Monday 5th November 11:30 – 13:00

Session 2: Ground Station Performance from Current Satellite Arrays

Session Co-Chairs: Georg Kirchner and Matt Wilkinson

In-orbit retro-reflector performance

A retro-reflector's response can be computationally modelled or tested in an optical laboratory.

Can SLR stations assess the optical performance of a retro-reflector array when it is in orbit?

Do retro-reflectors introduce any detectable range errors?

In-orbit retro-reflector performance

In-orbit retro-reflector performance can only be assessed if a station can account for all other factors that impact on its performance and this requires a complete link budget.

Relative assessments of performance can be more easily made between satellites and between stations.

Session 2: Performance from current arrays

Jan McGarry: *"NGSLR's measurement of the retro-reflector array response of various LEO to GNSS satellites"*

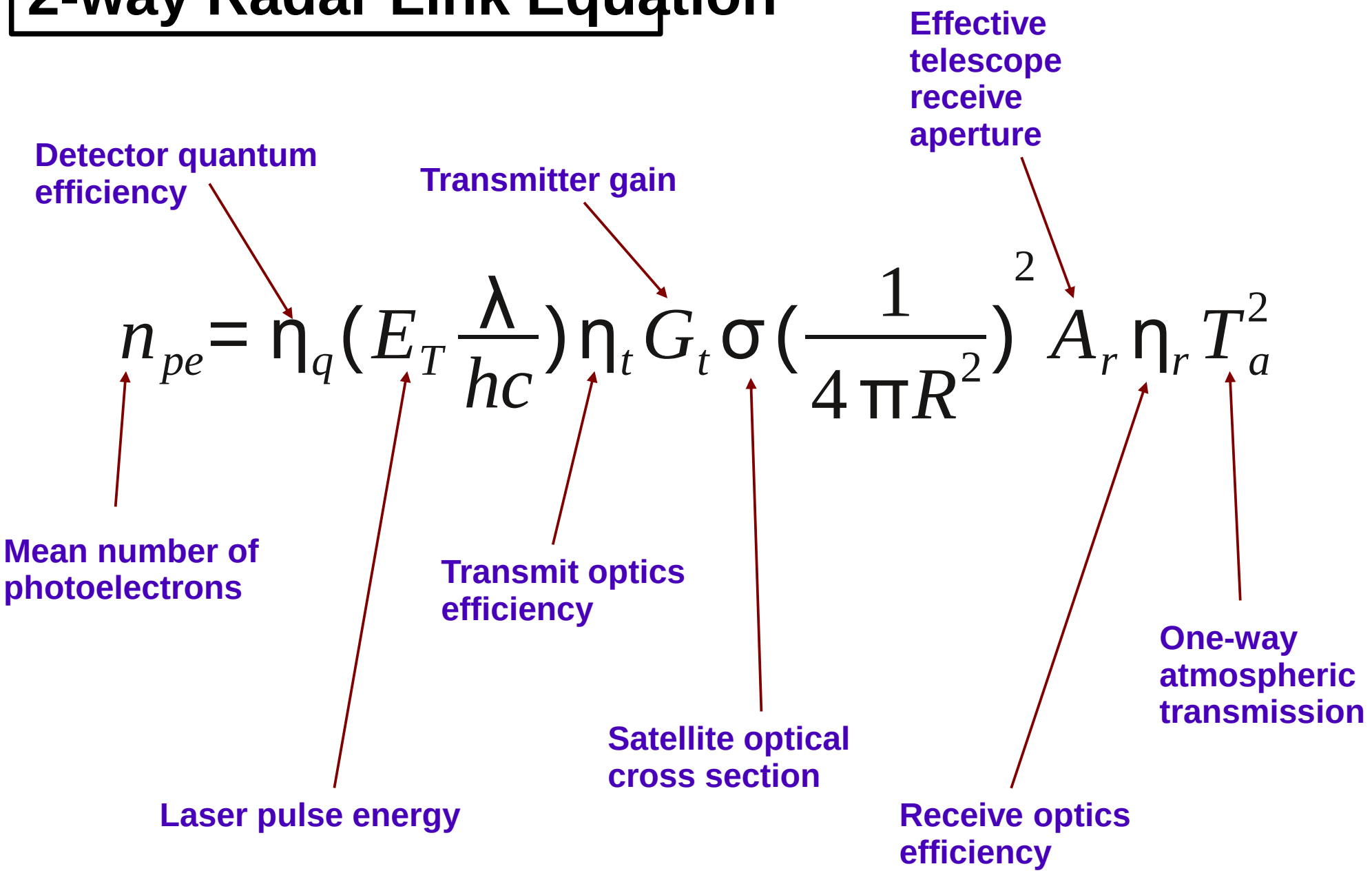
Mark Davis: *"Performance and Prediction of SLR Tracking on Regional GNSS Constellations"*

