

μ -Coax Cable Alternative Solution

RIKEN/RBRC
Itaru Nakagawa

INTT Production Status

* Beyond 112 are spares

	2022	1	2	3	4	5	6	7	8	Qty*	Status
Silicon										135	Done
HDI										176	Done
Stave										204	Done
Bus Extender										130	Production
Conversion Cable										130	Prototype
Beam Clock Board										20	Prototype

- Batch-2(40) Bus Extender Production is on schedule. Expected delivery is end of April as planned. All cables are to be shipped to BNL right away.
- **μ-coax cable procurement is in severe situation for INTT operation towards day-1 operation of sPHENIX. Started searching for the fallback solution.**

XSL Series @ KEL co.

KEL KEL CORPORATION

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Search products Search by keyword

Search by product category | Search by application | Search by condition

Product site > Extra-fine coaxial cable type > XSL series

XSL series

0.25 mm pitch micro-coaxial cable connector

Extra-fine coaxial cable type

Board to Cable Connector

- Extra-fine coaxial cable type
 - XSL series
 - XSLs series
 - USL series
 - USLS series
 - USLS21 series
 - SSL series
 - TSL series
 - TMC series
- crimp cable type
- flat cable type
- interface type

Contact us

Application Note

Features | **specification** | **Download materials** | **Product list / technical data** | **Contact & Support**

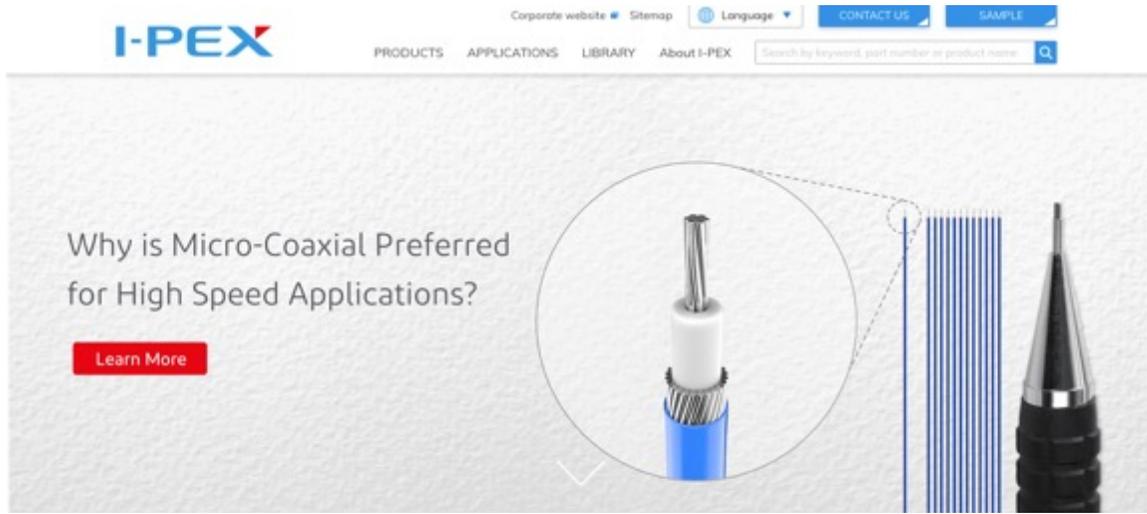
The "XSL series" connector for 0.25 mm pitch micro coaxial cable, and is the industry's smallest level product.

■ Micro coaxial cable
The micro coaxial cable is good at transmission characteristics and the very thin cable has high bending flexibility, so it could connect between PCBs within a small device with a high degree of freedom and the bundle of the cables can pass through a thin hinge part. Micro coaxial cable is small and has good transmission characteristics, there is a wide range of needs from products that require miniaturization and high functionality. We have been actively developing connector for micro coaxial cables.

Features of connector for micro coaxial cable
Our micro coaxial cable connector is designed to maintain the transmission characteristics that are the characteristics of coaxial cables at the point of connection.

- Both connectors and harness are suffered from severe delay.
- The lead time is at least 6 months even for the prototype-II fabrication.
- The harness is made by Hitachi Metals Ltd.

