

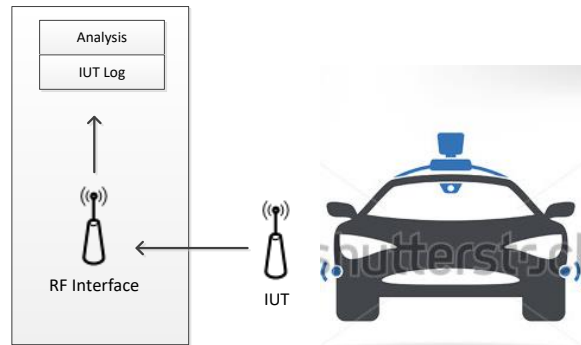
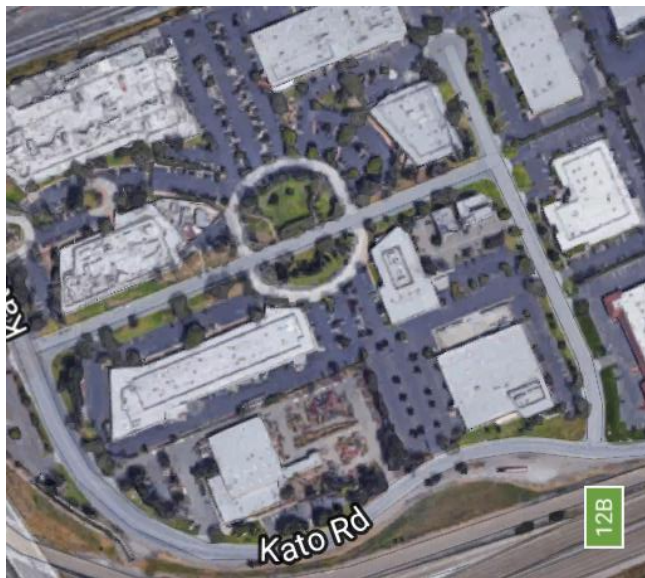
Hard Braking Event Instructions

Test Case Verification Objective:

- BSM: TP-BSM-ST-BV-02 thru 03-x, TP-BSM-ST-BV-08, TP-BSM-ST-BV-09
- Critical Flag Timing: TP-BSM-MV-BV-07-X
- Vehicle Event Flag: TP-BSM-ST-BV-01-X
- Certificate Population during Critical Event Flag: TP-BSM-ST-BV-01-X
- RadiusOfCurve: Straight Line

Test Location:

- Business Complex in non-congested/empty street where UL-Fremont located.

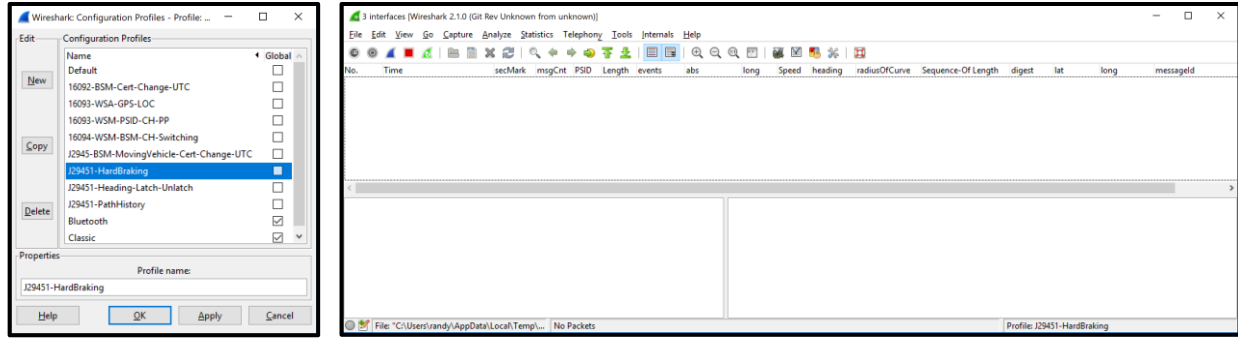


States in Initial Conditions

- IUT is powered up and transmitting.
- GNSS in open-sky conditions is being received and lock.
- IUT has security enabled with certificates and digests to successfully transmit BSMs.
- N-Type Headers enabled for power, channel and data rate.
- IUT is configured to transmit BSMs on a 10 MHz channel vChannelNumber (CH172), data rate vDataRate (6 Mbps) and power vPowerLevel (20 dBm) at 10 Hz transmission rate.

