

Quad test with radioactive source

Kees Ligtenberg

Lepcol meeting

May 20, 2019



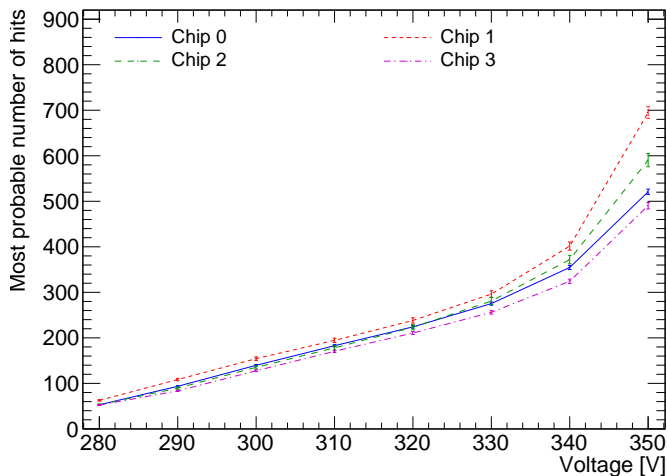
Outline

- Number of hits
 - ▶ Confirms what Fred already saw
 - ▶ Events with more than 500 hits can partially be recovered
- Topological analysis for cross-talk hits

Selections for number of hits and ToTs

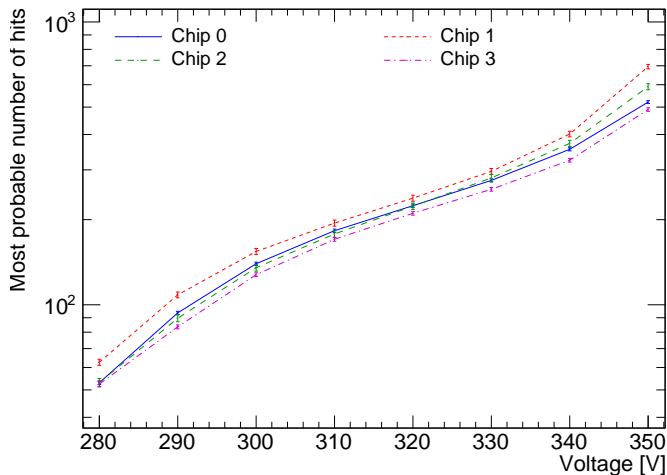
- Mean row, column < 40 pixels from edge
- 7 pixels $<$ r.m.s. row, column < 30 pixels

