

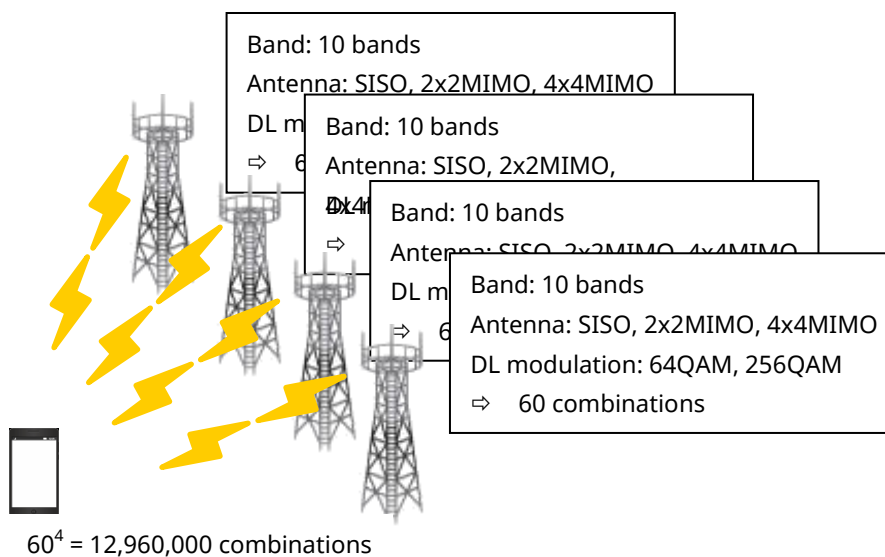
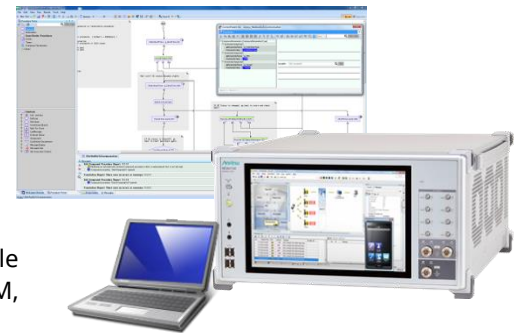
Efficient Test Environment for Exponential Increase in Number of CA Band Combinations

Signalling Tester MD8475B
 SmartStudio MX847570B
 SmartStudio Manager MX847503A

Test Items Increasing Exponentially

Mobile-phone data transmission rates are being increased to match rising application and contents traffic levels. Methods for increasing data communications speeds include use of Carrier Aggregation (CA) technology, which handles a group of base stations as one base station, MIMO using multiple antennas per base station/mobile unit, and modulation methods such as 64QAM, 256QAM, etc., that change the amount of data sent per symbol. Current data communications provide the optimum service by switching these parameters according to the radio-wave conditions (diversity), traffic congestion, etc.

However, supporting flexible setting changes causes a problem of hugely increased setting combinations. For example, the number of setting combinations reaches 1000 for a mobile supporting 10 frequency bands using three base stations (3CC), which increases by an order of magnitude to 10,000 for four base stations (4CC). And, the number of combinations increases even further when the number of antennas per base station and the modulation method become setting parameters as described above. This exponential increase in the combination of base station settings results in a huge number of mobile terminal test items as shown in the following diagram.



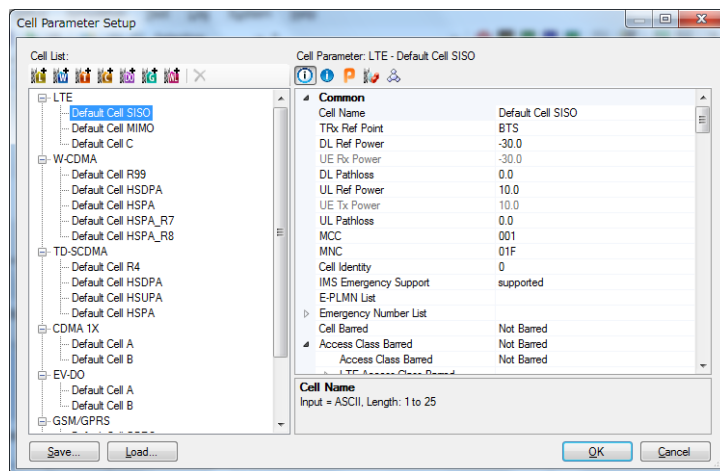
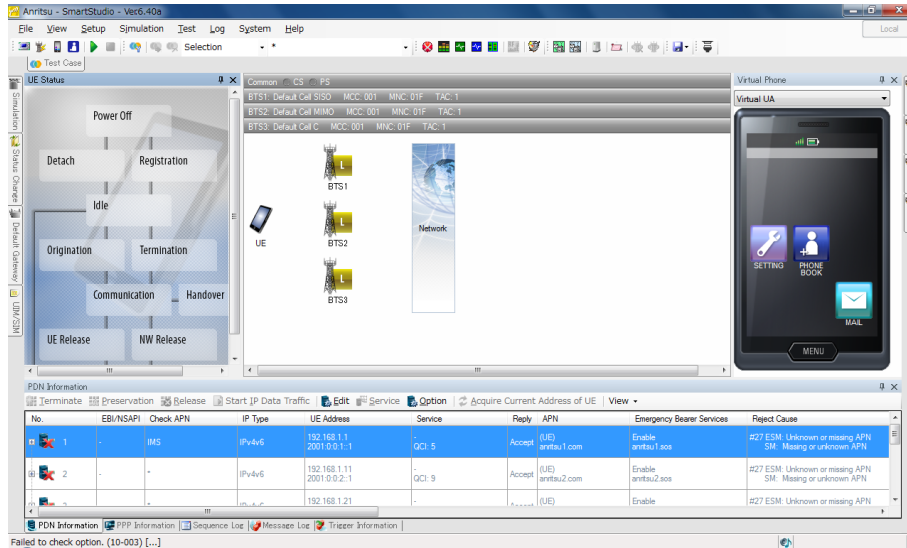
Efficient Automated Testing

