FINAL REPORT

Company:	Alpha & Omega Semiconductor
Model:	AOZ7100QI
Product Type:	USB Type-C PD Charger
Product SPEC:	USB BC1.2 / PD 2.0 / PD 3.0 with PPS Qualcomm QC 2.0 / QC 3.0 / QC 4.0+
Service Type:	Charger Compatibility Certification
Test Result	**Pass**
Project ID:	UCR-LRS-DVT-001
Update:	2019-04-30

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Alpha & Omega Semiconductor.
USB Type-C PD Charger (Model: AOZ7100QI)

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I. EXECUTIVE SUMMARY

As an international product validation and consulting engineering company, Allion Labs, Inc. (Allion) keeps pace with all the latest technology with specialized teams composed of experts in hardware and software analysis. These experts composed this test proposal, which focuses on Compatibility testing of USB Charger. This proposal outlines the overall methodology suggested by our expert staff, including detailed descriptions of both the test plan and test environment.

The following table lists potential risks and possible causes for USB Charger. Our test experts compiled this information to guide the proposal design process based on their prior test experience, customer consultation, and independent research. As a rule, Allion recommends that quality testing begin at the early design stage, since at this point in the process; there is greater freedom to alter the design with minimal impacts on downstream project schedules and associated costs.

⚠ POTENTIAL RISKS	☑ POSSIBLE CAUSES
• Device detection/ recognition	• Poor signal quality
• Device stability	• Unsuitable hardware design
• Device enumeration	• Charging state handling issue
• Device Charging function	• Incorrect firmware implementation
• Device damage	• Improper protocol applied

II. TEST PLAN

To ensure that the Alpha & Omega Semiconductor. USB Type-C PD Charger product passes standard-quality benchmarks, Allion proposes the following test plan consisting of various test items in the following testing categories:

A. Charging Test
B. Bundle Charger Test

See the tables below for testing details:

A. Charging Test

Test Item	Description
Mobile Phone / Tablet - Power On (Battery power capacity: 30%~70%)	• Power on the DUT and record the battery power capacity (%) • Connect the mobile phone / Tablet to DUT and check the charge function during 1 minutes ➢ Check the mobile phone / Tablet charging indication and battery charging status ➢ Measure the VBUS voltage and charge current
Mobile Phone / Tablet - Power Off (Battery power capacity: 30%~70%)	• Power on the DUT and record the battery power capacity (%) • Connect the mobile phone / Tablet to DUT and check the charge function during 1 minutes ➢ Check the mobile phone / Tablet charging indication and battery charging status ➢ Measure the VBUS voltage and charge current

B. Bundle Charger Test

Test Item	Description
Mobile Phone / Tablet - Power On (Battery power capacity: 30%~70%)	• Power on the DUT and record the battery power capacity (%) • Connect the mobile phone / Tablet to DUT and check the charge function during 1 minutes ➢ Check the mobile phone / Tablet charging indication and battery charging status ➢ Measure the VBUS voltage and charge current
Mobile Phone / Tablet - Power Off (Battery power capacity: 30%~70%)	• Power on the DUT and record the battery power capacity (%) • Connect the mobile phone / Tablet to DUT and check the charge function during 1 minutes ➢ Check the mobile phone / Tablet charging indication and battery charging status ➢ Measure the VBUS voltage and charge current

