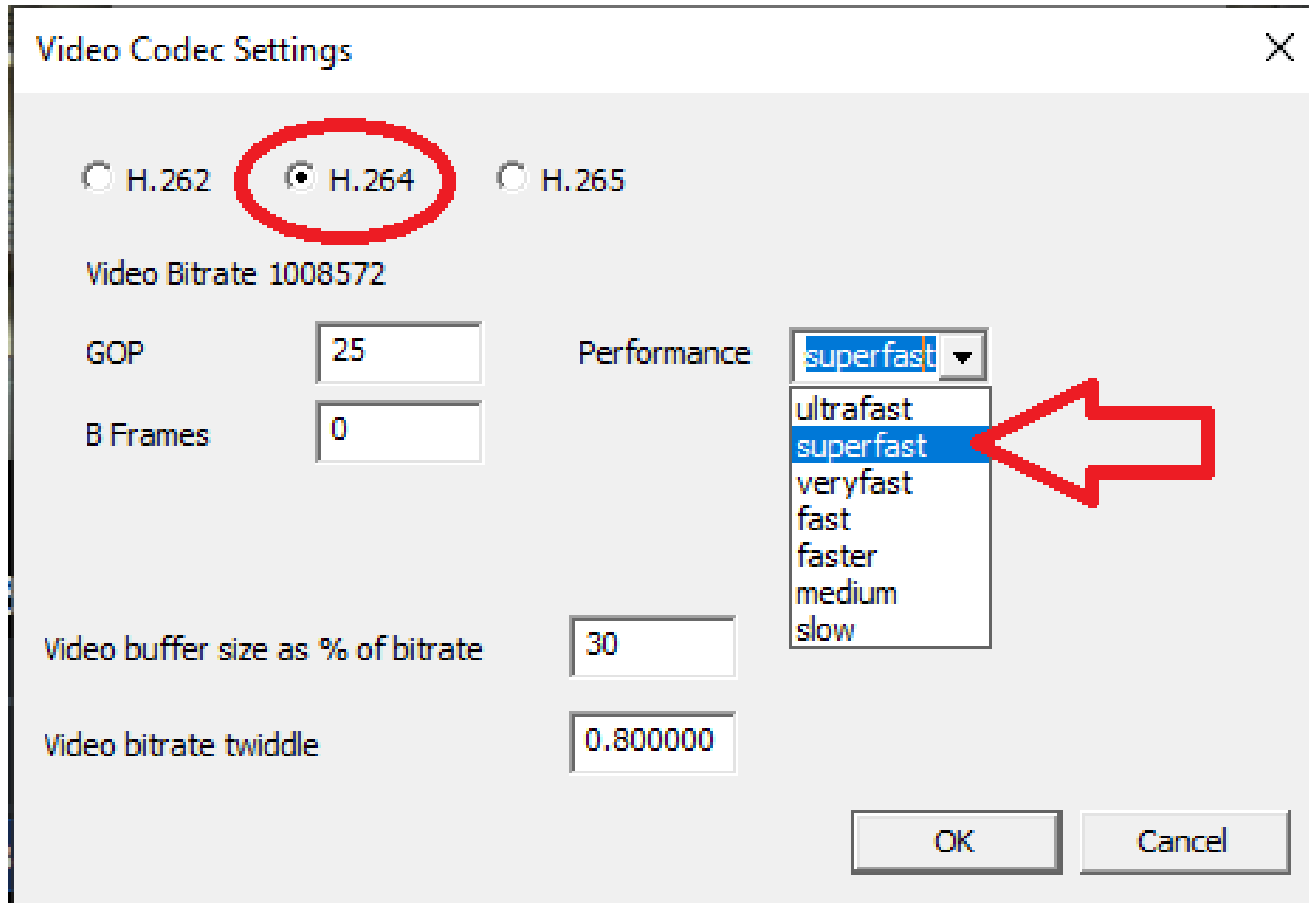
DATV  
Express:

Supported  
RF exciters



DATV  
Express:

