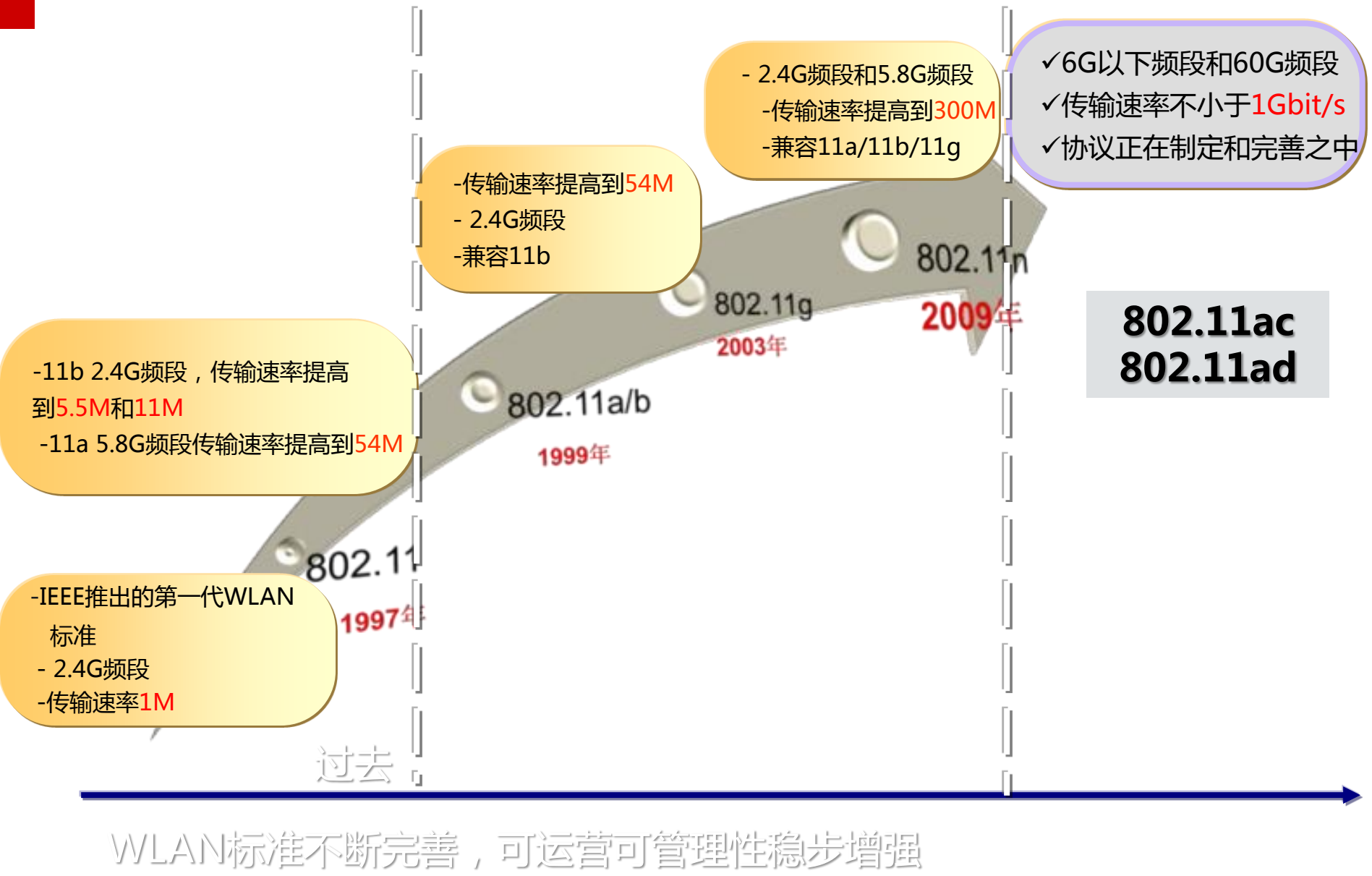
泰克低亲民价格 Wi-Fi测试

Tektronix®

什么是 WiFi

Wi-Fi是Wi-Fi Alliance（无线高保真）的简称， Wi-Fi联盟是一家全球及非营利性的行业协会，拥有300多家成员企业，共同致力于推动无线局域网络（WLANs）产业的发展。以增强移动无线、便携、移动和家用设备的用户体验为目标，Wi-Fi联盟一直致力于通过其测试和认证方案确保基于IEEE 802.11标准的无线局域网产品的可互操作性。自2000年3月Wi-Fi联盟开展此项认证以来，已经有超过4000种产品获得了Wi-Fi CERTIFIED™ 指定认证标志，有力地推动了Wi-Fi产品和服务在消费者市场和企业市场两方面的全面开展。

Tektronix®



WLAN标准不断完善，可运营可管理性稳步增强

Tektronix®

Review of 802.11n: Basis for 802.11ac

Feature	Mandatory	Optional
Transmission method	OFDM	
Channel bandwidth	20 MHz	40 MHz
FFT size	64	128
Data subcarriers / pilots	52 / 4	108 / 6
Subcarrier spacing	312.5 kHz	
OFDM symbol duration	4 µs (800 ns guard interval)	3.6 µs (with 400 ns short guard interval)
Modulation types	BPSK, QPSK, 16QAM, 64QAM	
Forward error correction	Binary convolutional coding (BCC)	Low density parity check (LDPC)
Coding rates	1/2, 2/3, 3/4, 5/6	
MCS supported	0 to 7, 0 to 15 for access points	8 to 76, 16 to 76 for APs
Spatial streams and MIMO	1, 2 for access points direct mapping	3 or 4 streams Tx beamforming, STBC
Operating mode / PPDU format	Legacy/non-HT (802.11a/b/g) Mixed/HT-mixed (802.11a/b/g/n)	Greenfield/HT-Greenfield (802.11n only)

Changes and Enhancements for 802.11ac

- Wider channels
- Higher-order modulation
