Freq1:450Mhz

Radio Tuning Method

Module	Tuning Name	tuning item	Tuning Equipments	instrument setting	Tuning frequence Points	Software Requirements	portable Specs	Note	hardware HTS set
Transmit	Reference Oscillator Warp	1	Communication Test Set(HP8921)	HP8921 setting: 1.TX test mode 2. set tune mode as manual mode 3.set tune frquence as "Tuning frequence Points" iteam	1 point 450.0125MHz	1.Analog mode 2.No signaling 3.Both SPK OFF 4.Both Mic OFF 5.force the radio to enter continuous transmiting state with low power. 6. adjust DAC to output a DC offset to the VCTCXO. 7.Finish tuning and store the DAC value to codeplug.	±40Hz		current radio HTS should be setted TX status
	TX CV synthesize for quick locked	2	Communication Test Set(HP8921)	HP8921 setting: 1.TX test mode 2. set tune mode as Auto mode 3.set IF filter as 30KHZ 4. set filter BW between 20HZ and 15KHZ 5. set De-emphasis as off mode	1 point, 450.0125MHz	1.Analog mode 2.No signaling 3.Both SPK OFF 4.Both Mic OFF 5.Low power 6.TX ON 7. Frequency locked (RX 399.975MHz) 8.ADC read the CV value 9.Calculate the △CV=CV-CV'(CV' is a fixed value for a frequency ,which obtain from the two fixed CV curve for RX) 10. save the △CV	±0.5 radix point 3 for △CV		
	DSP-to-Communication	3	Communication Test Set(HP8921)	HP8921 setting: 1.TX test mode 2. set tune mode as Auto mode 3.set IF filter as 30KHZ 4. set filter BW between 20HZ and 15KHZ 5. set De-emphasis as off mode	1 point 450.0125MHz	1.Analog mode 2.No signaling 3.Both SPK OFF 4.Both Mic OFF 5.Low power 6.DSP to provide a DC offset at the same value as Ref Oscillator Warp tuning to center carrier frequency. 7.DSP control PLL IC to provide a subtone of 100Hz with close to 5kHz deviation as low port MOD (MOD2). 8.Adjust low port gain to obtain 5kHz deviation and store the DAC value to codeplug.	3K+/-0.02K		
	Modulation Balance	4	Communication Test Set(HP8921)	HP8921 setting: 1.TX test mode 2. set tune mode as Auto mode 3.set IF filter as 30KHZ 4. set filter BW between 20HZ and 15KHZ 5. set De-emphasis as off mode	1 point 450.0125MHz	1.Analog mode 2.No signaling 3.Both SPK OFF 4.Both Mic OFF 5.Low power 6.DSP to provide a DC offset at the same value as Ref Oscillator Warp tuning to center carrier frequency. 7.DSP control PLL IC to provide a subtone of 100Hz with close to 5kHz deviation as low port MOD (MOD2). 8.Adjust low port gain to obtain 5kHz deviation and store the DAC value to codeplug.	mobile: Low Port:3+/-0.020KHz High Port:3+/-0.04KHZ		current radio HTS should be setted TX status
	Transmit Power Calibration	5	Communication Test Set(HP8921)	HP8921 setting: 1.TX test mode 2. set tune mode as Auto mode 3.set IF filter as 30KHZ 4. set filter BW between 20HZ and 15KHZ 5. set De-emphasis as off mode	8 points ,pls refered to Freq1:450MHz (FCC/IC) Freq2:460MHz (FCC/IC) Freq3:470MHz (FCC/IC) Freq4:480MHz (FCC) Freq5:490MHz (FCC) Freq6:500MHz (FCC) Freq7:510MHz (FCC) Freq8:512MHz (FCC)	1.Analog mode 2.No signaling 3.Both SPK OFF 4.Both MIC OFF 5.Select High Power tuner item and Low PowerTuner item 6.force the radio to enter continuous transmiting state 7.Provide a control voltage from DAC to APC(Auto-Power Control) circuit input. Finish tuning and store the DAC value to codeplug.	mobile: High Power =40 W Middle Power =25 W Low Power =5 W		

