

MATRIXVIEW LIMITED

INDEPENDENT REPORT ON THE RESULTS OF ECHOVIEW COMPRESSION SOFTWARE TESTING

19 April 2004


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To The Board of Directors  
MatrixView Limited

**Report on Compression Testing Results of EchoView Compression Software**

Please find attached our report resulting from our independent testing of the EchoView compression software.

Yours faithfully



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# About this Report

This report represents the findings of testing in March 2004 the image compression achieved by MatrixView Limited's EchoView compression software.

## Scope

MatrixView Limited has engaged Ernst & Young to carry out independent testing of the compression ratios achieved by EchoView. The scope of testing was as follows:

- For each of the tested images, we identified the image compression ratio achieved by the EchoView compression software and compared the result to the compression ratio obtained using software that compressed images using the JPG and the JP2 methods; and
- Compared the decompressed EchoView, JPG and JP2 images to the original image to determine whether there was any 'loss' in the image bitmap.

Our work was undertaken in accordance with Australian Auditing Standard AUS 904 "Engagements to Perform Agreed Upon Procedures". The responsibility for determining the adequacy or otherwise of the procedures agreed to be performed is that of MatrixView Limited management. The procedures performed do not constitute either an audit or a review and, as such, no assurance is expressed. Had additional procedures been performed, other matters may have come to our attention that would have been reported.

## Purpose

The purpose of this report is to independently report to the Board of MatrixView Limited and potential investors wishing to subscribe to MatrixView shares in the public offer document dated [ ], the image compression ratios achieved by the EchoView compression software in comparison to JPG and JP2, and to determine whether the Echoview decompressed images result in bitmap image loss

## About EchoView

MatrixView Limited has represented that the EchoView compression software is designed to be used only for the compression and decompression of 24 Bit Echocardiogram or Ultrasound images (single frame) in RGB bitmap colour only.

Matrixview represent that the EchoView software is based on their proprietary algorithm called 'ABO' (Adaptive Binary Optimisation), which they claim provides 'lossless' and more efficient compression than the JPG and JP2 standard. For our testing, MatrixView Limited has provided us a pre-commercial evaluation version of the EchoView compression software.

# Procedures Performed

## Pre-Test Procedures

On 8 March 2004 we received from MatrixView Limited a CD-Rom demonstration test kit labelled with serial number MV000136 containing the following:

- EchoView software on CD-ROM; and
- A USB dongle labelled with serial number 000136.

We installed the EchoView software onto our PC ('the Test PC') and attached the USB dongle. The PC used was a Dell PowerEdge with an x86 Intel 927 MHz processor, 1GB RAM. The Test PC was run using the Windows 2000 operating system.

## Sample of Images

- We received from Dr Tan Teng Hong, Cardiology Service, Paediatric Medicine, 100 Bukit Timah Road Singapore 229899 a CD-ROM containing four Ultrasound recordings in moving AVI format. The CD-ROM was received via FedEx packet number 8446 0243 0037 0423 on 24 March 2004;
- AVI Conversion: The individual frames from the four AVI format files were extracted using 'XnView' version 1.61 and saved as a total of 234 uncompressed 720 x 512 pixel BMP format images;
- Sample Selection: A random number generator was used to select 32 files from the 234 BMP format files created as above; and
- Sample Conversion: The 32 BMP format files selected were converted to 24 Bit RGB bitmap colour BMP format files and saved with new file names using 'EziImage – Release 1.01'.

All images were copied to our Test PC, and we recorded the size in bytes of each bitmap colour BMP format file before commencing the test procedures.

## Test Procedures

### Compression and Decompression with EchoView

- On the Test PC all sample images were compressed using EchoView compression software and saved in EchoView's compressed 'MVU' format in a new directory. We recorded the size in bytes of each compressed file.
- On the Test PC all compressed images were decompressed into bitmap colour BMP format files, and saved in a new directory. We recorded the size in bytes of each decompressed file.

### Compression, Decompression using JPG and JP2

- On the Test PC compression and decompression of images into JPG at 'Best' quality and 'Optimize Huffman Table' settings, and JP2 (JPEG-2000) at 'Best' quality and 'Lossless compression' setting formats using 'XnView' version 1.61 software (XnView is freeware software that allows the viewing and conversion of graphic file images). The size in bytes of each compressed and decompressed file was recorded.

### Error Checking

- On the Test PC the decompressed EchoView, JPG and JP2 images were compared for differences against the original images using the following software:
  - EchoView's 'Error Viewer' and the results were recorded; and
  - 'Dup Detector' version 3.101 (shareware software obtained from [www.prismaticsoftware.com](http://www.prismaticsoftware.com)).

