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DEFINITION AND ASSIGNEMENT OF SOME GLOBAL UNCERTAINTIES OF MEASUREMENTS

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Résumé

L'étalonnage réel d'un instrument de mesure concerne avec l'entier intervalle de mesure défini par les étalons utilisés, ainsi qu'il est nécessaire de définir une incertitude globale. Elle est introduite une série de ces valeurs sur la base des incertitudes standards (locals) , tant pour les étalons que pour l'instrument de mesure soumis à l'etalonnage. Leur signification physique et pratique est présentée en utilisant un Certificat d'Etalonnage exprimé en Excel sous Windows® et appliqué à "l'étalonnage" de deux opérateurs prédisant la seconde en comparaisond'un chronomètre numérique pour quatre périodes de temps standardisées. La structure du système de mesure pour le procédé experimental standard est présentée ensemble avec les conditions de répétabilité et l'incertitude intrinsèque défini comme valeur limite à un nombre infini des degrés de liberté. La qualité du système de mesure est définie par le produit entre l'incertitude et le nombre des degrès de liberté associé.

Abstract

The real calibration of a measuring instrument concerns with the overall measuring range defined by the used standards, so it appears as necessary to introduce a global uncertainty. A series of such values are defined based on local uncertainties both for standards and for the tested measuring instruments. Their physical assignments are discussed in terms of a proposed Calibration Certificate issued in Excel under Windows® applied for the "calibration" of two operators predicting the second in comparison with a digital chronometer for four standard periods of time. The structure of a general measuring system in correct conditions of repeatability is also presented together with the intrinsic uncertainty defined as the limiting value of uncertainty for infinite degrees of freedom.The figure of merit of the measuring system can be defined by the product between uncertainty and the figure of degrees of freedom.

Introductory notions

Calibration of measuring instruments [1] implies at least two basic operations : (1) measurements in conditions of repeatability for different standard values ,xj (j=1:m), imposed by experimental procedure; (ii) comparison and adjustement of the measuring instrument in view to optimize the correlation between the obtained results (as indicated values expressed by average values , yj) with xj. Standard operating procedure (so called SOP in good laboratory practice [2]) for each calibration point xj, may impose n experimental values yij (i=1:n, j=1:m).
The following two assumptions result as to be important for the good metrological practice :
(1) the basic experimental conditions for correct SOP define the repeatability; and
(2) the optimum calibration consists in an optimum linear correlation between the m pairs of the best estimates for average values (xj,yj). Its quality can be expressed by the quantities associated to the classical linear regression , namely :

$$yj = SLOPE * xj + INTERCEPT \quad (1)$$

where SLOPE , INTERCEPT and CORREL are expressed as functions from Excel under Windows® [3] and have classical significances.
The ideal calibration has the following values :

SLOPE = 1 (dimensionless for same units of xj and yj)
INTERCEPT = 0 (2)
CORREL = 1.

It is important to mention that the reference documents on this topic [4-6] do not comment this aspect.These are focussed only on the aspects connected with uncertainties associated to so called the calibration at a single point both of statistical origin (pure experimental , type A) and the evaluation of contributions of the influence quantities (type B , see a thourough overview in reference [6]).
Although the contributions of most important influence quantities may not be neglected even in highly accurate conditions of repeatability , the basic component of uncertainty is experimentally defined , namely on statistical retrieval of values (yij) and (xj) (or (xij)) for (i=1:n,j=1:m).
In a recent study of the type A uncertainty [7] , the assignments of the main standardized terms [1] are reviewed , so the notion of measuring system (MS) should be introduced. It mainly consists from :

- measuring instrument (MI) which is submitted to calibration (it also consists from : measuring quantity = measurand , sensor-transducer , memory block of internal calibration constants and the analog and/or digital display of the measured quantity expressed in the standard unit which the MI is devoted for);

- operator ;
- influence quantities or potentials (according to the generalized potentials defined in non-equilibrium thermodynamics [8,9]).

It is important to mention that MI must contain for its calibration on his front panel and/or by software runing of its specific SOP , at least two knobs (options, respectively) generally known as GAIN and OFFSET which allows to adjust the SLOPE and INTERCEPT , respectively , so to optimally realize the condition (2).

All these notions were explained in very practical manner by considering the suggestive case of MS of experiments of **"target shooting"** according to a specific SOP [7].Furthermore, the notion of **intrinsic uncertainty** was introduced as a threshold (limiting) value of uncertainty below which the distribution rule of the experimental results changes its nature [7 , 9].

