

**Proficiency test through interlaboratory comparison –
Current induced in the 9 kHz to 30 MHz frequency range in a
Large Loop Antenna System (LLAS) –
Scheme of the proficiency test PTC(LLAS-9k-30M)**

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Rev. 0 – April 14, 2025

Rev. 1 – November 10, 2025: corrected a typo in Table 1 and in the tables in Annex C and Annex D (numbering of harmonics in Band 1).

1. Scope

1.a) This document describes the participation scheme to a proficiency test performed through an interlaboratory comparison of currents induced in a Large Loop Antenna System (LLAS) by a source of magnetic field disturbance. The scheme includes:

- The description of the interlaboratory comparison;
- The selection criteria of the participants and the terms of admission to the proficiency test;
- The description of the technique adopted for the statistical analysis of the results of the interlaboratory comparison;
- The instructions to the participating laboratory (briefly, Laboratory) on how to perform measurements;
- The description of the method by which the results of the proficiency test are registered by the Laboratory and by the Coordinator of the proficiency test;
- The test reports forms to be filled by the Laboratory and by the Coordinator;
- The registration forms (for selecting the week for measurements and the purchase order regulating the agreements between the Laboratory and the Coordinator).

1.b) The last revision of the present document can be downloaded from the following URL:

<https://www.dinfo.unifi.it/vp-436-schemes-of-the-proficiency-tests.html>

2. Coordinator

2.a) The Coordinator of the proficiency test is Carlo Carobbi, from Università degli Studi di Firenze. The Coordinator relies on the technical and scientific support from:

- Alessio Bonci, ITT G. Ferraris (San Giovanni Valdarno, Firenze, ITALY);

2.b) The contact details of the Coordinator are reported below:

Carlo Carobbi

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3. Type of interlaboratory comparison

3.a) The interlaboratory comparison consists in the comparison of the measurements of a travelling standard (Sample) provided by the Coordinator. Each Laboratory makes a quantitative examination (measurement) of the Sample thus providing the Coordinator with a measurement result.

3.b) The Coordinator designed and assembled the Sample.

3.c) The Coordinator assigns to the Sample the reference value and the corresponding uncertainty. The reference value, x^* , and its expanded uncertainty, U^* , are obtained by the Coordinator through the statistical analysis of the measurement results provided by the Laboratories during the proficiency test. The reference value x^* and uncertainty U^* will be known at the end of the proficiency test, after that the last participating Laboratory has sent its measurement results.

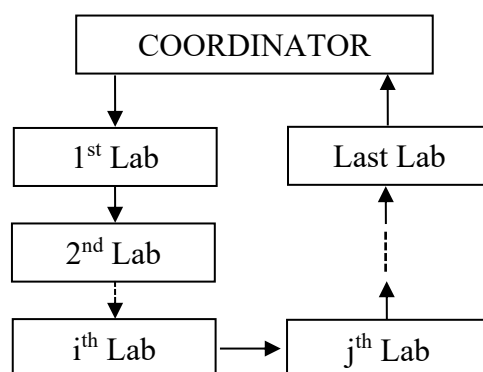


Fig. 1: Sequence by which the Sample is passed from the Coordinator to the Laboratories and from the Laboratories to the Coordinator.

3.d) The scheme of participation in the proficiency test is sequential and it is illustrated in Fig. 1. The Coordinator passes the Sample to the 1st participating Laboratory. The 1st Laboratory makes the measurement thus obtaining the 1st measurement result. Then, the 1st Laboratory passes the Sample to the 2nd Laboratory which, in turns, makes the measurement and determines the 2nd measurement result. The 2nd Laboratory passes the Sample to the 3rd Laboratory which determines the 3rd measurement result, and so on. The last Laboratory passes back the Sample to the Coordinator. The proficiency test is completed when all participating Laboratories have sent their measurement results to the Coordinator.

3.e) The measurement result provided by each Laboratory consists of a measured value x and its expanded uncertainty U_{lab} . The measurement result provided by each Laboratory shall be compared against the reference value assigned by the Coordinator.

3.f) The participation fee is 2500 Euro, as specified in the Contract that must be stipulated between the Laboratory and Università degli Studi di Firenze – Dipartimento di Ingegneria dell'Informazione (Annex A – Italian or Annex B – English).

3.g) The Laboratory has one (1) week available to perform the measurement and one week to communicate the measurement result to the Coordinator. Late results may not be accepted nor processed by the Coordinator.

3.h) In case a Laboratory is willing to submit more than one set of measurement results (e.g. because the Laboratory wants to assess the performance of different instrumentation) then the Laboratory shall contact the Coordinator in order to determine the appropriate scheduling and participation fee. In such case more than one test report shall be issued by the Laboratory, one for each submitted set of measurement results. Any request for more than one test report must be individually evaluated by the Coordinator (the Laboratory shall contact the Coordinator to this purpose), and it will imply, if viable, a higher cost (1000 Euro for any additional test report).

3.i) It is intended that the subscription of the contract in Annex A (Italian) or Annex B (English) allows for the submission of a single test report, both by the Laboratory and by the Coordinator.

4. Admission requirements

4.a) The present scheme applies to Electromagnetic Compatibility (EMC) test Laboratories that:

- Can make magnetic field emission measurements in accordance to the method described in §7.2 of EN 55016-2-3:2017/A1:2019/A2:2023, in the frequency range between 9 kHz and 30 MHz;
- Have evaluated the measurement uncertainty U_{lab} of the measurement method mentioned in the previous clause - and U_{lab} is less than or equal to the corresponding U_{cispr} value reported in EN 55016-4-2:2011/A1:2014/A2:2018, i.e. $U_{lab} \leq 3,3$ dB.

