
Amateur Radio and the Electrical and Computer Engineering Laboratory Curriculum: Federal Communication Commission (FCC) Amateur Radio Licenses are now available completely online for students with no cost.

Dr. Dennis Derickson, California Polytechnic State University, San Luis Obispo

Dennis Derickson is a Professor of Electrical Engineering at California Polytechnic State University. He received his Ph.D. , MS, and BS in electrical engineering from the University of California at Santa Barbara, the University of Wisconsin and South Dakota State respectively. He got his start in Electrical Engineering by getting his amateur radio license in 1975.

Mr. Chuck Clayton Bland, Cal Poly, SLO Electrical Engineering Department

Prof. Chuck Bland graduated from the Cal Poly electrical Engineering Department in 1982 to start a career with Motorola Solutions implementing Public Safety Communications systems. Thirty-five years later he returned to Cal Poly as a Lecturer in the Electrical Engineering Department. Chuck is a long time member and supporter of the Cal Poly Amateur Radio club. He and his wife Darla have two kids and a granddaughter.

Mr. Marcel Stieber, Cal Poly Amateur Radio Club

Marcel Stieber is an Electrical Engineering alumnus of California Polytechnic State University in San Luis Obispo. He was a former President and is current Industrial Advisor to the Cal Poly Amateur Radio Club (www.W6BHZ.org). His Masters Thesis is titled: "Radio Direction Finding Network Receiver Design for Low-cost Public Service Applications." Marcel was licensed in 2008 and received his Extra License in 2010. Marcel regularly volunteers at local repeater workdays as an RF technician and tower climber and was appointed as an ARRL Technical Specialist in 2021. He is an ARRL Life Member and has helped license over 1700 hams since 2009, mostly recently working to develop processes and train teams using fully-remote examination methods using ExamTools. Marcel has taught numerous classes including: Introduction to Electrical Engineering for Non-Majors and an Advanced Digital Communications Lab. Marcel currently works as an Electrical Engineering Systems Lead at Amazon Lab126 in Sunnyvale, CA and serves on the Cal Poly Electrical Engineering Industry Advisory Board.

Kevin Annik Shin-Wheeler, Cal Poly Amateur Radio Club

Former President and current Vice President of the Cal Poly Amateur Radio Club at the California Polytechnic State University in San Luis Obispo. Responsible for campus student amateur radio testing for the last two years. Accredited volunteer examiner and session manager for the Greater Los Angeles Amateur Radio Group VEC, involved in remote testing since September 2020.

Example Exam Questions

11 C01 Correct
When do the FCC rules NOT apply to the operation of an amateur station?

A. When operating under special FEMA rules
B. When operating a RACES station
C. When operating under special ARES rules
D. **Never, FCC rules always apply**

17 A04 Correct
Which term describes the ability of a receiver to discriminate between multiple signals?

A. Discrimination ratio
B. Harmonic distortion
C. **Selectivity**
D. Sensitivity

15 A02 Correct
Electrical power is measured in which of the following units?

A. Amperes
B. Ohms
C. Volts
D. **Watts**

11 A02 Correct
Which agency regulates and enforces the rules for the Amateur Radio Service in the United States?

A. FEMA
B. **The FCC**
C. Homeland Security
D. All of these choices are correct

17 A08
Which of the following describes combining speech with an RF carrier signal?

A. Oscillation
B. Low-pass filtering
C. Impedance matching
D. Modulation

19 A11 Correct
What is the gain of an antenna?

A. The additional power that is added to the transmitter power
B. The additional power that is lost in the antenna when transmitting on a higher frequency
C. The increase in impedance on receive or transmit compared to a reference antenna
D. **The increase in signal strength in a specified direction compared to a reference antenna**

13 C07
What band is best suited for communicating via meteor scatter?

A. 10 meter band
B. 70 centimeter band
C. 2 meter band
D. 6 meter band

15 C08
What is the formula used to calculate electrical power in a DC circuit?

A. Power (P) equals voltage (E) plus current (I)
B. Power (P) equals voltage (E) divided by current (I)
C. Power (P) equals voltage (E) minus current (I)
D. Power (P) equals voltage (E) multiplied by current (I)

