Minutes of the 39th meeting of WG8 Task Force 2

held at: AFNOR
11 avenue Francis de Pressensé
93571 Saint-Denis la Plaine
France
on: Monday 28th, Tuesday 29th and Wednesday 30th January 2013

Participants:

Pascal ROUX	Convener
Reinhard MEINDL	Austria
Erich REISENHOFER	Austria
Michael STARK	Austria
Pierre BENET	France
Franck BRICOUT	France
Olivier CONET	France
Jean-Pierre ENGUENT	France
Stéphane JOBARD	France
Jean-Luc MERIDIANO	France
Romain PALMADE	France
Klaus FINKENZELLER	Germany
Florian PETERS	Germany
Peter RAGGAM	Germany
Hemy ITAY	Israel
Kenichi NAKAMURA	Japan
Maksimiljan STIGLIC	Slovenia
Jose Luis GEIJO-PEREZ	Switzerland
Walt BONNEAU	USA

OPENING OF THE MEETING

1. The convener opened the thirty-ninth meeting of WG8 Task Force 2 by welcoming all the participants. He expressed special thanks to AFNOR for the organisation of this meeting.

ROLL CALL

2. The roll call was not necessary as every delegate knew each other.

REVIEW OF THE MEMBERSHIP LIST

3. An attendance register was circulated during the meeting. The TF2 membership is mentioned in the document WG8 SD2. The regular delegates are requested to register as TF2 members (through their national bodies) to get access to the TF2 documents.

ADOPTION OF THE AGENDA

4. The agenda (document TF2 N760) was agreed with four additions:

- S(DESELECT) frame waiting time,
- Waveform adjustment during PICC reception test,
- Type A and Type B request commands presence in PCD polling sequence,
- EMD requirements for classes 2, 3, 4, 5 and 6.

APPROVAL OF THE LAST MEETING MINUTES

5. The minutes of the thirty-eighth TF2 meeting in New Orleans (document TF2 N759) were approved.

REVIEW OF AVAILABLE DOCUMENTS

6. The documents submitted before and during this meeting were as follows:

TF2 N759	Minutes of the 38th meeting of WG8/TF2 New Orleans, USA – 24th and 25th September 2012	(TF2 convener)
TF2 N760	Agenda of the 39th meeting of WG8/TF2 Paris, France – 28th, 29th and 30th January 2013	(TF2 convener)
TF2 N761	Comments on ISO/IEC 14443-3/Amd.2:2012 (TR0)	(France)
TF2 N762	ISO/IEC 10373-6 – Improvements on Annexes G & H	(France)
TF2 N763	Proposal for ISO/IEC 10373-6 Additional Test Methods for PICCs supporting Active and/or Passive Transmission	(NXP)
TF2 N764	Proposed text for test methods for PICCs supporting active and/or passive transmission	(NXP)
TF2 N765	Contribution on extended Hmax	(ACS)
TF2 N766	PICC transmission phase analysis	(NXP)

TF2 N767	Comments ISO/IEC 10373-6:2011 (PICC reception test)	(France)
TF2 N768	Maximum field strength measurements for new classes and low loading	(Bundesdruckerei)
TF2 N769	WD ISO/IEC 10373-6:2011/Amd.x — Identification cards — Test methods — Part 6: Proximity cards — AMENDMENT x: Frame with error correction	(Project editor)

FRAME ERROR DETECTION AND CORRECTION – TEST METHODS

7. The document TF2 N769 was presented by Erich Reisenhofer. This working draft was reviewed and edited, with the addition of PICC tests for the selection of frame format. The finalised working draft amendment to ISO/IEC 10373-6 was considered ready for CD ballot by TF2.

PICCS WITH EXTERNAL POWER SUPPLY

8. The documents TF2 N763 and N764 were presented by Michael Stark. The existing Reference PICCs producing passive load modulation need to be adapted to produce active load modulation, or new Reference PICCs need to be defined.

The necessity of a static loading effect was discussed, as well as the PICC field waveform (which is not defined in the standard). It was proposed to test two extreme cases of loading effects and PICC field waveforms for each class:

- the maximum PICC loading effect as currently defined in the standard together with a sinusoidal modulation waveform (the Reference PICC would have a "high" quality factor);
- the minimum possible PICC loading effect together with a square modulation waveform (the Reference PICC would have a "low" quality factor).

