First experiences with the IP Delay Variation Metric

Reinhard Sojka, Henk Uijterwaal and René Wilhelm

RIPE NCC

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IPPM draft

- draft-ietf-ippm-ipdv-08.txt

  – Carlo Demichelis and Phil Chimento

  – IPPM working group work item

  – 8th iteration

  – About to go to last call

- "Can we measure something with it?"

IPDV Metric

- The IP-Delay Variations (IPDV) Metric is method to measure variations in arrival time or rate:
  - Send packets from source to destination
  - Measure 1 way delay
  - Sort packets by send time, then:

$$IPDV_{ij} = d_i - d_j$$

$$\Delta IPDV_{ij} = \sqrt{\Delta d_i^2 + \Delta d_j^2} \cong \sqrt{2}\sqrt{\Delta t_{src}^2 + \Delta t_{dst}^2}$$

$$\Delta IPDV_{ij} << \left| IPDV_{ij} \right|$$

IPDV Metric

- $\Delta IPDV_{ij} << |IPDV_{ij}|$

  for a measurement to be meaningful

- Optimal case: $IPDV_{ij}=0$

  - "All packets take the same time to travel from source to destination"
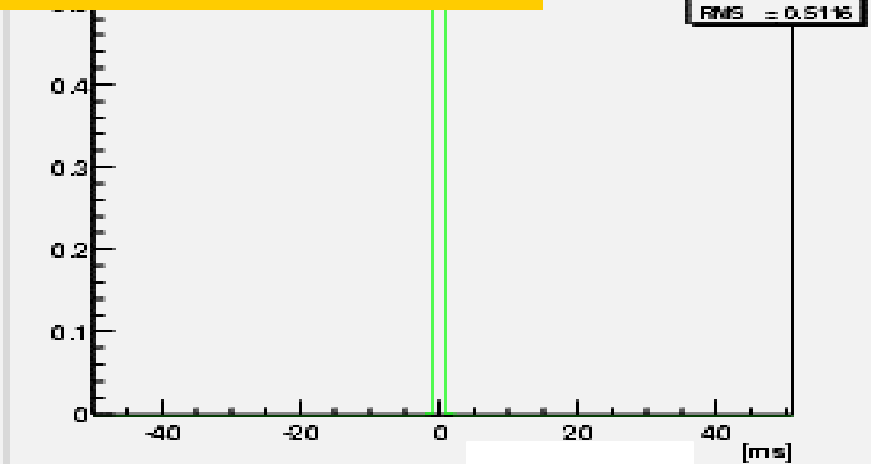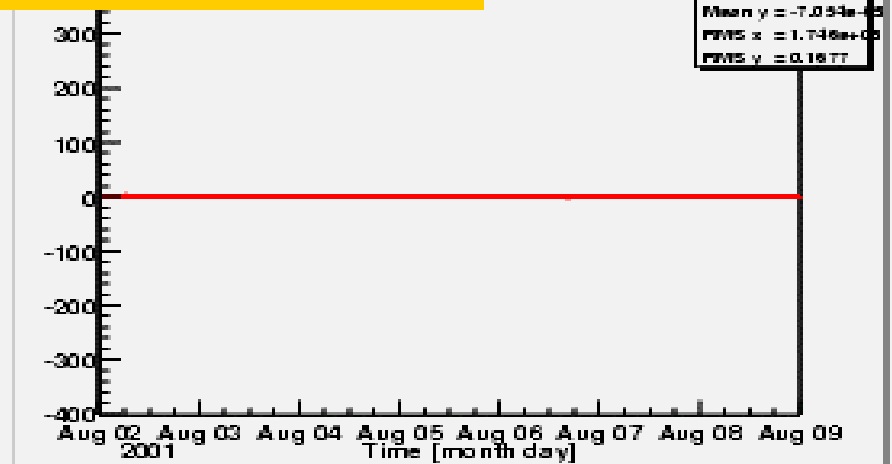
- IPDV is also known as "jitter"

Our code

- **Implements the draft**
  - Calculates experimental errors
  - Plots IPDV as a function of time
- **Data from the RIPE NCC TTM project**
  - http://www.ripe.net/test-traffic
- **First results on the next slides**