Prior to effectivelly introduce the global uncertainty, we must review shortly the physical assignment of the uncertainty as a general term . It appears as a relativistic effect of measuring (observing a quantity) in two different reference frames [9]. For instance , a standard or a certified reference material (CRM) has xj values with associated (intrinsic) uncertainties , ujS, representing the values expressed in their local reference frames or proper of highly accurate MS ; but , measured in another MI or MS these values are changed and represent their proper reference frame with new values x'j and associated uncertainties , u'jS (usually >ujS). Neglecting the contributions of the influence potentials , uncertainty represents the **oscillation amplitude** resulted by this relativistic effect. If we have to combine more contributions , it results to combine their associated uncertainties according to the composition rules proper to oscillations. For instance , if the SOP for a MI asserts that the considered standards must be taken with their initial values stated by their Calibration Certificates , namely: (xj , ujS ,vjS, Pj) (Pj=confidence levels considered in general as the same P=95%) , the resulted (combined) local uncertainties associated to the indicated values are as it follows :

Ujc = (ujS^2 + ujA^2)^0.5 (3),

and the combined figure of degrees of freedom can be estimated according to the recommended Welch-Satterthwaite formula [4-6] :

vceff = Ujc^4)/((ujS^4/vjS) + (ujA^4/vjA)) (4).

The figure of degrees of freedom , v , associated to a uncertainty , u , represents the dimension of the Hilbert space on which this is defined. In other words , we may conclude that at least for uncertainty, u of type A , the increase of its associated v will increase its confidence , so that the product (v*u) will tend to a finite limiting value for $v(n) \to \infty$ .In the framework of SOP this product allows to define the **figure of merit** or the **quality factor** of the measurement in MS as :

figure of merit = 1 / (v*u) (5).

Global Uncertainties

We may now introduce the term of global uncertainty : it appears as a combination of the local uncertainties either separately only for standards and only for the indicated values , either by their combination over the whole measuring range.

In addition to the classical quantities above mentioned of (SLOPE , INTERCEPT , CORREL) and associated standard uncertainties u(SLOPE) and u(INTERCEPT) resulted from linear regression procedure [7] , we may propose the following definitions of global uncertainty :

upS,A = (SUMSQ(STDEV(xj or yj))/(n*m))^0.5 (6)
vS,Aeff = n*m – 1

uR = (SUMXMY2(xj,yj)/(n*m))^0.5 (7)
vR = (n – 1)*m – 1

UcS,A = (SUMSQ(ujS,A))/m)^0.5 (8)
vcS,Aeff = SUM (vjS,Aeff)

Ug2 =(SUMSQ(Ujc)/m)^0.5 (9).
vg2 = (SUM(vjc)) – 1

We may mention that for each defined pair of (u,v) values , it results the associated figure of merit .

Calibration Certificate and its Application

On the basis of the primary experimental values xj (or xij) and yij obtained in conditions stipulated by SOP , it is possible to calculate all above values by considering a general Calibration Certificate issued in Excel under Windows® [7].

As a highly efficient application of MI calibration it was considered the "calibration" of an operator predicting the second on a range of four standardized periods of time (5 , 10 , 15 , 20 seconds) by considering as standards the readings on a digital chronometer with 0.001 s resolution , but without seeing the display [7]. The resulted periods (as indicated values) were noted by another person. This was successfuly used in practical works on biophysics for students in view to better understanding statistical retrieval of experimental data [10].

The proposed Calibration Certificate consists from two pages (worksheets) , so the final results are presented in the second one. This presents the comparative values obtained for two operators ,MD and GMT , for which the following observations can be sketched in the Table below :

CALIBRATION CERTIFICATE

pag. 2

GLOBAL UNCERTAINTIES Type A

DATE / No.CERTIFICATE :	11-Aug-98		11-Aug-98	
LABORATORY :	BRML		BRML	
OPERATOR / POSITION :	MIRELA DRAGOMIR (MD)		GIGI–MICU TATARU (GMT)	
STANDARDS :	Digital Chronometer		Digital Chronometer	
	0.001 s resolution		0.001 s resolution	
CERTIFIED REF. MATERIALS:				
MEASURING INSTRUMENT :	MD		GMT	
PROCEDURE :	Application 1		Application 1	
PRODUCER :				
MEASURING UNIT :	SECOND	Figure of Merit	SECOND	Figure of Merit
SLOPE	9.78E-01	1/(u*v)	1.00E+00	1/(u*v)
INTERCEPT	3.66E-01		6.61E-01	
CORREL	0.99973069		0.99942504	
u(SLOPE)	2.8E-02	1.028E+00	4.2E-02	6.863E-01
u(INTERCEPT)	3.8E-01	7.507E-02	5.7E-01	5.012E-02
uR	6.3E-02	4.562E-01	2.2E-01	1.271E-01
vR	35		35	
upE	0.0E+00	#DIV/0!	0.0E+00	#DIV/0!
vEeff	-1		-1	
UcE	1.0E-03	5.000E+01	1.0E-03	5.000E+01
vcEeff	20		20	
upA	3.1E-01	8.311E-02	2.4E-01	1.049E-01
vAeff	39		39	
UcA	3.1E-01	9.004E-02	2.4E-01	1.137E-01
vcAeff	36		36	
Uc1	3.1E-01	5.893E-02	2.4E-01	7.439E-02
vc1eff	55		55	
P (%)	95		95	
t (p , vceff)	2.00E+00		2.00E+00	
Ug1	6.2E-01	2.941E-02	4.9E-01	3.712E-02
Ug2	7.0E-01	4.094E-02	5.5E-01	5.168E-02
vg2	35		35	
min(average(xj))	5.00E+00		5.00E+00	
max(average(xj))	2.00E+01		2.00E+01	

