# 2022 General meeting Meeting Minutes – Harmonics WG (519 & 519.1)

## Meeting Location and Time

Webex - Remote

2022 July 20
10:00 AM – 12:00 PM MDT

## MEEting Minutes

### Attendees

David Zech David Langmer

Eugen Starschich Mariol Martinez

Mark Halpin Andrew Berrisford

Steven Johnston Alan Hannah

Kevin Kittredge Theo Laughner

Joe Grappe Andrew Sagl

Bill Howe Jan Meyer

Farhad Omar Dan Sabin

Glenn Aiemjoy Julio Barros

Thai Nguyen Mohammad Anarwala

Math Bollen Justin Kuhlers

David Mueller Heath Helstrom

Tom Ortmeyer Lyman Morikawa

Kenn Sedziol Roberto Langella

Gaurav Singh Anthony Murphy

Chandra Pallem Matt Norwalk

Chris Mullins Krishnat Patil

Gerald Scheuer Timothy Unruh

Alexandre Naves Joe Warner

The meeting was called to order by David Zech at 10:00 am. Minutes were recorded by Joe Grappe.

### Old Business

IEEE mandatory legal slides were reviewed by the Chair. No patents were identified by the attendees.

Quorum was established. Minutes unanimously approved from 2022 JTCM.

### New Business

David Zech went over the IEEE required slides.

There were no notifications of conflicts nor issues regarding the IEEE legal slides.

Quorum was achieved at the meeting.

A motion was made to approve the previous meetings minutes and the motion was carried to approve the minutes.

David Zech discussed the status of the current draft of 519. It is in final editing by IEEE and will be published in August of 2022 by IEEE.

Mark Halpin led a discussion about THD definitions and applications. The presentation is below and can be opened.



Existing Total Harmonic distortion definition – Understanding what it is and what it is not. The formal definition was shown: root of Sum of the squares of the individual harmonics divided by fundamental only through the 50th harmonic

 Mark showed the calculation for how the individual harmonics are also calculated using the adjacent 5hz bins on either side of the integer harmonic.

 Reality of the calculations – numerator of the classic THD definition was originally intended to represent the total deviation from a sinusoidal waveform but that is not what we are really doing in current methods. What happens to the distortion of the interharmonic terms and higher frequency content in the THD calculation.

Considering frequencies only up to 3khz is not exactly accurate and may not capture the total deviation. We are ignoring the deviation above that frequency value.

One idea for rectifying this would be to include each of the 5hz terms (bins) in the numerator summation this would capture the interharmonic distortion but there are other issues this would create. The upper limit could also be increased above the 50th harmonic.

Another idea is to evaluate the distortion in a different way such as removing the fundamental from the rms value and then square it. As an attempt to truly quantify the amount of distortion in a waveform.

There was a long discussion on the differences of the formulas and what they truly represent and what the working group is trying to ultimately achieve with a total distortion value and how having a total distortion value can be useful along with the existing Total Harmonic Distortion value. The total distortion term would include interharmonics and frequencies above the 50th harmonic.

Things that will need to be discussed and laid out include items such as sample rate, filtering, sensing, and aliasing just to name a few.

The consensus of the working group was to start down the path of including a total distortion quantity as an addition to the existing standard quantities.

After Mark finished his presentation, Roberto Langella discussed interharmonics in reference to LED lighting and testing that has been performed. Specifically, he is investigating what the interharmonic voltage limits should be for various ranges. He hopes to include some of the findings and investigation research in 519.1

Dave Zech discussed some of the comments that were made during the balloting session of the 519 revision. A list is shown below. A few of the items were discussed by the group and that discussion is shown below each item. Online Webex meetings were mentioned as an option for getting the work started for a subsequent revision. It would be ideal for the balloters who made the comments to lead the effort to come up with a proposal for the next revision.

* + Include interharmonic current limits in tables 2 through 4
		- this may not be possible for the next revision given that the work is not mature enough, but this is a goal of the working group.
	+ 2nd harmonic current limits are not achievable for arc furnaces
		- 519 is not intended to address all situations
	+ Consumer’s inability to control system impedance characteristics resulting in amplified voltage distortion (last paragraph in clause 1.2)
		- If a customer is metered at distribution or transmission level, they could have passive equipment such as capacitor banks that can change harmonic impedance of the system. It was suggested to include an example of this in the next revision.
	+ Consumer’s inability to control their harmonic current emissions resulting in amplified voltage distortion (in the case of VSC)
	+ Add text to allow consumers to exceed current distortion limits if the effect is reduced voltage distortion
	+ Revise or remove the HVDC note under Table 1
	+ Examples for how to do something in 519 (such as computing percentiles)
		- There is a contribution in 519.1 that will show an example of this.
	+ The rationale for changing a limit (such as the even harmonic limits change)
		- There is a contribution in 519.1 that will explain the rationale.
	+ Changing harmonic voltage and current limits for systems > 161 kV (primarily related to VSC HVDC). Also include explanatory information in 519.1 related to background harmonic voltage, network harmonic impedance, and frequency dependent damping of the network harmonic impedance.
		- There is a contribution from Siemens that has good explanatory information.
	+ In Annex A, relax higher order interharmonic voltage limits when compared with lower order interharmonic voltage limits. Claim is that flicker is not an issue at interharmonics above the 11th order.
		- This is consistent with what is written in Annex A and can be further clarified.

IEEE 519.1

PAR Update: There are still not enough submissions of information for the document. Mark Halpin called for contributions again for the topics listed below.

The PAR is about to expire and there are two paths forward. One option is to let it expire and then resubmit for a new par. The second option is to withdraw par before it expires and then resubmit it. Par has already been extended previously, so we are unlikely to get another extension.

It was decided in the meeting to formally withdraw the PAR and then re-submit before the end of the year. Motion was made to withdraw par by Joe seconded by Kenn and motion carried unanimously. Then a motion was made to submit for a new PAR by Joe, seconded by Chris and motion carried unanimously.

Meeting adjourned at 12:00 PM

### Summary of Volunteers for Future Activities: