



Swisstom EIT Resistor Mesh Phantom 32-HG

User Manual 1ST504-103



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Now I can see.

CONTENT

1 Introduction.....	3
1.1 Purpose	3
1.2 Definitions / Acronyms / Abbreviations	3
1.3 Intended use	3
1.4 References	3
1.5 Technical contact	3
1.6 Copyright	3
1.7 Disclaimer	3
1.8 Acknowledgment.....	3
2 Specifications	4
2.1 Electrical circuit and layout.....	4
2.2 Technical Specifications.....	5
3 Simulation Results: Signals.....	5
4 Simulation Results: Images	6

1 INTRODUCTION

1.1 Purpose

This User Manual describes background and function of the Resistor Mesh Phantom.

1.2 Definitions / Acronyms / Abbreviations

R: Resistor
FEM: Finite Element Method

1.3 Intended use

The Resistor Mesh Phantom HB 32 is intended for laboratory applications, exclusively. They must not be used on humans!

Set-up and use of the components is the sole responsibility of the user.

1.4 References

A. Adler and R. Guardo: "*Electrical Impedance Tomography: Regularized Imaging and Contrast Detection*", *IEEE Transactions on Medical Imaging*, vol. 15, no. 2, April 1996.

H. Gagnon, M. Cousineau, A. Adler and A. E. Hartinger, "*A Resistive Phantom for the Assessing the Performance of EIT Systems*," *Biomedical Engineering, IEEE Volume: 57 Issue: 9*, 2010.

1.5 Technical contact

The contact for technical questions is:
support@swisstom.com or +41 81 330 0914

1.6 Copyright

The copyright and all other intellectual property rights in this document (this manual), the functional specification and in all other listings and specifications and documentation relating to the Resistor Mesh Phantom is sole property of Swisstom.

1.7 Disclaimer

All product, product specifications and data are subject to change without notice to improve reliability, function or design or otherwise.

1.8 Acknowledgment

The major part of this work was subcontracted to and completed by Hervé Gagnon, Montreal, Canada.

2 SPECIFICATIONS

2.1 Electrical circuit and layout

The layout of the circuit is given in Figure 1. The circuit is completely regular with the following resistor values, all 1% and ≥ 0.1 W:

- R1-R32 = 100 Ω
- R33-R64 = 196 Ω
- R65-R96 = 63.4 Ω
- R97-R128 = 6.34 Ω
- R129-R160 = 68.1 Ω

Each of resistors R129, R137, R145, and R163 can be individually short-circuited by one of four pushbuttons, thus creating an inhomogeneity.