discussed value	comparative relationsheep
| 1 – SLOPE |	MD > GMT
INTERCEPT	MD < GMT
CORREL	MD > GMT
u(SLOPE) u(INTERCEPT)	MD < GMT
uR	MD < GMT
upA	MD > GMT
UcA	MD > GMT
Ug2	MD > GMT

These comparative results could be translated in the following few words : MD shows greater local uncertainties , but maintains more constant its own unit on the calibration range. These conclusions are suported also by the associated figures of merit. The adjustment of GAIN(SLOPE) and OFFSET(INTERCEPT) options could be possible by a feedback loop so operator could optimize his "fire".

Concluding remarks

As a result of the above presented experience in a condensed form on MI calibration , we are able to draw up the following main conclusions :

1. The introduction in the calibration practice of global uncertainties according to linear regression and other combined forms of the local uncertainties appears as absolutely necessary .

2. It is obvious that the above mentioned definitions of global uncertainties do not superpose hundred per cent, but they complete each other bringing specific information about the MS behaviour on the measuring range.

3. It is also necessary to develop the theoretical background for composition rules of figures of degrees of freedom .

4. The above considered analysis of uncertainties of type A could be completed with the contributions of the influence potentials , but substantiated also on experimental basis.

5.The intrinsic uncertainty appeared to be as an important characteristic of MI and MS , so it is compulsory characteristic for certification of standards and for pattern approval of MI.The effective SOP for this purpose is the universal procedure defined according to topoenergetic principles [9].

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HuPoTest – errors originating from software

Metrology must be the first step in all measurements

One of practical techniques considered in HuPoTest measurements was the stopwatch tic-toc function from professional math software Matlab2017b [1]. There were differences between particular elapsed times with accuracy of 10 ns displayed at each measurement and the final reported times with accuracy of 1 ms. In Tables bellow are gathered the row values obtained by standard procedure described in the recent studies [2], the calculated errors between elapsed and final values and corresponding several parameters previously defined [3]. The main origin of these errors/differences is from the delay between start command and real start of time measurements. The most visible such delay resulted for the data logger NI-DAQ6008 [2, 3]. It is generally known that all software have such delay, but their amplitude depends on the software, operating system and configuration of working computer. This was the reason the best CFOM resulted for the simple digital stopwatch used during the long term tests on over 1000 Persons Under Test [2, 4]. Important such delay must be constant during measurements in given conditions. Unfortunately, the bellow errors show oscillating values for each xj, although the differences in the parameters can be tolerated at first sight.

In conclusion: rigorous metrology of measurements is imposed in view to establish highly accurate HuPoTest pattern.

elapsed times			
4.75479	9.94304	14.85031	19.96884
4.92908	9.98334	15.11237	20.74681
5.04030	10.00047	14.92005	20.00080
4.99331	10.17682	14.92941	19.94514
4.98963	10.04637	14.90410	20.12005
4.96271	10.02923	15.12689	19.89578
4.99972	10.08957	15.04880	20.71302
4.81339	10.06458	15.14503	20.06745

final times			
4.769	9.942	14.757	19.978
4.925	9.974	15.114	20.749
5.034	10.002	14.927	19.995
5.001	10.174	14.941	19.946
5.001	10.049	14.909	20.123
4.970	10.042	15.130	19.886
5.004	10.084	15.037	20.718
4.816	10.067	15.146	20.073

	error=100*(elapsed-final)/elapsed,%			
	-0.299	0.010	0.628	-0.046
	0.083	0.094	-0.011	-0.011
	0.125	-0.015	-0.047	0.029
	-0.154	0.028	-0.078	-0.004
	-0.228	-0.026	-0.033	-0.015
	-0.147	-0.127	-0.021	0.049
	-0.086	0.055	0.078	-0.024
	-0.054	-0.024	-0.006	-0.028
min	**-0.299**	**-0.127**	**-0.078**	**-0.046**
MAX	**0.125**	**0.094**	**0.628**	**0.049**
MAX-min	**0.424**	**0.221**	**0.706**	**0.095**

	elapsed times		final times	
		uncert		uncert
slope	1.014	0.0055	1.014	0.006
intercept	-0.135	0.076	-0.131	0.083
Δa	0.114	0.042	0.107	0.051
Δb	-0.274	0.10	-0.257	0.13

	K21	K23	TR	K33	GFOM	PS	AP1	AP2	a	M	SC
elapsed	34.592	113.937	3.29	25.062	65.932	17	30	61	-31	53.20	66
final	33.250	114.883	3.46	25.263	62.379	16	27	63	-36	53.53	56

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HuPoTest – seven week mental training during Orthodox Easter Fasting
I. New rules for more realistic and efficient measurements.

