

12 GHz

The New Frontier

Exploring 4K Cable Technology

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Choices for 4K 12 GHz Infrastructure

- Fiber Optic Cable
- Premise/data cable
- Coaxial Cable



Fiber Optic Cable

- Single mode
 - Unlimited bandwidth
 - Unlimited distance
 - Multimode
 - Single mode price approaching multimode
- Conversion: electrons to photons
 - Fiber is cheap, conversion is not
- Fiber will win when....
 - Fiber amplifiers, splitters, optical circuitry



Video and IP – Twisted Pairs or Fiber

- Grass Valley is promoting video over IP.
- In installations of 16 cameras or more.
- TICO compression....a gentle 4:1
- Takes 12 GHz down to 3 GHz
- On a 10GbaseT data cable
 - Three 12 GHz TICO signals
 - 1 GHz left over – audio, control, metadata



Copper Twisted-Pair Data Cable

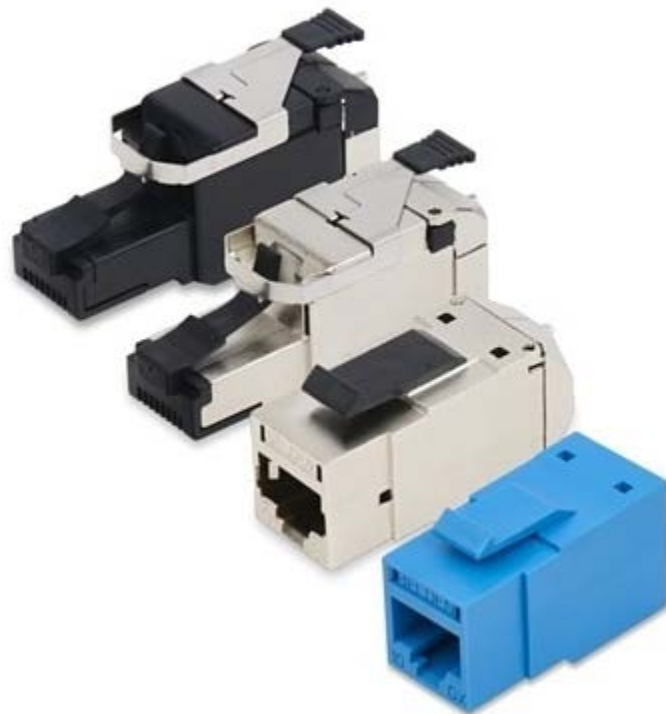
- Category 6a, “augmented” Category 6
 - 10GbaseT
 - 10 gigahertz bandwidth, 10 gigabits data rate
 - 100Ω 100m (328 ft.)



