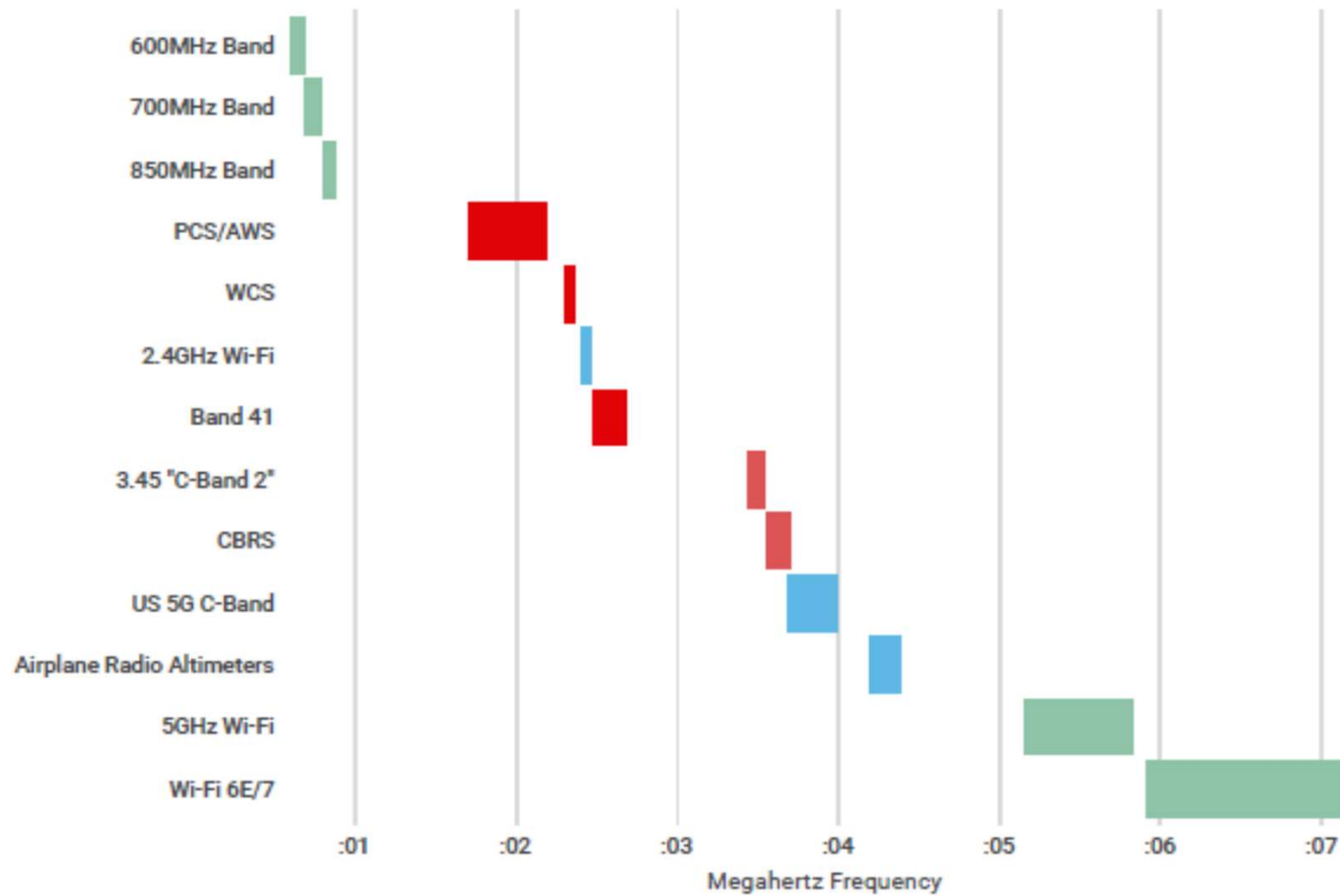


5G C-Band Interference Mitigation Solutions

June 14, 2023

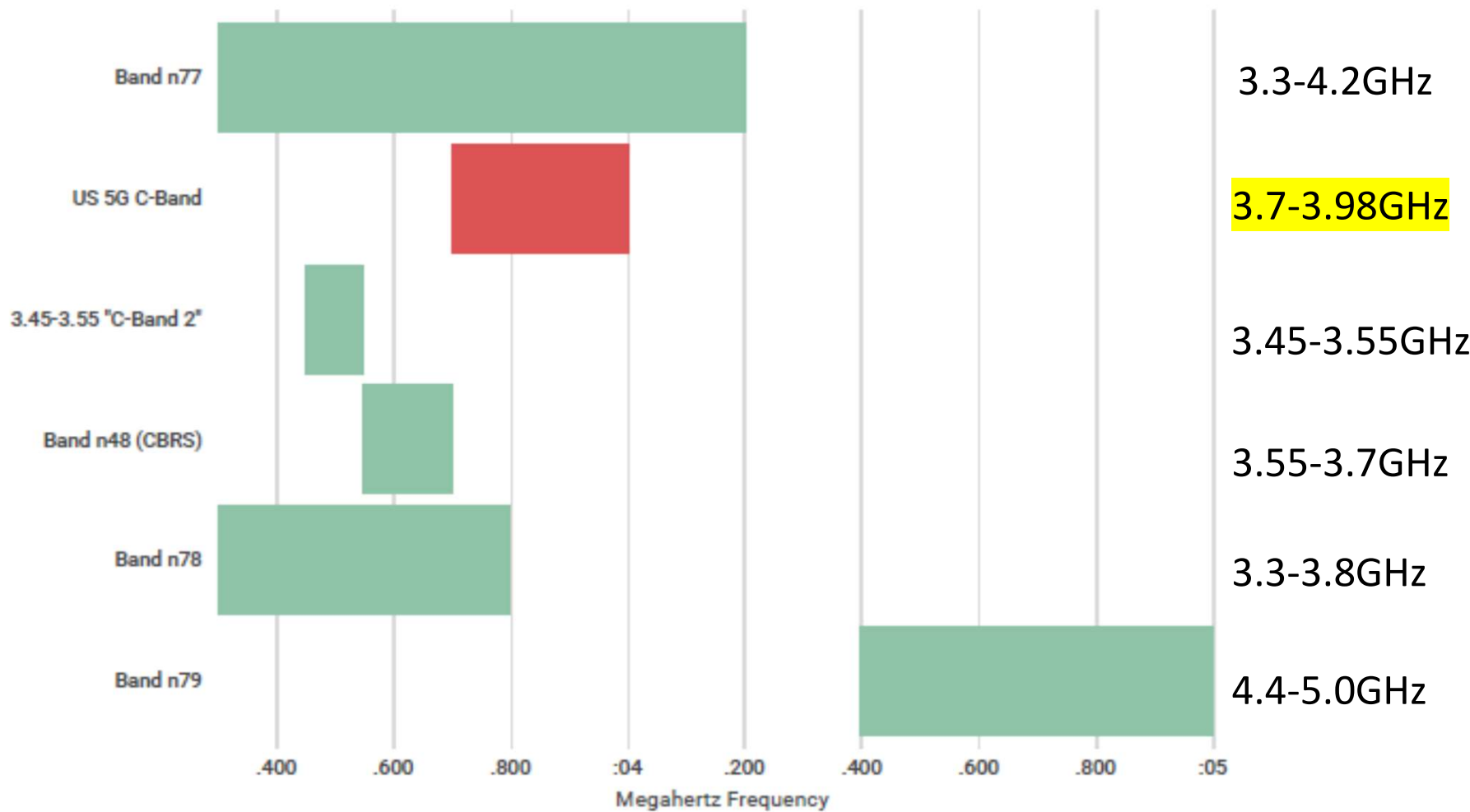
Edward Liang, PhD, MCV Microwave East, Inc.

