Minutes of the 25th meeting of WG8 Task Force 2

held at: AFNOR
11 avenue Francis de Pressensé
93571 Saint-Denis la Plaine, France
on: 21st, 22nd, 25th, 26th and 27th September 2006

Participants:

Pascal ROUX	Convener
Michael GEBHART	Austria
Reinhard MEINDL	Austria
Ralph PRESTROS	Austria
Peter RAGGAM	Austria
Guangwen YAN	China
Wenfeng WANG	China
Jean-Paul CARUANA	France
Christophe CATALDO	France
Jean-Pierre ENGUENT	France
Jean-Pierre MESSA	France
Renke BIENERT	Germany
Claus FREYTAG	Germany
Michael HEGENBARTH	Germany
Wolfgang MEINDL	Germany
Mickey COHEN	Israel
Hemy ITAY	Israel
Hiroshi KARIBE	Japan
Hiroo SHIMIZU	Japan
Alan McHALE	UK
Francis CHRISTIAN	USA
Marty FRARY	USA
Kristopher KENDALL	USA
Mark KAMERS	Mastercard
David MAIN	Visa

OPENING OF THE MEETING

1. The convener opened the twenty-fifth 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. During the roll call, the convener asked all the participants to introduce themselves and to indicate their affiliations.

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 on the WG8 website.

ADOPTION OF THE AGENDA

4. The agenda (document TF2 N458) was agreed with the following addition:

- Very high data rates.

APPROVAL OF THE LAST MEETING MINUTES

5. The minutes of the twenty-fourth meeting in Vienna (document TF2 N457) were approved.

REVIEW OF AVAILABLE DOCUMENTS

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

TF2 N459	ISO/IEC 10373-6 Modulation index & waveform test - Measurement procedure improvement proposal	(Infineon)
TF2 N460	ISO/IEC 10373-6 Load modulation test for PCDs - New Reference PICC circuit proposal	(Infineon)
TF2 N461	Very High Data Rate Contactless Interface	(France)
TF2 N462	Germany's position on the revision procedure of ISO/IEC 14443 and 10373-6	(Germany)
TF2 N463	ISO/IEC 14443-2/3 Margin Concept	(Infineon)
TF2 N464	ISO/IEC 14443, ISO/IEC 10373-6, Multiple PICCs in one operating field	(Infineon)
TF2 N465	Proposal for changing tr max and tf max parameters of Type B modulation waveform in ISO/IEC 14443-2:2001/AMD1	(Atmel / ST)
TF2 N466	ISO/IEC 14443-2 - Ambiguities on waveform definitions	(Infineon)
TF2 N467	Improvement proposal on Type A High Bit Rate Waveform Testing	(Infineon)
TF2 N468	ISO/IEC 14443 Limits for load modulation amplitude	(Infineon)

TF2 N469	Noise Level Definition - Proposal for Measurement Methods	(Infineon)
TF2 N470	WD ISO/IEC 14443-3 (Revision) – Ambiguities	(Infineon)
TF2 N471	WD ISO/IEC 14443-4 (Revision) – Ambiguities	(Infineon)
TF2 N472	ISO/IEC 10373-6:2002/AM1 – Ambiguities	(Infineon)
TF2 N473	Further comments on WD ISO/IEC 14443-2 (Revision)	(Infineon)
TF2 N474	Received comments on WD ISO/IEC 14443-3 (Revision)	(project editor)
TF2 N475	Position of TF2 on margins in 14443-2 and 14443-3	(TF2)
TF2 N476	Proposal for noise definition of card	(Watchdata)
TF2 N477	G&D comments on WG8 N 1188, WD ISO/IEC 14443-3 (Revision)	(G&D)
TF2 N478	G&D comments on WG8 N 1211, WD ISO/IEC 14443-4 (Revision)	(G&D)
TF2 N479	Comments from Pascal Roux on the G&D comments in WG8 N 1246 and WG8 N 1247	(ACS)
TF2 N480	Contribution from Mickey Cohen on the removal of the probabilistic anticollision method from 14443-3 and 14443-4	(Shanit)
TF2 N481	DIN Contribution on ISO/IEC 14443 & Noise	(Germany)
TF2 N482	Comment on WD 14443-3, Clause 7.4.8, HALT State	(Mastercard)
TF2 N483	Note to New ref. PICC with Integrated Pickup Coil, Annex I	(OTI)
TF2 N484	ISO/IEC 14443-4 Test command contribution	(OTI)
TF2 N485	Feedback on proposed resolution for issue raised in TF2 N482 - Issue with section 7.4.8 in ISO/IEC 14443-3	(Mastercard)
TF2 N486	DRAFT TEXT on: "Informative text and proposed amendments relating to Multiple PICCs in the field"	(project editor)