14 B11
What is the function of automatic gain control, or AGC?

A. To protect an antenna from lightning
B. To eliminate RF on the station cabling
C. An asymmetric goniometer control used for antenna matching
D. To keep received audio relatively constant

Amateur Radio and the Electrical and Computer Engineering (ECE) Laboratory Curriculum: Federal Communication Commission (FCC) Amateur Radio Licenses Are Now Available Completely Online For Students With No Cost. (LIVE DEMOS INCLUDED)

Author Information Here

Objectives

- Use the Amateur Radio exam as a tool for ECE education and hands-on training
- Utilize the NEW online examination tools provided by volunteers across the nation.

Methods

- Have students take the Technician Radio Exam as part of laboratory credit or homework assignment.
- Utilize NEW Zoom-based examinations where students do not need to travel to take the exam.
- No cost to students with GLAARG VEC exam sessions

The activity

- Students generally spend 5 hours or more studying 400 questions about ECE-related topics that are at the edge of their knowledge base. (150 students/yr.)
- Add radio related activities to Laboratory Sessions
- Encourage students to consider radio club membership and activities.

Study Resources

www.HamStudy.org

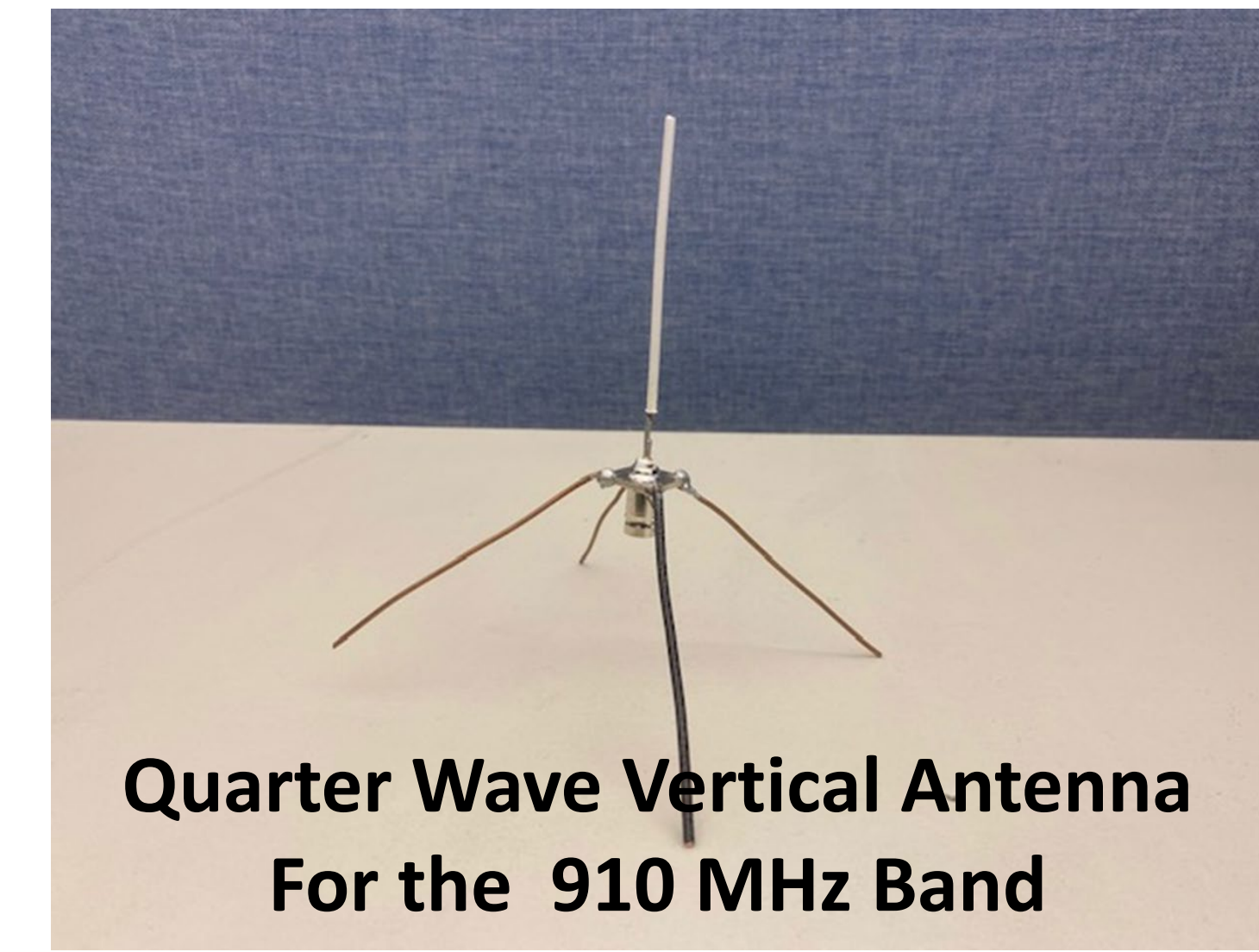
Example Available Exam Dates for Students (Very Frequent)

