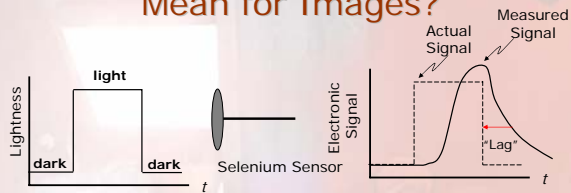


What Does "Slow Response" Mean for Images?



Slow Response of Sensor Produces "Smeared" Image
"Lag" Blurs Sharp Corners

Sidebar: High-Contrast Makeup



- Precompensates for slow speed and low efficiency of sensor
 - **pre-enhanced edges**
- Whitened face
 - Heavy white between eyebrows and eyelids
- Blue-black applied to
 - eyebrows
 - eyelashes
 - lips
 - sides of nose

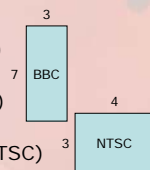


Jane Carr made up for BBC Telecast
November 15, 1932
"I'm ready for my closeup, Mr. DeMille."

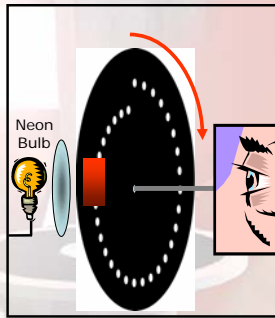
off-screen photo

Signal Specs for Baird BBC TV

- 30 lines per frame (vs. 525 in NTSC)
 - vertical scan instead of horizontal
 - $\cong 70$ spots per line (vs. 480 in NTSC)
 - 3:7 aspect ratio (vs. 4:3 for NTSC)
 - 12.5 frames per second (vs. 30 in NTSC)
 - Video Signal Bandwidth
 - $\cong 30 \text{ lpf} \times 70 \text{ spl} \times 12.5 \text{ fps} = 26,250 \text{ spots per sec.}$
 - $\Rightarrow \text{max frequency } v_{\text{max}} = 13,125 \text{ Hz} \cong 13 \text{ kHz}$
- \Rightarrow Video Signal at AUDIO FREQUENCIES!!
(was transmitted by AM radio)



Schematic of Baird TV Receiver



Receiver

Baird "Televisor" Receiver

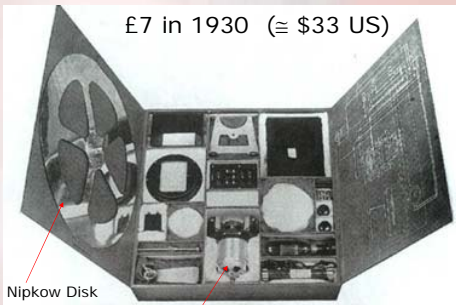
- Manufactured by Plessey Co., UK, 1930
 - Reports of Production Vary
 - 1000 to "several thousand"
 - Reports of Price Vary
 - £18 (≅ \$86 US then, ≅ \$1000 now)
 - (BBC quotes £100 ≅ \$480)
- Displayed video from transmitted radio signal
- Received BBC 30-line broadcasts (1932-1935)
- Image size ≅ 20mm x 60mm (≅ 0.8" x 2.4")



<http://www.tvhistory.tv/1930BairdTelevisor>

Televisors Also Sold as Kits

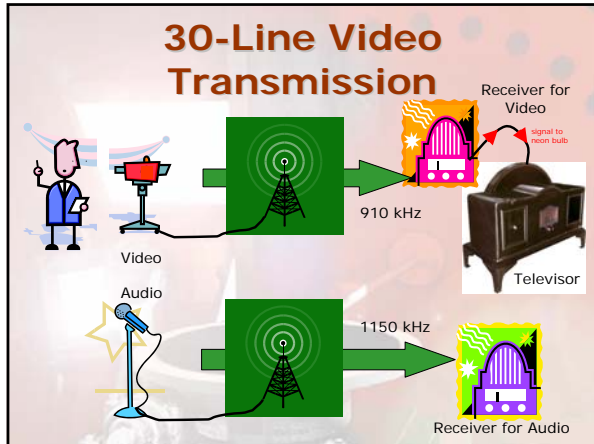
£7 in 1930 (≅ \$33 US)



Nipkow Disk

Motor

http://www.earlytelevision.org/baird_mechanical.html



1930 TV Dramatization

“The Man with the Flower in His Mouth”
by Luigi Pirandello

- Broadcast from Baird’s Studio in London by BBC
 - 3:30 PM, Monday July 14, 1930
 - video @ 330m (910 kHz), audio @ 261m (1150 kHz)
- Received in Dublin and Lisbon (!)
- Directed by Val Gielgud
 - (elder brother of Sir John Gielgud)




Val
John

1930 TV Dramatization

The photograph shows three people in a studio setting. Red arrows point from the text to the individuals: Earle Grey (the man), Gladys Young (the woman), and Lionel Millard (the customer).

