Agilent N1891A Digital Communication Measurement System

Product Overview

Automated satellite payload testing with the N1891A digital communication measurement system improves your measurement repeatability and reduces integration and test time, resulting in reduced labor costs and faster time to satellite launch.

- Accuracy, high throughput, fast calibration and flexible testing of analog bent-pipe, digital-transparent and digital-regenerative Ku and Ka band communication payloads
- Designed to be upgradeable to keep pace with changing technology and program needs, tailored to accommodate your specific needs

Agilent Technologies

The challenge

There are many challenges facing satellite payload manufacturers: ever increasing transponder counts, technology transitions from analog bent pipe to digital transparent and fully digital regenerative. The demand for faster throughput and test-system flexibility have never been greater. The Agilent N1891A series digital communications measurement system (DCMS) addresses all of these concerns and rises to a new level of performance.

Our payload test heritage and future

The Agilent 85121A payload test system was the industry's most popular commercially available payload test system (PTS) for nearly 10 years. Agilent's PTS was the industry's de facto commercial payload test solution. Agilent's N1891A DCMS is now setting the standard.

The DCMS is built using a new architecture that supports innovative measurement and calibration methods to dramatically reduce measurement and calibration time. Hardware innovations such as Agilent's exclusive dual tracking down-converter allow the system to make measurements that were virtually impossible to make previously.

The system architecture is designed to provide modular functionality, so you can choose just the functionality you need for now and expand or change as your needs evolve. For example, an entry-level version of the DCMS configured to test traditional analog bent-pipe payloads can be expanded to cover digital-transparent payloads and again to cover digital-regenerative payloads. This flexibility provides tremendous protection for your test-system investment.

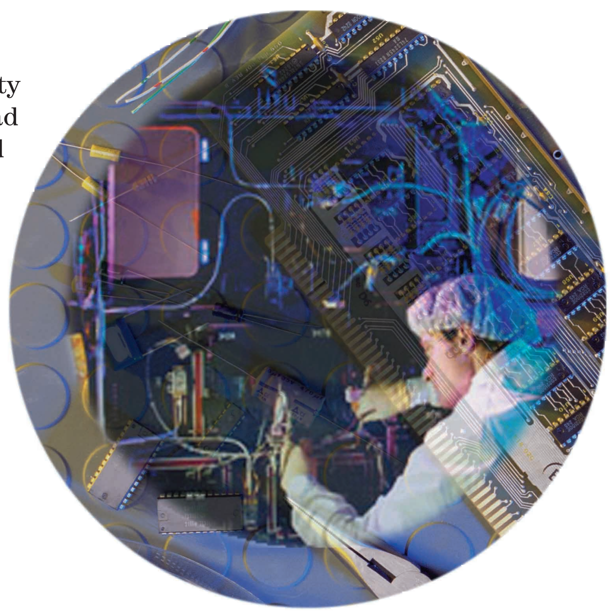
Convenience and flexibility

Testing digital-transparent and digital-regenerative communication payloads used to mean you needed more than one test system. Not any more.

The N1891A provides the convenience and flexibility to handle multiple payload technologies. This unified approach minimizes the time it takes to integrate the system into your test environment and provides a level of data integrity not possible with multiple test systems.

Hardware architecture

The DCMS hardware architecture supports both digital signal processing (DSP) and non-DSP payload testing using a common core set of high-performance test instruments. It is expandable to measure signals from baseband to Ka-band, and has a port expansion feature that allows the DCMS to be configured for testing units of varying size and complexity. The hardware has been designed to allow the core components to operate at a fixed frequency range. The frequency range of the core equipment is 1 to 19.5 GHz. Agilent provides additional external equipment to extend the core frequency range up to 31 GHz.



Measurement architecture
The DCMS measurement architecture includes multitone stimulus for high-throughput testing of digital transparent processors, as well as single and two-tone stimulus for testing bent-pipe payloads. In addition, this architecture allows for expansion to complex digital stimulus for testing the regenerative processors of the future. The measurement architecture is designed to support various standard and tailored measurement suites. The standard suites are available for both analog and digital transparent repeater test. All measurements are corrected to allow the reference plane to be configured by the user. This allows the system to be used in different test environments.

Software architecture
The DCMS software architecture provides an RF measurement subsystem with a consistent, well-defined interface. In effect, the DCMS serves as a measurement server to the external environment, accepting commands from an external sequence controller and returning measurement results for post-test processing. The software is designed to support both remote and local control. You can control the system remotely by sending messages through the external LAN interface. This interface follows standard socket-based communication. You can control the system locally using the system's graphical user interface. The software architecture has been designed for the manufacturing environment and supports the multiple requirements for logging events, storing test results, and validating the test system's readiness for test.

Configure a N1891A DCMS to meet your exact requirements
N1891A DCMS systems are configured to your specific requirements.

Basic features
- Test 1 to 19.5 GHz analog bent pipe payloads, with up to 5 uplink/ downlink ports
- Optimized architecture for fast throughput
- Consistent results achieved through the integration of advanced measurement science, specialized subsystems and standard equipment
- Exceptional reliability
- Worldwide support and training

Optional features
- Upgrades to test digital-transparent and digital-regenerative payloads
- Upgrade to UHF and Ka band payload test frequencies
- Port expansion capability for payloads with large numbers of RF connections

DCMS system configuration

The Agilent N1891A DCMS is an automated system for evaluating the radio frequency (RF) performance of communications satellite transponders, telemetry transmitters, and command receivers. The DCMS presented in this document is Agilent's typical configuration, which can be customized to address your specific measurement requirements.

The Agilent N1891A DCMS integrates instrumentation hardware and software to provide a flexible, mobile test system that meets the needs of many test environments in satellite manufacturing and pre-launch operations. Automatic measurements in the Windows operating environment (see Figure 1) provide an easy-to-operate system that significantly reduces test time. Satellite manufacturers using Agilent's DCMS have reduced integration and test cycle time, resulting in reduced labor costs and faster time to satellite launch.

The typical DCMS instrumentation configuration is mounted in a rack assembly (see cover photograph) optimized for mobility within the factory for various testing stations: integration and test, highbay, antenna range, and thermal vacuum test facilities. Because of its compact size, the DCMS can also be moved to a launch site for post-transport and pre-launch spacecraft testing.

