

**Minutes: TC-10 Subcommittee on ADCs**  
Mitre Corp., Boston, MA – Sept. 30, Oct. 1, 1999

Attendance: Eric Blom  
Philip Green  
Fred Irons  
Dan Kien  
Tom Linnenbrink  
Tom Meyer  
Sureshbabu  
Steve Tilden

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Thursday, September 30, 1999:

- Steve announced that in order to vote on IEEE Standards, one must be a member of the IEEE Standards Association. He passed out forms to those who needed them. This membership costs another \$10.
- Steve told the group that we have to submit a draft by mid December and we have been told that our subcommittee will not be given any further extensions. Once the draft is submitted, it is distributed to the balloting committee.
- The DYNAD project (ADC/DAC Standard) : This was a funded project and the group has written their final report. We should look carefully at it for suggested improvements to 1241. Some people noted that it seemed to read quite a bit easier than 1241.
- Review of IMTC99: Special session was well received. We have general support to promote 1241 and it is important to note that we do not have to merge the DYNAD work with 1241. However, we anticipate looking carefully at their work and incorporating improvements where applicable.
- IMTC2000 – Baltimore, MD: May 1-4, 2000. Abstracts due October 14, 1999 and Dan Kien noted that the abstract requirements were 2-3 pages with figures. It is nearly equivalent to completing the paper.
- Next meeting of 1241 subcommittee will be late January, 2000, in Boulder. When a draft is sent out for balloting, the committee has only 60 days to respond. We should have some feedback by then.
- IMEKO/EUPAS2000 in Vienna, Austria will be September 25-28, 2000. We hope to have 1241 representation.

Revision discussions:

- Eric Blom: IMEKO#10 under General Technical Remarks: Eric proposed a section defining BWSNR and SSBWSNR. Fred Irons will review and consider where to insert this material in clause 4.5. Fred Irons has also been asked to write a test method for SINAD in the frequency domain using DFTs.
- Eric Blom: Proposed additional Definitions: Small Signal Bandwidth and Power Bandwidth. This is still an open issue. Eric's point is that at large output, the frequency at which the ADC output is down 3 dB may be well above the point where the ADC begins failing because of missing or spurious codes. In general the group felt that some guidance might be included, but that a new definition for Power BW was probably too much.

Assignments:

Looking back at the Oct. '97 minutes, we discussed assigning ownership for individual sections.

1. Tom Meyer
2. Steve Tilden
3. Eric Blom
- 4.1 Fred Irons
- 4.2 Sureshbabu
- 4.3 Steve Tilden
- 4.4 Tom Meyer
- 4.5 Fred Irons: Make primary method frequency domain and secondary the time domain.
- 4.6 Dan Knierim
- 4.7 Dan Knierim
- 4.8 Tom Linnenbrink: Clause is considered done, but any corrections should be reported to Tom.
- 4.9 Dan Kien will take on responsibility for moving this discussion of clocking to the front under Test Conditions and/or in definitions.
- 4.10 Bryan Waltrip from NIST will review this section. It was given a lot of attention by the IMEKO review.
- 4.11 Dan Kien will correct this section. The main problem is that the test methods are embedded throughout, coupled with definitions. Need to rearrange.
- 4.12 Eric Blom will review. We think it is basically a plug from 1057 and will need little modification.
- 4.13 Tom Meyer will own this section.
- 4.14 Bryan Waltrip will review this section. We consider it complete, but it has not been scrutinized.
- 4.15 Dan Kien will be responsible for moving this into definitions.
- 4.16 Bryan Waltrip will review this section on Power Supply parameters.

Annex B: Sureshbabu will review this section and respond to the IMEKO issues raised regarding this annex.

DYNAD has published their preliminary draft: "Methods and draft standards for the DYNAMIC characterisation and testing of Analogue to Digital converters." We are encouraged to read for possible improvements to 1241.

IMEKO Review: Our subcommittee received an extensive review from the IMEKO group which included General Comments, General Technical Remarks, and several pages of tabular feedback referenced by page or section. Assignments were made for all of these elements at a prior meeting. We went over these assignments to make sure the assignments were appropriate.

