EN4165/EB16-MM
TE Action Items

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EVERY CONNECTION COUNTS

TE Action Items from ARINC-FOS Mtg, Tulsa-OK, Oct 2015

Need drawings for

Type 1 Pin	TBD	Attachment 1	ARINC 845, Supp 1
Type 1 Socket	TBD	Attachment 2	ARINC 845, Supp 1
Completed:			
Type 2 Pin	TE Action Item	Attachment 3	November 20th
Type 2 Socket (Springless)	TE Action Item	Attachment 4	November 20th
Type 3 Pin (same as Type 2 Pin)	TE Action Item	Attachment 5	November 20th
Type 3 Socket (with spring)	TE Action Item	Attachment 6	November 20th
Type 3 Socket (Springless)	TE Action Item	Attachment 7	November 20th
Type 4 Pin	TBD	Attachment 8	ARINC 845, Supp 1
Type 4 Socket	TBD	Attachment 9	ARINC 845, Supp 1

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Action item 1: Testing data for Type 2 Pin/Socket (Springless) (December 15th)
16-08 insert (~ARINC 809)

Action item 2: Data on differences for Type 2 Socket for spring and springless (December 15th)

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Action item 3: Equipment/Process needed for the Table of parameters (December 15th)

Action item 4: Optical Interface Requirements for Interoperability (December 15th)
Location of the focus (beam waist)
Amount of spherical aberration (in mm)
Bonus Points: Diagram expressing these measurements

Item 1: EN4165 with Type 2 EB16 Termini – Test result update

Test results for EN4165 (ARINC 809) connector with Insert type 16-08. 12/14/2015
The test program is on-going. Reporting is tests completed so far.
Samples: 4 x EN4165-Mono connectors with Type 2 Pin and Sockets. Total: 32 Channels, WL: 1300nm
Termini: Type 2 (springless). Launch Condition: Arinc-805

A-845	Test Type	Reference	Test Limits	Requirement per A-845	Actual Results	Pass/Fail	Max. Change Limits per A-845	Pass/Fail	Unit
Section 2.4.3	Insertion Loss	Class 01, 03, 04	Intial IL	<1.50	<0.82	Pass	N/A	N/A	dB
Section 2.4.3	Return Loss	Table 1-2	Initial RL, >12dB lens	>20	>15.3	Pass	N/A	N/A	dB
Section 2.4.3	Return Loss	Table 1-2	Initial RL, >20dB lens	>12	>28.4	Pass	N/A	N/A	dB
Section 2.4.4.2	Temperature Life	IL - During Test	1,000 hrs at 125C	<1.50	<0.88	Pass	+/- 0.5	Pass	dB
Section 2.4.4.2	Temperature Life	IL - After Test	1,000 hrs at 125C	<1.50	<0.87	Pass	+/- 0.5	Pass	dB
Section 2.4.4.2	Temperature Life	RL - After Test	1,000 hrs at 125C	>12/>20	>13.2/>24.0	Pass	N/A	N/A	dB
Section 2.4.4.1	Thermal Cycling, Cat 1	IL - During Test	TC -50/+125C, 3-5C/min, 50X	<1.50	<1.19	Pass	+/- 0.5	Pass	dB
Section 2.4.4.1	Thermal Cycling, Cat 1	IL - After Test	TC -50/+125C, 3-5C/min, 50X	<1.50	<1.13	Pass	+/- 0.5	Pass	dB
Section 2.4.4.1	Thermal Cycling, Cat 1	RL- After Test, 12dB & 20dB lens	TC -50/+125C, 3-5C/min, 50X	>12/>20	>13.2/>23.0	Pass	>12/>20	Pass	dB
Section 2.4.4.1	Thermal Cycling, Cat 2	IL - During Test	TC -65/+165C, 3-5C/min, 50X	<1.50	<1.29	Pass	+/- 0.75	Pass	dB
Section 2.4.4.1	Thermal Cycling, Cat 2	IL - After Test	TC -65/+165C, 3-5C/min, 50X	<1.50	<1.06	Pass	+/- 0.75	Pass	dB
Section 2.4.4.1	Thermal Cycling, Cat 2	RL- After Test, 12dB & 20dB lens	TC -65/+165C, 3-5C/min, 50X	>12/>20	>13.0/>24.2	Pass	>12/>20	Pass	dB
Insertion Loss - Post thermal testing			1668 hrs total	<1.50	<1.06	Pass	+/- 0.5	Pass	dB
Return Loss - Post thermal testing (12dB & 20dB)			1668 hrs total	>12/>20	>13.2/>23.0	Pass	>12/>20	Pass	dB
Testing continues...									