A New Kind of Category 6a Cable – 10GXS

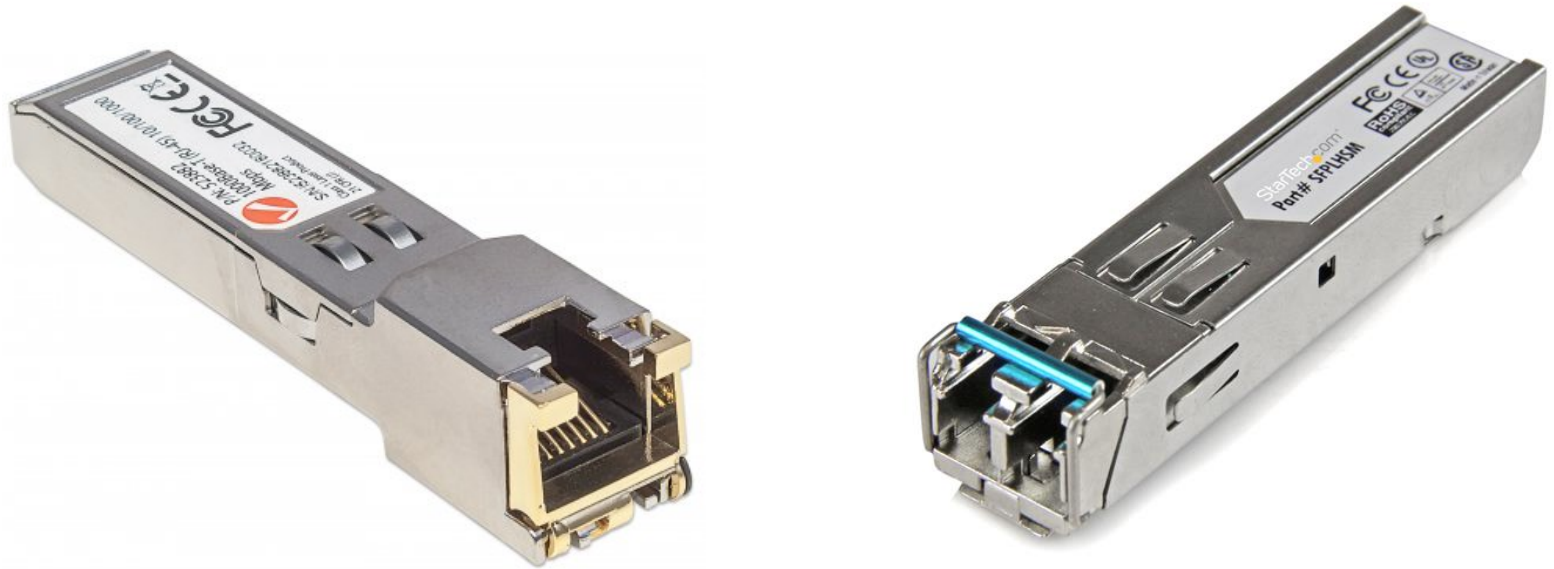


A New Kind of Category 6a Connector – REVConnect



SFP and Copper/Glass Data Cables

- Can change instantly between twisted pairs and fiber



Belden 4794R – first of many 12 GHz 4K single-link coax



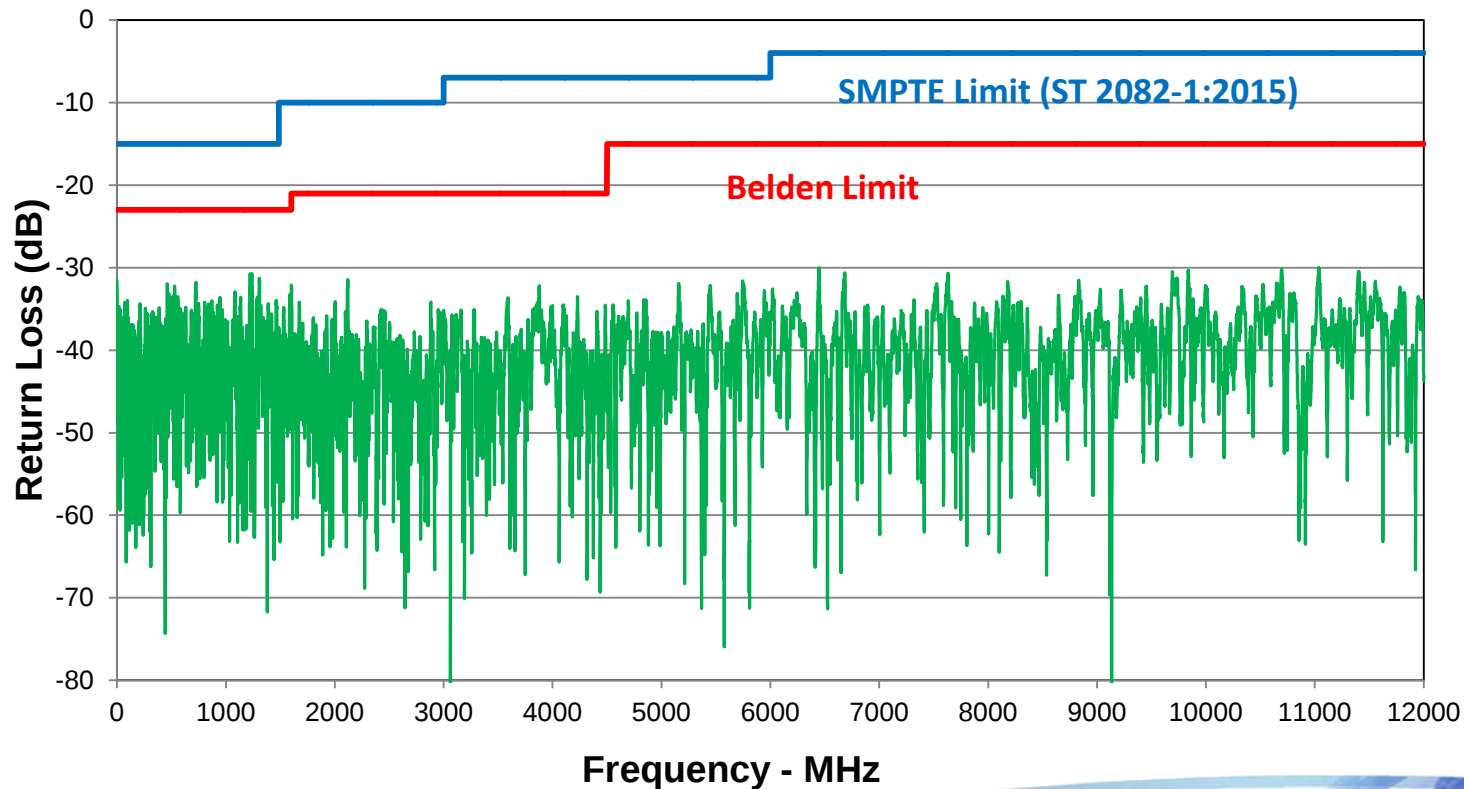
20 Years of Improvements

- Center conductor
 - Silver-coated copper
- Dielectric
 - New high performance polyethylene
- Shield
 - Foil-Braid-Foil
 - Foil bonded to core, foil bonded to jacket
 - Highest shield effectiveness we have ever made
 - Special braiding machines – 95% coverage tinned copper

NEW: Belden 4855R

- The 4K version of Belden 1855A
- Diameter 4.03mm, 0.159 inches
 - Same size, same connectors
- Short distance
- Inter-rack wiring
- High density
- *4855P coming soon!*

