



ALLOY

Product Brief

Product Introduction

ALLOY provides highly reliable and accurate frequency stability, timing synchronization, and automatic location determination for femtocells, picocells, and macrocells, in the challenging indoor and urban environments where they are deployed. ALLOY also supports GPS-denied applications such as timing and frequency synchronization for critical national infrastructure.

ALLOY provides fast frequency and timing acquisition out-of-the-box so customers do not have to wait tens of minutes or hours for A-GPS reception. Further ALLOY uses minimal network data (less than 1KB per minute) to achieve this performance, compared with network timing solutions such as NTP and IEEE1588 which can require a large percentage of the entire broadband network connection.

ALLOY is a low-cost, multi-sensor solution. Component sensors, including TV-timing, A-GPS, Rosum network timing, and (optional) macrocell sniffing are tightly-coupled (TC) together to maximize the effectiveness of each individual sensor. Then the highly-overdetermined set of sensor measurements are fused together with RAIM and Kalman filtering technology to produce better results than any single-component technology can deliver.

ALLOY eliminates GPS holdover and the expensive crystal oscillators that come with GPS holdover. ALLOY can maintain frequency and timing using even a single DTV signal.

Product Performance

The primary benefit to wireless carriers and femtocell vendors of ALLOY is its out-of-the-box timing and location performance. ALLOY provides very high availability where femtocells, picocells, and macrocells are deployed or where non-GPS synchronization solutions are required.

The challenge for GPS is that the system relies on radio-frequency (RF) signals broadcast at frequencies that are strongly blocked by building materials and that are “blurred” by the strong multi-path effects of urban and suburban environments. Where multipath is minimal and where building attenuation is low, A-GPS can work well, but this combination of signal attenuation and multipath makes it exceedingly challenging to use A-GPS for indoor or urban location. Even the best available A-GPS solutions can tolerate only 30dB of signal attenuation before they can no longer function. A single steel-reinforced concrete wall blocks 26dB of signal at GPS frequencies, leaving very little usable signal for synchronizing the femtocell.

The result is a marginal A-GPS synch solution that is subject to GPS jamming or outages, requires placement of the femtocell or picocell by a window, and which requires tens of minutes or hours for start-up. To enable mass deployments of femtocells, Rosum ALLOY provides a solution that works quickly, out-of-the-box wherever people live leveraging the power and the highly distributed and redundant nature of broadcast TV.

TV signals are an ideal complement or backup for GPS. TV-timing and location performs well where GPS is worst - in urban and suburban areas where indoor environments are the most challenging. Broadcast TV deployments are highly aligned with population, and TV is deployed at very high power levels to support indoor TV viewing. Rosum ALLOY can use broadcast TV signals for timing, frequency, and location even with only 1/10,000th the power required for viewing TV. For typical broadcast power levels of hundreds of kilowatts, this means that Rosum can use TV signals even after 80dB or more of building attenuation. This represents a 50dB power margin advantage over A-GPS solutions. That is, TV signals can withstand attenuation from several more walls and still be used effectively for synchronization and location determination. TV-timing can be used in the absence of GPS.

With ALLOY, consumers will enjoy quick start-up time, out-of-the-box, and carriers will have fewer customer support calls regarding femtocell installation and set-up. Further, carriers will not be required to roll trucks for enterprise femtocell and picocell installations to have a technician install a GPS antenna.

Product Details

The ALLOY client provides femtocells, picocells, and macrocells with 20ppb frequency accuracy, 1microsecond timing synchronization (GPS-referenced), and location determination and verification to support emergency caller location.



The ALLOY client includes:

- the ALLOY RSM2001 TV-timing chip
- high-sensitivity GPS
- a low-cost voltage-controlled crystal oscillator,
- ALLOY client software which runs on the local CPU.

The ALLOY solution is an assisted RF solution, with assistance data provided by the ALLOY Aiding Server. Aiding data are provided to the client periodically, and the total data rate is less than 1KB per minute in all modes of operation. The Aiding



