

Long-Reach Unrepeated Transmission Amplification schemes

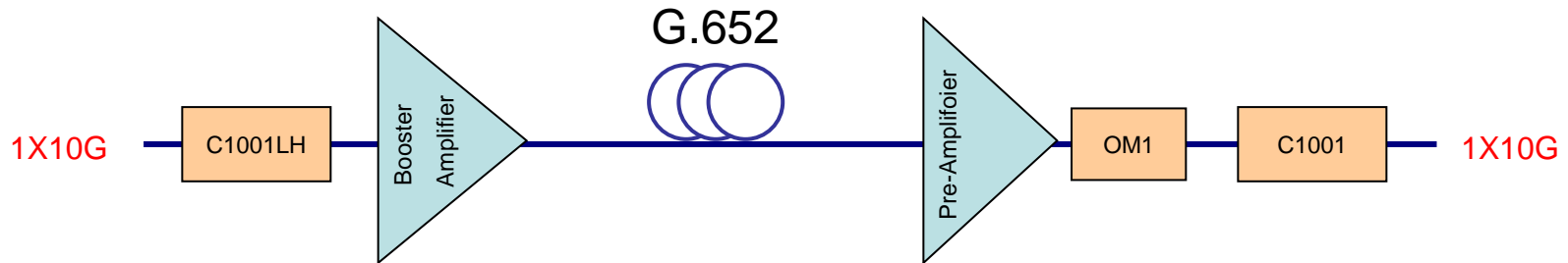
February 2011



3.2 TERABITS PER SECOND CARRIER CLASS TRANSPORT

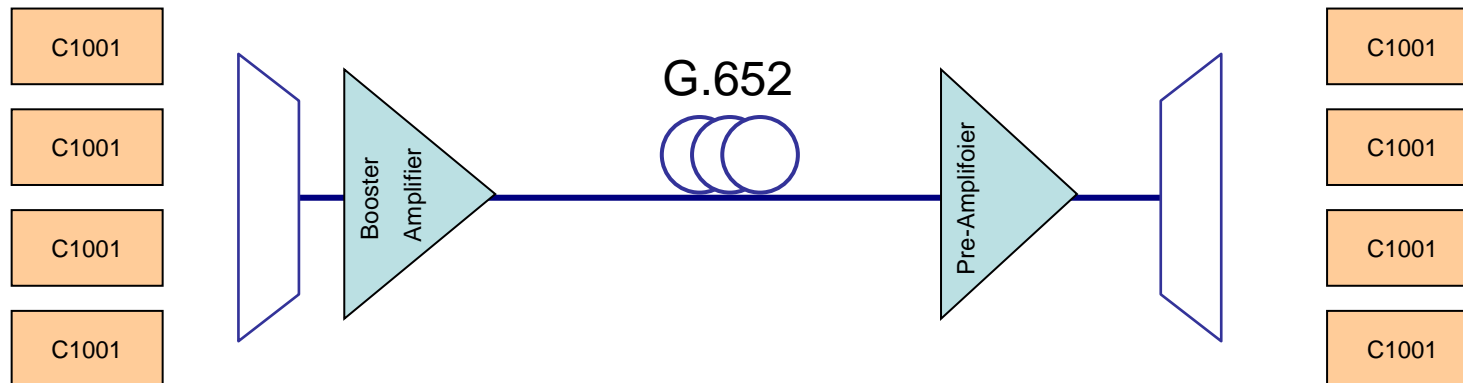
ETHERNET, SONET/SDH, FIBER CHANNEL, UNCOMPRESSED HD/SD-SDI/ASI VIDEO FLEXIBLE MULTI-PROTOCOL AGGREGATION