Matthew Wilkinson: *"SLR energy density modelled and measured at Jason-2 and at the Herstmonceux station"*

Clément Courde: *"Current performances and developments of MeO laser station"*

Georg Kirchner: *"Linear Polarization Issues for Laser Ranging to Uncoated Retro-Reflectors"*

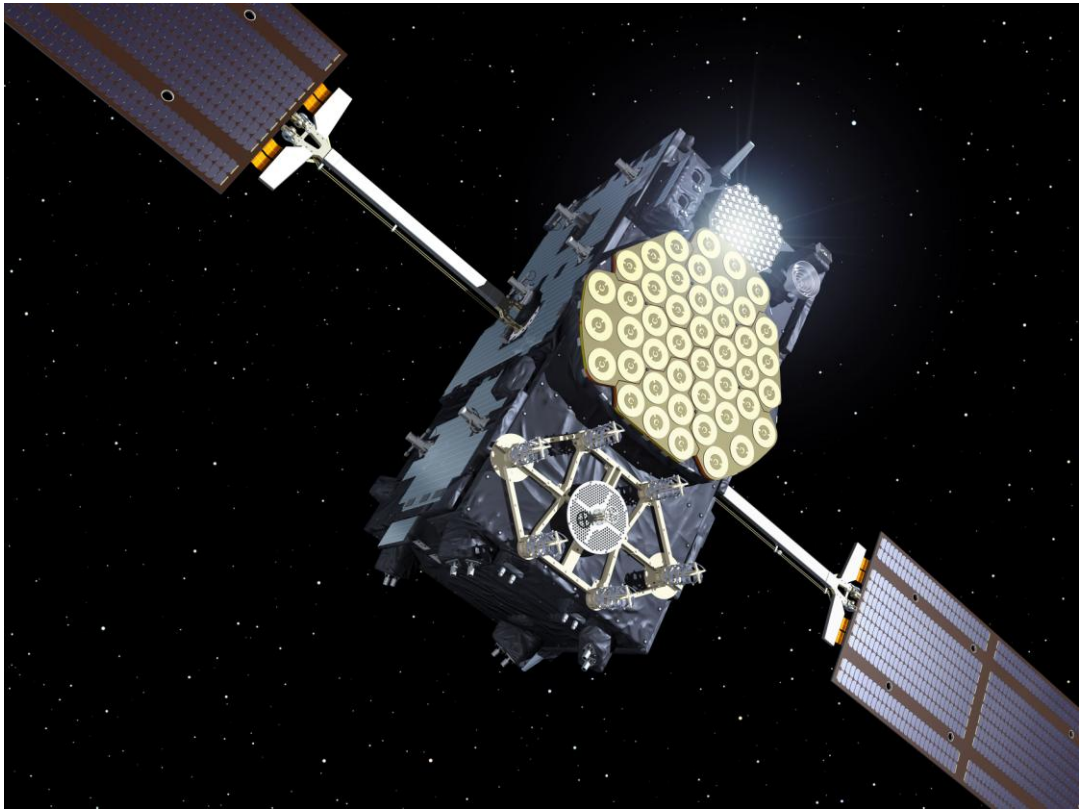
2-way Radar Link Equation



Degnan, J.J. *Millimeter accuracy satellite laser ranging: a review*, in: Contributions of Space Geodesy to Geodynamics: Technology, Geodynamics Series. Series, vol. 25, pp. 133–162, 1993.

In-orbit assessment of retro-reflector efficiency

Without taking the link budget approach, it is still possible for individual SLR stations to make relative in-orbit assessments of satellite retro-reflectors.

