

# Using Pressure Transducers for Noninvasive Heart and Respiratory Monitoring

Matthew Richard Barcroft Dowden

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State  
University in partial fulfillment of the requirements for the degree of

Master of Science

In

Mechanical Engineering

Alfred L. Wicks, Chair

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**Draft 09/01/2009**

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: [gailmac@vt.edu](mailto:gailmac@vt.edu))

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## Virginia Tech ETD Fair Use Analysis Results

*This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.*

Name: Matthew R. B. Dowden

Description of item under review for fair use: Figure 1. Steven Kang, M., ECG, in UMMC Encyclopedia 2009, University of Maryland Medical Center: Baltimore, MD.

Report generated on: 08-19-2012 at : 14:34:02

### Based on the information you provided:

#### Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

#### Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *against fair use*

#### Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

#### Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

**Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use***

**Draft 09/01/2009**

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Name: Matthew R. B. Dowden

Description of item under review for fair use: Wagner, G.S., Marriott's Practical Electrocardiography (Eleventh Edition)2008, Philadelphia, PA: Lippincott Williams & Wilkins. 468.

Report generated on: 08-19-2012 at : 14:40:56

### **Based on the information you provided:**

#### **Factor 1**

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

#### **Factor 2**

Your consideration of the nature of the copyrighted work you used weighs: *against fair use*

#### **Factor 3**

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

#### **Factor 4**

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Name: Matthew R. B. Dowden

Description of item under review for fair use: Euan A Ashley, J.N., Cardiology Explained2004, London, UK.

Report generated on: 08-19-2012 at : 14:44:12

### **Based on the information you provided:**

#### **Factor 1**

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

#### **Factor 2**

Your consideration of the nature of the copyrighted work you used weighs: *against fair use*

#### **Factor 3**

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

#### **Factor 4**

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**Draft 09/01/2009**

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Name: Matthew R. B. Dowden

Description of item under review for fair use: Mobile Cardiac Monitoring: Bluetooth ECG and Activity Monitor, 2008, Alive Technologies: Queensland, Australia.

Report generated on: 08-19-2012 at : 14:51:54

### Based on the information you provided:

#### Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

#### Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *against fair use*

#### Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

#### Factor 4

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Name: Matthew R. B. Dowden

Description of item under review for fair use: Measuring Respiration Using the Cardio-Respiratory Belt, 2005, TMS International.

Report generated on: 08-19-2012 at : 14:54:22

### **Based on the information you provided:**

#### **Factor 1**

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

#### **Factor 2**

Your consideration of the nature of the copyrighted work you used weighs: *against fair use*

#### **Factor 3**

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*This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.*

Name: Matthew R. B. Dowden

Description of item under review for fair use: Respiration Monitor Belt, 2010, Vernier.

Report generated on: 08-19-2012 at : 14:56:57

### **Based on the information you provided:**

#### **Factor 1**

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

#### **Factor 2**

Your consideration of the nature of the copyrighted work you used weighs: *against fair use*

#### **Factor 3**

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Name: Matthew R. B. Dowden

Description of item under review for fair use: Ford Unveils Contactless ECG Sensing Driver, in Medgadget2011.

Report generated on: 08-19-2012 at : 15:03:29

### **Based on the information you provided:**

#### **Factor 1**

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

#### **Factor 2**

Your consideration of the nature of the copyrighted work you used weighs: *against fair use*

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*This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.*

Name: Matthew R. B. Dowden

Description of item under review for fair use: Yosuke Kurihara, K.W., Development of Sensing Device to Detect Persons Hiding in a Car. IEEE Sensors Journal, 2011. 11(9).

Report generated on: 08-19-2012 at : 15:14:22

### Based on the information you provided:

#### Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

#### Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *against fair use*

#### Factor 3

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Report generated on: 08-19-2012 at : 15:14:22

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*This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.*

Name: Matthew R. B. Dowden

Description of item under review for fair use: Freescale MPVZ4006GW7U Datasheet  
[http://www.freescale.com/files/sensors/doc/data\\_sheet/MPVZ4006G.pdf](http://www.freescale.com/files/sensors/doc/data_sheet/MPVZ4006G.pdf)

Report generated on: 08-19-2012 at : 15:35:16

### Based on the information you provided:

#### Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

#### Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *against fair use*

#### Factor 3

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#### Factor 4

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## MEMORANDUM

**DATE:** May 31, 2012

**TO:** Alfred L Wicks, Matthew Richard Dowden, Sara Jeasmeen Chowdhury, Andre A Muelenaer MD

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires May 31, 2014)

**PROTOCOL TITLE:** Heart and Respiratory Monitor

**IRB NUMBER:** 12-157

Effective May 31, 2012, the Virginia Tech Institution Review Board (IRB) Chair, David M Moore, approved the Amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

<http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

### PROTOCOL INFORMATION:

Approved As: **Exempt, under 45 CFR 46.110 category(ies) 2**  
Protocol Approval Date: **March 27, 2012**  
Protocol Expiration Date: **N/A**  
Continuing Review Due Date\*: **N/A**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

### FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Date*	OSP Number	Sponsor	Grant Comparison Conducted?
05/30/2012	11205003	Carilion Clinic	Not required (Not federally funded)

\* Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.

## MEMORANDUM

**DATE:** June 20, 2012

**TO:** Alfred L Wicks, Matthew Richard Dowden, Sara Jeasmeen Chowdhury, Andre A Muelenaer MD

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires May 31, 2014)

**PROTOCOL TITLE:** HARMONI - Human Testing

**IRB NUMBER:** 12-433

Effective June 12, 2012, the Virginia Tech Institution Review Board (IRB) Chair, David M Moore, approved the Amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

<http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

### PROTOCOL INFORMATION:

Approved As: **Expedited, under 45 CFR 46.110 category(ies) 4,7**  
Protocol Approval Date: **May 23, 2012**  
Protocol Expiration Date: **May 22, 2013**  
Continuing Review Due Date\*: **May 8, 2013**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

### FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Date*	OSP Number	Sponsor	Grant Comparison Conducted?
06/05/2012	11205003	Carilion Clinic	Not required (Not federally funded)

\* Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.