4.b) Accreditation to ISO/IEC 17025 is not required for admission to the proficiency test. The Coordinator designed the present scheme assuming participation of both accredited and non-accredited Laboratories.

4.c) The Coordinator starts the proficiency test if there are at least five participating Laboratories. The maximum number of participating laboratories is thirty (30) which corresponds to a total duration of the proficiency test of less than one year.

4.d) The Laboratory that is willing to participate in the proficiency test shall:

- Fill, print, sign, scan and send by certified e-mail to the certified e-mail address dinfo@pec.unifi.it the contract in Annex A (Italian) **or** Annex B (English). It is generally intended that Italian laboratories use Annex A, foreign laboratories use Annex B.
- Designate a Technical Responsible. The Technical Responsible shall sign the test report submitted by the Laboratory to the Coordinator (Annex C), in addition he/she will be the reference person for correspondence with the Coordinator.
- Select the week in which measurements will be performed as follows:
 - Find the available weeks at this spreadsheet
 - <https://docs.google.com/spreadsheets/d/1wOa9kJfKp7JNGr3kxqQrHprALt9IM1OKfjw5Re46Kxs/edit?usp=sharing>
 - Send, by e-mail, to the Coordinator (carlo.carobbi@unifi.it) the name of the Laboratory, the shipping address, the name of the Technical Responsible, his/her e-mail and phone number and the selected week for measurements;
 - The Coordinator will fill the spreadsheet with the Laboratory information.

4.e) The Laboratory shall observe the following shipping rules:

- Shipping of the Sample from the Coordinator to the Laboratory is in charge of the Coordinator;
- Shipping of the Sample from Laboratory X to the next Laboratory Y or to the Coordinator is in charge of Laboratory X;
- Shipments shall be done by means of an express courier;
- The same packaging used by the Coordinator shall be used by the Laboratory.

4.f) Handle with care the travelling Sample. A damage to the Sample will cause a delay and eventually the interruption of the proficiency test. Each Laboratory shall verify by inspection the mechanical integrity of the Sample. Possible defects or damage, proven or suspected, shall be immediately notified to the Coordinator. A verification of the electrical performance of the Sample is also envisaged (see §7).

4.g) The Coordinator assigns a code to the Laboratory. The same code will be used to identify the Laboratory in the correspondence and in the test reports. The code is as follows:

PTC(LLAS-9k-30M)LAB(#)

The code is the combination of a general part – PTC(LLAS-9k-30M) – that identifies the measurement method, and therefore a homogenous set of measurement results, and a specific part – LAB(#) – that identifies a particular Laboratory.

5. Statistical analysis of the measurement results

5.a) The statistical analysis is based on the zeta-scores (symbol ζ) performance statistics (see §9.6 of ISO 13528:2022). The measurement result x_i , in dB(μA), provided by the i-th Laboratory ($i = 1, 2, \dots, p$, where p is the number of participating Laboratories) is compared with the reference value X , in dB(μA), assigned by the Coordinator. The standard uncertainty of x_i is $u_{xi} = (U_{lab})_i / 2$ where $(U_{lab})_i$, in dB, is the expanded uncertainty stated by the i-th Laboratory (see §3). The standard uncertainty of X is $u_X = U / 2$, where U , in dB, is the expanded uncertainty obtained multiplying the standard uncertainty by a coverage factor $k = 2$ (which corresponds to a coverage probability of about 95 %, assuming a normal distribution) that the Coordinator assigned to the reference value X . The Coordinator calculates the following measure ζ_i of relative deviation between x_i and X :

$$\zeta_i = \frac{x_i - X}{\sqrt{u_{xi}^2 + u_X^2}}. \quad (1)$$

The value of ζ_i is calculated for each Laboratory, for each investigated frequency and for each conductor (line and neutral). Therefore as many values of ζ_i will be calculated as the number of investigated frequencies times the number of conductors (ten frequencies investigated, four conductors then forty values of ζ_i for the i-th Laboratory). The measurement result provided by the i-th Laboratory will produce a warning signal if, at least at one frequency, we have ζ_i less than -2 or greater than $+2$. The measurement result provided by the i-th Laboratory will produce an action signal if, at least at one frequency, we have ζ_i less than -3 or greater than $+3$. If at all

frequencies we have ζ_i greater than -2 and less than $+2$ then the measurement result provided by the i -th Laboratory will not give evidence of any anomaly.

5.b) The reference values X and U that the Coordinator uses to evaluate the performance of a Laboratory are x^* and U^* .

5.c) The standard uncertainty of the reference value $X = x^*$ is $u_X = U^*/2 = 1,25 \cdot s^*/\sqrt{p}$. Both x^* and s^* are obtained from the statistical analysis of the measurement results provided by the p laboratories.

5.d) The values of x^* and s^* are obtained by the Coordinator by using the robust analysis (Algorithm A) described in Annex C of ISO 13528:2022. The robust analysis is based on an iterative calculation. At the first step of iteration

$$x^* = \text{median of } x_i \quad (i = 1, 2, \dots, p) \quad (2)$$

and

$$s^* = 1,483 \cdot \left\{ \text{median of } |x_i - x^*| \right\} \quad (i = 1, 2, \dots, p). \quad (3)$$

NOTE 1: The factor 1,483 which appears in (3) represents the ratio between the standard deviation σ and the median of the absolute deviations from the median, MAD , assuming normal distribution. It is indeed possible to show that in the case of symmetric distribution, $MAD/\sigma = \Phi^{-1}(3/4)$, where Φ is the cumulative distribution function. In the case of normal distribution $\Phi^{-1}(3/4) = 0,6745$ and therefore $\sigma = 1,4826 \cdot MAD$.

