S5 Hardware Injections

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Overview

- **Injection stream always ON.**
  - » Pulsars, bursts, inspirals added together, then injected.
- Bursts and inspirals: ~5 injections per day
  - » Inspirals: 32 sec long, 1 inspiral per injection
  - » Bursts: 21-106 sec long, several bursts per injection (gaussian, sine-gaussian etc)
  - » Typical overhead: ~20 sec per injection
- **Hand-shake:**
  - » Warn operator 5 min before inspiral/burst is scheduled.
  - » Skip injection if GRB alert, operator override, or not in science mode.
  - » Otherwise, proceed with injection and automatically flag the time-interval as injection (not science) mode.
- Pulsars: two weeks on, two weeks off
- **Stochastic injections done manually.**

Injection History
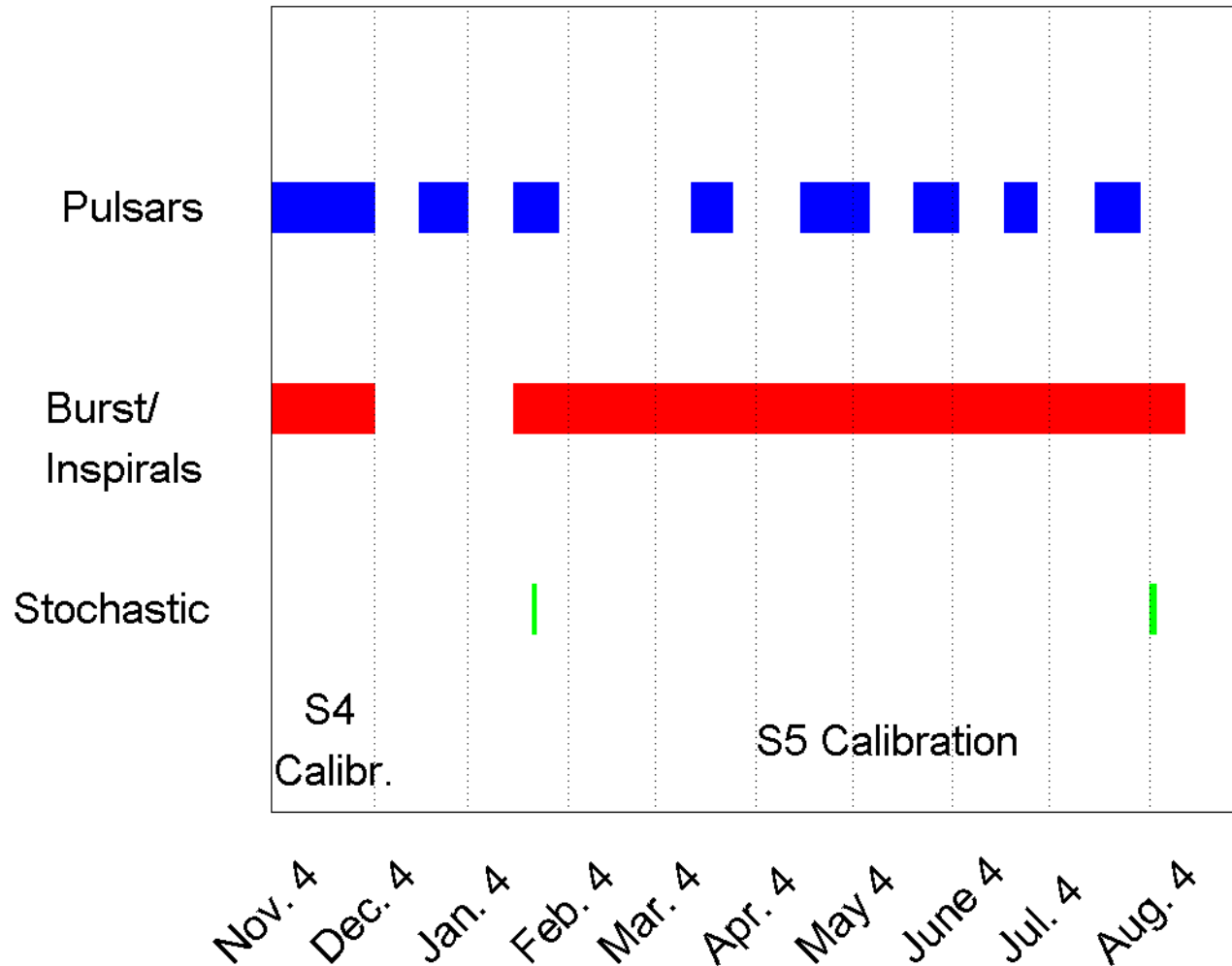
Burst/Inspiral (1)

	H1	H2	L1	H1L1	Triple
Total	648	795	556	408	388
Burst	386	452	305	237	224
Inspiral	262	343	251	171	164
Successful	642	788	541	} Performed Injections	
Compromised	6	7	15		
Attempted and Skipped	~416	~269	~508		

Burst/Inspiral (2)

Time spent in injection mode.

	H1 (hrs)	H2 (hrs)	L1 (hrs)	H1L1 (hrs)	Triple (hrs)
Total	10.9	15.2	9.4	7.2	7.0
Burst	6.6	9.5	5.3	4.2	4.1
Inspiral	4.4	5.7	4.2	2.9	2.9

Pulsar/Stochastic

- **10 pulsars injected: 2 weeks on, 2 weeks off**
  - » Deviated from this schedule a bit.
  - » Nominal frequencies (Hz): 52.8, 108.9, 148.7, 194.3, 265.6, 575.2, 763.8, 849.1, 1221.0, 1403.2.
  - » Amplitudes varied during the run.

- **Stochastic injections, in triple coincidence:**
  - » Performed manually
  - » 1 pre-calculated, Ω_{inj} = 1, ~20 min
  - » 1 on-the-fly, Ω_{inj} = 0.01, ~40 min
  - » 1 on-the-fly, Ω_{inj} = 0.0036, ~4 hrs

Running

- Smooth running for most of the run.
  - » Early-run problems: Clearing test-points, booting awg, etc.
  - » More recently, H1 awg reboots frequent.
  - » Checks made ~weekly to verify injections are properly flagged etc.
  - » Some injections intentionally loud (causing dips in inspiral range)
    - – Verify we can detect large signals
    - – Check veto by auxiliary channels
- Reporting:
  - » Burst/inspiral injection summaries updated within seconds.
  - » Myungkee's recovery web-pages updated within minutes.
  - » Weekly summaries posted in ilog.
- Special loud injections performed (Gaby, Mike L. et al):
  - » Verify that we can detect nearby BNS
  - » 1.4-1.4 Solar Mass BNS at 5 kpc detectable (LSC overflows, but not AS-triggers)

Recovery

- Bursts and inspiral injections often observed in online monitors
    - » Sometimes followed by inspiral range dips.
    - » Online recovery with automated web-based reporting (Myungkee)
- Also successfully recovered in offline analyses.
- Pulsars recovered in offline analyses.
    - » Also monitored in control room.
- Stochastic recovered offline (except for the last long injection).
    - » Correct sign.