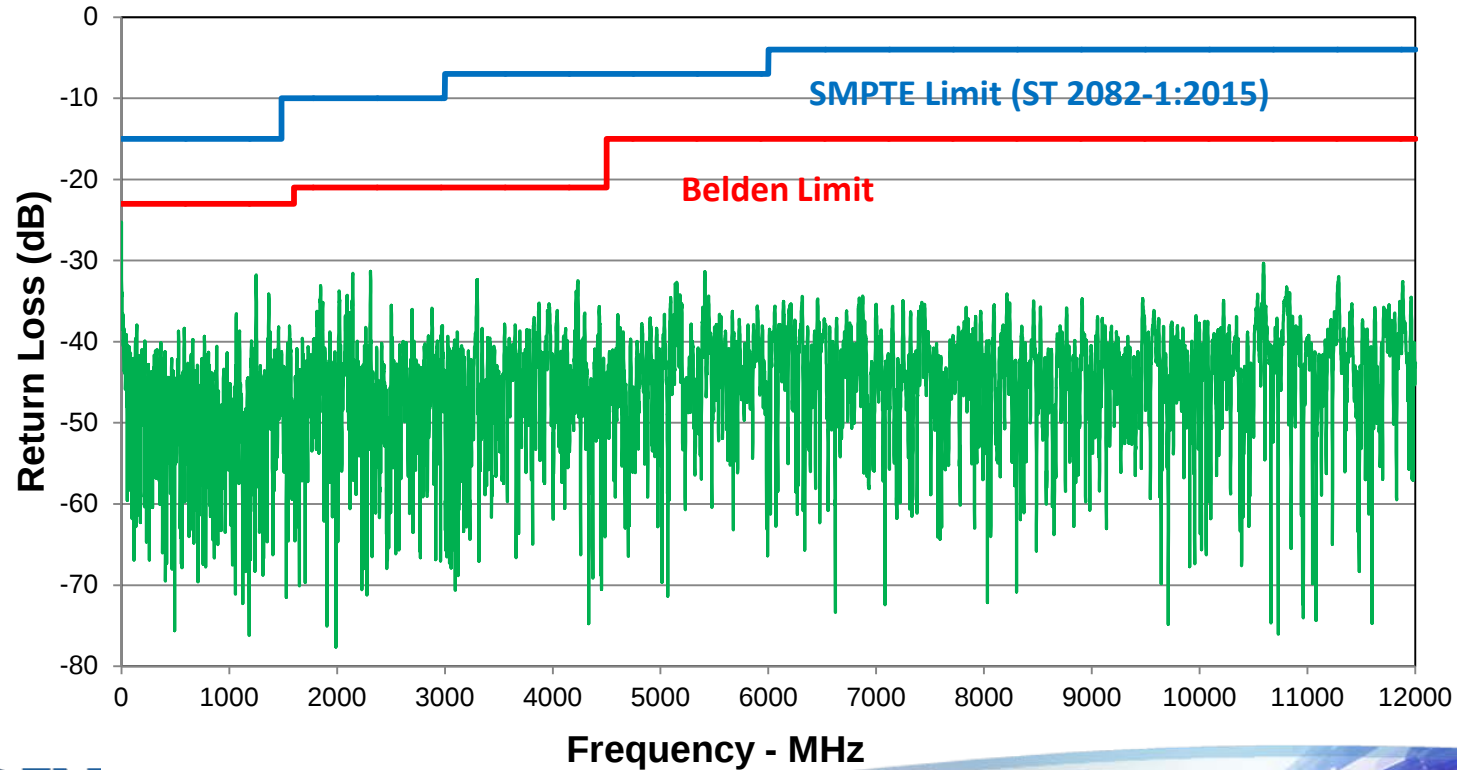
Belden 4855R – Return Loss



NEW: Belden 4505R

- The 4K version of Belden 1505A
- Diameter 5.92mm, 0.233 inches
 - Same size, same connectors
- Medium distance
- Inter-rack wiring
- Flexibility vs Performance