- **Answer to my own question** ☺

Example (1)
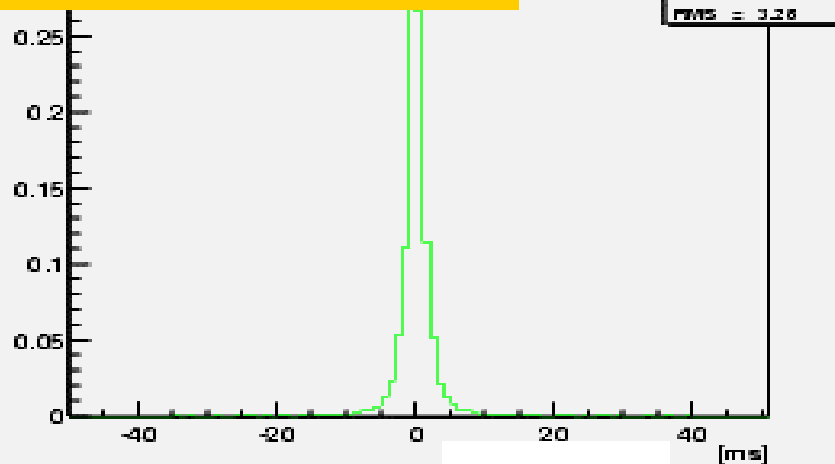

IPDV Distribution

IPDV over time

Delay Distribution
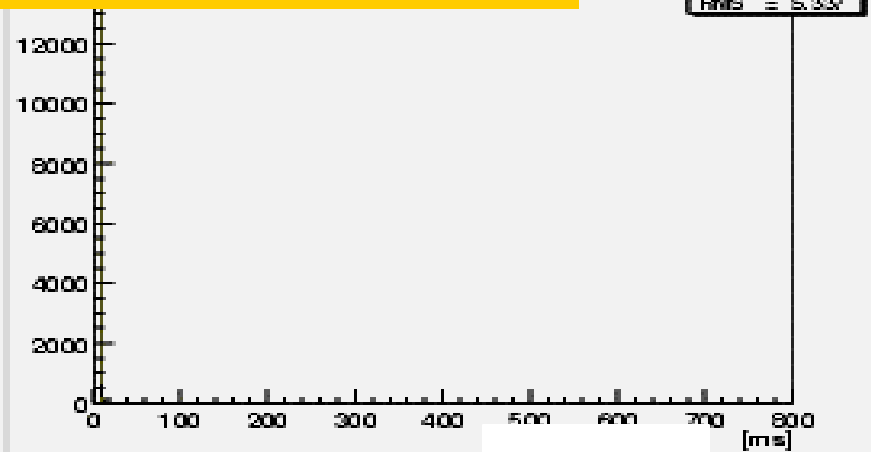
Delay over time, Hops*10
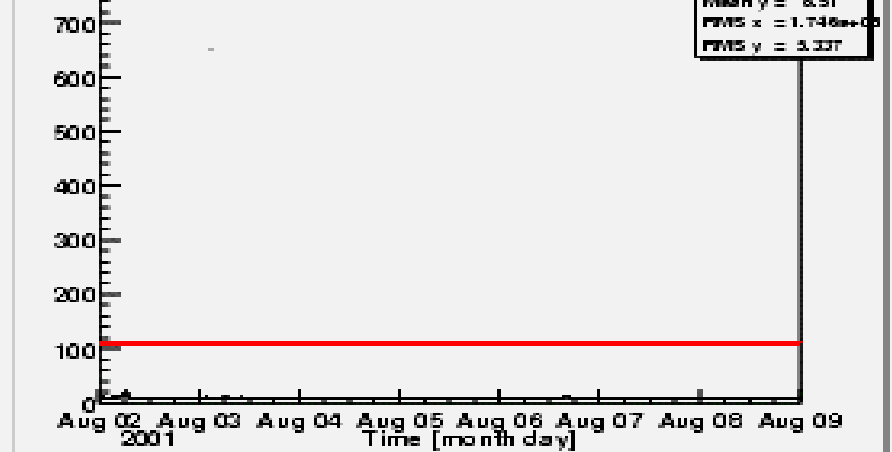
Example (2)

