Cobalt 4 DA

Automatic balunless measuring system for LAN cables

DESCRIPTION

LAN cables are more and more specified for large and wider frequency ranges. Balun based systems cannot measure more than 3 frequency decades with reasonable accuracy. The Cobalt system based on a modal decomposition mathematical algorithm supports the development of new cables (complete tests at the lab) and simplifies operator's difficult job within systematic testing operations during production which are essential to achieve reliable results.

Cobalt can measure very easily patch cords or coaxial cables. Using a simple interface and introducing a de-embedding software correction, it doesn't need frequent and time-consuming calibration routines. It can provide not only the standard parameters as Next and RL, but also many other cable and individual wire parameters required for development of new cable designs as well as for detailed troubleshooting and quality analysis.

KEY FEATURES

- **Multiple uses**
  - Quality inspection, with very high accuracy
  - Development, with individual values per wire
  - Data cables
  - Patch cords with RJ45 connectors (standard) or others
- **High-Tech**
  - Balunless technology (modal decomposition mathematical algorithm)
  - Executive HF switches using MIL standardized relays (min 2'000'000 cycles)
- **Performant**
  - More than 170 parameters (including LCL measurement with integrated common mode)
  - Performs all electric tests on cables responding to major standards
- **Go over the limits**
  - Very broad frequency range (<4GHz) for cat 8 and higher
  - Full dynamic range available
  - Short cable length (10m)
- **Add-on**
  - EMC parameters (TI, AS, AC)
  - Alien Crosstalk

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TECHNICAL SPECIFICATIONS

Parameters	More than 170 parameters available (Transmission, Reflection, NEXT, FEXT, …) *Note: Cobalt offers complete S-parameter capabilities (Differential-, Common- and Mixed Mode Parameters)*
Standards	Performs all electrical tests on cables responding to: • ANSI/TIA-568-C.2 for Category 3, 5e, 6 and 6A • ANSI/TIA-568-C.2-1 for Category 8 • IEC 61156-5/-6 for Category 5e, 6, 6A, 7 and 7A • IEC 61156-7/-8 for cables up to 1200MHz • IEC 61156-9/-10 for Category 8.1 and 8.2
Measuring length	Cable samples from 10m up to 100m
Components	• 4 pairs connecting frame for HF measurements exceeding 4 GHz • 1 state-of-the-art computer with a 17” colour monitor • Operating Windows system • 1 license OptiTest, AESA measurement and result management software • Power supplies, interfaces, connecting cables and measurement accessories
Supply Voltage	100 - 240 VAC / 50 - 60 Hz, Consumption: 600 W without printer, 1000 W with printer
Article No:	03.3504.0001.0

ACCURACY

	100 kHz - 10 MHz	**10 MHz - 100 MHz**	**100 MHz - 200 MHz**	**200 MHz - 400 MHz**	**400 MHz - 750 MHz**	**750 MHz - 1.5 GHz**	**1.5 GHz - 3 GHz**	**3 GHz - 4.5 GHz (typical)**
Attenuation (corrected at 20°C)								
-80 to -50 dB	± 1.3 dB	± 1.5 dB	± 1.7 dB	± 1.9 dB	± 3 dB	± 4 dB	± 6 dB	± 6 dB
-50 to -25 dB	± 0.5 dB	± 0.6 dB	± 0.6 dB	± 0.7 dB	± 0.9 dB	± 1.5 dB	± 2 dB	± 3 dB
-25 to -10 dB	± 0.2 dB	± 0.2 dB	± 0.3 dB	± 0.4 dB	± 0.8 dB	± 1.3 dB	± 1.7 dB	± 2 dB
-10 to 0 dB	± 0.2 dB	± 0.2 dB	± 0.2 dB	± 0.4 dB	± 0.8 dB	± 1.3 dB	± 1.5 dB	± 1.5 dB
Near-End Crosstalk NEXT & Far-End Crosstalk FEXT								
-90 to -60 dB	± 2 dB	± 2 dB	± 2 dB	± 2.5 dB	± 4 dB	± 6 dB	± 8 dB	± 8 dB
-60 to -30 dB	± 1.6 dB	± 1.4 dB	± 1.4 dB	± 1.6 dB	± 1.8 dB	± 4 dB	± 6 dB	± 6 dB
-30 to -10 dB	± 0.5 dB	± 0.8 dB	± 0.8 dB	± 1 dB	± 1.5 dB	± 2 dB	± 3 dB	± 3 dB
Impedance								
70 Ω - 90 Ω	± 1 Ω	± 1.5 Ω	± 2 Ω	± 2 Ω	± 3 Ω	± 4.5 Ω	± 6 Ω	± 6 Ω
90 Ω - 110 Ω	± 0.75 Ω	± 1 Ω	± 1.5 Ω	± 1.5 Ω	± 2 Ω	± 4 Ω	± 5 Ω	± 5 Ω
110 Ω - 130 Ω	± 1 Ω	± 1.5 Ω	± 2 Ω	± 2 Ω	± 3 Ω	± 4.5 Ω	± 6 Ω	± 6 Ω

