PROPERTIES AND PERFORMANCE OF THE NEW LEICA TRINOVID 7X35B (=HERE NAMED RETROVID) COMPARED WITH OLDER LEITZ-LEICA TRINOVIDS AND WITH BINOCULARS FROM BECK, FOTON AND THE NEW KOWA 6,5X32.

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INTRODUCTION.

In 1953 Leitz filed a patent request for a roof prism binocular with a remarkable design: a roof prism and two mirrors. Another remarkable feature was the focussing wheel with a built-in diopter adjustment and a fully internal focussing system to prevent intrusion of dust and moisture into the binocular body. Because of these three new features this new binocular was named TRINOVID from TR=three, NOV= novelties and VID= video=see. Two models were made: 7x42 (FOV170m/1000m) and 8x40 (FOV 80m/1000m). It was the Trinovid-1 series launched in 1958. Not very many were made for different reasons among others because of the high price and because of the complicated repair proces.
In 1963 Leitz introduced a new range of Trinovid binoculars: the Trinovid-2 series with the models 6x24, 8x32 and 10x40.

– *THE 7X35B LEITZ TRINOVID-2*

This Trinovid-2 range was in May 1965 extended with the introduction of the 7x35B Trinovid, the first Leitz binocular with roll-down rubber eyecups to give spectacle users better access to the whole field of view.

At the end of the seventies production of the 7x35B was stopped, but started again around 1982 because of the many requests from customers for this binocular, so Leitz restarted production of the binoculars again in the time period 1982-1988. Around 2016-2017 Leica developed plans to restart production of the Trinovid-2 series 7x35, 8x40 and 10x40. It took until 2019 until they came in limited amounts available and that only in special Leica shops, not in regular binocular shops.

In this paper we have investigated three original 7x35B Trinovids from 1966, 1982 and 1986 respectively. The performance of these binoculars was compared with the new Leica Trinovid 7x35 B, here indicated as the Leica Retrovid 7x35B based on a proposal on the WEB-site Birdforum to use this name for the new Trinovids.

Figure 1. From left to right: Leitz Trinovid 7x35B (1966), Leitz trinovid 7x35B (1982, Leitz Trinovid

7x35 BA (1986) and Leica Retrovid 7x35BA (2020)

*T*he new 7x35B Retrovid (as well as the 8x40 and 10x40 Retrovids) does not have roll down rubber eyecups, but eyecups that can be pulled out/pushed in, a construction also used in other binoculars, see figure 1. Two less known roof prism binoculars were also included in the test: The Beck Diorit 8x30 and the Russian Foton 7x35. N.B. The Leitz Trinovids were all optically except for the 7x35B from 1966. This binocular was not perfectly clean inside, hardly visible, but it affects light transmission, as shown by the measured very low light transmission. Cleaning will undoubtedly help, but we did not do that since it shows the possible problems when buying used binoculars.

The original Leitz Trinovids had Uppendahl roof prisms, whereas the new Leica Retrovids were supplied with Schmidt-Pechan roof prisms. Both prisms have six reflective surfaces and in both prisms one of the surfaces has to be supplied with a reflecting mirror to avoid light losses due to non-perfect reflections on that surface. Nowadays these reflective mirrors consist of di-electric coating materials, which are very effective and not sensitive to oxidation etc. like the silver coatings, see Figure 2.

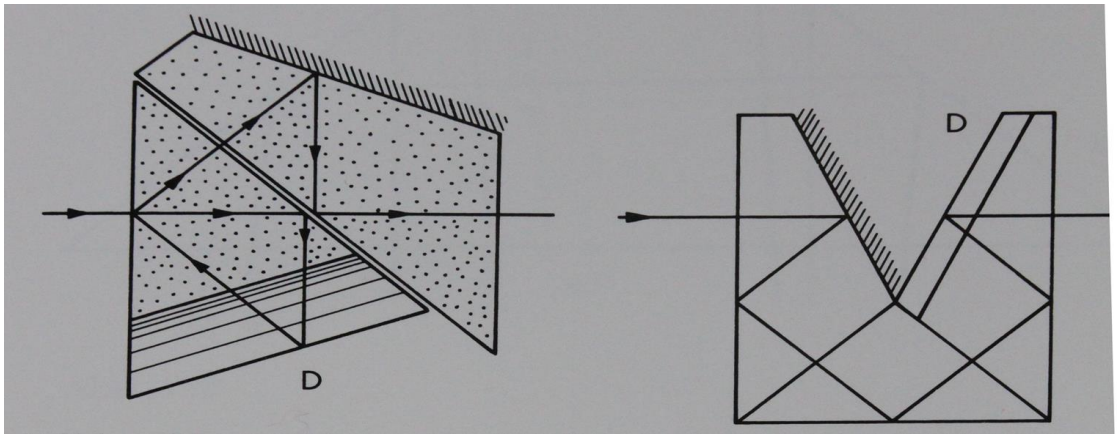


Figure 2. Schmidt-Pechan Roof prism (left) and Uppendahl roof prism (right). The mirror surfaces are indicated (Figure from Dr. Seeger, "Feldstecher. Fernglaeser im Wandel der Zeit", Bresser, 1989)

