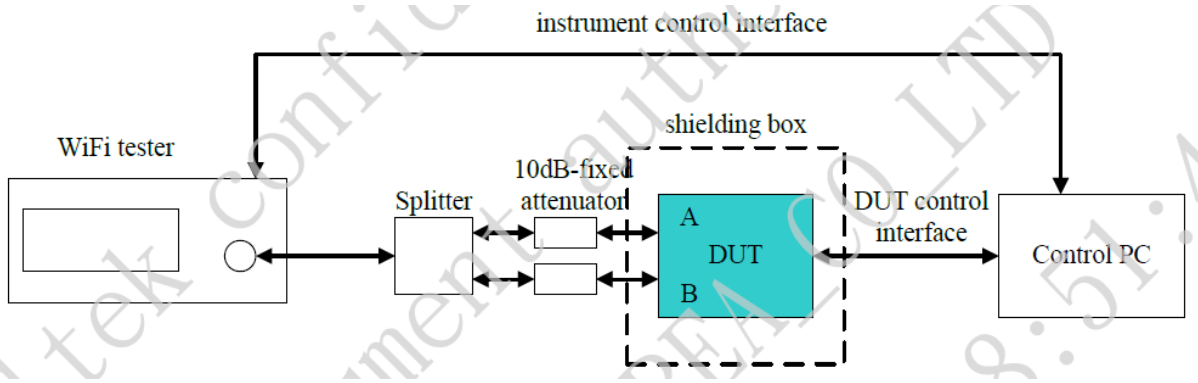
1. Test Environment

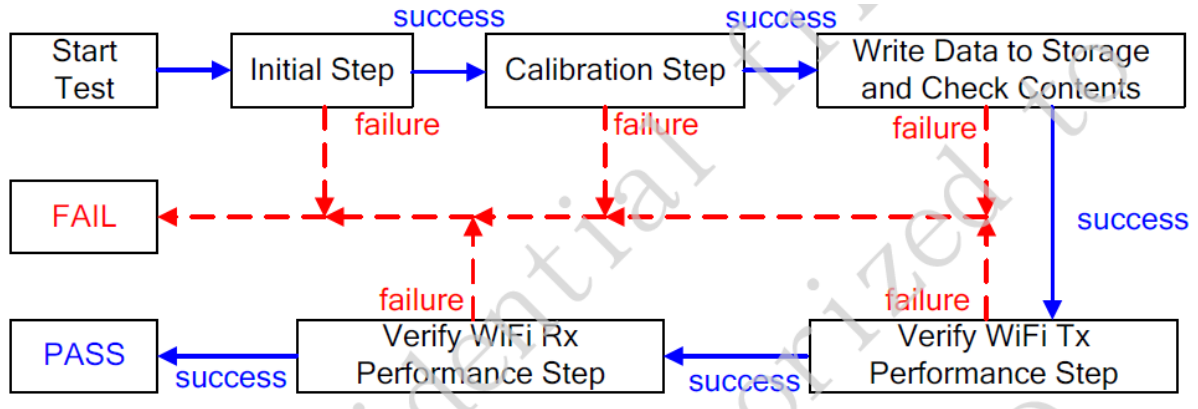
The test environment setup is as below:



Note the 10dB-fixed attenuator has to set as close as possible to DUT since it will reduce the mismatch effect between DUT and the environment.

2. DUT MP Flow

Below diagram shows a global view of mass production flow, please refer to following seb-section to get detailed description for each step.



2.1 Environment Setup

First you need to install the Windows MP driver correctly.

