



Antenna Composite Gain Test Report

Equipment	5400 Mbps 11ax Wi-Fi Mesh Extender Wi-Fi 6 Smart Mesh System 5400 Mbps 11ax Wi-Fi Mesh Access Point AX5400 Wi-Fi 6 Router Home Wi-Fi Solution Kit WiFi 6 Booster Wi-Fi 6 Smart Mesh Extender
Brand Name	Airties
Model Name	Air 4960X, Air 4960XR
Applicant	Airties Wireless Networks Sehit Mehmet Mikdat Uluunlu Sokagi No:23 Esentepe, Sisli İstanbul, 34394 Turkey
Manufacturer	Airties Wireless Networks Sehit Mehmet Mikdat Uluunlu Sokagi No:23 Esentepe, Sisli İstanbul, 34394 Turkey
Sample Received	Mar. 10, 2022
Start Test Date	Mar. 30, 2022
Final Test Date	Mar. 30, 2022
SW version	4.130.1.0.1755_wltest
HW version	4960X-D01-M01-R08
Serial Number	AG2932203000004



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History of this test report

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1. Operation Mode and Antenna Information

Antenna Position	RF Port		Brand Name	Model Name	Ant. Type	Connector	Modes of Operation
	2.4GHz	5GHz					
2G 5GAnt1	2	1	AirTies	A01	Printed	N/A	2.4GHz, 5GHz UNII 1~3
2G 5GAnt2	1	4	AirTies	A30	Printed	N/A	2.4GHz, 5GHz UNII 1~3
5GAnt3	-	2	AirTies	A1X	Printed	N/A	5GHz UNII 1~3
5GAnt4	-	3	AirTies	A2X	Printed	N/A	5GHz UNII 1~3

Note:

2.4GHz Operation Mode (2TX/2RX)

2G 5GAnt1~2G 5GAnt2 can be used as transmitting/receiving antenna.

2G 5GAnt1~2G 5GAnt2 could transmit/receive simultaneously.

5GHz Operation Mode (4TX/4RX)

2G 5GAnt1~5GAnt 4 can be used as transmitting/receiving antenna.

2G 5GAnt1~5GAnt 4 could transmit/receive simultaneously.

2. Test Frequency

The listed frequency of each bands are selected to represent each frequency bands

Band [MHz]	Test Frequency [MHz]
2400-2483.5	2450
5150-5250	5200
5250-5350	5300
5470-5725	5600
5725-5850	5785

3. Testing Location

Testing Location		
☒	HWA YA	ADD : No.13-1 & 14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333, Taiwan R.O.C.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated	05CH03-HY	Rex Liao	23.5-24.5 / 50-55	Mar. 30, 2022

Note:

Testing Site Information

Brand Name: TDK

Dimension: 11m*6m*6m

Characteristic: Fully Anechoic Chamber

4. Test Facility and Configuration

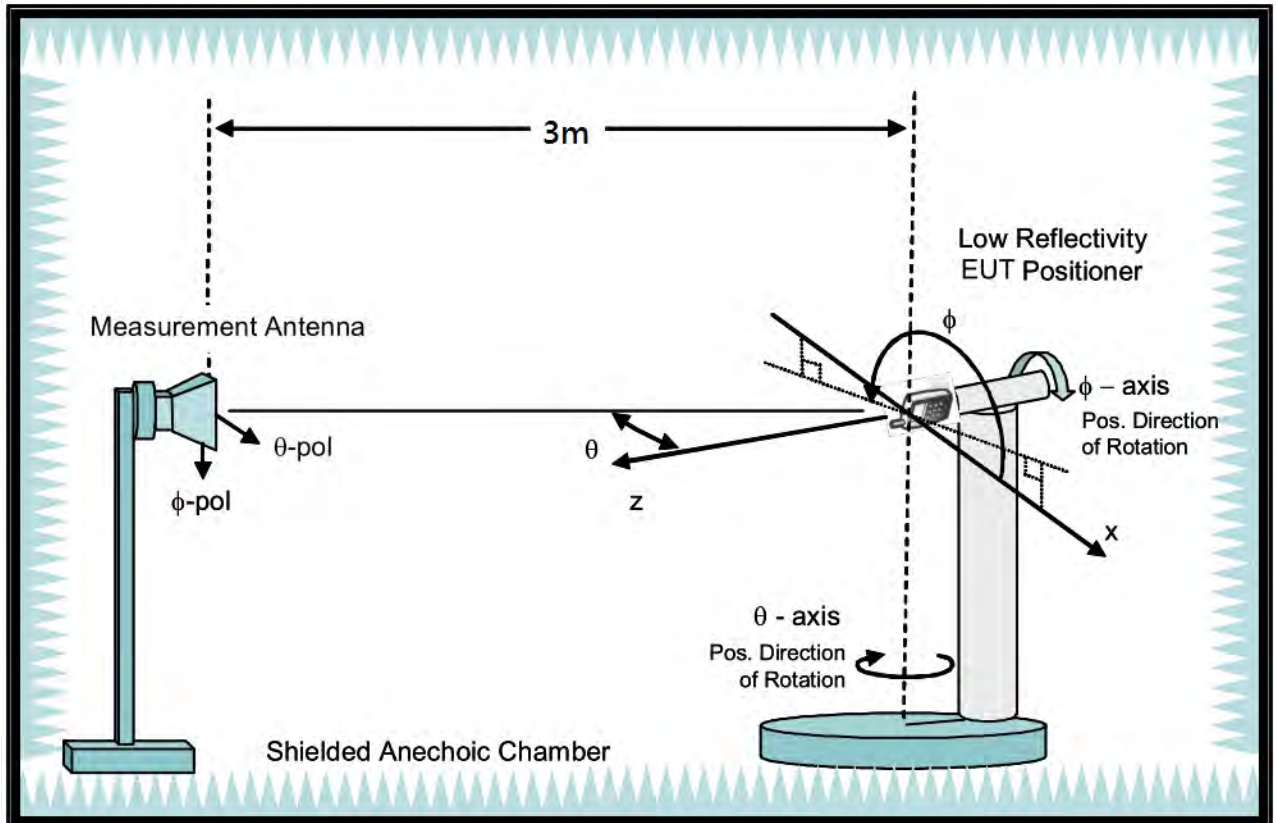
Test configuration: Reference to CITA OTA distributed-axes system configuration.

Chamber: Fully Anechoic Chamber.

Measurement antenna: Single Polarization Horn antenna calibrated according to ANSI C63.5.

Turntable: Multi-axis positioner (Theta and Phi angle).

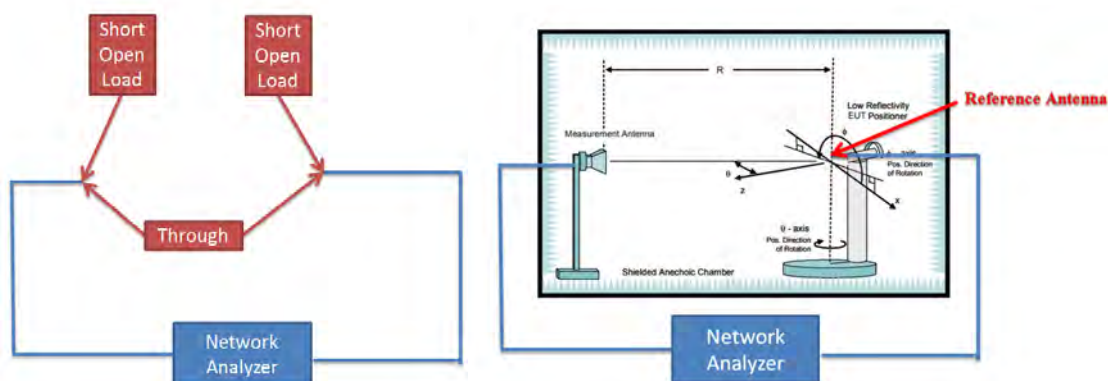
#Reference to CTIA "ctia-test-plan-for-wireless-device-over-the-air-performance-ver-3-7-1"



5. Reference Calibration

Connected cables to VNA calibration kit and use network analyzer internal function to do calibration. Do short, open and load to each side. Then connect through to both side and calibrate S21 values. The cable loss is calibrated and set inside the network analyzer.

Measurement Antenna is connected to port1 of Network analyzer and reference antenna connected to port 2 of Network Analyzer. Record S21 values and used with reference antenna gain to calculate gain factor.



