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Doses Measured in Air Luggage

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Purpose

- Provide a small reference body of data from known irradiations in air luggage
  - For use in investigations of the occasional inadvertent exposures of TLDs in luggage experienced by Sandia National Laboratories personnel during air travel
  - Air luggage is irradiated in radiation generating devices (RGDs) during examination for prohibited items by agents of the Transportation Security Agency (TSA).

Method

- Piggy-backed the study on existing travel within Radiation Protection
- TLDs were packed in luggage
  - checked and carry-on
- Prepped and processed per Dosimetry Services standard procedures

Method

- 6 travelers
- 6 trips
- 74 dosimeters
- 3 destination cities
  - Las Vegas (x4), Oakland, SLC
  - All round-trip from Albuquerque

Method

- Mostly packed in sets of 10 TLDs
  - To allow population statistics
- Included one inadvertent exposure
  - Circumstances known to me
    - No other dose on the TLD
  - Single dosimeter, SLC trip

Data and Observations

- Summary data in handout tables
- Δ = shallow – deep
  - Differential shallow dose
  - Statistics on Δ may be significantly perturbed by *data censoring*
    - Small observed Δ in the study may be purely or largely an artifact of censoring

Data and Observations

- Population statistics very tight for each trip
  - All in range of 3% to 12%
- Overall statistics much looser
  - Strong evidence of airport-dependent dose

Chart 1
Air Luggage Deep Dose
(shown with 1σ error bars)

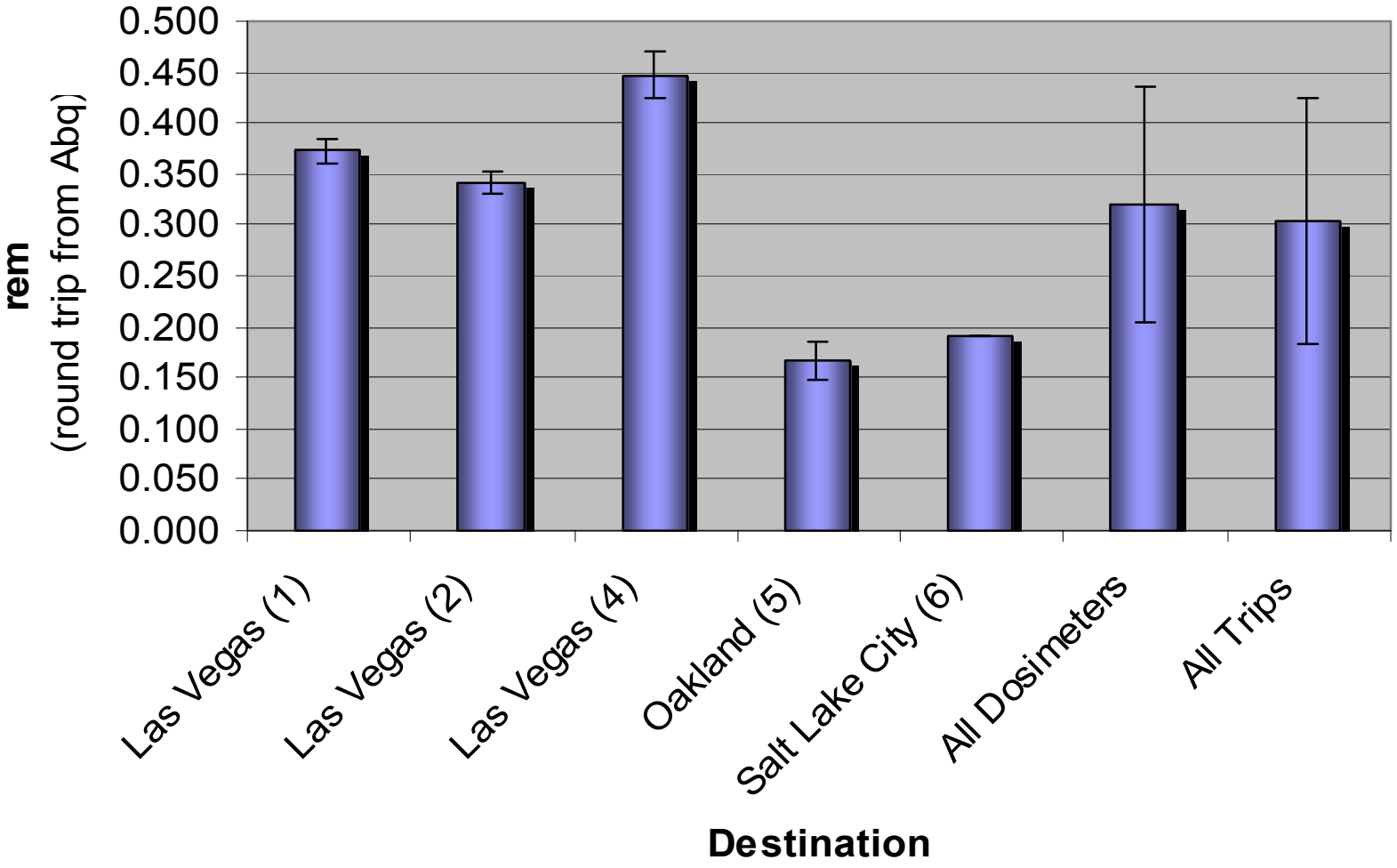


Chart 2
Air Luggage Shallow Dose
(shown with 1σ error bars)