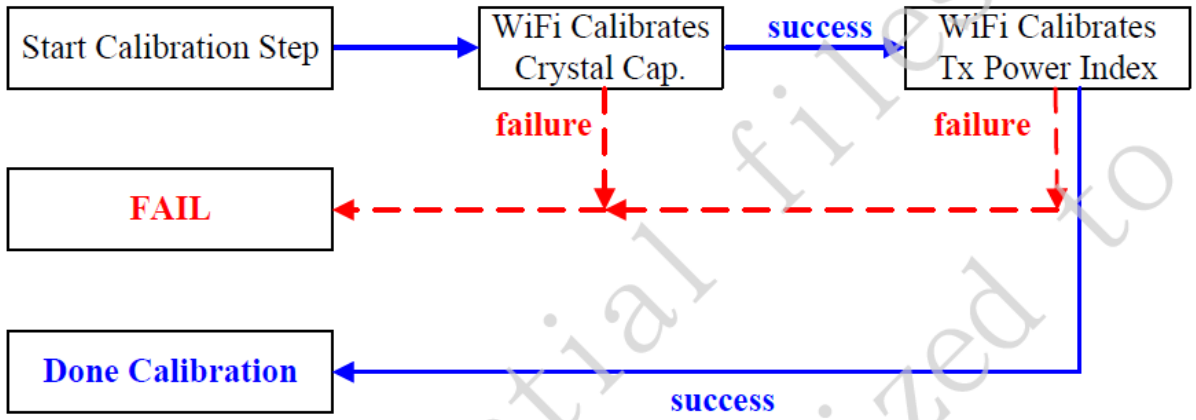
2.2 WiFi Initial Step

The relative control commands about initializing WiFi DUT is in the released UI sample code. The main MP API function is

```
BOOL RTLMP_API StartPacketDriver(LPTSTR ServiceName, BOOL bReloadService = FALSE);
BOOL RtlWlanCard(IN ULONG ChipID, IN ULONG ChipVer );
```

3. Calibration Step

This step includes 2 sub-steps as shown in the below figure.



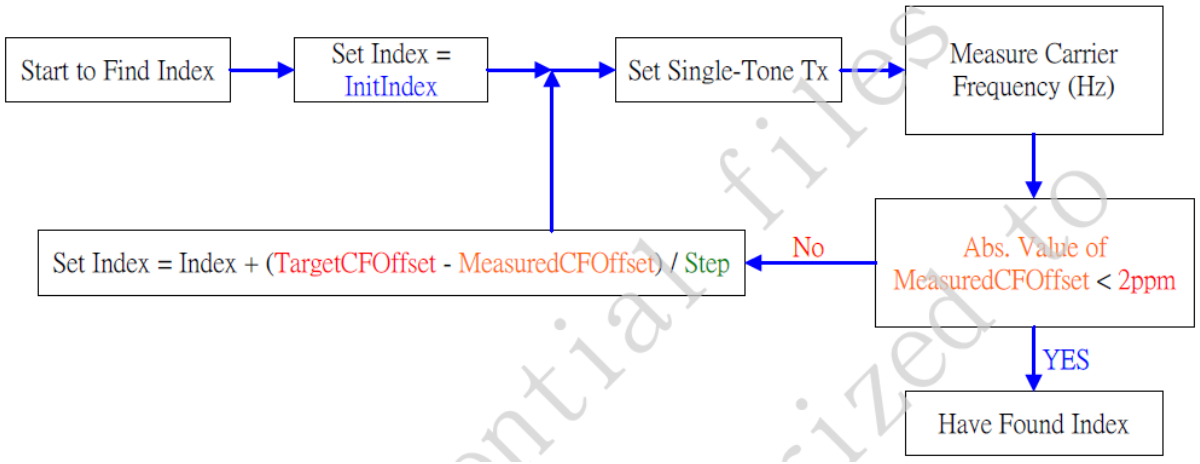
3.1 WiFi Calibrates Crystal Cap.

3.1.1 EFuse definition about Crystal Cap

First, take a look at eFuse content about setting of Crystal Cap. Normal driver will load this value in initial step. So this value must be well-calibrated and filled on correct eFuse location.

Crystal Calibration	0xB9[5:0]

3.1.2 Calibrated Crystal Cap. Flow



InitIndex : the default value is 0x20. Index range is 0x0 to 0x3F.

MeasuredCFOffset: Carrier frequency measured by instrument – Ideal Carrier Frequency

Target range Abs. Value of 2ppm in 2.4Ghz band is about 10KHz

TargetCFOffset : generally is 0 ppm

Step : This value is dependent of different module dominated by external capacitor beside the crystal, so it needs to modify easily in initial file of test program. Usually, the value is about +2~3KHz by experience. The suitable value should be checked by Hardware RD and fill it in the setup file of test program. The plus symbol means that the crystal cap. Index and carrier frequency is positive- dependent.

3.2 WiFi Calibrates Tx Power Index

3.2.1 Efuse definition about Tx power index and thermal meter

First, take a look at eFuse content about setting of RF Tx gain index. Normal driver will load bellow Tx gain setting for each channel group or each PHY data rate. So these Tx gain setting must be well-calibrated and filled on correct eFuse location.