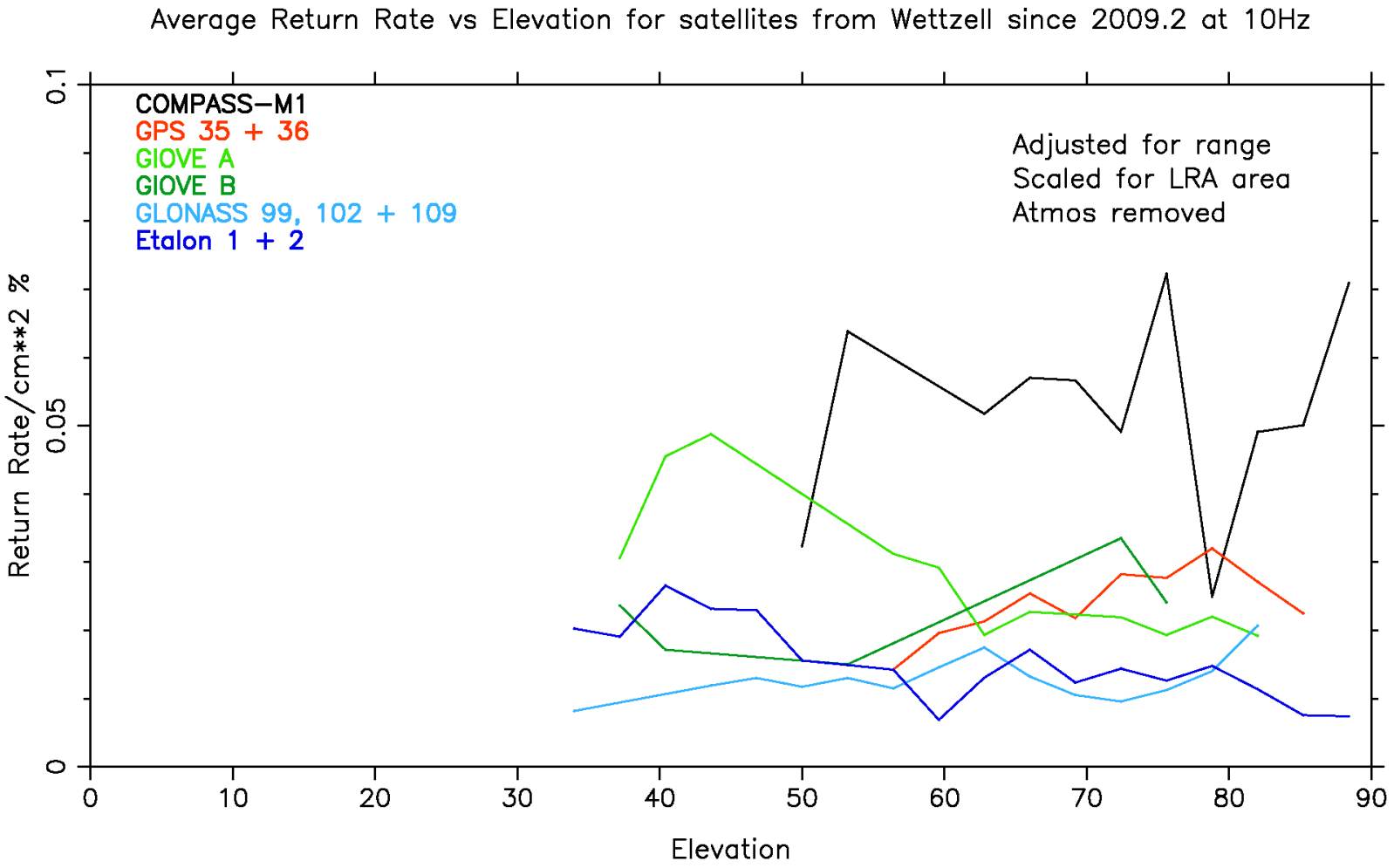


This is best done by averaging return signal measurements over many satellite passes which helps to smooth atmospheric transmission variability and system polarisation dependence.

Careful consideration of station working practices and system upgrades is required.

Matthew Wilkinson, Graham Appleby, I*n-orbit assessment of laser retro-reflector efficiency onboard high orbiting satellites,* Advances in Space Research, Volume 48, Issue 3, 3 August 2011, Pages 578-591, ISSN 0273-1177, 10.1016/j.asr.2011.04.008. (http://www.sciencedirect.com/science/article/pii/S0273117711002456)

In-orbit assessment of retro-reflector efficiency



Matthew Wilkinson, Graham Appleby, I*n-orbit assessment of laser retro-reflector efficiency onboard high orbiting satellites,* Advances in Space Research, Volume 48, Issue 3, 3 August 2011, Pages 578-591, ISSN 0273-1177, 10.1016/j.asr.2011.04.008.
(http://www.sciencedirect.com/science/article/pii/S0273117711002456)

In-orbit assessment of retro-reflector efficiency

Scaling for satellite range, atmospheric attenuation and array area the Compass-M1 retro-reflectors were shown to perform approximately **twice** as well as those on Etalon1+2, 3 GLONASS, GIOVEA+B and GPS35+36.

This investigation used full rate data from 2007 to 2010.

An improvement would be if such comparisons could be reliably done on a shorter timescale.

Matthew Wilkinson, Graham Appleby, I*n-orbit assessment of laser retro-reflector efficiency onboard high orbiting satellites,* Advances in Space Research, Volume 48, Issue 3, 3 August 2011, Pages 578-591, ISSN 0273-1177, 10.1016/j.asr.2011.04.008.
(http://www.sciencedirect.com/science/article/pii/S0273117711002456)

Summary

Retro-reflector performance directly impacts on the successful tracking of ILRS supported satellites.

Stations can assess the performance of in-orbit retro-reflectors by making comparisons to the expected results if they fully account for their SLR systems. This includes filters applied, laser characteristics, optical losses and atmospheric attenuation.

Relative comparisons can be made between satellites, which should be repeatable by other stations.