

EUROMET PROJECT FINAL REPORT

1. Ref. No.: 879	2. Subject Field: Ultrasound																																																																														
3 Type of collaboration: Comparison																																																																															
4A. Partners: Physikalisch-Technische Bundesanstalt (PTB), DE (<i>inst.</i>) Istituto Nazionale di Ricerca Metrologica (I.N.RI.M.), IT		4B. CEC funded? no																																																																													
5. Participating countries: DE, IT																																																																															
6. Title: Bilateral comparison of ultrasonic power (10 mW to 15 W) in the frequency range from 1.8 MHz to 11 MHz																																																																															
<p>7. Progress:</p> <p>An ultrasonic reference transducer fabricated at PTB was circulated. The task was to apply an electric RF voltage of certain frequency and amplitude to the transducer and to measure the time-averaged ultrasonic output power emitted by the transducer into an anechoic water volume at room temperature. The quantity of interest was the transducer's electroacoustic radiation conductance G which is the ultrasonic power divided by the square of the RMS value of the input voltage.</p> <p>Measurements were to be made at three frequencies, namely at the transducer's fundamental resonance and third and fifth harmonics, and near five nominal power levels, namely "very low" (10 mW), "low" (100 mW), "medium" (1 W), "high" (10 W), and "very high" (15 W).</p> <p>The following table lists the G results (in millisiemens) and expanded uncertainties (95 % level of confidence) of both institutes and the mutual degrees of equivalence. There is a complete consistency in all cases. The detailed final report is available from the coordinator (see below).</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th colspan="2">PTB</th> <th colspan="2">I.N.RI.M.</th> <th colspan="2">Degree of equivalence</th> </tr> <tr> <th>$f/\text{MHz, level}$</th> <th>G / mS</th> <th>$k \cdot u_G / 10^{-2}$</th> <th>G / mS</th> <th>$k \cdot u_G / 10^{-2}$</th> <th>$d / 10^{-2}$</th> <th>$k \cdot u_d / 10^{-2}$</th> </tr> </thead> <tbody> <tr> <td>1.88, v. low</td> <td>5.589</td> <td>2.8</td> <td>5.62</td> <td>5.9</td> <td>0.6</td> <td>6.6</td> </tr> <tr> <td>low</td> <td>5.602</td> <td>2.8</td> <td>5.62</td> <td>3.3</td> <td>0.3</td> <td>4.3</td> </tr> <tr> <td>medium</td> <td>5.599</td> <td>2.8</td> <td>5.64</td> <td>3.2</td> <td>0.7</td> <td>4.3</td> </tr> <tr> <td>high</td> <td>5.623</td> <td>2.8</td> <td>5.62</td> <td>6.1</td> <td>-0.1</td> <td>6.7</td> </tr> <tr> <td>v. high</td> <td>5.639</td> <td>2.8</td> <td>5.61</td> <td>6.0</td> <td>-0.5</td> <td>6.6</td> </tr> <tr> <td>6.30, v. low</td> <td>6.618</td> <td>3.4</td> <td>6.63</td> <td>7.0</td> <td>0.2</td> <td>7.8</td> </tr> <tr> <td>low</td> <td>6.622</td> <td>3.3</td> <td>6.57</td> <td>3.4</td> <td>-0.8</td> <td>4.7</td> </tr> <tr> <td>10.58, v. low</td> <td>7.037</td> <td>4.7</td> <td>6.95</td> <td>8.1</td> <td>-1.2</td> <td>9.3</td> </tr> <tr> <td>low</td> <td>7.015</td> <td>4.5</td> <td>6.93</td> <td>5.1</td> <td>-1.2</td> <td>6.8</td> </tr> </tbody> </table>				PTB		I.N.RI.M.		Degree of equivalence		$f/\text{MHz, level}$	G / mS	$k \cdot u_G / 10^{-2}$	G / mS	$k \cdot u_G / 10^{-2}$	$d / 10^{-2}$	$k \cdot u_d / 10^{-2}$	1.88, v. low	5.589	2.8	5.62	5.9	0.6	6.6	low	5.602	2.8	5.62	3.3	0.3	4.3	medium	5.599	2.8	5.64	3.2	0.7	4.3	high	5.623	2.8	5.62	6.1	-0.1	6.7	v. high	5.639	2.8	5.61	6.0	-0.5	6.6	6.30, v. low	6.618	3.4	6.63	7.0	0.2	7.8	low	6.622	3.3	6.57	3.4	-0.8	4.7	10.58, v. low	7.037	4.7	6.95	8.1	-1.2	9.3	low	7.015	4.5	6.93	5.1	-1.2	6.8
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<p>8. Coordinator's name: K. Beissner</p> <p>Address: Physikalisch-Technische Bundesanstalt, Department 1.6: Sound P.O.Box 3345, D-38023 Braunschweig, Germany</p> <p>Telephone: +49 531 592 1431 Fax: +49 531 592 9292 E-mail: Klaus.Beissner@ptb.de</p>																																																																															
9. Completion date: 19 July 2006	10. Coordinator's signature:	11. Date:																																																																													

Notes for completion of the form overleaf

*) Delete as appropriate

NOTES FOR THE COMPLETION OF THE FORM

(numbers refer to boxes overleaf)

IMPORTANT - The form must be typed or completed in black ink to facilitate photocopying.

- 1) Ref. No.** The reference number of the Agreed Project Form on which progress is being reported should be entered.
- 2) Subject Field** The field specified on the Agreed Project Form on which progress is being reported should be entered.
- 3) Type of collaboration** See "PROPOSED EUROMET PROJECT" item 3.
- 4A) Partners** Any institutes, which have already indicated a desire to participate in the proposed collaboration, should be indicated in alphabetical order using their standard acronyms.
- 4B) CEC Funding** Place "X" only if funding is ensured.
- 5) Participating countries** The participating countries should be indicated in alphabetical order by the letters signifying their State. See country codes in the last section of the directory.
- 6) Title** The title of the proposed collaboration should be specified in not more than 60 characters (including spaces).
- 7) Progress** A brief description of the progress should be entered in the space provided. Comments on the advantages of undertaking the work collaboratively through EUROMET would be useful. Completion of this Report is not deemed as publication of the work. Collaborators are encouraged to publish their work through normal channels, mentioning it was undertaken as a EUROMET collaboration.
- 8) Coordinator** The Coordinator is the person who is appointed as the contact point for the project detailed overleaf. The name, full postal address, telephone and fax numbers, e-mail address (where available) of the coordinator should be given.
- 9) Completion date** If the progress of a project is being reported on this form then an estimate of the completion date should be made. If the project has now been completed then the actual date of completion should be given. For permanent agreements (e.g. development of primary standards) "ON-GOING" should be entered.
- 10) Coordinator's signature** Only the original signed copy of a final report should be forwarded to the EUROMET Secretary.
- 11) Date** This form should be dated the day of signature.