

Increased Sensitivity in Mixtures and Low Level Samples Using OSIRIS

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<https://www.ncbi.nlm.nih.gov/projects/SNP/osiris/>



OSIRIS Sensitivity

- OSIRIS gives increased signal sensitivity in comparison to GeneMapper IDX
- Sensitivity is critical when detecting low level signals:
 - Minor contributors to mixtures
 - Degraded and low quantity samples
- GeneMapper differences are due to:
 - Smoothing
 - Baselining
 - Peak measurement

Current OSIRIS Users

- Forensic Casework
- CODIS
- Kinship Analysis
- Chimerism/Engraftment testing for stem cell transplants
- Bio Sample ID/fingerprinting
- Biometric ID

Software Differences GeneMapper/OSIRIS

Smoothing

- OSIRIS - no data smoothing to eliminate effect of noise on peak analysis
 - Mathematical curve fit to raw data peak to remove noise
- GM IDX - smoothing peak data is standard practice
 - Reduces peak heights

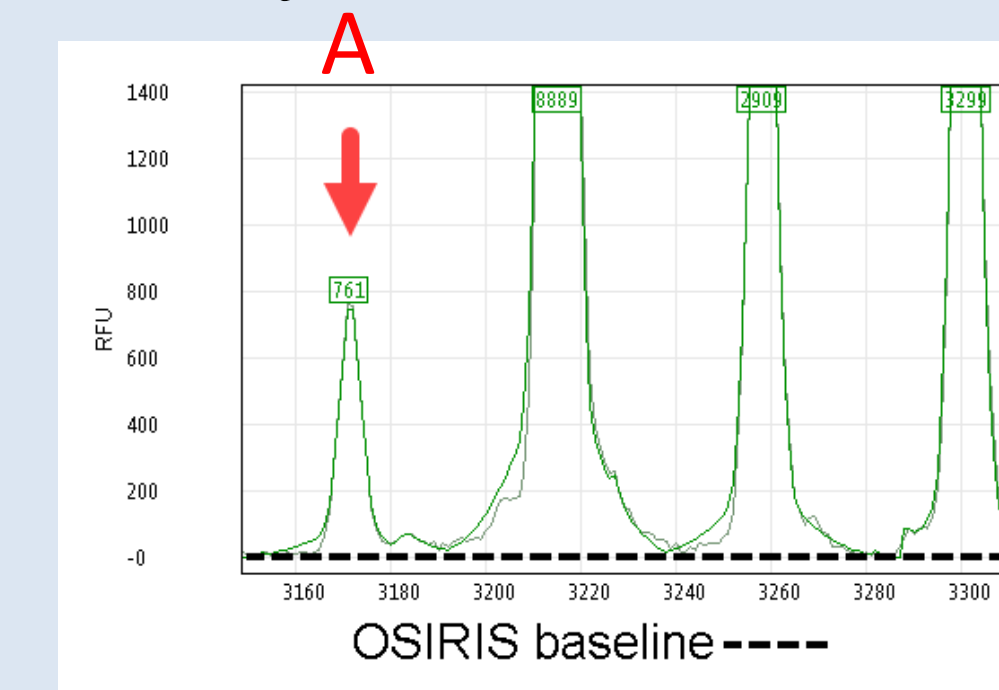
Baselining

- OSIRIS calculates a smooth curve through the raw data for the analyzed baseline
 - Gives accurate baseline
- GM IDX takes lowest point in a range
 - Overcorrects closely spaced clusters of peaks, reduces peak heights