IPDV Distribution
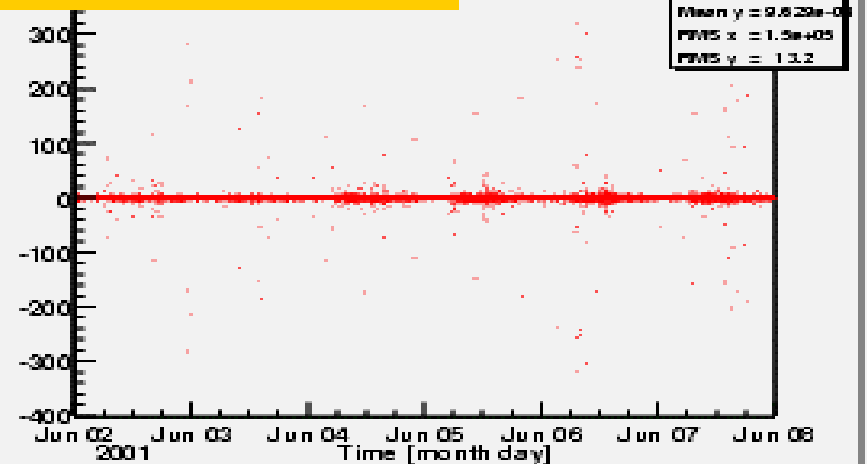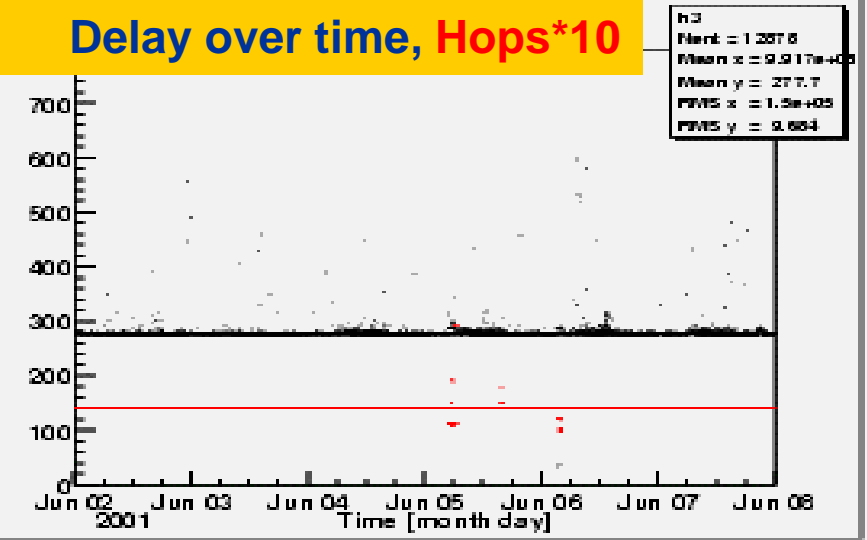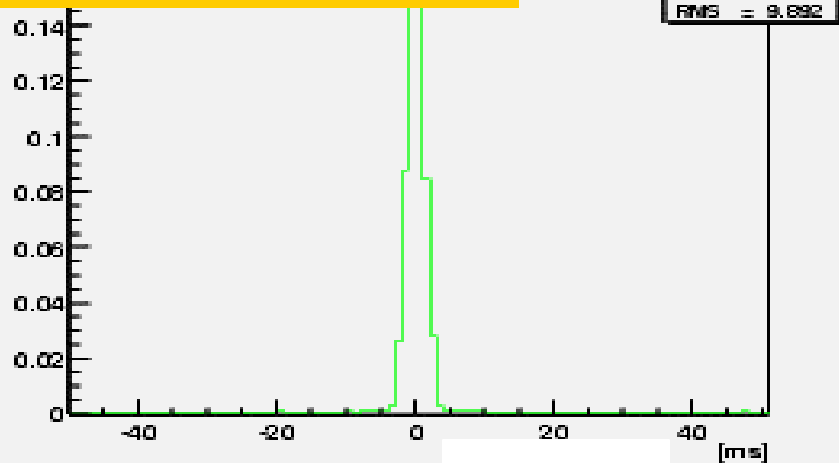
IPDV over time

Delay Distribution
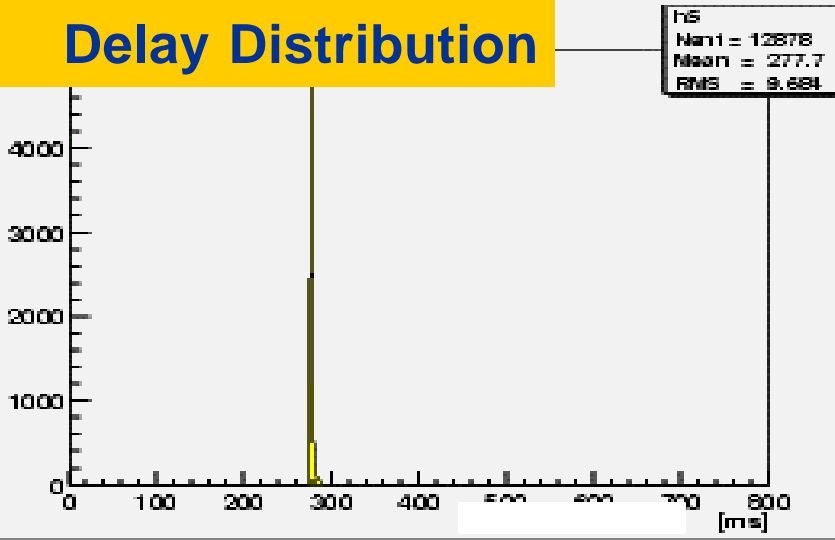
Delay over time, Hops*10

Example (3)