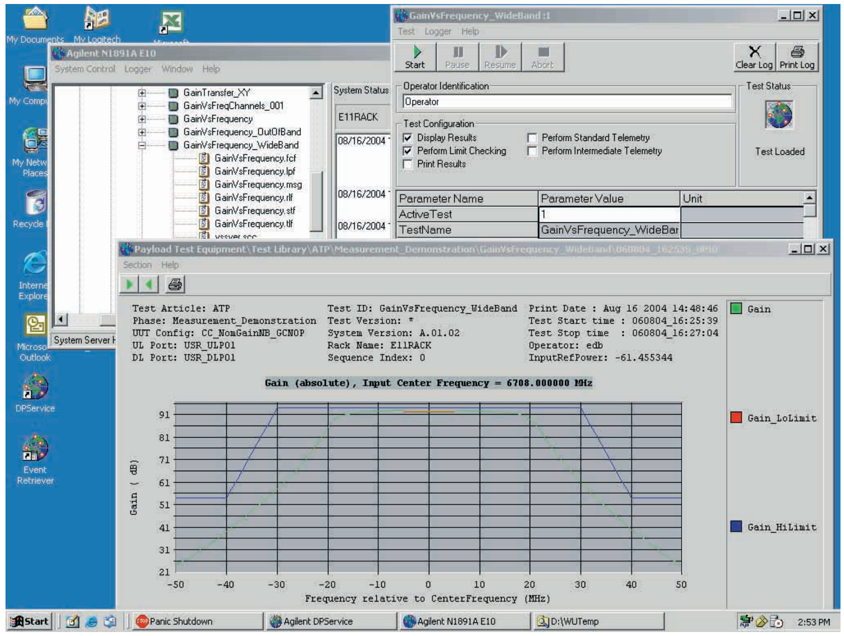


Figure 1. The DCMS provides an easy-to-use Windows measurement environment. The open windows (shown clockwise from the top left) are the main window, test control window, and graphical data display.

The DCMS design is based on years of Agilent experience at providing test systems to the major satellite-industry manufacturers worldwide for testing components, subsystems, antennas, and payloads. The N1891A DCMS provides consistent, repeatable measurements throughout the integration and test manufacturing process. Therefore, you can expect a high degree of correlation between measurements made during different stages of manufacturing, from panel and payload through spacecraft testing.

The typical DCMS has the following characteristics:

- Single- or two-rack simultaneous measurement
- Single- and two-tone measurements
- 1–19.5 GHz frequency coverage
- 5 uplink and 5 downlink ports

Enhancements are available for the typical DCMS, and Agilent can evaluate your requested customizations for feasibility, cost, and delivery. DCMS options currently available include:

- Frequency extensions
  - UHF band: 100–1,000 MHz
  - Ka band: 27.5–31.0 GHz uplink, 18.0–21.2 GHz downlink
- Multiple-tone measurements
  - Noise power ratio (NPR)
  - Error vector magnitude (EVM)
- Increased number of uplink and downlink ports
- Automated test interface calibration

Measurement equipment

The block diagram in Figure 2 illustrates how the typical DCMS instrumentation connects to a unit under test (UUT), such as a communications payload. Two microwave sources are used to provide uplink RF stimulus to the UUT. A vector signal generator is used to generate multi-tone and complex digital stimulus. A continuous-wave (CW) signal generator is used to provide an additional uplink tone for the wide-bandwidth stimulus required in passive and active intermodulation testing.

On the downlink side of the UUT, the DCMS employs two types of receivers. For vector measurements such as group delay and error vector magnitude, a dual-channel downconverter and vector signal analyzer (VSA) are used to simultaneously measure uplink and downlink signals. For scalar measurements such as out-of-band spurious response, a preselected spectrum analyzer (SA) provides broadband image-free scanning. The DCMS also includes a dual-power meter to provide for periodic amplitude calibration of the two receivers.
The DCMS switching subsystem is composed of a system switching unit (SSU) that routes signals within the rack and between the rack and the UUT and remote distribution units (RDUs) that allow for expansion of the number of uplink and downlink ports. The RDUs reduce the number of long RF cables in the uplink and downlink paths by placing the port switching closer to the UUT in environments such as thermovac or range testing.

Agilent N1891A DCMS block diagram

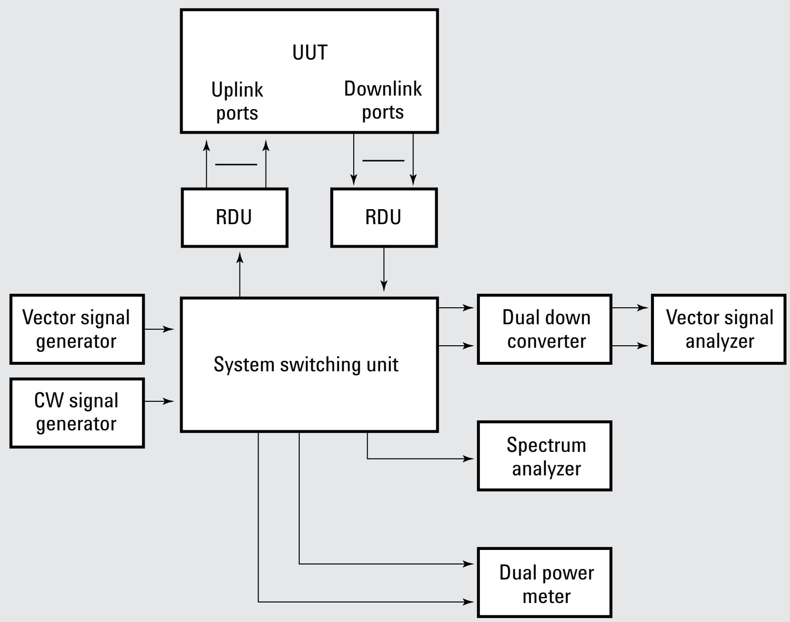


Figure 2. The DCMS uses COTS test equipment for increased reliability.

The DCMS design minimizes the number of instruments by utilizing commercial off-the-shelf (COTS) test equipment and application-specific test software. Thus, one 2-bay DCMS rack can perform both the communication transponder measurements and tracking, telemetry and control (TT&C) measurements that formerly required multiple bays of custom test equipment. The use of COTS equipment provides the DCMS with high reliability, high mean-time-between-failures, and low mean-time-to-repair.

Computer equipment

The DCMS includes two types of computers: a measurement computer for each equipment rack and a system computer that communicates with up to five racks (see Figure 3). The measurement computer is devoted to controlling rack equipment and performing payload measurement algorithms. The system computer is devoted to centralized functions, such as test setup, data collection and hardware asset management for multiple racks. It provides a local graphical user interface for manual control of tests and a remote interface that allows the DCMS to be controlled by your test-sequencing computer.

The measurement computer, which is installed in the DCMS rack, is an industrial-grade dual Pentium® processor personal computer (PC) with an LCD monitor and keyboard. The system control computer, which can be located near the DCMS rack or at a remote location, is a desktop Pentium PC with a display, keyboard, backup tape drive and Laser Jet printer.