NOTE 2: The factor 1,25 that appears in the formula $U^*/2 = 1,25 \cdot s^*/\sqrt{p}$ represents the ratio between the standard deviation of the median and the standard deviation of the mean (see §7.7.7 of ISO 13528:2022). Therefore x^* and s^* are interpreted as the median and the standard deviation of the mean of the measurement results, respectively.

6. Characteristics of the Sample

6.a) The Sample is a magnetic field source made of the combination of a battery-operated comb generator and a radiating loop antenna having size 50 cm x 50 cm (overall width and height of the radiating loop), see Fig. 2.

6.b) The Sample is assembled by the user by connecting one to each other the left, right and top side of the loop antenna and them to the bottom side. Screws are provided to fix the structure.

6.c) The power supply/frequency band selection button is on the top, left side of the aluminum box hosting the comb generator and power supply circuitry, see Fig. 2. The internal battery is recharged by the power supply provided with the Sample, which shall be connected to a receptacle placed on the right side of the aluminum box, see Fig. 2.

6.d) If battery charge is insufficient to provide adequate supply the Sample automatically switches off.

6.e) To recharge the battery, connect the power supply to the receptacle and push the power on button until the “RELEASE BUTTON” message appears on the display. Release the button and the “CHARGE ON” message appears. When charging is complete then the message “SYSTEM READY REMOVE CHARGER” is displayed. Remove the charger and the Sample is ready for measurements.

6.f) Pushing the button the first time Band 1 is activated. Pushing the button the second time Band 2 is activated. Pushing the button the third time the Sample is switched off.

6.g) About 1 hour of continuous operation is assured by a fully charged battery.

6.h) The Sample shall be supplied from the battery during measurement (power supply disconnected from the Sample)

6.i) The comb generator frequency spacing is about 10 kHz from 10 kHz in Band 1 (harmonics at 10 kHz, 20 kHz, 30 kHz, 40 kHz, ...) and it is about 900 kHz from 900 kHz in Band 2 (harmonics at 0.9 MHz, 1.8 MHz, 2.7 MHz, ...).

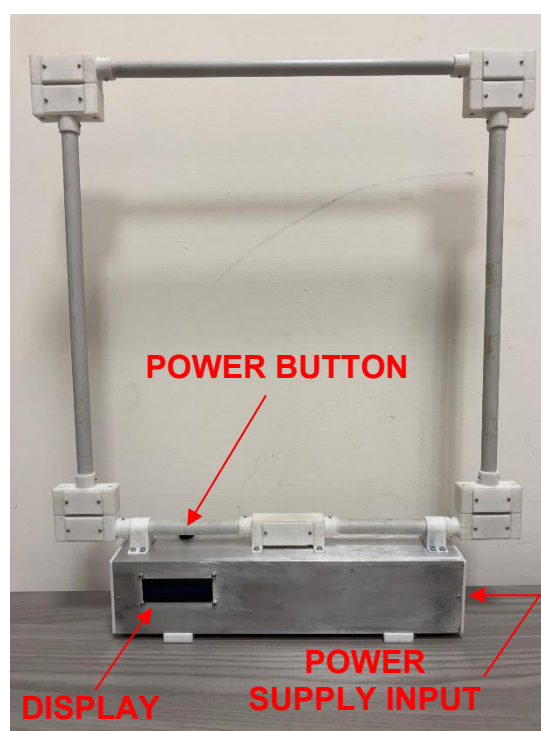


Fig. 2: The travelling Sample.

6.j) The Sample requires 1 minute warm up.

6.k) The Coordinator identifies the harmonics to be measured through their ordinal number in the selected frequency band (Band 1 or Band 2) and the approximate frequency value. For example: the 5th harmonic in Band 1 is approximately at 50 kHz (the 1st harmonic in Band 1 being at 10 kHz), the 10th harmonic in Band 2 is approximately at 9 MHz (the 1st harmonic in Band 2 being at 900 kHz).

6.l) What identifies the harmonic is its order not its frequency. Frequencies are given only for guidance.

6.m) The combination of the lock is 183 (see Fig. 3). Input the figures from top to bottom.



Fig. 3: Picture of the lock.

7. Measurement procedure

7.a) The Laboratory shall measure the amplitude of ten (10) harmonics selected by the Coordinator in the frequency range between 9 kHz and 30 MHz (i.e. covering both band A and band B).

7.b) The average detector shall be used.

7.c) The measurement result provided by the Laboratory shall be:

- The estimate x , expressed in dB(μ A), of the amplitude of the selected harmonics, see Table 1;
- The expanded uncertainty of the estimate x , U_{lab} , expressed in dB and obtained multiplying the combined standard uncertainty by the coverage factor $k = 2$ (which corresponds to a coverage probability of about 95 % assuming normal distribution).

7.d) The Laboratory may assign a different value of U_{lab} to each measured frequency.

