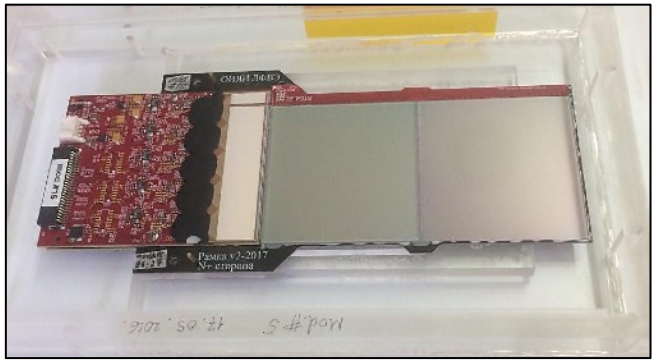
Silicon Vertex Detector
Front-end electronics

25.03.2021

Relevant FEE DAQ numbers

# layer	1 (MAPS)	2 (MAPS)	3 (MAPS)	4 (DSSD)	5 (DSSD)	Total
Sensor numbers /layer	448	840	1736	228	368	596(DSSD) + 3024(MAPS)
Ladder numbers	11	20	28	19	23	101
Sensor numbers /stave (module)	28	28	28	2	2	
Numbers stave (modules)/layer	16	30	62	114	184	
Numbers e-links/stave	8	8	8			
Numbers analog MUX-OUT/module				10	10	
Read-out channels / layer	128 e-links	240 e-links	496 e-links	1140	1840	864 e-links + 2980 analog MUX-OUT

