

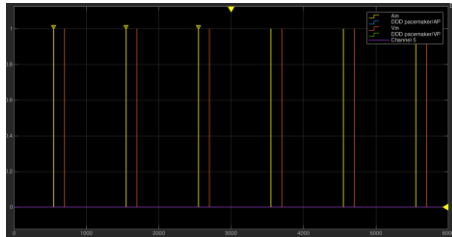
# ,Test Report

Yixuan Meng

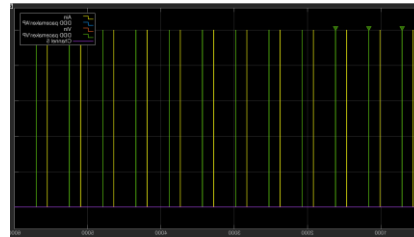
## 1. Functional Testing

Connect a Node-Path-Node heart model to your Stateflow pacemaker model. Also connect a scope which monitors the following signals: [Ain,AP,Vin,VP]. The following output patterns are observed:

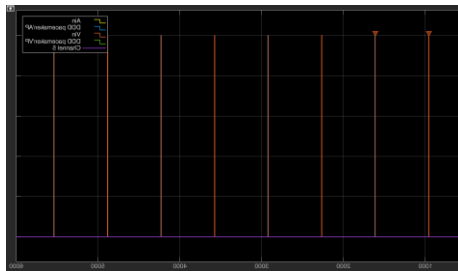
a. Ain-Vin



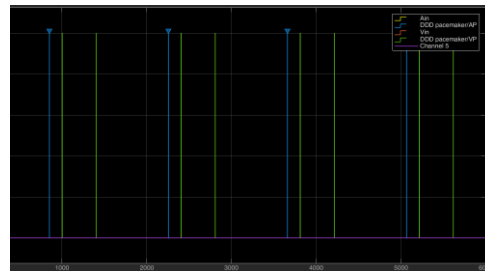
b. Ain-VP



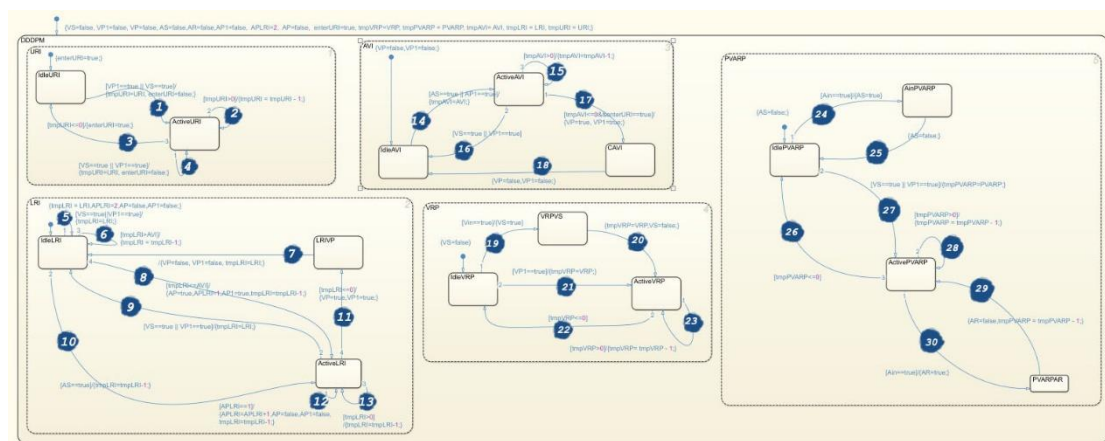
c. AP-Vin (overlap blue & red line )



d. AP-VP



## 2. Conformance Testing



Stateflow Model

### 2.1 The combined states are listed below:

(Red: unreachable states; Blue: reachable states)

IdleURL & IdleLRI & IdleAVI & IdleVRP & IdlePVARP	S1
IdleURL & IdleLRI & IdleAVI & IdleVRP & ActivePVARP	S2
IdleURL & IdleLRI & IdleAVI & IdleVRP & PVARP_AS	S3

