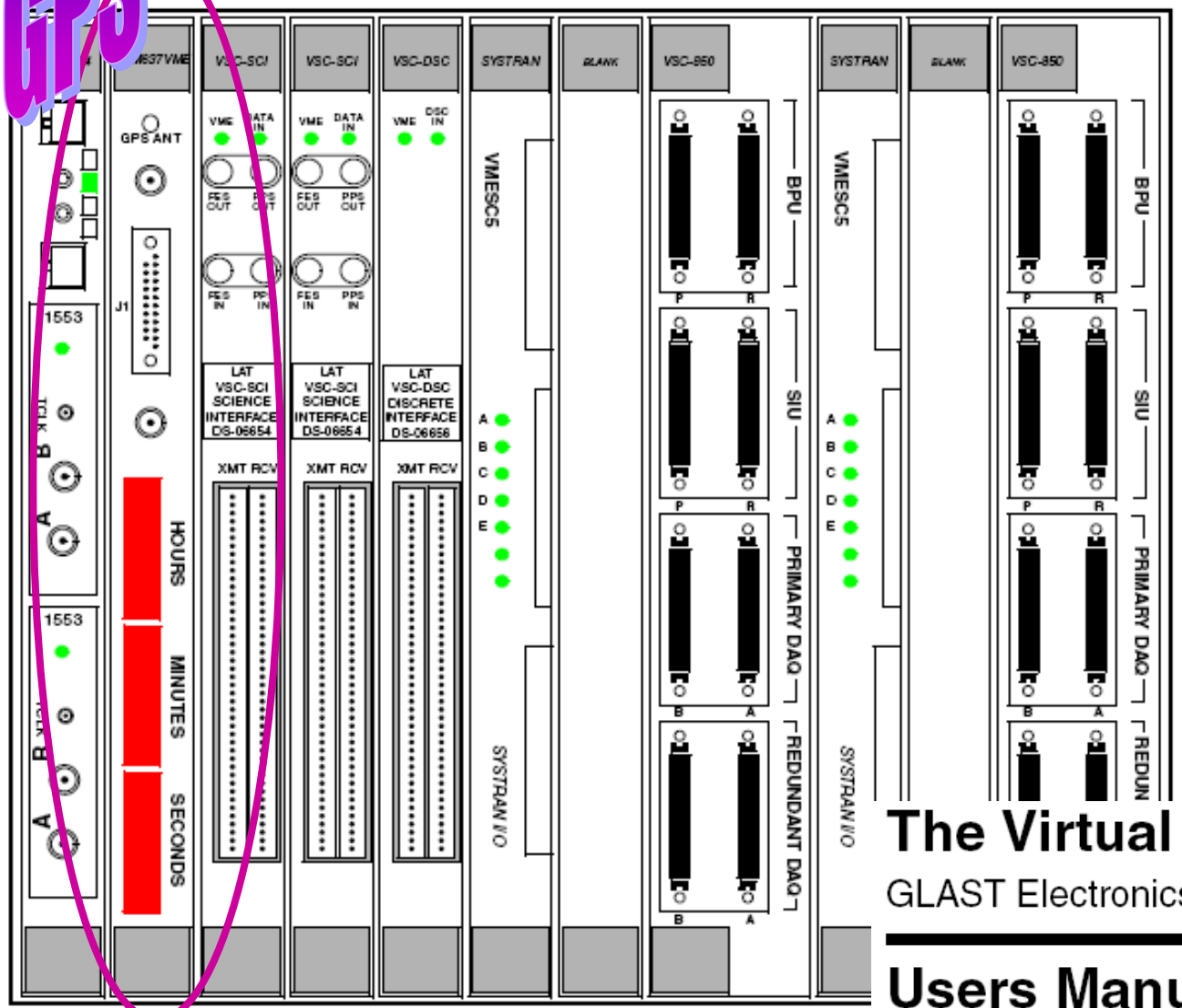
Miscellaneous timing musings

GPS



David Smith et al
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The Virtual Spacecraft (VSC)

