IS THERE A TYPICAL ORCHESTRA SIGNATURE IN VIENNA, AUSTRIA ?

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Abstract

"Vienna is Different" is the slogan you read when you enter the city on the highways. Differences are also associated with the sound of the famous Vienna Philharmonic Orchestra (VPO). This orchestra's individual sound characteristic is caused partly by different musical instruments (oboe, horn or timpani), and partly through a specific playing style. While the individual sound variations of these instruments have been investigated in previous studies at our Institute, this paper presents a more general approach to the "distinguishing mark" of this orchestra. 21 sound-pairs of orchestral CD-recordings were offered to test subjects: one example from the VPO and a second from the Berlin Philharmonic or New York Philharmonic Orchestras. The task was to listen and to identify the Viennese one. Listener test data are statistically analyzed to find who identified the orchestra correctly most often and through which examples (involved instruments in the example, musical background and origin of the listener, etc. are taken into account). The aim of the study is to find out which instruments do establish the typical Vienna orchestra signature.
Which instruments give the best clues for identifying the VPO? The members of the audience are invited to make their own decisions.

INTRODUCTION

What is special about the Viennese orchestra ? This question exists as long as the world famous orchestra itself. There are thousands of individual hypothesis and millions of ideas for possible reasons among musicians, audiences and scientists. In the 1950‘s the University of Music founded an institute to provide objective data on that question, but very first studies already showed that the question is much too complex for a simple answer. Too many variables are involved in the process of creation and perception. Since then, single parameters became the focus, which are obvious different in the Viennese orchestra: musical instruments such as the oboe, the horn and the timpani. The particular characteristics of these Viennese musical instruments have been studied in previous projects [1,2,3,4]. An important relevance of these studies was also that survival of these „red watch list“ instruments was endangered. In the 1970‘s almost all original Vienna horns and oboes were in disrepair, and the know-how to build these instrument was almost lost in Austria. Today, the first “brood” of new instruments can be heard in the orchestra.
So, even though “musical acoustics” already helped the Viennese orchestra tradition, there is still no answer about what the main acoustical trademarks of these orchestras are. Which of our scientific methods could solve a task this difficult ? The approach of this project is to carry out an elementary study of musical acoustics: to hear music with a large amount of experienced ears and to collect their analytical power: a large-scale listening test setup including hundreds of musicians and listeners.

METHOD

The question “Is there a typical orchestra signature in Vienna, Austria ?” has been asked using a listening test in Vienna, which started in March 2001 and is going on till December 2001. Since the aim of the test is to collect about 1000 test persons, this paper presents a documentation of the setup and shows preliminary results from 302 test persons. As the test is still in progress, details on the tasks will not be revealed. The unveiling of the final results will be presented at Forum Acusticum in Seville 2002.

The task of the listening test itself is simply to decide which of two sound examples was recorded by the

Vienna Philharmonic Orchestra (VPO). 21 pairs of sound examples from CD-recordings of nine standard orchestral pieces (see LIST “21 tasks”), are played to the test persons. The recording of the alternative sound example in the test pair is either played by the Berlin Philharmonic Orchestra or the New York Philharmonic. The sound examples were unmodified digital copies of pieces from commercial CDs. The duration of the examples is between 3 and 35 seconds (15 seconds on average). While short examples allow the comparison of timbre and short time elements, longer examples are preferred by most listeners to focus on the interpretation. A compromise for the duration of the tasks and many other variables had to be made for a better chance of comparison of other parameters.

Test Parameters. While previous studies by the author have named almost 100 influencing parameters for the tone generation on a trumpet [5], the numbers of parameters influencing a orchestral CD recording is even larger. A large number of individual players, individual instruments are building an orchestra formed by a conductor to interpret a work in a single moment (time) at particular place (room). The recording of this event results in a product that is sold as CD. The recording-technique and the post-production has not a little effect on this result and audio engineers have many powerful tools to manipulate the original sound. In spite of the infinite differences between various CD recordings, the consumer must decide on one recording in the shop, and which one he chooses depends not only on the cover design, but