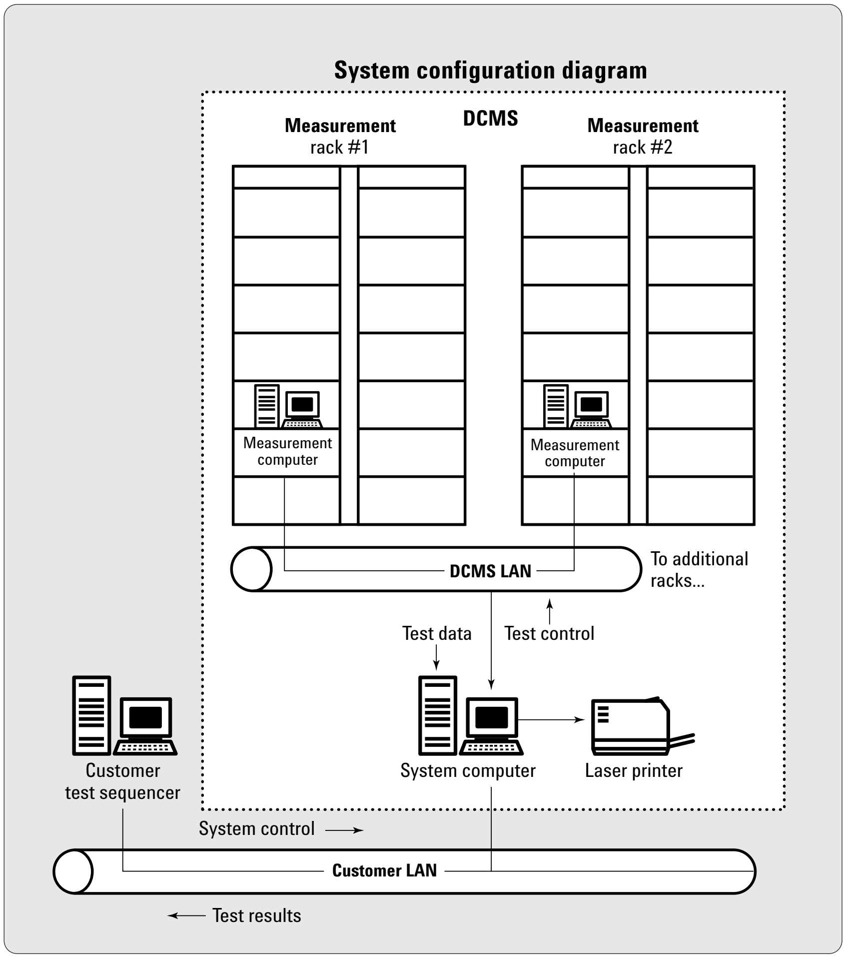


Figure 3. You can perform standalone testing from the system or measurement computer or remote testing from the host computer.

Computer software includes test algorithms for running the measurement equipment and system control for simultaneously operating multiple measurement racks and collecting test data. The system computer stores test data, and the printer provides hard copies of tabular and graphical test results. Through a graphical user interface (GUI) shown on both computer monitors, you can set up and run tests and collect test results.

The DCMS operates in either of two modes:

- *Local:* an operator conducts tests from the GUI displayed on the system control computer or the measurement computer.
- *Remote:* an operator executes tests from a remote host computer that communicates to the DCMS system control computer through a LAN interface. This mode requires external test executive or sequencer software not supplied with the typical DCMS.

System software

The diagram in Figure 4 shows the major software blocks of the DCMS software package. The Agilent software provided with the system includes five basic sections:

- DCMS control software
- GUI software
- Agilent Visual Engineering Environment (Agilent VEE) software test routines
- Results display software
- Remote interface software

The system software includes proprietary test algorithms that run in the Microsoft Windows operating environment. Operators run the DCMS through the GUI, which has an intuitive windows-based structure. Test data gathered by the system computer can be stored or printed.

The DCMS can be controlled externally with test-executive or sequencer software. You can provide this software or Agilent can provide it as an option. External test sequencing is performed through the use of TCP/IP socket communication.

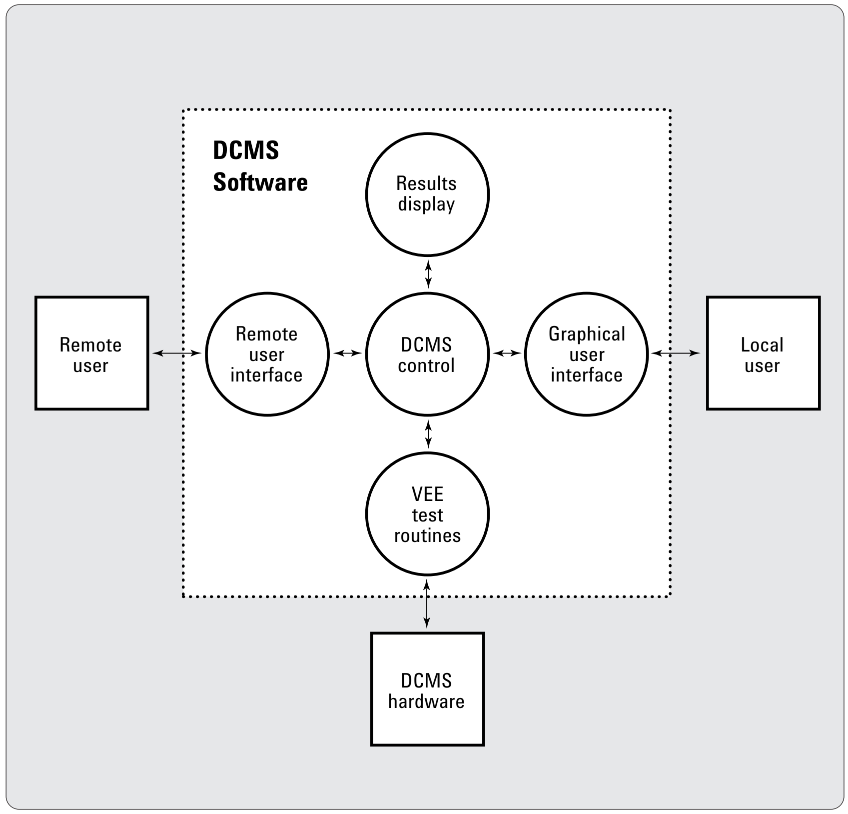


Figure 4. The DCMS software includes five basic sections of system control.