IdleURL & IdleLRI & IdleAVI & IdleVRP & PVARP_AR	S4
IdleURL & IdleLRI & IdleAVI & ActiveVRP & IdlePVARP	S5
IdleURL & IdleLRI & IdleAVI & ActiveVRP & ActivePVARP	S6
IdleURL & IdleLRI & IdleAVI & ActiveVRP & PVARP_AS	S7
IdleURL & IdleLRI & IdleAVI & ActiveVRP & PVARP_AR	S8
IdleURL & IdleLRI & IdleAVI & VRP_VS & IdlePVARP	S9
IdleURL & IdleLRI & IdleAVI & VRP_VS & ActivePVARP	S10
IdleURL & IdleLRI & IdleAVI & VRP_VS & PVARP_AS	S11
IdleURL & IdleLRI & IdleAVI & VRP_VS & PVARP_AR	S12
IdleURL & IdleLRI & ActiveAVI & IdleVRP & IdlePVARP	S13
IdleURL & IdleLRI & ActiveAVI & IdleVRP & ActivePVARP	S14
IdleURL & IdleLRI & ActiveAVI & IdleVRP & PVARP_AS	S15
IdleURL & IdleLRI & ActiveAVI & IdleVRP & PVARP_AR	S16
IdleURL & IdleLRI & ActiveAVI & ActiveVRP & IdlePVARP	S17
IdleURL & IdleLRI & ActiveAVI & ActiveVRP & ActivePVARP	S18
IdleURL & IdleLRI & ActiveAVI & ActiveVRP & PVARP_AS	S19
IdleURL & IdleLRI & ActiveAVI & ActiveVRP & PVARP_AR	S20
IdleURL & IdleLRI & ActiveAVI & VRP_VS & IdlePVARP	S21
IdleURL & IdleLRI & ActiveAVI & VRP_VS & ActivePVARP	S22
IdleURL & IdleLRI & ActiveAVI & VRP_VS & PVARP_AS	S23
IdleURL & IdleLRI & ActiveAVI & VRP_VS & PVARP_AR	S24
IdleURL & IdleLRI & CAVI & IdleVRP & IdlePVARP	S25
IdleURL & IdleLRI & CAVI & IdleVRP & ActivePVARP	S26
IdleURL & IdleLRI & CAVI & IdleVRP & PVARP_AS	S27
IdleURL & IdleLRI & CAVI & IdleVRP & PVARP_AR	S28
IdleURL & IdleLRI & CAVI & ActiveVRP & IdlePVARP	S29
IdleURL & IdleLRI & CAVI & ActiveVRP & ActivePVARP	S30
IdleURL & IdleLRI & CAVI & ActiveVRP & PVARP_AS	S31
IdleURL & IdleLRI & CAVI & ActiveVRP & PVARP_AR	S32
IdleURL & IdleLRI & CAVI & VRP_VS & IdlePVARP	S33
IdleURL & IdleLRI & CAVI & VRP_VS & ActivePVARP	S34
IdleURL & IdleLRI & CAVI & VRP_VS & PVARP_AS	S35
IdleURL & IdleLRI & CAVI & VRP_VS & PVARP_AR	S36
IdleURL & ActiveLRI & IdleAVI & IdleVRP & IdlePVARP	S37
IdleURL & ActiveLRI & IdleAVI & IdleVRP & ActivePVARP	S38
IdleURL & ActiveLRI & IdleAVI & IdleVRP & PVARP_AS	S39
IdleURL & ActiveLRI & IdleAVI & IdleVRP & PVARP_AR	S40
IdleURL & ActiveLRI & IdleAVI & ActiveVRP & IdlePVARP	S41
IdleURL & ActiveLRI & IdleAVI & ActiveVRP & ActivePVARP	S42
IdleURL & ActiveLRI & IdleAVI & ActiveVRP & PVARP_AS	S43
IdleURL & ActiveLRI & IdleAVI & ActiveVRP & PVARP_AR	S44
IdleURL & ActiveLRI & IdleAVI & VRP_VS & IdlePVARP	S45
IdleURL & ActiveLRI & IdleAVI & VRP_VS & ActivePVARP	S46

