



GravEn Simulation Engine

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Capabilities

- Full sky
- Population simulations
- Simulates both $+$ and \times polarizations
- Projects onto antenna pattern
- Calibrated
- Multi-detector
 - » MATLAB
 - » Documentation available in DCC: LIGO-T040020-00-Z
 - » Code to become available

How does GravEn work?

- Developed in MATLAB
- Compiles to stand alone using the MATLAB Compiler Toolbox
- Does not need MATLAB toolboxes
- Driver function
 - » Flexible usage modes
 - » Process input through list function
 - » Loop through the list:
 - Generate waveform
 - Project onto antenna pattern
 - Transform to AS_Q for given IFO
 - Save result and write info to log file

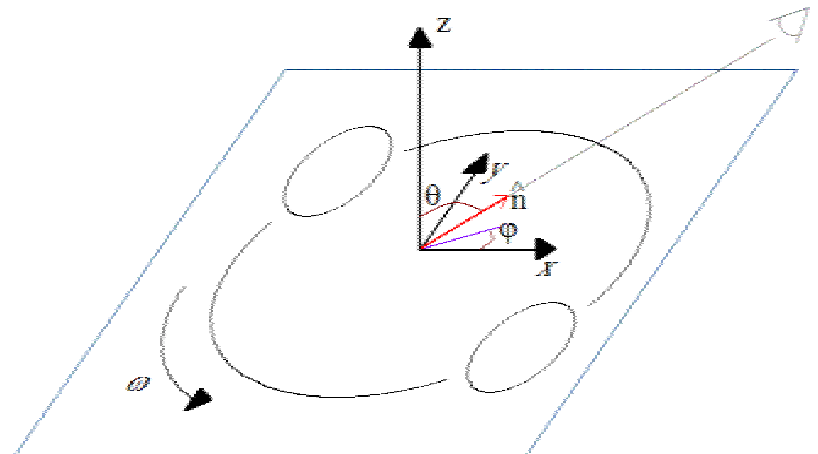
Simulation Controls

sims, type, amplitude, start time, internal and external angles

- Amplitude can be fixed or chosen from a random logarithmic or linear distribution
- Source sky location (external)
 - » Randomly choose location on sky or chose to be zenith to IFO
 - » Draw from file containing a population
- Source orientation (internal)
 - » Chose a random or optimal orientation (optimal = no rotations)
 - » Fixed

Waveform Generation

- Specify perturbation as a function of time
- Generates metric perturbation in TT gauge given a source's orientation to line of sight
- Code can be adapted to accept previously generated waveforms (ZM, etc.)
 - » This adaptation will be implemented soon



Multiple Detectors

- All calculations done at the center of the earth
 - » Common coordinate origin
 - » Start time of signal adjusted for GW's time of flight
- Multi-detector (including TAMA, GEO, etc.)
 - » Detectors other than LIGO will be added before code release
 - » Sampling rate adjusted for appropriate IFO
- IFO's response function used to transform strain into AS_Q

For the Future

- Expand available waveforms
- Working on galactic population
 - » Will be available with engine as data set
- Undergo code review
 - » Code will meet PSU MATLAB coding standard; T040035-00-Z
- Will be used for LIGO/TAMA simulations with BlockNormal
- Code will become available after code review
 - » Will be available on WWW until central code distribution available