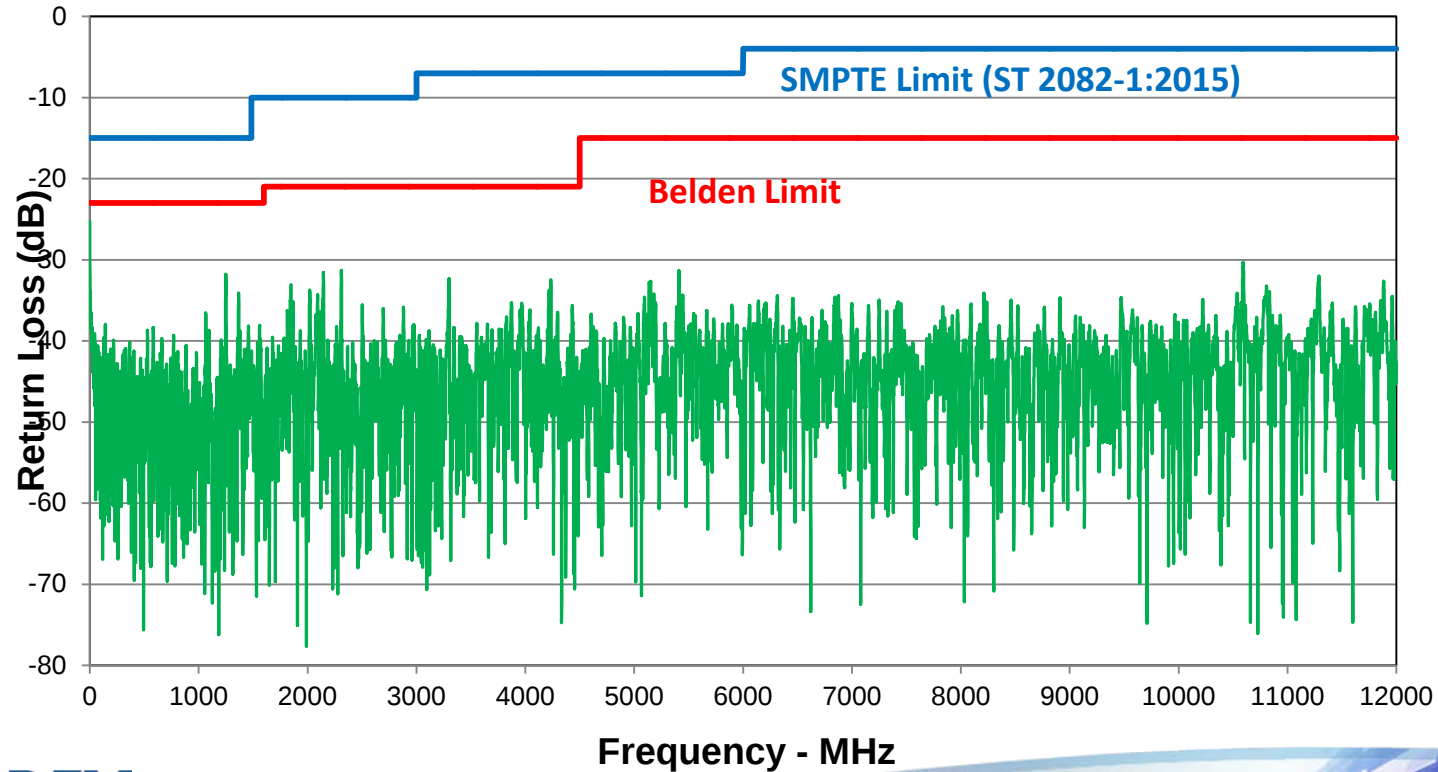
Belden 4505R – Return Loss



NEW: Belden 4694R

- The 4K version of Belden 1694A
- Diameter 6.96mm, 0.274 inches
 - Same size, same connectors
- Long distance
- Most popular size
- *4694P coming soon!*