– ***Beck Diorit 8x30 and Foton 7x35.***

For those not familiar with Beck: The company Christoph Beck & Söhne (CBS) started in March 1892 in Kassel. The company made among others binoculars and microscopes of excellent quality. Especially the TORDALK 11X80 and 22X80 binoculars were highly valued by users. The binocular program consisted mainly of different types of binoculars with porro-prisms, but for a short time also two roof prism binoculars were produced: the Beck Diorit 7x35 and 8x30. They are well made with a specific design. We had only the Diorit 8x30 available for this test. Since I had no information about the year of production of the Diorits, I guessed the year of production as 1973, but it seems more likely that it is produced around 1965. The Russian Foton binoculars look a bit like the East German Zeiss Notarem binoculars, but I did not check that in depth. Two different Foton models were made: a 7x35 and a 10x40. The Foton 7x35 is tested here. It is reported to be waterproof, but we did not investigate that.

Figure below: left Beck Diorit 8x30, right Foton 7x35.

– COMPACT LEITZ-LEICA TRINOVIDS/ULTRAVIDS.

Figure 4. From left to right: Leitz Trinovid 8x20C (1978), Leica Trinovid 8x20BC (1998), Leica Ultravid 8x20 (2004) and Kowa 6,5x32 (2019).

– THE LEITZ-LEICA COMPACT TRINOVIDS AND THE ULTRAVID.

In the beginning of the nineteen seventies the Leitz design team developed some protoypes for a series of new compact binoculars. Production of it started in 1974 with the models 8x20C and 10x22 C, where C stands for Compact. The binoculars had internal focusing and a diopter adjustment control around the right-side eyepiece. The first ones had hard eyecups (an example is tested here) but later designs had pull out-push in eyecups (the Trinovid BC series). The binoculars were showerproof but not completely water tight. In the BC Trinovids the right eye diopter control was moved from the eyepiece to a new position around the objective barrel, see the Titanium Trinovid BC from 1998 investigated here.
N.B. Because of the measured low light transmission of the Leitz 8x20C it was carefully inspected over and over, but we did not observe pollution of the internal optical system.

In the beginning of the new millenium Leica introduced another compact line: the Ultravids 8x20 and 10x25. These compacts have an internal focussing system and a completely new body design, see figure 4. The Ultravid minis can also be considered as excellent quality compacts.

- ***KOWA 6,5X32: A REMARKABLE COMPACT BINOCULAR***

In 2019 Kowa introduced an attractive compact binocular with a large field of view: the Kowa BD II-32 6,5X32 XD. In figure 4 above this binocular is shown to the far right. Its performances are investigated here also, see table 2 and the transmission graphs. The binocular offers attractive features like a large field of view, a short close focusing distance, lower magnification for good observation stability, handling comfort all right, although the strap rings may fit close in the palm of the hand and that can be painful. The price is attractive.

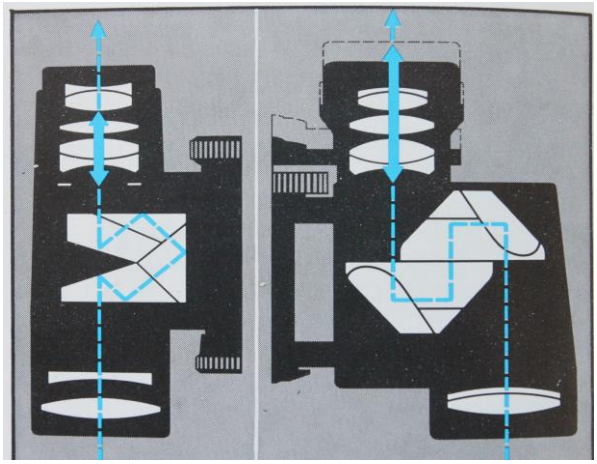


Figure 5. Schematic cut away from a Leitz Trinovid (left) and a porro prism binocular (right)