Number of hits: T2K gas

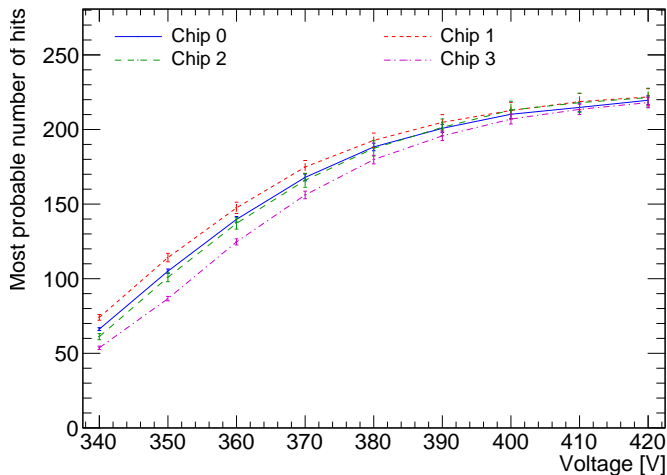


Number of hits: T2K gas

with log scale

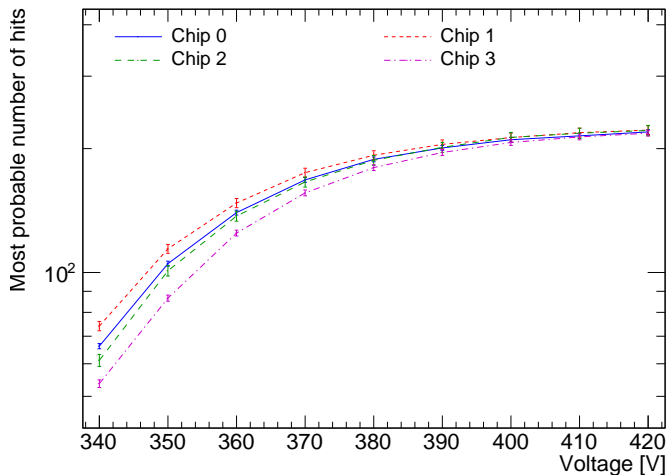


Number of hits: 18.8% Isobutane



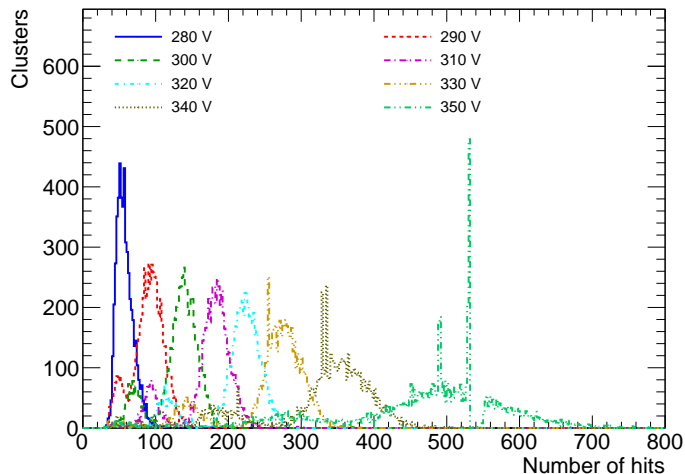
Number of hits: 18.8% Isobutane

with log scale



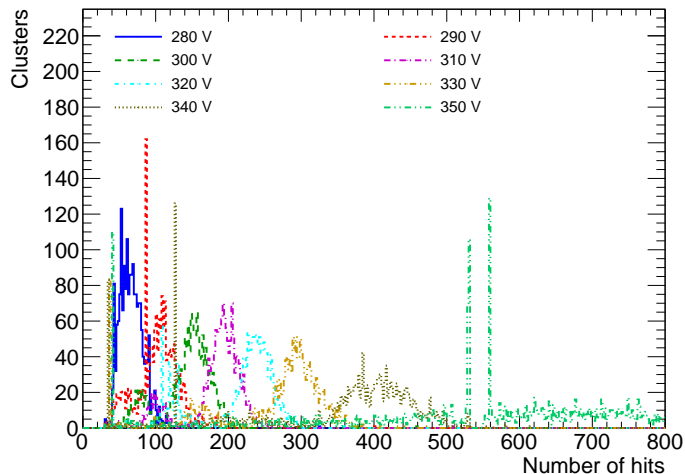
Number of hits T2K gas

Chip 0



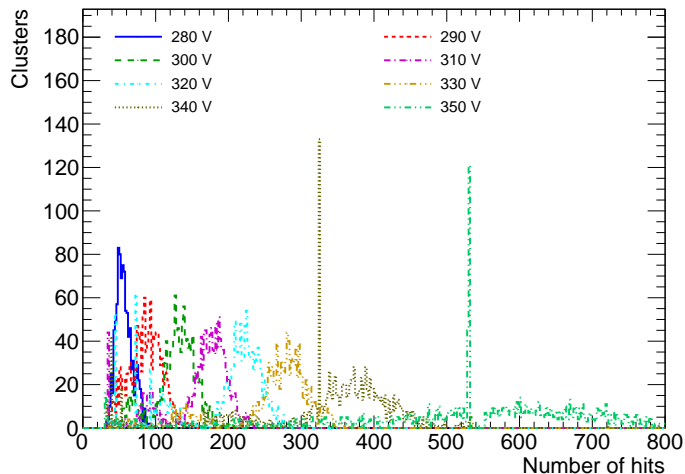
Number of hits T2K gas

Chip 1



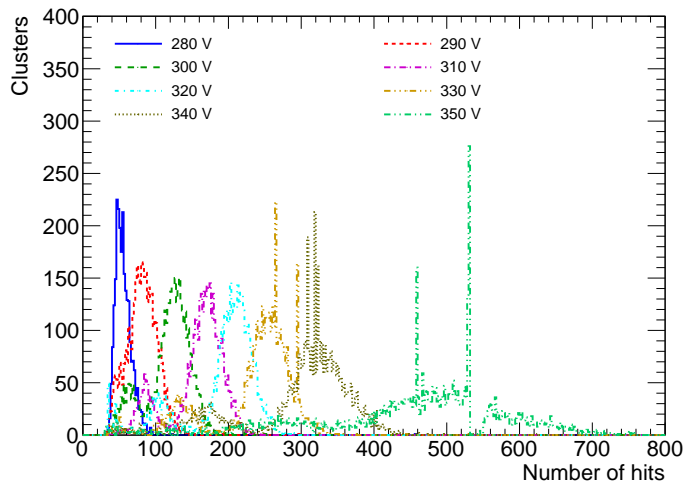
Number of hits T2K gas

Chip 2



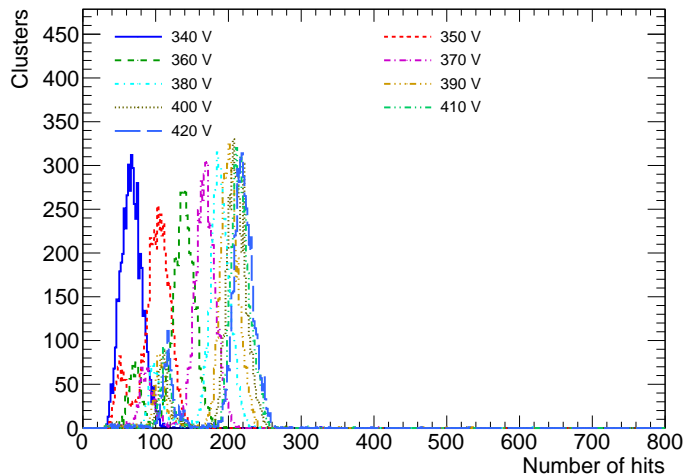
Number of hits T2K gas

Chip 3



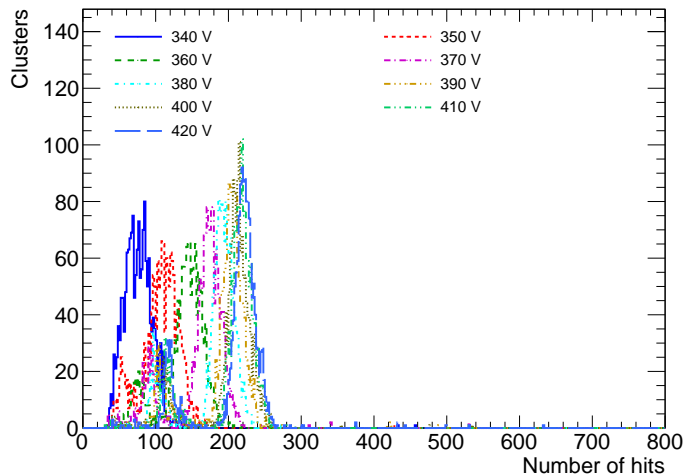
Number of hits 18.8% isobutane

Chip 0



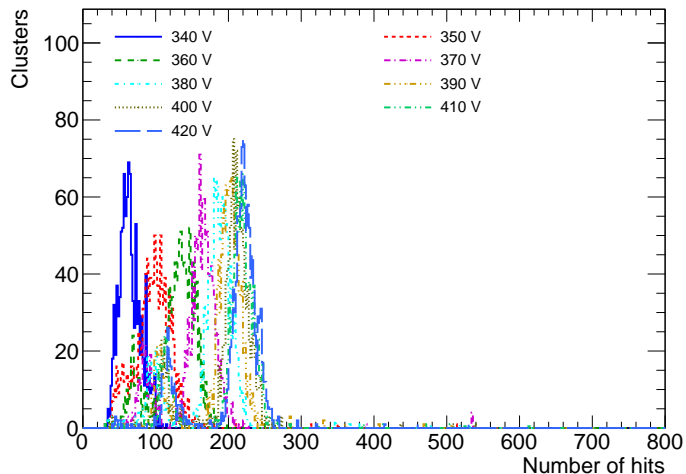
Number of hits 18.8% isobutane

