

EREC G5 Stage 2 Sub-group

Meeting No. 7

Held at Sir William Siemens House, Princess Road, Manchester M20 2UR

On Wednesday 11th January 2017 10:00-15:00

Meeting Notes

Attendee	Affiliation	Initials	Role
Frank Griffiths	ABB	FG	Member
Andrew Oliver	TNEI	AO	Member
Simon Scarbro	WPD	SPS	Chair & Secretary
Murali Venkata	Siemens	MV	Stand-in for AS
Apologies	Affiliation	Initials	Role
Ahmed Shafiu	Siemens	AS	Secretary
Ben Gomersall	National Grid	BG	Member
Forooz Ghassemi	National Grid	FGh	Member

Item	Topic & Note	Action
2.	Agree Notes of Previous Meeting Agreed.	
3.	Actions from Meeting 7	
3.1	Definition of Converter Types Action from meeting 6 is outstanding: "AS to check this with Siemens' technical specialists." In the absence of AS this was not discussed.	AS
3.2	Harmonic Impedance of LV Networks Action from meeting 6 is outstanding: "It was agreed that SPS would highlight to the full WG that it would be useful to instigate harmonic impedance measurement of sample networks. This may not fit with the delivery timescales for the revision." In the absence of FGh & BG this was not discussed.	SPS
4	Stage 1 & 2 Draft	
4.1	Impact of Siemens Emission Data & (BS) IEC 10002-6 The Siemens current emission data appears to correlate well with the ABB data. Action from meeting 6 is outstanding: "AS to send the data to FG" – complete. FG confirmed the values were similar to those from ABB.	Done
4.2	Stage 1 & 2 Draft – Update SPS circulated Draft 5 'Item 4_2 Stage 1&2 Draft 5' and explained that there were various changes. Stages 1A, 1B and 2C have been updated. Revisions arising from comments from AO/FG/BG discussed in Meeting 4 were incorporated where thought appropriate. SPS asked that all read the revised text and comment accordingly.	All

4.3	<p>Stage 1A – Revised Figure 2, Text & Supporting Spreadsheet</p> <p>SPS circulated the spreadsheet entitled: ‘Item 4_3 61000-3-2 Further Analysis rev2’.</p> <p>This analysis looks at how many IEC 61000-3-2 compliant products, each emitting up to the Class A limits, can be connected for networks with reference impedance. This analysis supports $N \leq 5$ and $N \leq 2$ in Figure 2. Reference to aggregate current has been removed as each item is allowed a given emission in Amperes.</p> <p>SPS raised the question of whether equipment connected between two phases only – ‘interphase’ - should be considered. It was agreed that such equipment is rare and need not be considered.</p>	
4.4	<p>Stage 1B - Revised Figure 3, Table 2, Table 3, Text & Supporting Spreadsheet</p> <p>SPS circulated the spreadsheet entitled: ‘Item 4_4 61000-3-12 Further Analysis rev3’.</p> <p>SPS has revised spreadsheet this to allow a table of maximum number of items of a particular individual rating, I_{equ}, to be established. This results in Table 2.</p> <p>The previous draft included Tables 4a-4d based on achieving $R_{sce}=33$. This has been replaced by Tables 3a-3d. SPS has used the permitted current emissions under IEC 61000-3-12 corresponding to $R_{sce} = 33$ to derive the required Short-circuit level when allowed to produce the specified maximum Global contribution, G_{hLV}, summation exponent α and impedance factor k.</p> <p>Equipment connected between two phases only – ‘interphase’ – is not considered. Such equipment is rare.</p> <p>SPS circulated the spreadsheet entitled: ‘Item 4_4 SSC MIN CALC Draft Rev 1’ and discussed how the permitted harmonic current emission as a percentage of reference current increase in a way that can be expressed in $y=mx+c$ form. SPS highlighted that where a manufacturer has found that they cannot comply with the limits specified for $R_{sce} = 33$ and have had to specify a required short-circuit capacity S_{sc} we could apply the same methodology as above to determine a revised SSC that follows the method used to derive Tables 3a-3d. The group discussed this and decided to simply design for the manufacturer’s stated value.</p> <p>SPS showed a graph illustrating current emissions for a few real examples of equipment.</p>	
4.5	<p>Stage 2C – Impact of 77A/926/CDV Compatibility Levels beyond 40th</p> <p>Action from meeting 6 is outstanding:</p> <p>“SPS showed the group the interim response from FGh/BG:</p> <p style="padding-left: 40px;">‘We think that accepting the IEC document as the basis for compatibility</p>	

	<p>levels would avoid a lot of discussions later. However, we need to understand exactly how the proposed CP can be used and what the implications would be.</p> <p>We would come back to you with our final proposal but as things stand now we probably recommend the use of IEC.”</p> <p>In the absence of FGh & BG this was not discussed.</p>	<p>FGh/ BG</p>
4.6	<p>Stage 1 & 2 Draft Worked Examples - Update</p> <p>SPS circulated a revised set of Worked Examples that match the revised text in ‘Item 4_2 Stage 1&2 Draft 5’.</p> <p>The Sub-group went through the examples and identified the following issues:</p> <ul style="list-style-type: none"> i) Example 5: Replace 0.350 ohms with 0.200 ohms. ii) Example 6: Replace $\geq 100A$ with $< 100A$ in table. iii) Example 9: on 5th page replace 15VA with 15kVA. iv) Example 9: on 9th/10th page add summation exponents. Do same with Examples 10 & 12. v) Example 12: review current aggregation and explain in text. vi) Example 13: consider using $Z_h = \sqrt{R_1^2 + k^2 h^2 X_1^2}$ as more accurate than $Z_h = khZ_1$. Also consider using $R_h = R_1 \sqrt{h}$ where R_1 and X_1 are the 50Hz source resistance and reactance. vii) Add example 14 covering a Stage 2C Thevenin Equivalent example for a particular harmonic that has failed (e.g. 5th) 	<p>SPS</p> <p>FG/SPS</p>
4.7	<p>Stage 2C Thevenin Equivalent Example</p> <p>At Meeting 6 it was agreed that FG would prepare a simple worked example based on superposition to illustrate how to take advantage of the reduced current emission that occurs when background voltage distortion is considered. FG reported that this is proving difficult to do but agreed to persevere.</p> <p>FG is to also explore the relationship between internal impedance and R_{sce} to see if any simple guidance can be given as to when the current emission might be expected to reduce making a Thevenin Equivalent approach worthwhile.</p>	<p>FG</p> <p>FG</p>
5	<p>Agree Further Work</p> <p>See the actions recorded above.</p>	
6	<p>AOB</p> <p>Given the concerns that FGh/BG had expressed about the style of the draft, SPS had asked Ian Povey at ENW for some comments on the previous draft text. Ian Povey was generally supportive of the draft style and asked colleagues to prepare comments on the previous draft. SPS has recently received these comments and showed them to the Sub-group. SPS to circulate these and prepare draft response.</p> <p>All to review and agree response/suggest response.</p>	<p>SPS</p> <p>All</p>

7	<p>Future meetings</p> <ul style="list-style-type: none"> Dates <p>A date was <u>provisionally</u> agreed in case a further meeting is required; date = 8 February 2017. SPS to confirm.</p> <p>Venue could be at ABB Warrington. FG agreed to see if a room is available.</p> <ul style="list-style-type: none"> Agenda items <p>Not discussed. SPS to consider.</p>	<p>SPS</p> <p>FG</p> <p>SPS</p>
---	---	---------------------------------