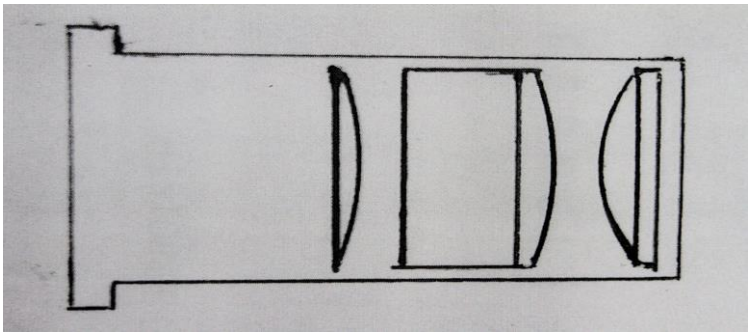


Figure 6. Schematic drawing of a Leica Retrovid eyepiece.

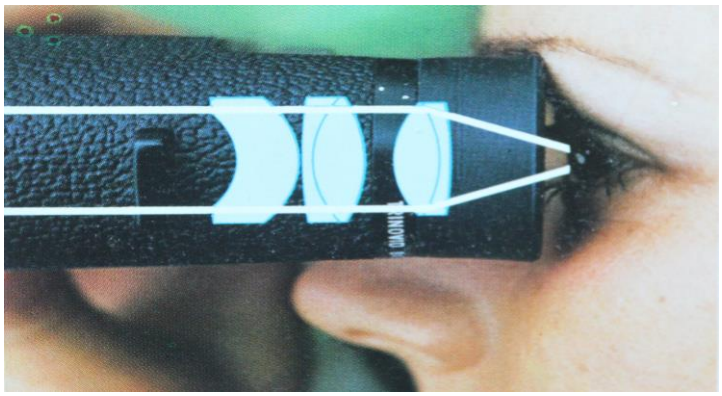


Figure 7. Scheme of a Leitz Trinovid eyepiece (from an old Leitz flyer).

CONCLUSIONS.

-1- The Leica/Leitz compacts.

- The Leitz 8x20 C from 1978 is still in the present time an attractive binocular, easy to handle and with a good optical quality except for the fairly low light transmission.

- The Leica Trinovid 8x20BC Titanium from 1998 is a very nice compact binocular, with good handling comfort and very good optical quality.

- The Leica Ultravid 8x20 can be considered as one of the best compact binoculars on the market: excellent handling comfort and with a very high optical quality.

-2- The new Leica Retrovid 7x35B is as far as body construction/appearance is concerned a perfect copy of the beautiful original Leitz/Leica Trinovids 7x35B from the sixties-seventies and eighties, but it now has pull-push eyecups which is more attractive than the original foldable rubber eyecups. Handling comfort is excellent just like the original Trinovids. The original 7x35B Trinovids had a larger field of view, whereas the Leica Retrovid has 8-9% higher light transmission over the whole measured spectrum which yields a brighter image. Both the old Trinovids as the Retrovid show minor remnants of color dispersion.

Personally I prefer the original Leitz-Leica Trinovid of the most recent production of 1982-1986 over the new Leica Retrovid from 2019-2020 because of the slightly larger field of view.

-3- The Beck Diorit 8x30 and the Foton 7x35 are interesting binoculars certainly from a collectors point of view. With regard to user comfort and optical quality they stay behind as compared to the most modern roof prism binoculars. Nevertheless, they are still useful binoculars for users with a low budget.

-4- The Kowa BD II-32 6,5x32 XD is for its price of 399 euros an excellent binocular: compact with good handling comfort, good optical quality and rock steady image quality due to its lower magnification of 6x (we could not confirm 6,5x). Especially its large field of view, short close focus and bright image quality (high light transmission in combination with a 5,3 mm exit pupil) makes this a very attractive instrument. The only disadvantage is the placement of the lugs for the carrying strap, which can be rather painful when using the binocular, since they fall in the most sensitive part of the hands.

Acknowledgments: I am grateful to Ing. Dave van den Heuvel for his efforts to realize the presented transmission spectra and to Jan van Daalen, House of Outdoor (www.houseofoutdoor.com) and some other collectors for the supply of different binoculars for this test.

BECK BINOCULARS

Below: ***Flyer of Beck binoculars also containing the technical data of the two Diorit models that were made by Beck. As far as I know these are the only roof prism binoculars made by Beck. The company however did have a large production programme of porro prism binoculars.***

Different models listed in other Beck flyers are for example: Beck Merkur mini 8x20, three different types of 8x30 binoculars from which the 8x30W is remarkable with its FOV of 175m/1000m.
Two types of Beck Merkur 8x40, the 8x40W with FOV of 158m/1000m, three different Merkur 7x50 models, the Merkur 8x56, 10x40 and two Merkur 10x50 models.