7. The documents submitted just after this meeting were as follows:

TF2 N487	WD ISO/IEC 14443-2 (Revision) - Identification cards - Contactless integrated circuit(s) cards - Proximity cards - Part 2: Radio frequency power and signal interface	(project editor)
TF2 N488	WD ISO/IEC 14443-3 (Revision) - Identification cards - Contactless integrated circuit(s) cards - Proximity cards - Part 3: Initialization and anticollision	(project editor)
TF2 N489	This document	(TF2 convener)
TF2 N490	NXP Contribution into SC17/WG8 on multiple PICCs	(NXP)
TF2 N491	Multiple PICC in operating Field - Simulation results	(Infineon)

VERY HIGH DATA RATES

8. The document TF2 N461 was presented by Pascal Roux. The following comments were made:

- the two subcarriers (*fc*/16 and *fc*/8) could be allowed in the standard so that the PCD choose the one it prefers to receive as it is easy for all PICCs to implement both subcarriers;
- 180° phase shifts in PCD to PICC communication may cause problems to comply with regulations; maybe the PCD should be shielded: whit is the scope of use of the very high data rates.

MULTIPLE PICCS IN A SINGLE OPERATING FIELD

9. The document TF2 N491 was presented by Ralph Prestros. The stacking of PICCs was simulated and it was shown that:

- 3 stacked PICCs tuned to 15 MHz would need 9 A/m to get 6 V DC (corresponding to 2 A/m when tested independently);
- with 7 A/m, 3 stacked PICCs tuned to 16 MHz and needing 10 mW to operate may be powered but not 4 stacked PICCs, whatever their resonance frequency;
- a PCD may be strongly detuned if such a stack of 3 PICCs is close coupled with its antenna
- if the PICCs need only 1 mW, the situation is similar.

The PICC clamping was not included in this simulation and may help the other PICCs in the stack. This will be studied in next simulation from Infineon. When they are stacked, real PICCs present a better behaviour in front of a PCD. Jean-Paul Caruana will also prepare a contribution before next TF2 meeting.

10. The document TF2 N464 was then presented by Ralph Prestros. The proposed parameters are dependent on the number N of PICCs and correspond to existing parameters when N=1. PCDs would be tested with N "worst case reference PICCs" and be declared ISO/IEC 14443 compliant "up to N PICCs" (N defined by the PCD manufacturer). PICCs would be tested together with N-1 "worst case reference PICCs".

Three tests were discussed for PICCs:

1. the non modification of the local field,
2. the PICC ability to operate with "extended" modulation parameters (e.g. with a modulation index < 8% or > 14%),
3. the PICC ability to operate together with "worst case reference PICCs.

TF2 agreed on test No. 1, with two possible methods: either with a calibration coil very close to the DUT or with the two sense coils of the test PCD assembly (probably better and more stable for "relative" measurements).

Tests No. 2 and 3 may be redundant with each other. No consensus was reached to choose 2 or 3 or both.

