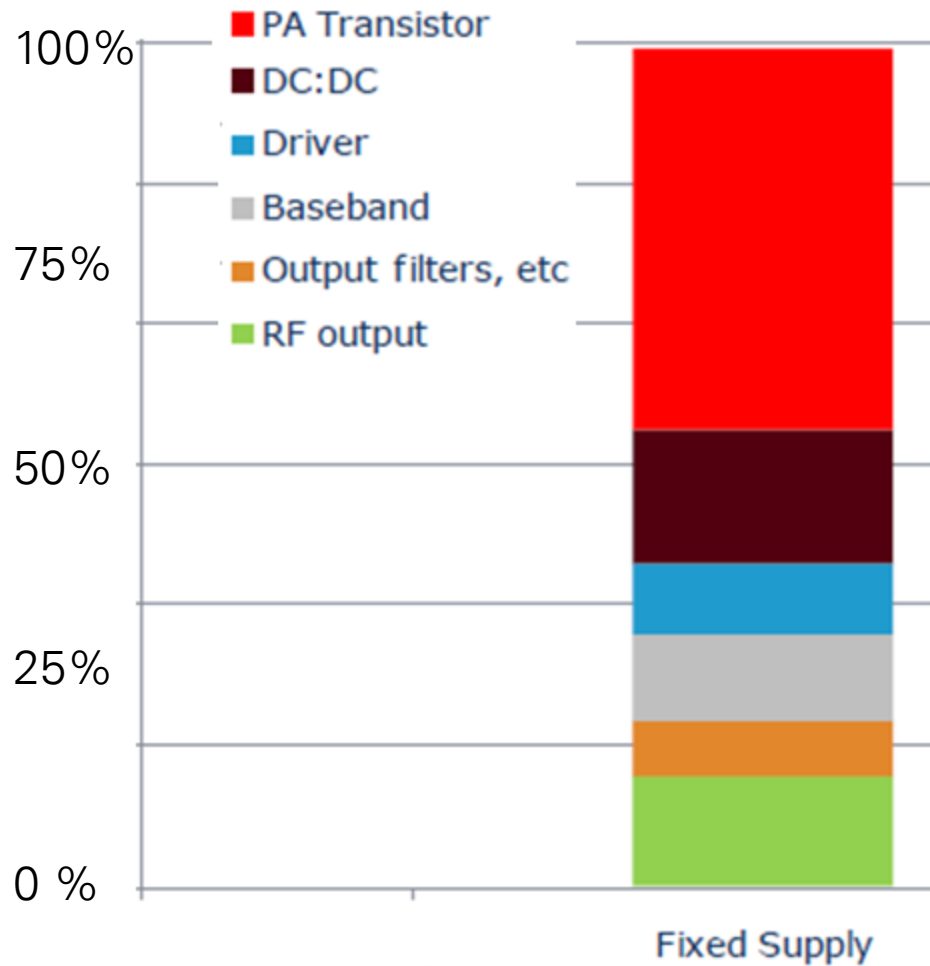


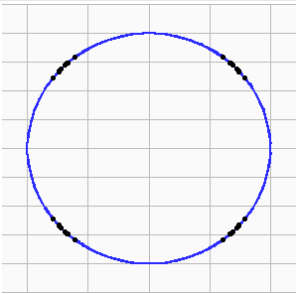
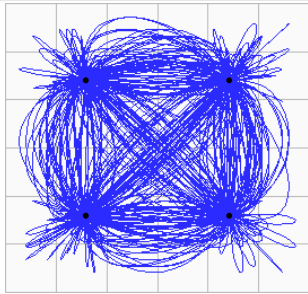
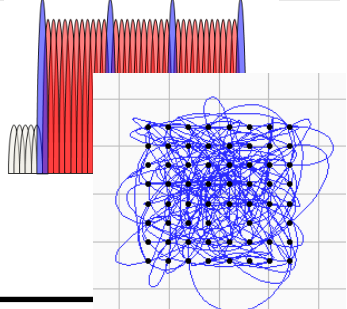
# 包络跟踪技术探讨及测试方案

National Instruments

# 发射器功耗分布

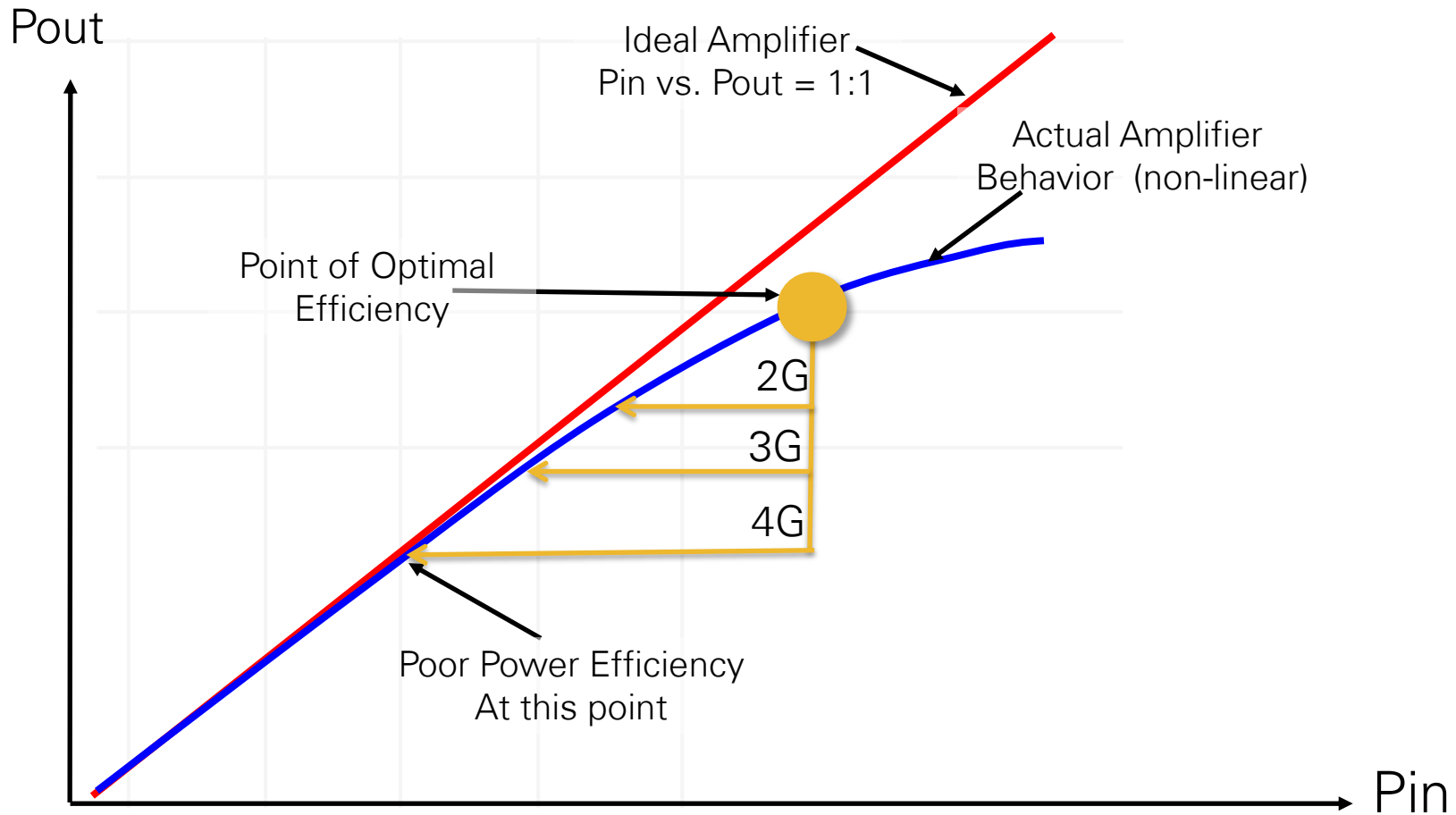


# 无线通信标准技术对比

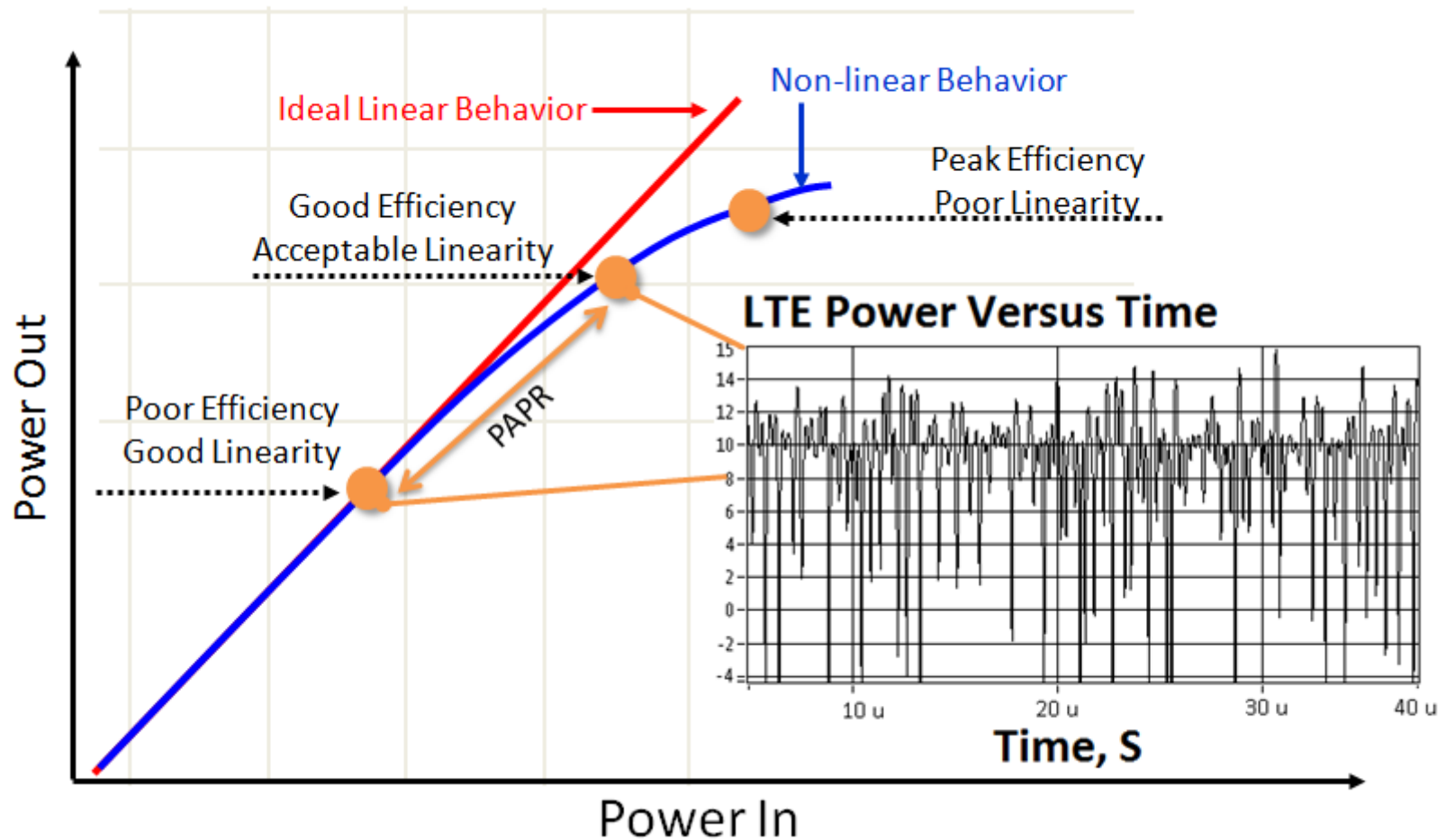
	GSM / EDGE	WCDMA	LTE
空间接入技术	TDMA/FDMA	Code Division Multiple Access	OFDMA (DL) SC-FDMA (UL)
代别	2G – 2.5G	3G	4G
带宽	200 kHz	5 MHz	1.4 to 20MHz
调制方式	GMSK (GSM), 8PSK (EDGE)	QPSK	OFDM, MIMO Up to 64-QAM
信号峰均值功率比(PAPR)	0-2dB	~3.5dB	>8dB
星座图			