Upcoming online / remote sessions			
HamStudy.org is not responsible for administering these exam sessions; for any questions about a session, please contact the group who runs it. Not sure how remote sessions work? Read more here.			
Showing sessions from 2022-02-03 to 2022-04-03			
Feb 03, 2022 (Thu)	7:00am CST	*AVAILABLE SLOTS* PABC - REHQTE Online Testing Session - K4HIE *AVAILABLE SLOTS* - Any State / Location -	(online) \$15.00 K4HIE
	7:00pm EST	Aurora Amateur Radio Group (Alaska) Remote Session	(online) \$15.00 WB1BR
Feb 04, 2022 (Fri)	7:00am CST	*AVAILABLE SLOTS* PABC - REHQTE Online Testing Session - K4HIE *AVAILABLE SLOTS* - Any State / Location -	(online) \$15.00 K4HIE
Feb 05, 2022 (Sat)	7:00am CST	*AVAILABLE SLOTS* PABC - REHQTE Online Testing Session - K4HIE *AVAILABLE SLOTS* - Any State / Location -	(online) \$15.00 K4HIE
	10:00am EST	VE Testing session (all license classes welcome) (1 slot remaining)	(online) \$15.00 K0BBS
	9:00pm UTC	*SEDA SESION EN ESPAÑOL, GLAARG (Señal gratuita para menores, estudiantes, militares, personal de emergencias y VE) (14 slots remaining)	(online) \$10.00 AC3GR
	10:30am PST	Anchorage ARC On Line Exam Sessions - PLEASE READ THE NOTES FOR INSTRUCTIONS IIII (1 slot remaining)	(online) \$15.00 W1LD
	2:00pm EST	Aurora Amateur Radio Group (Alaska) Remote Session	(online) \$15.00 WB1BR
	2:30pm PST	Anchorage ARC On Line Exam Sessions - PLEASE READ THE NOTES FOR INSTRUCTIONS IIII (2 slots remaining)	(online) \$15.00 W1LD
	7:00pm EST	LAKEVIEW AMATEUR RADIO CLUB L.A.R.C. 7:00 EST (1 slot remaining)	(online) \$15.00 W4WKE