Another Beck flyer lists the: Kolibri 4,5x20 (FOV 175m/1000m), Kobold 7x20, Zenith 8x30, Stern 8x32, Diana 8x40, Condor 8x45, Diana 8x40W, Luchs 7x50, Saturn 15x60, Merkur 20x60, Comes 30x60, Tordalk 11x80, Planet 22x80, Ozelot 8x30, Avus 8x30W, Jagdfalke 7x50, Jagdfalke 10x50, Hogla 8x56 and Hogla 10x56

This is only a review of two Beck flyers, which makes it clear that Beck was at that moment in time an important player in the German binocular world.

Optisch-technische Daten

CBS-Modell	Austritts-pupille mm	Geometr. Lichtstärke	Dämmerungszahl	Gesichtsfeld 1000 m	Gesichtsfeld in Graden	Artikel-Nr. Fernglas	Artikel-Nr. Etui	Gewicht in g	Höhe mm
DIORIT 8x30	3,75	14,0	15,5	130	7,4	234.01	296.50	430	135
DIORIT 7x35	5,0	25,0	15,7	140	8,0	235.01	296.50	535	150
OZELOT 8x30	3,6	13,0	15,5	130	7,4	229.51	296.06	450	122
AVUS 8x30 W	3,75	14,0	15,7	148	8,2	230.51	296.06	450	114
CONDOR 8x45	5,6	31,4	19,0	110	6,3	216.01	296.25	580	167
LUCHS 7x50	7,15	51,0	18,7	128	7,3	220.01	296.34	870	176
JAGDFALKE 7x50	7,1	51,0	18,7	105	5,9	218.01	296.31	690	186
JAGDFALKE 10x50	5,0	25,0	22,4	100	5,6	219.51	296.31	690	182
TORDALK 11x80	7,2	51,8	29,7	80	4,6	225.01	296.42	1570	285
TORDALK 15x80	5,3	30,3	34,7	75	4,3	232.01	296.42	1675	282
TORDALK 22x80	3,6	13,0	42,0	55	3,2	226.01	296.42	1490	285