III. TEST RESULT

Mobile phone			Original Charger Battery Power 30%~70%								Lyra Semiconductor DUT Battery Power 30%~70%								
			Test Cable	Power On				Power Off				Test Cable	Power On				Power Off			
No.	Vendor	Phone Name		Electricity	Voltage (V)	Current (A)	Power (W)	Electricity	Voltage (V)	Current (A)	Power (W)		Electricity (%)	Voltage (V)	Current (A)	Power (W)	Electricity (%)	Voltage (V)	Current (A)	Power (W)
1	ASUS	ZenFone 3	USB-A to USB-C	43%	4.96	1.88	9.32	46%	4.96	1.88	9.32	USB-C to USB-C	47%	5.03	1.87	9.41	48%	5.03	1.88	9.46
2	ASUS	ZenFone 3 Deluxe	USB-A to USB-C	31%	8.69	1.76	15.29	34%	8.70	1.64	14.27	USB-C to USB-C	35%	9.14	0.75	6.86	37%	9.15	1.47	13.45
3	ASUS	ZenFone 4 (ZE554KL)	USB-A to USB-C	54%	4.96	1.83	9.08	55%	4.96	1.83	9.08	USB-C to USB-C	56%	9.15	1.23	11.25	58%	9.14	1.08	9.87
4	ASUS	ZenFone 4 Pro (ZS551KL)	USB-A to USB-C	52%	9.22	1.79	16.50	58%	9.21	1.79	16.49	USB-C to USB-C	55%	9.16	1.88	17.22	57%	9.16	1.82	16.67
5	ASUS	ZenFone 5 (ZE620KL)	USB-A to USB-C	47%	5.00	1.86	9.30	49%	5.00	1.86	9.30	USB-C to USB-C	50%	9.16	1.58	14.47	51%	9.16	1.58	14.47
6	ASUS	ZenFone 5Z (ZS620KL)	USB-A to USB-C	49%	5.01	1.91	9.57	51%	5.01	1.91	9.57	USB-C to USB-C	52%	9.16	1.50	13.74	53%	9.16	1.52	13.92
7	ASUS	ZenFone AR (ZS571KL)	USB-A to USB-C	50%	9.16	1.71	15.66	52%	9.16	1.69	15.48	USB-C to USB-C	54%	9.16	1.73	15.85	55%	9.16	1.70	15.57
8	ASUS	ZenFone Ares(ZS572KL)	USB-A to USB-C	43%	9.21	1.85	17.04	45%	9.21	1.66	15.29	USB-C to USB-C	48%	9.16	1.72	15.76	50%	9.15	1.68	15.37
9	Apple	iPhone 8	USB-A to Lightning	66%	5.08	0.93	4.72	N/A	N/A	N/A	N/A	USB-C to Lightning	64%	9.20	0.91	8.37	N/A	N/A	N/A	N/A
10	Apple	iPhone 8 Plus	USB-A to Lightning	46%	5.05	0.95	4.80	N/A	N/A	N/A	N/A	USB-C to Lightning	47%	9.25	1.42	13.14	N/A	N/A	N/A	N/A
11	Apple	iPhone XR	USB-A to Lightning	34%	5.07	0.98	4.97	N/A	N/A	N/A	N/A	USB-C to Lightning	34%	9.29	1.98	18.39	N/A	N/A	N/A	N/A
12	Apple	iPhone Xs	USB-A to Lightning	39%	5.08	0.97	4.93	N/A	N/A	N/A	N/A	USB-C to Lightning	34%	9.24	1.33	12.29	N/A	N/A	N/A	N/A
13	Apple	iPhone Xs Max	USB-A to Lightning	66%	5.05	0.98	4.95	N/A	N/A	N/A	N/A	USB-C to Lightning	63%	9.28	1.48	13.73	N/A	N/A	N/A	N/A
14	Blackberry	Key2	USB-A to USB-C	42%	7.54	1.94	14.63	48%	7.74	1.36	10.53	USB-C to USB-C	52%	5.02	2.39	12.00	53%	5.02	2.39	12.00
15	Coolpad	Changer S1	USB-A to USB-C	31%	8.59	2.39	20.53	34%	7.82	2.62	20.49	USB-C to USB-C	66%	4.90	2.45	12.01	66%	5.02	2.67	13.40
16	Google	Google Pixel XL	USB-C to USB-C	50%	8.75	1.80	15.75	53%	8.71	1.82	15.85	USB-C to USB-C	58%	8.97	1.87	16.77	59%	9.04	1.02	9.22
17	Google	Google Pixel	USB-C to USB-C	34%	5.04	2.76	13.91	36%	5.04	2.69	13.56	USB-C to USB-C	37%	5.00	2.85	14.25	39%	5.00	2.57	12.85
18	Google	Google Pixel 2	USB-C to USB-C	35%	9.09	0.81	7.36	35%	9.13	0.75	6.85	USB-C to USB-C	65%	9.06	0.91	8.24	65%	9.05	0.74	6.70
19	Google	Pixel 3	USB-C to USB-C	53%	4.09	1.25	5.11	54%	9.04	1.10	9.94	USB-C to USB-C	58%	9.14	1.26	11.52	56%	9.14	1.09	9.96
20	HTC	10	USB-A to USB-C	35%	4.21	1.59	6.69	37%	8.87	1.51	13.39	USB-C to USB-C	38%	5.03	2.62	13.18	40%	5.03	2.61	13.13
21	HTC	10 evo	USB-A to USB-C	33%	8.78	1.49	13.08	34%	8.88	1.14	10.12	USB-C to USB-C	38%	5.03	1.47	7.39	39%	5.02	1.45	7.28
22	HTC	U11	USB-A to USB-C	40%	7.15	2.03	14.51	40%	7.15	2.03	14.51	USB-C to USB-C	35%	9.22	1.81	16.69	35%	9.21	1.68	15.47
23	HTC	U11+	USB-A to USB-C	46%	7.19	2.04	14.67	48%	7.18	2.04	14.65	USB-C to USB-C	50%	9.16	1.83	16.76	51%	9.16	1.83	16.76
24	HTC	U11 EYEs	USB-A to USB-C	37%	7.22	2.03	14.66	38%	9.33	0.57	5.32	USB-C to USB-C	39%	9.12	0.43	3.92	40%	9.08	0.58	5.27
25	HTC	U12+	USB-A to USB-C	47%	7.26	2.04	14.81	51%	7.28	1.17	8.52	USB-C to USB-C	52%	9.13	0.59	5.39	54%	9.14	0.95	8.68
26	HUAWEI	Mate RS	USB-A to USB-C	61%	4.92	4.21	20.71	64%	4.84	3.68	17.81	USB-C to USB-C	61%	9.21	1.68	15.47	61%	9.19	1.50	13.79
27	HUAWEI	Mate 20 X	USB-A to USB-C	31%	4.71	4.36	20.54	N/A	N/A	N/A	N/A	USB-C to USB-C	31%	9.22	1.78	16.41	N/A	N/A	N/A	N/A
28	HUAWEI	Mate 20	USB-A to USB-C	50%	4.91	4.13	20.28	N/A	N/A	N/A	N/A	USB-C to USB-C	68%	9.20	1.55	14.26	N/A	N/A	N/A	N/A
29	HUAWEI	Honor 10	USB-A to USB-C	64%	9.22	1.72	15.82	61%	9.19	1.35	12.41	USB-C to USB-C	37%	9.22	1.88	17.33	35%	9.23	1.91	17.63
30	HUAWEI	Nova 4	USB-A to USB-C	52%	8.94	1.26	11.26	52%	8.91	1.94	17.29	USB-C to USB-C	52%	9.17	1.26	11.55	49%	9.24	1.94	17.93
31	HUAWEI	nova3	USB-A to USB-C	42%	8.76	1.92	16.82	43%	8.76	1.91	16.73	USB-C to USB-C	46%	9.14	1.15	10.51	47%	9.14	1.03	9.41
32	HUAWEI	Mate 9 Pro	USB-A to USB-C	36%	4.59	4.60	21.11	37%	4.59	4.57	20.98	USB-C to USB-C	38%	9.16	1.80	16.49	39%	9.16	1.81	16.58
33	HUAWEI	Mate 10 Pro	USB-A to USB-C	41%	4.49	4.30	19.31	42%	4.49	4.26	19.13	USB-C to USB-C	43%	9.15	1.78	16.29	44%	9.16	1.75	16.03
34	HUAWEI	Mate 10	USB-A to USB-C	49%	4.51	4.47	20.16	54%	4.59	4.54	20.84	USB-C to USB-C	56%	9.15	1.85	16.93	58%	9.14	0.80	7.31
35	HUAWEI	Mate 20 Pro	USB-A to USB-C	35%	9.09	3.07	27.91	N/A	N/A	N/A	N/A	USB-C to USB-C	40%	9.14	1.69	15.45	N/A	N/A	N/A	N/A
36	HUAWEI	P20	USB-A to USB-C	44%	4.50	4.08	18.36	50%	4.50	4.01	18.05	USB-C to USB-C	54%	9.14	1.14	10.42	53%	9.15	1.48	13.54
37	HUAWEI	P20 Pro	USB-A to USB-C	44%	4.50	4.08	18.36	50%	4.50	4.01	18.05	USB-C to USB-C	54%	9.14	1.14	10.42	53%	9.15	1.48	13.54
38	LG	G5	USB-A to USB-C	31%	5.00	1.36	6.80	N/A	N/A	N/A	N/A	USB-C to USB-C	37%	9.13	0.65	5.93	N/A	N/A	N/A	N/A
39	LG	G6	USB-A to USB-C	35%	6.22	0.84	5.22	N/A	N/A	N/A	N/A	USB-C to USB-C	42%	9.12	0.56	5.11	N/A	N/A	N/A	N/A
40	LG	G7+ ThinQ	USB-A to USB-C	33%	5.05	1.06	5.35	N/A	N/A	N/A	N/A	USB-C to USB-C	36%	5.04	1.05	5.29	N/A	N/A	N/A	N/A
41	LG	V20	USB-A to USB-C	34%	6.28	0.97	6.09	N/A	N/A	N/A	N/A	USB-C to USB-C	35%	9.14	0.69	6.31	N/A	N/A	N/A	N/A
42	Meitu	T9	USB-A to USB-C	46%	6.29	2.41	15.16	46%	6.30	2.41	15.18	USB-C to USB-C	45%	6.19	2.51	15.54	44%	6.19	2.45	15.17
43	Meizu	16th	USB-A to USB-C	36%	8.37	1.73	14.48	34%	8.36	1.71	14.30	USB-C to USB-C	47%	5.14	1.88	9.66	46%	5.14	1.88	9.66
44	Meizu	Pro 5	USB-A to USB-C	47%	5.08	1.59	8.08	49%	11.95	1.48	17.69	USB-C to USB-C	51%	9.14	0.94	8.59	52%	9.16	1.84	16.85
45	Microsoft	Lumia 950	USB-A to USB-C	40%	5.35	2.67	14.28	N/A	N/A	N/A	N/A	USB-C to USB-C	45%	5.02	2.79	14.01	N/A	N/A	N/A	N/A