IPDV Distribution
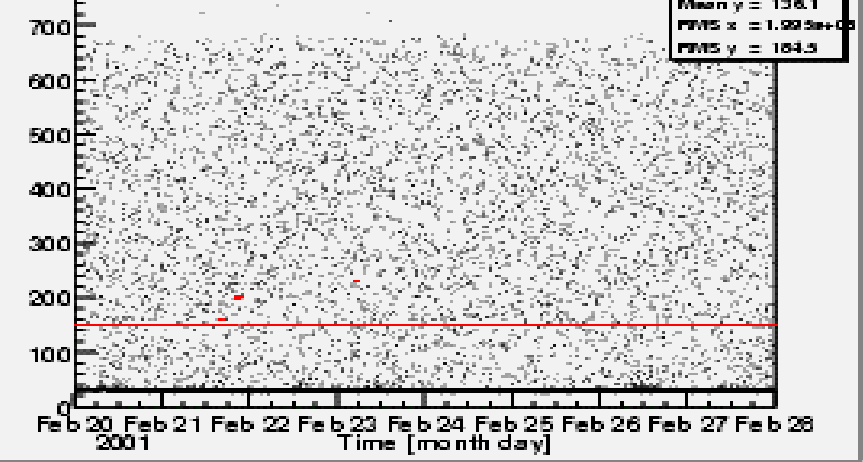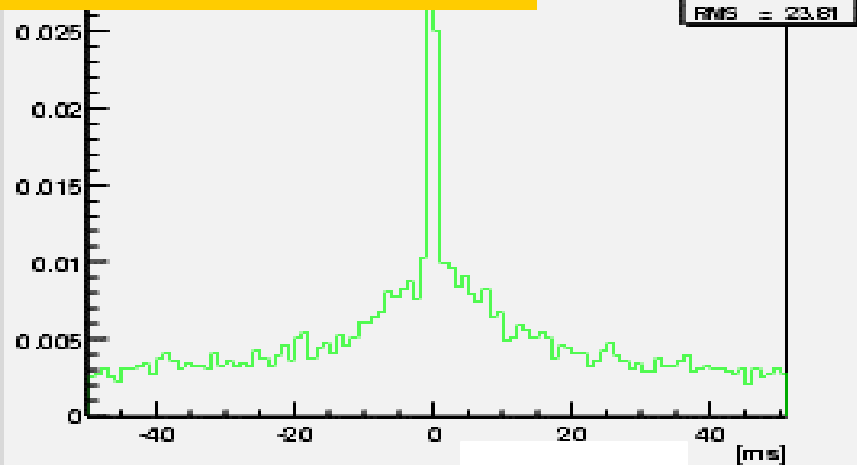
IPDV over time

Delay Distribution

Delay over time, Hops*10

Henk Uijterwaal   .   **January 9, 2002**   .   **http://www.ripe.net/test-traffic/**
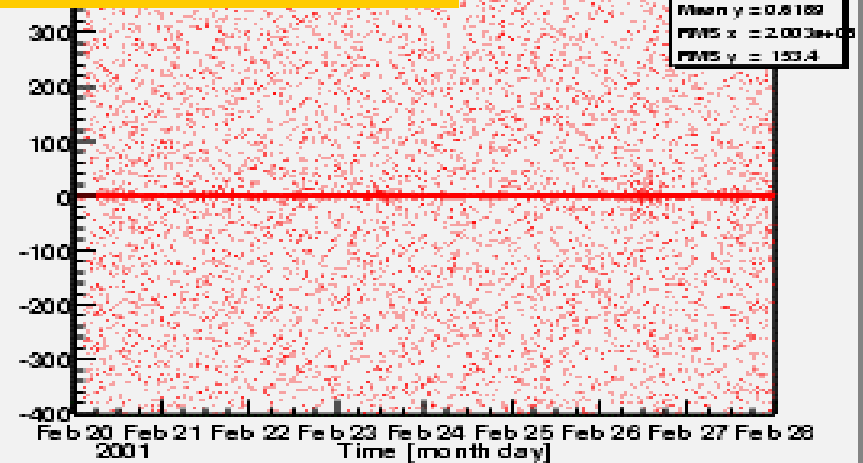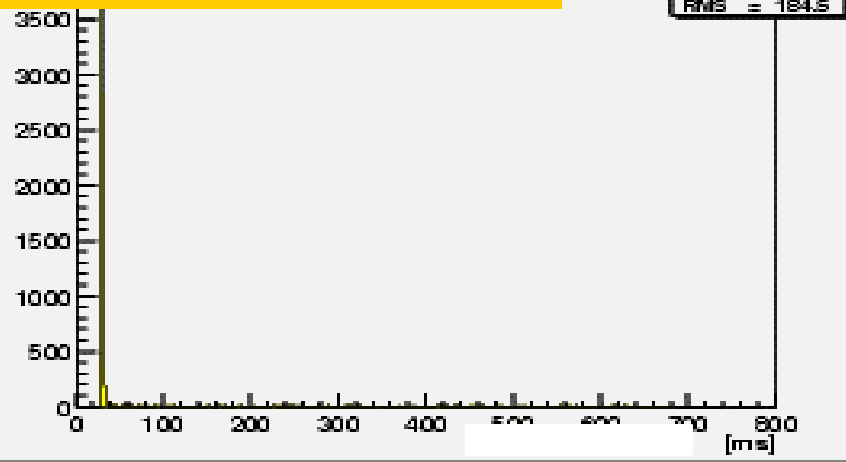
Example (4)

