

# **Proficiency test through interlaboratory comparison Radiated emission measurements in the 30 MHz to 6000 MHz frequency range Scheme of the proficiency test PTC(RE-30-6000-IV)**

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Rev. 1 – September 27, 2018 (changes to Annex A and Annex B in order to comply with modifications 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)

## **1. Scope**

1.a) This document describes the participation scheme to a proficiency test performed through an interlaboratory comparison of radiated emission measurements. 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 issued by the Laboratory and the Coordinator;
- The registration form.

1.b) The last revision of the present document can be downloaded from the following URL:  
<http://www.emc.unifi.it/CMpro-v-p-26.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:

- Michele Borsero, Istituto Nazionale di Ricerca Metrologica (Torino, ITALY);
- Giuseppe Vizio, Istituto Nazionale di Ricerca Metrologica (Torino, ITALY);
- Alessio Bonci, ITT G. Ferraris (San Giovanni Valdarno, Firenze, ITALY);
- Marco Cati, Powersoft S.p.A. (Firenze, ITALY).

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

Carlo Carobbi

Dipartimento di Ingegneria dell'Informazione

Università degli Studi di Firenze

Via S. Marta, 3 – 50139 Firenze, ITALY

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Mob. phone: +39 329 6509116  
e-mail: [carlo.carobbi@unifi.it](mailto:carlo.carobbi@unifi.it)  
skype: carlo.carobbi

### 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 assigned to the Sample two reference values and the corresponding uncertainties. One reference value,  $X_{cal}$  (and its expanded uncertainty  $U_{cal}$ ), was obtained by the Coordinator through measurements and numerical predictions. The reference value  $X_{cal}$  (and  $U_{cal}$ ) is known before the start of the proficiency test. The other reference value,  $x^*$  (and its expanded uncertainty  $U^*$ ), is 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  $U^*$ ) will be known at the end of the proficiency test, after that the last participating Laboratory has sent its measurement results.

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 1<sup>st</sup> participating Laboratory. The 1<sup>st</sup> Laboratory takes the measurement thus obtaining the 1<sup>st</sup> measurement result. Then, the 1<sup>st</sup> Laboratory passes the Sample to the 2<sup>nd</sup> Laboratory which, in turns, makes the measurement and determines the 2<sup>nd</sup> measurement result. The 2<sup>nd</sup> Laboratory passes the Sample to the 3<sup>rd</sup> Laboratory which determines the 3<sup>rd</sup> measurement result, and so on. The last Laboratory passes back the Sample to the Coordinator. The proficiency test is completed when the last participating Laboratory has sent its 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 one or both the reference values assigned by the Coordinator (see below).

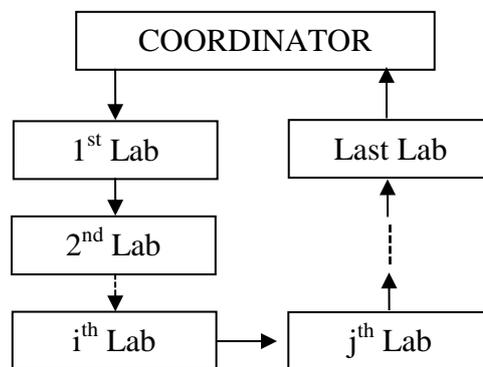
3.f) Two options are available to Laboratories:

- **Option I:** The transmission of the test report from the Coordinator to the Laboratory will take place only after that the proficiency test is concluded. No communication of the results of the proficiency test shall be done by the Coordinator to the Laboratory in the time period between the beginning and the conclusion of the proficiency test. The measurement result provided by each Laboratory shall be compared against the reference value  $x^*$  (and its expanded uncertainty  $U^*$ ).
- **Option II:** The Laboratory sends the measurement result to the Coordinator and the Coordinator immediately communicates to the Laboratory the outcome of the comparison between the measurement result and the reference value  $X_{cal}$  and its expanded uncertainty  $U_{cal}$ . The communication of the outcome of the comparison between the measurement result

provided by the Laboratory,  $x$  and  $U_{lab}$ , with  $x^*$  and its expanded uncertainty  $U^*$  will be made at the conclusion of the proficiency test. The Coordinator will therefore send two test reports:

- The first test report with the outcome of the comparison between the measurement result,  $x$  and  $U_{lab}$ , and the reference value  $X_{cal}$  and  $U_{cal}$ .
- The second test report with the outcome of the comparison between the measurement result,  $x$  and  $U_{lab}$ , and the reference value  $x^*$  and  $U^*$ .