Testing thousands of items is a practical impossibility due to the length of time and the high probability of operation errors by test engineers, so test automation is required.

Combining the SmartStudio MX847570B mobile network simulator software with the SmartStudio Manager MX847503A application automation software not only simplifies test automation but also assures test quality.

■ SmartStudio

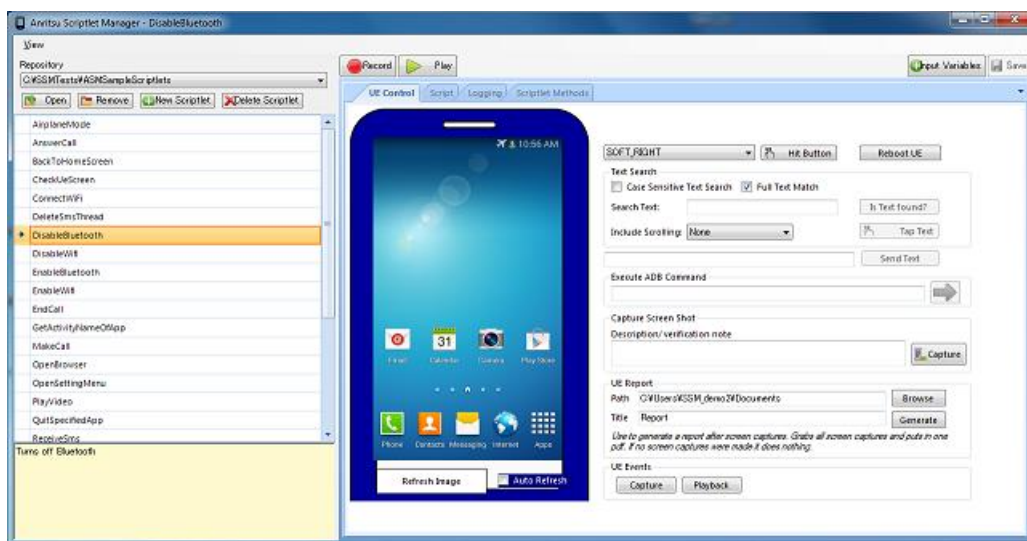
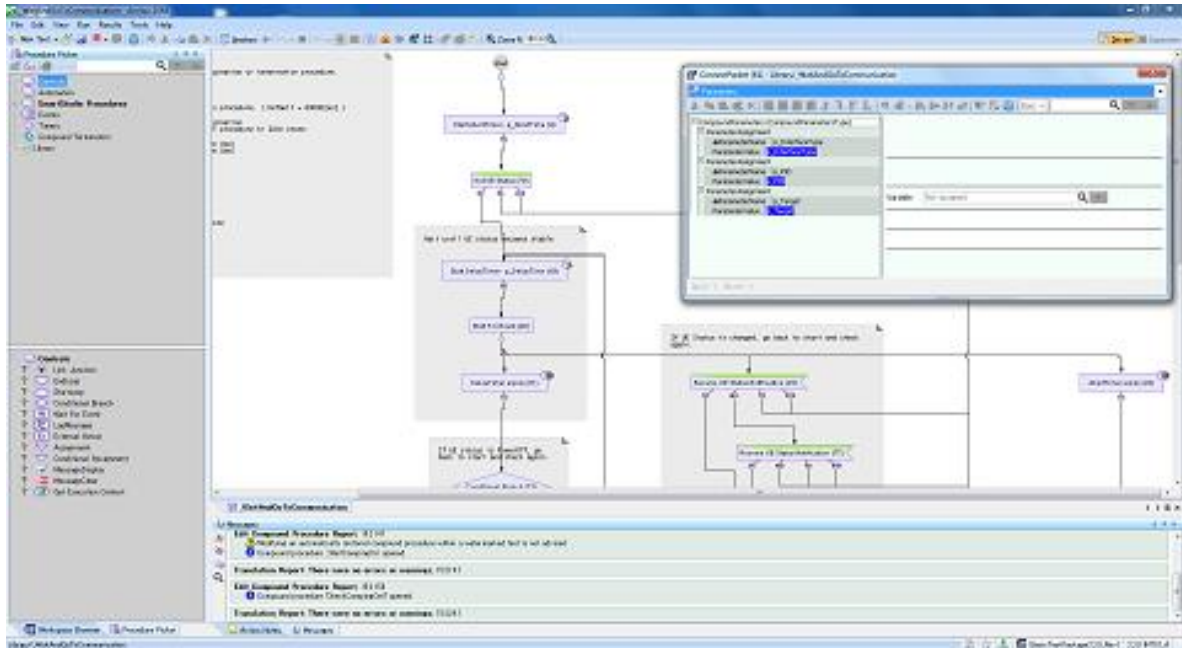
SmartStudio MX847570B is a state-machine-based mobile network simulator using GUI parameter settings to simulate a multi-base-station network.



