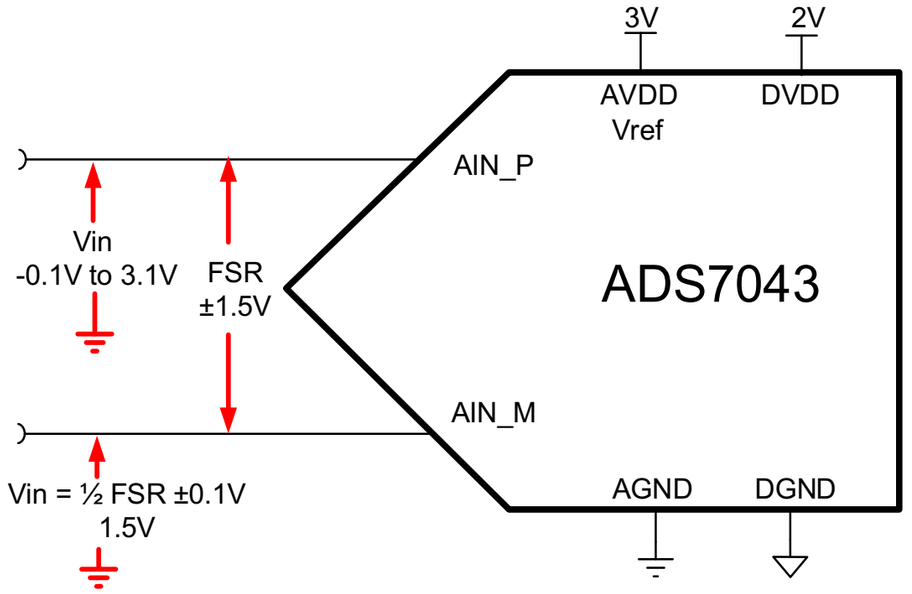
Introduction to Precision Labs-Pro Webinar Series

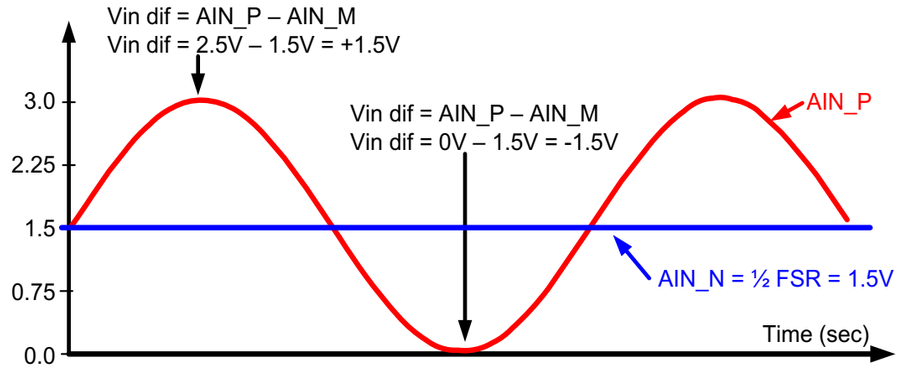
TI Precision Labs – ADC

by Art Kay

What is Precision Labs (PLABS)?

- Logical sequence – like a college curriculum
- Questions and solutions to reinforce learning
- Covers a wide range of expertise
- Hands-on aspect (EVM)
- Teaching with pictures and heavily animated
- Teaching with practical real world examples
- Less math more practical
- Short length to each video (10 to 15min)

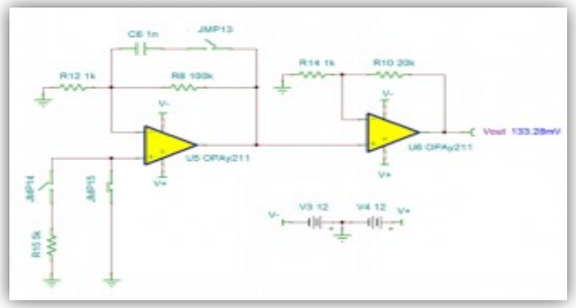


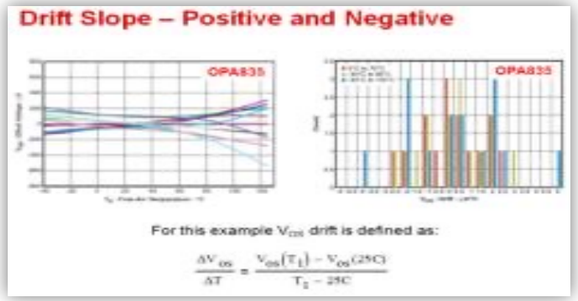


TI Precision Labs Now including ADCs, MUXs, and Comparators!!!

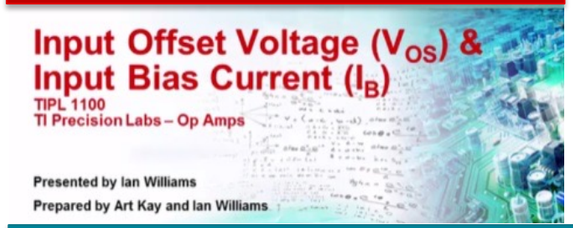
ti.com/PrecisionLabsADCs

- Created for both new and experienced engineers
- 80+ Lectures with quizzes & Labs with experiments
- < 15 minutes per video, 16 hrs of total content





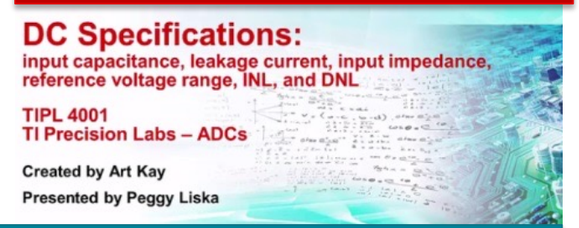
Op Amps



Comparators

MUXes

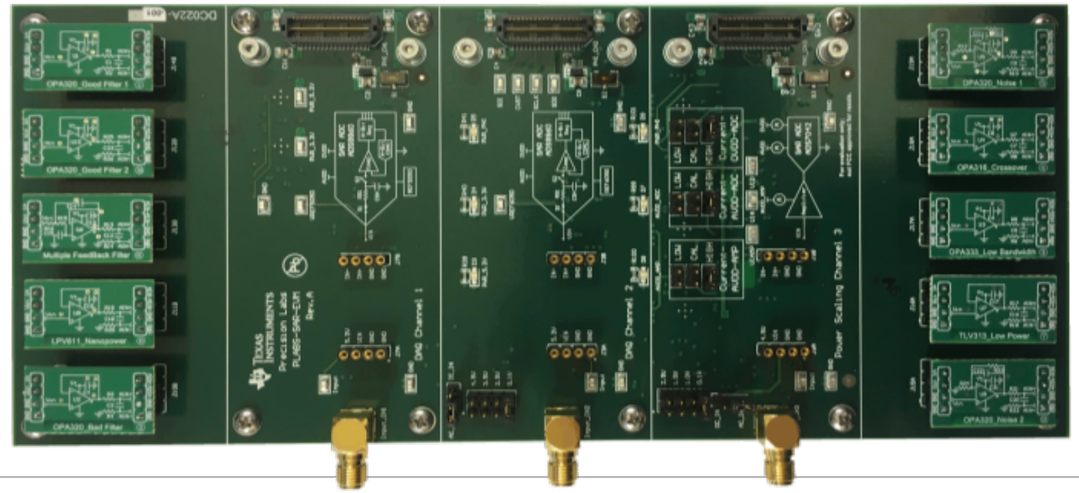
ADCs

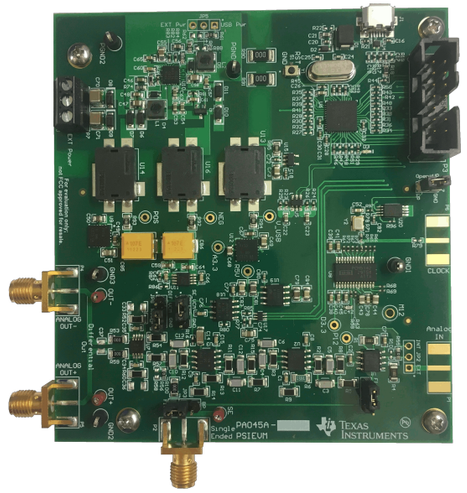


More than 80+ videos!!!