Video  
capture  
setting



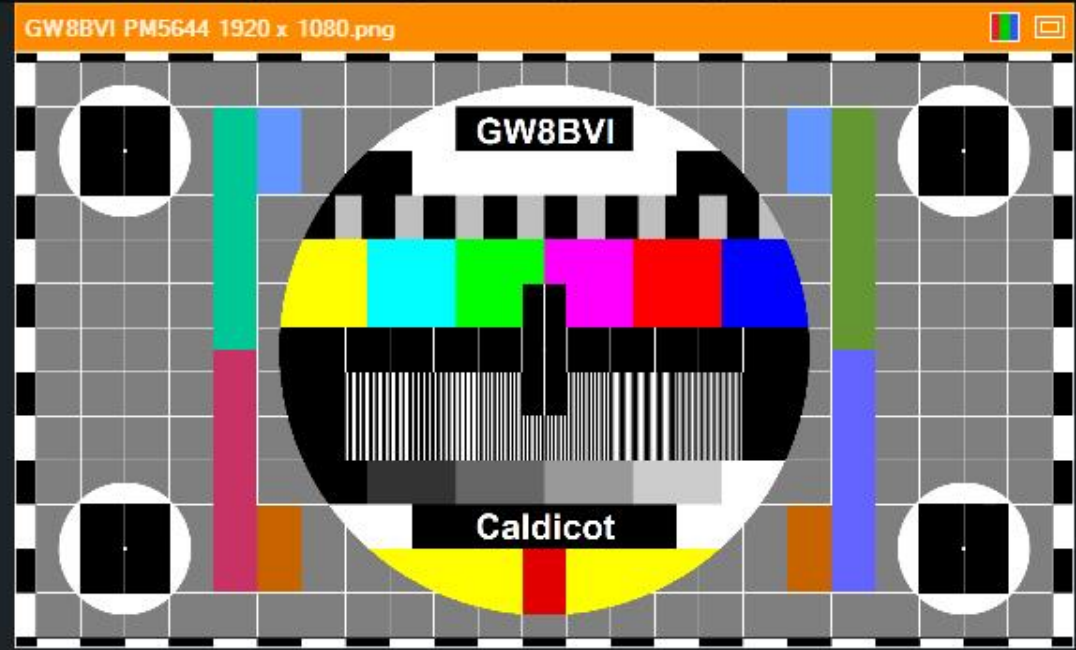
DATV  
Express:

H.264  
Codec  
setting

# Video Mixer companion apps to DATV Express

An entire broadcast studio on your PC

- Vmix (free SD, paid HD)
- OBS (free, including HD)