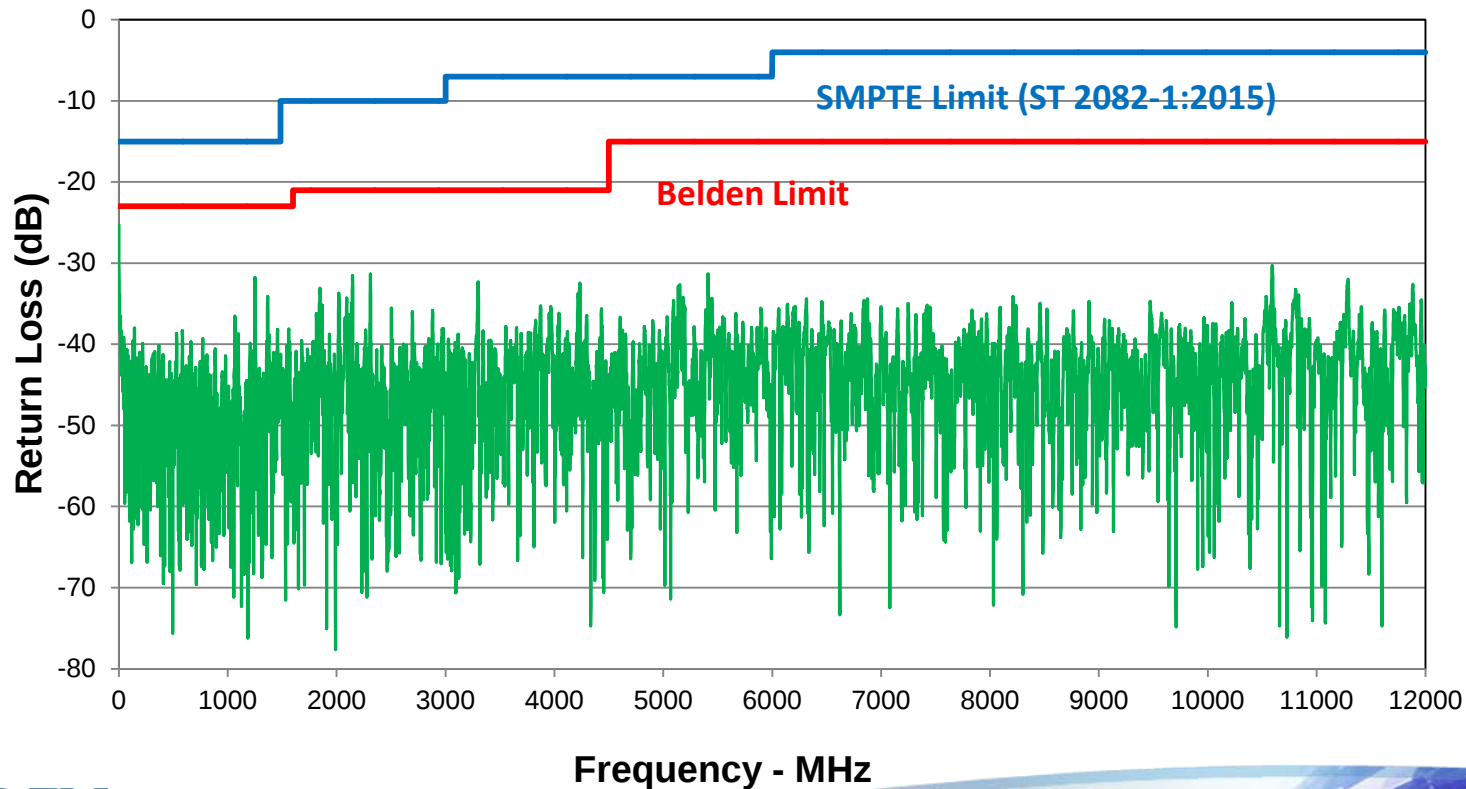
Belden 4694R – Return Loss



Belden 4794R

- The 4K version of Belden 1794A
- Diameter 8.13mm, 0.320 inches
 - Same size, same connectors
- 98 metres at 4K
- High performance, long distance
- Improved performance since last year

Belden 4794R – Return Loss



COMING SOON : Belden 4731R