Common US Spectrum Bands

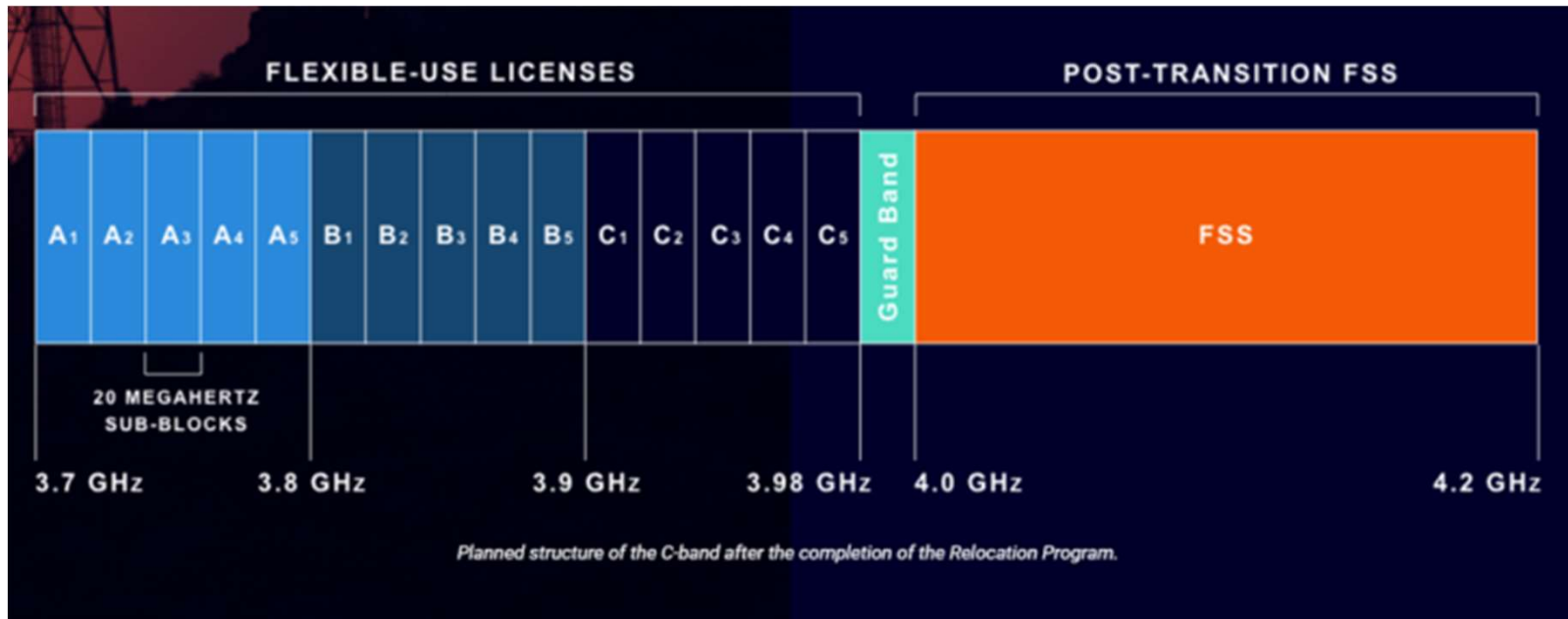


(The chart above shows the primary wireless carrier user of each band; it does not include minor users)

C-Band Classes



C-Band Satellite Earth Station



The new 5G cellular network operates at 3.3 to 3.6 GHz poses interference concerns with the C-band satellite communication terminals which receive Space-to-Earth signals in the 3.4 to 4.2 GHz band and transmit signals in the range of 5.85 GHz to 6.425 GHz. It can also interfere with radio altimeters operate between 4.2-4.4GHz. In the case of Satcom, the interference-mitigating LNB does not completely eliminate the interference problem and some additional filtering before the LNB may be required. This paper presents McV RED and BLUE filter solutions which successfully suppress all spurious signals for Satcom receive and transmit frequencies.

C-BAND EARTH STATIONS 5G FILTERS SPECIFICATIONS

The specifications for C-band satellite earth stations filters are used to prevent harmful interference from 5G signals included in the FCC Report and Order of Proposed Modification (FCC 20-22) in the matter of "Expanding Flexible Use of the 3.7 to 4.2 GHz Band" (adopted February 28, 2020). The filter rejection specifications contained in this document comply with the filter mask requirements in the FCC Report and Order.