Frequency (MHz)	2400	2450	2500	5150	5200	5300	5600	5750	5800	5900	6000	6500	7000	7500
S21 values (dBi)	-31.4	-31.4	-31.3	-31.3	-31	-30.7	-30.1	-30.5	-30.5	-30.8	-31.3	-32.8	-34.4	-35.4
Reference gain (dBi)	10.2	10.4	10.6	12.4	12.8	13.4	13.4	13.3	13.3	13.1	13.2	12.3	11.7	11.1
Factor (dB)	41.63	41.81	41.89	43.72	43.78	44.12	43.5	43.78	43.76	43.88	44.45	45.14	46.08	46.51



6. Test Method

EUT set on multi-axis positioner and adjust EUT's physical center to measurement reference center. Measurement antenna set at phi polarization and 1.5 meter height. Port 1 of Network analyzer connect to antenna 1 of EUT. Record S21 value every 15 degree from 0 to 345 degree on Phi angle and 0 to 180 on theta angle of multi-axis positioner. Then set measurement antenna to theta polarization and repeat process. Repeat process to each antenna of EUT.

DG steps:

1. Each Phi and Theta polarization antenna gain are measured for all test angles.
2. Composite Phi and Theta antenna gain are computed, using formula in KDB662911 D01 d) (i) and e) (ii), for all angles.
3. Composite antenna gain are examined for all angles to determine max gain and Phi/Theta position. Max gain and phi/theta position are listed in section 7 tables.

7. Measured Values and Calculation of Maximum Gain Positions

DG_1SS max value position

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 (dBi)	-1.69	-2.37	-3.28	2.98	-3.64
Ant. 2 (dBi)	1.31	-1.07	-1.03	-6.92	-0.68
Ant. 3 (dBi)	-	1.14	2.05	-0.51	1.02
Ant. 4 (dBi)	-	0.6	1.09	-0.97	2.7
DG [1SS] (dBi)	2.95	5.7	5.96	5.34	6.17
Polarization	Theta	Theta	Theta	Phi	Theta
$\Theta(^{\circ})$	110	10	100	20	110
$\Phi(^{\circ})$	30	90	270	10	270

Note: The DG 1SS max value position is the maximum value of section 11 table DG 1SS Result.

DG_1SS max value position calculation

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 [$10^{(G/20)}$]	$10^{(-1.69/20)}$	$10^{(-2.37/20)}$	$10^{(-3.28/20)}$	$10^{(2.98/20)}$	$10^{(-3.64/20)}$
Ant. 2 [$10^{(G/20)}$]	$10^{(1.31/20)}$	$10^{(-1.07/20)}$	$10^{(-1.03/20)}$	$10^{(-6.92/20)}$	$10^{(-0.68/20)}$
Ant. 3 [$10^{(G/20)}$]	-	$10^{(1.14/20)}$	$10^{(2.05/20)}$	$10^{(-0.51/20)}$	$10^{(1.02/20)}$
Ant. 4 [$10^{(G/20)}$]	-	$10^{(0.6/20)}$	$10^{(1.09/20)}$	$10^{(-0.97/20)}$	$10^{(2.7/20)}$
Ant. 1 [$10^{(G/20)}$] value	0.823	0.761	0.685	1.409	0.658
Ant. 2 [$10^{(G/20)}$] value	1.163	0.884	0.888	0.451	0.925
Ant. 3 [$10^{(G/20)}$] value	-	1.14	1.266	0.943	1.125
Ant. 4 [$10^{(G/20)}$] value	-	1.072	1.134	0.894	1.365
Sum All Antenna [Amax]	1.986	3.857	3.974	3.697	4.072
DG [$10^{\log(Amax^2/Nant)}$]	2.95	5.7	5.96	5.34	6.17

Note:

Directional Gain (1SS) is the max value of every look angle. Each position value is calculated by KDB662911 D01 d) (i).