Action 1 Contributions to add active modulation in the Reference PICC circuit diagram

9. It was also proposed to authorise a large phase drift, only for Type A PICC transmission at a bit rate of *fc*/128 (OOK subcarrier modulation with Manchester coding). However, it was pointed out that, depending on their internal receiver design, some PCDs may tolerate this large phase drift while other PCDs may only tolerate the same phase drift as for the PICC transmission used for Type A at bit rates higher than *fc*/128 and for Type B (BPSK subcarrier modulation with NRZ coding). It was concluded that this topic belongs to the amendment 6 of ISO/IEC 14443-2 under CD ballot and should be dealt with by WG8.

10. The document WG8 N1066 was presented by Pascal Roux and the PICC field initial phase requirement was discussed. It was agreed that the Reference PICC field initial phase will vary for each PCD reception test, so that the test passes when the PCD successfully receives at least 10 (or more) consecutive Reference PICC responses, each with a different initial phase. The phase step and the minimum number of consecutive correctly received responses will be chosen so that the PCD reception is fully tested against PICC field initial phase (which may have any value as there is no requirement on this PICC parameter in the base standard).

11. The maximum load modulation amplitude test method was discussed and TF2 agreed that the PCD reception test should be done with the 6 Reference PICCs, all of them using active modulation. The PCD reception test with maximum load modulation amplitude test will be similar to the PCD reception test with minimum load modulation amplitude, i.e. it will also use various PICC field initial phases and phase drift.

12. The different possible phase drifts and the use by the Reference PICC of "unipolar" modulation (OOK carrier modulation by the subcarrier signal) or "bipolar" modulation (BPSK carrier modulation by the subcarrier signal) in PCD reception tests were discussed and the following PCD reception tests were agreed:

- for Type A at a bit rate of *fc*/128 (OOK subcarrier modulation with Manchester coding):
  - slow phase drift over the whole Reference PICC frame / bipolar modulation,
  - fast phase drift over each group of 4 or 8 subcarrier cycles / bipolar modulation,
  - very fast phase drift over each half period of subcarrier / unipolar modulation,
- for Type A at bit rates higher than *fc*/128 and Type B (BPSK subcarrier modulation with NRZ coding):
  - slow phase drift over the whole Reference PICC frame / bipolar modulation,
  - very fast phase drift over each half period of subcarrier / unipolar modulation.

These 3 or 2 tests, depending on the subcarrier modulation type, will be repeated:

- with positive and negative phase drifts,
- with various initial phases,
- for maximum and minimum load modulation amplitude tests,
- with all 6 Reference PICCs,
- in different positions of each operating volume.

13. The PICC transmission test was discussed. The whole PICC frame needs to be recorded in order to measure the PICC maximum phase drift in any part of the frame. If the minimum sampling rate of 500 million samples per second is used to record a 4096 byte frame at a bit rate of fc/128, 1 to 2 Gbytes of raw PCD field and PICC field data should be stored for processing. This may be a problem for such long frames.

Action 2 Contributions to propose a solution to measure the PICC load modulation phase drift which is compatible with current measurement instruments storage capacity

14. The document TF2 N766 was presented by Michael Stark. The Hilbert algorithm method previously proposed does not give PICC phase drift consistent results as the measured phase drift depends on the field strength. The I/Q-demodulation algorithm method gives much more consistent results.

Action 3 Contributions to check the PICC phase drift measurement method and optionally propose modifications

15. As no contributions has been received for one year on attenuation factors (Kin and Kout) for µSD and other formats, this topic will not be mentioned in next TF2 agenda.

16. It was agreed later in WG8 that test methods for parameters supporting active and passive PICC transmissions are necessary to resolve the comments on the CD amendment ISO/IEC 14443-2/PDAM6 on these parameters.

Michael Stark volunteered to be the project editor of the amendment to ISO/IEC 10373-6 on this topic.

IMPROVEMENT OF PICC AND PCD TESTS IN ISO/IEC 10373-6, ANNEXES G AND H

17. The working draft document TF2 N762 was presented by Stéphane Jobard and discussed by TF2 with the following main results:

- corrigenda are needed:
  - to add a margin on TR2 and Frame delay time PICC to PCD
  - to consider parity bit error as a transmission error
  - to allow a Type A PICC in ACTIVE* state to go to IDLE or HALT state or to continue a transaction in progress after receiving any Type B command
- no margin is added on bit boundaries as most current PCDs are accurate when transmitting characters ; the PICC reception of frames using bit boundaries limits will be tested using defined rise and fall times (Condition 1 defined in ISO/IEC 10373-6, 7.2.2.2.1, 7.2.2.2.2 and 7.2.2.3.1)
- most new tests correspond to existing base standard requirements which were not tested

The working draft of this amendment to ISO/IEC 10373-6 will be finalised during next TF2.

