**Iain E. Richardson**
Vcodex BV
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*iain@vcodex.com*

Internationally known expert on video compression, streaming technology and standards including H.264 / MPEG-4 and HEVC. Author of four widely cited books on video and image coding. Experienced expert witness in US and international patent litigation cases.

## Personal Profile

Regularly advise companies on video compression and streaming technology, video coding patents and technology acquisitions. Expert witness in multiple US and EU patent litigation cases. I have given expert testimony in San Diego, New York, Washington DC and The Hague and have given many invited lectures on video compression coding, including the Smithsonian Institution and the US Patent and Trademark Office.

I have made an internationally significant contribution to research in the field of image and video compression. This is the essential technology for applications such as digital television, internet video streaming and video on mobile phones. My research addresses the growing challenge faced by industry, namely how to support sophisticated video compression on an increasing range of devices and platforms. Member of the expert group responsible for coding of audio, picture and multimedia content, within NEN, the Royal Netherlands Standardization Institute. Member of Advisory Group 5 (Video Quality) of ISO/IEC SC29, the committee responsible for the MPEG and JPEG video, audio and image compression standards.

I invented and commercialised Beamshare, a novel technology for rapid and secure sharing and streaming of video and other media. Beamshare is now in use in industries such as Search and Rescue and broadcast video production.

I am based in the Netherlands and travel frequently to the US.

## Qualifications

Ph.D. (1999), Video Coding for Reliable Communications, Robert Gordon University, Aberdeen, UK
M.Eng. (1990), Electrical and Electronic Engineering, Heriot-Watt University, Edinburgh, UK



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## Employment experience

| | |
|---|---|
| 2006 - present | Managing Director, Vcodex Limited, Aberdeen, Scotland & Vcodex B.V., Delft, The Netherlands |
| 2009 – 2015 | Managing Director, Onecodec Ltd, Aberdeen, UK |
| 1993 - 2010 | Full Professor, School of Engineering, The Robert Gordon University |
| 1995 - 2000 | Director, 4i2i Communications Ltd |
| 1990 - 1993 | Digital Signal Processor Designer, GEC Ltd, Edinburgh |

## Professional affiliations

*Honorary Professor of Video Communications*, Robert Gordon University, Aberdeen, UK
*Member, Advisory Group 5 (Video Quality)*, ISO/IEC SC29 (MPEG)
*Member,* Royal Netherlands Standardization Institute
*Member,* IEEE
IAM Strategy 300 (2017, 2018): The World's Leading IP Strategists

## Expert witness and intellectual property experience

As an experienced expert witness in patent litigation cases, I have testified at deposition and trial in:

1. *Qualcomm Inc v. Broadcom Corporation SDCA-3-05-cv-01958*
   United States District Court, Southern District of California), 2006
   (Video Compression, H.264)
   On behalf of *Qualcomm Inc*
2. *Electronic Devices With Image Processing Systems, Components Thereof, and Associated Software ITC-337-TA-724*
   United States International Trade Commission Investigation, 2011
   (Graphics compression)
   On behalf of *S3 Graphics, Inc.*
3. *Multimedia Patent Trust v. Apple Inc., et. al. SDCA-3-10-cv-02618*
   United States District Court, Southern District of California, 2012
   (Video Compression, MPEG-2 and H.264)
   On behalf of *Multimedia Patent Trust*
4. *Audiovisual Components ITC-337-TA-837*
   United States International Trade Commission Investigation, 2013
   (Data / Video compression, H.264)
   On behalf of *LSI Corporation*
5. *Certain Video Processing Devices, Components Thereof, and Digital Smart Televisions Containing the Same; Inv. No. 337-TA-1222*
   United States International Trade Commission Investigation, 2021
   (Video Streaming)
   On behalf of *DivX*
6. *Certain Fitness Devices, Streaming Components Thereof, and Systems Containing Same; 337-TA-1265*
   United States International Trade Commission Investigation, 2022
   (Video Technology)
   On behalf of *Peloton Interactive, Inc., Mirror and Icon Health & Fitness, Inc*
7. *Certain Video Processing Devices and Components Thereof; Inv. No. 337-TA-1343*