OPTIONS

- Network analyser
- Low frequency parameters measuring unit
- 50 / 75 Ohm switch for coaxial cable or options
- Alien Crosstalk
- Connecting frame for connectors (e.g. RJ45)
- Gating
- EMC parameters
  (Transfer Impedance TI, Screening Attenuation AS, Coupling Attenuation AC)
- Movable trolley
- Printer
- Set of High Frequency calibration standards AESA 9800
- Set of Low Frequency calibration standards AESA 9000
- Maintenance contract

AESA proposes other specific equipment for high frequency measurement

AVAILABLE HF PARAMETERS

Transmission/Reflection	• Reflection Differential Mode (each parameter is available at near and/or far end): Return Loss dd, characteristic impedance, S11, Fitted impedance, SRL • Transmission Differential Mode (each parameter is available for forward and reverse measurement): Attenuation (Insertion Loss), S21, S21 phase, Phase delay, phase delay velocity, Group delay, Delay skew… • Reflection Common Mode (each parameter is available at near and/or far end): Return Loss cc, characteristic impedance, S11, Fitted impedance, SRL • Transmission Common Mode (each parameter is available for forward and reverse measurement): Insertion Loss, S21, S21 phase, Phase delay, phase delay velocity, Group delay, Delay skew… • Conversion Loss (each parameter is available for forward and reverse measurement): LCLdc, LCTLdc, TCLcd, TCTLcd, ELTCTLcd • Single Ended Reflection (each parameter is available at near and/or far end and for wire a and/or b): Characteristic impedance, S11, Fitted impedance, SRL • Single Ended Transmission (each parameter is available for forward and reverse measurement and for wire a and/or b): Attenuation (Insertion Loss), S21, Phase, Phase delay, In Pair Skew… • Single Ended NEXT: S31, S13, S42, S24 • Single Ended FEXT: S41, S14, S32, S23
Near-NEXT	• NEXT Differential Mode: Nextdd, PSNextdd, ACR-Ndd, PSACR-Ndd • NEXT Common/Differential Mode: Nextcd • NEXT Differential/Common Mode: Nextdc • NEXT • Common Mode: Nextcc
Far-NEXT	• Same as Near-NEXT but measured at the far end
FEXT	• FEXT Differential Mode: Fextdd, PSFextdd, Elfextdd, PSElFextdd, ACR-Fdd, PSACR-Fdd • FEXT Common/Differential Mode: Fextcd • FEXT Differential/Common Mode: Fextdc • FEXT Common Mode: Fextcc

