A Comparison of Performance Statistics for Manual and Automated Operations at Mt Stromlo

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The new Mt Stromlo SLR Station was rebuilt in the 12 months following the destruction of the original station by the January 2003 bushfires, and was reopened in April 2004. It became fully operational in December 2004 and since then the station has been operated manually pending completion of the development of a more advanced infra-structure that will support automated operations.

The original station had conducted automated operations for over three years before the bushfires and the performance measures that were in place during this period have continued to be collected for recent operations. This provides a unique opportunity to compare the productivity performance between automated and manual operations undertaken at the same site and with the same management team.

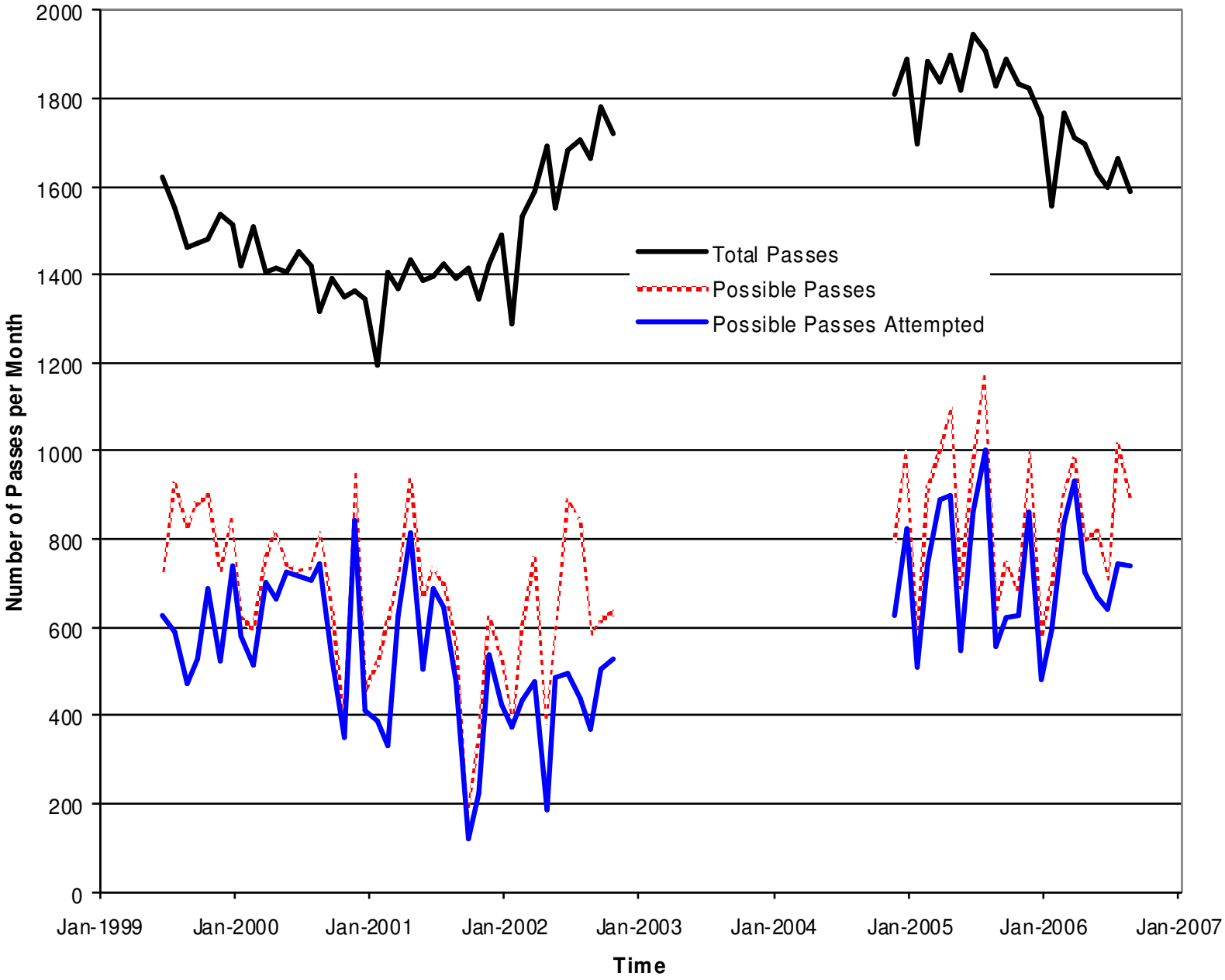
Provided that periods of abnormal events are taken into account, net productivity from these two modes of operation are quite comparable with differences less than about 5% over periods of many months. The fact that automated operations persist for longer periods and in conditions that discourage manual operation appear to compensate for the efficiencies that human interaction can provide.