7.e) The following **preliminary Sample verification** shall be carried out, see Fig. 4. By using the loop probe (see (2) in Fig. 4) provided with the Sample measure the magnetic field generated by the Sample (see (1) in Fig. 4) at 2.7 MHz (3rd harmonic in Band 2). To this purpose let the loop probe touch the center of the left side of the Sample. The loop probe and the Sample radiating loop shall be on the same plane. The loop probe shall be connected to the EMI receiver (or spectrum analyzer, see (3) in Fig. 4) by using a coaxial cable of length comprised between 1 m to 2 m (not provided). Verify that if the loop probe is orthogonal to the plane of the radiating loop the reading decreases by at least 20 dB. The reading of the spectrum analyzer when the two loops are coplanar shall be within $-29 \text{ dBm} \pm 3 \text{ dB}$.

7.f) If the preliminary Sample verification is successful then the Laboratory can move on to the next step, otherwise the Coordinator shall be informed and the measurement of the induced current in the LLAS is temporarily delayed.

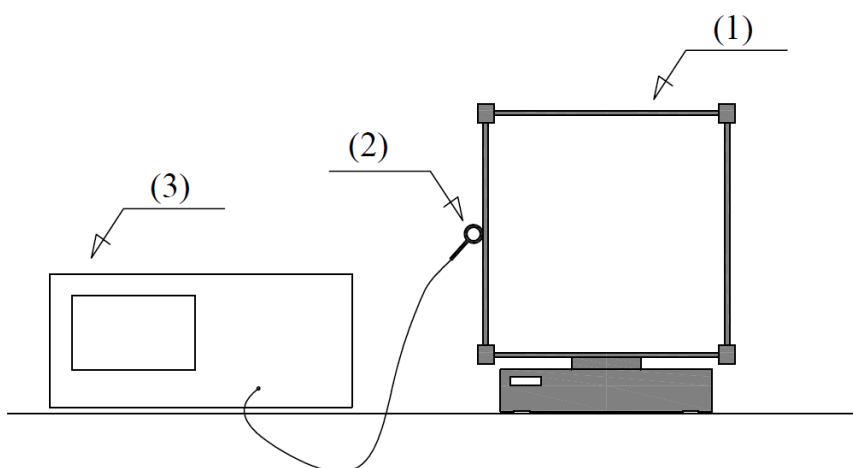


Fig. 4: Preliminary verification.

7.g) After successful preliminary Sample verification, measurement can be carried out, see Fig. 5. The Sample (see (2) in Fig. 5) shall be placed on a non-metallic support (see (3) in Fig. 5) so that the radiating loop of the Sample is at the center of the receiving loop (see (1) in Fig. 5). The two loops (radiating and receiving) shall be coplanar.

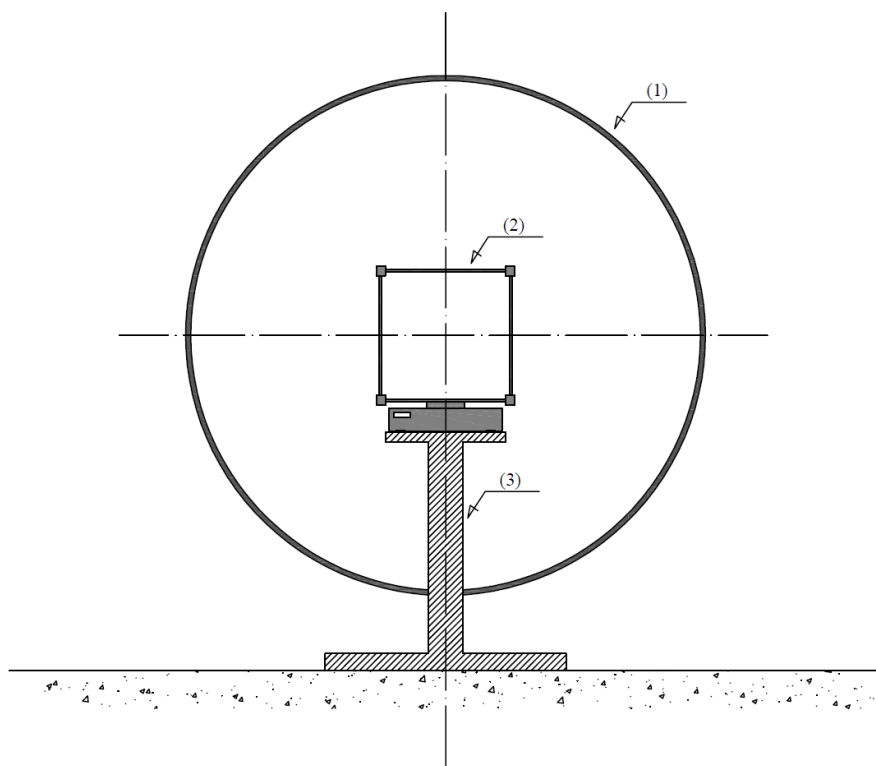


Fig. 5: Measurement.

7.h) For a LLAS, consisting of three orthogonal receiving loops, reported measurement results shall refer to a single receiving loop. The Laboratory is encouraged to check consistency of the reported measurement results with those obtained with the other two loops.

8. Recording induced disturbance current measurement results

8.a) The measured disturbance current x , in dB(μ A), shall be rounded up to 1 decimal digit (e.g. 68,5 dB(μ A)). Measurement uncertainty U_{lab} , in dB, shall be rounded up to 2 significant digits (e.g. 3,2 dB).

8.b) The values of x and U_{lab} shall be recorded in the sixth and seventh column of Table 1, respectively. The Coordinator will complete the rest of Table 1.

Table 1: Table to be used for recording the induced current measurement result x and its measurement uncertainty U_{lab} . Columns six and seven shall be filled up by the Laboratory, the other columns will be filled up by the Coordinator.