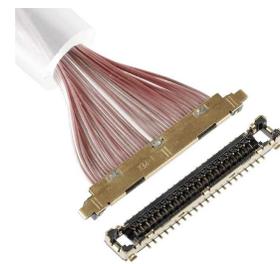
Alternative μ -Coax Model



Trade Name	I-PEX Inc.
Date of Incorporation	July 10th, 1963 History
President	Takaharu Tsuchiyama Top Message Board Members
Head Office	12-4 Negoro, Momoyama-cho, Fushimi-ku, Kyoto, JAPAN 612-8024
Paid-in Capital	10.968 billion yen (as of December 31, 2021)
Consolidated Net Sales	66.8 billion yen (ended December 31, 2021)
Stock Exchange Listings	1st Sec., Tokyo Stock Exchange (Code: 6640) Investor Relations
Head Count	Consolidated: 5,667 (as of December 31, 2021) Non-Consolidated: 1,972 (as of December 31, 2021)
Group Companies	Japan: 4 (Including I-PEX Inc.) Overseas: 17 Network
Business Operation	Connectors & Electronics Components Business Automotive Electronics & Associated Components Business Semiconductor Mfg. Equipment and Other Business

CABLINE[®]-UX II

Slim design suitable for through-hole solution, narrow pitch (0.25 mm), Right angle vertical mating type micro-coaxial connector



- ✓ Suitable for small connector spaces.
- ✓ Slim plug design, suitable for through-hinge assemblies.
- ✓ EMI shielding and multi-point ground design.

Pin counts:

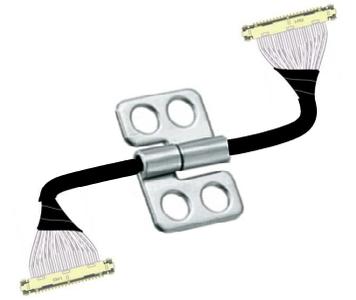
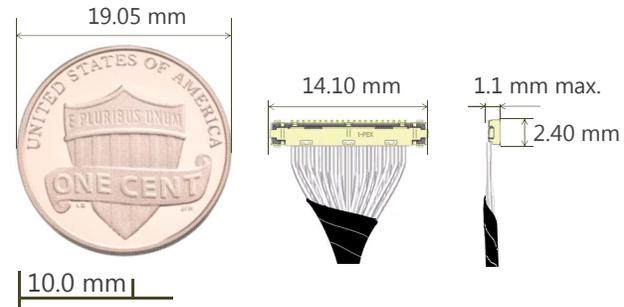
Range	Up to 50
Available	30, 34, 40, 50

*Please inquire for pin counts not listed or outside of the pin count range.

Mating type	Right angle vertical	
Wire (FPC) pitch (mm)	0.25	
Board pitch (mm)	0.5	
Mated size (mm)	Height	1.0 +/- 0.1
	Width Formula	4.1 + (0.25*p)
	Depth	2.40
Wiping length (mm)	0.20	
Applicable wire (AWG#)	Micro-coax for signals	45ohm : #44 or smaller 50ohm : #46 or smaller
	Twincoax	-
	Discrete	#39 or smaller
Contact point	-	
Performance (Reference only)		USB 3.1 Gen 1 (5 Gbps)
		V-By-One HS 1.4 (4 Gbps)
		HDMI 1.3 (3.4 Gbps)

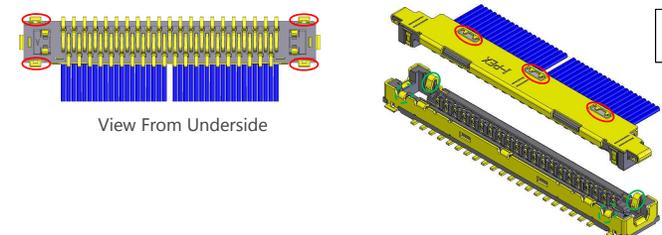
Suitable for Small Connector Spaces

CABLINE-UX II 40p size is smaller than a one-cent coin.