Power Index Location in EFuse of Antenna A						
	Group 1 CH1 – CH2	Group 2 CH3 – CH5	Group 3 CH6 – CH8	Group 4 CH9 – CH11	Group 5 CH12 – CH13	Group 6 CH14
MCS7 B40	0x16[7:0]	0x17[7:0]	0x18[7:0]	0x19[7:0]	0x1A[7:0]	
CCK	0x10[7:0]	0x11[7:0]	0x12[7:0]	0x13[7:0]	0x14[7:0]	0x15[7:0]

Power Index Location in EFuse of Antenna B						
	Group 1 CH1 – CH2	Group 2 CH3 – CH5	Group 3 CH6 – CH8	Group 4 CH9 – CH11	Group 5 CH12 – CH13	Group 6 CH14
MCS7 B40	0x40[7:0]	0x41[7:0]	0x42[7:0]	0x43[7:0]	0x44[7:0]	
CCK	0x3A[7:0]	0x3B[7:0]	0x3C[7:0]	0x3D[7:0]	0x3E[7:0]	0x3F[7:0]

Power Difference Location in EFuse of Antenna A		
2G Band	54M-1T to MCS7-B40	0x1B[3:0]
	MCS7-B20 to MCS7-B40	0x1B[7:4]
	MCS15-B40 to MCS7-B40	0x1C[7:4]
	MCS15-B20 to MCS7-B20	0x1C[3:0]
	54M-2T to 54M-1T	0x1D[7:4]
	CCK-2T to CCK-1T	0x1D[3:0]

Power Difference Location in EFuse of Antenna B		
2G Band	54M-1T to MCS7-B40	0x45[3:0]
	MCS7-B20 to MCS7-B40	0x45[7:4]
	MCS15-B40 to MCS7-B40	0x46[7:4]
	MCS15-B20 to MCS7-B20	0x46[3:0]
	54M-2T to 54M-1T	0x47[7:4]
	CCK-2T to CCK-1T	0x47[3:0]

3.2.2 Define target power

According to

EMI/EMC requlatory

IEEE TX EVM / Spectrum Mask requirement

Then you can define your target power for each channel group and also each PHY data rate. The recommended target power is listed below and assumes all channel have the same target power for each PHY data rate.