Chip 1



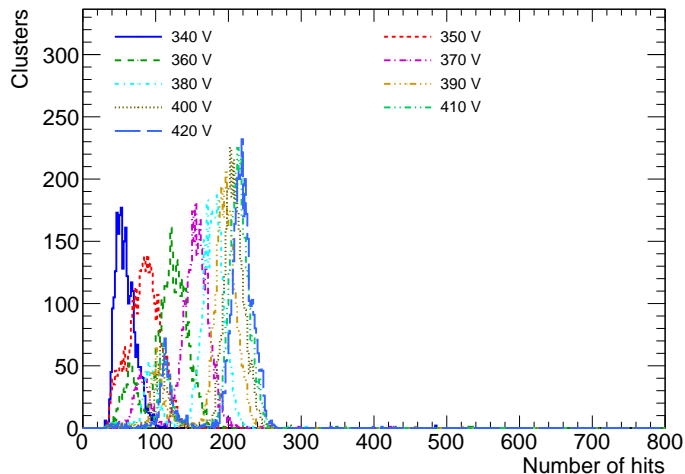
Number of hits 18.8% isobutane

Chip 2

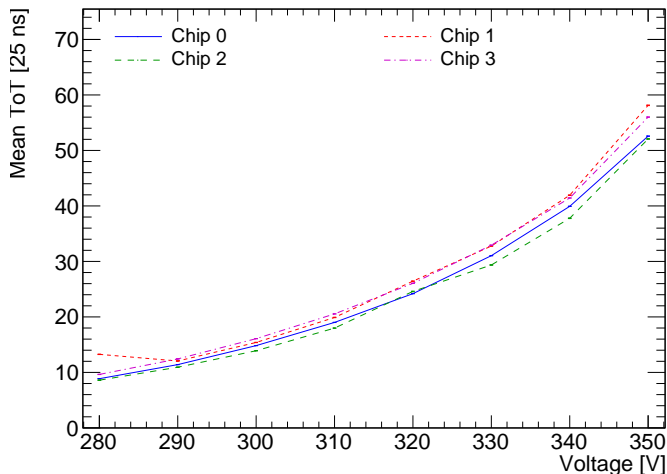


Number of hits 18.8% isobutane

Chip 3

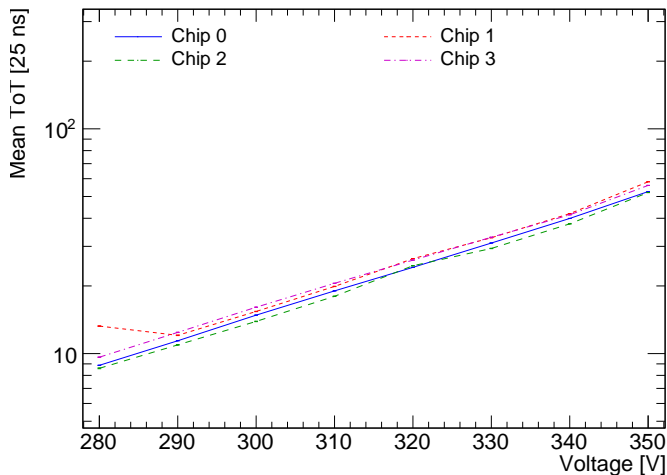


Time over threshold: T2K gas

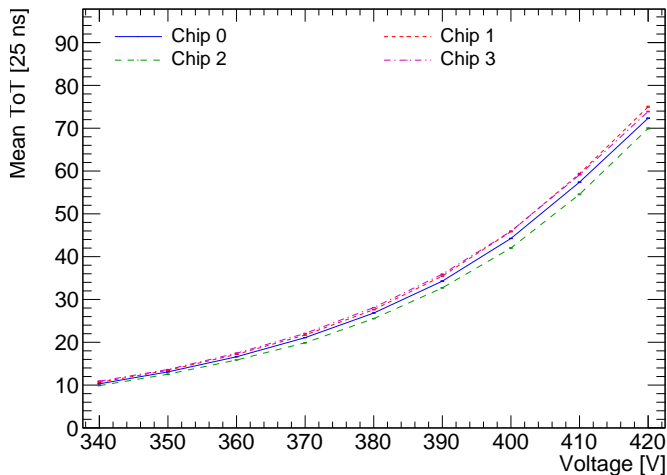


Time over threshold: T2K gas

with log scale

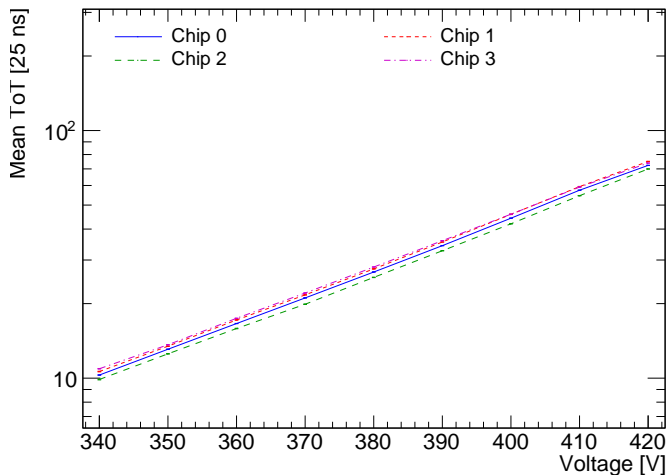


Time over threshold: 18.8% Isobutane



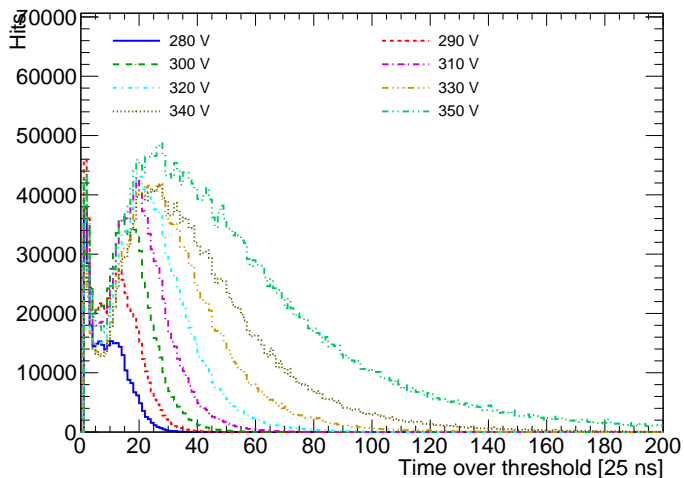
Time over threshold: 18.8% Isobutane

with log scale



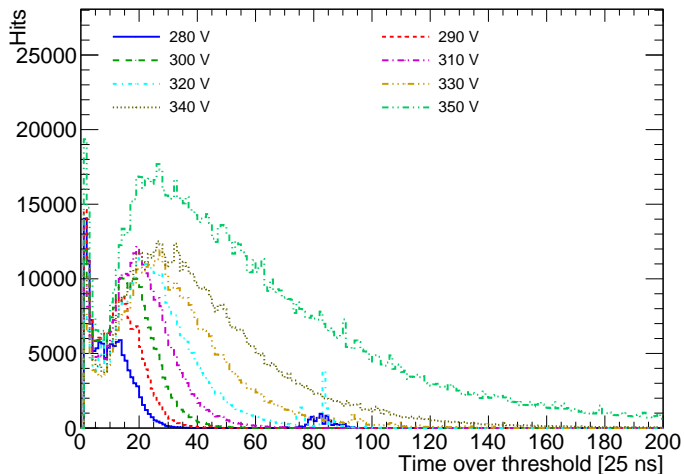
ToT spectrum: T2K gas

Chip 0



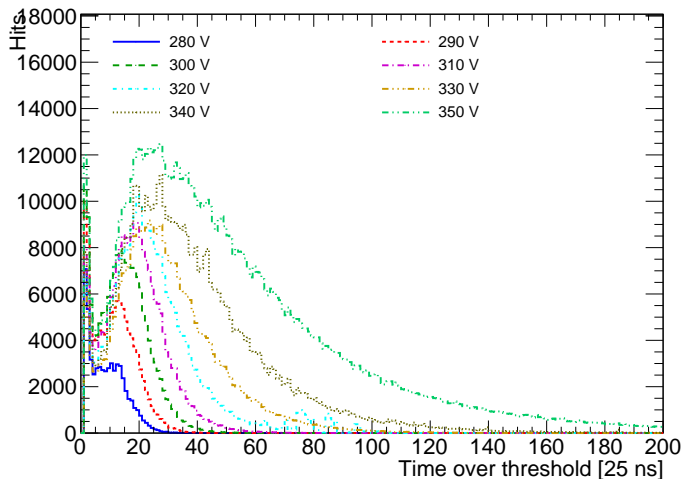
ToT spectrum: T2K gas

Chip 1



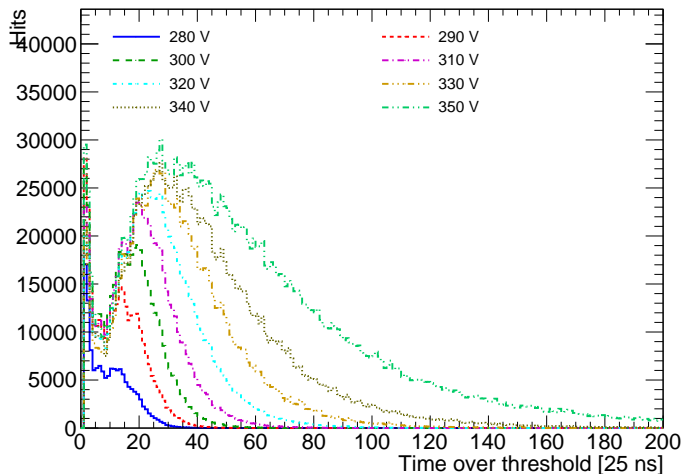
ToT spectrum: T2K gas

