Implementation and evaluation of an Ethernet based DAQ for a beam telescope

Current status:

Beam rates and corresponding data rates

Basis

- **Use rates of the usual beam sites**
  - DESY
  - PSI
  - MAMI
- **MuPix 10 properties**
  - Area: 4 cm²
  - Efficiency: 1
- **One to four layers**

$$R = B \cdot a \cdot l \cdot e$$

Basis

- **Use rates of the usual beam sites**
  - DESY
  - PSI
  - MAMI
- **MuPix 10 features**
  - Area: 4 cm²
  - Efficiency: 1
- **One to four layers**
- **Different sizes of MuPix packets**

$$R = B \cdot a \cdot l \cdot e$$

$$S = 7 + 2 \cdot n$$

$$D_w = (R \cdot \frac{1}{n}) \cdot S$$

$$D_w = (R \cdot \frac{1}{n}) \cdot (7 + 2 \cdot n)$$

$$D_b = (R \cdot \frac{1}{n}) \cdot (7 + 2 \cdot n) \cdot 32$$

Registered Hits

Id	Facility	B	a	l	e	R
1	DESY	1000	4	1	1	4000
2	DESY	1000	4	2	1	8000
3	DESY	1000	4	3	1	12000
4	DESY	1000	4	4	1	16000
5	DESY	1000	4	1	1	4000
6	DESY	1000	4	2	1	8000
7	DESY	1000	4	3	1	12000
8	DESY	1000	4	4	1	16000
9	DESY	25000	4	1	1	100000
10	DESY	25000	4	2	1	200000
11	DESY	25000	4	3	1	300000
12	DESY	25000	4	4	1	400000

Registered Hits

13	PSI	300000	4	1	1	1200000
14	PSI	300000	4	2	1	2400000
15	PSI	300000	4	3	1	3600000
16	PSI	300000	4	4	1	4800000
17	PSI	300000	4	1	1	1200000
18	PSI	300000	4	2	1	2400000
19	PSI	300000	4	3	1	3600000
20	PSI	300000	4	4	1	4800000
21	PSI	300000	4	1	1	1200000
22	PSI	300000	4	2	1	2400000
23	PSI	300000	4	3	1	3600000
24	PSI	300000	4	4	1	4800000