# Findings

## Compression

We found that the EchoView compression ratio was:

- higher than the JPG compression ratio, with the Compression Ratio Gain ranging from 4.12 to 4.92;
- higher than the JP2 compression ratio, with the Compression Ratio Gain ranging from 3.44 to 4.55.

The following table summarises the results:

	Sample Size	Sample Average Compression Ratio				
		EchoView	JPG	JP2	Ratio Gain EchoView to JPG <sup>1</sup>	Ratio Gain EchoView to JP2 <sup>2</sup>
Sample	32	32.65	7.28	8.30	4.48	3.93

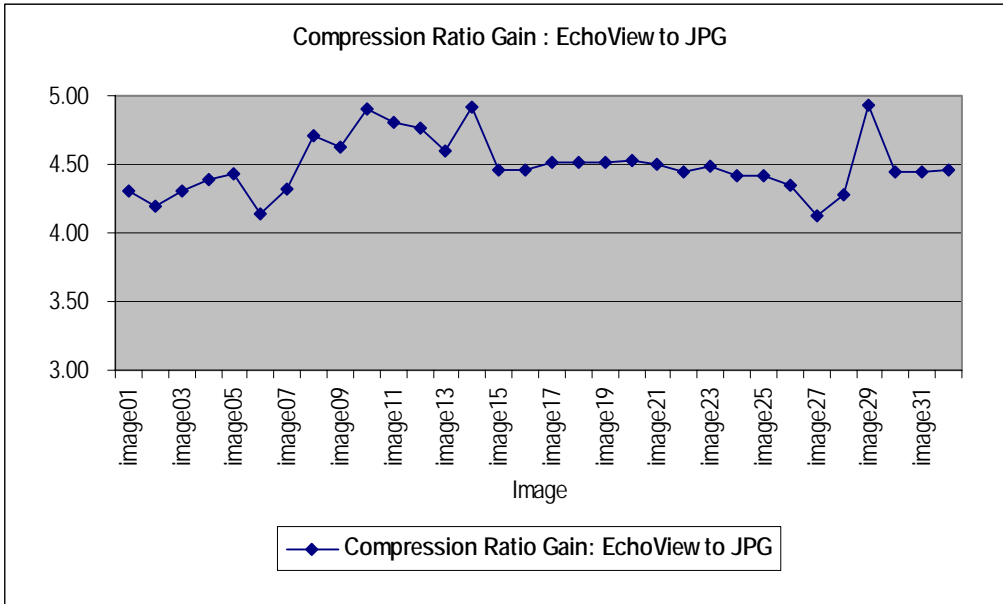
	Sample Size	Sample Compression Range (Min, Max)				
		EchoView	JPG	JP2	Ratio Gain EchoView to JPG <sup>1</sup>	Ratio Gain EchoView to JP2 <sup>2</sup>
Sample	32	25.98 / 35.79	6.28 / 7.93	6.08 / 9.69	4.12 / 4.92	3.44 / 4.55

### Table Notes

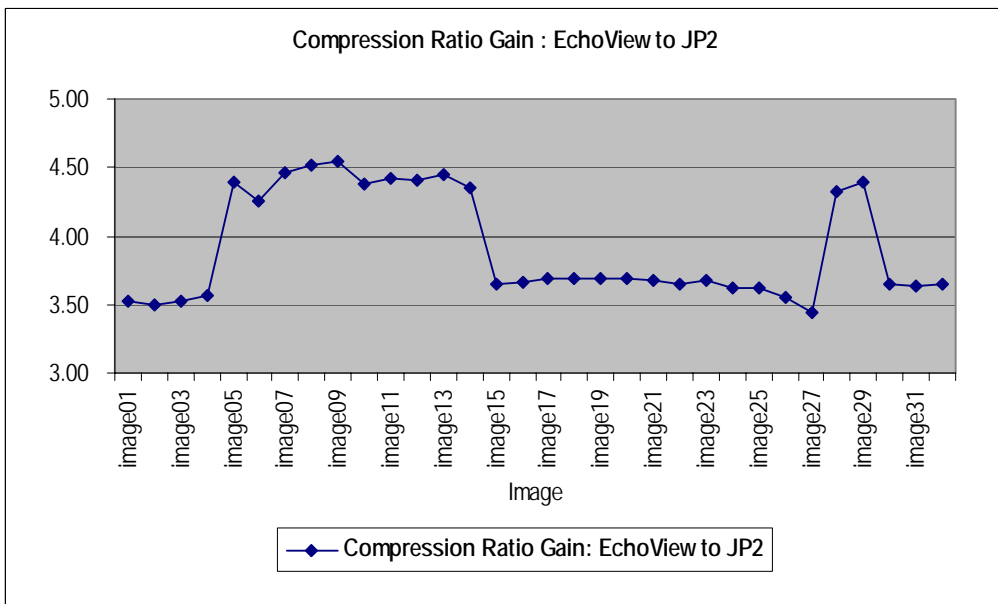
<sup>1</sup> "Ratio Gain EchoView to JPG" has been derived by dividing EchoView's compressed image ratio by JPG's compressed image ratio, with the result rounded to 2 decimal places. A ratio greater than 1 indicates that EchoView achieved a compression ratio greater than JPG.