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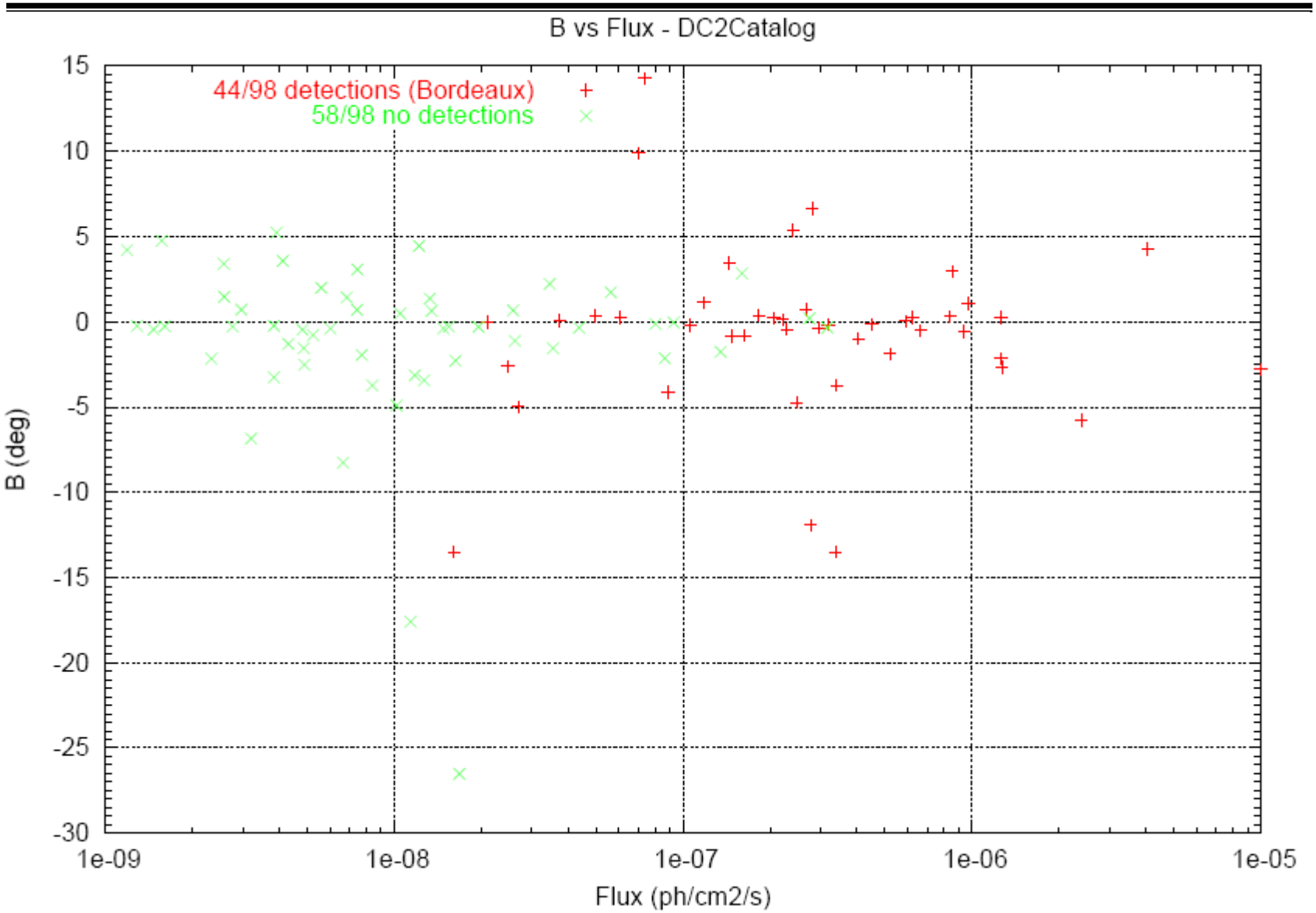
Users Manual

(four short) Topics

1. DC2 follow-up
2. Towards the flight version of the D4.fits ephemeredes database.
3. Short rumination about MSP/XRB ephemeredes
4. Minor news about absolute timing in real data.

