IEEE P2520.1 Working Group #21
Meeting Minutes
27 February 2023
WG Chair: James Covington
WG Secretary: H. Troy Nagle

Meeting link:
https://ieeesa.webex.com/ieeesa/j.php?MTID=mf96791b98f36d1a495cde56e593d7d92

1. **Call to Order**
   Chair called meeting to order at 10:04 AM EST. He announced that the meeting was being recorded for the purpose of preparing minutes.

2. **Roll Call and Disclosure of Affiliation**
   Affiliation FAQs: http://standards.ieee.org/faqs/affiliation.html
   The Chair announced that participants can sign-in at this link:
   https://docs.google.com/spreadsheets/d/1x3Le7jd_5h3bgiNcYMZIfjIbzE2XdE0U8Daon00O8Ks/edit#gid=0.
   The Chair asked the Secretary to check for a quorum. No new members were participating. The List of Participants is shown in **Attachment A**. A quorum was achieved (13 of the 18 voting members were present).

3. **Approval of Agenda**
   The Chair asked for approval of the agenda. Krishna Persaud made the motion; Susan Schiffman seconded. Without objection to unanimous consent, the motion was adopted.

4. **Approval of Previous Meeting Minutes**
   Minutes for WG#20 will be considered at our next meeting.

5. **IEEE-SA Patent & Copyright Policies**
   a. Call for Patents
      https://development.standards.ieee.org/myproject/Public/mytools/mob/slideset.pdf
      Per standard IEEE SA WG meeting practice, the Chair displayed the required policy regarding potentially essential patents. No one raised concerns for consideration.
   b. Copyright Policy https://standards.ieee.org/ipr/copyright-materials.html
      Per standard IEEE-SA WG meeting practice, the Chair displayed the required policy regarding copyrights. There were no questions or concerns.

6. **Discussion on scoring system for Level 2**
   The Chair reviewed our most recent approach to evaluating Level 2 performance.

LEVEL 2 – PASS/FAIL

- Level 2 is a classification problem employing our three chemicals
- Originally the level used % correct – though the current version uses absolute numbers
- Based on the number of "Measurement Periods" that are correctly identified
- Each Measurement Period contains 9 separate tests with the three chemicals and neutral air – repeated three times in a different combination

CURRENT

To pass Level 2 testing the EUT should be able to:

- i. For LVL2-1 correctly identify 2 MPs or more out of 3 MPs
- ii. For LVL2-2 correctly identify 15 MPs or more out of 18 MPs.
- iii. For LVL2-3 correctly identify 15 MPs or more out of 18 MPs.
- iv. For LVL2-4 correctly identify 43 MPs or more out of 54 MPs.
- v. For LVL2-5 correctly identify 113 MPs or more out of 162 MPs.

A possible replacement for our current scheme is to consider allowing some error in a MP. The following Exclusion Scoring method was reviewed.

POSSIBLE?

During MP1, there are 27 possible combinations for reporting the results. The three-correct result (ABC) is the only one combination; the other 26 are excluded. Two-correct results (AAC, ABA, ABB, ACC, BBC, CBC) total to six combinations; the other 21 are excluded. Similarly, a single-correct result totals 12 choices; the other 15 are excluded.

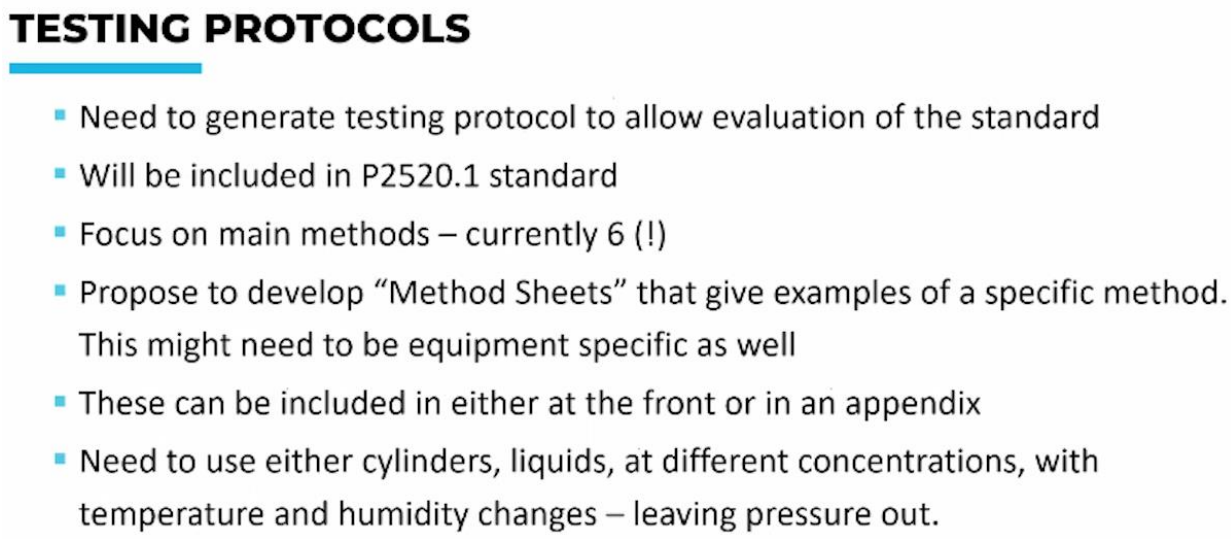
Suggestion to create a Exclusion Score (ES) for each MP. If all three gases are recognized, the ES is 26, If a single gas is not recognized in a MP, that ES is 21. If two are not recognized, the ES is 15.

