

## Template for comments and convener's observations

Date:2019-03-05

Document: Revision of D5 – 2CD

Project: TC 4 / p 2

Country Code <sup>1</sup>	Part	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment <sup>2</sup>	Comments	Proposed change	Convener's responses
0001 JP1		All		Gen	We appreciate the convener for accepting our comments to 1CD. However, we had to propose many minor changes. 2CD still contains many unclear expressions and it is premature to be published. The basic concept of the document is good, but the readers may not understand this draft correctly. We submitted a negative vote because we wished to review 3CD after necessary revisions.	Shown in each clause.	See below mentioned
0002 ISO/REM CO	Entire document			technical	Does Legal Metrology encompass both physical metrology and chemical metrology? Either way, this document must make it clear to which sides it applies.	Add to the introduction and explanation of what is being addressed – chemical metrology, physical metrology or both. If chemical metrology is included, the document must be revised by chemical metrologists and physical metrologists working together.	Not accepted. The definition of the “legal metrology” as well as “metrology” is mentioned in clause 3 of the document. The VIML as well as VIM3 does not refer to the definition physical and chemical metrology. The document is revised by PG members and liaisons.
0003 ISO/REM CO	Entire document			technical	There is a serious misunderstanding of the term “metrological traceability”, at least with regards to the definition of this term in the VIM3 and among metrologists generally. As stated in several of the US comments, measurement results can be metrologically traceable, but instruments, methods, standards, and measurements are not traceable, but are needed to establish traceability.	Revise the entire document, with careful attention to the precise definition of “metrological traceability” and the precise definitions of related terms.	Taking into account. The document was updated regarding precise definition of “metrological traceability.”
0004 FR		1.1		ge	Today, digital revolution reaches plenty of fields, in particular measuring instruments under legal metrology.	Add digitalisation to developments in the sentence: “Metrology is facing multiple developments such as globalisation of economics and international trade, digitalisation,... »	Accepted. The text was modified accordingly.
0005 AU		1.1	1	ed	The sentence discusses the discipline and function of metrology – rather than the concepts of discipline and function themselves. As such, the sentence should begin with the definite article “The”.	The sentence should start with “The discipline and function of metrology...”	Accepted. The text was modified accordingly.
0006 AU		1.2	1	ed	To which measurements is the first sentence referring? If it is the concept of measurement, rather than specific measurements the definite article “the” should be removed. The same is true for the second sentence regarding the concept of metrological traceability.	The first sentence should begin “Measurement is important to conformity assessment, specifically...”  The second sentence should begin “Metrological traceability enters into...”	Partially accepted.  First sentence was modified as follows: “Measurements are important to conformity assessment, specifically ....”

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							Second sentence was modified as follows: "Metrological traceability enters into..."
0007 JP2		1.2, 4.6, 4.7, 5.1.1, 5.2.2, 6, 7 and Annex A (for British)		Ed	British spelling "Realise" and "realisation" are used with American spelling "realize" and "realization".	Use either British or American spelling.	Accepted.  Spelling "realize" and "realization" was used in the entire document.
0008 ISO/REM CO	1	1.2	Para 2	editorial	The language of traceability is incorrect, because it says calibrations and measurements are traceable to the SI units. Only values can be traceable to the SI units.	Change the last sentence to read as follows. The calibration program for equipment shall ensure that all results obtained by the laboratory are metrologically traceable to SI units.	Accepted. The text was modified accordingly.
0009 ISO/REM CO	1	1.2	Para 3	editorial	The language of traceability is incorrect, because it says calibrations and measurements are traceable to the SI units. Only values can be traceable to the SI units.	Change the last phrase of the sentence to read as follows: ' against measurement standards having values traceable to values for international or national measurement standards.'	Accepted. The text was modified accordingly.
0010 ISO/REM CO	1	1.3		editorial	The language of traceability is incorrect, because it says calibrations and measurements are traceable to the SI units. Only values can be traceable to the SI units. It is not necessary to (incorrectly) restate the part about calibrations.	Limit the paragraph to the part about equivalence among national measurement standards. 'Metrological traceability is based in part on demonstrated equivalence among national measurement standards, as stated...'	Accepted. The text was modified accordingly.
0011 UK		1.4, 6.1.9			"uncertainty of measurement" and "measurement uncertainty" is mentioned in parts of the document. The definition given in Note 1 in 6.1.9, is not strictly in accordance with accepted international definition in the OIML V 2-200 Edition 2012.	Insert into the terminology the following definition from the OIML V 2-200 Edition 2012:  <b>2.26 measurement uncertainty</b> uncertainty of measurement uncertainty non-negative parameter characterizing the dispersion of the <b>quantity values</b> being attributed to a <b>measurand</b> , based on the information used NOTE 1 Measurement uncertainty includes components arising from systematic effects, such as components associated with <b>corrections</b> and the assigned quantity values of <b>measurement standards</b> , as well as the <b>definitional uncertainty</b> . Sometimes estimated systematic effects are not corrected for but, instead, associated measurement uncertainty components are incorporated.	Accepted  The terminology "measurement uncertainty" was inserted in the part 3.