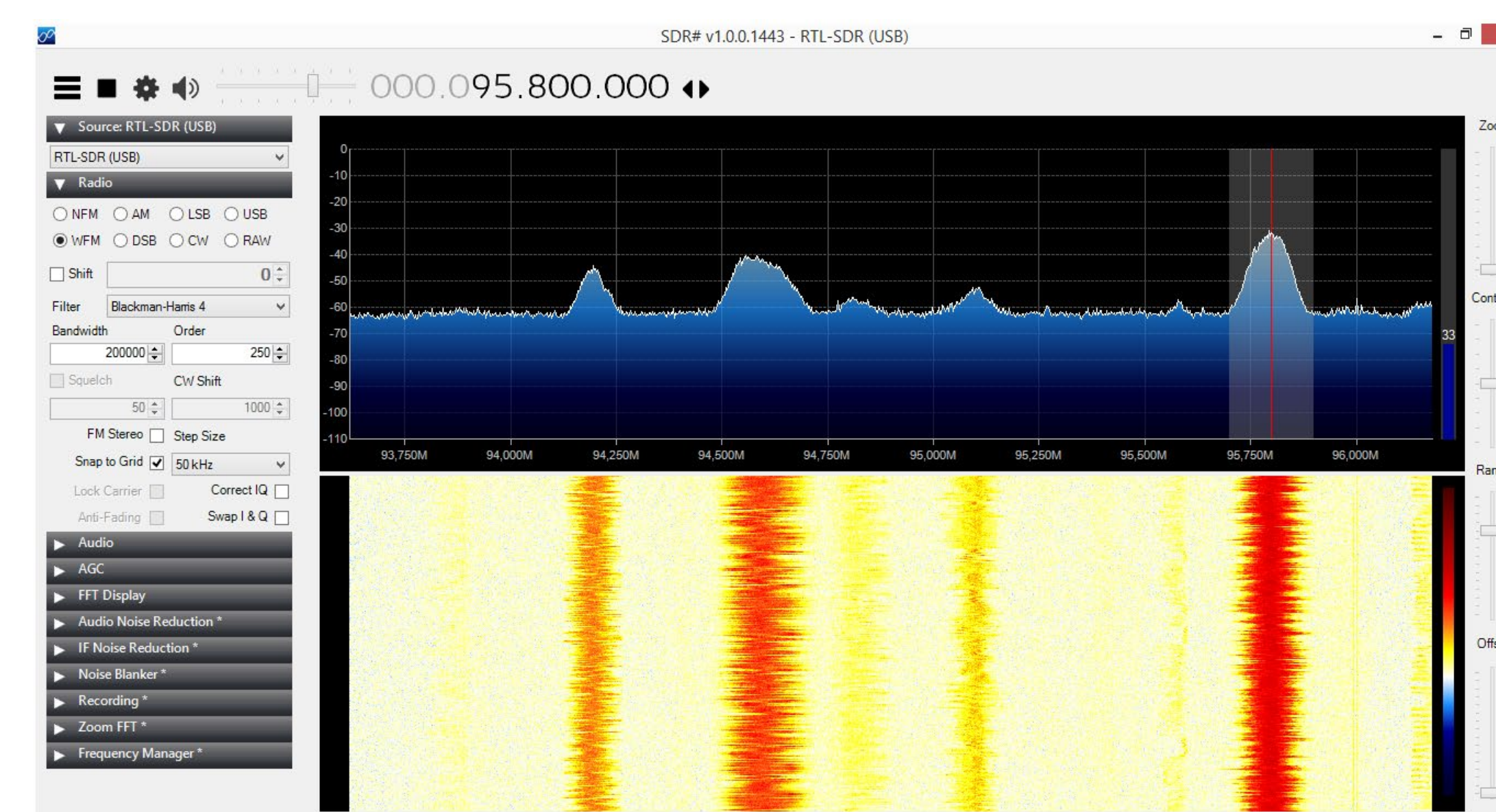
Student Feedback from End of Quarter Evaluation

- 75% of students passed the radio exam on the first try.
- Generally supportive written comments on taking the exam

Amateur Radio Inspired Lab Curriculum Activities



Student Owned Vector Network Analyzers Create Opportunities for Advanced Radio frequency Projects



RTL-SDR with SDR sharp software monitoring the FM band

Student -built antennas to access the radio spectrum at many different frequencies.