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United States International Trade Commission Investigation, 2023
(Video Streaming)
On behalf of *DivX*

8. *Electronic Devices Including Smartphones, Computers, Tablet Computers, and Components Thereof.; 337-TA-1373*
   United States International Trade Commission Investigation, 2024
   (Video Technology)
   On behalf of *InterDigital, Inc.*
9. *Certain Electronic Computing Devices, and Components and Modules Thereof; Inv. No. 337-TA-1387*
   United States International Trade Commission Investigation, 2024
   (Video Technology)
   On behalf of *Telefonaktiebolaget LM Ericsson.*

I have testified at deposition in:

10. *Multimedia Patent Trust v. Directv, Inc. et al SDCA-3-09-cv-00278*
    United States District Court, Southern District of California, 2011
    (Video compression, MPEG-2 and H.264)
    On behalf of *Multimedia Patent Trust*
11. *Portable Electronic Communications Devices, Including Mobile Phones and Components Thereof ITC-337-TA-885*
    United States International Trade Commission Investigation, 2013
    (Video Compression)
    On behalf of *Google*
12. *International Business Machines Corporation v. Intellectual Ventures I LLC PTAB-IPR2015-00302*
    Patent Trial and Appeal Board, Inter Partes Review, 2015
    (Data and Video Compression)
    On behalf of *Intellectual Ventures LLC*
13. *International Business Machines Corporation v. Intellectual Ventures I LLC PTAB-IPR2015-01089*
    Patent Trial and Appeal Board, Inter Partes Review, 2016
    (Data and Video Compression)
    On behalf of *Intellectual Ventures LLC*
14. *Avago Technologies General IP (Singapore) Pte. Ltd. v. ASUSTeK Computer, Inc. et al NDCA-3-15-cv-04525*
    United States District Court, Northern District of California, 2016
    (Video Compression)
    On behalf of *Avago Technologies*
15. *Broadcom Corporation et al v. Sony Corporation et al CDCA-8-16-cv-01052*
    United States District Court, Central District of California), 2017
    (Video Compression)
    On behalf of *Broadcom Corporation et al.*
16. *Global Tel*Link Corporation v. Securus Technologies, Inc. PTAB-IPR2016-01362*
    Patent Trial and Appeal Board, Inter Partes Review, 2017
    (Video Communications)
    On behalf of *Global Tel*Link Corporation*
17. *Sound View Innovations, LLC v. Hulu, LLC CDCA-2-17-cv-04146*
    United States District Court, Central District of California, 2017



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(Video Streaming)
On behalf of *Sound View Innovations, LLC*

18. *Semiconductor Devices and Consumer Audiovisual Products Containing the Same ITC-337-TA-1047*
United States International Trade Commission Investigation, 2017
(Video Compression)
On behalf of *Broadcom Corporation*
19. *Unified Patents Inc. v. Realtime Adaptive Streaming LLC PTAB-IPR2018-00883*
Patent Trial and Appeal Board, Inter Partes Review, 2019
(Data and Video Compression)
On behalf of *Unified Patents Inc.*
20. *Realtime Adaptive Streaming LLC v. Google LLC et al CDCA-2-18-cv-03629*
United States District Court, Central District of California, 2019
(Video Compression)
On behalf of *Google LLC*
21. *Unified Patents Inc. v. Velos Media, LLC PTAB-IPR2019-00194*
Patent Trial and Appeal Board, Inter Partes Review, 2019
(Video Coding)
On behalf of *Velos Media, LLC*
22. *Unified Patents Inc. v. Velos Media, LLC PTAB-IPR2020-00707*
Patent Trial and Appeal Board, Inter Partes Review, 2020
(Video Coding)
On behalf of *Velos Media, LLC*
23. *Unified Patents Inc. v. Velos Media, LLC PTAB-IPR2020-00757*
Patent Trial and Appeal Board, Inter Partes Review, 2020
(Video Coding)
On behalf of *Velos Media, LLC*
24. *Unified Patents Inc. v. Velos Media, LLC PTAB-IPR2020-00710*
Patent Trial and Appeal Board, Inter Partes Review, 2020
(Video Coding)
On behalf of *Velos Media, LLC*
25. *Unified Patents Inc. v. Velos Media, LLC PTAB-IPR2020-00635*
Patent Trial and Appeal Board, Inter Partes Review, 2020
(Video Coding)
On behalf of *Velos Media, LLC*
26. *Unified Patents Inc. v. Velos Media, LLC PTAB-IPR2020-00763*
Patent Trial and Appeal Board, Inter Partes Review, 2020
2020 (Video Coding)
On behalf of *Velos Media, LLC*
27. *Unified Patents Inc. v. Velos Media, LLC PTAB-IPR2020-00352*
Patent Trial and Appeal Board, Inter Partes Review, 2020
(Video Coding)
On behalf of *Velos Media, LLC*
28. *Certain Mobile Electronic Devices and Laptop Computers; 337-TA-1215*
United States International Trade Commission Investigation, 2021
(Image Technology)
On behalf of *Maxell, Ltd*.
29. *Broadcom Corporation et al v. Netflix, Inc. NDCA-3-20-cv-04677*
United States District Court (Northern District of California), 2022
(Video Coding)
On behalf of *Broadcom Corporation et al.*
30. *Maxell, Ltd. v. Lenovo Group Ltd. et al WDTX-6-21-cv-01169*