How is PLABS Pro Webinar Different?

- Opportunity to ask questions and get immediate feedback.
- Five 90 min Live Sessions
  - 60 min theory + 15 min hands-on experiments + 15 min Q & A
- Webinar material is a subset of on-line content
  - Webinar focuses on key concepts that relate to hands-on experiments
  - Webinar is a “readers digest” version of the on-line content





Sessions Cover

1. ADC Amplifier Drive Configurations and Swing Limitations
   - Hands-on: Crossover distortion measurement
2. ADC Error Sources (Offset, Gain Error, Noise)
   - Hands-on: Noise calculation, simulation, and measurement
3. Understanding the frequency domain (FFT, Windowing, Aliasing)
   - Hands-on: Aliasing and anti- aliasing filters
4. Selecting Components in SAR ADC Drive (amplifier bandwidth and RC filter)
   - Hands-on: Comparison of properly designed input to improperly designed
5. Low Power SAR Design (ADC Power Scaling and low power amplifiers)
   - Hands-on: Power measurement vs sampling rate with different amplifiers.

Suggested Pre-work: Watch ADC and Op Amp PLABS

ADC PLABS: DC Specifications: Input Capacitance, Leakage Current, Input Impedance, Reference Voltage Range, INL, and DNL

https://training.ti.com/ti-precision-labs-adcs-dc-specifications?cu=1128375

ADC PLABS: AC & DC Specifications: Offset Error, Gain Error, CMRR, PSRR, SNR, and THD

https://training.ti.com/ti-precision-labs-adcs-ac-dc-specifications?cu=1128375

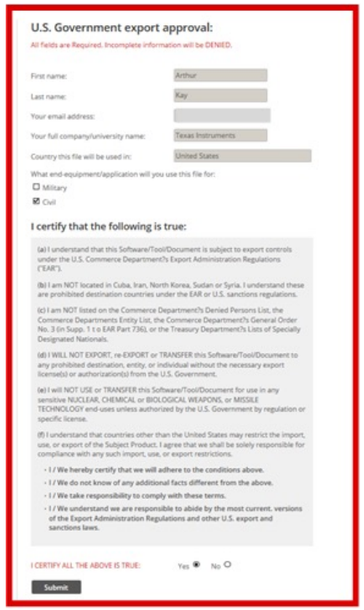
Op Amp Plabs: Input and Output Limitations 1

https://training.ti.com/ti-precision-labs-op-amps-input-and-output-limitations-1?cu=14685

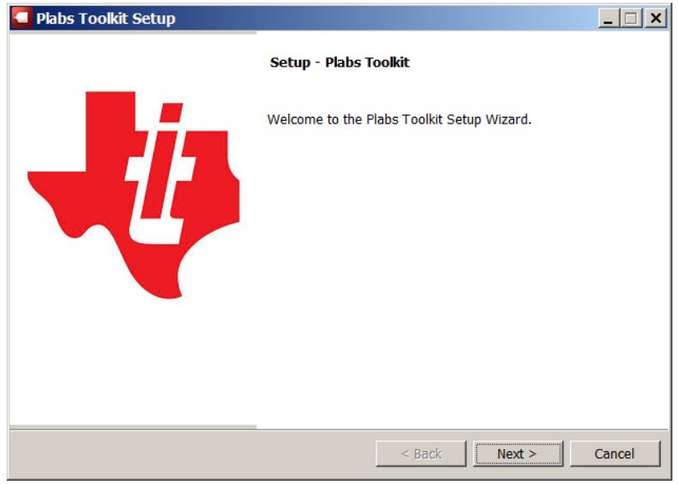
Install PLABS-SAR-EVM-PDK Setup Toolkit

- Purchase hardware and download at: http://www.ti.com/tool/plabs-sar-evm-pdk
- You will need to fill out forms and accept license agreements.
- It will take a few minutes to download and install (275MByte file).

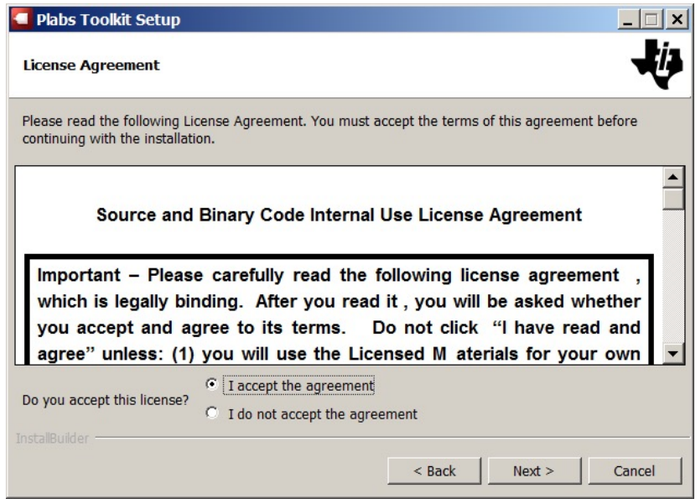
US Government Approval



Start software installation



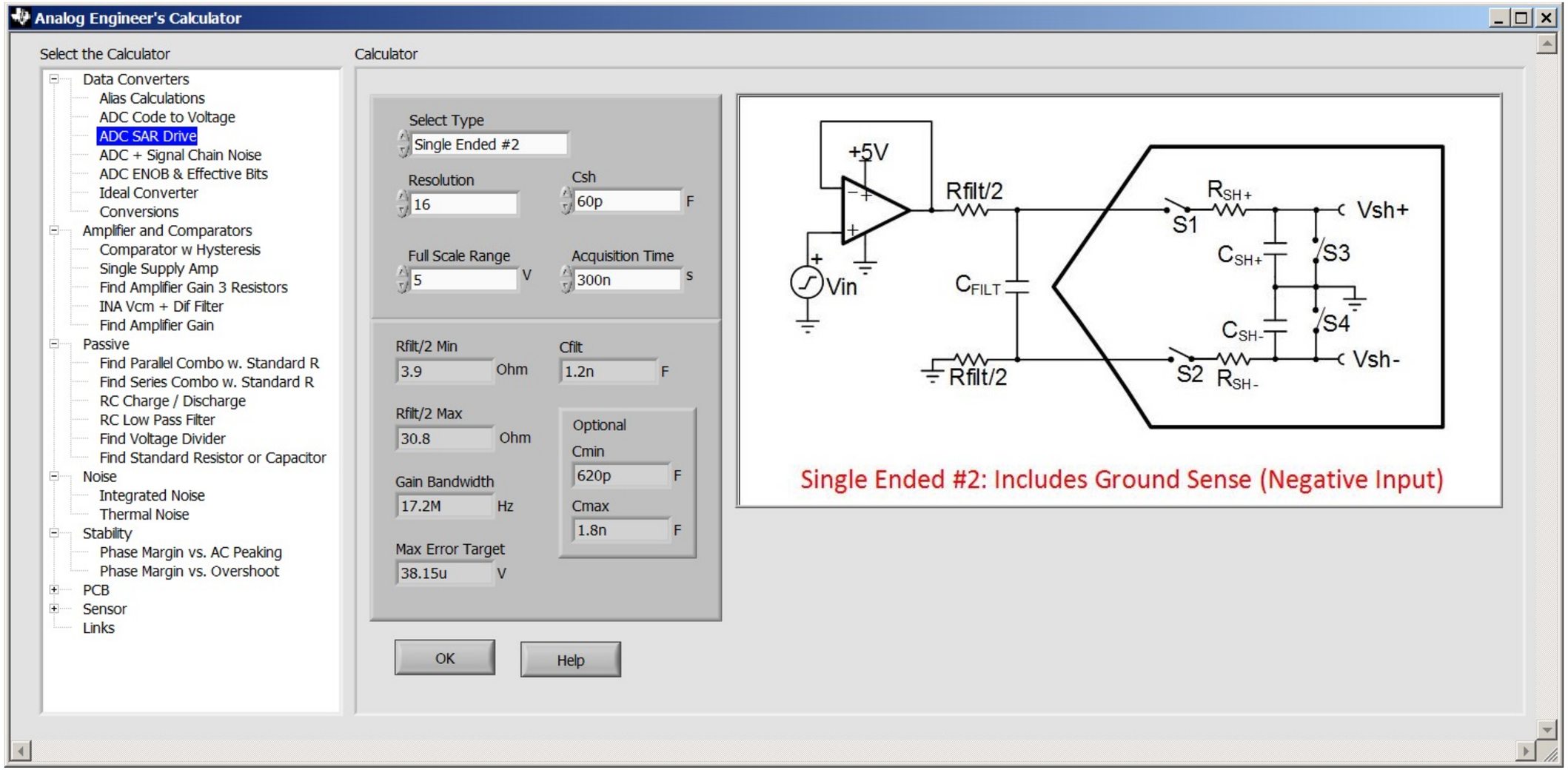
Accept license agreements.