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						<p>NOTE 2 The parameter may be, for example, a standard deviation called <b>standard measurement uncertainty</b> (or a specified multiple of it), or the half-width of an interval, having a stated <b>coverage probability</b>.</p> <p>NOTE 3 Measurement uncertainty comprises, in general, many components. Some of these may be evaluated by <b>Type A evaluation of measurement uncertainty</b> from the statistical distribution of the quantity values from series of <b>measurements</b> and can be characterized by standard deviations. The other components, which may be evaluated by <b>Type B evaluation of measurement uncertainty</b>, can also be characterized by standard deviations, evaluated from probability density functions based on experience or other information.</p> <p>NOTE 4 In general, for a given set of information, it is understood that the measurement uncertainty is associated with a stated quantity value attributed to the measurand. A modification of this value results in a modification of the associated uncertainty.</p>	
0012 ISO/REM CO	1	1.4		editorial	Again, there is confusion of measurements with results. Measurements are not traceable; values can be.	Change “measurements necessary” to ‘values necessary’ and changes “possible, to national” to ‘possible, to values for national’.	Accepted. The text was modified accordingly.
0013 JP3		1.5	2 <sup>nd</sup> sentence	Ed	Recommend rephrasing for better understanding.	<p>We recommend the following text.</p> <p><i>While the quality is achievable in a number of ways, the classical scheme <del>that is based on the a</del> direct calibration chain is <del>the most</del> widely used.</i></p>	Accepted  The text was modified accordingly.
0014 AU		1.6	1	ge	<p>The wording of the 3<sup>rd</sup> sentence requires review. If a verification is performed without consideration of the uncertainty of the reference standard (i.e. there is no stated uncertainty for the reference standard or no assessment of whether it is acceptable for the intended purpose), then we would agree that the verification is not traceable, and the use of the verified instrument does not provide traceable measurements. However, if the uncertainty of the reference standard that was used to perform the verification is considered (i.e. as above), then the verification should be</p>	Suggest amending the 3 <sup>rd</sup> sentence to “Where verification is performed without consideration of the uncertainty of the reference standard used for the verification, then such a verification is not considered to preserve or assure traceability.”	Accepted. The text was modified as follows (see also comment to 1.6 from JP): “Where verification is performed without consideration of measurement uncertainty assessment, then such a verification may not be considered to preserve or assure traceability.”

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					considered traceable. If the uncertainty of the verified instrument is not considered when it is used to make subsequent measurements, then it could be argued whether or not these measurements are traceable. However, it could be argued that the establishment, use and ongoing compliance with MPEs for verified instruments does reflect a consideration of the uncertainty of the verified instrument. Regardless, in this case the verified instrument could not be used as a reference standard to further propagate traceability.		
0015 JP4		1.6	2 <sup>nd</sup> sentence	Ge/Te	We appreciate because this clause has been revised following our comment to 1CD. However, we found recently that an international agreement has not been achieved regarding how to treat a verification with MPE in the process to establish a metrological traceability. The agreement among the related international organizations, "Joint BIPM, OIML, ILAC and ISO declaration on metrological traceability (2018)" does not mention the treatment of verification. Taking account of such a situation, we consider that each country should decide on this issue.	We recommend the following text.  <i>Such a verification <del>is</del> <u>may not be</u> considered to assure a traceability.</i>	Accepted. The text was modified accordingly.
0016 ISO/REM CO	1	1.6		editorial	This section is written poorly. Part of the problem is grammar. Part of the problem is the concept of uncertainty of the instrument. It is thought the actual concern of the authors is the use of incomplete uncertainty budgets that do not take into account all critical components of uncertainty. If this is the case, then the concern is not special to legal metrology. It is of concern in all metrology. OIML Guide 19 can still be referenced.	Revise the section to explain the concern that uncertainty assessment must be complete for assurance of traceability of values.	Accepted. The text was modified accordingly.
0017 JP5		2.1	1 <sup>st</sup> and 2 <sup>nd</sup> sentence	Ed	The sentences are redundant. Recommend rephrasing for better understanding.	We recommend the following text.  <i><del>This document deals with the principles and methods for-of metrological traceability-and describes methods to-achieve metrological traceability.</del> It proposes general rules for the establishment of hierarchy schemes for measuring instruments <del>as a</del> including specification of <u>calibration</u> chains <del>of calibration for measuring instruments (including means and methods</del></i>	Accepted. The text was modified accordingly.

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						<i>for the dissemination of units), which. The schemes then serve as <u>an</u> evidence of <del>their</del> <u>the</u> metrological traceability.</i>	
0018 ISO/REM CO	Term inolo gy	3	3	te	The terminology section lacks the definition of certified reference material, CRM (see VIM, 5.14)	The CRM definition should be written in the text after the RM definition (3.15).	Accepted. The CRM definition was added.
0019 ISO/REM CO	Term inolo gy	3	3.22	te	The terms “ National Standard Laboratory, Designated Laboratory” to remove from parentheses.	In the parentheses it should be use the term “Designated Institute” according the documents of CIPM.	Accepted.
0020 ISO/REM CO/	Term inolo gy	3	3.22	ge	After entering the term Designated Institute (DI) makes a NOTE 2 about the role of the DI, below the NOTE about the role of NMI.	NOTE 2 should contain links to documents CIPM 2005-07 NMI and other Designated Institutes. 27 <sup>th</sup> July 2005 and CIPM 2005-06 (V4): “The CIPM MRA: 2005 Interpretation Document”. August 2018	Accepted. NOTE 2 was added.
0021 ISO/REM CO/	Term inolo gy	3	3.24	ed	After ISO/IEC 17025:2017 lacks of literature reference number.	It should be insert the literature reference number [1] after ISO/IEC 17025:2017	Accepted
0022 JP7		3.9 verification	New item	Te	The definition of "verification" in VIM is a general expression for conformity assessment. VIML (OIML V 1) provides more practical definition in legal metrology. We recommend adding this definition. If necessary, both definitions may be given.	Add the definition in 2.09 of OIML V 1 (2013) shown below.  <b><i>verification of a measuring instrument</i></b>  <i>conformity assessment procedure (other than type evaluation) which results in the affixing of a verification mark and/or issuing of a verification certificate</i>	Accepted. The definition of verification of a measuring instrument from 2.09 of VIML was added and definition of verification according to VIM 2.44 was deleted.
0023 DE		3.9	NOTE 1	te	Use of the term “measuring system” is misleading. “Measuring system” should be defined separately.	Please add definition for “measuring system” from VIM No. 3.2:  „measuring system set of one or more measuring instruments and often other devices, including any reagent and supply, assembled and adapted to give information used to generate measured quantity values within specified intervals for quantities of specified kinds NOTE A measuring system may consist of only one measuring instrument.“	Accepted. The definition of “measuring system” was added.
0024 AU		3.21	1	ed	Definitions should be sentence fragments, not complete sentences. It is suggested that the second	The second sentence of the definition should be separately provided as a NOTE.	Accepted. The second sentence of the