100+20 MHz "Red" Filter

Electrical Characteristics	Passband	3820 - 4200 MHz
	Group delay variation within +/- 0.5 MHz	1.45 nSec max
	Insertion Loss in Pass Band	1.3 dB max
	Return Loss	20 dB min
	Rejection from 3700 MHz to 3720 MHz	70 dB min
	Rejection from 3720 MHz to 3800 MHz	60 dB min
	Rejection from 3800 MHz to 3805 MHz	30 dB min
	Rejection from 3805 MHz to 3820 MHz	0 dB min
Mechanical Characteristics	Rejection above 4230 MHz	25 dB min
	Interfaces	CPR-229G & CPR-229F Through holes both ends
	Size (L x W x H)	
	Length inclusive of flanges	6.75" x 3.00" x 2.00"
	Width and height exclusive of flanges	6.75" x 3.00" x 2.96"
	Width and height inclusive of flanges	6.75" x 3.00" x 2.96"
Operating Temperature	-40° C to +50° C	
Finish	Matte white light textured paint	

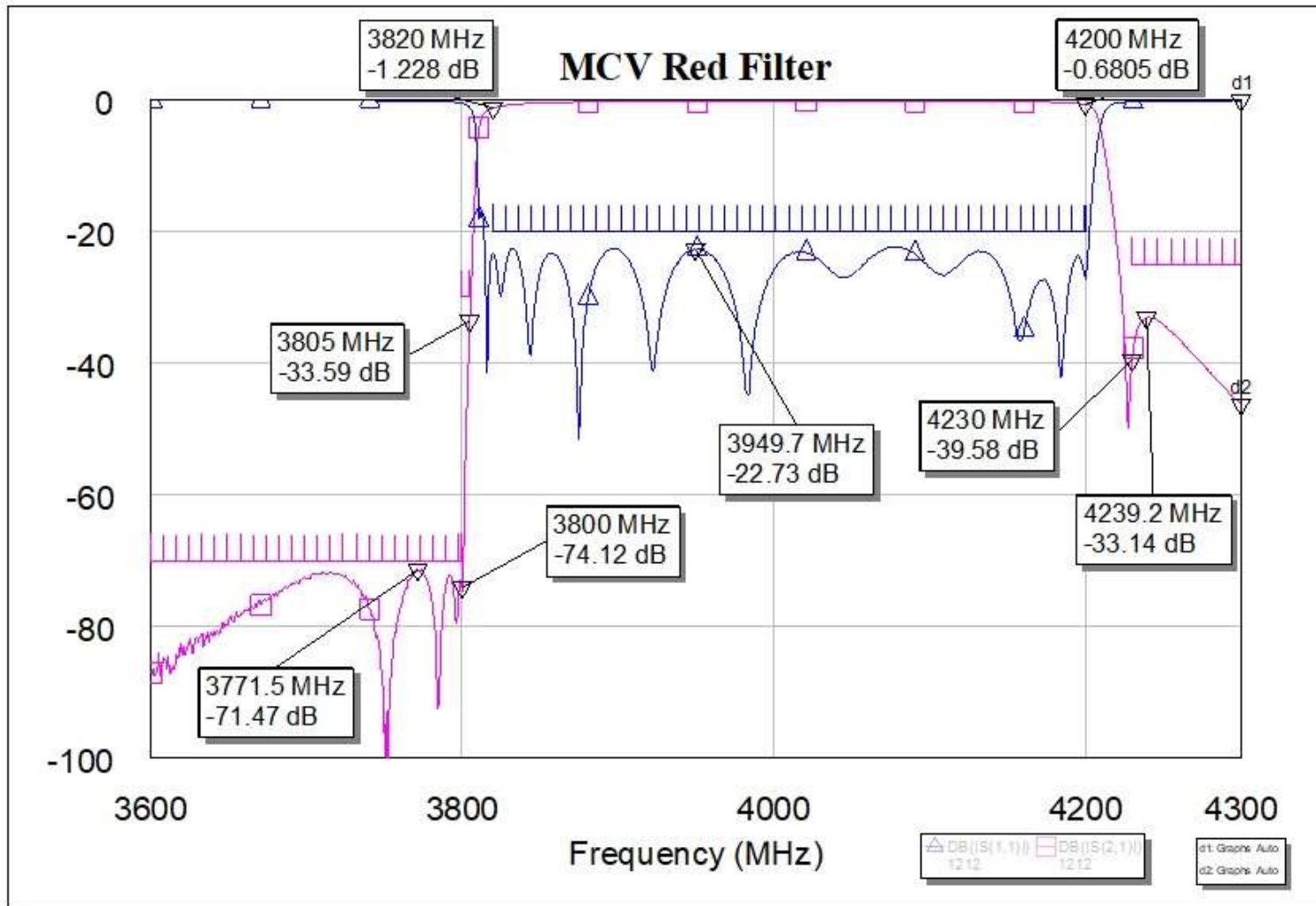
McV RED



Electrical Specifications

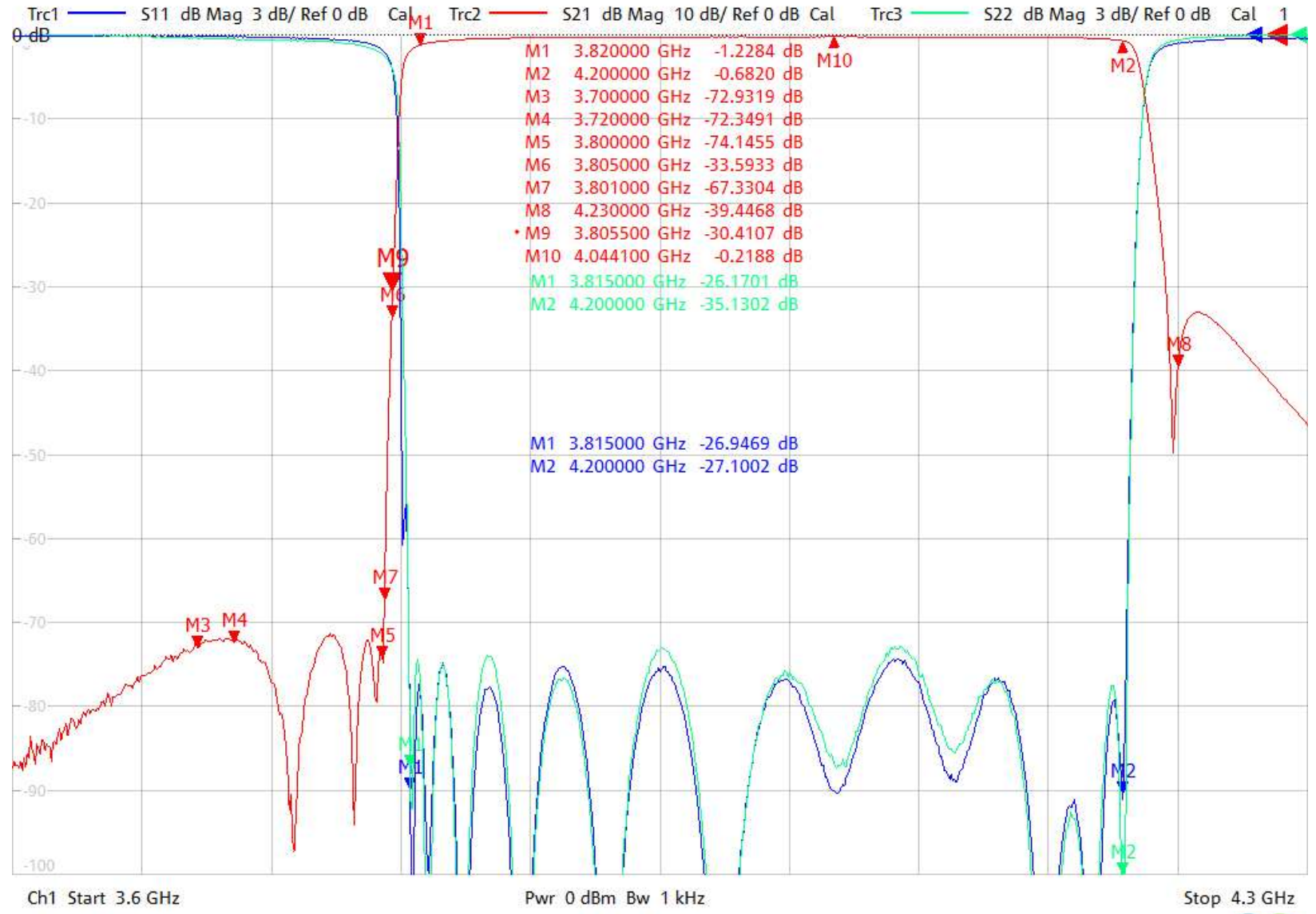
PASSBAND	3820 – 4200 MHz
PASSBAND INSERTION LOSS	1.3 dB Max.
PASSBAND RETURN LOSS	18 dB Min.
REJECTION	
