A comparison of DSPSR with matDSPSR using a known input signal

- matDSPSR is the signal processing model recently developed for testing PST design options
- This is the first rigorous attempt to test it against DSPSR

Procedure:
- A complex baseband signal is generated (in Matlab) from known input Stokes parameters
- The same file is analyzed using DSPSR and matDSPSR
- The results are compared to the input Stokes parameters and the resulting differences (residuals) compared to each other

Analysis characteristics
- The same dedispersion kernel length was used in both analyses
- The same length of data was used in both analyses
- No filterbanking was used (apart from in the demonstration in the next slide)

DSPSR was called using:
dspsr -cepoch=start -D 100.64476 -c 0.00575745 sig_test_complex.dump

The dispersion value was adjusted to produce significant delay across the pulsar period in order to properly test the dedispersion analyses
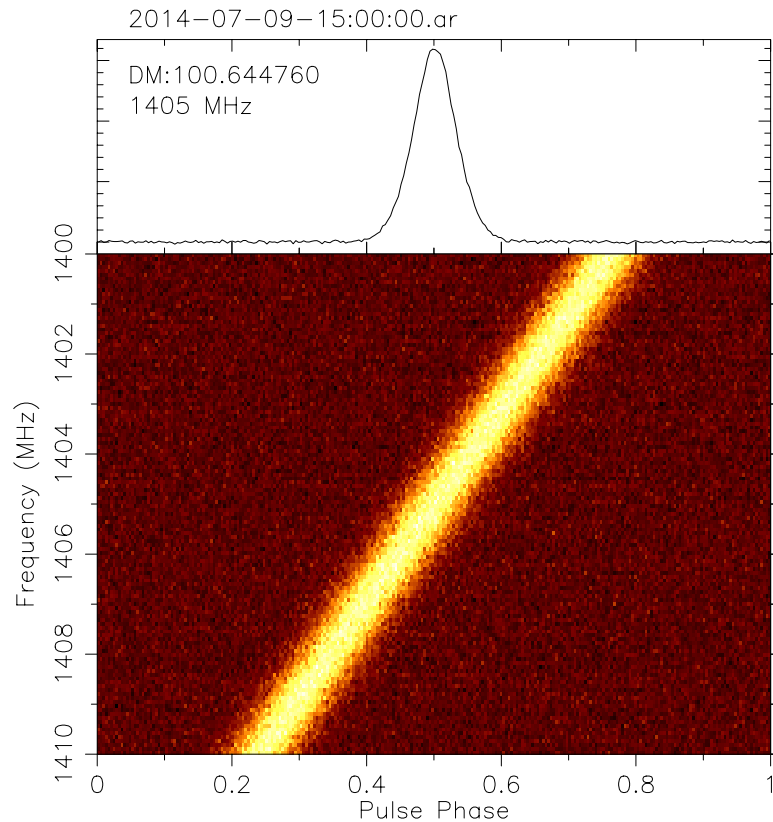

File header for sig_test_complex.dump

HDR_VERSION 1.000000
TELESCOPE   PKS
RECEIVER   unknown
SOURCE   DM:100.644760 P:0.005757
MODE   PSR
FREQ   1405.000000
BW   -10.000000
NCHAN   1
NPOL   2
NBIT   32
NDIM   2
STATE   Analytic
TSAMP   0.100000
UTC_START   2014-07-09-15:00:00
OBS_OFFSET   0
INSTRUMENT   dspsr
DSB   0
HDR_SIZE   4096

File contained ~0.6 s of data

Note that no filterbanking was used in the actual test; here it is applied just to illustrate the amount of dispersion in the signal