1	2	3	4	5	6	7	8
Band	Harmonic #	f MHz	x^* dB(μ A)	s^* dB	x dB(μ A)	U_{lab} dB	ζ
1	4	0,04	-	-			-
1	20	0,20	-	-			-
1	36	0,36	-	-			-
1	44	0,44	-	-			-
2	1	0,90	-	-			-
2	3	2,7	-	-			-
2	10	9,0	-	-			-
2	15	13,5	-	-			-
2	23	20,7	-	-			-
2	30	27,0	-	-			-

8.c) The Laboratory fills columns six and seven and sends a copy of Table 1 to the Coordinator (see §9). The Coordinator completes the rest of Table 1 and sends a copy to the Laboratory. The proficiency test result does not give evidence of any anomaly if, at all frequencies, $-2 \leq \zeta \leq 2$. Otherwise, anomalies shall be described in terms of warning and action signals as discussed in §5.

NOTE: Warning signals do not add up to give an action signal.

9. Test reports

9.a) The test report issued by the Laboratory to the Coordinator shall conform to Annex C and it shall be signed by the Technical Responsible or his/her Deputy (see §4.d). The test report issued by the Coordinator to the Laboratory will conform to Annex D. Annexes C and D, once completed by the Laboratory and by the Coordinator, will be an integral part of the present document and they will provide evidence to any interested part (e.g. the Accreditation Body) of the participation of the Laboratory to the proficiency test.

9.b) The test report shall include:

- Pictures of the measurement setups used in the different frequency ranges;
- A list of the measurement equipment.

10. Remarks and complaints

10.a) The Coordinator issued and made this document freely available in order to prevent remarks and complaints from the Laboratories during the progress of the proficiency test.

10.b) Remarks and complaints will be considered by the Coordinator only if they are related to management or technical aspects relevant to the proficiency test but not considered in the present document. Subscription of the contract in Annex A (Italian) or B (English) implies formal acceptance of the terms and conditions of participation in the proficiency test described in this document.

10.c) Laboratories can verbally contact (e.g. by phone) the Coordinator to present possible remarks and complaints about management and technical problems related to the proficiency test that appear during the progress of the proficiency test itself. If possible and depending on the importance of the problem originating the remark or complaint, the Coordinator will give advice to the Laboratories in order to resolve the problem.

10.d) If the Coordinator judges that the problem cannot be verbally solved through an advice to the Laboratory, then he will ask the Laboratory a written communication of the remarks and complaints. The Coordinator will discuss the remarks and complaints with his scientific and technical collaborator (see §2) and collectively take a decision about their management.

10.e) Possible technical problems related to the management of the Sample (including shipment), delay in the progress of the proficiency test caused by a Laboratory or by the Coordinator himself, can be solved by the Coordinator without involving the scientific and technical collaborators.

11. Confidentiality and impartiality

11.a) The Coordinator and his technical and scientific collaborators will keep confidential any information pertaining to the performance of the Laboratories involved in the proficiency test during its progress and after its completion. The Coordinator warrants that the results originated from the participation of the Laboratories in the proficiency test will be kept confidential through:

- Keeping anonymous the result associated with each Laboratory. The individual result produced by each Laboratory may be released only in such a way that the anonymity of the Laboratory is preserved.
- Keeping anonymous aggregate results (i.e., statistical average, dispersion, ...). The aggregate proficiency test results may be released only in such a way that the anonymity of the Laboratories that generated the results is preserved.
- Informing accredited Laboratories about a possible request of the Accreditation Body to reveal their proficiency test result. The proficiency test result will be revealed to the Accreditation Body under written permission of the accredited test Laboratory.

11.b) The Coordinator and his scientific and technical collaborator will avoid any conduct that could cause some Laboratories to take advantage with respect to the others in the successful participation in the proficiency test.

11.c) Laboratories shall avoid raising issues that, if accepted by the Coordinator and his scientific and technical collaborator, could generate a situation of disparity in the successful completion of the proficiency test.

Annex A

Compilare inserendo i seguenti dati negli appositi campi evidenziati in giallo nel testo del contratto:

- (1) Ragione sociale
- (2) Codice fiscale
- (3) Partita IVA
- (4) Indirizzo
- (5) Nome, cognome e qualifica del rappresentante
- (6) Indirizzo PEC
- (7) Codice univoco
- (8) Specificare se l'emissione di fattura deve seguire un ordine di acquisto da parte del Committente
- (9) Link informativa
- (10) Titolare del trattamento dati personali
- (11) Luogo
- (12) Data
- (13) Nome e cognome di chi firma

Verificare di aver inserito tutti i dati richiesti ed eliminare queste note. Possibilmente, firmare digitalmente e spedire il contratto con PEC alla seguente PEC dinfo@pec.unifi.it

CONTRATTO TRA LA ... (1) ... E IL DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE DELL'UNIVERSITA' DI FIRENZE PER L'EFFETTUAZIONE DELLA SEGUENTE PRESTAZIONE:

“Prova valutativa di misura di corrente indotta nell'intervallo di frequenza 9 kHz to 30 MHz in un Large Loop Antenna System (LLAS) – Prova valutativa PTC(LLAS-9k-30M)”

(Art. 3/C del Regolamento sullo svolgimento di attività di ricerca o didattica commissionate da soggetti pubblici e privati emanato con D.R. 451/2018, Prot. 63016 del 16/04/2018)

Tra

... (1) ... c.f. ... (2) ... P.I. ... (3) ... con sede in ... (4) ... in seguito indicata/o “Committente”, rappresentato da ... (5) ...

e

il Dipartimento di Ingegneria dell'Informazione dell'Università di Firenze, c.f. e P.I. 01279680480, in seguito indicato “Unità Amministrativa”, rappresentato dal Prof. Giorgio Battistelli in qualità di Direttore autorizzato a firmare il presente atto ai sensi dell'art. 36, comma 6 del Regolamento di Amministrazione, Finanza e Contabilità dell'Ateneo Fiorentino.