STANDARDS

Cobalt capabilities ***Standard requirements***

Port 8		Port 7		Port 6	
Sdd18	FEXTdd18	Sdd17	FEXTdd17	Sdd16	FEXTdd16
Sdd28	FEXTdd28	Sdd27	FEXTdd27	Sdd26	ILdd26
Sdd38	FEXTdd38	Sdd37	ILdd37	Sdd36	FEXTdd36
Sdd48	ILdd48	Sdd47	FEXTdd47	Sdd46	FEXTdd46
Sdd58	NEXTdd58	Sdd57	NEXTdd57	Sdd56	NEXTdd56
Sdd68	NEXTdd68	Sdd67	NEXTdd67	Sdd66	RLdd66
Sdd78	NEXTdd78	Sdd77	RLdd77	Sdd76	NEXTdd76
Sdd88	RLdd88	Sdd87	NEXTdd87	Sdd86	NEXTdd86
Sdc18	FEXTdc18	Sdc17	FEXTdc17	Sdc16	FEXTdc16
Sdc28	FEXTdc28	Sdc27	FEXTdc27	Sdc26	LCTLdc26
Sdc38	FEXTdc38	Sdc37	LCTLdc37	Sdc36	FEXTdc36
Sdc48	LCTLdc48	Sdc47	FEXTdc47	Sdc46	FEXTdc46
Sdc58	NEXTdc58	Sdc57	NEXTdc57	Sdc56	NEXTdc56
Sdc68	NEXTdc68	Sdc67	NEXTdc67	Sdc66	LCLdc66
Sdc78	NEXTdc78	Sdc77	LCLdc77	Sdc76	NEXTdc76
Sdc88	LCLdc88	Sdc87	NEXTdc87	Sdc86	NEXTdc86
Scd18	FEXTcd18	Scd17	FEXTcd17	Scd16	FEXTcd16
Scd28	FEXTcd28	Scd27	FEXTcd27	Scd26	TCTLcd26
Scd38	FEXTcd38	Scd37	TCTLcd37	Scd36	FEXTcd36
Scd48	TCTLcd48	Scd47	FEXTcd47	Scd46	FEXTcd46
Scd58	NEXTcd58	Scd57	NEXTcd57	Scd56	NEXTcd56
Scd68	NEXTcd68	Scd67	NEXTcd67	Scd66	TCLcd66
Scd78	NEXTcd78	Scd77	TCLcd77	Scd76	NEXTcd76
Scd88	TCLcd88	Scd87	NEXTcd87	Scd86	NEXTcd86
Scc18	FEXTcc18	Scc17	FEXTcc17	Scc16	FEXTcc16
Scc28	FEXTcc28	Scc27	FEXTcc27	Scc26	ILcc26
Scc38	FEXTcc38	Scc37	ILcc37	Scc36	FEXTcc36
Scc48	ILcc48	Scc47	FEXTcc47	Scc46	FEXTcc46
Scc58	NEXTcc58	Scc57	NEXTcc57	Scc56	NEXTcc56
Scc68	NEXTcc68	Scc67	NEXTcc67	Scc66	RLcc66
Scc78	NEXTcc78	Scc77	RLcc77	Scc76	NEXTcc76
Scc88	RLcc88	Scc87	NEXTcc87	Scc86	NEXTcc86