Chip 2



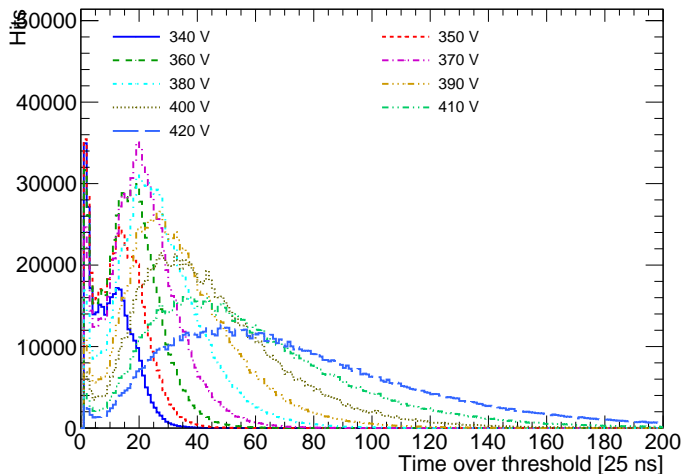
ToT spectrum: T2K gas

Chip 3



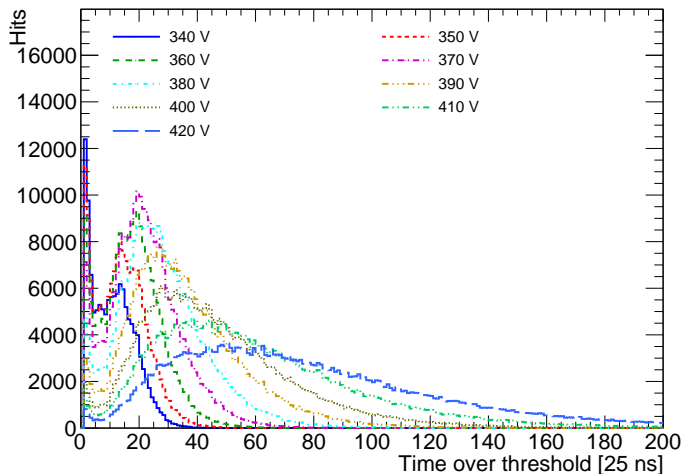
ToT spectrum: 18.8% isobutane

Chip 0



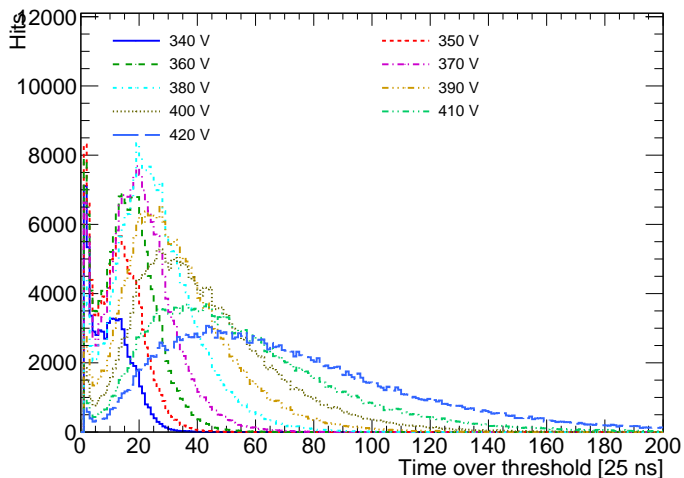
ToT spectrum: 18.8% isobutane

Chip 1



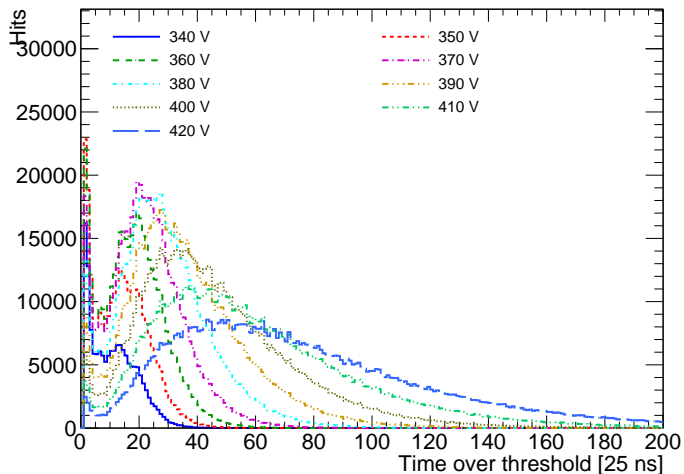
ToT spectrum: 18.8% isobutane

Chip 2



ToT spectrum: 18.8% isobutane

Chip 3



Cross talk

Try to find cross talk by comparing pairs and isolated hits

- Controlpairs: exactly one empty pixel in between, in otherwise empty 4×3 grid
- Isolatedpairs: pair of two pixels, otherwise isolated.
- RandomPairs: pair of two randomly selected hits
- randomIsolatedPair: pair of two randomly selected isolated hits (one hit in 3×3 pixels)