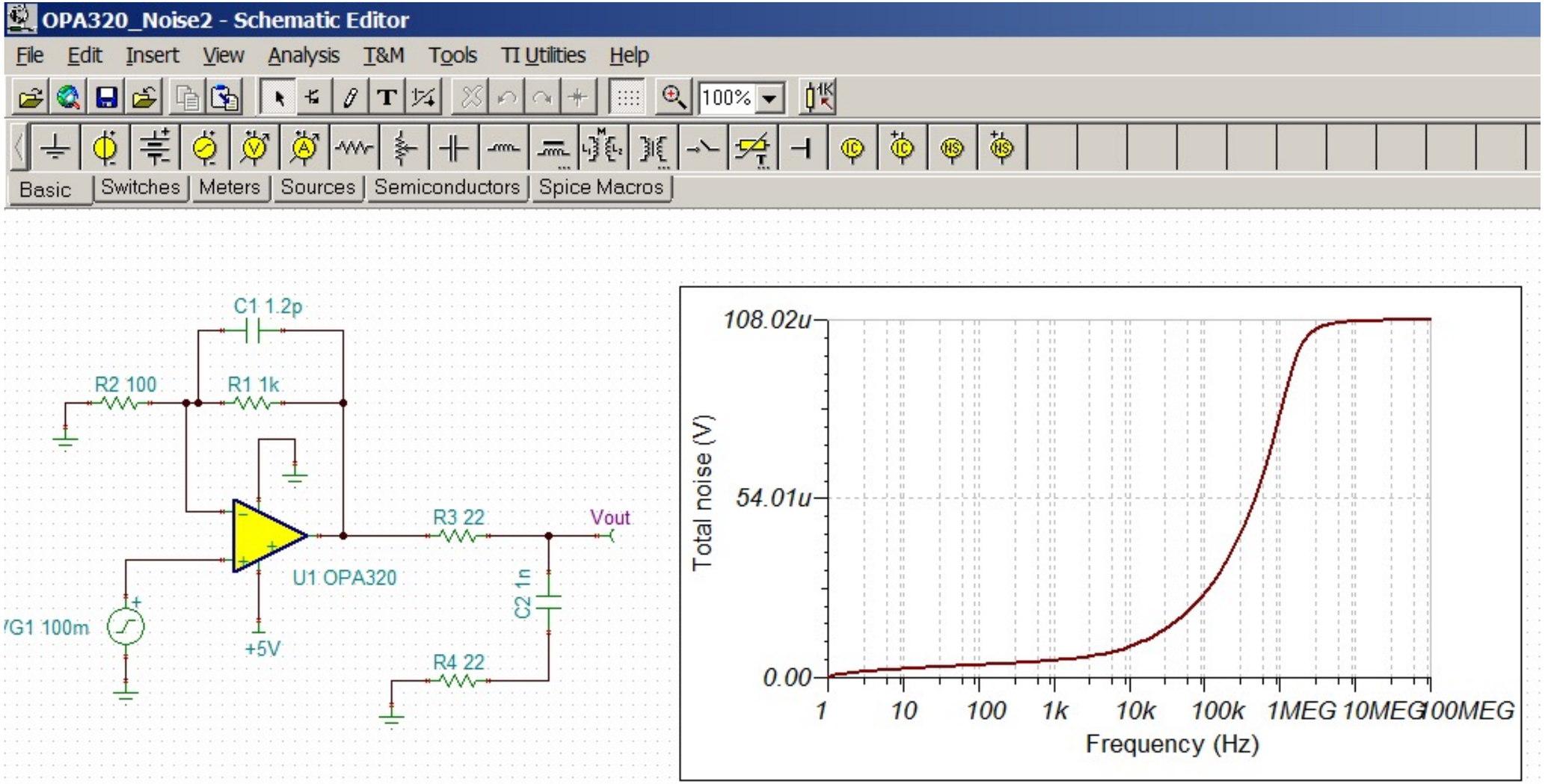
Finish the installation

Install “Analog Engineer’s Calculator” Free Tool

http://www.ti.com/tool/analog-engineer-calc

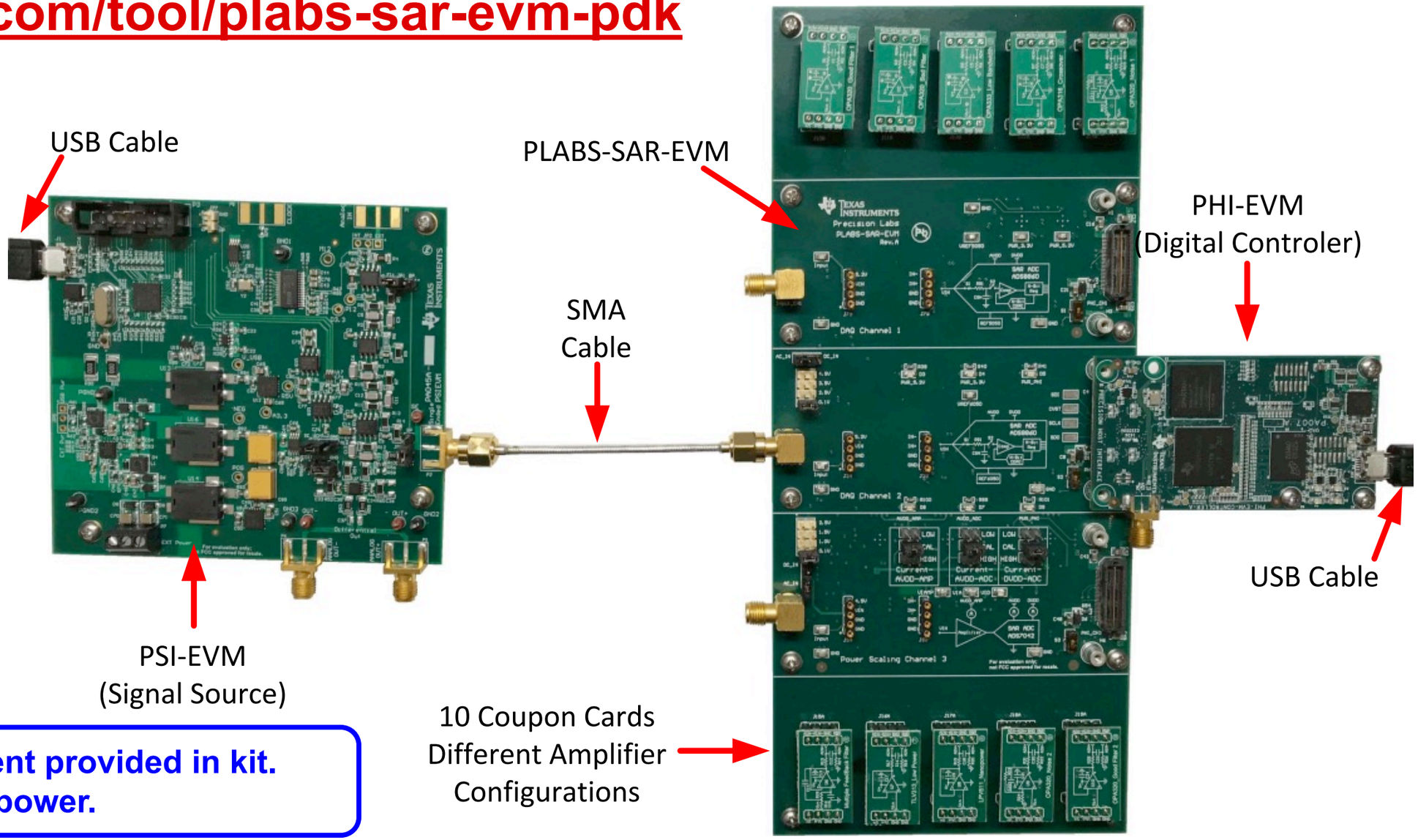


Install “TINA-TI™” Free SPICE Software