3.g) A higher participation fee is requested to the Laboratory willing to choose Option II, in addition to the agreement to not disclose the reference value  $X_{cal}$  and  $U_{cal}$  assigned by the Coordinator (see the Contract in Annex A – Italian – or Annex B – English).



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

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

3.i) In case that 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 instrumentations) 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 (500 Euro for any additional test report).

3.j) 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 radiated emission measurements in accordance to the methods described in the following clauses of the standard EN 55016-2-3:2017:
  - o §7.3 (30-1000 MHz, semi-anechoic room or open area test site, at 3 or 10 m distance) or in §7.4 (30-1000 MHz, fully-anechoic room or absorber-lined semi-anechoic room or absorber-lined open area test site, at 3 m distance) and,
  - o §7.6 (1-18 GHz, fully-anechoic room or absorber-lined semi-anechoic room or absorber-lined open area test site, at 3 m distance)
 in the frequency range between 30 and 6000 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  $U_{cisprr}$  value reported in EN 55016-4-2:2011, i.e.  $U_{lab} \leq 6,3$  dB in the frequency range between 30 and 1000 MHz in a semi-anechoic room or open area test site,  $U_{lab} \leq 5,3$  dB in the frequency range between 30 and 1000 MHz in a fully-anechoic room or absorber-lined semi-anechoic room or absorber-lined open area test site,  $U_{lab} \leq 5,2$  dB in the frequency range between 1 and 6 GHz in a fully-anechoic room or absorber-lined semi-anechoic room or absorber-lined open area test site.

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 twenty five (25) 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](mailto:dinfo@pec.unifi.it) the contract in Annex A (Italian) or Annex B (English).
- Designate a Technical Responsible and, if possible, his/her Deputy by filling and sending by e-mail to the Coordinator ([carlo.carobbi@unifi.it](mailto:carlo.carobbi@unifi.it)) the form in Annex C. The Technical Responsible shall sign the test report submitted by the Laboratory to the Coordinator, in addition he/she will be the reference person for correspondence with the Coordinator. The Laboratory shall communicate to the Coordinator its address through the same Annex C.
- Select the period during which the measurement will be performed by using the Doodle link <http://doodle.com/6fy7265i6z9e4i4c>. Use the Laboratory name when making the selection, do not use the code assigned by the Coordinator.

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.

Information to each Laboratory about the address and contact details of the previous and the next Laboratories in the round is provided by the same Doodle link. Be accurate when inserting the address and contact details in the “Comment” field provided by Doodle.

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 damages, 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 correspondence and in the test reports. The code is as follows:

**PTC(RE-30-6000-IV)LAB(#)**

The code is the combination of a general part – PTC(RE-30-6000-IV) – 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  $\zeta$ ) performance statistics (see §9.6 of ISO 13528:2015). The measurement result  $x_i$ , in dB( $\mu$ V), provided by the  $i$ -th Laboratory ( $i = 1, 2, \dots, p$ , where  $p$  is the number of participating Laboratories) is compared with the value  $X$ , in dB( $\mu$ V/m), assigned by the Coordinator. The standard uncertainty of  $x_i$  is  $u_{x_i} = (U_{lab})_i / 2$  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  $\zeta_i$  of relative deviation between  $x_i$  and  $X$ :

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

The value of  $\zeta_i$  is calculated for each Laboratory and for each investigated frequency. Therefore as many values of  $\zeta_i$  will be calculated as the number of investigated frequencies (ten frequencies investigated, ten values of  $\zeta_i$  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  $\zeta_i$  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  $\zeta_i$  less than  $-3$  or greater than  $+3$ . If at all frequencies we have  $\zeta_i$  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 may be only  $x^*$  and  $U^*$  or both  $x^*$  and  $U^*$  and  $X_{cal}$  and  $U_{cal}$ , depending on the Option I or II chosen by the Laboratory (see §3).