3700 – 3800 MHz	70 dB Min.
3800 – 3805 MHz	30 dB Min.
4230 – 5000 MHz	25 dB Min.
5000 – 6450 MHz	40 dB Min.
Group Delay Variation	2nS Max. over any 1 MHz Band
Power Handling	100 W Avg.

McV RED



McV RED

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280+20 MHz "Blue" Filter

Electrical Characteristics	Passband	4000 - 4200 MHz
	Group delay variation within +/- 0.5 MHz	1.45 nSec max
	Insertion Loss in Pass Band	1.3 dB max
	Return Loss	20 dB min
	Rejection from 3700 MHz to 3900 MHz	70 dB min
	Rejection from 3900 MHz to 3980 MHz	60 dB min
	Rejection from 3980 MHz to 3985 MHz	30 dB min
	Rejection from 3985 MHz to 4000 MHz	0 dB min
	Rejection above 4230 MHz	25 dB min
Mechanical Characteristics	Interfaces	CPR-229G & CPR-229F Through holes both ends
	Size (L x W x H)	
	Length inclusive of flanges	
	Width and height exclusive of flanges	6.75" x 3.00" x 2.00"
	Width and height inclusive of flanges	6.75" x 3.00" x 2.96"
	Operating Temperature	-40° C to +50° C
	Finish	Matte white light textured paint