Data Rate	MCS7-B40	MCS7-B20	54M	CCK
Target Power 2G	13dBm	13dBm	14dBm	16dBm

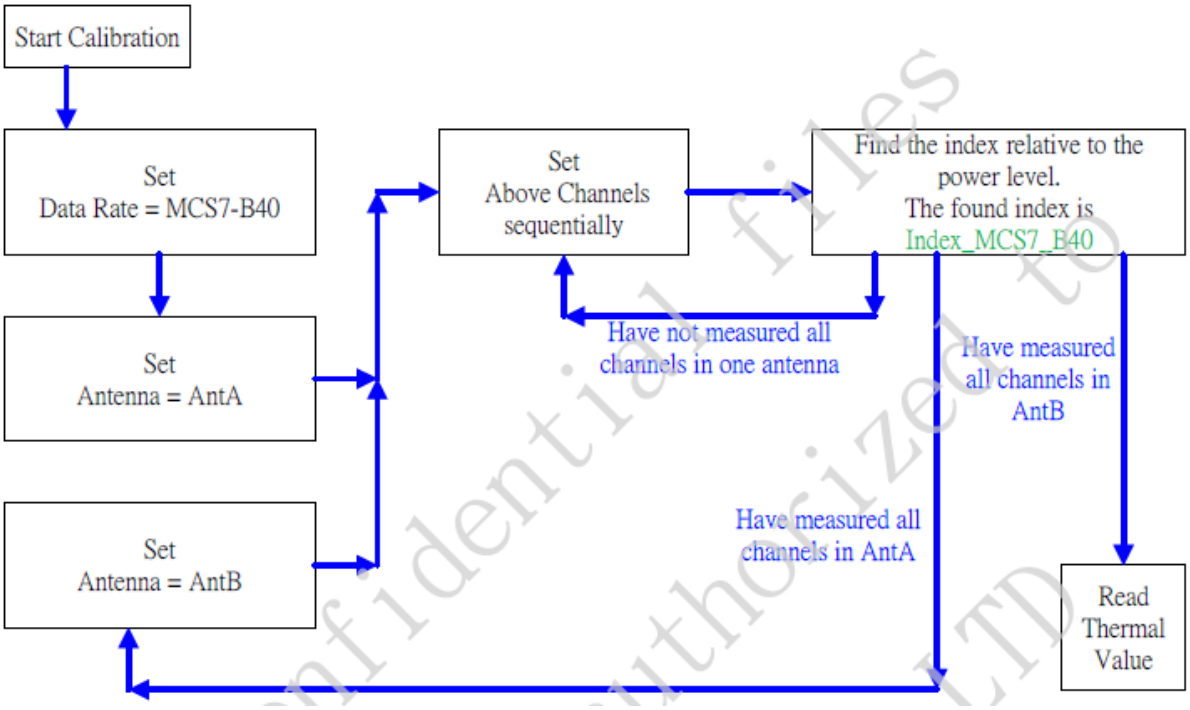
3.2.3 Tx calibration flow

Theoretically, we need to measure all value defined above in eFuse to calibrate the Tx power level. But since it needs too much time, we only measure several channels with MCS7-B40 signal and figure out the other non-measured value by some easy mathematics method.

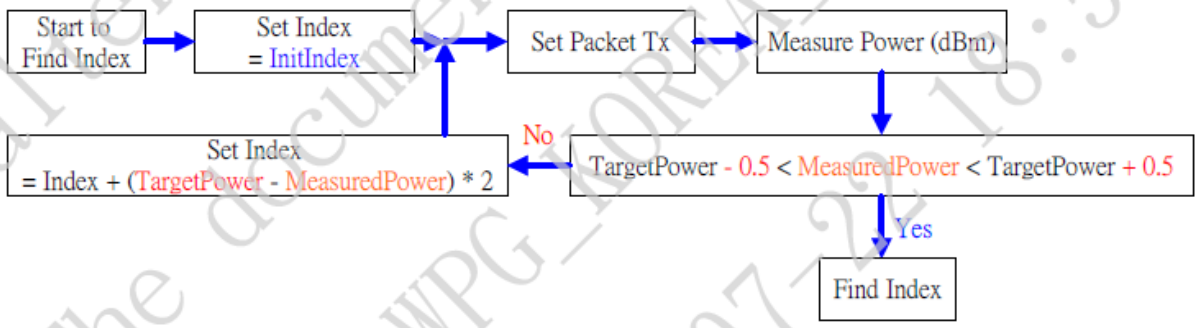
Usually, the recommended measured channels are listed below:

2G Band	
CH4	CH10

Table 4: The recommended measured channel for Tx power calibration



Each finding index flow is shown as below:



While finding Index_MCS7_B40, the init Index is defined by user or programmer and target power is MCS7-B40 target power level defined before.

After finding all Index_MCS7_B40, use these values to get all Tx gain index in each channel set by interpolation. As 2G channels for example, if the measured index in CH4 is 41 and the measured index in CH10 is 43, all 2G group MCS7-B40 index is shown as below:

Group 1	Group 2	Group 3	Group 4	Group 5
40 (Calculated by Interpolation)	41 (Measured)	42 (Calculated by Interpolation)	43 (Measured)	44 (Calculated by Interpolation)

Table 5: The example of finding index in 2G band by interpolation

The 2G CCK index will be a fix offset to MCS7-B40 dependent on CCK and MCS7-B40 target power defference and input baseband signal amplitude. So it also needs to be checked by RDand fill it to the setup file of test program. If we define a CCK offset value as CCK_Offset, the CCK index in above measured example will be shown as below.:

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
40 + CCK_Offset	41 + CCK_Offset	42 + CCK_Offset	43 + CCK_Offset	44 + CCK_Offset	45 + CCK_Offset

Table 6: The example of finding CCK index

The all power difference values are between +7 and -8. The value 0x0 ~ 0x7 in eFuse measns 0~ +7 and the value 0x8~0xF in eFuse means -8~-1. The +1 power difference will plus 0.5dBm power theoretically, so we calculate all power difference by the defined target power. We take Table 4 as an example, the2G power difference is shown as below:

54M-1T to MCS7-B40	0x2 ((14 – 13) * 2)
MCS7-B20 to MCS7-B40	0x0 ((13 – 13) * 2)
MCS15-B40 to MCS7-B40	0xE
MCS15-B20 to MCS7-B20	0xE
54M-2T to 54M-1T	0xE
CCK-2T to CCK-1T	0xE

Table 7: The example of finding power difference

The 2T(2S) relative to 1T(1S) difference is recommended value for avoiding 2 antennas influence.