- The 4K version of Belden 7731A
- Diameter 10.2 mm, 0.400 inches
 - Same size, same connectors
- Longest distance – 117 metres (384 feet)
- Next stop fiber optic cable
- *4731P coming soon!*
- For the entire list....

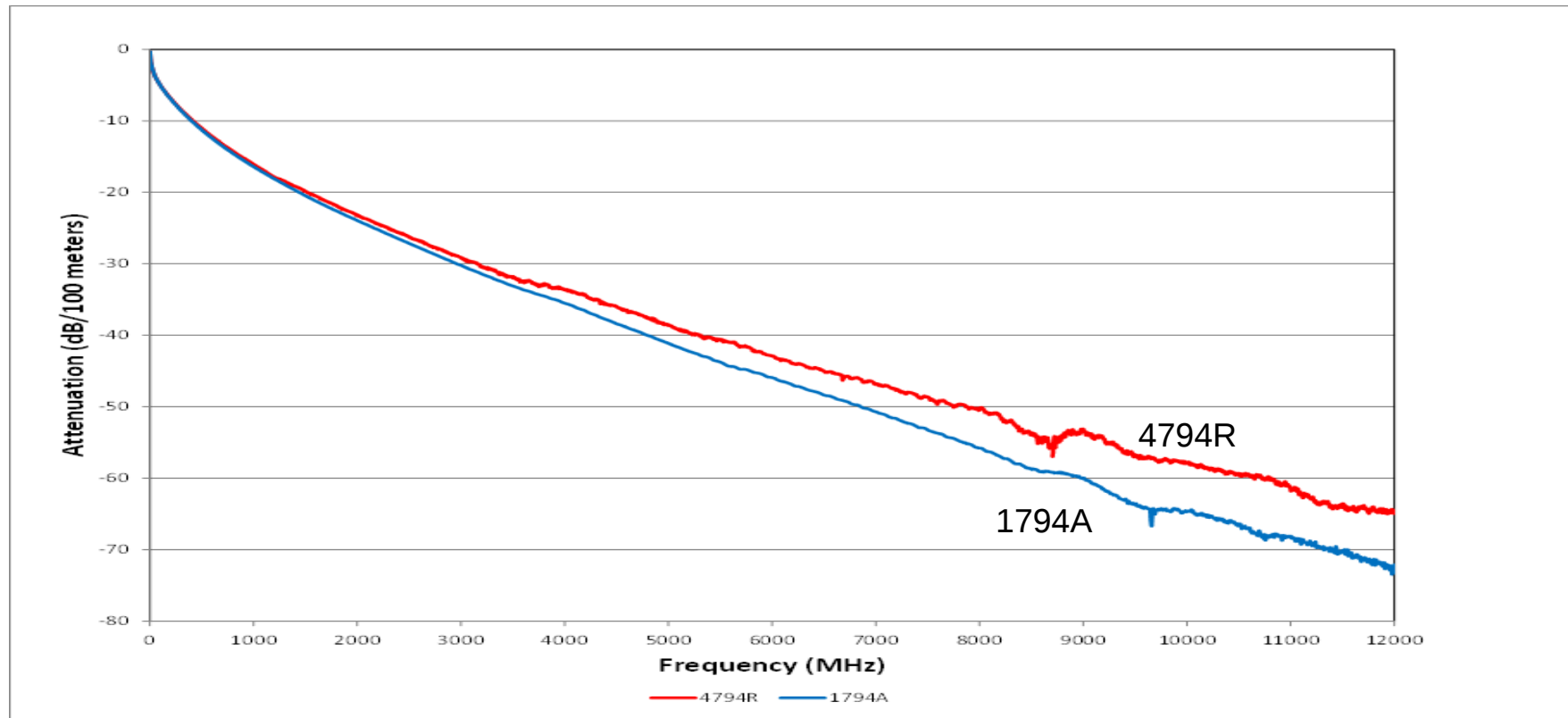
<http://info.belden.com/ecos/video-distance-chart>