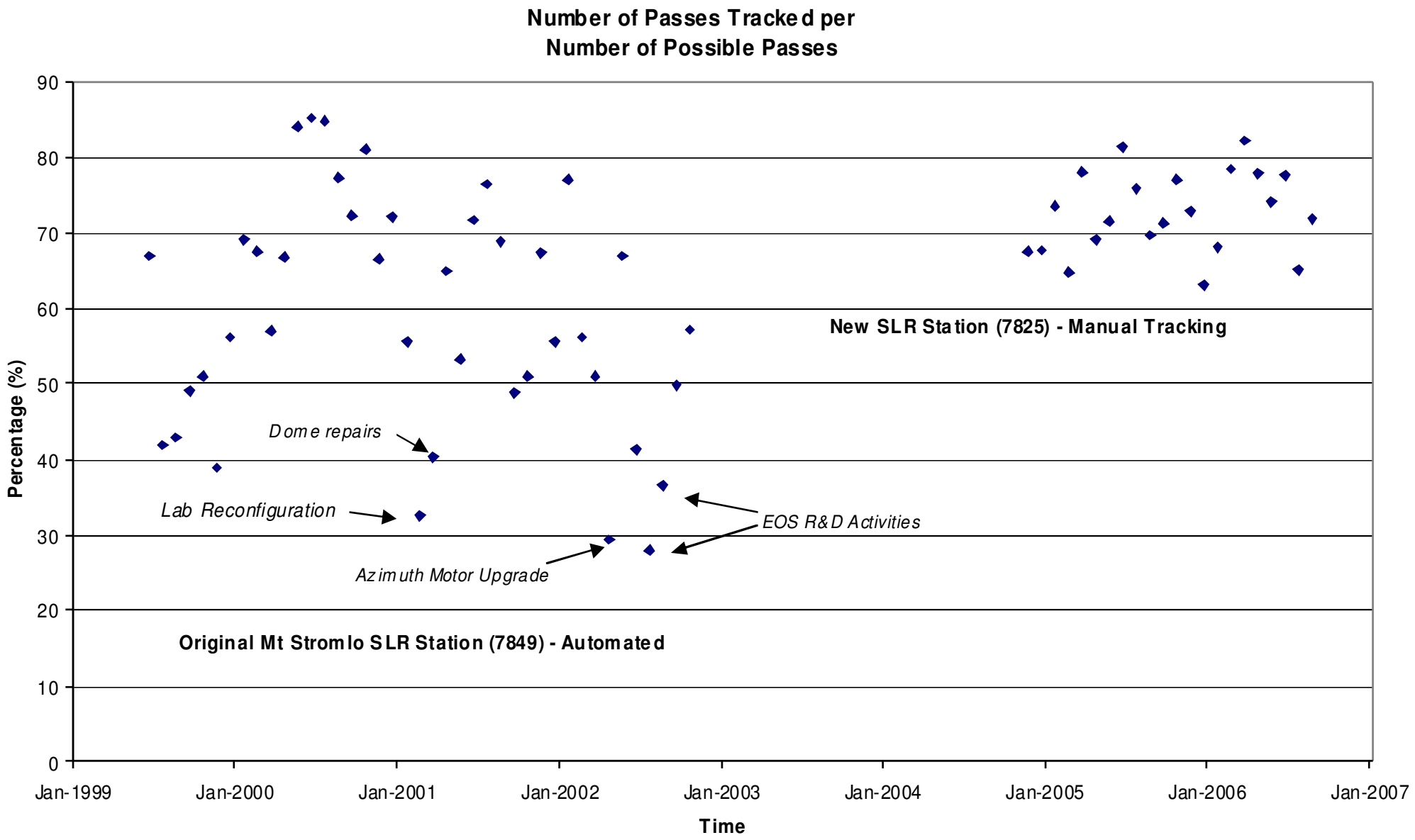
- Original Stromlo SLR Station commissioned in Oct 1998.
- Automation commenced late 1999.
- Continued until Jan 2003 bushfires.
- New station built during 2003 and opened April 2004.
- Commenced full (manual) operations from Dec 2004 to present.
- Consistent productivity metrics in both periods