Characterize antennas and components with 50 kHz to 3 GHz nanoVNAs (\$130 each)



Monitor Spectrum with RTL-SDR (100kHz to 1.5 GHz for \$30), antennas, SDR sharp, and software (Free)

Conclusions

- Utilize the NEW online radio examination tools provided by volunteers across the nation.
- Use Amateur Radio to enhance Learn-by-Doing in ECE curriculum

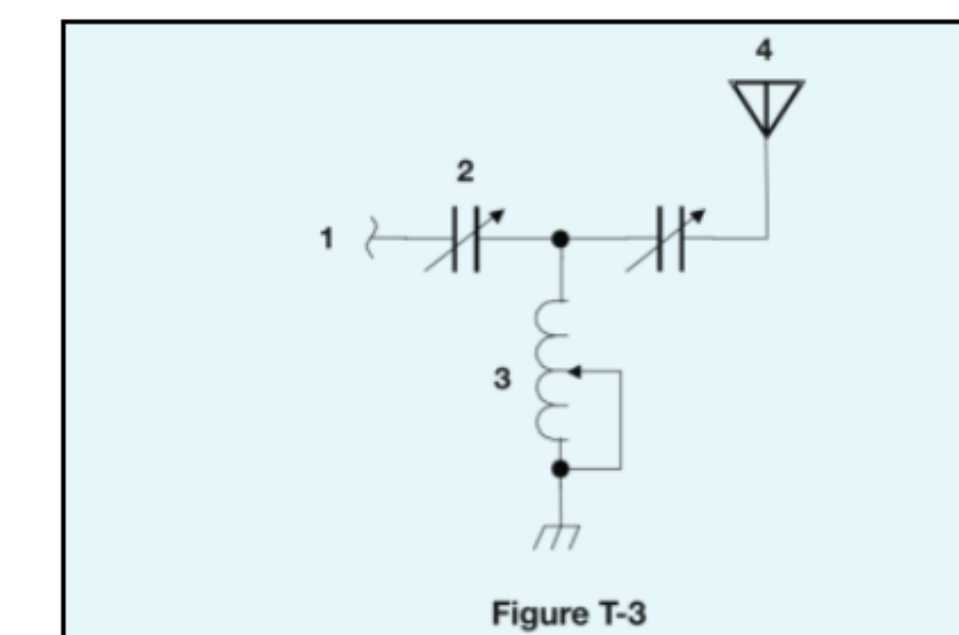
Example Exam Questions

10 B06
If an ammeter calibrated in amperes is used to measure a 3000-milliamperere current, what reading would it show?

A. 0.3 amperes
B. 0.003 amperes
C. 3,000,000 amperes
D. 3 amperes

19 A12
What is an advantage of using a properly mounted 5/8 wavelength antenna for VHF or UHF mobile service?

A. It has a lower radiation angle and more gain than a 1/4 wavelength antenna
B. It eliminates distortion caused by reflected signals
C. It has 10 times the power gain of a 1/4 wavelength design
D. It has very high angle radiation for better communicating through a repeater



16 C11
What is component 4 in figure T3?

A. Ground
B. Dummy load
C. Antenna
D. Transmitter

19 B10
What is the electrical difference between RG-58 and RG-8 coaxial cable?

A. RG-58 cable has two shields
B. RG-58 cable can handle higher power levels
C. RG-8 cable has less loss at a given frequency
D. There is no significant difference between the two types

14 A04
What electrical component stores energy in an electric field?

A. Diode
B. Capacitor
C. Resistor
D. Inductor

19 A14 Correct
In which type of circuit is voltage the same across all components?

A. Resonant
B. Branch
C. **Parallel**
D. Series

12 A08 Correct
What is the meaning of the procedural signal "CQ"?

A. A new antenna is being tested (no station should answer)
B. Only the called station should transmit
C. Call on the quarter hour
D. **Calling any station**

14 A09 Correct
Which of the following could you use to cure distorted audio caused by RF current on the shield of a microphone cable?

A. Low-pass filter
B. **Ferrite choke**
C. Pre-amplifier
D. Band-pass filter