

IN-SITU MEASUREMENT OF HIGH FREQUENCY EMISSION CAUSED BY PHOTO VOLTAIC INVERTERS

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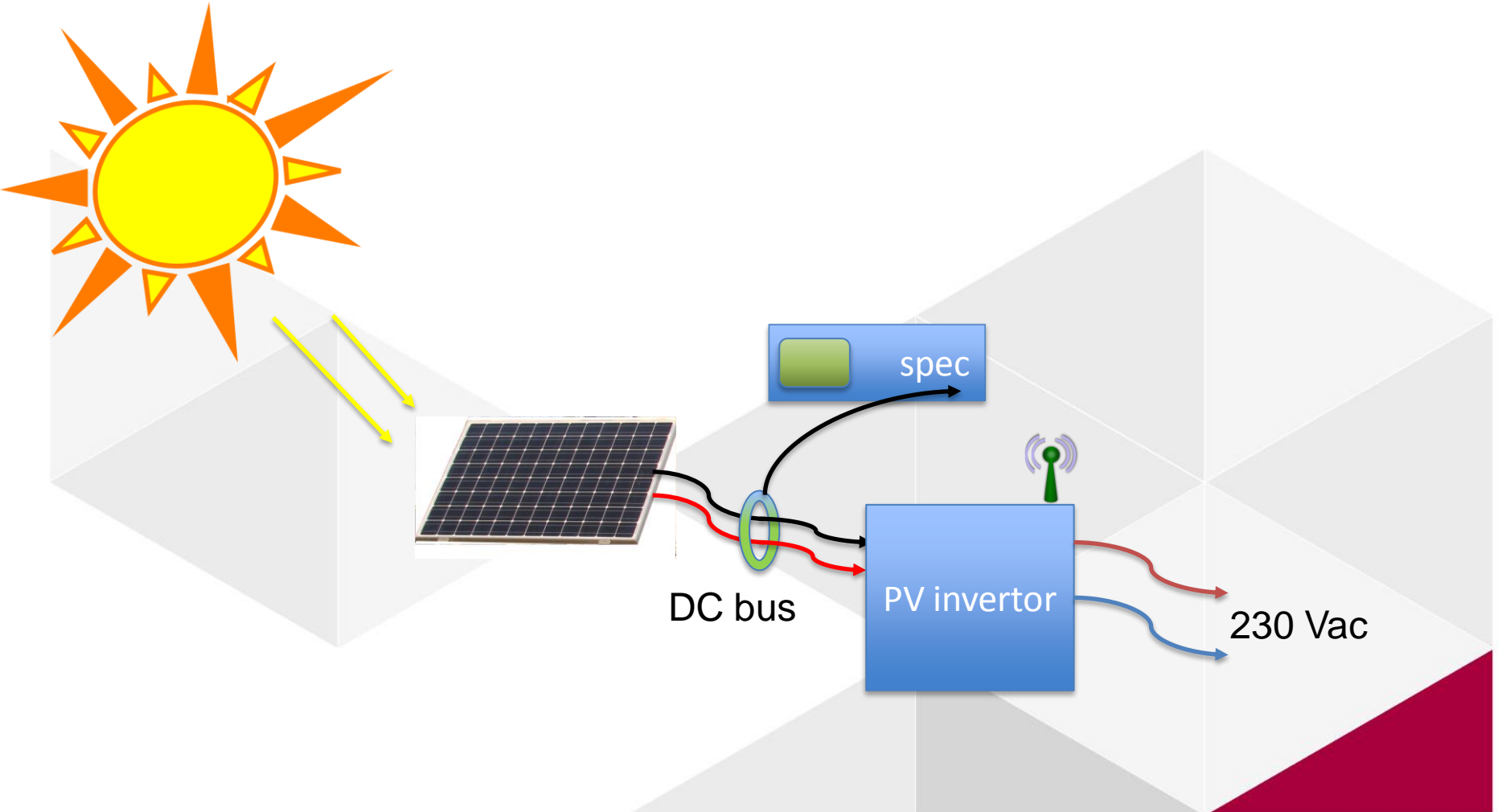
PROBLEM

No standard for PV DC bus emissions!