Worst case load modulation: when several type A PICCs answer simultaneously there is a (theoretical) risk of cancellation of the load modulation because each PICC load modulation angle is free and because the sentence "The bit period shall start with the loaded state of the subcarrier." in ISO/IEC 14443-2:2001, 8.2.4 cannot be verified. In practice, the complete cancellation should be very rare, but the vectorial sum of several load modulations may give a weak resulting signal.

For type B PICCs, the same risk exists but the anticollision procedure may guarantee the PICCs detection (if they support the Slot-MARKER command).

In addition, Hemy Itay mentioned possible problems due to capacitive coupling between very close PICCs.

11. The document TF2 N490 was then presented by Renke Bienert. Two approaches are possible for the e-visas antenna size:

1. antenna size > class 1 antenna
2. antenna size < class 1 antenna

NXP idea is that the perfect stacking of several e-visas cannot be prevented, so it is better to use large antennas, tune them much above 13,56 MHz and therefore get more energy in case of stacking. TF2 agreed that the coupling between e-visas should be minimised. If large antennas are standardised a new test setup may be needed. Comments on NXP results are welcome.

12. The project editor will prepare a working draft with PCD and PICC requirements for:

- field strength,
- communication PCD to PICC,
- communication PICC to PCD,

and associated test methods. The working draft introduction will emphasize the context and the difficulties. Contributions are welcome.

REVISIONS OF 14443-2, 14443-3, 14443-4

13. The document TF2 N462 was presented by Michael Hegenbarth. On the one side the present standard with its amendments is difficult to read, so a clean version should be balloted as soon as possible; on the other side, many improvements have just been proposed and should be included in current working drafts. The second option was finally chosen by TF2, with request that the technical improvements are clearly identified.

ISO/IEC WD 14443-2

14. The document TF2 N463R1 was presented by Peter Raggam. The main problem is that Reference PICCs are different from DUT (which are very various).

The margin concept was discussed in detail. Margins should not be mixed up with measurement errors. Measurement errors are linked with test methods and tools. Some test labs may use cheap and not very accurate tools when the tested parameter is far from the limit (and expensive and accurate tools when the tested parameter is close to the limit).

Margins should cover at least production variation and products ageing. They will be added in the base standard when they are easy to implement and when the test is not totally representative of the reality (e.g. H_{min}). For H_{min}, a warning will state that the margin may be insufficient in some specific cases.

A general principle was proposed for margin definition: the sender parameters are not modified and the receiver is more tolerant.

TF2 proposed the following field strength limits:

- PICC: H_{min} = 1,5 A/m and H_{max} = 7,5 A/m
- PCD: H_{min} = 1,75 A/m and H_{max} = 7 A/m

15. The document TF2 N468 was then presented by Peter Raggam. At high field strength most PICCs produce a load modulation which is much above the present limit (except if their antenna is very small). TF2 agreed to change the load modulation limit to $22/H^{0,5}$ for the PICC and $18/H^{0,5}$ for the PCD. Additionally it was agreed to allow the PICC lower side band level to be below the limit provided that the average between the two side bands levels is above the limit.

Several other parameters were debated; the working draft ISO/IEC WD 14443-2 is the result of TF2 discussions.

16. The document TF2 N466 was then presented by Peter Raggam. As some extreme values never exist simultaneously (e.g. minimum fall time with maximum rise time) TF2 agreed to remove such possibilities from the standard.

Overshoots for type B PCD modulation: Infineon proposed to reduce the authorised overshoot when t_r/t_f are close to the maximum. This is to be checked on existing PCDs.

17. The document TF2 N465 was then presented by Christophe Cataldo. A long discussion took place about type B PCD modulation limits (modulation index, rise and fall times) and testing conditions. Because PICCs are usually more tolerant at high field strength and because PCDs modulation waveform may be modified by a PICC in close coupling, it was agreed to define different modulation index limits for low and high field strength. It was also agreed that PCDs shall be tested at all supported bit rates in case their antenna Q factor changes according to bit rate.