http://www.ti.com/tool/tina-ti



Overview of the PLABS Kit

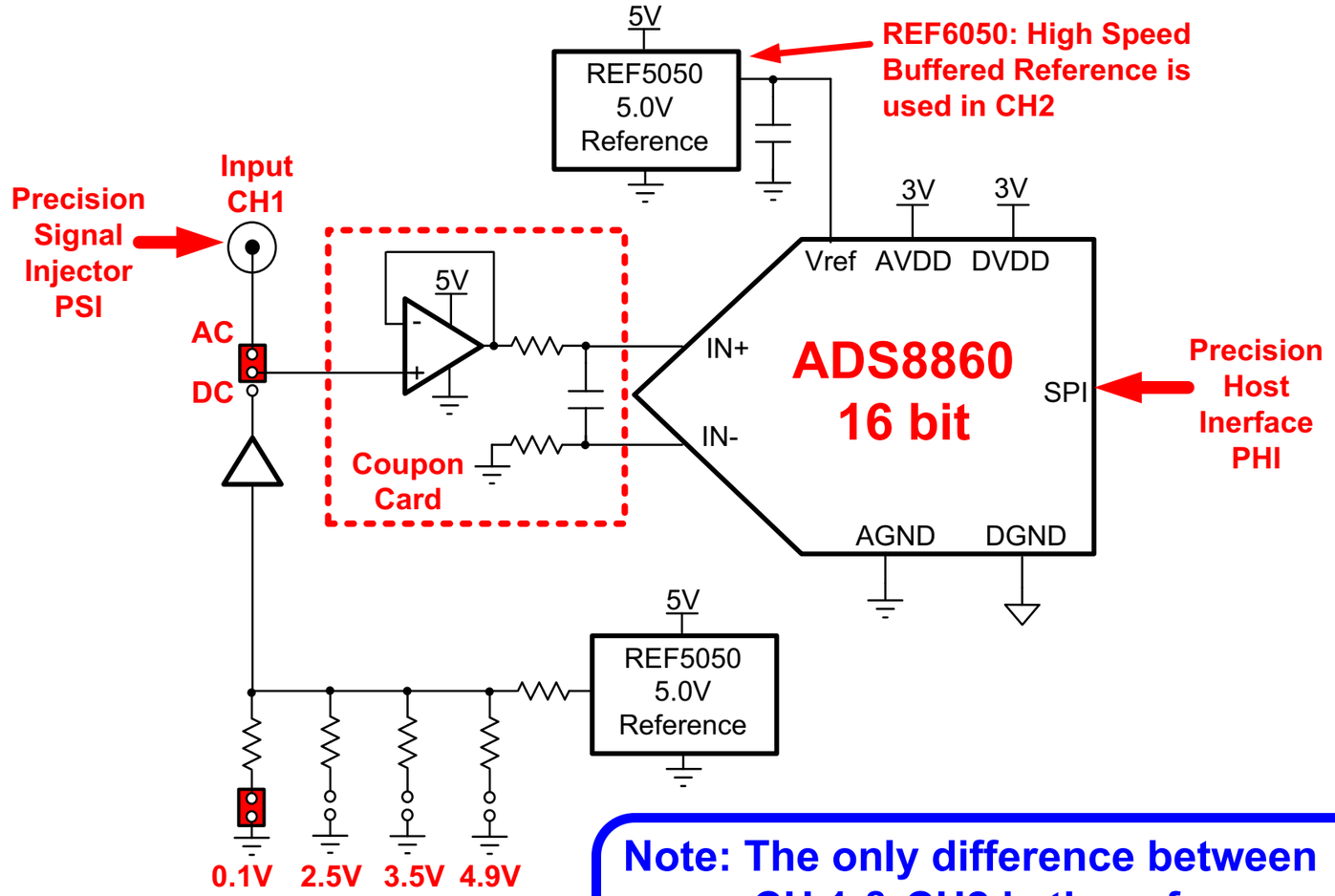
http://www.ti.com/tool/plabs-sar-evm-pdk



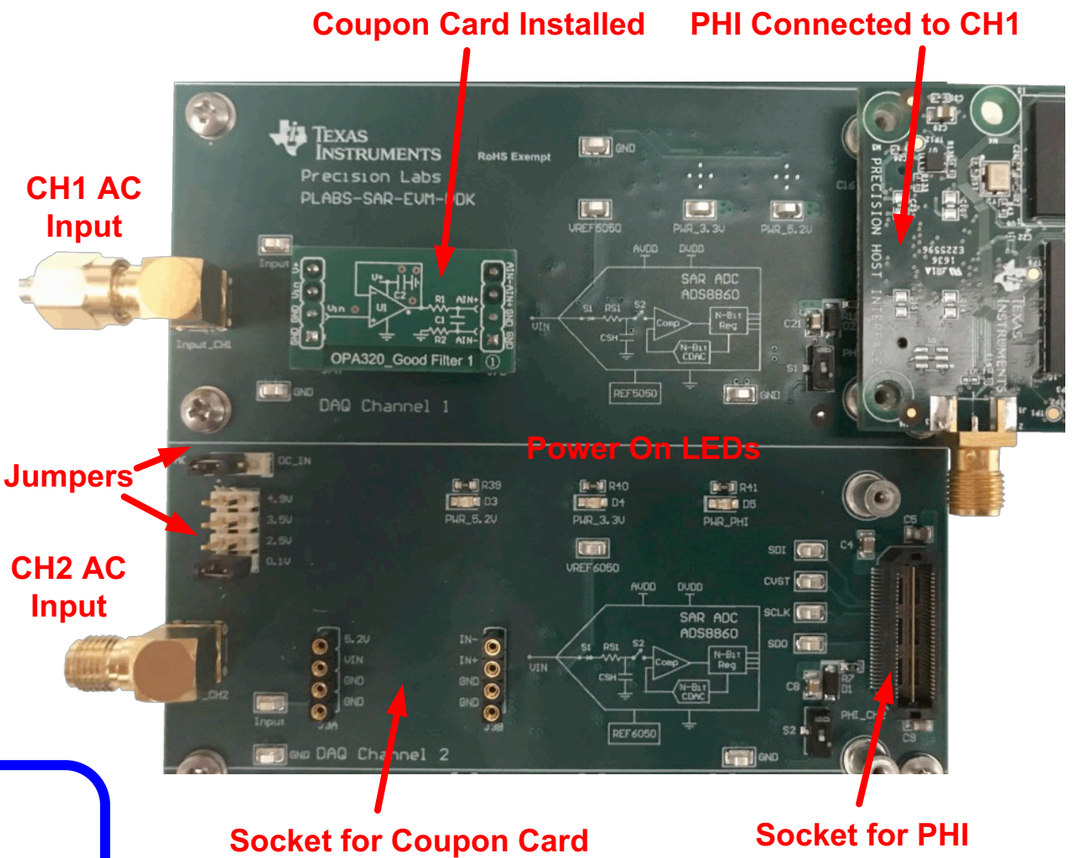
Note: All equipment provided in kit.
USB supplies all power.