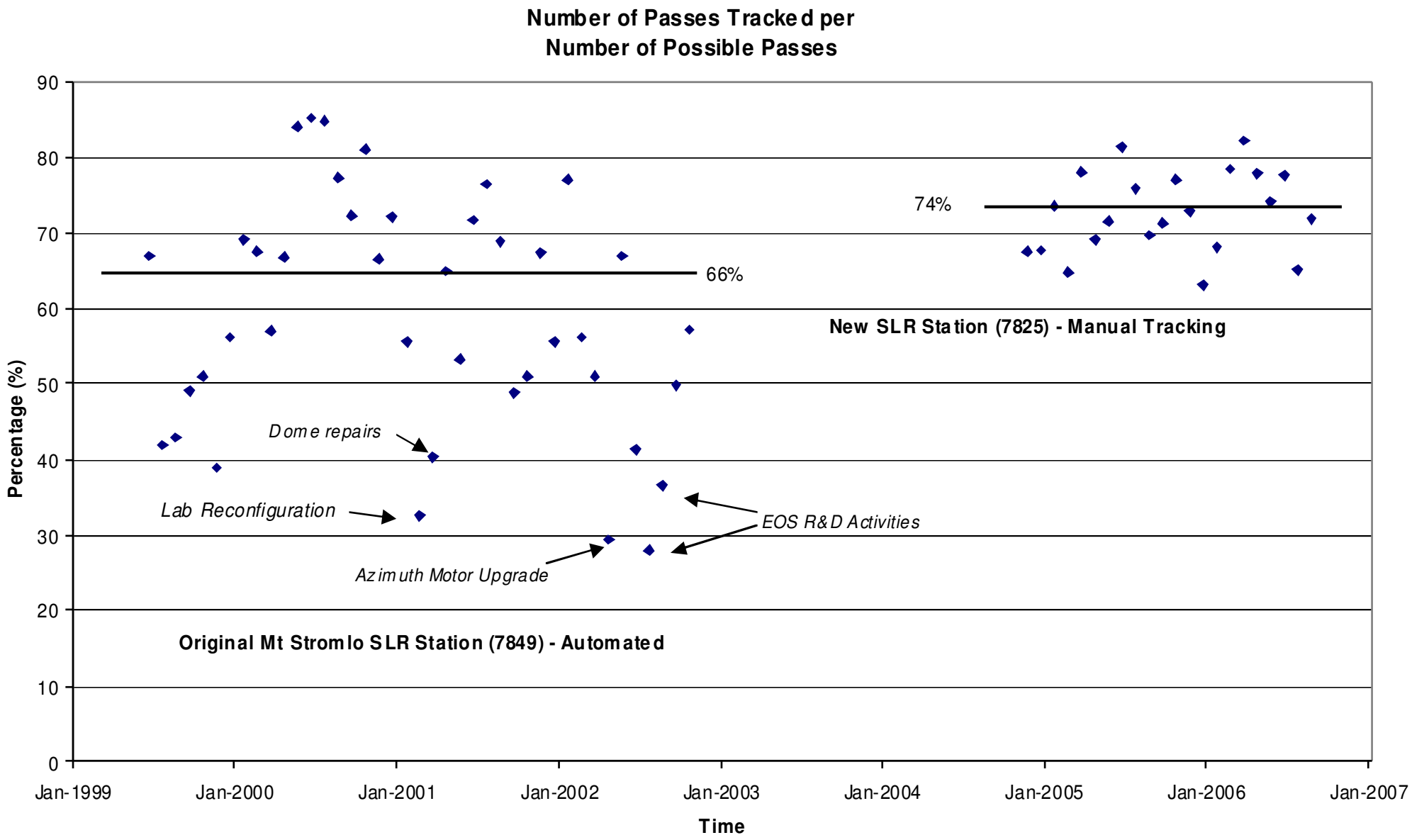
- 1999-2003 Automated Operations
  - Automated tracking, satellites and cal targets
  - Automated data processing
  - Automated downloads & uploads
  - Unmanned ~ 80% of time
- 2004-2006 Manual Operations
  - 24/7 operations
  - Unmanned in overcast weather
  - Unmanned when no targets

