

Sensing & Control – Test & Measurement

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Gautham Ramamurthy
Vijay Talikoti

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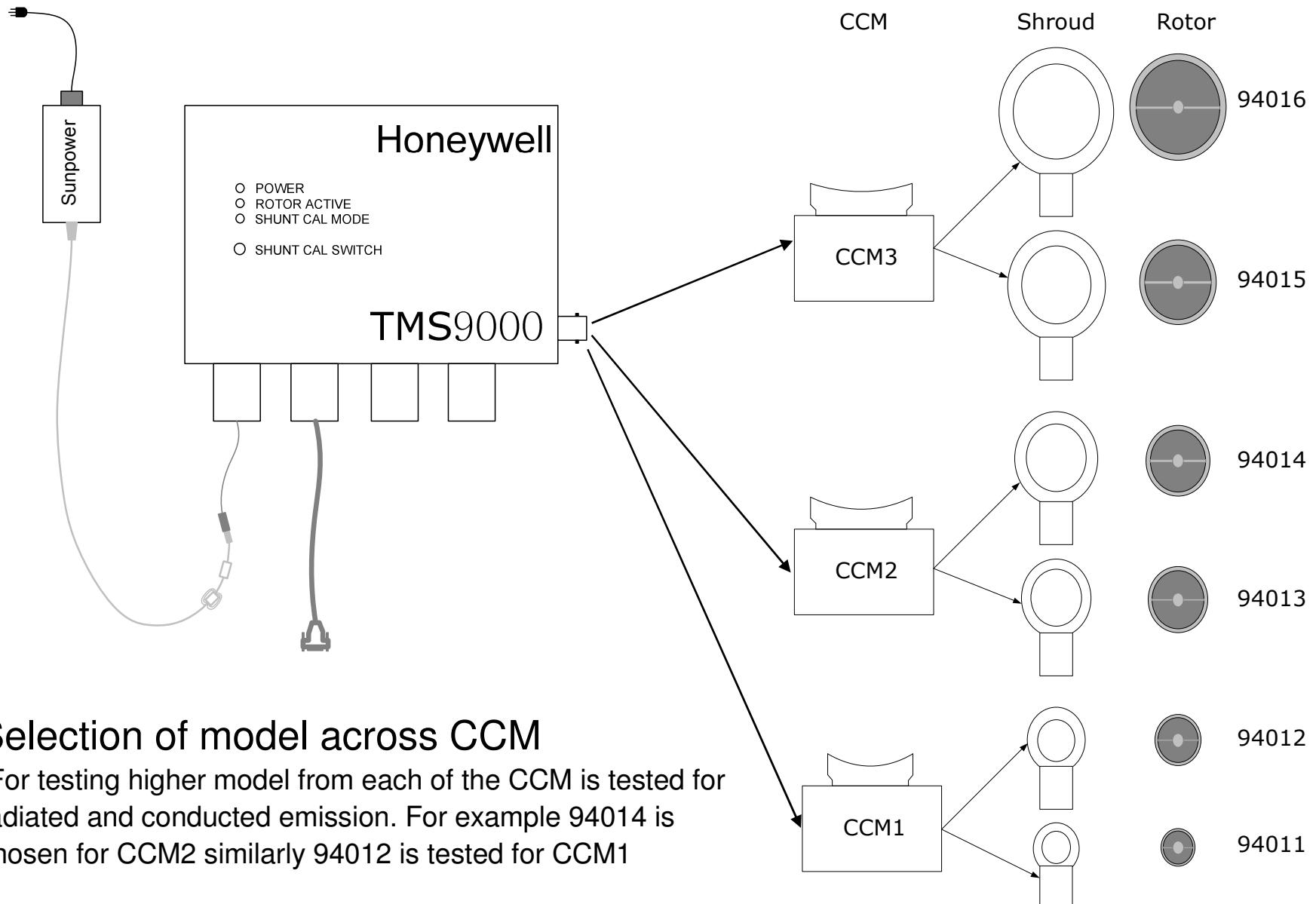
Identification of worst case model

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- The CCM antenna and rotor antenna of TMS9000 are like Primary and secondary coils of a transformer.
- Not all the primary flux links with the secondary flux. There will be some leakage flux. Also, the current in the coils sets up an electro-magnetic field around the coil. This causes radiated emissions.
- Larger the size of the antenna (coil in the CCM and rotor coils) larger would be the leakage and current drawn. Hence the radiated emissions would be higher.
- 94016 rotor (largest size of rotor antenna and largest CCM size) would be the worst case model for emissions (both conducted and radiated).
- The above trend is clearly seen from the test data available from certification testing of the flange type models. The margin is reducing with the increase in size of the antenna.