18. The document TF2 N473 was then presented by Peter Raggam. The two technical proposals to clarify the operating volume/distance were accepted after slights modifications. The final wording is in the document TF2 N473 R1.

19. The document TF2 N475R1 was presented by Peter Raggam (on the last meeting day) as a summary of all the discussions. Margins on time t_1 in PCD type A modulation were discussed at length. Many PCDs use 40/*fc* for the (digital) pause length at *fc*/128 bit rate and therefore margins on PICC reception may be useless. However, present limits at *fc*/128 bit rate are 2 to 3 µs, i.e. more than 40/*fc*, so a small margin already exists. In conclusion it was decided to request contributions on a recommended value for t_1 at all bit rates.

ISO/IEC WD 14443-3

20. Margins on timings were discussed at great length. Most delegates were in favour of adding some margins on timings. A general margin (100/*fc*) may be used unless otherwise specified.

Type B SOF and EOF limits were discussed: 10 to 11 etu is difficult to produce if only an integer number of etu can be produced. For both PCD to PICC and PICC to PCD directions, the following limits were finally agreed:

- sender: 9,9375 to 11,125 etu at low state then 1,9375 to 3,125 etu at high state (SOF only);
- receiver: 9,875 to 11,25 etu at low state then 1,875 to 3,25 etu at high state (SOF only).

In addition, the global SOF (12 to 14 etu) timing will no more be defined because redundant.

Besides, the PICC SOF/EOF measurement cannot be very accurate so a note will tell the labs to consider these PICC timings compliant unless proven non-compliant.

21. The document TF2 N470 R1 was then presented by Wolfgang Meindl.

The NVB proposal was agreed (to be checked by Reinhard Meindl).

The UID content and PUPI generation proposals were agreed.

The coding of AFI proposal was rejected; "unless defined in table 14" will be added after "Sub-family codes different from 0 are proprietary" in last paragraph. Additional lines for Y=1 and Y=2 will be added.

The extended ATQB proposal was withdrawn.

The DCOR TR2 will be included.

The tolerances on bit boundaries at all bit rates were discussed with the following result (to be checked):

- PICC to PCD: no more tolerance on bit boundaries
- PCD to PICC, falling edge:
  - +/- 8/*fc* at *fc*/128
  - +/- 1/*fc* at *fc*/64, *fc*/32 and *fc*/16
- PCD to PICC, falling edge:
  - +/- 8/*fc* at *fc*/128
  - +/- 4/*fc* at *fc*/64
  - +/- 2/*fc* at *fc*/32
  - +/- 1/*fc* at *fc*/16

The tolerance on Frame Delay time PCD to PICC was discussed. In the present sentence "The FDT tolerance is in the range of -0 to +0,4 µs (derived from t4 defined in ISO/IEC 14443-2:2001, Figure 3).", the text in parenthesis will be deleted and the measurement will be done from the beginning of the PCD rising edge. The tolerance -0 to +0,4 µs is preserved.

22. The document TF2 N474 was presented by Reinhard Meindl. Here below are the TF2 decision on each comment on WD 14443-3.

6.2.4: the proposal was agreed (Request guard time also applicable to WUPA command).

6.3, figure 7: a dotted line will encircle "RATS", "PROTOCOL" and "DESELECT", with legend "ISO/IEC 14443-4". No "Else" arrow will be added because transition rule are defined not defined in this document but in part 4.

6.5.2.1: the problem is complex as collisions in ATQA may occur on any bit and therefore the PCD cannot really know which PICCs are in the field (compliant or not with present standard or with future version defining RFU bits). So TF2 agreed not to change the text in document WG8 N1188 until RFU are defined.

6.5.3.4, table 9 (1st comment): the proposal was agreed (when b3 is set to 1, all other bits of SAK shall be set to 0 to avoid different CRCs and therefore a collision on the SAK CRC byte).

6.5.3.4, table 9 (2nd comment): the proposal was rejected (ISO/IEC 14443-4 is not included in ISO/IEC 18092 which defines another protocol).