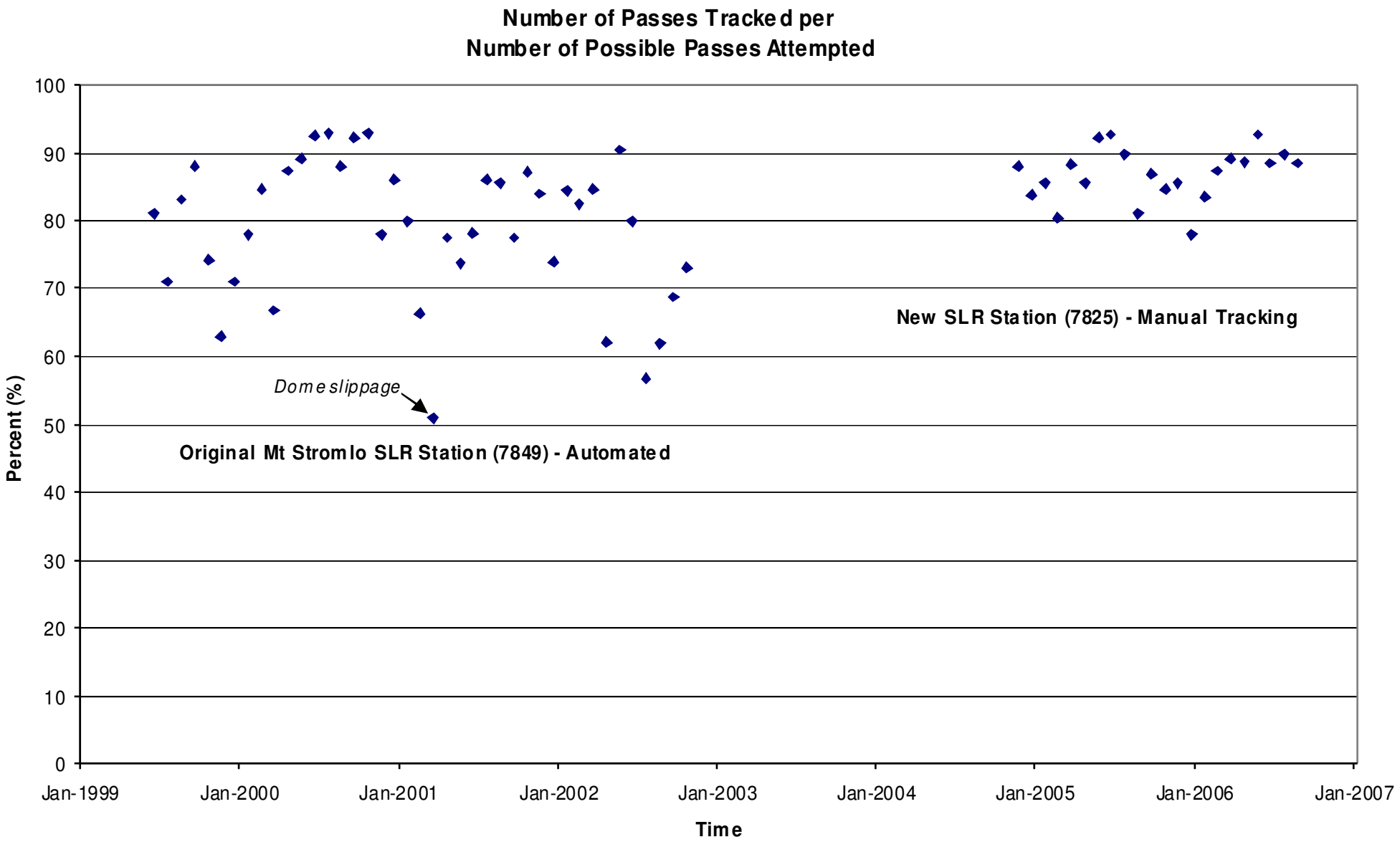
Metrics

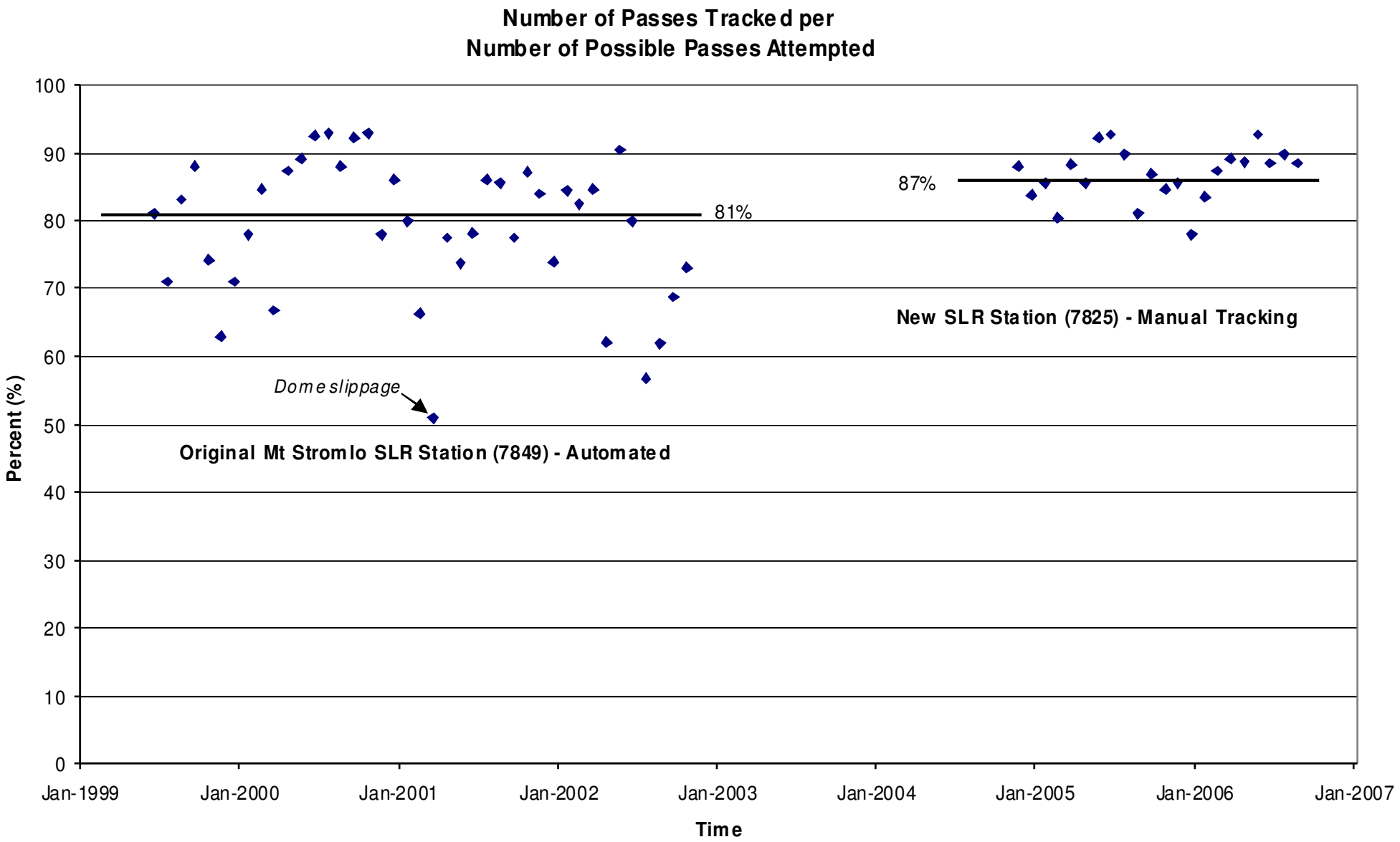
- Number of all ILRS satellite passes above 20 degree site horizon.
- Number of possible passes
  - accounts for poor weather, low elevation passes and pass overlaps
- Number of possible passes attempted
- Number of passes successfully tracked.