	Port 1		Port 2		Port 3		Port 4		Port 5	
Port 1	RLdd11	Sdd11	NEXTdd12	Sdd12	NEXTdd13	Sdd13	NEXTdd14	Sdd14	ILdd15	Sdd15
Port 2	NEXTdd21	Sdd21	RLdd22	Sdd22	NEXTdd23	Sdd23	NEXTdd24	Sdd24	FEXTdd25	Sdd25
Port 3	NEXTdd31	Sdd31	NEXTdd32	Sdd32	RLdd33	Sdd33	NEXTdd34	Sdd34	FEXTdd35	Sdd35
Port 4	NEXTdd41	Sdd41	NEXTdd42	Sdd42	NEXTdd43	Sdd43	RLdd44	Sdd44	FEXTdd45	Sdd45
Port 5	ILdd51	Sdd51	FEXTdd52	Sdd52	FEXTdd53	Sdd53	FEXTdd54	Sdd54	RLdd55	Sdd55
Port 6	FEXTdd61	Sdd61	ILdd62	Sdd62	FEXTdd63	Sdd63	FEXTdd64	Sdd64	NEXTdd65	Sdd65
Port 7	FEXTdd71	Sdd71	FEXTdd72	Sdd72	ILdd73	Sdd73	FEXTdd74	Sdd74	NEXTdd75	Sdd75
Port 8	FEXTdd81	Sdd81	FEXTdd82	Sdd82	FEXTdd83	Sdd83	ILdd84	Sdd84	NEXTdd85	Sdd85
Port 1	LCLdc11	Sdc11	NEXTdc12	Sdc12	NEXTdc13	Sdc13	NEXTdc14	Sdc14	LCTLdc15	Sdc15
Port 2	NEXTdc21	Sdc21	LCLdc22	Sdc22	NEXTdc23	Sdc23	NEXTdc24	Sdc24	FEXTdc25	Sdc25
Port 3	NEXTdc31	Sdc31	NEXTdc32	Sdc32	LCLdc33	Sdc33	NEXTdc34	Sdc34	FEXTdc35	Sdc35
Port 4	NEXTdc41	Sdc41	NEXTdc42	Sdc42	NEXTdc43	Sdc43	LCLdc44	Sdc44	FEXTdc45	Sdc45
Port 5	LCTLdc51	Sdc51	FEXTdc52	Sdc52	FEXTdc53	Sdc53	FEXTdc54	Sdc54	LCLdc55	Sdc55
Port 6	FEXTdc61	Sdc61	LCTLdc62	Sdc62	FEXTdc63	Sdc63	FEXTdc64	Sdc64	NEXTdc65	Sdc65
Port 7	FEXTdc71	Sdc71	FEXTdc72	Sdc72	LCTLdc73	Sdc73	FEXTdc74	Sdc74	NEXTdc75	Sdc75
Port 8	FEXTdc81	Sdc81	FEXTdc82	Sdc82	FEXTdc83	Sdc83	LCTLdc84	Sdc84	NEXTdc85	Sdc85
Port 1	TCLcd11	Scd11	NEXTcd12	Scd12	NEXTcd13	Scd13	NEXTcd14	Scd14	TCTLcd15	Scd15
Port 2	NEXTcd21	Scd21	TCLcd22	Scd22	NEXTcd23	Scd23	NEXTcd24	Scd24	FEXTcd25	Scd25
Port 3	NEXTcd31	Scd31	NEXTcd32	Scd32	TCLcd33	Scd33	NEXTcd34	Scd34	FEXTcd35	Scd35
Port 4	NEXTcd41	Scd41	NEXTcd42	Scd42	NEXTcd43	Scd43	TCLcd44	Scd44	FEXTcd45	Scd45
Port 5	TCTLcd51	Scd51	FEXTcd52	Scd52	FEXTcd53	Scd53	FEXTcd54	Scd54	TCLcd55	Scd55
Port 6	FEXTcd61	Scd61	TCTLcd62	Scd62	FEXTcd63	Scd63	FEXTcd64	Scd64	NEXTcd65	Scd65
Port 7	FEXTcd71	Scd71	FEXTcd72	Scd72	TCTLcd73	Scd73	FEXTcd74	Scd74	NEXTcd75	Scd75
Port 8	FEXTcd81	Scd81	FEXTcd82	Scd82	FEXTcd83	Scd83	TCTLcd84	Scd84	NEXTcd85	Scd85
Port 1	RLcc11	Scc11	NEXTcc12	Scc12	NEXTcc13	Scc13	NEXTcc14	Scc14	ILcc15	Scc15
Port 2	NEXTcc21	Scc21	RLcc22	Scc22	NEXTcc23	Scc23	NEXTcc24	Scc24	FEXTcc25	Scc25
Port 3	NEXTcc31	Scc31	NEXTcc32	Scc32	RLcc33	Scc33	NEXTcc34	Scc34	FEXTcc35	Scc35
Port 4	NEXTcc41	Scc41	NEXTcc42	Scc42	NEXTcc43	Scc43	RLcc44	Scc44	FEXTcc45	Scc45
Port 5	ILcc51	Scc51	FEXTcc52	Scc52	FEXTcc53	Scc53	FEXTcc54	Scc54	RLcc55	Scc55
Port 6	FEXTcc61	Scc61	ILcc62	Scc62	FEXTcc63	Scc63	FEXTcc64	Scc64	NEXTcc65	Scc65
Port 7	FEXTcc71	Scc71	FEXTcc72	Scc72	ILcc73	Scc73	FEXTcc74	Scc74	NEXTcc75	Scc75
Port 8	FEXTcc81	Scc81	FEXTcc82	Scc82	FEXTcc83	Scc83	ILcc84	Scc84	NEXTcc85	Scc85

KEY BENEFITS

1. Technical hardware features

- No movable parts for maximum measurement speed, accuracy and reliability
- Mechanical design studied to facilitate maintenance and servicing operations

2. Main software features

The OptiTest software is a stand-alone application specially designed for data capture with automatic testing equipment. This module is a part of the AESA's Quality Management System CIQ 3.0 specially designed according to the needs of the cable manufacturing industry.