IPDV Distribution

IPDV over time

Delay Distribution

Delay over time, Hops*10

Henk Uijterwaal . **January 9, 2002** . **http://www.ripe.net/test-traffic/**
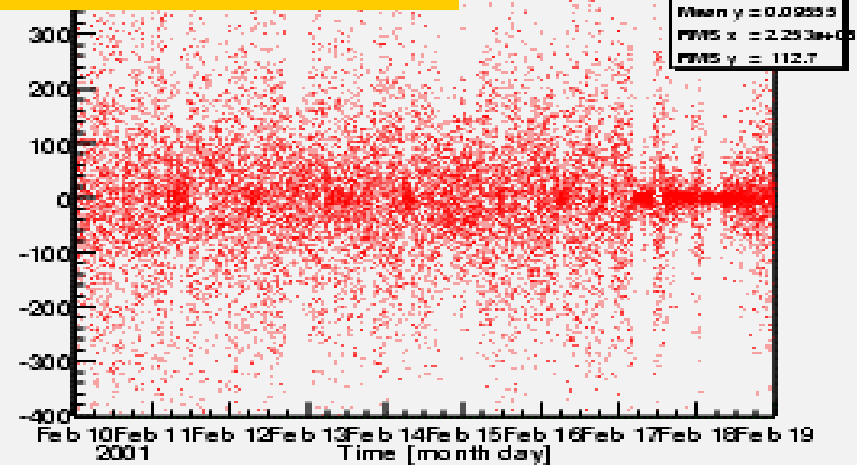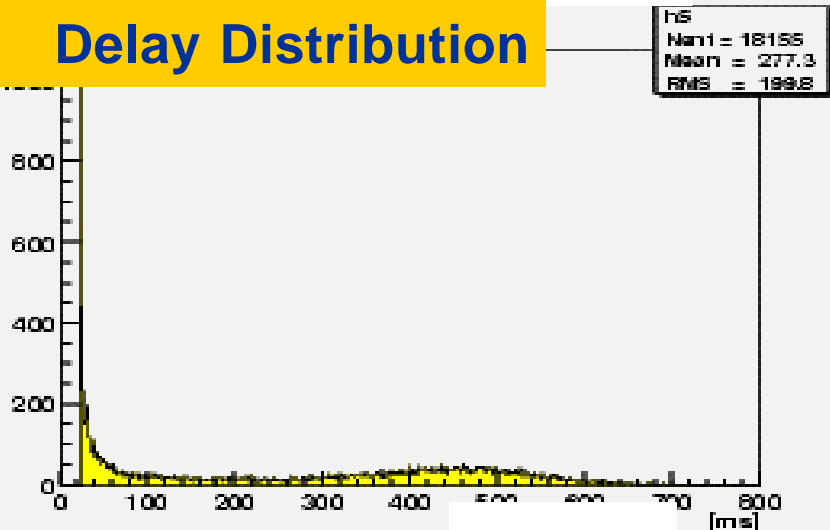