BTR code Recent Modifications for Multi-Run Operation

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BTR code OVERVIEW

- Born To Run (released for public usage) - in 2005, MS Visual C++
- Purpose: NBI design and studies
- Fully functional NBI simulator, very intuitive GUI (Windows standard)
- 3D NB geometry. Surfaces number not limited
- Multi-beamlet source beam (4x), RS GG optics
- Beamlet (EMI): core + halo fractions (bi-gauss)
- 10^7-10^10 macro-particles (MP) per beamlet
- Regular angular splitting of EMI current (bi-gauss), each MP << individual weight
- Direct tracing, MP conversions/collisions << cross-sections
- Fields, gas, plasma input
- Neutral particles >> Neutral Beam Tracking model
- No randoms >> results determinism
- Parallel - multi-thread approach
- Easily verified on a Statistical Models (PDP)
- Manually tuned for any standard NB Config
- Unlimited statistics >> refined resolution
- Output: beam normal footprints, power Maps, peak power Profiles
- CAD compatible input (TXT)
- Permanent Development and Construction
- Purpose Related
- Full Hespan Support [https://sites.google.com/site/btrcode]

BTR Moves towards MULTI-RUN

Each single run in a conventional Single-Run BTR session is started by the input manual tuning procedure for a specific scenario, which is next followed by the code restart. This input routine requires the User’s extensive efforts and time to obtain and comprehend the results for multiple operation scenarios, with several input parameters scanned independently. Recent modifications in the code engine and input-output concept have formed a new BTR version 5 (or Multi-Run), which made possible to run automatically multi-parametric scans of different scenarios by a single click, with a preset list of scenarios input records. The main purpose was to implement the Multi-Scenarios / Multi-Task running modes in BTR sessions, with keeping intact the customary Single-run mode for all dedicated BTR users. In other words, the transition to the new version should be seamless and intuitive, compatible with the global BTR concept.

BTR Moves towards MULTI-RUN

- PURPOSE: multi-scenarios, multi-tasks
- NEW FEATURES
  - Model: multi-task settings, run options (split steps, splits through runs)
  - Model: plasma module, beam ionization maps, shine-through refined maps
  - Model: static surfaces (including transparent) - no limit
  - Input: Automatic Surfaces downloads, Hidden Surfaces
  - Input: Scenario file with parameters and Macro-Commands
  - Output: Requested Maps resolution up to 1000x1000 cells
  - Output: Folders tree, Reports (TXT, CSV format), All Scenarios Summary
  - Output: Additional Format for Loads
  - Output: Falls Statistics (option)
- Safety and Control: Surfaces clones, invalid corners
- Safety and Control: Terminal screen, Log file
- Safety and Control: Reports (TXT, CSV format), All Scenarios Summary
- Safety and Control: Terminal screen, Log file

BTR MULTI APPLICATION

- NBI Surfaces are imported by BTR from CAD generated (TXT) format
- MATLAB view of NBI surfaces, from left to right: Colorimeter, Exit Scrapper, Fast Shutter, Absolute Valve, Drift duct liner, connecting duct, and the Duct Liner DLM (in red)
- The DLM model: 54 surfaces, including two surfaces mimicking the DLM opening towards the neutron shield (DIM-MS) area behind Duct Liner

BTR Multi-Run Usage for Any Task: A long and complex routine, a sequence of massive runs with multiple parameters scan

The NEED for UPGRADE

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BTR-MULTI USAGE SUMMARY

BTR version 5 (MULTI) is more adapted for Complex Thermal Load Studies in NB lines and beam ducts. 

BTR-5 modifications provide:
- Parameters scanning with no restart
- Flexibility in NB Geometry input
- Input Control and Diagnostics
- Unlimited Particles Statistics, Surfaces
- Numerical options maps and Beam Foot Maps Resolution
- Results Load- Summary and Reports

The Multi-Scanning run option can be used also for NBI Geometry Optimization – during the 1st stages of NBI Design, when all NBI components and the Beam (or NBI Config) need to be carefully tuned.

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RESULTS PLOTS

Directly Intercepted atoms (DI) mostly load the Toe (for vert. lifting UP) and bottom for vert. Lifting DOWN) panels of the DLM. Maximum Total Power and Peak PD are caused by DI particles, Re-ionized particles (RI) are deflected Left or Right (depending on local MF) RI deposition >> onto Left and Right DLM panels. Horizontal Alignment >> small effect on the RI power distribution; both Total Power and Peak PD are mainly defined by high beam Div (Trmrad) Max Peak PD << for beam vert. points 210 mrad >> on the hop/bottom panel

2D views of the maximum power loading on each DLM panel calculated in BTR run of all the scenarios (Multi-Scenario opt).

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