Single Channel Application



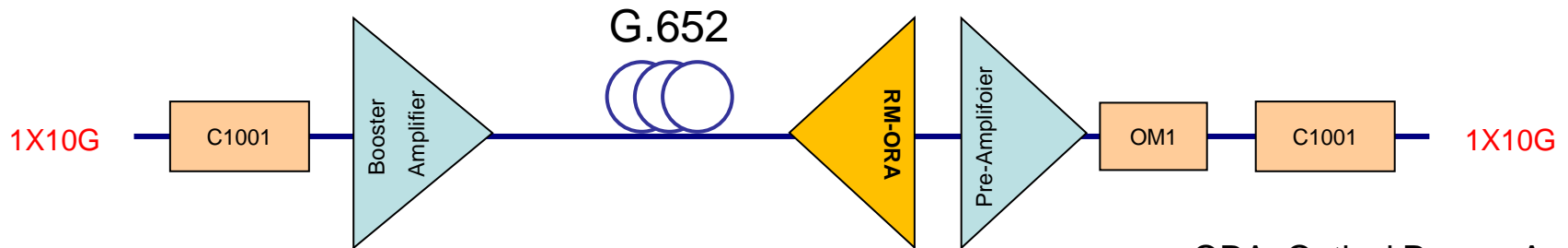
230 kms G652 – 58 dB

4-channels Applications



210 kms G652 – 53dB

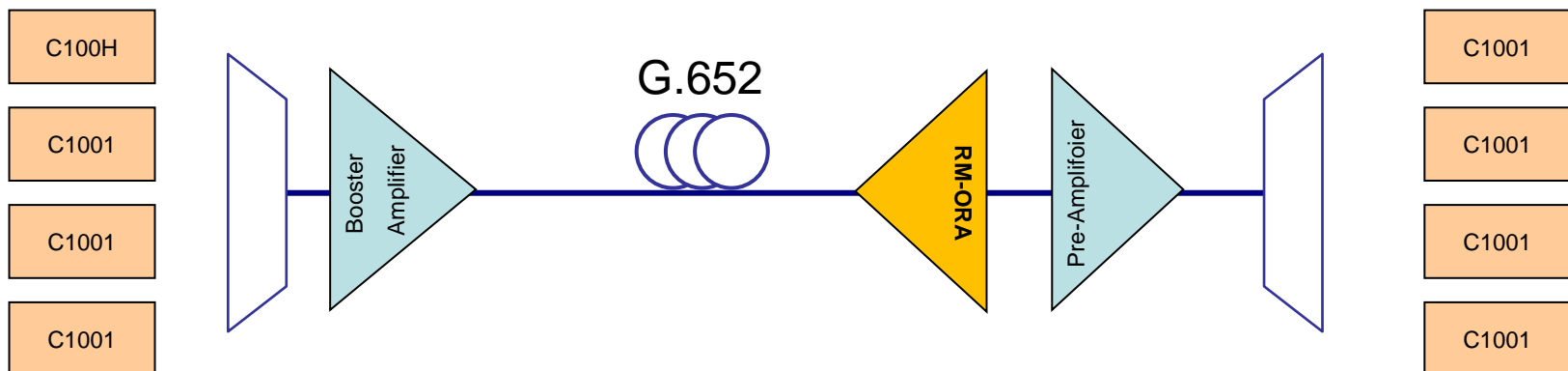
Single Channel Application



ORA: Optical Raman Amplifier

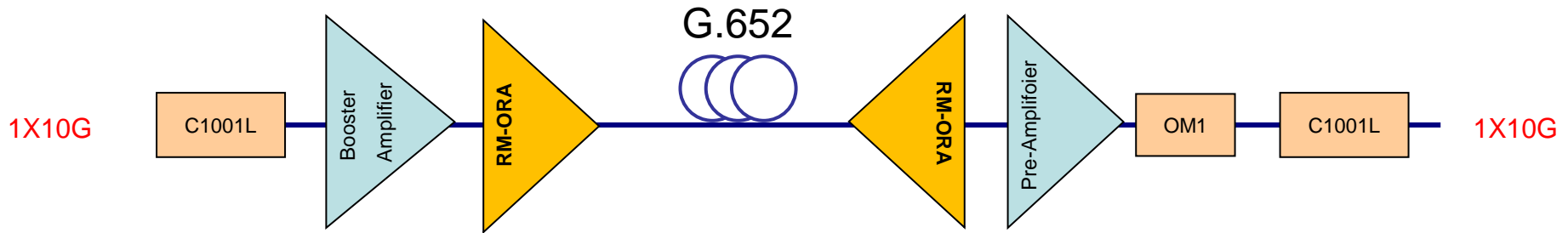
255 kms G652 – 64dB

4-channels Applications



240 kms G652 – 60dB

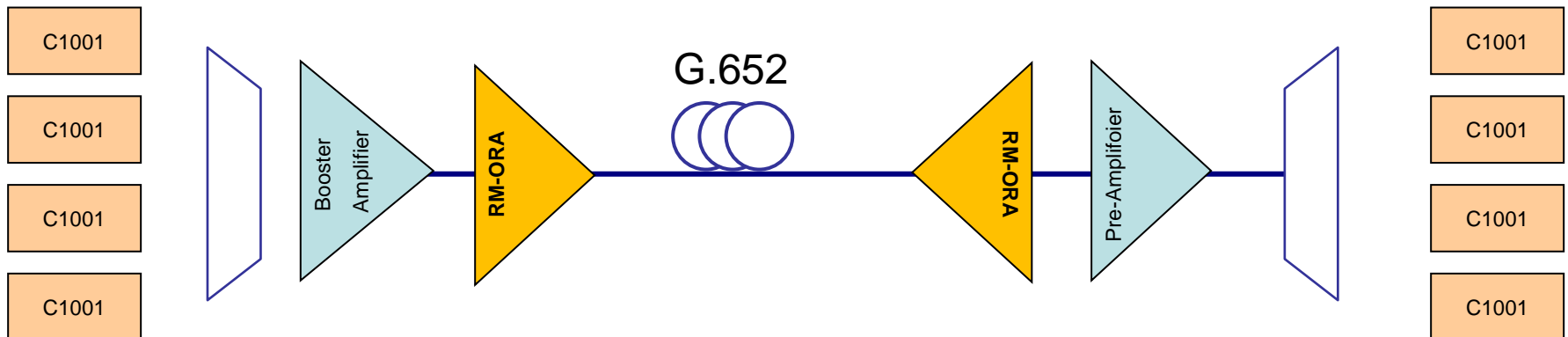
Single Channel Application



270 kms G652 – 68 dB

ORA: Optical Raman Amplifier

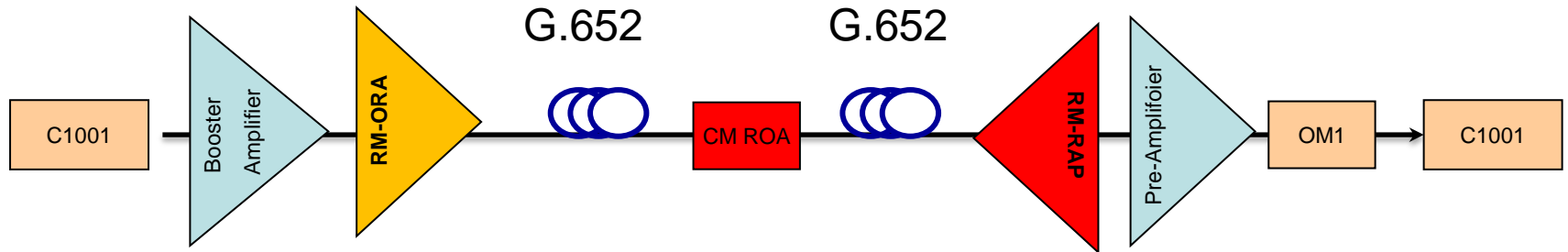
4-channels Applications



255 kms G652 – 64 dB

Remote Optical Amplification

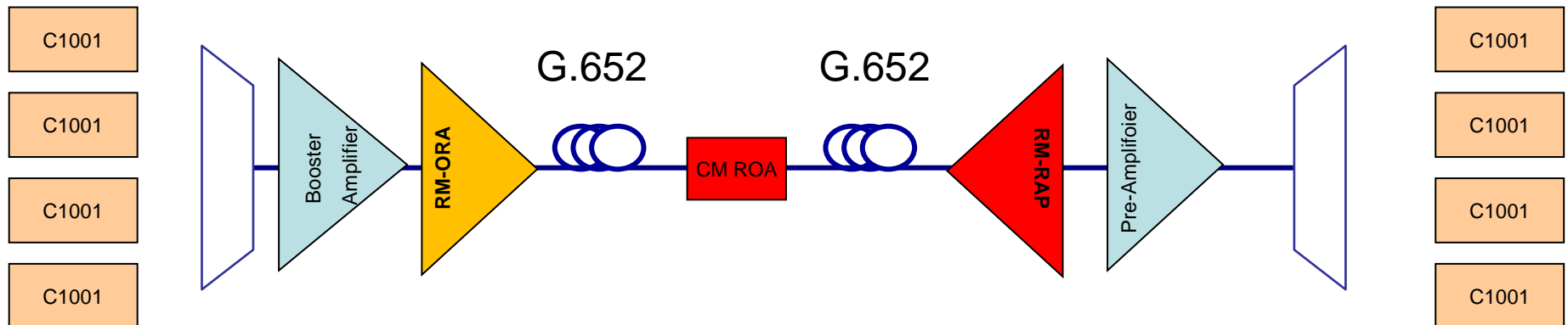
Single Channel Application



300 kms G652 - 75 dB

RAP: Remote Amplifier Pump
ROA: Remote Optical amplifier

4-channels Applications



280 kms G652 – 70dB

Single channel budgets

□ Emission power 17dBm

Single Channel Application @10G						
Booster 17dBm	PreAmp	Raman Amplifier	Raman Booster	RX ROFA	Budget	