Formula:	-30 dB @ ½ clock		-20 dB @ ½ clock		-20 dB @ ½ clock		-40 dB @ ½ clock		-40 dB @ ½ clock		-40 dB @ ½ clock	
Data Rate:	270 Mb/s		1.5 Gb/s		3.0 Gb/s		3.0 Gbps		6 Gb/s		12 Gb/s	
SMPTE Std:	ST-259M		ST-292M		ST-424M		ST-425		2081-1		2082-1	
Application:	SD-SDI		HD-SDI		3G-SDI		3G-SDI		6 GHz 4K		12 GHz 4K	
Cable Part #	Ft.	m	Ft.	m	Ft.	m	Ft.	m	Ft.	m	Ft.	m
179DT	410	125	115	35	81	25	161	49	111	34		
1855P	733	223	190	58	125	38	249	76	168	51		
1855A	766	233	214	65	149	45	298	91	203	62		
4855R	800	244	221	67	155	47	310	94	215	66	148	45
1505F	839	256	220	67	147	45	294	90	197	60		
1506A	1014	309	265	81	177	54	353	108	233	71		
1694F	1046	319	279	85	188	57	376	115	225	69		
1505A	1082	330	301	92	209	64	418	127	285	87		
4505R	1079	329	307	94	217	66	433	132	302	92	208	63
1695A	1258	383	321	98	210	64	420	128	274	84		
1694A	1338	408	370	113	255	78	510	155	346	105		
4694R	1397	426	386	118	270	82	540	165	375	114	258	79
1794A	1702	519	469	143	319	97	637	194	432	132		
4794R	1716	523	480	146	329	100	659	201	449	137	321	98
7722A	1877	572	451	137	282	86	565	172	225	108		

Dimensions and Tolerances – Belden 4794R

	mm	Tolerance +/-	Inches	Tolerance +/-
Conductor Diameter 16AWG	1.29	0.00508	.051	.0002
Dielectric Diameter	5.72	0.127	.225	.005
Inner Shield Tape Diameter	5.87		.231	
Braid Diameter	6.66	0.635	.262	.0025
Jacket Diameter	8.13	0.127	.320	.005

Belden 4794R – Attenuation (Compared to 1794A)



Connectors

- 75 Ω BNC for digital video
 - 4.5 GHz: Existing cable & connectors
 - 6 GHz: Marked cable & connectors !!
 - 12 GHz New cable, one connector
 - 1-piece and 3-piece