TMS9000 models

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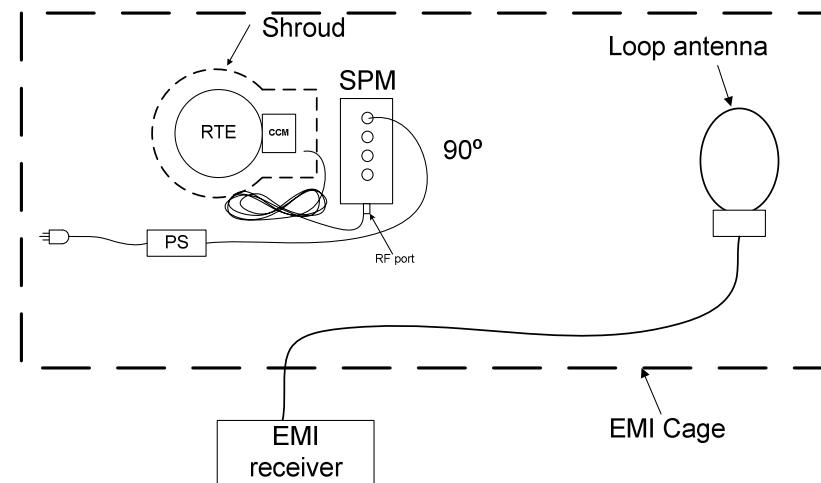


Selection of model across CCM

- For testing higher model from each of the CCM is tested for radiated and conducted emission. For example 94014 is chosen for CCM2 similarly 94012 is tested for CCM1

Loop Antenna Measurements up to 30MHz:

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Summary of readings:

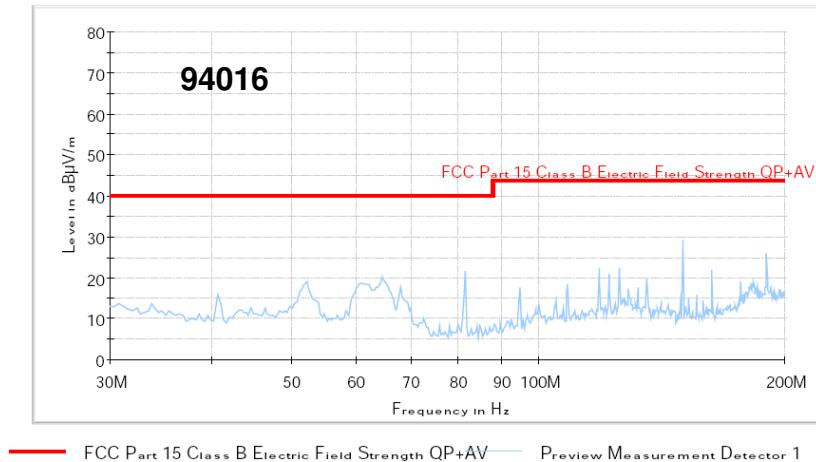
Models	Readings at 90° 'A' dBuV/m	Antenna Factor 'B' dBuV/m	Final reading A+B	Limit C	Margin for 90° D= C - (A+B)
92016	12	44	56	63.5	7.5
92014	8	44	52	63.5	11.5
92013	4	44	48	63.5	15.5
92012	3	44	47	63.5	16.5
92011	1	44	45	63.5	18.5

Conclusion:

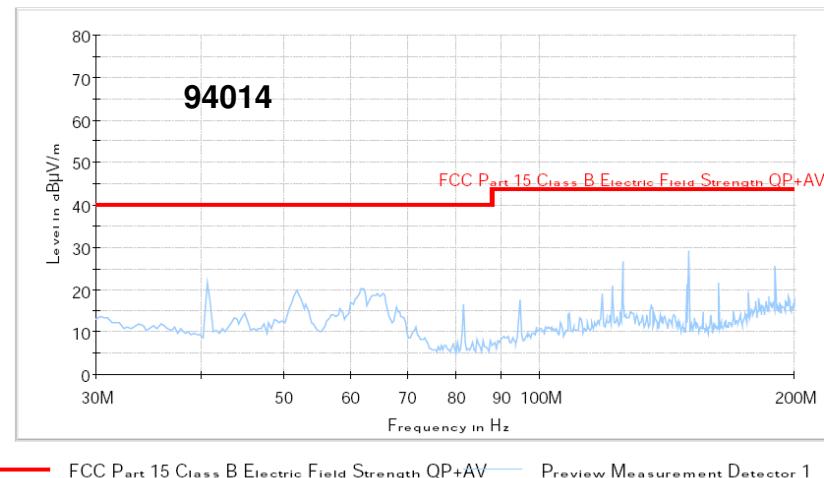
- 92016 has the largest rotor diameter and largest CCM. The above data also clearly indicates that the margin is the least for 92016 model.
- So, clearly 92016 is the worst case model for Loop Antenna Measurements.
- For any future testing with loop Antenna it would suffice to test & certify only 92016 model as this is worst case.