<sup>2</sup> "Ratio Gain EchoView to JP2" has been derived by dividing EchoView's compressed image ratio by JP2's compressed image ratio, with the result rounded to 2 decimal places. A ratio greater than 1 indicates that EchoView achieved a compression ratio greater than JP2.

The following graph shows the Compression Ratio Gain of EchoView over JPG for each image in the sample:



The following graph shows the Compression Ratio Gain of EchoView over JP2 for each image in the sample:





## Compression Loss

No compression loss was detected on the decompressed images for EchoView and JP2 using the 'Error Viewer' and 'Dup Detector' software. The following losses were noted for JPG:

Image	Dup Detector Image Match <sup>1</sup>	Error Viewer Pixel Errors Identified <sup>2</sup>
image01	99.9%	19,329
image02	99.9%	18,948
image03	99.9%	19,058
image04	99.9%	19,527
image05	100.0%	46,121
image06	100.0%	48,894
image07	100.0%	53,342
image08	100.0%	43,455
image09	100.0%	47,021
image10	100.0%	35,280
image11	100.0%	39,238
image12	100.0%	39,837
image13	99.9%	44,212
image14	99.9%	33,876
image15	100.0%	20,951
image16	100.0%	20,750
image17	99.9%	20,821
image18	99.9%	20,464
image19	99.9%	20,785
image20	99.9%	20,594
image21	99.9%	20,612
image22	99.9%	20,672
image23	99.9%	20,813
image24	99.9%	20,917
image25	99.9%	20,993
image26	99.9%	19,112
image27	99.9%	19,047
image28	100.0%	48,546
image29	99.9%	34,661
image30	99.9%	20,709
image31	99.9%	20,858
image32	99.9%	20,978

### Table Notes

<sup>1</sup> "Dup Detector Image Match" has been derived from the image comparison function within this software.

<sup>2</sup> "Error Viewer Pixel Errors Identified" has been derived from the image comparison function within this software.