Sri Swami Sivananda:"Time is life; it is more precious than money
Utilize time profitably in spiritual pursuits".

After a careful study of several measurement techniques imposed by HuPoTest procedure [1], I decided to try the simultaneous most accessible and accurate one for personal mental training on important period of the year – the Orthodox Easter Fasting extended on 7 weeks (19 March – 8 April 2018). This time measurement technique is provided by the website:

http://stopwatch.onlineclock.net/

and the basic requirements to save and retrieve the data are the followings: personal computer connected to internet with Word and Excel on any Windows® platform (recommended Office 2003).I followed initially imposed conditions for measurements [2], excepting the training stage for accustoming with standard seconds. This stage was replaced by measuring series of 5 "personal" seconds up to the 4-5 values become close enough to start the real measurements. In this way I consider that me as Person Under Test (PUT), I established a stable rhythm of measurements, independently of standard seconds, which must be kept constant during further series of measurements. Before to start, the screen was covered with a cartoon or a piece of fabric remaining uncovered only the front order figures. Simultaneous 2 websites were opened selecting medium font size in view to measure 2 series of 8 values on each one. I used to measure in the following order of xj: 5, 15, 10 and 20 standard seconds avoiding any interruptions. These values are transferred by copy-paste in a table of 1 row-4 columns in Word (first table bellow) and subsequently removing the unnecessary characters (second one). This entire table was copied on an intermediary Excel sheet and retrieved by removing borders and setting the font Times New Roman size 12 points and finally properly copied in the template Excel form recently explained [3] and posted on my website.

04.672	09.361	14.272	18.235
2 Stop: 00:00:04.794	2 Stop: 00:00:09.387	10 Stop: 00:00:14.409	10 Stop: 00:00:18.577
3 Stop: 00:00:04.776	3 Stop: 00:00:09.170	11 Stop: 00:00:14.281	11 Stop: 00:00:19.097
4 Stop: 00:00:04.793	4 Stop: 00:00:09.473	12 Stop: 00:00:14.231	12 Stop: 00:00:19.289
5 Stop: 00:00:04.800	5 Stop: 00:00:09.481	13 Stop: 00:00:14.377	13 Stop: 00:00:19.236
6 Stop: 00:00:04.721	6 Stop: 00:00:09.287	14 Stop: 00:00:14.116	14 Stop: 00:00:18.938
7 Stop: 00:00:04.698	7 Stop: 00:00:09.433	15 Stop: 00:00:14.321	15 Stop: 00:00:18.471
8 Stop: 00:00:04.672	8 Stop: 00:00:09.100	16 Stop: 00:00:14.056	16 Stop: 00:00:19.000

04.672	09.361	14.272	18.235
04.794	09.387	14.409	18.577
04.776	09.170	14.281	19.097
04.793	09.473	14.231	19.289
04.800	09.481	14.377	19.236
04.721	09.287	14.116	18.938
04.698	09.433	14.321	18.471
04.672	09.100	14.056	19.000

30 measurements were performed on each week (4x5+5x2) and all row and calculated data are saved and retrieved on separate Excel documents corresponding to each week. On the six attached Figures are represented the most suggestive parameters resulted from Excel template and other original formulas [4, 5] (established by face-to-face tests on over 1000 PUT) by using Matlab2017b.

The most important conclusion is that personal rhythm ~ (1-slope), GFOM and K21 continuously increases over the 7 weeks with proportional SC values. More details will be given in the next part.

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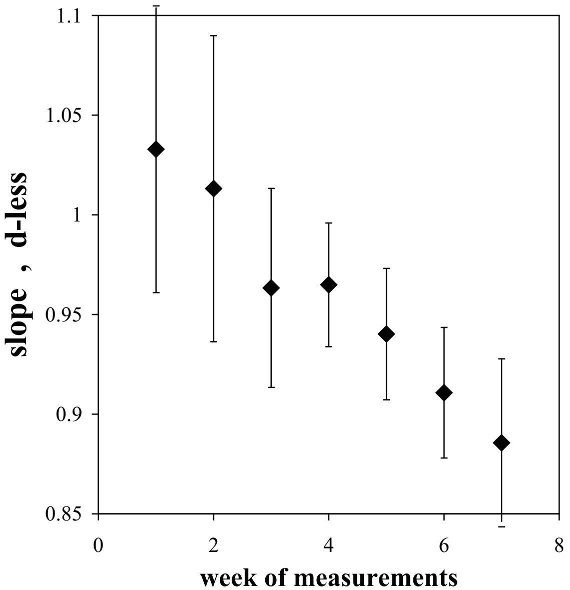

Figure 1.