IdleURL & ActiveLRI & IdleAVI & VRP_VS & PVARP_AS	S47
IdleURL & ActiveLRI & IdleAVI & VRP_VS & PVARP_AR	S48
IdleURL & ActiveLRI & ActiveAVI & IdleVRP & IdlePVARP	S49
IdleURL & ActiveLRI & ActiveAVI & IdleVRP & ActivePVARP	S50
IdleURL & ActiveLRI & ActiveAVI & IdleVRP & PVARP_AS	S51
IdleURL & ActiveLRI & ActiveAVI & IdleVRP & PVARP_AR	S52
IdleURL & ActiveLRI & ActiveAVI & ActiveVRP & IdlePVARP	S53
IdleURL & ActiveLRI & ActiveAVI & ActiveVRP & ActivePVARP	S54
IdleURL & ActiveLRI & ActiveAVI & ActiveVRP & PVARP_AS	S55
IdleURL & ActiveLRI & ActiveAVI & ActiveVRP & PVARP_AR	S56
IdleURL & ActiveLRI & ActiveAVI & VRP_VS & IdlePVARP	S57
IdleURL & ActiveLRI & ActiveAVI & VRP_VS & ActivePVARP	S58
IdleURL & ActiveLRI & ActiveAVI & VRP_VS & PVARP_AS	S59
IdleURL & ActiveLRI & ActiveAVI & VRP_VS & PVARP_AR	S60
IdleURL & ActiveLRI & CAVI & IdleVRP & IdlePVARP	S61
IdleURL & ActiveLRI & CAVI & IdleVRP & ActivePVARP	S62
IdleURL & ActiveLRI & CAVI & IdleVRP & PVARP_AS	S63
IdleURL & ActiveLRI & CAVI & IdleVRP & PVARP_AR	S64
IdleURL & ActiveLRI & CAVI & ActiveVRP & IdlePVARP	S65
IdleURL & ActiveLRI & CAVI & ActiveVRP & ActivePVARP	S66
IdleURL & ActiveLRI & CAVI & ActiveVRP & PVARP_AS	S67
IdleURL & ActiveLRI & CAVI & ActiveVRP & PVARP_AR	S68
IdleURL & ActiveLRI & CAVI & VRP_VS & IdlePVARP	S69
IdleURL & ActiveLRI & CAVI & VRP_VS & ActivePVARP	S70
IdleURL & ActiveLRI & CAVI & VRP_VS & PVARP_AS	S71
IdleURL & ActiveLRI & CAVI & VRP_VS & PVARP_AR	S72
IdleURL & LRI_VP & IdleAVI & IdleVRP & IdlePVARP	S73
IdleURL & LRI_VP & IdleAVI & IdleVRP & ActivePVARP	S74
IdleURL & LRI_VP & IdleAVI & IdleVRP & PVARP_AS	S75
IdleURL & LRI_VP & IdleAVI & IdleVRP & PVARP_AR	S76
IdleURL & LRI_VP & IdleAVI & ActiveVRP & IdlePVARP	S77
IdleURL & LRI_VP & IdleAVI & ActiveVRP & ActivePVARP	S78
IdleURL & LRI_VP & IdleAVI & ActiveVRP & PVARP_AS	S79
IdleURL & LRI_VP & IdleAVI & ActiveVRP & PVARP_AR	S80
IdleURL & LRI_VP & IdleAVI & VRP_VS & IdlePVARP	S81
IdleURL & LRI_VP & IdleAVI & VRP_VS & ActivePVARP	S82
IdleURL & LRI_VP & IdleAVI & VRP_VS & PVARP_AS	S83
IdleURL & LRI_VP & IdleAVI & VRP_VS & PVARP_AR	S84
IdleURL & LRI_VP & ActiveAVI & IdleVRP & IdlePVARP	S85
IdleURL & LRI_VP & ActiveAVI & IdleVRP & ActivePVARP	S86
IdleURL & LRI_VP & ActiveAVI & IdleVRP & PVARP_AS	S87
IdleURL & LRI_VP & ActiveAVI & IdleVRP & PVARP_AR	S88
IdleURL & LRI_VP & ActiveAVI & ActiveVRP & IdlePVARP	S89