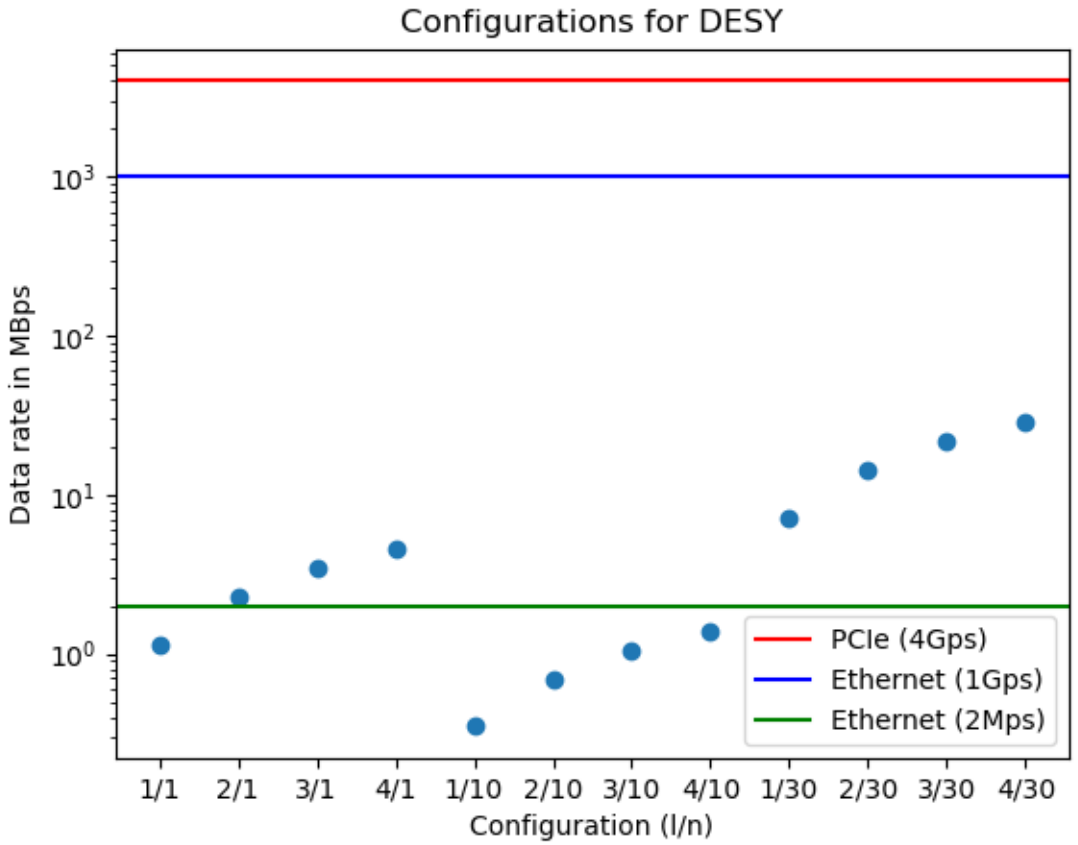
Registered Hits

25	MAMI	30000000	1	1	1	30000000
26	MAMI	30000000	1	2	1	60000000
27	MAMI	30000000	1	3	1	90000000
28	MAMI	30000000	1	4	1	120000000
29	MAMI	30000000	1	1	1	30000000
30	MAMI	30000000	1	2	1	60000000
31	MAMI	30000000	1	3	1	90000000
32	MAMI	30000000	1	4	1	120000000
33	MAMI	30000000	1	1	1	30000000
34	MAMI	30000000	1	2	1	60000000
35	MAMI	30000000	1	3	1	90000000
36	MAMI	30000000	1	4	1	120000000