Overview: CH1 & CH2 PLABS-SAR-EVM

Schematic CH1 Shown



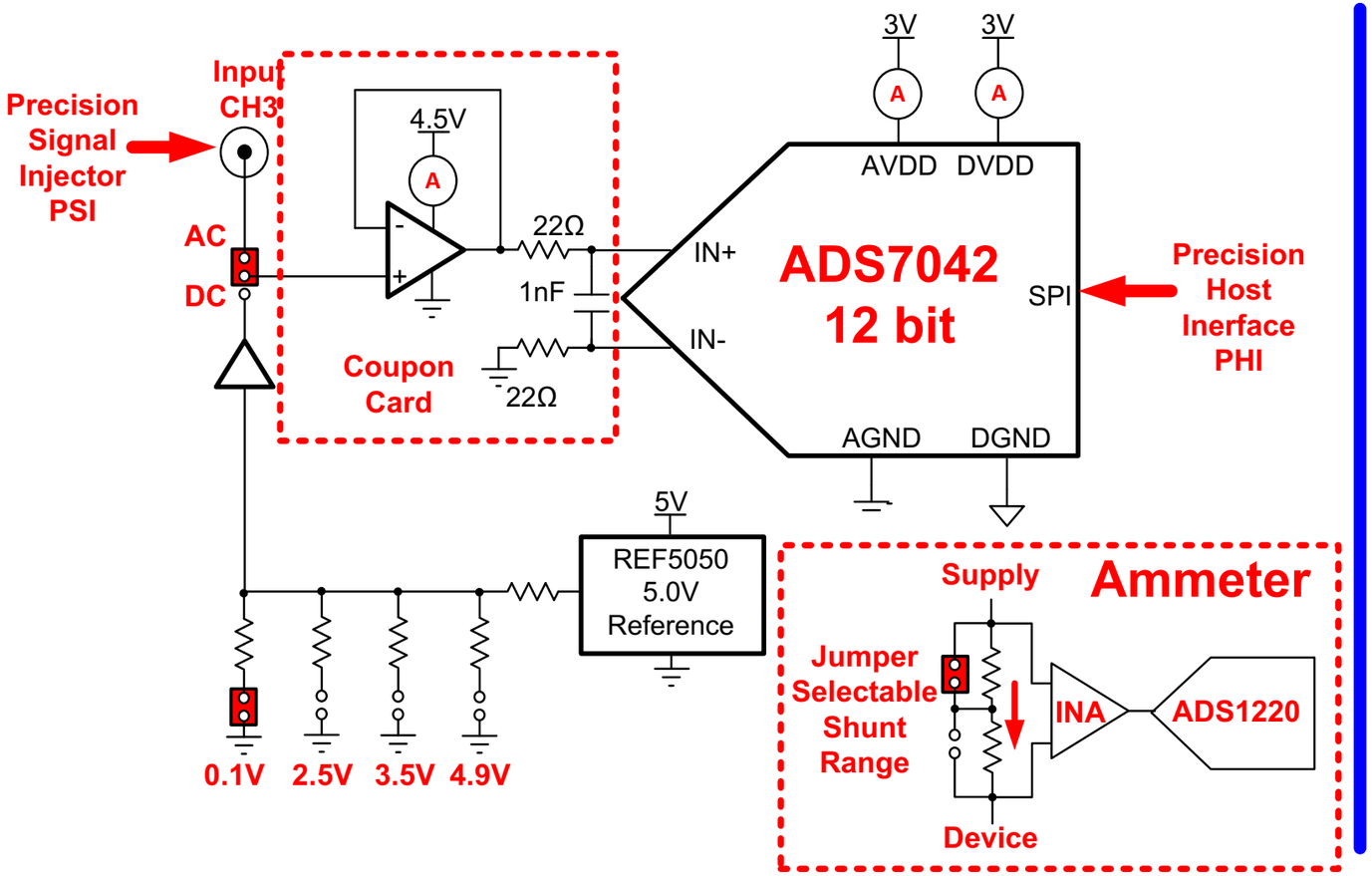
Picture of Hardware



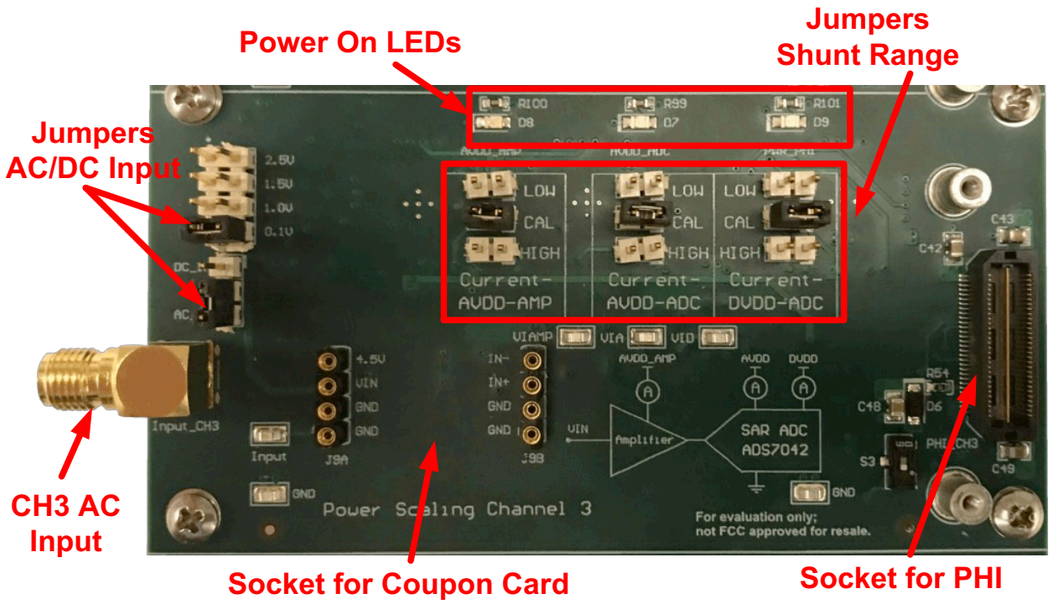
Note: The only difference between CH 1 & CH2 is the reference.
CH1 = REF5050 (No high speed buffer)
CH2 = REF6050 (high speed buffer)

Overview: CH3 PLABS-SAR-EVM

Schematic



Picture of Hardware



Overview: Precision Signal Injector (PSI)

PSI Spec.