# Comparison of DSPSR and matDSPSR with input model
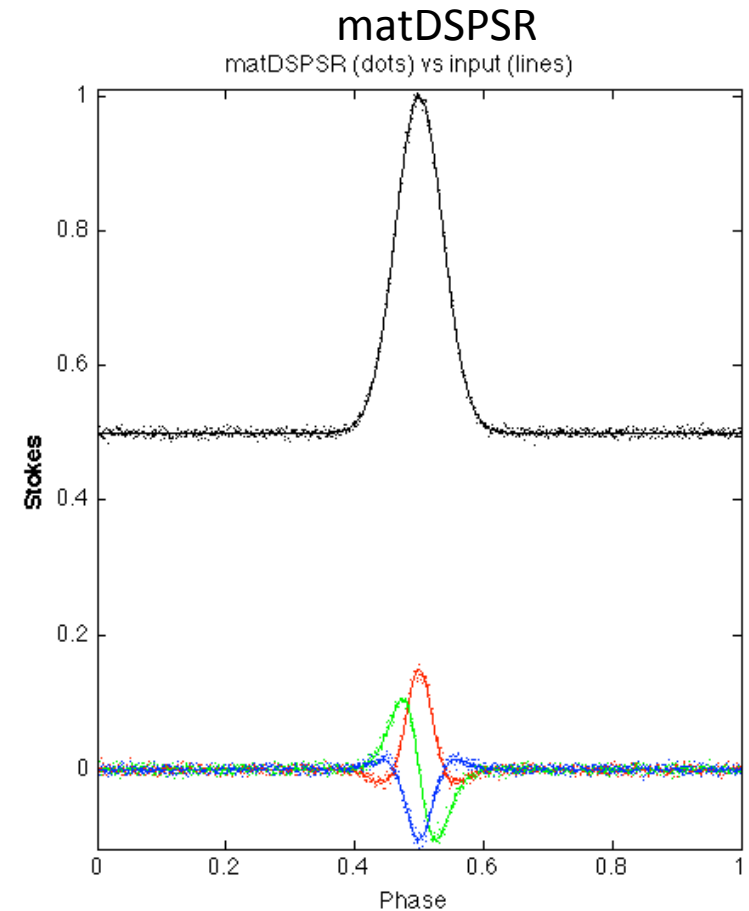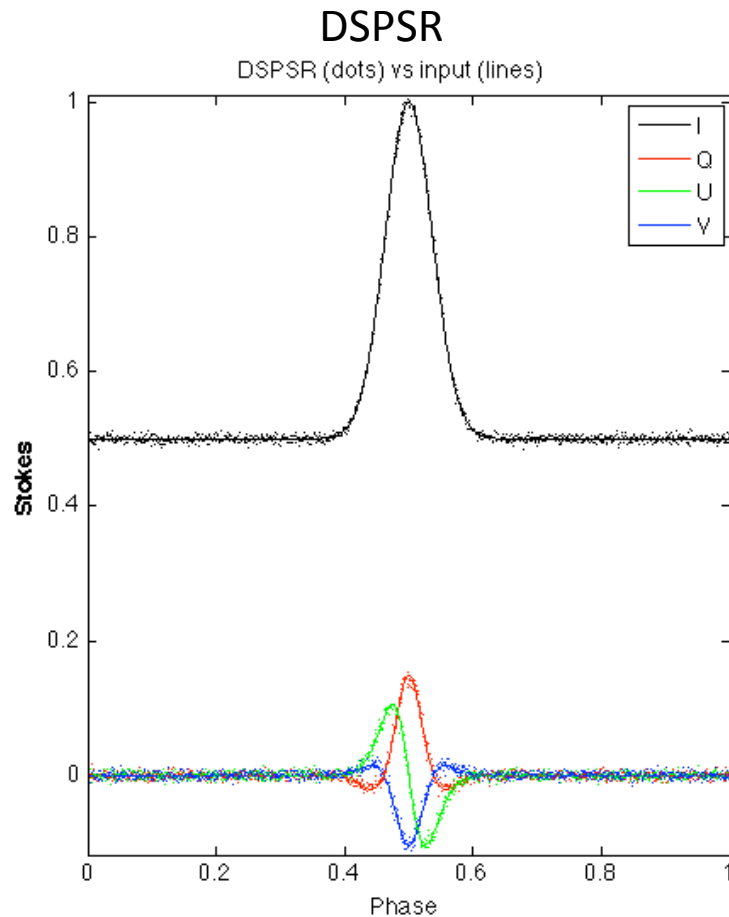
Input model is given by solid lines; Analysis results are given by points
Good visual agreement

