Phitek Portable Stereo Tuneable FM Transmitter – Operational Description

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The device is based around ROHM BH1415F Wireless Audio Link IC and ATMEL ATMEGA48 microcontroller. A detailed description of the Wireless Audio Link IC is provided in the BH1415F.PDF file.

The device is turned ON/OFF by tact switch S1. The microcontroller detects the activation of S1 and turns ON Silicon switches Q9 and Q3 which in turn provides power to the rest of the device.

A discrete 5V regulator consisting of Q1, Q4A, Q4B and D3 provides 5V output when an external DC power source is used. The device is powered from this 5V regulator or an internal battery. A 3V3 regulator, U3 provides power to the microcontroller U4 and the LCD.

The LCD displays the selected transmission frequency and audio level (VU meter) while music is playing. The display data is sent to the LCD by the microcontroller via latches U1 & U2. The LCD backlight is provided by D5 & D6 and is only lit momentarily while the function switches are activated.

The stereo audio input signal from the 3.5mm plug is AC coupled in to the L & R audio inputs of the BH1415F (U5). U5 in conjunction with C12 and C13 provides audio pre-emphasis with a time constant of t = 23k * 3n3 = 75us. U5 then provides audio limiting (to prevent over-modulation) followed by a 2 pole low pass filter set at 15 kHz. C15 and C16 form part of this filter. The final L&R audio signals are then combined in a multiplexer along with a 38 kHz sub carrier and 19 kHz pilot signal both derived from the 7.6MHz clock.

The composite signal is the fed out of U5 in to the modulation coupler circuit consisting of C11, C17 and R34. C17 and R34 have been carefully chosen such that the maximum modulation depth is around 180 kHz. These components couple the composite signal in to the VCO circuit and therefore create the FM modulation.

The VCO consists of an internal active RF oscillator which is coupled viaC27 to a parallel resonant circuit consisting of L6, C26, C28 and D8. The resonant frequency can be varied as a function of the control voltage applied to the varicap diode D8. This varies the total parallel capacitance of the resonant circuit and hence the frequency.

This carrier frequency is stabilised by a Phase Locked Loop (PLL). The frequency selections are 88.1 to 107.9MHz in 0.1MHz steps.

The oscillator output is divided down by the program counter in U5, the exact ratio of which is determined by the frequency selection circuitry which interfaces, via a serial data interface (SPI) to the microcontroller. The transmission frequency selected by using switches S3, S4 which increase/decrease the frequency respectively. Switch S2 is used to store transmission frequencies as presets up to a maximum of 6 frequencies.

The output of the RF oscillator is fed to an RF output stage in U5 which in turn is fed out of U5 passing through a filter (C21/L4) which removes higher order harmonics to the aerial consisting of a wire of total length 215mm. R4 reduces output power to below 48dBuV at all transmission frequencies.

Part of the aerial is on the PCB and does not follow a liner path so that its effective length is somewhat less