For distributions hits are selected by topology:

| | | |
|---|---|---|
| 0 | 0 | 0 |
| 0 | × | 0 |
| 0 | × | 0 |
| 0 | 0 | 0 |

Isolated pair

| | | |
|---|---|---|
| 0 | 0 | 0 |
| 0 | × | 0 |
| 0 | 0 | 0 |
| 0 | × | 0 |

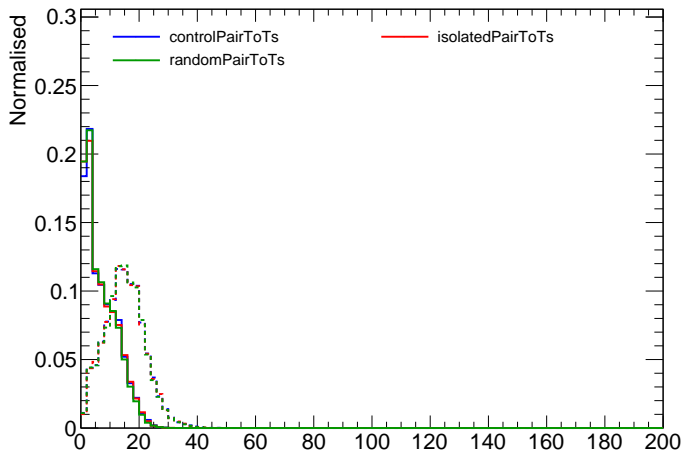
Control pair

| | | |
|---|---|---|
| 0 | 0 | 0 |
| 0 | × | 0 |
| 0 | 0 | 0 |

Isolated hit

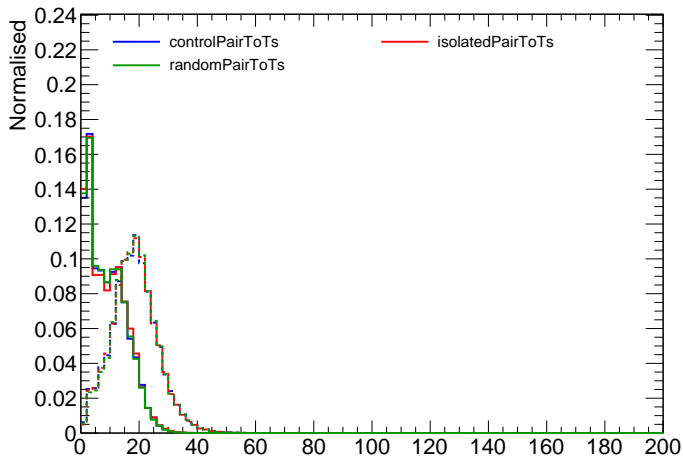
Topologically selected pairs: 18.8% isobutane

at 340 V



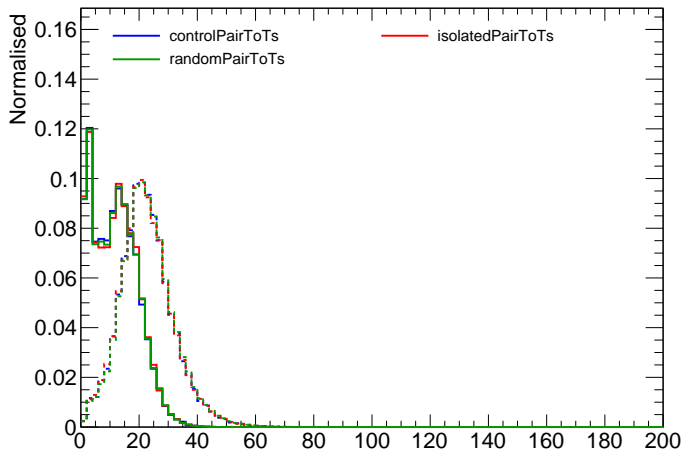
Topologically selected pairs: 18.8% isobutane

at 350 V



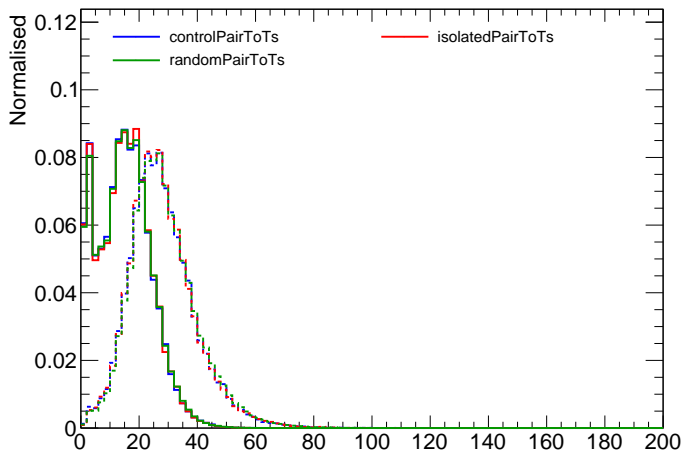
Topologically selected pairs: 18.8% isobutane

at 360 V



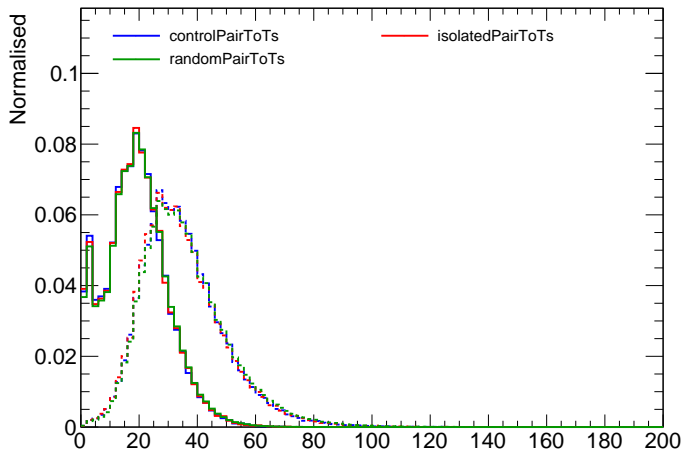
Topologically selected pairs: 18.8% isobutane

at 370 V



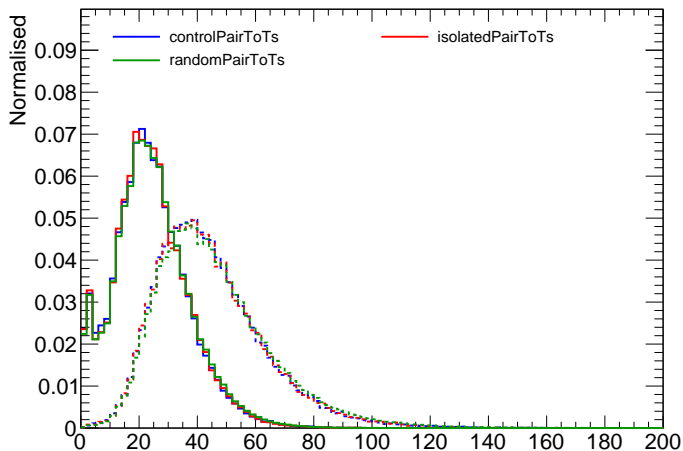
Topologically selected pairs: 18.8% isobutane