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United States District Court (Western District of Texas), 2022
(Image Technology)
On behalf of *Maxell, Ltd.*

31. *Video Processing Devices and Products Containing the Same; 337-TA-1323*
United States International Trade Commission Investigation, 2023
(Video Coding)
On behalf of *VideoLabs, Inc*.
32. *Certain Mobile Electronic Devices; 337-TA-1324*
United States International Trade Commission Investigation, 2023
(Image Technology)
On behalf of *Maxell, Ltd*.
33. *Broadcom Corporation et al v. Netflix, Inc. NDCA-3-20-cv-04677*
United States District Court (Northern District of California), 2023
(Video Coding)
On behalf of *Broadcom Corporation et al.*
34. *VideoLabs, Inc. v. Dell Technologies Inc. et al WDTX-6-21-cv-00456*
United States District Court (Western District of Texas), 2023
(Video Coding)
On behalf of *VideoLabs, Inc.*
35. *Amazon.com, Inc. et al v. Nokia Technologies Oy, IPR2024-00626/7*
Patent Trial and Appeal Board, Inter Partes Review, 2025
(Video Coding)
On behalf of *Nokia Technologies Oy*
36. *Amazon.com, Inc. et al v. Nokia Technologies Oy, IPR2024-00691*
Patent Trial and Appeal Board, Inter Partes Review, 2025
(Video Coding)
On behalf of *Nokia Technologies Oy*
37. *Amazon.com, Inc. et al v. Nokia Technologies Oy, IPR2024-00604/5*
Patent Trial and Appeal Board, Inter Partes Review, 2025
(Video Coding)
On behalf of *Nokia Technologies Oy*

**Publications and invited lectures**

***Books/Chapters/Theses***

1. Iain Richardson, *Coding Video,* John Wiley and Sons, 2024
2. Iain Richardson, *H.264 Advanced Video Compression*, John Wiley and Sons, May 2010.
3. Iain Richardson, *H.264 and MPEG-4 Video Compression*, John Wiley and Sons, 2003.
4. Iain Richardson, *Video Codec Design*, John Wiley & Sons, 2002.
5. Iain Richardson, "Coefficient Modelling in a Block-Based Video CODEC", in IMAGE PROCESSING III: Mathematical Methods, Algorithms and Applications, Horwood Publishing, ISBN 1-898563-72-1, 2001.
6. Iain Richardson, "Video Coding for Reliable Communications", PhD Thesis, The Robert Gordon University, October 1999.
7. Mohammed Ghanbari and Iain Richardson (editors), *Proceedings of International Workshop on Audio-Visual Services over Packet Networks*, 1997.
8. M J Riley and Iain Richardson, *Digital Video Communications*, Artech House, 1997.