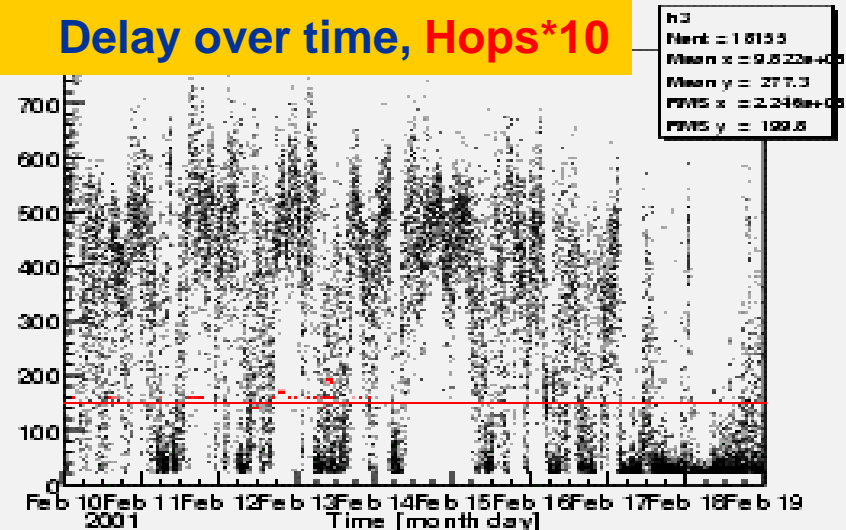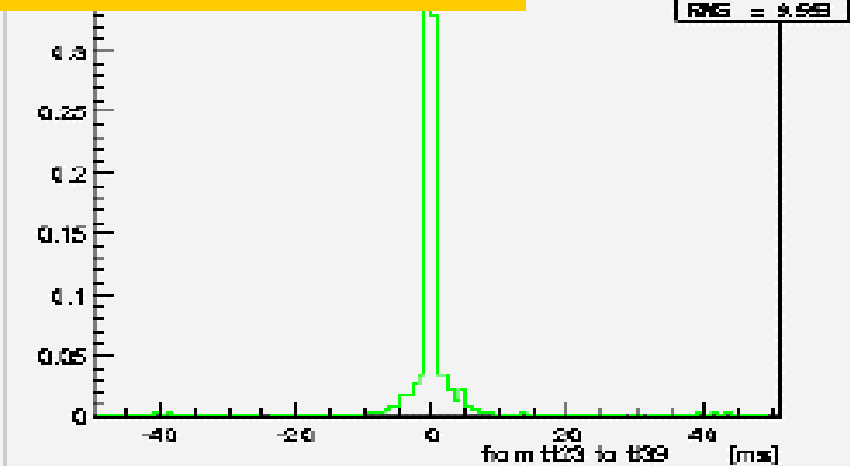
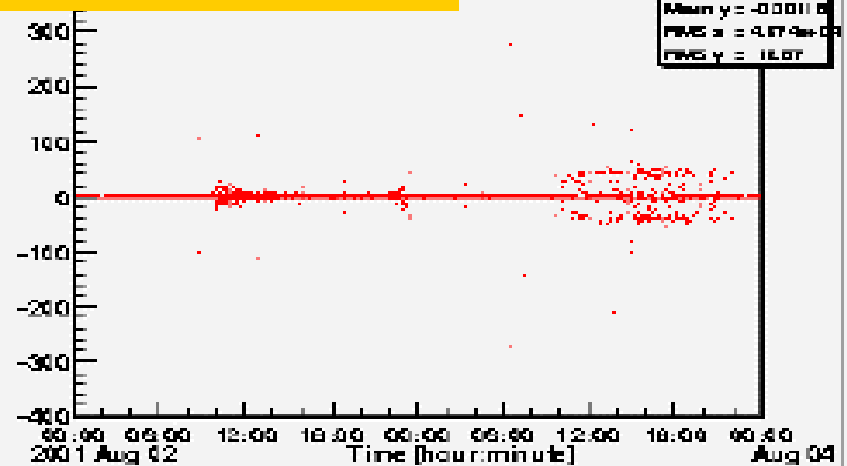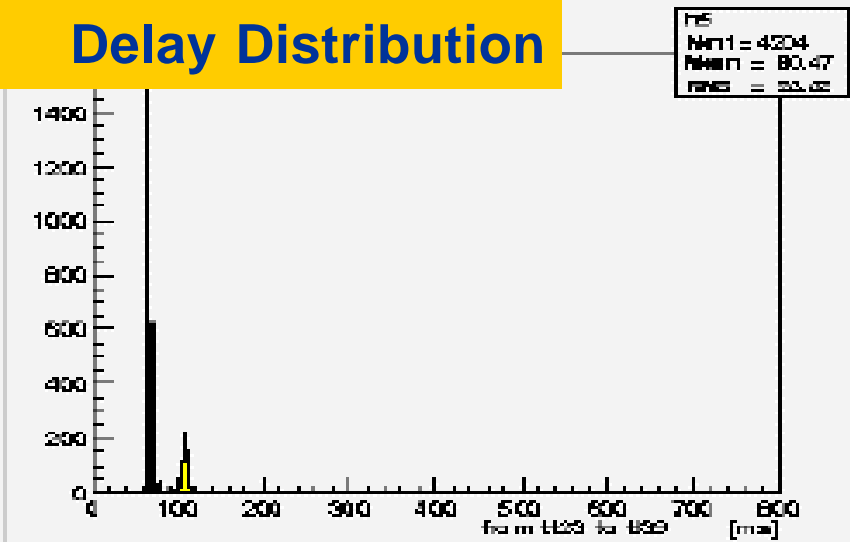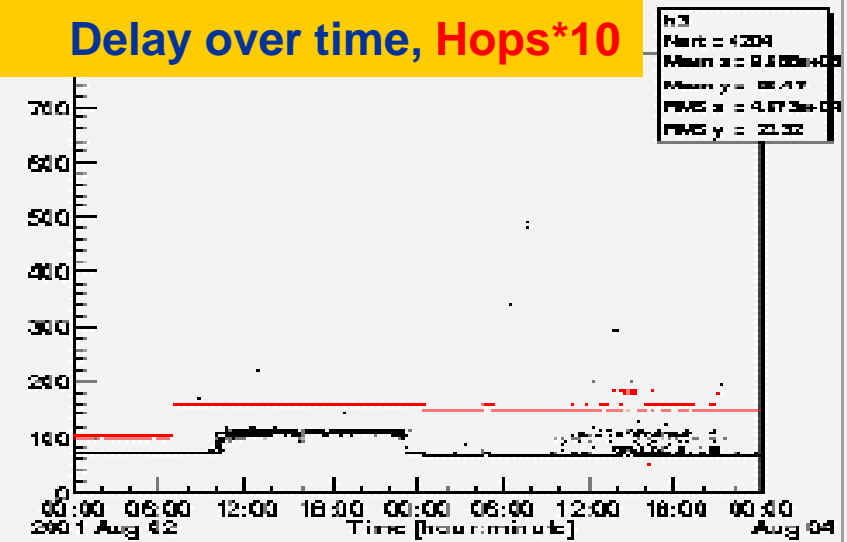# Example (5)