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					sentence of the definition be separately provided as a NOTE.		definition was provided as a NOTE.
0025 JP8		3.21 means of units dissemination	All	Te/Ed	The term "means of units dissemination" is not used in this draft. Instead, another term "dissemination of units" is used frequently. It is better to define this term.	We recommend the following text.  <del>3.21 means of units dissemination</del> <u>dissemination of units</u>  <del>technical devices, reference materials or material measures, which are necessary to carry out calibration by comparing the measurement standards and the measuring instruments to be calibrated. These means influence uncertainties of dissemination of units.</del>	Partially accepted.  The term was renamed as "means of dissemination of units"  The term “means of dissemination of units” is defined because it is used in the definitions for “national hierarchy scheme” and “local hierarchy scheme”.
0072 JP6		3 Terminology	New item	Te	We propose adding a definition of "type approval" because it is an important role of legal metrology.	Add the definition in 2.05 of OIML V 1 (2013) shown below.  <b><i>type approval</i></b>  <i>decision of legal relevance, based on the review of the type evaluation report, that the type of a measuring instrument complies with the relevant statutory requirements and results in the issuance of the type approval certificate</i>	Accepted
Convenor SK (1)		3 Terminology	New item	Te	We propose adding a definition of "national measurement standard "	Add the definition  3.14 national measurement standard national standard (VIM, 5.3) measurement standard recognized by national authority to serve in a state or economy as the basis for assigning quantity values to other measurement standards for the kind of quantity concerned	Added
Convenor SK (2)		3 Terminology	New item	Te	We propose adding a definition of " primary measurement standard "	Add the definition  3.15 primary measurement standard primary standard (VIM, 5.4) measurement standard established using a primary reference measurement procedure, or created as an artifact, chosen by convention  For examples see (VIM, 5.4)	Added
0073 JP9		4 Metrological	All	Ed	Add an informative title to each subclause at the second level as they are given to the subclauses under	We propose the titles shown below.	Accepted as follows: 4.1 Objectives of metrological

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		traceability and its elements			Chapters 5, 6 and 7.	4.1 Objectives of metrological traceability 4.2 Application in legal metrology 4.3 Other legal applications 4.4 Calibration for traceability 4.5 Maximum permissible error 4.6 Elements of metrological traceability 4.7 Reference materials	traceability 4.2 Application in legal metrology 4.3 Other legal applications 4.4 Metrological traceability (replaced "Calibration for traceability") 4.5 Maximum permissible error 4.6 Elements of metrological traceability 4.7 Reference materials
0026 ISO/REM CO/	4	4.1		editorial	The phrase 'in order to' is meaningless.	Delete the words in order	Accepted
0027 AU		4.2	1	ge	The wording of the second sentence requires review. While the use of MPEs alone does not assure traceability of a verification, MPEs do play a role in assuring that the performance and calibration of the instrument being verified is acceptable for its intended use. Furthermore, the value of an MPE should be defined, at least in part, with consideration of the uncertainty achievable as part of the verification process (as per clauses 4.5 and 6.1.9).	Suggest amending the second sentence to "Compliance with prescribed maximum permissible error <b>alone</b> should not <b>necessarily</b> be considered to assure traceability."	Accepted  The second sentence was amended and was moved to section 4.5 (see below mentioned comments from JP10 and JP 12) as follows: <i>"However, compliance with prescribed maximum permissible error alone should not necessarily be considered to assure traceability"</i>  The term "maximum permissible measurement error" was added in the chapter 3 "Terminology"
0028 JP10		4.2	2 <sup>nd</sup> sentence	Te/Ed	It is better to move the second sentence to 4.5 with some amendments because this is a statement regarding MPE (see JP12).	Move "Compliance with prescribed maximum permissible error should not be considered to assure the traceability" to 4.5.	Accepted  Second sentence was moved to 4.5 (see also 0015 AU for modification of the sentence)
0029 JP11		4.3	All	Ed	Recommend rephrasing for better understanding.	We recommend the following text.  4.3 For the application of any laws and regulations prescribing requirements on measurements, <del>on</del>	Accepted with small modifications, proposed by BIML after language