Judgement Criteria

	Power (Watt) is over 10W		Power (Watt) between 7~10W		Power (Watt) is lower than 7W

Mobile phone					Original Charger Battery Power 30%~70%								Lyra Semiconductor DUT Battery Power 30%~70%							
					Test Cable	Power On				Power Off				Test Cable	Power On				Power Off			
No.	Vendor	Phone Name	I/O interface	OS		Electricity (%)	Voltage (V)	Current (A)	Power (W)	Electricity (%)	Voltage (V)	Current (A)	Power (W)		Electricity (%)	Voltage (V)	Current (A)	Power (W)	Electricity (%)	Voltage (V)	Current (A)	Power (W)
46	Microsoft	Lumia 950 XL	USB Type-C	Windows 10 Mobile	USB-A to USB-C	51%	5.35	1.53	8.19	N/A	N/A	N/A	N/A	USB-C to USB-C	47%	5.02	2.43	12.20	N/A	N/A	N/A	N/A
47	Motorola	Moto G6	USB Type-C	Android 8.0.0	USB-A to USB-C	59%	5.38	1.78	9.58	65%	5.37	2.75	14.77	USB-C to USB-C	33%	5.01	2.74	13.73	37%	5.01	2.71	13.58
48	Motorola	Moto G6 Plus	USB Type-C	Android 8.0.0	USB-A to USB-C	51%	5.04	2.90	14.62	52%	4.93	2.66	13.11	USB-C to USB-C	55%	5.02	2.63	13.20	56%	5.02	2.33	11.70
49	Motorola	Moto Z	USB Type-C	Android 7.1.1	USB-A to USB-C	44%	5.38	1.27	6.83	43%	5.37	1.21	6.50	USB-C to USB-C	43%	9.13	1.33	12.14	46%	9.13	1.26	11.50
50	Motorola	Moto X4	USB Type-C	Android 9.0.0	USB-A to USB-C	53%	5.16	2.64	13.62	56%	5.16	2.18	11.25	USB-C to USB-C	57%	5.02	2.44	12.25	58%	5.03	2.02	10.16
51	Nokia	5.1 Plus	USB Type-C	Android 9.0.0	USB-A to USB-C	49%	4.92	1.79	8.81	50%	4.90	1.76	8.62	USB-C to USB-C	51%	5.03	2.14	10.76	52%	5.03	1.81	9.10
52	Nokia	6.1	USB Type-C	Android 9.0.0	USB-A to USB-C	52%	6.56	1.29	8.46	55%	5.96	1.20	7.15	USB-C to USB-C	56%	9.14	0.94	8.59	58%	9.14	0.78	7.13
53	Nokia	7	USB Type-C	Android 8.1.0	USB-A to USB-C	65%	8.86	0.85	7.53	65%	6.71	1.10	7.38	USB-C to USB-C	67%	4.95	1.49	7.38	66%	8.96	1.00	8.96
54	Nokia	7 Plus	USB Type-C	Android 9.0.0	USB-A to USB-C	47%	7.74	1.38	10.68	49%	5.95	1.44	8.57	USB-C to USB-C	52%	9.15	1.92	17.57	53%	9.15	1.89	17.29
55	Nokia	8 Sirocco	USB Type-C	Android 9	USB-A to USB-C	48%	6.90	2.33	16.08	47%	6.34	2.63	16.67	USB-C to USB-C	46%	9.22	1.88	17.33	46%	9.21	1.77	16.30
56	Nokia	X6	USB Type-C	Android 9	USB-A to USB-C	51%	4.99	1.94	9.68	51%	5.00	1.94	9.70	USB-C to USB-C	47%	5.16	2.22	11.46	47%	5.16	2.15	11.09
57	Nubia	Red Magic	USB Type-C	Android 8.1.0	USB-A to USB-C	63%	4.92	2.57	12.64	61%	4.87	2.42	11.79	USB-C to USB-C	43%	12.16	1.06	12.89	43%	12.16	1.04	12.65
58	OPPO	Find X	USB Type-C	Android 8.1.0	USB-A to USB-C	35%	8.71	4.79	41.72	40%	8.80	4.76	41.89	USB-C to USB-C	47%	5.03	1.16	5.83	48%	5.03	1.90	9.56
59	Razer	Phone	USB Type-C	Android 7.1.1	USB-C to USB-C	30%	7.95	2.45	19.48	30%	7.76	2.51	19.48	USB-C to USB-C	30%	12.19	1.43	17.43	30%	12.19	1.43	17.43
60	Samsung	Galaxy A8s	USB Type-C	Android 8.1.0	USB-A to USB-C	58%	9.27	1.28	11.87	59%	9.28	1.24	11.51	USB-C to USB-C	58%	5.19	2.75	14.27	57%	5.16	2.29	11.82
61	Samsung	Galaxy A8+	USB Type-C	Android 8.0.0	USB-A to USB-C	39%	4.98	1.01	5.03	40%	8.83	1.34	11.83	USB-C to USB-C	44%	5.03	1.17	5.89	45%	5.03	2.03	10.21
62	Samsung	Galaxy A9 (2018)	USB Type-C	Android 8.0.0	USB-A to USB-C	43%	9.03	1.33	12.01	48%	9.03	1.27	11.47	USB-C to USB-C	49%	5.04	1.17	5.90	50%	5.02	2.29	11.50
63	Samsung	Galaxy S8+	USB Type-C	Android 7.0.0	USB-A to USB-C	33%	4.90	1.08	5.29	34%	8.82	1.36	12.00	USB-C to USB-C	35%	5.01	2.83	14.18	36%	5.01	2.43	12.17
64	Samsung	Galaxy S8	USB Type-C	Android 8.0.0	USB-A to USB-C	34%	4.87	1.17	5.70	35%	8.88	1.14	10.12	USB-C to USB-C	36%	5.03	1.17	5.89	38%	5.03	2.03	10.21
65	Samsung	Galaxy S9	USB Type-C	Android 9	USB-A to USB-C	65%	5.23	1.77	9.22	66%	5.22	1.77	9.22	USB-C to USB-C	30%	5.16	2.32	11.97	30%	5.14	1.97	10.13
66	Samsung	Galaxy S9+	USB Type-C	Android 8.0.0	USB-A to USB-C	44%	4.93	1.17	5.77	46%	8.93	1.28	11.43	USB-C to USB-C	47%	5.04	1.17	5.90	48%	5.01	2.36	11.82
67	Samsung	Galaxy S10	USB Type-C	Android 9.0.0	USB-A to USB-C	43%	9.04	1.60	14.46	45%	9.02	1.18	10.64	USB-C to USB-C	46%	9.15	1.62	14.82	48%	9.15	1.18	10.80
68	Samsung	Galaxy S10+	USB Type-C	Android 9.0.0	USB-A to USB-C	37%	8.87	1.61	14.28	38%	8.88	1.61	14.30	USB-C to USB-C	40%	9.15	1.61	14.73	42%	9.15	1.61	14.73