7.10.7: the "Higher layer INF" field is used in some cases, so it is kept in the text. However the allowed PICC answers to a valid ATTRIB command (valid CRC, valid PUPI…) must be clarified. The following rules are proposed:

- If the valid ATTRIB command includes no Higher layer Command the PICC shall answer with no Higher layer Response;
- If the valid ATTRIB command includes a Higher layer Command the PICC
  - may answer with a valid Higher layer Response;
  - may answer with a Higher layer Response indicating that the higher layer command is not supported;
  - may answer with no Higher layer Response (to be checked by TF2 experts)
  - shall not stay mute.

23. The document TF2 N480R1 was presented by Mickey Cohen. This document includes two proposals to improve type B initialisation and anticollision:

1. suppression of the probabilistic anticollision method, as it seems that all type B PICCs compliant with ISO/IEC 14443-3 support the Slot-Marker command;
2. addition of a new "Quick-Answer" command to allow simple PICCs both to always answer (without waiting for a Slot-Marker command) and not to disturb the anticollision process of other type B PICCs.

The decision to integrate or not these two modifications in ISO/IEC WD 14443-3 will be taken during next TF2 meeting.

24. The document TF2 N482 was presented by Mark Kamers. The problem will be resolved by adding "for processing" after "The PICC shall respond only to a WUPB Command which brings it back to the IDLE State". Thus the first WUPB will be processed by the PICC.

In addition the type B state diagram is not precise enough. The project editor will propose a new type B state diagram by next TF2 meeting (see TF2 N485).

ISO/IEC WD 14443-4

25. The document TF2 N471 was presented by Wolfgang Meindl.

The "PICC rules for RATS" proposal was agreed.

The PICC block numbering rule D was discussed at great length. Because the existing standard may be interpreted in two different ways, some existing PICCs detect PCD block numbering errors and some other PICCs do not detect these errors. Many options were discussed:

- mandatory block number checking and error detection (with associated test methods, i.e. scenarios 53 and 54 kept);
- recommended block number checking and error detection (with no mandatory associated test methods, i.e. scenarios 53 and 54 optional or removed);
- two possibilities allowed (no test, i.e. scenarios 53 and 54 removed);
- neither block number checking nor error detection (with associated test methods, i.e. scenarios 53 and 54 modified).

The chosen option is the third one and will be written as follows:

"Rule D. When an I-block is received, the PICC shall toggle its block number before sending a block.

Note The PICC may check if the received block number is not in compliance with PCD rules to decide not to toggle its internal block number nor send a response block."

Test scenarios 53 and 54 will be removed from ISO/IEC 10373-6 Annex G.

The PICC presence check was then discussed and TF2 agreed to propose a new wording for subclause 7.5.5:

"The following methods may be used to check the presence of a PICC at any time including before any I-block exchange.

The PCD shall not check the presence of a PICC until the current pair of command / response has been completed or if the frame waiting time is exceeded with no response."

26. The document TF2 N478 was presented by Reinhard Meindl. It was agreed that sending PPS with no PPS1 byte is useless. But this possibility is included in ISO/IEC 7816-3 and therefore ISO/IEC 14443-4 should be consistent with it. So it was agreed not to change ISO/IEC WD 14443-4 nor ISO/IEC 10373-6, Annex G, scenario 17.

Noise

27. The document TF2 N476 was presented by Guangwen Yan. A maximum PICC noise level of 0,57 mV peak (with same measurement method as the subcarrier) was proposed for any field strength between H_{min} and H_{max}.

28. The documents TF2 N469 and TF2 N481 were presented by Peter Raggam and Renke Bienert. As PICC consumption variations are seen as load modulation it was proposed to guarantee a minimum time with little noise just before the PICC transmission. This time would allow the PCD to recover from any reception error due to the PICC noise and be ready to receive the real PICC response. Before this "guard time", the noise could be as large as the PICC load modulation. If this proposal is agreed, the PCD shall wait for a valid PICC answer until the end of FWT, even if an answer with error (parity, CRC…) has been received.