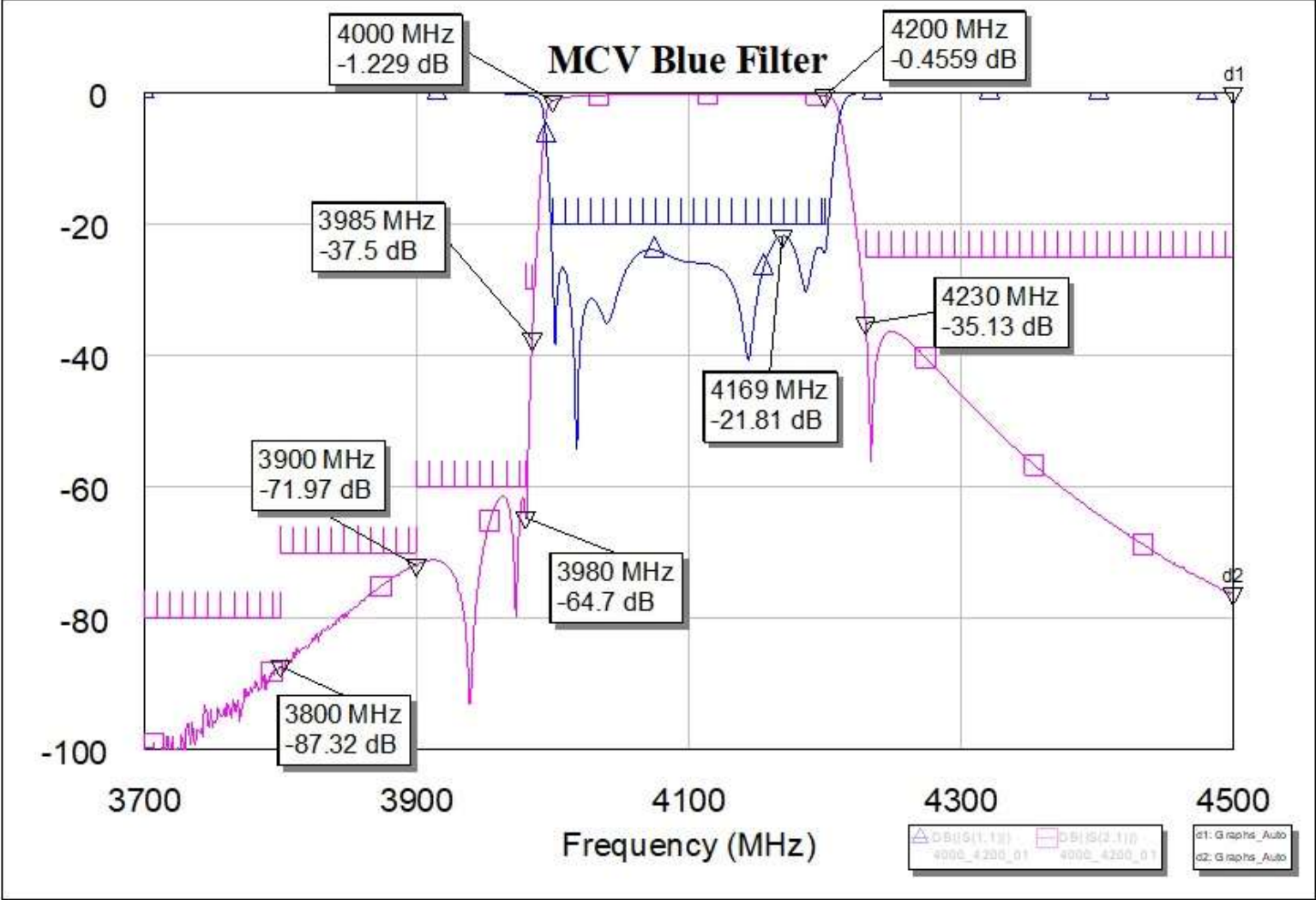
McV BLUE

Electrical Specifications



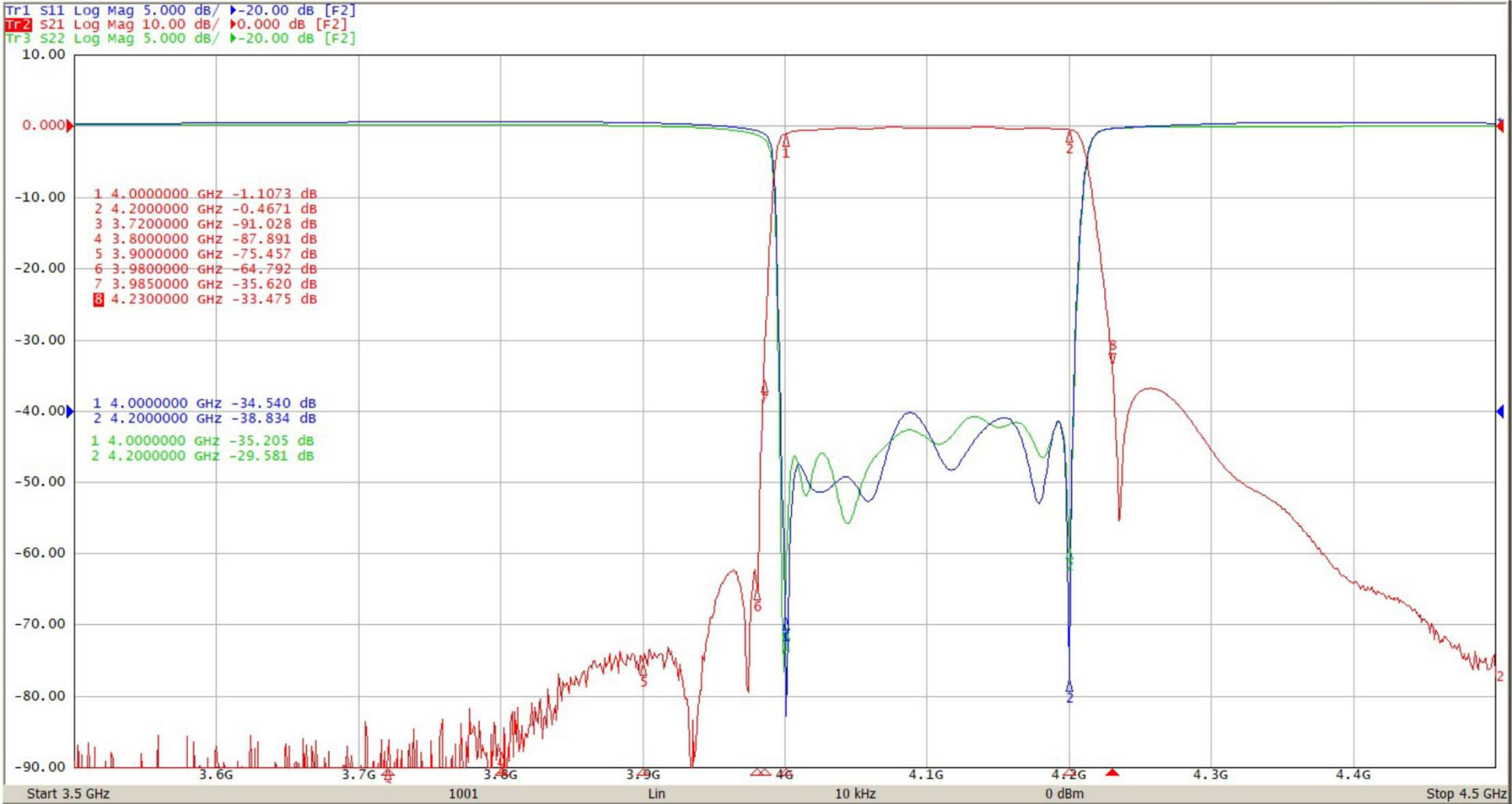
PASSBAND	4000 – 4200 MHz
PASSBAND INSERTION LOSS	1.3 dB Max. (25 ± 5° C); 1.4 dB Max.
PASSBAND RETURN LOSS	18 dB Min.
REJECTION	
3720 – 3800 MHz	80 dB Min.
3800 – 3900 MHz	70 dB Min.
3900 – 3980 MHz	60 dB Min.
3980 – 3985 MHz	30 dB Min.
4230 – 5000 MHz	25 dB Min.
5000 – 6425 MHz	40 dB Min.
Power Handling	100 W Avg
Group Delay Variation	2nS Max. over any 1 MHz Band