- The software has been developed in the Microsoft® Windows™ environment and complies with the Windows features.
- All data gathered with OptiTest can be used for further statistical evaluations and combined with other measurements gathered during the complete manufacturing process, from incoming good inspection until to the dispatch of the finished product.
- No special HF or LF knowledge required, thus ideal for shop floor integration.
- Full automatic measurements.
- The measurements can be performed in the sweep mode and/or by using frequency tables.
- Open choice for start/stop frequencies and number of points (for HF sweep measurements, the test system allows to enter an unlimited number of measurement points, which is not limited by the specified number of points as referred by the used VNA analyzer itself).
- Choice of logarithmic or linear scales.
- Self-configurable reports.
- Fully automatic calibration management including automated calibration procedure.
- Possibility to create an unlimited number of cable specifications and test sequences. These "test specifications" will be stored with an individual customised name and are easily retrievable.
- Possibility to generate complex limit curves. Most of the limits and formulas recommended by the international standards are integrated. Their variables are programmable to enable the preparation of special specifications.

I. OptiTest facilitates the tasks itemised below:
   a. Creation and administration of test specifications
   b. Performance of tests
   c. Report generation after testing
   d. Basic statistic evaluation

II. Test Plan Creation:
   a. A wide range of measurement modes are available as options, such as HF Sweep, HF Sweep(Alien), HF Coax-50, HF Coax-75, HF fixed frequency, LF single cores, LF pairs, LF triples, LF quads, LCL, LCTL, TCL,
   b. TCTL, TI, AS, worst case summaries for HF-Sweep / LF / HF discrete frequencies, inductance, conductance and high voltage.
   c. Report generation is very easy. If set by default, a highly comprehensive report is generated, containing a limit case compilation with graphics and for each measuring block a separate summary with related graphics.

III. Document:

a. Reports:

OptiTest offers various report options such as:

- Test certificates for the customer
- Creating (control) quality charts
- Graphical HF evaluations

The results may be printed, stored as PDF files, or sent as emails.

It is also possible to create data files for Office products such as Microsoft Excel.

b. Evaluation:

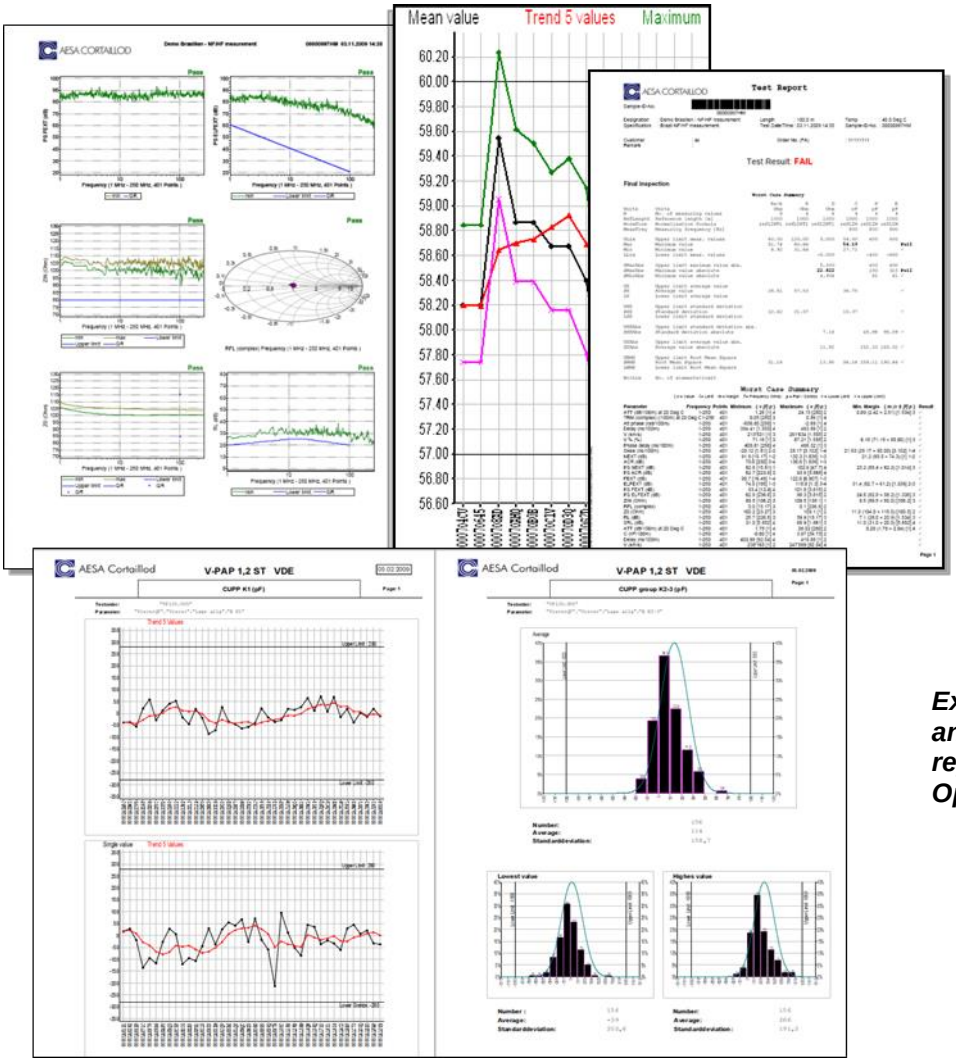
All data are available for evaluation at any time. Thus, all test data of a cable can be collectively evaluated and printed.

