

EMI ANALYSIS DEBUGGING SOLUTION



This papers is prepared for understanding about EA-2100 and its operation

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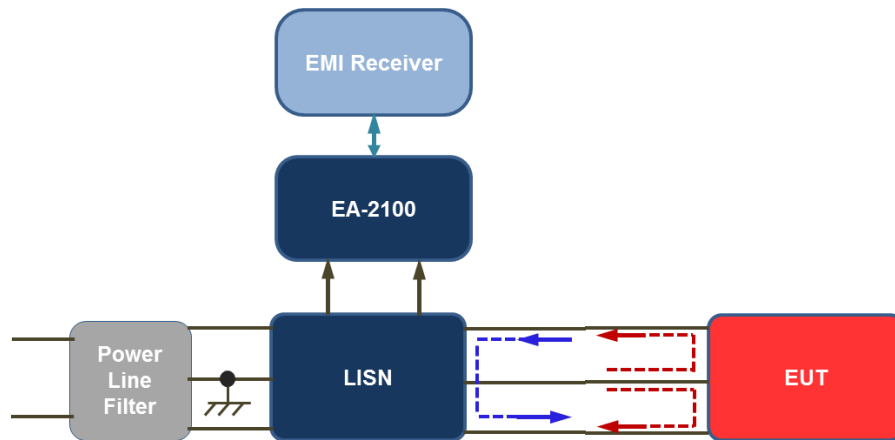
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EA-2100 operation

Basic system Configuration ;

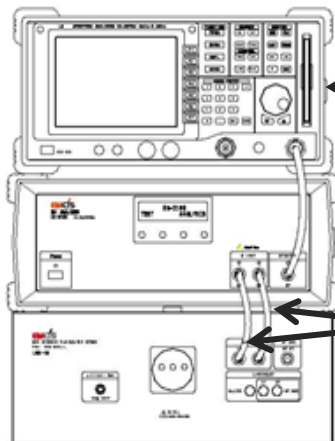
- EMI Receiver (any brand can be used with our EA-2100)
- LISN requires two ports



EMI Analyzer
(EA-2100)



LISN
(LN2-16N)



Any brand of EMI Receiver

EA-2100

Two line from LISN to
EA-2100 simultaneously

All of EMCIS LISN are designed as two
port connection



Front control panel of LN2-16N

EA-2100 operation

- EA-2100 has **“TEST”** & **“ANALYSIS”** Mode
- On “TEST” Model, measure L1, and L2 with EMI Receiver
- Select one of them, L1 or L2, measured as the higher noise
- Select **“ANALYSIS”** Mode ; Default is “LOW” and “CM[ON]”
- Measure Common-Mode Noise



Default screen



Test Mode

EMCIS EMI Analyzer has two selectable frequency ranges ;

LOW : from 9KHz to 30MHz - Principle range for CE

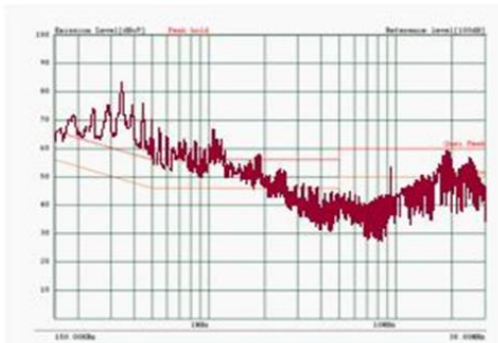
HIGH : from 30MHz to 300MHz ; by extracting the noise in this range and by viewing the spectrum , the user can obtain an indication about potential RE noise sources, as detected at the origin.

*RE measurement is from 30MHz to 1.8GHz, but most of RE noise is detected below 300MHz.....
Based on this strategy, the EMI Analyzer is designed for the extended range, up to 300MHz

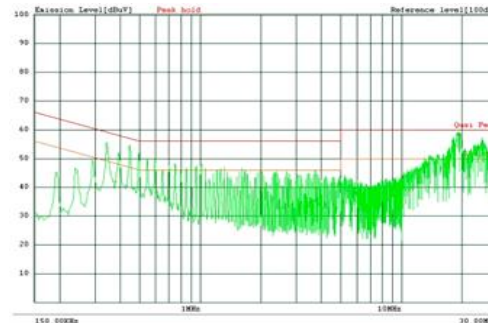


Analysis Mode

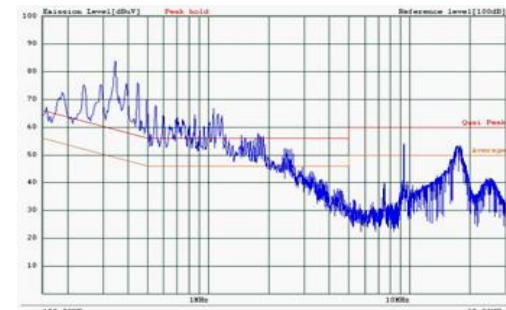
If the supply is 3ph and the standard single phase LISN is used with EA-2100, then measure all lines by selecting them in pairs and proceeding as above, same as 1ph/2P LISN case.



L1 or L2 Noise (Total Noise)



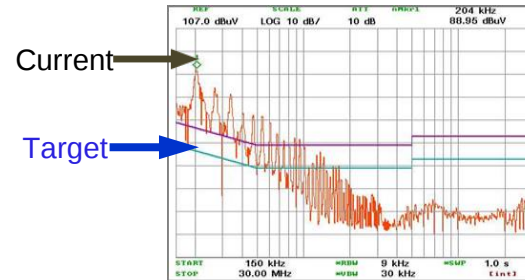
CM Mode Noise



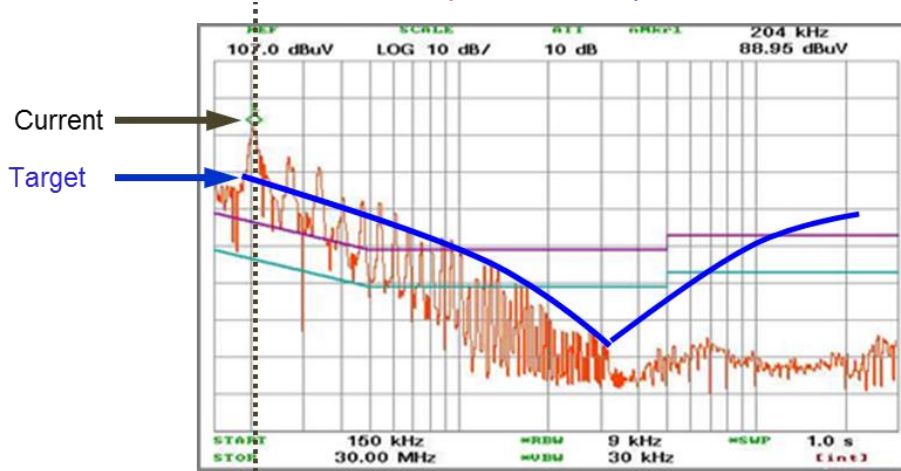
DM Mode Noise

EA-2100 operation

- Check how much the noise is over the limit line
- Decide how much you want to reduce the noise
- Select CM Mode Components you achieve your target



- Select 1st Highest Noise point at the lowest frequency (close to the start frequency of the measurement range)
- The components selected for the target will work for the noise in the measured frequency range
 - the characteristics of components – Impedance curve



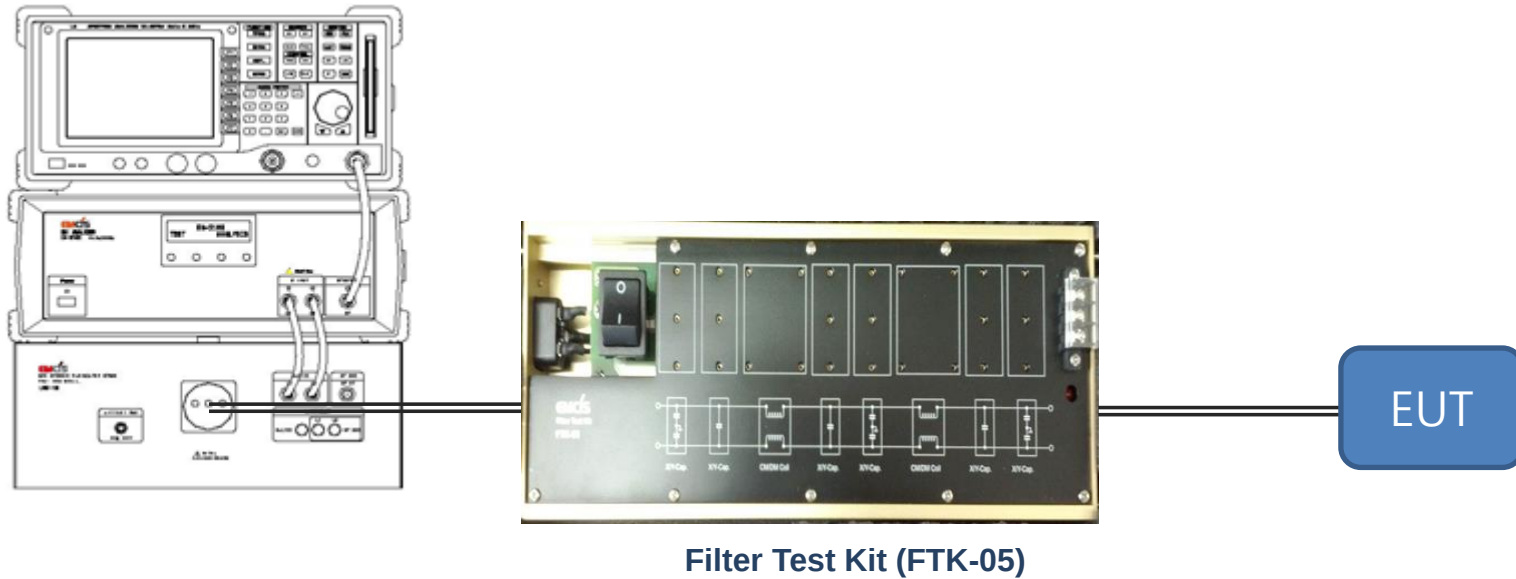
EMI Filter

- Do same process for Differential-Mode Noise
- Design and make the EMI filter with your selected components
- Measure the results (L1, L2, CM, and DM)
- Modify the EMI filters accordingly
- Finalize the EMI filter



Designed Filter

EA-2100 with FTK-05



The FTK-05 enables filter design / components selection to be tested quickly and easily.

User can insert selected components in the kit and check the effect on the noise levels.
User can therefore configure and test a range of components to optimize filter design.

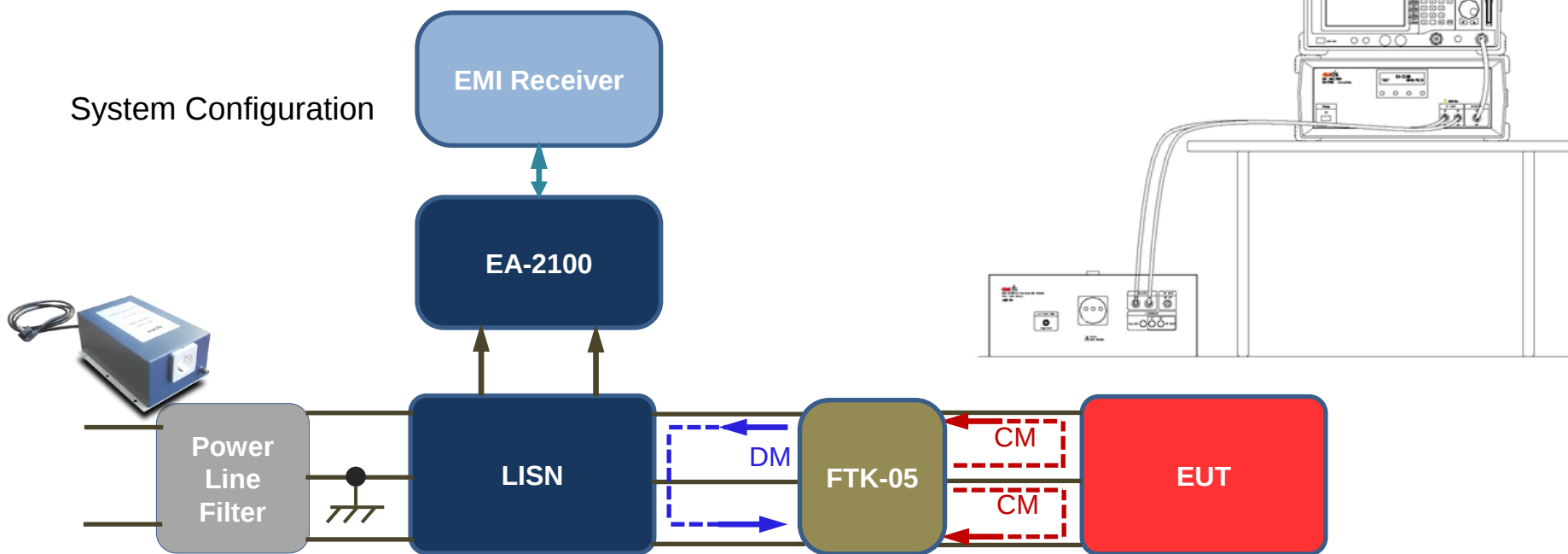
Note that this 'breadboarded' filter and a final manufactured version installed in the product may have differing results because of filter location, cable and & other reasons... But, it can give the guidance to the customers in filter design

EA-2100 with FTK-05

Preparation – System Set Up

- Set up the system = EMI Receiver + EA-2100 + FTK-05 + LISN
- Set up EMI Receiver to suit your selected measurement condition

Most EMI Receivers have EMI software which will display the limit lines, frequency ranges, detectors, dwell times and RBW as appropriate.

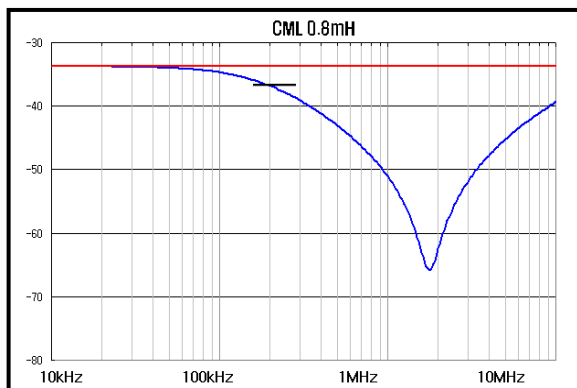
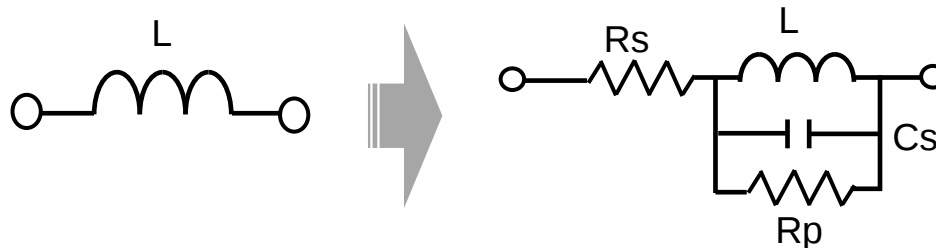


- Check the ground of each unit/item = **Good ground condition is Important**
- Power Line Filter is recommended to protect any outer noise influence

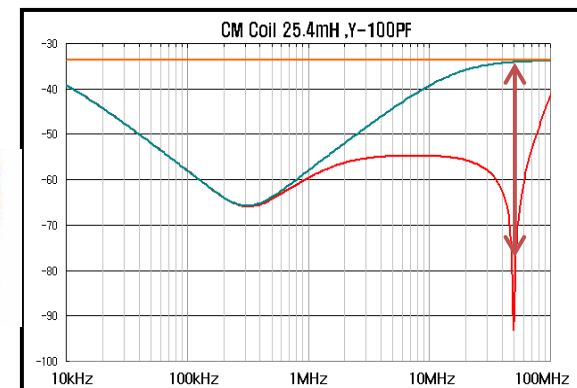
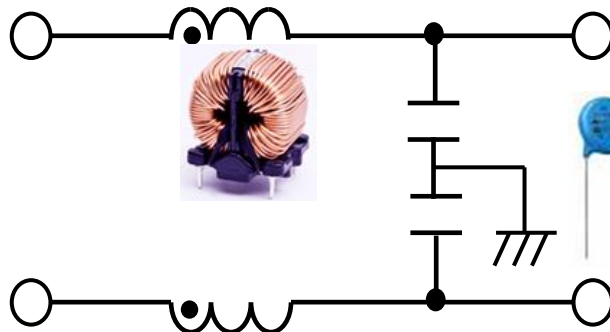
EA-2100 with FTK-05

Components Selection –CM Mode – Understanding the components

- Impedance is the Key parameter of the Component
- Other factors such as stray capacitance, leakage and series resistance will affect the performance of the filter.
- Testing of the design will enable these secondary factors to be taken into account and used to greatest benefit.



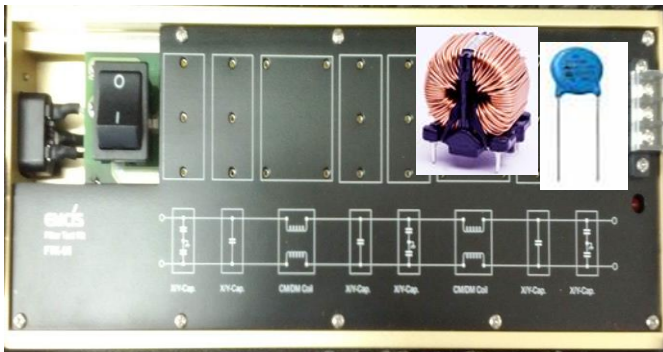
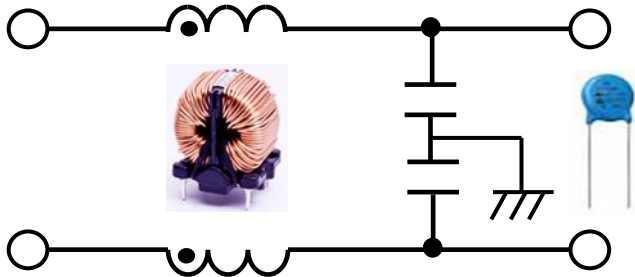
CM Coil



CM Coil + Y-Capacitor

EA-2100 with FTK-05

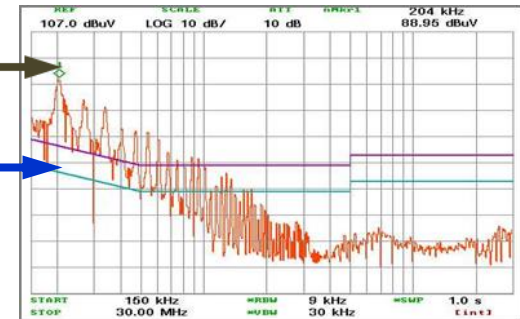
Components Selection –CM Mode



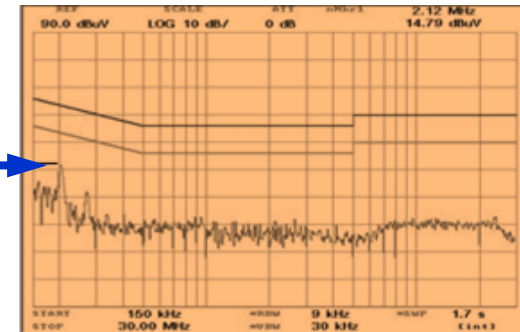
- Select any of CM Mode Components you have
- Apply it(them) on FTK
- Measure the results.

Current

Target

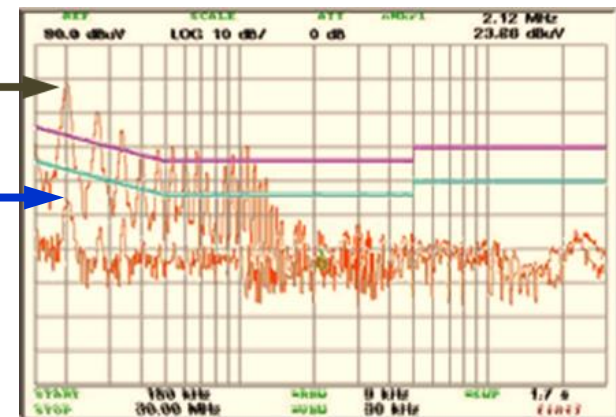


Result



Before

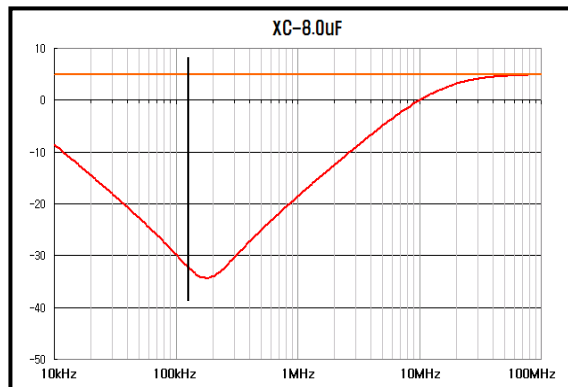
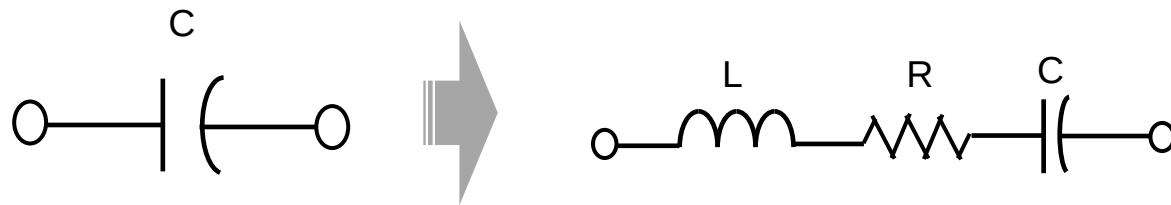
After



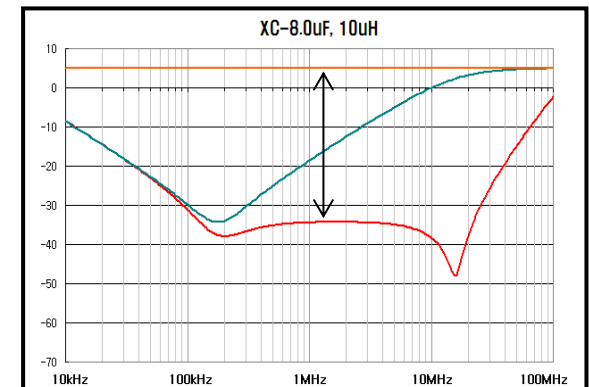
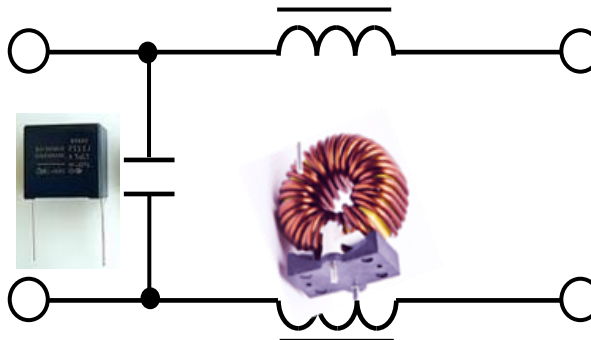
EA-2100 with FTK-05

Components Selection –DM Mode – Understanding the components

- Capacitance is the key characteristic of the component
- But there are secondary characteristics that will affect performance.
- Optimize the design by considering/using these secondary factors



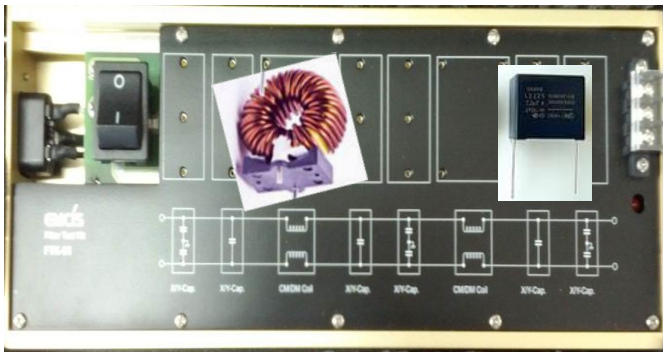
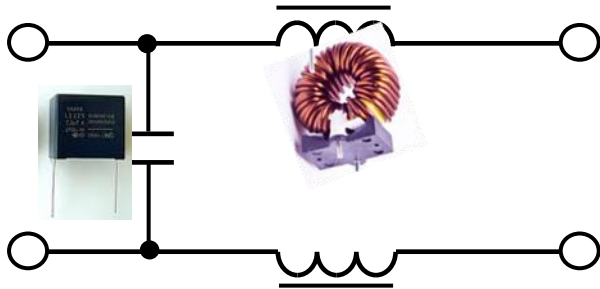
X-Capacitor



X-Capacitor + DM Choke Coil

EA-2100 with FTK-05

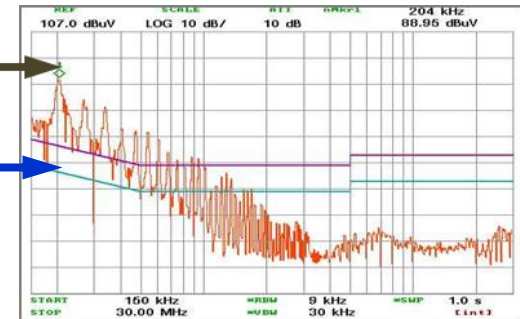
Components Selection –DM Mode



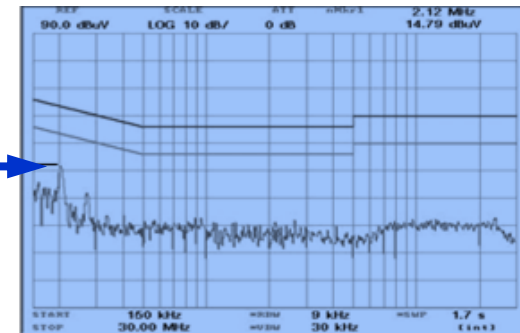
- Select any of DM Mode Components you have
- Apply it on FTK
- Measure the results.

Current

Target

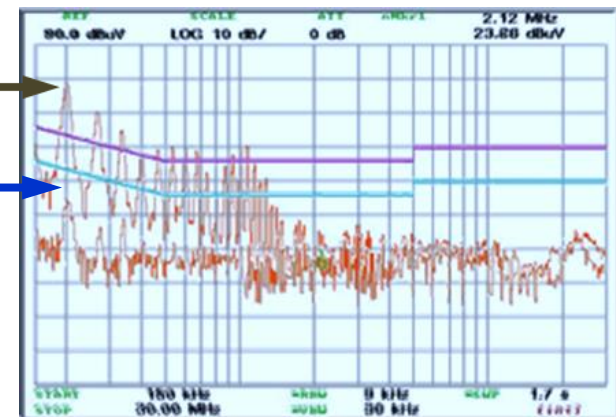


Result



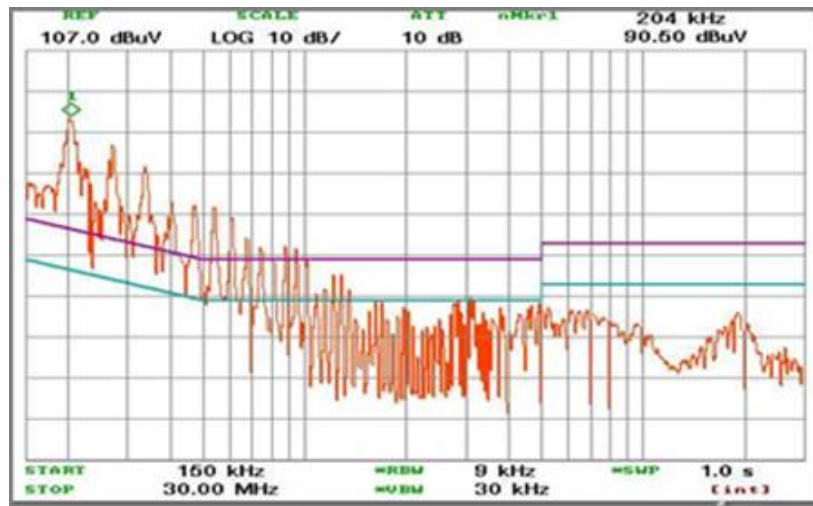
Before

After

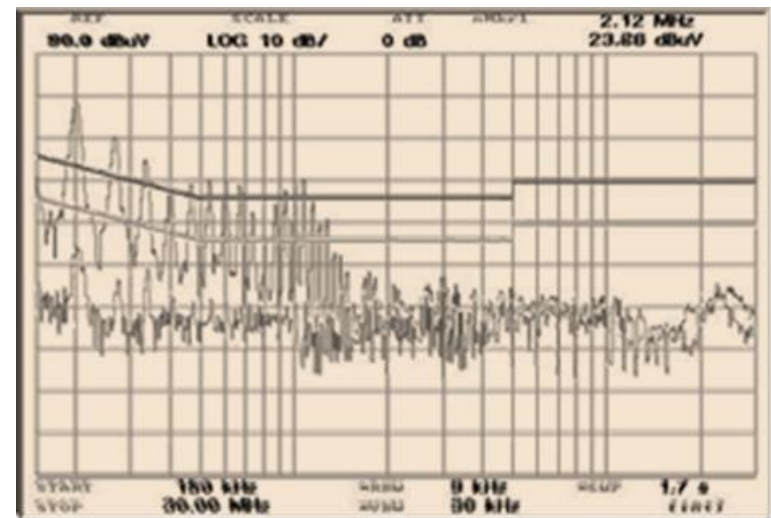


EA-2100 with FTK-05

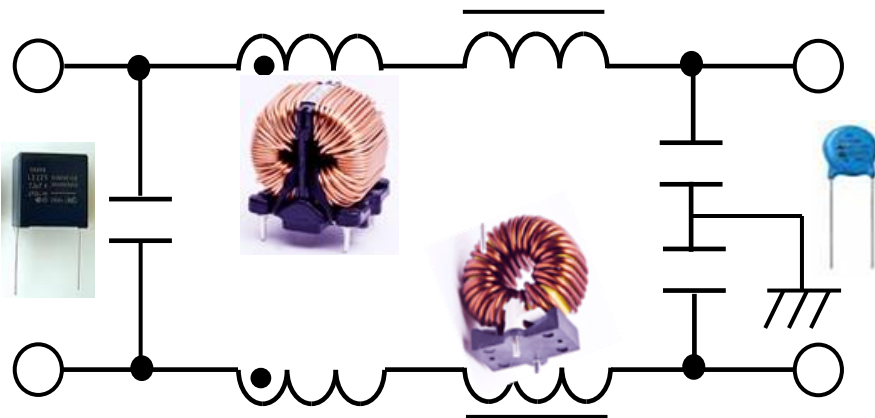
Measurement - Final



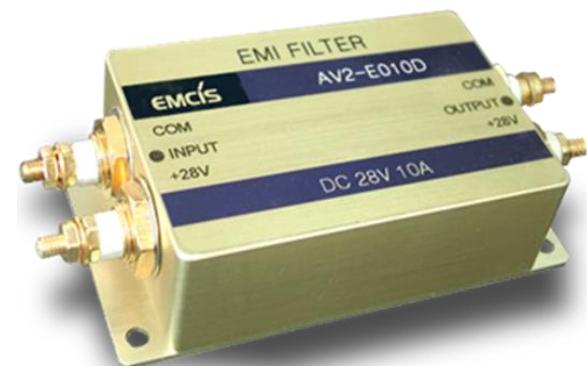
Line 1



Analysed and Solved



Designed Filter



EMI Filter

EA - 2100

Specification

Frequency Range	9kHz ~ 30MHz (Low) 30MHz ~ 300MHz (High)
Mode Selector	(Line 1, Line 2)
Analysis Mode	Differential , Common
Signal Tracking Loss	9kHz~30MHz < 2dB 30MHz~300MHz < 3dB
CM/DM Separation	9kHz~30MHz > 40dB 30MHz~300MHz > 30dB
Signal Input Sensitivity	-97dBm (10dBuV)
Noise Level	<10dBuV Max
Max RF Input Level	0dB attenuator (110dBuV)
Input Dynamic Range	100dB
Display	Front panel VFD display
Front panel control	4 Button control
Input Impedance	50Ω
Power Input Voltage	AC100V~240V 50/60Hz
Input Connectors	BNC 50Ω
Output Connectors	BNC 50Ω
Dimension	W365 D330 H150 (mm)
Weight	6.6 kg

FTK-05



EUT Voltage	220VAC, 1Ph, 60Hz
Rated Current	5A
Power Inlet	Power Code
Power Outlet	Terminal
Operation Temp.(°C)	.+5 ~ +40
Humidity(RH)	20% ~ 80%
Dimension(mm)	364W x 54H x 112D
Weight	1.6kg



ETS Debugging Station

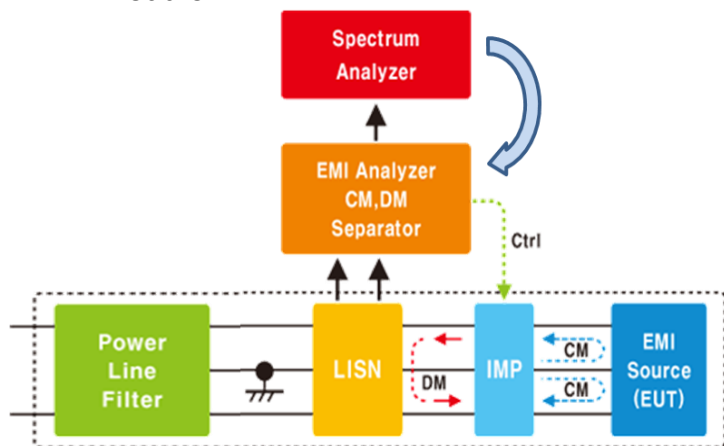
2nd Generation EMI ANALYZER



EA - 300



Impedance
Module



1. Measure Total Mode Noise
2. CM, DM Noise Analysis
3. Source Impedance Analysis
4. Analysis of each components
5. EMI Filter Design (Basic)