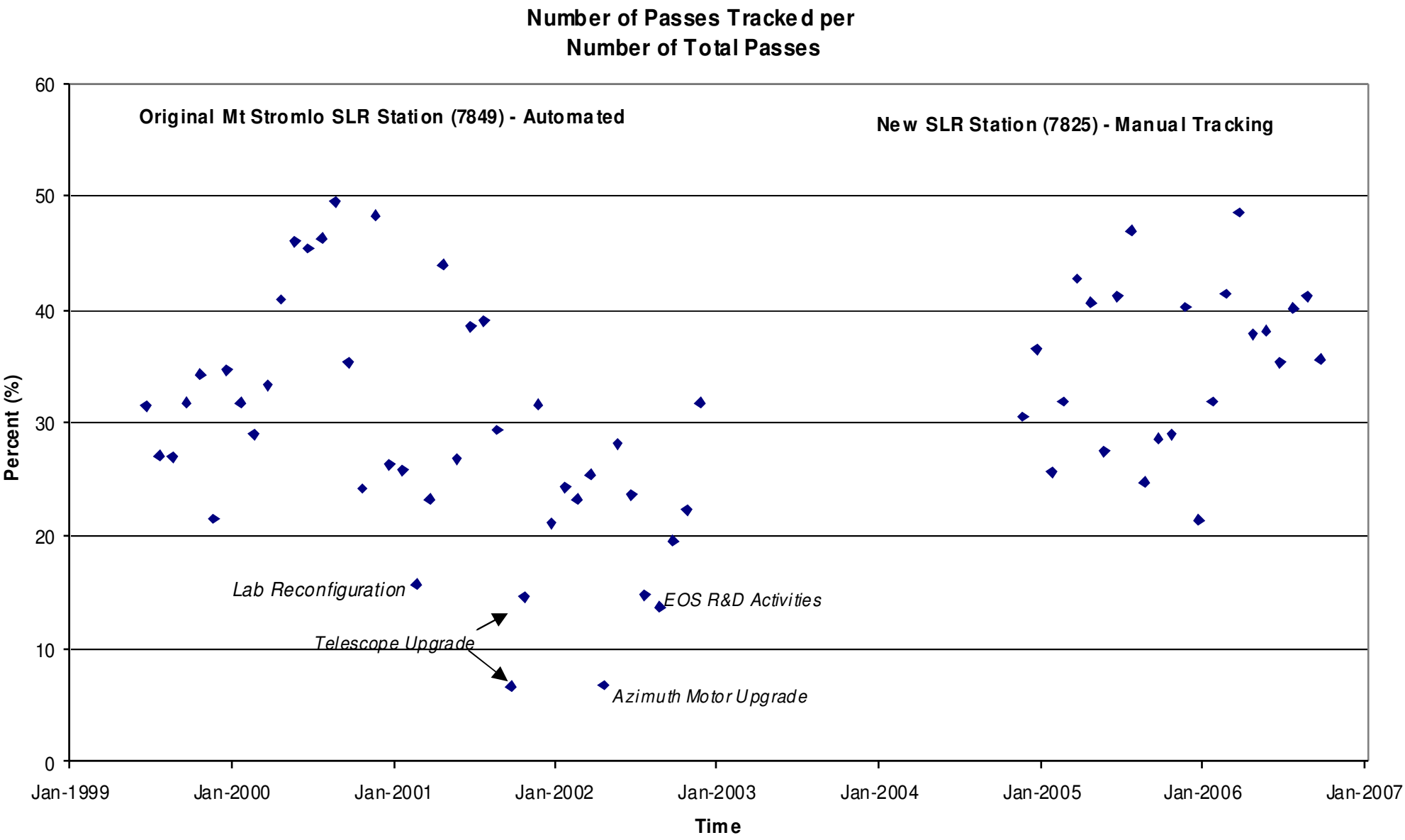

2000
1800
1600
1400
1200
1000
800
600
400
200
0
Number of Passes per Month
Total Passes
Possible Passes
Possible Passes Attempted
Jan-1999
Jan-2000
Jan-2001
Jan-2002
Jan-2003
Jan-2004
Jan-2005
Jan-2006
Jan-2007
Time