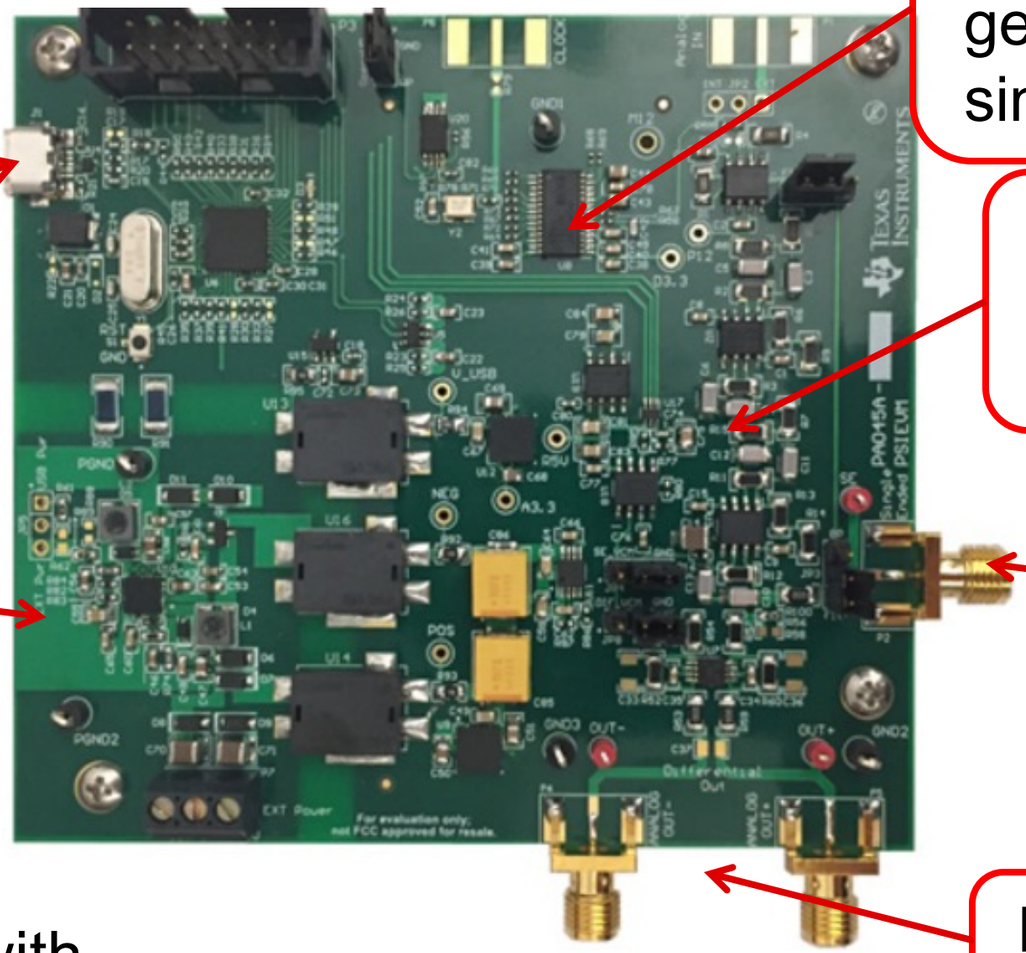
THD 125dB
SNR 100dB
Vout = 12Vpp
Voffset = ±5V