- More spatial streams and antennas (up to 8)
- Multi-user MIMO

Feature	Mandatory	Optional
Channel bandwidth	20 MHz, 40 MHz, 80 MHz	160 MHz, 80+80 MHz
FFT size	64, 128, 256	512
Data subcarriers / pilots	52 / 4, 108 / 6, 234 / 8	468 / 16
Modulation types	BPSK, QPSK, 16QAM, 64QAM	256QAM
MCS supported	0 to 7	8 and 9
Spatial streams and MIMO	1	2 to 8 Tx beamforming, STBC Multi-user MIMO (MU-MIMO)
Operating mode / PPDU format	Very high throughput / VHT	

Data rates: 1.56 Gbps (80 MHz, 4 Tx, MCS9) "reasonable" case
6.93 Gbps (160 MHz, 8 Tx, MCS9, short GI) best case

Tektronix®

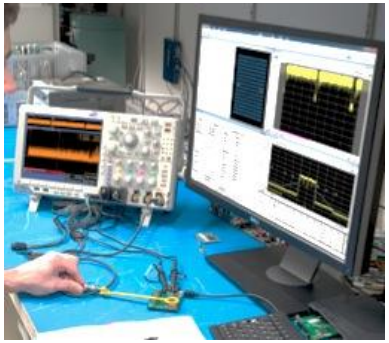
泰克亲民价格Wi-Fi 测试方案

802.11 RF layer standard transmitter measurements

- Transmit power
- Transmit Power On/Off Ramp
- Transmit Spectrum mask → Spectrum Emission Mask
- RF Carrier suppression
- Center frequency leakage

  } I/Q Origin Offset
- Transmit Spectral flatness
- Transmission spurious
- Transmit Center frequency tolerance
- Symbol clock frequency tolerance
- Transmit Modulation Accuracy
- Transmitter Constellation Error

  } Error Vector Magnitude



Error Vector Magnitude (**EVM**) to measure the quality of the transmission

Spectrum Emission Mask (**SEM**) to determine the correctness of the transmission emission.

