Evolution of Wide Screen Broadcasting in the United Kingdom

ITU Inter-Regional Seminar
Kyiv, 13 November 2000

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Widescreen Broadcasting in the UK

- Factors Affecting Subjective Picture Quality
- The Domestic Viewing Environment
- Digital TV in the UK
- Widescreen Production & Transmission
- Conclusions
ITC

• Regulates commercial TV in the UK
• Manages UHF frequency planning
• Manages research into new technologies

( IBAG: MAC/enhanced PAL/digital - 1980s)
– contributed to PALplus, digital terrestrial
– collaborative European projects
  for example, picture quality evaluation
How to Improve Picture Quality

• Lessons from ‘early’ work:
  – eliminate PAL artefacts (e.g. MAC, PALplus)
PALplus

**Advantages:**
- widescreen: 16:9 letterbox (430 active lines)
- MACP - luminance/chrominance separation
- vertical helper for luminance
- line 23 signalling
- close to Rec. 601 studio quality at 4H

**Disadvantages**
- letterbox!
How to Improve Picture Quality

• Lessons from ‘early’ work:
  – eliminate PAL artefacts (e.g. MAC, PALplus)
  – widescreen picture
The Shape of the Picture
How to Improve Picture Quality

• Lessons from ‘early’ work:
  – eliminate PAL artefacts (e.g. MAC, PALplus)
  – widescreen picture
  – ghost cancellation
GCR - Line 318

- Rec. ITU-R BT. 1124
How to Improve Picture Quality

• Lessons from ‘early’ work:
  – eliminate PAL artefacts (e.g. MAC, PALplus)
  – widescreen picture
  – ghost cancellation
  – reduce picture noise
  – improve sound quality!
  – HDTV?

• Digital Production & DVB Transmission
  – can achieve all the above
  – AND improved spectrum efficiency
How Do We Classify TV Systems?

- Proposal in ITU-R BT. 1127: According to ‘Design Viewing Distance’ at which Picture Quality graded ‘excellent’:
  - SDTV: 6H
  - EDTV: 4H
  - HDTV: 3H
HDTV

- Aspect Ratio 16:9
- “Twice the horizontal & vertical resolution of standard definition television”
- “Essentially transparent to a bi-dimensional representation of the real world when the picture is seen at three times the height of the screen (3H)”
- Production: Rec. ITU-R BT. 709
  - 1920 x 1080 pixels, 24/25/30/50/60 Hz
‘MOSAIC’: 1994-5

- Tools to evaluate subjective picture quality
  - single-stimulus continuous quality evaluation technique (SSCQE)
- Study the effects of viewing conditions
  - the domestic environment
  - survey of 500 homes
Actual Viewing Distances

- 1-1.5m: 24%
- 1.6-2.5m: 36.3%
- 2.6-3.5m: 46.6%
- 3.6-4.5m: 12.9%
- >4.5m: 2%
Actual Viewing Distances

<table>
<thead>
<tr>
<th>Distance</th>
<th>4H</th>
<th>5H</th>
<th>6H</th>
<th>7H</th>
<th>8H</th>
<th>9H</th>
<th>10H</th>
<th>11H</th>
<th>12H</th>
<th>13H+</th>
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<tbody>
<tr>
<td></td>
<td>1.2</td>
<td>4.4</td>
<td>13.5</td>
<td>13.9</td>
<td>17.3</td>
<td>13.9</td>
<td>11.3</td>
<td>6.0</td>
<td>6.9</td>
<td>11.7</td>
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Preferred Viewing Distance

Viewing Distance (H) vs. Screen Height (m)

- SDTV
- HDTV
Preferred Viewing Distance

Viewing Distance (H) vs. Screen Height (m)

- SDTV
- HDTV
Preferred Viewing Distance

Screen Height (m) vs. Viewing Distance (H)

- Red line: SDTV
- Green line: HDTV
### Home Environment: ITU-R BT. 500

<table>
<thead>
<tr>
<th>Screen diagonal (in)</th>
<th>4/3 ratio</th>
<th>16/9 ratio</th>
<th>Screen height (H) (m)</th>
<th>PVD (H)</th>
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<tbody>
<tr>
<td>12</td>
<td>15</td>
<td>0.18</td>
<td>9</td>
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<tr>
<td>15</td>
<td>18</td>
<td>0.23</td>
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<td>24</td>
<td>0.30</td>
<td>7</td>
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<tr>
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<td>&gt; 120</td>
<td>&gt; 1.53</td>
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UK Digital TV