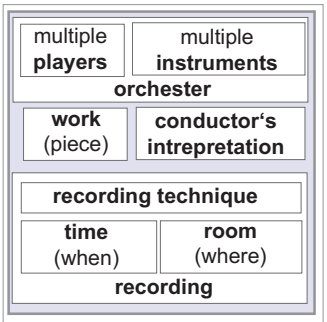


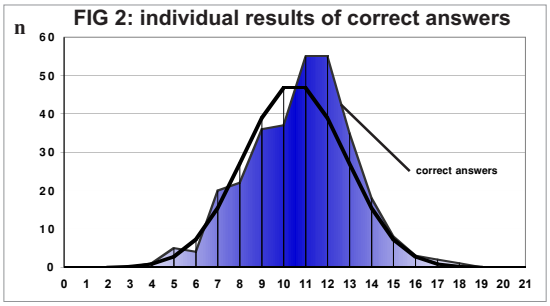
FIG 1: varying CD parameters

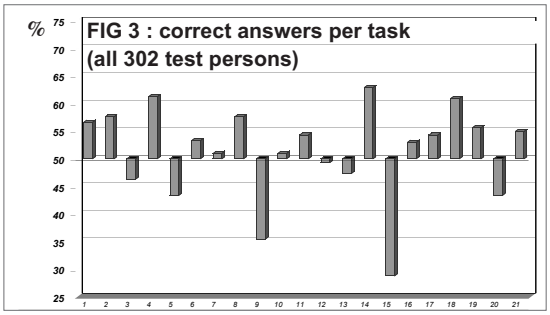
21 tasks of the listening test : „Vienna-Berlin-New York 2001“

[Task 1-2] Mozart: Symph. Nr. 41 (3. Menuetto) [1788]
Task 1: tutti in 3/4 - [bar 52 - 59]. (dynamic =f) - flute, oboe, bassoon, horn, trump., timp., 1. viol., 2. viol., cello, bass, viola Task 2: - downward phrase, 3/4 - [bar 44 - 51]. (dynamic =p) - flute, oboe, bassoon
[Task 3-5] Beethoven: Symph. Nr. 3 “Eroica” (4. Finale) [1804]
Task 3: - strings pizzicato, woodwind staccato - [bar 12 - 27]. (dynamic =p) - flute, clar., bassoon, 1. viol., 2. viol., viola, cello, bass Task 4: flute solo (16th) above orchestra - [bar 182 - 198]. (dynamic =p) - flute, oboe, 1. viol., 2. viol., viola, cello, bass Task 5: tutti passage, theme played by horn and basses - [bar 380 - 388]. (dynamic =ff) - flute, oboe, clar., bassoon, horn, trump., timp., 1. viol., 2. viol., viola, cello, bass
[Task 6] Beethoven: Symph. Nr. 7 (2. Allegretto) [1812]
Task 6: - slow theme played by strings; poco a poco crescendo - [bar 51 - 66]. (dynamic =p-mf) - 1. viol., 2. viol., viola, cello, bass
[Task 7-8] Schubert : Symph. Nr. 8 "Unvollendete" (1. Allegro) [1822]
Task 7: celli theme, syncopic contrapunct - [bar 44 - 47]. (dynamic =pp) - clar., viola, cello, bass Task 8: strings theme - [bar 312 - 316]. (dynamic =p) - flute, oboe, bassoon, horn, 1. viol., 2. viol., viola, cello, bass
[Task 9] Brahms: Symph. No. 4 e-moll op. 98 (4. Allegro) [1885]
Task 9: begin, accord theme played by all wind players - [bar 1 - 8]. (dynamic =f) - flute, oboe, clar., bassoon, horn, trump., tromb., timp.
[Task 10-13] Bruckner: Symph. Nr. 7 E-Dur (3.Scherzo) [1883]
Task 10: trumpet - theme, strings rhythmic accomp. - [bar 5 - 8]. (dynamic =p) - trump., 1. viol., 2. viol., viola, cello, bass Task 11: tutti, trumpet ff punctated motifs - [bar 77 - 89]. (dynamic =ff) - flute, oboe, clar., bassoon, horn, trump., tromb., tuba, timp., 1. viol., 2. viol., viola, cello, bass Task 12: begin, timpani solo - [bar 273 - 276]. (dynamic =pp) - timp. Task 13: end of trio, flute melodic motifs - [bar 397 - 405]. (dynamic =p) - flute, oboe, clar., timp., 1. viol., 2. viol., viola, cello, bass
[Task 14] Berlioz: Symph. fantastique (1. Rêveries) [1831]
Task 14: oboe and bassoon motivs - [bar 456 - 460]. (dynamic =p) - oboe, clar., bassoon, horn, bass
[Task 15,16,17] Mahler: Symph. Nr. 1 “Der Titan” (2. Kräftig bewegt) [1889]
Task 15: beginn, 3/4 “Ländler”, rough motifs - [bar 1 - 22]. (dynamic =f) - flute, oboe, bassoon, horn, triangel, 1. viol., 2. viol., viola, cello, bass Task 16: stringendo, climax, “Ländler”-theme, tutti - [bar 132 - 169]. (dynamic =ff-fff) - flute, oboe, clar., bassoon, horn, trump., tromb., tuba, timp., triangel, 1. viol., 2. viol., viola, cello, bass Task 17: - horn solo, rit. dim. - [bar 171 - 175]. (dynamic =mf-pp) - horn
[Task 18-21] Mahler: Symph. Nr. 5 (1. Trauermarsch) [1904]
Task 18: - trumpet solo - [bar 0 - 5]. (dynamic =p-mf) - trump. Task 19: strings “Weinend” (sad), legato - [bar 42 - 50]. (dynamic =pp-ppp) - clar., bassoon, 1. viol., 2. viol., viola, cello, bass Task 20: tutti, triplets, tuba solo - [bar 254 - 265]. (dynamic =ff-pp) - clar., bassoon, horn, trump., tromb., tuba, timp., drum, l.drum Task 21: horn theme, 1.violin contrapart, strings triplet motifs - [bar 337 - 344]. (dynamic =f-ff) - horn, 1. viol., 2. viol., viola, cello, bass

