Factors to be Evaluated
for the POF Cable Plant Loss Budget

Satoshi Takahashi

POF Promotion

Our Goal at this Ad-hoc;
to draw up PMD to MDI optical specifications

Worst-case link power budget (tentative)

Description	Value	Unit
Base transmission loss of POF		dB/km
Loss increment due to environment		dB
Loss increment due to launch condition		dB
Loss increment due to macrobend		dB
Link power budget		dB
Operating distance		m
Number of connections		
Channel insertion loss		dB
Link power penalties		dB
Unallocated margin in link power budget		dB

Need classification?

Class	Operating temperature		Operating distance	Max. number of connection
	Minimum	Maximum		
1A	-40°C	105°C	15m	4
1B	-40°C	95°C	15m	4
2A	-40°C	105°C	40m	0
2B	-40°C	95°C	40m	0
3A	0°C	85°C	50m	1
3B	-20°C	70°C	50m	1

Transmitter characteristics (tentative)

Description	Value	Unit
Signaling speed (range) (?)		MBd
Peak wavelength (range)		nm
FWHM spectral width (max)		nm
T_{rise}/T_{fall} (max; 20%-80%)		ns
Average launch power (max) [a]		dBm
Average launch power (min) [b]		dBm
Average launch power of OFF Tx (max)		dBm
Launch condition		
Extinction ratio (min) (?)		dB

[a] Measured at TP2
[b] Measured at TP3

Receiver characteristics (tentative)

Description	Value	Unit
Signaling speed (range) (?)		MBd
Average receive power		dBm
Receive sensitivity		dBm
Stressed receive sensitivity		dBm
Vertical eye-close penalty (?)		dB
Cutoff frequency (min)		MHz

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Characteristics	Factors	
Transmission Loss	Base transmission loss	
	Launch condition dependence ➡ MRC report -1	
	Loss increment due to ambient temperature and humidity ➡ MRC report -2	
	Transmission loss change due to the light source	
		Peak emission wavelength and spectrum width
		Temperature dependence of the emission spectrum
Bandwidth	Launch condition dependence	
	Mode conversion at connection points	
Connection Loss	Base connection loss	
	Lateral offset	
	Tilt	
	End separation	
	Environment (Vibration, temperature, etc.)	

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Characteristics	Factors
Transmission Loss	Base transmission loss
	Launch condition dependence
	Loss increment due to ambient temperature and humidity
	Transmission loss change due to the light source
	Peak emission wavelength and spectrum width
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	Mode conversion at connection points
Connection Loss	Base connection loss
	Lateral offset
	Tilt
	End separation
	Environment (Vibration, temperature, etc.)