Stéphane Jobard volunteered to be the project editor of this amendment as well as the necessary corrigenda on the same topic.

Action 4 The working draft document will be updated by Stéphane Jobard and posted at least one month before next TF2 meeting

RFU VALUES AND MEANINGS IN WG8 STANDARDS

18. This topic was not discussed for lack of time. An ad-hoc Webex meeting will be organised to deal with this topic on 19th March 2013.

DEFINITION OF PCD HMAX TEST IN ISO/IEC 10373-6

19. The document TF2 N765 was presented by Pascal Roux, showing a worst case ratio of 1,5 between maximum unloaded PCD field strength and maximum loaded PCD field strength. It is considered as a reasonable worst case as the PCD antenna size was close to the Reference PICC 1 antenna size.

20. The document TF2 N768 was presented by Florian Peters, showing a ratio of 1,1 between maximum unloaded PCD field strength and maximum loaded PCD field strength. The PCDs antennas were significantly larger than the Reference PICC 1 antenna.

21. To let some flexibility on PCD design, it was agreed to define, for each class, a maximum unloaded PCD H_{max} (e.g. 11 A/m for "Class 1") instead of a maximum ratio between unloaded PCD H_{max} and loaded PCD H_{max}. (e.g. 1,5 for "Class 1" or for all classes).

For each class, the proposed method to measure the maximum unloaded PCD field strength is the following:

- find the maximum loaded PCD field strength position with the Reference PICC by finding the maximum voltage at CON3,
- measure the voltage on a "figure of 8" shape coil fixed as close as possible to the PCD antenna (see ISO/IEC 10373-6, 7.1.4.2, Note 2); this voltage is an image of the loaded PCD field,
- move the Reference PICC to the DUT position of the test PCD assembly and measure the maximum loaded PCD field strength by increasing the test PCD assembly field strength until the voltage at CON3 is the same as the one previously measured,
- measure the voltage on the "figure of 8" shape coil fixed to the PCD; this voltage is an image of the unloaded PCD field,
- compute the maximum unloaded PCD field strength from the maximum loaded PCD field strength and the ratio between the two values of the voltage on the "figure of 8" shape coil.

22. For PICCs with a loading effect at H_{max} less than the corresponding H_{max} Reference PICC loading effect, it was agreed that:

- the extended PICC H_{max} formula will be linear, based on the PICC loading effect measured on the test PCD assembly,
- both load modulation amplitude and EMD limits defined at H_{max} will be used in the "H_{max} - Extended H_{max}" field strength range.

23. TF2 agreed on the principle of these new PCD and PICC requirements despite loading effect possible variations due to commands processing in PICCs.

Florian Peters volunteered to be the project editor of an amendment to ISO/IEC 14443-2 on this topic. The maximum loading effect at H_{min} and the minimum loading effect at H_{max} requirements will be both defined in ISO/IEC 14443-2 (ISO/IEC 14443-1 will no more contain reference to loading effect tests defined in ISO/IEC 10373-6, but only reference to requirements in ISO/IEC 14443-2 or no reference at all).

Peter Raggam volunteered to be the project editor of an amendment to ISO/IEC 10373-6 on this topic.

Action 5 These two working draft amendments will be prepared by the project editors and posted before next TF2 meeting for finalisation during next TF2 meeting

R2 VALUES

24. Several experts mentioned R2 values at H_{min} in the 700 to 900 Ohms range for Reference PICC 6 despite a 900 to 1100 Ohms range defined in the standard.

25. A corrigendum on R2 range for Reference PICC 6 is needed. Peter Raggam volunteered to be the project editor of this corrigendum to ISO/IEC 10373-6.

26. Besides, it was acknowledged that R2 values at H_{max} need to be defined.

Action 6 Check R2 values at H_{max} for the 6 Reference PICCs

27. The step b) of the Reference PICC resonance frequency tuning procedure defined in ISO/IEC 10373-6, 5.4.3 needs to be corrected to indicate the use of calibration coil 1 when tuning Reference PICCs 1, 2 and 3 and of calibration coil 2 when tuning References PICC 4, 5 and 6.