High Res mode
fout = 2kHz

Bypass Mode
fout = 20 to 20kHz

USB Control and Power

DC-to-DC converts 5V USB Power to ±12V



PCM5142 Audio DAC generates sine wave

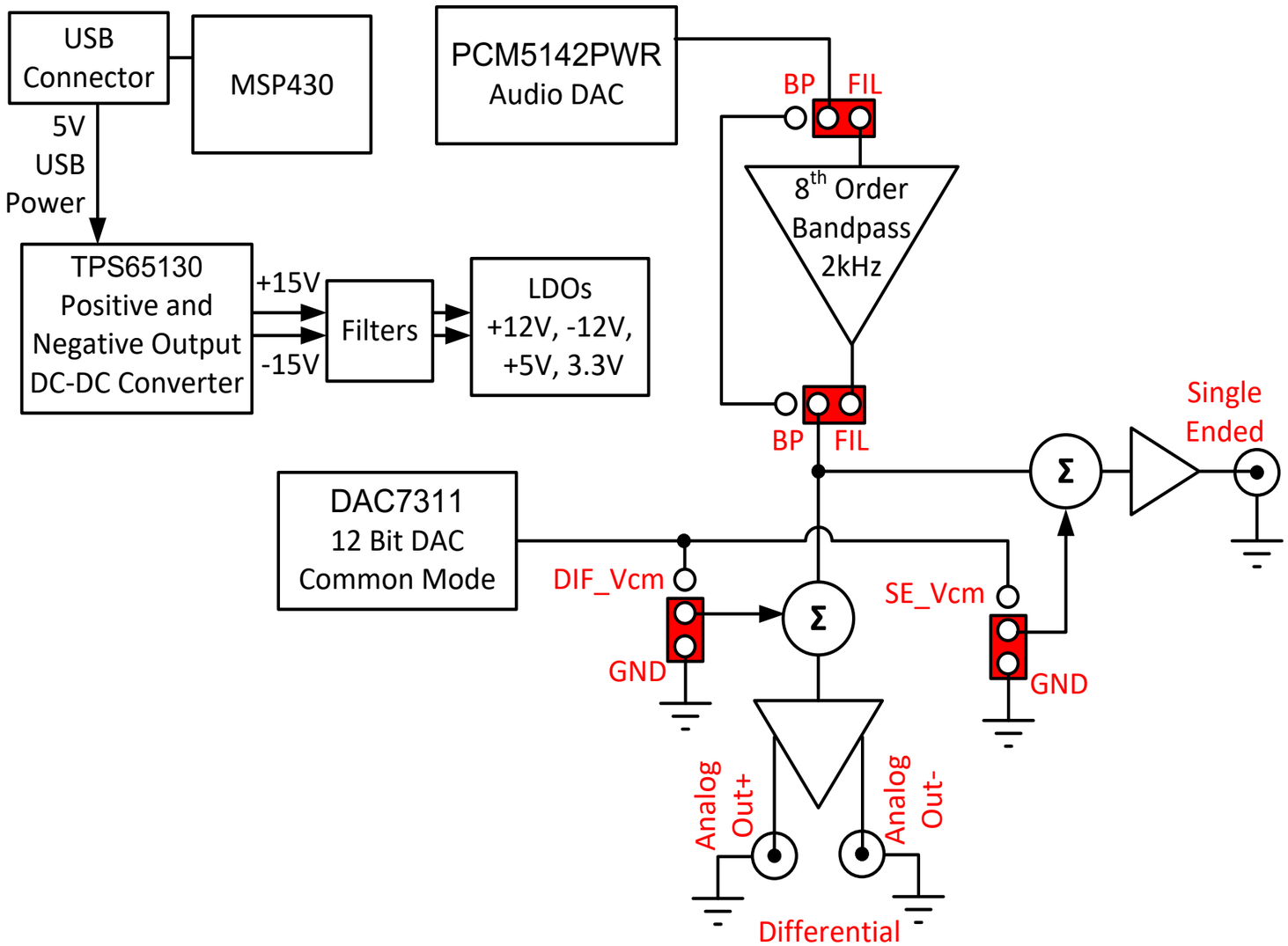
8th order BPF

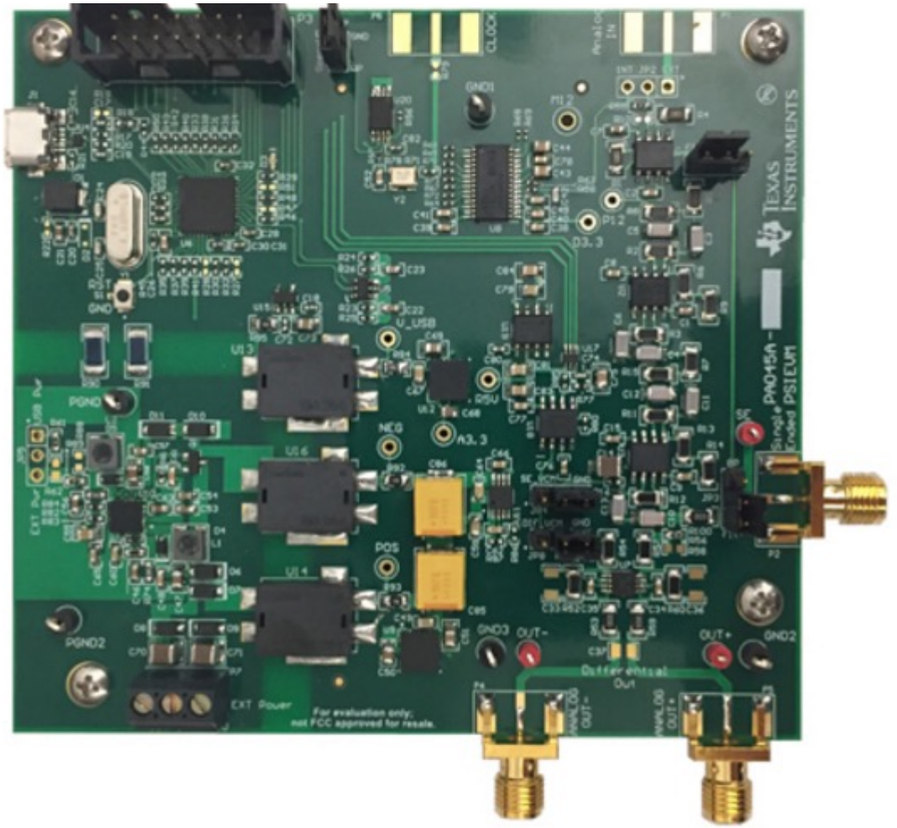
Single Ended Output

Differential Output

Note: A commercial signal generator with comparable performance is very costly!

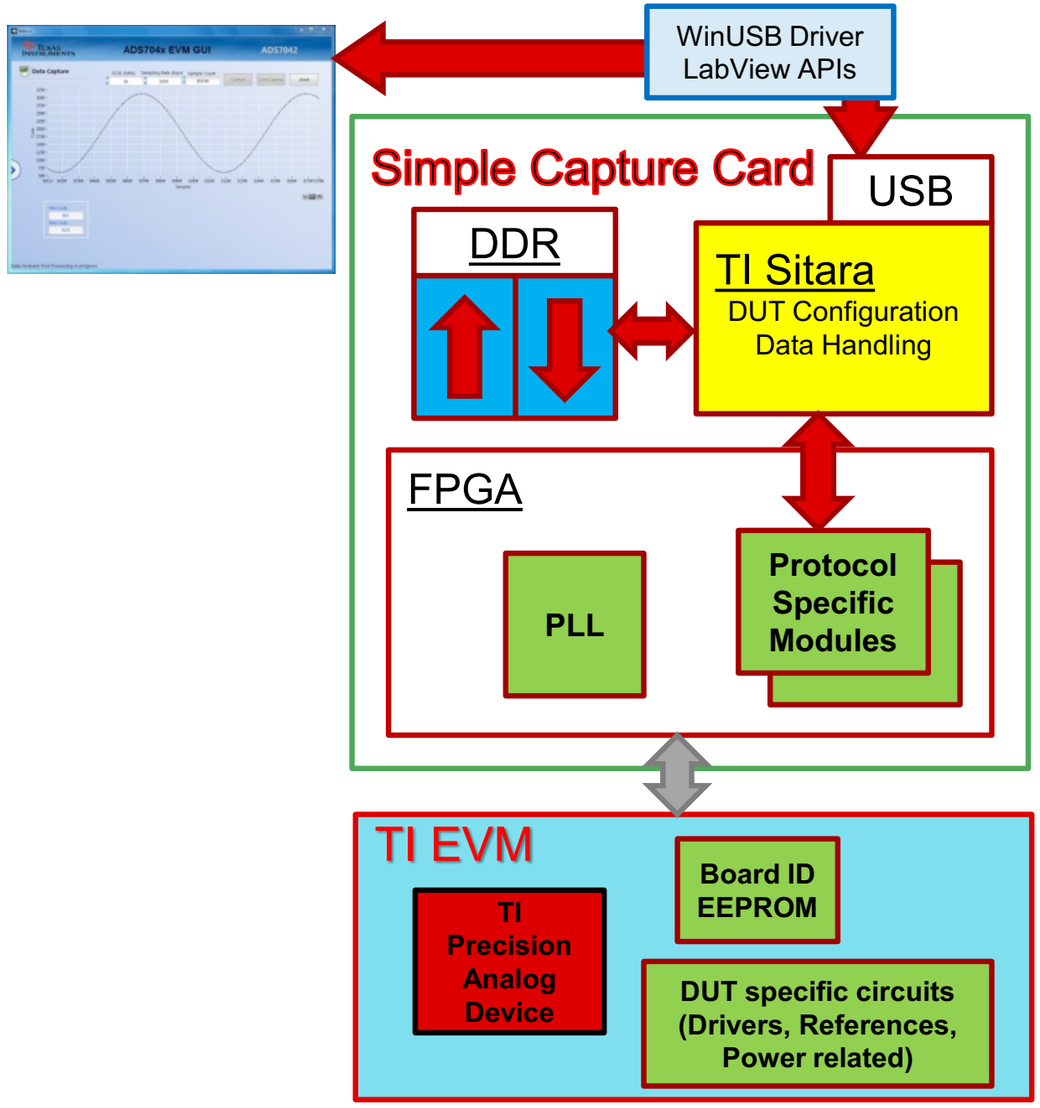
Hardware Overview: Precision Signal Injector (PSI)