现代无线通信标准具有不断增加的调制复杂度

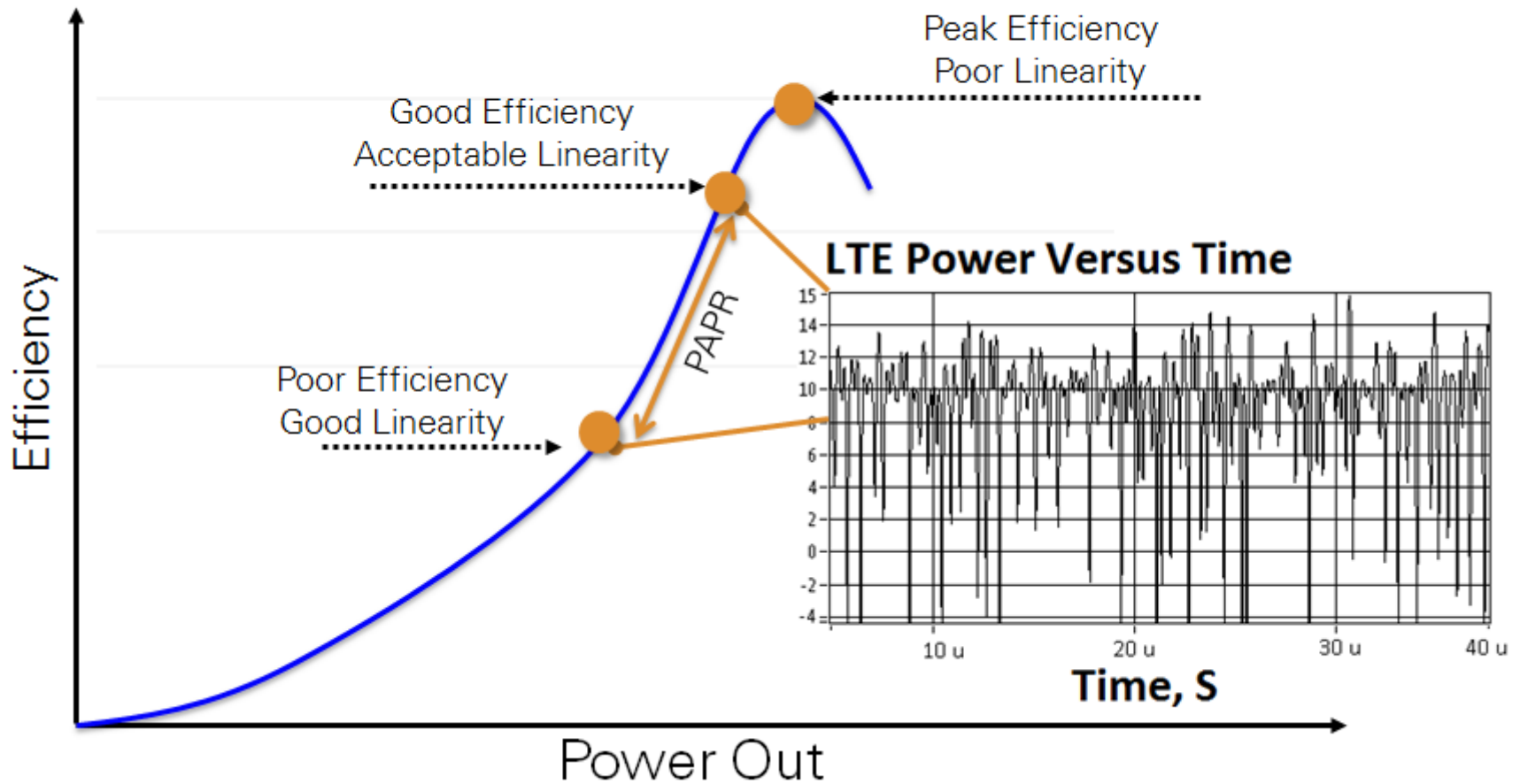
# 功率放大器输入输出曲线(Power Out vs Power In)



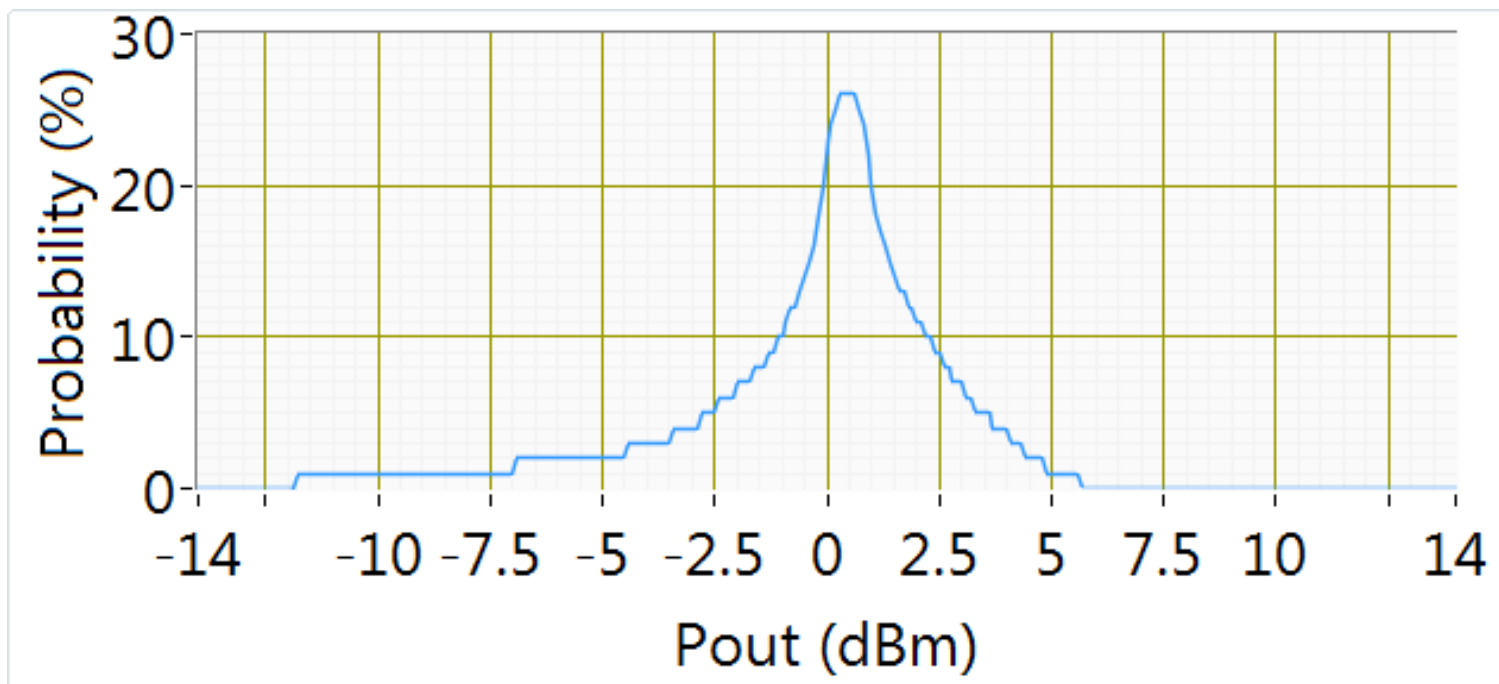
# 功率放大器输入输出曲线(Power Out vs Power In)



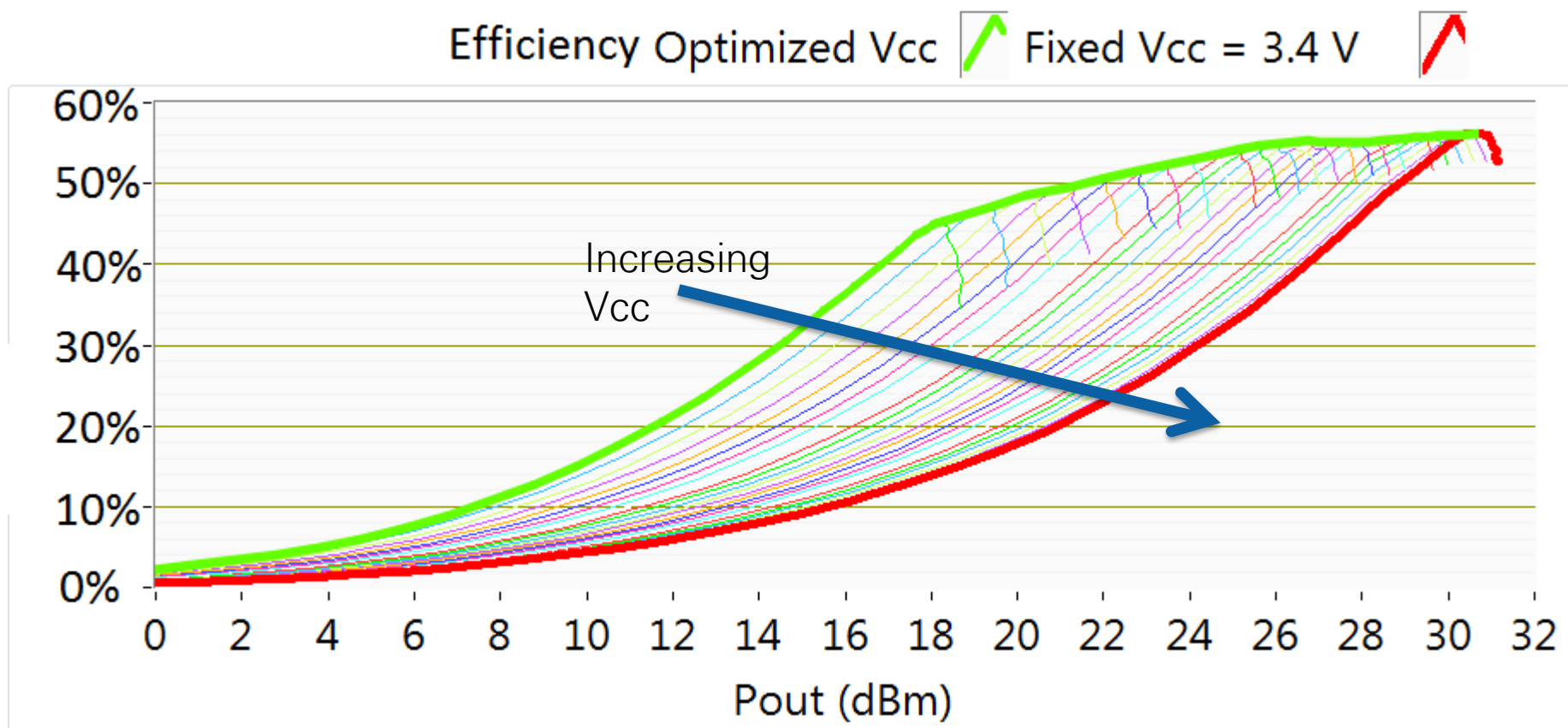
# 功率放大器效率曲线(Efficiency vs Power Out)