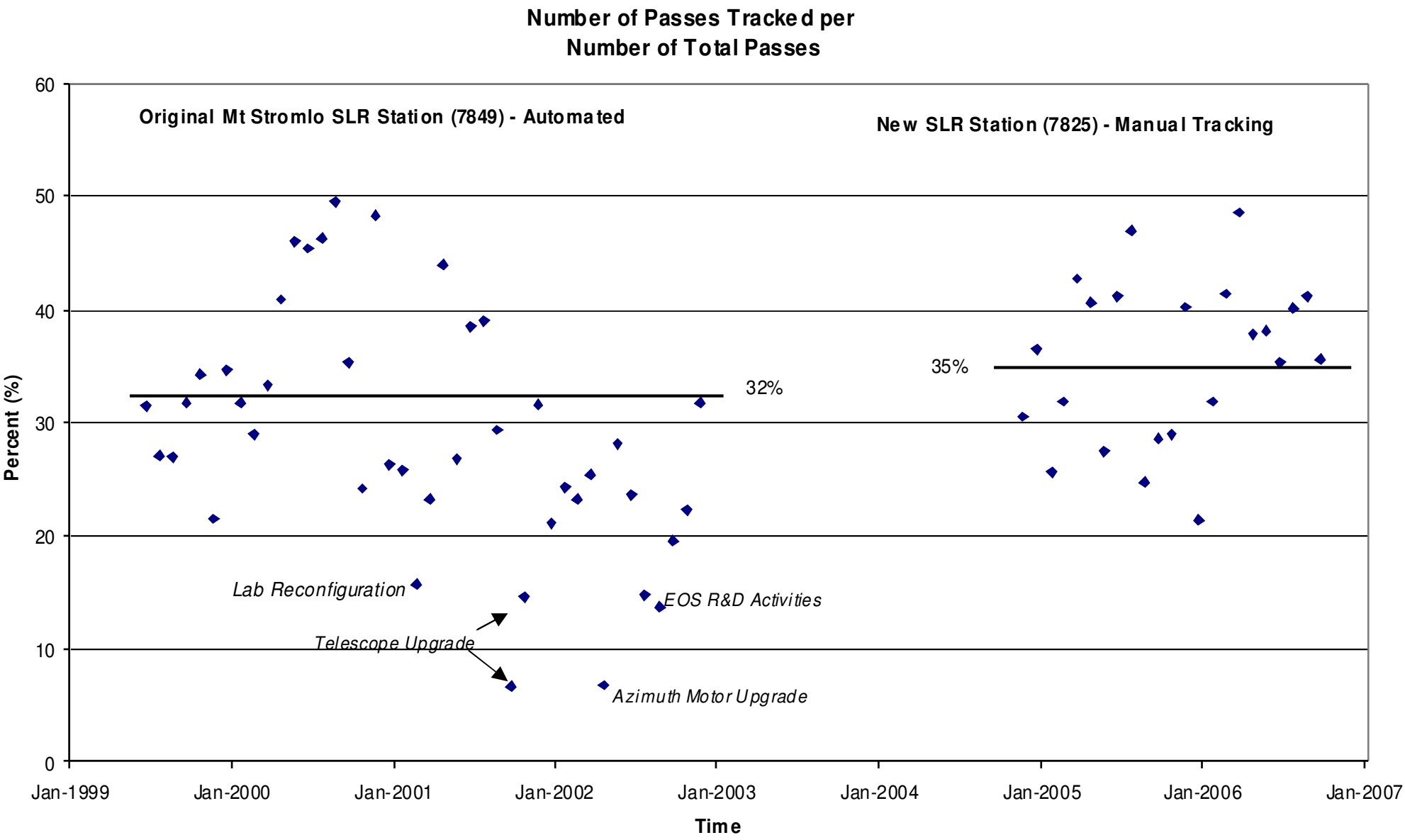

Number of Passes Tracked per
Number of Possible Passes
Percentage (%)
90
80
70
60
50
40
30
20
10
0
Jan-1999
Jan-2000
Jan-2001
Jan-2002
Jan-2003
Jan-2004
Jan-2005
Jan-2006
Jan-2007
Time
New SLR Station (7825) - Manual Tracking
Dome repairs
Lab Reconfiguration
EOS R&D Activities
Azimuth Motor Upgrade
Original Mt Stromlo SLR Station (7849) - Automated


Number of Passes Tracked per
Number of Possible Passes
Percentage (%)
90
80
70
60
50
40
30
20
10
0
Jan-1999
Jan-2000
Jan-2001
Jan-2002
Jan-2003
Jan-2004
Jan-2005
Jan-2006
Jan-2007
Time
66%
74%
New SLR Station (7825) - Manual Tracking
Dome repairs
Lab Reconfiguration
EOS R&D Activities
Azimuth Motor Upgrade
Original Mt Stromlo SLR Station (7849) - Automated


Number of Passes Tracked per
Number of Possible Passes Attempted
Percent (%)
100
90
80
70
60
50
40
30
20
10
0
Jan-1999
Jan-2000
Jan-2001
Jan-2002
Jan-2003
Jan-2004
Jan-2005
Jan-2006
Jan-2007
Time
Dome slippage
Original Mt Stromlo SLR Station (7849) - Automated
New SLR Station (7825) - Manual Tracking


Number of Passes Tracked per
Number of Possible Passes Attempted
100