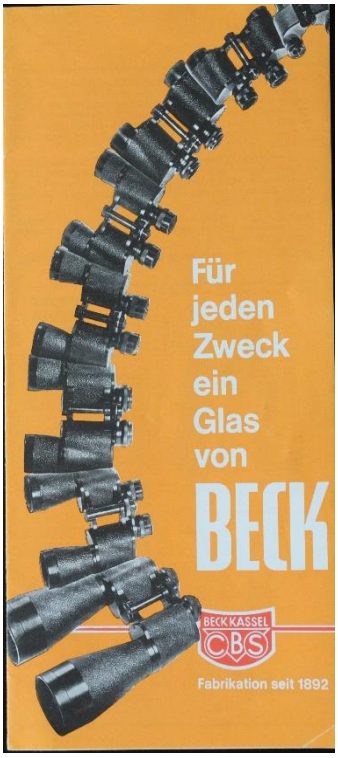


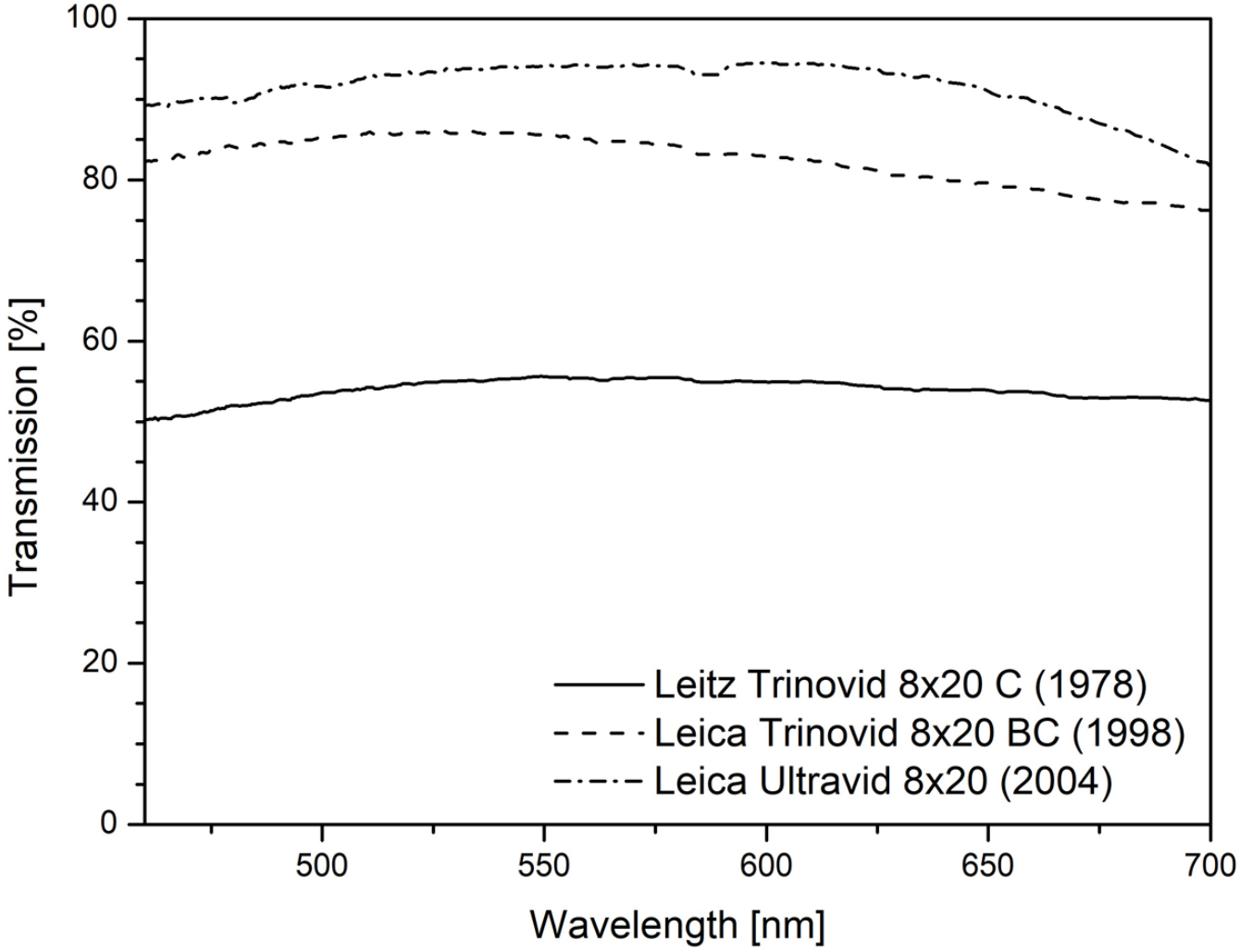
TABLE 1

BINOCULAR	**LEITZ TRINOVID COMPACT 8X20C (1978)**	**LEICA TRINOVID COMPACT 8X20 BC (1998)**	**LEICA ULTRAVID 8X20 (2004)**
Weight	180 g	228 g	243
Prism type	Uppendahl roof	Uppendahl roof	Uppendahl roof
Diameter objective **O**	20,9 mm	19,95 mm	20,0 mm
Diameter exit pupil **P**	2,45 mm	2,65 mm	2,6 mm
Magnification **M=O/P**	8,5x	7,5x	7,7x
Eye relief (mm)	8 mm	17 mm	16 mm
Field of view (m/1000m)	120m	115 m	110m
Close focus (m)	2m	2,6 m	1,6m
Eye distance beween both tubes	32-80 mm	32-80 mm	36-74 mm
Revolutions close focus to infinity	3,7	2	2
Transmission 500 nm 550 nm	 54% 56%	 85% 86%	 92% 94%
Revolutions close focus to infinity	3,7	2	2
Color reproduction	ok	ok	good
Diopter compensation	+/- 3,5 dpt	+/- 3,5 dpt	+/- 3,5 dpt
Phase coating	no	yes	yes
Authors judgment	+	++++	+++++
Price (euro) *opinion of the author*	25-75 euro	100-200 euro	500 euro