Comparison of DSPSR and matDSPSR residuals (difference between output and input)
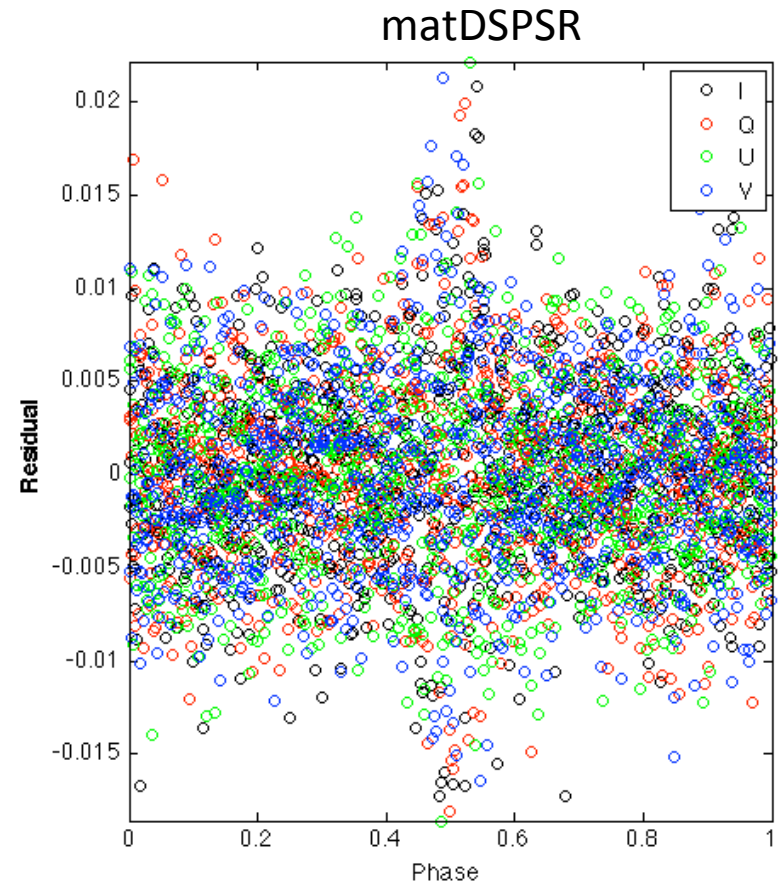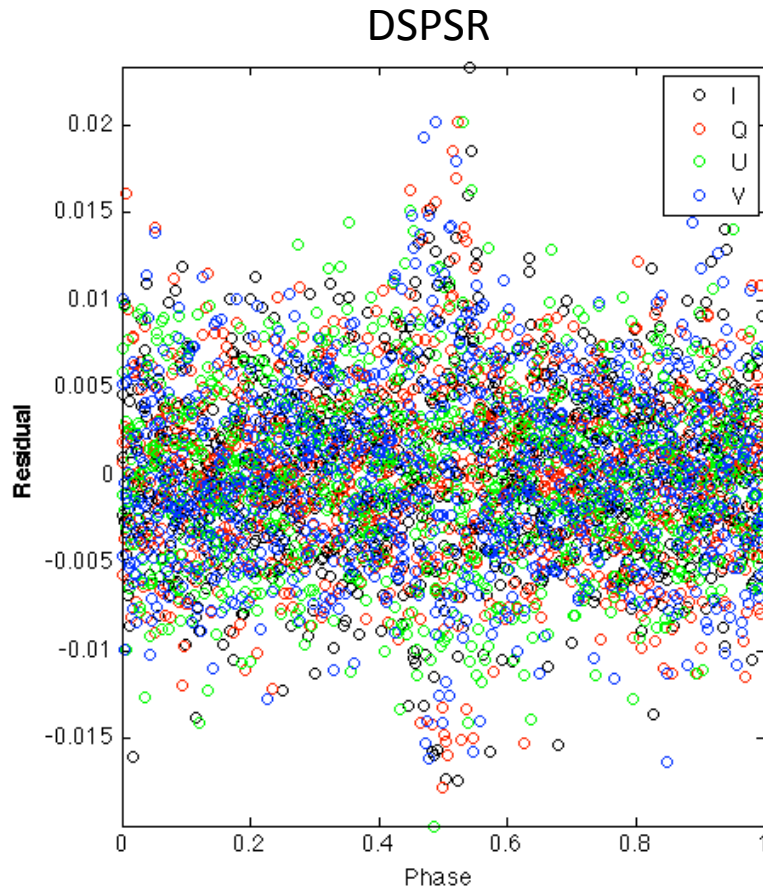
No systematic errors are evident in the difference (residual) between each analysis and the input model