- The Actors
 - The Man: **Earle Grey**
 - The Woman (his wife): **Gladys Young**
 - The Customer: **Lionel Millard**
 - Narrator: **Lance Sieveking**

1930 Video "Studio"



Checkered "Fade Board"

- One fixed camera
 - 29 "scenes"
 - no pan or zoom
- One actor at a time
- Actors switched places behind "fade board"
- First recorded instance of make-up to accentuate the actor's features

1967 Recreation of Play on 30-Line Video

- Recorded on stereo tape, audio and video in separate audio tracks
 - Lance Sieveking (original Producer) did voiceovers
 - Original music (from 78 rpm audio disc)
 - Original artwork, by C.R. Nevinson
 - Unnamed Student Actors from Inner London Education Authority (ILEA)
- Shown at *Ideal Home Exhibition* of 1968 on an original Televisor



<http://www.tvdawn.com/mwfihtm.HTM>

1967 30-Line Camera

- Modified from Baird Televisor by Bill Elliott
 - Engineer for Granada Television in UK
- Converted one Televisor into camera by replacing neon display bulb with photomultiplier
- Lens placed focused scene onto disc
- Result displayed either on second Televisor or on homemade CRT display



1967 Recreation of 1930 Teleplay



<http://www.tvdawn.com/mw/film.HTM>

Significant Error in Video

- First televised drama was broadcast September 11, 1928 by GE, Schenectady
 - 40-minute play "The Queen's Messenger"
 - video broadcast over W2XAD
 - audio over WGY
- 24 scanning lines
- 3 cameras
 - one on each of two actors
 - one on props
- Reported on front page of *New York Times* next day

BBC 30-Line Broadcasting Service

BBC 30-Line Television Service



Logo Card for
BBC 30-Line Service

- Baird System
 - Began 11:02 PM, Monday, 8/22/1932
 - One 30-min. program, 4 nights per week
- Ran until 9/11/1935
 - (hiatus to change studios in 2/1934)

Logo Looks Familiar?



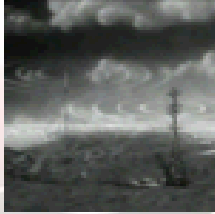
1951-1966

Advance of Technology...

- 30-line broadcasts replaced with 405-line service
 - alternated broadcasts using Baird and Marconi/EMI all-electronic systems
- 11/2/1936 – 9/1/1939

Why Did It End?

BBC 408-Line TV Identification Logo



<http://www.transdiffusion.org/emc/baird/index.htm>

Recording Video from Mechanically Scanned TV



Signal Specs for Baird BBC TV

- 12.5 frames per second (vs. 30 in NTSC)
- Video Signal Bandwidth
 - $\cong 30 \text{ lpf} \times 70 \text{ spl} \times 12.5 \text{ fps} = 26,250 \text{ spots per sec.}$
 - $\Rightarrow \text{max frequency } v_{\text{max}} = 13,125 \text{ Hz} \cong 13 \text{ kHz}$
 - assume $v_{\text{min}} = 0 \text{ Hz} \Rightarrow \text{bandwidth} \cong 13 \text{ kHz}$

- \Rightarrow Video Signal at AUDIO FREQUENCIES!!
- \Rightarrow Transmitted by AM radio

Baird "Phonovision"

- Gramophone records
 - 10"-diameter shellac discs
 - (analogous to vinyl!)
- first disc dated September 20, 1927
 - four months after Lindbergh's flight
 - seven years after first scheduled AM radio broadcasts



<http://www.tvdawn.com/silvaton.H>

Needle in Groove



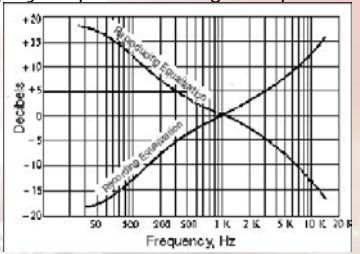
- Needle converts groove to motion
- Motion converted to electronic signal
 - by electromagnetic or piezoelectric interaction
 - electromagnetic vs. crystal cartridge

Response of Needle vs. Frequency

- Needle responds "well" to low frequencies
 - Can track more easily in groove
- Responds "less well" to high frequencies
- Need to "Compensate" for Response of Needle + Cartridge
 - by "Equalization"

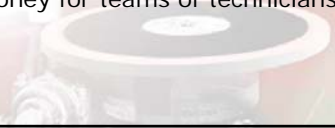
RIAA Equalization for Disc Recording

- During Recording:
 - Reduce Amplitudes of Low Frequencies
 - Amplify Amplitudes of High Frequencies