Directional gain (1SS) = $10^{\log(10^{(G_{ant1}/20)} + 10^{(G_{ant2}/20)} + 10^{(G_{ant3}/20)} + 10^{(G_{ant4}/20)} + \dots)^{2/N_{ant}}}$

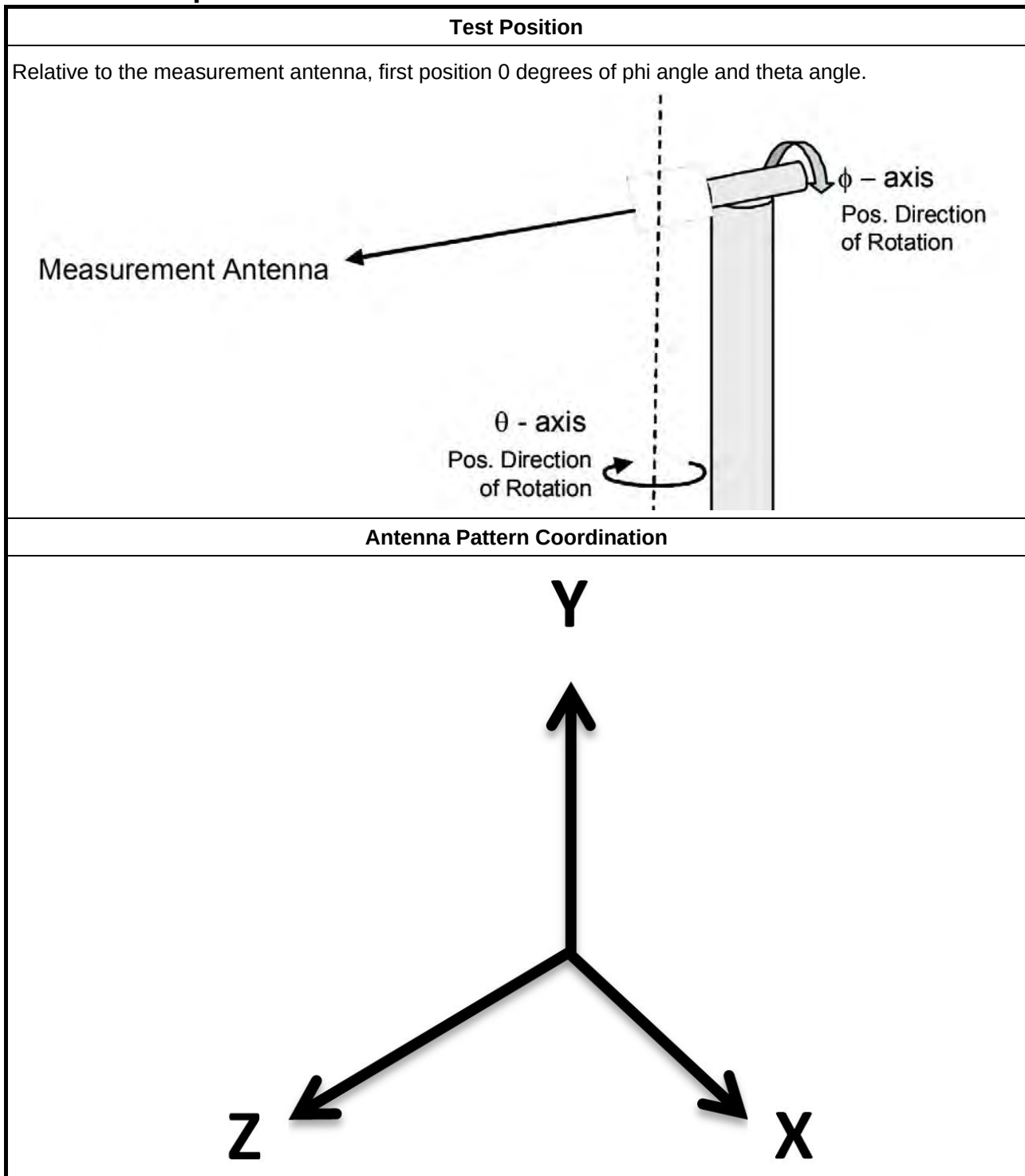
8. Summary of Test Result

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	2.73	3.56	3.95	4.61	4.2
Ant. 2 Max Gain (dBi)	1.86	2.24	1.7	3.3	3.16
Ant. 3 Max Gain (dBi)	-	1.89	2.05	1.17	1.02
Ant. 4 Max Gain (dBi)	-	1.89	1.14	2.73	3.97
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/70/80	Phi/150/0	Theta/140/270	Theta/140/270	Theta/140/270
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/120/30	Theta/90/90	Theta/110/130	Theta/120/60	Theta/120/60
Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	-	Theta/20/90	Theta/100/270	Theta/20/90	Theta/110/270
Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	-	Theta/120/200	Theta/120/200	Theta/120/200	Theta/90/290
Max Gain (dBi)	2.73	3.56	3.95	4.61	4.2
DG [1SS] (dBi)	2.95	5.7	5.96	5.34	6.17
DG [2SS] (dBi)	2.73	3.56	3.95	4.61	4.2
DG [4SS] (dBi)	-	3.56	3.95	4.61	4.2

Note:

1. Antenna max gain is the max value of each individual antenna through all measurement angles.
2. The max gain is the max value of all antennas.
3. Directional Gain (2SS) = Directional Gain (1SS) – 3dB. If directional gain is less than max gain, use max gain as directional gain.
4. Directional Gain (4SS) = Directional Gain (1SS) – 6dB. If directional gain is less than max gain, use max gain as directional gain.