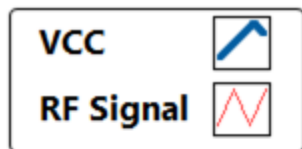
# 输出功率概率分布



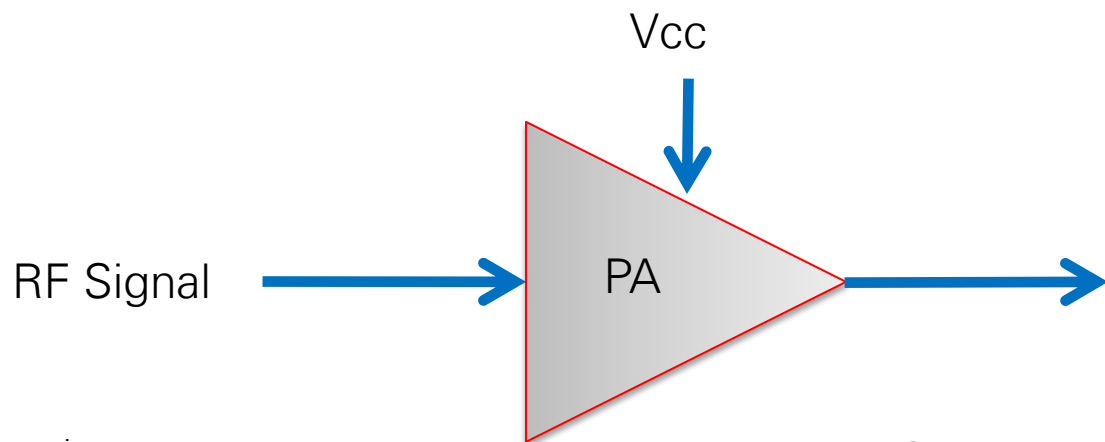
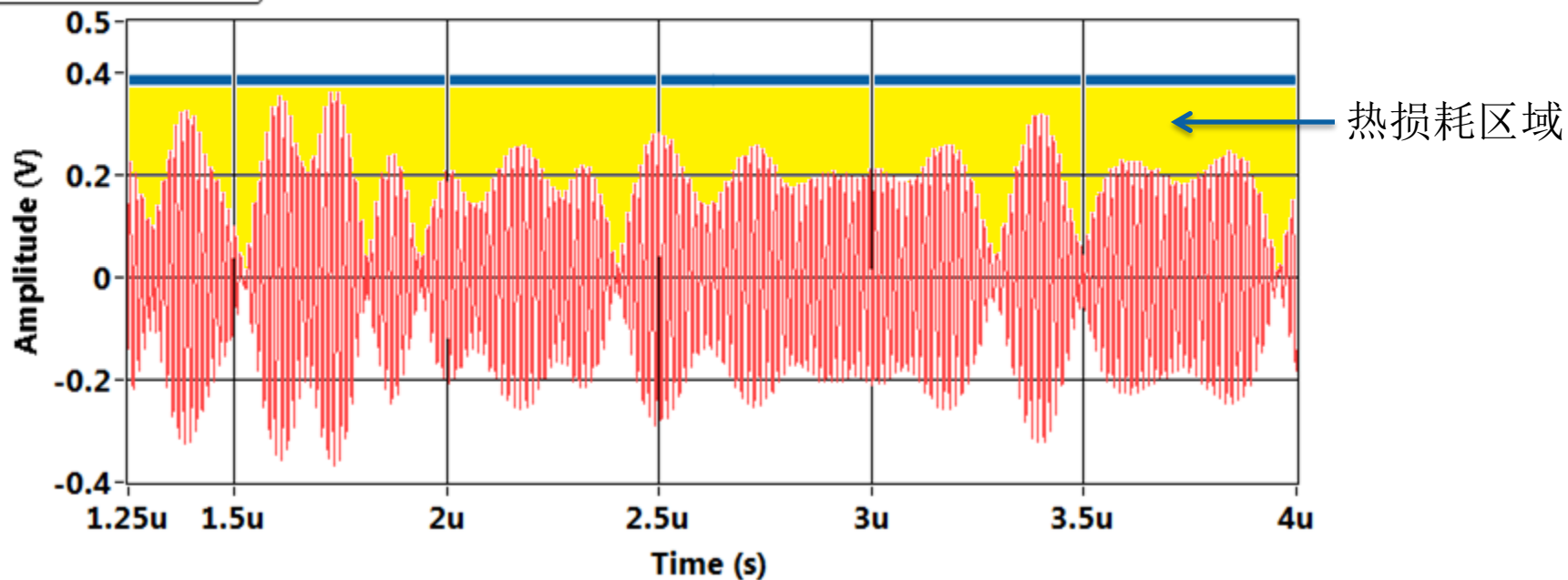
# 不同Vcc下功放效率曲线





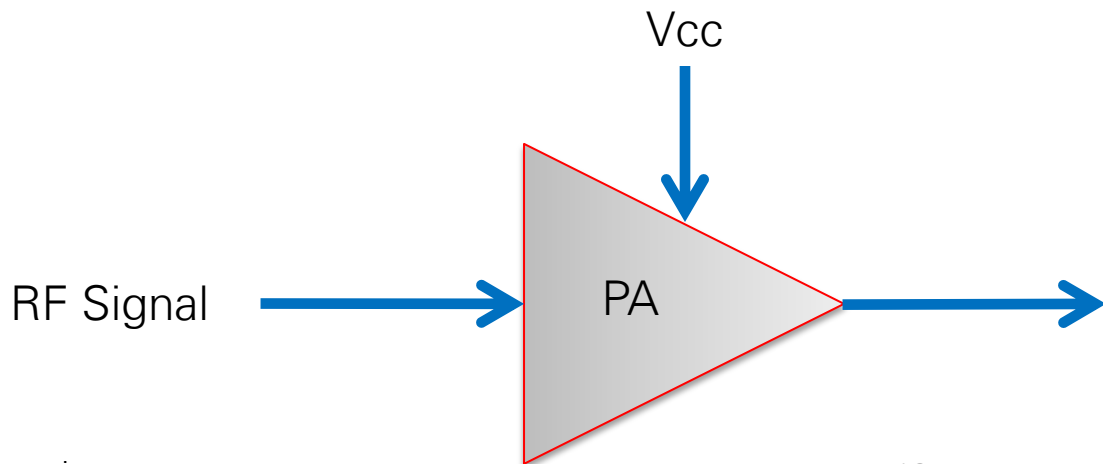
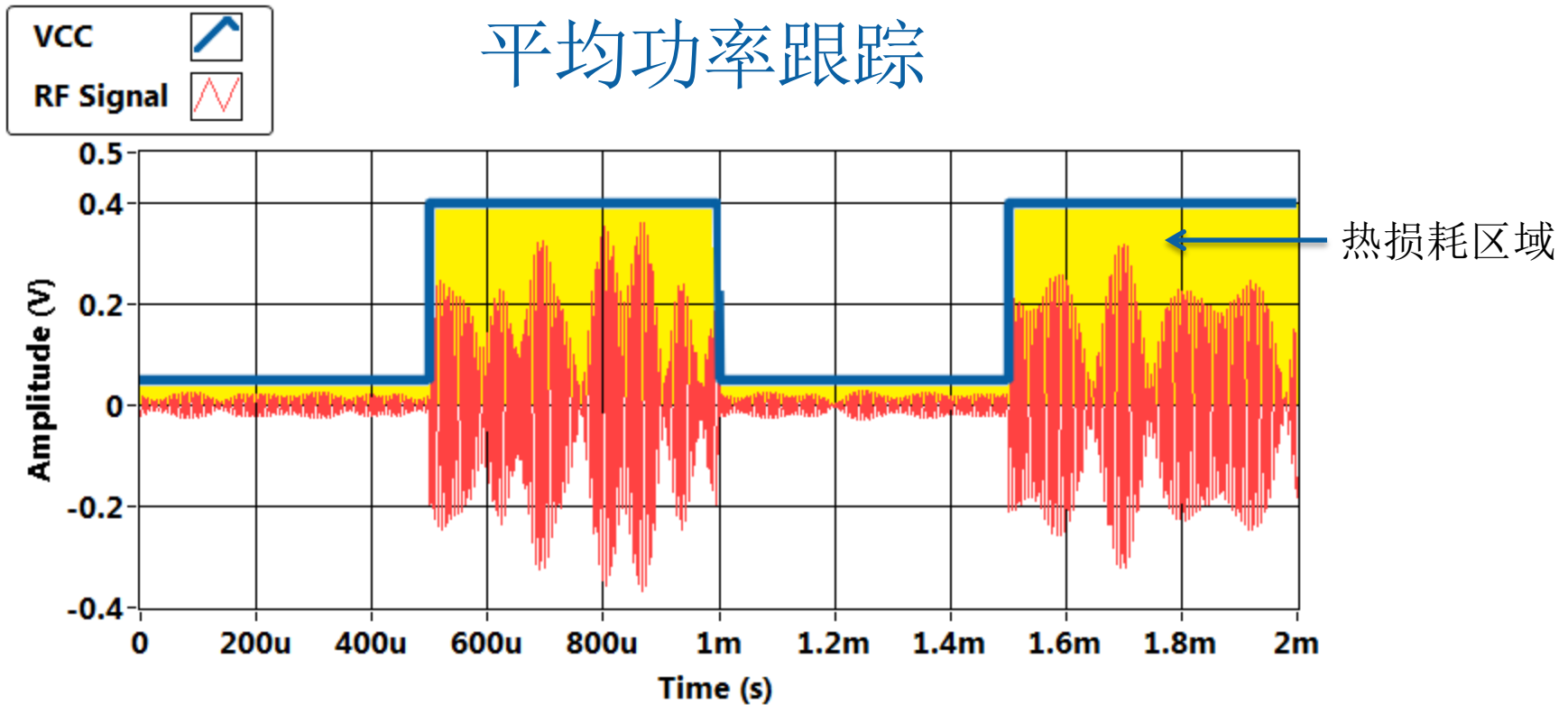