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						<p><del>prepackages and on the measuring instruments and prepackages, the metrological traceability to SI units is required and may be obtained through the national system of measurement standards and certified reference materials provided either in one's own country or in another recognized country.</del></p> <p><del>a) either through the system of national measurement standards and certified reference materials, or</del></p> <p><del>b) through traceability to recognised national measurement standards or certified reference materials of other countries.</del></p>	<p>correction.</p> <p>The text was modified as follows:  “4.3.1 For the application of any laws and regulations prescribing requirements on measurements, on prepackages and on measuring instruments, metrological traceability to SI units is required and may be obtained through the system of national measurement standards and certified reference materials provided either by local sources or by any other internationally recognised sources.”</p>
0030 DE		4.4 / 4.6		ed	Parts 4.4 and 4.6 are both giving a definition or characteristics of metrological traceability and should be combined into one part.	Include 4.6 in 4.4	Accepted
Convenor SK (3)		4.4.1	a)	Ed	On the basic of language correction by BIML and recommendation, we suggest to delete the item a) because the meaning of the text is the same as in the item e).	Delete the item a)	Deleted
0031 JP12		4.5	All	Te/Ed	Recommend rephrasing for better understanding. Also, move the second sentence of 4.2 to this clause with some amendments (see JP10). In this sentence, replace "should" with "may" following our comment to 1.6 regarding traceability (see JP4).	<p>We recommend the following text.</p> <p><i>4.5 For practical reasons, especially in <u>verifications and routine calibrations</u> in legal metrology, <u>a maximum permissible error (MPE)</u> is specified instead of <u>a measurement uncertainty</u>. In such cases, the MPE should be defined in consideration of <u>the measurement uncertainty</u>. <u>However, compliance with the prescribed MPE may not be considered to assure the traceability.</u></i></p>	<p>Accepted with small modification (see also 0015 AU).</p> <p>The clause 4.5 was amended as follows:</p> <p><i>4.5 For practical reasons, especially in verifications in the legal metrology or in case of repeated standard or routine calibrations, a maximum permissible error (MPE) of measurement standard (or measuring</i></p>

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							<i>instrument) indications is specified instead of the measurement uncertainty. In such a case, the MPE should be defined in consideration of the measurement uncertainty. However, compliance with prescribed maximum permissible error alone should not necessarily be considered to assure traceability.</i>
0032 ISO/REM CO/	4	4.6		technical	The list of essential elements appears to relate specifically to the field of legal metrology, because within metrology generally, elements c-h are not strictly part of establishing metrological traceability.	Change the first sentence to read: “The following essential elements are important to metrological traceability within the context of legal metrology:”	Accepted
0033 ISO/REM CO/		4.6	d)	te	Insert “and shall be accredited” at the end of the paragraph.	d) Competence, the laboratories performing one or more steps in the chain shall supply evidence for their technical competence (equipment, skills of personnel , environmental conditions etc.) and shall be accredited.	Accepted
0034 JP13		4.7	Notes 1 and 2	Te/Ed	These notes mention documentation and they are not related to the main text regarding the roles of reference materials.	These notes should be separated as a new clause "4.8 Documentation".	Accepted  New clause was established (but it was placed before the clause related to the roles of reference materials, to keep the flow of information).  See also others comments to the clause 4.7.
0035 ISO/REM CO/	4	4.7		editorial	Again, the language is not adhering to the definition of traceability. Values are traceable, not artifacts.	In the second sentence, it should read ‘...important that values assigned for such reference materials...’	Accepted
0036 ISO/REM CO/	Metr ologi cal trace abilit y and its elem	4	4.7	te	At the end of the text lacks of information about such important documents in this field of metrology as ISO 17034:2016 (E) General requirements for the competence of reference materials producers and ISO Guide 35:2017 (E) Reference materials – Guidance for characterization and assessment of homogeneity and stability.	These two literature references should be included in this section.	Accepted. New Note was added as follows:  „Note 1: Additional information on the reference materials can be found in ISO 17034:2016 or ISO Guide

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	ents						35:2017“  See also others comments to the clause 4.7.
0037 ISO/REM CO/		4.7	Note	te	Add the following note as note 1: Reference materials produced by accredited RMPs (Reference materials producers) as per ISO 17034 are also considered as traceable to national or international standards.	Note 1: Reference materials produced by accredited RMPs (Reference materials producers) as per ISO 17034 are also considered as traceable to national or international standards.	Accepted New Note was added as follows (to keep the flow of information, it was added as Note 2):  “Note 2: Reference materials produced by accredited RMPs (Reference materials producers) as per ISO 17034 are also considered as traceable to national or international standards.”  See also others comments to the clause 4.7.
0038 ISO/REM CO/		5.1.1	Para 1, Line 4	ge	In line 4: Replace “Intercomparisons on the highest level” with “Key Comparisons(Intercomparisons on the highest level)”	Change the line as:  The Bureau International des Poids et mesures (BIPM) is charged with coordinating the development and maintenance of primary standards and organises key comparisons(intercomparisons on the highest level)	Accepted
0039 JP14		5.2.1	2 <sup>nd</sup> sentence	Ed	The second sentence may be rephrased.	We recommend the following text.  <i>The National Metrology Institute (NMI) represents the country internationally in relation to <del>the National Metrology Institutes of other countries in relation to the other NMIs, Regional Metrology Organisations and to the BIPM.</del></i>	Accepted.  The text was modified as follows:  “The National Metrology Institute (NMI) represents the country internationally in relation to the National Metrology Institutes of other countries, the Regional Metrology Organisations and the BIPM.”  See also others comments to the clause 5.2.1.

