

EV-DO Rev A (DOrA) Development, Conformance and QoS Test System

(CDMA-AIME Options 6402-101A and 6402-123)

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A passion for performance.



DOrA Solution Highlights:

- High data rate throughput
- Quality of Service (QoS) support
- C.S0038-A Protocol Conformance
- C.S0044-A Interoperability
 - Hybrid Mode, Multiple Personality, Multiflow and QoS Test Cases
- QoS, Application and EV-DO Rev A Performance Testing
 - High data rates, low latency, QoS guarantees and applications such as video telephony (VT) and Voice Over IP (VoIP)
- Full automation to reduce test time, increase engineering productivity and allow for regression testing
- Upgrade options to protect existing investment in Aeroflex systems
 - Future upgrade to EV-DO Rev B

6402 CDMA-AIME test platform provides comprehensive testing of CDMA2000 EV-DO Revision A mobile devices and access terminals. The test system provides an ideal platform for development, conformance, interoperability assessments and regression testing in a controlled and easily-repeatable lab environment.

Using the 6402 EV-DO Rev A solution to identify potential device issues at the earliest opportunity increases product confidence and reduces product launch delays and re-design costs.

Additional DoRA Solution Highlights:

- Backward compatible with 1x and EV-DO Release 0
- Multi-cell emulation including hybrid mode with EV-DO Rev A (DOrA), EV-DO Rel 0 (DOR0) and 1X technologies
- Multi-Flow packet application
- Support for all EV-DO Rev A specific protocols and protocol subtypes

CDMA2000 EV-DO Rev A, as defined by the C.S0024-A standard, increases the speed of packet data download from 2.4 Mbps to 3.1 Mbps and upload speeds from 153.6 kbps to 1.8 Mbps when compared with EV-DO Release 0.

In addition, DOrA introduces guaranteed Quality of Service (QoS), enabling better multi-user efficiencies and new services such as VT and VoIP telephony along with other real-time applications.

The 6402 platform/hardware supports the higher modulation schemes, larger packet sizes, and QoS mechanisms required to perform throughput and application testing such as FTP or VT.

This solution features an extensive development API for customised testing of all DOrA protocols. Prewritten conformance scripts are available covering the C.S0038-A and C.S0044-A standardized test plans supporting execution in fully automated mode.

Multiflow and QoS Improvement

The 6402 also supports the new Multiflow and QoS technologies of DOrA, and allows users to gain confidence in the operation of the device under test, thus allowing multimedia services to be tested prior to commercial launch. This is achieved by providing a test solution with flexible control over how data packets are sent in a simulated network environment.

For the very latest specifications visit www.aeroflex.com

During DOrA operation, the test system is able to prioritize data packets based on the service being modelled and/or the type of packet that is being sent. Furthermore, the system can prioritize data packets using a flow-based QoS, where packets within an application are prioritized based on the negotiated reservation parameters per data flow.

The DOrA test solution provides an ideal lab based environment for analyzing applications such as video telephony which contains video and audio data streams that are prioritized differently; audio packets receive a higher priority over video packets which are more easily buffered without adversely impacting the user experience.

Low data packet latency is another important parameter for feature-rich applications to create an enjoyable user experience. DOrA includes technical advances to address this requirement such as the use of smaller data packets and HARQ techniques which limits the retransmission of data packets and reduces the transmission time of an individual packet.

The DOrA Aeroflex solution offers a test environment to examine the behaviour of this HARQ mechanism allowing the user to force failure conditions to assess the impacts on data rates.