at 380 V



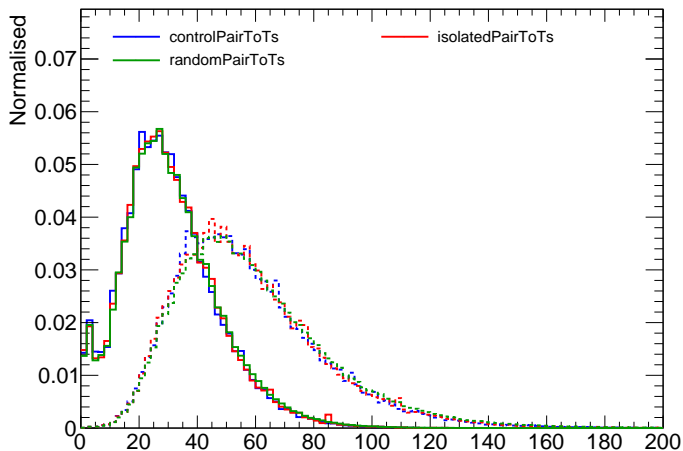
Topologically selected pairs: 18.8% isobutane

at 390 V



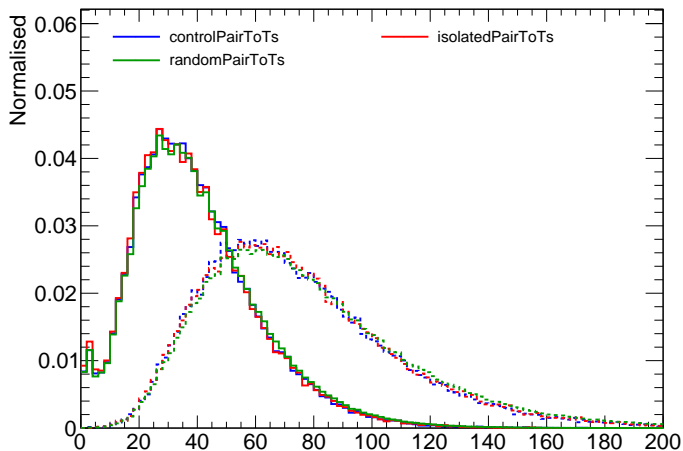
Topologically selected pairs: 18.8% isobutane

at 400 V



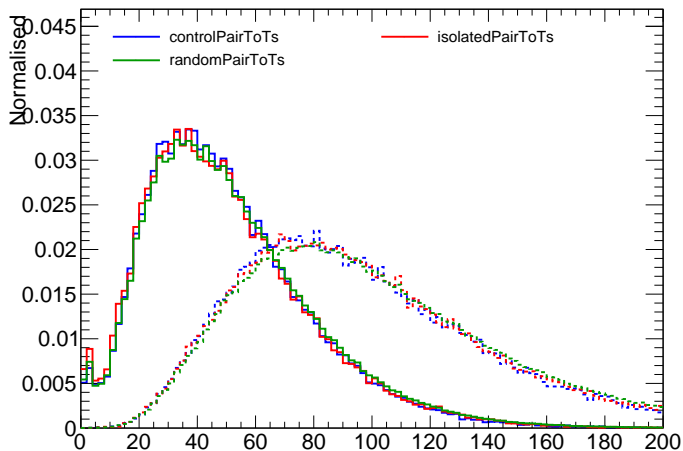
Topologically selected pairs: 18.8% isobutane

at 410 V



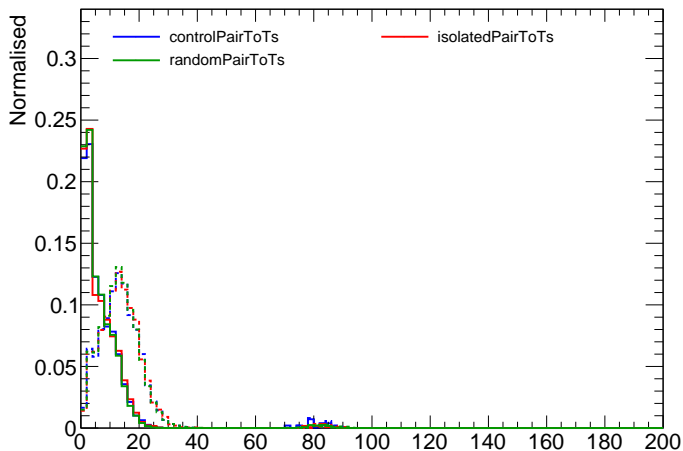
Topologically selected pairs: 18.8% isobutane