McV BLUE

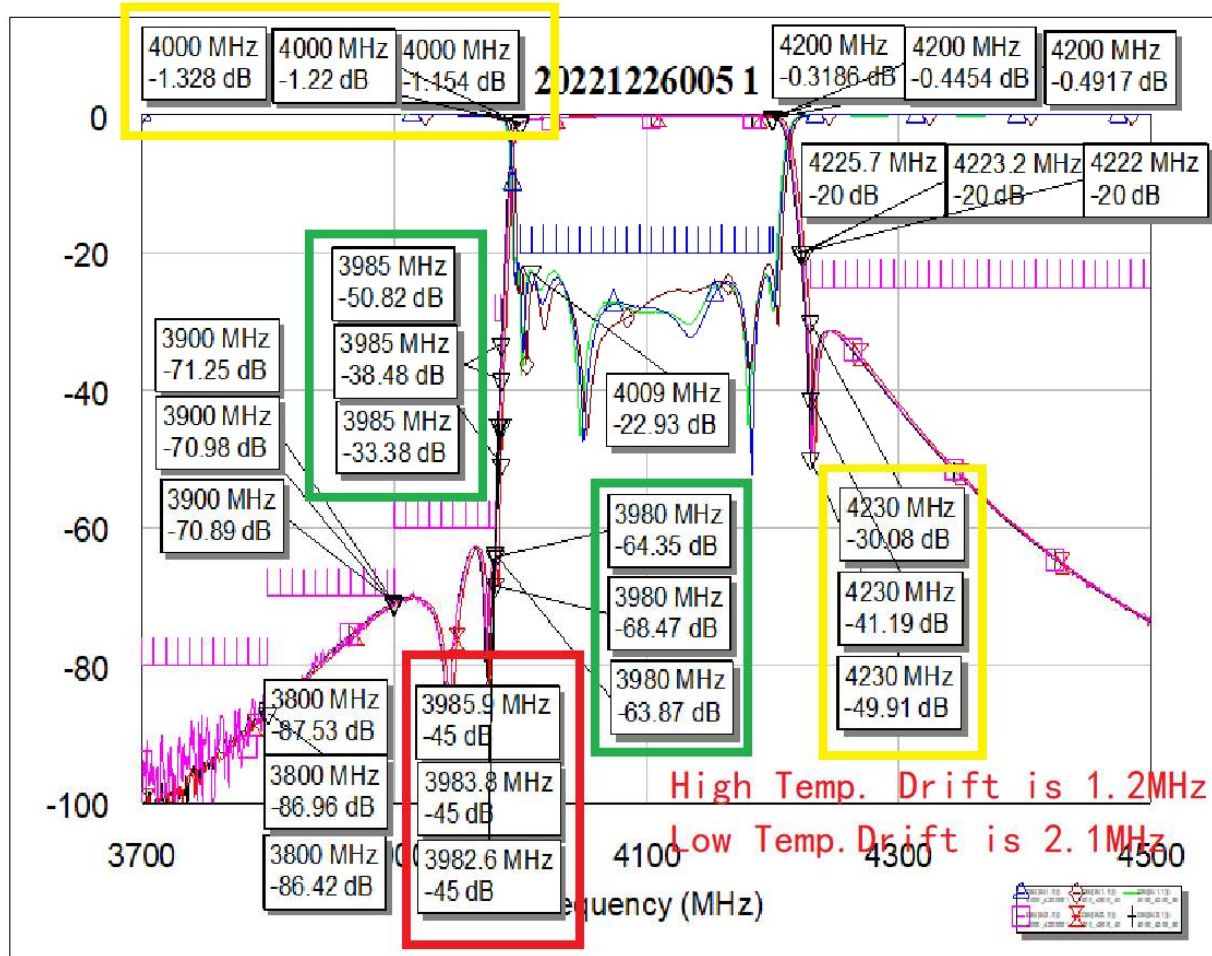


McV BLUE

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McV BLUE



5G C-Band 3700-4200 MHz Bandpass Filter Example #1

Parameter	Unit	Specification
Center Frequency (Fc)	MHz	3950
Passband	MHz	3700 ~ 4200 min.
Passband Insertion Loss	dB	1.5 max. (excluding connectors)
Passband Return Loss	dB	17 min.
Rejection	dB	60 min @ 3500 MHz
		60 min @ 3600 MHz
		60 min @ 3670 MHz
		60 min @ 3680 MHz
		30 min @ 4230 MHz
		40 min @ 4250 MHz
Group Delay	ns	16 max. within ± 5 MHz
Average Power	W	100 max.
In / Out Impedance	Ohms	50
In / Out connection	-	CPR-229G / CPR-229F
Operating Temperature Range	°C	-40 to +65
Dimensions (including flanges)	mm	130.0 x 98.4 x 69.9 (L x W x H)
Weight	kg	0.85
External Finish	-	White
Sealing (mated)	-	IP66
RoHS	-	Yes