Setup Verification with Test Tool

1. Verify time correlation of Test Computer and UTC Network time at day start.
2. Verify time correlation of Test Tool (GPS PPS – Second value) and Test Computer at each test session.
3. Verify PCAP packet capture date/time stamp with the test computer at each test.
4. Select Configuration Profile "J29451-HardBraking" in Wireshark for this test.



BSM Capture Population Example of Hard Braking Event.

Hard Braking (3.413 seconds) shows starting at packet 1228 and ends packet 1261 showing event flag and no digests. Event flag occurred before 250 msec limit.

No.	Time	secMark	msgCnt	PSID	Length	events	abs	long	Speed	heading	radiusOfCurve	Sequence-Of	Length	digest	messageId
1223	2017-09-13 20:49:41.997	40700	32	321	249	Engaged,1	-283	1100	19680	-10323	1,3	d3066e2780a0debc	1,3	d3066e2780a0debc	BasicSafetyMessage
1226	2017-09-13 20:49:42.057	40800	6	32	249	Engaged,1	-311	1093	19682	-16081	1,3	d3066e2780a0debc	1,3	d3066e2780a0debc	BasicSafetyMessage
1227	2017-09-13 20:49:42.158	40900	7	32	320	Engaged,1	-352	1068	19672	-15389	1,3				BasicSafetyMessage
1228	2017-09-13 20:49:42.258	41000	8	32	321	01004e	Engaged,1	-400	1052	19690	-14435	1,3			BasicSafetyMessage
1229	2017-09-13 20:49:42.458	41200	10	32	321	01004e	Engaged,1	-528	999	19664	-12338	1,3			BasicSafetyMessage
1230	2017-09-13 20:49:42.560	41300	11	32	321	01004e	Engaged,1	-559	971	19648	-11268	1,3			BasicSafetyMessage
1231	2017-09-13 20:49:42.659	41400	12	32	321	01004e	Engaged,1	-578	936	19647	-10423	1,3			BasicSafetyMessage
1232	2017-09-13 20:49:42.759	41500	13	32	321	01004e	Engaged,1	-596	926	19631	-9746	1,3			BasicSafetyMessage
1233	2017-09-13 20:49:42.861	41600	14	32	321	01004e	Engaged,1	-605	880	19647	-8913	1,3			BasicSafetyMessage
1234	2017-09-13 20:49:42.961	41700	15	32	321	01004e	Engaged,1	-655	851	19636	-8518	1,3			BasicSafetyMessage
1235	2017-09-13 20:49:43.060	41800	16	32	321	01004e	Engaged,1	-675	823	19609	-8702	1,3			BasicSafetyMessage
1236	2017-09-13 20:49:43.160	41900	17	32	321	01004e	Engaged,1	-655	790	19608	-8618	1,3			BasicSafetyMessage
1237	2017-09-13 20:49:43.262	42000	18	32	321	01004e	Engaged,1	-636	753	19622	-8504	1,3			BasicSafetyMessage
1238	2017-09-13 20:49:43.361	42100	19	32	321	01004e	Engaged,1	-655	723	19633	-8717	1,3			BasicSafetyMessage
1239	2017-09-13 20:49:43.462	42200	20	32	321	01004e	Engaged,1	-628	690	19617	-8796	1,3			BasicSafetyMessage
1240	2017-09-13 20:49:43.563	42300	21	32	321	01004e	Engaged,1	-646	663	19635	-8956	1,3			BasicSafetyMessage
1241	2017-09-13 20:49:43.662	42400	22	32	321	01004e	Engaged,1	-636	624	19640	-9026	1,3			BasicSafetyMessage
1242	2017-09-13 20:49:43.763	42500	23	32	321	01004e	Engaged,1	-655	597	19615	-9229	1,3			BasicSafetyMessage
1243	2017-09-13 20:49:43.864	42600	24	32	321	01004e	Engaged,1	-655	557	19608	-9107	1,3			BasicSafetyMessage
1244	2017-09-13 20:49:43.964	42700	25	32	321	01004e	Engaged,1	-665	527	19624	-8802	1,3			BasicSafetyMessage
1245	2017-09-13 20:49:44.065	42800	26	32	321	01004e	Engaged,1	-684	498	19598	-8323	1,3			BasicSafetyMessage
1246	2017-09-13 20:49:44.164	42900	27	32	321	01004e	Engaged,1	-675	459	19640	-8316	1,3			BasicSafetyMessage
1247	2017-09-13 20:49:44.264	43000	28	32	321	01004e	Engaged,1	-646	436	19588	-8624	1,3			BasicSafetyMessage
1248	2017-09-13 20:49:44.366	43100	29	32	321	01004e	Engaged,1	-628	403	19617	-9659	1,3			BasicSafetyMessage
1249	2017-09-13 20:49:44.465	43200	30	32	321	01004e	Engaged,1	-596	381	19649	-11070	1,3			BasicSafetyMessage
1250	2017-09-13 20:49:44.565	43300	31	32	321	01004e	Engaged,1	-559	351	19600	-11414	1,3			BasicSafetyMessage
1251	2017-09-13 20:49:44.665	43400	32	32	321	01004e	Engaged,1	-546	322	19628	-11107	1,3			BasicSafetyMessage
1252	2017-09-13 20:49:44.767	43500	33	32	321	01004e	Engaged,1	-559	300	19698	-10915	1,3			BasicSafetyMessage
1253	2017-09-13 20:49:44.868	43600	34	32	321	01004e	Engaged,1	-536	267	19668	-9893	1,3			BasicSafetyMessage
1254	2017-09-13 20:49:44.968	43700	35	32	321	01004e	Engaged,1	-559	241	19652	-9313	1,3			BasicSafetyMessage
1255	2017-09-13 20:49:45.068	43800	36	32	321	01004e	Engaged,1	-546	215	19655	-8571	1,3			BasicSafetyMessage
1256	2017-09-13 20:49:45.167	43900	37	32	321	01004e	Engaged,1	-528	190	19634	-7905	1,3			BasicSafetyMessage
1257	2017-09-13 20:49:45.268	44000	38	32	321	01004e	Engaged,1	-500	165	19711	-6924	1,3			BasicSafetyMessage
1258	2017-09-13 20:49:45.371	44100	39	32	321	01004e	Engaged,1	-478	142	19628	-5911	1,3			BasicSafetyMessage
1259	2017-09-13 20:49:45.469	44200	40	32	321	01004e	Engaged,1	-459	120	19644	-5089	1,3			BasicSafetyMessage
1260	2017-09-13 20:49:45.572	44300	41	32	321	01004e	Engaged,1	-421	100	19575	-4289	1,3			BasicSafetyMessage
1261	2017-09-13 20:49:45.671	44400	42	32	321	01004e	Engaged,1	-390	82	19659	-3742	1,3			BasicSafetyMessage
1262	2017-09-13 20:49:45.770	44500	43	32	249	Engaged,1	-330	67	19592	-3134	1,3	d3066e2780a0debc	1,3	d3066e2780a0debc	BasicSafetyMessage
1263	2017-09-13 20:49:45.873	44600	44	32	249	Engaged,1	-293	55	19735	-2563	1,3	d3066e2780a0debc	1,3	d3066e2780a0debc	BasicSafetyMessage
1264	2017-09-13 20:49:45.972	44700	45	32	249	Engaged,1	-215	45	19384	32767	1,3	d3066e2780a0debc	1,3	d3066e2780a0debc	BasicSafetyMessage