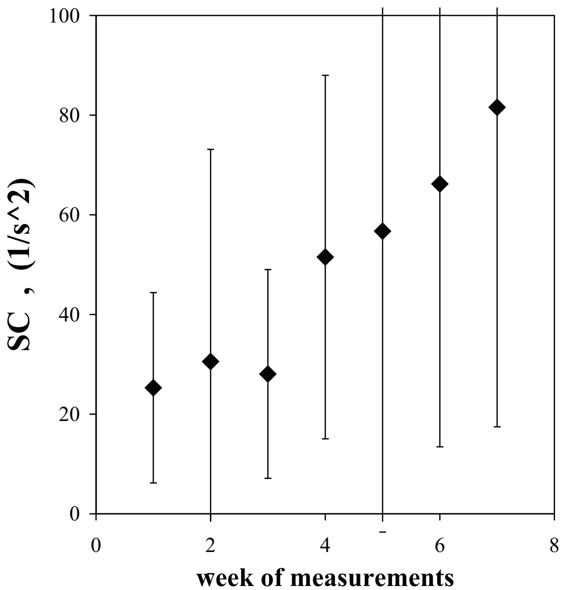

Figure 2.

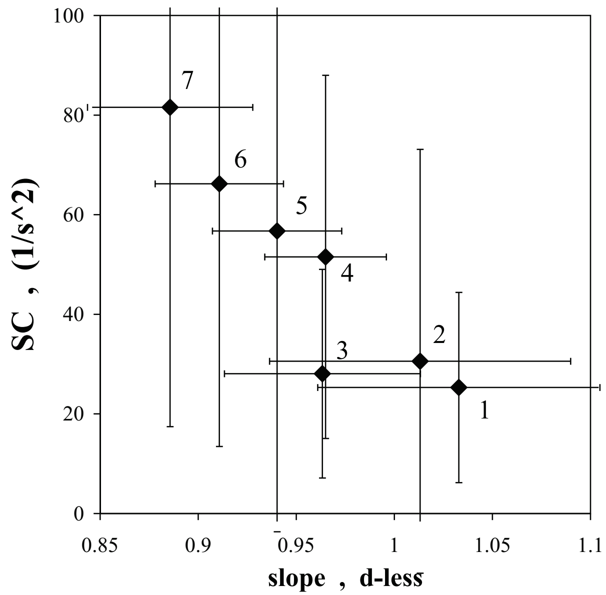

Figure 3.

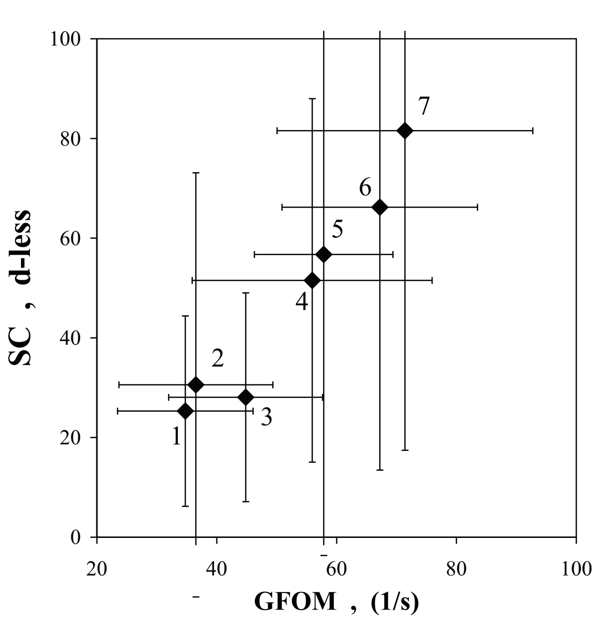

Figure 4.

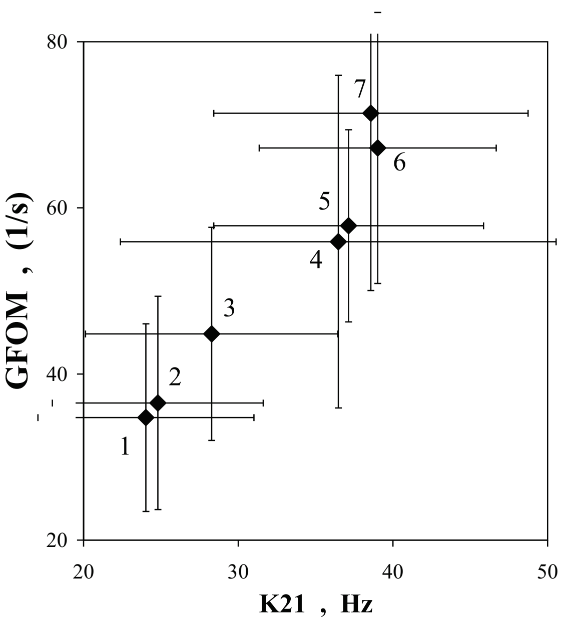

Figure 5.