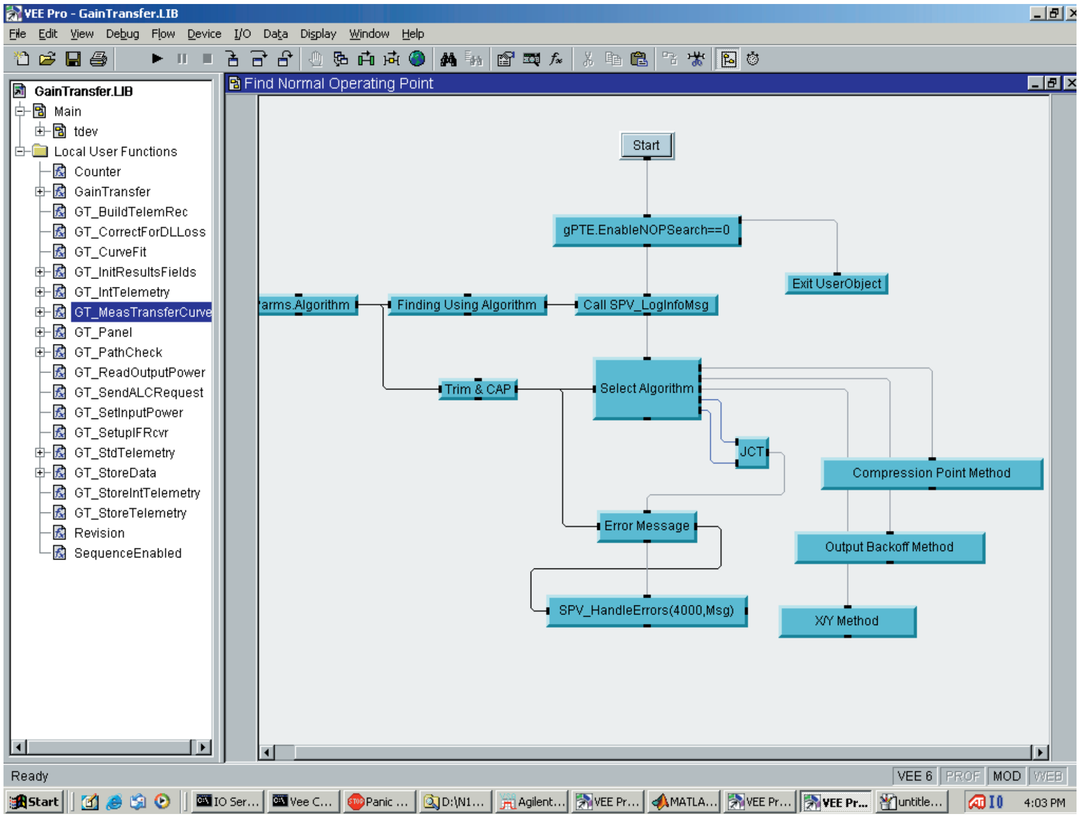


Figure 5. DCMS tests can be modified using the Agilent VEE test-development window.

Test software

Test algorithms were designed with Agilent VEE software, which is an easy-to-use, graphical test development tool (see the test-development window in Figure 5). VEE allows you to modify and add tests, even if you don't have an in-depth knowledge of higher-level programming languages such as C++. VEE instrument drivers provide system interfacing between the test instruments and the measurement software.

The measurements provided with the typical DCMS are based on satellite-industry accepted test methods for payload equipment, and they have been analyzed for accuracy and repeatability. The analysis has been verified with test equipment that has measurement accuracies traceable to industry standards. The DCMS design and accuracy have been proven by multiple customers on multiple satellite programs.

DCMS operation

By using the computer GUI, the test operator controls the DCMS, selects and runs tests, recovers test results, and verifies system functionality. The following examples demonstrate how the operator runs the DCMS.

Controlling the system

An entire system of multiple DCMS racks or individual racks can be operated from the GUI. From the main screen shown in Figure 6, you can perform the following functions:

- Run tests or calibrations
- Add or remove spacecraft, environments, or tests
- Launch a text editor to modify files that define test parameters, data presentation, and other settings
- View and print test results
- View system status logs
- Control the system switch matrix and monitor its state

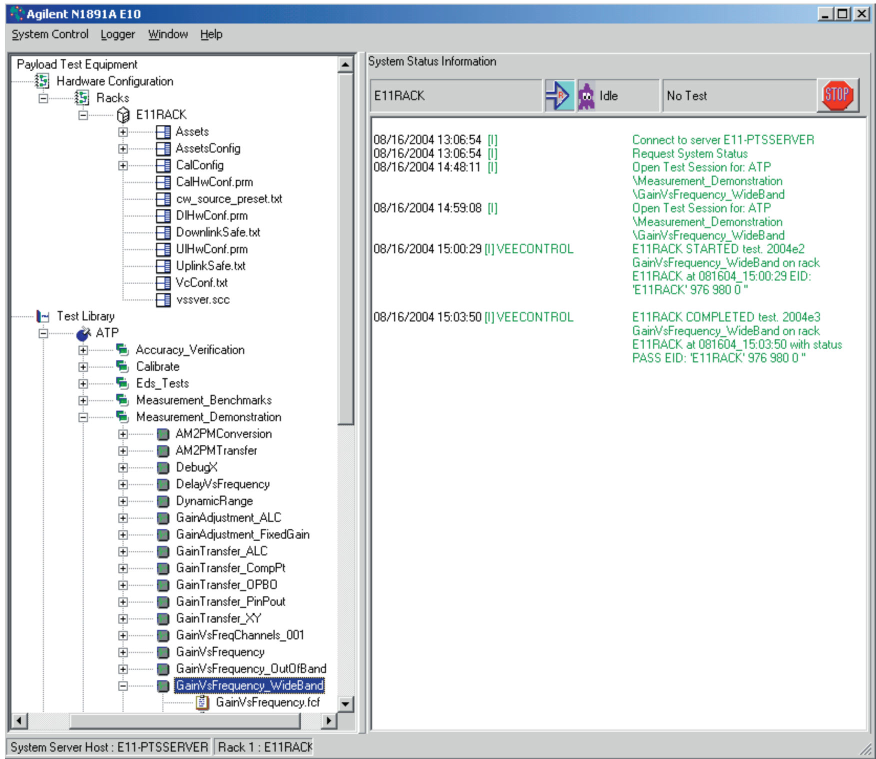


Figure 6. You can run tests and calibrations from the main screen.