					dB	km @0.25dB/km
X	X				58	232
x	x	x			64	256
x	x	x	x		68	272
x	x		x	x	73	292

Single Channel Application @2.5G						
Booster	PreAmp	Raman Amplifier	Raman Booster	RX ROFA	Budget	
					dB	km @0.25dB/km
X	X				63	252
x	x	x			69	276
x	x	x	x		73	292
x	x	x		X	78	312

Tested on a single span of 200kms G652 with ODC 100+60 on RX



4-channels budgets

□ Emission power 20dBm

4 Channels Application @10G						
Booster 20dBm	PreAmp	Raman Amplifier	Raman Booster	RX ROFA	Budget	
					dB	km @0.25dB/km
X	X				54	216
x	x	x			60	240
x	x	x	x		64	256
x	x		x	x	69	276

4 Channels Application @2.5G						
Booster 20dBm	PreAmp	Raman Amplifier	Raman Booster	RX ROFA	Budget	
					dB	km @0.25dB/km
X	X				59	236
x	x	x			65	260
x	x	x	x		69	276
x	x	x		x	74	296

Tested on a single span of 200kms G652 with ODC 100+60 on RX

10-channels budgets

□ Emission power 25dBm

10 Channels Application @10G						
Booster+ OBE25	PreAmp	Raman Amplifier	Raman Booster	RX ROFA	Budget	
					dB	km @0.25dB/km
X	X				57	228
x	x	x			61	244
x	x	x	x		64	256
x	x		x	x	69	276

10 Channels Application @2.5G						
Booster+ OBE25	PreAmp	Raman Amplifier	Raman Booster	RX ROFA	Budget	
					dB	km @0.25dB/km
X	X				62	248
x	x	x			66	264
x	x	x	x		69	276
x	x	x		x	74	296

Tested on a single span of 200kms G652 with ODC 100+60 on RX



Unrepeated Systems: Ekinops modules



□ C1001

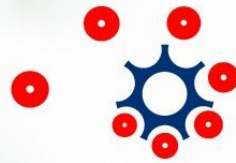
- ⇒ Ekinops Digital Wrapper
- ⇒ High gain FEC
- ⇒ ONSR >12dB
- ⇒ Embedded EDC

□ OABP-EO

- ⇒ Native output power 17dBm
- ⇒ Delivers 20dBm output power with a PUMP3 module

□ RM-ORA

- ⇒ 2 pumps version: 10dB gain on SMF (on RX side)
- ⇒ 3 pumps version: 14dB gain on SMF (on RX side)
- ⇒ Gain saturation when used at Tx, still some 2dB gain achievable compared to booster alone.



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Thank You



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