# 固定供电电压



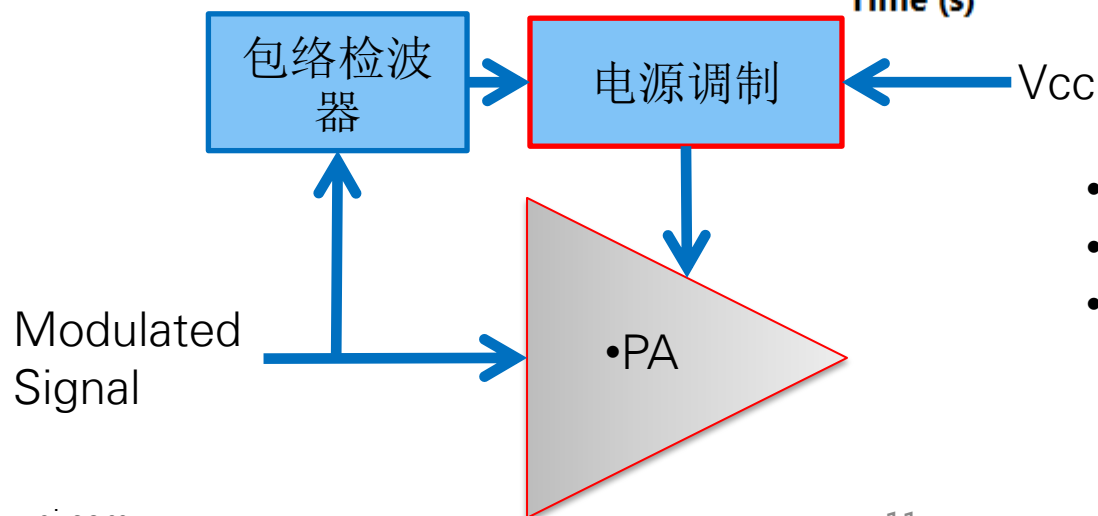
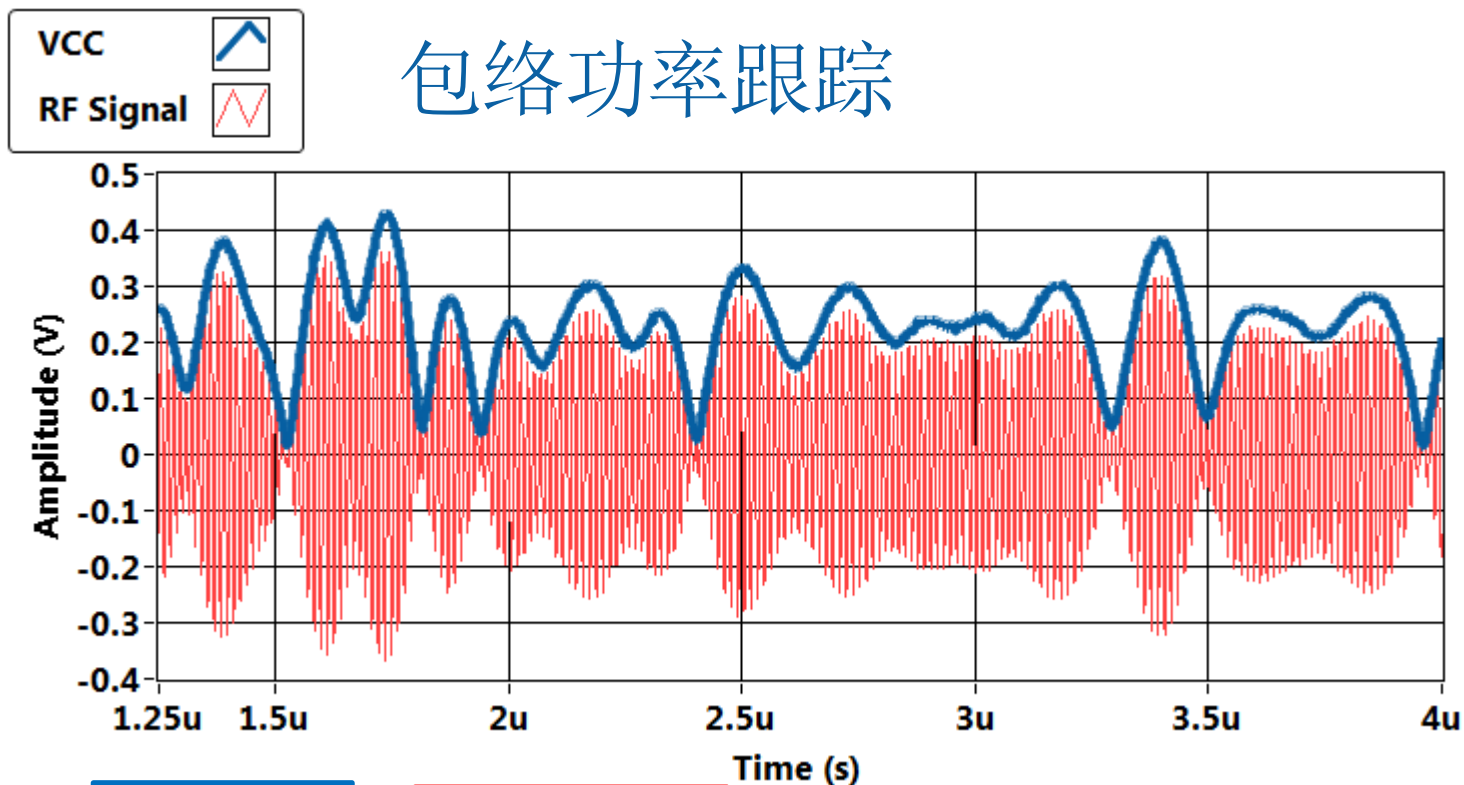
- 简单，有效性差
- 有效性是PAPR的函数

# 平均功率跟踪



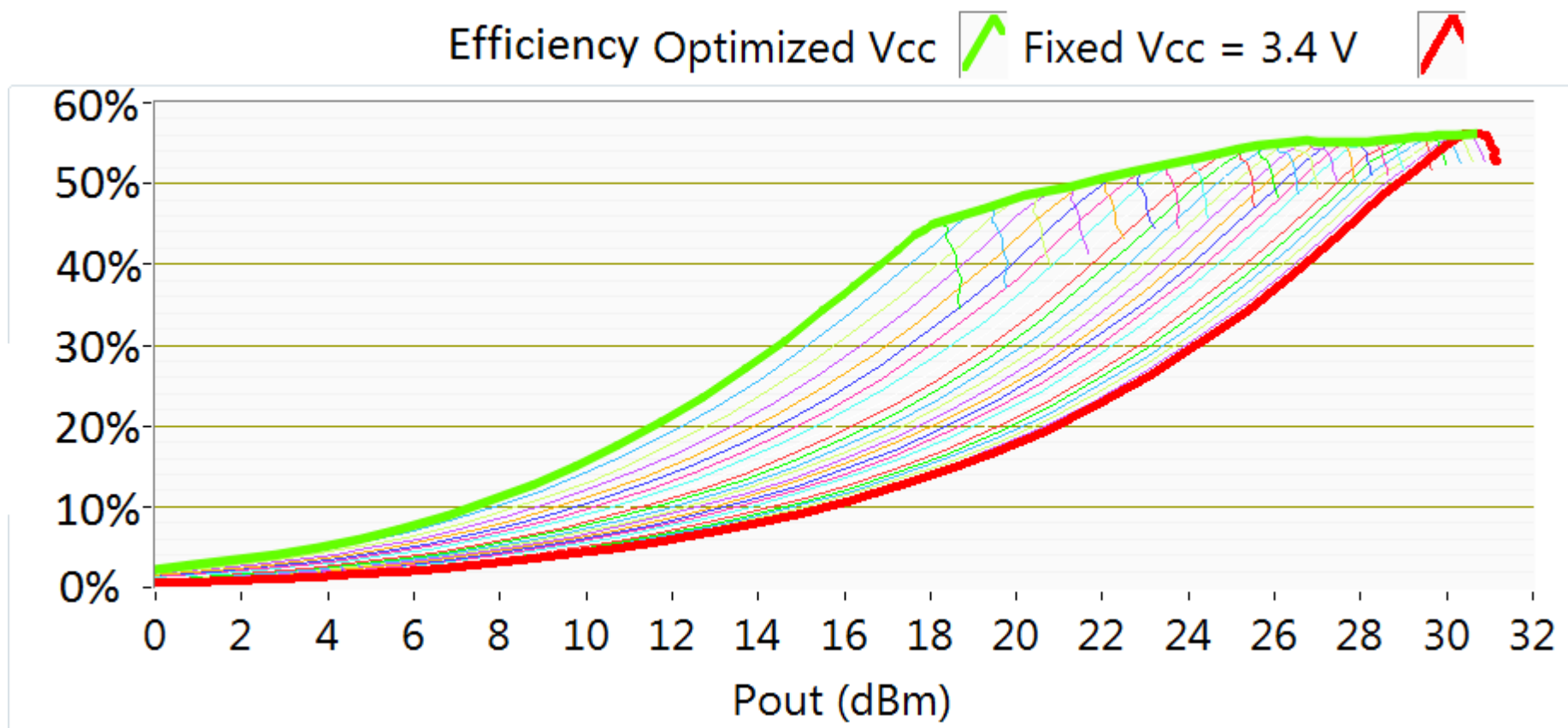
- 多用于TDMA
- 在低功耗时提高了有效性
- 对高功率没有改善
- 有效性受波形影响