TABLE 2

BINOCULAR	**LEITZ TRINOVID 7X35B (1966)**	**LEITZ TRINOVID 7X35B (1982)**	**LEITZ TRINOVID 7X35BA (1986)**	**LEICA RETROVID 7X35B (2020)**	**BECK DIORIT 8x30 (1973)**	**FOTON 7X35**	**KOWA BD-II32 6,5X32XD**
Weight (g)	535 g	523 g	586 g	572 g	485 g	488 g	528 g
Prism type	Uppendahl roof	Uppendahl roof	Uppendahl roof	Schmidt-Pechan roof	Schmidt-Pechan roof	Schmidt-Pechan roof	Schmidt Pechan roof
Diameter objective **(O)**	34,6 mm	34,7 mm	35,6 mm	34,6 mm	29,5mm	34,8 mm	31,75 mm
Diameter exit pupil **(P)**	4,8 mm	4,7 mm	4,8 mm	5 mm	3,9 mm	4,8 mm	5,3 mm
Magnification **M=O/P**	7,2x	7,4x	7,4x	6,9x	7,6x	7,3x	6x
Eye relief (mm)	13 mm	15 mm	16 mm	17 mm	12 mm	12 mm	20 mm
Field of view (m/1000m)	150m/1000m	150m/1000m	150m/1000m	140m/1000m	130m/1000 m	150m/1000m	175m/1000m
Close focus (m)	5,5 m	5,5 m	6 m	4,2 m	6 m	6,5 m	1,1 m
Eye distance between both tubes	56-76 mm	56-75 mm	56-76 mm	55-76 mm	57-74 mm	53-74 mm	55-75 mm
Transmission (N.B.) 500 nm 550 nm	Left Right 37% 49,3% 41% 57%	 81,2% 84,5%	 81,2% 84,5%	 90% 92%	 61% 63%	 68,5% 69%	 90% 90%
Revolutions close focus to infinity	2,1	2	2	2	0,8	1,5	1,4
Color reproduction	ok	ok	ok	good	ok	Slightly yellow	good
Diopter compensation	+/- 3 dpt	+/- 3 dpt	+/- 3 dpt	+/- 3 dpt	?	+/- 5 dpt?	+/- 3 dpt
Phase coating	no	no	no	yes	no	no	yes
Authors judgment	+	++++	++++	++++	+	+	++++++
Price (euros)	50-100	300-500	300-500	1400	50-100	30-75	400