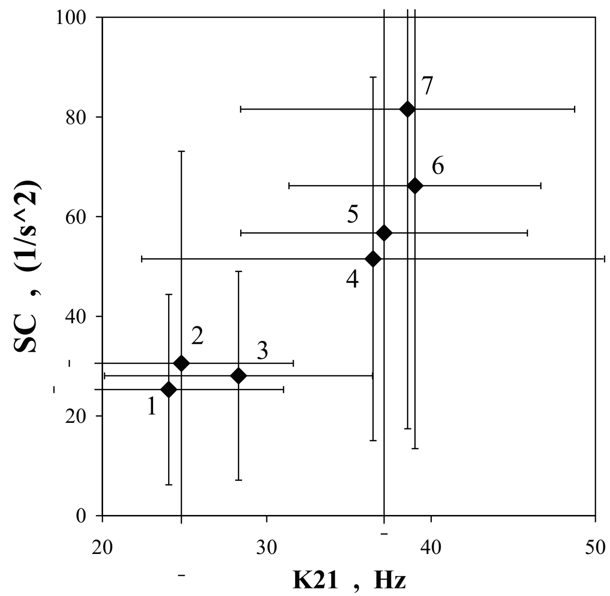

Figure 6.

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Previous issues of GDF DATABANKS BULLETIN

Year	VOL	NO	Content (titles)	$*)
1997	1	1	Editorial: Databanks – the compulsory language. LOGKOW – a Databank of evaluated octanol-water partition coefficients (James Sangster). Solubility behavior introducing topoenergetic working principles. Comments on 1-octanol-water partition of several n-alkane related series.	F
1997	1	2	Guide of good practice in metrology (Romanian)	AFI
1998	2	1	Editorial: socio-psychological implications in creation and utilization of a databank (Ioan-Bradu Iamandescu); Behavior in vapor-liquid equilibria (VLE): I. Structural aspects; Behavior in vapor-liquid equilibria: II. Several structures in databanks; Symposium on VDC-4 held on 30 October 1997 at Lubrifin-SA, Brasov (Romania).	F
1998	2	2	Practical course of metrology (Romanian)	AFI
1998	2	3	DIFFUTOR-01: Thermally driven diffusion in pure metals	AFI
1998	2	4	VAPORSAT-01: Databanks of thermally driven VLE. The first 100 simple molecules	AFI
1999	3	1	Editorial: New trends in material science: nanostructures (Dan Donescu) DIFFUTOR: Databanks of diffusion kinetics. VAPORSAT: Databanks of vapor-liquid separation kinetics.	F
1999	3	2	Discussions on Applied Metrology	AFI
2000	4	1	Editorial: Laboratory accreditation and inter-laboratory comparisons (Virgil Badescu) Doctoral Theses – important data banks. GDF intends to open new series of experiments on thermo-physical properties. Some comments on uncertainty: global budget and DFT analysis. Events: The 9th International Metrology Congress, Bordeaux, France, 18-21 October 1999.	F
2000	4	2	Measurement and Calibration.	AFI
2001	5	1	Editorial: Metrology ensures moral and technological progress. Topoenergetic aspects of amorphous-crystalline coupling. I. Composite behavior of water and aqueous solutions (paper presented at nanotubes and Nanostructures 2001, LNF, Frascati, Rome Italy, 17-27 October 2001). Events: Nanotubes and nanostructures 2000.School and workshop, 24 September – 4 October 2000, Cagliari, Italy.	F
2001	5	2	Editorial: Viscosity – a symptomatic problem of actual metrology. Visco-Dens Calorimeter: general features on density and viscosity measurements. New vision on the calibration of thermometers: ISOCALT® MOSATOR: Topoenergetic databanks on molten salts properties driven by temperature and composition.	F
2002	6	1	MOSATOR-01: Topoenergetic databanks for one component molten salts; thermally driven viscosity and electrical conductance.	AFI
2002	6	2	Editorial: HuPoTest - Operator calibration or temporal scale psychic test. MOSATOR: topoenergetic databanks of one component molten salts; thermally driven viscosity and electrical conductance.	F
2002	6	3	Editorial: Quo vadis Earth experiment? ISOCALT® : Report on metrological tests	F
2003	7	1	Editorial: Time – an instrument of the selfish thinking. 1st NOTE: Homoeopathy: upon some efficient physical tests revealing structural modifications of water and aqueous solutions. I. Mixing experiments.	F
2004	8	1	Metrological verification and calibration of thermometers using thermostats type ISOCALT® 21/70/2. Metrological verification and calibration of thermometers using thermostats type ISOCALT® 2.2R.	F
2004	8	2	Aspects of correct measurements of temperature. I. measurement of a fixed point according to ITS-90. Physics and Homoeopathy: some physical requirements for homoeopathic	F