# 包络功率跟踪

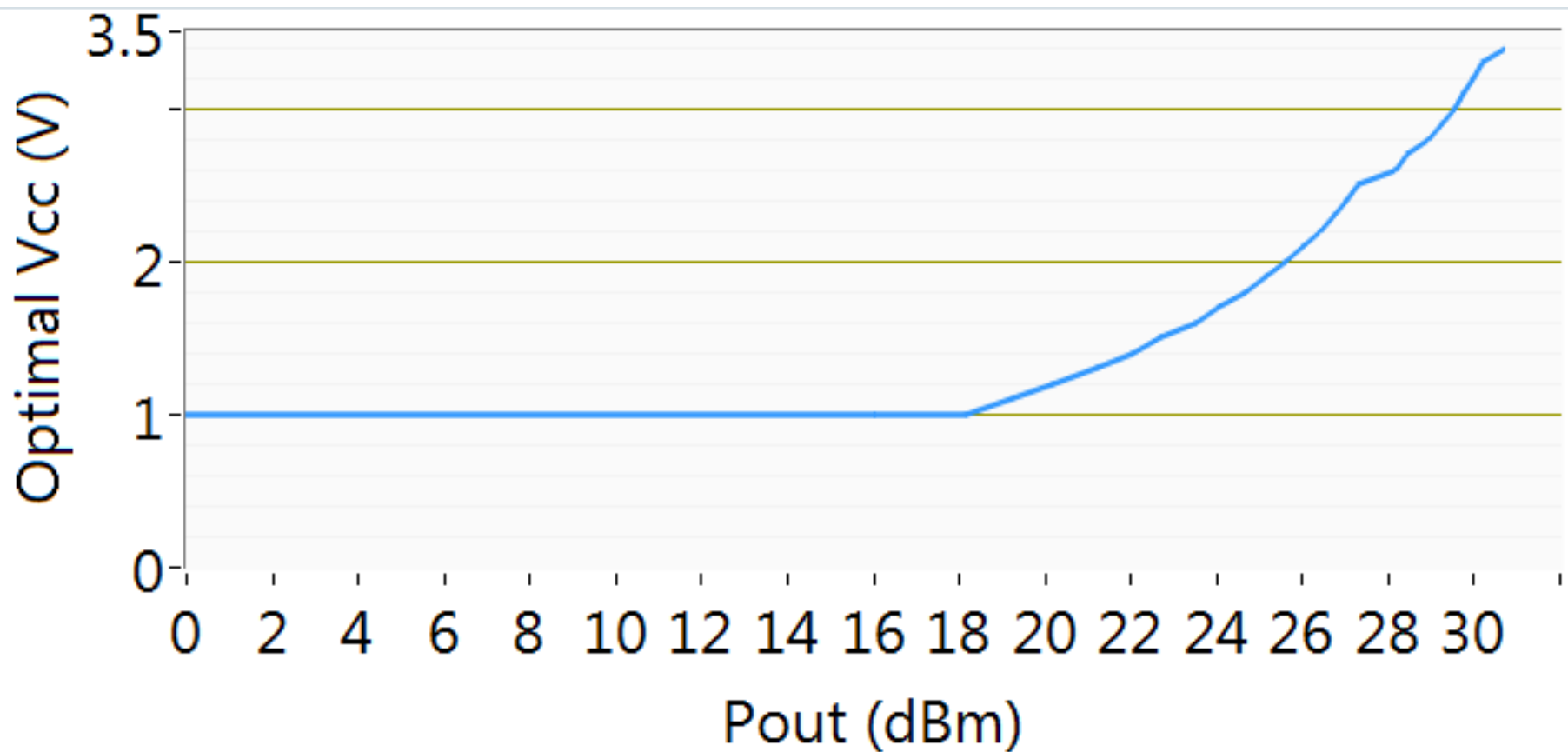


- 动态高带宽供电电源
- 有效性提升近90%
- 与信号波形无关

# 不同Vcc下功放效率曲线

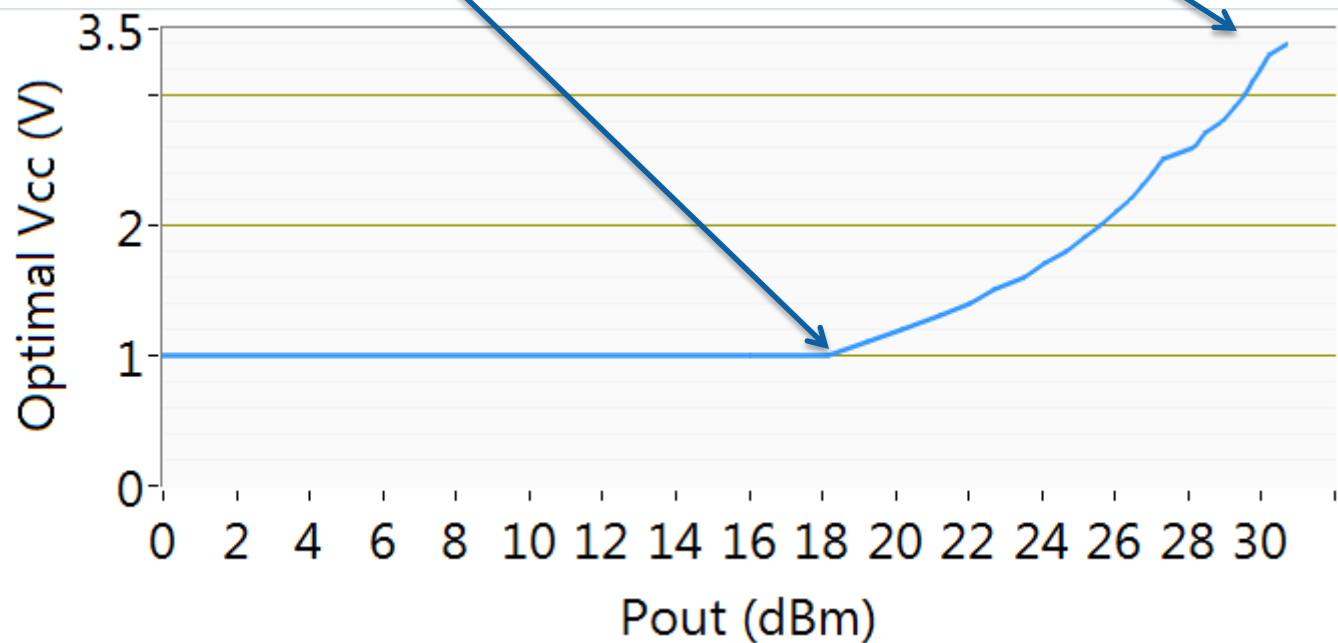
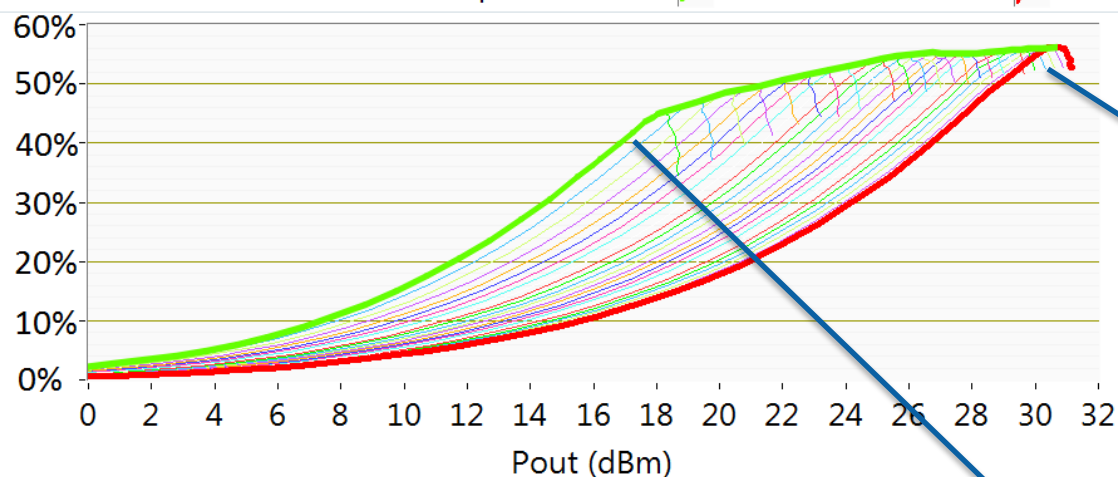


# 功放供电电源电压查找表

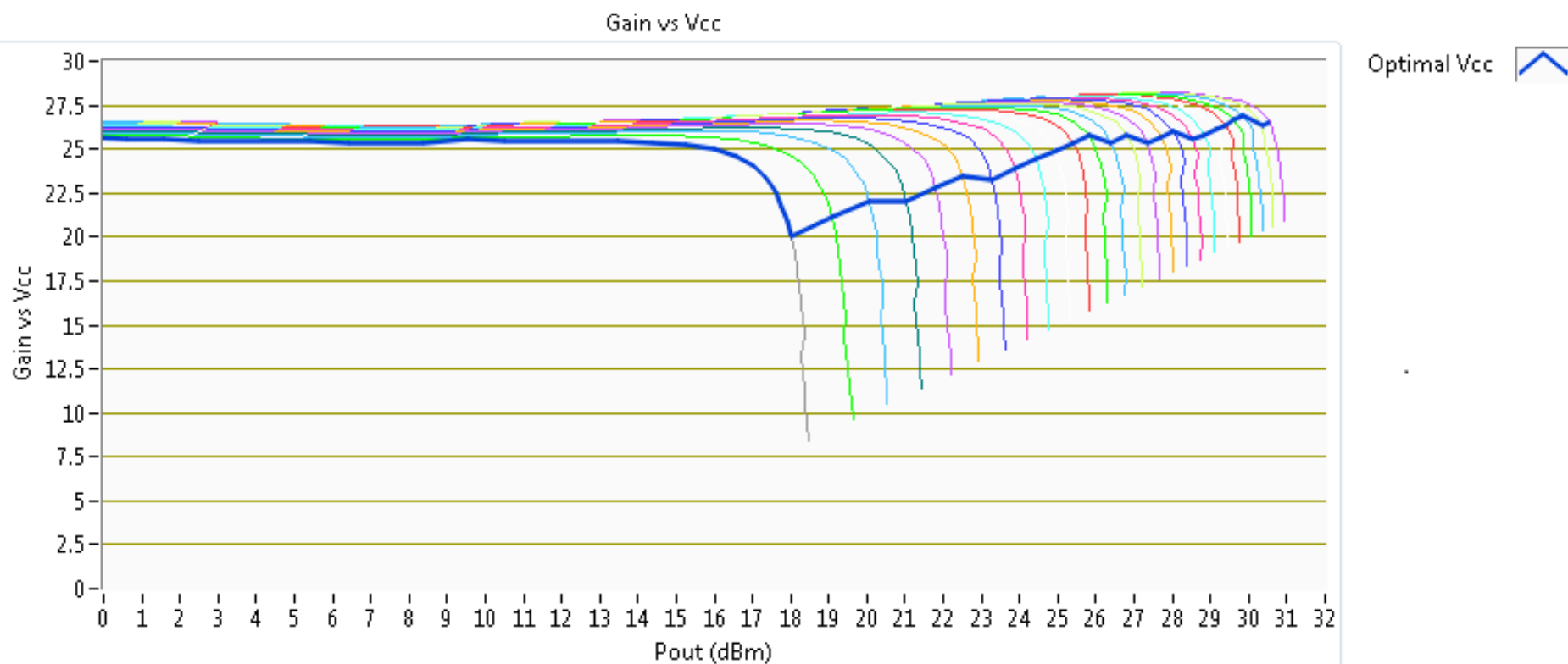


# 功放供电电源电压查找表

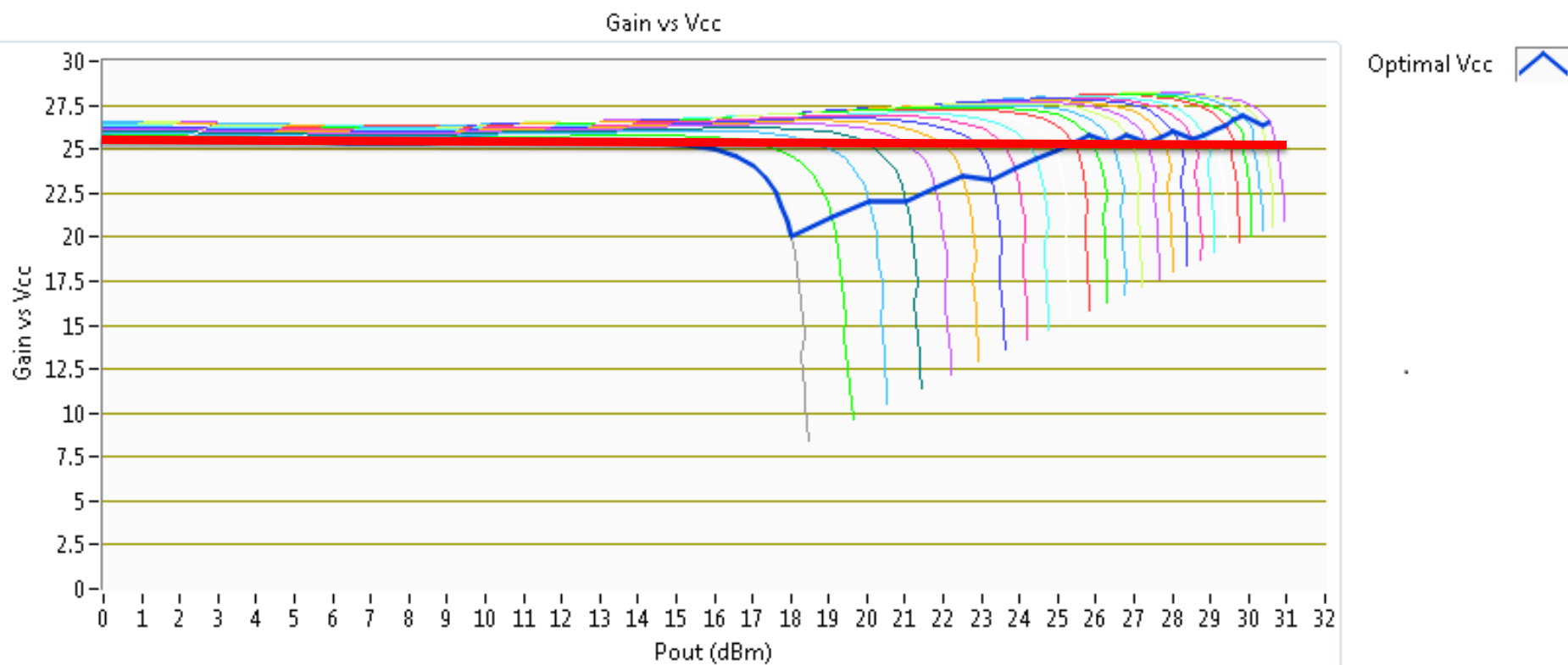
Efficiency Optimized Vcc  Fixed Vcc = 3.4 V 



