

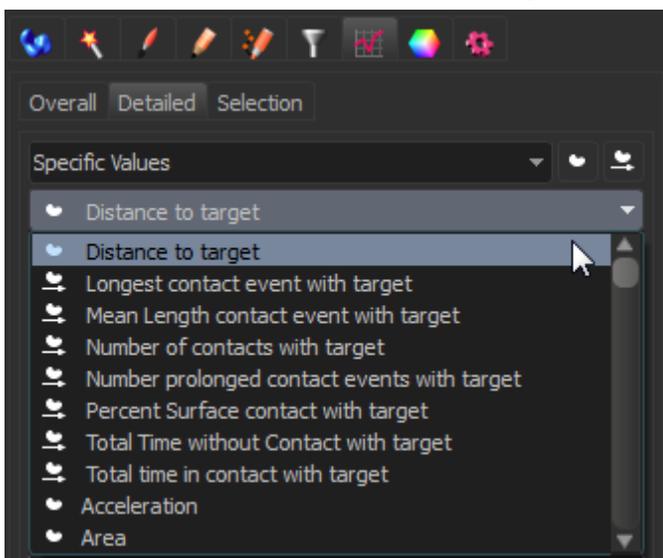
# Kiss and Run Analysis XTension

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**Description:** This XTension calculates the contact events between: 1) Two different surface objects or 2) Spots object and a surface object. It is calculated by one of 2 methods.

**Method#1(default):** Using the a Distance Transformation outside of the target surface object, the closest surface to surface distance is determine of tracked object. Based on user-selected threshold to define a contact event the various new statistics will be generated. This method is typically faster and the added option to chose contact event that are not necessarily overlapping.

- Workflow:
  - Image is auto-converted to 32 bit float (if necessary)
  - A Distance Transformation on the primary surface object
    - defines the distance outside of all surface objects
    - In the script, this new DT channel is hidden and will NOT populate in the Imairs Surpass view.
  - For each tracked object (secondary surface) over time, the script will determine the minimum distance to the closest primary surface object using the distance transformation data calculated above.
    - **In Imaris terms, it will grab the IntensityMin value for each object in the Distance Transform channel**
  - All original objects will maintain the existing tracks, but a new statistic named “distance to target” will be generated for each object
  - From this new statistic and a user-defined distance threshold, we can identify “contact events” between the 2 surfaces



- **New Stats per track**
  - Longest contact event (sec)
  - Mean time contact event (sec)
  - Number of contacts
  - Number of prolonged contact events
  - Percent surface contact with target
  - Total time without contact
  - Total time in contact
- **New Overall stats**
  - Number of contacts per timepoint
  - Percent surface contacts per timepoint

**Method#2:** Using a surface mask for the target and the tracked surfaces, the region of surface overlap is determined for each surface object. In order to be defined as a contact event the surface must have at least one overlapping voxel in each mask. Using the method, the process may be slower for large number of surfaces and long time lapses. However, you will have the added statistics that will provide the Volume of overlap at each timepoint for each surface.

- Workflow
  - A binary surface mask is generated for the target surface
    - Each voxel is assigned new value
      - Inside surface=1, outside surface=0
  - The masking procedure is repeated for each tracked surface
    - Tracks and surface connections are maintained
    - On a slice by slice manner (3D), each tracked surface is compared to corresponding slice and timepoint from the masked target
  - If one or more voxel, are in the same position and time as the target mask, it is considered an “overlapping” voxel
    - This is a contact event
  - If for the entire tracked object mask, no overlapping voxels are found, there is no contact at that time point.
  - New Stat (per object)
    - Surface Overlap Volume ( $\mu\text{m}^3$ )
    - Surface Mask Volume( $\mu\text{m}^3$ )
    - **New Stats per track**
      - Longest contact event (sec)
      - Mean time contact event (sec)
      - Number of contacts
      - Number of prolonged contact events
      - Percent surface contact with target
      - Total time without contact
      - Total time in contact
    - **New Overall stats**
      - Number of contacts per timepoint
      - Percent surface contacts per timepoint

**Installation:** Copy the files into the appropriate directory. If running the full version of Matlab, copy this in the “matlab” folder in the current version of Imaris directory. If you are running Imaris XTensions using the Matlab Compiler Runtime, then you will need to copy both the .exe and .xml files in the “rtmatlab” folder in the current version of Imaris directory (if present).

I have a customer folder in the Bitplane folder of the Program Files directory. I have all custom Matlab scripts copied here. Then, I ‘add’ that folder in the Custom Tools menu in Imaris for the XTensions to show up in Imaris Surpass view.

XTension was written in Matlab 2015a, and runs on Imaris 8.2. Running on earlier versions of Imaris will result in errors.

**NOTES:** This XTension seems to be working for most files. It is not a fully supported Bitplane-sponsored XTension. Thus, this it may have bugs or it may not work with all datafiles. I have tried to make it as universal as I can. These scripts, I work on in my own time. If you do find a bug or error in the code, please let me know and I can look into it when I can. I can not guarantee they will be fixed.