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 13528:2015, clause C.3.1. 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  $\sigma$  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  $\Phi$  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 the note 2 in §7.7.3 of ISO 13528:2015). Therefore  $x^*$  and  $s^*$  are interpreted as the median and the standard deviation of the mean of the measurement results, respectively.

NOTE 3: The Coordinator compares the reference value assigned to the electromagnetic field generated by the Sample with the average of the measurement results provided by the Laboratories by using the performance statistic described in §7.8.1 of ISO 13528:2015 where  $x^*$  and  $s^*$  are obtained by using the robust analysis (Algorithm A) described in Annex C of the standard ISO 13528:2015. In this way the Coordinator can highlight the presence of a possible bias affecting the reference value (due to an uncorrected systematic effect) or affecting the measurement results produced by the Laboratories (because inherent in the standard measurement method).

## 6. Characteristics of the Sample

6.a) The Sample is an electromagnetic field source made of the combination of a battery operated comb generator and an antenna. The comb generator and the battery are embedded in the antenna. The shape of the Sample is cylindrical with approximate sizes 10 cm (base diameter) x 12 cm (height).



(a)



(b)

**Fig. 1:** (a) – Picture of the Sample; (b) – Picture of the Sample inside its case. Note that also the power supply and the loop probe for the verification of the Sample (see §7.a) are included in the case (three items: 1) Sample, 2) power supply, 3) loop probe).

6.b) The Sample is equipped with a button through which the Laboratory can turn on and turn off the comb generator. In order to turn on/off the comb generator press the button for at least five seconds. The (green) led in the button flashes when the comb generator is on.

6.c) When the Sample is turned on a single flash at regular time intervals of the led in the button indicates 50 MHz harmonic frequency operation. This is the operation mode to be selected. If the button is pushed again double flashes are emitted at regular time intervals which correspond to 25 MHz harmonic frequency operation. This mode of operation shall not be selected. Push again the button turning off the Sample and then push the button again to re-enter in the 50 MHz harmonic frequency operation mode (single flashes are emitted at regular time intervals).

6.d) Three hours of continuous and reliable operation of the comb generator are permitted by the fully charged battery. The comb generator automatically turns off when the charge level drops below the limit for reliable operation.

6.e) The Sample is equipped with a jack connector for battery recharge. The power supply is provided by the Coordinator. Three hours are needed to fully recharge the battery. During battery recharge the led intermittently flashes. If the led is continuously on then the battery is fully charged.

6.f) The comb generator does not require warm up prior to measurement.

6.g) The harmonics' spacing is 50 MHz and the first available harmonic in the frequency range from 30 MHz to 6000 MHz is at 50 MHz.

6.h) The Coordinator identifies the harmonics to be measured through their ordinal number and the approximate frequency value. For example: the 5<sup>th</sup> harmonic at approximately 250 MHz.

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

6.j) The combination of the lock is 183. Input the figures from top to bottom.

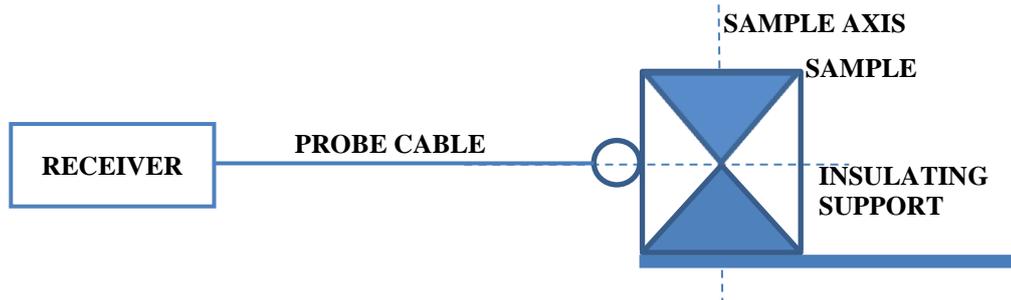


## 7. Measurement procedure

7.a) Radiated electromagnetic field measurement must be preceded by a preliminary verification of the correct operation of the Sample by using the magnetic field loop probe provided by the Coordinator, a short section of coaxial cable (length less than 1 m, not provided by the coordinator) and a receiver (spectrum analyzer or EMI receiver). The verification shall be as follows:

- Connect the probe to the input of the receiver through the short section of coaxial cable.
- Put the Sample on the same table used for radiated emission testing of table-top equipment.
- Turn on the Sample. The Sample shall be fed by its internal battery (the Sample shall not be connected with the power supply).
- Place the probe in the position sketched in Fig. 2. In particular the probe shall be positioned so that its cable is perpendicular to the axis of the Sample and at half height of the Sample. The plane of the loop shall be the one containing the probe cable and the axis of the Sample. The probe shall touch the plastic wall of the Sample.
- Use your hand to support the probe. No special care is required.
- Measure the power  $P_m$  that the probe delivers to the input of the receiver at the frequency of the 4<sup>th</sup> harmonic (about 200 MHz). Register the values of  $P_m$  (in dBm, rounded to the

integer) in Table 1. Calculate and annotate the deviation  $\Delta = P_m - P_{ref}$  (in dB, rounded to the integer).



**Fig. 2:** Verification of the Sample by using a magnetic field probe (the one provided by the Coordinator).

- Verify that:
  - The measured power  $P_m$  decreases by at least 20 dB rotating the probe by  $90^\circ$ ;
  - $-6\text{dB} \leq \Delta \leq 6\text{dB}$ .

**Table 1:** Verification of the power that the probe delivers to the receiver.

Harmonic #	Frequency MHz	$P_{ref}$ dBm	$P_m$ dBm	$\Delta$ dB
4	200	-52		

7.b) If the preliminary Sample verification is successful then the Laboratory can pass to the next step, i.e. the radiated emission measurement, otherwise the Coordinator is informed and the radiated emission measurement is temporarily delayed.

**7.c) Measurements performed above a reflective ground plane in the frequency range comprised between 30 and 1000 MHz (§7.3 of EN 55016-2-3:2017) at 3 or 10 m distance.**

The scope of the measurement is to obtain the best estimate and measurement uncertainty of the maximum electric field strength, in dB( $\mu\text{V}/\text{m}$ ), emitted by the Sample in vertical polarization at the specified horizontal distance from the Sample (3 or 10 m) at a height between 1 and 4 m above the reflecting ground plane, see Fig. 3. The reference of the Sample for distance measurement is the plastic wall of the Sample. The use of the same measuring instrumentation as that used for radiated emission tests in the corresponding frequency range is recommended. Measurement frequencies are reported in Table 2.