1. DC2 follow-up

Galactic latitude versus True flux of the 98 simulated pulsars with known ephemeredes (D. Parent).



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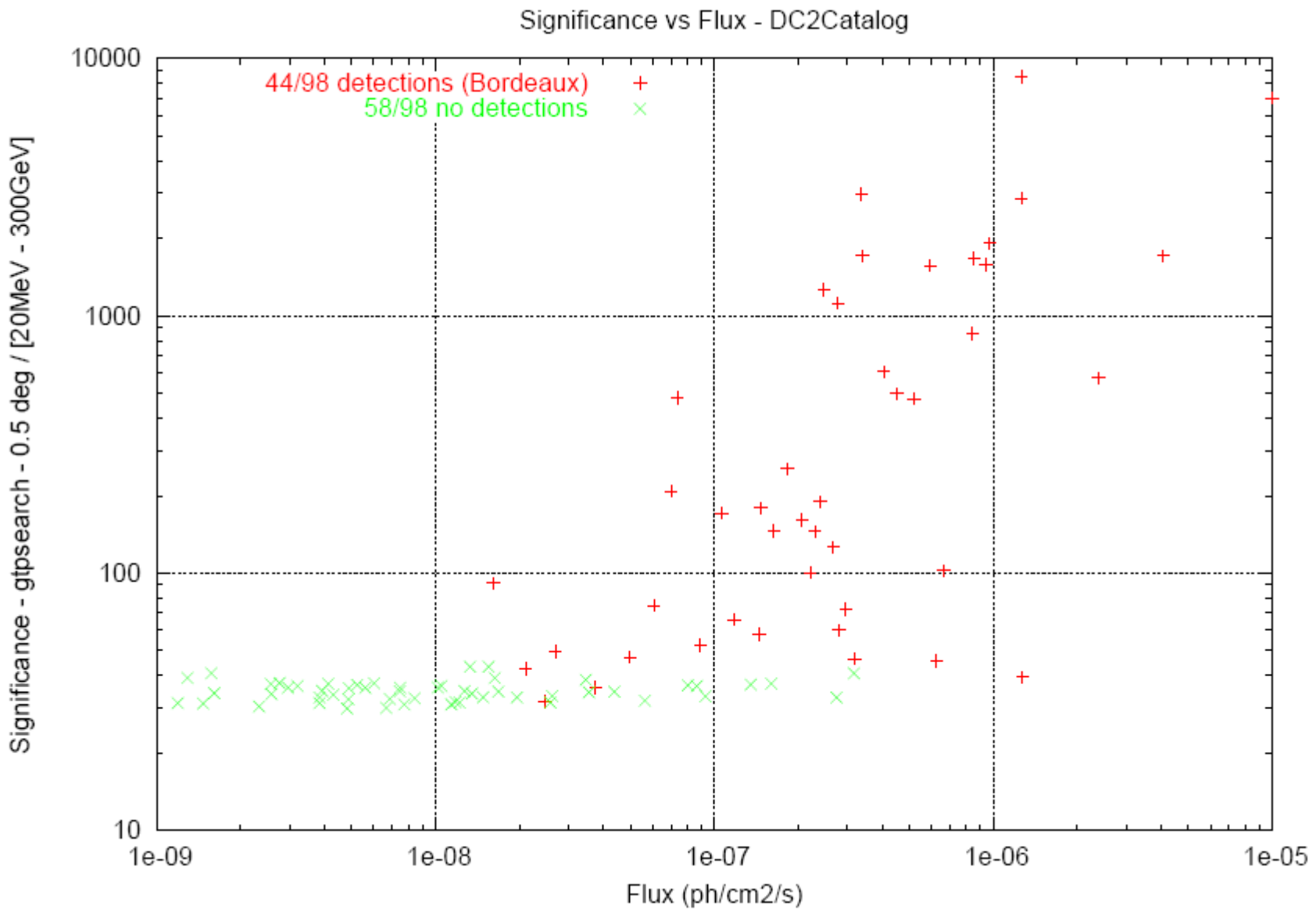