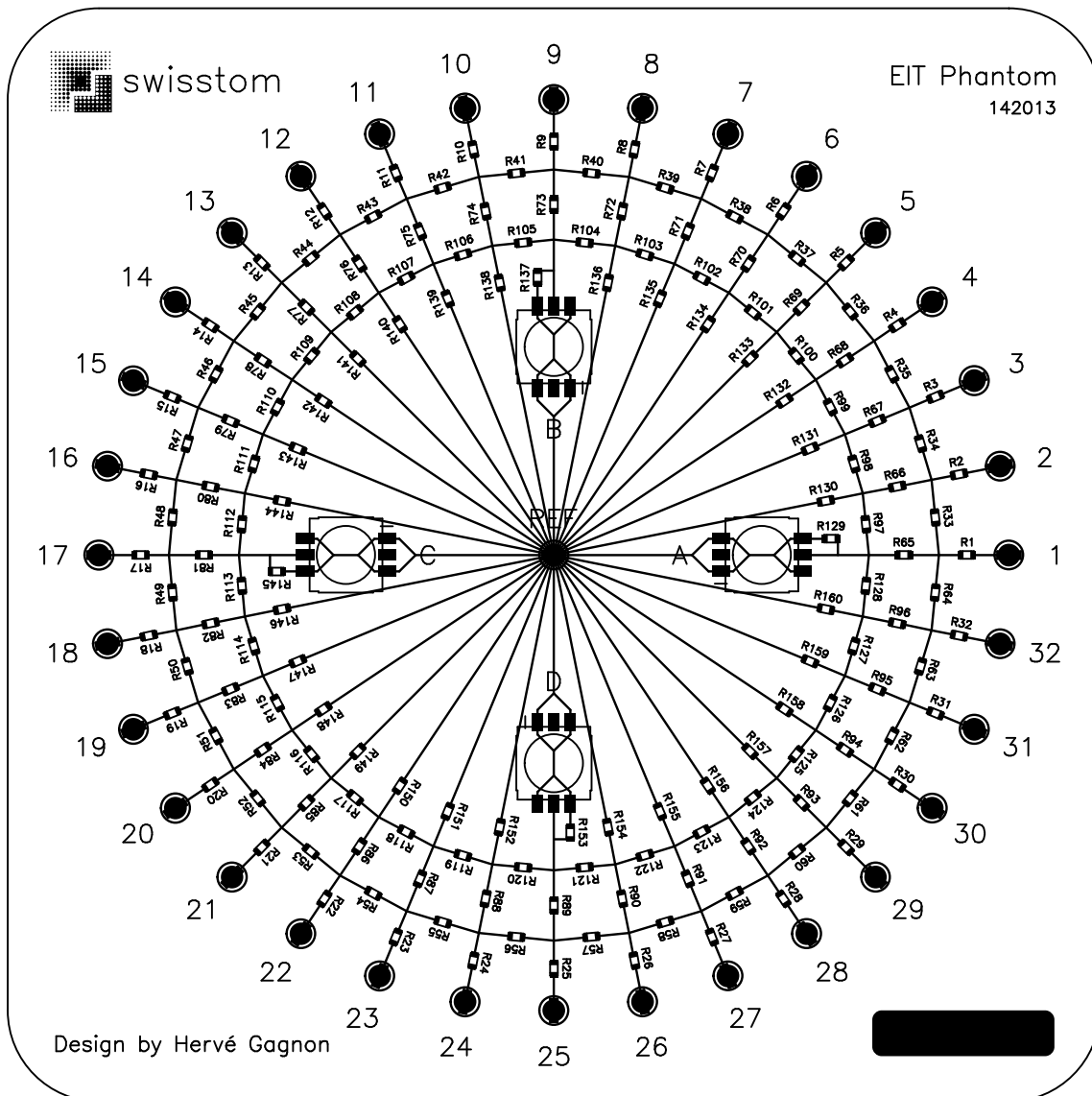


Figure 1: Circuit diagram.

2.2 Technical Specifications

Dimensions: 12 cm x 12 cm

Voltage range: +/- 20 Volts

Frequency range: DC to 1 MHz

Environmental conditions: 0-65 °C

3 SIMULATION RESULTS: SIGNALS

The results of a simulation on the resistor mesh phantom are provided in Figures 2 and 3. "Target FEM Signal" represents the signal that was used to fit the resistor values composing the mesh phantom. "Exact Resistor Mesh" represents the signal that would be obtained if resistors have the exact optimal values. "1% Resistor Mesh" represents the signal that is obtained with the 1% resistor values.