IdleURL & LRI_VP & ActiveAVI & ActiveVRP & ActivePVARP	S90
IdleURL & LRI_VP & ActiveAVI & ActiveVRP & PVARP_AS	S91
IdleURL & LRI_VP & ActiveAVI & ActiveVRP & PVARP_AR	S92
IdleURL & LRI_VP & ActiveAVI & VRP_VS & IdlePVARP	S93
IdleURL & LRI_VP & ActiveAVI & VRP_VS & ActivePVARP	S94
IdleURL & LRI_VP & ActiveAVI & VRP_VS & PVARP_AS	S95
IdleURL & LRI_VP & ActiveAVI & VRP_VS & PVARP_AR	S96
IdleURL & LRI_VP & CAVI & IdleVRP & IdlePVARP	S97
IdleURL & LRI_VP & CAVI & IdleVRP & ActivePVARP	S98
IdleURL & LRI_VP & CAVI & IdleVRP & PVARP_AS	S99
IdleURL & LRI_VP & CAVI & IdleVRP & PVARP_AR	S100
IdleURL & LRI_VP & CAVI & ActiveVRP & IdlePVARP	S101
IdleURL & LRI_VP & CAVI & ActiveVRP & ActivePVARP	S102
IdleURL & LRI_VP & CAVI & ActiveVRP & PVARP_AS	S103
IdleURL & LRI_VP & CAVI & ActiveVRP & PVARP_AR	S104
IdleURL & LRI_VP & CAVI & VRP_VS & IdlePVARP	S105
IdleURL & LRI_VP & CAVI & VRP_VS & ActivePVARP	S106
IdleURL & LRI_VP & CAVI & VRP_VS & PVARP_AS	S107
IdleURL & LRI_VP & CAVI & VRP_VS & PVARP_AR	S108
ActiveURI & IdleLRI & IdleAVI & IdleVRP & IdlePVARP	S109
ActiveURI & IdleLRI & IdleAVI & IdleVRP & ActivePVARP	S110
ActiveURI & IdleLRI & IdleAVI & IdleVRP & PVARP_AS	S111
ActiveURI & IdleLRI & IdleAVI & IdleVRP & PVARP_AR	S112
ActiveURI & IdleLRI & IdleAVI & ActiveVRP & IdlePVARP	S113
ActiveURI & IdleLRI & IdleAVI & ActiveVRP & ActivePVARP	S114
ActiveURI & IdleLRI & IdleAVI & ActiveVRP & PVARP_AS	S115
ActiveURI & IdleLRI & IdleAVI & ActiveVRP & PVARP_AR	S116
ActiveURI & IdleLRI & IdleAVI & VRP_VS & IdlePVARP	S117
ActiveURI & IdleLRI & IdleAVI & VRP_VS & ActivePVARP	S118
ActiveURI & IdleLRI & IdleAVI & VRP_VS & PVARP_AS	S119
ActiveURI & IdleLRI & IdleAVI & VRP_VS & PVARP_AR	S120
ActiveURI & IdleLRI & ActiveAVI & IdleVRP & IdlePVARP	S121
ActiveURI & IdleLRI & ActiveAVI & IdleVRP & ActivePVARP	S122
ActiveURI & IdleLRI & ActiveAVI & IdleVRP & PVARP_AS	S123
ActiveURI & IdleLRI & ActiveAVI & IdleVRP & PVARP_AR	S124
ActiveURI & IdleLRI & ActiveAVI & ActiveVRP & IdlePVARP	S125
ActiveURI & IdleLRI & ActiveAVI & ActiveVRP & ActivePVARP	S126
ActiveURI & IdleLRI & ActiveAVI & ActiveVRP & PVARP_AS	S127
ActiveURI & IdleLRI & ActiveAVI & ActiveVRP & PVARP_AR	S128
ActiveURI & IdleLRI & ActiveAVI & VRP_VS & IdlePVARP	S129
ActiveURI & IdleLRI & ActiveAVI & VRP_VS & ActivePVARP	S130
ActiveURI & IdleLRI & ActiveAVI & VRP_VS & PVARP_AS	S131
ActiveURI & IdleLRI & ActiveAVI & VRP_VS & PVARP_AR	S132