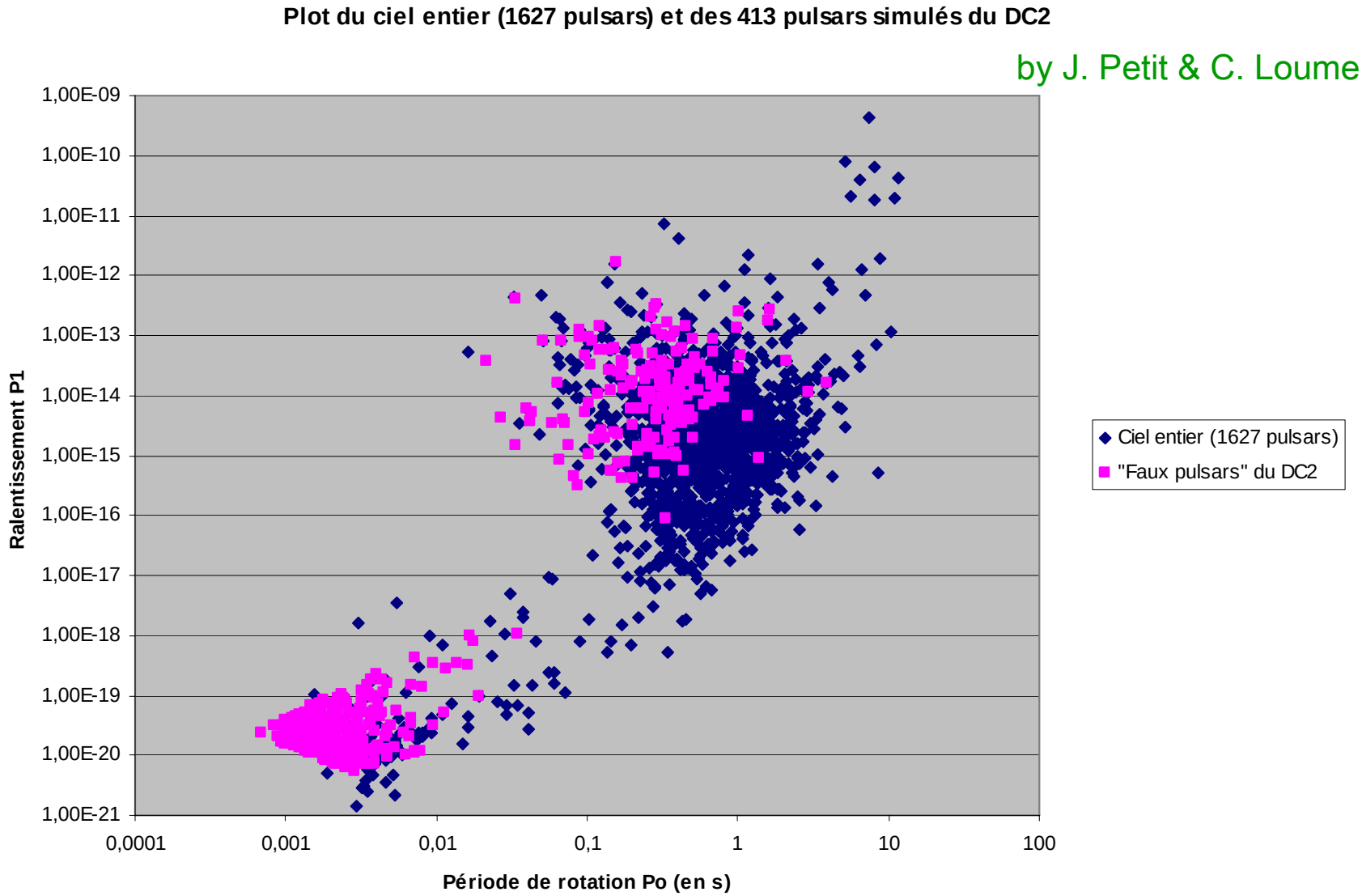
DC2 follow-up, cont'd

Gtpsearch test statistic versus True Flux of the 98 simulated pulsars with known ephemeredes. (D. Parent).