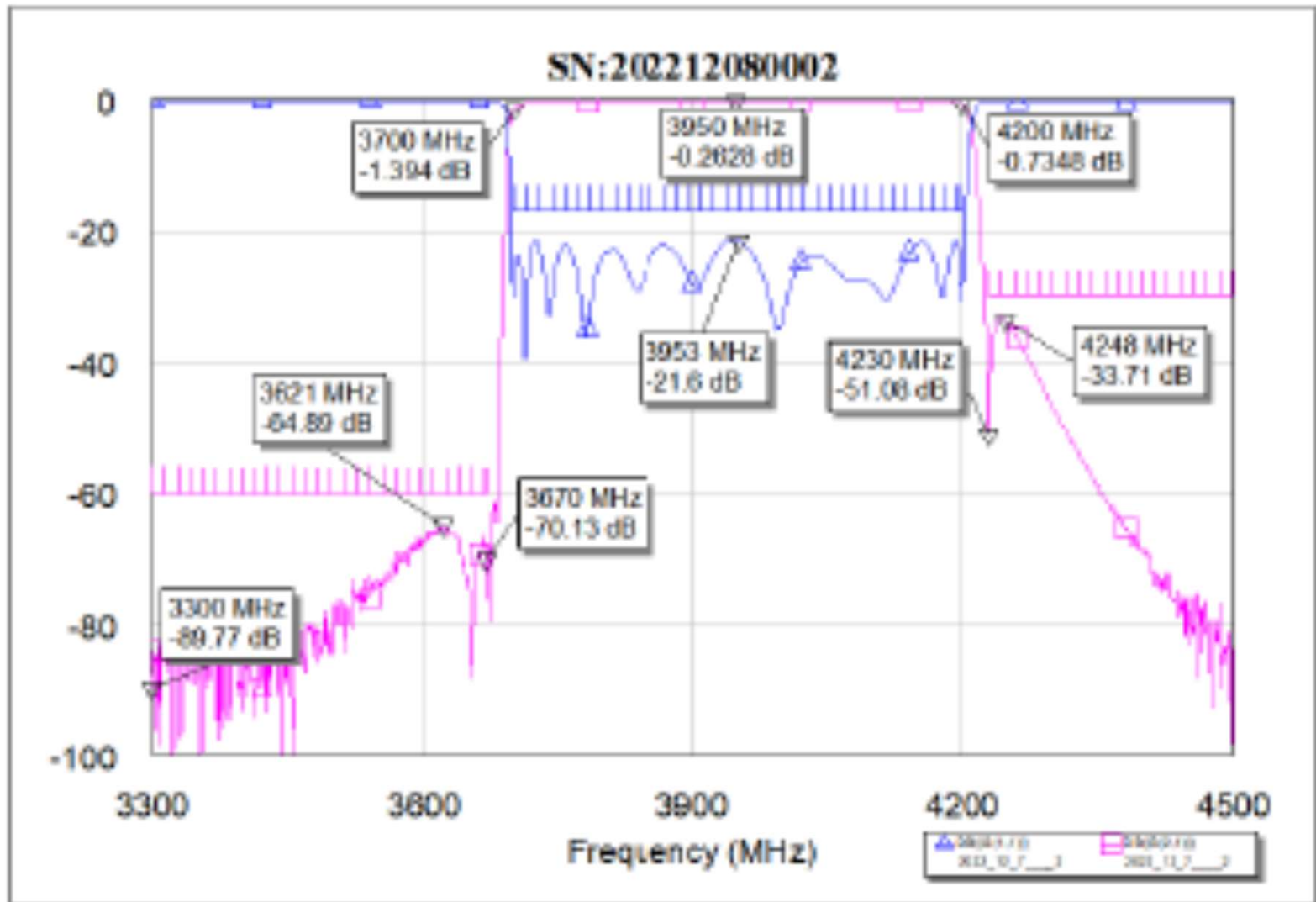
5G C-Band 3700-4200 MHz Bandpass Filter Example #2

Parameter	Unit	Specification
Center Frequency (Fc)	MHz	3950
Passband	MHz	3700 ~ 4200 min.
Passband Insertion Loss	dB	0.5 max. (including connectors)
Passband Ripple	dB	0.2 max.
Passband Return Loss	dB	18 min.
Rejection	dB	75 min @ 3400 to 3500 MHz
		70 min @ 3500 to 3600 MHz
		75 min @ 5800 to 6500 MHz
Group Delay	ns	8 max.
Average Power	W	100 max.
In / Out connection	-	CPR-229G / CPR-229F
Operating Temperature Range	°C	-40 to +65
Dimensions (including flanges)	mm	120.0 x 98.4 x 69.9 (L x W x H)
Weight	kg	0.7
External Finish	-	White
Sealing (mated)	-	IP66
RoHS	-	Yes

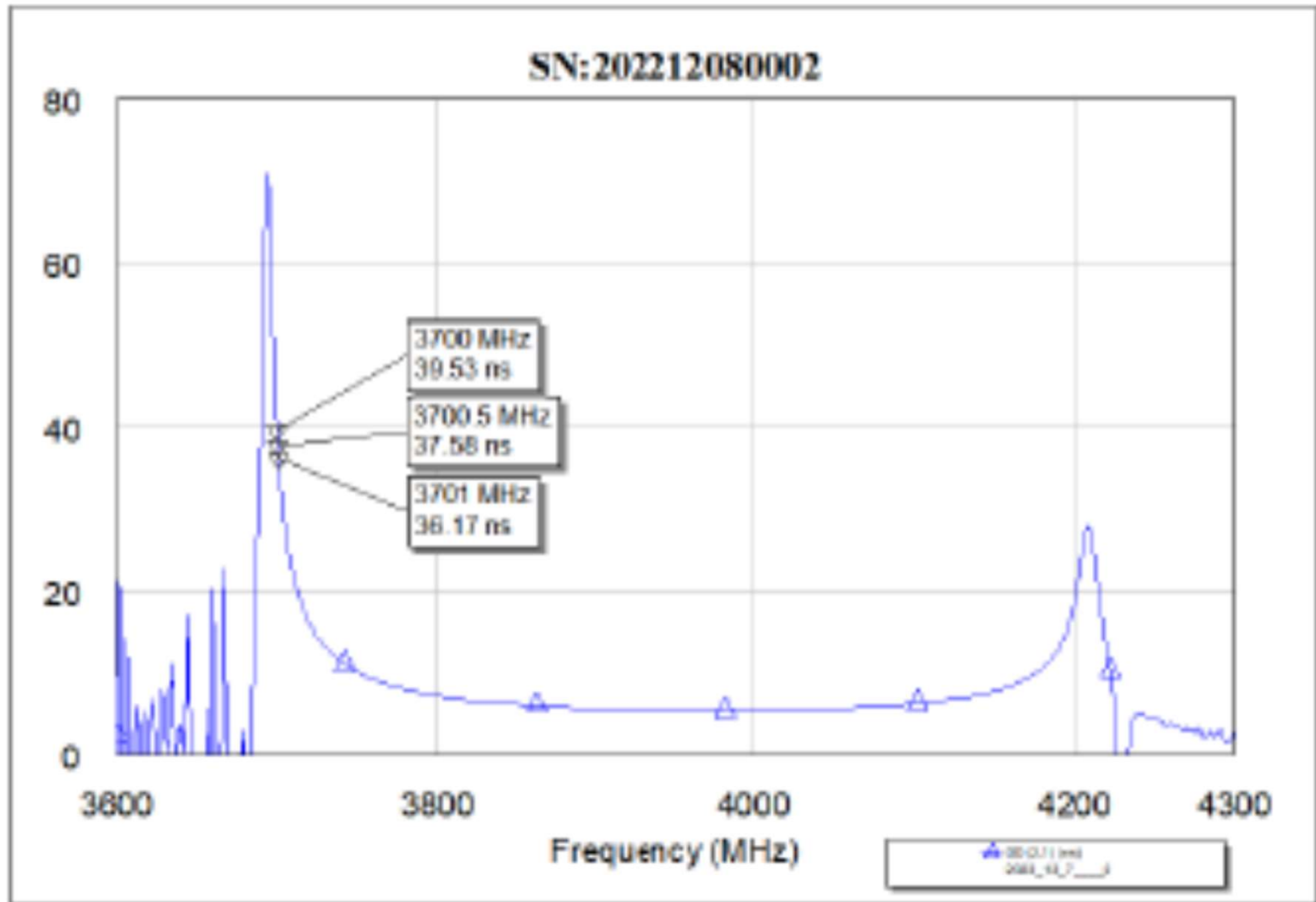
5G C-Band 3700-4200 MHz Bandpass Filter Example #3