Additional measurements are needed to debug and find the root causes of failure (Constellation Diagram, EVM vs. time and IQ imbalance)

Tektronix®

泰克亲民价格Wi-Fi 测试方案

Standard: 802.11a/g/j/p **Bandwidth:** 20 MHz **Guard Interval:** Auto from SIG

Burst Power:	-48.00 dBm	**Peak-to-Average:**	10.11 dB
Burst Index:	1	**IQ Origin Offset:**	-36.88 dB
Frequency Error:	-25.58 kHz	**Common Pilot Error:**	2.979 %
Symbol Clk Error:	-11.834 ppm		

SIG Data		**Parity:**	Pass
Rate	5	**Reserved**	0
Length	239	**Parity**	1
Tail	0		

EVM

	All	**Pilots**	**Data**
RMS	-22.73 dB	-25.45 dB	-22.56 dB
Peak	-8.94 dB	-16.07 dB	-8.94 dB
Pk@Sym/Sub	3 / -26	31 / 21	3 / -26

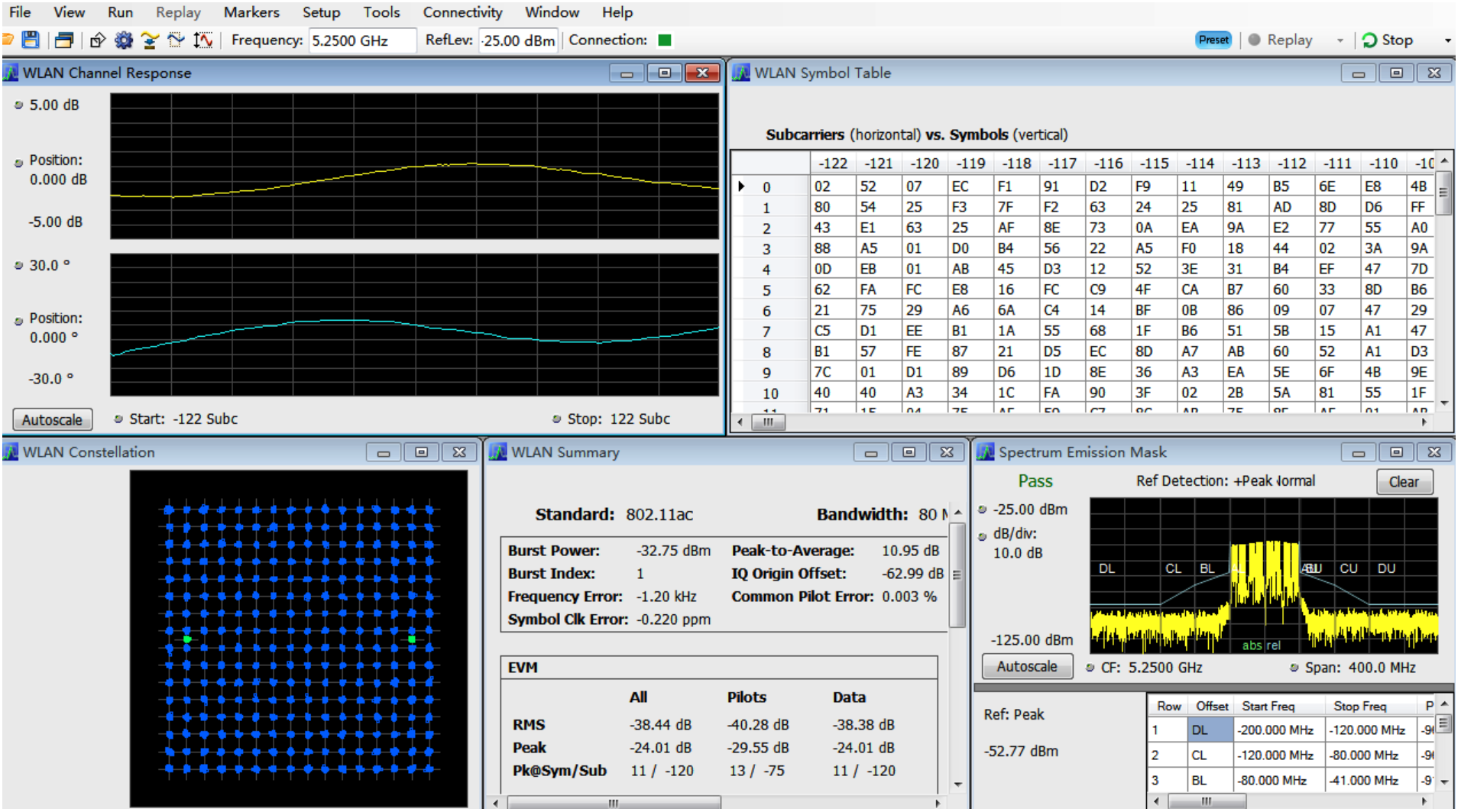
Avg RMS -22.73 dB
1 of 20 Bursts
Max RMS -22.73 dB