- LVL2-1 (std conditions): Sum the three MP ES scores. A perfect ES-std is $3 \bullet 26 = 78$. The passing ES-std allows for one mistake and is $2 \bullet 26 + 21 = 73$.
- LVL2-2 (temperature): This adds two more sets of three MPs to the LVL2-1 data (forms Half-Set-1). The passing ES-temp for this level is $3 \bullet 73$.
- LVL2-3 (relative humidity): This adds two more sets of three MPs to the LVL2-1 data (forms Half-Set-2). The passing ES-rh for this level is $3 \bullet 73$.
- LVL2-4 (day test): Add the two Half-Sets to form the Complete Set. This adds the LVL-2 and LVL-3 ES values (ES-day = ES-temp + ES-rh). The passing ES-day is $6 \bullet 73$.
- LVL2-5 (week test): This adds the three day ES values. ES-wk = ES-day1 + ES-day2 + ES-day-3. The passing ES-week is $3 \bullet 6 \bullet 73$.

We will continue this discussion after the WG members have evaluated this concept. Rather than using the MPs as the passing criteria, we agreed to use instead an absolute number of tests. We will also allow some test failures. As higher levels are considered, excellent performance at lower levels can offset test failures. Our final scoring method will be adopted after we experiment with some currently available systems with varying capabilities to see if our requirements are reasonable.

7. Discussion on testing of the standard

The Chair then transitioned to a discussion of the testing protocols.



The example methods can be equivalent to application notes. From our last session, the six methods are summarized below. Each method can have a "crib sheet" to help the operator set up the tests. This materials could be located in Appendix B.

TESTING PROTOCOLS JAN23

Method	Sample Collection	Chemical media	Concentration Control	Temperature Control	Humidity Control	Pre-concentration
Method 1	Syringe headspace Autosampler – Positive pressure	Liquid phase in a vial	Dilute with liquid	Heat/cool(?) the vial	With difficulty…Possible to add water to air line	Yes – SPME, Tenax etc.
Method 2	Gas flow control – Positive pressure	Gas cylinder	Mixing with neutral air	Heat/cool sample on gas line?	Bubbler or wet line mixed through MFC	Unlikely
Method 3	Sample bags – Negative pressure	Gas cylinder, liquid + neutral air (with pump to add gas)	Dilute with liquid and/or air? Mixing with neutral air	Heat/cool bag in environmental chamber	Fill bag with humid air. Add pure water to bag (DI water).	Yes, SPME, Tenax etc.
Method 4	Sample bags – in a barrel with valve on top	Gas cylinder, liquid + neutral air	Dilute with liquid and/or air? Mixing with neutral air	Heat/cool bag in environmental chamber	Fill bag with humid air. Add pure water to bag (DI water).	Yes, SPME, Tenax etc.
Method 5	Headspace collection with flow control	Liquid phase in a vessel	Dilute with liquid and/or mix with neutral air	Heat/cool sample on gas line?	Bubbler or mixed humid line	Yes, Tenax
Method 6	Point source	Gas cylinder or liquid	Diffusion/distance from source	Heat/cool whole lab/environmental chamber	Humidify whole test area/environmental chamber.	Unlikely

The Methods table is summarized more concisely below. Permeation was added to the list.

EXAMPLE METHODS TO BE INCLUDED

- Method 1: Syringe autosampler
- Method 2: Positive pressure gas flow
- Method 3: Sample bags with negative pressure
- Method 4: Sample bags with barrel
- Method 5: Headspace collection
- Method 6: Permeation tubes
- Method 7: Point source

Operators can use a combination of Methods but we won't provide guidelines for that.

Next the Chair began a more detailed discussion of Method 1.

METHOD 1: SYRINGE AUTOSAMPLER

Sample Collection:

- Both commercial and custom autosampler can be used.
- Syringe based method with sample in glass vial. Glass vial typically 10-20ml. Injection into system <5ml
- Multiple injections will be permissible.

Chemical Media:

- Liquid phase sample placed into syringe (we could provide liquid volume?).

Concentration Control:

- Mix with a dilutant, potentially water or solvent with a low vapour pressure. Need to create different mixes associated with different temperatures – Example & Henry's equation

Temperature Control:

- Place sample in a heater – most samplers are provided with auto sampler. Sample should be heated to ensure that the sample is homogenous.

Humidity Control:

- Humidity will be generated by? Water in sample? Double injection?

Pre-concentration:

- Could use purge and trap or similar system constructed into instrument. Will we allow multiple injections from the same syringe into the pre-concentrator?

These are liquid based samples. Dilution in water is normal. For some applications, water may not be compatible. Paraffin oil or some inert solvent with low vapor pressure may be necessary for some test chemicals. Humidity control is problematic for systems with autosamplers.

8. **New Business/Activities for the Next Meeting**
   There was no New Business.

9. **Future Meetings**
   The Chair announced the next meeting (WG#21) will take place on March 27 at 10:00 AM EST.

10. **Adjourn**
    Due to a fire alarm alert in the Chair's office building and without objection to unanimous consent, the Chair adjourned the meeting at 10:55 AM.

Attachment A: Participants (13)

NAME	AFFILIATION
Carlos Diaz	Ambiente et Odora
Christopher Jensen	Self
Duke Oeba	Egerton University, Kenya
Ehsan Danesh	Advanced Sensing Technologies Ltd.
Ettore Massera	ENEA
Fengchun Tian	Chongqing University
James Covington	University of Warwick
Krishna Persaud	University of Manchester
Paul Kagan	AWLDM Systems
Radislav Potyrailo	GE Research
Saverio De Vito	ENEA
Susan Schiffman	North Carolina State University
Troy Nagle	North Carolina State University