Controlling the switch matrix

The DCMS system software automatically controls the switch matrices during test execution. Between tests, the switch matrix GUI allows you to manually control the signal routing. From the GUI (a typical example is shown in Figure 7), you can set up the switch matrix to route signals throughout the DCMS and between the DCMS and the UUT:

- Select the uplink and downlink ports
- Select internal or external RF sources
- Select uplink signal attenuation
- Select receiver gain or attenuation
- Select VSA, SA, power meters or external receivers
- Select power meter operational mode (RF measure or calibration)
- Select receiver triggering source
- Interrogate the switch matrix to view its current settings

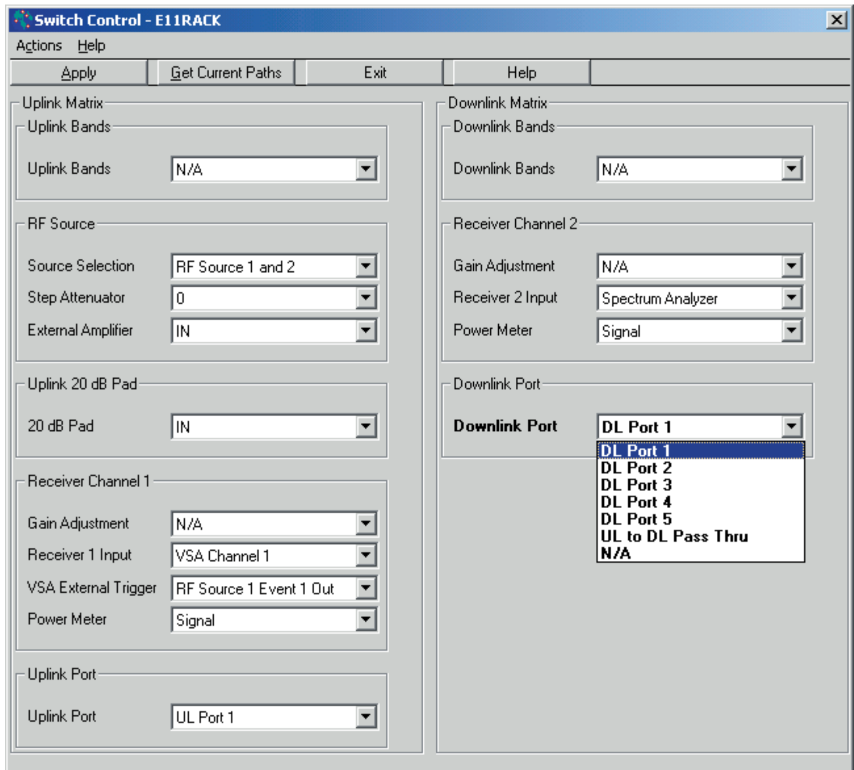


Figure 7. Define signal routing using the switch-control window.

Running tests

From the test-control window shown in Figure 8, you can perform the following functions:

- Select and start tests
- Log test execution
- Select payload telemetry recording
- Enable results display at end of test
- Enable limit testing
- Examine or modify test parameters
- Abort test and place system in safe state
- View test pass or fail messages

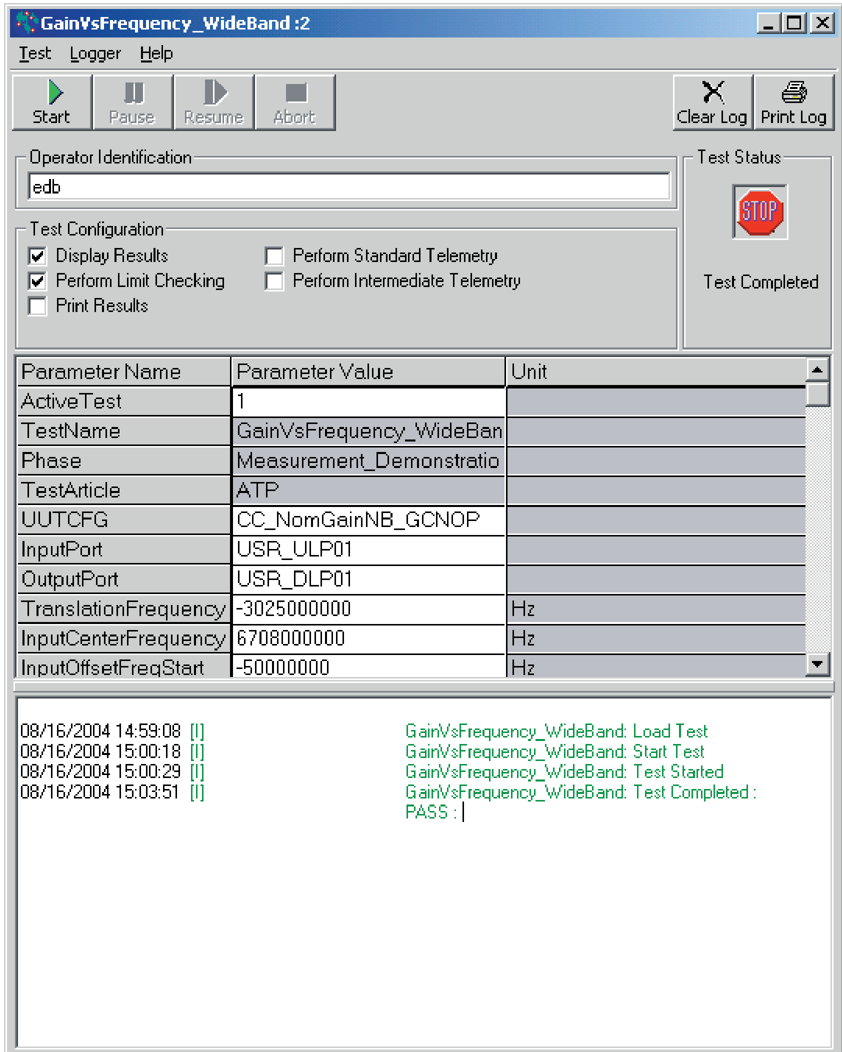


Figure 8. Tests are started from the test-control window.

Monitoring test progress

You can monitor test progress by viewing the measurement computer display, shown in Figure 9. At lower left, the Agilent 89600 vector signal analyzer display shows the uplink and downlink carrier levels for the gain vs. frequency test. At upper right, the Agilent VEE panel shows a graphical display of the gain measurement progress and a log of the measurement status. These real-time displays give the operator confidence that the test is proceeding correctly.

