

**Minutes of TC-10 Waveform Recorder Subcommittee Meeting of  
March 16, 2004 in Boulder, Colorado**

**Attendance:**

Steve Tilden	Texas Instruments
Tom Linnenbrink	Q-Dot
Bill Boyer	Sandia National Laboratories
Sol Max	LTX Corporation
David Bergman	NIST
Jerry Blair	Bechtel Nevada
Fang Xu	Teradyne
Pasquale Daponte	University of Sannio
Bob Graham	Sandia National Laboratories

**1. Agenda**

Bill Boyer distributed an agenda by email prior to the meeting. It is attached to the minutes.

**2. New Material**

The new material for the standard was distributed on the web site prior to the meeting. Bill Boyer has added a section (4.7.3) on cable losses that was not an assignment. Sol Max supplied a corrected figure for equivalent time sampling, 4.3.1. It will be incorporated in the draft after he sends it to Bill.

**3. Review of Assignments**

The material is presented here in order by the sections of the draft as opposed to the order in which it was covered in the meeting.

**Annex I — Jerry Blair.** Not done yet.

**Section 4.5.7 — Jerry Blair.** This was done and reviewed during the meeting with the following comments:

Add comment in amplitude modulation section about the modulation being much slower than the signal.

Add a comment about using an external attenuator with the spectrum analyzer.

Mention placing a terminator at the input.

Add a brief description of the 2 dB correction for spectrum analyzer noise measurements to summarize where it comes from.

**Section 4.6.3.2** has been replaced with a section from 1241. The = signs were replaced with is the . This must be cleaned up.

**Section 4.6.3.3** The title has been changed. The figures must be changed for consistent fonts.

**Section 4.7.7** Changed to 4.7.4. This may not be needed with the reorganization of discussing error sources in each test.

**Section 4.7.5** Delete, because it is already covered 9.2.3.

**Section 4.7.3.1** Blair will add more material. Move to Connecting signal sources.

**Section 4.7.3.2** Important sections needs to be moved to the appropriate sections. This references 9.2.3 that does not exist.

**Section 4.7.7.2.** Bernouli-process statement has been removed.

**Section 4.7.6** Jerry Blair will move to the appropriate place in equivalent time sampling section.

**Section 4.7.7** Test Equipment Performance will be removed.

**Old Section 4.7.7** Bill Boyer will make sure he gets all of the material into the new sections.

**Section 9.5** Incorporate introductory material — done.

**Section 9.5.2** Sends user to wrong clause for more additional information. Other places in section 9 refer to the wrong place in section 4.

**Section 6.1.1** The matrix versions of gain and offset are still not there.

**Section 7.1.1** Should mention the problem of non-monotonicity.

**Section 7.4** First paragraph should say least squares fit of straight line. Same for figure 13 caption. Captions of figures 13-15 might go with the wrong figures.

**Section 7.1** INL Sol will add a discussion of an INL curve and of rms INL.

**Section 7.6 Hysteresis** This only defines only a static hysteresis. Call it static hysteresis and the following subsection test method 7.5 might also need to be characterized as static and dynamic. Sol will investigate

**Section 7.7** Early in 7.7 give definition of THD without all of the details.

**Section 7.7.1** Mention that we are using a convention of going from 0 to fs rather than from —fs to fs. The 1/M factors will be removed from the 7.7 and put in the test methods.

**Section 7.7.1.1** I will rewrite to simplify.

**Equation (45)** I will investigate whether it gives all of the harmonics or just half. Done- It gives all of them. Change  $f_r$  to  $f_i$  remove the  $+Mfs$ .

**Section 7.7.1.2** Question: Do all equations need numbers? Also use  $f_i$  rather than  $f_0$ .

**Section 7.7.1.2.1** Change the  $M$  used for number of cycles in a record to  $J$ .

**Figure 18** Y-axis label does not appear on PCs, but it does appear on Macs.

## **Section 8.**

We will redefine noise to not include harmonic distortion.

Bill Boyer will add a section on spurious components Blair will review.

Is being rewritten to use the new noise definition.

Steve Tilden will add a swept power snr definition.

## **4. Meeting Adjourned**

### **Agenda**

Agenda for Waveform Recorder Subcommittee Meeting  
March 16, 2004

1. Introductions
2. Review of status of the draft
3. Review of status of assignments per minutes of November 2003 meeting:
  - Sections 4.2.3 Connecting Signal Sources, 4.2.4 Reducing Noise. These need to be written (Steve Tilden, Tom Meyer)
  - Annex I, Section 4.5.6 Presentation of Sinewave data (Jerry Blair)
  - Section 4.5.7 Introduction to aberrations in sine wave sources ( Jerry Blair)
  - Section 4.6.3.2. Replace with version from 1241. (Bill Boyer) (done)

- Section 4.6.3.3. Change name to Effect on Transition Levels of Harmonic Distortion of signal source (Bill Boyer) (done)
- Section 4.7.7 (now 4.7.4) Introduction to rest of section (Jerry Blair, Boyer)
- Section 4.7.7.2 (now 10.3.3) Clarify Bernouli process statement (Mike Souders) (done?)
- Section 4.7.8 (now 4.7.5) Introduction on time jitter and aperture uncertainty (Bill Boyer)
- Section 9.2. Update terminology consistent with new Std 181 (Don Larson)
- Section 4.7.7 — Break up and move to Sections 9 and 10 (David Bergman) (done)
- Section 9.5 Incorporate introductory material on aperture weighting function from 1241 (Bill Boyer) (done)
- Section 6.1.1 provide matrix versions of equations for gain and offset (Mike Souders)

3. Definitions of large and small signals

4. Waveform Simulation Software proposed by LeCroy

5. Other business

6. Detailed review of draft concentrating on Section 7 THD issues first

7. Review action items