69	Samsung	Galaxy S10e	USB Type-C	Android 9.0.0	USB-A to USB-C	32%	8.96	0.68	6.09	33%	9.00	1.61	14.49	USB-C to USB-C	34%	9.13	0.63	5.75	35%	9.15	1.60	14.64
70	Samsung	Galaxy Note 9	USB Type-C	Android 8.1.0	USB-A to USB-C	51%	9.03	1.62	14.63	53%	9.04	1.46	13.20	USB-C to USB-C	54%	5.01	2.91	14.58	55%	5.01	2.75	13.78
71	Sharp	Aquos S3 mini	USB Type-C	Android 7.1.1	USB-A to USB-C	60%	5.15	1.76	9.06	60%	5.15	1.76	9.06	USB-C to USB-C	42%	5.13	1.78	9.13	36%	5.13	1.78	9.13
72	Sharp	Aquos S3	USB Type-C	Android 8.0.0	USB-A to USB-C	31%	5.00	0.99	4.95	31%	5.99	2.70	16.17	USB-C to USB-C	32%	9.14	1.09	9.96	33%	9.16	1.73	15.85
73	Smartisan	Jianguo R1	USB Type-C	Android 8.1.0	USB-A to USB-C	31%	8.86	1.86	16.48	32%	8.87	1.84	16.32	USB-C to USB-C	57%	5.19	2.84	14.74	55%	5.19	2.84	14.74
74	SONY	Xperia X Compact	USB Type-C	Android 8.0.0	USB-A to USB-C	33%	5.04	1.49	7.51	36%	5.03	1.49	7.49	USB-C to USB-C	38%	7.49	1.40	10.49	42%	9.14	1.10	10.05
75	SONY	Xperia XZ Premium	USB Type-C	Android 9	USB-A to USB-C	44%	8.88	1.39	12.34	49%	8.29	1.41	11.69	USB-C to USB-C	30%	5.10	1.42	7.24	30%	5.10	1.42	7.24
76	SONY	Xperia XZ1	USB Type-C	Android 8.0.0	USB-A to USB-C	52%	8.28	1.33	11.01	52%	6.69	1.57	10.50	USB-C to USB-C	64%	9.16	1.13	10.35	65%	9.16	1.05	9.62
77	SONY	Xperia XZ2	USB Type-C	Android 9.0.0	USB-A to USB-C	42%	8.27	1.32	10.92	45%	7.67	1.43	10.97	USB-C to USB-C	46%	9.15	1.38	12.63	47%	9.15	1.22	11.16
78	Sony	Xperia XZ2 Premium	USB Type-C	Android 9.0.0	USB-A to USB-C	49%	8.93	1.16	10.36	52%	7.17	1.42	10.18	USB-C to USB-C	53%	9.15	1.13	10.34	55%	9.14	1.12	10.24
79	SONY	Xperia XZ3	USB Type-C	Android 9.0.0	USB-A to USB-C	33%	5.03	1.39	6.99	35%	5.02	1.39	6.98	USB-C to USB-C	36%	9.15	1.37	12.54	38%	9.15	1.24	11.35
80	SONY	Xperia XA2	USB Type-C	Android 8.0.0	USB-A to USB-C	55%	5.03	1.63	8.20	56%	5.02	1.63	8.18	USB-C to USB-C	57%	9.16	1.42	13.01	60%	9.14	0.95	8.68
81	SONY	Xperia XA2 Ultra	USB Type-C	Android 8.0.0	USB-A to USB-C	39%	5.08	1.41	7.16	40%	5.06	1.41	7.13	USB-C to USB-C	41%	9.15	1.34	12.26	44%	9.15	1.27	11.62
82	SONY	Xperia XA2 Plus	USB Type-C	Android 8.0.0	USB-A to USB-C	35%	5.05	1.41	7.12	36%	5.04	1.41	7.11	USB-C to USB-C	36%	9.15	1.61	14.73	38%	9.15	1.29	11.80
83	Xiaomi	Mi MIX 2	USB Type-C	Android 8.0.0	USB-A to USB-C	33%	6.56	1.54	10.10	36%	6.30	2.49	15.69	USB-C to USB-C	39%	12.16	1.21	14.71	38%	12.16	1.30	15.81
84	Xiaomi	Mi MIX 3	USB Type-C	Android 9	USB-A to USB-C	40%	6.65	2.33	15.49	40%	6.45	2.41	15.54	USB-C to USB-C	39%	5.19	2.83	14.69	39%	5.19	2.82	14.64
85	Xiaomi	Mi Max 3	USB Type-C	Android 8.1.0	USB-A to USB-C	31%	6.24	2.50	15.60	34%	6.23	2.63	16.38	USB-C to USB-C	35%	9.14	0.93	8.50	36%	9.16	1.82	16.67
86	Xiaomi	Mi 4c	USB Type-C	Android 7.0.0	USB-A to USB-C	31%	8.79	1.17	10.28	33%	8.81	0.98	8.63	USB-C to USB-C	34%	9.14	1.14	10.42	35%	9.14	0.94	8.59
87	Xiaomi	Mi 5s Plus	USB Type-C	Android 8.0.0	USB-A to USB-C	43%	5.91	1.50	8.87	45%	5.85	2.31	13.51	USB-C to USB-C	47%	6.05	1.94	11.74	48%	6.04	2.25	13.59
88	Xiaomi	Mi 8	USB Type-C	Android 8.1.0	USB-A to USB-C	57%	6.23	2.63	16.38	60%	6.07	2.30	13.96	USB-C to USB-C	61%	12.16	1.22	14.84	64%	9.15	1.44	13.18
89	Xiaomi	Mi A2	USB Type-C	Android 9.0.0	USB-A to USB-C	55%	4.94	1.89	9.34	56%	4.94	1.89	9.34	USB-C to USB-C	57%	9.15	1.37	12.54	59%	9.15	1.25	11.44
90	Xiaomi	Mi 8 SE	USB Type-C	Android 9	USB-A to USB-C	68%	6.54	2.21	14.44	68%	6.56	2.11	13.85	USB-C to USB-C	55%	9.20	1.56	14.35	54%	9.20	1.59	14.63
91	Xiaomi	5	USB Type-C	Android 8.0.0	USB-A to USB-C	31%	6.10	2.37	14.46	34%	5.97	1.62	9.67	USB-C to USB-C	35%	6.03	2.58	15.56	37%	6.06	1.58	9.57
92	Xiaomi	6	USB Type-C	Android 8.0.0	USB-A to USB-C	31%	6.53	1.50	9.80	36%	6.09	2.46	14.98	USB-C to USB-C	33%	12.10	1.37	16.58	35%	12.16	1.25	15.20
93	Xiaomi	Note 3	USB Type-C	Android 8.1.0	USB-A to USB-C	56%	6.82	2.37	16.16	64%	6.81	2.49	16.95	USB-C to USB-C	47%	9.20	1.56	14.35	47%	9.22	1.81	16.69
94	ZTE	Axon M	USB Type-C	Android 8.1.0	USB-A to USB-C	51%	6.32	2.42	15.29	52%	6.32	2.43	15.36	USB-C to USB-C	43%	6.18	2.14	13.23	59%	6.17	1.99	12.28
95	ZUK	Z2 Pro	USB Type-C	Android 8.0.0	USB-A to USB-C	65%	5.45	2.35	12.81	63%	5.46	2.31	12.61	USB-C to USB-C	63%	6.17	1.99	12.28	62%	6.17	1.96	12.09