- GUI-based settings including wireless parameters and Radio Resource Control (RRC) layer, Non-access Stratum (NAS) layer, SIP, XCAP, etc.
- Easy DL throughput verification using built-in data generator
- Inter-base-station mobility tests under various test conditions

■ SmartStudio Manager

SmartStudio Manager MX847503A is an application for automatic control of the MX84750B. It uses an intuitive flowchart-style description of processing layout and connections.

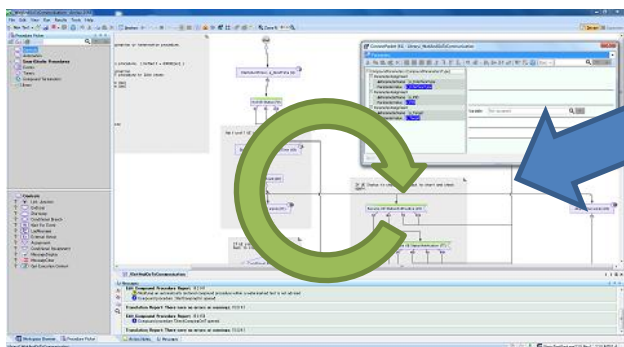


- Easy substitution of manual procedures with automation sequences using prepared procedures supporting GUI operations and getting GUI status
- Includes automated control functions for Android mobiles as well as complete two-way test automation between base station and mobile

■ Using CSV Files for Managing Test Conditions

When running the same test procedure under various conditions, such as a CA Band Combination test, it can be flexible to increases/decreases in test conditions if test procedures and conditions are managed separately. The MX847503A has a function for reading .csv files , which supports implementation of test procedures described as sequences and conditions in .csv files.

Test Repetition Sequence for Each Test Condition



CSV File Describing Test Conditions

Cell 1	Cell 2	Cell 3	Cell 4
Band 1	Band 3	Band 5	Band 7
Band 1	Band 21	Band 28	Band 42
Band 2	Band 4	Band 5	Band 30
⋮			

- Flexible future-proof expandability supporting new frequency bands, etc., using separate files describing test conditions
- Prepared .csv files with CA settings for each operator eliminating terminal model and version dependence
- CSV-format files linked easily with other software tools. For example, you can create .csv file of complete coverage test using script for enumerating all parameter combinations. Or you can create .csv file using combined test creation tools supporting All Pairs Testing, etc., method with limited number of test items even when test combination increasing exponentially

Ordering Information

Model	Name	Function
MX847570B	SmartStudio	Mobile network simulator
MD8475B-071	Enhanced Multi-signalling Unit	Testing unit supporting high-speed throughput tests such as 4CC, 4x4 MIMO, DL 256QAM, etc.
MX847550B	LTE Simulation Software	Software for simulating LTE base station
MX847550B-040	LTE Carrier Aggregation Option	Option for implementing 2CC at LTE base station
MX847550B-041	LTE Carrier Aggregation DL3CCs Option	Option for implementing 3CC at LTE base station
MX847550B-042	LTE Carrier Aggregation DL4CCs Option	Option for implementing 4CC at LTE base station
MX847503A	SmartStudio Manager	Software for automating SmartStudio operation
MX847504A	Smartphone Control Platform	Software for automating Android UE operation