Some examples of how to perform evaluations are:

- Sample list sorted by test order
- Search with pre-defined or customized filters (e.g. searching for the last 20 samples by cable number, date, certain characteristics)
- Free search through the data pool with user-specific search criteria

Filters and search criteria normally generate sample lists which facilitate multiple further actions as:

- Display and process measured values
- Print reports and labels
- Generate quality charts (statistics)



Examples of test and statistical reports with AESA Optitest

c. Archiving:

Windows backup function used for archiving the data.

d. Statistics:

Filtering tool: Select a group of measurements according to various criteria such as:

- Cable specification
- Cable structure
- Production period
- Production line, test station
- Etc…

Following the measurements management, this powerful tool allows generating many types of statistics.

Worst case values for a pair or a cable

- Pair identification with extreme values
- Min, max, average values
- Standard deviation, quality factor, RMS values
- Etc…

These statistical means are calculated for all measured LF (and partly HF) parameters

e. Graphical presentation:

- Statistical distribution (Gauss type curve)
- Evolution and parameter survey in function of the time
- Measurements repartition in a defined time period to determine the testing load

Options

1. *Set of 5 standards (resistance & capacitance) type AESA 9000*

Article No: 45.9000.0001.0

Complete ISO 17025 certified LF calibration standards.

The kit of certified LF calibration standards is composed of:

- **Standard type 9001**
  C1,2 with 19,20 nF ± 0,1 % ± 30 ppM/°C
- **Standard type 9002**
  C1,2 with 192,0 nF ± 0,1 % ± 30 ppM/°C
- **Standard type 9003**
  C3 with 16,00 nF ± 0,1 % ± 30 ppM/°C
  K1, K2, K3 with 16000 pF ± 0,1 % ± 30 ppM/°C
- **Standard type 9004**
  E1, E2, E3 with 12000 pF ± 0,1 % ± 30 ppM/°C
- **Standard type 9005**
  RA, RD with192 Ω ± 0,01 % ± 2 ppM/°C
  RB, RC with 1920 Ω ± 0,01 % ± 2 ppM/°C

ISO 17025 ACCREDITED

2. *Set of HF calibration standards (attenuators and loads) type AESA 9800*

Article No: 45.9800.0001.0

With each sold measuring system, AESA delivers a "daily" calibration kit to create the different calibration files necessary to measure LAN cables. These easy-to-use standards have been developed in the symmetrical way to get the maximum accuracy. Unfortunately, these "daily" standards cannot be referenced as primary standards. But AESA has developed its HF technology by using hi-tech strategic components. These miniaturized resistors are sorted and guaranteed up to 3GHz. Tolerance: 1% (50 ppm/deg.) for values between 50 and 200Ω.

ISO 17025 ACCREDITED

During a quality control calibration, the symmetric elements have to be replaced by 50Ω coaxial standards which are certified. With an appropriate set of terminations and attenuators, it is possible to prove within defined tolerances that the testing system (network analyzer + HF multiplexer + connecting frame) is measuring correctly. It is also possible to prove that the calibration done for the measurement of LAN cables has been done correctly.

The kit of certified HF calibration standards is composed of:

- 2 attenuation references –3dB type 9801
- 2 attenuation references –6dB type 9802
- 2 attenuation references –10dB type 9803
- 2 attenuation references –20dB type 9804
- 2 attenuation references –30dB type 9805
- 2 x 50Ω terminations
- 2 special connectors for the terminations
- 4 HF connecting cables for the attenuation
- 1 set of miscellaneous HF material

3. *Coaxial options*

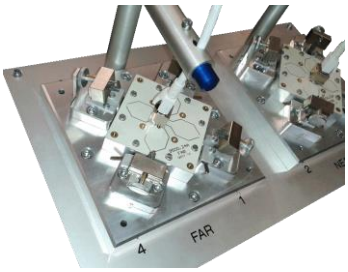
Specific output (N-connectors) for coax measurement. The solution includes the equipment modification and the related software module.