Packet Format: AG **Data Modulation:** QPSK
Guard Interval: 1/4

	Symbols	**EVM**	**Avg Power**
STF	2	-22.70 dB	-47.79 dBm
LTF	2	-27.60 dB	-48.17 dBm
SIG	1	-24.97 dB	-48.09 dBm
Data	41	-22.73 dB	-48.00 dBm

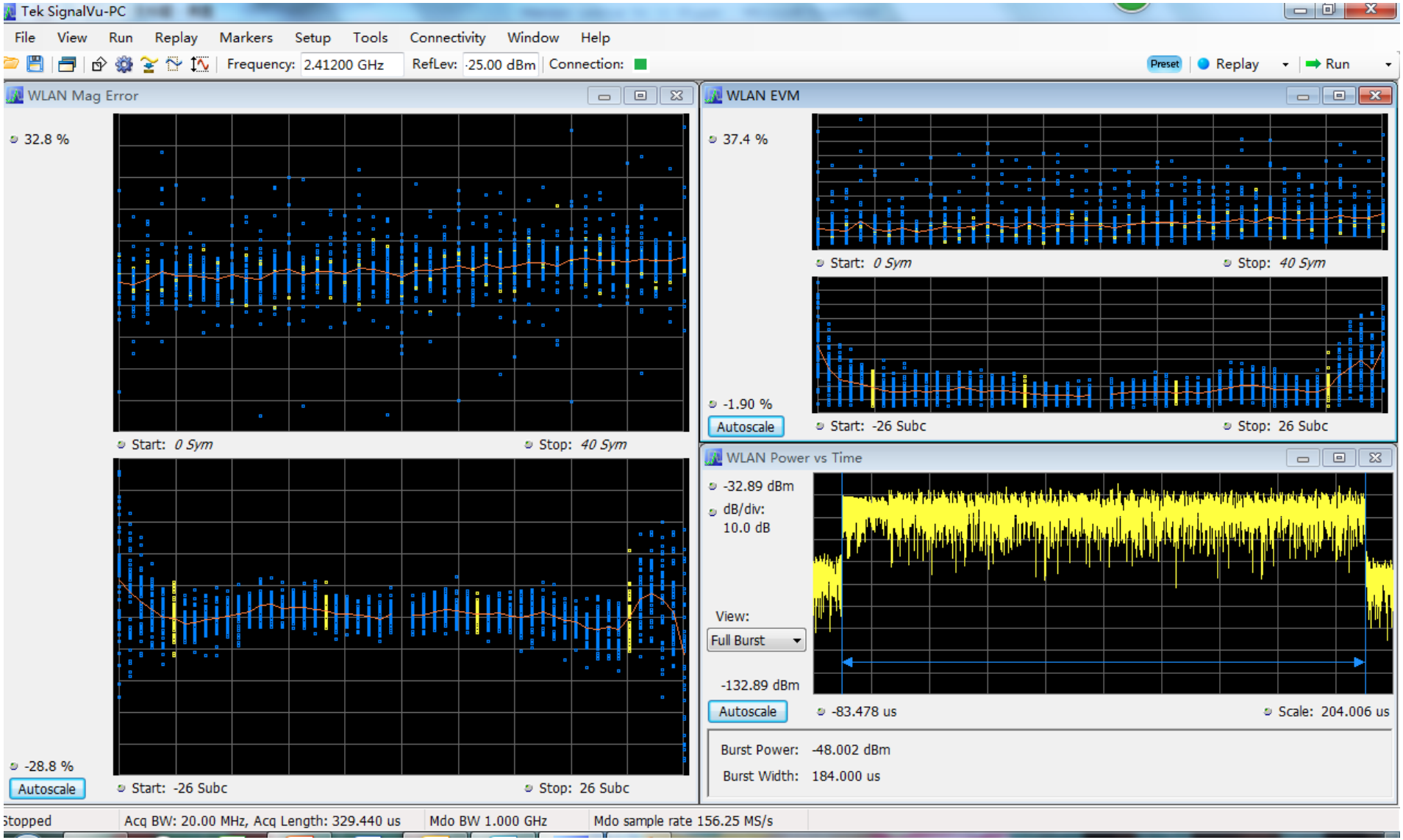
Tektronix®

泰克亲民价格Wi-Fi 测试方案



Tektronix®

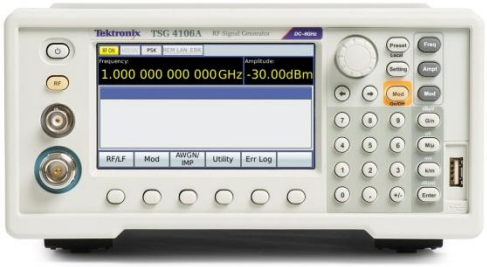
泰克亲民价格Wi-Fi 测试方案