DC2 follow-up, cont'd

Blue: all real ATNF pulsars. Pink: 413 DC2 pulsars.



DC2 follow-up, end

- Thierry studying gtlikelihood vs xspec. Damien probably won't add gtlikelihood to his script in the near future (due to University calendar…).
- Also intend to add gtpsearch *three* times (for the three different statistical tests), each time with only *one* frequency step, at the *a priori* frequency, to avoid Ntrials getting out of control (result of discussion between Masa & DJT).

2.Towards a flight D4 database

- While at GSFC for Closeout, we met with Masa H and James P to hash out details of how to transfer timing solutions from the radio observatories to the GSSC LAT data servers.
- Denis then wrote a routine to take Nançay "tempo" ascii output and translate it to the ascii input illustrated in the Workbook tutorial for gtpulsardb, see

http://glast-ground.slac.stanford.edu/workbook/pages/sciTools_gtpulsardbEphemerisDataFileTutorial/gtpulsardbTutorial.htm

- David is making a short .html to document the above.
- We'll give both to MH & JP. Idea is that GSSC will have a small number of translation scripts, they'll receive ephemeredes from radiotelescopes (perhaps via Glast middlemen in the early days), and thus maintain the Official D4.fit files.
- For starters – we suggested that MH&JP build a "version 0" D4.fit using the ephemeredes for the1627 pulsars in ATNF. They have begun looking at syntax details…
- (Since then: not clear to DD & DS that most of the 1627 have real timing solutions. A *P* and a rough *Pdot* at discovery time is *not* the same as a full-blown set of timing parameters.)
- In any case: goal is to have as many pulsars as possible in the D4.fits – only worth asking radiotelescope time for the 236 "best candidates" but if ephemeredes exist for others, include them as well.

Towards a flight D4 database

- Meanwhile: Denis (with 2 juniors) has been learning Tempo. He takes Nançay TOA measurements to generate ephemeredes. We're learning that there's a significant difference between "detections and routine observations" on the one hand and "accurate ephemeredes in the database" on the other.

- The number of GLAST pulsars detected by Nançay so far is about 40.