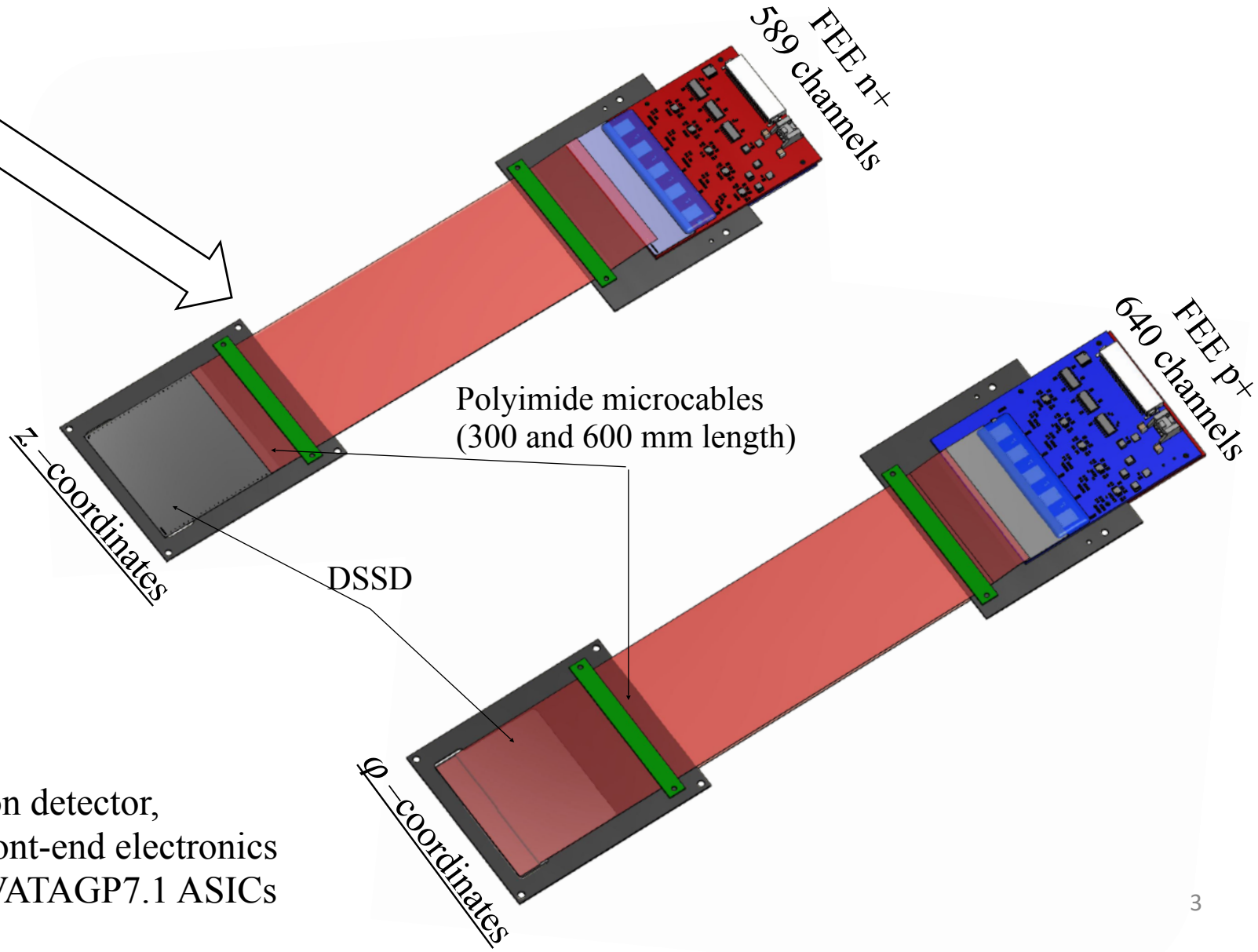
Current SPD Si module prototype



BM@N Si-Module

DSSD parameters:

- Size: 63x63x0.3 mm^3 (on 4" – FZ-Si wafers)
- Topology: double side microstrip (DSSD) (DC coupling)
- Pitch p^+ strips: 95 μm;
- Pitch n^+ strips 103 μm;
- Stereo angle between p^+/n^+ strips: 2.5^0
- Number of strips: 640 (p^+)× 614(n^+)

