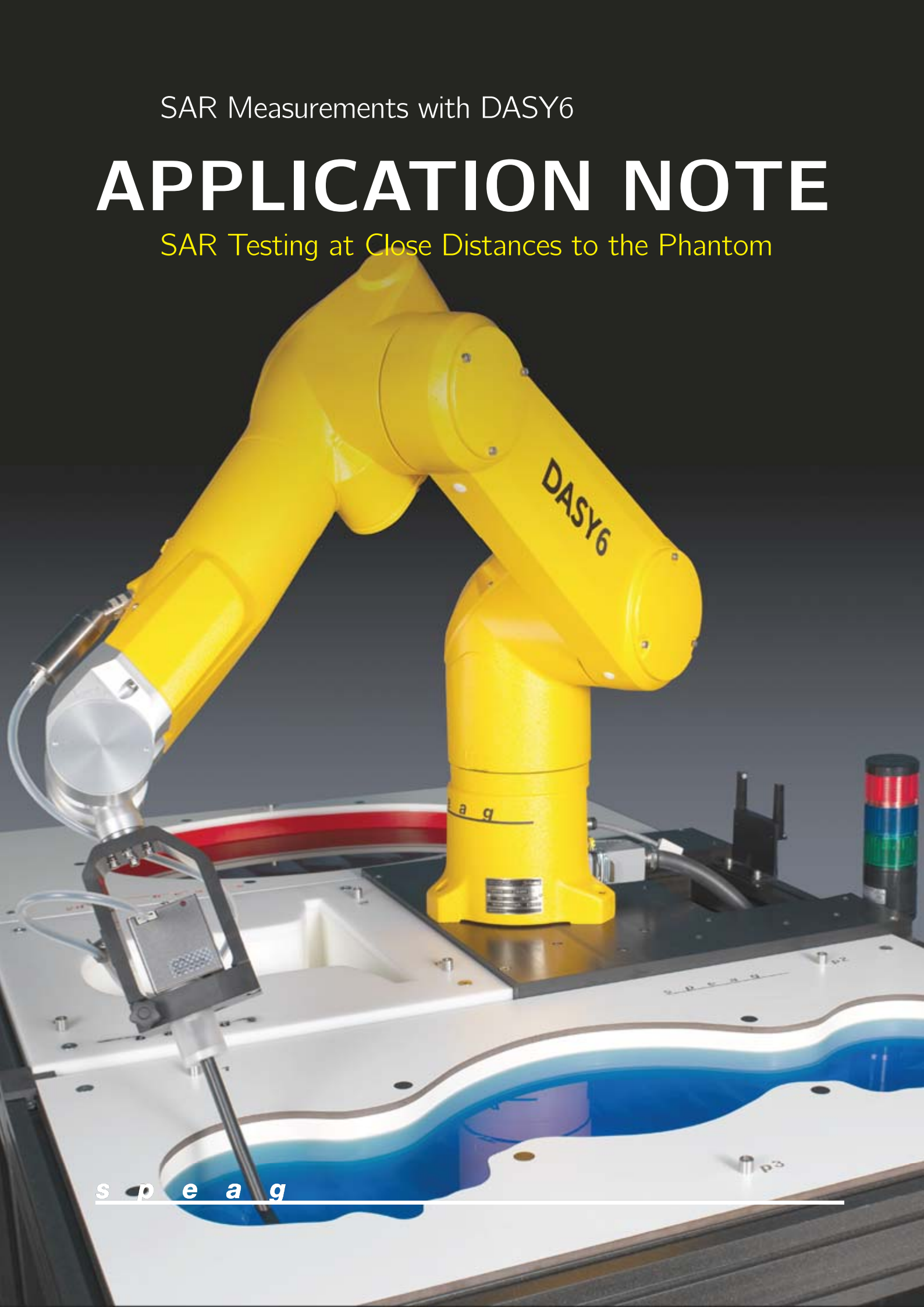
SAR Measurements with DASY6

APPLICATION NOTE

SAR Testing at Close Distances to the Phantom



s p e a g

SAR Testing at Close Distances to the Phantom (d $\leq$5 mm)

1 Introduction

Since the publication of the IEC 62209-2 standard in 2010, thinner devices with electrically short antennas and/or feeding networks close to the surface have been developed. These devices are often tested at a separation distance closer than 5 mm to the outer surface of the phantom shell. In these cases, the radio-frequency (RF) coupling mechanism may be predominately capacitive rather than inductive, resulting in the generation of evanescence like induced fields or specific absorption rate (SAR) distributions with very localized absorption. In other words, for these configurations, SAR decay is steeper than the presumed exponential decay. Hence, the minimal requirements as specified in the IEC 62209-2 standard are no longer appropriate to accurately determine the peak spatial SAR for devices that are positioned close to or touching the phantom, i.e., d $\leq$5 mm.