ActiveURI & IdleLRI & CAVI & IdleVRP & IdlePVARP	S133
ActiveURI & IdleLRI & CAVI & IdleVRP & ActivePVARP	S134
ActiveURI & IdleLRI & CAVI & IdleVRP & PVARP_AS	S135
ActiveURI & IdleLRI & CAVI & IdleVRP & PVARP_AR	S136
ActiveURI & IdleLRI & CAVI & ActiveVRP & IdlePVARP	S137
ActiveURI & IdleLRI & CAVI & ActiveVRP & ActivePVARP	S138
ActiveURI & IdleLRI & CAVI & ActiveVRP & PVARP_AS	S139
ActiveURI & IdleLRI & CAVI & ActiveVRP & PVARP_AR	S140
ActiveURI & IdleLRI & CAVI & VRP_VS & IdlePVARP	S141
ActiveURI & IdleLRI & CAVI & VRP_VS & ActivePVARP	S142
ActiveURI & IdleLRI & CAVI & VRP_VS & PVARP_AS	S143
ActiveURI & IdleLRI & CAVI & VRP_VS & PVARP_AR	S144
ActiveURI & ActiveLRI & IdleAVI & IdleVRP & IdlePVARP	S145
ActiveURI & ActiveLRI & IdleAVI & IdleVRP & ActivePVARP	S146
ActiveURI & ActiveLRI & IdleAVI & IdleVRP & PVARP_AS	S147
ActiveURI & ActiveLRI & IdleAVI & IdleVRP & PVARP_AR	S148
ActiveURI & ActiveLRI & IdleAVI & ActiveVRP & IdlePVARP	S149
ActiveURI & ActiveLRI & IdleAVI & ActiveVRP & ActivePVARP	S150
ActiveURI & ActiveLRI & IdleAVI & ActiveVRP & PVARP_AS	S151
ActiveURI & ActiveLRI & IdleAVI & ActiveVRP & PVARP_AR	S152
ActiveURI & ActiveLRI & IdleAVI & VRP_VS & IdlePVARP	S153
ActiveURI & ActiveLRI & IdleAVI & VRP_VS & ActivePVARP	S154
ActiveURI & ActiveLRI & IdleAVI & VRP_VS & PVARP_AS	S155
ActiveURI & ActiveLRI & IdleAVI & VRP_VS & PVARP_AR	S156
ActiveURI & ActiveLRI & ActiveAVI & IdleVRP & IdlePVARP	S157
ActiveURI & ActiveLRI & ActiveAVI & IdleVRP & ActivePVARP	S158
ActiveURI & ActiveLRI & ActiveAVI & IdleVRP & PVARP_AS	S159
ActiveURI & ActiveLRI & ActiveAVI & IdleVRP & PVARP_AR	S160
ActiveURI & ActiveLRI & ActiveAVI & ActiveVRP & IdlePVARP	S161
ActiveURI & ActiveLRI & ActiveAVI & ActiveVRP & ActivePVARP	S162
ActiveURI & ActiveLRI & ActiveAVI & ActiveVRP & PVARP_AS	S163
ActiveURI & ActiveLRI & ActiveAVI & ActiveVRP & PVARP_AR	S164
ActiveURI & ActiveLRI & ActiveAVI & VRP_VS & IdlePVARP	S165
ActiveURI & ActiveLRI & ActiveAVI & VRP_VS & ActivePVARP	S166
ActiveURI & ActiveLRI & ActiveAVI & VRP_VS & PVARP_AS	S167
ActiveURI & ActiveLRI & ActiveAVI & VRP_VS & PVARP_AR	S168
ActiveURI & ActiveLRI & CAVI & IdleVRP & IdlePVARP	S169
ActiveURI & ActiveLRI & CAVI & IdleVRP & ActivePVARP	S170
ActiveURI & ActiveLRI & CAVI & IdleVRP & PVARP_AS	S171
ActiveURI & ActiveLRI & CAVI & IdleVRP & PVARP_AR	S172
ActiveURI & ActiveLRI & CAVI & ActiveVRP & IdlePVARP	S173
ActiveURI & ActiveLRI & CAVI & ActiveVRP & ActivePVARP	S174
ActiveURI & ActiveLRI & CAVI & ActiveVRP & PVARP_AS	S175