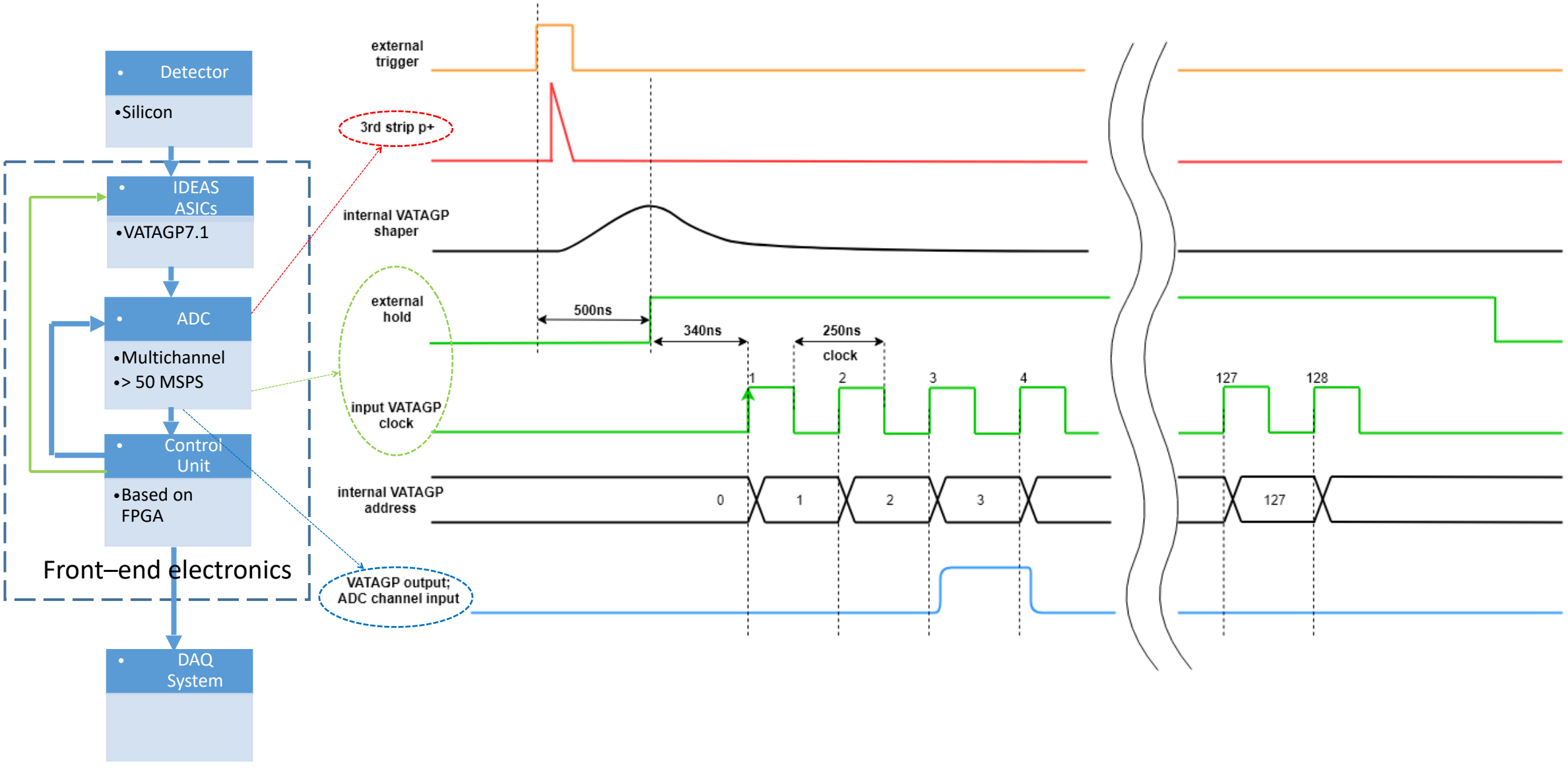


The module consists of one silicon detector, glued to the frame and connected with front-end electronics via thin polyimide cable. FEE based on VATAGP7.1 ASICs

Parameters of read-out chips

	ASIC VATAGP7.1
Number of CSA	128 channels
Input charges (dynamic range)	30 fC
Peaking time (slow shaper)	500 ns (typ.)
Peaking time (fast shaper)	50 ns
Noise (ENC)	70e +12e/pF (typ.)
Lowest threshold (no capacitance)	0.12 fC
Voltage supply	+1.5V, -2.0 V
Gain from input to output buffer (diff. output currents)	16.5 μA/fC
Output Serial analog multiplexer clock speed	3.9 MHz
Power dissipation per channel	2.2 mW

Serial read-out diagram



Possible solutions for ASIC read-out

ASIC	APV25	VATAGP7.3	n-XYTER	TIGER	ToASt
Channels number	128	128	128	64	64
Dynamic Range	-40fC ÷ 40fC	-30fC ÷ 30fC	Input current 10nA Polarity - and+	1÷50fC	1÷40fC
Gain	25mV/fC	20µA/fC	59.4 mV/fC	10.35mV/fc	ToT gain 40ns/fC
Noise	246e^-+36 e^-/pF	70e^-+12 e^-/pF	900e^- at 30pF	2000e^- at 100pF	1500e^-
Peaking time	50ns	50ns/500ns	30ns/ 280ns	60ns/ 170ns	50 / ≥ 100ns
Power consumption	1.15mW/ch.	2.18mW/ch.	10mW/ch.	12mW/ch.	4mW/ch.
ADC	No	No	16fC, 5 bit	10-bit Wilkinson ADC	8 bit
TDC	No	No	Timestamp resolution < 3.125ns	Timestamp resolution < 5ns	Timestamp resolution < 6.25ns