

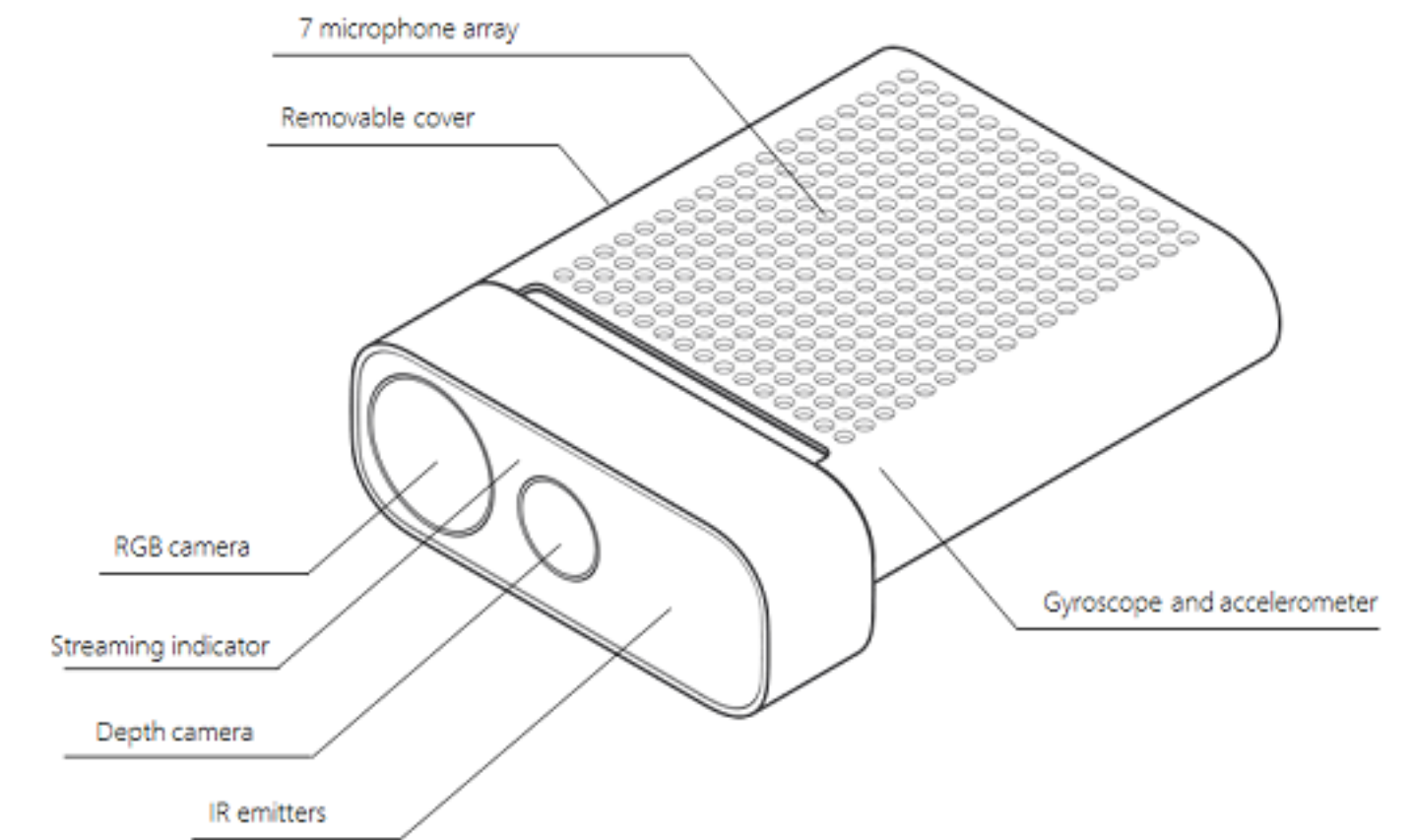
Sensor Overview

3D Capturing Sensors

Julian Bogenberger 16.11.2023

Microsoft Azure Kinect

- Depth camera using TOF (time of flight)
- RGB camera included
- Error: approx. 0.5mm @ 1m distance with $\sigma=1\text{mm}$
- Price: approx. 900€
- Not in Production anymore, but Femto Bolt same device



Femto Bolt / Femto Mega

- Same Sensor as Azure Kinect without Mics
- Working distance: 0.5m-3.5m
- Price: 600€
- Link: [Femto Bolt](#)
- Femto Mega has Ethernet port and mics and Nvidia Jetson Nano additionally (PoE capable)
- Price: 1000€