also on the associations he makes with a specific orchestra. These characteristics attributed to an orchestra are an important commercial factor for a label and the orchestra itself. The objective of this study is to reveal if there are acoustic orchestra trademarks and if yes, how significant different groups of listener can recognize them.

Statistic groups of 302 listener (all). female: 46%, male: 54% ; age0-19years: 36%, age20-39years: 44%, age40-99years: 20%, Austrian: 75%, Non-Austrian: 25%, professional-musican: 14%, student-amateur-musician: 70%, passive-listener: 16%. The absolute number (n=) of each group can be seen in table 1 (first column). Further groups are formed by instrument sections of all test persons playing string, brass, woodwind or percussive instruments, for persons who conduct or compose music, for each single instrument and persons playing no instrument (for final analysis at least 30-65 listeners in each group are planned). Three groups are formed by persons with 9-12 of 21 correct answers, persons with 13 or more correct answers and those with a result of 8 or less correct answers.





RESULTS

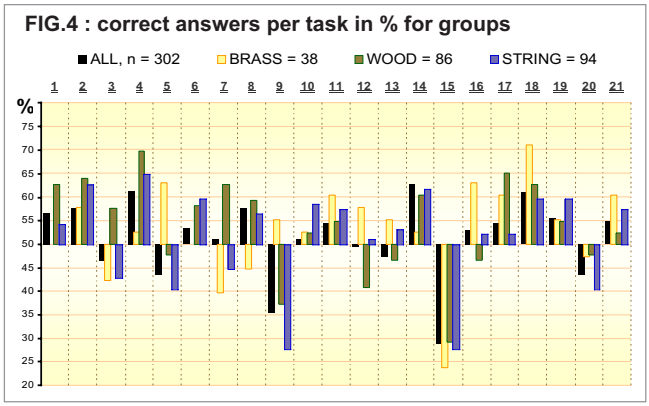
Since the test setup is very simple, each single decision has a 50 % chance to be correct. If the decisions were random, 10,5 correct answers of each test person can be expected. The actual preliminary result over all tasks with 52% is just slightly higher (FIG 2). Also, if the decisions were random, the expected amount of correct answers (k) for each task were 50%. In fact, the preliminary results show a large variation of correct answers for each of the 21 tasks. (FIG 3) While 63% of 302 test persons identified the Vienna orchestra in task 14, only 29% decided the correct answer in task 15. The difference of correct answers varies also between the test groups (FIG 4). All mean values of k can be found in table 1.

