RUBIDIUM ATOMIC CLOCKS

GPS-Synchronized Rubidium Clocks

Time & Frequency Systems
<table>
<thead>
<tr>
<th>Main Business</th>
<th>Accurate Time and Frequency Sources – Atomic Clocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Jerusalem, Israel</td>
</tr>
<tr>
<td>Founded</td>
<td>Founded in 1993 by Benny Levy and Dr Avinoam Stern</td>
</tr>
<tr>
<td>Ownership</td>
<td>Private Company: 50% Founders, 50% RAFAEL (since 2011)</td>
</tr>
<tr>
<td>Workforce</td>
<td>55 Employees; ~ 60% Engineers and Physicists</td>
</tr>
</tbody>
</table>
Main Product Lines

- **Rubidium Frequency Standards**
  - Nano Atomic Clock
  - AR133
  - Ruggedized AR133
  - Tactical - AR61A

- **MIL-STD GPS Disciplined Rubidium Systems**
  - AR51A - Family

- **GPS Disciplined Rubidium Systems**
  - AR7X - Family
• Qualification of Rubidium Frequency Standard model AR81A was done with Thales Alenia Space Italy (TAS-I) and supervised by TAS-F and ESA
• The unit met all requirements and exceeds some by large margins
• AccuBeat is the sole qualified supplier
Sample International Customers

- AccuBeat Ltd.
- U.S. Air Force
- Boeing
- Northrop Grumman
- Airbus
- Raytheon
- Galileo
- Motorola
- HDW
- Thales Alenia Space
- ND SATCOM
- Astraum
- EDIC Systems Inc.
- Larsen & Toubro
- Vectron
- Anite
A special proprietary algorithm detects a spoofing attempt by comparing the time received to the time indicated by the AccuBeat atomic clock. The algorithm filters abnormal time that result from deception and only updates the atomic clock with normal time.

The exact time provided is a result of the atomic clock (which is protected from deception) and not from the GPS output.

When an spoofing attack is detected, the algorithm sends an alert to the cyber center.

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**Immune GPS Clock - Type A**

- None immune GPS Receiver
  - GPS TOD & Data
  - GPS 1PPS
- Smart Spoofing Detection Algorithm
- Frequency Control
  - Atomic 1PPS
- Atomic Clock
  - Secure GPS Data
  - Secure Atomic TOD
  - Secure Atomic 1PPS
  - Accurate 10MHz

This presentation contains Confidential Proprietary Information to AccuBeat Ltd. Distribution is prohibited.
Time FireWall™ Concept

Plug and Play solution for Legacy Equipment
Patented Solution

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AccuBeat has passed PCT Worldwide
Key Features

- Input: GPS L1 antenna
- Output: GPS L1 signals
- Monitor & Control: RS232
- Power supply: 110 / 220 V AC
- 19” 1U Rack Mounted
- Holdover (Rb clock configuration): 1µs/24 hrs (typ.)
Time Server - AR79

**Unit Interfaces**
- 4x 100/1000/2500BaseX (SFP)
- 2x 10/100/1000BaseT RJ45
- 2x 1/2.5/10G (SFP+)
- Support SFP/SFP+: MM, SM, SFS, xWDM, Copper
- 1x RS232 (RJ45) Console
- GNSS Antenna
- 1PPS output, 1PPS Input, 10Mhz output
- TOD In, TOD Out

**Network Protocols**
- IPv4/IPv6
- SNMP v1/v2/v3 extensive MIBs, Trap profile
- HTTP/HTTPS
- IPv6 Management
- TACACS, RADIUS, LDAP
- SYSLOG
- SSH-V2
- SMTP
- MD5

**Time Server**
- NTPv4
- 10,000 NTP request per second
- PTP - Optional
“Fast is fine, but accuracy is everything”
(Xenophon, 430 - 354 BC)
david@accubeat.co.il