9. Test Setup



Note:

Photos of Test Position: Please refer to the test photos in the appendix.



10. Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Horn Antenna	SCHWARZBECK	BBHA9120D	BBHA 9120D-1292	1GHz~18GHz	Aug. 04, 2021	Aug. 03, 2022
ENA Series Network Analyzer	AGILENT	E5071C	MY46419201	100kHz~8.5GHz	Feb. 21, 2022	Feb. 20, 2023
Test Software	SPORTON	SENSE-RDG	V1.0.6	-	N.C.R.	N.C.R.

Note: Calibration Interval of instruments listed above is one year.

NCR means Non-Calibration required.



11. Test Results

Please refer to the appendix.

Appendix A – Radiated Composite Gain of 2.4GHz and 5GHz.....	Page 13
Appendix B –Antenna Pattern of 2.4GHz and 5GHz.....	Page 21
Appendix C –Test Photos.....	Page 28



Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	2.73	3.56	3.95	4.61	4.2
Ant. 2 Max Gain (dBi)	1.86	2.24	1.7	3.3	3.16
Ant. 3 Max Gain (dBi)		1.89	2.05	1.17	1.02
Ant. 4 Max Gain (dBi)		1.89	1.14	2.73	3.97
Ant. 1 Polarization/Θ(°)/Φ(°)	Theta/70/80	Phi/150/0	Theta/140/270	Theta/140/270	Theta/140/270
Ant. 2 Polarization/Θ(°)/Φ(°)	Theta/120/30	Theta/90/90	Theta/110/130	Theta/120/60	Theta/120/60
Ant. 3 Polarization/Θ(°)/Φ(°)		Theta/20/90	Theta/100/270	Theta/20/90	Theta/110/270
Ant. 4 Polarization/Θ(°)/Φ(°)		Theta/120/200	Theta/120/200	Theta/120/200	Theta/90/290
Max Gain (dBi)	2.73	3.56	3.95	4.61	4.2
DG [1SS] (dBi)	2.95	5.7	5.96	5.34	6.17
DG [2SS] (dBi)	2.73	3.56	3.95	4.61	4.2
DG [4SS] (dBi)		3.56	3.95	4.61	4.2