at 420 V



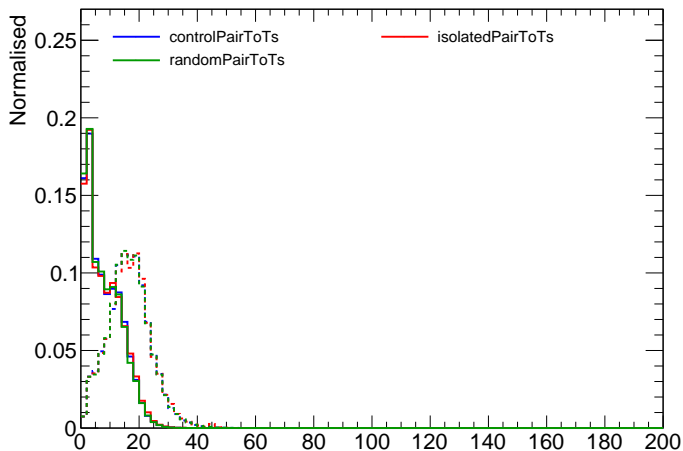
Topologically selected pairs: T2K

at 280 V



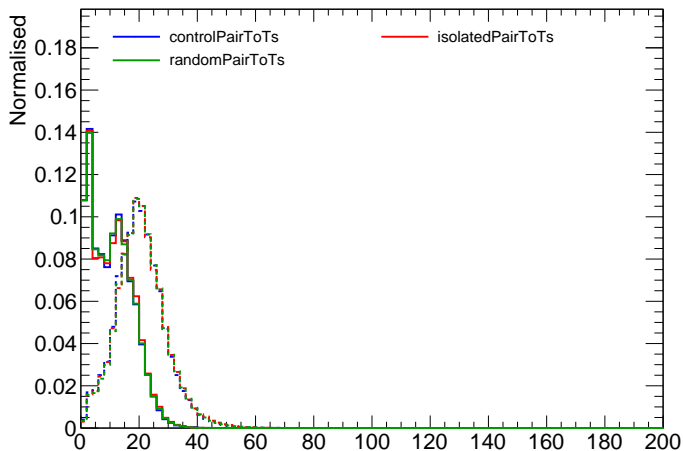
Topologically selected pairs: T2K

at 290 V



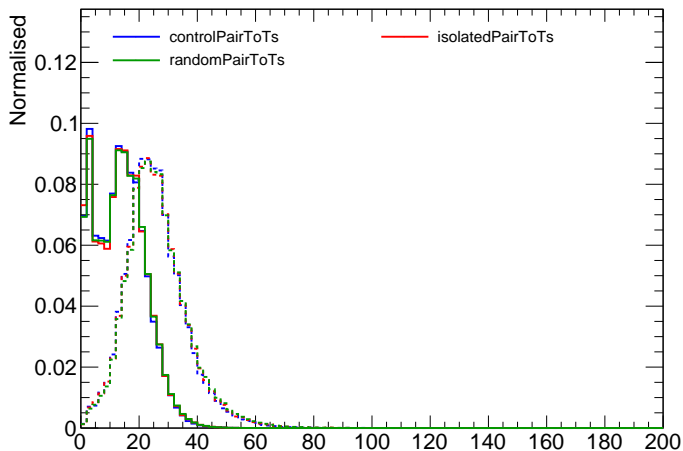
Topologically selected pairs: T2K

at 300 V



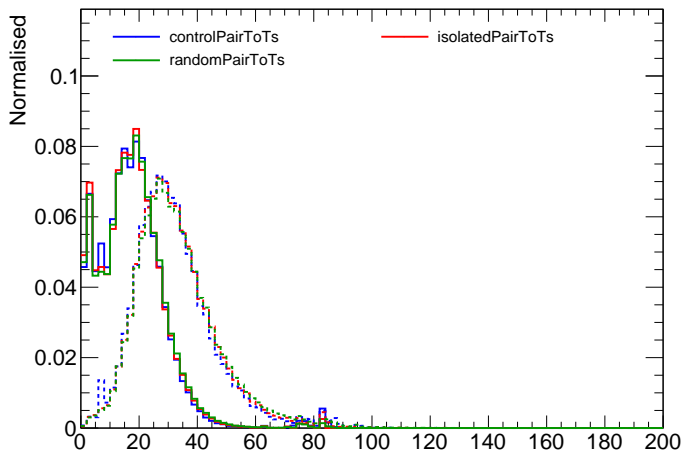
Topologically selected pairs: T2K

at 310 V



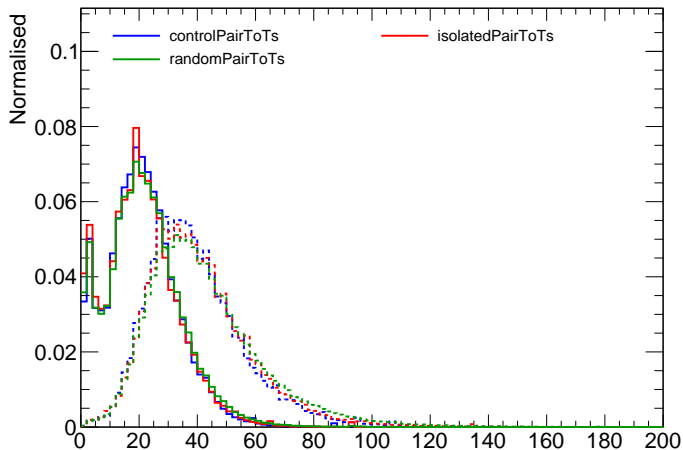
Topologically selected pairs: T2K

at 320 V



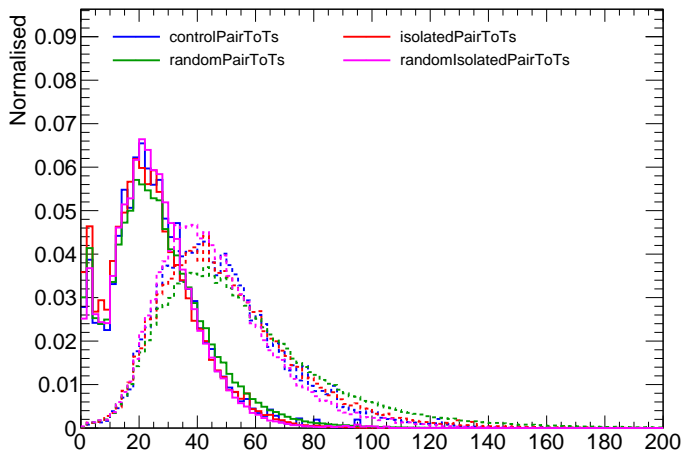
Topologically selected pairs: T2K

at 330 V



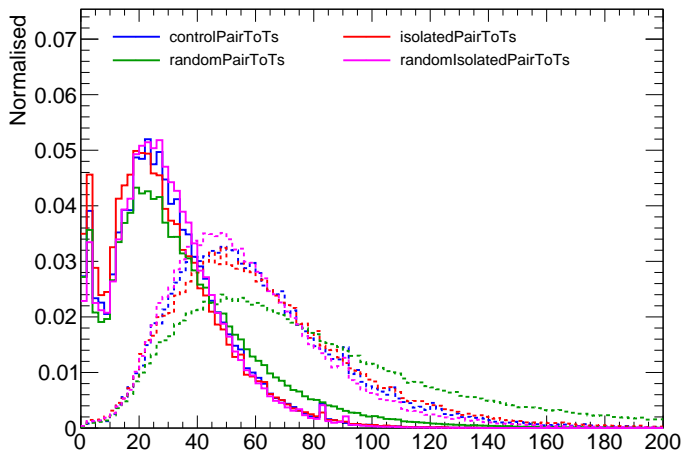
Topologically selected pairs: T2K

at 340 V

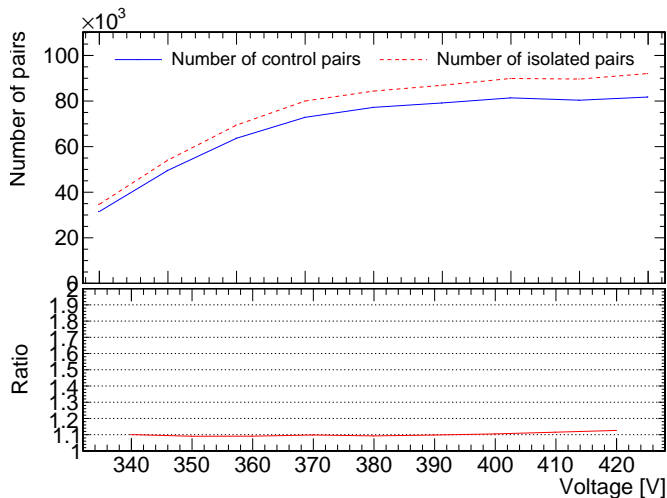


Topologically selected pairs: T2K

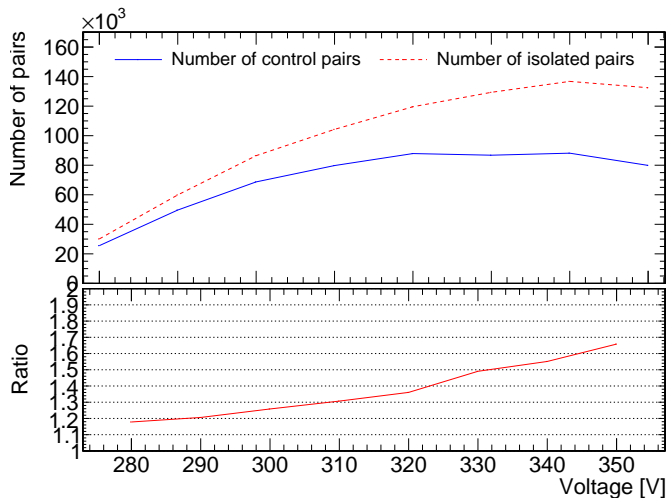
at 350 V



Number of isolated / control pairs: 18.8% isobutane

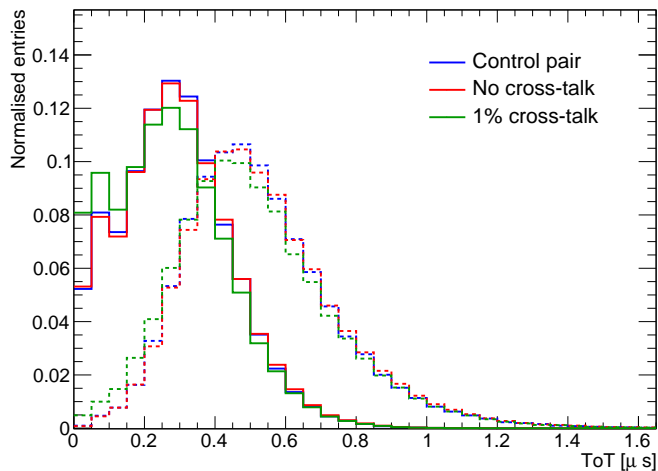