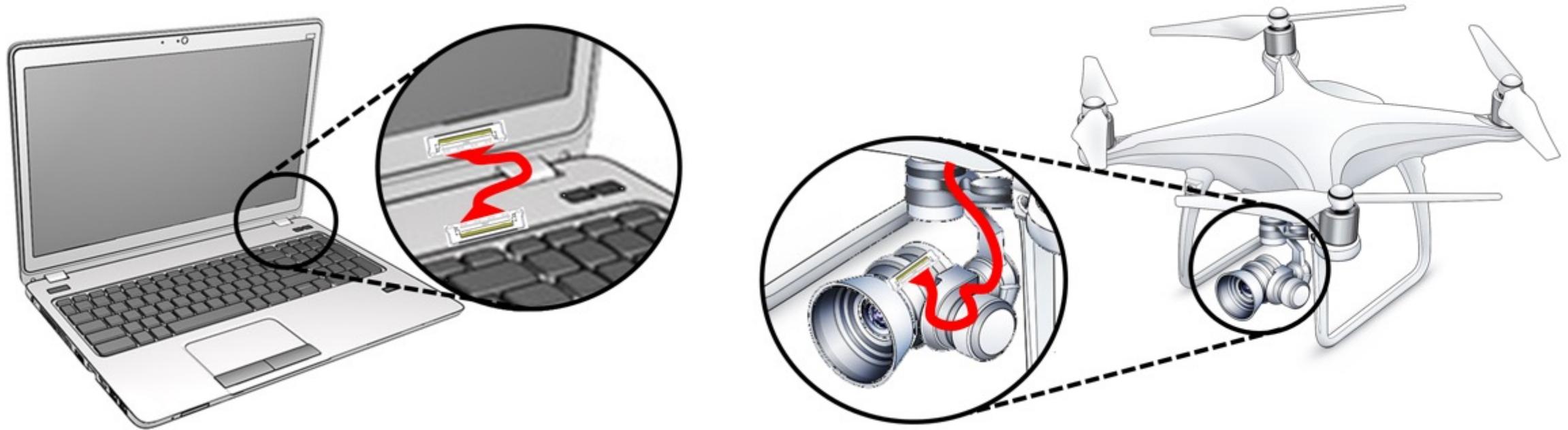


Flexible micro-coaxial cable harness is suitable for small applications with a hinge design.

EMI Shielding and Multi-point Ground Design



Market Share of I-PEX μ -Coax Product



I-PEX Dominates world's market

Specification Comparison (Executive Summary)

High Frequency Signal Transmission Performance @400MHz

	FPC		KEL XSL				IPEX UX-II
Length [cm]	20	40	10	10	20	30	50
AWG	N/A	N/A	46	44			44
Impedance [Ω]	50	50	50	45 \pm 3			50
Diff Impedance [Ω]	110	110	93	83			
Insertion Loss [%]	80	56	84	90	84	80	
Return Loss [%]	10	20	25	18			
Cross Talk [%]	<12*		1				
Eye Diagram	similar		similar				

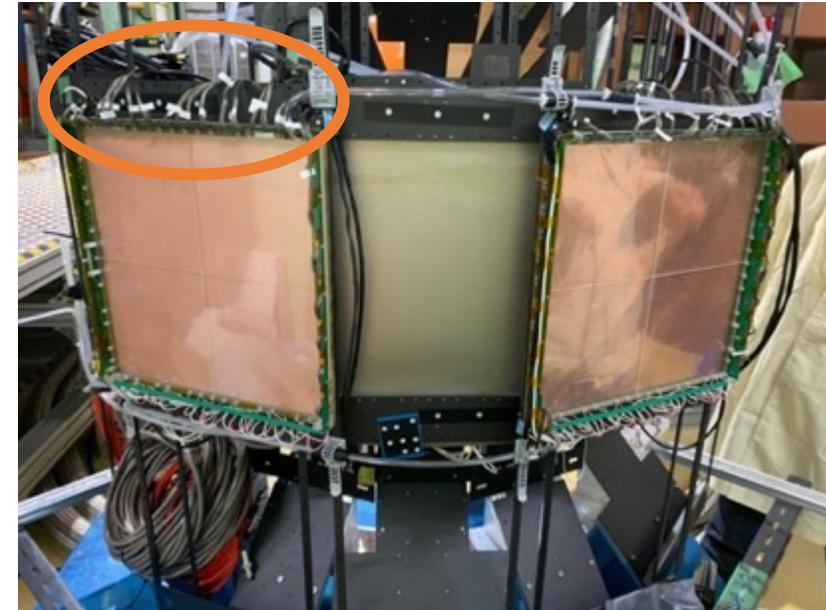
*20cm conversion cable with bus extender