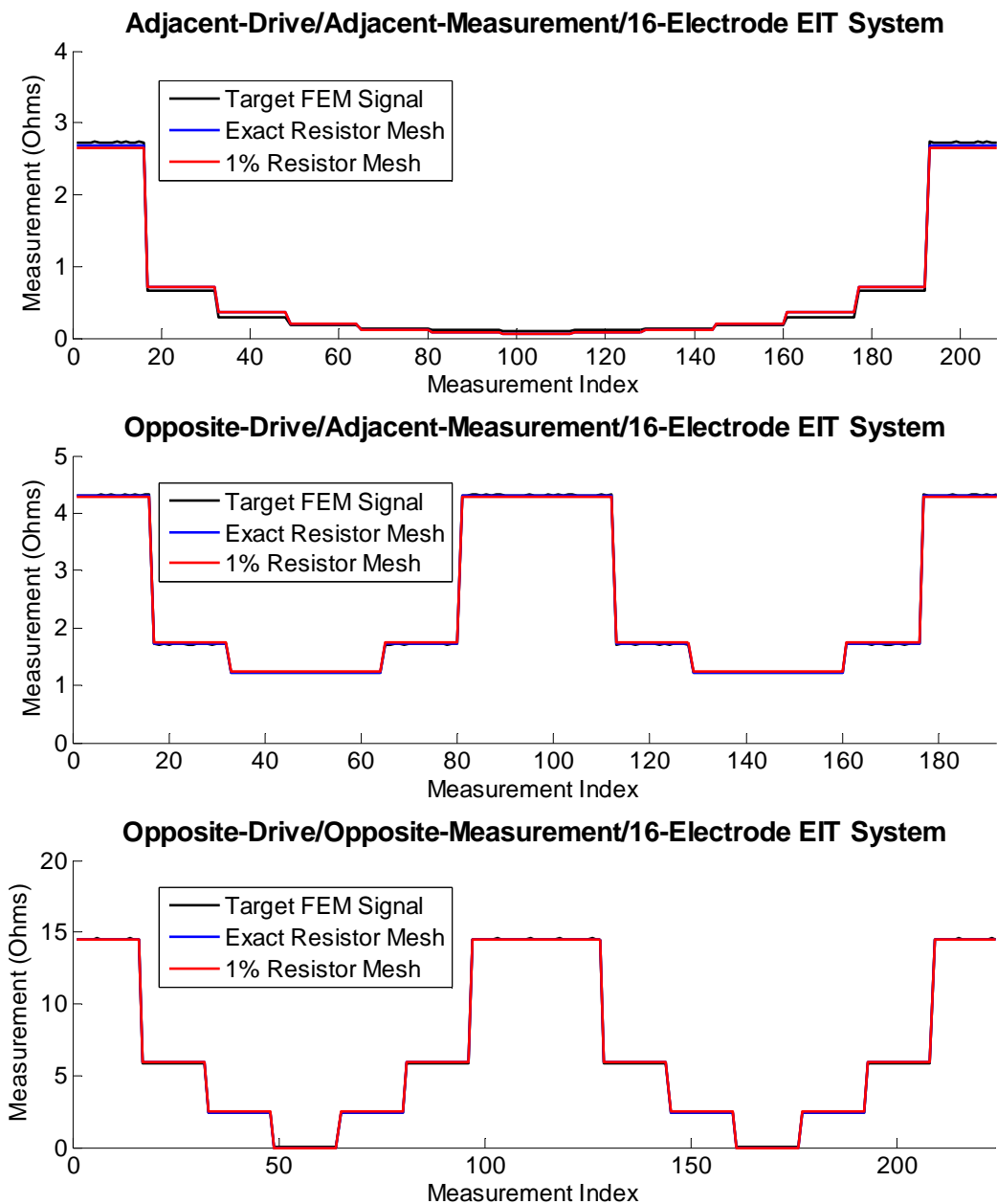


Figure 2: Expected signals from a 16-electrode EIT system and different scanning methods.