Radiated emission tests using Bi-conical antenna for the frequency range 30MHz to 200MHz **Honeywell**

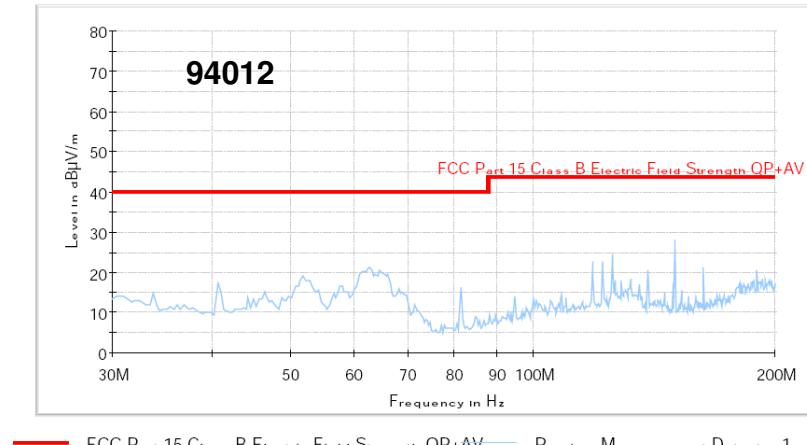
Electric Field Strength with Sweeps CISPR22 _30 MHz - 200 MHz



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Electric Field Strength with Sweeps CISPR22 _30 MHz - 200 MHz



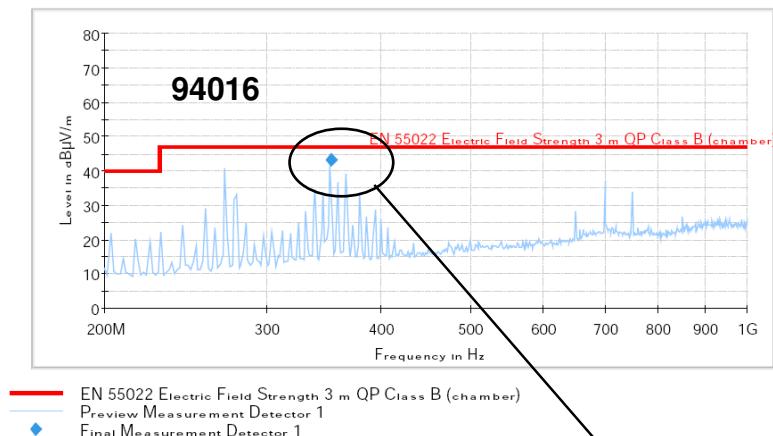
Conclusion:

1. Radiated emissions for the freq range of 30 to 200MHz was conducted for 3 models 94016, 94014 & 94012. All the 3 models have a different CCM.
2. CCM1 is for 94011 & 94012. CCM2 is for 94013 & 94014. CCM3 is for 94015 & 94016.
3. All the 3 models pass the test with sufficient margin.
4. The margin is at least 15dB in each case. Also, emissions from the 3 models is almost the same.

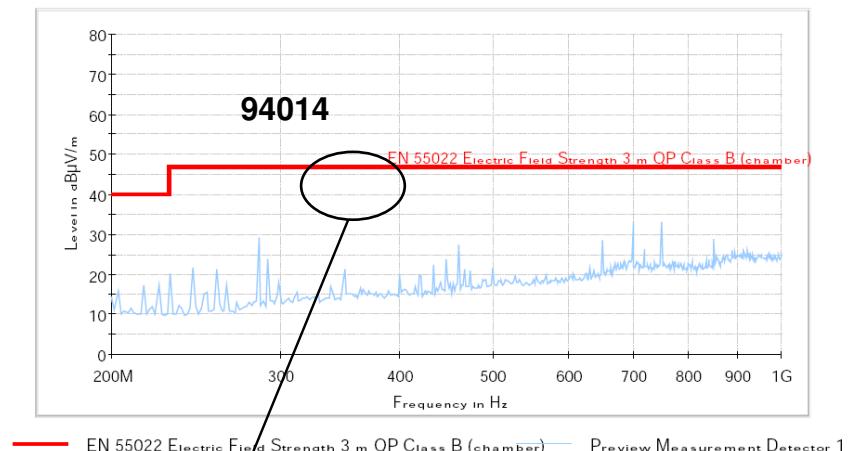
Radiated emission tests using log antenna for the frequency range 200MHz to 1GHz

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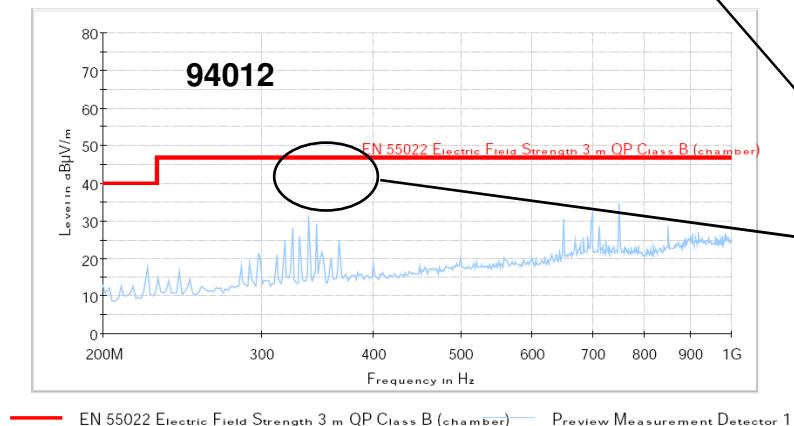
Electric Field Strength with Sweeps CISPR22 _200 MHz - 1GHz



Electric Field Strength with Sweeps CISPR22 _200 MHz - 1GHz

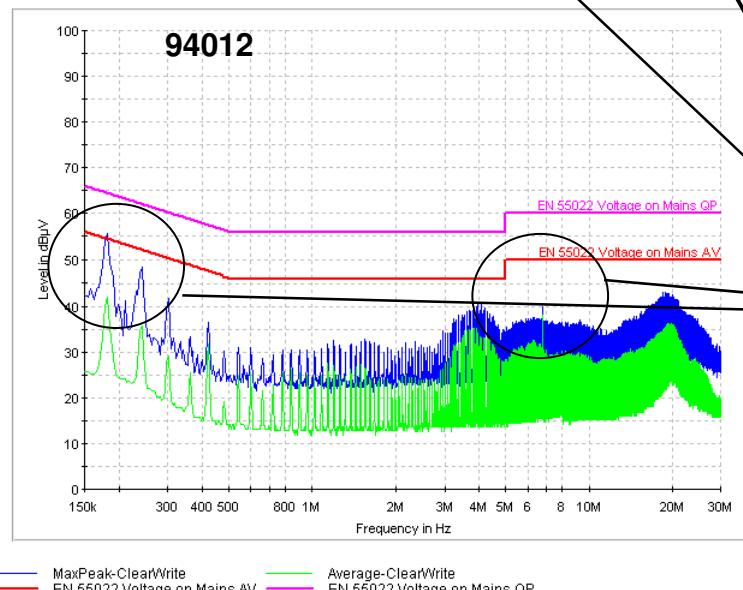
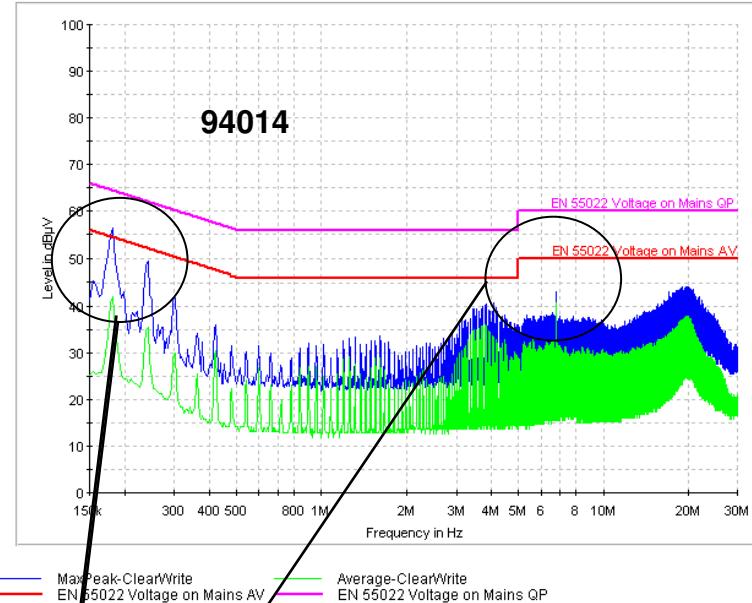
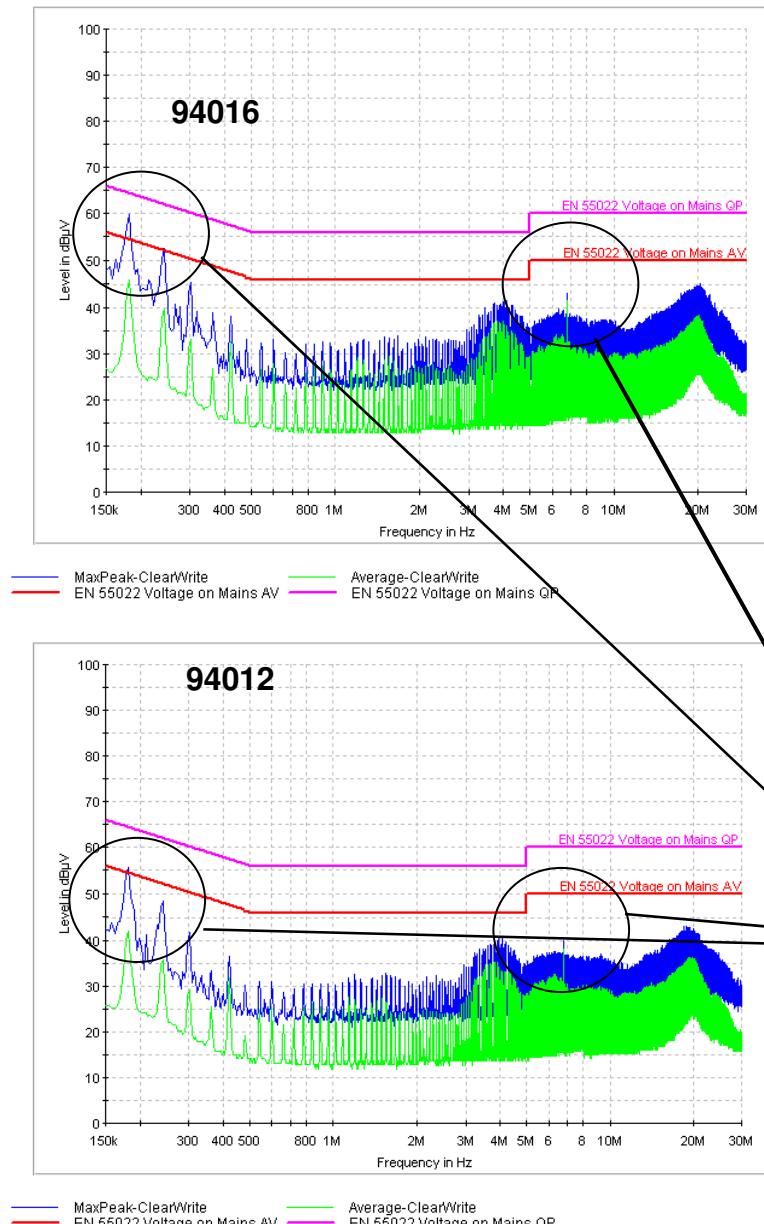


Electric Field Strength with Sweeps CISPR22 _200 MHz - 1GHz



Conclusion:

1. Radiated emissions for the freq range of 200MHz to 1GHz was conducted for 3 models 94016, 94014 & 94012. All the 3 models have a different CCM. CCM1 is for 94011 & 94012. CCM2 is for 94013 & 94014. CCM3 is for 94015 & 94016.
- 2.
3. Clearly 94016 has the least margin and is the worst case model.



Conclusion:

1. Conducted emissions for the freq range of 150KHz to 30MHz was conducted for 3 models 94016, 94014 & 94012. All the 3 models have a different CCM.
2. CCM1 is for 94011 & 94012. CCM2 is for 94013 & 94014. CCM3 is for 94015 & 94016.
3. Clearly 94016 has the least margin and is the worst case model.

Conclusions:

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1. 94016 rotor (largest size of rotor antenna and largest CCM size) is the worst case model for emissions (both conducted and radiated).
2. Test results clearly show that from an emissions (conducted & Radiated) perspective 94016 is the worst case.
3. For FCC/CE certification purpose it would suffice to test 94016 model as this is the worst case.