PREMESSA

DINFO ha le capacità per fornire servizi di circuito interlaboratorio ai Laboratori operanti nel settore delle prove di Compatibilità Elettromagnetica e il Committente intende dare evidenza della propria competenza tecnica attraverso la partecipazione a circuiti interlaboratorio.

SI CONVIENE E SI STIPULA QUANTO SEGUE

Art. 1

Oggetto del contratto

L'Unità Amministrativa effettuerà la seguente prestazione:

“Prova valutativa di misura di corrente indotta nell’intervallo di frequenza 9 kHz to 30 MHz in un Large Loop Antenna System (LLAS) – Prova valutativa PTC(LLAS-9k-30M)”, voce di tariffa “Partecipazione a circuito interlaboratorio tipo D” approvata dal Consiglio dell’Unità Amministrativa in data 27 maggio 2024.

Art. 2

Responsabile dell’attività

Responsabile dello svolgimento della prestazione è il Prof. Carlo Carobbi. La prestazione sarà eseguita nei locali dell’Unità Amministrativa con le modalità definite nel documento tecnico dal titolo “Proficiency test through interlaboratory comparison – Current induced in the 9 kHz to 30 MHz frequency range in a Large Loop Antenna System (LLAS) – Scheme of the proficiency test PTC(LLAS-9k-30M)” (Allegato Tecnico) che accompagna il presente atto e ne costituisce parte integrante.

Art. 3

Pagamenti

Per la realizzazione della prestazione il Committente corrisponderà all'Università la somma di € 2500 oltre IVA (oppure indicare il titolo di inapplicabilità dell'IVA). Il pagamento verrà effettuato dal Committente:

- entro 30 giorni dal ricevimento di fattura elettronica; la fattura elettronica sarà trasmessa all’indirizzo PEC **...(6)...** e codice destinatario (codice univoco) **...(7)...**
- in conformità a quanto previsto dal Decreto Semplificazioni (DL n. 76 del 16/07/2020) esclusivamente attraverso l'utilizzo del Sistema pagoPA. Ogni pagamento sarà identificato univocamente dal codice IUV (Identificativo Univoco di Versamento), generato in sede di creazione della fattura e notificato al Committente tramite un Avviso di Pagamento contenente anche il Codice Avviso di Pagamento, il Codice QR e il Codice Interbancario (circuito CBILL: AAB1Y) che consentono di effettuare il pagamento – con le seguenti modalità:
- in un’unica soluzione alla stipula del presente atto.

L'emissione di fattura avverrà a seguito di emissione di ordine di acquisto da parte del Committente (facoltativo, cancellare se non applicabile) **...(8)...**

Art. 4

Risultati e proprietà intellettuale

La conoscenza pregressa di ciascuna parte è e rimane di proprietà della stessa parte.

L'Università di Firenze si riserva i diritti di proprietà intellettuale relativi ai servizi erogati nell'ambito del presente accordo.

Le parti concordano che, in base alla natura del servizio, non si prevede che possano derivare da questa attività invenzioni brevettabili.

Gli eventuali risultati della ricerca condivisa saranno pubblicati dopo che tutte le parti si saranno accordate sui termini e le condizioni della pubblicazione medesima.

Art. 5

Durata e termini di esecuzione del servizio

La prestazione avrà inizio dalla data di stipula del presente accordo e verrà effettuata entro un anno secondo la procedura descritta nell'Allegato Tecnico, che costituisce parte integrante del presente Contratto. Firmando questo Contratto il Committente accetta i termini di svolgimento del servizio descritti nell'Allegato Tecnico.

L'importo delle prestazioni e la durata possono essere estesi attraverso un nuovo accordo sottoscritto dalle parti.

Art. 6

Riservatezza e pubblicità

Il Dipartimento ed il personale coinvolto sono tenuti a rispettare gli obblighi di non concorrenza e riservatezza (le informazioni che devono essere considerate riservate sono specificate nell'Allegato Tecnico).

Art. 7

Trattamento dei dati

I dati forniti dalle Parti saranno trattati per le finalità del presente contratto, nel rispetto dei principi di liceità, correttezza, trasparenza, adeguatezza, pertinenza e necessità di cui all'art.5, paragrafo 1 del Regolamento Generale sulla Protezione dei Dati (GDPR). Il conferimento di tali dati tra le Parti è obbligatorio al fine di adempiere a tutti gli obblighi di contratto comunque connessi all'esecuzione del rapporto instaurato con il presente atto.

I medesimi dati potranno essere comunicati unicamente all'interno della struttura del Committente e del Dipartimento per la gestione del rapporto instaurato dal presente atto.

I dati forniti dalle Parti saranno raccolti e trattati, con modalità manuale, cartacea e informatizzata, mediante il loro inserimento in archivi cartacei e/o informatici.