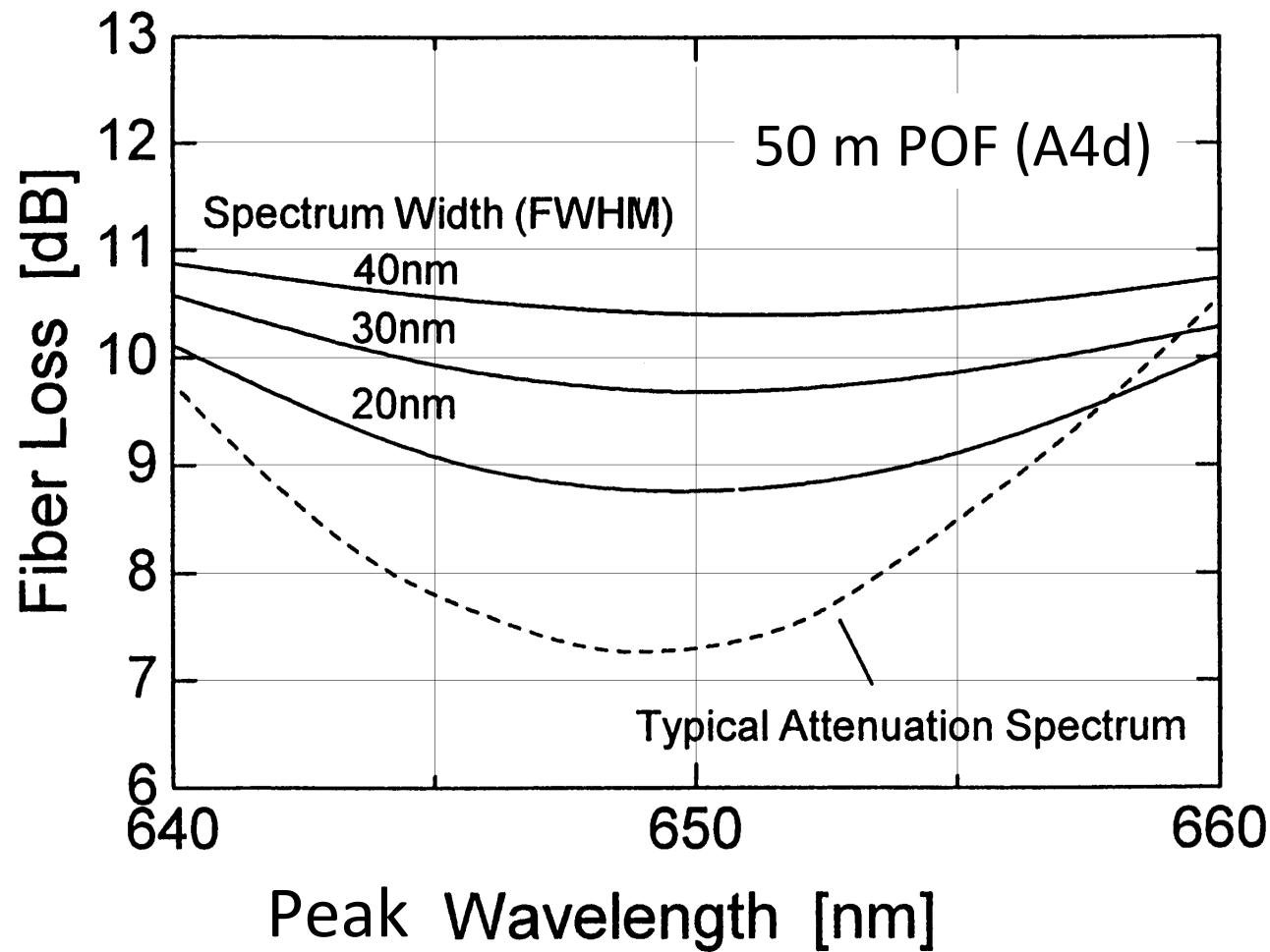# Transmission loss change due to the light source