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0040 ISO/REM CO/		5.2.1	Para 1, Line 3 and Line 4	ed	In the 3 <sup>rd</sup> and 4 <sup>th</sup> line remove the words as indicated below:  The National Metrology Institute represents the country internationally in relation to the National Metrology Institutes of other countries, <del>in relation to</del> the Regional Metrology Organisations and <del>to</del> the BIPM.	Change the 3 <sup>rd</sup> and 4 <sup>th</sup> lines as: “the National Metrology Institutes of other countries, the Regional Metrology Organisations and the BIPM.”	Accepted  The text was modified as follows:  “ <i>The National Metrology Institute (NMI) represents the country internationally in relation to the National Metrology Institutes of other countries, the Regional Metrology Organisations and the BIPM.</i> ”  See also others comments to the clause 5.2.1.
0041 ISO/REM CO/	5	5.2	5.2.1	ge	At the end of the sentence about “more distributed” national metrological system lacks information about designated institutes.	Information about DI should be written in the parentheses at the end of the last sentence (e.g. including one or more Designated Institute).	Accepted  The text was modified as follows:  “ <i>more distributed national metrological system (e.g. including one or more Designated Institute).</i> ”
0042 JP15		5.2.2	2 <sup>nd</sup> and 3 <sup>rd</sup> sentences	Te/Ed	Our understanding is that the second sentence means a traceability to the international prototype of kilogram in BIPM. However, it becomes inapplicable officially after the redefinition in 2018. Now any NMI can maintain the primary standards (including kilogram) following the physical definitions of the units. Therefore, the 2 <sup>nd</sup> sentence should be deleted. In addition, the 3 <sup>rd</sup> sentence should be rephrased.	We recommend the following text after deleting the 2 <sup>nd</sup> sentence.  <del><i>In some cases, the metrological traceability is to the measurement standards maintained by BIPM. If the National Metrology Institute has facilities and skills to realise the corresponding SI base units and derived units of (the term SI unit includes all derived units), the national measurement standards may be identical to equivalent with the primary standards realising the units.</i></del>	Accepted
0043 ISO/REM CO/		5.2.2	1, Line 9	ed	Replace the word “signature” with “signatory”	Change line 9 as;  “standards realized at an national Metrology Institute which is a signatory to the Mutual”	Accepted
0044		5.2.2,	Para 1	ed	Cl. 5.2.2	Cl. 5.2.2 :	Accepted

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Country Code <sup>1</sup>	Part	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment <sup>2</sup>	Comments	Proposed change	Convener's responses
ISO/REM CO/		5.4.1			<p>Add the following another para at the end of para 1:</p> <p>“The metrological traceability to the standards maintained by NMIs may be checked by the reference to calibration and measurement capabilities of NMIs as held on the BIPM’s key comparison database published on the BIPM web site(<a href="http://www.bipm.org">www.bipm.org</a>)”</p> <p>Cl. 5.4.1</p> <p>Delete the following line of para 1:</p> <p>“The metrological traceability to the standards maintained by NMIs may be checked by the reference to calibration and measurement capabilities of NMIs as held on the BIPM’s key comparison database published on the BIPM web site(<a href="http://www.bipm.org">www.bipm.org</a>)”</p>	<p>Add the following para 2 at the end of para 1 as:</p> <p>The metrological traceability to the standards maintained by NMIs may be checked by the reference to calibration and measurement capabilities of NMIs as held on the BIPM’s key comparison database published on the BIPM web site(<a href="http://www.bipm.org">www.bipm.org</a>)</p> <p>Cl. 5.4.1</p> <p>Delete the following line of para 1:</p> <p>“The metrological traceability to the standards maintained by NMIs may be checked by the reference to calibration and measurement capabilities of NMIs as held on the BIPM’s key comparison database published on the BIPM web site(<a href="http://www.bipm.org">www.bipm.org</a>)”</p>	
0045 FR		5.3.1		ge	To be consistent with § 5.2.2 related to the CIPM MRA, § 5.3.1 should mention the ILAC MRA and regional MLAs	<p>Add the following note coming from ILAC P10 « Policy on the Metrological Traceability of Measurement Results » :</p> <p>“Note : Some calibration laboratories indicate that their service is covered by the ILAC Arrangement by including the ILAC Laboratory Combined MRA mark on the calibration certificate. Alternatively, the accreditation symbol of the accreditation body that is a signatory to the ILAC Arrangement and/or a recognised regional MLA may be included on the calibration certificate. Both of these options may be taken as evidence of traceability.”</p>	Accepted
0046 FR		5.3.1		ge	The notion of <u>critical</u> equipment does not exist in the ISO/IEC 17025:2017. An explanation of this wording, based on the § 6.4.5 & 6.4.6 of this new standard, seems necessary.	<p>Add a note to explain the idea of critical equipment: “Note : a critical equipment is an equipment achieving measurement which affects the validity of the reported results. Equipments used for a direct measurement of the mesurand, such as a standard weights for a weighing instrument, are always critical equipments. Equipments used to correct the measured quantity values or to obtain a measurement result calculated from several quantities can be critical equipments.”</p>	<p>Partially accepted.</p> <p>The text of clause 5.3.1 was rewording on the basis of comment JP 16 as follows:</p> <p><i>“5.3.1 Calibration laboratories accredited by national accreditation bodies according to internationally established criteria (e.g.</i></p>

