

Supplementary Materials

I. SECTION 1

TABLE I: Detailed Specifications of the Local Server Used for Training the AE

SPECIFICATION	DETAIL
OS Name	Microsoft Windows 11 Pro
Processor	AMD Ryzen 9 5950X 16 Core, 3401 MHz, 32 Logical Processor
RAM	128 GB
Available Physical Memory	113 GB
Available Virtual Memory	93.7 GB
BIOS version/Date	American Megatrends Inc. 5003, 10/07/2023
BaseBoard Manufacturer	ASUSTeK COMPUTER INC.
BaseBoard model	PRIME X570-P

II. SECTION 2

TABLE II: Measurements with a ± 4 mm deviation due to faults, comparing the Standard Image Processing (SIP) method and the Neural Network (NN) method.

DIMENSION	LASER (mm)	BAND (mm)	ΔL (mm)	NOTE	SIP (p.p.)	NN (p.p.)
300 x 1 800	2 775	2 772	3	Wave after burning	2.52	1.66
300 x 1 800	2 881	2 884	-3	Wave after burning	2.38	1.87
300 x 1 800	2 941	2 944	-3	Wave after burning	4.54	2.83
300 x 1 800	2 980	2 983	-3	Wave after burning	3.39	1.42
300 x 1 800	3 012	3 015	-3	Wave after burning	1.87	1.23
300 x 1 800 (s.A)	3 021	3 024	-3	Wave after burning	5.50	2.67
300 x 1 800 (s.B)	3 080	3 076	4	Wave after burning	3.20	2.60
300 x 1 800 (s.C)	3 291	3 294	-3	Scarred forehead	2.12	1.63
300 x 1 800	3 291	3 295	-4	Scarred forehead	1.90	1.17

The results presented in Table II and Table III indicate the percentage points (p.p.) by which the detected area is smaller than the area detected using the laser sensor. Each measured value in the tables represents the average of ten measurements, with the maximum cutting faults recorded. Table II contains measurements with deviations not exceeding ± 2 mm, while Table III highlights measurements where deviations exceeded ± 2 mm. These larger deviations were likely due to defects introduced during previous material treatments. However, none of the deviations surpassed ± 4 mm, satisfying the accuracy requirement of ± 5 mm. Notably, no measurements reached this threshold.

TABLE III: Measurements with a ± 2 mm deviation, where * indicates wave after burning, comparing the Standard Image Processing (SIP) method and the Neural Network (NN) method.

DIMENSION	LASER (mm)	BAND (mm)	ΔL (mm)	SIP (p.p.)	NN (p.p.)
300 x 1 800 *	2 430	2 432	-2	1.87	1.59
300 x 1 800 (s.D)	2 451	2 450	1	-	-
300 x 1 800	2 452	2 452	0	-	-
300 x 1 800	2 463	2 461	2	-	-
145 x 1300	2 530	2 531	-1	-	-
145 x 1300 *	2 530	2 532	-2	3.20	2.04
300 x 1 800	2 580	2 580	0	-	-
300 x 1 800	2 621	2 619	2	-	-
300 x 1 800	2 621	2 622	-1	-	-
300 x 1 800	2 631	2 629	2	-	-
300 x 1 800	2 815	2 815	0	-	-
300 x 1 800 *	2 881	2 879	2	3.73	2.21
300 x 1 800	2 962	2 962	0	-	-
300 x 1 800	3 000	3 000	0	-	-
300 x 1 800	3 021	3 020	1	-	-
300 x 1 800	3 051	3 050	1	-	-
300 x 1 800	3 201	3 202	-1	-	-
300 x 1 800	3 201	3 203	-2	-	-
300 x 1 800	3 261	3 261	0	-	-
300 x 1 800	3 330	3 329	1	-	-