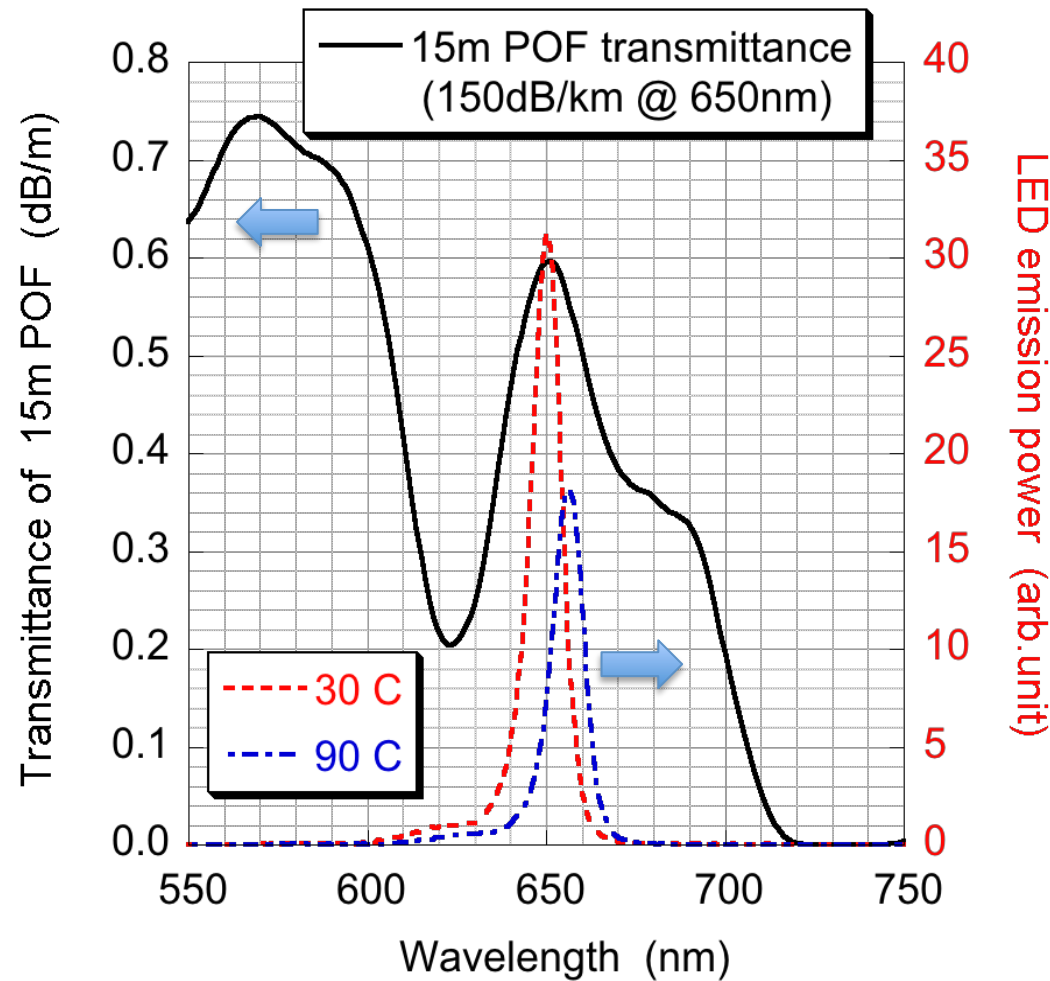
✓ Transmission loss depends on the wavelength