Quick Play

Cut

Fade

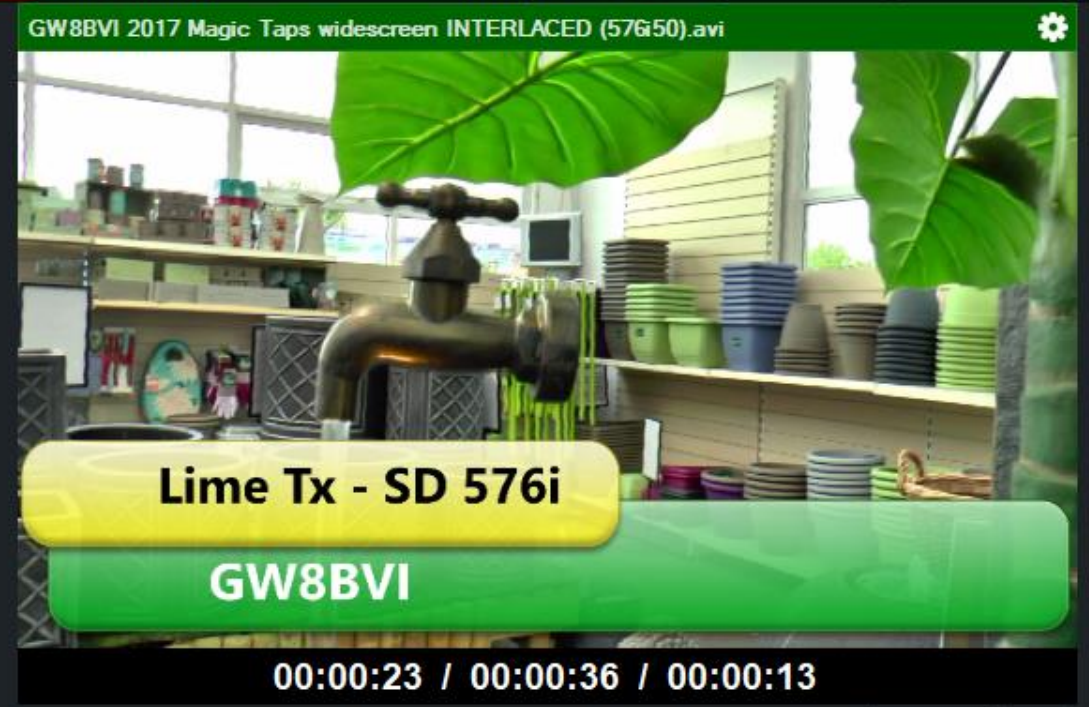
Wipe

Fly

CubeZoom

FTB

1 2 3 4



1 GW8BVI 2017 Magic Taps widescreen

2 GW8BVI PM5644 1920 x 1080.png

3 NewsHD10.xml

Lime Tx - SD 576i

GW8BVI

Close Quick Play Cut Loop

1 2 3 4 Audio

Audio Mixer

Master

OUTPUTS

INPUTS

Settings icon

Volume icon

- Add
- Group Selected Items
- Copy
- Paste (Reference)
- Paste (Duplicate)
- Copy Filters
- Paste Filters
- Set Color
- Rename
- Remove
- Order
- Transform
- Hide in Mixer
- Deinterlacing
  - Disable
  - Discard
  - Retro
  - Blend
  - Blend 2x
  - Linear
  - Linear 2x
  - Yadif
  - Yadif 2x
  - Top Field First
  - Bottom Field First
- Resize output (source size)
- Scale Filtering
- Fullscreen Projector (Source)
- Windowed Projector (Source)
- Interact
- Filters
- Properties

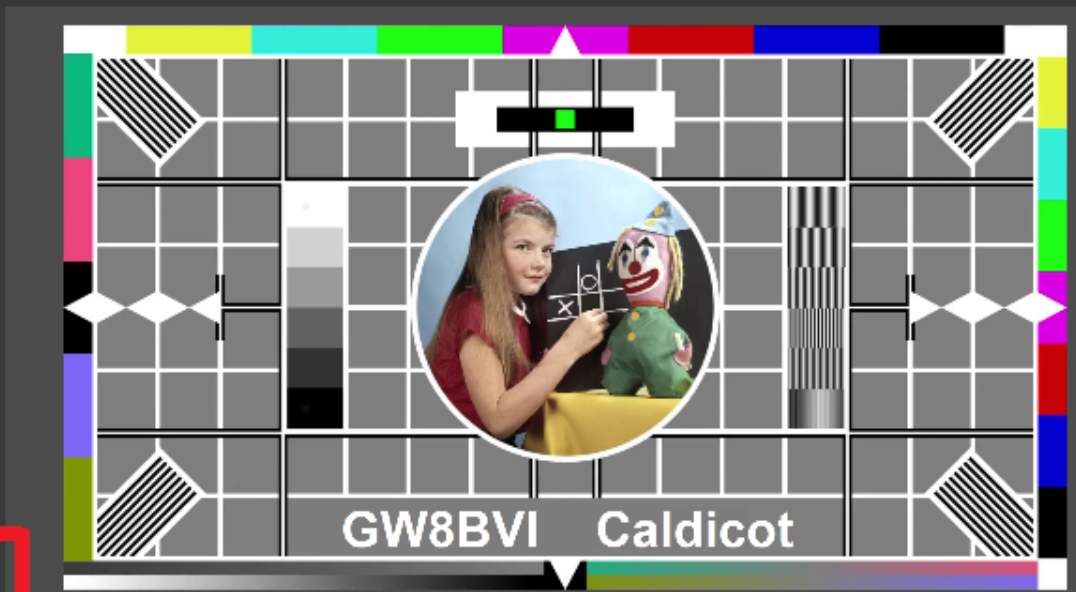


Transition

Quick Transitions

Cut

Fade (300ms)



