

## Application of a new intelligent method for selecting SAR testing scenarios

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### Abstract

Historically, SAR (Specific Absorption Rate) measurement methods were exclusively based on scanning systems that consist of single probe performing a direct SAR acquisition over 2-D and 3-D plans, as specified in EN IEC 62209-1528 [1]. Since 2019, new measurement systems have been developed as defined in EN IEC 62209-3 [2]. These systems are equipped with hundreds of sensors that constitute a vector array and are capable of measuring SAR more quickly. The coexistence of these two technologies has raised questions about the equivalence of the two approaches. The EU joint research center (JRC) conducted a study on equivalence of the two methods and recommended to improve system validation of the measurement methods. The system validation is a procedure that ensures the measurement system will not deviate by more than the uncertainty from the targeted values. Currently, this procedure is performed on a limited number of fixed configurations, despite the large number of possible configurations arising from many input parameters. This limits the representativeness of the validation results and the detection of potential failure. Probabilistic approaches, particularly the randomized selection of test parameters, are therefore considered more suitable to detect potential outliers and ensure representativeness.

Thus, standardization bodies have been working to improve the system validation procedure. Especially by developing IEC PAS 62209-5 [3], a working group is drafting a standard establishing methods for validating SAR measurement systems that conform to EN IEC/IEEE 62209-1528 [1] and EN IEC/IEEE 62209-3 [2], regardless of the technology involved. One of the basic validation principles is to use a randomized selection of parameters for tested configuration to maximize the likelihood of detecting outliers. In this context a Python package for generating SAR testing scenarios using Latin Hypercube sampling has been made available to the scientific community [4].

This paper will illustrate an application of this new intelligent method for selecting SAR testing scenarios introduced by [3], compared to deterministic method published in [1,2]. Since a testing laboratory can select its desired frequencies according to its own capability, this comparison is made on flat phantom with four frequencies (900 MHz, 1750 MHz, 1950 MHz, and 5200 MHz). A system validation based on the combination of frequencies, modulations, power level, positions, distances and antenna type according to [2] results in 49 measurements, whereas according to [3] and applying the LHS method given in [4], it results in 225 measurements. The measurements are performed on a probe array measurement system (CSAR-3D) at ANFR laboratory. To mimic probe failures, a small bag containing extra liquid with low permittivity and conductivity is added on a fixed location of the probe array. The objective is to compare the ability to detect failures of both methods [2] and [3]. The number of configurations will be discussed.

### References

- [1] EN IEC/IEEE 62209-1528:2020, Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-worn wireless communication devices - Human models, instrumentation and procedures (Frequency range of 4 MHz to 10 GHz)
- [2] EN IEC 62209-3:2019, measurement procedure for the assessment of Specific Absorption Rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 3: Vector measurement-based systems (Frequency range of 600 MHz to 6 GHz)
- [3] IEC/IEEE PAS 62209-5 Committee Draft 2026, Methods for validation of SAR measurement systems for hand-held and body-mounted wireless communication devices (frequency range of 4 MHz to 10 GHz)
- [4] IT<sup>2</sup>IS Foundation github repository, A Python package for generating structured samples for SAR (Specific Absorption Rate) testing scenarios using Latin Hypercube sampling with domain-specific constraints and mappings, <https://github.com/ITISFoundation/sarsampling-iec62209>