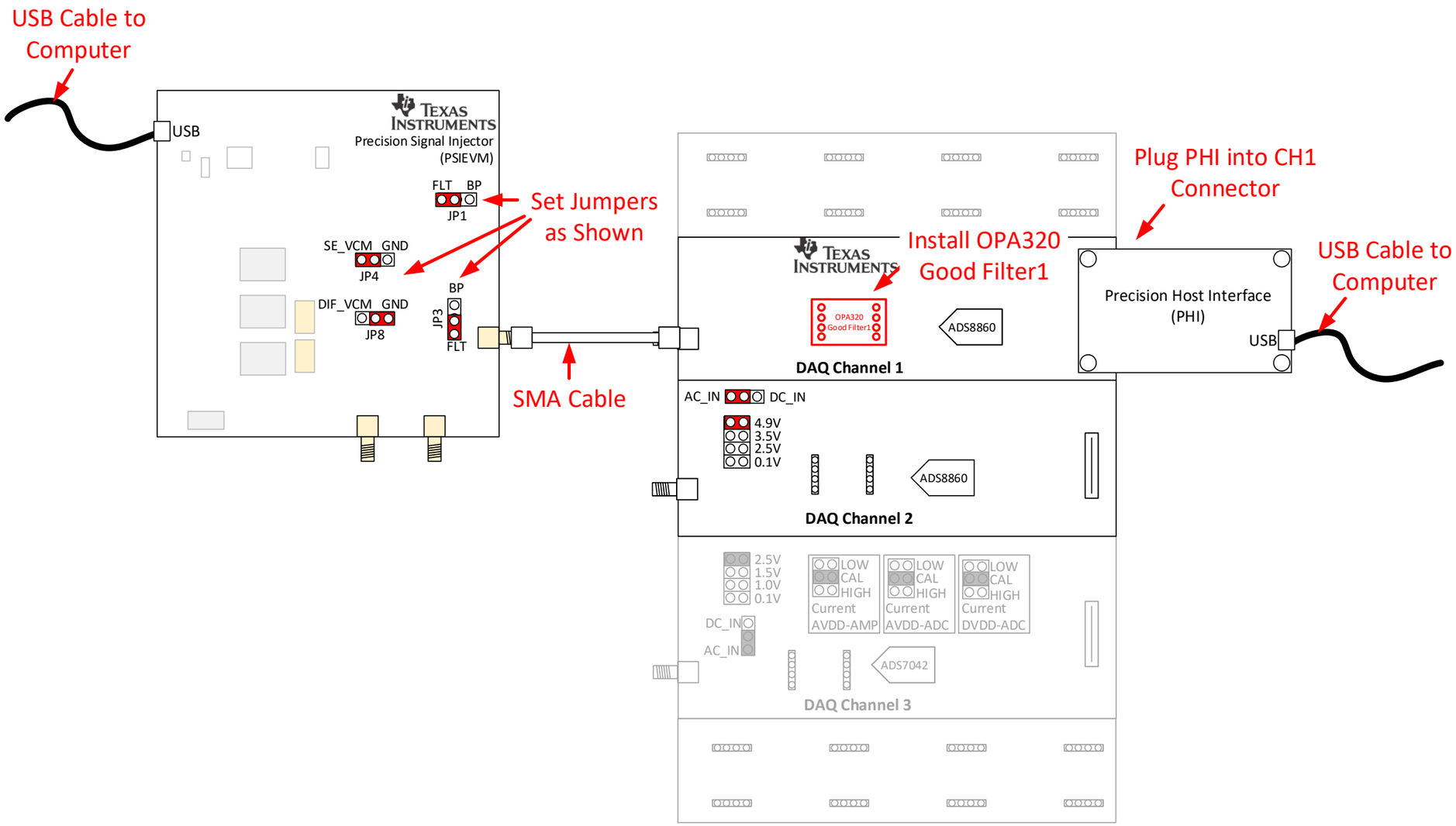


Precision Host Interface (PHI)

- Supports USB2.0 to Serial or Parallel-bus interfaces
- Powered by and communicates using of a single USB2.0 supply
- TI AM3352 Sitara Processor & FPGA configurable data capture and pattern generator
- High speed data communications (80MHz SCLK)
- PHI can work with a wide range of TI-EVMs using a common firmware (no reprograming required)
- EEPROM based board identification scheme
- Auto boot up when paired with the right GUI
- In-field/in-system programmability/upgradability

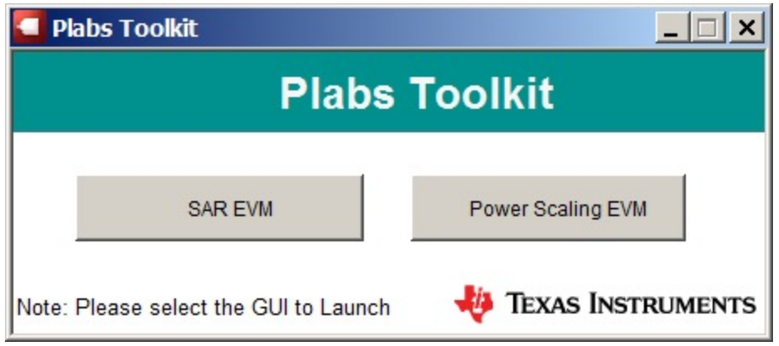


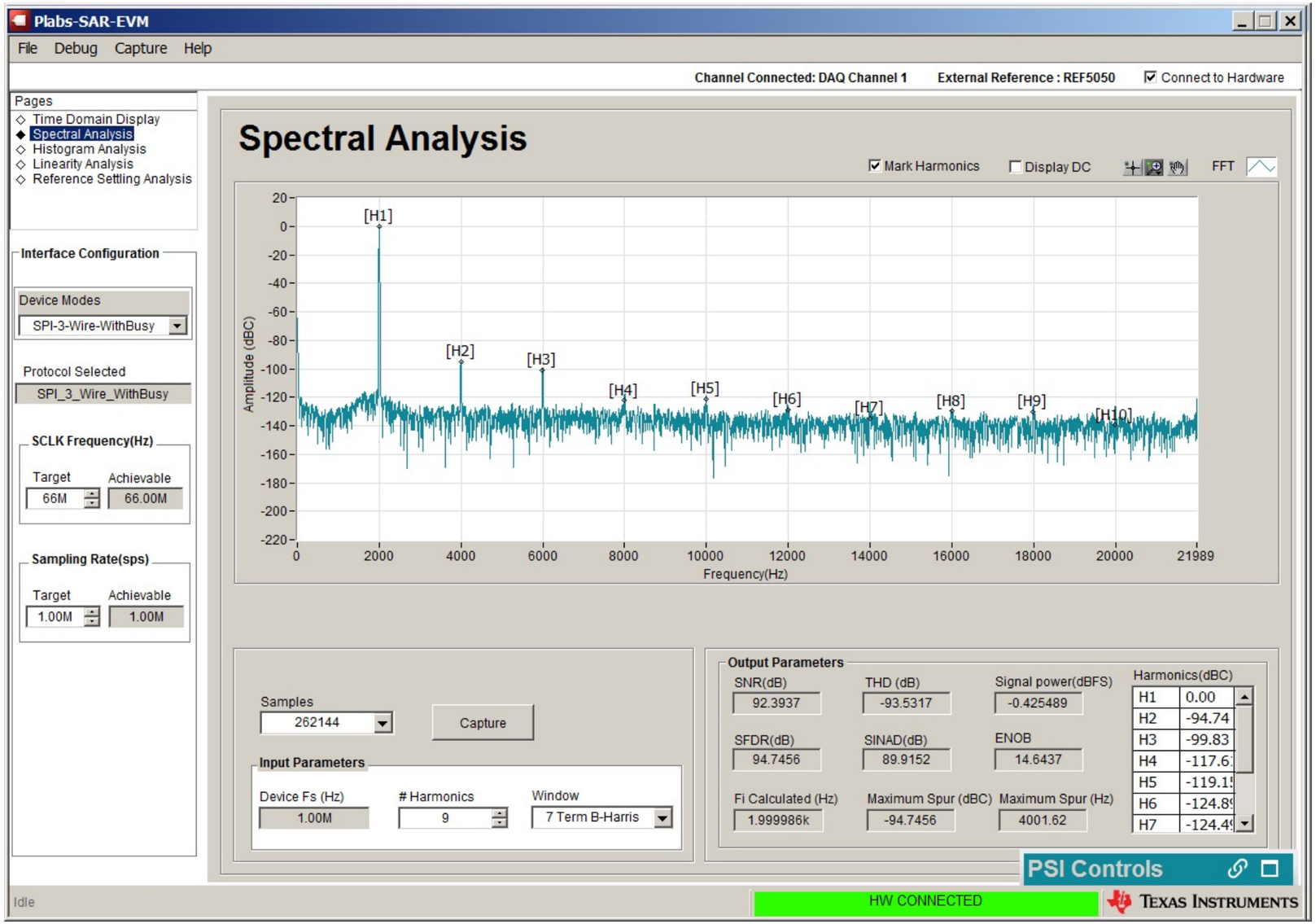
Connecting the hardware



Connecting the hardware: Avoiding common problems

Running the software.





Thanks for your time!
I hope you find the webinar useful.