application note

Why does the 2935 have 2 Manual Modes

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Within the 2935 and PhoneTest there are 2 manual modes of operation, designed to simplify the test, repair and alignment of GSM Mobiles.

INTRODUCTION

Why are there 2 different manual modes in PhoneTest?

Within the 2935 and PhoneTest there are 2 manual modes of operation, designed to simplify the test and repair of a mobile. Firstly there is a synchronous mode called BCCH mode (in call testing) and a unsynchronised mode called TCH mode (used for alignment).

BCCH Manual Mode

This mode controls the mobile as if it were operating on a network and is used to verify autotest failures and assist in the repair of the mobile. BCCH (Broadcast Control CHannel) Manual mode gives the user control over the important network functions of the mobile such as:

Registration
Placing a call to the mobile
Placing a call from the mobile
Clear down from the mobile
Clear down from the basestation
Handoffs between traffic channels
Handoffs between frequency bands
Setting of control channel, traffic channel, time slot, power level, timing advance and signal generator level

In addition a wide range of parametric functions are measured to the ETSI 300 607-1 specification. These are measured for both normal conversation bursts and also the access burst (RACH burst).

The transmitter measurements are :-
Mobile power,
Power ramp profile,
Frequency error,
Peak and RMS phase and
Timing advance.
Graphical displays of:-
Full Power Profile,
Useful Part,
Ramps, and
In-channel spectrum.

The receiver can be evaluated by measuring bit error rates and residual bits error rates on class 1b and class 2 bits, as well as the frame erasure rate (FER).

Information reported to the network is also displayed such as the RSSI (RX LEV and RX QUAL) and the reported timing advance and power level.

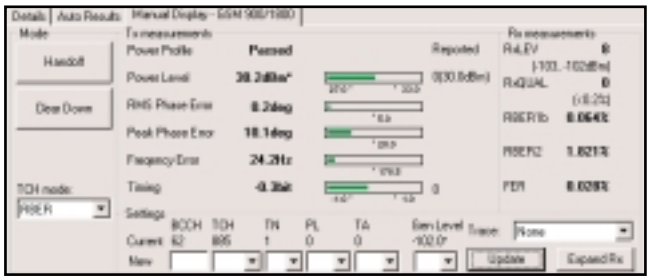


Figure 1: BCCH Manual Mode

The flexibility and ease of use of the 2935 allows the user to quickly assess the operation of a mobile under a wide range of operating conditions.

TCH Test Mode

TCH test mode is used in the alignment and fault finding of a mobile when the mobile have been placed in a test mode by either the use of external propriety software or by a sequence of "hidden" key presses.

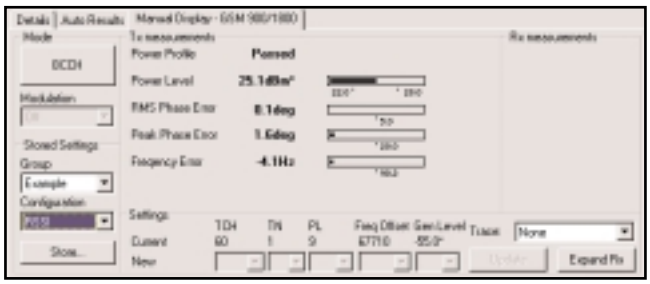


Figure 2: TCH Manual Mode

TCH mode provides an unsynchronised mode where the transmitter parameter can be measured without the need for a call to be established. The measurements available are mobile power, power ramp profile, frequency error, peak and RMS phase, timing advance and output spectrum. As the training sequence is used as a reference for frequency, phase and timing measurements, if a training sequence is not present then only the transmit power and output spectrum can be measured.

In addition to the transmitter measurements an unbursted GMSK signal or a fixed carrier signal can be generated at any frequency in the 900, 1800 and 1900 bands. The output level can be set within the range -40 to -120 dBm in steps of 0.1 dB.

The graphical TCH mode display of the mobile is simple and efficient. With the TCH mode the user has the ability to save the test configurations for allowing routine calibration steps to be easily recalled.

TYPES OF ALIGNMENT

Each manufacturer has a different method of mobile alignment.

The following identifies the parts of the mobile that can be aligned and how the alignment is carried out.

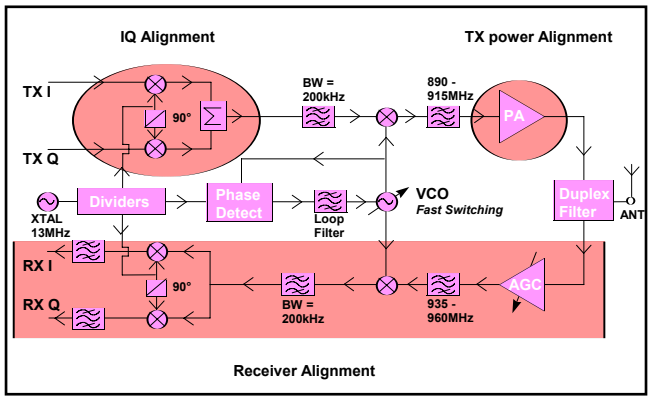


Figure 3: A very simplistic block diagram of a 900 MHz GSM Mobile. The grey areas represent the areas of primary alignment.

Mobiles transmit power alignment

The mobile is placed in a test mode, where it is set up to transmit a signal of predefined frequency and power. The test equipment is set up to measure the transmitted power from the mobile and the transmitted power is adjusted for a desired level.

RSSI (Received Signal Strength Indicator)

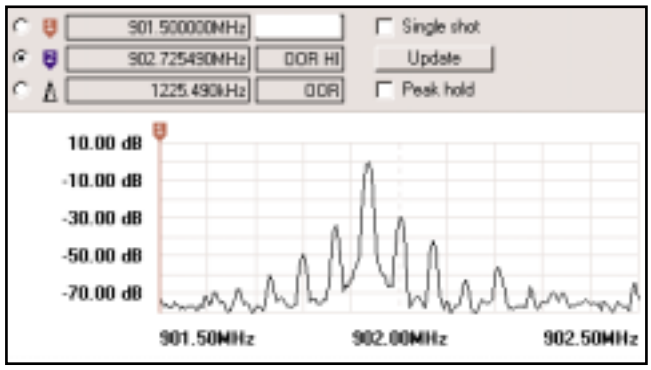
The test equipment is set up to generate a signal of a known level and frequency which is injected into the mobile. The signal strength measured via the test mode on the mobile. Then a second signal generator level is then measured, from this the absolute RSSI and the RSSI linearity is determined.

AFC (Automatic Frequency Control)

A signal is injected into the mobile at a known offset from the channel and the mobile then measures the frequency to identify if it within its AFC capture range.

IQ alignment

The separate gains of the IQ channels in the mobile are adjusted until they are balanced. This is usually carried out with the mobile generating a GMSK (Gausian Minimum Shift Keying) signal carrying all 1's or all 0's data. This produces a characteristic spectrum where the maximum signal is offset by 67.71 kHz from the nominal carrier and distinctive spurs are produced as shown below.



Automatic testing

When the mobile has been repaired and aligned a sequence of predefined test are carried out. To verify the mobile is suitable to be used on the GSM network. The 2935 and PhoneTest provide a highly flexible and high speed approach to GSM mobile repair and test.

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