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### *Standards contributions*

1. Y. Zhao, M. Bystrom, C.S. Kannangara, I. Richardson and J. Philp, "A Random Access Protocol for Configurable Video Coding", Document M16927, ISO/IEC JTC1/SC29/WG11 (MPEG), China, October 2009.
2. I.E. Richardson, C.S. Kannangara, M. Bystrom, J. Philp and Y. Zhao, "Fully Configurable Video Coding, Part 2 - A Proposed Platform for Reconfigurable Video Coding", Document M16752, ISO/IEC JTC1/SC29/WG11 (MPEG), London, July 2009.
3. I.E. Richardson, C.S. Kannangara, M. Bystrom, J. Philp and Y. Zhao, "Fully Configurable Video Coding, Part 1 - Overview", Document M16751, ISO/IEC JTC1/SC29/WG11 (MPEG), London, July 2009.

### *Journal papers*

1. I. Richardson, "Compressed Video Quality", *IASA Journal No. 48*, February 2018
2. I. Richardson, "Video compression codecs: a survival guide", *IASA Journal No. 47*, January 2017.
3. A. Bhat, C. S. Kannangara, Y. Zhao and I. Richardson, "A Full Reference Quality Metric for Compressed Video Based on Mean Squared Error and Video Content", *IEEE Trans. Circuits and Systems for Video Technology*, Vol 22:2, February 2012.
4. A. Bhat, I. Richardson and C. S. Kannangara, "A new perceptual quality metric for compressed video based on mean squared error", *Signal Processing: Image Communication*, Vol 25, 2010, pp. 588 - 596
5. M Bystrom, I Richardson, S Kannangara and M de Frutos-Lopez, "Dynamic Replacement of Video Coding Elements", *Signal Processing: Image Communication*, Vol 25:4, April 2010.
6. C S Kannangara, I E Richardson, M Bystrom & Y Zhao, "Complexity Control of H.264/AVC based on Mode-conditional Cost Probability Distributions", *IEEE Trans. Multimedia*, April 2009.
7. C S Kannangara, I E Richardson & A J Miller, "Computational Complexity Management of a Real-Time H.264/AVC Encoder", *IEEE Trans. Circuits and Systems for Video Technology*, September 2008.
8. M. Bystrom, I. Richardson and Y. Zhao, "Efficient Mode Selection for H.264 Complexity Reduction in a Bayesian Framework," *Signal Processing: Image Communication*, vil. 23, iss. 2, pp. 71-86, February 2008.
9. C S Kannangara, I E G Richardson, M Bystrom, J Solera, Y Zhao, A MacLennan & R Cooney, "Low Complexity Skip Prediction for H.264 through Lagrangian Cost Estimation", *IEEE Transactions on Circuits and Systems for Video Technology*, February 2006.
10. L Muir and I E G Richardson, "Perception of Sign Language and its Application to Visual Communications for Deaf People", *Journal of Deaf Studies and Deaf Education*, September 2005.
11. I E G Richardson and S Kannangara, "Fast subjective video quality measurement with user feedback", *Electronics Letters,* Vol. 40, Number 13, June 2004 pp. 799-800.
12. Y Zhao and I E G Richardson, "Macroblock Classification for Complexity Management of Video Encoders", *Signal Processing: Image Communication*, Vol. 18, Issue 9, Oct. 2003 pp. 801-811.



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13. I E G Richardson and Y Zhao, "Adaptive Management of Video Encoder Complexity", *Journal of Real-Time Imaging*, Vol. 8, No. 4, Aug 2002, pp. 291-301.
14. I E G Richardson, M J Riley, W Haston and I Armstrong, "Telemedicine and teleconferencing: the SAVIOUR project", *IEE Computing and Control Journal*, January 1996.
15. I E G Richardson and M J Riley, "Improving the error tolerance of MPEG video by varying slice size", *Signal Processing Journal*, Vol. 46, No. 3, October 1995.