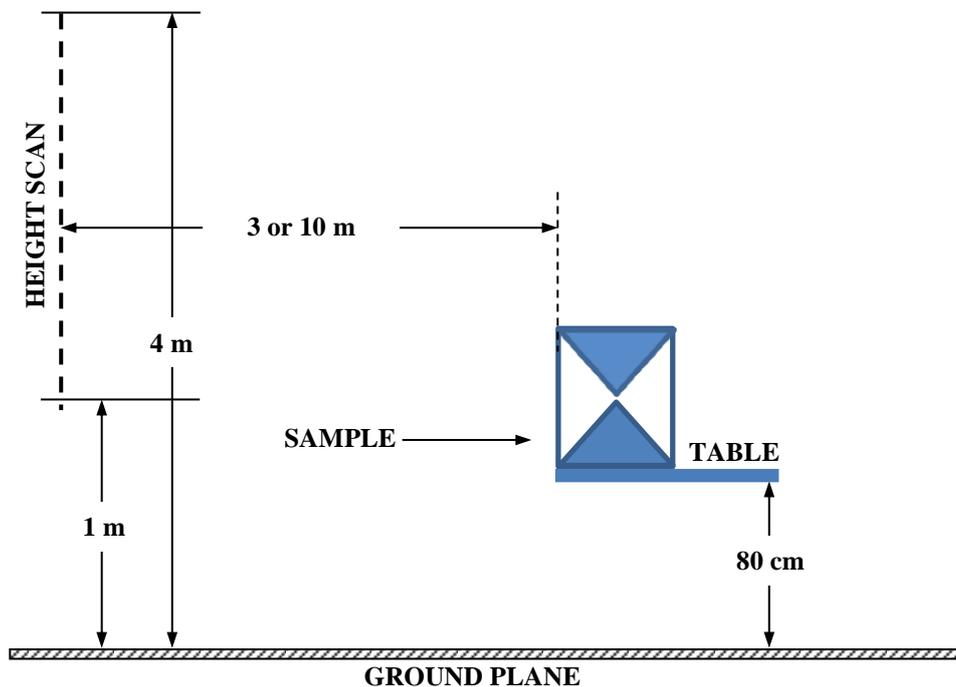


Fig. 2: Measurement layout for the 30 to 1000 MHz frequency range, semi-anechoic room (3 or 10 m).

**7.d) Measurements performed in a free-space environment in the frequency range comprised between 30 and 1000 MHz (§7.4 of EN 55016-2-3:2017) and between 1000 and 6000 MHz (§7.6 of EN 55016-2-3:2017) at 3 m distance.**

The scope of the measurement is to obtain the best estimate and measurement uncertainty of the electric field strength, in dB( $\mu$ V/m), emitted by the Sample at 3 m distance from the Sample in the boresight direction. The reference of the Sample for distance measurements is the plastic wall of the Sample facing the receiving antenna. The use of the same measuring instrumentation as that used for radiated emission tests in the corresponding frequency range is recommended. Measurement frequencies are reported in Table 2.

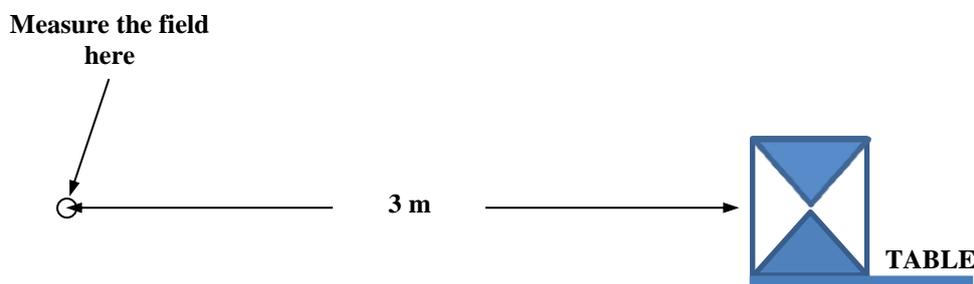


Fig. 3: Measurement layout for the 30 MHz to 1000 MHz and for the 1000 to 6000 MHz frequency ranges in a fully-anechoic room.

7.e) It is up to the Laboratory to charge the battery before preliminary verification and measurement. Handle the Sample with care.

7.f) The EMI receiver's detector shall be set to average.

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

- The estimate  $x$ , expressed in dB( $\mu$ V/m), of the amplitude of the selected harmonics;
- 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.h) The Laboratory may assign a different value of  $U_{lab}$  to each measured frequency.

## 8. Recording electromagnetic field measurement results

8.a) The measured disturbance voltage  $x$ , in dB( $\mu$ V/m), shall be rounded up to 1 decimal figure (e.g. 68,5 dB( $\mu$ V/m)). Measurement uncertainty  $U_{lab}$ , in dB, shall be rounded up to 2 significant figures (e.g. 3,2 dB).

8.b) The values of  $x$  and  $U_{lab}$  shall be recorded in the eighth and ninth column of Table 2, respectively. The Coordinator will complete the rest of the Table 2.

**Table 2:** Table to be used for recording the electromagnetic field measurement result  $x$  and its measurement uncertainty  $U_{lab}$ . Columns eight and nine 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	9	10
Band	Harmonic #	Frequency MHz	$X$ dB( $\mu$ V/m)	$U$ dB	$x^*$ dB( $\mu$ V/m)	$s^*$ dB	$x$ dB( $\mu$ V/m)	$U_{lab}$ dB	$\zeta$
C	1	50	-	-	-	-			-
C	3	150	-	-	-	-			-
C	5	250	-	-	-	-			-
D	10	500	-	-	-	-			-
D	15	750	-	-	-	-			-
D	19	950	-	-	-	-			-
E	40	2000	-	-	-	-			-
E	60	3000	-	-	-	-			-
E	100	5000	-	-	-	-			-
E	120	6000	-	-	-	-			-

8.c) The Laboratory fills columns eight and nine and sends a copy of Table 2 to the Coordinator. The Coordinator completes the rest of Table 2 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 D 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 E. Annexes D and E, once completed by the Laboratory and by the Coordinator, will be 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.