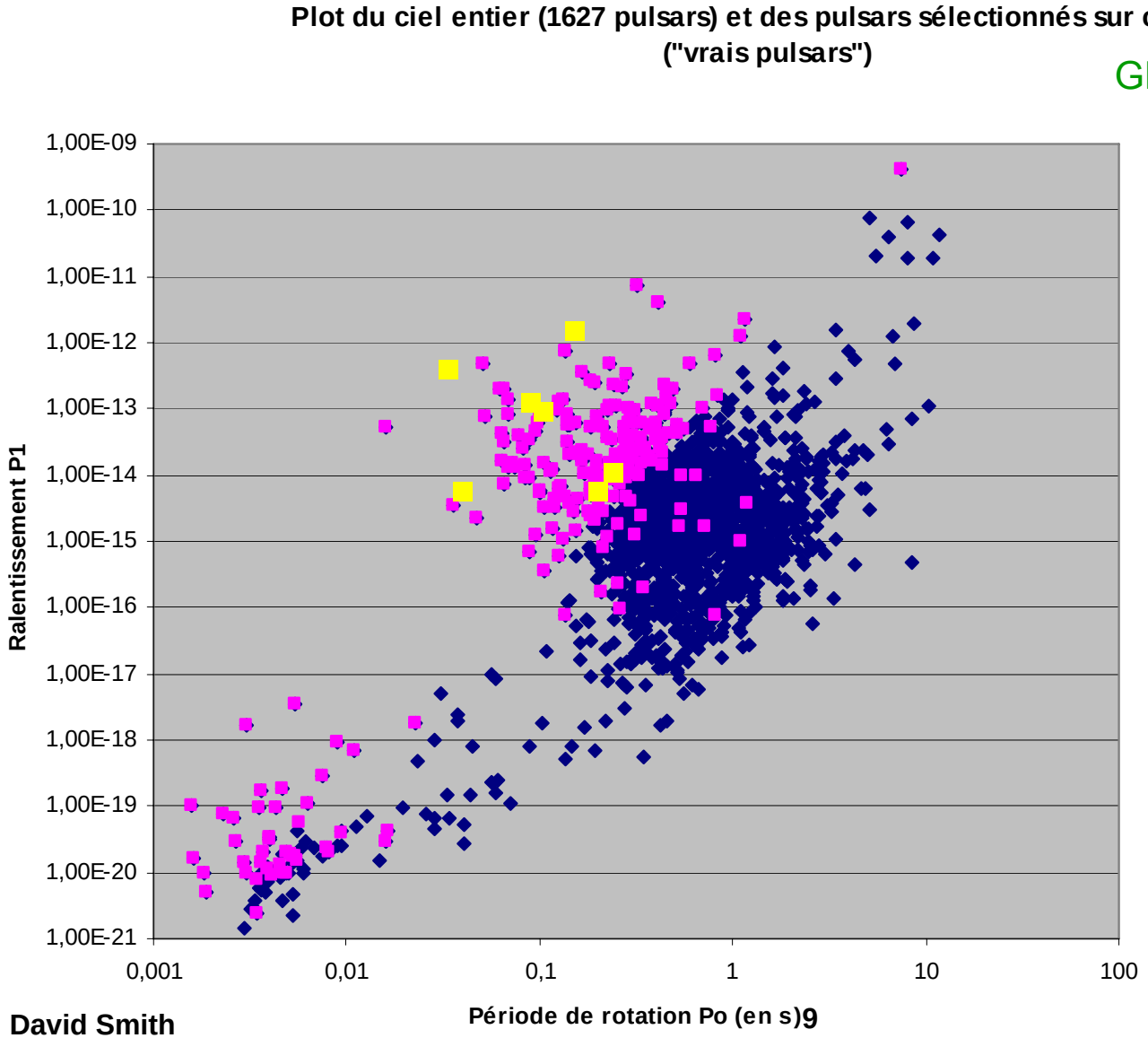
- The sample Tempo output from Nançay can be seen on slide 4 of

https://confluence.slac.stanford.edu/download/attachments/2162/PSR_Face2Face30Mai2006.pdf

- FYI, real D4.fits filled with the CGRO ephemeredes exist, see

http://glast.gsfc.nasa.gov/ssc/dev/psr_tools/exampleD4.html

Towards a flight D4 database, end



GLAST's 236 gamma candidates, compared to all known pulsars and the CGRO 7, prepared by J. Petit & C. Loumena

3. Ephemeredes for MSP's in XRBs.

- After DC2 it dawned on us that the "binary orbital elements" part of the DC2 D4.fits file is empty – the many MSP's in the simulated sky are *not* XRB's as they will mostly be in Real Life.
- Max confirmed that this was a deliberate pre-DC2 choice. With hindsight, a *wise* choice given the difficulties encountered with lightcurve simulations.
- DJT says "MSPs intrinsically more stable. Binary orbits too, once you have them nailed down*. So not necessarily a big impact on radio telescope time."
- Certainly needs to be exercised before launch. Max planning to add to simulators. We are too, but not soon… Anyone under-employed could help out.

"Aye, there's the rub."
-Hamlet, in the "to be or not to be" soliloquy.