Judgement Criteria

	Power (Watt) is over 10W		Power (Watt) between 7~10W		Power (Watt) is lower than 7W

Tablet					Original Charger Battery Power 30%~70%								Lyra Semiconductor DUT Battery Power 30%~70%							
					Test Cable	Power On				Power Off				Test Cable	Power On				Power Off			
No.	Vendor	Phone Name	I/O interface	OS		Electricity (%)	Voltage (V)	Current (A)	Power (W)	Electricity (%)	Voltage (V)	Current (A)	Power (W)		Electricity (%)	Voltage (V)	Current (A)	Power (W)	Electricity (%)	Voltage (V)	Current (A)	Power (W)
1	Apple	iPad Pro 3rd Gen Wi-Fi 12.9" MTEL2TA/A	USB Type-C	iOS 12.1.4	USB-C to USB-C	55%	8.78	1.91	16.77	N/A	N/A	N/A	N/A	USB-C to USB-C	55%	12.09	1.42	17.17	N/A	N/A	N/A	N/A
2	Google	Pixel C	USB Type-C	Android 8.1.0	USB-A to USB-C	57%	4.92	2.71	13.33	58%	4.92	2.71	13.33	USB-C to USB-C	59%	5.02	2.71	13.60	60%	9.15	1.82	16.65
3	HUAWEI	M5 10.8"	USB Type-C	Android 8.0.0	USB-A to USB-C	64%	9.14	1.91	17.46	64%	9.14	1.95	17.82	USB-C to USB-C	64%	9.23	1.89	17.44	63%	9.22	1.88	17.33
4	SamSung	Tab S4 SM-T835C 10.5"	USB Type-C	Android 8.1.0	USB-A to USB-C	34%	5.35	1.80	9.63	35%	5.35	1.80	9.63	USB-C to USB-C	33%	9.18	1.42	13.04	33%	9.20	1.56	14.35
5	Xiaomi	Mi Pad 2	USB Type-C	Android 5.1	USB-A to USB-C	47%	4.75	2.11	10.02	47%	4.74	2.11	10.00	USB-C to USB-C	47%	12.15	0.94	11.42	48%	12.15	0.94	11.42

Judgement Criteria

	Power (Watt) is over 10W		Power (Watt) between 7~10W		Power (Watt) is lower than 7W

IV. TEST ENVIRONMENT

For this test proposal, Allion recommends the following test equipment and environment.

Mobile Phone (95)

No.	Vendor	Phone Name	I/O interface	OS
1	ASUS	ZenFone 3	USB Type-C	Android 8.0.0
2	ASUS	ZenFone 3 Deluxe	USB Type-C	Android 7.0.0
3	ASUS	ZenFone 4 (ZE554KL)	USB Type-C	Android 8.0.0
4	ASUS	ZenFone 4 Pro (ZS551KL)	USB Type-C	Android 8.0.0
5	ASUS	ZenFone 5 (ZE620KL)	USB Type-C	Android 9.0.0
6	ASUS	ZenFone 5Z (ZS620KL)	USB Type-C	Android 8.0.0
7	ASUS	ZenFone AR (ZS571KL)	USB Type-C	Android 7.0.0
8	ASUS	ZenFone Ares(ZS572KL)	USB Type-C	Android 7.0.0
9	Apple	iPhone 8	Lightning	iOS 12.1.4
10	Apple	iPhone 8 Plus	Lightning	iOS 12.1.4
11	Apple	iPhone XR	Lightning	iOS 12.1.2
12	Apple	iPhone Xs	Lightning	iOS 12.1
13	Apple	iPhone Xs Max	Lightning	iOS 12.2
14	Blackberry	Key2	USB Type-C	Android 8.1.0
15	Coolpad	Changer S1	USB Type-C	Android 6.0.1
16	Google	Google Pixel XL	USB Type-C	Android 9.0.0
17	Google	Google Pixel	USB Type-C	Android 9.0.0
18	Google	Google Pixel 2	USB Type-C	Android 9
19	Google	Pixel 3	USB Type-C	Android 9.0.0
20	HTC	10	USB Type-C	Android 8.0.0
21	HTC	10 evo	USB Type-C	Android 7.0.0
22	HTC	U11	USB Type-C	Android 8.0.0
23	HTC	U11+	USB Type-C	Android 8.0.0
24	HTC	U11 EYEs	USB Type-C	Android 7.1.2
25	HTC	U12+	USB Type-C	Android 8.0.0
26	HUAWEI	Mate RS	USB Type-C	Android 9
27	HUAWEI	Mate 20 X	USB Type-C	Android 9
28	HUAWEI	Mate 20	USB Type-C	Android 9
29	HUAWEI	Honor 10	USB Type-C	Android 8.1.0
30	HUAWEI	Nova 4	USB Type-C	Android 9
31	HUAWEI	nova3	USB Type-C	Android 8.1.0
32	HUAWEI	Mate 9 Pro	USB Type-C	Android 8.0.0
33	HUAWEI	Mate 10 Pro	USB Type-C	Android 8.0.0
34	HUAWEI	Mate 10	USB Type-C	Android 9.0.0
35	HUAWEI	Mate 20 Pro	USB Type-C	Android 9.0.0
36	HUAWEI	P20	USB Type-C	Android 9.0.0