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							ISO/IEC 17025:2017 [1]) shall be able to demonstrate that calibration of the measuring instruments and measurement results, are traceable to SI units.”
0047 JP16		5.3.1	1 <sup>st</sup> sentence	Ed	This sentence is too long. Because a calibration laboratory usually belongs to a company or a public organization, the expression "in industry and other organisations" is not necessary. In addition, "(As far as ...)" is not necessary too.	We recommend the following text.  <i>5.3.1 Calibration laboratories <del>in industry and other organisations</del> accredited by national accreditation bodies according to internationally established criteria (e.g. <del>in accordance with</del> ISO/IEC 17025:2017 [1]) shall be able to demonstrate that calibration of <del>critical equipment</del> the measuring instruments and hence their measurement results, <del>relevant to their scope of accreditation</del> are traceable to SI units <del>(as far as technically possible or as far as applicable)</del>.</i>	Accepted
0048 JP17		5.4.1	1 <sup>st</sup> sentence	Te/Ed	Expression of this sentence might be strict for some legal metrology laboratories. The working standard for verification is sometimes believed to have a "true value" without uncertainty. Also, verification is a conformity assessment and it is different from measurement and calibration.	We recommend the following text.  <i>Legal metrology laboratories <del>shall</del> <u>should</u> be able to demonstrate that <del>calibration of the</del> measurement standards, <u>and measuring instruments used for verification devices and their measurement results</u> are traceable to SI units within their scope of authorization according to the national legislation.</i>	Accepted
0049 ISO/REM CO/	5	5.4	5.4.1	ed	After words: „BIPM’s key comparison database” lacks of the acronym KCDB.	The acronym KCDB should be insert in the text because it helps users to find this database on the BIPM web site.	Accepted
0050 JP18		5.6 and 5.6.1		Ed	The text of 5.6.1 should be rephrased for clarification. The clause number "5.6.1" is not necessary.	We recommend the following text.  <b>5.6 Hierarchy of measurement standards</b>  <i><del>5.6.1 The hierarchy of measurement standards and a resulting metrological organisations structure, which ensures that all results of the tests and measurements are traceable to the national measurement standards, for tracing measurement and test results within a laboratory or a company to national measurement standards in general</del> is shown in Fig. 2.</i>	Partially accepted.  The clause number was not deleted to keep the same structure in the entire document.  The text in clause 5.6 was updated as follows:  <i>5.6.1 The hierarchy of measurement standards and metrological organisations, which ensures that all results of the tests and measurements</i>

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							<i>are traceable to the national measurement standards, is shown in Fig. 2.</i>
0051 ISO/REM CO/		5.6.1	Fig. 2	te	<p>Replace contents of row 2, column 5 by “ CIPM MRA for national measurement standard”</p> <p>Replace contents of row 3, column 5 by” calibration certificate for reference standard”</p> <p>Replace contents of row 4 , column 5 by “ calibration certificate for working standard”</p> <p>Delete the existing text of row 5, column 5 and replace by “calibration or type approval or verification certificate, Type approval or verification or calibration mark”</p>	<p>row 2, column 5 : “ CIPM MRA for national measurement standard”</p> <p>row 3, column 5 :“ calibration certificate for reference standard”</p> <p>row 4 , column 5 : “ calibration certificate for working standard”</p> <p>row 5, column 5 : “calibration or type approval or verification certificate, Type approval or verification or calibration mark”</p>	Not accepted. The last column in Fig. 2 is intended for output documents concerning legal control, calibration and measurements and that are realized by the relevant measurement standard. The table was modified for better understanding of this intention.
Convenor SK (4)		5.6.1	Fig.2	Ed	Replace contents of row 4, column 3 by” Legal control or calibration of ordinary measuring instruments”	row 4, column 3: ” Legal control or calibration of ordinary measuring instruments”	Replaced
0052 AU		6	1	ed	The clause should begin with an “A”.	The clause should begin with an “A”.	Accepted
Convenor SK (5)		6.1.4	Note 1	Ed	Replace “Note 1” by “Note”	Replace “Note 1” by “Note”	Replaced
0053 JP19		6.1.7	a) to d)	Ed	Parenthesis in the items a) - d) should be replaced with colons because the contents in the parenthesis is too long. It is better to separate the item a) into two cases; a-1) calibration of an indicating instrument and a-2) calibration of a measure. In addition, a word "standard" is added to indicate the upper level in a hierarchy scheme.	<p>We recommend the following text.</p> <p><i>a-1) direct measurements</i><del>;</del><i> used in verification or calibration of an indicating measuring instrument against a <u>standard</u> measure of a measure against a <u>indicating measuring instrument</u>;</i></p> <p><i>a-2) direct measurements: used in verification or calibration of a measure against a standard indicating measuring instrument;</i></p> <p><i>b) direct comparison or comparison using a measure (standard <del>of</del> comparison)</i><del>;</del><i> used in verification or calibration of a measuring instrument against a <u>standard</u> measuring instrument;</i></p> <p><i>c) comparison with the help of a comparator</i><del>;</del><i> used in verification or calibration of a measure against a <u>standard</u> measure;</i></p>	<p>Partially accepted. The text was modified as follows:</p> <p>a) <i>direct measurements:</i></p> <ul style="list-style-type: none"> <li>— <i>used in verification or calibration of an indicating measuring instrument against a standard measure; or</i></li> <li>— <i>used in verification or calibration of a measure against a standard indicating measuring instrument;</i></li> </ul> <p>b) <i>direct comparison or comparison using a measure (standard comparison):</i></p> <ul style="list-style-type: none"> <li>— <i>used in verification or calibration of a measuring instrument against a standard measuring instrument;</i></li> </ul> <p>etc.</p>