	Modulation Balance (Delay)	6	Communication Test Set(HP8921)	HP8921 setting: 1.TX test mode 2. set tune mode as Auto mode 3.set IF filter as 30KHZ 4. set filter BW between 20HZ and 15KHZ 5. set De-emphasis as off mode	Carrier Frequency:8 points , from low to high Fre1:450MHz (FCC/IC) Fre2:460MHz (FCC/IC) Fre3:470MHz(FCC/IC) Fre4:480MHz (FCC) Fre5:490MHz (FCC) Fre6:500MHz (FCC) Fre7:510MHz (FCC) Fre8:512MHz(FCC)	1.Analog mode 2.Single Tone: random points, 100Hz - 5kHz, 100Hz step 3.No signaling 4.Both SPK OFF 5.Both MIC OFF 6.force the radio to enter continuous transmiting state at low power 7.Input a desired modulation frequency (100Hz - 5kHz). 8.Restore the gain value that saved in previous tuning steps. 9.DSP to output the desired modulation signal to MOD1 and MOD2 path with equivalent amplitude. 10.Adjust low port Delay to 175 value 11.Save the Delay value to codeplug.	165		
	Modulation flat checking	7	Communication Test Set(HP8921)	HP8921 setting: 1.TX test mode 2. set tune mode as Auto mode 3.set IF filter as 30KHZ 4. set filter BW between 20HZ and 15KHZ 5. set De-emphasis as off mode	Single Tone: random points, 100Hz - 5kHz, 100Hz step Carrier Frequency: 8 points, from low to high band. Fre1:450MHz (FCC/IC) Fre2:460MHz (FCC/IC) Fre3:470MHz (FCC/IC) Fre4:480MHz (FCC) Fre5:490MHz (FCC) Fre6:500MHz (FCC) Fre7:510MHz (FCC) Fre8:512MHz(FCC)	1.Analog mode 2.Single Tone: random points, 100Hz - 5kHz, 100Hz step 3.No signaling 4.Both SPK OFF 5.Both MIC OFF 6.force the radio to enter continuous transmiting state at low power 7.Restore the gain value and delay value that saved in previous tuning steps. 8.DSP to output the desired modulation signal to MOD1 and MOD2 path with equivalent amplitude. 9.switch modulation frequency (100Hz - 5kHz) to observe whether the modulation flat less than+/-0.35dB for each carrier frequence. 10.if the modulation flat is big than+/-0.4dB,then repeat tuning item 6 to 7 . 11 end	<+/-0.30dB		
Receive	Front-end Filt	8	Communication Test Set(HP8921)	HP8921 setting: 1.RX test mode 2.set carrier frquence as "Tuning frequence Points" iteam 3.set carrier RF level as "Software Requirements" iteam 4. set filter BW between 300HZ and 3KHZ	8 points Fre1:450MHz (FCC/IC) Fre2:460MHz (FCC/IC) Fre3:470MHz (FCC/IC) Fre4:480MHz (FCC) Fre5:490MHz (FCC) Fre6:500MHz (FCC) Fre7:510MHz (FCC) Fre8:512MHz(FCC)	1.Analog mode 2.No signaling 3..SPK ON, ext speaker gain set to Rated Audio. 4.Both MIC OFF 5.RX ON 6.Squelch open input RF level -80dBm to calculate the RX FE gain prameter for the RSSI equation and store the prameter value in codeplug.	SINAD>15dB @ -118.5dBm input		
	Max Audio output	9	Communication Test Set (HP8921)	HP8921 setting: 1.RX test mode 2.set carrier frquence as "Tuning frequence Points" iteam 3.set carrier RF level as "Software Requirements" iteam 4. set filter BW between 50HZ and 15KHZ 5. set AF level unit as "W" 6. set external load as "16Ω" for portable and as "20Ω" for mobile	1 points, U2:wideband and narrowband @ 450.0125MHz	1.Analog mode 2.No signaling 3.Both MIC OFF 4.RX ON 5.input -47dBm RF signal with 1kHz(@60% system deviation) modulation. 6.DSP to adjust the codec audio gain of SPK to obtain Max audio volume. 7.Finish tuning and store the tuning value in codeplug.	mobile: 5±1W		
	RX CV synthesize for quick locked	10	Communication Test Set (HP8921)	HP8921 setting: 1.RX test mode 2. set carrier frquence as "Tuning frequence Points" iteam 3. set carrier RF level as "Software Requirements" iteam 4. set filter BW between 300HZ and 3KHZ	1 point 450.0125MHz	1.Analog mode 2.No signaling 3.Both SPK OFF 4.Both Mic OFF 5.Low power 6.RX ON 7. Frequency locked (RX 399.975MHz) 8.ADC read the CV value 9.Calculate the △CV=CV-CV'(CV' is a fixed value for a frequency ,which obtain from the two fixed CV curve for RX) 10. save the △CV	±0.5 radix point 3 for △CV		

Bluetooth frequency range is 2402-2480MHz, the maximum power is 7.5dBm for BT3.0 and 5.0 dBm for BLE

The modulation type of bluetooth are GFSK π/4-DQPSK and 8DPSK.The modulation type of BLE is GFSK.