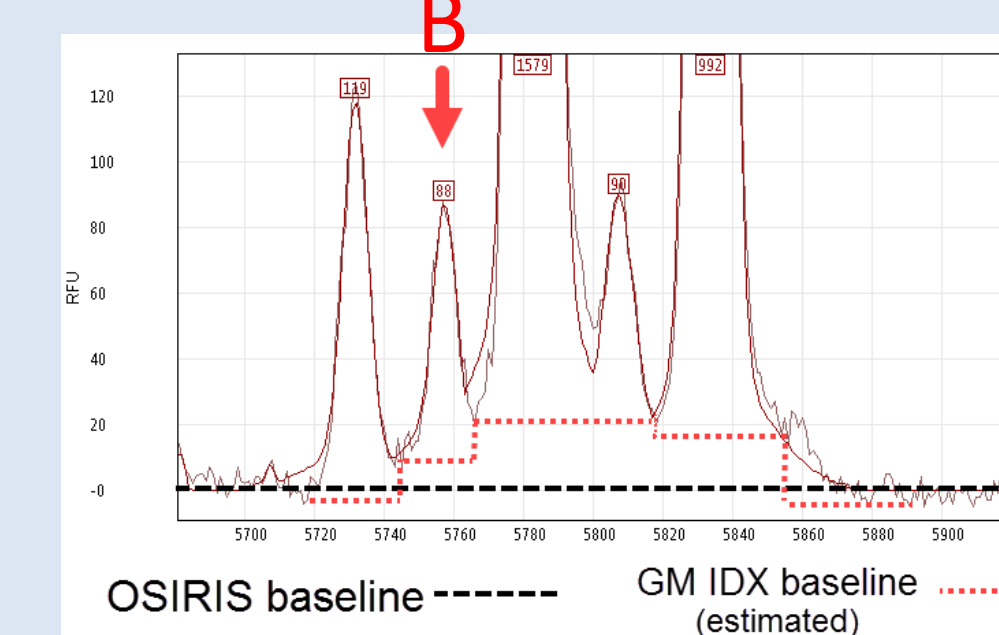
Peak height measurement

- OSIRIS measures peak height of analyzed curve center
 - May lie between time points
 - Models real DNA intensity
- GM IDX measures smoothed data
 - Artificially lowers peak heights