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						<i>d) indirect measurements <del>to</del> used in calibration or verification of a <u>measure</u> <del>measurement standards or a measuring instruments using other measurement standards calibrated in terms of other physical quantities connected</del> <u>related functionally with a the measurand</u>.</i>	
0054 JP20		6.1.9	All	Ed	A ratio between the measurement uncertainty in verification and MPE is frequently used in legal metrology, and it is defined as TUR (test uncertainty ratio) or $f_{EI}$ ( $=1/TUR$ ) in OIML G 19. Considering the descriptions in G 19, we recommend rephrasing the clause.	We recommend the following text.  <i>6.1.9 In verification of measuring instruments to determine the compliance with the specified requirements, the recommended ratio of <u>the total uncertainty of the measurements standard to that of the measuring instrument</u> the MPE is 1:3 or better (i.e., e.g., 1:10).</i>  <i>Note 1: Uncertainty of <u>the measurement standard or measuring instrument</u> means the <u>total</u> uncertainty of <u>all associated</u> measurements carried out <u>in the verification</u> by means of <u>this measurement standards and/or measuring instruments</u>.</i>	Accepted
0055 JP21		6.2.2	All	Ed	We recommend rephrasing the text for better understanding.	We propose the following text.  <i>6.2.2 The graphic part provides a visual preview on metrological traceability <del>of with</del> measuring instruments and <u>it includes only basic information on some, from the metrological traceability view,</u> important characteristics. If the graphic part is <del>wide</del> <u>too large</u> and complicated, it is possible to divide it into sections, while the commentary remains common.</i>	Accepted
0056 ISO/REM CO/		6.2.2	Para.1, line 2	ed	Add the “point of” after “traceability”	Change Line 2 as: “instruments and only basic information on some, from the metrological traceability point of view”	The clause 6.2.2 was rewritten according to recommendation JP21. The text “from the metrological traceability view” was removed.
0057 JP22		6.2.3	All	Ed	This clause should explain briefly what is "commentary" as an introduction to the detailed explanation in 7.4. We understand the commentary is a document supporting the graphic part.	We recommend the following text.  <i>6.2.3 <u>Commentary is a document explaining the-of-a hierarchy scheme for traceability. The commentary contains all items of necessary information of explanations, hierarchy levels, metrological traceability, and methods for placing measuring instruments, i.e., explanations, recommendations and</u></i>	Partially accepted.  The first sentence from the recommendation was not included as a commentary does not need to be explicitly “document”.

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						<i>any comments concerning the traceability. See 7.4 for the details of its contents.</i>	Next recommendations was accepted.
0058 AU		6.2.5	1	ed	The clause should begin with “The”.	The clause should begin with “The”.	Accepted
0059 JP23		6.2.5 and 6.2.6	All	Ed	These clauses should be merged because both mention the working standards used in the field. The long statement in the parenthesis in 6.2.5 should be given as a note.	<p>We recommend the following text.</p> <p><i>6.2.5 Field of working standards can be divided into a number of levels according to accuracy (levels of working standards may be indicated by Arabic numbers where 1st level mark belongs to the measurement standards of highest level in the hierarchy).</i></p> <p><i>6.2.6 Measuring instruments in the field of measuring instruments are can be divided into a number of levels according to not only their kinds but also their accuracies and measurement ranges.</i></p> <p><i>Note: Levels of working standards may be indicated by Arabic numbers where 1st level mark belongs to the measurement standards of highest level in the hierarchy.</i></p>	<p>Not accepted for merging.</p> <p>Both clauses 6.2.5 and 6.2.6 do not mention the working standards used in the field. The clause 6.2.5 is related to working standards, whereas 6.2.6 is related to measuring instruments. This separation is connected to clause 6.2.4.</p> <p>Accepted to create the note in 6.2.5 from the long statement in the parenthesis in 6.2.5.</p> <p>Accepted to update the text in 6.2.6 as ...”can be divided into a number of levels according to not only their kinds but also their accuracies and measurement ranges.”</p>
0060 ISO/REM CO/		6.2.6	Para. 1, line 1	ge	Replace “measuring Instruments in the field of measuring instruments” by “ordinary instruments used as standards in shop floor measurement”	<p>Change para as:</p> <p>“Ordinary instruments used as standards in shop floor measurement are divided according to not only their kinds but also their accuracy and measurement ranges.”</p>	<p>Not accepted</p> <p>The field of measuring instruments is connected with division in 6.2.4.</p> <p>The text in para was updated as follows: “Measuring instruments used as standards in the field of measuring instrument ...”</p> <p>For modification of the text, see also comments to the 6.2.6 from JP23.</p>
0061		7.1.1	1	ge	The contents of a national hierarchy scheme could also	Suggesting include a dot point regarding calibration	Not accepted.

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AU					contain information, requirements or recommendations regarding the intervals between the calibration of standards.	intervals.	The recalibration interval requirement is already included in 7.4.2 as a part of commentary to the hierarchy scheme.
0062 KZ		7.2		ge	Procedures for uncertainty calculations are provided in the calibration procedures. Links to the calibration procedures are prescribed by clause e)	It is necessary to Delete clause f) of the paragraph 7.2.1	Not accepted It was already updated during preparation of 2CD, as a comment to 1CD.  On the present, clause f) in 7.2.1 relates to prescription of recalibration intervals of measuring standards (not to uncertainty calculations) <i>“f) intervals between calibrations of measurement standards;”</i>
0063 KZ		7.2		te	The concepts of reference and working standards cannot be clearly divided, as the same standard can be used both for calibration of working standards (i.e. as a reference standard) and ordinary instruments (i.e. as a working standards)	It is necessary to delete the row for reference standards from Figure 2 and Annex A.	Not accepted to delete the row for reference standards from Figure 2 and Annex A. The using of reference and working standards follows the actual trends in this area and is based on definitions of reference and working standards according to VIM.  Accepted for concept that reference standard may be used also as a working standard in the case of direct calibration or legal control of ordinary measuring instruments. The following Note was added in 7.2.2. <i>“Note: In the case that reference standards are directly used for legal control or calibration of ordinary measuring instruments then</i>