Scenes

Scene

HD60 TCW

+ - ^ v

Mixer

-inf dB

-40 -35 -30 -25 -20 -15 -10 -5 0

0.0 dB

-40 -35 -30 -25 -20 -15 -10 -5 0

-60.0 dB

-40 -35 -30 -25 -20 -15 -10 -5 0

Scene Transitions

Cut

+ -

Controls

Start Streaming

Start Recording

Studio Mode

Settings

Exit



Display

Outputs / NDI

Options

Performance

Decoders

Recording

External Output

Audio

Audio Outputs

Web Controller

Tally Lights

Shortcuts

Activators

About

Theme: Charcoal8

Preview Colour:



Output Colour:



Master Frame Rate: PAL 25p

Output Size: 720x576

Output Aspect Ratio: Widescreen

Fullscreen: Display 1

Display: 2

Position:



0

0

0

0

 Hide Cursor On Top Minimise

Input Size: 208x156

Import

Export

Default

 Show Advanced Settings

OK

Cancel

- Display
- Outputs / NDI
- Options
- Performance
- Decoders**
- Recording
- External Output
- Audio
- Audio Outputs
- Web Controller
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- About

**Preferred Deinterlacing:**

Camera: None

Video Playback: None

**FFMPEG:**

Play the file types below using the FFMPEG decoder (Example: \*.mov, \*.qt, \*.mxf)