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
ALL, n = 302	56,6	57,6	46,3	61,3	43,4	53,3	51,0	57,6	35,4	51,0	54,3	49,3	47,4	62,9	28,8	53,0	54,3	60,9	55,6	43,4	55,0
MALE = 162	58,0	52,5	47,5	56,8	46,3	47,5	50,0	53,7	40,1	54,9	60,5	51,2	46,9	61,1	32,1	57,4	56,8	61,1	57,4	45,7	52,5
FEMALE = 138	54,3	64,5	45,6	65,9	39,9	59,4	52,2	62,3	30,4	46,4	47,8	46,4	48,6	65,2	25,4	47,1	51,4	60,1	53,6	41,3	58,0
BRASS = 38	50,0	57,9	42,1	52,6	63,2	50,0	39,5	44,7	55,3	52,6	60,5	57,9	55,3	52,6	23,7	63,2	60,5	71,1	55,3	47,4	60,5
WOOD = 86	62,8	64,0	57,6	69,8	47,7	58,1	62,8	59,3	37,2	52,3	54,7	40,7	46,5	60,5	29,1	46,5	65,1	62,8	54,7	47,7	52,3
STRING = 94	54,3	62,8	42,9	64,9	40,4	59,6	44,7	56,4	27,7	58,5	57,4	51,1	53,2	61,7	27,7	52,1	52,1	59,6	59,6	40,4	57,4
PERC = 10	50,0	70,0	50,0	70,0	30,0	40,0	50,0	80,0	30,0	60,0	60,0	20,0	30,0	70,0	30,0	40,0	80,0	60,0	40,0	40,0	30,0
PROF = 42	50,0	59,5	53,7	45,2	47,6	57,1	54,8	40,5	33,3	45,2	59,5	61,9	61,9	54,8	52,4	42,9	69,0	50,0	64,3	52,4	54,8
STUD = 210	57,6	57,6	44,9	64,3	43,8	52,4	52,4	63,8	35,7	54,3	56,7	46,7	45,7	63,3	25,2	58,1	55,7	66,7	51,4	44,3	53,8
LISTENER = 48	58,3	58,3	47,9	60,4	39,6	54,2	41,7	45,8	37,5	43,8	39,6	47,9	41,7	68,8	25,0	37,5	33,3	45,8	64,6	33,3	60,4
AT = 221	53,4	59,3	42,2	63,8	41,2	54,3	48,4	56,6	33,5	45,2	56,6	52,0	47,5	67,0	29,4	49,8	52,0	60,2	58,8	45,2	54,8
NON-AT = 79	64,6	54,4	57,7	54,4	50,6	50,6	58,2	60,8	41,8	68,4	48,1	41,8	46,8	53,2	27,8	60,8	59,5	63,3	45,6	39,2	55,7
A.0-19 = 105	52,4	56,2	44,7	66,7	39,0	48,6	48,6	69,5	26,7	57,1	54,3	37,1	49,5	66,7	14,3	55,2	57,1	71,4	48,6	43,8	45,7
A.20-39 = 133	59,4	60,2	47,3	56,4	46,6	54,9	53,4	54,1	44,4	49,6	55,6	50,4	47,4	58,6	38,3	52,6	57,9	54,9	55,6	45,1	60,9
A.40-99 = 62	58,1	54,8	46,8	61,3	45,2	56,5	50,0	45,2	32,3	43,5	51,6		43,5	66,1	33,9	48,4	40,3	56,5	66,1	38,7	58,1
FLUTE = 22	77,3	63,6	54,5	81,8	54,5	54,5	50,0	63,6	45,5	45,5	50,0	50,0	59,1	63,6	22,7	45,5	54,5	72,7	54,5	59,1	50,0
CLAR = 12	66,7	50,0	63,6	58,3	33,3	58,3	66,7	58,3	33,3	58,3	66,7	25,0	50,0	58,3	33,3	41,7	83,3	50,0	66,7	41,7	50,0
OBOE = 9	55,6	77,8	66,7	55,6	33,3	33,3	44,4	22,2	55,6	55,6	44,4	33,3	55,6	77,8	11,1	66,7	55,6	66,7	66,7	66,7	44,4
HORN = 11	54,5	45,5	45,5	45,5	81,8	72,7	27,3	45,5	72,7	54,5	54,5	27,3	81,8	36,4	45,5	63,6	54,5	81,8	72,7	63,6	81,8
TRP = 15	46,7	60,0	20,0	46,7	46,7	60,0	40,0	40,0	46,7	40,0	66,7	53,3	53,3	60,0	20,0	80,0	73,3	60,0	53,3	40,0	60,0
TRB = 9	22,2	66,7	44,4	66,7	55,6	22,2	55,6	55,6	55,6	55,6	44,4	77,8	22,2	55,6	11,1	33,3	44,4	66,7	44,4	33,3	33,3
TIMP = 4	75,0	75,0	50,0	75,0	25,0	50,0	75,0	75,0	25,0	25,0	25,0	0,0	0,0	50,0	25,0	75,0	50,0	25,0	50,0	50,0	50,0
VIOLIN = 54	53,7	63,0	44,2	72,2	38,9	59,3	44,4	55,6	33,3	53,7	63,0	53,7	57,4	68,5	27,8	55,6	48,1	53,7	64,8	44,4	53,7
VLA = 12	33,3	50,0	50,0	58,3	25,0	66,7	33,3	41,7	58,3	75,0	50,0	75,0	58,3	41,7	41,7	33,3	50,0	66,7	83,3	50,0	50,0
CELLO = 29	58,6	65,5	42,9	55,2	48,3	58,6	37,9	51,7	20,7	62,1	48,3	55,2	41,4	55,2	24,1	51,7	51,7	65,5	41,4	41,4	72,4
BASS = 6	50,0	50,0	66,7	66,7	50,0	50,0	83,3	50,0	33,3	66,7	33,3	16,7	66,7	66,7	50,0	33,3	100,0	50,0	66,7	33,3	16,7
PIANO = 119	55,5	61,3	46,6	65,5	37,8	50,4	49,6	52,9	30,3	47,9	51,3	48,7	45,4	69,7	26,9	47,9	52,1	63,9	54,6	46,2	54,6
DIR/COMP = 15	40,0	60,0	33,3	53,3	66,7	46,7	60,0	40,0	20,0	53,3	60,0	46,7	33,3	60,0	33,3	46,7	60,0	46,7	73,3	33,3	60,0
No-INSTR. = 22	59,1	54,5	31,8	63,6	45,5	59,1	31,8	45,5	27,3	31,8	22,7	54,5	27,3	68,2	18,2	45,5	22,7	45,5	63,6	27,3	59,1
Res13+ = 67	85,1	70,1	58,2	74,6	68,7	74,6	61,2	77,6	40,3	62,7	64,2	62,7	64,2	64,2	41,8	70,1	68,7	82,1	64,2	61,2	67,2
Res9-12 = 183	51,9	58,5	48,3	62,3	39,9	53,6	53,0	56,3	33,9	48,6	55,7	50,8	47,5	68,3	26,8	50,3	53,6	57,4	58,5	42,6	53,6
Res8- = 53	36,5	38,5	23,5	40,4	23,1	25,0	30,8	36,5	34,6	44,2	36,5	26,9	25,0	42,3	19,2	40,4	38,5	46,2	34,6	23,1	44,2