Front View



Rear View

Xbox Kinect v1

- Depth-Camera using Structured-Light
- No RGB
- Error: 1.5mm @ 0.5m
- Price: 30€



Intel D415

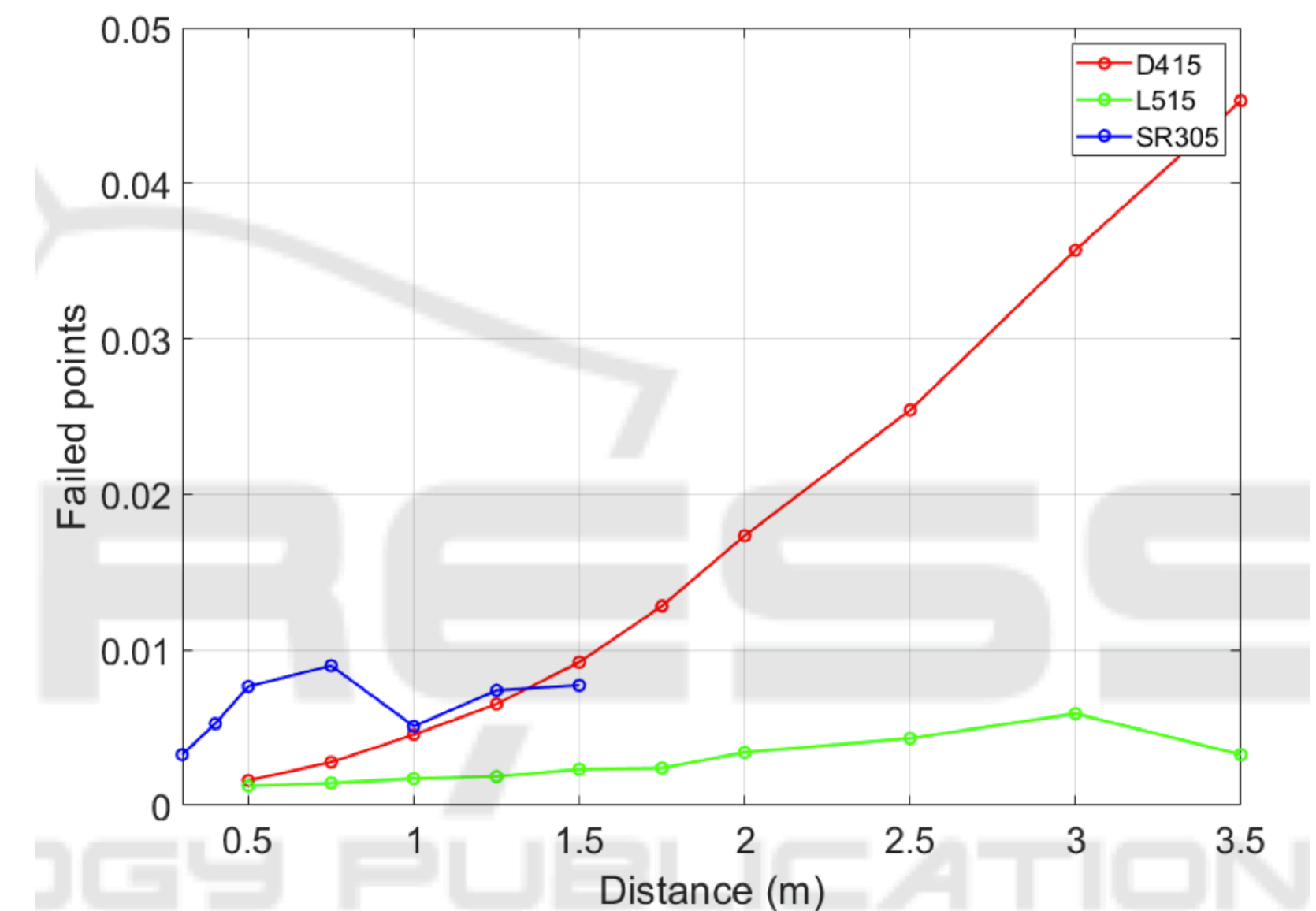
- Depth camera using structured-light and stereo vision
- RGB camera included
- Error: $\pm 2\%$ @ 1m with $\sigma=4.74\text{mm}$
- Price: approx. 350€