# 增益曲线—最佳有效性

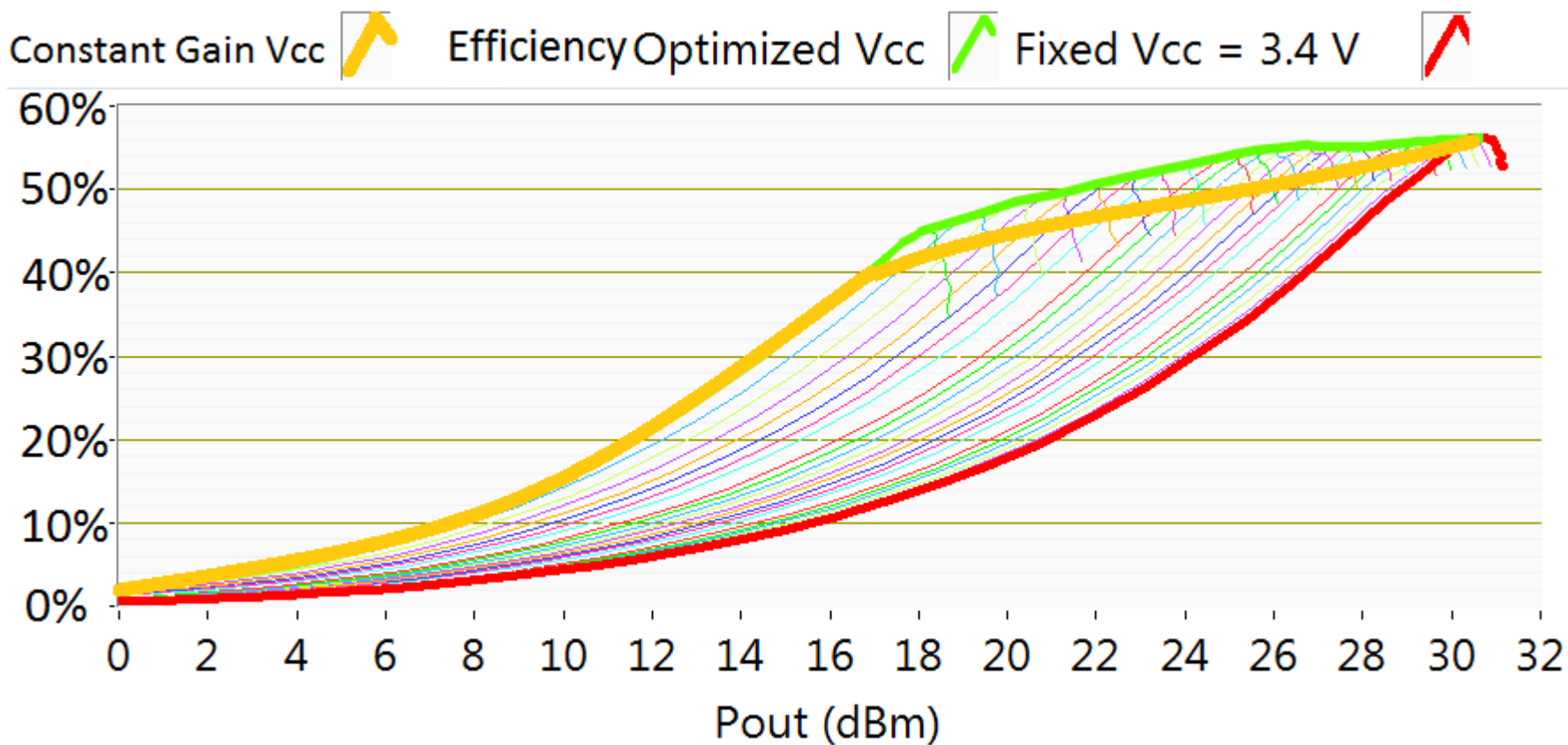


# 恒定增益曲线



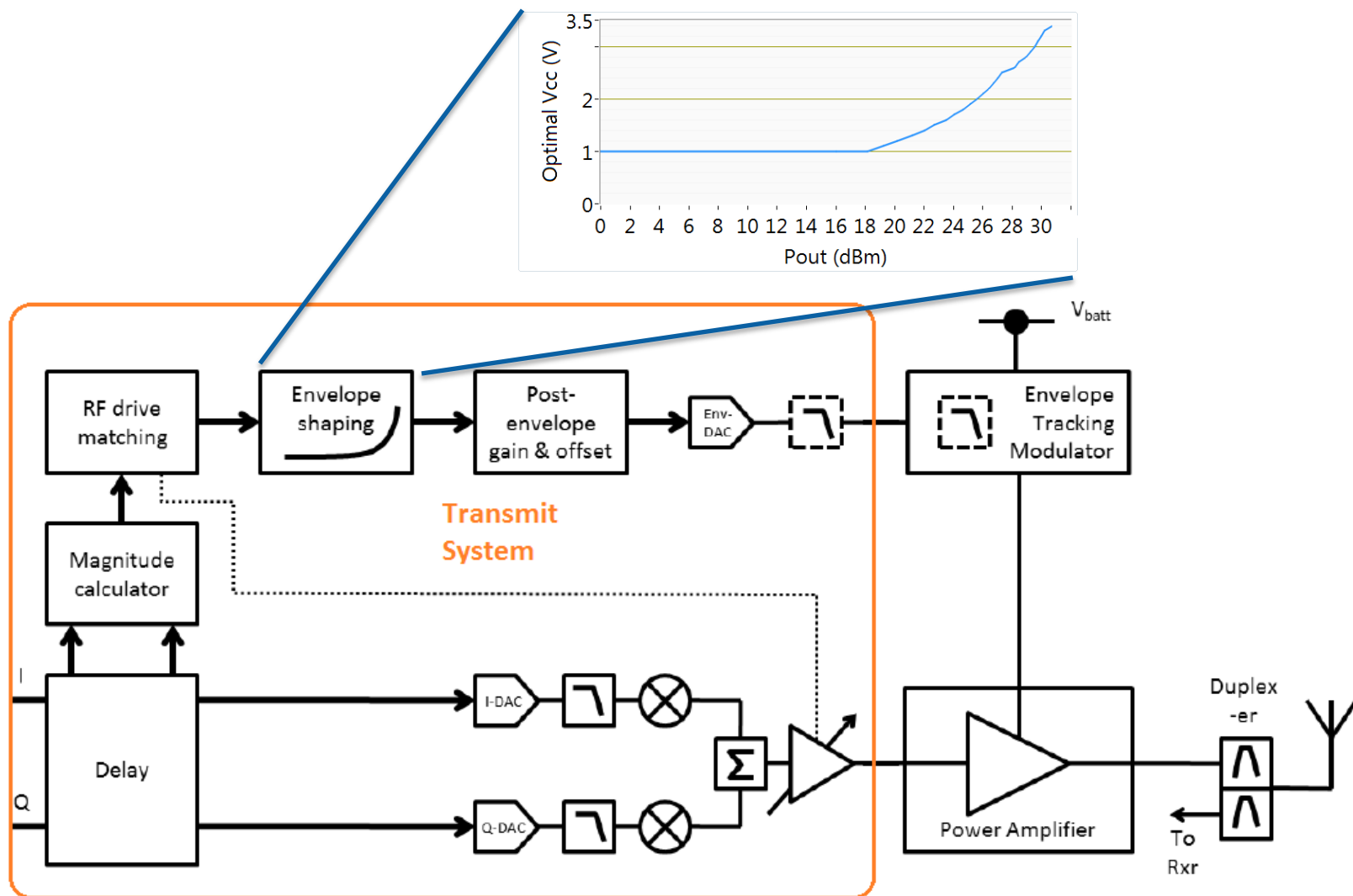


# 恒定增益与最佳有效性增益

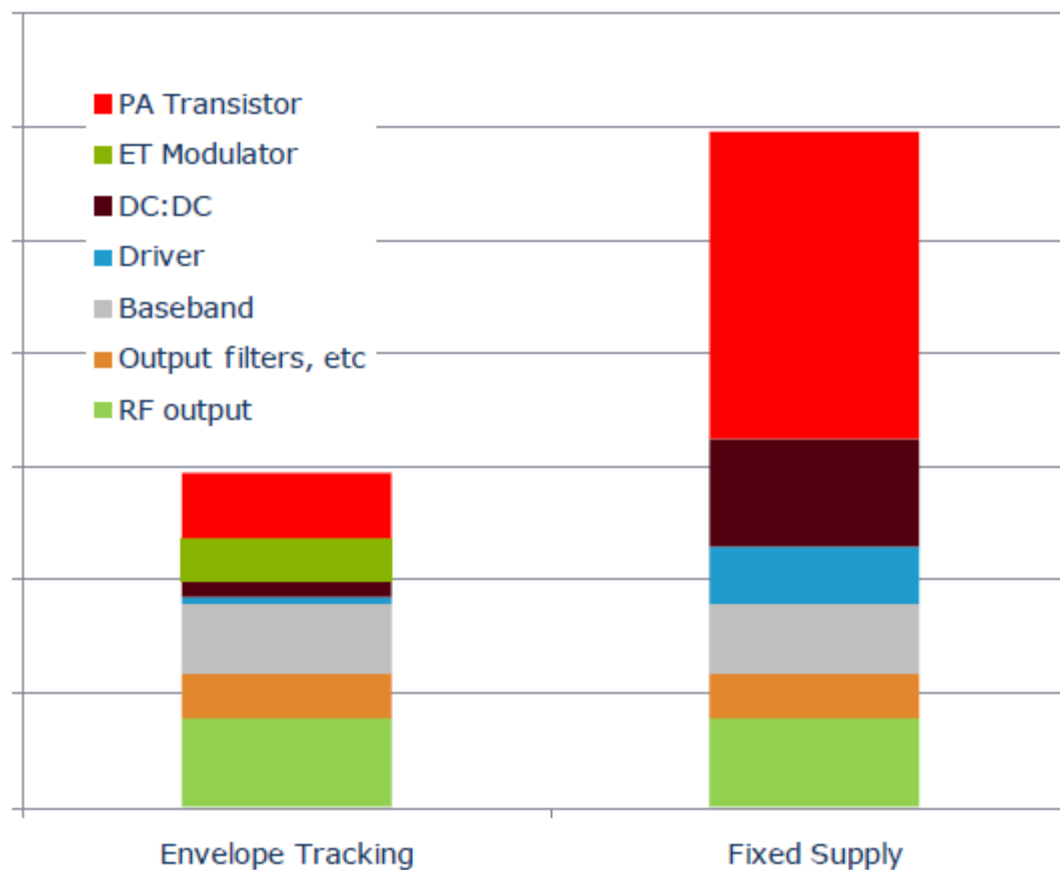


NO DPD Required

# 包络跟踪发射器

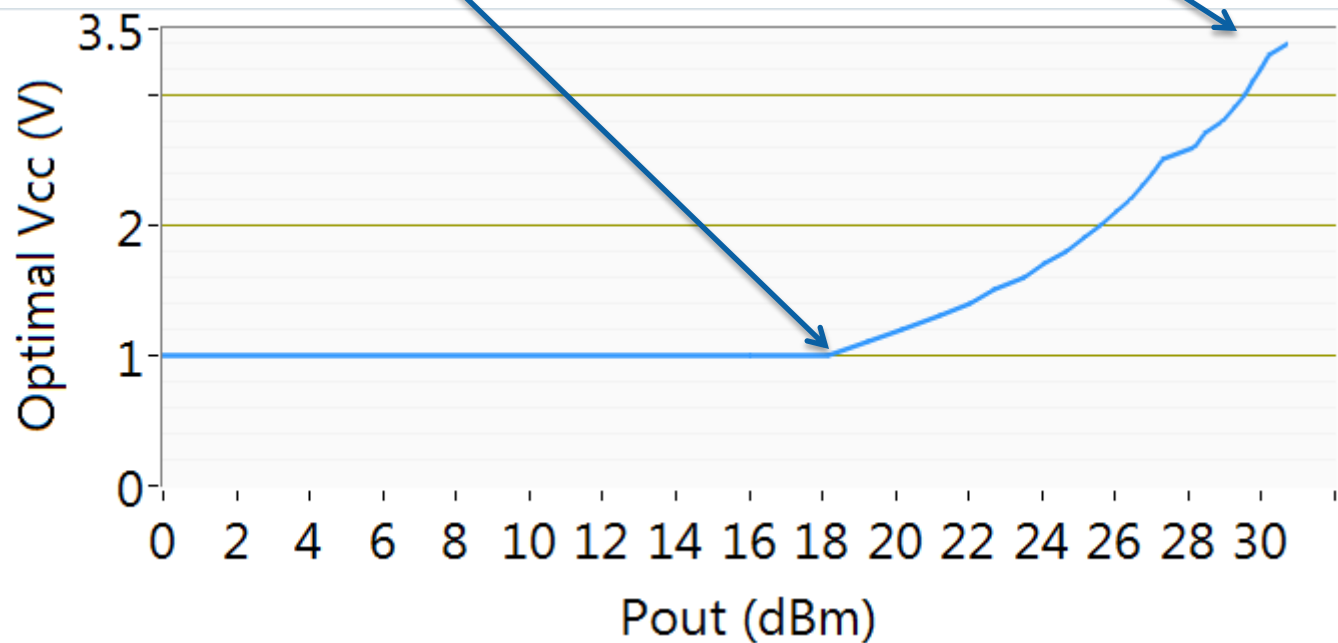
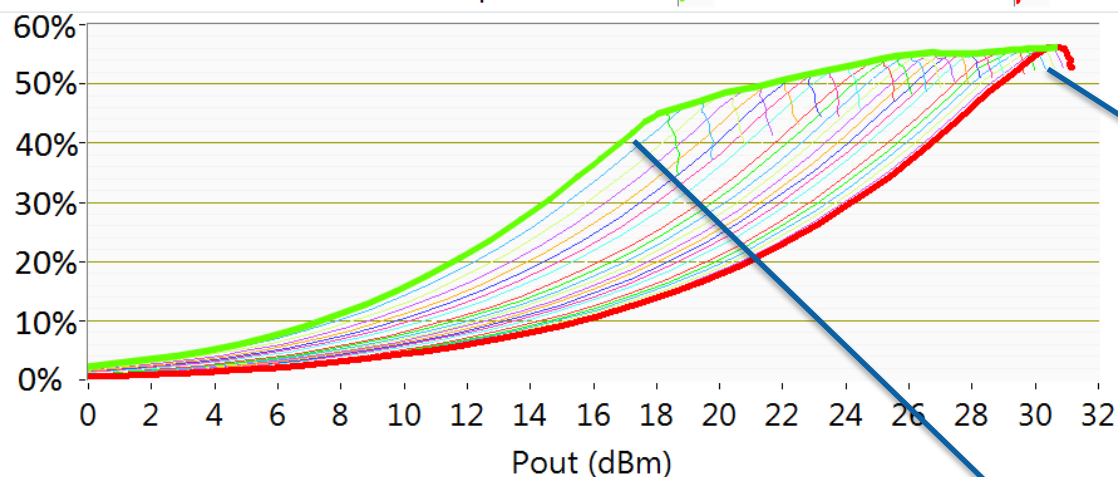