Sporton International Inc. Hsinchu Laboratory

Radiated Composite Gain of 2.4GHz and 5GHz

Appendix A

Gain Result

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000000	1.0000	1.000000	2.0000	3.0000	4.0000	5.0000	6.0000	7.0000	8.0000	9.0000	10.0000	11.0000	12.0000	13.0000	14.0000	15.0000	16.0000	17.0000	18.0000	19.0000	20.0000	21.0000	22.0000	23.0000	24.0000	25.0000	26.0000	27.0000	28.0000	29.0000	30.0000	31.0000	32.0000	33.0000	34.0000	35.0000	36.0000	37.0000	38.0000	39.0000	40.0000	41.0000	42.0000	43.0000	44.0000	45.0000	46.0000	47.0000	48.0000	49.0000	50.0000	51.0000	52.0000	53.0000	54.0000	55.0000	56.0000	57.0000	58.0000	59.0000	60.0000	61.0000	62.0000	63.0000	64.0000	65.0000	66.0000	67.0000	68.0000	69.0000	70.0000	71.0000	72.0000	73.0000	74.0000	75.0000	76.0000	77.0000	78.0000	79.0000	80.0000	81.0000	82.0000	83.0000	84.0000	85.0000	86.0000	87.0000	88.0000	89.0000	90.0000	91.0000	92.0000	93.0000	94.0000	95.0000	96.0000	97.0000	98.0000	99.0000	100.0000
000001	1.0001	1.000100	2.0002	3.0003	4.0004	5.0005	6.0006	7.0007	8.0008	9.0009	10.0010	11.0011	12.0012	13.0013	14.0014	15.0015	16.0016	17.0017	18.0018	19.0019	20.0020	21.0021	22.0022	23.0023	24.0024	25.0025	26.0026	27.0027	28.0028	29.0029	30.0030	31.0031	32.0032	33.0033	34.0034	35.0035	36.0036	37.0037	38.0038	39.0039	40.0040	41.0041	42.0042	43.0043	44.0044	45.0045	46.0046	47.0047	48.0048	49.0049	50.0050	51.0051	52.0052	53.0053	54.0054	55.0055	56.0056	57.0057	58.0058	59.0059	60.0060	61.0061	62.0062	63.0063	64.0064	65.0065	66.0066	67.0067	68.0068	69.0069	70.0070	71.0071	72.0072	73.0073	74.0074	75.0075	76.0076	77.0077	78.0078	79.0079	80.0080	81.0081	82.0082	83.0083	84.0084	85.0085	86.0086	87.0087	88.0088	89.0089	90.0090	91.0091	92.0092	93.0093	94.0094	95.0095	96.0096	97.0097	98.0098	99.0099	100.0100
000002	1.0004	1.000400	2.0008	3.0012	4.0016	5.0020	6.0024	7.0028	8.0032	9.0036	10.0040	11.0044	12.0048	13.0052	14.0056	15.0060	16.0064	17.0068	18.0072	19.0076	20.0080	21.0084	22.0088	23.0092	24.0096	25.0100	26.0104	27.0108	28.0112	29.0116	30.0120	31.0124	32.0128	33.0132	34.0136	35.0140	36.0144	37.0148	38.0152	39.0156	40.0160	41.0164	42.0168	43.0172	44.0176	45.0180	46.0184	47.0188	48.0192	49.0196	50.0200	51.0204	52.0208	53.0212	54.0216	55.0220	56.0224	57.0228	58.0232	59.0236	60.0240	61.0244	62.0248	63.0252	64.0256	65.0260	66.0264	67.0268	68.0272	69.0276	70.0280	71.0284	72.0288	73.0292	74.0296	75.0300	76.0304	77.0308	78.0312	79.0316	80.0320	81.0324	82.0328	83.0332	84.0336	85.0340	86.0344	87.0348	88.0352	89.0356	90.0360	91.0364	92.0368	93.0372	94.0376	95.0380	96.0384	97.0388	98.0392	99.0396	100.0400