Technical Specification

• Session Negotiation Options

- Accept AT requested parameters or force alternate AN parameters
- Multiple personalities i.e. simultaneous DOr0 and DOrA operation

• Multi-Flow Packet Application

- MultiFlowRLP - support for configuring multiple Forward and Reverse flows, including configuration of the following:
 - Fwd Flow/Rev Flow:
 - RLP Flow number
 - RLP Flow ID (up to 30)
 - Activate/Deactivate Flow
 - Sequence Length - Size of sequence space bits
 - Length of RLP Flow ID
 - NAK Enable/Disable - Automatic Transmission of an RLP containing the NAK sequence number
 - Corruption - Sequence Numbers, Repeating/Dropping/Truncation of Packets
 - Mapping of RLP flows to Reservation Labels
- Fwd Flow Only:
 - Flush Timer - Value of RLP Flush Timer in ms
- Rev Flow Only:
 - Abort Time - Value of RLP Abort Timer in ms

• Enhanced Idle State

- Configuration allows the user to define mask duration values for the Monitor State:
 - MaskCount - number of mask entries
 - PreMaskDuration - number of pre-mask durations in units of four slots
 - MaskDuration - number of mask durations in units of four slots
 - PostMaskDuration - number of post-mask durations in units of four slots
- Configuration of Slotted Mode Operation:
 - SlottedMode - Control to enter or leave the Monitor State
 - PreferredCycle - Value to be used in SleepState wake ups for R (as defined in the standard)
 - SlotCycle1/2/3 - SlotCycle value to be used during Period 1/2/3
 - WakeCount1/2 - Number of wake ups dictating length of stay in Period 1/2
- Ability to override the automatic slot cycle calculation to force the AT to use Slot Cycle 1, 2, or 3.

• MAC Layer Protocols

- Enhanced Control Channel
- Enhanced Access Channel
 - Automatic ACK generation for received access channel messages
 - Automatic Access Parameter transmission
- Forward Traffic Channel
 - Enhanced Forward Traffic Channel MAC Protocol
- Reverse Traffic Channel
 - Subtype1 Reverse Traffic Channel MAC Protocol
 - Subtype2 Reverse Traffic Channel MAC Protocol
 - Subtype3 Reverse Traffic Channel MAC Protocol

• Physical Layer

- Support for Subtype 0/1/2 and all SubSync and Async rates
- Single User Packet and Multi User Packets
 - Ability to select serving probability and Multi User Probability
- MAC_ARQ Channel - H-ARQ, L-ARQ and P-ARQ
 - ARQ Mode - Bipolar Keying or ON-OFF Keying
 - Operation Mode - Automatic, ACKs or NAKs always transmitted

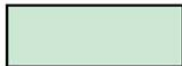
- **Physical Layer Reverse Link Enhancements**
 - Higher data rates and finer quantization
 - Support of data rates ranging from 4.8 kbps to 1.8 Mbps with 48 payload sizes
 - 4-slot sub-packets (6.66 ms)
 - Support of QPSK and 8-PSK modulation
 - Hybrid ARQ using fast re-transmission and early termination.
 - Flexible rate allocation at each AT via autonomous as well as scheduled mode
 - 3-channel synchronous stop-and-wait protocol
- **Physical Layer Forward Link Enhancements**
 - Peak rates increased from 2.4 Mbps to 3.1 Mbps
 - Multi-user packet support:
 - Creates additional small payload sizes (128, 256, 512 bits)
 - Improves frame fill efficiency
 - Data Source Control (DSC) Channel introduced (on RL) to indicate the desired forward-link serving cell
 - Minimize service interruption due to server switching on FL
- **Logging**
 - Real time logging and decoding of signalling (configuration and control) messages
 - Real time logging of packets from the individual EVDO Protocol Stack layers
 - Real time logging of RLP packets for all the forward and reverse flows
- **Support for QoS**
 - Prioritization and delivery of packets based on the type of application or user's QoS profile
 - Allows evaluation of real-time broadband and delay sensitive services, such as Voice over IP (VoIP), Push-To-Talk (PTT), Video Telephony (VT), Multicasting, Personal Media
- **Conformance and Interoperability Scripts**
 - C.S0038-A Signalling Conformance Scripts for EV-DO Revision A Air Interfaces. Covering protocol initialization, negotiation and performance of all Rev A protocols / protocol layers. Aeroflex option 6402-290.
 - C.S00044-A Interoperability Scripts for EV-DO Revision A Air Interfaces. Providing testing for field scenarios including concurrent operation of air interfaces DOr0, DOrA and IX. In addition to these field scenarios there are tests covering new EV-DO Rev A air interface features including Multi-Flow, QoS and Data Over Signalling. Aeroflex option 6402-291.
- **EV-DO Rev A (DOrA) License Options**
 - Option 6402-101A - EV-DO Rev A System Software
 - Option 6402-123 - Advanced QoS System Software
 - Option 6402-290 - C.S0038-A EV-DO Rev A Protocol Conformance Scripts
 - Option 6402-291 - C.S0044-A EV-DO Rev A Interoperability Scripts

