

RFI from MS SURFACE CHARGER while CHARGING

WØLEV

24 April 2018

RADIATED EMISSIONS

Antenna: 300-foot long doublet

Feedline: 2X Window Line (two lengths in parallel – phase matched)

Into Receiver: 5 kW Quadfilair Common Mode choke (homebrew and swept on HP 8753 Vector Network Analyzer) wired as bifilar

Receiver: RSP1

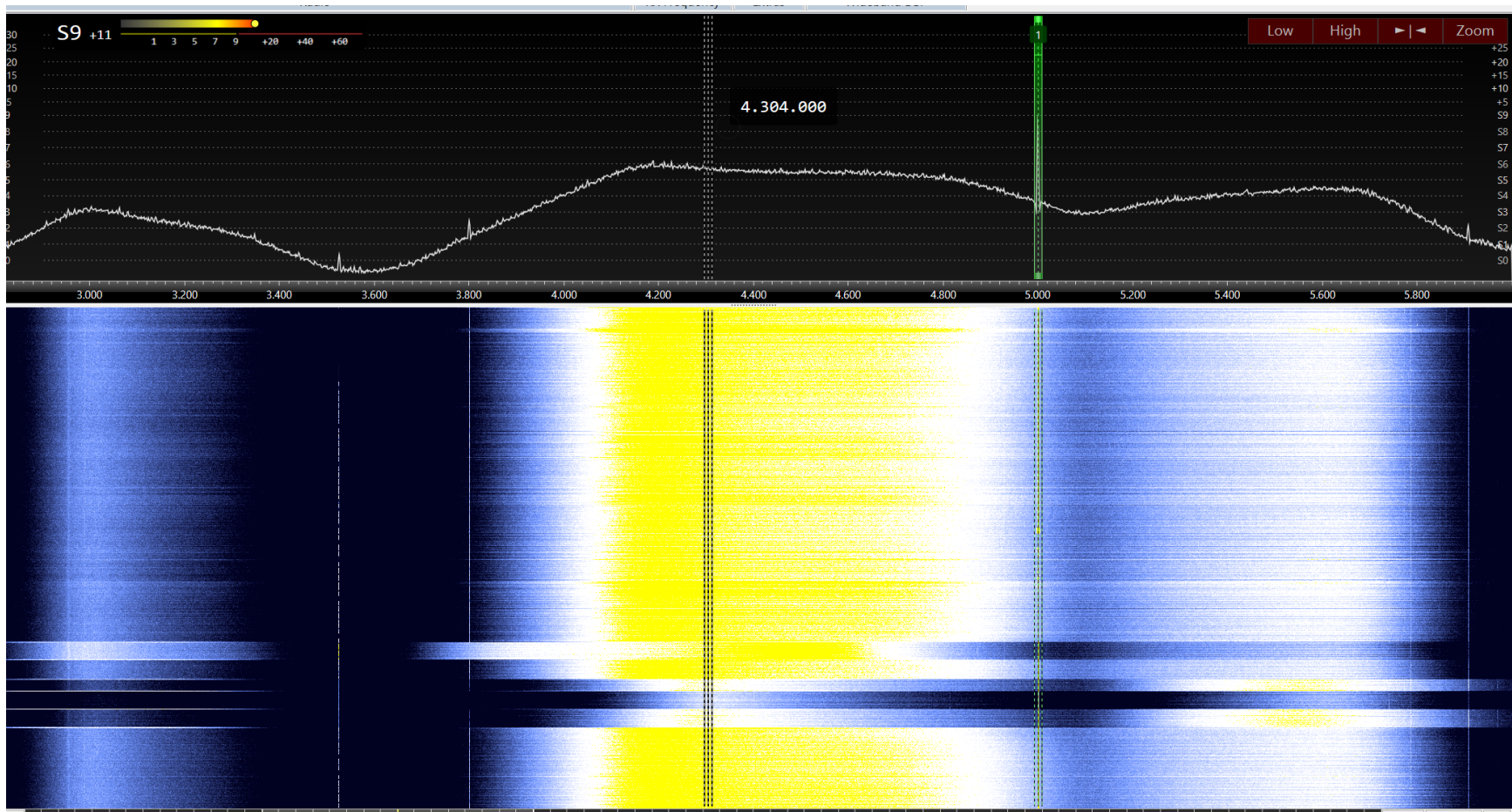
Tuned to: WWV 5 MHz

Measured Levels: No Antenna (input terminated with 20 dB attenuator): -131 dBm (S-0)
 With Antenna (attenuator removed): WWV: -62 dBm (11 dB over S-9)
 Peak of Strongest interference 'hump': -88 dBm (S-6)

My Location: 11.5 miles WSW of Berthoud, Colorado (about 30 miles from WWV with mountains in the way).

40:16:37N 105:13:00 W

The pattern below pretty much replicates with decreasing amplitude to at least 10 MHz and downward through the BC band. Pretty bad. Too bad radiated emissions are not required by the FCC and the EU to be measured below 30 MHz!!



Antenna: 2/70 cm mag. mount about 2-feet from the MS Surface

Receiver: Rigol Spectrum Analyzer

Frequency Sweep: 0.500 to 15.5 MHz

Yellow: Charging

Magenta: Not Charging

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The spikes on the left are AM BC signals.