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			practice.(Plenary lecture at the 19th SRH National Congress, 21-22 September 2004, Bucharest, Romania)	
2005	9	1	AWARD for ISOCALT® at the International Fair TIB-2004, October 2004, Bucharest. ISOCALT® 3/70/21 was awarded in a selection of 20 products by a commission of experts from the Polytechnic University of Bucharest. Upon some aspects of temperature measurements. (12th International Metrology Congress, 20-23 June 2005, Lyon, France)	F
2005	9	2	A new technique for temperature measurement and calibration. National Society of Measurements (NSM). Important warning for T-calibrator users: MSA has chose metrology well calibrators from Fluke (Hart Scientific).	F
2005	9	3	Universal representation of Cancer Diseases. 1. First sight on NSW-2003 report. Universal representation of Cancer Diseases. 2. UK cancer registrations on 1999-2002. Vital Potential can estimate our predisposition for cancer diseases.	F
2006	10	1	NTC – thermistors -1	AFI
2007	11	1	HuPoTest - 40 years of continuous research Basic rules for preventing and vanishing cancer diseases Climate change = change of mentality Hot nuclear fusion – a project of actual mentality	F
2007	11	2	MT – Introduction to Mental Technology HuPoTest – general procedure, assignments of results, specimen of complete test, order and obtain your complete HuPoTest report	F
2007	11	3	TRESISTOR© - data banks of materials with thermally driven electric and magnetic properties TRESISTOR© - NTC -1 - data bank of NTC thermistors	AFI
2008	12	1	Australian population: life, death and cancer	F
2008	12	2	Pattern of Cancer Diseases	F
2008	12	3	Adiabatic calorimetry – summary description of the demo prototype	F
2008	12	4	Flight QF 30 and even more… Temperature calibration of NTC-thermistors. 1.Preliminary results.	F
2009	13	1	Proposal for interlaboratory comparisons. Calibration of NTC-thermistors (The 14th International Metrology Congress, Paris, France, 22-25 June 2009).	F
2009	13	2	Sudoku – un algoritm de rezolvare. (Sudoku – an algorithm for solution).	AFI
2009	13	3	Cancer and Diabetes – as social diseases. (Open letter to all whom it may concern).	F
2010	14	1	Studies on cement hydration by High Resolution Mixing Calorimetry (HRMC).	F
2010	14	2	Measuring tools for subtle potentials; pas-LED: an efficient measuring tool for subtle potentials.	F
2010	14	3	Upon some features of cancer in Australia: 1982 – 2006.	F
2010	14	4	Cancer as an erosion process in human society.	F
2010	14	5	Cancer erosion in Australian human society: 1982 – 2006.	F
2010	14	6	Cancer erosion in German human society:1980-2008.	F
2011	15	1	Procedures and devices for energy and water saving. (I) (in Romanian).	F
2011	15	2	Structural and relativistic aspects in transforming systems. I. Arrhenius and Universal representations of thermally driven processes.	F
2011	15	3	Topoenergetic aspects of water structuring as revealed by ac electric conductivity.	F
2011	15	4	Topoenergetic aspects of human body	F
2011	15	5	HuPoTest: four month study of a case	F
2012	16	1	DTA study of water freezing. I. Upon some aspects of repeatability.	F
2012	16	2	DTA study of water freezing. II. Statistical features on one week of experiments.	F
2012	16	3	DTA study of water freezing. III. New facts on daily mental field.	F
2012	16	4	Mental field and state of health. Câmpul mental și starea de sănătate.	F

