

## CABLE TV TUNERS ENABLE VIDEO QUALITY AND RELIABILITY IN CHINA HD SET-TOP BOXES

by Jaime Chunda, Microtune® Cable Marketing Manager

*Proven silicon tuners can overcome the challenges of noisy cable networks while enabling new high-definition programs, digital video recording, video-on-demand services, and data modem services for interactivity.*

### SUMMARY

**In single or multi-tuner set-top boxes, the tuner is the key electronics component that enables high-performance cable TV signal reception.**

China's cable operators are migrating to full entertainment and interactive services – HDTV, picture-in-picture, digital video recording and video-on-demand. Cable operators are demanding cost-optimized cable set-top-boxes that deliver these new digital content services with the highest video quality, which in turn, enables operators to attract more and more subscribers.

In single or multi-tuner set-top boxes, the tuner is the key electronics component that enables high-performance cable TV signal reception. High-performance tuners, proven in field tests, can enable quality video services even across China's challenging cable transmission environments. The right silicon tuner can achieve a clear, reliable signal even in noisy or high-interference cable environments.

### TECHNOLOGICAL ISSUES

Ensuring HD video quality requires knowledge of the errors and inaccuracies that can be introduced by real-world cable conditions. The set-top box and its tuner, often operating in less than ideal circumstances, must be able to adjust to dynamic loading and sudden noise or interference. This ensures that they will consistently operate to the highest levels of performance.

Several tuner performance characteristics particularly influence video quality and reliability in a cable environment. These include dynamic range, selectivity, and linearity. The tuner must deliver strong performance across various metrics, and meet the DVB-C standard, in order to overcome the challenges faced by China's cable operators.

#### **Selectivity**

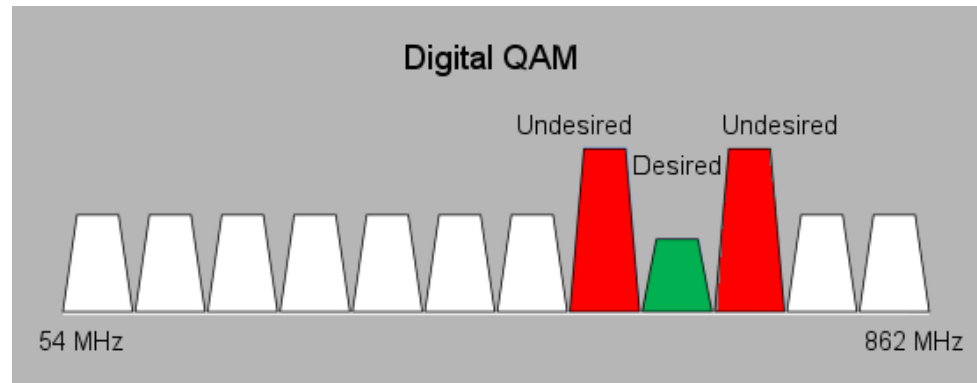
In addition to having wide dynamic range, the tuner must also discriminate a desired signal from strong adjacent TV channels or in-band interference that could be caused by the environment. Tuners in challenging radio frequency (RF) environments require sharp filtering in order to attenuate the adjacent channels that are not desired. This filtering can be performed within the tuner or external to the tuner with a surface acoustic wave (SAW) filter, or it could even be done with a combination of both. Selectivity and dynamic range can also be improved when the tuner has distributed automatic gain control (AGC) which adjusts the level of the signal as it passes through filtering stages. Silicon tuners with advanced filtering technology, such as [Microtune's MT2066 tuner](#), can offer superior selectivity performance by reducing the overall RF energy allowed into the mixer of the tuner

## Linearity

To deliver HD signals in a challenging cable environment, the tuner must avoid generating its own distortions. This requires high linearity in the tuner signal path. Linearity is characterized by the following distortion performance parameters: composite second order (CSO), composite triple beat (CTB), and cross modulation (XMOD). Good tuning performance requires that these parameters meet minimum levels: -60dBc CSO, -63dBc CTB, and -57dBc XMOD.

It is important for the cable set-top box to use a linear tuner, such as the Microtune MT2066, in order to meet the more demanding QAM demodulation and MPEG decoding required of HD video.

## The Tuner Ensures Video Quality



The tuner must attenuate high-strength undesired signals to reliably receive digital QAM signals.

By deploying future-ready, existing silicon technology, cable operators can scale their solutions as end-user demand grows, handling future services such as ultra high-speed data, IP voice, video on demand, interactive online gaming, IPTV video, and new commercial services. With the 'mix and match' approach, service providers can offer the most advanced, cost-effective and agile solutions, allowing them to compete aggressively in the broadband services marketplace.

## Advantages of Silicon Tuners

The new class of advanced, miniaturized silicon tuners can offer a very small footprint and competitive price/performance advantage for cost-optimized set-top boxes. For example, Microtune's chip tuners, deployed in millions of worldwide set-top boxes and cable modems, have proven advantages over can tuners. [Microtune's specialized cable tuners](#) offer:

- Better or comparable performance
- Better reliability (a can tuner can have a defective rate of 3000ppm, while Microtune's silicon tuner defective rates are closer to 20 to 30ppm) – they are also resistant to mechanical and temperature stresses that can cause tracking filter coils to drift out of tune
- Flexible designs – they are easy to design in with multiple, available reference designs

- Smaller footprint and board area, especially for multiple tuner applications such as interactive and DVR
- Modern silicon processes allow Microtune tuners to be offered at low competitive prices

Not all silicon tuners are the same. Manufacturers should carefully consider the tuner's performance specifications to ensure operation in challenging cable environments and to select a tuner chip that was developed specifically for the challenges of the Chinese cable market.

The tuner must meet the stringent performance requirements of the DVB-C digital cable TV standard and the additional dynamic range, noise and adjacent channel requirements specific to China. The tuner must also be proven in operator field tests and deployments to ensure reliable operation in the varying fidelity of the Chinese cable networks. It is also important to ensure that the silicon tuner manufacturer has the global manufacturing, supply, and infrastructure in place to satisfy sudden surges in high-volume production demand.

Silicon cable tuners from Microtune offer critical additional advantages.



- Microtune tuners are proven technology. Microtune's TV tuners, deployed in both single- and multi-tuner cable products, have pioneered new classes of cable services, including digital TV, digital video recording, ultra-high speed data (DOCSIS® 3.0), telecommunications and on-demand services. Microtune's cable TV tuners are being used by domestic brand leaders, including [Shanghai Digivision Ltd.](#) and [Coship Electronics Co. Ltd](#) as well as top-tier international companies such as Cisco, ARRIS and Motorola.
- The low-cost Microtune MT2066 tuner chip was designed for China, and is already deployed in the Chinese cable market both in major cities and in rural locations (currently the only silicon tuner to ship in Chinese set-top boxes)
- In addition, MT2066 reference designs are available to simplify the design-in process. Board design support is available locally to ensure good system and application performance, even in noisy networks with substantial interference issues.

### The Future of HD Video in China

Silicon tuners are attractive for HD cable set-top boxes in China because of their high performance, small footprint, and low bill of materials cost (especially for multi-tuner designs). The transition to a silicon tuner does not have to be costly or risky, if manufacturers select proven tuner technology from a dependable tuner vendor. For equipment manufacturers, it is important to evaluate the performance, technical support, and cost of tuner options and to consider exploiting the advantages of a single-chip silicon tuner for HD video applications