✓ Emission spectrum of LED varies with ambient temperature

Example: Transmission Loss calculated Considering Peak Emission Wavelength and Spectral Width of the Light Source (IEEE1394b)

50 m POF (A4d)

Spectrum Width (FWHM)
- 40nm
- 30nm
- 20nm

Typical Attenuation Spectrum

Source: NEC
LED: NL2100

Fiber Loss [dB] — Peak Wavelength [nm]

Transmission loss change due to the light source

Loss Increment Factor: Source spectrum and Launch NA
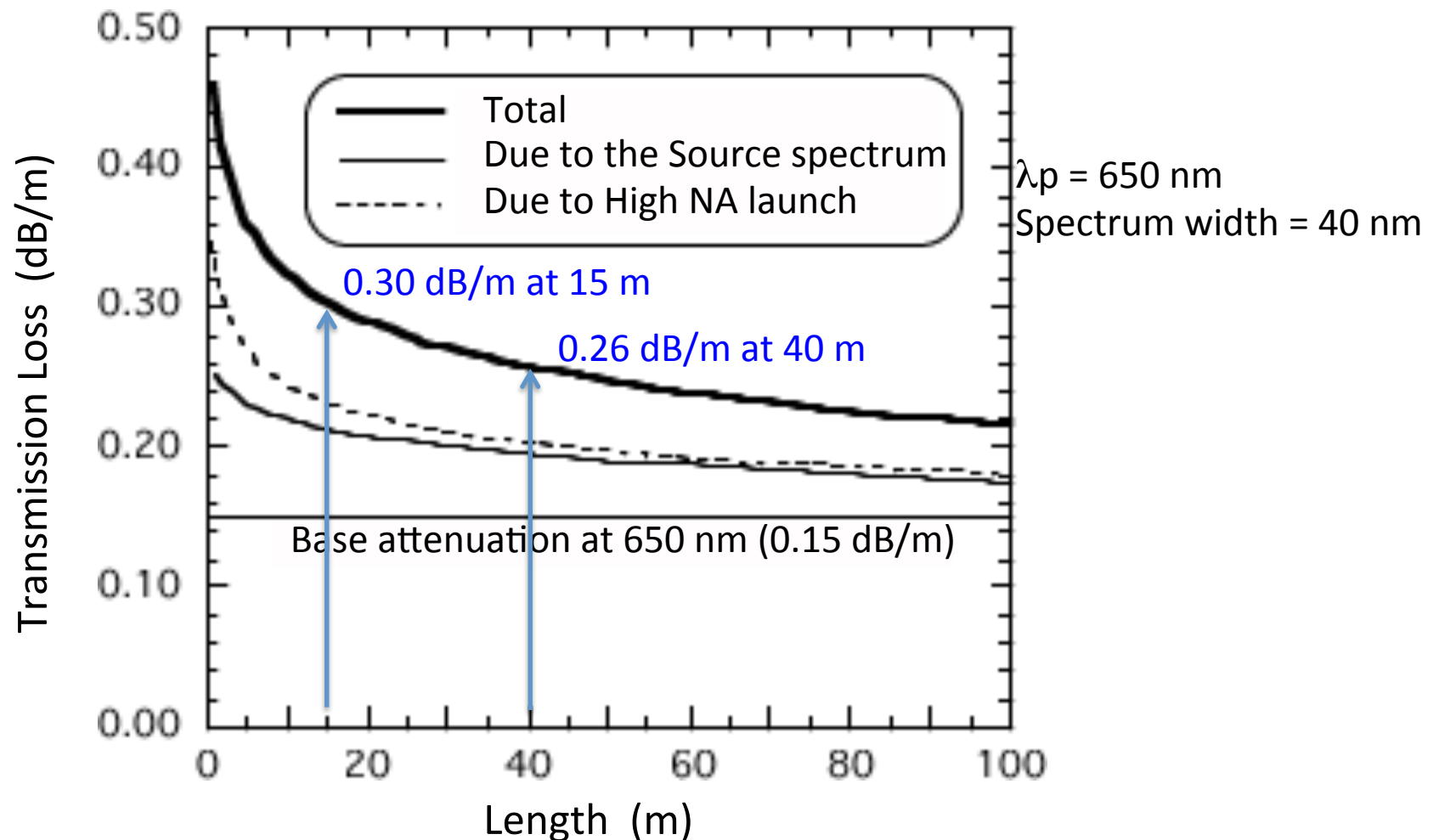
POF Cable Plant Loss Budget of IEEE 1394b S100/S200
(Just for an information)

Transmission loss of 50 m POF (A4d) without connection

Loss factor	Typical (dB)	Worst (dB)	Condition
Base transmission loss	7.3	7.8	650nm, Launch NA=0.1
Environment	0	0.8	70 C, 95 %RH
Launch NA	0.2	0.5	0.2 < Launch NA <0.3
Spectrum of the light source	3.1	3.4	λp=660nm, FWHM=40nm
Macrobend loss	0	0.5	10 quarter bends, 25mmR
Total	10.6	13.0	

- Maximum POF Attenuation = 0.26 dB/m
- Maximum connection loss = 2.08 dB / connection
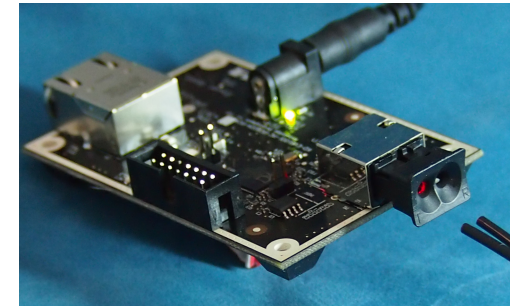
Transmission length will be shortened 8 m a connection.
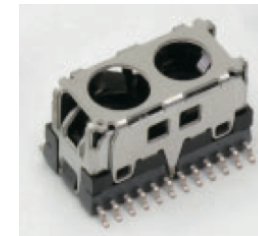
Launch Condition with FOTs