4. Real GPS timestamps in real data

- Slides 5 through 8 of

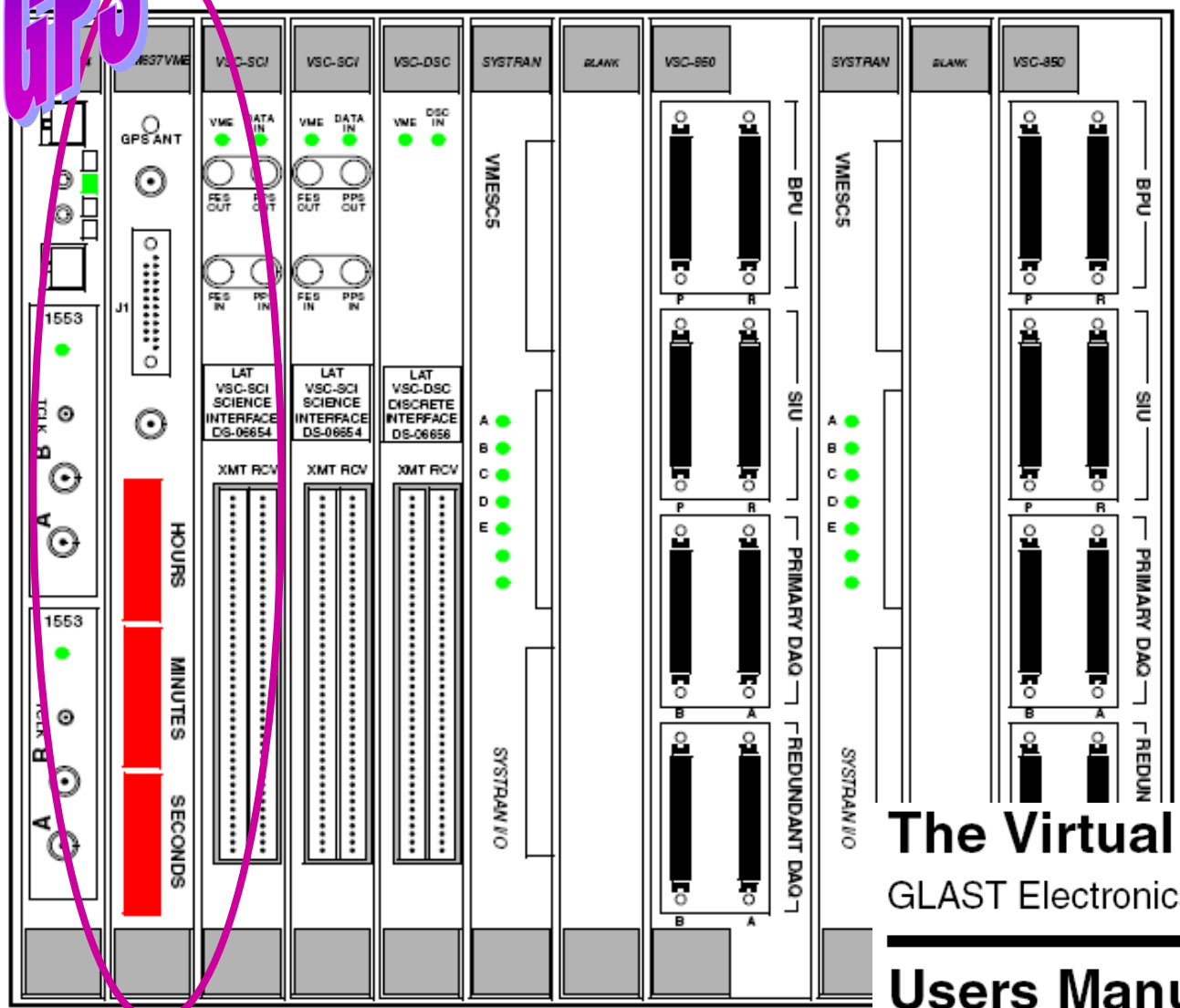
https://confluence.slac.stanford.edu/download/attachments/2162/PSR_Face2Face30Mai2006.pdf

explain why we'd like to test the LAT absolute time stamps presently coming out of the hardware, or before launch in any case (major missions have had problems).