Except the generic standard.



BASIC PV SYSTEM



EUROPEAN EMC DIRECTIVE

- Preamble 2: Ensure radio communications, including broadcast and amateur radio service.
- Presumption of conformity to the directive if the product is tested against standards published in the Official Journal of the European Union. (http://ec.europa.eu/enterprise/policies/european-standards/harmonised-standards/electromagnetic-compatibility/index_en.htm)

THE LAW HIERARCHY IN THE NETHERLANDS.

International
treaties

*Universal Declaration of
Human Rights*



Charter for the
kingdom of the
Netherlands.

Rules concerning the
relations between the
countries in the Kingdom



Constitution

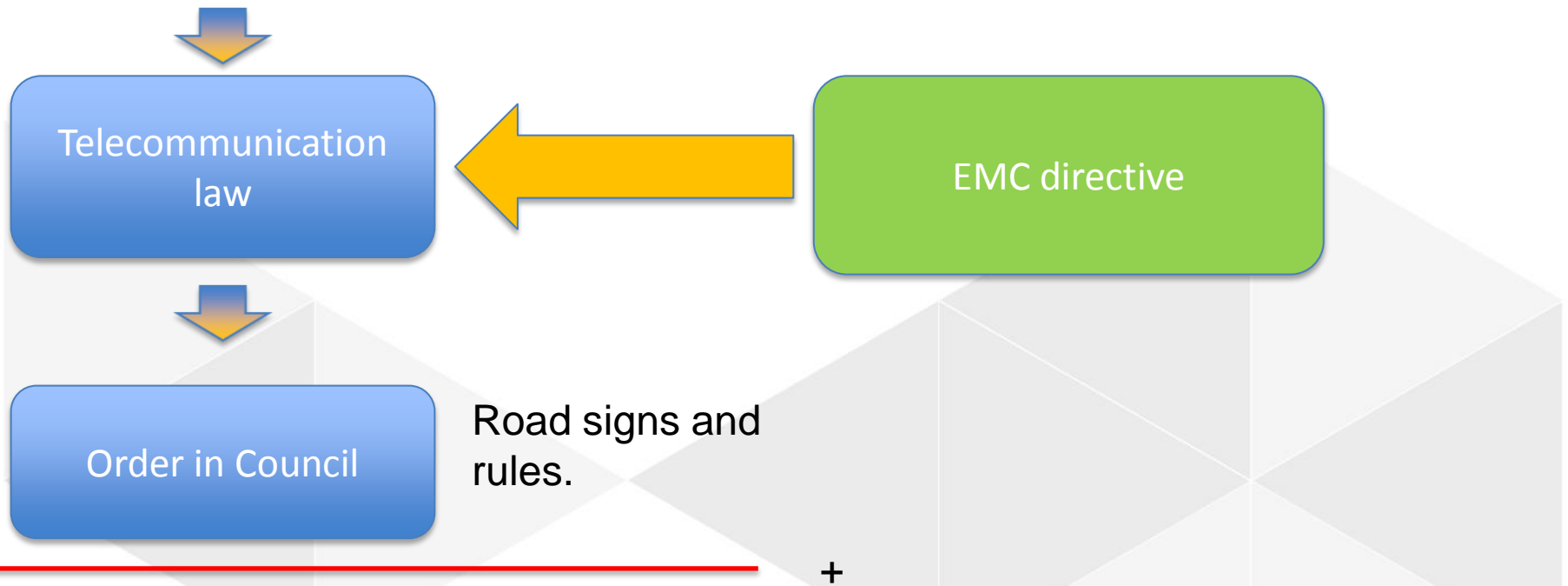
Basic rights: freedom of
speech, faith etc



Law

Basic laws, for example crime, organization of the
Dutch government etc. Thou shalt not kill thy
neighbours wife.

THE LAW HIERARCHY IN THE NETHERLANDS.



NO STANDARDS!!!! Standards are not a law what so ever.