L'informativa completa dell'Università di Firenze sulla protezione dei dati personali degli operatori economici relativi al presente contratto è disponibile al seguente link https://www.unifi.it/upload/sub/protezionedati/Informativa_TERZI.pdf

L'informativa completa del Committente sulla protezione dei dati personali degli operatori economici relativi al presente contratto è disponibile al seguente link **...(9)...**, ovvero allegata al presente contratto.

Con la sottoscrizione del presente atto le parti esprimono il proprio consenso al trattamento ed alla comunicazione dei propri dati personali secondo le modalità e per le finalità sopra descritte. Titolari del trattamento sono l'Università degli Studi di Firenze e il Committente e, Referenti per la protezione dei dati sono il Direttore del Dipartimento per l'Università e **...(10)...** per il Committente. Ai sensi dell'art. 8 del Regolamento per lo Svolgimento di attività di ricerca o didattica commissionate da soggetti pubblici e privati, l'Università di Firenze potrà utilizzare i dati del presente atto in forma anonima per analisi statistiche sull'andamento delle attività conto terzi (https://www.unifi.it/upload/sub/statuto_normativa/dr825_100718_regolamento_conto_terzi.pdf).

Art. 8

Disposizioni finali e Foro Competente

Per tutto quanto non espressamente stabilito, restano ferme le disposizioni previste dal Codice Civile. Tutte le eventuali dispute connesse all'esecuzione del presente contratto dovranno essere risolte in via amichevole fra le parti. In caso ciò non risultasse possibile, si dichiara sin d'ora che deve considerarsi foro esclusivamente competente il Tribunale di Firenze

Art. 9

Spese del contratto

Il presente atto verrà registrato solo in caso d'uso ai sensi dell'art. 5, II comma, del D.P.R. n. 131 del 26/4/1986 e successive modifiche, a cura e spese della parte richiedente.

Le spese di bollo sono a carico del Committente

p. il COMMITTENTE **...(11)...**, lì **...(12)...**
(.....(13).....)

..... (firma)

p. l'UNITA' AMMINISTRATIVA Firenze, lì
(Il Direttore Prof. Giorgio Battistelli)

..... (firma)

Per presa visione,
il responsabile dell'attività

(Prof. Carlo Carobbi)

..... (firma)

Annex B

Fill the relevant fields highlighted in yellow in the contract by inserting the following information:

- (1) Corporate name
- (2) Tax identification number
- (3) Address
- (4) Name, surname and qualification of the representative
- (5) Address for billing notice and invoice
- (6) Specify whether the issuance of the invoice must be subsequent the issuance of a purchase order by the Laboratory
- (7) Jurisdiction of the defendant
- (8) Place
- (9) Date
- (10) Name and surname of who signs the contract

Check that the required information has been inserted, delete these notes, print, sign and scan the contract, then send it to carlo.carobbi@unifi.it. If possible, please use digital signature.

AGREEMENT BETWEEN ... (1) ... AND THE DEPARTMENT OF INFORMATION ENGINEERING OF THE UNIVERSITY OF FLORENCE FOR THE FOLLOWING SERVICE

“Proficiency test through interlaboratory comparison – Current induced in the 9 kHz to 30 MHz frequency range in a Large Loop Antenna System (LLAS) – Proficiency test PTC(LLAS-9k-30M)”

(Art. 3, paragraph C, of the Regulation about the execution of research or academic activities commissioned by public and private entities issued by D.R. 451/2018, Prot. 63016 on 16 April 2018)

Between

... (1) ..., tax identification number ... (2) ..., with premises in ... (3) ... hereinafter referred to as “the Laboratory”, represented by ... (4) ...

and

The Department of Information Engineering of the University of Florence, fiscal code and VAT number 01279680480, hereinafter referred to as “DINFO”, represented by Prof. Giorgio Battistelli, in the capacity of Department head, authorized to sign the present agreement pursuant to art. 36,

paragraph 6 of the Regulations of Administration, Finance and Accounting of the University of Florence

whereas

DINFO has the capability to provide the interlaboratory comparison service to Laboratories operating in the sector of Electromagnetic Compatibility testing and the Laboratory is willing to give evidence of his technical competence through participation to interlaboratory comparisons.

the following agreement is drawn-up

Art.1. – Subject of the Contract

DINFO will carry out the following service “Proficiency test through interlaboratory comparison – Current induced in the 9 kHz to 30 MHz frequency range in a Large Loop Antenna System (LLAS) – Proficiency test PTC(LLAS-9k-30M)” price list item “Participation in interlaboratory comparison type D” as approved by the Board of DINFO on May 27, 2024.

Art. 2. Responsibility of the service

The person (Responsible) in charge of carrying out the service is Prof. Carlo Carobbi. The service will be carried out in the DINFO premises according to the procedure defined in the technical document titled “Proficiency test through interlaboratory comparison – Conducted emission measurements in the 9 kHz to 30 MHz frequency range – Scheme of the proficiency test PTC(LLAS-9k-30M),” (for brevity “Technical Annex” in the following) which is an integral part of this Contract.

Art. 3. Fees

In order to obtain the service specified in the Technical Annex, the Laboratory will pay the sum of € 2500 plus VAT (or indicate the title of inapplicability of VAT).

- within 30 days from receipt of billing notice which will be followed by regular invoice, the billing notice and subsequent invoice will be sent to the address **...(5)...**

All payments will be made by the Laboratory according to the instructions provided through the invoice. The invoice will be issued after the issuance of a purchase order by the Laboratory (optional, delete if not applicable) ...(6)...

Art. 4. Results and Intellectual property

The background of each party is and remains property of the same party.

The University of Florence retains the intellectual property related to the concept of the services supplied.