***Invited lectures***

Invited lectures include:

1. "Adaptive Bitrate Streaming", *United States Patent and Trademark Office TC2400 Tech Fair*, 2022
2. "Motion Vector Prediction in Video Coding", *United States Patent and Trademark Office TC2400 Tech Fair*, 2021
3. "A brief history of video coding", *United States Patent and Trademark Office TC2400 Tech Fair*, 2014
4. "Coding video", *Smithsonian Institute / Library of Congres*s, Washington DC, 2013
5. "Configurable video coding", *Rochester Institute of Technology*, Rochester, NY, 2009
6. "Dynamic configuration: beyond video coding standards", plenary presentation, *IEEE International System on Chip Conference (SOCC08)*, 2008

***Papers in refereed conference proceedings***

1. A. Bhat, I. E. Richardson & C. S. Kannangara, "A Novel Perceptual Quality Metric for Video Compression", Proc. International Picture Coding Symposium 2009, Chicago, May 2009.
2. I. Richardson, C. S. Kannangara, M. Bystrom, J. Philp and M. De. Frutos-Lopez, "A Framework for Fully Configurable Video Coding," Proc. International Picture Coding Symposium 2009, Chicago, May 2009.
3. A. Bhat, I. Richardson and S. Kannangara, "A New Perceptual Quality Metric for Compressed Video", Proc. ICASSP 2009, Taipei, Taiwan, April 2009.
4. C. S. Kannangara, I. Richardson, M. Bystrom, M. de-Frutos-Lopez, "Fast, Dynamic Configuration of Transforms for Video Coding", Proc. ICIP 2008, San Diego, California, October 2008.
5. I E Richardson, "Dynamic Configuration: Beyond Video Coding Standards", Invited Plenary Presentation, *IEEE System on Chip Conference* (SOCC08), Newport Beach, CA, September 2008.
6. I. Richardson, M. Bystrom, M. de-Frutos-Lopez, C. S. Kannangara, "Dynamic Transform Replacement in an H.264 Codec", Proc. ICIP 2008, San Diego, California, October 2008.



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7. Chaminda Kannangara, Yafan Zhao, Iain Richardson and Maja Bystrom, "Complexity Control of H.264 Based on a Bayesian Framework", Proc. PCS 2007, Portugal, November 2007.
8. Y Zhao, M Bystrom and I E Richardson, " A MAP Framework for Efficient SKIP/CODE Mode Decision in H.264", Proceedings of International Conference on Image Processing, Atlanta, USA, 8-11 October 2006.
9. C S Kannangara, I E Richardson and A Miller, "Computational Management of an H.264 Encoder," Proceedings of International Picture Coding Symposium, Beijing, China, 24~26 April 2006.
10. I E Richardson, M Bystrom and Y Zhao, "Fast H.264 Skip Mode Selection Using an Estimation Framework", Proceedings of International Picture Coding Symposium, Beijing, China, 24-26 April, 2006.
11. C. S. Kannangara and I. E. Richardson, "Computational Control of an H.264 Encoder Through Lagrangian Cost Function Estimation", International Workshop on Very Low Bitrate Video, Sardinia, Italy, 15-16 September 2005.
12. L J Muir, I E G Richardson and K Hamilton, "Visual perception of Content-Prioritised Sign Language Video Quality". Proceedings IEE Visual Information Engineering, Glasgow. 4 ~ 6 April 2005.
13. Y Zhong, I Richardson, A Miller and Y Zhao, " Perceptual Quality Of H.264/AVC Deblocking Filter", Proceedings IEE Visual Information Engineering, Glasgow, 4~6 April, 2005.
14. C S Kannangara, I E G Richardson, M Bystrom, J Solera, Y Zhao, A MacLennan & R Cooney, "Complexity Reduction of H.264 using Lagrange Optimization Methods," Proceedings IEE Visual Information Engineering, Glasgow, 4~6 April, 2005.
15. I E G Richardson and Y Zhao, "Video Encoder Complexity Reduction by Estimation Skip Mode Distortion", Proc. ICIP 2004, Singapore, Oct. 2004.
16. Y Zhong, I Richardson, A Sahraie and P McGeorge, "Influence of Task and Scene Content on Subjective Video Quality", Lecture Notes in Computer Science, Volume 3211 / 2004, pp. 295.
17. W W Lee, I E G Richardson and R Staff, "Volumetric Analysis of Brain MRI scans Using Geometric Deformable models. ", ESMRMB 2004, September 2004, Copenhagen.
18. C S Kannangara, I E G Richardson and Y Zhao, "H.264 Complexity Management using Macroblock Skip-Mode Prediction", PGNet, Liverpool, June 2004.
19. Y Zhong, I Richardson, A Sahraie and P Mcgeorge, "Qualitative and quantitative assessment in video compression", 12th European Conference on Eye Movements, 20-24 August 2003, Dundee,Scotland.
20. Yafan Zhao and Iain Richardson, "Macroblock skip-mode prEdiction for Complexity control of Video Encoders", IEEE Visual Information Engineering, Surrey, July 2003.
21. Laura Muir, Iain Richardson, Steven Leaper, "Gaze tracking and its application to video coding for sign language", International Picture Coding Symposium 2003, Saint Malo - France, 23~25, April 2003.
22. Yafan Zhao, Iain Richardson, "Macroblock classification for video encoder complexity management", International Picture Coding Symposium 2003, Saint Malo - France, 23~25, April 2003.
23. Y Zhao and I E G Richardson, "Complexity Management for Video Encoders", Doctoral Symposium, ACM Multimedia Conference, Juan Les Pins, France, 1-6 December 2002.
24. L Muir and I E G Richardson, "Video Telephony for the Deaf: Analysis and Development of an Optimised Video Compression Product", Doctoral