MEASUREMENT SET UP

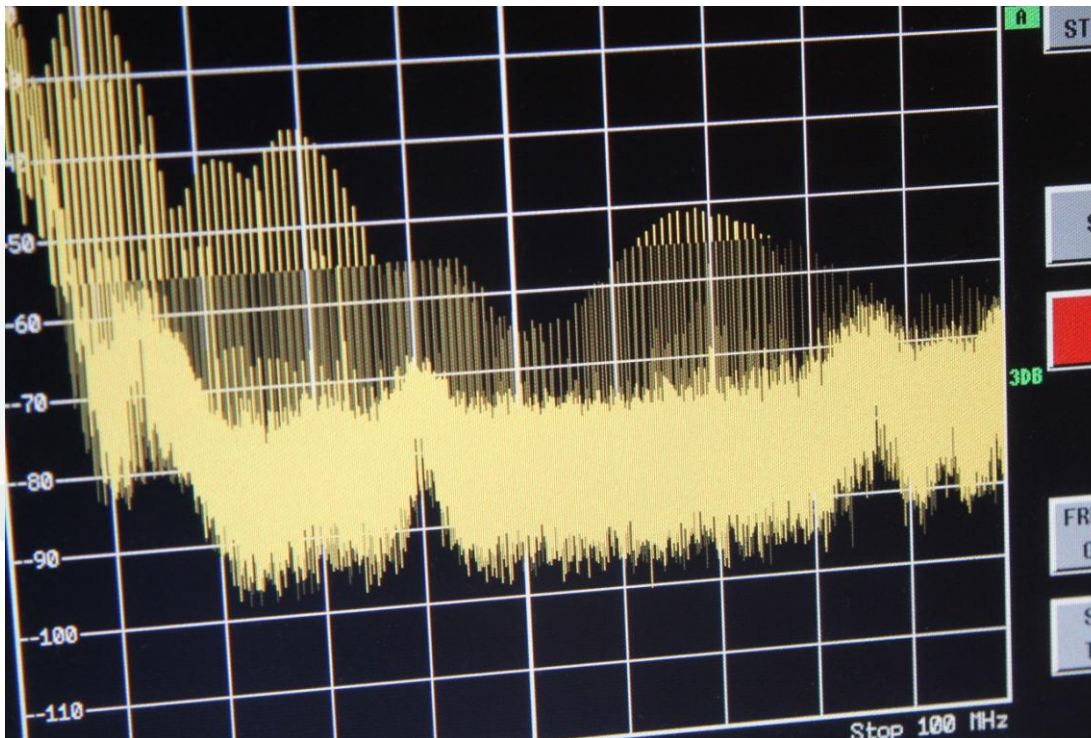


Spectrum
analyzer:
Rigol DSA 815
TG (€ 1500)

Current probe:
Fischer Custom
Communications
F-35

PV INSTALLATIONS MEASURED

Soladin 600 inverter 30 mtr cable.



Indicative measurement due to complaints on interference of HF Ham Radio. Same measurement setup, except the spec R&S FSP7