000003	1.0009	1.000900	2.0018	3.0027	4.0036	5.0045	6.0054	7.0063	8.0072	9.0081	10.0090	11.0099	12.0108	13.0117	14.0126	15.0135	16.0144	17.0153	18.0162	19.0171	20.0180	21.0189	22.0198	23.0207	24.0216	25.0225	26.0234	27.0243	28.0252	29.0261	30.0270	31.0279	32.0288	33.0297	34.0306	35.0315	36.0324	37.0333	38.0342	39.0351	40.0360	41.0369	42.0378	43.0387	44.0396	45.0405	46.0414	47.0423	48.0432	49.0441	50.0450	51.0459	52.0468	53.0477	54.0486	55.0495	56.0504	57.0513	58.0522	59.0531	60.0540	61.0549	62.0558	63.0567	64.0576	65.0585	66.0594	67.0603	68.0612	69.0621	70.0630	71.0639	72.0648	73.0657	74.0666	75.0675	76.0684	77.0693	78.0702	79.0711	80.0720	81.0729	82.0738	83.0747	84.0756	85.0765	86.0774	87.0783	88.0792	89.0801	90.0810	91.0819	92.0828	93.0837	94.0846	95.0855	96.0864	97.0873	98.0882	99.0891	100.0900
000004	1.0016	1.001600	2.0032	3.0049	4.0064	5.0079	6.0094	7.0109	8.0124	9.0139	10.0154	11.0169	12.0184	13.0199	14.0214	15.0229	16.0244	17.0259	18.0274	19.0289	20.0304	21.0319	22.0334	23.0349	24.0364	25.0379	26.0394	27.0409	28.0424	29.0439	30.0454	31.0469	32.0484	33.0499	34.0514	35.0529	36.0544	37.0559	38.0574	39.0589	40.0604	41.0619	42.0634	43.0649	44.0664	45.0679	46.0694	47.0709	48.0724	49.0739	50.0754	51.0769	52.0784	53.0799	54.0814	55.0829	56.0844	57.0859	58.0874	59.0889	60.0904	61.0919	62.0934	63.0949	64.0964	65.0979	66.0994	67.1009	68.1024	69.1039	70.1054	71.1069	72.1084	73.1099	74.1114	75.1129	76.1144	77.1159	78.1174	79.1189	80.1204	81.1219	82.1234	83.1249	84.1264	85.1279	86.1294	87.1309	88.1324	89.1339	90.1354	91.1369	92.1384	93.1399	94.1414	95.1429	96.1444	97.1459	98.1474	99.1489	100.1504
000005	1.0025	1.002500	2.0050	3.0075	4.0100	5.0125	6.0150	7.0175	8.0200	9.0225	10.0250	11.0275	12.0300	13.0325	14.0350	15.0375	16.0400	17.0425	18.0450	19.0475	20.0500	21.0525	22.0550	23.0575	24.0600	25.0625	26.0650	27.0675	28.0700	29.0725	30.0750	31.0775	32.0800	33.0825	34.0850	35.0875	36.0900	37.0925	38.0950	39.0975	40.1000	41.1025	42.1050	43.1075	44.1100	45.1125	46.1150	47.1175	48.1200	49.1225	50.1250	51.1275	52.1300	53.1325	54.1350	55.1375	56.1400	57.1425	58.1450	59.1475	60.1500	61.1525	62.1550	63.1575	64.1600	65.1625	66.1650	67.1675	68.1700	69.1725	70.1750	71.1775	72.1800	73.1825	74.1850	75.1875	76.1900	77.1925	78.1950	79.1975	80.2000	81.2025	82.2050	83.2075	84.2100	85.2125	86.2150	87.2175	88.2200	89.2225	90.2250	91.2275	92.2300	93.2325	94.2350	95.2375	96.2400	97.2425	98.2450	99.2475	100.2500
000006	1.0036	1.003600	2.0072	3.0108	4.0144	5.0180	6.0216	7.0252	8.0288	9.0324	10.0360	11.0396	12.0432	13.0468	14.0504	15.0540	16.0576	17.0612	18.0648	19.0684	20.0720	21.0756	22.0792	23.0828	24.0864	25.0900	26.0936	27.0972	28.1008	29.1044	30.1080	31.1116	32.1152	33.1188	34.1224	35.1260	36.1296	37.1332	38.1368	39.1404	40.1440	41.1476	42.1512	43.1548	44.1584	45.1620	46.1656	47.1692	48.1728	49.1764	50.1800	51.1836	52.1872	53.1908	54.1944	55.1980	56.2016	57.2052	58.2088	59.2124	60.2160	61.2196	62.2232	63.2268	64.2304	65.2340	66.2376	67.2412	68.2448	69.2484	70.2520	71.2556	72.2592	73.2628	74.2664	75.2700	76.2736	77.2772	78.2808	79.2844	80.2880	81.2916	82.2952	83.2988	84.3024	85.3060	86.3096	87.3132	88.3168	89.3204	90.3240	91.3276	92.3312	93.3348	94.3384	95.3420	96.3456	97.3492	98.3528	99.3564	100.3600