- Minor progress since then:
  - FSW (=Flight Software) gets GPS absolute time stamp for individual triggers from the VSC (virtual space craft, see next slide).
  - The elements for building MET (=Mission Elapsed Time, that is, seconds since 2001 January 1, the input to gtbary, and thus what *this* group cares about), which are "TimeTone at PPS" and "50 ns ticks since last PPS" appear in the digi.root and SvacNtuple.root files.

VSC = Virtual Space Craft

GPS



It's just a VME crate with some ordinary and some special modules.

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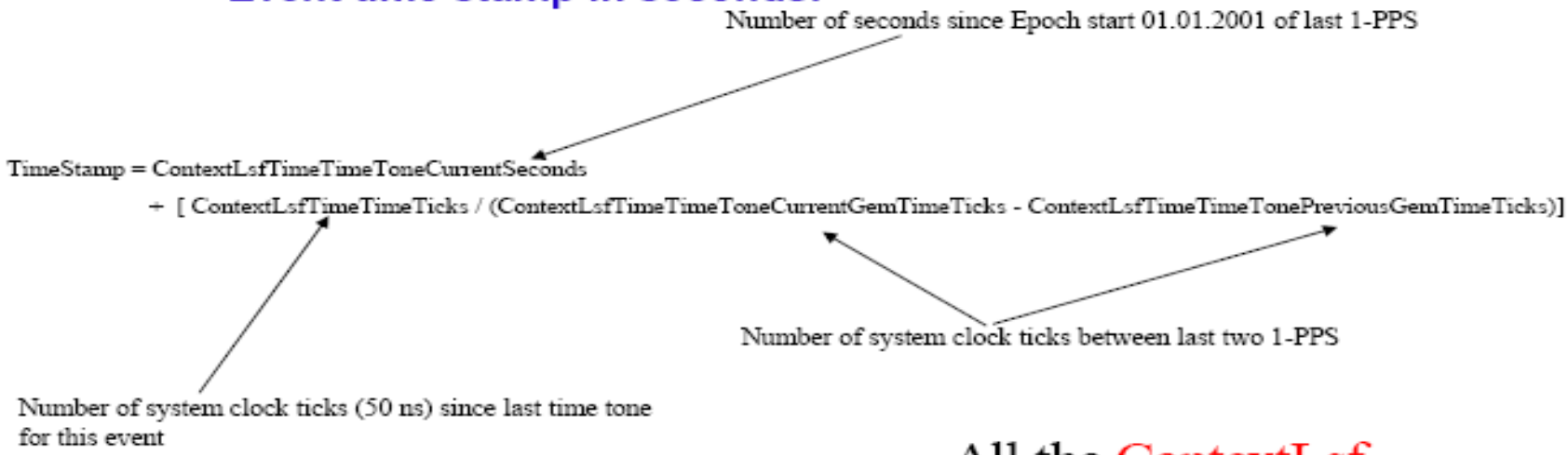
How to build MET from raw data

Slide 9 of Anders Borgland's talk,

http://www-glast.slac.stanford.edu/IntegrationTest/SVAC/Instrument_Analysis/Meetings/05262006/SVAC.pdf

Time Tones

- We receive a time tone from the GPS every second: 1-PPS
- Can be used to make an event time stamp!
- For every event:
  - Information about the current and previous time tone
  - Can correct for drift in the system clock i.e. The Tiem Tone is our absolute time!
- Example:
  - Event time stamp in seconds:



All the ContextLsf....
are SVAC ntuple variables!

Real GPS timestamps in real data, end

- I followed Anders' recipe, using a recent muon run from NRL. Generated METs. Learned lotsa nifty little details (which I will spare you unless asked).
- GOAL – compare absolute time at the very end of the hardware + software chain to some independent absolute time.
- Downstream: since FSW running, .fits data files no longer generated so can't check MET (am inquiring…)
- Upstream: Bryson Lee providing me some VSC info not in the "Science Data stream", will see how fare upstream we can go. Eric Grove is in the loop (a hardware+pulsar man '*par excellence*').
- So, at present, this remains mostly FYI.