90
80
70
60
50
40
30
20
10
0
Percent (%)
81%
87%
Dome slippage
Original Mt Stromlo SLR Station (7849) - Automated
New SLR Station (7825) - Manual Tracking
Jan-1999
Jan-2000
Jan-2001
Jan-2002
Jan-2003
Jan-2004
Jan-2005
Jan-2006
Jan-2007
Time


Number of Passes Tracked per
Number of Total Passes
Original Mt Stromlo SLR Station (7849) - Automated
New SLR Station (7825) - Manual Tracking
Lab Reconfiguration
EOS R&D Activities
Telescope Upgrade
Azimuth Motor Upgrade
Percent (%)
60
50
40
30
20
10
0
Jan-1999
Jan-2000
Jan-2001
Jan-2002
Jan-2003
Jan-2004
Jan-2005
Jan-2006
Jan-2007
Time


Number of Passes Tracked per
Number of Total Passes
Original Mt Stromlo SLR Station (7849) - Automated
New SLR Station (7825) - Manual Tracking
32%
35%
Lab Reconfiguration
EOS R&D Activities
Telescope Upgrade
Azimuth Motor Upgrade
Percent (%)
Time
60
50
40
30
20
10
0
Jan-1999
Jan-2000
Jan-2001
Jan-2002
Jan-2003
Jan-2004
Jan-2005
Jan-2006
Jan-2007

Conclusions

- Little difference in net productivity between automated and manual operations
- Improvements in software systems will allow automation to equal, if not better, manual operations.