OSIRIS Peaks and Baseline Closely match raw data

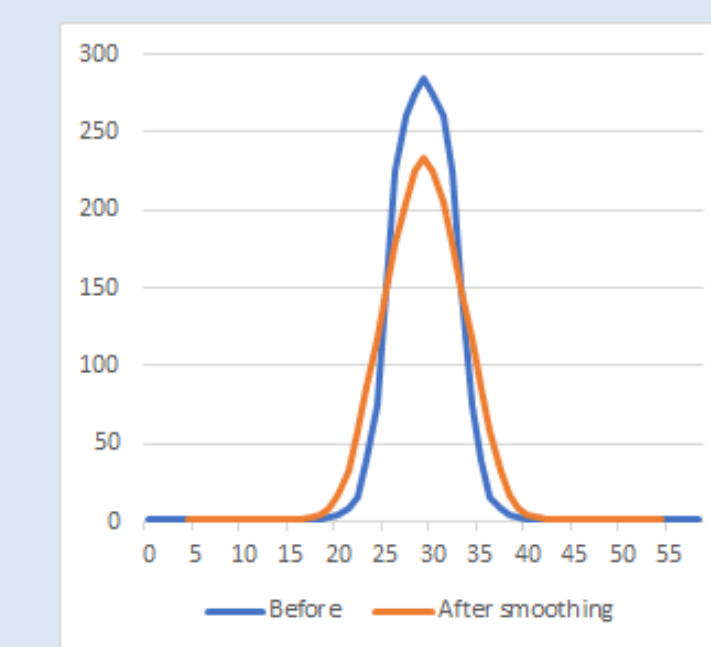


Analyzed peak curve closely matches superimposed raw data



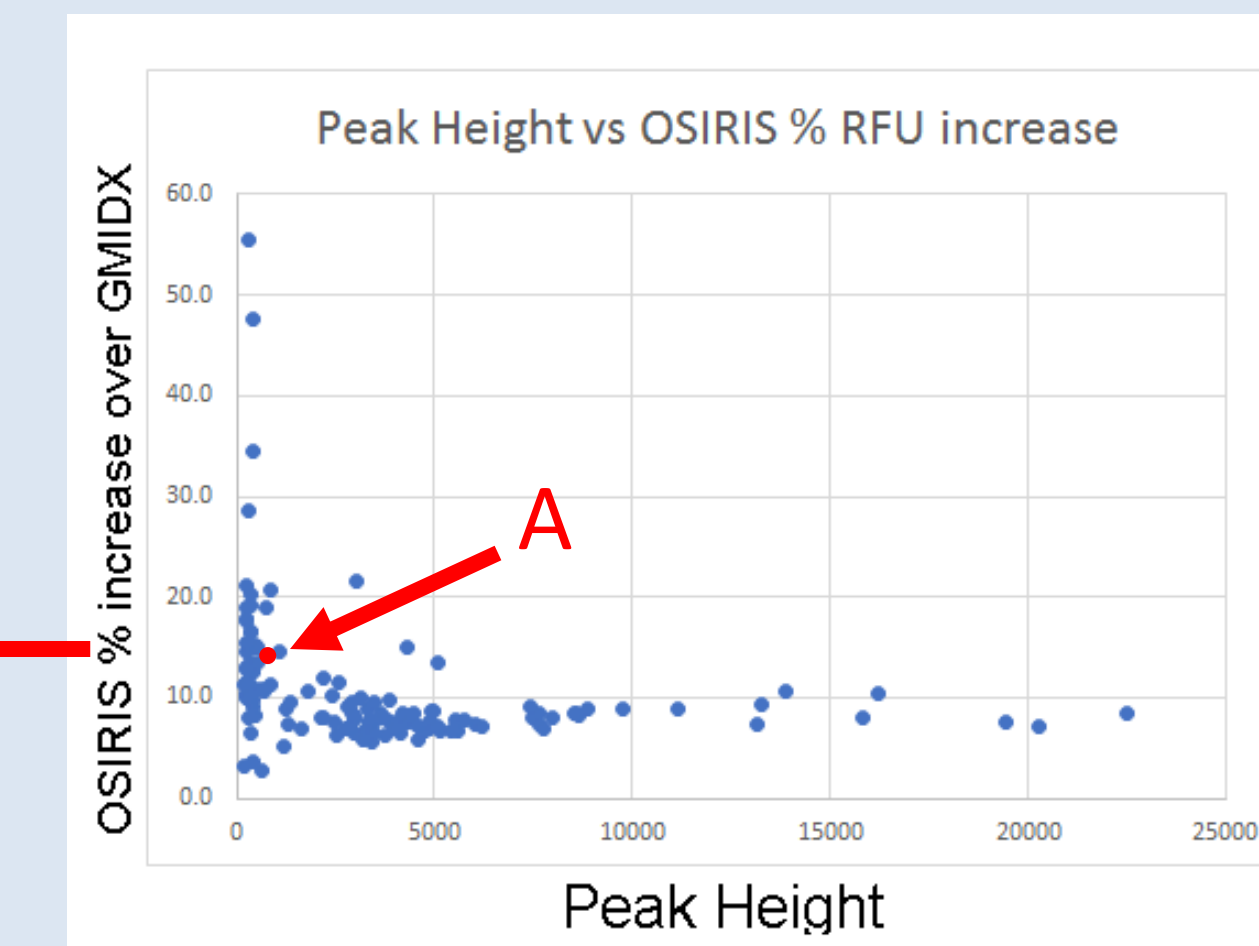
OSIRIS baseline matches raw baseline. GM IDX baseline overcorrects peak heights in tight clusters where the signal between peaks does not return to zero