## Detailed Table of Results by Image

		EchoView		JPG		JP2		Ratio Compression Gain of EchoView over:	
Image File Name	BMP Original Size (bytes)	Compressed Size (bytes)	Compression Ratio	Compressed Size (bytes)	Compression Ratio	Compressed Size (bytes)	Compression Ratio	JPG	JP2
image01	1,105,974	34,172	32.36	147,318	7.51	120,232	9.20	4.31	3.52
image02	1,105,974	35,484	31.17	148,930	7.43	123,890	8.93	4.20	3.49
image03	1,105,974	34,125	32.41	146,950	7.53	120,295	9.19	4.30	3.53
image04	1,105,974	33,360	33.15	146,381	7.56	118,955	9.30	4.38	3.56
image05	1,105,974	39,201	28.21	173,994	6.36	172,213	6.42	4.44	4.39
image06	1,105,974	42,566	25.98	176,143	6.28	181,002	6.11	4.14	4.25
image07	1,105,974	40,787	27.12	176,175	6.28	181,950	6.08	4.32	4.46
image08	1,105,974	36,068	30.66	169,816	6.51	162,803	6.79	4.71	4.52
image09	1,105,974	37,288	29.66	172,175	6.42	169,707	6.52	4.62	4.55
image10	1,105,974	32,377	34.16	158,706	6.97	141,755	7.80	4.90	4.38
image11	1,105,974	33,862	32.66	162,580	6.80	149,657	7.39	4.80	4.42
image12	1,105,974	34,180	32.36	162,614	6.80	150,736	7.34	4.76	4.41
image13	1,105,974	36,325	30.45	167,013	6.62	161,639	6.84	4.60	4.45
image14	1,105,974	32,214	34.33	158,520	6.98	140,216	7.89	4.92	4.35
image15	1,105,974	31,500	35.11	140,424	7.88	115,007	9.62	4.46	3.65
image16	1,105,974	31,423	35.20	140,055	7.90	114,954	9.62	4.46	3.66
image17	1,105,974	30,906	35.79	139,501	7.93	114,125	9.69	4.51	3.69
image18	1,105,974	31,126	35.53	140,338	7.88	114,905	9.63	4.51	3.69
image19	1,105,974	31,102	35.56	140,215	7.89	114,597	9.65	4.51	3.68
image20	1,105,974	30,919	35.77	139,743	7.91	114,276	9.68	4.52	3.70
image21	1,105,974	31,035	35.64	139,844	7.91	114,211	9.68	4.51	3.68
image22	1,105,974	31,499	35.11	139,859	7.91	114,883	9.63	4.44	3.65
image23	1,105,974	31,148	35.51	139,768	7.91	114,625	9.65	4.49	3.68
image24	1,105,974	31,742	34.84	140,141	7.89	114,941	9.62	4.42	3.62
image25	1,105,974	31,858	34.72	140,634	7.86	115,374	9.59	4.42	3.62
image26	1,105,974	33,788	32.73	146,787	7.53	119,891	9.22	4.35	3.55
image27	1,105,974	36,254	30.51	149,519	7.40	124,878	8.86	4.12	3.44
image28	1,105,974	40,776	27.12	174,409	6.34	176,190	6.28	4.28	4.32
image29	1,105,974	32,135	34.42	158,266	6.99	141,138	7.84	4.92	4.39
image30	1,105,974	31,517	35.09	140,120	7.89	115,134	9.61	4.45	3.65
image31	1,105,974	31,532	35.07	140,261	7.89	114,737	9.64	4.44	3.64
image32	1,105,974	31,635	34.96	140,938	7.85	115,378	9.59	4.45	3.65

## Non Endorsement of Products and Services

Our findings do not constitute an endorsement of MatrixView Limited's EchoView compression software or any other products or services.

We have not been involved in the software development testing of the EchoView compression software, and have not performed any testing of the stability, security, performance or functionality of the EchoView compression software. We provide no assurance on the readiness of the EchoView compression software for market launch.

## Inherent Risk in Tools Used

We have used certain software tools in performing the test procedures as indicated in this report, including 'XnView', 'Error Viewer' and 'Dup Detector'. We have relied on these software tools, and have not sought to verify whether the software tools have programming errors that may otherwise alter the validity of this Report's findings.

## Limitations of Use

This report makes no assertions about the mathematical validity of the ABO compression algorithm or the implementation of the algorithm.

The results of this report are only valid under the conditions of the performance of the tests. We are not responsible for any extension of the findings to other related or unrelated situations or conditions.

This report was prepared solely for the purpose set out in this report and is not to be used for any other purpose or distributed to any other party without our prior written consent. We disclaim all liability to any other party for all costs, loss, damage and liability that the other party may suffer or incur arising from or relating to or in any way connected with the contents of our report, the provision of our report to the other party or the reliance upon our report by the other party.

## Definition of Terms

Term	Definition
24 Bit RGB bitmap colour	Where the intensities of the three colour components Red, Green and Blue (RGB) are specified for each and every pixel in an image. Each of the RGB components is stored as an 8-bit integer, thus each pixel requiring 24 bits to completely define its colour.
AVI	An AVI (Audio Video Interleaved) file is a sound and motion picture file that conforms to the Microsoft Windows Resource Interchange File Format (RIFF) specification.
Bitmap	A representation, consisting of rows and columns of dots, of a graphics image in computer memory. The value of each dot (whether it is filled in or not) is stored in one or more bits of data.
BMP	The standard bit-mapped graphics format for Windows.
Dongle	A mechanism for ensuring that only authorised users can copy or use specific software applications. Common mechanisms include a hardware key that plugs into a USB, parallel or serial port on a computer and that a software application accesses for verification before continuing to run.
JP2	An image compression standard (International Standard 15444) developed by the Joint Photographic Experts Group (JPG) of the ISO (International Standards Organisation).
JPG	An image compression standard (International Standard 10918) developed by the Joint Photographic Experts Group (JPG) of the ISO (International Standards Organisation).
Lossless	A term describing a data compression algorithm which retains all the information in the data, allowing it to be recovered perfectly by decompression.
RGB	A system where a number is used to represent between zero intensity and maximum intensity for each of the colours Red Green and Blue (RGB). These numbers can then be used to describe precise colours in the spectrum.
USB	USB (Universal Serial Bus). Provides an interface between a computer and add-on physical devices.