N.B. Older binoculars may suffer from loss of transmission due to impurities in the optical system, as an example see the spectra of the two Leitz Trinovid tubes from 1966; the left one has a tiny optical unclarity in the optical path, the right tube does not and that yields a 12-15% transmission loss. Visually it is even difficult to observe.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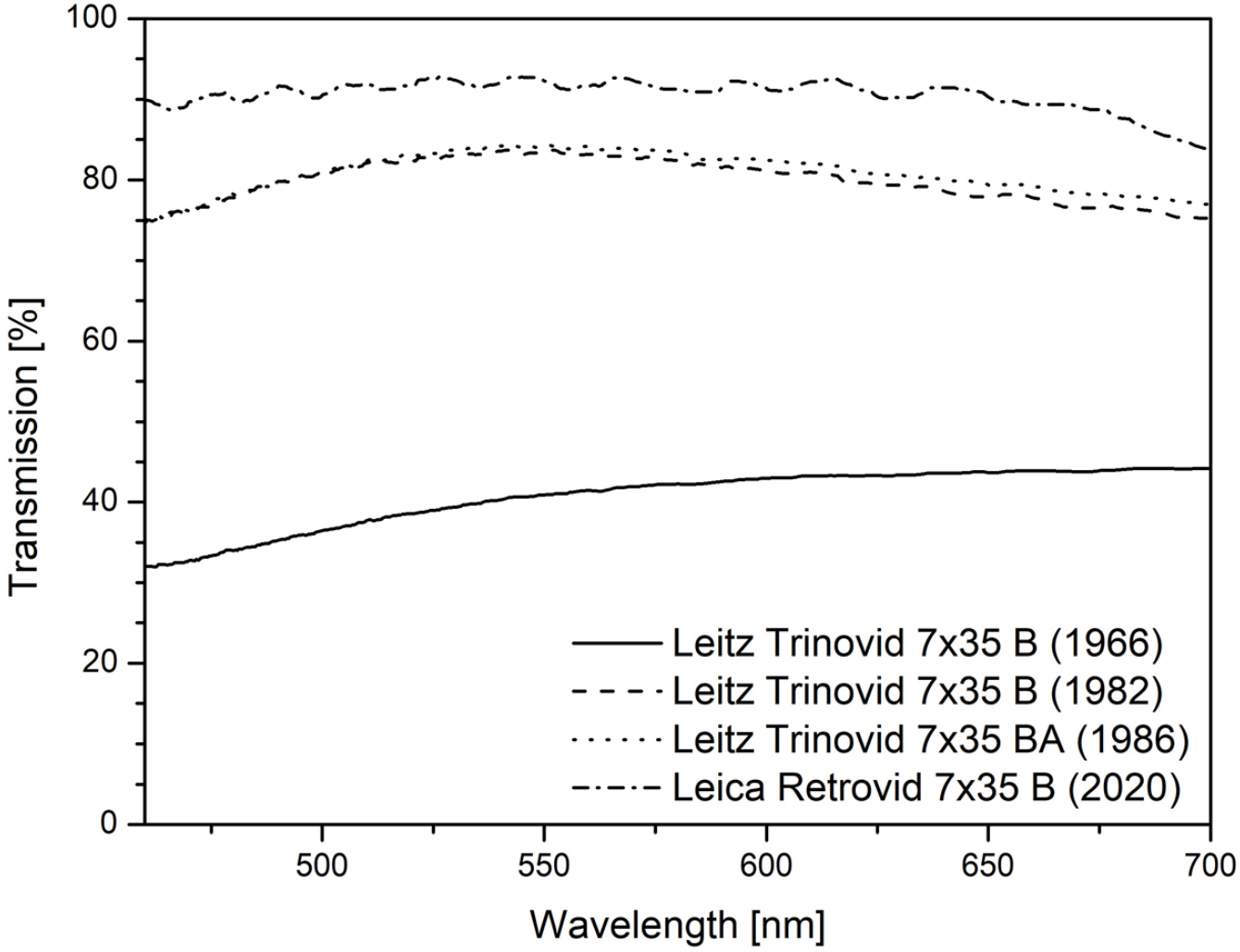