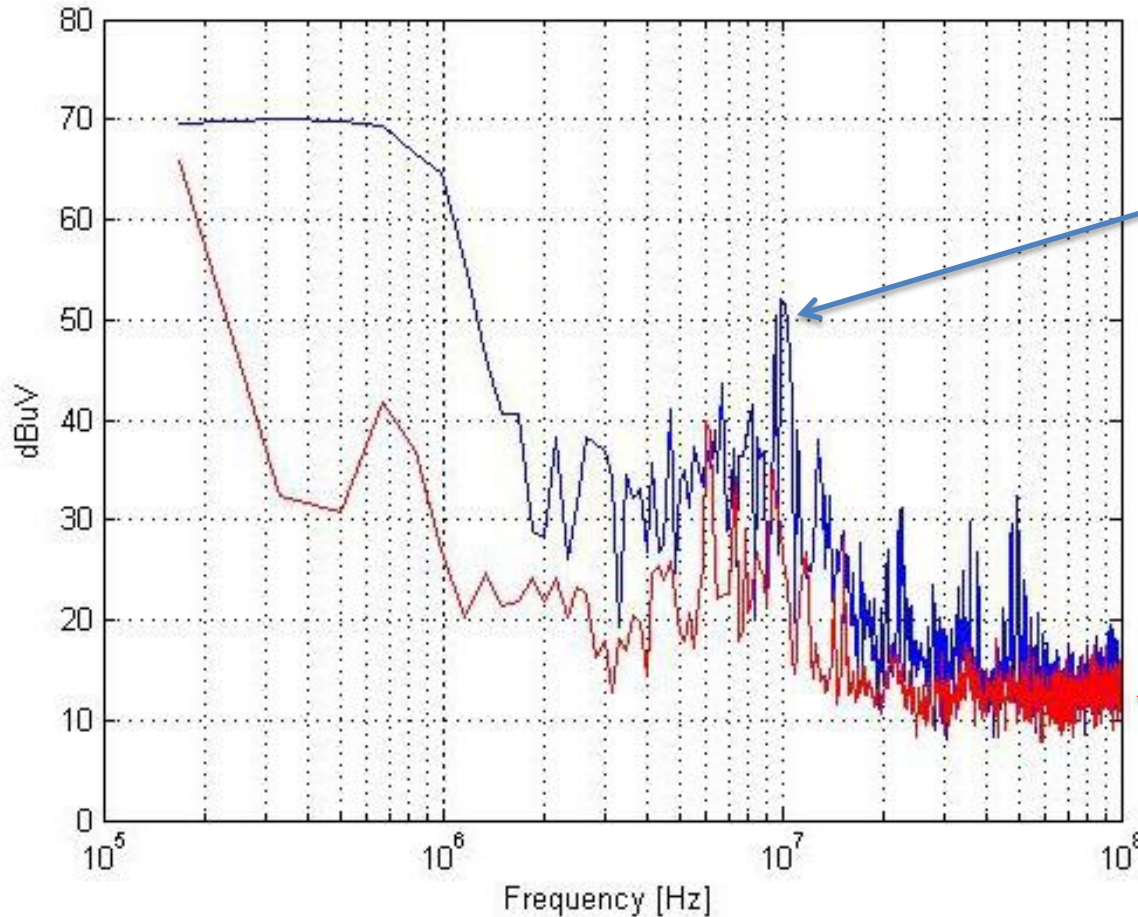
PV INSTALLATIONS MEASURED



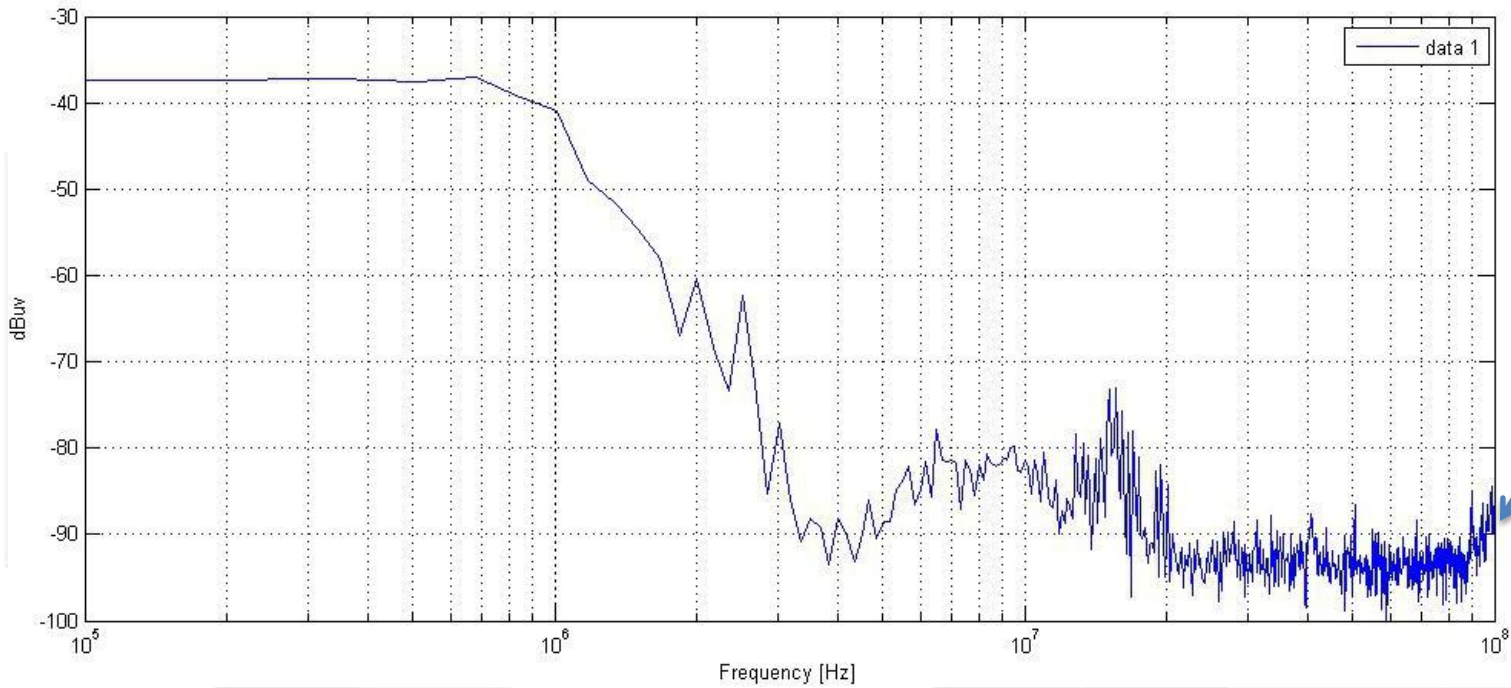
PV INSTALLATIONS MEASURED CONT.



MEASUREMENT RESULTS



MEASUREMENT RESULTS CONT.



STANDARDS TESTED AGAINST

Soladin 600	Omnik 3K	SMA Sunny Boy
IEC 55022	IEC 61000-6-3	IEC 61000-6-3
IEC 61000-3-2	IEC 61000-6-4	IEC 61000-6-4
	IEC 61000-3-12	IEC 55022
	IEC 61000-3-11	

IEC 55022, aka CISPR 22 is a standard for Information Technology Equipment! Is it a computer????

IEC 61k-6-3 Generic standards - Emission standard for residential, commercial and light-industrial environments.

61k-6-4 Generic standards - Emission standard for industrial environments

STANDARDS TESTED AGAINST.

- IEC 61000-6-3 contains limits for DC power bus. What is a DC power bus?
*§ 3.5 power port port at which a conductor or cable carrying the **primary electrical power** needed for the operation (functioning) of an apparatus or associated apparatus is connected to the apparatus”*
- And: *§ 3.8 d.c. power network local electricity supply network in the infrastructure of a certain site or building intended for flexible use by one ore more different types of equipment and guaranteeing continuous power supply **independently** from the conditions of the public mains network”*
- Conclusion These definitions exclude the DC bus of a PV installation, so that part is not applicable.

WHICH STANDARDS TO CHOOSE?

Depends on the company policy.

Company with too many spreadsheet managers look only at the cheapest way to get a product to the market.

What is the cheapest way..... Less standards to test against?

A lot of complaints of ham radio operators concerning the Soladin 600. The producer had to replace a number of inverters with more expensive ones. The producer introduced a contact person for ham radio EMC problems.