000007	1.0049	1.004900	2.0098	3.0147	4.0196	5.0245	6.0294	7.0343	8.0392	9.0441	10.0490	11.0539	12.0588	13.0637	14.0686	15.0735	16.0784	17.0833	18.0882	19.0931	20.0980	21.1029	22.1078	23.1127	24.1176	25.1225	26.1274	27.1323	28.1372	29.1421	30.1470	31.1519	32.1568	33.1617	34.1666	35.1715	36.1764	37.1813	38.1862	39.1911	40.1960	41.2009	42.2058	43.2107	44.2156	45.2205	46.2254	47.2303	48.2352	49.2401	50.2450	51.2499	52.2548	53.2597	54.2646	55.2695	56.2744	57.2793	58.2842	59.2891	60.2940	61.2989	62.3038	63.3087	64.3136	65.3185	66.3234	67.3283	68.3332	69.3381	70.3430	71.3479	72.3528	73.3577	74.3626	75.3675	76.3724	77.3773	78.3822	79.3871	80.3920	81.3969	82.4018	83.4067	84.4116	85.4165	86.4214	87.4263	88.4312	89.4361	90.4410	91.4459	92.4508	93.4557	94.4606	95.4655	96.4704	97.4753	98.4802	99.4851	100.4900
000008	1.0064	1.006400	2.0128	3.0192	4.0256	5.0320	6.0384	7.0448	8.0512	9.0576	10.0640	11.0704	12.0768	13.0832	14.0896	15.0960	16.1024	17.1088	18.1152	19.1216	20.1280	21.1344	22.1408	23.1472	24.1536	25.1600	26.1664	27.1728	28.1792	29.1856	30.1920	31.1984	32.2048	33.2112	34.2176	35.2240	36.2304	37.2368	38.2432	39.2496	40.2560	41.2624	42.2688	43.2752	44.2816	45.2880	46.2944	47.3008	48.3072	49.3136	50.3200	51.3264	52.3328	53.3392	54.3456	55.3520	56.3584	57.3648	58.3712	59.3776	60.3840	61.3904	62.3968	63.4032	64.4096	65.4160	66.4224	67.4288	68.4352	69.4416	70.4480	71.4544	72.4608	73.4672	74.4736	75.4800	76.4864	77.4928	78.4992	79.5056	80.5120	81.5184	82.5248	83.5312	84.5376	85.5440	86.5504	87.5568	88.5632	89.5696	90.5760	91.5824	92.5888	93.5952	94.6016	95.6080	96.6144	97.6208	98.6272	99.6336	100.6400
000009	1.0081	1.008100	2.0162	3.0243	4.0324	5.0405	6.0486	7.0567	8.0648	9.0729	10.0810	11.0891	12.0972	13.1053	14.1134	15.1215	16.1296	17.1377	18.1458	19.1539	20.1620	21.1701	22.1782	23.1863	24.1944	25.2025	26.2106	27.2187	28.2268	29.2349	30.2430	31.2511	32.2592	33.2673	34.2754	35.2835	36.2916	37.2997	38.3078	39.3159	40.3240	41.3321	42.3402	43.3483	44.3564	45.3645	46.3726	47.3807	48.3888	49.3969	50.4050	51.4131	52.4212	53.4293	54.4374	55.4455	56.4536	57.4617	58.4698	59.4779	60.4860	61.4941	62.5022	63.5103	64.5184	65.5265	66.5346	67.5427	68.5508	69.5589	70.5670	71.5751	72.5832	73.5913	74.5994	75.6075	76.6156	77.6237	78.6318	79.6399	80.6480	81.6561	82.6642	83.6723	84.6804	85.6885	86.6966	87.7047	88.7128	89.7209	90.7290	91.7371	92.7452	93.7533	94.7614	95.7695	96.7776	97.7857	98.7938	99.8019	100.8100
000010	1.0100	1.010000	2.0200	3.0300	4.0400	5.0500	6.0600	7.0700	8.0800	9.0900	10.1000	11.1100	12.1200	13.1300	14.14																																																																																						

[illegible]

Sporton International Inc. Hsinchu Laboratory

[illegible]

E1(XY plane) – $\Theta(90^\circ)\Phi(0-360^\circ)$
E2(XZ plane) – $\Theta(0-180^\circ)\Phi(0^\circ)$ and $\Theta(0-180^\circ)\Phi(180^\circ)$
E3(YZ plane) – $\Theta(0-180^\circ)\Phi(90^\circ)$ and $\Theta(0-180^\circ)\Phi(270^\circ)$