No.	Vendor	Phone Name	I/O interface	OS
37	HUAWEI	P20 Pro	USB Type-C	Android 9.0.0
38	LG	G5	USB Type-C	Android 8.0.0
39	LG	G6	USB Type-C	Android 8.0.0
40	LG	G7+ ThinQ	USB Type-C	Android 8.0.0
41	LG	V20	USB Type-C	Android 8.0.0
42	Meitu	T9	USB Type-C	Android 8.1.0
43	Meizu	16th	USB Type-C	Android 8.1.0
44	Meizu	Pro 5	USB Type-C	Android 7.0.0
45	Microsoft	Lumia 950	USB Type-C	Windows 10 Mobile
46	Microsoft	Lumia 950 XL	USB Type-C	Windows 10 Mobile
47	Motorola	Moto G6	USB Type-C	Android 8.0.0
48	Motorola	Moto G6 Plus	USB Type-C	Android 8.0.0
49	Motorola	Moto Z	USB Type-C	Android 7.1.1
50	Motorola	Moto X4	USB Type-C	Android 9.0.0
51	Nokia	5.1 Plus	USB Type-C	Android 9.0.0
52	Nokia	6.1	USB Type-C	Android 9.0.0
53	Nokia	7	USB Type-C	Android 8.1.0
54	Nokia	7 Plus	USB Type-C	Android 9.0.0
55	Nokia	8 Sirocco	USB Type-C	Android 9
56	Nokia	X6	USB Type-C	Android 9
57	Nubia	Red Magic	USB Type-C	Android 8.1.0
58	OPPO	Find X	USB Type-C	Android 8.1.0
59	Razer	Phone	USB Type-C	Android 7.1.1
60	Samsung	Galaxy A8s	USB Type-C	Android 8.1.0
61	Samsung	Galaxy A8+	USB Type-C	Android 8.0.0
62	Samsung	Galaxy A9 (2018)	USB Type-C	Android 8.0.0
63	Samsung	Galaxy S8+	USB Type-C	Android 7.0.0
64	Samsung	Galaxy S8	USB Type-C	Android 8.0.0
65	Samsung	Galaxy S9	USB Type-C	Android 9
66	Samsung	Galaxy S9+	USB Type-C	Android 8.0.0
67	Samsung	Galaxy S10	USB Type-C	Android 9.0.0
68	Samsung	Galaxy S10+	USB Type-C	Android 9.0.0
69	Samsung	Galaxy S10e	USB Type-C	Android 9.0.0
70	Samsung	Galaxy Note 9	USB Type-C	Android 8.1.0
71	Sharp	Aquos S3 mini	USB Type-C	Android 7.1.1
72	Sharp	Aquos S3	USB Type-C	Android 8.0.0
73	Smartisan	Jianguo R1	USB Type-C	Android 8.1.0
74	SONY	Xperia X Compact	USB Type-C	Android 8.0.0
75	SONY	Xperia XZ Premium	USB Type-C	Android 9
76	SONY	Xperia XZ1	USB Type-C	Android 8.0.0
77	SONY	Xperia XZ2	USB Type-C	Android 9.0.0

No.	Vendor	Phone Name	I/O interface	OS
78	Sony	Xperia XZ2 Premium	USB Type-C	Android 9.0.0
79	SONY	Xperia XZ3	USB Type-C	Android 9.0.0
80	SONY	Xperia XA2	USB Type-C	Android 8.0.0
81	SONY	Xperia XA2 Ultra	USB Type-C	Android 8.0.0
82	SONY	Xperia XA2 Plus	USB Type-C	Android 8.0.0
83	Xiaomi	Mi MIX 2	USB Type-C	Android 8.0.0
84	Xiaomi	Mi MIX 3	USB Type-C	Android 9
85	Xiaomi	Mi Max 3	USB Type-C	Android 8.1.0
86	Xiaomi	Mi 4c	USB Type-C	Android 7.0.0
87	Xiaomi	Mi 5s Plus	USB Type-C	Android 8.0.0
88	Xiaomi	Mi 8	USB Type-C	Android 8.1.0
89	Xiaomi	Mi A2	USB Type-C	Android 9.0.0
90	Xiaomi	Mi 8 SE	USB Type-C	Android 9
91	Xiaomi	5	USB Type-C	Android 8.0.0
92	Xiaomi	6	USB Type-C	Android 8.0.0
93	Xiaomi	Note 3	USB Type-C	Android 8.1.0
94	ZTE	Axon M	USB Type-C	Android 8.1.0
95	ZUK	Z2 Pro	USB Type-C	Android 8.0.0

Tablet (5)

No.	Vendor	Phone Name	I/O interface	OS
1	Apple	iPad Pro 3rd Gen Wi-Fi 12.9" MTEL2TA/A A1876	USB Type-C	iOS 12.1.4
2	Google	Pixel C	USB Type-C	Android 8.1.0
3	HUAWEI	M5 10.8"	USB Type-C	Android 8.0.0
4	SamSung	Tab S4 SM-T835C 10.5"	USB Type-C	Android 8.1.0
5	Xiaomi	Mi Pad 2	USB Type-C	Android 5.1

Test Fixture

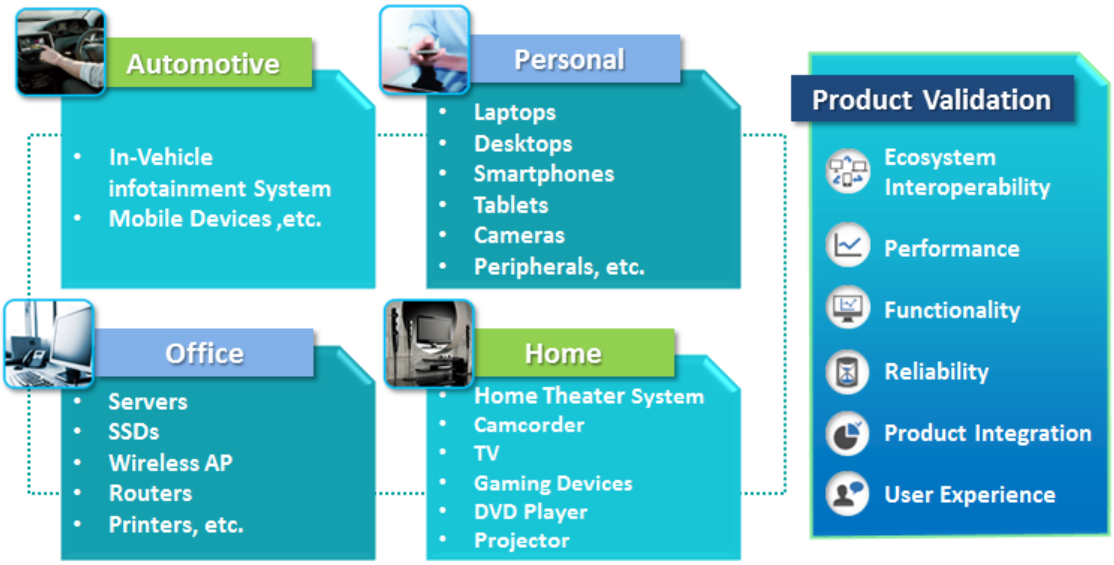
No.	Name	Photo
1	Allion Lab Type-C Power Measurement AU-16002	
2	Chargerlab Power-Z KM001C	

Note: The proposed test equipment listed above is subject to change based on availability. For detailed equipment lists or customized requirements, please contact us at service@allion.com.