29. As a conclusion on noise topic it was proposed that the three contributors give (by end of November 2006) guidelines for additional PICC noise measurements so that TF2 experts may give some measurement results during next TF2 meeting.

IMPROVEMENT OF TEST METHODS AND TEST TOOLS

30. The document TF4 N37 was presented by Francis Christian. The discussion results are:

- 8.2 Resonant frequency of PICC: it was once again agreed that the PICC resonance frequency is too complex to be specified (partly because there are several different chips on the market);

- 9.3 Continuous operating range: contributions are requested on "communication holes" problem, how to test them between H_{min} and H_{max} and whether they should be forbidden or simply advised against. TF2 agreed that at least note should mention them;
- 9.5.1: TF2 must redefine PCD waveform shapes and their testing;
- 9.5.2: The manufacturer specified temperature should be added in some PCD tests;
- A1 Definition of the Reference PCD: the Reference PCD must be described in detail (amplifier, attenuator…) but the test PCD assembly must be stabilised first in accordance with new tests; contributions are welcome;
- B.3 PICC test command(s): contributions are requested (interest of a test command, proposed definition…).

31. The document TF2 N483 was then presented by Hemy Itay. Annex I Reference PICC may show some problems:

- coils misalignment: if the symmetry is not perfect and if baluns are added, the result is worse; common mode chokes are not recommended;
- zero coupling between the two coils: there was a discussion to know whether the inhomogeneous PCD field changes the zero coupling factor between the two coils or whether this coupling factor was only dependent on the Reference PICC coils geometry; contributions are welcome to clarify this issue; anyway, TF2 agreed that the 0,8mm thickness may influence the coupling factor and therefore must be observed; the coupling factor between the two coils should be measurable;
- there are capacitive coupling effects which may cause problems; they should be measured to decide if the tool and/or the method must be improved; in particular a resistor could be connected with L2 to reduce capacitive coupling effects; this would cause an additional load to the PCD but the Reference PICC has anyway to load the PCD;
- the measured waveform (so the harmonics) depends if the Reference PICC is flipped over.

32. The document TF2 N459 was then presented by Peter Raggam. The PCD test could be improved to emulate the various real PICCs. The 6 V DC voltage could be used to define the Class 1 operating volume, and a 3 V DC voltage could be used to define the ISO/IEC 14443-2 operating volume.

33. The document TF2 N460 was then presented by Peter Raggam. Two technical comments were made:

- Dz parasitic capacitor may equivalent to C3;
- A 50 Ω resistor can be added on the right side of CMF2.

Two procedures are possible with this tool:

1. "Go – No Go": the tool is calibrated first, then put in the right place in PCD operating volume;
2. "Sensitivity measurement": the tool signal is reduced to find the PCD reception limit, then measured on the Test PCD assembly.

34. The document TF2 N467 was then presented by Peter Raggam. TF2 agreed on the principle of these modifications but ISO/IEC 14443-2 must first be stabilised before precise test values are finalised.

35. The document TF2 N472 was then presented by Wolfgang Meindl:

- the UID (type A) or PUPI (type B) may change when the PICC is reset; contributions are requested to resolve the testing issue created by this possibility;
- a test to verify that the PICC switches back to fc/128 bit rate after a DESELECT command will be added in ISO/IEC 10373-6.

36. The document TF2 N484 was then presented by Mickey Cohen. There was no consensus to standardise a test command because for security reasons some PICC operating systems will not implement any additional command.

ACTIONS FOR NEXT MEETING

37. See 9, 12, 19, 29, 30, 31 and 35 above.

NEXT TF2 MEETING

38. The twenty-sixth meeting will be held in San Diego, USA in January 2007 from Tuesday 23rd to Friday 26th.

Distribution: WG8 and TF2 members

Pascal ROUX