

# ETA Kappa Nu (HKN) E&C Request

## New Oscilloscope and Accompanying Equipment

April 16, 2023

### Objective

HKN would like to purchase a new oscilloscope and accompanying equipment for use in our student lab and for conducting more advanced workshops. This purchase would allow us to have a professional grade oscilloscope and equipment that will provide us with more functions, measurements, and be operational for the next fifteen years plus.

### Equipment and Quotes

1. Quote 1
  - a. Rohde and Schwarz RTO6 3 GHz Oscilloscope with 100 MHz AWG
    - i. \$33,632
  - b. SMA Cable Kit (2 kits) [Link](#)
    - i. \$12 per, \$24 total
  - c. BNC to SMA Adapters (2 kits) [Link](#)
    - i. \$7 per, \$14 total
  - d. Precise RF TDR Generator [Link](#)
  - e. Total: **\$34,520**
2. Quote 2
  - a. Rohde and Schwarz RTO6 3 GHz Oscilloscope (No AWG)
    - i. \$32,040
  - b. Sigilent SDG6000X 200MHz AWG [Link](#)
    - i. \$1,525
  - c. SMA Cable Kit (2 kits) [Link](#)
    - i. \$12 per, \$24 total
  - d. BNC to SMA Adapters (2 kits) [Link](#)
    - i. \$7 per, \$14 total
  - e. Precise RF TDR Generator [Link](#)
    - i. \$850
  - f. Total: **\$34,453**

### Equipment Uses and Purpose

HKN currently has the following equipment: 1 GHz spectrum analyzer, 50 MHz (non arbitrary) function generator, and 100 MHz Oscilloscope. This equipment works for hobby grade electronics and basic measurements but is very restricted in it's operation, especially compared to modern day instruments. HKN provides workshops to teach younger students techniques or knowledge about electronics that will be useful in their

future classes. One area that is not introduced to students in their early classes is the area of EMC and signal integrity. These are typically more advanced classes that students have the option of taking later in their junior or senior year of undergraduate, but aren't introduced to. HKN would like to start introducing younger students to these areas and give them the background knowledge that will let them succeed in these areas and eventually in their careers. HKN also prides itself on being able to provide insight to help students with classwork and provide examples and real measurements of techniques that students learn in the classroom. Currently, HKN is unable to do this with our current equipment. The new equipment that is quoted will vastly expand the types of measurements and workshops that HKN, as well as our sister organization IEEE, will be able to provide. Examples of the workshops that can be implemented have already been brainstormed and listed below:

- High Speed Oscilloscope Operation
- Oscilloscope Tutorial
- Time Domain Reflectometry Measurements
- Eye Diagram and Channel Analysis
- Spectrum Analyzer Tutorial
- Impedance Matching
- Instrument Integration

This list could provide a year of workshops at the rate that HKN and IEEE typically put on workshops throughout the semester. It should be noted that this oscilloscope can act as a spectrum analyzer as well, allowing us to upgrade our current spectrum analyzer for essentially no extra cost and allow us to do an even more advanced spectrum analyzer workshop.

While participating in workshops and using the equipment, students will learn valuable skills that are typically only found in research positions. HKN realizes that not every student has the time to put into undergraduate research and the purchase of this equipment would help us be able to get these students the skills they need for their career such as learning new softwares, using multiple instruments and creating good and accurate testing setups.

Many students have come to HKN and IEEE wanting help with their labs and specifically help using the instruments. This purchase will also help us to provide more insight to help students not only in their skills, but in the classroom as well as we would be able to provide more detailed instruction on the operation of the equipment.

In conclusion, this purchase will vastly increase the capability of HKN and IEEE, allowing us to provide opportunities to students that we never could before in terms of

more technical workshops and help in the classroom. Allowing us this purchase will only benefit HKN, but an entire department that relies on HKN for help and resources.

### **Damage Prevention and Care**

High end equipment can be very sensitive and fragile. Care must be taken to make sure it is properly stored and when in use, used properly. HKN has a lab in the Emerson Electric building (Room 201) that we have the ability to lock and store items. Only HKN active members and IEEE officers are allowed card access to the lab. Other students can take part in the lab during open lab hours during the week, or by appointment with an officer of either IEEE or HKN. This guarantees that the new equipment will be kept in a safe location and under the supervision of an officer at all times.

HKN would like everyone to have access and to be able to use our high end equipment. Due to the nature and price of this equipment, HKN has decided students will need to go through training in order to use the new oscilloscope. The exact training hasn't been defined yet but the important aspects of usage will be hit.

With either quote, the oscilloscope will come with a 3 year warranty covering damages and can be sent back to Rohde and Schwarz for repair.

### **Current Funding Sources**

HKN has secured funding from two different sources already in order to help pay for this purchase. The first one being the ECE department. Funding from the department can be hard to get as the department has to make sure that all ECE students will benefit from the purchase. Given that the department has decided to fund us, we believe this reinforces our case for equipment and contingencies funding from SAFB, as our goal is to inform and allow as many students access as possible. The EMC Laboratory has also provided funding for this purchase. This lab works on problems revolving around EMC and signal integrity, which are the areas we hope to strengthen in the addition of these workshops. They are looking to invest in these workshops to attract more students to the area.

### **Funding Breakdown**

Below is the current funding breakdown for each funding source (Quote 1):

- EMC Laboratory
  - \$15,000
- ECE Department
  - \$3,000
- SAFB E&C Fund
  - \$16,520