

SIRIUS SATELLITE RADIO

REMOTE RADIATOR VEHICLE TESTING
UNIVERSITY OF MICHIGAN
Model SV-2

September 27, 2006

DISCUSSION OF TESTING AND RESULTS

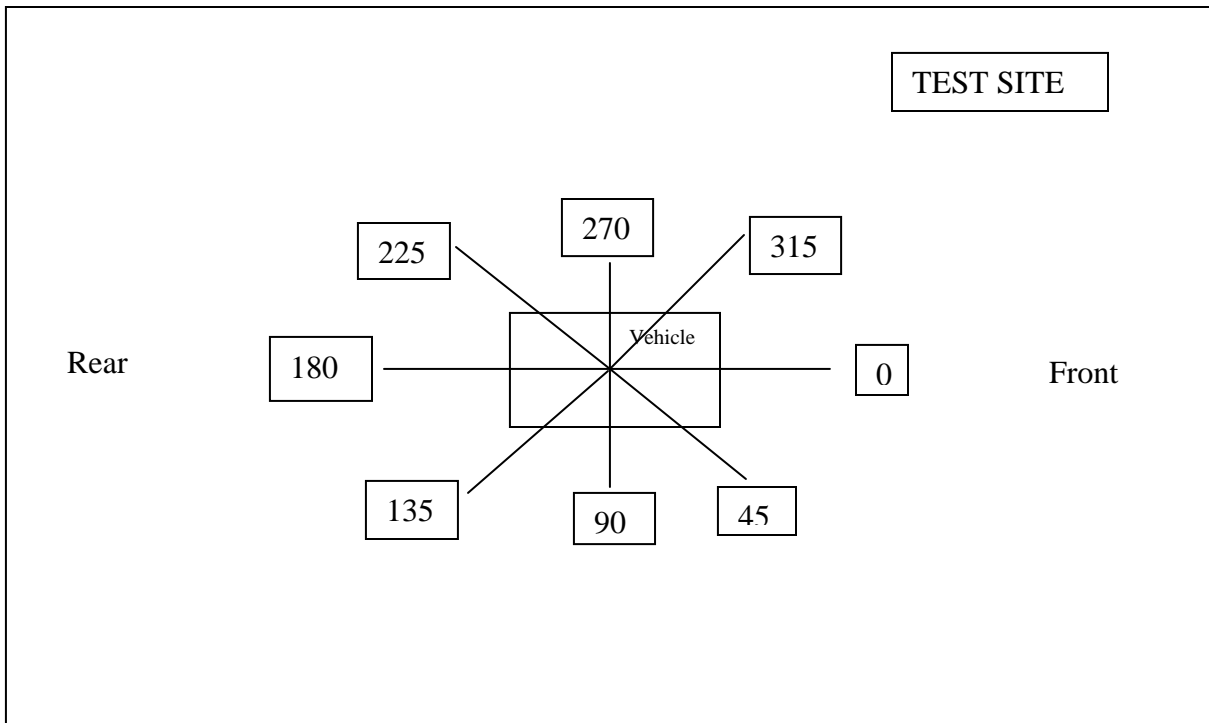
Satellite radio products function to receive satellite radio channels, decode the modulation on the satellite signal and modulate the recovered base band signal onto a carrier in the FM radio band for reception by the FM radio in the vehicle. The remote radiator concept provides for better coupling to the car radio of the modulated FM signal from the satellite receiver.

These tests were implemented to gather data on a remote radiator configuration with Sirius Satellite radio products. The data was taken on 8 radials with 3 different vehicles at a distance of 3 meters from the closest point of the vehicle.

In situ testing was performed for three vehicles based on the following vehicle sizes; small, medium, and large. The selected vehicles were: Chrysler 300, Mercedes ML 320, and a Honda Accord. The above vehicles have window mount antennas and the remote antenna was located adjacent to the window antenna in each case. Three frequencies in the FM band were measured; one near the low end (88 MHz), middle, (98 MHz) and high end (108 MHz) of the band in both horizontal and vertical polarizations.

The results show that the remote radiator produces levels are about 14 dB or more below the FCC Section 15.239 limits when measured 3 meters from the perimeter of the vehicle. In the tables that follow, K_g is the correction factor for preamp gain and cable loss and K_a is the antenna factor for the measurement antenna.