Parameter	Unit	Specification
Center Frequency (Fc)	MHz	3950
Passband	MHz	3700 ~ 4200 min.
Passband Insertion Loss	dB	0.5 max. @3950 MHz; 1.5 max @3700 & 4200 MHz
Passband Return Loss	dB	17 min.
Rejection	dB	60 min @ 3300 to 3670 MHz
		30 min @ 4230 MHz and higher
Group Delay Variation within ± 0.5 MHz	ns	3 max.
Average Power	W	100 max.
In / Out connection	-	CPR-229G / CPR-229F
Operating Temperature Range	°C	-30 to +60
Dimensions (including flanges)	mm	160 x 99 x 70.5 (L x W x H)
Weight	kg	1.0 max.
External Finish	-	White
Sealing (mated)	-	IP67
RoHS	-	Yes

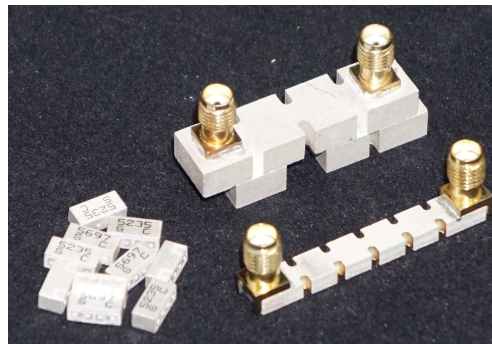
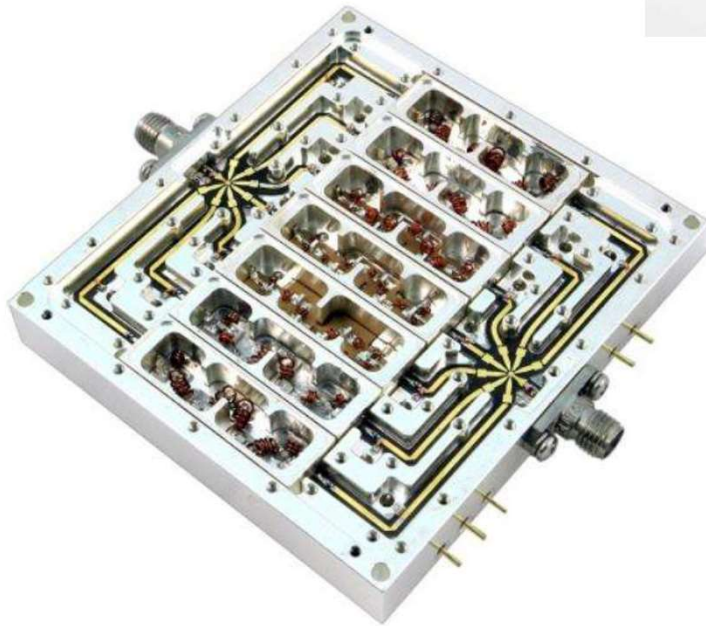
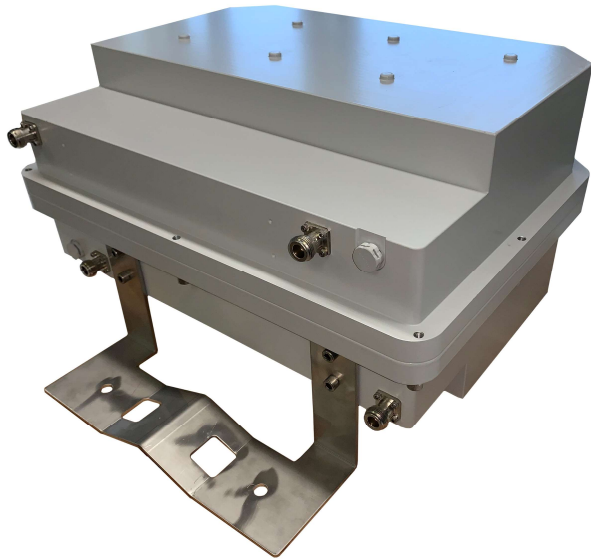
5G C-Band 3700-4200 MHz Bandpass Filter Example #3



5G C-Band 3700-4200 MHz Bandpass Filter Example #3



MCV Product Offering





- **MATERIALS**
- **CUSTOMER CENTRIC**
- **VERTICALLY INTEGRATED**

Discover how our materials expertise, customized solutions, and state-of-the-art US manufacturing and testing facility, can meet your RF microwave materials and filters requirements.