The parties agree that, due to the nature of the service, it is not expected that patentable inventions can arise from this activity. Possible joint results of the research will be published after both parties have agreed about the publication terms.

Art. 5. Duration and terms of execution of the service

The service will be completed within one year starting from the date of drawing up of this Contract (*). The service will be performed according to the procedure described in the Technical Annex which is an integral part of this Contract. By signing this Contract, the Laboratory agrees on the terms of execution of the service as described in the Technical Annex. The amount of the services and the duration can be extended through an agreement signed by the parties.

() When the signatures have not been placed contemporarily, the date of the last signature marks the stipulation of the Contract.*

Art. 6. Confidentiality and publicity

DINFO, the Laboratory and the staff involved are bound to respect the obligations of non-rivalry and confidentiality (possible details about which information must be considered confidential are specified in the Technical Annex).

Art. 7. Data processing

Pursuant to Legislative Decree no. 196/2003, the parties mutually authorize the processing of personal data, computer and / or paper, in order to fulfil all legal and contractual obligations in any case related to the execution of the relationship established with the present contract. The data will

be made accessible only to those who, both within the structure of the Customer and the Department, and outside, need it exclusively for the management of the relationship established by this contract. It is right of the contracting parties to obtain confirmation of the existence of the data and to know its content and origin, verify its accuracy or request its integration, updating or correction and to oppose, for legitimate reasons, to their treatment. By signing this document, the parties express their consent to the processing and communication of their personal data according to the methods and for the purposes described above. The Data Controller is the Customer, and the Data Processor is the Director of the Department. Pursuant to art. 8 of the Regulations for the conduct of research or teaching activities commissioned by public and private subjects, the University of Florence may use the data in this document anonymously for statistical analysis on the performance of activities on behalf of third parties.

Art. 8. Final provisions

For whatsoever has not been expressly agreed, the laws of the Civil Code abide. All disputes or differences between the Parties arising out or in connection with this Agreement which the Parties cannot settle amicably shall be finally submitted to the jurisdiction of the defendant, that is **...(7)...** if the Laboratory is the defendant, Florence Court if the University of Florence is the defendant.

Art. 9. Cost of the Contract

This Contract will be registered only in the case of use according to art. 5, paragraph II of the D.P.R. 26/4/1986 n. 131 and subsequent modifications. The Laboratory is responsible for the necessary arrangements and expenses, including the cost of stamps.

-----00-----

For the Laboratory

...(8)..., ...(9)...

(.....(10).....)

..... (*signature*)

For the Department of Information Engineering

Florence,

(Prof. Giorgio Battistelli)

..... (*signature*)

Signature of acknowledgment of the Responsible of the service

Prof. Carlo Carobbi

..... (*signature*)

Test report issued by the participating Laboratory

Laboratory: Name of the Laboratory

Laboratory Code: PTC(LLAS-9k-30M)LAB(#)

Address: Address of the Laboratory

Technical Responsible: First name and last name of the Technical Responsible or his/her Deputy

E-mail: E-mail address of the Technical Responsible or his/her Deputy

Phone: Phone number of the Technical Responsible or his/her Deputy

Date of issue: Date of issue of this test report

Date of Sample receipt:

Date of measurements:

Data of Sample shipment:

Test result

Fill in the empty cells of columns six and seven with the measured value x and the measurement uncertainty U_{lab} .

1	2	3	4	5	6	7	8
Band	Harmonic #	f MHz	x^* dB(μ A)	s^* dB	x dB(μ A)	U_{lab} dB	ζ
1	4	0,04	-	-			-
1	20	0,20	-	-			-
1	36	0,36	-	-			-
1	44	0,44	-	-			-
2	1	0,90	-	-			-
2	3	2,7	-	-			-
2	10	9,0	-	-			-
2	15	13,5	-	-			-
2	23	20,7	-	-			-
2	30	27,0	-	-			-

Comments: Comments may be inserted here (optional)

Photos: At least one photo shall be inserted here (mandatory).

Sign of the Technical Responsible or his/her Deputy

.....

Test report no. XYZ
Issued by the Coordinator of the proficiency test code PTC(LLAS-9k-30M)

Carlo Carobbi
 Dipartimento di Ingegneria dell'Informazione
 Università degli Studi di Firenze
 Via S. Marta, 3 – 50139 Firenze
 Phone: +39 055 2758501
 Mob. phone: +39 329 6509116
 e-mail: carlo.carobbi@unifi.it

to the participating Laboratory

Laboratory: Name of the Laboratory
 Laboratory Code: PTC(LLAS-9k-30M)LAB(#)
 Address: Address of the Laboratory

Start and stop dates of the proficiency test:

Number of participants:

Date of measurements of the participating Laboratory:

Data of issue of this report:

Test result

1	2	3	4	5	6	7	8
Band	Harmonic #	f MHz	x^* dB(μ A)	s^* dB	x dB(μ A)	U_{lab} dB	ζ
1	4	0,04	-	-			-
1	20	0,20	-	-			-
1	36	0,36	-	-			-
1	44	0,44	-	-			-
2	1	0,90	-	-			-
2	3	2,7	-	-			-
2	10	9,0	-	-			-
2	15	13,5	-	-			-
2	23	20,7	-	-			-
2	30	27,0	-	-			-

Outcome

Here the Coordinator inserts the applicable outcomes:

- No anomaly is detected
- Warning signal(s) is (are) detected
- Action signal(s) is (are) detected

Sign of the Coordinator

.....