Comparison of DSPSR and matDSPSR residuals
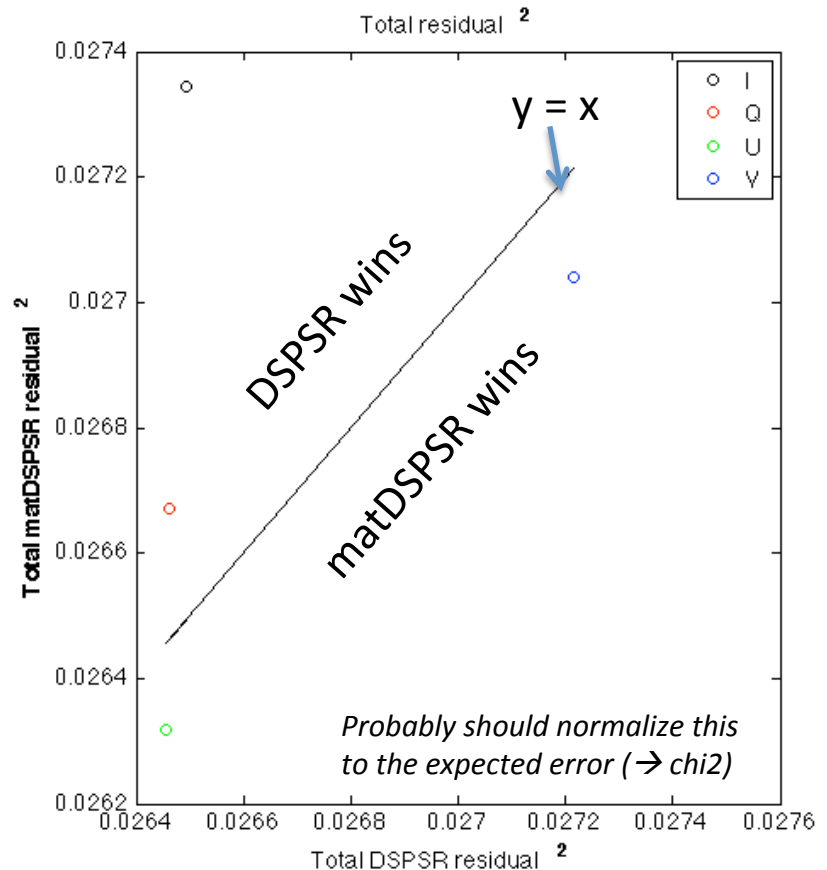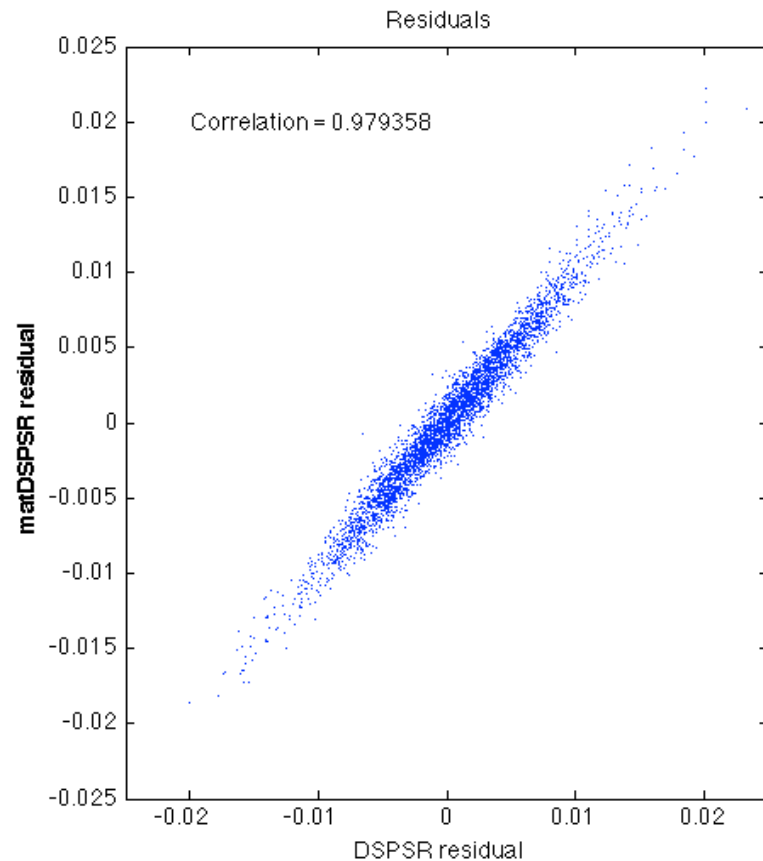
Residuals from both analyses are strongly correlated
No obvious "winner" in this particular test
→ **Given that the correlation between matDSPSR and DSPSR residuals is not exactly 1, there are still unknown differences; overall though the agreement is excellent**