Below is a diagram of the radial arrangement for measurements as laid out on the test site showing their position relative to the vehicle position. Measurement were made using an antenna and mast moved to each marked location. Antenna height was varied from 1 to 4 meters at each location.



Chrysler 300 w/ Rear Glass Antenna

Data taken 15Sep2006								
Radial Angle	MHz (dBuV)		98 MHz (dBuV)		108 MHz (dBuV)			
	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal		
0	45.6	34.9	42.4	34.1	34.3	34.2		
45	39.2	32.7	40.6	38.7	37.3	31.7		
90	46.4	39.0	34.0	41.8	35.7	33.4		
135	38.4	39.2	42.4	39.5	33.8	35.8		
180	42.1	37.5	37.7	36.0	41.9	35.4		
225	35.5	32.4	37.1	29.4	33.2	34.2		
270	35.0	39.2	39.4	36.9	35.9	36.3		
315	38.1	37.2	45.5	42.2	35.6	35.2		
Max dBuV	46.4	39.2	45.5	42.2	41.9	36.3	46.4	Max Reading (dBuV)
Max dBuV/m	34.1	26.9	33.8	30.5	31.5	25.9	34.1	Max Output (dBuV/m)
Limit Margin	-13.9	-21.1	-14.2	-17.5	-16.5	-22.1	-13.9	Min Margin (dB)
and BICON calibration								
	Kg	Ka	Corr					
88	20.2	7.9	-12.3					
98	20	8.3	-11.7					
108	19.4	9	-10.4					
Conducted Power per FMAS								
88.1MHz	-31.5dBm							
107.9MHz	-31.8dBm							



Mercedes ML320 w/ Rear Glass Antenna

Data taken 27 Sep 2006

Radial Angle	88 MHz (dBuV)		98 MHz (dBuV)		108 MHz (dBuV)			
	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal		
0	32.4	25.5	25.2	23.4	30.4	25.7		
45	30.3	28.2	30.6	30.0	32.6	29.7		
90	32.7	30.6	32.1	31.3	34.9	38.7		
135	33.0	42.0	32.6	39.8	33.6	41.7		
180	42.4	41.8	39.0	39.3	32.2	44.5		
225	35.1	34.7	33.4	33.7	29.8	31.7		
270	34.5	30.9	34.0	31.4	30.9	29.0		
315	23.9	29.6	28.2	25.1	23.9	28.8		
Max dBuV	42.4	42	39	39.8	34.9	44.5	44.5	Max Reading (dBuV)
Max dBuV/m	30.1	29.7	27.3	28.1	24.5	34.1	34.1	Max Output (dBuV/m)
Limit Margin	-17.9	-18.3	-20.7	-19.9	-23.5	-13.9	-13.9	Min Margin (dB)
Range and BICON calibration								
	Kg	Ka	Corr					
88	20.2	7.9	-12.3					
98	20	8.3	-11.7					
108	19.4	9	-10.4					
Conducted Power per FMAS								
88.1MHz	-31.5dBm							
107.9MHz	-31.8dBm							



Honda Accord w/ Rear Glass Antenna

Data taken 27Sep2006

Radial Angle	88 MHz (dBuV)		98 MHz (dBuV)		108 MHz (dBuV)			
	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal		
0	32.3	39.5	44.8	32.8	41.4	31.4		
45	37.9	37.0	41.9	35.4	35.3	31.9		
90	34.0	43.5	32.7	42.0	33.6	41.2		
135	35.8	35.0	35.7	38.2	32.1	36.9		
180	40.5	29.6	41.8	39.4	42.8	38.2		
225	34.0	35.9	38.0	39.9	34.6	34.4		
270	31.9	38.5	40.1	43.3	29.7	41.4		
315	33.7	34.6	37.3	37.6	36.4	37.2		
Max dBuV	40.5	43.5	44.8	43.3	42.8	41.4	44.8	Max Reading (dBuV)
Max dBuV/m	28.2	31.2	33.1	31.6	32.4	31	33.1	Max Output (dBuV/m)
Limit Margin	-19.8	-16.8	-14.9	-16.4	-15.6	-17	-14.9	Min Margin (dB)
Range and BICON calibration								
	Kg	Ka	Corr					
88	20.2	7.9	-12.3					
98	20	8.3	-11.7					
108	19.4	9	-10.4					
Conducted Power per FMAS								
88.1MHz	-31.5dBm							
107.9MHz	-31.8dBm							



TEST SITE PHOTOS

