Phitek Portable Stereo FM Transmitter – Operational Description

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The device is based around ROHM BH1417F Wireless Audio Link IC. A detailed description of the IC operation is provided in the BH1415.pdf file.

The device has a power on/off control section, based around Q1 and flip-flop IC U1. U1 is configured such that its output state will toggle on receipt of "clock" pulses. These pulses are generated by activation of the on/off tact switch. The output of UI controls Q1 which in turn switches power to the rest of the device.

The led D1 indicates when the device is powered up.

The stereo audio input signal from the 3.5mm plug is AC coupled in to the L & R audio inputs of the BH1417F (U2). The IC, in conjunction with C10 and C11, provides audio pre-emphasis, with a time constant of t = 23k x 3n3 = 75us. The IC then provides audio limiting (to prevent over-modulation) followed by a 2 pole low pass filter set at 15kHz. C10 and C11 form part of this filter.
The final L & R audio signals are then combined in a multiplexer along with a 38kHz subcarrier and 19kHz pilot signal, both derived from the 7.600MHz clock.

The composite signal is then fed out of the IC in to the modulation coupler circuit consisting of C3, C6 and R8. C6 and R8 have been carefully chosen such that the maximum modulation depth is around 160kHz. These components couple the composite signal in to the VCO circuit and therefore create the FM modulation.

The VCO consists of an internal (ie in the IC) active RF oscillator which is coupled via C15 to a parallel resonant circuit consisting of L2, C23, C22 and D4. The resonant frequency can be varied as a function of the control voltage applied to the varicap diode D4. This varies the total parallel capacitance of the resonant circuit and hence the frequency.

This carrier frequency is stabilized by a Phase Locked Loop (PLL). The frequency selections are 88.1, 88.3, 88.5 and 88.7 MHz.

 The oscillator output is divided down by the program counter in the IC, the exact ratio of which is determined by the frequency selection circuitry which interfaces, via some diode logic (D2 & D3) to the 4 way frequency select switch. The program counter output is then compared with a reference frequency derived from the 7.600MHz clock. A phase error signal is then created which is fed out of the IC and through an external low pass filter, based around Q2, before being applied to the varicap diode D4, hence completing the control loop.
The composite signal is able to modulate the VCO because the external low pass filter in the PLL prevents it from responding at audio frequencies.

The output of the RF oscillator is fed to an RF output stage in the IC which in turn is fed out of the IC, passing through a filter (L1) which removes higher order harmonics, to the aerial consisting of a wire of total length 200mm.

Part of the aerial is within the case (110mm), part of it external (90mm).(NB The internal aerial portion does not follow a linear path so that it's effective length is somewhat less).