Obs. No.	Ground Truth (m)		K4A (m)			RealSense (m)		
	Pre-warmup	Post-warmup	Mean	SD	Offset	Mean	SD	Offset
1	0.505	0.503	0.51	0.58	0.016	0.52	0.93	0.01
2	1.033	1.029	1.05	0.74	0.45	1.03	3.04	0.33
3	1.509	1.505	1.53	1.12	0.24	1.4	6.60	-0.18
4	1.999	1.902	2.02	1.53	0.21	1.85	9.18	-0.20
5	2.506	2.507	2.52	1.86	0.23	2.2	10.35	-0.68

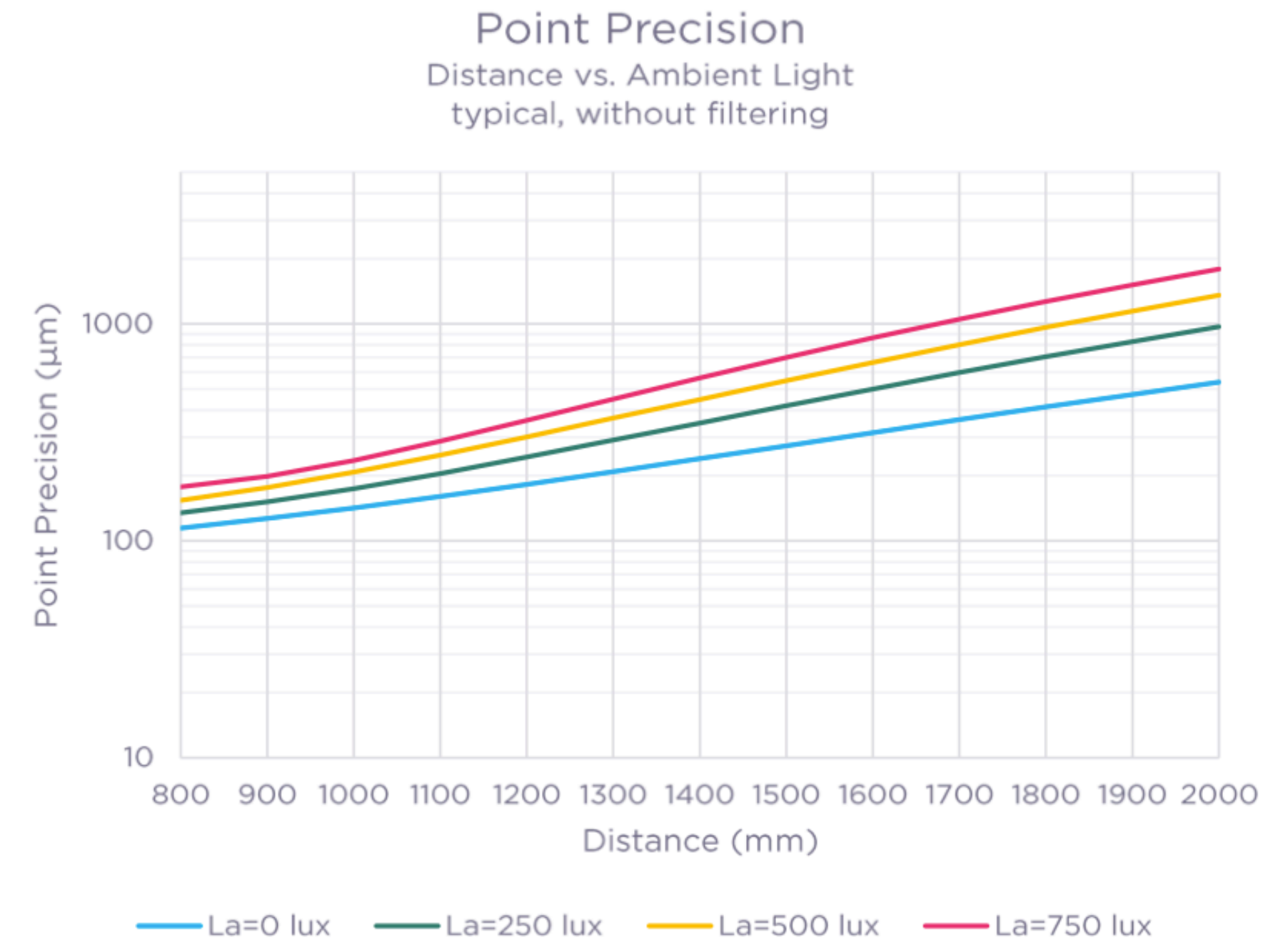
Intel L515

- LiDAR Camera
- RGB Camera included
- Error: $< 5\text{mm}$ @ 1m with $\sigma=2.5\text{mm}$
- Working distance: 0.5m - 3.5m
- Price: approx. 600€