## **10. Remarks and complaints**

10.a) The Coordinator issued and made freely available this document 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 actually 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 are allowed to verbally contact (e.g. by phone) the Coordinator to represent 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 technical and scientific collaborators (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 shall keep confidential any information pertaining 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 shall 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 shall be revealed to the Accreditation Body under written permission of the accredited test Laboratory.

11.b) The Coordinator and his scientific and technical collaborators 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 could generate a situation of disparity in the successful completion in the proficiency test.

## Annex A

Compilare, firmare, stampare, scansionare e spedire per posta certificata a [dinfo@pec.unifi.it](mailto:dinfo@pec.unifi.it).

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**CONTRATTO TRA LA** Fare clic qui per immettere testo. **E IL DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE DELL'UNIVERSITA' DI FIRENZE PER L'EFFETTUAZIONE DELLA SEGUENTE PRESTAZIONE:**

**“Prova valutativa di misure di emissione radiata nell'intervallo di frequenza 30-6000 MHz”**

(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**

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il Dipartimento di Ingegneria dell'Informazione dell'Università di Firenze, c.f. e P.I. 01279680480, in seguito indicato “Unità Amministrativa”, rappresentato dal Prof. Enrico Vicario 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 misure di emissioni radiate nell'intervallo di frequenza 30-6000 MHz”, voce di tariffa “Partecipazione a circuito interlaboratorio tipo Scegliere un elemento.” (*selezionare “E” per Opzione I oppure “G” per Opzione II, vedi §3 dello schema*) approvata dal Consiglio dell'Unità Amministrativa in data 21 Marzo 2013.

#### **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 – Radiated emission measurements in the 30 MHz to 6000 MHz frequency range – Scheme of the proficiency test PTC(RE-30-6000-IV)” (in seguito 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 € Scegliere un elemento. (*selezionare 1500 per Opzione I oppure 2000 per Opzione II*) oltre IVA (oppure indicare il titolo di inapplicabilità dell’IVA).

Il pagamento verrà effettuato dal Committente:

- entro 30 giorni dal ricevimento di avviso di fatturazione cui seguirà regolare fattura; l’avviso di fatturazione e successiva fattura saranno trasmessi all’indirizzo pec [Fare clic qui per immettere testo.](#)
- mediante versamenti sul: codice IBAN IT88A0200802837000041126939 presso la Unicredit Banca S.p.A. a favore dell’Università di Firenze – Dipartimento di Ingegneria dell’Informazione (Cod. U.A. 58507) – con le seguenti modalità:
- in un’unica soluzione alla stipula del presente atto.

### **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 può essere estesa 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](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 [Fare clic qui per immettere testo.](#), 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 [Fare clic qui per immettere testo.](#) 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](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      Fare clic qui per immettere testo., lì Fare clic qui per immettere testo.  
(Fare clic qui per immettere testo.)

..... (firma)

p. l'UNITA' AMMINISTRATIVA      Firenze, lì Fare clic qui per immettere testo.

(Il Direttore Prof. Enrico Vicario)

..... (firma)

Per presa visione,

il responsabile dell'attività

(Prof. Carlo Carobbi)

..... (firma)

**AGREEMENT BETWEEN Fare clic qui per immettere testo. AND THE DEPARTMENT OF INFORMATION ENGINEERING OF THE UNIVERSITY OF FLORENCE FOR THE FOLLOWING SERVICE**

**“Proficiency test of radiated emission measurements in the 30-6000 MHz frequency range”**

(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**

Fare clic qui per immettere testo., tax identification number Fare clic qui per immettere testo., with premises in Fare clic qui per immettere testo. hereinafter referred to as “the Laboratory”, represented by Fare clic qui per immettere testo.