ActiveURI & ActiveLRI & CAVI & ActiveVRP & PVARP_AR	S176
ActiveURI & ActiveLRI & CAVI & VRP_VS & IdlePVARP	S177
ActiveURI & ActiveLRI & CAVI & VRP_VS & ActivePVARP	S178
ActiveURI & ActiveLRI & CAVI & VRP_VS & PVARP_AS	S179
ActiveURI & ActiveLRI & CAVI & VRP_VS & PVARP_AR	S180
ActiveURI & LRI_VP & IdleAVI & IdleVRP & IdlePVARP	S181
ActiveURI & LRI_VP & IdleAVI & IdleVRP & ActivePVARP	S182
ActiveURI & LRI_VP & IdleAVI & IdleVRP & PVARP_AS	S183
ActiveURI & LRI_VP & IdleAVI & IdleVRP & PVARP_AR	S184
ActiveURI & LRI_VP & IdleAVI & ActiveVRP & IdlePVARP	S185
ActiveURI & LRI_VP & IdleAVI & ActiveVRP & ActivePVARP	S186
ActiveURI & LRI_VP & IdleAVI & ActiveVRP & PVARP_AS	S187
ActiveURI & LRI_VP & IdleAVI & ActiveVRP & PVARP_AR	S188
ActiveURI & LRI_VP & IdleAVI & VRP_VS & IdlePVARP	S189
ActiveURI & LRI_VP & IdleAVI & VRP_VS & ActivePVARP	S190
ActiveURI & LRI_VP & IdleAVI & VRP_VS & PVARP_AS	S191
ActiveURI & LRI_VP & IdleAVI & VRP_VS & PVARP_AR	S192
ActiveURI & LRI_VP & ActiveAVI & IdleVRP & IdlePVARP	S193
ActiveURI & LRI_VP & ActiveAVI & IdleVRP & ActivePVARP	S194
ActiveURI & LRI_VP & ActiveAVI & IdleVRP & PVARP_AS	S195
ActiveURI & LRI_VP & ActiveAVI & IdleVRP & PVARP_AR	S196
ActiveURI & LRI_VP & ActiveAVI & ActiveVRP & IdlePVARP	S197
ActiveURI & LRI_VP & ActiveAVI & ActiveVRP & ActivePVARP	S198
ActiveURI & LRI_VP & ActiveAVI & ActiveVRP & PVARP_AS	S199
ActiveURI & LRI_VP & ActiveAVI & ActiveVRP & PVARP_AR	S200
ActiveURI & LRI_VP & ActiveAVI & VRP_VS & IdlePVARP	S201
ActiveURI & LRI_VP & ActiveAVI & VRP_VS & ActivePVARP	S202
ActiveURI & LRI_VP & ActiveAVI & VRP_VS & PVARP_AS	S203
ActiveURI & LRI_VP & ActiveAVI & VRP_VS & PVARP_AR	S204
ActiveURI & LRI_VP & CAVI & IdleVRP & IdlePVARP	S205
ActiveURI & LRI_VP & CAVI & IdleVRP & ActivePVARP	S206
ActiveURI & LRI_VP & CAVI & IdleVRP & PVARP_AS	S207
ActiveURI & LRI_VP & CAVI & IdleVRP & PVARP_AR	S208
ActiveURI & LRI_VP & CAVI & ActiveVRP & IdlePVARP	S209
ActiveURI & LRI_VP & CAVI & ActiveVRP & ActivePVARP	S210
ActiveURI & LRI_VP & CAVI & ActiveVRP & PVARP_AS	S211
ActiveURI & LRI_VP & CAVI & ActiveVRP & PVARP_AR	S212
ActiveURI & LRI_VP & CAVI & VRP_VS & IdlePVARP	S213
ActiveURI & LRI_VP & CAVI & VRP_VS & ActivePVARP	S214
ActiveURI & LRI_VP & CAVI & VRP_VS & PVARP_AS	S215
ActiveURI & LRI_VP & CAVI & VRP_VS & PVARP_AR	S216