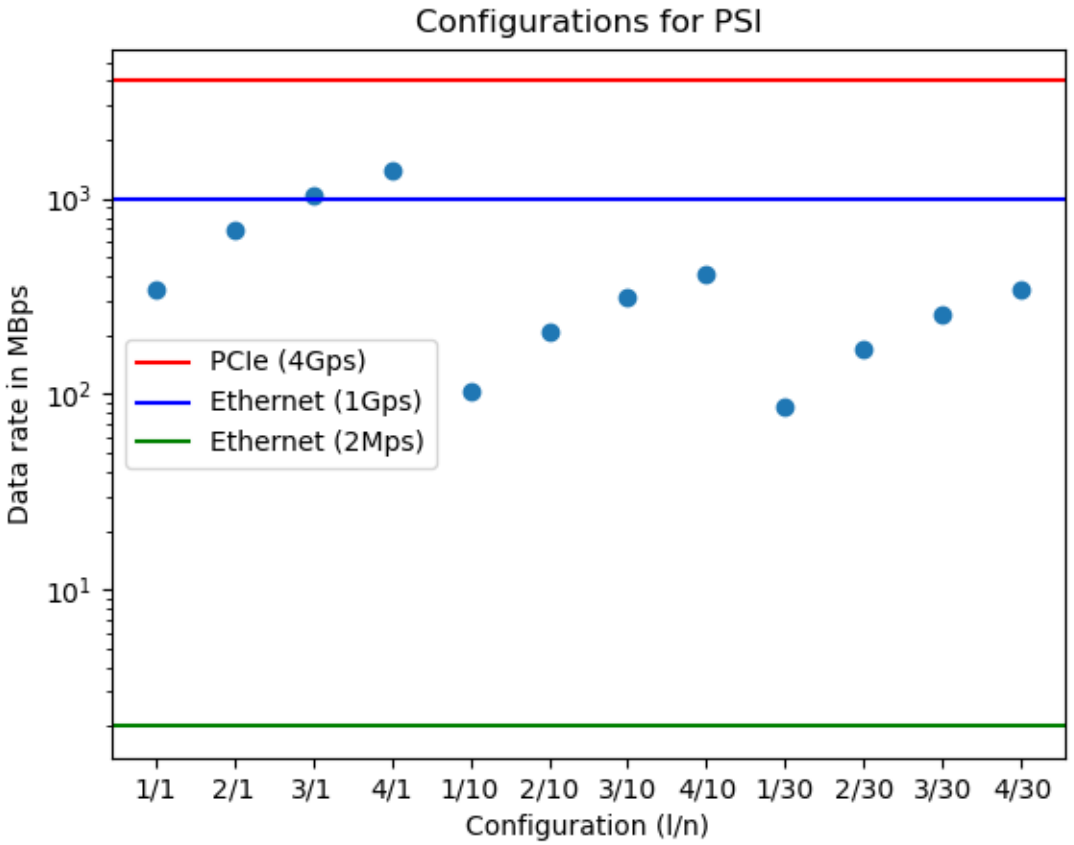
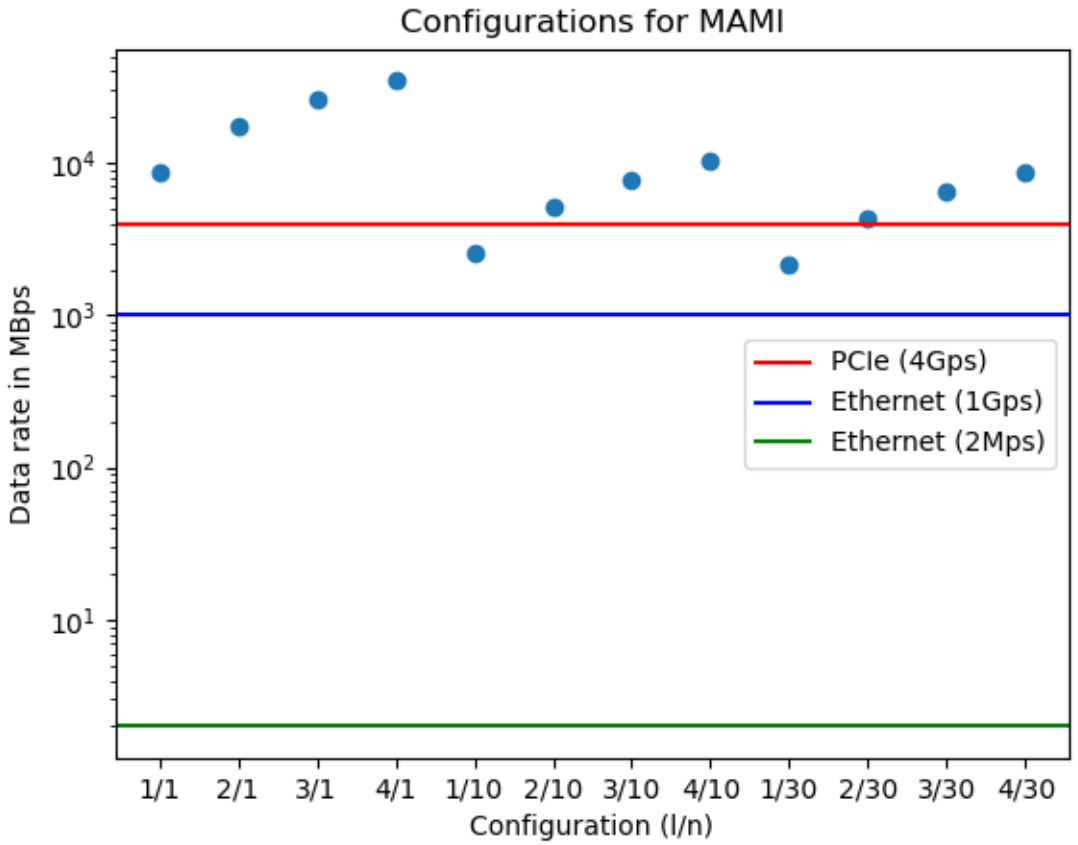
Resulting data rate

Id	Parameters R	n	D_b (Mbps)	Reachable PCIe (4Gbps)	Ethernet (2Mbps)	Ethernet (1Gbps)
1	4000	1	1,15	1	1	1
2	8000	1	2,30	1	0	1
3	12000	1	3,46	1	0	1
4	16000	1	4,61	1	0	1
5	4000	10	0,35	1	1	1
6	8000	10	0,69	1	1	1
7	12000	10	1,04	1	1	1
8	16000	10	1,38	1	1	1
9	100000	30	7,15	1	0	1
10	200000	30	14,29	1	0	1
11	300000	30	21,44	1	0	1
12	400000	30	28,59	1	0	1

Resulting data rate



Resulting data rate



Resulting data rate