Number of isolated / control pairs: T2K



Results from 2017 single chip

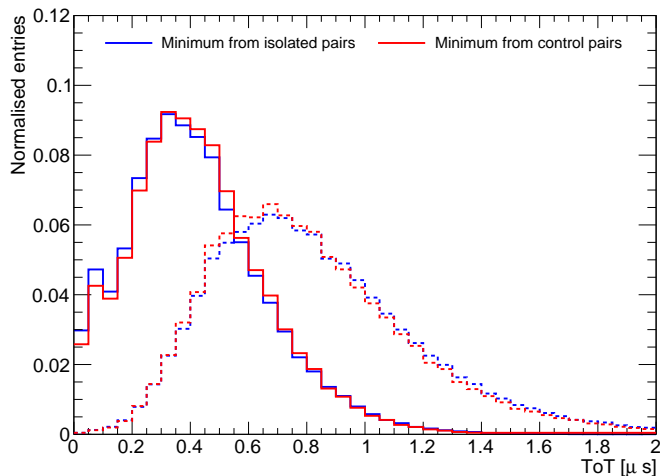
at 330 V



Note: 1% cross talk is 'simulated', legend is different
See also presentation 15 January 2018

Results from 2017 single chip

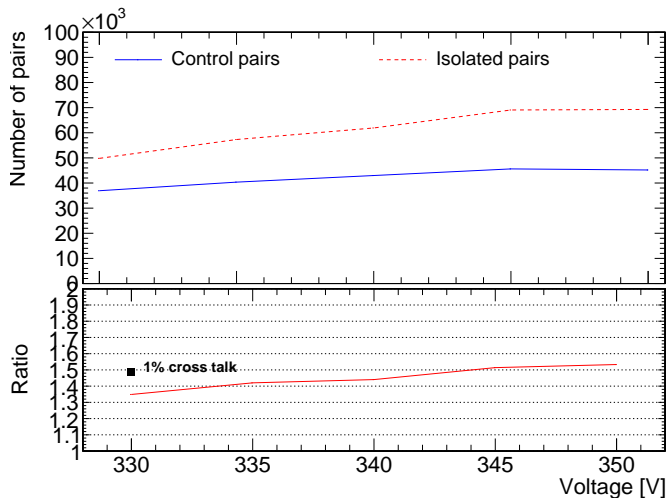
at 350 V



See also presentation 15 January 2018

Results from 2017 single chip

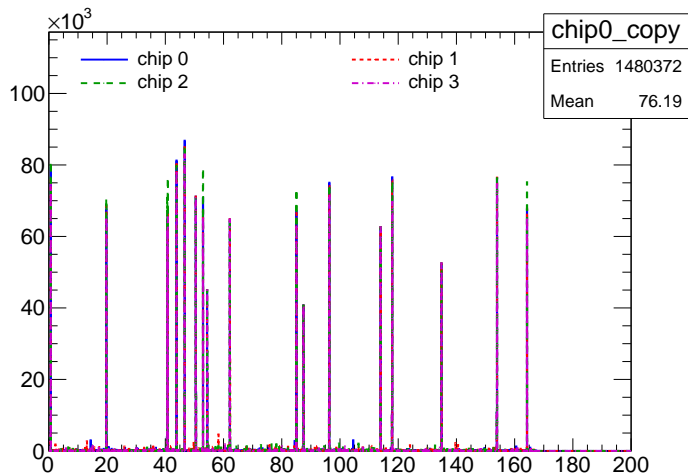
Number of isolated / control pairs



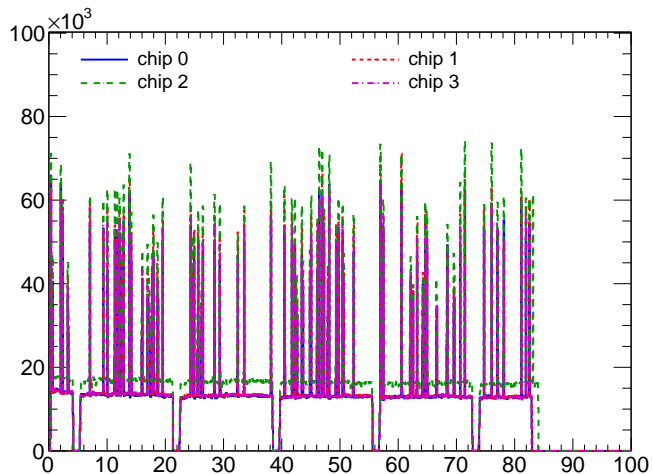
Conclusions

- Number of hits and ToT spectra are similar to Freds results
- There is indication for cross talk in the number of hits
- It is unclear how much the ToT spectrum is affected

Time line of quad without source or laser



Time line of quad in test beam



Time line of single chip detector in test beam

$(\text{ToA} - 8.745\text{e}+15) / 4096 * 25\text{E}-9 \{ \text{ToT} < 8 \}$