\*.mov, \*.qt, \*.mxf, \*.mp4, \*.mpg, \*.ts, \*.m4v

**Direct Show:**

MPEG 2 Video: Auto

Properties

Use vMix Deinterlacing

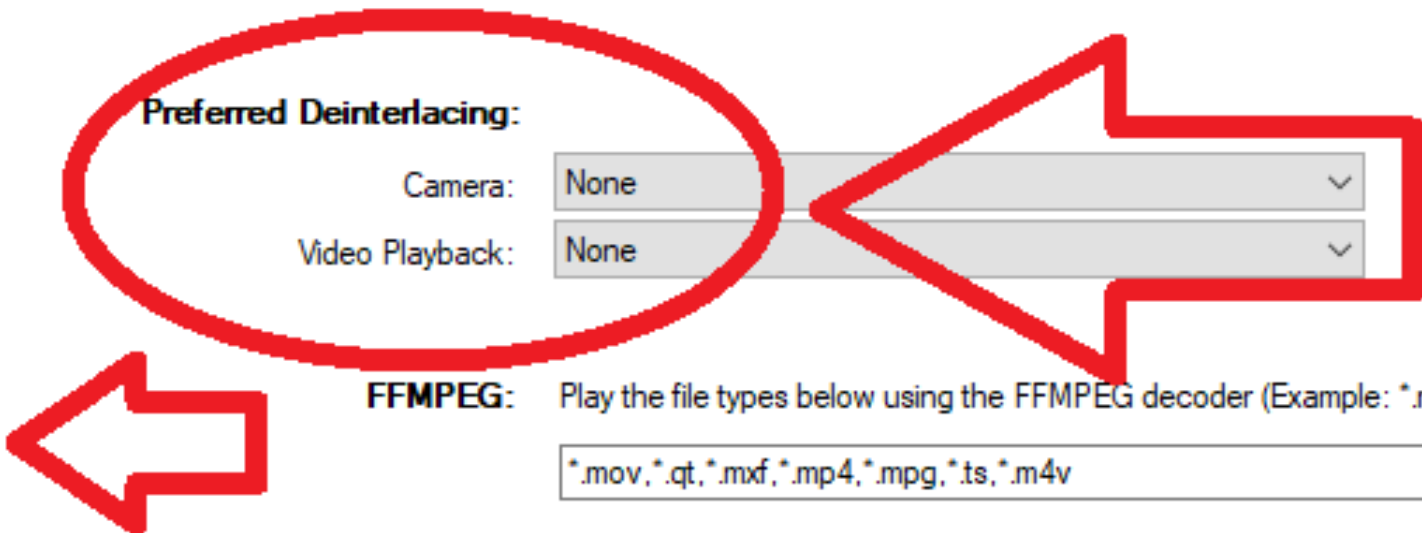
MPEG Audio: Auto

Properties

x264 Video: Auto

Properties

Filters: Blocked Filter List



- Display
- Outputs / NDI
- Options
- Performance
- Decoders**
- Recording
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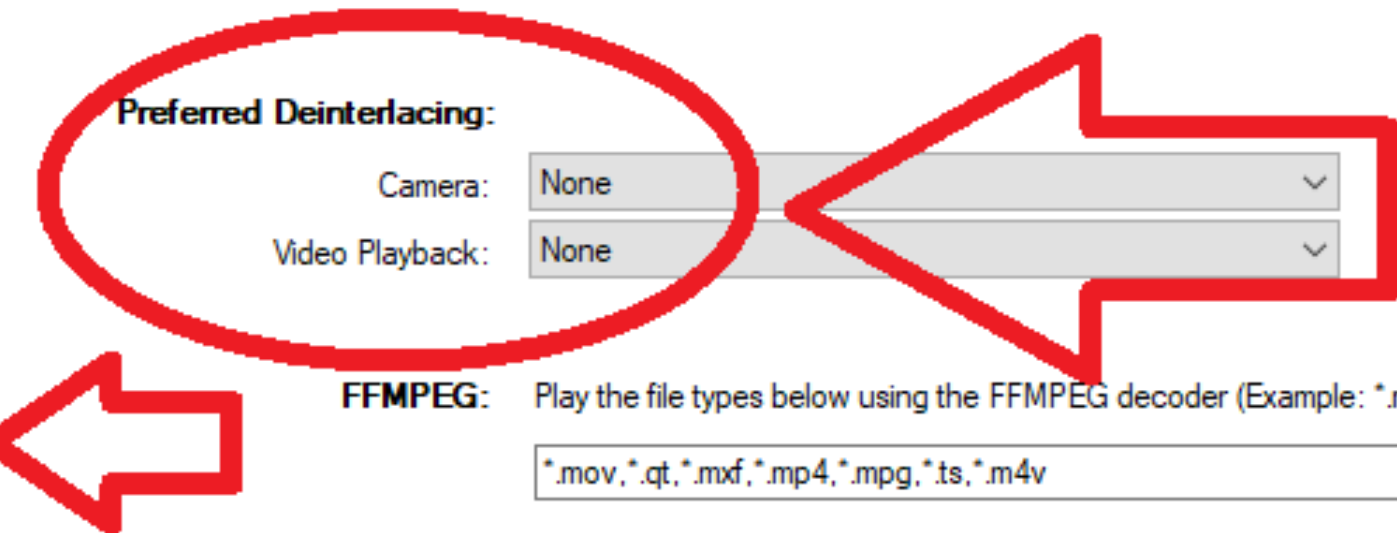
MPEG Audio: Auto

Properties

x264 Video: Auto

Properties

Filters: Blocked Filter List



# INTERLACING: **FIELD ORDER**

Top Field First (tff)

Bottom Field First (bff)

INTERLACING: **WRONG FIELD  
ORDER**... what does it look like?

