

**RTCA Special Committee 186, Working Group 3**

**ADS-B 1090 MOPS, Revision A**

**Meeting #14**

**ATCRBS Timing Distribution Summary**

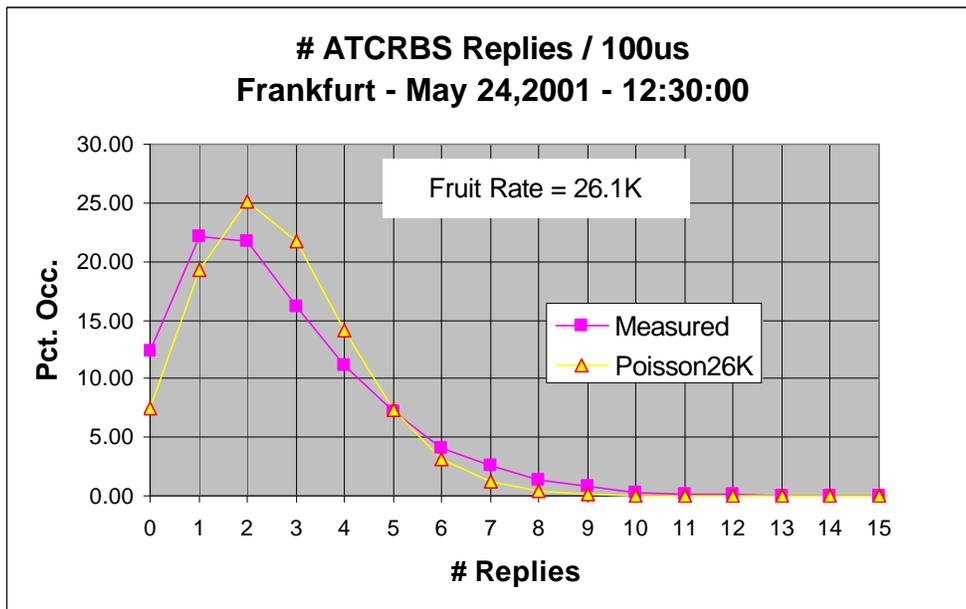
**Presented by Thomas Pagano**

**SUMMARY**

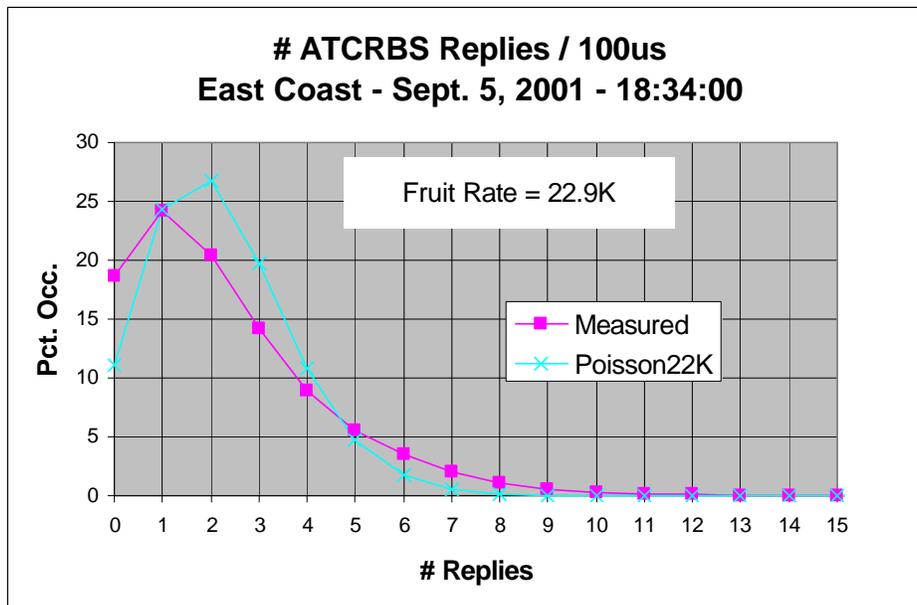
This Working Paper is a re-submission of 1090-WP-13-05. The data in this Working Paper summarizes the time distribution of ATCRBS replies measured from a sample of the Frankfurt environment from May 2000 flight tests and a sample from an East Coast environment flight test in September 2001. The analysis was performed to validate the timing distribution that will be utilized in Extended Squitter performance measurement models.

The following data summarizes the time distribution of ATRCBS replies measured from a sample of the Frankfurt environment from May 2000 flight tests and a sample from an East Coast environment flight test in September 2001. The analysis was performed to validate the timing distribution that will be utilized in Extended Squitter performance measurement models.

A sample from a flight during the Frankfurt ADS-B flight trials when ATRCBS Fruit rates were at peak values was selected. The results from the selected Frankfurt sample are shown herein. The sample analyzed was taken for over a 3 second time interval. The sample selected was during a fairly constant rate allowing a comparison to a single Poisson distribution. The average ATRCBS rate measured over the interval is approximately 26,000 replies per second. The first plot represents the percent distribution of the number of replies occurring in 100 microsecond intervals. The x – axis represents the number of replies in a 100 microsecond interval and the y – axis represents the percentage of 100 microsecond intervals containing that number of replies. As can be seen from the comparison, the measured data does not exactly map to the distribution predicted by Poisson. There is a slight skew that indicates that measured arrivals may tend to bunch. Whether this is due to lack of adequate samples or is a real behavior is hard to determine without further analysis.



The following data was collected from a flight conducted on the East coast to measure ATCRBS and Mode S reply rates. The sample evaluated here was taken during a measurement flight conducted September 5, 2001. The flight profile took the aircraft from the Atlantic City area, north to New York reversing to the south to as far as Washington, DC and returning to Atlantic City. The data sample analyzed herein was when the aircraft was located between Philadelphia and Baltimore. The sample represents over 3 seconds of ATCRBS replies having amplitudes of  $-84$  dBm and above. The next plot shows the measured distribution and comparison to the Poisson distribution of the average measured rate for the sample. The measured rate at amplitudes of  $-84$  dBm and above is 22.9K.



The data sample timing distribution shows the general shape of a Poisson distribution. The East Coast sample also shows a bias to “bunching”, more so than the Frankfurt data sample.