Zivid 2+ M130

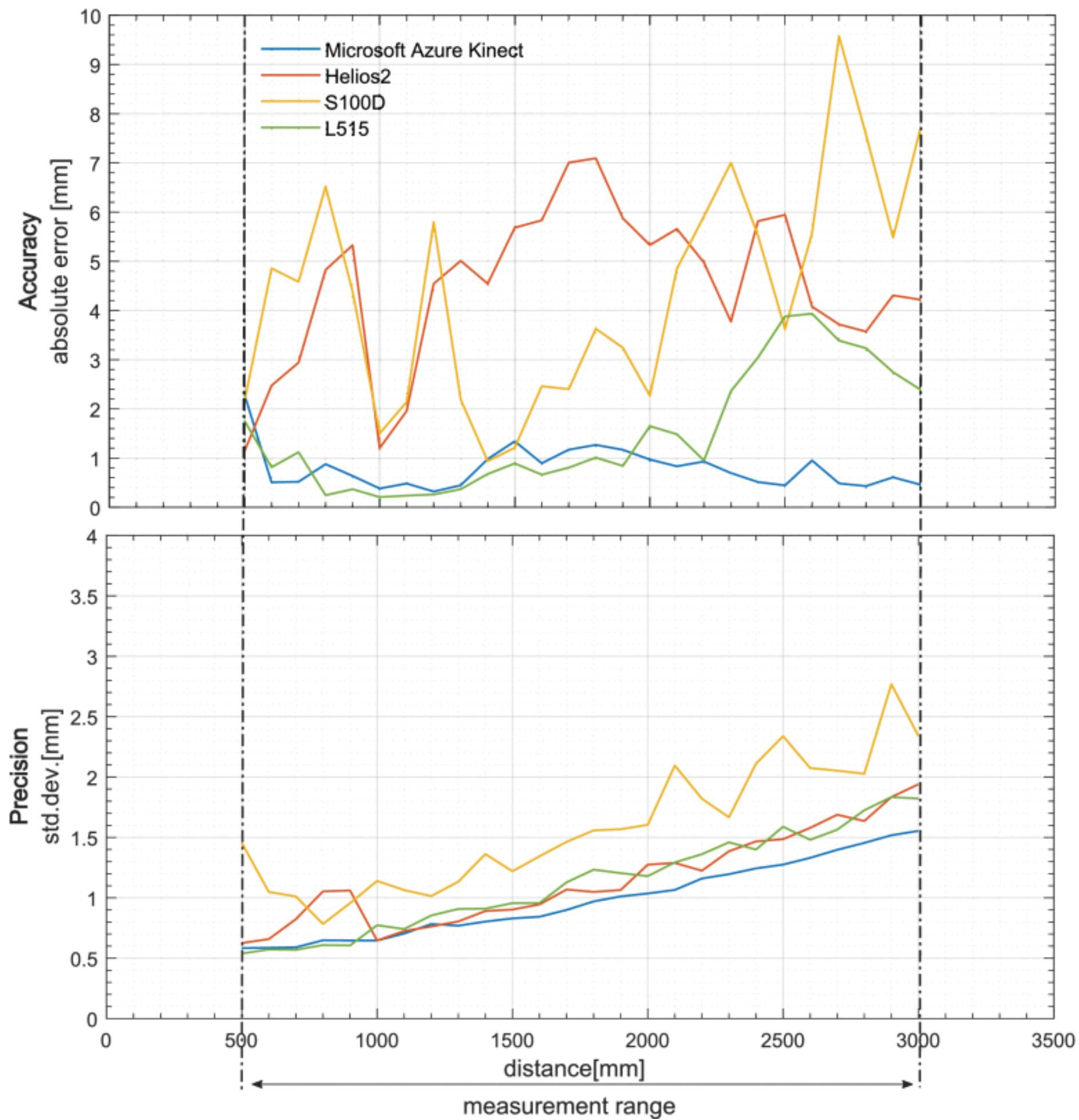
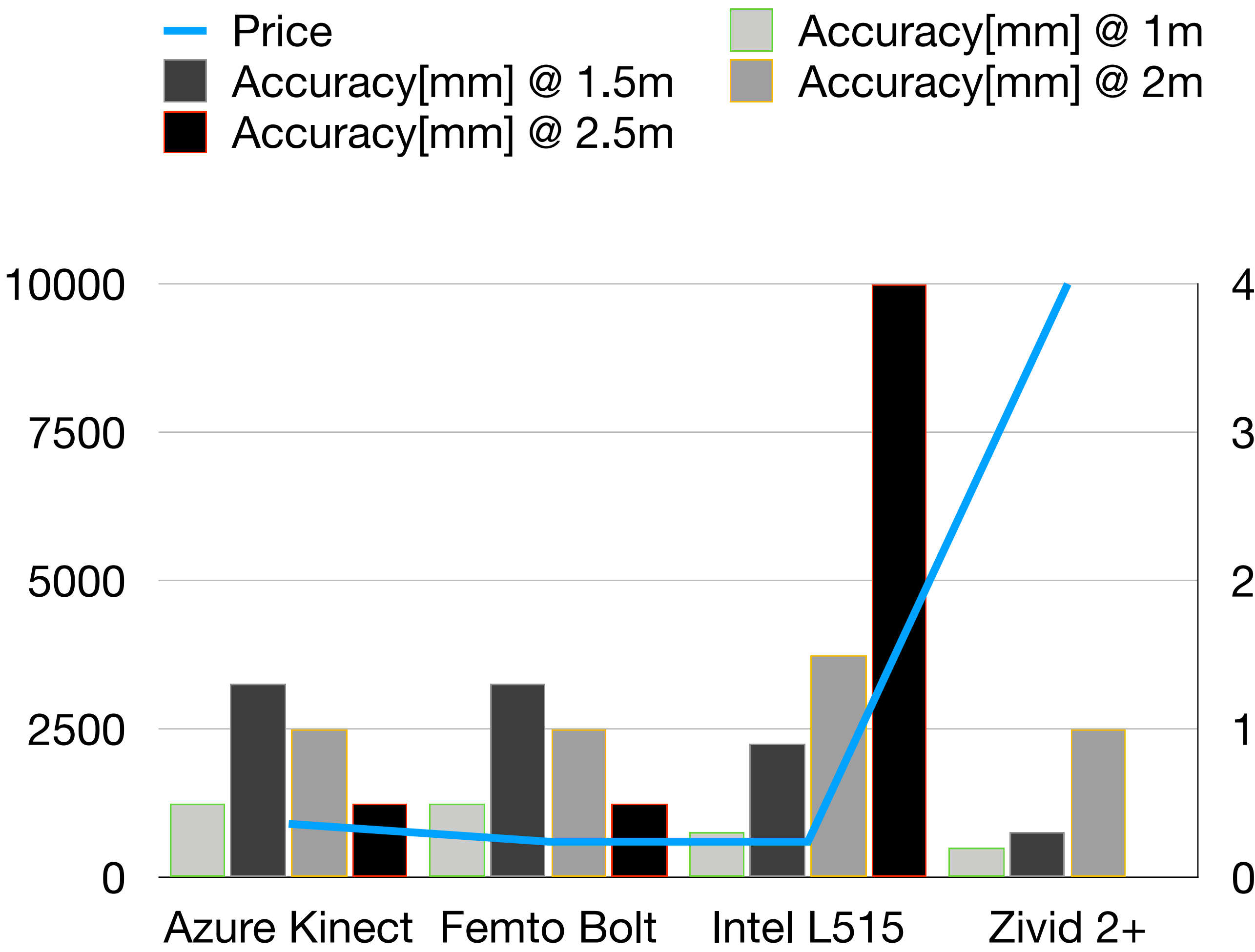
- Industrial structured-light depth camera
- Working distance: 0,8m-2m
- Error: 0,2mm @ 1m distance
- Price: upon request
approx. X.000€-XX.000€
- Link: [Zivid 2+ M130](https://www.zivid.com/hubfs/User%20guides%20and%20datasheets/Zivid%202%20M130%20Datasheet%20Rev%201.0.pdf)



Quelle: [https://www.zivid.com/hubfs/User guides and datasheets/Zivid 2+ M130 Datasheet Rev 1.0.pdf?](https://www.zivid.com/hubfs/User%20guides%20and%20datasheets/Zivid%202%20M130%20Datasheet%20Rev%201.0.pdf)

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Comparison Kinect vs L515 vs Zivid 2+



Quelle: <https://ieeexplore.ieee.org/abstract/document/10122518>

Recommendation

- Femto Bolt / Femto Mega goof trade-off for prototype
 - Fair price for decent accuracy
- L515 is similar to Livox Horizon
 - But additional RGB-Camera included
- Zivid 2+ very expensive but may be useful in production env
 - High accuracy for prob. high price
- For Development Femto Bolt or Femto Mega will be recommended