- **50 ohms coaxial option** Article No: 50.0001.0031.0
- **50 and 75 ohms coaxial option** Article No: 50.0001.0029.0

4. *Option for connector RJ45*

Article No: 50.0001.0070.0

Patch cord for RJ45 connectors: easy and direct adaptation to the Cobalt frame.



5. LF option for Cobalt 4Da

Article No: 50.0001.0061.0

The low frequency parameters measuring technology provides a self-calibration. It is designed to test up to 4 pairs or 2 quads. Different measuring frequencies are integrated in the capacitance bridge. They can be used depending on the length of the cable

Description	Designation for pairs	Designation for quads	Accuracy	Scale
Conductor resistance	Ra, Rb	Ra, Rb Rc, Rd	± 0,1% + 10 mΩ	0 - 19,999 kΩ
Loop resistance	R	R1, R2		
Resistance unbalance	DR	DR1, DR2, DR3	Computed	%, Ω
Capacitance	C	C1, C2, C3	± 0,25% ± 10pF at 800 Hz ± 0,25% ± 10pF at 125 Hz ± 0,25% ± 50pF at 12,5Hz	0 – 2'000nF
Capacitance unbalance	K	K1 – K12	± 1% ± 6pF at 800 Hz ± 1% ± 3pF at 125 Hz ± 1% ± 30pF at 12,5 Hz	
Capacitance unbalance to ground	Ei, Ea, E	Ei1-Ei3 Ea1-Ea3 E1-E3		

Calculated parameters at 800Hz (1'000Hz)

Attenuation Phase
Characteristic Impedance Velocity of propagation (VOP)
Crosstalk

Statistical parameters

Maximum and minimum measured values Upper quality factor
Absolute minimum measured value Lower quality factor
Average value RC product
Quadratic average Standard deviation RC
Standard deviation Variance

6. Transfer Impedance Kit, incl. Coupling and Screening Attenuation 2.3-9.8 mm

To perform EMC measurements with the triaxial method, following accessories are required:

- One hardware package to prepare the sample and take care for the impedance adaptation
- One software package (specific module)

Article No: 51.0001.0035.0

This option allows measuring the transfer impedance, the screening attenuation and coupling attenuation according to IEC 62153-4-9 when knowing the impedance of the internal coaxial cable created with the sample under test.

It is possible to add a multiplexer with a coaxial 50Ω and 75Ω switch allowing connecting the cable under test to a different port. This avoids numerous manipulations on the expensive output ports of the Network Analyser.

7. Gating option

Article No: 52.0001.0009.0

Gating for cables is used to remove the influence of operator's cable preparation in the measurement results. This function provides the opportunity to selectively remove or reduce unexpected mismatches in transmission occurring out of the defined gate (caused by separated wires, slightly open foil or compression connectors for coaxial cables). Gating is a function designed to set a measuring "gate" in the "time domain", that means to set start and stop positions.

8. Network Analyzer

- Agilent type E5071C 4 ports (9 kHz – 4.5 GHz) Article No: 51.0001.0044.0
- Rohde & Schwarz ZNB4 (9 kHz – 4.5 GHz) Article No: 51.0001.0060.0

Other types can be proposed upon request.

9. Movable Trolley

Article No: 51.0190.0001.0

For convenience or operational reasons, it is possible to add a professional movable trolley to the system. In such a case, all tester components are integrated in the trolley, including the computer system and the printer.

10. *Printer*

Article No: 55.0500.0012.0

LaserJet printer

11. Spare parts

AESA recommends following set of spare parts for a secured operation for two years:

Cobalt Type	HF measurement only (Mini kit)	Including optional LF measurement (Full kit)
1 CKE measuring bridge type KM		✓
1 R measuring bridge type RM		✓
1 LF relay matrix board type AZU		✓
1 CPU board		✓
2 test heads (4 if two different connecting frames)	✓	✓
2 HF relays (3 if two different connecting frames)	✓	✓
1 control boards set	✓	✓
1 set of HF cable	✓	✓
1 set of different mechanical and electronic hardware	✓	✓
Article No	50.0900.0003.0	50.0900.0002.0