V. ENGINEERING SERVICE

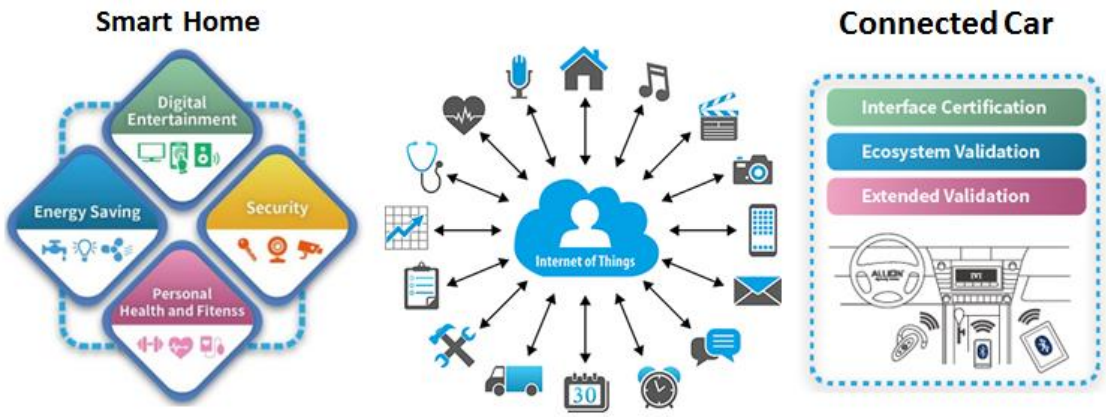
A. Product Validation

Allion offers comprehensive product validation, marketing support, and related services to leading technology companies around the world.



B. IoT Ecosystem Validation

Allion can evaluate, validate, and certify all types of smart home and connected car (IVI) devices. Our comprehensive services will help you develop better products and launch them faster than the competition.



C. Ecosystem Interoperability Testing

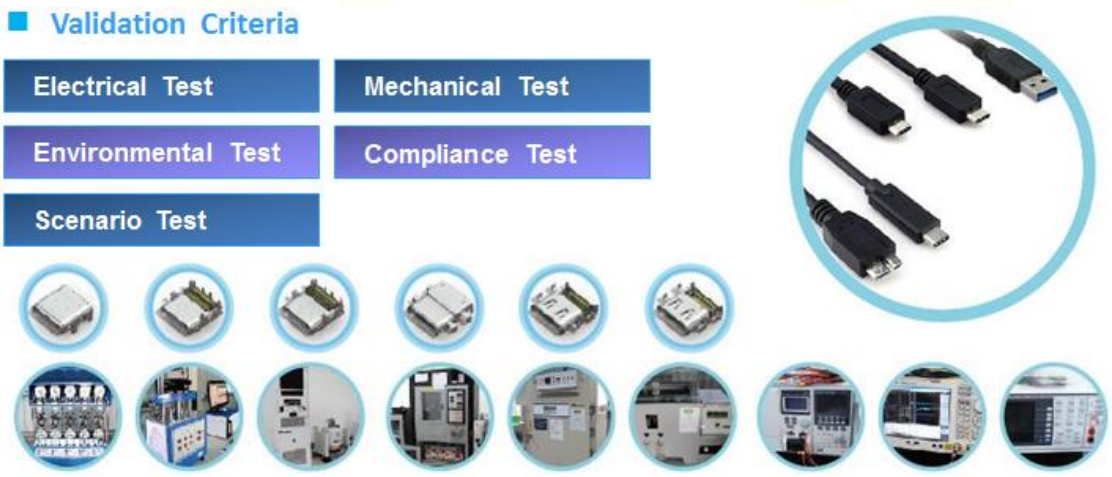
Interoperability testing verifies product compatibility within digital ecosystems using customized test plans and cases that mimic real-world product interactions.

Interoperability Testing (IOT)

- **Scenario-based IOT** covers the full test matrix scope (HW & SW) for every validation configuration
- **Customized test plans and cases** for a variety of product categories to mimic real-world interactions.
- **20,000+ test tools, terminal equipment & CE devices** for IOT campaign organization, performance & analysis.

D. Cable & Connector Testing

Allion provides complete Cable & Connector validation services, including specification conformance, quality assurance, and advanced testing for USB, SATA, HDMI, Display Port, MHL, and other wiring standards.



E. RF Validation & Signal Integrity

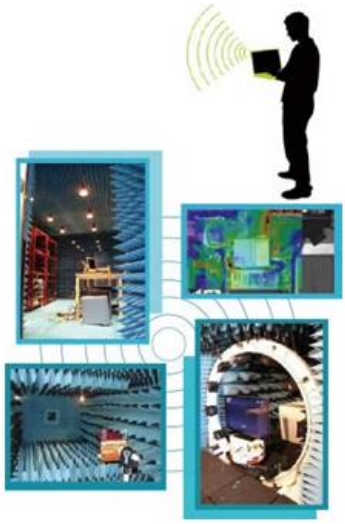
RF signal integrity is a critical issue in wireless communication. As a technology pioneer, Allion offers cutting-edge validation methods & environments to test and resolve wireless issues.

