3.0.2 Functional Hazard Analysis

Functional Hazard Analysis							
Version:	*1.1*	**Safety Engineers:**	*Anubhav Sigdel , Sven Keppler, Tyler West, Umang Patel*				
System:	Hyundai's Saint Jose 2.0 4WD Sport SUV			**Subsystem:**	*The rear-view camera with cross-traffic detection, rear collision avoidance, and smart trunk hatch*		
Hazard ID	**Functional Requirement**	**Hazard Description**	**Effect (Accident)**	**Trigger Conditions**	**IMRI**	**Safety Goal**	**FMRI**
H 1.1	SC 6	Camera failure	Rear-end collision leading to human death, injury,	Rear-view camera feed not played in screen to the driver RCCW warning may not display on camera screen	3D	The system shall have automatic brake system which depends on sensors	4E
H 1.2	SC 6	Inclement weather conditions or dirt impacting camera's ability to see	Poor visibility causing the driver to engage in risky behavior and/or have a collision (without Active Assist)	Rear-view camera is obfuscated by objects or inclement weather covering it	2D	Operability of camera and systems must be able to persist through partial obfuscation to maintain safety of driver	4E
H 2	G 14	Sensor failure	See H1.1	Audio to alert driver is not working and system does not display alert	3D	The system shall have two sensors working independent from each other.	4E
H 3	G 15	Blind Spot in Sensing Capabilities	Collision to approaching vehicle in speed	The car does not have a full radar covering the whole back	2D	The system shall have full range of sensor to alert the driver and safely brake	4E

H 4.1	G 16	changing warning time	See H1.1	If you change the warning timing, the warning time of other systems may change.	3E	The system shall be able to change the warning time to a specific limit	4E
H 4.2	G 17	Changing warning volume	rear collision and the driver does not hear the sound alert	If you change the warning volume, the warning volume of other systems may change.	3E	The system shall be able to change the volume to a specific limit	4E
H 5	SC 7	The brake activation by the system lasts for about 2 seconds	Driver mistakenly keeps accelerating the car without knowing the system is braking	The user keeps their foot on the accelerator while and after the 2 second of automatic braking is over	3B	The system shall be able to alert the driver of its braking and the car control will be given over back.	4E
H 6	SC6	The system might be turned off due to strong electromagnetic waves.	RCCW fails leading to rear collision, human death or injury	sensor failure and RCCW error	1D	Rear camera could have a system that could predict the distance/ sense object through image recognition to alert the driver of the surrounds	4E
H 7	SR 1	Damaged Sensor	The system would not be able to warn the driver leading to collision	The sensor might not be connected to the system or could be physically broken	3D	The system shall alert the driver when the system component is broken/ damaged/ not connected	4E

H 8	G18	System disabled/ radar blocked	BCW would not be able to alert the driver of the blind spot leading to collision	blind spot collision/ not detected	3D	The system shall be able to alert the driver if the radar systems are blocked or if the BCW system is unable	4E
H 9	G22	A trailer is attached to the back of the car	RCCA failed and the trailer crashed	RCCA system sensor would be turned off as the sensor wouldn't be able to detect behind the trailer	2D	The system could have portable sensors that could be attached to the trailer.	4E
H 10	G 20	When the sensors are blocked by other vehicles, walls or parking-lot pillars	The system might send alert to the driver while the car is parked nearby an object	The driver might turn off the system due to sensors reading the object near which are not in the path of the driver	3A	The sensor should be trimmed to a specific setting that driver don't get annoyed with the alerts/warning	3E
H 11.1	G23	The entire RCCA system is rendered useless due to elevation differences	The RCCA fails and the driver is involved in a side-on collision	Car is approaching from an incline causing the sensor to not be able to sense the others car's presence	1D	The sensor should sense the the road and if there's a severe enough elevation change, informs the user that the RCCA is unable to work in the current conditions	3D
H 11.2	G23	The vehicle height gets lower or higher due to heavy loading in a trunk, abnormal tire pressure	System might give error due to sensor not align in the specified height	The system will not give accurate safety directions	4C	The car should have a system on the suspension of the car to alert the driver the sensor are too low of too high	4E

H 12	G13	Small objects don't get sensed by the car sensor	The car would crash in the small object such as shopping carts or a baby stroller	RCCA can't see an object and the RCCW is not raised.	2D	The system sensor should be very sensitive to detect any small object on the rear	4E
H 13	SC6	ESC (Electronic Stability Control) malfunctions	See H1.1	ESC fails to apply brakes on the car	1D	The system be able to alert the driver that the ESC system is malfunctioning so that the driver pays attention to the roads	4D
H 14	SC4	When pulling out diagonally from a parking space, the system may not detect the vehicle approaching from the rear left/right	See H1.1	ESC does not apply brakes	2C	RCCW should be able to warn the driver that the angle of the sensor is being blocked	4E
H 15	G11	When opening and closing, if the power liftgate is blocked by an object or body part, the power liftgate will detect the resistance and the liftgate will stop and move in the opposite direction.	It might injure the person while closing and opening	Object is too near the smart liftgate door and safety release	3D	The smart trunk should detect if someone is on the way before closing and opening	4E