Extreme motion judder

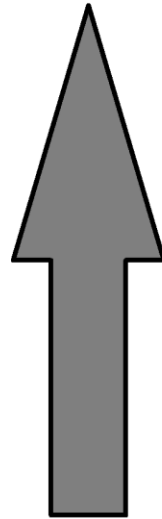
But stationary objects look OK

Pairs of fields are being displayed  
swapped in time sequence

# Extreme motion judder?? Fix that wrong field order!!



**tff**



**1-line  
V shift**



**bff**

General

Colour Adjust

Colour Key

Colour Correction

**Position**

Multi View

Triggers

Tally Lights

PTZ

Advanced

Main

Zoom: 1 Reset

Zoom X: 1 Reset

Zoom Y: 1 Reset

Pan X: 0 Reset

**Pan Y: 0.206 Reset**

Rotate: Z 0 Reset

Crop X1: 0

Crop Y1: 0

Crop X2: 720

Crop Y2: 576

Reset All

Shift  
input UP  
by 1 line





# Scene Item Transform



Position 0.0000

Rotation 0.00

Size 1920.0000 1080.0000

Positional Alignment Top Left

Bounding Box Type No bounds

Alignment in Bounding Box Center

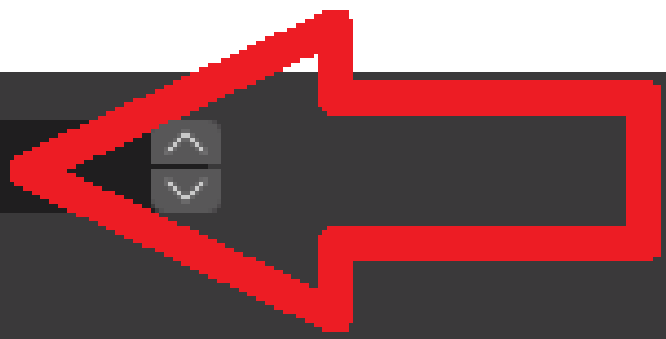
Bounding Box Size 1.0000 1.0000

Crop Left 0 Right 0

Top 0 Bottom 0

Reset

Close



1 line  
vertical  
shift



SR (kS) Freq (kHz)  
**01000 01249000**  
 Offset-> - **00000000**

SR250	1255Mhz
SR333	1280Mhz
SR2000	437Mhz
SR4000	11538 Mhz
SR22000	11597 MHz
SR250	1255Mhz
SR333	1280Mhz
SR2000	437Mhz