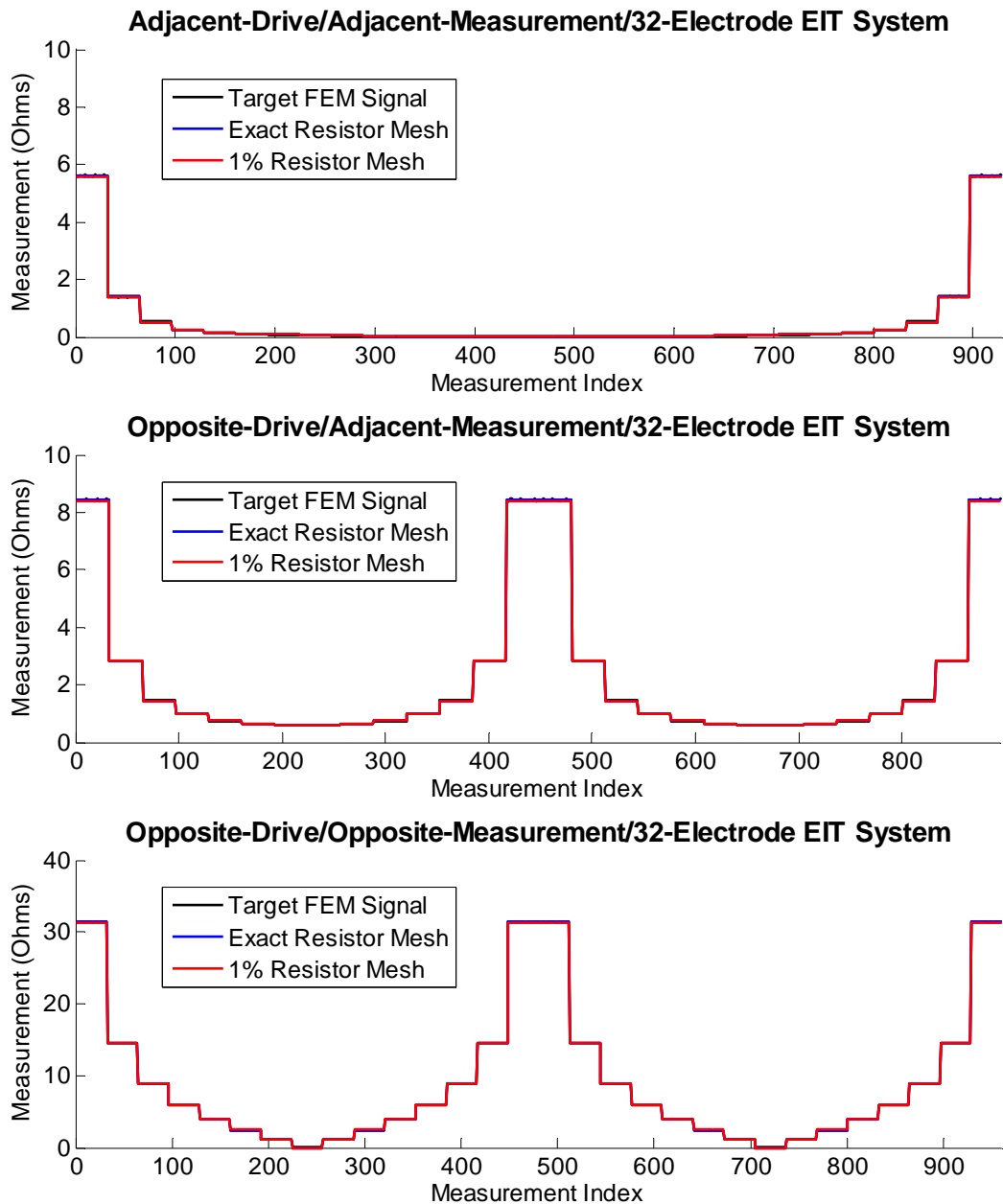


Figure 3: Expected signals from a 32-electrode EIT system and different scanning methods.

4 SIMULATION RESULTS: IMAGES

Images obtained while pushbuttons are pressed are shown on the next Figures. Each of the five columns corresponds to a different scenario where 1) “A” pushbutton is pressed, 2) “B” pushbutton is pressed, 3) “C” pushbutton is pressed, 4) “D” pushbutton is pressed, and 5) “All” four pushbuttons are pressed.

Images are reconstructed using the maximum *a posteriori* (MAP) estimator method where each row corresponds to a different noise figure (NF): 2, 1, 0.5, and 0.25. Further information about NF can be found in Adler et al.