# 发射机功率损耗对比

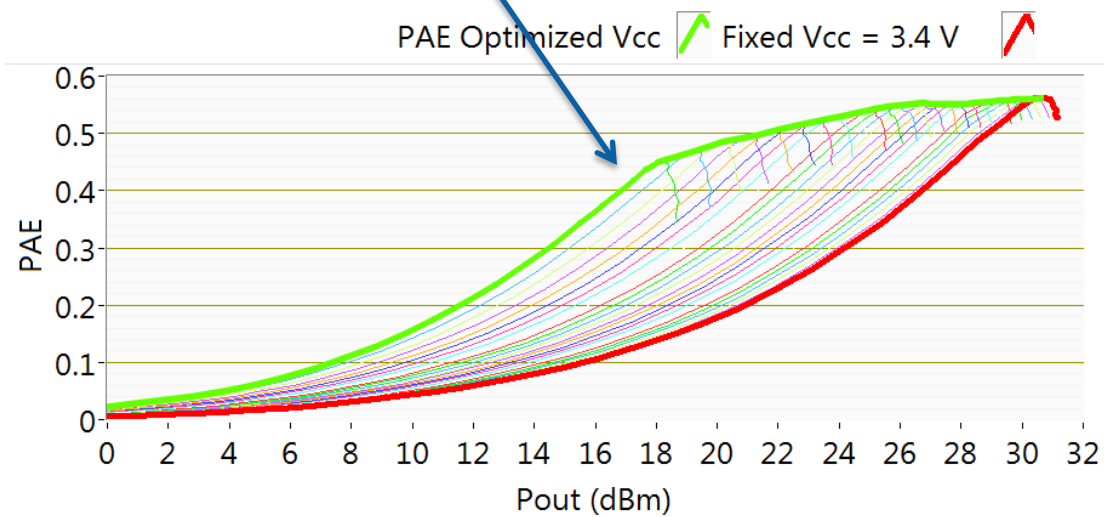
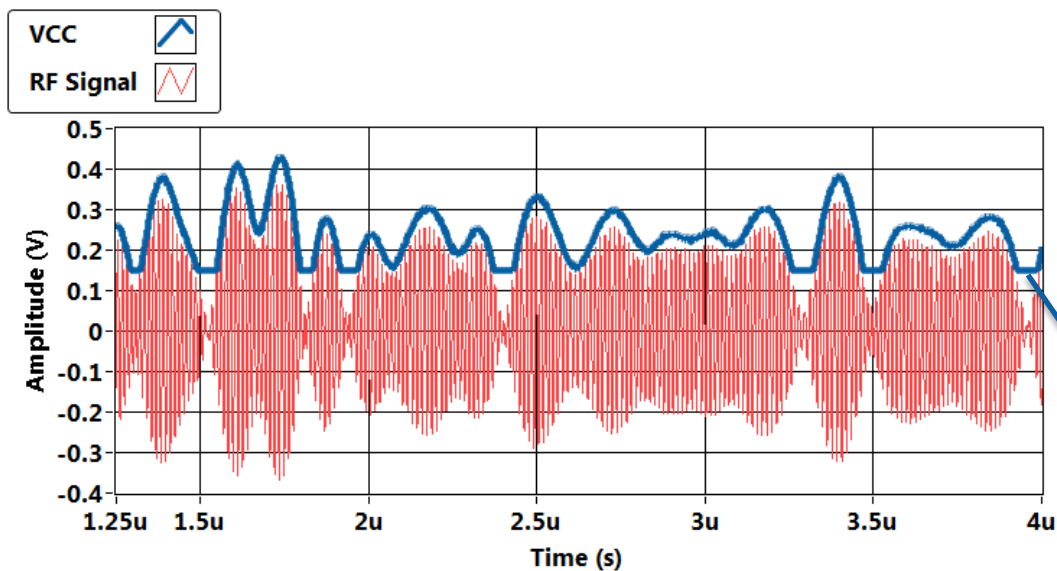