2 Recommended Scan Settings

The IT'IS Foundation has developed validation sources for vector array systems, and the analysis shows that, in extreme cases, even the proposed measurement grid for devices operating at 6 GHz is not accurate enough.

In these cases, the recommend measurement setup is:

- only use EX3DVx probes
- distance from the surface of the shell to the geometric center of the probe sensors is 1.4 mm
- zoom scan size is at least 22 *x* 22 *x* 22 mm
- initial horizontal grid step of 4 mm
- vertical spacing is a graded-grid which has first measurement step of 1.4 mm and then variable spacing increasing by an incremental factor of 1.4 (graded ratio).

3 DASY Warnings

According to IEC62209-2 Amendment 1, published in 2019 the scan settings needs to be refined under the following conditions:

- the horizontal grid step is more than the −3 dB radius from SAR peak
- the second measured point in z-direction (M2) is less than 30% of the first point

Both software cDASY6.10 or higher and DASY V52.10.3 or higher will issue the warnings shown in Figure 1.1 and in Figure 1.2 if the conditions above are not satisfied. Additionally the calculated values are displayed in the measurement plot for every measurement.

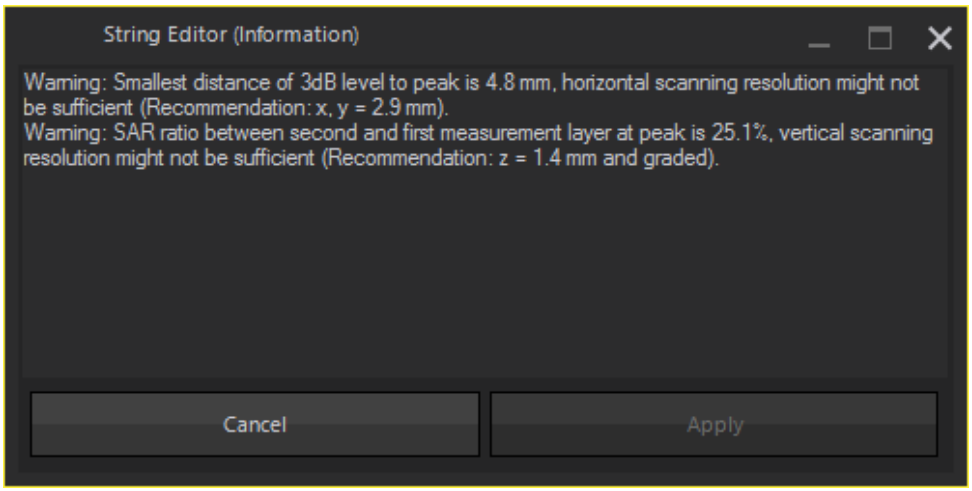


Figure 1.1: Warning message in cDASY6

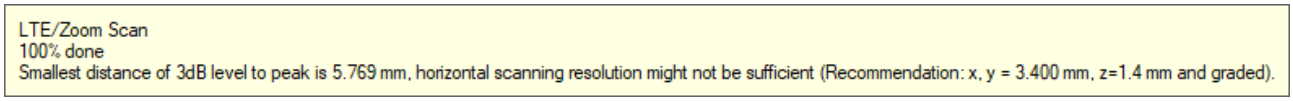


Figure 1.2: Warning message in DASY52

Please note that the conditions above are rarely violated, i.e., only when the main coupling mechanism is capacitive, e.g., for the vertical PIFA antennas that had been developed for validation purposes. The DASY systems will propose an optimized grid. Alternatively, a 2 mm horizontal spacing and a 1.4 mm vertical spacing with 1.4 mm grading ratio can be used. If these recommendations are not followed the uncertainty budget is not valid and reliable results cannot be achieved.

4 PIFA study

To evaluate the impact of grid step size on SAR measurements, a study using a V-PIFA 750 MHz antenna with an input power of 6 dBm was conducted. The summary if provided in Table 1.1.

Summary of Deviations in SAR depending on the grid step size						
			SAR-meas		Dev to Target	
Case Nr.	# grid step	sensor	1 g	10 g	1 g	10 g
1	dx=dy=2 mm, graded dz=1.4 mm	1.4 mm	13.8	3.75	0.26	-0.15
2	dx=dy=6 mm, graded dz=2.5 mm	2 mm	11.8	3.18	-0.42	-0.86
3	dx=dy=4 mm, uniform dz=4 mm	4 mm	11.9	3.20	-0.38	-0.84

Table 1.1: psSAR1g/10g deviations from targets in dB as function of the grid resolution for the V-PIFA 750 MHz