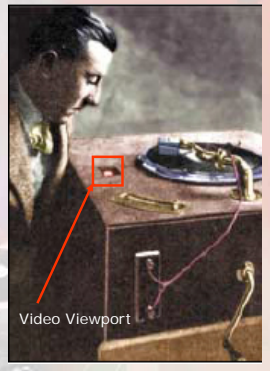
Significance of Phonovision

- World's first recorded electronic images
- Pre-dated invention of first practicable videorecorder (Ampex VR1000) by 25+ years
- Predated of home video by 50 years (±)
- Many of Baird's problems were overcome later ONLY by investing much time and money for teams of technicians

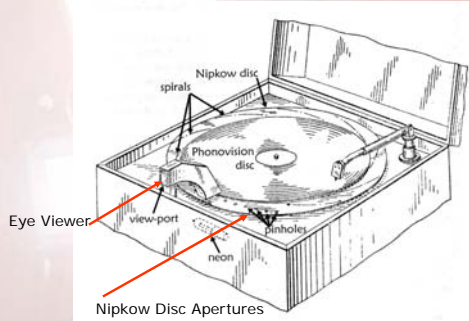


Planned Phonovision Player

- 10-spiral Nipkow disc
 - 10 scans per rotation
 - 12.5 frames per second
 - Rotates with disc turntable
 - Improves synchronization
- Viewed directly through port
 - Promotes Chiropractic Care!



Later Proposal for Phonodisc Player



Baird's Solution for Recording Audio with Video

- Both Signals on Same Side of One Disc



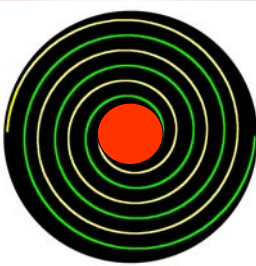
Stereo LP, Arista, 1973

Baby Boomer Quiz

- Q: How many grooves on the LP disc "Matching Tie and Handkerchief?"
- 500
(= 15 min × 33 1/3 rpm)
 - 2 (one per side)
 - 3

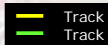
Answer: C, 3!

Schematic of "Matching T&H" Side 1

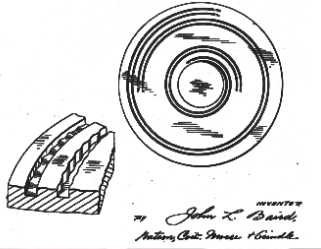


- Two interlaced grooves with different programs
- Which program plays is determined by (random) drop of tonearm

"Boy, that is a short record!"



Baird Recording of Audio and Video on Same Disc

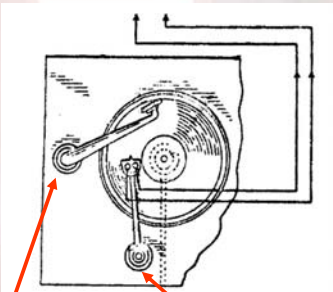


- Audio and Video in Separate Grooves
 - one each with horizontal and vertical vibration

1926 Illustration of Phonovision, showing "hill-and-dale" concept of two tracks

<http://homepages.strath.ac.uk/~clcs09/pete/jlb/jlb.htm>

Baird Patent #320,909 for Playback System



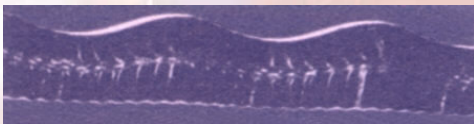
- Two "Tonearms" for Simultaneous Pickup

Audio Pickup

Video Pickup

Might Remind Boomers of Their Analog Past

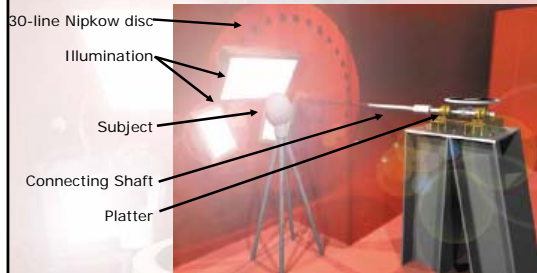
- Stereo LPs recorded two signals along orthogonal axes in same groove
 - originally Horizontal, Vertical
 - later 2 channels at $\pm 45^\circ$ from vertical



Phonovision Recording Speed

- Discs store 90 scan lines per rotation
⇒ Three 30-line frames per rotation
- 78 rpm playback ⇒ 3.9 frames per second
- If video at 12.5 frames per second, number of rotations per second would be:
 $12.5 / 3 = 4 \frac{1}{6}$ rotations per second
= 250 rpm
(Record would have had to rotate at 250 rpm instead of 78 rpm)
⇒ Slower frame rate must have been used

Phonovision Recording Studio



Computer graphic © Don McLean: <http://www.tvdawn.com/articles.htm>