# 功放供电电源电压查找表

Efficiency Optimized Vcc  Fixed Vcc = 3.4 V 

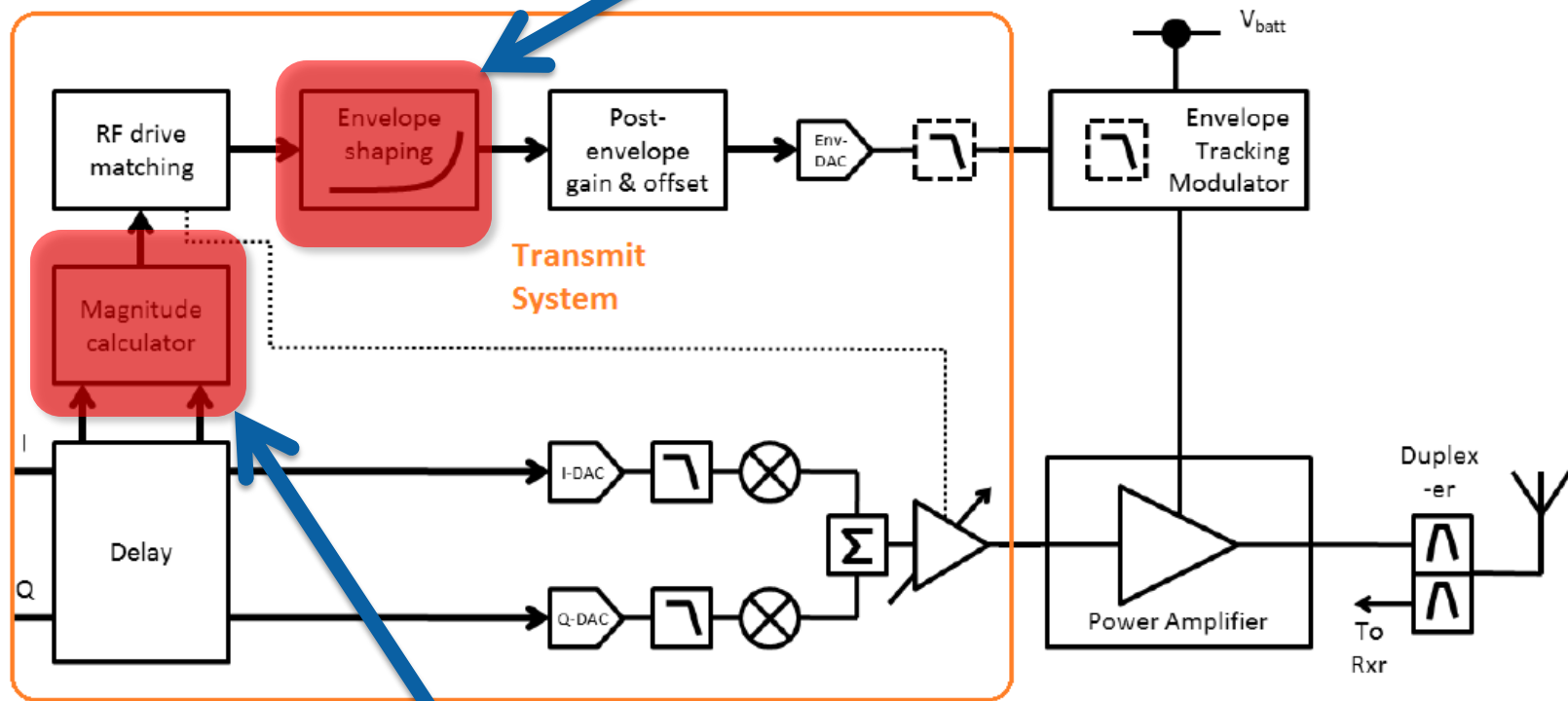


# 包络跟踪电源电压钳制



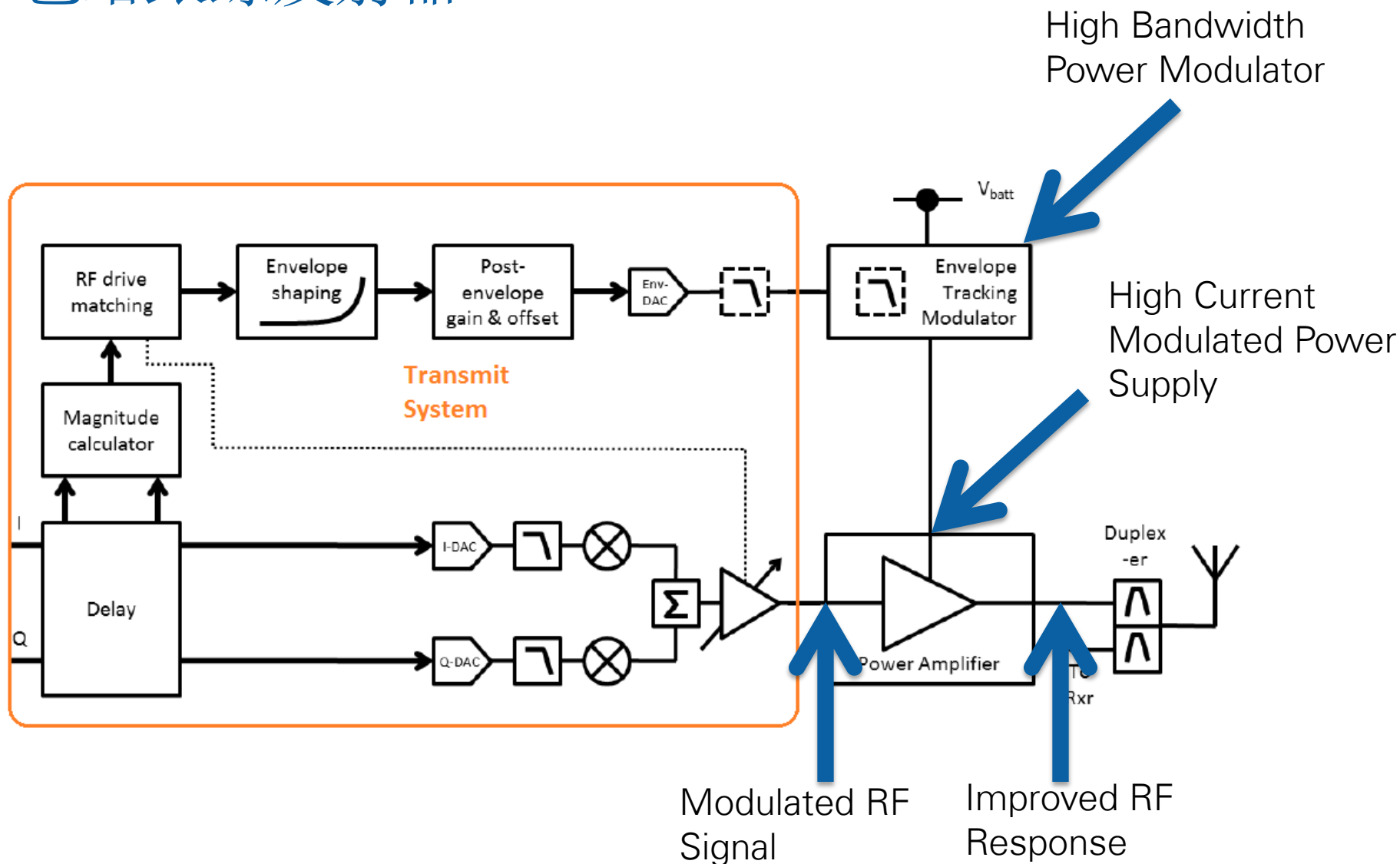
# 包络跟踪发射器

Voltage Limits  $\rightarrow$  Increased Bandwidth

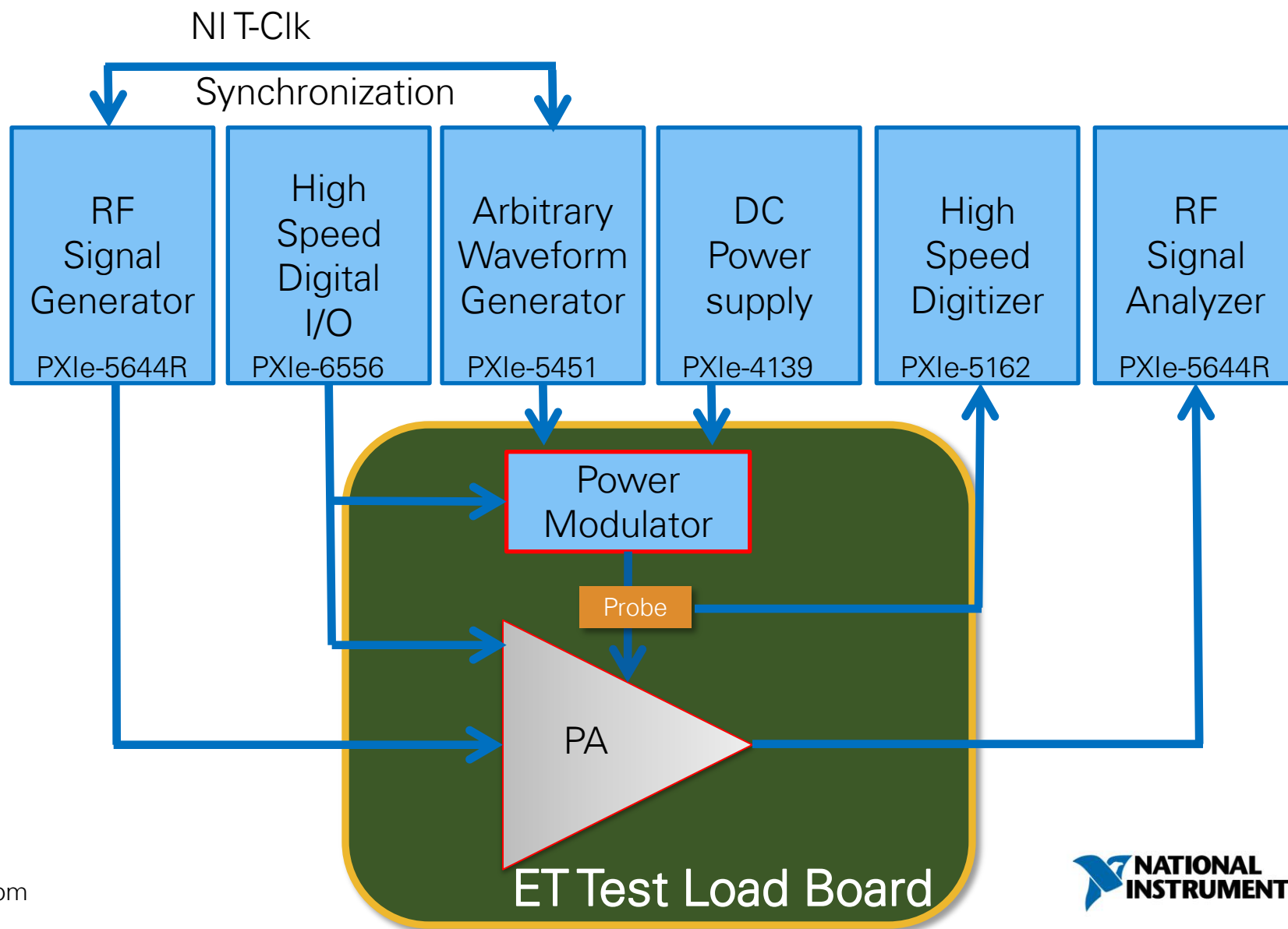


Results in a Squared Term  $\rightarrow$  Increased Bandwidth

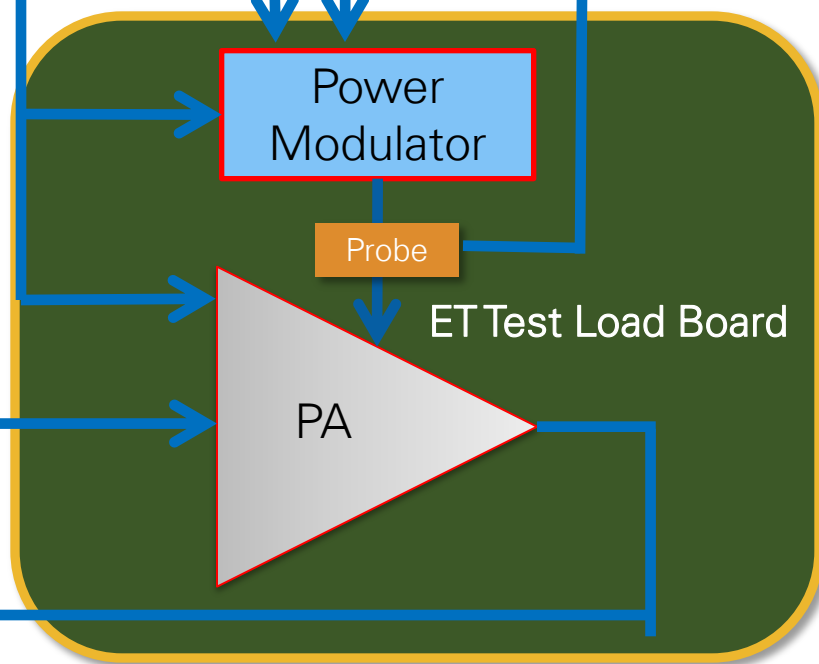
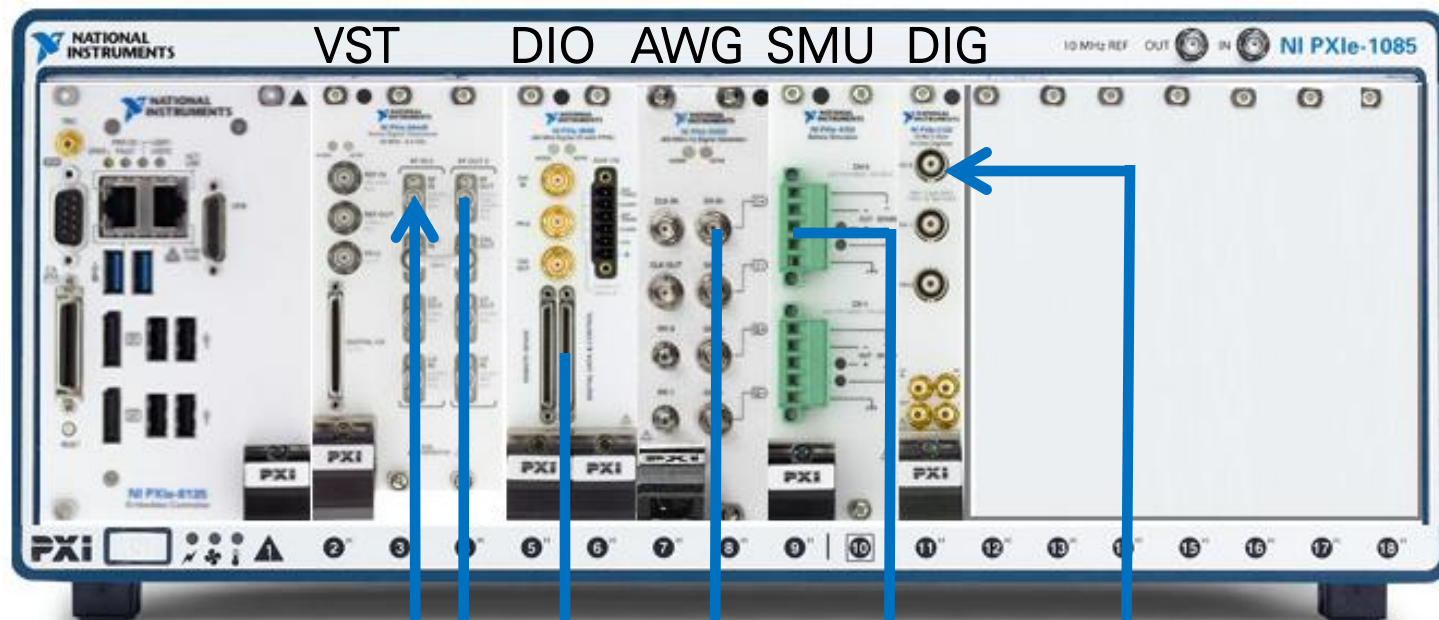
# 包络跟踪发射器



# 包络跟踪测试系统





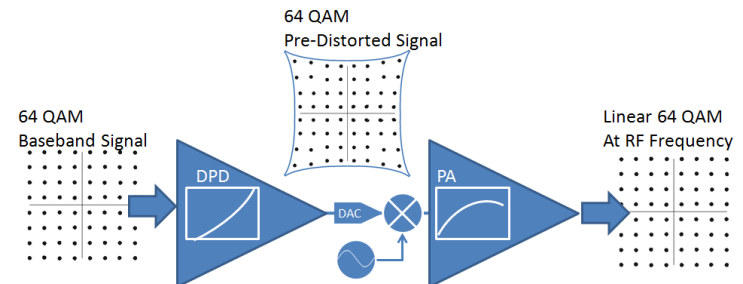
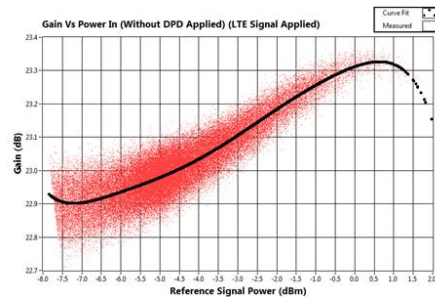
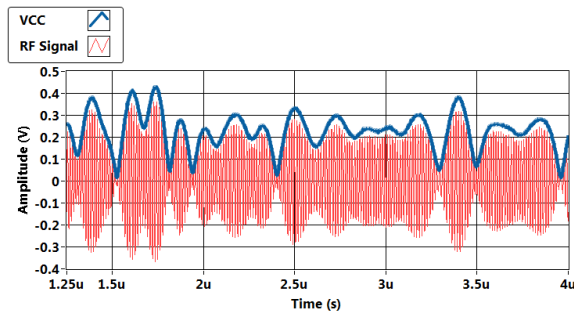


# 演示系统



# NI包络跟踪技术优势

- 高性能PXI平台提供高速兼具灵活的包络跟踪方案
- 通用的模块化仪器为包络跟踪方案提供了更多可能
- PXI T-CLOCK技术保障了精准的模拟与数字信号同步
- 具有多种DPD算法可供选择
  - Look up Table, AMPM, Memory Polynomial, etc...





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Questions ?