IPDV Distribution

IPDV over time

Delay Distribution

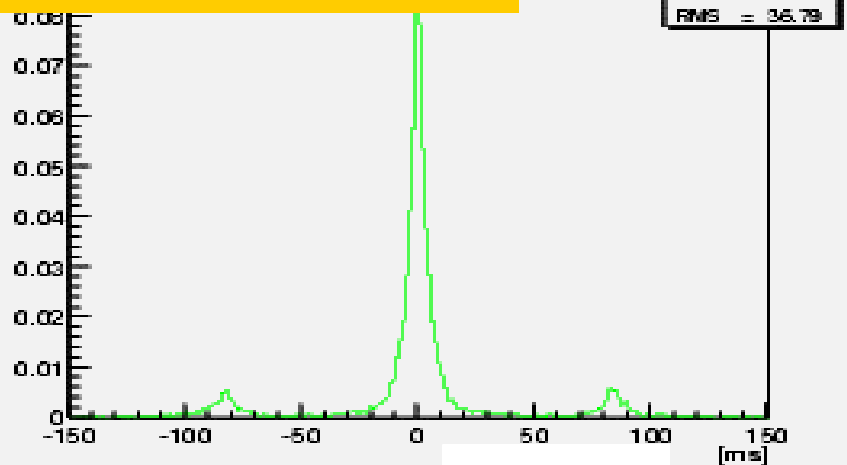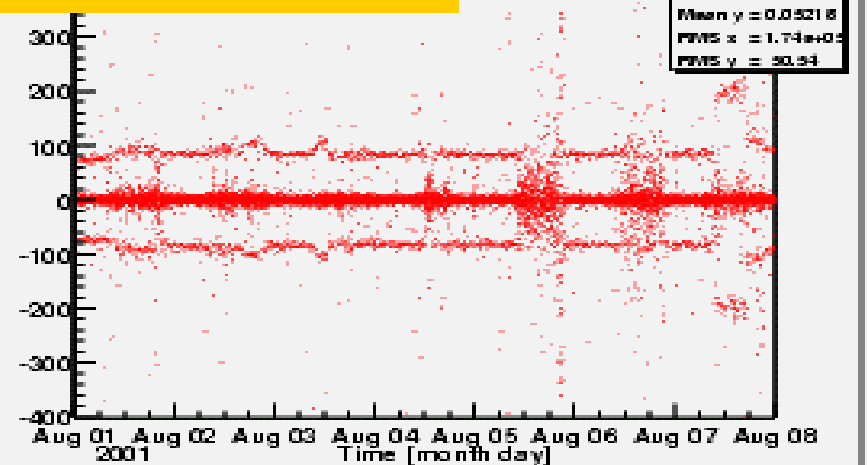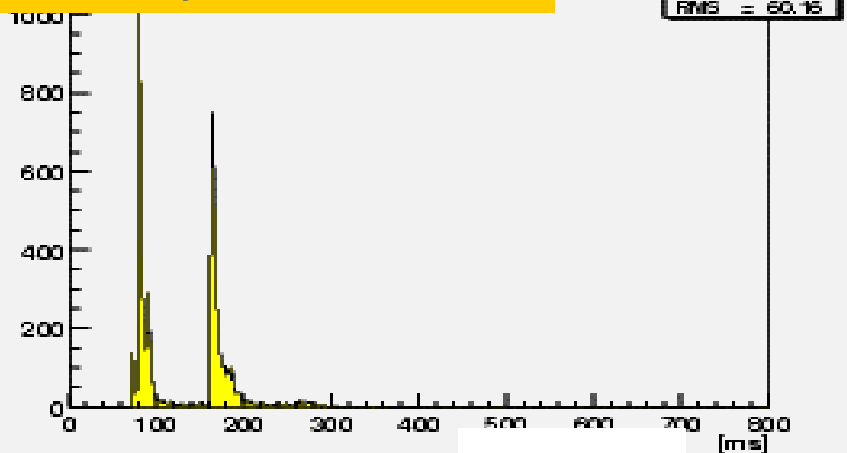Delay over time, **Hops*10**
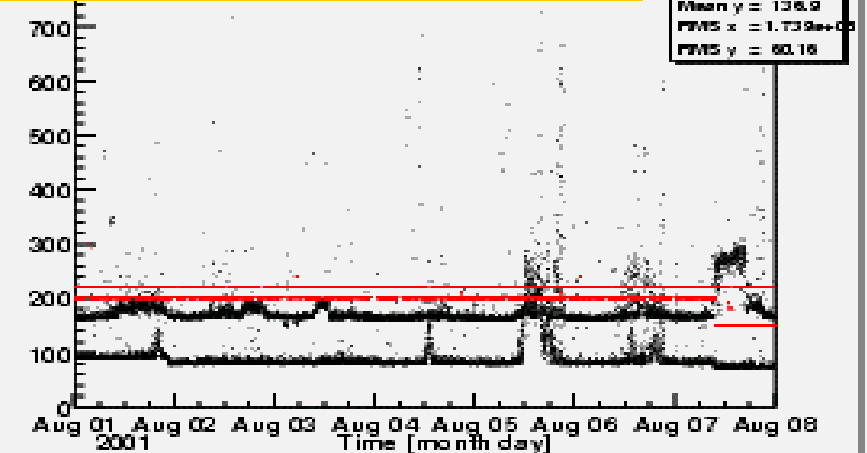
Example (6)