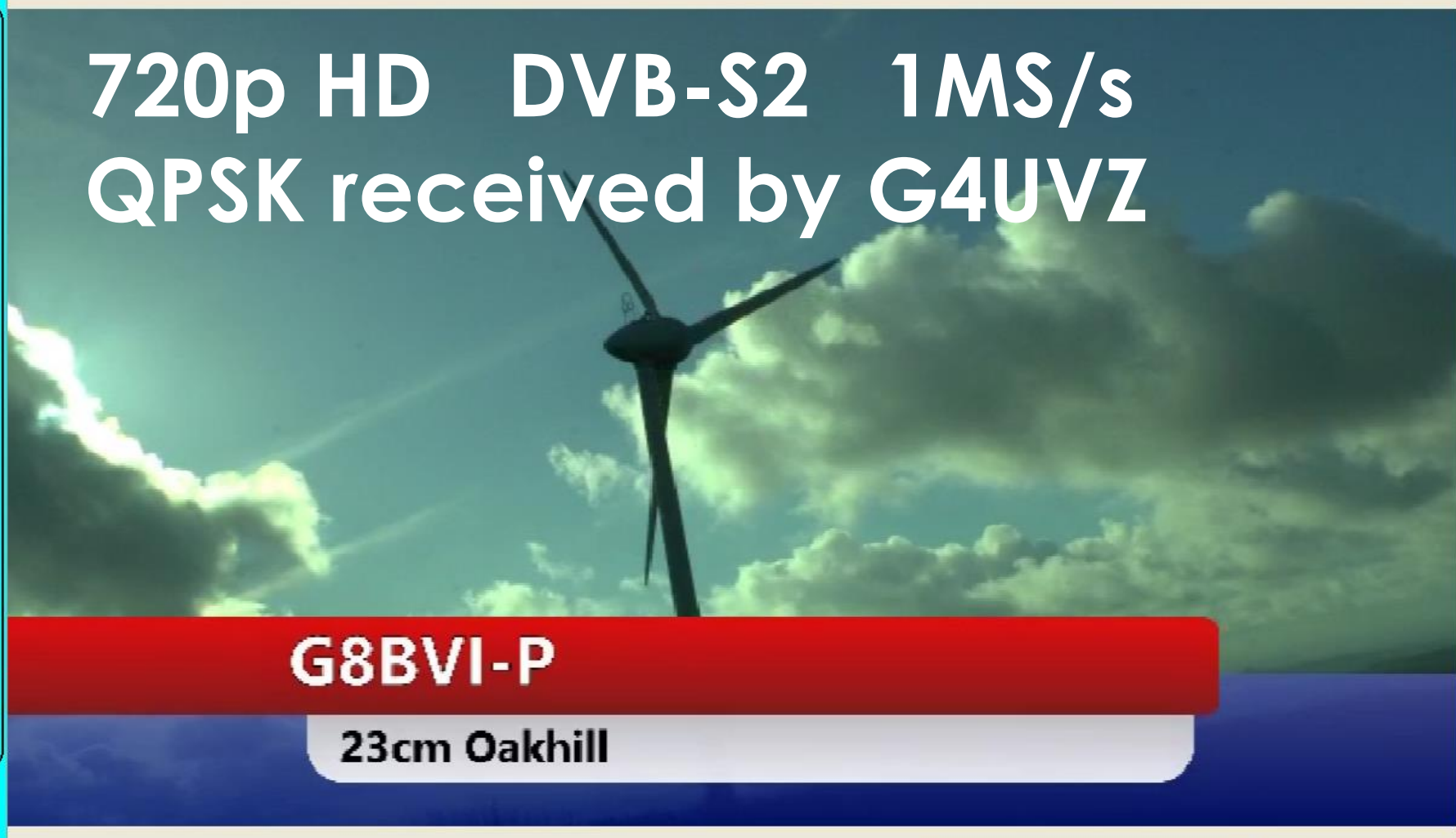
**Oscar 100**

DVB mode:  DVB-S  DVB-S2  Auto  
 FEC DVBS:  All  1/2  2/3  3/4  5/6  6/7  7/8

Wide scan  Low SR

Fplug:  A  B  
 LNB volt:  0  13(V)  18(H)  
 22kHz:  OFF  ON  TS

Store into Memory



**PIDs**

Pid from .ini

DATV

PID Video: **00256**  
 PID audio: **00257**

Codec:  
 Mpeg2  H264  H265

Format:  
 4/3  16/9  1/1  auto  
 Width: 1138 Height: 360

Audio:  
 MPA  AAC  AC3

Zoom:  
 adapt  x1  maxi

Program: **DATV**  
 infos: **DVB-S2**  
 Provider: **GW8BVI**  
 Codec: **VH264 + MPA**

Audio level

Info

<input checked="" type="radio"/> Carrier	<input checked="" type="radio"/> SR	<input checked="" type="radio"/> Full	RF Pw -42dBm	C/N MER 30.0dB

BCH errors: **0**

LDPC:  0%

FEC: **3/4 QPSK\_L20**

C/N must be > 4.03 dB **D26**

TS:     err **0**

Bytes recvd: **1438 kb/s** 267ms

**SR (kS) Freq (kHz)**  
**01000 01249000**

Offset-> - **00000000**

SR250	1255Mhz
SR333	1280Mhz
SR2000	437Mhz
SR4000	11538 Mhz
SR22000	11597 MHz
SR250	1255Mhz
SR333	1280Mhz
SR2000	437Mhz

**Oscar 100**

DVB mode **M1** FEC DVBS  
 DVB-S  All  
 **DVB-S2** **M2**  1/2  
 Auto **M3**  2/3  
  3/4  
  5/6  
  6/7  
  7/8

Wide scan  
 Low SR

Fplug LNB volt 22kHz  
 A  0  OFF  
 B  13(V)  ON  
  18(H)  TS

**Store into Memory**  
**M1 M2 M3**



**PIDs**

**Pid from .ini**  Auto PID

DATV  **PID Video**  
 program2 **00256**

program3  **PID audio**  
 program4 **00257**

program5  Codec  
 Mpeg2  
 H264  
 H265

program6   H265

Format  
 4/3 Width: 1138  
 16/9 Height: 360  
 1/1 Audio  
 MPA  
 AAC  
 AC3

Zoom  
 adapt  
 x1  
 maxi

**GRAPH**  **Reset**

**Program** DATV  
 infos : DVB-S2  
 Provider:GW8BVI  
 Codec : VH264 + MPA

**photo**

**Audio level**

Info

<b>Carrier</b>	<b>SR</b>	<b>Full</b>	<b>RF Pw -47dBm</b>	<b>C/N MER 24.0dB</b>

BCH errors **0**

LDPC **0%** **0**

FEC **3/4 8PSK\_L20**

C/N must be > 7.91 dB **D16**

TS **err 0**

Bytes recvd: **2209 kb/s** **300ms**

Beep  Dsave  UDP  Record

Expert  Web **Quit**