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							they act also as working standards.”
0064 AU		7.3		ge	The contents of 7.3 reads as highly prescriptive, definitive requirements for the development of a graphical representation. It is suggested that the clause is introduced with a statement indicating that the directions and descriptions provided are intended as guidance.	Reword the clause as guidance, rather than prescriptive requirements.	Accepted Clauses 7.3.1 to 7.3.6 were reworded as a guidance. The words “usually”, “should be”, “may” were used.
0065 JP24		7.3	All	Ed	It is difficult to understand the recommended graphical expressions only from the text.	Please indicate a corresponding part of the graphical examples in Annexes A, B and C to illustrate each subclause as shown by the example below.  <i>7.3.1 Name of hierarchy ..... field of working standards (See Level 1 of Annex A).</i>	Not accepted.  The examples of hierarchy schemes that follow the recommended graphical expressions are shown in Annex A, Annex B and Annex C.  Suggestion would cause labyrinthine reading of the text with the risk of misunderstandings as not all descriptions are simply referred (some references would require complicated explanation to avoid misunderstandings).
0066 AU		7.3.1	1	ed	The clause should begin with “The”.	The clause should begin with “The”.	Accepted
0067 ISO/REM CO/		7.3.1	Para 1, Line 2	ed	Replace “reference and working standards” by “reference & working standard”	Change line 2 as: “reference & working standards and measuring instruments are separated in the graphic part”	Not accepted. The sing „&” is not commonly used in OIML documents.
0068 JP25		7.3.4	Items a) and b)	Ed	Items a) and b) look similar and the difference between them is not clear.	(No practical suggestions.)	Items a) and b) are not similar as result if the text.  Examples were added in items a) and b) “....(e.g. item 8 of Annex C)” and “....(e.g. item 6 of Annex C)”, respectively.
0069 JP26		7.3.5	All	Ed	It is difficult understand practically. What "characteristics", "absolute or relative" and "similar" mean?	(No practical suggestions.)	This clause prescribes for individual hierarchy scheme to use the same expressions (or similar) for all fields (levels) in

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							the hierarchy scheme. For example, if metrological characteristic of reference standard is expressed in relative value, the relative values should be used for all other standards in fields (levels) in the hierarchy scheme, if possible. It means, for example, do not use the relative value for reference standard and absolute value for working standards concerning the same metrological characteristic.
0070 JP27		7.3.6	Note 1	Te/Ed	The explanation of Annexes should be placed in the beginning of 7.3 not in 7.3.6. In addition, please indicate a corresponding graphic example to each applicable clause (see JP24 to 7.3).	(See JP24 to 7.3.)	Partially accepted.  Accepted that the explanation of Annexes should not be mentioned in 7.3.6.  To keep the fluent framework of clause 7.3, new point 7.3.7 was established from the note 1 of 7.3.6. (it is more suitable to refer to Annexes at the end of the clause 7.3 than at the beginning).  Concerning indication a corresponding graphic example to each applicable clause see response in JP24 to 7.3.
Convenor SK (6)		7.4.1	All	Ed	We recommend rephrasing the text for better understanding.	We propose the following text.  <i>7.4.1 Commentary to the hierarchy scheme should contain all the data concerning metrological traceability <del>measuring instruments metrological traceability</del>, including information, requirements and notes, which are not included in the graphic part of scheme for any other reason and cannot be ignored</i>	Replaced

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						<i>from the metrological traceability <u>point of</u> view.</i>	
Convenor SK (7)		7.4.3	Note 1	Ed	Replace “Note 1” by “Note”	Replace “Note 1” by “Note”	Replaced
0071 ISO/REM CO/	Refer ences	8	8	te	Complete the list of references about 4 more publications related to DI and RM.	It should be following publications: [14] CIPM 2005-07 NMI and other Designated Institutes. 27 <sup>th</sup> July 2005 [15] CIPM 2005-06 (V4): “The CIPM MRA: 2005 Interpretation Document”. August 2018 [16] ISO 17034:2016 (E) General requirements for the competence of reference materials producers [17] ISO Guide 35:2017 (E) Reference materials – Guidance for characterization and assessment of homogeneity and stability.	Accepted
0075 JP28		Annexes A and B	Titles	Te/ed	The format of Annex A is different from that of Annex B. Note 1 of 7.3.6 mentions that the former is a simple one for the national scheme and the latter is a detailed one for a local scheme. We understand that these annexes are merely examples and we can use either Annex A or Annex B regardless the level (national or local). We propose amendments of the titles based on this understanding.	We recommend revising the titles of the annexes (figures) as shown below.  <i>Annex A</i> <i><u>Example of a simplified national hierarchy scheme</u></i> <i>(Informative)</i>  <i>Annex B</i> <i><u>Example of a detailed local hierarchy scheme for measuring instruments</u></i> <i>(Informative)</i>	Accepted
0074 JP29		Annex C	Title	Ed	Change "unit" in the title to the plural form following our proposal to the terminology (3.21).	Change "unit" to "units" in the title.	Accepted
Convenor SK (8)		all			The 3 CD was reviewed by BIML for language correction. All changes marked in 3 CD that are not mentioned above follow the language corrections recommended by BIML.		Language corrections

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