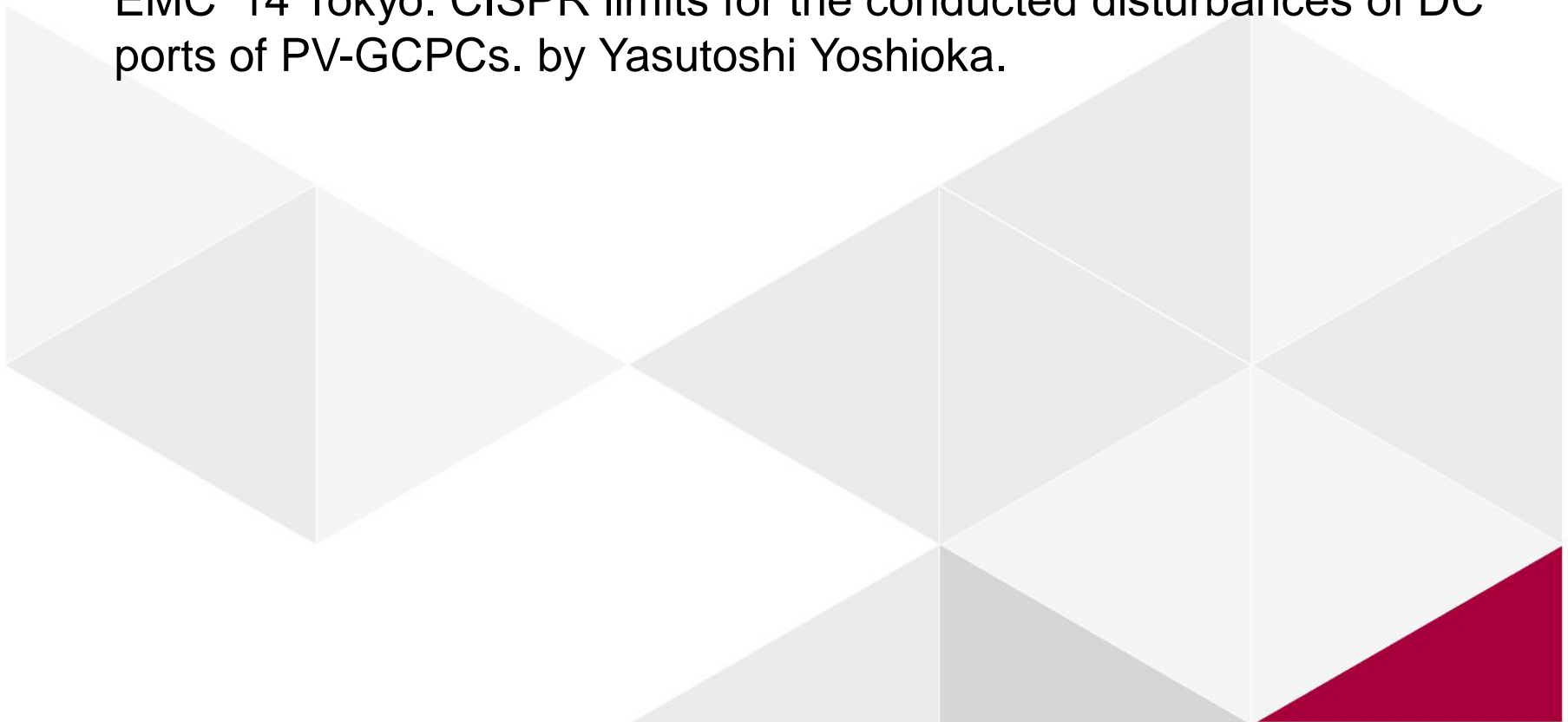
EMC DIRECTIVE 2014/30/EU ART 6*

- **Essential requirements**
- The equipment shall meet the essential requirements set out in Annex I.
 - *ANNEX I* / ESSENTIAL REQUIREMENTS
 - **1. General requirements**
 - Equipment shall be so designed and manufactured, having regard to the state of the art, as to ensure that:
 - (a) the electromagnetic disturbance generated does not exceed the level above which radio and telecommunications equipment or other equipment cannot operate as intended;
 - (b) it has a level of immunity to the electromagnetic disturbance to be expected in its intended use which allows it to operate without unacceptable degradation of its intended use.

* same as article 5 in EMC directive 2004/108/EC

RECENT DEVELOPMENTS.

- CISPR B addressed these problems. A presentation was given at EMC '14 Tokyo. CISPR limits for the conducted disturbances of DC ports of PV-GCPCs. by Yasutoshi Yoshioka.



QUESTIONS?