12 GHz BNC Connectors

1-Piece Compression

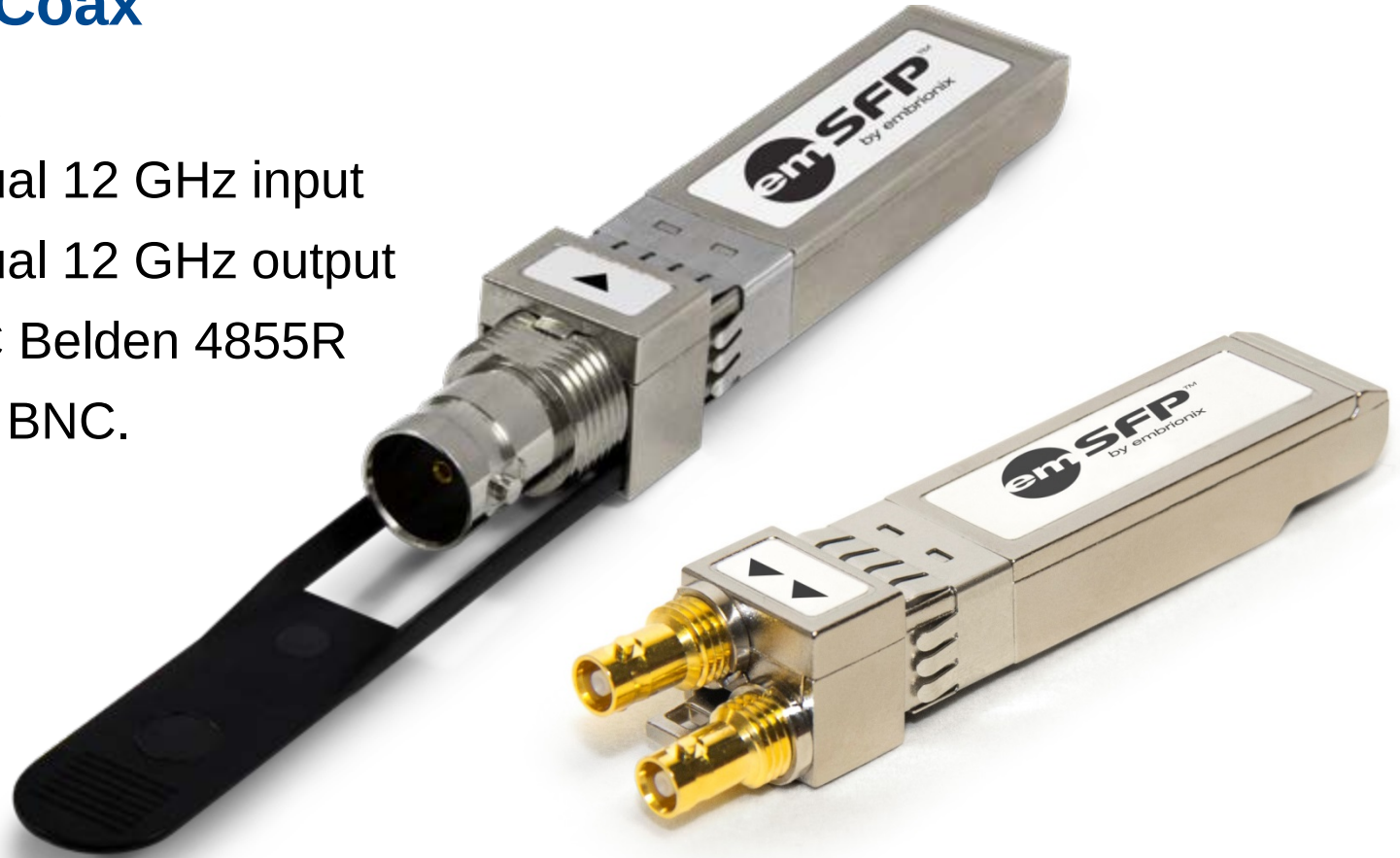
BNC Part #	Cable	Compression Tool	Strip Tool
4855RBUHD1	Mini RG-59	CPLCRBC-BR	PS59/6/RGB
4505RBUHD1	RG-59	CPLCRBC-BR	PSA59/6
4694RBUHD1	RG-6	CPLCRBC-BR	PSA59/6
4794RBUHD1	Series 7	CPLCRBC1794	PS-11

3-Piece Crimp

BNC Part #	Cable	Crimp Tool	Strip Tool
4855RBUHD3	Mini RG-59	BB3PHCT	BB3PST
4505RBUHD3	RG-59	BB3PHCT	BB3PST
4694RBUHD3	RG-6	BB3PHCT	BB3PST
4794RBUHD3*	Series 7	Kings KTH-1000	
4731RBUHD3*	RG-11	Kings KTH-1000	

SFP and Coax

- Embrionix
 - Single/Dual 12 GHz input
 - Single/Dual 12 GHz output
 - Mini-BNC Belden 4855R
 - Standard BNC.



What is Available and NOT Available

- Current Colors
 - Black, Red, Orange, Yellow, Green, Blue, Violet,
 - Any other color: special order 5,000 feet.
- One more size coming....
 - Smaller than 4855R, bigger than 179DT
- Other applications being considered....
 - Stranded (flexible)
 - Outdoor/Direct Burial
 - Fire Ratings (LSOH, Plenum) in progress



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