



### LAN cable measurement

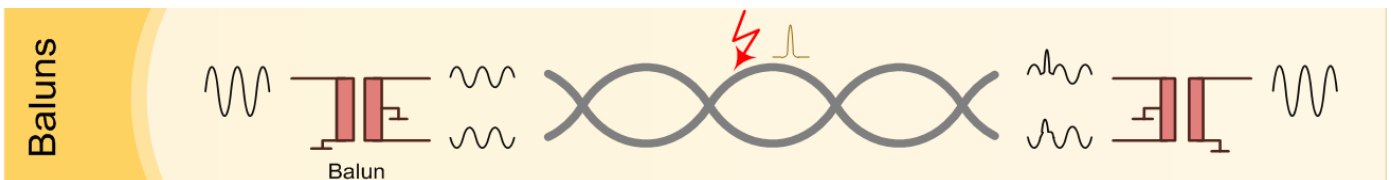
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### WITH or WITHOUT BALUN ?

AESA introduces Cobalt, a new test equipment for HF measurements based on the most recent balunless technology. Does it replace the traditional equipment ?

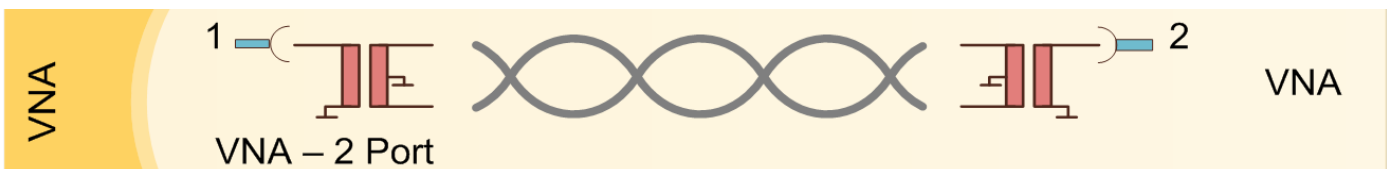
#### ■ What is a BALUN?

Balun is the shortening of "BALanced/Unbalanced". It is a bi-directional passive device used to send / receive a signal into a twisted pair. As sender, the balun transforms a "normal" signal into a positive and negative (inverted) signals with half the amplitude. As receiver, it reconstruct the original signal with the original amplitude. Within the cable metrology, baluns are used to minimise the external disturbances during the data transmission.



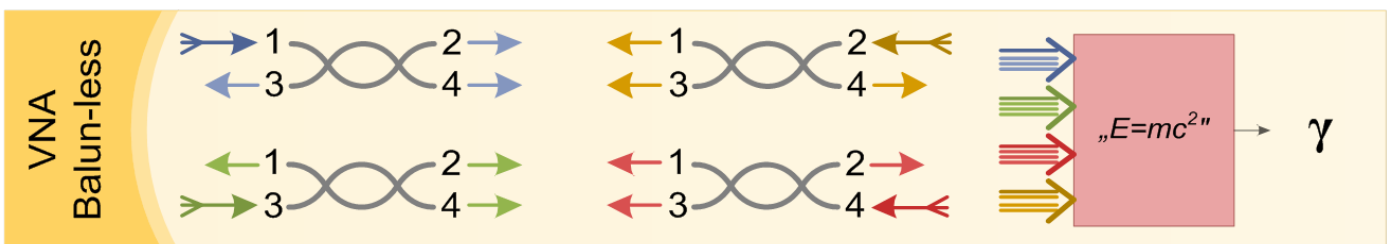
#### ■ Measurement WITH baluns

The near end and the far end of the cable are connected with baluns. The sender and the receiver are part of a two ports Vector Network Analyser (VNA). VNA calculates the energy ratio, how much of the injected energy reaches the receiver and how much comes back to the sender.



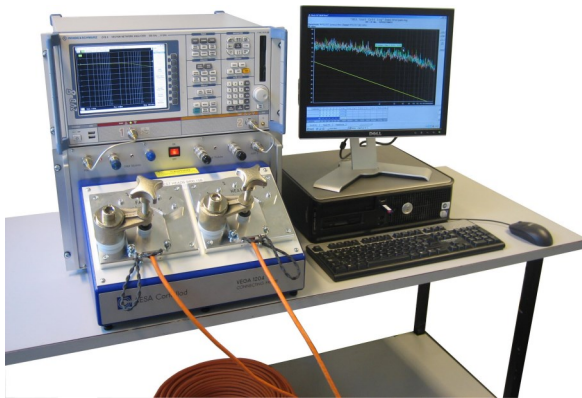
#### ■ Measurement WITHOUT balun

Thanks to modal decomposition algorithms and a four ports VNA, the baluns can be removed from the automatic test equipment. Each of the four cable ends have to be successively connected to the sender. The energy transmitted to the three other ends and the reflected energy are measured. The 16 resulting curves are used to calculate the parameters.



#### ■ Which method to choose

Both methods offer advantages but also restrictions. It is important to carefully analyze its own needs, constraints and expectations. The information provided in the next page can help. We are also available to support you to take the most relevant decision.



■ Vega



■ Cobalt\*

	BALUNS	BALUNLESS
Rapidity	short calibration & preparation very fast measurements	longer calibration & preparation fast measurements
Frequency	range limited by the baluns = 3 decades (example : 1 MHz to 1 GHz)	no limitation (100% of VNA range) (example : 9 KHz to 4 GHz)
Price	cost favourable	higher economic efficiency
Length	minimum cable length 100m	minimum cable length 15m
Pairs	4 to 32 pairs	4 pairs
Others	additional losses (impedance mismatches)	Full dynamic
...	Simplicity (hardware, preparation, calibration)	additional parameters conversion loss LCL, in pair skew, direct Ti measurements

why you will choose for a balun or balunless testing equipment

- **fast system**  
Your systematic verifications require a fast & reliable system able to measure the basic HF parameters
- **cost effective system**  
The possibility to reuse one 2 ports available VNA will limit the investment.
- **more than 4 pairs**  
You have to measure automatically multiple pair LAN cables.
- **simple system**  
Vega simply completes your existing system.

- **no frequency limitation**  
Cobalt offers the possibility to extend the frequency range according to the *highest* LAN cables specifications.
- **short cables**  
You measure cables shorter than 100 meters (330 feet).
- **full dynamic**  
You have to measure Alien ELFEXT then 100dB is helpful.
- **more than 170 parameters**  
Save significant operational costs as all main parameters as conversion loss (LCL, TCL, TCTL,...), individual parameters, in-pair skew etc. are measured simultaneously.

\* Cobalt system allows optionnally the patchcord measurements: direct testing of RJ45 samples with connectors is already available, other type can be proposed on request.