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Symposium, ACM Multimedia Conference, Juan Les Pins, France, 1-6 December 2002.

25. Y Zhao, L Muir and I E G Richardson, "Implementing MPEG-4 Visual in software", IEE Seminar on Visual Media Standards, 25 April 2002
26. Y Zhao and I E G Richardson, "Computational Complexity Management of Motion Estimation in Video Encoders", IEEE Data Compression Conference (DCC02), Snowbird, Utah, April 2002.
27. I E G Richardson and Y Zhao, "Adaptive Algorithms for Variable Complexity Video Coding", Proc. International Conference on Image Processing (ICIP01), Thessaloniki, Greece, October 2001.
28. I E G Richardson and Y Zhao, "Video CODEC Complexity Management", Proc. International Picture Coding Symposium (PCS01), Seoul, Korea, April 2001.
29. I E G Richardson, K Kipperman et al, "Video Coding using Digital Signal Processors", DSP World Fall Design Conference, Orlando, USA, November 1999 (invited workshop).
30. M J Riley, I E G Richardson, K Kipperman, L Muir and G Smith, "High speed bit accurate communication system modelling in C", Proc. DSP World Spring Design Conference, Santa Clara, USA, April 1999.
31. I E G Richardson, A J Turnbull and M J Riley, "Temporal Filtering of Coded Video", Proc. SPIE Int. Conf. on Digital Compression Technologies and Systems for Video Communications, Berlin, October 1996.
32. M J Riley and I E G Richardson, "Quality of Service Issues for MPEG-2 Video over ATM", Proc. IEE International Broadcasting Convention, Amsterdam, September 1996.
33. M J Riley and I E G Richardson, "An Optimised Implementation of Reed-Solomon FEC on the PC", Proc. 4th UK/Australian International Symposium on DSP for Communication Systems, Perth, September 1996, published as chapter in "Digital Signal Processing for Communication Systems", Kluwer Academic Publishers.
34. M J Riley and I E G Richardson, "An FEC Protocol for Video over ATM", Proc. Fourth Workshop on Performance Modelling and Evaluation of ATM Networks, Ilkley, W.Yorkshire, July 1996.
35. I E G Richardson and M J Riley, "Controlling the rate of MPEG video by dynamic variation of sequence structure", Picture Coding Symposium, Melbourne, March 1996.
36. I E G Richardson, I J Hunter and M J Riley, "Temporal smoothing of coded video data", Picture Coding Symposium, Melbourne, March 1996.
37. I E G Richardson and M J Riley, "Reducing cell loss effects on MPEG video by varying slice size", International Packet Video Workshop, Brisbane, March 1996.
38. I E G Richardson and M J Riley, "Varying slice size to improve error tolerance of MPEG video", Proc. SPIE vol. 2668, Digital Video Compression 96, San Jose, January 1996.
39. I E G Richardson, M J Riley and A J Miller, "Video Coding and Transmission: Standards and Scalability", Proc. ITU Telecom 95, Geneva, October 1995.
40. I E G Richardson and M J Riley, "Video Quality of Service in Broadband Networks", Proc. IEE International Broadcasting Convention 95, Amsterdam, September 1995.
41. M J Riley and I E G Richardson, "Minimising the Effect of Cell Losses on MPEG Video", Proc. 4th Int. Conference on Broadband Islands, Dublin, September 1995.