Tektronix®

泰克射频创新解决方案

- 信号源的推出实现完整端到端测试



TSG 4100A

Modulation Signal

DUT

Spectrum Analysis

MDO3K/4K

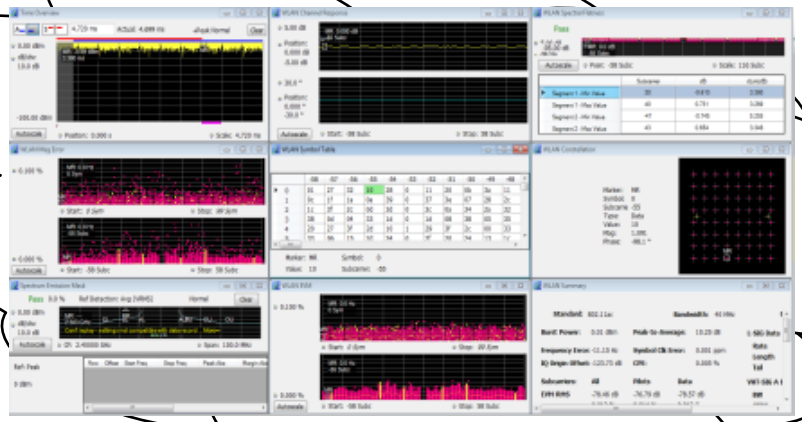
RSA5K/6K

RSA306A

Signal modulation Analysis

PSM 功率计及FCA 频率计

RF Power Measurement



Signal VU

- RSA306 的推出实现低成本测试
- 延续MDO跨域分析的优势
- 延续实时频谱分析仪的优势
- 高性能射频附件将整体方案完备

PSPL高频器件件

Tektronix®