Conclusion

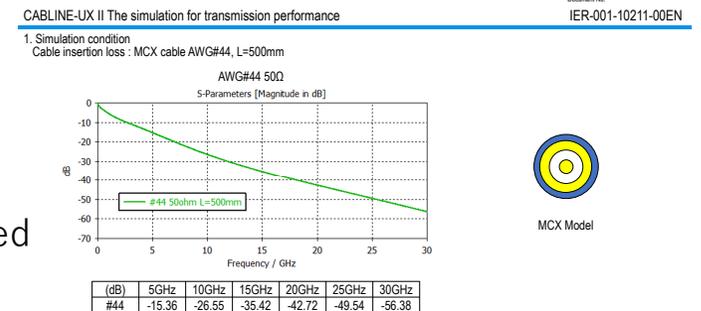
There is no data available for the exactly same condition between FPC and μ Coax cables. Presumably 20cm FPC can be compared to XSL-AWG46-10cm and XSL-AWG44-20cm. Resulting performances look similar within 20cm. To be executed actual measurement once prototype is made. Hard to extrapolate the performance to 1.41m, need to wait for the actual measurement.

The reason of XSL(KEL) as the first choice

1. It was used in E16 experiment at J-Parc and survives radiation (7.2Gray)
2. Fabrication experience of connector boards in Hayashi Repic.
3. Free samples were available.
4. KEL was willing to provide detailed signal transmission performance data.



The performance data provided by I-PEX was too coarse



PROS & CONS to switch to I-PEX

- 😊 Lead-time is 1 month for prototype. 2 months+ for production.
 - The factory of the harness provider is in Shenzhen (深圳). The whole city has been under rock down since this week. 86 new cases/17M population/day
- 😊 Material/structure/performance seem to be similar to KEL's XSL series. Dielectric/Jacket=PFA, same flammability rated.
- 😊 AWG44, Impedance 45Ω model is also available.
- 😓 Need to redesign the footprints of the connector boards.
- 😓 Need to re-evaluate signal transmission/radiation hardness to confirm they are similar with KEL's.

Redesign board and re-evaluation are worthy price to pay for the given hopeless situation with KEL co. We shouldn't postpone the decision.

Harness Make



項目 Item	單位 Unit	規格值 Specified Value
中心導體抵抗 Center conductor resistance	Ω/km	Max. 12,000
外部導體抵抗 Outer conductor resistance	Ω/km	Max. 2,870
耐電壓 Dielectric strength	A.C. V for 1min	A.C. 500
絕緣抵抗 Insulation resistance	MΩkm	Min. 1,200
特性インピーダンス(at 1ns TDR) Characteristic Impedance	Ω	45 (Nominal)
定格電圧 Rating Voltage	V	30
定格温度 Rating temperature	°C	80
動作温度 Working temperature	°C	-0~80
難燃性 Flammability	-	VW-1
許容電流(*) Allowable Current	A	0.25 (Ref.)

項目 Item	單位 Unit	規格值 Specified Value
内部導體 Center Conductor	材質 Material	銀めつ銅合金線 Silvered copper alloy
	AWG サイズ AWG Size	44
	構成 Stranding	本/mm No./mm
	外径 Diameter	mm
絶縁体 Insulation	材質 Material	PFA
	標準厚 Thickness	mm
	外径 Diameter	mm
シールド Shielding	材質 Material	錫めつ銅合金線 Tinned copper alloy
	構成 Stranding	mm
ジャケット Jacket	材質 Material	PFA
	標準厚 Thickness	mm
	外径 Diameter	mm

(*) 周囲温度 40°C, 导体最高温度 80°C 气中 1 条配線の場合。
Single coaxial cable in the air, at ambient temperature 40°C, Max conductor temperature 80°C.