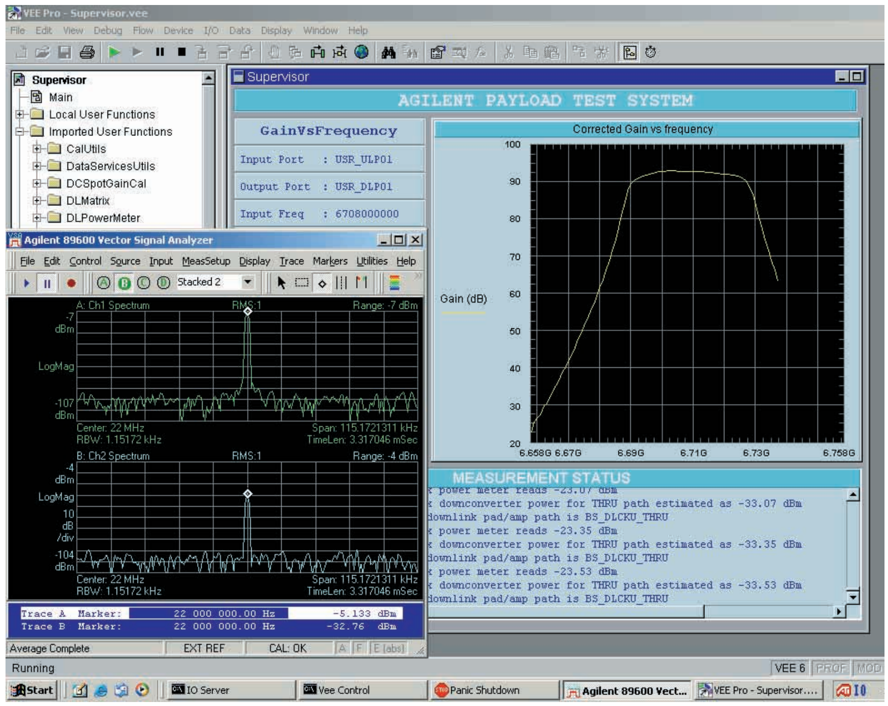
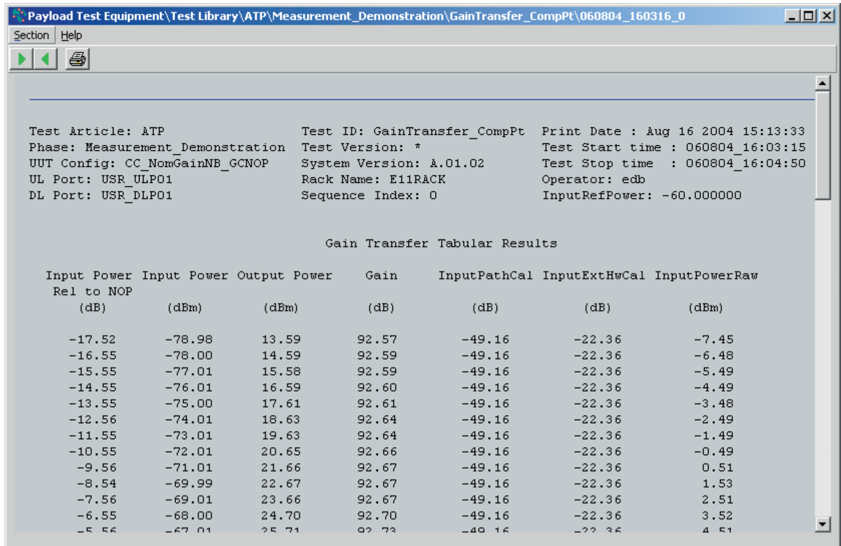


Figure 9. You can monitor test progress by viewing the measurement computer display.

Viewing and printing results

You can view test results on the computer display and print them in both tabular and graphical form. You can select the test data file and header, which contains the test title, time the test was run, and other test information. For tabular data, you can select the table size, location, column width, and other formatting. For graphical data, up to eight data sets and 16 limit lines can be put on a single graph. A gain transfer test example is shown in Figure 10 for tabular data and Figure 11 for graphical data.



Input Power Rel to NOP (dB)	Input Power (dBm)	Output Power (dBm)	Gain (dB)	InputPathCal (dB)	InputExtHwCal (dB)	InputPowerRaw (dBm)
-17.52	-78.98	13.59	92.57	-49.16	-22.36	-7.45
-16.55	-78.00	14.59	92.59	-49.16	-22.36	-6.48
-15.55	-77.01	15.58	92.59	-49.16	-22.36	-5.49
-14.55	-76.01	16.59	92.60	-49.16	-22.36	-4.49
-13.55	-75.00	17.61	92.61	-49.16	-22.36	-3.48
-12.56	-74.01	18.63	92.64	-49.16	-22.36	-2.49
-11.55	-73.01	19.63	92.64	-49.16	-22.36	-1.49
-10.55	-72.01	20.65	92.66	-49.16	-22.36	-0.49
-9.56	-71.01	21.66	92.67	-49.16	-22.36	0.51
-8.54	-69.99	22.67	92.67	-49.16	-22.36	1.53
-7.56	-69.01	23.66	92.67	-49.16	-22.36	2.51
-6.55	-68.00	24.70	92.70	-49.16	-22.36	3.52

Figure 10. Tabular results for the gain transfer test

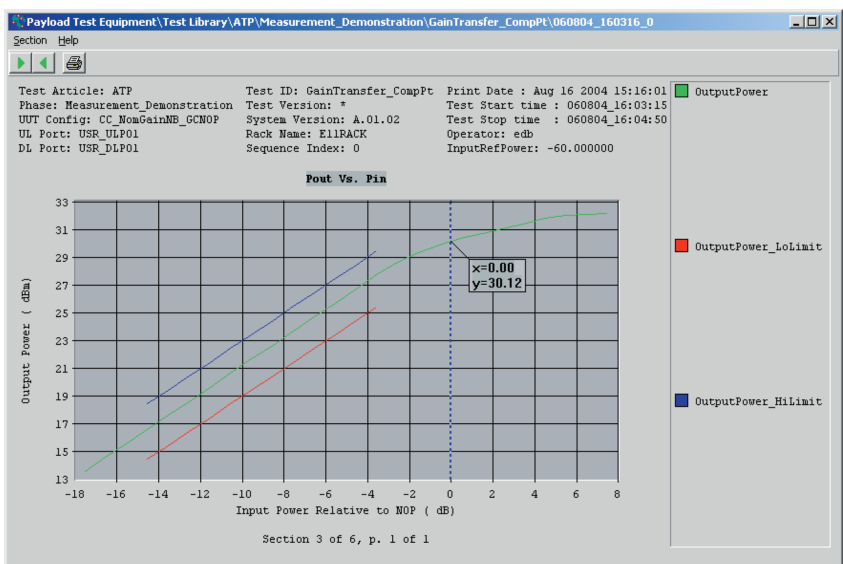


Figure 11. Graphical results for the gain transfer test

Verifying system operation

A system functional test (SFT) can be run at any time to verify that the DCMS is functioning properly for instrument operation and signal path integrity. The SFT also provides a quick method of troubleshooting DCMS equipment. The operator can select any or all tests from the SFT window (see Figure 12), and the DCMS automatically runs the tests in sequence and reports the pass or fail results at the bottom of the window.