FFP
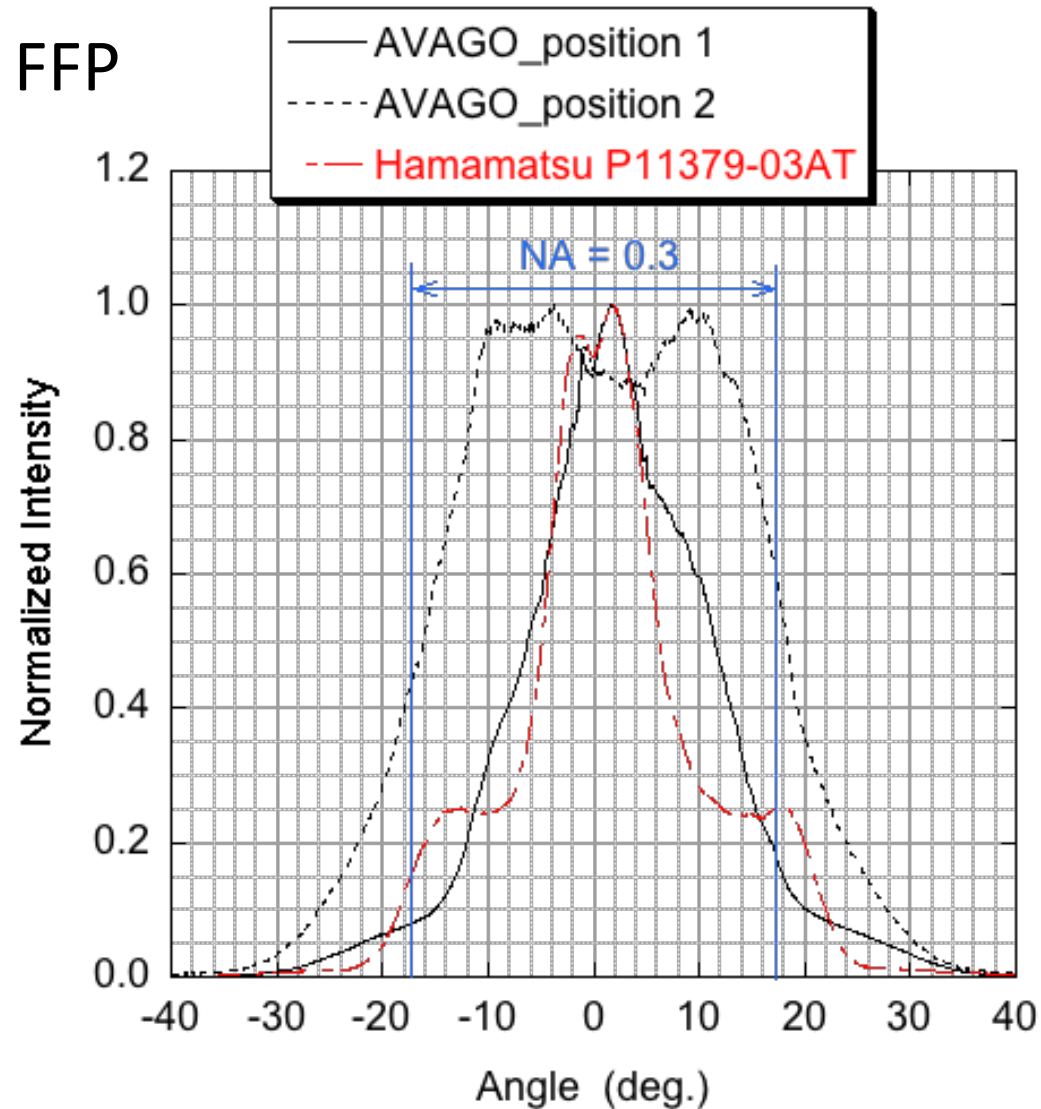
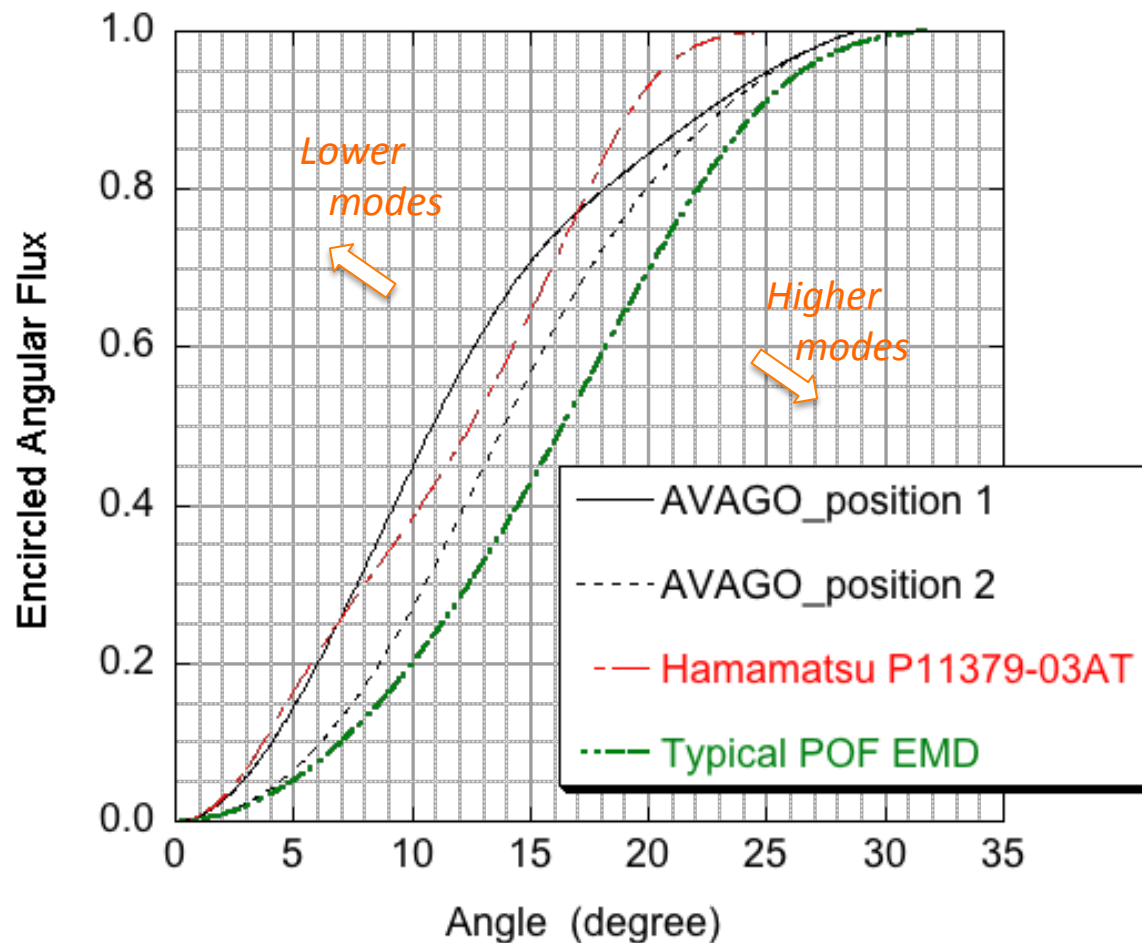AVAGO
(on a KDPOF evaluation board)

Hamamatsu
P11379-04AT

Launch Condition with FOTs

Encircled Angular Flux

✓ Launch conditions of AVAGO FOT
  and
Hamatsu FOT
are **Lower**
   than typical **EMD**
   of category A4a.2 POF

The ad-hoc group has many tasks

- We have to make many experiments

- We need many samples

- We need many discussions

Thank you for your attention