**Design Log**

**Avalanche Transceiver (transmit mode only)**

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**Frequency Generation**

Avalanche transmitters are equipped with electronic components that generate a stable radio frequency signal. This signal is set to the specified carrier frequency of 457 kHz as per the EN 30071801 standard.

**Crystal Oscillator**

Many electronic devices, including avalanche transceivers, use crystal oscillators to generate precise and stable frequencies. A crystal oscillator provides an accurate timing reference, ensuring that the transmitter's carrier frequency remains within the specified range.

**Tuning and Calibration**

During the manufacturing process, avalanche transceivers undergo tuning and calibration to ensure that the actual carrier frequency aligns with the standard's requirements. This process involves adjusting the electronic components to achieve the desired frequency accuracy.

**Compliance Testing**

Manufacturers subject their avalanche transceivers to compliance testing to verify that the devices meet the specified standards, including the carrier frequency of 457 kHz. This testing helps ensure that the transceivers will operate effectively and reliably in real-world avalanche rescue scenarios.

**Digital Signal Processing (DSP)**

Avalanche transceivers often employ digital signal processing (DSP) to enhance the performance of the radio frequency components. DSP can help filter out interference, optimize signal strength, and improve the overall reliability of communication between transceivers.

**Regulatory Compliance (Just FCC for transmitters)**

Avalanche transceiver manufacturers adhere to international regulatory standards, such as those outlined by the European Telecommunications Standards Institute (ETSI). Compliance with these standards ensures that the devices meet the necessary technical specifications, including carrier frequency, to facilitate interoperability among different brands and models.

**Microcontrollers/Microprocessors**

Avalanche transceivers incorporate microcontrollers or microprocessors to handle the overall control and processing of signals. These components manage tasks such as frequency generation, signal processing, user interface control, and power management.

**Radio Frequency (RF) Components**

To generate and transmit the radio frequency signal, avalanche transceivers use RF components, which may include RF transceivers, crystal oscillators, and filters. These components work together to ensure the transceiver operates on the designated frequency (e.g., 457 kHz) and communicates effectively with other devices.

**Digital Signal Processing (DSP):**

Many modern avalanche transceivers utilize digital signal processing to enhance the accuracy and reliability of signal reception and transmission. Dedicated DSP components or processors may be integrated to handle these tasks.

**Memory**

Avalanche transceivers have memory components to store firmware, settings, and other necessary data. This may include Flash memory for firmware storage and RAM for temporary data storage during operation.

**Power Management ICs**

Efficient power management is crucial in avalanche transceivers due to the need for extended battery life. Power management ICs help regulate power distribution, optimize energy usage, and manage battery levels.

**User Interface Components**

Avalanche transceivers typically feature user interfaces with displays, buttons, and indicators. The components for these interfaces can include display controllers, button interfaces, and LED drivers.

Based on this information, we potentially need:

Microcontroller

Low power consumption, real-time processing capabilities, and sufficient memory for firmware storage and data handling.

RF transceiver or crystal oscillator or filter

Flash memory for firmware and bootloader

Power management ICs to optimize energy usage by microcontroller and RF output module

No UI needed since we are only concerned about transmitter mode

Will have LED display to warn the user when battery life is below compliance levels,

as seen in EN 300 718-1 - V1.2.1

(https://nhqc3s.hq.nato.int/Apps/ETSI/specs/EN\_30071801v010201p.pdf)

Dedicated DSP components might be needed, determined during breadboard testing in RF chamber

Below is a more in-depth dive into each component we need or possibly need

**Microprocessor / Microcontroller**

1. ARM Cortex-M Series

Microcontrollers based on ARM Cortex-M cores are widely used in various embedded systems, including those requiring low power and real-time capabilities. Examples include the Cortex-M0, Cortex-M3, Cortex-M4, and Cortex-M7.

1. STMicroelectronics STM32 Series

STM32 microcontrollers, based on ARM Cortex-M cores, are known for their versatility and are commonly used in applications with stringent power requirements. They offer a range of performance levels and features suitable for real-time processing.

1. Texas Instruments MSP430 Series

MSP430 microcontrollers from Texas Instruments are known for their ultra-low power consumption, making them suitable for battery-operated devices. They are often used in applications where power efficiency is critical.

1. NXP Semiconductors Kinetis Series

The Kinetis series of microcontrollers, based on ARM Cortex-M cores, are designed for applications that require low power and real-time processing. They offer a range of options with different performance levels.

1. Microchip PIC32 Series

Microchip's PIC32 microcontrollers are based on the MIPS architecture and are known for their real-time processing capabilities. They come with various peripherals and memory options.

1. Atmel AVR Series

AVR microcontrollers, often used in Arduino boards, are known for their simplicity and low power consumption. While they may be more commonly found in hobbyist and educational projects, some models can meet the requirements for certain applications.

https://www.microchip.com/en-us/products/microcontrollers-and-microprocessors/8-bit-mcus

-Standalone PWM - signal

-APM – power control

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1. Renesas RX Series

The RX series of microcontrollers from Renesas is designed for real-time processing and features a variety of options with different power consumption profiles.