Item 2:

Data on differences for Type 2 Socket for spring and springless (December 15th)

This request is not clear as TE does not provide a spring version of the Type 2 Termini.

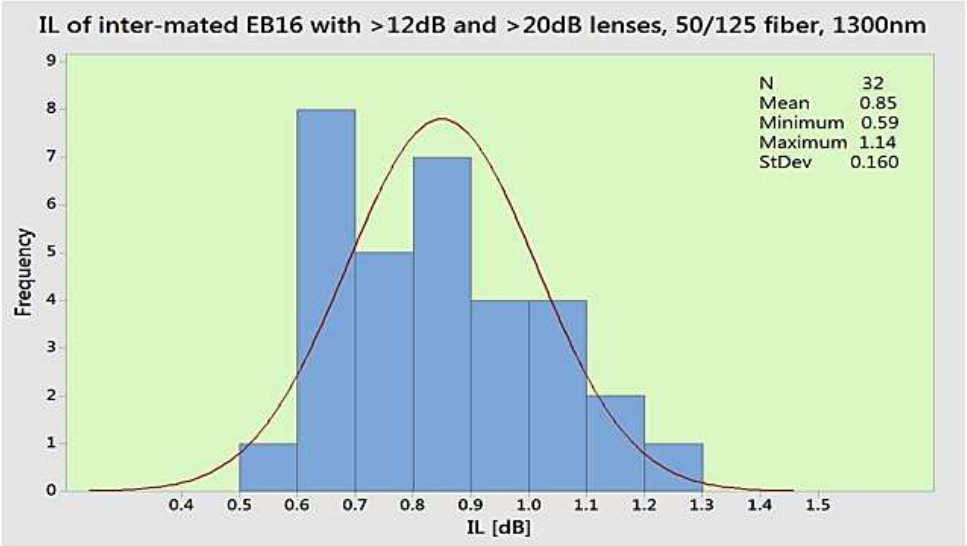
I believe this action item may have resulted from a discussion about whether it is possible to intermate the >12dB product with a >20dB product.

The next slide shows that if this special case is desirable, the A-845 specifications will still be met.

Item 2: Insertion Loss & Return Loss with Mix of RL-levels

	EB16 - Mated insertion Loss, 50/125 @ 1300nm [dB]			
Lens types	>12dB / >12dB	>20dB / >20dB	>12dB / >20dB	>20dB / >12dB
	0.85	0.86	1.13	0.97
	1.20	0.76	0.98	1.13
	0.67	1.06	0.87	0.93
	0.59	0.88	0.70	0.82
	0.81	0.69	0.67	1.05
	0.65	0.82	0.70	0.79
	0.74	0.79	1.04	1.03
	0.63	0.78	0.92	0.67
Mean	0.77	0.83	0.88	0.92
Max RL	1.20	1.06	1.13	1.13
Min RL	0.59	0.69	0.67	0.67
StDev	0.20	0.11	0.17	0.15

	EB 16 - Mated Return Loss, 50/125 @ 1300nm [dB]			
Lens types	>12dB / >12dB	>20dB / >20dB	>12dB / >20dB	>20dB / >12dB
	14.7	39.1	14.8	17.0
	15.1	36.9	15.6	16.5
	14.6	38.4	15.0	16.2
	14.9	34.5	15.4	16.6
	14.7	37.1	14.8	16.7
	14.9	41.1	15.0	16.4
	14.8	35.0	15.0	16.6
	14.9	35.3	15.1	16.3
Mean	14.8	37.2	15.1	16.5
Max RL	15.1	41.1	15.6	17.0
Min RL	14.6	34.5	14.8	16.2
StDev	0.16	2.25	0.26	0.26