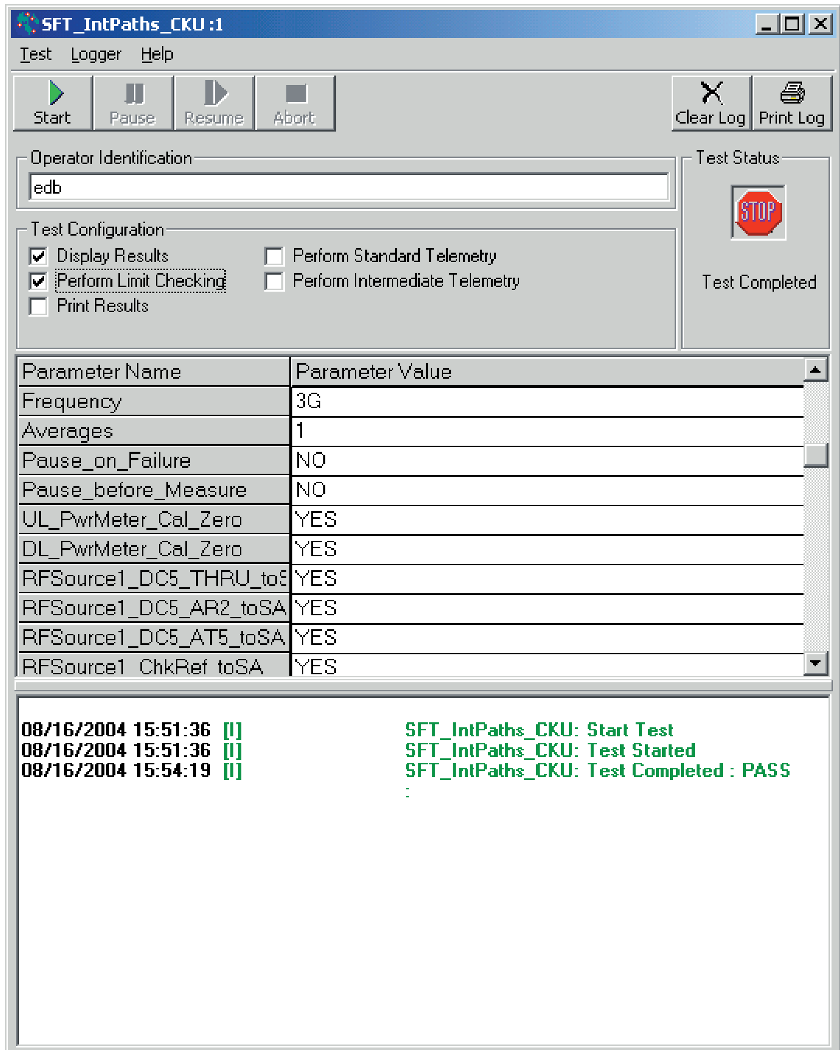


Figure 12. System operation can be verified by running an SFT.

Measurement descriptions

The DCMS measurement suite is described in the documentation package for the system. Detailed descriptions include the following information for each measurement:

- Test setup diagram showing test equipment and signal paths
- Detailed test description
- Input and output data descriptions
- Test input parameters with mnemonics
- Test output data packages with mnemonics
- Test limits
- Test calibration file with correction file mnemonics

The communications payload measurements include tests for full transponders and individual receivers and transmitters. Optional telemetry, tracking, and command (TT&C) measurements provide tests for the command receiver and telemetry transmitter, including the ranging path delay. The following measurements are grouped into analog, digital, and TT&C categories.

Analog (bent-pipe) transponder measurements

Test	Description	Typical payload test plan requirement it fulfills
AM to PM conversion	Measures the conversion of amplitude modulation to phase modulation on a carrier that has passed through the repeater channel	AM/PM conversion Phase versus drive
AM to PM transfer	Measures the transfer of amplitude modulation on one carrier to phase modulation on another carrier that has passed through the repeater channel	AM/PM transfer
Delay versus frequency	Determines the group delay and frequency response (gain) across the channel bandwidth of the repeater. Calculates slope and ripple of the delay and gain measurements in the channel pass-band	Group delay/group delay slope/ group delay ripple Repeater turnaround delay In-band frequency response
Dynamic range	Stimulates the repeater channel with a two-tone signal and measures the distortion and noise impairments appearing on the output as the input power is stepped over a specified range	Amplitude linearity/two-tone IMD Carrier to-noise and noise figure Output power versus input power
Gain adjustment	Measures the adjustable gain/attenuation steps of a repeater	Gain adjustment, fixed gain mode Gain adjustment, ALC mode
Gain transfer	Measures the gain transfer (power out versus power in) curve of the repeater under test and determines the input reference power required to saturate the repeater output. The input reference power is stored by the system to be used by other repeater measurements. This test can be performed on a repeater in either fixed gain or ALC mode.	Gain transfer, fixed-gain mode Gain transfer, ALC mode
Gain versus frequency	Measures the frequency response (gain vs. frequency) of the repeater. The test also calculates gain slope and gain ripple in the channel pass-band.	In-band frequency response/gain slope Out-of-band rejection
Noise figure	Measures the noise figure of a repeater channel	System noise figure
Noise power ratio	Stimulates the repeater channel with a multi-tone signal and measures the distortion and noise impairments appearing on the output as the input power is stepped over a specified range	Carrier-to-noise and noise figure Noise power ratio Multi-tone output power versus input power
Nominal gain and frequency	Provides a quick measurement of repeater gain and translation frequency using a single CW carrier	Nominal channel gain Translation frequency DC power efficiency Radiated emissions or susceptibility
Passive inter-modulation	Measures the level of passive intermodulation (PIM) signals that transfer between two repeaters	Passive intermodulation
Phase noise	Determines the level of spurious sidebands and phase noise associated with local oscillators in the payload	Spurious phase modulation Local oscillator sidebands
Repeater isolation	Measures the level of leakage signals that transfer between two repeaters	Repeater isolation
Spurious response	Determines the level and frequency of spurious output signals generated by the repeater. The test can be configured to operate with a single CW carrier present or absent	Spurious outputs, carrier-related Spurious outputs, non-carrier-related

Digital (transparent or regenerative) payload measurements

Test	Description	Typical payload test plan requirement it fulfills
Channel performance	Measures the frequency response of individual communication channels in a digital transparent transponder. Both magnitude and phase response over the specified transponder bandwidth are measured using a multi-tone stimulus.	Channelization and phase linearity
Error vector magnitude	Measures the error vector magnitude of a digital payload output signal. EVM is a measure of modulation or demodulation accuracy. The ideal modulation vector is compared to the resulting vector coming from the device under test (DUT). Error vector magnitude is the root mean square value of the error vector over time at the instant of the symbol clock transitions.	Error vector magnitude
Phased array relative amplitude and phase	Measures the relative amplitude and phase of a pair of inputs or outputs for a digital transparent payload. The stimulus signal is a multi-tone waveform.	Relative amplitude and phase tracking