**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. Enrico Vicario, in the capacity of Department head (hereinafter individually a "Party" and collectively "the Parties")

**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 of conducted emission measurements in the 9 kHz to 30 MHz frequency range” price list item “Participation in interlaboratory comparison type Scegliere un elemento.” (*select “E” for Option I or “G” for Option II, see §3 of the scheme*) as approved by the Board of DINFO in March 21, 2013.

### **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 – Radiated emission measurements in the 30-6000 MHz frequency range – Scheme of the proficiency test PTC(RE-30-6000-IV),” (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 € Scegliere un elemento. (*insert 1500 if Option I is selected, or 2000 if Option II is selected*) 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 Fare clic qui per immettere testo.

All payments will be made by the Laboratory addressed to:

Bank name: UNICREDIT Banca SpA

Bank’s address: Via Vecchietti 11 – Firenze

Account holder: University of Florence - Department of Information Engineering - (cod. UA. 58507)

IBAN: IT88A0200802837000041126939

#### **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 *Fare clic qui per immettere testo*. 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.

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For the Laboratory

Fare clic qui per immettere testo., Fare clic qui per immettere testo.

(Fare clic qui per immettere testo.

..... (*signature*)

For the Department of Information Engineering

Florence, Fare clic qui per immettere testo.

(Prof. Enrico Vicario)

..... (*signature*)

Signature of acknowledgment of the Responsible of the service

Prof. Carlo Carobbi

..... (*signature*)

Annex C

**Proficiency test through interlaboratory comparison –  
Radiated emission measurements in the 30-6000 MHz frequency range**

**Name of the Laboratory (mandatory):** .....

.....

**Technical Responsible (mandatory)**

First name: ..... Last name: .....

E-mail: .....

Phone: .....

Cell phone (optional): .....

**Deputy of the Technical Responsible (optional):**

First name: ..... Last name: .....

E-mail: .....

Phone: .....

Cell phone (optional): .....

**Shipping address (mandatory):**

Address: .....

.....

ZIP Code: .....

City: .....

Country: .....

Date: ...../...../.....

**Test report issued by the participating Laboratory**

Laboratory: Name of the Laboratory

Laboratory Code: PTC(RE-30-6000-IV)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 eight and nine with the measured value  $x$  and the measurement uncertainty  $U_{lab}$ .

1	2	3	4	5	6	7	8	9	10
Band	Harmonic #	Frequency MHz	$X$ dB( $\mu$ V/m)	$U$ dB	$x^*$ dB( $\mu$ V/m)	$s^*$ dB	$x$ dB( $\mu$ V/m)	$U_{lab}$ dB	$\zeta$
C	1	50	-	-	-	-			-
C	3	150	-	-	-	-			-
C	5	250	-	-	-	-			-
D	10	500	-	-	-	-			-
D	15	750	-	-	-	-			-
D	19	950	-	-	-	-			-
E	40	2000	-	-	-	-			-
E	60	3000	-	-	-	-			-
E	100	5000	-	-	-	-			-
E	120	6000	-	-	-	-			-

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(RE-30-6000-IV)**

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](mailto:carlo.carobbi@unifi.it)

**to the participating Laboratory**

Laboratory: Name of the Laboratory  
 Laboratory Code: PTC(RE-30-6000-IV)LAB(#)  
 Address: Address of the Laboratory

Start and stop dates of the proficiency test:  
 Number of participants:  
 Date of measurements of the participating Laboratory:  
 Date of issue of this report:

**Test result**

The cells of columns eight and nine are filled in by the Laboratory, the other ones are filled by the Coordinator.

1	2	3	4	5	6	7	8	9	10
Band	Harmonic #	Frequency MHz	$X$ dB( $\mu$ V/m)	$U$ dB	$x^*$ dB( $\mu$ V/m)	$s^*$ dB	$x$ dB( $\mu$ V/m)	$U_{lab}$ dB	$\zeta$
C	1	50	-	-	-	-			-
C	3	150	-	-	-	-			-
C	5	250	-	-	-	-			-
D	10	500	-	-	-	-			-
D	15	750	-	-	-	-			-
D	19	950	-	-	-	-			-
E	40	2000	-	-	-	-			-
E	60	3000	-	-	-	-			-
E	100	5000	-	-	-	-			-
E	120	6000	-	-	-	-			-

**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

.....