Summary: Both the IL and RL of mixed RL products meet the specifications

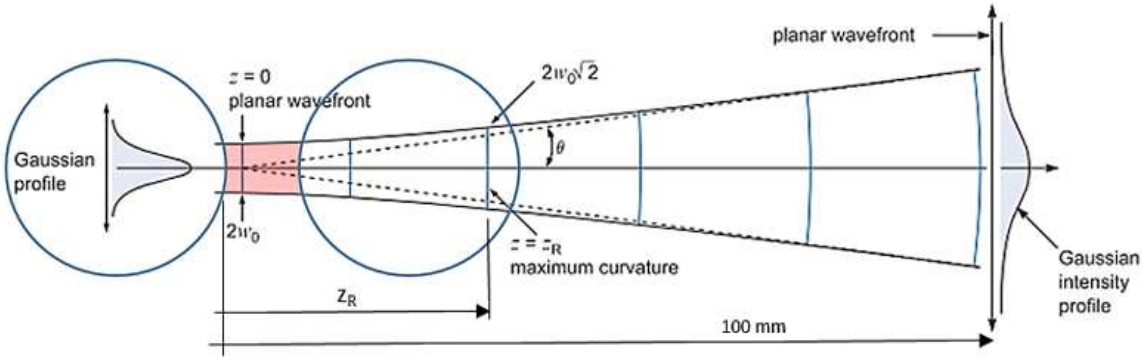
Item 3: Beam Scan Equipment and Process

Equipment/Process needed for the Table of parameters (December 15th)

See the updated table 2-3 in the new revision of the ARINC-845 document.

Parameter	Value (>12dB RL)	Value (>20dB RL)	Units
Beam size (13.5%)	0 mm: 0.278 50 mm: 3.230 100 mm: 6.270	0 mm: 0.303 50 mm: 3.548 100 mm: 6.901	mm
Air gap distance	0.90 +/- 0.2	0.90 +/- 0.2	mm
Angle of Beam Divergence (@ 100mm)	1.72 +/- 0.1	1.89 +/- 0.1	degrees
Beam Centroid Angle, Max.	50 mm: 0.145 100 mm: 0.171	50 mm: 0.165 100 mm: 0.185	degrees
Max. beam angle error	0.03	0.03	degrees
Beam Ellipticity (13.5%)	>90	>90	%
Notes: (1) All Measurements were performed with a Thorlabs BP209-IR Dual Scanning Slit Beam Profiler. (2) Procedures used are detailed in the BP209 Operation Manual which can be found at: *https://www.thorlabs.com/thorproduct.cfm?partnumber=BP209-IR*			

Item 3-addition: Suggestions to the Beam Characteristics



The surface of the receiving lens needs to be positioned (z) well within the Rayleigh distance (z_R) and preferably within the Near-field zone ($z<<z_R$). For multimode, the Rayleigh distance z_R is typically less than 50mm and the Near-field is less than 25 mm. For single mode z_R is less than 10 mm and the Near-field is within a few mm's. The divergence angle of the far-field beam (at 100 mm) will not really contribute any useful information.

I suggest that we only use the Near-field to specify the beam size. Perhaps in increments of 5mm from the lens surface through the extent of the Rayleigh distance z_R.

Rayleigh Distance: $$z_R = \frac{\pi w_0^2}{\lambda},$$

Radius of beam at distance z from waist $$w(z) = w_0\sqrt{1+\left(\frac{z}{z_R}\right)^2}$$

Beam Divergence $$\theta \simeq \frac{\lambda}{\pi w_0}$$ [radians]
Only valid for z >> z(R)

Item 4: Request for additional information beyond the scope of the APIM

Optical Interface Requirements for Interoperability (December 15th)
Location of the focus (beam waist)
Amount of spherical aberration (in mm)
Bonus Points: Diagram expressing these measurements

During the ARINC-FOS meeting in Tulsa, OK (October 2015), Amphenol requested that additional optical parameters shall be provided by TE in order for other manufacturers to be able to come up with alternative lens designs that will be intermateable with the TE design. They stated that the TE lens design works really well when the same lens design is used for both the pin and the socket. TE agrees. Amphenol further stated that it would be a relative simple task to reverse engineer the TE design and come up with these desired parameters but they think that TE should do the required modeling work and provide this information.

In accordance with the scope of the ARINC APIM 13-008, TE has proposed a design which was selected by the committee as the best solution. We have provided intermateability information for the ARINC-845 document and offered RAND terms which will enable manufacturers to produce and practice the design.

If a manufacturer does not wish to follow the design selection but prefers to use a different lens design and make it intermateable with the ARINC-845 design, they are welcome to do so on their own.