General Comments:

1. Done
2. Steve Tilden will appropriately fix references.
3. Done
4. Tom Meyer submitted corrections. Inserted.
5. Tom Meyer submitted a sentence to add to clause 1.3.3. Inserted.
6. We feel that we are only referencing three basic instrument setups and further reduction is not necessary.
7. As in 7, we feel that three setups is appropriate.
8. We will focus on general structure editing later.
9. Confusion on IEEE style. We are doing this. (Steve Tilden will sort out what goes in references and what goes in bibliography.)
10. We feel that table 1.4.4 accomplishes this requested linkage of test procedures. The DYNAD publication includes a table that is very similar. Phil Green will consolidate the two tables and send to Babu for review.

General Technical Remarks:

1. Static/Dynamic clarification for parameters: Tom Meyer has responded with some wording for clause 1.2. There is still some need for clarification.
2. We agree.
3. Fred Irons has agreed to write up a DFT version of SINAD.
4. Fred Irons will address this while writing the DFT for SINAD.
5. Eric Blom will add a definition of decimation and Dan Kien will review.
6. Dan Kien will add a statement in clause 4.1, general test methods.
7. Phil Green will insert these in 1.4.
8. This is addressed in the rewrite of 4.1 done by Dan Kien. Richard Elder will review this.
9. Steve Tilden will find the paper and determine if this should be included.
10. This will be resolved by Eric Blom who will write up something that allows the extraction of this parameter, dBFS/footHz.
11. Steve Tilden will email Arpaia requesting further clarification on this and item 12.

Technical remarks table:

We quickly reviewed the table to see if assignments were all made. Some changes were made in preparation for Friday's meeting.

Friday, October 01, 1999:

Assembled at 9:15 AM at MITRE

- Tom Meyer emphasized the need to accumulate figures in electronic form. Figures sent to him can be regenerated in VISIO to make the figures editable and insertable.
- Tom Meyer noted that the IMEKO feedback raised the old "mid-tread" vs "mid-riser" interpretation conflict. IMEKO says a standard can't have two interpretations. Tom believes he can generate some verbage to accommodate the ambiguity. None of the calculations such as DNL, INL are ambiguous. The tests in the standard are unambiguous.
- Steve Tilden has agreed to take over the monitoring of our responses to the IMEKO review. Phil Green will provide the IMEKO review document to Steve. Steve will add a column for a sequential reference for each assignment and a column to monitor the status of the assignments.
- We went through the May '98 Minnesota minutes and checked on status of assignments.
  - **(Fred Irons and Kan Kien)**John D. will write a test method for SNHR 4.5.2
  - (deferred) Fred I. will check with Allan Belcher re patent comment for PRBS which looks interesting to add to the standard if clear of patent limits. Does he have example plots with data?
  - **(Eric Blom and Ian Mazsa)**
  - Eric B. will take a shot at sinewave frequency response test method
  - **Notes to Phil G.** Remove date and clause numbers to Std 181 & 194, e.g., in 4.6.4. Check that all references match the printed listings. Update working group (? not clear who is supposed to do this).
  - **(Steve Tilden will contact Dan about doing this.)**Dan Knierim owes figure for aperture width. Note: Phil may already have revised figures, but we have not solved the figure editor problem yet. An important issue here is what software/processes do we want to use, especially in regards to being able to set fonts uniformly on all figures and who wants to take responsibility for this part of the standard
  - **(Dan Kien with review by Tom Meyer.)**Steve T. will rewrite 4.11 with review from Tom M.
- We went through assignment notes in September '98 minutes.
  - **(Brian Waltrip agreed to do this.)**Eric B. will look for reference on method to measure differential input impedance.
  - **(Not reassigned.)**Dave H. will check out other definitions and bring back to next meeting.

- **Phil.** It was suggested that the document be searched for the string "under test". It is used for "ADC under test". The committee felt that the phrase could either be replaced with DUT (standard lingo) or delete altogether the use of under test where appropriate.
  - **(Eric Blom)** pg8. appropriate place insert new definition: common-mode-range:(lift from IEEE Std, Ref 3)
  - **(Tom Meyer will draw in VISIO)** Sol wil resubmit Fig.4.1.3.1 pg19 with dashes
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- In definitions we need to get step-topline and step-baseline definitions from the IEC standard.
  - Eric Blom will get definition of common-mode-range from the IEEE Dictionary of terms and forward to Phil Green.

Review of Dan Kien's rewrite of 4.1:

- Dan is keeping the detailed edits and will correct and forward to Phil Green.
- We had a windup debriefing and realized that the tasks before us were huge. We do not see how we can quickly provide the necessary feedback to Dan Kien to complete his rewrite. We will probably do a superficial rewrite and not try such an ambitious rewrite at this point.

Adjourned at 3:10 PM, Friday.