GM Smoothing Effect

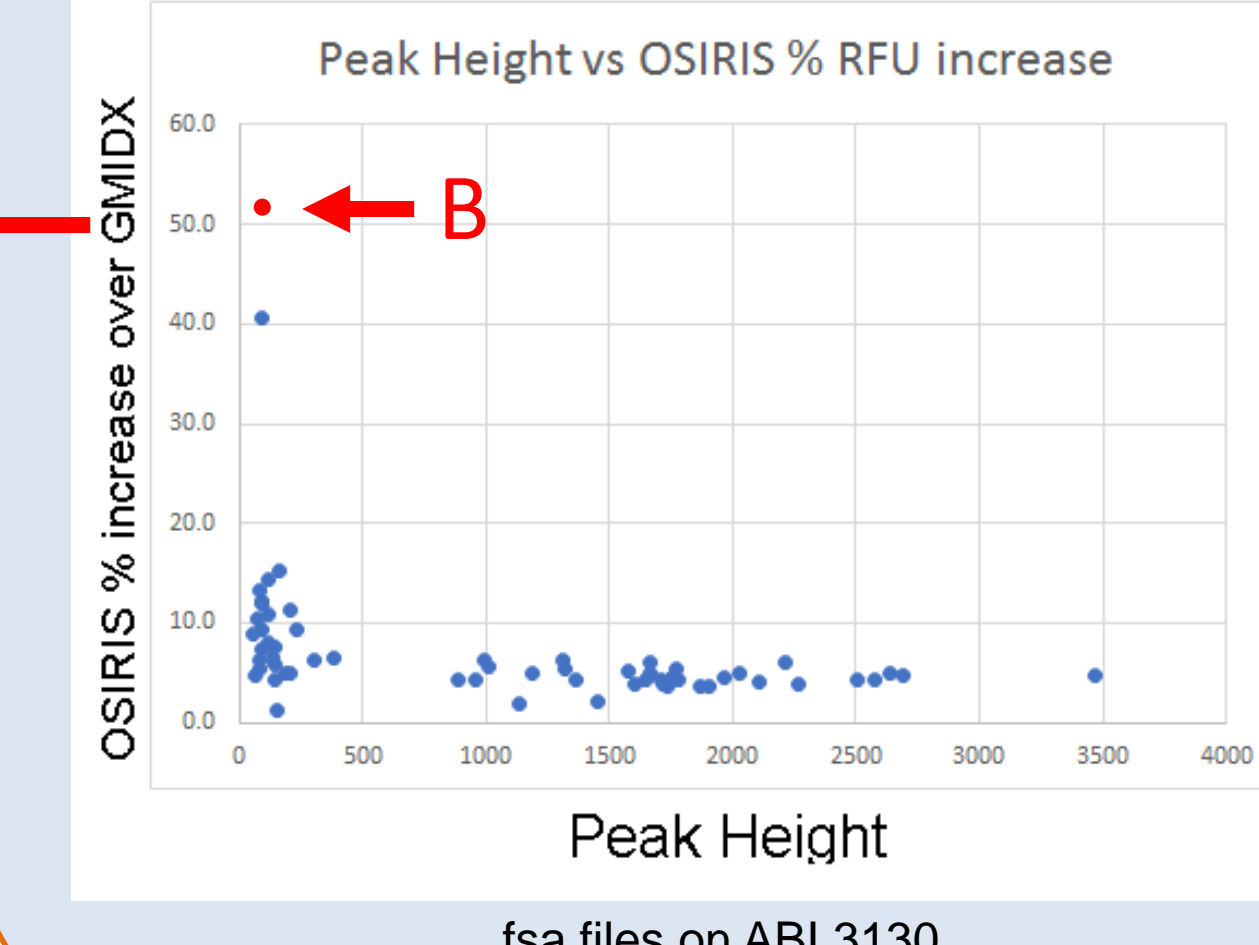


GeneMapper IDX light smoothing example reduces unsmoothed peak by 10%. Bigger impact on smaller peaks
 From GeneMapper IDX Software v. 1.5 Reference Guide

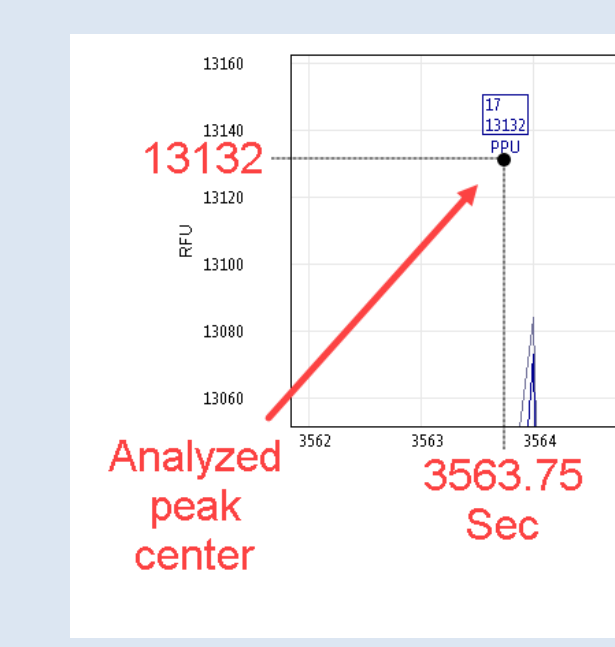
OSIRIS Peak Height Increase Over GM IDX



	RFU <500	RFU >500
AVG % Increase	10.3	4.5
Std Dev.	10.8	1.0



Peak Measurement



OSIRIS measures center of mathematical curve. May be between time points and slightly higher than raw data at time point. Relatively insignificant impact.

OSIRIS Percent Increase Over GM IDX

ABI 3500 .hid files

	RFU <1000	RFU 1000-5000	RFU >5000
AVG % Increase	15.1	8.4	8.2
Std Dev.	9.7	2.6	1.4

ABI 3130 .fsa files

	RFU <500	RFU >500
AVG % Increase	10.3	4.5
Std Dev.	10.8	1.0

Conclusions

- OSIRIS' increased signal sensitivity gives reliably higher peak RFU
- OSIRIS peaks average 4-15% higher than GM IDX peaks, depending on peak size and analysis platform
- Small peaks are more affected, averaging 10-15% higher, with some small peaks as much as 50% higher
- Increased signal sensitivity increases the ability to detect low level peaks close to the analytical threshold. This increases:
 - The number of low level and degraded samples that give full profiles
 - Mixtures that give high probabilities for minor contributors
 - The number of successful CODIS samples
- GM IDX smoothing and baselining scheme account for the difference in OSIRIS signal sensitivity.

Using OSIRIS

The OSIRIS program is a free download on the home page: www.ncbi.nlm.nih.gov/projects/SNP/osiris/

Downloads include the OSIRIS User's Guide with a Tutorial. The program includes demonstration data.

Questions or feedback, please contact: forensics@ncbi.nlm.nih.gov



Email a question



Osiris Home page

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