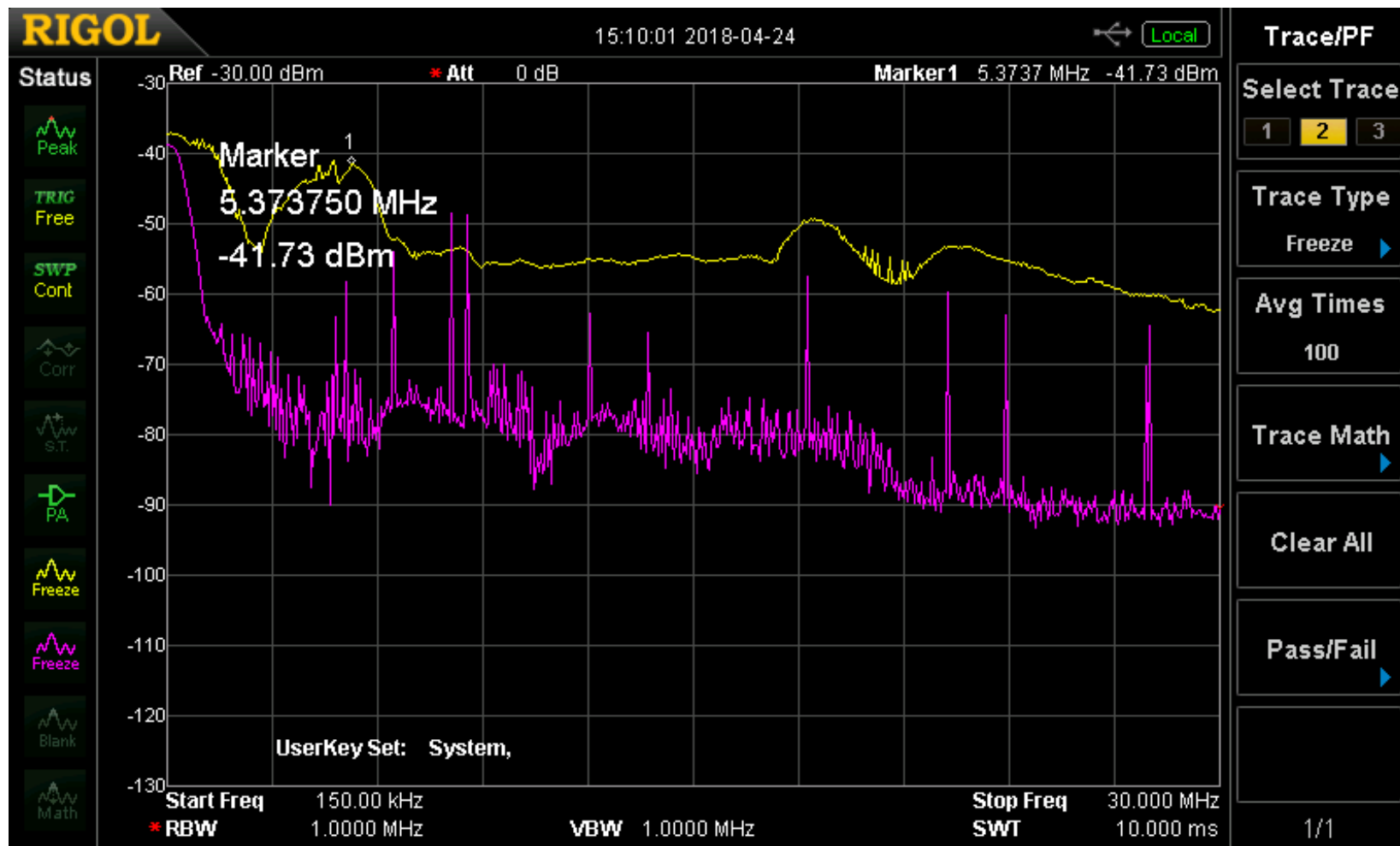
COMMON MODE CONDUCTED EMISSIONS

“Antenna”: Clamp-on current around the line cord

Transfer Function: -10 dB from 100 kHz through 100 MHz. The power measured with the spectrum analyzer will be 10 dB GREATER than is reported on the screen grab. This applies to both the yellow and magenta traces. The marker indicates -41.7 dBm on the yellow trace. Taking into account the transfer function, this is -31.7 dBm.

Yellow: Charging

Magenta: Not Charging



This energy lights up the the house wiring. That's how it gets out to my 300-foot doublet even though I have steel siding on the house and roof. Note the spikes on the magenta trace. These are low duty cycle pulses to keep the voltage at the set point of the charger with no load. When the charger is charging the MS Surface, they become very dense due to the high load and fill almost immediately! This energy is coupled to the house wiring from which it is radiated in all directions. The measurement of conducted emissions is pretty much an FCC prescribed measurement from 150 kHz through 30 MHz. I should point out that this charger would NOT PASS FCC or EU specification limits for conducted emissions. Note the energy is 'still going' above 30 MHz. This charger would likely not even pass radiated emissions when measured in an approved lab setup. Personally, I'm surprised at MS. The Surface, itself, is pretty clean. I suspect the charger is "With Love from China". Let me unwrap the aluminum foil I have placed around the unit.

The charger has all the proper regulatory markings for pretty much world-wide distribution. BUT:.....it does read "Made in China".

MS Surface itself: Clean and FCC/EU compliant

Charger: RFI and dirty and , well, you fill in the blank_____!!!!

QED