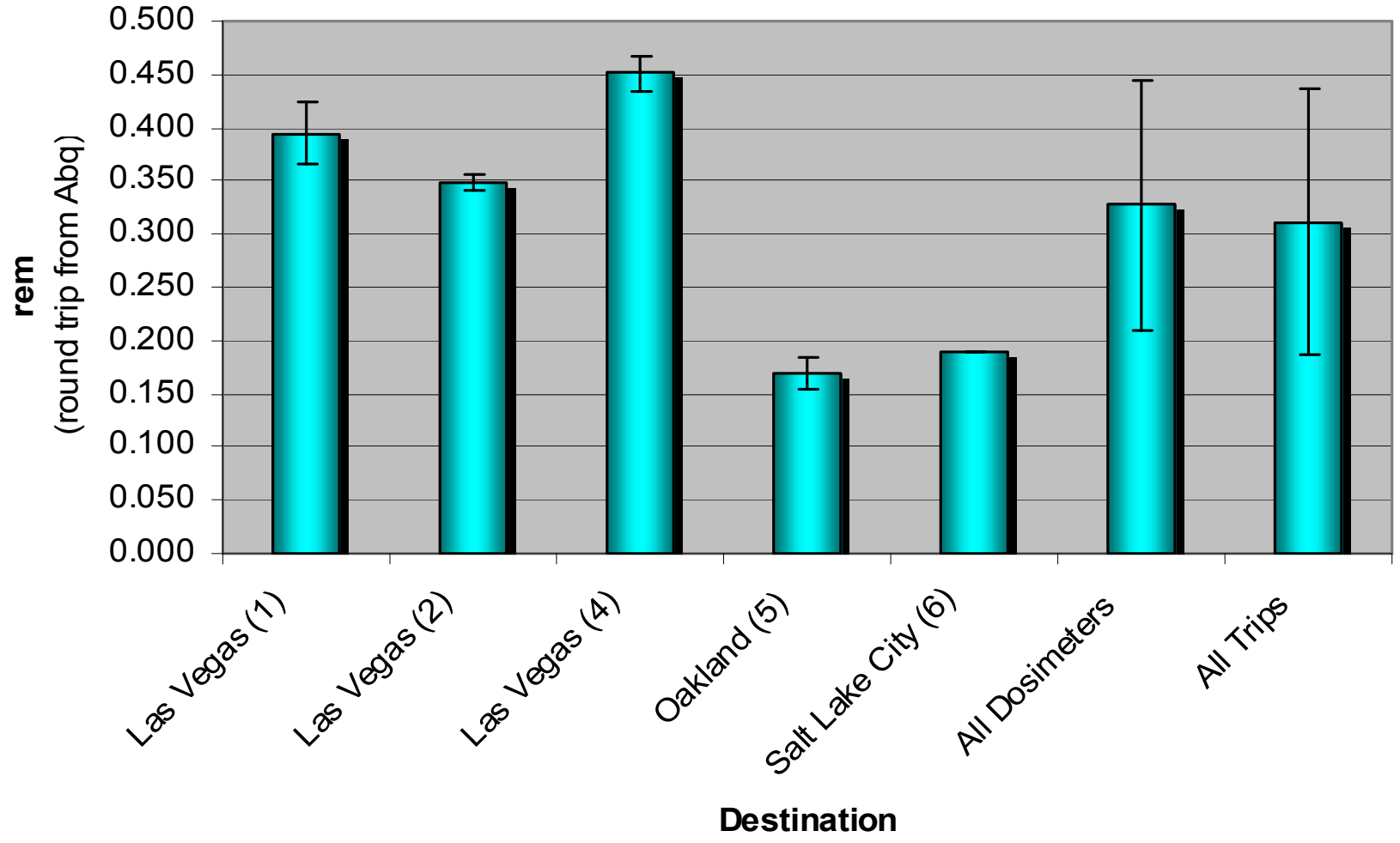
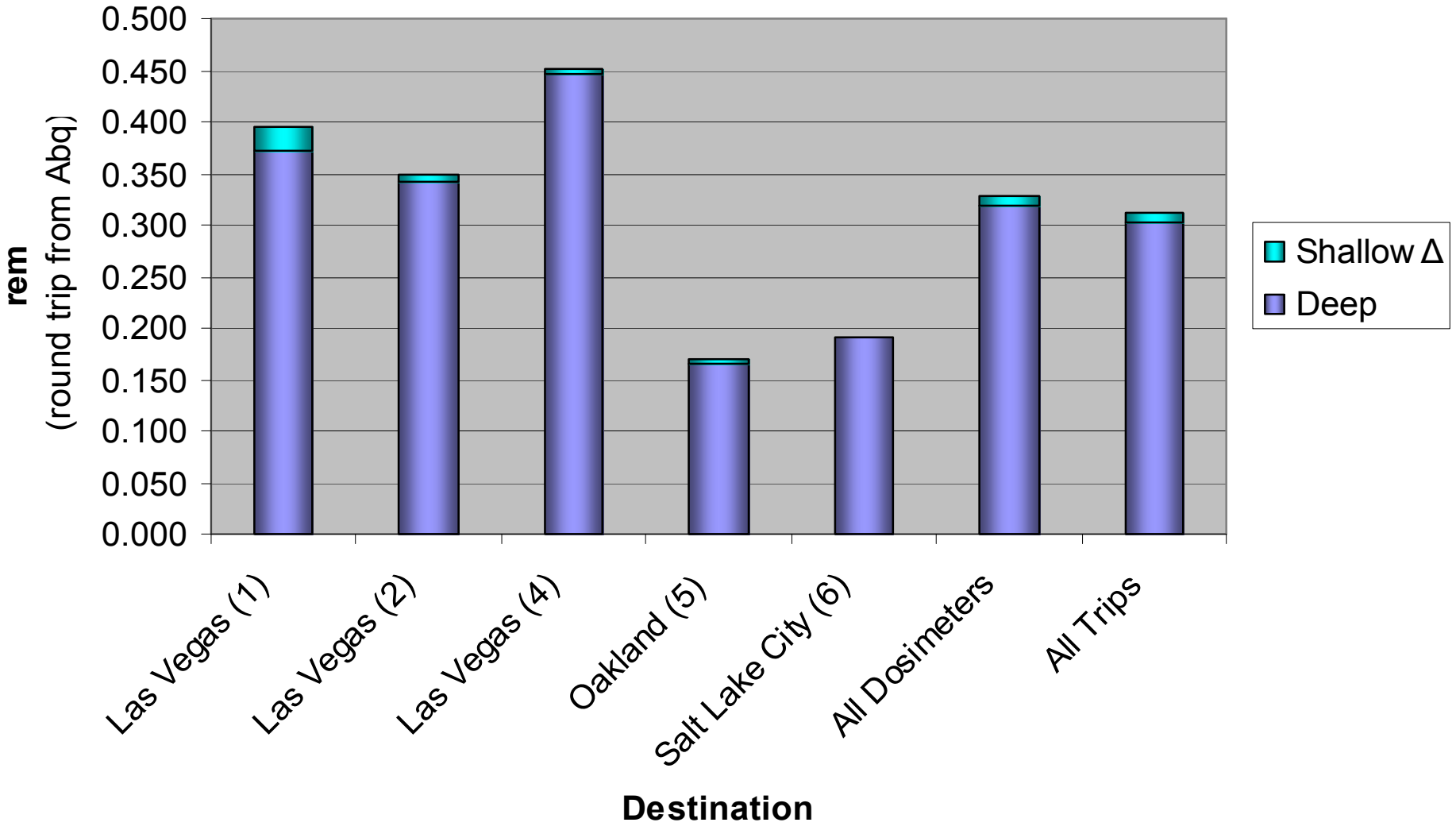


Chart 3

Air Luggage Deep and Shallow Dose

(shallow dose shown as shallow Δ above deep dose)



Conclusions

Assuming this small study is representative of domestic air travel:

- Dosimeters exposed in *checked* luggage may be expected to show deep dose in the range of a few hundred mrem.
  - In this study:
    - average of just over 300 mrem
    - range of 141 mrem to 487 mrem
- Such dosimeters may show a few percent of incremental shallow dose (Δ).
  - In this study:
    - the average Δ amounted to ~2.5%.
    - Δ ranged from 0% to 14.3%.

Conclusions

- Dosimeters exposed to *hand-carry* examination may be expected to show no detectable exposure.
  - In this study, no hand-carry dosimeter showed results above the lower limit of detection (LLD) (10 mrem).

Recommendations

- At Sandia National Laboratories:
  - Investigators of suspected air luggage dose events involving Sandians traveling from Albuquerque should use the conclusions of this report to establish a baseline of expectation from known air luggage dose.

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