Setup OBU Verification while Vehicle Stationary

1. Three Sharkfin magnet mount dual “DSRC/GNSS” antennas with 10M cables with fakra connectors mounted on vehicle’s roof in organized alignment across vehicle directional center line. 10m cables These components are consistent with all tests and testing sessions.
2. Three IUTs should use center mounted antenna.
3. Each IUT should provide their power cable if cable is not available.
4. IUT verifies its UTC Time Correlation (TP-BSM-ST-BV-20-V) with its system clock and BSM capture of the test tool.
5. IUT verifies vehicle’s length and width (TP-BSM-MV-BV-14) in BSM that matches vehicle used in the test.

Test Procedure

1. Start packet sniffer with CH172 enabled and GPS/Time synchronized to record PCAP and WireShark in "J29451-BSM-HardBraking" configuration profile.
2. Power OBU under test with BSMs starting to transmit. Verify Capture TimeStamp and GPS coordinates being populated.
3. Start OBU under test with BSMs transmitting.
4. Drive route at approximately 45 mph (72 kph = 20 m/s) or speed limit. RadiusofCurve should be similar with road radius and pathHistory should be within 3 (straightaway) within 1m.
5. During straight away and traffic permits, conduct hard braking event in bringing the vehicle to sudden stop from 45 mph to 0 mph. Event flag is triggered when de-acceleration is greater than -4.00 m/s^2 (0.4 G). Save PCAP.
6. Repeat test for two runs.
7. Save PCAP as "HardBraking-OBU-[Manufacturer's Names] and show analysis.