



# Moving Object Tracklet Reporting Procedure



## I. Introduction

This document is intended to provide sufficient direction to complete a regular submission to the MPC of moving object candidate tracklets as detected by the WMOPS (WISE Moving Object Pipeline Software) subsystem. WMOPS is run once every two days, at an approximate interval of once every 30 scans. Output will be generated in the form of two MPC-formatted detection lists (**.mpc** files) with two associated files (**.mpc.sids** files) for Quality Assurance (QA) analysis. Three additional files (**.rpt**, **.relog** and **.detlog**) will also be generated for compilation of SSOID comparison statistics. Finally, a **.els** file will be generated which outputs orbital fits to WMOPS candidate tracklets.

## II. WMOPS QA Structure

The first set of **.mpc** and **.mpc.sids** files (the *sound* tracklets) are for those tracks which have passed the automated QA checks in WMOPS, including length-of-tracks, track linearity or orbit fit checks, point psf rchi2 pathologies, multi-band detections, and color/temp consistency. These should be ready-to-go, for the most part, and all set to send off to the MPC. The second set (of the *unverified* tracks) consists of the tracks found by WMOPS which have not passed the automated QA checks.

We generate **two** classes of QA products then initially; *summary* data for the **sound** tracklets and *per-tracklet* data for the **unverified** tracklets. The products will include:

### Summary ("sound tracklet") Products

- Color Histogram (Bands 3 and 4)
- psf rchi2 histogram.
- reported tracklet length histogram.
- histograms of log (q), e, and i of the orbit-fitted data.
- plots: a vs. e, a vs. i, and e vs. i.
- RA vs. Dec of *all* detections in one plot
- Ecliptic Long. vs. Ecliptic Lat. of *all* detections in one plot
- SSOID comparison completeness and reliability summary.

### Per-Tracklet Products

- Thumbnails of objects in Bands 3 & 4.
- plot: Color vs. time (w3-w4), with error bars
- plot: mag. vs. time, with error bars
- plot: psf rchi2 vs. time
- plots: RA vs. Dec, time vs. Dec with err bars, & time vs. RA with err bars

## III. Procedure

What follows are the basic steps to perform before submitting reports to the MPC:

### 1. *Sound* tracklets

[1] Perform a word-count check on the *sound*.mpc file, to confirm the length falls within the bounds of normality, as determined during the IOC.

[2] Look over the file briefly (unix head or tail commands are sufficient).

[3] Confirm the SSOID *reliability* and *completeness* values in the SSOID.rpt file are within the normative range.

[4] Look over the WMOPS run generated plots which include:

- Color & tracklet-length histogram plots,
- rchi2 histogram.
- orbital fit parameters for all "sound" objects: a vs. e, a vs. i, and e vs. i,
- sky position distribution plots for the combined set of objects.

[5] Notify WMOPS core team members if there is an error, otherwise notify the WMOPS core team that a "sound-tracklet" report is ready to be sent to the MPC. Once approved by a core team member, send of the sound tracklet .mpc file to the Minor planet Center via ftp, in the specified ftp directory (cfa-ftp.harvard.edu). Tim Spahr is our primary contact at MPC. He will often be the first to view our reports, so immediately after this is done, you should inform him that you deposited the file in the ftp directory, the time-span of the orbits the file covers, and any concerns there may be, and cc the WMOPS [core team](#) members.

### 2. *Unverified* tracklets

These remaining tasks are meant to verify the questionable tracklets and prepare them for MPC submission.

[6] Make sure the QA routines generated the necessary plots, thumbnails and linked html pages from the .mpc and .mpc.sids files for the *unverified* tracklets.

[7] Review the pages:

- start with the object list page, proceeding in order. After reviewing a questionable tracklet, issuing a "confirm/reject/indeterminate" verdict will return you to the top-level object list page.
- first review the tracklet plots (time vs. RA, time vs. dec, ra vs. Dec with *orbitfit* positions overlaid). If you see several bad points in the candidate tracklet, such that they dominate the orbit fit, reject it. If the fit is decent, and most of the points fall over the fit, then confirm the track. If it is "indeterminate", mark it so, but use this option sparingly; they will have to be reviewed by a WMOPS core science team member. There should only be a few of these per day.

- review the thumbnail images next. These are arranged in two sets of W3, and W4. The left hand (LH) column for each set is comprised of on-object detections, and the bottom two images in the LH column as a the co-added detections and bands 2-4 three-color co-added image. The following 4 columns are off-object frames of the same sky location as the LH column's, i.e. taken before the object has moved on or after the object has moved off of that location. Ideally, the object should be present in the LH column and absent in the other columns, but if it is slow-moving, it may end up as a trailed object in the co-adds.

[8] At the bottom of each object page, there are the "confirm/reject/indeterminate" verdict buttons. When you are satisfied with the object, click the appropriate button to mark the tracklet as confirmed, or "reject" to remove it from the candidate tracklet list for reporting to the MPC.

[9] When finished reviewing all the objects, click on the "generate report" link at the bottom of the object list page. Send off the notice that the QA summary report was generated and .mpc list to the core team members, stating that the objects have been verified. Once a WMOPS core team member responds that it is OK, ftp the "verified.mpc" formatted file to the MCP and email Tim Spahr about the delivery of checked objects. The "indeterminate" objects will be saved in mpc and mpc.sids format, but not reported.

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