Signal Integrity

- High speed/frequency signal integrity
- External peripheral/embedded module validation

RF Validation

- Antenna and RF performance validation
- Testing facility design for telecom terminal equipment
- Vertical cell small chamber design and implementation
- EMI/EMS and RF performance test
- Platform noise measurement and analysis
- RF regulatory test



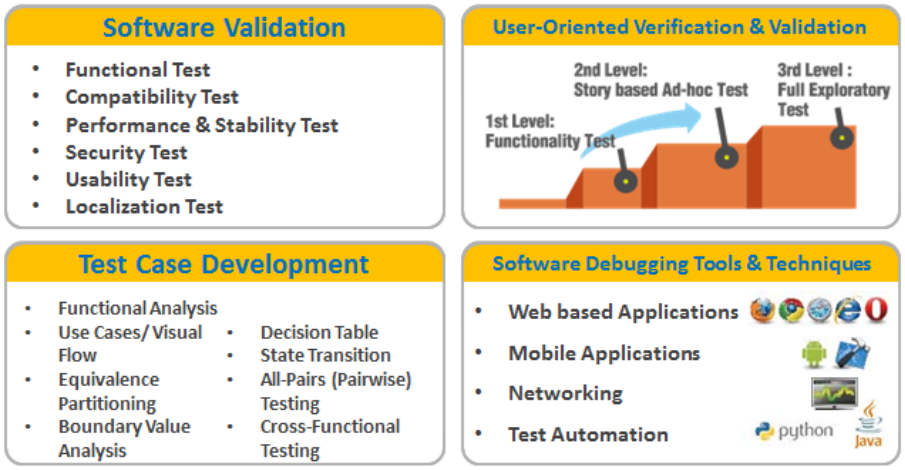
F. Customized Reliability Testing Service

In the real world, IT products are exposed to extreme environmental conditions, which is why reliability testing is such an important dimension of product testing.

- **Harsh Environment Testing**
  - Salt Spray Test
  - Mixed Flowing Gas Test
  - Altitude Test
  - Dust Proof Test
- **Thermal Testing**
  - Thermal Shock Test
  - Cold Test
  - Dry Heat Test
  - Temperature Life Test
  - Temperature Disturbance Test
  - Temperature Cycling
  - Logo/Label Adhesion Test
- **Humidity Testing**
  - Humidity Test
  - Damp Heat Test
- **Accelerated Life Testing**
  - Steam/Thermal Ageing Test
- **Vibration and Shock Testing**
  - Shock Test
  - Vibration Test
  - Drop Test
  - Packaging Clamp Truck Test
  - Falling Dart for Panel Test

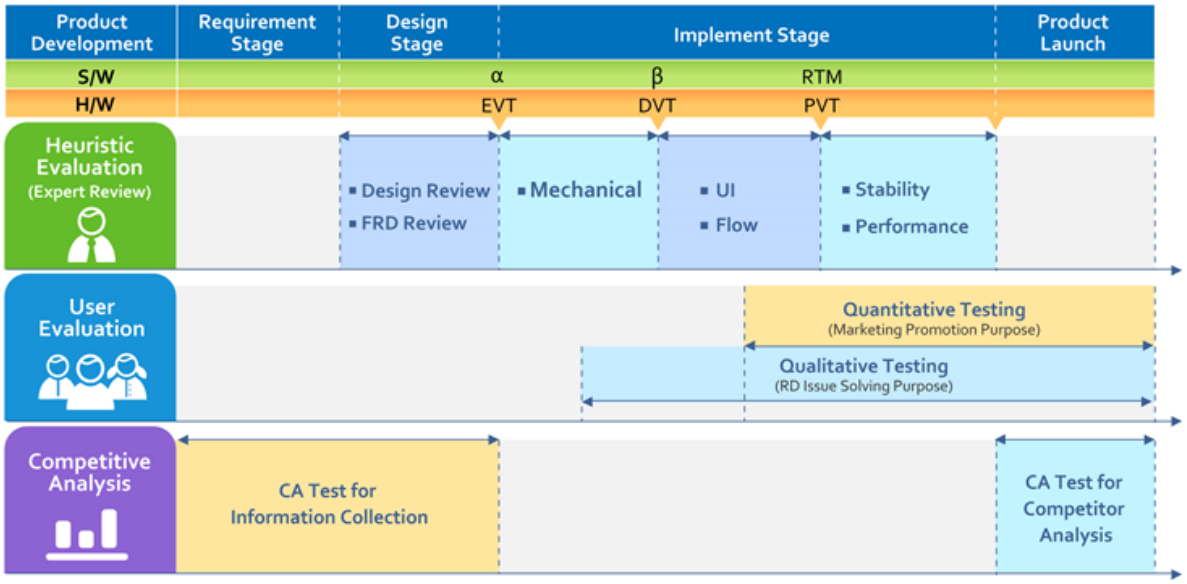
G. Software Validation Solutions

Allion offers comprehensive software validation solutions spanning the entire Software Development Life Cycle (SDLC) to optimize your products and methods.



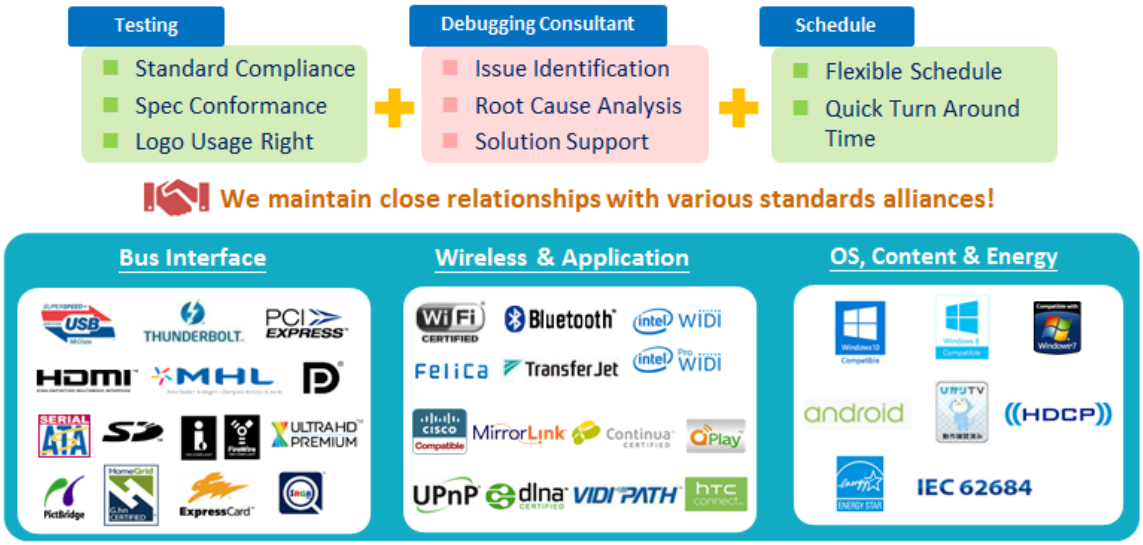
H. User Experience Optimization

Understanding the complexity of product development & your UX commitment, Allion provides comprehensive UX test solutions to fit your product life cycle.



I. Logo Certification & Compliance

Allion is an authorized 1st Tier lab partner of leading technical standard organizations.



VI. MARKETING ADVANTAGES

Third-party Product Endorsement by Allion can improve your product branding and our signature Competitive Analysis can reveal hidden strengths and weaknesses in your product design and positioning from an informed yet objective perspective. Trade Show can bring more exposure to your brand.

VII. CONTACT INFORMATION

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