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42. I E G Richardson and M J Riley, "MPEG Coding for Error-Resilient Transmission", Proc. IEE Image Processing and its Applications 95, Edinburgh, July 1995.
43. M J Riley, B U Kohler and I E G Richardson, "A Variable Block Length FEC Protocol for MPEG Packet Video", Proc. 3rd Int. Symposium on Communication Theory and Applications, Ambleside, July 1995.
44. M J Riley, B U Kohler, I E G Richardson and A J Miller, "Statistical Multiplexing MPEG Video Traffic with FEC", Proc. 3rd IFIP Workshop on Performance Modelling and Evaluation of ATM Networks, Bradford, July 1995.
45. I E G Richardson and M J Riley, "UPC Cell Loss Effects on MPEG Video", Proc. IEEE International Conference on Communications 95, Seattle, June 1995.
46. M J Riley and I E G Richardson, "FEC and multi-layer video coding for ATM networks", chapter in Performance Modelling and Evaluation of ATM Networks, Ed. Demetres Kouvatsos, Pub. Chapman & Hall 1995, pp450-457.
47. I E G Richardson and M J Riley, "Intelligent Packetising of MPEG Video Data", Visual Communications and Image Processing 95, Proc. SPIE vol. 2501, Taipei, May 1995.
48. M J Riley and I E G Richardson, "Adapting MPEG Video Traffic to Avoid Network Congestion", Proc. IEE International Conference on Telecommunications 95, Brighton, March 1995.
49. M J Riley and I E G Richardson, "Error Tolerant Video Transmission using FEC and Multi-Level Coding", Proc. IEEE International Workshop on Intelligent Signal Processing and Communication Systems, Seoul, October 1994.
50. R A Butler, I E G Richardson and M J Riley, "A Multi-Level Video CODEC for Network Distribution in the Presence of Errors", Proc. IEE International Broadcasting Convention pp196-201, ISBN 0-85296-620-2, Amsterdam, September 1994.
51. I E G Richardson and M J Riley, "FEC and Multi-Level Video Coding for ATM Networks", Proc. 2nd IFIP Workshop on Performance Modelling and Evaluation of ATM Networks, Bradford, July 1994.
52. I E G Richardson and M J Riley, "ATM Cell Loss Effects on a Progressive JPEG Video Codec", Proc. 3rd International Conference on Broadband Islands, pp155-165, ISBN 0-444-81905-3, Hamburg, June 1994.

***Patents / Patent Applications Include***

1. Iain Richardson, Ying Zhong, Kang Shan, Abharana Bhat and Laura Muir, Method of and apparatus for processing image data, WO 2007144640 A1
2. Iain Richardson and Yafan Zhao, Video encoding with skipping motion estimation for selected macroblocks, WO 200405612
3. Iain Richardson, Selective perceptual masking via downsampling in the spatial and temporal domains using intrinsic images for use in data compression, US 20140269943 A1
4. Iain Richardson and Sampath Kannangara, Encoder control apparatus and method, WO 2007066101 A2
5. Iain Richardson and Sampath Kannangara, Video quality measurement, EP 1585348 A1
6. Iain Richardson and Maja Bystrom, Systems and methods for encoding and decoding, US8995534
7. Iain Richardson and Maja Bystrom, Systems and methods for encoding, transmitting and decoding, US 20120069911 A1



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8. Iain Richardson and Maja Bystrom, Systems and methods for encoding, sharing, and decoding of multimedia, US 20130188739 A1
9. Iain Richardson and Maja Bystrom, Systems and methods for encoding and decoding, US 9154797
10. Casey Smith, Iain Richardson and Abharana Bhat, Selective perceptual masking via scale separation in the spatial and temporal domains using intrinsic images for use in data compression, US 8897378
11. Iain Richardson, Maja Bystrom, Encoding and decoding a multimedia signal using syntax to generate a dynamically configured decoder, CA 2816284 A1



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