IPDV Distribution

IPDV over time

Delay Distribution
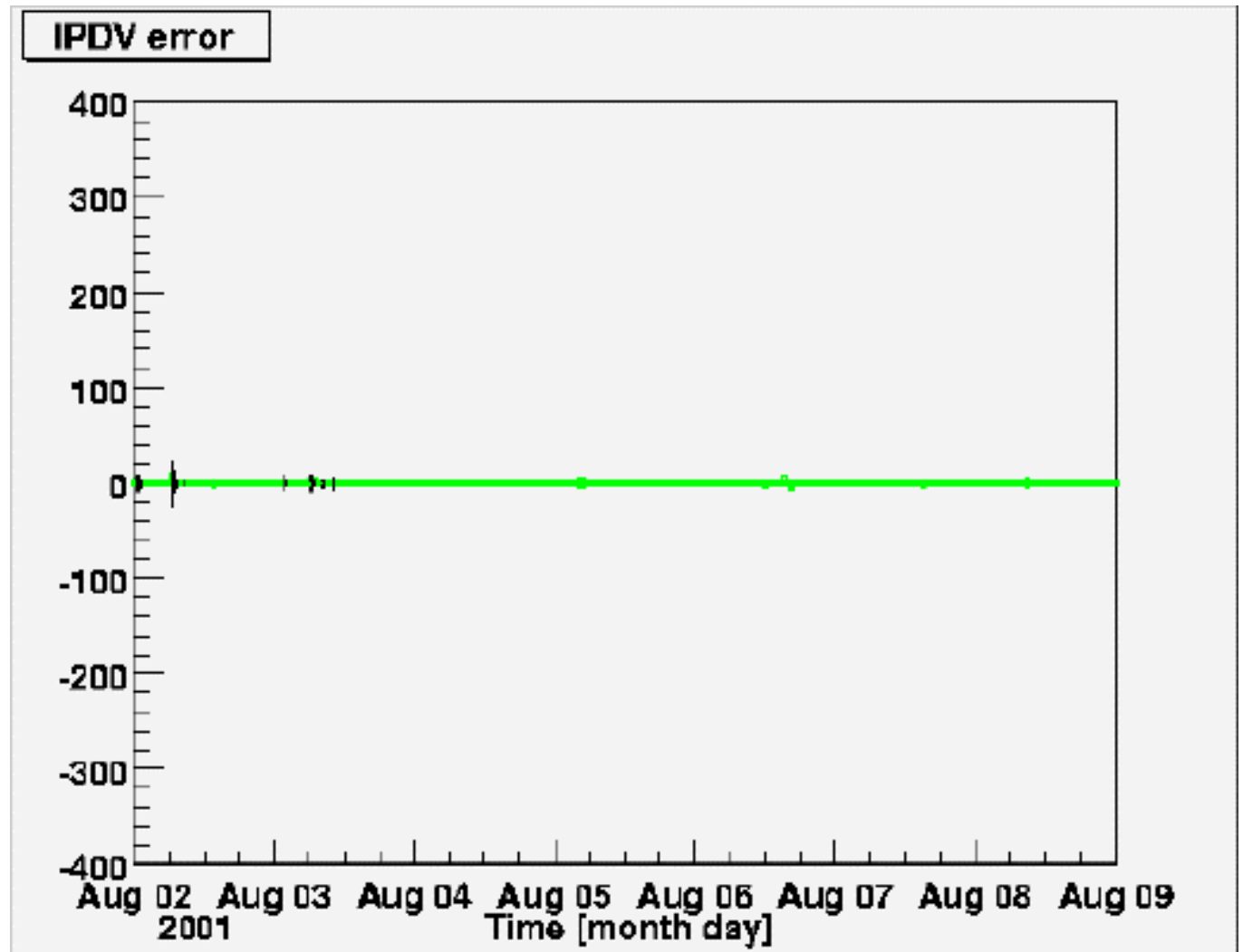
Delay over time, Hops*10

Experimental Errors

- Potential problem, one subtracts small time differences twice

- Turn out to be small for our setup

- Except for start-up effects

- Should be monitored when reporting this metric though

Experimental Errors

- Error bars smaller than the data points

Conclusions

- Implementation of IPDV draft

- Finds effects in the data not seen in regular delay plots

- Experimental errors are not an issue

- Finalize draft!

- More data at PAM2002

Questions, Discussion