

**PACKAGE ID** - 000806MLTPL00 TWOQUICK

**KWIC TITLE** - 2-1/2-D Electromagnetic Particle-In-Cell  
Finite-Difference Time-Domain

**AUTHORS** - Pointon, T.D.  
Sandia National Labs., Albuquerque, NM (United States)  
  
Seidel, D.B.  
Sandia National Labs., Albuquerque, NM (United States)

**LIMITATION CODE** -COPY           **AUDIENCE CODE** - LIM

**COMPLETION DATE** - 08/01/1992   **PUBLICATION DATE** - 04/01/1995

**DESCRIPTION** - TWOQUICK is a 2-1/2-dimensional, finite difference, relativistic, electromagnetic, particle-in-cell (EM PIC) simulation code, used to self-consistently advance interacting electromagnetic fields and charged particles forward in time. By 2-1/2-D, we mean that all three field and particle momentum components are present, but only on a 2-D spatial grid, i.e. the system is invariant in the third spatial coordinate. The electric and magnetic fields are advanced using Maxwell's equations, with currents computed from the motion of the particles. The particles use a fully relativistic algorithm to advance their two spatial coordinates and three momentum components under the action of the Lorentz force. Perfectly conducting, mirror and periodic boundaries are available for both particles and fields. Fields are driven with input TEM wave and circuit models. Particles can be preloaded, or dynamically created during the simulation with either field emission or beam injection algorithms.

**PACKAGE CONTENTS** - Media Directory; Software Abstract; Media Includes Source Code, User Guide, Executable Module, Auxiliary Material;

**SOURCE CODE INCLUDED?** - Yes

**MEDIA QUANTITY** - 1 CD Rom

**METHOD OF SOLUTION** - TWOQUICK uses finite-difference methods to solve Maxwell's equations, in time-domain, for the grid-based electromagnetic fields. It also uses the charge-conserving particle-in-cell method to advance the particles based on the Lorentz force and then allocate their motion to the grid-based current density.

**COMPUTER** - MLT-PLTFM

**OPERATING SYSTEMS** - UNIX

**PROGRAMMING LANGUAGES** - Standard Fortran 77

**SOFTWARE LIMITATIONS** - Only 2D simulations can be performed. There is no software imposed limit to the size of the grid nor the number

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**SOFTWARE LIMITATIONS - (CONT)** of particles that can be simulated.

**SOURCE CODE AVAILABLE (Y/N)** - Y

**UNIQUE FEATURES** - The source code has improved structure when compared to similar software packages. This allows for easier modification, such as increasing array limits and adding new physical models

**RELATED SOFTWARE** - The post-processor typically used to analyze TWOQUICK results, PFIDL, is based on the commercial IDL software from Research Systems, Inc. In order to use PFIDL, IDL must be purchased and PFIDL must be licensed from Sandia National Laboratories.

**OTHER PROG/OPER SYS INFO** - The source code does not include the Sandia-developed machine-dependent libraries nor the Portable File Format (PFF) library needed to build a new executable. These must be separately licensed from Sandia or replaced with local libraries performing similar functions. Also the PFIDL post-processor is not included.

**HARDWARE REQS** - There are no specific hardware requirements, only the Unix operating system and a Fortran compiler are required.

**TIME REQUIREMENTS** - Typical simulations require a few hours of CPU time on a single Cray Y-MP CPU.

**REFERENCES** - Informal documentation for users guide on media.

**ABSTRACT STATUS** - Submitted 4/95. Released AS-IS 9/20/96

**SUBJECT CLASS CODE** - V

**KEYWORDS** -

COMPUTER PROGRAM DOCUMENTATION  
T CODES  
BEAM DYNAMICS  
CHARGED-PARTICLE TRANSPORT  
ELECTROMAGNETIC FIELDS  
ELECTRON BEAMS  
FINITE DIFFERENCE METHOD  
FORTRAN  
ION BEAMS  
MAXWELL EQUATIONS  
PLASMA SIMULATION

**EDB SUBJECT CATEGORIES** -

990200 661220 430200

**SPONSOR** - DOE/DP

**PACKAGE TYPE** - AS - IS