Leica Trinovid 8x20 BC (1998)
Leica Ultravid 8x20 (2004)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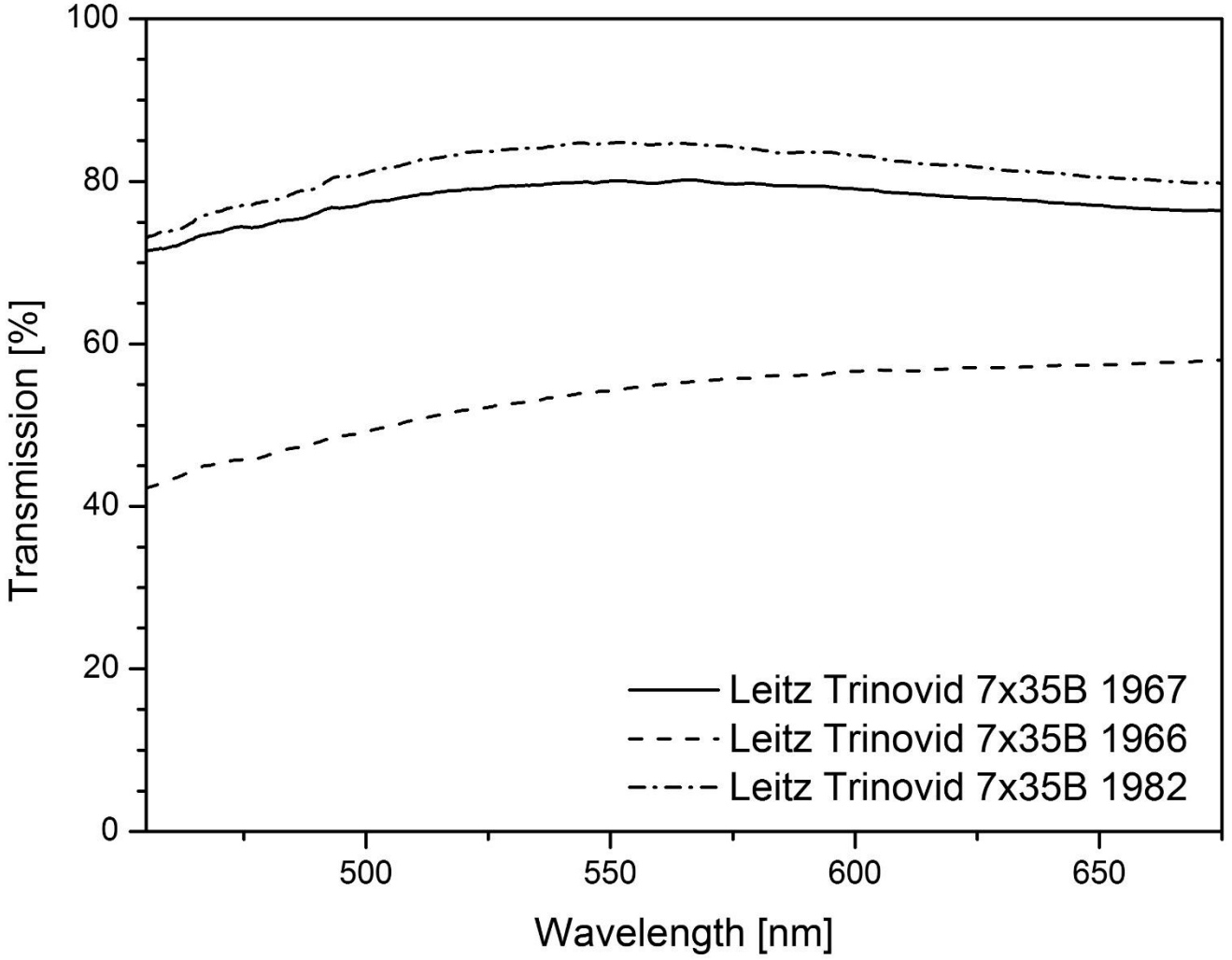
Leitz Trinovid 7x35 BA (1986)
Leica Retrovid 7x35 B (2020)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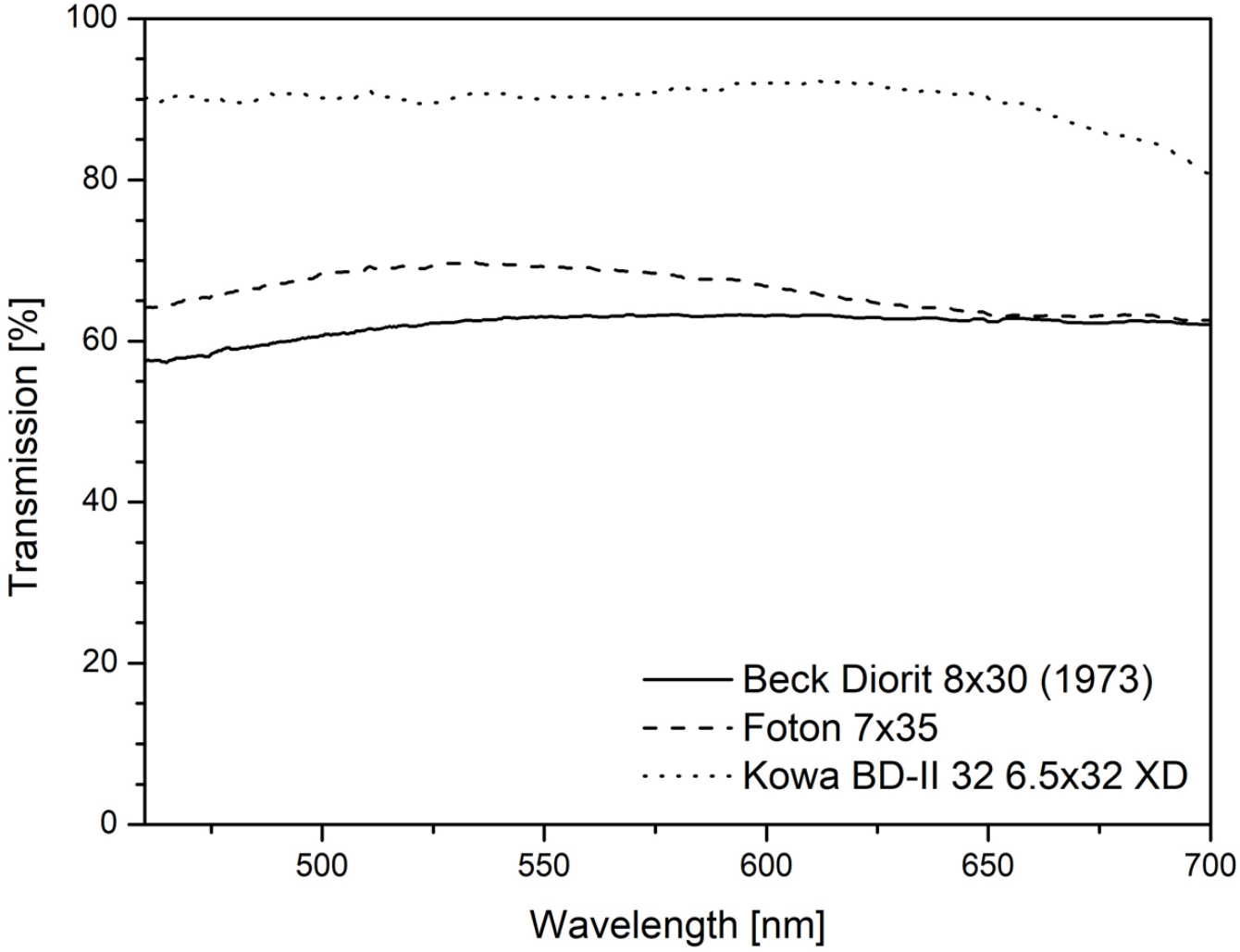
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