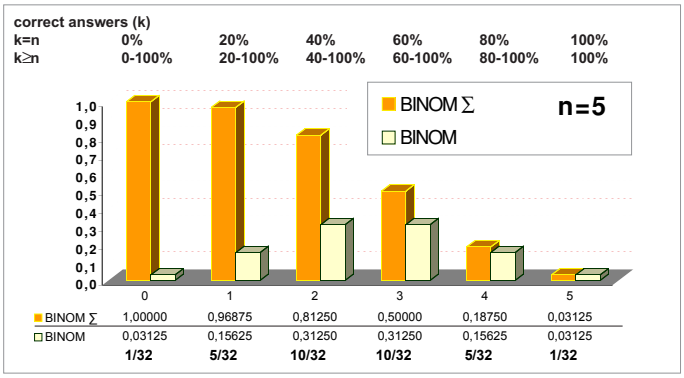
shown in FIG 3

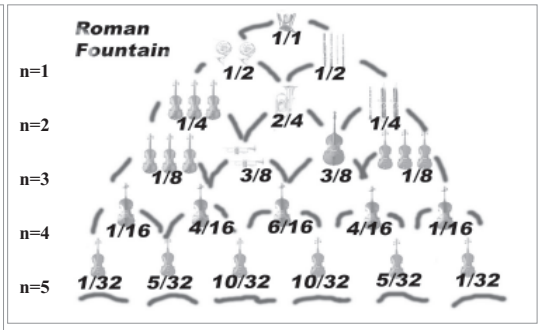
TABLE 1: correct answers of groups per task in percent.