TEST PLAN INCLUDING ALL PCD AND PICCS REQUIREMENTS DEFINED IN ISO/IEC 14443

28. This topic was not discussed for lack of time.

Action 7 Contributions to progress on this topic and finalise the test plan during next TF2 meeting

Action 8 A project editor is needed to prepare this technical report

S(DESELECT) FRAME WAITING TIME

29. The document TF2 N761 was presented by Stéphane Jobard. It was agreed to propose the following corrigendum on S(DESELECT) frame waiting time to be consistent with other frame waiting times:

In 14443-3:2011/Amd.2:2012, 7.1.6, replace the second dash:

— 65536/*fc* (~ 4,8 ms) for S(DESELECT) and S(PARAMETERS) blocks (see ISO/IEC 14443-4, 8.1);

with the following:

— 65536/*fc* − TR1 for S(DESELECT) and S(PARAMETERS) blocks (see ISO/IEC 14443-4, 8.1);

30. The possible value 0 of FWI (giving FWT = 256/*fs* = 4096/*fc*) was also discussed as it is a specific case where the PICC cannot use the maximum TR1 (200/fs) in order to respect the minimum TR0 (64/*fs*). It was agreed that the PICC shall take all TR0 and TR1 requirements into account and that no change on this topic is required in ISO/IEC 14443.

WAVEFORM ADJUSTMENT DURING PICC RECEPTION TEST

31. The document TF2 N767 was presented by Stéphane Jobard. The conditions under which waveforms are adjusted on the test PCD assembly may be one of the three following possibilities:

- with no load,
- with the Reference PICC of the same class as the PICC under test,
- with the PICC under test.

The first two options are more practical as the adjustment is only done once. But the third method is more logical as the PICC should receive the waveforms precisely defined in the standard. As there should not be much difference between these three options, TF2 agreed on the following:

- ISO/IEC 10373-6, 7.2.2 subclause will require the test conditions (waveforms) to be checked during the test with the PICC under test in DUT position and readjusted if not within the tolerances for at least one parameter.
- The Annex E procedure will be used to determine the test PCD assembly waveform parameters.
- The following absolute tolerances will apply:
  - for all timings (t_1, t_2, t_3, t_5, t_6, t_r, t_f): ± 1/*fc*
  - for overshoot Type A (h_{ovs}): ± 0,01 × (1-*a*)
    ($0 < h_{ovs} < 0{,}11 \times (1-a)$)
  - for overshoot Type B (h_f, h_r): ± 0,01 × (1-*b*)
    ($0 < h_r < 0{,}11 \times (1-b)$)
    ($0 < h_f < 0{,}11 \times (1-b)$)
  - for the modulation index *m*: ± 0,5 %
    (8 % < *m* < 14 %)
  - for the parameter *a*: ± 0,02
    ($0 < a < 0{,}6$)
- The general ± 5 % relative will apply for *H* (not to be specified).

TYPE A AND TYPE B REQUEST COMMANDS PRESENCE IN PCD POLLING SEQUENCE

32. The minimum time to get a REQA/WUPA and a REQB/WUPB from a PCD was discussed and the following was agreed:

- no specific requirement is needed when PCD field is off (e.g. for battery operated devices),
- when the PCD is polling, it shall send at least one REQA (or WUPA) and one REQB (or WUPB) in each period of 0,5 s duration, possibly with field shut-offs between polling commands.

It was agreed to propose the following addition in ISO/IEC 14443-3, Clause 5 (polling):

"The PCD shall not poll one single type for longer than 0,5 s without polling for the other type."

EMD REQUIREMENTS FOR CLASSES 2, 3, 4, 5 AND 6

33. Maximum EMD limit is currently defined only for "Class 1" PICCs. A maximum EMD limit for each class set approximately 20 dB below the corresponding minimum load modulation limit seems logical. However the noise level at high field strength is so high (because the sense coil signal increases) that even the Reference PICC EMD measured value is sometimes above the EMD limit.

With a noise standard deviation three times smaller than the EMD limit $V_{E,PICC}$, there should be statistically one problem every 162 periods of $t_{E,PICC}$. As the test procedure needs 10

consecutive positive tests, it is difficult to automatically pass an EMD test and a reduction of the maximum EMD limit would require a reduction of the noise floor.

Action 9 Contributions to confirm this EMD measurement problem at high field strength

Action 10 Contributions to improve the measurement method (at least for "Class 1") so that the values can be measured (not impacted by the test set-up noise)

Action 11 Contributions to propose EMD limits for each new class 2 to 6

Action 12 A project editor is needed for an amendment on this topic

PATENTS

34. No patent was declared by any participant on topics which were presented and discussed during this TF2 meeting.

ACTIONS FOR NEXT MEETING

35. See 8, 13, 14, 17, 23, 26, 28, and 33.

NEXT TF2 MEETINGS

36. The fortieth meeting will be held in Tokyo, Japan, in June 2013, on Monday 3rd, Tuesday 4th and Wednesday 5th.

The forty-first meeting will be held in Singapore, in September 2013, from Monday 23rd.

Distribution: WG8 and TF2 members

Pascal ROUX