- Transmission: 625-line interlace
  - no demand for HDTV
- Introduced from autumn 1998
- Simulcast existing channels
  - many programmes in 16:9
  - simulcast in 14:9 analogue PAL
- Also, many new programme services
UHF Television

- 4 analogue networks
  - over 1100 sites
  - 99.4% coverage

- Channel 5
  - 44 sites
  - 80% coverage

- 6 DVB-T multiplexes
80 DTT Sites
# DTT Coverage & Services

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<th>Coverage</th>
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<tr>
<td>BBC 1&amp;2, News 24, Choice, Text</td>
<td>81%</td>
</tr>
<tr>
<td>ITV &amp; ITV2, C4 &amp; FilmFour, Teletext</td>
<td>78%</td>
</tr>
<tr>
<td>SDN (S4C, C5 + other services)</td>
<td>78%</td>
</tr>
<tr>
<td>ONdigital</td>
<td>74%</td>
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<td>66%</td>
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<td>64%</td>
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Production in 16:9

- Content producers’ budgets are under enormous pressure...this influences choice of equipment
- *Single* production chain for widescreen digital & analogue simulcast is *highly* desirable
- Rec. 601 production/post-production:
  - well established
  - cost effective
  - can be used to produce in 16:9
- The solution: 14:9 ‘Safe Areas’
Production in 16:9
Shoot to Protect 14:9
Shoot to Protect 14:9

‘Safe Area’
Digital Viewer with 16:9 TV
Digital Viewer with 4:3 TV
Digital Viewer with 4:3 TV

Viewer chooses full screen or 16:9 letterbox
Analogue PAL Simulcast: 14:9
16:9 Shoot to Protect 14:9

- 16:9 frame raster edge
- 14:9 central zone
- 4:3 central zone

- 10% of 16:9 image (70 pixels)
- 4.2% of 14:9 image (26 pixels)
- 15% of 16:9 image (105 pixels)
- 9.9% of 14:9 image (61 pixels)
- 3.3% of 4:3 image (17 pixels)

- 3.5% Action safe area
- 5% Graphics safe area

- 14:9 action safe area
- 14:9 graphics safe area

- 88 pixels
- 526 pixels
- 614 pixels
- 702 pixels

- 88 pixels
- 44 pixels

- Lines: 23-310, 336-623
- Lines: 33-300, 346-613
- Lines: 38-295, 351-608
UK Widescreen Broadcasts

- Over 50% of simulcast BBC/ITV in peak time
- Several (digital only) movie channels
- ALL advertisements since 1 July 2000
- ALL programme genres
  - including news
  - but some sport remains in 4:3
- Programme sources:
  - mainly Rec. 601 in 16:9
  - film (including drama shot in Super 16)
  - (downconverted HTDV - Rec. 709)
16:9 TV: UK Sales

- September 2000: 127,000
- Year 2000 so far: 1,187,000
- 90% growth in sales over same period 1999
- 50% of large-screen TVs (>43 cm)
- 61% of value of TV market: £750 million
16:9 TV: UK Sales

Forecast penetration end 2000: 10.4%
16:9 Sales in Europe
16:9 Sales in Europe

- UK
- France
- Germany
- Netherlands
- Spain
- Italy
- Switzerland
- Sweden
Conclusions: Digital Transmission

- Digital TV in the UK is a success story
  - market take-up: 1 in 5 households
  - strong commercial players
  - consumer choice (terrestrial, satellite, cable)
  - widescreen is important

- 625-line interlace is adequate for the foreseeable future

- There is no commercial requirement to transmit HDTV ...for the time being
Conclusions: UK Widescreen

• Digital Widescreen transmission is a success
  – many programmes are in widescreen
  – 1 in 10 homes and growing rapidly

• Made possible and *affordable* by:
  – Rec. 601 in the studio
  – analogue PAL transmission in 14:9
  – single production chain using appropriate
    Safe Areas: Rec. ITU-R BT.1379
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