LIGO

S2/S3 Data Quality Flagging

John G. Zweizig
LIGO/Caltech

LIGO-G030642-00-E

LIGO

Data Quality Flags

- Data quality summary of S2 data provided by segments
- Segment ID assigned to each Lock segment
- Flag word associated with each segment indicates data quality issues for each segment.
- Segments split ifflags change during locked segment
- Segment list available online
  - » http://tenaya.physics.lsa.umich.edu/~keithr/S2DQ/S2seglist.html
  - » Version 3 released 29 Aug 2003, one more version?
- Segments (v1.2) package in ligotools

LIGO

S2 Segment Flags

- Missing Data
  - » Missing Raw Data
  - » DAQ Dropouts
  - » Missing RDS frames
  - » No calibration line RDS
- Running Mode
  - » Not in S2
  - » Nonstandard controls
  - » Mich Filters
  - » DAQ reboot

LIGO

S2 Segment Flags (cont'd)

- Data Problems
  - » Timing errors
  - » AS_PD saturation
  - » AS_Q Large peak-peak deviations
  - » AS_Q clustered outliers
  - » AS_Q correlated outliers
  - » AS_Q upper band outlier
  - » AS_Q lower band outlier
- Calibration
  - » No calibration line
  - » Invalid calibration line

LIGO

H1 Segment Flags

Segment Flag Name	Data Loss(%)	Glitch Rate
OUTSIDE_S2	0.34	0
MISSING_RAW	0.01	0
MICH_FILT	3.18	0.0023
AS_PD_SATURATION	0.05	0.1883
ASQ_LARGEP2P	0	0
DAQ_DROPOUT	0	0
NONSTAND_CTRLS	0	0
MISSING_RDS	0.29	0.0004
INVALID_TIMING	0	0
NO_CALIB_LINE	0.48	0.0034
INVALID_CALIB_LINE	0	0
CALIB_LINE_NO_RDS_V03	0.01	0.0068
ASQ_OUTLIER_CLUSTER	0.55	0.0018
ASQ_OUTLIER_CORRELATED	0.08	0.0483
ASQ_LOWBAND_OUTLIER	0.39	0.0066
ASQ_UPPERBAND_OUTLIER	0.61	0.1317
DAQ_REBOOT	0.01	0.0733
nTotal:	100	0.0015
No Flags:	94.47	0.0006

LIGO

H2 Segment Flags

Segment Flag Name	Data Loss (%)	Glitch Rate
OUTSIDE_S2	0.15	0.0051
MISSING_RAW	0.01	0
MICH_FILT	2.19	0.0104
AS_PD_SATURATION	0	0.1029
ASQ_LARGEP2P	0	0
DAQ_DROPOUT	0	0.1833
NONSTAND_CTRLS	0	0
MISSING_RDS	0.13	0.0019
INVALID_TIMING	0	0
NO_CALIB_LINE	0	0
INVALID_CALIB_LINE	0	0
CALIB_LINE_NO_RDS_V03	0.02	0
ASQ_OUTLIER_CLUSTER	0	0
ASQ_OUTLIER_CORRELATE	0	0
ASQ_LOWBAND_OUTLIER	0	0
ASQ_UPPERBAND_OUTLIER	0	0
DAQ_REBOOT	0	0
nTotal:	100	0.0067
No Flags:	97.65	0.0066

LIGO

L1 Segment Flags

Segment Flag Name	Data Loss(%)	Glitch Rate
OUTSIDE_S2	0.00	0
MISSING_RAW	0.00	0
MICH_FILT	10.79	0.0617
AS_PD_SATURATION	0.90	0.3394
ASQ_LARGEP2P	0.14	0.3359
DAQ_DROPOUT	0.01	0.3389
NONSTAND_CTRLS	0.15	0.0276
MISSING_RDS	0.00	0
INVALID_TIMING	0.15	0.0944
NO_CALIB_LINE	1.90	0.3165
INVALID_CALIB_LINE	0.02	0.4306
CALIB_LINE_NO_RDS_V03	0.00	0.05
ASQ_OUTLIER_CLUSTER	0.00	0
ASQ_OUTLIER_CORRELATE	0.04	0.2179
ASQ_LOWBAND_OUTLIER	0.00	0
ASQ_UPPERBAND_OUTLIER	0.00	0
DAQ_REBOOT	0.00	0
Total	100.00	0.0932
No Flags	86.23	0.0901

LIGO

Extrapolation to S3

- Important goal: Have S3 data quality info within weeks of end of run (rather than months).
- S2 problems not likely to reoccur in S3!
- Need to follow DQ issues, gather important statistics while run is in progress
- First Step: Online segment summary database
  - » Segment numbers assigned on transition to science mode
  - » Directory created for each segment containing: Start/stop times, Monitor statistics, ConLog information, Comments
  - » Accessible online at e.g. http://blue/gds/SegList/S3/H1/

LIGO

Segment Data Base

H1 Segment List for S3

ID	GPS	Duration	Status	Monitor Statistics
H1-0001	751651200	576	complete	DataQual, SenseMonitor
H1-0002	751651904	64	complete	DataQual, SenseMonitor
H1-0003	751652800	256	complete	DataQual, SenseMonitor
H1-0004	751655296	192	complete	DataQual, SenseMonitor
H1-0005	751658560	2816	complete	DataQual, SenseMonitor
H1-0006	751661568	832	complete	DataQual, SenseMonitor
H1-0007	751662464	5760	complete	DataQual, SenseMonitor
H1-0008	751673088	3520	complete	DataQual, SenseMonitor
H1-0009	751676736	17280	complete	DataQual, SenseMonitor
H1-0010	751694080	832	complete	DataQual, SenseMonitor
H1-0011	751697152	10432	complete	DataQual, SenseMonitor
H1-0012	751707648	20480	complete	DataQual, SenseMonitor

Generated: Mon Nov 10 20:46:05 2003
Contact: John Zweizig with questions/suggestions.

LIGO

Monitor Statistics (DataQual)

Description	Mean	5%	95%
Average AS_Q RMS in the 10 - 100Hz band:	2494.51	2057.98	3105.83
Average AS_Q RMS in the 100 - 200Hz band:	0.000175469	0.000143081	0.000226387
Average AS_Q RMS in the 200 - 400Hz band:	0.000475502	0.000317783	0.000687167
Average AS_Q RMS in the 400 - 1000Hz band:	0.0003231	0.000255971	0.000431863
Average AS_Q RMS in the 1000 - 7000Hz band:	0.00208257	0.00196123	0.0023164
Average AS_Q 4-sigma glitch rate 100Hz HP:	3.71241	2.16667	6.48333
Average AS_Q 6-sigma glitch rate 100Hz HP:	0.0446809	0	0.15
Average AS_Q 4-sigma glitch rate 500Hz HP:	2.35887	1.75	3.16667
Average AS_Q 6-sigma glitch rate 500Hz HP:	0.00319149	0	0.0166667

Description	Mean	5%	95%
Calibration alpha parameter:	0.915977	0.886269	0.93559
Calibration alpha*beta:	0.992834	0.975162	1.01263
Inspiral range in kPc:	1730.14	1283.16	2236.59

LIGO

Still More to Do

- Make segment database more useful
  - » More monitor statistics
  - » Conlog information
  - » Comments from Operators, SciMons, et al.
  - » Global histograms, other graphical information
- Identify important failure modes, pathologies
- Generate segment flags