2013	17	1	DTA study of water freezing. IV. New facts on energy circuits.	F
2013	17	2	DTA study of water freezing. V. Effect of a mental antenna	F
2013	17	3	AC electric conductivity of untreated and mentally treated electrolyte aqueous solutions.	F
2013	17	4	DTA study of water freezing. VI. Mental field in a working day.	F
2013	17	5	DTA study of water freezing. VII. More statistical features on one week of experiments.	F
2013	17	6	HuPoTest: New measurements and results	F
2013	17	7	Time as unique base quantity. (Proceedings of the 16th International Congress of Metrology, 7-10 October 2013, Paris, France).	F
2013	17	8	Eurovision song contest. 1.Basic social aspects	F
2013	17	9	Mental field-water interaction as evidenced by Isothermal Convection Flow Calorimetry (ICFC). I. ICFC description and preliminary results.	F
2013	17	10	1. Procedure for defining standard liquids for viscosity based on topoenergetic principles. 2. Topological aspects of flow and deformation in polymer composites, The VIII-th International Congress on Rheology, 1-5 September 1980, Naples, Italy, pp. 375-376. 3. Universal representation of flow behavior based on topoenergetic principles, The IX-th International Congress on Rheology, 8-13 October 1984, Accapulco, Gro. Mexico, pp.369-376. 4. Comments on “Universal representation of flow behavior based on topoenergetic principles”, The IX-th International Congress on Rheology, 8-13 October 1984, Accapulco, Gro. Mexico, pp. 369-376. 5. Open letter to BRML and INM.	F
2014	18	1	Adiabatic calorimeter as high accuracy T-calibrator	F
2014	18	2	Mental field-water interaction as evidenced by Isothermal Convection Flow Calorimetry (ICFC). II. Effect of convection flow power.	F
2014	18	3	Eurovision song contest. II. Copenhagen, Denmark 2014 and some more features on social mentality.	F
2014	18	4	The 38th Congress of American-Romanian Academy (ARA) of Arts and Sciences, 23-27 July 2014, Pasadena, California, USA	F
2015	19	1	Gold versus money. 1. An overview on main financial figures of world countries.	F
2015	19	2	Gold versus money. 2. Rich, middle and poor countries.	F
2015	19	3	High Resolution Mixing Calorimetry (HRMC) redivivus. 1. General presentation and heat capacity measurements.	F
2015	19	4	High Resolution Mixing Calorimetry (HRMC) redivivus. 2. Structure developing of aqueous solutions by mixing experiments.	F
2015	19	5	High Resolution Mixing Calorimetry (HRMC) redivivus. 3. Calibration	F
2015	19	6	Evidence of human mental field by ac-electric conductivity in electrolyte solutions. 1. Bio-energy.	F
2015	19	7	High resolution mixing calorimetry redivivus.IV. Specific heat of crystalline phase of water. WPA2015: International Congress of World Psychiatric Association,Primary care mental health: innovation and transdisciplinarity, Bucharest, 24-27 June 2015, ROMANIA	F
2016	20	1	Quo vadis population growth on planet Earth: more details	F
2016	20	2	Structural aspects revealed by topoenergetic view on ac electric conductivity in HCl/(water + organic solvent)	F
2016	20	3	Stability of amorphous-crystalline coupling in electrolyte aqueous solutions in relation to interaction with bio-fields	F
2016	20	4	Efficient, simple and cheap outdoor extension of exhausting system using Bernoulli and thermal convection effects applied for air forced boilers on natural gas	F
2016	20	5	Good quality home made soap in high efficient conditions	F
2016	20	6	Interaction of quartz crystals with bio-fields. I. Preliminary experiments on commercial quartz oscillators.	F
2016	20	7	Interaction of quartz crystals with bio-fields. II. Differential measurements on pairs of commercial quartz oscillators.	F

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2016	20	9	HuPoTest – new attempt for self-evaluation and improvement of mental state	F
2017	21	1	Interaction of quartz crystals with bio-fields. IV. Rough estimation of reproducibility	F
2017	21	2	Interaction of quartz crystals with bio-fields. V. Closer look on quantitative estimations	F
2017	21	3	Interaction of quartz crystals with bio-fields. VI. Influence of Moon phases	F
2017	21	4	HuPoTest – 50 years of continuous research and attempts to make it as efficient self-evaluation and improving procedure for mental state HuPoTest – read this first Message to the organizers of the snn2016 Conference (http://snn2016.snn.ro/) and to all whom it may concern HuPoTest – an efficient test and training procedure for mental and health state (Abstract for World Congress of Mental Health, New Dehli, INDIA, November 2-5, 2017) Interaction of unpolarized capacitors with Human Mental Field and Bio-Fields. VII. Dielectrics with high oriented crystalline structure.	F
2017	21	5	Interaction of unpolarized capacitors with Human Mental Field and Bio-Fields. VIII. Dielectrics with high oriented crystalline structure. HuPoTest – data base correlations revealing mental pattern.	F
2017	21	6	Upon some features of global economic structure Eurovision song contest 2017	F
2017	21	7	HuPoTest – proper training and creation of simple database in view to evaluate mental improvement HuPoTest – project for the complete software available for any individual user	F
2017	21	8	Global warming facts Topoenergetic structure of trees ramification	F
2017	21	9	HuPoTest – simple Matlab software for time measurements HuPoTest – preliminary tests on PUT response reaction	F
2018	22	1	Interaction of unpolarized capacitors with Human Mental Field and Bio-Fields. IX. Measurements on 1st June 2017- 9th January 2018.	F
2018	22	2	Interaction of unpolarized capacitors with Human Mental Field and Bio-Fields. X. Further estimations on 1st June 2017- 9th January 2018. HuPoTest – new tests on PUT response reaction HuPoTest – read this first before use it (updated) HuPoTest – an efficient test and training procedure for mental and health state (abstract sent to the International Congress of Royal College of Psychiatrics - 2018)	F
2018	22	3	Estimation of global warming by differential calorimetric procedure. I. Experimental principles, preliminary results and their significances.	F

*) F=free, AFI=ask for invoice.

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ERRATA:

VOL	NO	place	was written	must be
15	2	Figure 5	P+	P-
15	3	page 5, row 7 down-to-up	x=2	x=0.2
22	3	Figures 4-6	Values of dTc and exchanged heat must be divided by 10	

I encourage readers to advice me any observation.

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