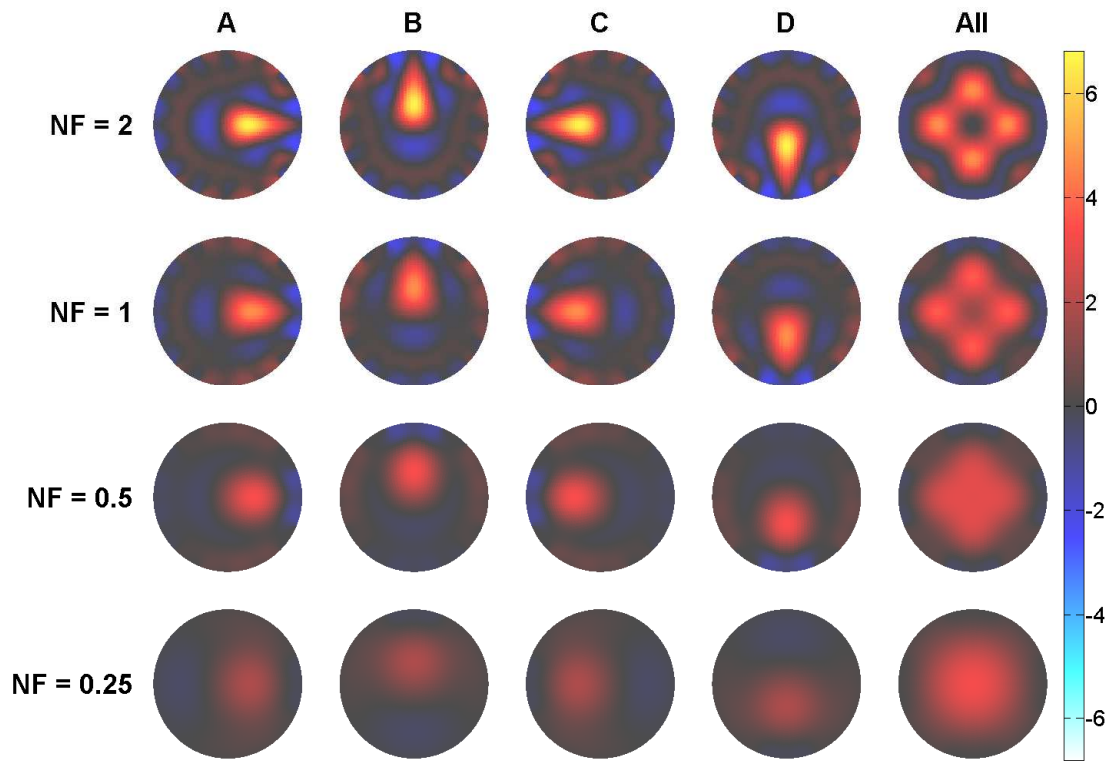


Figure 4: Simulated images for a 16-electrode EIT system.

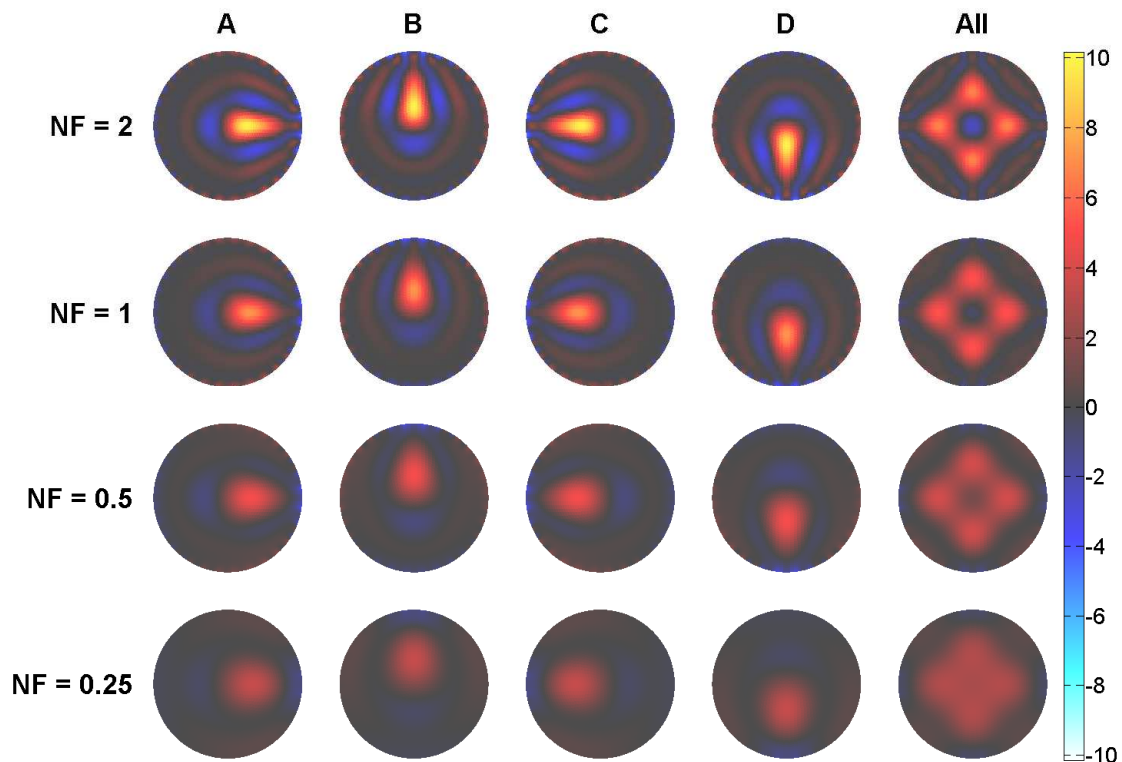


Figure 5: Simulated images for a 32-electrode EIT system.