Tracking, telemetry and control (TT&C) measurements

Test	Description	Typical payload test plan requirement it fulfills
Input power set	Allows for adjustment of the uplink power level under control of the test conductor computer. This test can be used to perform threshold testing of the command receiver.	Command receiver threshold Radiated emissions
Modulation index	Measures the PM modulation index or AM depth of a downlink beacon signal	Beacon modulation index Beacon power and fequency
Ranging delay	Measures the delay of a ranging signal through the command receiver and telemetry beacon	Ranging delay

System calibration

DCMS calibration is an automated, two-step process:

- First, the DCMS automatically calibrates the individual instruments in the DCMS measurement rack by running built-in calibration routines. You can set a calibration timing interval so that these calibrations can be run automatically on a periodic basis.
- Second, the DCMS performs a system calibration on the uplink and downlink UUT paths at the payload RF test interface. These calibrations are referenced to power meter sensors that have traceability to the National Institute of Standards and Technology (NIST). You initiate the system calibrations, which should be performed only when the test setup is changed.

Performing a system calibration is similar to running a payload measurement because the calibration tests are selected and started from the test-control window. You can perform the following calibrations:

- Uplink and downlink path loss calibrations
- Uplink and downlink group delay calibrations
- Relative amplitude and phase calibrations between paths

You can select a calibration verification function that compares the current calibration value with the last one performed and displays the difference. This feature can be used as a confidence check of DCMS calibration to ensure consistency in the calibration procedures. It also allows you to monitor calibration drift over time.

Measurement accuracy

The following measurement uncertainties in the table apply for room temperature (20° to 30°C) conditions, and uncertainty values are typical for DCMS performance.

Measurement	Uncertainty
Analog (bent-pipe) payload measurements	
AM-to-PM conversion	±2% of degree/dB reading
AM-to-PM transfer	±2% of degree/dB reading
Delay versus frequency	±0.5 ns
Dynamic range	±0.2 dB (intermodulation) ±0.3 dB (carrier to noise ratio)
Gain adjustment	±0.1 dB
Gain transfer	±0.2 dB
Gain versus frequency	±0.2 dB
Noise figure	±0.3 dB
Noise power ratio	±0.2 dB
Nominal gain and frequency	±0.2 dB (gain) ±100 ppb (frequency, standard time base)
Passive intermodulation	±0.2 dB
Phase noise	±0.7 dB
Repeater isolation	±0.2 dB
Spurious response	±0.5 dB
Digital (transparent or regenerative) payload measurements	
Channel performance	±0.2 dB (gain) ±0.7 degrees (phase)
Error vector magnitude	±3% RMS
Phased array relative	±0.2 dB (amplitude) ±0.7 degrees (phase)
Tracking, telemetry and control (TT&C) measurements	
Input power set	±0.2 dB
Modulation index	±0.5 degrees (modulation index) ±0.2 dB (power) ±100 ppb (frequency, standard time base)
Ranging delay	±2 ns

General parametric specifications

The following specifications apply to the base N1891A DCMS configuration, which contains 5 uplink and 5 downlink ports:

Description	Specification
Uplink frequencies	1 to 19.5 GHz
Uplink power at switch matrix panel	0 dBm to -60 dBm
Downlink frequencies	1 to 19.5 GHz
Downlink power at switch matrix panel	+20 dBm to -60 dBm

The Ka-band extension contains the base N1891A DCMS configuration, plus an additional 5 Ka uplink and 5 Ka downlink ports. The following specifications apply to the Ka band extension ports:

Description	Specification
Uplink frequencies	27.5 to 31.0 GHz
Uplink power at switch matrix panel	0 dBm to -60 dBm
Downlink frequencies	18 to 21.2 GHz
Downlink power at switch matrix panel	+20 dBm to -50 dBm

Most measurements exhibit the uncertainties shown below for in-channel performance:

Parameter	Uncertainty
Absolute power	±0.2 dB
Relative power (gain)	±0.2 dB
Absolute delay	±2 nsec
Relative delay	±0.5 nsec

Documentation

The documentation provided for measurement instruments, computer equipment, and the overall system include the following items:

- Installation guide
- Test operator's guide
- Test plan developer's guide
- Measurements reference
- Measurement uncertainty analysis
- System hardware reference
- Switch matrix manuals
- Instrument manuals
- Computer manuals
- Software manuals

Training

Technical training courses are provided to train the DCMS users and help integrate the DCMS into a company's internal test process. The typical training is provided in two separate classes, one for a cross-section of users and another for test operators. Additional training available, but not included with the typical DCMS, includes a course for test developers and standard courses in instrumentation and software.

DCMS operations class
This class provides a complete coverage of DCMS operation for a cross-section of users. Installers learn how to configure and verify the system, operators learn how to run the system manually and automatically, and developers learn how to configure the system. Topics include:

- System overview – hardware and software architectures
- DCMS file system overview
- Measurement description
- Manual hardware operation
- Troubleshooting
- System functional test
- DCMS operation

Test operator class
This class is designed to train test operators how to operate the DCMS. The course material follows the installation guide and test operator's guide and is similar to the DCMS operations class—the same topics are covered, but in-depth theory of operation is omitted.

System installations
To insure that the DCMS is installed correctly and is fully functional for you, Agilent provides the following installation services:

- Perform an acceptance test procedure (ATP) at the Agilent factory using a transponder simulator. (This equipment is not part of the DCMS and is used for acceptance testing only.)
- Deliver the DCMS to your site
- Install the system, and setup the equipment and software
- Verify system operation after installation at your site using an SFT

Warranty and support
The DCMS is warranted against defects in materials, workmanship, and operability (as the system was designed), for a period of one year from the date of installation. An optional two-year extended warranty for the DCMS increases the total warranty period to three years. Agilent can also provide support contracts beyond the extended warranty period.

During the warranty period, any defective hardware instrument or lowest replaceable unit for the DCMS will be repaired or replaced upon return to an Agilent Technologies service center. For software defects, Agilent will either deliver an improved software version or provide instructions on how to bypass defects.

Technical phone support is an available option for customers with questions on DCMS operation and troubleshooting. Although on-site repair is not provided for the typical DCMS, Agilent can provide this service with a separate support contract.

Ordering information

The typical DCMS is composed of COTS equipment, which may have standard instrument options that can be installed at your request. You can also request customizations to the standard DCMS:

- Different switch-matrix features and configurations
- Additional COTS equipment
- Hardware customizations
- Additional customized measurements

Contact your local Agilent Technologies sales office for price and delivery information.

Agilent Technologies' Test and Measurement Support, Services, and Assistance
Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise
Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you receive your new Agilent equipment, we can help verify that it works properly and help with initial product operation.

Your Advantage
Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and onsite education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

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