The first statistical approach was to find the probability of these results. The statistical probability of success in a binominal test can be demonstrated in a 'roman fountain'. FIG 5 and FIG 6 gives an example for 5 decisions. The probability for 5 correct answers (k=5or k=100%) in 5 decisions (n=5) is 1/32 (p=0,03125). The probability to have at least 4 correct answers (n=5, k≥4 or k≥80%, cumulated probability) is 5/32 plus 1/32 (p=0,18750).



The preliminary results (X) in TABLE 1 represent the percentage of correct answers. TABLE 2 shows the corresponding values of their probabilities [P(X)≥k]. Values of p below 0.001 (highly significant), below 0,01 (very significant) and below 0,05 (significant) can be found. This indicates that the decisions of the test persons are not always random, (as many of the comments of the test persons and there overall tasks result indicates). For example, in task 4, test persons playing a woodwind or string instrument had significant better identification of the Vienna orchestra than brass players. This and many more comparisons of the results from test persons playing brass, woodwind or string instruments can be concluded from TABLE 1,2 and FIG 4.





left: FIG 5 above: FIG 6 below: TABLE2

p (k≥Ø)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
ALL, n = 302	0,009	0,003	0,907	0,000	0,991	0,113	0,387	0,003	1,000	0,387	0,075	0,569	0,836	0,000	1,000	0,164	0,075	0,000	0,022	0,991	0,048
MALE = 162	0,017	0,291	0,760	0,049	0,846	0,709	0,531	0,194	0,993	0,091	0,005	0,347	0,760	0,003	1,000	0,035	0,049	0,003	0,035	0,881	0,291
FEMALE = 138	0,175	0,000	0,866	0,000	0,993	0,011	0,276	0,002	1,000	0,825	0,724	0,825	0,601	0,000	1,000	0,778	0,399	0,007	0,222	0,975	0,037
BRASS = 38	0,564	0,128	0,872	0,436	0,072	0,564	0,928	0,686	0,314	0,436	0,072	0,128	0,314	0,436	1,000	0,072	0,072	0,003	0,314	0,564	0,072
WOOD = 86	0,011	0,006	0,080	0,000	0,627	0,080	0,011	0,033	0,994	0,373	0,166	0,947	0,775	0,020	1,000	0,775	0,003	0,011	0,166	0,627	0,373
STRING = 94	0,177	0,009	0,910	0,003	0,975	0,025	0,823	0,090	1,000	0,061	0,090	0,459	0,303	0,009	1,000	0,303	0,303	0,025	0,025	0,975	0,090
PERC = 10	0,623	0,172	0,623	0,172	0,945	0,828	0,623	0,055	0,945	0,377	0,377	0,989	0,945	0,172	0,945	0,828	0,055	0,377	0,828	0,828	0,945
PROF = 42	0,561	0,140	0,322	0,780	0,678	0,220	0,220	0,860	0,990	0,780	0,140	0,082	0,082	0,220	0,322	0,780	0,004	0,561	0,022	0,322	0,220
STUD = 210	0,016	0,016	0,926	0,000	0,969	0,224	0,224	0,000	1,000	0,095	0,023	0,815	0,905	0,000	1,000	0,008	0,056	0,000	0,365	0,944	0,150
LISTENER = 48	0,156	0,156	0,557	0,056	0,944	0,235	0,844	0,765	0,970	0,844	0,944	0,557	0,844	0,007	1,000	0,970	0,993	0,765	0,030	0,993	0,056
AT = 221	0,173	0,003	0,989	0,000	0,997	0,089	0,657	0,022	1,000	0,931	0,022	0,295	0,749	0,000	1,000	0,553	0,295	0,001	0,005	0,931	0,069
NON-AT = 79	0,003	0,250	0,088	0,250	0,411	0,411	0,088	0,021	0,912	0,001	0,674	0,912	0,674	0,326	1,000	0,021	0,036	0,012	0,750	0,979	0,130

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[4] More publications of our Institute can be found via our Web-Site at **http://iwk.mdw.ac.at**

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