Transitions between these states given inputs are specified in the state table below:

State\Input	Ain	Vin	Time
S1	S52	S118	S37/AP
S109	S159	S118	S1
S25	S25	S25	S114
S13	S52	S118	S25/VP
S113	S113	S113	S109
S49	S52	S118	S25/VP    S85/VP
S114	S116/AR	S114	S113
S37	S52	S118	S73
S116	S116	S116	S114
S118	S118	S118	S114
S159	S159	S159	S157
S52	S52	S52	S49
S85	S85	S58	S114
S157	S159	S118	S25/VP
S73	S73	S73	S114

**2.2 Test cases were generated to cover all 30 transitions as shown below:**

Test Case1	1	2	3	4	5	6	7
Start state	S1	S1	S52	S49	S25	S114	S114
Input	199ms	Ain	1ms	150ms	1ms	99ms	1ms
Expected output	/	AS	/	VP	/	/	/
Finish State	S1	S52	S49	S25	S114	S114	S113
Test Coverage Item	6	10,14,24	13,15,25	9,17	1,6,18,21,27	2,6,23,28	2,6,23,26

8	9	10	11	12	13	14	15	16
S113	S109	S1	S37	S49	S49	S118	S109	S116
50ms	250ms	450ms	1ms	50ms	Vin	1ms	Ain	1ms
/	/	AP	/	/	VS	/	AR	/
S2	S1	S37	S49	S49	S118	S109	S116	S114
2,6,22	3,6	8,14	12,15	13,15	1,9,16,19,27	20,28	30	29

Test Case2	1	2	3	4	5	6	7
Start state	S1	S1	S52	S49	S25	S114	S114
Input	199ms	Ain	1ms	150ms	1ms	99ms	1ms
Expected output	/	AS	/	VP	/	/	/
Finish State	S1	S52	S49	S25	S114	S114	S113
Test Coverage Item	6	10,14,24	13,15,25	9,17	1,6,18,21,27	2,6,23,28	2,6,23,26

8	9	10
S113	S109	S109

50ms	50ms	Vin
/	/	VS
S2	S109	S1
2,6,22	2,6	4,5,19,27

Test Case3	1	2	3	4	5	6	7
Start state	S1	S1	S52	S49	S25	S114	S114
Input	199ms	Ain	1ms	150ms	1ms	99ms	1ms
Expected output	/	AS	/	VP	/	/	/
Finish State	S1	S52	S49	S25	S114	S114	S113
Test Coverage Item	6	10,14,24	13,15,25	9,17	1,6,18,21,27	2,6,23,28	2,6,23,26

8	9	10	11	12	13
S113	S109	S1	S37	S49	S25
50ms	250ms	450ms	1ms	149ms	1ms
/	/	AP	/	/	VP
S2	S1	S37	S49	S25	S1
2,6,22	3,6	8,14	12,15	11,17	7,18

### 2.3 Test case visualization:

