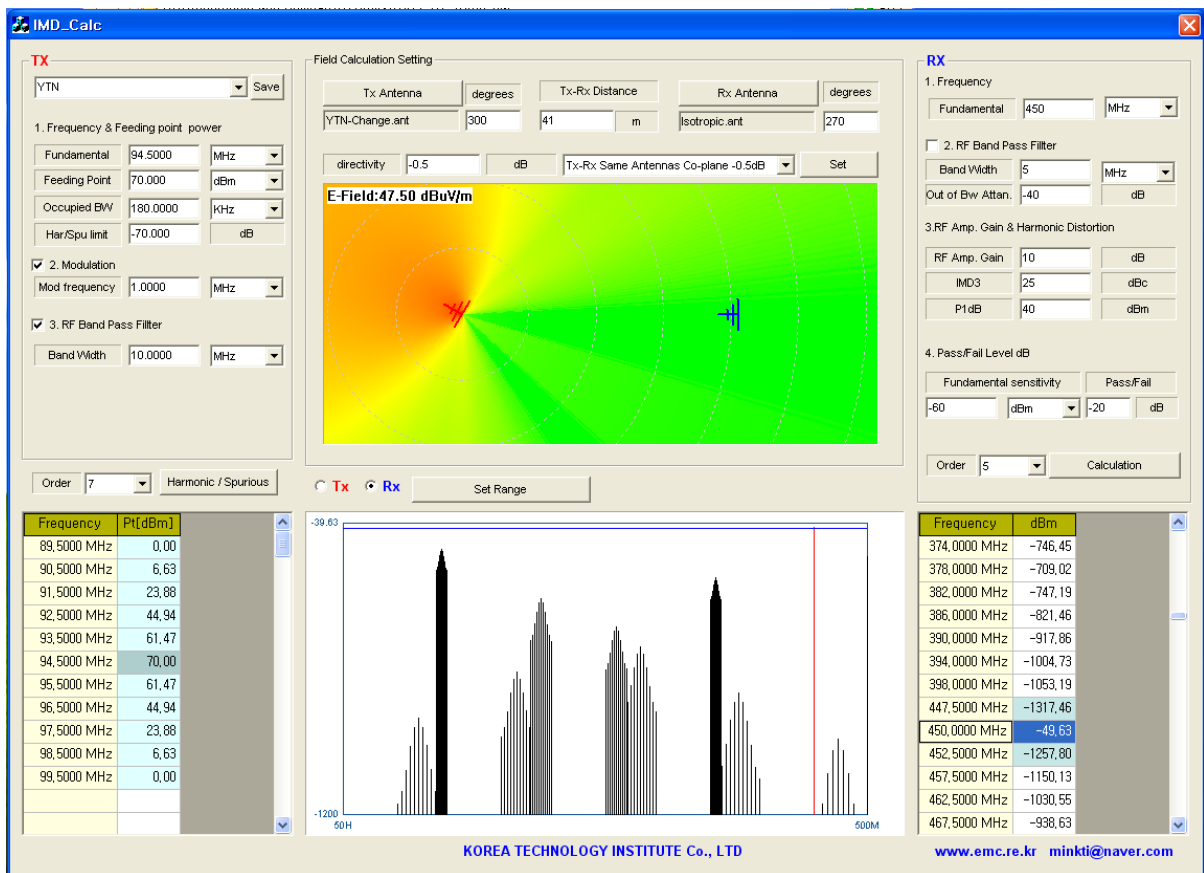


Advanced technology

IMD SIMULATION S/W

On the cosite/shared antenna tower

공동 안테나 타워의 전파간섭 예측 프로그램



RF and EMC engineering since 1987

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1. 제품명 : 공동 안테나 타워의 전파간섭 예측 프로그램
2. Version : IMD 1.0
3. Application;
Make an accurate estimation of radio interference on the shared radio site.
4. Input data for IMD calculation;
 - Tx power on the feeding point.
 - Tx radiation pattern with gain.
 - Tx 7th harmonics and spurious are calculated by it self.
 - BPF characteristics of the Tx .
 - Rx antenna factor or gain/ Tx antenna pattern.
 - Rx RF power gain.
 - BPF characteristics of Rx RF power amplifier.
 - Minimum RF sensitivity level of the receiver.
 - Distance [m] between Tx and Rx.
 - Directivity factor between Tx and Rx antenna.
 - IMD3 and P1 of the Tx RF amplifier.
 - ITU-R and each country's radio rules, limitation ratio of fundamental power to spurious and harmonics power.
5. Estimation parameters;
 - Automatic field strength calculation by the cursor position.
 - IMD frequencies and its level calculation.
 - Automatic IMD decision, pass/fail.
 - Optimizing Tx and Rx antenna position.
 - Reducing a radio interference on the cosite.
 - Fresnel zone calculation up to 5th order.
 - Field strength calculation in a diffraction zone.

6. How to use the IMD 1.0 ?

The screenshot shows the IMD_Calc software interface. The TX section is configured with a YTN antenna, a fundamental frequency of 94.5000 MHz, and a power of 70.000 dBm. The RX section is configured with a fundamental frequency of 450 MHz and a sensitivity of -60 dBm. The field calculation plot shows an E-Field of 47.50 dBuV/m. The spectral analysis graphs show the frequency spectrum with a peak at 450.000 MHz.

TX Settings:

- Antenna: YTN
- 1. Frequency & Feeding point power:
 - Fundamental: 94.5000 MHz
 - Feeding Point: 70.000 dBm
 - Occupied BW: 180.0000 kHz
 - Har/Spu limit: -70.0000 dB
- 2. Modulation:
 - Mod frequency: 1.0000 MHz
- 3. RF Band Pass Filter:
 - Band Width: 10.0000 MHz

Field Calculation Setting:

- Tx Antenna: YTN-Change.ant (degrees: 300)
- Tx-Rx Distance: 41 m
- Rx Antenna: Isotropic.ant (degrees: 270)
- directivity: -0.5 dB
- Tx-Rx Same Antennas Co-plane: -0.5dB

RX Settings:

- 1. Frequency: Fundamental 450 MHz
- 2. RF Band Pass Filter:
 - Band Width: 5 MHz
 - Out of Bw Attan: -40 dB
- 3. RF Amp. Gain & Harmonic Distortion:
 - RF Amp. Gain: 10 dB
 - IMD3: 25 dBc
 - P1dB: 40 dBm
- 4. Pass/Fail Level dB:
 - Fundamental sensitivity: -60 dBm
 - Pass/Fail: -20 dB

Spectral Analysis:

Frequency [MHz]	Pt[dBm]
89,5000	0,00
90,5000	6,63
91,5000	23,88
92,5000	44,94
93,5000	61,47
94,5000	70,00
95,5000	61,47
96,5000	44,94
97,5000	23,88
98,5000	6,63
99,5000	0,00

Frequency [MHz]	dBm
374,0000	-746,45
378,0000	-709,02
382,0000	-747,19
386,0000	-821,46
390,0000	-917,86
394,0000	-1004,73
398,0000	-1053,19
447,5000	-1317,46
450,0000	-49,63
452,5000	-1257,80
457,5000	-1150,13
462,5000	-1030,55
467,5000	-938,63

- 1) Write the Tx antenna gain on the each direction by way of "Tx antenna" click on next table.

The screenshot shows the Antenna gain pattern software interface. The frequency gain plot shows a peak at 94.5 MHz. The fundamental frequency pattern plot shows the gain in dB for various angles from 0 to 330 degrees.

Antenna gain pattern Settings:

- Bandwidth (Bw): 2
- Center Freq [MHz]: 94.5
- Max Gain [dBi]: 7.14
- Span [MHz]: 10.0
- Min Gain [dBi]: -40

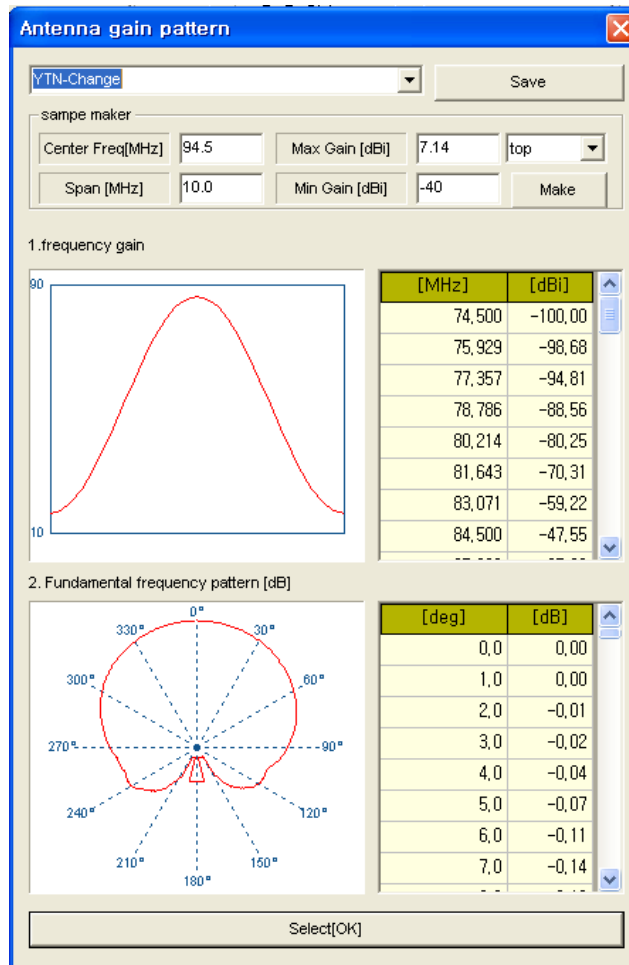
1. frequency gain:

[MHz]	[dBi]
89,500	-40,00
89,857	-39,76
90,214	-39,04
90,571	-37,84
90,929	-36,15
91,286	-33,99
91,643	-31,34
92,000	-28,22

2. Fundamental frequency pattern [dB]:

[deg]	[dB]
0,0	-0,10
1,0	-0,39
2,0	-0,88
3,0	-1,57
4,0	-2,46
5,0	-3,55
6,0	-4,82
7,0	-6,21

- 2) Write the Rx antenna gain on the each direction by way of "Rx antenna" click on next table. Also you could call and use the stored data.



After written Tx, Rx antenna data, click the lower side "Select"

- 3) Fill in or select the Tx, Rx antennas direction, distance and directivity

The 'Field Calculation Setting' window contains the following settings:

- Tx Antenna: 0 degrees
- Tx-Rx Distance: 41 m
- Rx Antenna: 0 degrees
- directivity: -0.5 dB
- Dropdown menu: Tx-Rx: Same Antennas Co-plane -0.5dB

4) Fill in the Tx, Rx parameters

The image shows two side-by-side configuration windows. The left window is titled 'TX' and contains the following fields: a dropdown menu with 'YTN' and a 'Save' button; a section '1. Frequency & Feeding point power' with 'Fundamental' (94.5000 MHz), 'Feeding Point' (70.000 dBm), 'Occupied BW' (180.0000 KHz), and 'Har/Spu limit' (-70.000 dB); a checked section '2. Modulation' with 'Mod frequency' (1.0000 MHz); and a checked section '3. RF Band Pass Filter' with 'Band Width' (10.0000 MHz). The right window is titled 'RX' and contains: '1. Frequency' with 'Fundamental' (100 MHz); an unchecked section '2. RF Band Pass Filter' with 'Band Width' (5 MHz) and 'Out of Bw Atten.' (-40 dB); a section '3. RF Amp. Gain & Harmonic Distortion' with 'RF Amp. Gain' (10 dB), 'IMD3' (25 dBc), and 'P1dB' (40 dBm); and a section '4. Pass/Fail Level dB' with 'Fundamental sensitivity' (-60 dBm) and 'Pass/Fail' (-20 dB). At the bottom of the RX window, there is an 'Order' dropdown set to '3' and a 'Calculation' button.

5) Select the order on the end user demand for Tx, Rx parts.

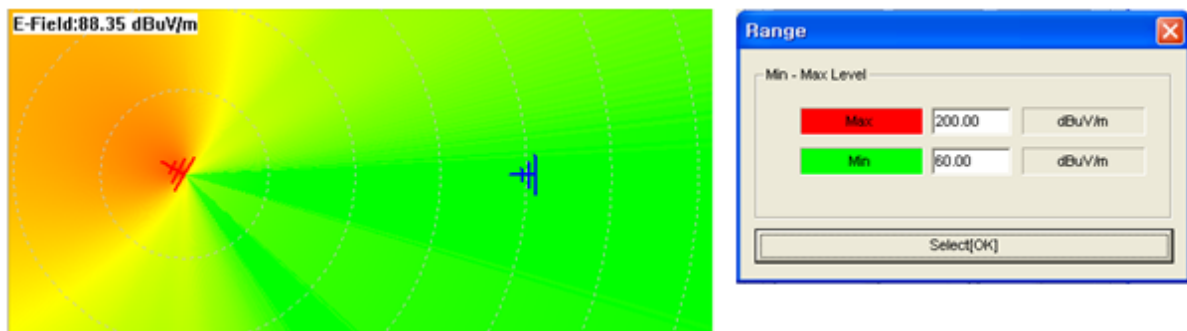
A close-up of the 'Order' dropdown menu from the RX configuration window, showing the value '3' selected and a 'Calculation' button to its right.

6) Click on "Calculation" on the Rx part.

7) After that "PASS or Failed" is displayed

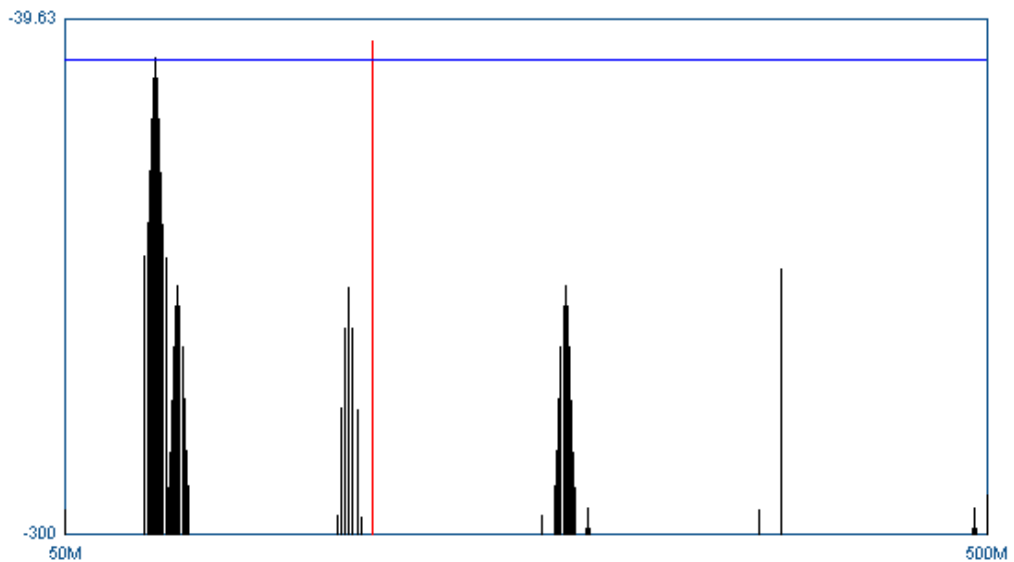
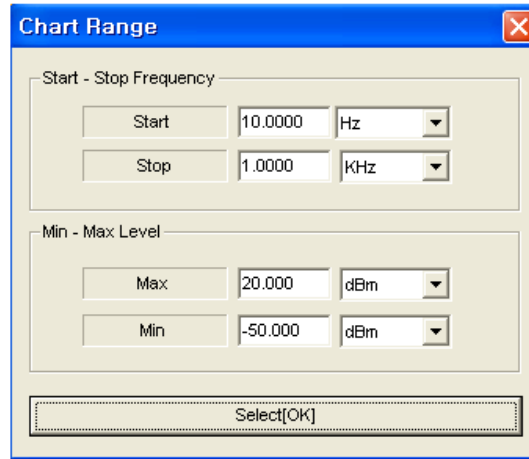
8) Automatic field strength estimation

End user could automatically know the field strength of fundamental frequency between Tx to Rx.



On this mode, Tx field colors could be adjusted by user selection

9) Spectrum " min. max " level and frequency band adjust



Notice;

More details and products upgraded could be done by end user demand and or be in contact with Korea Technology Institute, minkti@naver.com.