Expanded Protocol Support for Rev A

Application Layer	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">Default Signaling Application</div> <div style="border: 1px solid black; padding: 2px;">Default Packet Application</div> <div style="border: 1px solid black; padding: 2px;">Multi-flow Packet Application</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <div style="border: 1px solid black; padding: 2px;">Signalling Network Protocol</div> <div style="border: 1px solid black; padding: 2px;">Signalling Link Protocol</div> <div style="border: 1px solid black; padding: 2px;">Radio Link Protocol</div> <div style="border: 1px solid black; padding: 2px;">Flow Control Protocol</div> <div style="border: 1px solid black; padding: 2px;">Location Update Protocol</div> <div style="border: 1px solid black; padding: 2px;">Radio Link Protocol</div> <div style="border: 1px solid black; padding: 2px;">Flow Control Protocol</div> <div style="border: 1px solid black; padding: 2px;">Data Over Signalling Protocol</div> </div>
Stream Layer	<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">Stream Protocol</div>
Session Layer	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 2px;">Session Management Protocol</div> <div style="border: 1px solid black; padding: 2px;">Address Management Protocol</div> <div style="border: 1px solid black; padding: 2px;">Session Configuration Protocol</div> </div>
Connection Layer	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 2px;">Air Link Management Protocol</div> <div style="border: 1px solid black; padding: 2px;">Initialization Protocol</div> <div style="border: 1px solid black; padding: 2px;">Idle State Protocol</div> <div style="border: 1px solid black; padding: 2px;">Connected State Protocol</div> </div> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">Packet Consolidation Protocol</div> <div style="border: 1px solid black; padding: 2px;">Route Update Protocol</div> <div style="border: 1px solid black; padding: 2px;">Enhanced Idle State Protocol</div> <div style="border: 1px solid black; padding: 2px;">Overhead Messages Protocol</div> </div>
Security Layer	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 2px;">Generic Security Protocol</div> <div style="border: 1px solid black; padding: 2px;">DH Key Exchange Protocol</div> <div style="border: 1px solid black; padding: 2px;">SHA-1 Authentication Protocol</div> </div> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">Security Protocol</div> <div style="border: 1px solid black; padding: 2px;">Key Exchange Protocol</div> <div style="border: 1px solid black; padding: 2px;">Authentication Protocol</div> <div style="border: 1px solid black; padding: 2px;">Encryption Protocol</div> </div>
MAC Layer	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 2px;">Enhanced Control Channel MAC Protocol</div> <div style="border: 1px solid black; padding: 2px;">Enhanced Forward Traffic Channel MAC Protocol</div> <div style="border: 1px solid black; padding: 2px;">Enhanced Access Channel MAC Protocol</div> <div style="border: 1px solid black; padding: 2px;">Subtypes 1, 2, 3 Rev. Traffic Channel MAC Protocols</div> </div> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">Control Channel MAC Protocol</div> <div style="border: 1px solid black; padding: 2px;">Forward Traffic Channel MAC Protocol</div> <div style="border: 1px solid black; padding: 2px;">Access Channel MAC Protocol</div> <div style="border: 1px solid black; padding: 2px;">Reverse Traffic Channel MAC Protocol</div> </div>
Physical Layer	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 2px;">Physical Layer Protocol</div> <div style="border: 1px solid black; padding: 2px;">Subtype 1 Physical Layer Protocol</div> <div style="border: 1px solid black; padding: 2px;">Subtype 2 Physical Layer Protocol</div> </div>



EV-DO Release 0 protocol – Currently supported



EV-DO Revision A protocol – Currently supported



EV-DO Revision A protocol – Planned for upcoming release

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